



# Pearl River Basin, Mississippi, Federal Flood Risk Management Project

## Appendix J - USFWS Coordination Act Report and USACE Responses



**July 2025**

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# United States Department of the Interior



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November 13, 2024

Colonel Jeremiah A. Gipson  
Vicksburg District Commander  
U.S. Army Corps of Engineers  
4155 Clay Street  
Vicksburg, Mississippi 39183

Dear Colonel Gipson:

Enclosed is our draft interim Fish and Wildlife Coordination Act (FWCA) (48 Stat. 401, as amended; 16 U.S.C. 661-667e) report for the Pearl River Basin, Mississippi Federal Flood Risk Management Project (Project) in Hinds and Rankin Counties, Mississippi. This is presented in partial fulfillment of FWCA and does not constitute the final report of the Secretary of the Interior as required by Section 2(b) of the FWCA. We consider this a partial fulfillment since your agency is still reviewing a range of alternatives to achieve flood damage reductions, and the plan for implementation has not been identified and further refined. In addition, your agency has not fully identified and refined mitigation measures for loss of riverine function and habitat for each alternative. The U.S. Fish and Wildlife Service (Service) continues to support ongoing coordination and planning for riverine mitigation.

The purpose of the proposed Project is to identify and evaluate alternatives to improve flood risk management for the Jackson metropolitan area along the Pearl River in Hinds and Rankin Counties, Mississippi. A number of alternatives are being considered and evaluated, including both structural and nonstructural solutions (DEIS 2024). Our draft report presents expected ecological impacts, recommendations to avoid or minimize those impacts, conservation measures, and proposed mitigation measures for these alternatives.

The Service continues to advocate for a plan that balances the needs of fish, wildlife, and wetland resources alongside the need to provide flood risk management for the Jackson metropolitan area. We favor a plan that provides flood risk management benefits without the construction of a weir and the resulting impoundment, thus protecting important riverine functions and habitats. In our opinion, a weir will have the greatest adverse impact on fish and

wildlife resources in the Project area. Therefore, our position is that the currently proposed Alternatives C and D do not meet the Service's fish and wildlife resource planning goals and objectives and are not environmentally acceptable.

We recommend that the USACE fully consider the ecological restoration and recreational potential to the Pearl River within the Project area with Alternative E, a proposed structural solution that does not include a weir and resulting impoundment. We believe a flood reduction solution for the Jackson metropolitan area is achievable that provides recreational and economic development opportunities and protects important riverine functions for current and future generations.

We appreciate the opportunity to provide our draft interim FWCA Report on the Pearl River Basin, Mississippi Federal Flood Risk Management Project. If you have any questions or require additional information, please contact our point of contact for this project, David Felder (769-487-6850).

Sincerely,  
**JAMES  
AUSTIN**

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cc: Environmental Protection Agency, Atlanta, GA  
Mississippi Department of Wildlife, Fisheries, and Parks  
Mississippi Department of Marine Resources  
Fish and Wildlife Service, Ecological Services, Louisiana Field Office  
Louisiana Department of Wildlife and Fisheries

Fish and Wildlife Coordination Act Report  
Pearl River Basin, Mississippi Federal Flood Risk  
Management Project



U.S. Fish and Wildlife Service  
Ecological Services  
Jackson, Mississippi  
November 2024

# Table of Contents

Introduction.....	6
History .....	7
Description of Project Area.....	8
Water Quality.....	12
Lower Pearl River Basin.....	13
Hydrology .....	13
Fish and Wildlife Resources .....	15
Aquatic Resources.....	15
Terrestrial Resources.....	17
Conservation Lands.....	18
Threatened and Endangered Species.....	18
At-risk Species and Species of Concern.....	21
Migratory Birds .....	23
Fish and Wildlife Resources Planning Goals and Objectives.....	24
Description of Alternatives and Preliminary National Economic Development Plan.....	26
Alternative A1 .....	26
Alternative C .....	26
Alternative D.....	27
Alternative E.....	28
National Economic Development Plan .....	28
Description of Impacts.....	29
Alternative A1 .....	29
Alternative C .....	29
Alternative D.....	38
Alternative E.....	38
Habitat Evaluation Procedures Analysis .....	39
Conservation Measures and Recommendations .....	41
Summary of Findings and Service Position.....	48

Literature Cited ..... 51

# Introduction

The U.S. Fish and Wildlife Service (Service) has prepared this draft Fish and Wildlife Coordination Act (FWCA) (48 Stat. 401, as amended; 16 U.S.C. 661-667e) report for the Pearl River Basin, Mississippi Federal Flood Risk Management Project (Project), Hinds and Rankin Counties, Mississippi. This Act requires that the U.S. Army Corps of Engineers (USACE) coordinate with the Service to ensure that wildlife conservation be given equal consideration alongside other features of water-resource development programs through planning, development, maintenance, and coordination of wildlife conservation and rehabilitation. This report is presented in partial fulfillment of FWCA and does not constitute the final report of the Secretary of the Interior as required by Section 2(b) of the FWCA. Once a plan for implementation is selected and additional analysis is completed during the pre-construction engineering and design (PED) phase, the Service will complete its final FWCA obligations.

The purpose of the Project is to provide flood reduction benefits for the Jackson metropolitan area. Planning opportunities being considered include providing recreational opportunities along the Pearl River for the City of Jackson and adjacent areas in Hinds and Rankin Counties, Mississippi. The USACE has prepared a draft environmental impact statement (DEIS, 2024) to analyze flood risk management plans that can be implemented under section 3104 of the Water Resources Development Act of 2007.

The USACE has identified a range of alternatives for providing flood risk management to the Jackson metropolitan area including a nonstructural alternative (Alternative A1), a channel improvement with new weir structural alternative (Alternative C), and two combination-thereof (CTO) alternatives (Alternative D with a new weir, Alternative E without a weir). Each alternative is further defined in the Description of Alternatives section.

The USACE has not made a final determination on which of the alternatives would be the national economic development (NED) plan; however, Alternative D has been identified as the preliminary NED plan. Due to limited design maturity and the inability to sufficiently refine alternative costs, a final NED determination has not been made. The USACE is currently assessing the environmental acceptability and technical feasibility of the alternatives and will provide the Secretary of the Army the information necessary to choose a plan.

Because of the high habitat diversity, the complexity of hydrological relationships to ecosystem structure and function, and some structural modification to the system, numerous studies, reports, and data sources were available to develop and evaluate recommendations for the Pearl River. In previous assessments of flood control alternatives, the Service concluded that Alternative C (channel improvements, widening, and construction of a large weir) was the most ecologically

damaging of those presented (USACE, 2020), and our position has not changed. This evaluation is based on current data and analysis available from USACE sources and Service files. Additional Service involvement for subsequent detailed planning, engineering design, and construction phases of each planning effort is required to fulfill our responsibilities under FWCA. Additionally, as pointed out in the USACE's mitigation plan, the Service is concerned that mitigating function and habitat loss of the southeast region's fourth largest river system may be challenging, particularly for permanent adverse impacts related to construction of a large weir and impoundment.

This FWCA report has been provided to the Mississippi Department of Wildlife, Fisheries, and Parks (MDWFP), the Louisiana Department of Wildlife and Fisheries, and the Louisiana Ecological Services Field Office for comment. Their comments will be incorporated in and attached to the final report as provided. The Service under the authority of FWCA, worked with representatives of the USACE to assess fish and wildlife resources in the area, evaluate alternatives, address issues and objectives, and recommend any preliminary measures for protection and conservation of resources. We will continue to cooperate in ongoing and additional investigations regarding potential impacts, conservation, and mitigation measures.

## History

Altered river systems generally reduce their natural capacity to retard flood flows, absorb pollutants, anchor soils, reduce sediment loads, and support natural resources. Consequences from ongoing timber and agriculture land-use practices, upstream and tributary alterations, and floodplain encroachment prompted flood control investigations within the Pearl River Basin. Efforts such as the River and Harbor Act of 1945 and the Flood Control Act of 1946 resulted in construction of the Jackson and East Jackson levees, with pumping plants to relieve interior ponding and to promote floodplain development. However, such flood control measures did not eliminate flooding issues, as evidenced by the devastating flood of 1979. This cycle of alleviating flood issues, while simultaneously opening the floodplain to more development, has potentially exacerbated the issues.

The Ross Barnett Reservoir (RBR) was constructed in the early 1960's, resulting in a 33,000-acre impoundment that inundated 16 miles of the former river and floodplain. As pointed out in previous Service assessments, the RBR removed the upper one-third of the drainage basin from contributing sediment to the riverine system. Reports indicate that incision and degradation of the Pearl and Strong Rivers were caused by the RBR (Kennedy and Hasse 2009). Such destabilization and degradation led to a decline in aquatic resources (Tipton et al. 2004). Additionally, research revealed that the Pearl River south of its confluence with the Strong River had undergone a dramatic change, with gravel substrates being replaced with unstable sand

substrate following construction of the reservoir (Piller et al. 2004). Further analysis is needed to determine if and how much the system has stabilized.

Urban encroachment into the floodplain in the Jackson area necessitated flood control measures that included construction of levees initiated in 1968 along 13.2 miles of the Pearl River. Those flood control measures were inadequate in protecting against the 1979 flood where levees were flanked or nearly overtopped. Following the 1979 flood, local entities formulated measures that included a cleared floodway, removal of vegetation and other encroachments, a diversion canal, pumping plants, and expansion of the existing levee and channel system. Further constricting flows or influencing water surface elevation are highways 43, 25, Old Brandon Road, U.S. 80, Interstates 55 and 20, and railroad bridges at Jackson Water Works and upstream of highway 80.

In 1983, Congress authorized the Four-Point Plan whose primary component was clearing within the floodway, which occurred in 1984. In 1996, USACE examined the feasibility of constructing additional levees along both sides of the Pearl River to provide flood control to the greater Jackson area. However, no local sponsor agreed to cost-share project implementation. Subsequently, the Two Lakes Plan and LeFleur Lakes Plan were also investigated but determined infeasible.

### Description of Project Area

Forming from the confluence of Nanih Waiya and Tallahaga Creeks in Neshoba County, the Pearl River Basin meanders over 400 miles and drains over 8,500 square miles through Mississippi and South Louisiana before emptying into the Mississippi Sound (Figures 1 and 2). Major waterbodies include the Pearl, Yockanookany, Strong, and Bogue Chitto Rivers. The basin also includes the state's largest surface source of drinking water, the RBR (RM 301.77). The impoundment inundated approximately 16 miles of the Pearl River, and the normal pool covers approximately 33,000 acres. Also, within the Project area, at RM 290.7, is a weir (i.e. low-head dam) built for the city's water supply (J.H. Fewell Water Treatment Plant).

Several levees and flood control structures exist within the Project area. Also, some structures have been elevated above the 100-year flood mark through fill or piling. Two former landfills (Gallatin Street and Jefferson Street) and former Gulf States Creosote plant exist in the Project area. One of those, Gallatin Street, extends centrally into the floodplain, further restricting flow.

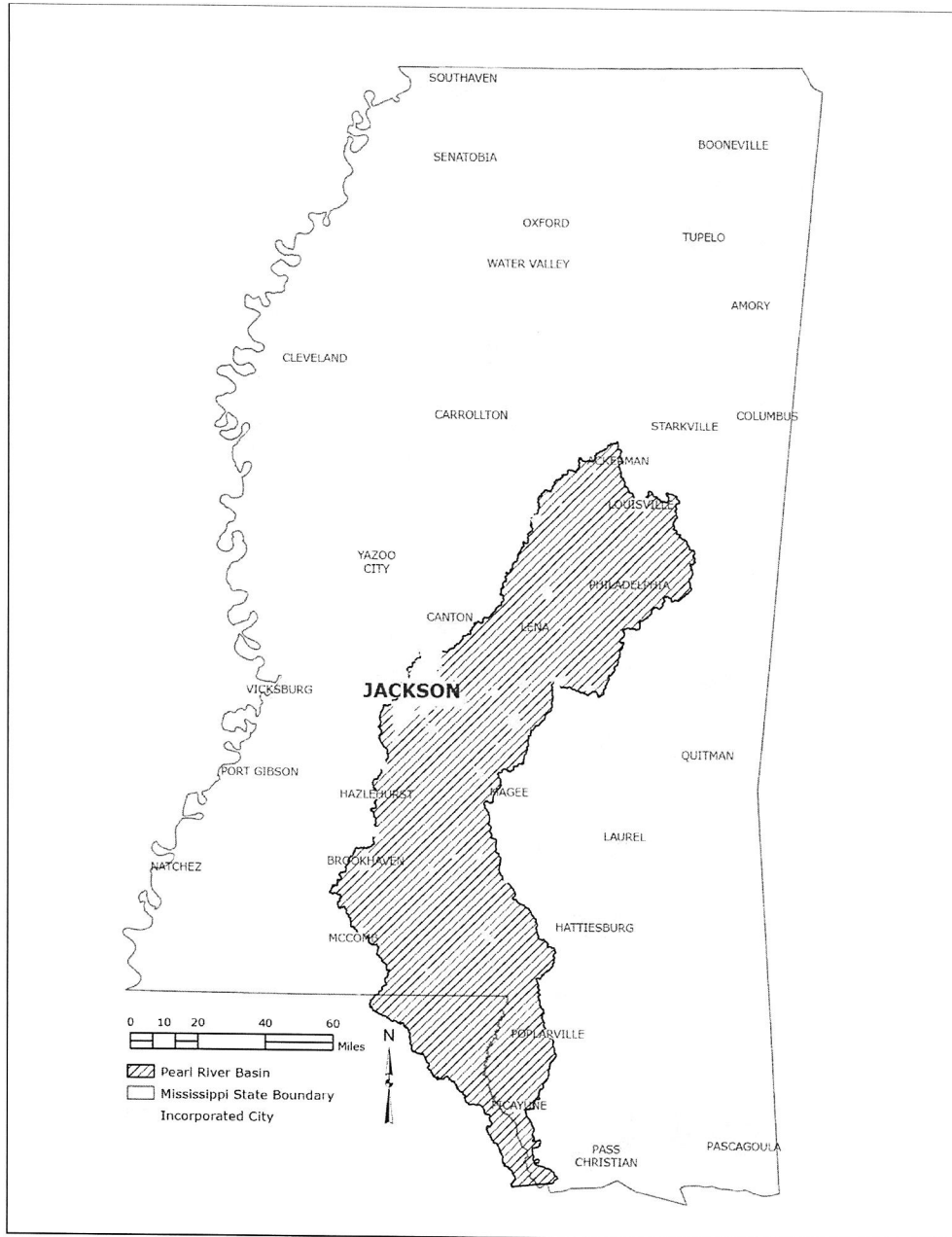


Figure 1. Map of Pearl River Basin, Mississippi, and portion of Louisiana.

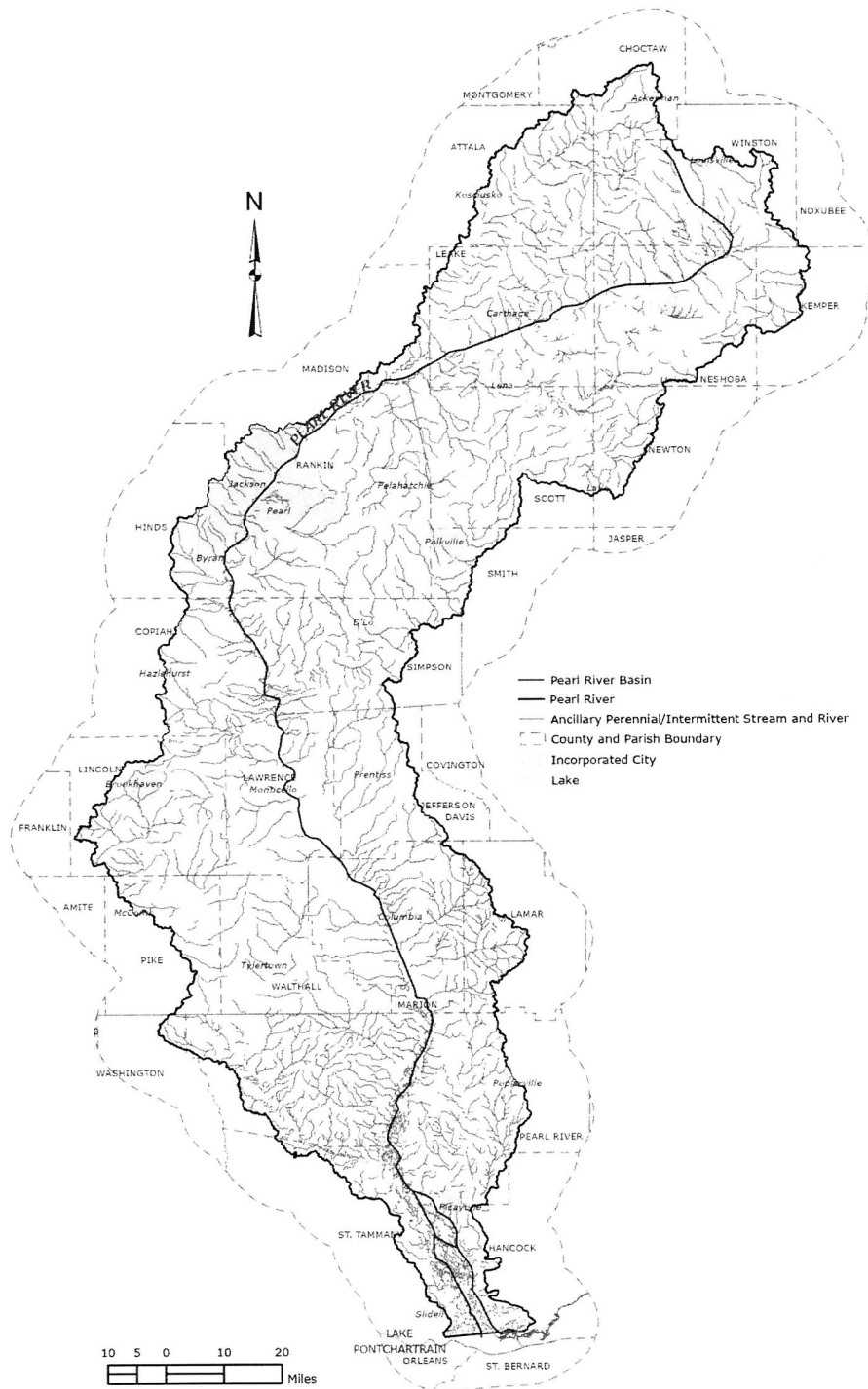


Figure 2. Map of the Pearl River Basin watershed.

The USACE defined the study or Project area as the floodplain from RBR to just south of Byram (RM 270.0 – RM 301.77) (Figure 3), however, flood inducements are anticipated as far downstream as the confluence of Copiah Creek south of Georgetown, Mississippi (RM 223). Therefore, the Service considers the area for which direct and indirect effects could occur to include the Pearl River floodplain from the RBR Dam (RM 301.77) downstream approximately 79 miles to the confluence of Copiah Creek near RM 223; and includes land in Copiah, Hinds, Madison, and Rankin Counties, Mississippi.

The floodplain averages 3 miles wide. Land along this portion includes low swamp areas, pastureland, cropland, forests, residential, and commercial development. This Project area is drained by several small tributaries of the Pearl River including Town, Hanging Moss, Eubanks, Lynch, Richland, Hardy, Caney, Purple, and Hog Creeks, and many additional tributaries downstream to just south of Georgetown, Mississippi. Alteration of the 650-foot-wide cleared strip of floodplain along the river within the Jackson metropolitan area contains reduced habitat quality, as do the 13.2 miles of earthen levees. Such flood control features have fragmented and reduced the value of floodplain habitat directly within those areas. However, remaining areas provide higher quality habitat and a travel corridor for wildlife.

