Mississippi Valley Division,
Regional Planning and Environment Division South

Yazoo Backwater Area Water Management Project

APPENDIX J - Compensatory Mitigation Plan

June 2024

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SECTION 1

Overview

This document presents the compensatory mitigation plan for unavoidable habitat impacts associated with the Yazoo Backwater Area Water Management Project (Project). This plan addresses only compensatory mitigation work and not the sequence of other activities performed during project planning to avoid, minimize, rectify, or reduce habitat impacts from the subject Project (see Engineer Regulation (ER) 1105-2-100, Section C-1(e)(8). The planning work performed to document those sequencing actions is complete and led the team to the need to develop a compensatory habitat mitigation plan for unavoidable impacts to wetlands and fish and wildlife resources. This document details the work performed, including coordination and plan formulation to develop a compensatory habitat mitigation plan for the current Water Management Plan under the Yazoo Backwater Area Water Management Project to account for the highest potential impact to the environment. Mitigation requirements for already constructed portions from the overarching Yazoo Basin, Yazoo Backwater, Mississippi, project are separate and not integrated into the impacts or recommendations described in this mitigation plan.

A draft mitigation plan for the Yazoo Backwater Area Water Management Project (YSA) is being presented in the May 2024 DEIS for consideration and feedback. The mitigation plan will be further refined based on the input received during the review of the DEIS and additional analysis to inform the mitigation plan included with the Final EIS prior to signing the ROD record of decision (ROD). The mitigation plan will continue to be refined during preconstruction engineering and design (PED). Work for the Project will not be commenced in waters of the United States (WOTUS) until the compensatory mitigation plan has been approved through the process outlined in the Memorandum of Agreement by USACE, EPA, and USFWS and the compensatory mitigation sites and or credits have been secured.

SECTION 2

Requirements

The authority and requirements for compensatory mitigation are founded in Federal laws and regulations. The legal foundation for mitigation for ecological resources includes the Clean Water Act, Fish and Wildlife Coordination Act (FWCA), Migratory Bird Treaty Act of 1918, Estuary Protection Act of 1968, Endangered Species Act (ESA), Coastal Zone Management Act of 1972, Magnuson – Stevens Fishery Conservation and Management Act, National Environmental Policy Act (NEPA), various Water Resources Development Acts, and other environmental laws. These laws are implemented and administered through rules, guidance, regulations, and policies issued by Executive Branch agencies. The relevant laws and regulations specific to compensatory mitigation planning for U.S. Army Corps of Engineers (USACE) civil works projects are listed in the References section of this document. The specific procedures followed to develop this compensatory habitat mitigation plan are found in ER 1105-2-100, Appendix C. After reviewing input received on the DEIS, the mitigation plan will be finalized to address all of the required components of a complete mitigation plan as outlined in 33 CFR 332.4(c).

Compensatory mitigation is the “restoration (re-establishment or rehabilitation), establishment, enhancement, and/or in certain circumstances preservation of aquatic resources for the purposes of offsetting unavoidable adverse impacts which remain after all appropriate and practicable avoidance and minimization has been achieved” (see 40 CFR 230.92). It is the policy of the USACE civil works program, and in accordance with Section 906 of WRDA 1986, as amended, to demonstrate that impacts to all significant ecological resources, both terrestrial and aquatic, have been avoided and minimized to the extent practicable, and that any remaining unavoidable impacts have been compensated to the extent possible as discussed in ER 1105-2-100, paragraph C-3(d)(3)(1). Section 906(d) of WRDA 1986, as amended, requires that all reports submitted to Congress for authorization of a water resources development project will include a specific plan to mitigate for non-negligible damages to ecological resources, including terrestrial and aquatic resources and fish and wildlife losses due to the project. Section 906(d) of WRDA 1986, as amended, requires functional assessments to be performed to define ecological impacts and to set mitigation requirements for impacted habitats. USACE policy in ER 1105-2-100, paragraph C-3(e), requires the use of a habitat-based methodology, supplemented with other appropriate information, to describe and evaluate the impacts of the alternative plans, and to identify the mitigation needs.

Once a mitigation need has been identified, mitigation objectives must be developed to address the identified losses. Mitigation objectives are specific actions to be taken to avoid and minimize adverse effects and to identify specific amounts of environmental offsets required to compensate for remaining unavoidable losses.

SECTION 3

Coordination and Collaboration

Development of this plan involved extensive coordination, collaboration and input from the project's non-federal sponsor, state, and federal natural resource agencies, and from landowners, and the public. Public input was obtained during public scoping meetings and is further being sought during review of the DEIS. The DEIS main report contains additional details of the project's public involvement efforts (see Section 8 of the DEIS).

An interagency planning team contributed expertise and information to support the identification of impacts and the development of compensatory mitigation plan alternatives. The discussions helped characterize local site conditions and gauge opportunities for potential mitigation work in these areas. The views of resource agencies, including the U.S. Fish and Wildlife Service and the U.S. Environmental Protection Agency were considered in the development of the draft mitigation plan. These organizations will be offered an opportunity to continue to play a role in the design and implementation phases of the mitigation work.

The cooperating and participating agencies are listed below. An early interagency coordination meeting was held to comply with the provisions of the Water Resources Reform and Development Act of 2014 Section 1001 on 14 September 2023. The meeting afforded agencies an opportunity to learn about the project and to provide initial input into the planning. These agencies will also be invited to the USACE's annual consultation meeting for mitigation project coordination and reporting.

- *Federal Emergency Management Agency*
- *Mississippi Department of Environmental Quality*
- *Mississippi Department of Transportation*
- *Mississippi Department of Wildlife, Fisheries, and Parks*
- *Natural Resource Conservation Service*
- *U.S Department of Agriculture*
- *U.S. Environmental Protection Agency*
- *U.S. Fish and Wildlife Service*
- *U.S. Forest Service*

The United States Department of the Army (Army), the United States Environmental Protection Agency (EPA), and the United States Fish and Wildlife Service (USFWS) are committed to a collaborative and expeditious path forward to establish a flood risk reduction solution in the Yazoo Backwater Area; in light of the regionally and nationally important significant natural resources and species involved and the complexity of required compensatory mitigation a Memorandum of Agreement is being developed to establish procedures regarding efficient and effective coordination in the development, review, approval, and oversight of compensatory mitigation component for the Yazoo Backwater Area Water Management Project (Project). A Compensatory Mitigation Management Team (CMMT) is being proposed which will be jointly led by the USACE, EPA and USFWS to help ensure that the Project's unavoidable impacts are effectively offset.

Ecological Resources

The purpose of this section is to document Project area's ecological resources and their significance from a watershed perspective. Information established in this inventory forms the baseline for assessing Project impacts and compensatory mitigation needs. The details presented in this section meet the procedures outlined in ER 1105-2-100, Appendix C, Section C-4(g)(1). See Section 4 of the DEIS and the Wetland Appendix for a more thorough discussion of the environmental settings and baseline conditions.

The Yazoo Basin (YB) lies within the Mississippi River Alluvial plain. The YB covers 13,400 square miles, extending from Memphis, Tennessee, to Vicksburg, Mississippi. The Mississippi River Alluvial plain is protected by the Mississippi River Mainline Levees, which are designed to protect from extreme flood events by confining flow to the leveed floodway, except where it enters the natural backwater areas or is diverted intentionally into floodway areas. The Yazoo River tributary area is commonly known as the Yazoo Backwater Area (YBA), or the Yazoo Study Area (YSA). The YSA is located in west-central Mississippi between the Mississippi River east bank levee and the Will Whittington Channel on the east. See Figure 1. Big Sunflower and Little Sunflower Rivers, Deer Creek, and Steele Bayou flow through the project area. Interior drainage of the area is provided by structures at Little Sunflower River (upper ponding area) and Steele Bayou (lower ponding area).

The YSA is approximately 926,000 acres in the lower portion of the Mississippi River alluvial plain and includes all or portions of Humphreys, Issaquena, Sharkey, Warren, Washington, and Yazoo counties, Mississippi, and a small part of Madison Parish, Louisiana. The topography is characterized by relatively flat, poorly drained land with slopes of 0.3 to 0.9 feet per mile. Elevations range from 120.0 to 75.0 feet, NGVD, from north to south. From a habitat standpoint the area is comprised of forested lands and open fields.

Wetlands are a plentiful and vital resource in the YSA, consisting of wooded ecosystems adapted to soil saturation and flood inundation. In areas unaltered by current agricultural production, the flora is dominated by deciduous hardwood trees such as oak (*Quercus spp*.), elm (*Ulmus spp*.), green ash (*Fraxinus pennslyvanica*), cottonwood (*Populus deltoides*), and sugarberry (*Celtis laevigata*). Anthropogenic land use changes, such as logging, conversion of wooded areas to agriculture, flood control projects, and reforestation, have altered species composition and resulted in a variety of successional forest stands.

The YB lands are regionally, nationally, and hemispherically important because they provide habitat for a diverse range of species (Nichols et al. 1983; Reinecke et al. 1989). Both game and nongame species rely on the area's bottomland hardwood forests (bottomland hardwood riverine wetlands) to survive and reproduce, including resident and migratory songbirds, waterfowl, White-tailed Deer (*Odocoileus virginianus*), Raccoon (*Procyon lotor*), woodpeckers, owls, rabbits, mice, Wild Turkey (*Meleagris gallopavo*), squirrel, turtles, alligators, fish, and other species (Glasgow and Noble 1971, Klimas et al. 1981).

The YB is part of the Mississippi Flyway, a bird migration route following the Mississippi, Missouri, and Lower Ohio from the south into Canada. Approximately 40 percent of the Mississippi Flyway's waterfowl and 60 percent of all U.S. bird species either migrate through or winter in the MAV (LMVJV 2015). Furthermore, the bottomland hardwoods fulfill special waterfowl habitat requirements not provided by open lands including production of nutritious foods for waterfowl, secure roosting areas, cover during inclement weather, loafing sites, protection from predators, and isolation for pair formation. Thus, this area serves as critical habitat for a number of species including Mallard (*Anas platyrhynchos*), Gadwall (*Mareca strepera*), Green-winged Teal (*Anas crecca),* Bluewinged Teal (*Spatula discors*), Northern Shoveler (*Spatula clypeata*), and Wood Duck (*Aix sponsa*).

Size of the migratory waterfowl population are a function of three habitat requirements: availability, utilization, and suitability in meeting social behavioral requirements. Within the 926,000-acre ,YSA, abundant water sources provide habitat for aquatic organisms and fish. Aquatic resources in the YSA include rivers, oxbow lakes, scatters, brakes, sloughs, and tributary mouths as well as wetlands associated with bottomland hardwood forests which support approximately 32 species of fish in addition to federally listed mussel species (e.g., Fat Pocketbook).

The utility of these lands to wildlife is largely dependent on hydrology. Prior to European descendant settlement, connections between the floodplain and the Mississippi River were frequent due to an unmodified hydrologic regime (Biedenharn et al. 2000). Adaptation of the subsidy-stress model in bottomland hardwoods suggest the highest rates of production and benefit occur with periodic floods of short duration, while longer duration floods in which water becomes stagnant cause stress and result in lower production (Odum et al. 1979).

Wetland hydrology within the study areas is of particular interest in the current analysis as the presented Water Management Plan has the capacity to alter the extent and timing of flood inundation in the study area. Historically, prolonged and extensive inundation occurred in the Yazoo Basin following precipitation during the winter wet season (Smith and Klimas 2002). Localized flooding occurred as precipitation and runoff from the surrounding landscape (mostly the hills on the eastern edge of the basin) discharged into the tributary network of the Yazoo River, which provides the only natural drainage feature to the Mississippi River at the southern end of the basin. Additionally, large flood events associated with the Mississippi River and tributary system inundated most of the Yazoo Basin in some years (Moore 1972). While the implementation of flood risk reduction measures has decreased flood frequency and duration in portions of the Yazoo Basin (Smith and Klimas 2002), development of the Mississippi River levee system in conjunction with incomplete flood risk reduction projects in the southern portion of the Yazoo Basin has increased wetland hydrology duration in some wetlands during some years. As a result of these landscape scale manipulations, the wetland hydropatterns observed in the study area do not reflect historic conditions or natural patterns of wetland hydrology observed in other systems subject to unimpeded overbank and backwater flood events.

Many forested wetlands associated with the Mississippi River and its tributaries, including those within the study area, experience a combination of local precipitation and backwater flooding as

major hydrologic influences (Smith and Klimas 2002). Backwater flooding describes inundation resulting from impeded drainage, usually due to high flood stages in downstream waterways that inhibits drainage within adjacent tributaries. Impeded drainage leads to increasing water tables and surface inundation on the landscape.

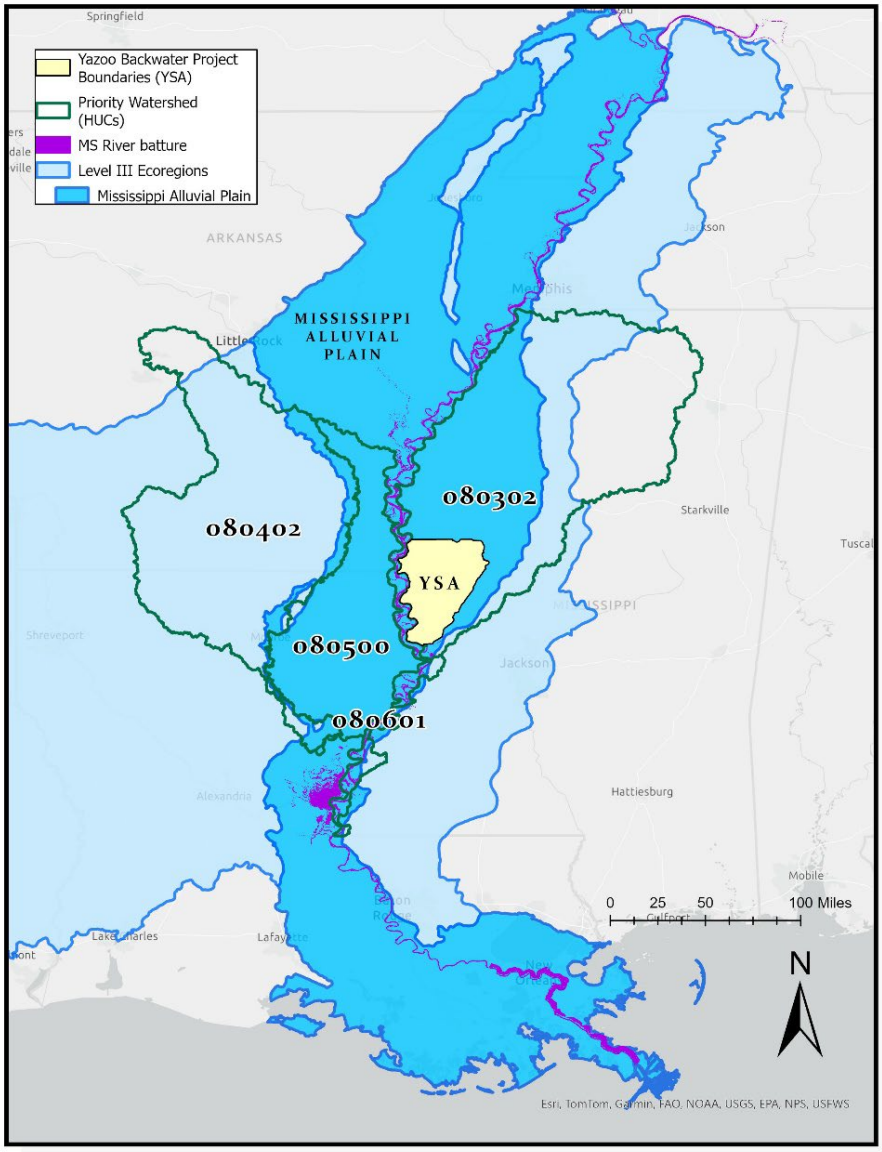

Figure 1: The YSA is situated in the Lower Mississippi Region (HUC 08), within the southern portion of the Yazoo subregion (HUC 0803).

Over the past century, land use change has altered the spatial distribution and extent of aquatic habitat within the Yazoo Basin creating the current mosaic of agricultural and forested areas adjacent to aquatic resources. Today, a lack of riparian buffers and associated accretion of

sediment, and reduced flows which impede fish passage create an array of challenges for aquatic organisms in this habitat. (LMRRA, 2015)

The lack of riparian buffers on streams, rivers, and ditches in the YSA enable erosion increasing turbidity, reduce shading thereby magnifying the amplitude of the thermal regime, and reduce habitat complexity available for various fish reproduction strategies.

