ATTACHMENT 3

REPRESENTATIVE LETTERS FROM NONGOVERNMENTAL (NGO) ORGANIZATIONS AND INDIVIDUALS

Colonel Robert Crear
U.S. Army Corps of Engineers
P.O. Box 80
Vicksburg, MS 39181-0080

November 24, 2000

Dear Colonel Crear,

I strongly oppose the construction and operation of the Yazoo Backwater Pumps in Mississippi. Intensifying agriculture by destroying 200,000 acres of wetlands in the guise of flood control disturbs me. This area is still reeling from DDT and does not need further pesticide contamination.

The claims that the Yazoo pumps are a flood control project cannot be justified without assurance that even a single family's home will be free from flooding. This project is specifically designed to drain wetlands in order to intensify agriculture on lands that have always flooded. In the ecological scheme of things, areas that already flood and have always flooded are better off remaining wetlands and providing habitat for wildlife. The only ones to benefit from draining the wetlands are large scale agribusiness, whose increased pesticide usage would only do further damage to an area already plagued by toxic contamination. Waterways in the region are already unfit for fishing, drinking and swimming.

The principal environmental feature of the plan, the reforestation program, remains unrealistic. Any incentive for landowners to choose reforestation over the continued farming of poorly drained, frequently flooded agricultural land disappeared because of the 1999 State legislation that taxes the Corps reforested lands at a rate disproportionately higher than other such lands in the State of Mississippi.

The Environmental Protection Agency opposes this plan because of substantial and unacceptable adverse environmental consequences. They believe it will result in detrimental impacts to the more than 200,000 acres of wetlands in the Mississippi River floodplain, cause water quality impairment and further degrade already impaired waters. The U.S. Fish and Wildlife service opposes this plan not simply because of a loss of habitat, but for loss of economic and environmental sustainability. Their concerns are over the imbalance between agricultural expansion and the conservation of the Nation's largest and most environmentally rich floodplain ecosystem.

I strongly oppose a project that would destroy twice as many acres of wetlands as are destroyed by all other public and private projects across the nation during an entire year. I urge the Corps to abandon its plans for this destructive and misguided project.

Sincerely,

Julia Balter
21 King Street
Hampton Falls, NH 03844

5737 Adams-Leidenfrost Road
Hector, NY 14841-0014
October 3, 2000

Mr. Gary Young
Department of the Army, Vicksburg District
Corps of Engineers
4155 Clay Street
Vicksburg, MS 39183-3435

Dear Mr. Young;

I am writing to you to encourage you to halt your Yazoo Backwater Pumping Station Project. It is a costly, unnecessary and environmentally destructive project which should be scrapped.

This wasteful project would benefit only a handful of people, but at tremendous expense to taxpayers and the environment.

The pumps would destroy some of the best remaining forests along the lower Mississippi River, which provide habitat for bald eagles, alligator, bobcat, deer, and the threatened Louisiana black bear.

The project threatens highly productive freshwater lakes and swamps that support a burgeoning hunting, fishing and ecotourism industry.

The pumps would establish a dangerous precedent for the nation's flood control policy.

Sincerely,

Marion D. Adams

Marion D. Adams

November 21, 2000

Timothy Klika
P.O. Box 12
Hamilton, NY 13346

Colonel Robert Crear
District Engineer
U.S. Army Corps of Engineers
P.O. Box 80
Vicksburg, MS 39181-0080

Dear Colonel Crear,

I strongly oppose construction and operation of the Yazoo Backwater Pumps in Mississippi. National policy should be to protect and restore, rather than destroy, our wetlands, which filter pollution, absorb floodwaters, and provide critical habitat for many threatened, endangered and other species. The Yazoo pumps project is in direct conflict with this policy.

Specifically, the Yazoo pumps will:

- Drain and damage 200,000 acres of wetlands, twice the number of acres destroyed each year across the country by all public and private projects combined;
- Promote increased pesticide and fertilizer use in a region already plagued by toxic contamination; and
- Waste millions of tax dollars to increase agricultural production when the federal government is spending billions on farm subsidies and on taking excess and sensitive croplands out of production.

Communities in the region have real needs that have been neglected for too long. The $181 million earmarked for the Yazoo pumps project could be better spent improving basic services, reducing pesticide pollution, providing targeted and real flood protection, and diversifying the region's economy to increase opportunities for its residents.

Again, I urge the Corps to abandon its plans for this destructive and misguided project.

Sincerely,

Tim

Same issues as "Dump the Pump" Cards plus last ¶ on this

3704 85th AV NW
Olympia WA 98502

Re: Yazoo Pumping Project 21 Oct 00

Mr Gary Young
CofE, Vicksburg

Dear Mr Young:

I have just read about this project and am very disturbed.

This seems to be another case of the Corps creating "a problem" (and generating more work for itself) when it completed prior, ill-planned projects. Further, this proposal smacks of pure "politics".

Considering the precedent this project would establish, the damage to environment, & the high costs vs limited benefit, this project should be halted.

Please provide a copy of the summary of the Draft EIS & place my name/address on your mailing list for future information about this project.

Thnk you.

Yours truly,

Jack A. Ziemke
360-866-8896

550 Kendig Drive
Manheim, PA 17545
Oct. 25, 2000

Dear Mr. Young,

I am writing to express my puzzlement at the Yazoo pump project and to express anger at use of my tax dollar for such a ridiculous project. Puzzlement at the perceived need for such a project when nothing new has flooded in the basin since white farmers decided to plow it. And anger at the waste for such limited results, a waste of federal money. Would the locals vote for this if 50% state matching money were needed to build and operate such a pump system?

I would like to have a ski run closer to home. Such a run would benefit the people in my area and business would improve locally. Would the Corp please raise the height of the local hills so we can improve the economy of the region? Such a request looks silly from the point of someone in Mississippi but I assure you it is no more absurd than the planned scheme for the Yazoo.

Finally, the costs of all forms of fuel are about to rise even higher and electricity will rise along with it. Costs for all will double within about eight years or so and the pumps will then be shut down because of operational costs going out of sight.

No pumps for the Yazoo please.

Sincerely

Jay R George

Mr. Gary Young
Department of the Army
Vicksburg District
US Army Corps of Engineers
4155 Clay St
Vicksburg, MS 39183

November 4, 2000

Mr. Young,

I wish to have my comments made part of the public record regarding the proposed Yazoo River Pump Station.

This project perfect typifies all that is bad about government and the Army Corps of Engineers. Not only does the Corps have enough work to keep their people gainfully employed for years in needed projects, but you have taken upon yourselves an effort to grow the agency and its financial impact on the taxpaying public into endeavors that do nothing but grow the Corps. This includes the destructive and unnecessary Yazoo River Pump Station project.

I find it amazing that projects such as this are even possible in this day and age. This project is nothing but a 'make work' project for the Corps that would not have passed a cost benefit analysis if it were not for specific legislative maneuvers by members of the US Congress that support such wasteful and destructive pork projects.

To think that the destruction of all that bottomland hardwood forests comes just to keep some local Corps employees working just turns my stomach. Without question, this government project threatens the continued existence of federally listed endangered species. Most branches of the federal government are required by law to minimize or avoid impacts on listed species, yet here, the Corps is able to work by a different set of rules, compliments of greedy and self serving members of Congress.

This is the year 2000 and we are supposed to be moving away from destructive and wasteful projects such as this one. The Corps can spend centuries working to just undo the damage you have caused in the last two centuries, but you continue to promote and execute projects you know damn well are destructive and not cost effective.

If the Corps were a business in the private sector, you would be out of business in no time and probably end up in jail.

I can only hope that some Corps staff decides to blow the whistle on the Yazoo Pump Station project. That is the right thing to do.

Jim Sweeney

Jim Sweeney
1773 Selo Dr.
Schererville, IN 46375

Cc: Indiana and Mississippi
Congressional delegations

To:Vicksburg District
US Army Corps of Engineers
ATTN: CEMVK-PP-D
4155 Clay Street
Vicksburg, MS 39188

Gentlemen:

Twice before this I have written letters to the Corps in Vicksburg, and both timeshave received no response. Maybe this, the third time will be the charm and I will hear SOMETHING!

Being born in 1931 within one quarter mile of the Sunflower River in Sunflower County, MS, I have a great attachment and love for that river, having fished it,hunted frogs on its banks, and learned to swim in it.

I have listened to my Mother,who was born on the west bank 6 miles Northwest of Drew,MS, tell stories of it, how all the old iron turn bridges would have to be turned 1/4 turnin order to let steamboats pass by on the way to Clarksdale,MS, also how she and her brothers and sisters rode a ferry across it(before the bridge) in order to go to school at Sandyn Bayou. They all were born on the West bank of the river 4 miles East of Mound Bayou, MS. Their Grandad cleared the farmland which is still owned by the family and he is buried on the West bank, was shot off a horse while deerhunting at the age of 52.

All the trees growing down close to the river were cleared and burned in the 60's in order to quote'make better drainage' unquote, but all that did was cause flooding problems further down stream in the South Delta. Heavy rains in the upper Delta watershed of the Sunflower in the late fall and early spring have no resistance to hold the water back resulting problems downriver, along with the fact of not replenishing our underground water supply for our wells.

There are remnants of a lock and dam on the river just south of MS highway 12 a few miles west of Belzoni. My opinion, instead of dredging, clearing, and pumping, if we were to rebuild the locks and dams, maybe put in some weirs or low water dams, maybe we could control flood waters, while at the same time adding some recreational fishing, boating, etc.as was done over on the Tombigbee. Also, it is my belief that this would hold water back and put water back in the water bearing sand where our irrigation wells draw from, which we sorely need, since most all the land in the Delta is going to irrigation. The rains we get now in the upper Delta are lost in a headlong rush to the Gulf.

Let's take a long look and give a lot of thought to this pump project that is like a lot of government projects, many of which have the idea of "Spend the money or lose it mentality".

Taxes are so high now that my wife and I work 7 months out of the year to pay them.

Do some thinking and rationalizing before throwing away a ton of money on dredging and clearing.

Sincerely,Robert Eiland,430 Ruby Ave. Drew, MS 38737

Robert Eiland

Robin Mann
266 Beechwood Drive
Rosemont PA 19010
610-527-4598

December 4, 2000

U.S. Army Corps of Engineers
Vicksburg District
Attention: CEMVK-PP-PQ
4155 Clay Street
Vicksburg, MS 39183-3435

RE: Yazoo Backwater Area Reformulation Report

Dear Sirs:

I am writing to you as a concerned citizen and taxpayer to express my strong opposition to the proposed construction and operation of the Yazoo Backwater Pumps. I am opposed to this $181 million, totally federally funded, project because it is wholly inconsistent with federal agricultural and floodplain management policies, it would cause massive and unjustified environmental damage, it would largely benefit a small number of agribusiness interests entirely at the expense of the federal taxpayer, and it would not even solve the main flooding problem.

Two-thirds of the economic benefits of the Yazoo Backwater Pump project would, according to the Army Corps of Engineers, accrue to agricultural interests able to take advantage of reduced flooding on marginal lands to intensify cropping there, that is, if the benefits of the project are accurately estimated, as seems very much in doubt based on the review by Leonard Shabman and Laura Zepp commissioned by the EPA ["Review Comments on Yazoo Backwater Area Reformulation, Sept. 24, 2000]. Even accepting the Corps' economic justification, the proposal would subsidize intensified row cropping of marginal land, which is diametrically opposed to the direction the nation has been trying to go towards reducing cropping in environmentally sensitive areas by providing billions of dollars of incentives to farmers. Furthermore, more intensive production in these areas will add greatly to the already serious problems associated with pesticide and fertilizer contamination in the lower Yazoo basin. In addition, the Corps has refused to give equal consideration to non-structural alternatives for flood control and floodplain management, through reforestation, in direct contravention of Administration policy.

This project would directly cause the loss and degradation of somewhere

near 200,000 acres of wetlands in the backwater area. By using remote measurement methods, the Corps has apparently vastly understated the acreage of impact, and the EPA has only been able to come up with a rough estimate. As EPA's comments on the reformulation indicate, no agency or organization has conducted a comprehensive and site-specific analysis of the extent of the wetlands that would be impacted in the project area. It seems inconceivable that a thorough analysis of the areas to be directly impacted would not be a prerequisite before the project could be approved. At any rate, removal and impairment of the habitat, flood-mitigating, groundwater recharging, and pollution filtration functions of somewhere near 200,000 acres of wetlands in the lower Mississippi basin seems impossible to justify, in light of the importance of those functions to the ecosystem.

I have reviewed the outline of the proposed alternative plan submitted by the Environmental Protection Agency, and I strongly believe that it offers the possibility to fix what's broken while providing important environmental benefits. EPA indicates that the alternative would increase the acreage of forested wetlands, providing for additional trapping of suspended sediments and nutrients and other pollutants, as well as additional flood storage and groundwater recharge. The EPA's alternative would also address the real needs for flood protection, of those whose residences and businesses are impacted by flooding. The multi-agency approach they recommend would be expensive, but the money would be going towards constructive, not destructive, purposes. The combined flood protection, floodplain restoration, and nature-based tourism economic development approach seems more worthy of such a massive federal project in the 21st century than a project based on out-dated engineering, highly questionnable economics, and a very small public benefit. I know that as a taxpayer, and one who believes strongly in wetlands conservation, I do not want my taxes going towards destroying what is left of the bottomland hardwood forests in the Mississippi Delta by the very agency charged with administering federal wetlands protections.

I urge you to recognize and act on the outpouring of opposition by the public and the recommendations of the federal resource agencies, EPA and the Fish and Wildlife Service, by abandoning this massively destructive and expensive project.

Sincerely yours,

Robin Mann

cc: Rep. Curt Weldon
Sen. Arlen Specter
Sen. Rick Santorum

October 27, 2000

Department of The Army
Vicksburg District Corps of Engineers
4155 Clay Street
Vicksburg, MS 39183-3435

ATTN: Mr. Gary Young CEMVK-PP-PQ
RE: Draft Yazoo Backwater Reformulation Report September 2000

We the undersigned **(with individual comments)** recommend **any non-structural options that do not contain a pump(s).** This could include purchase, reforestation and compensation to counties involved in lieu of taxes.

With so many discrepancies as to cost/benefit ratios between the Corps and the Shabman report we **request that the comment period for this project be extended at least a year and that an independent consultant make a study of this project. The Corps has known about this project for 59 years and has studied this project Intensely for the past 18 years. Surely, citizens should be given additional time to absorb this 2000+page report, especially since this Reformulation Report has been on the street less than 2 months.**

We believe that there are **too many unanswered questions** concerning the methodology used in determining the cost / benefit ratio of this project. **What is the dollar cost of the pump(s) protection per acre, per farm and per person in actual harm's way,** within each reach and the 2- year return frequency flood of 121,000 acres compared to protection without the pump?

Colonel Crear states in his recommendation for the pump option that the cost of the project is $181,595,000 based on February 2000 prices. In the next sentence he states that the total price is $207,178,000. Adding the yearly maintenance costs of $995,000, for 50 years brings the total cost over time to $256,928,000. With the Corps' authority to award contracts exceeding their estimates by 20% this project could **easily cost in excess of $300, 000, 000+,** not including change orders after the project has been let.