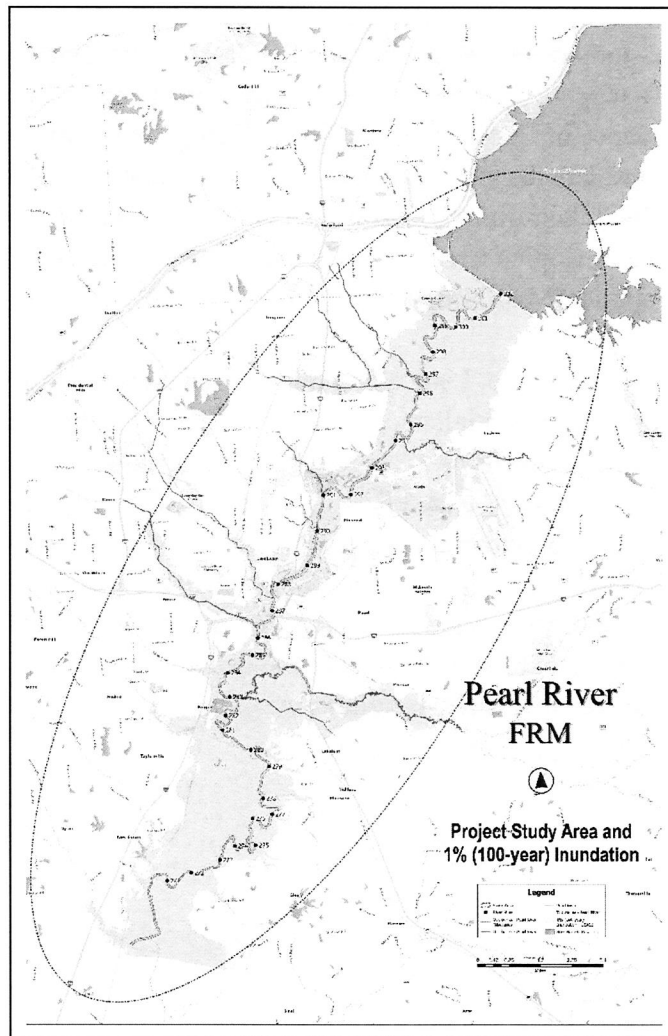


Figure 3. Project study area and 1% (100-year) inundation (MVK).

### Water Quality

Water quality in the Pearl River main stem as well as its tributaries varies with some urban tributaries not meeting all water quality standards. According to the Mississippi Department of Environmental Quality (MDEQ), more than half of streams monitored in the Pearl River Basin are rated good or very good, while another 23 percent are rated fair in supporting aquatic resources. Concerns reported from poor water quality include organic enrichment, low dissolved oxygen (DO), and sediment possibly resulting from bank instability and surrounding land uses. Urban influences have reduced water quality within the Project area but may improve downstream with flushing and dilution. During droughts, minimal discharge from the RBR at times could be below that required for adequate dilution and flushing of the wastewater facilities discharges. Additionally, the MDEQ reported ongoing issues with sewage leaking from

Jackson's wastewater pipes and flowing into tributaries and ultimately the Pearl River. As mentioned, there are also several hazardous waste sites located within the Project area.

The bed and banks of the river are comprised of silts, sands, sandstone, and clays, including marl, with gravel deposits (Monroe 1954). Overall, the basin has a gentle slope with that of the tributaries being less than 10 feet per mile except near the headwaters, where it is greater. The downstream slope of the Pearl River is approximately one foot per mile with the floodplain sloping less than 2 feet per mile (Monroe 1954; Wilson and Landers 1991).

#### Lower Pearl River Basin

Due to concerns regarding downstream resources, the USACE continues to assess impacts to the Pearl River downstream of the proposed project to the Mississippi Sound. Downstream of the Project area, the Pearl River flows through rural areas, primarily forested, two cities – Columbia and Monticello, and some smaller towns. The Strong River (RM 227) and Silver Creek (RM 186) are the two largest tributaries in Mississippi and the Bogue Chitto River of Louisiana (RM 37) is the largest in the lower Pearl River.

In the lower watershed, the West Pearl River Navigation Project was completed in 1953, and includes three navigation locks and two low-head dams (*i.e.*, sills) located on the Bogue Chitto River and the Pearl River at Poole's Bluff. The Pearl River becomes braided with numerous bifurcations around Bogalusa, Louisiana, which eventually give way to swamps then tidal marshes. Saline marshes occur as a fringe along the Gulf coast. The West Pearl River flows 44 miles emptying into the Rigolets, which is the principal outlet from Lake Pontchartrain into Lake Borgne. The East Pearl flows 45 miles, forming the state line between Mississippi and Louisiana and empties into the Gulf of Mexico via Lake Borgne and Mississippi Sound.

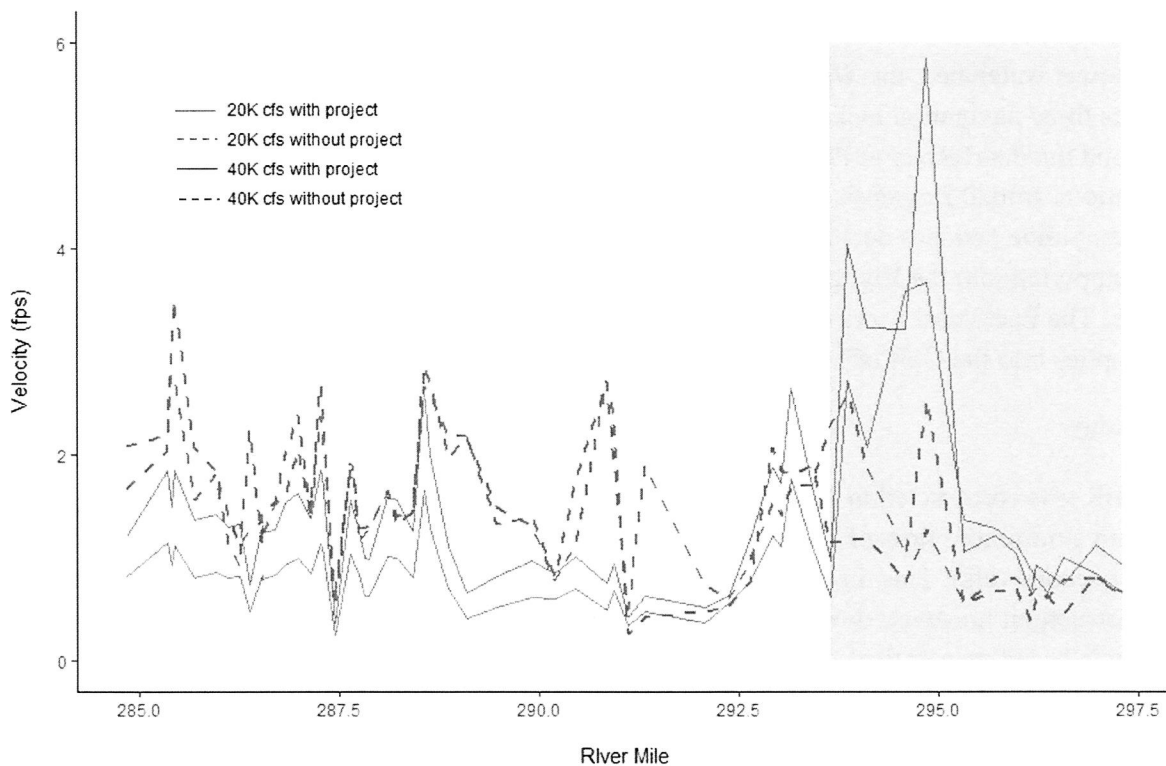
#### Hydrology

The RBR was constructed in 1961 and was filled by 1965. Operationally, the RBR must maintain a minimum flow of 112 million gallons of water per day or approximately 170 cubic feet per second (cfs). This discharge rate is greater than low-flow discharge rates experienced preconstruction; however, downstream discharge of the Savanna Street Wastewater Treatment Facility is based on a critical low flow of 227 cfs. Thus, the minimal discharge from the reservoir at times could be below that required for adequate dilution and flushing of the wastewater facility's discharges. The RBR is eutrophic with low DO levels documented in the summer months (MDEQ 2018, Phalen et al. 1988).

Regarding flow dynamics, Hasse (2006) reported an increase in magnitude of flood and low-flow events post-construction of the RBR and dam. Parameters used indicated that only one-third of the alterations at the Jackson station and one-half at the Bogalusa station were related to

landscape and weather pattern changes while the remaining were attributed to the RBR. As measured at four stream gauge stations, Hasse observed longer low-flow events, an increase in low-flow pulses, and a similar trend in high flow events post-reservoir construction. The increase in hydrograph rise and fall rates post-construction and the increase in hydrograph reversals are typically associated with flow alterations from dams (Hasse 2006).

In Mississippi, greatest rainfall occurs from December through April, producing seasonal influence in the watershed. Previous modeling in the Project area under existing conditions indicated that average cross-sectional velocities varied from approximately 0.27 feet per second (fps) to 2.2 fps during high seasonal discharge rates. Typically, the lowest discharge rates occur between June – October (usually not exceeding 5,000 cfs), while the highest rates occur between December – April. Those rates transition between high and low periods in May and November. Discharges greater than 5,000 cfs do not occur between June and November. Rates greater than 20,000 cfs occur infrequently between December and May, usually not exceeding 10,000 cfs.



Graph 1. Velocities in the Project area. With project velocities represent Alternative C (no instream work proposed for Alts A1 and E, and specific velocities are still pending for Alt D) and green shade represents areas north of Alt C pool. Discharges represent high flows.

Biological communities are in a dynamic equilibrium with the hydrological processes associated with a river and its floodplain (Junk et al. 1989). Anthropogenic impacts to this system have altered ecological functions. Ongoing impacts have led to the reduction and/or loss of habitat which contributed to the need for federal protections for species in accordance with the Endangered Species Act (ESA). Protections may be warranted for additional species endemic to the Pearl River due to declines in their populations. Minimizing loss of wildlife and fisheries habitat and proactively conserving natural resources while achieving flood control measures should be considered.

## Fish and Wildlife Resources

River systems provide vital ecological functions, natural resources, and ecosystem services for human society. Although it is difficult to place a monetary value on freshwater systems, some reports estimate \$8.2 trillion in value provided by these ecosystems in the United States (Bergkamp et. al. 2000). River and riparian corridors provide commercial and recreational value, flood water storage, bank stabilization, erosion protection, and water filtration. At least 90 percent of sediment eroded from uplands is trapped in alluvial systems (Meade et al. 1990, Saucier 1994).

Many of the habitat types found in the Project area are considered imperiled or vulnerable (i.e., bottomland hardwoods, mixed scrub-shrub wetland, emergent wetland/palustrine, riverine, etc.) (Mississippi State Wildlife Action Plan, 2015-2025). The Pearl River and its associated oxbows, tributaries, and forested wetlands support biologically diverse species and their habitats. Further, riparian forested areas are an important source of deadwood and other allochthonous materials that provide habitat for many species inhabiting the Pearl River and its tributaries.

### Aquatic Resources

Considered one of the most biologically diverse rivers in the country, the Pearl River supports 140 species of fish (including bass, bluegill, sunfish, crappie, catfish, topminnows, etc.), 14 species of turtles (including the endemic Pearl River map turtle (*Graptemys pearlensis*)), 40 species of mussels, and other aquatic species (MDWFP 2016). One survey identified 44 species of fish within the Project area, dominated by minnows, darters, suckers, and sunfishes (Kilgore et al. 2006). Included among those species found, several are considered intolerant or moderately intolerant of habitat changes.

Unmodified riverine ecosystems are important for many aquatic species requiring moving currents and habitat diversity. Aquatic habitat within the Project area includes the main stem and tributaries, RBR, several oxbow lakes such as Mayes Lake, channel cutoffs such as Crystal Lake,

and several other smaller lakes or ponds. These areas are used by sport fishermen, kayak outfitters, and recreational boaters. Semi-aquatic mammalian species include beaver, river otter, muskrat, and mink. There is also a great diversity of reptiles and amphibians found within the Project area.

The Pearl River hosts areas of firm stable substrate with various sediment types ideal for mussels. They can embed in this habitat without being dislodged by river currents such as below sand bars and along flats/bottoms of river channels. There is a known mussel bed located just north of the J.H. Fewell Water Treatment Plant (WTP) weir, where firm silty/sandy beds provide suitable habitat for numerous mussel species. The bed contains a diverse compliment of mussels totaling nearly 20 species, including several rare species (Weiland 2000). Within the Pearl River, the proposed threatened Louisiana pigtoe is found in the Project area and a small portion of the Lower Pearl River (Ellwanger et al. 2023).

Oxbow lakes generally support recreational fisheries due to their valuable spawning and nursery habitat, diverse benthic forage communities, abundant phytoplankton and zooplankton, and structure complexity (Messina and Conner 1998). Oxbows are hydrologically connected to the river when high river stages facilitate fish movement and introduce seasonal pulse of oxygenated river water with nutrient rich sediments. During the summer, any eutrophic tendencies created by upstream closures are intensified, and extreme conditions of warm water temperatures and low DO concentrations may cause fish mortality.

Sandbars in various stages of development are a typical feature of the Pearl River in the Project area. Riverine sandbar habitat, especially unmodified, has high wildlife value. Small fishes concentrate along these features. They also serve as important nesting habitat for turtles and some birds. In fact, within the Project area, the threatened ringed and Pearl River map turtles have been documented using these features for nesting. Although sandbar creation within the proposed impoundment for Alternative C was previously proposed as a conservation measure for the ringed map turtle, we believe these features would need extensive maintenance and monitoring since they could be overtaken by undesirable plant and non-target turtle species, experience nest predation, and may not be adequately protected from human disturbance.

Since downstream impacts are being analyzed, it's important to note those resources downstream of the Project area. Coastal wetlands of the Pearl River provide nursery and foraging habitat that supports economically important marine fishery species (*i.e.*, spotted seatrout (*Cynoscion nebulosus*), sand seatrout (*Cynoscion arenarius*), southern flounder (*Paralichthys lethostigma*), Atlantic croaker (*Micropogonias undulatus*), spot (*Leiostomus xanthurus*), Gulf menhaden (*Brevoortia patronus*), striped mullet (*Mugil cephalus*), white mullet (*Mugil curema*), blue crab (*Callinectes sapidus*), and shrimp). Some of these species serve as prey for other commercially

and/or recreationally important fish species. The productivity of the Pearl River estuary contains a significant portion of the total commercial fisheries catch of the Gulf States (Gunter 1967). Menhaden, shrimp, crab, oyster, and mullet are estuarine dependent. This area also ranks in the top 10 for endemic species of reptiles, amphibians, butterflies, and mammals (MDEQ 2008). However, estuaries are sensitive to adverse influences and can be devastated by environment changes. Hurricanes and the Deepwater Horizon oil spill prompted development of a task force strategy that prioritizes restoration and conservation of this important habitat.

The Pearl River estuary freshwater inflow positively influences appropriate salinity characteristics of the Mississippi Sound and Lake Borgne waters. Relatively sharp salinity interfaces occur in some channels, with rises more than 10 ppt occurring within a 5-foot increase in depth. Combinations of precipitation and stream discharge influence fresh water mixing and system evaporation. This estuary is highly productive and rich in nutrients, concentrating and recycling phosphorus and nitrogen. Such nutrient cycling and absorption promote estuarine productivity and dissuade harmful algal blooms.

## Terrestrial Resources

The Pearl River floodplain is defined by its hydrology and biogeochemical processes which support important life history strategies for plants and wildlife. Terrestrial habitats in the Project area include forested wetlands, agricultural lands, open fields, shrub-scrub habitat, and forested uplands. Forested wetland areas contain bald cypress (*Taxodium distichum*), tupelo gum (*Nyssa sylvatica*), red maple (*Acer rubrum*), water oak (*Quercus nigra*), willow oak (*Quercus phellos*), American elm (*Ulmus americana*), swamp hickory (*Carya cordiformis*), green ash (*Fraxinus pennsylvanica*), sycamore (*Platanus occidentalis*), black willow (*Salix nigra*), and other species. Bottomland hardwoods are the primary wildlife habitat type in the floodplain, while cypress-tupelo swamps add to the diversity of this system. The Pearl River Basin serves as a major travel corridor for deer, squirrel, waterfowl, migratory birds, rabbits, fox, raccoon, and others. Additionally, a great diversity of reptiles and amphibians depend on bottomland hardwood, riparian, and aquatic habitats in the Project area.

Riparian forests provide important breeding and wintering habitat for bats and a variety of migratory birds. Surveys have identified more than 250 known species of birds in the Pearl River Basin. More than 200 species were identified at LeFleur's Bluff State Park, including prothonotary warbler (*Protonotaria citrea*), Swainson's warbler (*Limnothlypis swainsonii*), Mississippi kite (*Ictinia mississippiensis*), bald eagle (*Haliaeetus leucocephalus*), wood duck (*Aix sponsa*), sandpipers (*Scolopacidae* spp.), herons (*Ardeidae* spp.), and others. This and several areas within the Pearl River Basin are habitat for stop-over, foraging, and nesting vital for the conservation of bird populations (MDWFP 2016). Many are considered species of greatest conservation need (SGCN, NatureServe and MDWFP 2016), meaning their populations

have declined due to emerging threats. In fact, the Golden winged warbler (*Vermivora chrysoptera*), a species under review for federal protection, ranges within this basin. Quantitative data can be accessed from the Breeding Bird Survey and Christmas Bird Count, (U.S. Geological Survey; Audubon).

## Conservation Lands

Conservation lands within the Pearl River Basin include the Natchez Trace Parkway, Mississippi Band of Choctaw Tribal Lands, Fannye Cook Natural Area, Bienville and Tombigbee National Forests, Lefleur's Bluff State Park, Bienville, Caney Creek, Nanih Waiya, Pearl River, and Old River Wildlife Management Areas (WMA), and Bogue Chitto National Wildlife Refuge. Also within the drainage system are the Marion County and Ben's Creek WMAs, Hancock County Coastal Preserve, Mike's Island, White Kitchen Preserve, and Fischer Wildlife Sanctuary. Louisiana designated the West Pearl River and Holmes Bayou as a state Natural and Scenic River System (Louisiana Wildlife and Fisheries Commission 1976). There is significant acreage along the Pearl River within the Project area that provides habitat unique for a metropolitan area. These lands not only serve as habitat for wildlife, but also many of them allow non-consumptive recreation and public hunting for game species.

## Threatened and Endangered Species

Reports reveal that destabilization and degradation of the Pearl River following construction of the RBR led to a decline in aquatic resources (Tipton et al. 2004). Additionally, research revealed that the Pearl River south of its confluence with the Strong River had undergone a dramatic change, with gravel substrates being replaced with unstable sand substrate following construction of the RBR (Piller et al. 2004). Such impacts contributed to extirpation of the pearl darter, Alabama shad, southern walleye, and freckled darter.

The most important measure to assure the continued existence and recovery of federally listed species is through the maintenance of preferred habitat type and quality. The Pearl River and associated riparian and wetland habitats in the Project area contain suitable habitat for several threatened and endangered species including Gulf sturgeon, northern long-eared bat, ringed map turtle, and Pearl River map turtle. These species are briefly described below.

The northern long-eared bat (*Myotis septentrionalis*), federally listed as an endangered species, is a medium sized bat about 3 to 3.7 inches in length and is distinguished by its long ears. Its fur color can range from medium to dark brown. The northern long-eared bat can be found in much of the eastern and north central United States. Northern long-eared bats occur in mixed pine/hardwood forest with intermittent streams. Northern long-eared bats roost alone or in small colonies underneath bark or in cavities or crevices of both live trees and snags (dead trees).

During the winter, northern long-eared bats often hibernate in caves and abandoned mines. They emerge at dusk to fly through the understory of forested hillsides and ridges to feed on moths, flies, leafhoppers, caddis flies, and beetles, which they catch using echolocation. This bat can also feed by gleaning motionless insects from vegetation and water surfaces. The most prominent threat to this species is white-nose syndrome, a disease known to cause high mortality in bats that hibernate in caves. Other sources of mortality for northern long-eared bats are wind energy development, habitat destruction or disturbance, climate change, and contaminants.

The ringed map (also known as the ringed sawback) turtle (*Graptemys oculifera*), federally listed as threatened, can be found in the Pearl River system and Bogue Falaya River. This turtle prefers riverine habitats with moderate currents; channels wide enough to permit sunlight penetration for several hours each day; numerous logs for basking; and large, sandy banks used for nesting. The ringed map turtle is a small turtle (4 to 7 inches in plastron length) with a yellow ring bordered inside and outside with dark olive-brown on each shield of the carapace and a yellow plastron. The head has a large yellow spot behind the eye, two yellow stripes from the orbit backwards, and a characteristic yellow stripe covering the whole lower jaw. The decline of the ringed map turtle has been attributed to habitat modification (i.e., loss of exposed sandbars, basking areas) and water quality deterioration, reservoir construction, channelization, desnagging for navigation, siltation, and the subsequent loss of invertebrate food sources.

The Pearl River map turtle (*Graptemys pearlensis*), federally listed as threatened, is a moderate-sized aquatic turtle endemic to the Pearl River drainage of Louisiana and Mississippi. The species overlaps with the federally listed ringed map turtle and has similar habitat requirements (i.e., flowing streams, nesting sandbars, basking logs, etc.). Historically, the Pearl River map turtle was commonly found in higher abundance than the threatened ringed map turtle; however, the species is now found in lower numbers than the ringed map turtle throughout much of its range (Jones and Selman 2009); including the Project area (Selman 2020). Threats have been attributed to water pollution impacting mollusk populations on which the turtles feed, snag and log removal, channelization and impoundment, collection for the pet trade, increasing nest predation rates, and target shooting (Service 2021).