Finally, due to increased water withdrawals and diversions associated with increased agricultural production in the YSA over the last century, low to no flow conditions are observed typically in the fall. Low flow conditions can desiccate mussel beds, prevent periodic fish passage flows over weirs for spawning movements and recolonization, and reduce hydraulic connectivity between the flowing waters and low-elevation backwaters or tributary mouths (see Aquatic Resources Appendix).

Table 1 shows the habitat resources in the project area and described the potential impact to the resource from the Project. These resources are recognized as significant across institutional, public, and technical perspectives. (Mississippi Watershed Management Organization's Watershed Management Plan, 2011-2021; Natural Communities of Louisiana: Freshwater Marsh, 2014; Smith, R.D. and C.V. Klimas, 2002; Smith, R.D., C.V. Noble, and J.F. Berkowitz, 2013). The DEIS discusses these three significance factors in detail. Table 1 summarizes the resource significance from a qualitative perspective based upon the interagency planning team's assessment. Table 2 summarizes the types of land coverage and respective acreage at 90- and 93-foot elevations.

Table 1: Ecological Resources

Habitat	Type of Impact from presented project
Wetland	Altered hydrology and direct impacts to the footprint
Waterfowl	Altered hydrology
Wildlife	Altered hydrology
Aquatic resources	Altered hydrology
Shorebirds	Altered Habitat

Table 2: Land Cover Acres at 90- and 93-foot elevations

Land Cover	90 acres	93 acres
Cleared	11,816	39,491
Forestry	3,042	5,476
Developed	681	967
Woody Wetlands	110,058	167,822
Grasslands	348	511
Wetlands	989	1,153
Water	4,320	4,480
Other	17,299	24,187
Total	**148,553**	**244,088**

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SECTION 4

Significant Net Losses

Based upon the types of habitats in the project area the interagency planning team determined that a suite of models would be needed to assess the project's impacts on fish and wildlife habitat and other ecological resources (USACE 1105-2-412, 2011 and USACE 1105-2-100, 2019). Table 3 identifies the models and their associated habitats. The models are certified for use by the USACE Ecosystem Restoration National Planning Center of Expertise. The tools are also suitable for assessing mitigation potential at alternative mitigation sites in the watershed.

Table 3 additionally displays the model output results for each of the impacted habitat types. The estimated acreage needed for each habitat type is also presented in Table 3; the actual mitigation requirements will depend on the characteristics of the sites that are selected in the final mitigation plan. Additional details on the use of the model and the results of the analysis are presented in the DEIS, Appendix F.

Table 3: Unavoidable Fish and Wildlife Habitat Impacts

Habitat Type	Model Name	Impact Quantity (habitat units)*	Estimated Mitigation Required (acres) * based on highest potential mitigation need*
Wetlands	Regional Guidebook for Applying the Hydrogeomorphic Approach to Assessing Wetland Functions of Selected Regional Wetland Subclasses, Yazoo Basin, Lower Mississippi River Alluvial Valley	36,570 Average Annual Functional Capacity Units (AAFCU)	7,650 Acres
Waterfowl	Manual for Calculating Duck-Use Days in the Mississippi Alluvial Valley	202,798 Annual Duck Use Days (Duck-use-days (Annual DUD))	143 Acres
Aquatic Resources and Fisheries	EnviroFish 1.0 for the Yazoo Backwater Project	3,969 Average Daily Flooded Area (ADFA)	3,201 Acres
Terrestrial Wildlife - Migratory Birds	Habitat Sustainability Index (HSI)	694 Average annual habitat units (AAHU)	1,506 acres
Terrestrial Wildlife - Great Blue Heron	Habitat Sustainability Index (HSI)	714 AAHU	739 acres
Terrestrial Wildlife - Shorebirds	Shorebird Migration Model (Clark and Jordan 2017)	352 AAHU	403 acres

**Impacts to multiple resources will be mitigated within a single footprint where possible. For example mitigation for wetlands would also provide mitigation for waterfowl, aquatic resources, and terrestrial wildlife.*

Table 4 presents additional information characterizing the significance of the resources from a national, regional, and state perspective. The interagency assessment of project impacts determined that the habitat resources in the project area are significant. This determination is based upon the factors of significance and the magnitude of unavoidable project impacts.

Table 4: Ecological Resource Significance

Resource	Institutionally Important	Technically Important	Publicly Important
Bottomland Hardwood Forest	Section 906 of the Water resources Development Act of 1986 and the Fish and Wildlife Coordination Act of 1958, as amended.	Provides necessary habitat for a variety of plant, fish, and wildlife species; it often provides a variety of wetland functions and values; it is an important source of lumber and other commercial forest products; and it provides various consumptive and non- consumptive recreational opportunities.	The high priority that the public places on its esthetic, recreational, and commercial value.
Aquatic Resources/ Fisheries	Fish and Wildlife Coordination Act of 1958, as amended; Clean Water Act of 1977, as amended; Coastal Zone Management Act of 1972, as amended; and the Estuary Protection Act of 1968.	They are a critical element of many valuable freshwater and marine habitats; they are an indicator of the health of the various freshwater and marine habitats; and many species are important commercial resources.	The high priority that the public places on their esthetic, recreational, and commercial value.
Wildlife/Waterfowl	Fish and Wildlife Coordination Act of 1958, as amended and the Migratory Bird Treaty Act of 1918	They are a critical element of many valuable aquatic and terrestrial habitats; they are an indicator of the health of various aquatic and terrestrial habitats; and many species are important commercial resources.	The high priority that the public places on their esthetic, recreational, and commercial value.

SECTION 5

Mitigation Planning Objectives

The project includes mitigation sequencing actions employed during the development and refinement of details for each alternative plan. These sequencing actions include steps to avoid, minimize, rectify, and reduce/eliminate habitat impacts for each alternative. These actions are part of the overall mitigation plan for the project. The need for compensatory mitigation is driven by the remaining unavoidable impacts to significant ecological resources. The ecological model results define project impacts in habitat units or other quality indicators. Mitigation planning objectives reflect the specific unavoidable significant losses to be addressed. The objectives are later used in formulation to help identify potential mitigation measures and to establish performance standards. Defining the mitigation planning objectives is a specific procedure identified in ER 1105-2-100, Appendix C, Section C-4(g)(3).

The goal of this mitigation plan is to fully compensate for the unavoidable impacts to significant ecological resources that would occur with project implementation. The objectives of the mitigation plan are defined by the results of the habitat impact assessment model using quantified units. The same habitat assessment model is used to estimate potential project impacts and potential outputs of mitigation measures. The objectives of this mitigation plan are:

- Compensate for the loss of 36,570 AAFCU wetland habitat in the Yazoo Basin or the Lower Mississippi Valley Alluvial Plain.
- Compensate for the loss of 202,798 Annual DUD of waterfowl habitat in the Yazoo Basin or the Lower Mississippi Valley Alluvial Plain.
- Compensate for the loss of 714 average annual habitat units of Great Blue Heron wildlife habitat based in the Yazoo Basin or the Lower Mississippi Valley Alluvial Plain.
    - *Note: Great Blue Heron impacts had the highest impacts for the terrestrial resources and were used to determine the terrestrial wildlife mitigation objective.*
- Compensate for the loss of 3,987 ADFA of aquatic resources and fisheries habitat in the Yazoo Basin or the Lower Mississippi Valley Alluvial Plain.
- Compensate for the loss of 37 average annual habitat unites of shorebird habitat in the Yazoo Basin or the Lower Mississippi Valley Alluvial Plain.

Other factors may influence planning objectives and the development of strategies, measures, and alternative plans. These may even play a role in mitigation plan selection depending on specific project circumstances and opportunities. Some of these factors are based on legal requirements and policies and others are derived from scientific or technical standards. For example, acquisition of lands or interests in lands for mitigation must be acquired before construction of the project commences or concurrently with acquisition of lands and interests in lands for other project purposes; and the physical construction of the mitigation work is required to be carried out before or concurrently with project construction (see Section 906(a) of WRDA 1986, as amended). This introduces an implementation time factor to consider later in plan evaluation and selection. Another example, from a scientific perspective, larger contiguous land tracts may offer better habitat value for fish and wildlife compared to dispersed smaller areas. This may influence site selection and land considerations for a mitigation project.

SECTION 6

Land Considerations

A watershed approach to compensatory mitigation seeks to support the sustainability or improvement of aquatic resources in the watershed. It involved consideration of watershed needs and how locations and types of mitigation projects address those needs. Under a watershed approach, consideration is given to the landscape scale, historic and potential aquatic resource conditions, past and projected aquatic resource impacts in the watershed, and terrestrial connections between aquatic resource. The ecological resources landside of the Mississippi River and Tributaries system are in sub-optimal condition due to the general loss of bottomland hardwood habitat and connection with the Mississippi and Yazoo Rivers (U.S. EPA, 2017; U.S. FWS, 2011; and Price, J.J. and J.F. Berkowitz, 2020). Based on the conditions found within project area watershed, the following assumptions were made regarding identification of potential mitigation sites:

- Compensatory mitigation would focus on areas that remain connected to the Mississippi and Yazoo Rivers and on areas in watershed basins that continue to experience backwater seasonal flood pulses.
- Priority would be given to areas that flood more frequently and for longer periods (i.e., lands located at the lowest elevations) as they are valuable for wetlands and waterfowl.
- Areas adjacent to large tracts of high-value habitat are generally more desirable for mitigation than those that are not (Elliott et al. 2020, Murray and Klimas 2013).

To help ensure that compensatory mitigation adequately offsets unavoidable impacts to wetlands and other aquatic resources, as well as other significant natural resources and species, preference will be given to compensation sites which:

- Replace natural resource functions similar to those lost or degraded as a result of construction and operation of the Project (i.e., in-kind compensatory mitigation). Such compensation sites would post project continue to be in a similar geomorphic position (e.g., riverine backwater wetlands in the 2- and 5-year post project floodplains) to areas adversely affected by the Project and would support communities of fish and wildlife species similar to those adversely affected by the Project.
- Provide opportunities to offset impacts to multiple affected natural resources and species.
- Increase the size of and/or improve the connectivity between existing protected lands.
- Re-establish floodplain connectivity where feasible.
- Provide large contiguous tracts.

The Yazoo Backwater Management Project’s adverse impacts are concentrated on natural resources in the YSA. The YSA is in the southern portion of the 080302 HUC watershed (Figure 1). Because the adverse impacts are concentrated in the YSA, preference will be given to large sites within the YSA with restoration potential that will not experience alterations in

flood frequency and duration from the Project. If suitable sites are not found within the YSA sites may also be located in areas outside the YSA in the same 6-digit HUC watershed (i.e., 080302 – the Yazoo River Basin) and within the Mississippi Alluvial Plain Level III Ecoregion (Figure 1), provided such sites are consistent with the considerations identified above. Prioritizing areas outside of the YSA but within the 080302 HUC watershed and within the Mississippi Alluvial Plain Level III Ecoregion can yield benefits to ecological resources and communities located downstream in the YSA.

If the required mitigation cannot be completed within the YSA or other portions of the 080302 HUC watershed within the Mississippi Alluvial Plain Level III Ecoregion, adjacent watersheds within the Lower Mississippi River Alluvial Valley (LMRAV) with the natural resource types found in the Project impact area will be considered. For example, as discussed below, riverine backwater wetlands have been mapped across the LMRAV (Figure 2 below) and provide habitat for similar communities of fish and wildlife species. Thus, a restored riverine backwater wetland in an adjacent watershed could potentially offset Project impacts to wetlands and other aquatic resources, as well as fish and wildlife species and their habitats. Considering these factors, potential compensation sites may also be within portions of the 080402, 080500, and 080601 HUC watersheds within the Mississippi Alluvial Plain Level III Ecoregion (Figure 1) at locations that provide in-kind compensatory mitigation consistent with the considerations identified in Section 7.0. This potentially includes mitigation bank sites and in-lieu fee program project sites located within this same geographic area. Consideration was also given to batture areas as out of basin mitigation.

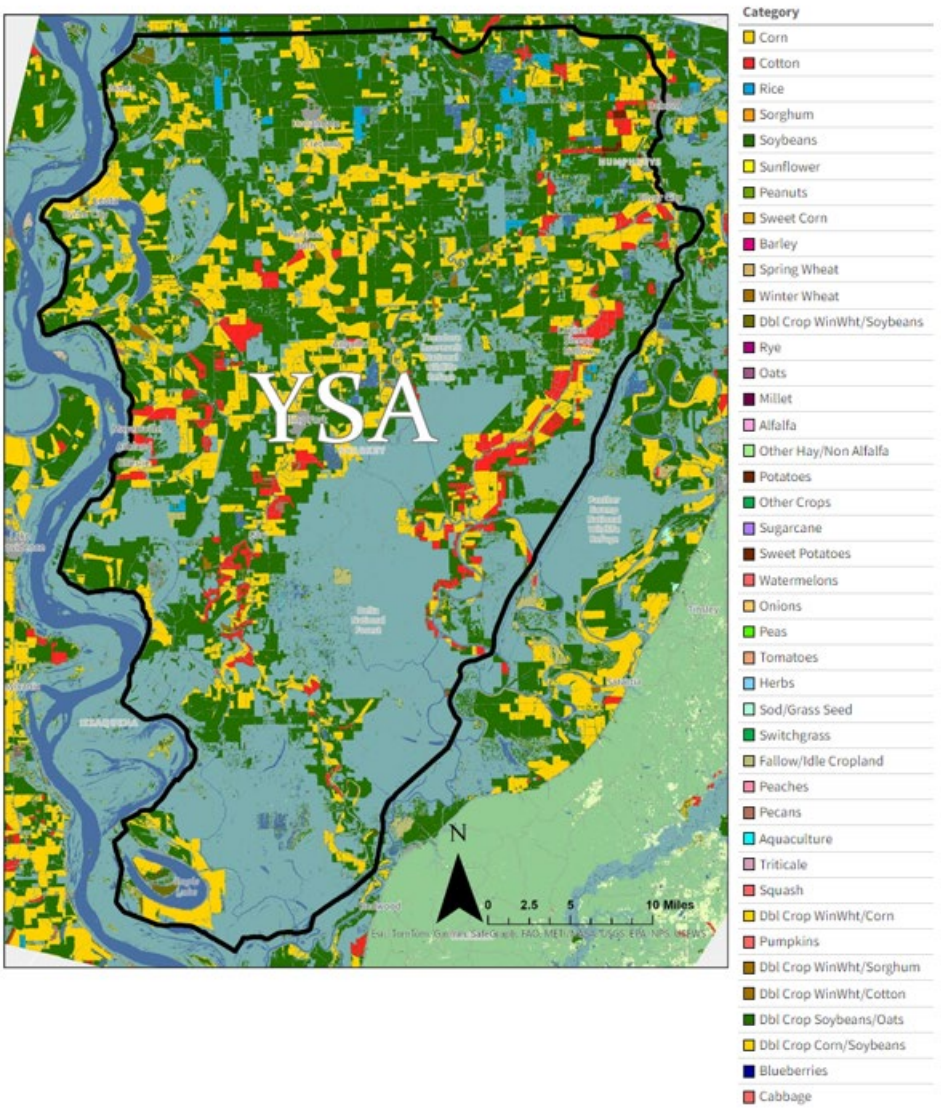

Figure 2: Land Classification of Habitat in the Project Area

6.1 Identification of Mitigation Sites

The interagency planning team assessed various lands for potential use as a site for compensatory mitigation work. Parcels capable of supporting the types of habitats impacted by the presented project was identified through the following methods:

- Geographic information system tools were utilized to systematically identify tracts of suitable size and habitat support characteristics. Mapping tools and layers considered included:
    - Available Parcel data from Humphreys, Issaquena, Sharkey, Warren, Washington, and Yazoo County Assessors
    - City land, county lands, state lands, federal lands, and other trust lands

  - EPA EcoRegions
  - LiDAR/ Elevation
  - Lower Mississippi Valley Joint Venture Mississippi Alluvial Valley Potential Natural Vegetation Maps (Figure 3)
  - Projected Project area inundation at the 2 year and 5 year floodplain
  - United States Geological Survey (USGS) contour maps
  - USACE Regulatory In-lieu Fee and Bank Information Tracking System
  - USGS HUC Watershed Boundaries
  - USGS-NRCS (Natural Resources Conservation Service) soil survey maps

- Review of existing Priority watershed, restoration and or protection plans including:
  - Deer Creek Watershed Implementation Plan, Mississippi State Wildlife Action Plan, Lower Mississippi River Resource Assessment, Mississippi Watershed Management Organization's Watershed Management Plan 2011-2021, forest breeding bird reforestation and protection priorities maps developed by the Lower Mississippi Valley Joint Venture and priority areas within FWS approved refuge acquisition boundaries.

