



Yazoo Backwater Area A Resilience Alternative

Strategic use of voluntary wetland reserve easements, restoration, and non-structural measures can reduce flood risks for vulnerable communities in the Yazoo Backwater Area (YBWA) of Mississippi, make those communities and the nation's wildlife more resilient to climate change, and advance the vitally important 30x30 Initiative by permanently protecting 80,000 acres of critical wetlands. These commonsense measures could be implemented through existing federal programs under the direction of an interagency task force convened by the Council on Environmental Quality and led by the U.S. Fish and Wildlife Service, U.S. Department of Agriculture, and Federal Emergency Management Agency.

The hemispherically significant wetlands in the YBWA are "some of the richest wetland and aquatic resources in the nation."¹ They support 450 species of birds, fish and wildlife; are used by 29 million migrating birds each year; and include tens of thousands of acres of federal, state, and privately-owned conservation lands. Critically, these wetlands help protect YBWA communities by storing hundreds of billions of gallons of floodwaters, improving water quality, and sequestering carbon. To prevent unacceptable damage to more than 67,000 acres of these vital wetlands, the Environmental Protection Agency used its Clean Water Act 404(c) authority in 2008 to veto the Yazoo Pumps. This veto paved the way for the subsequent protection of an additional 53,300 acres of YBWA wetlands through conservation easements and other voluntary mechanisms.

But in a reckless about-face and in direct violation of the law, the Trump Administration hastily revoked the 2008 veto and then approved the Yazoo Pumps just days before President Biden was sworn in to office. The Corps refused to consider this Resilience Alternative—or any other alternative to the destructive and ineffective Yazoo Pumps—despite repeated requests to do so. The Corps' decision was opposed by the U.S. Fish and Wildlife Service, 110 scientific professionals, four scientific associations, 120 conservation and social justice organizations, and more than 55,000 members of the public.

The \$450 million Yazoo Pumps will drain tens of thousands of acres of wetlands to subsidize large-scale agribusiness operations that have already received \$1.05 billion in farm subsidies.² The Yazoo Pumps are not designed to protect communities and will not prevent flooding.³ The Pumps will leave 82% to 89% of flooded lands underwater, take weeks to months to drawdown floodwaters on the remaining lands, and increase flood risks for downstream frontline communities.⁴

The Biden Administration can deliver immediate, sustainable flood relief to underserved communities in the YBWA while protecting nationally significant wildlife resources by reconfirming EPA's 2008 veto of the Yazoo Pumps, withdrawing the fatally flawed Record of Decision approving the project, and appointing an interagency task force to implement the Resilience Alternative outlined below.

Targeted Use of Existing Federal Programs in the Yazoo Backwater Area

Flooding in the YBWA is primarily restricted to conservation lands managed as wetland systems, low-lying marginal agricultural lands targeted for restoration by the Lower Mississippi Valley Joint Venture, and other low-lying, sparsely populated areas.⁵ Strategic implementation of existing federal programs can protect communities in the YBWA, while also achieving the area’s critical restoration goals.

The programs outlined below authorize and fund the voluntary wetland reserve easements, restoration, and non-structural measures that are part of this Resilience Alternative. Strategic use of these measures can be achieved through an interagency task force led by the U.S. Fish and Wildlife Service, U.S. Department of Agriculture, and Federal Emergency Management Agency.

Federal Program	Structures	Agricultural Lands	Community Facilities	Roads, Bridges Utility Systems
Wetland Reserve Easements (WRE) USDA		✓		
Floodplain Easement Program USDA	✓	✓		
Building Resilient Infrastructure and Communities (BRIC) FEMA – Pre-Disaster Mitigation	✓		✓*	✓
Flood Mitigation Assistance (FMA) FEMA – Pre-Disaster Mitigation	✓		✓*	✓
Hazard Mitigation Grant Program (HMGP) FEMA – Post-Disaster Recovery	✓		✓	✓
Community Facilities Grant Program USDA – Post-Disaster Recovery	✓		✓	

*With some limitations. Other federal programs, including the HUD Community Development Block Grants-Disaster Recovery Program, are also available to assist with post-disaster recovery subject to targeted appropriations.