The Atlantic or Gulf sturgeon (*Acipenser oxyrinchus desotoi*), federally listed as threatened, is an anadromous fish that occurs in many rivers, streams, and estuarine and marine waters along the northern Gulf coast between the Mississippi River and the Suwannee River, Florida. In Louisiana, Atlantic sturgeon have been reported at Rigolets Pass, rivers and lakes of the Lake Pontchartrain Basin, the Pearl River System, and adjacent estuarine and marine areas. Spawning occurs in coastal rivers between late winter and early spring (i.e., March to May). Adults and sub-adults may be found in those rivers and streams until November, and in estuarine or marine waters during the remainder of the year. Atlantic sturgeon less than two years old appear to

remain in riverine habitats and estuarine areas throughout the year, rather than migrate to marine waters. Habitat alterations such as those caused by water control structures and navigation projects that limit and prevent spawning, poor water quality, and over-fishing have negatively affected this species.

On March 19, 2003, the Service and the National Marine Fisheries Service (NMFS) published a final rule in the Federal Register (Volume 68, No. 53) designating critical habitat for the Gulf sturgeon in Louisiana, Mississippi, Alabama, and Florida. The proposed Project area is in critical habitat Unit 1, which includes “the Pearl River main stem from the spillway of the RBR Dam, Hinds and Rankin Counties, Mississippi, downstream to where the main stem river drainage discharges at its mouth joining Lake Borgne, Little Lake, or The Rigolets in Hancock County, Mississippi, and St. Tammany Parish, Louisiana. It includes the main stems of the East Pearl River, West Pearl River, West Middle River, Holmes Bayou, Wilson Slough, downstream to where these main stem river drainages discharge at the mouths of Lake Borgne, Little Lake, or the Rigolets. Unit 1 also includes the Bogue Chitto River main stem, a tributary of the Pearl River, from Mississippi State Highway 570, Pike County, Mississippi, downstream to its confluence with the West Pearl River, St. Tammany Parish, Louisiana. The lateral extent of Unit 1 is the ordinary high-water line on each bank of the associated rivers and shorelines” (Federal Register Volume 68, No. 53, p. 13391). The primary constituent elements essential for the conservation of Gulf sturgeon, which should be considered when determining potential project impacts, are those habitat components that support feeding, resting, sheltering, reproduction, migration, and physical features necessary for maintaining the natural processes that support those habitat components. These primary constituent elements for Gulf sturgeon critical habitat include:

- abundant prey items within riverine habitats for larval and juvenile life stages, and within estuarine and marine habitats for juvenile, sub-adult, and adult life stages;
- riverine spawning sites with substrates suitable for egg deposition and development, such as limestone outcrops and cut limestone banks, bedrock, large gravel or cobble beds, marl, soapstone, or hard clay;
- riverine aggregation areas, also referred to as resting, holding and staging areas, used by adult, sub-adult, and/or juveniles, generally, but not always, located in holes below normal riverbed depths, believed necessary for minimizing energy expenditures during freshwater residency and possibly for osmoregulatory functions;
- a flow regime (i.e., the magnitude, frequency, duration, seasonality, and rate-of-change of freshwater discharge over time) necessary for normal behavior, growth, and survival of all

life stages in the riverine environment, including migration, breeding site selection, courtship, egg fertilization, resting, and staging; and necessary for maintaining spawning sites in suitable condition for egg attachment, egg sheltering, resting, and larvae staging;

- water quality, including temperature, salinity, pH, hardness, turbidity, oxygen content, and other chemical characteristics, necessary for normal behavior, growth, and viability of all life stages;
- sediment quality, including texture and other chemical characteristics, necessary for normal behavior, growth, and viability of all life stages; and,
- safe and unobstructed migratory pathways necessary for passage within and between riverine, estuarine, and marine habitats (e.g., a river unobstructed by a permanent structure, or a dammed river that still allows for passage).

## At-risk Species and Species of Concern

The Service’s Southeast Region has defined “at-risk species” as those that are:

1. Proposed for listing under the ESA by the Service;
2. Candidates for listing under the ESA, which includes species that have a "warranted but precluded 12-month finding"; or
3. Petitioned for listing under the ESA, which means a citizen or group has requested that the Service add them to the list of protected species. Petitioned species include those for which the Service has made a substantial 90-day finding as well as those that are under review for a 90-day finding. As the Service develops proactive conservation strategies with partners for at-risk species, the states’ Species of Greatest Conservation Need (defined as species with low or declining populations) will also be considered.

The Service’s goal is to work with private and public entities on proactive conservation to conserve these species thereby precluding the need to federally list as many at-risk species as possible. Discussed below are species currently designated as “at-risk” that may occur within the Project area. While not all species identified as at-risk will become ESA listed species, their potentially reduced populations warrant their identification and attention in mitigation planning.

The Louisiana pigtoe (*Pleurobema riddellii*), proposed for listing at threatened, was recently found within the Project area (Ellwanger et al. 2023) and downstream in the West Pearl River. The Louisiana pigtoe is a rare freshwater mussel with a thick, inflated, triangular to sub-quadrate shell. The beaks are elevated well above the hinge line but are sometimes eroded. The external shell is without sculpturing and reddish-brown, dark brown, or black in color. The interior shell surface (nacre) is typically white, rarely peach tinted, and iridescent posteriorly. Pseudocardinal

teeth (molar-like structures located near the beaks on the interior surface) are heavy to massive, triangular, and rough with the anterior tooth in the left valve compressed and parallel to the margin. The lateral teeth, two in the left valve and one with a basal flange in the right, are short and straight or slightly curved. Soft tissues are described as white to off-white. Individuals approaching 5 inches (127 mm) in length have been collected in Texas. The Louisiana pigtoe is a medium-sized freshwater mussel (shell lengths to greater than 62 mm) with a brown to black, triangular to subquadrate shell without external sculpturing, sometimes with greenish rays.

One petitioned mussel species occurs within the Pearl River. The Alabama hickorynut (*Obovaria unicolor*) is generally found on gravel or sand shoals of medium sized creeks to large rivers and are occasionally found on sand-bottomed runs with slow, steady current. Threats to this species include dams, weirs, channelization, and other stream modification actions, as well as poor water quality and sedimentation. It has been collected between the Project area and the RBR and in the lower Pearl.

One turtle species proposed for federal protection as threatened occurs within the Project area, the alligator snapping turtle (*Macrochelys temminckii*). The alligator snapping turtle occurs in waterways that drain into the Gulf of Mexico. Although the species' range is large, population densities are likely low throughout the range. They occur in various habitats including rivers, oxbows, lakes, and backwater swamps, including those within the Project area. The main threats include bycatch on fishing equipment, habitat alteration, historic exploitation by trappers, pollution, and pesticide accumulation (Service 2021). They have been documented at Crystal Lake and in the Pelahatchie Bay portion of the RBR (Berry 2019; Pearson et al. 2023).

The monarch butterfly (*Danaus plexippus*) is a candidate species and not yet listed or proposed for listing under the ESA. The monarch is a member of the milkweed butterfly group (subfamily Danainae, order Lepidoptera) and is known for its large size, its orange and black wings, and its long annual migrations. Monarchs are concentrated in North, Central, and South America but also can be found intermittently in other locations. Threats are believed to be ongoing land development in areas along the monarch's different migratory route and loss of milkweed plants associated with the expansion in the early 21st century of the use of genetically modified herbicide-resistant crops.

The USACE submitted a biological assessment in June of 2024, and the Service agreed to enter into ESA Section 7 consultation on the effects of the alternatives on listed, proposed, and candidate species. This consultation is ongoing.

## Migratory Birds

In accordance with the Migratory Bird Treaty Act of 1918 (as amended) and FWCA, please be advised that the Project area includes habitats which are commonly inhabited by colonial nesting waterbirds and bald eagles.

For colonies containing nesting wading birds (i.e., herons, egrets, night-herons), anhingas, and/or cormorants, all activity occurring within 1,000 feet of a rookery should be restricted to the non-nesting period, depending on the species present. Below is the list of colonial nesting birds that may be found and the corresponding activity window during which the Project may occur without affecting nesting wading bird colonies (Table 1). The Service recommends that the Project be constructed outside of those windows to the maximum extent practicable.

<b>Species</b>	<b>G. species</b>	<b>Project Activity Window/Non-nesting Period</b>
Anhinga	<i>Anhinga anhinga</i>	July 1-March 1
Double-crested Cormorant	<i>Phalacrocorax auritus</i>	July 1-March 1
Great Blue Heron	<i>Ardea herodias</i>	August 1-February 15
Great Egret	<i>Ardea alba</i>	August 1-February 15
Little Blue Heron	<i>Egretta caerulea</i>	August 1-March 1
Tricolored Heron	<i>Egretta tricolor</i>	August 1-March 1
Cattle Egret	<i>Bubulcus ibis</i>	September 1-April 1
Green Heron	<i>Butorides virescens</i>	September 1-March 15
Black-crowned Night Heron	<i>Nycticorax nycticorax</i>	September 1-March 1
Yellow-crowned Night Heron	<i>Nyctanassa violacea</i>	September 1-March 15

Table 1. Colonial nesting birds and their corresponding non-nesting period.

# Fish and Wildlife Resources Planning Goals and Objectives

The Service's planning goal for the Pearl River Flood Risk Management Project continues to be implementation of a project that balances the needs of fish, wildlife, and wetland resources alongside the need to provide flood risk management for the Jackson metropolitan area. We favor a plan that provides flood risk management benefits without the construction of a weir and the resulting impoundment, thus conserving important riverine functions and habitats. Maintaining wildlife habitat adjacent to urban areas adds to the overall quality of life for local residents. In addition, forested wetlands function as a natural area to store floodwaters and to filter and purify the water before it returns to the Pearl River system. Therefore, there is need to limit non-flood compatible development from flood-prone areas. Finally, in order to allow and encourage the citizens of the Jackson metropolitan area to use the remaining fish and wildlife resources of the area, there is a need for improved access to the Pearl River.

The Service acknowledges the need to protect existing urban development from flood damages. However, trends reveal a decline in species diversity and abundance within this basin. Thus, other needs of the basin should be considered including the protection of remaining fish and wildlife habitat values, such as existing habitat for federally listed species and the conservation of at-risk species and their habitats within the Pearl River Basin.

To ensure that fish and wildlife resources receive equal consideration with other project purposes, the Service recommends the following planning objectives be adopted to guide future planning efforts:

- Avoid impounding rivers when such actions do not address the primary mission of flood risk management.
- Conserve, protect, and restore riverine habitats and fish communities (including flowing waters with velocities, backwaters, and oxbow lakes representative of the natural river).
- A site-specific mitigation plan to offset riverine habitat impacts should be developed before selecting a plan for implementation. Riverine mitigation should target removal of obsolete structures that inhibit fish passage within the Pearl River Basin downstream of the proposed project.
- Important terrestrial wildlife habitats (i.e., bottomland hardwoods, cypress swamps, riparian corridors, and sandbars) should be conserved, protected, and restored.
- Downstream resources should be conserved, protected, and restored.
- A basin-wide assessment of the hydrological changes, sedimentation, land use, and water quality should be conducted to determine their influence on flooding and the ecosystem

response with a goal of identifying and developing ecosystem restoration projects that are coupled with flood risk reduction features through the basin.

Section 2036(a) of the Water Resources Development Act of 2007, Mitigation for Fish and Wildlife and Wetlands Losses, amended Section 906(b) of the Water Resources Act of 1986 to state that “Specifically, mitigation plans shall ensure that impacts to bottomland hardwood forest are mitigated in-kind, and other habitat types are mitigated to not less than in-kind conditions, to the extent possible. In carrying out this subsection, the Secretary shall consult with appropriate Federal and non-Federal agencies.” The Service’s mitigation policy reflects this standard regarding in-kind mitigation.

The Service’s Mitigation Policy (Federal Register, Vol. 46, pp. 7644-7663, January 23, 1981) has designated four resource categories, which ensure that the level of mitigation recommended will be consistent with the fish and wildlife resources involved. The mitigation planning goals, and associated Service recommendations are based on those four categories, as follows:

Resource Category 1 - Habitat to be impacted is of high value for evaluation species and is unique and irreplaceable on a national basis or in the ecoregion section. The mitigation goal for this Resource Category is that there should be no loss of existing habitat value.

Resource Category 2 - Habitat to be impacted is of high value for evaluation species and is relatively scarce or becoming scarce on a national basis or in the ecoregion section. The mitigation goal for habitat placed in this category is that there should be no net loss of in-kind habitat value.

Resource Category 3 - Habitat to be impacted is of high to medium value for evaluation species and is relatively abundant on a national basis. The Service’s mitigation goal here is that there be no net loss of habitat value while minimizing loss of in-kind habitat value.

Resource Category 4 - Habitat to be impacted is of medium to low value for evaluation species. The mitigation goal is to minimize loss of habitat value.

Considering the overall high value of cypress swamp and bottomland hardwood forests (i.e., forested wetlands), including their riparian component, and riverine habitat for fish and wildlife and the loss of that habitat type as previously mentioned, they are designated as Resource Category 2, the mitigation goal for which is no net loss of in-kind habitat value. The Service has also determined that the oxbow lakes and cutoffs functioning as oxbows within the existing floodplain area are Resource Category 2 habitat. Project features that would avoid impacts to

Category 2 resources should be selected over ones that would require conversion of forested wetlands to project purposes.

The scrub-shrub and upland habitat that may be impacted is placed in Resource Category 3 due to either their reduced value to wildlife and fisheries, degraded wetland functions, or abundance. The mitigation goal for Resource Category 3 habitats is no net loss of habitat value.

Due to their low flows and the impacts of the adjacent urban development, the Service classifies most of the tributary creeks that drain the Project area as Resource Category 4, defined as habitat "... of medium to low value for evaluation species." The mitigation goal for Resource Category 4 habitat is to "... minimize loss of habitat value." However, we encourage these tributaries be inspected for opportunities to improve habitat quality when and where practicable (e.g., debris clean-up, erosion control, proper placement, and sizing of culverts). Cropland and pastureland are also classified as Resource Category 4.

## Description of Alternatives and Preliminary National Economic Development Plan

### Alternative A1

This nonstructural alternative consists of elevation, flood-proofing, and voluntary property acquisition within the cumulative four percent annual exceedance probability floodplain. Acquired properties would become permanent/perpetual greenspace that is publicly owned and maintained by the non-federal interest (NFI), the Rankin Hinds Pearl River Flood Control District. This alternative is anticipated to have very minimal adverse impacts to the natural environment, including fish and wildlife resources.

### Alternative C

This alternative consists of clearing and expanding cross-sectional areas of the river channel corridor to increase hydraulic conveyance. Specifically, it consists of the excavation of approximately 20 million cubic yards from the floodplain and channel overbanks – RM 284.0 to RM 294 – using heavy equipment. Approximately 2,557 acres would be directly disturbed. The channel widening would range in width from approximately 400 to 2,000 feet. Excavation depths would vary between 5 to 20 feet to meet the proposed bottom elevation of 248 National Geodetic Vertical Datum (NGVD 29). The total includes 1,692 acres of excavation to widen the channel and 865 acres used for placement of the excavated fill material. Excavation limits near existing levees will be determined during final design.

Alternative C also includes construction of a 1,500-foot-wide weir structure (weir or dam) at RM 284.3 to create a 2,562-acre year-round recreational water body (i.e., lake). The weir will create an approximately 9.5-mile impoundment with average depth of 22 feet. Current average depth is 6.7 feet. The 12-foot by 12-foot gate and culvert structure built to maintain minimum flows during low water periods would have a culvert bottom elevation on the upstream side of approximately 248 feet (North American Vertical Datum of 1988 [NAVD 88]) while the downstream side would connect to the existing channel at an elevation of approximately 230 feet (NAVD 88). Activities would include clearing and grubbing along all the rights-of-way for project features, construction of staging areas and access roads, and hauling of earthen fill for the levee. The proposed weir does not provide any flood control benefits, and its construction necessitates additional pumping needs at existing levees as well as seepage protection in the form of berms and slurry walls on existing levee features upstream of the weir.

Upgrades to the existing non-Federal levee and a new federalized levee will be constructed around the Savanna Street Wastewater Treatment Plant. Mayes Lake within the LeFleur's Bluff State Park may require connection and fill. An existing 200-foot-wide weir for drinking water retention located at RM 291 (J.H. Fewell WTP) within the project footprint would be removed. A fish by-pass channel around the weir and low flow structure would be constructed on the east bank of the river. Maintenance and reinforcement of bridge abutments may be required (e.g., placement of riprap, slope paving, slide repairs). Multiple tributary inflow points will receive hardpoints (i.e., riprap) to prevent backward erosion.

Wooded areas to the east of the proposed new banks and small areas on the west side will be cleared. Excavated fill would be placed in designated disposal areas on the protected side of existing levees, including some wetlands. Fill will be at the same elevation or lower to facilitate future land development. New land mass created behind the levees would range from 200 to over 1,000 feet in width.

Prior descriptions of this alternative noted some sandbar replacement for lost sandbar habitat. This feature would require tremendous maintenance and monitoring, and several concerns were expressed regarding their effectiveness in supporting target wildlife species. Additionally, relocation of ringed map turtles from Crystal Lake, relocation of nests from excavation areas, relocation of mussels, wildlife and water quality monitoring, and adaptive management was also included in previous plans.

## Alternative D

This alternative, also referred to as the "CTO with weir" alternative; includes a combination of features from Alternatives A1 and C. This alternative is similar to Alternative C but with a smaller footprint (approximate 1,706-acre lake 7.5 river miles in length). Alternative D was recently designated the Locally Preferred Plan. It includes clearing and expanding cross-sectional

areas of the river channel corridor to increase hydraulic conveyance (i.e., channel improvements similar to Alternative C), construction of a new weir (with the existing Fewell WTP weir being left in place), federal levee improvements, raising the ring levee around the Savanna Street WWTP, additional levee construction near the Canton Club subdivision in Northeast Jackson, MS, bridge countermeasures, hard points in tributary channels to prevent incision, slurry walls, an additional pump to address interior drainage impacts, limited property acquisition, and a fish passage structure around the new weir. Ancillary benefits would include recreational facilities around the lake and recreational opportunities including boat ramps, boating, camping, fishing piers, nature/hiking trails, and/or wildlife viewing.

### Alternative E

This alternative, referred to as the “CTO without weir” alternative, is similar to Alternative D but without a new weir and other features that are associated with the new weir (i.e., slurry walls, pump for interior drainage, fish passage structure). This alternative is the less expensive of the two CTO alternatives and according to the 2024 DEIS, will have no ancillary benefits (recreational opportunities including boat ramps, boating, camping, fishing piers, trails, and or wildlife viewing).

The USACE has stated that additional design, analysis, and coordination will be required during the PED phase for Alternatives D and E. Thus, a full analysis of impacts to fish and wildlife resources is not feasible at this time. Most notably, the Service is unable to fully assess potential impacts to riverine species for Alternative D since a velocity analysis has not been conducted, similar to what was conducted for Alternative C. In addition, a mitigation plan to offset riverine impacts resulting from Alternative C or D has not been provided. Since the USACE is presumably considering the selection of a plan for implementation without such information, we strongly encourage the USACE to give full consideration to nonstructural solutions that will not impact federal trust resources and structural solutions that reduce impacts to riverine resources and potential mitigation requirements.

### National Economic Development Plan

Section 3104 Pearl River Basin, Mississippi, of (WRDA) 2007, authorizes that the Secretary may construct the project identified as the NED, locally preferred plan, or some combination thereof. Alternative D (CTO with weir) has been preliminarily identified as the NED. The USACE has initially concluded that of the alternatives assessed, this alternative minimizes implementation risks, maximizes the differences between monetized benefits and costs, and satisfies the USACE Planning Principles and Guidelines criteria of completeness, effectiveness, efficiency, and acceptability. Even though Alternatives D and E achieve similar flood risk management results, and Alternative E is less expensive to construct, the USACE determined net benefits would be greater for Alternative D, and therefore has selected it as the preliminary NED.

The Service is concerned that the net benefits of Alternative E have not been fully vetted by the USACE, NFI, and the public; and that Alternative E may in fact be the NED once accurate net benefits are provided. For example, the USACE has determined there would be ancillary benefits associated with Alternative D (recreational opportunities including boat ramps, boating, camping, fishing piers, trails, and or wildlife viewing), but concluded no such recreational benefits would be achieved with Alternative E. We anticipate comparable ancillary benefits could be realized with a “no weir” alternative. The NFI has been shortsighted in seeing the potential for recreational opportunities associated with a free-flowing, unobstructed river through past planning efforts; therefore, we encourage the USACE to give full consideration of the recreational opportunities that could be achieved with Alternative E.