Signers of this document appear on the following pages along with the request that individual questions be answered individually along with questions raised above.

Copies to: Senators Trent Lott and Thad Cochran
2nd District Congressman Bennie G. Thompson

October 27, 2000
Individual responses and petition
To Draft Yazoo Backwater Reformulation Report dated September 2000
Department of the Army, Corps of Engineers, Vicksburg MS

Kenneth P. Tober
4033 Eastwood Place
Jackson, Ms. 39211
The land involved is marginal land so why not buy the property rather than build the very expensive pump - It doesn't make sense!!

Eugene T Clark
5440 Saratoga Dr
Jackson Ms. 39211
Why do we want the continued expense of an expensive pump to protect a few farmers on marginal land?

Thom J Carpenter
5105 Ledgewick
Jackson. Ms 39211
There is no rational way this project can be justified. Spend our tax dollars in a more intelligent way.

October 27, 2000
Individual responses and petition
To Draft Yazoo Backwater Reformulation Report dated September 2000
Department of the Army, Corps of Engineers, Vicksburg MS

J.J. Mastrodi (Mastrasdi)
4911 OLD CANTON RD
Jackson, MS 39211
(RETIRED EX-POW)
HOW CAN THE CORPS PREDICT COSTS OVER 50 YEARS?

a.j. Martin
5707 Pepper Ridge Rd.
Jackson, MS 39211
IS THE CORPS TRYING TO PROTECT AGRICULTURAL LAND FROM A 100 YEAR FLOOD BY BUILDING THIS PUMP?

James A. Scott 4911 OLD CANTON RD. APT. 237, JACKSON, MS 39211
BSCE. FORMERLY P.E. I AGREE WITH ATTACHED

Charles G. Stacy Jr
#42 Autumn Hill Dr.
Jackson Miss. 39211
Retired Business owner -

Benny E. Helms
4635 Nottingham Rd
Jackson, MS 39211
Banker
How can the Corps predict ~~Soybean~~ and Cotton prices 50 years in the future?

October 27, 2000
Individual responses and petition
To Draft Yazoo Backwater Reformulation Report dated September 2000
Department of the Army, Corps of Engineers, Vicksburg MS

Greg Elmore
5727 Orchardview Dr.
Jackson, MS. 39211
I agree with the text of This letter.

Lloyd Swaco, 5554 Marblehead Dr,
Jackson, MS. -
I agree with this written text.

Murphy 141 Caribbean Cove, Clinton, MS

Ronnie Mc, 928 Park Lake Dr., Jackson, MS
This is a completely foolish project.

U.R. Stevens, 1614 Wellcrest, Jxn 39211

Jesse E Parker
5957 Baxter Drive
Jackson MS. 39211
I agree with the text of This Letter

Bill Carlisle
160 Montrose Dr
Jackson, MS 39206

39056

4 of 5 pages

N. Montgomery Dodson P.E.
104 Quail Hollow Dr.
Brandon, MS 39047

CONT'D RESPONSES
BACKWATER REFORMULATION
REPORT

The Miss. River Needs Somewhere To Go!

CLINTON J. STAPLES
1335 W. WILLIAMSWOOD DR
RAYMOND - MS - 39154

ENOUGH BUNGLING - PLEASE LEAVE THE WATERS ALONE

HOWARD W. McDUFFIE
6058 FERNCREEK DR.
JACKSON, MS 39211

I JUST DON'T TRUST THE CORPS FIGURES, WHEN 1.48 to 1 COST BENEFIT RATIOS ARE QUOTED I THINK ABOUT HOW THEY MISSED THE TONNAGE RATIOS ON THE TOMBIGBEE WATERWAY BY 1900% AND SIMILAR RATIOS ON RED RIVER IN ARKANSAS HAVE YOU IMPROVED?
ON PAGE 27 IN VOL I MAIN REPORT YAZOO BACKWATER AREA REFORMULATION PARAGRAPH 66. WITH ONLY 23A FARMS IN AREA, WHAT IS COST PER FARM FOR THIS PROTECT.
VOL 3
TABLE 4, 27 PAGE 79 IN SHABMAN'S EXTENDED REPORT SAYS TOTOL DAMAGE IS $38,607,000 FOR A 100 YEAR FLOOD ON ONLY 154A STRUCTURES USING CORPS FIGURES HOW DOES IT MAKE ANY SENSE TO BUILD A PUMP FOR 200,000 MILLION PLUS?

5 OR 6 PAGES

MISSISSIPPI WILDLIFE FEDERATION

December 7, 2000

Colonel Robert Crear, Commander
Vicksburg District, US Army Corps of Engineers
ATTN: CEMVK-PP-PQ
4155 Clay Street
Vicksburg, MS 39183-3435

RE: Yazoo Backwater Area Project, Draft Reformulation Report

Dear Colonel Crear:

The Mississippi Wildlife Federation wishes to express again its longstanding opposition to the above referenced project. Please find attached our statement detailing many of our concerns. In addition, MWF hereby adopts and incorporates by reference the comments of the National Wildlife Federation.

Sincerely,

Martin W Brunson

Marty Brunson, President

Protecting Our Wildlife Legacy
Affiliate Of The National Wildlife Federation
855 S. Pear Orchard Rd., Suite 500 Ridgeland, MS 39157
Phone: (601) 206-5703 Fax: (601) 206-5705

POSITION STATEMENT

YAZOO BACKWATER AREA PROJECT

THE MISSISSIPPI WILDLIFE FEDERATION

NOVEMBER 9, 2000

The area contained within the Yazoo Backwater Area Project covers approximately 1,074,000 acres of environmentally, agriculturally and recreationally rich land. It is home both to endangered species of plant life, containing some of the larger known areas of Pondberry, as well as imperiled wildlife species like black bears, bald eagles and alligators. In addition, popular game wildlife species like turkey, deer, waterfowl, as well as game, commercial and subsistence fish species thrive in this area.

From a historical perspective, decades of deforestation and water development projects within the Yazoo River Basin have caused an increase in flooding in the backwater, creating an obstacle to new farm development. Flood control in the lower Mississippi alluvial valley began in the 1800's with local attempts by residents to protect homes, livestock and crops from flood damage and progressed through a series of flood control acts whereby the government accepted responsibility for the welfare of the people in flood prone areas.

The "Yazoo Pumps Project" is a function of the 1941 Flood Control Act and House Document 359, in which authorization provided for construction of a backwater levee, associated channelization, and 14,000 cfs pumping facilities to limit the level of interior ponding to a maximum elevation of 91.5 feet msl. It was reasoned, at that time, flood control would not be necessary below the 90 feet msl for the 125,000 affected acres since that portion would be dedicated to flood water storage. The proposed pumps would attempt to drain the subject area, which is now established to include all lands below the 87 ft. msl mark, and thereby place an extraordinary ecosystem in danger removing 14,000 cfs of water from the interior of the Delta with discharge going into the Yazoo River near its confluence with the Mississippi. The outcomes of this project include a broad range of specific and general ecological changes in the basin both above and below the proposed pump station. These changes include destruction of bottomland hardwood forests above the proposed station and undetermined, but questionable, impacts upon bottomland hardwood below the proposed pumps. The resulting potential wildlife habitat loss both above and below the pump site is great, and an altered hydrology above the pump station, in addition to threatening forest and wildlife resources, threatens fisheries resources by reducing available spawning and feeding floodplain areas at critical times of the reproductive cycle.

The reality of this project, which has a vastly wide ranging price tag (upwards of $181.6 million depending on the source of data used) attached for the taxpayers of the United States, is that it will primarily benefit the owners of about 125,000 acres in the project but will greatly harm the entire ecosystem that it encompasses.

The Mississippi Wildlife Federation continues to maintain that a non-structural approach to flood control in the Yazoo Backwater Basin is the most logical solution. We have opposed the construction of a pumping station since the mid-nineteen-eighties and we continue to oppose this structural approach today. Increased damage to this vital Delta ecosystem cannot be justified by the cost:benefit ratio presented by the Corps, because the benefit truly inures to very few individuals and there are other less expensive and less invasive means to assist these people. Reforestation of flood-prone lands would reduce flood damages to agriculture and allow part of the original purpose of House Document 359 to be met by providing flood storage capacity via the backwater system. Numerous additional benefits from reforestation, both financial and in terms of habitat enhancement would be recognized. These include provision of wildlife habitat, improvements in water quality and filtration of potentially detrimental agricultural runoff. Economic benefits to habitat enhancement and restoration for the area would equate to an opportunity for eco-tourism and benefits to local landowners for highly sought after, and profitable, hunting leases, as well as other consumptive and non-consumptive wildlife and fisheries related recreation.

Recently the National Wildlife Federation listed the Yazoo Backwater Pumping Station as one of the top 10 worst Corps projects profiled in its Troubled Waters report.

Specifically regarding the Corps recently released and modified Draft EIS MWF lifts the following concerns.

FIRST, MWF believes that the DEIS issued by the Corps is deficient and does not adequately address the system-wide ecological impact of the proposed project. Our concerns are two-fold: 1) The baseline environmental ecology of the systems is not adequately defined nor documented, and 2) the potential impact upon this baseline ecology thus is not accurately nor adequately considered and elucidated. Without the benefit of empirical data upon which to establish the critical baseline ecology of the system, it is impossible to accurately predict the impacts that a change in hydrology or flood regime may impose. It is possible, however, that the implementation of a radically different hydrologic regime could influence every plant and animal resource within the area. Since the fauna and flora have developed over time in adaptation to the historical (natural) hydrology, any change in the hydrology could result in changes in the composition, distribution, and/or abundance of the plant and animal communities. Well designed, pre-project field research should be conducted to develop empirical data to 1) develop baseline profiles of the ecology of the entire system, including species composition and community dynamics and 2) determine the potential impacts of the proposed hydrological changes upon these resources.

SECOND, a substantial body of information now exists that documents the potential and real benefits accruing to both agriculture and to the environment in the area due to the existing and traditional periodic spring flooding. These benefits must be factored into an analysis of the environmental and the economic impacts of the proposed project.

THIRD, the significant changes in land-use patterns, especially with regard to reforested areas and private landowner participation in voluntary federal conservation programs, have altered the potential and the need for the project since its inception. A thorough analysis of the changes and their implications is needed.

FOURTH, the Corps states that it will buy easements and reforest 62,500 acres of agricultural land below the 87 ft. msl point. However, it is our understanding that much land is not physically available for easement purchase due to various factors, including previous commitment of these lands to other conservation or agricultural programs. One source estimates that 10,000 acres is a more realistic figure available for reforestation. Under this easement agreement, the Corps will stop trying to buy easements just one year after they complete construction of the pumps, even if they have not purchased a single easement. In the Corps Vicksburg District alone, where easements will need to be bought, the agency still owes the nation over 28,000 acres of wetland mitigation from previously completed projects.

FIFTH, the 1941 Flood Control Act stated that flood control protection would not be provided below 90 ft. msl. It was stated that controlling floods below the 90 ft. msl stage would "impair" timberland values, and that denial of flood protection below this level would avert such impairment of land values. Plus, as stated earlier, it was the intent of the original legislation to recognize and grant a need for flood storage. The Corps persists in designating the 87 ft. msl mark in their program instead of the 90 ft. msl mark as originally designated. The five-year flood event is now at 90 ft. msl; however, there is not significant damage to structures below 91 feet msl and the one-year flood event is 87 ft. msl. To approach a flood control project of this magnitude using a yardstick of 87 ft. msl as the base point is inconsistent with the original intent of the Act.

SIXTH, we disagree with the Corps statement that there will be little impact on the Pondberry. Instead we believe the Corps should enter into formal consultation with the US Fish and Wildlife Service regarding the potential threat to the Pondberry if pumps are erected and function.

SEVENTH, a Washington Post article written by Michael Grunwald and dated October 5, 2000 tells how the Army Corps of Engineers has agreed to delay its controversial seven-year study of major construction projects on the Mississippi River, after an independent review concluded the study's forecasts were riddled with serious flaws and unrealistic assumptions. The independent reviewers hired by the Corps – North Dakota State economists John Betzan and Denver Folliver – issued a blistering evaluation of the original Corps forecasts. They cited numerous "*flaws in the methodology*" and "*assumptions that are tenuous at best.*"

In light of these recent developments, there is reasonable doubt cast upon the assumptions and forecasts presented by the Corps on the many issues involved, not the least of which is the cost benefit analysis.

EIGHTH, when a science-based federal peer agency such as the US Fish and Wildlife Service takes noted exception to the findings and determinations of the Corps of Engineers on the Yazoo Pump and Backwater Project, and has done so going back to at least 1982, we find it difficult to believe the facts presented by the Corps are creditable or believable. There have been repeated requests from another federal agency, the Environmental Protection Agency and the public to use nonstructural measures instead of pumps, but even peer agencies such as these have been ignored by the Corps.

In SUMMARY, it is the belief of the Mississippi Wildlife Federation that the Corps has failed to adequately address potential environmental impacts that are the likely result of implementation of the pumps project as proposed. These impacts have not only been poorly addressed but, in fact, many facets of the potential impacts have not even been delineated. We find the Draft EIS to the be woefully inadequate and deficient in numerous areas as outlined in detail by the two primary federal agencies that are charged with, among other things, the tasks of wildlife, fisheries and natural resource stewardship in this country; namely the Environmental Protection Agency and the US Fish and Wildlife Service. These agencies are staffed by competent environmental and natural resources professionals who are imminently qualified to analyze environmental, ecological and natural resource community dynamics. The mere fact that these agencies have publicly indicated concern and reservations regarding the rigor and the quality of the DEIS should suffice to cast indictment upon the proposed plan of action. This lack of scientific rigor and credibility is coupled with the unfathomable fact that the Corps of Engineers continues efforts to drain areas that have historically always been wetlands. We believe the project to be a faulted and irresponsible effort that, if successfully implemented, would serve primarily, and most exclusively, to allow marginal farmland to come into production with minimal overall economic benefits to a very few in the agribusiness community, but at great expense and damage to this valued ecosystem within the state of Mississippi. The costs -- economic, cultural and natural resource-based, far exceed the poorly demonstrated benefits.

DUCKS UNLIMITED, INC
SOUTHERN REGIONAL OFFICE

193 Business Park Drive, Suite E
Ridgeland, Mississippi 39157
Office (601) 956-1936 Fax (601) 956-7814

October 26, 2000

Colonel Robert Crear, District Engineer
ATTN: CEMVK – PP – D
Department of the Army
Vicksburg District, Corps of Engineers
4155 Clay St.
Vicksburg, MS 39183-3435

Dear Colonel Crear:

Ducks Unlimited is pleased to take this opportunity to provide comments on the Yazoo Backwater Area, Mississippi Reformulation Report. Our comments are geared toward directing the Corps toward maximizing benefits and minimizing impacts of this project to waterfowl habitat and they are not intended to reflect a position in favor of or against the project. The Corps has clearly put considerable effort into the reformulation report and analyzed many options in great detail. We note the Corps examined several options that applied non-structural means of flood control in the Yazoo Backwater Area. We are particularly pleased that the Corps has given consideration to the use of conservation easements and reforestation of flood prone areas. We have much experience with these techniques and we believe they hold great promise for protecting or restoring wetland functions and values in this highly altered system. In fact, we believe reforestation of flood-prone land offers an excellent opportunity to regain a portion of the lost ecological integrity of the Mississippi Alluvial Valley (MAV).

