

**IN THE UNITED STATES DISTRICT COURT
FOR THE EASTERN DISTRICT OF ARKANSAS
LITTLE ROCK DIVISION**

UNITED STATES OF AMERICA

and

**ARKANSAS GAME AND FISH
COMMISSION AND ARKANSAS
DEPARTMENT OF ENERGY AND
ENVIRONMENT, DIVISION OF
ENVIRONMENTAL QUALITY, AS
AGENCIES OF THE STATE OF
ARKANSAS,**

Plaintiffs,

**EXXONMOBIL PIPELINE COMPANY
and MOBIL PIPE LINE COMPANY,**

Defendants.

Civil Action No. 4:24-cv-473-KGB

PLAINTIFFS' UNOPPOSED MOTION FOR ENTRY OF CONSENT DECREE

The United States of America (“United States”) on behalf of the Secretary of the United States Department of the Interior (“DOI”), acting through the Director of the United States Fish and Wildlife Service (“USFWS”) as a federal trustee of natural resources, and the Arkansas Game and Fish Commission (“AGFC”) and the Arkansas Department of Energy and Environment, Division of Environmental Quality (“ADEQ”), as state co-trustees of natural resources acting on behalf of the State of Arkansas, (collectively hereinafter “Plaintiffs”), move that the Court sign and enter the proposed Consent Decree (“CD”) between the Plaintiffs and ExxonMobil Pipeline Company and Mobil Pipe Line Company lodged with the Court on June 3,

2024. ECF Doc. 2-1.

The proposed Consent Decree resolves Plaintiffs’ civil complaint filed the same day, ECF Doc. 1, seeking damages to compensate for injuries to natural resources resulting from an oil spill from Defendants’ Pegasus Pipeline on March 29, 2013, in and around Mayflower, Arkansas. The complaint alleges claims under the Oil Pollution Act (“OPA”), 33 U.S.C. § 2702(a) and (b)(2)(A), and for the State also under Section 103(b)(3) of the AWAPCA, Ark. Code Ann. § 8–4–103(b)(3) and Arkansas Game and Fish Commission Code 01.00-H—Restitution.

The United States published a Notice of the lodging of the proposed Consent Decree in the Federal Register on June 10, 2024, to provide an opportunity to consider public comment. 89 Fed. Reg. 48919. The thirty (30) day public comment period has expired, and the United States received no public comments on the settlement. Defendants support the settlement and consent to entry of the Consent Decree without further notice. (CD ¶ 43).

As explained in the attached Supporting Memorandum, the proposed Consent Decree was negotiated by the parties in good faith and is fair, adequate, reasonable, and consistent with the objectives of the OPA and state law. The Consent Decree meets the Eighth Circuit standards

for entry. Therefore, the Plaintiffs request that the Court enter the Consent Decree as a final judgment by executing page 25 of the Decree. ECF Doc. 2-1.

Respectfully submitted,

FOR THE UNITED STATES:

TODD KIM
Assistant Attorney General
Environment and Natural Resources Division
United States Department of Justice

s/ Kenneth G. Long
KENNETH G. LONG
Senior Trial Attorney (DC Bar No. 414791)
Environmental Enforcement Section
Environment and Natural Resources Division
United States Department of Justice
P.O. Box 7611, Ben Franklin Station
Washington, DC 20044-7611
Telephone: (202) 514-2840
Fax: (202) 616-6584
Email: kenneth.long@usdoj.gov

JONATHAN D. ROSS
United States Attorney
Eastern District of Arkansas

SHANNON SMITH
Assistant United States Attorney
United States Attorney's Office
Eastern District of Arkansas
P.O. Box 1229
Little Rock, Arkansas 72203
Telephone: (501) 340-2600
Fax: (501) 340-2730
Email: shannon.smith@usdoj.gov

FOR THE STATE:

JOHN P. MARKS
Acting General Counsel
Arkansas Game and Fish Commission
Legal Division
2 Natural Resources Drive
Little Rock, AR 72205
Tele: (501) 382-3807
Fax: (501) 223-6463
Email: john.marks@agfc.ar.gov

Of Counsel:

MICHAEL MCALISTER
Deputy Chief Counsel
Arkansas Energy and Environment
Division of Environmental Quality
5301 Northshore Dr.
North Little Rock, AR 72118-5317
Tele: (501) 682-0744
Fax: (501) 682-0880
Email: Michael.McAlister@adeq.state.ar.us

CERTIFICATE OF SERVICE

I hereby certify that on July 27, 2024, a true and correct copy of the foregoing Plaintiffs' Unopposed Motion for Entry of Consent Decree was filed with the Clerk of the U.S. District Court for the Eastern District of Arkansas using the Court's CM/ECF system. Notice of this Electronic Filing will be sent to all parties by operation of the Court's Electronic Filing System. In addition, a true and correct copy of the foregoing was served on counsel for the Defendants by electronic mail to the following:

Kevin J. Vaughan
Senior Counsel, Environmental & Safety
Exxon Mobil Corporation
22777 Springwoods Village Parkway, N1.5B
Spring, Texas 77389
kevin.j.vaughan@exxonmobil.com

s/ Kenneth G. Long
Kenneth G. Long
Counsel for the United States

**IN THE UNITED STATES DISTRICT COURT
FOR THE EASTERN DISTRICT OF ARKANSAS
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UNITED STATES OF AMERICA

and

**ARKANSAS GAME AND FISH
COMMISSION AND ARKANSAS
DEPARTMENT OF ENERGY AND
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ENVIRONMENTAL QUALITY, AS
AGENCIES OF THE STATE OF
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Plaintiffs,

**EXXONMOBIL PIPELINE COMPANY
and MOBIL PIPE LINE COMPANY,**

Defendants.

Civil Action No. 4:24-cv-473-KGB

**PLAINTIFFS' MEMORANDUM IN SUPPORT OF UNOPPOSED MOTION FOR
ENTRY OF CONSENT DECREE**

The United States of America (“United States”) on behalf of the Secretary of the United States Department of the Interior (“DOI”), acting through the Director of the United States Fish and Wildlife Service (“USFWS”) as a federal trustee of natural resources, and the Arkansas Game and Fish Commission (“AGFC”) and the Arkansas Department of Energy and Environment, Division of Environmental Quality (“ADEQ”), as state co-trustees of natural resources acting on behalf of the State of Arkansas, (collectively hereinafter “Plaintiffs”), respectfully request that the Court sign and enter the proposed Consent Decree (“CD”) between

the Plaintiffs and Defendants, ExxonMobil Pipeline Company and Mobil Pipe Line Company. *See* ECF Doc. 2-1.

The proposed Consent Decree, which was lodged with the Court on June 3, 2024, resolves Plaintiffs' civil complaint filed the same day, ECF Doc. 1, which seeks recovery of money damages to compensate for injuries to natural resources resulting from the discharge of heavy crude oil from Defendants' Pegasus Pipeline on March 29, 2013, that migrated into nearby waterways, wetlands, and a portion of Lake Conway in Mayflower, Faulkner County, Arkansas (the "Oil Spill"). The Complaint alleges claims for damages under the Oil Pollution Act ("OPA"), 33 U.S.C. § 2702(a) and (b)(2)(A), and for the State also under Section 103(b)(3) of the Arkansas Water and Air Pollution Control Act ("AWAPCA"), Ark. Code Ann. § 8-4-103(b)(3) and Arkansas Game and Fish Commission Code 01.00-H—Restitution.

The United States published a Notice of the lodging of the proposed Consent Decree in the Federal Register on June 10, 2024. 89 Fed. Reg. 48919. In the Consent Decree, the United States and the State reserved the right to withdraw or withhold consent if comments received regarding the Consent Decree disclose facts or considerations that indicate the Consent Decree is inappropriate, improper, or inadequate. (CD ¶ 42). The thirty (30) day public comment period has expired, and the United States received no public comments on the settlement. Defendants do not oppose entry of this Consent Decree and consent to entry of the Consent Decree without further notice. (CD ¶ 43).

The proposed Consent Decree was negotiated by the parties in good faith and is fair, adequate, reasonable, and consistent with the objectives of the OPA and state law. The Consent Decree meets the Eighth Circuit standards for entry. Plaintiffs request that the Court enter the Consent Decree as a final judgment by executing page 25 of the Decree. ECF Doc. 2-1.

BACKGROUND

Defendants own and/or operate the Pegasus Pipeline which handled heavy crude oil. On March 29, 2013, a rupture of the pipeline resulted in the discharge of approximately 3,190 barrels of heavy crude oil in and around Mayflower, Arkansas that flowed into nearby waterways, wetlands, and entered Dawson Cove, an inlet at the southwest end of Lake Conway causing injuries to flora (habitat), fauna (including oiled migratory birds), and resource services (recreational fishing loss) in Lake Conway.

OPA provides that any person owning or operating a pipeline from which oil is discharged, or which poses the substantial threat of a discharge of oil, is liable for damages to natural resources arising from the discharge, or substantial threat of discharge, of oil, 33 U.S.C. § 2702, subject only to enumerated defenses. OPA defines “damages” for which a responsible party is liable, pursuant to Section 1002(a) of OPA, 33 U.S.C. § 2702(a), to include “[d]amages for injury to, destruction of, loss of, or loss of use of, natural resources, including the reasonable costs of assessing the damage, which shall be recoverable by a United States trustee, [and] a State trustee. . . .” 33 U.S.C. §§ 2701(5) and 2702(b)(2). Migratory birds and their supporting habitats are federal trust resources protected under the Migratory Bird Treaty Act of 1918, as amended 16 U.S.C. § 701 *et seq.*, and are also natural resources of the State of Arkansas managed by the AGFC. Pursuant to 40 C.F.R. § 300.600 (b)(2), DOI, acting through USFWS, is designated the Federal Trustee for migratory birds. AGFC and ADEQ are designated as State Trustees over state resources. The goal of OPA “is to make the environment and public whole for injuries to natural resources and services resulting from an incident involving a discharge or substantial threat of a discharge of oil (incident).” 40 C.F.R. § 990.10.

The regulations at 40 C.F.R. Part 990, OPA Natural Resource Damage Assessments (“NRDA”), provide “a natural resource damage assessment process for developing a plan for restoration of the injured natural resources and services and pursuing implementation or funding of the plan by responsible parties.”¹ The Trustees’ activities were conducted consistent with NRDA regulations. Following the Oil Spill and response, the Trustees conducted extensive assessment work (including sampling and analysis of media, wildlife collection, and surveys) in order to quantify the injury and determine a plan for restoration. In accordance with 15 C.F.R. § 990.55 (Restoration selection—developing restoration plans), on June 5, 2024, the DOI published a Draft Mayflower Oil Spill Restoration Plan for a thirty (30) day public comment period. https://www.cerc.usgs.gov/orda_docs/CaseDetails?ID=1442. DOI did not receive any public comment. The Mayflower Oil Spill Final Restoration Plan, dated July 2024 (“Restoration Plan”), is attached as Exhibit A.

As described in the Restoration Plan, the Trustees’ determined that vegetation and sediment were oiled as a direct result of the Oil Spill.² Also, a significant number of wildlife were exposed to oil, including migratory birds, mammals, fish, invertebrates, amphibians, and reptiles. *Id.* at 2-1 to 2-11. The goal of restoration is to compensate the public for injuries to natural resources and their services resulting from the Oil Spill. Under the Restoration Plan, the Trustees propose restoration projects that include preservation of approximately forty (40) acres of forested habitat, conversion of approximately four (4) acres of agricultural land to over-

¹ Part 990 may be used by trustees in conducting natural resource damage assessments when natural resources and/or services are injured as a result of an incident involving a discharge of oil. “This part is not intended to affect the recoverability of natural resource damages when recoveries are sought other than in accordance with this part.” 40 C.F.R. § 990.11. If followed, the process in Part 990 creates a “rebuttable presumption as to the damages determination.” 40 C.F.R. § 990.13.

² “Approximately 16.5 acres of vegetated area in the cove were affected by the spill and associated response activities. Contaminated soils and vegetation along the shoreline were removed to facilitate cleanup. A total of 281 dump truck loads were filled with biomass removed from the site, for a total weight of 1,829 US tons.” *Id.* at 1-3.

wintering habitat suitable for migratory waterfowl, and programs to enhance recreational fishing on Lake Conway. *Id.* at 1-7 and 3-1 to 3-5. “The purpose of the Trustees’ proposed restoration actions . . . is to make the public whole for injuries to natural resources and their services resulting from the incident by returning the injured natural resources and related services to their “baseline” condition (i.e., the condition that would have occurred but for the Mayflower Oil Spill) and compensating the public for associated interim losses.” *Id.* at 1-6.

The Complaint under OPA and state law asserts that the Oil Spill resulted in injuries to, destruction of, loss of, or loss of use of natural resources belonging to, managed by, held in trust by, appertaining to, or otherwise controlled by the Plaintiffs. The Complaint further alleges that the USFWS as the “Federal Trustee” and AGFC and ADEQ as the “State Co-Trustees” have incurred unreimbursed natural resource damage assessment costs as a result of the Oil Spill, and that Defendants are liable for damages for such injuries, destruction and losses, including for assessment costs under the OPA, and state law (Section 103(b)(3) of the AWAPCA, Ark. Code Ann. § 8–4–103(b)(3) and Arkansas Game and Fish Commission Code 01.00-H—Restitution).

TERMS OF THE SETTLEMENT

Under the proposed Consent Decree the Defendants will make a total cash payment of \$1,755,082.49 to resolve the claims in the Complaint. (CD ¶ 7). Of that sum, \$1,300,000 shall be deposited in the DOI Natural Resource Damage Assessment Restoration Fund as the Mayflower Pegasus Pipeline Oil Spill Restoration Account for the joint benefit and use of the Trustees in restoration of natural resources to conduct restoration planning and perform restoration projects to redress each type of identified injury consistent with a final Restoration Plan. (CD ¶ 22). AGFC will be the lead Trustee for Restoration Plan implementation, but “decisions regarding

any use or expenditure of funds under this Section shall be made by the Trustees.” (CD ¶¶ 22 and 23).

The Consent Decree also secures payment of the Federal Trustee’s estimated future oversight costs of \$75,000, payment to the State Trustees of \$340,082.49 for reimbursement of natural resource damages assessment costs, and \$40,000.00 as a prepayment to reimburse the State Trustees for future costs. (CD ¶ 7). Subject to a reservation of rights in Paragraph 25, the Consent Decree provides a covenant not to sue for natural resource damages from the Release Incident under OPA and under Section 113(f)(4) and (5) of the Clean Water Act (“CWA”), 33 U.S.C. § 1321(f)(4) and (5). (CD ¶ 24). The Consent Decree also requires interest and stipulated penalties for late payment. (CD ¶¶ 10-11).

Entry of the Consent Decree as a final order will resolve this civil action. The Consent Decree provides that the Court will retain jurisdiction over the matter until termination to enforce the Decree and to resolve any disputes that may arise under it. (CD ¶ 35).

STANDARD FOR ENTRY

When reviewing a proposed consent decree, the trial court is to review the settlement for fairness, reasonableness, and consistency with the statute. *See United States v. Union Elec. Co.*, 132 F.3d 422, 430 (8th Cir. 1997) (citing *United States v. Metro. St. Louis Sewer Dist.*, 952 F.2d 1040, 1044 (8th Cir. 1992) and *United States v. Cannons Engineering Corp.*, 899 F.2d 79, 86-90 (1st Cir.1990)); *Van Horn v. Trickey*, 840 F.2d 604, 606 (8th Cir.1988); *United States v. Delek Logistics Operating LLC*, No. 1:18-cv-1040, 2019 WL 5866073, at *2 (W.D. Ark. Nov. 8, 2019) (court considers whether the settlement is procedurally fair, substantively fair, reasonable, and consistent with statute.) In addition, the district court must conclude that the proposed consent decree is not the product of collusion, *Cotton v. Hinton*, 559 F.2d 1326, 1330 (5th Cir. 1977), or

unlawful, *United States v. Oregon*, 913 F.2d 576, 580-81 (9th Cir. 1990) (citing *United States v. City of Miami*, 664 F.2d 435, 441 (5th Cir. 1981) (Rubin, J., concurring)).

The Eighth Circuit has stated that the judiciary's role in assessing the merits of a consent decree is "limited to the minimum necessary to protect the interests of the class and the public. Judges should not substitute their own judgment as to optimal settlement terms for the judgment of the litigants and their counsel." *Little Rock Sch. Dist. v. Pulaski Cnty. Special Sch. Dist. No. 1*, 921 F.2d 1371, 1388 (8th Cir. 1990) (quoting *Armstrong v. Board of School Directors of Milwaukee*, 616 F.2d 305, 315 (7th Cir.1980)) (class action settlement). This limited standard of review reflects a public policy that strongly favors settlements of disputes without litigation. "The law strongly favors settlements. Courts should hospitably receive them." *Id.* at 1383. Public policy and the law favor settlements because they conserve the resources of the courts, the litigants, and the taxpayers and "should...be upheld whenever equitable and policy considerations so permit." *Aro Corp. v. Allied Witan Co.*, 531 F.2d 1368, 1372 (6th Cir. 1976).

This is particularly true in disputes involving environmental violations "where voluntary compliance by the parties...will contribute significantly toward ultimate achievement of statutory goals." *Kelley v. Thomas Solvent Co.*, 717 F. Supp. 507, 516 (W.D. Mich. 1989) (citations omitted). Moreover, the presumption in favor of settlement "is particularly strong where a consent decree has been negotiated by the Department of Justice on behalf of a federal administrative agency like EPA which enjoys substantial expertise in the environmental field." *United States v. Akzo Coatings of America, Inc.*, 949 F.2d 1409, 1436 (6th Cir. 1991) (citing *Cannons Engineering Corp.*, 899 F.2d at 84). Courts should be sensitive to the "resources consumed by the federal agencies in negotiating these decrees, as well as the chance justly to finalize a matter that otherwise would burden agencies and courts." *United States v.*

Allegheny-Ludlum Industries, Inc., 517 F.2d 826, 851 (5th Cir. 1975).

DISCUSSION

The proposed Consent Decree is consistent with the public objectives sought to be attained by the Oil Pollution Act and state law, is substantively and procedurally fair, and is adequate and reasonable. It meets the standard for entry and should be entered as a final order of the Court.

