United States Department of the Interior

FISH AND WILDLIFE SERVICE
Mississippi Ecological Services Field Office
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August 22, 2025

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 the 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.

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 (Revised Draft Environmental Impact Statement [RDEIS] for the Pearl River Basin Mississippi Federal Flood Risk Management Project, 2025). 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.

Consequently, of the remaining implementable alternatives presented in the RDEIS, the Service supports the selection of Alternative E1 as the tentatively selected plan. This alternative achieves the same flood reduction benefits of Alternative D1 and costs less to construct, all while preserving important riverine functions and habitats. Also, Alternative E1 is the only structural solution that offers the potential to conduct ecological restoration within the Pearl River and its floodplain once overbank excavation activities have been completed. Depending on what restoration activities are feasible or compatible with maintaining adequate flood conveyance, we anticipate this could represent a unique opportunity to increase fish and wildlife resources in the Project area over current conditions. Therefore, we recommend the USACE continue to analyze the level and kinds of ecological restoration activities that could occur with Alternative E1 while still providing effective flood risk flood risk management for the Jackson metropolitan area.

Finally, we encourage the USACE to further consider additional avoidance and minimization efforts for Alternative E1 during the Planning and Environmental Design (PED) phase including limiting overbank excavation to below (downstream of) the existing weir at the E.H. Fewell Water Treatment Plant (WTP), thereby avoiding direct impacts to the LeFleur's Bluff State Park and adjacent forested wetland habitats. By doing so, the project would focus overbank excavation to the section of the Pearl River most impacted by previous USACE and local agency projects and avoid direct impacts to higher value wildlife habitat and conservation lands within the Project area. We also recommend the USACE continue to consider the recreational and sustainable economic development potential of Alternative E1, similar to efforts that have already occurred for Alternative D1.

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
Digitally signed by JAMES AUSTIN
Date: 2025.08.22 12:16:24 -05'00'

James A. Austin
Field Supervisor
Mississippi Field Office

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
August 2025

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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. The FWCA 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 revised draft environmental impact statement (RDEIS, June 2025) 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 that include a combination of both nonstructural and structural measures. Alternative A1 includes primarily nonstructural measures along with one new levee segment. Alternatives D1 and E1 are similar in nature except that D1 includes construction of a weir and associated features, while E1 does not. 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, the RDEIS states that Alternative E1 could be considered the NED plan. 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 previous 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 risk management 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, 2024). That determination was based on existing data and analysis available from USACE sources and Service files. The USACE has since dropped this alternative from further consideration.

The USACE has identified numerous areas where additional analysis will be required once a plan is selected for implementation. They include velocity, sedimentation, and water quality analysis, as well as further refinement of a complete wetland and riverine mitigation plan. Therefore, additional Service involvement for subsequent detailed planning, engineering design, and construction phases of each planning effort is required to fulfill our responsibilities under FWCA.

Previous draft FWCA reports (2020, 2024) have been provided to the Mississippi Department of Wildlife, Fisheries, and Parks (MDWFP), the Louisiana Department of Wildlife and Fisheries (LDWF), the Service's Louisiana Ecological Services Field Office, and the Rankin Hinds Pearl River Flood and Drainage Control District for comment. Their comments have been considered and incorporated into this draft report as appropriate. The LDWF also provided comments on the 2025 RDEIS (August 11, 2025), which are attached to this report.

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 have prompted flood control investigations within the Pearl River Basin since the late 1800's (1879 USACE report). Efforts such as the River and Harbor Act of 1945 and the Flood Control Act of 1946 resulted in construction of the Jackson (Fairgounds) and East Jackson levees, with pumping plants to relieve interior ponding and to promote floodplain development. Approximately 5.34 miles of river channel work also occurred at this time. The most severe aspects of this channel work resulted in shortening of the river between river mile (RM) 288 and 290.5. However, those flood control measures were inadequate in protecting against the 1979 flood where levees were flanked or overtopped. In 1983, channel modifications were conducted at the Highway 25 bridge, which consisted of removing material from the west bank of the Pearl River to increase river conveyance. In 1984, a levee extension near Fortification Street was completed, and a total of 3.3 river miles were partially or completely

cleared of forested habitat by the former Pearl River Basin Development District. This project consisted of 237 acres of complete clearing, 30 acres of selective clearing, 89 acres of partial clearing, and placement of riprap for protection of bridges.

Since that time, there have been numerous proposals to further address flooding issues in the Jackson metropolitan area. In 1985, the USACE recommended construction of the Shoccoe Dam upstream of the Ross Barnett Reservoir, however, it was later identified as not implementable. In 1996, the 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, the project was not implemented due to lack of local support. Finally, in 2007, the LeFleur Lakes Plan was also investigated but did not meet USACE environmental and policy objectives.

The Ross Barnett Reservoir 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 Ross Barnett Reservoir 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 reservoir (Kennedy and Hasse 2009). 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). The construction of the reservoir, along with the 1953 construction of the West Pearl River navigational canal in Louisiana, have been the two biggest changes to the Pearl River as a whole. The extreme changes in channel stability that have occurred as a result of these projects have led to a decline in aquatic resources (Tipton et al., 2004). Further analysis is needed to determine if and how much the system has stabilized.

Other features that constrict flows or influence water surface elevation within the Project area are Highway 25, Old Brandon Road, U.S. 80, Interstates 55 and 20, railroad bridges at the E.H. Fewell WTP and upstream of Highway 80, levees at the Savanna wastewater treatment plant (WWTP), along with an existing weir at the E.H. Fewell WTP.

Description of Project Area

The USACE defined the study or Project area as the Pearl River Basin from the Ross Barnett Reservoir dam to just south of Byram (RM 270.0 – RM 301.77) (Figure 1). This Project area is limited to the areas where specific improvements would be implemented. Indirect effects may also occur downstream of the USACE defined Project area. The RDEIS describes potential downstream inducements where a channelized river system forces water downstream more rapidly. This can result in increased erosion and channel instability, impacting areas farther downstream. This happens because channelization, like straightening or widening, alters natural

river flow patterns, leading to increased velocity and the potential for more sediment transport, erosion, and even flooding. The inducements due to any event less than the 100-year event appear to resolve to less than 0.25 feet of added water less than 20 miles downstream of the Project area and completely resolve just prior to the Copiah Creek confluence, approximately 32 miles downstream of the project area (RDEIS Appendix E, p 126). The USACE also states that major impacts to the downstream watershed beyond RM 200 (approximately 5 miles north of Monticello, MS) are highly unlikely; and that no impacts to the State of Louisiana or Gulf Coast Region are expected to occur (RDEIS, p 4 –26).

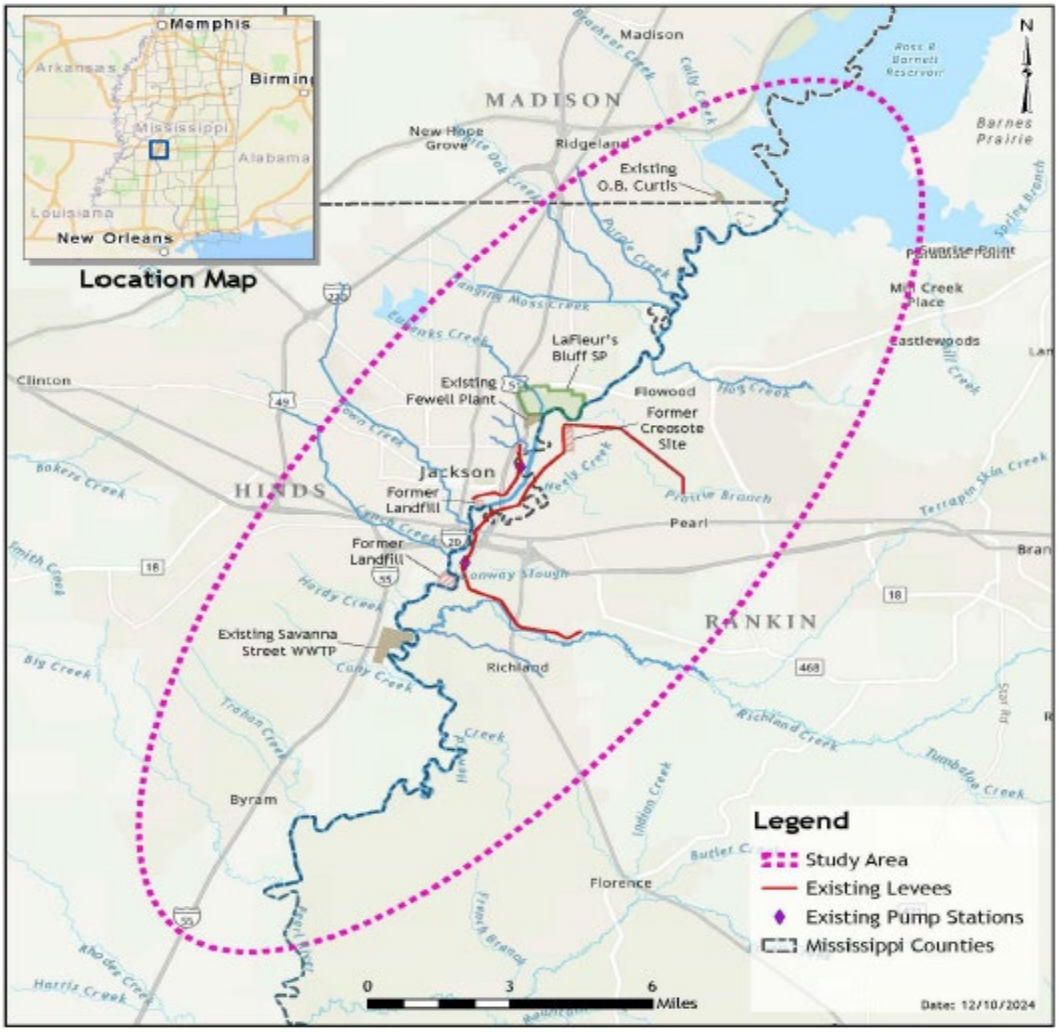


Figure 1. Project study area.