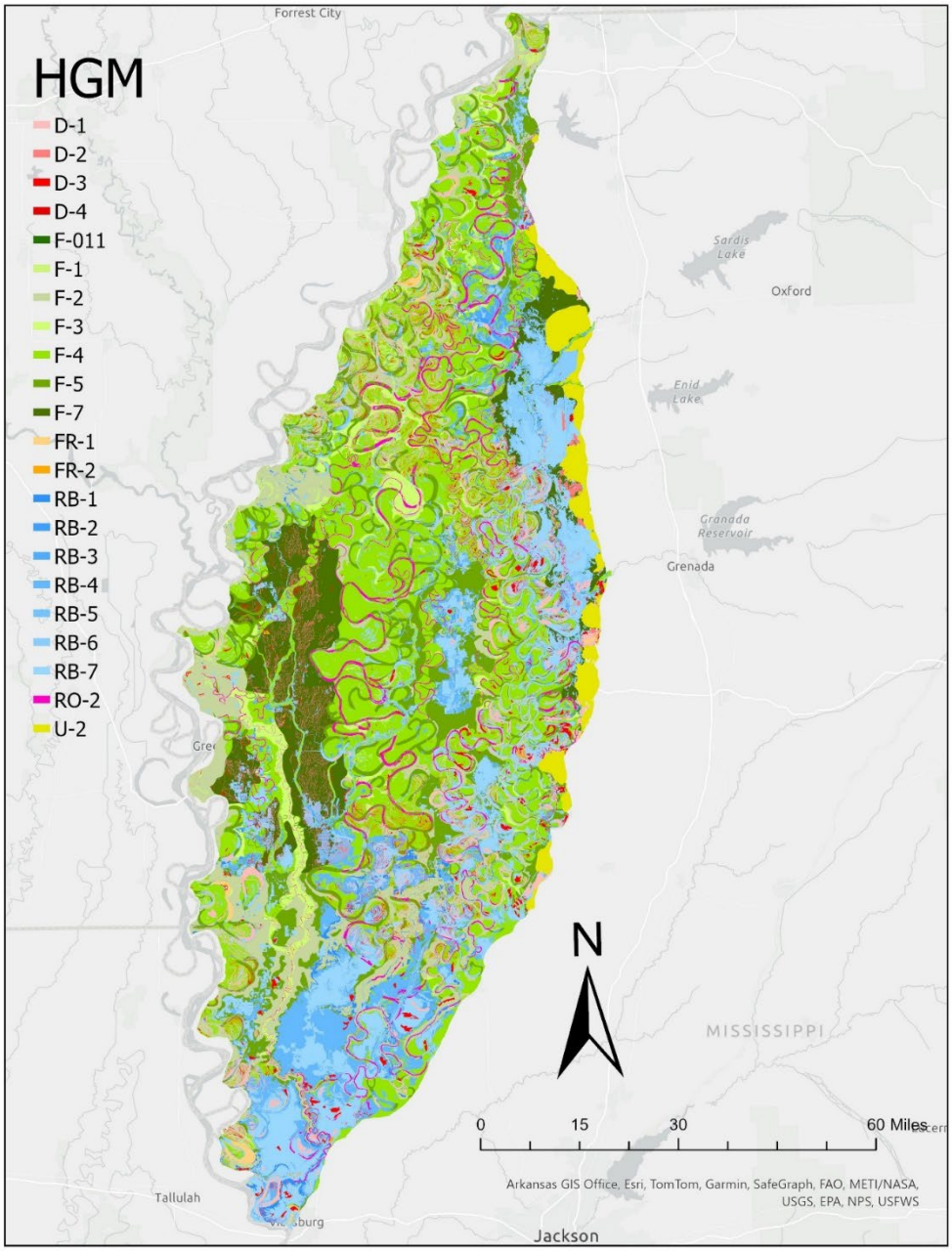

Figure 3: Potential Natural Vegetation Maps in the Project Area based on hydrogeomorphic (HGM) models.
The maps identify the appropriate plant communities to restore based on the various site conditions.

Table 5: Potential Natural Vegetation in the Project Area based on hydrogeomorphic (HGM) models.

Hydrogeomorphic (HGM) Subclasses	Hydrogeomorphic HGM Class	General Site Characteristics	Specific Site Descriptions	Principal Dominant Species
D-1	Connected and Unconnected Depressions	Wetlands in Depressions	Stream-connected depressions in abandoned channels	Baldcypress-Water Tupelo
D-2	Connected and Unconnected Depressions	Wetlands in Depressions	Stream- connected depressions on Pleistocene outwash terraces	Baldcypress-Water tupelo
D-3	Connected and Unconnected Depressions	Wetlands in Depressions	Unconnected depressions in abandoned channels	Baldcypress- Water Tupelo
D-4	Connected and Unconnected Depressions	Wetlands in Depressions	Unconnected depressions on Pleistocene outwash terraces	Baldcypress-Water Tupelo
F-1	Flat	Wetlands maintained by precipitation	High natural levees	Cottonwood-Water Oak-Sugarberry
F-2	Flat	Wetlands maintained by precipitation	Well drained recent alluvial in lowlands	Cherrybark-Water Oak-Sweetgum
F-3	Flat	Wetlands maintained by precipitation	Well drained older alluvium in lowlands	Cherrybark Oak-Water Oak-Cow Oak
F-4	Flat	Wetlands maintained by precipitation	Moderately drained lowlands	Sugarberry-Green Ash-American Elm
F-5	Flat	Wetlands maintained by precipitation	Poorly drained Mississippi River sediments	Willow Oak-Cedar Elm
F-7	Flat	Wetlands maintained by precipitation	Poorly drained undulating topography on Pleistocene outwash terraces	Willow Oak-Water Oak-Cherrybark Oak
F-011	Flat	Wetlands maintained by precipitation	Alkali prairie/savanna	Three Awn-Little Bluestem-Delta Post Oak
FR-1	Connected and unconnected fringe	Wetlands fringing waterbodies	Stream Connected Lake and Pond fringe wetlands	Baldcypress-Buttonbush-Emergents
FR-2	Connected and unconnected fringe	Wetlands fringing waterbodies	Unconnected lake and pond fringe	Baldcypress-Buttonbush-Emergents
RB-1	Riverine backwater	Wetlands maintained by riverine backwater flooding	Occasionally flooded well drained lowlands	Nuttal Oak-Willow Oak-Water Oak
RB-2	Riverine backwater	Wetlands maintained by riverine backwater flooding	Occasionally flooded, moderately drained lowlands	Willow Oak-Water Oak-Sweetgum
RB-3	Riverine backwater	Wetlands maintained by riverine backwater flooding	Occasionally flooded flats	Willow Oak-Sweetgum
RB-4	Riverine backwater	Wetlands maintained by riverine backwater flooding	Occasionally flooded, poorly drained lowlands	Nuttal Oak-Sweetgum
RB-5	Riverine backwater	Wetlands maintained by riverine backwater flooding	Occasionally flooded Pleistocene deposits	Willow Oak-Nuttall Oak

Hydrogeomorphic (HGM) Subclasses	Hydrogeomorphic HGM Class	General Site Characteristics	Specific Site Descriptions	Principal Dominant Species
RB-6	Riverine backwater	Wetlands maintained by riverine backwater flooding	Frequently flooded Pleistocene deposits	Overcup Oak- Bitter Pecan- Green Ash
RB-7	Riverine backwater	Wetlands maintained by riverine backwater flooding	Frequently flooded lowlands	Overcup-Bitter Pecan
RO-2	Riverine Overbank	Wetland maintained by riverine overbank and headwater flooding	River swamp in underfit channels	Baldcypress-Water Tupelo
U-2	Upland	Non-wetlands/uplands	Well-drained soils on alluvial fans	Mixed Hardwoods

6.2 Identified Land Types

Public Lands. There are 17 federal and/or State-managed areas within the YSA which include parks, natural areas, historic sites, fish and wildlife areas, scenic areas, and trails. These lands provide mitigation opportunity to increase connectivity by placing mitigation next to these existing protected lands. See Figure 5 for a map of federally owned lands.

- Delta National Forest
- Hillside National Wildlife Refuge
- Howard Miller WMA
- Lake George WMA
- Leroy Percy WMA
- Leroy Percy State Park
- Mahannah WMA
- Matthews Brake National Wildlife Refuge
- Mississippi State Sunflower Wildlife Management Area (WMA)
- Morgan Brake National Wildlife Refuge
- Muscadine Farms WMA
- Panther Swamp National Wildlife Refuge
- Phil Bryant WMA
- Shipland WMA
- The Holt Collier National Wildlife Refuge
- Theodore Roosevelt National Wildlife Refuge
- Twin Oaks WMA
- Yazoo National Wildlife Refuge

Private land. Within the watershed there are sites held in private ownership that are potentially suitable in size and site conditions for mitigation work. These areas vary greatly in conditions and current uses. Some are actively used in agriculture and others are undeveloped. The undeveloped sites further vary in uses with some serving as recreational lands, hunting lands or forestry investments.

These lands are considered potential mitigation areas and were further evaluated for use in mitigation work in collaboration with the resource agencies and the individual landowners.

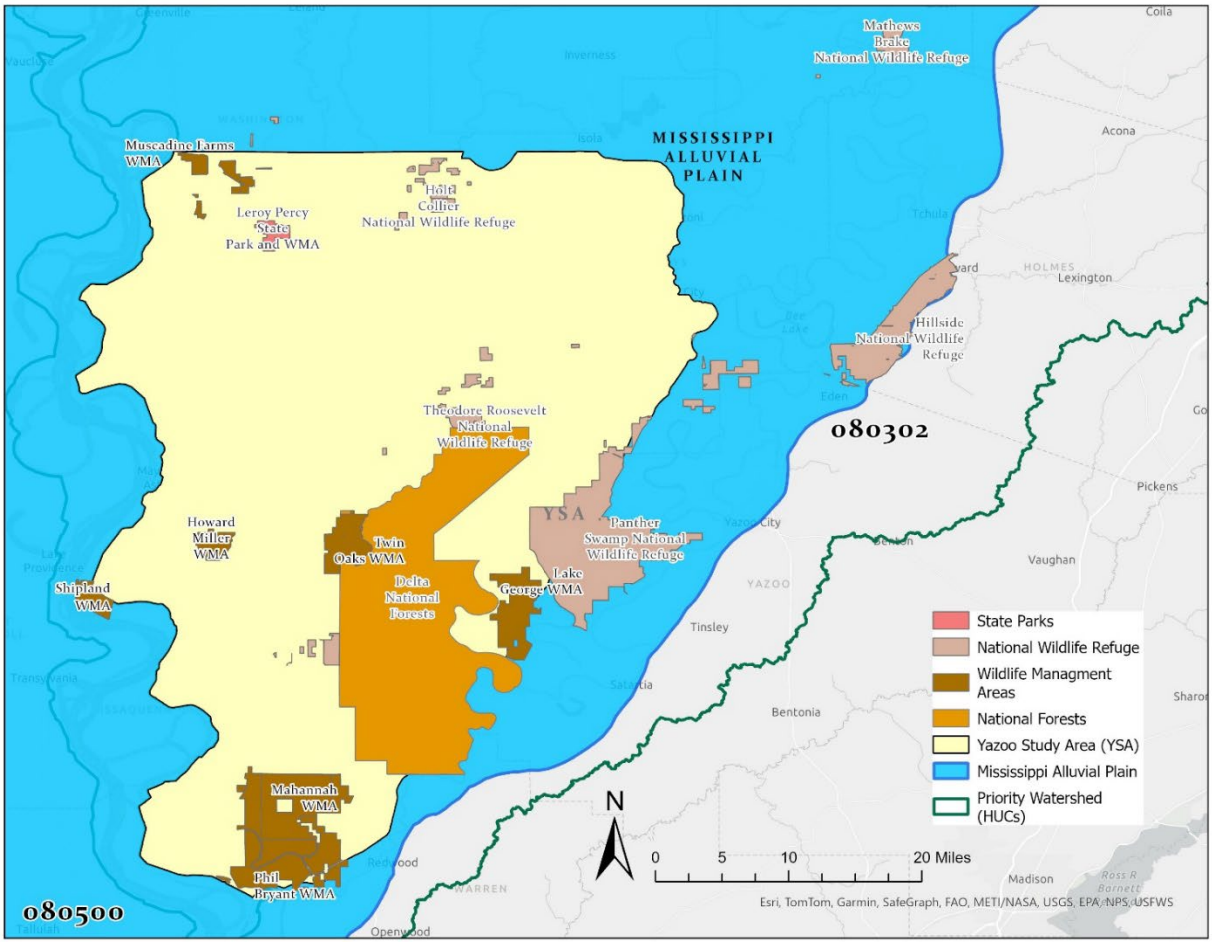

Figure 4: Public Lands Identified in Yazoo Study Area

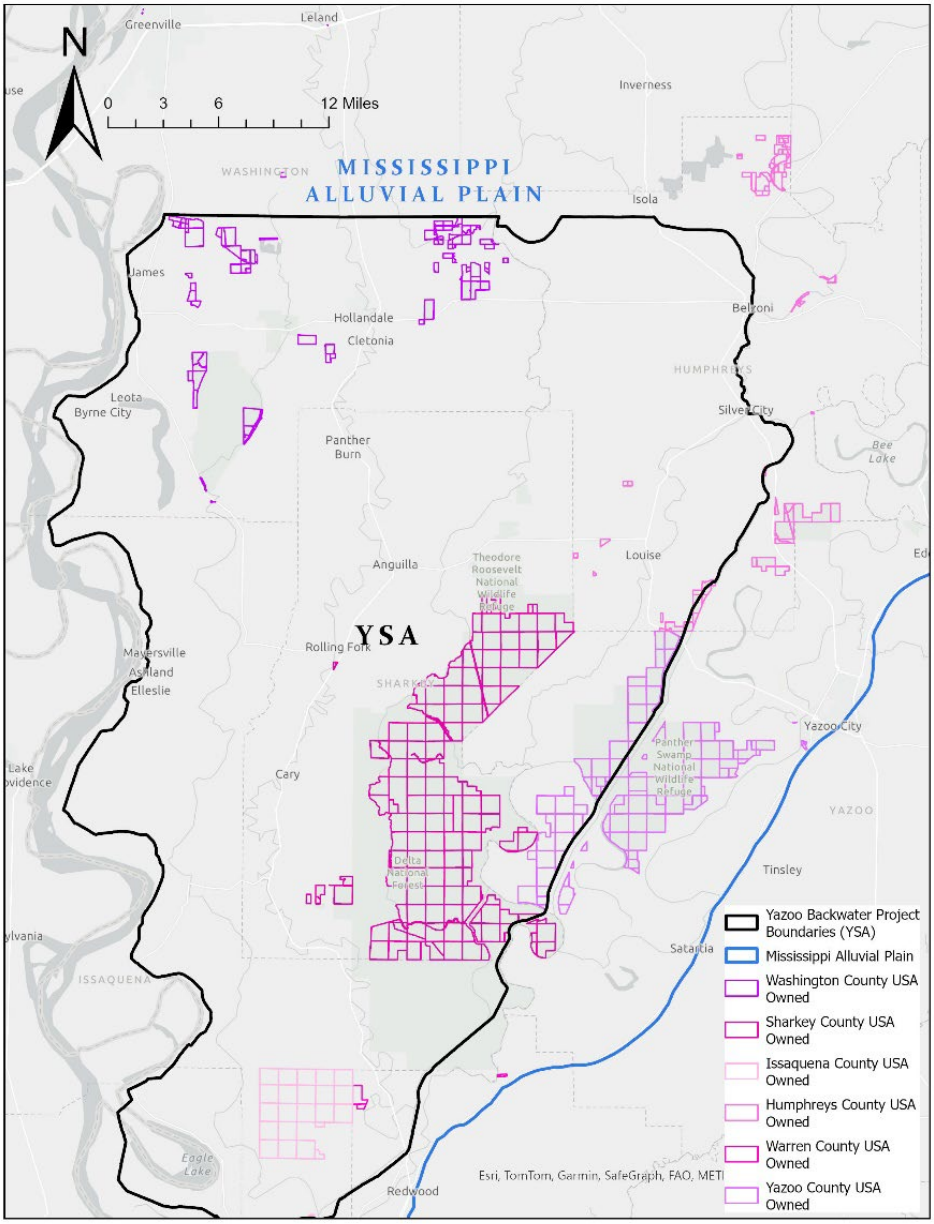

Figure 5: Parcel information for Public Lands of YSA Area

SECTION 7

Mitigation Strategies

Planning strategies are different means employed to develop an alternative plan or plans to achieve a project goal. The use of one or more strategies helps teams focus on an approach to developing a plan. The work associated with mitigation strategies is a procedural requirement identified in ER 1105-2-100, Appendix C, Section C-4(g)(5). For mitigation planning work, strategies may range from the purchase of mitigation bank credits to the construction of a project or projects to achieve the objectives and compensate for unavoidable habitat impacts. Strategies may also involve different approaches to site selection such as the use of public lands or identifying contiguous sites to enhance wildlife corridors or expand wildlife populations. In accordance with Section 2036(c) of WRDA 2007, as amended (33 U.S.C. 2317b), USACE will consider available and potential in-kind credits from mitigation banks and in-lieu fee programs that have service areas that include the location of project impacts, as potential strategies to address compensatory mitigation for unavoidable ecological impacts. Additionally, (i)(4) as codified at

> "33 U.S.C. 2283(i)(4) PREFERENCE -- At the request of the non-Federal project sponsor, preference may be given, to the maximum extent practicable, to mitigating an environmental impact through the use of a mitigation bank, in-lieu fee, or other third-party mitigation arrangement, if the use of credits from the mitigation bank or in-lieu fee, or the other third-party mitigation arrangement for the project has been approved by the applicable Federal agency."