The proposed Consent Decree appropriately serves the objectives of the federal and state statutes by requiring a cash payment of \$1,755,082.49, the bulk of which will be used to fund projects proposed by the Trustees in the Restoration Plan to compensate for the injuries to natural resources and resource services. On the basis of their assessment work as described in the Restoration Plan, the Trustees have determined that the payment amount will adequately compensate for the injury on consideration of the facts in this case. The settlement is substantively fair and is reasonable because it requires the parties who owned and operated the pipeline at the time of the spill and resulting injury to bear responsibility by making a cash payment now so that the Trustees can begin the restoration efforts without further delay.

Furthermore, the proposed Consent Decree is procedurally fair as the result of good-faith, arms-length negotiation between the parties. Plaintiffs were represented by experienced counsel who worked closely with technical and legal staff from DOI, AGFC and ADEQ. ExxonMobil was represented by experienced, in-house environmental counsel with support from ExxonMobil's technical staff. The proposed Consent Decree reflects the parties' careful and informed assessment of the relative merits of each other's positions, taking into account the costs, delays and risks associated with litigating a case such as this one, including Defendants' potential challenges to evidence and methodologies supporting the Trustees' injury assessment.

Finally, the public has been provided notice and a meaningful opportunity to comment on the settlement. Plaintiffs' signatures were conditioned on review of public comment. No public comments were received. Additionally, DOI has not received public comments on the Restoration Plan. See Restoration Plan at p. iii.

CONCLUSION

This settlement is fair, adequate, reasonable and consistent with the objectives of the statutes upon which the claims are based. The United States respectfully requests that the Court execute page 25 of the Consent Decree, which was lodged with the Court on June 3, 2024 (ECF Doc. 2-1), and enter the Consent Decree as a final judgment of the Court. Defendants have consented to entry of the Decree without further notice. (CD ¶ 43). The United States requests that the proposed Consent Decree be entered without a hearing or other further proceeding.

Respectfully submitted,

FOR THE UNITED STATES:

TODD KIM
Assistant Attorney General
Environment and Natural Resources Division
United States Department of Justice

s/ Kenneth G. Long
KENNETH G. LONG
Senior Trial Attorney (DC Bar No. 414791)
Environmental Enforcement Section
Environment and Natural Resources Division
United States Department of Justice
P.O. Box 7611, Ben Franklin Station
Washington, DC 20044-7611
Telephone: (202) 514-2840
Fax: (202) 616-6584
Email: kenneth.long@usdoj.gov

JONATHAN D. ROSS
United States Attorney
Eastern District of Arkansas

SHANNON SMITH
Assistant United States Attorney
United States Attorney's Office
Eastern District of Arkansas
P.O. Box 1229
Little Rock, Arkansas 72203
Telephone: (501) 340-2600
Fax: (501) 340-2730
Email: shannon.smith@usdoj.gov

FOR THE STATE:

JOHN P. MARKS
Acting General Counsel
Arkansas Game and Fish Commission
Legal Division
2 Natural Resources Drive
Little Rock, AR 72205
Tele: (501) 382-3807
Fax: (501) 223-6463
Email: john.marks@agfc.ar.gov

Of Counsel:

MICHAEL MCALISTER
Deputy Chief Counsel
Arkansas Energy and Environment
Division of Environmental Quality
5301 Northshore Dr.
North Little Rock, AR 72118-5317
Tele: (501) 682-0744
Fax: (501) 682-0880
Email: Michael.McAlister@adeq.state.ar.us

July 2024



Photo Credit: On Wings of Care

Mayflower Oil Spill Final Restoration Plan

July 2024



Executive Summary

The Mayflower Oil Spill occurred on March 29, 2013, when the Pegasus Pipeline, owned by ExxonMobil Pipeline Company, ruptured in Mayflower, Arkansas, about 25 miles (40 km) northwest of Little Rock and released about 3,190 barrels of Canadian Wabasca heavy crude into the environment. Oil from the rupture flowed through a residential area and entered Dawson Cove, an inlet area at the southwest end of Lake Conway, a 6,700-acre man-made lake constructed in the late 1940s.

Within 30 minutes of the detection of the spill, response crews were on-site, including ExxonMobil Pipeline Company employees as well as federal, state, and local responders. Arkansas Game and Fish Commission staff built earthen berms at the head of Dawson Cove that were instrumental in containing spilled oil within the cove. Contaminated soils and vegetation along the shoreline of the cove were removed as part of response activities, resulting in the disposal (in a hazardous waste landfill) of 281 dump truck loads (1,829 US tons) of biomass removed from approximately 23 acres of the site. In addition, despite the best efforts of response personnel, a significant number of wildlife were killed due to exposure to spilled oil and response activities.

Lake Conway is a popular, high-quality fishing area. While no fishing or other water-based recreation closures or warnings were put in place due to the spill, the extensive publicity associated with the spill and concern about potential impacts in the months immediately following the spill resulted in fewer fishing trips to Lake Conway and decreased enjoyment of trips that were taken to it.

The Mayflower Oil Spill Trustees (the Arkansas Game and Fish Commission, the Arkansas Department of Energy and Environment, Division of Environmental Quality, and the U.S. Department of the Interior as represented by the U.S. Fish and Wildlife Service, collectively the “Trustees”) prepared this Restoration Plan to address injury to natural resources as a result of the Mayflower Oil Spill. The purpose of restoration is to make the environment and the public whole by implementing restoration actions that return injured natural resources and services to baseline conditions and compensate for interim losses, in accordance with the Oil Pollution Act of 1990 and associated natural resource damage assessment regulations.

In support of a proposed settlement between the ExxonMobil Pipeline Company and the Trustees, this Restoration Plan identifies three restoration efforts to be implemented by the Trustees at a total estimated cost of \$1.415 million. These efforts include preservation of habitat, conversion of agricultural land to moist soils units, and programs to enhance recreational fishing. More specifically, the Trustees anticipate:

- Acquiring, protecting and managing approximately 40 acres of forested habitat comparable to that impacted by the spill;
- Providing approximately four acres of over-wintering habitat suitable for migratory waterfowl through conversion of agricultural lands to moist soil units; and
- Allocating approximately \$450,000 to programs and/or infrastructure to enhance recreational fishing opportunities at Lake Conway.

For reasons described in more detail throughout this document, the Trustees determined that the proposed settlement satisfies the goal of OPA and is fair, reasonable, and in the public interest. These restoration efforts are in addition to actions already taken at the site by ExxonMobil Pipeline Company to address oiling and response-related impacts and facilitate the recovery of affected natural resources. ExxonMobil Pipeline Company will also reimburse the Trustees for assessment costs arising from the spill.

This Restoration Plan was available for public review and comment from June 10, 2024, through July 10, 2024. No comments from the public were received.

List of Abbreviations/Acronyms

ADEQ	Arkansas Department of Energy and Environment, Division of Environmental Quality
AGFC	Arkansas Game and Fish Commission
BHF	Bottomland Hardwood Forest
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
DOC	U.S. Department of Commerce
DSAY	Discounted Service Acre Year
DOI	U.S. Department of the Interior
ESA	Endangered Species Act
GIS	Geographic Information System
GPS	Geographic Positioning System
HEA	Habitat Equivalency Analysis
kg	kilogram
L	liter
µg	microgram
mg	milligram
NEPA	National Environmental Policy Act of 1969
NRDA	Natural Resource Damage Assessment
OPA	Oil Pollution Act of 1990
PAH	Polycyclic Aromatic Hydrocarbon
P/O	Pine/Oak
USFWS	U.S. Fish and Wildlife Service
VOC	Volatile Organic Compounds

Table of Contents

EXECUTIVE SUMMARY	I
LIST OF ABBREVIATIONS/ACRONYMS	IV
TABLE OF CONTENTS	V
CHAPTER 1: INTRODUCTION	1-1
1.1 Authorities and Regulations.....	1-1
1.2 Summary of Incident and Response.....	1-3
1.3 Purpose and Need.....	1-6
1.4 Proposed Action: Implementation of Specified Restoration Efforts to Address Vegetation, Wildlife and Recreational Fishing Spill Impacts	1-6
1.5 Public Participation.....	1-7
1.6. Administrative Record.....	1-7
1.7 Document Organization	1-7
CHAPTER 2: SUMMARY OF INJURIES TO NATURAL RESOURCES AND RESOURCE SERVICES	2-1
2.1 Vegetation/Habitat	2-1
2.2 Wildlife	2-5
2.3 Recreational Fishing.....	2-8
CHAPTER 3: SUMMARY OF ANTICIPATED RESTORATION	3-1
3.1 Vegetation/Habitat	3-2
3.2 Wildlife	3-3
3.3 Recreational Fishing.....	3-5
REFERENCES	
APPENDIX A: PAH DISTRIBUTION PLOTS FOR THE SOURCE OILS AND SEDIMENT SAMPLES FROM LAKE CONWAY ADJACENT TO DAWSON COVE SAMPLED IN JULY AND RE-SAMPLED IN NOVEMBER 2013	A-1
APPENDIX B: DETAILED HABITAT LOSS CALCULATIONS	B-1
APPENDIX C: DETAILED WILDLIFE LOSS CALCULATIONS	C-1
APPENDIX D: MAYFLOWER OIL SPILL RECREATIONAL ANGLER SURVEY	D-1
APPENDIX E: MAYFLOWER OIL SPILL RECREATIONAL ANGLER FOLLOW-UP SURVEY	E-1

Chapter 1: Introduction

On March 29, 2013, the Pegasus Pipeline, owned by ExxonMobil Pipeline Company, ruptured in Mayflower, Arkansas, about 25 miles (40 km) northwest of Little Rock and released about 3,190 barrels of Canadian Wabasca heavy crude into the environment (hereafter known as the “Mayflower Oil Spill”). Oil from the rupture flowed through a residential area and entered Dawson Cove, an inlet area at the southwest end of Lake Conway, a 6,700-acre man-made lake constructed in the late 1940s. Spilled oil fouled habitats, injured numerous species of wildlife, and made its way into Lake Conway, a popular, high-quality fishing area.

The natural resource trustees for the Mayflower Oil Spill (see Section 1.1) prepared this Restoration Plan to address injury to natural resources as a result of the spill. The purpose of restoration is to make the environment and the public whole by implementing restoration actions that return injured natural resources and services to baseline conditions and compensate for interim losses, in accordance with the Oil Pollution Act of 1990 (OPA, 33 USCA §§ 2701 to 2761) and associated natural resource damage assessment regulations.

In support of a proposed settlement with ExxonMobil Pipeline Company (the Responsible Party), this Restoration Plan identifies three efforts to be implemented by the natural resource trustees at a total estimated cost of \$1.415 million to return injured resources to baseline (i.e., conditions they would have been if not for the Mayflower Oil Spill). These are preservation of habitat, conversion and management of agricultural land to moist soils units, and programs to enhance recreational fishing. These efforts are in addition to actions already taken at the site by ExxonMobil Pipeline Company to address oiling and response-related impacts and facilitate the recovery of affected natural resources.

1.1 Authorities and Regulations

1.1.1 Oil Pollution Act Compliance

As an oil pollution incident, the Mayflower Oil Spill is subject to OPA provisions. A primary goal of OPA is to make the environment and public whole for injuries to natural resources and services resulting from an incident involving an oil discharge or substantial threat of an oil discharge. Under OPA, each party responsible for a vessel or facility from which oil is discharged, or which poses the substantial threat of a discharge, is liable for, among other things, removal costs and damages for injury to, destruction of, loss, or loss of use of natural resources, including the reasonable cost of assessing the damage. This process of injury assessment and restoration planning is referred to as natural resource damage assessment (NRDA).

OPA also identifies natural resource trustees, who are government agencies designated to implement the NRDA on behalf of the public. The Mayflower Oil Spill Trustees (Trustees) are:

- U.S. Department of the Interior (DOI), represented by the U.S. Fish and Wildlife Service (USFWS);
- The State of Arkansas Game and Fish Commission (AGFC); and
- The State of Arkansas Department of Energy and Environment, Division of Environmental Quality (ADEQ).

As described in OPA NRDA regulations (15 CFR Part 990), the NRDA process consists of three phases: (1) Pre-assessment; (2) Assessment and Restoration Planning; and (3) Restoration Implementation. The Trustees have completed the Pre-assessment phase and are currently in the Assessment and Restoration Planning phase of the Mayflower Oil Spill NRDA. The Trustees have conducted the assessment and restoration evaluation activities discussed herein. Consistent with §990.25 of the OPA NRDA regulations, the Trustees propose to exercise their authority to settle claims for natural resource damages, in a manner the Trustees deem appropriate to satisfy the goal of OPA and to be fair, reasonable, and in the public interest.

Restoration activities under OPA are intended to return injured natural resources and services to their baseline condition (primary restoration) and to compensate the public for interim losses from the time of the incident until the time resources and services recover to baseline conditions (compensatory restoration). To meet these goals, the restoration activities must produce benefits that are related to or have a nexus (connection) to natural resource injuries and service losses resulting from the spill. Consistent with OPA NRDA regulations, sums recovered by the Trustees pursuant to this settlement, other than reimbursement of Trustee costs, will be expended in accordance with this Restoration Plan, which may be set forth in whole or in part in a Consent Decree or other settlement agreement made available for public review.

1.1.2 National Environmental Policy Act Compliance

Under the OPA NRDA regulations, federal trustees must comply with the National Environmental Policy Act of 1969 (NEPA) and the Council on Environmental Quality's (CEQ) NEPA implementing regulations, 40 CFR Parts 1500-1508, when proposing restoration projects. NEPA requires federal agencies to consider the potential environmental impacts of planned actions. NEPA also provides a mandate and framework for federal agencies to determine if their proposed actions have significant environmental effects and related social and economic effects, consider these effects when choosing among alternative approaches, and inform and involve the public in the environmental analysis and decision-making process.

Although areas near the spill were used as examples for purposes of restoration scaling described in this Restoration Plan, the Trustees have not yet identified specific restoration project locations. Such information is needed to conduct NEPA evaluations. However, based on their knowledge of the local area and experience with similar projects, the Trustees believe that the type and magnitude of restoration efforts proposed (see Chapter 3) have a very low likelihood of resulting in adverse environmental, social, or economic impacts. The explicit objective of proposed actions is to enhance natural resources and resource services. By its very nature, the acquisition, protection, and management of habitat described herein is unlikely to raise NEPA concerns. Likewise, expenditures on programs and/or infrastructure to enhance recreational fishing opportunities at Lake Conway have been made for decades with no significant negative impacts to the human environment. Regardless, the Trustees would complete required NEPA analyses prior to implementation of projects funded by a NRDA settlement for this case.

1.1.3 Compliance with Other Applicable Authorities

In addition to the requirements of OPA and NEPA, requirements of other laws, regulations, and executive orders may apply to restoration implementation. The Trustees will ensure compliance with all applicable Federal, state, and local authorities prior to restoration implementation.

1.2 Summary of Incident and Response

Constructed in 1947-1948, the Pegasus pipeline is a 20-inch diameter line that runs approximately 850 miles from Patoka, IL to Nederlands, TX. The pipeline has a normal operating capacity of 95,000 barrels (bbl) per day, and is buried approximately 24 inches underground at Mayflower, Arkansas. On March 29, 2013, the Pegasus pipeline ruptured at Mayflower, spilling Canadian Wabasca heavy crude oil¹ into adjacent neighborhoods, Dawson Cove and Lake Conway.

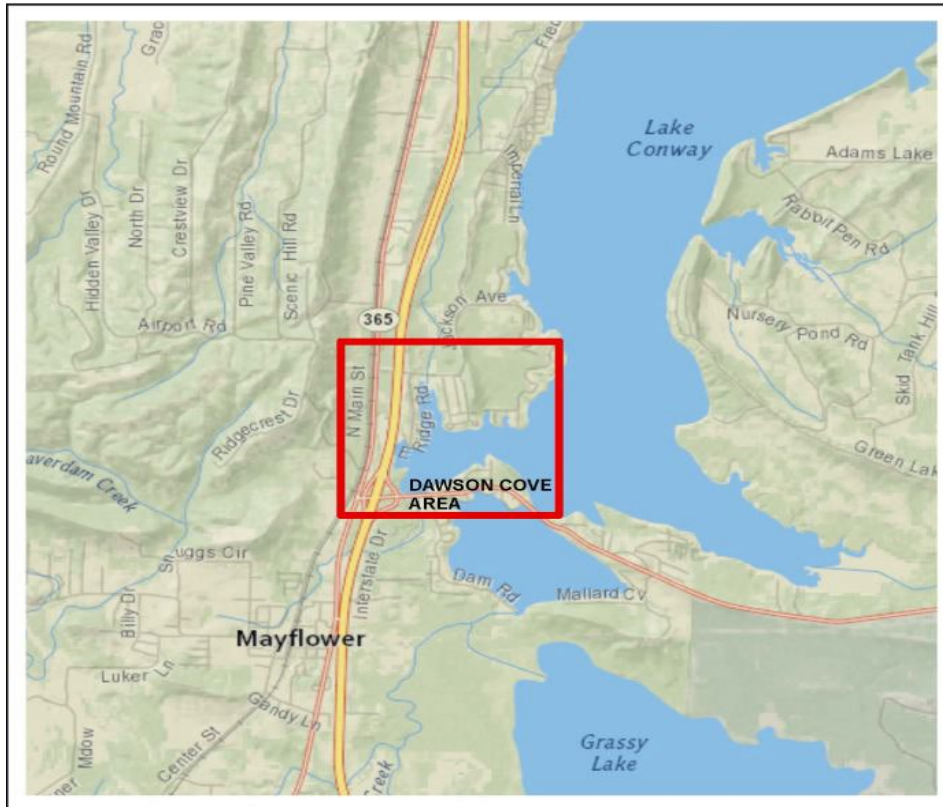
Within 30 minutes of the detection of the spill, response crews were on-site, including ExxonMobil Pipeline Company employees as well as federal, state, and local responders. Local residents were evacuated from 22 homes due elevated levels of VOCs and the amount of oil present on the ground and in the street. As part of response activities, impacted soil was removed from affected neighborhoods and damaged infrastructure replaced. AGFC staff built earthen berms at the head of Dawson Cove that were instrumental in containing the amount of oil released into the cove and Lake Conway. Other response actions included deploying thousands of feet of booms, washing and jetting areas of Dawson Cove shoreline where oil pockets were present, and extensive removal of oiled soil, sediment, and vegetation in Dawson Cove and at the site of the spill. A total of nine frack tanks were filled with approximately 4,500 bbl of oil and water.