The MAV is one of only five waterfowl habitat areas in North America that ranked as "Highest Priority" in the most recent update of the Ducks Unlimited Conservation Plan. Accordingly, DU has developed a campaign entitled River CARE (Conservation of Agriculture, Resources, and Environment) to secure funding that will enable us to protect, restore, enhance, and manage thousands of additional acres of important waterfowl habitat throughout the MAV, thereby directly contributing to the achievement of the goals of the North American Waterfowl Management Plan Lower Mississippi Valley Joint Venture. We use multiple techniques to achieve our habitat goals within River CARE, including: (1) conservation easements to protect existing wetlands; (2) reforestation to expand the forested wetland coverage in the Mississippi Alluvial Valley; (3) working with farmers to flood harvested cropland and set-aside areas (moist soil habitats) to provide foraging habitat for wintering waterfowl; (4) cooperating with various state and Federal agencies, including the Corps, to restore or enhance important waterfowl habitat on lands held in the public trust; and (5) provision of waterfowl management technical assistance to both private and public land managers.

We write of our efforts to point out that we have a vested interest in the region that will be affected by the Yazoo Backwater Project. We believe that this project, ***with the proper balance of structural and non-structural flood control features,*** could significantly enhance wetland and waterfowl resources in the Yazoo Delta. Unfortunately, after considerable review of the Yazoo Backwater Area Mississippi Reformulation Report, we believe the recommended plan ***does not*** have the appropriate balance of structural and non-structural flood control features. In fact, the recommended alternative appears to be weighted in favor of structural features, and it does not adequately apply non-structural techniques. Further, the recommended plan does not adequately measure or duly consider the potential positive environmental benefits that could accrue from other options in the report that called for reforestation of open lands and initiation of pumping at higher elevations. Because of this, we believe the Corps is missing an important opportunity to "break new ground" and exhibit precedent-setting leadership in the application of non-structural methods of flood control.

On August 23, 2000, at the "Conference on Effectively Restoring Ecosystems" in St. Louis, Missouri, General Hans Van Winkle gave a presentation entitled "*Bringing the Environment & Economic Development into Balance*" in which he summarized the Corps civil works mission – past, present, and future. In that presentation, General Van Winkle noted "a broader array of impacts and benefits for comparison among different kinds of projects is needed" and suggested that current Corps "planning guidance not only supports, but encourages projects that provide both (*emphasis his*) economic and environmental outputs." He went on to challenge Corps field staff to "...push the planning horizon in meeting these new opportunities." Finally, he indicated, "No longer can we be satisfied with traditional projects with minor modifications and add-ons to "satisfy" (*emphasis his*) ecosystem needs. We need, and I am calling for, major initiatives to improve performance of our projects: 1) Flood reduction and navigation projects that also (*emphasis his*) provide substantial ecosystem restoration benefits; and 2) Ecosystem restoration projects that provide measurable economic benefits."

Ducks Unlimited believes that, while the Corps' recommended option breaks new ground with the use of non-structural methods of flood abatement, the recommended option does not fully capitalize on the opportunity to more broadly apply non-structural flood control techniques. The recommended option as it is described in the report, in our opinion, does not go beyond the "traditional projects with minor modifications and add-ons to satisfy ecosystem needs" with which General Van Winkle suggested the Corps could no longer be satisfied. We believe this because the Corps has eliminated several options that would have resulted in reforestation of over 100,000 acres, with that area dedicated to flood storage. Further, the Corps analysis falls short by failing to develop and/or apply techniques to assess and include: (1) the ecosystem benefits of carbon sequestration; (2) ecosystem benefits to water quality improvements; and (3) economic value of carbon credits. We believe that with reasonable assessment of these values, Plans 9 or 21 in the Second Array of Alternatives, or Plans 14 or 26 from the Third Array, or Plans 2 or 7 from the Final Array could be justified and provide far more significant environmental and economic outputs than the recommended option.

During his presentation, General Van Winkle indicated that the Corps has "over the past year, ...substantially increased the level of funding to investigate and develop new procedures (to assess the impacts and benefits of various projects)." We urge the Corps to examine progress to date in regard to developments related to these "new procedures", and to examine the possibility of applying or testing new procedures to evaluate the Yazoo Backwater Project. We believe the Yazoo Backwater Area Project provides the Corps with a prime opportunity to evaluate new methods of analysis of flood control projects that accurately assess both economic and environmental outputs of flood control projects. Clearly, projects applying conservation easements and reforestation provide very substantial environmental benefits, and placing those benefits on par in the evaluation process with standard economic-based decision-making tools currently utilized is required to accurately analyze project benefits. Ultimately, the Yazoo Backwater Project is a prime opportunity to apply the words spoken by General Van Winkle in St. Louis last August and demonstrate that the Corps can indeed play a significant role not only in flood control and abatement, but also in restoring lost ecosystem functions and benefits to systems that have been drastically altered as a result of previous Corps projects.

One or more projections of the United States Department of Agriculture's Wetlands Reserve Program (WRP) future accomplishments must be factored into this analysis. By assuming that Congress will not authorize increased enrollment in and funding for the Wetlands Reserve Program, and subsequently ignoring likely future accomplishments under WRP, the Corps has biased the projections of all options. Congress has demonstrated that the Conservation Reserve Program (CRP) and WRP are important programs to farmers and the American people by reauthorizing funding and additional enrollment for these programs in the 1995 Farm Bill. More recently, toward the end of the 106th session, Congress authorized and funded an additional enrollment of 100,000 acres for the Wetlands Reserve Program. Ducks Unlimited believes, because of the groundswell of support demonstrated by their constituents for Farm Bill programs like WRP and CRP, that Congress will continue to authorize these programs in future Farm Bills, and appropriate funding in future budget cycles. Consequently, we believe the Corps analysis falls short by failing to include benefits based upon a reasonable or even conservative projection of future WRP enrollment during the life of this project. Perhaps several scenarios including various levels of WRP

enrollment could be modeled as one means of more reasonably assessing and incorporating these programs into the Yazoo Backwater Project.

Finally, we offer the following specific comments:

1. Item 103, Page 40, Yazoo Backwater Area Mississippi Reformulation Report, Volume 1, Main Report:

   Under the "Environmental Setting" section, the Corps speculates "Based on local action to date and on recent congressional actions, future expansion of these programs [WRP and CRP] is not likely in the opinion of the Vicksburg District." This statement is not accurate, as Congress, in its most recent session, authorized an increase in WRP by 100,000 acres, bringing the total authorized level to 140,000 acres in FY01. This came about for many reasons, but the most obvious was that Congress heard the voice of their constituents loud and clear. DU believes that the record of Congress to date in regard to the WRP and CRP provisions of the Farm Bill suggests the exact opposite of the opinion the Corps has offered. These Farm Bill provisions were authorized and funded in the 1995 Farm Bill, and we believe Congress will authorize funding in the 2002 Farm Bill also. Reauthorization in 1995 was due in part to the hard work of DU and many other conservation-minded organizations. Most importantly, however, it came about because affected landowners and constituents felt strongly that WRP and CRP are very worthy programs, and they conveyed their feelings on this issue to their congressmen. In the most recent session of Congress, representatives from Mississippi supported the enrollment increase. In fact, Senators Cochran and Lott, as well as Congressmen Pickering, Thompson, Wicker and Shows, have expressed their continued support for these provisions. Consequently, DU believes and will work very hard to assure these provisions remain in subsequent Farm Bills. Further, as we suggested above, we believe it is essential for the Corps to incorporate a projection of future benefits of WRP/CRP into the project evaluation. By ignoring future accomplishments of WRP and CRP, the Corps has failed to accurately assess the project impacts and cost benefit analysis. The Corps should work hard to find a way to accurately incorporate projected conservation provisions of the Farm Bill over the life of this project, which would allow the development of a more accurate analysis of the effects of these programs on the environmental and economic outcomes of the project.

2. Item 210, Page 99, Yazoo Backwater Area Mississippi Reformulation Report, Volume 1, Main Report:

   The Corps has indicated that no additional conservation easements will be purchased beginning one year after completion of the pump station, at which time the Corps will resort to fee title acquisition to fulfill any remaining compensatory or mitigation requirements. Ducks Unlimited has considerable experience in the acquisition of conservation easements. Over approximately 4 years, DU has secured conservation easements on 33,543 acres in the MAV, and we are considering additional easements on approximately 30,000 acres. The Corps has projected that the pumping station will require about 7-8 years to complete, which means that, at most, 7 years would be available to secure the 62,500 acres in the recommended plan. DU believes it is highly unlikely that the Corps will achieve easement objectives of the recommended plan within the time allotted because of the various Federal requirements the Corps must complete regarding real estate planning, budget preparation, budget authorization and other steps that must be taken **before** the Corps can begin easement acquisition. Consequently, a significant portion of the 7-8 years allowed will elapse during the planning stages, and the Corps will not have sufficient time to acquire conservation easements affecting a minimum of 62,500 acres. Further, by indicating plans to revert to fee title acquisition one year post-completion of the pump, we sense a lack of commitment on part of the Corps to fully develop non-structural aspects (conservation easements and reforestation) of the recommended plan. If the Corps lacks a clear and strong commitment to the non-structural aspects of the project, they will not be achieved, and the final project outcome will not go beyond the "traditional projects with minor modifications and add-ons to satisfy ecosystem needs" with which General Van Winkle suggested the Corps could no longer be satisfied. Consequently, the Corps will have missed a prime opportunity to dramatically

demonstrate leadership in the wetland ecosystem restoration arena. The recommended plan should state unequivocally that the Corps is committed to achieving the targeted goals for conservation easements and associated reforestation, even after the pump is completed if necessary, which would clearly demonstrate that the Corps is fully committed to application of non-structural methods of flood control outlined in the recommended plan. Ideally the plan would call for the Corps to achieve the easement objective ***prior*** to initiation of construction of the pumping station.

3. Item 214, Page 100, of the Yazoo Backwater Area Mississippi Reformulation Report, Volume 1, Main Report:

   The Corps has written "In order to achieve the level of protection projected by the recommended plan, it is anticipated that some of the pumps would have to be turned on prior to stages reaching the 87.0 feet, NGVD." While we recognize that the hydrology of the watershed as well as backwater events of the Mississippi River might cause the Corps to **desire** to begin pumping at elevations below that in the recommended option to maximize structural flood protection, we feel this allows too much latitude in the operation of this pumping station. Operation of the pumps should be tied to a specific fixed elevation, below which the pumps will not be utilized. Anything less allows too much latitude to the Corps and the non-Federal sponsor in determination of when pumping should be initiated. Further, we note other alternatives that called for additional non-structural methods that would have affected lands at higher elevations (e.g., 91 feet NGVD). These lands should be included in the project to allow temporary storage of floodwater at elevations higher than 87 feet NGVD. In so doing, a fixed elevation could be selected below which the pumps would not be operated, and when hydrological conditions caused elevation of water to exceed the minimum pumping elevation, flood waters could be temporarily stored on lands under easement until the pumps could lower and/or maintain the elevation of water at the pump site as designated in the pump operation manual.

4. Item 216, Page 101-102, of the Yazoo Backwater Area Mississippi Reformulation Report, Volume 1, Main Report:

   The Corps lists a host of projected plan accomplishments that are directly tied to successful attainment of the conservation easement and reforestation goals under the plan. Further, the Corps states "The plan represents a rare opportunity to obtain significant bottom-land hardwood/wetland restoration, thus helping to achieve the management/ecosystem goals that have been established for this important area." Indeed, the project area offers significant opportunities for the Corps to demonstrate leadership in the analysis, development, and implementation of nonstructural methods of flood control that would include conservation easements and reforestation. However, we believe the Corps has come up short in its efforts to maximize application of the use of these two techniques in particular. We believe the Corps should revisit its analysis and seek to develop means by which ecosystem and economic values related to carbon sequestration, water quality improvements, and other important, but difficult to model and quantify, aspects of this project could be fairly evaluated and accurately estimated. The Corps should step forward and break new ground both in terms of techniques to quantitatively assess ***both*** environmental and economic benefits of the project. Benefits to water quality, from carbon sequestration, and potentially the value of carbon credits should enter into this evaluation process – we believe they are real and have tangible, measurable value.

Finally, we believe the Corps is remiss in their evaluation of cumulative impacts of multiple flood control projects in the Yazoo Delta, including the Little Sunflower River Structure, the Steele Bayou Structure, the Whittington Channel, and many other structural projects whose cumulative impacts, while providing considerable flood control benefits, have come at great cost to the environment in terms of reduced water quality, wildlife and fish habitat, carbon sequestration, and other ecological values and functions that were impaired or lost because of the cumulative effects of these projects. Clearly, the Corps, with its experienced staff of engineers, hydrologists, and other scientists, must recognize that major modifications resulting from an individual project affects the need, performance, and environmental and economic

outputs of projects both upstream and downstream of the project under consideration. Cumulative impacts should be considered by the Corps for projects throughout well-defined physiographic regions or ecosystems such as the Lower Mississippi Alluvial Valley.

Thank you for the opportunity to comment on the Yazoo Backwater Mississippi Reformulation Report.

Sincerely,

Kenneth M. Babcock
Director of Operations
Southern Region

Cc: Alan Wentz, Group Manager, Conservation Programs
Bill Earnest, MS Senior Regional Director
John Peeples, MS Regional Director
Ronal Roberson, MS State Chairman

Barry Kohl, Ph.D.
1522 Lowerline St.
New Orleans, LA 70118

December 2, 2000

Col. Robert Crear
District Engineer
US Army Corps of Engineers
4155 Clay St.
Vicksburg, MS 39180-5191

Re: Comments on the Draft Supplement No.1 to the 1982 Yazoo Area Pump Project, FEIS for the Yazoo Backwater Area Mississippi, Reformulation Report.

Dear Col. Crear,

I have reviewed the Draft EIS entitled, "Yazoo Backwater Area Mississippi, Reformulation Report (dated, September 2000)." I have also reviewed the Big Sunflower Maintenance Project: Water Quality Monitoring Plan; Item 2 Pre-project Sediment Screening, (dated February, 2000) which is cited in the DEIS. I request that this letter and my attachments be included in the Final Supplement EIS to the Yazoo Backwater Area Mississippi Reformulation Report.

Yazoo Backwater Report, Appendix 16, Water Quality Section:

It has been proposed that the river sediments in the Big Sunflower project increase in Total DDT at depth and that dredging will resuspend sediments which are more contaminated at the surface. (Kohl, 1998).

According to Sec. 16, p. 21 of the Draft EIS for the Yazoo Pumps:

> "An additional 25 segmented core samples were collected from the Little Sunflower Basin in 1998 and 1999. A statistical analysis of pesticide concentration with depth found no significant differences with depth." (USACE, 2000, p. 21).

This statement is false and misleading. The raw data presented in the USACE, Feb. 2000 report show that TDDT increases with depth in the majority of cores. The mean values presented by the Corps in the Report also show an increase of TDDT at depth. (see attachments)

General Comments:

- Who was the preparer of the Water Quality Appendix?
- Why weren't raw data tables included?
- Why weren't detection limits for analytes included?
- Paragraphs are numbered twice - p.16-47 repeats the numbering system.