Requirements for use of mitigation banks, in-lieu fee programs, or other third-party mitigation arrangements can be found in implementation guidance for the above-mentioned WRDA provisions in Section 2 and the References Section 15.

The strategies considered for planning this mitigation project are described below.

Purchase of mitigation bank credits. Mitigation banks sell credits for mitigation work performed at an approved site. The banks are approved and legally bound through banking instruments that hold the operators to certain standards of performance and reporting. The use of mitigation banks for a project may offer advantages to the government and non-federal sponsor by reducing performance risk and eliminating project specific requirements for operations and maintenance work and the development of monitoring and adaptive management plans.

Purchase of in-lieu fee program credits. In-lieu fee programs are established by a governmental or non-profit natural resource management entity and approved by USACE to accept funds for future mitigation work. The programs are approved to implement either specific or general wetland or other aquatic resource development projects. Programs must meet the requirements that apply to an offsite mitigation effort and provide adequate assurances of success and timely implementation. A formal agreement between the

program sponsor and the agencies, like a banking instrument, defines the conditions under which the use of the program is considered appropriate. Using an in-lieu-fee program for a project's mitigation needs may offer advantages to the government and non-federal sponsor by reducing performance risk and eliminating project specific requirements for operations and maintenance work and the development of monitoring and adaptive management plans.

Develop project-specific mitigation (construction). The government and non-federal sponsor may choose to construct a mitigation project. This construction strategy offers some potential advantages in tailoring a project to specific needs or locations. In addition, the partners may bring special expertise to the project gained from previous work on similar projects in the area.

Non-structural mitigation methods. Various non-structural approaches may be available for accomplishing mitigation objectives. These approaches generally do not involve major construction work and therefore potentially reduce some associated environmental impacts. These actions may include land preservation, invasive species control, project operation changes, or other management actions that produce ecosystem benefits. As a strategy reducing environmental impacts may be more appropriate and complimentary in sensitive or protected areas. Non-structural mitigation may be combined with all other mitigation strategies to guide formulation of alternative plans.

Partnership opportunities. Many organizations have goals that align with USACE mitigation planning needs, the Environmental Operating Principles, or other missions. Opportunities may exist to collaborate to plan a project that meets the goals of the mitigation plan and the watershed goals of one or more partners. This strategy offers an opportunity to benefit from the strengths of organizations outside of government and may leverage existing information or offer unique local insight. There may be opportunities to perform habitat mitigation work on lands managed by partners.

Combination of mitigation bank and/or in-lieu fee program credit purchases and construction of a project. One potential strategy is to combine multiple approaches - a bank and/or in-lieu fee program credit purchase and project construction – together to achieve the mitigation objectives. This strategy could allow the for the tailoring of a plan to the needs of some small impacts in one habitat and larger impacts to another habitat type and or purchase credits to allow construction to proceed with certain portions of the project.

SECTION 8

Identify Measures and Formulate Alternative Mitigation Plans

Management measures are actions or activities that work towards accomplishing mitigation objectives. A measure may be standalone as a single activity that serves as an alternative plan or more individual measures may be combined to form an alternative plan.

- Measure 1 – Purchase mitigation bank credits. This measure addresses the mitigation objectives through the purchase of in-kind credits from an approved mitigation bank located in the basin.

- Measure 2 – Purchase in-lieu fee program credits. This measure addresses the mitigation objectives through the purchase of in-kind credits from an approved in-lieu fee program with credits available in the basin.

- Measure 3 – Land Preservation. This measure addresses mitigation objectives by the purchase of lands that are in threat of being degraded and thereby preventing the decline of wetland and aquatic resources. Lands to be considered include land coming out of easements and land being acquired as part of the nonstructural plan.

- Measure 4 – Plant suitable wetland vegetation for enhancement or restoration. Active restoration of vegetation on mitigation tracts involves preparing the site and reforesting cleared and agricultural areas with naturally occurring and historically- occurring species and hydric soils. This measure addresses the mitigation objectives by transplanting vegetation suitable for growth in wetlands. This measure would increase wetland function to increase forested wetlands, and habitat for terrestrial wildlife, and aquatic resources and fisheries.

- Measure 5 – Restore hydrology to habitat for establishment, restoration or enhancement. This measure addresses the mitigation objectives by reintroducing appropriate water levels (based on future hydrology) to restore conditions a modified or degraded site. This measure could address hydrologic changes needed for wetlands, terrestrial wildlife, shorebirds, waterfowl and aquatic resources and fisheries.

- Measure 6- In-channel features to maintain pooling and hydrologic connection. This measure addresses the mitigation objectives by providing habitat for aquatic resources and fisheries.

- Measure 7- Environmental Flows- Series of wells northeast of the Yazoo Backwater Area within the Big Sunflower-Steele Bayou watershed. that will be used to augment

streamflow in certain Yazoo Backwater Area streams during low flow times of the year. This measure addresses mitigation objectives by providing habitat for aquatic resources and fisheries. Re-establishing perennial flows with the SLFGWs is considered out-of-kind mitigation but offsets high mortality of larvae and juvenile fish in the spring from hypoxia with higher rates of survival of juveniles and adults during autumn.

- Measure 8 – Change topography to create wetland habitat. This measure addresses the mitigation objectives by lowering or raising surface elevations to heights conducive to the growth of wetland vegetation.

- Measure 9- Best Management Sediment Practices for agricultural fields. This measures addresses the mitigation objectives by reducing sediment input from agricultural fields and their impacts to aquatic resources and fisheries.

- Measure 10- Best Management Hydrology Practices for agricultural fields. This measure addresses the mitigation objectives by water retention during migratory bird period to benefit shorebirds and waterfowl. Numerous farmlands in the project area are managed for waterfowl during the waterfowl season, which require perimeter levees, water control devices, and water sources. A portion of these areas can be managed for shorebirds through inundation at depths that are suitable for shorebirds during the spring and fall migration periods. Additional agricultural areas could be purchased and water control devices, perimeter levees installed to allow for water management. Agricultural areas would be inundated during portions of the shorebird migratory period. Following the migratory period, the area would be planted for an agricultural commodity. Some agricultural techniques that require inundation, such as techniques for rice production may also be utilized to compensate for impacts if those techniques are complimentary to shorebird management.

A qualitative analysis of the potential effectiveness of each measure towards achieving the mitigation planning objectives was performed. Table 6 summarizes the results of the screening of potential mitigation measures. After the effectiveness screening the team retained 8 measures for further consideration and potential combinability into alternative plans.

Table 6: Initial Screening of Mitigation Measures

Measure	Screening Analysis	Screening Result	Objectives to be Addressed
Measure 1 - Banks	Likely to partially meet mitigation objectives	Carried forward for further analysis	All
Measure 2 - In Lieu Fee	Likely to meet mitigation objectives	Carried forward for further analysis	All
Measure 3 - Preservation	Likely to meet objective but would require additional acres since additional land would be required. No net gain in wetlands.	Carried forward for further analysis	All
Measure 4 - Reforestation	Likely to meet mitigation objectives	Carried forward for further analysis	All
Measure 5 - Recreate Hydrology	Likely to meet mitigation objectives at a much higher cost	Carried forward for further analysis	All
Measure 6 - Pooling	Likely to meet mitigation objective for aquatic resources and fisheries.	Screened out Determined not to be required since mitigation for wetland impacts would meet needs for the aquatic resources and waterfowl.	Aquatic Resources and Waterfowl
Measure 7- Enviro Flows	Likely to meet aquatic resource's objective but at much higher cost. Out of basin. Included in Yazoo project as a Best Management Practice	Screened out – not carried forward for further analysis under mitigation	Aquatic Resources and Waterfowl
Measure 8 - Topography Changes	Likely to partially meet mitigation objective. Changes to topography increase risks for site performance.	Carried forward for further analysis	All
Measure 9 - Best Management Practices - Sediment	Potential implementation risk	Screened out – not carried forward for further analysis	Aquatic Resources
Measure 10 – Best Management Practices - Hydrology	Likely to meet objective for shorebirds and waterfowl	Carried forward for further analysis, only identified measure to meet shorebird requirements. Will be a required part of any selected mitigation plan	Shorebirds and waterfowl

Each measure was further assessed to determine the potential to combine it with other measures to form alternative plans. All measures were determined to be combinable with other measures. This assessment determined if a measure could stand alone as a plan and whether the measure had any restrictions that would prevent its combination with other measures. Results of the assessment are shown in the table below.

Table 7: Mitigation Measure Combinability Assessment

Measure	Potential to Stand Alone as a Plan?	Potential to Combine with Other Measures?
Measure 1 - Banks	No, not enough available credits	Yes
Measure 2 - In Lieu Fee	Yes, potential to meet mitigation needs as released credits become available	Yes
Measure 3 - Preservation	Yes	Yes
Measure 4 - Reforestation	Yes	Yes
Measure 6- Pooling	No, would not address all objectives and would need to be combined with other measures	Yes
Measure 5 - Recreate Hydrology	No, would not address all objectives and would need to be combined with other measures	Yes
Measure 8 - Topography Changes	No, would not address all objectives and would need to be combined with other measures	Yes

The remaining measures were then combined into an array of alternative plans aligned with the mitigation planning strategies and identified sites. The measures incorporated into each alternative are listed. All alternatives beyond the No Action will also include Measure 10 for Shorebird Mitigation. A No Action alternative is included as a basis for comparison as well as meeting the requirements of the NEPA.

No Action Alternative

Under this scenario no mitigation work would be performed, and the structure, functions and values of project impacted habitats would be permanently lost. The alternative is retained for purposes of a baseline comparison against other action alternatives.

Alternative 1 – purchase mitigation bank credits (includes Measure 1)

To be considered as an alternative, a mitigation bank must be approved through the Regulatory Program, as demonstrated by a banking instrument; has to provide available or potential in-kind credits; has to have a service area that includes the location where project impacts occur; have appropriate credits available for purchase at the time of construction and has to has to have completed a functional analysis of credits using a USACE certified habitat assessment model (see Implementation Guidance for Section 1163 of WRDA 2016). Alternatives denoted with “a” are within the YSA; alternatives labeled “b” are within the Yazoo Basin and Alluvial Plain and alternatives labeled “c” are out of basin but still within the priority areas identified in Section 7.

Table 8: Mitigation Alternative 1 Plan Numbers and Site Names

Alternative Number	Alternative	Site Name
1a	Mitigation Bank Credits-YSA	Delta Mitigation Bank
1b	Mitigation Bank Credits- Yazoo Basin and Alluvial Plain	Delta Mitigation Bank
1c	Mitigation Bank Credits-Out of Basin (LMRAV 0803, 080402, 080500, 080601)	Deer Creek Road Mitigation Bank
1d	Mitigation Bank Credits-Out of Basin (LMRAV 0803, 080402, 080500, 080601)	Upper Coldwater Mitigation Bank
	Mitigation Bank Credits-Out of Basin (LMRAV 0803, 080402, 080500, 080601) Out of State	Black Bayou Phase I
	Mitigation Bank Credits-Out of Basin (LMRAV 0803, 080402, 080500, 080601) Out of State	Black Bayou Phase II
	Mitigation Bank Credits-Out of Basin (LMRAV 0803, 080402, 080500, 080601) Out of State	Black Bayou Phase III
	Mitigation Bank Credits-Out of Basin (LMRAV 0803, 080402, 080500, 080601) Out of State	Pelican Foster Mitigation Bank
	Mitigation Bank Credits-Out of Basin (LMRAV 0803, 080402, 080500, 080601) Out of State	Sicily Island
	Mitigation Bank Credits-Out of Basin (LMRAV 0803, 080402, 080500, 080601) Out of State	Sicily Island Phase II

Alternative 2 – purchase credits from an approved in-lieu fee program (includes Measure 2)

To be considered as an alternative, an in-lieu-fee program must be approved through the Regulatory Program, as demonstrated by an in-lieu-fee program instrument; has to provide available or potential in-kind credits; has to have a service area that includes the location where project impacts occur; have appropriate credits available for purchase at the time of construction; and has to have completed a functional analysis of credits using a Corps of Engineers certified habitat assessment model, consistent with the model used to determine project impacts (see Implementation Guidance for Section 1163 of WRDA 2016).

Alternatives denoted with an “a” are within the YSA; alternatives labeled “b” are within the Yazoo Basin and Alluvial Plain and alternatives labeled “c” are out of basin but still within the priority areas identified in Section 7.

Table 9: Mitigation Alternative 2 Plan Numbers and Site Names

Alternative Number	Alternative	Site Name
2a	In Lieu Fee Program-YSA	Ducks Unlimited, Inc, Mississippi Delta In-Lieu-Fee Program (MSD-ILFP)
2b	In Lieu Fee Program- Yazoo Basin and Alluvial Plan	Ducks Unlimited, Inc, Mississippi Delta In-Lieu-Fee Program (MSD-ILFP)
2c	In Lieu Fee Program-Out of Basin	No viable ILF program identified out of basin

Alternative 3 – Land Preservation (includes Measure 3)

Preserved wetlands can qualify as compensatory mitigation when they "(1) perform physical or biological functions, the preservation of which is important to the region in which the aquatic resources are located, and (2) are under demonstrable threat of loss or substantial degradation due to human activities that might not otherwise be expected to be restricted. In some cases, preservation may protect wetlands that might have otherwise been lost to agricultural conversion or development.

Alternatives denoted with an "a" are within the YSA; alternatives labeled "b" are within the Yazoo Basin and Alluvial Plain and alternatives labeled "c" are out of basin but still within the priority areas identified in Section 7.

Table 10: Mitigation Alternative 3 Plan Numbers and Site Names

Alternative Number	Alternative	Site Name
3a	Land Preservation-YSA	Theodore Roosevelt
3b	Land Preservation- Yazoo Basin and Alluvial Plan	No sites identified
3c	Land Preservation-Out of Basin	*No sites identified*

Alternative 4 – Construct a mitigation project (includes Measures 4, 5, and 8)

Project specific mitigation would be constructed by acquiring previously cleared lands and restoring the vegetation and hydrology on these lands to meet mitigation requirements for wetlands, aquatic resources and fisheries, waterfowl, and wildlife. Wetlands have the highest mitigation need and meeting the acres needed for wetland compensation will mitigation for the other resources (Table 3). An estimated 7,650 acres of wetlands are estimated to be needed for compensatory mitigation for the project. Potential sites were identified in accordance with Section 7 resulting in the identification of 21 initial sites which were screened based off of land elevation and floodplain resulting in 8 potential sites for consideration (See Figure 6). Constructed mitigation sites would be located in the 5-year post project floodplain with portions in the 2 year post project floodplain to adequately compensate for aquatic resources and fisheries.