As part of spill response activities, active wildlife searches were conducted, a wildlife hotline for the public was established, and response personnel collected and relocated wildlife encountered in the field (or in the case of venomous snakes, euthanized due to concerns for responder safety). Oiled wildlife was transferred to a rehabilitation facility for cleaning prior to release. Wildlife response directors approved hazing of wildlife at several locations, on a case-by-case basis. Exclusion netting was used on culverts at Highway 365 and Highway 40 to prevent swallows from entering the area. Hazing at culverts was planned to avoid disturbing nests of migratory birds that may have been present. Additionally, responders placed scarecrows and mylar balloons in the cove to discourage waterfowl from landing.

Dawson Cove (the Cove; Figure 1-1) is an inlet area in the southwest end of Lake Conway, near Mayflower, and was the primary destination point of oil from the Pegasus pipeline spill flowing toward the Lake. Oil from the rupture site flowed through a residential area and entered Dawson Cove via a ditch and tributary draining into Dawson Cove, as discussed in greater detail below. Dawson Cove is inhabited primarily with wetland woody species of vegetation, such as black willow, water willow, and buttonbush. Larger willows are found in the outer portion of the Cove, at higher elevations, while the lower portion is made up mainly of smaller vegetation. Approximately 16.5 acres of vegetated area in the cove were affected by the spill and associated response activities. Contaminated soils and vegetation along the shoreline were removed to facilitate cleanup. A total of 281 dump truck loads were filled with biomass removed from the site, for a total weight of 1,829 US tons. All materials removed from the cove area and the spill site were ultimately disposed of off-site in an approved hazardous waste landfill.

Figure 1-1. Location map of the area affected by the Pegasus pipeline spill (Mayflower Oil Spill) on 29 March 2013.

¹Wabasca Heavy crude oil is a blend of heavy oils obtained by polymer injection and water flooding from the Athabasca region of Canada.



Lake Conway (the Lake) is a 6,700-acre man-made lake in Faulkner County, Arkansas, constructed in the late 1940s. The southwest shore of the Lake is approximately two miles from the center of the City of Mayflower. The Lake, a tributary to the Arkansas River, is approximately eight miles long, with an average depth of six feet and a maximum depth of 18 feet. As a popular recreational fishing lake, it is stocked with several types of fish including bass and catfish. Based on analytic chemistry results for more than 1,800 water samples and 40 sediment samples collected from the Lake, the Trustees determined that only minor amounts of oil potentially entered the Lake beyond Dawson Cove (see Section 1.2.1). However, prior to the completion of those analyses, AGFC learned that some anglers were avoiding fishing in areas near the spill. As a result, the Trustees conducted a survey of licensed anglers to evaluate potential spill-related recreational fishing impacts (see Section 2.3).

Response activities continued through 2016, by that time generally limited to environmental monitoring associated with completed remediation and mitigation measures.

1.2.1 Potential for Oil Transport into Lake Conway

Water sampling locations in Lake Conway included eight sites adjacent to Dawson Cove and six background sites along the northern and eastern edges of Lake Conway. Water samples were taken at pre-determined locations in the Lake throughout the response period to monitor potential impacts of the spill on water quality. Samples were collected both from the surface and at various depths below the surface, starting on 29 March 2013. From 29 March to 31 October samples were collected daily and analyzed for volatile organic compounds (VOCs) and Priority Pollutant (parent) polycyclic aromatic

hydrocarbons (PAHs); from 1 November to 31 December 2013 samples were collected weekly and analyzed only for PAHs. Results showed:

- In 1,864 water samples analyzed for volatile organic compounds (VOCs), benzene was detected six times and only in the first week; toluene was detected 131 times with a range of 0.1-15 micrograms per liter (ug/L), and xylenes were detected 46 times with a range of 0.1-6.8 ug/L, mostly in the first ten days.
- In 1,920 water samples analyzed for PAHs, parent PAHs were detected in 0.2 to 4 percent of samples, except for naphthalene (16 percent) and pyrene (7 percent). Most of the detections in samples adjacent to Dawson Cove were collected in July 2013.
- The maximum concentration of individual PAHs was 0.9 µg/L, with the exception of pyrene. However, the maximum detected pyrene concentration adjacent to the Cove (1.0 µg/L) was less than the maximum detected background concentration (1.5 µg/L).

In addition to the above sampling program, ExxonMobil Pipeline Company prepared a Downstream Areas Remedial Sampling Plan that was approved by ADEQ on 12 July 2013. Sampling and investigation work targeted three general areas downstream of the release location (drainage ways, Dawson Cove, and Lake Conway), as well as background locations in the drainage ways and Lake, to meet three primary objectives:

- Characterize soil, sediment, and surface water quality.
- Compare analytical results for soil, sediment, and surface water to established quantitative risk-based screening levels.
- Develop a preliminary assessment of background soil and sediment quality in Lake Conway and in the drainage ways.

Additional activities included an assessment of the potential for excess sedimentation to have occurred in the Lake as a result of the response.

Sediment sampling locations in the Lake included six adjacent to Dawson Cove and six background sites along the eastern side of the Lake sampled in July and November 2013. Sediment cores were subsampled into a surface sample (0 to 0.5 foot below ground surface [bgs]) and subsurface sampling intervals (0.5 to 1 foot, etc.). Surface sediments and selected subsurface sediments were analyzed for a larger suite of PAHs², VOCs, and metals; surface sediment samples collected adjacent to Dawson Cove in July 2013 were also analyzed for grain size, black carbon, total organic carbon, and petroleum biomarkers.

Sediment sampling showed that no VOCs were detected in Lake Conway sediments (i.e., beyond Dawson's Cove).

² The PAH analyzed in sediment samples included 16 Priority Pollutant PAHs, four additional non-alkylated PAHs (benzo(a)fluoranthene, benzo(b)fluorene, benzo(e)pyrene, and perylene) and 20 alkylated PAHs. Benzo(a)fluoranthene and benzo(b)fluorene were only measured in surface sediment samples.

Background total PAH concentrations in Lake sediments ranged from 851-4,558 micrograms per kilogram ($\mu\text{g}/\text{kg}$). Higher concentrations in this range were associated geographically with highway construction and runoff from developed areas. Total PAH concentrations in Lake sediments close to Dawson Cove ranged from 1,182-2,461 $\mu\text{g}/\text{kg}$.

The Trustees conducted an oil fingerprinting analysis to determine the likely sources of measured PAHs in the sediment samples collected in July and November 2013 at six locations in the Lake adjacent to Dawson Cove. There were very few differences in the PAH distribution patterns between the July and November 2013 sampling events; all of the PAH distribution patterns appeared to be dominated by background PAHs. Of the twelve surface and six subsurface sediment samples analyzed for PAHs, all but three of them decreased between July and November, some by a factor of up to 25.

The fingerprint analysis to determine if the PAHs in samples matched the product from the Mayflower Oil Spill was based first on the hopane ratios in the six July 2013 surface sediment samples taken from adjacent to Dawson Cove and then on the PAH distribution patterns in all July and November 2013 samples. If the hopane ratio of $\text{C}29/(\text{C}29+\text{C}30)$ was between 0.400 and 0.480 (the range in the two source oil samples), then the sediment sample was determined to be a potential match with the source oil. Next, the PAH distribution patterns of potential matches were reviewed. Four of the six surface sediments samples from the Lake adjacent to Dawson Cove in July 2013 were not a match based on the hopane ratios. Upon review of the PAH distributions, the two that were potential matches were determined to represent background based on their similarities to the PAH distributions in sediment samples from the north end of the Lake. All of the sediment samples collected in November 2013 also had PAH distributions that represented background contamination. See Appendix A for PAH distribution plots for selected sediment samples and a short explanation of the PAH patterns for match and no match sediments.

Based on these results, the Trustees determined that only minor amounts of oil from the Mayflower Oil Spill potentially entered Lake Conway.

1.3 Purpose and Need

Natural resources were injured from exposure to oil as a result of the Mayflower Oil Spill. Public services provided by these natural resources were also injured. The Trustees for this incident prepared this **Final** Restoration Plan to inform the public about natural resource injuries caused by the Mayflower Oil Spill; potential restoration alternatives considered to compensate the public for those injuries; and activities the Trustees propose as the “Preferred Alternative” to accomplish the goal of restoring, rehabilitating, replacing and/or acquiring the equivalent of those resources and the services they provide.

This document is part of the Natural Resource Damage Assessment (NRDA) process being performed pursuant to OPA. The purpose of the Trustees’ proposed restoration actions, as outlined herein, is to make the public whole for injuries to natural resources and their services resulting from the incident by returning the injured natural resources and related services to their “baseline” condition (i.e., the condition that would have occurred but for the Mayflower Oil Spill) and compensating the public for associated interim losses.

The ExxonMobil Pipeline Company has been identified as the Responsible Party for the Mayflower Oil Spill under OPA. As part of the NRDA process, the Trustees reached a settlement agreement on natural resource damage claims with Exxon Pipeline Company outlined in a Consent Decree. The Department of

Justice lodged the proposed Consent Decree and filed the Complaint with the U.S. District Court for the Eastern District of Arkansas. The terms of the proposed settlement were subject to public notice but received no public comment. The settlement is subject to approval by the United States District Court. Accordingly, implementation of the restoration activities identified by the Trustees as the preferred restoration alternative(s) herein is contingent upon future court approval of a settlement agreement between the Trustees and ExxonMobil Pipeline Company. Implementation would occur as described in the court-approved Consent Decree.

1.4 Summary of Proposed Actions

The goal of restoration under OPA is to make the public whole by restoring the injured natural resources and related services to their baseline condition. The Trustees evaluated a range of restoration actions with the potential to compensate for the natural resource and resource service losses from the Mayflower Oil Spill, and propose to accomplish this by:

- Acquiring, protecting and managing approximately 40 acres of forested habitat comparable to that impacted by the spill;
- Providing approximately four acres of over-wintering habitat suitable for migratory waterfowl through conversion of agricultural lands to moist soil units; and
- Allocating approximately \$450,000 to programs and/or infrastructure to enhance recreational fishing opportunities at Lake Conway.

More information on proposed activities is provided in Chapter 3.

1.5 Public Participation

This Restoration Plan was available for public review and comment from June 10, 2024, through July 10, 2024. No comments from the public were received.

1.6 Administrative Record

OPA regulations require trustees to open a publicly available administrative record concurrently with the publication of the Notice of Intent to Conduct Restoration Planning (15 CFR § 990.45). Because a settlement agreement for the Mayflower Oil Spill was reached prior to the initiation of the Restoration Planning phase, an Administrative Record has not been established for this incident. This Restoration Plan provides the supporting information and basis for the Trustees' judgment that the proposed settlement is fair, reasonable, and in the public interest.

1.7 Document Organization

This document is organized into the following chapters:

- **Chapter 1** (Introduction): Introductory information and context for this document;
- **Chapter 2** (Summary of Natural Resource Injuries): Description of the affected environment and summary of the type and magnitude of injuries to natural resources resulting from the Mayflower Oil Spill that the Trustees intend to address in this Restoration Plan; and

- **Chapter 3** (Summary of Restoration Efforts): Description of the type and magnitude of anticipated restoration efforts and their nexus to injuries attributable to the Mayflower Oil Spill.

In addition, this document references and includes the following appendices:

- **Appendix A:** PAH Distribution Plots for the Source Oils and Sediment Samples from Lake Conway Adjacent to Dawson Cove Sampled in July and Re-sampled in November 2013;
- **Appendix B:** Detailed Habitat Loss Calculations;
- **Appendix C:** Detailed Wildlife Loss Calculations;
- **Appendix D:** Mayflower Oil Spill Recreational Angler Survey; and
- **Appendix E:** Mayflower Oil Spill Recreational Angler Follow-Up Survey.

Chapter 2: Summary of Injuries to Natural Resources and Resource Services

This chapter summarizes data and analyses supporting Trustee injury determination and quantification efforts for the three categories of natural resource and resource service loss attributable to the spill: 1) vegetation/habitat; 2) wildlife; and 3) recreational fishing. Based on Trustee review and evaluation of site and incident data, the Trustees believe that these three categories of loss reasonably capture substantive spill impacts.

2.1 Vegetation/Habitat

2.1.1 Affected Environment

Division of the impacted area into different vegetation habitats was made based on digital elevation and hydrology maps, satellite imagery, and site data on species composition by AGFC (2013) and ARCADIS (2014). Using the land cover analysis of 2011 WorldView-2 imagery, the impacted vegetation was classified as predominately shrub/scrub (58.36 percent) and tree (36.11 percent) vegetation classes with patches of bare soil (2.33 percent), water (1.79 percent), and unclassified vegetation (1.4 percent).

ARCADIS (2014) described 23 species from wetland sites within the tree vegetation class in Dawson Cove, though the dominant species were oaks, maple, and gums. AGFC (2013) provided separate descriptions of the “shrub/scrub” vegetation class as composed largely of buttonbush and black willow. Matching these species assemblages to forest communities described in published literature, the vegetation in Dawson Cove was determined to be typical of bottomland hardwood forest (BHF) communities (Wharton et al., 1982; Brown and Peterson, 1983; Engler, 1988; Hodges, 1997; Giese et al., 2003).

The riparian vegetation along the ditch and stream between the release site and Dawson Cove and the vegetation behind the affected residential area are composed of shortleaf pine and oaks, based on AGFC (2014) surveys of adjacent forested areas.

The ages of these habitats were determined by tree cores from AGFC (2013), satellite imagery, and the maximum age of vegetation in Dawson Cove based on the year that Lake Conway was completed (1950). The results were used to determine the following ages for the vegetation that was removed during response and remediation activities:

- Pine/Oak (PO): Older growth trees near the residences (most upstream habitat) were 66 years old prior to the spill.
- Pine/Oak (PO): Younger growth trees along the stream between the residences and Dawson Cove were 13 years old prior to the spill.
- Bottomland Hardwood Forest (BHF) dense tree cover: Larger trees in upper Dawson Cove were 63 years old prior to the spill.
- Bottomland Hardwood Forest (BHF) shrub/scrub cover: Smaller trees in upper Dawson Cove were 63 years old prior to the spill.

2.1.2 Pathway and Injury Determination

The oil spill released from the pipeline flowed across a residential area and into a stream that drains into Dawson Cove. The oil entered Dawson Cove and was contained within the cove by an earthen dam constructed to contain the spill, booms, and the thick vegetation. In addition to impacts from oiling, cleanup operations that adversely affected the vegetated habitats included:

Vegetation Behind the Residential Area:

- Removal of oiled trees.
- Excavation of oiled sediment.

Riparian Vegetation Along the Stream Channel:

- Removal of oiled vegetation and sediment along 1,300 linear feet during the first phase of the response.
- Further sediment excavation (three to 36 inches depth) from the stream channel in September 2014 to reduce chronic sheening; with areas with greater than 12 inches excavation backfilled.

Dawson Cove:

- Manual removal and flushing of oiled soils and vegetation along the edges of the cove.
- Mechanical removal of oiled soils and vegetation: in the forested part of the cove the larger trees were not removed; in the scrub/shrub part of the cove the majority of the vegetation was removed.
- In late 2014, to address chronic sheening, organoclay was placed on over two acres of forested wetlands in the middle cove; and a reactive cap (sand and PM-199 organoclay) of three to seven inches in thickness was placed on over four acres of open water area.

The large-scale mechanical removal of oil, oiled sediment, and oiled vegetation in Dawson Cove resulted in extensive disturbance to the substrate, mortality of wetland-associated vegetation and biota, and the removal of 1,829 US tons of soil and vegetation.

2.1.3 Injury Quantification

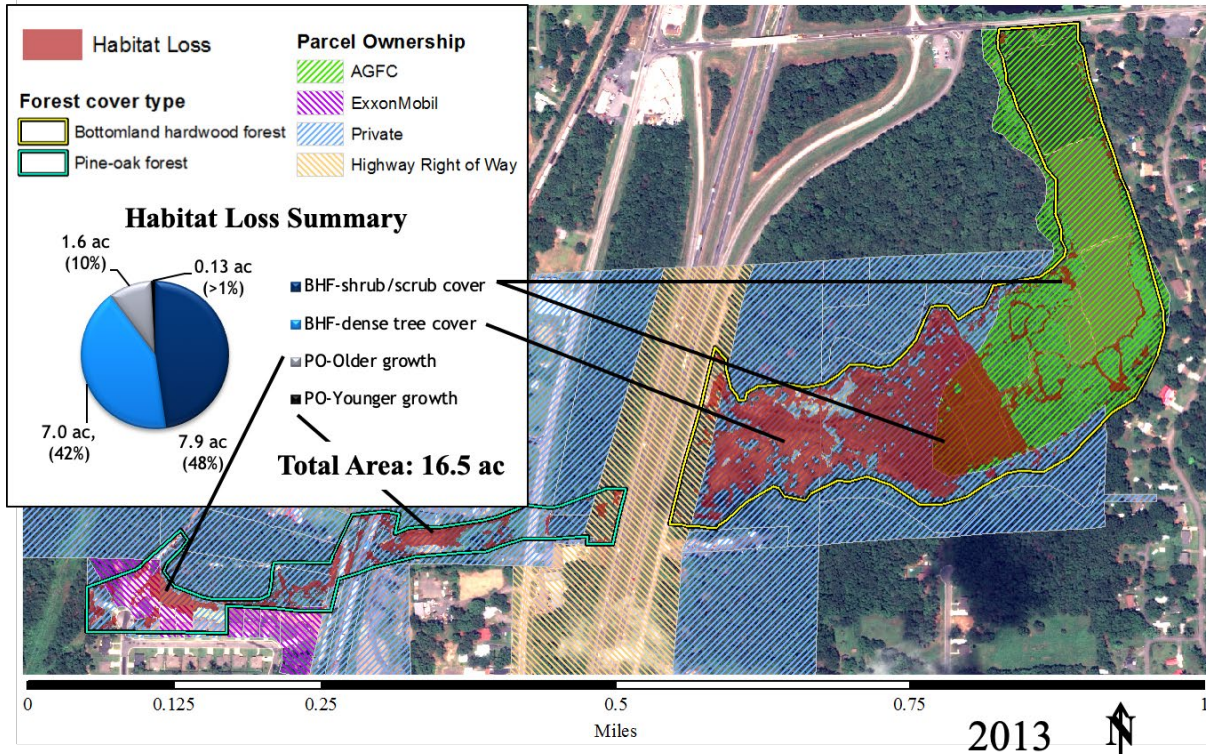
Remote sensing imagery was used to determine the areal extent of these vegetation types on 9 July 2011 (nearly two years before the spill on 29 March 2013) and 31 July 2013 (four months post-spill). Figure 2-1 shows the two images. Figure 2-2 shows the extent of habitat loss by forest cover types as a result of the spill and response actions. The acres of habitat loss were determined as:

- Pine-Oak – older near residences = 1.6 acres;
- Pine-Oak – younger in stream = 0.13 acres;
- Bottomland Hardwood Forest – trees in upper Cove = 7.0 acres;
- Bottomland Hardwood Forest – shrub/scrub in middle Cove = 7.9 acres; and

Figure 2-1. (top) Image of Dawson Cove taken on 9 July 2011, about two years prior to the spill. (bottom) Image of Dawson Cove taken on 31 July 2013, four months post-spill.