Sediment Quality: paragraphs 20-38.

21. This is a discussion of surface sediments. "Surface" should be added for clarity.

22. What are the detection limits for metals and pesticides? Those numbers need to be added.

23. How were the sites selected in the Steele Bayou basin? Why weren't cores taken further downstream? Four cores are not enough to determine the contaminant trend on Steele Bayou. There should be more.

Raw data for the cores should be included in a table. Data from several core layers are excluded in the figures (see Fig. 16-4, 16-5). Two core layers are omitted for SL-5 in Fig 16-5 and 4 core layers omitted from Fig. 16-4. Were the levels of DDE and TDDT below detection? If so, what is the detection limit?

24. There should be detection limits listed for all the priority pollutant pesticides included in table 16-3.

I agree that it is difficult to draw conclusions from only 4 cores. Why weren't more cores taken to establish a trend?

Why not include the TDDT, DDE data from the sediment cores taken in the Little Sunflower River and add those to the graphs?

A statement cannot be made rationally that TDDT decreases in the deeper layers. The cores from the Little Sunflower, analyzed by the USACE, show a definite increase in TDDT with depth (see attached figures).

The statement that a "statistical analysis of pesticide concentration with depth found no significant differences with depth." is flawed. TDDT increased in the cores with depth, based on the Corps' own data. The statement about the Little Sunflower cores is misleading and false and does not represent the facts based on evaluation of the raw data presented by the Corps in the Big Sunflower Water Quality Monitoring Plan (USACE Feb., 2000). The raw 1998 & 1999 core data should be included as a table in the EIS for comparison.

25. The Bowen (1966) concentrations of metals occurring in the earth's crust has been replaced by newer data. See Wedenpohl (1991). Also include the reference for the USGS citation in the reference section.

26. Include the reference for the USGS citation.

27. Raw data should be added as a table for comparison of data. Detection limits should be included. Are the values in dry or wet weights? How long were the sediment samples stored before analysis?

37. The background level for mercury in the earth's crust is 0.02 ppm average according to Wedenpohl (1991). The DEIS author speculates that: "it is <u>unlikely</u> that aquatic organisms will be susceptible to trace metals in the range of concentrations that they occur naturally." This is a stupid statement which is not supported by any scientific data. First, neither the Corps or the USGS has determined what the normal background level of trace metals are in the Yazoo basin. You can't use a average for the earth's crust as a benchmark for judging the impacts on organisms in one single watershed!

The ER-L and ER-M are based on scientific observations under laboratory conditions and not speculation.

Where is the USGS reference for the naturally occurring concentrations of trace metals?

38. The statements are speculative. What scientific resources does the author have to support his/her statements. The benchmarks ER-L, ER-M cannot be compared to averages in the earth's crust. The trace elements change in concentration based on the types of rocks/strata occurring in an area.

It is true that trace elements can act synergistically. The effect of several contaminants may be more toxic in the sediment than each one individually. The effects range, determined by NOAA, used spiked concentrations of single trace elements to determine toxicity to test organisms.

Fish Tissue Quality: para. 39-43.

39. There should be table with the raw fish-tissue data available for comparison. It is important to know the values of contaminants by fish size, species and location. The locations (stations) should be included on the base map for the project to compare the fish stations with sediment sampling stations.

41. Raw data for pesticides in fish should be included in the EIS.

42. Raw data for trace metals in fish should be included in the EIS. Certain individual fish samples are discussed but there is no mention which sample or which species the author is discussing. Table 16-8 should be supplemented by a raw data table so that the reader knows the level of metal concentration in each species by size and location.

43. The screening level (level of concern) for mercury in fish for Mississippi is 0.75 ppm according to MDEQ personnel. Any fish over the 1.0 ppm FDA maximum would be excluded from interstate commerce.

Risk Assessment: para. 44-20a.

20a. If DDT is "indeed this toxic there should be some clinical evidence of that in the medical records." Unfortunately there probably has not been blood sampling for TDDT or mercury in the Yazoo Basin. Usually doctors are unaware of the clinical symptoms resulting from metal or pesticide toxicity.

Project Impacts: para. 21a-24a.

21a. Another of the project impacts is the dredging of Big Sunflower and tributaries which is an integral part of the Yazoo Backwater Area Project. The dredging will cause a resuspension and redistribution of toxic sediments which have been documented as part of the Big Sunflower EIS and the USACE report (Feb. 2000). The 220 acres in the immediate vicinity of the pump plant is only a small fraction of the acreage to be impacted by this project.

All the feeder streams will be dredged or snagged increasing the erosion in the rivers and banks as well as the direct resuspension of contaminated sediments and exposure of more contaminated sediments at depth in the river bed. Ninety-seven miles of streams (FEIS Big Sunflower) will be dredged by dragline or hydraulic dredge resuspending sediments

contaminated by TDDT. This will cause additional downstream contamination by TDDT and probable bioaccumulation in the fish.

The project has also included the clear cutting of trees along the Bogue Phalia and Holly Bluff cutoff which will increase erosion and introduction of contaminated soils into the river system.

23a. A study of mercury on the Ouachita River in Louisiana is alluded to but there are no data produced nor a reference to the work. Based on the lack of information included in the EIS we can only discount the information as being anecdotal. Where are the sampling stations? What is the frequency of sediment collection and analysis?

For the hypothesis to be proven, one must compare the chemical parameters in both basins and see if there is a close correspondence. A similar mercury study in the Yazoo Basin should be undertaken to directly compare the results with the Ouachita River. There will always be some differences in the biologic systems and levels or differences in mercury compounds, pH, sulfate availability etc. Studies have shown that the pH needed to intiate methylation should be much less than a pH of 7.0. The pH of water from Steele Bayou, Big Sunflower, and Backwater Lakes (Table 16-2) show a mean pH of about 7.0 for these waterbodies. This is much higher than the acidic waters needed to initiate methylation.

The Corps' statement that a 57% "increase in forested acres would undoubtedly increase fish-tissue mercury levels . . ." is speculative and unsupported by data! Has there been a study in the basin to support this hypothesis?

The public health effects of TDDT in fish in the Sunflower Basin is more a concern. Why isn't the Corps considering the proposed dredging of the contaminated river sediment a direct impact to bioaccumulation of TDDT in fish?

24a. The Corps' presentation is speculative and unsupported by data.

One could also weave a story that the TDDT in sediments could increase the bioaccumulation in fish by reforestation/or deforestation.

Water Quality Summary: para. 25a-27a.

26a. Heavy metals and pesticides are hydrophobic and one would expect a higher level in the sediments than the water column. The hydrophobic chemicals settle out of the water column and collect on the river bottom sorbed to fine grained sediments and colloids.

The levels of TDDT in sediment cores are presently high in the Little Sunflower River (see USACE 2/00 report). Twenty five years ago there was not an extensive data base of cores in the rivers giving us a baseline in which to compare. This is a speculative statement unsupported by facts.

There are no data to support the contention that levels of TDDT in cores now are significantly lower than they were 25 years ago. In fact the high levels of TDDT from30 years ago may still be buried at depth in the project area. The Little Sunflower cores support a downcore increase in TDDT.

27a. The statement: "Conversion of cropland to forestland will likely increase the amount of methyl-mercury produced and could lead to increase mercury in fish-tissue." This statement speculative and not supported by facts.

In Conclusion:

The Water Quality Section of the DEIS is deficient in not including appropriate references supporting statements made by the author.

The Section is also deficient by its exclusion of the raw data which were used to provide summary information in the tables. See detail comments above.

Of particular concern is that there are no data included in the DEIS for cores taken on the Little Sunflower River, as part of the Item 2, Pre-Project Screening (USACE, Feb., 2000). These data have been used in this DEIS to support the <u>false</u> statement that there is no increase in pesticides with depth in any of the LSR cores. The fact is that TDDT increases at depth in all the cores taken on the Little Sunflower River included in the USACE (2/2000) report. (See attachments).

There are several statements made by the author/s which are not supported by corroborative evidence. They are pure speculation and should not appear in an EIS document.

I thank you for providing me the opportunity to comment on the DEIS and I request a response to the issues I have raised. Please send me a copy of the Final EIS when it is available to the public for review.

Sincerely,

Barry Kohl

Barry Kohl, Ph.D.
Geologist

Attachments: Kohl-Figures (1-3).

References:

Kohl, B. 1998. Affidavit #1: Mississippi Dept of Environmental Quality Certification issued to Applicant US Army Corps of Engineers, Big Sunflower River Navigation Project. 12 pp. 3 figs., references.

USACE, 2000. Big Sunflower Maintenance Project: Water Quality Monitoring Plan; Item 2 Pre-project Sediment Screening dated February, 2000.

Wedenpohl, M., 1991. In Merian, E. (editor), Metals and Their Compounds in the Environment: Occurrence, Analysis and Biological Relevance: VCH Publishers, New York, 1438 pp.

cc: EPA, Atlanta
USF&WS, Atlanta
Earth Justice, New Orleans
Sierra Club, Mississippi
Miss. DEQ, Jackson
Nat'l. Wildlife Fed., Washington D.C.

Summary of Total DDT mean values for River Sediment Cores: Little Sunflower River, Plan for Work-Item 2

SEDIMENT SAMPLES: LITTLE SUNFLOWER RIVER Values for all cores		
Position in core	number of samples	Total DDT mean (ppb)
Top	21	76.3
Middle	21	94.9
Bottom	12	128.2
Tip	19	126.4
Auger	20	67.4
Composite	6	95.5

Data from Water Quality Monitoring Plan, Item 2, USACE, Feb. 2000 (Attach. "C")

The ER-M for Total DDT = 46.1 ppb

Note: The average of the means for Top, Middle, Bottom and Tip = 106.4 ppb TDDT

Compiled by: B. Kohl, Ph.D., 5/28/00

Kohl-Figure 1. Table with mean values for all segments of the Little Sunflower River sediment cores analyzed in this study. Included are the mean values for TDDT which increase downcore for all cores tested by the Corps of Engineers. All mean values reported exceed the ER-M value of 46.1 ppb for Total DDT. (Data from Plan for Work-Item 2, Attachment" C").

Data from USACE Little Sunflower River, Plan for Work- Item 2
Feb. 2000: Total DDT in Sediment Cores

12/18/98

LS- 7 (comp.)	
Depth (in)	TDDT (ppb)
2	87.7
21	150.8
42	320.9
* 84	0.0

12/18/98

LS- 9 (comp)	
Depth (in)	TDDT (ppb)
2	86.1
21	141.0
42	132.1

1/21/99

LS- 11A (A)	
Depth (in)	TDDT (ppb)
2	43.7
10	33.8
18	80.4
21	11.7
* 60	0.0

1/21/99

LS- 11B (A)	
Depth (in)	TDDT (ppb)
2	92.3
18	30.7
30	91.8
37	131.2

12/11/98

LS- 12 (comp)	
Depth (in)	TDDT (ppb)
2	52.0
18	107.3
36	236.0

Depths in Cores are not necessarily correlative from one core to another

LS- 11A (B)	
Depth (in)	TDDT (ppb)
2	43.7
10	33.4
18	82.1
21	11.8
* 60	0.0

LS- 11B (B)	
Depth (in)	TDDT (ppb)
2	91.9
18	60.5
30	62.3
37	150.1

Duplicate analysis of 11B

LS-11A (C)	
Depth (in)	TDDT (ppb)
2	42.8
10	33.7
18	82.9
21	11.8
* 60	0.0

Triplicate analysis of 11A

LEGEND		
Depth numbers represent		
	Top	
	Middle	
	Bottom	
	Tip	
	Auger *	

(*) = Auger sample may represent older strata

Data from USACE, Little Sunflower Plan for Work-Item 2, Appendix "A"

Data in chart compiled by:
Barry Kohl, Ph.D., 5/29/00

Kohl-Figure 2a. Detailed chart showing the TDDT in each Little Sunflower River sediment core segment included in this study. Some of the cores were subsampled in triplicate and duplicate. Those values are shown in each column. The depth with an (*) is the auger sample which was taken separately to test deeper sediments below the core base. (Data from Plan for Work-Item 2, Attachment "A").

Data from USACE Little Sunflower River, Plan for Work- Item 2
Feb. 2000: Total DDT in Sediment Cores

1/21/99

LS- 13 (A)	
Depth (in)	TDDT (ppb)
2	44.8
10	41.6
18	169.5
21	202.4
* 84	209.0

1/21/99

LS-13 (P) (A)	
Depth (in)	TDDT (ppb)
2	100.1
18	115.8
32	193.4

12/11/98

LS- 14 (comp)	
Depth (in)	TDDT (ppb)
2	50.0
22	120.0
44	56.0
* 56	248.4

12/11/98

LS- 16 (comp)	
Depth (in)	TDDT (ppb)
2	96.1
24	139.7
48	78.0

4/26/99

LS17.5 (A)	
Depth (in)	TDDT (ppb)
12	171.7
24	171.1
36	13.5
* 66	200.8

LS- 13 (B)	
Depth (in)	TDDT (ppb)
2	44.5
10	41.1
18	160.0
21	203.5
* 84	231.9

LS-13 (P) (B)	
Depth (in)	TDDT (ppb)
2	81.9
18	138.1
32	173.2

Depths in Cores are not necessarily correlative from one core to another

LS-13 (C)	
Depth (in)	TDDT (ppb)
2	45.4
10	41.9
18	148.6
21	194.8
* 84	204.5

Triplicate analysis

LS-13 (P) (C)	
Depth (in)	TDDT (ppb)
2	90.3
18	46.0
32	166.8

Triplicate analysis of13 (PVC)