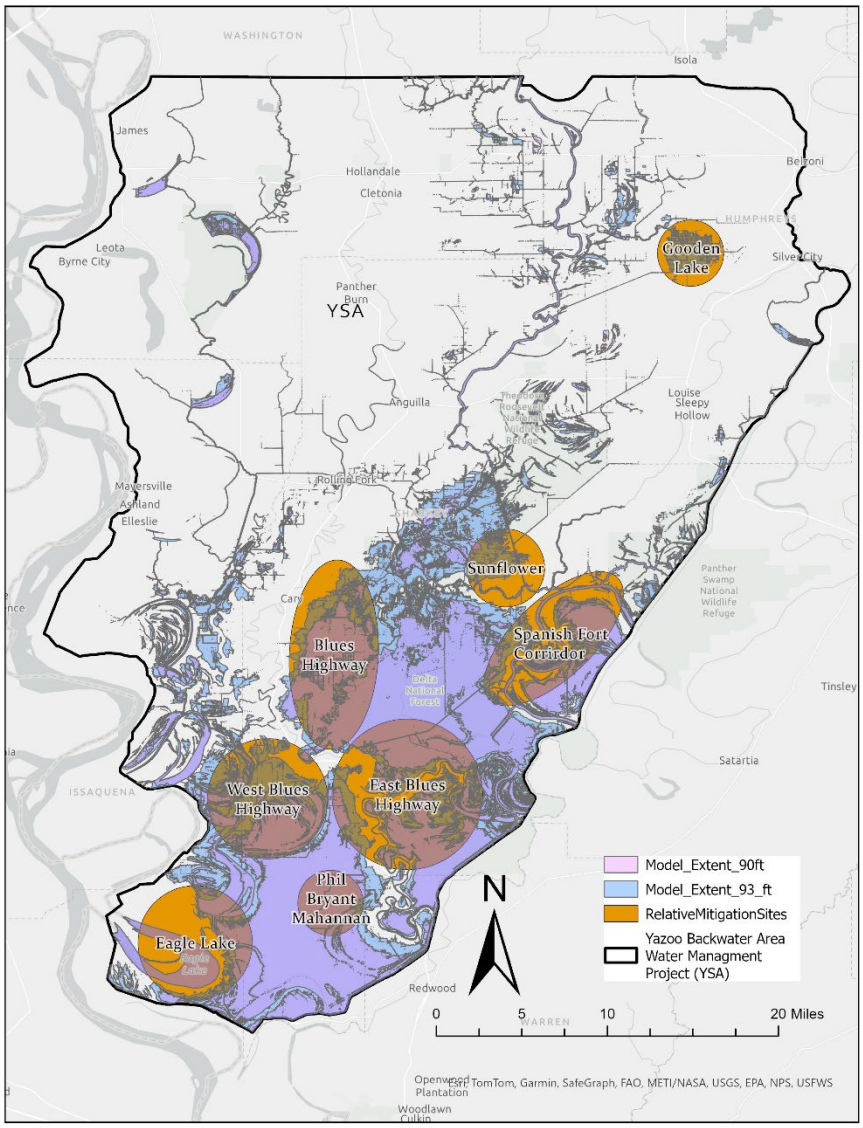

Figure 6: Alternative 4a Potential Sites for Construction of a Mitigation Site

Agricultural lands located within the future 5-year floodplain (e.g., low lying flooded areas whose hydrologic conditions are dictated by precipitation and landscape position) were identified using the preferences identified in Section 7. These areas are often at the lowest lying elevations which are subject to precipitation run-off from large areas and pond water for long durations and serve as an important benchmark to many ecological resources as well as defining the upper limit of optimal fish spawning and rearing habitat associated with flooded bottomland hardwood forest. Additionally, these areas are adjacent to existing tracts of bottomland hardwoods.

Active restoration of vegetation on mitigation tracts involves preparing the site, restoring hydrology to the extent practical (based on projected future hydrology) and reforesting cleared

and agricultural areas with naturally occurring and historically- occurring species. Considering the projected future hydrology in these areas, a mixture of bottomland hardwoods would be planted according to site conditions, as well as creating microtopography, providing earthwork, and conducting other hydrologic restorative activities. A general planting plan can be found in Section 14. Final site design will be developed in accordance with HGM criteria based off of successful mitigation taking place in the YSA (Berkowitz 2019).

Alternatives denoted with “a” are within the YSA; alternatives labeled “b” are within the Yazoo Basin and Alluvial Plain and alternatives labeled “c” are out of basin but still within the priority areas identified in Section 7. Additional potential sites identified would be in accordance with Section 7.

Table 11: Mitigation Alternative 4 Plan Numbers and Site Names

Alternative Number	Alternative	Site Name
4a	Constructed Project-YSA	Phil Bryant/Mahannah
	Constructed Project-YSA	Grace road
	Constructed Project-YSA	North Eagle Bend
	Constructed Project-YSA	East Blues Highway
	Constructed Project-YSA	Blues Highway
	Constructed Project-YSA	West Blues Highway
	Constructed Project-YSA	Sunflower
	Constructed Project-YSA	Eagle Lake
	Constructed Project-YSA	Gooden Lake
	Constructed Project-YSA	Spanish Fort Corridor 1
	Constructed Project-YSA	Spanish Fort Corridor 2
	Constructed Project-YSA	Panther Swamp YSA
	Constructed Project-YSA	Yazoo NWR
	Constructed Project-YSA	Holt Collier 1
	Constructed Project-YSA	Holt Collier 2
	Constructed Project-YSA	Holt Collier 3
	Constructed Project-YSA	Corridor North between Delta and Panther- Silver Creek
	Constructed Project-YSA	South of Holt NWR
	Constructed Project-YSA	Panther Extension to Silver Creek North
	Constructed Project-YSA	Panther Extension to Silver Creek 2 North
	Constructed Project-YSA	Theodore Roosevelt
4b	Constructed Project- Yazoo Basin and Alluvial Plan	Panther Swamp South
	Constructed Project- Yazoo Basin and Alluvial Plan	Panther Swamp North
4c	Constructed Project-Out of Basin	Batture

SECTION 9

Plan Selection Consideration

Plan selection criteria considered when ranking and selecting the mitigation alternatives for the Yazoo Backwater Management Project include:

- Environmental Considerations
- Risk & Reliability
- Time
- Watershed & Ecological Site Considerations

Risk & Reliability: Reliability refers to the chance that a project may fail to perform its intended purpose as a function of the forces placed upon it. Risk is defined as the combination of likelihood of an occurrence and the severity of consequences that may arise from it. Actions can be implemented to reduce risk, but because risk can never be completely eliminated, residual risk will remain.

- Uncertainty Relative to Achieving Ecological Success/Potential Need for Adaptive Management (Contingency) Actions
    - Sources of uncertainty relative to achieving ecological success include:
        - incomplete understanding of the system (environmental or engineering) to be managed or restored (e.g., hydroperiod, water depth, water supply, substrate, nutrient levels, toxic compounds)
        - imprecise estimates of the outcomes of alternative management actions (e.g., proven methodology, project complexity)
        - Is there sufficient flexibility within project design and operation to permit adjustments to management actions?

Environmental: The National Environmental Policy Act (NEPA) and other environmental laws require federal agencies to consider the environmental impacts in their decision- making, identify unavoidable environmental impacts and make this information available to the public. All evaluated alternatives should be investigated with respect to environmental consequences. The NEPA document records this investigation.

Time: Time metrics account for engineering and design, real estate acquisition, construction, and period to project turn-over. Time metrics include:

- Estimated time to construction contract award (measured from ROD).
- Estimated time to Notice of Construction Complete milestone (measured from ROD)
- Estimate time to achieve ecological success.
- Ability to achieve mitigation prior to construction completion date.

Watershed and Ecological Site Considerations: Guidance from 40 CFR Part 230 discusses consideration of a mitigation site's role in the larger landscape and other ecological conditions. The items below aim to capture this guidance.

- 40 CFR Part 230 Compensatory Mitigation for Losses of Aquatic Resources includes guidance regarding the siting of mitigation projects. This guidance directs that mitigation should consider existing watershed plans within the project area. Therefore, the selection criteria consider how a given alternative relates to existing watershed plans within the project area.
- Size of contiguous wetland area (Smith and Klimas 2002)
- Habitat connectivity (Smith and Klimas 2002)
- Flood Frequency and Duration (Smith and Klimas 2002)
- Contiguous with or within resource managed area (i.e., Federal, state, private mitigation bank or other restoration projects considered under Future Without Project condition)
- Correlation to an existing watershed or management plant. For example A watershed plan is a plan developed by federal, tribal, state, and/or local government agencies or appropriate non-governmental organizations, in consultation with relevant stakeholders, for the specific goal of aquatic resource restoration, creation, enhancement, and preservation. Existing Priority watershed, restoration and or protection plans in the Project area include but are not limited to :Deer Creek Watershed Implementation Plan, Mississippi State Wildlife Action Plan, Lower Mississippi River Resource Assessment, Mississippi Watershed Management Organization’s Watershed Management Plan 2011-2021, forest breeding bird reforestation and protection priorities maps developed by the Lower Mississippi Valley Joint Venture and priority areas within FWS approved refuge acquisition boundaries.
- Located in county of impact by habitat-type.

Table 12: Plan Selection Considerations

	No Action	1a	1b	1c	1d	2a	2b	2c	3a	3b	3c	4a	4b	4c
Watershed Considerations: Is the mitigation alternative located in YSA or impacted county?	No	No	Yes	No	No	Yes	No	No	Yes	No	No	Yes	No	No
Ecological Site Considerations: Is the alternative contiguous with or within a resource management area?	No	Yes	Yes	Yes	Yes	TBD	TBD	TBD	Yes	Yes	TBD	Yes	Yes	TBD
Watershed Considerations: Does the alternative correlate to an existing watershed, management or priority plan?	No	No	No	No	No	Yes	Yes	TBD	Yes	Yes	TBD	Yes	Yes	TBD
Ecological Site Considerations: Does the alternative provide habitat linkages?	No	No	No	TBD	TBD	TBD	TBD	TBD	Yes	Yes	TBD	Yes	Yes	TBD
Watershed Considerations: Does the mitigation alternative provide in-kind mitigation?	No	No	No	No	TBD	Yes	Yes	TBD	Yes	Yes	TBD	Yes	Yes	TBD
Watershed Considerations: Is the mitigation alternative in the same basin as the habitat impacts?	No	Yes	Yes	No	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes	No
Ecological Site Considerations: Does the alternative meet HGM criteria for tract size, connectivity, flood frequency and duration?	No	No	No	Yes	Yes	Yes	Yes	TBD	No	TBD	TBD	Yes	Yes	TBD

	No Action	1a	1b	1c	1d	2a	2b	2c	3a	3b	3c	4a	4b	4c
Environmental: Does the alternative avoid negative environmental impacts?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No	Yes	Yes	Yes
Time: Can the alternative be implemented before or concurrent with construction?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time: Could the alternative be implemented faster than other alternatives?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	TBD	No	No	No	No	No	No
Risk and Reliability: Does the alternative have lower implementation risks than others?	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No
Risk and Reliability: Can the alternative be adapted or adjusted if needed to meet/maintain ecological success?	No	Yes	Yes	Yes	Yes	Yes	Yes	TBD	Yes	Yes	Yes	Yes	Yes	Yes
Risk and Reliability: Does the mitigation alternative avoid operation or sustainability risks for the government?	No	Yes	Yes	Yes	Yes	Yes	Yes	TBD	No	No	No	No	No	No

Table evaluates alternatives and lands identified to date. Any other lands or sites to be identified under the alternatives will be in accordance with Section 7.

Table 12 assesses each alternative plan by posing and answering a set of questions aimed at discerning differences in alternatives. Based upon these considerations Alternative 2a/b and 4a were moved forward for further consideration and evaluation.

Several questions are related to location and in-kind replacement of lost functions and values. These questions are linked to water resources law and policy that in most cases requires in-basin and in-kind mitigation. Since viable alternatives were identified for in-basin and in-kind alternatives proposing out of basin mitigation were screened from consideration. This included Alternative 1c, 2c, 3c, and 4c. Alternative 3 was also removed from consideration since land preservation would not replace the habitat value lost from the project. Alternative 4b was removed from consideration since viable potential sites within the YSA were identified thus eliminating the need for Alternative 4b. If sites within 4a are determined not to be adequate additional sites with 4b could be identified.

Law requires mitigation work to be performed before or concurrently with project construction. All alternatives can be implemented before construction.

There are differences in risks between the alternatives. Constructing mitigation work as in Alternative 4a versus purchasing mitigation bank (Alternative 1) or in lieu fee credits (Alternative 2) carries risks of project non-performance that would have to be addressed by additional work at government expense. Although mitigation bank credits (Alternative 1) are less risky there are currently not a sufficient number of bank credits expected to be available within the basin to meet the mitigation requirement for the Project. Alternative 1 (mitigation bank credits) although not selected as the primary source of mitigation for the project could be used to supplement either Alternative 2a/b or Alternative 4.

SECTION 10

Recommended Compensatory Mitigation Plan

The recommended plan for compensatory mitigation for the Yazoo Backwater Management Project is to pursue a combination of mitigation strategies to meet the full mitigation need and includes:

- Purchase of in-kind credits from the Ducks Unlimited, Inc. Mississippi Delta In Lieu Fee Program (approved: 24 September 2010) located in the YSA if they are available.
- Purchase of In-Kind Mitigation Bank Credits located in the YSA (will only meet partial mitigation needs due to the availability of credits)
- Construction of a YSA specific Mitigation Project
- Management of Agricultural Area Inundation for Shorebirds

10.1 Wetland, Aquatic Resources, Waterfowl and Terrestrial Wildlife Impacts

The recommended plan to compensate for wetlands, aquatic resources, waterfowl, and terrestrial wildlife impacts is Alternative 1a, 2a/b and 4a/b/c which is to purchase in-kind credits from the partners within the Mississippi Delta In Lieu Fee Program (approved: 24 September 2010) located in the YSA if they are available, mitigation bank credit purchases, and/or construction of a YSA specific mitigation project. Specifically, the mitigation will compensate for the unavoidable loss of habitats in the YSA as follows:

- Wetlands 36,570 AAFCU*
- Aquatic Resources and Fisheries 3,969 ADFA**
- Waterfowl 202,798 Annual DUD
- Terrestrial Wildlife 714 AAHU AAHU***

**Purchase of credits for wetlands will provide the necessary mitigation for the loss of waterfowl, aquatic resources and fisheries and terrestrial wildlife.*
***Aquatic resource and fisheries credits will need to be in the 2-year floodplain or below and the difference can be included up to the 5-year floodplain.*

The Final Mitigation Plan in the Final EIS will be adjusted to meet the mitigation needs required by the selected plan for the Yazoo Backwater Management Project and will be based on these same mitigation strategies (ILF credit purchases, Project Specific Mitigation Construction and Mitigation bank credit purchases). Figure 6 shows the potential locations for project specific construction, Figure 7 shows the Service Area for the DU ILF program where mitigation would occur. Figure 8 displays the location of the mitigation bank footprints in the Yazoo Basin and Alluvial Plain.

For purchase of ILF Credits Partners will be required to submit site-specific mitigation plans to compensate for 36,570 AAFCU for review and approval. In the case of ILF and or mitigation bank credits, the program operator is responsible for demonstrating and reporting that the

success criteria are being met. Therefore, no specific ecological success criteria are required to be developed for this plan. A specific monitoring and adaptive management plan is also not needed as these activities are the operator's responsibility (see Implementation Guidance for Section 1163 of WRDA 2016, Wetlands Mitigation). The program and or mitigation bank is also responsible for meeting financial assurance requirements and long-term management. Work for the Project will not be commenced in waters of the United States (WOTUS) until the compensatory mitigation plan has been approved through the process outlined in the Memorandum of Agreement by USACE, EPA, and USFWS and the compensatory mitigation sites and or credits have been secured.