Figure 2-2. Extent of habitat and vegetation injury resulting from the spill and response actions.



- Lower part of Dawson Cove: No significant change.
- The Trustees determined a total of 16.5 acres of lost vegetation.

A Habitat Equivalency Approach (HEA) model (NOAA, 2000; Unsworth and Bishop, 1994; Dunford et al., 2004) was used to quantify the habitat injury using vegetative biomass as a metric to represent the ecological resources and services that were affected as a result of the spill and associated response actions. Information from the peer-reviewed literature and public information repositories was used to determine biomass accumulation rates (in US tons per acre) of the different forest types over time. Specifically, the US Forest Service Forest Inventory and Analysis Database, which includes long-term empirical data for biomass accumulation, was used for the South Central Region Oak/Pine and Oak/Cypress/Gum forest types. Baseline was determined to be the cove biomass (in US tons per acre) present at the time of the spill, and that would be present based on its future accumulation over time, for each forest type. Injury was quantified as the difference between baseline and the forecasted biomass accumulation after the spill and response, which removed the vegetation. Components of loss include above ground biomass of the trees and understory, and belowground biomass. In the modeling of accumulation rates, soil carbon accounts for approximately 20 US tons/acre of biomass at the time secondary succession begins. For the HEA, habitat service losses are based on the differences in the two biomass accumulation rates for each forest type over time. Calculations were carried out to 100 years and losses discounted at three percent per year. Discounted losses were then summed for all forest habitat types. Table 2-1 shows the results of the HEA model, with vegetation habitat injury reported as discounted service acre years (DSAYs). See Appendix B for additional habitat loss calculations.

Table 2-1. Vegetation habitat injury in discounted service acre years (DSAYs).

Vegetation Habitat Type	DSAYs
Bottomland Hardwood Forest – Dense tree cover	134
Bottomland Hardwood Forest - Shrub/scrub cover	108
Pine-Oak Forest – older growth	28
Pine-Oak Forest – younger growth	1
Total Vegetation Habitat Service Loss	271

2.2 Wildlife

2.2.1 Impacted Wildlife Surveys

As part of spill response activities, wildlife searches were conducted and field teams collected location information using handheld geographic positioning system (GPS) devices, allowing daily track lines to be recorded for wildlife surveys and captures. Figure 2-3 shows wildlife search track lines from late May to November 2013. Information on the date and location of wildlife that was encountered, as well as species, oiling status, and, if applicable, rehabilitation and release status, was maintained in a wildlife database throughout the response period. Table 2-2 provides a list of wildlife species potentially impacted by the Mayflower Oil Spill, based on a dataset of all wildlife captured, rehabilitated, and released throughout the response period.

Figure 2-3. Wildlife search track lines recorded from late May to November 2013.

Table 2-2. Species identified in the Mayflower Oil Spill wildlife database.

BIRDS		
Wood duck	Sora	Blue wing teal
American coot	Indigo bunting	Eastern kingbird
Mallard	Northern parula	Hooded merganser
American robin	Canada goose	Purple finch
Pied-billed grebe	Common grackle	Sparrow
Coot	Cormorant	Mockingbird
Gadwall		
REPTILES		
Cottonmouth	Midland water snake	Fence lizard
Mud snake	Speckled king snake	Southern painted turtle
Banded watersnake	Yellow-bellied watersnake	Southern coal skink
Ribbon snake	Eastern racer	Ornate box turtle
Rough green snake	Hognose snake	Five-lined skink
Black rat snake	Broad-banded watersnake	Broadhead skink
Copperhead	Common snapping turtle	Prairie kingsnake
Western ribbon snake	Red-eared slider	Chicken turtle
Tree snake	Yellow-bellied slider	Spiny soft-shell turtle
Midland brown snake	Eastern river cooter	Mississippi map turtle
Worm snake	Three-toed box turtle	Mississippi mud turtle
Garter snake	Musk turtle	
AMPHIBIANS		
Three-toed amphiuma	Bronze frog	Lesser siren
American toad	Narrow mouth toad	Mole salamander
Green tree frog	Dwarf American toad	Marbled salamander
Leopard frog	American bull frog	Spotted salamander
Fowler's toad	Eastern narrow-mouthed toad	Juvenile salamander
Cricket frog		
MAMMALS		
Muskrat	Armadillo	Short-tailed shrew
Nutria	Field mouse	Opossum
Beaver	Skunk	Grey squirrel
Raccoon	Ground squirrel	Beaver kit
FISH		
Sunfish	Largemouth bass	Channel catfish
Gar	Crappie	

2.2.2 Pathway and Injury Determination

A significant number of birds, mammals, fish, invertebrates, amphibians, and reptiles were exposed to oil from the spill. Trained government and Responsible Party personnel were authorized to handle and collect wildlife. As noted above, some oiled wildlife were collected and moved to a rehabilitation center until they could be re-released. Response personnel collected data on the oiling status of wildlife encountered and collected in the field.

All animal releases, with the exception of birds, took place in the Bell Slough Wildlife Management Area, located approximately 1.5 miles south of the Incident Command Center. All birds, except waterfowl, were banded at the time of release. One beaver was also captured within the response area and released at Ed Gordon Point Remove Wildlife Management Area, under the direction of AGFC.

The Trustees created a separate protocol for the collection of oiled wildlife carcasses. Field personnel photographed each carcass that was collected and placed it into a paper bag within a plastic bag. All carcasses were then stored at the designated carcass collection facility in North Little Rock, about 18 miles from Mayflower.

Despite the best efforts of response personnel, a significant number of wildlife were killed due to the direct effects of oiling (immediate or delayed) or response activities. Finally, as noted above, venomous snakes encountered during response activities were also euthanized in the field due to concerns for responder safety.

2.2.3 Injury Quantification

Trustee and Responsible Party representatives recorded the number and species of animals observed oiled following the spill.³ However, due to limitations in response workers' abilities to find all oiled wildlife, additional calculations must be performed to reasonably estimate the likely true magnitude of wildlife losses attributable to the oil spill. Impacted wildlife might be missed, for example, due to limitations in the location and frequency of wildlife searches, difficulties observing injured wildlife in and among vegetation, consumption of injured wildlife by predators, and other factors.

The Trustees relied on published and site-specific information and a GIS-based models to "scale up" to the actual number of wildlife estimated to have been killed as a result of the Mayflower Oil Spill, a well-established approach in natural resource damage assessment (see Appendix C for detailed information on these calculations). Briefly:

- The Trustees estimated the number of oiled birds not found by multiplying the number of oiled birds found by 1) an assumed searcher efficiency (i.e., less than 100%) and 2) an assumed bird carcass persistence (i.e., how long an impacted bird might persist in the area to be found). These factors resulted in an overall searcher efficiency and carcass persistence multiplier of 1.33 (i.e., 1.33 more birds were assumed killed by exposure to oil than were found).
- With the exception of turtles, based on relevant technical literature and experience at other spills, oiled, rehabilitated, and released wildlife were assumed to die prematurely post-release.

³ Based on the 2013 Wildlife Database compiled by AGFC.

- The Trustees summed the total numbers of collected oiled wildlife carcasses, the numbers of animals euthanized in the field and that died in transit or possession, the numbers of oiled and released (but assumed to die prematurely) animals, and the estimated numbers of unrecovered oiled wildlife (see Appendix C) to calculate total estimated wildlife mortalities by wildlife group.

The results of Trustee wildlife injury calculations are summarized in Table 2-3.

Table 2-3. Total estimated wildlife mortality as a results of the Mayflower Oil Spill.

Species Category	Found Oiled And Dead By Searchers ⁴	Died In Transit/Rehab Or Euthanized	Oiled, Rehabilitated, and Released	Estimated Oiled and Not Discovered	Total Estimated Killed
Birds	43 ⁵	9	13	55	120
Turtles	9	8	440	79	96⁶
Snakes	13	276 ⁷	56	47	392
Amphibians	12	25	89	47	173
Mammals	3	6	3	-	12
Other Reptiles	1	1	3	-	5
Fish	2	0	0	-	2

2.3 Recreational Fishing

2.3.1 Affected Environment

Lake Conway is a popular, high-quality fishing area. As stated on the AGFC website:

“Lake Conway is the largest Game and Fish Commission lake and the largest lake ever constructed by a state wildlife agency. Because of its large size, central location and excellent fishing, it has been one of the state's favored fishing spots since it was built on Palarm Creek in 1948. Lake Conway was the first lake constructed by the Arkansas Game and Fish Commission.

Conway is best known for its seemingly endless supply of bluegills and redears. Creel surveys indicate that bream are not only the most popular fish, they account for the most poundage taken by anglers.

Bass and crappie fans also flock to Conway, hoping to catch one of the lake's lunker largemouths or a mess of big slabs. Big blue and channel catfish are abundant, and Conway is a hotbed for monster flatheads.

⁴ Includes only animals that were oiled and dead when found by searchers.

⁵ Adjusted using the searcher efficiency and carcass persistence multiplier of 1.33. The actual number of birds that were both oiled and dead when found by searchers is 32.

⁶ Oiled, rehabilitated, and released turtles are not included in the total calculation for turtles.

⁷Includes snakes that were euthanized upon encounter in the field.

Fishing is good around logjams, brushpiles, stumps, cypress trees, lily pads buckbrush, inundated lakes, creek channels, private docks and the Highway 89 bridge.

Numerous boat trails are cleared and marked. Boaters leaving the trails should navigate cautiously. Many stumps and logs lie unseen just below the water's surface, making spare shear pins essential gear here.

An east-side nursery pond permits stocking millions of crappies, largemouth bass and catfish directly into the lake. Fingerling fish from hatcheries are fed until they reach sizes ensuring safety from most predators. The fish are then released into the lake through a canal. Before the nursery pond was constructed in 1968, crappie were almost non-existent in Lake Conway.”⁸

Although estimates of the total number of fishing trips taken annually to Lake Conway have not been made since the early 1980s, a 1981 Lake Conway creel survey (i.e., approximately 32 years prior to the spill) estimated 117,434 fishing trips on the Lake from 1 March through 31 December 1981. A 1982 Lake Conway creel survey (i.e., approximately 31 years prior to the spill) estimated 103,175 fishing trips on the lake from 1 January through 31 December 1982.

At the time of the spill, there were approximately 8,300 licensed anglers in the zip codes adjacent to Lake Conway, and approximately 16,200 licensed anglers in zip codes not adjacent to but within 10 miles of Lake Conway. While no fishing or other water-based recreation closures or warnings were put in place as part of Mayflower Oil Spill response activities, AGFC conducted intercept surveys on the Lake and learned that some anglers were avoiding fishing in areas near the spill, potentially resulting in fewer trips taken to Lake Conway and decreased enjoyment of trips taken to the Lake.

2.3.2 Pathway and Injury Determination

The OPA NRDA regulations state that a key component of injury determination includes evaluation of whether “an injury to a natural resource or impairment of a natural resource service has occurred as a result of response actions or a substantial threat of a discharge of oil” (emphasis added; 15 CFR § 990.51(b)(2)(ii)). The goal of the OPA, 33 U.S.C. 2701 *et seq.*, is to make the environment and public whole for injuries to natural resources and services resulting from an incident involving a discharge or substantial threat of a discharge of oil (incident) (15 CFR § 990.10), where “services” (or *natural resource services*) means the functions performed by a natural resource for the benefit of another natural resource and/or the public (15 CFR § 990.30). In the case of the Mayflower Oil Spill, “services” includes lost recreational fishing opportunities.

Oil spills of this magnitude are uncommon in Arkansas, and the Mayflower Oil Spill received extensive press coverage. Informal angler interviews conducted in the weeks following the spill indicated clear, understandable concern about the presence of oil in Lake Conway, potential exposure to spilled oil, and/or potential health risks associated with consumption of fish caught in the Lake. Based on surveys with potential anglers, the Trustees determined that recreational fishing services provided by Lake Conway were reduced due to the spill and the associated substantial threat of discharge into the Lake during the several months following the spill (see Section 2.3.3).

⁸ <https://www.agfc.com/en/zone-map/fishing-map/579/>. Accessed 16 June 2020.

2.3.3 Injury Quantification

In response to changes in the perceived quality of a fishing area or perceptions of potential health impacts, anglers may feel inclined to travel to alternative, less preferred sites, fish less frequently, or change fishing practices, all which may result in a loss of value to the angler. Value refers to the economic concept of “consumer surplus”, which represents the additional benefit that an angler derives from a fishing trip above and beyond their trip expenditures (e.g., costs to travel to the fishing site, supplies, etc.). The Trustees conducted a survey of licensed anglers, summarized below, to evaluate the potential impact of the Mayflower Oil Spill on recreational fishing at Lake Conway.

The Trustees’ angler survey was pre-tested with a small sample of local anglers and ultimately mailed to 1,200 adult license holders in early September 2013 by the Survey Research Center at the University of Arkansas, Little Rock. The sample was drawn from all zip codes that fall wholly or partially within a 10-mile radius of the Lake. The survey (Appendix D) included questions about fishing activity and locations during April – July 2013 (i.e., the first four full months following the spill), aspects of respondents’ most recent trip, opinions regarding resource management activities, and demographic characteristics. The specific questions regarding changes in fishing experience and activity due to the spill are excerpted in Figure 2-4 below.

The overall response rate for the survey was approximately 40 percent, reasonable for this type of survey based on decades of experience conducting similar surveys. A brief follow-up survey was mailed to a random sample of 400 survey non-respondents in late October 2013. Because avid anglers may be more likely to respond to a survey, the follow-up survey (Appendix E) contained identical questions regarding fishing activity to determine whether and what extent this may have been the case. The response rate to the follow-up survey was 13 percent, reasonable for this type of follow-up survey (i.e., of people who chose not to respond to the initial survey) based on prior experience.

Responses to the survey were used to calculate the average numbers of diminished trips to the Lake, and additional trips not taken, due to the spill. The averages were then multiplied by the total number of licensed anglers in the sampled area, resulting in an estimate of approximately 3,700 diminished trips and 24,500 trips not taken to the Lake in the four months following the spill.

Figure 2-4 Excerpt from Mayflower Spill Recreational Fishing Survey.

13 Did you take any fishing day trips to Lake Conway in the four months after the spill — April, May, June, and July of 2013?

- YES ₍₁₎ How many? _____ DAY TRIPS
- NO ₍₂₎ → Skip to Question **16**.

14 Did the oil spill have any impact on these fishing trips to Lake Conway?

- YES ₍₁₎ NO ₍₂₎ → Skip to Question **16**.

15 Please indicate how the oil spill affected these Lake Conway fishing trips. *(Check all that apply.)*

- BECAUSE OF THE SPILL, I DIDN'T FISH THE AREA OF LAKE CONWAY THAT I WOULD NORMALLY FISH ₍₁₎
- BECAUSE OF THE SPILL, I DECIDED TO THROW BACK FISH THAT I WOULD NORMALLY KEEP ₍₂₎
- BECAUSE OF THE SPILL, MY TRIP WAS LESS ENJOYABLE THAN NORMAL BECAUSE I WAS WORRIED ABOUT THE POSSIBILITY OF OIL IN THE LAKE ₍₃₎
- OTHER (SPECIFY): _____

16 Did you fish Lake Conway less often than you normally would in April, May, June, and July because of the spill?

- YES ₍₁₎ NO ₍₂₎ → Skip to Question **18**.

17 If the spill had not occurred, how many additional fishing day trips do you think you would have taken to Lake Conway in April, May, June, and July of 2013?

_____ ADDITIONAL DAY TRIPS

Chapter 3: Restoration Alternatives

3.1 Introduction

The goal of restoration under OPA is to compensate the public for injuries to natural resources and their services resulting from an oil spill. This goal is achieved through the return of the injured natural resources and their services to baseline conditions and compensation for interim losses from the date of the incident until recovery. To fulfill this purpose, this section introduces potential restoration actions (to be funded by a settlement with ExxonMobil Pipeline Company) to restore the natural resources and resource services injured by the Mayflower Oil Spill and identifies the Trustees' preferred alternative.

The analysis completed by the Trustees described in Chapter 2 quantified the amount of injury to natural resources resulting from the Incident. Per section 1006(c)(1)(C) of OPA, Trustee restoration actions must restore the equivalent of the injured resources by providing resources and services of the same type and quality and of comparable value (i.e., restore, rehabilitate, replace or acquire the equivalent) as those injured. The process of "scaling" compensatory restoration actions involves determining the size of the restoration action(s) needed to provide resource and service gains equal to the value of interim losses due to the release of hazardous substances (NOAA 1997, 1999). Because the duration of the injury differs from the lifespan of the restoration action(s), equivalency is calculated in terms of the present discounted value of services lost due to resource injuries and gained due to compensatory restoration.

The OPA NRDA regulations require that trustees consider a reasonable range of restoration alternatives, including a "No Action/Natural Recovery" alternative before selecting their preferred alternative(s) (OPA § 990.53). Restoration actions are defined as primary or compensatory. Primary restoration actions are actions that restore injured natural resources and services to their baseline condition (that is, their condition prior to the release of oil). Active primary restoration is an action that expedites the return of injured resources to their baseline condition. Compensatory restoration addresses interim losses of natural resource services from the time of initial injury until full recovery of natural resources to their baseline condition. Natural recovery, in which no human intervention is taken to restore the injured resources, is considered a primary restoration alternative, and is appropriate where feasible or cost-effective active primary restoration actions are not available or where the injured resources would recover relatively quickly without human intervention. The scale of compensatory restoration projects depends on the nature, extent, severity, and duration of the resource injury. Active primary restoration actions that speed resource recovery would reduce the scale of compensatory restoration required.

