JUNE 2024

Credit: Steve Hillebrand

ALABAMA TRUSTEE IMPLEMENTATION GROUP

DEEPWATER HORIZON OIL SPILL

Draft Restoration Plan IV and Environmental Assessment:

Wetlands, Coastal and Nearshore Habitats; Nutrient Reduction; Birds; Oysters; and Provide and Enhance Recreational Opportunities (Draft RP IV/EA)

EXECUTIVE SUMMARY

On or about April 20, 2010, the *Deepwater Horizon* (DWH) mobile drilling unit exploded, caught fire, and eventually sank in the Gulf of Mexico, resulting in a massive release of oil and other substances from the BP Exploration and Production, Inc. (hereinafter referred to as "BP") Macondo well and causing loss of life and extensive natural resource injuries. Initial efforts to cap the well following the explosion were unsuccessful, and for 87 days after the explosion the well continuously and uncontrollably discharged oil and natural gas into the northern Gulf of Mexico. Approximately 3.19 million barrels (134 million gallons) of oil were released into the ocean (U.S. v. BP et al., 2015). Oil spread from the deep ocean to the surface and nearshore environment from Texas to Florida. The oil came into contact with and injured natural resources as diverse as deep-sea coral, fish and shellfish, productive wetland habitats, sandy beaches, birds, sea turtles, and other protected marine life. The DWH oil spill prevented people from fishing, going to the beach, and enjoying typical recreational activities along the Gulf of Mexico. Extensive response actions, including cleanup activities and actions to try to prevent the oil from reaching sensitive resources, were undertaken to try to reduce harm to people and the environment. However, many of these response actions had collateral impacts on the environment and on natural resource services. The oil and other substances released from the well, in combination with the extensive response actions, together make up the DWH oil spill.

The DWH oil spill was subject to the provisions of the Oil Pollution Act (OPA) of 1990, which addresses preventing, responding to, and paying for oil pollution incidents in navigable waters, adjoining shorelines, and the exclusive economic zone of the United States. Under the authority of OPA, a council of federal and state "Trustees" was established on behalf of the public to assess natural resource injuries resulting from the incident and to work to make the environment and public whole for those injuries. As required under OPA, the Trustees conducted a natural resource damage assessment (NRDA) and prepared the Final Programmatic Damage Assessment and Restoration Plan/Programmatic Environmental Impact Statement (PDARP/PEIS).

The 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, the natural resource injuries for which responsible parties are liable include injuries resulting from the oil discharge and those resulting from response actions or substantial threat of a discharge. OPA specifies that Trustees responsible for representing the public's interest (in this case, state and federal agencies) must be designated to act on behalf of the public to assess the injuries and to address those injuries. The DWH Oil Spill Natural Resource Damage Assessment Trustees for the affected natural resources (DWH Trustees) conducted an NRDA to:

- Assess the impacts of the DWH oil spill on natural resources in the Gulf of Mexico and the services those resources provide.
- Determine the type and amount of restoration needed to compensate the public for these impacts.

Following the assessment, the DWH Trustees determined that the injuries caused by the DWH oil spill affected such a wide array of linked resources over such an enormous area that the effects of the spill must be described as constituting an ecosystem-level injury. Consequently, the DWH Trustees' chosen alternative for restoration planning employs a comprehensive, integrated ecosystem approach to address these ecosystem-level injuries.

In the Final PDARP/PEIS, the DWH Trustees adopted a portfolio of Restoration Types that addresses the diverse suite of injuries that occurred at both regional and local scales. The DWH Trustees identified the need for a comprehensive restoration plan at a programmatic level to guide and direct the ecosystem-level restoration effort, based on the following five restoration goals:

- Restore and conserve habitat.
- Restore water quality.
- Replenish and protect living coastal and marine resources.
- Provide and enhance recreational opportunities.
- Provide for monitoring, adaptive management, and administrative oversight to support restoration implementation.

These five goals work both independently and together to restore injured resources and services.

The Final PDARP/PEIS included the funding allocations for each restoration goal. In the 2016 Consent Decree resolving the DWH Trustees' claims against BP for natural resource injuries under OPA, BP agreed to pay up to $8.1 billion in natural resource damages (which includes the $1 billion that BP previously committed to pay for Early Restoration projects) over a 15-year period.

Draft Restoration Plan IV and Environmental Assessment

The Alabama Trustee Implementation Group (AL TIG) prepared this document, the Alabama Trustee Implementation Group Draft Restoration Plan IV and Environmental Assessment: Wetlands, Coastal and Nearshore Habitats; Nutrient Reduction; Birds; Oysters; and Provide and Enhance Recreational Opportunities (Draft RP IV/EA) pursuant to OPA and the National Environmental Policy Act. The content and findings included in this document are consistent with the DWH Trustees' findings in the Final PDARP/PEIS, from which it tiers. The AL TIG includes two state trustee agencies and four federal trustee agencies: the Alabama Department of Conservation and Natural Resources; the Geological Survey of Alabama; the United States Department of Commerce, represented by the National Oceanic and Atmospheric Administration; the United States Department of the Interior, represented by the United States Fish and Wildlife Service, Bureau of Land Management, and National Park Service; the United States Department of Agriculture; and the United States Environmental Protection Agency (collectively the AL TIG). For this restoration plan, the United States Department of Interior serves as the lead federal agency for National Environmental Policy Act compliance.

The AL TIG prepared this Draft RP IV/EA to (1) inform the public about DWH NRDA restoration planning efforts, (2) present analysis on the potential restoration benefits and environmental consequences of the alternatives, and (3) seek public comment on the alternatives presented in Table ES-1. In identifying proposed projects/alternatives[1] for this Draft RP IV/EA, the AL TIG considered (1) the OPA regulations screening criteria found at 15 Code of Federal Regulations 990.54, (2) the Restoration Goals and other criteria identified by the DWH Trustees in the Final PDARP/PEIS, (3) goals developed by the AL TIG for this restoration plan, (4) prior input from the public on the previous project screening processes conducted under previous restoration planning efforts, and (5) the current and future availability of funds under the DWH oil spill NRDA settlement payment schedule. To develop a reasonable range of alternatives for this Draft RP IV/EA, the AL TIG reviewed all projects analyzed in previous Restoration Plans developed by the AL TIG, Regionwide TIG, and by the DWH Trustee Council during Early Restoration, and identified those projects the TIG believes could provide restoration benefits in the Alabama Restoration Area if selected, continued, or expanded upon. Table ES-1 shows the range of alternatives, noting those that are preferred in this Draft RP IV/EA.

[1] For the purposes of this Draft RP IV/EA, each proposed project is considered a separate alternative; therefore, the terms "project" and "alternative" are used interchangeably.

Table ES-1: Reasonable Range of Alternatives and Associated Cost[2]

Alternative	Preferred Y/N	Project Costs
Restoration Type—Wetlands, Coastal and Nearshore Habitats		
Lower Perdido Islands Habitat Restoration – Phase II	Y	$6,100,000
Walker Island Expansion	N	$12,450,000
Restoration Type—Nutrient Reduction		
Puppy Creek – Juniper Creek-Big Creek Nutrient Reduction	Y	$1,520,900
Bayou La Batre Nutrient Reduction	N	$1,000,000
Restoration Type—Birds		
Stewardship of Coastal Alabama Beach Nesting Bird Habitat	Y	$4,740,456
Walker Island Expansion	N	$4,150,000
Lower Perdido Islands Habitat Restoration – Phase II	Y	$2,032,000
Restoration Type—Oysters		
Improving Resilience for Oysters by Linking Brood Reefs and Sink Reefs (Large-scale) – Component 4 – Mid-lower Mobile Bay, AL	Y	$2,800,000
Oyster Grow-Out and Restoration Reef Replacement – 5 Year Continuation	Y	$1,369,827
Oyster Grow-Out and Restoration Reef Replacement – 3 Year Continuation	N	$925,873
Restoration Type—Recreational Use		
Bayfront Park Restoration and Improvement Phases IIa and IIb	Y	$2,200,000
Laguna Cove Little Lagoon Natural Resource Protection – Large Scale Amenities	N	$2,750,000
Laguna Cove Little Lagoon Natural Resource Protection – Small Scale Amenities	Y	$2,000,000
Total Funding for Preferred Alternatives		**$22,763,183**

[2] Two projects, Lower Perdido Islands Habitat Restoration – Phase II and Walker Island Expansion, are jointly proposed under two Restoration Types: Wetlands, Coastal, and Nearshore Habitats, and Birds. The estimated Project costs in Table ES-1 are specific to each Restoration Type.

This page intentionally left blank.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

APPENDICES

1.0 INTRODUCTION

The Alabama Trustee Implementation Group (AL TIG) prepared this Alabama Trustee Implementation Group Draft Restoration Plan IV and Environmental Assessment: Wetlands Coastal Nearshore Habitats, Nutrient Reduction, Birds, Oysters and Recreational Use (RP IV/EA or plan) to continue restoration of lost natural resources and their services in Alabama as a result of the Deepwater Horizon (DWH) oil spill. The AL TIG is responsible for restoring the natural resources and resource services in the Alabama Restoration Area that were injured by the DWH oil spill and the associated spill response efforts. The AL TIG prepared this Draft RP IV/EA to (1) inform the public about its DWH natural resource damage assessment (NRDA) restoration planning efforts, (2) analyze the potential restoration benefits and environmental consequences of a reasonable range of projects/alternatives that would meet the purpose and need, and (3) seek public comment on the restoration alternatives considered in this document.

1.1 BACKGROUND AND SUMMARY OF THE SETTLEMENT, RESTORATION PLANNING, AND AUTHORITIES AND REQUIREMENTS

In response to the April 20, 2010, DWH oil spill, in February 2016, the Deepwater Horizon Oil Spill Natural Resource Damage Assessment Trustees (DWH Trustees) issued the Deepwater Horizon Oil Spill: Final Programmatic Damage Assessment and Restoration Plan/Programmatic Environmental Impact Statement (PDARP/PEIS)[3] detailing a specific proposed plan to select and implement restoration projects across the Gulf of Mexico region over a 15-year period. As a programmatic restoration plan, the PDARP/PEIS provides direction and guidance for identifying, evaluating, and selecting future restoration projects to be carried out by the Trustee Implementation Groups (TIGs) (Section 5.10.4 and Chapter 7 of the PDARP/PEIS) and is the document from which future restoration plans, including this Draft RP IV/EA, tier.

In March 2016, the DWH Trustees published a Notice of Availability of a Record of Decision for the PDARP/PEIS. Based on the DWH Trustees' injury determination established in the PDARP/PEIS, the Record of Decision set forth the basis for the DWH Trustees' decision to select Alternative A: Comprehensive Integrated Ecosystem Alternative. In April 2016, the United States District Court for the Eastern District of Louisiana entered a Consent Decree resolving civil claims by the DWH Trustees against BP Exploration and Production Inc. (BP) arising from the DWH oil spill.[4] This historic settlement resolves the DWH Trustees' claims against BP for natural resources damages under the Oil Pollution Act (OPA) of 1990. As part of the settlement, the settlement proceeds are allocated to the DWH Trustees to conduct restoration within specific Restoration Areas and for specific Restoration Types.

1.1.1 Oil Pollution Act

The DWH oil spill was subject to the provisions of OPA (33 United States Code [U.S.C.] §§ 2701 et seq.), which address preventing and responding to oil pollution incidents in navigable waters, adjoining shorelines, and the exclusive economic zone of the United States. The 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 the authority of OPA,

---

[3] The final PDARP/PEIS can be found at http://www.gulfspillrestoration.noaa.gov/restoration-planning/gulf-plan

[4] See *United States v. BPXP et al.*, Civ. No. 10-4536, centralized in MDL 2179, In re: Oil Spill by the Oil Rig "*Deepwater Horizon*" in the Gulf of Mexico, on April 20, 2010 (E.D. La.)

a council of federal and state DWH Trustees was established on behalf of the public to assess natural resource injuries resulting from the DWH oil spill and to work to make the environment and public whole for those injuries. For more information on the Trustee Council, including the federal and state agencies that are designated Trustees under OPA for the DWH oil spill, please see Chapter 7 of the PDARP/PEIS, incorporated by reference herein.

The AL TIG consists of two state Trustee agencies and four federal Trustee agencies:

- Alabama Department of Conservation and Natural Resources (ADCNR)
- Geological Survey of Alabama
- United States Department of Commerce, represented by the National Oceanic and Atmospheric Administration (NOAA)
- United States Department of the Interior (USDOI), represented by the United States Fish and Wildlife Service (USFWS), Bureau of Land Management, and National Park Service
- United States Department of Agriculture (USDA)
- United States Environmental Protection Agency (USEPA)

1.1.2 National Environmental Policy Act

The National Environmental Policy Act of 1969 (NEPA) (42 U.S.C. §§ 4321 et seq.) and Council on Environmental Quality regulations implementing NEPA (40 Code of Federal Regulations [CFR] §1500.1 et seq.) apply to restoration actions by Federal Trustees. The DWH Trustees conducted a programmatic NEPA analysis in the PDARP/PEIS from which subsequent DWH restoration plans could tier their site-specific NEPA analyses, as provided for in 40 CFR 1501.11. The NEPA analysis in this Draft RP IV/EA tiers from the PDARP/PEIS programmatic NEPA analysis (See also, USDOI NEPA regulations at 43 CFR 46.140).

The Fiscal Responsibility Act (42 USC § 4336b, June 2023) amended NEPA to require that when a federal agency relies on a programmatic environmental document more than 5 years old, the federal agency must reevaluate the analysis and any underlying assumptions in the programmatic environmental document to ensure the analysis remains valid. The DWH Federal Trustees reviewed the framework of the PDARP/PEIS for continued relevance and in a memo dated June 2024 affirmed the continued validity of the PDARP/PEIS to the overall program. The federal trustees will evaluate whether new information or changed circumstances may affect the continued validity of the PDARP/PEIS at the project level during the preparation of each tiered RP/EA. Consistent with the FRA amendment to NEPA and with 40 CFR 1501.11 the Deepwater Horizon Oil Spill Federal Trustees of the AL TIG determined that the analysis in the PDARP/PEIS (2016) and the underlying assumptions therein in the context of the projects proposed in this RP/EA remain valid and that it continues to be applicable as a programmatic evaluation for DWH restoration planning.

1.1.3 Lead, Cooperating Agencies, and Intent to Adopt

For this restoration plan, the Department of the Interior serves as the lead federal agency for NEPA compliance. Each of the other federal and state co-Trustees are participating as cooperating agencies pursuant to NEPA (40 CFR 1501.8). In accordance with 40 CFR 1506.3(a), each of the three federal cooperating agencies (USDA, USEPA, and NOAA) will review the RP IV/EA for adequacy in meeting the standards set forth in their own NEPA implementing procedures and decide whether to adopt the analysis in this document.

1.2 PLANNING BY THE AL TIG TO DATE

Restoration planning from the DWH oil spill began in Alabama under Early Restoration, which included projects in four of the Early Restoration phases and continued by implementing three Alabama-specific restoration plans following the 2016 settlement. Table 1-1 shows the total settlement allocation to the AL TIG by restoration type, as well as the amount of funding previously obligated under each restoration type. In addition to the original settlement allocation, each TIG earns interest on the funds they were awarded in the settlement, and they can choose to apply those earnings to whatever restoration type they wish. Note that one restoration type, Provide and Enhance Recreational Opportunities, has already exceeded its settlement allocation.

The data regarding total allocations and allocations to restoration projects previously approved do not account for project modifications, terminations, or the availability of additional interest funds. As a result, amounts do not reflect a final balance sheet regarding available funds under each restoration type. Section 6.5.3.1 of the DWH Administrative Record presents more information about project changes adopted by the AL TIG.[5] Chapter 2 of the Final PDARP/PEIS presents additional details about the background of the DWH oil spill, the impact of the spill on the Gulf of Mexico ecosystem, and additional context for the settlement and allocation of funds.

[5] Available at www.doi.gov/deepwaterhorizon/adminrecord.

Table 1-1: Allocation of Deepwater Horizon Settlement Funds for the Alabama Restoration Area by Restoration Type

Final PDARP/PEIS Programmatic Restoration Goals and Underlying Restoration Types	Alabama Total Allocation	Previously Allocated to Restoration Projects[6]
1. Restore and Conserve Habitat	**$96,110,000**	
Wetlands, Coastal, and Nearshore Habitats	$93,110,000	$34,636,998
Habitat Projects on Federally Managed Lands	$3,000,000	$484,001
2. Restore Water Quality	**$5,000,000**	
Nutrient Reduction (Nonpoint Source)	$5,000,000	$3,479,090
3. Replenish and Protect Living Coastal and Marine Resources	**$53,974,000**	
Sea Turtles	$5,500,000	$4,545,566
Marine Mammals	$5,000,000	$3,118,763
Birds	$30,000,000	$12,561,456
Oysters	$10,000,000	$4,942,505
4. Provide and Enhance Recreational Opportunities	**$110,505,305**	$113,557,642
5. Monitoring, Adaptive Management, Administrative Oversight	**$30,000,000**	
Monitoring and Adaptive Management	$10,000,000	$3,508,766
Administrative Oversight and Comprehensive Planning	$20,000,000	$4,475,644
TOTAL	**$295,589,305**	$185,310,432

Source: USDOJ, 2016

[6] The funds listed in this column represent funds allocated in prior restoration plans and includes any budget changes associated with a particular project. All documents regarding any budget change for any project can be viewed in the DWH Administrative Record.

1.3 RESTORATION PURPOSE AND NEED

The purpose of restoration, as discussed in this document and detailed more fully in the PDARP/PEIS, is to make the environment and the public whole for injuries resulting from the DWH oil spill (NOAA, 2016). Designated Trustees accomplish this by implementing restoration actions that return injured natural resources and resource services to baseline conditions and compensate for interim losses in accordance with OPA NRDA regulations.

To develop a reasonable range of alternatives for this Draft RP IV/EA, the AL TIG reviewed all projects analyzed in previous Restoration Plans developed by the AL TIG, Regionwide TIG, and by the DWH Trustee Council during Early Restoration, and identified those projects the TIG believes could provide additional restoration benefits in the Alabama Restoration Area if selected, continued, or expanded upon. The purpose of this plan is to provide new or continued benefits through these previously identified and evaluated projects. Action is needed at this time to provide new benefits or to continue the benefits from past efforts and to not allow the benefits of those projects to lapse without the expansion or continuation.

The AL TIG has undertaken this restoration planning effort to meet the purpose of contributing to the compensation for and restoration of natural resources and resource services injured in the Alabama Restoration Area as a result of the DWH oil spill. Specifically, this Draft RP IV/EA addresses restoration of five Restoration Types injured by the DWH oil spill: (1) Wetlands Coastal Nearshore Habitats, (2) Nutrient Reduction, (3) Birds, (4) Oysters, and (5) Provide and Enhance Recreational Opportunities. As described in Section 5.3 of the Final PDARP/PEIS, the five Trustee programmatic restoration goals work independently and together to benefit injured resources and services. The alternatives presented in this Draft RP IV/EA address four of the five Trustee programmatic restoration goals: (1) restore and conserve habitat, (2) restore water quality, (3) replenish and protect living coastal and marine resources and (4) provide and enhance recreational opportunities.

1.4 PROPOSED ACTION: IMPLEMENTATION OF THE AL TIG RP IV/EA

To meet the above stated purpose and need, the AL TIG proposes to implement its preferred alternatives addressing injury to five Restoration Types: (1) Wetlands Coastal Nearshore Habitat, (2) Nutrient Reduction, (3) Birds, (4) Oysters, and (5) Provide and Enhance Opportunities. Table 1-2 identifies the preferred alternatives. The AL TIG proposes to implement the preferred alternatives using approximately $22,985,283 in DWH settlement funds in accordance with the Consent Decree.

1.5 REASONABLE RANGE OF ALTERNATIVES

Table 1-2 identifies the alternatives that compose the reasonable range for this Draft RP IV/EA, including the seven alternatives preferred by the AL TIG for implementation at this time. The project descriptions for the alternatives listed in Table 1-2 are detailed in Chapter 2. Under the Natural Recovery/No Action Alternative, the AL TIG would not select or implement any of the restoration alternatives proposed in this RP/EA. The Natural Recovery/No Action Alternative is further discussed below in Section 1.7. As noted in Section 1.2, the original settlement allocation for Provide and Enhance Recreational Opportunities has been obligated, and any projects selected from that restoration type would be funded with earned interest. Additionally, one project under the Nutrient Reduction restoration type (Puppy Creek-Juniper Creek – Big Creek Nutrient Reduction), if selected, would expend the full Nutrient Reduction settlement allocation; any projects proposed under that restoration type in future restoration plans would be funded with earned interest.

Table 1-2: Reasonable Range of Alternatives and Associated Costs[7]

Alternative	Preferred Y/N	Project Costs
Restoration Type—Wetlands Coastal Nearshore Habitat		
Lower Perdido Islands Habitat Restoration – Phase II	Y	$6,100,000
Walker Island Expansion	N	$16,600,000
Restoration Type—Nutrient Reduction		
Puppy Creek – Juniper Creek-Big Creek Nutrient Reduction	Y	$1,520,900
Bayou La Batre Nutrient Reduction	N	$1,000,000
Restoration Type—Birds		
Stewardship of Coastal Alabama Beach Nesting Bird Habitat	Y	$4,740,456
Walker Island Expansion	N	$16,600,000
Lower Perdido Islands Habitat Restoration – Phase II	Y	$2,032,000
Restoration Type—Oysters		
Improving Resilience for Oysters by Linking Brood Reefs and Sink Reefs (Large-scale) – Component 4 – Mid-lower Mobile Bay, AL	Y	$2,800,000
Oyster Grow-Out and Restoration Reef Replacement – 5 Year Continuation	Y	$1,369,827
Oyster Grow-Out and Restoration Reef Replacement – 3 Year Continuation	N	$925,873
Restoration Type—Recreational Use		
Bayfront Park Restoration and Improvement Phases IIa and IIb	Y	$2,200,000
Laguna Cove Little Lagoon Natural Resource Protection – Large Scale Amenities	N	$2,750,000
Laguna Cove Little Lagoon Natural Resource Protection – Small Scale Amenities	Y	$2,000,000
Total Funding for Preferred Alternatives		**$22,763,183**

[7] Two projects, Lower Perdido Islands Habitat Restoration – Phase II and Walker Island Expansion, are jointly proposed under two Restoration Types: Wetlands, Coastal, and Nearshore Habitats, and Birds. The estimated Project costs in Table ES-1 are specific to each Restoration Type.

1.6 SEVERABILITY OF PROJECTS

The alternatives presented in this Draft RP IV/EA are independent of each other and may be individually selected for implementation. A decision to not select one or more of the alternatives does not affect the AL TIG's selection of any remaining alternatives. Projects not included in the reasonable range of alternatives or not selected for implementation in this Draft RP IV/EA may continue to be considered for inclusion in future restoration plans by the AL TIG.

1.7 NATURAL RECOVERY/NO ACTION

Pursuant to NEPA, this RPIV/EA considers a No Action Alternative for each Restoration Type. Under the No Action Alternative, the AL TIG would not select or implement any of the restoration alternatives proposed in this RP/EA. In the PDARP/PEIS the DWH Trustees analyzed the Natural Recovery/No Action Alternative programmatically and found that it would not meet the purpose and need for restoring lost natural resources and their services. No Action Alternatives are included in this RPIV /EA as a "benchmark, enabling decision makers to compare the magnitude of environmental effects of the action alternatives." See Section 3.11 for more details.

1.8 COORDINATION WITH OTHER GULF RESTORATION PROGRAMS

The DWH Trustees are committed to coordinating with other Gulf of Mexico restoration programs to maximize the overall ecosystem benefits from DWH NRDA restoration efforts. During the course of the restoration planning process, the AL TIG coordinated with and will continue to coordinate with other DWH oil spill and Gulf of Mexico restoration programs, including the Resources and Ecosystems Sustainability, Tourist Opportunities, and Revived Economies of the Gulf Coast States Act (RESTORE Act) as implemented by the Gulf Coast Ecosystem Restoration Council; the Gulf Environmental Benefit Fund managed by the National Fish and Wildlife Foundation; and other state and federal funding sources. Specifically in this plan, the NOAA Transformational Habitat Restoration and Coastal Resiliency grant program is proposed for project coordination. That coordination is incorporated into the discussion of the Lower Perdido Islands Habitat Restoration – Phase II project. Additional restoration efforts are considered in the analysis of cumulative impacts in this Draft RP IV/EA (Chapter 4). More details about coordination can be found in Section 1.5.6 of the Final PDARP/PEIS.

1.9 PUBLIC INVOLVEMENT

Public input, an integral part of NEPA, OPA, and the DWH oil spill restoration planning effort, has been ongoing since October 1, 2010, when the DWH Trustees published a Notice of Intent to Conduct Restoration Planning (75 Federal Register 60800). On April 19, 2024, the AL TIG issued a Notice of Intent informing the public that it was initiating the drafting of this RP/EA to restore water quality, wetlands, coastal, and nearshore habitat, recreational opportunities, birds, and oysters.

As noted above in Section 1.6, projects not carried forward in a previous restoration plan can be considered in a future restoration plan. To develop a reasonable range of alternatives for this Draft RP IV/EA, the AL TIG reviewed all projects analyzed in previous Restoration Plans developed by the AL TIG, Regionwide TIG, and by the DWH Trustee Council during Early Restoration, and identified those projects the TIG believes could provide restoration benefits in the Alabama Restoration Area if selected, continued, or expanded upon. Since these alternatives were considered and evaluated in previous restoration plans, the public involvement and comment on those projects was also considered.

1.9.1 Public Review Process for this RP/EA

Public review of a Draft RP/EA is an integral component of the restoration planning process. In accordance with NEPA and OPA, the Draft RP IV/EA is available for public review and comment for 30 days following public notification as specified in the Notice of Availability (NOA) published in the *Federal Register*. The public is encouraged to review and comment on the RP/EA.

Comments on the Draft RP/EA can be submitted during the comment period by one of the following methods:

Online: The public may access a link to the RP/EA's Planning, Environment, and Public Comment portal by navigating first to www.gulfspillrestoration.noaa.gov/restoration-areas/alabama

By mail: The public may submit hard copy comments addressed to U.S. Fish and Wildlife Service Gulf Restoration Office, 1875 Century Blvd., Atlanta, GA 30345.

Mailed submissions must be postmarked on or before the comment deadline specified in the *Federal Register* and on the Gulf Spill Restoration website.

The AL TIG will also hold a virtual public meeting to facilitate the public review and comment process on July 10, 2024 at 12:00 PM CT. Additional information for the public meeting will be provided on the Alabama Restoration website (www.gulfspillrestoration.noaa.gov/alabama) along with the notice of the release of this EA.

At the close of the public comment period, the AL TIG will consider all comments received during the comment period and revise the RP IV/EA as appropriate. A summary of comments received and the TIG's responses, where applicable, will be included in the final RP/EA.

Please note that personal identifying information included in submitted comments (such as name, address, phone number, and email address) may be made publicly available. Personal information is not required to submit comments.

2.0 RESTORATION PLANNING PROCESS: SCREENING AND ALTERNATIVES

NRDA restoration under OPA is a process that includes evaluating injuries to natural resources and resource services to determine the types and extent of restoration needed to address the injuries. Restoration activities must produce benefits that are related to or have a nexus (connection) to natural resource injuries and service losses resulting from a spill. Trustees identify a reasonable range of restoration alternatives and then evaluate those proposed alternatives. The OPA NRDA regulations (15 CFR 990.54) provide factors for Trustees to consider when evaluating projects designed to compensate the public for injuries caused by oil spills. Following the OPA regulations (15 CFR 990.53), the AL TIG developed a screening process to identify a reasonable range of alternatives to be further evaluated in this Draft RP IV/EA. This chapter describes the screening process the AL TIG used to identify a reasonable range of alternatives to include in this Draft RP IV/EA for evaluation under both OPA and NEPA. The reasonable range of alternatives identified is consistent with the DWH Trustees' selected programmatic alternative and the goals identified in the Final PDARP/PEIS. The restoration planning process was also conducted in accordance with the Consent Decree, the 2021 "Trustee Council Standard Operating Procedures for Implementation of the Natural Resource Restoration for the *Deepwater Horizon* (DWH) Oil Spill" (Trustee Council Standard Operating Procedures [SOP]), OPA regulations, and NEPA regulations.

2.1 SUMMARY OF INJURIES ADDRESSED IN THE DRAFT RP IV/EA

The DWH oil spill introduced numerous contaminants into the environment. Chapter 4 of the Final PDARP/PEIS summarizes the injury assessment and documents the nature, degree, and extent of injuries from the incident to both natural resources and the services they provide. Restoration projects proposed in this Draft RP IV/EA and in future AL TIG restoration plans are designed to address injuries in the Alabama Restoration Area resulting from the incident. This Draft RP IV/EA proposes alternatives for the following Restoration Types described in the Final PDARP/PEIS: Wetlands Coastal Nearshore Habitat, Nutrient Reduction, Birds, Oysters, and Provide and Enhance Recreational Opportunities. This section summarizes the information on injures from the Final PDARP/PEIS injury assessment (Chapter 4), with specific reference to the injuries in Alabama. The identification of the restoration alternatives proposed in this plan is informed by the assessment of injuries.

2.1.1 Wetlands, Coastal, and Nearshore Habitats

The DWH Trustees evaluated impacts on the nearshore marine ecosystem as part of the injury assessment (Final PDARP/PEIS, Section 4.6). The spill and response activities caused extensive injuries to wetland, coastal, and nearshore habitats across the northern Gulf of Mexico and in Alabama specifically. Injuries that informed the AL TIG's restoration planning for wetlands, coastal, and nearshore habitats occurred to estuarine coastal wetlands and nearshore complexes and to sand beach habitats. In Alabama, 95 miles of shoreline were oiled. Response activities occurred on 84 miles of shoreline. The Final PDARP/PEIS summarizes studies in Alabama demonstrating the presence of DWH oil in nearshore sediments and at wetlands sites; reductions of live biomass in salt marshes; losses in the numbers of nearshore oysters; increased shoreline erosion because of the loss of oysters; and other physical and biological injuries to beach, wetland, and nearshore habitats resulting from oiling and response activities in the state.

2.1.2 Nutrient Reduction

Nutrient reduction projects are included as a Restoration Type because the water quality improvements associated with nutrient reduction projects exhibit strong ecological linkages to Alabama's estuarine and coastal habitats and communities. This connectivity to the larger Gulf of Mexico ecosystem is expected to result in cascading ecological benefits, increasing the overall health and productivity of the Gulf of

Mexico ecosystem, thereby restoring natural resources injured by the DWH oil spill. In coastal Alabama, an ongoing watershed planning process documents these linkages.

2.1.3 Birds

The DWH Trustees evaluated impacts on birds as part of the injury assessment (Final PDARP/PEIS, Section 4.7). At least 93 species of birds, including both resident and migratory species and across all five Gulf Coast states, were exposed to DWH oil in multiple northern Gulf of Mexico habitats, including open water, islands, beaches, bays, and marshes. For more information on the impacts on birds caused by the DWH oil spill, see section 4.7 of the PDARP. The DWH Trustees evaluated impacts on oysters as part of the injury assessment (Final PDARP/PEIS, Section 4.6). Substantial injury to intertidal and subtidal oysters in the northern Gulf of Mexico occurred as the result of the DWH oil spill and response actions. Nearshore oyster cover in the northern Gulf of Mexico was significantly reduced over 155 miles of shoreline and resulted in the loss of 8.3 million adult-equivalent oysters because of the impacts of response activities and physical fouling by oil. The loss of nearshore oyster cover also contributed to an increase in shoreline erosion rates and wetland loss. The long-term sustainability of nearshore and subtidal oysters throughout the north-central Gulf of Mexico has been compromised as a result of the combined effects of reduced spawning stock, larval production, spat settlement, and spat substrate availability caused by the spill.

The Final PDARP/PEIS indicates that the spill severely affected oyster reproduction in Mississippi Sound. It concludes that the spill resulted in reduced larval production, spat settlement, and spat substrate availability there that compromises the long-term sustainability of oyster reefs. In addition, losses of intertidal oysters occurred because of oiling and cleanup actions, resulting in the destruction of oyster cover, which has been associated with accelerated coastal erosion. The assessment notes this effect was observed along oiled shorelines in Alabama.

2.1.4 Oysters

The DWH Trustees evaluated impacts on oysters as part of the injury assessment (Final PDARP/PEIS, Section 4.6). Substantial injury to intertidal and subtidal oysters in the northern Gulf of Mexico occurred as the result of the DWH oil spill and response actions. Nearshore oyster cover in the northern Gulf of Mexico was significantly reduced over 155 miles of shoreline and resulted in the loss of 8.3 million adult-equivalent oysters because of the impacts of response activities and physical fouling by oil. The loss of nearshore oyster cover also contributed to an increase in shoreline erosion rates and wetland loss. The long-term sustainability of nearshore and subtidal oysters throughout the north-central Gulf of Mexico has been compromised as a result of the combined effects of reduced spawning stock, larval production, spat settlement, and spat substrate availability caused by the spill.

The Final PDARP/PEIS indicates that the spill severely affected oyster reproduction in Mississippi Sound. It concludes that the spill resulted in reduced larval production, spat settlement, and spat substrate availability there that compromises the long-term sustainability of oyster reefs. In addition, losses of intertidal oysters occurred because of oiling and cleanup actions, resulting in the destruction of oyster cover, which has been associated with accelerated coastal erosion. The assessment notes this effect was observed along oiled shorelines in Alabama.

2.1.5 Provide and Enhance Recreational Opportunities

The DWH Trustees evaluated losses to recreational users as part of the injury assessment (Final PDARP/PEIS, Section 4.10). In general, the DWH lost recreational use injury assessment covered two broad categories of recreation: shoreline use and boating. Shoreline use refers to recreational activities at locations near beaches and other shoreline areas and includes swimming, sunbathing, surfing, walking, kayaking, and fishing from the shore or shoreline structures. It also includes fishing at sites that are considered coastal but are not directly on the beach. Specifically excluded from the shoreline use assessment are recreational boating, commercial activities, and DWH oil spill response. Boating includes recreational boating activities that begin at sites providing access to salt water near the Gulf Coast. Excluded from this category are non-recreational boating activities, including commercial fishing, law enforcement/safety, and DWH oil spill response.

2.2 SCREENING FOR REASONABLE RANGE OF ALTERNATIVES

As described in Chapter 1, this Draft RP IV/EA continues the restoration planning process that began during Early Restoration and was continued by the AL TIG in the Restoration Plan I/Environmental Impact Statement (RP I/EIS), the Restoration Plan II/Environmental Assessment (RP II/EA) and the Restoration Plan III/Environmental Assessment (RP III/EA). In this Draft RP IV/EA, the AL TIG is focusing on projects for five of the Restoration Types identified in the Final PDARP/PEIS: (1) Wetlands Coastal Nearshore Habitats, (2) Nutrient Reduction, (3) Birds, (4) Oysters, and (5) Provide and Enhance Recreational Opportunities. The AL TIG selected these Restoration Types for RP IV/EA because at this time, the benefits of further investment of restoration funds in these Restoration Types would be expected to build on the success of previous efforts.

For the range of alternatives in Draft RP IV, the AL TIG looked at past planning efforts and projects from all of its prior restoration plans (including Early Restoration plans) and also the RW TIG RP1 to determine whether any of the projects reviewed in those plans could provide restoration benefits through (1) continuation in time, (2) expansion in scope, (3) additional funding needed due to cost increases, or (4) which had previously been a non-preferred alternative but were possible candidates for implementation at this time. The AL TIG considered but dismissed 64 potential alternatives from this group for various reasons listed below in Table 2-1. The screening process yielded 11 projects for more detailed OPA and NEPA analysis across the five Restoration Types. The remainder of this chapter discusses the screening process and includes detailed descriptions of the 11 projects that make up the reasonable range, organized by Restoration Type.

2.3 RESTORATION PROJECT SCREENING OVERVIEW

The goal of the AL TIG's screening process is to identify a set of restoration projects that provide a reasonable range of alternatives for compensating the public, at least partially, for the resource injuries addressed under the included five restoration types. The results of the screening process (the reasonable range of alternatives) represent those restoration projects that, based on preliminary investigation, have a reasonable likelihood of satisfying the evaluation standards.

The AL TIG has completed or is nearing completion for several ongoing projects and based on project success, has decided to evaluate all past projects to determine if successful projects can be further expanded and/or continued to leverage additional restoration benefits through additional investment or if previously nonselected projects could now provide meaningful restoration benefits. The AL TIG revisited each alternative included in all AL TIG restoration plans (RPI, RPII, RPIII, and RPIII addendum), Trustee early restoration plans (Phase I, Phase II, Phase III, and Phase IV), and Regionwide TIG restoration plan(s) (Regionwide TIG RP1). The AL TIG considered the status of each alternative and whether the alternative could potentially provide additional restoration benefits. Restoration types include wetlands, coastal, and nearshore habitats, nutrient reduction, oysters, birds, and provide and enhance recreational opportunities. Projects not advanced and reasons for not advancing are listed in table below.

2.4 ALTERNATIVES CONSIDERED BUT DISMISSED FOR FURTHER EVALUATION IN THIS PLAN

A number of projects considered during screening were ultimately not included in the reasonable range of alternatives for this plan (Table 2-1). The AL TIG's decisions to advance projects to the reasonable range of alternatives are based on balancing the considerations outlined above and have been taken in the context of the full suite of restoration alternatives being advanced for analysis in this restoration plan. As a result, while a project considered in the screening process may have received a generally favorable review, the AL TIG may still have decided not to advance it to the reasonable range of alternatives for this plan. While these projects have restoration potential and may be evaluated and potentially selected in a future restoration plan, they are not considered for further evaluation under OPA or NEPA in this plan.

Table 2-1: Projects Not Carried Forward for Further Analysis

Projects Considered but Dismissed	Reason Not Carried Forward
Restoration Type – Wetlands Coastal Nearshore Habitats	
Southwestern Coffee Island Habitat Restoration Project – Phase I (Engineering and Design [E&D])	Project design not complete; timing not right.
Alabama Dune Restoration Cooperative Project	Considered successful, but additional locations not readily available.
Alabama Swift Tract Living Shoreline	Project complete. Currently successfully implemented. Further evaluation for geographic benefits is ongoing but not ready at this time.
Lower Perdido Islands Restoration – Phase I	Project has successfully completed Conservation Management Plan and 30% design plans. Project received NOAA grant to fund 100% design plans and 75% of construction funds. Great opportunity to leverage other funds to complete 100% of the project.
Magnolia River Land Acquisition (Holmes Tract)	Project is complete. Land is already acquired – cannot acquire again.
Marsh Island (Portersville Bay) Restoration Project	Original project still ongoing – in adaptive management; outcomes still being evaluated.
Perdido River Land Acquisition (Molpus Tract)	Do not have a willing seller.
Point aux Pins Living Shorelines	Project is complete. Additional nearby locations not readily available.
Weeks Bay Land Acquisition (East Gateway Tract)	Project is complete. Land has been acquired.

Projects Considered but Dismissed	Reason Not Carried Forward
Weeks Bay Land Acquisition (Harrod Tract)	Do not have a willing seller.
Weeks Bay Land Acquisition (Lloyd Tract)	Project is complete. Land has already been acquired.
Weeks Bay Nutrient Reduction	Additional project opportunities/success may be limited.
Restoration Type - Habitat on Federally Managed Land	
Little Lagoon Living Shoreline	Project is in progress; outcomes still being evaluated.
Restoring the Night Sky – Assessment, Training, and Outreach (E&D)	Project is in progress; outcomes still being evaluated.
Shell Belt and Coden Belt Roads Living Shoreline	Project was terminated. Not feasible.
Restoration Type - Nutrient Reduction	
Fowl River Nutrient Reduction	Additional project opportunities/benefits may be limited.
Toulmins Spring Branch Engineering and Design (E&D)	Currently in E&D phase; outcomes not known; timing not right.
Restoration Type - Sea Turtles	
Improving Habitat Injured by Spill Response: Restoring the Night Sky	Project is currently being completed; outcomes still being evaluated.
Reducing Marine Debris Impacts on Birds and Sea Turtles	Currently in progress, outcomes not yet evaluated.
Coastal Alabama Sea Turtle (CAST) Conservation Program	Share the Beach project could be extended for additional years under the Regionwide TIG project, which still has existing funding available.
CAST Protection: Enhancement and Education	Project is in progress and nearing completion; outcomes not yet known.
CAST Triage	Project currently in progress; outcomes not yet known.
CAST Habitat Usage and Population Dynamics	Although the project could be expanded to create a more comprehensive dataset, the current level of

Projects Considered but Dismissed	Reason Not Carried Forward
	funding appears adequate to expand the project if needed.
Guiding Restoration Success for Nesting Females and Hatchlings in the Northern Gulf of Mexico	Alternative focuses on data gathering. May be more effective as a long-term monitoring program to help document restoration success for sea turtles rather than a restoration project.
Reducing Sea Turtle Bycatch at Recreational Fishing Sites	Currently in progress; outcomes not yet known.
Regionwide Enhancements to the Sea Turtle Stranding and Salvage Network and Enhanced Rehabilitation – Component 1 – Enhancing Response, Coordination, and Preparedness in the Gulf of Mexico	Currently in progress; outcomes not yet known.
Restore and Enhance Sea Turtle Nest Productivity	Currently in progress; outcomes not yet known.
Restoration Type - Marine Mammals	
Alabama Estuarine Bottlenose Dolphin Protection: Enhancement and Education	This project is currently in progress; outcomes are not yet known.
Assessment of Alabama Estuarine Bottlenose Dolphin Populations and Health	Project is still in progress; outcomes still being evaluated.
Enhance Capacity, Diagnostic Capability, and Consistency of the Marine Mammal Stranding Network in the Gulf of Mexico	Project activities are being proposed in the Enhancing Capacity for the Alabama Marine Mammal Stranding Network Project extension described in the Draft RPII Supplemental Restoration Plan.
Enhance Marine Mammal Stranding Network Diagnostic Capabilities and Consistency across the Gulf of Mexico	This RW TIG project is complementary to the AL TIG Enhancing Capacity for the Alabama Marine Mammal Stranding Network Project, which is proposed to be extended in the Draft RPII Supplemental Restoration Plan.
Enhancing Capacity for the Alabama Marine Mammal Stranding Network	Project is under evaluation in a Supplemental MMRP that was already under preparation when this RP IV/EA began.

Projects Considered but Dismissed	Reason Not Carried Forward
Reducing Impacts to Dolphins from Hook-and-Line Gear and Provisioning through Fishery Surveys, Social, Science, and Collaboration	Project is in progress; outcomes not yet known.
Restoration Type – Birds	
Southwestern Coffee Island Habitat Restoration Project – Phase I (E&D)	Design not complete yet; timing not right.
Improving Habitat Injured by Spill Response: Restoring the Night Sky	Project is currently being completed; outcomes still being evaluated.
Reducing Marine Debris Impacts on Birds and Sea Turtles	Currently in progress; outcomes not yet evaluated.
Bird Nesting and Foraging Area Stewardship	This RW project covers project activities that are the same as those included in the Stewardship of Coastal Alabama Beach Nesting Bird Habitat Project, which has been advanced to the reasonable range of alternatives.
Colonial Nesting Wading Bird Tracking and Habitat Use Assessment – Four Species	The Two Species project is currently underway, and outcomes are still being evaluated.
Colonial Nesting Wading Bird Tracking and Habitat Use Assessment – Two Species	Project is currently being implemented/nearing completion; outcomes are still being evaluated.
Conservation and Enhancement of Nesting and Foraging Habitat for Birds – Component 2 – Pilot Town, AL	Acquisition is complete.
Dauphin Island West End Acquisition	Project in progress; outcomes are still being evaluated.
Enhanced Management of Avian Breeding Habitat Injured by Response is the Florida Panhandle, Alabama, and Mississippi	Bird stewardship/habitat management is being considered under another project.
Osprey Restoration in Coastal Alabama	Project is complete. Additional locations not readily known at this time.
Stewardship of Coastal Alabama Beach Nesting Bird Habitat – Stewardship and Monitoring Only	Bird stewardship/habitat management is being considered under another project.

Projects Considered but Dismissed	Reason Not Carried Forward
Restoration Type – Oysters	
Alabama Oyster Cultch Restoration	Could potentially do another round of cultch planting (better addressed through other projects).
Oyster Cultch Relief and Reef Configuration	Project currently in progress; outcomes not yet known.
Oyster Hatchery at Claude Peteet Mariculture Center – High Spat Production with Study	Project was terminated. Not feasible at this time.
Oyster Hatchery at Claude Peteet Mariculture Center – Low Spat Production without Study	Project was terminated. Not feasible at this time.
Side-scan Mapping of Mobile Bay Relic Oyster Reef	Project is complete; outcomes are still being evaluated.
Restoration Type – Provide and Enhance Recreational Opportunities	
Bayfront Park Restoration and Improvement Phase IIa	Different version of project implemented in plan.
Bayfront Park Restoration and Improvements – E&D	Could gain additional restoration benefits by expanding amenities. Combine with RP3 implementation project.
Bon Secour National Wildlife Refuge Recreation Enhancement – Centennial Trail Boardwalk	Project was previously not selected due to cost/available funding amounts. Reasons still valid.
Bon Secour National Wildlife Refuge Recreation Enhancement – Mobile Street Boardwalk Restoration	Project is currently being implemented; outcomes not yet available.
Dauphin Island Eco-Tourism and Environmental Education Area	Project is in progress; outcomes not yet known.
Fort Morgan Pier Rehabilitation Restoration	Project is complete; additional amenities not contemplated at this time.
Gulf State Park Enhancement Project	Project is complete; additional amenities not contemplated at this time.
Gulf State Park Lodge and Associated Public Access Amenities Project	Project is complete; additional amenities not contemplated at this time.

Projects Considered but Dismissed	Reason Not Carried Forward
Gulf State Park Pier Renovation	Project is in progress; outcomes not yet known; but likely will achieve all restoration benefits for this location.
Mid-Island Parks and Public Beach Improvements Project (Parcels A, B, and C)	Smaller scale project that included Parcels B and C selected. Parcel A has been purchased with other funding source (NFWF).
Mid-Island Parks and Public Beach Improvements Project (Parcels B and C)	Project is in progress; outcomes not yet known.
Perdido Beach Public Access Coastal Protection	Do not have willing property owners.
Perdido River Land Acquisition (Molpus Tract)	Do not have a willing seller.
Restoration Type - Monitoring and Adaptive Management	
Assessment of Alabama Estuarine Bottlenose Dolphin Populations and Health	Project is still in progress; outcomes still being evaluated.
Restoring the Night Sky – Assessment, Training, and Outreach (E&D)	Project is in progress; outcomes still being evaluated.

2.5 REASONABLE RANGE OF RESTORATION ALTERNATIVES CONSIDERED

In Table 1-2, the AL TIG lists the reasonable range of alternatives evaluated in this plan and identifies its preferred restoration alternatives. All restoration alternatives included in the reasonable range are evaluated below pursuant to OPA (Chapter 3) and NEPA (Chapter 4). In addition to the reasonable range of action alternatives, no action alternatives for each Restoration Type are evaluated pursuant to NEPA in Chapter 4. The following sections of Chapter 2 describe the projects considered in the reasonable range.

2.5.1 Wetlands, Coastal, and Nearshore Habitats

Project screening in the Wetlands, Coastal, and Nearshore Habitats (WCNH) Restoration Type identified two projects for inclusion in the reasonable range of alternatives. The No Action Alternative was also evaluated pursuant to the requirements of NEPA. Table 1-2 presents the two projects and their anticipated costs.

2.5.1.1 Lower Perdido Islands Habitat Restoration – Phase 2

Project Summary/Background. The purpose of this project is to restore valuable coastal island habitats in the Lower Perdido Bay area using the following restoration approaches: create, restore, and enhance barrier and coastal islands and headlands; restore and conserve bird nesting and foraging habitat;

create, restore, or enhance coastal wetlands; restore and enhance dunes and beaches; create, restore, or enhance coastal islands and headlands. The habitats of the Lower Perdido Islands consist of emergent marsh, unconsolidated sandy shorelines, and forested/scrub-shrub uplands, as well as adjacent submerged aquatic vegetation (SAV). These unique habitats support a diverse array of wildlife, especially shorebirds, wading birds, and waterfowl.

In recent decades, the Lower Perdido Islands have decreased in habitat acreage, experiencing sustained erosion and other ecological degradation resulting from storms, intense boat traffic in nearshore waters, and shoreline and upland recreational use. This project builds on the AL TIG RPII Lower Perdido Islands Restoration – Phase I project. The Phase I project resulted in the development of a Conservation Management Plan for the islands and 30 percent restoration design plans for Robinson and Walker Islands. Extensive public input was also gathered during the Phase I project. The Implementing Trustees for the Phase 2 project are NOAA and the USDOI. The City of Orange Beach and The Nature Conservancy (TNC) received additional funding through the NOAA Transformational Habitat Restoration and Coastal Resiliency grant program to complete the 100 percent design and permitting for the project. The permitting is complete, and the 100 percent design is expected to be completed by summer 2024. The Phase 2 project would include construction to restore 23 acres of connected coastal habitat at Walker Island, including 5 acres of subtidal habitat, 13 acres of scrub-shrub habitat, 1 acre of marsh habitat, and 4 acres of unconsolidated beach habitat on Walker Island. It would also include project performance monitoring in accordance with the project Monitoring and Adaptive Management (MAM) plan (Appendix B). TNC would receive funds through NOAA to implement the Phase 2 project. This project would restore multiple habitat types contributing to a more integrated restoration of the nearshore ecosystem and its service flows. The NOAA transformational habitat grant would cover the costs of restoration at Robinson Island to create 7 acres of habitat (1 acre of subtidal habitat, 3 acres of marsh habitat, 3 acres of dune habitat) and enhancement of an existing breakwater.

The primary drivers of design for Walker Island were to address erosion in the existing marsh habitat, avoid impacts to the abundance of seagrass in the general area, cover exposed vegetation roots on the island, and maximize the high elevation habitat generated to support birds and overall longevity. The marsh has become increasingly eroded and degraded over the last few decades and continues to lose vegetation and convert from a marsh to a pond. By providing a lift of sediment, the marsh would be nourished to an elevation of approximately +1.5 feet North American Vertical Datum of 1988 (NAVD88) (with a 1-foot tolerance), supporting vegetation health and promoting stability. TNC performed habitat surveys of the island using aerial imagery dating back to 1999. The results showed a complete loss of herbaceous dune habitat by 2013 and a continued reduction in scrub-shrub habitat. Replanting of native vegetation following construction would be completed.

Sediment placement on the west side of Walker Island would provide increased shorebird habitat, protection of neighboring seagrass beds, and reduction in boat traffic through seagrass. Passage of boats/jet skis through this area and around the tip of Walker Island is a chronic problem for the seagrass beds in this area. Sediment placement on the west side of Walker Island would ultimately provide a physical shield from natural and anthropogenic impacts to the seagrass beds to the south.

Widening of the island to restore the exact historic footprint is not feasible due to the abundance of new seagrass in the area. Several configurations were explored to increase the island footprint and the recommended alternative (this project, Lower Perdido Islands – Phase 2) was preferred because of several factors, including that it has the least overlap with the adjacent seagrass beds, maximizes the acreage of habitat created, and has a viable sediment source identified. Also, the design and permitting is complete for this project, including the United States Army Corps of Engineers (USACE) permit. This would help reduce costs because if the construction timing of this project happens in sync with the

NOAA grant-funded Robinson Island construction phase in late 2024, substantial savings related to equipment mobilization and demobilization could be realized.

Construction Methodology (or Implementation Methodology) and Timing. This project would consist of dredging and filling activities on and around Walker Island in Perdido Bay, Alabama as well as installation of vegetation. The project is expected to take approximately seven years, including construction and monitoring. Material would be excavated from two nearby borrow areas and placed within subtidal and intertidal waters to enhance, restore, and create coastal estuarine habitat within the Lower Perdido system. The two borrow areas are located in Terry Cove (Borrow Area 1) and Bayou Saint John (Borrow Area 2) just north of Walker Island (see borrow areas map below). Borrow Area 1 would be excavated to a depth of approximately -11 feet NAVD88 and Borrow Area 2 would be excavated to a depth of approximately -15 feet NAVD88 with an approximate 5-foot tolerance for each.

According to the Department of the Army permit no. SAM-2022-00826-JCC, approximately 73,350 cubic yards of sediment would be dredged from the borrow areas and placed on and surrounding the west side of Walker Island to create 4 acres of subtidal habitat, a 5-acre scrub-shrub platform, and a central 1-acre upland platform on the west end of the island (USACE, 2024). The final elevation of the scrub-shrub platform would be approximately +4 feet NAVD88 (with a tolerance of 1 foot) with a typical width of approximately 75 feet (with a tolerance of 15 feet). In the center of the placement area would be a +6 feet NAVD88 elevation (with a tolerance of 1 foot) upland platform of variable width. Approximately 120,240 cubic yards of sediment would be dredged and placed on and surrounding the east side of Walker Island to create 1 acre of subtidal habitat, 1 acre of restored marsh habitat, 8 acres of scrub-shrub habitat, and 3 acres of upland habitat on the east end of the island. Approximately six inches of material (with a 1-foot tolerance) would be used as thin-layer placement within the existing marsh to raise the platform elevation in response to erosion of sediment, loss of vegetation, and overall degradation of habitat, which would result in an elevation of approximately +1.5 feet NAVD88 (with a 1-foot tolerance). The scrub-shrub platform would have an elevation of approximately +4 feet NAVD88 (with a 1-foot tolerance) and a typical width of about 75 feet (with a 15-foot tolerance). In the center of the placement area would be a +6 feet NAVD88 elevation (with a 1-foot tolerance) upland platform of variable width. Approximately 10,890 square feet (0.25-acre) of SAV would be transplanted out of the project footprint in accordance with the approved mitigation plan prior to the placement of fill (USACE, 2024).

A parallel, connected action would take place with a different funding source that involves the following activities at Robinson Island. Approximately 44,455 cubic yards of sediment would be dredged from the identified borrow areas and placed on and surrounding Robinson Island to create 1 acre of subtidal habitat, 3 acres of marsh habitat, and 3 acres of dune habitat. An existing breakwater would be supplemented with approximately 925 cubic yards of class 4 riprap within approximately 0.01-acre of water bottom and previous riprap footprint to achieve an elevation of +4.5 feet NAVD88. The new rock would tie into the existing submerged breakwater at an elevation of -1.2 feet NAVD88 in order to maintain a continuous structure and eliminate the placement of new rock along most of the breakwater face through relocation of some existing rock. Approximately 31,363 square feet (0.72-acre) of SAV would be transplanted out of the project footprint in accordance with the attached mitigation plan prior to the placement of fill. In addition, an existing breakwater on the north side of Robinson Island would be supplemented with additional riprap material. Two borrow areas would be used to obtain approximately 308,000 cubic yards of material for construction. Borrow area A (5 acres) would be dredged to an elevation of -11 feet NAVD88 and Borrow Area B (17 acres) would be dredged to an elevation of -15 feet NADV88. Approximately 95,000 total plants are proposed to be planted after creation of the new coastal habitat on the project islands.

Operation and Maintenance Requirements. Walker Island is owned and operated by the City of Orange Beach. Short-term and long-term operations and maintenance activities would be the responsibility of the City of Orange Beach. Operations and maintenance costs are not included in this project budget.

Project Monitoring Summary. A draft MAM plan is attached in Appendix B.

Costs. The total estimated cost of this project is $8,132,000. This includes implementation, monitoring, and trustee oversight. Of the total project budget, $6,100,000 would come from WCNH restoration type funds and $2,032,000 would come from Bird restoration funds.

Figure 2-1: Approximate Area of Sediment Placement on the East Side of Walker Island

Figure 2-2: Approximate Area of Sediment Placement on the West Side of Walker Island

2.5.1.2 Walker Island Expansion

Project Summary/Background. The purpose of this project is to restore valuable coastal island habitats in the Lower Perdido Bay area using the following restoration approaches: Create, restore, and enhance barrier and coastal islands and headlands; restore and conserve bird nesting and foraging habitat; create, restore, or enhance coastal wetlands; restore and enhance dunes and beaches; create, restore, or enhance coastal islands and headlands. The habitats of the Lower Perdido Islands consist of emergent marsh, unconsolidated sandy shorelines, and forested/scrub-shrub uplands, as well as adjacent SAV. These unique habitats support a diverse array of wildlife, especially shorebirds, wading birds, and waterfowl. Common birds include tricolor herons, reddish egrets, little blue herons, snowy egrets, white ibis, and brown pelicans. Great blue herons, great egrets, clapper rails, willets, and woodcock also forage in the marsh. Migratory waterfowl and neotropical migrants frequent the area seasonally. Herons and other wading birds heavily use Walker Island for feeding. Adjacent submerged habitats provide nursery areas for coastal finfish and shellfish, including speckled seatrout, redfish, Atlantic croaker, shrimp, and blue crabs. The scrub-shrub and forest habitat areas have historically been used as a heron rookery. Emergent habitats on the Islands include salt marsh plants that are intertidal and dominated by Spartina species. These marsh habitats are extremely productive and provide nursery habitat for fish, crustaceans, and invertebrates, as well as foraging habitat for a variety of birds including herons, egrets, rails, and willets. Marshes act as a transition zone connecting upland habitats to submerged habitats, including seagrasses and help with shoreline stabilization.

Walker Island contains important areas of emergent marsh habitat and is surrounded by extensive seagrass beds. These two adjoining habitats work in concert to provide significant ecosystem benefits for the surrounding area. Beach habitats on the islands include bare areas of unconsolidated sand extending from the water landward to the emergent vegetation. Shorebirds such as least terns loaf and nest specifically in these beach habitats. Least terns prefer open, sandy areas that have been disturbed by dredging or storms and are devoid of vegetation. Unfortunately, these areas are often exposed to heavy boat traffic and human use. Increasing sea levels are also reducing suitable bird habitat (because of inundation) and intensifying human interactions, which can impact the health of the birds, nesting success, and chick survival.

In recent decades, the Lower Perdido Islands have decreased in habitat acreage, experiencing sustained erosion and other ecological injuries resulting from storms, intense boat traffic in nearshore waters, and shoreline and upland recreational use. This project builds on the AL TIG RP2 Lower Perdido Islands Restoration – Phase I project. The Phase I project resulted in the development of a Conservation Management Plan for the islands and 30 percent restoration design plans for Robinson and Walker Islands.

To the northeast of Walker Island is a shoal which could support creation of a new island (Figure 2-3). The proposed location benefits from shallow water and the absence of seagrass. Due to the long northeastern fetch in this region, the new island may prove to be somewhat sacrificial in nature, similar to the concept proposed on the east side of Walker Island, but this would not necessarily be detrimental. The transport of material could potentially serve as a sediment source for Walker Island and support its longevity. Further morpho dynamic modeling would be necessary to predict sediment transport following island creation. Hydrodynamic modeling indicates that on both flood and ebb tides, average flow speeds over the northern portions of this shoal reach 1.3 to 1.6 feet per second (0.4 to 0.5 meters per second) closer to the northern tidal channel. Flow speeds decrease slightly over the southern areas of this shoal but remain high enough to preclude any significant growth of seagrass. The channel northwest of the concept area is one of two high velocity channels in Bayou Saint John and should be avoided. This alternative includes the creation of a stable, long-term placement area protecting the shoreline with rock riprap. The presence of a rock revetment would impede human use of the island and preserve the habitat, and a high elevation area protected from recreational boaters would provide ideal habitat for birds.

The footprint is a large area (approximately 24 acres in size) over which island creation could be implemented. A variety of project dimensions and orientations may be considered within the boundary, but the complete area is not recommended for island creation. Additional data and stakeholder coordination would be needed to refine the concept boundary to a smaller alternative and/or a phased approach to island creation. A phased approach could involve expansion of the initial placement area pending sediment material availability to expand the habitat over time. Sediment would be placed at an elevation to support approximately 10 acres of unconsolidated beach habitat (approximately +1 to +4 NAVD88) and 14 acres of upland scrub-shrub habitat (approximately +3 NAVD88 to +6 NAVD88).

A USACE permit has not yet been applied for or received for this project. This project would need additional modeling and design prior to moving forward. The likelihood of success is less well known for this project at this time due to the long northeastern fetch in this region and the need for additional modeling, engineering, design, permitting, and public input. Further, a sediment source has not yet been identified for this project. Further, the City of Orange Beach and TNC received funding through the NOAA Transformational Habitat Restoration and Coastal Resiliency grant program to complete the 100 percent design and permitting for other portions of the overall Lower Perdido Islands project, including Robinson Island and the project described in this RP4/EA, the Lower Perdido Islands Habitat Restoration – Phase 2 project; however, this island creation alternative has yet not advanced past 30 percent design. Implementing Trustees for the Walker Island Creation project are NOAA and the USDOI.

Operation and Maintenance Requirements. Walker Island is owned and operated by the City of Orange Beach. Short-term and long-term operations and maintenance activities would be the responsibility of the City of Orange Beach. Operations and maintenance costs are not included in this project budget.

Project Monitoring Summary. N/A

Costs. The total estimated project cost is $16,600,000 and would include funds for planning and design, implementation, monitoring, and trustee oversight. The portion of funding that falls under the WCNH restoration type would be $12,450,000, and the portion that falls under the Birds restoration type would be $4,150,000.

Figure 2-3: Approximate Area of Potential Island Creation

2.5.2 Nutrient Reduction

Project screening in the Nutrient Reduction Restoration Type identified two projects for inclusion in the reasonable range of alternatives. The Bayou La Batre watershed project was included in the AL RPII/EA but was not selected for implementation at that time. While the Puppy Creek and Juniper Creek-Big Creek watersheds were not included in previous RP efforts, this project would include the same restoration techniques as previously evaluated, and those watersheds are similar in character to the watersheds analyzed in AL RPII/EA. The No Action Alternative was also evaluated pursuant to NEPA. Table 1-2 in Chapter 1 presents the two projects and their anticipated costs.

2.5.2.1 Puppy Creek – Juniper Creek-Big Creek Nutrient Reduction

Project Summary/Background. The primary goal of this nutrient reduction project is to improve water quality by reducing nutrient and sediment loading from agricultural lands. The health of the Gulf of Mexico depends upon the health of its estuaries, and the health of those coastal waters is influenced by land uses in the watersheds of its tributaries. In the five Gulf States, over 80 percent of the acreage is in private ownership (USDA-NRCS 2014) and is used for forestry and agriculture. This watershed-scale project would restore water quality impacted by the DWH oil spill by reducing nutrients and the sediments carrying them from agricultural lands into coastal waters. Runoff from cropland, grassland, forest, and urban sources contributes nutrients and sediments to coastal Gulf waters that adversely affect their health. While agricultural and forested lands are not the sole contributors (and in many instances, not the leading contributors) of nutrients to coastal waters, there are opportunities to address this resource concern at these sources within the Puppy Creek and Juniper Creek-Big Cedar Creek watersheds.

The USDA would be the Implementing Trustee and would provide outreach and technical assistance to voluntary participants (private landowners), especially on acres within the watersheds where conservation measures would have the greatest potential to improve water quality, develop conservation plans, and implement nutrient reduction-related conservation practices. The project proposes to implement clusters of conservation practices within the smallest watershed practicable with the goal of making a discernable difference in water quality at the watershed level.

While the targeted approach described here is expected to reduce pollution and hydrologic degradation, implementation of conservation practices depends on landowner participation; therefore, outreach is a key component of the overall effort. The proposed conservation practices would reduce nutrient and sediment losses from the landscape, reduce nutrient and sediment loads to streams and downstream receiving waters, and reduce water quality degradation in watersheds that could provide benefits to coastal watersheds and marine resources.

Proposed Infrastructure/Improvements. Proposed conservation practices would reduce nutrient and sediment losses from the landscape, nutrient and sediment load to streams and downstream receiving waters, and water quality degradation in watersheds that could benefit coastal and marine resources. A comprehensive list of USDA Conservation Practice Standards is available online.[8]

Activities to be Funded:

- Program Oversight and Management
- Conservation Planning/Environmental Compliance/Engineering and Design (E&D)
- Implementation (non-construction)
- Implementation (construction)
- Short-term Operations and Maintenance

Construction Methodology (or Implementation Methodology) and Timing. The project would be implemented over five years, with the first year consisting mainly of landowner outreach and planning. Implementation of the conservation plans would begin in year two and continue through year four. The project has been organized into four phases for implementation:

[8] Available at https://www.nrcs.usda.gov/resources/guides-and-instructions/conservation-practice-standards.

1) Conservation planning (landowner outreach, environmental evaluation)

2) E&D

3) Implementation

4) Monitoring

Operation and Maintenance Requirements. Operations and maintenance of restoration activities, best management practices (BMPs), and conservation practices would be included in this project and coordinated with the stakeholders during the planning/implementation phases of the project.

Project Monitoring Summary. If the proposed project is selected, a detailed MAM plan would be developed. Monitoring metrics would include number of installed conservation practices, reduction in total nitrogen/total phosphorus, and reduction in total suspended sediments and turbidity from agricultural lands. A draft MAM plan is included in Appendix B.

Cost. The total estimated cost of this project is $1,520,900 for Puppy Creek and Juniper Creek-Big Creek. The budget for implementing this project in the previously mentioned 12-digit hydrologic unit code watersheds is approximately $760,450 per watershed. If this project is ultimately selected in the final restoration plan, all funds allocated at settlement under the Nutrient Reduction restoration type would be obligated.

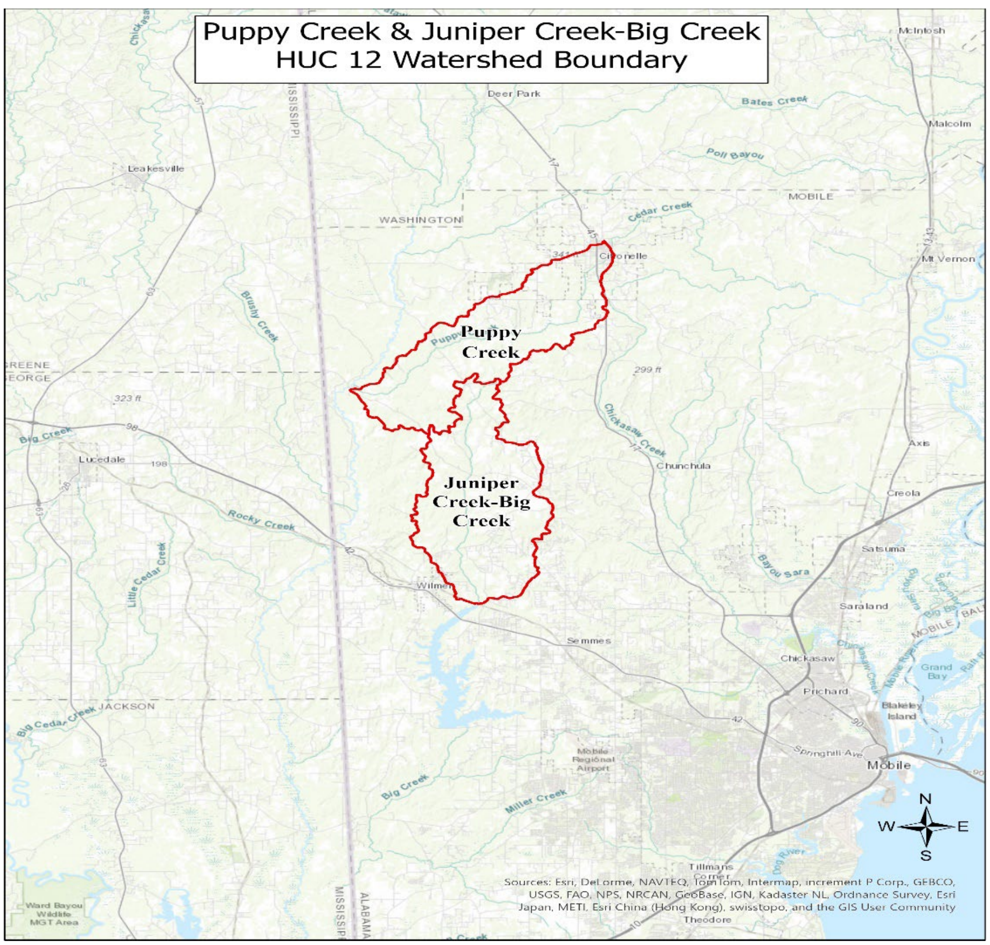


Figure 2-4 Location of Puppy Creek – Juniper Creek-Big Creek Nutrient Reduction

2.5.2.2 Bayou La Barte Nutrient Reduction

Project Summary/Background. The primary goal of this nutrient reduction is to improve water quality by reducing nutrient and sediment loading. The health of the Gulf of Mexico depends upon the health of its estuaries, and the health of those coastal waters is influenced by land uses in the watersheds of its tributaries. In the five Gulf States, over 80 percent of the acreage is in private ownership (USDA-NRCS 2014) and is used for forestry and agriculture. This watershed-scale project would restore water quality impacted by the DWH oil spill by reducing nutrients and the sediments carrying them into coastal waters. Runoff from cropland, grassland, forest, and urban sources contributes nutrients and sediments to coastal Gulf waters that adversely affect their health. While agricultural and forested lands are not the sole contributors (and in many instances, not the leading contributors) of nutrients to coastal waters, there are opportunities to address this resource concern at these sources within the Bayou La Batre watershed.

The USDA would be the Implementing Trustee and provide outreach and technical assistance to voluntary participants (private landowners), especially on acres within the watersheds where conservation measures would have the greatest potential to improve water quality, develop conservation plans, and implement nutrient reduction-related conservation practices. The project proposes to implement clusters of conservation practices within the smallest watershed practicable, with the goal of making a discernable difference in water quality at the watershed level.

While the targeted approach described here is expected to reduce pollution and hydrologic degradation, implementation of conservation practices depends on landowner participation; therefore, outreach is a key component of the overall effort. The proposed conservation practices would reduce nutrient and sediment losses from the landscape, reduce nutrient and sediment loads to streams and downstream receiving waters, and reduce water quality degradation in watersheds that could provide benefits to coastal watersheds and marine resources.

Proposed Infrastructure/Improvements. Proposed conservation practices would reduce nutrient and sediment losses from the landscape, nutrient, and sediment loads to streams and downstream receiving waters, and water quality degradation in watersheds that could benefit coastal and marine resources. A comprehensive list of USDA Conservation Practice Standards is available online.[9]

Activities to be Funded:

- Program Oversight and Management
- Conservation Planning/Environmental Compliance/E&D
- Implementation (non-construction)
- Implementation (construction)
- Short-term Operations and Maintenance

Construction Methodology (or Implementation Methodology) and Timing. The project would be implemented over five years, with the first year consisting mainly of landowner outreach and planning. Implementation of the conservation plans would begin in year two and continue through year four. The project has been organized into four phases for implementation:

[9] Available at https://www.nrcs.usda.gov/resources/guides-and-instructions/conservation-practice-standards.

1) Conservation planning (landowner outreach, environmental evaluation)

2) E&D

3) Implementation

4) Monitoring

Operation and Maintenance Requirements. Operations and maintenance of restoration activities, BMPs, and conservation practices would be included in this project and coordinated with the stakeholders during the planning/implementation phases of the project.

Project Monitoring Summary. If the proposed project is selected, a detailed MAM plan would be developed. Monitoring metrics would include number of installed conservation practices, reduction in total nitrogen/total phosphorus, and reduction in total suspended sediments and turbidity from agricultural lands.

Costs. The total estimated cost of this project is $1,000,000. The budget for implementing this project in the previously mentioned 12-digit hydrologic unit code watersheds is approximately $1,000,000 per watershed.

Figure 2-5: Location of Bayou La Batre Nutrient Reduction

2.5.3 Birds

Project screening in the Birds restoration type identified one project for inclusion in the reasonable range of alternatives. The No Action Alternative was also evaluated pursuant to the requirements of NEPA. Table 1-2 presents the one project and its anticipated costs.

2.5.3.1 Stewardship of Coastal Alabama Beach Nesting Bird Habitat

Project Summary/Background. The Gulf Coast region supports a diversity of coastal bird species throughout the year as nesting grounds during the summer, a stopover for migrating species in the spring and fall, and as wintering habitat for numerous species that breed elsewhere.

The DWH NRDA Trustees documented a large-scale and pervasive injury to at least 93 species of birds across the Gulf of Mexico that included both resident and migratory species (DWH Trustees 2021). The Trustees have previously funded several bird restoration activities in the State of Alabama, including *Stewardship of Coastal Alabama Beach Nesting Bird Habitat* in Restoration Plan III.

This project works to improve the status of those beach nesting bird species of conservation concern through the continuation of efforts set forth in the *Stewardship of Coastal Alabama Beach Nesting Bird Habitat* project funded through Restoration Plan III.

Stewardship of Coastal Alabama Beach Nesting Bird Habitat – Phase II would continue and expand upon restoration by reducing human disturbance to and predation of nests and chicks of coastal nesting bird species injured by the oil spill, thereby increasing productivity of those species. These techniques have been identified as restoration approaches likely to provide both direct and indirect benefits to birds by the DWH Trustees in the Strategic Framework for Bird Restoration Activities (DWH Trustees 2021). This proposed five-year project would complement the work of similar initiatives in the Gulf of Mexico in Florida, Mississippi, Louisiana, and Texas. ADCNR would be the lead implementing Trustee, with USDOI as a co-Implementing Trustee.

The program consists of five components that work together to reduce stressors that impact coastal bird populations while also providing information to support future restoration decision-making. Specific activities and target locations across coastal Alabama may vary from year to year based on a number of factors including, but not limited to, where nesting occurs, what management activities are most successful at each area, and where project implementers are able to gain access (some nesting areas may be located in private property and will require authorization from landowners to access). Project components are as follows:

1. **Conduct stewardship activities to reduce human disturbances that contribute to nest failure.** Human disturbance is of particular concern for beach nesting birds in coastal Alabama due to the popularity of Alabama's beaches for recreational activities. This disturbance often leads to seasonal nest or colony abandonment in local areas, resulting in egg loss and chick mortality. Reducing anthropogenic disturbance at important nesting areas effectively reduces human disturbance of nesting sites. Project implementers will erect symbolic (temporary post and rope) and/or exclusionary fencing (e.g., electric, metal, or vinyl mesh fencing) around nesting areas prior to the start of the nesting season to reduce human ingress and disturbance. While on site, implementers would also work to educate and guide beachgoers to stay away from sensitive nesting areas. Implementers may also engage the public by providing opportunities to view nesting areas through a spotting scope, allowing the public to observe adults incubating eggs and/or feeding small, flightless chicks from a safe distance. These activities serve to encourage protective behavior by the public, further reducing disturbance. While the primary contacts with the public will occur during outreach and signage activities, funding will also be used to

support the enforcement of law and local ordinances aimed at protecting nesting beach bird species.

2. **Conduct targeted, coordinated predator management activities.** Site-specific predator management strategies (i.e., trapping and euthanasia) can help increase bird productivity where predators are among the primary causes of nest or fledgling mortality. Funding would support implementation of these activities within Bon Secour National Wildlife Refuge (BSNWR), the City of Orange Beach, and lands recently acquired on the West end of Dauphin Island, Alabama.
3. **Conduct monitoring in support of adaptive management at project sites to determine nesting and fledging success.** Monitoring critical nesting sites, assessing nest success, and determining breeding densities provides insight into the status of Alabama breeding populations for the least tern (*Sternula antillarum*), black skimmer (*Rynchops niger*), snowy plover (*Charadrius nivosus*), and Wilson's plover (*Charadrius wilsonia*), all of which are listed as Alabama Species of Conservation Concern. Nesting activity, nest success, brood success, and predator activity will be monitored following previously established protocols that facilitate consistent data collection across similar projects in the Gulf region. In addition to bird numbers and breeding productivity, monitoring will also assess habitat quality, degree of predator activity, extent of human disturbance, and number of people reached with outreach and education activities. These data can serve as a bioindicator of coastal ecosystem health and population effects from human-induced threats, as well as from natural disturbances such as hurricanes, flooding, or storm surge. In addition, special attention will be given to the proximity of nests, eggs, chicks, and adults outside of posted project areas. Project implementers will coordinate routinely to discuss adaptive management of posted areas (e.g., shifting or expanding a posted area).
4. **Deploy decoys or protective measures.** Species-specific decoys will be deployed to attract target bird species to suitable nesting areas (e.g., lower risk of human disturbance or predation). In some cases, species are nesting in areas of high human traffic or predation, which increases the likelihood of failure. Deploying decoys to areas that are not currently used for nesting, but that are deemed suitable habitat, could encourage target species to use habitat that experiences reduced stressors associated with nest or fledgling mortality. Electric fencing may be deployed when feasible and has been shown to be effective at protecting plover nests from predation by mesopredators. Decisions regarding specific deployment locations will be made in coordination with ADCNR and USDOI prior.
5. **Conduct habitat and nesting area enhancements.** Activities such as removing vegetation and installing/distributing shell hash have been shown to be beneficial to several beach nesting species, including least tern and black skimmer. Decisions regarding specific locations and actions will be made in coordination with ADCNR and USDOI prior to implementation of this work.

Operation and Maintenance Requirements. Operation and maintenance activities would be required for this project. A supply of posting materials would need to be maintained. Fencing would be taken down at the end of the nesting season but is subject to disturbance by storms and people while in place; therefore, the need to re-post some areas is anticipated.

Project Monitoring Summary. A complete monitoring and data management plan would be articulated in a project MAM plan in Appendix B. In general, project nesting sites would be monitored to support adaptive management practices/responses (e.g., if birds shift nesting site locations, posting materials would be relocated accordingly), and to gather the data needed to quantitatively evaluate the effectiveness of the management actions.

Project success monitoring would occur throughout the term of the project. Project success parameters would include the following:

- Number/linear feet of post and rope erected.
- Number/linear feet of exclusionary fencing erected.
- Total acres of habitat protected (i.e., via post and rope or exclusionary fencing) at and a map of each project site.
- Proximity of target areas to permanent structures (e.g., buildings, roads, or parking lots).
- Degree of human disturbance at each project location (observations of nearby vehicle traffic, number of visitor ingress events into excluded areas, number of interactions between project implementers and visitors, and nature of interactions).
- Species-specific productivity in excluded areas (numbers of breeding pairs, nests, nest success, and chicks fledged/fledging success).
- Degree of nest predation (number of eggs/chicks documented lost to predators; species responsible for predation).
- Other ancillary observations related to project success, such as ecological condition of project areas and habitat (extent of maintenance of natural wrack along shoreline).

Project reports would also outline proposed management activities for subsequent years based on information gained or hot spots identified through this or other related activities.

Monitoring of nests, eggs, chicks, and adult nesting shorebirds of these species will occur at all posted sites. Each project site will be monitored at weekly intervals beginning in mid-February through August, or until all breeding activity has concluded (e.g., no active nests remain, and all juveniles and nesting birds have left the area), whichever is later. Nesting location and estimates of nests, eggs, chicks, and nesting adults or each species will be recorded. Data will also be collected on the location, chronology, number of eggs that hatch and the number of chicks that fledge per nest, and the number of nests, eggs, or chicks that are lost due to anthropogenic disturbances, storm events, or predators. Weekly counts of colonial nesting species (e.g., black skimmer and least tern) allow shorebird monitors to estimate peak numbers of nests, chicks, and flight-capable juveniles, which helps to better determine colony size, nesting success, and productivity. Similarly, weekly monitoring of nests of solitary nesting species (e.g., American oystercatcher and snowy plover) also allows for better tracking of nest success and productivity of these species. A draft MAM plan is included in Appendix B.

Costs. The total estimated cost of this project is $4,740,456. The funds include planning and design, implementation, monitoring, and trustee oversight.

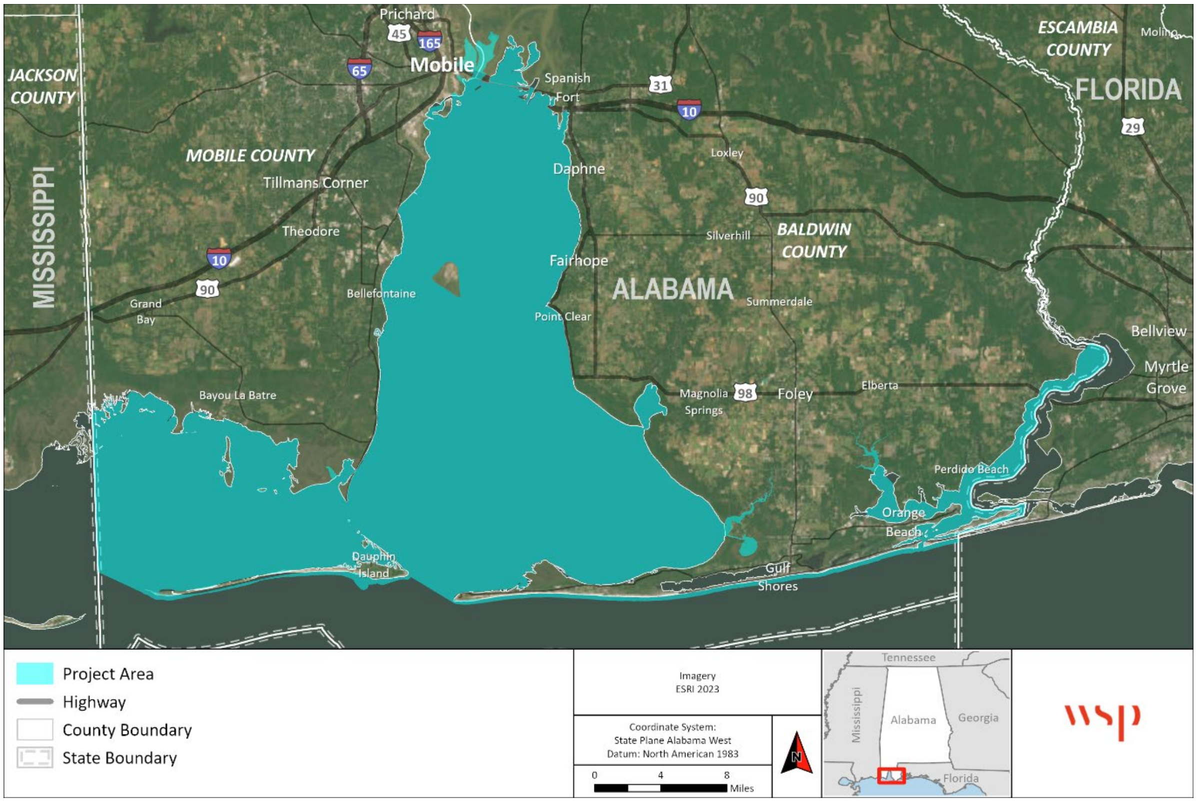


Figure 2-6: Location of the Stewardship of Coastal Alabama Beach Nesting Bird Habitat Project

2.5.3.2 Lower Perdido Islands Habitat Restoration – Phase 2

This project is being analyzed under both the WCNH and Birds restoration type because it benefits both restoration types. See Section 2.5.1.1 for project summary.

2.5.3.3 Walker Island Expansion

This project is being analyzed under both the WCNH and Birds restoration type because it benefits both restoration types. See Section 2.5.1.2 for project summary.

2.5.4 Oysters

Project screening in the Oysters Restoration Type identified two projects for inclusion in the reasonable range of alternatives. The No Action Alternative was also evaluated pursuant to the requirements of NEPA. Table 1-2 presents the two projects and their anticipated costs.

2.5.4.1 Improving Resilience for Oysters by Linking Brood Reefs and Sink Reefs (Large Scale) – Component 4 – Mid-lower Mobile Bay, Alabama

Project Summary/Background. The Improving Resilience for Oysters by Linking Brood Reefs and Sink Reefs (Large-scale) was approved by the Regionwide Trustee Implementation Group (RWTIG) in the RWTIG RP I/EA. The Alabama component of the regionwide project included construction of new brood reefs or supplementation to existing reef areas at two or more sites on the western shore portions of mid-lower Mobile Bay, over an approximately 15-square-mile area. The additional reefs would be sited to facilitate spat transport from the brood reefs toward other reefs. The AL TIG proposes to expand the scope of this project by approximately 40 percent for the Alabama component, adding funds to increase the number of brood reef sites in Alabama. This includes the construction of new brood reefs or supplementation to existing reef areas at two or more sites of the western shore portions of mid-lower Mobile Bay. ADCNR would be the Implementing Trustee for this project.

Construction Methodology (or Implementation Methodology) and Timing. Project duration would be seven years and would include planning, implementation, and monitoring. During years 1–2, the Implementing Trustees would use existing bottom mapping, water quality data, habitat suitability indices, and larval transport models to identify appropriate locations for brood and sink reefs for each project component. Additional mapping and larval transport modeling may be necessary to assist with site selection. During years 1–2, Implementing Trustees would also conduct pre-construction oyster surveys, E&D activities, environmental compliance consultations, and permitting. In years 3–4, the Implementing Trustees would construct reefs in the waters of each state based on the engineering plans developed in years 1–2. Post-construction surveys would verify that the reefs meet design specifications. In years 5–7, oyster reefs would be monitored for abundance, density, size distribution, and larval settlement.

Operation and Maintenance Requirements. If monitoring indicates that the brood reefs do not receive a natural spat set, hatchery spat, or adult oysters may be transplanted to the reefs.

Project Monitoring Summary. Appendix B includes a MAM plan for this alternative.

Costs. The cost estimate for this project enhancement is $2,800,000 which includes implementation, monitoring, and trustee oversight.

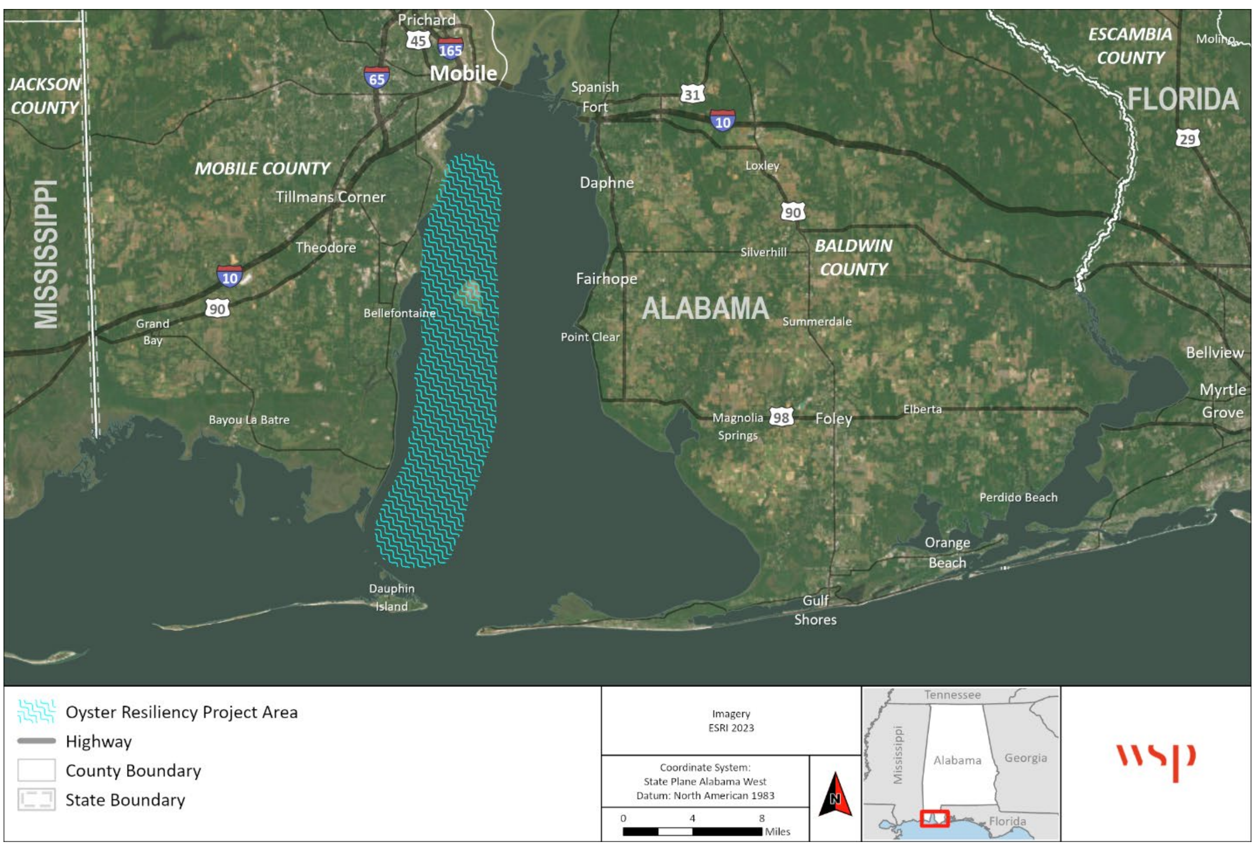


Figure 2-7: Location of the Improving Resilience for Oyster Project

2.5.4.2 Oyster Grow-Out and Restoration Reef Replacement – 5 Year Continuation

Project Summary/Background. The original Oyster Grow-Out and Restoration Reef Replacement project was approved by the AL TIG in RP II/EA (Figure 2-7). Although two timelines are being evaluated for this project, being the 5-year and 3-year continuation, the project activities are identical under both timelines. Project activities under the 5-year continuation would simply take place for longer. These projects established two protected oyster gardening grow-out areas located in Grand Bay and Bon Secour Bay and used these adult sized oysters for restoration reef placement. The project, which was conducted and managed by the Alabama Cooperative Extension System in coordination with its other oyster gardening activities, grew out oysters to at least one year old, placed these oysters on existing reef sites, including existing complementary living shoreline sites in Mobile Bay and Mississippi Sound as well as cultched sites, and identified and prioritized future restoration reef locations, including nearshore living shorelines and intertidal reefs. This project also included monitoring the success in terms of oyster survival and reproduction of both the grow-out areas and restoration sites to determine effective techniques to increase the sustainability of oyster populations in Alabama. ADCNR would be the Implementing Trustee for this project.

Proposed Infrastructure/Improvements. Phase II of this project would continue all of the activities described above conducted in the original project and build off information learned and observed during the initial project by conducting the following additional activities:

- Grow out oysters to one year old.
- Place grown-out oysters on existing reef sites.
- Monitor oyster grow-out and mortality.
- Complete a detailed water quality analysis specifically for nutrient concentrations.
- Conduct a classification and timing of the documented growth of potential fouling organisms associated with what should be quality substrate.
- Conduct current larval and settlement sampling within the existing restoration zone.
- Identifying flow patterns that would impact larval movement.
- Install dense brood stock aggregates to supply larvae into the restoration zone.

Construction Methodology (or Implementation Methodology) and Timing. The Auburn University Marine Extension and Research Center would continue its work from the original project and would also implement the following project elements:

<u>Nutrient Concentrations</u>. Nutrient levels in marine environments can significantly impact growth of fouling organisms (e.g., algae), which may affect oyster larvae recruitment. Thick layers of algae and other fouling organisms have been observed seasonally on the aggregate substrate placed along the NRDA Swift Tract Living Shoreline project, but it is unclear which factors contribute to their growth. Phase II of this project would evaluate the nitrogen and phosphorus levels within the restoration zone of the Swift Tract Living Shoreline project and nearby freshwater sources to determine the variability in conditions relative to the documented fouling of the hard substrate, which to date has not demonstrated meaningful recruitment success.

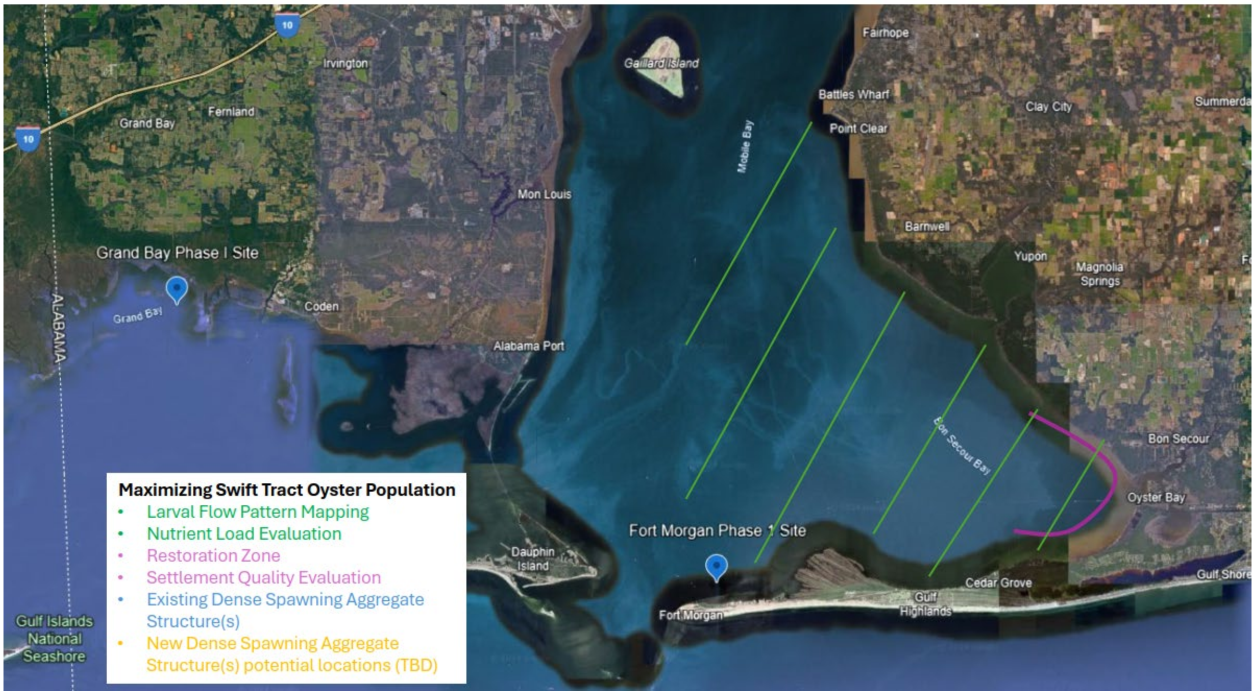


Figure 2-8: Oyster Grow-Out Project Area

Substrate Quality. The quality of settlement substrates profoundly influences oyster larval attachment and subsequent growth. Generally, clean surfaces with a biofilm layer promote successful settlement in the hatchery, whereas excessive fouling may impede attachment or increase mortality rates of oyster larvae. Phase II of this project would involve conducting regular surveys at the grow-out and restoration sites to assess substrate conditions to determine if current substrate conditions are favorable for oyster larval settlement. Additionally, this project would help determine timing considerations that may allow ongoing management efforts to take advantage of periods of lower fouling presence.

Recruitment Potential. Recruitment potential, defined as the ability of oyster larvae to successfully settle and survive to adulthood, depends on various factors, including predation pressure, habitat availability, and water quality. If oysters are unable to survive in the restoration zone, additional efforts must be considered for long-term success. This project would evaluate recruitment potential by installing pre-set substrate and tracking survival and growth of the spat under different conditions.

Larval Distribution Patterns. Understanding oyster larval distribution patterns is crucial for restoration zone recruitment success. This project would evaluate current surface circulation and flow patterns to prioritize optimal broodstock locations to source the restoration zone. The project would use replicated drifters to determine optimal broodstock placement for the restoration zone as well as optimal restoration zone placement from optimal broodstock aggregates. Using replicated drifters would provide real-world estimations of larval dispersal, connectivity between habitats, and potential recruitment sites. This knowledge would aid in the installation of dense brood stock aggregates, maximizing larval settlement and population growth.

Installation of Dense Brood Stock Aggregates. This project would involve the installation of up to 15 dense spawning aggregate structures independently and/or on existing, appropriate structures based on the information derived as part of the original project and this project extension. Strategic installation of dense brood stock aggregates offers a promising approach to maximize oyster populations. By concentrating reproductive individuals in specific areas, opportunities for successful fertilization and larval production are increased. Moreover, aggregating brood stock allows for implementing predator protection mechanisms explored within the original project. Regular monitoring and maintenance of these aggregates are essential to ensure continued reproductive success and long-term population sustainability and would be conducted.

Operation and Maintenance Requirements. Maintenance costs are allocated within the implementation costs, would begin in year 2, and would cover the routine maintenance required on field and laboratory equipment. Additionally, periodic maintenance may be necessary following severe weather events or other situations which would disturb the installed dense spawning aggregate structures. The Trustees would incorporate the adaptive management derived from Phase I findings and would continue to adaptively manage over the project period to negotiate changing field conditions as warranted.

Project Monitoring Summary. A MAM plan has been developed and would be implemented as part of this project; the MAM plan is included in Appendix B.

Costs. The cost estimate for the 5-year project continuation is $1,369,827, with planning, design, implementation, and monitoring accounting for $1,199,827, oversight totaling $50,000, and contingency funds of $120,000. The cost estimate for the 3-year project continuation is $925,873, with planning, design, implementation, and monitoring accounting for $815,873, oversight totaling $30,000, and contingency funds of $80,000.

2.5.4.3 Oyster Grow-Out and Restoration Reef Replacement – 3-Year Continuation

This project is the same as described above in Section 2.5.4.2 with the exception of the shorter timeline and reduced cost. Project activities and level of impact are identical for both projects and only differ in cost and timeline.

2.5.5 Provide and Enhance Recreational Opportunities

Project screening in the Provide and Enhance Recreational Opportunities restoration type identified three projects for inclusion in the reasonable range of alternatives. The No Action Alternative was also evaluated pursuant to the requirements of NEPA. Table 1-2 presents the two projects and their anticipated costs.

2.5.5.1 Bayfront Park Restoration and Improvement Phases IIa and IIb

Project Summary/Background. Bayfront Park is a publicly accessible outdoor recreation area located on Dauphin Island Parkway near the Alabama Port community. Phase I for this project included funds for E&D work to develop the concept to enhance Mobile County's Bayfront Park and was funded by the AL TIG RP I/EIS Bayfront Park Restoration and Improvement (E&D only) project. Phases IIa and IIb of this project included funds for the construction of various park amenities and a pocket beach and was selected by the AL TIG in RP III/EA with a project budget of $4,683,304. Due to dramatic increases in construction costs and additional unforeseen environmental issues, the AL TIG increased the budget by $3,884,081 via resolution (AL-2023-002) bringing the total project budget for Phases IIa and IIb to $8,567,385. To fund this increase, the TIG authorized the use of the remaining Provide and Enhance Recreational Opportunities restoration type funds of $2,892,358 and earned interest funds of $991,723.

When the project was bid through the state procurement process, all of the construction bids came in in excess of the anticipated amount of the construction increase. ADCNR and the chosen contractor worked to value engineer the scope of the amenities to preserve the recreational use benefits of the project while fitting within the bid price. If selected in this RP IV/EA, this project would provide additional funds for the complete construction of the originally proposed boardwalk and an additional boardwalk pavilion to further enhance the recreational use amenities at Bayfront Park. Because the AL TIG has used all of the originally allocated funds under the Provide and Enhance Recreational Opportunities restoration type, the AL TIG proposes using earned interest funds for this project. ADCNR would continue to be the Implementing Trustee for this project.

Construction Methodology (or Implementation Methodology) and Timing. Construction of the boardwalk and pavilion would be in accordance with the plans and designs developed and analyzed in Phases I and IIa and IIb of this project.

Operation and Maintenance Requirements. As with the prior phases of this project, the Mobile County Commission would continue to operate and maintain the park and facilities after improvements are complete.

Project Monitoring Summary. Project monitoring would take place at the end of construction to ensure completion. The project as a whole would be monitored in accordance with the monitoring requirements presented in RP III/EA. The project MAM plan can be found in Appendix B.

Costs. The cost estimate for this budget increase is $2,200,000 which includes $2,000,000 for implementation and $200,000 for contingency funds. The monitoring and trustee oversight activities would be completed in accordance with the original project.

Figure 2-9: Bayfront Park Restoration and Improvement Project Site Plan

2.5.5.2 Laguna Cove Little Lagoon Natural Resource Protection – Large-Scale Amenities

Project Summary/Background. The Laguna Cove Little Lagoon Natural Resource Protection Project, which included land acquisition and public access improvements, was selected for implementation by the AL TIG in RP I/EIS. Laguna Cove consists of two undeveloped tracts of land, totaling approximately 53 acres near Little Lagoon in Gulf Shores, Southwest Baldwin County, Alabama. As planned in RP I/EIS, ADCNR State Parks Division successfully purchased the 53-acre property from the Erie Meyer Foundation and transferred the property to the City of Gulf Shores. The City of Gulf Shores then developed the plans for the public access improvements outlined in the RP I/EIS. These improvements included parking (including Americans with Disabilities Act [ADA] accessible parking), a bathhouse and fishing pier, boardwalk, kayak launch, ADA-accessible restrooms, and sea turtle-friendly lighting. The City of Gulf Shores requested bids for the remaining amenities, however, all bids came back higher than the originally approved project budget. The AL TIG is now revisiting the project and considering allocating additional funds to complete some level of the public access improvements.

For this large-scale budget increase, the AL TIG is analyzing an increase to the original project budget to construct all of the originally anticipated recreational use amenities: the parking, bathhouse, fishing pier, boardwalk, kayak launch, ADA-accessible restrooms, and sea turtle-friendly lighting. Because the AL TIG has used all of the originally allocated funds under the Provide and Enhance Recreational Opportunities restoration type, the AL TIG proposes using earned interest funds for this project. ADCNR would continue to be the Implementing Trustee for this project.

Construction Methodology (or Implementation Methodology) and Timing. Construction of the recreational use amenities would be in accordance with those outlined for the original project. Construction would take approximately six months.

Operation and Maintenance Requirements. Maintenance would be the responsibility of the City of Gulf Shores and is included in the project budget.

Project Monitoring Summary. The restoration objective of this project is to restore a portion of the lost recreational use caused by the DWH oil spill by acquiring land and preserving Alabama shoreline from future development while improving the public's access to and enjoyment of Alabama's coastal resources. The project would be deemed successful when the land has been acquired and access improvements (pier, boardwalk, kayak launch, restrooms, and parking spaces) are in place. Performance criteria for this project are the satisfactory construction of the desired pier, boardwalk, kayak launch, restrooms, and parking spaces, and the associated infrastructure and completion of the public use monitoring. The project MAM plan can be found in Appendix B.

Costs. The cost estimate for this budget increase is $2,750,000, which includes implementation, monitoring, and trustee oversight activities.

2.5.5.3 Laguna Cove Little Lagoon Natural Resource Protection – Small-Scale Amenities

Project Summary/Background. The Laguna Cove Little Lagoon Natural Resource Protection Project, which included land acquisition and public access improvements, was selected for implementation by the AL TIG in RP I/EIS. Laguna Cove consists of two undeveloped tracts of land, totaling approximately 53 acres near Little Lagoon in Gulf Shores, Southwest Baldwin County, Alabama. As planned in RP I/EIS, ADCNR State Parks Division successfully purchased the 53-acre property from the Erie Meyer Foundation and transferred the property to the City of Gulf Shores. The City of Gulf Shores then developed the plans for the public access improvements outlined in the RP I/EIS. These improvements included parking (including ADA-accessible parking), a bathhouse and fishing pier, boardwalk, kayak launch, ADA-accessible restrooms, and sea turtle-friendly lighting. The City of Gulf Shores requested bids for the remaining amenities, however all bids came back higher than the project budget. The AL TIG is now revisiting the originally approved project and considering allocating additional funds to complete a subset of the public access improvements.

For this small-scale budget increase, the AL TIG is analyzing an increase to the original project budget to construct the parking, boardwalk, kayak launch, ADA-accessible restrooms, and sea turtle-friendly lighting. The bathhouse and fishing pier are not proposed for completion under this small-scale alternative. Because the AL TIG has used all of the originally allocated funds under the Provide and Enhance Recreational Opportunities restoration type, the AL TIG proposes using earned interest funds for this project. ADCNR would continue to be the Implementing Trustee for this project.