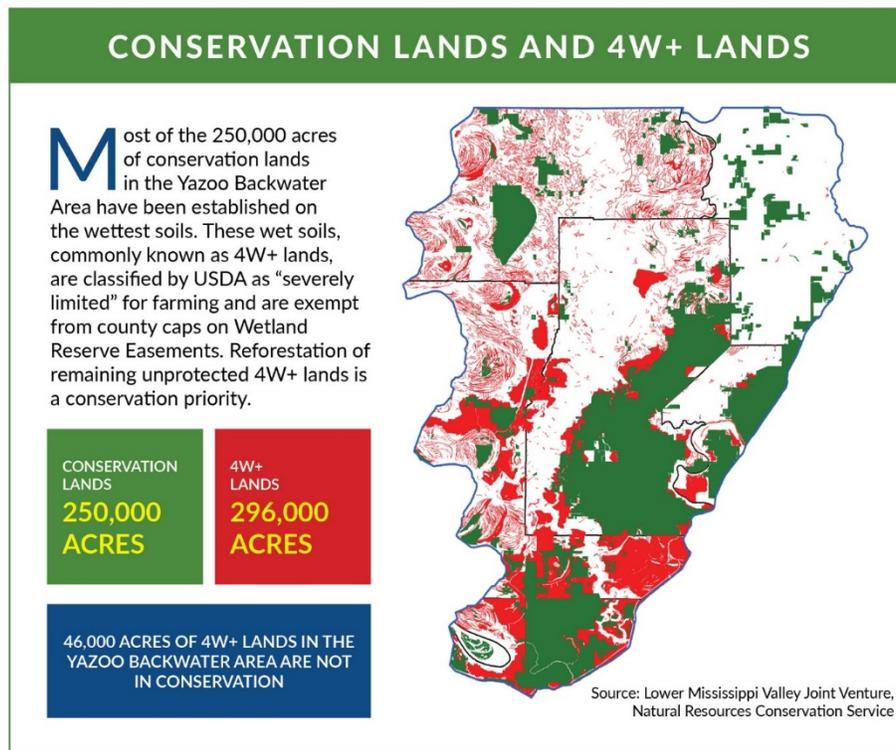
The benefits of these measures could be amplified by an innovative marketing campaign to stimulate wildlife and cultural heritage-associated tourism in the YBWA developed in collaboration with the [Mississippi Delta National Heritage Area](#), the [Delta Blues Trail](#), the [Delta National Forest](#), and the [Theodore Roosevelt National Wildlife Refuge Complex](#). The Delta Interpretive Center, which will be housed in the newly constructed Theodore Roosevelt Wildlife Refuge Visitor Center, could be a centerpiece of this effort.⁶ Funding for such a campaign could be sought through the [Mississippi Delta National Heritage Area Grant Program](#).⁷

Diversifying the economy of the YBWA in this manner would provide a substantial lifeline to the region’s struggling economy. Outdoor recreation in Mississippi [generates \\$8 billion in consumer spending, \\$620 million in state and local tax revenue, and 79,000 jobs](#).⁸ In 2011, state residents and nonresidents spent \$2.63 billion on wildlife recreation in Mississippi.⁹ The demand for wildlife-related recreation is increasing nationwide and directing more of this demand to the YBWA could produce significant economic benefits for the region’s rural, low income communities.

1. Wetland Reserve and Floodplain Easement Programs (USDA)

Goal: Enroll at least **80,000 acres** of YBWA lands in the Wetland Reserve Easement (WRE) and Floodplain Easement Programs managed by the U.S. Department of Agriculture. These easements should be targeted towards marginal croplands (those with 4W+ soils) adjacent to existing conservation lands, croplands inundated during the 2019 floods, croplands within the acquisition boundaries established for the National Wildlife Refuges in the YBWA, and croplands targeted for restoration by the Lower Mississippi Valley Joint Venture. Floodplain easements should also target frequently flooded residential properties.