The proposed Project area is located within the Pearl River Basin. 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 (Figure 2). The floodplain within the overall basin averages

3 miles wide. Major waterbodies include the Pearl, Yockanookany, Strong, and Bogue Chitto Rivers. 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).

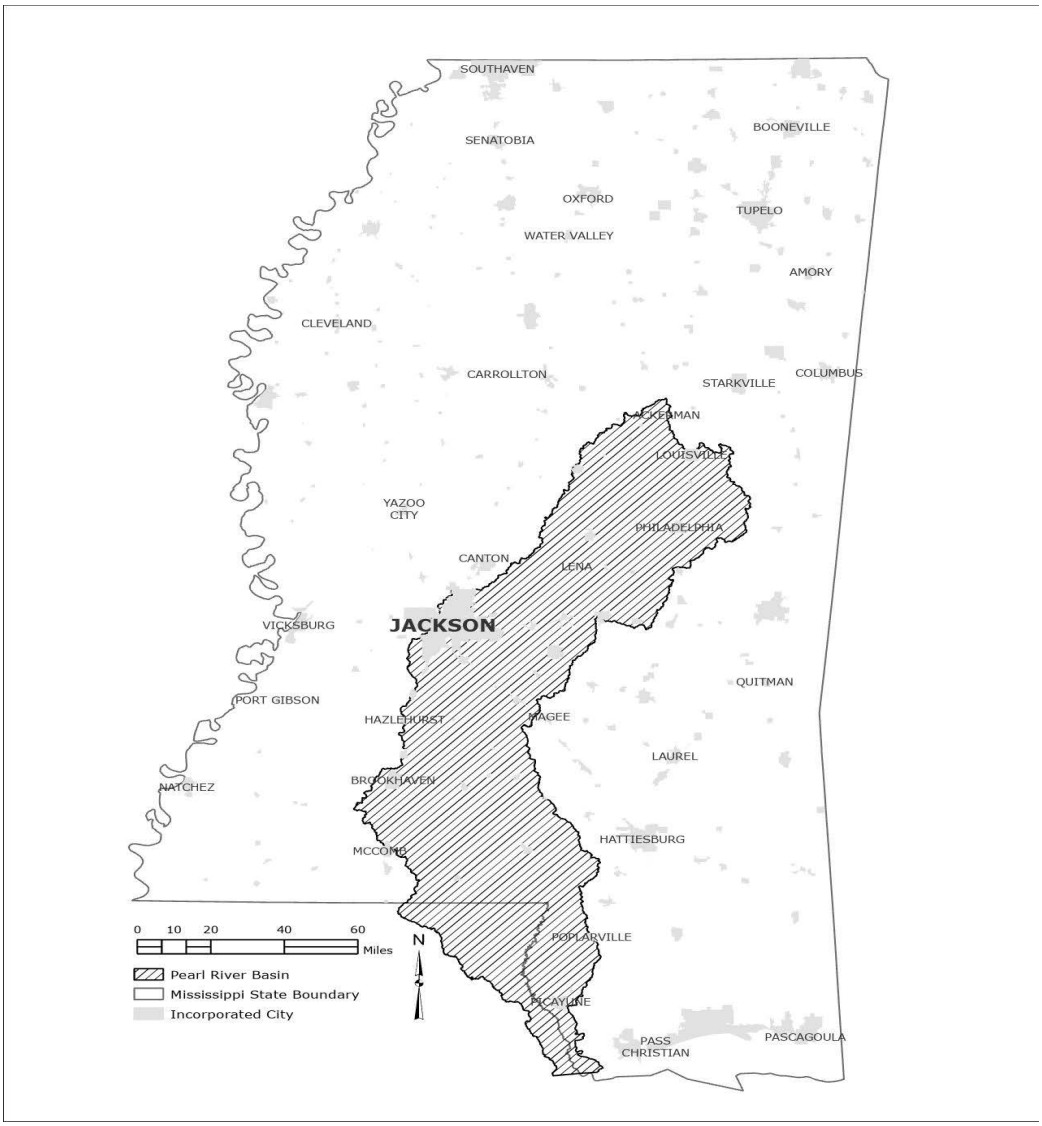


Figure 2. Map of Pearl River Basin, Mississippi, and portion of Louisiana.

The basin also includes the state's largest surface source of drinking water, the Ross Barnett Reservoir (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 basin and Project area, a weir (i.e., low-head dam) was built in 1915 at RM 290.7 for the city of Jackson's water supply

(J.H. Fewell WTP). The weir was built to a height or elevation of 250 feet, is approximately 200 feet in length, and has a major effect on river slope readings during low flow periods; however, once gage heights reach about 256 feet elevation, the weir effect of the dam is undetectable (Weiland, 2000). Downstream of the Project area, a sill (i.e., weir) was built at RM 48.7 in 1953 as part of the Pearl River Navigation Project (Pool's bluff sill). Downstream of the Pool's bluff sill, the Walkiah Bluff weir was constructed by the USACE in 1995 to split flow evenly between the East and West Pearl Rivers, however, the weir began to fail several years ago and now almost zero flow goes down the East Pearl River during certain times of the year (Picayune Item, 2021).

Several levees and flood control structures exist within the Project area. In 1968, levees were created within the Jackson metropolitan area constricting the width of the floodplain within the Project area. Also, 5.34 miles of river channel work occurred at that time. Around 1970, a levee was created around the Savanna WWTP. 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. Finally, approximately 3.3 river miles were completely or partially cleared of forested habitat by the former Pearl River Basin Development District in 1984 and continues to be maintained by the Rankin Hinds Pearl River Flood & Drainage Control District in an herbaceous state.

Land along the Pearl River in the Project area includes low swamp areas, pastureland, forests, residential, and commercial development. The 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. Previous flood control and water supply features have fragmented and reduced the value of floodplain habitat directly within the Project area, specifically between RM 286 and 291. These previous flood control features include the 13.2 miles of earthen levees, the 5.34 miles of river channel work, and the complete or partial clearing of 3.3 miles of floodplain vegetation. Also within the Project area are higher quality habitats including the wetland forests, oxbow lakes, and riverine habitat within the LeFleur's Bluff State Park and the Fannye Cook Natural Area. These lands are north of the existing E.H. Fewell WTP weir where fewer impacts from past flood control projects have occurred. While the existing weir at the E.H. Fewell WTP blocks upstream fish migration when the river is below elevation 256 (ft), the impact of the weir on other riverine dependent species is less clear. Nearly 20 mussel species can be found just upstream of the existing weir (Weiland, 2000), and the only increasing population of ringed map turtle is found within this portion of the Project Area (Devros et al., 2023). We suspect the small size of this weir (200 ft in length, 250 ft elevation) results in a smaller impact on river velocities behind the weir and therefore a smaller adverse impact on these riverine dependent species.

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, 2018), 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 Ross Barnett Reservoir at times could be below that required for adequate dilution and flushing of the wastewater facilities discharges at the Savanna WWTP. Additionally, the MDEQ reports ongoing issues with sewage leaking from Jackson's wastewater pipes into tributaries and ultimately the Pearl River. These wastewater overflows have prompted extended water contact advisories on the river as far downstream as Monticello, MS, with the latest failure dumping millions of gallons of untreated wastewater into the Pearl River (Clarion Ledger, July 10, 2025). The city received roughly 800 million in federal funding in 2023 to address this and other water system issues (WLBT, Jan 5, 2023).

Hydrology

The Ross Barnett Reservoir was constructed in 1961 and was filled by 1965. Operationally, the reservoir 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. The reservoir is eutrophic (MDEQ, 2024) with low water clarity, higher phosphorus and nitrogen concentrations compared to less productive lakes, abundant aquatic plants along the shoreline, and lower dissolved oxygen levels in the deeper stratified bottom waters during the warmer months. As of 2024, the reservoir is meeting its water quality criteria necessary to protect its designated uses.

Regarding flow dynamics, Hasse (2006) reported an increase in magnitude of flood and low-flow events post-construction of the Ross Barnett Reservoir. 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 occur much less often between June and November. Rates greater than 20,000 cfs occur infrequently between December and May, usually not exceeding 10,000 cfs.

Lower Pearl River Basin

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 Pool's Bluff (RM 48.7). 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 River flows 45 miles, forming the state line between Mississippi and Louisiana and empties into the Gulf of Mexico via Lake Borgne and Mississippi Sound.

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 parts per trillion 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.

The 2025 RDEIS states that major impacts to the downstream watershed beyond the RM 200 (approximately 5 miles north of Monticello, MS) are highly unlikely. The Service recommends that the USACE continue to analyze the impact of these downstream effects on fish and wildlife resources during future PED phases and mitigate for any adverse impacts accordingly. The RDEIS states that no impacts to the State of Louisiana or Gulf Coast Region are expected to occur.