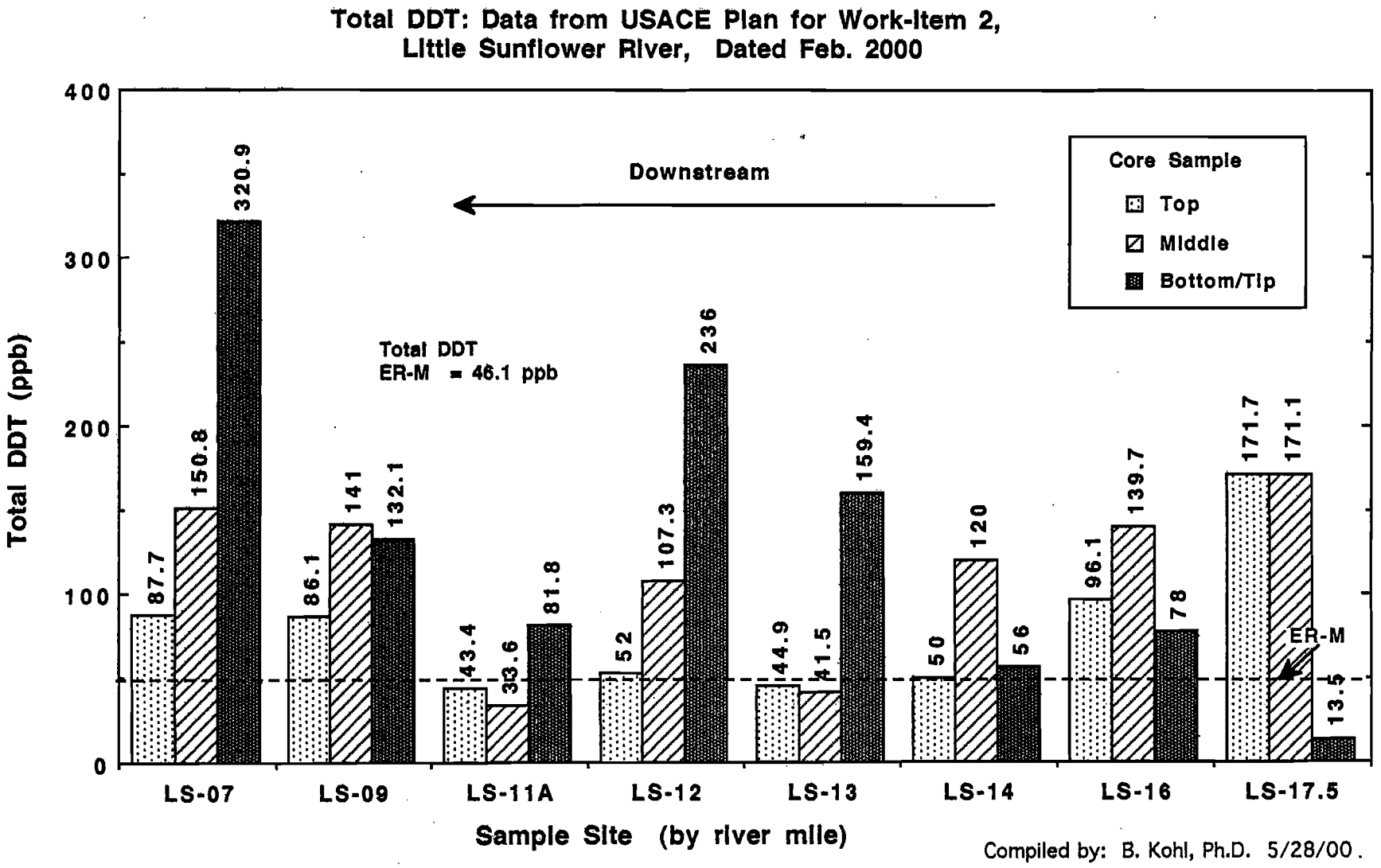
LEGEND	
Depth numbers represent	
Top	
Middle	
Bottom	
Tip	
Auger *	

(*) = Auger sample may represent older strata

Data from USACE, Little Sunflower
Plan for Work-Item 2, Appendix "A"

Data in chart compiled by:
Barry Kohl, Ph.D., 5/29/00

Kohl-Figure 2b. Detailed chart showing the TDDT in each Little Sunflower River sediment core segment included in this study. Some of the cores were subsampled in triplicate and duplicate. Those values are shown in each column. The depth with an (*) is the auger sample which was taken separately to test deeper sediments below the core base. (Data from Plan for Work-Item 2, Attachment "A").



Kohl-Figure 3. Bar graph showing the values for TDDT in each core segment from the Little Sunflower River sediment cores used in this study. All cores have increases in TDDT downcore. (Data from Plan for Work-Item 2, Attachment "A").

DELTA LAND TRUST

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December 8, 2000

ATTN: CEMVK-PP-PQ, Mr. Gary Young
Department of the Army
Vicksburg District
4155 Clay St.
Vicksburg, MS 39180

Dear Sirs/f:

The purpose of this letter is to express Delta Land Trust's extreme displeasure over what the Vicksburg District represents to be a Draft Environmental Impact Statement for the Yazoo Pumping Plant project. Both the project itself and the document that purportedly describes it are completely unacceptable to any clear thinking American. While time does not allow a full litany of the many unacceptable facets of this situation, consider the following a list the TOP TEN LIST OF THE PUMPS DEBACLE:

1- DEIS does not adequately consider impact of Pumps on downstream water quality. Since contaminant-laden silt will be pumped through Pumps instead of allowing to the silt to settle and somewhat cleanse, said water quality will be detrimentally affected.

2- DEIS does not adequately consider impact of Pumps on global warming. Pumps use electricity created by burning of fossil fuels, which leads to increased CO2 emissions and greenhouse effect, which cause global warming. Agricultural intensification is a stated goal of the Pumps, yet the global warming effect of ag intensification is not addressed in the DEIS.

3- DEIS does not adequately consider non-structural alternative of buying flowage easements and planting trees throughout the study area. The Corps treatment of this subject in the DEIS is a joke.

4- DEIS does not adequately consider Big Sunflower River "Maintenance" Project as a feature of the Yazoo Pumps Project.

5- DEIS does not acknowledge that it was Corps, not Congress, whom modified the original 3 small pump plan specified in the Flood Control Act of 1941 in favor of channeling the combined flow of the Big Sunflower

River, the Little Sunflower River and Deer Creek to Steele Bayou via the Corps constructed Sunflower River-Steele Bayou Connecting Channel and subsequently proposing to build one mammoth pumping plant at Steele Bayou Control Structure and DEIS does not adequately recognize the Sump areas that were features of earlier versions of the Pumps Project.

6- DEIS does not adequately recognize that the dominant trend in land use in the YBWA is away from agricultural intensification in favor of reforestation.

7- DEIS does not adequately consider effect of Pumps effluent on downstream landowners, including on lands owned by the Trust in fee and via conservation easement that lie just to the south and east of the proposed Pumping Plant.

8- DEIS does not adequately recognize the implicit and explicit subsidy payments in the commodity prices used in its benefits and costs analysis.

9- DEIS does not adequately consider the effect of Pumps on endangered pondberry, threatened wood stork, endangered Florida panther, threatened Louisiana black bear or threatened red wolf amongst many species of flora and fauna resident in the area.

10- DEIS does not adequately consider the massive amount of channelization, ditching and other flood control infrastructure work that will be necessary in order for the Pumps to work as projected.

As seen in the enclosed* economic studies conducted by Dr. Dennis King of the University of Maryland, Dr. Len Shabman of Virginia Tech University and their associates, approximately 3 million acres of the 16 million acres of row crop land in the ARK-LA-MISS Delta are economically marginal i.e. these acres of land cannot be farmed profitably. Rather than catering to the special interests whom would continue to represent that this 3 million acres of land should have been cleared and should be farmed, the Corps should adopt a leadership position in reforesting this land. The Yazoo Pumps project is the poster child of a Corps project that stretches the limits of reason far beyond any acceptable boundaries and should be terminated immediately.

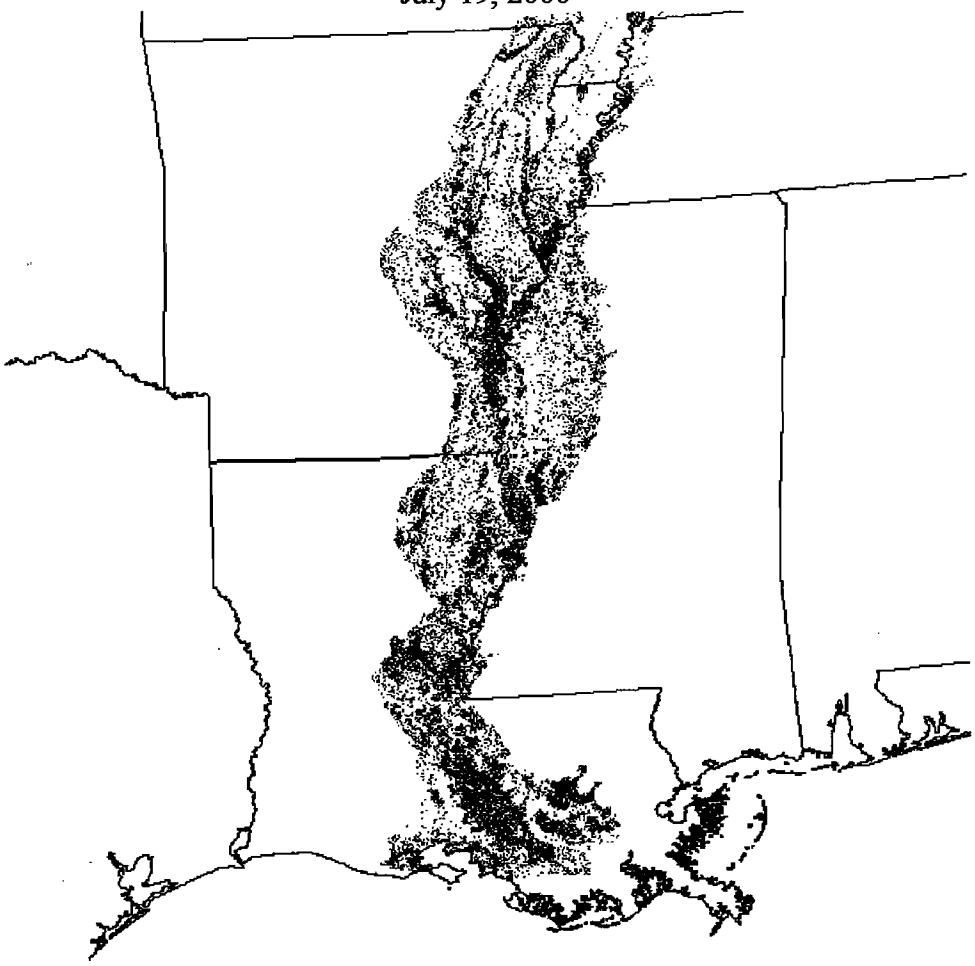
Respectfully Submitted,

T. Logan Russell, President

*Enclosed on floppy disk in MS Word format. File names are Cover Page, Benefits and Costs Report and Land Clearing Report.

The Benefits and Costs of Reforesting Economically Marginal Cropland in the Mississippi Delta

July 19, 2000



Prepared for:
Delta Land Trust
Madison, Mississippi

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1. Introduction

Since the 1800s, thousands of acres of the swamplands and bottomland hardwood forests that originally covered the area of the Mississippi River flood plain, known as the Delta (Figure 1), have been cleared, drained, and cultivated in corn, cotton, rice and soybeans. Initially, clearing occurred on lands at higher elevations that were comprised of loamy, well-drained soils. With time, however, clearing progressed to the bottomlands and farmers began to cultivate heavier clay soils that were prone to saturation, slow to dry and of lower potential productivity. (These lower elevation fields were particularly susceptible to flooding occurring in the spring and early summer along with the springtime flows of the Mississippi River and its tributaries.

Flooding and soil saturation proved to be significant deterrents to expanding agricultural production. Late spring flooding delayed the planting of crops, resulting in reduced yields or requiring the substitution of a lower-value, later-planted crop. Damages also occurred when flooding destroyed a crop in the field, resulting in a complete loss or requiring the farmer to incur the additional costs of replanting the crop.

Substantial private and government investments have been made in the Delta to reduce agricultural flood damages.[1] Over time, a network of levees, floodgates, diversion channels and other flood control structures have been constructed to prevent the inundation of agricultural fields as well as prolonged periods of soil saturation by minimizing flood elevation and expediting the drainage of flooded fields. While this complex system of flood control structures provided partial protection to some agricultural land, frequent flooding remained a persistent problem in the lower elevations. Nonetheless, clearing of bottomlands for agricultural cultivation continued up through the 1960s and '70s, (even in the most flood prone areas,) encouraged in part by market conditions and government agricultural policies.[2]

An examination of 1989-1999 data in the National Agricultural Census database (USDA 1999) shows how many acres of farmland in the Delta, in any given year, may currently be effected by late floods. By comparing acres planted to acres harvested in soybean, we can roughly judge the number of acres that failed or where crop yields were too low to harvest profitably (McMaster, personal comm.) due primarily to flooding, droughts, or market conditions.[3] Our analysis showed that only a small percentage of farmland in counties lying completely within the Delta remains unharvested after being planted. On average, the number of

---

[1] Initially, local drainage districts provided floodwater control structures and channel enlargements to facilitate on-farm drainage systems. Starting in the 1930s, the United States Army Corps of Engineers took on a leading role in the construction of projects to prevent flood damages to existing agricultural activity and to aid in the conversion of wetlands to agricultural production.

[2] In the late 1960s and early 70s, the price of soybeans was quite high, in real terms, relative to current day soybean prices. In 1976, the average annual price per bushel was $6.81. At other times, prices were even higher: $10.00 per bushel in June 1973, $8.99 per bushel in August 1973, $9.05, $9.24 and $8.13 per bushel in April, May and June of 1977 respectively. By contrast, in 1998, the US price for soybeans was $5.30/bu. Consider these prices in real (i.e. inflation-adjusted) terms: the annual price of $6.81 in 1976 would be $17.75 in 1998 dollars (using the GNP implicit price deflator forecasts from WEFA, 1996).

[3] Based on conversation with Larry McMaster, USDA Farm Service Agency, Federal Crop Insurance Corporation, MS.

acres planted not harvested within all Delta counties (Figure 2) was 2,400 acres/year for the ten-year period from 1989-1998. The total acreage for individual years ranged from 50,000 in 1994 to 190,000 in 1989. These acreages were typically 1-8% of planted acres within a county and averaged 3% of planted acres over all Delta counties in all years (Table 1). During the ten-year period analyzed, two meteorological events of note were widespread flooding in 1993, and a drought in 1989. The effect of the 1988-89 drought is readily apparent in the yield data for 1989. The 1993 flood does not appear to have resulted in a high rate of failed acres in 1993, but heavy June rains that preceded the flood may have prevented planting on marginal lands.

Starting in the late 1970s through to present times, however, changes in agricultural market conditions and national agricultural policies began to diminish the profitability of agricultural production on frequently flooded lands and curbed incentives to convert bottomland forests to farmland (Shabman and Zepp 2000, pg. 25). At the same time, recognition was growing for the many environmental services provided by forested wetlands, including wildlife habitat, water quality maintenance, carbon sequestration and floodwater retention. These changes motivated an interest in restoring these frequently flooded areas to their former forested conditions.

A 1997 study (Amacher, et al.) reported that the reforestation of frequently flooded agricultural fields in the Mississippi Delta might not only offer the environmental benefits associated with forested wetlands, but also might provide financial returns to private landowners that are on par with returns currently earned producing soybeans. That study considered several possible revenue sources from reforestation, including the net returns to the sale of timber and pulpwood, the sale of hunting leases, payments from government programs such as the Wetlands Reserve Program (WRP) and payments for environmental services, such as carbon sequestration and the retention of nutrient-laden runoff.

In light of these possibilities, the objectives of this project are to:

- identify the extent of frequently flooded agricultural lands in the Delta area where reforestation is most likely to generate both financial and environmental benefits.
- examine the extent of the possible financial benefits that could be earned by landowners who reforest the lands identified, and
- determine the extent of possible ecological benefits generated by reforestation of the lands identified, including increased wildlife habitat, reduced nutrient runoff, floodwater retention and carbon sequestration.

2. Project Procedures

1. Determine what features characterize economically marginal farmland in the Mississippi Delta and define spatial variables for identifying economically marginal farmlands.

2. Use the spatial variables and other available data regarding landcover and land attributes to provide an estimate of the total acreage and location of lands that meet these criteria.

3. Develop estimates of the per acre financial returns that landowners could earn by reforesting land under four different forestry scenarios: nuttall oak, seeded nuttall oak, cottonwood and cottonwood - nuttall oak interplanted.