This goal is supported by extensive planning assessments, GIS analyses, and the best available conservation science which have been used to identify 80,000 acres of conservation and reforestation priorities for the YBWA. The USDA has classified 46,000 acres of unprotected lands in the YBWA as 4W+ lands, which means they are “severely limited” for agriculture because they are saturated at least 50% or more of the growing season. These 4W+ lands, most of which are adjacent to existing conservation lands, are a priority for WRE enrollment and are exempt from WRE enrollment and county wide caps.



The Lower Mississippi Alluvial Valley Joint Venture has identified 60,000 acres (which includes 20,000 acres of the unprotected 4W+ lands described above) as priorities for restoration and protection to benefit wetland forest breeding birds (e.g. Prothonotary Warbler, Wood Thrush, Wood Duck, Wild Turkey, Swallow-tailed Kite). Restoring and protecting bottomland hardwood forests also benefits other forest-dependent wildlife, including Louisiana Black Bear, at-risk bat species, and the swamp rabbit.



Prothonotary Warblers rely heavily on the Yazoo Backwater Area during spring migration.
Photo: Gary Robinette/Audubon Photography Awards

Responsible Federal Agency and Partners: U.S. Department of Agriculture (Natural Resources Conservation Service) working with landowners, homeowners, communities, and non-governmental organizations.

Funding: Both programs are funded and regularly accept proposals for enrollment.

Multiple Benefits: Restoring enrolled lands to healthy wetlands would provide multiple benefits.

- **Reducing Flood Risks:** Restoring enrolled lands would provide significant flood damage reduction benefits, reduce emergency response costs, and help create safer and healthier communities. A single acre of wetland can store 1.5 million gallons of floodwater,¹⁰ preventing flood damages. For example, wetlands prevented \$625 million in flood damages in the 12 coastal states affected by Hurricane Sandy, and reduced damages by 20% to 30% in the four states with the greatest wetland coverage.¹¹ In its flood damage reduction recommendation for the Charles River in Massachusetts, the Corps of Engineers concluded that: “Nature has already provided the least-cost solution to future flooding in the form of extensive [riverine] wetlands which moderate extreme highs and lows in streamflow. Rather than attempt to improve on this natural protection mechanism, it is both prudent and economical to leave the hydrologic regime established over millennia undisturbed.”¹²
- **Improving Water Quality and Groundwater Recharge:** Restoring enrolled lands will help purify water supplies, reduce nutrient loading into streams and rivers, and recharge groundwater in the YBWA. Irrigation in the Mississippi Delta, including the YBWA, has caused some of the most severe groundwater declines in the United States and highly damaging low-flow conditions in many Delta streams. Recent studies demonstrate the significant value of wetlands to groundwater recharge in the YBWA.¹³
- **Providing Vital Wildlife Habitat:** Restoring enrolled lands will provide essential benefits to fish and wildlife in the YBWA and beyond. Wetlands are some of the most biologically productive natural ecosystems in the world, and support an incredibly diverse and extensive array of fish

and wildlife. The wetlands in the YBWA support 450 species of birds, fish and wildlife and are used by 29 million migrating birds each year. The YBWA contains one of the last existing and most substantial tracts of highly productive bottomland hardwood forests in the Lower Mississippi River Alluvial Valley, and the U.S. Fish and Wildlife Service has determined that the YBWA is the area with the “greatest potential” for meeting breeding bird habitat restoration and protection needs within the Mississippi Alluvial Valley.¹⁴ Restoring wetlands in the YBWA is a conservation priority for the Lower Mississippi Valley Joint Venture. An additional 1.73 million acres of sustainable forest habitat are needed in the Mississippi Alluvial Valley to attain population goals for most forest-dependent bird species in the region.¹⁵