Construction Methodology (or Implementation Methodology) and Timing. Construction of the recreational use amenities would be in accordance with those outlined for the original project. Construction would take approximately six months.

Operation and Maintenance Requirements. Maintenance would be the responsibility of the City of Gulf Shores and is included in the project budget.

Project Monitoring Summary. Performance criteria and monitoring for this project would be identical to the Large-Scale Amenities project described in Section 2.5.5.2. The project MAM plan can be found in Appendix B.

Costs. The cost estimate for this budget increase is $2,000,000, which includes implementation, monitoring, and trustee oversight activities.

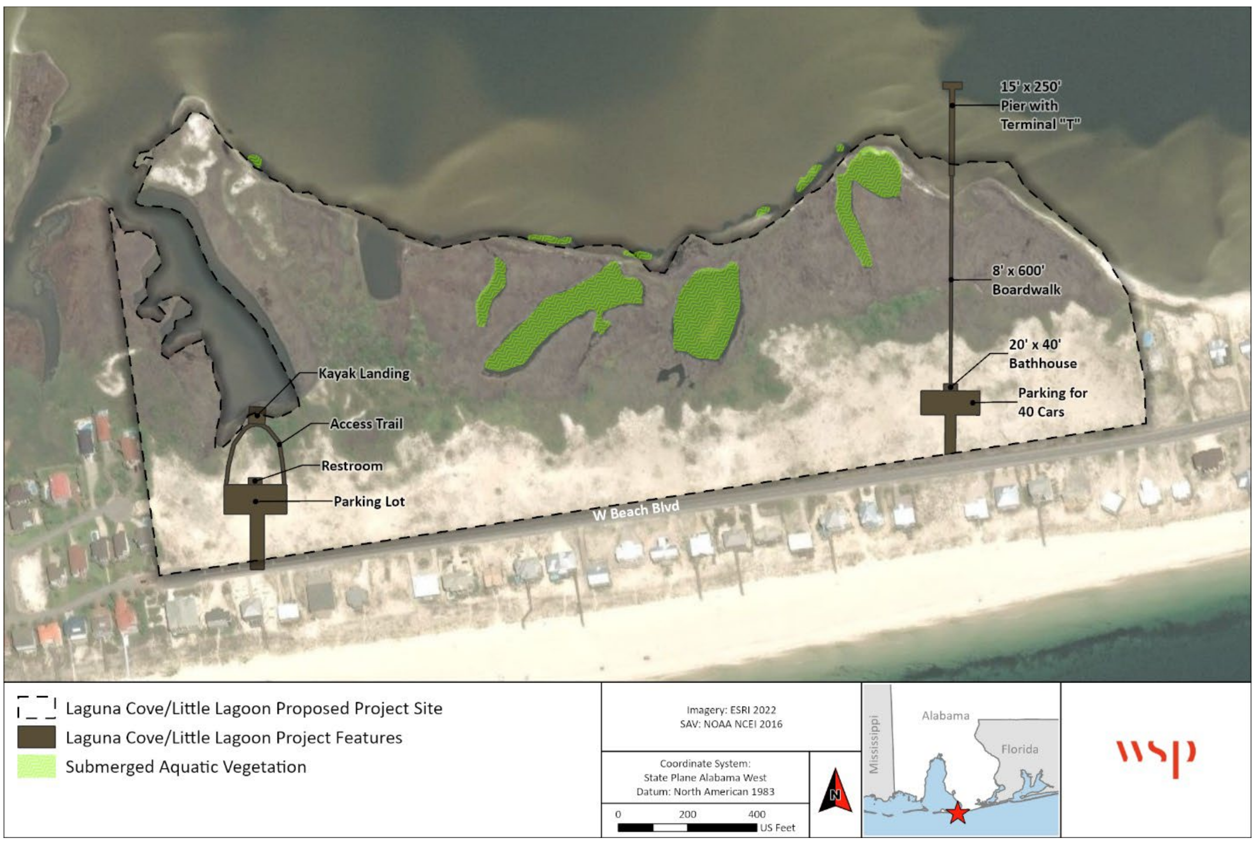


Figure 2-10: Approximate Location of the Laguna Cove Little Lagoon – Small-Scale Amenities Project

2.6 NO ACTION/NATURAL RECOVERY

In accordance with the OPA NRDA regulations, the Final PDARP/PEIS considered a "natural recovery alternative in which no human intervention would be taken to directly restore injured natural resources and services to baseline" (15 CFR 990.53(b)(2)). Under a natural recovery alternative, no additional restoration would be completed by the Trustees to accelerate the recovery of injured natural resources or to compensate for lost services. The Trustees would allow natural recovery processes to occur, potentially resulting in one of four outcomes for injured resources: (1) gradual recovery, (2) partial recovery, (3) no recovery, or (4) further deterioration. Although injured resources could presumably recover to baseline or near-baseline conditions under this scenario, recovery would take much longer compared to a scenario in which restoration actions were undertaken. Given that technically feasible restoration approaches are available to compensate for interim natural resource and service losses, the Trustees rejected this alternative from further OPA evaluation in the Final PDARP/PEIS. This RP IV/EA tiers to the Final PDARP/PEIS and incorporates the analysis of the no action/natural recovery alternative by reference. The AL TIG did not further evaluate natural recovery for the included five restoration types as a viable alternative under OPA, and natural recovery is not considered further in this Draft RP IV/EA.

A no action alternative is evaluated under NEPA in this Draft RP IV/EA as a basis for comparison of potential environmental consequences of the action alternatives(s) for each Restoration Type. Chapter 4 presents analysis of the conditions and environmental consequences that would result if the AL TIG did not select to undertake any additional restoration for injured natural resources or to compensate for lost services at this time.

3.0 OPA EVALUATION OF RESTORATION ALTERNATIVES

The Trustees are responsible for identifying a reasonable range of restoration alternatives (15 CFR 990.53(a)(2)) that are to be evaluated according to the OPA standards (15 CFR 990.54). Chapter 2 describes the screening and identification of the proposed reasonable range of alternatives for this Draft RP IV/EA. This chapter discusses the OPA evaluation. This evaluation process was informed by the OPA standards found in 15 CFR 990.54(a) and by additional deliberations on restoration goals and objectives conducted by the AL TIG.

For each alternative, the following six OPA standards were evaluated independently, and a determination was made as to how well the alternative met each individual criterion.

- Trustee goals and objectives
- Cost to carry out the alternative
- Likelihood of success
- Avoidance of collateral injury
- Benefits to more than one natural resource/service
- Effects on public health and safety

3.1 WETLANDS, COASTAL, AND NEARSHORE HABITAT AND BIRDS PROJECTS

3.1.1 Lower Perdido Islands Habitat Restoration – Phase 2

Project Summary. The Lower Perdido Islands Habitat Restoration – Phase II project would restore valuable coastal island habitats in the Lower Perdido Bay area. This project builds on the Lower Perdido Islands Restoration – Phase I project (RP II/EA). The Phase I project resulted in the development of a Conservation Management Plan for the islands and 30 percent restoration design plans for Robinson and Walker Islands. This Phase II project would include construction to restore approximately 23 acres of connected coastal habitat at Walker Island, including 5 acres of subtidal habitat, 13 acres of scrub-shrub habitat, 1 acre of marsh habitat, and 4 acres of unconsolidated beach habitat on Walker Island. It would also include project performance monitoring in accordance with the project MAM plan which is located in Appendix B.

Trustee Goals and Objectives. This alternative would create, restore, and enhance barrier and coastal islands and headlands; restore and conserve bird nesting and foraging habitat; create, restore, or enhance coastal wetlands; restore and enhance dunes and beaches; create, and restore, or enhance coastal islands and headlands.

PDARP Restoration Goals: *(1) Restore lost birds by facilitating additional production and/or reduced mortality of injured bird species; (2) restore or protect habitats on which injured birds rely; (3) restore a variety of interspersed and ecologically connected coastal habitats in each of the five Gulf states to maintain ecosystem diversity, with particular focus on maximizing ecological functions for the range of resources injured by the spill, such as oysters, estuarine-dependent fish species, birds, marine mammals, and nearshore benthic communities; (4) restore for injuries to habitats in the geographic areas where the injuries occurred, while considering approaches that provide resiliency and sustainability; and (5) while acknowledging the existing distribution of habitats throughout the Gulf of Mexico, restore habitats in appropriate combinations for any given geographic area. Consider design factors, such as connectivity,* *size, and distance between projects, to address injuries to the associated living coastal and marine resources and restore the ecological functions provided by those habitats.*

Cost to Carry Out the Alternative. The total estimated cost of this alternative is $8,132,000. This includes implementation, monitoring, and trustee oversight. Of the total project budget, $6,100,000 would come from WCNH restoration type funds and $2,032,000 would come from Bird restoration type funds. The AL TIG determined that this cost is reasonable based on Trustees' extensive experience and expertise acquired while implementing similar island restoration and creation projects across the Gulf of Mexico.

Likelihood of Success. This alternative is technically feasible and likely to succeed. Walker Island currently provides some nesting and feeding habitat for many bird species. Restoring habitats at the island would increase the capacity to deliver benefits. Shorebirds use sites created or enhanced with dredged materials for resting, foraging, and nesting. This alternative maximizes the acreage of habitat created, has a viable sediment source identified, and has completed design and permitting, including the USACE permit, which is important for the construction timing of this project to happen in sync with the NOAA grant-funded Robinson Island construction phase The Implementing Trustees would also implement a MAM plan (see Appendix E) that would assess progress toward project goals, help minimize risk, and address key uncertainties on an ongoing basis.

Avoids Collateral Injury. Although there could be some minor collateral injury to existing vegetation, including SAV in the area, implementation of this alternative is not expected to result in substantial short- or long-term collateral injuries to natural resources that would outweigh the restoration benefits of this project. Widening of the island to restore the exact historic footprint is not feasible due to the abundance of new seagrass in the area. Several configurations were explored to increase the island footprint and this alternative has the least overlap with the adjacent seagrass beds. SAV transplantation would occur in accordance with the Compensatory Mitigation Plan for SAV in order to mitigate for the 0.97 acres of SAV impacts.

Benefits More Than One Natural Resource or Service. This alternative would benefit wetlands, coastal, and nearshore habitats and many species of shorebirds and waterbirds injured by the DWH oil spill such as tricolor heron, reddish egret, little blue heron, snowy egret, white ibis, brown pelicans, great blue heron, great egret, clapper rail, and willet. This alternative could also benefit fish and other wildlife (e.g., crabs, finfish, and sea turtles) that use coastal island habitat and the aquatic systems surrounding them.

Effects on Public Health and Safety. The AL TIG does not anticipate impacts to public health and safety from the implementation of this alternative. The construction sites would be clearly marked and closed to public access while construction is underway. The Implementing Trustee would comply with all relevant safety measures, practices, and regulations during project implementation to maintain a safe, protective environment for those are involved with the project.

Summary OPA Evaluation: The OPA evaluation indicates that implementation of this alternative would meet the Trustees' goals of restoring for injuries to habitats in the geographic areas where the injuries occurred by creating, restoring, and enhancing coastal wetlands, creating, restoring, and enhancing barrier and coastal islands and headlands, restoring and conserving bird nesting and foraging habitat, and restoring and enhancing dunes and beaches. The costs of the project are reasonable. The proposed restoration approaches have been demonstrated to be effective across the Gulf of Mexico, giving the alternative a high likelihood of success. The alternative would not result in short- or long-term collateral injuries to natural resources that would outweigh its restoration benefits, and the alternative also has the potential to benefit multiple resources. Public health and safety issues are not expected to be a concern.

3.1.2 Walker Island Expansion

The Walker Island Creation project would restore valuable coastal island habitats in the Lower Perdido Bay area. This project builds on the Lower Perdido Islands Restoration – Phase I project (RP II/EA). This Walker Island Creation project would create a new island northeast of Walker Island on an existing shoal. It would include the creation of a stable, long-term placement area protecting the shoreline with rock riprap. The presence of a rock revetment would impede human use of the island and preserve the habitat, and a high elevation area which was protected from recreational boaters would provide ideal habitat for birds. However, because this project has not advanced past the 30 percent design phase, the precise construction elements could change.

Trustee Goals and Objectives. This alternative would restore coastal islands, wetlands, beaches, and dunes and restore and conserve bird nesting and foraging habitat. The objectives of the project are to restore marsh, subtidal habitat, unconsolidated beach and dune habitat, and scrub-shrub island habitat to provide habitat for fish, birds, and other wildlife.

PDARP Restoration Goals: *(1) Restore a variety of interspersed and ecologically connected coastal habitats to maintain ecosystem diversity, with particular focus on maximizing ecological functions for the range of resources injured by the spill, such as oysters, estuarine-dependent fish species, birds, marine mammals, and nearshore benthic communities; and (2) restore or protect habitats on which injured birds rely.*

Cost to Carry Out the Alternative. The total estimated cost of this alternative is $16,600,000, with $12,450,000 coming from the WCNH restoration type and $4,150,000 coming from the Birds restoration type. The AL TIG determined that this cost is reasonable based on Trustees' extensive experience with bird island restoration and creation. However, this island creation is more expensive than the Lower Perdido Islands Restoration – Phase II project which would add similar habitat to an already-existing island.

Likelihood of Success. This alternative is technically feasible, and likely to succeed. Walker Island currently provides some nesting and feeding habitat for many bird species. Construction of a new nearby island would increase the capacity to deliver benefits. Shorebirds use sites created or enhanced with dredged materials for resting, foraging, and nesting. However, the likelihood of success is less well known for this project than for the Lower Perdido Islands Restoration – Phase II project due to the long northeastern fetch in this region and the need for additional modeling, engineering, design, permitting, and public input. Further, a sediment source has not been identified for this project.

Avoids Collateral Injury. Implementation of this alternative is not expected to result in substantial short- or long-term collateral injuries to natural resources that would outweigh the restoration benefits of this project. The proposed location benefits from shallow water and the absence of seagrass. Due to the long northeastern fetch in this region the new island may prove to be somewhat sacrificial in nature, but the transport of material could potentially serve as a sediment source for Walker Island and support its longevity.

Benefits More Than One Natural Resource or Service. This alternative is intended to benefit WCNH and birds. This alternative could also benefit other wildlife (e.g., crabs, finfish, and sea turtles) that use coastal island habitat and the aquatic systems surrounding them.

Effects on Public Health and Safety. The AL TIG does not anticipate impacts to public health and safety from the implementation of this alternative. The construction sites would be clearly marked and closed to public access while construction is underway. The Implementing Trustee would comply with all relevant safety measures, practices, and regulations during project implementation to maintain a safe, protective environment for those are involved with the project.

Summary OPA Evaluation: Walker Island Creation. The OPA evaluation indicates that implementation of this alternative would meet the Trustees' goals of restoring coastal islands, wetlands, beaches, and dunes and restoring and conserving bird nesting and foraging habitat. The costs of the project are reasonable; however, they are substantially more and less certain than the Lower Perdido Islands Restoration – Phase II alternative which would provide similar benefits. The likelihood of success for this project is not as well-known at this time. The alternative would not result in short- or long-term collateral injuries to natural resources that would outweigh its restoration benefits, and the alternative also has the potential to benefit other wildlife. Public health and safety issues are not expected to be a concern.

3.2 NUTRIENT REDUCTION PROJECTS

3.2.1 Puppy Creek – Juniper Creek-Big Creek Nutrient Reduction

Project Summary. The Puppy Creek – Juniper Creek-Big Creek Nutrient Reduction project would restore water quality through implementation of improved land management practices that reduce nutrient and sediment loadings to Portersville Bay and Mississippi Sound. The implementation of land management practices using existing USDA Natural Resources Conservation Service (NRCS) conservation practice standards and specifications would be the primary tool for reducing erosion and nutrient inputs in the watershed. Improved water quality in the Puppy Creek and Juniper Creek-Big Cedar Creek watershed would broadly benefit the ecological health of the estuarine and marine resources of coastal Alabama. This project would also include project performance monitoring in accordance with the project MAM plan which is located in Appendix B.

Trustee Goals and Objectives. This project directly addresses the Trustees' goal of reducing nutrient loadings to Gulf Coast estuaries, habitats, and resources that are threatened by chronic eutrophication, hypoxia, or harmful algal blooms or that suffer habitat losses associated with water quality degradation. The AL TIG conducted its analysis using USEPA's Recovery Potential Screening Tool, which generated rankings of watersheds flowing into areas injured by the spill, based on their nutrient loadings and the potential for reductions in nutrient driven ecological stressors. Due to its amount of land in agriculture, the Puppy Creek and Juniper Creek-Big Cedar Creek watershed showed potential to benefit from implementation of the types of agricultural conservation practices proposed for this project. Nutrient reductions would improve overall water quality in the affected streams and in the coastal waters of Portersville Bay and Mississippi Sound. Implementation of this project would likely increase overall marine and estuarine ecological health, benefiting nearshore habitats and species and generally increasing the resiliency of these coastal ecosystems.

PDARP Restoration Goal: *Reduce nutrient loadings to Gulf Coast estuaries, habitats, and resources that are threatened by chronic eutrophication, hypoxia, or harmful algal blooms or that suffer habitat losses associated with water quality degradation.*

Cost to Carry Out the Alternative. The proposed cost of Puppy Creek and Juniper Creek-Big Cedar Creek project is $2,000,000. The restoration approaches proposed by USDA-NRCS to reduce nutrient loads from agricultural lands in the Puppy Creek and Juniper Creek-Big Cedar Creek watershed have been applied extensively across the country, and the costs are well documented and reasonable. Previous studies demonstrate that these approaches provide cost-effective reductions in nutrient loadings for the type of agricultural operations occurring in the Puppy Creek and Juniper Creek-Big Cedar Creek watershed. The conservation planning, practice implementation, and monitoring costs represent best estimates from USDA and are consistent with previously implemented initiatives/programs. Based on this review, the AL TIG finds the total estimate of the proposed costs for this project to be reasonable and appropriate.

Likelihood of Success. This alternative's goal of reducing nutrient loadings from agricultural lands in the Puppy Creek and Juniper Creek-Big Cedar Creek watershed has a reasonable likelihood of success. The proposed BMPs are well demonstrated for reducing nutrient loadings and appropriate for agricultural lands in the watershed. Although participation in the project is voluntary, USDA-NRCS does not anticipate any difficulties implementing an outreach strategy that would result in high demand for technical and financial assistance offered in this project. Further contributing to the likelihood of success, a monitoring program would be implemented to document changes to water quality and identify whether any adaptive management actions are needed to achieve nutrient reduction goals.

Avoids Collateral Injury. The Puppy Creek and Juniper Creek-Big Cedar Creek project would contribute to healthier and more resilient downstream coastal ecosystems in habitats that were injured by the DWH oil spill. No direct or indirect collateral injuries to natural resources are anticipated from implementation of the nutrient reduction measures in the watershed.

Benefits More Than One Natural Resource or Service. By improving water quality in Portersville Bay and Mississippi Sound, implementation of the Puppy Creek and Juniper Creek-Big Cedar Creek project has the potential to benefit the entire range of coastal and estuarine habitats, species, and natural resource services that experience improved health in the presence of lower sediment levels, higher oxygen concentrations, and reductions in the frequency and intensity of toxic algal blooms.

Effects on Public Health and Safety. The Puppy Creek and Juniper Creek-Big Cedar Creek project is not likely to have adverse impacts on public health and safety. The implementation of nutrient reduction measures, such as construction of sediment control structures or changes in cover crop or tillage practices, would not create any new risks for agricultural workers or pose any threats to air or water quality. To the extent that the project reduces bacterial contaminants in surface waters, there may be a public health benefit.

Summary OPA Evaluation: The OPA evaluation indicates that implementation of this alternative would meet the Trustees' goal of reducing nutrient loadings to coastal habitats and waters injured by the DWH oil spill. The project costs are reasonable. The project has a reasonable likelihood of success because the proposed techniques have been fully demonstrated in other locations for the types of agricultural operations in the Puppy Creek and Juniper Creek-Big Cedar Creek watershed. The project is expected to benefit multiple natural resources in coastal Alabama and would pose no risks of collateral injuries to other natural resources. The measures taken to reduce nutrients and sediments may have a beneficial impact on public health because of their potential to reduce bacterial contamination in surface waters.

3.2.2 Bayou La Batre Nutrient Reduction

Project Summary. The Bayou La Batre Nutrient Reduction project was evaluated in RP II/EA but ultimately was not selected for implementation. This project would restore water quality through implementation of improved land management practices that reduce nutrient and sediment loadings to Portersville Bay and Mississippi Sound. Improved water quality in the Bayou La Batre watershed would broadly benefit the ecological health of the estuarine and marine resources of coastal Alabama. The OPA analysis for this project is generally the same as was provided in RP II/EA.

Trustee Goals and Objectives. This project directly addresses the Trustees' goal of reducing nutrient loadings to Gulf Coast estuaries, habitats, and resources that are threatened by chronic eutrophication, hypoxia, or harmful algal blooms or that suffer habitat losses associated with water quality degradation.

The AL TIG conducted its analysis using USEPA's Recovery Potential Screening Tool, which generated rankings of watersheds flowing into areas injured by the spill, based on their nutrient loadings and the potential for reductions in nutrient driven ecological stressors. Due to its amount of land in agriculture, the Bayou La Batre watershed showed potential to benefit from implementation of the types of agricultural conservation practices proposed for this project, although not to the extent of other nutrient reduction projects included in this RP IV/EA. Nutrient reductions would improve overall water quality in the affected streams and in the coastal waters of Portersville Bay and Mississippi Sound. Implementation of this project would likely increase overall marine and estuarine ecological health, benefiting nearshore habitats and species and generally increasing the resiliency of these coastal ecosystems.

PDARP Restoration Goal: *Reduce nutrient loadings to Gulf Coast estuaries, habitats, and resources that are threatened by chronic eutrophication, hypoxia, or harmful algal blooms or that suffer habitat losses associated with water quality degradation.*

Cost to Carry Out the Alternative. The proposed cost of Bayou La Batre Nutrient Reduction project is $1,000,000. The restoration approaches proposed by USDA-NRCS to reduce nutrient loads from agricultural lands in the Bayou La Batre watershed have been applied extensively across the country, and the costs are well documented and reasonable. Previous studies demonstrate that these approaches provide cost-effective reductions in nutrient loadings for the type of agricultural operations occurring in the Bayou La Batre watershed. The conservation planning, practice implementation, and monitoring costs represent best estimates from USDA and are consistent with previously implemented initiatives/programs. Based on this review, the AL TIG finds the total estimate of the proposed costs for this project to be reasonable and appropriate.

Likelihood of Success. This alternative's goal of reducing nutrient loadings from agricultural lands in the Bayou La Batre watershed has a reasonable likelihood of success. The proposed BMPs are well demonstrated for reducing nutrient loadings and appropriate for agricultural lands in the watershed. Although participation in the project is voluntary, USDA-NRCS does not anticipate any difficulties implementing an outreach strategy that would result in high demand for technical and financial assistance offered in this project. Further contributing to the likelihood of success, a monitoring program would be implemented to document changes to water quality and identify whether any adaptive management actions are needed to achieve nutrient reduction goals. However, this watershed has lower agricultural production for agricultural nutrient reduction than the other proposed alternative in this RP IV/EA. Therefore, while yielding positive impacts, the Bayou La Batre alternative is expected to be less beneficial than these other two alternatives because it would offer fewer opportunities for implementing nutrient reduction measures.

Avoids Collateral Injury. The Bayou La Batre Nutrient Reduction project would contribute to healthier and more resilient downstream coastal ecosystems in habitats that were injured by the spill. No direct or indirect collateral injuries to natural resources are anticipated from implementation of the nutrient reduction measures in the watershed.

Benefits More Than One Natural Resource or Service. By improving water quality in Portersville Bay and Mississippi Sound, implementation of the Bayou La Batre Nutrient Reduction project has the potential to benefit the entire range of coastal and estuarine habitats, species, and natural resource services that experience improved health in the presence of lower sediment levels, higher oxygen concentrations, and reductions in the frequency and intensity of toxic algal blooms.

Effects on Public Health and Safety. The Bayou La Batre Nutrient Reduction project is not likely to have adverse impacts on public health and safety. The implementation of nutrient reduction measures, such as construction of sediment control structures or changes in cover crop or tillage practices, would not create any new risks for agricultural workers or pose any threats to air or water quality. To the extent that the project reduces bacterial contaminants in surface waters, there may be a public health benefit.

Summary OPA Evaluation: The OPA evaluation indicates that implementation of this alternative would meet the Trustees' goal of reducing nutrient loadings to coastal habitats and waters injured by the DWH oil spill. The project costs are reasonable. The project has a reasonable likelihood of success because the proposed techniques have been fully demonstrated in other locations for the types of agricultural operations in the Bayou La Batre watershed. The project is expected to benefit multiple natural resources in coastal Alabama and would pose no risks of collateral injuries to other natural resources. The measures taken to reduce nutrients and sediments may have a beneficial impact on public health because of their potential to reduce bacterial contamination in surface waters. However, because the watershed has lower agricultural production than the other proposed alternative for agricultural nutrient reduction in this RP IV/EA, it is expected to be less beneficial, with fewer opportunities to implement nutrient reduction measures.

3.3 BIRDS PROJECTS

3.3.1 Stewardship of Coastal Alabama Beach Nesting Bird Habitat

Project Summary. The Stewardship of Coastal Alabama Beach Nesting Bird Habitat – Phase II project would continue and expand upon restoration begun by the original Stewardship of Coastal Alabama Beach Nesting Bird Habitat project (RP III/EA) by reducing human disturbance to and predation of nests and chicks of coastal nesting bird species injured by the oil spill, thereby increasing productivity of those species. The project consists of five components that work together to reduce stressors that impact coastal bird populations while also providing information to support future restoration decision-making: (1) Conduct stewardship activities to reduce human disturbances that contribute to nest failure, (2) conduct targeted, coordinated predator management activities, (3) conduct monitoring in support of adaptive management at project sites to determine nesting and fledging success, (4) deploy decoys or protective measures, and (5) conduct habitat and nesting area enhancements. This project would also include project performance monitoring in accordance with the project MAM plan which is located in Appendix B. The OPA analysis for this project is generally the same as that provided for the original Stewardship of Coastal Alabama Beach Nesting Bird Habitat project in RP III/EA.

Trustee Goals and Objectives. This alternative would advance the Trustees' goals of protecting and enhancing coastal habitats that are critically important to the nesting success and reproduction of bird species injured by the DWH oil spill, with the primary focus on least terns, black skimmers, snowy plovers, and Wilson's plovers. The activities proposed as part of this alternative—active stewardship and education in conjunction with symbolic or exclusionary fencing, predator control and management, decoy deployment, and habitat and nesting enhancement activities—are expected to result in substantial increases in nesting bird populations. The data collected as part of the MAM efforts would further help the Trustees to focus the program each year on the areas that would benefit most from further stewardship and predator control activities.

PDARP Restoration Goal: *Restore or protect habitats on which injured birds rely.*

Cost to Carry Out the Alternative. The proposed cost of the Stewardship of Coastal Alabama Beach Nesting Bird Habitat – Phase II alternative is $4,399,015. The AL TIG reviewed the alternative's costs and finds these costs to be reasonable and appropriate based on the implementation of the original Stewardship of Coastal Alabama Beach Nesting Bird Habitat project, in addition to other similar projects. In particular, stewardship programs often rely heavily on volunteers, making them particularly cost-effective, while simultaneously building public engagement. In addition, combining the various components of this alternative into a single initiative would allow data sharing and would likely increase the overall cost-effectiveness of the efforts.

Likelihood of Success. This alternative has a high likelihood of improving the protection of coastal habitats that are critically important to the nesting success and reproduction of bird species injured by the DWH oil spill. The proposed stewardship, habitat, and nesting area enhancement approaches have already been demonstrated to be effective along the Gulf Coast and around the country (Burger et al., 2004; Johnson, 2016). Predator control and management programs are a widely used tool for increasing nest success for beach nesting birds and have been implemented by federal Trustee agencies along the Gulf Coast (DWH Trustees, 2013; Florida TIG, 2019). Decoy programs of the type proposed as part of this alternative have been demonstrated effective for establishing new nesting sites for beach nesting birds (Kotliar and Burger, 1984). The Trustees anticipate the alternative's overall likelihood of success would be further improved by implementing the MAM component to provide essential data for further targeting the stewardship and predator management activities over the five-year life of the initiative.

Avoids Collateral Injury. Implementation of this alternative could result in collateral injury to wildlife through accidental trapping, deterrence measures, fence entanglement, or other means. Established protocols and methods for fence construction and trap setting would be used to avoid incidental mortality and collateral injury to native species. On sites that would involve installation of exclusion devices, shell, or vegetated plantings, disturbance would be expected to be short term (during construction). In all cases, construction would be designed to avoid impacts to resources such as the disturbance of birds and sea turtles during nesting season. The Implementing Trustees would use BMPs and protective measures to avoid collateral injury.

Benefits More Than One Natural Resource or Service. The primary NRDA benefit of this alternative would be to restore and protect bird species injured by the DWH oil spill. Management of predators, however, is also expected to benefit nesting sea turtles.

Effects on Public Health and Safety. The Stewardship of Coastal Alabama Beach Nesting Bird Habitat – Phase II alternative is not expected to affect public health and safety. Bird stewardship and habitat and nest enhancements rely on measures such as public education and symbolic fencing that pose no risks to the general public. Decoy placement similarly poses no risk to the general public. Predator management may involve electric fencing and other activities that could pose risks. Use of such measures, however, would be limited to areas at BSNWR that would be off-limits to the public.

Summary OPA Evaluation: The OPA evaluation indicates that implementation of this alternative would meet the Trustees' goals of protecting and enhancing coastal habitats that are critically important to the nesting success and reproduction of four bird species injured by the DWH oil spill. The costs of the project are reasonable. The proposed restoration approaches have been demonstrated to be effective across the Gulf of Mexico, giving the alternative a high likelihood of success. The alternative would not result in short- or long-term collateral injuries to natural resources, and the alternative also has the potential to benefit nesting sea turtles. Public health and safety issues are not expected to be a concern.

3.3.2 Lower Perdido Islands Habitat Restoration – Phase 2

Refer to Section 3.1.1 for the Lower Perdido Islands Habitat Restoration OPA Evaluation.

3.3.3 Walker Island Expansion

Refer to Section 3.1.2 for the Walker Island Expansion OPA Evaluation.

3.4 OYSTERS PROJECTS

3.4.1 Improving Resilience for Oysters by Linking Brood Reefs and Sink Reefs (Large Scale) – Component 4 – Mid-lower Mobile Bay, AL

Project Summary. The Improving Resilience for Oysters by Linking Brood Reefs and Sink Reefs (Large-scale) – Alabama Enhancement project proposes to add additional funding to the Improving Resilience for Oysters by Linking Brood Reefs and Sink Reefs (Large-scale) RWTIG project (RW RP I/EA) to further increase oyster abundance and resilience in Alabama waters by creating a network of brood and sink reefs over a range of habitats and salinities. The AL TIG Trustees adopt and incorporate the OPA analysis performed by RWTIG for the original project (RW RP I/EA, Chapter 3.7.1), and a summary of those findings follows. This project would also include project performance monitoring in accordance with the project MAM plan which is located in Appendix B.

Trustee Goals and Objectives. This alternative would restore natural resources injured by the DWH oil spill as described in the PDARP/PEIS, Strategic Framework for Oyster Restoration Activities by creating additional reefs to increase oyster abundance and spawning stocks, creating a network of source and sink reefs that are sufficiently connected to allow oyster settlement and growth across the reef network, and by establishing reefs in a variety of habitat types to support a variety of ecological functions.

PDARP Restoration Goals: *(1) Restore oyster abundance and spawning stock to support a regional oyster larvae pool sufficient for healthy recruitment levels to subtidal and nearshore oyster reefs; (2) restore resilience to oyster populations that are supported by productive larval source reefs and sufficient substrate in larval sink areas to sustain reefs over time; and (3) restore a diversity of oyster reef habitats that provide ecological functions for estuarine-dependent fish species, vegetated shoreline and marsh habitats, and nearshore benthic communities.*

Cost to Carry Out the Alternative. The proposed cost for the Improving Resilience for Oysters by Linking Brood Reefs and Sink Reefs (Large-scale) – Alabama Enhancement project is $2,800,000. The RWTIG determined that the costs associated with this project are reasonable because they were developed based on an average unit cost for recent oyster restoration projects across the northern Gulf of Mexico Cost estimates are based on building reefs to an average height of 1 foot above the surrounding bottom to help ensure the reefs are elevated above potentially hypoxic conditions. This height can be varied and would be scaled based on site characteristics as well as considerations of cost-effectiveness.

Likelihood of Success. This alternative is anticipated to have a high likelihood of success because similar oyster restoration projects in other regions have successfully addressed specific known threats in a manner that promotes oyster resilience across a variety of biological and chemical gradients. To increase resilience, reefs would be placed along depth-relief and salinity gradients at each site to the extent practicable. Given annual variations in salinity, this strategy increases the likelihood of larval settlement, growth, and survival on some reefs each year and in multiple years. To enhance reefs that do not have natural spat, hatchery spat, or adult oysters could be transplanted to the reefs as part of the adaptive management process.

Avoids Collateral Injury. Implementation of this alternative is not expected to result in substantial short- or long-term collateral injuries to natural resources that would outweigh the restoration benefits of this project. Construction would be designed and/or required under applicable and relevant permits to avoid impacts to resources, such as the disturbance of birds during the nesting season or the disturbance of existing oyster beds.

Benefits More Than One Natural Resource or Services. This alternative would likely have a wide range of benefits to nearshore and coastal marine resources. A healthy network of oyster reefs would restore the ecosystem services that oysters provide, including improved water quality through filtration, shoreline, and estuarine habitat protection through attenuation of wave energy, recreational oyster harvesting, and food and/or habitat for reef-dwelling species (e.g., fish and shellfish) and the species that prey upon them (e.g., birds).

Effects on Public Health and Safety. Depending on the locations of this alternative’s activities, restored reefs may benefit the public health and safety of nearby communities by dissipating wave and storm energy, which would protect infrastructure and reduce shoreline erosion and the degradation of nearby estuarine wetland ecosystems. The Implementing Trustees would comply with all relevant safety measures, practices, and regulations during project implementation to maintain a safe, protective environment for those involved with the project.

Summary OPA Evaluation. Implementation of this alternative would meet the Trustees’ goals by creating additional reefs to increase oyster abundance and spawning stocks, creating a network of source and sink reefs that are sufficiently connected to allow oyster settlement and growth across the reef network, and by establishing reefs in a variety of habitat types to support a variety of ecological functions. The costs of the project are reasonable. The proposed approach is well designed and has a reasonable probability of success. The project is not expected to cause any collateral injury to natural resources. The project has the potential for a broad range of ecological benefits in the marine and estuarine environment. Any potential public health and safety issues would be adequately mitigated.

3.4.2 Oyster Grow-Out and Restoration Reef Replacement – 5-Year Continuation

Project Summary. The Oyster Grow-Out and Restoration Reef Placement – Phase II (5 Year) Project proposes to fund the continuation of the work conducted by the Auburn University Marine Extension and Research Center for the original Oyster Grow-Out and Restoration Reef Placement project (RP II/EA). Phase II of this project would install up to 15 dense spawning aggregate structures over a five-year period and conduct monitoring. The project performance monitoring in accordance with the project MAM plan is located in Appendix B. The AL TIG Trustees adopt and incorporate the OPA analysis performed by the AL TIG for the original project (RP II/EA, Chapter 3.7.6), and add to that analysis as follows.

Trustee Goals and Objectives. The analysis for this OPA factor is the same as for the original project. This project meets the Trustees’ Oyster restoration goals by restoring oyster abundance and spawning stock to support a regional oyster larvae pool sufficient for healthy recruitment levels to subtidal and nearshore oyster reefs and enhanced survivorship.

PDARP Restoration Goal: *Restore a diversity of oyster reef habitats that provide ecological functions for estuarine-dependent fish species, vegetated shoreline and marsh habitat, and nearshore benthic communities.*

Cost to Carry Out the Alternative. The proposed cost for the Oyster Grow-Out and Restoration Reef Placement – Phase II (5 Year) project is $1,369,827. Based on similar past projects, including the original project, the AL TIG found these costs to be reasonable and appropriate. The proposed cost for the Oyster Grow-Out and Restoration Reef Placement – Phase II (3 Year) project is $925,873. Based on similar past projects, including the original project, the AL TIG found these costs to be reasonable and appropriate.

Likelihood of Success. Based on the success of the original Oyster Grow-Out and Restoration Reef Placement project, this alternative has a reasonable likelihood of continuing to successfully develop alternative oyster grow-out approaches, thereby increasing the abundance of live multiple-size class oysters at restoration sites in Alabama.

Avoids Collateral Injury. The analysis for this OPA factor is the same as for the original project. The grow-out approach is not expected to cause any collateral damage to natural resources because BMPs will be used during installation of the grow-out areas and placement of oysters on restoration reefs.

Benefits More Than One Natural Resource or Services. Over the long term, if this alternative is successful, it would lead to the development of new restoration methods that would broadly benefit the health of Alabama's coastal and estuarine ecosystems. Oysters are an ecological keystone species, and successful restoration of oyster reefs through improved survivorship would provide habitat for a diversity of marine organisms, provide structure integrity to reduce shoreline erosion, and improve water quality.

Effects on Public Health and Safety. This alternative is not expected to affect public health and safety. The project would involve creation of offshore structures in areas that are currently used for recreational and commercial boating. However, installation of navigational markers and observance of oyster reef work safety practices would mitigate any potential impacts on boating safety.

Summary OPA Evaluation. Implementation of this alternative would meet the Trustees' goals by increasing oyster abundance and spawning stock to support a regional oyster larvae pool sufficient for healthy recruitment levels to subtidal and nearshore oyster reefs and enhanced survivorship. The costs of the project are reasonable. The proposed approach is well designed and has a reasonable probability of success. The project is not expected to cause any collateral injury to natural resources. The project has the potential for a broad range of ecological benefits in the marine and estuarine environment. Any potential public health and safety issues would be adequately mitigated.

3.4.3 Oyster Grow-Out and Restoration Reef Replacement – 3-year Continuation

The OPA evaluation for this project is the same as described above in Section 3.4.2 with the exception of the reduced cost and timeline.

3.5 PROVIDE AND ENHANCE RECREATIONAL OPPORTUNITIES PROJECTS

3.5.1 Bayfront Park Restoration and Improvement Phases IIa and IIb – Budget Increase

Project Summary. The Bayfront Park Restoration and Improvement— Phases IIa and IIb Budget Increase project proposes to increase the funding allocated to Bayfront Park Restoration and Improvement— Phases IIa and IIb Project to account for increases in the cost of construction of the amenities, specifically the originally planned boardwalk and boardwalk pavilions. It would also include project performance monitoring in accordance with the project MAM plan which is located in Appendix B.

The TIG concludes that the allocation of additional funds to this project does not affect the TIG's selection of this project under OPA, as there is no change in expected restoration benefits associated with the project and the increased costs are found to remain reasonable under current conditions. When the original project was bid through the state procurement process, all of the construction bids returned were in excess of construction budget. Based on other projects recently and currently being implemented by ADCNR, this project budget is reasonable given the increase in costs of construction over the past few years. To further ensure the reasonableness of the costs, if the AL TIG selects this project, the construction of these amenities would either be added to the scope of the contract already awarded to the low bidder for the construction of the amenities or would be rebid.

3.5.2 Laguna Cove Little Lagoon Natural Resource Protection Project Budget Increase – Large-Scale Amenities

Project Summary. The Laguna Cove Little Lagoon Natural Resource Protection Project Budget Increase – Large-Scale project proposes to increase the funding allocated to the Laguna Cove Little Lagoon Natural Resource Protection Project to account for increases in the cost of construction of the amenities. For this project, all of the originally planned amenities (parking, boardwalk, kayak launch, ADA-accessible restrooms, bathhouse, fishing pier, and sea turtle-friendly lighting) would be constructed. It would also include project performance monitoring in accordance with the project MAM plan which is located in Appendix B.

The TIG concludes that the allocation of additional funds to this project does not affect the TIG's selection of this project under OPA, as there is no change in expected restoration benefits associated with the project and the increased costs are found to remain reasonable under current conditions. Based on other projects recently and currently being implemented by ADCNR, this increase in expense is reasonable given the increase in costs of construction over the past few years. If the AL TIG selects this project, the construction of these amenities would be rebid to further ensure the reasonableness of the costs. However, because the AL TIG has spent its allocation of Provide and Enhance Recreational Opportunities restoration type funds and will need to use earned interest funds for this project, and because the reduction in restoration benefits is small as compared to the Small-Scale Amenities Alternative, the Small-Scale Amenities Alternative provides a better restoration benefit under a more economic approach.

3.5.3 Laguna Cove Little Lagoon Natural Resource Protection Budget Increase – Small-Scale Amenities

Project Summary. The Laguna Cove Little Lagoon Natural Resource Protection Project Budget Increase – Small-Scale project proposes to increase the funding allocated to the Laguna Cove Little Lagoon Natural Resource Protection Project to construct a smaller suite of amenities than that approved for the original project. For this project, a subset of the amenities would be implemented: the parking, boardwalk, kayak launch, ADA-accessible restrooms, and sea turtle-friendly lighting would still be constructed, but the bathhouse and fishing pier would not be constructed. It would also include project performance monitoring in accordance with the project MAM plan which is located in Appendix B.

The TIG concludes that the allocation of additional funds to this project does not affect the TIG's selection of this project under OPA, as there is no change in expected restoration benefits associated with the project and the increased costs are found to remain reasonable under current conditions. Based on other projects recently and currently being implemented by ADCNR, this increase in expense is reasonable given the dramatic increase in costs of construction over the past few years. If the AL TIG selects this project, the construction of these amenities would be rebid to further ensure the reasonableness of the costs. While the current proposed project also reduces the recreational amenities at the site, the public benefits of the remaining amenities are considered in the context of the overall project costs. The project would continue to offer the public recreational opportunities that represent reasonable and appropriate compensation for natural resource injuries incurred as a result of the DWH oil spill.

4.0 ENVIRONMENTAL ASSESSMENT

Under NEPA (40 CFR § 1502.16), federal agencies must comparatively evaluate the environmental effects of the alternatives being considered, including but not limited to impacts on social, cultural, and economic resources, as well as natural resources. To determine whether an action has the potential to result in significant impacts, the context and intensity of the action must be considered (40 CFR 1501.3(d)). For purposes of this document, impacts are characterized as minor, moderate, or major and temporary, short term or long term. The analysis of beneficial impacts focuses on the duration (short term or long term), without attempting to specify the intensity of the benefit. "Adverse" is used in this chapter only to describe the federal trustees' evaluation under NEPA. This term is defined and applied differently in consultations conducted pursuant to the Endangered Species Act (ESA) and other protected resource statutes.

To ensure compliance with the FRA (42 U.S.C. § 4336(b)) in the preparation of this RP/EA, the AL TIG compared their assessment of each project's anticipated impacts on each resource analyzed with the impact intensity definitions (short or long term, minor, moderate, or major) found in Table 6.3-2 of the PDARP/PEIS (and in this RP/EA as Appendix A), and with the anticipated impacts the PDARP/PEIS forecasted for the restoration approaches and techniques proposed in this RP/EA (see Tables 4.1 to 4.5 below). The AL TIG found that the resource impacts as forecasted in the PDARP/PEIS are consistent with the impacts anticipated from the projects analyzed in this RP/EA, and thus the AL TIG affirms the applicability of the PDARP/PEIS' NEPA analysis to this RP/EA. The methodology for determining impacts and the definitions of thresholds for each resource topic or area (e.g., hydrology, water quality, air quality) are described in Section 6.3.2 of the Final PDARP/PEIS. For each resource area, the analysis in this chapter and in Appendix A addresses impacts by discussing any background or methodology that is applicable to all sites. The affected environment of the Alabama coast in general can be found in Chapter 4 of the AL TIG Final RP I/EA, AL TIG Final RP II/EA, AL TIG Final RP III/EA, and the RWTIG Final RP I/EA. The analysis in Appendix A provides a site-specific affected environment for each project evaluated, including the No Action Alternative, broken down by restoration alternative and impact topic.

4.1 RESOURCES CARRIED FORWARD AND NOT CARRIED FORWARD FOR FURTHER ANALYSIS

Certain resource areas are unaffected or minimally affected by the restoration actions being proposed for any of the given five Restoration Types. For all restoration types, the following resources were not carried forward for further analysis:

- **Air quality and greenhouse gas emissions**: All activities associated with projects included in this Restoration Plan would not present a measurable change in regional criteria air pollutant production. Projects requiring motorized equipment would have short-term, negligible impacts on air quality, with no long-term impacts anticipated. Carbon dioxide (CO_2) is the primary greenhouse gas produced by motorized vehicles. The overall contribution of these vehicles to regional or global CO_2 output would be negligible. Projects requiring these motorized vehicles with CO_2 output would have short-term impacts on greenhouse gas production, with no long-term impacts anticipated. Therefore, this resource area was not carried forward for detailed analysis.
- **Noise:** All project activities that would be implemented under this Restoration Plan would not generate enough noise to dramatically alter existing soundscapes. Projects that would involve the use of motorized equipment such as vessels or construction equipment would be short term and temporary in nature, resulting in short-term, minor, adverse impacts. In all cases, the noises

would cease once equipment use is complete. No long-term, adverse impacts are expected under any of the alternatives; therefore, this resource topic was not carried forward for detailed analysis.

- **Socioeconomic and environmental justice**: Projects proposed in this Restoration Plan may result in very small, short-term, beneficial economic impacts accruing through an increase in employment and associated spending in the project area while project activities take place. No short or long-term adverse impacts to communities with environmental justice concerns are expected from the alternatives included in this plan; therefore, this resource topic was not carried forward for detailed analysis.
- **Infrastructure and transportation**: None of the proposed projects evaluated in this Restoration Plan would create increased demands on area infrastructure that could not be accommodated by existing infrastructure or would affect traffic and transportation. Improving recreational facilities may attract more users; however, the proposed improvements would provide necessary infrastructure, such as parking, to accommodate anticipated use. Therefore, this resource topic was not carried forward for detailed analysis.
- **Land and marine management**: All proposed projects analyzed in this Restoration Plan would be consistent with current land use plans as well as the Coastal Zone Management Act of 1972. Although certain projects would consist of construction, implementation would not disrupt existing land and marine management and no project would involve the acquisition of land. As a result, no short- or long-term adverse impacts on land or marine management would occur; therefore, this resource area was not carried forward for detailed analysis.
- **Public health and safety:** None of the activities proposed would adversely affect public health. Predator management activities under the Stewardship of Coastal Alabama Beach Nesting Bird Habitat project have the potential for adverse impacts related to safety. These management activities could include direct reduction, trapping, or exclusionary fencing. However, these activities would be carried out when the public is not present and would be executed by authorized personnel. These actions would minimize any potential for adverse impacts. Projects such as the Lower Perdido Islands Habitat Restoration would aid in reducing shoreline erosion, providing long-term beneficial safety impacts to the public. Therefore, this resource topic was not carried forward for detailed analysis.
- **Fisheries and aquaculture:** There are no commercial fisheries or aquaculture operations within any of the coastal projects included in this plan. Therefore, no impacts on fisheries or aquaculture are expected, and this resource topic was not carried forward for detailed analysis.
- **Marine transportation:** None of the proposed projects would have substantial impacts on marine transportation. Both projects under the WCHN Restoration Type have the potential to cause minor, short-term adverse impacts. However, impacts would be temporary in nature and would only last while construction activities are underway. No long-term adverse impacts are anticipated. Therefore, this resource topic was not carried forward for detailed analysis.

Only those resource areas for which potentially adverse impacts are expected are discussed in detail in this section. To avoid redundant or unnecessary information, resource areas and topics that are not expected to be affected by a proposed restoration alternative are not evaluated further under a given project. If there are resources not carried forward under specific restoration types, those are noted below.

4.2 INCORPORATION OF PREVIOUS NEPA ANALYSES

Through the planning process, the AL TIG considered the NEPA analysis conducted for previous phases of restoration planning, including the following documents for the projects discussed in Section 4.2:

- PDARP/PEIS (2016) (https://repository.library.noaa.gov/view/noaa/18084).
- Alabama Trustee Implementation Group Final Restoration Plan I and Environmental Impact Statement: Provide and Enhance Recreational Opportunities (2017) (https://www.gulfspillrestoration.noaa.gov/media/document/dwh-arz000458pdf).
- Alabama Trustee Implementation Group Final Restoration Plan II and Environmental Assessment: Restoration of WCNH; Habitat Projects on Federally Managed Lands; Nutrient Reduction (Nonpoint Source); Sea Turtles; Marine Mammals; Birds; and Oysters (2018) (https://www.gulfspillrestoration.noaa.gov/media/document/dwh-arz001374pdf).
- Alabama Trustee Implementation Group Final Restoration Plan III and Environmental Impact Statement: Provide and Enhance Recreational Opportunities and Birds (2019) (https://www.gulfspillrestoration.noaa.gov/media/document/dwh-arz003892pdf).
- Regionwide Trustee Implementation Group Final Restoration Plan and Environmental Impact Statement I: Birds, Marine Mammals, Oysters, and Sea Turtles (2021) (https://www.gulfspillrestoration.noaa.gov/media/document/finalrpea-20210916-tigapproved0pdf) (RW TIG RP1/EA).

A majority of the locations and actions for the projects discussed in Appendix A have been previously analyzed in a preceding Restoration Plan and Environmental Assessment. If the project is an incorporation from an earlier analysis, the Restoration Plan and Environmental Assessment in which the project was incorporated is referenced. The listed documents above are not linked for every in-text reference; however, they are linked above as well as in the Literature Cited section in Appendix D. If a preceding Restoration Plan and Environmental Assessment is not referenced, then the project has not been previously analyzed. The full NEPA analysis in the following sections discuss how these previous analyses have been incorporated by reference as well as new projects being analyzed for the first time.

4.3 SUMMARY OF ENVIRONMENTAL CONSEQUENCES

The analysis of environmental consequences for each alternative in this RP IV/EA can be found in the NEPA Supporting Documentation Report in Appendix A. Tables 4-1 through 4-5 summarize direct and indirect impacts of each project under all the restoration types as well as a summary of environmental consequences for the corresponding restoration types determined programmatically in the PDARP/PEIS. The PDARP/PEIS environmental consequences are discussed first in each table to show that the consequences discussed in the RP IV/EA projects fall within the range of consequences determined in the PDARP/PEIS. In general, implementation of the alternatives would result in short-term and long-term, minor-to-moderate adverse impacts to physical resources including geology and substrates, air quality, and hydrology and water quality. There would be some long-term, minor adverse effects to geology and substrates associated with alternatives that involve sediment placement for implementation. Construction activities are expected to have some short-term minor adverse impacts to water quality from expected increased in turbidity. Some alternatives would benefit hydrology and water quality by reducing sources of water quality impairment and restoring habitat.

Biological resources would also experience long-term benefits from improved water quality and hydrologic restoration and restoring/creating habitat. After construction, birds as well as fish would be able to utilize the habitat resulting in long-term beneficial impacts. Habitats in the project areas are likely to provide long-term beneficial impacts to finfish and shellfish species. Long-term impacts from projects are anticipated to be mainly beneficial; however, moderate, adverse, long-term impacts could occur to Essential Fish Habitat (EFH) due to conversion of habitats. Activities that could potentially produce long-term adverse impacts would be permanently impacting estuarine water bottoms and estuarine water column during placement of dredged material and breakwater enhancement and permanently impact SAV during dredging and filling activities for the Lower Perdido Habitat Restoration project. When construction is complete, the alternatives would provide long-term beneficial impacts to habitats and wildlife species, marine and estuarine resources, as well as rare and protected species that use the restored island site for roosting, loafing, nesting, and foraging. No adverse impacts to cultural resources are expected.

Table 4-1: Summary of Environmental Consequences for Wetlands Coastal Nearshore Habitat Projects

Project	Physical Resources		Biological Resources					Socioeconomic Resources	
	Geology and Substrates	Hydrology and Water Quality	Habitats	Wildlife	Marine and Estuarine Resources	Rare and Protected Species	Federally Managed Fisheries	Cultural Resources	Tourism and Recreation
PDARP/PEIS 6.4.1.1	Short-term and long-term, minor-to-moderate adverse impacts on the physical environment could result from construction activities related to creating, restoring, and enhancing coastal wetlands. Short-term impacts could result from the use of staging areas (causing water turbidity from sediment disturbance) and construction equipment (releasing emissions causing adverse air quality and noise impacts from the operation of machinery). Short-term, minor-to-moderate noise impacts associated with construction activities could temporarily displace human use of those areas; however, this approach is expected to be implemented outside densely populated areas. Construction of hard structures such as breakwaters can involve use of heavy equipment on the shoreline and barges that can cause direct localized and short-term, moderate adverse impacts from sediment disturbance and compaction, increased turbidity, and noise as the materials are placed in the designed configuration. Long-term, minor adverse indirect impacts on the physical environment could occur from the placement of dredged material and breakwaters in shallow water areas, which may affect sediment dynamics. Placement of materials (such as dredged material or riprap) would result in long-term, but localized, adverse impacts to the existing substrate. Hydrology also may be affected where tidal connectivity is modified per project design. However, projects would typically require implementation of best practices to minimize or avoid adverse impacts.		Short-term, minor-to-moderate adverse impacts to the biological environment could occur during construction activities related to (1) disturbance to wetland vegetation during construction and (2) displacement of land-based or aquatic faunal species resulting from staging equipment and materials, as well as entrapment of marine mammals. Long-term, minor-to-moderate impacts could include conversion of one wetland vegetation type to another (e.g., saline vegetation to more freshwater vegetation) with changes in the distribution of fauna communities. Some applications of this approach could also result in localized, permanent, adverse impacts to shallow intertidal or subtidal habitat—such as that for SAV or oysters. There would be long-term benefits for many ecologically and economically important animals, including fish, shrimp, shellfish, birds, sea turtles, marine mammals, and terrestrial mammals in the form of food, shelter, breeding, and nursery habitat. Many of the species that directly utilize coastal marshes and mangroves as juveniles later migrate offshore, where they serve as prey for ecologically and economically important open ocean species.					This approach could result in minor-to-moderate, localized, adverse impacts to socioeconomic resources if a project includes protection of lands that otherwise would have been developed for residential housing or commercial uses. Indirect adverse impacts in the immediate area could occur during construction through (1) limits on recreational activities near the construction area to protect public safety; (2) temporary increases in road traffic due to movement of construction vehicles; or (3) adverse effects on aesthetics due to the presence of construction equipment, new breakwaters, or other changes to the surrounding environment. Creating, enhancing, or restoring coastal wetlands could result in minor (temporary disturbance) to moderate (disturbance without loss of cultural information) impacts on cultural and historic resources due to construction activities such as dredging, addition of sediments or borrow materials, and/or removal of sediments, depending on the scale of the action and site-specific characteristics. Adverse impacts could include physical destruction or alteration of resources and may alter, damage, or destroy resources such as historic shipwrecks, engineering structures or landscapes, or connectivity with related sites.	

<table>
<tr><th>Project</th><th colspan="2">Physical Resources</th><th colspan="5">Biological Resources</th><th colspan="2">Socioeconomic Resources</th></tr>
<tr><th></th><th>Geology and Substrates</th><th>Hydrology and Water Quality</th><th>Habitats</th><th>Wildlife</th><th>Marine and Estuarine Resources</th><th>Rare and Protected Species</th><th>Federally Managed Fisheries</th><th>Cultural Resources</th><th>Tourism and Recreation</th></tr>
<tr><td>PDARP/PEIS 6.4.1.3</td><td colspan="2">Construction associated with the restoration of barrier and coastal islands and headlands could result in direct, short-term, adverse impacts to geology, substrates, water quality, and air quality from sediment handling at both the borrow site (sediment source) and the placement site. Local noise levels and vehicle emissions would increase temporarily, and minor to major adverse impacts from noise may occur, particularly at large barrier island restoration projects where sediment addition activities may occur over many months. The severity of these physical impacts is expected to be minor to major and would depend to a large degree on the location of the project, the amount of disturbance that these activities would generate, and the distance to sensitive receptors such as recreational users or wildlife.</td><td colspan="5">There may be direct short-term adverse impacts to benthic habitats during construction of barrier and coastal islands and headlands due to the temporary placement of pipelines (for transport of sediments) and temporary storage of dredged sediments in nearshore habitats. Long-term adverse impacts may also occur due to final placement of sediment in the footprint where existing habitats would be covered by additional sediment. Increased turbidity around the borrow site and placement sites may affect sensitive benthic habitats such as oyster reefs, coral reefs, and seagrasses (Michel et al., 2013). Sea turtles and marine mammals present in project areas where dredging or underwater use of equipment occurs could be adversely affected by temporary increases in noise and turbidity, water quality changes, alteration or loss of habitats, entrapment, and potential interactions with dredging equipment.

Restoration efforts that increase stability and resilience of barrier and coastal islands may result in long-term habitat benefits, including increased areal extent and improvement of beach habitat for beach mice, foraging birds, nesting bird colonies, and sea turtle nesting. Restored barrier and coastal islands and headlands could benefit interior freshwater wetland habitats, back-bay seagrass and oyster reefs, and coastal and riparian areas by reducing erosion, scouring, and subsequent water quality impacts of storm surge events.</td><td colspan="2">Area closures are anticipated during construction to protect public safety and may result in short-term limits to tourism and recreational uses. Adverse impacts to tourism and recreation resulting from potential closures would be expected to be short term and minor to moderate. Over the long term, these projects could provide wildlife enthusiasts with increased wildlife viewing opportunities. Long-term benefits for the public are anticipated as a result of the restoration approach. Impacts to cultural resources resulting from the implementation of this restoration technique are dependent on site-specific conditions associated with a proposed project. Creating, enhancing, or restoring barrier and coastal wetlands and headlands could result in minor (temporary disturbance) to moderate (disturbance without loss of cultural information) impacts on cultural and historic resources due to construction activities such as dredging, adding sediments or borrow materials, or removing sediments. Barrier island restoration projects generally result in beneficial impacts on human use of those areas. Additionally, there would be socioeconomic benefits from improved shoreline integrity and additional buffer and flood storage during storms.</td></tr>
</table>

Project	Physical Resources		Biological Resources					Socioeconomic Resources	
	Geology and Substrates	Hydrology and Water Quality	Habitats	Wildlife	Marine and Estuarine Resources	Rare and Protected Species	Federally Managed Fisheries	Cultural Resources	Tourism and Recreation
Lower Perdido Islands Restoration – Phase 2	The placement of sediment would have long-term moderate adverse impacts on geology and substrates directly under the placement area. Substrates adjacent to the fill area would experience long-term benefits because of sediment placement and protection of the shoreline from erosion and wave action.	Construction activities at Walker Island are expected to have short-term minor adverse impacts to water quality from expected increases in turbidity. Restoring wetland habitats is expected to have long-term benefits to water quality by reducing erosion of this island.	Small animals, burrowing invertebrates, and vegetation habitats would experience short-term, minor adverse impacts from the dredging and placement of sediment. The project would have long-term beneficial impacts by restoring/ creating habitat.	Birds and fish would experience temporary disruptions/displacement during construction activities resulting in localized short-term minor adverse impacts. After construction, birds as well as fish would be able to utilize the habitat resulting in long-term beneficial impacts.	The dredging and placement of sediment would result in localized, long-term, moderate adverse impacts to benthic communities in the project area. Activities that could potentially produce long-term moderate adverse impacts affecting EFH would permanently impact estuarine water bottoms and estuarine water column during placement of dredged material and breakwater enhancement. The restored vegetated intertidal habitats are likely to provide long-term beneficial impacts to finfish and shellfish species.	Birds within the project area may experience temporary disruptions during construction, leading to short-term minor adverse impacts. Likewise, sea turtles and marine mammals in the vicinity of the construction site could experience short-term minor disruption during construction activities. When construction is complete, the project would provide long-term beneficial impacts to protected species that use the restored island site for roosting, loafing, nesting, and foraging.	Long-term project impacts are anticipated to be mainly beneficial; however, moderate, adverse, long-term impacts could occur due to the conversion of habitats. Project activities could create short-term, minor, adverse impacts to EFH that could include turbidity impacts and benthic habitat disturbances due to dredging and filling activities. Managed species could experience short-term, minor, direct adverse impacts due to project related activities.	No adverse impacts to cultural resources are expected.	There would be short-term, minor adverse impacts to tourism and recreation due to the construction occurring in an area heavily used recreationally. This project is anticipated to provide long-term benefits directly through increased opportunities for wildlife viewing and indirectly through providing restored habitat that could benefit fishing.

Project	Physical Resources		Biological Resources					Socioeconomic Resources	
	Geology and Substrates	Hydrology and Water Quality	Habitats	Wildlife	Marine and Estuarine Resources	Rare and Protected Species	Federally Managed Fisheries	Cultural Resources	Tourism and Recreation
Walker Island Expansion	Same as described above.	The creation of the new island is expected to have short-term minor adverse impacts to water quality from expected increases in turbidity.	Same as described above.	Fish populations that utilize the shoal would experience temporary disruptions during construction activities, resulting in localized short-term minor adverse impacts. The creation of the island would provide ideal habitat for birds due to the rock revetment impeding human usage resulting in long-term beneficial impacts.	The placement of sediment/ rock riprap would result in localized long-term moderate adverse impacts to benthic communities in the project area. Mobile organisms would experience short-term minor impacts due to temporary disruptions.	Same as described above.	Same as described above.	Same as described above.	Same as described above.

Table 4-2: Summary of Environmental Consequences for Nutrient Reduction Projects.

Project	Physical Resources	Biological Resources		Socioeconomic Resources
	Hydrology and Water Quality	**Wildlife**	**Rare and Protected Species**	**Cultural Resources**
PDARP/PEIS 6.4.3.1	Some agricultural best practices include small-scale construction projects (e.g., to manage manure and runoff from feedlots). Therefore, during construction, short-term, minor adverse impacts on geology, substrate, hydrology, surface, and ground water quality (e.g., nutrients, fertilizers, pesticides, total suspended solids in runoff, and high-conductivity ground water), air quality, and noise (due to emissions) would be anticipated. However, long-term benefits are expected to result because these conservation practices to reduce nutrients would slow erosion, stabilize soils, improve water quality, and increase ground water recharge.	Depending on the projects implemented, short-term, minor adverse impacts may be anticipated during construction. For example, if construction includes earth-moving work, terrestrial vegetation may be disturbed. Benefits to biological resources such as benthic invertebrates, shellfish, finfish, and marine mammals could result from (1) improved water quality in the watershed and associated estuary and (2) reduced contaminant loadings (e.g., pesticides and fuel contaminants such as polyaromatic hydrocarbons and metals).		Impacts to socioeconomics resulting from the implementation of this restoration approach are dependent on site-specific conditions associated with a project proposed for implementation. Depending on the techniques employed, short-term benefits to the local economy could accrue through an increase in employment and associated spending in the project area during construction activities. Improvements to water quality could result in indirect benefits to recreational activities and commercial fishing. If cultural or historic resources are present, minor adverse impacts to the resource would be anticipated during construction activities such as dredging and placement/removal of sediments or other materials.
Bayou La Batre Nutrient Reduction	Short-term minor-to-moderate adverse impacts on hydrology and water quality from ground-disturbing activities. Short-term minor-to-moderate adverse impacts on wetlands, depending on the location of conservation practices. Long-term beneficial impacts from the enhancement of wetland health from reduction in nonpoint source pollutants. No impact on floodplains.	Temporary short-term adverse impacts from construction activities. Long-term beneficial impacts from prevention of gully formation, reduction of off-site, downstream effects of sediment, nutrients, and organic material into surface waters.	Rare and protected species could experience short-term, minor adverse impacts while construction activities took place. Beneficial impacts on these species would result from water quality improvements because of targeted land management practices intended to reduce (1) nutrient losses from the landscape, (2) nutrient loads to streams and downstream receiving waters, and (3) water quality degradation in watersheds, and thus would provide benefits to coastal watersheds and marine resources.	Appropriate avoidance/mitigation measures would be identified through the National Historic Preservation Act (NHPA) Section 106 consultation process.
Puppy Creek – Juniper Creek-Big Creek Nutrient Reduction	Same as described above.	Same as described above.	Same as described above.	Same as described above.

Table 4-3: Summary of Environmental Consequences for Bird Projects

<table>
<tr><th>Project</th><th colspan="2">Physical Resources</th><th colspan="4">Biological Resources</th><th colspan="2">Socioeconomic Resources</th></tr>
<tr><th></th><th>Geology and Substrates</th><th>Hydrology and Water Quality</th><th>Habitats</th><th>Wildlife (Birds)</th><th>Marine and Estuarine Resources</th><th>Rare and Protected Species</th><th>Cultural Resources</th><th>Tourism and Recreation</th></tr>
<tr><td>PDARP/PEIS 6.4.10.1</td><td colspan="2">Temporary, short-term, adverse impacts to existing soils, geology, water quality, and air quality are anticipated for any construction activities associated with the techniques; however, the project itself would result in long-term impacts if sediments or shells are borrowed and/or placed for construction of shell rakes or islands. Minor impacts are anticipated for activities associated with stewardship and enhancing nest sites. Impacts would be temporary and minor and limited to installation of signs, access, fences, or other means of reducing human trespass. Protecting bird habitat could have long-term benefits to geology, substrates, and water quality by preventing disturbance and loss of soil and reducing erosion. Protecting nesting and foraging habitat for birds could have indirect, long-term benefits by preventing development and disturbances, which can reduce surface water runoff and result in water quality benefits.</td><td colspan="4">Construction associated with installation of signs, access, fences, or other means of reducing human trespass may result in temporary minor adverse effects on biological resources, in the form of temporary disturbances to birds and other biota. Creation of riverine islands and oyster and shell rakes would require the use of heavier construction activities and result in minor to moderate adverse impacts to water and air quality. Placement of shells or borrow materials on estuarine sediments would bury existing habitats and have moderate to major adverse impacts on those habitats by burying and replacing existing habitats. Benefits of the proposed restoration approach include conservation of bird nesting and foraging habitat that would increase bird health and reproduction by preventing habitat loss through land conversion.</td><td colspan="2">Minor, short-term, adverse impacts could result due to construction activities. Impacts may be long term for large projects such as island creation. However, improvements in habitat associated with this approach may draw additional visitors to the area with associated visitor spending, increasing sales and tax receipts on retail purchases.

Creating, enhancing, or restoring bird nesting habitat may result in minor (temporary disturbance) to moderate (disturbance without loss of cultural information) impacts on cultural and historic resources due to construction activities such as dredging, adding sediments or borrow materials, or removing sediments, depending on the scale of the action and site-specific characteristics. Discovery or recovery of cultural or historic resources would allow their future protection.</td></tr>
<tr><td>Stewardship of Coastal Alabama Beach Nesting Bird Habitat</td><td>No impact.</td><td>No impact.</td><td>No impact.</td><td>Stewardship activities, including installing symbolic (temporary post and rope) and/or exclusionary fencing around nesting areas, predator management, deploying decoys, nest monitoring, and habitat enhancements (including removing vegetation and installing/distributing shell hash) under the project would have short- and long-term beneficial impacts on birds by reducing human disturbances and predation, which could enhance nesting success. Monitoring would inform future conservation efforts.</td><td>No impact.</td><td>Stewardship activities, including installing symbolic (temporary post and rope) and/or exclusionary fencing around nesting areas, predator management, deploying decoys, nest monitoring, and habitat enhancements (including removing vegetation and installing/distributing shell hash) under the project would result in short- and long-term beneficial impacts on rare and protected species by reducing human disturbances and predation, which could enhance nesting success. Monitoring would inform future conservation efforts.</td><td>This project's actions would be both noninvasive and minimally invasive from the installation of symbolic (temporary post and rope) and exclusionary fencing around nesting areas prior to the start of the nesting season to reduce human ingress and disturbance. No infrastructure or construction would be associated with the project beyond the temporary fencing and barriers described herein. There would be no anticipated involvement with historic properties as defined in 36 CFR 800.16. All required consultations with state tribal historic preservation offices will be carried out prior to commencement of any activities with the potential to have impacts on cultural resources.</td><td>No effects on tourism and recreational use are anticipated as a result of the proposed project because no operation and maintenance activities would be associated with the project. Overall, the project would result in direct and indirect long-term beneficial impacts on tourism and recreation by reducing human disturbances, potentially leading to enhanced nesting success, and increased passive recreation such as bird watching.</td></tr>
</table>

Project	Physical Resources		Biological Resources				Socioeconomic Resources	
	Geology and Substrates	Hydrology and Water Quality	Habitats	Wildlife (Birds)	Marine and Estuarine Resources	Rare and Protected Species	Cultural Resources	Tourism and Recreation
Lower Perdido Islands Habitat Restoration – Phase 2	The placement of sediment would have long-term, moderate, adverse impacts on geology and substrates directly under the placement area. Substrates adjacent to the fill area would experience long-term benefits because of sediment placement and protection of the shoreline from erosion and wave action.	Construction activities are expected to have short-term, minor, adverse impacts to water quality from expected increases in turbidity. Restoring wetland habitats is expected to have long-term benefits to water quality by reducing erosion of this island.	Small animals, burrowing invertebrates, and vegetation habitats would experience short-term, minor, adverse impacts from the placement of sediment. The project would have long-term beneficial impacts by restoring and creating habitat.	Wading birds that may use the project area would experience temporary disruptions during construction activities, resulting in localized short-term, minor, adverse impacts.	The placement of sediment would result in localized, long-term, moderate adverse impacts to benthic communities in the project area. Activities that could potentially produce long-term adverse impacts affecting EFH would permanently impact estuarine water bottoms and estuarine water column during placement of dredged material and breakwater enhancement. The restored vegetated intertidal habitats are likely to provide long-term beneficial impacts to finfish and shellfish species.	Birds within the project area may experience temporary disruptions during construction, leading to short-term minor adverse impacts. Likewise, sea turtles and marine mammals in the vicinity of the construction site could experience short-term minor disruption during construction activities. When construction is complete, the project would provide long-term beneficial impacts to protected species that use the restored island site for roosting, loafing, nesting, and foraging.	No adverse impacts to cultural resources are expected.	Same as described above.
Walker Island Expansion	Same as described above.	The creation of the new island is expected to have short-term, minor, adverse impacts to water quality from expected increases in turbidity.	Same as described above.	Fish populations that use the shoal would experience temporary disruptions during construction activities, resulting in localized short-term, minor, adverse impacts. The creation of the island would provide ideal habitat for birds due to the rock revetment impeding human usage resulting in long-term beneficial impacts.	The placement of sediment/ rock riprap would result in localized long-term moderate adverse impacts to benthic communities in the project area. Mobile organisms would experience short-term minor impacts due to temporary disruptions.	Same as described above.	Same as descried above.	Same as described for the Stewardship of Coastal Alabama Beach Nesting Bird Habitat project.

Table 4-4: Summary of Environmental Consequences for Oyster Projects

Project	Physical Resources		Biological Resources			Socioeconomic Resources
	Geology and Substrates	Hydrology and Water Quality	Habitats and Wildlife Species	Marine and Estuarine Resources	Rare and Protected Species	Cultural Resources
PDARP/PEIS 6.4.12.1	Short-term, minor adverse impacts on air quality and noise would be anticipated during cultch placement associated with construction activities. Long-term, minor adverse impacts on air quality and noise would be expected through emissions and noise associated with increased recreational and commercial use of the restored oyster habitat. Short-term, minor adverse impacts on geology, substrates, water quality, air quality, and noise could result from activities such as anchoring marker buoys and signs for reserve areas. The installation of infrastructure could have short-term, minor adverse impacts on water quality, including increased turbidity and reduced water clarity. Long-term benefits to substrates would be anticipated as a result of the placement of oyster shell or other suitable substrate for oyster recruitment. Placement of reefs may reduce wave energy reaching shorelines, which may reduce wave energy and erosion of shorelines and stabilize substrates. Long-term benefits to water quality could also occur due to increased filter feeding by oysters.		Short-term, minor impacts to biological resources could occur during placement of cultch or substrate required for living shorelines: doing so could cause short-term increases in turbidity, reducing water clarity (and photosynthetically available light), increasing crab predator abundance and subsequent predation on oyster spat, and burial of existing benthic communities. Short-term, minor-to-moderate adverse impacts to fish, turtles, and (albeit unlikely) marine mammals in the form of direct injury and/or mortality may be anticipated due to cultch placement activities, including entrainment. Creation of oyster habitat would support increased populations of oysters, which would be a long-term beneficial impact. Long-term benefits of the created/restored reef include foraging and nursery habitat and refuge for numerous finfish and shellfish. Long-term benefits to other organisms, including marine mammals, sea turtles, fish, and birds are also anticipated due to the oyster reef role as "ecosystem engineer." Reefs provide protection, habitat, foraging, and propagation grounds for these organisms. Oyster reefs also dissipate wave energy and improve water clarity, in turn, benefiting SAV and marshes.			Restoring oyster reef habitat could result in minor (temporary disturbance) to moderate (disturbance without loss of cultural information) impacts on cultural and historic resources that may be located in the area of the restoration. Discovery or recovery of cultural or historic resources would allow their future protection.
Improving Resilience for Oysters by Linking Brood Reefs and Sink Reefs (Large Scale) Component 4 – Mid-lower Mobile Bay, AL	Short-term minor adverse impacts would occur with placement of anchoring buoys, which would disturb surrounding sediment, and with placement of cultch material, which would disturb and cover the substrates onto which cultch is placed. Long-term beneficial impacts to geology and substrates would occur from restoring oyster habitat.	Project-related vessels, equipment, and construction activities, primarily associated with cultch placement, could result in an increase in local turbidity which would cause short-term minor adverse impacts. The project would have long-term benefits on water quality because of the newly restored oysters' filter feeding.	Creation of new oyster reef habitat could result in short-term, minor adverse disruptions to bird species during construction; however, newly created reefs would likely provide long-term beneficial impacts to birds through an increase in foraging habitat.	Benthic resources as well as finfish and shellfish would experience short-term, minor adverse impacts from cultch placement, which can smother benthic resources and convert soft bottom habitats to hard bottom habitats. The combination of the mobility of nekton species, the implementation of BMPs, and the short duration of construction activities suggest that the alternatives would have short-term minor adverse effects to aquatic wildlife. The components of the alternative would, by design, provide long-term benefits to oysters and to commercially important fish species that rely on reefs for foraging as well as other wildlife that depend on the fish that would benefit from additional reef habitat.	Rare and protected species that frequent the project area would likely experience short-term minor impacts. All project components would cause short-term, adverse impacts to EFH species (see list in Section A.4.1.10). The combination of mobility, the implementation of BMPs, and the short duration of construction activities suggest that the alternatives are unlikely to have adverse effects on rare and protected species.	Coordination with the Alabama Historical Commission and all relevant Indigenous tribes regarding the extent and nature of cultural resources at the site would occur.
Oyster Grow-Out and Restoration Reef Replacement – 5 year continuation	Installation of the pilings would result in short-term moderate impacts from activities that disturb soils and cause sediment to suspend in the water. The oyster grow-out areas are anticipated to be "off-bottom" reefs and thus would not affect substrates, geologic hazards, or geology. Placement of material from the oyster grow-out areas on restoration reefs would not affect geology or substrates because oysters would be	All construction would be completed via barges. No activity would alter the hydrology of the area. No short-term impacts on hydrology would occur because of this project. The restoration of oysters would result in no long-term impacts on hydrology. The installation of off-bottom oyster grow-out sites via pilings would result in short-term moderate impacts on water quality from the increased suspended sediment from bed-disturbing activities. After 1 year, the cultch, live oysters, and spat on shells would be relayed from	Implementation of the project would result in short-term, minor adverse impacts on unvegetated soft bottom estuarine habitats in Portersville Bay, Grand Bay, and Bon Secour Bay. The project would result in long-term beneficial impacts on oyster reef habitat	Implementation of the project would result in short-term minor adverse impacts on marine and estuarine fauna within the footprint of the grow-out sites and oyster restoration sites. The project would result in long-term beneficial impacts on marine and estuarine fauna because oysters placed at the sites would enhance spat production, potentially increasing oyster abundance and recruitment in	Implementation of the project would result in short-term, minor impacts on some ESA-listed species that could occur within the project vicinity, including all sea turtle species, Gulf sturgeon, West Indian manatee, piping plover, red knot, and wood stork. Noise from project construction, especially driving 12 to 20	Same as described above.

Project	Physical Resources		Biological Resources			Socioeconomic Resources
	Geology and Substrates	Hydrology and Water Quality	Habitats and Wildlife Species	Marine and Estuarine Resources	Rare and Protected Species	Cultural Resources
	placed on existing hard substrate. Placement of material from the oyster grow-out areas on restoration reefs would not affect geology or substrates because oysters would be placed on existing hard substrate; however, pile driving would be used that could result in short-term, minor, adverse impacts on substrates but would not influence the overall geology or substrates of the bay. Installation of the pilings would result in short-term, moderate impacts from activities that disturb soils and cause sediment to suspend in the water.	the grow-out sites to existing reefs, living shorelines, and intertidal areas. Moving oysters from the grow-out sites to natural areas would not affect water quality because the grow-out sites would be off-bottom and there would be no disruption to floor sediments that could increase turbidity. The establishment of an oyster cultch in the Mississippi Sound and Bon Secour Bay would result in long-term beneficial impacts on water quality. No short-term impacts on floodplains would occur. Placing oysters on living shorelines and in intertidal areas would improve the water quality of the area and ultimately the health of the floodplain. Long-term, beneficial effects on the floodplain would occur because of this project. No short-term impacts on wetlands would occur. Long-term beneficial effects on wetlands would occur because of the restoration of oysters to the area.	because oysters placed at the sites would enhance spat production, potentially increasing oyster abundance and recruitment in Alabama waters. The development of three oyster grow-out sites in Grand Bay, Portersville Bay, and Bon Secour Bay would result in short-term minor adverse impacts on wildlife. Daily human activity to grow oysters at the sites would have long-term minor effects on birds. However, these activities would occur on a regular, predictable daily schedule, which would allow some birds to habituate to humans at the grow-out sites and therefore, experience no adverse impact.	Alabama waters. The project requires an assessment of EFH by NOAA Fisheries Habitat Conservation Division because sand/mud bottom and water column habitat would be affected. The benefits of the project would likely outweigh the impacts.	pilings, could adversely affect bottlenose dolphins because it would be detectable for miles, which would potentially interfere with dolphin communication, echolocation and breeding. However, the pile driving would be a temporary occurrence and impacts would quickly subside. During construction, underwater noise, vibration, and temporary increases in turbidity during pile driving could result in short-term direct or indirect adverse impacts on Gulf sturgeon critical habitat.	
Oyster Grow-Out and Restoration Reef Replacement – 3 year continuation	Same as described above but with fewer benefits over time.	Same as described above but with fewer benefits over time.	Same as described above but with fewer benefits over time.	Same as described above but with fewer benefits over time.	Same as described above but with fewer benefits over time.	Same as described above but with fewer benefits over time.

Table 4-5: Summary of Environmental Consequences for Provide and Enhance Recreational Opportunities Projects

Project	Physical Resources		Biological Resources				Socioeconomic Resources		
Project	**Geology and Substrates**	**Hydrology and Water Quality**	**Habitats**	**Wildlife**	**Marine and Estuarine Resources**	**Rare and Protected Species**	**Cultural Resources**	**Tourism and Recreation**	**Aesthetics and Visual Resources**
PDARP/PEIS 6.4.13.1	Depending on the location and intensity of construction necessary to implement various improvements to infrastructure, short-term and long-term, minor-to-moderate adverse impacts on the physical environment could result from projects that enhance public access. For example, construction of a dock or pier to provide increased public access could result in short-term impacts on turbidity and sediments during construction. Possible minor adverse effects could also include temporary localized impacts on air and noise quality from increased vessel traffic during construction. The potential for long-term, minor-to-moderate adverse impacts exists depending on the use and placement of bulkheading in association with certain infrastructure improvements (e.g., boat ramps, roads and bridges). Bulkheading has the potential for localized disruption of sediment dynamics. The purchase of access rights, easements, and/or property could result in long-term, minor impacts on soils if the lands were previously vacant and require installation of trails or other access infrastructure.		Short-term, minor to moderate, adverse impacts on biological resources could result from improving recreational opportunities through enhancements to infrastructure. Short-term impacts associated with the construction or enhancements of certain types of infrastructure (e.g., boat ramps or bridges) are possible due to potential changes in sediment dynamics and would be site-specific. Other adverse impacts could include the short-term displacement of animals, including protected species such as beach mice, and the change of habitats from natural areas to built environments. Much of this infrastructure is or can be located in sensitive resources areas such as occupied beach mouse habitat, Gulf sturgeon critical habitat, and EFH. Therefore, specific project design must consider the potential impacts on these resources and include BMPs and other mitigation measures to avoid adversely affecting sensitive natural resources. In-water construction activities may cause entrapment of marine mammals, sea turtles, and other protected species; however, use of best practices should mitigate this risk. Depending on the intensity of recreational use, an increase in human and/or vehicular traffic on a land conservation tract could cause overall long-term, moderate adverse impacts to the biological resources. Added disturbance associated with human and vehicular presence could disrupt biological resources. Conservation measures could be taken to reduce the stress on these resources. Additional piers could cause harm or mortality to marine mammals and other organisms from fishing gear entanglements or ingestion, as well as from people illegally feeding dolphins from piers. Adverse impacts could also occur as a result of increased fishing mortality from recreational fishing. Improved access to resource-based recreational opportunities (e.g., bird watching) furthers the public's appreciation and understanding of the species and the habitats they need for survival. This awareness could bring long-term, minor beneficial impacts to biological resources as the public further supports conservation and wildlife management efforts.				The enhancement or construction of infrastructure would have long-term beneficial impacts on the socioeconomic resources of the surrounding area. This restoration approach would also improve socioeconomic resources by providing public access. Improvements in recreational opportunities that result from infrastructure enhancement have the potential to create localized increases in business opportunities and have long-term beneficial impacts. Long-term benefits to cultural resources resulting from implementation of this restoration approach would be dependent on site-specific conditions. If cultural resources are present in a specific area, conservation of land would protect the resource from future impacts (e.g., due to development or construction).		
Bayfront Park Restoration and Improvement Phase IIa and IIb	Adverse impacts would involve temporary and minor increased sedimentation and erosion, while beneficial geologic- and soil-related impacts would include decreased sedimentation and erosion and shoreline hardening.	Construction of a sand pocket beach would have permanent minor adverse impacts on wetlands. Short-term adverse impacts are expected during construction and stabilization of the beach, including increased siltation and turbidity. Over the long term, sand nourishment and native plantings would have beneficial impacts on hydrology, water quality, floodplains, and wetlands by improving storm resiliency, and providing habitat for filter feeders that improve water quality. Any net increase in	Improvements to the park entrance, access road, and parking areas would increase disturbance to the pine flatwoods habitat. The construction of a 10-acre sand pocket beach would also disturb the brackish tidal marsh and savanna wet prairie habitats along Mobile Bay. Therefore, the project would have moderate long-term adverse impacts on local habitats.	Construction of the proposed amenities would result in short- and long-term minor adverse impacts on wildlife from potential disturbances associated with noise and human presence and mortality of some intertidal species that may be buried during construction of the sand beach. The mortality would not be discernable at the population level.	Construction of the proposed amenities would result in short- and long-term minor adverse impacts on marine and estuarine resources from the mortality of some intertidal species associated with construction of the sand beach and increased noise during the construction period. The mortality would not be discernable at the population level.	Construction of the proposed amenities would result in short- and long-term, minor, adverse impacts on rare and protected species from increased turbidity and temporary disturbances associated with noise and human presence during the construction period.	To ensure there would be no involvement with historic properties as defined in 36 CFR 800.16 (specifically, any prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion in, the NRHP), ADCNR would initiate an archaeological records review and consultation with the Alabama	Temporary, minor impacts on tourism and recreation would occur during the construction period, when public access to park amenities would be restricted. Overall, the project would have long-term benefits on tourism and	Short-term, moderate impacts on aesthetics and visual resources would occur during the construction period. Overall, long-term benefits on aesthetics and visual resources would occur from the proposed improvements.

		impervious surfaces would have a permanent, minor increase in polluted stormwater runoff that could be mitigated by low-impact development.					Historical Commission once preliminary design and construction plans are available. Appropriate actions would be undertaken as required as a result of this records review and consultation.	recreation at Bayfront Park by providing improved access to the natural resources in south Mobile County.	
Laguna Cove Little Lagoon Natural Resource Protection – Large-Scale Amenities	There would be no impacts on geologic resources during construction. Impacts on soils during construction would be short term, adverse, minor, and localized. Substrates would experience minor long-term impacts.	Impacts on the hydrology of the project area during construction would be short-term and minor. With the implementation of BMPs, impacts on water quality during construction would be short-term and minor. Floodplains would experience no short-term adverse impacts. Wetlands would experience minor short-term impacts from increased turbidity due to piling installation as well as compressed vegetation from construction equipment.	The project is expected to have moderate long-term adverse impacts on local habitats.	Proposed construction activities may result in temporary, minor, adverse impacts on wildlife species inhabiting the proposed site and nearby vicinity, including temporary disturbance to wildlife during construction from noise and temporary displacement. Some minor impacts could occur from species avoiding areas, overall, impacts would be long term and beneficial from placing the majority of the site into conservation and preserving species and their habitat in this area.	The construction of a proposed pier and kayak launch would potentially have short-term minor adverse impacts on fish and shellfish in the lagoon. The fishing pier located on the eastern side of the property would cause long-term, minor adverse impacts on species being fished due to the abundance of these species in a healthy lagoon habitat.	Rare and protected species within the project area would experience short-term, minor, adverse impacts from the construction of the proposed amenities and compaction of soils. Post construction, increased site use may have long-term minor adverse impacts on rare and protected species, including beach mice and migratory birds.	Appropriate avoidance or mitigation measures would be identified through the NHPA Section 106 consultation process. Appropriate avoidance/mitigation measures would be identified through the NHPA Section 106 consultation process.	During construction of the proposed access improvements and recreational use amenities, the public would not be able to access the site, resulting in short-term minor adverse impacts. Additional amenities would provide long-term benefits for recreational users and tourism overall.	During construction, short-term impacts on visual resources at the proposed alternative site would be minor and adverse, primarily because of the presence of construction personnel, equipment vehicles, and unfinished structures visible to the public and recreational users.
Laguna Cove Little Lagoon Natural Resource Protection – Small-Scale Amenities	Same as described above.	Same as described above.	Same as described above.	Same as described above.	Same as described above.	Same as described above.	Same as described above.	Same as described above, but less beneficial as fewer amenities would be constructed.	Same as described above.

This page intentionally left blank.

4.4 POTENTIAL CUMULATIVE IMPACTS

Section 6.6 and Appendix 6B of the Final PDARP/PEIS are incorporated by reference into the following cumulative impacts analysis, including the methodologies for assessing cumulative impacts, identification of affected resources, and the cumulative impacts scenario. To effectively consider the potential cumulative impacts, the AL TIG identified past, present, and reasonably foreseeable future actions along the Alabama coast near the proposed project areas. Table 4-6 identifies the cumulative action scenario for this Draft RP IV/EA. Many of the resources analyzed would only have negligible to minor adverse and/or beneficial effects. Resources with negligible to minor effects will not be included in the cumulative impacts analysis to appropriately narrow the scope of the environmental analysis to the issues that would have an influence on the decision-making process or deserve attention from an environmental perspective (Council on Environmental Quality, 1997). The following resources were excluded from this cumulative impact analysis because they were not carried forward for analysis or based on their beneficial or negligible to minor adverse effects:

- Physical Environment: hydrology and water quality, geology and substrates, air quality and greenhouse gas emissions, and noise
- Biological Environment: protected species and living coastal marine resources
- Human Uses and Socioeconomics: socioeconomics and environmental justice, cultural resources, infrastructure, land and marine management, fisheries and aquaculture, land and marine transportation, and public health and safety

The following resources were analyzed in detail for environmental consequences that could result from implementation of the proposed alternatives/projects:

- Physical Environment: habitats (moderate impacts are expected only under the Bayfront Park Restoration and Improvement Phase IIa and IIb projects) and marine and estuarine resources (Lower Perdido Islands Habitat Restoration and Walker Island Expansion)
- Human Uses and Socioeconomics: tourism and recreation (moderate impacts are expected under the Bayfront Park Restoration and Improvement Phases IIa and IIb)

Table 4-6: Cumulative Action Scenario

Category	Action Description	Key Resource Areas with Potential to Contribute to Cumulative Impacts
Restoration Related to the DWH oil spill (DWH Early Restoration, AL TIG RP I and II, RESTORE Act, Gulf Environmental Benefit Fund, North American Wetlands Conservation Fund, National Academy of Sciences)	Non-NRDA projects will leverage other funding sources where available to achieve habitat restoration. These programs seek to restore habitat, water quality, and living coastal and marine resources throughout coastal Alabama and in the greater Gulf Coast region. Projects currently funded through the multiple restoration programs would improve bird populations, oyster populations, sea turtle populations, dune habitat, marsh habitat, and coastal resiliency through shoreline protection, habitat protection, hydrologic restoration, and acquisition.	Habitats Marine and Estuarine Resources Tourism and Recreation
Resource Stewardship: Marsh and Shoreline Restoration	Outside the NRDA process, various marsh and shoreline restoration efforts include: ▪ Boggy Point Living Shoreline Project ▪ Coffee Island Living Shoreline Study ▪ The Nature Conservancy Swift Tract Living Shoreline ▪ Helen Wood Park Living Shoreline ▪ Marsh Restoration in Oyster Bay	Habitats Marine and Estuarine Resources Tourism and Recreation
Restoration Programs through Other State Agencies	Section 384 of the Energy Policy Act of 2005 (Public Law 109-58) establishes the Coastal Impact Assistance Program, which authorizes funds to be distributed to Outer Continental Shelf oil and gas producing states for the conservation, protection, and preservation of coastal areas, including wetlands. ADCNR was designated as the lead agency for development and implementation of the Coastal Impact Assistance Program. A list of completed and in progress Coastal Impact Assistance Program projects can be found here: http://www.outdooralabama.com/sites/default/files/images/file/Status%20of%20CIAP%20Grants%20rev4.pdf	Habitats Marine and Estuarine Resources Tourism and Recreation

Category	Action Description	Key Resource Areas with Potential to Contribute to Cumulative Impacts
Coastal Development and Land Use	The Alabama coastal area is rapidly developing and will continue to be developed. Known projects include Amber Isle Development, Phoenix West II Condominium, and Gulf State Park Master Plan.	Habitats Tourism and Recreation
Beach Nourishment	Alabama beach nourishment projects (Orange Beach, Gulf State Park, and Gulf Shores Beach) are a collaborative effort between ADCNR and local municipalities. These projects aim to restore beaches that have suffered a loss from storms and/or erosion to historical conditions by placing sand from offshore borrow sites via dredge and pipe.	Habitats Marine and Estuarine Resources Tourism and Recreation

4.5 CUMULATIVE IMPACT ANALYSIS

The following section describes the cumulative impacts of the alternatives being considered when combined with other past, present, and reasonably foreseeable future actions. The analysis considers the impacts of the cumulative actions. The analysis recognizes that in most cases, the contribution to the cumulative impacts for a given resource from implementing the alternatives would be difficult to discern. In many situations, implementing one of the alternatives would likely help reduce overall long-term adverse impacts by providing a certain level of offsetting benefits, especially when considered in concert with other actions of similar nature (e.g., stewardship programs or non-NRDA restoration). The cumulative impact analysis is evaluated by affected resource. Effects may come together in several ways to result in cumulative effects. For purposes of the following analysis, cumulative effects have been identified and may fall under one or more of four categories:

- **Additive adverse or beneficial effect —** Occurs when the adverse or beneficial impact on a resource adds to effects from other actions.
- **Synergistic (interactive) adverse effect —** Occurs when the net adverse impact on a resource is greater than the sum of the adverse impacts from individual actions. This could also result in a different type of impact than the impact from individual impacts, e.g., increased temperature discharges in water when added to increased nutrient loading can result in reduced dissolved oxygen.
- **Synergistic (interactive) beneficial effect —** Occurs when the net beneficial impact on a resource is greater than the sum of the benefits from individual actions. This could also result in a different type of impact than the impact of the individual impacts.
- **Countervailing effect —** Occurs when the overall net effect of two or more actions, when combined, is less than the sum of their individual effects.

In the following sections, the analysis is organized by resource and alternative.

4.5.1 Habitats

The range of proposed alternatives in this Draft RP IV/EA would have short-term minor-to-moderate adverse impacts on habitats in Baldwin and Mobile Counties. Overall, the adverse impacts would be minor. Short-term impacts would result from projects with construction elements, such as the Bayfront Park Restoration and Improvement Phase II project, which would disturb habitats during construction and after the recreational improvements are complete.

Short-term adverse impacts from cumulative actions would occur during construction. Implementation of other restoration projects, marsh and shoreline restoration, beach nourishment, and coastal development and land use impacts are expected to cause short-term habitat impacts from disturbance during construction. These impacts are expected to be short-term and minor, and in general, species would be able to use the sites for habitat soon after construction activities cease. Many of the actions in Table 4-6 would contribute beneficial impacts to habitats, including many of the restoration projects proposed under the AL TIG RP IV, Early Restoration, NRDA, and other restoration projects occurring in the area with land acquisition projects providing long-term preservation of habitats. Some of the actions, such as coastal development, would likely result in permanent loss of habitat for area species, resulting in long-term adverse impacts.

When the range of proposed alternatives in this RP IV/EA is analyzed in combination with other past, present, and reasonably foreseeable future actions, short- and long-term adverse cumulative impacts on habitats would likely occur ranging from minor to moderate. Overall, the projects proposed in this plan would have beneficial impacts from the preservation of habitat, either through land acquisition related to recreational use or restoration of habitat. The range of alternatives in this RP IV/EA, when carried out in conjunction with other environmental restoration efforts has the potential to result in long-term moderate impacts on habitats, with the actions in this plan contributing a benefit to these adverse impacts through habitat preservation. While some adverse impacts from the actions proposed in this plan would occur from construction of new recreational amenities, disturbance would occur in already developed areas, such as Bayfront Park. The Final PDARP/PEIS found that implementation of projects in the Restoration Types analyzed in this RP IV/EA is consistent with the goals of the selected alternative and is not expected to contribute substantially to short-term or long-term adverse cumulative impacts on habitats when analyzed in combination with other past, present, and reasonably foreseeable future actions. This site-specific analysis for habitats is consistent with that finding.

4.5.2 Marine and Estuarine Resources

Both the Lower Perdido Islands Habitat Restoration and Walker Island Expansion project would have short-term moderate adverse impacts on geology and substrates in Perdido Bay. Short-term impacts would result from dredging and the permanent placement of sediment and/or rock riprap on existing habitats, resulting in benthic organism fatalities.

Short-term adverse impacts from these actions would occur during construction. Implementation of other restoration projects, marsh and shoreline restoration, beach nourishment, and coastal development and land use impacts are expected to cause short-term minor impacts from increased human disturbance. These impacts are expected to be short-term and minor, and in general, species would be able to use the sites for habitat soon after construction activities cease. Many of the actions in Table 4-6 would contribute beneficial impacts to habitats, including many of the restoration projects proposed under the AL TIG RP IV, Early Restoration, NRDA, and other restoration projects occurring in the area with land acquisition projects providing long-term preservation of habitats. Some of the actions, such as island creation and/or expansion, would likely result in permanent loss of marine resources in the immediate project area resulting in long-term adverse impacts.

When the range of proposed alternatives in this RP IV/EA is analyzed in combination with other past, present, and reasonably foreseeable future actions, short- and long-term adverse cumulative impacts on marine and estuarine resources would likely occur ranging from minor to moderate. Overall, the projects proposed in this plan would have beneficial impacts from the creation of habitat, either through expanding upon Walker Island or creating a new island. The Final PDARP/PEIS found that implementation of projects in the Restoration Types analyzed in this RP IV/EA is consistent with the goals of the selected alternative and is not expected to contribute substantially to short-term or long-term adverse cumulative impacts on marine and estuarine resources when analyzed in combination with other past, present, and reasonably foreseeable future actions. This site-specific analysis for habitats is consistent with that finding.

4.5.3 Tourism and Recreation

Adverse impacts on tourism and recreation would be minor overall because projects would modify existing recreational facilities. On the whole, the projects proposed in this RP IV/EA may have short-term moderate impacts if an area is not accessible during construction but would have long-term benefits once the recreational amenities are constructed and operational for the public. For projects under the Bird Restoration Type, the two projects related to the Stewardship of Coastal Alabama Beach Nesting Bird Habitat would involve data collection and research and would not affect tourism and recreation long-term directly but may provide long-term benefits by enhancing the environment.

All of the actions identified in Table 4-5 could affect tourism and recreation. For all projects, similar to the range of alternatives analyzed in this RP IV/EA, there would be short-term impacts for projects that include construction with impacts ranging from minor for projects with a construction period of a few months to a year (as is anticipated for marsh restoration and beach nourishment) to moderate for projects with a longer time frame (such as coastal development) if recreational amenities are not available during construction. Long-term impacts on tourism and recreation would be mostly beneficial because restoration and land acquisition projects of various types would improve the natural environment, and where possible, provide additional recreational access. Projects that remove previously open areas from public access and recreational use such as the development of coastal amenities utilized by the public and dredging would have long-term minor-to-moderate adverse impacts.

When the range of proposed alternatives in this RP IV/EA is analyzed in combination with other past, present, and reasonably foreseeable future actions, cumulative impacts on tourism and recreation would be short term, minor, and adverse because most of the projects involve a construction process that would restrict use during construction but would cease once construction is completed. The range of alternatives in this RP IV/EA would not contribute substantially to adverse cumulative impacts because many projects do not include a construction component, or the construction is small in scale compared to other projects in the area. The range of alternatives in this RP IV/EA, when carried out in conjunction with other projects along the Alabama coast, could have long-term beneficial cumulative impacts on tourism and recreation through conservation, restoration, and enhancement of recreational amenities, all of which would provide areas for people to visit and recreate.

The Final PDARP/PEIS found that implementation of projects in the Restoration Types analyzed in this RP IV/EA is consistent with the goals of the selected alternative and is not expected to contribute substantially to short-term or long-term adverse cumulative impacts on tourism and recreation when analyzed in combination with other past, present, and reasonably foreseeable future actions. This site-specific analysis for tourism and recreation is consistent with that finding.

5.0 COMPLIANCE WITH OTHER LAWS AND REGULATIONS

Chapters 3 and Appendix A of this document provide detailed information and OPA and NEPA analyses for each proposed restoration alternative, expected environmental consequences, and consistency with the Final PDARP/PEIS. In addition, coordination and reviews to ensure compliance with a variety of other legal authorities potentially applicable to the selected alternatives have begun. The AL TIG has started coordination and technical assistance reviews for protected species and their habitats under the relevant regulations, where appropriate. The potential effects of the restoration projects in this RP IV/EA were evaluated and found to be within the scope of effects evaluated in the Final PDARP/PEIS.

Progress to date suggests that all the selected alternatives would meet permitting and other environmental compliance requirements. All alternatives would be implemented in accordance with applicable laws and regulations. Compliances statuses are presented in Table 5-1. Federal environmental compliance responsibilities and procedures, which will follow the Trustee Council SOP, are presented in Section 9.4.6 of the SOP document. Following this SOP, the Implementing Trustees for each alternative will ensure that the status of environmental compliance (e.g., completed versus in progress) is tracked through the Restoration Portal. The Implementing Trustees will keep a record of compliance documents (e.g., ESA biological opinions, USACE permits) and ensure that they are submitted for inclusion in the Administrative Record.

Table 5-1: Status of Environmental Compliance Reviews for Preferred Alternatives

Alternative	Bald and Golden Eagle Protection Act (USFWS)	Coastal Zone Management Act (ADEM)	Endangered Species Act - Terrestrial Species (USFWS)	Endangered Species Act - Marine Species (NMFS)	Magnuson-Stevens Fishery Conservation and Management Act (NMFS)	Marine Mammal Protection Act (NMFS)	National Historic Preservation Act (USDOI)	Rivers and Harbors Act/Clean Water Act (USACE)	Migratory Bird Treaty Act	Marine Mammal Protection Act (USFWS)
Wetland Coastal Nearshore Habitats										
Lower Perdido Islands Habitat Restoration Phase II	Complete	Complete	Complete	Complete	Complete	Complete	In Progress	Complete	Complete	Complete
Nutrient Reduction										
Puppy Creek – Juniper Creek-Big Creek Nutrient Reduction	In Progress	In Progress	In Progress	In Progress	In Progress	In Progress	In Progress	In Progress	In Progress	In Progress
Birds										
Stewardship of Coastal Alabama Beach Nesting Bird Habitat	In Progress	In Progress	In Progress	In Progress	In Progress	In Progress	In Progress	In Progress	In Progress	In Progress
Oysters										

Alternative	Bald and Golden Eagle Protection Act (USFWS)	Coastal Zone Management Act (ADEM)	Endangered Species Act - Terrestrial Species (USFWS)	Endangered Species Act - Marine Species (NMFS)	Magnuson-Stevens Fishery Conservation and Management Act (NMFS)	Marine Mammal Protection Act (NMFS)	National Historic Preservation Act (USDOI)	Rivers and Harbors Act/Clean Water Act (USACE)	Migratory Bird Treaty Act	Marine Mammal Protection Act (USFWS)
Improving Resilience for Oysters by Linking Brood Reefs and Sink Reefs (Large Scale) – Component 4 – Mid-lower Mobile Bay, AL	In Progress	In Progress	In Progress	In Progress	In Progress	In Progress	In Progress	In Progress	In Progress	In Progress
Oyster Grow-Out and Restoration Reef Replacement – 5- and 3-year continuation	In Progress	In Progress	In Progress	In Progress	In Progress	In Progress	In Progress	Complete	In Progress	In Progress
Provide and Enhance Recreational Opportunities										
Bayfront Park Restoration and Improvement Phases IIa and IIb	In Progress	In Progress	In Progress	In Progress	In Progress	In Progress	In Progress	In Progress	In Progress	In Progress
Laguna Cove Little Lagoon Natural Resource Protection – Small-Scale Amenities	In Progress	In Progress	In Progress	In Progress	In Progress	In Progress	In Progress	N/A	In Progress	In Progress

5.1 ADDITIONAL FEDERAL LAWS

Additional federal laws may apply to the preferred alternatives considered in this Draft RP IV/EA. Legal authorities applicable to restoration alternative development were fully described in the context of the DWH restoration planning in the Final PDARP/PEIS, Section 6.9, Compliance with Other Applicable Authorities, and Appendix 6D, Other Laws and Executive Orders. That material is incorporated by reference here. Examples of applicable laws or executive orders include but are not necessarily limited to those listed below. Additional detail on each of these laws or executive orders can be found in Chapter 6 of the Final PDARP/PEIS.