## Description of Impacts

### Alternative A1

Of the alternatives considered, Alternative A1 is expected to have the least impacts to fish and wildlife resources because no instream work would be conducted, and no aquatic or forested habitat would be impacted. The proposed work would include voluntary property acquisition and rehabilitate existing infrastructure within the existing footprint (e.g., elevating structures, flood-proofing structures). Acquired properties would become permanent/perpetual greenspace that is publicly owned and maintained by the NFI. We strongly support further consideration of this alternative as the final selected alternative as it would have significantly fewer impacts to fish and wildlife resources when compared to the three alternatives below.

### Alternative C

This alternative was previously identified as the most ecologically damaging alternative (2020 FWCAR). Based on current project information, approximately 2,562 acres of terrestrial habitat would be converted to aquatic habitat. Approximately 1,374 acres of wetlands and “other waters of the U.S.” and approximately 487 acres of existing surface water bodies, including the Pearl River channel and its tributaries, would be impacted. Additionally, converting the portion of the Pearl River within the Project area from a riverine system to a lake system will have impacts on threatened and endangered species and will impact resources downstream.

Alternative C is still considered the most damaging alternative for both terrestrial and aquatic resources. Primary impacts from this project include:

1. Loss of habitat diversity and associated aquatic species diversity resulting from conversion of the Pearl River into a wide excavated channel (or relatively slack-water pool).

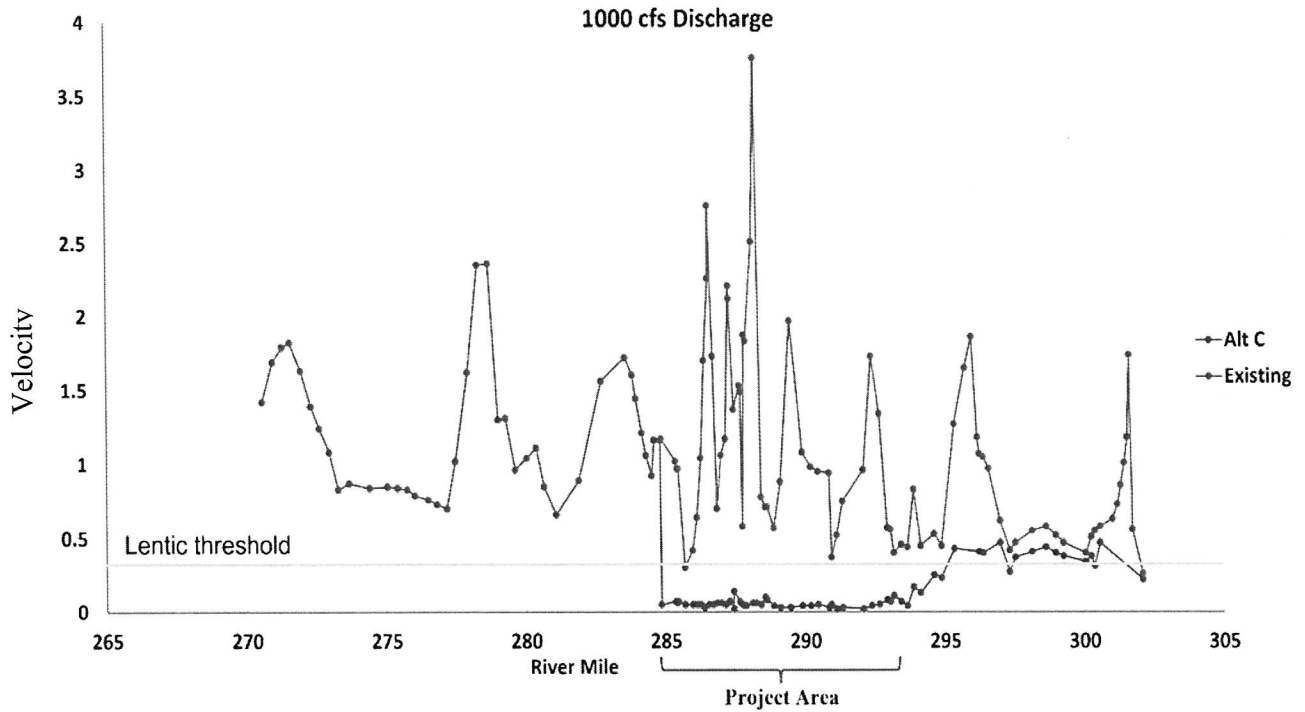
2. Direct and indirect loss of riparian woodlands and other terrestrial habitats important to fish and wildlife resources.
3. Loss of riverine sandbar habitat due to the increased water levels or to vegetation encroachment resulting from stabilized water levels in the pool.
4. The potential for upstream and downstream channel readjustment or other hydrogeomorphic changes (e.g., bank erosion, channel incision) to the Pearl River, as well as tributaries, resulting from decreased sediment transport due to the weir. The Service is also concerned about impacts to public lands from hydrologic and geomorphic changes upstream and downstream, as well as reduced water flows and sediment delivery.

This plan proposes dredging, channel widening, placing fill material, and construction of a large weir near RM 284 that could permanently alter the water regime of over 9.5 miles of the Pearl River, transforming the river into a more lentic (lake-like) water body while altering geomorphology downstream. While some species can thrive in lentic habitats (e.g., gizzard shad, bluegill, and largemouth bass), others, such as riverine obligates (e.g., Pearl River map turtle, Louisiana pigtoe, and darters), cannot exist in such habitats. Further, barriers restrict fish movements and alter aquatic species communities.

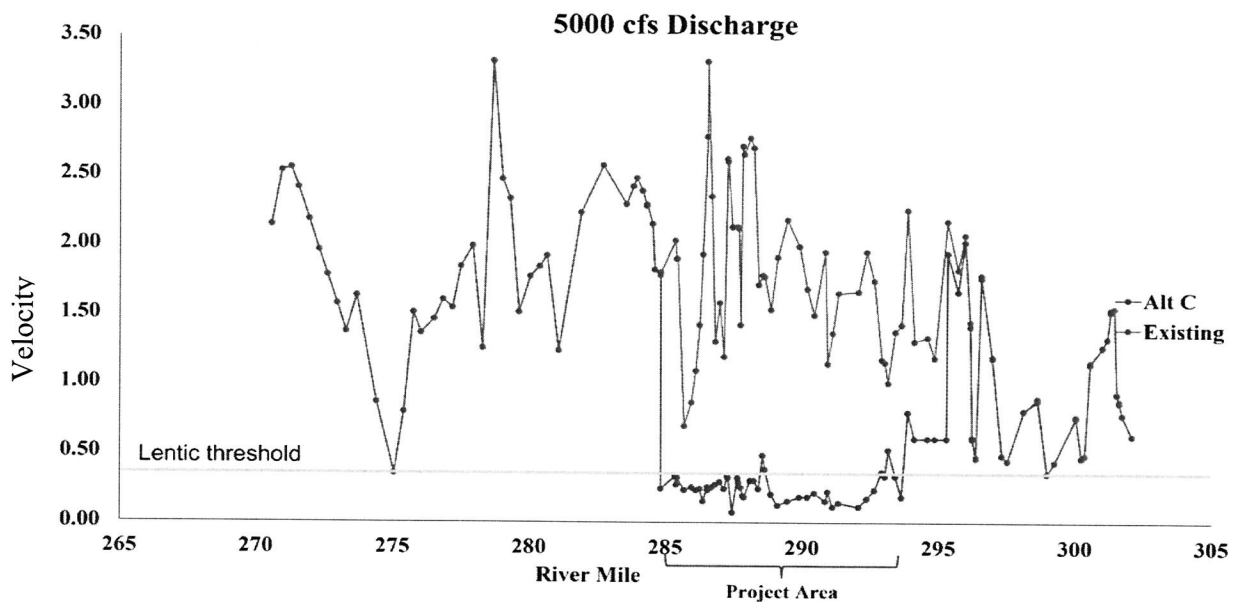
Anthropogenic impacts to river basins are complex (Bergkamp et al. 2000, National Academy of Sciences 1992, Pringle 2001, and Ward and Stanford 1989). These basins contain aquatic habitats within the river channel from the headwaters to the sea, elements of the river catchment and landscape, inputs to the river, riparian areas, groundwater throughout the basin, floodplains, wetlands, estuaries, and its associated system resources. Impoundments constructed on rivers interrupt the complex ecosystem continuum that exists within its network. Some of the functions lost when impounding a river include flood control and storm protection, wildlife and fish habitat, forest resources, water quality and quantity. Furthermore, reduction in downstream flooding and water quality affect biodiversity, floodplains, deltas, and estuaries (Rosenberg et al. 1997, McCully 1996, Dynesius and Nilsson 1994, Gillilan and Brown 1997, Olsen et al. 2006). Multiple impoundments can increase sedimentation entrapment, further reduce or inhibit fish passage, and reduce genetic flow of organisms.

As demonstrated by the models (Graphs 2 through 5), velocities in the proposed project area could be significantly reduced approximately 73 percent of the time for Alternative C, interrupting important life history strategies (i.e., prey sources, breeding substrate). Based on available data, the range of velocities reported fall below the lentic threshold of 0.10 m/s (0.33 ft/s) (Pellett et al. 1983) throughout most of the year, particularly during the active or breeding season for many riverine obligates. The graphs below depict pre- and post-project (Alternative

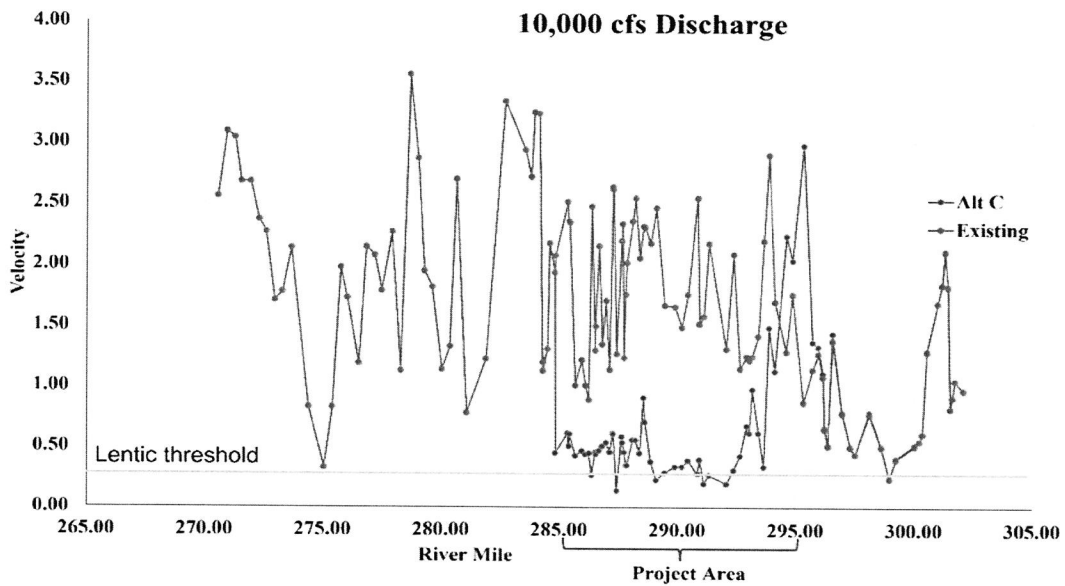
C) velocities within the Project area (which includes the pooled area) for 1,000 cfs, 5,000 cfs, 10,000 cfs, and 20,000 cfs.



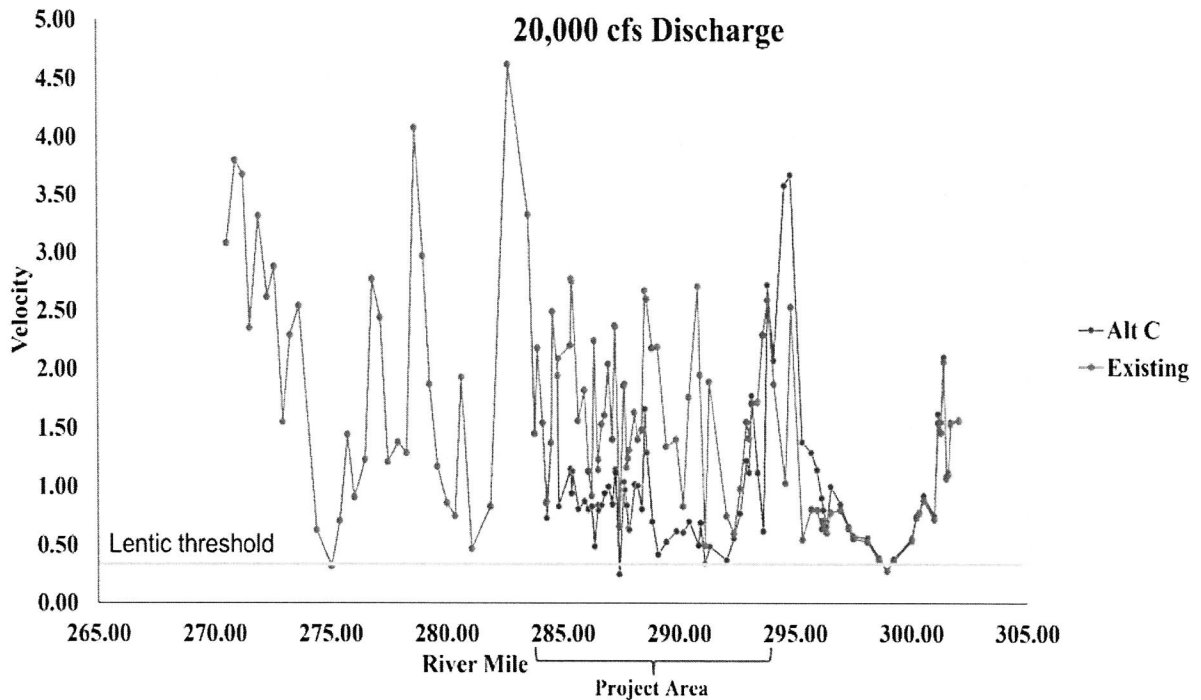
Graph 2. Existing velocities at 1,000 cfs discharge rate compared to project induced velocities. Lentic threshold of velocity is 0.10 m/s (0.33 ft/s) (Pellet et al. 1983).



Graph 3. Existing velocities at 5,000 cfs discharge rate compared to project induced velocities. Lentic threshold of velocity is 0.10 m/s (0.33 ft/s) (Pellet et al. 1983).



Graph 4. Existing velocities at 10,000 cfs discharge rate compared to project induced velocities. Lentic threshold of velocity is 0.10 m/s (0.33 ft/s) (Pellet et al. 1983). Note: Discharges at or above 10,000 cfs are only reported to occur in the pooled area approximately 13 percent of the time, during anticipated high flow season (Dec-April).



Graph 5. Existing velocities at 20,000 cfs discharge rate compared to project induced velocities. Lentic threshold of velocity is 0.10 m/s (0.33 ft/s) (Pellet et al. 1983). Note: Discharges at or above 20,000 cfs occur infrequently.

Average annual discharge in the Project area is 4,700 cfs. Based on current data, only 4.4 percent of daily Jackson gage records (1966-2013) occur above 20,000 cfs, and only nine percent of the daily Jackson gage discharges occur between 10,000 and 20,000 cfs. Even throughout predicted high flow season (December – April), average monthly discharges reported are less than 10,000 cfs in the area. Consequently, three of those months are considered inactive season for some riverine species (i.e., map turtles). Noteworthy, with project modifications, once discharges decrease below 10,000 cfs, the modified channel’s velocities would significantly decrease, and lake-like velocities would occur (below 0.33 fps; Graphs 2-4). Low flow conditions (Graph 2-3) are expected to occur throughout most of the year with approximately 73 percent of daily gage records below 5,000 cfs (268 days per year).

Lentic-like velocities ranging from 0.75 to 3.3 fps exist in the Project area under the average discharge conditions of 4,700 cfs. However, post project construction, velocities fall below the lentic threshold at discharges below 20,000 cfs (Graphs 2 through 5). The project-induced lentic condition persists throughout the channelized reach (RM 284 – RM 294) especially at/and below average flow conditions (i.e.,  $\leq 5,000$  cfs; Graphs 2 through 4) mentioned above. Further, at discharge rates  $\leq 1,000$  cfs, average velocities will be reduced from 1.15 fps (range 0.3 – 3.7 fps) to 0.06 fps (range 0.02 – 0.17 fps), below the lentic threshold (Graph 2). This trend remains

fairly constant throughout the modified channel portion with variations caused primarily by differences in the proposed cross-section of the channel.

At infrequent high flows (i.e., 40,000 cfs or greater), a significant reduction in velocity is not anticipated within the channelized reach. Neither are velocities at discharges of 5,000 to 20,000 cfs expected to be significantly different (pre- and post-project scenarios) in the reach beyond the channelized section, north of RM 297 (Graphs 3 and 4). However, a project-induced increase in velocity in a portion just upstream of the upper limit of the pool (approximately RM 296 to RM 297) (Graphs 1, 4, and 5) is anticipated at discharges above 10,000 cfs.

Between RM 293 (upper end of the improved channel) and RM 295, the river and floodplain will not be altered, but the water surface elevation will be reduced several feet for discharges between 10,000 cfs and 50,000 cfs. In this same general area, there will be an increase in velocities (i.e., 1.28 fps to 5.85 fps) for discharges greater than 40,000 cfs. This decrease in water surface and increase in velocities could result in scouring and destabilization of the banks (i.e., head cutting).

Alterations in riverine and riparian forest conditions are expected to have long-term negative impacts to several federally listed and at-risk aquatic species potentially found within the Project area. Even the alligator snapping turtle, which persists in slow-moving waters, prefers habitat structure (e.g., tree roots, snags). Therefore, due to the removal of all structure within the impoundment, the number of turtles may be lower than typically found in other lake-like waterbodies. Placement of trees around the man-made beaches may partially offset loss of such structure; however, they would quickly decay, needing constant replacement. Retrieval of trees along the stream as replacement structure is not recommended since it would further reduce habitat along those areas.

The impounding of the Pearl River via weir construction and the resulting creation of a 9.5-mile-long pool will result in the removal of riverine features (i.e., swifter flowing water, snags) that provide suitable habitat for other listed and at-risk species. Populations of the Alabama hickorynut and Louisiana pigtoe may be present in the Project area, and we anticipate extirpation within the impounded reach of the river due to the loss of riverine conditions and stratification leading to hypoxic conditions near the lake bottom. Alternative C would also preclude any future restoration efforts for those species in the unchannelized areas. We also anticipate a reduction or extirpation of the Pearl River and ringed map turtles in the Project area. Other turtle species (red-eared slider) more adapted to slow-flow conditions would likely flourish in the impoundment (Selman 2020) and displace the map turtles.

Changes in water flows from impoundments cause detrimental effects (Poff et al. 1997, Postel and Richter 2003). They could alter water temperature, chemistry, transport, and distribution of

sediments, and could also cause changes in geomorphology. Other threats to downstream flows include unregulated water withdrawals and extractions, sewage disposal, and land-use changes. Such threats and alterations in natural flows can lead to adverse impacts to wildlife and habitat. For example, the Pearl River sustained long- and short-term impacts from construction of the RBR. Construction of the dam created extensive downstream erosion, sedimentation, and other hydro-geomorphological changes that reportedly destabilized the system (Tipton et al. 2004, Piller et al. 2004). These changes likely contributed to the loss or reduction of several species within the Pearl River drainage. Sensitive mussel species were eliminated from the main channel (i.e., Alabama hickorynut, inflated heelsplitter) and the Strong River (i.e., Alabama spike, black sandshell) (Ellwanger et al. 2023). Some species of fish (i.e., crystal darter, frecklebelly madtom) experienced sharp population declines, not returning to pre-construction status until decades later. Still other sensitive fish species were extirpated (i.e., Pearl darter, Alabama shad, freckled darter).

The proposed fish passage around the weir may allow continued fish migration for some species; however, the design and operation should be defined, and velocities, sediment, and water quality through the passage identified before confirming that this feature will be beneficial for many species of concern.

In addition to a loss of species and habitat diversity due to an altered flow regime, there could be a direct and indirect loss of terrestrial habitats and their functions important for wildlife. There may also be a loss of sandbar habitat due to increased water levels or to undesirable vegetation encroachment resulting from stabilized water levels. Santucci et al. (2005) reported that free-flowing river reaches supported a higher quality macroinvertebrate community while pool communities consisted of relatively few taxa dominated by oligochaetes and chironomid larvae that are more tolerant of poorer water quality. Additionally, the potential for up- and downstream channel re-adjustments may cause other hydrogeomorphic changes to the Pearl River and its tributaries within and outside of the Project area. Other concerns include impacts to conservation lands within (i.e., Fannye Cook Preserve, Lefleur's Bluff State Park) and downstream of the Project area, the potential flood inducements on 33,000 acres down to the confluence of Copiah Creek south of Georgetown, the reduction in sediments to coastal marshes, and loss of flows.