Although outside the scope of the current project, the Service recommends that a comprehensive assessment of changes in the Pearl River Basin's hydrology and land uses 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.

Fish and Wildlife Resources

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 found in the Pearl River due to declines in their populations. Minimizing loss of wildlife and fisheries habitat and proactively conserving natural resources while achieving flood risk management should be prioritized.

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, bald cypress forests, freshwater marshes, oxbow lakes, riverine) (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 large woody debris and other allochthonous materials that provide habitat for many species inhabiting the Pearl River and its tributaries.

Aquatic Resources

The Southeastern United States is a global hotspot of freshwater biodiversity, supporting almost two-thirds of the country's fish species, over 90% of the country's mussel species, and one-third of the global total for crayfish species (Elkins et al., 2019). The southeast is also one of three global biodiversity hotspots for turtle species (Turtle Taxonomy Working Group, 2025), including the state of Mississippi, where over 30 species can be found (Berry, 2019). Within the Pearl River basin, one subbasin ranks in the top 24% of subbasins in the southeast for species richness, imperilment, and endemism scores (Elkins et al., 2019). 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.

Riverine ecosystems are important for many aquatic species requiring moving currents and habitat diversity. Aquatic habitat within the Project area includes the main stem Pearl River and tributaries, several oxbow lakes such as Mayes Lake, channel cutoffs such as Crystal Lake, and several other smaller lakes or ponds. These lakes provide habitat for fish, reptiles, aquatic birds, and other aquatic animals. The shallow swampy zones of the lakes support a variety of wetland herbs, including the showy *Hibiscus moscheutos* (crimsoneyed rosemallow) and provide ideal habitat for wood ducks (Weiland, 2000). These areas are also used by sport fishermen, kayak outfitters, and recreational boaters. Semi-aquatic mammalian species include beaver, river otter, muskrat, and mink.

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 sandbars and along flats/bottoms of river channels. There are known mussel beds located in the Project area where firm silty/sandy beds provide suitable habitat for numerous mussel species. The mussel bed just north of the J.H. Fewell WTP weir 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 (*Pleurobema riddellii*) is found in the Project area and an 87-mile segment of the West Pearl River downstream of the Project area (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 pulses 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 can have 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.

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, 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 serves as a major travel corridor for deer, squirrel, waterfowl, migratory birds, rabbits, fox, raccoon, and others. Additionally, a large 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 other 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 Project area include the LeFleur's Bluff State Park, Crystal Lake, and the Fannye Cook Natural Area. They represent significant acreage along the Pearl River within the Project area that provides habitat unique for a metropolitan area. For example, the Fannye Cook Natural Area alone ranks in the top 20 for largest urban natural areas east of the Mississippi River (wildllifemiss.org). These lands not only serve as habitat for wildlife but also provide non-consumptive recreational activities.

Threatened and Endangered Species

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. Within the Project area, the species' consultation range includes the Pearl River from the Savanna Street WWTP downstream to Byram, Mississippi. 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 scute 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). Historically, the Pearl River map turtle

was commonly found in higher abundance than the 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 2023).

The Gulf sturgeon (*Acipenser oxyrhynchus 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 2021, a Gulf sturgeon was detected above the J.H. Fewell WTP weir in LeFleur's Bluff State Park and in 2022 the same sturgeon was detected closer to the spillway of the Ross Barnett Reservoir (M. Andres, pers. comm. 2023). 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. Gulf 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 Ross Barnett Reservoir 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 FWCA provides clear authority and a mandate for the conservation of fish and wildlife resources associated with Federal water resource development projects. Section 8 defines the terms “wildlife” and “wildlife resources” to include all “birds, fishes, mammals, and all other classes of wild animals and all types of aquatic and land vegetation upon which wildlife is dependent.” Such wildlife can include those currently protected under the ESA, as well as other species that are declining and are at risk of becoming candidates for listing under the ESA.

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*) is proposed for federal listing as a threatened species and occurs in Mississippi, Arkansas, Louisiana, and Texas (March 20, 2023; 88 FR 16776). In Mississippi, it occurs in the Pearl River in Hancock, Hinds, Marion, Pearl River, and Rankin counties. Specifically, the species has been found in the Project area near the Ross Barnett Reservoir dam and an 87-mile segment of the West Pearl River downstream of the Project area (Ellwanger et al., 2023). 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. Other native mussel species (e.g., Wabash pigtoe, *Fusconaia flava* and Mississippi pigtoe, *Pleurobema beadleianum*) can easily be mistaken for Louisiana pigtoe when identified by shell morphology alone. Threats to this species include dams, weirs, channelization, and other stream modification actions, as well as poor water quality and sedimentation.

The undescribed hickorynut *(Obovaria cf. unicolor)* is proposed for federal listing as a threatened species and occurs in Mississippi and Louisiana (September 10, 2024; 89 FR 73330). This is a small species that is smooth with a black to brown shell that resembles a hickorynut. It 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. This species can be found in the Amite River, Tangipahoa River, Tickfaw River, Pearl River, and Pascagoula Rivers. The last known record of this species in the Project area is from 1992 (MDWFP Heritage Program).

The alligator snapping turtle (*Macrochelys temminckii*) is a large freshwater turtle that is proposed for federal listing as a threatened species throughout 14 states in the Southeast and Midwest United States (November 8, 2021; 88 FR 62434). The species generally

occurs in large rivers and major tributaries; however, they also inhabit a variety of small streams, bayous, canals, swamps, oxbow lakes, and reservoirs associated with these large rivers. They have been documented at Crystal Lake and in the Pelahatchie Bay portion of the Ross Barnett Reservoir (Berry 2019; Pearson et al., 2023). Threats include legal and illegal harvest, drowning as a result of by-catch from recreational and commercial fishing, hook ingestion, habitat alteration, and nest predation. Adult turtles congregate in pools of perennial water bodies during the winter. Nesting occurs in the spring and summer months along steep banks of perennial waterbodies, with nests sometimes detected on dams and other water control structures.

The monarch butterfly (*Danaus plexippus*) is proposed for federal listing as a threatened species (December 12, 2024; 89 FR 100662). Adult monarch butterflies are large and conspicuous, with bright orange wings surrounded by a black border and covered with black veins. During the breeding season, monarchs lay their eggs on their obligate milkweed host plant (primarily *Asclepias* spp.), and larvae emerge after two to five days. The larva then pupates into a chrysalis before emerging 6 to 14 days later as an adult butterfly. There are multiple generations of monarchs produced during the breeding season, with most adult butterflies living approximately two to five weeks; overwintering adults enter into reproductive diapause (suspended reproduction) and live six to nine months. Individual monarchs in temperate climates, such as eastern and western North America, undergo long-distance migration, and live for an extended period of time. In the fall, in both eastern and western North America, monarchs begin migrating to their respective overwintering sites. This migration can take monarchs distances of over 3,000 km and last for over two months. Habitat for the monarch butterfly is present within the Project area, however, ongoing mowing activities by the Rankin Hinds Pearl River Flood and Drainage Control District likely reduce the quality of this habitat.

The tricolored bat (*Perimyotis subflavus*; TCB) is proposed for federal listing as an endangered species (September 14, 2022; 87 FR 56381). The TCB is a small insectivorous bat that is distinguished by its unique tricolored fur and often appears yellowish to nearly orange. This species is wide ranging across the eastern and central United States and portions of southern Canada, Mexico and Central America. During the winter, TCB are often found in caves and abandoned mines, although in the southern United States, where caves are sparse, TCBs are often found roosting in road-associated culverts where they exhibit shorter torpor bouts and forage during warm nights. During the spring, summer, and fall, TCB are found in forested habitats where they roost in trees, primarily among leaves of live or recently dead deciduous hardwood trees, but may also be found in Spanish moss, pine trees, and often human structures such as culverts and bridges. TCB face extinction due primarily to the range-wide impacts of white-nose syndrome, a deadly disease affecting cave-dwelling bats across the continent. White-nose syndrome has caused estimated declines of more than 90 percent in affected TCB colonies across most of the species' range.

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. The Service issued a Biological Opinion (opinion) on November 21, 2024. The Service concurred with the USACE's determination that the formerly proposed Alternatives D and E "may affect, but are not likely to adversely affect" the northern long-eared and tricolored bats. Table 1 outlines the amount of incidental take expected by Alternatives D and E for the remaining species. Neither alternative would jeopardize the continued existence of these species or adversely modify designated critical habitat. Since our 2024 consultation, additional levee segments and other minor changes have been added, resulting in previous alternatives D and E now being called D1 and E1. However, these changes are consistent with our 2024 opinion, therefore, our estimates of the amount of take of federally listed and proposed for listing species has not changed.

On July 1, 2025, the Service concurred with the USACE's determination that Alternative A1 "may affect, but is not likely to adversely affect" the monarch butterfly. The USACE also determined Alternative A1 would have "no effect" on all other federally listed and proposed for listing species.

Reinitiation of consultation with the USACE should occur if (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the action that may affect listed species or critical habitat in a manner or to an extent not considered in our opinion; (3) the action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in our opinion; or (4) a new species is listed or critical habitat designated that could be affected by the action and was not covered by our opinion.