- ESA (16 U.S.C. §§ 1531 et seq.)
- Magnuson-Stevens Fishery Conservation and Management Act (16 U.S.C. §§ 1801 et seq.)
- Marine Mammal Protection Act (16 U.S.C. §§ 1361 et seq.)
- Coastal Zone Management Act (16 U.S.C. §§ 1451 et seq.)
- National Historic Preservation Act (NHPA) (16 U.S.C. §§470 et seq.)
- Coastal Barrier Resources Act (16 U.S.C. §§ 3501 et seq.)
- Bald and Golden Eagle Protection Act (16 U.S.C. §§ 668 et seq.)
- Clean Air Act (42 U.S.C. §§ 7401 et seq.)
- Federal Water Pollution Control Act (Clean Water Act) (33 U.S.C. §§ 1251 et seq.)
- Rivers and Harbors Act (33 U.S.C. §§ 401 et seq.)
- Marine Protection, Research and Sanctuaries Act (16 U.S.C. §§ 1431 et seq. and 33 U.S.C. §§ 1401 et seq.)
- Estuary Protection Act (16 U.S.C. §§ 1221 et seq.)
- Archaeological Resource Protection Act (16 U.S.C. §§ 470aa–470mm)
- National Marine Sanctuaries Act (16 U.S.C. §§ 1431 et seq.)
- Farmland Protection Policy Act (7 U.S.C. §§ 4201–4209)
- Executive Order 11988, Floodplain Management (now as augmented by Executive Order 13690, January 30, 2015)
- Executive Order 11990, Protection of Wetlands
- Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations
- Executive Order 12962, Recreational Fisheries
- Executive Order 13112, Safeguarding the Nation from the Impacts of Invasive Species
- Executive Order 13175, Consultation and Coordination with Indian Tribal Governments
- Executive Order 13186, Responsibilities of Federal Agencies to Protect Migratory Birds
- Executive Order 13693, Planning for Federal Sustainability in the Next Decade
- Executive Order 14096, Revitalizing Our Nation's Commitment to Environmental Justice for All

5.2 COMPLIANCE WITH STATE AND LOCAL LAWS AND OTHER FEDERAL REGULATIONS

Additional state laws may apply to the proposed preferred alternatives considered in this Draft RP IV/EA. Potentially applicable state laws may include but may not be limited to:

- ADEM Division 8 Coastal Program Rules
- ADEM Division 6 Volume 1 Water Quality Program (NPDES)

APPENDIX A – NATIONAL ENVIRONMENTAL POLICY ACT SUPPORTING DOCUMENTATION REPORT

This appendix contains the National Environmental Policy Act (NEPA) supporting documentation that informs the NEPA analysis presented in Chapter 4. The NEPA analysis presented in this appendix is consistent with the Programmatic Damage Assessment and Restoration Plan/Programmatic Environmental Impact Statement (PDARP/PEIS) and tiers where applicable. This appendix addresses the affected environment in which the reasonable range of alternatives would occur as well as the anticipated effects (or impacts) to the human environment from the proposed alternatives and those reasonably foreseeable environmental trends and planned actions that occur in the affected area.

A.1 WETLANDS, COASTAL, AND NEARSHORE HABITATS

After preliminary investigation, some resource areas under the Wetlands, Coastal, and Nearshore Habitats (WCNH) Restoration Type alternatives were determined to be either unaffected or minimally affected by the restoration actions proposed for this Restoration Type. Accordingly, these resources are discussed briefly below. Only those resource areas for which potential adverse impacts are expected are discussed in detail in this Draft Restoration Plan IV and Environmental Assessment: Wetlands, Coastal and Nearshore Habitats; Nutrient Reduction; Birds; Oysters; and Provide and Enhance Recreational Opportunities (Draft RP IV/EA). Additionally, the NEPA analysis for the WCNH alternatives looks at a further subset of the total resource areas and topics as part of the biological, physical, and socioeconomic environment for each restoration alternative. To avoid redundant or unnecessary information, resource areas and topics that are not expected to be affected by a proposed restoration alternative are not evaluated further.

The following resource areas were not analyzed in detail for the WCNH Restoration Type:

- **Aesthetics and Visual Resources:** Both projects include the place of sediment or rock riprap either directly adjacent or near Walker Island for the purpose of conserving or creating wetland habitats. Impacts on the aesthetics and visual resources during construction efforts would be negligible in both the short and long term. Therefore, this resource topic was not carried forward for further analysis.

The following sections describe the resources in more detail.

A.1.1 Lower Perdido Islands Habitat Restoration – Phase 2

The Lower Perdido Islands Habitat Restoration project was included in the Alabama Trustee Implementation Group (AL TIG) RP II/EA. However, because the project was in the engineering and design phase, the associated impacts analyzed in that plan fell within the analysis provided in Section 6.4.14 of the Final PDARP/PEIS, and no further NEPA analysis was required at the time. This Draft RP IV/EA includes a complete NEPA analysis for the additional project activities (e.g., construction) now proposed in the Lower Perdido Island Habitat Restoration Phase II project.

A.1.1.1 Physical Environment: Geology and Substrates – Affected Environment

The Gulf of Mexico encompasses approximately 615,000 square miles of coastal and open ocean habitat, extending across five U.S. states (Texas, Louisiana, Mississippi, Alabama, and Florida), south to Mexico and east to Cuba. Moving seaward from the coastline, the northern Gulf of Mexico is characterized by broad geomorphological zones, including the coastal transition areas, the continental shelf, the continental slope, and the abyssal plain. The bays, estuaries, wetlands, and barrier islands make up the coastal transition zone. The nearshore benthic substrates generally consist of sand, silt, clay, hard bottom substrates, and vegetation (Lavoie et al., 2013). The predominant sediment grain size in nearshore areas is typically sand that becomes increasingly finer with increasing distance from the shore (Lavoie et al., 2013). Approximately 12,000 square miles (approximately 5 percent) of U.S. territorial waters in the Gulf of Mexico have hard-bottom substrate (Jenkins, 2011).

Sediments found in Perdido Bay range from coarse-grained sands to fine silts and clays. In the lower bay, near Perdido Pass, clayey silts and sands are most common, while in the middle bay, where there is less freshwater inflow, the sediment is mostly clayey silt. In the upper portion of the bay, where there is a strong freshwater influence, the sediment is composed of sands, silts, and clays. A large volume of this sand comes from the discharging rivers and creeks within the Perdido Watershed (Niedoroda, 2010). The deepest central locations of the bay are made up of fine particles leaving thick deposits of clayey silt sediments on the bed while the coarser grained sands are often deposited near the shorelines in shallow water. The presence of sand in the lower bay region can be attributed to Perdido Key and Perdido Pass.

A.1.1.2 Physical Environment: Geology and Substrates – Environmental Consequences

Material would be excavated from two nearby borrow areas and placed within subtidal and intertidal waters as well as upland areas to enhance, restore, and create coastal estuarine habitat within the Lower Perdido Bay system. The two borrow areas are located in Terry Cove (Borrow Area 1) and Bayou Saint John (Borrow Area 2) just north of Walker Island. Borrow Area 1 would be excavated to a depth of about -11 feet of the North American Vertical Datum of 1988 (NAVD88) and Borrow Area 2 would be excavated to a depth of about -15 feet NAVD88 with a 5-foot tolerance for each. Placement of sediment on the western and eastern end of Walker Island would affect substrates within the footprint of the project and at the borrow site. Long-term, minor, adverse impacts on geology and substrates would occur to the substrates within the borrow site and from the placement of dredged material in shallow water areas, which may affect sediment dynamics. Placement of materials, such as sediment or rip rap, would result in long-term but localized adverse impacts to the existing substrate. In addition, bottom substrates adjacent to the fill area would experience long-term benefits because of sediment placement and protection of the shoreline from erosion and wave action.

A.1.1.3 Physical Environment: Hydrology and Water Quality – Affected Environment

Perdido Bay is a relatively small, shallow estuarine embayment at the terminus of the Perdido River in the far western Florida Panhandle and Southeastern Alabama. The bay has a shallow shelf peripheral to deeper mid and lower bay regions (Livingston, 2007). Perdido Pass, which connects Perdido Bay to the Gulf of Mexico, contributes conditions of salinity stratification and hypoxia in deeper waters within the bay (Livingston, 2007). The Perdido River is the primary source of freshwater inflow into the bay with an annual average flow of 767 cubic foot per second (Northwest Florida Water Management District, 2017). Two sizable tributaries, the Styx and Blackwater rivers, enter the Perdido River downstream which contributes additional freshwater input into Perdido Bay. The many tributaries and creeks that discharge into Perdido Bay are commonly affected by nonpoint source (NPS) pollution, which then impacts Perdido Bay. NPS pollution is generated when stormwater runoff collects pollutants from across the landscape and carries them into receiving waters. Pollutants entering the water in this way vary and can include nutrients, pathogens, metals, pesticides, and other contaminants. Perdido Bay itself as well as the connecting freshwater sources such as lagoons and tributaries, are vulnerable to NPS pollution from different sources such as stormwater, erodible soils, pesticides from crops and wastewater. The Perdido Bay watershed has numerous wastewater facilities situated within the watershed that ultimately impact Perdido Bay. The most substantial pollutant source affecting Perdido Bay is International Paper’s pulp and paper mill in Cantonment (Northwest Florida Water Management District, 2017). The facility is responsible for discharge of up to 28 million gallons per day of untreated wastewater to Elevenmile Creek which then ultimately discharges into Perdido Bay (Northwest Florida Water Management District, 2017).

A.1.1.4 Physical Environment: Hydrology and Water Quality – Environmental Consequences

Construction activities such as dredging are expected to have short-term minor adverse impacts to water quality from expected increases in turbidity caused by disrupting and displacing benthic substrates. Increased turbidity from sediment placement would be minimal as the sediment is coarser material placed behind a retainment dike and would settle rapidly out of the water column. Restoring wetland habitats is expected to have long-term benefits to water quality by reducing erosion of this island.

A.1.1.5 Biological Resources: Habitats – Affected Environment

Wetlands

Wetlands include marshes (saltwater, brackish, and freshwater), mudflats, salt pannes, tidal flats, forested wetlands, pine savanna, riparian forests, mangroves, and swamps. Coastal wetlands provide millions of acres of habitat for aquatic and terrestrial organisms that are ecologically and economically important to the Gulf of Mexico coastal region. Both tidal and non-tidal wetland habitats provide a wide variety of ecosystem services and host a variety of species.

Perdido Bay is classified as an Estuarine and Marine Deepwater habitat as identified by the U.S. Fish and Wildlife Service (USFWS) National Wetland Inventory (NWI) with Walker Island as well as the other Lower Perdido Islands being classified as estuarine and marine wetlands. The grouping of islands within the project area are identified as being intertidal, emergent, persistent wetlands that consist of different wetland components, such as unconsolidated shores, scrub/shrub and broad-leaved evergreen habitat. Portions of the islands are also subtidal meaning the substrate in these habitats is continuously covered with tidal water. Wetlands in the emergent class are characterized by erect, rooted, herbaceous hydrophytes excluding mosses and lichens. This habitats subclass is classified as persistent which is dominated by species that normally remain standing at least until the beginning of the next growing season. Habitat classified as unconsolidated shore includes all wetland habitats having two characteristics: (1) unconsolidated substrates with less than 75 percent areal cover of stones, boulders, or bedrock and (2) less than 30 percent areal cover of vegetation. Landforms such as beaches, bars, and flats are included in the unconsolidated shore class. Scrub/shrub and broad-leaved evergreen habitat includes areas dominated by woody vegetation less than 6 meters tall and woody angiosperms (trees and shrubs) with relatively wide, flat leaves that generally remain green and are usually persistent for a year or more.

Essential Fish Habitats

An essential fish habitat (EFH) assessment was completed for this project in September of 2023. Managed species under the Gulf of Mexico Fisheries Management Council that may be present in the project area are presented in the table below.

Table A-1: Management Species Identified in the Project Area

Species/Management Unit	Life Stage(s) Found at Location	Management Council	Fishery Management Plan
Brown Shrimp (*Farfantepenaeus aztecus*)	Larvae/Post-larvae/Juvenile/Sub-adult	Gulf of Mexico	Shrimp
White Shrimp (*Litopenaaeus setiferus*)	Eggs/Larvae/Post-larvae/Juvenile/Sub-adult/Adult	Gulf of Mexico	Shrimp
Pink Shrimp (*Pandalus borealis*)	Larvae/Post-larvae/Juvenile/Sub-adult	Gulf of Mexico	Shrimp
Red Drum (*Sciaenops ocellatus*)	Larvae/Juveniles	Gulf of Mexico	Red Drum
Gray Snapper (*Lutjanus griseus*)	Adult	Gulf of Mexico	Reef Fish
Lane Snapper (*Lutjanus synagris*)	Larvae/Juveniles	Gulf of Mexico	Reef Fish
Spanish Mackerel (*Scomberomorini*)	Juvenile/Adult	Gulf of Mexico	Coastal Migratory Pelagic
Hammerhead Shark (*Sphyrnidae*)	None	Atlantic Highly Migratory	Highly Migratory
Scalloped Hammerhead Shark (*Sphyrna lewini*)	Juvenile/Adult	Atlantic Highly Migratory	Highly Migratory
Nurse Shark (*Ginglymostoma cirratum*)	Juvenile/Adult	Atlantic Highly Migratory	Highly Migratory
Blacktip Shark (*Carcharhinus limbatus*)	Neonate/YOY/Juvenile/Adult	Atlantic Highly Migratory	Highly Migratory
Bull Shark (*Carcharhinus leucas*)	Neonate/YOY/Juvenile/Adult	Atlantic Highly Migratory	Highly Migratory
Atlantic Sharpnose Shark (*Rhizoprionodon terraenovae*)	Neonate/YOY/Juvenile/Adult	Atlantic Highly Migratory	Highly Migratory
Spinner Shark (*Carcharhinus brevipinna*)	Neonate/YOY/Juvenile/Adult	Atlantic Highly Migratory	Highly Migratory

Source: Moffatt & Nichol, 2023

Beaches and Dunes

Beaches are defined as land covered by unconsolidated, sand-sized material with minimal vegetation, extending landward from the low-water line to dunes or a place where there is a distinct change in material or physical features. Dunes are wind-blown deposits of sand that form just behind the beach face and separate the higher energy beach from lower energy habitats, such as barrier flats, wetlands, and mudflats. Beaches, dunes, and swale wetlands are ecologically and recreationally important shoreline habitats. Beach and dune habitats are important breeding, nesting, wintering, resting, and foraging habitats for a variety of species. In addition, beaches provide habitat for a range of burrowing invertebrates and meiofauna (microscopically small benthic invertebrates).

Submerged Aquatic Vegetation

Submerged aquatic vegetation (SAV) describes plants that have adapted to living in aquatic environments. SAV includes seagrasses, oligohaline grasses, attached macroalgae, and drift algae. SAV provides habitat, food, and/or shelter for turtles, marine mammals, birds, fish, shellfish, invertebrates, and other aquatic species, and are among the most productive habitats in coastal areas. SAV species filter contaminants and sediments; improve water quality; regenerate and recycle nutrients; and produce, export, and accumulate organic matter.

Submerged habitats in the Lower Perdido Islands area consists primarily of sandy, soft bottom with SAV beds interspersed. The beds are dominated by shoal grass (*Halodule wrightii*) with some scattered patches of widgeon grass (*Ruppia maritima*).

Oysters

The eastern oyster (*Crassostrea virginica*) is the primary oyster species found across the northern Gulf of Mexico and is the major commercial species. Oysters are important organisms and providers of habitat, with an integral role in the function and structure of estuarine ecosystems. Oysters are an ecological keystone species in most estuaries in the northern Gulf of Mexico, and oyster populations contribute to the integrity and functionality of estuarine ecosystems (Eastern Oyster Biological Review Team, 2007). Self-sustaining oyster populations form reefs that are crucial components of estuaries. They improve water quality, recycle nutrients, and act as natural breakwaters, helping to prevent shoreline erosion and provide habitat for a large number of commercially and recreationally important fish species (Grabowski and Peterson, 2007; Coen et al., 2007; Eastern Oyster Biological Review Team, 2007; GSMFC, 2012; Peterson et al., 2003). The structural complexity of oyster reefs provides refuge, nursery areas, foraging grounds, and breeding grounds for fish (Grabowski et al., 2005; GSMFC, 2012) and foraging grounds for birds.

The National Shellfish Sanitation Program categorizes Perdido Bay as unclassified waters, thus shellfish harvesting is prohibited. For this reason, these zones have not been surveyed extensively. No known continuous oyster reefs have been located. However, oyster growth does occur readily on piers, pilings, bulkheads, boulders, and riprap, suggesting that oyster larvae enter the bays (DWH Trustees, 2017).

A.1.1.6 Biological Resources: Habitats – Environmental Consequences

Long-term project impacts are anticipated to be mainly beneficial; however, moderate, adverse, long-term impacts could occur due to the conversion of habitats. Activities that could potentially produce long-term adverse impacts would be permanently impacting estuarine water bottoms and estuarine water column during placement of dredged material and breakwater enhancement (20.2 acres) and permanently impact SAV during dredging and filling activities (0.97 acres). To address the impacts to SAV habitat, SAV transplantation would occur in accordance with the Compensatory Mitigation Plan for SAV (included in the EFH Assessment) to mitigate for the 0.97 acres of SAV impacts.

This project is anticipated to result in long-term benefits to EFH. Project activities could create short-term, minor, adverse impacts to EFH that could include turbidity impacts and benthic habitat disturbances due to dredging and filling activities. The habitat would return to baseline following construction activities. Specifically, activities expected to produce short-term adverse impacts include:

- Dredging borrow area (22 acres) composed of soft-bottom benthic habitat
- Placing riprap rock in soft-bottom benthic habitat
- Placing thin layers of dredged material on existing tidal marsh (4 acres)
- Placing dredged material in soft-bottom benthic habitat

Potential adverse impacts to managed species are anticipated to be limited to short term, minor, and localized, with the project also resulting in long-term benefits for managed species. Short-term, minor, direct adverse impacts could include displacement, injury, or mortality to managed species as a result of habitat disturbance stemming from noise, turbidity, and construction activities. The loss of estuarine soft-bottom habitat and SAV habitat would result in long-term moderate adverse impacts; however, the habitat created from the project would have higher primary, secondary, and tertiary productivity. The project, overall, would provide long-term beneficial impacts for the managed species.

A.1.1.7 Biological Resources: Wildlife – Affected Environment

<u>Marine Organisms</u>

With Perdido Bay being an estuarine system fed by freshwater from the Perdido River and saltwater from the Gulf of Mexico through the Perdido Pass, it hosts a diverse myriad of fish species. Perdido Bay is home to a variety of fish, including but not limited to redfish (*Sciaenops ocellatus*), speckled trout (*Cynoscion nebulosus*), sheepshead (*Archosargus probatocephalus*), red snapper (*Lutjanus campechanus*), flounder (*Pseudopleuronectes americanus*), bluefish (*Pomatomus saltatrix*), Spanish mackerel (*Scomberomorini*), and mangrove snapper (*Lutjanus griseus*). Additionally, the marine environment is home to different mollusks and crustaceans with the seagrass beds and calm, protected water surrounding the islands providing nursery areas for coastal finfish and shellfish such as the speckled trout, redfish, Atlantic croaker (*Micropogonias undulatus*), shrimp and blue crabs (*Callinectes sapidus*) (TNC, 2024).

<u>Birds and Terrestrial Species</u>

The Lower Perdido Islands host many different habitats, including marsh, sandy shoreline, forest, and seagrass beds. These unique habitats support a diverse array of wildlife, especially shorebirds, wading birds, and waterfowl. Common birds include tricolor herons (*Egretta tricolor*), reddish egrets (*Egretta rufescens*), little blue herons (*Egretta caerulea*), snowy egrets (*Egretta thula*), white ibis (*Eudocimus albus*), and brown pelicans (*Pelecanus occidentalis*). Great blue herons (*Ardea herodias*), great egrets (*Ardea alba*), clapper rails (*Rallus crepitans*), willets (*Tringa semipalmata*), and woodcock (*Scolopax*) also forage in the marsh (TNC, 2024). Migratory waterfowl and neotropical migrants also utilize the area seasonally. Common migratory birds that utilize the project area include American oystercatcher (*Haemattopus palliatus*), bald eagle (*Haliaeetus leucocephalus*), black scoter (*Melanitta americana*), black skimmer (*Rynchops niger*), brown-headed nuthatch (*Sitta pusilla*), chimney swift (*Chaetura pelagica*), chuck-will's-widow (*Antrostomus carolinensis*), common loon (*Gavia immer*), gull-billed tern (*Gelochelidon nilotica*), king rail (*Rallus elegans*), lesser yellowlegs (*Tringa flavipes*), magnificent frigatebird (*Fregata magnificens*), marbled godwit (*Limosa fedoa*), pectoral sandpiper (*Calidris melanotos*), prothonotary warbler (*Protonotaria citrea*), purple sandpiper (*Calidris maritima*), razorbill (*Alca torda*), red phalarope (*Phalaropus fulicarius*), red-breasted merganser (*Mergus serrator*), red-header woodpecker (*Melanerpes erythrocephalus*), ring-billed gull (*Larus delawarensis*), royal tern (*Thalasseus maximus*), ruddy turnstone (*Arenaria interpres*), short-billed dowitcher (*Limnodromus *griseus*), sooty shearwater (*Ardenna grisea*), sooty tern (*Onychoprion fuscatus*), south polar skua (*Stercorarius maccormicki*), southeastern American kestrel (*Falco sparverius paulus*), swallow-tailed kite (*Elanoides forficatus*), white-winged scoter (*Melanitta deglandi*), willet, Wilson's plover (*Anarhynchus wilsonia*), and wood thrush (*Hylocichla mustelina*).

Terrestrial wildlife species are present throughout the northern Gulf of Mexico coastal region. Snakes, including, but not limited to, the Eastern Cottonmouth (*Agkistrodon piscivorous*) and copperhead (*Agkistrodon contorix*), have been observed in Perdido Key. Beach mice are also found in Alabama. The Alabama beach mouse (*Peromyscus polionotus ammobates*) lives along the coast of Baldwin County, Alabama; and the Perdido Key beach mouse (*P. p. tryssyllepsis*) lives on Perdido Key in Baldwin County, Alabama. American alligators (*Alligator mississippiensis*) are found within the great river swamps, lakes, bayous, marshes, and other bodies of water along the northern Gulf of Mexico and Lower Atlantic Coastal Plains (Conant and Collins, 1991). This species of alligator is common in the Perdido River which drains into the Perdido Bay; however, alligators commonly prefer freshwater habitat over saltwater. American mink (*Mustela vison*) range throughout the Alabama coastal region. They prefer small streambanks, lakeshores, and marshes and favor forested wetlands with abundant cover such as shrub thickets, fallen trees, and rocks (DeGraaf and Yamasaki, 1986). Overall, the Lower Perdido Islands are undeveloped and contain a wide variety of habitats that contain suitable habitat for myriad terrestrial species.

A.1.1.8 Biological Resources: Wildlife – Environmental Consequences

Bird populations that use the small area of emergent habitat in the project area would experience temporary disruptions during construction activities, resulting in localized, short-term, minor, adverse impacts due to temporary displacement of bird species that use the project area for foraging and resting. When construction is complete, a variety of shorebirds and wading birds would begin using the site for nesting and foraging habitat, resulting in long-term beneficial impacts to bird species. Bird species that would potentially benefit from project implementation include tricolor herons, reddish egrets, little blue herons, snowy egrets, white ibis, brown pelicans, great blue herons, great egrets, clapper rails, willets, and woodcock.

Although marine organisms such as fish could be displaced during construction activities, causing short-term, minor, adverse impacts, implementation of this project would provide more vegetated intertidal habitats resulting in long-term beneficial impacts to marine organisms. Fish within the project area are highly mobile and would most likely avoid the area while construction is underway and would relocate to adjacent habitat that is similar in nature. The newly created vegetated intertidal habitats are likely to provide beneficial impacts to finfish and shellfish species, which are known to use intertidal vegetated habitats as nursery and foraging areas, as well as for protection from predation.

A.1.1.9 Biological Resources: Marine and Estuarine Resources – Affected Environment

<u>Marine and Estuarine Fauna</u>

Sections 3.6.2 through 3.6.3 of the PDARP/PEIS describe the Gulf of Mexico living aquatic resources, including resident and migratory fishes, mammals, crustaceans, mollusks, reptiles, and benthic invertebrates. This section provides additional information to expand on the PDARP/PEIS. Nekton that potentially could be found in this area include economically important marine species that use estuaries as nursery and foraging habitats, including brown shrimp (*Penaeus aztecus*) and white shrimp *(P. setiferus*), blue crab (*Callinectes sapidus*), red drum *(Sciaenops ocellatus*) and black drum (*Pogonias cromis*), spotted seatrout (*Cynoscion nebulosus*) and sand seatrout (*C. arenarius*), Gulf menhaden (*Brevoortia patronus*), bay anchovy (*Anchoa mitchilli*), and southern flounder (*Paralichthys lethostigma*). Additionally, many cartilaginous nekton, such as sharks and rays, also are common inhabitants of these shallow estuarine and nearshore habitats. Phytoplankton and zooplankton are common basic

components of the aquatic food web found throughout the estuarine and marine portions of the Gulf of Mexico. Benthic organisms are another important food source for birds, fish, marine mammals, and other animals. Mollusks (clams, mussels, oysters, snails), sponges, polychaetes (marine worms), and amphipods (small shrimp-like crustaceans) are examples of benthic organisms.

Nearshore Benthic Communities

Nearshore benthic communities in the northern Gulf of Mexico are largely composed of macroinvertebrate groups such as mollusks, crustacea, sponges, and polychaetes. These diverse groups are found in habitats spanning from the intertidal zone to the soft sediments on the continental shelf. There are two main components to benthic communities: the infauna and epifauna. The benthic infauna includes worms, mollusks, and crustaceans that live in bottom sediments. These species maintain sediment and water quality and provide a food source for bottom-feeding fish, shrimp, and birds. The benthic epifauna includes commercially important shellfish and finfish that live on the surface of bottom sediments.

Mollusks are soft-bodied animals that may have a hard external shell composed of calcium carbonate, a hard internal shell, or no shell at all. Mollusk species are found attached to rocks and shells, on seagrass blades, on plant stems and roots, burrowed into sediment and other substrates, and moving freely on the ocean floor and water column. Mollusk taxa include commercially important organisms such as clams, scallops, and squid, along with snails, slugs, whelks, and other cephalopods (squid, cuttlefish, and octopi). Mollusks are an important food source to many larger benthic and water column species. Two main subgroups of mollusks are gastropods and bivalves. The eastern oyster is the predominant commercial bivalve species in the Gulf of Mexico.

Crustacea is a class of diverse organisms that vary in many ways including size, mobility, feeding strategy, and habitat preference. There are over a dozen subgroups of crustaceans within the Gulf of Mexico (Felder and Camp, 2009). Smaller crustaceans, such as isopods, amphipods, and tanaids, are ecologically important and have large populations within the northern Gulf of Mexico. Larger crustaceans include commercially important species such as shrimps, crawfishes, lobsters, and crabs. Shrimp are widely distributed in Gulf of Mexico habitats, ranging from estuaries to open water habitat on the continental shelf. Shrimp are also associated with EFH for many other important aquatic species such as red drum, reef fish, coastal migratory species, stone crab (*Menippe mercenaria*), blue crab, and spiny lobster (*Panulirus argus*). Crabs are bottom dwellers in every type of habitat from the saltiest water of the Gulf of Mexico to the almost freshwater of the back bays and estuaries, from the low-tide line to waters 120 feet deep (Perry and McIlwain, 1986; TPWD, 2013). Blue crabs, which are one of the primary species of commercial importance in the Gulf of Mexico, use a wide variety of benthic habitats throughout their life history. Offshore, high-salinity waters are used by blue crabs during their early larval stages. Larvae then move into estuaries and use subtidal and intertidal mudflats, oyster bars, channel edges, tidal marshes, seagrass beds, and soft-sediment shorelines as they grow (NOAA, 2012).

Sponges and polychaetes contribute to benthic biomass and productivity. Sponges are found throughout the northern Gulf of Mexico on substrates that include reefs, mangrove roots, seaweed, and artificial structures (e.g., oil platforms). Polychaetes are present in nearly all marine environments and are common in the sandy and muddy substrates of the Gulf of Mexico; many species use the soft sediment to create burrows. These taxa include many species that are filter feeders. Filter feeders remove and digest phytoplankton and particulate organic matter, and deposit processed materials on the substrate (Turgeon et al., as cited in Felder and Camp, 2009).

A.1.1.10 Biological Resources: Marine and Estuarine Resources – Environmental Consequences

The act of dredging as well as the placement of dredged materials would result in localized long-term, moderate, adverse impacts to benthic communities in the project area. The two borrow areas being used to obtain project material could result in the mortality of benthic and burrowing organisms. Approximately 95,000 total plants are proposed to be planted after creation of the new coastal habitat. Construction activities would increase turbidity resulting in localized short-term minor adverse impacts to aquatic organisms adjacent to the project area. Mobile organisms like finfish, some shellfish, marine mammals, and sea turtles would likely avoid the project area during construction activities. When construction is complete, turbidity would return to ambient levels, and nekton and shellfish abundance in the project vicinity would return to pre-construction conditions. After construction, newly created marsh areas would provide beneficial impacts to finfish and shellfish species, which are known to use intertidal vegetated habitats as nursery and foraging areas, as well as for protection from predation.

The presence of project-related vessels and equipment could temporarily disturb habitats and wildlife species that use or transit through the construction areas. Boat operators associated with the project components would follow the National Oceanic and Atmospheric Administration (NOAA) National Marine Fisheries Service (NMFS) Southeast Region's Vessel Strike Avoidance Measures and Reporting for Mariners, which also would minimize potential harm to nekton species in the construction areas, including marine mammals and sea turtles. The combination of the mobility of nekton species, the implementation of best management practices (BMPs), and the short duration of construction activities suggest that the alternatives would have only short-term, minor adverse effects to aquatic wildlife.

A.1.1.11 Biological Resources: Rare and Protected Species – Affected Environment

As identified by the NOAA Endangered Species Act (ESA) Section 7 Mapper, the following species are listed as occurring within the project area: green sea turtle, hawksbill sea turtle, Kemp's ridley sea turtle, loggerhead sea turtle, leatherback sea turtle, giant manta ray, and gulf sturgeon. As identified by the USFWS Information for Planning and Consulting (IPaC) system, the species identified in table A-2 may also occur within the county. There are additionally two critical habitats situated near the project area: the loggerhead sea turtle critical habitat (LOGG-N-33) and the green sea turtle critical habitat (FL01).

Table A-2: Endangered Species Act–Listed Species in Mobile County and Baldwin County, Alabama

ESA-Listed Species	Federal Status
Alabama red-bellied turtle	Endangered
Alabama beach mouse	Endangered
Alabama sturgeon	Endangered
Alligator snapping turtle	Proposed Threatened
Black pinesnake	Threatened
Dusky gopher frog	Endangered
Eastern black rail	Threatened
Eastern indigo snake	Threatened
Gopher tortoise	Threatened
Green sea turtle	Threatened
Gulf sturgeon	Threatened
Hawksbill sea turtle	Endangered
Kemp's ridley sea turtle	Endangered
Leatherback sea turtle	Endangered

ESA-Listed Species	Federal Status
Loggerhead sea turtle	Threatened
Monarch butterfly	Candidate
Northern Long-Eared Bat	Threatened
Piping plover	Threatened
Perdido Key beach mouse	Endangered
Red knot	Threatened
Tricolored bat	Proposed Endangered
West Indian Manatee	Threatened

Source: USFWS, 2024b

A.1.1.12 Biological Resources: Rare and Protected Species – Environmental Consequences

Protected bird species that potentially use the site are the red knot (*Calidris canutus*) and piping plover (*Charadrius melodus*). These species may experience temporary disruptions during construction, leading to short-term, minor, adverse impacts. Likewise, sea turtles and marine mammals in the vicinity of the construction site could experience short-term, minor disruption during construction activities. When construction is complete, the component would provide long-term beneficial impacts to protected species that use the restored island site for roosting, loafing, nesting, and foraging. The project activities taking place on the Lower Perdido Islands could have minor adverse impacts to the following species: green sea turtle (*Chelonia mydas*), hawksbill sea turtle (*Eretmochelys imbricata*), Kemp's ridley sea turtle (*Lepidochelys kempii*), loggerhead sea turtle (*Caretta caretta*), leatherback sea turtle (*Dermochelys coriacea*), giant manta ray (*Manta birostris*), gulf sturgeon (*Acipenser oxyrinchus desotoi*), West Indian manatee (*Trichechus manatus*), piping plover, and red knot.

Project activities are anticipated to have no impact on the following species listed within the project area: northern long-eared bat (*Myotis septentrionalis*), tricolored bat (*Pipistrellus suflavus*), Alabama or Perdido Key beach mice, alligator snapping turtle (*Macrochelys temminckii*), and eastern indigo snake (*Drymarchon couperi*), because these animals, while known to be present in Baldwin County, are not found on the island.

The identified designated loggerhead critical habitat (LOGG-N-33) is characterized as a nearshore reproductive habitat that lines the gulf shores of both Florida and Alabama. Any construction activities taking place on the Lower Perdido Islands would not have a direct impact to a designated critical habitat. There would be no adverse modifications occurring to an identified loggerhead critical habitat. Any adverse impacts the loggerhead critical habitat could experience due to construction activities, such as increase in turbidity, would be deemed negligible because the habitat is not situated in proximity to the project area.

The designated green sea turtle critical habitat (FL01) as identified by the NOAA Section 7 Mapper would not be adversely affected by this project as this proposed critical habitat only included nearshore water up to 20 meters deep around Florida. The Lower Perdido Islands project area is of great enough proximity from the identified critical habitat that adverse impacts are not expected.

A.1.1.13 Biological Resources: Federally Managed Fisheries – Affected Environment

Essential fish habitat, also known as EFH, includes all types of aquatic habitats – wetlands, coral reefs, seagrasses, rivers – where fish spawn, breed, feed, or grow to maturity. In 1996, congress established the Magnuson-Stevens Fishery Conservation and Management Act which highlights the importance of healthy habitat for commercial and recreational fisheries. Essential fish habitat covers federally managed fish as well as invertebrates. NOAA Fisheries works with the regional fishery management councils to identify the essential habitat for every life stage of each federally managed species using the best available scientific information. Essential fish habitat has been described for approximately 1,000 managed species (NOAA, 2014).

Pursuant to the Magnuson-Stevens Fishery Conservation and Management Act and the 1996 amendments to the Act known as the Sustainable Fisheries Act, an EFH consultation was completed for this project. This required EFH be identified for all fish species managed by the Gulf of Mexico Fisheries Management Council. Managed species under the Gulf of Mexico Fisheries Management Council that may be present in the project area are presented in Table A-1.

A.1.1.14 Biological Resources: Federally Managed Fisheries – Environmental Consequences

The environmental consequences EFH and federally managed species would experience is described above in Section A.1.1.6.

A.1.1.15 Socioeconomic Resources: Cultural Resources – Affected Environment

Cultural resources are evidence of past human activity and can include pioneer homes, buildings, old roads, structures with unique architecture, prehistoric village sites, historic or prehistoric artifacts or objects, rock inscription, human burial sites, battlefield entrenchments, prehistoric canals, or mounds. The Alabama Gulf Coast is one of the most historically significant regions in the southeastern United States, with culturally significant resources throughout the area. The region was popular with prehistoric Native Americans for fishing and food gathering long before the first European explorers arrived on the coast (Cox, 2012). Although many have been discovered and protected, numerous forgotten, undiscovered, or unprotected cultural resources exist in rural America (USDA-NRCS, n.d.).

A.1.1.16 Socioeconomic Resources: Cultural Resources – Environmental Consequences

Compliance with Section 106 of the National Historic Preservation Act (NHPA) would be completed prior to implementation of any project activities with the potential to disturb cultural resources. During project design, the Implementing Trustees would identify measures to avoid, minimize, or mitigate any adverse impacts on cultural or historic resources located within the project area in consultation with the relevant State and Tribal Historic Preservation Offices. Therefore, no adverse impacts are anticipated.

A.1.1.17 Socioeconomic Resources: Tourism and Recreation – Affected Environment

Numerous tourism and recreational opportunities are available for visitors to enjoy the natural resources present in the area of the project in Perdido Bay. The main attraction of the Gulf Coast of Alabama is the beach, which, among other forms of passive and active recreation, provides tourists and recreational visitors with opportunities for sightseeing and bird watching. In particular, the project area contains habitat for the diverse array of birds, including seabirds, shorebirds, and raptors—that are found across the Alabama coastline.

A.1.1.18 Socioeconomic Resources: Tourism and Recreation – Environmental Consequences

This project could potentially cause short-term, minor, adverse impacts on tourism and recreation during construction by limiting recreational activities near the action area to protect public safety. This project could also adversely affect aesthetics because of the presence of construction equipment. However, restoring habitat may provide long-term benefits to recreationists because of the increased opportunities for wildlife viewing and fishing opportunities as a result of coastal habitat restoration that benefits fish.

A.1.2 Walker Island Expansion

The Walker Island Expansion project was previously analyzed in the Regionwide Trustee Implementation Group (RWTIG) RP I/EA. The following analysis is an incorporation of the previous analysis with an updated design. The affected environments as well as the environmental consequences for this project are largely the same as described above for the Lower Perdido Habitat Restoration project. Affected environments and environmental consequences that are similar would be incorporated by reference. Areas of the project that differ are explained. The original project analysis can be found in Section 4.3.2.2.4 of the RWTIG RP I/EA.

A.1.2.1 Physical Environment: Geology and Substrates – Affected Environment

The affected environment with regards to geology and substrates would be the same as described above in Section A.1.1.1.

A.1.2.2 Physical Environment: Geology and Substrates – Environmental Consequences

The creation of an island northeast of Walker Island would affect substrates within the footprint of the project. The placement of sediment/rock riprap would have long-term moderate adverse impacts on geology and substrates directly under the placement area. Activities that could potentially produce long-term adverse impacts would be dredging and permanently impacting estuarine water bottoms and estuarine water column during placement of dredged material. Because the adverse impacts are expected to be localized the overall impacts to geology and substrates would likely be minor and short-term. In addition, the transport of material could potentially serve as a sediment source for Walker Island and support its longevity, resulting in long-term beneficial impacts. However, if the sediment source were harvested for the project, rather than being a beneficial use placement, there would be long-term, minor-to-moderate impacts at the borrow site.

A.1.2.3 Physical Environment: Hydrology and Water Quality – Affected Environment

The affected environment with regards to hydrology and water quality would be the same as described above in Section A.1.1.3.

A.1.2.4 Physical Environment: Hydrology and Water Quality – Environmental Consequences

The construction activities for the creation of the new island would be expected to have short-term, minor, adverse impacts to water quality from expected increases in turbidity. Increased turbidity from rock riprap placement would be minimal as the rock is a coarse material. Suspended sediment is expected to settle quickly. No long-term adverse impacts are expected to occur to hydrology and water quality but rather long-term beneficial impacts from reducing erosion to the shoreline.

A.1.2.5 Biological Resources: Habitats – Affected Environment

The manner in which habitats are affected by this project would be similar to that described above in Section A.1.1.5.

A.1.2.6 Biological Resources: Habitats – Environmental Consequences

The environmental consequences to habitats for this project are similar to that described above in Section A.1.1.6.

A.1.2.7 Biological Resources: Wildlife – Affected Environment

The affected environment for this project is similar to that described in Section A.1.1.7.

A.1.2.8 Biological Resources: Wildlife – Environmental Consequences

The environmental consequences to wildlife for this project are similar to that described above in Section A.1.1.8.

A.1.2.9 Biological Resources: Marine and Estuarine Resources – Affected Environment

The manner in which marine and estuarine resources would be affected by this project would be similar to that described in Section A.1.1.9.

A.1.2.10 Biological Resources: Marine and Estuarine Resources – Environmental Consequences

The marine and estuarine resources environmental consequences for this project is similar to that described above in Section A.1.1.10.

A.1.2.11 Biological Resources: Rare and Protected Species – Affected Environment

The affected environment for this project is similar to that of the project described above in Section A.1.1.11.

A.1.2.12 Biological Resources: Rare and Protected Species – Environmental Consequences

The environmental consequences for this project are similar to that described in Section A.1.1.12. The presence of a rock revetment would impede human use of the island and further preserve the habitat that could potentially be utilized by endangered and protected species.

A.1.2.13 Biological Resources: Federally Managed Fisheries – Affected Environment

The affected environment for this project is similar to that described above in Section A.1.1.13.

A.1.2.14 Biological Resources: Federally Managed Fisheries – Environmental Consequences

The environmental consequences that EFH and federally managed species would experience is described above in Section A.1.1.6.

A.1.2.15 Socioeconomic Resources: Cultural Resources – Affected Environment

The affected environment for this project is similar to that described above in Section A.1.1.13.

A.1.2.16 Socioeconomic Resources: Cultural Resources – Environmental Consequences

The environmental consequences to cultural resources for this project would be similar to that described in Section A.1.1.14.

A.1.2.17 Socioeconomic Resources: Tourism and Recreation – Affected Environment

The manner in which tourism and recreation would be affected by this project is similar to that described in Section A.1.1.15 above.

A.1.2.18 Socioeconomic Resources: Tourism and Recreation – Environmental Consequences

The environmental consequences tourism and recreation would experience is similar to that described in Section A.1.1.16 above.

A.1.3 No Action Alternative – Wetlands, Coastal, and Nearshore Habitats

A.1.3.1 Physical Environment: Hydrology and Water Quality – Environmental Consequences

Some restoration activities described in this RP IV/EA have the potential to have short- and long-term, minor, adverse impacts to physical resources. Under the No Action Alternative, the preferred restoration actions designed to benefit wetland coastal nearshore habitats would not be implemented. Any minor adverse impacts to physical resources would not occur. In addition, expected long-term beneficial impacts to physical resources would not occur, and long-term minor-to-moderate adverse impacts would be expected from the continued degradation of project areas, including the potential loss of Walker Island as it erodes. Additionally, indirect impacts would include missed opportunities to build knowledge that data collection and management activities would provide.

A.1.3.2 Biological Resources: Habitats – Environmental Consequences

Some restoration activities described in this RP IV/EA have the potential to have short- and long-term minor adverse impacts to habitats. Under the No Action Alternative, the preferred restoration actions designed to benefit wetland coastal nearshore habitats would not be implemented. Any minor adverse impacts to habitats would not occur. In addition, expected long-term beneficial impacts to habitats would not occur, and long-term minor-to-moderate adverse impacts would be expected from the continued degradation of project areas. Additionally, indirect impacts would include missed opportunities to build knowledge that data collection and management activities would provide.

A.1.3.3 Biological Resources: Wildlife – Environmental Consequences

Some restoration activities described in this RP IV/EA have the potential to have short- and long-term minor adverse impacts to wildlife. Under the No Action Alternative, the preferred restoration actions designed to benefit wetland coastal nearshore habitats would not be implemented. Any minor adverse impacts to physical resources would not occur. In addition, expected long-term beneficial impacts to physical resources would not occur, and long-term minor-to-moderate adverse impacts would be expected from the continued degradation of project areas. Additionally, indirect impacts would include missed opportunities to build knowledge that data collection and management activities would provide.

A.1.3.4 Biological Resources: Marine and Estuarine Resources – Environmental Consequences

Under the No Action Alternative, restoration activities that had the potential to have short- and long-term minor adverse effects to marine and estuarine resources would not occur. Additionally, under the No Action Alternative, marine and estuarine resources would not experience the lasting benefits of habitat restoration as well as the restoration of ecological diversity.

A.1.3.5 Biological Resources: Rare and Protected Species – Environmental Consequences

Under the No Action Alternative, projects related to the conservation of WCNH would not occur. The parcels considered for restoration under both action alternatives would remain undeveloped and could potentially be disturbed by a variety of human activities. If the properties remain undeveloped, there would be no short- or long-term adverse impacts to any state-protected, ESA-listed, or protected marine mammals, and their habitat would remain mostly unaltered.

A.1.3.6 Socioeconomic Resources: Cultural Resources – Environmental Consequences

Under the No Action Alternative, projects related to the goal of restoring WCNH would not occur. The undeveloped natural area in which project activities would occur has no identified cultural resources.

A.2 NUTRIENT REDUCTION

Prior to implementation of the Nutrient Reduction alternatives identified in this RP IV/EA, the Implementing Trustee would confirm that the impacts expected from a planned site-specific action would not exceed adverse impacts described in this RP IV/EA by completing an Environmental Evaluation Worksheet. Examples of the Environmental Evaluation Worksheets used to document the review are attached as Appendix C. If the Environmental Evaluation Worksheet indicates effects are likely to exceed the maximum adverse impacts described in this RP IV/EA, the AL TIG would undertake additional site-specific environmental review consistent with NEPA requirements and other requirements for protection of the environment, or would alter the planned site-specific action so that impacts would not exceed the maximum adverse impacts described in this RP IV/EA.

After preliminary investigation, some resource areas under the Nutrient Reduction Restoration Type alternatives were determined to be either unaffected or minimally affected by the restoration actions being proposed for this Restoration Type. Accordingly, these resources are discussed briefly below. Only those resource areas for which potential adverse impacts are expected are discussed in detail in this

Draft RP IV/EA. Additionally, the NEPA analysis for the Nutrient Reduction alternatives looks at a further subset of the total resource areas and topics as part of the biological, physical, and socioeconomic environment for each restoration alternative. To avoid redundant or unnecessary information, resource areas and topics that are not expected to be affected by a proposed restoration alternative are not evaluated further under a given project.

In addition to those listed in Section 4.1, the resource areas below were not analyzed in detail for the Nutrient Reduction Restoration Type:

- **Geology and Substrates:** No impacts associated with geologic hazards are expected for the proposed Nutrient Reduction projects and any local impacts on geology are expected to be short term and minor. Therefore, this resource was not carried forward for further analysis.
- **Marine and Estuarine Fauna:** All proposed Nutrient Reduction projects would result in long-term, beneficial impacts on marine and estuarine species due to the improved water quality associated with the reduction in nutrient loads, reduced erosion, and reduced sedimentation in upstream portions of the watersheds. No short-term or long-term adverse impacts on marine and estuarine fauna would occur. Therefore, this resource topic was not carried forward for further analysis.
- **Federally Managed Fisheries:** Proposed projects related to Nutrient Reduction would not result in destruction or adverse modification to fishery management plan (FMP) species or EFH. Rather, because of improved water quality associated with reduced land-based pollution, there would be only beneficial effects on downstream EFH for red drum, coastal migratory pelagics, shrimp, gulf stone crab, and juvenile reef fish that may use estuaries for nursery habitat. Therefore, this resource area was not carried forward for detailed analysis.
- **Tourism and Recreation:** The proposed projects under the Nutrient Reduction (Nonpoint Source) Restoration Type would be carried out by the voluntary application of practices by landowners on private land. Private land is not subject to tourism and recreational benefits associated with the implementation of conservation practices. Therefore, this resource was not carried forward for further analysis.
- **Aesthetics and Visual Resources:** Conservation practices would be implemented on cropland, associated agricultural lands, pasture/grasslands, and forestland for projects proposed under the Nutrient Reduction Restoration Type. Said practices would have no impact on aesthetics and visual resources. Therefore, this resource was not carried forward for further analysis.

A.2.1 Puppy Creek – Juniper Creek-Big Creek Nutrient Reduction

A.2.1.1 Physical Environment: Hydrology, Water Quality, Floodplains, and Wetlands – Affected Environment

Hydrology

This project is focused within Puppy Creek and Juniper Creek-Big Creek watershed. Puppy Creek is a low-gradient stream located in the Southern Pine Plains and Hills ecoregion. The stream drains approximately 42 square miles to its source in the Escatawpa River. Benthic substrate consists primarily of sand with some organic matter. Overall habitat quality was categorized as sub-optimal for supporting diverse aquatic macroinvertebrate and fish communities. Juniper Creek in Mobile County near Fairview, Alabama lies within the Upper Big Creek Subwatershed of the Escatawpa River Basin.

Water Quality

Puppy Creek was originally listed on the ADEM 303(d) list in 1998, 2000, 2002, and 2004 for nutrients and pathogens. In 2002, ADEM completed a total maximum daily load (TMDL) that addressed pathogens impairment within Puppy Creek, and that TMDL was approved by the USEPA in 2005. Puppy Creek remains on the 2006 303(d) list for nutrients. The site was also incorporated into ADEM's 2015 assessment for the Escatawpa, Mobile, Perdido, and Tombigbee River Basins. Puppy Creek met USFWS use classification criteria for temperature, turbidity, and dissolved oxygen. Five of the nine pH measurements were below the 6.0 standard unit criteria for USFWS. However, a slightly acidic pH is not unusual in this stream type. Median nitrogen concentrations were higher than the expected values based on the 90th percentile of data collected at reference reaches within the Southern Pine Plains and Hills ecoregion (ADEM, 2024)

Juniper Creek was put on the State of Alabama's § 303(d) use impairment list in 1996 for pH. However, pH was removed from the 1998 303(d) list based on the low pH values being due to natural conditions caused by acid clay soils and tannic acid from decaying vegetation, which are typical of coastal blackwater streams. Juniper Creek has been on the State of Alabama's § 303(d) use impairment list since 1998 for Pathogens (Fecal Coliform), which is what this TMDL report addresses (ADEM, 2024).

Floodplains

The floodplain associated with the three creeks in both watersheds are designated as Flood Hazard Zone AE, which is a 100-year regulatory floodway. North of Puppy Creek is classified as Flood Hazard Zone X, which is designated as area of minimal flood hazard. North of Big Creek and Juniper Creek is designated as Flood Hazard Zone A, which is classified as having 1 percent annual risk of a major flood. Both watersheds also contain Flood Hazard Zone X with 0.2 Percent Annual Chance Flood Hazard (FEMA, 2024).

Wetlands

Both watersheds primarily consist of freshwater forested/shrub wetlands with freshwater emergent wetlands intermixed. The Juniper Creek-Big Creek watershed discharges into what is classified as a 3,224-acre lake habitat (USFWS, 2024a).

A.2.1.2 Physical Environment: Hydrology, Water Quality, Floodplains, and Wetland – Environmental Consequences

The Puppy Creek - Juniper Creek-Big Creek Nutrient Reduction project aims to enhance water quality in both watersheds by helping landowners develop and implement conservation plans that limit nonpoint source pollution. Implementing conservation measures may include installing erosion and sediment control structures on cropland. The installation of these structures would not involve any soil compacting activities and would not result in any adverse, short-term impacts on hydrology, but may result in minor adverse impacts on water quality and wetlands from ground-disturbing activities that could temporarily increase turbidity levels in nearby waters and temporarily disrupt the ecology of the wetland. This disruption is expected to cease shortly after the construction period. Floodplains would not incur any adverse, short-term impacts from the implementation of this project.

This project would decrease nutrient and sediment runoff and improve the hydrology of the watershed by restoring it to a more natural hydrologic cycle. It would also enhance water quality in both watersheds by helping landowners develop and implement conservation plans that reduce nonpoint source pollution. This would have a long-term, beneficial impact on the hydrology and water quality in both watersheds. The drainage area for the watershed, Pascagoula Bay and the Mississippi Sound, would experience long-term beneficial impacts on water quality as well. The decrease in runoff that would occur from this project would reduce flood hazard within the watershed, resulting in long-term beneficial impacts on floodplains. The reduction in nonpoint source pollutants would enhance wetland health by decreasing the amount of nutrient and sediment inputs resulting in long-term beneficial impacts on wetlands within the watershed.

Impacts on these resources are further discussed below, except for floodplains, as the proposed alternative would not result in a detectable change to natural and beneficial floodplain values. Stream crossings and grade stabilization installed in streams would be designed so as not to cause an appreciable rise in floodwaters.

A.2.1.3 Biological Resources: Habitats – Affected Environment

Inland ecosystems of the Alabama Gulf Coast occur within the Gulf Coast Flatwoods as well as in the Southern Pine Plain and Hills Ecoregion. Puppy Creek itself is classified as a low-gradient stream located in the Southern Pine Plains and Hills ecoregion. Juniper Creek-Big Creek is also a low-gradient stream situated near Fairview. Juniper Creek lies within the Upper Big Creek Subwatershed of the Escatawpa River Basin. Both the Puppy Creek watershed and Juniper Creek-Big Creek watershed are largely composed of forests and agricultural croplands, with a small percentage of land being wetlands. The Puppy Creek watershed is 59 percent forest, 16 percent shrub/scrub, 11 percent pasture/hay, 3 percent cultivated crops, 3 percent woody wetlands, 5 percent developed, and 1 percent open water (ADEM, 2006). The Juniper Creek-Big Creek watershed is 66.4 percent forest, 18.4 percent pasture, 11.4 percent cropland, 3.5 percent transitional, and 0.1 percent low residential (ADEM, 2004). The southern pine plains and hills ecoregion mainly consists of oak-hickory-pine forest with longleaf pine dominating a majority of coverage. Other habitats pocketed amidst the longleaf pine include floodplain forest, upland forest and wetlands.

Floodplain Forest

Floodplain forests occur only along certain river and stream drainages within the Gulf Coast region. Vegetation along theses larger waterways is generally dominated by bottomland hardwood species and other trees tolerant of flooding. Typical trees of these forests include bald cypress (*Taxodium distichum*), water tupelo (*Nyssa aquatica*), swamp tupelo (*Nyssa biflora*), green ash (*Fraxinus pennsylvanica*), sweetgum *(Liquidambar styraciflua*), sweetbay (*Magnolia virginiana*), Atlantic white cedar (*Chamaecyparis thyoides*), and several oaks (*Quercus* spp.). Common shrubs are buckwheat tree (*Cliftonia monophylla*) and swamp cyrilla (*Cyrilla racemiflora*).

Upland Forest

Much of the upland forested habitat in this region has been converted to pine plantations. Where natural forest remains, longleaf pine (*Pinus palustris*), shortleaf pine (*Pinus echinata*), and loblolly pine (*Pinus taeda*) pines dominate most uplands, with slash pine (*Pinus elliottii*) in the lower areas with scattered areas of the hardwood species mentioned above.

Isolated Wetlands

Isolated wetlands are typically depressional areas embedded within upland habitats, such as some palustrine-forested wetlands, herbaceous bogs, or temporary ponds and marshes. Such wetlands host a significant portion of the biodiversity of the region. These wetlands are dominated primarily by plants that are adapted to living in saturated soils, but not in frequently inundated soils. Low wetlands include palustrine-forested wetlands, palustrine scrub-shrub wetlands, and palustrine-emergent wetlands. Palustrine-forested wetlands are often dominated by pines, oaks, and water tupelo (*Nyssa aquatic*), while palustrine scrub-shrub wetlands are often dominated by black willow (*Salix nigra*), elderberry (*Sumbucus canadensis*), saw palmetto (*Serenoa repens*), and sweet bay (*Magnolia virginiana*). Palustrine-emergent wetlands are dominated by a number of herbaceous species, including cardinal flower (*Lobelia cardinalis*), cinnamon fern (*Osmunda cinnamomea*), chain fern (*Woodwardia fimbriata*), and royal fern (*Osmunda regalis*) (ADEM, 2015).

A.2.1.4 Biological Resources: Habitats – Environmental Consequences

Project activities would take place upland in several different water bodies such as lakes, ponds, rivers, and creeks as well as along streambank and shorelines. Grading may result in the loss of individual plants and habitat within the streambank and shoreline habitats; however, these short-term, minor adverse impacts would be limited to localized areas, and similar habitat is available outside of the disturbance area. The proposed conservation practices would reduce nutrient and sediment losses from the landscape, reduce nutrient and sediment loads to streams and downstream receiving waters, and reduce water quality degradation in watersheds that could ultimately provide long-term, beneficial impacts to coastal watersheds and marine resources such as EFH.

A.2.1.5 Biological Resources: Wildlife – Affected Environment

Mammals

Potential species present include red (*Vulpes vulpes*) and gray fox (*Urocyon cinereoargenteus*), chipmunks, coyotes, bats, long-tailed weasel (*Mustela frenata*), white-tailed deer (*Odocoileus virginianus*), mice, voles, striped skunk (*Mephitis mephitis*), eastern woodrat (*Neotoma floridana*), bobcat (*Lynx rufus*), and nutria (*Myocastor coypus*).

Reptiles

Common snakes that could occur within the watershed include Gulf saltmarsh snake (*Nerodia clarkii*), ring-necked snake (*Diadophis punctatus*), glossy crayfish snake (*Regina rigida rigida*), rough greensnake (*Opheodrys aestivus*), eastern ribbonsnake (*Thamnophis saurita*), eastern water snake (*Nerodia sipedon*), Mississippi green water snake (*Nerodia cyclopion*), and cottonmouth (*Agkistrodon piscivorus*). American alligator likely occurs within larger waterbodies in the Bayou La Batre watershed. Turtles that may be present include eastern diamondback terrapin (*Malaclemys terrapin*), common snapping turtle (*Chelydra serpentina*), eastern mud turtle (*Kinosternon subrubrum*), common box turtle (*Terrapene carolina*), and southern painted turtle (*Chrysemys picta dorsalis*).

Amphibians

Numerous amphibians could occur within the watershed, including green tree frog (*Ranoidea caerulea*), squirrel tree frog (*Dryophytes squirellus*), northern cricket frog (*Acris crepitans*), greenhouse frog (*Eleutherodactylus planirostris*), southern leopard frog (*Lithobates sphenocephalus*), southern toad (*Anaxyrus terrestris*), Fowler's toad (*Anaxyrus fowleri*), and eastern spadefoot (*Leptobrachium*). Several salamander species could also occur within the project area, although data on their presence and distribution are not available.

Birds

Common passerines include gray catbird (*Drumetella carolinensis*), black-and-white warbler (*Mniotilta varia*), yellow-rumped warbler (*Setophaga coronata*), red-winged blackbird (*Agelaius phoeniceus*), purple martin (*Progne subis*), American robin (*Turdus migratorius*), blue jay (*Cyanocitta cristata*), pine warbler (*Setophaga pinus*), swamp sparrow (*Melospiza georgiana*), belted kingfisher (*Megaceryle alcyon*), barn swallow (*Hirundo rustica*), cedar waxwing (*Bombycilla cedrorum*), northern mockingbird (*Mimus polyglottos*), and Carolina wren (*Thryothorus ludovicianus*). Numerous less-common passerines use the property, especially during spring and fall migration. Common shorebirds within the Bayou La Batre watershed include laughing gull (*Leucophaeus atricilla*), sanderling (*Calidris alba*), sandwich tern (*Thalasseus sandvicensis*), ring-billed gull (*Larus delawarensis*), royal tern, common tern, willet, Forster's tern (*Sterna forsteri*). Wading birds frequenting the project area include cattle egret (*Bubulcus*), great blue heron, white ibis, and great egret and snowy egret. Waterfowl in the project area include blue-winged teal (*Spatula discors*), red-breasted merganser, and common loon. Raptors often observed from the property are osprey (*Pandion haliaetus*), bald eagle, red-tailed hawk (*Buteo jamaicensis*), and black vulture (*Coragyps atratus*). Other common seabirds would include brown pelican, northern gannet (*Morus bassanus*), and double-crested cormorant (*Phalacrocorax auritus*).

A.2.1.6 Biological Resources: Wildlife – Environmental Consequences

In general, the proposed watershed-scale nutrient reduction project would result in adverse, short-term, minor impacts on wildlife as a result of altered land management practices on primarily agricultural land uses, which include increased planting of cover crops to decrease erosion and planting field borders. Adverse impacts on wildlife would include the temporary displacement and or disturbance to the species in proximity to the implemented land management practices. Construction activities would likely result in mortality of small animals and burrowing invertebrates. However, the altered land management practices would likely benefit wildlife because of reduced crop tillage, increased soil moisture storage, reduced fertilizer application, and reduced heavy equipment usage, all of which have demonstrated adverse impacts on wildlife. These changes to current land management would not have long-term, adverse impacts on any wildlife species because there would be no destruction or other changes to the configuration of wildlife habitat. The project would result in long-term, beneficial impacts on wildlife in the Puppy Creek – Juniper Creek-Big Creek watershed, especially for amphibians that are most sensitive to water quality. Reducing nutrient and sediment loads to the system would enhance habitat values for all species, and the project would indirectly benefit all downstream species through the improvement of water quality. Impacts related to the specific conservation practices in consideration for this project include the following:

Grade Stabilization Structure (410). There would be short-term, minor-to-moderate, adverse impacts from soil excavation and grading to construct or install grade stabilization structures, including berms, riprap, and hard structures, which could result in temporary short-term adverse impacts on wildlife that use these areas, but these species would be able to reoccupy the area after construction. Most of these structures would be installed in agricultural fields, although some could be installed in drainageways or tributaries that tend to have minimal wildlife. There would be long-term beneficial impacts on wildlife from prevention of gully formation, reduction of erosion and sedimentation, and drainageway stabilization that would contribute to improved habitats for wildlife. Areas would be replanted or seeded to prevent erosion after bank regrading. Erosion control plans would be implemented during and after construction.

Grassed Waterway (412). There would be short-term, minor-to-moderate, adverse impacts from shaping or grading a channel and grading to form or install a stable outlet, which could result in temporary short-term, adverse impacts on wildlife that use these areas, but these species would be able to reoccupy the area after construction. The area would be replanted, where possible with vegetation that would serve to reduce erosion and provide benefit to wildlife. There would be a long-term benefit from controlling and managing flow to prevent soil erosion, which could also increase soil infiltration and soil biological activity. The trapping of sediments in the waterways would improve habitat for wildlife. The grassed waterway practices would be implemented primarily on cropland.

Heavy Use Area Protection (561). This practice would be applied to stabilize a ground surface that is frequently and intensively used by people, animals, or vehicles. There would be short-term minor-to-moderate adverse impacts from grading, reshaping, and planting areas in and around the disturbed area, which could result in temporary or short-term, adverse impacts on wildlife that use these areas, but these species would be able to reoccupy the area after construction. Impacts would also be long term and beneficial because stabilization would reduce the off-site effects from sediment, nutrients, and organic material and improve habitats for wildlife. Areas would be replanted with native vegetation and or seeded to prevent erosion after regrading in and around the disturbed area. Erosion control plans would be implemented during and after construction.

Streambank and Shoreline Protection (580). There would be short-term, minor-to-moderate, adverse impacts from grading, reshaping, and planting of streambanks, ponds, lakes, and other aquatic systems that could result in temporary to short-term, adverse impacts on wildlife that use these areas, but these species would be able to reoccupy the area after construction. Additional short-term, minor-to-moderate, adverse impacts would occur from a temporary increase in erosion and sedimentation into local waterbodies during construction of these measures. There would be long-term, beneficial impacts from revegetating areas with native species. This practice would improve or enhance the stream corridor for fish and wildlife habitat. Areas would be replanted with native vegetation and/or seeded to prevent erosion after bank regrading. Erosion control plans would be implemented during and after construction.

Structure for Water Control (587). This practice would be applied to install a structure in a water management system that conveys water, controls the direction or rate of flow, maintains a desired water surface elevation, or measures water. There would be short-term, minor-to-moderate, adverse impacts from grading, reshaping, and planting of streambanks, ponds, lakes, and other aquatic systems, which could result in temporary, adverse impacts on wildlife that use these areas, but these species would be able to reoccupy the area after construction. Impacts would be long term and beneficial because stabilization would reduce the off-site, downstream effects of sediment, nutrients, and organic material into surface waters. Areas would be replanted with native vegetation and/or seeded to prevent erosion after bank regrading. Erosion control plans would be implemented during and after construction.

A.2.1.7 Biological Resources: Rare and Protected Species—Affected Environment

ESA-listed species within the project area as determined by the USFWS IPaC include northern long-eared bat, tricolored bat, alligator snapping turtle, black pinesnake (*Pituophis melanoleucus lodingi*), eastern indigo snake, gopher tortoise (*Gopherus polyphemus*), and dusky gopher frog (*Lithobates sevosus*). The project area may also harbor species that are federally protected under the ESA, Marine Mammal Protection Act (MMPA), Bald and Golden Eagle Protection Act, and the Migratory Bird Treaty Act (MBTA). The Alabama Regulations on Game and Fish and Fur Bearing Animals also provide state-level protection for some additional species (Alabama Administrative Code r. 220-1-1 et seq.) (ADCNR, 2024).

A.2.1.8 Biological Resources: Rare and Protected Species – Environmental Consequences

Project activities could have short-term, minor, adverse impacts on the following species: alligator snapping turtle, black pinesnake, dusky gopher, eastern indigo snake, and gopher tortoise. Some project activities would involve the use of heavy equipment to implement improved agricultural land management practices (e.g., cover crops) or natural habitat enhancements (e.g., field borders). These activities could directly affect a small number of individual animals through direct mortality or by influencing their reproductive or foraging behavior because of human disturbance. However, because of the limited duration of the activities, any adverse effects would be minor and temporary. The conservation practices implemented by this project would have an overall beneficial impact on all rare and protected species. Beneficial impacts on these species would result from water quality improvements because of targeted land management practices intended to reduce (1) nutrient losses from the landscape, (2) nutrient loads to streams and downstream receiving waters, and (3) water quality degradation in watersheds, and thus would provide benefits to coastal watersheds and marine resources. These beneficial impacts could translate downstream to affect protected marine mammals that could occur in estuaries and marine habitats, including bottlenose dolphin and West Indian manatee.

Because there would be no tree clearing or other project activities adversely affecting suitable bat habitat, there would be no adverse impacts to the following species listed as being within the project area: northern long-eared bat and tricolored bat. All project activities would occur upland; therefore, any protected and endangered aquatic species or species occurring on beach or nearshore habitats would not be affected.

A.2.1.9 Socioeconomic Resources: Cultural Resources – Affected Environment

Cultural resources are evidence of past human activity. These may include pioneer homes, buildings, or old roads; structures with unique architecture; prehistoric village sites; historic or prehistoric artifacts or objects; rock inscription; human burial sites; or earthworks, such as battlefield entrenchments, prehistoric canals, or mounds. These nonrenewable resources often yield unique information about past societies and environments and provide answers for modern-day social and conservation problems. Although many have been discovered and protected, numerous forgotten, undiscovered, or unprotected cultural resources exist in rural America (USDA-NRCS, n.d.).

The Alabama Gulf Coast is one of the most historically significant regions in the southeastern United States. It was popular with prehistoric Native Americans for fishing and food gathering long before the first European explorers arrived on the coast (Cox, 2012).

A.2.1.10 Socioeconomic Resources: Cultural Resources – Environmental Consequence

Compliance with Section 106 of the NHPA would be completed prior to implementation of any project activities with the potential to disturb cultural resources commence. During project design, the Implementing Trustees would identify measures to avoid, minimize, or mitigate any adverse impacts on cultural or historic resources located within the project area in consultation with the relevant State and Tribal Historic Preservation Offices, therefore no adverse impacts are anticipated. Project activities would include providing outreach and technical assistance to private landowners on acres within the watershed to develop conservation plans and implement nutrient-reduction-related conservation practices. In the event project activities would include land disturbance, all required consultations under Section 106 of the NHPA would be completed before land-disturbing activities would occur. Resources that are eligible for the National Register of Historic Places (NRHP) would be avoided in the design of the projects. All project activities would be implemented in accordance with all applicable laws and regulations concerning the protection of cultural and historic resources. No adverse impacts to cultural or historic resources are anticipated from this project.

A.2.2 Bayou La Batre Nutrient Reduction

The Bayou La Batre Nutrient Reduction project was previously analyzed in the AL TIG RP II/EA. The following analysis is an incorporation of the previous analysis as the information in that analysis is still applicable. The following is a summary of the previous analysis; further information can be found in Section 9.0 in the RP II/EA.

A.2.2.1 Physical Environment: Hydrology and Water Quality – Affected Environment

The affected environment for this project would include hydrology, water quality, floodplains, and wetlands. This project takes place within the Bayou La Batre watershed. The Bayou La Batre River empties into Portersville Bay along the Gulf of Mexico. The river is approximately 5.5 miles long, with a drainage area of around 30 square miles (ADEM, 2009). The Bayou La Batre River was last listed on the Alabama Department of Environmental Management (ADEM) 303(d) list of impaired waters in 2008 for pathogens (Enterococci) from urban runoff/storm sewers (ADEM, 2008). The Bayou La Batre River was removed from the 303(d) list when a TMDL was established in 2009 to address the loading of pathogens into the river. The Bayou La Batre watershed lies within multiple floodplain designations, including VE, A, AE, and X, with roughly 7,500 acres of the watershed consisting of freshwater forested/shrub wetland and 515 acres consisting of estuarine and marine wetlands.

The affected environment is further described in Section 9.4.1.1 of RP II/EA and has not changed since RP II/EA was drafted.

A.2.2.2 Physical Environment: Hydrology and Water Quality– Environmental Consequences

The Bayou La Batre Nutrient Reduction project aims to enhance water quality in the Bayou La Batre watershed by helping landowners develop and implement conservation plans that limit nonpoint source pollution. Implementing conservation measures may include installing erosion and sediment control structures on cropland. The installation of these structures would not involve any soil compacting activities and would not result in any adverse short-term impacts on hydrology but may result in minor, adverse impacts on water quality and wetlands from ground-disturbing activities that could temporarily increase turbidity levels in nearby waters and temporarily disrupt the ecology of the wetland. This disruption is expected to cease shortly after the construction period. Floodplains would not incur any short-term impacts from the implementation of this project.

The Bayou La Batre Nutrient Reduction project would ultimately decrease nutrient and sediment runoff and improve the hydrology of the watershed by restoring it to a more natural hydrologic cycle. It would also enhance water quality in the Bayou La Batre watershed by helping landowners develop and implement conservation plans that reduce nonpoint source pollution. This would be a long-term, beneficial impact on the hydrology and water quality of the Bayou La Batre watershed. The drainage area for the watershed, Portersville Bay and the Mississippi Sound, would experience long-term, beneficial impacts on water quality as well. The decrease in runoff that would occur from this project would reduce flood hazard within the watershed, resulting in long-term, beneficial impacts on floodplains. The reduction in nonpoint source pollutants would enhance wetland health by decreasing the amount of nutrient and sediment inputs resulting in long-term, beneficial impacts on wetlands within the watershed.

The environmental consequences are further described in Section 9.4.2.2 of RP II/EA.

A.2.2.3 Biological Resources: Habitats – Affected Environment

The Bayou La Batre watershed covers over 19,500 acres in south Mobile County and flows southwesterly into Portersville Bay and Mississippi Sound situated within the Gulf Coast Flatwoods ecoregion. It encompasses a wide variety of habitats, including urban, rivers, creeks, wetlands, forests, and crops. Large areas of pine flatwoods and maritime forest habitat dominate the natural land cover with 51 percent of land being forested (MBNEP, 2024). Roughly 7,500 acres of land within the watershed are freshwater forested/shrub wetland. The freshwater forested/shrub wetlands are pocketed with freshwater emergent wetlands (equaling approximately 118 acres). About 515 acres of estuarine and marine wetlands exist near the discharge point for the watershed. Bayou La Batre itself is a shallow tidally influenced river that receives drainage from several named tributaries (Hammar Creek, Bishop Manor Creek, and Carls Creek) and multiple unnamed tributaries which all flow south into the bayou.

Coastal Flatwoods

The coastal flatwood ecoregion, in which the Bayou La Batre watershed lies within, is a generic description for the pine woodlands that occupy sandy flatlands, principally in the Gulf Cost Flatwoods and the Southern Pine Plain and Hills ecoregions (Griffith et al., 2001). The vegetation is predominantly longleaf pine (*Pinus palustris*) and to a lesser degree by slash pine (*Pinus eliottii*). Pocketed within these two species ranges from dense shrubs to open and herbaceous-dominated and is heavily influenced by fire history.

Floodplain Forest

Floodplain forests occur only along certain river and stream drainages within the Gulf Coast region. Vegetation along theses larger waterways is generally dominated by bottomland hardwood species and other trees tolerant of flooding. Typical trees of these forests include bald cypress (*Taxodium distichum*), water tupelo (*Nyssa aquatica*), swamp tupelo (*Nyssa biflora*), green ash (*Fraxinus pennsylvanica*), sweetgum *(Liquidambar styraciflua*), sweetbay (*Magnolia virginiana*), Atlantic white cedar (*Chamaecyparis thyoides*), and several oaks (*Quercus* spp.). Common shrubs are buckwheat tree (*Cliftonia monophylla*) and swamp cyrilla (*Cyrilla racemiflora*).

Upland Forest

Much of the upland forested habitat in this region has been converted to pine plantations. Where natural forest remains, longleaf pine (*Pinus palustris*), shortleaf pine (*Pinus echinata*), and loblolly pine (*Pinus taeda*) pines dominate most uplands, with slash pine (*Pinus elliottii*) in the lower areas with scattered areas of the hardwood species mentioned above.

Isolated Wetlands

Isolated wetlands are typically depressional areas embedded within upland habitats, such as some palustrine-forested wetlands, herbaceous bogs, or temporary ponds and marshes. Such wetlands host a significant portion of the biodiversity of the region. These wetlands are dominated primarily by plants that are adapted to living in saturated soils, but not in frequently inundated soils. Low wetlands include palustrine-forested wetlands, palustrine scrub-shrub wetlands, and palustrine-emergent wetlands. Palustrine-forested wetlands are often dominated by pines, oaks, and water tupelo (*Nyssa aquatic*), while palustrine scrub-shrub wetlands are often dominated by black willow (*Salix nigra*), elderberry (*Sumbucus canadensis*), saw palmetto (*Serenoa repens*), and sweet bay (*Magnolia virginiana*). Palustrine-emergent wetlands are dominated by a number of herbaceous species, including cardinal flower (*Lobelia cardinalis*), cinnamon fern (*Osmunda cinnamomea*), chain fern (*Woodwardia fimbriata*), and royal fern (*Osmunda regalis*) (ADCNR, 2015).

A.2.2.4 Biological Resources: Habitats – Environmental Consequences

The environmental consequences habitats would experience would be similar to that described above in Section A.2.1.4.

A.2.2.5 Biological Resources: Wildlife – Affected Environment

The affected environment with regards to wildlife for this project would be similar to that described above in Section A.2.1.5.

A.2.2.6 Biological Resources: Wildlife – Environmental Consequences

The environmental consequences wildlife may experience from the proposed project activities is similar to that described above in Section A.2.1.6.

A.2.2.7 Biological Resources: Rare and Protected Species – Affected Environment

ESA-listed species within the project area as determined by USFWS IPaC include northern long-eared bat, tricolored bat, West Indian manatee, eastern black rail (*Laterallus jamaicensis jamaicensis*), rufa red knot, Alabama red-bellied turtle (*Pseudemys alabamensis*), alligator snapping turtle, black pinesnake, eastern indigo snake, gopher tortoise, Kemp's ridley sea turtle, loggerhead sea turtle, and gulf sturgeon (USFWS, 2024b). Rare species of highest conservation concern (designated SGCN P1) that could occur within the Bayou La Batre watershed include river frog (*Rana heckscheri*), southern dusky salamander (*Desmognathus auriculatus*), Mississippi diamondback terrapin, Bewick's wren (*Thryomanes bewickii*), and Henslow's sparrow (*Ammodramus henslowii*). Rare species of high conservation concern (designated SGCN P2) that could occur within the Bayou La Batre watershed include one-toed amphiuma (*Amphiuma pholeter*), mimic glass lizard (*Ophisaurus mimicus*), southeastern five-lined skink (*Plestiodon inexpectatus*), rainbow snake (*Farancia erytrogramma*), eastern kingsnake (*Lampropeltis getula*), speckled kingsnake (*Lampropeltis holbrooki*), eastern coral snake (*Micrurus fulvius*), eastern diamondback rattlesnake (*Crotalus adamanteus*), alligator snapping turtle, least bittern (*Ixobrychus exilis*), reddish egret, northern harrier (*Circus hudsonius*), American kestrel, American oystercatcher, wood thrush, short-eared owl (*Asio flammeus*), worm-eating warbler (*Helmitheros vermivorum*), Swainson's warbler (*Limnothlypis swainsonii*), Kentucky warbler (*Geothlypis formosa*), Bachman's sparrow (*Peucaea aestivalis*), Nelson's sharp-tailed sparrow (*Ammodramus nelsoni*), and seaside sparrow (Ammodramus maritimus).

A.2.2.8 Biological Resources: Rare and Protected Species – Environmental Consequences

The Bayou La Batre Nutrient Reduction project would have minor temporary impacts on some ESA-listed species, although their potential to occur on the targeted agricultural lands is very low. Some project activities would involve the use of heavy equipment to implement improved agricultural land management practices (e.g., cover crops) or natural habitat enhancements (e.g., field borders). These activities could directly affect a small number of individual animals through direct mortality or by influencing their reproductive or foraging behavior because of human disturbance. However, because of the limited duration of the activities, any adverse effects would be minor and temporary. The conservation practices implemented by this project would have an overall beneficial impact on all rare and protected species. Beneficial impacts on these species would result from water quality improvements because of targeted land management practices intended to reduce (1) nutrient losses from the landscape, (2) nutrient loads to streams and downstream receiving waters, and (3) water quality degradation in watersheds, and thus would provide benefits to coastal watersheds and marine resources. These beneficial impacts could translate downstream to affect protected marine mammals that could occur in estuaries and marine habitats, including common bottlenose dolphin (*Tursiops truncatus*) and West Indian manatee.

Project activities could have short-term, minor adverse impacts *on* the following species: alligator snapping turtle, black pinesnake, eastern black rail, eastern black rail, eastern indigo snake, and gopher tortoise.

Because of the lack of suitable habitat on lands potentially affected by this watershed nutrient reduction project, there project would have no direct impacts to the following ESA-listed species that could potentially occur in the project area: loggerhead sea turtle, Kemp's ridley sea turtle, Gulf sturgeon, West Indian manatee, Alabama red-bellied turtle, tricolored bat, northern long-eared bat, and red knot. All project activities would occur on land; therefore, the listed aquatic species would not be affected.

A.2.2.9 Socioeconomic Resources: Cultural Resources – Affected Environment

The affected environment with regards to cultural resources would be similar to that described above in Section A.2.1.9.

A.2.2.10 Socioeconomic Resources: Cultural Resources – Environmental Consequences

Compliance with Section 106 of the NHPA would be completed prior to implementation of any project activities with the potential to disturb cultural resources commence. During project design, the Implementing Trustees would identify measures to avoid, minimize, or mitigate any adverse impacts on cultural or historic resources located within the project area in consultation with the relevant State and Tribal Historic Preservation Offices. Therefore, no adverse impacts are anticipated. Project activities would include providing outreach and technical assistance to private landowners on acres within the watershed to develop conservation plans and implement nutrient-reduction-related conservation practices. In the event project activities would include land disturbance, all required consultations under Section 106 of the NHPA would be completed before land-disturbing activities would occur. Resources that are eligible for the NRHP would be avoided in the design of the projects. All project activities would be implemented in accordance with all applicable laws and regulations concerning the protection of cultural and historic resources. No adverse impacts to cultural or historic resources are anticipated from this project.

A.2.3 No Action Alternative – Nutrient Reduction

A.2.3.1 Physical Environment: Hydrology and Water Quality – Environmental Consequences

Under the No Action Alternative, projects related to Nutrient Reduction (Nonpoint Source) would not occur, and conservation/restoration practices that reduce nutrient and sediment runoff would not be implemented. This would result in minor-to-moderate adverse impacts on hydrology, water quality, floodplains, and wetlands because runoff would continue to occur.

A.2.3.2 Biological Resources: Wildlife – Environmental Consequences

Under the No Action Alternative, projects related to nutrient reduction within the watersheds encompassing Bayou La Batre would not occur. Unless funded through other means, addressing the excess nutrient inputs into waters of these watersheds would not occur. This lack of action would result in short- and long-term minor-to-moderate adverse impacts on wildlife because of poor habitat quality, reduced ecosystem function, and reduced water quality. The intensity of the impact would depend on the level of development in the area and corresponding increase in nonpoint source nutrients.

A.2.3.3 Biological Resources: Rare and Protected Species – Environmental Consequences

Under the No Action Alternative, projects related to nutrient reduction within the watershed encompassing Bayou La Batre would not occur. Unless funded through other means, addressing the excess nutrient inputs into waters of these watersheds would not occur. This lack of action would result in short- and long-term moderate adverse impacts on rare and protected species because of poor habitat quality, reduced ecosystem function, and reduced water quality.

A.2.3.4 Socioeconomic Resources: Cultural Resources – Environmental Consequences

Under the No Action Alternative, projects related to nutrient reduction within the watershed encompassing Bayou La Batre would not occur; therefore, there would be no change or impact to surrounding cultural resources.

A.3 BIRDS

After preliminary investigation, some resource areas under the Birds Restoration Type alternatives were determined to be either unaffected or minimally affected by the restoration actions being proposed for this Restoration Type. Accordingly, these resources are discussed briefly below. Only those resource areas for which potential, adverse impacts are expected are discussed in detail in this Draft RP IV/EA. Additionally, the NEPA analysis for the Bird alternatives looks at a further subset of the total resource areas and topics as part of the biological, physical, and socioeconomic environment for each restoration alternative. To avoid redundant or unnecessary information, resource areas and topics that are not expected to be affected by a proposed restoration alternative are not evaluated further under that given project.

The following resource areas not analyzed in detail for the Birds Restoration Type, with brief rationale for their non-inclusion:

- **Geology and Substrates:** The Stewardship of Coastal Alabama Beach Nesting Bird Habitat project proposed under the Bird Restoration Type would not include ground-disturbing activities or otherwise create changes to substrates, geologic hazards, or geology and no impacts would occur. Banding and use of transmitters on birds for tracking the population and habitat use would not include any ground-disturbing activities. Therefore, this resource topic with regards to this project was not carried forward for further analysis. The Walker Island Expansion project also included under the Bird Restoration Type, as well as the WCNH Restoration Type, would cause adverse impacts to geology and substrates. This analysis is further described in Section A.1.2.2.

- **Hydrology and Water Quality:** The Stewardship of Coastal Alabama Beach Nesting Bird Habitat project proposed under the Bird Restoration Type would involve tracking wading bird to assess population and habitat trends. No short- or long-term impacts on hydrology, water quality, floodplains, or wetlands would occur because of this project. Therefore, this resource topic was not carried forward for further analysis with regards to this project. The Lower Perdido Islands Habitat Restoration project would cause adverse impacts to hydrology and water quality and was therefore further analyzed under Section A.1.2.4.
- **Habitats:** The Stewardship of Coastal Alabama Beach Nesting Bird Habitat project proposed under the Bird Restoration Type would have no direct impacts on habitat because no construction or other disturbance to habitats would occur. Indirect, negligible impacts could occur because of temporary disturbance and related stress to wildlife that may alter nutrient cycling within wetland habitats. The projects would not result in any long-term adverse impacts on habitats. However, data gathered by the projects could be used to prioritize important habitats used by colonial nesting wading birds, which could have long-term beneficial impacts on key habitats if that information is used to promote future habitat protections. Therefore, this resource area was not carried forward for detailed analysis with regards to this project. The Lower Perdido Islands Habitat Restoration project would cause adverse impacts to habitats and was therefore further analyzed under Section A.1.2.6.
- **Marine and Estuarine Fauna:** The Stewardship of Coastal Alabama Beach Nesting Bird Habitat project proposed under the Bird Restoration Type would have short-term negligible adverse impacts and no long-term adverse impacts on birds. These projects would be consisting of tagging and tracking four species of colonial nesting wading birds at Mississippi Sound, Gaillard Island, and Perdido Bay. The projects would result in short-term negligible adverse impacts on marine and estuarine fauna from boat traffic, noise, and human presence during banding excursions or other activities that include site visits. Impacts would mainly consist of temporary displacement of mobile species such as fish and crabs, and conditions would quickly return to baseline. The projects would not result in long-term effects on marine and estuarine fauna or their habitats. Therefore, this resource area was not carried forward for detailed analysis. The Lower Perdido Islands Habitat Restoration project would cause adverse impacts to marine and estuarine fauna and was therefore further analyzed under Section A.1.2.10.
- **Federally Managed Fisheries:** The Stewardship of Coastal Alabama Beach Nesting Bird Habitat project does not contain any in water work. Therefore, it would not result in the destruction or adverse modification to any FMP species or EFH. Therefore, this resource was not carried forward for detailed analysis. The Lower Perdido Islands Habitat Restoration and Walker Island Expansion projects would result in long-term, moderate, adverse impacts to EFH and was therefore further analyzed under Section A.1.1.6.
- **Aesthetics and Visual Resources:** None of the alternatives proposed under the Birds Restoration Type would alter existing aesthetic or visual resources in the area in the long term. The Walker Island Expansion would cause temporary minor impacts to visual resources while construction activities are taking place. However, these would be short term and would not dramatically alter the existing viewscape. Therefore, this resource topic was not carried forward for further analysis.

A.3.1 Stewardship of Coastal Alabama Beach Nesting Bird Habitat

The Stewardship of Coastal Alabama Beach Nesting Bird Habitat project was previously analyzed in the AL TIG RP III/EA. The following analysis is an incorporation of the previous analysis as the project has changed very little since that RP/EA was drafted in 2019. Further information can be found in Section 4.4.1 of the AL TIG RP III/EA.

A.3.1.1 Biological Resources: Birds – Affected Environment

Birds that frequent the Gulf Coast of Alabama include passerines (songbirds), seabirds, waterfowl, shorebirds, wading birds, and hawks. The majority of the birds in the region are migratory. Approximately 200 species of migratory birds are known in the Western Hemisphere. In spite of its relatively small area, the Gulf Coast region of Alabama contains a large percentage of the state's birds. Of the 445 species listed for the entire state, 420, or about 95 percent, have been observed in Baldwin and Mobile counties. About 30 percent, or 130 species, of those 420 species have been documented as breeding in Baldwin and Mobile counties (Rosenberg et al., 2016; Mobile Bay Audubon Society, 2011).

The majority of birds along the Alabama coast are passerines, such as finches, warblers, sparrows, and buntings. Numerous species of migratory birds have been observed within the project areas of each restoration alternative proposed herein. Most bird species found within these areas are covered under the MBTA; exotic species such as house sparrows (*Passer domesticus*) are not covered. Common seabird species are found within open-water, estuarine, and marine habitats of several proposed restoration alternatives. Seabird species in the project areas would include Wilson's storm petrel (*Oceanites oceanicus*), band-rumped storm petrel (*Oceanodroma castro*), Audubon's shearwater (*Puffinus lherminieri*), northern gannet (*Morus bassanus*), and magnificent frigatebird (*Fregata magnificens*) (Mobile Bay Audubon Society, 2011). The brown pelican (*Pelicnus occidentalis*) is a coastal seabird that was previously listed under the ESA and was removed in 2009 because of population recovery. The species is now commonly nesting along the Alabama Gulf Coast, feeding on fish in shallow estuarine waters and nearshore marine areas. American white pelican (*Pelecanus erythrorhynchos*) is also present seasonally in the project area. Waterfowl, such as ducks, geese, and swans, are more commonly associated with freshwater habitats than marine or estuarine environments but are sometimes found in Alabama's coastal habitats. Common waterfowl on the Alabama Gulf Coast that would likely occur within wetland and open-water areas of the proposed alternatives include lesser scaup (*Aythya affinis*), ring-necked duck (*Aythya collaris*), mallard duck (*Anas platyrhynchos*), mottled duck (*Anas fulvigula*), blue-winged teal (*Anas discors*), and snow goose (*Chen caerulescens*) (Mobile Bay Audubon Society, 2011).

Shorebirds are species that are associated with coastal or nearshore habitats and include terns, skimmers, sandpipers, and plovers. Common shorebirds that may be found within the project area include black tern (*Chlidonias niger*), least tern (*Sternula antillarum*), black-bellied plover (*Pluvialis squatarola*), Wilson's plover (*Charadrius wilsonia*), semipalmated plover (*Charadrius semipalmatus*), American oystercatcher (*Haematopus palliatus*), greater yellowlegs (*Tringa melanoleuca*), willet (*Tringa semipalmata*), and spotted sandpiper (*Actitis macularius*) (Mobile Bay Audubon Society, 2011). Two ESA-listed shorebirds that could occur along the beaches of the Alabama Gulf Coast include red knot (*Calidris canutus rufa*) and piping plover (*Charadrius melodus*).

Wading birds are generally large, long-legged species associated with coastal marshes, riverine shorelines, swamps, or other wetland habitats. These species typically forage while standing in shallow water. This includes species such as herons, egrets, ibises, storks, and bitterns. Prey for these species includes fish, frogs, aquatic insects, and crustaceans. Along the Alabama Gulf Coast, common species would include great blue heron (*Ardea herodias*), great egret (*Ardea alba*), snowy egret (*Egretta thula*), white ibis (*Eudocimus albus*), and American bittern (*Botaurus lentiginosus*).

Raptor species that could occur on the Alabama coast include osprey (*Pandion haliaetus*), bald eagle (*Haliaeetus leucocephalus*), red-tailed hawk (*Buteo jamaicensis*), peregrine falcon (*Falco peregrinus*), Mississippi kite (*Ictinia mississippiensis*), swallow-tailed kite (*Elanoides forficatus*), and broad-winged hawk (*Buteo platypterus*).

A.3.1.2 Biological Resources: Birds – Environmental Consequences

Under this project, stewardship activities would increase public awareness of coastal Alabama bird species, potentially reducing human disturbances that contribute to nest failure. Erecting symbolic fencing to reduce human disturbance prior to the start of nesting season could increase nesting success for birds at target sites identified by project implementors, ADCNR, and USFWS. Deployment of decoys would lower the risk of human disturbance and nest predation by attracting target species to suitable habitat areas where such disturbances are less likely to occur. Predator management activities would reduce predation by coyote and red fox, which would lead to increased reproductive success for target species. Enhancement of nesting habitat area in Lower Perdido Islands would increase the size of a current least tern nesting area by removing vegetation and installing/distributing shell hash. These activities would have direct and indirect short- and long-term beneficial impacts on birds by reducing human disturbances and predation and creating additional nesting habitat, potentially leading to enhanced nesting success.

USDA would implement predator management in accordance with its Mammal Damage Management in Alabama Environmental Assessment (EA) (USDA, 2014). Predator management activities would include the use of exclusionary fencing, including electric fencing, but could also include trapping or lethal removal methods (USDA, 2014). Any fencing would be temporary and would only be in place during breeding season. A site-specific analysis would be performed at every location where predator management would occur to develop the most appropriate strategy at each location, as described in the Mammal Damage Management in Alabama EA (USDA, 2014). Predator management techniques that could be implemented could have unintended temporary disturbances on waterbirds, raptors, and passerines from noise and habitat intrusion (USDA, 2014). However, the potential for such impacts would be minimal and should not affect the overall populations of any nontarget wildlife species (USDA, 2014). Monitoring at critical nesting sites to determine nesting success of target species could result in indirect long-term beneficial impacts to birds by informing future conservation efforts aimed at enhancing nesting success.

Mammalian nuisance species control activities could adversely impact nontarget wildlife, but steps would be taken to mitigate these potential negative outcomes. Live traps and nets restrain wildlife once captured; therefore, those methods would be considered live-capture methods. Live traps would have the potential to capture nontarget species. Trap and net placement in areas where target species are active, and the use of target-specific attractants, would likely minimize the capture of nontargets. While there is a risk that nontarget wildlife would be captured in traps meant for target species, the risk is greatly reduced by using appropriate trap sizes and bait, selecting proper sites to set traps, and checking traps mornings biweekly during nesting season for the duration of the project. Trapping would be carried out by qualified personnel during specific time frames, which would reduce the risk of trapping other wildlife.

Overall, the project would have direct and indirect short- and long-term beneficial impacts on birds but may have short-term, minor, adverse impacts on nontarget species that could be caught in traps inadvertently.

A.3.1.3 Biological Resources: Rare and Protected Species – Affected Environment

ESA-listed bird species that are of primary concern include the following:

- **Piping plover:** known to occur seasonally on Alabama beaches and coastal flats
- **Red knot:** known to occur seasonally on Alabama beaches and coastal flats

Critical wintering habitat for piping plover has been designated at several locations in coastal Alabama, including Dauphin Island, Isle Aux Herbes (Coffee Island), and the western portion of the Fort Morgan Peninsula. Critical nesting habitat for loggerhead sea turtle has been designated along most Gulf-facing beaches in Baldwin County. Other state-protected and rare species that are a focus of the Audubon Coastal Bird Survey include American oystercatcher, snowy plover (*Charadrius nivosus*), Wilson's plover, and reddish egret.

A.3.1.4 Biological Resources: Rare and Protected Species – Environmental Consequences

Stewardship and predator management activities would result in short- and long-term beneficial impacts on birds by reducing human disturbances and predation. USDA would be the lead for predator management in accordance with its Mammal Damage Management in Alabama EA (USDA, 2014). Although predator management activities could have unintended adverse impacts on nontarget wildlife species, including rare and protected species, USDA would incorporate techniques to minimize these risks (USDA, 2014). Therefore, as noted in the Mammal Damage Management in Alabama EA, these methods are not likely to result in adverse impacts on any rare or protected species (USDA, 2014). A site-specific analysis would be performed at every location where predator management would occur to develop the most appropriate strategy at each location, as described in the Mammal Damage Management in Alabama EA (USDA, 2014). Monitoring at critical nesting sites and collecting data to determine nesting success could result in long-term beneficial impacts on birds by informing future conservation efforts aimed at enhancing nesting success.

ESA-listed bird species that would benefit from the project include piping plover and red knot. Green, Kemp's ridley, and loggerhead sea turtles are known to nest on Alabama beaches and could be present in areas where project activities would occur. Nesting sea turtles could be temporarily disturbed by increased human presence during stewardship activities. However, every effort would be made to avoid disturbances to nesting sea turtles. Hatchlings would not likely be affected because stewardship activities would be conducted during the day, while hatchlings typically emerge at night. Predator management may result in long-term beneficial impacts on nesting sea turtles because removal of predators, including but not limited to coyote and red fox, would decrease the likelihood of nest predation. Therefore, project activities could have short-term, minor adverse impacts to loggerhead sea turtle, Kemp's ridley sea turtle, green sea turtle, hawksbill sea turtle, leatherback sea turtle, Alabama beach mouse, piping plover, Perdido Key beach mouse, and red knot. Overall, the project would result in short- and long-term beneficial impacts on rare and protected species.

Due to unsuitable habitat where project activities would occur, the project would have no direct impacts on the following species: gulf sturgeon, Alabama sturgeon (*Scaphirhynchus suttkusi*), alligator snapping turtle, black pinesnake, dusky gopher frog, eastern black rail, eastern indigo snake, gopher tortoise, northern long-eared bat, tricolored bat, and West Indian manatee.

A.3.1.5 Socioeconomic Resources: Cultural Resources – Affected Environment

Cultural resources are evidence of past human activity. These may include pioneer homes, buildings, or old roads; structures with unique architecture; prehistoric village sites; historic or prehistoric artifacts or objects; rock inscription; human burial sites; or earthworks, such as battlefield entrenchments, prehistoric canals, or mounds. These nonrenewable resources often yield unique information about past societies and environments and provide answers for modern-day social and conservation problems.

Although many have been discovered and protected, numerous forgotten, undiscovered, or unprotected cultural resources exist in rural America (USDA-NRCS, n.d.). The Alabama Gulf Coast is one of the most historically significant regions of the South. The region was popular with prehistoric Native Americans for fishing and food gathering long before the first European explorers arrived on the coast (Cox, 2012).

A.3.1.6 Socioeconomic Resources: Cultural Resources – Environmental Consequences

Compliance with Section 106 of the NHPA would be completed prior to implementation of any project activities with the potential to disturb cultural resources commence. During project design, the Implementing Trustees would identify measures to avoid, minimize, or mitigate any adverse impacts on cultural or historic resources located within the project area in consultation with the relevant State and Tribal Historic Preservation Offices. Therefore, no adverse impacts are anticipated. A complete review of this project under Section 106 of the NHPA would be completed prior to implementation of any project activities with the potential to disturb cultural resources commence. During project design, the Implementing Trustees would identify measures to avoid, minimize, or mitigate any adverse impacts on cultural or historic resources located within the project area in consultation with the relevant State and Tribal Historic Preservation Offices. Resources that are eligible for the NRHP would be avoided in the design of the projects. No adverse impacts to cultural or historic resources are anticipated from this project.

A.3.1.7 Socioeconomic Resources: Tourism and Recreation – Affected Environment

The affected environment for the Alabama Coastal Bird Stewardship Program includes myriad tourism and recreational opportunities located on Alabama's Gulf Coast, which boasts white sand beaches adjacent to turquoise waters. Numerous tourism and recreational opportunities are available for visitors to enjoy the natural resources present in the area. The main attraction of the Gulf Coast of Alabama is the beach, which provides tourists and recreational visitors with opportunities for sightseeing and bird watching, among other forms of passive and active recreation, as it contains habitat for the diverse array of birds using the project area—including seabirds, shorebirds, and raptors—that are found across the Alabama coastline.

A.3.1.8 Socioeconomic Resources: Tourism and Recreation – Environmental Consequences

No effects on tourism and recreational use are anticipated as a result of the proposed project. Project activities would include ongoing stewardship and monitoring. No operation and maintenance activities would be associated with the project. Continued activities would not change tourism and recreational opportunities in the project area. Overall, the project would result in direct and indirect long-term beneficial impacts on tourism and recreation by reducing human disturbances, potentially leading to enhanced nesting success, and increased passive recreation such as bird watching. Furthermore, the collection of nesting data would inform future conservation efforts.

A.3.2 Lower Perdido Islands Habitat Restoration – Phase 2

This project is also being considered under the WCHN Restoration Type and was analyzed under NEPA in Section A.1.1 above.

A.3.3 Walker Island Expansion

This project is also being considered under the WCNH Restoration Type and was analyzed under NEPA in Section A.1.2 above.

A.3.4 No Action Alternative – Birds

A.3.3.1 Biological Resources: Birds – Environmental Consequences

Under the No Action Alternative, projects with the goal of restoring coastal Alabama bird populations and habitats would not occur. The Alabama Coastal Bird Stewardship Program would expire when funding runs out, and there would be no expansion or creation of habitat at Walker Island. The adverse impacts on Walker Island would continue and the island would slowly erode, eliminating viable bird habitat.

A.3.3.2 Biological Resources: Rare and Protected Species – Environmental Consequences

Under the No Action Alternative, projects with the goal of restoring coastal Alabama bird populations and habitats would not occur. Benefits to rare and protected species associated with these projects would not occur. The Alabama Coastal Bird Stewardship Program would expire when funding runs out, and there would be no expansion or creation of habitat at Walker Island. The adverse impacts on Walker Island would continue and the island would slowly erode, eliminating viable habitat that could be used by rare and protected species. Shorebirds would experience long-term, minor, adverse impacts from continued nest disturbance and predation.

A.3.3.3 Socioeconomic Resources: Cultural Resources – Environmental Consequences

Under the No Action Alternative, projects related to the goal of enhanced bird stewardship would not occur; funding for ongoing data collection of coastal bird populations would not be granted. If the property were purchased for future development, previously undiscovered resources could be discovered, and the impacts would be adverse. Without continued funding for the ongoing monitoring of coastal bird populations and the expansion/creation of bird habitat, cultural resources would not be affected over the long term. Prehistoric or historic districts, sites, buildings, structures, or objects included in, or eligible for inclusion in, the NRHP would not be affected and would continue to be managed without change.

A.3.3.4 Socioeconomic Resources: Tourism and Recreation – Environmental Consequences

Under the No Action Alternative, projects related to the goal of enhanced bird stewardship would not occur, funding for ongoing data collection of coastal bird populations would not be granted, and habitat for birds at Walker Island would not be restored. Without continued funding for the ongoing data collection on coastal bird populations, tourism and recreational opportunities could be adversely affected over the long term. This would occur in cases where research was not available to ascertain proper methods for species enhancement, resulting in a possible long-term decline in viability of coastal bird populations.

A.4 OYSTERS

After preliminary investigation, some resource areas under the Oysters Restoration Type alternatives were determined to be either unaffected or minimally affected by the restoration actions being proposed for this Restoration Type. Accordingly, these resources are discussed briefly below. Only those resource areas for which potential adverse impacts are expected are discussed in detail in this RP IV/EA. To avoid redundant or unnecessary information, resource areas and topics that are not expected to be affected by a proposed restoration alternative are not evaluated further under a given project.

The following resource areas were not analyzed in detail for the Oysters Restoration Type:

- **Federally Managed Fisheries:** Projects proposed under the Oysters Restoration Type would not result in the destruction or adverse modification to FMP species or EFH. Projects that consist of in water work could result in short-term, minor, adverse impacts on FMP species because of disturbance from boat traffic, noise, and increased human presence. For all of the projects analyzed under the Oysters Restoration Type, upon completion of the projects, overall water quality would improve, which would ultimately be beneficial for FMP and EFH. In the short term, water quality may decrease due to project implementation actions, but these changes would be short term, negligible, and adverse. Species that could potentially be affected are highly mobile and would likely avoid the project area while work is underway. Therefore, this resource was not carried forward for detailed analysis.

- **Tourism and Recreation:** Projects proposed under the Oysters Restoration Type would have no to negligible short-term adverse impacts and no long-term adverse impacts on tourism and recreation. In areas where use currently does occur, there could be short-term disruptions to existing boating use while project implementation is occurring, but any disruption is expected to be short term, negligible, and adverse. Therefore, this resource area was not carried forward for detailed analysis.

A.4.1 Improving Resilience for Oysters by Linking Brood Reefs and Sink Reefs (Large-scale) – Component 4 – Mid-lower Mobile Bay, AL

The Improving Resilience for Oysters project was previously analyzed in the RWTIG RP I/EA. The following analysis is an incorporation of the previous analysis as the information has not changed since that RP was drafted. Further information can be found in Section 4.3.2.4.1 of the RWTIG RP I/EA.

A.4.1.1 Physical Resources: Geology and Substrates – Affected Environment

The project would be located throughout the western portion of Mobile Bay, Alabama. Mobile Bay is a large (greater than 1000 square kilometers) microtidal estuary in southern Alabama that receives drainage through the Mobile River system (USGS, 1994). The area is located alongside the coastal lowlands and alluvial-deltaic plain formed through alluvial, coastal, and low terrace deposits (Jones and Tidwell, 2011). Upper Mobile Bay is confined by steep topography that opens up into lower Mobile Bay and the Mississippi Sound. This low-gradient shoreline area contains geology that has been influenced by channel branching during falling sea levels (Greene et al., 2007). Geomorphologically, Mobile Bay is a combination of drowned river valley and bar-built estuary, which makes it a bathymetrically and hydrologically complex estuary. There are two openings in the lower part of the bay: one to the Gulf of Mexico, the other to the Mississippi Sound (MBNEP, 2012). Mobile Bay contains silty clays and clay. In water depths less than 2 meters, clean quartz sands occur. Grain size decreases and sorting increases downbay and toward the southeast (Ryan and Goodell, 1972).

A.4.1.2 Physical Resources: Geology and Substrates – Environmental Consequences

Short-term minor adverse impacts and long-term beneficial impacts to geology and substrates would occur. Restoring degraded oyster habitat would have a long-term benefit to substrates by providing additional habitat suitable for oyster recruitment, and reefs may also reduce wave energy and erosion of adjacent shorelines and help stabilize sediments in the long term. The impact of the alternative on geology and substrates would result in short-term minor adverse impacts and long-term beneficial impacts.

A.4.1.3 Physical Resources: Hydrology and Water Quality – Affected Environment

Watershed weather patterns and the geographic location of Mobile Bay significantly influence the water quality of Mobile Bay. Human uses such as the expansion of the industrial complex within Alabama's coastal zone and increased commercial shipping, as a function of the growth of the Port of Mobile, petroleum recovery enterprises, increased shoreline development, and recreational boating sewage disposal also greatly influence water quality in Mobile Bay (MBNEP, 2012). Freshwater inflow mixes with saltwater from the Gulf of Mexico, which enters Mobile Bay via wind and tides (Burgan and

Engle, 2006). Because of the unique conditions surrounding Mobile Bay, including shallow waters, a dynamic climate, and artificial hydrologic modifications—such as the construction of the Mobile Bay Causeway in the 1920s, which serves as an unintentional barrier between Delta waters north of the Causeway and saline waters south of the Causeway—the salinity of Mobile Bay is highly variable.

Hypoxic and anoxic conditions are common in Mobile Bay and are generally prevalent during the summer months. These frequently stressed water quality conditions are marked by stratification with low dissolved oxygen (MBNEP, 2012).