We also anticipate impacts from other channel improvement actions such as dredging and widening of the channel. Such actions could cause direct and indirect harm to natural resources. Dredging can reduce prey species, remove shelter and spawning habitat, and cause mortality to turtles, mussels, and fish. Channel widening could destabilize the banks, change flow regime, alter instream and terrestrial habitat, increase water temperatures, and cause direct mortality of some species. Additionally, sediment plumes from these actions can smother species both within the project footprint and downstream. However, depending on the morphology, structure, and depth of the river after dredging, some species may recolonize if no barriers exist.

Previously, Alternative C reported riverine impacts up to 1.6 miles downstream. However, many variables can contribute to downstream impacts, including changes in the river's width and depth, geology, channel confinement, slope, height of dam compared to bank height, etc. Contradicting the 1.6-mile downstream impact zone, recent models developed by the USACE show impacts (i.e., inducements) extending an additional 59 river miles downstream to Copiah Creek just South of Georgetown, Mississippi. Not only is this river reach important to aquatic organisms, but the area also contains one of the largest tributaries to the Pearl River, the Strong River, where listed species recovery work is occurring. Several studies examined impacts downstream of impoundments and found declines in species associated with gravel substrates (e.g., frecklebelly madtom) and those intolerant of geomorphological instability (i.e., darters). Such declines were attributed to water resource projects, land use practices, and changes in sedimentation (Tipton et al. 2004, Piller et al. 2004). Since we expect similar impacts from Alternative D, we agree with the USACE that further watershed and sedimentation analysis would be helpful in confirming downstream impacts.

Construction, future development, and maintenance activities could also cause long-term impacts to water quality resulting from pollutants from existing landfills, storm run-off, and changes in sediment transport. During construction, the project could result in temporary increases in sediment and turbidity in the main stem and tributaries within the Project area and downstream. Increased turbidity can interfere with light penetration and reduce photosynthesis while increased sediments can adversely impact benthic populations of aquatic species. If construction activities occur during the spawning season, increased sediment would smother invertebrates, fish eggs, and larvae. Increased sediment could also smother mussel beds. Conversely, sediment trapping behind the weir can reduce sediment flow downstream, causing long-term adverse impacts to aquatic species habitat and life history strategies. Reduced sediment transport could also result in increased downstream erosion (Csiki and Rhoads 2010).

Alternative C would also result in direct loss of forested wetlands and associated wildlife habitat. Since out-of-bank overflows maintain forested and/or scrub-shrub wetlands, channelization proposed for this project could further impact these forested wetlands by preventing or reducing those overflows. Additionally, disturbed areas along the banks would be exposed and vulnerable to erosion until vegetation becomes established. Forest fragmentation can contribute to population declines in some avian species because fragmentation reduces avian reproductive success (Robinson et al. 1995). The Service is especially concerned when those impacts affect nesting forest interior migratory birds of conservation concern.

The Service classifies wetlands within the Project area as Resource Category 2 habitat, as defined in the Service Mitigation Policy (FR, Vol. 46, No. 15, January 23, 1981). This resource is of "high value for evaluation species and is relatively scarce or becoming scarce on a national basis or in the ecoregion section". The mitigation goal for this habitat is "no net loss of in-kind

habitat value”. Terrestrial habitat within the Pearl River Basin supports more than 400 species (Service 1981). Some wetlands within the Project area could be directly impacted, such as areas in and near Lefleur’s Bluff (i.e., Mayes Lake), around Crystal Lake, and other areas as fill material is placed. Environmental guidelines (40 C.F.R. § 230.91(c)) prescribe that dredged or fill material should not be discharged into the aquatic ecosystem unless it can be demonstrated that such a discharge will not have an unacceptable adverse impact either individually or in combination with known and/or probable impacts of other activities affecting the ecosystems of concern. From a national perspective, the degradation or destruction of special aquatic sites, such as filling operations in wetlands, is considered to be among the most severe environmental impacts covered by those guidelines. The guiding principle should be that degradation or destruction of special sites may represent an irreversible loss of valuable aquatic resources (Federal Water Pollution Control Act, 33 U.S.C. 1344 (b)(1); 40 CFR 230.1).

Increasing development along the Pearl River could contribute to cumulative impacts from Alternative C. Should further development occur, it would remove high priority forested wetlands, reduce habitat available for wildlife, reduce floodplain water storage capacity and filtration, and degrade water quality. Removing vegetation along the banks could increase instability, run-off, and temperatures, damaging aquatic species habitat. Further, removing forested vegetation and increasing impervious services could cause eutrophication of water bodies. A visual representation of concentrated sediments resulting from construction along Pelahatchie Bay can serve as an example of impacts to water quality from development activities (Figure 4). The Mississippi Department of Health reported that rains and floodwaters created a chemical imbalance on one side of the water treatment plant from RBR intake water, leading to a loss of pressure (Inman and Beveridge 2022).



**Figure 4. Aerial visual (2020) of sedimentation in Pelahatchie Bay from construction activities.**

## Alternative D

The “CTO with Weir” alternative will have similar channel improvement activities as Alternative C but will have a smaller footprint and does not propose to relocate some levees further away from the river.

Although Alternative D will have a smaller lake footprint (1,706 acres, 7.5 miles in length) when compared to Alternative C (2,562 acres, 9.5 miles in length), we anticipate similar impacts to fish and wildlife resources as described above for Alternative C. Based on linear footage of riverine habitat being impacted, we could expect a 21 percent reduction in riverine impacts compared to Alternative C. Even though this is an improvement over Alternative C, the addition of a weir and new lake for Alternative D for recreational and economic development purposes results in significant impacts to fish and wildlife resources in the Project area.

Velocity data for Alternative D has not been collected; therefore, the Service is unable to analyze how Alternative D would impact velocities through the newly established impoundment. Accordingly, without such data, we must assume velocities will be similar to those of Alternative C and will fall below the lentic threshold of 0.10 m/s (0.33 ft/s) (Pellett et al. 1983) throughout most of the year, particularly during the active or breeding season for many riverine obligate species. The USACE has committed to providing velocity data for Alternative D during the PED phase should this plan be selected for implementation.

## Alternative E

The (CTO without Weir) alternative would have the same channel improvement activities (i.e. floodplain lowering) as Alternative D. However, there would be no weir and associated impoundment, no slurry walls required, no additional pump stations, and would not require the addition of a fish passage structure. Alternative E would provide the same flood reduction benefits as Alternative D but at a lower cost due to elimination of the features mentioned above. The USACE determined that there would be no recreational and economic development opportunities associated with Alternative E in the DEIS.

No excavation of material would occur within the Pearl River channel; however, temporary increases in turbidity and suspended solids in adjacent water bodies (i.e. the Pearl River and tributaries) would be expected. Erosion control features could decrease the amount of sedimentation, but the sheer volume of material to be moved makes turbidity in the system likely. However, once excavation of the overbank areas is complete and exposed areas are revegetated, riverine species would be expected to recolonize the Pearl River since no barrier (i.e., weir) would exist.

## Habitat Evaluation Procedures Analysis

Habitat Evaluation Procedures (HEP) are a habitat-based evaluation system that produces estimates of current habitat conditions, predictions about future conditions and comparison between alternatives, and aids in devising mitigation strategies, all without the need for direct sampling of animal populations (Service 1980a, 1980b).

HEP is based on the fundamental assumption that the quantity and quality of a habitat can be numerically documented and reasonably predicted for future conditions. This numerical description is represented by the Habitat Suitability Index (HSI) and the area of available habitat for a particular species. The numerical range of the HSI is from 0.0, which represents no habitat value for an evaluation species to 1.0 representing optimum habitat value. This is a linear index with the degree of difference between 0.0 and 0.1 the same as the degree of difference between 0.9 and 1.0. Multiplying the HSI by the area results in Habitat Unit (HU) data which form the essence of the HEP methodology. These HUs serve not only as the principal units of comparison in HEP, but also as a means of communicating the gains and losses in habitat resulting from management activities and project implementation.

Most Federal agencies use annualization to display benefits and costs of a project. Federal projects are evaluated over a period that is referred to as the period of analysis. This is defined as that period between the time that the project becomes operational and the end of the period of analysis (typically 50 years). Habitat unit gains or losses are annualized by summing the cumulative HUs across all impact intervals in the period of analysis and dividing the total HUs by the period of analysis, resulting in AAHUs.

AAHUs for each evaluation species are calculated by summing HUs for successive years and dividing by the period of analysis. Determining the net impacts of a proposed alternative requires that two future annualizations be performed and compared to one another. These future predictions are the expected future conditions with and without the proposed alternative. The net impact computation reflects the difference in AAHUs between the future with and without the project. The change (increase or decrease) in AAHUs under each future with-project condition, compared to future without-project condition, provides a quantitative comparison of project impacts that are expected to occur with each project alternative. An increase in AAHUs indicates that the project is beneficial to the evaluation species; a decrease in average annual habitat units indicates that the project is damaging to the evaluation species.

It is not logistically feasible to analyze habitat impacts to all the species that occupy the Project area. Selection of a limited number of species from a larger set is necessary. Sixteen evaluation species were selected by the NFI to represent the various habitats impacted by the Project. Those evaluation species included barred owl, gray squirrel, swamp rabbit, brown thrasher, eastern

meadowlark, slider turtle, black crappie, bluegill, channel catfish, common carp, great blue heron, great egret, largemouth bass, redear sunfish, white crappie, and wood duck. These species have been utilized by the Service in past analysis of flood control projects for the Jackson area; however, they were selected to analyze a levee project that would not impact riverine habitat.

An Interagency Mitigation Team (IMT) was formed to review HEP models and results from previous flood control efforts in the Jackson area. The team included the Service, USACE, NFI, and MDWFP. The team collaborated on habitat types, used updated acreages, and revised average annual habitat units (AAHUs) accordingly. Since a final mitigation plan has not been developed, the IMT will continue to collaborate during the PED phase to establish a mitigation plan that fully offsets impacts to fish and wildlife resources.

The Project area includes mixed forested wetlands, emergent wetlands, mixed scrub-shrub wetlands, mixed upland forest, upland scrub-shrub, grassland, evergreen forest, and riverine habitat. The IMT agree that mitigation would not be required for grassland impacts, and that lacustrine habitat impacts would be self-mitigating for Alternatives C and D. The IMT also agreed that riverine mitigation would not be required for Alternative E as riverine impacts are not expected to occur. Table 1 displays the unavoidable habitat impacts and terrestrial mitigation requirements associated with the Project.

Habitat Type	Alt C acres of Impact	Alt D acres of impact	Alt E acres of impact	Alt C AAHU's	Alt D AAHU's	Alt E AAHU's
Lacustrine/Open Water	200	81	81	1,231	497	497
BLH wet	1,224	689	689	3,011	1,695	1,695
Swamp	150	55	55	368	135	135
Forested Uplands	710	223	223	2,733	859	859
Riverine	287	232	0	TBD	TBD	0

Table 1. Unavoidable fish and wildlife habitat impacts – habitat type in proposed Project area and model results for each impacted habitat types quantified using AAHUs for Alternative C, D, and E.

The NFI has identified lands that could be used to satisfy all, or a portion of, the terrestrial mitigation needs (impacts to BLH wet, swamp, and forested upland) for Alternatives C, D, and E. The NFI has also identified other available tracts of land that could satisfy any remaining terrestrial mitigation needs. Although a detailed mitigation plan has not been presented to the IMT, the Service anticipates the NFI has access to enough potential mitigation lands to completely satisfy the required terrestrial mitigation. A final mitigation plan for terrestrial impacts will be completed during the PED phase. No mitigation will be required for Alternative A1.

The IMT has agreed that riverine impacts would need to be mitigated in-kind. The pool-like environment behind the weir for Alternative C and D would not compensate for lost riverine habitat and function. The Service has recommended that future planning and mitigation efforts should use the USACE's Engineering Research and Development Center (ERDC) impact and mitigation analysis (ERDC 2006) developed for the Two-lakes Flood Control Plan (a former flood control project considered for the Project area), since it more appropriately captured riverine species. Their analysis of that lake project indicated that obligate riverine species (e.g., darters, suckers) would no longer persist and facultative riverine species (e.g., catfish, shiners, minnows) numbers would decrease. Therefore, HEP models should be conducted during the PED phase using appropriate obligate riverine species to determine the habitat units of riverine habitat impacted and required for mitigation.

Although challenging, the IMT is collaborating on compensatory mitigation with the goal of fully compensating for riverine function loss that would occur. The IMT has identified mitigation strategies for losses to riverine habitat, including purchase of mitigation bank stream credits, removal of obsolete aquatic barriers, hydrological enhancement through replacement of undersized, perched, or damaged culverts with arch span culverts, streambank stabilization, and other similar strategies.

Among these general riverine mitigation strategies, the IMT has only identified one specific measure that could offset most, if not all, of the riverine impacts associated with Alternatives C and D. Pools Bluff Sill on the lower Pearl River and the Bogue Chitto Sill on the lower Bogue Chitto River are the only obsolete aquatic barriers identified that could be successfully removed under the USACE's authority. These decommissioned and non-functional sills are part of the USACE's Pearl River Navigation Project completed in 1956. The project included three navigation locks, two low-head dams (sills), and an overflow structure that facilitated maritime commerce on the Pearl River until 1974. The project was placed in caretaker status in 1995. The removal of these sills remains a high priority conservation action as these sills have altered the historic migration routes and the overall life cycle of fish species, including the Gulf sturgeon (Service 1995). The removal of these sills would also improve recreational boater access within the Pearl River Basin and remove current safety hazards that have killed numerous boaters over the years while attempting to pass over the sills.

## Conservation Measures and Recommendations

The USACE is evaluating four different alternatives for flood risk management in the Project area, including a nonstructural solution (Alternative A1), a structural solution (channel improvements with construction of a large weir; Alternative C), and two "combination thereof" (CTO) alternatives that combine features of A1 and C (Alternative D with weir and Alternative E

without weir). Alternative C, the former tentatively selected plan by the NFI, was identified as the most environmentally damaging alternative. Alternative A1 is expected to produce the smallest environmental impact compared to other alternatives, because no instream work would be conducted, and no aquatic or forested habitat would be impacted.

Both CTO alternatives have the same flood risk management benefits; however, Alternative E will result in significantly fewer impacts to fish and wildlife resource resources. Both CTO alternatives would have similar terrestrial mitigation requirements; however, Alternative E would have fewer riverine impacts and therefore fewer, if any, riverine mitigation requirements. Alternative E is also the less expensive of the two CTO alternatives and has a number of potential advantages over Alternative D that the USACE has failed to consider in its DEIS (i.e., recreational and ecological restoration opportunities). Finally, the Service has concerns with the USACE selecting a weir-based plan for implementation without knowing how or if riverine impacts can be fully mitigated.

In order to achieve FWCA planning goals and objectives, the Service recommends the following:

1. Fully evaluate the river and floodplain restoration potential of Alternative E.

Since no weir would be installed with Alternative E, we anticipate there will be current and future opportunities by the USACE, Service, and other federal, state, and local partners to restore and enhance existing river functions after flood risk management activities are completed. These measures could include the placement of instream habitat (shoals, gravel bars, woody debris), enhancement or creation of sandbars, the creation of oxbows in the newly excavated floodplain (i.e., similar to riverside levee borrow pits along the MS River; see [USACE](#) website), and the reforestation of the riparian buffer along the Pearl River within the Project area. Selection of this alternative also allows the future opportunity to retrofit the existing weir at the J.H. Fewell WTP for improved fish passage, or possibly the complete removal of the weir if the WTP is eventually decommissioned. Provided such measures do not negatively impact flood storage and conveyance, we anticipate they could significantly improve the fish and wildlife resources found within the Project area, especially for those areas of the river that have been previously channelized and have reduced riparian vegetation (i.e., mowing, herbicide areas). Such measures could fulfill the USACE's responsibilities under Section 7(a)(1) of the Endangered Species Act, which directs all federal agencies to carry out "programs for the conservation of endangered and threatened species".

Finally, Alternative E provides the opportunity to restore rivercane (*Arundinaria gigantea*) and switch cane (*Arundinaria tecta*) to suitable sites within the Project area. These species were identified by Tribal Nations as Cultural Keystone Species that should be conserved and restored. Therefore, we request these measures and opportunities be evaluated in the final EIS and considered when selecting a final plan for implementation. Such measures would be

permanently eliminated for future consideration should a weir and impoundment be constructed.

2. Fully evaluate the recreational and economic development potential of Alternative E.

The USACE, in developing the DEIS, has failed to consider and describe the recreational and economic development opportunities associated with Alternative E. The DEIS incorrectly assumes Alternative E would not provide any of the recreational opportunities that Alternative D would provide, such as biking/hiking trails, boat ramps, kayak launches, camping, and wildlife viewing. Many of these recreational opportunities are realized on urban rivers across the United States, and it's unclear as to why such opportunities have not been further explored in the DEIS. For example, the existing multi-use Museum Trail and greenway could be expanded along the existing levee system and new fill material areas. An expanded trail system such as this would not require the establishment of a new lake to be successful. New boat ramps and public access points to the Pearl River south of the J.H. Fewell WTP weir could alleviate reduced river access that currently exists. The creation of a series of oxbow lakes/borrow pits along the newly excavated Pearl River floodplain could create fishing opportunities that may be lacking in the Jackson metropolitan area. Such river-based recreational opportunities could result in increased economic development within the Jackson metropolitan area while preserving and restoring fish and wildlife resources that would be lost with the creation of a new lake.

Such features associated with Alternative E could also assist in creating a new greenway and blueway system connecting public lands (i.e., Fannye Cook Natural Area, LeFleur's Bluff State Park, Crystal Lake) through the Jackson metropolitan area, further improving recreational access to the river and economic development associated with such sustainable development of the river. The DEIS as currently written fails to realize these benefits and implies such opportunities can only be gained via creation of a new lake. Therefore, we recommend these recreational and economic development opportunities be evaluated in the final EIS and considered before a plan for implementation is selected.

3. Develop a site-specific riverine mitigation strategy for Alternatives C and D before selecting a plan for implementation.

We recommend identifying the specific riverine mitigation strategy and/or location of mitigation lands before selecting either Alternative C or D for plan implementation. With the significant impacts to riverine species that are expected with either of the weir alternatives, we believe it would be prudent to identify specific sites and measures that will be conducted to offset riverine impacts before either weir plan is selected.

Many experts indicate that riverine mitigation is challenging, since loss of both habitat and function are difficult to compensate (National Academy of Sciences 1992, King et al. 1991).

Mitigation efforts that restore in-stream functions elsewhere within the range of at-risk species could offset expected habitat loss to those resources. Mitigation efforts on the main stem of the Pearl River and its tributaries (e.g., Strong River, Bogue Chitto) should be a priority. Measures to promote fish passage, such as removing obsolete barriers (i.e., Poole's Bluff and Bogue Chitto Sills) and incorporating monitoring and adaptive management could benefit the Gulf sturgeon, southeastern blue sucker, Alabama shad, American eel, striped bass, various darters, mussels, and others.

Riparian protection via land acquisition or conservation easements could provide benefits to at-risk species through removal of threats associated with sedimentation and riparian forest loss. Maintaining or implementing vegetated streamside management zones in agricultural areas could also stabilize the bank, protect water quality, benefit aquatic habitat, and provide habitat and travel corridors for wildlife. Removing threats associated with channel clearing/desnagging could also provide benefits to the alligator snapping turtle and other riverine turtles. Many of these conservation efforts could also benefit freshwater mussels, one of the most imperiled taxonomic groups in the country.

#### 4. Conduct a sediment analysis for Alternatives C and D.

A watershed and sedimentation analysis could aid in determining impacts and developing mitigation measures. Where the Pearl River and tributary stream water levels will be increased or decreased by project implementation, the potential extent of resulting channel re-adjustment or other hydrogeomorphic changes (e.g., bank erosion, channel incision) should be analyzed and appropriate mitigation measures implemented, such as in-stream structures, to ameliorate negative impacts to stream habitat and benthic and aquatic fauna. Impacts resulting from tributary channel re-adjustment and proposed mitigation should be quantified and included in the impact and mitigation analysis including increased sedimentation and loss of riparian habitat. The potential for reduced flows during droughts and the resulting impact to downstream aquatic resources is a concern. Reduced flows could result in poor water quality conditions from downstream discharges further impacting aquatic resources.

#### 5. Avoid and minimize impacts to sandbar habitat for Alternative E.

The vulnerable riverine sandbar habitat, especially the less modified sites located outside of the channelized areas, has high wildlife resource value and is becoming relatively scarce on a regional and national basis. The Service's mitigation goal for this habitat type is no net loss of in-kind habitat value. Measures to avoid and minimize impacts should be developed and implemented for Alternative E. Mitigation measures could also include implementation of some of the recovery criteria for the threatened ringed map turtle and should explore the

inclusion of measures to help protect and restore habitat for those Pearl River endemic species.