4. Develop estimates of the ecological benefits of reforesting the economically marginal agricultural lands identified, including increased wildlife habitat, reduced nutrient runoff, floodwater retention and carbon sequestration.

3. Establishing Criteria for Identifying Economically Marginal Agricultural Land

3.1. Features of Economically Marginal Agricultural Land

For the purposes of this project, economically marginal agricultural lands are considered to be fields that are located in bottomland areas and subjected to frequent flooding or soil saturation that results in diminished returns to agricultural production. Generally, agricultural fields with these characteristics are planted to soybeans. Soybeans can be planted later in the season than most other crops and are better suited to the heavy, clay soils than are crops such as cotton or corn.

In this study, a market land value of $400/ acre is assumed to be the threshold value for identifying economically marginal agricultural lands. This means land that would be valued at $400/acre or less is likely economically marginal. Market values for agricultural land can be approximated by capitalizing the average annual net returns earned on the land.[4] The average annual net returns to soybean production are influenced by a variety of features, including flooding regime, production costs, flood-free soybean yields and the rate used to discount future returns. In order to examine the range of economic and physical features that characterize economically marginal agricultural lands, the tables below report estimated average annual returns per acre to soybean production under differing assumptions about soybean yields, production costs and discount rates. The estimates of average annual net returns are calculated by a simulation model designed to calculate soybean returns in a two-year flood plain, that is, land with a 50% chance of being flooded in any given year. In calculating average annual net returns, the simulation model accounts for the effects of flooding on annual production costs and harvested yield.

[4] The market value of these frequently flooded lands is based primarily on the potential income generated by agricultural production, because there is little prospect of development or other forms of land use. This means the market value of the land can be approximated by capitalizing the average annual net returns earned on the land. Capitalizing the net returns requires dividing the average annual net returns by the interest rate.

Table 2. Net Soybean Returns and Approximate Land Values with a flood-free yield of 30 bushels/acre and 7% Discount Rate

	Average per acre annual returns	Approximated Land Value (Annual Returns Capitalized at 7%)
Mississippi	$26.03	$372.14
Louisiana	$27.90	$398.57
Arkansas	$25.48	$364.00

*Results are inflation adjusted and expressed in year 2000 dollars

Table 3. Net Soybean Returns and Approximate Land Values with a flood-free yield of 25 bushels/acre and 7% Discount Rate

	Average per acre annual returns	Approximated Land Value (Annual Returns Capitalized at 7%)
Mississippi	$-0.18	N/A.
Louisiana	$1.20	$17.00
Arkansas	$-0.75	N/A.

*Results are inflation adjusted and expressed in year 2000 dollars

Table 4. Net Soybean Returns and Approximate Land Values with a flood-free yield of 25 bushels/acre and 4% Discount Rate

	Average per acre annual returns given 2-year flood frequency	Approximated Land Value (Annual Returns Capitalized at 4%)
Mississippi	$0.42	$11.25
Louisiana	$1.21	$30.25
Arkansas	Approx. $0.00	Approx. $0.00

*Results are inflation adjusted and expressed in year 2000 dollars

3.2. Establishing Criteria for Identifying Marginal Agricultural Land

The land value estimates reported in Tables 2, 3 and 4 above suggest several possible criteria for identifying the economically marginal agricultural lands in the Delta, including:

1. **Fields planted to soybeans.** Many of the Delta's lower-elevation, frequently flooded agricultural lands were initially cleared to be planted to soybeans in the 1960s and '70s in

response to elevated soybean prices. Often, these lands remained in soybeans, even after prices moderated because of the constraints presented by flooding and poorly drained, clay soils. Soybeans can be planted later in the cropping season than most other crops, making them best suited to fields that remain flooded through spring and early summer.

2. **Land cleared between 1960 and 1980.** For the reasons discussed above, much of the land clearing in the Delta between 1960 and 1980 was occurring in response to a sustained period of high soybean prices. The unusually high soybean prices, in combination with federal policies designed at the time to encourage clearing and draining wetlands for cultivation, made the clearing of bottomland areas for soybean production appear profitable to landowners. Under this special combination of market conditions and government policy, many frequently flooded forested bottomland areas that were previously considered worthless for agricultural production were cleared and cultivated in soybeans.

3. **Fields in the 2-year flood plain.** Land falling within the 2-year flood plain has a 50% chance of flooding in any given year. This high risk of flooding means that any type of agricultural activity also stands a good chance of incurring some type of damages in any given year that would diminish the expected net returns to production.

4. **Fields producing a flood-free soybean yield of 25 bu/ac or less.** As is reported in Tables 2, 3 and 4 above, at an assumed flood-free yield of 25 bu/acre, the simulated annual agricultural returns produced approximate land values that were consistently less than $400/ acre, regardless of the production costs or discount rates applied. At 30 bu/ac and a 4% discount rate, the same simulation model showed annual net returns that produced approximate land values ranging from $655 - $685, all in excess of the $400 threshold used to define marginal land. From the results of the simulation model, 25 bu/ac seems to represent the flood-free yield that best identifies economically marginal agricultural land under a wide range of different production costs and discount rates.

5. **Fields that are typically flooded through late May or early June.** The planting period for soybeans lasts through June 15th in the region, although planting dates may end by June 1 in parts of Arkansas. Soybeans rely on the length of day to initiate flowering. This means that soybeans planted after the planting period are exposed to shorter days before they are fully matured, resulting in early flowering and reduced yields. Additionally, late-planted soybeans tend to have underdeveloped root systems and are vulnerable to drought. In order to plant within the ideal period for soybeans, floodwaters must have receded from a field, and up to ten additional days are required to allow the field to dry out sufficiently to support farm equipment. This means that the timely planting of soybeans will be prevented on fields that tend to remain flooded through late May or early June. Soil data (STATSGO) are available from the USDA that characterize the typical *flood end date* as the, "month in which annual flooding (flooding likely to occur during the year) ends in a normal year" (USDA NRCS 1995).

6. **Fields comprised of hydric soils with high clay content**. Soils found in the sumps and basins that comprise the bottomland areas of the Mississippi Delta are generally hydric soils with high clay content. USDA soil data (STATSGO) include soils rated as hydric.

4. Determining Total Number of Acres and Geographic Location of Lands Suited for Reforestation

This section addresses Task 2: Use the spatial variables and other available data on landcover and land attributes to provide an estimate of the total acreage and geographic location of lands that meet the above criteria.

We employed two different methods to estimate the acreage and spatial distribution of marginal farmland in the Delta. Due to data limitations and methodological uncertainties, we felt a comparison of the two techniques would lead to the best possible estimate of the amount and location of land suitable for reforestation. We describe the methods and comment on the limitations of each.

The Mississippi Delta comprises an area of about 39,000 mi^2 and covers portions of Arkansas, Mississippi, Louisiana, Tennessee and Missouri. For this analysis, we ignored the fairly small portions of the Delta that lay within Tennessee and Missouri. Hereafter we refer to the Delta as the portion of the Mississippi Alluvial Valley that is within the states of Arkansas, Mississippi and Louisiana (Figure 1). We used a geologic data coverage from the US Fish and Wildlife Service (LMV/GIS SC 1996) to delineate the alluvial valley (Figure 3).

4.1. Soil Data (STATSGO) Analysis

Much of the information concerning flooding regime, soils, crop type and crop yield are contained within the STATSGO database maintained by the USDA National Resource Conservation Service. However, these data are less than ideal for our purposes because: 1) data are out of date since they are typically based on soil surveys conducted during the 1940s-1960s, and 2) data are combined over large spatial units which prevents areas with appropriate soil characteristics from being located with a high degree of specificity. The age of the data prevents us from using the crop yield information directly because it underestimates current yield. And, more importantly, the data age prevents us from identifying all the spatial units (polygons) likely to have portions planted in soybeans, since much of the clearing of marginal farmland occurred in the 1970s. The soil surveys and associated agricultural data are based on the area identified as containing crops at the time of the survey and the data do not identify the extent of potential cropland based on soil characteristics. Further, a statistical technique was used to extrapolate from point data, which represents the small areas actually surveyed, to the area (polygon) information represented in the database, so the data do not represent an exact census of the agriculture acreage or location.

STATSGO data are presented in map units which identify characteristics of portions of each mapped polygon in the Geographic Information System (GIS) output (Figures 4, 5, 6 and 7). Since we do not have information about the physical location of the map units with the polygon, each polygon appearing on a map can be defined to represent one map unit at a time, or a sum or other combination of map unit characteristics. Thus, maps generally show values that represent the percentage of the polygon meeting the specified criteria (e.g. percent of the polygon with hydric soils). STATSGO data were not intended to be used for fine scale analysis, and

therefore, are useful for generalizing over areas and roughly estimating acreage, but not for detailed spatial analysis.

The STATSGO database included a wide variety of data fields including basic soil characteristic measurements (e.g., percent clay content) as well as information on typical crops grown, yield characteristics of those crops on particular soils, average flooding regime, and whether the soils are hydric. To select the areas (polygons) that were likely to contain marginal farmland, we selected polygons that had some percentage of any of the following characteristics:

- Hydric soils (Figure 7)
- Soybean yields in the 10-25 bushel/acre range[5] (hereafter referred to as marginal soybean yields)
- Average annual flood end date of May or June
- Soil drainage class of C or D

Although the STATSGO data are organized so that we could select soil components (portions of map units) that share characteristics (e.g., units that contain both hydric soils and soybean yields in the 10-25 bu/ac range), missing data and other data errors resulted in very few polygons being selected through this method. Instead, we compared the acreage estimates for the various characteristics that would tend to identify marginal farmland.

This STATSGO data analysis yielded estimates of 1.5-1.9 million acres of marginal farmland based on flood end dates and soybean yields respectively (Table 5). These values are well below the 9.2 million acres of hydric soil since much of this land is not farmable. This estimate of marginal farmland is likely to be low compared to current marginal acreage because the data on agricultural crop patterns and yields were collected prior to major clearing of marginal farmland, as discussed above.

Table 5. Area (1000s of Acres) with various soil properties (from STATSGO)

	Hydric	Average Flood End Date of May or June	Soy Yields of 10-25 bu/acre
	1000 acres	1000 acres	1000 acres
Arkansas	4890	900	626
Louisiana	3010	800	906
Mississippi	1340	180	404
Total	9250	1900	1540

[5] We used the 10-25 bu/acre range that would be considered marginal farmland by today's standards. However, since the yield data are predominantly from the 1940s and 1950s, these yields would translate into 1990 yields of as much as 30-60 bu/acre. Therefore, much of this acreage would not be considered marginal farmland today. These adjusted yields are based on a 3-5% annual average growth rate in soybeans in Mississippi from 1954-99. Historical records of soybean yields are available from the National Agricultural Statistical Service http://www.nass.usda.gov:81/ipedb/.

4.3. Technique Using FWS Land Use Coverages: Landcover Change Analysis

The best data that we were able to obtain for spatially locating marginal soybean farms was landcover data from the USFWS (LMV/GIS SC). A GIS coverage of 1950s forest cover data[6] was generously provided to us by USFWS (Uihlein, personal comm.). This spatial data allowed us to compare areas that were identified as forest in the 1950s and were no longer mapped as forest in a 1992 land use coverage (LMV/GIS SC) (Figure 8). The forest coverage within the Delta is dominated by bottomland hardwood forested wetlands (Twedt and Uihlein 1999), so we assumed all forest cover represented wetlands. Since significant clearing of forested wetlands to create marginal farmland took place during the 1960s and 70s (see Introduction and Table 6), differences in the extent of forested wetlands before and after this period should reveal the location of current marginal farmland in soybeans, in addition to areas deforested for all other reasons since the 1950s.

Table 6. Total Acreages of Bottomland Hardwood Forest (1,000 acres) for portions of Mississippi, Louisiana, Arkansas and Tennessee included in the Mississippi Alluvial Plain (US FWS, November 1979)

Land Use Class	Dates of Estimates and Data Sources					
	U.S. Forest Service Data			**PI/ Planimetered data**		
	1937	1947	1957	1957	1967	1977
Mississippi	1764.0	1619.0	1566.0	1514.1	1179.8	931.3
Louisiana	5270.5	5072.1	4682.6	4320.3	3738.5	3000.1
Arkansas	3947.3	3715.6	3437.7	2083.0	1326.8	1015.1
Total Forest Land	10981.8	10406.7	9686.3	7917.4	6245.1	4946.5

U.S. Forest Service data provides an estimate of both bottomland and upland forest area combined
Adapted from US DOI 1979

The analysis was straightforward, except for determining the proportion of deforested land that should be considered to be marginal farmland. A GIS analysis allowed us to identify which of the ~2 acre grid cells in the GIS coverage had primarily been forest in the 1950s *and* were classified as land converted to farming or other developed uses in the 1992 USFWS land cover data (Figure 9). The 1992 land use of all regions deforested over this period, according to the data, is shown in Table 7. The portion of the deforested area that was also in soybean farms in the 1992 land use coverage was 1.7 million acres (Figure 10) and the total of deforested land in all cropland was 3.4 million acres. These estimates were somewhat consistent with the estimate of marginal farmland from STATSGO data since the 1.7 million acre estimate for soybeans was the mean value between the two STATSGO estimates of 1.5 and 1.9 million acres (Table 5). However, the STATSGO and the 1.7 million acre estimates are all likely to be underestimates as we discuss in the next section.

[6] The coverage was digitized from paper maps (NWI, Circular 39).

4.4. Marginal Farmland Area Results and Discussion

The estimate of 1.7 million acres, which were identified as marginal farmland in the land use change analysis above, is likely to be an underestimate of total marginal farmland in the Delta. The reasons have to do with potential errors in and limitations of the 1992 USFWS land use coverage, many of which originate from the fact that land was classified into use categories based on data from a single year. Since farmers on marginal land will rotate soybeans, cotton and milo, any of these crops may potentially represent marginal farmland.[7] Further, in any given year, a certain percentage of farms will not be planted, particularly since farms only need to be planted once every 5 years to retain USDA status as active farmland. The classification process is also subject to significant error since satellite imagery for spring and fall was the primary data set used, making crop identification difficult.

A comparison with another recent (MRLC) land use analysis[8] shows that the USFWS landcover map has significantly less cropland than this more recent analysis. It is important to note that the MRLC land use data exclude roughly 2.5 million acres of the southern portion of Louisiana's Delta or 10% of the USFWS data (compare Figures 8 and 11). The MRLC data show that all crops (row crops and small grains) cover 14 million acres or 66% of the land within the alluvial valley only.[9] In comparison, the U.S. Fish and Wildlife Service land cover data show soybeans covering 5.4 million acres (22%) and total crop coverage covering 11 million acres or 46% of the Delta area. So the USFWS has 3 million fewer acres of cropland in an area that is 2.5 million acres *larger* than the more recent MRLC data. Therefore, the USFWS coverage provides 20% less cropland relative to the MRLC.

So, while the total amount of land deforested, gives us a rough upper bound on marginal farmland (3.6 million acres), the total of land deforested and classified as soybean (1.7 million acres) is probably an underestimate of marginal farmland. Given that the MRLC data are more recent and indicate more overall farmland in the Delta, it seems likely that some of the deforested areas that are currently in soybeans were not identified as being in soybeans on the 1992 USFWS coverage. Therefore, we need to include more than just land classified as soybean in the USFWS coverage in order to provide an accurate estimate of marginal farmland. Of the total deforested acreage from the USFWS data, 3.4 million is in crops. While the 3.4 million acres includes some farmland that generates normal yields, we feel an estimate between 1.7 and 3.4 million acres, such as the mean of 2.6 million, is more representative of total marginal farm acreage in the region than the 1.7 million acres classified as soybean.