10.2 Project Specific Mitigation Construction

If all impacts are not able to be mitigation with ILF and or mitigation banks, Alternative 4a Project Specific Mitigation a YSA specific mitigation project will be constructed. Approximately 7,650 acres is needed of offset the impacts (Table 3). Constructed mitigation sites would be located in the 5-year post project floodplain with portions in the 2 year post project floodplain to adequately compensate for aquatic resources and fisheries. Selection of sites for reforestation should ensure that lands are flooded at depths of least 1-ft over an 8-day period during part of the spawning season. 21 potential sites for construction were identified and investigated, 8 potential sites remain (See Figure 6). These remaining sites combined are estimated to identify approximately 40,000 acres which is above the 7,650 acres estimated to be needed to fulfill the mitigation required. Additional evaluation of these potential sites will continue concurrent with the investigations into Alternative 2a/b to determine the most optimal site for placement of the constructed project should a project end up needing to be constructed if Alternative 2a/b is not implementable.

Habitat assessment(s) will be completed on the specific sites utilizing the same USACE certified habitat assessment model(s) used to determine the functional impacts of the presented action (Smith, et al. 2002, and USACE. 1991). This information will be used to determine the final site location and size. The five HGM assessment variables, that are expected to differ at the potential mitigations sites include: 1) the size of the wetland tract associated with the mitigation parcel and the surrounding area, 2) the core area of the parcel, 3) the habitat connectivity of the parcel, 4) the flood frequency of the parcel, and 5) the flood duration of the parcel. The remaining 14 variables are expected to display the same HGM variable subindex scores at all agricultural lands in the project area that would be considered for mitigation establishment. As a result, the selection of the final mitigation site and site-specific designs will be guided by the values outlined in Tables 5-9 of the DEIS Wetlands Appendix which establish the minimum criteria used to design the sites for mitigation.

Active restoration of vegetation on the selected mitigation site in general will include preparing the site, restoring hydrology to the extent practical (based on projected future hydrology) and reforesting cleared and agricultural areas with naturally occurring and historically- occurring species. Considering the projected future hydrology in these areas, a mixture of bottomland hardwoods would be planted according to site conditions, as well as creating microtopography, providing earthwork, and conducting other hydrologic restorative activities. Final site design will be developed in accordance with HGM criteria based off of successful

mitigation taking place in the YSA (Wetlands Appendix, Smith and Klimas 2002 and Berkowitz 2019).

The summary of the baseline conditions of sites within the YSA are presented in Section 4. A narrative regarding the current hydrologic conditions, soils, vegetation, the wetland classification of the specific site based on the Hydrogeomorphic Approach (HGM) classification and the historic hydrology and stressors of the site will be included in the final site mitigation plan (if construction of a mitigation project is required).

If a project specific mitigation project is constructed the USACE commits to fully undertaking the monitoring, operation, and maintenance responsibilities to successfully complete the compensatory mitigation project and provide required funding for the full 50-year project life. Fee interest will be acquired in the lands, thus ensuring that no human activities will be allowed that could result in adverse effects to the constructed mitigation features to ensure protection of the site.

If Alternative 4a (constructed wetland mitigation project) is implemented the acquisition process would begin after the Record of Decision is signed. Specifically, presented work for the Project will not be commenced in waters of the United States (WOTUS) until the compensatory mitigation sites have been secured.

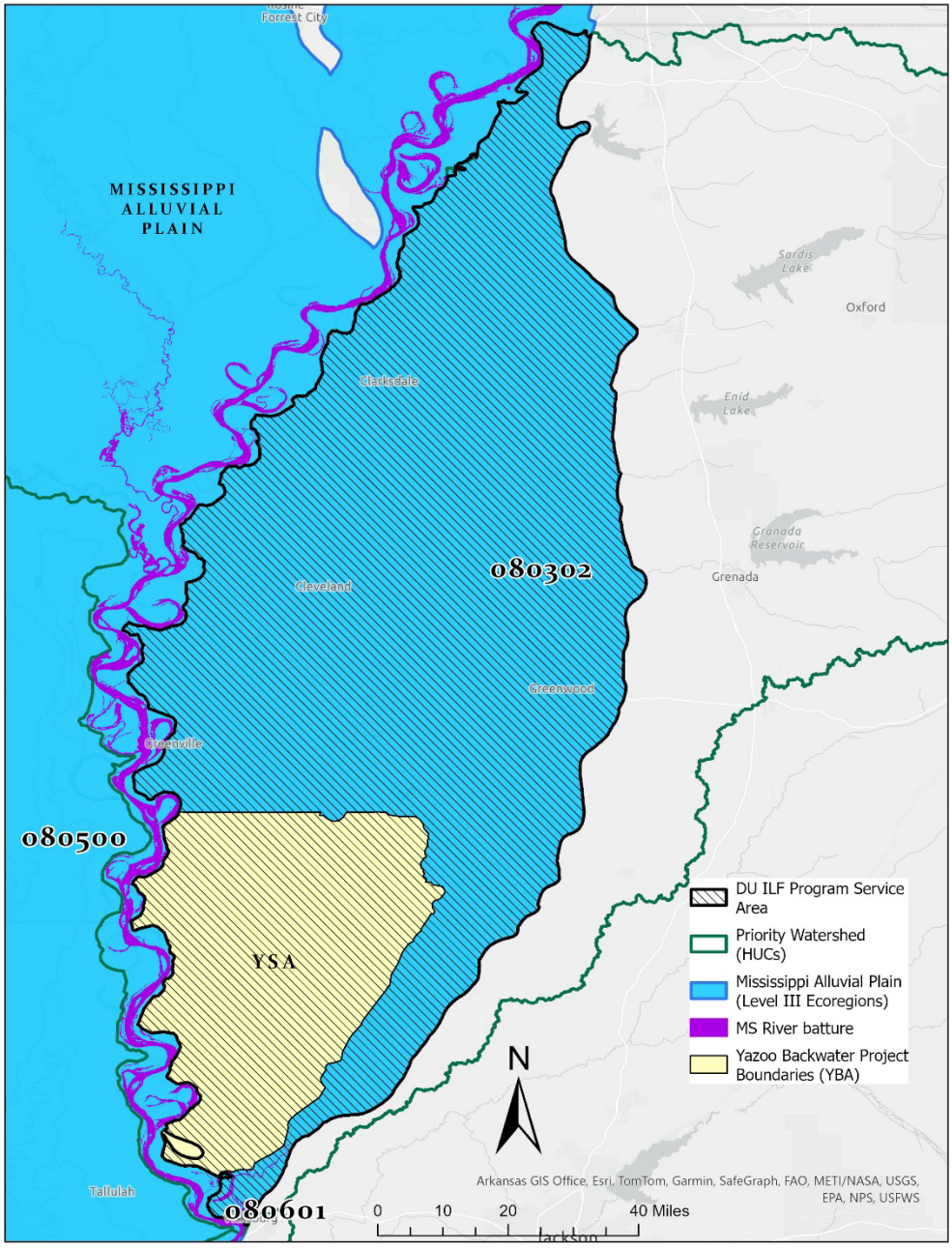

Figure 7: Alternative 2a/b. Service area for the Ducks Unlimited In Lieu Fee Program (Recommended Mitigation Plan for the Yazoo Backwater Management Project).

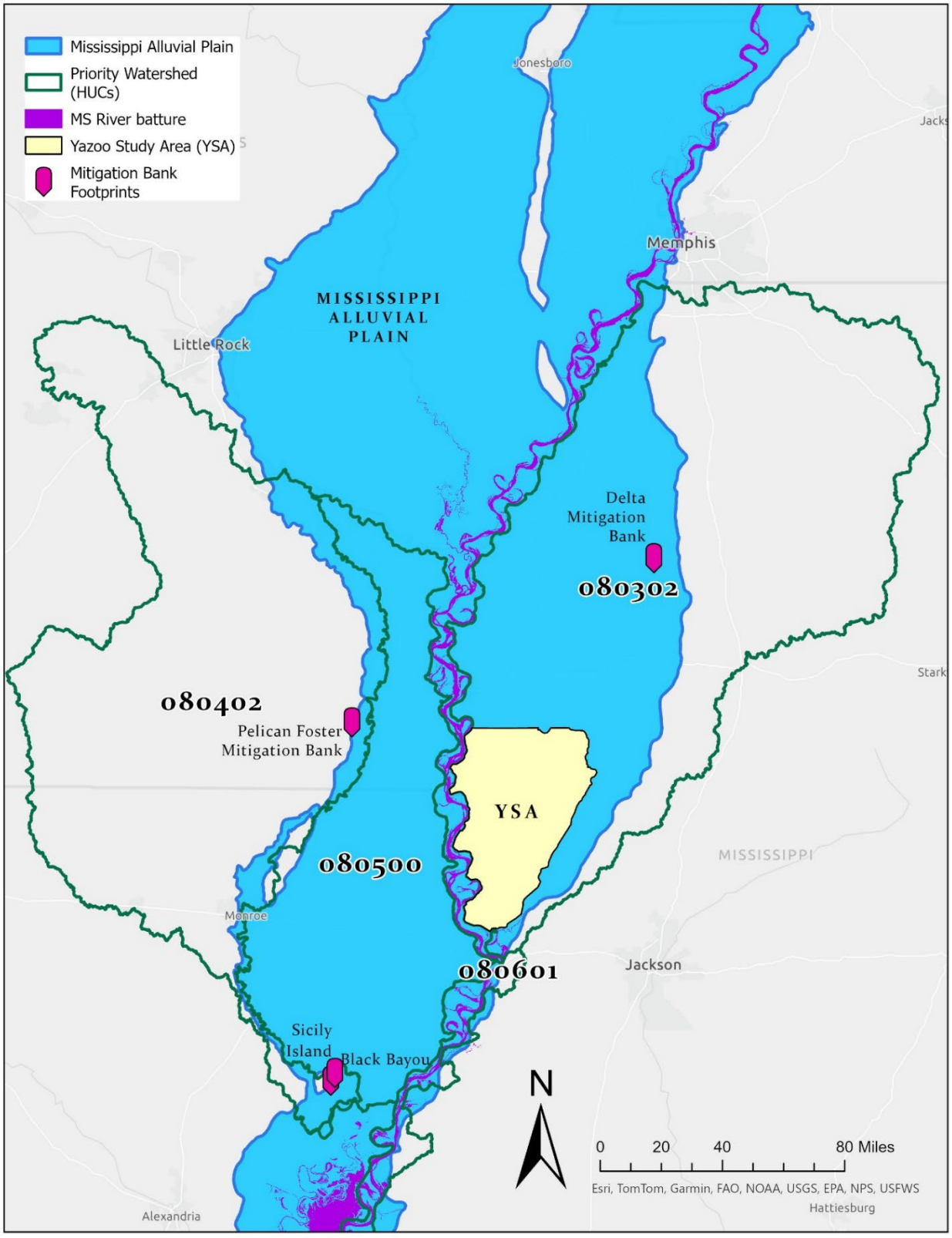

Figure 8: Mitigation Banks within the Yazoo Basin and the Alluvial Plain

10.3 Shorebird Impacts

In addition to purchase of ILF credits, mitigation bank credits and or a project specific construction project Measure 10 will be required to offset shorebird impacts of 352 AAHUs or approximately 403 acres . Numerous farmlands in the project area are managed for waterfowl during the waterfowl season, which require perimeter levees, water control devices, and water sources. A portion of these areas can be managed for shorebirds through inundation at depths that are suitable for shorebirds during the spring and fall migration periods. Likewise, additional agricultural areas could be purchased and water control devices, perimeter levees installed to allow for water management. Agricultural areas would be inundated during portions of the shorebird migratory period. Following the migratory period, the area would be planted for an agricultural commodity. Some agricultural techniques that require inundation, such as techniques for rice production may also be utilized to compensate for impacts if those techniques are complimentary to shorebird management.

Implementation Risks

The planning team identified a suite of foreseeable implementation risk factors across each phase of implementation (Pre-Construction Engineering and Design, Construction, and Operations). These factors are based upon experience from similar projects and the consideration of regional risks generally associated with design and construction work in wet environments. Each risk was assessed and assigned a significance level. Potential risk management measures were identified and will be considered should the need arise during implementation or adaptive management.

Table 13: Risk Assessment and Management Measures

Pre-Construction Engineering and Design Phase			
Risk Factor	**Risk Potential**	**Risk Rating**	**Risk Management Measures**
Increase in habitat impacts	Low	Low	Include mitigation sequence commitments in P&S development. Employ Best Management Practices in P&S. Confirm during BCOES review. Planning to make sure sites could be expanded with additional acreage.
Poor soil conditions	Low	High	Address through design considerations. Inability to address could lead to change in mitigation site or plan.
Construction Phase			
Risk Factor	**Risk Potential**	**Risk Rating**	**Risk Management Measures**
Excessive rainfall or flooding	Medium	Medium	Plan for construction during more favorable weather seasons. Anticipate weather events before initiating weather-dependent phases of construction. Use appropriate equipment for site conditions.
Construction management	Medium	varies	Monitor use of Best Management Practices during construction work. Confirm construction as-built requirements are met. Document all conditions pre- and post-construction at site.

Operations Phase			
Risk Factor	**Risk Potential**	**Risk Rating**	**Risk Management Measures**
Storm impacts to mitigation	High	High	Incorporate engineering with nature elements into mitigation design. Develop a storm impact assessment and response plan. Employ adaptive management measures to address impacts that prevent the achievement of ecological success criteria.
Herbivory	High	varies	Monitor vegetation for survival and resistance to herbivores. Adaptively manage by implementing exclusion or treatment measures to address herbivore impacts as needed.
Invasive Species	Medium	Low	Monitor vegetation. Adaptively manage by implementing invasive species control treatment measures as needed.

SECTION 11

Ecological Success Criteria

If Alternative 1a or 2a/b is implemented, then the identification of ecological success criteria is not needed (see Water Resources Development Act of 2007 Section 2036(c)(2)(B)). The operator is responsible for demonstrating and reporting that the success criteria are being met. Therefore, no specific ecological success criteria would be provided by the USACE.

The success criteria described below will be used in the event that Alterative 2a/b is not implementable and the construction of Alternative 4a is required to meet mitigation requirements.

11.1 General Construction

Complete all necessary earthwork and related construction activities in accordance with the mitigation work plan and the project plans and specifications. The necessary activities will vary with the mitigation site, but may include clearing, grubbing, and grading activities; construction of new water management features (weirs, flap-gates, diversion ditches, etc.); modifications or alterations to existing water control structures and surface water management systems; plantings; and eradication of invasive and nuisance plant species.

11.2 Topography

For mitigation features requiring earthwork (grading) to attain desired elevation:

a. Following completion of Gen2107522210eral Construction Criteria but prior to plantings:

- Demonstrate that at least 80% of the total graded area within each feature is within approximately +0.25 feet of the desired target soil surface elevation.

Notes:

1Elevation surveys must be taken to document achievement of success criterion. The resulting data and report will be provided to the interagency CMMT for review.

2The desired target elevation for each feature was determined during the final design phase.

11.3 Native Vegetation

A. Initial Success Criteria (at end of first growing season following the year planting meets construction requirements/years 1-3) –

1. Achieve a minimum average survival of 80% of planted canopy species.
2. The surviving plants must approximate the species composition and percentages specified in the initial plantings component of the final planting plan found in the project plans and specifications. This will include a minimum diversion measure or percent hard mast.
3. These criteria will apply to the initial plantings, as well as any subsequent re-plantings necessary to achieve this initial success requirement.

B. Intermediate Success Criteria (Target Year 5 and 8)

1. Submittal of a monitoring report
2. Verification of an 80% or greater survival rate (or 240 trees/acre) of planted species at the minimum required initial planting density of 302 trees/acre, hard mast species should comprise between 50 to 60% of total species planted,
3. Documentation verifying that hydrology restoration features are successful,
4. Demonstration of positive growth in planted tree: lateral canopy diameter, stem diameter, and/or height. Must have at least two additional feet in height from planted species, and at least 50% growth in lateral canopy from previous monitoring event.
5. Exotic and nuisance (*Chinese tallow, privet*, or other species as defined by the US Department of Agriculture National Invasive Species Information Center) species shall not comprise more than 5% cover and noxious species (e.g., *honey locust, black willow, Baccharis spp, cotton wood*) shall not comprise more than 15% of the total stem density.

Demonstrate that vegetation satisfies USACE hydrophytic vegetation criteria. Plant community must exhibit characteristics and diversity indicative of a viable native forested wetland community, i.e., vegetation community where more than 50% of all dominant species are facultative (FAC) or wetter.

C. Long-Term Success Criteria (Target Year 10 and maintained for the duration of the remaining 50-year monitoring period) will follow the success criteria identified in the HGM methodology. See the Wetlands Appendix Tables 8-10 for the Target Metric Values for each.