A.4.1.4 Physical Resources: Hydrology and Water Quality – Environmental Consequences

Short-term minor adverse impacts and long-term beneficial impacts are expected. Project-related vessels, equipment, and construction activities, primarily cultch placement, could result in an increase in local turbidity. Additionally, anchoring operations associated with installing marker buoys and signs to mark cultch deployment areas could increase turbidity. The projects would also have long-term benefits on water quality because of the newly restored oysters' filter feeding. The impact of the large-scale alternative on hydrology and water quality may last longer in duration or have a greater area of impact than the small-scale alternative, but ultimately both would result in short-term minor adverse impacts and long-term beneficial impacts.

A.4.1.5 Biological Resources: Habitats and Wildlife Species – Affected Environment

Numerous terrestrial habitats are present along the shores of Mobile Bay, including submerged aquatic habitats, intertidal marshes, beaches and dunes, maritime forests, floodplain forests, wet pine savanna, near-coast pine flatwoods, and upland forest. The habitats found along Mobile Bay largely consist of salt and brackish tidal marsh, developed open space, and pine flatwoods. Common birds in proximity to the shoreline areas numerous shorebirds, ducks, gulls, terns, and pelicans. Common species include but are not limited to common loon, magnificent frigatebird, northern gannet, double-crested cormorant, brown pelican, ring-billed gull, laughing gull, herring gull (*Larus argentatus*), royal tern, Forster's tern, Caspian tern (*Hydroprogne caspia*), and osprey.

A.4.1.6 Biological Resources: Habitats and Wildlife Species – Environmental Consequences

Creation of new oyster reef habitat could result in short-term disruptions to bird species during construction. Birds using the restoration sites in intertidal areas for foraging would need to use surrounding areas during construction activities. This would be temporary however, until construction is complete, and would likely provide long-term benefits to birds via increases in foraging habitat (e.g., American oystercatchers). The impact of the alternative on habitats is expected to result in short-term minor adverse impacts and long-term beneficial impacts to bird species.

A.4.1.7 Biological Resources: Marine and Estuarine Resources – Affected Environment

Mobile Bay was named an Estuary of National Significance in 1995 under the USEPA National Estuary Program and is the largest bay found in Alabama's coastal area. Its ecosystem provides habitat for more than 300 fish species, 65 reptile species, and 15 shrimp species. The Mobile Bay ecosystem boasts high biological diversity and productivity and supports many freshwater and saltwater species of recreational and commercial importance.

EFH includes all types of aquatic habitats that a managed species requires to spawn, breed, feed, or grow to maturity (NOAA, 2013). Under provisions of the Magnuson-Stevens Fishery Conservation and Management Act, for consistency the Gulf of Mexico Fishery Management Council delineated EFH for federally managed fishery species throughout the Gulf of Mexico. Categories of EFH potentially impacted by project components in the estuarine and nearshore areas include open water, emergent saline and brackish marsh, sand/shell bottom, and mud/soft bottom. NMFS also manages highly migratory species (e.g., sharks) for which EFH is identified by geographical area rather than habitat type.

Marine and Estuarine Fauna

Nekton that potentially could be found in this area include economically important marine species that use estuaries as nursery and foraging habitats, such as brown shrimp (*Penaeus aztecus*), pink shrimp (*Penaeus duorarum*), royal red shrimp (*Pleoticus robustus*) and white shrimp (*Penaeus setiferus*), red drum (*Sciaenops ocellatus*) and black drum (*Pogonias cromis*), spotted seatrout (*Cynoscion nebulosus*) and sand seatrout (*C. arenarius*), Gulf menhaden (*Brevoortia patronus*), bay anchovy (*Anchoa mitchilli*), and southern flounder (*Paralichthys lethostigma*). Additionally, a number of cartilaginous nekton, such as sharks, also are common inhabitants of this habitat. Phytoplankton and zooplankton are common basic components of the aquatic food web found throughout the estuarine and marine portions of the Gulf of Mexico. Benthic organisms are another important food source for birds, fish, marine mammals, and other animals. Mollusks (clams, mussels, oysters, snails), sponges, polychaetes (marine worms), and amphipods (small shrimp-like crustaceans) are examples of benthic organisms.

A.4.1.8 Biological Resources: Marine and Estuarine Resources – Environmental Consequences

Short-term minor adverse impacts and long-term beneficial impacts are expected to marine and estuarine resources. Cultch placement can smother benthic resources and convert soft-bottom habitats to hard bottom habitats, adversely impacting species that depend on this habitat. However, only a small percentage of the soft-bottom substrate in project locations would be converted to hard bottom substrate. The projects would have short-term minor adverse impacts on this habitat. SAV is not expected to occur in these locations. However, any SAV found during the site selection process would be documented and measures would be taken to avoid and minimize any impacts. Placement of cultch could result in short-term minor adverse impacts to finfish and shellfish resulting from disturbance and potential injury during cultch placement. Increases in water turbidity could cause mobile organisms to leave the project area in the short term. However, it is likely that those organisms would return to the project area once construction activities cease, resulting in only short-term adverse impacts to these species. The presence of project-related vessels and equipment could temporarily disturb habitats and wildlife species that use or transit through the construction areas. Boat operators associated with the project components would follow the NOAA NMFS Southeast Region’s Vessel Strike Avoidance Measures and Reporting for Mariners, which also would minimize potential harm to nekton species in the construction areas, including marine mammals and sea turtles. The combination of the mobility of nekton species, the implementation of BMPs, and the short duration of construction activities suggest that the alternatives would have short-term minor adverse effects to aquatic wildlife. The alternative would, by design, provide long-term benefits to oysters and to commercially important fish species that rely on reefs for foraging, as well as other wildlife that depend on the fish that would benefit from additional reef habitat (e.g., terns, wading birds). The components would also improve the quality of nearby habitat by reducing erosion and improving water quality, providing long-term benefits to marine and estuarine fauna. The impact would result in short-term minor adverse impacts and long-term beneficial impacts.

A.4.1.9 Biological Resources: Rare and Protected Species – Affected Environment

Birds

Two species of marine and coastal birds listed as threatened or endangered under the ESA are present within the project area: the piping plover and red knot. Bird stopover habitat (non-critical) also exists for the piping plover and red knot. Some nearby beaches and mud or sand flats also contain designated critical habitat for wintering piping plover.

Sea Turtles

Five species of federally endangered or threatened sea turtles are present in the Gulf of Mexico: loggerhead, green, Kemp’s ridley, hawksbill, and leatherback. The leatherback, Kemp’s ridley, and hawksbill sea turtle are listed as endangered. The Northwest Atlantic Ocean loggerhead turtle Distinct Population Segment and the North Atlantic green turtle, both of which occur in the Gulf of Mexico, are listed as threatened. The USFWS and NMFS share jurisdiction for sea turtles under the ESA, with the USFWS having jurisdiction in the terrestrial environment and NMFS having jurisdiction in the marine environment.

Mammals

Two marine mammal species that are likely to be present in Gulf of Mexico state waters could be impacted by the alternatives in this RP IV/EA.

West Indian Manatee

The West Indian manatee, Florida subspecies (*Trichechus manatus latirostris*), is the only sirenian found in the northern Gulf of Mexico and listed under the ESA. Most of the West Indian manatee population is in peninsular Florida (USFWS, 2001), where critical habitat has been designated in Citrus, Hillsborough, Manatee, Sarasota, Charlotte, Lee, Collier, and Monroe Counties. The Florida subspecies has been reclassified as threatened (81 Federal Register 1597). It is present throughout the southeastern United States, with sightings of individuals as far north as Massachusetts and as far west as Texas (Fertl et al., 2005; Rathbun et al., 1982; Schwartz, 1995). It is present mainly in warm coastal waters of peninsular Florida, but also exists in the northern Gulf (Hayes et al., 2018). West Indian manatees are protected under both the ESA and the MMPA.

Bottlenose Dolphins

The bottlenose dolphin is a common inhabitant of the northern Gulf of Mexico, particularly within continental shelf, coastal, and bay, sound, and estuary (estuarine) waters. For NMFS management purposes under the MMPA in the northern Gulf of Mexico, bottlenose dolphins are separated into 35 geographically distinct population units, or stocks, including one continental shelf, three coastal, and 31 estuarine stocks (Hayes et al., 2018). The 31 estuarine stocks spend most of their time within their respective bays, sounds, and estuaries, with many of them considered “strategic” under the MMPA. The strategic stock designation in many cases is a result of annual human-caused mortality exceeding sustainability levels (i.e., Potential Biological Removal) and/or because most of the stock sizes are currently unknown but are likely small such that relatively few mortalities and serious injuries would exceed Potential Biological Removal.

A.4.1.10 Biological Resources: Rare and Protected Species — Environmental Consequences

If individual Gulf of Mexico sturgeon would enter the project area during construction, short-term minor adverse impacts could result. However, sturgeon are mobile marine species and would likely avoid project activities, suggesting that transitory routes would not be impeded. Therefore, the alternatives are not likely to adversely impact the species. Placement of cultch material would result in short-term, adverse impacts to soft bottoms and sand/shell bottoms categorized as EFH for a number of federally managed fishery species at each project component site. The project would impact EFH for Atlantic sharpnose shark (*Rhizoprionodon terraenovae*), blacktip shark (*Carcharhinus limbatus*), bull shark (*C. leucas*), spinner shark (*Carcharhinus brevipinna*), bonnethead shark (*Sphyrna tiburo*), finetooth shark (*Carcharhinus isodon*), reef fish, pink shrimp, white shrimp, brown shrimp, royal red shrimp, and red drum. Construction crews would comply with the NMFS Protected Species Construction Conditions, Measures for Reducing the Entrapment Risk to Protected Species, Vessel Strike Avoidance Measures, and USFWS Standard Manatee In Water Conditions and Appropriate State Manatee Conditions. The presence of project-related vessels and equipment and construction activities could temporarily disturb marine mammals (e.g., dolphins and manatees) and sea turtles in the vicinity of the project area. However, these highly mobile species would likely be able to utilize other habitats during project construction. If individuals did enter construction areas, activities would halt until they leave the site. Boat operators associated with the projects would also follow the NOAA NMFS Southeast Region's Vessel Strike Avoidance Measures, Measures for Reducing the Entrapment Risk to Protected Species, and Reporting for Mariners, which also would minimize potential harm. The combination of mobility, the implementation of BMPs, and the short duration of construction activities suggest that the alternatives are unlikely to have adverse effects on these taxa. In addition, neither sea turtle nesting habitat nor designated or proposed critical habitat would be impacted by these alternatives as these are not located in the proposed project area for either alternative.

A.4.1.11 Physical Environment: Cultural Resources – Affected Environment

Coordination with the Alabama Historical Commission (AHC) regarding the extent and nature of cultural resources at the site would occur.

A.4.1.12 Physical Environment: Cultural Resources – Environmental Consequences

Compliance with Section 106 of the NHPA would be completed prior to implementation of any project activities with the potential to disturb cultural resources commence. During project design, the Implementing Trustees would identify measures to avoid, minimize, or mitigate any adverse impacts on cultural or historic resources located within the project area in consultation with the relevant State and Tribal Historic Preservation Offices. Therefore, no adverse impacts are anticipated.

A.4.2 Oyster Grow-Out and Restoration Reef Placement – 5- and 3-Year Continuation

The Oyster Grow-Out and Restoration Reef Replacement project was previously analyzed in the AL TIG RP II/EA. The following analysis is an incorporation of the previous analysis, with the project now being separated into two projects with different continuation periods: five-year and three-year. The Oyster Grow-Out and Restoration Reef Placement three-year continuation would result in identical beneficial and adverse impacts to the Oyster Grow-Out and Restoration Reef Placement five-year continuation; however, the duration and severity of those impacts would be decreased due to the shortened duration of the action. Further information can be found in Section 13.0 of the AL TIG RP II/EA.

The anticipated oyster grow-out areas would be located in Grand Bay, Portersville Bay, and Bon Secour Bay. These sites would be developed using off-bottom oyster techniques; specifically, grow-out units would be suspended in the middle of the water column above the sediment. The oyster grow-out areas are anticipated to be "off-bottom" reefs and thus would not affect substrates, geologic hazards, or geology. Placement of material from the oyster grow-out areas on restoration reefs would not affect geology or substrates because oysters would be placed on existing hard substrate; however, pile driving would be used that could result in short-term minor adverse impacts on substrates but would not influence the overall geology or substrates of the bay. Each site would be approximately 0.5 acres and would require between 12 and 20 pilings. Installation of the pilings would result in short-term moderate impacts from activities that disturb soils and cause sediment to suspend in the water. In-water construction BMPs would be implemented to localize and ameliorate any adverse impacts.

A.4.2.1 Physical Resources: Geology and Substrates – Affected Environment

Geology

This project would be located in the Mississippi Sound, including Portersville Bay and Grand Bay and Bon Secour Bay. Bon Secour Bay is located in Mobile Bay. Geology for the project is the same as described above in Section A.4.1.1.

Upper Mobile Bay is confined by steep topography that opens up into lower Mobile Bay and the Mississippi Sound. This low-gradient shoreline area contains geology that has been influenced by channel branching during falling sea levels (Greene et al., 2007).

Substrates

Mobile Bay and the Mississippi Sound contain silty clays and clay. In water depths less than 2 meters, clean quartz sands occur. Grain size decreases and sorting increases downbay and toward the southeast (Ryan and Goodell, 1972). The Bon Secour watershed empties into the Bon Secour Bay and contains three types of soils. The soils include Lakewood-St. Lucie-Leon, which are poorly drained and often associated with wetland habitats; Marlboro-Faceville-Greenville Association, which are often well drained and have good agricultural potential; and the Norfolk-Klej-Goldsboro Association, which are the most dominant through the watershed and are well drained. Rivers draining into the Mississippi Sound all contain high sediment loads, including Pearl, Pascagoula, and Alabama rivers (Handley et al., 2012). The Mississippi Sound contains a significant amount of coarse material such as oyster shell, which is often used for reef creation. During reef creation, the oyster shells often fall onto the bottom of the Mississippi Sound and become covered by finer material over time (Gillam, 2016).

A.4.2.2 Physical Resources: Geology and Substrates – Environmental Consequences

The anticipated oyster grow-out areas would be located in Grand Bay, Portersville Bay, and Bon Secour Bay. These sites would be developed using off-bottom oyster techniques; specifically, grow-out units would be suspended in the middle of the water column above the sediment. The oyster grow-out areas are anticipated to be “off-bottom” reefs and thus would not affect substrates, geologic hazards, or geology. Placement of material from the oyster grow-out areas on restoration reefs would not affect geology or substrates because oysters would be placed on existing hard substrate; however, pile driving would be used that could result in short-term minor adverse impacts on substrates but would not influence the overall geology or substrates of the bay. Each site would be approximately 0.5 acres and would require between 12 and 20 pilings. Installation of the pilings would result in short-term moderate impacts from activities that disturb soils and cause sediment to suspend in the water. In-water construction BMPs would be implemented to localize and ameliorate any adverse impacts.

A.4.2.3 Physical Resources: Hydrology and Water Quality – Affected Environment

The project is located in Portersville Bay and Grand Bay within eastern Mississippi Sound and in Bon Secour Bay within Mobile Bay. This includes Dauphin Island, East/West Fort Morgan, Gulf State Park, and Laguna Cove. Nearshore waters that border these sites to the north include Perdido Bay, Little Lagoon, Bon Secour Bay, Mobile Bay, and the Mississippi Sound.

The hydrologic cycles of Alabama’s coastal beaches are largely driven by storms, waves, and currents since the tidal range in the north-central Gulf is very low. Dauphin Island is one of the Gulf of Mexico’s microtidal barrier islands (Froede, 2007), meaning that it rests on a continuous sand shelf that is about 13 feet shallower than the surrounding Gulf of Mexico (Morton, 2008). At 14 miles long, this island acts as a protective barrier for the coastline from storm surges (USGS, 2016). Storm forces not only affect the shape of the island, but storms that breach the beaches facing the Gulf of Mexico can crash on to the island and infiltrate the aquifer beneath it (Kidd, 1988). Groundwater is the sole water source on Dauphin Island because the excessive drainage capacity of the sandy substrate removes any potential for perennial streams to exist on the island. Because the aquifer is unconfined and so close to the overlying waters (with levels that are less than 5 feet above sea level), groundwater water quality issues exist in this region because of salt intrusion.

Perdido Bay is a shallow estuary with an average salinity of 15 parts per thousand (ADEM, 2010b). It is connected to the Gulf of Mexico through the Perdido Pass and the east and west branches of the Gulf Intracoastal Waterway. Perdido Bay has a total surface area of approximately 50 square miles (ADEM, 2010b), but the collective watershed encompasses more than 1,250 square miles of coastal Alabama, including tributaries, lagoons, bayous, and land (Kirschenfeld et al., 2006). The main freshwater input to the estuarine bay is the Perdido River, which contributes approximately 70 percent of the freshwater

(ADEM, 2010b). The bed of the Perdido River is sand and gravel, which allows for continual recharge from the underlying aquifer (Kirschenfeld et al., 2006). The tributaries within the Perdido Bay watershed receive their water from heavy precipitation and groundwater discharge. Perdido Bay is subject to rapid changes from rainfall, wind, and tides (Kirschenfeld et al., 2006).

Little Lagoon is an estuarine brackish body of water that receives most of its water from precipitation, groundwater recharge, runoff, and overflow from the surrounding waterbodies of Lake Shelby and the Gulf of Mexico.

Bon Secour Bay is the sub-estuary of Mobile Bay and has three main watershed inputs: Skunk Bayou watershed, Bon Secour River watershed, and Oyster Bay watershed. These three watersheds and the mouth of Weeks Bay make up the coastline of Bon Secour Bay. Bon Secour Bay comprises an area of approximately 43,670 acres (MBNEP, 2017). The main surface water inputs to Bon Secour Bay include Bon Secour River, Weeks Bay, the Gulf Intracoastal Waterway, Oyster Bay, and the Skunk Bayou (MBNEP, 2017). The Bay receives recharge from the unconfined Miocene-Pliocene and watercourse aquifers through the sand and gravel substrates that comprise its bottom (MBNEP, 2017). Precipitation is the main source of recharge for the surface and groundwater in this region.

Mobile Bay is a relatively shallow estuary (Gesch, 2013). Primary freshwater inputs include the Mobile and Tensaw rivers, which make up approximately 95 percent of the freshwater flow (Modlin and Dardeau, 1987). The Gulf waters pass between the barrier island and the Mississippi Sound, creating an estuarine profile. Mobile Bay has an area of more than 1,900 square miles (Gesch, 2013). The hydrologic processes of the bay are influenced by storms, heavy rainfall, groundwater discharge, and runoff.

The Mississippi Sound is an estuary with a surface area of more than 800 square miles (Eleuterius, 1978). The sound is bordered on the south by a series of barrier islands, with Dauphin Island being the easternmost island. The Pascagoula and Pearl rivers are the main freshwater inputs into the estuary (Eleuterius, 1978). The Mississippi Sound is subject to the same hydrologic processes as Mobile Bay.

Water Quality

Both Mobile Bay and its sub-estuary, Bon Secour Bay, were listed on the ADEM 2016 303(d) list of impaired waters for pathogen pollution from urban runoff and storm sewers (ADEM, 2016). Even though the bay is listed as impaired, the surface waters on the peninsula are not listed as impaired mainly because of the high permeability of the sands that allows a portion of the runoff to drain into the ground before reaching the surface waterbodies.

Perdido Bay is listed as impaired for pathogens (Enterococcus) from collection system failure and on-site wastewater systems. A TMDL was developed in 2010 to reduce Enterococci levels in Perdido Bay, but the waterbody has remained on the list in the years since (ADEM 2010, 2012, 2014, 2016, 2022, 2024). Perdido Bay is also listed for mercury pollution from atmospheric deposition. The Mississippi Sound is listed as impaired for pathogens (Enterococcus) from urban runoff/storm sewers and municipal inputs (ADEM, 2016). The Gulf of Mexico is not listed as impaired.

Floodplains

The coastline of Alabama is designated as Zone VE. The inland area is designated predominately as Zone AE, with the area of Bon Secour Refuge and a small area in the Town of Dauphin Island designated as Zone X (FEMA, 2024).

Wetlands

A small strip of estuarine and marine wetland occurs where the coastline meets the Gulf of Mexico along Dauphin Island and the Fort Morgan Peninsula. On the western end of the Fort Morgan Peninsula, an area in between the sandy coastal beach and Mobile Bay is designated as freshwater emergent wetland. The Bon Secour National Wildlife Refuge (BSNWR) encompasses land designated as freshwater forested/shrub wetland. Areas of estuarine and marine and freshwater forested/shrub wetlands exist around the nearshore waterbodies (USFWS, 2024c).

A.4.2.4 Physical Resources: Hydrology and Water Quality – Environmental Consequences

The anticipated oyster grow-out areas would be located in Grand Bay, Portersville Bay, and Bon Secour Bay. All construction would be completed via barges. This project would involve installing off-bottom oyster grow-out sites that are suspended in the middle of the water column above the sediment via pilings. No activity would alter the hydrology of the area.

Placing oysters on living shorelines and in intertidal areas would improve the water quality of the area and placing oysters in wetlands would assist wetlands in removing excess nutrients from inflow and outflow. Long-term beneficial effects on wetlands and floodplains would occur because of the restoration of oysters to the area.

A.4.2.5 Biological Resources: Habitats and Wildlife Species – Affected Environment

The proposed project would create up to three off-bottom oyster grow-out sites in Portersville Bay, Grand Bay, and Bon Secour Bay. Oyster grow-out sites would be located in shallow water near the shoreline, on unvegetated soft-bottom estuarine habitats.

Mammals

Bottlenose dolphin and West Indian manatee are the only mammals that could occur within the project area, although overflights by bats are also possible.

Reptiles

The only reptiles within the project area, within the Mississippi Sound and Bon Secour Bay are sea turtles and American alligator. Loggerhead sea turtle would be most common, and Kemp’s ridley would occur on occasion. Infrequent occurrences of green, hawksbill, or leatherback could also occur.

Amphibians

Amphibian species are limited to freshwater habitat and thus would not occur within any habitats used by oysters.

Birds

Common birds in proximity to the shoreline areas where grow-out sites would be located include numerous shorebirds, ducks, gulls, terns, and pelicans. Common species include but are not limited to common loon, magnificent frigatebird, northern gannet, double-crested cormorant, brown pelican, ring-billed gull, laughing gull, herring gull, royal tern, Forster’s tern, Caspian tern, and osprey.

A.4.2.6 Biological Resources: Habitats and Wildlife Species—Environmental Consequences

Implementation of the project would result in short-term minor adverse impacts on unvegetated soft-bottom estuarine habitats in Portersville Bay, Grand Bay, and Bon Secour Bay. Potential impacts would be temporary, including increased noise, vibration, turbidity, and visual disturbances associated with pile driving for the construction of grow-out sites. The project would result in long-term, beneficial impacts on oyster reef habitat because oysters placed at the sites would enhance spat production, potentially increasing oyster abundance and recruitment in Alabama waters.

The development of three oyster grow-out sites in Grand Bay, Portersville Bay, and Bon Secour Bay would result in short-term minor adverse impacts on wildlife. Storage of cultch would occur at already existing cultch storage area or in already disturbed areas near where the cultch would be deployed; there would be no impacts on habitats from cultch storage. Temporary disturbance to birds, including primarily shorebirds or wading birds, would occur during the construction of three grow-out areas, which could decrease bird foraging or cause them stress because of displacement. Other passerines and American alligator could also be affected. Affected animals would likely avoid the area during construction, but once completed, impacts would be minimal. Daily human activity to grow oysters at the sites would have long-term minor effects on birds. However, these activities would occur on a regular, predictable daily schedule, which would allow some birds to habituate to humans at the grow-out sites and therefore experience no adverse impact.

A.4.2.7 Biological Resources: Marine and Estuarine Resources – Affected Environment

This project would create up to three off-bottom oyster grow-out sites within nearshore waters in Portersville Bay, Grand Bay, and Bon Secour Bay. Sites would be located in marine or estuarine unvegetated soft-bottom habitat. Oysters would be deployed in nearby restoration reefs or living shoreline projects. Marine and estuarine fauna that could occur within the project area include the following:

- **Finfish:** southern flounder, mullet (*Mugilidae*), southern kingfish (*Menticirrhus americanus*), Atlantic croaker, spot (*Leiostomus xanthurus*), weakfish (*Cynoscion regalis*), speckled seatrout, red drum, black drum, sheepshead, sea bream (*Sparidae*), pinfish (*Lagodon rhomboides*), Gulf toadfish (*Opsanus beta*), blennies (*Salarias fasciatus*), and gobies (*Gobiidae*)
- **Shellfish:** oysters, white shrimp, brown shrimp, pink shrimp, grass shrimp, blue crabs, marsh crabs (*Sesarma reticulatum*), mud crabs (*Scylla serrata*), fiddler crabs (*Uca*), coquina clams (*Donax variabilis*), stout tagelus (*Tagelus plebeius*), and bent mussels (*Ischadium recurvum*)
- **Benthic Organisms and Other Invertebrates:** jellyfish, polychaetes, amphipods, copepods, isopods, and barnacles

A.4.2.8 Biological Resources: Marine and Estuarine Resources – Environmental Consequences

Implementation of the project would result in short-term minor adverse impacts on marine and estuarine fauna within the footprint of the grow-out sites and oyster restoration sites. Potential impacts would include the continuation of noise, vibration, temporary increases in turbidity, and visual disturbances associated with pile driving for the construction of grow-out sites, boat traffic, and human presence. Pile driving could result in injury or mortality of less-mobile benthic species. Mobile species such as finfish, crabs, and shrimp would likely avoid the area for the duration of in-water work, avoiding injury or mortality. The project would result in long-term beneficial impacts on marine and estuarine fauna because oysters placed at the sites would enhance spat production, potentially increasing oyster abundance and recruitment in Alabama waters. This would also benefit other marine and estuarine species such as crabs, gobies, blennies, and gulf toadfish that are associated with oyster reef habitat. Care would be taken not to place the grow-out areas over existing oyster reef. The benefits of the project would likely outweigh the impacts.

A.4.2.9 Biological Resources: Rare and Protected Species – Affected Environment

This project would involve activities within estuarine habitat where oysters are known to occur. No Species of Greatest Conservation Need are within the project area, apart from the marine species also listed under the ESA. ESA-listed species that are known to occur or may potentially occur within the project area include the following:

- **Loggerhead sea turtle**: potentially present in the project vicinity
- **Kemp's ridley sea turtle:** potentially present the project vicinity
- **Green sea turtle:** potentially present in nearby Alabama coastal waters

- **West Indian manatee**: potentially present in the project area
- **Gulf Sturgeon**: potentially present in the project area
- **Piping plover**: potentially present in the project vicinity on unvegetated beaches, mud flats, and sand flats during winter
- **Red knot**: potentially present in the project vicinity on unvegetated beaches, mud flats, and sand flats during winter
- **Gulf sturgeon**: potentially present in the project area

The project area is near waters that are designated critical habitat for Gulf sturgeon, and nearby beaches and mud or sand flats contain designated critical habitat for wintering piping plover. Gulf sturgeon Critical Habitat Unit 8 encompasses the western portion of Grand Bay in Mobile County, Alabama. The action area contains one grow-out site within water designated as critical habitat for Gulf sturgeon. Some nearby beaches and mud or sand flats also contain designated critical habitat for wintering piping plover, and critical habitat for wintering piping plover includes Units 1, 2, and 3, located at Isles aux Herbes (Coffee Island), Dauphin Island, and Fort Morgan. The West Indian manatee is a protected marine mammal that could occur near this oyster reef grow-out project.

A.4.2.10 Biological Resources: Rare and Protected Species—Environmental Consequences

Implementation of the project would result in short-term minor impacts on some ESA-listed species that could occur within the project vicinity, including the green sea turtle, Kemp's ridley sea turtle, loggerhead sea turtle, Gulf sturgeon, West Indian manatee, Eastern indigo snake, tricolored bat, Northern long-eared bat, piping plover, and red knot. Potential impacts would include noise, vibration, temporary increases in turbidity, and visual disturbances associated with pile driving and boat and vehicle traffic during construction of grow-out sites and placement of the cultch, as well as human presence for the five-year project duration. Most species would likely avoid the area during construction, but any individuals that are displaced because of noise would likely return to the area upon completion of construction activities or use other suitable habitats nearby. Oyster grow-out sites or placement would not be located in seagrass beds or SAV habitats, but noise associated with construction activities could temporarily disturb sea turtles or manatees that may be foraging in nearby habitats, Gulf sturgeon could be similarly disturbed by noise and turbidity during construction, if present in the action area. Measures that would be implemented to avoid or minimize impacts to marine mammals include Standard Manatee Conditions for In-Water Work, Measures for Reducing Entrapment Risk to Protected Species, and Sea Turtle and Small tooth Sawfish Construction Conditions.

One grow-out site, located on the west side of Point aux Pins, is within Gulf sturgeon critical habitat. However, the site selected is not likely to provide suitable habitat for the species because of its close proximity to the shoreline. During construction, underwater noise, vibration, and temporary increases in turbidity during pile driving could result in short-term direct or indirect adverse impacts on Gulf sturgeon critical habitat. Measures to reduce the effects of the vibrations from pile driving would be used to minimize impacts, and no construction would occur between May 1 and September 30. The substrate in the proposed Point aux Pins grow-out site is soft, with a muddy bottom, which is not ideal foraging habitat for Gulf sturgeon, which as suction feeders extract prey from soft, sandy bottoms. The construction of the grow-out sites would not alter the substrate to a degree that would potentially influence Gulf sturgeon foraging. Furthermore, the small size of the project and the limited number of supporting pilings would not affect the movement of any Gulf sturgeon that potentially use the area. The combination of the mobility of species, the lack of ideal Gulf sturgeon habitat in the project area, the implementation of BMPs, and the short duration of construction activities suggest that the alternatives would have short-term minor adverse effects to aquatic wildlife. In the long term, the oyster grow-out project would improve water quality through the filter feeding activity of oysters.

A.4.2.11 Socioeconomic Resources: Cultural Resources – Affected Environment

The Alabama Gulf Coast is one of the most historically significant regions in the southeastern United States. The region was popular with prehistoric Native Americans for fishing and food gathering long before the first European explorers arrived on the coast (Cox, 2012). Although many have been discovered and protected, numerous forgotten, undiscovered, or unprotected cultural resources exist in rural America (USDA-NRCS, n.d.).

A.4.2.12 Socioeconomic Resources: Cultural Resources—Environmental Consequences

A complete review of this project under Section 106 of the NHPA would be completed prior to implementation of any project activities with the potential to disturb cultural resources commence. During project design, if any culturally or historically important resources are identified during project preparations or predevelopment surveys, such areas would be avoided during construction in consultation with the relevant State and Tribal Historic Preservation Offices. Resources that are eligible for the NRHP would be avoided in the design of the projects. No adverse impacts to cultural or historic resources are anticipated from this project.

A.4.4 No Action Alternative – Oysters

A.4.4.1 Physical Resources: Geology and Substrates—Environmental Consequences

Under the No Action Alternative, projects related to the restoration of oy sters would not occur, and there would be no impacts on substrates, geologic hazards, or geology.

A.4.4.2 Physical Resources: Hydrology and Water Quality—Environmental Consequences

Under the No Action Alternative, projects related to the restoration of oysters would not occur. If these projects were not implemented, there would be no short- or long-term impacts and no impacts on hydrology, floodplains or wetlands. There would be long-term, minor, adverse impacts to water quality under the No Action Alternative as restored reefs help sustain healthier oyster populations which enhances filter feeding, ultimately improving water quality.

A.4.4.3 Biological Resources: Habitats and Wildlife Species—Environmental Consequences

Under the No Action Alternative, no projects focused on oyster restoration would occur. As a result, there would be no short- or long-term impacts on habitat because no additional human activities to conserve or restore oyster reefs would occur. The benefits provided by these restoration projects would not be realized under the No Action Alternative.

Under the No Action Alternative, projects related to the restoration of oysters would not occur which would have long-term, minor, adverse impacts to wildlife both directly and indirectly. As oysters are an important food source for a variety of species; wildlife would be adversely impacted from the reduction of food availability. Additionally, restored reefs host more invertebrates and small fish than in locations without oyster reefs, ultimately providing food sources for larger fish. If the proposed projects were not implemented, there would be long-term moderate adverse impacts on oyster reefs in coastal Alabama from continued erosion and sedimentation, drought, predation, and harvesting.

A.4.4.4 Biological Resources: Marine and Estuarine Resources—Environmental Consequences

Under the No Action Alternative, projects related to the restoration of oysters would not occur. If these projects were not implemented, oyster reefs in Alabama would remain in their current condition, and there would be no short- or long-term benefits to oysters and other marine or estuarine fauna associated with oyster reef habitats. Therefore, the No Action Alternative would have no effect on marine and estuarine fauna.

A.4.4.5 Biological Resources: Rare and Protected Species—Environmental Consequences

Under the No Action Alternative, projects related to the restoration of oysters would not occur. If these projects were not implemented, oyster reefs in Alabama would remain in their current condition and there would be no short- or long-term impacts on any rare and protected species. Therefore, the No Action Alternative would have no effect on marine and estuarine fauna.

A.4.4.6 Socioeconomic Resources: Cultural Resources—Environmental Consequences

Under the No Action Alternative, expansion and/or continuation of oyster projects would not occur. With additional activities not occurring, there would be no expected impacts to cultural resources.

A.5 PROVIDE AND ENHANCE RECREATIONAL OPPORTUNITIES

Resource areas with the potential to be affected under the Provide and Enhance Recreational Opportunities Restoration Type alternatives are discussed in detail below. Additionally, the NEPA analysis for the Provide and Enhance Recreational Opportunities alternatives looks at a further subset of the total resource areas and topics as part of the biological, physical, and socioeconomic environment for each restoration alternative. To avoid redundant or unnecessary information, resource areas and topics that are not expected to be affected by a proposed restoration alternative are not evaluated further.

The following resource areas were not analyzed in detail for the Provide and Enhance Recreational Opportunities Restoration Type:

- **Federally Managed Fisheries**: Projects proposed under the Provide and Enhance Recreational Opportunities Restoration Type would result in no destruction or adverse modification to FMP species or EFH. Project activities that are occurring either in water or adjacent to water could result in short-term, minor, adverse impacts on FMP species due to disturbance from increase in noise from construction and human presence. However, potentially affected species occurring near any work taking place are highly mobile and would easily move to adjacent suitable habitat. Therefore, this resource was not carried forward for detailed analysis.

A.5.1 Bayfront Park Restoration and Improvement Phases IIa and IIb

The Bayfront Park Restoration and Improvement Phases IIa and IIb project was previously analyzed in the AL TIG RP III/EA. The following analysis is an incorporation of the previous analysis as the information has not changed since that RP was drafted. Further information can be found in Section 4.3.1 of the AL TIG RP III/EA.

A.5.1.1 Physical Environment: Geology and Substrates – Affected Environment

Bayfront Park largely contains high-salinity soils and non-saline complex soils. The high-salinity soils are very poorly drained and have a high frequency of ponding and flooding. The complex soils are somewhat poorly drained and have no frequency of ponding or flooding (USDA, 2017). The project area contains unconsolidated shores that are characterized by less than 75 percent areal cover of stones (USDA, 2017).

A.5.1.2 Physical Environment: Geology and Substrates – Environmental Consequences

Alternatives evaluated may include new construction, soil excavation, utility installation, and other environmental modifications that would disturb geology and substrates. Areas where these activities would occur are noted below. These alterations may result in short- and long-term geologic- and soil-related impacts at the alternative sites. These impacts could be both adverse and beneficial. Adverse impacts would involve temporary and minor increased sedimentation and erosion, while beneficial geologic- and soil-related impacts would include decreased sedimentation and erosion and shoreline hardening.

Construction would take place over a 24-month period and would be completed in accordance with all applicable local, state, federal, and coastal compliance requirements. There would be an increase in disturbed areas associated with the construction of civil works improvements (crushed aggregate access roads, concrete parking pads and sidewalks for ADA access, concrete apron at park entry, and beach overlooks). The stabilization and construction of the sand pocket beach would permanently affect the geology and substrates in the area. The parking area would be reconfigured, and the size would increase; however, the parking area would be constructed using a low-impact design. Additionally, a new pavilion would be added to the playground equipment. These improvements would have no impact on substrates because they would occur on a previously disturbed area. Erosion control BMPs would be followed to protect adjacent water resources. Overall, the stabilization of the sand pocket beach, civil works improvements, and parking improvements would have indirect, beneficial impacts on this project area by decreasing erosion and sedimentation.

A.5.1.3 Physical Environment: Hydrology, Water Quality, Floodplains, and Wetlands – Affected Environment

Bayfront Park is located on the western shore of Mobile Bay. Mobile Bay is approximately 32 miles long and 23 miles across, with an average depth of 10 feet. Mobile Bay was listed on the ADEM 2014 303(d) list of impaired waters because of pathogens caused by urban runoff and storm sewers; however, after the implementation of management and monitoring plans and volunteer programs, Mobile Bay was removed from the 2018 303(d) list of impaired waters, and overall water quality has improved (ADEM, 2014, 2016, 2018, 2022, 2024).

Bayfront Park is at an elevation of 9 feet. This site is within the Federal Emergency Management Agency (FEMA)-designated 100-year floodplain with a designation of Zone VE, coastal flood zone velocity (wave action) hazard (FEMA, 2024). Approximately half of Bayfront Park’s approximately 20 acres are wetlands and are classified as estuarine and intertidal that are emergent, persistent, and irregularly flooded. (USFWS, 2024a).

A.5.1.4 Physical Environment: Hydrology, Water Quality, Floodplains, and Wetlands – Environmental Consequences

Hydrology

The undertaking for Bayfront Park Restoration and Improvement Phase IIa and IIb would involve two new components and two replacement projects. The replacement projects would not affect hydrology because the footprints for the sites would not change. These activities would have minor short-term impacts on hydrology from grading by heavy machinery that would compact portions of the substrate and increase runoff in the project area.

The installation of additional parking, accessible roads, and pathways may have a long-term minor adverse impact on hydrology where new substrates are not permeable (concrete sidewalks and pads) and stormwater runoff is increased. Where impermeable materials are installed, efforts would be taken to ensure proper drainage along the sidewalks and concrete pads. Beach lookouts would be installed on pilings and would not affect the hydrology of the project site. While runoff around new concrete installments would increase, hydrology would benefit from the installation of the sand pocket beach, which would be placed along the shoreline, east of the riprap storm wall.

Water Quality

Water quality would experience temporary, minor adverse impacts from the heavy machinery and ground-disturbing activities used to improve and construct new park facilities and amenities. These impacts could potentially include increased siltation and turbidity during the construction process. The installation of impermeable pathways and concrete pads for parking would result in long-term, minor adverse impacts on water quality by slightly decreasing filtration through the wetland and increasing polluted stormwater runoff.

Floodplains

Minor grading would occur for the construction of park facilities, including an increase in disturbed area associated with the park entrance, access road improvements, and parking area reconfiguration. The floodplain would be compacted in these areas during the construction process resulting in short-term minor adverse impacts on floodplains. Over the long term, the addition of the pathways and amenities would not change the floodplain designation, and no adverse impacts on the floodplain are expected as a result of this portion of the project.

Wetlands

Temporary, minor, direct and indirect adverse impacts would occur from temporary increases in turbidity in adjacent waters during beach construction. Temporary minor adverse impacts on wetlands would occur during the construction process of this project from heavy machinery disturbance in a designated wetland area. Areas that would receive new concrete pads, sidewalks, and roads would need to be graded and filled. However, the park improvements were designed to be low-impact, and efforts would be taken to localize adverse impacts by providing designated access roads for machinery and silt fencing. Installation of impermeable sidewalks and amenities would have long-term minor adverse impacts on wetlands by increasing runoff and disrupting the natural wetland hydrologic processes around those areas. The pocket beach would have long-term beneficial impacts on wetlands by providing increased protection against erosion from storm surges.

A.5.1.5 Biological Resources: Habitats – Affected Environment

Numerous habitats are present along the Alabama coast and in this specific project area, including submerged aquatic habitats, intertidal marshes, beaches and dunes, maritime forests, floodplain forests, wet pine savanna, near-coast pine flatwoods, and upland forest. The Bayfront Park project site is an approximately 20-acre park with public access to the Mobile Bay shoreline and other public amenities, such as a playground, picnic areas, and restrooms. The habitats found in the park largely consist of salt and brackish tidal marsh, developed open space, and pine flatwoods. Table A-3 shows the habitat types in the park by percentage of land cover. The salt and brackish tidal marshes receive regular daily tidal water and are typically dominated by smooth cordgrass (*Spartina alterniflora*) and needlegrass rush (*Juncus roemerianus*). Overstory vegetation in the project area is characterized by longleaf pine and, to a lesser degree, by slash pine.

Table A-3: Habitat Types in Bayfront Park

Habitat Type	Percent
Savanna and Wet Prairie	3.6%
Salt and Brackish Tidal Marsh	38.6%
Undifferentiated Barren Land	4.4%
Near-Coast Pine Flatwoods	15.3%
Developed, Open Space	37.3%
Developed, Low Intensity	0.8%
TOTAL	**100.0%**

Source: USGS, 2011

A.5.1.6 Biological Resources: Habitats – Environmental Consequences

The project would update and replace playground equipment with a new pavilion and replace and expand the footprint of the existing boardwalk with overlooks. The project would also replace and expand existing boardwalks and overlooks and add additional crushed aggregate and concrete walkways and concrete for ADA parking. Approximately 43 percent of the park is developed or barren land that has been previously disturbed. The low-impact design of the new development would limit disturbance to the extent practicable; however, improvements to the park entrance, access road, and parking areas would increase disturbance to the pine flatwoods habitat. Therefore, the project would be expected to have moderate long-term adverse impacts on local habitats.

A.5.1.7 Biological Resources: Wildlife – Affected Environment

Mammals

Mammal species would be limited to those adapted to disturbances, including habitat fragmentation, development, and frequent nearby human presence and noise. Common species include striped skunk, eastern cottontail rabbit (*Sylvilagus floridanus*), raccoon, white-tailed deer, nine-banded armadillo (*Dasypus novemcinctus*), nutria, gray and red foxes, squirrels, chipmunks, bats, and mice and other small rodents.

Reptiles

Reptile species could include common box turtle, eastern glass lizard (*Ophisaurus ventralis*), common five-lined skink (*Plestiodon fasciatus*), and green anole (*Anolis carolinensis*), black racer (*Coluber constrictor*), rat snake (*Ptyas mucosus*), eastern watersnake (*Nerodia sipedon*), and cottonmouth.

Amphibians

Amphibian species would be limited at Bayfront Park because the park does not contain any constant freshwater sources. Species could include cricket frog, northern spring peeper (*Pseudacris crucifer*), green tree frog, eastern spadefoot, eastern narrow-mouthed toad (*Gastrophyrne carolinensis*), and southern toad.

Birds

Bayfront Park contains limited habitat for year-round nesting birds but may provide stopover habitat for birds crossing the Gulf of Mexico during seasonal migrations given its close proximity to Dauphin Island. Common passerine species at Bayfront Park could include finches, warblers, sparrows, and buntings. The

Mobile Bay shoreline provides foraging habitat for wading birds, including herons and egrets. Common raptor species could include osprey and bald eagle. Shorebirds and water birds, including pelicans, gulls, terns, and skimmers, are also common in the project area.

A.5.1.8 Biological Resources: Wildlife – Environmental Consequences

Noise and the presence of construction equipment and crews necessary for improvements to the park entrance, access road, walkways, and parking areas would temporarily disturb wildlife, but impacts would not be noticeable over the long term because the majority of the project area has been previously disturbed. Species that may occur in the project area are accustomed to frequent nearby human presence and noise from the existing high levels of visitor use. Overall, the project is expected to have direct and indirect short- and long-term minor adverse impacts on wildlife.

A.5.1.9 Biological Resources: Marine and Estuarine Resources – Affected Environment

Marine and estuarine fauna include commercially and recreationally harvested finfish and shellfish species such as shrimp, crabs, oysters, and other benthic invertebrates. Bayfront Park is located adjacent to Mobile Bay, and its estuarine open water and salt marsh habitats support many estuarine finfish species, as well as crabs, shrimp, and other shellfish. Salt marshes in the project area may also provide nursery habitat for early life stages of offshore finfish species. The project area does not contain oyster reefs, although they are present nearby in Mobile Bay and Mississippi Sound. Riprap, which currently protects the shoreline of Bayfront Park, provides habitat for encrusting organisms such as barnacles and mussels. Soft-bottom benthic habitat adjacent to the park supports a variety of burrowing benthic invertebrates, including mollusks and polychaetes.

A.5.1.10 Biological Resources: Marine and Estuarine Resources – Environmental Consequences

Updating and replacing playground equipment with a new pavilion, completing civil work such as a crushed aggregate access road, and constructing new restroom facilities could result in temporary disturbances to adjacent estuarine habitats from noise during construction. Similarly, improvements to the park entrance, access road, and parking areas would temporarily disturb species in nearby habitats, but impacts would not be noticeable over the long term. Species that may occur in the project area are accustomed to frequent human presence and noise as from the current high levels of visitor use. Overall, the project is expected to have direct and indirect short- and long-term minor adverse impacts on marine and estuarine resources.

A.5.1.11 Biological Resources: Rare and Protected Species – Affected Environment

A number of species listed as endangered or threatened under the ESA occur in coastal Alabama and may be present in the project areas. The project areas may also harbor species that are federally protected under the ESA, MMPA, Bald and Golden Eagle Protection Act, and the MBTA. The Alabama Regulations on Game and Fish and Fur Bearing Animals also provide state-level protection for some additional species (Alabama Administrative Code r. 220-1-1 et seq.) (ADCNR, 2024).

ESA-listed species that are known to occur or may occur at Bayfront Park include the following:

- **Green sea turtle:** present in Alabama coastal waters and could occur in Mobile Bay on occasion; the project area does not provide suitable sea turtle nesting habitat.
- **Kemp's ridley sea turtle:** present in Alabama coastal waters and could occur in Mobile Bay on occasion; the project area does not provide suitable sea turtle nesting habitat.
- **Loggerhead sea turtle:** present in Alabama coastal waters and could occur in Mobile Bay on occasion; the project area does not provide suitable sea turtle nesting habitat.
- **West Indian manatee**: present in Mobile Bay.

- **Gulf sturgeon:** present in Mobile Bay.
- **Giant manta ray:** present in Mobile Bay.

Bayfront Park does not contain designated critical habitat for ESA-listed species. Dolphins are common in southern Mobile Bay and Mississippi Sound and may be present near the Bayfront Park shoreline on occasion. Other state-protected and rare species that could occur in the project area include but are not limited to bald eagle, northern harrier, and reddish egret.

A.5.1.12 Biological Resources: Rare and Protected Species – Environmental Consequences

Impacts on rare and protected species as a result of the Bayfront Park Restoration and Improvement Phase IIa and IIb project would be similar to those described for wildlife. Updating and replacing playground equipment with a new pavilion and completing civil work such as a crushed aggregate access road would result in temporary disturbances to other state-protected and rare species, including bald eagle, northern harrier, and reddish egret from noise and the presence of construction equipment. The low-impact design of the new development would further limit disturbances to these species over the long term. Overall, the project is expected to have direct and indirect short- and long-term minor adverse impacts on rare and protected species. The low-impact design of the new development would limit disturbance to the extent practicable. BMPs that would be implemented to prevent erosion and runoff during construction could include silt fences, wetting, and erosion matting, as described in the Alabama Handbook for Erosion Control, Sediment Control and Stormwater Management on Construction Sites and Urban Areas. The USFWS Standard Manatee Conditions for In-Water Work or Events in Alabama would avoid or minimize potential impacts to manatees. Implementation of the NMFS Southeast Region’s Measures for Reducing Entrapment Risk to Protected Species and Sea Turtle and Smalltooth Sawfish Construction Conditions would reduce potential for impacts to sea turtles and gulf sturgeon. Implementation of the NMFS Southeast Region’s Vessel Strike Avoidance Measures would minimize the potential for vessel strike impacts to all listed species.

The following ESA-listed species may be impacted by the project: loggerhead sea turtle, Kemp’s ridley sea turtle, leatherback sea turtle, Gulf sturgeon, Alabama sturgeon, giant manta ray, West Indian manatee, Alabama red-bellied turtle, hawksbill sea turtle, tricolored bat, piping plover, eastern black rail, black pinesnake, Perdido Key beach mouse, monarch butterfly, Alabama beach mouse, green sea turtle, gopher tortoise, northern long-eared bat, Tricolored bat, wood stork (*Mycteria americana*), and red knot. Because of the lack of suitable habitat on lands potentially affected by this project, there would be no impact on the following ESA-listed species that could potentially occur in the project area: eastern indigo snake, and alligator snapping turtle.

A.5.1.13 Socioeconomic Resources: Cultural Resources – Affected Environment

The Alabama Gulf Coast is one of the most historically significant regions of the South. The region was popular with prehistoric Native Americans for fishing and food gathering long before the first European explorers arrived on the coast (Cox, 2012). Although many have been discovered and protected, numerous forgotten, undiscovered, or unprotected cultural resources exist in rural America (USDA-NRCS, n.d.). Coordination with the AHC regarding the extent and nature of cultural resources at all of the locations under consideration in this Daft RP IV/EA is ongoing and would be completed prior to project implementation.

A.5.1.14 Socioeconomic Resources: Cultural Resources – Environmental Consequences

Compliance with Section 106 of the NHPA would be completed prior to implementation of any project activities with the potential to disturb cultural resources commence. During project design, the Implementing Trustees would identify measures to avoid, minimize, or mitigate any adverse impacts on cultural or historic resources located within the project area in consultation with the relevant State and Tribal Historic Preservation Offices. Therefore, no adverse impacts are anticipated.

A.5.1.15 Socioeconomic Resources: Tourism and Recreation – Affected Environment

The roughly 20-acre Bayfront Park is located on Dauphin Island Parkway near the Town of Alabama Port. Bayfront Park receives more than 300 visitors on the weekends and more than 1,200 visitors per week during the peak summer months. Recreational activities include covered picnic areas, fishing, kayaking, bird watching, and wildlife observation. A user survey conducted in February 2019 indicates that visitors feel the park is well-maintained, but the facilities are old and in need of upgrades. According to the Mobile County Commission, Bayfront Park generally draws in a more local group of residents than those who visit Dauphin Island itself.

A.5.1.16 Socioeconomic Resources: Tourism and Recreation – Environmental Consequences

The construction of park amenity improvements at Bayfront Park would not have long-term adverse impacts on tourism and recreation. Site-specific improvements would occur over a 24-month period and would involve expanding the boardwalk, completing civil works improvements such as creating a crushed aggregate access road, and updating playground equipment with a new picnic pavilion. During the construction period, public access to these amenities would be restricted, resulting in short-term minor impacts on tourism and recreation. However, once the improvements are complete, these enhanced recreational amenities would serve visitors. Overall, this would result in long-term benefits on tourism and recreation at Bayfront Park by providing improved access to recreation in southern Mobile County, especially to the local, underserved residents injured by the Deepwater Horizon oil spill.

A.5.1.17 Socioeconomic Resources: Aesthetic and Visual Resources – Affected Environment

The landscape of Bayfront Park consists of tidal marsh, developed open space, and forest. Infrastructure in the park includes an unpaved road, a boardwalk, picnic shelters and benches, playground structures, grills, and a building. Scenic views of Mobile Bay are available along the entire shore of the park. The park is located adjacent to a segment of Alabama's Coastal Connection Scenic Byway, which follows State Highway 193/Dauphin Island Parkway from Dauphin Island to Alabama Port before continuing westward on State Highway 188 (Alabama’s Coastal Connection Scenic Byway, 2019).

A.5.1.18 Socioeconomic Resources: Aesthetic and Visual Resources – Environmental Consequences

The proposed construction of several park amenity improvements would not result in long-term adverse impacts on the visual character of the site. These developments would be partially visible from the segment of Alabama's Coastal Connection Scenic Byway, which follows State Highway 193/Dauphin Island Parkway to the west of the project site. However, they would not attract attention, dominate the view, or detract from current visitor activities or experiences along the scenic byway. Proposed improvements would include expanding the boardwalk, completing civil work such as a crushed aggregate access road, and updating playground equipment with a new picnic pavilion. Over the construction period, these site-specific improvements would require that visitors be restricted from certain areas of the park but would not significantly affect the visual character of the site or detract from views of the surrounding tidal marsh, forest, or Mobile Bay. These impacts would be temporary and would cease once construction is complete. Once complete, the proposed improvements would promote enhanced access to a scenic resource. Overall, long-term beneficial impacts on aesthetics and visual resources are anticipated as a result of the project.

A.5.2 Laguna Cove Little Lagoon Natural Resource Protection - Large-Scale Amenities

The Laguna Cove Little Lagoon Natural Resource Protection project was previously analyzed in AL TIG RP I/EA. The following analysis is an incorporation of the previous analysis with the project now being separated into two scales: large and small. Further information can be found in Section 4.0 of the AL TIG RP I/EA.

A.5.2.1 Physical Environment: Geology and Substrates – Affected Environment

Geology

Laguna Cove is located adjacent to Little Lagoon, a 10-mile lagoon that stretches from Fort Morgan Peninsula to the western border of Gulf State Park. The tract is situated north of State Route 182 and extends into Little Lagoon. This area is located within the coastal lowlands and is geologically underlain by alluvial sand deposits from the Holocene era. These lagoons are believed to be formed through the breaching and filling of spits over time (Schwartz, 1971).

Substrate

Marsh makes up the majority of the Laguna Cove site and begin in the northern portion of the tract where they are bordered by Little Lagoon. According to the USDA-NRCS Web Soil Survey (2021), soil in the marshlands is considered tidal marsh. These tidal marshes are 70 percent brackish, 20 percent salt, and about 10 percent other materials (USDA-NRCS, 2021). As the site extends inland, the substrate transitions from tidal marsh to relatively flat coastal beaches until the tract reaches the barrier of State Route 182.

A.5.2.2 Physical Environment: Geology and Substrates – Environmental Consequences

Geology

The construction of recreational improvements at the site would last up to six months. Piles would be sunk into the substrate of the lagoon during the installation of the boardwalk. This sinking would not affect the underlying geology of the bedrock. There would be no impacts on geologic resources during construction.

The entire site totals approximately 53 acres adjacent to Little Lagoon. The construction of two parking lots, restrooms, and a kayak launch would not adversely affect the underlying geology of the site. If any bedrock drilling were to occur to install the boardwalk, it would be shallow, minimal, and have short-term minor impacts. Therefore, there would be no long-term impacts on geology.

Substrate

This alternative would establish two parking areas: one on the east side of the property to accommodate approximately 40 cars and one on the west side that would accommodate approximately 20 cars. The parking areas combined would disturb approximately 0.34 acre of land. Construction of the parking lots would require wetting and grading the substrate.

Soil at the site would have to be excavated to lay down approximately 400 feet of utility lines to service the restroom and lights. The excavated soil would be used as fill on top of the installed lines to create an even surface. The excavation of soil would result in exposed soil piles along the length of the utility installation area. BMPs, such as erosion matting and silt fencing, would minimize erosion from these exposed soils. Revegetation would occur over the filled area following utility line installation.

An 8-foot-wide by 600-foot-long boardwalk would be installed off of the east parking lot. The boardwalk would extend out through the tidal marsh and into the lagoon, where it would become a 15-by-250-foot pier with a terminal “T” on the end. This boardwalk would require pilings to be installed and would require associated soil excavation.

Because the site is larger than 1 acre, ADEM-approved BMPs would be used to minimize erosion, runoff, and the amount of disturbed area for all construction measures. All appropriate BMPs would be outlined in the Construction Best Management Practices Plan (CBMPP), and a Qualified Credentialed Inspector

(QCI) would monitor BMPs for effectiveness. Therefore, impacts on soils during construction would be short term, adverse, minor, and localized.

The substrate of the site would be minimally affected over the operational period of the alternative. The parking lot areas would be covered in crushed aggregate, a pervious paver, which would allow water to drain through the lots into the underlying substrate. Construction would not occur on existing dunes, and elevated pathways would allow the underlying substrate to be minimally affected. Therefore, long-term impacts on substrates would be minor.

A.5.2.3 Physical Environment: Hydrology, Water Quality, Floodplains, and Wetlands – Affected Environment

Hydrology

The site is located on Little Lagoon. Little Lagoon is an estuarine brackish body of water on Fort Morgan Peninsula (Little Lagoon Preservation Society, 2011). It receives most of its water from precipitation, groundwater discharge, runoff, and overflow from the surrounding waterbodies of Lake Shelby and the Gulf of Mexico.

Water Quality

Little Lagoon used to be listed on the ADEM 303(d) impairment list for excess nutrients. Prior to 2010, the entire waterbody was reported as being impaired (ADEM, 2008). After 2010, only the central and eastern portions of the waterbody were impaired (ADEM, 2010a). Urban runoff and storm sewers have added pollution to this site that elevate nutrient levels in the lagoon (ADEM, 2010a). The lagoon has not been on the impaired list since 2012 (ADEM, 2012, 2014, 2016, 2022, 2024).

Floodplains

The site is in Zone AE of the FEMA-designated 100-year floodplain with a Base Flood Elevation (BFE) of 11 feet. The coastal beach portion of the site is in the FEMA-designated 100-year floodplain Zone VE with a BFE of 12 feet (FEMA, 2024).

Wetlands

The tidal marshes of the Laguna Cove site are designated as wetlands. Most of the marshes are designated as intertidal estuarine wetlands, with Broad-leaved Evergreen Scrub-Shrub Irregularly Flooded (NWI code E2SS3P) wetlands existing closest to the coastal beaches. As the intertidal estuarine wetlands extend into the lagoon, they transition mostly to persistent emergent wetlands that are irregularly flooded (NWI code E2EM1P) (USFWS, 2016). The wetlands at the tip of the tidal marshes extend into the lagoon and are intertidal estuarine wetlands that are unconsolidated and regularly flooded (NWI code E2USN) (USFWS, 2016). Some small pockets within the tidal marshes are categorized as subtidal estuarine wetlands that are continuously submerged and have an unconsolidated bottom (NWI code E1UBL) (USFWS, 2016). Altogether, the wetlands compose approximately 39 acres of the site (USFWS, 2016).

A.5.2.4 Physical Environment: Hydrology, Water Quality, Floodplains, and Wetlands – Environmental Consequences

Hydrology

The alternative site abuts Little Lagoon. National Pollutant Discharge Elimination System (NPDES) permits would be acquired, and appropriate BMPs would be outlined in the CBMPP before the alternative would begin in order to minimize potential impacts on hydrology. BMPs would be implemented and regularly inspected by a QCI during the construction period to keep sediment and pollutants from entering Little Lagoon. The construction of a boardwalk and pier would not affect the hydrology of the area. The creation of two parking areas with pervious materials would limit the amount of runoff that would occur. Pervious pavers would allow precipitation and floodwaters to seep through the parking area and soil, ultimately recharging the underlying aquifer. The installation of two bathrooms would require the grading and compacting of an estimated total area of 0.06 acre. The associated utility lines would require the excavating and backfilling of an estimated 0.1-acre area. ADEM NPDES permits would be obtained that would outline the appropriate BMP measures to implement for stormwater runoff from the construction of these facilities. These would most likely include silt fences and wattles. Impacts on the hydrology of the project area during construction would be short-term and minor.

The limited number of impervious surfaces that would occur as a result of the implementation of this project would result in minimal impacts on the hydrology of the site. Due to its small and pervious footprint, the proposed alternative would not be expected to increase the amount of runoff the lagoon receives. There would be no long-term adverse impact to hydrology.

Water Quality

Water quality would be slightly affected during the construction process due to activities in the wetlands and the lagoon to install the boardwalk, pier, and kayak launch. Construction activities could stir up sediment and temporarily increase turbidity levels but would not likely exceed state levels. BMPs would be outlined in the CBMPP and implemented to ensure that no excess sediment or pollutants are being deposited into the lagoon, such as turbidity curtains and silt fences. With the implementation of these BMPs, impacts on water quality during construction would be short-term and minor.

While the proposed alternative may slightly affect water quality during the construction process, disturbed sediments would settle quickly, and water quality would return to normal following the construction process. There would be two bathroom facilities installed, resulting in an approximate total disturbed area of 2,513 square feet. All other surfaces would be pervious and there would not be a large increase in runoff to the lagoon. Appropriate long-term runoff BMPs would be installed around the bathroom facilities and parking lots, including runoff ditches and vegetation buffers, to minimize the amount of runoff and pollutants that may otherwise enter the lagoon. With these appropriate measures in place, long-term impacts on water quality would be minor.

Floodplains

Construction for this proposed alternative would not require any filling. Therefore, it would not create any change in the BFE or floodplain level. Construction of the proposed project would be in compliance with all required permits and would not result in changes to the coastal zone. The structures would be built above the BFE, no changes to the BFE or the 100-year floodplain would occur, and there would be no short-term adverse impacts.

Because all of the in-water structures would be set on pilings and the parking lots would be pervious, they would not interfere with the natural flooding regime of the lagoon. There would be no appreciable change to the floodplain, and no increased risk to human safety and welfare would result. No long-term adverse impacts on floodplains would occur.

Wetlands

Within the project area there are approximately 39 acres of wetlands. As discussed under "Hydrology," during the construction process some wetland disturbance would be expected due to the installation of boardwalk and pier pilings, as well as during the construction of the kayak launch. Impacts would include increased turbidity from piling installation, as well as compressed vegetation from construction equipment. Impacts on project area wetlands would be avoided and minimized to the maximum extent practicable. Boardwalks are sited to avoid construction in areas with SAV. Furthermore, vegetation underneath the structure may experience impacts during construction because there could be blockage of light to the vegetation from boardwalks; however, boardwalk regulations would be implemented that require the structures to be as tall as they are wide, which would limit the blockage of light to the plants and allow them to continue to function. Impacts on vegetation from construction of this element of the proposed project would be adverse but short-term and minor because boardwalks would be put over areas of emergent herbaceous vegetation and timber matting would be used. No wetlands would be filled, nor would any considerable number of wetlands be lost during the construction process besides where the pilings would be installed, resulting in minimal impacts on wetlands during the construction processes. Potential impacts on wetlands and other waters would be avoided and minimized to the maximum extent practicable. Any required USACE and ADEM NPDES permits would be obtained prior to construction.

There may be a small strip of wetlands affected by the presence of the boardwalk, which would block light during certain times of the day that had once reached the underlying vegetation. However, due to the height of the boardwalks over the herbaceous vegetation, it is expected that the light would be able to reach these areas, and adjacent natural areas would naturally revegetate any areas disturbed by construction. These impacts would be detectable but localized, natural conditions would not measurably be altered, and natural processes in the area would be sustained. There would be minor long-term adverse impacts on wetlands. All potential impacts on wetlands and other waters would be avoided and minimized to the maximum extent practicable, in coordination with U.S. Army Corps of Engineers.

A.5.2.5 Biological Resources: Habitats – Affected Environment

The site totals 53.36 acres and includes approximately 27 acres of wetlands and 26 acres of maritime forests/uplands.

- **Wetlands/low wetlands:** wetlands/low wetlands are dominated primarily by plants that are adapted to living in saturated soils, but not in frequently inundated soils. Low wetlands include palustrine-forested wetlands, dominated by pines, oaks, and water tupelo (*Nyssa aquatic*); palustrine scrub-shrub wetlands, dominated by black willow (*Salix nigra*), elder berry (*Sumbucus canadensis*), saw palmetto (*Serenoa repens*), and sweet bay (*Magnolia virginiana*); and palustrine-emergent wetlands, dominated by a number of herbaceous species, including cardinal flower (*Lobelia cardinalis*), cinnamon fern (*Osmunda cinnamomea*), chain fern (*Woodwardia fimbriata*) and royal fern (*Osmunda regalis*) (Alabama State Parks, 2013).
- **Maritime forest:** maritime forests contain primarily upland forest species. These areas are dominated by large trees such as pignut hickory (*Carya glabra*), oaks (*Quercus* sp.), pines (*Pinus* sp.), southern magnolia (*Magnolia grandifolia*), and red maple (*Acer rubrum*). Beneath the trees, the maritime forest contains a thick understory of shrubs and herbaceous species, including blueberries (*Vaccinium* spp.), dwarf huckleberry (*Gaylussacia dumosa*), wax myrtle (*Myrica cerifera*), hollies (*Ilex* sp.), and coreopsis (*Coreopsis tinctoria*) (Alabama State Parks, 2013).

A.5.2.6 Biological Resources: Habitats – Environmental Consequences

The site is currently planned for a subdivision of 69 lots for upscale single-family residences, associated roads and amenity features, and a 69-slip marina complex. Acquisition of this property would put the majority of this land into conservation and prevent the planned development, which would preserve habitat. Construction of the proposed recreational access improvements would take approximately six months and would include two parking lots, accessible boardwalks over wetlands, a bathhouse, and a pier. Construction of boardwalks over wetlands would temporarily disturb the lands by compacting soils and disturbing sediments, which could affect growth of native vegetation and would make the habitat temporally unavailable or disturbed during the construction period. Construction of the pier and kayak launch would also affect maritime forests and dune habitats through the possible removal of vegetation, making this habitat unavailable during construction. Impacts from land acquisition and protection would be beneficial because the land would not be subject to further development. Impacts from construction would be short term, minor, and adverse because BMPs would be employed to minimize impacts. These BMPs would be outlined in the CBMPP and would be regularly inspected by a QCI. All habitats would be expected to return to normal functioning following construction.

Construction equipment, personal protective equipment, delivery services, foot traffic, and vehicles could serve as pathways for the introduction and spread of non-native and invasive species in the area. ADCNR would establish methods for controlling existing populations of undesirable species and develop a program to prevent the introduction of undesirable plants during construction. If landscaping is planted, only native species with limited use of non-native, non-invasive species in small ornamental landscaping areas would be used.

The construction of facilities such as parking lots, the bathhouse, and accessible boardwalks would permanently remove habitat. However, the majority of the site would remain undeveloped, preserving current habitat. It is expected that any species displaced as a result of the minimal site development, either on land or in water, would relocate to the remaining habitat nearby and would not have long-term impacts from displacements. Acquiring the land would greatly benefit habitats because the residence/marina complex would not be developed, thereby allowing the majority of the site to remain undisturbed, resulting in overall long-term, beneficial impacts.

A.5.2.7 Biological Resources: Wildlife – Affected Environment

Baldwin County provides habitat that supports a variety of wildlife species, including mammals, reptiles, amphibians, birds, fish, and invertebrates. This includes 73 native amphibians, 420 bird species (migratory and native), 62 native mammals, and 93 native reptiles (Animalia, 2024). Mammals that would likely be present include species such as opossum, white-tailed deer, squirrels, beaver, and bobcat. Commonly observed reptiles and amphibians include various types of turtles, skinks, snakes, and frogs. Birds include passerines (songbirds), hawks, and shorebirds. Several species of fish such as minnows and sunfish likely inhabit the inland aquatic areas. Invertebrates include worms, snails, insects, and crustaceans.

Many of the wildlife species, particularly those that are mobile, such as mammals, birds, and some amphibians and reptiles, may frequent the project site, but are not necessarily present at all times.

Migratory Birds

Migratory birds include not only neotropical (long-distance) migrants, but also temperate (short-distance) migrants and resident species. Neotropical migratory birds are Western Hemisphere species of which the majority of individuals breed in areas north of the Tropic of Cancer in the spring/early summer and spend the winter in areas south of the Tropic of Cancer. Approximately 200 species of neotropical migratory birds are known in the Western Hemisphere. The majority are passerines (songbirds) such as the red-eyed vireo (*Vireo olivaceus*), hooded warbler (*Setophaga citrine*), American redstart (*Setophaga ruticilla*), and common yellowthroat (*Geothlypis trichas*) (USFWS, 2004a).

Numerous species of migratory birds have been observed at the alternative sites over the course of the year. Neotropical migratory birds in particular, such as the warblers, use scrub dune habitats and pine woodlands as stopover habitats during spring and fall migrations across the Gulf of Mexico.

Migratory birds may be present or pass through the alternative areas, but because of limited habitat diversity, are likely to be fewer in number. Because of their mobility, it is possible that many of the species could be present at the alternative sites at a given time, although they would not likely reside there permanently.

The following are wildlife species for consideration at the project site:

- **Birds:** all migratory and native birds in the region
- **Reptiles/amphibians**: lizards, including fence (*Sceloporus occidentalis*), eastern glass, and five-lined; skinks, including broadhead (*Plestiodon laticeps*) and ground (*Scincella lateralis*); turtles, including eastern box (*Terrapene carolina carolina*), eastern mud, and snapping; snakes, including black racer, eastern coachwhip (*Coluber flagellum flagellum*), and eastern diamondback rattlesnake; toads, including American (*Anaxyrus americanus*), oak (*Anaxlyrus quercicus*), and gulf coast (*Incilius valliceps*); and frogs, including chorus (*Pseudacris*) and common
- **Terrestrial:** black bear (*Ursus americanus*), coyotes, squirrels, bats, beavers, red fox, deer, bobcats, voles, mice, chipmunks, and gophers

A.5.2.8 Biological Resources: Wildlife – Environmental Consequences

This project would acquire two parcels totaling 53 acres of wetland and maritime forest habitats known for providing habitat for migratory and native shorebirds in the region, as well as terrestrial animals such as black bear, white-tailed deer, coyotes, squirrels, bats, and beavers.

Proposed construction activities may result in temporary, minor, adverse impacts on wildlife species inhabiting the proposed site and nearby vicinity, including temporary disturbance to wildlife during construction from noise and temporary displacement (including less-mobile species such as invertebrates, mammals, and migratory birds). During construction, some less-mobile species, including invertebrates (e.g., ground-dwelling insects) or juveniles (e.g., reptiles, fish or invertebrates), within the proposed sites would likely experience impacts due to direct mortality, but after construction, these species would reestablish in the area. Terrestrial animals such as white-tailed deer, black bear, and coyotes require relatively large tracts of land for foraging and reproduction. While the proposed construction activities may involve setting up fencing for safety or as a visual barrier around the construction areas, the fencing would not result in fragmented habitat because the area of disturbance would be limited. Therefore, construction activities would not interfere with the overall movement of wildlife species. Impacts from noise and displacement on other species, such as migratory birds would be short term and minor because the construction period would be short (approximately six months), in a limited area, and species would be expected to return to the site once construction is complete. There would be short-term minor adverse impacts on some individual migratory birds during construction, primarily from noise disturbance. Land clearing and grading would be planned to begin outside of nesting season, and once the area is cleared and activities are underway, birds would not be expected to nest in areas of active construction. If land clearing must begin during nesting/hatching/or fledging, surveys for nesting birds would be conducted prior to the implementation of any land clearing or construction action. If nesting birds are located, activities would not begin around the nests until the birds have fledged. A buffer distance to avoid the nests would be determined in coordination with USFWS. Some individual amphibians, reptiles, or fish may be lost due to direct mortality during water construction activities for the pier and boardwalk; however, these impacts would be limited in nature, and after construction is complete these species would return to the site and continue to inhabit the area.

Once access improvements are constructed at the site, operation of the parking area, boardwalk, and restrooms would result in increased human presence on the proposed site; however, these access improvements would allow recreational access to the site in a controlled manner. While species may avoid areas where improvements are located, the rest of the site would be put in conservation from development and would provide habitat in an area that would otherwise be available for development. The site would also include educational/informational signage to inform the public about the wildlife in the area and its importance to the ecosystem. Therefore, while some minor impacts could occur from species avoiding areas, overall, impacts would be long term and beneficial from placing the majority of the site into conservation and preserving species and their habitat in this area.

A.5.2.9 Biological Resources: Marine and Estuarine Resources – Affected Environment

A variety of habitats support marine and estuarine fauna in the Gulf Coast of Alabama, including soft-bottom habitats consisting of sand or mud, hard-substrate habitats, mesophotic reefs, and deep-sea coral communities. Waters of the northern Gulf of Mexico support many of the nation's most commercially and recreationally important fish and shellfish species, such as oysters, shrimp, red snapper, and tuna; as well as other marine species, including whales, dolphins, and sea turtles (NOAA, 2020). In this restoration plan, the majority of the project area is on land; therefore, very few marine and estuarine fauna would be disturbed.

The following marine and estuarine fauna are for consideration at the project site:

- **Fish:** speckled trout, drag-stripping redfish, and flounder
- **Shellfish:** shrimp, oysters, and crabs
- **Benthic organisms:** snails and worms

A.5.2.10 Biological Resources: Marine and Estuarine Resources – Environmental Consequences

The construction of a proposed pier and kayak launch would potentially have adverse impacts on fish (e.g., speckled trout, redfish, and flounder) and shellfish (e.g., shrimp and crab) in the lagoon because of bottom sediments disturbance and underwater noise that would disturb habitat and displace fish. Accidental mortality of these species is also possible from construction activities, but this mortality would be minimal and would not affect the continued existence of these species. Species displaced by disturbance would be expected to return to the site shortly after the six-month construction period. Any adverse impacts would be short term and minor.

The fishing pier located on the eastern side of the property would cause minor adverse impacts on species being fished due to the abundance of these species in a healthy lagoon habitat. This includes EFH for coastal migratory pelagics, reef fish, red drum, and shrimp. No other long-term impacts on marine and estuarine fauna are expected from the operation of this alternative.

A.5.2.11 Biological Resources: Rare and Protected Species – Affected Environment

Baldwin County harbors species protected under the ESA. The ESA and subsequent amendments provide for the conservation of federally listed threatened and endangered species and their habitats. The ESA prohibits jeopardizing endangered and threatened species or adversely modifying critical habitats essential to their survival. Section 7 of the ESA requires consultation with the NMFS and USFWS to determine whether any federally listed endangered or threatened species under their jurisdiction may be affected by a proposed project.

Alabama does not have a state law equivalent to the federal ESA; therefore, species do not have regulatory protection as state endangered or threatened species. However, some species do receive regulatory protection through the Alabama Regulations on Game and Fish and Fur Bearing Animals published annually (Alabama Administrative Code R. 220-1-1 *et seq*). These are the primary regulations affording state protection for some species in Alabama and are administered by ADCNR. The Nongame Species Regulation also provides some species protection. The Alabama Natural Heritage Program maintains species inventory lists to help promote state-level conservation efforts (ALNHP, 2011).

Baldwin County hosts several federally listed special-status species. This section focuses on the species that are most likely to occur in or around the proposed alternative locations. The protected species list was determined by downloading information from the USFWS Information for Planning and Conservation system, reviewing scientific literature, and using professional judgment. Protected species and their habitats that are known to occur or may potentially occur at this site include the following:

Species:

- **Alabama beach mouse** – likely to be present within the site
- **Sea turtles: green, Kemp's ridley, loggerhead, leatherback, and hawksbill** – not likely to be present at the site because the area does not contain Gulf-fronting beaches
- **West Indian manatee** – likely to be present in Little Lagoon
- **Bottlenose dolphin** – likely to be present in coastal waters
- **Gulf sturgeon** – potentially occurring but not likely to be present in Little Lagoon
- **Piping plover** – potentially present during seasonal migrations
- **Red knot** – potentially present during seasonal migrations
- **Eastern indigo snake** – not likely to be present in the area

Habitat:

- Alabama beach mouse non-critical habitat (26.25 acres)
- Bird stopover habitat (non-critical) for red knots and piping plover
- EFH – coastal migratory pelagics, red drum, reef fish, and shrimp

A.5.2.12 Biological Resources: Rare and Protected Species – Environmental Consequences

The proposed site at Laguna Cove consists of wetlands, maritime forest, dunes, and beach habitat and includes 26.25 acres of Alabama beach mouse non-critical habitat. Piping plover and red knot could potentially occur on the site during seasonal migrations but are not likely to be present with regularity because the site does not contain large expanses of sandy shoreline. West Indian manatees are also known to enter Little Lagoon and may be present in waters adjacent to the proposed construction site. Construction of the proposed amenities, including a parking lot, boardwalk, and fishing pier could result in short-term minor adverse impacts on protected species at the site, lasting during the period of construction.

Construction of the proposed amenities would result in temporary disturbances to protected species from noise and the presence of construction equipment and crews. This could temporarily displace Alabama beach mice or migratory birds (including piping plover and red knot), if present during construction. Construction of the fishing pier could disturb manatees if they are present in Little Lagoon. These species would likely avoid the area during construction, and displaced individuals would likely return to the area upon completion of construction. Therefore, these impacts are anticipated to be short term, minor, and adverse.

Compaction of soils during construction could potentially destroy Alabama beach mouse burrows. Any affected Alabama beach mouse habitat would be restored to pre-project conditions, although dune features would likely be lost in some areas. Impacts during construction would be short term, minor, and adverse because all measures would be taken to protect habitat during construction. ADEM-approved BMPs would be used to minimize erosion, runoff, and amount of disturbed area for all construction measures. BMPs, including installation of turbidity curtains and silt fences, would be implemented to ensure that no excess sediment or pollutants are being deposited into the lagoon.

EFH would also be affected during construction of the fishing pier. Impacts include noise, disturbance of benthic habitats, increased turbidity, and sedimentation, which could affect spawning. However, most protected species would likely avoid the area during construction. The construction footprint would be relatively small. Overall, short-term impacts on protected species would be adverse but minor.

Following construction, secondary effects associated with public use of the site and amenities may affect the Alabama beach mouse over the long term. Garbage or refuse left behind by visitors may attract predators, and lights may alter Alabama beach mouse nocturnal behavioral patterns. Although no studies have been performed on the impact of artificial illumination on Alabama beach mouse habitat, behavior of the nocturnal mouse could be altered or disturbed by direct and indirect illumination of its habitat. Studies have documented bright moonlight as an inhibitor to Alabama beach mouse activity (USFWS, 2004b). The lighting systems for the parking lot areas and around walkways would be designed to minimize direct and indirect illumination of Alabama beach mouse habitat. Techniques to control light overspill from these areas would include the best available lighting technologies and effective light management programs.

Once the facility is operational, increased visitation and pedestrian traffic may disturb protected species, including beach mice and migratory birds, over the long term. Boardwalks would safeguard against possible pedestrian impacts on protected species habitat. Overall, long-term impacts on protected species would be adverse and minor. Increased fishing activity associated with the proposed fishing pier located on the eastern side of the property would have minor, adverse impacts on EFH-managed species over the long term. However, the abundance of these species and habitats in the area make it unlikely that increased fishing would lead to changes in populations.

Fishing could also result in accidental bycatch of sea turtles. However, this is unlikely because of the location of the proposed fishing pier within Little Lagoon. Coordination with NMFS would occur prior to construction to ensure that impacts on protected species are avoided, minimized, or mitigated to the maximum extent practicable. Overall, impacts on protected species are expected to be adverse, but minor due to the small size of the alternative and the large area of adjacent habitat. Because of the lack of suitable habitat on lands potentially affected by this project, there would be no impact on the following ESA-listed species that could potentially occur in the project area: loggerhead sea turtle, Kemp's ridley sea turtle, leatherback sea turtle, Gulf sturgeon, West Indian manatee, Alabama red-bellied turtle, hawksbill sea turtle, tricolored bat, eastern black rail, and green sea turtle.

A.5.2.13 Physical Environment: Cultural Resources – Affected Environment

The Alabama Gulf Coast is one of the most historically significant regions of the South. The region was popular with prehistoric Native Americans for fishing and food gathering long before the first European explorers arrived on the coast (Cox, 2012). Although many have been discovered and protected, numerous forgotten, undiscovered, or unprotected cultural resources exist in rural America (USDA-NRCS, n.d.). Coordination with the AHC regarding the extent and nature of cultural resources at all of the locations under consideration in this Daft RP IV/EA is ongoing and would be completed prior to project implementation.

A.5.2.14 Physical Environment: Cultural Resources – Environmental Consequences

Compliance with Section 106 of the NHPA would be completed prior to implementation of any project activities with the potential to disturb cultural resources commence. During project design, the Implementing Trustees would identify measures to avoid, minimize, or mitigate any adverse impacts on cultural or historic resources located within the project area in consultation with the relevant State and Tribal Historic Preservation Offices. Therefore, no adverse impacts are anticipated.

A.5.2.15 Physical Environment: Tourism and Recreational Use – Affected Environment

Little Lagoon is a 10-mile-long brackish lagoon west of Gulf Shores on Fort Morgan Peninsula. This body of water is not a major tourist destination, but does provide excellent recreational opportunities, specifically fishing (Gulf Shores and Orange Beach Tourism, 2023). Little Lagoon is home to recreational species such as speckled trout, redfish, and flounder fishing (Gulf Shores and Orange Beach Tourism, 2023). The calm waters of Little Lagoon are also a resource for other recreational activities such as canoeing and kayaking. Furthermore, the extensive wetland system that surrounds the lagoon allows for abundant wildlife watching and birding. Although no recreation or tourism access points exist in the proposed parcel, various parks, trails, and piers surround the perimeter of the lagoon (LittleLagoon.net, 2009).

A.5.2.16 Physical Environment: Tourism and Recreational Use – Environmental Consequences

During construction of the proposed access improvements and recreational use amenities, the public would not be able to access the site, resulting in short-term, minor, adverse impacts. However, the area where the improvements would occur are only on a portion of the site, and other areas of the site would be accessible. Further, the construction would last only six months, after which time the site would be open to the public.

The proposed alternative at Little Lagoon is expected to yield additional recreation benefits. Little Lagoon is culturally valuable for its serene beauty that provides a natural recreation area with white sand beaches, nature walks, and bird watching. These additional amenities would provide long-term benefits to recreational use and tourism.

A.5.2.17 Physical Environment: Aesthetics and Visual Resources – Affected Environment

The alternative site is surrounded by mostly undeveloped land. To the south of the site sand dunes, beachfront homes, and the Gulf of Mexico are visible. Little Lagoon is visible as a 10-mile-long brackish lagoon to the north; BSNWR is visible beyond the lagoon. To the east and west of the site State Route 182 and the beach homes that exist along the road are visible.

A.5.2.18 Physical Environment: Aesthetics and Visual Resources – Environmental Consequences

During construction, short-term impacts on visual resources at the proposed alternative site would be minor and adverse, primarily because of the presence of construction personnel, equipment (e.g., fences, stockpiles), vehicles, and unfinished structures visible to the public and recreational users. Construction activities could detract from the overall visual environment at the site, but these activities would be temporary. As the construction of the alternative elements progress, potential impacts would increase in intensity. For all construction efforts, a screen or visual barrier at the construction site to obscure the site for the duration of the construction could minimize impacts. These screens could also be used to educate visitors and could include information (such as posters or banners) about the flora and fauna of the area or other issues of interest. Impacts for all elements discussed would be short term, minor, and adverse during construction. Even though existing viewsheds could be temporarily affected, these impacts would not dominate the view or detract from current user activities or experiences.

Implementation of the proposed alternative would change the current visual character of the proposed access points by adding a parking lot, fishing pier, bathhouse, restroom, boardwalk, and kayak launch. However, the site is currently under development pressure to implement 69 single-family residences and a 69-slip marina that this proposed alternative would eliminate. The existing site, which primarily consists of 2,700 feet of Gulf coastline, would change to a developed area containing the amenities described above. The presence of new structures would not be out of character with other beach access points in the region or boardwalks in the BSNWR. The parking lot would include 60 parking spaces, the fishing pier and boardwalk would be approximately 8 feet by 600 feet each, the kayak launch would be

10 feet by 20 feet, and the restrooms would be approximately 20 feet by 30 feet. The existing views that would change the most would be the views from the lagoon and from homes on the Gulf of Mexico.

While some visitors may be sensitive to the change in visual environment and consider these impacts adverse, others may find the potential impacts beneficial because developmental pressures would alter the visual environment drastically. The proposed facilities would be constructed with appropriate materials and include a muted color scheme that would fit the overall beach feel of the area. Therefore, long-term impacts from the proposed alternative would be considered minor and adverse to some visitors and beneficial to others.

A.5.3 Laguna Cove Little Lagoon Natural Resource Protection - Small-Scale Amenities

The affected environment and environmental consequences for the Laguna Cove Little Lagoon Natural Resource Protection - Small-Scale Amenities project is the same as described above in Section A.5.2, Laguna Cove Little Lagoon Natural Resource Protection - Large-Scale Amenities. The only difference between the two projects is the budget and scale of the amenity improvements, as more amenities could potentially be constructed. The Laguna Cove Little Lagoon Natural Resource Protection - Small-Scale Amenities project would likely result in identical beneficial and adverse impacts, as described in Section A.5.2.

A.5.4 No Action Alternative – Provide and Enhance Recreational Opportunities

A.5.4.1 Physical Environment: Geology and Substrates – Environmental Consequences

Under the No Action Alternative, projects related to geology and soils would not occur, properties being considered for acquisition to enhance recreational opportunities could remain undeveloped or could be developed in a number of ways, and improvements at existing recreational areas, such as Bayfront Park, would not occur. If properties being considered for acquisition remained in their current condition and no enhancements were made to existing recreational areas, the state of geology and soils would remain the same. Areas would continue to see erosion and potential loss of public beach areas. If properties being considered for acquisition were developed for other uses, there would likely be minor to major adverse impacts on soils because the projects would modify land use through future development and construction, which could increase erosion.

A.5.4.2 Physical Environment: Hydrology, Water Quality, Floodplains, and Wetlands – Environmental Consequences

Under the No Action Alternative, projects related to recreational use would not occur. Additionally, parcels being considered for purchase to preserve habitat could remain undeveloped, or they could be developed for commercial and/or residential use. If properties were acquired for preservation, impacts would be similar to those described for the action alternatives. However, if the properties were developed, there would be short- and long-term adverse impacts on hydrology, water quality, floodplains, and wetlands because the development of infrastructure (e.g., parking lots or buildings) would disturb soil and compact the earth during construction, and increase runoff and infiltration during this period. In the long term, development of the parcels would increase the number of impervious surfaces in the area, increasing runoff and decreasing infiltration. The level of adverse impacts would be directly related to the intensity and type of development, if it were to occur.

A.5.4.3 Biological Resources: Habitats – Environmental Consequences

Under the No Action Alternative, projects related to the goal of providing and enhancing recreational opportunities would not occur, properties being considered for acquisition to enhance recreational opportunities could remain undeveloped or could be developed in a number of ways, and improvements at existing recreational areas would not occur. Where wildlife-friendly lighting is proposed, this would not occur, and light pollution would not decrease, resulting in long-term moderate adverse impacts. If properties being considered for acquisition remained in their current condition and no enhancements were made to existing recreational areas, there would be no resulting impact on existing habitat. If properties being considered for acquisition were developed for other uses, there would likely be minor to major adverse impacts on habitats because the projects would modify land use through future development.

A.5.4.4 Biological Resources: Wildlife - Environmental Consequences

Under the No Action Alternative, projects related to the goal of providing and enhancing recreational opportunities would not occur, properties being considered for acquisition to enhance recreational opportunities could remain undeveloped or could be developed in a number of ways, and improvements at existing recreational areas would not occur. Where wildlife-friendly lighting is proposed, this would not occur, and light pollution would not decrease, resulting in long-term moderate adverse impacts. If properties being considered for acquisition remained in their current condition and no enhancements were made to existing recreational areas, there would be no resulting impact on wildlife. If properties being considered for acquisition were developed for other uses, there would likely be minor to major adverse impacts on wildlife because the projects would modify wildlife habitat through future development.

A.5.4.5 Biological Resources: Marine and Estuarine Resources - Environmental Consequences

Under the No Action Alternative, projects related to the goal of providing and enhancing recreational opportunities would not occur, properties being considered for acquisition to enhance recreational opportunities could remain undeveloped or could be developed in a number of ways, and improvements at existing recreational areas would not occur. If properties being considered for acquisition remained in their current condition and no enhancements were made to existing recreational areas, there would be no beneficial impacts on existing marine or estuarine resources. If properties being considered for acquisition were developed for other uses, there would likely be minor to major adverse impacts on marine and estuarine resources because the projects would modify land use through future development near these resources.

A.5.4.6 Biological Resources: Rare and Protected Species – Environmental Consequences

Under the No Action Alternative, projects related to the goal of providing and enhancing recreational opportunities would not occur, properties being considered for acquisition to enhance recreational opportunities could remain undeveloped or could be developed in a number of ways, and improvements at existing recreational areas would not occur. If properties being considered for acquisition remained in their current condition and no enhancements were made to existing recreational areas, rare and protected species would not be affected. If properties being considered for acquisition were developed for other uses, impacts on rare and protected species would likely be minor to major and adverse, if habitats are altered or lost through future development.

A.5.4.7 Socioeconomic Resources: Cultural Resources – Environmental Consequences

Under the No Action Alternative, projects related to the goal of providing and enhancing recreational opportunities would not occur. It is not known if these properties would otherwise be developed, but if they were, any potential cultural resources on the site could be disturbed. If left undeveloped, cultural resources would not be affected.

A.5.4.8 Socioeconomic Resources: Tourism and Recreation – Environmental Consequences

Under the No Action Alternative, projects related to the goal of providing and enhancing recreational opportunities would not occur. If properties being considered for acquisition remained in their current condition and no enhancements were made to existing recreational areas, there would be no resulting beneficial impact on tourism and recreational use. If properties being considered for acquisition were developed for other uses, there would likely be minor impacts on tourism and recreation because these sites could restrict public access with future development. Similarly, if improvements at existing recreational areas were not undertaken and these public amenities were allowed to deteriorate further, there would likely be moderate adverse impacts on tourism and recreation because closures to protect public safety could result in potential visitors choosing to pursue activities in other available local or regional areas.

A.5.4.9 Socioeconomic Resources: Aesthetics and Visual Resources – Environmental Consequences

Under the No Action Alternative, projects related to the goal of providing and enhancing recreational opportunities would not occur. If properties being considered for acquisition remained in their current undeveloped condition, there would be no resulting beneficial impact on aesthetics and visual resources. If developed, there would likely be minor-to-moderate impacts on aesthetics and visual resources because further development on the properties would change the visual landscape, with the level of impact related to the intensity of development. Similarly, if improvements at existing recreational areas were not undertaken and these public amenities were allowed to deteriorate further, there would likely be moderate, adverse impacts on aesthetics and visual resources because the deteriorated condition of these public amenities would be readily apparent and attract attention. Although such conditions would not dominate the viewscape, they could detract from the current user activities or experiences.

Appendix B:

Monitoring and Adaptive Management Plans

APPENDIX B – MONITORING AND ADAPTIVE MANAGEMENT PLANS

Monitoring and Adaptive Management (MAM) plan implementation was identified as one of the programmatic goals in the Final Programmatic Damage Assessment and Restoration Plan/Programmatic Environmental Impact Statement (PDARP/PEIS). The Deepwater Horizon (DWH) natural resource damage assessment MAM framework provides a flexible, science-based approach to effectively and efficiently implement restoration over several decades to provide long-term benefits for the resources and services injured by the DWH oil spill. The project MAM plans, included in this appendix, identify the monitoring needed to evaluate progress toward meeting project objectives and support adaptive management of the restoration project. The plans identify key sources of uncertainty, incorporate monitoring data needs and decision points that address these uncertainties, and establish a decision-making process for making adjustments, if needed. MAM plans are living documents and should be updated as needed to reflect changing conditions or new information. For example, a MAM plan may need to be revised if the project design changes, if initial data analysis indicates that the sampling design is inadequate, or if any uncertainties are resolved or new uncertainties are identified during project implementation and monitoring. Any significant future revisions to MAM plans will be made publicly available through the Restoration Portal.

MAM plans are responsibilities for the Alabama Trustee Implementation Group (AL TIG). As described in the Final PDARP/PEIS (Section 7.5.1), TIGs are responsible for both resource- and project-level MAM activities. The AL TIG has developed and will implement MAM plans for all restoration projects consistent with guidance provided by the Trustee Council. Data generated through monitoring will provide the basis for annual project reporting that keeps the public fully informed about project progress and for adaptive management and corrective action decisions. Monitoring data will also be applied to improve the likelihood of success and benefits of future projects.

Many of the projects in this Draft Restoration Plan IV/Environmental Assessment would be implemented in partnership with entities that have deep expertise in their fields; this collaborative approach would leverage and expand existing efforts and increase confidence in outcomes and approaches for future restoration work. The content of each MAM plan depends on the type of project, the level of uncertainty, and the proposed activities.

The MAM plans have three primary purposes:

1. Identify how restoration managers will measure and track progress toward achieving restoration goals and objectives. This work is accomplished via monitoring specific parameters that, individually and collectively, help the AL TIG understand the extent to which a project is achieving its restoration objectives.
2. Increase the likelihood of successful implementation through identification, of potential corrective actions that could be undertaken if a project does not proceed as expected before the project begins. This is accomplished by conceptually outlining the reasons why a project might fail to meet its objectives and responses the AL TIG could take to correct these problems. The focus is on restoration planning uncertainties for the project and how these uncertainties may be best addressed through project design and implementation decisions.
3. Capture lessons learned or new information acquired that can be incorporated into future project selection, design, and implementation. The evaluation section of each plan contains basic questions that the AL TIG will answer to help understand whether a project achieved its objectives, the unanticipated issues that were encountered during implementation, and how such issues were addressed. This information will provide insights for future project development and will be updated with additional information as monitoring methods are

determined for each project. In the future, the AL TIG will work to identify ways to evaluate the overall success of the DWH restoration work by incorporating feedback from project-level evaluations into a larger resource-level framework to understand how projects could be expected to contribute collectively to restoration of injured resources and improved ecosystem conditions and functions along the Alabama coast.

The Monitoring and Adaptive Management Procedures and Guidelines Manual Version 2.0 provides detailed information regarding the importance and use of adaptive management regarding the importance and use of adaptive management.

MONITORING AND ADAPTIVE MANAGEMENT PLAN FOR DEEPWATER HORIZON NRDA PROJECT: Lower Perdido Islands Habitat Restoration – Phase 2

INTRODUCTION

Monitoring, Adaptive Management, and Administrative Oversight was identified as one of the programmatic goals in the *Deepwater Horizon* oil spill Programmatic Damage Assessment and Restoration Plan and Programmatic Environmental Impact Statement (PDARP/PEIS). The *Deepwater Horizon* Natural Resource Damage Assessment (NRDA) Monitoring and Adaptive Management Framework (Chapter 5, Appendix E) provides a flexible, science-based approach to effectively and efficiently implement restoration over several decades to provide long-term benefits to the resources and services injured by the spill. Project monitoring and adaptive management is an important component of the overall Monitoring and Adaptive Management Framework. This Monitoring and Adaptive Management plan identifies the monitoring needed to evaluate progress toward meeting project objectives and to support adaptive management of the restoration project. This project is being implemented as restoration for the *Deepwater Horizon* oil spill NRDA, consistent with the PDARP/PEIS.

PROJECT OVERVIEW

The goal of this project is to restore coastal island habitat in lower Perdido Bay, Alabama. In recent decades, the Lower Perdido Islands have decreased in habitat acreage, experiencing sustained erosion and other ecological injuries resulting from storms, intense boat traffic in nearshore waters, and shoreline and upland recreational use. The primary drivers of design for Walker Island were to address erosion in the existing marsh habitat, avoid impacts to the abundance of seagrass in the general area, cover exposed vegetation roots on the island, and maximize the high elevation habitat generated to support birds and overall longevity.

The objectives of this project are to restore 23 acres of connected coastal habitat at Walker Island, including 5 acres of subtidal shoal habitat, 13 acres of scrub-shrub habitat, 1 acre of marsh habitat, and 4 acres of unconsolidated beach/dune habitat. This will be accomplished by placing sediment to appropriate elevations in accordance with the 100% design plans and installing vegetation in accordance with the vegetation plan. Additionally, bird stewardship activities will be conducted to reduce human disturbance that often contribute to nest or colony failure. Monitoring efforts will be conducted in support of adaptive management to determine nesting and fledging success. Monitoring critical nesting sites, assessing nest success, and determining breeding densities provides insight into the status of Alabama breeding populations for the above-referenced species, all of which are listed as Alabama Species of Conservation Concern (ADCNR 2015).

RESTORATION TYPE GOALS AND PROJECT RESTORATION OBJECTIVES

- Programmatic goal: Restore and Conserve Habitat; Replenish and Protect Living Coastal and Marine Resources
- Restoration type: Wetlands, Coastal, and Nearshore Habitats; Birds
- Restoration approach: Create, restore, and enhance barrier and coastal islands and headlands; restore and conserve bird nesting and foraging habitat; create, restore, or enhance coastal wetlands; restore and enhance dunes and beaches; create, restore, or enhance coastal islands

and headlands.

- Restoration type goal(s): Restore a variety of interspersed and ecologically connected coastal habitats in each of the five Gulf states to maintain ecosystem diversity, with particular focus on maximizing ecological functions for the range of resources injured by the spill, such as oysters, estuarine-dependent fish species, birds, marine mammals, and nearshore benthic communities; restore or protect habitats on which injured birds rely.

Objective 1: Restore 1 acre of marsh habitat by placing sediment to appropriate design elevation and installing native vegetation.

Objective 2: Restore 5 acres of subtidal shoal habitat by placing sediment to appropriate design elevation.

Objective 3: Restore 4 acres of unconsolidated beach/dune habitat by placing sediment to appropriate design elevation and installing native vegetation.

Objective 4: Restore 13 acres of scrub-shrub island habitat by placing sediment to appropriate design elevation and installing native vegetation.

Objective 5: Provide at least 23 acres of bird nesting and foraging habitat.

Objective 6: Provide at least 6 acres of habitat for fish.

PROJECT MONITORING, PERFORMANCE CRITERIA, POTENTIAL CORRECTIVE ACTIONS AND MONITORING SCHEDULE

The proposed monitoring plan for this restoration project was developed to evaluate project performance, key uncertainties, and identify potential corrective actions, if needed. For each of the monitoring parameters identified below, information is provided on the intended purpose of each monitoring parameter (e.g., monitor progress toward meeting one or more of the restoration objectives, regulatory compliance, support adaptive management of the project), monitoring methods, timing and frequency, duration, sample size, and sites. This section also describes applicable performance criteria and potential corrective actions for project parameters associated with project objectives.

The decision-making process requires a structured approach for incorporating new information gained from monitoring and evaluation. As specified in the NRDA regulations, performance criteria are used to determine restoration success or the need for corrective action (15 CFR 990.55(b)(1)(vii)). However, unanticipated consequences, previously unknown conditions or unanticipated environmental drivers uncovered during the evaluation step may also determine the need for corrective actions. The decision to implement a corrective action will holistically consider the overall outcomes of the restoration project by assessing the results of all monitoring parameters compiled in the evaluation step.

Parameter: Area, by habitat type

a. Purpose: To monitor the total area of each restored habitat over time.
b. Method: Multiple options – traditional bathy/topo TKN survey; and/or aerial (from a manned plane) or unmanned aerial drone photography digitized with permanent photo marker locations, or water-based unmanned drone; or a combination of the above methods.
c. Timing and Frequency: Year 0 (as-built), Year 2, and Year 5
d. Sample Size: entire area
e. Sites: all restored habitat areas where sediment was placed

f. Performance Criteria: at least 23 acres total of connected coastal habitat at Walker Island, including 5 acres of subtidal shoal habitat, 13 acres of scrub-shrub habitat, 1 acre of marsh habitat, and 4 acres of unconsolidated beach/dune habitat.
g. Corrective Action(s): None.

Parameter: Survival of plantings

a. Purpose: To determine if installed plants have survived
b. Method: stem counts, percent cover in field using quadrats
c. Timing and Frequency: once at 6 months and once at 12 months
d. Sample Size: to be determined in sampling plan
e. Sites: all areas where vegetation was installed
f. Performance Criteria: 75% survival
g. Corrective Action(s): install additional plants

Parameter: Vegetation species composition, percent cover, and height

a. Purpose: To determine colonization of vegetation in habitats over time and help delineate habitat types for the Area parameter
b. Method: in field quadrats
c. Timing and Frequency: once annually for 5 years
d. Sample Size: to be determined in sampling plan
e. Sites: All areas where vegetation was installed or expected to colonize
f. Performance Criteria: 75% percent cover of expected colonization areas, not including open water or purposefully unvegetated sandy areas
g. Corrective Action(s): install additional plants

Parameter: Presence of undesirable plant species

a. Purpose: to determine if invasive or undesirable plant species are colonizing the new habitat areas
b. Method: in field quadrats combined with the vegetation species composition, percent cover, and height parameter
c. Timing and Frequency: Once annually for 5 years
d. Sample Size: to be determined in sampling plan
e. Sites: all restored habitat areas with visible vegetation colonization
f. Performance Criteria: 0 undesirable species, 0% cover of undesirable species
g. Corrective Action(s): invasive species management techniques

Parameter: Epibenthic and infaunal organisms, abundance, density and species composition

a. Purpose: to determine if important fish and other aquatic invertebrates, such as shrimp and crabs, are utilizing the newly restored habitats
b. Method: Seins or hand trawls for small/medium fish and invertebrate abundance along the marsh edge; drop samplers or throw traps on the marsh platform for density
c. Timing and Frequency: see Table 1 – monitoring schedule
d. Sample Size: to be determined in sampling plan
e. Sites: restored marsh edge, marsh platform, and open water subtidal shoal
f. Performance Criteria: None, for information only
g. Corrective Action(s): None

Parameter: Bird density, abundance, and species composition

a. Purpose: to determine if birds are utilizing the newly restored habitats and if so, are more birds using these habitats than were in this same area before
h. Method: count by species
b. Timing and Frequency: see Table 1 - monitoring schedule
c. Sample Size: to be determined in sampling plan
d. Sites: all restored habitat areas over the 23 acres
e. Performance Criteria: to be determined
f. Corrective Action(s): to be determined

Parameter: Bird nesting success, fledgling survival

a. Purpose: to determine if nesting attempts are occuring and resulting in fledgling survival
b. Method: systematic nest monitoring surveys to document nest attempts, nest outcome, hatchling and fledgling survival
c. Timing and Frequency: see Table 1 - monitoring schedule
d. Sample Size: to be determined in sampling plan
e. Sites: all restored habitat areas over the 23 acres
f. Performance Criteria: to be determined
g. Corrective Action(s): to be determined

Parameter: Nest/colony disturbance

a. Purpose: to determine if rates or types of nest disturbance are impactful to nest outcome
b. Method: systematic nest monitoring surveys to document observed disturbances and causes of nest or colony failure, when observed
c. Timing and Frequency: see Table 1 - monitoring schedule
d. Sample Size: to be determined in sampling plan
e. Sites: all restored habitat areas over the 23 acres
f. Performance Criteria: to be determined
g. Corrective Action(s): to be determined

The schedule for project monitoring is shown in Table 1, separated by monitoring activity. Performance monitoring will begin with pre-execution monitoring (as-built, Year 0) and continue through Year 5. This schedule may be revised as needed depending on changing site conditions over time.

Table 1: Monitoring Schedule

Monitoring Parameter	Objective	Pre-execution Monitoring	As-Built (Year 0)	Year 1	Year 2	Year 3	Year 4	Year 5
Area, by habitat type	1,2,3,4,5,6		X	X		X		X

Survival, vegetation	1,3,4		X	X				
Percent cover, vegetation	1,3,4				X	X	X	X
Presence of undesirable plant species	1,3,4				X	X	X	X
Epibenthic and infaunal organisms, abundance, density	6	X	X	X	X			X
Bird density, abundance	5	X		X	X			X
Bird nesting success, fledgling survival, by species	7	X		X	X			
Nest disturbance	7	X		X	X			

Monitoring and Adaptive Management Plan: Puppy Creek – Juniper Creek-Big Creek Nutrient Reduction Project

1.0 Introduction

The Deepwater Horizon (DWH) Alabama Trustee Implementation Group (AL TIG) developed this Monitoring and Adaptive Management Plan (MAM Plan) for Puppy Creek – Juniper Creek-Big Creek Nutrient Reduction Project. The Project will be constructed using funds associated with the Natural Resource Damage Assessment (NRDA). The purpose of this MAM Plan is to identify monitoring activities that will be conducted to evaluate and document restoration effectiveness, including performance criteria for determining restoration success or need for interim corrective action (15 CFR 990.55(b)(1)(vii)). Where applicable, the MAM Plan identifies key sources of project uncertainty and incorporates monitoring data and decision points that address these uncertainties to ensure that restoration objectives are met, and project benefits are maximized. It also establishes a decision-making process for making adjustments where needed.