If we compare our estimate to available literature estimates of related acreage, we do not find anything that would contradict an estimate of 2.6 million marginal farm acres. The area we identified as marginal farmland is larger than any estimated area that is currently slated to be reforested, but well below the total area previously in forest. One study (US DOI 1979) estimated the amount of land deforested between 1957 and 1977 as 2.97 million acres (Table 6).

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[7] Based on conversation with Bill Maily, Hinds County Cooperative Extension Service.

[8] The more recent land cover data set was extracted from the Federal Region 4 portion of the satellite-derived land-cover data set currently being produced through a cooperative project between the U.S. Environmental Protection Agency (EPA) and the U.S. Geological Survey (USGS), as part of the Multi-Resolution Land Characteristics (MRLC) Consortium activities.

[9] For the analysis the land cover data were clipped to include only the portion within the alluvial valley and not the wider area seen in Figure 11).

About 2.5 million acres within the alluvial valley are available for reforestation in Bird Conservation Regions according to one study (Twedt and Uihlein 1999). Acreage enrolled in the Wetland Reserve Program, which converts marginal farmland to wetlands, totals 140,000 acres for all counties partially or completely within the 3-state Delta. Land in the Conservation Reserve Program, which also targets marginal farmland totals 11,000 acres of new trees planted for those counties (Table 8). The total of all acres in soybean farms for counties completely within the Delta is 36 million acres (based on National Agricultural Statistical Survey, USDA 1999).

4.5. Summary of Findings

Through analysis of the two distinct data sets, we were able to create a likely range of marginal farmland acreage within the Delta area of Arkansas, Mississippi and Louisiana as 1.5-3.4 million. Given points raised regarding data limitations, we feel the most reliable estimate is the mean of this range, or 2.6 million acres based on an analysis of land deforested between the 1950s and 1992. The cropped area identified as marginal is 7% of the mapped soybean cropland in Delta (based on USFWS coverage) and 48% of land identified as being deforested between 1950s and 1992 (Table 7). The estimate of 2.6 million acres is generally supported by an independent landuse cover dataset and by available literature values.

5. Examining the Financial and Environmental Benefits of Reforestation

The previous section summarized our assessment of the extent of economically marginal cropland in the Delta. This section summarizes our assessment of the economic and environmental benefits of reforesting this economically marginal cropland. For purposes of our analysis the overall economic benefits of reforestation, including those associated with improved environmental conditions, are distinguished from the economic benefits that are likely to accrue to landowners as financial returns. The results of this analysis will help determine the financial incentives private landowners would need to switch land use from crops to forests, and the extent of the public benefits that would result.

5.1. Reporting the Financial Benefits of Reforestation

Reforestation of economically marginal agricultural lands provides landowners the opportunity to earn revenues from timber harvests and the sale of wood products, including sawtimber and pulpwood. Net revenues earned from the sale of wood products equal the difference between the revenues received and the financial outlays required to establish and maintain a forest stand on former agricultural fields. A simulation model was used to calculate the possible financial benefits to reforestation in the form of net returns earned from the sale of timber and pulpwood under four different reforestation scenarios:

1. cottonwood (*Populus deltoides*) for pulpwood,
2. nuttall oak (*Quercus nuttallii*) for sawtimber and pulpwood production,
3. seeded nuttall oak (planted from seed) for sawtimber and pulpwood production,
4. cottonwood/nuttall oak interplanted with cottonwood for sawtimber and pulpwood production

The simulation model calculates tree growth rates, rotation lengths and establishment costs based on the assumption that reforestation is occurring on economically marginal agricultural lands, as they have be defined in this study. This means that returns are calculated for reforestation occurring on hydric soils. Additionally, the model accounts for the effects of flooding on timber stand establishment for sites located in the 2-year flood plain. The net returns are calculated over a 130-year period, discounted and summed to produce a net present value (NPV) estimate of returns. Annual equivalent value is reported for each NPV estimate, and results are reported using both a 4% and 7% discount rate. (See Tables 9 and 10)

Table 9. Net Returns from the Sale of Wood Products: 7% Discount Rate

Reforestation Scenario	Net Present Value per acre	Annual Equivalent Value per acre
Nuttall Oak	$-85.06	$-5.96
Seeded Nuttall Oak	$-18.43	$-1.29
Cottonwood	$-35.09	$-2.46
Cottonwood – Nuttall Oak interplanted	$-73.70	$-5.16

*Results are inflation adjusted and expressed in year 2000 dollars

Table 10. Net Returns from the Sale of Wood Products: 4% Discount Rate

Reforestation Scenario	Net Present Value per acre	Annual Equivalent Value per acre
Nuttall Oak	$123.72	$4.99
Seeded Nuttall Oak	$162.18	$6.55
Cottonwood	$42.35	$1.71
Cottonwood – Nuttall Oak interplanted	$121.90	$4.92

*Results are inflation adjusted and expressed in year 2000 dollars

Additional income sources include the sale of hunting leases, and payments made through government programs that pay landowner to idle environmentally sensitive agricultural lands, such as the Wetlands Reserve Program (WRP).

5.2. Identifying the Environmental Benefits of Reforestation

For the purposes of evaluating environmental benefits, we considered 4 scenarios for reforesting marginal cropland which would result in land being placed in the following four categories:

1. cottonwood on 10-year rotations for pulpwood
2. cottonwood/nuttall oak interplant with cottonwood on 10-year rotation
3. nuttall oak for sawtimber and pulpwood production on 60-80 year rotations
4. bottomland hardwood (*Quercus spp.*, *Fraxinus spp.*, etc.) with no commercial production

The different scenarios are expected to create different levels of benefits due to differences in growth rates, harvesting frequencies and tree characteristics. Cottonwood plantations have high survival rates and fast growth leading to rapid establishment of minimal wildlife habitat requirements and aesthetic benefits. When interplanted with oak, cottonwoods provide the benefits of a fast growing species while the oaks mature more slowly, and provide a more diverse habitat structure favored by wildlife. Also, the cottonwoods may act to increase oak survival by altering the microclimate (Schweitzer et al. 1997). The bottomland hardwood scenario represents a return to the pre-deforestation state, which assumes the hydrology could be restored to support the previous land use.

Knowing only the overall acreage of reforested land allows us to make rough estimates of expected benefits. However, the actual distribution of any level of reforestation can lead to higher or lower benefits. For example, increased forest cover in riparian areas can have a larger impact on sediment and nutrient removal from runoff than the reforestation of land farther from streams. On the other hand, reforestation may lead to increased floodwater retention if it takes place further from rivers and streams. Additionally, forest added in a manner that increases the core area of forest, or so that it links together adjacent forested wetlands, can disproportionately increase the quantity and quality of habitat, especially for flora and fauna that require more specialized habitat (Rudis 1995, Bender et al. 1998). A series of interconnected patches, versus isolated patches is thought to contribute to long-term species survival (Gibbs 2000).

5.2.1. Sources of Reforestation Benefits

Terrestrial Habitat Improvement

While soybean production offers cover and a growing season food source for deer and small mammals, reforestation will increase and improve cover, nesting sites and brood-rearing habitat (Wesley et al. 1981). Also, newly established forests can act as corridors connecting existing forest habitat, increase edge, and eventually forest interior habitat (Peterken and Hughes 1995). However, variation in stand composition associated with different reforestation scenarios will affect relative habitat suitability for different game and non-game species. Cottonwood plantations show rapid biomass growth resulting in rapid stand closure, thereby quickly providing interior habitat. Oak plantings, unlike cottonwood, produce potentially large quantities of hard mast in the form of acorns in stands aged 20 years and greater. Hard mast is a preferred food source for both wild turkey and deer (Wesley et al. 1981). Nuttall oak is considered to

provide excellent terrestrial habitat compared to many other bottomland hardwood species (Appendix A). For the above reasons, bottomland hardwood forests in the Yazoo basin can provide habitat for a variety of game species, including whitetail deer, wild turkey, rabbit, bobwhite quail, mourning dove, squirrel and waterfowl (Woolfolk, 1997).

Recreational hunting is a popular pastime in Mississippi and a significant source of economic income for the region. In 1996, 433,000 recreational hunters spent an estimated $576.3M on hunting in Mississippi. (DOI, 1997). With significant demand for suitable hunting sites, the sale of hunting leases provides landowners with a non-timber source of income from reforested land. A 1997 survey of private landowners in 66 Mississippi counties reports an average annual hunting lease value of $31 per acre. (Jones et.al.1999) In general, wetland areas that are well suited for waterfowl draw significantly higher lease values, ranging from $49 – 98 / acre (Jones et. al. 1999). "All-purpose" hunting leases can range from $1.50 to $25/acre annually (Woolfolk, 1997). Fallow agricultural fields tend to be the least desirable for most game, with the exception of northern bobwhite quail and mourning dove. Higher valued sites tend to be mature, bottomland hardwood stands or mature hardwood stands intermixed with agricultural fields, which provide excellent habitat for whitetail deer, wild turkey and rabbit. Areas with younger, immature tree stands provide less cover and food for wildlife and thus tend to earn lower lease prices, but they still draw lease prices that exceed those for agricultural fields.

A 1995 study quantified the potential habitat gains from reforestation of bottomland hardwoods in the Yazoo River basin (Wakeley 1996), which is part of the Mississippi Delta. That study defined habitat improvements in terms of net change in average annual habitat units (AAHUs), where one HU is equivalent to one acre of optimal habitat. The six evaluation species were gray squirrels, Carolina chickadee, pileated woodpeckers, wood ducks, and minks. In the study 100 acres of cleared land was restored to bottomland hardwoods under various management plans and the benefits were assessed over a 50-year period.

The results were consistent for the barred owl (34.35), the Carolina chickadee (46.80) and the pileated woodpecker (27.00) for all six of the management plans. The results for the gray squirrel differed between the plans. For the three management plans that left the area to naturally revegetate, the increase in the AAHU was 25.95, but was 47.85 for the three management plans that required active reforestation of the area. Wood duck results were either 37.77 or 62.70 depending on the plan, and mink results ranged from 10.89 - 55.65.

With the reforestation of 1.7 million acres, under the no-harvest scenario, we would expect to see over 10,000 times the number of habitat units created in the Wakeley (1996) study after the same 50-year period. The amount and type of habitat created would vary based on land configuration, as discussed below, since each marginal farm parcel we are evaluating covers approximately 2.5 acres, compared to the 100 acre unit used in the Wakeley study. However, since much of the marginal farmland is adjacent to existing forest, we would expect reforestation to result in increasing extent of interconnected forest areas, as opposed to creating isolated patches of forest. Since some wildlife prefers edge habitat, we might expect some decrease in edge species that would be offset by increases in habitat for interior species.

The benefits related to the scenarios that involve harvesting would be expected to be somewhat less than the natural reforestation/no-harvest scenario. We would expect cottonwood

harvested on 10-year rotations, for example, to provide less habitat for fewer species than the no-harvest scenario. The nuttall oak scenario should provide an intermediate level of habitat once trees reach a given level of maturity. While, the oak/cottonwood interplant should provide a similar level of benefits to the natural reforestation scenario since the cottonwood grow quickly to provide cover, and the oaks mature later to provide the preferred canopy structure and food source for many species.

Forest Core Area Improvements for Habitat

Almost any level of reforestation offers an opportunity to improve forest habitat, and in particular interior forest habitat, because much of the marginal farmland is adjacent to forested wetlands. Population density of many birds and mammals is a function of habitat patch size (Bender et al. 1998). Specialist species that require undisturbed forest interior habitat or rare vegetation benefit from reforestation that connects forest patches into larger, more continuous patches than current conditions. Tree species richness in southern bottomland forests was shown to increase with forest fragment size at small to intermediate patch sizes (Rudis 1995), demonstrating that even modest increases in forest patch area can lead to greater diversity of species.

We conducted an analysis to quantify the additional rare habitat that might be added to existing forest under the 100% reforestation plan. Our spatial analysis quantified the percent of the landscape in forest, the increase in forest patch size,[10] and core area (interior) of each forest patch both before and after reforestation (Figure 12). Each reforestation scenario, regardless of the percent of forest included, could disproportionately increase this rare interior habitat through careful allocation. An analysis of bird habitat in the region (Twedt and Uihlein 1999) demonstrated some of the potential benefits of such an approach.

Using the 3-state area of the Delta (AR, MS, LA), we evaluated the configuration of forest patches under current conditions and compared those values to the scenario of 100% reforestation of marginal farmland based on the land cover change analysis of likely distribution of marginal farmland (Section 4.3). We divided the landscape into two scenes at a natural break in the forest patches close to the northern border of Louisiana with Arkansas. This allowed us to characterize changes to both the less densely forested northern portion of the region and the more densely forested southern region of the Delta.

We examined the following indicators: total area of forest, % of landscape in forest, largest forest patch area as a percent of all forest, mean patch size, total core area, number of core areas and core area as a percent of all forest cover. Results are shown in Table 11. Core area was defined as the interior portion of a forest patch that was at least 5 cells (approx. 1640 ft or 500 m) away from a forest patch edge in any direction.

We saw modest increases in forest as a percent of the landscape under the scenario of 100% reforestation of marginal farmland. The upper region increased from 12 to 17 % and the lower region from 18 to 21%. Natural land cover in the range of 25-30% is thought to be a

[10] A forest patch is an area that appears contiguous in forest at the scale of the GIS coverage. Patches may have interior parcels in a non-forest coverage, but can not be completely separated from the patch by non-forested areas.

threshold for maintaining high quality natural habitat. Clearly, these increases will bring many new portions of the Delta above that threshold, thereby improving habitat for a range of species.

We also saw an increase in total core area of about 25,000 acres in the upper scene and 17,000 acres in the lower scene. The number of core areas increased by 400 in the upper scene and by about 175 in the lower scene. This is the equivalent to the creation of 575 new habitat "islands" in which interior plant, bird, and animal species can expand their range. The mean patch size jumped significantly in the northern scene from 44 to 64 acres, but remained the same (89 acres) in the more densely forested southern scene. These core area increases would translate into both increased species abundance and species richness.

5.2.2. Aquatic Habitat Improvements

Farmland is known to leak nutrients into adjacent ecosystems, which can cause deterioration of aquatic environments (Matson et al. 1997). Excessive nutrients in surface waters, or eutrophication, can cause deterioration of aquatic systems through several processes. An overabundance of algal growth can influence fish survival by causing low oxygen conditions, particularly in bottom waters. Nutrients in the Mississippi contribute to degraded water quality and to the formation of an hypoxic area that forms in the Gulf of Mexico, limiting aquatic habitat during those times.[11] Negative effects on fisheries include: decreases in stock levels, shifts in location of fishing grounds, increased congestion in unaffected fishing areas, and changes in the quality of harvested species (Doering et al. 1999). Eutrophication has been linked to the loss of underwater seagrass beds that serve as fish nurseries and habitat for many aquatic species. Also, eutrophication is thought to contribute to rapidly growing population of toxic algal species which create red or brown tides and can result in large fish kills, death of marine mammals and poisoning in humans who consume contaminated shellfish.