- **Sequestering Carbon:** The Mississippi Alluvial Valley was an early proving ground for carbon sequestration through forest restoration and protection. In the 1990’s public utilities provided millions of dollars to voluntarily offset their carbon emissions by expanding carbon sequestration on private lands and federal wildlife refuges. There is now renewed interest in facilitating, funding and expanding carbon sequestration incentives on private land in the region.
- **Creating Jobs and Economic Activity:** Restoration work associated with easement enrollment would create jobs. In Mississippi, the Fish and Wildlife Service Partners for Wildlife Program created 29.7 jobs for each million dollars spent on restoration, and \$1.63 of economic activity for each dollar spent on restoration in FY2011.¹⁶
- **Reducing National Flood Insurance Program Rates:** Protecting floodplains has the largest impact on lowering National Flood Insurance Program (NFIP) rates for communities participating in the voluntary Community Rating System Program (CRS). Participation in the CRS can reduce NFIP rates from 15% to 45%. The CRS credits over 90 elements of comprehensive floodplain and watershed management, including significant credits for preserving natural floodplain open space, acquiring flood-prone land and returning it to its natural state, and protecting and restoring natural floodplain functions and habitat.
- **Avoiding Farm Subsidy Costs:** Enrolling cropped wetlands in Wetland Reserve Easements reduces the costs of commodity, federal crop insurance, and noninsured crop disaster assistance programs. A recent study documents these avoidance benefits (present value of avoided costs less the Wetlands Reserve easement and restoration costs) in Mississippi at \$870 per acre.¹⁷

Program Details—Wetland Reserve Easements:

- Cropped and forested lands can be enrolled in the Wetland Reserve Easement Program (WRE) . Enrolled lands are taken out of agricultural production and restored to wetlands.
- Enrollment provides direct payments to landowners, currently up to \$3,100 per acre.¹⁸ USDA also pays to restore the enrolled lands. Landowners can make additional profits by selling or leasing the land for hunting, fishing, or other uses compatible with maintaining the restoration. Landowners may also be eligible for a tax deduction.
- Lands classified by USDA as 4W+ are “severely limited” for agriculture because they are saturated at least 50% or more of the growing season. The 2014 Farm Bill exempted 4W+ lands from WRE enrollment and county-wide caps. At least 46,000 acres of 4W+ lands in the YBWA are not in conservation, with many of these acres adjacent to existing conservation lands.
- The WRE program is extremely popular in Mississippi. At least 186,000 acres—including almost 80,000 acres in the YBWA counties—have already been enrolled in the WRE program in

Mississippi (in both the Wetlands Reserve Program and WRE programs which are now combined), according to the NRCS.

Program Details—Floodplain Easements:

- Both cropland and residential properties may be enrolled in the USDA Floodplain Easement program. Cropped lands are taken out of agricultural production and restored. Structures located within the area of a floodplain easement are demolished and removed, or relocated outside of the affected floodplain, and the lands are then restored.
- Enrollment provides direct payments to landowners, currently up to \$3,100 per acre.¹⁹ USDA pays to restore the enrolled lands. USDA also pays the costs of demolishing and removing, or relocating structures out of the affected floodplain. Landowners can make additional profits by selling or leasing the land for hunting, fishing, or other uses compatible with maintaining the restoration. Landowners may also be eligible for a tax deduction.

2. Pre-Disaster Mitigation Programs (FEMA)

Goal: Significantly expand pre-disaster mitigation planning and protection in the YBWA to reduce the risk of damage from future high water events and increase community resilience.

Responsible Federal Agency and Partners: Federal Emergency Management Agency working with the State of Mississippi and local governments.