1. Wetland Track
2. Core Area
3. Habitat Connectivity
4. Minimum Flood Frequency (Years) Observed in completed mitigation sites
5. Mitigation sites will display a minimum hydroperiod of 5% of growing season
6. Portion of wetland exhibiting altered soils from recent activity
7. Change in Cation Exchange Capacity
8. Micro-depressional ponding
9. Tree Basal Area
10. Tree Density
11. Ground Vegetation Cover
12. Count of trees within a .04 ha plot
13. Vegetation Composition
14. Tree Composition
15. Woody Debris biomass
16. Shrub Sapling Density
17. Log Biomass
18. A horizon Biomass
19. O Horizon Biomass

11.4 Invasive and Nuisance Vegetation

Maintain the project area such that the total average vegetative cover accounted for by invasive species and the total average vegetative cover accounted nuisance species each constitute less than 5% of the total average plant cover each throughout the 50-year project life. The list of invasive and nuisance species will be tailored to reflect specific site needs but include *Chinese tallow tree, Chinese privet*, or other species as defined by the US Department of Agriculture National Invasive Species Information Center.

Note:
1Yearly inspections to determine the need for invasive/nuisance control would be conducted until the long-term success criteria for vegetation is achieved. After it is achieved, the frequency of inspections to determine the need for invasive/nuisance control would be adjusted based on site conditions.

11.5 Thinning of Native Vegetation (Timber Management)

The USACE, in cooperation with the CMMT, may determine that thinning of the canopy and/or mid-story strata is warranted to maintain or enhance the ecological value of the site. This determination will be made approximately 15 to 20 years following successful completion of plantings (General Construction). If it is decided that timber management efforts are necessary, the USACE will develop a Timber Stand Improvement/Timber Management Plan, and associated long-term success criteria, in coordination with the CMMT. Following approval of the plan, the USACE will perform the necessary thinning operations and demonstrate these operations have been successfully completed. Timber management activities will only be allowed for the purposes of ecological enhancement and maintenance of the mitigation site.

11.6 Hydrology

A. Intermediate and Long-term Success Criteria
Every 5 years through year 10 and then every 10 years through year 50 site hydrology will be assessed to determine that the site meets the wetland criterion as described in the USACE Wetland Delineation Manual and applicable regional supplement. (USACE 2010). Success criteria can be found in the Wetland Appendix Tables 8-9 which define metrics for the Minimum Flood Frequency years observed in completed mitigation sites and a minimum hydroperiod of 5% of the growing season.

SECTION 12

Planting Guidelines for Bottomland Hardwood (BLH) Habitats

If a project specific mitigation plan is constructed (Alternative 4a) a planting plan will be implemented. General guidelines are presented below and will be revised based on specific site conditions. Canopy species will be planted on 12-foot centers (average) to achieve a minimum initial stand density of 302 seedlings (trees) per acre. Stock will be at least 1 year old, at least 2 feet in height, have a minimum root collar diameter of 3/8 inch, have a root length of at least 8 to 10 inches with at least 4 to 8 lateral roots, and must be obtained from a registered licensed regional nursery/grower and of a regional eco-type species properly stored and handled to ensure viability. The plants will typically be installed during the period from December through February 15 (planting season/dormant season); however, unanticipated events such as spring flooding may delay plantings until late spring or early summer. The seedlings will be installed in a manner that avoids monotypic rows of canopy and midstory species (i.e. goal is to have spatial diversity and mixture of planted species). If herbivory may threaten seedling survival, then seedling protection devices such as wire-mesh fencing, or plastic seedling protectors will be installed around each planted seedling.

12.1 Species for Bottomland Hardwood Habitats (BLH- Habitats)

The canopy species installed will be in general accordance with the species lists provided in Tables 14A and 14B and in accordance with the Woody Vegetation Composition Class A dominants identified in Figure 26 in Smith and Klimas 2002. Plantings will be conducted such that the total number of plants installed in a given area consists of approximately 60% hard mast-producing species (Table 14A) and approximately 40% soft mast- producing species (Table 14B). The species composition of the plantings for each of the two groups of canopy species (e.g. hard mast species and soft mast species) should mimic the percent composition guidelines indicated in Tables 14A and 14B. However, site conditions (factors such as hydrologic regime, soils, composition of existing native canopy species, etc.) and planting stock availability may necessitate deviations from the species lists and/or the percent composition guidelines indicated in these tables. In general, a minimum of 3 hard mast species and a minimum of 3 soft mast species should be utilized.

The midstory species installed will be selected from the species list provided in Table 14C. Plantings will consist of at least 3 different species. The species used and the proportion of the total midstory plantings represented by each species (percent composition) will be dependent on various factors including site conditions (composition and frequency of existing native midstory species, hydrologic regime, soils, etc.) and planting stock availability.

Table 14a: Preliminary Planting List for Wet BLH Habitat, Hard Mast-Producing Canopy Species *(60% of Total Canopy Species)*

Common Name	Scientific name	Percent Composition
Nuttall oak	*Quercus nuttalli, Q. texana*	30% - 40%
Willow oak	*Quercus phellos*	30% - 40%
Water oak	*Quercus nigra*	5%
Overcup oak	*Quercus lyrata*	10% - 20%
Swamp chestnut oak	*Quercus michauxii*	10% - 20%
Water hickory	*Carya aquatica*	10% - 20%
Green ash	*Fraxinus pennsylvanica*	15% - 25%
Sweetgum	*Liquidambar styraciflua*	10% - 20%
American elm	*Ulmus americana*	10% - 20%
Bald cypress	*Taxodium distichum*	5% - 15%

Table 15b: Preliminary Planting List for Wet BLH Habitat, Soft Mast-Producing Canopy Species (40% of Total Canopy Species)

Common Name	Scientific name	Percent Composition
Drummond red maple	*Acer rubrum* var. *drummondii*	15% - 25%
Sugarberry	*Celtis laevigata*	15% - 25%

Table 16: Preliminary Planting List for Wet BLH Habitat, Midstory Species

Common Name	Scientific name	Percent Composition
Saltbush	*Baccharis halimifolia*	TBD
Buttonbush	*Cephalanthus occidentalis*	TBD
Roughleaf dogwood	*Cornus drummondii*	TBD
Mayhaw	*Crataegus opaca*	TBD
Green hawthorn	*Crataegus viridis*	TBD
Common persimmon	*Diospyros virginiana*	TBD
Honey locust	*Gleditsia triacanthos*	TBD
Possumhaw	*Ilex decidua*	TBD
Dahoon holly	*Ilex cassine*	TBD
Red mulberry	*Morus rubra*	TBD
Wax myrtle	*Myrica cerifera*	TBD

TBD = To Be Determined

12.2 Deviations from Typical Planting Guidelines

Presented mitigation features that involve restoration will commonly require planting the entire feature using the prescribed planting guidance addressed in the preceding sections. In contrast, mitigation features that involve enhancement will often require adjustments to the typical plant spacing/density guidelines and may further require adjustments to the guidelines pertaining to species composition.

Where initial enhancement activities include the eradication of invasive and nuisance plant species, significant numbers of native canopy and/or midstory species may remain, but in a spatial distribution that leaves relatively large “gaps” in the canopy stratum and/or the midstory stratum. In such cases, areas measuring approximately 25 feet by 25 feet that are devoid of native canopy species should be planted and areas measuring approximately 45 feet by 45 feet that are devoid of native midstory species should be planted.

The initial enhancement actions involved within a particular mitigation site could include measures such as the eradication of invasive and nuisance plant species, topographic alterations (excavation, filling, grading, etc.), and hydrologic enhancement actions (alterations to drainage patterns/features, installation of water control structures, etc.). These actions may result in areas of variable size that require planting of both canopy and midstory species using the typical densities/spacing described previously. There may also be areas where several native canopy and/or midstory species remain, thus potentially altering the general guidelines described as regards the spacing of plantings, and/or the species to be planted, and/or the percent composition of planted species. Similarly, areas that must be re-planted due to failure in achieving applicable mitigation success criteria may involve cases where the general guidelines discussed above will not necessarily be applicable.

Given these uncertainties, initial planting plans specific to enhancement features will be required and must be specified in the Mitigation Work Plan for the mitigation site. The initial planting plans will be developed by the USACE in cooperation with the CMMT. Initial plantings will be the responsibility of the USACE. If re-planting of an area is necessary following initial plantings, a specific re- planting plan must also be prepared in cooperation with the CMMT prior to re-planting.

1. Hydrologic Restoration
2. Maintenance Plan
3. Monitoring Sampling Methodology

If a mitigation project is constructed site monitoring will be performed in accordance with the HGM methodology outlined in Smith and Klimas 2002 and the ongoing wetland monitoring to determine the success of the mitigation work (see Annex 1 and Appendix K Section 7). The elements of the monitoring plan are designed to measure the attainment of ecological success criteria at key points over the course of the mitigation construction and operation periods.

The location of vegetation and hydrology monitoring plots will be identified at the specific mitigation site in accordance with the HGM methodology described in Smith and Klimas 2002 and in Appendix K Section 7.

SECTION 13

Monitoring And Adaptive Management

13.1 Recommended Plan

The recommended plan includes to be adjusted to meet the mitigation needs required by the selected plan and will be based on these same mitigation strategies (ILF credit purchases, Project Specific Mitigation Construction and Mitigation bank credit purchases). For an ILF Program or mitigation bank purchases a specific monitoring and adaptive management (MAM) plan is not needed (see Section 2036(c)(3)(A) of the Water Resources Development Act of 2007). In these instances, the operator is responsible for monitoring and reporting that the ILF program or bank is meeting performance expectations. In addition, the ILF program or bank is responsible for any contingency plans (adaptive management) for taking corrective actions in cases where monitoring demonstrates that mitigation measures are not achieving the ecological success criteria. The ILF program and or bank used is responsible for monitoring, reporting, and assuring performance of the mitigation bank in accordance with the requirements of the approved mitigation banking instrument.

13.2 Monitoring for a Project Specific Mitigation Plan

In the event that Alternative 4a is needed to meet mitigation need for construction monitoring and adaptive management will be a required part of the project. Below is a summary of the monitoring and adaptive management for Alternative 4a. It is noted that monitoring work also offers an opportunity to build upon partnerships with local interests, non-governmental organizations, universities, and the public. The CMMT is interested in these partnership opportunities. Parties interested in participating in monitoring efforts are encouraged to discuss potential work with the sponsors.

The Vicksburg District initiated a wetland function monitoring program for mitigation lands in the Yazoo Basin in 2000. This monitoring is being conducted by the U.S. Army Engineer Research and Development Center using the Hydrogeomorphic methodology used in the impact assessment.

Established monitoring techniques and published scientific resources will be used document increases in wetland functions as a result of compensatory mitigation and identify data-driven mitigation success trajectories and milestones. If a mitigation project is constructed site monitoring will be performed in accordance with the USACE mitigation regulatory program for the initial and intermediate success criteria and the HGM methodology outlined in Smith and Klimas 2002 and Berkowitz 2018 and the ongoing wetland monitoring to determine the long term success of the mitigation work (Appendix K Section 7). Table 15 includes a summary of monitoring work (monitoring will occur pre-project, baseline, years 1, 3, 5, 8, 10, 20, 30, 40 and 50). The elements of the monitoring plan are designed to measure the attainment of ecological success criteria at key points over the course of the mitigation construction and operation periods. This approach

ensures that the compensatory mitigation efforts effectively offset impacts to wetland resources and inform adaptive management strategies if the mitigation sites fail to meet the milestones.

In addition to the documentation of functional responses to implementation of the presented plan and the associated compensatory mitigation, an evaluation of potential changes in wetland hydroperiods will be conducted. The hydrology of wetlands within the study area has been identified as an area of concern, including the potential to decrease the duration or frequency of wetland hydroperiods and periods of flood water inundation.

While hydrologic studies have been completed in the region (Berkowitz et al., 2019), additional hydrologic monitoring are needed. Hydrologic monitoring conducted using shallow groundwater wells has proven effective in identifying both hydroperiod and hydropatterns within wetlands in the study area. The goal of water table monitoring is to acquire data related to potential hydrologic changes resulting from operation of the project, provide explanatory data related to observed changes in forested wetland function, and support adaptive operation of the project to improve wetland conditions if required.

The location of monitoring sites would consider multiple factors including: 1) flood duration and frequency, 2) proximity to surface waters and other hydrologic sources, 3) availability of historic or ongoing data collection efforts, 4) site access and continuity considerations, 5) forest successional stage and substrate (i.e., soils), and forested wetland condition (e.g., restored vs mature second growth wetlands).

The monitoring is further described in Appendix K Monitoring and Adaptive Management Section 7.

Table 17: Monitoring Activities

Year	Activity	Data
-1	Pre-construction surveys	Water-depth, hydrology, land cover
0	Pre-construction monitoring following HGM protocols Smith and Klimas 2002	Baseline ecological data; vegetation composition and structure
1	As-Built Surveys and Construction Completion Report	Confirm project is built to P&S
1	Topographic survey	ground elevation
1	Hydrologic monitoring	elevations must be conducive to establishment and support of hydrophytic vegetation
1	Vegetation survey	Invasive species removal needs; vegetation composition and structure
3	Hydrologic monitoring	demonstrating that wetland hydrology has been re-established
3	Vegetation survey	invasive species removal needs; vegetation composition and structure;
5	Hydrologic monitoring	demonstrating that wetland hydrology has been re-established
5	Vegetation survey	invasive species removal needs; vegetation composition and structure;

Year	Activity	Data
8	Hydrologic monitoring	demonstrating that wetland hydrology has been re-established
8	Vegetation survey	invasive species removal needs; vegetation composition and structure;
10	Vegetation survey	invasive species removal needs; vegetation composition and structure;
10	Hydrologic monitoring	demonstrating that wetland hydrology has been re-established
15	Vegetation survey	invasive species removal needs; vegetation composition and structure;
20	Vegetation survey	invasive species removal needs; vegetation composition and structure;
20	Hydrologic monitoring	demonstrating that wetland hydrology has been re-established
30	Vegetation survey	invasive species removal needs; vegetation composition and structure;
30	Hydrologic monitoring	demonstrating that wetland hydrology has been re-established
40	Vegetation survey	invasive species removal needs; vegetation composition and structure;
40	Hydrologic monitoring	demonstrating that wetland hydrology has been re-established
50	Vegetation survey	invasive species removal needs; vegetation composition and structure;
50	Hydrologic monitoring	demonstrating that wetland hydrology has been re-established
50	Final monitoring report	Comprehensive report

Reports documenting the monitoring activities and the results should be prepared after each activity and in accordance with Section 17. Results should be shared with the USACE and interested resource agencies. The project team should discuss the project at the district's annual mitigation consultation meeting with resources agencies (per Section 906(d)(4) of WRDA 1986, as amended).

Any adaptive management activities will be informed by the results of the project monitoring. It is important that a science-based monitoring plan target the collection of performance information that can help inform potential adaptive management actions if needed. Adaptive management allows the project team to use monitoring feedback to potentially make changes to project features or operations to improve attainment of ecological success criteria. This contingency plan outlines a range of corrective actions in cases where monitoring demonstrates that mitigation features are not achieving ecological success goals.

The ILF program and or mitigation bank operator is responsible for demonstrating and reporting that the success criteria are being met.

13.3 Adaptive Management for a Project Specific Mitigation Plan

Adaptive Management prescribes a process wherein management actions can be changed in response to monitored system response, as to maximize restoration efficacy or achieve a desired ecological state. If a project specific mitigation plan is required to be constructed, the project will

be adaptively managed to make sure success criteria are achieved. Figure 9 below shows a summarizing flowchart of the adaptive management process.

The basic steps include:

- Plan: Defining the desired goals and objectives, evaluating alternative actions, and selecting a preferred strategy with recognition of sources of uncertainty.
- Design: Identifying or designing a flexible management action to address the challenge.
- Implement: Implementing the selected action according to its design.
- Monitor: Monitoring the results or outcomes of the management action.
- Evaluate: Evaluating the system response in relation to specified goals and objectives.
- Adjust: Adjusting (adapting) the action if necessary to achieve the stated goals and objectives.

Figure 9: Adaptive Management Process

The mitigation site will be selected and developed to minimize risk and uncertainty. The items listed below will be incorporated into the mitigation project work plan to minimize project risks.