This plan was developed in accordance with the MAM Plan template provided in the MAM Manual Version 2.0 (Updated December, 2021), and was adapted to fit the needs of this project (DWH NRDA Trustees 2019). This MAM Plan is a living document and may be updated as needed to reflect changing conditions. Future revisions to this document will be made publicly available as part of project implementation through the Data Integration, Visualization, Exploration, and Reporting (DIVER) website (www.diver.orr.noaa.gov/web/guest/home) and accessible through the Trustee Council's website (www.habitat.noaa.gov/storymap/dwh/).

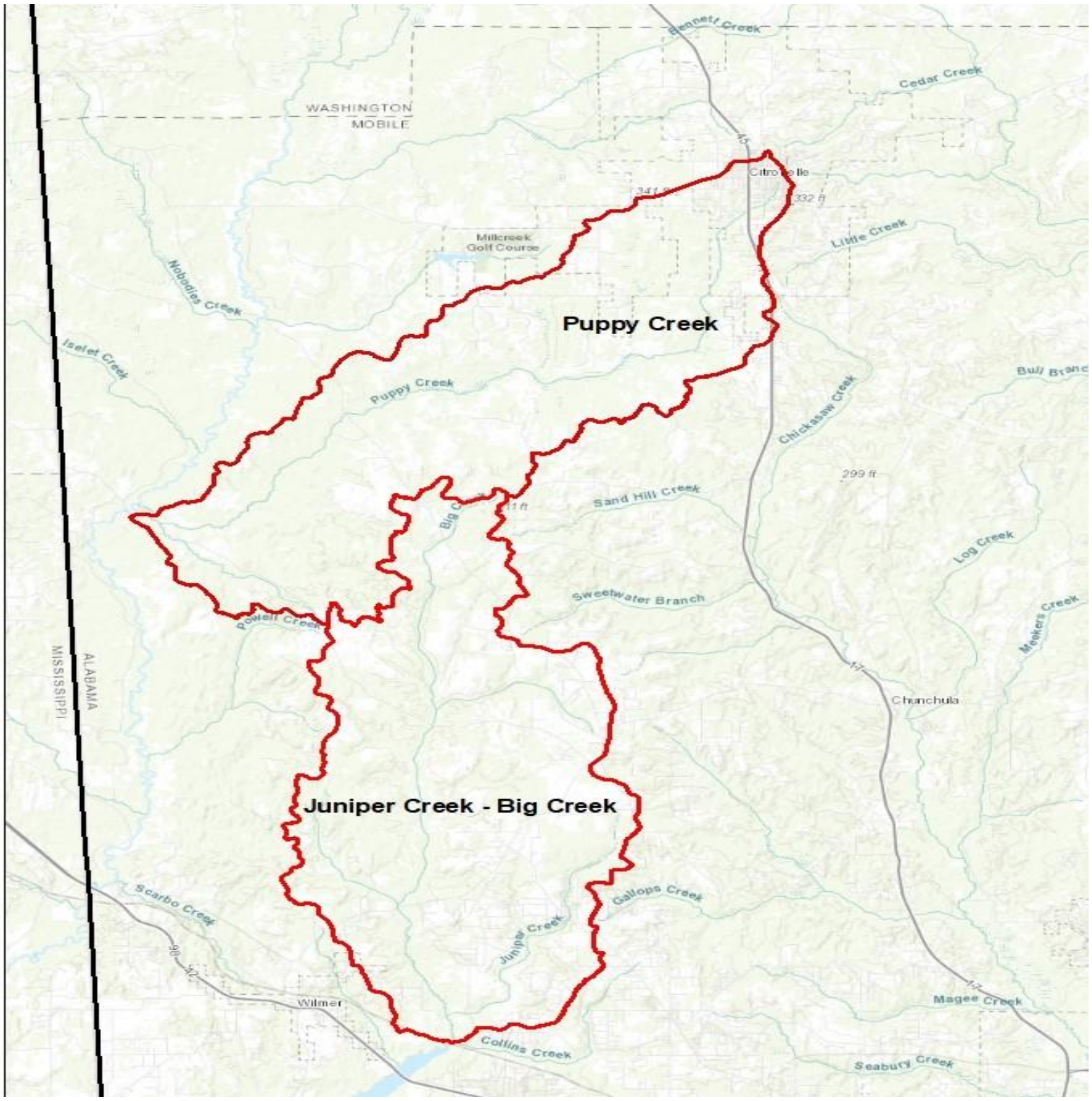
1.1 Project Overview

The Puppy Creek – Juniper Creek-Big Creek Nutrient Reduction Project is located within two watersheds 1. Puppy Creek and 2. Juniper Creek-Big Creek (Figure 1). The Project proposes to implement conservation practices on agricultural lands within these two 12-digit hydrologic unit codes (HUCs) to improve water quality conditions at the watershed level. Outreach and financial and technical assistance would be provided to voluntary participants to develop and implement conservation practices on agricultural land that is vulnerable to nutrient and sediment runoff. Conservation practices are technical methods designed to help conserve soil, water, air, energy, and related plant and animal resources. Conservation practices are included in Appendix A of AL TIG RP4/EA.

The watershed is composed of approximated 6,852 acres with four dominate land use types: 1.) forestland (4,523 acres; 66 %), 2.) pastureland (1,225 acres; 17.8 %), 3.) cropland (740 acres (10.7), 4.) developed (354 acres; 5.3 %). Nutrient runoff from agricultural lands can adversely affect the health of coastal waters. Excessive nutrient enrichment, or eutrophication, of Gulf Coast estuaries and their watersheds is a chronic threat that can lead to hypoxia (low oxygen levels), harmful algal bloom, habitat loss, and fish kills (DWH Trustees 2016). The Project would restore and enhance the ecological and hydrological integrity of water resources within immediate tributaries and receiving waterbodies. The Project would implement conservation practices to reduce nutrient and sediment runoff from agricultural lands within Puppy Creek – Juniper Creek-Big Creek watersheds. Although agricultural lands are not the sole contributors of nutrients to coastal waters, they are a major contributor. Reducing nutrient and sediment loads to the system would improve the functionality of in-stream habitats and downstream estuarine/Gulf habitats used by aquatic organisms to fulfill critical life history cycles.

Given the success of USDA-NRCS Farm Bill programs and their strong acceptance by private landowners, there is a significant opportunity to implement conservation practices on private lands. This project would include four phases: 1) landowner outreach and education, 2) conservation planning, 3) engineering and design and environmental compliance, and 4) conservation practice implementation. USDA will work with NRCS (a project partner) and will perform landowner outreach activities and implementation of conservation practices in targeted watersheds. The USDA will work with NRCS (a project partner) and will provide outreach and technical assistance to voluntary participants (landowners), especially on the most vulnerable acres in the watersheds, to develop and implement site-specific conservation plans. Implementation of conservation practices would include implementation of structural practices (e.g., earth moving) and non-structural practices (e.g., nutrient management). The landowners would be responsible for maintenance and operation of structural measures and application of non-structural measures. Engineering plans and designs for structural practices included in the conservation plans and funding would help landowners acquire all local, state, and federal permits required to implement the conservation practice(s). Landowners would receive financial and technical assistance to implement the conservation practices.

Figure 1. Project location map



The project proposes to implement clusters of projects in hydrologic unit code 12 (HUC 12 level) with the goal of making a discernable difference in local water quality. While this targeted and concentrated approach is desired, the project proponents understand the voluntary nature of conservation implementation and will strive to reach the critical sources within the watershed. Contracts with landowners would serve as an agreement to implement the conservation practices on their properties as outlined in a conservation plan developed according to appropriate standards and specifications (including any required property access agreement and activities related to project monitoring). Although the landowner would typically implement the conservation practices, if the landowner is not capable of carrying out the work, a third party could be hired to implement them. Operation and maintenance (O&M) would be evaluated as specified in the conservation plan and may include, but would not be limited to, addressing soil erosion or vegetation establishment issues due to weather-related events. O&M activities would be identified in the conservation plan based on site evaluations and performance monitoring data and reports.

This project is being implemented as restoration for the Deepwater Horizon oil spill (DWH oil spill) Natural Resource Damage Assessment (NRDA), consistent with the Final Programmatic Damage Assessment and Restoration Plan and Final Programmatic Environmental Impact Statement (Final PDARP/PEIS) (DWH Trustees 2016). Per the PDARP/PEIS, the project falls into the following restoration categories:

- **Programmatic Goal:** Restore Water Quality
- **Restoration Type:** Nutrient Reduction (Nonpoint Source)
- **Restoration Approach:** Reduce Nutrient Loads to Coastal Wetlands
- **Restoration Technique**: Agricultural Conservation Practices
- **Trustee Implementation Group:** Alabama TIG
- **Restoration Plan:** Alabama Trustee Implementation Group Draft Restoration Plan and Environmental Assessment #4: Restoration of Wetlands, Coastal, and Nearshore Habitats; Nutrient Reduction (Nonpoint Source); and Provide and Enhance Recreational Opportunities

1.2 Restoration Type Goals and Project Restoration Objectives

To help meet the restoration goals for injuries to coastal habitats, the Project's restoration objective is to reduce nitrogen, phosphorus, and sediment loads during storm events leaving private agricultural lands in the Puppy Creek – Juniper Creek-Big Creek watershed. Focusing on croplands and pasturelands, the Project will implement conservation practices to reduce nutrient losses from the landscape; reduce nutrient loads to streams and downstream receiving waters; and reduce water quality degradation in watersheds that provide benefits to marine resources and coastal watersheds. In reducing nonpoint source nutrient and sediment loading, the Trustees envision that the Project will compensate, in part, for water quality impacts associated with the DWH oil spill.

As summarized in Chapter 5 of the PDARP/PEIS, the restoration goals for injuries to water quality are as follows:

- Reduce nutrient loadings to Gulf Coast estuaries, habitats, and resources that are threatened by chronic eutrophication, hypoxia, or harmful algal blooms or that suffer habitat losses associated with water quality degradation.
- Where appropriate, co-locate nutrient load reduction projects with other restoration projects to enhance ecological services provided by other restoration approaches.
- Enhance ecosystem services of existing and restored Gulf Coast habitats.

1.3 Conceptual Setting

The conceptual setting identifies factors and interactions that may influence the project outcomes. This may include factors affecting whether the project is implemented as planned (e.g., the expected number of samples were obtained), cofactors that may have a significant effect on variance in the data, and factors that may alter the expected outcome of the restoration effort. Understanding the conceptual setting would aid in adaptive management of the project, as well as future projects of a similar type by identifying some of these factors and providing the opportunity to anticipate their effects and plan for contingencies.

Aspects of the ecological system within and outside of the Puppy Creek – Juniper Creek-Big Creek watershed that may be affected by implementation of the Project will depend on the type of BMPs and/or CPs implemented on the cropland and grazing lands. For example, construction of CPs could result in the spread of invasive species near each project site, which would result in a minor, long-term impact to the surrounding environment. Another example includes the effects of grassed waterways on terrestrial species. Installation of grassed waterways could potentially cause short-term minor impacts to terrestrial habitats due to potential vegetation clearing. However, there may be long-term beneficial effects, as the grassed waterways may provide additional habitat for certain species, as well as improve downstream aquatic habitats with the improvement of localized water quality. At the time of the drafting of this Plan, specific Project locations and BMPs/CPs have not yet been identified, and this MAM Plan will need to be updated to include a more robust analysis of the conceptual setting.

In addition, subsequent environmental review will need to occur to determine whether a planned site-specific action is below the maximum impacts described in RP/EA#4 (AL TIG 2023). If the site-specific action is below the maximum impacts described in this RP/EA, the analysis of the effects will be documented and reviewed by the Implementing Trustee, and the action will proceed. Any associated documentation will be routed through the Alabama TIG to the administrative record, where it will be publicly available. If the evaluation of the planned site-specific action indicates the effects are likely to exceed the maximum impacts described in this RP/EA, the AL TIG will undertake additional site-specific environmental review consistent with the National Environmental Policy Act (NEPA) requirements and other requirements for protection of the environment. The AL TIG does not propose to take actions that would result in any significant adverse impacts on the environment.

1.4 Potential Sources of Uncertainty

Although the likelihood of project success is evaluated under the OPA regulations (15 CFR § 990.54(a)(3)), uncertainties may exist regarding how to best implement projects to achieve the greatest benefits for the injured resources. These uncertainties may arise from an incomplete understanding of the current conceptual setting; from unknown conditions in the future; or from project elements that do not perform as anticipated (e.g., sediment compaction or vegetation success). For the Puppy Creek – Juniper Creek-Big Creek Nutrient Reduction Project, the uncertainties (summarized in Table 1) could affect project success and could therefore be key drivers of corrective actions or adaptive management decisions. The below sections summarize project monitoring protocols and describe how this information will be used to inform adaptive management to address these uncertainties.

Potential uncertainties are defined as those that may affect the ability to achieve stated project restoration objective(s). To aid in the identification of uncertainties, Trustees utilized a variety of sources, including but not limited to PDARP/PEIS Restoration Type MAM sections (DWH Trustees 2016), Monitoring and Adaptive Management Procedures and Guidelines Manual Version 2.0, Updated December 2021 (DWH Trustees 2021), and other documents. Select monitoring activities can then be implemented to inform these uncertainties and to select appropriate corrective actions in the event the Project is not meeting its performance criteria (Table 1).

Table 1. Key Uncertainties

Reference Number	Key Uncertainty	Description on How the Uncertainty Could Impact Project Success and/or Decision Making
1	Willingness of landowners to participate	Based upon early engagement, it is assumed that the USDA would be able to attract farmers and landowners to participate in the development and implementation of BMPs/CPs. However, there is always a level of uncertainty in eventual participation. A lack of participation by landowners would impact the overall goals of nutrient and sediment loading reduction in the watershed.
2	Linkages between water quality improvements and ecosystem benefits	Linkages in this specific watershed to water quality and ecosystem health are not fully understood. It may be possible that specific projects do not result in immediate or significant improvements to ecosystem health.
3	Pollutant transport and freshwater flow through Gulf coastal watersheds	With increased flooding events, freshwater flow regimes through the watershed may change, which may alter the effectiveness of specific projects. Changes in flow patterns could result in additional nonpoint source water quality impacts to occur.
4	Degree to which local improvements in water quality contribute to water quality improvements downstream	The degree to which local improvements in water quality at the cropland and grazing land to water quality improvements downstream is not fully known at this time. If the linkages are not strong, then Project implementation may not be able to significantly reduce sediment and nutrient loading in the watershed.

As the projects are implemented and ongoing success monitoring is conducted, project uncertainties may become apparent. Additional discussion and specific details regarding how uncertainties may affect the Project should be added to this MAM plan.

2.0 Project Monitoring

The MAM Plan was developed to evaluate project performance, key uncertainties, and potential corrective actions, if needed, after the Project's execution. The monitoring data collected will also be used to predict the Project's performance during the project's design life. The implementation of conservation practices in agricultural and forestry landscapes are well-known management actions that reduce nonpoint source pollutant loads of nutrients and sediment impacting downstream receiving waters (Baker et al., 2018). Conservation practices would follow the USDA paradigm of avoid, control, and trap. Thus, practices are designed to reduce erosion, slow runoff velocities, and increase hydraulic residence time within the field or tract, and/or edge of field, all which are imperative to the physical, chemical, and biological processes that decrease nutrient and sediment loadings (Barlow and Kröger, 2014). Utilizing model outputs as well as observational data, conservation practices can be targeted into small watershed areas to produce measurable decreases in nutrients and sediments from the field itself, as well as within the downstream receiving water body. Reducing nutrient and sediment loads to the system is imperative for the functionality of in-stream habitats that are used by aquatic organisms to fulfill critical life history cycles.

Though additional measures may be implemented to more fully characterize the Project's effectiveness, the AL TIG proposes the continued implementation of proven and established monitoring methodologies to monitor project success:

- Parameter #1: Number of installed CPs and BMPs on cropland and grazing land
- Parameter #2: Number of Contracts (if different from number of installed CPs
- Parameter #3: Reduction in TN and TP from cropland and grazing land
- Parameter #4: Reduction in TSS and turbidity from cropland and grazing land

For each of the identified monitoring parameters, information is provided as to their intended purpose (e.g., monitor progress toward meeting one or more of the restoration objectives, support adaptive management of the project, etc.), monitoring methods, timing and frequency, duration, sample size, and sites (Table 2). Further, these parameters will be monitored to demonstrate how the restoration project is trending toward the performance criteria and to inform the need for corrective actions (see Table 2, and Section 5, Project-Level Decisions). In addition to monitoring the overall Project, as well as specific projects implemented with landowners, the Monitoring and Adaptive Management Procedures and Guidelines Manual Version 1.0, Updated (DWH Natural Resource Damage Assessment Trustees 2019) recommends project-level monitoring be conducted at reference or control sites. Throughout project implementation, project team members, and USDA partners, will have the opportunity to refine design parameters as additional information becomes available. Performance criteria will be identified/implemented to determine restoration success or the need for corrective action in accordance with 15 CFR 990.55(b)(1)(vii)).

Table 2. Project objectives, parameters, data collection activities, performance criteria and potential corrective actions.

Project Objective	Parameter(s)	Method	Timing and frequency of data collection	Sample size/sites	Performance Criteria	Potential Corrective Actions
Reduce sediment, phosphorus, and nitrogen loads during storm events leaving private lands in the Puppy Creek-Juniper Creek-Big Creek watershed	Number of installed conservation practices (CPs) and best management practices (BMPs) on cropland and grazing land.	The recommended methodology for monitoring this parameter is to count the number of improvements implemented at each cropland and grazing as part of the Project. Monitoring of this parameter should occur on-site through direct observation of the implemented CPs and BMPs. One observation is sufficient to record this parameter; follow-up visits to the participating cropland and pastureland for data collection would not be necessary, unless changes to the CPs and BMPs are made after initial implementation.	Throughout the implementation period of specific projects, and after construction of CPs/BMPs on the landowner(s) property.	To be determined	Increased number of installed CPs and BMPs on cropland and grazing land	Adding additional CPs and BMPs to participating agricultural operations, as necessary, to reduce nutrient loading to the Gulf Coast. Increase outreach or approach previously unwilling partners a second time.
	Reduction in total nitrogen (TN) and total phosphorus (TP) in receiving waters cropland and grazing land.	The recommended methodology for monitoring this parameter is direct sampling and detection to measure the sum of all forms of phosphorus and nitrogen, including organic and inorganic forms. Guidance for specific water sampling methodology to measure TN can be found in the American Society for Testing and Materials (ASTM) D5176 Volumes 11.01 and 11.02 and the USGS National Field Manual for the Collection of Water-Quality Data (ASTM 2013a, 2013b;	To be determined	Sample Size: To be determined Sites: To be determined	Identifiable reduction in TN and TP from cropland and grazing land Need baseline data and/or modeling to compare final vs. initial	Improving project infrastructure (e.g., installing additional wastewater treatment CPs and BMPs). Conducting routine maintenance activities (e.g., cleaning and maintaining waste separators and associated filters)

		USGS variously dated). For guidance on potential methodologies to measure TP, see the US EPA Methodologies 300.0, 365.2, 365.3, and 300.1 (EPA 1997, 1993a, 1971a, 1978). Also, for additional guidance see the Standard Methodologies 4110C and 4110B, and the United States Geological Society (USGS) Methodology for Evaluation of Alkaline Persulfate Digestion as an Alternative to Kjeldal Digestion for Determination of Total and Dissolved Nitrogen and Phosphorus in Water (National Environmental Methods Index 2011a, 2011b; USGS 2003). Additional information would also be collected when sampling for TN and total phosphorus TP, such as loads (i.e., water level and flow), depth of the sample, and collection method. Further, ammonium nitrogen (NH4-N), nitrite plus nitrate nitrogen (NO2-N + NO3-N), and total Kjeldahl nitrogen (TKN) could be analyzed from the samples. Data collection and calibration procedures of detection instruments would be determined by the respective instrument's quality assurance and quality control (QA/QC) procedures. At this time, the exact locations, types, and amounts of CPs and BMPs are unknown; therefore, it is impossible to establish exact				

		sampling methodologies and guidance in the first version of this MAM plan. However, the project specific planning, engineering, and design documents would outline the specifics necessary to update this MAM plan to include the locations, frequencies, sample size, and durations of sampling for this monitoring parameter.				
	Reduction in TSS and turbidity from cropland and grazing land	The recommended methodology for monitoring this parameter is direct sampling and detection to measure the TSS and turbidity. TSS is defined as the dry weight of sediment from the known volume of a sub-sample of the original water sample and is measured as milligrams per liter (mg/L) or parts-per-million (ppm). Turbidity is defined as a measure of intensity of light scatter by a sample, or the cloudiness/haziness of a sample. For methods on collection of TSS, see EPA 160.2, and for methods on assessing water turbidity see EPA 180.1 (EPA 1971b; EPA 1993b) and Wagner et al. (2006). Data collection and calibration procedures of detection instruments would be determined by the respective instrument manual(s) and QA/QC of the Trustee over monitoring.	To be determined	To be determined	Identifiable reduction in TSS and turbidity from cropland and grazing land Need baseline data and/or modeling to compare final vs initial	Improving project infrastructure (e.g., installing additional wastewater treatment CPs and BMPs). Conducting routine maintenance activities (e.g., cleaning and maintaining diversion channels to increase the effectiveness of TSS reduction)

	Number of Contracts (if different from number of installed CPs/BMPs)	The recommended methodology for monitoring this parameter is to count the number of contracts (landowners signed onto the program).	Throughout the implementation period of specific projects.	To be determined	Number of contracts continue to grow on a yearly basis.	Additional outreach to landowners, continued education and communication with communities within the four 12-digit HUCs.

3.0 Adaptive Management

Monitoring information collected at the project-level can also inform adaptive management (a form of structured decision-making applied to the management of natural resources in the face of uncertainty of that individual project) (Pastorok et al. 1997; Williams 2011). Adaptive Management was identified as one of the Trustee programmatic restoration goals in the Final PDARP/PEIS. As described in Chapter 5, Appendix E of the Final PDARP/PEIS, the Trustee Council, including the AL TIG, has committed to a MAM Framework to support restoration activities, including determining the need for corrective actions through supported compliance and success monitoring.

Adaptive management will occur for the Project throughout the entire project lifecycle. If negative impacts from the projects occur, or if the projects are unable to attract landowners, adaptive management may be necessary to ensure the projects' goals and objectives are achieved. The focus for adaptive management is on identifying and, where possible, reducing those uncertainties that affect the decisions within the scope of the projects. If not addressed, uncertainties may delay the time it takes to achieve the restoration objectives or hinder the projects' ability to fully achieve their objectives.

The projects activities proposed under the Puppy Creek – Juniper Creek-Big Creek Nutrient Reduction Project would use previously established types of CPs and BMPs. USDA has demonstrated success in developing and implementing the same types of CPs within similar watersheds across the Gulf Coast. Examples of past successful water quality restoration projects include regional watershed management plans, state Clean Water Act (CWA) 319 programs, and USDA conservation programs (i.e., EQIP, Conservation Reserve Program, Wetlands Reserve Program, Wildlife Habitat Incentives Program). Additionally, the USDA conservation programs, and the US EPA have funded the successful implementation of agriculture CPs throughout the nation, resulting in significant reductions in nutrient loadings to water bodies nationwide.

4.0 Evaluation

Project MAM includes planned evaluations of the selected parameters (see Table 2) throughout the project's lifetime. Evaluation of monitoring data is needed to assess the project implementation and performance in meeting restoration objectives, resolving uncertainties to increase understanding, and determining whether corrective actions are needed. The monitoring data would be used to answer the following questions:

- Were the project restoration objectives achieved? If not, is there a reason why they were not met?
- Did the restoration project produce unanticipated effects?
- Were there unanticipated events unrelated to the restoration project that potentially affected the monitoring results (e.g., hurricanes)?
- Were any new uncertainties identified?

By thoughtfully designing evaluation methods for the design and implementation of project restoration activities, the project team can assess if the project is meeting its restoration objectives and could determine the need for adaptive management or corrective actions. Project performance would be assessed against the following performance criteria, all of which are quantitative and based on the projects' goals and objectives:

- Increase in the number of nutrient reduction CPs and BMPs on cropland and grazing land.
- Targeted reduction (percent nutrient reduction over time) of instream TN and TP on cropland and grazing land.
- Targeted reduction (percent nutrient reduction over time) of instream of TSS and turbidity on cropland and grazing land.
- Increased number of contracts over time (if different from number of installed CPs/BMPs).

To properly establish if the BMPs/CPs are achieving nutrient reduction, pre-construction evaluations would need to occur. Pre-construction water quality monitoring would provide baseline information on the project-specific nutrient loads entering the ecosystem from the cropland and grazing land. Using the baseline data, USDA will be able to gauge whether targeted reduction of TN, TP, and TSS is occurring as a result of project implementation. Because the details of the proposed monitoring regimes are unknown, the following methods for analyzing, evaluating, and interpreting the monitoring data collected for the Project could include the following:

- <u>Data summarization and characterization:</u> This analysis would include calculation of the basic statistics of the monitoring data (e.g., linear regression of TN) within the proposed sampling location(s). This information would form the basis for a more comprehensive analysis (if needed). Data from this analysis can be presented in both graphical and tabular formats.
- <u>Status determination:</u> This evaluation would help determine if the projects are meeting their performance criteria. Observed values from the monitoring efforts would be compared to the performance criteria and perhaps to observed historical values. For example, if the monitoring results indicate that there is an increase in TSS and turbidity entering the nearest waterway, there may be an issue with the CPs and BMPs, or increased agricultural use on the site. This evaluation methodology would involve both expert interpretation and statistical analysis.
- <u>Trends evaluation:</u> This evaluation methodology can be used to address whether there is a change in nutrient loading and water quality over time. This analysis can inform how trends form, and if those trends are randomly occurring.

Specific analysis methods would be applied to all of the monitoring parameters once the specific projects are designed and implemented. At that time, this MAM plan would also be updated to include project-specific information.

5.0 Project-Level Decisions: Performance Criteria and Potential Corrective Actions

The AL TIG describes how updated knowledge gained from the evaluation of monitoring data will be used at the project-level to determine whether the Project is considered successful or whether corrective actions are needed. A project may not be achieving its intended objectives because of previously identified key uncertainties, unanticipated consequences, previously unknown conditions, or unanticipated environmental drivers. The decision to implement (or not implement) corrective actions is one type of decision within the larger adaptive management decision-making framework.

Learning through monitoring allows for corrective actions to be made to achieve desired outcomes. Table 2 identifies performance criteria, monitoring parameters, and potential corrective actions that could be taken if the performance criteria are not met (as defined in NRDA regulations (15 CFR 990.55(b)(1)(vii)). This table should not be considered all encompassing; rather, it represents a listing of potential actions for each individual parameter to be considered if the Project is not performing as expected once implemented. Other corrective actions may be identified post-implementation and included in an operations and maintenance (O&M) plan. The decision of whether or not a corrective action should be implemented for the Project should consider the overall outcomes of the restoration project (i.e., looking at the combined evaluation of multiple performance criteria) in order to understand why project performance deviates from the predicted or anticipated outcome. Corrective action may not be taken in all cases based on such considerations. The knowledge gained from this process could also inform future restoration decisions such as the selection, design, and implementation of similar projects.

6.0 Monitoring Schedule

The schedule for the project monitoring is in Table 3, separated by monitoring activity. The duration of monitoring activities will be determined upon completion of the individual landowner projects and prior to implementation of this MAM plan. This information will be added and revised as needed whenever monitoring methods are refined or revised. However, monitoring the effectiveness of BMPs/CPs on agricultural lands on water quality can take many years. It is possible that future iterations of this MAM plan would include long-term monitoring requirements, estimated to be 5 years.

Table 3. Monitoring Schedule

Monitoring Parameters	Monitoring Time Frame		
	Pre Construction and Planning	Construction	Post Construction
Number of installed CPs and BMPs on cropland and grazing land			X
Reduction in TN and TP from cropland and grazing land	X		X
Reduction in TSS and turbidity from cropland and grazing land	X		X
Number of Contracts	X		X

7.0 Data Management

To the extent practicable, all environmental and biological data generated during monitoring activities will be documented using standardized field datasheets. If standardized datasheets are unavailable or not readily amendable to record project-specific data, then project-specific datasheets will be drafted prior to conducting any project monitoring activities. Original hard copy datasheets and notebooks and photographs will be retained by the implementing Trustee.

Relevant project data that are handwritten on hard copy datasheets or notebooks will be transcribed (entered) into standard digital format. If digital files are recorded (via ipad or tablet), the data will be downloaded into the standard format. All field datasheets and notebook entries will be scanned to PDF files. Electronic data files should be named with the date on which the file was created and should include a ReadMe file that describes when the file was created and by whom and any explanatory notes on the file contents. If a data file is revised, a new copy should be made, including explanation of the need for the revision, and the original preserved.

All data will have properly documented FGDC/ISO metadata, a data dictionary (defines codes and fields used in the dataset), and/or a Readme file as appropriate (e.g., how data were collected, quality assurance/quality control [QA/QC] procedures, and other information about data such as meaning, relationships to other data, origin, usage, and format—can reference different documents).

7.1 Data Review and Clearance

Data will be reviewed for QA/QC in accordance with the *Monitoring and Adaptive Management Procedures and Guidelines Manual Version 1.0, Updated 2021* (DWH Natural Resource Damage Assessment Trustees. 2021), and any errors in transcription will be corrected. Implementing Trustees will verify and validate data and information and will ensure that all data are entered or converted into agreed upon/commonly used digital format and labeled with metadata following FGDC/ISO standards to the extent practicable and in accordance with implementing Trustee agency requirements.

After all identified errors are addressed, the implementing Trustee will give the other AL TIG members time to review the data before making such information publicly available (as described below). Before submitting the monitoring data and information package, co-implementing Trustees shall confirm with one another that the package is approved for submission and will then be considered cleared.

7.2 Data Storage and Accessibility

After data have been cleared, they will be submitted to the DIVER Restoration Portal. Trustees will provide DWH NRDA MAM data and information to the Restoration Portal as soon as possible, and no more than 1 year from when data are collected.

7.3 Data Sharing

Data will be made publicly available in accordance with the Federal Open Data Policy through the DIVER Restoration Portal and the Deepwater Horizon NRDA Trustees website.

8.0 Reporting

Reporting should follow the guidelines set forth in Section 2.6.3 and Attachment D of the MAM Manual (DWH Trustees 2021). Information to be reported includes the following:

1. An introduction that provides an overview of the project, location, and restoration activities, as well as restoration objectives and performance criteria applicable to the project
    a. This information can be taken from this MAM plan and repeated in all reports.
2. A detailed description of the methods used for implementation of the MAM

    a. This information can be taken from this MAM plan and repeated in all reports.
3. Results from the reporting period, or, in the case of the final report, a comprehensive summary of results from the entire MAM plan implementation period.
    a. Results should be presented clearly and show progress that has been made toward performance criteria and/or restoration objectives. Information that can be used to present results includes tables or graphs, site visit summaries, and other datasets that support analysis of the project's progress toward meeting performance standard.
4. A discussion of the results (optional for interim reports, required for final report).
5. Conclusions that summarize the findings, progress toward meeting performance criteria and restoration objectives, and recommendations for corrective actions (optional for interim reports, required for final report).
6. Project highlights showcasing lessons learned to inform future project planning and implementation.
7. Transmission of data and meta-data used in the report, as well as a description of all data collected during the reporting period, even if they were not used in the report
8. A complete list of references

The first report would be submitted after the completion of pre-construction monitoring of a proposed project. Subsequent reports would be submitted after the completion of post-construction monitoring. The number of reports would be dependent on the CPs and BMPs installed, and other project-specific details (such as location) that are not known at this time. This MAM plan would be updated once the project-specific information is understood.

9.0 Roles and Responsibilities

The AL TIG is responsible for addressing MAM objectives that pertain to their restoration activities and for communicating information to the Trustee Council or Cross-TIG MAM work group. The USDA will be the Implementing Trustee. The implementing Trustees' roles include:

- Data collection
- Data analysis
- Report composition
- Ensuring corrective action activities are performed, if necessary
- Providing project progress information to the AL TIG

10.0 References

American Society for Testing and Materials (ASTM). 2013a. Annual Book of ASTM Standards, Section 11, Water and Environmental Technology, Volume 11.01, Water (I). Conshohocken, Pennsylvania: American Society for Testing and Materials.

______. 2013b. Annual Book of ASTM Standards, Section 11, Water and Environmental Technology, Volume 11.02, Water (I). Conshohocken, Pennsylvania: American Society for Testing and Materials.

Baker, B.H.; Prince Czarnecki, J.M.; Omer, A.R.; Aldridge, C.A.; Kröger, R.; and, J.D. Prevost. 2018. Journal of Soil and Water Conservation January 2018, 73 (1) 75-85; DOI: https://doi.org/10.2489/jswc.73.1.75

Baird, E.W., A.D. Eaton, and E.W. Rice. 2017. Standard Methods for the Examination of Water and Wastewater, 23rd Edition. American Public Health Association, American Water Works Association, and Water Environmental Federation.

Barlow, Jeannie & Robert Kroger. 2014. Nitrogen transport within an agricultural landscape: Insights on how hydrology, biogeochemistry, and the landscape intersect to control the fate and transport of nitrogen in the Alabama Delta. Journal of Soil and Water Conservation. 69. 11A-16A. 10.2489/jswc.69.1.11A.

Deepwater Horizon Oil Spill Trustees (DWH Trustees). 2016. Deepwater Horizon Oil Spill: Final Programmatic Damage Assessment and Restoration Plan and Final Programmatic Environmental Impact Statement (Final PDARP/PEIS). Available at: http://www.gulfspillrestoration.noaa.gov/restoration-planning/gulf-plan. Accessed November 10, 2021.

_____. 2021. Monitoring and Adaptive Management Procedures and Guidelines Manual Version 2.0, Updated. Appendix to the Trustee Council Standard Operating Procedures for Implementation of the Natural Resource Restoration for the DWH Oil Spill. December 2019. Available: http://www.gulfspillrestoration.noaa.gov/. Accessed November 1, 2021.

DWH NRDA Trustees. 2017a. “Monitoring and Adaptive Management Procedures and Guidelines Manual Version 1.0.” Appendix in *Trustee Council Standard Operating Procedures for Implementation of the Natural Resource Restoration for the DWH Oil Spill*. December. www.gulfspillrestoration.noaa.gov/

National Environmental Methods Index. 2011a. Standard Method 4110C: Anions in Water by Ion Chromatography. Available at: https://www.nemi.gov/methods/method_summary/5705/. Accessed January 25, 2018.

______. 2011b. Standard Method 4110B: Anions in Water by Ion Chromatography with Chemical Suppression of Eluent conductivity. Available at: https://www.nemi.gov/methods/method_ summary/7428/. Accessed January 25, 2018.

National Oceanic and Atmospheric Administration Deepwater Horizon (DWH) Data Management Team. n.d. DIVER Portal-DWH Restoration User Manual.

Pastorok, R.A.; MacDonald, A.; Sampson, J.R.; Wilber, P.; Yozzo, D.J.; Titre, J.P. (1997) An ecological decision framework for environmental restoration projects. Ecological Engineering. 9(1-2):89-107.

U.S. Environmental Protection Agency (EPA). 1971a. Method 365.2, Phosphorous, All forms (Colorimetric, Ascorbic, Acid, Single Reagent). Available at: http://monitoringprotocols.pbworks.com/f/EPA365_2.pdf. Accessed January 25, 2018.

______. 1971b. Method 160.2: Residue, Non-Filterable (Gravimetric, Dried at 103-105℃). Available at: http://www.caslab.com/EPA-Methods/PDF/EPA-Method-160-2.pdf. Accessed January 25, 2018.

______. 1978. Method 365.3, Phosphorous, All forms (Colorimetric, Ascorbic, Acid, Single Reagent). Available at: http://www.caslab.com/EPA-Methods/PDF/EPA-Method-3653.pdf. Accessed January 25, 2018.

______. 1993a. Method 300.0, Determination of Inorganic Anions by Ion Chromatography. Revision 2.1. Available at: https://www.epa.gov/sites/production/files/2015-08/documents/method_300-0_rev_2-1_1993.pdf. Accessed January 25, 2018.

_______. 1993b. Method 180.1: Determination of Turbidity by Nephelometry. Available at: https://www.epa.gov/sites/production/files/2015-08/documents/method_180-1_1993.pdf. Accessed January 25, 2018.

_______. 1997. Method 300.1, Determination of Inorganic Anions in Drinking Water by Ion Chromatography. Revision 1.0. Available at: https://www.epa.gov/sites/production/files/2015-06/documents/epa-300.1.pdf. Accessed January 25, 2018.

_______. 2002. Method 1604: Total Coliforms and Escherichia Coli in Water by Membrane Filtration Using a Simultaneous Detection Technique (MI Medium). EPA-821-R-02-024. Washington, DC.: U.S. Environmental Protection Agency, Office of Water.

_______. 2004. Standard Method 9223B: Enzyme Substrate Coliform Test. Available at: https://www.standardmethods.org/store/ProductView.cfm?ProductID=313. Accessed January 25, 2018.

_______. 2017. Clean Water Act Methods Update Rule – Final Rule. Table 1H – List of Approved Microbiological Methods for Ambient Water. August 28, 2017. Federal Register 82(165):40867–408768.

U.S. Geological Survey (USGS). Variously dated. National Field Manual for the Collection of Water-Quality Data. U.S. Geological Survey, Techniques and Methods, Book 9, Handbooks for Water-Resources Investigations. Available at: http://pubs.water.usgs.gov/twri9A. Accessed January 25, 2018.

——. 2003. Methods of Analysis by the U.S. Geological Survey National Water Quality Laboratory—Evaluation of Alkaline Persulfate Digestion as an Alternative to Kjeldahl Digestion for Determination of Total and Dissolved Nitrogen and Phosphorus in Water. Available at: https://nwql.usgs.gov/Public/pubs/WRIR03-4174/WRIR03-4174.pdf. Accessed January 25, 2018.

Wagner, R.J., R.W. Boulger Jr., C.J. Oblinger, and B.A. Smith. 2006. Guidelines and Standard Procedures for Continuous Water-Quality Monitors: Station Operation, Record Computation, and Data Reporting. U.S. Geological Survey. Available at: http://pubs.water.usgs.gov/tm1d3. Accessed January 29, 2018.

Williams, B.K. (2011) Adaptive management of natural resources – framework and issues. Journal of Environmental Management. 92(5): 1346-1353.

12.0 MAM Plan Revision History

Old Version #	Revision Date	Reason for Change	New Version #

H-6: MONITORING AND ADAPTIVE MANAGEMENT PLAN FOR DEEPWATER HORIZON NRDA PROJECT
Stewardship of Coastal Alabama Beach Nesting Bird Habitat

1. PROJECT OVERVIEW

The Gulf Coast region supports a diversity of coastal bird species throughout the year, as nesting grounds during the summer, as a stopover for migrating species in the spring and fall, and as winter foraging and sheltering habitat for numerous species that breed elsewhere.

This project would expand on existing work in coastal Alabama by reducing human disturbance to and predation of nests and chicks of coastal nesting bird species injured by the DWH oil spill, thereby potentially increasing productivity of those species. These techniques have been identified by the DWH Trustees in the Strategic Framework for Bird Restoration Activities (DWH NRDA Trustees, 2017a). This proposed five-year project would complement the work of similar initiatives in the Gulf of Mexico in Florida, Mississippi, Louisiana, and Texas. ADCNR would be the implementing Trustee; USDOI would be a collaborating agency.

The program would consist of five components that would work together to reduce stressors that affect coastal bird populations and provide information to support future restoration decision-making. Specific activities and target locations may vary from year to year based on a number of factors including, but not limited to: where nesting occurs, where evidence of stressors is detected, what management activities are most successful at each area, and where project implementers are able to gain access (some nesting areas may be located on private property and will require authorization from landowners to access). Proposed initial target project areas and restoration actions are listed in Table 3.

a. **Conduct stewardship activities to reduce human disturbances that contribute to nest failure.** Human disturbance is of particular concern for beach nesting birds in coastal Alabama because of the popularity of Alabama's beaches for recreational activities. This disturbance often leads to seasonal nest or colony abandonment in local areas, resulting in egg loss and chick mortality. Reducing anthropogenic disturbance at important nesting areas can support success (Burger et al., 2004; DWH Trustees 2016a; Larson et al., 2016; McGowan and Simons, 2006; Molina and Erwin, 2006; Pruner et al., 2011). A primary element of the proposed program would involve reducing human disturbance in target nesting areas to improve local productivity. Species that would benefit from this project include the least tern (*Sternula antillarum*), black skimmer (*Rynchops niger*), snowy plover (*Charadrius nivosus*), and Wilson's plover (*Charadrius wilsonia*). Project implementers would install symbolic (temporary post and rope) and/or exclusionary fencing around nesting areas prior to the start of the nesting season to reduce human ingress and disturbance. While on site, implementers may also work to educate and guide beachgoers away from sensitive nesting areas. Implementers could also engage the public by providing opportunities to observe birds from a safe distance using viewing scopes into nesting areas for the public to observe adults incubating eggs and/or feeding small, flightless chicks from a safe distance. These activities would serve to encourage protective behavior by the public, further reducing disturbance.

b. **Conduct targeted, coordinated predator management activities.** Site-specific predator management strategies can help increase bird productivity where predators are among the primary causes of nest or fledgling mortality (Greer et al., 1988; Saalfield et al., 2011). The City of Orange Beach, for example, is currently implementing a predator management strategy on islands in Perdido Bay focused on the management of red fox and coyote, and BSNWR is planning coyote removal from targeted units at strategic times to facilitate beach nesting bird production. This project would coordinate with these activities to help refine beach nesting bird predator management activities. Funding would support continued predator management efforts at BSNWR and in the City of Orange Beach and begin predator management activities on Dauphin Island and/or other sites where needed.

c. **Conduct monitoring in support of adaptive management at project sites to determine nesting and fledging success.** Monitoring critical nesting sites, assessing nest success, and determining breeding densities provides insight into the status of Alabama breeding populations for the above-referenced species, all of which are listed as Alabama Species of Conservation Concern (ADCNR 2015). Nesting activity and evidence of predator activity would be monitored following Pruner et al. (2011) or another appropriate method that facilitates consistent data collection across similar projects in the Gulf region. In addition to bird numbers and breeding productivity, monitoring would also quantify and assess the number of acres treated with fencing, education, predator reduction; quantify and assess habitat quality, degree of predator activity, extent of human disturbance, and number of people reached with outreach and education activities. These data would help inform Trustees' understanding of coastal ecosystem health and the extent of human-induced threats. Project implementers would coordinate routinely to discuss adaptive management of posted areas (e.g., shifting or expanding a posted area).

d. **Deploy decoys.** Species-specific decoys would be deployed to attract target bird species to suitable nesting areas (e.g., lower risk of human disturbance or predation and that contain natural cover and forage access for adults and chicks). In some cases, species are nesting in areas of high human traffic or predation, which increases the likelihood of nest failure. Deploying decoys to areas that are not currently used for nesting, but are deemed suitable habitat, would potentially encourage target species to use habitat that experiences reduced stressors associated with nest or fledgling mortality. Decisions regarding specific deployment locations would be made in coordination with ADCNR and USDOI experts prior to implementation.

e. **Conduct habitat and nesting area enhancements.** The City of Orange Beach actively manages a number of islands in the Perdido area for bird species, including least tern, black skimmer, and great blue heron. The project would increase the size of a current least tern nesting area by removing vegetation and installing/distributing shell hash. Vegetation plantings are also proposed and would include a variety of native trees and shrubs and coastal dune grasses on Robinson and Walker Islands. The project would also repair/replace signage and perch posts as needed in Submerged Aquatic Vegetation (SAV) beds to deter boat traffic in areas that serve as foraging habitat for birds.

1.1 Restoration Type Goals and Project Restoration Objectives

- **Programmatic Goal:** Replenish and protect living coastal and marine resources.
- **Restoration Type:** Birds
- **Restoration Type Goal:** Restore lost birds by facilitating additional production and/or reduced mortality of injured bird species.
- **Restoration Approaches:** Establish or re-establish breeding colonies. Protect and conserve marine, coastal, estuarine and riparian habitats.
- **Restoration Technique(s):** Use decoys to attract breeding adults to potential breeding sites. Develop and implement management actions in conservation areas and/or restoration projects. Conduct stewardship activities to address anthropogenic stress.

Objective 1: Reduce anthropogenic disturbances to colonial beach nesting birds and solitary beach nesting birds.

Objective 2. Reduce threats to birds from mammalian predators.

Objective 3. Conduct habitat enhancements in nesting areas.

Objective 4. Monitor nesting and fledging success at select sites.

1.2 Conceptual Setting and Anticipated Outcomes

A conceptual model forms the basis of this monitoring plan, and includes a summary of the project activities, the expected product or output of those activities and the desired project outcome. The purpose of the conceptual setting within a Monitoring and Adaptive Management (MAM) Plan is to identify, document and communicate interactions and linkages among system components at the project site and to understand how these system components may be affected by associated restoration actions.

Table 1: Conceptual Model

<table>
<tr><th>Activity</th><th>Output</th><th>Short-term outcome</th><th>Long-term outcomes</th></tr>
<tr><td>Install symbolic fencing and conduct outreach at select nesting areas</td><td>Deter human disturbance and educate visitors</td><td>Reduce anthropogenic disturbance</td><td rowspan="5">• Enhanced bird reproductive success
• Enhanced habitat quality and availability for target bird species
• Enhanced bird forage base
• Enhanced bird diversity
• Improved resiliency and sustainability of coastal habitat</td></tr>
<tr><td>Conduct predator management activities at select nesting sites</td><td>Remove predators</td><td>Reduce stress/mortality to nests/young/adults</td></tr>
<tr><td>Monitor nesting and fledging success at select sites.</td><td>New information to understand potential benefits of restoration actions and inform future restoration decision-making</td><td>Increase knowledge of the most effective restoration techniques for beach nesting birds</td></tr>
<tr><td>Apply alternative site attraction</td><td>Deploy decoys deployed to selected suitable habitats</td><td>Attract birds to nest in more suitable habitats</td></tr>
<tr><td>Prepare sites with suitable vegetation/shell hash, install signage, and deploy decoys.</td><td>Habitat enhancements are completed</td><td>Enhanced habitat quality/quantity</td></tr>
</table>

1.3 Sources of Uncertainty

Drivers are outside forces, natural or anthropogenic, that have the potential to influence the outcomes of a restoration project (DWH Trustees 2017: Section E.6.3). Drivers tend to be large-scale, long-term forces that are not easily controlled at the scale of a single restoration project (Harwell et al. 2016).

When evaluating the proposed project, the following outside drivers and stressors were considered:

- Sea level rise
- Catastrophic weather
- Human disturbance
- Predators

This list should not be considered exhaustive; additional drivers may be identified as the project is implemented and/or monitored. These drivers may affect the achievement of the restoration goals and objectives of the project. For example, if the intensity and frequency of hurricanes increase in the region, or if there is an increase in the rate of sea level rise, nesting areas could be impacted. The target species for this project are highly vulnerable to disturbance because they commonly forage and nest in areas that are also highly utilized by humans, and are located in areas that are susceptible to weather disturbance events such as hurricanes (Enwright et al., 2017). If any drivers and/or stressors are negatively impacting the project, adaptive management may be necessary to ensure the project's goals and objectives are being achieved. The adaptive management strategy for the project is outlined below.

Uncertainties or information gaps have the potential to affect adaptive management decisions for individual or multiple restoration projects. These decisions may include how to improve the likelihood of achieving favorable project outcomes or selecting corrective actions in the event a project is not performing as intended. The following are example uncertainties that may be applicable to this project. This list should not be considered exhaustive; additional uncertainties may be identified as many uncertainties exist around bird responses to various restoration techniques (NAS 2017).

- Land use changes
- Whether people respond positively to stewardship efforts to reduce disturbance
- Frequency of high intensity overwash or nest site flooding
- Short-and long-term fate of natural and/or placed material
- Natural variability in ecological and physical processes, such as wave-driven transport or vegetation growth, and in the associated habitat responses
- Effect of predator management on nesting success

2. PROJECT MONITORING, PERFORMANCE CRITERIA, POTENTIAL CORRECTIVE ACTIONS AND MONITORING SCHEDULE

The proposed monitoring plan for this restoration project was developed to evaluate project performance, key uncertainties, and identify potential corrective actions, if needed. For each of the monitoring parameters identified below, information is provided on the intended purpose of each monitoring parameter (e.g., monitor progress toward meeting one or more of the restoration objectives, regulatory compliance, support adaptive management of the project), monitoring methods, timing and frequency, duration, sample size, and sites. This section also describes applicable performance criteria and potential corrective actions for project parameters associated with project objectives. The decision-making process requires a structured approach for incorporating new information gained from monitoring and evaluation. As specified in the NRDA regulations, performance criteria are used to determine restoration success or the need for corrective action (15 CFR 990.55(b)(1)(vii)). However, unanticipated consequences, previously unknown conditions or unanticipated environmental drivers uncovered during the evaluation step may also determine the need for corrective actions. The decision to implement a corrective action will holistically consider the overall outcomes of the restoration project by assessing the results of all monitoring parameters compiled in the evaluation step.

The monitoring parameters below are directly related to assessing the performance of the proposed project activities, which include predator management, active stewardship, decoy deployment and habitat enhancements.

The ALTIG is taking an adaptive approach to this project in order to maximize benefits over time. The ALTIG has preliminarily identified a number of potential target locations based on previous nesting data compiled under the National Fish and Wildlife Foundation Gulf Environmental Benefit Fund- funded Alabama Coastal Bird Stewardship Program (ALCBSP) (Table 3). These sites as well as the potential activities may change in Year 1 and in subsequent years depending on where target species are nesting and what management activities are determined to be most effective at a particular location. ADCNR, DOI and the selected contractor implementing the project will meet annually prior to nesting season to determine target locations and actions. In the event birds are not present in a previously identified location, new locations will be identified. In addition to site locations varying from year to year, monitoring frequency for parameters will also vary based on priority locations. For example, monitoring nests on an island may be conducted less frequently than a site that is more easily accessed. Additional parameters will be collected on standardized data sheets as part of the project; these data sheets will be appended to the MAM Plan when available. This MAM Plan will be updated on a yearly basis to reflect additional information as it is available prior to the start of nesting season. Standardized data sheets will be developed to conduct monitoring for parameters identified below.

2.1 Monitoring Parameters

Objectives	Parameter	Purpose	Method	Timing, Frequency, Duration	Performance Criteria	Potential Corrective Action(s)
1: Reduce anthropogenic disturbances to colonial beach nesting birds and solitary beach nesting birds.	Symbolic fencing and outreach	Monitor progress toward meeting the restoration objective.	Record # acres fenced; Record # hours/ people contacted and type of outreach	Monthly for the duration of the project	No human encroachment into fenced areas	Reevaluate efficacy of treatment methods to advise future efforts (e.g. add additional fencing/ outreach).
2: Address threats to birds from mammalian predators.	Prevalence of predators	Monitor progress toward meeting the restoration objective.	Visual observation of predators (photos, tracks, scat) and depredation (eggs, nests, birds)	Areas checked mornings approx. biweekly during nesting season for duration of project	Annual decreases in prevalence of predators over course of project	Reevaluate methods and results to advise future efforts.

Objectives	Parameter	Purpose	Method	Timing, Frequency, Duration	Performance Criteria	Potential Corrective Action(s)
3: Conduct habitat enhancements in nesting areas.	Vegetation % survival; Area	Monitor progress toward meeting the restoration objective.	Calculate percent survival or any planted vegetation; Calculate area of enhanced habitat through vegetation enhancements, shell hash placed and/or decoys	Baseline, then yearly for three years	Increase in habitat area and/or quality	Reevaluate methods and results to advise future efforts.
4: Conduct monitoring at select nest sites	Bird densities	Monitor progress toward meeting the restoration objective.	Visual count methods by age class as outline in FSA breeding bird protocol	Once/week throughout nesting season	Annual use of sites by breeding shorebirds	Reevaluate methods and results to advise future efforts.

Table 2: Monitoring Schedule

Monitoring Parameter	Objective(s)	Pre-Execution Monitoring	As-Built (year 0)	Project Monitoring (Years 1-3)
MONITORING PARAMETERS APPLICABLE TO ALL SITES				
Parameter 1: Symbolic fencing and outreach	**1,4**			**X**
Parameter 2: Prevalence of predators	**2**			**X**
Parameter 3: Vegetation % survival	**3**	**X**	**X**	**X**
Parameter 4: Area	**3**		**X**	**X**
Parameter 5: Bird densities	**1,2,3,4**			**X**

3. ADAPTIVE MANAGEMENT

As discussed in the PDARP/PEIS, adaptive management is a form of structured decision-making applied to the management of natural resources in the face of uncertainty (Pastorok et al. 1997; Williams 2011). It is an iterative process that integrates monitoring and evaluation of management actions with flexible decision-making, where adjustments are made to management approaches based on observed outcomes (NRC 2004). Within the context of ecological restoration, adaptive management addresses key uncertainties by linking science to restoration decision-making (Steyer & Llewellyn 2000). Although adaptive management is a critical component of the restoration plan as a whole, the need for adaptive management may vary on a project-by-project basis. Some projects may be well understood and not have uncertainties which warrant adaptive management. The monitoring and adaptive management framework may be more robust for elements of the restoration plan with high degrees of uncertainty or where numerous restoration projects are planned within a given geographic area and/or for the benefit of a particular resource (DWH NRDA Trustees 2016a, Appendix 5.E.1). Under OPA NRDA regulations, restoration projects clearly identify performance criteria that would be used to determine project success or the need for corrective action. Adaptive management should not be used for projects where learning is unlikely, where decisions are irreversible, or where no opportunity exists to revise or reevaluate decisions based on new information (Doremus et al. 2011).

This alternative has a high likelihood of improving the protection of coastal habitats that are critically important to the nesting success and reproduction of four bird species injured by the DWH oil spill. The proposed stewardship, habitat, and nesting area enhancement approaches have already been demonstrated to be effective along the Gulf Coast and around the country (Burger et al., 2004; Johnson, 2016). Predator control and management programs are a widely used tool for increasing nest success for beach nesting birds and have been implemented by federal Trustee agencies along the Gulf coast (DWH Trustees, 2013; Florida Trustee Implementation Group [FL TIG], 2019). Decoy programs of the type proposed as part of this alternative have been demonstrated effective for establishing new nesting sites for beach nesting birds (Kotliar and Burger, 1984). The Trustees anticipate the alternative's overall likelihood of success would be further improved by implementing the monitoring and adaptive management component to provide essential data for further targeting the stewardship and predator management activities over the 3-year life of the initiative.

The ALTIG is taking an adaptive approach to this project in order to maximize benefits over time. See Section 2 above for more information on this approach. The ALTIG has preliminarily identified a number of potential target locations based on previous nesting data compiled under the National Fish and Wildlife Foundation Gulf Environmental Benefit Fund- funded Alabama Coastal Bird Stewardship Program (ALCBSP) (Table 3). These sites as well as the potential activities may change in Year 1 and in subsequent years depending on where target species are nesting and what management activities are determined to be most effective at a particular location. See Section 2 above for more information related to how the ALTIG will adaptively manage the project.

Table 3: Potential Project Areas, Activities, and Species

Potential Areas	Potential Activities	Potential Species
Tern Island Pelican Island • Marsh Island • Coffee Island • Cat Island[a] • Alabama Point • BSNWR • Gulf State Park • Dauphin Island West End[a] • Lower Perdido Islands • Additional/other sites to be determined	• Erect signage • Install symbolic and/or exclusionary fencing; • Provide active stewardship to reduce human and predator disturbance; • Conduct predator management; and Install shell hash and/or plantings to encourage nesting; • Other activities as appropriate.	• Black skimmer • American oystercatcher • Least tern • Reddish egret • Brown pelican • Least tern • Snowy plover • Wilson's plover • Great blue heron • Other species as appropriate

[a] This property is currently under private ownership and would require consent and cooperation from the landowner for access. In the event that appropriate access cannot be obtained for this property, these activities would be redirected to another appropriate location if possible.

4. EVALUATION

Evaluation of monitoring data is needed to assess the performance of the project in meeting its restoration objectives, resolving uncertainties to increase understanding, and determine whether corrective actions are needed. As part of the larger decision-making context beyond the project scale, the evaluation of monitoring data from the individual projects would be compiled and assessed at the Restoration Type and TIG level, and the results would be used to update the knowledge base to inform decisions such as future TIG project prioritization and selection, implementation techniques, and the identification of critical uncertainties. The results of the analysis would be used to answer the following questions:

- Were the project objectives achieved? If not, is there a reason why they were not met?
- Did project activities undertaken produce unanticipated effects?
- Were there unanticipated events unrelated to the project that potentially affected the monitoring results (e.g., hurricanes)?
- Were any of the uncertainties identified prior to project implementation resolved?
- Were any new uncertainties identified?
- In areas where predator management activities were implemented, did nesting success increase, if nest fate was ascertained?

- Did the number of disturbance events change over time as stewardship actions were implemented?

These questions will be answered and compiled in annual monitoring reports for the project and revision to the MAM plan will be made if needed.

5. DATA MANAGEMENT

5.1 Data Description

All data collected will follow the data standards as per the MAM Manual 1.0 (DWH NRDA Trustees 2017). To the extent practicable, all environmental and biological data generated during monitoring activities will be documented using standardized field datasheets. If standardized datasheets are unavailable or not readily amendable to record project-specific data, then project-specific datasheets will be drafted prior to conducting any project monitoring activities. Original hardcopy datasheets and notebooks and photographs will be retained by the Implementing Trustee. Relevant project data that are handwritten on hardcopy datasheets or notebooks will be transcribed (entered) into standard digital format. All field datasheets and notebook entries will be scanned to PDF files. All data will have properly documented FGDC/ISO metadata, a data dictionary (defines codes and fields used in the dataset), and/or a Readme file as appropriate (e.g., how data was collected, QA/QC procedures, other information about data such as meaning, relationships to other data, origin, usage, and format – can reference different documents). Electronic data files will be named with the date on which the file was created and will include a ReadMe file that describes when the file was created and by whom, and any explanatory notes on the file contents. If a data file is revised, a new copy will be made and the original preserved.

5.2 Data Review and Clearance

After transcription of the data, a second person not associated with data transcription will perform a verification of the data in the electronic data sheets against the original hardcopy datasheets and/or notebooks and would make any corrections to transcription errors as appropriate before data are used for any analyses or distributed outside the agency. Implementing Trustees will verify and validate monitoring data and information and ensure that all data are entered or converted into agreed upon/commonly used digital format labeled with metadata. All data will undergo proper QA/QC protocols, be reviewed and verified following the process outlined in Section 3 of the MAM Manual Version 1.0. Data will be made publicly available, in accordance with the Federal Open Data Policy (Section 10.6.6 of SOP; DWH NRDA Trustees 2016b), through the DIVER Explorer Interface within a year of when the data collection occurred.

5.3 Data Storage and Accessibility

Once all data have been verified by quality assurance/quality control procedures, they will be submitted to the DIVER Restoration Portal. Trustees will provide DWH NRDA MAM data and information to the Restoration Portal as soon as possible and no more than one year from when data are collected.

5.4 Data Sharing

Data will be made publicly available, in accordance with the Federal Open Data Policy (Section 10.6.6 of SOP; DWH NRDA Trustees 2016b), through the DIVER Explorer Interface within a year of when the data collection occurred. Some data collected may be protected from public disclosure under federal and state law (e.g., personally identifiable information under the Privacy Act or observer information collected under Magnuson–Stevens Fishery Conservation and Management Act (MSFCMA), etc.) and therefore will not be publicly distributed. Data will be formatted in accordance with machine-readable acceptable formants, per the Evidence Based Policy Making Act (Public Law 115-435).

6. REPORTING

Annual MAM reports describing results of project monitoring and evaluation will be made publicly available, in accordance with the Federal Open Data Policy (Section 10.6.6 of SOP; DWH NRDA Trustees 2016b), through the DIVER Explorer Interface. A final MAM report for the project will be developed prior to project closeout and submitted to the DIVER Restoration Portal.

7. ROLES AND RESPONSIBILITIES

ADCNR is the Implementing Trustee agency for this project and will ensure that the project is completed and implemented. ADCNR will be responsible for monitoring progress of towards each parameter and will provide regular reports documenting the progress and results of each parameter. Reports provided by Third Party Contractor and the City of Orange Beach will be qualitative and quantitative and will be in a format which is easily interpreted and transcribed into DIVER at least annually and in accordance with Section 5, above.

DOI will consult.

ADCNR, the Third-Party Contractor and DOI will collaboratively develop priority locations and activities for work to be conducted on an annual basis, prior to nesting season.

The Trustee Council facilitates consistency in monitoring and data management procedures to evaluate and report on progress towards meeting restoration goals articulated in the PDARP/PEIS.

8. REFERENCES

Alabama Department of Conservation (ADCNR). 2015. Alabama's Wildlife Action Plan: 2015: 2025.

Burger, J.S.A. Carlucci, C.W. Jeitner, K. Clark and L. Niles. 2004. The effects of human activities on migrant shorebirds: successful adaptive management.

Doremus, H., W.L. Andreen, A. Camacho, D.A. Faber, R.L. Glicksam, D.D. Goble, B.C. Karkkainen, D. Rohlf, A.D. Tarlock, S.B. Zellmer, S. Campbell-Jones, and Y. Huang. 2011. Making Good Use of Adaptive Management. Center for Progressive Reform White Paper No. 1104

Deepwater Horizon Trustees (NRDA DWH Trustees). 2013. Phase II Early Restoration Plan & Environmental Review.

DWH NRDA Trustees. 2016a. Deepwater Horizon oil spill: final programmatic damage assessment and restoration plan (PDARP) and final programmatic environmental impact statement (PEIS).

DWH NRDA Trustees. 2016b. Trustee Council Standard Operating Procedures for Implementation of the Natural Resource Restoration for the Deepwater Horizon Oil Spill. Originally approved May 4, 2016; revised November 15, 2016.

Deepwater Horizon Natural Resource Damage Assessment Trustees (DWH Trustees). 2017a. Deepwater Horizon Oil Spill Natural Resource Damage Assessment: Strategic Framework for Bird Restoration Activities. June. Available: https://www.gulfspillrestoration.noaa.gov/strategic-frameworks

Deepwater Horizon Natural Resource Damage Assessment Trustees (DWH Trustees). 2017. Deepwater Horizon Oil Spill Natural Resource Damage Assessment: Strategic Framework for Bird Restoration Activities. June. Available: http://www.gulfspillrestoration.noaa.gov/restoration-planning/gulf-plan.

DWH NRDA Trustees (DWH Trustees). 2017b. Monitoring and Adaptive Management Procedures and Guidelines Manual Version 1.0. Appendix to the Trustee Council Standard Operating Procedures for Implementation of the Natural Resource Restoration for the DWH Oil Spill. December.

Enwright, N.M., Borchert, S.M., Day, R.H., Feher, L.C., Osland, M.J., Wang, Lei, and Wang, Hongqing, 2017, Barrier island habitat map and vegetation survey—Dauphin Island, Alabama, 2015: U.S. Geological Survey Open-File Report 2017–1083, 17 p., https://doi.org/10.3133/ofr20171083.

Florida Trustee Implementation Group (FLTIG). 2019. Final Restoration Plan I and Environmental Assessment: Habitat Projects on Federally Managed Lands; Nutrient Reduction; Water Quality; and Provide and Enhance Recreational Opportunities.

Greer, R.D., C.L. Cordes, and S.H. Anderson. 1988 Habitat Relationships of island nesting seabirds along coastal Louisiana. Colonial Waterbirds 11: 181-188.

Harwell, M.A., J.H. Gentile, L.D. McKinney, J.W. Tunnell Jr., W.C. Dennison, and R.H. Kelsey. 2016. A New Framework for the Gulf of Mexico EcoHealth Metrics. Available at: http://www.harte researchinstitute.org/sites/default/files/resources/Framework%20for%20the%20Gulf%20EcoHe a lth%20Metric.pdf. Accessed January 29, 2018.

Johnson, E. I. 2016. Louisiana's Coastal Stewardship Program 2015 Annual Report: Beach-nesting Bird Protection, Monitoring, and Community Outreach. National Audubon Society, Baton Rouge, LA.v

Kotliar N.B. & Burger J. (1984) The use of decoys to attract least terns (*Sterna antillarum*) to abandoned colony sites in New Jersey. *Colonial Waterbirds*, 7, 134-138

Larson CL, Reed SE, Merenlender AM, Crooks KR (2016) Effects of Recreation on Animals Revealed as Widespread through a Global Systematic Review. PLoS ONE 11(12): e0167259. doi:10.1371/journal.pone.0167259

McGowan, C.P. and T.R. Simons. 2006. Effects of human recreation on the incubation behavior of American oystercatchers. Wilson Journal of Ornithology 118:485–493.

Molina, K.C. and R.M. Erwin. 2006. The distribution and conservation status of the gull-billed tern (*Gelochelidon nilotica*) in North America. Waterbirds 29:271–295.

National Academies of Sciences, Engineering, and Medicine (NAS) 2017. Effective Monitoring to Evaluate Ecological Restoration in the Gulf of Mexico. Washington, DC: The National Academies Press. https://doi.org/10.17226/23476.

National Research Council (NRC). 2004. Adaptive Management for Water Resources Project Planning. Washington, DC: The National Academies Press.

Pastorok, R.A., MacDonald, A., Sampson, J.R., Wilber, P., Yozzo, D.J., & Titre, J.P. 1997. An ecological decision framework for environmental restoration projects. Ecological Engineering, 9, 89-107.

Pruner, R. A., M. J. Friel, and J. A. Zimmerman. 2011. Interpreting the influence of habitat management actions on shorebird nesting activity at coastal state parks in the Florida panhandle. 2010-2011 study final report. Department of Environmental Protection, Florida Park Service. Panama City, FL.

Saalfeld, S.T., W.C. Conway, D.A. Haukos, and W.P. Johnson. 2011. Nest success of snowy plovers (*Charadrius nivosus*) in the southern high plains of Texas. Waterbirds 34:389–399.

Steyer, G.D. & Llewellyn, D.W. 2000. Coastal Wetlands Planning, Protection and Restoration Act: A programmatic application of adaptive management. Ecological Engineering, 26, 27-39.

Williams, B.K. 2011. Adaptive management of natural resources - Framework and issues. Journal of Environmental Management, 92, 1346-1353.

9. MAM PLAN REVISION HISTORY

Old File Name	Revision Date	Changes Made	Reason for Change	New File Name

Monitoring and Adaptive Management Plan: Improving Resilience for Oysters by Linking Brood Reefs and Sink Reefs

Introduction, Purpose and Need, and Public Participation

This project Monitoring and Adaptive Management (MAM) Plan identifies the monitoring and data collection needed to evaluate progress toward meeting the project's objectives and to support necessary adaptive management. This plan was developed in accordance with the MAM Plan template provided in the MAM Manual Version 1.0 and was adapted to fit the needs of this project (DWH NRDA Trustees 2017a). This MAM Plan is a living document and will be updated as needed to reflect new information or changing conditions. More specifically, the Regionwide Trustee Implementation Group (TIG) will update this plan as project components are more fully developed and siting and design activities are completed. While general areas of implementation and design are defined for this project, the exact locations and site-specific design details will be developed as a part of project implementation. Because such details have not yet been resolved, many aspects of this MAM Plan have not yet been determined (e.g., parameters to track, the method and frequency of measuring specific parameters). Future revisions to this document will be made publicly available as part of project implementation through the Data Integration, Visualization, Exploration, and Reporting (DIVER) Portal (www.diver.orr.noaa.gov/web/guest/home) and accessible through the Trustee Council's website (www.habitat.noaa.gov/storymap/dwh/).

Project Overview

The project aims to increase oyster abundance and restore resilience to oyster populations by increasing connectivity through larval transport and constructing oyster habitat within a range of habitats and salinities. The project would create a network of high-vertical relief brood (protected) reefs. These brood reefs would be linked by larval transport to sink reefs (harvested or protected) that either already exist or that would be created through the project. This interlinked network of reefs would increase oyster population sustainability and oyster reef resilience. The reef design would help ensure connectivity between larvae produced on the brood reefs and the sink reefs. The selected project sites may contain both subtidal and intertidal habitat, to address the lost connection between these habitats identified in the 2016 *Deepwater Horizon* Oil Spill Final Programmatic Damage Assessment and Restoration Plan/Programmatic Environmental Impact Statement (PDARP/PEIS). (The PDARP/PEIS and the Record of Decision (ROD) are available at www.gulfspillrestoration.noaa.gov/restoration-planning/gulf-plan/.)

To increase resilience, the reefs would be placed along a salinity gradient based on local conditions. Given annual variation in rainfall, associated freshwater inputs to estuaries, and ensuing variations in salinity, constructing reefs across a range of habitats and salinities increases the likelihood of oyster recruitment and survival. Furthermore, where possible, constructing reefs along an intertidal-subtidal gradient may restore the population linkage that was disrupted by the *Deepwater Horizon* (DWH) oil spill. Reefs would be constructed high enough to protect oysters from hypoxic bottom waters. Where possible, reefs would be constructed on suitable hard substrate that does not currently support oysters. If the brood reefs do not receive a natural spat set, hatchery spat or adult oysters would be transplanted to the reefs. A healthy network of oyster reefs would increase the ecosystem services provided by this species, including increased water filtration, shoreline protection (depending upon reef design and location), and habitat for reef-dwelling species.

The project would be implemented in Mid-Lower Mobile Bay, AL. The above general project summary applies to all components of this project. The following section provides additional details that are specific to each component of the project:

- **Component 4: Alabama:**
  - The project area would include new reef construction or supplement existing reef areas at two or more sites on the western shore portions of mid-lower Mobile Bay, over an approximately 15-mile area.
  - The reefs would be sited to facilitate spat transport from the brood reefs toward commercially harvestable reefs.

Restoration Type and Project-Specific Objectives

This project is designed to primarily address the Oysters Restoration Type, defined in the PDARP/PEIS. The overall objectives for oysters that are relevant to this project, as identified in the *Strategic Framework for Oyster Restoration Activities* (DWH NRDA Trustees 2017b) include:

- Restore oyster abundance and spawning stock to support a regional oyster larvae pool sufficient for healthy recruitment levels to subtidal and nearshore oyster reefs.
- Restore resilience to oyster populations that are supported by productive larval source reefs and sufficient substrate in larval sink areas to sustain reefs over time.
- Restore a diversity of oyster reef habitats that provide ecological functions for estuarine-dependent fish species, vegetated shoreline and marsh habitats, and nearshore benthic communities.

In addition, the specific objective of the project is to increase oyster abundance and restore resilience to oyster populations by increasing connectivity through larval transport and the construction of oyster habitat over a range of habitats and salinities. This project objective may be further refined or divided into multiple objectives in future versions of this MAM Plan.

Conceptual Setting

Salinity and reef connectivity are two key factors that affect the distribution, survival, and growth of oysters in the Gulf of Mexico. Gulf of Mexico oysters need salinities between 10 to 30 practical salinity unit (psu) (Turner 2006) to successfully survive, grow, and reproduce. Oyster growth slows below this range, and oyster predation and disease increase above this range. However, the salinity of any specific location can change substantially over time due to spatial and temporal variability in rainfall, which affects the amount of freshwater entering the Gulf of Mexico through streams and rivers. Thus, creating reefs across gradients of salinity (i.e., across habitats that are close to or far from freshwater outlets into the Gulf of Mexico) can help ensure that at least some of the reefs provide suitable salinities for oysters each year. Reef connectivity is also critical to sustaining oysters in the Gulf of Mexico. In the northern Gulf of Mexico, intertidal oysters typically supply larvae to subtidal reefs. Injury to the intertidal reefs resulting from the DWH oil spill caused the loss of larval supply to subtidal reefs, reducing the ability of oysters to successfully reproduce. By restoring reefs along a depth/tidal gradient, this project aims to restore this connectivity, which will help sustain subtidal reefs over the long term.

Potential Sources of Uncertainty

Potential sources of uncertainty are defined as those that may affect the ability to achieve project restoration objectives. Sources of uncertainty, the degree of uncertainty, and the level of uncertainty associated with project components will vary.

Uncertainties or information gaps have the potential to affect adaptive management decisions for individual or multiple restoration projects. These decisions may include how to improve the likelihood of achieving favorable project outcomes or selecting corrective actions in the event a project is not performing as intended.

Potential sources of uncertainty could include (but are not limited to):

- Whether there is sufficient suitable bottom over a range of salinities for restoration
- Rainfall amount, which can affect the salinity of restored areas
- Colonization of brood and sink reefs by oysters
- Occurrence, frequency, and intensity of hypoxia events in project locations
- Occurrence, frequency, and intensity of tropical storms and hurricanes

This list should not be considered exhaustive; additional uncertainties may be identified as the project is further designed, implemented, and monitored. These uncertainties may affect the achievement of the restoration objectives of the project. For example, tropical storms and hurricanes can damage or bury reefs, which could greatly reduce project benefits or cause the project to fail. Similarly, rainfall amounts can affect the salinity to which restored reefs are exposed; if drought occurs in restored areas, driving up salinity, oysters may suffer from increased disease and predation. If any drivers or stressors are negatively impacting the project, adaptive management may be necessary to ensure that project objectives are being achieved. The adaptive management strategy for this project is outlined in the Project Monitoring section above.

Project Monitoring

Performance monitoring would be conducted to evaluate project success and to identify the need for potential corrective actions or adaptive management. It is likely that the activities implemented in each project component will not be identical, given differences in site conditions that are likely to be present. Therefore, specific parameters and methodologies will be identified as part of an update to this MAM Plan. The draft project objective and associated potential parameters that could be used to assess and track project progress and performance are listed in Table 1. As noted in the section titled Restoration Type and Project-Specific Objectives above, this draft project objective may be refined further in future versions of this MAM Plan.

Table 1. Project objectives, parameters, data collection activities, performance criteria and potential corrective actions.

Monitoring parameters	Purpose	Method	Timing and frequency of data collection	Sample size/sites	Performance criteria	Potential corrective actions
Oyster habitat created	Performance criterion	Survey or similar method to delineate total new oyster reef areas created	once annually post-restoration for 3 years.	All newly created reef areas	TBD	TBD
Oyster density (live and dead)	Performance criterion	Quadrat (number of oysters/m^2)	Pre-restoration and once annually post-restoration for 3 years. Sampling should occur at the same time each year	at least 3 samples on each constructed reef; including a control and/or reference site as appropriate	More oysters on restored reefs (both brood and sink) relative to control sites.	If there are no oysters on reefs, consider placing adult oysters and/or spat on shell on reefs as appropriate.
Oyster mortality	Explanatory parameter	Divide the number of dead oysters by the total number of live and dead oysters and express as a percentage (% dead oysters).	pre-restoration and annually post-restoration for 3 years	at least 3 samples on each constructed reef; including a control and/or reference site as	None, explanatory variable	If possible, identify source of mortality. Address source of mortality if possible. Apply lessons learned to future projects.

				appropriate		
Oyster size distribution	Performance criterion	Use a ruler or calipers to measure (mm) the shell height (umbo to opposite edge) of each live and dead oyster collected	Pre-construction and once annually post-construction for 3 years. If possible, sampling should occur after newly settled oysters have grown to a size greater than 10 mm and can be confidently classified as recruits. May measure the first 100 oysters under 25 mm and count the rest, or subsample as appropriate.	at least 50 oysters per sample, 3 samples per reef	oysters of spat, seed, and adult size classes should be present	If possible, determine why a particular size class is absent (e.g., no larval settlement, mortality). Address the cause if possible. If not, transplant oysters of missing size classes to reef, if appropriate.
Density of large oysters on brood reefs (for states using brood reefs)	Performance criterion	Quadrat (number of large oysters ≥ 3 inches shell height/m^2)	pre-restoration and once annually post-restoration for 3 years	at least 3 samples on each constructed reef	TBD based on control and reference sites	If possible, identify and address the reason for lack of broodstock. If not possible, consider seeding reef with spat, seed oysters, or broodstock if

						appropriate.
Bottom temperature	Explanatory parameter	water quality sonde with data logger, hand-held temperature probe, thermometer, or take advantage of existing monitoring programs; report in degrees C	TBD	TBD	none, explanatory parameter	none, explanatory parameter
Bottom Dissolved Oxygen	Explanatory parameter	water quality sonde with data logger; report in mg/l	TBD	TBD	none, explanatory parameter	none, explanatory parameter
Salinity	Explanatory parameter	in-situ salinity or conductivity probe with data logger (continuous sampling), hand-held salinity or conductivity probe, or refractometer; report salinity (parts per thousand [ppt] or Practical Salinity Scale [unitless])	TBD	TBD	None, explanatory parameter	None, explanatory parameter

Adaptive Management

As discussed in the PDARP/PEIS, adaptive management is a form of structured decision-making applied to the management of natural resources in the face of uncertainty (Pastorok et al. 1997; Williams 2011). It is an iterative process that integrates monitoring and evaluation of management actions with flexible decision-making, where adjustments are made to management approaches based on observed outcomes (NRC 2004). Within the context of ecological restoration, adaptive management addresses key uncertainties by linking science to restoration decision-making (Steyer and Llewellyn 2000; Thom et al. 2005). Performance may be evaluated in terms of implementation of the project plan, expected project outputs, or the ability of the project to achieve the desired restoration outcomes.

Adaptive management could be used at several points throughout the project. First, it may be used in initial site selection. If sites chosen for restoration are determined not to be suitable for oyster restoration (i.e., the location has soft bottom habitat, has poor water quality, or is not likely to be connected to other reefs by larval transport), other sites would be considered. Second, it could be used during project implementation to improve project performance. For example, if larvae do not reach and settle on constructed brood reefs, Trustees could consider placing brood stock or spat (i.e., larvae that have settled on and attached to a hard surface) on these reefs, factoring in whether the reef is harvestable. If sink reefs do not receive a natural spat set, Trustees could attempt to determine why and, if possible, take appropriate actions to improve spat set. Third, it could be used after project implementation to improve understanding of factors that improved or hindered project success. For example, if specific configurations of restored oyster reefs seem more productive or resilient than others, future projects could be designed to incorporate such configurations.

Evaluation

Project MAM would include carefully planned evaluations of the selected parameters (potentially including the examples in the Project Monitoring section above) throughout the project's lifetime. By thoughtfully designing evaluation methods for the design and implementation of project restoration activities, the project team could assess whether the project is meeting its restoration objectives and determine the need for adaptive management. Such evaluations could include tracking the productivity of reefs over time, comparing reef performance (e.g., density, mortality, spat set) with appropriate reference sites, assessing reef inter-connectivity, and evaluating whether the gradients over which reefs were constructed improved the resiliency of the restored network of oyster reefs overall. As specific parameters for given project components are selected, this MAM Plan will be updated accordingly.

Project-Level Decisions: Performance Criteria and Potential Corrective Actions

This section describes how knowledge gained from the evaluation of the monitoring data (described in the Project Monitoring section above) would be used at the project-level (1) to determine whether the project, once implemented, is considered successful, and (2) to inform the need for potential corrective actions. Project success would be determined by comparing monitoring data to project-specific performance criteria for the key parameters related to the restoration objectives described in the Project Monitoring section. For example, the amount of oyster habitat created could be compared against the habitat restoration objective that Trustees set for the project to determine if the project is successful. However, at this stage, project-specific performance criteria have not yet been identified for any example parameter identified in the Project Monitoring section. Such criteria and potential corrective actions will continue to be developed, and this MAM Plan will be updated accordingly.

Monitoring Schedule

The project monitoring schedule will be determined when siting and design are completed for the different project components, wherein monitoring parameters will be identified.

Data Management

To the extent practicable, after consideration of ongoing federal and/or state-specific efforts (e.g., current protocols, existing databases), all environmental and biological data generated during monitoring activities will be documented using standardized field datasheets. If standardized datasheets are unavailable or not readily amendable to record project-specific data, project-specific datasheets will be drafted prior to conducting any project monitoring activities. Electronic data file names should include the date on which the file was created, a ReadMe file that describes when and by whom the file was created, and any explanatory notes about the file contents. If a data file is revised, a new copy will be made and the original preserved. The Implementing Trustees will verify and validate monitoring data and information and will ensure that all data are entered or converted into agreed upon/commonly used digital format labeled with metadata.

Data Review and Clearance

A standardized reporting format would be developed to the extent practicable (e.g., from standardized data sheet). Prior to publication, data will be reviewed and verified for completeness. A quality check is done by comparing the entered electronic data to the original hard copy data sheet. Data are validated and any necessary corrections are made. Upon validation, data are approved for analysis, reporting and archiving.

After any and all errors are addressed, data are considered to have completed a QA/QC review. Before submitting the monitoring data and information package, Implementing Trustees shall confirm with one another that the package is approved for submission. The Implementing Trustees will give the other TIG members time to review the data before publication in DIVER. No data release can occur if it is contrary to federal or state laws.

Data Storage and Accessibility

After all data has been verified by QA/QC procedures, it will be stored on DIVER and, where applicable, on Implementing Trustee databases.

Data Sharing

Data will be made publicly available through DIVER and, where applicable, Implementing Trustee databases, in accordance with the applicable data sharing policies and regulations in operation at the time of data collection.

Reporting

Project monitoring reports will be prepared and uploaded to DIVER annually. In addition, consistent with Trustee Council Standard Operating Procedures and any future amendments, the Implementing Trustee will develop a final, high-level summary report prior to project close-out (Section 10.7.1 of SOPs; DWH NRDA Trustees 2016). This final report will provide a range of information about the project, including activities, key achievements, and lessons learned.

Roles and Responsibilities

This project's components will be implemented by ADCNR who will work in cooperation with project partners (e.g., nongovernmental organizations [NGOs], state resource agencies, local governments) to develop and implement each project component. For each component, the lead Implementing Trustee will also serve as the lead coordinator and implementer of MAM activities. Implementing Trustees' roles will be further identified in accordance with SOP Section 9.5.

Monitoring and Adaptive Management Budget

The budget for this project includes support for the full range of monitoring and adaptive management activities described above, including field sampling, data management, report writing, and adaptive management.

References

DWH NRDA (Deepwater Horizon Natural Resource Damage Assessment) Trustees. 2016. "Trustee Council Standard Operating Procedures for Implementation of the Natural Resource Restoration for the *Deepwater Horizon* (DWH) Oil Spill." www.gulfspillrestoration.noaa.gov/sites/default/files/DWH%20TC%20SOP%202.0%20with%20appendices.pdf.

DWH NRDA Trustees. 2017a. "Monitoring and Adaptive Management Procedures and Guidelines Manual Version 1.0." Appendix in *Trustee Council Standard Operating Procedures for Implementation of the Natural Resource Restoration for the DWH Oil Spill*. December. www.gulfspillrestoration.noaa.gov/.

DWH NRDA Trustees. 2017b. Deepwater Horizon Oil Spill Natural Resource Damage Assessment: *Strategic Framework for Oyster Restoration Activities*. June. www.gulfspillrestoration.noaa.gov/restoration-planning/gulf-plan.

Johnson, M.W., S.P. Powers, J. Senne, and K. Park. 2009. "Assessing *in situ* Tolerances of Eastern Oysters (*Crassostrea virginica*) Under Moderate Hypoxic Regimes: Implications for Restoration." *J. Shellfish Res.* 28(2):185–192. https://doi.org/10.2983/035.028.0202.

NRC (National Research Council). 2004. *Adaptive Management for Water Resources Project Planning*. Washington D.C.: The National Academies Press.

Pastorok, R.A., A. MacDonald, J.R. Sampson, P. Wilber, D.J. Yozzo, and J.P. Titre. 1997. An ecological decision framework for environmental restoration projects. *Ecological Engineering* 9(1-2):89–107.

Steyer, G.D., and D.W. Llewellyn. 2000. "Coastal Wetlands Planning, Protection, and Restoration Act: A programmatic application of adaptive management." *Ecological Engineering* 15(3-4): 385–395. https://doi.org/10.1016/S0925-8574(00)00088-4.

Thom R.M., G. Williams, A. Borde, J. Southard, S. Sargeant, D. Woodruff, J.C. Laufle, and S. Glasoe. 2005. "Adaptively addressing uncertainty in estuarine and near coastal restoration projects." *J Coastal Res*. 40:94–108. www.jstor.org/stable/25736618.

Turner, R.E. 2006. "Will lowering estuarine salinity increase Gulf of Mexico oyster landings?" *Estuaries and Coasts* 29(3): 345–352.

Williams, B.K. 2011. "Adaptive management of natural resources—framework and issues." *Journal of Environmental Management* 92(5):1346–1353. https://doi.org/10.1016/j.jenvman.2010.10.041.

MONITORING AND ADAPTIVE MANAGEMENT PLAN FOR DEEPWATER HORIZON NRDA PROJECT: OYSTER GROW-OUT AND RESTORATION REEF PLACEMENT – Phase II

INTRODUCTION

Monitoring, Adaptive Management, and Administrative Oversight was identified as one of the programmatic goals in the *Deepwater Horizon* oil spill Programmatic Damage Assessment and Restoration Plan and Programmatic Environmental Impact Statement (PDARP/PEIS). The *Deepwater Horizon* Natural Resource Damage Assessment (NRDA) Monitoring and Adaptive Management Framework (Chapter 5, Appendix E) provides a flexible, science-based approach to effectively and efficiently implement restoration over several decades to provide long-term benefits to the resources and services injured by the spill. Project monitoring and adaptive management is an important component of the overall Monitoring and Adaptive Management Framework. This Monitoring and Adaptive Management plan identifies the monitoring needed to evaluate progress toward meeting project objectives and to support adaptive management of the restoration project. This project is being implemented as restoration for the *Deepwater Horizon* oil spill NRDA, consistent with the PDARP/PEIS.

PROJECT OVERVIEW

The original Oyster Grow Out and Restoration Reef Replacement project was approved by the AL TIG in RP II/EA. This project established two protected oyster gardening grow-out areas located in Grand Bay and Bon Secour Bay and used these adult sized oysters for restoration reef placement. This project, which was conducted and managed by the Alabama Cooperative Extension System in coordination with its other oyster gardening activities, grew out oysters to at least 1 year old, placed these oysters on existing reef sites, including existing complementary living shoreline sites in Mobile Bay and Mississippi Sound as well as cultched sites, and identified and prioritized future restoration reef locations (including nearshore living shorelines and intertidal reefs). This project also included monitoring the success in terms of oyster survival and reproduction of both the grow-out areas and restoration sites to determine effective techniques to increase the sustainability of oyster populations in Alabama.

Phase II of this project would build off information learned and observed during the initial project by conducting the following activities:

- monitor oyster grow-out and mortality
- detailed water quality analysis specifically for nutrient concentrations,
- classification and timing of the documented growth of potential fouling organism(s) associated with what should be quality substrate,
- current larval and settlement sampling within the existing restoration zone,
- flow patterns that would impact larval movement,
- and the strategic installation of dense brood stock aggregates to supply larvae into the restoration zone.

RESTORATION TYPE GOALS AND PROJECT RESTORATION OBJECTIVES

- Programmatic goal: Replenish and Protect Living Coastal and Marine Resources.

- Restoration type: Oysters. Restore oyster abundance and spawning stock to support a regional oyster larvae pool sufficient for healthy recruitment levels to subtidal and nearshore oyster reefs.
- Restoration approach: Restore oyster reef habitat.
- Restoration technique: Enhance Oyster Reef Productivity through Spawning Stock Enhancement Projects Such as Planting Hatchery-Raised Oysters, Relocating Wild Oysters to Restoration Sites, Oyster Gardening Programs, and Other Similar Projects.
- Restoration type goal: Restore oyster abundance and spawning stock to support a regional oyster larvae pool sufficient for healthy recruitment levels to subtidal and nearshore oyster reefs.

Objective 1: Create up to three protected oyster gardening program grow-out areas.

Objective 2: Grow out oysters to one year old and place on existing reef sites.

Objective 3: Identify and prioritize future restoration reef locations (including nearshore living shorelines and intertidal reefs).

Objective 4: Evaluate nutrient levels in restoration zone and potential impacts on substrate quality relative to fouling.

Objective 5: Evaluate substrate quality within restoration zone.

Objective 6: Evaluate recruitment potential within restoration zone for oyster larvae and successful settlement.

Objective 7: Better understand larval flow patterns into and around restoration zone.

Objective 8: Install dense spawning aggregates strategically to capitalize on larval flow patterns to support recruitment of spat with restoration zone.

CONCEPTUAL SETTING AND ANTICIPATED OUTCOMES

A conceptual model forms the basis of this monitoring plan, and includes a summary of the project activities, the expected product or output of those activities and the desired project outcomes. Stressors negatively impact habitat condition and habitat relationships, resulting in loss of habitat, function, or capacity. For this project, the specific stressors addressed include predation, loss of habitat and water quality issues (e.g., low dissolved oxygen) that results in poor spat recruitment. Activities including the placement of spat in designated grow out areas and placement of grow out oysters on reefs will result in increased settlement in grow-out areas, and an increase in abundance or larger class size oysters, as well as anticipated reduced predation by the oyster drill.

Sources of Uncertainty

Stressors like storms and changes in water quality may negatively impact the success of this project by disturbing grow-out structures. Predation is also a concern. Previous efforts have demonstrated that oysters can be successfully grown “off-bottom,” although not using the specific techniques proposed by this project.[1] The proposed initiative would further test the salinity and other environmental conditions under which grow-out can take place. The project would also provide a better understanding of the economics of these grow-out approaches. Additionally, the project would monitor the success of the grow-out areas at increasing the oyster larval pool nearby.

PROJECT MONITORING, PERFORMANCE CRITERIA, POTENTIAL CORRECTIVE

ACTIONS AND MONITORING SCHEDULE

The proposed monitoring plan for this restoration project was developed to evaluate project performance, key uncertainties, and identify potential corrective actions, if needed. For each of the monitoring parameters identified below, information is provided on the intended purpose of each monitoring parameter (e.g., monitor progress toward meeting one or more of the restoration objectives, regulatory compliance, support adaptive management of the project), monitoring methods, timing and frequency, duration, sample size, and sites. This section also describes applicable performance criteria and potential corrective actions for project parameters associated with project objectives.

The decision-making process requires a structured approach for incorporating new information gained from monitoring and evaluation. As specified in the NRDA regulations, performance criteria are used to determine restoration success or the need for corrective action (15 CFR 990.55(b)(1)(vii)). However, unanticipated consequences, previously unknown conditions or unanticipated environmental drivers uncovered during the evaluation step may also determine the need for corrective actions. The decision to implement a corrective action will holistically consider the overall outcomes of the restoration project by assessing the results of all monitoring parameters compiled in the evaluation step.

---

[1]See http://www.aces.edu/pubs/docs/A/ANR-1207/index2.tmpl

Parameter: Number of oysters at grow-out site

a. Purpose: To understand if project is producing anticipated number of oysters
b. Method: Estimate count
c. Timing and Frequency: Annually at the end of growing season
d. Sample Size: up to 3 grow out sites (300 square feet / site)
e. Sites: Up to 3 grow-out sites
f. Performance Criteria: 40,000 oysters / grow out site per year
g. Corrective Action(s): Supplement with additional hatchery grown oysters

Parameter: Oyster mortality (grow-out and placement sites)

a. Purpose: To understand how environmental conditions drive oyster mortality
b. Method: Calculated based on the number of dead and live oysters collected for Oyster Density and size distribution parameter and documentation of potential cause of mortality (e.g oyster drill, low DO, etc.)
c. Timing and Frequency: Baseline at placement sites, annually for grow-out and placement sites for Years 2-5 at end of growing season
d. Sample Size: 3 grow out sub-sites per area (75 square feet per site)
e. Sites: Up to 3 grow-out sites
f. Performance Criteria: Less than 50% per year
g. Corrective Action(s): Structures will be retrofitted with effective predator controls as needed

Parameter: Oyster density and size class distribution (placement sites)

h. Purpose: The size and number of oysters on a reef provide information on population age structure
i. Method: Quadrat

j. Timing and Frequency: Baseline at placement sites, Annually at placement sites for Years 2-5 at end of growing season
k. Sample Size: Placement areas are TBD and number and size of quadrats will be determined based on placement site
l. Sites: Placement areas are TBD
m. Performance Criteria: TBD
n. Corrective Action(s): Choose different sites if there is high mortality

Parameter: Spat settlement

a. Purpose: To understand if project is resulting in increased settlement over time
b. Method: Settlement tiles or French Tubes
c. Timing and Frequency: Annually for grow-out sites for Years 2-5 at end of growing season
d. Sample Size: At least three tiles or tubes per grow-out site
e. Sites: Up to 3 grow-out sites
f. Performance Criteria: Positive evidence of settlement
g. Corrective Action(s): NA

Parameter: Substrate Quality

a. Purpose: The quality of settlement substrates profoundly influences oyster larval attachment and subsequent growth.
b. Method: Presence/Absence
c. Timing and Frequency: Quarterly
d. Sample Size: N/A
e. Sites: Up to 2 restoration zones
f. Performance Criteria: As possible, measurements of fouling thickness, or subjective thickness will be documented.
g. Corrective Action(s): NA

Parameter: Spat Presence and Settlement

a. Purpose: To determine growth and survival within the restoration zone
b. Method: Pre-seeded substrate will be planted and monitored for growth and survival
c. Timing and Frequency: Quarterly
d. Sample Size: TBD
e. Sites: Up to 2 restoration zones
f. Performance Criteria: Positive evidence of spat settlement
g. Corrective Action(s): TBD

Parameter: Larval Transport

a. Purpose: Understanding oyster larval distribution patterns is crucial for restoration zone recruitment success
b. Method: Replicated drifters
c. Timing and Frequency: Monthly
d. Sample Size: Spat Plates
e. Sites: Placement areas are TBD
f. Performance Criteria: Positive spat recruitment
g. Corrective Action(s): Choose different sites if there is high fouling.

Parameter: Oyster Spawning Aggregates

a. Purpose: Offers approach to maximize oyster populations
b. Method: up to 15 dense spawning aggregates
c. Timing and Frequency: Biannually
d. Sample Size: Up to 15 dense brood stock aggregates per restoration zone
e. Sites: Up to 2 restoration zones
f. Performance Criteria: Positive evidence ofsettlement
g. Corrective Action(s): NA

Parameter: Nitrogen

a. Purpose: Evaluate the nitrogen levels within the restoration zone
b. Method: Physical water sample
c. Timing and Frequency: Monthly
d. Sample Size: NA
e. Sites: Up to 2 restoration zones
f. Performance Criteria: NA
g. Corrective Action(s): NA

Parameter: Phosphorus

a. Purpose: Evaluate the phosphorus levels with the restoration zone
h. Method: Physical water sample
b. Timing and Frequency: Monthly
c. Sample Size: NA
d. Sites: Up to 2 restoration zones
e. Performance Criteria: NA
f. Corrective Action(s): NA

Parameter: Water temperature

a. Purpose: Temperature may influence oyster distribution and their physiological rate processes such as feeding and growth rates
b. Method: thermometer or temperature probe
c. Timing and Frequency: Discrete sampling in conjunction with other monitoring activities
d. Sample Size: NA
e. Sites: Up to 2 restoration zones
f. Performance Criteria: NA
g. Corrective Action(s): NA

Parameter: Salinity

a. Purpose: Oyster reefs can be found along a salinity gradient. Changes in salinity may influence oyster spawning activities.
b. Method: Discrete samples with hand-held probe
c. Timing and Frequency: Discrete sampling in conjunction with other monitoring activities
d. Sample Size: NA
e. Sites: Up to 2 restoration zones
f. Performance Criteria: NA
g. Corrective Action(s): NA

Parameter: Dissolved Oxygen

a. Purpose: DO plays a role in oyster survival and growth
b. Method: dissolved oxygen meter, water quality sonde or data logging system
c. Timing and Frequency: Discrete sampling in conjunction with other monitoring activities
d. Sample Size: NA
e. Sites: Up to 2 restoration zones
f. Performance Criteria: NA
g. Corrective Action(s): NA

The schedule for project monitoring is shown in Table 1, separated by monitoring activity. Performance monitoring will begin with baseline monitoring (as-built, Year 0) and continue through Year 5. This schedule may be revised as needed depending on changing site conditions over time.

Table 1: Monitoring Schedule

Monitoring Parameter	Objective	Pre-execution Monitoring	As-Built (Year 0)	Year 1	Year 2	Year 3	Year 4	Year 5
Number of oysters at grow-out sites	1	X	X	X	X	X	X	X
Oyster density and size class distribution	2,3	X			X	X	X	X
Oyster mortality	2,3	X			X	X	X	X
Spat settlement	1,2	X			X	X	X	X
Substrate Quality	2	X	X	X	X	X	X	X
Spat Presence and Settlement	2, 3			X	X	X	X	X
Larval Transport	1, 2, 3, 4				X	X	X	X
Oyster Spawning Aggregates	4, 3, 5				X	X	X	X

Nitrogen	1	X	X	X	X	X	X	X
Phosphorus	1	X	X	X	X	X	X	X
Water Temperature	1	X	X	X	X	X	X	X
Salinity	1	X	X	X	X	X	X	X
Dissolved Oxygen	1	X	X	X	X	X	X	X

MONITORING AND ADAPTIVE MANAGEMENT PLAN FOR DEEPWATER HORIZON NRDA PROJECT

Bayfront Park Restoration and Improvements Project – Phases III

INTRODUCTION

Monitoring, Adaptive Management, and Administrative Oversight was identified as one of the programmatic goals in the *Deepwater Horizon* oil spill Programmatic Damage Assessment and Restoration Plan and Programmatic Environmental Impact Statement (PDARP/PEIS). The *Deepwater Horizon* Natural Resource Damage Assessment (NRDA) Monitoring and Adaptive Management Framework (Chapter 5, Appendix E) provides a flexible, science-based approach to effectively and efficiently implement restoration over several decades to provide long-term benefits to the resources and services injured by the spill. Project monitoring and adaptive management is an important component of the overall Monitoring and Adaptive Management Framework. This Monitoring and Adaptive Management plan identifies the monitoring needed to evaluate progress toward meeting project objectives and to support adaptive management of the restoration project. This project is being implemented as restoration for the *Deepwater Horizon* oil spill NRDA, consistent with the PDARP/PEIS.

PROJECT OVERVIEW

Bayfront Park is a publicly accessible outdoor recreation area located on Dauphin Island Parkway near the Alabama Port community. Phase I for this project included funds for engineering and design (E&D) work to develop the concept to enhance Mobile County's Bayfront Park and was funded by the AL TIG RP I/EIS Bayfront Park Restoration and Improvement (E&D only) project. The resulting master plan broke down construction activities into two phases, hereby known as Phases IIa and IIb. The project described in RP III/EA implemented Phases IIa and IIb of shoreline recreational improvements developed under Phase I at Bayfront Park on Dauphin Island Parkway near the Alabama Port community. Enhancements would facilitate public access and improve recreational amenities. The final phase, Phase III which is described in the RPIV/EA implements the boardwalk portion of construction. The 20-acre park, operated by the Mobile County Commission, currently receives more than 300 visitors on weekends and more than 1,200 visitors per week during the peak summer months. Recreational activities currently supported at this site include biking, playground use, fishing and crabbing, picnicking, walking, exercising, paddle sports such as kayaking, and bird watching. The park provides public access to Mobile Bay and other public amenities, such as a playground, picnic areas, and restrooms. The park also provides public access to the shoreline. The Mobile County Commission owns, maintains, and staffs the park. ADCNR would serve as the implementing Trustee for this project.

Proposed Infrastructure/Improvements. This project proposes to fund the Phase III construction of a boardwalk.

Phase III:

- Replacing and expanding the footprint for existing boardwalk with overlooks, with a proposed dimension of approximately 2,250 linear feet.

1.1 Restoration Type Goals and Project Restoration Objectives

- **Programmatic Goal:** Provide and enhance recreational opportunities.
- **Restoration Type:** Provide and enhance recreational opportunities
- **Restoration Type Goal:** Increase recreational opportunities such as fishing, beach-going,

camping, and boating with a combination of ecological restoration and creation of infrastructure, access, and use opportunities.

- **Restoration Approaches:** Enhance Recreational Experience. Enhance public access to natural resources for recreational use.
- **Restoration Technique(s):** Enhance or construct park infrastructure.

Objective 1: Enhance public access through infrastructure development.

1.2 Conceptual Setting and Anticipated Outcomes

A conceptual model forms the basis of this monitoring plan, and includes a summary of the project activities, the expected product or output of those activities and the desired project outcome.

Table 1: Conceptual Model

Activity	Output	Short-term Outcome	Long-term Outcome
Complete construction of improved amenities.	Amenities are completed and the amenities are utilized.	New amenities function as designed.	• The public is able to use the amenities as designed. • Visitation to Bayfront Park increases.

1.3 Sources of Uncertainty

Drivers are outside forces, natural or anthropogenic, that have the potential to influence the outcomes of a restoration project (DWH NRDA Trustees 2017: Section E.6.3). Drivers tend to be large-scale, long-term forces that are not easily controlled at the scale of a single restoration project (Harwell et al. 2016).

When evaluating the proposed project, the following outside drivers and stressors were considered:

- Development and changes in land use
- Human attachment to or interest in recreational activities
- Frequency and intensity of hurricanes
- Public interest or need

This list should not be considered exhaustive; additional drivers may be identified as the project is implemented and/or monitored. These drivers may affect the achievement of the restoration goals and objectives of the project. If any drivers are negatively impacting the project, adaptive management may be necessary to ensure the project's goals and objectives are being achieved. The adaptive management strategy for the project is outlined below.

Project uncertainties, or information gaps, have the potential to affect adaptive management decisions for restoration projects, such as how to improve the likelihood of achieving the goals and objectives of the project, or identifying corrective actions if the project is not performing as intended.

When evaluating this recreational use project, the following uncertainties were considered:

- Increased use of the area
- Ability to attract public use of the park
- Potential need for ecological restoration (e.g., as a result of increased use of the area)
- Potential impact on local community (e.g., noise related to having too many visitors, trash).

This list should not be considered exhaustive; additional uncertainties could be identified as the project is implemented and/or monitored. Mobile County will maintain the park and provide personnel to reduce likelihood of potential impacts on the local community (e.g., nuisance noise). During the planning phase of the project, it was assumed that the improvements to the park would attract increased public use of the park.

PROJECT MONITORING, PERFORMANCE CRITERIA, POTENTIAL CORRECTIVE ACTIONS, AND MONITORING SCHEDULE

The proposed monitoring plan for this restoration project was developed to evaluate project performance, key uncertainties, and identify potential corrective actions, if needed. For each of the monitoring parameters identified below, information is provided on the intended purpose of each monitoring parameter (e.g., monitor progress toward meeting one or more of the restoration objectives, regulatory compliance, support adaptive management of the project), monitoring methods, timing and frequency, duration, sample size, and sites. This section also describes applicable performance criteria and potential corrective actions for project parameters associated with project objectives. The decision-making process requires a structured approach for incorporating new information gained from monitoring and evaluation. As specified in the NRDA regulations, performance criteria are used to determine restoration success or the need for corrective action (15 CFR 990.55(b)(1)(vii)). However, unanticipated consequences, previously unknown conditions or unanticipated environmental drivers uncovered during the evaluation step may also determine the need for corrective actions. The decision to implement a corrective action will holistically consider the overall outcomes of the restoration project by assessing the results of all monitoring parameters compiled in the evaluation step.