Funding: FEMA’s Building Resilient Infrastructure and Communities (BRIC) Grant Program and Flood Mitigation Assistance Program are well funded and accept proposals yearly. FEMA can provide free Flood Risk Management Workshops for elected officials and community administrators to assist communities in reducing flood risks and increasing resilience.

Benefits: Significant public benefits through creation of safer communities by improving resilience, eliminating impacts of future flood events, and providing long-term solutions to flooding problems. Effective pre-disaster mitigation reduces loss of life and property damage from future floods, minimizes flood disaster disruptions, and allows more rapid recovery when flooding does occur. On average, \$1 spent on hazard mitigation through a federally funded mitigation grant saves \$6 in future disaster costs. Federal grants provide \$7 in benefits for each \$1 invested in riverine flood mitigation.

Program Details—FEMA BRIC Program:

- The BRIC Program provides funding to states, tribes, and local communities to reduce overall risk to the population and structures from future hazard events and increase community resilience through funding hazard mitigation projects and activities.
- The BRIC priorities are to incentivize: public infrastructure projects; projects that mitigate risk to one or more lifelines; projects that incorporate nature-based solutions; and adoption and enforcement of modern building codes.
- The BRIC program typically covers up to 75% of eligible activity costs, but “small impoverished communities” are eligible for coverage of up to 90% of eligible costs. A small impoverished community is an economically disadvantaged community with 3,000 or fewer individuals having an average per capita annual income not exceeding 80% of the national per capita income.
- The BRIC program is funded through a 6% equivalency set-aside of all disaster expenditures from the Disaster Relief Fund. The BRIC program was funded at \$500 million in FY20.

Program Details—FEMA Flood Mitigation Assistance Program:

- The [Flood Mitigation Assistance \(FMA\) Program](#) provides funding to states, tribes, and local governments to reduce or eliminate the risk of repetitive flood damage to buildings and structures insured under the National Flood Insurance Program. [FMA funding may cover up to 100% of costs to address severe repetitive loss properties and up to 90% of costs to address repetitive loss properties.](#) Other activities will be funded up to 75%.
- The FMA program was funded at \$200 million in FY20.

Program Details—Floodplain Management Training:

- FEMA can provide free Flood Risk Management Workshops for elected officials and community administrators to assist communities in reducing flood risks and increasing resilience. [Trainings include information on the National Flood Insurance Program, including its history, standards, regulations and administration; floodplain mapping; flood hazard mitigation; and floodplain management for environmental benefits.](#) FEMA can also provide additional relevant trainings in the YBWA through its [Integrated Emergency Management Course](#).
- The [Association of State Floodplain Managers \(ASFPM\)](#) offers a [Certified Floodplain Management](#) program for public and private sector professionals that compliments the FEMA floodplain management trainings. Anyone can join ASFPM and take the CFM exam for a nominal fee. ASFPM members and Certified Floodplain Managers® have access to unique resources that can help their communities more effectively administer FEMA programs, reduce flood insurance rates, and minimize flood damages.

3. Post-Disaster Recovery Programs (FEMA, USDA, HUD)

Goal: Prioritize disaster recovery funds to voluntary buy-outs and elevations of “severe repetitive loss” and “repetitive loss” properties in the YBWA, and improve essential community infrastructure.²⁰ FEMA has identified 198 severe repetitive loss properties in Issaquena and Sharkey counties (which are located entirely within the YBWA).²¹

Responsible Federal Agencies and Partners: Federal Emergency Management Agency, U.S. Department of Agriculture, U.S. Department of Housing and Urban Development (depending on program used), working with the State of Mississippi, local governments, property owners, and residents.

Funding: The FEMA Hazard Mitigation Grant Program is funded and accepts applications from state and local governments in areas covered by a Presidential disaster declaration. The USDA Community Facilities Grant Program is funded and accepts applications from rural communities with up to 20,000 residents in areas covered by a Presidential disaster declaration. Supplemental appropriations targeted to the YBWA would be required to take advantage of the HUD Community Development Block Grants – Disaster Recovery program and the HUD Community Development Block Grants – Mitigation program.