Common Name	Life Stage/Form of Take	Alternative D1	Alternative E1
Gulf Sturgeon	Adults/lethal	4/year	0
Ringed Map Turtle	Adults/lethal	1,196	0
	Adults/nonlethal	4,717	1,596
	Eggs/lethal	364	92
Pearl River Map Turtle	Adults/lethal	70	0
	Adults/nonlethal	302	84
	Eggs/lethal	16	4
Alligator Snapping Turtle	Adults/lethal	13	11
	Eggs/lethal	28	7
Louisiana Pigtoe	Adults/lethal	45,653	0
Monarch Butterfly	Acreage surrogate/ permanent	1,706	0
	Acreage surrogate/ temporary	0	1,500

Table 1. Estimates of the amount of take caused by the two alternatives being considered by the USACE: by species, life stage, and form of take (2024 Service Biological Opinion).

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 2). The Service recommends that the Project be constructed within these windows near known rookeries to the maximum extent practicable.

Species	Scientific Name	Project Activity Window/Non-nesting Period
Anhinga	*Anhinga anhinga*	July1-March 1
Double-crested Cormorant	*Phalacrocorax auritus*	July 1-March 1
Great Blue Heron	*Ardea herodias*	August 1-February 15
Great Egret	*Ardea alba*	August 1-February 15
Little Blue Heron	*Egretta caerulea*	August 1-March 1
Tricolored Heron	*Egretta tricolor*	August 1-March 1
Cattle Egret	*Bubulcus ibis*	September 1-April 1
Green Heron	*Butorides virescens*	September 1-March 15
Black-crowned Night Heron	*Nycticorax nycticorax*	September 1-March 1
Yellow-crowned Night Heron	*Nyctanassa violacea*	September 1-March 15

Table 2. 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. Finally, in order for the citizens of the Jackson metropolitan area to enjoy the remaining fish and wildlife resources of the area, there is a need for improved recreational access (i.e., boat ramps, hiking and biking trails,

wildlife viewing) to the Pearl River. The Service fully supports efforts to reconnect the community to the river, not a new lake. Such lake-based recreational opportunities are already provided within the Jackson metropolitan area at the existing Ross Barnett Reservoir.

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 (Tipton et al., 2004). Thus, other needs of the basin should be considered such as the protection of remaining fish and wildlife habitat value, including habitats for federally listed and at-risk species.

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).
- Riverine mitigation for Alternative D1 should target removal or replacement 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, and other riparian habitats) should be fully mitigated.
- 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 throughout 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 updated its mitigation policy on May 15, 2023 (88 FR 31000). The revised mitigation policy establishes fundamental mitigation principles and provides a framework for applying a landscape-scale approach to achieve, through application of the mitigation hierarchy, no net loss of resources and their values, services, and functions resulting from proposed actions.

Achieving the mitigation goal of this policy involves:

1. Avoiding and minimizing those impacts that most seriously compromise resource sustainability,
2. rectifying and reducing impacts over time by restoring or maintaining conditions in the affected area to attain resource sustainability, and
3. strategically compensating for impacts so that actions result in no net loss of the affected resources.

Portions of the riverine habitat within the Project area have been adversely impacted by previous USACE and local agency projects. These impacts have included the addition the E.H. Fewell WTP weir which was built in 1915; along with the 5.34 miles of channel work that started in 1984. However, this riverine habitat continues to contribute to the conservation of species, most notably for the federally listed gulf sturgeon, ringed map turtle, and Pearl River map turtle. Also, fully mitigating for this habitat type in order to achieve no net loss of affected resources could prove challenging with the selection of Alternative D1 (new weir). Therefore, we recommend avoidance and minimization of impacts to this resource to the maximum extent practical.

Considering the overall value of cypress swamp and bottomland hardwood forests (i.e., forested wetlands), including their riparian component, the Service's mitigation goal is no net loss of the affected resource. The Service has also determined that the oxbow lakes located within LeFleur's Bluff State Park and other forested oxbow lakes in the Project area offer important habitat for fish and wildlife resources, therefore, the mitigation goal is also no net loss of affected resource. Other habitat types (scrub-shrub, upland habitat) are of lower value due to either their reduced value to wildlife and fisheries, degraded wetland functions, or abundance. However, we recommend no net loss of affected resource. We also recommend strategically compensating for impacts for all habitat types within the Pearl River Basin so that actions result in no net loss of affected resources.

Finally, due to their low flows and the impacts of adjacent urban development, the Service classifies the tributary creeks that drain the Project area as habitat of low value for species of conservation concern. Therefore, our mitigation goal for this 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).

Description of Alternatives and Preliminary National Economic Development Plan

Alternative A1

This alternative proposes elevation of residential structures and floodproofing of nonresidential structures plus the option of nonstructural property acquisition on a voluntary basis. It also includes the construction of a 1.4-mile levee segment on the west bank of the Pearl River (Canton Club area). The USACE has determined this alternative is not an effective solution, and has been screened from further consideration, and is therefore not recommended for implementation.

Alternative D1

This structural alternative includes the construction of the Canton Club Levee discussed in Alternative A1, along with three additional levee segments in the McCloud, Cany Creek, and Richland areas. It also includes channel improvements via excavation of overbank areas adjacent to the Pearl River channel, placement of excavated material, existing federal levee improvements, non-federal levee improvements at the Savanna Street WWTP, countermeasures for bridges in the Project area, utilization of the existing E.H. Fewell WTP weir, construction of a new weir (2,200 feet in length) and fish passage structure (i.e., fish ladder) just south of Interstate I-20, additional pumping needs at existing levees, seepage protection in the form of berms and slurry walls on existing levees upstream of the new weir, and riverine mitigation features. This alternative would create a 1,556-acre water surface area (i.e., lake) that could include future ancillary recreational benefits and opportunities including boat ramps, boating, camping, fishing piers, nature/hiking trails, and/or wildlife viewing. This plan currently is labeled as likely the new Locally Preferred Plan (LPP).

Alternative E1

This structural alternative is similar to Alternative D1 but without a new weir and other features that are associated with a new weir (i.e., berms and slurry walls for existing levee seepage protect, additional pumping needs for interior drainage behind existing levees, and a fish ladder). It would also not require the replacement of an obsolete aquatic barrier downstream of the Project area for riverine mitigation purposes. The recreational benefits and opportunities are similar to D1, except that these opportunities would be adjacent to the existing Pearl River, not a new lake.

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 A1 is the only alternative with a positive benefit-to-cost ratio (BCR). However, this alternative was screened from further consideration by the USACE as it was not deemed an effective solution for flood risk management.

According to the RDEIS, estimated project first cost for Alternative D1 are between $873 million (M) and $917M and accrues annual benefits of $25M with annual net benefits between $11M and $12.8M resulting in a BCR of 0.7. Estimated project first cost for Alternative E1 are between $708M and $753M and accrues annual benefits of $25M, with annual net benefits between $3.8M and $5.6M, resulting in a BCR between 0.8 and 0.9.

Neither Alternatives D1 nor E1 yield positive net benefits, which preclude their selection as the NED plan. However, both plans produce total benefits of approximately $25M, far exceeding the nearly $2M generated by Alternative A1. Furthermore, both Alternatives D1 and E1 reduce residual damages from flooding by approximately 70% compared to the 10% damage reduction from Alternative A1.

According to the RDEIS, “of the implementable alternatives assessed, and considering the potential for varying cost or plan participation during implementation, Alternatives D1 and E1 minimize implementation risks, maximize the reduction in residual damages from flooding, and satisfy the USACE Planning Principles and Guidelines (P&G) criteria of completeness, effectiveness, and acceptability. Accordingly, either alternatives D1 or E1 could be considered for selection” (RDEIS, Executive Summary).

Finally, the Economic summary within the RDEIS (Table 3-3) states that “Alternative E1 provides the highest net benefits when assuming high costs, and therefore, could be considered as the preliminary NED plan”.

Description of Impacts

Alternative A1

Alternative A1 would result in adverse impacts to 1.5 acres of forested bottomland hardwood wetlands, 9 acres of forested uplands, and 0.04 acres or riverine habitat. Of the alternatives considered, Alternative A1 is expected to have the least impacts to fish and wildlife resources because the only aquatic or forested habitat that would be impacted would be associated with the Canton Club levee segment. However, the USACE has determined this alternative is not an

effective solution, and has been screened from further consideration, and is not recommended for implementation.

Alternative D1

Based on current project information, Alternative D1 would impact 689 acres of forested bottomland hardwood wetlands, 55 acres of swamp (cypress) forests, 260 acres of forested uplands, 81 acres of lacustrine/open water (i.e., oxbow lakes), and 232 acres of riverine habitat.

Primary impacts from Alternative D1 include:

1. Permanent loss of habitat diversity and associated aquatic species diversity resulting from addition of the weir, resulting in conversion of the Pearl River into a relatively slack-water pool.
2. Permanent loss of riverine sandbar habitat due to the increased water levels or to vegetation encroachment resulting from stabilized water levels in the pool.
3. Permanent and temporary loss of bottomland hardwood, swamp forests, upland forests, and other terrestrial habitats important to fish and wildlife resources.
4. The potential for 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.
5. Indirect impacts to public lands from hydrologic and geomorphic changes upstream of the Project area.

This plan proposes overbank excavation of material, placing fill material, and construction of a large weir near RM 286.5 that could permanently alter the water regime of over 7.5 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.