Parameter 1: Infrastructure and habitat constructed and/or enhanced and completed as designed.

a. Purpose: On-site monitoring will be conducted during construction to ensure improvements are constructed according to plans and to ensure that construction activities comply with the full set of environmental permit conditions.

b. Method: Project implementor to review contractor reports, conduct on-site inspections as needed, and compare to construction drawings.

c. Timing and Frequency: Approximately monthly and at end of project unless otherwise provided by contract. The project is expected to be completed within a 24-month time frame.

d. Sample Size: Approximately 24 (once per month for 24 months) unless otherwise provided by contract.

e. Sites: Bayfront Park

f. Performance Criteria: Level of construction to terms of contract and permit requirements.

g. Corrective Action(s): Resolution with contractor such that the terms of the contract are met.

Parameter 2: Visitor use/access

a. Purpose: To estimate number of members of the public that are able to access and are using the site.

b. Method: Visual observation and/or use of automated counters

c. Timing and Frequency: 2 per year in years 1, 2 and 3 following completion of project.

d. Sample Size: Six (6) surveys total.

e. Sites: Bayfront Park.

f. Performance Criteria: Members of the public are able to use the amenities constructed/enhanced.

g. Corrective Action(s): Evaluate reason(s) the public may not be able to access the infrastructure and/or improvements and/or are not using them to the desired potential and correct those issues. A visitor satisfaction survey may be conducted to perform evaluation.

The schedule for project monitoring is shown in Table 2, separated by monitoring activity. Pre-execution monitoring will occur before project execution. As-built monitoring occurs when project has been fully executed as planned. Project/Performance monitoring will occur in the year following initial project execution.

ADAPTIVE MANAGEMENT

As discussed in the PDARP/PEIS, adaptive management is a form of structured decision-making applied to the management of natural resources in the face of uncertainty (Pastorok et al. 1997; Williams 2011). It is an iterative process that integrates monitoring and evaluation of management actions with flexible decision-making, where adjustments are made to management approaches based on observed outcomes (NRC 2004). Within the context of ecological restoration, adaptive management addresses key uncertainties by linking science to restoration decision-making (Steyer & Llewellyn 2000). Although adaptive management is a critical component of the restoration plan as a whole, the need for adaptive management may vary on a project-by-project basis. Some projects may be well understood and not have uncertainties which warrant adaptive management. The monitoring and adaptive management framework may be more robust for elements of the restoration plan with high degrees of uncertainty or where numerous restoration projects are planned within a given geographic area and/or for the benefit of a particular resource (DWH NRDA Trustees 2016a, Appendix 5.E.1). Under OPA NRDA regulations, restoration projects clearly identify performance criteria that would be used to determine project success or the need for corrective action. Adaptive management should not be used for projects where learning is unlikely, where decisions are irreversible, or where no opportunity exists to revise or reevaluate decisions based on new information (Doremus et al. 2011).

The Bayfront Park Restoration and Improvement Project Phases IIa and IIb proposes to use standard engineering specifications and tried-and-tested construction methodology for constructing the improvements. The alternative's goal of enhancing public recreational access to and enjoyment of coastal areas along southwestern Mobile Bay has a high likelihood of success. Surveys indicate public demand for these amenities. No land acquisition is required, and the Mobile County Commission has a history of successfully implementing and managing similar recreational improvement projects as part of its natural resource management responsibilities at public parks and other county-owned properties. Because the project proposes to establish physical infrastructure, the decision to implement the project is mostly irreversible, as is the opportunity to revise or reevaluate the decision to construct and enhance the recreational features at Bayfront Park. For these reasons, significant adaptive management is not included in this MAM plan. However, if monitoring determines that the project is not meeting its goals and objectives, then corrective actions should be used. Suggested corrective actions, if appropriate, are described above in Section 2.

EVALUATION

Evaluation of monitoring data is needed to assess the performance of the project in meeting its restoration objectives, resolving uncertainties to increase understanding, and determine whether corrective actions are needed. As part of the larger decision-making context beyond the project scale, the evaluation of monitoring data from the individual projects would be compiled and assessed at the Restoration Type and TIG level, and the results would be used to update the knowledge base to inform decisions such as future TIG project prioritization and selection, implementation techniques, and the identification of critical uncertainties. The results of the analysis would be used to answer the following questions:

- Were the project restoration objectives achieved? If not, is there a reason why they were not met?
- Did project activities undertaken produce unanticipated effects?
- Were there unanticipated events unrelated to the project that potentially affected the monitoring results (e.g., hurricanes)?
- Were any of the uncertainties identified prior to project implementation resolved?
- Were any new uncertainties identified?

These questions will be answered and compiled in annual monitoring reports for the project and revision to the MAM plan will be made if needed.

DATA MANAGEMENT

Data Description

All data collected will follow the data standards as per the MAM Manual 1.0 (DWH NRDA Trustees 2017). To the extent practicable, all environmental and biological data generated during monitoring activities will be documented using standardized field datasheets. If standardized datasheets are unavailable or not readily amendable to record project-specific data, then project-specific datasheets will be drafted prior to conducting any project monitoring activities. Original hardcopy datasheets and notebooks and photographs will be retained by the Implementing Trustee. Relevant project data that are handwritten on hardcopy datasheets or notebooks will be transcribed (entered) into standard digital format. All field datasheets and notebook entries will be scanned to PDF files. All data will have properly documented FGDC/ISO metadata, a data dictionary (defines codes and fields used in the dataset), and/or a Readme file as appropriate (e.g., how data was collected, QA/QC procedures, other information about data such as meaning, relationships to other data, origin, usage, and format – can reference different documents). Electronic data files will be named with the date on which the file was created and will include a ReadMe file that describes when the file was created and by whom, and any explanatory notes on the file contents. If a data file is revised, a new copy will be made and the original preserved.

Data Review and Clearance

After transcription of the data, a second person not associated with data transcription will perform a verification of the data in the electronic data sheets against the original hardcopy datasheets and/or notebooks and would make any corrections to transcription errors as appropriate before data are used for any analyses or distributed outside the agency. Implementing Trustees will verify and validate monitoring data and information and ensure that all data are entered or converted into agreed upon/commonly used digital format labeled with metadata. All data will undergo proper QA/QC protocols, be reviewed and verified following the process outlined in Section 3 of the MAM Manual Version 1.0. Data will be made publicly available, in accordance with the Federal Open Data Policy (Section 10.6.6 of SOP; DWH NRDA Trustees 2016b), through the DIVER Explorer Interface within a year of when the data collection occurred.

Data Storage and Accessibility

Once all data have been verified by quality assurance/quality control procedures, they will be submitted to the DIVER Restoration Portal. Trustees will provide DWH NRDA MAM data and information to the Restoration Portal as soon as possible and no more than one year from when data are collected.

Data Sharing

Data will be made publicly available, in accordance with the Federal Open Data Policy (Section 10.6.6 of SOP; DWH NRDA Trustees 2016b), through the DIVER Explorer Interface within a year of when the data collection occurred. Some data collected may be protected from public disclosure under federal and state law (e.g., personally identifiable information under the Privacy Act or observer information collected under Magnuson–Stevens Fishery Conservation and Management Act (MSFCMA), etc.) and therefore will not be publicly distributed.

REPORTING

Annual MAM reports will be developed in accordance with Appendix E in the MAM Manual, describing results of project monitoring and evaluation will be made publicly available, in accordance with the Federal Open Data Policy (Section 10.6.6 of SOP; DWH NRDA Trustees 2016b), through the DIVER Explorer Interface. A final MAM report for the project will be developed prior to project closeout and submitted to the DIVER Restoration Portal.

ROLES AND RESPONSIBILITIES

ADCNR is the Implementing Trustee for this project and will ensure the project is completed.

Mobile County will implement the project and be responsible for the timely submission of reports to the TIG via an Implementation Agreement with ADCNR. Mobile County will be responsible for monitoring progress towards each parameter and will provide regular reports to ADCNR documenting the progress and results of each parameter. Reports provided by Mobile County will be qualitative and quantitative and will be in a format which is easily interpreted and transcribed into DIVER at least annually and in accordance with Section 5, above.

The Trustee Council facilitates consistency in monitoring and data management procedures to evaluate and report on progress towards meeting restoration goals articulated in the PDARP/PEIS.

REFERENCES

Doremus, H., W.L. Andreen, A. Camacho, D.A. Faber, R.L. Glicksam, D.D. Goble, B.C. Karkkainen, D. Rohlf, A.D. Tarlock, S.B. Zellmer, S. Campbell-Jones, and Y. Huang. 2011. Making Good Use of Adaptive Management. Center for Progressive Reform White Paper No. 1104.

DWH NRDA Trustees. 2016a. Deepwater Horizon Oil Spill: Final Programmatic Damage Assessment and Restoration Plan (PDARP) and Final Programmatic Environmental Impact Statement (PEIS).

DWH NRDA Trustees. 2016b. Trustee Council Standard Operating Procedures for Implementation of the Natural Resource Restoration for the Deepwater Horizon Oil Spill. Originally approved May 4, 2016; revised November 15, 2016.

DWH NRDA Trustees. 2017. Monitoring and Adaptive Management Procedures and Guidelines Manual Version 1.0. Appendix to the Trustee Council Standard Operating Procedures for Implementation of the Natural Resource Restoration for the DWH Oil Spill. December.

Harwell, M.A., J.H. Gentile, L.D. McKinney, J.W. Tunnell Jr., W.C. Dennison, and R.H. Kelsey. 2016. A New Framework for the Gulf of Mexico EcoHealth Metrics. Available at: http://www.harteresearchinstitute.org/sites/default/files/resources/Framework%20for%20the%20Gulf%20EcoHea lth%20Metric.pdf. Accessed January 29, 2018.

National Research Council (NRC). 2004. Adaptive Management for Water Resources Project Planning. Washington, DC: The National Academies Press.

Pastorok, R.A., MacDonald, A., Sampson, J.R., Wilber, P., Yozzo, D.J., & Titre, J.P. 1997. An Ecological Decision Framework for Environmental Restoration Projects. *Ecological Engineering* 9:89–107.

Steyer, G.D. & Llewellyn, D.W. 2000. Coastal Wetlands Planning, Protection and Restoration Act: A programmatic application of adaptive management. *Ecological Engineering* 26:27–39.

Williams, B.K. 2011. Adaptive Management of Natural Resources - Framework and Issues. *Journal of Environmental Management* 92:1346–1353.

LAGUNA COVE LITTLE LAGOON NATURAL RESOURCE PROTECTION PROJECT MONITORING AND ADAPTIVE MANAGEMENT PLAN – Phase II

INTRODUCTION

Monitoring, Adaptive Management, and Administrative Oversight was identified as one of the programmatic goals in the *Deepwater Horizon* oil spill Programmatic Damage Assessment and Restoration Plan and Programmatic Environmental Impact Statement (PDARP/PEIS). The *Deepwater Horizon* Natural Resource Damage Assessment (NRDA) Monitoring and Adaptive Management Framework (Chapter 5, Appendix E) provides a flexible, science-based approach to effectively and efficiently implement restoration over several decades to provide long-term benefits to the resources and services injured by the spill. Project monitoring and adaptive management is an important component of the overall Monitoring and Adaptive Management Framework. This Monitoring and Adaptive Management plan identifies the monitoring needed to evaluate progress toward meeting project objectives and to support adaptive management of the restoration project. This project is being implemented as restoration for the *Deepwater Horizon* oil spill NRDA, consistent with the PDARP/PEIS.

Project Overview

Under Phase I of the project, the City of Gulf Shores acquired in fee simple two undeveloped tracts of land, totaling approximately 53 acres, near Little Lagoon in Gulf Shores, Alabama. The two tracts are located near the Bon Secour National Wildlife Refuge and include large areas of coastal wetlands, with a total of approximately 6,100 feet of shoreline on Little Lagoon. Under Phase II of the project, the acquired land will develop and manage recreational amenities on the property.

The project includes development of recreational amenities (e.g., parking and walkways) that would facilitate public access to Little Lagoon and the surrounding lands. Sixty parking spaces, divided between two locations at the site, would be built, and lighting would be provided at the parking lot and walkways as needed. In addition, the alternative would construct a variety of additional recreational amenities to enhance visitor experiences. These amenities would include a pier, a kayak landing, a boardwalk, and restrooms. Educational signage focused on coastal resources would be placed around the site to promote environmental awareness and stewardship.

Restoration Goals and Project Restoration Objectives

The restoration goal and restoration type for this plan is to provide and enhance recreational opportunities by enhancing public access and enhancing recreational experiences. The specific restoration objectives relevant for this monitoring plan are to: (1) construct and complete the project as scoped; and (2) provide all visitors access to the site.

Roles and Responsibilities

The Alabama Department of Conservation and Natural Resources (ADCNR) would work with the City of Gulf Shores staff and/or city contractors to ensure that the project is constructed and completed as designed. The City of Gulf Shores staff or city contractors would document the use of the sites by the public.

Conceptual Model and Monitoring Questions

Table B- 7 outlines the conceptual model for this restoration, which forms the basis of this monitoring plan, and includes a summary of the project activities, the expected product or output of those activities, and the desired project outcomes.

Table B- 1: Conceptual Model for Restoration

Activity	Output	Short-term outcome	Long-term outcome
▪ Construct and implement improvements and enhancements for the public's use.	▪ Improvements and enhancements are complete.	New infrastructures function as designed.	▪ The public, including those with different abilities, are able to use the site after project completion. ▪ New infrastructure is maintained for lifespan of project.

This monitoring plan has been designed around the objectives and desired outcomes for this restoration project and is intended to address the following monitoring questions for each objective:

<u>Objective #1: Construct and complete the project as scoped.</u>

- Was the project constructed and completed as designed and contracted?

<u>Objective #2: Provide access and use by the public for the site.</u>

- Is the public using the site?

PROJECT MONITORING

The proposed monitoring for this restoration project, outlined below, is organized by project objective, with one or more monitoring parameters for each objective. For each of the identified monitoring parameters, information is provided on the monitoring methods, timing and frequency, sample size, and sites. In addition, performance criteria for each parameter are identified (if applicable), including example corrective actions that could be taken if the performance criteria are not met. The parameters listed below may or may not be tied to performance criteria and/or corrective actions.

<u>Objective #1: Construct and complete the project as designed.</u>

- Was the project constructed and completed as designed and contracted?

  Parameter #1: Construction of project completed in accordance of terms of contract.

  a. Method: review contractor reports, conduct on-site inspections, and compare to construction drawings

b. Timing and frequency: at least weekly and at end of project, unless otherwise provided by contract
c. Sample size: unknown, dependent on actual construction time
d. Sites: project site
e. Performance criteria: project is constructed and completed as designed and specified in the contract
f. Corrective action: resolution with construction contractor such that the terms of the contract are met

Objective #2: Provide access and public use of the site.

- Are members of the public of different abilities using the site?

  Parameter #1: Level of public use.

a. Method: gate counts, visual observation, and/or use of automated counters
b. Timing and frequency: post-construction gate counts, visual observations or automated counters will be used to estimate daily visitor use; counts will be conducted quarterly for five years post construction
c. Sample size: one day per quarter for 5 years post construction
d. Sites: Laguna Cove site
e. Performance criteria: After construction, the public is using the site at a level consistent with its reasonably anticipated potential (described in Section 3.5.2).
f. Corrective action: If the site is not being used to its potential, the TIG would ask the City of Gulf Shores to implement actions to encourage additional public use at the site (e.g., distribution of promotional brochures, organization of guided nature tours, etc.).

Additional Monitoring: The use and performance of the project will continue to be measured throughout the life of the project, however, less frequently and methodically than the first year of monitoring. The continued monitoring will occur in the course of regular management activities and all costs associated with monitoring, maintenance, and/or corrective actions after construction is accepted, will be the responsibility of City of Gulf Shores and are, therefore, outside the scope of this monitoring plan. Additional monitoring may also occur to satisfy compliance requirements and to help ensure that additional use of the site minimizes the potential effect to natural resources.

MONITORING SCHEDULE

The schedule for the project monitoring is shown in Table B- 8, separated by monitoring activity. Pre-execution monitoring will occur before project execution. Execution monitoring occurs when project has been fully executed as planned (Year 0). Performance monitoring will occur in the year following initial project execution.

Table B- 2: Monitoring Schedule

Monitoring Parameters	Monitoring Timeframe		
		Execution Monitoring (initial)	Post-Execution Monitoring
	Pre-Execution Monitoring	As-built (Year 0)	Years 1–5
Review contractor invoices and deliverables, including the completed project	X	X	
Observations or counts of visitors (TBD)			X

REPORTING AND DATA REQUIREMENTS

Once all data have been reviewed for accuracy and completeness, they will be submitted to the Restoration Project Database. Data will be made publicly available through the DIVER Explorer Interface.

Reporting will occur once at Year 0 and annually during Years 1–5. Reports will be in the form of brief narratives.

APPENDIX C – USDA WORKSHEETS

Code	Practice
201	Edge of Field Water Quality Monitoring Data Collection
202	Edge of Field Water Quality Monitoring System Implementation
313	Waste Storage Facility
314	Brush Management (Heavy Equipment)
315	Herbaceous Weed Control
317	Composting Facility
327	Conservation Cover
328	Conservation Crop Rotation
329	Residue Management, No-Till
338	Prescribed Burning
340	Cover Crops
342	Critical Area Planting
345	Residue and Tillage Management, Reduced Till
350	Sediment Basin
356	Dike
362	Diversion
378	Pond
381	Silvopasture Establishment
382	Fence
386	Field Border
390	Riparian Herbaceous Cover
391	Riparian Forest Buffer
393	Filter Strip
394	Firebreak (New construction)
410	Grade Stabilization Structure
412	Grassed Waterways
422	Hedgerow Planting
430	Irrigation Pipeline
441	Irrigation System, Microirrigation
442	Irrigation System, Sprinkler
443	Irrigation System, Surface and Subsurface
449	Irrigation Water Management
460	Land Clearing
464	Irrigation Land Leveling
468	Lined Waterway Or Outlet
484	Mulching
490	Forest Site Preparation (Chemical or Burning)
490	Forest Site Preparation (Mechanical)
511	Forage Harvest Management
512	Pasture and Hay Planting
516	Pipeline
528A	Prescribed Grazing
554	Drainage Water Management
561	Heavy Use Area Protection
576	Livestock Shelter Structure

578	Stream Crossing
580	Streambank and Shoreline Protection
587	Structure For Water Control
590	Nutrient Management
595	Pest Management
600	Terrace
612	Tree/Shrub Establishment (Hand Planting)
612	Tree/Shrub Establishment (Mechanical Planting)
614	Watering Facility
642	Water Well
644	Wetland Wildlife Habitat Management
666	Forest Stand Improvement (Chemical/Hand Tools)
666	Forest Stand Improvement (Cutting/removal with heavy equipment)

Instructions for Completing the Environmental Evaluation Worksheet (Form NRCS-CPA-52)

INTRODUCTION

The Environmental Evaluation (EE) is “the part of planning that inventories and estimates the potential effects on the human environment of alternative solutions to resource problems”. (7 CFR 650.4 and GM 190 Part 410.4(D).) This form provides for the documentation of that part of the planning process, and was designed to assist the conservation planner with compliance requirements for applicable Federal laws, regulations, Executive Orders, and policy. The form also provides a framework for documenting compliance with applicable State, Tribal and local requirements.

NRCS is required to conduct an EE for all planning to determine if there is a need for an Environmental Assessment (EA) or an Environmental Impact Statement (EIS). The EE process results in a "Finding" or conclusion (see guidance for "Q" below) that, either further NEPA analysis is required (EA or EIS) or that no EA or EIS is required because: 1) There is no federal action; 2) The action is categorically excluded; or 3) There is an existing NRCS or NRCS-adopted NEPA document that has sufficiently analyzed the effects of this action. The EE applies to all assistance provided by NRCS (7 CFR 650.5 and GM 190, Part 410.5). The NRCS-CPA-52 form is used by NRCS to document the results of the evaluation and show compliance with NRCS regulations implementing NEPA at 7 CFR Part 650.

A copy of the NRCS-CPA-52, including supporting documentation such as Special Environmental Concerns Evaluation Procedure Guide Sheets, must be included in the administrative file. **Do not hesitate to attach additional documents if needed to meet environmental evaluation requirements.**

COMPLETING THE NRCS-CPA-52

A. **Client Name**

B. **Conservation Plan ID #** (as applicable)

Program Authority (optional)**:** Identifying the program authority (EQIP, CSP, etc.) can help lead the planner to the appropriate NRCS NEPA document the planner may tier to as addressed later in section "R. Rationale Supporting the Finding".

C. **Identification #:** Record any other relevant client identification # (farm, tract, field #, etc.).

D. **Client's Objective(s) (purpose):** (Record results from planning step 2.) Briefly summarize the client's stated objective(s) [synonymous to "Purpose" under NEPA]. Refer to Step 2 of the NRCS planning process found in the NPPH, Part 600.22 for help, if needed. "Purpose" refers to a goal or desired future condition being pursued in the process of meeting the "Need", such as keeping the operation economically viable or meeting TMDL requirements. Clearly articulated purposes become the decision factors used to decide between the action alternatives.

E. **Need for Action: (Record results from planning step 1.)** Describe the underlying need being met. Why is the action being proposed? What is the root cause of the existing problem or opportunity? The underlying need will define and shape the alternatives and potentially justify the expenditure of federal funds; therefore it is important to accurately articulate the need(s) based on the identified resource concerns and the client objectives. All alternatives should clearly address an underlying need(s). In conservation planning, a "need" is usually a required improvement in the condition of a natural resource(s), such as when the quality of runoff water from a farm does not meet State standards, or inadequate forage supply and/or grazing strategies are resulting in poor livestock performance. Use information from Steps 3 and 4 of the Conservation Planning Process to help define the need. Identify here which Resource Concerns need to be addressed in the plan.

F. <u>Resource Concerns and Existing / Benchmark Conditions:</u>

Resource Concerns (Record results from planning steps 3 and 4.) Record the resource concerns that have been identified through the scoping and Resources Inventory and Analysis processes. Use the Resource Concern List and Planning Criteria Section 3 to identify Resource Concerns present and use approved Measurement and Assessment Tools to compare the potential environmental effects of alternatives. Include resource concerns that apply, adding additional sheets as necessary.

Documenting Existing/Benchmark Conditions (Record results from planning step 4.) Analyze the existing (benchmark) conditions for each relevant concern. Record the amount, kind, status, location and method of measurement for each identified concern. For example, if soil erosion were identified as a resource concern, the recorded benchmark might be "64 ac sheet & rill @ 6T/ac/yr, field 3, RUSLE 2." The benchmark is the baseline from which the change in resource condition under the no action and other alternatives is measured. Without it, there is no context for the degree of change.

Human - Below are some examples for what to consider when addressing Human Economic and Social Considerations.

Land use:
- Is the present land use suitable for the proposed alternative?
- Will land use change after practice(s) installation?
- How will a change affect the operation? (e.g., Feed and Forage Balance Sheet)
- Will the action affect resources on which people depend for subsistence, employment or recreation?
- Will land be taken in or out of production?

Capital:
- Does the producer have the funds or ability to obtain the funds needed to implement the proposed alternative?
- What are the impacts of the cost of the initial investment for this alternative?
- What are the impacts of any additional annual costs for Operation and Maintenance?
- What possible impact does implementing this alternative have on the client’s future eligibility for farm programs?

Labor:
- Does the client understand the amount and kind of labor needed to implement, operate and maintain the proposed practice(s)?
- Does the client have the skills and time to carry out the conservation practice(s) or will they have to hire someone?

Management level:
- Does the client understand the inputs needed to manage the practice(s) and the client's responsibility in obtaining these inputs?
- Does the client understand their responsibility to maintain practice(s) as planned and implemented?
- Is it necessary for the client to obtain additional education, or hire a technical consultant, to operate and/or maintain the practice(s)?

Profitability:
- Profitability describes the relative benefits and costs of the farm or ranch operation, and is often measured in dollars. An activity is profitable if the benefits are greater than the costs.
- Is the proposed alternative needed and feasible?
- Do the benefits of improving the current operation outweigh the installation and maintenance costs (positive benefit/cost ratio)?
- Is there a reasonable expectation of long-term profitability/benefits for the operation if implemented?
- Will crop, livestock, or wildlife yield increase/decrease?

Risk:
- What is the potential for monetary loss, physical injury, or damage to resources or the environment?
- Will the proposed alternative aid/risk client participation in USDA programs?
- Is there flexibility in modifying the conservation plan at a future date?
- What issues are involved with the timing of installation and maintenance?
- What are the cash flow requirements of this alternative?
- What, if any, are the hazards involved?

Public Health and Safety:

- What effect (both positive or negative) will the action have on the client and community with regard to public health and safety?
- Are there any hazards associated with no action or any of the alternatives about which the client should be informed?

G. **Special Environmental Concerns** (Record results from planning steps 3 and 4.)
Under each Special Environmental Concern, document the current status or condition of the concern. Record the amount, kind, status, location, and method of measurement or source of information for each special resource concern. For example, if endangered species habitat is present, under Endangered and Threatened Species, the recorded benchmark condition is “64 ac, I-bat habitat-roosting cover, field 3, FOTG-2.” If it is determined that no floodplains exist within the affected planning area, document the fact and cite the source. The benchmark condition would read “not present, FEMA flood map #xxx.”

For guidance in addressing special environmental concerns, see NECH Subpart B and the Special Environmental Concern Evaluation Procedure Guide Sheets. Document any additional State and/or local special environmental concerns in "K. Other Agencies and Broad Public Concerns". Attach additional documentation if needed.

H. **Alternatives** (Record results from Planning step 5.)
Describe Alternatives Briefly summarize the practice/system of practices being proposed. The no action alternative is required. Alternatives should be formulated to meet the underlying need. Note that the no action alternative may not meet the underlying need and is still required to be evaluated and compared to other alternatives (see below). To the extent possible, the alternatives should also prevent additional problems from occurring and take advantage of available opportunities. *If there are unresolved conflicts concerning alternative uses of resources, appropriate alternatives that meet the underlying need must be developed.*

"No Action": Include a brief summary of the activities that would be implemented in the absence of USDA assistance (financial or technical). Unless a change in management direction or intensity will be undertaken, record effects of existing activities. The "No Action" alternative requires the same level of analysis as other alternatives. It should answer the question of what impacts are likely to occur (or what the predicted future condition of the identified resource concerns might be) under the client's current and planned management strategies without implementation of a federally assisted action.

"Alternatives 1,2,etc.": List here the practices or system of practices being proposed for each alternative. Indicate if the alternative meets RMS criteria based on your State's requirements. One or more other alternatives may be evaluated to aid in the decision-making process or at the request of the client. It is beneficial for one alternative to contain the practices that NRCS has determined best address all of the identified resource concerns (RMS alternative) so the client can consider potential future conservation actions. Use additional sheets if necessary.

It is important to quantify to the extent feasible the differences between each alternative, including the "No Action" alternative. See "Helpful Tips" in the NECH, Part 610.67 for guidance on narrowing the scope of your analysis when considering alternatives.

I. **Effects of Alternatives** (Record results from planning step 6.)
Under "Amount, Status, Description," record the effect of each alternative on the concerns listed, quantifying where possible. *Consider and document both short-term and long-term consequences for all foreseeable direct, indirect, and cumulative effects (described below).* If a change to the concern is predicted, then estimate the amount. Professional judgment should be used where Planning Criteria or other tools are not available.

Resource Concerns Use your State's FOTG Section III Planning Criteria to identify the established threshold levels for resource concerns. Professional judgment should be used where Planning Criteria or other tools are not available. Place a check in the "NOT meet PC" box for each resource concern to indicate when FOTG Section III Planning Criteria will not be met (i.e., where additional measures are needed to meet PC).

Analyze effects based on the combined effect of all practices on the resource concern. For example, if one proposed practice may impact the water quality of an adjacent stream, but another proposed practice such as a buffer may reduce or eliminate the impact, the overall effect is the one that should be recorded here. As mentioned above, one or more "Other Alternative(s)" may be evaluated to aid in the decision-making process or at the request of the client. Use additional sheets if necessary.

"No Action": Record the impacts that are likely to occur (or what the predicted future condition of the identified resource concerns might be) under the client's planned management strategies without implementation of a federally assisted action. Address impacts to each identified resource concern, quantifying where possible. If this information is found elsewhere in the conservation plan, simply provide a summary here.

"Alternatives 1,2, etc.": Record the impacts that are likely to occur under each alternative scenario. Document impacts to each identified resource concern, quantifying where possible. If this information is found elsewhere in the conservation plan, simply provide a summary here. Include both short and long-term consequences in the analysis.

Categories of Effects to Consider- There are three categories of effects that must be considered when predicting short- and long-term effects of an alternative on resource concerns:

Direct effects are caused by the alternative and occur at the same time and place.

Indirect effects are caused by the alternative and are later in time or farther removed in distance, but are still reasonably foreseeable (e.g., "downstream" effects).

Cumulative effects are those that result from all past, present, and reasonably foreseeable future actions. They can result from individually minor but collectively significant actions taking place over a period of time. Cumulative effects are most appropriately analyzed on a watershed or area-wide level. *Cumulative impacts ideally consider "...all actions in the area of potential effect, REGARDLESS of what agency (Federal or non-Federal) or person undertakes such other actions." (CEQ 1508.7)*

The NECH, Part 610.70, "Effects Analysis," provides important information on describing effects so that an adequate analysis can be made and appropriate mitigation measures included when the proposed alternative has adverse effects. (See also Section L.)

J. **Impacts to Special Environmental Concerns** (Record results from planning step 6.)

Briefly describe the status and/or description of effects on all identified Special Environmental Concerns, and include supporting data as needed. Document the degree of change in amount/condition, using the same protocols and units of measure used to determine the benchmark condition. *It is important to consider and document both short-term and long-term consequences for all foreseeable direct, indirect, and cumulative effects on these resource concerns.*

Place a check in the "needs further action" box when effects have not been fully determined or when additional procedural action is needed, such as the need for a permit or completing required consultation with regulatory agencies. Where consultation with another federal agency is required (e.g., USFWS or NMFS) to determine potential environmental effects, follow established State protocols or contact the appropriate NRCS State Specialist for guidance. Neither the NEPA Finding in Section "Q" nor practice implementation should occur until all required consultations and coordination with the appropriate agency have been completed and all necessary permits provided. Planning and practice implementation may continue for practices not involved in required consultation/coordination efforts only if they are not connected to, or dependent on, the other action.

Complete applicable Evaluation Procedure Guide Sheets or other state specific documentation as needed and include them in the client's administrative file. If the Special Environmental Concern is not present in the project area then there is no need to attach the Guide Sheet. Completion of Guide Sheets is not mandatory, but appropriate documentation must be provided. Check your own States' guidance for compliance and planning requirements.

K. **<u>Other Agencies and Broad Public Concerns</u>:** List any necessary easements, permissions, or permits (e.g., Clean Water Act, Endangered Species Act, wetland mitigation easements, state or county permits) required to implement the alternatives. *<u>Remember that identifying needed permits for ALL alternatives may be an important decision criteria between alternatives and should be considered during the planning process.</u>*

Relay public concerns related to land-use, demographics, landscape characteristics, or other Federal, Tribal, State, and local laws/regulations. Document the impacts of each alternative on these issues. Responses will impact the selection of an alternative as well as issues surrounding "significance."

Document contact and communications with USFWS, NOAA-NMFS, Corps, EPA, SWCD's, NRCS State Office, State/Tribal/local environmental agencies, etc., and others consulted, including public participation activities. The NECH provides important information on public participation requirements.

Cumulative Effects. (See NECH Exhibit 610.126) A cumulative impact is defined as "the impact on the environment which results from the incremental impact of the action when added to other past, present and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time" (40 CFR 1508.70). Cumulative effects include the direct and indirect effects of a project together with the effects from reasonably foreseeable future actions of others. For a project to be reasonably foreseeable, it must have advanced far enough in the planning process that its implementation is likely. Reasonably foreseeable future actions are not speculative, are likely to occur based on reliable resources and are typically characterized in planning documents. Add additional pages as needed.

L. **<u>Mitigation:</u>** Include here any mitigation measures that are NOT already incorporated in the alternatives that will offset any adverse impacts. This may include conditions included in required permits. Briefly describe or reference all mitigation measures to be applied for each alternative. Mitigation actions for the preferred (selected) alternative must be included in the conservation plan, designs, and specifications.

As referenced in CEQ regulations (40 CFR 1508.20) and NECH (Part 610.71), mitigation includes:

- Avoiding the impacts altogether by not taking a certain action or parts of an action.
- Minimizing impacts by limiting the degree of magnitude of the action and its implementation.
- Rectifying the impact by repairing, rehabilitating, or restoring the affected environment.
- Reducing or eliminating impact over time by preservation/maintenance operations during action life.
- Compensating for the impact by replacing or providing substitute resources or environments.

M. **<u>Preferred Alternative</u>**: (Record results from planning step 7.)
Record the alternative to be implemented and indicate why it was chosen. Ultimately, the client will decide what actions will occur on their land, but NRCS funding or assistance may not always be appropriate for that action. For NRCS assistance to proceed, the alternative must clearly address the underlying need(s) as identified in "E". The Objective(s) (Purpose) stated in "D" serves as the decision factors between alternatives.

N. **<u>Context:</u>** Record the context used in the alternatives analysis. Significance varies with the setting of the proposed action. For instance, in the case of a site-specific action, significance would usually depend upon the effects in the locale rather than in the world as a whole. Both short- and long-term effects are relevant.

Part "O" is completed by the planner and Parts "P" thru "S" must be completed by the Responsible Federal Official (RFO).
If NRCS is providing planning assistance for another federal agency, then the NRCS planner must sign Section "O" as the planner. The RFO for the lead agency (e.g., FSA for CRP) will complete everything below the planner's signature. For NRCS the State Conservationist is the RFO, but they may delegate that authority to a designated agency representative. Normally, the authority to serve as RFO is delegated to an Area or Field Office employee for farm bill program agreements. Check with your State Office or State Directives if you have questions.

O. **Signature (planner):** The individual completing Parts "A" thru "N" of the NRCS-CPA-52 must sign and date to indicate they have used the best available information. This may or may not be the same person as the agency representative. In cases where the planner is not an NRCS employee, they must sign in the first signature area and then the NRCS will sign in the second signature area to confirm and validate the information as the responsible agency. When NRCS plans on behalf of another agency, NRCS need sign only as the planner and then the lead agency RFO will complete the rest of the NRCS-CPA-52.

P. **Determination of Significance or Extraordinary Circumstances:** NRCS evaluates each action using its list of special environmental concerns along with the significance factors to determine whether an action has extraordinary circumstances. Action(s) that have potential for significant impacts on the human environment cannot be categorically excluded. Thus, in the absence of any extraordinary circumstances the actions can proceed without the preparation of an environmental assessment (EA) or environmental impact statement (EIS). Where extraordinary circumstances are determined to exist, the categorical exclusion will not apply.

Categorical Exclusions (CE): Before documenting the use of a categorical exclusion, it is important to read Section 610.46 of the NECH. This section provides a list of all categorical exclusions that apply to actions as well as more detailed considerations and requirements for their use. For an action to be categorically excluded, there must be appropriate documentation on the NRCS-CPA-52 indicating that the proposed action does not meet any of the criteria for "significance," as discussed above. These criteria are also known as "extraordinary circumstances" when discussing categorical exclusions. *If any part of a proposed plan involves actions that are NOT on the list of allowable categorical exclusions, the entire plan is not eligible for a categorical exclusion.*

To complete the determination on the NRCS-CPA-52, check "yes" or "no" for each of the questions. If you are not sure about the answer, contact your State Environmental Liaison for assistance. The NRCS-CPA-52 must provide evidence to conclude that the activity will not result in extraordinary circumstances or significant adverse environmental effects on the quality of the human environment, either individually or cumulatively. If any of the extraordinary circumstances are found to apply to the proposed action, then you should determine whether the proposal can be modified to mitigate the adverse effects and prevent the extraordinary circumstances. If this can be done and the client agrees to any necessary change(s) in the proposed action to avoid significant adverse impacts, then the proposed action is to be modified and implemented. If the proposed action cannot be modified or the client refuses to accept a proposed change, then Item 5 in Section "Q" must be checked for the NRCS NEPA Compliance Finding to indicate that additional analysis and documentation is needed.

Q. **NEPA Compliance Finding (check one):** This finding will determine the appropriate NEPA action required. Instructions below correspond to the option numbers in Section "Q" of the Form. In Section "R" document the rationale for your Finding.

1) Federal actions do NOT include situations in which NRCS (or any other federal agency) provides technical assistance (CTA) only. The agency cannot control what the client ultimately does with that assistance. Non-Federal actions include, but are not limited to:
    - NRCS providing HEL or wetland conservation determinations.
    - NRCS providing technical designs where there is **no** federal financial assistance.
    - NRCS providing planning assistance or other technical assistance and information to individuals, organizations, States, or local governments where there is no federal financial assistance or other control of the decision or action.

2) CE actions are a category of actions that do not individually or cumulatively have a significant effect on the human environment; therefore, neither an environmental assessment nor an environmental impact statement is required. First determine whether the proposed action is a categorically excluded action as identified in NRCS or USDA regulations implementing NEPA. (USDA and NRCS categorical exclusions are listed in the NECH, Part 610.46.) Note that there may be overarching or CE-specific side boards that must be met in order to apply a CE. If the proposed action is listed as a CE action, then assess whether there are any applicable extraordinary circumstances that would prevent the action from being eligible as a CE. Check this box only if the action is categorically excluded **AND** there are no EXTRAORDINARY CIRCUMSTANCES associated with the proposed action. (See NECH Exhibit 610.116, "How to Use NRCS's Categorical Exclusions.")

3) Check this box if there is an existing NRCS NEPA document that has sufficiently analyzed the action being proposed. A number of NRCS National Programmatic NEPA documents have analyzed effects of many practices planned under nationwide conservation programs. There may also be Regional, State, or area wide Programmatic NEPA documents that can be referred to. For information about "Tiering" to existing NRCS NEPA documents see the NECH Part 610.81.

   Keep in mind that Programmatic EA's and EIS's are not site-specific so they do not attempt to describe every possible type of effect resulting from actions that could be taken. Thus, you must use your knowledge of site-specific conditions to decide if additional analysis is needed. Network diagrams illustrating general effects of conservation practices are associated with national or State EA's or EIS's. These diagrams may help in analyzing effects of practices. If the planner believes the site-specific impacts are outside the range of effects described in the programmatic EA or EIS, this box may not be checked.

   Copies of NRCS national programmatic NEPA documents may be viewed on NRCS' Environmental Compliance web page.

4) It is possible to tier to NEPA documents prepared by other Federal agencies if those documents have been formally adopted by NRCS as outlined in the NECH 610.83 and CEQ regulations 40 CFR1506.3. NRCS must have prepared and published the agency's own Finding of No Significant Impact (FONSI) for an EA or Record of Decision for an EIS in order for a NEPA document to be "adopted". For information about "Tiering" to NEPA documents see the NECH Section 610.81.

5) *<u>If 1), 2), 3), or 4) do not apply, the action may cause a significant effect on the quality of the human environment and an EA or EIS may be required.</u> Additional analysis may be required to comply with NEPA.* Contact the State Environmental Liaison or equivalent for guidance on completing this analysis and provide them with a copy of the NRCS-CPA-52 and supporting documentation.

R. **<u>Rationale Supporting the Finding:</u>** Explain the reasons for making the "Finding" in "Q".
<u>If "Q 1)" was selected,</u> explain why the action is NOT a federal action subject to NRCS regulations implementing NEPA.
<u>If "Q 2)" was selected,</u> document the categorical exclusion(s) applicable to the entirety of the proposed action and indicate that there are no extraordinary circumstances.
<u>If "Q 3)" was selected,</u> identify any applicable NRCS NEPA document. Record the citation of the NRCS NEPA document you are tiering to.
<u>If "Q 4)" was selected,</u> identify any applicable NRCS NEPA document that was officially adopted from another agency. Record the citation of the NRCS adopted NEPA document you are tiering to.
<u>If " Q 5)"was selected,</u> document your analysis and provide this information (NRCS-CPA-52 and supporting documents) to your State Environmental Liaison or equivalent.

S. **<u>Signature of Responsible Federal Official (RFO):</u>** The appropriate agency RFO must sign and date. The RFO should wait to make the finding until all consultations, permits, etc., are finalized. This signature certifies that the proposed action/plan complies with all NRCS policies implementing NEPA and all other applicable Federal, State, Tribal and local laws/Executive Orders.

USDA United States Department of Agriculture | U.S. Department of Agriculture | NRCS-CPA-52
Natural Resources Conservation Service | 04/2023

ENVIRONMENTAL EVALUATION WORKSHEET

A. Client Name:

B. Conservation Plan ID # (as applicable):
Program Authority (optional):

C. Identification # (farm, tract, field #, etc. as required):

D. Client's Objective(s) (purpose):

E. Need for Action:

H. Alternatives

No Action √ if RMS ☐	*Alternative 1* √ if RMS ☐	*Alternative 2* √ if RMS ☐

Resource Concerns

In Section "F" below, analyze, record, and address concerns identified through the Resources Inventory process (see FOTG Section 3 - Resource Concerns List and Planning Criteria for guidance).

F. Resource Concerns and Existing/ Benchmark Conditions (Analyze and record the existing/benchmark conditions for each identified concern)	**I. Effects of Alternatives** *No Action* **Amount, Status, Description** *(Document both short and long term impacts)*	√ if does NOT meet PC	*Alternative 1* **Amount, Status, Description** *(Document both short and long term impacts)*	√ if does NOT meet PC	*Alternative 2* **Amount, Status, Description** *(Document both short and long term impacts)*	√ if does NOT meet PC
SOIL						
		☐ NOT meet PC		☐ NOT meet PC		☐ NOT meet PC
		☐ NOT meet PC		☐ NOT meet PC		☐ NOT meet PC
		☐ NOT meet PC		☐ NOT meet PC		☐ NOT meet PC
		☐ NOT meet PC		☐ NOT meet PC		☐ NOT meet PC
WATER						
		☐ NOT meet PC		☐ NOT meet PC		☐ NOT meet PC
		☐ NOT meet PC		☐ NOT meet PC		☐ NOT meet PC
		☐ NOT meet PC		☐ NOT meet PC		☐ NOT meet PC

F. Resource Concerns and Existing/ Benchmark Conditions (Analyze and record the existing/benchmark conditions for each identified concern)	I. Effects of Alternatives (continued)					
	No Action		*Alternative 1*		*Alternative 2*	
	Amount, Status, Description *(Document both short and long term impacts)*	√ if does NOT meet PC	**Amount, Status, Description** *(Document both short and long term impacts)*	√ if does NOT meet PC	**Amount, Status, Description** *(Document both short and long term impacts)*	√ if does NOT meet PC
AIR						
		☐ NOT meet PC		☐ NOT meet PC		☐ NOT meet PC
		☐ NOT meet PC		☐ NOT meet PC		☐ NOT meet PC
PLANTS						
		☐ NOT meet PC		☐ NOT meet PC		☐ NOT meet PC
		☐ NOT meet PC		☐ NOT meet PC		☐ NOT meet PC
		☐ NOT meet PC		☐ NOT meet PC		☐ NOT meet PC
ANIMALS						
		☐ NOT meet PC		☐ NOT meet PC		☐ NOT meet PC
		☐ NOT meet PC		☐ NOT meet PC		☐ NOT meet PC
		☐ NOT meet PC		☐ NOT meet PC		☐ NOT meet PC
ENERGY						
		☐ NOT meet PC		☐ NOT meet PC		☐ NOT meet PC
		☐ NOT meet PC		☐ NOT meet PC		☐ NOT meet PC
Human Economic and Social Considerations						

Special Environmental Concerns: Environmental Laws, Executive Orders, Policies, etc.

In Section "G" complete and attach Environmental Procedures Guide Sheets for documentation as applicable. Items with a "●" may require a federal permit or consultation/coordination between the lead agency and another government agency. In these cases, effects may need to be determined in consultation with another agency. Planning and practice implementation may proceed for practices not involved in consultation.

G. Special Environmental Concerns (Document existing/ benchmark conditions)	**J. Impacts to Special Environmental Concerns**					
	No Action		***Alternative 1***		***Alternative 2***	
	Document all impacts (Attach Guide Sheets as applicable)	√ if does NOT meet	Document all impacts (Attach Guide Sheets as applicable)	√ if needs further action	Document all impacts (Attach Guide Sheets as applicable)	√ if needs further action
●Clean Air Act *Guide Sheet*		☐		☐		☐
●Clean Water Act / Waters of the U.S. *Guide Sheet*		☐		☐		☐
●Coastal Zone Management *Guide Sheet*		☐		☐		☐
Coral Reefs *Guide Sheet*		☐		☐		☐
●Cultural Resources / Historic Properties *Guide Sheet*		☐		☐		☐
●Endangered and Threatened Species *Guide Sheet*		☐		☐		☐
Environmental Justice *Guide Sheet*		☐		☐		☐
●Essential Fish Habitat *Guide Sheet*		☐		☐		☐
Floodplain Management *Guide Sheet*		☐		☐		☐
Invasive Species *Guide Sheet*		☐		☐		☐
●Migratory Birds/Bald and Golden Eagle Protection Act *Guide Sheet*		☐		☐		☐
Natural Areas *Guide Sheet*		☐		☐		☐
Prime and Unique Farmlands *Guide Sheet*		☐		☐		☐
Riparian Area *Guide Sheet*		☐		☐		☐
Scenic Beauty *Guide Sheet*		☐		☐		☐
●Wetlands *Guide Sheet*		☐		☐		☐
●Wild and Scenic Rivers *Guide Sheet*		☐		☐		☐

K. Other Agencies and Broad Public Concerns	No Action	Alternative 1	Alternative 2
Easements, Permissions, Public Review, or Permits Required and Agencies Consulted.			
Cumulative Effects Narrative (Describe the cumulative impacts considered, including past, present and known future actions regardless of who performed the actions)			
L. Mitigation (Record actions to avoid, minimize, and compensate)			
M. Preferred Alternative — √ preferred alternative	☐	☐	☐
M. Preferred Alternative — Supporting reason			

N. Context (Record context of alternatives analysis)
The significance of an action must be analyzed in several contexts such as society as a whole (human, national), the affected region, the affected interests, and the locality.

O. To the best of my knowledge, the data shown on this form is accurate and complete:
In the case where a non-NRCS person (e.g. a TSP) assists with planning they are to sign the first signature block and then NRCS is to sign the second block to verify the information's accuracy.

Signature (TSP if applicable)	**Title**	**Date**
Signature (NRCS)	**Title**	**Date**

If preferred alternative is not a federal action where NRCS has control or responsibility and this NRCS-CPA-52 is shared with someone other than the client, then indicate to whom this is being provided.

The following sections are to be completed by the Responsible Federal Official (RFO)

NRCS is the RFO if the action is subject to NRCS control and responsibility (e.g., actions financed, funded, assisted, conducted, regulated, or approved by NRCS). These actions do not include situations in which NRCS is only providing technical assistance because NRCS cannot control what the client ultimately does with that assistance and situations where NRCS is making a technical determination (such as Farm Bill HEL or wetland determinations) not associated with the planning process.

P. Determination of Significance or Extraordinary Circumstances

To answer the questions below, consider the severity (intensity) of impacts in the contexts identified above. Impacts may be both beneficial and adverse. A significant effect may exist even if the Federal agency believes that on balance the effect will be beneficial. Significance cannot be avoided by terming an action temporary or by breaking it down into small component parts.

If you answer ANY of the below questions "yes" then contact the State Environmental Liaison as there may be extraordinary circumstances and significance issues to consider and a site specific NEPA analysis may be required.

Yes	No	
☐	☐	• Is the preferred alternative expected to cause significant effects on public health or safety?
☐	☐	• Is the preferred alternative expected to significantly affect unique characteristics of the geographic area such as proximity to historic or cultural resources, park lands, prime farmlands, wetlands, wild and scenic rivers, or ecologically critical areas?
☐	☐	• Are the effects of the preferred alternative on the quality of the human environment likely to be highly controversial?
☐	☐	• Does the preferred alternative have highly uncertain effects or involve unique or unknown risks on the human environment?
☐	☐	• Does the preferred alternative establish a precedent for future actions with significant impacts or represent a decision in principle about a future consideration?
☐	☐	• Is the preferred alternative known or reasonably expected to have potentially significant environment impacts to the quality of the human environment either individually or cumulatively over time?
☐	☐	• Will the preferred alternative likely have a significant adverse effect on ANY of the special environmental concerns? Use the Evaluation Procedure Guide Sheets to assist in this determination. This includes, but is not limited to, concerns such as cultural or historical resources, endangered and threatened species, environmental justice, wetlands, floodplains, coastal zones, coral reefs, essential fish habitat, wild and scenic rivers, clean air, riparian areas, natural areas, and invasive
☐	☐	• Will the preferred alternative threaten a violation of Federal, State, or local law or requirements for the protection of the environment?

Q. NEPA Compliance Finding (check one) **The preferred alternative:**		**Action required**
☐	1) is **not a federal action** where the agency has control or responsibility.	Document in "R.1" below. No additional analysis is required
☐	2) is a federal action **ALL** of which is **categorically excluded** from further environmental analysis **AND** there are **no extraordinary circumstances as identified in Section "P".**	Document in "R.2" below. No additional analysis is required
☐	3) is a federal action that has been **sufficiently analyzed** in an existing Agency state, regional, or national NEPA document **and** there are no predicted significant adverse environmental effects or extraordinary circumstances.	Document in "R.1" below. No additional analysis is required.
☐	4) is a federal action that has been sufficiently analyzed in another Federal agency's NEPA document (EA or EIS) that addresses the proposed NRCS action and its' effects **and has been formally adopted by NRCS**. NRCS is required to prepare and publish its own Finding of No Significant Impact for an EA or Record of Decision for an EIS when adopting another agency's EA or EIS document. (**Note: This box is not applicable to FSA)**	Contact the State Environmental Compliance Liaison for list of NEPA documents formally adopted and available for tiering. Document in "R.1" below. No additional analysis is required
☐	5) is a federal action that has **NOT** been sufficiently analyzed or may involve predicted significant adverse environmental effects or extraordinary circumstances and may require an EA or EIS.	Contact the State Environmental Compliance Liaison. Further NEPA analysis required. Explain in Notes Section.

R. Rationale Supporting the Finding	
R.1 Findings Documentation	
R.2 Applicable Categorical Exclusion(s) **(more than one may apply)** 7 CFR Part 650 *Compliance With NEPA*, subpart 650.6 *Categorical Exclusions* states prior to determining that a proposed action is categorically excluded under paragraph (d) of this section, the proposed action must meet six sideboard criteria. See NECH 610.116.	

I have considered the effects of the alternatives on the Resource Concerns, Economic and Social Considerations, Special Environmental Concerns, and Extraordinary Circumstances as defined by Agency regulation and policy and based on that made the finding indicated above.

S. Signature of Responsible Federal Official:

______________________	______________________	______________________
Signature	**Title**	**Date**

Additional Notes

CLEAN AIR ACT **NECH 610.21** **Evaluation Procedure Guide Sheet**	Client/Plan Information:
Check all that apply to this Guide Sheet review: ☐ Alternative 1 ☐ Alternative 2 ☐ Other	

NOTE: STEPS 1 and 2 help determine whether construction permitting is needed for the planned action or activity. STEP 3 helps determine whether the opportunity for emissions reduction credits exist. STEP 4 helps determine whether any other permitting, record keeping, reporting, monitoring, or testing requirements are applicable. Each of these steps should be updated with more specific language as needed, since air quality permitting and regulatory requirements are different for each state. In each step, if more information is needed or there is a question as to whether there are air quality requirements that need to be met, the planner or client should contact the appropriate air quality regulatory agency with permitting jurisdiction for the site to determine what air quality regulatory requirement must be met prior to implementing the planned action or activity.

STEP 1.

Is the action(s) expected to increase the emission rate of any regulated air pollutant?

NOTE: The definition of a "regulated air pollutant" differs depending on the air quality regulations in effect for a given site. For a federal definition of "regulated air pollutant," please refer to the 40 CFR 70.2. Other definitions for "regulated air pollutant" found in state or local air quality regulations may be different. *States should tailor this question to the State air quality regulations and definitions since those will include any Federal requirements.*

☐ No — **If "No,"** it is likely that no permitting or authorization is necessary to implement the proposed action or alternative. **Document on the NRCS-CPA-52, or notes section below, the finding, rationale, and information sources used** and advise the client to contact the appropriate air quality regulatory agency with permitting jurisdiction for the site to either verify that no permitting or authorization is necessary or to determine what requirements must be met prior to implementing the planned action or activity. **Go to step 3.**

☐ Yes — **If "Yes," go to Step 2.**

STEP 2.

Can the action(s) be modified to eliminate or reduce the increase in emission rate of the regulated air pollutants?

NOTE: This Step is to prompt the planner to review the planned action or activity to see if there is an opportunity to either eliminate the emission rate increase (possibly remove a permitting requirement) or reduce the emission rate increase (possibly move to less stringent permitting).

☐ No

Need for — **If "No,"** it is likely that permitting or authorization from the appropriate air quality regulatory agency will be required prior to implementing the planned action or activity. **Document on the NRCS-CPA-52, or notes section below, the finding, rationale, and information sources used** and advise the client to contact the appropriate air quality regulatory agency with permitting jurisdiction for the site to either verify that no permitting or authorization is necessary or to determine what requirements must be met prior to implementing the proposed action or alternative. **Go to Step 3.**

☐ Yes — **If "Yes,"** modify the proposed action or alternative and **repeat Step 1.**

CLEAN AIR ACT (continued)

STEP 3.

Is the action(s) expected to result in a decrease in the emission rate of any criteria air pollutant for which the area in which the site is located in an EPA designated nonattainment area for that criteria air pollutant?
NOTE: For an explanation of criteria air pollutants and nonattainment areas, refer to Section 610.21 of the NECH. Further information regarding nonattainment areas can also be found on the U.S. EPA nonattainment area Web page.

☐ No **If "No," go to Step 4.**

☐ Yes **If "Yes,"** the opportunity for obtaining nonattainment pollutant emission credits may exist. **Document on the NRCS-CPA-52, or notes section below, the finding, rationale, and information sources used** and advise the client of that potential opportunity. If the client is interested in registering nonattainment pollutant emission credits, advise him/her to contact the appropriate air quality regulatory agency with permitting jurisdiction for the site to determine if and how credits can be documented and/or registered for potential sale. **Go to Step 4.**

STEP 4.

Is the action(s) subject to any other federal (e.g.., New Source Performance Standards, National Emissions Standards for Hazardous Air Pollutants, etc.), State, or local air quality regulation (including odor, fugitive dust, or outdoor burning)?
NOTE: Refer to Section 610.21 of the NECH for a further discussion of air quality regulations.

☐ No **If "No," document on the NRCS-CPA-52, or notes section below, the finding, rationale, and information sources used and proceed with planning.**

☐ Yes **If "Yes,"** additional permits, authorizations, or controls may be needed before implementing the proposed action or alternative. **Document on the NRCS-CPA-52, or notes section below, the finding, rationale, and information sources used** and advise the client to contact the appropriate air quality regulatory agency with permitting jurisdiction for the site to determine what requirements must be met prior to implementing the proposed action or alternative.

Notes:

CLEAN WATER ACT/WATERS of the U.S.
NECH 610.22
Evaluation Procedure Guide Sheet

Check all that apply to this Guide Sheet review:	☐ Alternative 1 ☐ Alternative 2 ☐ Other	Client/Plan Information:

NOTE: This guide sheet should be tailored to meet the specific needs of individual State and local regulatory and permitting requirements. It is important for each State to coordinate with their individual State and Federal regulatory agencies to tailor State-specific protocols in order to prevent significant delays in processing permit applications.

Complete both sections of this guide sheet to address Federal as well as State-administered regulatory requirements of the Clean Water Act (CWA).

SECTION I

Federally Administered Regulatory Program - Section 404 of the CWA

STEP 1.

Will the action(s) involve or likely result in the discharge or placement of dredged or fill material or other pollutants into areas that could be waters of the United States (including lakes, ponds, impoundments, rivers, streams, channels, some wetlands, and some water conveyances, including some small ditches)? *More detailed information regarding waters of the United States and Federal permitting programs under CWA is found in the NECH 610.22 and the link above.*

☐ No **If "No," document on the NRCS-CPA-52, or notes section below, the finding, rationale, and information sources used and proceed with Section II below.**

☐ Yes **If "Yes," go to Step 2.**

STEP 2.

Is the action(s) an activity exempt from section 404 regulations (40 CFR Part 232)?
Note: the exemption should be verified with the local U.S. Army Corps of Engineers (Corps) district.

☐ No **If "No," go to Step 3.**

☐ Yes **If "Yes," document on the NRCS-CPA-52, or notes section below, the finding, rationale, and information sources used to verify the exemption applies and proceed with Section II below.**

STEP 3.

Can the action(s) be modified to avoid the discharge of dredged or fill material or other pollutants into waters of the United States?

☐ Need for No **If "No," go to Step 4.**

☐ Yes **If "Yes," modify the action to avoid discharge. Document on the NRCS-CPA-52, or notes section below, the finding, rationale, and information sources used and proceed with Section II below.**

CLEAN WATER ACT/WATERS of the U.S. (continued)

STEP 4.

Has the client obtained a section 404 permit (individual, regional, or nationwide) or a determination of an exemption from the appropriate Corps office?

☐ No **If "No,"** determine if the client has applied for a permit. If a permit has not been applied for, the client will need to do so. If a permit has been applied for, document this, and continue the planning process in consultation with the client and the regulatory agencies. The permit authorization should be reflected in the final plan and documentation. **Continue planning, but a permit is required prior to implementation. Complete Section II below.**

☐ Yes **If "Yes," document on the NRCS-CPA-52, or notes section below, the finding, rationale, and information sources used and complete Section II below.** The final plan should not be contrary to the provisions of the permit authorization or exemption. Changes made during the planning process that may impact the applicability of the permit, such as amount or location of fills or discharges of pollutants should be coordinated with the Corps. **Complete Section II below.**

Notes:

SECTION II

State Administered Regulatory Programs, Sections 303(d) and 402 of CWA

STEP 1

Is the proposed action or alternative located in proximity to waters listed by the State as "impaired" under Section 303(d) of the CWA?

☐ No **If "No," document on the NRCS-CPA-52, or notes section below, the finding, rationale, and information sources used and proceed to Step 2.**

☐ Yes **If "Yes,"** insure consistency with any existing water quality or associated watershed action plans that have been established by the State for that stream segment. Even if TMDLs have not been established by the State for that stream segment, ensure that the action will not contribute to further degradation of that stream segment. **Document on the NRCS-CPA-52, or notes section below, the finding, rationale, and information sources used and proceed to Step 2.**

STEP 2

Will the proposed action or alternative likely result in point-source discharges from developments, construction sites, or other areas of soil disturbance, or sewer discharges [e.g. projects involving stormwater ponds or point-source pollution, including concentrated animal feeding operations (CAFOs) for which comprehensive nutrient management plans (CNMPs) are being developed]? *Section 402 of the CWA requires a permit for these activities through the National Pollutant Discharge Elimination System (NPDES) program which the States administer.*

☐ No **If "No," document on the NRCS-CPA-52, or notes section below, the finding, rationale, and information sources used and proceed with planning.**

☐ Yes **If "Yes," go to Step 3.**

CLEAN WATER ACT/WATERS of the U.S. (continued)

STEP 3

Has the client obtained a NPDES permit or a determination of an exemption from the appropriate EPA or State-regulatory office?

☐ No — **If "No,"** determine if the client has applied for any necessary permits. If a permit has not been applied for, the client will need to do so. If they have applied, document this and continue the planning process in consultation with the client and the regulatory agency. Continue the planning process in consultation with the client and the regulatory agencies. The permit authorization should be reflected in the final plan and documentation. **Continue planning, but a permit is required prior to implementation.**

☐ Yes — **If "Yes," document on the NRCS-CPA-52, or notes section below, the finding, rationale, and information sources used and proceed with planning.** The final NRCS conservation plan should not be contrary to the provisions of the permit authorization or exemption. Changes made during the planning process that may impact the applicability of the permit should be coordinated with the appropriate State regulatory agency.

Notes:

COASTAL ZONE MANAGEMENT AREAS NECH 610.23 **Evaluation Procedure Guide Sheet**	Client/Plan Information:
Check all that apply to this Guide Sheet review: ☐ Alternative 1 ☐ Alternative 2 ☐ Other	

STEP 1.

Is the action(s) in an officially designated "Coastal Zone Management Area"?

☐ No **If "No," document on the NRCS-CPA-52, or notes section below, the finding, rationale, and information sources used and proceed with planning.**

☐ Yes **If "Yes," go to Step 2.**

STEP 2.

Is the action(s) "consistent" with the goals and objectives of the State's Coastal Zone Management Program (as required by Section 307 of the Coastal Zone Management Act)?

☐ No **If "No," go to Step 3.**

☐ Yes **If "Yes," document the finding, including the reasons, on the NRCS-CPA-52 and proceed with planning.**

STEP 3.

Is NRCS providing financial assistance or otherwise controlling the action?

☐ No **If "No,"** NRCS should provide the landowner with relevant information regarding any local and State compliance requirements and protocols (permitting, etc.) in special management areas as appropriate to comply with local Coastal Zone Management Programs. **Document on the NRCS-CPA-52, or notes section below, the finding, rationale, and information sources used and proceed with planning.**

☐ Yes **If "Yes,"** the NRCS District Conservationist or an NRCS State Office employee must contact the State's Coastal Zone Program Office before the action is implemented to discuss possible modifications to the proposed action. NRCS may not provide assistance if the proposed action or alternative would result in a violation of a State's Coastal Zone Management Plan. NRCS shall provide a consistency determination to the State agency no later than 90 days before final approval of the activity. **When concurrence is received from the State, document the agreed to items and reference or attach them to the NRCS-CPA-52.**

Notes:

CORAL REEFS **NECH 610.24**	Client/Plan Information:
Evaluation Procedure Guide Sheet	
Check all that apply to this Guide Sheet review: ☐ Alternative 1 ☐ Alternative 2 ☐ Other	

STEP 1.

Are coral reefs or associated water bodies (e.g. embayment areas) present in or near the planning area?

☐ No **If "No," document on the NRCS-CPA-52, or notes section below, the finding, rationale, and information sources used and proceed with planning.**

☐ Yes **If "Yes," go to Step 2.**

STEP 2.

Is there a potential for the action(s) to degrade the conditions of the coral reef ecosystem? (Refer to U.S. coral Reef Task Force Web site for local action strategies in your area.)

☐ No **If "No," document on the NRCS-CPA-52, or notes section below, the finding, rationale, and information sources used and proceed with planning.**

☐ Yes **If "Yes," go to Step 3.**

STEP 3.

Can the action(s) be modified to reduce or avoid degradation to the coral reef ecosystem?

☐ No **If "No,"** identify the component(s) of the system which will cause the potential impacts. Document on the NRCS-CPA-52, or notes section below, the finding, rationale, and information sources used. **Go to Step 4.**

☐ Yes **If "Yes,"** modify the action or alternative and **repeat Step 2.**

STEP 4.

Is NRCS providing financial assistance or otherwise controlling the action(s)?

☐ No **If "No,"** and degradation of the reefs is unavoidable, provide the client with information regarding the current status of U.S. coral reefs and the documented causes of degradation (including sedimentation and nutrient runoff), and the beneficial aspects of maintaining coral reefs

☐ Yes **If "Yes," the significance of the impacts must be determined.** An Environmental Assessment (EA) or Environmental Impact Statement (EIS) may be required. Contact your State Office for assistance.

Need for

Notes:

CULTURAL RESOURCES / HISTORIC PROPERTIES NECH 610.25	Client/Plan Information:
Evaluation Procedure Guide Sheet	
Check all that apply to this Guide Sheet review: ☐ Alternative 1 ☐ Alternative 2 ☐ Other	

NOTE: This guidesheet provides general guidance to field planners and managers. States may need to tailor this Evaluation Procedure Guide Sheet to reflect State Level Agreements (SLAs) with SHPOs or Tribal consultation protocols or operating procedures pertinent to your State or other State-specific protocols that reflect the terms of the current National Programmatic Agreement among NRCS, the Advisory Council on Historic Preservation, and the National Conference of SHPOs. For additional information regarding compliance with Section 106 of the NHPA and NRCS cultural resource policy refer to Title 420, General Manual (GM), Part 401, Cultural Resources; for current operating procedures see Title 190, National Cultural Resource Procedures Handbook (NCRPH), Part 601.

NOTE regarding consultations: When dealing with undertakings with the potential to affect cultural resources or historic properties, it is important to follow NRCS policy and the regulations that implement Section 106 and complete consultation with mandatory (SHPOs, THPOs, federally recognized Tribes, and native Hawaiians) and identified consulting parties during the course of planning. This consultation is not documented on this guide sheet but would occur with Steps 2, 3, 4, and 6 and these must be conducted in accordance with NRCS State Office operating procedures to ensure appropriate oversight by Cultural Resources Specialists who meet the Secretary of Interior's Qualification Standards.

STEP 1.

Is the action(s) funded in whole or part or under the control of NRCS? **To make this determination, answer the following:**

Is technical assistance carried out by or on behalf of NRCS?	☐ No	☐ Yes	☐ Unknown
Is it carried out with NRCS financial assistance?	☐ No	☐ Yes	☐ Unknown
Does it require Federal approval with NRCS as the lead federal agency (permit, license, approval, etc.)?	☐ No	☐ Yes	☐ Unknown
Is it a joint project with another Federal, State, or local entity with NRCS functioning as lead federal agency?	☐ No	☐ Yes	☐ Unknown

- **If all of your responses are "No," document on the NRCS-CPA-52, or notes section below, the finding, rationale, and information sources used and proceed with planning.**
- **If any responses are "Yes," go to Step 2.**
- **If "Unknown,"** consult with your State Cultural Resources Coordinator or Specialist (CRC or CRS) to determine if this is an action/undertaking that requires review and then **complete Step 1.**

STEP 2.

Is the action(s) identified as an "undertaking" (as defined in the 190-NCRPH and 420-GM) with the potential to cause effects to cultural resources/historic properties?

☐ No	**If "No," document on the NRCS-CPA-52, or notes section below, the finding, rationale, and information sources used and proceed with planning.**
☐ Yes	**If “Yes,” go to Step 3.**

STEP 3.

Has the undertaking's Area of Potential Effect (APE) been determined? **NOTE:** Include all areas to be altered or affected, directly or indirectly: access and haul roads, equipment lots, borrow areas, surface grading areas, locations for disposition of sediment, streambank stabilization areas, building removal and relocation sites, disposition of removed concrete, as well as the area of the actual conservation practice. Consultation is essential during determination of the APE so that all historic properties (buildings, structures, sites, landscapes, objects, and properties of cultural or religious importance to American Indian tribal governments and native Hawaiians) are included.

☐ No ☐ Unknown	**If "No," or "Unknown,"** consult with your state specific protocols or the CRC or CRS to **determine the APE.**
☐ Yes	**If “Yes,” go to Step 4.**

CULTURAL RESOURCES (continued)

STEP 4.

Have the appropriate records (National, State and local registers and lists) been checked or interviews conducted to determine whether any known cultural or historic resources are within or in close proximity to the proposed APE or project area? **Note:** This record checking does not substitute for mandatory consultation with SHPO, THPO, Tribes, and other identified consulting parties.

National Register of Historic Places?	☐ No	☐ Yes	☐ Unknown
State Register of Historic Places?	☐ No	☐ Yes	☐ Unknown
The SHPO's statewide inventory or data base?	☐ No	☐ Yes	☐ Unknown
Local/county historical society or commission lists?	☐ No	☐ Yes	☐ Unknown
Client knowledge of existing artifacts, historic structures, or cultural features?	☐ No	☐ Yes	☐ Unknown

- **If any responses are "No" or "Unknown," work with your CRC or CRS** to be sure these files are checked (sometimes the SHPO will let only the CRS or CRC review the files). Follow all other operating procedures as required by NRCS policy and procedures, SLA, and Tribal consultation protocols or operating procedures, as appropriate.
- **If all responses are "Yes," and NRCS providing technical assistance only,** then use any known information, notify the landowner of any potential affects, and provide recommendations for consideration. **Document on the NRCS-CPA-52, or notes section below, the finding, rationale, and information sources used and proceed with planning.** If NRCS is providing more than technical assistance **go to Step 5.**

STEP 5.

Did Step 4 reveal the existence of any known or potential cultural resources in the APE, or were any cultural resource indicators observed during the field inspection of the APE? **NOTE:** Field inspections or cultural resource survey will need to be conducted by qualified personnel in your state. Check with your State Cultural Resources Specialist to determine qualification criteria.

☐ No — **If "No," document on the NRCS-CPA-52, or notes section below, the finding, rationale, and information sources used and proceed with planning.**

☐ Yes — **If "Yes,"** contact the CRC or CRS. Do **NOT** proceed with finalizing project design or project implementation until the final CRS response is received. **Go to Step 6.**

STEP 6.

Can the proposed actions or alternatives be modified to avoid effects on the known cultural resources?

☐ No — **If "No," go to Step 7.**

☐ Yes — **If "Yes,"** modify the planned actions or activities and proceed according to CRS guidance and **document this on the NRCS-CPA-52, or notes section below and continue with planning.**

STEP 7.

Has consultation with appropriate and interested parties been completed and documented? **NOTE:** The field planner completing the NRCS-CPA-52 generally does not do the consultation unless it is the CRS or CRC. Refer to the appropriate specialist for the documentation information.

☐ No — **If "No" refer to State CRC or CRS** for further consultation and recommendations to the State Conservationist.

☐ Yes — **If "Yes,"** and all necessary historic preservation activities of identification, evaluation, and treatment have been completed, **document any consultation and proceed with planning.**

Notes:

ENDANGERED AND THREATENED SPECIES NECH 610.26 **Evaluation Procedure Guide Sheet**	Client/Plan Information:
Check all that apply to this Guide Sheet review: ☐ Alternative 1 ☐ Alternative 2 ☐ Other	

STEP 1.

Are protected species or their habitat present in the area of potential effect?
Note: protected species include federally listed, proposed, and candidate specie, as well as State and Tribal species protected by law or regulation. In addition, if a species' listing or status changes before implementation, you must complete this review again.

☐ No — **If "No," document on the NRCS-CPA-52, or notes section below, the finding, rationale, and information sources used and proceed with planning.**

☐ Yes — **If "Yes,"** document the species and relevant benchmark data on NRCS-CPA-52, then proceed to the applicable section(s) listed below:

- Section 1- Federally listed endangered or threatened species/habitats
- Section 2- Federally proposed species/habitats
- Section 3- Federal candidate species/habitats
- Section 4- State/Tribal species/habitats

SECTION 1: Federally listed endangered or threatened species/habitats

STEP 1.

What is the effect (i.e. beneficial/adverse, short-term/long-term, etc.) of the action(s) on endangered or threatened species or their habitat?

☐ No effect — **If "No effect, "document on the NRCS-CPA-52, or notes section below, the finding, rationale, and information sources used and proceed with planning.**

☐ May affect — **If "May affect,"** meaning that the action might affect endangered and threatened species or their habitat in some way, **go to Step 2.**

Federally listed endangered or threatened species/habitats (continued)

STEP 2.

Is NRCS providing financial assistance or otherwise controlling the action(s)?

☐ No Need for **If "No," and the effects are purely benign or beneficial,** continue with planning but ensure the client is aware endangered and threatened species or their habitat exists and conservation practices must be applied in a manner that avoids adverse effects. **Document on the NRCS-CPA-52, or notes section below, the finding, rationale, and information sources used and proceed with planning.**

☐ No **If "No," and there is a possibility of short-term or long-term adverse effects** then inform the client of NRCS's policy concerning endangered and threatened species and the need to use alternative conservation treatments to avoid adverse effects on these species or their habitat. Further, NRCS assistance will be provided only if one of the conservation alternatives is selected that avoids adverse effects or the client obtains a "take" permit from the FWS/NMFS. Refer the client to FWS/NMFS to address the client's responsibilities under Sections 9 & 10 of the ESA, for Federally listed species. **Document on the NRCS-CPA-52, or notes section below, the finding, rationale, and information sources used. If assistance is continued, document how the alternative conservation treatments avoid adverse effects and proceed with planning.**

☐ Yes **If "Yes," and the action will be implemented according to an existing informal consultation, biological opinion, or 4(d) special rule, document on the NRCS-CPA-52, or notes section below, the finding, rationale, and information sources used and proceed with planning.**

☐ Yes **If "Yes," and the action cannot be modified to avoid the effect,** inform client that in order to proceed with the action NRCS must consult with FWS/NMFS. Contact your area or State biologist for consultation procedures. The action can only be implemented according to the terms of the consultation. **When consultation is complete, attach the consultation documents to NRCS-CPA-52 or reference them in the notes section below and proceed with planning.**

Notes for Federally listed endangered or threatened species/habitats:

SECTION 2: Federally proposed species/habitats

STEP 1.

What is the effect (i.e. beneficial/adverse, short-term/long-term, etc.) of the action(s) on proposed species or their habitat?

☐ No effect

If "No effect," additional evaluation is not needed concerning proposed species or proposed critical habitat. Document on the NRCS-CPA-52, or notes section below, the finding, rationale, and information sources used and proceed with planning.

☐ May effect

If "May affect," meaning that the action might affect endangered and threatened species or proposed critical habitat in any way, **go to Step 2.**

STEP 2.

Is NRCS providing financial assistance or otherwise controlling the action?

☐ No **If "No," and the effects are purely benign or beneficial,** continue with planning but ensure the client is aware proposed species or their habitat exists and conservation practices must be applied in a manner as to avoid adverse effects. **Document on the NRCS-CPA-52, or notes section below, the finding, rationale, and information sources used and proceed with planning.**

☐ No **If "No," and there is a possibility of short-term or long-term adverse effects** then inform the client of NRCS's policy concerning proposed species and the need to use alternative conservation treatments to avoid adverse effects on these species or their habitat. Further, NRCS assistance will be provided only if one of the conservation alternatives is selected that avoids adverse effects, and to the extent practicable, provide long-term benefits to species and habitat. Should the client or landowner refuse to apply the recommended alternative conservation treatment, NRCS will inform the client and landowner of the NRCS policy and shall not provide assistance for the action or portion of the action affecting the proposed species.

☐ Yes **If "Yes," and the action will be implemented according to an existing conference report or conference opinion. Document on the NRCS-CPA-52, or notes section below, the finding, rationale, and information sources used and proceed with planning.**

☐ Yes **If "Yes," and the action cannot be modified to avoid the effect,** inform client that the NRCS must conference with FWS/NMFS. Contact your area or State biologist for conference procedures. Further NRCS assistance can only be provided only if the client agrees to implement the conference recommendations to the extent practicable. **When the conference is complete, attach the conference documents to NRCS-CPA-52, or reference them in the notes section below, and proceed with planning.**

Notes for Federally proposed species/habitats:

SECTION 3: Federal candidate species/habitats

STEP 1.

What is the effect (i.e. beneficial/adverse, short-term/long-term, etc.) of the action(s) on candidate species or their habitat?

☐ No adverse effect

If "No adverse effect," additional evaluation is not needed concerning proposed species or proposed critical habitat. **Document on the NRCS-CPA-52, or notes section below, the finding, rationale, and information sources used and proceed with planning.**

☐ May adversely effect

If "May adversely affect," recommend alternative treatments that avoid or minimize the adverse effects and, to the extent practicable, provide long-term benefit to the species. **Document the effects of the selected alternative on the NRCS-CPA-52 and proceed with planning.**

Notes for Federally proposed species/habitats:

SECTION 4: State/Tribal species/habitats

STEP 1.

What is the effect (i.e. beneficial/adverse, short-term/long-term, etc.) of the proposed action or alternative on State/Tribal species or their habitat?

☐ No adverse effect

If "No adverse effect," additional evaluation is not needed concerning State or Tribal species of concern. **Document on the NRCS-CPA-52, or notes section below, the finding, rationale, and information sources used and proceed with planning.**

☐ May adversely affect

If "May adversely affect," go to Step 2.

STEP 2.

Is NRCS providing financial assistance or otherwise controlling the action?

☐ No

If "No," and there is a possibility of short-term or long-term adverse effects then inform the client of NRCS's policy concerning State and Tribal species and the need to use alternative conservation treatments to avoid or minimize adverse effects on these species or their habitat. Further, NRCS assistance will be provided only if one of the conservation alternatives is selected that avoids or minimizes adverse effects to the extent practicable. **Document on the NRCS-CPA-52, or notes section below, the finding, rationale, and information sources used.** If assistance is continued, document how the alternative conservation treatments avoid or minimize those adverse effects and proceed with planning.

☐ Yes

If "Yes," and the action cannot be modified to avoid the adverse effect, inform client that the NRCS must coordinate with State/Tribal government and receive concurrence on recommended alternatives. Contact your area or State biologist for coordination procedures. Further NRCS assistance will be provided only if the client agrees to implement a concurred upon alternative and obtains any required permits. **Document on the NRCS-CPA-52, or notes section below, the finding, rationale, and information sources used and proceed with planning.**

Notes for State/Tribal species/habitats:

ENVIRONMENTAL JUSTICE
NECH 610.27
Evaluation Procedure Guide Sheet

Check all that apply to this Guide Sheet review:	☐ Alternative 1 ☐ Alternative 2	☐ Other	Client/Plan Information:

STEP 1.

In the area affected by the NRCS action, are there low-income populations, minority populations, Indian Tribes, or other specified populations that would experience disproportionately high and adverse human health impacts resulting from the proposed action or alternative?

☐ No — **If "No," document on the NRCS-CPA-52, or notes section below, the finding, rationale, and information sources used and proceed with planning.**

☐ Yes — **If "Yes," go to Step 2.**

☐ Unknown — **If "Unknown,"** consult your State Environmental Specialist, or equivalent and Tribal Liaison for additional guidance, **and repeat Step 1. NOTE:** The USDA Departmental Regulation on Environmental Justice (DR 5600-002) provides detailed "determination procedures" for NEPA as well as non-NEPA activities and suggests social and economic effects for considerations.

STEP 2.

Is the action(s) the type that might have a disproportionately high and adverse environmental or human health effect on a low-income population, minority population, or Indian Tribe?

☐ No — **If "No," document on the NRCS-CPA-52, or notes section below, the finding, rationale, and information sources used and proceed with planning.**

☐ Yes — **If "Yes,"** initiate Tribal consultation or community outreach to affected and interested parties that are categorized as low-income, minority, or as Indian Tribes. The purpose is to encourage participation and input on the proposed program or activity and any alternatives or mitigating options. Participation of these populations may require adaptive or innovative approaches to overcome linguistic, institutional, cultural, economic, historic, or other potential barriers to effective participation. If assistance is needed with this process, contact your State Public Affairs Specialist or Tribal Liaison. **Go to Step 3.**

STEP 3.

Considering the results of the outreach initiative together with other information gathered for the decision-making process, will the action(s) have a disproportionately high and adverse effect on the human health or the environment of the minority, low-income, or Indian populations?

☐ No — **If "No," notify interested and affected parties of agency decision. Document on the NRCS-CPA-52, or notes section below, the finding and rationale.**

☐ Yes — **If "Yes,"** consider the feasibility and appropriateness of the proposed alternatives and their effects and the possibility of developing additional alternatives or a mitigation alternative and **repeat Step 3. Document results of these early scoping sessions on the NRCS-CPA-52.** If it is determined that there remains a disproportionately high and adverse effect on human health or the environment, or the project or action carries a high degree of controversy then an Environmental Assessment (EA) or Environmental Impact Statement (EIS) may be required. Contact your State Office for assistance.

Notes:

ESSENTIAL FISH HABITAT **NECH 610.28** **Evaluation Procedure Guide Sheet**	Client/Plan Information:
Check all that apply to this Guide Sheet review: ☐ Alternative 1 ☐ Alternative 2 ☐ Other	

STEP 1.

Is the action(s) in an area designated as Essential Fish Habitat (EFH) or in an area where effects could indirectly or cumulatively affect EFH?

NOTE: Additional information regarding EFH Descriptions and Identification can be found on NMFS's website.

☐ No **If "No," document on the NRCS-CPA-52, or notes section below, the finding, rationale, and information sources used and proceed with planning.**

☐ Yes **If "Yes," go to Step 2.**

STEP 2.

Will the action(s) result in short-term or long-term disruptions or alterations that may result in an "adverse effect" to EFH? [16 U.S.C. 1855(b)(2); Magnuson Stevens Act (MSA) Section 305(b)(2)]

☐ No If "No," consultation with NMFS and further evaluation is not needed concerning EFH unless otherwise specified by the State Biologist. **Document on the NRCS-CPA-52, or notes section below, the finding, rationale, and information sources used and proceed with planning.**

☐ Yes **If "Yes," go to Step 3.**

STEP 3.

Can the action(s) be modified to avoid the potential adverse effect?

☐ No **If "No," document on the NRCS-CPA-52, or notes section below, the finding, rationale, and information sources used. Go to Step 4.**

☐ Yes **If "Yes," modify the action or activity and repeat Step 2.**

STEP 4.

Is NRCS providing assistance that would result in the funding, authorization, or undertaking of the action(s)? [MSA Section 305(b)]

☐ No **If "No," an alternative conservation system that avoids the adverse effect must be identified as the proposed action or NRCS must discontinue assistance.** If assistance is terminated, indicate the circumstances in the Remarks section of the NRCS-CPA-52 or

Need for contact the NRCS State Office for assistance. (Title 190, General Manual, Part 410, Subpart A, Section 410.3)

☐ Yes **If "Yes," inform the client that the NRCS District Conservationist or NRCS State Biologist must consult with NMFS before further action or activity can proceed** [MSA, Section 305(b)(2)].

Note: For specific information regarding consultation for EFH, see NMFS "Essential Fish Habitat Consultation Guidance," April 2004, available online.

Notes:

FLOODPLAIN MANAGEMENT NECH 610.29	Client/Plan Information:
Evaluation Procedure Guide Sheet	
Check all that apply to this Guide Sheet review: ☐ Alternative 1 ☐ Alternative 2 ☐ Other	

NOTE: This Guide Sheet is intended for evaluation of "non-project" technical and financial assistance only (individual projects). For "project" assistance criteria (those assisting local sponsoring organizations), consult Title 190, General Manual, Part 410, Subpart B, Section 410.25.

STEP 1.

Is the project area in or near a 100-year floodplain?

☐ No **If "No," document on the NRCS-CPA-52, or notes section below, the finding, rationale, and information sources used and go to Step 4.**

☐ Yes **If "Yes," go to Step 2.**

☐ Unknown **If "Unknown,"** review the HUD/FEMA flood insurance maps and other available data such as soils information relating to flood frequency. If still "Unknown", contact the appropriate field or hydraulic engineer. **Repeat Step 1.**

STEP 2.

Is the planning area in the floodplain an agricultural area that has been used to produce food, fiber, feed, forage or oilseed for at least 3 of the last 5 years before the request for assistance?

☐ No **If "No," go to Step 4.**

☐ Yes **If "Yes," document the agricultural use history and go to Step 3.**

STEP 3.

Is the floodplain's agricultural production in accordance with official state or designated area water quality plans?

☐ No **If "No,"** advise the client of conservation practices or other measures that will bring the land into accordance with water quality plans and incorporate these into the conservation plan. **Go to Step 4.**

☐ Yes **If "Yes," document on the NRCS-CPA-52, or notes section below, the finding, rationale, and information sources used and go to Step 4.**

STEP 4.

Over the short or long term, will the proposed action or alternative likely result in an increased flood hazard, incompatible development, or other adverse effect to the existing natural and beneficial values of the floodplain or lands adjacent or downstream?

☐ No **If "No," document on the NRCS-CPA-52, or notes section below, the finding, rationale, and information sources used and proceed with planning.**

☐ Yes **If "Yes,"** modify the action if possible to avoid adverse effects. Inform landuser of the hazards of locating actions in the floodplain and discuss alternative methods of achieving the objective and/or alternative locations outside the 100-year floodplain. **If the action can be modified, describe the modification on the NRCS-CPA-52 and repeat 4. If the action cannot be modified to eliminate adverse effects, go to Step 5.**

FLOODPLAIN MANAGEMENT (continued)

STEP 5.

Is one or more of the alternative methods or locations practical?

☐ No **If "No,"** the District Conservationist will carefully evaluate and document the potential extent of the adverse effects and any increased flood risk before making a determination of whether to continue providing assistance. **Document on the NRCS-CPA-52, or notes section below, the finding, rationale, and information sources used and go to Step 6.**

☐ Yes **If "Yes," and the client agrees** to implement the alternative methods or locations outside the floodplain, **document on the NRCS-CPA-52, or notes section below, the finding, rationale, and information sources used and proceed with planning.**

☐ Yes **If "Yes," and the client DOES NOT AGREE** to implement the alternative methods or locations, advise the client that NRCS may not continue to provide technical and/or financial assistance where there are practicable alternatives. **Document on the NRCS-CPA-52, or notes section below, the finding, rationale, and information sources used and go to Step 6.**

STEP 6.

Will assistance continue to be provided?

☐ No **If "No,"** provide written notification of the decision to terminate assistance to the client and the local conservation district, if one exists. **Document on the NRCS-CPA-52, or notes section below, the finding, rationale, and information sources used and proceed with planning.**

☐ Yes **If "Yes,"** the district conservationist should **design or modify the proposed action or alternative to minimize the adverse effects to the extent possible. Circulate a written public notice** locally explaining why the action is proposed to be located in the 100-year floodplain. **Document on the NRCS-CPA-52, or notes section below, the finding, rationale, and information sources used and proceed with planning.**

Notes:

INVASIVE SPECIES **NECH 610.30** **Evaluation Procedure Guide Sheet**	Client/Plan Information:
Check all that apply to this Guide Sheet review: ☐ Alternative 1 ☐ Alternative 2 ☐ Other	

NOTE: Executive Order 13112 states that "a Federal agency shall not authorize, fund, or carry out actions that it believes are likely to cause or promote the introduction and spread of invasive species in the U.S. or elsewhere." Remember that invasive species can include plants, fish, animals, insects, etc.

STEP 1.

Is the action(s) in an area where invasive species are known to occur or where risk of an invasion exists?
NOTE: Executive Order 13112 (1999) directs Federal agencies to "prevent the introduction of invasive species, provide for their control, and to minimize the economic, ecological, and human health impacts that invasive species cause."

☐ No — **If "No," document on the NRCS-CPA-52, or notes section below, the finding, rationale, and information sources used and proceed with planning.**

☐ Yes — **If "Yes," go to Step 2.**

STEP 2.

Conduct an inventory of the invasive species and identify areas at risk for future invasions (Title 190, General Manual, Part 414, Subpart D, Section 414.30). Delineate these areas on the conservation plan map and document management considerations in the plan or assistance notes. Have all appropriate tools, techniques, management strategies, and risks for invasive species prevention, control, and management been considered in the planning process?

☐ No — **If "No,"** you must consider and include all appropriate factors relating to the existing and potential invasive species for the planning area and **repeat Step 2.**

☐ Yes — **If "Yes,"** describe strategies, techniques, and reasons on NRCS-CPA-52 and **go to Step 3.**

STEP 3.

Is the action(s) consistent with the Executive Order 13112, the national invasive species management plan, and any applicable State or local invasive species management plan?

☐ No — **If "No," modify the action and repeat Step 3.** If the client is unwilling to modify the proposed action, NRCS must discontinue assistance. **Document the circumstances on the NRCS-CPA-52. or notes section below. and in the case file.**

☐ Yes Need for — **If "Yes," document on the NRCS-CPA-52, or notes section below, the finding, rationale, and information sources used and proceed with planning.**

Notes:

MIGRATORY BIRDS, BALD AND GOLDEN EAGLE PROTECTION ACT, NECH 610.31 **Evaluation Procedure Guide Sheet**	Client/Plan Information:
Check all that apply to this Guide Sheet review: ☐ Alternative 1 ☐ Alternative 2 ☐ Other	

NOTE: This guide sheet includes evaluation guidance for compliance with the Migratory Bird Treaty Act, Executive Order 13186 (2001), and the Bald and Golden Eagle Protection Act. Both sections must be completed if eagles are identified within the area of potential effect.

SECTION I: MIGRATORY BIRD TREATY ACT & E.O 13186

In the lower 48 states, all wild birds except introduced species (House Sparrow, Rock Pigeon, European Starling, Eurasian Collared-dove) and resident game birds managed by State Wildlife Agencies are protected under the MBTA.

STEP 1.

Could the action(s) result in a take (intentionally or unintentionally) to any migratory bird, occupied nest or egg? The term **"take"** means to pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to pursue, hunt, shoot, wound, kill, trap, capture, or collect (50 CFR Section 10.12).

☐ No **If "No," document on the NRCS-CPA-52, or notes section below, the finding, rationale, and information sources used and proceed with planning. Go to Section II.**

☐ Yes **If "Yes," go to Step 2.**

STEP 2.

Have adverse effects on migratory birds been mitigated (avoided, reduced, or minimized) to the maximum practicable extent?

☐ No **If "No,"** modify the action and **repeat Step 1.**

☐ Yes **If "Yes," document mitigation measures on the NRCS-CPA-52, or notes section below, and in the plan. Go to Step 3.**

STEP 3.

Is it the purpose of the action(s) to intentionally "take" a migratory bird or any part, nest or egg (such as, but not limited to: controlling depredation by a migratory bird, or removal of occupied nests of nuisance migratory birds)?

NOTE: Migratory game birds taken under state and Federal hunting regulations are exempt.

☐ No **If "No," go to Step 4.**

☐ Yes **If "Yes," document the effects, including the reasons, on the NRCS-CPA-52, or notes section below. Inform the client that they must obtain all required permits before the action is implemented.**

MIGRATORY BIRDS TREATY ACT / BALD AND GOLDEN EAGLE PROTECTION ACT (continued)

STEP 4.

Will unintentional take of migratory birds result in a **measurable** negative effect on a migratory bird species' **population?**

☐ No **If "No," document on the NRCS-CPA-52, or notes section below, the finding, rationale, and information sources used and go to Section II.**

☐ Yes **If "Yes,"** additional principles, standards and practices shall be developed in coordination with USFWS to further lessen the amount of unintentional take (E.O. 13186(3)(e)(9)). **Repeat Step 1. Document the effects, including the reasons, on the NRCS-CPA-52, or notes section below.**

Notes:

SECTION II: BALD & GOLDEN EAGLE PROTECTION ACT

STEP 1.

Will the action(s) result in the take, possession, sale, purchase, barter, or offer to sell, purchase, or barter, export or import "of any bald or golden eagle, alive or dead, including any part, nest, or egg, unless allowed by permit"? (The term **"take"** is defined as "pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest or disturb" a bald or golden eagle. The term "disturb" under this act means to agitate or bother a bald or golden eagle to a degree that causes, or is likely to cause, based on the best scientific information available, injury to an eagle; a decrease in its productivity by substantially interfering with normal breeding, feeding, or sheltering behavior; or nest abandonment by substantially interfering with normal breeding, feeding, or sheltering behavior.)

☐ No **If "No," document on the NRCS-CPA-52, or notes section below, the finding, rationale, and information sources used and proceed with planning.**

☐ Yes **If "Yes," go to Step 2.**

STEP 2.

Can the action(s) be modified to avoid the adverse effect? Refer to the National Bald Eagle Management Guidelines for measures that can be taken to avoid disturbing nesting bald eagles and their young.

☐ No **If "No," document the finding, including the reasons, on the NRCS-CPA-52, or notes section below. Contact the NRCS State Biologist or appropriate NRCS official** about working with the client and USFWS to permit the action or finding another alternative action to avoid adverse effects prior to providing final designs or implementing the proposed action or alternative. No permit authorizes the sale, purchase, barter, trade, importation, or exportation of eagles, or their parts or feathers. The regulations governing eagle permits can be found in 50 CFR Part 22.

☐ Yes **If "Yes,"** modify the alternative and **repeat Step 1.** If the client is unwilling to modify the action then NRCS may need to discontinue assistance. Contact the NRCS State environmental specialist or wildlife biologist for assistance. **Document the effects, including the reasons, on the NRCS-CPA-52, or notes section below.**

Notes:

NATURAL AREAS NECH 610.32 **Evaluation Procedure Guide Sheet**	Client/Plan Information:
Check all that apply to this Guide Sheet review: Alternative 1 ☐ Alternative 2 ☐ Other ☐	

Natural Areas are defined as land and water units where natural conditions are maintained. They may be areas designated on Federal government, non-federal government, or on private land. Designation may be provided under Federal regulations, by foundations or conservation organizations, or by private landowners that specify it as such (GM 190. Part 410.23).

STEP 1.

Are there any designated natural areas present in or near the planning area?

☐ No **If "No, "document on the NRCS-CPA-52, or notes section below, the finding, rationale, and information sources used and proceed with planning.**

☐ Yes **If "Yes," go to Step 2.**

STEP 2.

Will the action(s) affect the natural area?

☐ No **If "No," document on the NRCS-CPA-52, or notes section below, the finding, rationale, and information sources used and proceed with planning.**

☐ Yes **If "Yes," go to Step 3.**

STEP 3.

Are the effects consistent with maintaining, protecting, and preserving the integrity of the natural characteristics?

☐ No **If "No," I**nform the client about the effects of the proposed action or alternatives on the identified natural areas. You must also encourage the client to consult with concerned parties to arrive at a mutually satisfactory alternative [GM 190, Part 410.23(c)4]. **Document the effects of the action and any communications with the client on the NRCS-CPA-52, or notes section below, and proceed with planning.**

☐ Yes **If "Yes," document on the NRCS-CPA-52, or notes section below, the finding, rationale, and information sources used and proceed with planning.**

Notes:

PRIME AND UNIQUE FARMLANDS NECH 610.33 **Evaluation Procedure Guide Sheet**	Client/Plan Information:
Check all that apply to this Guide Sheet review: ☐ Alternative 1 ☐ Alternative 2 ☐ Other	

STEP 1.

Using the criteria found in the FPPA Rule (7 CFR Part 658.5), does the action(s) convert farmland to a nonagricultural use? **NOTE:** Conversion does not include construction of on-farm structures necessary for farm operations. Also, form AD-1006 entitled "Farmland Conversion Impact Rating" and form NRCS-CPA-106 entitled "Farmland Conversion Impact Rating for Corridor Type Projects" are used to document effects of proposed projects that may convert farmland. If you are uncertain about the effects on prime and unique farmlands in your planning area, consult the State Soil Scientist.

☐ No **If "No," document on the NRCS-CPA-52, or notes section below, the finding, rationale, and information sources used and proceed with planning.**

☐ Yes **If "Yes," go to Step 2.**

STEP 2.

Are prime or unique farmlands or farmlands of statewide or local importance present in or near the area that will be affected by the action(s)?

☐ No **If "No," document on the NRCS-CPA-52, or notes section below, the finding, rationale, and information sources used and proceed with planning.**

☐ Yes **If "Yes," go to Step 3.**

STEP 3.

Can the action(s) be modified to avoid adverse effects or conversion?

☐ No **If "No," document the adverse effects on the NRCS-CPA-52, or notes section below, and proceed with planning.**

☐ Yes **If "Yes,"** modify and **repeat Step 1 or contact the State Soil Scientist** for further assistance. **Document on the NRCS-CPA-52, or notes section below, the finding, rationale, and information sources used and proceed with planning.**

Notes:

RIPARIAN AREA **NECH 610.34** **Evaluation Procedure Guide Sheet**	Client/Plan Information:
Check all that apply to this Guide Sheet review: ☐ Alternative 1 ☐ Alternative 2 ☐ Other	

STEP 1.

Is a riparian area present in or near the planning area? (Definition can be found in Title 190, General Manual, Part 411.)

☐ No **If "No," document on the NRCS-CPA-52, or notes section below, the finding, rationale, and information sources used and proceed with planning.**

☐ Yes **If "Yes," go to Step 2.**

STEP 2.

Do the action(s) address maintenance or improvement of water quality, water quantity, and fish and wildlife benefits provided by the riparian area?

☐ No **If "No,"** revise the plan to maintain or improve water quality, water quantity, and fish and wildlife benefits**.** Document the benchmark conditions and effects on the NRCS-CPA-52, or notes section below, **go to Step 3.**

☐ Yes **If "Yes,", go to Step 3.**

STEP 3.

Do the action(s) conflict with the conservation values/functions of the riparian area?

☐ No **If "No," document on the NRCS-CPA-52, or notes section below, the finding, rationale, and information sources used and proceed with planning.**

☐ Yes **If "Yes,"** inform the client of the values and functions of riparian areas, including their contribution to floodplain function, stream bank stability and integrity, nutrient cycling, pollutant filtering, sediment retention, and biological diversity, and present alternatives that will resolve the conflict. **Document on the NRCS-CPA-52, or notes section below, the finding, rationale, and information sources used and proceed with planning.**

Notes:

SCENIC BEAUTY **NECH 610.35** **Evaluation Procedure Guide Sheet**	Client/Plan Information:
Check all that apply to this Guide Sheet review: Alternative 1 ☐ Alternative 2 ☐ Other ☐	

STEP 1.

Will the action(s) adversely affect the scenic quality of the general landscape or any specifically designated unique or valuable scenic landscape? (Consult Section II of the FOTG for a listing of any identified areas of scenic beauty.)

☐ No **If "No," document on the NRCS-CPA-52, or notes section below, the finding, rationale, and information sources used and proceed with planning.**

☐ Yes **If "Yes," go to Step 2.**

STEP 2.

Can the action(s) be modified to avoid the adverse effects on the scenic quality of the landscape? NOTE: NRCS must provide technical assistance with full consideration of alternative management and development systems that preserve scenic beauty or improve the landscape (GM 190, Part 410.24).

☐ No **If "No," consider any state or local requirements. Document on the NRCS-CPA-52, or notes section below, the finding, rationale, and information sources used and proceed with planning.**

☐ Yes **If "Yes,"** modify the planned action or activity and **repeat Step 1.**

Notes:

WETLANDS
NECH 610.36
Evaluation Procedure Guide Sheet

Check all that apply to this Guide Sheet review:	☐ Alternative 1 ☐ Alternative 2 ☐ Other	Client/Plan Information:

This guide sheet addresses policy found in Title 190, General Manual, Part 410, Subpart B, Section 410.26. Use the Clean Water Act Guide Sheet for addressing wetland concerns relating to the Clean Water Act.

STEP 1.

Are wetlands present in or near the planning area?

NOTE: Wetlands are areas that are inundated by surface or ground water with a frequency sufficient to support and, under normal circumstances, do or would support prevalence of vegetative or aquatic life that requires saturated or seasonally saturated soil conditions for growth and reproduction, except for irrigation or leakage-induced wetlands created in uplands.

☐ No **If "No," document on the NRCS-CPA-52, or notes section below, the finding, rationale, and information sources used.** (If the area could qualify as an "other water of the United States" such as lakes, streams, channels, or other impoundment or conveyances, a Clean Water Act Section 404 permit may be required from the Corps of Engineers. Refer to the Clean Water Act Guide sheet.)

☐ Yes **If "Yes," document the extent and location of wetlands and go to Step 2.**

STEP 2.

Will the action(s) impact any wetland areas (this includes changing wetland types when considering wetland restoration projects)?

☐ No **If "No," document on the NRCS-CPA-52, or notes section below, the finding, rationale, and information sources used and proceed with planning.**

☐ Yes **If "Yes," assess the wetland functions and describe (on the NRCS-CPA-52) the effects** of the proposed activity on the wetland area. If effects are solely beneficial, continue with planning. If adverse effects exist, **go to Step 3.**

STEP 3.

Do practicable alternatives exist that avoid adverse impact to wetlands?

☐ No **If "No," go to step 4.**

☐ Yes **If "Yes,"** advise the client of the available alternatives. If the client chooses to implement the alternative that avoids adverse impact (including obtaining all necessary permits), **document on the NRCS-CPA-52, or notes section below, the finding, rationale, and information sources used and proceed with planning.** Otherwise, NRCS shall terminate all assistance for the project.

Need for

WETLANDS (continued)

STEP 4.

Do other measures exist that will minimize adverse effects to wetlands?

☐ No **If "No," go to step 5.**

☐ Yes **If "Yes,"** advise the client of the minimization measures. If the client chooses to implement the minimization measures (including obtaining all necessary permits), **document on the NRCS-CPA-52, or notes section below, the finding, rationale, and information sources used and proceed with planning.** Otherwise, NRCS shall terminate all assistance for the project.

STEP 5.

Does the client wish to pursue an action that will result in adverse impacts to wetlands (where no practicable alternatives or minimization measures exist)?

☐ No **If "No," document on the NRCS-CPA-52, or notes section below, the finding, rationale, and information sources used and proceed with planning.**

☐ Yes **If "Yes,"** advise that client of the need to compensate for the lost wetland acres and functions. NRCS may assist the client in the development of a mitigation plan. If the client chooses to implement the compensation measures (including obtaining all necessary permits), **document on the NRCS-CPA-52, or notes section below, the finding, rationale, and information sources used and proceed with planning.** Otherwise, NRCS shall terminate all assistance for the project.

NOTE: Compensation is not required for irrigation or leakage-induced wetlands where no natural wetlands existed before the irrigation or waste management activity, though such areas may be regulated by other Federal agencies or State, Tribal, or local agencies.

Notes:

WILD AND SCENIC RIVERS **NECH 610.37** **Evaluation Procedure Guide Sheet**	Client/Plan Information:
Check all that apply to this Guide Sheet review: ☐ Alternative 1 ☐ Alternative 2 ☐ Other	

STEP 1.

Could the action(s) have an effect on the natural, cultural or recreational values of any nearby rivers?

☐ No **If "No," document on the NRCS-CPA-52, or notes section below, the finding, rationale, and information sources used and proceed with planning.**

☐ Yes **If "Yes,"** analyze the potential effects and develop alternatives, as necessary, that would mitigate potential adverse effects, then **go to Step 2.**

STEP 2.

Is there a Federal or State designated Wild, Scenic, or Recreational River segment or a river listed in the Nationwide Rivers Inventory (NRI) in or near the planning area?

☐ No **If "No," document on the NRCS-CPA-52, or notes section below, the finding, rationale, and information sources used and proceed with planning.**

☐ Yes **If "Yes,"** and there is still potential for effect consult your State environmental liaison to assist with determining the nature and significance of the effect. **Go to Step 3.**
NOTE: The State Office may request the administering federal or state agency (National Park Service in the case of NRI) to assist you in developing appropriate avoidance and mitigation measures.

STEP 3.

Could the proposed action or alternative have an adverse effect on the natural, cultural or recreational values of the wild, scenic, or recreational river segment that cannot be avoided or minimized?

☐ No **If "No," document on the NRCS-CPA-52, or notes section below, the finding, rationale, and information sources used and proceed with planning.**

☐ Yes **If "Yes," go to Step 4.**

STEP 4.

Is NRCS providing financial assistance or otherwise controlling the action(s)?

☐ No **If "No," inform the client that a permit may be required** for their activities and they should consult with the administering federal or state agency. The permit authorization should be reflected in the final plan and documentation. Continue planning, but a permit is required prior Need for to implementation.

☐ Yes **If "Yes," consult with the administering federal or state agency** to determine whether the proposed action could foreclose options to classify any portion of the river segment as wild, scenic or recreational and to develop avoidance or mitigation measures. **Document on the NRCS-CPA-52, or notes section below, the finding, rationale, and information sources used and proceed with planning.**

Notes:

RESOURCE CONCERN CHECKLIST

Field Inventory Guide Sheet (Optional)

Identify the resource concern(s) that need to be addressed and the assessment tool(s) used for the evaluation.