6. Conduct a comprehensive assessment of changes in the Pearl River Basin's hydrology and land uses.

Alteration of the Pearl River Basin's floodplain has contributed to the decline in the overall function and values of the Pearl River as evidenced by the increased loss or decline of riverine dependent species, including some at-risk species, within the watershed and the loss of species diversity. A comprehensive assessment of changes in the Pearl River Basin's hydrology and land uses should be conducted to determine their influence on flooding and the ecosystem response with a goal of identifying and developing ecosystem restoration projects that can reduce flood risk throughout the Basin.

Additional Service recommendations for Alternatives C and D only:

7. Continue to coordinate with the Service on construction of a fish passage structure to ensure designs facilitate appropriate velocities and staging/resting areas for fish and turtles.
8. In consultation with the natural resource agencies, a plan should be developed to identify and designate shoreline usage areas within the Project area, as well as down and upstream areas influenced by the project. Designations should include: 1) limited development, 2) public recreation, 3) protected shoreline, and 4) prohibited access areas (e.g., public safety). This would help ensure that fish and wildlife mitigation, including minimization, associated with the project are maintained and would aid in complying with ER 1110-2-8154.
9. During low-flow periods, including droughts, sufficient flow should be maintained even if water levels fall below target pool elevations, matching the discharge from the RBR.
10. When filling the pool, the downstream flow should at least maintain the minimum required discharge from the RBR, while also allowing portions of flood flows to pass downstream. Develop a plan to aid in sediment flushing.
11. Gate operations at reservoirs have been used to help flush sediment captured within pools downstream (Fruchard and Camenen 2012, Espa et al. 2013); therefore, development of an operational plan to aid sediment flushing should be undertaken. Since benthic communities can be at risk of impairment (Cattaneo et al. 2021), such a plan should include ecological objectives and operations should limit or avoid adverse impacts downstream.

12. Release of contaminants during construction and pool filling, and their impact on fish and wildlife resources is a concern that should be addressed via the development of a contaminant investigation and report on methods for addressing this potential issue.
13. Long-term water quality and quantity monitoring up and down stream and within the expanded channel should be undertaken pre- and post-construction. Measured parameters should include at minimum temperature, DO, total suspended sediments, nitrogen, pH, fecal coliforms, velocity, discharge, and water levels, as well as other physical and chemical parameters necessary to maintain the life cycle of selected aquatic species. This water quality monitoring plan should be developed in cooperation with the natural resource agencies and should be used to ensure aquatic AAHUs mitigated by the pool are achieved (ER 1110-2-8154; engineer regulation on water quality).
14. Loss of any flows and the resulting potential changes to water quality, including salinities, within the Mississippi Sound should be monitored. Details regarding water quality parameters and location should be developed with the LDWF Marine Fisheries staff.

Additional Service Recommendations for Alternatives C, D, and E:

15. On-site contract personnel including project-designated inspectors should be trained to identify colonial nesting birds and their nests and avoid impacting them during the breeding season (i.e., the period outside the activity window). Should on-site contractors and inspectors observe potential nesting activity, coordination with the MDWFP and the Service should occur.
16. Bald eagles (*Haliaeetus leucocephalus*) are found within the Project area and are protected under the Bald and Golden Eagle Protection Act (BGEPA). During project construction, on-site personnel should be informed of the possible presence of nesting bald eagles near the project boundary, and should identify, avoid, and immediately report any such nests to this office. If an active or inactive eagle nest is discovered within two miles of the project footprint, then follow the bald and golden eagle guidelines to determine whether disturbance will occur and/or an incidental take permit is needed.
17. Continue to include the Service in planning and project collaboration during the PED phase once a plan for implementation has been selected.
18. Creation and reforestation of a riparian zone from the toe of the levee to the river or lake should be undertaken where feasible to provide riparian habitat and provide erosion protection to the fill areas.
19. Mitigation should be implemented concurrent with construction.
20. Mitigation for unavoidable losses of fish and wildlife habitat, as reflected by loss of AAHUs, as well as loss of function, should be implemented within the Pearl River Basin.

We recommend maintaining the interagency mitigation team for planning, coordination, future sampling, and HEP analysis. At minimum plan components should include:

- a. criteria for determining ecological success;
  - b. monitoring until after successful completion;
  - c. a description of available lands for mitigation and the basis for the determination of availability;
  - d. incorporate a public land measure for any impacts to public lands;
  - e. identification of the entity responsible for monitoring;
  - f. development of a contingency plan (i.e., adaptive management);
  - g. during consideration of mitigation sites, recovery goals for ESA listed species within the Project area should be considered as well as habitat that would help conserve at-risk species;
  - h. implement riverbank protection/stabilization in areas that are experiencing instability, gravel bar protection/restoration, sand and gravel mine restoration; and
  - i. establish a consultation process with appropriate Federal and State agencies to determine acceptable means of mitigation and success criteria.
21. Impacts to the public lands, such as LeFleur's Bluff State Park, and other conservation lands (Fannye Cook Natural Area) should be avoided and minimized. Mitigation for such impacts should be located on public lands or property that is placed into the public trust.
  22. A conservation easement, in perpetuity, should be recorded on the deed of any mitigation sites not transferred to public ownership.
  23. Adequate turbidity, silt, and spoil containment barriers should be used to protect aquatic and wetland resources.
  24. Incorporate sediment and erosion control measures during construction and re-vegetate all disturbed areas not proposed for future access or staging immediately following construction. Incorporate measures to identify potential erosion issues, and control erosion and potential head-cutting downstream.
  25. Assess existing constrictions within the main stem of the Pearl River and identify solutions for flood reduction considerations (i.e., in stream debris-clean up, road and railroad bridge obstructions and inadequacy for flow).
  26. Sediment testing for contaminants is recommended in areas proposed for use as borrow or that would be flooded by the project, especially those around known contaminated areas that are proposed for use in levees, berms, or islands, where contaminant exposure to fish and wildlife is probable. The testing and response plan for any contaminated soil should be developed in cooperation with the natural resource agencies.
  27. An invertebrate, fishery, and aquatic turtle monitoring plan should be developed to ensure that all impacts of the project have been mitigated and that mitigation features (e.g., river restoration) are functioning as intended. This long-term plan should incorporate various

gear types (e.g., electro-shocking, seines, gill nets) to maximize the detection of various riverine guild species most susceptible to water resource development projects. This plan should be developed in cooperation with the natural resource agencies.

28. A monitoring and adaptive management plan addressing upstream and downstream geomorphology impacts should be developed in coordination with the natural resource agencies to determine the need to implement grade or other erosion control (e.g., bank stabilization) features to minimize project impacts to the Pearl River and its tributaries. That plan should include at minimum the use of aerial photographs, geographical information systems, gauge and cross-section data, as well as other parameters deemed necessary during development of that plan. The plan should be developed in cooperation with the natural resource agencies. Monitoring may result in the determination of additional monitoring and/or mitigation needs from such impacts. The plan should incorporate a request for pre-authorization for such mitigation if it is determined necessary.
29. Undeveloped portions of the floodplain serve to absorb and store storm run-off and reduce additional flood damages. Restrictive use zoning or non-development easements should be implemented by the NFI, prior to project construction, and contain language stringent enough to ensure that flood-prone development does not occur and that undeveloped lands in the floodplain are used for floodwater storage, wildlife, outdoor recreation, and other flood compatible land uses. Floodplain ordinances could be an effective measure to avoid additional future flood damages throughout the Jackson metropolitan area.

## Summary of Findings and Service Position

The Service Mitigation Policy (Federal Register, Vol. 46, pp. 7644-7663, January 23, 1981) is specific in its guidance pertaining to formulation of an official position relative to a given water development project. In essence, a project must meet the five criteria presented below to gain Service approval.

- 1) Proposals are ecologically sound.
- 2) The least environmentally damaging reasonable alternative is selected.
- 3) Every reasonable effort is made to avoid or minimize damage or loss of fish and wildlife resources and uses.
- 4) All important recommended means and measures have been adopted with guaranteed implementation to satisfactorily compensate for unavoidable damage or loss consistent with the appropriate mitigation goal.
- 5) For wetlands and shallow water habitats, the proposed activity is clearly water dependent, and there is a demonstrated public need.

The Mitigation Policy also provides explicit guidance regarding formulation of the Service position regarding a given project:

“The Service may recommend the ‘no project’ alternative for those projects or other proposals that do not meet all the above criteria and where there is likely to be a significant fish and wildlife resource loss.”

In accordance with the above provisions, it is the Service’s position that only Alternatives A1 and E meet the five criteria provided above. These alternatives minimize fish and wildlife resource impacts, and specifically avoid the construction of a weir and resulting impoundment for potential recreational and economic development opportunities.

The Service is not opposed to providing flood protection to the Jackson metropolitan area; however, the Service currently has significant concerns regarding implementation of Alternatives C or D as proposed for the Pearl River Basin, Mississippi, Federal Flood Risk Management Project, Rankin and Hinds Counties, Mississippi. The reasons for our concerns, which address the five criteria presented above, are provided below:

1. For Alternatives C and D, a weir would impede aquatic species movement for an additional 16 to 18 miles upstream (from new weir to RBR dam) and would convert approximately 7.5 to 9.5 miles of riverine habitat to lacustrine habitat for approximately nine months of each year. Some at-risk species and other aquatic species that are more dependent on riverine habitat would no longer persist at current population levels due to this habitat conversion. A fish passage may mitigate fish migration impacts of the weir, but velocities and staging/resting areas would need to be confirmed and monitoring and adaptive management would be warranted.

Hydrological processes are critical to riverine systems. Constructing a large weir or impoundment on a river system can alter conditions permanently, causing significant direct and indirect adverse impacts within and downstream of the Project area (Cross 1987, Tipton et al. 2004, National Academy of Sciences 1992). Impoundments reduce fish diversity and change the relative abundance of species (Whitley and Campbell 1974, Cross 1987). Other impacts include water quality degradation, altered sediment loads, severe geomorphological changes, and disturbance in freshwater flow to the Mississippi Sound. Hence, riverine obligates may not only decline significantly, but could be extirpated from the Project area. Consequently, coupled with the loss in function and habitat, mitigation for such impacts could be challenging and costly (National Academy of Sciences 1992, King et al. 1991, Palmer et al. 2005, Michener 2008, Wohl et al. 2005,

2015). In fact, so much is the impact to natural resources and ecosystem services by impounding rivers, that the national trend is to remove these barriers (Loomis 1996, McCully 1997, Lovett 1999). Lake habitat, on the other hand, especially ponds, has increased in the last decade and is deemed common, widespread, and abundant in Mississippi (MDWFP 2016).

2. Alternative C is the most damaging alternative for both terrestrial and aquatic resources. Alternative A1 would induce the least ecological damage while providing flood reduction benefits. Alternatives D and E have the same flood reduction benefits; however, Alternative E costs less to construct and results in significantly fewer impacts to fish and wildlife resources. Therefore, the Service concludes that of the structural solutions proposed, Alternative E is the least environmentally damaging, reasonable alternative.
3. The Service has provided recommendations within the draft interim FWCA report that would aid in avoiding and minimizing impacts to fish and wildlife resources, namely the avoidance of a new weir and impoundment on the fourth largest river in the Southeast. Incorporation of these recommendations would aid in complying with this criterion. Construction of a weir and impoundment for recreational and economic development opportunities, and not for flood risk management purposes, is not making a reasonable effort to avoid and minimize damage or loss of fish and wildlife resources and uses.
4. The lack of a detailed riverine mitigation plan at this stage in the planning process precludes the USACE and Service from determining how or if a proposed weir alternative can satisfactorily compensate fish and wildlife losses. Selection of a plan for implementation without such information would not comply with this criterion.
5. There is a demonstrated need for flood protection within the Jackson metropolitan area; however, the need for the proposed Alternatives C and D in-lieu of other possible flood reduction alternatives that may be less damaging to fish and wildlife resources has not been clearly demonstrated.

Regardless of what alternative is ultimately finalized for implementation, the Service requests that all our recommendations be incorporated into the project plans to ensure compliance with the FWCA. A final FWCA report will be provided when final design details and potential impacts are provided and a complete mitigation plan for terrestrial and riverine impacts is identified. The Service looks forward to our continued work with the USACE to address the flood risk reduction needs of the Jackson metropolitan area.

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## US Fish and Wildlife Service Recommendations and USACE Responses

### 1. Fully evaluate the river and floodplain restoration potential of Alternative E.

Since no weir would be installed with Alternative E, we anticipate there will be current and future opportunities by the USACE, Service, and other federal, state, and local partners to restore and enhance existing river functions after flood risk management activities are completed. These measures could include the placement of instream habitat (shoals, gravel bars, woody debris), enhancement or creation of sandbars, the creation of oxbows in the newly excavated floodplain (i.e., similar to riverside levee borrow pits along the MS River; see USACE website), and the reforestation of the riparian buffer along the Pearl River within the Project area. Selection of this alternative also allows the future opportunity to retrofit the existing weir at the J.H. Fewell WTP for improved fish passage, or possibly the complete removal of the weir if the WTP is eventually decommissioned. Provided such measures do not negatively impact flood storage and conveyance, we anticipate they could significantly improve the fish and wildlife resources found within the Project area, especially for those areas of the river that have been previously channelized and have reduced riparian vegetation (i.e., mowing, herbicide areas). Such measures could fulfill the USACE's responsibilities under Section 7(a)(1) of the Endangered Species Act, which directs all federal agencies to carry out "programs for the conservation of endangered and threatened species".

Finally, Alternative E provides the opportunity to restore rivercane (*Arundinaria gigantea*) and switch cane (*Arundinaria tecta*) to suitable sites within the Project area. These species were identified by Tribal Nations as Cultural Keystone Species that should be conserved and restored. Therefore, we request these measures and opportunities be evaluated in the final EIS and considered when selecting a final plan for implementation. Such measures would be permanently eliminated for future consideration should a weir and impoundment be constructed.

**USACE Response:** Concur. USACE will include a qualitative assessment of river and floodplain restoration potentials of Alt E in the current report. Detailed assessments will be conducted in subsequent phase(s).

### 2. Fully evaluate the recreational and economic development potential of Alternative E.

The USACE, in developing the DEIS, has failed to consider and describe the recreational and economic development opportunities associated with Alternative E. The DEIS incorrectly assumes Alternative E would not provide any of the recreational opportunities that Alternative D would provide, such as biking/hiking trails, boat ramps, kayak launches, camping, and wildlife viewing. Many of these recreational opportunities are realized on urban rivers across the United States, and it's unclear as to why such opportunities have not been furthered explored in the DEIS. For example, the existing multi-use Museum Trail and greenway could be expanded along the existing levee

system and new fill material areas. An expanded trail system such as this would not require the establishment of a new lake to be successful. New boat ramps and public access points to the Pearl River south of the J.H. Fewell WTP weir could alleviate reduced river access that currently exists. The creation of a series of oxbow lakes/borrow pits along the newly excavated Pearl River floodplain could create fishing opportunities that may be lacking in the Jackson metropolitan area. Such river-based recreational opportunities could result in increased economic development within the Jackson metropolitan area while preserving and restoring fish and wildlife resources that would be lost with the creation of a new lake.

Such features associated with Alternative E could also assist in creating a new greenway and blueway system connecting public lands (i.e., Fannye Cook Natural Area, LeFleur's Bluff State Park, Crystal Lake) through the Jackson metropolitan area, further improving recreational access to the river and economic development associated with such sustainable development of the river. The DEIS as currently written fails to realize these benefits and implies such opportunities can only be gained via creation of a new lake. Therefore, we recommend these recreational and economic development opportunities be evaluated in the final EIS and considered before a plan for implementation is selected.

**USACE Response:** Concur. USACE will include a qualitative assessment of recreational and economic development opportunities associated with Alternative E in the current report. Detailed assessments will be conducted in subsequent phase(s).

3. Develop a site-specific riverine mitigation strategy for Alternatives C and D before selecting a plan for implementation.

We recommend identifying the specific riverine mitigation strategy and/or location of mitigation lands before selecting either Alternative C or D for plan implementation. With the significant impacts to riverine species that are expected with either of the weir alternatives, we believe it would be prudent to identify specific sites and measures that will be conducted to offset riverine impacts before either weir plan is selected.

Many experts indicate that riverine mitigation is challenging, since loss of both habitat and function are difficult to compensate (National Academy of Sciences 1992, King et al. 1991). Mitigation efforts that restore in-stream functions elsewhere within the range of at-risk species could offset expected habitat loss to those resources. Mitigation efforts on the main stem of the Pearl River and its tributaries (e.g., Strong River, Bogue Chitto) should be a priority. Measures to promote fish passage, such as removing obsolete barriers (i.e., Poole's Bluff and Bogue Chitto Sills) and incorporating monitoring and adaptive management could benefit the Gulf sturgeon, southeastern blue sucker, Alabama shad, American eel, striped bass, various darters, mussels, and others.

Riparian protection via land acquisition or conservation easements could provide benefits to at-risk species through removal of threats associated with sedimentation and riparian forest loss. Maintaining or implementing vegetated streamside management

zones in agricultural areas could also stabilize the bank, protect water quality, benefit aquatic habitat, and provide habitat and travel corridors for wildlife. Removing threats associated with channel clearing/disengaging could also provide benefits to the alligator snapping turtle and other riverine turtles. Many of these conservation efforts could also benefit freshwater mussels, one of the most imperiled taxonomic groups in the country.

**USACE Response:** Concur. A preliminary riverine mitigation plan has been developed in coordination with the resource agencies. A site-specific mitigation plan will be developed in subsequent phases once a FRM project is identified for further analysis.

#### 4. Conduct a sediment analysis for Alternatives C and D.

A watershed and sedimentation analysis could aid in determining impacts and developing mitigation measures. Where the Pearl River and tributary stream water levels will be increased or decreased by project implementation, the potential extent of resulting channel re-adjustment or other hydrogeomorphic changes (e.g., bank erosion, channel incision) should be analyzed and appropriate mitigation measures implemented, such as in-stream structures, to ameliorate negative impacts to stream habitat and benthic and aquatic fauna. Impacts resulting from tributary channel re-adjustment and proposed mitigation should be quantified and included in the impact and mitigation analysis including increased sedimentation and loss of riparian habitat. The potential for reduced flows during droughts and the resulting impact to downstream aquatic resources is a concern. Reduced flows could result in poor water quality conditions from downstream discharges further impacting aquatic resources.

**USACE Response:** Concur. USACE has committed to conducting sedimentation analysis in subsequent phase(s) and prior to implementation.

#### 5. Avoid and minimize impacts to sandbar habitat for Alternative E.

The vulnerable riverine sandbar habitat, especially the less modified sites located outside of the channelized areas, has high wildlife resource value and is becoming relatively scarce on a regional and national basis. The Service's mitigation goal for this habitat type is no net loss of in-kind habitat value. Measures to avoid and minimize impacts should be developed and implemented for Alternative E. Mitigation measures could also include implementation of some of the recovery criteria for the threatened ringed map turtle and should explore the inclusion of measures to help protect and restore habitat for those Pearl River endemic species.

**USACE Response:** Concur. The USACE is working and will continue to work closely with USFWS to ensure avoidance, minimization, and mitigation of sandbar habitat.

#### 6. Conduct a comprehensive assessment of changes in the Pearl River Basin's hydrology and land uses.

Alteration of the Pearl River Basin's floodplain has contributed to the decline in the overall function and values of the Pearl River as evidenced by the increased loss or

decline of riverine dependent species, including some at-risk species, within the watershed and the loss of species diversity. A comprehensive assessment of changes in the Pearl River Basin's hydrology and land uses should be conducted to determine their influence on flooding and the ecosystem response with a goal of identifying and developing ecosystem restoration projects that can reduce flood risk throughout the Basin.

**USACE Response:** Acknowledged. The current authority does not afford opportunity to conduct such a comprehensive assessment.

*Additional Service recommendations for Alternatives C and D only:*

7. Continue to coordinate with the Service on construction of a fish passage structure to ensure designs facilitate appropriate velocities and staging/resting areas for fish and turtles.

**USACE Response:** Concur. USACE will continue to coordinate with the Service throughout all phases of the project.

8. In consultation with the natural resource agencies, a plan should be developed to identify and designate shoreline usage areas within the Project area, as well as down and upstream areas influenced by the project. Designations should include: 1) limited development, 2) public recreation, 3) protected shoreline, and 4) prohibited access areas (e.g., public safety). This would help ensure that fish and wildlife mitigation, including minimization, associated with the project are maintained and would aid in complying with ER 1110-2-8154.

**USACE Response:** Acknowledged. These designated shoreline usage areas will be considered in subsequent phase(s). Some of these designations could be considered in the project specific mitigation plan to be developed.