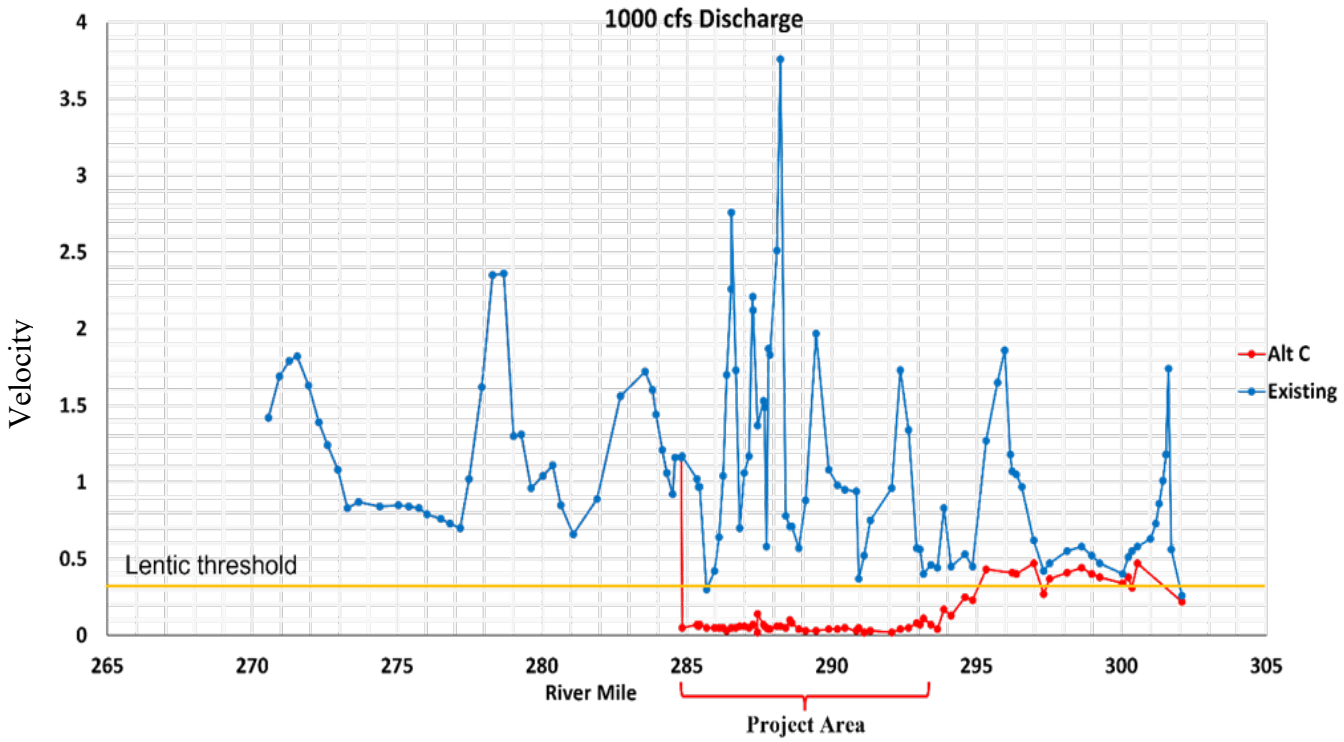
Dams and weirs significantly affect river basins, influencing hydrology, ecology, and sediment transport. Dams and weirs alter natural flow patterns, leading to changes in seasonal and daily discharge (Poff et al., 1997). Dams and weirs also result in altered habitats that can lead to declines in native species, particularly those that are migratory or dependent on specific flow conditions (Stayer and Dudgeon, 2010). These impoundments trap sediments that would naturally flow downstream, which can disrupt river morphodynamics and downstream ecology (Syvitski and Milliman, 2007). Trapped sediments carry nutrients such as nitrogen and phosphorus. As a result, nutrient concentrations can rise in impoundments, leading to

eutrophication, which promotes algal blooms that deplete oxygen and produce toxins (Anderson et al., 2002). Finally, dams create reservoirs that often stratify into layers of different temperatures, which can lead to reduced oxygen levels in deeper waters, negatively impacting aquatic life (Imberger and Patterson, 1990).

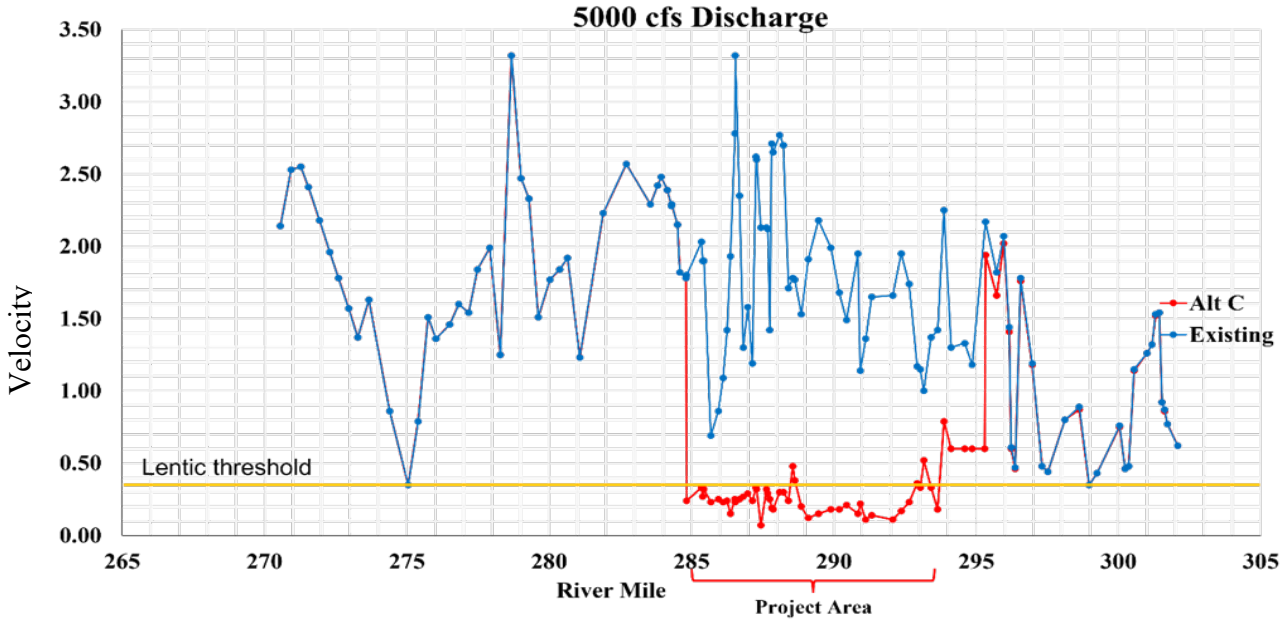
Water velocity analysis for Alternative D1 has not been completed; therefore, the USACE and Service are unable to fully analyze how Alternative D1 would impact velocities through the newly established impoundment. The USACE has committed to conducting a velocity analysis during the PED phase for D1 if selected, using the most current data available.

However, a velocity analysis was conducted for the formerly proposed Alternative C (2024 DEIS), a similar plan with a weir further downstream of the currently proposed weir for Alternative E1. That velocity analysis used river data from the years 1966 to 2013. The USACE determined in the 2025 RDEIS, and the Service concurs, that velocities for both Alternative C and D1 will be similar, and therefore, their impact to riverine species will be similar.

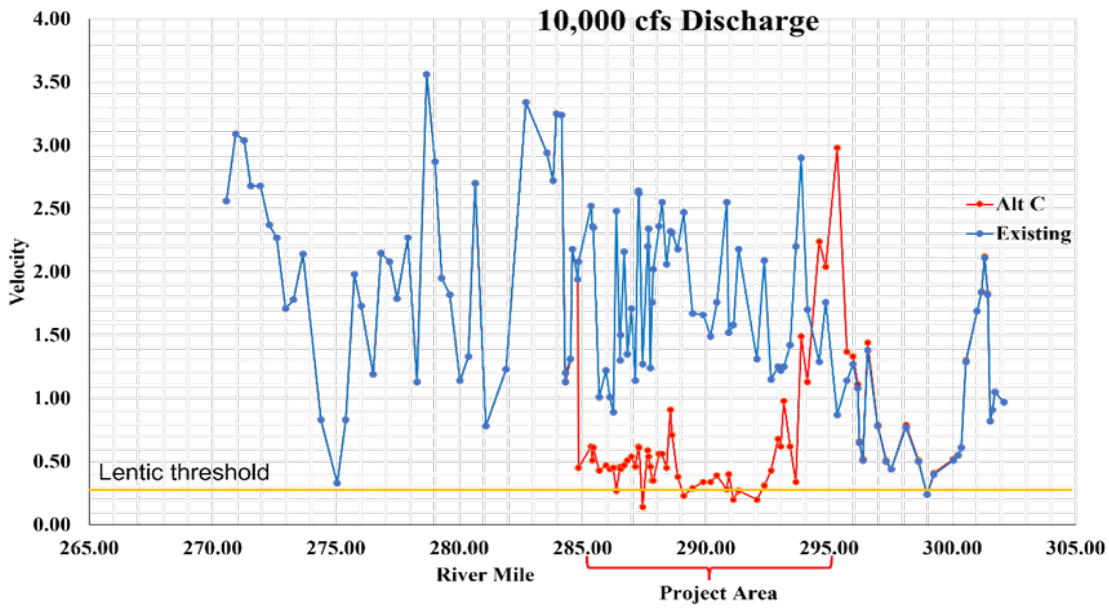
As demonstrated by the models for formerly proposed Alternative C (Graphs 1 through 4), velocities in the proposed project area could be significantly reduced approximately 73 percent of the time, interrupting important life history strategies (i.e., prey sources, breeding substrate). Based on available 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 velocities within the Project area (which includes the pooled area) for 1,000 cfs, 5,000 cfs, 10,000 cfs, and 20,000 cfs, based on discharge data collected from 1966 to 2013.