For primary restoration, the Trustees considered both the natural recovery option and active primary restoration at the spill site. Although response actions were taken following the spill, impacts to the environment were not fully restored and interim ecological service losses were anticipated to ensue. Accordingly, the Trustees determined that a number of potential restoration actions would be needed to compensate the public for the losses. For compensatory restoration, OPA regulations clearly establish Trustee authority to seek compensation for interim losses if technically feasible, cost-effective alternatives exist. While the Trustees have not yet proposed specific logistics in implementing restoration, they have identified technically feasible, cost-effective restoration alternatives in the area of the spill and propose to settle claims for natural resource damages at this time as the proposed

settlement would satisfy the goal of OPA and be fair, reasonable, and in the public interest (OPA §990.24).

To make the public whole for injuries to natural resources and their services resulting from the Mayflower Oil Spill, the Trustees propose to settle claims for natural resource damages in the amount of \$1,415,000 (in addition to reimbursement for past assessment and administration costs) to implement three primary restoration activities:

- Acquiring, protecting and managing approximately 40 acres of forested habitat comparable to that impacted by the spill;
- Providing approximately four acres of over-wintering habitat suitable for migratory waterfowl through conversion of agricultural lands to moist soil units; and
- Allocating approximately \$450,000 to programs and/or infrastructure to enhance recreational fishing opportunities at Lake Conway.

This chapter summarizes data and analyses underlying the type and magnitude of restoration proposed by the Trustees for these activities.

3.2 No Action/Natural Recovery

Under the No Action alternative, none of the proposed efforts identified in this Restoration Plan would be implemented at this time. The No Action alternative, inclusion of which is a NEPA requirement, provides a benchmark enabling decision makers to compare the magnitude of environmental effects of the action alternatives (40 CFR § 1502.14(d)). Under a No Action alternative, the Trustees would not undertake compensatory restoration projects to offset injuries to natural resources attributable to the Mayflower Oil Spill. Given that technically feasible, cost-effective restoration approaches are available to compensate for interim natural resource and service losses, the Trustees rejected this alternative and do not consider it further in this Restoration Plan.⁹

3.3 Vegetation/Habitat

To compensate the public for the habitat losses, the Trustees evaluated various restoration options including a new weir spillway for the Lake Conway dam, bank stabilization, silt removal from the upper end of Lake Conway, and projects to reduce the sediment load into Lake Conway. Considering potential logistics, costs, and benefits, the Trustees propose land acquisition and subsequent protection and management as the preferred option, where service gains are credited from the prevention of future habitat loss as a result of residential development or timber harvest. By preventing future degradation of habitat similar to that impacted by the spill, compensatory vegetative biomass and associated natural resource services will be generated.

⁹As used in OPA regulations, the term ‘cost effective’ is defined to mean “the least costly activity among two or more activities that provide the same or a comparable level of benefits, in the judgment of the trustees” (15 CFR § 990.30).

Biomass accumulation rates were determined for several illustrative parcels in the vicinity of Lake Conway representative of the forest types that were injured, using a three percent discount rate for consistency with injury quantification calculations. The potential for future development is a key factor in scaling the benefits of land acquisition. The probability of development for illustrative parcels in the vicinity of Lake Conway was based on the opinion of AGFC real estate staff (Mark Kilburn, pers. comm., August 2017) as: 5-10 years = 20%; 10-25 years = 30%; and 25-100 years = 50%. The resulting HEA analysis indicated that acquisition, protection and management of approximately 40 acres of land by AGFC would compensate the public for the habitat losses resulting from the spill. The Trustees will identify parcels to be targeted for acquisition after completing the settlement process with ExxonMobil Pipeline Company.

Based on the market for potentially relevant properties in the Lake Conway area, the Trustees believe that the settlement amount of \$450,000 for this restoration component is reasonable to meet the Trustees' land acquisition objective. AGFC will not close on final acquisition of property as compensation for the Mayflower Oil Spill until after all real estate and legal due diligence has been fully completed, including any applicable NEPA requirements. Acquired properties will be owned and managed by AGFC to maintain habitat conditions compensating for habitat service losses caused by the spill, which the Trustees anticipate will also be suitable for a variety of game and nongame animals.

3.4 Wildlife

To quantify the amount of restoration required to restore the animals estimated to have been killed as a result of the spill, the Trustees focused on a combination of two restoration approaches, discussed below.

3.4.1 Habitat preservation to restore resident birds and wildlife

The preservation and management of approximately 40 acres of appropriate habitat to compensate for vegetation/habitat losses (see Section 3.1) also will be sufficient to offset injuries to certain bird species, reptiles, amphibians, mammals, and fish impacted by the spill. This determination was based on the relative magnitude of habitat injured as a result of response activities (16.5 acres) compared to the acreage of area to be preserved through restoration (40 acres), the assumption that densities of wildlife in these two areas would be similar, and the need to avoid double-counting (consistent with 43 C.F.R. § 11.83(c)(2) and considering the wildlife benefits provided by the habitat acquisition, protection and management restoration project approach).

3.4.2 Construction and maintenance of moist soils units (MSUs) to restore migratory waterfowl

The majority of birds killed as a result of the oil spill were waterfowl. Some proportion of those birds likely were migratory, only passing through the area at the time of the spill. The land acquisition and protection/management proposed to address vegetation loss is not expected to provide substantive benefit to migratory waterfowl, because that effort will target developable land likely to be drier than habitat utilized by them during over-wintering stays. As a result, the Trustees required additional targeted restoration to compensate for potential migratory waterfowl losses. The Trustees estimate that approximately four acres of land would need to be acquired and managed as MSUs for at least 30 years into the future to offset the loss of approximately 50 potentially migratory waterfowl due to the spill.

The Trustees will identify specific parcels to be targeted for acquisition and management as MSUs. Based on their experience with MSUs, the Trustees are confident that appropriate habitat can be found in local areas utilized by over-wintering waterfowl. Calculations underlying the MSU acreage estimate are summarized below.

Creation of MSUs is a common practice in Arkansas and one that is supported by AGFC, the U.S. Fish and Wildlife Service, and other conservation organizations as a means to provide services to waterfowl. To estimate how much MSU restoration is required to restore the estimated 50 migratory waterfowl lost due to the Mayflower Oil Spill, the Trustees focused on the energetic benefits provided by this land management technique (i.e., “duck energy days” – a measure of the energy expected to be consumed by one duck in one day). Trustee calculations utilized life history information for the mallard, a well-characterized species reasonably representative of waterfowl killed by the spill. Calculation inputs were drawn from a variety of sources, including but not limited to reports and information from U.S. government agencies, websites such as Birds of the World maintained by the Cornell Lab of Ornithology, and the peer-reviewed literature. Key inputs are summarized below.

- Reinecke and Kaminski (2006) estimated per-acre duck energy days (DEDs) provided by a variety of habitat types. The Trustees applied data on the midpoint of DEDs provided by moist soils (1,868) and the average value for harvested crops (290). The harvested crops values were used because farmlands are typically converted to MSUs. Therefore, net DEDs provided by an acre of MSU = $1,868 - 290 = 1,578$ DEDs.
- Migratory waterfowl were assumed to overwinter in Arkansas for approximately 110 days. Therefore, one acre of conserved habitat converted to MSU providing 1,578 DEDs per acre would support approximately fourteen ducks (i.e., $1,578 \text{ DED per acre} / 110 \text{ DED per duck} = 14.3$ ducks per acre).
- Half of the impacted ducks were assumed to be female (i.e., approximately seven hens per acre per year). The pre-hunting season male-to-female sex ratio for mallard is 1:2, but more males are typically hunted than females (Cornell Lab of Ornithology, 2020).
- The Trustees assumed 100 percent of mallards in Arkansas survive from the end of the hunting season to end of winter (Dugger et al., 1994). The hunting season in Arkansas ends in January. Since the Mayflower Oil Spill occurred at the end of March, oiled ducks had already survived through the winter.
- Annual survival rates for mallard range from 46 to 68 percent (midpoint = 57 percent) depending on sex and age (Cornell Lab of Ornithology, 2020). For females, the range is 46 to 61 percent for juveniles and 54 to 59 percent for adults. The Trustees applied an annual survival of 57 percent for purposes of restoration scaling calculations.
- Overall mallard reproductive success (percentage of hens producing at least one flying bird, per year) was estimated to be 15 percent (Cowardin et al., 1985).
- Therefore, each hen supported through the winter in Arkansas would result in at least 0.085 new ducks the following year (i.e., $1 \text{ hen} \times 0.57 \times 0.15 = 0.085$).

- On an acre basis, the seven hens supported by each acre of MSU would produce a net total of at least 0.6 new ducks the following year (i.e., 7 hens / acre x 0.085 birds produced / hen = 0.6 fledglings produced per acre). Therefore, for every acre of farmland converted into MSU in Arkansas, the Trustees assumed 0.6 new waterfowl would be created.
- MSUs would be managed for 30 years. Application of a three percent discount rate to account for differences in timing between injury and restoration (a standard practice in NRDA restoration scaling) resulted in a requirement of approximately 4 acres of MSUs to ‘create’ approximately 50 waterfowl.
- The total estimated cost of creating 4 acres of MSU in Arkansas is approximately \$400,000. This estimate assumes approximately \$125,000 for construction to restore hydrology, approximately \$200,000 for annual maintenance and monitoring for 30 years, approximately \$25,000 for fee purchase of land and approximately \$50,000 in contingency to address unforeseen circumstances. These cost estimates are based on costs for recent MSU project confirmed with the AGFC Waterfowl Program. The Trustees therefore propose to allocate \$400,000 of the settlement toward the creation of MSUs.

3.5 Recreational Fishing

To compensate the public for recreational fishing impacts attributable to the Mayflower Oil Spill, the Trustees propose to invest in programs and/or infrastructure to enhance recreational fishing opportunities at Lake Conway. The Trustees will identify specific programs/infrastructure to receive this investment after completing the settlement process with ExxonMobil Pipeline Company. To facilitate the settlement process, the Trustees developed estimates of the total lost value (i.e., consumer surplus) of impacted fishing trips during the April-July 2013 period using the ‘benefits transfer’ methodology commonly used in NRDA. The benefits transfer methodology involves transferring information available from studies completed in one location or context to another (in this case, to the Mayflower Oil Spill context). The natural resource economics literature contains numerous articles and reports from studies that have estimated such values for a wide array of locations and fishing opportunities.¹⁰

As part of the settlement process, the Trustees and ExxonMobil Pipeline Company discussed inputs, assumptions, and uncertainties underlying the Trustees’ estimate of 3,700 diminished trips and 24,500 trips not taken to Lake Conway in the four months following the spill. As noted above, the Trustees also considered the potential applicability of various per-trip recreational fishing values identified in the natural resource economics literature. Based on an overall evaluation of information relevant to this injury category, the Trustees propose that a settlement amount of \$450,000 for recreational fishing impacts reasonably compensates the public for this category of injury resulting from the Mayflower Oil Spill. The Trustees propose to spend this allocation on one or more to-be-determined programs and/or infrastructure projects to enhance recreational fishing opportunities at Lake Conway. This ‘value to cost’ restoration scaling approach (i.e., selecting a scale of restoration that has a cost equivalent to the lost value) is explicitly authorized by OPA NRDA regulations (15 CFR § 990.53(d)(3)). Funded projects will

¹⁰ For example, see the Recreation Use Values Database at: <http://recvaluation.forestry.oregonstate.edu/>.

meet relevant federal, state, and local regulatory requirements, including any applicable requirements of NEPA.

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Appendix A

PAH Distribution Plots for the Source Oils and Sediment Samples from Lake Conway Adjacent to Dawson Cove Sampled in July and Re-sampled in November 2013

Exhibit A-1. PAH Abbreviations

C0DE	cis/trans Decalin	C0D	Dibenzothiophene
C1DE	C1-Decalins	C1D	C1-Dibenzothiophenes
C2DE	C2-Decalins	C2D	C2-Dibenzothiophenes
C3DE	C3-Decalins	C3D	C3-Dibenzothiophenes
C4DE	C4-Decalins	C4D	C4-Dibenzothiophene
C0N	Naphthalene	FL	Fluoranthene
C1N	C1-Naphthalenes	P	Pyrene
C2N	C2-Naphthalenes	C1F/P	C1-Fluoranthenes/Pyrenes
C3N	C3-Naphthalenes	C2F/P	C2-Fluoranthenes/Pyrenes
C4N	C4-Naphthalenes	C3F/P	C3-Fluoranthenes/Pyrenes
BTP	Benzothiophene	C4F/P	C4-Fluoranthenes/Pyrenes
C1BTP	C1-Benzothiophenes	C0NB	Naphthobenzothiophene
C2BTP	C2-Benzothiophenes	C1NB	C1-Naphthobenzothiophenes
C3BTP	C3-Benzothiophenes	C2NB	C2-Naphthobenzothiophenes
C4BTP	C4-Benzothiophenes	C3NB	C3-Naphthobenzothiophenes
BIP	Biphenyl	C4NB	C4-Naphthobenzothiophenes
ACY	Acenaphthylene	BAA	Benz(a)anthracene
ACE	Acenaphthene	C0C	Chrysene/Triphenylene
DBF	Dibenzofuran	C1C	C1-Chrysenes
C0F	Fluorene	C2C	C2-Chrysenes
C1F	C1-Fluorenes	C3C	C3-Chrysenes
C2F	C2-Fluorenes	C4C	C4-Chrysenes
C3F	C3-Fluorenes	BBF	Benzo(b)fluoranthene
CAR	Carbazole	BKF	Benzo(k,j)fluoranthene
C0A	Anthracene	BAF	Benzo(a)fluoranthene
C0P	Phenanthrene	BEP	Benzo(e)pyrene
C1P/A	C1-Phenanthrenes/Anthracenes	BAP	Benzo(a)pyrene
C2P/A	C2-Phenanthrenes/Anthracenes	PER	Perylene
C3P/A	C3-Phenanthrenes/Anthracenes	IND	Indeno(1,2,3-c,d)pyrene
C4P/A	C4-Phenanthrenes/Anthracenes	DAH	Dibenzo(a,h)anthracene
		BGHI	Benzo(g,h,i)perylene

Exhibit A-2. Lake Conway sediment sample locations for fingerprinting analysis.

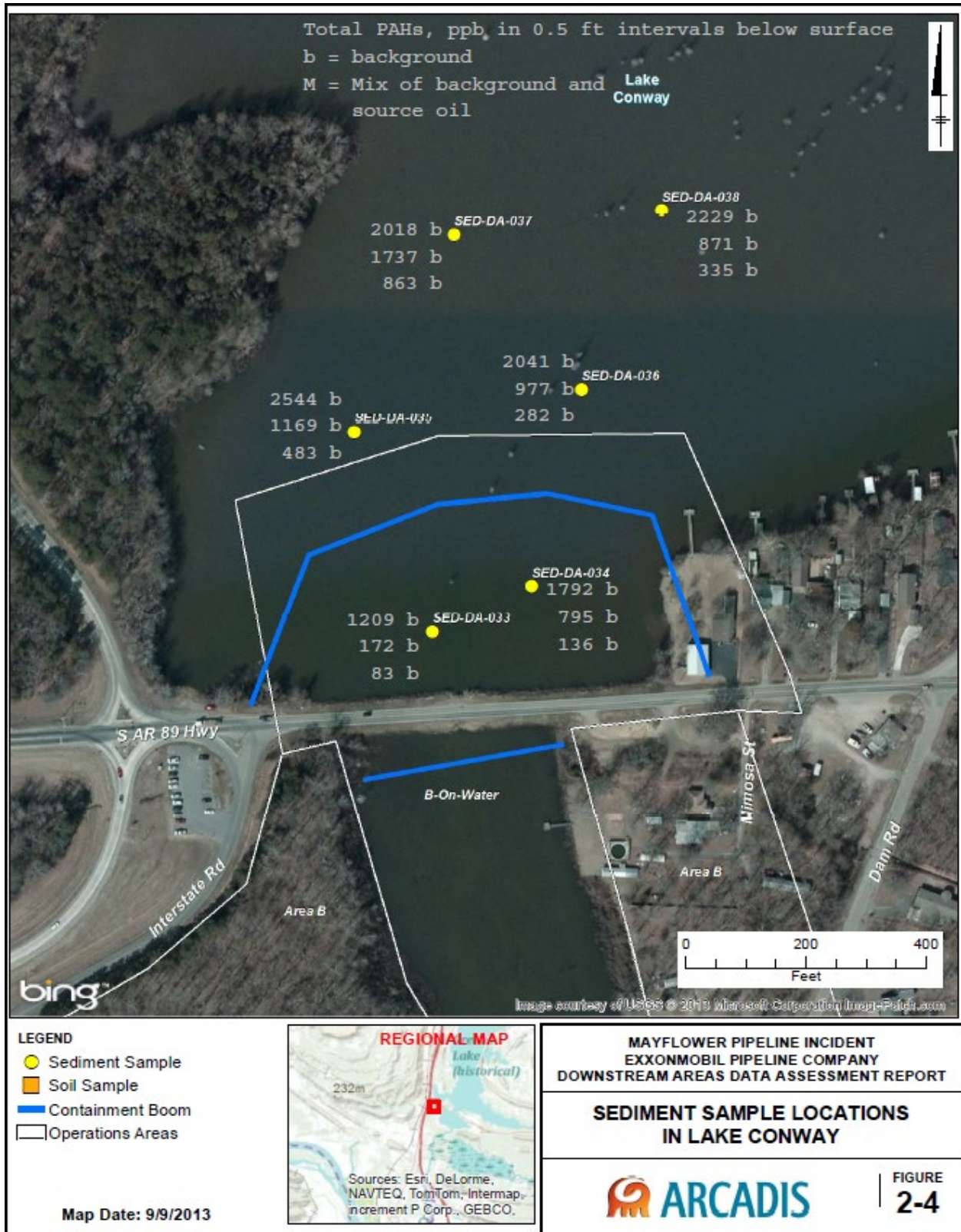
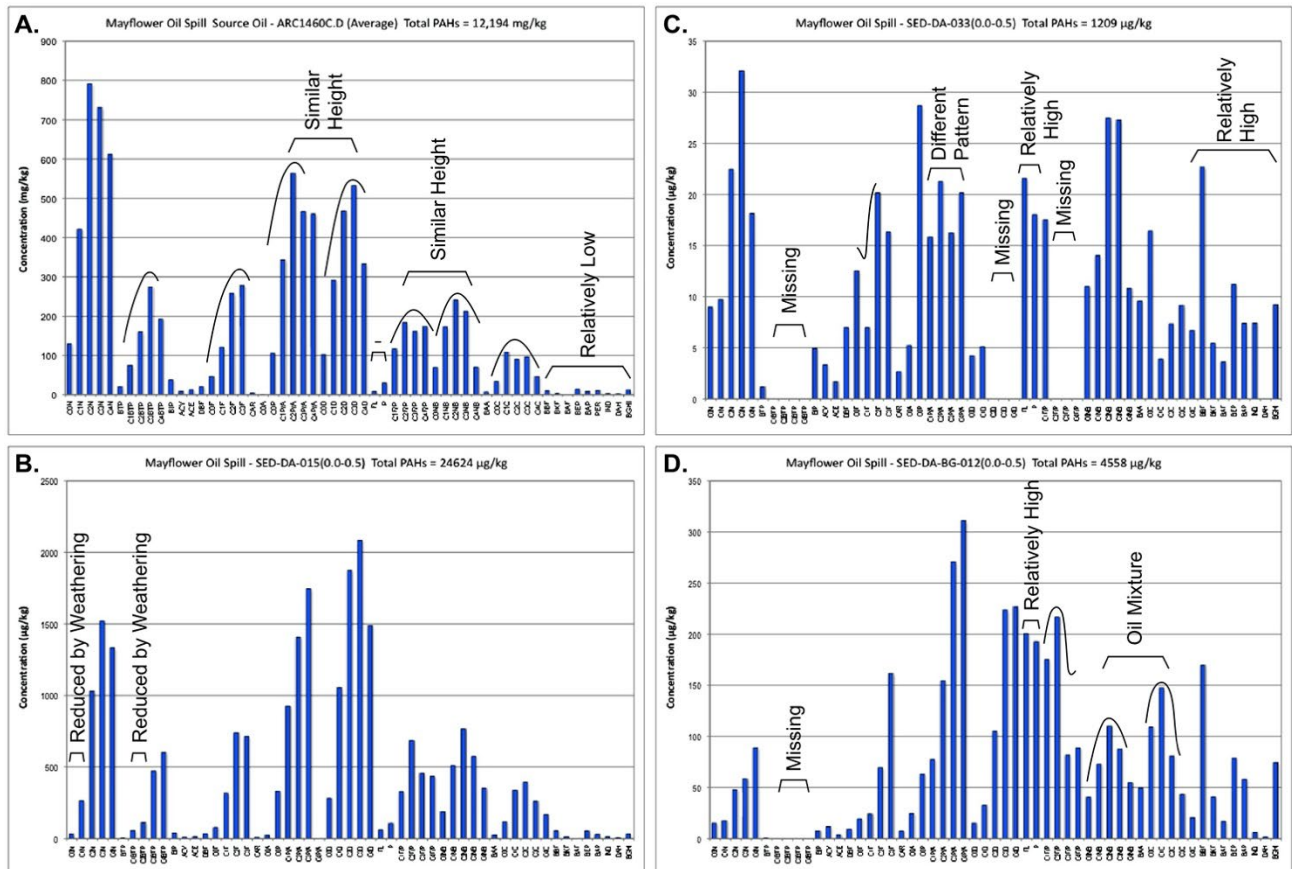