Benefits: Significant public benefits, including reducing flood risks and emergency response costs, creating safer and healthier communities, and restoring vital floodplain habitat. Increasing the resilience of roads and other community infrastructure improves community well-being and supports economic development. Homeowners are compensated for moving out of harm’s way or elevating homes and other structures to avoid future flood damages. Targeting buy-outs to the YBWA would help

refocus the HMGP program, which historically has disproportionately funded buy-outs in white communities rather than communities of color.

Program Details—FEMA Hazard Mitigation Grant Program:

- The FEMA Hazard Mitigation Grant Program (HMGP) provides grants to state and local governments in areas covered by a Presidential disaster declaration. FEMA accepts HMGP applications for **one year** after a federal disaster declaration with the possibility of up to a 180-day extension at the state’s request. Approximately 70% of FEMA buy-out projects are approved within two years of the associated disaster.
- HMGP grants can be used to purchase flood-damaged properties from willing sellers at pre-flood values and preserve the land as open space, or to elevate structures.
- Any structure in the 100-year floodplain (*i.e.*, a Special Flood Hazard Area) valued at up to \$276,000 automatically qualifies for a FEMA-funded buy-out, and any structure in a Special Hazard Area valued at up to \$175,000 automatically qualifies for a FEMA-funded elevation. Other structures may also qualify if the buy-out or elevation would be cost-effective.
- The YBWA was eligible for HMGP grants through the April 23, 2019 Federal Disaster Declaration 4429 (as amended), which made FEMA’s HMGP available to the entire state of Mississippi. Extending this Disaster Declaration would ensure that funding is available for the HMGP program in the YBWA, and any future applicable disaster declaration would re-trigger the availability of post-disaster recovery funds and programs to the YBWA.
- FEMA has funded **638 buy-outs in Mississippi, including 105 in Warren County**, since the 1980s. In all, FEMA has funded the buy-out of more than 43,360 properties through 3,839 “projects” in 49 states. Of these properties, 96% suffered from river flooding or intense rains, while 4% suffered from coastal flooding. The HMGP has funded 96% of all FEMA buy-outs.
- Targeting buy-outs to the YBWA would help refocus the HMGP program, which historically has disproportionately funded buy-outs in white communities rather than communities of color, according to a 2019 NPR investigation. For example, after the 2008 floods in Iowa, “households in high social vulnerability areas were less likely to obtain full financial compensation” from federally funded buyout programs and waited longer to receive acquisition funds.

Program Details—USDA Community Facilities Grant Program:

- The USDA Community Facilities Grant Program provides grants to rural communities with up to 20,000 residents in areas covered by a Presidential disaster declaration. Funding under this grant program can be used to advance more than 100 types of projects, including the purchase, construction, or improvement of essential community facilities. Essential community facilities include such things as health care facilities, town halls, courthouses, community centers, fairgrounds, police and fire departments, libraries, museums, and food banks.
- The 2019 Additional Supplemental Appropriations for Disaster Relief Act appropriated \$150 million for grants under this program in areas where FEMA provided a notice declaring a Major Disaster Declaration, which includes the YBWA.

Program Details—HUD Community Development Block Grants – Disaster Recovery:

- The HUD Community Development Block Grants-Disaster Recovery Program (CDBG-DR) supplements FEMA disaster recovery funds to help cities, counties, and states recover from Presidentially-declared disasters, especially in low-income communities. Activities funded through these flexible grants must meet one of three national objectives: benefit low-and-moderate-income persons; aid in the prevention or elimination of slums or blight; or meet other

community development needs having a particular urgency because existing conditions pose a serious and immediate threat to the health or welfare of the community where other financial resources are not available to meet such needs.