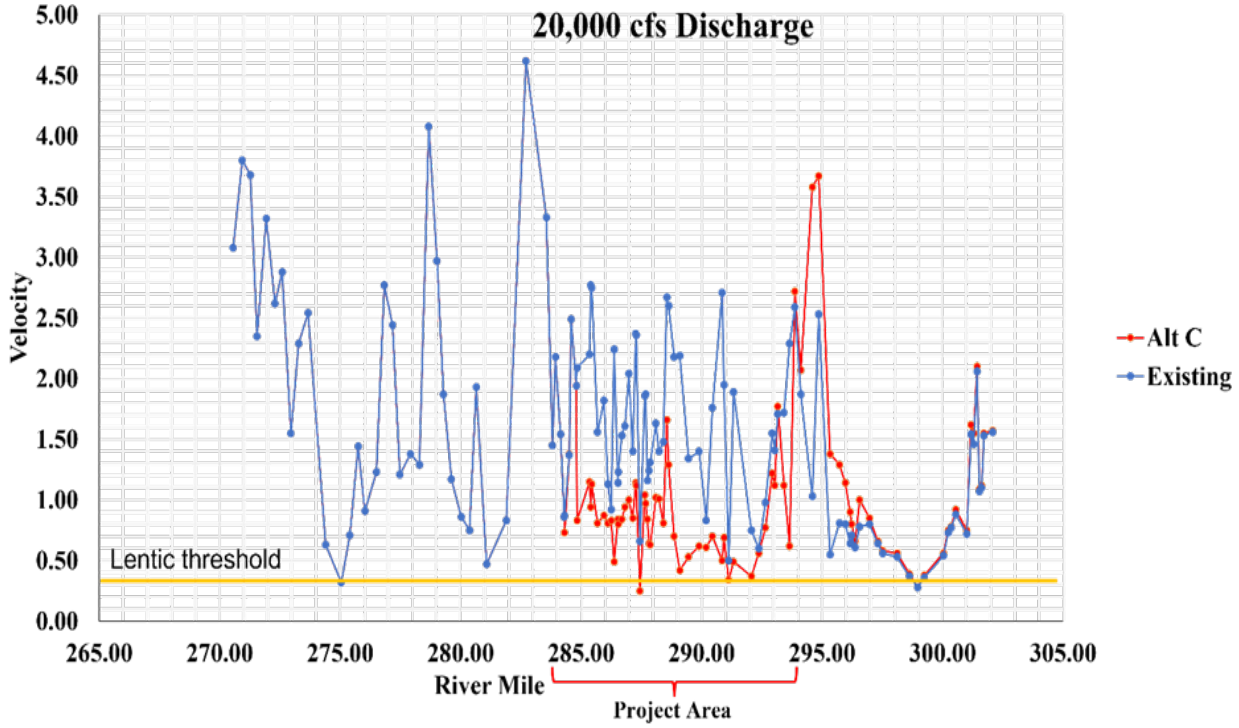
Graph 1. Existing velocities at 1,000 cfs discharge rate compared to project induced velocities. Lentic threshold of velocity is 0.10 m/s (0.33 ft/s) (Pellet et al., 1983).



Graph 2. 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 3. 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 4. 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 available 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 1-3). Low flow conditions (Graph 1-2) 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).

Lotic-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 10,000 cfs (Graphs 1 through 4). The project-induced lentic condition persists throughout the channelized reach (RM 284 – RM 294) especially at/and below average flow conditions (i.e., ≤ 5,000 cfs; Graphs 1 through 3) mentioned above. Further, at

discharge rates ≤ 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 1). 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 impoundment section. 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 impoundment, north of RM 297 (Graphs 2 and 3). However, a project-induced increase in velocity in a portion just upstream of the upper limit of the impoundment (approximately RM 296 to RM 297) (Graphs 3 and 4) is anticipated at discharges above 10,000 cfs.

Between RM 293 (upper end of the pool) 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 habitat structure within the impoundment, the number of turtles may be lower than typically found in other lake-like waterbodies. Placement of trees in the impoundment may partially offset loss of such structure; however, they would quickly decay, needing constant replacement. Retrieval of trees along the river upstream of the impoundment 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 7.5-mile-long pool will result in the permanent removal of riverine features (i.e., swifter flowing water, snags) that provide suitable habitat for other listed and at-risk species. Potential populations of the undescribed hickorynut and Louisiana pigtoe would likely be extirpated within the impounded reach of the river due to the loss of riverine conditions and stratification leading to hypoxic conditions near the lake bottom. We also anticipate a significant 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 and disturbed conditions would likely flourish in the impoundment (Selman 2020) and displace the map turtles.

The negative impact of impoundments on riverine species are evident at other existing weirs and dams in the Project area. The dam at the Ross Barnett Reservoir (RM 301.77) created a roughly 33,000-acre impoundment which no longer provides habitat for riverine species like the ringed and Pearl River map turtles and rare mussel species. It also created a permanent barrier for turtle movement and upstream fish passage for the gulf sturgeon, striped bass, and other migratory fish species.

The E.H. Fewell WTP weir at RM 290.7 was constructed to an elevation of 250 feet NAVD 88 and is approximately 200 feet in length. This weir is a barrier to upstream fish passage when the river elevation is below 256 feet (Weiland, 2000). However, this weir creates a much smaller pool area compared to the Ross Barnett dam, therefore, the impact on other riverine species including mussels and riverine turtles has been minimal. The proposed weir for Alternative D1 will have a higher height (elevation of 256 feet NAVD 88) and will have an estimated length of 2,200 feet, which is eleven times longer than the existing E.H. Fewell WTP weir. This new weir would impound approximately 4 feet of water along the excavated overbanks and up to 22 feet across the main channel, significantly greater than the impounded water currently behind the E.H. Fewell WTP weir.

Changes in water flows from impoundments cause other detrimental effects such as altering water temperature, chemistry, transport and distribution of sediments, and could also cause changes in geomorphology (Poff et al., 1997, Postel and Richter, 2003). 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 Ross Barnett Reservoir. 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., 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.

There will also be a loss of sandbar habitat due to increased water levels or due 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.

We also anticipate impacts from other project actions such as dredging of the overbank areas to create a deeper and wider floodplain. Overbank excavation would result in the loss of forested wetlands and associated wildlife habitat. 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. Other concerns include direct and indirect impacts to conservation lands within (i.e., Fannye Cook Natural Area, Lefleur's Bluff State Park) the Project area.

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 State Park (i.e., Mayes Lake), Crystal Lake, and other areas as these wetlands are either excavated as part of the overbank excavation or used as fill areas for the excavated material. 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).

Previously, Alternative C reported riverine impacts up to 1.6 miles downstream of the new weir. 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 potential impacts (i.e., inducements) extending an additional 32 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 D1, 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).

Increasing development along the newly established impoundment could contribute to cumulative impacts from Alternative D1. Should further development occur outside of designated fill areas, it could remove forested wetlands, reduce habitat available for wildlife, reduce floodplain water storage capacity and filtration, and degrade water quality. 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 within the Ross Barnett Reservoir can serve as an example of impacts to water quality from development activities (Figure 3). The Mississippi Department of Health reported that rains and floodwaters created a chemical imbalance on one side of the water treatment plant from Ross Barnett Reservoir intake water, leading to a loss of pressure (Inman and Beveridge, 2022).

Finally, the Service remains concerned that mitigating function and habitat loss associated with Alternative D1 to the southeast region’s fourth largest river system may be challenging.

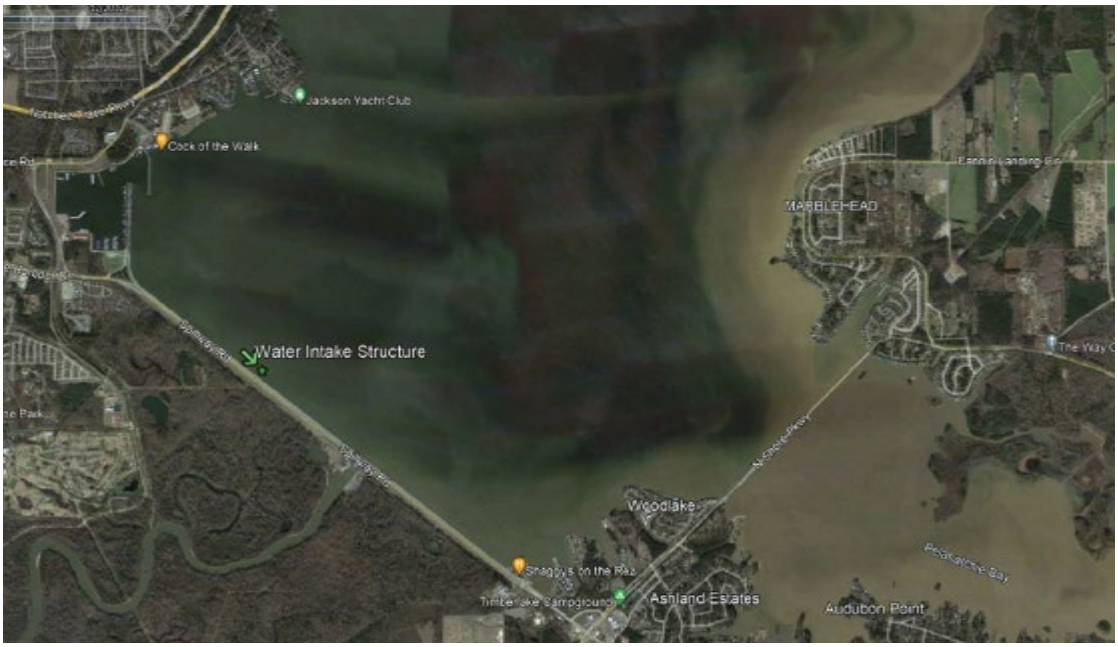


Figure 3. Aerial visual (2020) of sedimentation in Pelahatchie Bay from construction activities.