Exhibit A-4. The source oil (A), an oiled sample from Dawson Cove (B), a background sediment sample from Lake Conway near Dawson Cove (C), and a background sediment sample from Lake Conway (D). Note the differences in the y axis scales for each sample.



The sediment sample from within Dawson Cove (SED-DA-015(0.0-0.5); “B” in Exhibit A-4), shown below the source oil has a very similar PAH pattern to that of the source oil (“A” in Exhibit A-4), but shows the effects of some initial weathering, in that the parent PAH and the C1 and C2 alkylated homologues have been reduced. Weathering by both volatilization and microbial degradation removes the parent PAH most quickly, then the alkylated homologues in increasing order. Naphthalenes are also considered to be semi-volatile and they are lost very early in the weathering process. Thus, in this sample, the naphthalenes are reduced in height relative to the other PAH groups, reflecting some initial weathering; but nevertheless, this sample can be considered a “match”.

By way of comparison, the low background sediment sample from Lake Conway near Dawson Cove (SED-DA-033(0.0-0.5); “C” in Exhibit A-4) has a very different PAH distribution pattern. Key PAH groups characteristic of the source oil are missing, such as the benzothiophenes, dibenzothiophenes, and fluoranthenes/pyrenes. Parent fluoranthene and pyrene also are much higher in concentration compared to the other PAHs in this sample versus the source oil. The PAH distribution pattern within each group shows a different pattern, with the parent compound higher than the alkylated homologues, such as for phenanthrenes/anthracenes. The last nine high-molecular weight PAHs are relatively high in concentration compared to the other PAHs. This sample shows evidence of PAHs from both combustion

of fossil fuels and use of motorized boats on the lake, with the relatively large amounts of the naphthalenes. The hopanes in this sample were below detection limits. Each of these factors contributes to the notion that this samples does not represent a “match”.

The relatively high background sediment sample from Lake Conway to the north of the spill (SED-DA-BG-012(0.0-0.5); “D” in Exhibit A-4), which is located near a highway drainage and a construction site, shows evidence of contamination with multiple sources of PAHs, including refined petroleum products and combustion byproducts. The hopanes in this sample were below detection limits.

Exhibits A-5 through A-16 show the PAH distribution patterns in all the sediment samples collected in Lake Conway adjacent to Dawson Cove in July and November 2013.

Exhibit A-5. PAH distribution in samples from Lake Conway adjacent to Dawson Cove. See Exhibit A-1 for sampling locations. Sample SED-DA-033. Top row: 0-0.5 ft; Bottom row: 0.5-1.0 ft; Left: July and Right: November 2013.

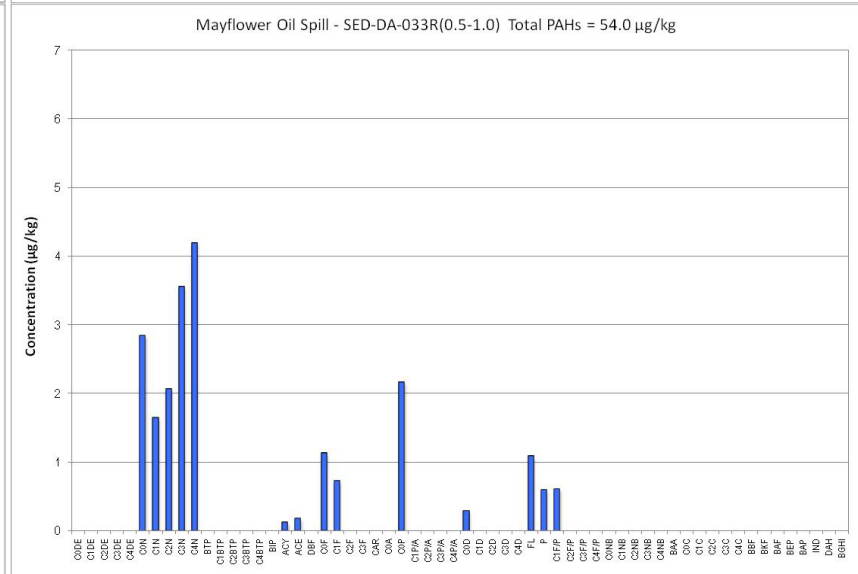
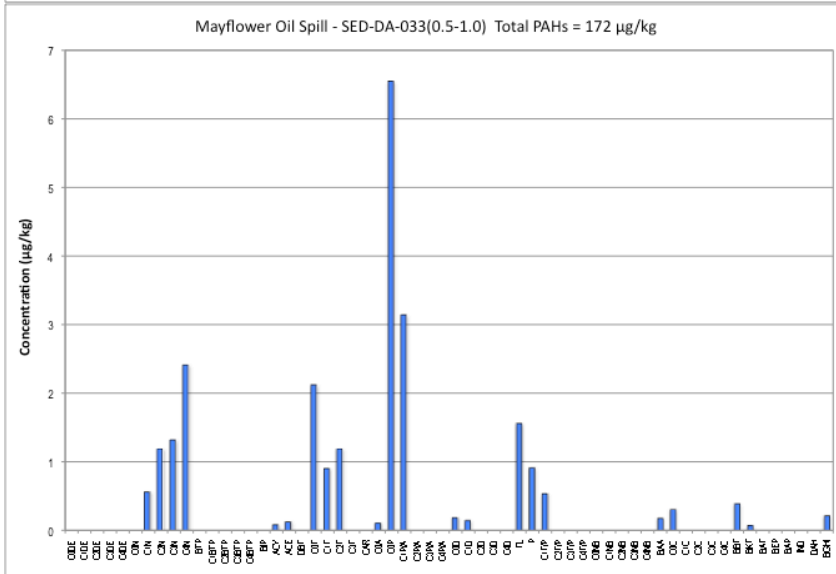
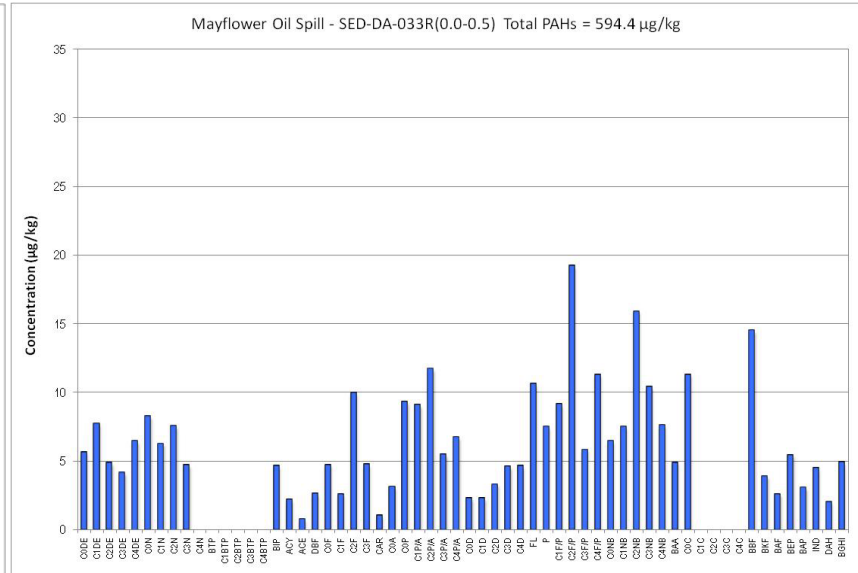
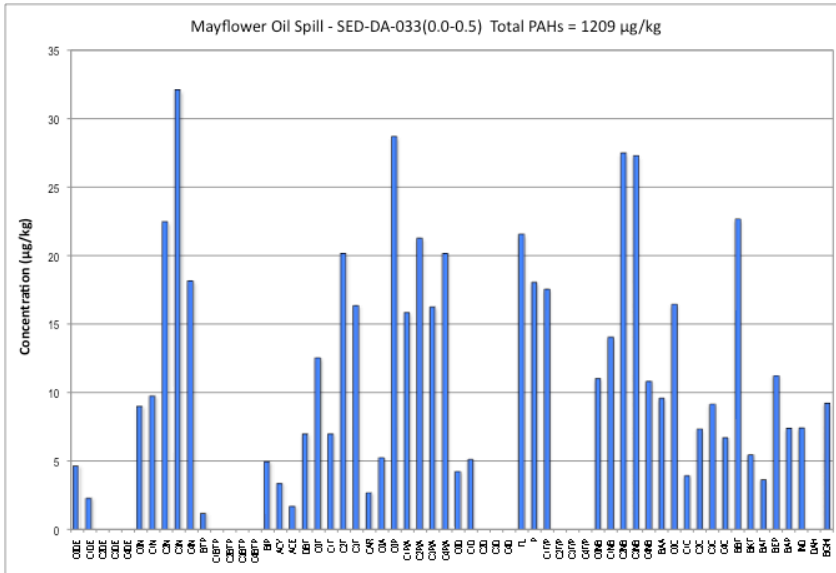
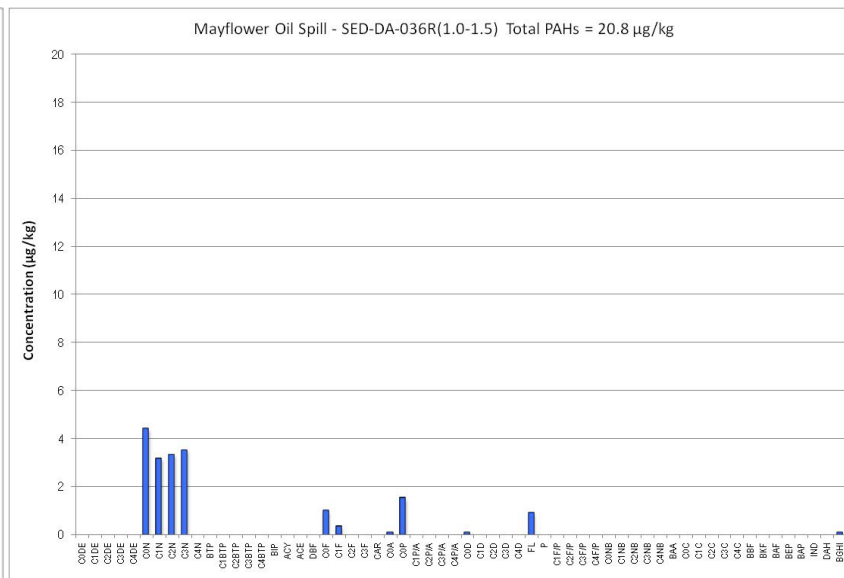
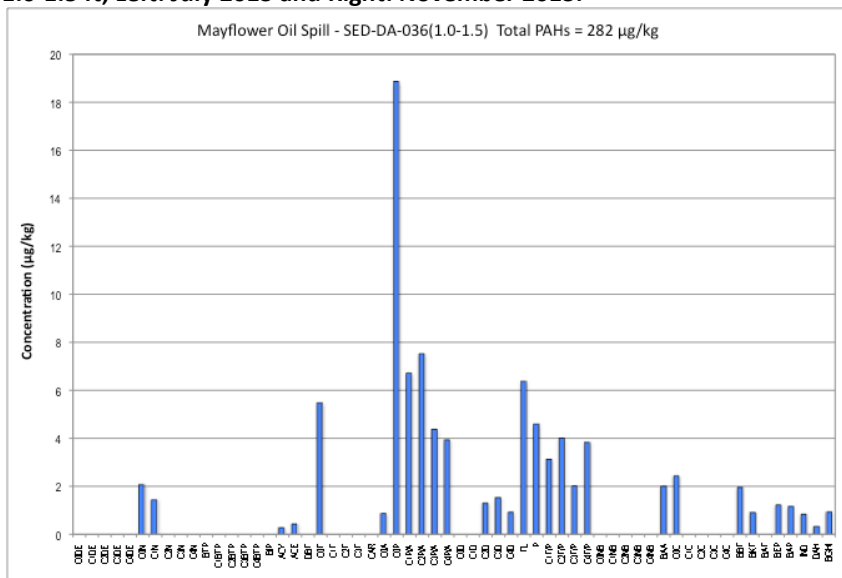


Exhibit A-12. PAH distribution in samples from Lake Conway adjacent to Dawson Cove. See Exhibit A-1 for sampling locations. Sample SED-DA-036. Top row: 1.0-1.5 ft; Left: July 2013 and Right: November 2013.



Appendix B

Detailed Habitat Loss Calculations

INTRODUCTION

Habitat Equivalency Analysis (HEA) methods were used to quantify the injury to habitats as a result of the ExxonMobil Pipeline Company spill, using biomass as the metric of ecological services.

BIOMASS LOSS CALCULATIONS

Four habitat classes of injury were identified: two in the southwestern cove of Lake Conway and adjacent riparian area (bottomland hardwood trees and bottomland hardwood shrub/scrub) and the pine-oak forest (younger and older) in the residential area and the inlet channel west of I-40. The areal extent of these habitat classes were derived from the 2011 and 2013 World Imagery as well as reports and personal communication with the Arkansas Game and Fish Commission (AGFC) and ARCADIS (2014) that describe site vegetation and preliminary biomass removal estimates.

In a post-spill assessment, ARCADIS (2014) described 23 species from wetland sites within the bottomland hardwood tree vegetation class. AGFC (2013) provided separate descriptions of the “shrub/scrub” vegetation class as composed largely of buttonbush and black willow. The estimated maximum age of vegetation in Dawson Cove and riparian areas prior to vegetation removal is approximately 63 years. This is based both on the year the Lake Conway dam was completed (1950) and results of tree cores taken by AGFC from large trees that remained at the site post-spill, which included a 63 year old overcup oak, a 51-year old red maple (*Acer rubra*), and a 33-year old sweetgum (AGFC, personal communication). The age of the older pine-oak forest was determined to be 67 years by AGFC (2014) based on an increment borer sample of a dominant shortleaf pine during a 2014 survey of the site. The age of the younger pine-oak forest in the inlet channel was determined to be 13 years. AGFC also inventoried a remaining patch of forest adjacent to the excavated site and provided a per-acre estimate of forested biomass removed.

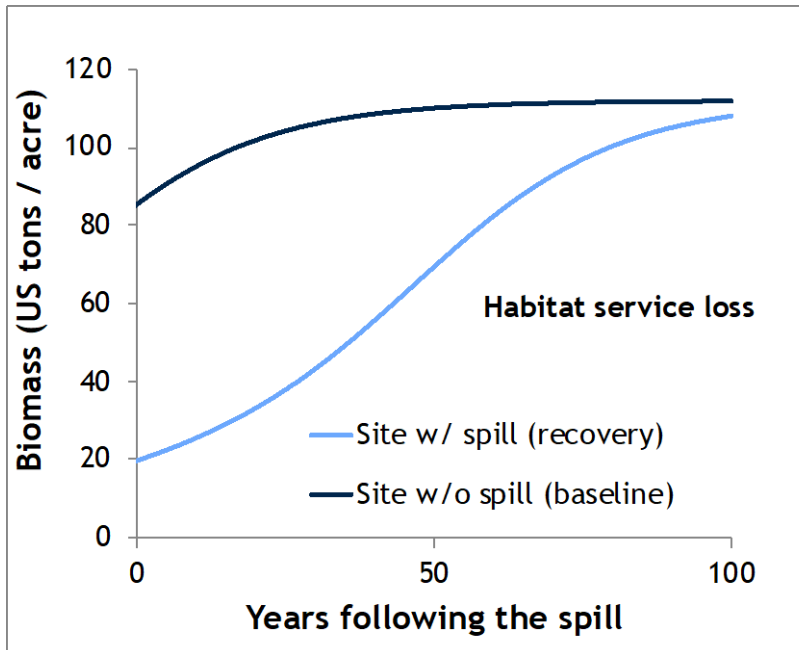
To estimate biomass loss as a result of the spill and response operations, separate sigmoid-shaped baseline accumulation rates were calculated for each habitat class (Mathews, 2003) with the following equation:

$$y = \frac{L}{1 + c(e^{ax})}$$

Where y is biomass, L is the upper limit of the sigmoid curve (i.e., the maximum biomass of a mature forest), x is the age since secondary succession began, and a and c are parameters specific to a vegetation class.