- Significant funding can be obtained through the CDBG-DR grant process. For example, Mississippi is currently finishing up two CDBG-DR grants for Hurricane Katrina recovery (\$5.06 billion and \$423 million) and a third CDBG-DR grant for the 2008 storms (\$11.7 million).

Program Details—HUD Community Development Block Grants – Mitigation:

- HUD Community Development Block Grants—Mitigation (CDBG-MIT) may be provided to CDBG-DR grant recipients to “carry out strategic and high-impact activities to mitigate disaster risks and reduce future losses” including by supporting data-informed investments in high-impact mitigation projects; building state and local government capacity for comprehensively analyzing disaster risks; supporting adoption of policies that minimize future disaster costs; and maximizing the impact of funds by leveraging other funding sources.
- Congress appropriated \$12 billion in CDBG funds in February 2018 for mitigation activities related to qualifying disasters in 2015-2017, and HUD has allocated an additional \$3.9 billion, bringing the amount available for mitigation to nearly \$16 billion.

Targeting these available and funded programs to the YBWA would provide immediate, cost-effective, and sustainable flood relief to underserved communities in the YBWA while protecting nationally significant wildlife resources.

Endnotes

¹ U.S. Environmental Protection Agency, Final Determination of The U.S. Environmental Protection Agency’s Assistant Administrator for Water Pursuant to Section 404(C) of the Clean Water Act Concerning the Proposed Yazoo Backwater Area Pumps Project, Issaquena County, Mississippi (August 31, 2008).

² USDA data compiled through the Environmental Working Group Farm Subsidy Database, shows that farms in the 16 zip codes that fall within the YBWA received a total of \$1.05 billion in farm subsidy payments between 1995 and 2019, with the top 5 recipients receiving a total of \$20.5 million, \$17.4 million, \$15.5 million, \$14.2 million, and \$10.7 million, respectively. The top 5 recipients in each zip code received a total of \$430.7 million—an average of \$215,000 for each of 80 recipients every year for 25 years—while 272 recipients received more than \$1 million each for an average of \$40,000 a year for each recipient every year for 25 years.

³ Operation of the Yazoo Pumps would put downstream frontline communities on the receiving end of an additional 9 billion gallons of water a day when the Yazoo River is already at flood stage. Communities in the Yazoo Backwater Area could flood if that massive influx of water overtopped or damaged the Yazoo Backwater Levee, which is at risk of crevassing and is so low that it is not accredited to handle a 100-year flood. Collapse of this levee would flood the very communities the pumps are purported to protect.

⁴ 2020 Final Supplement No. 2 To The 1982 Yazoo Area Pump Project Final Environmental Impact Statement (FSEIS), Appendix C (Tables), Table 5.3 (the “sloped pool” model is the most accurate).

⁵ Since completion of the Yazoo Backwater Levee in 1978, there has been a significant decline in the elevation of backwater floods, with water levels in the YBWA reaching the 20-year floodplain elevation just one time—during the unprecedented flood of 2019. From 1978 to 2018, water levels in the YBWA reached the 10-year floodplain just 2 times. By comparison, in 1973 flooding in the YBWA reached 101.48 feet, which is well above the 100 year floodplain elevation. [U.S. Army Corps of Engineers Rivergages Website.](#)

⁶ The Theodore Roosevelt Wildlife Refuge Visitor Center is “one of the most significant investments in tourism infrastructure” in the Delta.

⁷ The Mississippi Delta National Heritage Area, which includes all the YBWA counties, was established by Section 8008 of the Omnibus Federal Land Management Act of 2009, [Pub. L. 111–11](#) (16 USC 461 note) to preserve and

promote the landscape, culture and history of the Mississippi Delta. Section 8008 authorizes appropriations of up to \$1 million a year through 2024, and establishes a management authority and a local coordinating entity to assist in developing recreational and educational opportunities in the Heritage Area and increasing public awareness of, and appreciation for, natural, historic, scenic, and cultural resources of the Heritage Area.