9. During low-flow periods, including droughts, sufficient flow should be maintained even if water levels fall below target pool elevations, matching the discharge from the RBR.

**USACE Response:** Acknowledged. An operation plan will be developed in subsequent phases and in coordination with the natural resource agencies.

10. When filling the pool, the downstream flow should at least maintain the minimum required discharge from the RBR, while also allowing portions of flood flows to pass downstream. Develop a plan to aid in sediment flushing.

**USACE Response:** Acknowledged. An implementation and operation plan will be developed in subsequent phase(s) and will be coordinated closely with the natural resource agencies.

11. Gate operations at reservoirs have been used to help flush sediment captured within pools downstream (Fruchard and Camenen 2012, Espa et al. 2013); therefore, development of an operational plan to aid sediment flushing should be undertaken.

Since benthic communities can be at risk of impairment (Cattaneo et al. 2021), such a plan should include ecological objectives and operations should limit or avoid adverse impacts downstream.

**USACE Response:** Acknowledged. An operations plan will be developed in subsequent phase(s) and coordinated with the natural resource agencies.

12. Release of contaminants during construction and pool filling, and their impact on fish and wildlife resources is a concern that should be addressed via the development of a contaminant investigation and report on methods for addressing this potential issue.

**USACE Response:** Prior to any construction, an American Society for Testing Materials (ASTM) Phase I and Phase II will be conducted to ensure this concern is addressed.

13. Long-term water quality and quantity monitoring up and down stream and within the expanded channel should be undertaken pre- and post-construction. Measured parameters should include at minimum temperature, DO, total suspended sediments, nitrogen, pH, fecal coliforms, velocity, discharge, and water levels, as well as other physical and chemical parameters necessary to maintain the life cycle of selected aquatic species. This water quality monitoring plan should be developed in cooperation with the natural resource agencies and should be used to ensure aquatic AAHUs mitigated by the pool are achieved (ER 1110-2-8154; engineer regulation on water quality).

**USACE Response:** Concur. WQ monitoring is required per the ESA consultation and the mitigation monitoring plan.

14. Loss of any flows and the resulting potential changes to water quality, including salinities, within the Mississippi Sound should be monitored. Details regarding water quality parameters and location should be developed with the LDWF Marine Fisheries staff.

**USACE Response:** Acknowledged. Current H&H models show no impacts to the MS Sound. If additional analysis, which will be conducted in subsequent phase(s), indicate any changes as far down as the MS Sound, USACE will coordinate with the Service on appropriate monitoring efforts.

*Additional Service Recommendations for Alternatives C, D, and E:*

15. On-site contract personnel including project-designated inspectors should be trained to identify colonial nesting birds and their nests and avoid impacting them during the breeding season (i.e., the period outside the activity window). Should on-site contractors and inspectors observe potential nesting activity, coordination with the MDWFP and the Service should occur.

**USACE Response:** Concur. The EIS states that a qualified biologist would survey the area prior to construction to determine the presence of nesting birds. Coordination with

The Service and MDWFP would establish buffer zones and other guidelines to be implemented for nesting migratory birds depending on the species present.

16. Bald eagles (*Haliaeetus leucocephalus*) are found within the Project area and are protected under the Bald and Golden Eagle Protection Act (BGEPA). During project construction, on-site personnel should be informed of the possible presence of nesting bald eagles near the project boundary, and should identify, avoid, and immediately report any such nests to this office. If an active or inactive eagle nest is discovered within two miles of the project footprint, then follow the bald and golden eagle guidelines to determine whether disturbance will occur and/or an incidental take permit is needed.

**USACE Response:** Concur. The EIS states that a qualified biologist would survey the area prior to construction to determine the presence of nesting birds. If eagle nests are found in the project area, the USACE MVK would apply for an incidental eagle take permit and would implement avoidance and minimization features described in the National Bald Eagle Management Guidelines until a permit with applicable requirements is received.

17. Continue to include the Service in planning and project collaboration during the PED phase once a plan for implementation has been selected.

**USACE Response:** Concur. USACE will continue to coordinate with The Service throughout all phases of the project.

18. Creation and reforestation of a riparian zone from the toe of the levee to the river or lake should be undertaken where feasible to provide riparian habitat and provide erosion protection to the fill areas.

**USACE Response:** Acknowledged. Some creation or reforestation of a portions of this area near the edges of the river or lake could be added in subsequent phase(s). However riparian habitat will not be feasible everywhere. Further testing would need to occur to show that the reforestation would not significantly impact flood level reduction. It may be easier to create forested areas, at edges of excavation area, rather than along edge of river for portions of Alternative E.

19. Mitigation should be implemented concurrent with construction.

**USACE Response:** Concur. Mitigation will be implemented prior to or concurrent with construction of any FRM measures.

20. Mitigation for unavoidable losses of fish and wildlife habitat, as reflected by loss of AAHUs, as well as loss of function, should be implemented within the Pearl River Basin. We recommend maintaining the interagency mitigation team for planning, coordination, future sampling, and HEP analysis. At minimum plan components should include:

- a. criteria for determining ecological success;
- b. monitoring until after successful completion;

- c. a description of available lands for mitigation and the basis for the determination of availability;
- d. incorporate a public land measure for any impacts to public lands;
- e. identification of the entity responsible for monitoring;
- f. development of a contingency plan (i.e., adaptive management);
- g. during consideration of mitigation sites, recovery goals for ESA listed species within the Project area should be considered as well as habitat that would help conserve at-risk species;
- h. implement riverbank protection/stabilization in areas that are experiencing instability, gravel bar protection/restoration, sand and gravel mine restoration; and
- i. establish a consultation process with appropriate Federal and State agencies to determine acceptable means of mitigation and success criteria.

**USACE Response:** Concur. The natural resource agencies will continue to be included in all phases of the project. As stated in the preliminary mitigation plan, loss of value and function of each habitat type will be mitigated in kind and within the PR basin. Each component listed will be included in the project specific mitigation plan to be developed during subsequent phases.

21. Impacts to the public lands, such as LeFleur's Bluff State Park, and other conservation lands (Fannye Cook Natural Area) should be avoided and minimized. Mitigation for such impacts should be located on public lands or property that is placed into the public trust.

**USACE Response:** Concur. USACE has requested input from MDWFP regarding properties MDWFP would be interested in receiving as a substitution for USACE' S consideration in mitigating potential impacts to park property from the PR FRM project. USACE will continue to coordinate with MDWFP on this matter.

22. A conservation easement, in perpetuity, should be recorded on the deed of any mitigation sites not transferred to public ownership.

**USACE Response:** Concur: any mitigation lands not transferred to public ownership will have a conservation easement, in perpetuity, recorded on the deed.

23. Adequate turbidity, silt, and spoil containment barriers should be used to protect aquatic and wetland resources.

**USACE Response:** Concur. A storm water pollution prevention plan (SWPPP) is required and will include measures to be implemented during construction to address turbidity, siltation, and sluffing of soils.

24. Incorporate sediment and erosion control measures during construction and re-vegetate all disturbed areas not proposed for future access or staging immediately

following construction. Incorporate measures to identify potential erosion issues, and control erosion and potential head-cutting downstream.

**USACE Response:** Concur. A SWPPP is required and will include measures to be implemented during construction to address erosion. Re-vegetation of cleared areas not intended for FRM or future access/staging will be considered in PED.

25. Assess existing constrictions within the main stem of the Pearl River and identify solutions for flood reduction considerations (i.e., in stream debris-clean up, road and railroad bridge obstructions and inadequacy for flow).

**USACE Response:** Acknowledged. This has been partially completed at this time, i.e. removal of abandoned railroad embankment just south of the Fewell Weir. Further analysis of “pinch points” could be completed in subsequent phase(s). Generally, stream debris issues are more significant on the tributaries rather than the Pearl River itself and would not be expected to show a significant improvement to flood stages from flooding caused by the Pearl River.

26. Sediment testing for contaminants is recommended in areas proposed for use as borrow or that would be flooded by the project, especially those around known contaminated areas that are proposed for use in levees, berms, or islands, where contaminant exposure to fish and wildlife is probable. The testing and response plan for any contaminated soil should be developed in cooperation with the natural resource agencies.

**USACE Response: Concur.** Borrow material whether being brought onto USACE property or taken from USACE property shall be screened for environmental contaminants prior to transfer. Soils that exhibit hazardous waste characteristics (40 CFR 261.21- 261.24), even if naturally occurring, are not eligible as borrow material. Professional judgement will be used to identify material that is suitable. USACE will ensure that the guidelines outlined within ER 1165-2-132 and the guidelines outlined within the Mississippi Department of Environmental Quality Groundwater Assessment Remediation Division and Waste Division are followed if testing and response to contaminated material is needed.

27. An invertebrate, fishery, and aquatic turtle monitoring plan should be developed to ensure that all impacts of the project have been mitigated and that mitigation features (e.g., river restoration) are functioning as intended. This long-term plan should incorporate various gear types (e.g., electro-shocking, seines, gill nets) to maximize the detection of various riverine guild species most susceptible to water resource development projects. This plan should be developed in cooperation with the natural resource agencies.

**USACE Response:** Concur. A detailed monitoring plan for the project specific mitigation plan will be developed in coordination with the natural resource agencies in subsequent phase(s) and prior to implementation.

28. A monitoring and adaptive management plan addressing upstream and downstream geomorphology impacts should be developed in coordination with the natural resource agencies to determine the need to implement grade or other erosion control (e.g., bank stabilization) features to minimize project impacts to the Pearl River and its tributaries. That plan should include at minimum the use of aerial photographs, geographical information systems, gauge and cross-section data, as well as other parameters deemed necessary during development of that plan. The plan should be developed in cooperation with the natural resource agencies. Monitoring may result in the determination of additional monitoring and/or mitigation needs from such impacts. The plan should incorporate a request for pre-authorization for such mitigation if it is determined necessary.

**USACE Response:** Concur. A preliminary monitoring and adaptive management plan has been developed in coordination with the natural resource agencies. A detailed monitoring and adaptive management plan will be developed in subsequent phase(s) in cooperation with the natural resource agencies.

29. Undeveloped portions of the floodplain serve to absorb and store storm run-off and reduce additional flood damages. Restrictive use zoning or non-development easements should be implemented by the NFI, prior to project construction, and contain language stringent enough to ensure that flood-prone development does not occur and that undeveloped lands in the floodplain are used for floodwater storage, wildlife, outdoor recreation, and other flood compatible land uses. Floodplain ordinances could be an effective measure to avoid additional future flood damages throughout the Jackson metropolitan area.

**USACE Response:** Acknowledged.

**SUMMARY OF NFI COMMENTS ON USFWS CAR FOR**  
**PEARL RIVER FLOOD RISK MANAGEMENT PROJECT**

**PAGE 7**

**Paragraph 2**

**Text:** This FWCA report has been provided to the Mississippi Department of Wildlife, Fisheries, and Parks (MDWFP), the Louisiana Department of Wildlife and Fisheries, and the Louisiana Ecological Services Field Office for comment.

**Comment:** and Corps? - and no formal input from RH

**Paragraph 3**

**Text:** The Service under the authority of FWCA, worked with representatives of the USACE to assess fish and wildlife resources in the area, evaluate alternatives, address issues and objectives, and recommend any preliminary measures for protection and conservation of resources.

**Comment:** greater involvement with RH could have resolved many RH concerns

**Heading:** History

**Comment:** Should add the real history of the Pearl River re corps report from the late 1800's - explains the erosion, sediment and other issues that are currently blamed only on RBR and other more recent conditions

**Paragraph 3**

**Text:** Efforts such as the River and Harbor Act of 1945 and the Flood Control Act of 1946 resulted in construction of the Jackson and East Jackson levees, with pumping plants to relieve interior ponding and to promote floodplain development. However, such flood control measures did not eliminate flooding issues, as evidenced by the devastating flood of 1979. This cycle of alleviating flood issues, while simultaneously opening the floodplain to more development, has potentially exacerbated the issues

**Comment:** ignores the important fact of the extensive channelization of the river in the project area during the construction of the levees in 1960's and the impacts to the environment/species etc

**Paragraph 4**

**Text:** As pointed out in previous Service assessments, the RBR removed the upper one-third of the drainage basin from contributing sediment to the riverine system. Reports indicate that incision and degradation of the Pearl and Strong Rivers were caused by the RBR (Kennedy and Hasse 2009).

**Comment:** see comment above about history - furthermore, until RH is able to review all the supporting cited reports its reserves comments on many of these issues - this is because much of the studies conducted on the Pearl River have many flawed and use untested assumptions in their conclusions

**Text:** Such destabilization and degradation led to a decline in aquatic resources (Tipton et al. 2004).

**Comment:** ditto

## PAGE 8

### Paragraph 1

**Text:** Additionally, research revealed that the Pearl River south of its confluence with the Strong River had undergone a dramatic change, with gravel substrates being replaced with unstable sand substrate following construction of the reservoir (Piller et al. 2004).

**Comment:** ditto references

### Paragraph 2

**Text:** Those flood control measures were inadequate in protecting against the 1979 flood where levees were flanked or nearly overtopped.

**Comment:** it was overtopped

**Text:** In 1996, USACE examined the feasibility of constructing additional levees along both sides of the Pearl River to provide flood control to the greater Jackson area. However, no local sponsor agreed to cost-share project implementation.

**Comment:** misrepresents the facts - downstream folks got the legislature to kill the project - doesn't mention the upstream dry dam approach and why it died - these are important facts to understand what is "practicable"

### Heading: Description of Project Area

**Comment:** this language is confusing and does not clearly define the "project area" - this does not match the term used by the Corps and other entities – the project area is the immediate area around the actual construction – using this broader definition appears to be an attempt to mislead the public - the proper term for this broad area is study area - RH comments when addressing corrections and comments involving "project area" reflect this created confusion - also note Figure 3 in this document "Project Study Area"

## **Paragraph 5**

**Text:** Several levees and flood control structures exist within the Project area.

**Comment:** and channelization

## **PAGE 11**

### **Paragraph 1**

**Text:** The USACE defined the study or Project area as the floodplain from RBR to just south of Byram (RM 270.0 – RM 301.77), however, flood inducements are anticipated as far downstream as the confluence of Copiah Creek south of Georgetown, Mississippi (RM 223).

**Comment:** this is wrong - potential inundations not inducements and it implies they are factual - they are not at this time - only potentially and that is 0-6"

**Text:** Therefore, the Service considers the area for which direct and indirect effects could occur to include the Pearl River floodplain from the RBR Dam (RM 301.77) downstream approximately 79 miles to the confluence of Copiah Creek near RM 223; and includes land in Copiah, Hinds, Madison, and Rankin Counties, Mississippi.

**Comment:** not based upon solid facts - see above comment

### **Paragraph 2**

**Text:** The floodplain averages 3 miles wide.

**Comment:** ignores the width of the flood plain above the project area, its severe reduction in the project area and then the expansion to several miles below the project area - important fact when understanding the constraints on selecting an alternative

**Text:** Alteration of the 650-foot-wide cleared strip of floodplain along the river within the Jackson metropolitan area contains reduced habitat quality, as do the 13.2 miles of earthen levees.

**Comment:** again ignores the prior channelization

## **PAGE 12**

### **Paragraph 1**

**Text:** During droughts, minimal discharge from the RBR at times could be below that required for adequate dilution and flushing of the wastewater facilities discharges.

**Comment:** deal in facts not speculation

**Text:** Additionally, the MDEQ reported ongoing issues with sewage leaking from Jackson's wastewater pipes and flowing into tributaries and ultimately the Pearl River. As mentioned, there are also several hazardous waste sites located within the Project area.

**Comment:** if this is going to be inserted into the discussion then a more comprehensive review of the work underway to improve these conditions should be included

## PAGE 13

### Paragraph 1

**Text:** The bed and banks of the river are comprised of silts, sands, sandstone, and clays, including marl, with gravel deposits (Monroe 1954). Overall, the basin has a gentle slope with that of the tributaries being less than 10 feet per mile except near the headwaters, where it is greater.

**Comment:** but not all the tributaries which is an important fact when considering alternatives

### Paragraph 2

**Text:** Due to concerns regarding downstream resources, the USACE continues to assess impacts to the Pearl River downstream of the proposed project to the Mississippi Sound.

**Comment:** what does this mean – an unsupported statement

### Paragraph 3

**Text:** The Pearl River becomes braided with numerous bifurcations around Bogalusa, Louisiana, which eventually give way to swamps then tidal marshes.

**Comment:** there is a lot more going on in this section of the river - unrelated to the river in the project area - which is important when considering downstream issues - sediment, erosion, river course changes etc

### Paragraph 4

**Text:** Operationally, the RBR must maintain a minimum flow of 112 million gallons of water per day or approximately 170 cubic feet per second (cfs). This discharge rate is greater than low-flow discharge rates experienced preconstruction; however, downstream discharge of the Savanna Street Wastewater Treatment Facility is based on a critical low flow of 227 cfs.

**Comment:** a key fact which is ignored when considering the RBR issues

**Text:** The RBR is eutrophic with low DO levels documented in the summer months (MDEQ 2018, Phalen et al. 1988).

**Comment:** suggest better research on this issue as more recent data on DO suggests DO not low during summer - also eutrophic status is misleading to the reader as the RBR, in the 2024 305(b) report is considered under the attaining status

#### **Paragraph 5**

**Text:** Regarding flow dynamics, Hasse (2006) reported an increase in magnitude of flood and low-flow events post-construction of the RBR and dam.

**Comment:** see comments on research

### **PAGE 14**

#### **Paragraph 2**

**Text:** Discharges greater than 5,000 cfs do not occur between June and November

**Comment:** this is not factual - in 2024 the river met or exceed 5000cfs three times between June November - in 2023 it met or exceeded 5000cfs four times - i can go on .....

**Text:** Rates greater than 20,000 cfs occur infrequently between December and May, usually not exceeding 10,000 cfs

**Comment:** again misleading - in 2023 it exceeded 10000cfs five times - with several sustained periods of 7-10 days

### **PAGE 15**

#### **Paragraph 4**

**Text:** Considered one of the most biologically diverse rivers in the country, the Pearl River supports 140 species of fish (including bass, bluegill, sunfish, crappie, catfish, topminnows, etc.), 14 species of turtles (including the endemic Pearl River map turtle (*Graptemys pearlensis*)), 40 species of mussels, and other aquatic species (MDWFP 2016).

**Comment:** this statement is tossed about frequently as tool to advocate a position. The Pearl is diverse but calling "one of the most" is not scientifically neutral - additionally, biologically diverse can cover a wide area - fish, birds, plants, mammals etc - which are included in this statement?

## Paragraph 5

**Text:** Unmodified riverine ecosystems are important for many aquatic species requiring moving currents and habitat diversity. Aquatic habitat within the Project area includes the main stem and tributaries, RBR, several oxbow lakes such as Mayes Lake, channel cutoffs such as Crystal Lake,

**Comment:** the sequence of these sentences implies the Pearl is unmodified - it clearly is not in the project area - weir, channelizations etc - furthermore, the lower Pearl with its weirs cannot be considered unmodified - in fact when considering the 1879 Corps report which finds extensive channel cutting and other river manipulation over 140 years ago, the entire Pearl should not be considered unmodified

## PAGE 16

### Paragraph 1

**Text:** There is a known mussel bed located just north of the J.H. Fewell Water Treatment Plant (WTP) weir, where firm silty/sandy beds provide suitable habitat for numerous mussel species. The bed contains a diverse complement of mussels totaling nearly 20 species, including several rare species (Weiland 2000).

**Comment:** this suggests better adaptability of the species than claimed in the BO and this report

**Text:** Within the Pearl River, the proposed threatened Louisiana pigtoe is found in the Project area and a small portion of the Lower Pearl River (Ellwanger et al. 2023).

**Comment:** this is misleading -implies its only in these two areas - USFWS reports current distribution from the RBR to the lower Pearl (showing 280 miles) with proposed critical habitat on 87 miles in the lower Pearl – significantly below the project area

**Text:** Within the Pearl River, the proposed threatened Louisiana pigtoe is found in the Project area and a small portion of the Lower Pearl River (Ellwanger et al. 2023).

**Comment:** this is misleading -implies its only in these two areas - USFWS reports current distribution from the RBR to the lower Pearl (showing 280 miles) with proposed critical habitat on 87 miles in the lower Pearl – significantly below the project area

### Paragraph 3

**Text:** Sandbars in various stages of development are a typical feature of the Pearl River in the Project area. Riverine sandbar habitat, especially unmodified, has high wildlife value.