Alternative E1

Alternative E1 would have the same overbank excavation activities (i.e., floodplain lowering) as Alternative D1. However, impacts to riverine habitat would be significantly lower for Alternative E1, as there would be no weir and associated impoundment. Alternative E1 would also not require additional slurry walls and pump stations; and would not require the addition of a fish passage structure. Riverine mitigation required for Alternative E1 would be significantly lower than for Alternative D1 as the only impacts to riverine habitat would be associated with four new levees impacting small tributary streams. However, Alternative E1 would require mitigation for impacts to oxbow lakes (lacustrine habitat), whereas Alternative D1 would not since the new lake would self-mitigate for these impacts.

No excavation of material would occur within the Pearl River channel for Alternative E1; 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) and associated impoundment would exist.

Whereas the impacts associated with construction of a new lake for Alternative D1 are considered permanent due to the flooding of 1,556 acres of terrestrial and riverine habitat, the

impacts associated with only conducting overbank excavations for Alternative E1 could be considered only temporary in nature. While these temporary impacts are expected to have adverse impacts to fish and wildlife resources, the areas of excavation could be replanted or allowed to naturally regenerate, thereby restoring important fish and wildlife resources in the Project area. Riparian, wetland, and oxbow lake dependent species would benefit from such reforestation efforts. Riverine dependent species would also be expected to benefit from the increased input of large woody debris into the river, lower river temperatures resulting from greater shade along the banks, and other benefits associated with riparian habitats (Naiman and Decamps, 1997). By adding ecological restoration as a stated goal of the project, the Project area could result in increased fish and wildlife resources over current conditions. We understand that such restoration activities may impact flood conveyance and capacity; however, we recommend they receive full consideration to determine if both ecological restoration of the river and flood risk management in the Project area are both achievable.

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 Average Annual Habitat Units (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 Rankin Hinds Pearl River Flood & Drainage Control District, or nonfederal interest (NFI), during previous studies (2018 DEIS) to represent the various habitats impacted by the Project. Those evaluation species included barred owl, gray squirrel, swamp rabbit, brown thrasher, eastern meadowlark, red-eared 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 management 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 management 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 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 Alternative D1. The IMT also agreed that riverine mitigation for Pearl River impacts would not be required for Alternative E1 as riverine impacts to the main stem of the Pearl River are not expected to occur at this time. Additional riverine mitigation would be required should impacts to the main stem of the Pearl River be proposed during the PED phase. Table 2 displays the unavoidable habitat impacts and terrestrial mitigation requirements associated with Alternatives D1 and E1.

Habitat Type	Alt D1 acres of impact	Alt E1 acres of impact	Alt D1 AAHU's	Alt E1 AAHU's
Lacustrine/Open Water	81	81	497	497
BLH wet	689	689	1,732	1,732
Swamp	55	55	135	135
Forested Uplands	260	260	999	999
Riverine	232	0.1	164	0.1

Table 2. 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 D1 and E1.

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 D1 and E1. 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.

The USACE assumes, and the Service agrees, that the impacts to fisheries and aquatic resources from Alternative D1 are similar to those from Alternative C, and therefore, Alternative D1 will result in the loss of all riverine habitat. The pool-like environment behind the weir for Alternative D1 would not compensate for lost riverine habitat and function. The IMT has also agreed that riverine impacts would need to be mitigated in-kind. 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 the Service remains concerned over the ability to fully mitigate for riverine impacts associated with Alternative D1, we remain committed to identifying the most effective riverine mitigation strategies that would benefit fish and wildlife resources downstream of the Project area.

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 would help offset impacts associated with Alternative D1. 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 caretake 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 has most recently evaluated three different alternatives for flood risk management in the Project area, including a nonstructural solution with levee segment (Alternative A1), and two similar structural solutions (Alternative D1 with weir and Alternative E1 without weir).

Of the alternatives considered, Alternative A1 is expected to have the fewest impacts to fish and wildlife resources because the only habitats that would be adversely impacted would be associated with the Canton Club levee segment. However, the USACE has determined this alternative is not an effective solution, and therefore has been screened from further consideration, and is not recommended for implementation. The Service would support any future efforts to expand on the existing Alternative A1 to provide greater flood risk reductions as this alternative currently has minimal impacts to fish and wildlife resources and the greatest benefit-to-cost ratio.

Both D1 and E1 alternatives have the same flood risk management benefits; however, Alternative E1 will result in fewer impacts to overall fish and wildlife resource resources. Both alternatives would have similar terrestrial impacts; however, Alternative E1 would have significantly fewer riverine impacts and therefore fewer riverine mitigation requirements since 7.5 miles of the river would not be converted to a lake. Impacts to oxbow lakes would be self-mitigated for Alternative D1, whereas mitigation would be required for Alternative E1 by creating new oxbow lakes within the overbank excavation areas.

Many of the adverse impacts associated with Alternative E1 could be considered only temporary if an ecological restoration plan can be developed that allows the new floodplain to revert fully or partially back to forested habitat. It's feasible that implementation of such a restoration plan could result in greater fish and wildlife resources in the Project area over current conditions. Selection of Alternative E1 would also allow future opportunities outside of this project scope to restore the Pearl River via in-stream restoration actions and the removal or replacement of the existing weir at the E.H. Fewell WTP.

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

1. Continue to evaluate the river and floodplain ecological restoration potential of Alternative E1.

   Since no weir would be installed with Alternative E1, 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 full or partial 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 result in negligible impacts to 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".

   Alternative E1 also provides the potential 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 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. Continue to evaluate the recreational and economic development potential of Alternative E1.

Many of the recreational and economic development opportunities described for Alternative D1 could also be realized with Alternative E1. Such recreational opportunities are realized on urban rivers across the country. 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 forested 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 E1 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 sustainable development near rivers. Therefore, we recommend these recreational and sustainable economic development opportunities continue to de developed and evaluated if this alternative is selected.

3. Consider the feasibility of limiting overbank excavation for Alternative E1 to the areas most impacted by previous flood management projects; thereby avoiding impacts to higher quality habitats including state conservation lands.

As previously discussed, the 5.34 miles of channel work and levees that occurred between 1964-1968 and the partial or complete overbank vegetation clearing of 346 acres that began in 1984 have resulted in lower wildlife value for these areas compared to other less impacted reaches of the river in the Project area. We recommend weighing the environmental and cost benefits of focusing excavation to the south (downstream) of the E.H. Fewell WTP weir at RM 290.7 versus the flood risk management benefits of excavation above the weir. Benefits would include the avoidance of direct impacts to the Lefleur's Bluff State Park and the adjoining higher quality wetland and riparian habitats above the weir. It would also avoid potential sediment impacts to higher quality mussel habitat including a documented mussel bed with over 20 species just upstream of the weir (Weiland, 2000). Also, it would avoid riparian impacts to the section of the river that currently has an increasing population of ringed map turtles.

Other benefits include cost savings associated with not excavating areas above the weir or armoring Mayes Lake within the LeFleur's Bluff State Park and the existing E.H. Fewell weir. Bridge countermeasures may not be required at the Highway 25 as well. Finally, this would also presumably eliminate any concerns about the ongoing operation of the E.H. Fewell WTP during excavation activities upstream of the weir.

Although the Service does not support Alternative D1 as the Tentatively Selected Plan, the following recommendations are specific to Alternative D1 should it be selected for implementation.

4. 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.
5. 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 Ross Barnett Reservoir.
6. When filling the pool, the downstream flow should at least maintain the minimum required discharge from the Ross Barnett Reservoir, while also allowing portions of flood flows to pass downstream.
7. 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.
8. Long-term water quality and quantity monitoring up- and downstream and within the new impoundment should be undertaken during 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).

Additional Service Recommendations for Alternatives D1 and E1:

9. Conduct a sediment analysis. 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.

10. 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).
11. 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.
12. 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.
13. Continue to include the Service in planning and project collaboration during the PED phase once a plan for implementation has been selected.
14. Mitigation should be implemented concurrent with construction.
15. 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.