These curves were used to estimate the biomass (tons/acre) of a given habitat class for the age of the site, multiplied by the total area of habitat affected, and summed all habitat classes for a total biomass loss. For calculating biomass recovery times, these calculations include not only the amount of biomass removed immediately following the spill, but also the continued deficit in biomass that remained in the site given that, if not for spill, biomass would have continued to increase at the site. Exhibit B-1 shows an example plot for the bottomland hardwood tree class over 100 years.

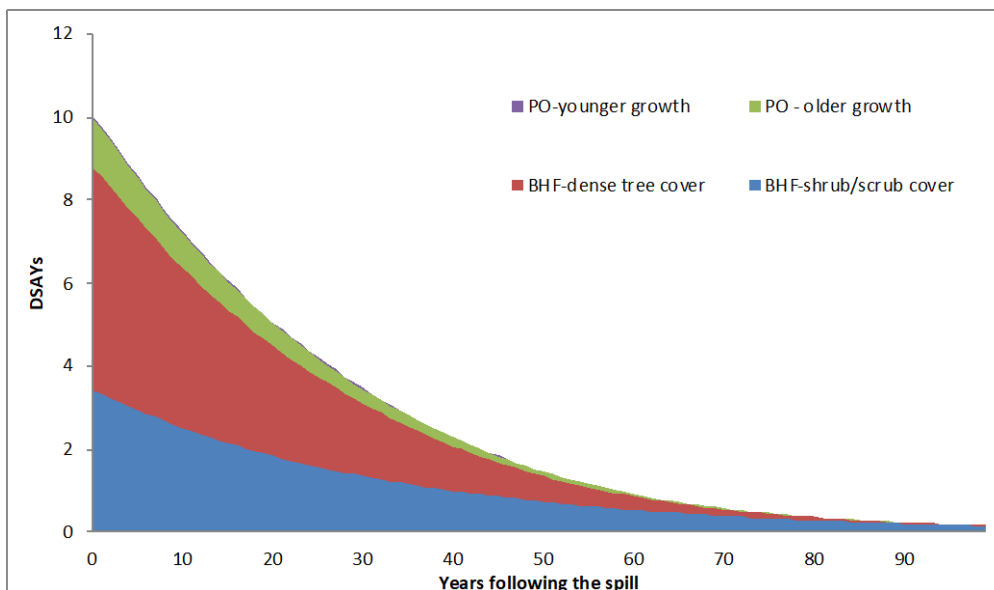
Exhibit B-1. Curves showing the biomass accumulation for the bottomland hardwood forest in Dawson Cove for what it would have been without the spill (baseline) as the top curve and for the biomass accumulation after the spill. The pink area represents the total biomass lost for this vegetation class.



HABITAT INJURY CALCULATION

As outlined by the methodology for HEA (NOAA, 2006), a three percent discount was applied to the annual difference in biomass between the predicted biomass at the site during recovery over a 100-year period after the spill and the predicted biomass at the site without injury (i.e., the spill). The curves in Exhibit B-2 were generated from HEA calculations, showing the contributions of each habitat class to the total of 271 discounted-service acre years (DSAYs).

Exhibit B-2. Plot of the annual DSAYs by injured habitat class.



REFERENCES CITED

ARCADIS. 2014. Stream and Wetland Compensatory Restoration Plan. Mayflower Pipeline Incident Response Mayflower, Arkansas. Prepared for ExxonMobil Environmental Services Company. 91 pp.

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Mathews, J. 2003. Module for logistic curve fitting. California State University Fullerton. <http://mathfaculty.fullerton.edu/mathews//n2003/LogisticEquationMod.html> [Accessed: May 28, 2014].

Appendix C

Detailed Wildlife Loss Calculations

WILDLIFE DATASETS

ARCADIS maintained a Microsoft Excel dataset of all wildlife captured, rehabilitated, and released throughout the response period. This dataset includes information such as species, degree of oiling, dates of capture and release if applicable, location of capture, and any movement of the animal to a care facility. Field teams also collected location information using handheld geographic positioning system (GPS) devices as part of the wildlife response effort, and this information is stored in a separate geographic information systems (GIS) database. Location information and daily track lines were recorded for wildlife surveys and captures. These data illustrate the geographic areas covered by field teams during each day of field wildlife recovery activities, as well as maintain a record of the location at which each animal was captured.

During the response period, the GPS devices used to collect capture and recovery data were changed, causing a considerable but consistent offset in collected location data. This issue was documented and ultimately resolved; ARCADIS corrected the erroneous locations by evaluating the timestamp corresponding to each data point in the context of the track log from each day. Although there is some degree of uncertainty associated with this solution, it increases the likelihood that data representing wildlife collection locations are closer to the true locations where wildlife were collected.

The vast majority of captured animals were reptiles, including 424 snakes and 717 other types of reptiles, with the vast majority being turtles. Of the 1,685 captured animals in the database, a total of 971, or 57.6 percent, were oiled to some degree, with 256 animals categorized as having a high degree of oiling. The highest oiling rates were observed among birds.

INJURY QUANTIFICATION

In order to determine the total number of wildlife killed as a result of the spill, the Trustees conducted the following analytical steps, using the wildlife dataset and GIS mapping tools:

- 1) Define and quantify the Assessment Area for wildlife species, and the fraction of that area searched.
- 2) Calculate the number of oiled wildlife collected in searched areas; for avian species calculate this value taking searcher efficiency and carcass persistence into account.
- 3) Based on oiled wildlife densities in searched areas (taking distance from oiled areas into account), estimate the number of oiled wildlife in unsearched areas.
- 4) Calculate the total number of wildlife killed based on the sum of estimated oiled/killed animals in the searched and unsearched areas, as well as animals collected alive but which died or were expected to die.

Each of these steps is discussed in the subsections that follow.

STEP 1: DEFINE THE ASSESSMENT AREA AND THE FRACTION SEARCHED

To determine the fraction of the study area searched by responders, the Trustees calculate (1) the total assessment area and (2) the total area searched using search tracklines and the 2013 wildlife database, as well as assumptions, as described below.

The Trustees calculate the assessment area, or total area in which any oiled animals could be expected to be located, using GIS. Specifically, the area is defined by a circle encompassing the Cove and surrounding areas with the center of the circle the centroid of oiling, as determined based on a high aggregation of collected oiled animals, and the radius of the circle the distance between this centroid and

the single furthest-extending point on a search trackline (a distance equal to approximately 5,124 feet or 1,562 meters). The assessment area includes land as well as water. Applying this 5,124-foot buffer around the centroid in GIS results in an assessment area of approximately 1,893 acres (82,476,504 square feet).

The area within the assessment area searched by response teams during the months following the spill was also calculated in GIS using available tracklines created as a part of daily search efforts and provided by ExxonMobil. Tracklines are available for searches conducted on an almost-daily basis between May 28, 2013 and October 31, 2013. In order to calculate the total area searched per day, the Trustees generate a five-foot buffer for each trackline, based on the assumption that searchers could see up to five feet to the right and left into Cove vegetation as they conducted their searches.

Within the assessment area the Trustees calculate two searched areas: one assumed to be actively searched and one assumed to be passively searched. The actively searched area is calculated by combining the buffered search tracklines with the area that underwent significant de-vegetation as a result of the spill. This area is considered actively searched because repetitive searches were documented throughout the months following the spill, and de-vegetation in the vicinity of these searches would have resulted in greater visibility within those areas. The passively searched area includes residential areas, parking lots, roadways, and other populated or heavily trafficked areas within the larger assessment area but outside of the actively searched area. In such areas, the Trustees assume that any oiled wildlife is likely to have been seen and reported by the public. All remaining space within the assessment area is considered unsearched (Exhibit C-1).

Exhibit C-1. Results of Search Area Analysis.

SECTION	DEFINITION	TOTAL AREA (ACRES)
Total Study Area	A circle centered around the oiled area where a high density of birds were collected, with a radius extending out to the furthest point at which an oiled bird was found (5,124 feet from the center)	1,893
Actively Searched Area	The area encompassing the five-foot buffered search tracklines, and the oiled, de-vegetated area within the cove	116
Passively Searched Area	The area of surface cover identified in an orthophoto as road, parking lot, or residential area; but excluding the actively searched area.	550
Unsearched Area	Remaining portion of the assessment area that is not considered actively or passively searched.	1,227

STEP 2: CALCULATE OILED WILDLIFE COLLECTED IN SEARCHED AREAS

Based on available wildlife collection data and assumptions the Trustees calculate the numbers of oiled wildlife found in areas that were searched. Both actively and passively searched areas are included in the calculations. For all wildlife categories other than birds, the Trustees sum the number of oiled animals collected as indicated in the Wildlife Intake database provided by ExxonMobil. Based on these data, 54 birds, 462 turtles, 283 snakes, 265 amphibians, 8 mammals, 5 other reptiles (i.e. skinks and lizards), and two fish were documented as visually oiled and collected (either alive or dead).

In order to account for searcher efficiency and carcass persistence in the estimate of oiled birds within the searched (actively and passively) area, the Trustees constructed a Microsoft Excel-based numerical model. The model functions by graphing the temporal distribution of birds collected during the Response, and reconstructing this distribution based on estimated oiled bird deposition, taking into consideration information on carcass persistence and searcher efficiency. Key inputs to the model include:

- **Number of oiled birds collected on a daily basis.** This number is taken directly from the ARCADIS Wildlife Intake database, provided by ExxonMobil Pipeline Company.
- **Carcass persistence.** Carcass persistence is expressed as a probability of unfound carcasses persisting from day to day. In studies in habitat types similar to Dawson Cove (Audet, et al. (1999), wetlands; Ford and Ward (2001), marsh habitat; and Engeman, et al. (1991), cattail marsh), searcher efficiency ranged from 24 to 84 percent. The lowest end of this range applied to small birds in a marsh habitat (Ford and Ward, 2001), while the highest end applied to cattail marshes with “low carcass density” (Engeman, et al., 1991). For modeling purposes, the Trustees rely on seven-day carcass persistence values, which are reported in two of these studies. Seven-day carcass persistence presented in Audet et al. (1999) range from 16.67 to 100 percent, averaging 74 percent across 11 wetland units; and is 60 percent in Engeman et al. (1991) for low carcass density marshes. For modeling purposes, the Trustees assume seven-day carcass persistence to be 70 percent—at the upper end of this range—given the high level of activity and vegetation clearing associated with the oil spill response. Further, the Trustees assumed carcass persistence to decrease linearly over time (i.e., is 95 percent on the first day following the spill and decreases by five percent each day to reach 70 percent on day seven). Finally, the Trustees assume that after seven days carcasses would remain permanently unrecovered by searchers.
- **Searcher efficiency.** As with carcass persistence, searcher efficiency can change with time, due to both Response-related vegetation removal, and a change in the density of carcasses over time. The three papers noted above also present values for searcher efficiency, which range from 33.2 percent (Ford & Ward, 2001; average for small & large birds) to 34.2 percent (Audet, 1999), to 78 and 84 percent for low and high carcass density, respectively (Engeman, 1991). In the case of the Mayflower spill, oiled vegetation was removed from the Cove during the weeks following the spill. For modeling purposes, therefore, the Trustees assume searcher efficiency increased linearly over time from 35 percent to 84 percent over the first two weeks of the Response, as vegetation was cleared and the Cove made more accessible and visible to searchers.

The outputs from the model include:

- **Oiling rate.** Although the rate of bird oiling is assumed to decrease linearly over time as oil was cleaned up in the Cove, it is estimated by the model, based on the goodness of fit of the modeled temporal distribution of recovered oiled birds to the observed temporal distribution of recovered oiled birds.
- **Number of birds deposited in the search area.** The number of birds deposited over time in the search area forms the basis for the estimate of the total number of birds oiled in the searched area as a result of the spill. Like the oiling rate, this number is estimated by the model, and is based on the linear decrease in oiling rate and the goodness of fit of the modeled temporal distribution of recovered oiled birds to the observed temporal distribution of recovered oiled birds.

- **Ratio of oiled to collected.** Ultimately, the total number of birds deposited in the searched area and the total number of recovered birds can be related to calculate the proportion of oiled birds not recovered within the searched area, or a simple ratio of total estimated oiled:collected birds.

Results of this modeling effort indicate that the ratio of oiled:collected birds is 1.33. In other words, searchers recovered only 75 percent of oiled birds deposited within searched (actively and passively) areas.

STEP 3: ESTIMATE UNRECOVERED OILED WILDLIFE IN UNSEARCHED AREAS

The Trustees use observed densities of collected wildlife in actively and passively searched areas to estimate the numbers of wildlife likely to have been oiled but unrecovered in unsearched areas. Densities of oiled wildlife collected (i.e., number per unit area) are calculated at increasing distances from the de-vegetated, oiled area (referred to as the “oiled area”). First, the Trustees calculate distances from the de-vegetated, oiled area to each oiled animal collected. Maximum distances at which oiled wildlife were encountered are presented in Exhibit C-2. Second, wildlife group-specific distance bands are chosen by using the Microsoft Excel histogram tool to automatically create distance bins in the datasets of distances calculated. Third, using GIS, the Trustees calculate the areas within each distance band, for each wildlife group, considered actively or passively searched (referred to as the “marginal searched area”) versus unsearched (referred to as the “marginal unsearched area”). Fourth, the Trustees calculate density in searched areas by dividing the number of oiled wildlife collected within a given distance bin by the marginal searched area of each bin. Finally, in order to estimate the numbers of oiled wildlife in unsearched areas, the Trustees apply the calculated densities in searched areas within each distance band to the unsearched areas within each band, based on the assumption that the densities of oiled wildlife would be the same in both searched and unsearched areas of each distance band.

For birds only, densities of recovered birds within each distance bin are first adjusted to account for unrecovered birds by multiplying by a factor of 1.33 prior to calculating the density in the searched area of the distance bin, based on the modeling effort described in Step 2 above. A summary of initially calculated and adjusted densities by distance bin for birds is presented in Exhibit C-3. The Trustees use these adjusted densities and the marginal unsearched areas to estimate the total number of oiled birds likely to have been deposited outside of the searched area and subsequently not found by search teams.

Since wildlife densities of wildlife categories other than birds are not adjusted to account for searcher efficiency and carcass persistence in searched areas, estimates for other wildlife groups should be viewed as underestimates. Results (rounded up to whole numbers) are presented for turtles, mammals, amphibians, and snakes in Exhibits C-4 through C-6, respectively. In total, the estimate that 55 birds, 79 turtles, 47 amphibians, and 47 snakes were oiled yet undiscovered in unsearched areas as a result of the spill.

Exhibit C-2. Maximum Distances at which Oiled Wildlife Were Collected From Centroid and from Edge of Oiled, Devegetated Area.

SPECIES CATEGORY	MAXIMUM DISTANCE FROM CENTROID (M)	MAXIMUM DISTANCE FROM OILED AREA (M)
Birds	1,557	1,429
Turtles	1,282	303
Snakes	882	110
Amphibians	1,043	108
Mammals	526	110
Other Reptiles	1,282	35
Fish	316	4

Exhibit C-3. Estimate of Oiled Birds not Recovered.

DISTANCE BIN (METERS)	NUMBER OF OILED BIRDS RECOVERED	NUMBER OF OILED BIRDS, ADJUSTED FOR SE AND CP	MARGINAL UNSEARCHED AREA (ACRES)	DENSITY OF BIRDS IN SEARCHED AREAS (BIRDS/ACRE)	ESTIMATED NUMBER OF OILED BIRDS IN UNSEARCHED AREAS
0*	14	19	0	0.78	0
0 - 204	35	47	103	0.33	35
204 - 408	1	2	117	0.01	2
408 - 612	2	3	171	0.03	5
612 - 816	1	1	225	0.01	3
816 - 1020	0	0	244	0	0
1,020 - 1,225	0	0	230	0	0
1,225 - 1,429**	1	2	129	0.07	10
Total***	54	74	1,228	0.11****	55

* The distance is zero because this area corresponds to the central devegetated, oiled area.

** 1,429 m represents the greatest distance at which an oiled bird was found from the devegetated, oiled area.

***Totals may not sum due to rounding.

****Total represents the number of oiled birds estimated deposited in searched areas (74 birds) divided by the total searched area within which birds were encountered of 666 acres.

Exhibit C-4. Estimate of Oiled Turtles not Recovered.

DISTANCE (METERS)	NUMBER OF OILED TURTLES RECOVERED	MARGINAL UNSEARCHED AREA WITHIN DISTANCE OF OILED AREA (ACRES)	DENSITY OF TURTLES IN SEARCHED AREAS (TURTLES/ ACRE)	ESTIMATED NUMBER OF OILED TURTLES IN UNSEARCHED AREAS
0*	165	0	6.73	0
0 - 14	153	2	10.37	21
14 - 29	75	3	5.53	19
29 - 43	44	4	3.37	13
43 - 58	6	6	0.56	4
58 - 72	2	7	0.20	2
72 - 87	3	7	0.30	2
87 - 101	1	8	0.11	1
101 - 115	2	9	0.24	3
115 - 130	0	9	0	0
130 - 144	1	9	0.12	2
144 - 159	3	10	0.37	4
159 - 173	1	10	0.12	2
173 - 188	0	9	0	0
188 - 202	0	9	0	0
202 - 216	1	9	0.10	1
216 - 231	0	9	0	0
231 - 245	0	8	0	0
245 - 260	3	8	0.27	3
260 - 274	1	9	0.09	1
274 - 289	0	10	0	0
289 - 303**	1	3	0.10	1
Total***	462	157	1.93****	79

* The distance is zero because this area corresponds to the central devegetated, oiled area.