Client/Plan Information:

SOIL

- ☐ Sheet & Rill
- ☐ Wind Erosion
- ☐ Other: ______
- ☐ Ephemeral gully erosion
- ☐ Classic gully erosion
- ☐ Other: ______
- ☐ Bank erosion from streams, shorelines or water conveyance channels
- ☐ Subsidence
- ☐ Organic matter depletion
- ☐ Other: ______
- ☐ Compaction
- ☐ Concentration of salts or other chemicals
- ☐ Other: ______
- ☐ Soil organism habitat loss or degradation
- ☐ Aggregate instability

Assessment tools, Problems & Notes:

WATER

- ☐ Ponding and flooding
- ☐ Seasonal High water table
- ☐ Seeps
- ☐ Drifted snow
- ☐ Surface water depletion
- ☐ Ground water depletion
- ☐ Naturally available moisture use
- ☐ Inefficient irrigation water use
- ☐ Other: ______
- ☐ Other: ______
- ☐ Nutrients transported to surface water
- ☐ Nutrients transported to groundwater
- ☐ Pesticides transported to surface water
- ☐ Pesticides transported to groundwater
- ☐ Pathogens and chemicals from manure, bio-solids or compost applications transported to surface water
- ☐ Pathogens and chemicals from manure, bio-solids or compost applications trasported to groundwater
- ☐ Salts transported to surface water
- ☐ Salts transported to groundwater
- ☐ Petroleum, heavy metals, and other pollutants transported to surface water
- ☐ Petroleum, heavy metals, and other pollutants transported to groundwater
- ☐ Sediment transported to surface water
- ☐ Elevated water temperature
- ☐ Other: ______
- ☐ Other: ______

Assessment tools, Problems & Notes:

AIR

- ☐ Emissions of particulate matter (PM) and PM precursors
- ☐ Emissions of greenhouse gases (GHGs)
- ☐ Other: ______
- ☐ Emissions of ozone precursors
- ☐ Other: ______
- ☐ Objectionable odors
- ☐ Emissions of airborne reactive nitrogen

Assessment tools, Problems & Notes:

PLANTS

- ☐ Plant productivity and health
- ☐ Wildfire hazard from biomass accumulation
- Nᴗd ☐ Plant structure and composition
- ☐ Other: ______
- ☐ Plant pest pressure
- ☐ Other: ______

Assessment tools, Problems & Notes:

ANIMALS

- ☐ Terrestrial habitat for wildlife and invertebrates
- ☐ Aquatic habitat for fish and other organisms
- ☐ Other: ______
- ☐ Other: ______
- ☐ Feed and forage imbalance
- ☐ Inadequate livestock shelter
- ☐ Inadequate livestock water quantity, quality and distribution
- ☐ Other: ______
- ☐ Other: ______

Assessment tools, Problems & Notes:

ENERGY

- ☐ Energy efficiency of equipment and facilities
- ☐ Other: ______
- ☐ Energy efficiency of farming/ranching practices and field operations

Assessment tools, Problems & Notes:

Field Inventory Guide Sheet - Notes Section

Natural Resources Conservation Service

CONSERVATION PRACTICE STANDARD

RESIDUE AND TILLAGE MANAGEMENT, NO TILL

CODE 329

(ac)

DEFINITION

Limiting soil disturbance to manage the amount, orientation and distribution of crop and plant residue on the soil surface year around.

PURPOSE

This practice is used to accomplish one or more of the following purposes–

- Reduce sheet, rill and wind erosion and excessive sediment in surface waters
- Reduce tillage-induced particulate emissions
- Maintain or increase soil health and organic matter content
- Increase plant-available moisture.
- Reduce energy use
- Provide food and escape cover for wildlife

CONDITIONS WHERE PRACTICE APPLIES

This practice applies to all cropland.

CRITERIA

General Criteria Applicable to All Purposes

Residue shall not be burned.

Distribute all residues uniformly over the entire field. Removing residue from directly within the seeding or transplanting area prior to or as part of the planting operation is acceptable.

This practice only involves an in-row soil disturbance operation during strip tillage, the planting operation, and a seed row/furrow closing device. There is no full-width soil disturbance performed from the time immediately following harvest or termination of one cash crop through harvest or termination of the next cash crop in the rotation regardless of the depth of the tillage operation. The soil tillage intensity rating (STIR) value shall include all field operations that are performed during the crop interval between harvest and termination of the previous cash crop and harvest or termination of the current cash crop (includes fallow periods). The crop interval STIR value shall be no greater than 20.

Additional Criteria to Reduce Sheet, Rill and Wind Erosion, Reduce Excessive Sediment in Surface Waters, and Reduce Tillage-Induced Particulate Emissions

Use the current approved water and wind erosion prediction technology to determine the if field operations planned provide the amount of randomly distributed surface residue needed, time of year residue needs to be present in the field, and amount of surface soil disturbance allowed to reduce erosion to the desired level. Calculations shall account for the effects of other practices in the management system.

Additional Criteria to Maintain or Increase Soil Health and Organic Matter Content

Ensure the soil condition index (SCI) for the cropping system results in a positive rating.

Additional Criteria to Increase Plant-Available Moisture

Maintain a minimum of 60 percent residue cover on the soil surface throughout the year.

Trapping Snow

Minimum crop stubble height during the time significant snowfall is expected to occur shall be

- At least 10 inches for crops with a row spacing of less than 15 inches.
- At least 15 inches for crops with a row spacing of 15 inches or greater.

Additional Criteria to Reduce Energy Use

Reduce the total energy consumption associated with field operations by at least 25 percent compared to the benchmark condition. Use the current approved NRCS tool for determining energy use to document energy use reductions.

Additional Criteria to Provide Food and Escape Cover for Wildlife.

Use an approved habitat evaluation procedure to determine when residue needs to be present, and the amount, orientation, and stubble height needed to provide adequate food and cover for target species.

CONSIDERATIONS

General Considerations

Removal of crop residue, such as by baling or grazing, can have a negative impact on resources. These activities should not be performed without full evaluation of impacts on soil, water, animal, plant, and air resources.

Production of adequate crop residues to achieve the purpose(s) of this practice can be enhanced through the use of high residue crops and crop varieties, use of cover crops, double cropping, and adjustment of plant populations through seeding rates and row spacing.

When providing technical assistance to organic producers, ensure residue and tillage management, activities are consistent with the USDA Agricultural Marketing Service National Organic Program regulations.

Residue should not be shredded after harvest. Shredding residue makes it more susceptible to movement by wind or water, and areas where residue accumulates may interfere with planting the next crop.

Using residue management - no till for all crops in the rotation or cropping system can enhance the positive effects of this practice by

- Increasing the rate of soil organic matter accumulation.
- Keeping soil in a consolidated condition and improved aggregate stability.
- Sequestering additional carbon in the soil.
- Further reducing the amount of particulate matter generated by field operations.
- Reduce energy inputs to establish crops.
- Forming root channels and other near-surface voids that increase infiltration.

Considerations to Increase Soil Health and Organic Matter Content

Carbon loss is directly related to the volume of soil disturbed, intensity of the disturbance and soil moisture content and soil temperature at the time the disturbance occurs. To make this practice more effective

- When deep soil disturbance is performed, such as by subsoiling or fertilizer injection, make sure the vertical slot created by these implements is closed at the surface.

- Planting with a single disk or slot opener no-till drill will release less CO2 and oxidize less organic matter than planting with a wide-point hoe/chisel opener seeder drill.
- Soil disturbance that occurs when soil temperatures are below 50° F will oxidize less organic matter and release less CO2 than operations done when the soil is warmer.
- Maximizing year-round coverage of the soil with living vegetation (e.g., cover crops) and/or crop residues builds organic matter and reduces soil temperature, thereby slowing organic matter oxidation.
- Use a diverse crop rotation, incorporating multiple crop types (cool-season grass, cool-season legume/forb, warm-season grass, warm-season legume/forb) into the croprotation.
- Plant a cover crop after every cash crop in the rotation. Multispecies cover crop mixes provide greater benefits than single-specie cover crops.

Considerations to Increase Plant-Available Moisture

Leaving stubble taller than the 10-inch minimum will trap more snow.

Variable-height stubble patterns may be created to further increase snow storage.

Performing all field operations on the contour will slow overland flow and allow more opportunity for infiltration.

Considerations for Wildlife Food and Cover

Leaving rows of unharvested crop standing at intervals across the field or adjacent to permanent cover will enhance the value of residues for wildlife food and cover. Leaving unharvested crop rows for two growing seasons will further enhance the value of these areas for wildlife.

Leave crop residues undisturbed after harvest (e.g., no shredding or baling) to maximize the cover and food source benefits for wildlife.

PLANS AND SPECIFICATIONS

Specifications for establishment and operation of this practice shall be prepared for each field or treatment unit. Record the specifications using the practice implementation requirements document. The specifications shall identify, as appropriate

- Purpose for applying the practice.
- Planned crop(s).
- Amount of residue produced by each crop.
- All field operations or activities that affect
    - Residue orientation including height (where applicable).
    - Surface disturbance.
    - The amount of residue (pounds/acre or percent surface cover) required to accomplish the purpose, and the time of year it must be present.
- Planned soil tillage intensity rating STIR value, soil condition index value, and erosion rate.
- Target species of wildlife, if applicable.
- Benchmark and planned fuel consumption, if applicable.

OPERATION AND MAINTENANCE

Evaluate/measure the crop residues cover and orientation after each crop to ensure the planned amounts and orientation are being achieved. Adjust management as needed to either plan a new residue amount and orientation or adjust the planting and/or harvesting equipment.

Limited tillage is allowed to close or level ruts from harvesting equipment. No more than 10 percent of the field may be tilled for this purpose.

If there are areas of heavy residue accumulation (because of movement by water or wind) in the field, spread the residue prior to planting so it does not interfere with planter operation.

REFERENCES

Bolton, Ryan. 2003. Impact of the surface residue layer on decomposition, soil water properties and nitrogen dynamics. M.S. thesis. Univ. of Saskatchewan, Saskatoon, Saskatchewan, CA.

Reicosky, D.C., M.J. Lindstrom, T.E. Schumacher, D.E. Lobb and D.D. Malo. 2005. Tillage-induced CO2 loss across an eroded landscape. Soil Tillage Res. 81:183-194.

Reicosky, D.C. 2004. Tillage-induced soil properties and chamber mixing effects on gas exchange. Proc. 16th Triennial Conf., Int. Soil Till. Org. (ISTRO).

Renard, K.G., G.R. Foster, G.A. Weesies, D.K. McCool, and D.C. Yoder, coordinators. 1997. Predicting soil erosion by water: A guide to conservation planning with the Revised Universal Soil Loss Equation (RUSLE). U.S. Department of Agriculture, Agriculture Handbook No. 703.

Shaffer, M.J., and W.E. Larson (ed.). 1987. Tillage and surface-residue sensitive potential evaporation submodel. In NTRM, a soil-crop simulation model for nitrogen, tillage and crop residue management. USDA Conserv. Res. Rep. 34-1. USDA-ARS.

Skidmore, E.L. and N.P. Woodruff. 1968. Wind erosion forces in the United States and their use in predicting soil loss. U.S. Department of Agriculture. Agriculture Handbook No. 346.

USDA Natural Resources Conservation Service. 2011. National Agronomy Manual. 190-V. 4th Ed.

S.J. van Donk, D. L. Martin, S. Irmak, S. R. Melvin, J. L. Petersen, D. R. Davison, 2010. Crop Residue Cover Effects on Evaporation, Soil Water Content, and Yield of Deficit-Irrigated Corn in West-Central Nebraska. http://watercenter.unl.edu/ResearchDB/publications/Crop_Residue_Cover_Effects.pdf.

Effects of NRCS Conservation Practices - National

Residue and Tillage Management, No Till/Strip Till/Direct Seed

Code: 329
Units: ac.

Managing the amount, orientation and distribution of crop and other plant residue on the soil surface year round, limiting soil-disturbing activities to those necessary to place nutrients, condition residue and plant crops.

C-Crop	F-Forest	R-Range	P-Pasture	Pr-Protected	FS-Farmstead	D-Developed	W-Water	O-Other	AL-Aso Land
C			P					O	

Typical Landuse: C P O

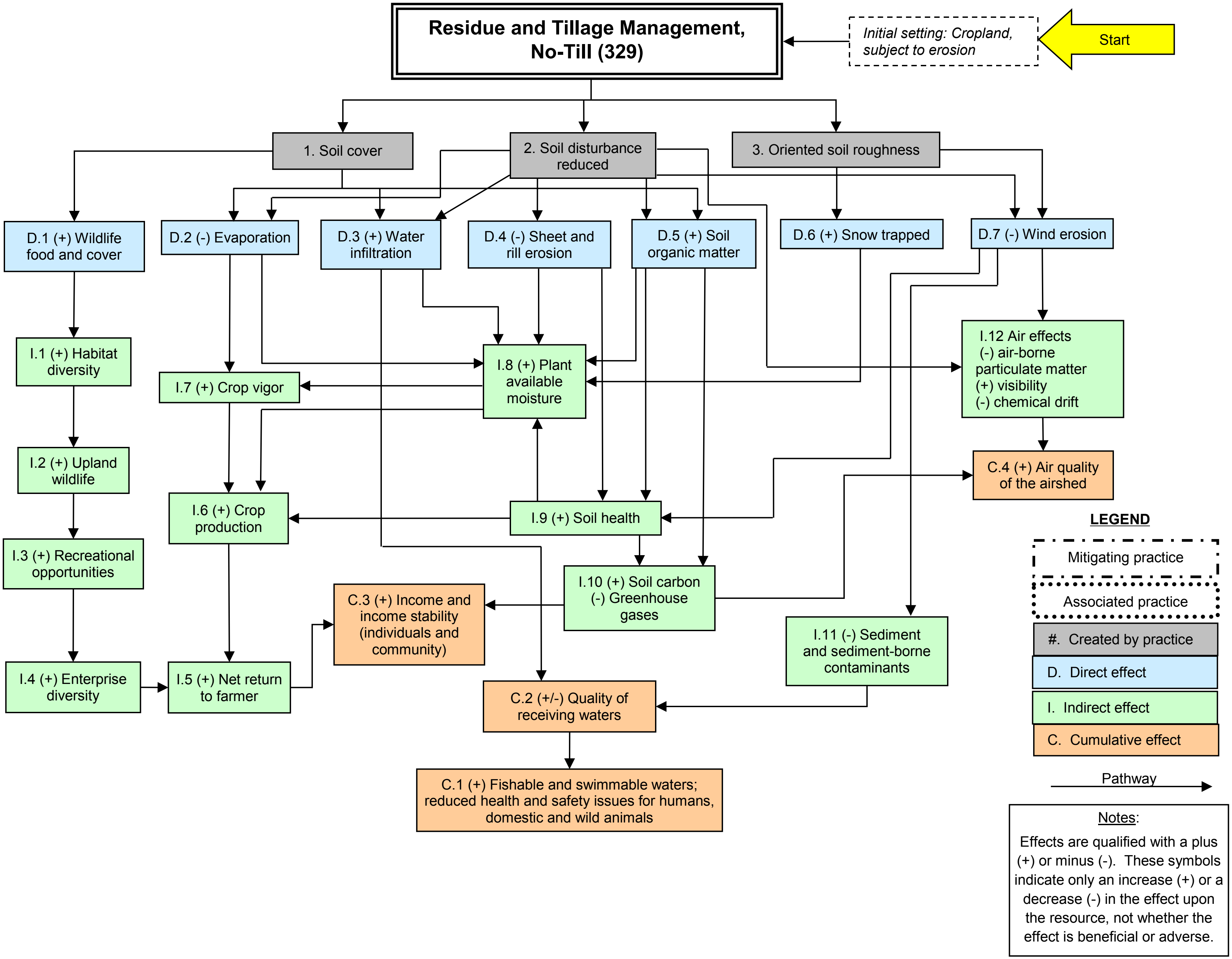
Soil Erosion	Effect	Rationale
Soil Erosion - Sheet and Rill Erosion	4	Managing residue to reduce soil disturbance and increase residue cover reduces erosion by water.
Soil Erosion - Wind Erosion	4	Managing residue to reduce soil disturbance and increase residue cover reduces erosion by wind.
Soil Erosion - Ephemeral Gully Erosion	4	Managing residue to reduce soil disturbance and increase residue cover reduces erosion by water.
Soil Erosion - Classic Gully Erosion	0	Not Applicable
Soil Erosion - Streambank, Shoreline, Water Conveyance C	0	Not Applicable
Soil Quality Degradation		
Organic Matter Depletion	2	Decreased erosion and less oxidation from lack of soil disturbance will increase or maintain organic matter.
Compaction	2	Fewer field operations and less tillage reduce the potential for soil compaction.
Subsidence	0	Not Applicable
Concentration of Salts or Other Chemicals	1	Low disturbance and high residue cropping systems increase organic matter which will buffer salts.
Excess Water		
Excess Water - Seeps	-1	No-till increases infiltration resulting in more water moving through the profile.
Excess Water - Runoff, Flooding, or Ponding	2	No-till increases infiltration, reducing runoff and ponding.
Excess Water - Seasonal High Water Table	-1	Can reduce evaporation and increase infiltration of water
Excess Water - Drifted Snow	0	Not Applicable
Insufficient Water		
Insufficient Water - Inefficient Use of Irrigation Water	2	No-till increases infiltration and decreases evaporation resulting in more available water. However, increased infiltration reduces the efficiency of flood and furrow irrigation.
Insufficient Water - Inefficient Moisture Management	2	No-till increases infiltration and decreases evaporation resulting in more available water.
Water Quality Degradation		
Pesticides in Surface Water	4	The action decreases runoff and erosion.
Pesticides in Groundwater	0	Not Applicable
Nutrients in Surface water	2	Less erosion and runoff reduces transport of nutrients.
Nutrients in Groundwater	-1	The action increases infiltration that contributes to nutrient leaching. Also, high organic carbon will cause microbes to immobilize nutrients.
Salts in Surface Water	1	Less runoff reduces transport of soluble salts. However increased infiltration results in more seepage which can carry soluble salts to the surface.
Salts in Groundwater	-1	Better infiltration may increase leaching potential.
Excess Pathogens and Chemicals from Manure, Bio-solic	1	Less erosion and runoff reduces delivery of pathogens.
Excess Pathogens and Chemicals from Manure, Bio-solic	0	Not Applicable

Excessive Sediment in Surface Water	4	Less erosion and runoff reduces transport of sediment.
Elevated Water Temperature	0	Not Applicable
Petroleum, Heavy Metals and Other Pollutants Transporte	0	Not Applicable
Petroleum, Heavy Metals and Other Pollutants Transporte	0	Not Applicable
Air Quality Impacts		
Emissions of Particulate Matter (PM) and PM Precursors	4	Less soil disturbance, increased residue on the surface and fewer field operations reduce the generation of particulate matter.
Emissions of Ozone Precursors	2	Reduced use of machinery reduces ozone precursor emissions.
Emissions of Greenhouse Gases (GHGs)	4	Reduced use of machinery reduces CO2 emissions and increases soil carbon storage.
Objectionable Odors	0	Not Applicable
Degraded Plant Condition		
Undesirable Plant Productivity and Health	2	Conserving moisture and improving soil conditions contribute to enhanced plant productivity and health. However, on cold and wet soils there may be a delay in emergence and early growth.
Inadequate Structure and Composition	0	Not Applicable
Excessive Plant Pest Pressure	0	Not Applicable
Wildfire Hazard, Excessive Biomass Accumulation	0	Not Applicable
Fish and Wildlife - Inadequate Habitat		
Inadequate Habitat - Food	2	Crop residue provides some food for wildlife.
Inadequate Habitat - Cover/Shelter	2	Crop residue provides some cover/shelter.
Inadequate Habitat - Water	4	Not Applicable
Inadequate Habitat - Habitat Continuity (Space)	1	Residue restores some habitat/space.
Livestock Production Limitation		
Inadequate Feed and Forage	0	Not Applicable
Inadequate Shelter	0	Not Applicable
Inadequate Water	0	Not Applicable
Inefficient Energy Use		
Equipment and Facilities	4	No tillage equipment needed
Farming/Ranching Practices and Field Operations	4	No tillage operations

CPPE Practice Effects:	*0 No Effect*
5 Substantial Improvement	*-1 Slight Worsening*
4 Moderate to Substantial Improvement	*-2 Slight to Moderate Worsening*
3 Moderate Improvement	*-3 Moderate Worsening*
2 Slight to Moderate Improvement	*-4 Moderate to Substantial Worsening*
1 Slight Improvement	*-5 Substantial Worsening*

NRCS CONSERVATION PRACTICE EFFECTS - NETWORK DIAGRAM

September 2016



Natural Resources Conservation Service

CONSERVATION PRACTICE STANDARD

COVER CROP

CODE 340

(ac)

DEFINITION

Grasses, legumes, and forbs planted for seasonal vegetative cover.

PURPOSE

This practice is applied to support one or more of the following purposes:

- Reduce erosion from wind and water
- Maintain or increase soil health and organic matter content
- Reduce water quality degradation by utilizing excessive soil nutrients
- Suppress excessive weed pressures and break pest cycles
- Improve soil moisture use efficiency
- Minimize soil compaction

CONDITIONS WHERE PRACTICE APPLIES

All lands requiring seasonal vegetative cover for natural resource protection or improvement.

CRITERIA

General Criteria Applicable to All Purposes

Plant species, seedbed preparation, seeding rates, seeding dates, seeding depths, fertility requirements, and planting methods will be consistent with applicable local criteria and soil/site conditions. *Table 1. Plants Used for Cover Crops in Alabama* provides appropriate seeding information for implementing this practice. A copy of Table 1 is available by opening this link: https://efotg.sc.egov.usda.gov/api/CPSFile/17134/340_AL_OTH_Plants_Used_for_Cover_Crops_in_Alabama_2018

Select species that are compatible with other components of the cropping system.

Ensure herbicides used with crops are compatible with cover crop selections and purpose(s).

Cover crops may be established between successive production crops, or companion-planted or relay-planted into production crops. Select species and planting dates that will not compete with the production crop yield or harvest.

Lime and fertilizer shall be applied according to NRCS Conservation practice Standard, Nutrient Management 590.

Do not burn cover crop residue.

Determine the method and timing of termination to meet the grower's objective and the current NRCS Cover Crop Termination Guidelines.

Herbicides used with cover crops shall be compatible with the following crop to be planted.

When a cover crop will be grazed or hayed ensure that crop selection(s) comply with pesticide label rotational crop restrictions and that the planned management will not compromise the selected conservation purpose(s).

Do not harvest cover crops for seed.

If the specific rhizobium bacteria for the selected legume are not present in the soil, treat the seed with the appropriate inoculum at the time of planting.

Additional Criteria to Reduce Erosion from Wind and Water

Time the cover crop establishment in conjunction with other practices to adequately protect the soil during the critical erosion period(s).

Select cover crops that will have the physical characteristics necessary to provide adequate erosion protection.

Use the current erosion prediction technology to determine the amount of surface and/or canopy cover needed from the cover crop to achieve the erosion objective.

Additional Criteria to Maintain or Increase Soil Organic Matter Content

Cover crop species will be selected on the basis of producing higher volumes of organic material and root mass to maintain or increase soil organic matter.

The planned crop rotation including the cover crop and associated management activities will score a Soil Conditioning Index (SCI) value > 0, as determined using the current approved NRCS Soil Conditioning Index (SCI) procedure, with appropriate adjustments for additions to and or subtractions from plant biomass.

The cover crop shall be planted as early as possible and be terminated as late as practical for the producer's cropping system to maximize plant biomass production, considering crop insurance criteria, the time needed to prepare the field for planting the next crop, and soil moisture depletion. If a multi species cover crop mix is to be used to improve soil health the conservation planner should have good experience in cover crop seeding recommendations and the appropriate Job Approval Authority level should be granted.

Additional Criteria Reduce Water Quality Degradation by Utilizing Excessive Soil Nutrients

Establish cover crops as soon as practical prior to or after harvest of the production crop. (i.e. before or after harvest)

Select cover crop species for their ability to effectively utilize nutrients.

Terminate the cover crop as late as practical to maximize plant biomass production and nutrient uptake. Practical considerations for termination date may include crop insurance criteria, the amount of time needed to prepare the field for planting the next crop, weather conditions, and cover crop effects on soil moisture and nutrient availability to the following crop.

If the cover crop will be harvested for feed (hay/balage/etc.), choose species that are suitable for the planned livestock, and capable of removing the excess nutrients present.

Additional Criteria to Suppress Excessive Weed Pressures and Break Pest Cycles

Select cover crop species for their life cycles, growth habits, and other biological, chemical and or physical characteristics to provide one or more of the following:

- To suppress weeds, or compete with weeds.
- Break pest life cycles or suppress of plant pests or pathogens.
- Provide food or habitat for natural enemies of pests.

Release compounds such as glucosinolates that suppress soil borne pathogens or pests. Select cover crop species that do not harbor pests or diseases of subsequent crops in the rotation.

Additional Criteria to Improve Soil Moisture Use Efficiency

In areas of limited soil moisture, terminate growth of the cover crop sufficiently early to

conserve soil moisture for the subsequent crop. Cover crops established for moisture conservation shall be left on the soil surface.

In areas of potential excess soil moisture, allow the cover crop to grow as long as possible to maximize soil moisture removal.

Additional Criteria to Minimize Soil Compaction

Select cover crop species that have the ability to root deeply and the capacity to penetrate or prevent compacted layers.

CONSIDERATIONS

Select cover crops that are compatible with the production system, well adapted to the region's climate and soils, and resistant to prevalent pests, weeds, and diseases. See *Table 1. Plants Used for Cover Crops in Alabama* for recommended species and planting dates.

Avoid cover crop species that harbor or carry over potentially damaging diseases or insects.

Plant cover crops in a timely matter and when there is adequate moisture to establish a good stand..

When applicable, ensure cover crops are managed and are compatible with the client's crop insurance criteria.

Maintain an actively growing cover crop as late as feasible to maximize plant growth, allowing time to prepare the field for the next crop and to optimize soil moisture.

Cover crops may be used to improve site conditions for establishment of perennial species.

When cover crops are used for grazing, select species that will have desired forage traits, be palatable to livestock, and not interfere with the production of the subsequent crop.

Use plant species that enhance forage opportunities for pollinators by using diverse legumes and other forbs.

Cover crops may be selected to provide food or habitat for natural enemies of production crop pests.

Cover crops residues should be left on the soil surface to maximize allelopathic (chemical) and mulching (physical) effects.

Seed a higher density cover crop stand to promote rapid canopy closure and greater weed suppression. Increased seeding rates (1.5 to 2 times normal) can improve weed-competitiveness.

Cover crops may be selected that release biofumigation compounds that inhibit soil-borne plant pests and pathogens.

Species can be selected to serve as trap crops to divert pests from production crops.

Select a mixture of two or more cover crop species from different plant families to achieve one or more of the following: (1) species mix with different maturity dates, (2) attract beneficial insects, (3) attract pollinators, (4) increase soil biological diversity, (5) serve as a trap crop for insect pests, or (6) provide food and cover for wildlife habitat management.

Plant legumes or mixtures of legumes with grasses, crucifers, and/or other forbs to achieve biological nitrogen fixation. Select cover crop species or mixture, and timing and method of

termination that will maximize efficiency of nitrogen utilization by the following crop, considering soil type and conditions, season and weather conditions, cropping system, C:N ratio of the cover crop at termination, and anticipated nitrogen needs of the subsequent crop. Use LGU- recommended nitrogen credits from the legume and reduce nitrogen applications to the subsequent crop accordingly. “If the specific rhizobium bacteria for the selected legume are not present in the soil, treat the seed with the appropriate inoculum at the time of planting.

Time the termination of cover crops to meet nutrient release goals. Termination at early vegetative stages may cause a more rapid release compared to termination at a more mature stage.

Both residue decomposition rates and soil fertility can affect nutrient availability following termination of cover crops

Allelopathic effects to the subsequent crop should be evaluated when selecting the appropriate cover crop.

Legumes add the most plant-available N if terminated when about 30% of the crop is in bloom.

Additional Considerations to Reduce Erosion by Wind or Water

To reduce erosion, best results are achieved when the combined canopy and surface residue cover attains 90 percent or greater during the period of potentially erosive wind or rainfall. Consider conservation tillage as an alternate to plowing and disking.

Use the Cover Crop Planning Tool and select the purpose for erosion to select plant species, seeding rates, planting dates and planting depths.

Additional Considerations to Reduce Water Quality Degradation by Utilizing Excessive Soil Nutrients

Use deep-rooted species to maximize nutrient recovery.

When appropriate for the crop production system, mowing certain grass cover crops (e.g., sorghum-sudangrass, pearl millet) prior to heading and allowing the cover crop to regrow can enhance rooting depth and density, thereby increasing their subsoiling and nutrient-recycling efficacy.

Additional Considerations to Increase Soil Health and Organic Matter Content

Increase the diversity of cover crops (e.g., mixtures of several plant species) to promote a wider diversity of soil organisms, and thereby promote increased soil organic matter.

Plant legumes or mixtures of legumes with grasses, crucifers, and/or other forbs to provide nitrogen through biological nitrogen fixation.

Legumes add the most plant-available N if terminated when about 30% of the crop is in bloom. See ***Alabama 340 Cover crop jobsheet for improved soil health.***

PLANS AND SPECIFICATIONS

Prepare plans and specifications for each field or treatment unit according to the planning criteria and operation and maintenance requirements of this standard. Specifications shall describe the requirements to apply the practice to achieve the intended purpose for the practice site. Plans for the establishment of cover crops shall, as a minimum, include the following specification components:

- Field number and acres
- Species of plant(s) to be established.
- Seeding rates.
- Seeding dates.
- Establishment procedure.
- Rates, timing, and forms of nutrient application (if needed).
- Dates and method to terminate the cover crop.
- Other information pertinent to establishing and managing the cover crop e.g., if haying or grazing is planned specify the planned management for haying or grazing.

OPERATION AND MAINTENANCE

Evaluate the cover crop to determine if the cover crop is meeting the planned purpose(s). If the cover crop is not meeting the purpose(s) adjust the management, change the species of cover crop, or choose a different technology.

REFERENCES

A. Clark (ed.). 2007. Managing cover crops profitably. 3rd ed. Sustainable Agriculture Network Handbook Series; bk 9.

Hargrove, W.L., ed. Cover crops for clean water. SWCS, 1991.Magdoff, F. and H. van Es. Cover Crops. 2000. p. 87-96 *In* Building soils for better crops. 2nd ed. Sustainable Agriculture Network Handbook Series; bk 4. National Agriculture Library. Beltsville, MD.

Reeves, D.W. 1994. Cover crops and erosion. p. 125-172 *In* J.L. Hatfield and B.A. Stewart (eds.) Crops Residue Management. CRC Press, Boca Raton, FL.

NRCS Cover Crop Termination Guidelines:
http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/climatechange/?cid=stelprdb1077238

Revised Universal Soil Loss Equation Version 2 (RUSLE2) website:
http://www.nrcs.usda.gov/wps/portal/nrcs/main/national/technical/tools/rusle2/

Wind Erosion Prediction System (WEPS) website:
http://www.nrcs.usda.gov/wps/portal/nrcs/main/national/technical/tools/weps/

USDA, Natural Resources Conservation Service, National Agronomy Manual, 4th Edition, Feb. 2011. Website: http://directives.sc.egov.usda.gov/ Under Manuals and Title 190.

Soil Quality - Agronomy Technical Note No. 14.

Improving Soil Quality on the Southern Coastal Plain. Soil Quality Institute, Auburn, AL 2002.
https://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_053262.pdf

Alabama Cooperative Extension ANR-2139 Cover Crops for Alabama

http://www.aces.edu/pubs/docs/A/ANR-2139/ANR-2139.pdf

NRCS Cover Crop Termination Guidelines
https://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb1263099.pdf

USDA-ARS Mechanical Termination of cover crops.
https://www.ars.usda.gov/ARSUserFiles/60100500/csr/ResearchPubs/kornecki/kornecki_09b.pdf

Effects of NRCS Conservation Practices - National

Cover Crop

Crops including grasses, legumes, and forbs for seasonal cover and other conservation purposes.

Code: 340
Units: ac.

C-Crop F-Forest R-Range P-Pasture Pr-Protected FS-Farmstead D-Developed W-Water O-Other AL-Aso Land

Typical Landuse: C F R P Pr O AL

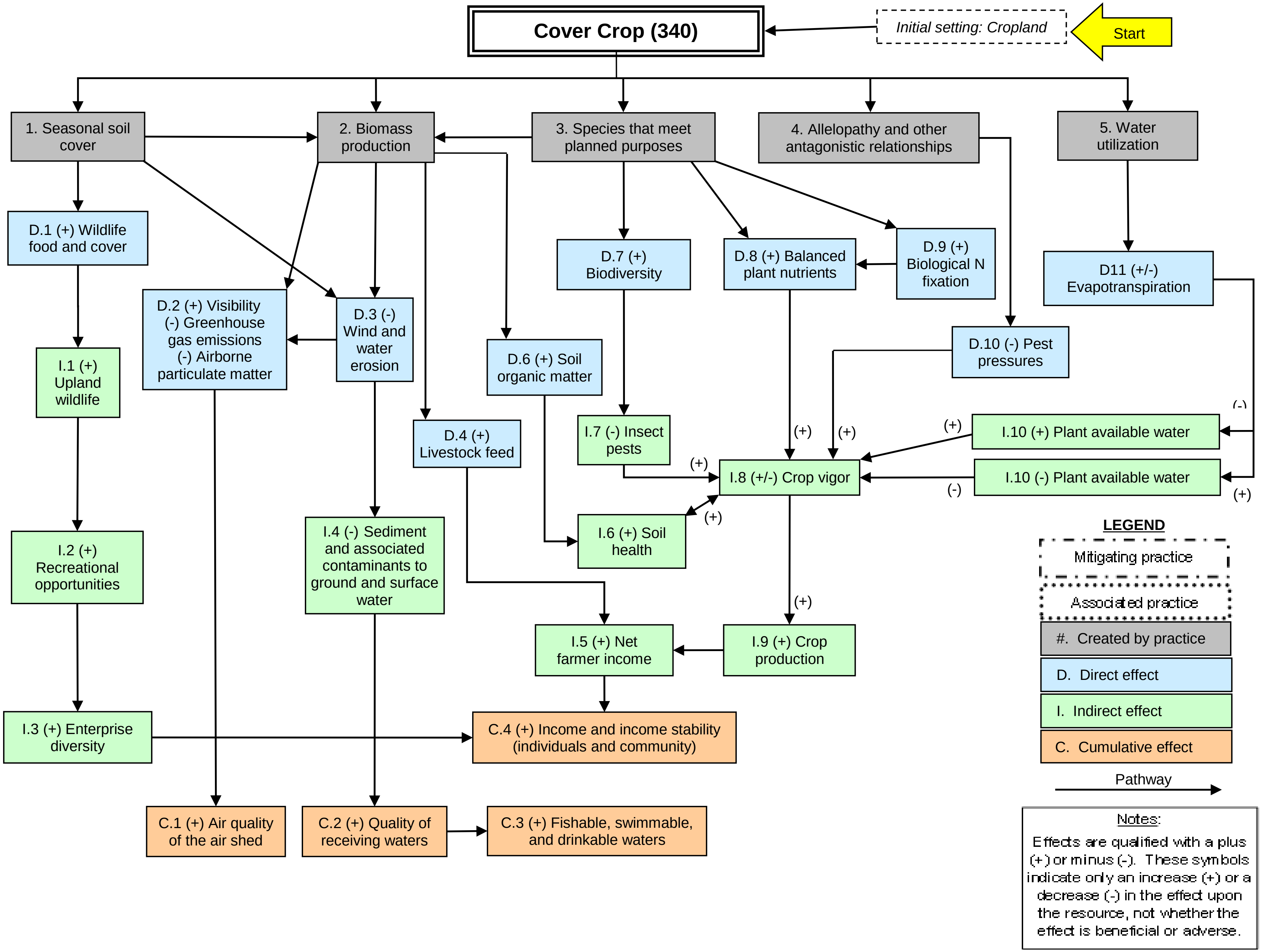
Soil Erosion	*Effect*	*Rationale*
Soil Erosion - Sheet and Rill Erosion	4	Increased cover during erosive periods will reduce soil detachment by water.
Soil Erosion - Wind Erosion	4	Increased cover during erosive periods will reduce soil detachment by wind.
Soil Erosion - Ephemeral Gully Erosion	3	Increased cover during erosive periods will reduce concentrated flow and associated soil detachment.
Soil Erosion - Classic Gully Erosion	0	Not Applicable
Soil Erosion - Streambank, Shoreline, Water Conveyance C	0	Not Applicable
Soil Quality Degradation		
Organic Matter Depletion	2	More biomass produced will increase organic matter.
Compaction	2	Increased biomass and roots improve aggregation, which gives better resistance to compaction.
Subsidence	0	If it affects drainage the practice can have an impact on subsidence.
Concentration of Salts or Other Chemicals	1	Increased organic matter will buffer salts.
Excess Water		
Excess Water - Seeps	1	Growing plants will take up excess water. However, infiltration will increase, which may offset some of the benefits.
Excess Water - Runoff, Flooding, or Ponding	2	Growing plants will reduce runoff and increase infiltration.
Excess Water - Seasonal High Water Table	1	Growing plants will take up excess water. However, infiltration will increase, which may offset some of the benefits.
Excess Water - Drifted Snow	0	Not Applicable
Insufficient Water		
Insufficient Water - Inefficient Use of Irrigation Water	1	Improves infiltration
Insufficient Water - Inefficient Moisture Management	2	Improves infiltration, soil structure, and winter water use that may otherwise be lost. For dry climates (<20 inches/year); cover crops will compete for main crop's moisture.
Water Quality Degradation		
Pesticides in Surface Water	2	The action reduces runoff and erosion.
Pesticides in Groundwater	2	The action increases soil organic matter, biological activity, and pesticide uptake.
Nutrients in Surface water	2	The action reduces erosion and runoff and transport of nutrients. Cover crops can uptake excess nutrients.
Nutrients in Groundwater	2	The action utilizes excess nutrients and increases organic matter. The additional organic matter will increase cation exchange capacity which will hold nutrients.
Salts in Surface Water	0	Less runoff reduces transport of soluble salts. Growing vegetation can use excess water which reduces seepage.
Salts in Groundwater	1	Cover crops can take up salts and water reducing the leaching potential of salts.
Excess Pathogens and Chemicals from Manure, Bio-solic	1	Less erosion and runoff reduces delivery of pathogens.
Excess Pathogens and Chemicals from Manure, Bio-solic	2	The action increases organic matter promoting microbial activity which competes with pathogens.

Excessive Sediment in Surface Water	2	Vegetation will reduce erosion and transport of sediment.
Elevated Water Temperature	0	Not Applicable
Petroleum, Heavy Metals and Other Pollutants Transporte	0	Not Applicable
Petroleum, Heavy Metals and Other Pollutants Transporte	0	Not Applicable
Air Quality Impacts		
Emissions of Particulate Matter (PM) and PM Precursors	3	Ground cover helps reduce wind erosion and generation of fugitive dust.
Emissions of Ozone Precursors	0	Not Applicable
Emissions of Greenhouse Gases (GHGs)	2	Vegetation removes CO2 from the air and stores it in the form of carbon in the plants and soil.
Objectionable Odors	0	Not Applicable
Degraded Plant Condition		
Undesirable Plant Productivity and Health	2	Plants are selected and managed to maintain optimal productivity and health and can contribute to subsequent crop health and productivity.
Inadequate Structure and Composition	5	Plants selected are adapted and suited.
Excessive Plant Pest Pressure	4	Vegetation is installed and managed to control undesired species.
Wildfire Hazard, Excessive Biomass Accumulation	0	Not Applicable
Fish and Wildlife - Inadequate Habitat		
Inadequate Habitat - Food	2	Increased quality and quantity of vegetation provides more food for wildlife.
Inadequate Habitat - Cover/Shelter	2	Increased quality and quantity of vegetation provides more cover for wildlife.
Inadequate Habitat - Water	4	Not Applicable
Inadequate Habitat - Habitat Continuity (Space)	2	Increased cover will increase space for wildlife. May be used to connect other cover areas.
Livestock Production Limitation		
Inadequate Feed and Forage	2	Cover crops will add supplemental forage.
Inadequate Shelter	0	Not Applicable
Inadequate Water	0	Not Applicable
Inefficient Energy Use		
Equipment and Facilities	0	Not Applicable
Farming/Ranching Practices and Field Operations	2	Cover crops can reduce nitrogen inputs.

CPPE Practice Effects:	*0 No Effect*
5 Substantial Improvement	*-1 Slight Worsening*
4 Moderate to Substantial Improvement	*-2 Slight to Moderate Worsening*
3 Moderate Improvement	*-3 Moderate Worsening*
2 Slight to Moderate Improvement	*-4 Moderate to Substantial Worsening*
1 Slight Improvement	*-5 Substantial Worsening*

NRCS CONSERVATION PRACTICE EFFECTS - NETWORK DIAGRAM

September 2014



Natural Resources Conservation Service

CONSERVATION PRACTICE STANDARD

FENCE

CODE 382

(ft)

DEFINITION

A constructed barrier to animals or people.

PURPOSE

This practice is used to accomplish one or more of the following purposes–

- This practice facilitates the accomplishment of conservation objectives by providing a means to control movement of animals and people, including vehicles

CONDITIONS WHERE PRACTICE APPLIES

This practice may be applied on any area where management of animal or human movement is needed.

CRITERIA

General Criteria Applicable to All Purposes

Fencing materials, type and design of fence installed shall be of a high quality and durability. The type and design of fence installed will meet the management objectives and site challenges. Based on need, fences may be permanent, portable, or temporary.

Fences shall be positioned to facilitate management requirements. Ingress/egress features such as gates and cattle guards shall be planned. The fence design and installation should have the life expectancy appropriate for management objectives and shall follow all federal, state and local laws and regulations.

Height, size, spacing and type of materials used will provide the desired control, life expectancy, and management of animals and people of concern.

Fences shall be designed, located, and installed to meet appropriate local wildlife and land management needs and requirements.

Fencing for Exclusion Purposes:

As a minimum use the following options and follow the construction specifications:

- 4 strands of barbed wire
- 4 strands of high tensile electric wire
- Woven wire topped with barbed wire or high tensile electric wire

CONSIDERATIONS

The fence design and location should consider: topography, soil properties, livestock management, animal safety, livestock trailing, access to water facilities, development of potential grazing systems, human access and safety, landscape aesthetics, erosion problems, soil moisture conditions, flooding potential, stream crossings, and durability of materials. When appropriate, natural barriers should be utilized instead of fencing.

Where applicable, cleared rights-of-way may be established which would facilitate fence construction and maintenance. Avoid clearing of vegetation during the nesting season for migratory birds.

Where applicable, fences should be marked to enhance visibility as a safety measure for animals or people.

Fences across gullies, canyons or streams may require special bracing, designs or approaches.

Fence design and location should consider ease of access for construction, repair and maintenance.

Fence construction requiring the removal of existing fencing materials should provide for the proper disposal to prevent harm to animals, people and equipment.

PLANS AND SPECIFICATIONS

Plans and specifications are to be prepared for all fence types, installations and specific sites. Requirements for applying the practice to achieve all of its intended purposes shall be described.

OPERATION AND MAINTENANCE

Regular inspection of fences should be part of an ongoing maintenance program to ensure continuing proper function of the fence. Operation and Maintenance (O&M) includes the following:

A schedule for regular inspections and after storms and other disturbance events.

Maintenance activities:

- Repair or replacement of loose or broken material, gates and other forms of ingress/egress
- Removal of trees/limbs
- Replacement of water gaps as necessary
- Repair of eroded areas as necessary
- Repair or replacement of markers or other safety and control features as required.

REFERENCES

Bell, H.M. 1973. Rangeland management for livestock production. University of Oklahoma Press.

Heady, H.F. and R.D. Child. 1994. Rangeland ecology and management. Western Press.

Holechek, J.L., R.D. Pieper, and C.H. Herbel. 2001. Range management: principles and practices. Prentice Hall.

Paige, C. 2012. A Landowner’s Guide to Fences and Wildlife: Practical Tips to Make Your Fences Wildlife Friendly. Wyoming Land Trust, Pinedale, WY.

Stoddard, L.A., A.D. Smith, and T.W. Box. 1975. Range management. McGraw-Hill Book Company.

United States Department of Interior, Bureau of Land Management and United States Department of Agriculture, Forest Service. 1988. Fences. Missoula Technology and Development Center.

United States Department of Agriculture, Natural Resources Conservation Service. 2005. Electric fencing for serious graziers. Columbia, Mo.

United States Department of Agriculture, Natural Resources Conservation Service. 2003. National range and pasture handbook, revision 1. Washington, DC.

Vallentine, J.F. 1971. Range development and improvement. Brigham Young University Press.

Fence

Effects of NRCS Conservation Practices - National

Fence

A constructed barrier to animals or people.

Code: 382
Units: ft.

C-Crop F-Forest R-Range P-Pasture Pr-Protected FS-Farmstead D-Developed W-Water O-Other AL-Aso Land

Typical Landuse: C F R P Pr FS D W O AL

Soil Erosion	Effect	Rationale
Soil Erosion - Sheet and Rill Erosion	1	Barriers reduce the excessive disturbance of soil and vegetation by facilitating the effective control of timing, frequency, duration and intensity of use of an area by animals or people.
Soil Erosion - Wind Erosion	0	Barriers reduce the excessive disturbance of soil and vegetation by facilitating the effective control of timing, frequency, duration and intensity of use of an area by animals or people.
Soil Erosion - Ephemeral Gully Erosion	0	Barriers reduce the excessive disturbance of soil and vegetation by facilitating the effective control of timing, frequency, duration and intensity of use of an area by animals or people.
Soil Erosion - Classic Gully Erosion	0	Barriers reduce the excessive disturbance of soil and vegetation by facilitating the effective control of timing, frequency, duration and intensity of use of an area by animals or people.
Soil Erosion - Streambank, Shoreline, Water Conveyance	0	Barriers reduce the excessive disturbance of soil and vegetation by facilitating the effective control of timing, frequency, duration and intensity of use of an area by animals or people. This promotes vegetative growth and streambank stabilization.
Soil Quality Degradation		
Organic Matter Depletion	0	Not applicable.
Compaction	1	Not applicable.
Subsidence	0	Not applicable.
Concentration of Salts or Other Chemicals	0	Not applicable.
Excess Water		
Excess Water - Seeps	0	Not Applicable
Excess Water - Runoff, Flooding, or Ponding	0	Not applicable.
Excess Water - Seasonal High Water Table	0	Not Applicable
Excess Water - Drifted Snow	0	Not applicable.
Insufficient Water		
Insufficient Water - Inefficient Use of Irrigation Water	0	Not Applicable
Insufficient Water - Inefficient Moisture Management	0	Not applicable.
Water Quality Degradation		
Pesticides in Surface Water	0	Not Applicable
Pesticides in Groundwater	0	Not Applicable
Nutrients in Surface water	0	Not applicable.
Nutrients in Groundwater	0	Not applicable.
Salts in Surface Water	0	Not Applicable
Salts in Groundwater	0	Not applicable.
Excess Pathogens and Chemicals from Manure, Bio-so	2	Control access of animals and/or people to stream areas.
Excess Pathogens and Chemicals from Manure, Bio-so	0	Not Applicable
Excessive Sediment in Surface Water	0	Not applicable.
Elevated Water Temperature	0	Not Applicable
Petroleum, Heavy Metals and Other Pollutants Transpo	0	Not applicable.
Petroleum, Heavy Metals and Other Pollutants Transpo	0	Not Applicable
Air Quality Impacts		
Emissions of Particulate Matter (PM) and PM Precursors	0	Not Applicable
Emissions of Ozone Precursors	0	Not Applicable
Emissions of Greenhouse Gases (GHGs)	1	Fencing can be used to protect and/or improve vegetation.
Objectionable Odors	0	Not Applicable
Degraded Plant Condition		
Undesirable Plant Productivity and Health	2	Control of animals facilitates grazing management enhancing health and vigor of desired plant communities.
Inadequate Structure and Composition	0	Control of animals facilitates grazing management which encourages growth of plants that are adapted and suitable for the site.
Excessive Plant Pest Pressure	0	Not applicable.
Wildfire Hazard, Excessive Biomass Accumulation	0	Not Applicable
Fish and Wildlife - Inadequate Habitat		
Inadequate Habitat - Food	0	Not Applicable
Inadequate Habitat - Cover/Shelter	0	Not Applicable
Inadequate Habitat - Water	1	Not Applicable
Inadequate Habitat - Habitat Continuity (Space)	0	Species dependent.
Livestock Production Limitation		
Inadequate Feed and Forage	3	Control of animals influences vigor and health of vegetation.
Inadequate Shelter	0	Not applicable.
Inadequate Water	0	Not Applicable
Inefficient Energy Use		
Equipment and Facilities	0	Not Applicable
Farming/Ranching Practices and Field Operations	0	Not Applicable

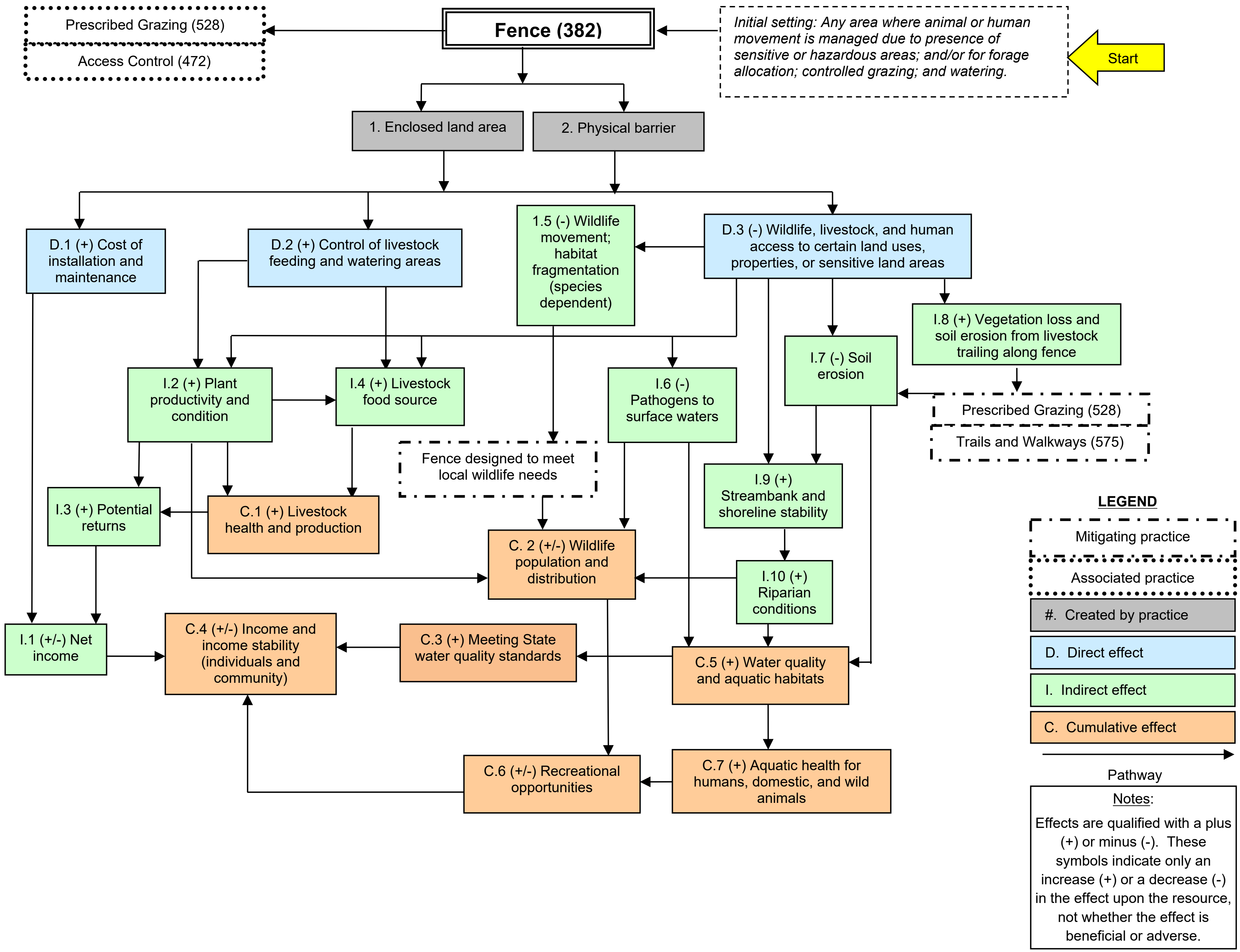
CPPE Practice Effects: *0 No Effect*

	5 Substantial Improvement	*-1 Slight Worsening*
	4 Moderate to Substantial Improvement	*-2 Slight to Moderate Worsening*
	3 Moderate Improvement	*-3 Moderate Worsening*
	2 Slight to Moderate Improvement	*-4 Moderate to Substantial Worsening*
	1 Slight Improvement	*-5 Substantial Worsening*

Source: National Conservation Practices Physical Effects
Hal Gordon, WNTSC Economist, Portland, Oregon
May-13

NRCS CONSERVATION PRACTICE EFFECTS - NETWORK DIAGRAM

July 2021



United States Department of Agriculture

Natural Resources Conservation Service

CONSERVATION PRACTICE STANDARD

ACCESS CONTROL

Code 472

(ac)

DEFINITION

The temporary or permanent exclusion of animals, people, vehicles, and equipment from an area.

PURPOSE

Achieve and maintain desired resource conditions by monitoring and managing the intensity of use by animals, people, vehicles, and equipment in coordination with the application schedule of practices, measures, and activities specified in the conservation plan.

CONDITIONS WHERE PRACTICE APPLIES

This practice applies on all land uses.

CRITERIA

General Criteria Applicable to All Purposes

Use-regulating activities (e.g., posting of signs, patrolling, gates, fences and other barriers, permits) must achieve the intended purpose and include mitigating associated resource concerns to acceptable levels during their installation, operation, and maintenance. Activities will complement the application schedule and life-span of other practices specified in the conservation plan.

Each activity or measure will identify the entity to be monitored and regulated (animals, people, vehicles, and equipment) and specify the intent, intensity, amounts, and timing of exclusion by that entity. Activities may involve temporary to permanent exclusion of one to all entities.

Placement, location, dimensions, and materials (e.g., signs, gates), and frequency of use (e.g., continuous, specific season, or specific dates) must be described for each activity including monitoring frequency.

CONSIDERATIONS

Even though usage of the area is monitored and controlled, the land manager and/or tenant should be advised about emergency preparedness agencies and related information (e.g., the local fire/wildfire control agency and pumper truck water sources) on or near the area. Information should be designated initially and redesignated annually.

PLANS AND SPECIFICATIONS

Specifications for applying this practice must be prepared for each area and recorded using approved specification sheets, job sheets, and narrative statements in the conservation plan, or other acceptable documentation.

OPERATION AND MAINTENANCE

Monitoring of the effectiveness of use-regulating activities will be performed routinely and at least annually with changes made to specifications and operation and maintenance requirements as necessary.

Modifications to activities and use of measures are allowed temporarily to accommodate emergency-level contingencies such as wildfire, hurricane, drought, or flood if resource conditions are maintained

REFERENCES

Gucinski, H., M.J. Furniss, R.R. Ziemer, M.H. Brookes. 2001. Forest roads: A Synthesis of Scientific Information. Gen. Tech. Rep. PNWGTR-509. U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. Portland, OR.

U.S. Department of Transportation, Federal Highway Administration. 2009. Manual on Uniform Traffic Control Devices for Streets and Highways - Part 5, Traffic Control Devices for Low-Volume Roads. Washington, DC. https://mutcd.fhwa.dot.gov/pdfs/2009r1r2/pdf_index.htm.

Effects of NRCS Conservation Practices - National

Access Control

The temporary or permanent exclusion of animals, people, vehicles, and/or equipment from an area.

Code: 472
Units: ac

C-Crop F-Forest R-Range P-Pasture Pr-Protected FS-Farmstead D-Developed W-Water O-Other AL-Aso Land

Typical Landuse: C F R P Pr FS D W O AL

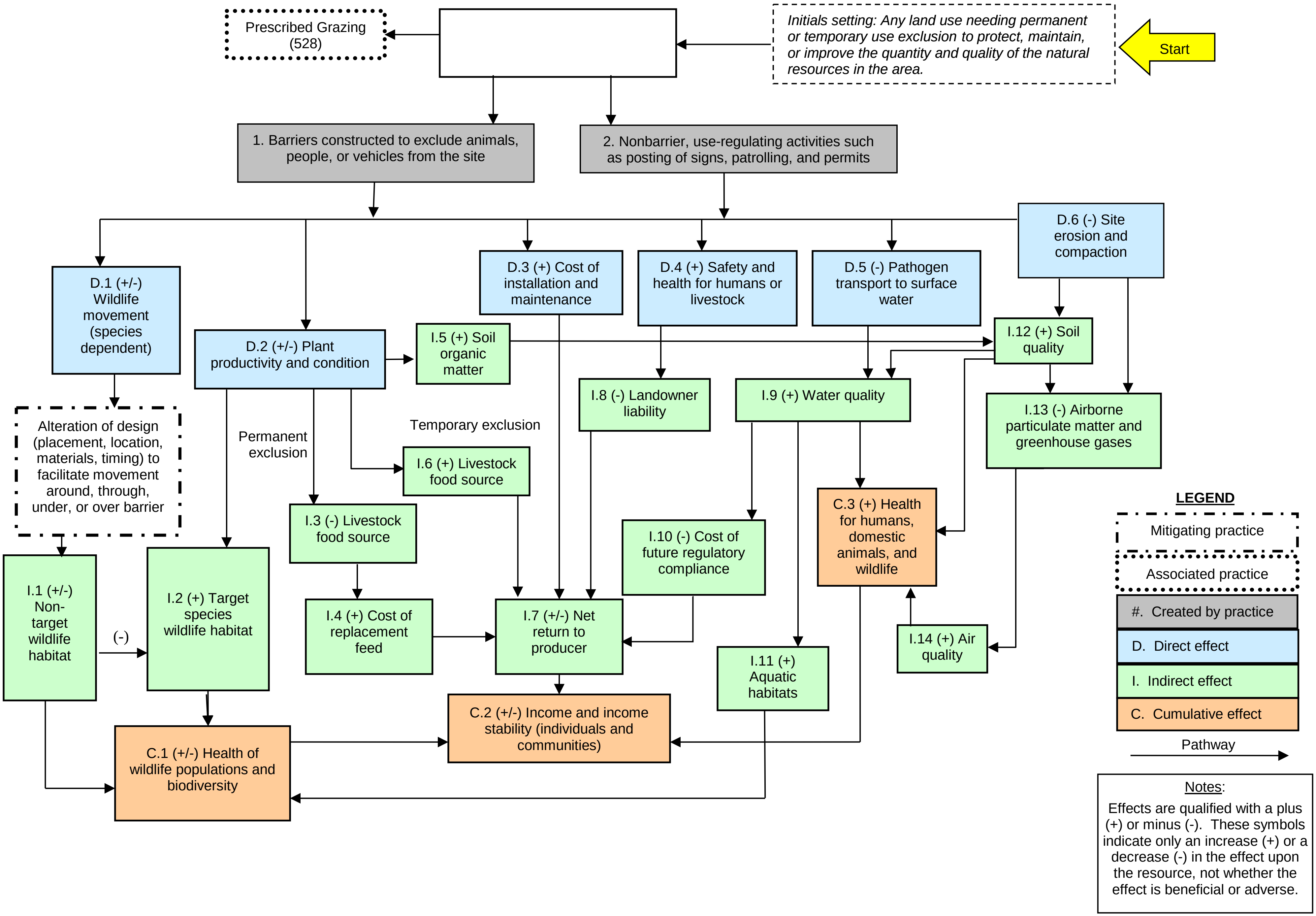
Soil Erosion	Effect	Rationale
Soil Erosion - Sheet and Rill Erosion	3	Control of animals, people and vehicles reduces disturbance of soil and vegetation.
Soil Erosion - Wind Erosion	1	Control of animals, people and vehicles reduces disturbance of soil and vegetation.
Soil Erosion - Ephemeral Gully Erosion	4	Control of animals, people and vehicles reduces disturbance of soil and vegetation.
Soil Erosion - Classic Gully Erosion	4	Control of animals, people and vehicles reduces disturbance of soil and vegetation.
Soil Erosion - Streambank, Shoreline, Water Conveyance (	4	Control of animals, people and vehicles reduces disturbance of soil and vegetation.
Soil Quality Degradation		
Organic Matter Depletion	1	Control of animals, people and vehicles help maintain conditions of soil and vegetation.
Compaction	4	Control of animals, people and vehicles lessens compactive forces on soil.
Subsidence	0	Not Applicable
Concentration of Salts or Other Chemicals	0	Control of animals, people and vehicles will influence plant growth and alter infiltration and leaching to a limited degree.
Excess Water		
Excess Water - Seeps	1	Control of animals, people and vehicles influences vigor and health of vegetation which in turn can influence water uptake and infiltration.
Excess Water - Runoff, Flooding, or Ponding	0	Control of animals, people and vehicles can improve vigor and health of vegetation which can increase retardance of water flows. Also, exclusion structures can trap debris further retarding flows.
Excess Water - Seasonal High Water Table	2	Control of animals, people and vehicles influences vigor and health of vegetation which in turn can influence water uptake.
Excess Water - Drifted Snow	0	Not Applicable
Insufficient Water		
Insufficient Water - Inefficient Use of Irrigation Water	0	Not Applicable
Insufficient Water - Inefficient Moisture Management	3	Control of animals, people and vehicles influences vegetation vigor and soil structure which can help optimize water use.
Water Quality Degradation		
Pesticides in Surface Water	1	Control of animals, people and vehicles influences vigor and health of vegetation and soil condition which retain pesticides when applied with other management practices.
Pesticides in Groundwater	0	Not Applicable
Nutrients in Surface water	1	Control of animals, people and vehicles influences vigor and health of vegetation and soil condition reducing runoff when applied with other management practices.
Nutrients in Groundwater	1	Control of animals, people, and vehicles influences vegetation vigor and soil structure which can accelerate use and breakdown of nutrients/organics.
Salts in Surface Water	0	Not Applicable
Salts in Groundwater	0	Not Applicable
Excess Pathogens and Chemicals from Manure, Bio-soli	1	Control of animals, people and vehicles influences vigor and health of vegetation and soil condition which in turn can influence water uptake and infiltration to reduce runoff and increase mortality of pathogens.
Excess Pathogens and Chemicals from Manure, Bio-soli	1	Control of animals and people lessens pathogen production in sensitive areas.
Excessive Sediment in Surface Water	3	Control of animals, people and vehicles influences vigor and health of vegetation and soil condition reducing sediment supply to surface waters when applied with other management practices.

Elevated Water Temperature	3	Control of animals, people and vehicles influences vigor, health, and availability of riparian vegetation which can shade associated surface waters.
Petroleum, Heavy Metals and Other Pollutants Transport	1	Control of animals, people and vehicles improves vigor and health of vegetation and soil condition, which in turn can influence water uptake and infiltration to reduce runoff. Reducing vehicles eliminates heavy metals from brakes and fuel.
Petroleum, Heavy Metals and Other Pollutants Transport	1	Control of animals, people, and vehicles influences vegetation vigor and soil structure which can accelerate attenuation of heavy metals.
Air Quality Impacts		
Emissions of Particulate Matter (PM) and PM Precursors	2	Restricting traffic on an area can reduce crushing action of tires on the surface and result in an improved stand of vegetation, which can reduce the generation of particulates.
Emissions of Ozone Precursors	1	Restricting traffic will reduce engine emissions from that area.
Emissions of Greenhouse Gases (GHGs)	1	Vegetation removes CO2 from the air and stores it in the form of carbon in the plants and soil. Restricting traffic will reduce engine emissions from that area.
Objectionable Odors	0	Not Applicable
Degraded Plant Condition		
Undesirable Plant Productivity and Health	3	Control of animals, people, and vehicles facilitates when used with other practices maintains and enhances health and vigor of desired plant communities.
Inadequate Structure and Composition	3	Control of access encourages plants that are adapted and suited for the site.
Excessive Plant Pest Pressure	5	Control of animals, people and vehicles influences vigor and health of desirable vegetation thereby reducing threat of noxious and invasive plants when applied with other conservation practices.
Wildfire Hazard, Excessive Biomass Accumulation	3	Access by people and vehicles to high hazard areas can be restricted.
Fish and Wildlife - Inadequate Habitat		
Inadequate Habitat - Food	3	Control of animals, people and vehicles influences vigor, health, and availability of vegetation for food.
Inadequate Habitat - Cover/Shelter	3	Control of animals, people and vehicles influences vigor, health, and availability of vegetation cover/shelter.
Inadequate Habitat - Water	3	Control of access protects available water sources.
Inadequate Habitat - Habitat Continuity (Space)	1	Excluded use protects wildlife space requirements.
Livestock Production Limitation		
Inadequate Feed and Forage	3	Control of animals influences vigor and health of vegetation.
Inadequate Shelter	0	Not Applicable
Inadequate Water	0	Not Applicable
Inefficient Energy Use		
Equipment and Facilities	0	Not Applicable
Farming/Ranching Practices and Field Operations	0	Not Applicable

CPPE Practice Effects:	*0 No Effect*
5 Substantial Improvement	*-1 Slight Worsening*
4 Moderate to Substantial Improvement	*-2 Slight to Moderate Worsening*
3 Moderate Improvement	*-3 Moderate Worsening*
2 Slight to Moderate Improvement	*-4 Moderate to Substantial Worsening*
1 Slight Improvement	*-5 Substantial Worsening*

NRCS CONSERVATION PRACTICE EFFECTS - NETWORK DIAGRAM

October 2017



Natural Resources Conservation Service

CONSERVATION PRACTICE STANDARD

FORAGE AND BIOMASS PLANTING

CODE 512

(ac)

DEFINITION

Establishing adapted and/or compatible species, varieties, or cultivars of herbaceous species suitable for pasture, hay, or biomass production.

PURPOSE

This practice is used to accomplish one or more of the following purposes–

- Improve or maintain livestock nutrition and/or health
- Provide or increase forage supply during periods of low forage production
- Reduce soil erosion
- Improve soil and water quality
- Produce feedstock for biofuel or energy production

CONDITIONS WHERE PRACTICE APPLIES

This practice applies on all lands suitable to the establishment of annual, biennial or perennial species for forage or biomass production. This practice does not apply to the establishment of annually planted and harvested food, fiber, or oilseed crops.

CRITERIA

General Criteria Applicable to All Purposes

Select plant species and their cultivars based on:

- Climatic conditions, such as annual precipitation and its distribution, growing season length, temperature extremes and the USDA Plant Hardiness Zone.
- Soil condition and landscape position attributes such as, pH, available water and holding capacity, aspect, slope, drainage class, fertility level, salinity, depth, flooding and ponding, and levels of phytotoxic elements that may be present.
- Resistance to disease and insects common to the site or location.

In Alabama, plant approved forage or biomass species identified in Table 1. Warm Season Forage Crops Commonly Grown for Pasture and Hay in Alabama, Table 2. Cool Season Forage Crops Commonly Grown for Pasture and Hay in Alabama; and, the Geographical Areas for Species Adaptation and Seeding Dates, Figure 1 accompanying each table. Otherwise, consult with the grazing specialist for other planting guidance.

Adjust coated seed planting rates to account for the extra weight from coating on the seed.

Plant at a depth appropriate for the seed size or plant material and ensure uniform contact with soil.

Prepare the site to provide a medium that does not restrict plant emergence.

Plant when soil moisture is adequate for germination and establishment.

Planting by conventional or no-till methods are acceptable. Planting methods shall provide a firm seed-bed that ensures good seed to soil contact. Prepare site to minimize weed pressure as much as possible before planting.

All seed and planting materials will meet state quality standards.

Do not plant species on federal, state, or locally recognized noxious plants lists.

Nutrient planning and application must be based on current soil manure, or organic by-products test results and recommendations developed in accordance with Alabama Cooperative Extension System (ACES) guidance. A soil test is considered current if soil samples are collected and tested within three years of the intended use date. Soil test analyses shall be conducted by Auburn University Soil Testing Laboratory or other laboratories that are accepted in The North American Proficiency Testing Program (Soil Science Society of America) program and accepted by the ACES. Recommendations developed outside the ACES guidance may be used if recognized by the ACES.

When planting legumes, use pre-inoculated seed or properly inoculate with the appropriate viable strain of Rhizobia bacteria immediately before planting.

Keep inoculum under cool conditions as heat may kill the bacteria.

Select forage or biomass species based on the intended use, level of management, realistic yield estimates, maturity stage, and compatibility with other species. Verify plant adaptation to the area prior to planting.

Exclude livestock until the plants are well established. Refer to Alabama NRCS conservation practice standard, Prescribed Grazing – Code 528 for information on when to begin grazing.

When an existing stand of vegetation is not compatible with the new stand, then existing stands of vegetation will be removed by mechanical or chemical means prior to establishment of the desired vegetation. For example, on an existing remnant stand of fungus infected fescue, existing stands of the grass will be destroyed and extra efforts, such as repeat herbicide applications or disking, will be used to destroy the existing seed bank. This process will likely cause a delay in the planting of the desired vegetation.

When a stand of forages needs improvement in density or species composition, e.g. adding white clover, over-seeding of desirable plant seed may be used. Graze or mow existing vegetation to at least a one-inch stubble prior to seeding. Prepare a seedbed by lightly disking, or other mechanical method to expose sufficient mineral soil for planting. Do not penetrate the sod more than 2 – 3 inches. Herbicides may be used to kill bands of vegetation before planting back into these bands. Apply fertilizer and lime according to soil test recommendations at or near the planting time.

Additional Criteria for Improving or Maintaining Livestock Nutrition and/or Health

Use forage species that will meet the desired level of nutrition (quantity and quality) for the kind and class of the livestock to be fed.

Forage species planted as mixtures will exhibit similar palatability to avoid selective grazing.

Additional Criteria for Providing or Increasing Forage Supply during Periods of Low Forage Production

Select plants that will produce forage for use during periods when other on-farm forage does not meet livestock needs. Forage species shall help balance the daily nutritional needs of the animals for the desired period of time.

Additional Criteria for Reducing Erosion and Improving Water Quality

Use plants that provide adequate ground cover, canopy cover, vegetative retardance and root mass needed to protect the soil from water erosion.

Additional Criteria for Producing Feedstock's for Biofuel or Energy Production

Select recommended plants that provide adequate kinds and amount of plant materials needed.

Additional Criteria for Planting Native Warm Season Grasses

Apply nutrients according to soil test results and recommendations. Do not apply nitrogen during the year of establishment. Refer to Alabama NRCS Job Sheet, Planting Native Grasses for Grazing Systems – No. AL512A.

CONSIDERATIONS

In areas where animals congregate consider establishing persistent species that can tolerate close grazing and trampling.

Where wildlife and pollinator concerns exist, consider plant selection by using an approved habitat evaluation procedure. Consider including native warm season grasses as part of the forage base. When possible, interseed or establish pollinator plants that provide benefits during spring, summer and fall.

Where air quality concerns exist consider using site preparation and planting techniques that will minimize airborne particulate matter generation and transport.

When carbon sequestration is a goal, select deep- rooted perennial species that will increase underground carbon storage.

During implementation of this standard, also consider implementing the following Alabama NRCS conservation practice standards:

- Forage and Biomass Harvest – Code 511
- Herbaceous Weed Control – Code 315
- Nutrient Management – Code 590
- Prescribed Grazing – Code 528

PLANS AND SPECIFICATIONS

Prepare plans and specifications for the establishment planting for each site or management unit according to the Criteria, Considerations, and Operations and Maintenance described in this standard. Record them on a site specific job sheet or in the narrative of a conservation plan, or other acceptable method of documentation.

The following elements will be addressed in the plan to meet the intended purpose:

- Site Preparation
- Fertilizer Application (if applicable)
- Seedbed/Planting Bed Preparation
- Methods of Seeding/Planting

- Time of Seeding/Planting
- Selection of Species
- Type of legume inoculant used (if applicable)
- Seed/Plant Source
- Seed Analysis
- Rates of Seeding/Planting
- Supplemental Water for Plant Establishment (if applicable)
- Protection of Plantings (if applicable)

PLANTING

Conventional tillage may be used when erosion will not be a concern. When used, prepare a firm seedbed by rolling or using a cultipacker.

When soils are particularly erodible, Erodibility index >8, consider use of companion crops to protect the soil while desired plants are establishing.

Mulch tillage or No-till planting procedures should be considered when erosion is a primary concern. Site preparation herbicides should be used to reduce weed competition and aid in the establishment. These will also help minimize degradation of existing soil organic matter and health.

Plant approved forage species. Refer to Table 1. Warm Season Forage Crops Commonly Grown for Pasture and Hay in Alabama, and Table 2. Cool Season Forage Crops Commonly Grown for Pasture and Hay in Alabama. Choose species that best address resource concerns.

Weed control during the establishment period shall be done to ensure the survival of the new seedlings and promote sound growth. When herbicides are used for weed control, follow the herbicide labels and extension system recommendations. Consider adopting the Alabama NRCS conservation practice standards listed below.

- Brush Management – Code 314
- Herbaceous Weed Control – Code 315
- Integrated Pest Management – Code 595

Mowing should be considered to assist in reducing weed competition. It will assist in reducing the weed canopy and stimulate desirable grasses to tiller.

OPERATION AND MAINTENANCE

Inspect and calibrate equipment prior to use. Continually monitor during planting to insure proper rate, distribution and depth of planting material is maintained.

Monitor new plantings for water stress. Drought stress may require controlling weeds, early harvest of any companion crops, irrigating when possible, or replanting failed stands.

Monitor competition from invasive or noxious weeds. Control as needed. Insects and diseases will be controlled when infestations threaten the survival of the stand.

Maintain fertility requirements for the success of this planting. Evaluate the stand composition to determine if planted species are being maintained or if reestablishment of some plant species is needed to achieve the desired purposes.

Consider implementing the following Alabama NRCS conservation practice standards as needed.

- Brush Management – Code 314

- Forage Harvest Management – 511
- Herbaceous Weed Control – Code 315
- Integrated Pest Management – Code 595
- Nutrient Management – Code 590
- Prescribed Grazing – Code 528

REFERENCES

Ball, D.M., C.S. Hoveland, and G.D.Lacefield, 2007. Southern Forages, 4th Ed. International Plant Nutrition Institute, Norcross, GA.

Alabama Planting Guides for Forage Grasses and Legumes, http://www.aces.edu/pubs/docs/A/ANR-0149/ANR-0149.pdf;

http://www.aces.edu/pubs/docs/A/ANR-0150/ANR-0150.pdf

USDA, Natural Resources Conservation Service. National Range and Pasture Handbook. http://www.nrcs.usda.gov/wps/portal/nrcs/detailfull/national/landuse/rangepasture/?cid=stelprdb1043084

The PLANTS Database, June 2014 (http://plants.usda.gov).

USDA, NRCS. 2009. Technical Note 3. Plantingand Managing Switchgrass as a Biomass EnergyCrop.

Effects of NRCS Conservation Practices - National

Forage and Biomass Planting

Establishing adapted and/or compatible species, varieties, or cultivars of herbaceous species suitable for pasture, hay, or biomass production.

Code: 512
Units: ac

C-Crop	F-Forest	R-Range	P-Pasture	Pr-Protected	FS-Farmstead	D-Developed	W-Water	O-Other	AL-Aso Land
C			P						

Typical Landuse: C P

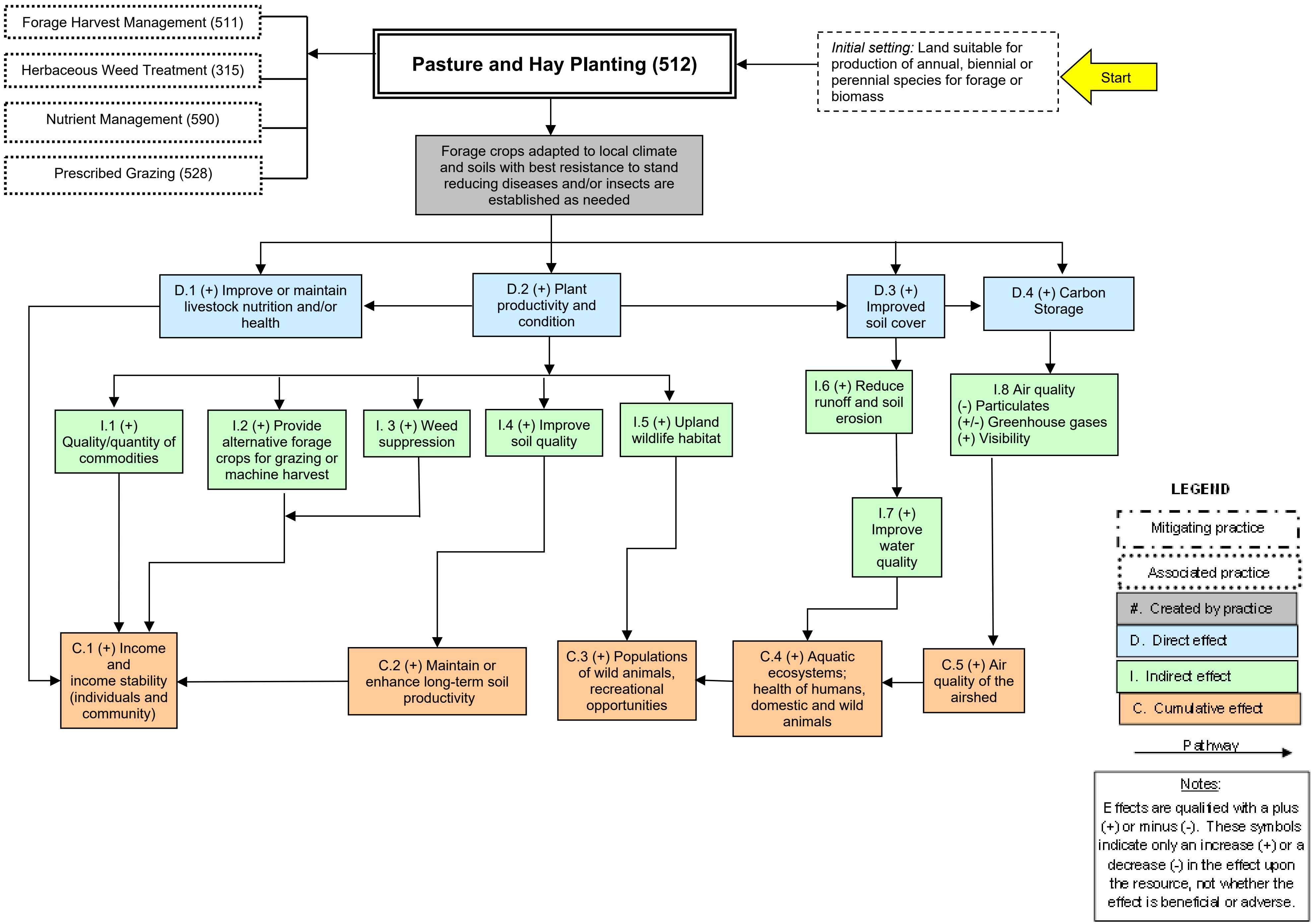
Soil Erosion	Effect	Rationale
Soil Erosion - Sheet and Rill Erosion	1	Establishment of adapted species increases vegetative cover and reduces erosion potential. During the establishment period, there may be a slight to moderate risk of erosion, depending on seedbed preparation, seeding method, and species planted.
Soil Erosion - Wind Erosion	1	Establishment of adapted species increases vegetative cover and reduces erosion potential. During the establishment period, there may be a slight to moderate risk of erosion, depending on seedbed preparation, seeding method, and species planted.
Soil Erosion - Ephemeral Gully Erosion	0	Establishment of adapted species increases vegetative cover and reduces erosion potential. During the establishment period, there may be a slight to moderate risk of erosion, depending on seedbed preparation, seeding method, and species planted.
Soil Erosion - Classic Gully Erosion	0	There will be an increase of vegetative cover and reduced runoff in the watershed in the long-term.
Soil Erosion - Streambank, Shoreline, Water Conveyance C	0	Not Applicable
Soil Quality Degradation		
Organic Matter Depletion	1	There will be enhanced biomass production, root development, litter accumulation, increased biological activity, and/or reduced tillage if associated with change in land use.
Compaction	2	There will be enhanced biomass production, root development, litter accumulation, increased biological activity, and/or reduced tillage if associated with change in land use.
Subsidence	0	Not Applicable
Concentration of Salts or Other Chemicals	0	Not applicable.
Excess Water		
Excess Water - Seeps	0	Not applicable.
Excess Water - Runoff, Flooding, or Ponding	1	There will be an increase in cover and infiltration, reducing runoff and overland flow.
Excess Water - Seasonal High Water Table	0	Not applicable.
Excess Water - Drifted Snow	0	Not Applicable
Insufficient Water		
Insufficient Water - Inefficient Use of Irrigation Water	0	Not Applicable
Insufficient Water - Inefficient Moisture Management	0	Not Applicable
Water Quality Degradation		
Pesticides in Surface Water	1	The plant species selected will decrease runoff and erosion.
Pesticides in Groundwater	0	Not applicable.
Nutrients in Surface water	1	Permanent vegetation will uptake excess nutrients.
Nutrients in Groundwater	0	Not applicable.
Salts in Surface Water	0	Not applicable.
Salts in Groundwater	0	Not applicable.
Excess Pathogens and Chemicals from Manure, Bio-solic	1	The improved vegetative cover and increased soil microbiological activity will reduce movement of pathogens, however a land use change to pasture may increase potential pathogen levels.
Excess Pathogens and Chemicals from Manure, Bio-solic	0	Not applicable.

Excessive Sediment in Surface Water	1	There will be improved vegetative cover with a reduction of runoff and sedimentation.
Elevated Water Temperature	0	Not Applicable
Petroleum, Heavy Metals and Other Pollutants Transporte	1	Increased uptake by some pasture plants and reduced erosion and runoff may reduce off-site movement of heavy metals attached to sediment.
Petroleum, Heavy Metals and Other Pollutants Transporte	0	Not applicable.
Air Quality Impacts		
Emissions of Particulate Matter (PM) and PM Precursors	1	Establishing permanent vegetation reduces the potential for generation of particulates by wind erosion.
Emissions of Ozone Precursors	0	Not Applicable
Emissions of Greenhouse Gases (GHGs)	4	Vegetation removes CO2 from the air and stores it in the form of carbon in the plants and soil. Also, use of biomass as an alternative energy source can greatly reduce the use of (and emissions of CO2 from) fossil fuels.
Objectionable Odors	0	Not Applicable
Degraded Plant Condition		
Undesirable Plant Productivity and Health	1	Plants are selected based on site adaptability.
Inadequate Structure and Composition	1	Plants selected are adapted and suited.
Excessive Plant Pest Pressure	0	Not applicable.
Wildfire Hazard, Excessive Biomass Accumulation	0	Not Applicable
Fish and Wildlife - Inadequate Habitat		
Inadequate Habitat - Food	1	Planted species provide food for certain species.
Inadequate Habitat - Cover/Shelter	1	Plant species are selected that are well-adapted and compatible to the site and provide cover for wildlife.
Inadequate Habitat - Water	1	Not Applicable
Inadequate Habitat - Habitat Continuity (Space)	0	Not applicable.
Livestock Production Limitation		
Inadequate Feed and Forage	5	Plant species will be selected that accommodate seasonal livestock production and nutritional needs.
Inadequate Shelter	0	Not Applicable
Inadequate Water	0	Not Applicable
Inefficient Energy Use		
Equipment and Facilities	0	Not Applicable
Farming/Ranching Practices and Field Operations	0	Not applicable.

CPPE Practice Effects:	*0 No Effect*
5 Substantial Improvement	*-1 Slight Worsening*
4 Moderate to Substantial Improvement	*-2 Slight to Moderate Worsening*
3 Moderate Improvement	*-3 Moderate Worsening*
2 Slight to Moderate Improvement	*-4 Moderate to Substantial Worsening*
1 Slight Improvement	*-5 Substantial Worsening*

NRCS CONSERVATION PRACTICE EFFECTS - NETWORK DIAGRAM

Date Oct. 2020



Natural Resources Conservation Service

CONSERVATION PRACTICE STANDARD

HEAVY USE AREA PROTECTION

CODE 561

(sf)

DEFINITION

Heavy Use Area Protection is used to stabilize a ground surface that is frequently and intensively used by people, animals, or vehicles.

PURPOSE

Heavy Use Area Protection is used:

- To provide a stable, non-eroding surface for areas frequently used by animals, people or vehicles
- To protect or improve water quality

CONDITIONS WHERE PRACTICE APPLIES

This practice applies to all land uses where a frequently or intensively used area requires treatment to address one or more resource concerns.

CRITERIA

General Criteria Applicable to All Purposes

All planned work shall comply with federal, state, and local laws and regulations.

Take measures to limit the generation of particulate matter.

Incorporate user safety into the design of the heavy use area protection.

Design Load

Base design load(s) on the type and frequency of traffic, (vehicular, animal, or human) anticipated on the heavy use area. The minimum design load for areas that support vehicular traffic will be a wheel load of 4000 pounds.

Foundation

Evaluate all site foundations for soil moisture, permeability, textures, and bearing strength in combination with the design load and anticipated frequency of use.

Provide a base course of gravel, crushed stone, other suitable material and/or geotextile on all sites with a need for increased load bearing strength, drainage, separation of material, and soil reinforcement. Refer to Natural Resources Conservation Service (NRCS), National Engineering Handbook, Part 642; Design Note 24, Guide for Use of Geotextiles and AASHTO M-288 (latest edition); which provides guidance in quality specification and geotextile selection.

If there is the potential for ground water contamination from the heavy use area, select another site or provide an impervious barrier.

Foundation preparation shall consist of removal and disposal at designated areas of soil and other material that are not adequate to support the design loads.

Surface treatment
Select a surface treatment that is stable and appropriate to the purpose of the heavy use area. Surface treatments must meet the following requirements according to the material used:

Concrete
Design slabs-on-ground subject to distributed stationary loads, light vehicular traffic, or infrequent use by heavy trucks or agricultural equipment in accordance with American Concrete Institute (ACI) *Guide for the Design and Construction of Concrete Parking Lots (ACI 330R)*. Design slabs-on-ground subject to regular or frequent heavy truck or heavy agricultural equipment traffic in accordance with ACI *Guide to Design of Slabs-on-Ground (ACI 360R).* Design liquid-tight slabs in accordance with ACI *Code Requirements for Environmental Concrete Structures, Slabs-on-Soil (ACI 350, Appendix H).*

Design concrete structures in accordance with NRCS National Engineering Manual (NEM), Part 536, *Structural Engineering*.

Bituminous Concrete Pavement
Design the thickness of the pavement course, aggregate size and type, the type of proportioning of bituminous concrete materials, and the mixing and placing of these materials in accordance with The Alabama Department of Transportation (ALDOT) criteria for the expected loading.

In lieu of a site specific design, for areas that will be subject to light use, pave with a minimum of 4 inches of compacted bituminous concrete over a subgrade of at least 4 inches of well compacted gravel. Use bituminous concrete mixtures commonly used for road paving in the area.

Compact the surface with a heavy steel wheel roller until the bituminous concrete is thoroughly compacted and roller marks are eliminated.

Other Cementious Materials
Cementitious materials, such as soil cement, agricultural lime, roller-compacted concrete, and coal combustion by- products (flue gas desulphurization sludge and fly ash), can be used to provide a durable, stable surfacing material. Based on the properties of the surface material, develop a site-specific mix design with compressive strengths necessary for the expected use and loading on the heavy use area. Select materials that are non-toxic and that have chemical properties that are compatible with the intended use.

Aggregate
Design aggregate surfaces for expected wear and intended use. In lieu of a site- specific design for areas that will be subject to light non-vehicular use, install a minimum combined thickness for aggregate surfacing and base course of 6 inches for livestock and 4 inches for other applications.

For other applications, use Agricultural Engineering Note 4, *Earth and Aggregate Surfacing Design Guide*, or other appropriate methodology to design aggregate thickness.

Mulches
Use a minimum layer thickness of 6 inches for materials such as limestone screenings, cinders, tanbark, bark mulch, brick chips, or shredded rubber. Mulches are not recommended for livestock or vehicular applications.

Vegetation
Select vegetation that can withstand the intended use. Establish the vegetation in accordance with the criteria in NRCS CPS *Critical Area Planting (Code 342)* or the appropriate State reference.

<u>Other</u>
Other materials can be used if they will serve the intended purpose and design life.

Structures
Design any structures associated with the heavy use area including roofs, according to appropriate NRCS standards. Where NRCS standards do not exist, design structures according to the requirements of the particular construction material and accepted engineering practice. When a roof is needed to address the resource concern, use NRCS CPS *Roofs and Covers (Code 367)*. For non-waste applications, design structures according to the accepted engineering practice.

Base environmental design loads for buildings associated with heavy use areas on criteria in ASCE 7-10 – Minimum Design Loads for Buildings and Other Structures: ASCE/SEI 7-10.

Drainage and erosion control
Include provisions in the design for surface and subsurface drainage, as needed. Include provisions for disposal of runoff without causing erosion or water quality impairment. To the extent possible, prevent surface water from entering the heavy use area. Make provisions to treat contaminated surface runoff from the impervious area.

Stabilize all areas disturbed by construction as soon as possible after construction. Refer to the criteria in NRCS CPS *Critical Area Planting (Code 342)* for establishment of vegetation. If vegetation is not appropriate for the site, use the criteria in NRCS CPS *Mulching (Code 484)* to stabilize the disturbed area.

Vegetative Measures
Lime, fertilize, prepare soil, seed, mulch, sod, and conduct vegetation management according to the planned use and appropriate conservation practice standard in the technical guide. In areas where traffic can be managed to maintain vegetative cover, grass species which are wear resistant and have fast recovery from wear may be used. Common bermudagrass, hybrid bermudagrass, bahiagrass, and tall fescue are species that may be used. Selection will be based on specific site and soil conditions. Vegetative cover will be established and managed according to the AL NRCS conservation practice standard, Code 342, Critical Area Planting. If vegetation is not appropriate, use other measures to accomplish the intended purpose.

<u>Additional Criteria for Areas Utilized by Livestock</u>
Use Alabama NRCS conservation practice standards: Critical Area Planting - Code 342; Fence - Code 382; Prescribed Grazing - Code 528A; Filter Strip - Code 393; Watering Facility - Code 614, or Access Control - Code 472, as companion practices, when needed, to meet the intended purpose of the heavy use area protection.

Make provisions to collect, store, utilize, and/or treat manure accumulations and contaminated runoff in accordance with other NRCS conservation practice standards. Porous heavy use protection for outdoor animal confinement locations will be underlain with good clay material to minimize drainage to groundwater. Surface runoff from these locations will be stored and/or treated.

Treatment area
Select a site having a ground slope of 4 percent or less in order to minimize cut and fill areas. Extend the treated area a minimum of 10 feet. (6 feet for small ruminants that are managed separately from larger animals) outside the limits of facilities such as portable hay rings, watering facilities, feeding troughs, mineral boxes, and other facilities where livestock concentrations cause resource concerns. If concrete is used for the treatment area, the slab thickness will be at least 4 inches and the concrete will meet all other minimum requirements in the Heavy Use Area Construction Specification (design, placement, joints, curing, etc.). Ensure finished surfaces are nearly level with positive drainage away from the center of the treatment area. Grade slopes around treatment area as appropriate to minimize ponding of water.

For walkways the minimum treatment width is 8 feet. (cattle only). A width of 15 feet is generally used for cattle/vehicles type walkways. Fence all walkways.

Provide treatment areas for stream crossings and watering ramps with a minimum bottom width of 10 feet, and a maximum bottom width of 20 feet. “Cattle only” stream crossings may be as narrow as 6 feet. Make provisions to minimize livestock loafing or wading in the stream or pond. Slope ramps at 5 to 1 or flatter toward the water source with side slopes of 2.5 to 1 or flatter. Extend protection for watering ramps into the pond or stream to protect the pond or stream bottom according to the criteria in AL conservation practice standard Code 614 – Watering facility. Where stream channels or pond bottoms are composed of stable coarse rocky material or solid bedrock, the requirement to extend the treatment area into the channel may be waived.

Stream Crossings
Locate crossings where the streambed is stable. Avoid stream crossings in wetland areas. Place crossings perpendicular to the direction of stream flow. Construct stream crossings with a toe trench constructed on the upstream and downstream edges. Install stream crossings in accordance with AL conservation practice standard, Code 578 - Stream Crossing.

Watering Ramps
Install watering ramps in accordance with AL conservation practice standard, Code 614 – Watering Facility. Extend ramps to the center of the stream or no more than 5 feet into the stream, whichever is less.

Fencing
Install fencing as necessary to control all animal traffic. Permanently fence stream crossings and watering ramps to prevent livestock access to the stream or pond except at the access ramps. Build fencing in accordance with AL conservation practice standard, Code 382 - Fence. Alternative fencing procedures, which provide permanent and positive control, may be approved on a case-by- case basis.

Geotextile
Install Class II non-woven needle- punched geotextile fabric under all aggregate treatment areas. Turn the outer edge upward and extend edges to the surface. Geotextile is not required if the foundation is on rock. The minimum requirements for geotextile fabric are as follows:

Property	Test Method	Minimum
Grab Tensile Strength ASTM D 4632	Grab Test ASTM D 4632	157 lb.
Puncture Test	ASTM D 6241	309 lb.

Place geotextile fabric in the toe trenches of stream crossings and watering ramps. In the upstream toe of stream crossings and watering ramps in streams, the fabric will be backlapped over its own trench. Use a minimum 12-inch overlap at all joints.

Surface treatment
Use a maximum stone size of 2 in. for material surface treatment in areas such as watering facilities, hay rings, walkways, paddocks, and loafing areas.

Smooth uniformly and compact all material. Acceptable graded aggregate base materials include ALDOT crushed stone sizes 5, 56, 57, 6, 67, 68, and 610, and Types A or B crushed aggregate base, and other similar products approved by an engineer. Gradation requirements are shown in Table 1. Minimum depth of material is 6 in., uncompacted. Materials that will not result in a smooth walking surface for livestock will be placed 5-inch thick uncompacted with a 1 inch Materials for treatment of stream crossings and watering ramps shall consist of one or both of the following:

1. Rock riprap
2. Table 1 material

Base selection of rock riprap material for stream crossings on stream velocities and soil conditions at the site according to the AL NRCS conservation practice standard, Code 578 - Stream Crossing.

Determine thickness of the material in accordance with the design. Extend surface material the full length and width of the treatment area. Smooth all surfaces uniformly and compact.

Place all finished material surfaces in the stream channel, at the same grade as the natural streambed above and below the site.

Additional Criteria for Areas Utilized for Recreation

The Americans with Disabilities Act of 1990 (ADA) requires recreation areas that are used by the public to be accessible to people with disabilities. Address accessibility requirements for new construction and when existing facilities are being altered.

Ensure the treated area is conducive to the overall recreation area and aesthetically blends with the general landscape and surroundings.

Evaluate plants, landscaping timbers, traffic control measures, wooden walkways, etc., for effectiveness, and aesthetics.

CONSIDERATIONS

Heavy use areas can have a significant impact on adjoining land uses. These impacts can be environmental, visual and cultural. Select a treatment that is compatible with adjoining areas. Consider such things as proximity to neighbors and the land use where the stabilization will take place.

If vegetation will be part of the stabilization technique, consider the durability of the vegetation. Choose plant species that can withstand the expected use. Vegetated heavy use areas may need additional materials such as geogrids or other reinforcing techniques or planned periods of rest and recovery to ensure that vegetative stabilization will succeed.

Consider the safety of the users during the design. Avoid slippery surfaces, sharp corners, or surfaces and structures that might entrap users. For heavy use areas used by livestock avoid the use of sharp aggregates that might injure livestock.

Paving or otherwise reducing the permeability of the heavily used area can reduce infiltration and increase surface runoff. Depending on the size of the heavy use area, this can have an impact on the water budget of the surrounding area. Consider the effects to ground and surface water.

Installation of heavy use area protection on muddy sites can improve animal health. Mud transmits bacterial and fungal diseases and provides a breeding ground for flies. Hoof suction makes it difficult for cattle to move around in muddy areas. In addition, mud negates the insulation value of hair coat and the animals must use more energy to keep warm. As temperatures fall, animal bunching may occur, which can reduce or eliminate vegetative cover and lead to erosion and water quality concerns.

To reduce the negative water quality impact of heavy use areas, consider locating them as far as possible from waterbodies or water courses. In some cases, this may require relocating the heavily used area rather than just armoring an area that is already in use.

To the extent possible, maintain a 2 foot separation distance between the bottom of the surface material and the seasonal high water table or bedrock.

To reduce the potential for air quality problems from particulate matter associated with a heavy use area, consider the use of NRCS CPS *Windbreak/Shelterbelt Establishment (Code 380)*, *Herbaceous Wind Barriers (Code 603)*, *Dust Control from Animal Activity on Open Lot Surfaces (Code 375)*, or *Dust Control on Unpaved Roads and Surfaces (Code 373)* to control dust from heavy use areas.

Consider ways to reduce the size of the heavy use area as much as possible. This may require changes in how the livestock are managed but in the long run may result in less maintenance and a more efficient operation.

The transport of sediments, nutrients, bacteria, organic matter from animal manures, oils, and chemicals associated with vehicular traffic, and soluble and sediment-attached substances carried by runoff should be considered in selection of companion conservation practices.

The size of the heavy use areas utilized by livestock is dependent on the landowner’s operation including type and number of animal, confinement periods, and/or the intended use. The size of treatment areas can range from 30 square feet per animal in partial-confinement to 400 square feet per animal in total confinement to 4000 or more square feet for animal exercise areas. Heavy use protection areas should be kept as small as practicable.

When surface treatment such as bark mulch, wood- fiber, or other non-durable materials are used for short-term livestock containment areas, consideration should be given to vegetation of the affected area with a cover crop.

For areas with aggregate surfaces that will be frequently scraped, give consideration to the use of concrete or cementious materials to lessen the recurring cost of aggregate replacement. Four-inch thickness of concrete may be used around watering facilities for agricultural applications. If concrete is used, it should have a roughened surface.

To minimize differential settlement at concrete contraction joints, consider the use of a tooled or formed keyway joint.

Consider changing how livestock are managed to reduce the size of the heavy use area resulting in less expense, less maintenance and a more efficient operation.

Byproducts from coal fired power plants such as fly ash and sludge from scrubbers can vary significantly. Therefore, their toxicity and cementation characteristics should be known to ensure they are compatible with the intended use.

PLANS AND SPECIFICATIONS

Prepare plans and specifications for Heavy Use Area Protection that describe the requirements for installing the practice according to this standard. As a minimum the plans and specifications shall include:

1. A plan view showing the location and extent of the practice. Include the location and distances to adjacent features and known utilities.
2. Typical section(s) showing the type and required thickness of paving or stabilization materials.
3. A grading plan, as needed.
4. Where appropriate, plans for required structural details.
5. Method and materials used to stabilize areas disturbed by construction.
6. Construction specifications with site specific installation requirements.

OPERATION AND MAINTENANCE

Prepare an operation and maintenance (O&M) plan and review with the operator prior to practice installation. The minimum requirements to be addressed in the O&M plan are:

1. Periodic inspections – annually and immediately following significant rainfall events.
2. Prompt repair or replacement of damaged components especially surfaces that are subjected to wear or erosion.
3. For livestock heavy use areas, include requirements for the regular removal and management of

manure, as needed.

4. For vegetated heavy use areas, restrict use as needed to protect the stand and to allow vegetative recovery.

REFERENCES

American Concrete Institute. 2006. Design of Slabs- on-Ground. ACI Standard 360R-06. Farmington Hills, MI.

Korcak, R. F. 1998. Agricultural Uses of Coal Combustion Byproducts. P. 103-119. *In* Wright, R. J., et al (eds.) Agricultural Uses of Municipal, Animal and Industrial Byproducts. USDA-ARS, Conservation Research Report 44.

USDA-Natural Resources Conservation Service. 2014. Agricultural Engineering Note 4, *Earth and Aggregate Surfacing Design Guide*, Washington, DC.

Watering Systems for Grazing Livestock: Great Lakes Basin Grazing Network and Michigan State University Extension.

Table 1. Coarse Aggregate (crushed Stone) Gradations											
Aggregate	**Percent Passing by Weight (mass), each Laboratory Sieve**										
	2 in.	1.5 in.	1 in.	3/4 in.	1/2 in.	3/8 in.	#4	#8	#16	#50	#200
5		100	90-100	20-55	0-10	0-5					
56		100	90-100	40-85	10-40	0-15	0-5				
57		100	95-100		25-60		0-10	0-5			
6			100	90-100	20-55	0-15	0-5				
67			100	90-100		20-55	0-10	0-5			
68			100	90-100		30-65	5-25	0-10	0-5		
610			100	90-100		25-60		7-30		0-15	
Type "A" Crushed Aggregate Base			100	86-100			26-55	15-41		3-18	5-15
Type "B" Crushed Aggregate Base	100	90-100	75-98		55-80		40-70	28-54	19-42	9-32	7-18

Heavy Use Area Protection

Effects of NRCS Conservation Practices - National

Heavy Use Area Protection

The stabilization or areas frequently and intensively used by people, animals or vehicles by establishing vegetation cover, by surfacing with suitable materials, and/or by installing needed structures.

Code: 561
Units: sq. ft.

