

# **The Effects of Recent Flooding Events on Ecological Resources in the Yazoo Backwater Area of Mississippi**

Prepared by:

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Prepared for:

**Board of Mississippi Levee Commissioners**

2283 Highway 82 West  
Greenville, Mississippi 38701

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## EXECUTIVE SUMMARY

### I. Introduction

In September of 2019, Pond was engaged by the Board of Mississippi Levee Commissioners (the Board) to evaluate the effects of recent backwater flooding events on various ecological resources within the Yazoo Backwater Area (YBA) of Mississippi. Specifically, Pond reviewed available literature and data to examine several of the observed and potential ecological effects of the YBA continuing without construction and operation of the Yazoo Backwater Pump Project (Pump Project).<sup>1</sup> Pond reviewed scientific literature to assess anticipated outcomes for ecological resources under flood conditions and compiled observational data from within the YBA (or areas comparable to the YBA) to evaluate observed responses of ecological resources to flooding events. Using the literature and observations, Pond inferred how ecological resources may respond to continued backwater flood events or, conversely, how these resources may respond to mitigated flood events associated with the installation and operation of the Pump Project.

### II. Ecological Resources Addressed

The YBA hosts a rich variety of ecological resources including wildlife, fisheries, and forests. The YBA contains numerous large tracts of public lands (e.g., wildlife management areas, national wildlife refuges, and national forests), that offer users outdoor recreational activities such as hunting, fishing, boating, birdwatching, camping, hiking, biking, horseback riding, and off-road vehicle use. Privately held properties also offer similar recreation opportunities and include the facilities for cabin rental and hosting a variety of outdoor activities including conservation workshops, conferences, outdoor team-building opportunities, and summer camps. Many of these properties are actively managed to support wildlife and fisheries, sustainable use of forest resources, and public

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<sup>1</sup> The Pump Project as used in the Pond study is described in the 2007 Final Supplemental Environmental Impact Statement (EIS) and the Yazoo Backwater Area Reformulation Study Main Report.

outdoor recreation. The recurrent backwater flooding in the YBA directly and indirectly affects these environmental resources.

The four major ecological resources categories examined in this evaluation are: wildlife resources and outdoor recreation (Report A); forest resources (Report B); methylmercury production (Report C); and Asian carp (Report D).<sup>2</sup> These categories were chosen because of their relative importance in ecological health and stability, their role within the natural environment, as well as their importance to for public use, stewardship, and influence on local economy.

**II. Summary of Impacts to Ecological Categories**

A generalized summary of findings for each resource category is available in the table below. In-depth evaluation of these ecological resources appears in the individual Reports (Reports A-D).

Resource Category	Effects of Flooding	Related Effects	Anticipated Outcome with Reduced Flood Depth & Duration
<b>Wildlife Resources and Outdoor Recreation</b>	<ul style="list-style-type: none"> <li>- Mortality and displacement.</li> <li>- Reduced recruitment or successful reproduction.</li> <li>- Crowding of wildlife, which leads to inter- and intra-species competition, starvation, forced predation, increased risk of spreading disease (i.e., CWD).</li> <li>- Increased human conflict (i.e., increased vehicle collisions with wildlife, wildlife occupying man-made structures [e.g., houses, barns, and sheds], and damage to levees and roadways from wildlife burrowing or rooting).</li> </ul>	<ul style="list-style-type: none"> <li>- Hunting season closures or modifications.</li> <li>- Damage to and closures of public recreation areas and associated infrastructure.</li> <li>- Potential long-term population effects.</li> <li>- Increased cancellation of bookings of potential users of the public and private lands for recreational uses.</li> <li>- Concern with the unpredictability of hunting season openings/closures (leading to a potential decrease in license sales), and decreased land value.</li> <li>- Spread of invasive feral swine.</li> </ul>	<ul style="list-style-type: none"> <li>- Less wildlife mortality and associated impacts to wildlife populations.</li> <li>- Less displacement of wildlife.</li> <li>- Less crowding of wildlife that leads to competition and the spread of disease.</li> <li>- Less wildlife stranding on patches of high ground or man-made structures, less human-wildlife conflict.</li> <li>- Increased predictability for land management to support wildlife and outdoor recreation use, including repairing damage to infrastructure.</li> </ul>
<b>Forest Resources</b>	<ul style="list-style-type: none"> <li>- Immediate damage and mortality to trees.</li> <li>- Delayed damage and mortality to trees through secondary infections including rot, fungal infections, infestations of wood-boring insects.</li> <li>- Poor health and stress to living trees (i.e., defoliation and reduced root development).</li> </ul>	<ul style="list-style-type: none"> <li>- Reduced timber quality.</li> <li>- Reduced timber prices and sales.</li> <li>- Inability to salvage dead or dying trees.</li> <li>- Increased risk of uprooting, toppling, breakages, and posing a risk to users of public recreation areas.</li> <li>- Decreased land value.</li> <li>- Habitat alteration for forest-dependent species.</li> </ul>	<ul style="list-style-type: none"> <li>- Reduced mortality and flood damage.</li> <li>- Reduced risk of secondary infections and wood-boring insect infestations.</li> <li>- Reduced stress associated with flooding, and potentially increased tree growth.</li> <li>- Increased ability to manage forest resources and establish predictable harvests, and reforestation/ regeneration plans.</li> </ul>

<sup>2</sup> Each report was written to be understood individually, resulting in some repetition of background material in the four reports.