⁸ Outdoor Industry Association, Economic Value of Recreation in Mississippi 2017 (https://outdoorindustry.org/wp-content/uploads/2017/07/OIA_RecEcoState_MS.pdf).

⁹ U.S. Fish and Wildlife Service, 2011 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation, State Overview, Table 3.

¹⁰ Environmental Protection Agency, “Wetlands: Protecting Life and Property from Flooding.” EPA 843-F-06-001. (2006) (factsheet).

¹¹ Narayan, S., Beck, M.B., Wilson, P., et al., The Value of Coastal Wetlands for Flood Damage Reduction in the Northeastern USA. *Scientific Reports* 7, Article number 9463 (2017), doi:10.1038/s41598-017-09269-z (available at <https://www.nature.com/articles/s41598-017-09269-z>).

¹² American Rivers, Unnatural Disasters, Natural Solutions: Lessons From The Flooding Of New Orleans (2006) (quoting USACE, from Massachusetts Department of Fish and Game, *Functions of Riparian Areas for Flood Control*, http://www.mass.gov/dfwele/river/pdf/riparian_factsheet_1.pdf.)

¹³ Ying Ouyanga, et al., [Estimating impact of forest land on groundwater recharge in a humid subtropical watershed of the Lower Mississippi River Alluvial Valley](#), *Journal of Hydrology: Regional Studies* 26 (2019) 100631 (wetlands in the lower Yazoo River Basin provide the highest rates of groundwater recharge while agricultural lands provide the lowest rates); Michael Gratzner, et al., [Quantifying Recharge to the Mississippi River, Valley Alluvial Aquifer from Oxbow Lake-Wetland Systems, \(2017\)](#) (oxbow lake wetlands near Belzoni, MS produce “significant vertical recharge” into the Mississippi River Valley Alluvial Aquifer).

¹⁴ U.S. Fish and Wildlife Service, Fish and Wildlife Coordination Act Report (October 23, 2006), 2007 Final SEIS, Appendix 3 at 7.

¹⁵ Elliott, A.B.; Mini, A.E.; McKnight, S.K.; Twedt, D.J. Conservation—Protection of Forests for Wildlife in the Mississippi Alluvial Valley. *Forests* 2020, 11, 75 (available at <https://www.mdpi.com/1999-4907/11/1/75>).

¹⁶ U.S. Fish and Wildlife Service, [The Contribution of Partners for Fish and Wildlife Program and Coastal Program Restoration Projects to Local U.S. Economies](#) (September 2013) at 18.

¹⁷ Wetland Reserve Easement Program Economic Assessment: Estimated Commodity Program and Crop Insurance Premium Subsidy Cost Avoidance Benefits, Prepared for the Nature Conservancy (June 2, 2018) (authored by retired U.S. Department of Agriculture economist Dr. Doug Lawrence).

¹⁸ In Mississippi, payments for enrolling lands in the WRE and Floodplain Easement Programs are the same. Easement purchase prices on forested land are slightly less than on cropland. The payment schedule is established by USDA on a yearly basis and may fluctuate slightly from year to year.

¹⁹ Id.

²⁰ “Severe repetitive loss properties” are properties covered by the National Flood Insurance Program (NFIP) that have been the subject of four or more damage claims of more than \$5,000 each, or two or more claims in which the insured structure sustained cumulative damage exceeding its fair market value. These structures, which are mostly homes, are priorities for elevation or removal. “Repetitive loss properties” are properties covered by the NFIP that have flood-related damage on two occasions where the cost of the repair equaled or exceeded 25% of the market value of the structure at the time of each such flood event; and the second incidence of flood-related damage increased the cost of flood-insurance compliance coverage.

²¹ Of these severe repetitive loss properties, 150 are in Issaquena county and 48 are in Sharkey county. An additional 1,191 severe repetitive loss properties are located in Warren, Washington, and Humphreys counties, but large portions of these counties (and thus, many of these properties) are located outside the YBWA.