C-Crop, F-Forest, R-Range, P-Pasture, Pr-Protected, FS-Farmstead, D-Developed, W-Water, O-Other, AL-Aso Land

Typical Landuse: C F R P Pr FS D O AL

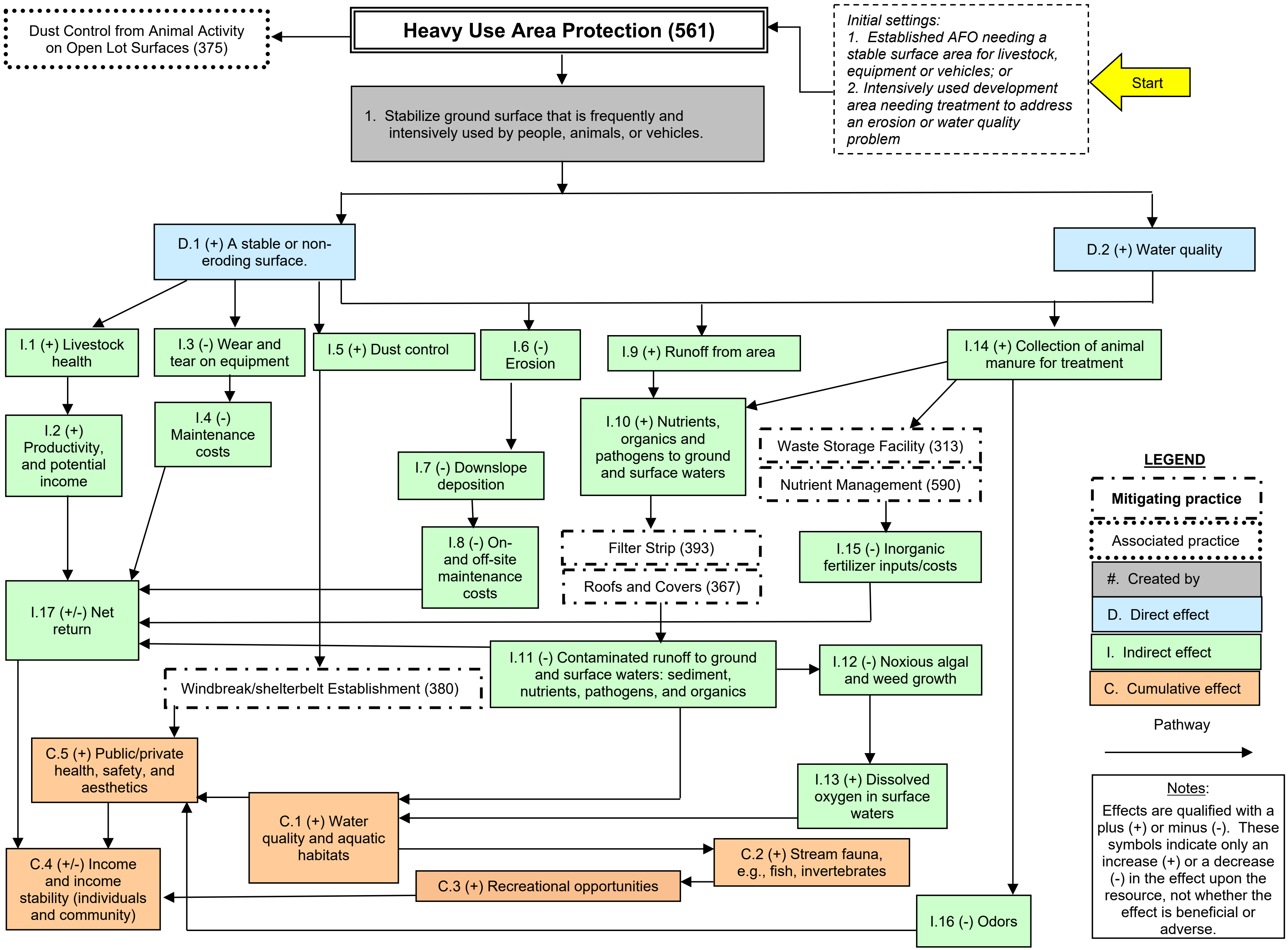
	Effect	Rationale
Soil Erosion		
Soil Erosion - Sheet and Rill Erosion	2	Establishment of vegetative cover, surfacing with suitable materials, or installing needed structures will provide needed cover to protect area from soil erosion.
Soil Erosion - Wind Erosion	2	The surface is protected from erosion by establishing vegetative cover, by surfacing with suitable materials, and/or by installing needed structures.
Soil Erosion - Ephemeral Gully Erosion	2	The surface is protected from erosion by establishing vegetative cover, by surfacing with suitable materials, and/or by installing needed structures.
Soil Erosion - Classic Gully Erosion	0	Not Applicable
Soil Erosion - Streambank, Shoreline, Water Conveyance C	0	HUAs are not installed on streambanks
Soil Quality Degradation		
Organic Matter Depletion	0	If vegetation is used to protect the site, organic matter may be increased. If some other material is used to protect the site, organic matter will be decreased or unchanged.
Compaction	-1	If non vegetated material is used to protect the site, compaction of the site is normally mandated. If vegetation is used to protect the site, compaction may or may not change depending on methods used to establish vegetation.
Subsidence	0	Not Applicable
Concentration of Salts or Other Chemicals	0	Not Applicable
Excess Water		
Excess Water - Seeps	0	Not Applicable
Excess Water - Runoff, Flooding, or Ponding	-1	Impermeable surfaces will cause increased runoff.
Excess Water - Seasonal High Water Table	0	Not Applicable
Excess Water - Drifted Snow	0	Not Applicable
Insufficient Water		
Insufficient Water - Inefficient Use of Irrigation Water	0	Not Applicable
Insufficient Water - Inefficient Moisture Management	0	Not Applicable
Water Quality Degradation		
Pesticides in Surface Water	0	Not Applicable
Pesticides in Groundwater	0	Not Applicable
Nutrients in Surface water	1	HUAs will allow collection of manure that would otherwise runoff to contaminated surface water
Nutrients in Groundwater	0	Not Applicable
Salts in Surface Water	0	Not Applicable
Salts in Groundwater	0	Not Applicable
Excess Pathogens and Chemicals from Manure, Bio-solid	2	Enables better runoff management
Excess Pathogens and Chemicals from Manure, Bio-solid	0	Not Applicable
Excessive Sediment in Surface Water	2	Protection can reduce erosion and sediment.
Elevated Water Temperature	0	Not Applicable
Petroleum, Heavy Metals and Other Pollutants Transporte	0	Not Applicable
Petroleum, Heavy Metals and Other Pollutants Transporte	0	Not Applicable
Air Quality Impacts		
Emissions of Particulate Matter (PM) and PM Precursors	2	Stabilizing high-traffic areas can reduce the amount of dust generated from human, animal and vehicular traffic.
Emissions of Ozone Precursors	0	Not Applicable
Emissions of Greenhouse Gases (GHGs)	0	If used, vegetation removes CO2 from the air and stores it in the form of carbon in the plants and soil.
Objectionable Odors	0	Not Applicable
Degraded Plant Condition		
Undesirable Plant Productivity and Health	2	If vegetation is selected, it will be maintained at optimal growing conditions for the intended purpose.
Inadequate Structure and Composition	0	Not Applicable
Excessive Plant Pest Pressure	4	Management of the area controls undesired plants.
Wildfire Hazard, Excessive Biomass Accumulation	0	Not Applicable
Fish and Wildlife - Inadequate Habitat		
Inadequate Habitat - Food	0	Not Applicable
Inadequate Habitat - Cover/Shelter	0	Not Applicable
Inadequate Habitat - Water	2	Not Applicable
Inadequate Habitat - Habitat Continuity (Space)	0	Not Applicable
Livestock Production Limitation		
Inadequate Feed and Forage	0	Not Applicable
Inadequate Shelter	0	Not Applicable
Inadequate Water	0	Not Applicable
Inefficient Energy Use		
Equipment and Facilities	0	Not Applicable
Farming/Ranching Practices and Field Operations	0	Not Applicable

CPPE Practice Effects:	*0 No Effect*
5 Substantial Improvement	*-1 Slight Worsening*
4 Moderate to Substantial Improvement	*-2 Slight to Moderate Worsening*
3 Moderate Improvement	*-3 Moderate Worsening*
2 Slight to Moderate Improvement	*-4 Moderate to Substantial Worsening*
1 Slight Improvement	*-5 Substantial Worsening*

Source: National Conservation Practices Physical Effects
Hal Gordon, WNTSC Economist, Portland, Oregon
May-13

NRCS CONSERVATION PRACTICE EFFECTS - NETWORK DIAGRAM

September 2020



United States Department of Agriculture

Natural Resources Conservation Service

CONSERVATION PRACTICE STANDARD

NUTRIENT MANAGEMENT

CODE 590

(ac)

DEFINITION

Managing the amount (rate), source, placement (method of application), and timing of plant nutrients and soil amendments.

PURPOSE

This practice is used to accomplish one or more of the following purposes–

- To budget, supply, and conserve nutrients for plant production
- To minimize agricultural nonpoint source pollution of surface and groundwater resources
- To properly utilize manure or organic by- products as a plant nutrient source
- To protect air quality by reducing odors, nitrogen emissions (ammonia, oxides of nitrogen), and the formation of atmospheric particulates
- To maintain or improve the physical, chemical, and biological condition of soil

CONDITIONS WHERE PRACTICE APPLIES

This practice applies to all lands where plant nutrients and soil amendments are applied. This standard does not apply to one-time nutrient applications to establish perennial crops.

CRITERIA

General Criteria Applicable to All Purposes

All planned activities shall be consistent with federal, state, and local regulations including but not limited to US Code, Reference 40 CFR, Part 503 and ADEM Rule 335-6-7-26. A nutrient budget for nitrogen, phosphorus, and potassium must be developed that considers all potential sources of nutrients including, but not limited to, residual amounts in the soil, commercial fertilizer, compost, animal manure, organic by-products (any organic material applied to the land as a nutrient source), biosolids, waste water, green manures, legumes, crop residues, organic matter, soil biological activity, and irrigation water. All application of nutrients must be according to the principles of the 4 R's (Right Source, Right Time, Right Rate, and Right Placement) and the applicable nutrient risk assessment tools (Alabama P Index and Alabama N leaching Index) to minimize nutrient loss without sacrificing the cropping system goals.

Erosion/Runoff Control

Erosion, runoff, and water management practices shall be installed, as needed, on fields that receive applications of nutrients. NRCS conservation practices shall be established and/or maintained to protect water quality. Fields adjacent to water bodies, water supplies, or have concentrated flow areas that convey runoff into these water bodies and water supplies without treatment shall require treatment. Conservation practices such as Filter Strip (393); Riparian Forest Buffers (391); Grass Waterway (412); Water and Sediment Control Basin (638); Critical Area Planting (342); Conservation Cover (327); Prescribed Grazing (528); Residue and Tillage Management, No-Till (329) or Mulch Till (345) and/or Cover

Crops (340) shall be planned singly or in combination, as needed, to avoid, control, trap and/or treat nutrients transported with sediment and runoff water.

Soil, Manure, and Tissue Sampling and Laboratory Analyses (Testing)
Nutrient planning must be based on current soil test results and recommendations developed in accordance with Alabama Cooperative Extension System (ACES) guidance or other ACES recognized industry practice. Tissue testing may be used to supplement soil, manure, and organic by-products test results or used as a diagnostic tool for midseason adjustment to the nutrient management plan. Follow ACES guidance for sample collection and sufficiency ranges. Current soil tests are those that are no older than 3 years. Soil samples shall be collected and prepared according to the ACES guidance. Where a conservation management unit (CMU) is used as the basis for a sampling unit, all acreage in the CMU must have similar soils, cropping history, and management practice treatment. One sample can represent only one soil condition.

Soil test analyses shall be conducted by Auburn University Soil Testing Laboratory or other laboratories that are accepted in The North American Proficiency Testing Program (Soil Science Society of America) http://www.naptprogram.org/ program and accepted by ACES.

The soil and tissue tests must include analyses pertinent to monitoring or amending the annual nutrient budget, e.g., pH, phosphorus, potassium, or other nutrients. Follow ACES guidelines regarding required analyses. Manure and any other organic by-products shall be analyzed prior to land application to establish nutrient content and application rates. Samples must be collected, prepared, stored, and shipped, following ACES guidance or industry practice.

Manure and any other organic by-products analyses must include, at minimum, total nitrogen (N), total phosphorus (P or P_2O_5), total potassium (K or K_2O), and percent solids (percent moisture) or follow ACES guidance regarding required analyses. In addition municipal and industrial sources of organic nutrients shall be analyzed for heavy metal content. For all manure and any other organic by-products use table 1 to determine plant available N from total N, application rates shall be based on plant available N and not total N. Manure, and any other organic by-products, samples must be collected and analyzed at least annually or more frequently if needed. Chemical analysis of these organic by-products varies due to moisture, temperature, feed sources, amount and kinds of bedding, number of batches consecutively reared, and conditions under which the manure and any other organic by- products was stored and handled prior to spreading. To account for these operational changes impacting nutrient concentrations different samples, risk assessments and rates may be required for different types of waste (e.g. fresh manure/litter, stored manure/litter, compost). Less frequent manure testing is allowable where operations can document a stable level of nutrient concentrations for the preceding three consecutive years. When the stable level has been documented analysis shall be conducted at least every three years. If a stable level cannot be documented, an average value of the tests that best represents the current material shall be used.

When planning for new or modified livestock operations, (or if there is not any representative material available to sample) use acceptable “book values” contained in Table 2 and/or in the NRCS Agricultural Waste Management Field Handbook for the plan and analyze the material, adjust rates, and risk assessment as needed before land application. To account for the site specific dilution that may affect nutrient content of the waste use the procedure outlined in the NRCS Agricultural Waste Management Field Handbook for liquid or slurry systems.

All organic by-product (manure, litter, compost, etc.) analyses must be performed by laboratories successfully meeting the requirements and performance standards of the Manure Testing Laboratory Certification program (MTLCP) under the auspices of the Minnesota Department of Agriculture, or other NRCS- approved program that considers laboratory performance and proficiency to assure accurate manure test results.

Nutrient Risk Assessment Tools

The nitrogen leaching index (NLI) will be used to assess the nitrogen leaching potential on sites receiving nitrogen application. Tables containing the leaching potential for soils within each county in Alabama are included in Agronomy technical note Al-73, “Nitrogen Leaching Index for Alabama”. If the leaching potential is greater than “low”, nitrogen containing material must be applied at the right rate and the right time according to ACES recommendation. See Agronomy technical note Al-73, “Nitrogen Leaching Index for Alabama” for more information and additional considerations to reduce the potential of nitrogen leaching.

The *Phosphorus Index for Alabama* shall be used to assess the potential risk of phosphorus movement into water. This applies to all fields or portions of fields that will have animal manure, poultry litter, compost or other organic by-products applied on them at a rate that is in excess of the soil test phosphorus recommendation. Additionally, in areas with an identified or designated phosphorus- related water quality impairment (303d and TMDL watersheds), an assessment shall be completed for the potential of phosphorus transport from the field. The Phosphorus Index (PI), or other recognized assessment tools will be used to assess movement potential of applied nutrients. The results of these assessments and recommendations shall be discussed with the producer and included in the conservation plan.

Applications of irrigation water must minimize the risk of nutrient loss to surface and groundwater.

Right Application Rates

Soil amendments shall be applied, as needed, to adjust soil pH to the specific range of the crop for optimum availability and utilization of nutrients.

Planned nutrient application rates for mineral nitrogen, phosphorus, and potassium must not exceed ACES guidelines or industry practice when recognized by the ACES.

At a minimum, determination of rate must be based on crop/cropping sequence, current soil test results, realistic yield goals, nutrient recommendations and nutrient risk assessments. Agronomy technical note Al-73, “Nitrogen Leaching Index for Alabama” contains ACES standard nitrogen recommendations. Realistic yield goals must be established based on historical yield data, soil productivity information, climatic conditions, nutrient test results, level of management, and local research results considering comparable production conditions.

Nutrient applications rates for crops which the ACES does not have a recommendation may be based on crop need per unit of yield or industry practice when recognized by the ACES. In addition, where yield potentials (higher or lower) for crops exist, the nitrogen rate may be based on crop need per unit of yield. Agronomy technical note AL-73, “Nitrogen Leaching Index for Alabama” contains more information that may be used to obtain these nitrogen rates. For new crops or varieties, industry- demonstrated yield, and nutrient utilization information may be used until land-grant university information is available. Lower-than-recommended nutrient application rates are permissible if the grower’s objectives are met.

Starter fertilizer shall be in accordance with ACES recommendations. When starter fertilizers are used, they shall be included in the nutrient budget.

To apply fertilizer, manure or other organic by- products accurately, application equipment should be calibrated and maintained in accordance with the manufactures recommendations and/or ACES recommendations. The following will be used for determining the right application rate:

- **Nitrogen Application:** The application rates shall be within 10% of recommended rates for the field and the intended crop. When manure or other organic by- products are a source of nutrients and the application rate is based on phosphorus, an additional nitrogen application, from non- organic sources, may be required to supply the recommended amounts of nitrogen.
- **Phosphorus Application:** The application rates shall be within 10% of recommended rates for the field and intended crop except when manure or other organic by- products are the source of nutrients. Where animal manure, poultry litter, compost or other organic by- products are used, a

field assessment for potential risk of phosphorus transport to surface water will be conducted (see Additional criteria applicable to properly utilize manure or organic by-products as a plant nutrient source). The Phosphorus Index for Alabama will be used to make this assessment of each field. A record of these assessments shall be included in the conservation plan.

- **Potassium Application**: Excess potassium shall not be applied in situations in which it causes unacceptable nutrient imbalances in crops or forages.
- **Other Plant Nutrients:** The application rates shall be applied consistent with ACES recommendations or other laboratory if recognized by Alabama Cooperative Extension System.

Right Nutrient Sources
Nutrient sources utilized must be compatible with the application timing, tillage and planting system, soil properties, crop, crop rotation, soil organic content, and local climate to minimize risk to the environment.

Sources of plant nutrients can include commercial fertilizer, livestock and poultry manure, poultry litter, compost, residual amounts in the soil, crop residues including cover and green manure crops, agricultural by- products, solids and waste water from municipal treatment plants, and nutrients recycled by grazing animals. When using commercial sources of fertilizer choose sources with the correct proportions of nitrogen, phosphorus and potassium that will meet the recommendation. Legume cover crops or green manure crops, where feasible, can provide nitrogen to the following crop. Be sure to consider these effects in the nutrient budget. Estimated available nitrogen provided by legume and cover crops is contained in Table 3.

On organic operations, the nutrient sources and management must be consistent with the USDA's National Organic Program. Enhanced efficiency fertilizers used in the State must be defined by the Association of American Plant Food Control Officials (AAPFCO) and be accepted for use by the State fertilizer control official, or similar authority, with responsibility for verification of product guarantees, ingredients (by AAPFCO definition) and label claims.

Right Nutrient Application Time
Timing of all nutrients must correspond as closely as practical with plant nutrient uptake (utilization by crops), and consider nutrient source, cropping system limitations, soil properties, and weather conditions.

For maximum efficiency and water quality benefits, nitrogen should be applied as close to the time of crop demand as practical. All applied nitrogen (commercial, animal manures or related organic by-products) shall be applied no more than 30 days prior to the beginning of the growth cycle (perennial crops) or 30 days prior to the planned planting date (annual crops). See Agronomy technical note Al-73, "Nitrogen Leaching Index for Alabama" for more information and additional considerations to reduce the potential of nitrogen leaching.

When applying nitrogen to hay, another cutting of hay should be expected during the current growing season. For pasture, another 45 days of grazing should be expected after the application of nitrogen. With stock-piled forage strategies, the length of additional grazing will depend on controlled grazing strategies being used.

Right Nutrient Application Place
Nutrient placement should keep nutrients where the crop can get to them and where nutrient use efficiency will be maximized. Crops, cropping systems, soil properties and nutrient source will dictate the most appropriate method of placement.

Nutrients must not be surface-applied if nutrient losses offsite are likely. This includes spreading on:

- frozen and/or snow-covered soils, and
- when the top 2 inches of soil are saturated from rainfall or snow melt.

Additional Criteria to Minimize Agricultural Nonpoint Source Pollution of Surface and Groundwater

Evaluate water quality standards and designated use limitations that exist locally or statewide in managing nutrients to protect the quality of water resources.

Planners must use the current “Nitrogen Leaching Index for Alabama”, “Phosphorus Index for Alabama”, and “RUSLE 2” to assess the risk of nutrient and soil loss. Identified resource concerns must be addressed to meet current planning criteria.

Conservation plans developed to minimize agricultural nonpoint source pollution of surface or groundwater resources will include practices and/or management activities that will reduce the risk of nitrogen or phosphorus movement from the field.

Planning and application of conservation practices must be coordinated to avoid, control, or trap manure and nutrients before they can leave the field by surface or subsurface drainage.

Nutrients must be applied with the right placement, in the right amount, at the right time, and from the right source to minimize nutrient losses to surface and groundwater. The following nutrient use efficiency strategies or technologies must be considered:

- incorporation or injection
- timing and number of applications
- coordinate nutrient applications with optimum crop nutrient uptake
- the use of guidance and rate control technology
- tissue testing, chlorophyll meters, and spectral analysis technologies

Additional Criteria Applicable to Properly Utilize Manure or Organic By-Products as a Plant Nutrient Source

All specifications shall be consistent with federal, state, and local regulations. Unless exceptions are granted according to ADEM Rule 335-6-7-26(2) the minimum buffer distance for animal waste application shall be:

- 50 feet from surface waters of the state including, but not limited to, perennial or intermittent streams, ponds, lakes, springs, or sinkholes. ADEM Rule 335-6- 7-26(2) (c)
- 100 feet from nearest existing occupied dwelling, church, school, hospital, park, or non-potable water wells. ADEM Rule 335-6-7-26(2) (c) and (o)
- 200 feet from Outstanding National Resources W ater, Outstanding Alabama W ater, potable water wells, or public water supply. ADEM Rule 335-6-7-26(2) (c)
- 200 feet from nearest existing occupied dwelling, church, school, hospital, or park when applying a non- pumped surface application of wastewater or subsurface injection/application of wastewater. ADEM Rule 335-6-7-26(2) (p)
- 500 feet from the nearest existing occupied dwelling, church, school, hospital, or park when using aerial wastewater irrigation application or other type pumped or pressurized surface application. ADEM Rule 335-6- 7-26(2) (p)
- not applied across property lines unless the adjoining property owner consents in writing and the land application site is approved (meets the requirements of 590). ADEM Rule 335-6-7-26(2) (q)

Nitrogen and phosphorus application rates must be planned based on risk assessment results as determined by “Nitrogen Leaching Index for Alabama” and “Phosphorus Index for Alabama” risk assessment tools. If the phosphorus application rate is limited to reduce the field vulnerability rating on the Phosphorus Index, phosphorus should not be applied at a rate greater than the rate used in the assessment tool.

For fields receiving manure, the phosphorus risk assessment may limit the application rate of phosphorus. Use the following table to determine the phosphorus limitation as a result of the risk assessment. In no case may the nitrogen rate be in excess of the recommendation regardless of the phosphorus limitation.

Risk Categories	Phosphorus Application Rate
Low	Nitrogen Rate
Moderate	3 x P removal by crop
Moderately High	2 x P removal by crop
High	1 x P removal by crop
Very High	No P application

When phosphorus risk assessment is HIGH, additional phosphorus and potassium may be applied at phosphorus crop removal rates if the following requirements are met:

- a strategy has been implemented that will reduce phosphorus loss risk in the future, and
- a site assessment for nutrients and soil loss has been conducted to determine if additional mitigation practices are required to protect water quality.

Manure may be applied annually at a rate equal to the recommended phosphorus application, or estimated phosphorus removal in harvested plant biomass. As an alternative these applications may be made at one time based on recommendation or phosphorus removal for the crop rotation, or multiple years in the crop sequence not to exceed three years. When such applications are made, the application rate:

- must not exceed the acceptable phosphorus risk assessment criteria;
- must not exceed the recommended nitrogen application rate;, and,
- no additional phosphorus must be applied in the current year and any additional years for which the single application of phosphorus is supplying nutrients.
- Use Table 4 to determine the phosphorus removal by various crops.

Animal manure, related organic by-products, or wastewater should not be applied within three days (72 hours) before a storm event having a prediction of: (1) periods of rain, (2) occasional rain, (3) rain likely, or (4) 50% or more probability as predicted by the National W eather Service. If these conditions occur, land application can still proceed if the county is rated favorable for spreading according to the National W eather Service Alabama Animal Waste/Nutrient Land Application Map (http:/www.srh.noaa.gov/bmx/adem/farmers_map.php). If any of the above conditions exist and the county is rated not favorable for spreading on the National W eather Service land application map, land application shall not occur in order to provide reasonable assurance that nutrients in storm water runoff will be reduced

Surface applied animal manure and other related dry organic by-products will not be applied to soils in months that are subject to very frequent and frequent flooding as posted on the Web Soil Survey. This is more than a 50 percent chance of flooding in any month.

Animal manure and related organic by-products will not be applied when wind direction and velocity will cause drift onto public areas, roads, residential areas cross property lines, or offsite.

Animal manure and related organic by-products shall not be applied to root vegetable crops during the current growing season, or to other vegetable crops one-month or less before harvest because of fecal bacterial contamination concerns. Dead animal compost will not be applied to vegetable crops.

Manure or organic by-products may be applied on legumes at rates equal to the estimated removal of nitrogen in harvested plant biomass, not to exceed land grant university recommendations.

Waste applications associated with irrigation systems shall be applied in accordance with the requirements of the NRCS conservation practice standard, *Irrigation Water Management-449*.

The total single application of liquid manure:

- must not exceed the soil's infiltration or water holding capacity
- must be based on crop rooting depth
- must be adjusted to avoid runoff or loss to subsurface tile drains.

When sewage sludge or other organic source of nutrients containing heavy metals are applied, the accumulation of potential pollutants (including arsenic, cadmium, chromium, copper, lead, mercury, molybdenum, nickel, selenium, and zinc) in the soil shall be monitored in accordance with the US Code, Reference 40 CFR, Part 503, and/or any applicable state and local laws or regulations. Apply municipal and industrial sludge only to soils that are adjusted to pH 6.5 or higher and are to be maintained at pH 6.2 or higher. Refer to ACES documentation for guidance.

Crop production activities and nutrient use efficiency technologies must be coordinated to take advantage of mineralized plant-available nitrogen to minimize the potential for nitrogen losses due to denitrification or ammonia volatilization.

Additional Criteria to Protect Air Quality by Reducing Odors, Nitrogen Emissions and the Formation of Atmospheric Particulates

To address air quality concerns caused by odor, nitrogen, sulfur, and/or particulate emissions; the source, timing, amount, and placement of nutrients must be adjusted to minimize the negative impact of these emissions on the environment and human health. One or more of the following may be used:

- incorporation
- injection
- residue and tillage management
- no-till or strip-till
- other technologies that minimize the impact of these emissions

Additional Criteria to Improve or Maintain the Physical, Chemical, and Biological Condition of the Soil to Enhance Soil Quality for Crop Production and Environmental Protection Nutrients shall be applied in such a manner as not to degrade the soil's structure, chemical properties, or biological condition. Use of nutrient sources with high salt content will be minimized in seasonal high tunnels (or other areas where rainfall is restricted) unless provisions are used to leach salts below the crop root zone.

Time the application of nutrients to avoid periods when field activities will result in soil compaction and/or tire ruts.

CONSIDERATIONS

When available use application equipment that utilizes rate controllers, GPS guidance, automatic section control or any combination of all 3 to improve application rate and placement of nutrients.

Use variable-rate nitrogen application based on expected crop yields, soil variability, or chlorophyll concentration. Use variable-rate phosphorus, and potassium application rates based on site-specific variability in crop yield, soil characteristics, soil test values, and other soil productivity factors.

Develop site-specific yield maps using a yield monitoring system. Use the data to further diagnose low- and high- yield areas, or zones, and make the necessary management changes. See Title 190, Agronomy Technical Note (TN) 190.AGR.3, Precision Nutrient Management Planning.

Use legume crops and cover crops to provide nitrogen through biological fixation and nutrient recycling.

When creating a new plan or modifying an existing plan soil test and other needed laboratory analysis should be taken within the past year. Excessive levels of some nutrients can cause induced deficiencies of other nutrients, e.g., high soil test phosphorus levels can result in zinc deficiency in corn.

Use soil tests, plant tissue analyses, and field observations to check for secondary plant nutrient deficiencies or toxicity that may impact plant growth or availability of the primary nutrients. Use the adaptive nutrient management learning process to improve nutrient use efficiency on farms as outlined in the NRCS National Nutrient Policy in GM 190, Part 402, Nutrient Management.

Potassium should not be applied in situations where an excess causes nutrient imbalances in crops or forages. Workers should be protected from and avoid unnecessary contact with plant nutrient sources.

Extra caution must be taken when dealing with organic wastes stored in unventilated enclosures. Material generated from cleaning nutrient application equipment should be utilized in an environmentally safe manner. Excess material should be collected and stored or field applied in an appropriate manner. Nutrient containers should be recycled in compliance with State and local guidelines or regulations.

Considerations to Minimize Agricultural Nonpoint Source Pollution of Surface and Groundwater and to Properly Utilize Manure or Organic By-Products as a Plant Nutrient Source

The conservation planner should consider appropriate use of vegetated filters and/or manure application setbacks. Vegetated filters are conservation practices designed to treat surface and subsurface runoff to reduce the risk of nutrient loss. Grass waterways, filter strips, and riparian forest buffers may be used to reduce the risk of nutrient loss at the edge of fields where runoff may occur.

Generally, a vegetated filter that meets the Filter Strip (393), Riparian Forest Buffers (391) and/or Grass Waterway (412) standard should be installed and/or maintained on the edges of the application field where runoff may occur to trap and/or treat nutrients transported with sediment and runoff water.

Application setbacks should also be considered when land applying animal manure or other organic by-products near wells. These distances should be determined after considering topography, geology, wellhead protection, and the well use. Generally, use a manure application setback of 200 feet if the application site is located down-gradient from the well and 300 feet if the application site is located up-gradient from the well. Site-specific conditions may warrant adjustments to the application distance. When land applying animal manure or other organic by-products near property lines and public roads application setbacks should be considered. Generally a recommended setback of 25 feet from property lines, 50 feet from public roads when applying waste with a spreader and 100 feet from public roads when pumped wastewater is used should be considered. However, site specific conditions on the ground should be considered to adjust these setback distances to meet the needs the conservation plan objectives.

Using conservation practices that slow runoff, reduce erosion, increase infiltration, and improve soil health will reduce the risk on nutrient loss and should be considered in the planning process. Consider managed rotational grazing systems [such as those in the conservation practice Prescribed Grazing (528)] that maintain minimum forage height, have proper stocking rates, provide sufficient recovery time to promote the vigor of the plant community, and/or permit grazing only when soil moisture conditions support livestock traffic without excessive compaction. These systems will improve soil health and minimize the risk of nutrient loss. Use no-till/strip-till in combination with cover crops to improve soil health and soil function. This improved soil function will sequester nutrients, increase soil organic matter, increase aggregate stability, reduce compaction, improve infiltration, and enhance soil biological activity to improve nutrient use efficiency. Use nutrient management strategies such as cover crops, crop rotations, and crop rotations with perennials to improve nutrient cycling and reduce energy inputs.

Apply manure at a rate that will result in an “improving” Soil Conditioning Index (SCI) without exceeding acceptable risk of nitrogen or phosphorus loss.

Use application methods and timing strategies that reduce the risk of nutrient transport by ground and surface waters, such as:

- split applications of nitrogen to deliver nutrients during periods of maximum crop utilization,
- banded applications of nitrogen and/or phosphorus to improve nutrient availability,
- drainage water management to reduce nutrient discharge through drainage systems, and
- incorporation of surface-applied manures or organic by-products.

Use the agricultural chemical storage facility conservation practice to protect air, soil, and water quality.

Considerations to Protect Air Quality by Reducing Nitrogen and/or Particulate Emissions to the Atmosphere

Manure application setbacks should be considered in the conservation planning process because of the odor and nuisance potential associated with animal manures and other wastes. These setbacks are separation distances between the land application site and public areas. Dwellings, churches, hospital, school, parks, public roads and property lines should be considered in determining the appropriate application setback. Additionally, trees and/or shrub screens that keep the application site from public view and influence air movement should also be a consideration when determining the setback distance.

Generally, a manure application setback of 25 feet from property lines, 100 feet from public roads when applying waste with an irrigation system, and 50 feet from public roads with all other waste applications should be considered.

Soil injection or incorporation by tillage will reduce odor potential when applying animal manure and other organic nutrients Use high- efficiency irrigation technologies (e.g., reduced- pressure drop nozzles for center pivots) to reduce the potential for nutrient losses.

PLANS AND SPECIFICATIONS

The following components must be included in the nutrient management plan:

- aerial site photograph(s)/imagery or site map(s), and a soil survey map of the site,
- soil information including: soil type, surface texture, pH, drainage class, permeability, available water capacity, depth to water table, restrictive features, and flooding and/or ponding frequency,
- location of designated sensitive areas and the associated nutrient application restrictions and setbacks,
- for manure applications, location of nearby residences, or other locations where humans may be present on a regular basis, and any identified meteorological (e.g., prevailing winds at different times of the year), or topographical influences that may affect the transport of odors to those locations,
- results of approved risk assessment tools for nitrogen, phosphorus, and erosion losses,
- documentation establishing that the application site presents low risk for phosphorus transport to local water when phosphorus is applied in excess of crop requirement.
- current and/or planned plant production sequence or crop rotation,
- soil, water, compost, manure, organic by- product, and plant tissue sample analyses applicable to the plan,
- when soil phosphorus levels are increasing, include a discussion of the risk associated with phosphorus accumulation and a proposed phosphorus draw-down strategy,
- realistic yield goals for the crops,
- complete nutrient budget for nitrogen, phosphorus, and potassium for the plant production sequence or crop rotation,
- listing and quantification of all nutrient sources and form,
- all enhanced efficiency fertilizer products that are planned for use,
- in accordance with the nitrogen and phosphorus risk assessment tool(s), specify the recommended nutrient application source, timing, amount (except for precision/variable rate applications specify

method used to determine rate), and placement of plant nutrients for each field or management unit, and

- guidance for implementation, operation and maintenance, and recordkeeping.

In addition, the following components must be included in a precision/variable rate nutrient management plan:

- Document the geo-referenced field boundary and data collected that was processed and analyzed as a GIS layer or layers to generate nutrient or soil amendment recommendations.
- Document the nutrient recommendation guidance and recommendation equations used to convert the GIS base data layer or layers to a nutrient source material recommendation GIS layer or layers.
- Document if a variable rate nutrient or soil amendment application was made.
- Provide application records per management zone or as applied map within individual field boundaries (or electronic records) documenting source, timing, method, and rate of all applications that resulted from use of the precision agriculture process for nutrient or soil amendment applications.
- Maintain the electronic records of the GIS data layers and nutrient applications for at least 5 years.

If increases in soil phosphorus levels are expected (i.e., when N-based rates are used), the nutrient management plan must document:

- the soil phosphorus levels at which it is desirable to convert to phosphorus based planning,
- the potential plan for soil test phosphorus drawdown from the production and harvesting of crops, and
- management activities or techniques used to reduce the potential for phosphorus transport and loss,
- for AFOs, a quantification of manure produced in excess of crop nutrient requirements, and
- a long-term strategy and proposed implementation timeline for reducing soil P to levels that protect water quality,

OPERATION AND MAINTENANCE

Conduct periodic plan reviews to determine if adjustments or modifications to the plan are needed. At a minimum, plans must be reviewed and revised, as needed with each soil test cycle, changes in manure volume or analysis, crops, or crop management.

Fields receiving animal manures and/or biosolids must be monitored for the accumulation of heavy metals and phosphorus in accordance with land- grant university guidance and State law.

Significant changes in animal numbers, management, and feed management will necessitate additional manure analyses to establish a revised average nutrient content. Calibrate application equipment to ensure accurate distribution of material at planned rates.

Document the nutrient application rate. When the applied rate differs from the planned rate, provide appropriate documentation for the change.

Records must be maintained for at least 5 years to document plan implementation and maintenance. As applicable, records include:

- soil, plant tissue, water, manure, and organic by-product analyses resulting in recommendations for nutrient application,
- quantities, analyses and sources of nutrients applied,
- dates, and method(s) of nutrient applications, source of nutrients, and rates of application,
- weather conditions and soil moisture at the time of application; lapsed time to manure incorporation;

rainfall or irrigation event,

- crops planted, planting and harvest dates, yields, nutrient analyses of harvested biomass, and crop residues removed,
- dates of plan review, name of reviewer, and recommended changes resulting from the review, and
- all enhanced efficiency fertilizer products used.

Additional records for precision/variable rate sites must include:

- maps identifying the variable application source, timing, amount, and placement of all plant nutrients applied, and
- GPS-based yield maps for crops where yields can be digitally collected.

REFERENCES

ADEM Administrative Code Chapter 335-6-7, as amended (AFO/CAFO rule).

Alabama Cooperative Extension Service Circular ANR-790. W ater Quality and Pollution Control Handbook.

Alabama Cooperative Extension Service Circular ANR-449. Nutrient Removal by Alabama Crops.

Alabama Cooperative Extension Service Circular ANR-450. Plant Diagnostic Lab Services.

Association of American Plant Food Control Officials (AAPFCO). 2011. AAPFCO Official Publication no. 64. AAPFCO Inc., Little Rock, AR.

Follett, R.F. 2001. Nitrogen transformation and transport processes. *In* Nitrogen in the environment; sources, problems, and solutions, (eds.) R.F. Follett and J. Hatfield, pp. 17-44. Elsevier Science Publishers. The Netherlands. 520 pp.

Mitchell, C.C. 2008. Biosolids on Alabama Cropland and pastures. Agronomy and Soils Departmental Series Timely Information. http://www.aces.edu/timelyinfo/Ag%20Soil/2 008/April/S-02-08.pdf

Mitchell, C.C. and G. Huluka 2012. The Basis of Soil Testing in Alabama. Agronomy and Soils Departmental Series No 324A. Alabama Agricultural Experiment Station. W. Batchelor, Director. Auburn University.

Mitchell, C.C. and G. Huluka 2012. Nutrient Recommendation Tables for Alabama Crops. Agronomy and Soils Departmental Series No 324B. Alabama Agricultural Experiment Station. W. Batchelor, Director. Auburn University.

Nutrient Management Planning of Animal Feeding Operations, Alabama Cooperative Extension System and NRCS, January 1999.

Schepers, J.S., and W.R. Ruan, (eds.) 2008. Nitrogen in agricultural systems. Agron. Monogr. no. 49, American Society of Agronomy (ASA), Crop Science Society of America (CSSA), Soil Science Society of America (SSSA). Madison, WI.

Sims, J.T. (ed.) 2005. Phosphorus: Agriculture and the environment. Agron. Monogr. no.

46. ASA, CSSA, and SSSA, Madison, WI.

Stevenson, F.J. (ed.) 1982. Nitrogen in agricultural soils. Agron. Series 22. ASA, CSSA, and SSSA, Madison, WI.

Code of Federal Regulations: Title 40: Part 503—Standards for the use or disposal of sewage sludge http://yosemite.epa.gov/r10/water.nsf/NPDES%2BPermits/Sewage%2BS825/$FILE/503-032007.pdf

U.S. Department of Agriculture, Natural Resources Conservation Service. 2010. Agronomy Technical Note, (TN) 190-AGR-3, Precision Nutrient Management Planning. Washington, DC.

U.S. Department of Agriculture, Natural Resources Conservation Service. 2011. Title 190, General Manual, (GM), Part 402, Nutrient Management. Washington, DC.

U.S. Department of Agriculture, Natural Resources Conservation Service. 2011, Title 190, National Instruction (NI), Part 302, Nutrient Management Policy Implementation. Washington, DC.

U.S. Department of Agriculture, Natural Resources Conservation Service, 2014. Web Soil Survey (WSS).http://websoilsurvey.sc.egov.usda.gov/

U.S. Department of Agriculture, Natural Resources Conservation Service. 2002. National Agronomy Manual. 190-V. 3rd ed.

Effects of NRCS Conservation Practices - National

Nutrient Management

Managing the amount (rate), source, placement (method of application), and timing of plant nutrients and soil amendments.

Code: 590
Units: ac.

Typical Landuse: C F R P Pr FS D O AL

C-Crop, F-Forest, R-Range, P-Pasture, Pr-Protected, FS-Farmstead, D-Developed, W-Water, O-Other, AL-Aso Land

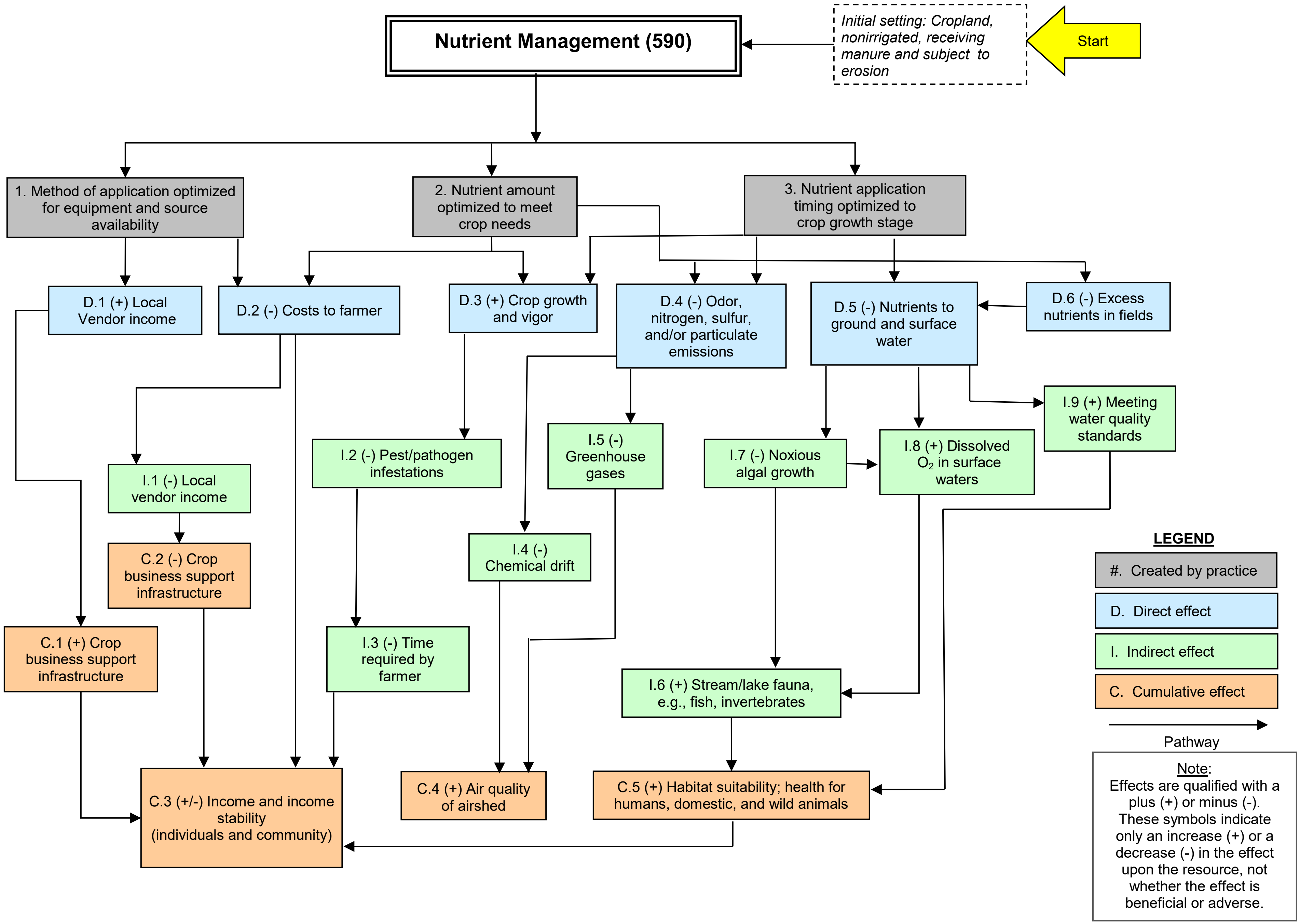
Resource Concern	Effect	Rationale
Soil Erosion		
Soil Erosion - Sheet and Rill Erosion	0	Soil disturbance to incorporate fertilizer loosens the soil and buries surface residue which can increase erosion. Other application methods do not contribute to erosion.
Soil Erosion - Wind Erosion	0	Soil disturbance to incorporate fertilizer loosens the soil and buries surface residue which can increase erosion. Other application methods do not contribute to erosion.
Soil Erosion - Ephemeral Gully Erosion	0	Soil disturbance to incorporate fertilizer loosens the soil and buries surface residue which can increase erosion. Other application methods do not contribute to erosion.
Soil Erosion - Classic Gully Erosion	0	Not Applicable
Soil Erosion - Streambank, Shoreline, Water Conveyance C	0	Not Applicable
Soil Quality Degradation		
Organic Matter Depletion	2	Management of pH and applying sufficient nutrients will maintain or enhance biomass production
Compaction	-2	Field operations on moist soils cause soil compaction.
Subsidence	0	Not Applicable
Concentration of Salts or Other Chemicals	2	Matching plant requirements with nutrient applications decreases excess nutrient conditions and reduces salts and other contaminants
Excess Water		
Excess Water - Seeps	0	Not Applicable
Excess Water - Runoff, Flooding, or Ponding	0	Not Applicable
Excess Water - Seasonal High Water Table	0	Not Applicable
Excess Water - Drifted Snow	0	Not Applicable
Insufficient Water		
Insufficient Water - Inefficient Use of Irrigation Water	0	Excess nitrogen promotes shoot growth in relation to root growth.
Insufficient Water - Inefficient Moisture Management	0	Excess nitrogen promotes shoot growth in relation to root growth.
Water Quality Degradation		
Pesticides in Surface Water	0	Not Applicable
Pesticides in Groundwater	0	Not Applicable
Nutrients in Surface water	5	Right: Amount, source, placement, and timing (4R) provides nutrients when plants need them most.
Nutrients in Groundwater	5	The amount and timing of nutrient application are balanced with plant needs.
Salts in Surface Water	1	Proper nutrient application should reduce salinity if nutrient source contains salts.
Salts in Groundwater	1	Proper nutrient application should reduce salinity if nutrient source contains salts.
Excess Pathogens and Chemicals from Manure, Bio-solic	1	Decrease application of pathogens if nutrient source contains pathogens.
Excess Pathogens and Chemicals from Manure, Bio-solic	1	The action limits the amount of manure that can be applied thus preventing harmful levels of pathogens.

Excessive Sediment in Surface Water	0	Proper nutrient application will minimize losses due to runoff.
Elevated Water Temperature	0	Not Applicable
Petroleum, Heavy Metals and Other Pollutants Transporte	2	Changing pH will alter the solubility of metals. The action will reduce the application rate of heavy metals if required.
Petroleum, Heavy Metals and Other Pollutants Transporte	2	Management of pH will alter the solubility of metals. The action will reduce the application rate of heavy metals, if required
Air Quality Impacts		
Emissions of Particulate Matter (PM) and PM Precursors	3	The proper application of nitrogen can greatly reduce ammonia emissions. Proper application techniques can also reduce particulate emissions from solid manure and fertilizers.
Emissions of Ozone Precursors	2	The proper application of nitrogen can reduce NOx emissions. Proper application techniques can also reduce VOC emissions from manure.
Emissions of Greenhouse Gases (GHGs)	4	Management of nutrients optimizes the storage of soil carbon. The propoer application of nitrogen can reduce emissions of nitrous oxide.
Objectionable Odors	4	The proper application of nitrogen can reduce ammonia emissions. Proper application techniques can also reduce emissions of VOCs and other odorous compounds from manure.
Degraded Plant Condition		
Undesirable Plant Productivity and Health	2	Nutrients and soil amendments are optimized to enhance health and vigor of desired species.
Inadequate Structure and Composition	2	Nutrients and soil amendments are optimized to enhance suited and desired species.
Excessive Plant Pest Pressure	0	Not Applicable
Wildfire Hazard, Excessive Biomass Accumulation	0	Not Applicable
Fish and Wildlife - Inadequate Habitat		
Inadequate Habitat - Food	1	Management enhances production of any food species planted.
Inadequate Habitat - Cover/Shelter	1	Management enhances cover/shelter conditions.
Inadequate Habitat - Water	0	Not Applicable
Inadequate Habitat - Habitat Continuity (Space)	0	Not Applicable
Livestock Production Limitation		
Inadequate Feed and Forage	4	Nutrients are managed to ensure optimal production and nutritive value of the forage used by livestock.
Inadequate Shelter	0	Not Applicable
Inadequate Water	2	Management improves livestock water quality.
Inefficient Energy Use		
Equipment and Facilities	0	Not Applicable
Farming/Ranching Practices and Field Operations	0	Not Applicable

CPPE Practice Effects:	*0 No Effect*
5 Substantial Improvement	*-1 Slight Worsening*
4 Moderate to Substantial Improvement	*-2 Slight to Moderate Worsening*
3 Moderate Improvement	*-3 Moderate Worsening*
2 Slight to Moderate Improvement	*-4 Moderate to Substantial Worsening*
1 Slight Improvement	*-5 Substantial Worsening*

NRCS CONSERVATION PRACTICE EFFECTS - NETWORK DIAGRAM

May 2019



United States Department of Agriculture

Natural Resources Conservation Service

Watering Facility

For Livestock

Alabama Job Sheet No. AL614

Definition

A watering trough or tank used as a container to provide drinking water for livestock.

General Information

Location - If possible, locate the trough so that cattle will not have to walk more than 800 feet to water. If located on a fence line, a trough can supply water for two pastures (paddocks). Select a site with good drainage and near level. More than one trough may be needed in a large pasture to better distribute the grazing. Avoid wet or boggy areas. In locations subject to prolonged freezing conditions, freeze-proof troughs should be considered. Concrete troughs can be partially buried to help prevent freezing.

Items in the pasture such as feeding locations, salt boxes, mineral feeders, back rubs, and shade structures should be located away from the watering facility.

Trough Materials - The watering trough or tank can be made of reinforced concrete, 20 gauge or thicker galvanized steel, approved plastic (UV protected), or quality used equipment tires. If made of concrete, the sides are to be at least 3 inches thick and the bottom 4 inches thick. Welded wire reinforcement shall be at least 8 gauge. Manufactured freeze-proof troughs or portable troughs may be used.

Trough Capacity - The trough should be sized with enough capacity to meet the livestock requirements. As a general rule, the trough should hold enough water to provide from 50 to 100 percent of the cattle needs for the day.

When cattle do not have to walk more than 800 feet to water, they will go to water singly; therefore, smaller troughs can be used.

Installation and Plumbing – The foundation of the trough is to be level and the trough placed on materials (graded aggregate base or concrete) according to the manufacturer or NRCS requirements. The water supply line shall be at least a 1-1/4 inch diameter for gravity flow systems and 3/4 inch for pressurized systems. The trough with continuous flow should have an overflow pipe to control the water level and to remove excess flow safely from the watering location. The water supply should be installed to be freeze-proof. Any floating valve or other mechanism should be protected from damage by the cattle. A drain plug is needed in the trough for maintenance.

Heavy Use Area Protection - The area around the trough for at least 10 feet should be protected from the heavy use of the cattle and gently sloped to prevent holding water. The preferred protective surface consists of a non-woven geotextile (fabric) material overlaid with at least 6 inches of graded aggregate base (crushed stone). Smaller graded aggregate base can be used on the surface if needed. All stone should be crushed limestone or granite that meets gradation requirements. If concrete is used, a thickness of at least 4 inches is required. The surface of the concrete should be roughened to prevent cattle from slipping. Heavy use area protection is not necessary where vegetation is maintained around portable troughs.

Operation and Maintenance

Maintenance should be performed to keep the trough clean and debris removed. Algae growth may need to be controlled. Stone may need to be replaced on heavy use areas.

References

NRCS AL Conservation Practice Standards:
- Watering Facility - Code 614
- Heavy Use Area Protection - Code 561

LIVESTOCK WATERING SYSTEM

PLAN VIEW

A plan view of the watering system is shown in the attached Conservation Plan Map. Locate well, troughs, heavy use areas and other practices in the approved locations shown on the Conservation Plan Map. Any variation(s) from the plan view or specifications must be requested and approved by NRCS prior to construction since any variation made without NRCS approval could jeopardize certification of the practice(s) and associated practice payments.

BILL OF MATERIALS[1]

Number of troughs __________ Capacity __________ gal. (Minimum capacity for open troughs = 50 gal.)
Trough materials:
- ☐ Reinforced Concrete (bottom minimum thickness = 4 in, side minimum thickness = 3 in)
- ☐ Galvanized Steel (20 gauge or thicker)
- ☐ Plastic (UV protected)
- ☐ Ball Waterer: stations per trough ______
- ☐ Used Equipment Tire

Well pump[2]: Minimum size __________ hp. Pressure tank[2]: Minimum Drawdown __________ gal.
Pressure settings: ON _____ psi OFF _____ psi

Pipe length _____________ ft. Nominal size _____________ in. Min. design pressure _____________ psi.
Pipe material ______________Wall designation _______________Pressure rating: _____________________
Fittings[1] (number and type) ____
Valves and special appurtenances[1] (number & type) ______________________________________

Dimensions of heavy use area: Length ___________ ft. x Width ___________ ft. Thickness ___________ in.
Heavy use area materials:
- ☐ Concrete: Thickness: ___________ in. Quantity: ___________cu.yd.
- ☐ Graded aggregate base[3]: Type _______Thickness: _______ in. Quantity: _______cu.yd. _________tons
- ☐ Finer graded aggregate base[3]: Type ______Thickness: _______ in. Quantity: _______cu.yd. ________tons
- ☐ Geotextile[4]: ___________ sq.yd. (includes 10% for overlap)

[1] The bill of materials includes the major system components. Other valves, fittings, or components may be required, as recommended by the equipment supplier/contractor, to ensure proper function and efficient operation of the system.
[2] Pump and pressure tank sizes and controls should be verified by the equipment supplier.
[3] Acceptable materials include ALDOT crushed stone sizes 5, 56, 57, 6, 67, 68, and 610, and Types A or B crushed aggregate base, and other similar products approved by an engineer.
[4] Geotextile shall be non-woven needle punched with min. grab tensile strength of 157 lb. and min. puncture strength of 309 lb.

ADDITIONAL NOTES AND INSTRUCTIONS:

____
____
____
____
____
____
____

NRCS CERTIFICATION:

______________________DATE: _________
PRACTICE MEETS NRCS
STANDARDS AND SPECIFICATIONS

LANDOWNER: ______________________________
FARM # _______________TRACT #_______________
COUNTY: ________________________________
DESIGNED BY: ________________ DATE: __________
CHECKED BY: _________________ DATE: __________

Effects of NRCS Conservation Practices - National

Watering Facility

A permanent or portable device to provide an adequate amount and quality of drinking water for livestock and or wildlife.

Code: 614
Units: no.

C-Crop
F-Forest
R-Range
P-Pasture
Pr-Protected
FS-Farmstead
D-Developed
W-Water
O-Other
AL-Aso Land

Typical Landuse: C F R P Pr FS D W O AL

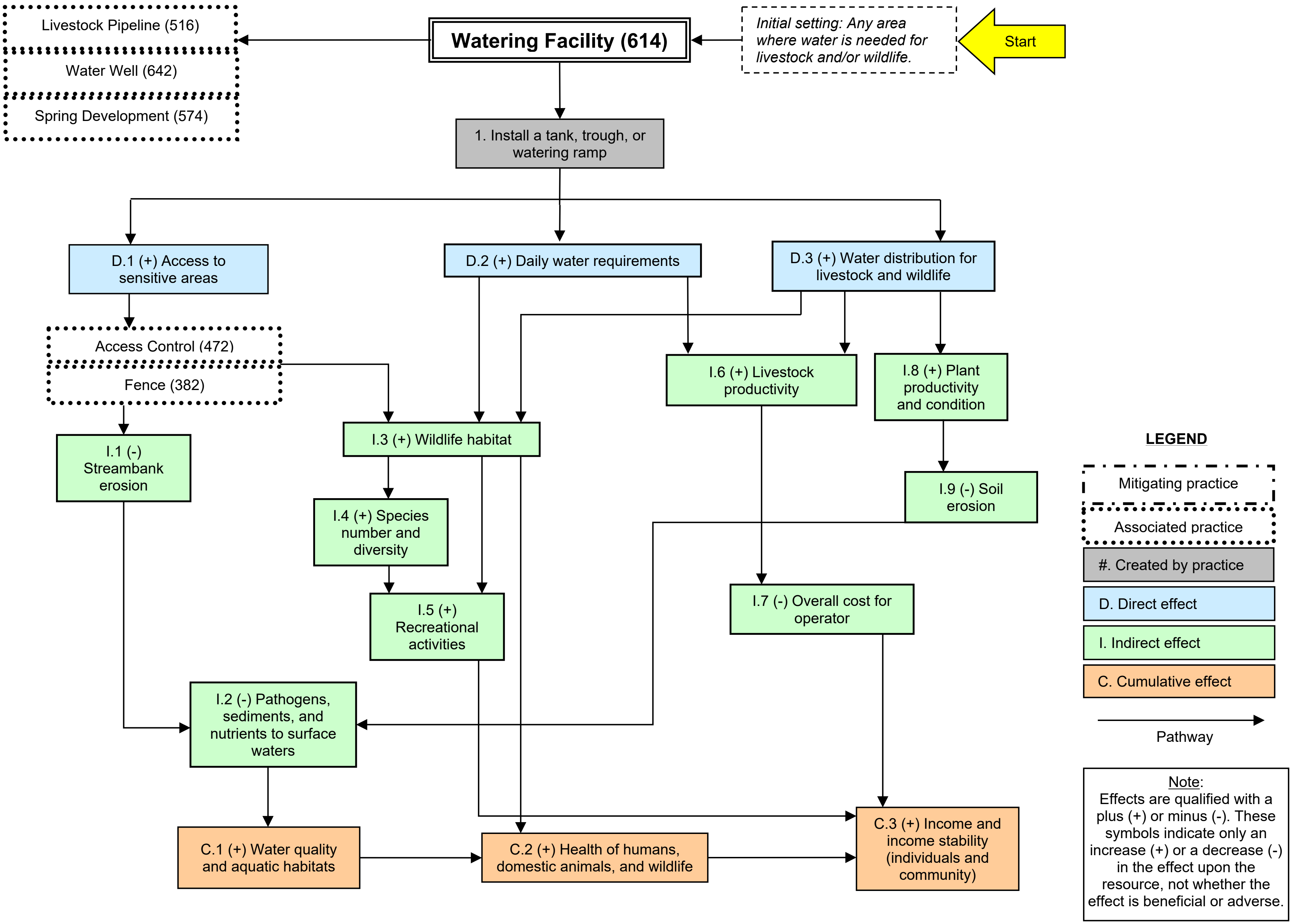
Soil Erosion	Effect	Rationale
Soil Erosion - Sheet and Rill Erosion	2	Increased vegetated cover due to better distribution of water reduces soil erosion.
Soil Erosion - Wind Erosion	2	Increased vegetated cover due to better distribution of water reduces soil erosion.
Soil Erosion - Ephemeral Gully Erosion	2	Increased vegetated cover due to better distribution of water reduces soil erosion.
Soil Erosion - Classic Gully Erosion	1	Increased grass cover due to better distribution of water will retard flows decreasing opportunity for classic erosion.
Soil Erosion - Streambank, Shoreline, Water Conveyance C	4	By providing an alternate water source animal traffic on streambanks is removed reducing erosion.
Soil Quality Degradation		
Organic Matter Depletion	0	Not Applicable
Compaction	0	Traffic may increase around the practice, but the practice will help reduce excess moisture where traffic occurs.
Subsidence	0	Not Applicable
Concentration of Salts or Other Chemicals	0	Not Applicable
Excess Water		
Excess Water - Seeps	0	The action may result in minor amounts of increased infiltration due to retarding flows with better vegetative cover.
Excess Water - Runoff, Flooding, or Ponding	0	The action may result in minor amounts of increased infiltration (less surface flows) due to retarding flows with better vegetative cover.
Excess Water - Seasonal High Water Table	0	The action may result in minor amounts of increased infiltration due to retarding flows with better vegetative cover.
Excess Water - Drifted Snow	0	Not Applicable
Insufficient Water		
Insufficient Water - Inefficient Use of Irrigation Water	0	Not Applicable
Insufficient Water - Inefficient Moisture Management	0	Not Applicable
Water Quality Degradation		
Pesticides in Surface Water	0	Not Applicable
Pesticides in Groundwater	0	Not Applicable
Nutrients in Surface water	0	Not Applicable
Nutrients in Groundwater	0	Not Applicable
Salts in Surface Water	1	Better distribution of animals away from surface water reduces the risk of salt contamination from manures.
Salts in Groundwater	0	Not Applicable
Excess Pathogens and Chemicals from Manure, Bio-solic	1	Improved vegetation due to better distribution of water will filter and reduce water borne contaminants. In addition, better distribution of animals results in less concentration of contaminants.
Excess Pathogens and Chemicals from Manure, Bio-solic	-1	The action tends to concentrate animals, increasing pathogens available for transport.

Excessive Sediment in Surface Water	2	Water development will decrease livestock trampling in wet areas and nearby streams.
Elevated Water Temperature	1	Purpose of practice is to protect vegetation along water courses, which in turn moderates stream temperatures.
Petroleum, Heavy Metals and Other Pollutants Transporte	1	Improved vegetation due to better distribution of water will filter and reduce water borne contaminants. In addition, better distribution of animals results in less concentration of contaminants.
Petroleum, Heavy Metals and Other Pollutants Transporte	0	Not Applicable
Air Quality Impacts		
Emissions of Particulate Matter (PM) and PM Precursors	0	Not Applicable
Emissions of Ozone Precursors	0	Not Applicable
Emissions of Greenhouse Gases (GHGs)	0	Not Applicable
Objectionable Odors	0	Not Applicable
Degraded Plant Condition		
Undesirable Plant Productivity and Health	2	Available water to facilitate grazing management improves growth and vigor of plants.
Inadequate Structure and Composition	0	Not Applicable
Excessive Plant Pest Pressure	0	Not Applicable
Wildfire Hazard, Excessive Biomass Accumulation	0	Not Applicable
Fish and Wildlife - Inadequate Habitat		
Inadequate Habitat - Food	0	Not Applicable
Inadequate Habitat - Cover/Shelter	0	Not Applicable
Inadequate Habitat - Water	2	The action supplies water to alternative locations hence protecting stream and riparian areas.
Inadequate Habitat - Habitat Continuity (Space)	3	Additional habitat/space is available once water is available.
Livestock Production Limitation		
Inadequate Feed and Forage	2	Improved distribution of animals makes forage more readily available to livestock.
Inadequate Shelter	0	Not Applicable
Inadequate Water	5	Facilities supply water at remote locations.
Inefficient Energy Use		
Equipment and Facilities	0	Not Applicable
Farming/Ranching Practices and Field Operations	0	Not Applicable

CPPE Practice Effects:	0 No Effect
5 Substantial Improvement	-1 Slight Worsening
4 Moderate to Substantial Improvement	-2 Slight to Moderate Worsening
3 Moderate Improvement	-3 Moderate Worsening
2 Slight to Moderate Improvement	-4 Moderate to Substantial Worsening
1 Slight Improvement	-5 Substantial Worsening

NRCS CONSERVATION PRACTICE EFFECTS - NETWORK DIAGRAM

August 2023



United States Department of Agriculture
NRCS Natural Resources Conservation Service

Water Well:

Water Well Protection on the Farm

Alabama Job Sheet No. AL642

Definition

A water well is constructed as an opening into an aquifer to provide general water needs for a farming or ranching operation. Proper water well protection involves the protection of wells already installed and the prevention of problems in wells that are being planned.

General Well Protection

All on-farm wells should be properly sited and protected to ensure there is no water contamination of either the well or the aquifer.

Wells should be located a safe distance from any potential source of contamination, hazardous products should not be stored near a well, and high-risk activities should be kept a safe distance from any well.

Any type of manure storage or animal confinement facility should be located a proper distance from any well. Also, the land application of manure and fertilizers should be kept a safe distance from wells. An NRCS technician can help identify state-required setbacks or recommended setbacks.

Surface runoff and drainage water can enter the top of a well, causing significant contamination; therefore, runoff should always be diverted away from all wells.

Install a well cap or sanitary seal to prevent unauthorized use and entry of contaminated water or live critters into the well.

Avoid mixing or using pesticides, fertilizers, fuels, and other potential chemical pollutants near the well.

Check valves can be used to prevent the back flow of contaminated water or hazardous products directly into a well.

Never dispose of wastes or other potential pollutants in a dry or abandoned well.

Protect all wells from freezing, mowing, livestock, etc., with an insulated well house, minimum R-9. Provide an electrical outlet for heating if needed.

Planning New Wells

When a new well is properly sited, constructed, and initially decontaminated; and when the potential sources of pollution near the well are eliminated; the quality of water delivered to the user should remain free from contamination.

New wells should be located the proper distance from manure storage areas, animal confinement facilities, and manure application sites. In addition, wells should always be located at least 100 ft from and upslope of any septic tank or its leach field.

If practicable, wells should be located on higher ground and upgradient from potential sources of contamination or flooding. New wells should be located a safe distance from both overhead and underground utility lines.

A detailed geologic investigation should be performed for wells planned in a limestone aquifer which contain underground channels.

New Well Construction

Always hire a certified well driller for any new well construction or modification. A licensed electrician will also need to certify all of the electrical connections. A well casing shall be installed in new wells to seal out undesirable surface or shallow groundwater and to support the side of the borehole from collapse of unstable earth materials. The casing shall extend from at least 1 ft above the ground surface to at least 2 ft into stable material or to the top of the screen. The casing shall be surrounded at the ground surface by a 4-inch thick concrete slab extending at least 2 ft in all directions from the well.

Operation and Maintenance

Some wells may require special provisions by the well driller so the aquifer will provide the flow desired. The well construction records should be kept on file by the landowner. The well owner should periodically inspect exposed parts of the well for problems such as:

- Damaged well casing,
- Broken or missing well cap, and
- Settling and cracking of surface seals.

Disinfect drinking water wells at least once per year. Have the well tested once a year for coliform bacteria, nitrates, and other constituents of concern. (Contact the County Environmentalist with the Department of Public Health for guidance on disinfecting a well and well water testing.)

References

NRCS AL Conservation Practice Standard
Water Well - Code 642

Effects of NRCS Conservation Practices - National

Water Well

A hole drilled, dug, driven, bored, jetted or otherwise constructed to an aquifer for water supply.

Code: 642
Units: no

C-Crop	F-Forest	R-Range	P-Pasture	Pr-Protected	FS-Farmstead	D-Developed	W-Water	O-Other	AL-Aso Land
C	F	R	P	Pr	FS	D		O	AL

Typical Landuse:

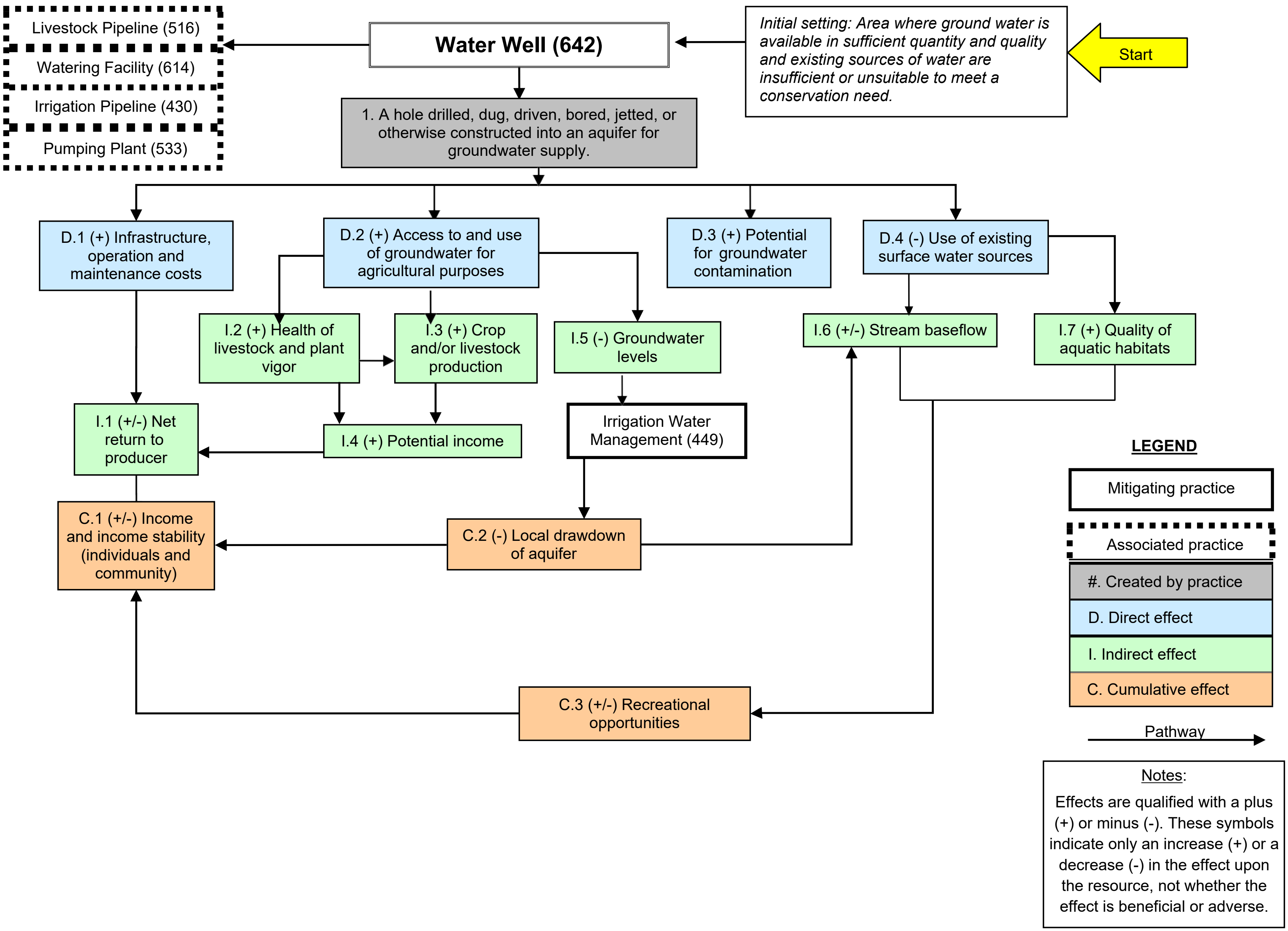
Soil Erosion	Effect	Rationale
Soil Erosion - Sheet and Rill Erosion	2	Increased vegetated cover due to better distribution of water reduces soil erosion.
Soil Erosion - Wind Erosion	2	Increased vegetated cover due to better distribution of water reduces soil erosion.
Soil Erosion - Ephemeral Gully Erosion	2	Increased vegetated cover due to better distribution of water reduces soil erosion.
Soil Erosion - Classic Gully Erosion	0	Not Applicable
Soil Erosion - Streambank, Shoreline, Water Conveyance C	0	Not Applicable
Soil Quality Degradation		
Organic Matter Depletion	0	Not Applicable
Compaction	0	The action involves production rather than distribution of available water.
Subsidence	0	Not Applicable
Concentration of Salts or Other Chemicals	1	Where well flows are used for irrigation, contaminants can be leached below the root zone.
Excess Water		
Excess Water - Seeps	0	Not Applicable
Excess Water - Runoff, Flooding, or Ponding	0	Not Applicable
Excess Water - Seasonal High Water Table	2	Water is removed from subsurface water source.
Excess Water - Drifted Snow	0	Not Applicable
Insufficient Water		
Insufficient Water - Inefficient Use of Irrigation Water	2	Well development will provide a dependable supply of water allowing more concentrated management.
Insufficient Water - Inefficient Moisture Management	0	Not Applicable
Water Quality Degradation		
Pesticides in Surface Water	0	Not Applicable
Pesticides in Groundwater	0	Not Applicable
Nutrients in Surface water	0	Not Applicable
Nutrients in Groundwater	0	Not Applicable
Salts in Surface Water	0	Not Applicable
Salts in Groundwater	0	In coastal areas pumping fresh groundwater may allow the intrusion of saltwater.
Excess Pathogens and Chemicals from Manure, Bio-solic	-1	Use of wells to irrigate previously non irrigated land will increase the likelihood of soluble and sediment-attached contaminants moving of-site. Probable less contaminants on grazing lands
Excess Pathogens and Chemicals from Manure, Bio-solic	0	Not Applicable

Excessive Sediment in Surface Water	**0**	**Not Applicable**
Elevated Water Temperature	**0**	**Not Applicable**
Petroleum, Heavy Metals and Other Pollutants Transporte	**0**	**Not Applicable**
Petroleum, Heavy Metals and Other Pollutants Transporte	**0**	**Not Applicable**
Air Quality Impacts		
Emissions of Particulate Matter (PM) and PM Precursors	**0**	**Not Applicable**
Emissions of Ozone Precursors	**0**	**Not Applicable**
Emissions of Greenhouse Gases (GHGs)	**0**	**Not Applicable**
Objectionable Odors	**0**	**Not Applicable**
Degraded Plant Condition		
Undesirable Plant Productivity and Health	**1**	**Increased availability and managed application of irrigation water enhances plant growth, health and vigor.**
Inadequate Structure and Composition	**0**	**Not Applicable**
Excessive Plant Pest Pressure	**0**	**Not Applicable**
Wildfire Hazard, Excessive Biomass Accumulation	**0**	**Not Applicable**
Fish and Wildlife - Inadequate Habitat		
Inadequate Habitat - Food	**0**	**Not Applicable**
Inadequate Habitat - Cover/Shelter	**0**	**Not Applicable**
Inadequate Habitat - Water	**2**	**Provides dependable water supply to livestock and wildlife in areas where surface water is scant.**
Inadequate Habitat - Habitat Continuity (Space)	**0**	**Not Applicable**
Livestock Production Limitation		
Inadequate Feed and Forage	**2**	**Improved distribution of animals makes forage more readily available to livestock.**
Inadequate Shelter	**0**	**Not Applicable**
Inadequate Water	**5**	**Wells facilitate the availability and distribution of water.**
Inefficient Energy Use		
Equipment and Facilities	**0**	**A properly designed well will allow use of an efficient pumping system.**
Farming/Ranching Practices and Field Operations	**0**	**Not Applicable**

CPPE Practice Effects:	***0 No Effect***
5 Substantial Improvement	***-1 Slight Worsening***
4 Moderate to Substantial Improvement	***-2 Slight to Moderate Worsening***
3 Moderate Improvement	***-3 Moderate Worsening***
2 Slight to Moderate Improvement	***-4 Moderate to Substantial Worsening***
1 Slight Improvement	***-5 Substantial Worsening***

NRCS CONSERVATION PRACTICE EFFECTS - NETWORK DIAGRAM

October 2020



APPENDIX D – LIST OF PREPARERS AND LITERATURE CITED

LIST OF PREPARERS

Agency/Firm	Name	Position
Alabama Department of Conservation and Natural Resources	Jaime Miller	Coastal Restoration Specialist
State of Alabama/Rosen Harwood	Jane Calamusa	Attorney
State of Alabama/WSP	Lori Fox	NEPA Specialist
State of Alabama/WSP	Joe Dalrymple	Environmental Planner
State of Alabama/WSP	Madison Reckman	Environmental Scientist
State of Alabama/WSP	Gabriella Benacquisto	Wildlife Biologist
State of Alabama/WSP	Patrick McKitrick	Editor
State of Alabama/Volkert	Michele Finn	Senior Scientist
USDA	Craig Johnson	Program Specialist
USDA	Jon Morton	Biologist
USDA	Ronald Howard	Senior Advisor
USEPA	Chris McArthur	Environmental Engineer
USEPA	Tim Landers	Life Scientist
NOAA	Stella Wilson	Marine Habitat Restoration Specialist
NOAA	Ramona Schreiber	Marine Habitat Restoration Specialist
NOAA	Jared Piaggione	Attorney Advisor
USDOI	Sarah Shattuck	Attorney-Advisor
USDOI	Amy Mathis	Restoration Planner
USDOI	Cody Haynes	Fish and Wildlife Biologist

LITERATURE CITED

Alabama Department of Conservation and Natural Resources (ADCNR)

2015 Alabama Department of Conservation and Natural Resources Administrative Code, Chapter 220-2, Game and Fish Division. Available at: https://casetext.com/regulation/alabama-administrative-code/title-220-alabama-department-of-conservation-and-natural-resources/chapter-220-2-game-and-fish-division. Accessed March 25, 2024.

2024 Alabama Department of Conservation and Natural Resources Administrative Code, Chapter 220-2, Game and Fish Division. Available at: https://casetext.com/regulation/alabama-administrative-code/title-220-alabama-department-of-conservation-and-natural-resources/chapter-220-2-game-and-fish-division. Accessed March 25, 2024.

Alabama Department of Environmental Management (ADEM)

2004 Final TMDL Development for Juniper Creek, AL. Pathogens (fecal coliform). Available at: https://adem.alabama.gov/programs/water/wquality/tmdls/FinalJuniperCreekFecalColiformTMDL.pdf. Accessed April 29, 2024.

2006 Rivers and Streams Monitoring Program. 2006 Monitoring Summary. Puppy Creek at Mobile County Road 21. Available at: https://adem.alabama.gov/programs/water/wqsurvey/table/2006PuppyCreekMobileCoRd21.pdf. Accessed April 29, 2024.

2008 Alabama §303(d) List. Available at: http://adem.alabama.gov/programs/water/wquality/2008AL303dList.pdf. Accessed March 25, 2024.

2009 Total Maximum Daily Load (TMDL) for Fish River. Available at: http://adem.alabama.gov/programs/water/wquality/tmdls/FinalBayouLaBatrePathogensTMDL.pdf. Accessed March 25, 2024.

2010a Alabama §303(d) List. Available at: http://adem.alabama.gov/programs/water/wquality/2010AL303dList.pdf. Accessed March 25, 2024.

2010b Total Maximum Daily Load (TMDL) for Perdido Bay. Available at: http://adem.alabama.gov/programs/water/wquality/tmdls/FinalPerdidoBayPathogensTMDL.pdf. Accessed March 25, 2024.

2012 Alabama §303(d) List. Available at: http://adem.alabama.gov/programs/water/wquality/2012AL303dList.pdf. Accessed March 25, 2024.

2014 Alabama's 2014 §303(d) List. Available at: http://adem.alabama.gov/programs/water/wquality/2014AL303dList.pdf. Accessed March 25, 2024.

2015 Alabama Department of Environmental Management Total Maximum Daily Load Nutrients Report. Available at: https://adem.alabama.gov/programs/water/wquality/tmdls/FinalPuppyCreekNutrientTMDL.pdf. Accessed March 25, 2024.

2016 Alabama's Final 2016 §303(d) List Fact Sheet. Available at: http://adem.alabama.gov/programs/water/wquality/2016AL303dFactSheet.pdf. Accessed March 25, 2024.

2018 Alabama's 2018 §303(d) List. Available at: https://adem.alabama.gov/programs/water/wquality/2018AL303dList.pdf. Accessed March 25, 2024.

2022 Alabama's 2022 §303(d) List. Available at: https://adem.alabama.gov/programs/water/wquality/2022AL303dList.pdf. Accessed March 25, 2024.

2024 Alabama's Draft 2024 §303(d) List. Available at: https://adem.alabama.gov/programs/water/wquality/2024ALDRAFT303dList.pdf. Accessed March 25, 2024.

Alabama Natural Heritage Program (ALNHP)

2011 Alabama Inventory List: the Rare, Threatened and Endangered Plants and Animals of Alabama. Privately printed by the Alabama Natural Heritage Program, 1090 South Donahue Drive, Auburn University, AL.

2022 Alabama Inventory List: the Rare, Threatened and Endangered Plants and Animals of Alabama. Privately printed by the Alabama Natural Heritage Program, 1090 South Donahue Drive, Auburn University, AL. Available at: https://www.auburn.edu/cosam/natural_history_museum/alnhp/data/2022_trackinglist.pdf. Accessed March 27, 2024.

Alabama State Parks

2013 Personal Communication between Kelly Reetz, Naturalist, Gulf State Park, Alabama State Parks, to Carol Zurawski, Environmental Planner, The Louis Berger Group, Inc., on Wildlife and Plant Species. July 26, 2013.

Alabama Trustee Implementation Group

2017 Deepwater Horizon Oil Spill Alabama Trustee Implementation Group Restoration Plan I and Environmental Impact Statement: Provide and Enhance Recreational Opportunities. https://www.gulfspillrestoration.noaa.gov/media/document/dwh-arz000458pdf.

2018 Deepwater Horizon Oil Spill Alabama Trustee Implementation Group Final Restoration Plan II and Environmental Assessment: Restoration of Wetlands, Coastal, and Nearshore Habitats; Habitat Projects on Federally Managed Lands; Nutrient Reduction (Nonpoint Source); Sea Turtles; Marine Mammals; Birds; and Oysters. https://www.gulfspillrestoration.noaa.gov/media/document/dwh-arz001374pdf.

2019 Deepwater Horizon Oil Spill Alabama Trustee Implementation Group Final Restoration Plan III and Environmental Impact Statement: Provide and Enhance Recreational Opportunities and Birds. https://www.gulfspillrestoration.noaa.gov/media/document/dwh-arz003892pdf.

Alabama's Coastal Connection Scenic Byway

2019 Interactive Map. Available at: https://alabamascoastalconnection.com/interactive-map/. Accessed March 25, 2024.

Animalia

2024 Animals of Alabama. Available at: https://animalia.bio/alabama-region. Accessed March 25, 2024.

Birds and Wetlands

2023 Wetlands in Alabama. Available at: https://birdsandwetlands.com/wetlands-in-alabama/. Accessed March 25, 2024.

Bureau of Ocean Energy Management (BOEM)

2012 Outer Continental Shelf Oil and Gas Leasing Program: 2012-2017 Final Programmatic Environmental Impact Statement. OCS EIS/EA BOEM 2012-030. U.S. Department of the Interior, Bureau of Ocean Energy Management. July. Available at: https://www.boem.gov/sites/default/files/documents/oil-gas-energy/2012-2017-Final-PEIS.pdf. Accessed March 25, 2024.

Burgan, B., & Engle, V.

2006 National Estuary Program Coastal Condition Report: US Environmental Protection Agency 842. B-06/001.

Burger, J.S., A. Carlucci, C.W. Jeitner, K. Clark, and L. Niles

2004 The Effects of Human Activities on Migrant Shorebirds: Successful Adaptive Management. *Environmental Conservation* 31(4):283–288. Available at: https://www.nj.gov/dep/fgw/ensp/pdf/literature/effect_human_activites_adaptive-mgt.pdf. Accessed March 25, 2024.

Coen, L.D., R.D. Brumbaugh, D. Bushek, R. Grizzle, M.W. Luckenbach, M.H. Posey, S.P. Powers, and G.S. Tolley.

2007 As We See It: Ecosystem Services Related To Oyster Restoration. Marine Ecology Progress Series 341:303-307.

Conant, R., and J.T. Collins

1991 Reptiles and Amphibians. Eastern/Central North America. Peterson Field Guides. New York: Houghton Mifflin Company. p. 39.

Connecticut Department of Energy and Environmental Protection (DEEP)

2015 Northern Diamondback Terrapin Fact Sheet. Available at: https://portal.ct.gov/-/media/DEEP/wildlife/pdf_files/outreach/fact_sheets/dmbkterppdf.pdf. Accessed March 25, 2024.

Council on Environmental Quality

1997 Considering Cumulative Effects Under the National Environmental Quality Act. Available at: https://www.energy.gov/sites/prod/files/nepapub/nepa_documents/RedDont/G-CEQ-ConsidCumulEffects.pdf. Accessed March 25, 2024.

Cox, D.

2012 Gulf Shores Alabama. Explore Southern History. Available at: http://www.exploresouthernhistory.com/gulfshores.html. Accessed March 25, 2024.

Deepwater Horizon Oil Spill Natural Resource Trustees (DWH Trustees)

2013 Phase II Early Restoration Plan & Environmental Review.

2017 Strategic Framework for Oyster Restoration Activities. Available at: https://www.gulfspillrestoration.noaa.gov/media/document/oysterstrategicframework062317pdf. Accessed April 29, 2024.

2021 Deepwater Horizon Natural Resource Damage Assessment Trustees. Deepwater Horizon Natural Resource Damage Assessment Programmatic Review. Available at: www.gulfspillrestoration.noaa.gov/sites/default/files/2021-11_Deepwater_Horizon_TC_Final_2021_Programmatic_Review.pdf. Accessed March 25, 2024.

DeGraaf, R.M., and M. Yamasaki

1986 "New England wildlife: habitat, natural history, and distribution." Gen. Tech. Rep. NE-108. Broomall, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station.

Dennis, G.D., and T.J. Bright

1988 "New Records of Fishes in the Northwestern Gulf of Mexico, with Notes on Some Rare Species." Northeast Gulf Science 10(1):1-18.

Eastern Oyster Biological Review Team

2007 Status Review of the Eastern Oyster (*Crassostrea virginica*). Report to the National Marine Fisheries Service, Northeast Regional Office. February 16, 2007.

Eleuterius, C.K.

1978 Classification of Mississippi Sound as to Estuary Hydrological Type. Gulf Research Reports 6(2): 185–187. Available at: http://aquila.usm.edu/gcr/vol6/iss2/12. Accessed March 25, 2024.

Federal Emergency Management Agency (FEMA)

2024 FEMA's National Flood Hazard Layer. Flood Insurance Rate Maps. Available at: http://fema.maps.arcgis.com/home/webmap/viewer.html. Accessed March 25, 2024.

Felder, D.L., and D.K. Camp

2009 Gulf of Mexico Origin, Waters, and Biota (J.W. Tunnell, Jr., D.L. Felder, and S.A. Earle, eds.). Harte Research Institute for Gulf of Mexico Studies Series 1, 1393. Texas A&M University Press, College Station.

Fertl, D., A.J. Schiro, G.T. Regan, C.A. Beck, N.M. Adimey, L. Price-May, A. Amos, G.A.J. Worthy and R. Crossland

2005 Manatee Occurrence in the Northern Gulf of Mexico, west of Florida. Gulf and Caribbean Research 17:69-74.

Florida Trustee Implementation Group (Florida TIG)

2019 Final Restoration Plan I and Environmental Assessment: Habitat Projects on Federally Managed Lands; Nutrient Reduction; Water Quality; and Provide and Enhance Recreational Opportunities.

Froede, C.R.

2007 Elevated Waves Erode the Western End of the Recently Completed Sand Berm on Dauphin Island, Alabama (U.S.A.). Journal of Coastal Research 23(6): 1602–1604.

Gesch, D.B.

2013 Consideration of Vertical Uncertainty in Elevation-Based Sea-Level Rise Assessments: Mobile Bay, Alabama Case Study. Journal of Coastal Research Published by Coastal Education and Research Foundation. Available at: http://www.bioone.org/doi/full/10.2112/SI63-016.1. Accessed March 25, 2024.

Gillam, P.D.

2005 How Habitat Setting Influences Restored Oyster Reef Communities. Ecology 86(7):1926-1935. Available at: https://www.researchgate.net/publication/250076832_How_habitat_setting_influences_restored_oyster_reef_communities. Accessed March 25, 2024.

2016 Community Structure and Production of the Macrobenthos on Four Artificial Reefs in the Mississippi Sound in Relation to Substrate and Profile Type. The University of Southern Mississippi. Grabowksi, J.H., A.R. Hughes, D.L. Kimbro, and M.A. Dolan

Grabowski, J.H., and C.H. Peterson

2007 Restoring Oyster Reefs To Recover Ecosystem Services. Ecosystem Engineers: Plants to Protists, K. Cuddington, J.E. Byers, W.G. Wilson, and A. Hastings (eds.). Burlington, MA: Academic Press. Available at: https://www.fws.gov/doiddata/dwh-ar-documents/1187/DWH-AR0005495.pdf. Accessed March 25, 2024.

Greene, D., A.B. Rodriguez, and J.B. Anderson

2007 Seaward-Branching Coastal-Plain and Piedmont Incised-Valley Systems through Multiple Sea-Level Cycles: Late Quaternary Examples from Mobile Bay and Mississippi Sound, U.S.A. Journal of Sedimentary Research 77 (2): 139–158. Available at: https://doi.org/10.2110/jsr.2007.016. Accessed March 25, 2024.

Griffith, G.E., J.M. Omernik, J.A. Comstock, S. Lawrence, G. Martin, A. Goddard, V.J. Hulcher, and T. Foster.

2001 Ecoregions of Alabama and Georgia. (2 sided color poster with map, descriptive text, summary tables, and photographs). U.S. Geological Survey, Reston, VA. Scale 1:1,700,000.

Connecticut Department of Energy and Environmental Protection (DEEP)

2015 Northern Diamondback Terrapin Fact Sheet. Available at: https://portal.ct.gov/-/media/DEEP/wildlife/pdf_files/outreach/fact_sheets/dmbkterppdf.pdf. Accessed March 25, 2024.

Gulf Shores and Orange Beach Tourism

2023 Fishing on Little Lagoon. Available at: https://www.gulfshores.com/blog/things-to-do/fishing/little-lagoon-fishing/https://www.gulfshores.com/blog/2015/03/18/whats-biting-little-lagoon-pass-update. Accessed March 25, 2024.

Gulf States Marine Fisheries Commission (GSMFC)

2012 The Oyster Fishery of the Gulf of Mexico, United States: A Fisheries Management Plan. Prepared by the Oyster Technical Task Force. Available at: https://www.gsmfc.org/publications/GSMFC%20Number%20202.pdf. Accessed April 29, 2024.

Handley, L., K. Spear, S. Jones, and C. Thatcher

n.d. Mobile Bay. United States Geological Survey. Available at: https://pubs.usgs.gov/publication/70041785. Accessed March 6, 2019.

2012 Mississippi Sound: Chapter 1 in Emergent Wetlands Status and Trends in the Northern Gulf of Mexico: 1950—2010. United States Geologic Survey.

Hayes, S.A., E. Josephson, K. Maze-Foley, P.E. Rosel, B. Byrd, S. Chavez-Rosales, T.V.N. Col, L. Engleby, L.P. Garrison, J. Hatch, A. Henry, S.C. Horstman, J. Litz, M.C. Lyssikatos, K.D. Mullin, C. Orphanides, R.M. Pace, D.L. Palka, M. Soldevilla, and F.W. Wenzel

2018 U.S. Atlantic and Gulf of Mexico Marine Mammal Stock Assessments 2017. Available at: https://www.fisheries.noaa.gov/resource/document/us-atlantic-and-gulf-mexico-marine-mammal-stock-assessments-2018. Accessed March 25, 2024.

Jenkins, C.

2011 Dominant Bottom Types And Habitats in the Gulf Of Mexico Data Atlas. Stennis Space Center, MS: National Centers for Environmental Information.

Johnson, E.I.

2016 Louisiana's Coastal Stewardship Program 2015 Annual Report: Beach-nesting Bird Protection, Monitoring, and Community Outreach. National Audubon Society, Baton Rouge, LA.

Jones, S.C. and Tidwell, D.K.

2011 Geologic Investigations Program, Comprehensive Shoreline Mapping, Baldwin and Mobile Counties, Alabama: Phase II. Available at: https://www.mobilebaynep.com/images/uploads/library/Shoreline_Mapping-

Baldwin_amp_Mobile_Counties,_AL-Phase2_JonesampTidwell2011.pdf. Accessed April 23, 2024.

Karl, T.R., J.M. Melillo, and T.C. Peterson (eds.)

2009 Global Climate Change Impacts in the United States. United States Global Change Research Program. Cambridge University Press.

Kidd, R.E.

1988 Hydrogeology and Water-Supply Potential of the Water-Table Aquifer on Dauphin Island, Alabama. United States Geological Survey Water-Resources Investigation Report, Tuscaloosa, AL. 56 pp.

Kirschenfeld, T., R.K. Turpin, and L.R. Handley

2006 Perdido Bay. United States Geological Survey. Available at: https://pubs.usgs.gov/sir/2006/5287/pdf/PerdidoBay.pdf. Accessed March 25, 2024.

Kotliar, N.B., and J. Burger

1984 The Use of Decoys to Attract Least Terns (*Sterna Antillarum*) to Abandoned Colony Sites in New Jersey. *Colonial Waterbirds* 7:134–138.

Lavoie, R.A., T.D. Jardine, M.M. Chumchal, K.A. Kidd, and L.M. Campbell

2013 Biomagnification of Mercury in Aquatic Food Webs: A Worldwide Meta-Analysis." Environ. Sci. Technol. 47(23):13385-13394. doi:dx.doi.org/10.1021/es403103t.

Little Lagoon Preservation Society

2011 Little Lagoon Fun Facts. Available at: https://littlelagoon.org/page-1075245. Accessed March 25, 2024.

LittleLagoon.net

2009 Information on Public Accesses to Little Lagoon. Available at: http://info.littlelagoon.net/. Accessed March 25, 2024.

Livingston, R.J.

1998 Fishes of the Gulf of Mexico. University of Texas Press.

2007 Phytoplankton Bloom Effects on a Gulf Estuary: Water Quality Changes and Biological Response. https://esajournals.onlinelibrary.wiley.com/doi/full/10.1890/05-0769.1 Accessed April 23, 2024.McEachran, J., and J.D. Fechhelm

Mobile Bay Audubon Society

2011 Checklist of the Birds of the Gulf Coast Region of Alabama. Available at: https://www.alapark.com/sites/default/files/2019-03/AL%20Gulf%20Coast%20Bird%20Checklist.pdf. Accessed April 29, 2024.

Mobile Bay National Estuary Program (MBNEP)

2012 Mobile Bay Modeling Report. Accessed April 23, 2024. Available at: https://www.mobilebaynep.com/assets/landing/Final_Bon_Secour_WMP_January_2017.pdf. Accessed March 25, 2024. 2012 Mobile Bay Modeling Report. Available at: https://www.mobilebaynep.com/images/uploads/library/Mobile_Bay_Modeling_Report_(2012).pdf. Accessed April 23, 2024.

2017 Bon Secour River, Oyster Bay, Skunk Bayou Watershed Management Plan. Available at: https://www.mobilebaynep.com/assets/landing/Final_Bon_Secour_WMP_January_2017.pdf. Accessed March 25, 2024.

2024 The Landscape. Available at: https://www.mobilebaynep.com/watersheds/bayou-la-batre-watershed/the-landscape. Accessed April 29, 2024.

Modlin, M., and M. Dardeau

1987 Seasonal and Spatial Distribution of Cumaceans in the Mobile Bay Estuarine System, Alabama. Journal of Estuaries. Published by the Estuarine Research Federation 10(4): 291–297. Morton, R.A.

2008 Historical Changes in the Mississippi-Alabama Barrier-Island Chain and the Roles of Extreme Storms, Sea Level, and Human Activities. *Journal of Coastal Research* 24(6):1587–1600.

Moffatt & Nichol

2023 Lower Perdido Islands Restoration Project: Essential Fish Habitat Assessment. Pp.48

National Oceanic and Atmospheric Administration (NOAA)

2012 Habitat website: Barrier Islands. Accessed September 27, 2012. Available at: https://oceanservice.noaa.gov/facts/barrier-islands.html. Accessed March 25, 2024.

2013 Essential Fish Habitat. Available at: www.habitat.noaa.gov/protection/efh/index.html. Accessed March 25, 2024.

2014 Habitat Conservation. Available at: https://media.fisheries.noaa.gov/dam-migration/i6-efh-websites.pdf. Accessed June 5, 2024.

2016 Deepwater Horizon Natural Resource Damage Assessment Trustees. Deepwater Horizon Oil Spill: Final Programmatic Damage Assessment and Restoration Plan and Final Programmatic Environmental Impact Statement. Available at: http://www.gulfspillrestoration.noaa.gov/restoration-planning/gulf-plan. Accessed March 25, 2024.

2020 Deepwater Horizon 10 Years Later: 10 Questions. Available at: https://www.fisheries.noaa.gov/news/deepwater-horizon-10-years-later-10-questions. Accessed March 25, 2024.

Northwest Florida Water Management District

2017 Perdido River and Bay Surface Water Improvement and Management (SWIM) Plan. Program Development Series 17-07. Available at: https://docslib.org/doc/5694327/perdido-river-and-bay-swim-plan-northwest-florida-water-management-district. Accessed on April 29, 2024.

Niedoroda, A.

2010 Perdido Bay Physical Oceanography.

Perry, H.M., and T.D. McIlwain

1986 Species Profiles: Life Histories and Environmental Requirements of Coastal Fishes and Invertebrates (Gulf of Mexico) – Blue Crab. U.S. Fish and Wildlife Service, U.S. Department of the Interior, U.S. Army Corps of Engineers. Biological Report 82(11.55).

Peterson, C.H., J.H. Grabowski, and S.P. Powers.

2003 Estimated enhancement of fish production resulting from restoring Oyster Reef Habitat: Quantitative Valuation. Marine Ecology Progress Series 264:249-264.

Rathbun, G.B., R.K. Bonde, and D. Clay

1982 The Status of the West Indian Manatee on the Atlantic Coast North of Florida. Pages 152-164 in R.R. Odum and J.W. Guthrie, editors. Proceedings: Symposium on Non-game and Endangered Wildlife. Technical Bulletin WL5. Georgia Department of Natural Resources, Game and Fish Division, Social Circle, GA.

Regionwide Trustee Implementation Group

2021 Final Restoration Plan/Environmental Assessment 1: Birds, Marine Mammals, Oysters, and Sea Turtles.

Rosenberg, K. V., J. A. Kennedy, R. Dettmers, R. P. Ford, D. Reynolds, J. D. Alexander, C. J. Beardmore, P. J. Blancher, R. E. Bogart, G. S. Butcher, A. F. Camfield, et al.

2016 Partners in Flight Landbird Conservation Plan: 2016 Revision for Canada and Continental United States. Partners in Flight Science Committee. Available at: www.partnersinflight.org/plans/landbird-conservation-plan/. Accessed April 29, 2024.

Schwartz, M.L.

1971 The Multiple Causality of Barrier Islands. The Journal of Geology, Vol. 79, No. 1 (Jan. 1971), pp. 91-94. Chicago, IL.

1995 Florida Manatees, Trichechus manatus (Sirenia: *Trichechidae*), in North Carolina 1919-1994. Brimleyana 22:53-60.

Texas Parks and Wildlife Department (TPWD)

2013 Blue Crab (*Callinectes sapidus*). Available at: www.tpwd.state.tx.us/huntwild/wild/species/bluecrab/. Accessed March 25, 2024.

The Nature Conservancy (TNC)

2024 Private and Public Partners are Working Together to Keep the Perdido Islands the Important and Special Place They Are for People and Nature. Available at: https://www.nature.org/en-us/get-involved/how-to-help/places-we-protect/lower-perdido-islands/. Accessed April 29, 2024.

United States Army Corps of Engineers (USACE)

2024 U.S. Amry Corps of Engineers (2024). Department of the Army Permit (Permit No. SAM-2022-00826-JCC).

United States of America v. BP Exploration & Production, Inc., et al. (U.S. v. BP et al.)

2015 Findings of Fact and Conclusions of Law: Phase Two trial. In re: Oil spill by the Oil Rig "Deepwater Horizon" in the Gulf of Mexico, on April 20, 2010, No. MDL 2179, 2015 WL 225421 (LA. E.D. Jan. 15, 2015). (Doc. 14021). U.S. District Court for the Eastern District of Louisiana. Available at: https://www.epa.gov/sites/default/files/2015-01/documents/phase2ruling.pdf. Accessed March 25, 2024.

United States Department of Agriculture (USDA)

2014 Environmental Assessment for USFWS Mammal Damage Management in Alabama. United States Department of Agriculture (USDA) Animal and Plant Health Inspection Service (APHIS) Wildlife Services (WS) in Cooperation with Tennessee Valley Authority (TVA). Available at: https://www.aphis.usda.gov/regulations/pdfs/nepa/AL/2014-AL-Mammal-EA.pdf. Accessed March 25, 2024.

2017 Web Soil Survey. Soil Survey Staff. Available at: https://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx. Accessed March 25, 2024.

United States Department of Agriculture, Natural Resources Conversation Service (USDA-NRCS)

n.d. Cultural Resources. Available at: https://www.nrcs.usda.gov/cultural-resources. Accessed March 25, 2024.

2014 Soil Series: Leon Soil. https://soilseries.sc.egov.usda.gov/OSD_Docs/L/LEON.html. Accessed March 25, 2024.

2021 Custom Soil Resource Report for Baldwin County, Alabama. Updated 2021 Report. Available at: https://www.mobilebaynep.com/assets/pdf/BaldwinCountySoilReport2014.pdf. Accessed March 25, 2024.

United States Department of Justice (USDOJ)

2016 Consent Decree Among Defendant BP Exploration & Production Inc. (BPXP), The United States of America, and the States of Alabama, Florida, Louisiana, Mississippi, and Texas. Available at: https://la-dwh.com/wp-content/uploads/2017/12/Proposed_ConsentDecree_Appendices.pdf. Accessed March 25, 2024.

United States Fish and Wildlife Service (USFWS)

2001 Florida Manatee Recovery Plan. (*Trichechus manatus latirostris*). Third Revision. U.S. Fish and Wildlife Service, Southeast Region. Atlanta, GA.

2004a Bon Secour National Wildlife Refuge Bird List.

2004b Environmental Assessment for Proposed Reconstruction of the Gulf State Park Hotel, Convention Center, and Pavilion. Gulf Shores, Alabama. December 2004.

2016 National Wetlands Inventory-V2: Surface waters and wetlands. Available at: https://www.fws.gov/wetlands/Data/Mapper.html. Accessed March 25, 2024.

2024a National Wetlands Inventory. Surface Waters and Wetlands Online Mapping Tool. https://fwsprimary.wim.usgs.gov/wetlands/apps/wetlands-mapper/. Accessed March 25, 2024.

2024b Information for Planning and Consulting (IPaC). Endangered and Listed Species. Available at: https://ipac.ecosphere.fws.gov/. Accessed March 25, 2024.

2024c Bon Secour National Wildlife Area, Alabama. Available at: https://www.fws.gov/refuge/bon-secour. Accessed March 1, 2024.

United States Geological Survey (USGS)

1994 Stratigraphy of the Mississippi-Alabama Shelf and the Mobile River Incised-Valley System. Available at: https://www.usgs.gov/publications/stratigraphy-mississippi-alabama-shelf-and-mobile-river-incised-valley-system. Accessed April 23, 2024.

2011 Land Cover Data for Conterminous United States. Available at: https://gapanalysis.usgs.gov/gaplandcover/data/download/. Accessed March 25, 2024.

2016 Alabama Barrier Island Restoration Assessment at Dauphin Island. Available at: https://www.usgs.gov/centers/wetland-and-aquatic-research-center-warc/science/alabama-barrier-island-restoration?qt-science_center_objects=1#qt-science_center_objects. Accessed March 25, 2024.

APPENDIX E – LIST OF ACRONYMS AND ABBREVIATIONS

ADA	Americans with Disabilities Act
ADCNR	Alabama Department of Conservation and Natural Resources
ADEM	Alabama Department of Environmental Management
AHC	Alabama Historical Commission
AL TIG	Alabama Trustee Implementation Group
BFE	Base Flood Elevation
BMP	best management practice
BP	BP Exploration and Production, Inc.
BSNWR	Bon Secour National Wildlife Refuge
CBMPP	Construction Best Management Practices Plan
CFR	Code of Federal Regulations
CO_2	carbon dioxide
Draft RP IV/EA	Alabama Trustee Implementation Group Draft Restoration Plan IV and Environmental Assessment: Nutrient Reduction; Wetlands Coastal Nearshore Habitat; Provide and Enhance Recreational Opportunities; Birds; and Oysters
DWH	Deepwater Horizon
DWH Trustees	DWH Oil Spill Natural Resource Damage Assessment Trustees
EA	Environmental Assessment
E&D	Engineering and Design
EFH	Essential Fish Habitat
ESA	Endangered Species Act
FEMA	Federal Emergency Management Agency
FMP	fishery management plan
FRA	Fiscal Responsibility Act
MAM	Monitoring and Adaptive Management
MBTA	Migratory Bird Treaty Act
MMPA	Marine Mammal Protection Act
NAVD88	North American Vertical Datum of 1988
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System

NPS	non-point source
NRCS	Natural Resources Conservation Service
NRDA	natural resource damage assessment
NRHP	National Register of Historic Places
NWI	National Wetland Inventory
OPA	Oil Pollution Act
PDARP/PEIS	Programmatic Damage Assessment and Restoration Plan/Programmatic Environmental Impact Statement
QCI	Qualified Credentialed Inspector
RESTORE Act	Resources and Ecosystems Sustainability, Tourist Opportunities, and Revived Economies of the Gulf Coast States Act
RP I/EIS	Restoration Plan I/Environmental Impact Statement
RP II/EA	Restoration Plan II/Environmental Assessment
RP III/EA	Restoration Plan III/Environmental Assessment
RWTIG	Regionwide Trustee Implementation Group
SAV	submerged aquatic vegetation
SOP	Standard Operating Procedure
TIG	Trustee Implementation Group
TMDL	total maximum daily load
TNC	The Nature Conservancy
USACE	United States Army Corps of Engineers
U.S.C.	United States Code
USDA	United States Department of Agriculture
USDOI	United States Department of the Interior
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
WCNH	Wetlands, Coastal, and Nearshore Habitats