Resource Category	Effects of Flooding	Related Effects	Anticipated Outcome with Reduced Flood Depth & Duration
<b>Methylmercury</b>	<ul style="list-style-type: none"> <li>- Increased methylmercury production (up to 32% during a typical 2-Year flood event).</li> </ul>	<ul style="list-style-type: none"> <li>- Increased methylmercury in the ecosystem available for uptake and bioaccumulation within the food web.</li> <li>- Increased risk to humans eating fish and fish advisories.</li> <li>- Increased risk to wildlife</li> </ul>	<ul style="list-style-type: none"> <li>- Reduced methylmercury production in the YBA.</li> <li>- Reduced associated risks to wildlife and humans.</li> </ul>
<b>Asian Carp</b>	<ul style="list-style-type: none"> <li>- Introduction of Asian carp to new locations (i.e., the spread of an invasive, injurious fish species).</li> <li>- Increased Asian carp competition with native fish and mussels.</li> </ul>	<ul style="list-style-type: none"> <li>- Reduced population, body condition, and biomass of native fishes in waterbodies with Asian carp presence.</li> <li>- Adverse effects to heavily managed sportfish populations and associated recreational opportunities.</li> <li>- Increased risk of Asian carp collisions with recreational boaters and associated bodily harm.</li> </ul>	<ul style="list-style-type: none"> <li>- Reduced risk of continued spread of an invasive, injurious fish species.</li> <li>- Reduced continued introduction of Asian carp into otherwise isolated waterbodies.</li> <li>- Increased ability to limit and control Asian carp spread, and to restore native fisheries.</li> </ul>

**IV. The Yazoo Backwater Area and Backwater Flooding**

This short description of the YBA will assist in setting the context for Pond’s study of backwater flooding impacts on ecological resources. In general, unaltered floodplains are connected to adjacent rivers and are subjected to the periodic, often seasonal, exchange of water, nutrients, and organisms through overbank flow. While groundwater and precipitation contribute to the hydrology of floodplains, overbank flow is usually a frequent hydrologic driver within unaltered floodplains. However, as a result of land use changes and man-made flood control measures (e.g., dams, levees, drainage canals, water control structures, etc.), historic floodplains within the Mississippi Alluvial Valley (MAV) – including the YBA – have been separated from their adjacent river systems. The flood control measures perform as intended, to reduce flood damage from Mississippi River flooding. A study of the effect of flooding on natural resources must be conducted in a manner that addresses the existing modified conditions of the floodplain as opposed to the historical conditions.

The YBA of Mississippi is generally bounded by the Mississippi River to the west and bluff hills and the Yazoo River to the east and has been subjected to flooding since time immemorial. However, as with other areas within the MAV, the YBA has been extensively modified to protect the area from overbank flooding from the adjacent Mississippi River. As originally envisioned, the flood control efforts within the YBA included a pumping station which would have allowed surface water trapped on the landward side of the levees, during flood stage on the Mississippi River, to exit the basin and discharge into the Mississippi River. However, the pumping station was never constructed. The existing levee and control structure system protect the YBA from overbank flooding from the Mississippi River; however, when the water control structure (Steele Bayou gate at Hwy 465) is closed, there is no outlet for rivers, streams, and surface waters within the YBA. As a result, surface waters within the YBA begin

to “back up” against the existing levee system; resulting in a backwater flood event. Floodwaters within the YBA remain on the landscape until the water level of the Mississippi River recedes and the control structures can be opened to allow the floodwaters trapped behind the levee to escape. Because the backwater flood events are not connected to overbank flooding from the Mississippi River, they do not flow, rise, and fall as would be expected in a natural, connected floodplain system. Rather, the backwater flood events resemble a filling of a bathtub with a closed drain where the water stacks up behind the levee system and creates a stagnant pool. The Steele Bayou Gates may be closed and opened several times during the period of Mississippi River flooding, generally between February and June most years. Floodwaters within the YBA may remain on the landscape for long durations.

The YBA has experienced backwater flooding every year since 2002, except for 2006 and 2012. Backwater flooding events since 2002 have varied in extent and duration, with a record-breaking flood in 2019. The 2019 YBA backwater flooding event exceeded 219 consecutive days with water above 87 feet elevation (NGVD) from January 4 until August 10, 2019 with a peak crest at a record-breaking 98.2 feet on May 23, 2019, which flooded 548,000 acres of the YBA. The YBA again experienced severe backwater flooding in 2020 with flood elevations reaching 96.9 feet on April 23, 2020, flooding approximately 500,000 total acres of land within the YBA. While all backwater flood events likely have some effect on the ecological resources, the extreme nature of the 2019 event (in terms of extent, depth, and duration) led to readily observable adverse effects. As a result, the Pond study focused primarily on effects of this event. This study recognized that (1) information on long term impacts of the 2019 flood is not yet available, and (2) the effects of each flood event may differ in intensity, but the resource categories studied would see adverse consequences if subject to prolonged and repeat flooding.

### **Individual Reports**

**Report A** - The Effects of Recent Flooding Events on Wildlife Resources and Outdoor Recreation in the Yazoo Backwater Area of Mississippi

**Report B** - Effects of Flooding on Bottomland Hardwoods in the Yazoo Backwater Area of Mississippi

**Report C** - Review of Methylmercury Production in Backwater Floodplains and Implications for the Yazoo Backwater Area of Mississippi

**Report D** - Invasive Asian Carp in the Yazoo Backwater Area of Mississippi