**Comment:** sandbars in the channelized section of the river do not respond in the manner to flooding as unaltered river sections - a relevant factor

**Text:** In fact, within the Project area, the threatened ringed and Pearl River map turtles have been documented using these features for nesting. Although sandbar creation within the proposed impoundment for Alternative C was previously proposed as a conservation measure for the ringed map turtle, we believe these features would need extensive maintenance and monitoring since they could be overtaken by undesirable plant and non-target turtle species, experience nest predation, and may not be adequately protected from human disturbance

**Comment:** there are no protections now from human disturbance – or from non-target species and nest predation

#### **Paragraph 4**

**Text:** Since downstream impacts are being analyzed, it's important to note those resources downstream of the Project area. Coastal wetlands of the Pearl River provide nursery and foraging habitat that supports economically important marine fishery species (*i.e.*, spotted seatrout (*Cynoscion nebulosus*), sand seatrout (*Cynoscion arenarius*), southern flounder (*Paralichthys lethostigma*), Atlantic croaker (*Micropogonias undulatus*), spot (*Leiostomus xanthurus*), Gulf menhaden (*Brevoortia patronus*), striped mullet (*Mugil cephalus*), white mullet (*Mugil curema*), blue crab (*Callinectes sapidus*), and shrimp). Some of these species serve as prey for other commercially and/or recreationally important fish species.

**Comment:** when are we going to stop talking about coastal issues - there no data showing any impacts to the coast.

**Text:** The productivity of the Pearl River estuary contains a significant portion of the total commercial fisheries catch of the Gulf States (Gunter 1967).

**Comment:** there many factors unrelated to anything going on the Jackson area or this project that have been shown to currently impact this estuary - and these known factors would have real benefits if the agencies focused on fixing those problems instead of hypothetical concerns

#### **PAGE 17**

**Text:** Heading: Terrestrial Resources

**Comment:** without a long dissertation on FWCA - plants are NOT part of the authority unless they benefit fish and wildlife

**Text:** Many are considered species of greatest conservation need (SGCN, NatureServe and MDWFP 2016), meaning their populations have declined due to emerging threats. In fact, the Golden winged warbler (*Vermivora chrysoptera*), a species under review for federal protection, ranges within this basin. Quantitative data can be accessed from the Breeding Bird Survey and Christmas Bird Count, (U.S. Geological Survey; Audubon).

**Comment:** threats that are not well documented in the research only assumed or speculated upon

## PAGE 18

### Paragraph 1

**Text:** There is significant acreage along the Pearl River within the Project area that provides habitat unique for a metropolitan area.

**Comment:** this requires better explanation - how is it unique

**Text:** These lands not only serve as habitat for wildlife, but also many of them allow non-consumptive recreation and public hunting for game species.

**Comment:** FYI discharging firearms not allowed with city limits

### Paragraph 2

**Text:** Reports reveal that destabilization and degradation of the Pearl River following construction of the RBR led to a decline in aquatic resources (Tipton et al. 2004). Additionally, research revealed that the Pearl River south of its confluence with the Strong River had undergone a dramatic change, with gravel substrates being replaced with unstable sand substrate following construction of the RBR (Piller et al. 2004). Such impacts contributed to extirpation of the pearl darter, Alabama shad, southern walleye, and freckled darter.

**Comment:** see prior comments about research - also Corps report from 1879 - this problem has been ongoing for decades before the RBR was constructed.

### Paragraph 4

**Text:** The northern long-eared bat (*Myotis septentrionalis*), federally listed as an endangered species, is a medium sized bat about 3 to 3.7 inches in length and is distinguished by its long ears. Its fur color can range from medium to dark brown. The northern long-eared bat can be found in much of the eastern and north central United States.

**Comment:** it should be noted that according to USFWS data this species range is not within the project area only the southern end of the study area

## PAGE 19

### Paragraph 2

**Text:** The decline of the ringed map turtle has been attributed to habitat modification (i.e., loss of exposed sandbars, basking areas) and water quality deterioration, reservoir construction, channelization, desnagging for navigation, siltation, and the subsequent loss of invertebrate food sources

**Comment:** the research on this work regarding population decline is speculative and assumptive - there are not actual quantitative data to support these statements

### Paragraph 3

**Text:** The Pearl River map turtle (*Graptemys pearlensis*), federally listed as threatened, is a moderatesized aquatic turtle endemic to the Pearl River drainage of Louisiana and Mississippi.

**Comment:** The recent (2024) identification of the species in Louisiana (done after its listing) and the strong claims that the species was only in the Pearl may support future findings of the species in other areas - this should new population should factor into the decision process

**Text:** Threats have been attributed to water pollution impacting mollusk populations on which the turtles feed, snag and log removal, channelization and impoundment, collection for the pet trade, increasing nest predation rates, and target shooting (Service 2021).

**Comment:** see comment above (No indication of what comment they are referring to)

### Paragraph 4

**Text:** Atlantic sturgeon less than two years old appear to remain in riverine habitats and estuarine areas throughout the year, rather than migrate to marine waters. Habitat alterations such as those caused by water control structures and navigation projects that limit and prevent spawning, poor water quality, and over-fishing have negatively affected this species.

**Comment:** it should be noted that as of 2022 that despite several catastrophic mortality events the species population is either stable or increasing

## PAGE 21

**Heading:** At Risk Species and Species of Concern

**Comment:** the inclusion of these species creates a focus, effort and costs on a species that may never obtain or need ESA status – by including third party petitioned species that speculative aspect is even higher - another example of regulatory creep, carrying the authority under the FWCA beyond "resources" - in fact the term endangered never appears in FWCA

**Text:** The Louisiana pigtoe (*Pleurobema riddellii*), proposed for listing at threatened, was recently found within the Project area (Ellwanger et al. 2023) and downstream in the West Pearl River.

**Comment:** see prior comment on both species locations and the term project area

## PAGE 22

### Paragraph 1

**Text:** It has been collected between the Project area and the RBR and in the lower Pearl.

**Comment:** on what data? The current report states that the only populations are above the RBR and in lower Pearl several miles below Columbia - no samples collected in the project area - is this another misuse of the term project area

### Paragraph 2

**Text:** One turtle species proposed for federal protection as threatened occurs within the Project area, the alligator snapping turtle (*Macrochelys temminckii*). The alligator snapping turtle occurs in waterways that drain into the Gulf of Mexico. Although the species' range is large, population densities are likely low throughout the range. They occur in various habitats including rivers, oxbows, lakes, and backwater swamps, including those within the Project area.

**Comment:** no mention that the species are found in deeper waters (ie large rivers, lakes and ponds etc) - just like Alt D

### Paragraph 3

**Text:** The monarch butterfly (*Danaus plexippus*) is a candidate species and not yet listed or proposed for listing under the ESA. The monarch is a member of the milkweed butterfly group (subfamily Danainae, order Lepidoptera) and is known for its large size, its orange and black wings, and its long annual migrations. Monarchs are concentrated in North, Central, and South America but also can be found intermittently in other locations. Threats are believed to be ongoing land development in areas along the monarch's different migratory route and loss of milkweed plants associated with the expansion in the early 21st century of the use of genetically modified herbicide-resistant crops.

**Comment:** it should be noted that two conditions significantly reduce the opportunity for this species to be found in the project area - RH regularly mows the habitats where milkweed would likely be found - this includes the levees - and the "clearing area" - that in the past was sprayed with herbicides by PRBDD - having the same impact

## PAGE 23

### Paragraph 2

**Text:** The Service recommends that the Project be constructed outside of those windows to the maximum extent practicable.

**Comment:** if I am reading this correctly this leaves 5 months to construct each year - it ignores whether there actual are species and nest in the construction area or the impact to the species if it decides to leave an area

## PAGE 24

### Paragraph 1

**Text:** The Service's planning goal for the Pearl River Flood Risk Management Project continues to be implementation of a project that balances the needs of fish, wildlife, and wetland resources alongside the need to provide flood risk management for the Jackson metropolitan area.

**Comment:** to properly consider the flood risk management USFWS needs to better understand the pros and cons of each alternates - from the current comments on A1 and E that is not apparent

**Text:** Finally, in order to allow and encourage the citizens of the Jackson metropolitan area to use the remaining fish and wildlife resources of the area, there is a need for improved access to the Pearl River.

**Comment:** this statement is disingenuous - how would the public "use" and endangered species that the public cant see, cant collect (fishing) and in for certain species, must not be allowed into its habitat?

### Paragraph 3, 3<sup>d</sup> bullet

**Text:** Riverine mitigation should target removal of obsolete structures that inhibit fish passage within the Pearl River Basin downstream of the proposed project.

**Comment:** acknowledging prior efforts to accomplish this and the many reasons why it has not been completed, should be stated

## PAGE 25

### Paragraph 2

**Text:** The Service's Mitigation Policy (Federal Register, Vol. 46, pp. 7644-7663, January 23, 1981) has designated four resource categories, which ensure that the level of mitigation recommended will be consistent with the fish and wildlife resources involved.

**Comment:** This does not appear to be the current version - is the may 2023 the correct version? See additional comment below

**Additional Comment:** RH review of current USFWS regulation on resource categories indicates the language provided in this report does not comply with the policy - as there are no longer resource categories see Fed Reg Vol 81 No 224 Nov 21 2016 p83440-83492 and the mitigation policy may 2023

### **Paragraph 7**

**Text:** The Service has also determined that the oxbow lakes and cutoffs functioning as oxbows within the existing floodplain area are Resource Category 2 habitat.

**Comment:** supporting data? Including quantitative

### **PAGE 26**

### **Paragraph 3**

**Text:** Acquired properties would become permanent/perpetual greenspace that is publicly owned and maintained by the non-federal interest (NFI), the Rankin Hinds Pearl River Flood Control District.

**Comment:** this has not been established

### **PAGE 27**

### **Paragraph 4**

**Text:** Prior descriptions of this alternative noted some sandbar replacement for lost sandbar habitat. This feature would require tremendous maintenance and monitoring, and several concerns were expressed regarding their effectiveness in supporting target wildlife species.

**Comment:** what has changed from the prior acceptance of this approach?

### **PAGE 28**

### **Paragraph 2**

**Text:** Most notably, the Service is unable to fully assess potential impacts to riverine species for Alternative D since a velocity analysis has not been conducted, similar to what was conducted for Alternative C. In addition, a mitigation plan to offset riverine impacts resulting from Alternative C or D has not been provided.

**Comment:** not really that different from all the work that was done for C

### **PAGE 29**

### **Paragraph 1**

**Text:** The NFI has been shortsighted in seeing the potential for recreational opportunities associated with a free-flowing, unobstructed river through past planning efforts; therefore, we encourage the USACE to give full consideration of the recreational opportunities that could be achieved with Alternative E.

**Comment:** USFWS has not demonstrated sufficient knowledge of the current and the proposed conditions required under E - had RH been involved in the development of this document we could have collaborated on these issues

## **Paragraph 2**

**Text:** The proposed work would include voluntary property acquisition and rehabilitate existing infrastructure within the existing footprint (e.g., elevating structures, floodproofing structures).

**Comment:** Corps – better check this

**Text:** Acquired properties would become permanent/perpetual greenspace that is publicly owned and maintained by the NFI.

**Comment:** this has not been established

## **Paragraph 4**

**Text:** Alternative C is still considered the most damaging alternative for both terrestrial and aquatic resources.

**Comment:** USFWS continues to overestimate quality the current conditions of the channelized section of the river - possibility from recent species reports (that are based on untested results)

## **PAGE 30**

### **Paragraph 3 (after items 2 through 4)**

**Text:** Some of the functions lost when impounding a river include flood control and storm protection, wildlife and fish habitat, forest resources, water quality and quantity. Furthermore, reduction in downstream flooding and water quality affect biodiversity, floodplains, deltas, and estuaries (Rosenberg et al. 1997, McCully 1996, Dynesius and Nilsson 1994, Gillilan and Brown 1997, Olsen et al. 2006).

**Comment:** see comments about downstream findings

### **Paragraph 4**

**Text:** As demonstrated by the models (Graphs 2 through 5), velocities in the proposed project area could be significantly reduced approximately 73 percent of the time for Alternative C, interrupting important life history strategies (i.e., prey sources, breeding substrate).

**Comment:** Based on prior comments revealing flaws in the cfs data and other concerns regarding H&H analysis RH does not agree with this entire discussion - as stated above if RH was involved with

the development of this document - instead of just limited to meetings prior to document development, the results may have been different

## PAGE 34

### Paragraph 5

**Text:** For example, the Pearl River sustained long- and short-term impacts from construction of the RBR. Construction of the dam created extensive downstream erosion, sedimentation, and other hydro-geomorphological changes that reportedly destabilized the system (Tipton et al. 2004, Piller et al. 2004). These changes likely contributed to the loss or reduction of several species within the Pearl River drainage. Sensitive mussel species were eliminated from the main channel (i.e., Alabama hickorynut, inflated heelsplitter) and the Strong River (i.e., Alabama spike, black sandshell) (Ellwanger et al. 2023). Some species of fish (i.e., crystal darter, frecklebelly madtom) experienced sharp population declines, not returning to pre-construction status until decades later. Still other sensitive fish species were extirpated (i.e., Pearl darter, Alabama shad, freckled darter).

**Comment:** see prior comments about pre RBR history (No indication of which comment they mean)

## PAGE 36

### Paragraph 1

**Text:** Contradicting the 1.6-mile downstream impact zone, recent models developed by the USACE show impacts (i.e., inducements) extending an additional 59 river miles downstream to Copiah Creek just South of Georgetown, Mississippi.

**Comment:** Corps - this is another example of unsettled H&H issues

### Paragraph 2

**Text:** Conversely, sediment trapping behind the weir can reduce sediment flow downstream, causing long-term adverse impacts to aquatic species habitat and life history strategies. Reduced sediment transport could also result in increased downstream erosion (Csiki and Rhoads 2010).

**Comment:** Has USFWS reviewed RH sediment report?

### Paragraph 4

**Text:** The Service classifies wetlands within the Project area as Resource Category 2 habitat, as defined in the Service Mitigation Policy (FR, Vol. 46, No. 15, January 23, 1981).

**Comment:** see prior comment on this (No indication of which comment they mean)

**Text:** From a national perspective, the degradation or destruction of special aquatic sites, such as filling operations in wetlands, is considered to be among the most severe environmental impacts covered by those guidelines.

**Comment:** RH does not concur with this as applied to the project

## PAGE 37

### Paragraph 1

**Text:** A visual representation of concentrated sediments resulting from construction along Pelahatchie Bay can serve as an example of impacts to water quality from development activities. The Mississippi Department of Health reported that rains and floodwaters created a chemical imbalance on one side of the water treatment plant from RBR intake water, leading to a loss of pressure (Inman and Beveridge 2022).

**Comment:** these are not all facts to this issue - if this language remains RH will be glad to explain the actual reasons

## PAGE 38

### Paragraph 3

**Text:** Velocity data for Alternative D has not been collected; therefore, the Service is unable to analyze how Alternative D would impact velocities through the newly established impoundment.

**Comment:** see comments about Alt C work (No indication of what comment they mean)

### Paragraph 4

**Text:** Alternative E would provide the same flood reduction benefits as Alternative D but at a lower cost due to elimination of the features mentioned above.

**Comment:** clearly they don't understand the operational and maintenance issues - if we worked with them on this issue it could have addressed

## PAGE 41

### Paragraph 3

**Text:** Among these general riverine mitigation strategies, the IMT has only identified one specific measure that could offset most, if not all, of the riverine impacts associated with Alternatives C and D. Pools Bluff Sill on the lower Pearl River and the Bogue Chitto Sill on the lower Bogue Chitto River are the only obsolete aquatic barriers identified that could be successfully removed under the USACE's authority

**Comment:** does not address all challenges associated with this work

## PAGE 42

### Paragraph 2, Item 1

**Text:** These measures could include the placement of instream habitat (shoals, gravel bars, woody debris), enhancement or creation of sandbars, the creation of oxbows in the newly excavated floodplain (i.e., similar to riverside levee borrow pits along the MS River; see USACE website), and the reforestation of the riparian buffer along the Pearl River within the Project area. Selection of this alternative also allows the future opportunity to retrofit the existing weir at the J.H. Fewell WTP for improved fish passage, or possibly the complete removal of the weir if the WTP is eventually decommissioned.

**Comment:** the need to maintain the area for maximum flood benefits ie low roughness etc, will limit much of this type of components

### Paragraph 2, Item 1, Second Paragraph

**Text:** Finally, Alternative E provides the opportunity to restore rivercane (*Arundinaria gigantea*) and switch cane (*Arundinaria tecta*) to suitable sites within the Project area. These species were identified by Tribal Nations as Cultural Keystone Species that should be conserved and restored. Therefore, we request these measures and opportunities be evaluated in the final EIS and considered when selecting a final plan for implementation. Such measures would be permanently eliminated for future consideration should a weir and impoundment be constructed.

**Comment:** before committing to this we need better science on why the plant died out – why spend time and money if they cannot be sustained

## PAGE 43

### Item 2, Line 1

**Text:** Fully evaluate the recreational and economic development potential of Alternative E.

**Comment:** again - if RH was more involved with USFWS we could have address this issue

### Item 2, Paragraph 2

**Text:** The USACE, in developing the DEIS, has failed to consider and describe the recreational and economic development opportunities associated with Alternative E.

**Comment:** Ditto

## **Item 2, Paragraph 2**

**Text:** Many of these recreational opportunities are realized on urban rivers across the United States, and it's unclear as to why such opportunities have not been furthered explored in the DEIS.

**Comment:** Ditto

**Text:** The creation of a series of oxbow lakes/borrow pits along the newly excavated Pearl River floodplain could create fishing opportunities that may be lacking in the Jackson metropolitan area.

**Comment:** see comments about maintenance issues (No indication of what comment they mean)

## **Item 2, Paragraph 3**

**Text:** The DEIS as currently written fails to realize these benefits and implies such opportunities can only be gained via creation of a new lake.

**Comment:** see comment above about E (No indication of what comment they mean)

## **PAGE 44**

### **Item 4, Line 1**

**Text:** Conduct a sediment analysis for Alternatives C and D.

**Comment:** see prior work (No indication of what comment they mean)

**THG:** USACE engineering determined that the prior sedimentation analysis is not sufficient. response is "USACE has committed to conducting sedimentation analysis in subsequent phase(s) and prior to implementation."

### **Item 5**

**Text:** The vulnerable riverine sandbar habitat, especially the less modified sites located outside of the channelized areas, has high wildlife resource value and is becoming relatively scarce on a regional and national basis.

**Comment:** reference regarding "becoming relatively scarce" ?

**TFG:** not relevant for our response

## **PAGE 46**

### **Item 14**

**Text:** Loss of any flows and the resulting potential changes to water quality, including salinities, within the Mississippi Sound should be monitored.

**Comment:** there is no data supporting the need for this

**TFG:** Concur. response is "Current H&H models show no impacts to the MS Sound. If additional analysis, which will be conducted in subsequent phases, indicate any changes as far down as the MS Sound, USACE will coordinate with the Service on appropriate monitoring efforts.

#### **Item 18**

**Text:** Creation and reforestation of a riparian zone from the toe of the levee to the river or lake should be undertaken where feasible to provide riparian habitat and provide erosion protection to the fill areas. Mitigation should be implemented concurrent with construction.

**Comment:** see comments about maintaining flood way performance

**TFG:** concur, see prior response

#### **PAGE 48**

##### **Paragraph 1 (After Summary of Findings and Service Position)**

**Text:** The Service Mitigation Policy (Federal Register, Vol. 46, pp. 7644-7663, January 23, 1981) is specific in its guidance pertaining to formulation of an official position relative to a given water development project.

**Comment:** This does not appear to be the current version – see 2016 revisions and is the may 2023 the correct version? Service Mitigation Policy (Federal Register, Vol. 46, pp. 7644-7663, January 23, 1981 In essence, a project must meet the five criteria presented below to gain Service approval.

**Text:** In essence, a project must meet the five criteria presented below to gain Service approval.

**Comment:** please provide a cite in the current policy were these five critieria are required for "approval"

#### **PAGE 49**

##### **Paragraph 2**

**Text:** “The Service may recommend the ‘no project’ alternative for those projects or other proposals that do not meet all the above criteria and where there is likely to be a significant fish and wildlife resource loss.”

**Comment:** same comment - cite please (No indication if what comment they mean)

### **Paragraph 5, Item 1**

**Text:** For Alternatives C and D, a weir would impede aquatic species movement for an additional 16 to 18 miles upstream (from new weir to RBR dam) and would convert approximately 7.5 to 9.5 miles of riverine habitat to lacustrine habitat for approximately nine months of each year.

**Comment:** the existing weir at the water plant is relevant when assessing a loss of habitat - as only flood stages could the fish make it over the weir into the section of the river

## **PAGE 50**

### **Item 5**

**Text:** There is a demonstrated need for flood protection within the Jackson metropolitan area; however, the need for the proposed Alternatives C and D in-lieu of other possible flood reduction alternatives that may be less damaging to fish and wildlife resources has not been clearly demonstrated

**Comment:** a better understanding of the limitations of A1 and E would help address these concerns