** 303 m represents the greatest distance at which an oiled turtle was found from the devegetated, oiled area.

***Totals may not sum due to rounding.

****Total represents the number of oiled turtles recovered divided by the total searched area within which turtles were encountered of 239 acres.

Exhibit C-5. Estimate of Oiled Amphibians not Recovered.

DISTANCE (METERS)	NUMBER OF OILED AMPHIBIANS RECOVERED	MARGINAL UNSEARCHED AREA WITHIN DISTANCE OF OILED AREA (ACRES)	DENSITY OF AMPHIBIANS IN SEARCHED AREAS (AMPHIBIANS/ ACRE)	ESTIMATED NUMBER OF OILED AMPHIBIANS IN UNSEARCHED AREAS
0*	55	0	2.24	0
0 - 7	41	1	5.74	4
7 - 13	69	1	10.32	12
13 - 20	24	1	3.77	6
20 - 27	46	2	7.31	12
27 - 34	10	2	1.57	3
34 - 40	17	2	2.80	6
40 - 47	0	2	0	0
47 - 54	0	3	0	0
54 - 61	0	3	0	0
61 - 67	1	3	0.22	1
67 - 74	1	3	0.21	1
74 - 81	0	3	0	0
81 - 88	0	3	0	0
88 - 94	0	4	0	0
94 - 101	0	4	0	0
101 - 108**	1	4	0.26	2
Total***	265	40	2.41	47

* The distance is zero because this area corresponds to the central devegetated, oiled area.

** 108 m represents the greatest distance at which an oiled amphibian was found from the devegetated, oiled area.

***Totals may not sum due to rounding.

****Total represents the number of oiled amphibians recovered divided by the total searched area within which amphibians were encountered of 110 acres.

Exhibit C-6. Estimate of Oiled Snakes not Recovered.

DISTANCE (METERS)	NUMBER OF OILED SNAKES RECOVERED	MARGINAL UNSEARCHED AREA WITHIN DISTANCE OF OILED AREA (ACRES)	DENSITY OF SNAKES IN SEARCHED AREAS (SNAKES/ACRE)	ESTIMATED NUMBER OF OILED SNAKES IN UNSEARCHED AREAS
0*	85	0	3.47	0
0 - 7	46	1	6.34	5
7 - 14	54	1	7.95	10
14 - 21	32	1	4.95	8
21 - 27	25	2	3.90	7
27 - 34	17	2	2.63	5
34 - 41	16	2	2.61	5
41 - 48	4	2	0.71	2
48 - 55	1	3	0.21	1
55 - 62	0	3	0	0
62 - 68	1	3	0.21	1
68 - 75	0	3	0	0
75 - 82	1	3	0.21	1
82 - 89	0	3	0	0
89 - 96	0	4	0	0
96 - 103	0	4	0	0
103 - 110**	1	4	0.25	2
Total***	283	41	2.55	47

* The distance is zero because this area corresponds to the central devegetated, oiled area.

** 110 m represents the greatest distance at which an oiled snake was found from the devegetated, oiled area.

***Totals may not sum due to rounding.

****Total represents the number of oiled snakes recovered divided by the total searched area within which snakes were encountered of 111 acres.

STEP 4: CALCULATE TOTAL WILDLIFE MORTALITY

Estimates presented above are all based on oiled animals; that is, animals that were identified as being oiled either in the field when collected or at the wildlife intake center. In some cases, unoiled animals were simply relocated to reduce the likelihood of becoming oiled. In other cases, oiled animals were rehabilitated (i.e., cleaned of oil) and released. The Trustees estimate the total number of animals killed as a result of the spill as those found dead or which died in transit or in rehab, were euthanized, or were estimated to have been oiled but never found; and in certain cases, those that were oiled and captured alive, rehabilitated, and released. Specifically, the Trustees include oiled, rehabilitated, and released birds in total mortality counts because several studies have shown that oiling and rehabilitation leads to adverse effects in birds, such as reduced survival (Wernham et al. 1997), reduced mobility (Wernham et al. 1997; Anderson et al. 1996), and decreased breeding productivity (Anderson et al. 1996). Although data on survival of oiled, rehabilitated, and released amphibians and reptiles are unavailable, the Trustees assume

that such animals, like birds, would also not survive; so we include this category of animals in mortality counts for these species groups as well. The exception to this assumption is in the case of turtles, for which the total mortality count excludes the number of individuals that were oiled, rehabilitated, and released. This is because evidence has shown rehabilitation to be effective for oiled freshwater turtles (Saba and Spotila 2003).

The sum total mortality results for all wildlife categories are presented in Exhibit C-7 below. The Trustees estimate that 120 birds; 96 turtles; 392 snakes; and 173 amphibians were killed as a result of the spill. No further calculations were made to extrapolate the number of mammals, fish, or other reptiles (mainly lizards) affected by the spill, due to the small sample sizes for these species categories. The totals for mammals, fish, and other reptiles are therefore the sum of the first three columns of Exhibit B-7.

Exhibit C-7. Total Estimated Wildlife Mortality¹¹.

SPECIES CATEGORY	OILED AND DEAD WHEN FOUND BY SEARCHERS ¹²	OILED THEN DIED IN TRANSIT/REHAB OR EUTHANIZED	OILED, REHABILITATED AND RELEASED	ESTIMATED OILED AND UNRECOVERED FROM UNSEARCHED AREAS	TOTAL ESTIMATED KILLED
Birds	43 ¹³	9	13	55	120
Turtles	9	8	440	79	96 ¹⁴
Snakes	13	276 ¹⁵	56	47	392
Amphibians	12	25	89	47	173
Mammals	3	2	3	-	8
Other Reptiles	1	1	3	-	5
Fish	2	0	0	-	2

The Trustees note that Exhibit C-6 shows that there are a large number of snakes that either died in transit/rehab or were euthanized, compared to other wildlife types. As noted above, search teams were instructed to euthanize all venomous snakes in the field as they were encountered, out of concern for search team safety. As a result, 261 of the 423 snakes encountered were euthanized in the field by searchers. These snakes were all included in the final mortality count, as they were killed as a direct result

¹¹ Based on 2013 Wildlife Database compiled by Arkansas Game & Fish Commission. A 2014 database of wildlife collected is also available. The 2014 database did not include any oiled animals and so was excluded from the analyses and calculations in this report.

¹² Includes only animals that were dead when found by searchers and were oiled.

¹³ For birds only, this number is adjusted using the searcher efficiency multiplier of 1.33. The actual number of birds that were both oiled and dead when found by searchers is 32.

¹⁴ Oiled, rehabilitated, and released turtles are not included in the total calculation for turtles.

¹⁵ Includes snakes that were euthanized upon encounter in the field.

of the spill. However, the density multiplier only takes into account oiled snakes, so that any unoiled snakes which were euthanized in the field do not contribute to an artificially high mortality count. Of the 261 euthanized snakes, 181 were oiled.

In many cases, oiled wildlife remained within a relatively short distance of the oiled area (see Exhibit B-2) and were found either within or a short distance from the Cove, close to the site of the pipeline break or along the pathway that the oil took to reach the Cove. For this reason, the Trustees assume that the majority of wildlife collected during the Response could be considered local inhabitants of the Cove. However, many birds injured as a result of the oil spill were migratory waterfowl, which may be seasonal residents or pass through the area only briefly. Of the 54 oiled birds physically collected (either alive or dead), 47—or approximately 87 percent—were identified as waterfowl. Approximately half of these waterfowl were migratory species. Therefore, of the 120 birds estimated killed, approximately 50 of those are estimated to be migratory waterfowl.

Appendix D

Mayflower Oil Spill Recreational Angler Survey



CENTRAL ARKANSAS ANGLER SURVEY



You have been randomly selected to participate in this survey. Your participation is totally voluntary. All of your answers will remain confidential and none of your personal identification information will be associated with your answers.

**The survey will take about 10 minutes to complete.
Thank you for your cooperation.**

This study has been reviewed and approved by the UALR Institutional Review Board (IRB) for human subject participation. If you have any questions about this survey, please contact David at 866-606-5595.

PART A: YOUR ARKANSAS FISHING TRIPS

1 When you go fishing in Arkansas, what species do you fish for?
(Check all that apply.)

- | | | |
|--|--|--|
| <input type="checkbox"/> LARGEMOUTH BASS ⁽¹⁾ | <input type="checkbox"/> REDEAR SUNFISH ⁽⁵⁾ | <input type="checkbox"/> CRAPPIE ⁽⁹⁾ |
| <input type="checkbox"/> SMALLMOUTH BASS ⁽²⁾ | <input type="checkbox"/> CHANNEL CATFISH ⁽⁶⁾ | <input type="checkbox"/> TROUT ⁽¹⁰⁾ |
| <input type="checkbox"/> SPOTTED BASS ⁽³⁾ | <input type="checkbox"/> BLUE CATFISH ⁽⁷⁾ | <input type="checkbox"/> WALLEYE ⁽¹¹⁾ |
| <input type="checkbox"/> BLUEGILL SUNFISH ⁽⁴⁾ | <input type="checkbox"/> FLATHEAD CATFISH ⁽⁸⁾ | |
| <input type="checkbox"/> OTHER _____ | | |

2 Approximately how many fishing day trips did you take **in Arkansas last year (in 2012)**? When we say “day trip” we mean any fishing trip where you left home and returned home within the same day. (Check one.)

- | | |
|---|---|
| <input type="checkbox"/> NONE ⁽⁰⁾ | <input type="checkbox"/> 31-40 TRIPS ⁽⁵⁾ |
| <input type="checkbox"/> 1-5 TRIPS ⁽¹⁾ | <input type="checkbox"/> 41-50 TRIPS ⁽⁶⁾ |
| <input type="checkbox"/> 6-10 TRIPS ⁽²⁾ | <input type="checkbox"/> 51-75 TRIPS ⁽⁷⁾ |
| <input type="checkbox"/> 11-20 TRIPS ⁽³⁾ | <input type="checkbox"/> 76-100 TRIPS ⁽⁸⁾ |
| <input type="checkbox"/> 21-30 TRIPS ⁽⁴⁾ | <input type="checkbox"/> MORE THAN 100 TRIPS ⁽⁹⁾ |

3 Where have you gone fishing in Arkansas so far this year? In the table below, please tell us the names of any waterbodies you fished between January and July of 2013 and the number of day trips you took to each.

Note: if you did not fish in Arkansas between January and July of 2013, simply check this box and skip to question **4**.

WATERBODY	CLOSEST TOWN	NUMBER OF FISHING DAY TRIPS	
		JANUARY TO MARCH 2013	APRIL TO JULY 2013
<i>Arkansas River</i>	<i>Morrilton</i> (EXAMPLE)	0	5

PART B: YOUR MOST RECENT FISHING TRIP

4 When did you take your most recent fishing day trip in Arkansas?

_____ MONTH _____ YEAR

5 Where did you fish?

_____ NAME OF WATERBODY

6 How did you get to the fishing site? (*Check one.*)

I WALKED OR BIKED ⁽¹⁾

I TOOK A BUS ⁽²⁾

I DROVE → Including yourself, how many adults were in your vehicle? ⁽³⁾
_____ ADULTS (18 OR OLDER) INCLUDING MYSELF

7 Did you fish from a boat or from the shore? (*Check one.*)

SHORE ⁽¹⁾

BOAT → ⁽²⁾ Did you trailer your boat to the site? YES NO

8 What species of fish were you primarily targeting?

_____ PRIMARY TARGET SPECIES

9 How many of these “targeted” fish did you catch?

_____ NUMBER OF TARGETED FISH CAUGHT

10 How long were the largest and smallest “targeted” fish that you kept?

_____ LENGTH (IN INCHES) OF LARGEST TARGETED FISH CAUGHT

_____ LENGTH (IN INCHES) OF SMALLEST TARGETED FISH CAUGHT

11 Approximately how much time did you spend fishing on this trip?

_____ HOURS

PART C: THE MAYFLOWER OIL SPILL

12 On March 29, 2013, a pipeline ruptured in Mayflower, Arkansas, releasing oil into the environment near Lake Conway. Were you aware of the Mayflower spill before today?

YES ₍₁₎ NO ₍₂₎ → Skip to Question **18**.

13 Did you take any fishing day trips to Lake Conway in the four months after the spill — April, May, June, and July of 2013?

YES ₍₁₎ How many? _____ DAY TRIPS

NO ₍₂₎ → Skip to Question **16**.

14 Did the oil spill have any impact on these fishing trips to Lake Conway?

YES ₍₁₎ NO ₍₂₎ → Skip to Question **16**.

15 Please indicate how the oil spill affected these Lake Conway fishing trips. *(Check all that apply.)*

BECAUSE OF THE SPILL, I DIDN'T FISH THE AREA OF LAKE CONWAY THAT I WOULD NORMALLY FISH ₍₁₎

BECAUSE OF THE SPILL, I DECIDED TO THROW BACK FISH THAT I WOULD NORMALLY KEEP ₍₂₎

BECAUSE OF THE SPILL, MY TRIP WAS LESS ENJOYABLE THAN NORMAL BECAUSE I WAS WORRIED ABOUT THE POSSIBILITY OF OIL IN THE LAKE ₍₃₎

OTHER ₍₄₎ (SPECIFY): _____

16 Did you fish Lake Conway less often than you normally would in April, May, June, and July because of the spill?

YES ₍₁₎ NO ₍₂₎ → Skip to Question **18**.

17 If the spill had not occurred, how many additional fishing day trips do you think you would have taken to Lake Conway in April, May, June, and July of 2013?

_____ ADDITIONAL DAY TRIPS

18 Approximately how many fishing day trips did you take to Lake Conway last year (in 2012)?

- | | |
|---|--|
| <input type="checkbox"/> NONE ⁽¹⁾ | <input type="checkbox"/> 31-40 TRIPS ⁽⁶⁾ |
| <input type="checkbox"/> 1-5 TRIPS ⁽²⁾ | <input type="checkbox"/> 41-50 TRIPS ⁽⁷⁾ |
| <input type="checkbox"/> 6-10 TRIPS ⁽³⁾ | <input type="checkbox"/> 51-75 TRIPS ⁽⁸⁾ |
| <input type="checkbox"/> 11-20 TRIPS ⁽⁴⁾ | <input type="checkbox"/> 76-100 TRIPS ⁽⁹⁾ |
| <input type="checkbox"/> 21-30 TRIPS ⁽⁵⁾ | <input type="checkbox"/> More than 100 TRIPS ⁽¹⁰⁾ |

PART D: FISHING IMPROVEMENTS IN THE LOCAL AREA

19 How important are the following management activities in improving the quality of your fishing experiences in the local area? *(Check one box for each activity.)*

	NOT AT ALL IMPORTANT ₍₁₎	SOMEWHAT IMPORTANT ₍₂₎	VERY IMPORTANT ₍₃₎	EXTERMELY IMPORTANT ₍₄₎
Increase the <i>number</i> of game fish available				
Increase the <i>size</i> of game fish available				
Provide additional public boat access				
Provide additional public shore access				
Improve facilities available at public access points				
Improve water quality				
Provide better information about fishing				

20 Is there anything else that the Game and Fish Commission can do to improve your fishing experience in the local area? Do you have any specific recommendations?

PART E: A FEW FINAL QUESTIONS

21 How many adults live in your household?

_____ ADULTS (18 OR OLDER)

22 What is your gender? (*Check one box.*)

MALE FEMALE

23 What is your age?

_____ YEARS

24 What is your ZIP code?

25 Which of the following income categories best describes your household income last year, before taxes? (*Check one box.*)

\$10,000 OR LESS ⁽¹⁾

\$60,001-\$75,000 ⁽⁷⁾

\$10,001-\$20,000 ⁽²⁾

\$75,001-\$100,000 ⁽⁸⁾

\$20,001-\$30,000 ⁽³⁾

\$100,001-\$125,000 ⁽⁹⁾

\$30,001-\$40,000 ⁽⁴⁾

\$125,001-\$150,000 ⁽¹⁰⁾

\$40,001-\$50,000 ⁽⁵⁾

\$150,001 OR MORE ⁽¹¹⁾

\$50,001-\$60,000 ⁽⁶⁾

Please return your completed survey in the enclosed postage-paid envelope, or mail to

**UALR Survey Research Center
Institute of Government
University of Arkansas at Little Rock
Ross Hall 404
2801 S. University Ave.
Little Rock, AR 72204-1099**

**501-569-8559
866-606-5595**

Appendix E

Mayflower Oil Spill Recreational Angler Follow-Up Survey

Central Arkansas Angler Survey

1 Approximately how many fishing day trips did you take in Arkansas last year (in 2012)?
When we say “day trip” we mean any fishing trip where you left home and returned home within the same day. (Please circle one number.)

- | | |
|-----------------|------------------------|
| 1 NONE | 6 31 — 40 TRIPS |
| 2 1 — 5 TRIPS | 7 41 — 50 TRIPS |
| 3 6 — 10 TRIPS | 8 51 — 75 TRIPS |
| 4 11 — 20 TRIPS | 9 76 — 100 TRIPS |
| 5 21 — 30 TRIPS | 10 More than 100 TRIPS |

2 Approximately how many fishing day trips did you take to Lake Conway last year (in 2012)?

- | | |
|-----------------|------------------------|
| 1 NONE | 6 31 — 40 TRIPS |
| 2 1 — 5 TRIPS | 7 41 — 50 TRIPS |
| 3 6 — 10 TRIPS | 8 51 — 75 TRIPS |
| 4 11 — 20 TRIPS | 9 76 — 100 TRIPS |
| 5 21 — 30 TRIPS | 10 More than 100 TRIPS |

3 On March 29, 2013, a pipeline ruptured in Mayflower, Arkansas, releasing oil into the environment near Lake Conway. Did you take any fishing day trips to Lake Conway in the four months after the spill — April, May, June, and July of 2013?

- 1 YES —————> How many? _____ DAY TRIPS
- 2 NO

Thank you for very much for participating!
Please return your survey in the enclosed postage-paid envelope.

You have been randomly selected to participate in this survey. Your participation is totally voluntary. All of your answers will remain confidential and none of your personal identification information will be associated with your answers. The survey will take about 1 minute to complete. This study has been reviewed and approved by the UALR Institutional Review Board (IRB) for human subject participation. If you have any questions about this survey, please contact David at 866-606-5595