16. Direct and indirect impacts to 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.
17. A conservation easement, in perpetuity, should be recorded on the deed of any mitigation sites not transferred to public ownership.
18. Adequate turbidity, silt, and spoil containment barriers should be used to protect aquatic and wetland resources.
19. 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.
20. Assess existing constrictions within the main stem of the Pearl River and identify solutions for flood reduction considerations (i.e., road and railroad bridge obstructions and inadequacy for flow).
21. 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.
22. 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.
23. 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.

24. 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 local entities, 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 is not opposed to providing flood protection to the Jackson metropolitan area. However, trends reveal a decline in species diversity and abundance within this basin (Tipton et al., 2004); therefore, other needs of the basin should be considered such as the protection of remaining fish and wildlife habitat values, including habitats for federally listed and at-risk species. Accordingly, the Service has significant concerns regarding implementation of Alternative D1 as proposed for the Pearl River Basin, Mississippi, Federal Flood Risk Management Project, Rankin and Hinds Counties, Mississippi.

The Service's mitigation policy (88 FR 31000, May 15, 2023) establishes fundamental mitigation principles and provides a framework for applying a landscape-scale approach to achieve, through application of the mitigation hierarchy, no net loss of resources and their values, services, and functions resulting from proposed actions.

Achieving the mitigation goal of this policy involves:

1. Avoiding and minimizing those impacts that most seriously compromise resource sustainability
2. rectifying and reducing impacts over time by restoring or maintaining conditions in the affected area to attain resource sustainability, and
3. strategically compensating for impacts so that actions result in no net loss of the affected resources.

In our opinion, construction of a weir and impoundment (Alternative D1) for reasons outside the stated primary purpose of flood risk management is not making a reasonable effort to avoid and minimize impacts that most seriously compromise resource sustainability. It is the Service's position that only Alternatives A1 and E1 meet our mitigation policy. These alternatives minimize fish and wildlife resource impacts and specifically avoid the construction of a weir and resulting impoundment. Alternative A1 would induce the least ecological damage while providing flood reduction benefits. However, the USACE has determined this alternative is not

an effective solution, has been screened from further consideration, and is therefore not recommended for implementation. Alternatives D1 and E1 have the same flood reduction benefits; however, Alternative E1 results in significantly fewer impacts to fish and wildlife resources. Selection of Alternative E1 also allows the USACE, Service, and other federal and local partners to rectify and reduce existing impacts over time by improving riverine and terrestrial habitats in the Project area in order to attain resource sustainability.

Therefore, of the remaining implementable alternatives being considered by the USACE, the Service would support the selection of Alternative E1 as the tentatively selected plan. If this alterative is selected, we recommend additional avoidance and minimization efforts be considered including limiting overbank excavation to the areas most impacted by previous flood management projects (i.e. downstream of the existing weir at the E.H. Fewell WTP); thereby avoiding impacts to higher quality fish and wildlife habitats in the Project area including state conservation lands.

Regardless of which alternative is ultimately finalized for implementation, the Service requests that our recommendations be incorporated into the project plans to ensure compliance with the FWCA. A final FWCA report will be provided when an alternative is selected for implementation, 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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August 11, 2025

U.S. Army Corps of Engineers
Attn: Jason Emery, Acting Chief
Environmental Branch, RPEDS
CEMVN-PDS
7400 Leake Avenue, Room 136
New Orleans, LA 70118

RE: *Application Number: RDEIS, Pearl River Basin Mississippi Federal Flood Risk Management Project*
Applicant: U.S. Army Corps of Engineers
Notice Date: July 3, 2025

Dear Mr. Emery:

The professional staff of the Louisiana Department of Wildlife and Fisheries (LDWF/the Department) has reviewed the above referenced Public Notice for the Revised Draft Environmental Impact Statement (RDEIS) for the Pearl River Basin Mississippi Federal Flood Risk Management Project (One Lake Project). Based upon this review, the following has been determined:

Fisheries Specific Comments:
It is the opinion of LDWF Fisheries that Alternative E1, with no weir, would have the least impact on aquatic species and offers the same flood protection as Alternative D1. Alternative D1, with the weir option, would encumber migratory fish species that utilize the Pearl River, and carry the potential to impact fisheries resources extending into Louisiana. However, it should be noted that the Department would have supported the Alternative A1 – Nonstructural Plan had it not been screened, as it was the only alternative with a positive benefit to cost ratio and was also the least impactful to fisheries resources.

Despite the RDEIS being described as an analysis of the Pearl River from its source to its terminus at the Gulf of Mexico, very little information is provided concerning impacts to the lower Pearl River. There appear to be no hydrological models to show the impacts of the various project alternatives to the entirety of the Pearl River. If the proposed weir results in reduced river levels downstream, this could have negative impacts to spawning diadromous fishes, such as Gulf Sturgeon (*Acipenser oxyrhynchus desotoi*), Gulf Striped Bass (*Morone saxatilis*), and Alabama Shad (*Alosa alabamae*), reaching critical habitat in the lower Pearl River. Page 2-20 of the RDEIS highlights the concerns for Gulf Sturgeon that should be considered seriously with this project. Further modifications of the Pearl River drainage, an already impacted waterway, will only exacerbate the problems encountered by Gulf Sturgeon utilizing the Pearl River drainage for spawning and survival.

The conversion of swift water (riverine) habitats to slackwater (lacustrine) habitats associated with the construction of a weir would introduce the possibility for the establishment of noxious invasive aquatic weed species, such as giant salvinia (*Salvinia molesta*) or water hyacinth (*Pontederia crassipes*). In addition, fish and mussel Species of Greatest Conservation Need (SGCN), as defined in the Louisiana State Wildlife Action Plan, shared between Louisiana and Mississippi could be impacted.

Pages 4-26 and 6-3, of the main report state: "Additional assessment of the changes to the downstream boundary was conducted for the 1% AEP event. Further analysis would be needed to validate the total impacts, specifically to verify sediment and velocity impacts of the additional water moving downstream. However, major impacts to the downstream watershed beyond the RM 200 (approximately 5 miles north of Monticello, MS) are highly unlikely. No impacts to the State of Louisiana or Gulf Coast Region are expected to occur." It would be prudent to remodel impacts for the entirety of the Pearl River Drainage after narrowing construction to a single chosen design and then updating the environmental impact statement at that time.

The productivity of oyster (*Crassostrea virginica*) reefs in Mississippi Sound depend on the mixing of freshwater from the Pearl River with saltwater from the Gulf of Mexico to maintain an optimum brackish salinity range for oysters. Disturbance/reduction of the freshwater flow from the Pearl River has the potential to upset the established balance, and a more saline environment would in turn create devastating consequences to existing oyster populations. Without an influx of cooler, fresher river water, estuarine water temperature, salinity, and pH ranges in the area could be permanently altered. Oysters are more susceptible to oyster Dermo disease (*Perkinsus marinus*) in higher water temperatures and salinities; oysters are more susceptible to predation from Southern Oyster Drill (*Stramonita haemastoma*) in higher water temperatures and salinities; and high salinity Gulf water will travel further into the estuary exacerbating hypoxic events. The USACE should model how the proposed weir would affect the flow rates at the mouth of the Pearl River to insure there is no alteration in the salinity regime and the ability for oysters to thrive on established reefs. The potential shift in fresh to saltwater ratios would decrease oysters' food supply and shift currently optimal salinity waters into areas that may lack adequate substrate or adequate food for oysters to reestablish. The potential loss of oyster habitat would have cascading impacts throughout many fisheries.

LDWF has concerns regarding risks to marine mollusks and how the proposed alternatives may alter hydrologic conditions and compromise water quality at the mouth of the Pearl River. On page 7-9 of the RDEIS, the United States Army Corps of Engineers (USACE) states, "WQ monitoring is required per the ESA consultation and the mitigation monitoring plan," in response to the following public comment: "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." While the USACE concurred with the public comment concerning the monitoring of the Mississippi Sound, and plans to pursue water quality monitoring, no specific mention is made of coordinating with LDWF concerning such matters. It is strongly recommended that the USACE contact the Department concerning any proposed monitoring plans in the Mississippi Sound. Combining the expertise of our agencies would surely be beneficial in developing a monitoring plan that would satisfy the concerns raised regarding this issue.

On page 3-5 of the RDEIS, the USACE references the possibility of a water control agreement between Mississippi and Louisiana for monitoring river conditions. If this agreement comes to fruition, extending monitoring and flow rate requirements to the mouth of the Pearl River should be

recommended. The ecological and environmental impacts of this project will not be limited to only that portion of the river being modified.

Strong consideration to mitigation projects beyond the project area and downstream, such as elements of the de-authorized West Pearl River Navigation Project (WPRNP) located in Louisiana, are highly recommended for inclusion in any proposed mitigation plans. The WPRNP was de-authorized as a federal navigation project in the 2016 Water Resources Development Act bill. Removal of the two low head sills, one on the Pearl River, below Bogalusa at Pools Bluff, and the other in the Bogue Chitto River near Bush, would allow migratory fish, e.g. Gulf Sturgeon, unencumbered passage.

The Louisiana Department of Wildlife and Fisheries submits these recommendations to the U.S. Army Corps of Engineers in accordance with provisions of the Fish and Wildlife Coordination Act (16 U.S.C. 661 et seq.). Please do not hesitate to contact Permits Coordinator Dave Butler at (504)286-4173 should you need further assistance.

Sincerely,

Ryan Montegut
Assistant Secretary

zc/rm/pc/ja/rc/cb