- Specified success criteria (i.e., mitigation targets)
- Detailed planting guidelines for BLH
- Invasive species control
- Supplementary plantings as necessary (contingency)
- Corrective actions to meet topographic and hydrologic success as required (contingency)

The adaptive management plan for Alternative 4a/b should a mitigation project need to be constructed is summarized in Table 13. If monitoring indicates success criteria are not being met potential corrective actions can include improvements of wetland sites conditions, changes in Yazoo project operations and or restoration of additional mitigation acreage to meet compensation mitigation need. Please see Appendix K Section 7 for the monitoring and adaptive management plans for a constructed wetland mitigation project.

A number of adaptive management strategies exist to address wetland functional gaps identified following implementation of the plan based upon data collected during monitoring activities as identified in Appendix K. These strategies would be initiated if 1) the impacts to wetlands within the impact area are more severe than anticipated or 2) the estimated benefits of mitigation activities fail to achieve the milestones outlined above. The data collection and monitoring

activities outlined above provide opportunities to identify the need for remedial action and determine what type of corrective actions are required to address a wetland functional shortfall. For example, if the hydrologic monitoring detects shifts in flood duration or frequency that exceed the estimates described in Table 53 in Wetlands Appendix then the unanticipated decrease in AAFCUs can be determined and addressed through implementation of additional compensatory mitigation. Also, if repeated measures HGM monitoring data demonstrates that the compensatory mitigation areas are not achieving the milestones outlined above adaptive management can conducted. For example, if mitigation locations do not display sufficient microtopography the soil surface can be contoured to create depressions that would retain water, improve habitat, and increase the wetland functional outcomes.

Three options exist to conduct adaptive management to address unanticipated impacts to wetland resources or shortfalls in mitigation performance. First, forested wetland conditions at established mitigation areas can be improved to increase functional capacity, generating additional FCUs and increasing the amount of AAFCUs provided by the mitigation lands over the period of analysis. Second, additional mitigation areas can be acquired and restored, increasing the AAFCUs generated over time. The third potential approach to increasing the performance of mitigation areas involves identifying opportunities to alter the operation of the project to increase wetland functional capacities.

A number of adaptive management techniques are available to improve wetland functions in established compensatory mitigation areas. Mitigation areas offer many opportunities for manipulation prior to seedling installation because most mitigation occurs on agricultural tracts devoid of native vegetation. For example, newly acquired fields can be shaped to increase microtopography and improve surface water storage capacity. Local hydrology can be manipulated to increase connectivity with surface water sources or decrease drainage rates through alteration of existing ditches. At a landscape perspective wetland functional score can be improved by linking forested tracts to increase connectivity with adjacent habitat. Once mitigation areas are established, active management of forest conditions may include re-planting areas subject to poor survival; selective removal or girdling trees to decrease stand density, improving conditions for adjacent tree growth, and provide for recruitment of snags/woody debris into forest stands.

Examples of specific actions that would improve functional outputs include: improved connectivity with sources of wetland hydrology (e.g., resizing culverts, maintenance of natural drainage features) to increase VFREQ and VDUR; expansion of adjacent forested tracts to increase VTRACT, VCORE, and VCONNECT; planting of desirable flood tolerant vegetation species and select species management (e.g., invasive/nuisance species control) to increase VCOMP; manipulation of ground conditions to increase ponding and storage of flood/rain water to increase VPOND, selective thinning to improve conditions for tree growth to increase VTBA, VSNAG, and other variables; and the removal/incorporation of carbon sources into the system to increase VWD, VLOG, VOHOR and other variables. Each of these activities alone would increase the functional status of wetlands. Implemented collectively have the potential to significantly improve functional wetland status within the compensatory mitigation tracts. However, the remedy selected should incorporate components which individually or collectively address the specific shortcomings identified in the HGM and hydrology monitoring phases described above. For

example, if the mitigation tracts already display variable subindex score of 1.0 for VCOMP, additional manipulation of species composition will not result in additional increases in FCI values. One major benefit of these ground-level adaptive management strategies is that they increase the generation of FCUs without requiring the acquisition of additional mitigation acres. Also, these activities can be accomplished without altering the operation of the project.

The acquisition of additional mitigation lands may be necessary if sufficient increases in wetland functions cannot be achieved through the active management of existing mitigation areas. Any additional land acquisitions should target the landscape conditions described above and adhere to the monitoring protocols, trajectories, and milestones herein. Mitigation areas are estimated to provide 4.78 AAFCUs per acre over the 50-year period of analysis (Table 23 and 24 in the Wetlands Appendix). As a result, a wetland functional shortfall of -478 AAFCUs would require establishment of 100 acres of additional compensatory mitigation. In some cases, alternative operation of the pump station may have the potential to result in higher levels of wetland function. Considering alternative pump station operation scenarios is complex due to the competing interests of flood risk reduction, water quality management, and natural resource benefits (including wetland functions). However, in some cases changing operational procedures may be applicable to the adaptive management of wetlands. For example, the project may have the capacity to maintain water levels during excessive drought periods to support wetland hydrology without increasing flood risk to infrastructure. Also, there may be benefits to alternating higher and lower water levels to increase the export of organic carbon to downstream environments, remove additional pollutants from surface waters, and improve habitat for floral and faunal communities.

Whether remedial activities occur the adaptive management of existing mitigation areas, the acquisition of additional mitigation parcels, or innovative operation of the pump station or other structures, the HGM and hydrology monitoring data provides valuable insight into the effect of any action. This targeted approach provides the best possible scenario under which to implement an adaptive management plan.

Table 18: Adaptive Management Actions

Element	Expected Condition	Potential Issue	Potential Corrective Action
Landscape characteristics	Bathymetry, elevation, and flood regime appropriate for sustainable growth of targeted vegetation	Inadequate hydrology	Improve site conditions such as Modify water depth, water table depth and frequency and or increase land elevation to reduce flooding
Vegetation community composition	Healthy vegetative communities	Invasive species dominance, poor tree survival, sub-optimal tree growth, incorrect community composition	Invasive species control, replanting larger tree for targeted species, canopy thinning or other forest management practices, alteration of project operation

The USACE would be responsible for the presented mitigation construction and monitoring. The USACE would monitor the completed mitigation to determine whether additional construction, invasive/nuisance plant species control, and/or plantings are necessary to achieve initial mitigation success criteria. If after meeting initial success criteria, the mitigation fails to meet its

intermediate and/or long- term ecological success criteria, the USACE would consult with other agencies and the NFS to determine the appropriate management or remedial actions required to achieve ecological success. The USACE would retain the final decision on whether or not the project's required mitigation benefits are being achieved and whether or not remedial actions are required. If structural changes are deemed necessary to achieve ecological success, the USACE would implement appropriate adaptive management measures in accordance with the contingency plan and subject to cost-sharing requirements, availability of funding, and current budgetary and other guidance.

SECTION 14

Reporting for a Project Specific Mitigation Project

REPORT REQUIREMENTS ONLY APPLY IF A PROJECT SPECIFIC MTIGATION PLAN IS IMPLEMENTED

14.1 Baseline Monitoring Report (First Monitoring Report)

Within 90 days of completion of all final construction activities (e.g., eradication of invasive and nuisance plants, planting of native species, completion of earthwork, grading, surface water management system alterations/construction, etc.) associated with General Construction, a "baseline" monitoring report will be prepared. Information provided will typically include the following items:

- A detailed discussion of all mitigation activities completed.
- A description of the various features and habitats within the mitigation site. Various qualitative observations will be made to document existing conditions and will include, but not be limited to, potential problem zones, general condition of native vegetation, and wildlife utilization as observed during monitoring.
- A plan view drawing and shapefiles of the mitigation site showing the approximate boundaries of different mitigation features including planted areas, planted rows, areas involving eradication of invasive and nuisance plant species, surface water management features, access rows, presented monitoring transects locations, sampling plot locations, photo station locations, and if applicable, piezometer and staff gage locations.
- Initial and final construction surveys for areas having had topographic alterations, including elevations of all constructed surface water drainage features, drainage culverts, and/or water control structures. The initial and final construction surveys should also include cross-sectional surveys of topographic alterations involving the removal of existing linear features such as berms/spoil banks, or the filling of existing linear ditches or canals. The number of cross-sections must be sufficient to represent elevations of these features. The initial and final construction surveys must include areas where existing berms, spoil banks, or dikes have been breached.
- A detailed inventory of all canopies and midstory species planted, including the number of each species planted and the stock size planted. In addition, provide an itemization of the number of each species planted and correlate this itemization to the various areas depicted on the plan view drawing of the mitigation site.
- Photographs documenting conditions in the project area will be taken at the time of monitoring and at permanent photo stations within the mitigation site. At least two

photos will be taken at each station with the view of each photo always oriented in the same general direction from one monitoring event to the next. The number of photo stations required, and the locations of these stations will vary depending on the mitigation site. The USACE will make this determination in coordination with the CMMT and will specify the requirements in the project-specific Mitigation Monitoring Plan. At a minimum, there will be 4 photo stations established. For mitigation sites involving habitat enhancement/earthwork only, permanent photo stations will primarily be established in areas slated for planting of canopy and mid-story species, but some may also be located in areas where plantings are not needed.

- Multiple baseline reports may need to be submitted if additional plantings are required by the contractor to meet planting survival acceptance criteria. Each revision will be updated to incorporate information regarding the re-planting.

14.2 Additional Monitoring Reports

All monitoring reports generated after the Baseline Monitoring Report will be called Initial, Intermediate or Long-Term Success Criteria Monitoring Reports and shall be numbered sequentially based on the year in which the monitoring occurred (i.e., Initial Success Criteria Monitoring Report 2019). All Monitoring Reports shall provide the following information unless otherwise noted:

- All items listed for the Baseline Monitoring Report with the exception of: (a) the topographic/construction surveys, although additional topographic surveys are required for specific monitoring reports (see below); and (b) the inventory and location map for all planted species.
- A brief description of maintenance and/or management and/or mitigation work performed since the previous monitoring report along with a discussion of any other significant occurrences.

  Quantitative data collection in accordance with the HGM methodologies and procedures described in Smith and Klimas 2002 and the Wetlands Appendix, Berkowitz 2019 and or any other requirements for initial and intermediate success criteria.
- Photographs will be taken to document conditions at each permanent monitoring plot and along each permanent monitoring transect. Two photos at each station will be taken, one facing north and one facing south.
- A summary of rainfall data will be collected during the year preceding the monitoring report based on rainfall data recorded at a station located on or in close proximity to the mitigation site. Once all hydrology success criteria have been achieved, reporting of rainfall data will no longer be required.
- Summary of Pump Operations and hydrology in the Yazoo Basin.
- In addition, various qualitative observations will be made in the mitigation site to help assess the status and success of mitigation and maintenance activities. These

observations will include general estimates of the average percent cover by native plant species in the canopy, midstory, and understory strata; general estimate of the average percent cover by invasive and nuisance plant species;

  - general estimates concerning the growth of planted canopy and mid-story species;
  - general observations concerning the colonization by volunteer native plant species;
  - general observations made during the course of monitoring will also address potential problem zones, general condition of native vegetation, trends in the composition of the plant communities, wildlife utilization as observed during monitoring, and other pertinent factors.

- A summary assessment of all data and observations along with recommendations as to actions necessary to help meet mitigation and management/maintenance goals and mitigation success criteria.
- A brief description of anticipated maintenance/management work to be conducted during the period from the current monitoring report to the next monitoring report.

14.2.1 Monitoring Reports Involving Timber Management Activities

In cases where timber management activities (thinning of trees and/or shrubs in the canopy and/or mid-story strata) have been approved by the USACE in coordination with the CMMT, monitoring will be required in the year immediately preceding and in the year following completion of the timber management activities (i.e. pre-timber management and post-timber management reports). These reports must include data and information that are in addition to the typical monitoring requirements. The presented Timber Stand Improvement/Timber Management Plan must include the presented monitoring data and information that will be included in the pre-timber management and post-timber management monitoring reports. The presented monitoring plan must be approved by the USACE in coordination with the CMMT prior to the monitoring events and implementation of the timber management activities.

14.2.2 Monitoring Reports Following Re-Planting Activities

Re-planting of certain areas within the mitigation site may be necessary to ensure attainment of applicable native vegetation success criteria. Any monitoring report submitted following completion of a re-planting event must include:

- an inventory of the number of each species planted and the stock size used;
- a depiction of the areas re-planted, cross-referenced to a listing of the species and number of each species planted in each area;
- documented GPS coordinates for the perimeter of the re-planted area. If single rows are replanted, then GPS coordinates should be taken at the end of the transect; and
- all requirements listed under “Additional Monitoring Reports” of the Mitigation Monitoring Guidelines.

14.2.3 Mitigation Monitoring Schedule and Responsibilities

Monitoring will be dependent upon site conditions but may be delayed until later in the growing season due to site conditions or other unforeseen circumstances. Monitoring reports submitted as soon as possible but no later than December 31 of that year.

The USACE will be responsible for conducting the monitoring events and preparing the associated monitoring reports throughout the 50-year project life:

1. General Construction
2. Topography
3. Native Vegetation
4. Invasive & Nuisance Vegetation

If the initial survival criteria for planted canopy species are not achieved (i.e. the initial success criteria specified in native vegetation success criteria, the CMMT will convene to decide by consensus between two remedial actions. 1) Complete replant or supplemental replant or 2) Wait one growing season, monitor for initial success again, and reconvene with the CMMT to discuss results and determine path forward. If a replant is selected, a monitoring report will be required for each consecutive year until two annual sequential monitoring reports indicate that all survival criteria have been satisfied (i.e. that corrective actions were successful). If the CMMT decides not to replant, then after one growing season another initial monitoring report will be prepared and the CMMT will reconvene to determine path forward. The USACE will be responsible for conducting this additional monitoring and preparing the monitoring reports. The USACE will also be responsible for the purchase and installation of supplemental plants needed to attain the initial success criterion, subject to the provisions mentioned in the Introduction section.

If the native vegetation success criteria specified in the Native Vegetation section are not achieved, a monitoring report will be required for each consecutive year until two annual sequential reports indicate that these criteria have been satisfied.

If timber management activities are conducted, additional monitoring and monitoring reports would be necessary for such activities (e.g. one monitoring event and report in the year immediately preceding timber management activities and one monitoring event and report in the year that timber management activities are completed). Management activities conducted should be documented in the monitoring report.

Twenty years following completion of initial plantings, the number of monitoring plots and/or monitoring transects that must be sampled during monitoring events may be reduced substantially if it is clear that mitigation success is proceeding as anticipated.

SECTION 15

References and Resources

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15.1 Additional References

15.1.1 Laws

Clean Water Act (33 U.S.C. 1531 et seq)

Coastal Zone Management Act of 1972

Endangered Species Act (16 USC 1531 et seq)

Estuary Protection Act of 1968

Fish and Wildlife Coordination Act

Magnuson – Stevens Fishery Conservation and Management Act (16 USC 1801 et seq)

Migratory Bird Treaty Act of 1918

National Environmental Policy Act

Water Resources Development Acts of 1986, 1990, 2000, 2007, 2014, and 2016.

15.1.2 Implementation Guidance

Implementation Guidance for Section 2036(a) of the Water Resources Development Act of 2007 (WRDA 07) - Mitigation for Fish and Wildlife and Wetlands Losses. Issued by ASA(CW) 31 August 2009.

Implementation Guidance for Section 1162 of the Water Resources Development Act of 2016 and Section 1040 of the Water Resources Reform and Development Act of 2014, Fish and Wildlife Mitigation (Section 906 of the Water Resources Development Act of 1986, as amended (33 U.S.C. 2283)) Issued by ASA(CW) 08 March 2019.

Implementation Guidance for Section 1163 of the Water Resources Development Act of 2016, Wetlands Mitigation. Issued by ASA(CW) 08 March 2019.

15.1.3 Policy

Cost Sharing for Lands Associated with Fish and Wildlife Mitigation. Issued by USACE Director of Civil Works 19 September 2006.

15.1.4 Regulations

33 CFR 332. Compensatory Mitigation for Losses of Aquatic Resources (FR V. 73 No. 70, April 10, 2008). Department of Defense, Department of the Army, Corps of Engineers. 33 CFR Parts 325 and 332.

33 CFR 332.4(c),33 U.S.C. 2283(i)(4)

33 U.S.C. 2317b,

40 CFR 1500.3(b)(2), include alternatives input from State, Tribal and local governments.

40 CFR 1503.3(e), cooperating agencies must cite statutory authority to specify mitigation.

40 CFR 1508.5, definition of cooperating agency.

40 CFR 1508.20, definition of mitigation.

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