In addition to the river, nitrogen on land also influences the atmosphere. Nitrous oxide, which is released from the breakdown of fertilizers, is a greenhouse gas that contributes to global climate change (Vitousek et al. 1997). Nitric oxide, another form of nitrogen, contributes to acid rain which can damage aquatic systems and kill fish and other species.

Many farming practices also cause sediments and pesticides to move from farms to ecosystems. Sediment removal from cropland has a direct effect on water quality in terms of increasing turbidity. Indirect effects can result from sediment acting as a transport mechanism for nutrients and pesticides. And excessive sediment loads reaching estuaries can bury bottom-dwelling (benthic) communities such as shellfish and prevent or hinder their growth and reproduction. Pesticides applied to agricultural land typically move into adjacent ecosystems through leaching or aerial drift, where they can have unintended impacts on the diversity and

[11] "On the Gulf of Mexico's Texas-Louisiana Shelf, an area of hypoxia (low dissolved oxygen levels) forms during the summer months covering 6,000 to 7,000 square miles, an area that has doubled in size since 1993. This condition is believed to be caused by a complicated interaction of excessive nutrients transported to the Gulf of Mexico by the Mississippi River; physical changes to the river, such as channelization and loss of natural wetlands and vegetation along the banks; and the interaction of freshwater from the river with the saltwater of the Gulf." (http://www.epa.gov/surf/surf98/Mississippi/backgrda.html)

abundance of species and result in changes to ecosystem structure and functions (Matson et al. 1997). These compounds can also pose serious health threats, either directly as humans come in contact with them or indirectly by altering biogeochemical processes.

This section provides estimates of a subset of potential benefits that result from the reforestation of marginal farmland. Many of the same characteristics that cause farmland to be unproductive also result in the land causing problems to aquatic systems. Soil characteristics that lead to low yields when farmed, for example, also may result in excessive soil losses when farmed. We describe a subset of benefits that may be derived from reforestation and provide quantitative estimates when sufficient information is available. Many other benefits could potentially result from reforestation, however insufficient data is available at this time to quantify many of them.

Benefits from Reduced Sediment Runoff

While cropping systems vary in terms of the sediment losses they cause, any agricultural system will usually result in larger sediment loss than will a forested system. In most cases, erosion losses from forestland are 1-10% of the losses from agricultural land (Gianessi et al. 1986). In some cases, forestlands have no net erosional losses of sediment and, instead, act as a sediment sink, removing more suspended soil particles from floodwater and runoff than they contribute (Aust et al. 1991).

To estimate the potential amounts of soil that would be kept out of the river under reforestation, we multiplied the average sediment loss rate from soybean farms planted on soil typical of the Delta riparian areas by the area to be reforested. Actual sediment loss will be a function of soil type, rainfall, tillage practices, slope, and other variables, but studies have shown an average of 4.9 tons/acre per year of sediment is lost from a Sharkey silty clay planted in soybeans (Murphree and McGregor 1991). Using this value, our general estimate of the increase in sediment retention from reforestation (Table 12) was 12.7 million tons of sediment per year. This average value was for a 6-year period, so we don't know how long this rate might be expected to continue. However this value is comparable to another estimate, based on field measurements of sediment retention in bottomland hardwood wetlands (Kleiss 1996) and other measured values (Table 13). That study predicts that 3.57 tons/acre/year of soil is sequestered in backwater swamp sites, reflecting as much as 9.3 million tons/year retained on land with the non-harvested reforestation scenario.

A study by Ribaudo (1998, as cited in Doering et al. 1999), estimated erosion damage costs at 3.44 $/ton in the Mississippi Delta. This value was based on damage to freshwater fishing, water storage, flooding, marine recreation, commercial fishing, navigation, roadside ditches, municipal water treatment, municipal and industrial water use, steam power cooling. Therefore, using the 2.6 million acres of wetlands that could be created from marginal farmland and the estimate of 4.9 tons/acre/year we could expect total benefits to be $43.8 million.

This value is only a rough estimate since sediment retention is affected by tree stand age, forest management techniques, and other factors that have not been considered in our analysis. Also, we do not have specific data to calculate how sediment retention would differ under the frequent rotations for cottonwood, or how that might differ in scenarios that involve

oak/cottonwood intermixing. We can assume a decrease in sediment retention with clear-cut harvesting, but management could be used to limit sediment runoff in the mixed tree scenarios, making those scenarios roughly comparable to the no-harvest scenario.

Reduced Pesticide Runoff

Much of the Delta is planted in crops using high pesticide inputs. Forestry-related activities have considerably less chemical input than most agricultural systems. Most forest cropping systems rely on herbicides for weed control only during the first growing season of the rotation. In contrast, row crop agriculture usually involves applications of several chemicals throughout the growing season every year. Soybeans in particular require insecticides and herbicides. Insecticide is applied to forest crops only rarely and only under the most intensive management scenarios. In the Delta, soybean farmers typically use 24.1 and 28.9 oz herbicide active ingredient per acre annually for conventional and stale seedbed methods, respectively (MAFES 1995, Ahrens 1994).

Cottonwood is the most chemical intensive of the forest crops proposed here due to its sensitivity to weeds and short rotation length. If we assume that herbicide is applied once per rotation, at 19.2 oz of active ingredient per acre (MAFES 1995), then a cottonwood plantation harvested every 10 years (scenario 1) would reduce herbicide inputs by more than 1500 oz. per acre over 70 years. Lower application rates are possible for oak and other hardwood species, but if we assume the same application rate, once per rotation, we end up with a reduction of more than 1600 oz. per acre of herbicide relative to soybean farms. Intensity of weed competition will dictate actual application rates, but these figures give some idea of the type of reduction possible.

Reduced Nutrient Runoff

With respect to the benefits from reduced nutrient runoff we can expect the reforestation of marginal farmland in this region to have an effect disproportionate to acreage because these lands are in perennially flooded riparian regions where soil interacts directly with river water. Wetlands in such regions have a comparative advantage in trapping constituents of runoff and carry out denitrification, which reduces the nitrogen reaching the river waters. Also the clay soils, which dominate on these lands, have been shown to trap phosphorus more efficiently than coarse soils (Mitsch and Gosselink 1993). Denitrification is carried out by microorganisms that thrive under conditions of high soil carbon and high nitrate availability. One of the consequences of forest growth is increased soil organic matter content due to leaf, twig and fine root accumulation, facilitating high nitrification rates throughout the life of the stand. Forest vegetation uses agricultural nutrients including nitrates and phosphorus (CENR, 1999). Riparian forests and streamside management zones have been shown to remove nutrients applied to adjacent agricultural lands, reducing their influx to rivers (Peterjohn and Correll 1984, Jordan et al. 1993). The reduction of nutrient levels by the wetlands that would replace the marginal farmland would be expected to lessen the hypoxia problems in the Gulf of Mexico described earlier (CENR 1999, Council for Agricultural Sciences and Technology 1999, Mitsch 1999).

We used the following values to determine the change in nitrogen and phosphorus under the various scenarios. These values were calculated for the Yazoo River Basin, which is part of the Lower Mississippi subwatershed. The numbers were derived by modeling the entire basin

and fitting the basin's land use proportions to the measured nutrient levels in river water. Therefore, these values take into account issues of slope, land configuration, typical rainfall intensity, etc. The Lower Mississippi basin has been shown to produce similar levels of nitrate in river water for a given level of nitrogen applied to land (Coupe 1998, Fig. 6), indicating that the pollutant loads calculated for the Yazoo would be largely applicable to the Lower Mississippi area.

Table 14. Pollutant loads from land uses as estimated for the Yazoo watershed (from Shabman and Zepp 2000)

	Total Nitrogen (lbs/acre/yr)	Total Phosphorus (lbs/acre/yr)
Forest	1.32	0.28
Wetland	0.66	0.17
Cropland Soybean	11.17	2.99

These values, which were used to represent nutrients moving from soybean farms into streams, are large compared to in-stream measurements of nutrients (Table 12). However, they are consistent with the high runoff values that would be expected from marginal farmland given farm characteristics.

If we assume the same nutrient loading for each acre of marginal farmland being reforested, farmland converted to wetlands (with no harvesting) have the potential to prevent 27 million pounds of nitrogen and 7 million pounds of phosphorus from reaching the Mississippi each year. It is likely that nitrogen and phosphorus would be released from the sites after harvesting, particularly in the two years immediately following harvest. Also, nitrogen is typically applied to cottonwood trees when they are established, creating the potential for initial release of nitrogen from the sites (Schweitzer et al. 1997). Therefore, the more frequent the harvests, the fewer nutrients will be retained. On the other hand, young trees take up nutrient at greater rates than older trees. Thus, the only difference in nutrient sequestration rates among the scenarios we examined is likely to be in scenario 1 that involves frequent cottonwood harvesting. The exact decrease is difficult to determine without modeling the important components.

Although the nitrate yields (Table 14) are similar for the Yazoo and Lower Mississippi basins, the Yazoo has shown a slightly lower nitrate level in river water for a given level of fertilizer use compared to the Lower Mississippi basin. Therefore, slightly fewer nutrients may actually be retained in the Lower Mississippi basin than this basic analysis suggests. However, without more sophisticated modeling, the Yazoo numbers provide the most reasonable estimate available.

Another analysis of nutrient release from Mississippi River basins provides estimates of the likely nutrient yields for the area we are examining (Goolsby et al. 1999). As with the Yazoo basin study, this study also examined all land uses and the nutrients measured within the river basin. The area being examined for reforestation is part of two basins analyzed in the Goolsby et al. study: the "Lower Mississippi" and the "Red and Ouachita". If we assume that the Lower Mississippi River Basin described in that study is representative of our entire region (since it includes about 2/3 of our study area), we can create another estimate of nutrient removal through reforestation for comparison. The 1.7 million acres that would be reforested under our scenario represent roughly 4% of the Lower Mississippi basin used in the Goolsby et al. study. If we

assume that reforestation reduces the nutrient flux 4%, we still see 9.7 million pounds of nitrogen and 880,000 lbs of phosphorus from reaching the river.[12] However, we have many reasons to suspect these numbers are underestimates of true nutrient sequestration since the basin includes a large proportion of upland areas and we know wetlands have a disproportionate effect on nitrogen. Also, we have reason to believe that phosphorus removal would also be enhanced in these sites (see beginning of this section).

Dollar value of nutrient and sediment removal

While we don't have an exact method to place a dollar value on the worth of the nutrients that would be trapped or transformed by new wetlands, we can put a reasonable estimate on their worth by examining what nutrient credits would sell for, if nutrient credit trading was instituted in the Delta region. The likelihood of nutrient credit trading is increasing as governments increase their regulation of nutrient dischargers and dischargers look for low cost solutions to reducing nutrient flow. An efficient solution to nutrient reduction can theoretically be achieved by allowing businesses with different nutrient reduction costs to trade nutrient credits. Through such trading those who can achieve nutrient reductions at low cost, are paid to take on the burden of nutrient reductions by nutrient dischargers that would have to spend much more to reduce nutrients. Since the costs of nutrient reduction may vary greatly between treatment plants and as a result of changing land uses the opportunities to increase nutrient reduction at a lower costs can be significant with nutrient trading. Under such a trading system taking land out of crop production that results in nutrient discharges to nearby water bodies would be a valid way of generating marketable nutrient credits.

A recent study (Faeth 2000) evaluated the feasibility of phosphorus credit trading in the Upper Mississippi River Basin and developed a range of values that could be applied to regions with heterogeneity in phosphorus reduction costs. Faeth evaluated the costs of reducing a pound of phosphorus in three watersheds of the Upper Mississippi and found that the costs varied considerably, both between treatment plants and between farms and treatment plants. Using a scenario of a 1 ppm goal at all treatment plants, he found that costs averaged about 10-24 $/lb for treatment plants, but only 6-16 $/lb for farms. By allowing free trade under various regulatory scenarios, average costs were reduced to 2-7 $/lb. with an average cost of $4/lb. This cost estimate includes supplemental government money paid to farmers to implement nutrient management practices. Without government subsidies, the cost per pound would be higher. At this dollar value, the 2.6 million acres of marginal farmland converted to wetlands could be worth $27 million in phosphorus credits.

While the Faeth study estimated costs of phosphorus removal, a similar study examined the costs of nitrogen removal and the value of nitrogen credits (where available) from a variety of US locations (Doering et al. 1999). In the Mississippi Delta, the authors calculated weighted average point source treatment costs to be 24 $/lb and the cost of a credit to achieve nutrient goals from trading between treatment plants and farms (or a marginal credit) was estimated to be

[12] These numbers are based on assuming all reforested land came from the Lower Mississippi River Basin as described in Goolsby et al. This is meant only to be a back of the envelope type of calculation for comparison with the Yazoo figures. Forested wetlands can and do release nitrogen and phosphorus, however, under conditions typical in the Delta, they have the potential to remove large quantities of these nutrients from runoff.

41.92 $/lb. These estimates were based on a detailed analysis of costs of treatment, nitrogen discharge rates, and available farmland by region. They did not include government subsidies to farmers, which might lower the cost of a nitrogen credit.

If we assume each pound of nitrogen removed is worth $24 on average, then 2.6 million acres of created wetland would be worth over $650 million in nitrogen credits under no harvest and potentially half that or $325 million under the cottonwood scenario.

Reduced Flood Damage

Reforestation in riparian zones may affect flood levels in several ways. First, the higher evapotranspiration rates of trees compared to soybeans would tend to dry the soil and remove water prior to flooding, allowing more floodwater to be retained. Also, forest floor litter and increased organic matter in the soil would be expected to increase the infiltration of water into the soil and slow its movement to the river (Dunne and Leopold 1978).

Increase in Carbon Sequestration

Evidence that the buildup of greenhouse gases is contributing to global warming is now overwhelming. One of the greatest environmental challenges facing policy makers everywhere is determining how to reduce the buildup of these gases, especially atmospheric carbon. Reducing carbon emissions will become expensive, but forests sequester significant amounts of carbon and reforesting farmland has been recognized as a potential way to offset the contribution of carbon emissions to the overall pool of atmospheric carbon. As a result of the 1998 Kyoto Protocol, or subsequent agreements, it is widely expected that markets will emerge for carbon credits, and that landowners that reforest their land will be able to earn income by selling carbon sequestration credits to carbon emitting industries.

Although these markets have not emerged yet, a recent deal in the Delta region involves an energy utility (Illanova) paying $12,00,000 to a private company (Environmental Synergy) to reforest 100,000 acres of publicly owned land in return for prospective carbon credits. This provides evidence of the potential for the reforestation of private land in the Delta region to provide carbon-related benefits and a new source of income for landowners.

The criteria that international carbon negotiators and national resource agencies are discussing for scoring carbon sequestration credits include not only expected increases in rates of carbon sequestration, but other ancillary environmental benefits and costs. Previous sections identify the habitat and water quality benefits associated with reforesting farmland in the Delta region. In this section, we summarize the potential for this reforestation to sequester carbon, and assess the potential for private landowners to earn income by selling carbon sequestration credits that result.

Methods

We developed models for carbon sequestration that were specific to the tree species identified in each reforestation scenario. We also tailored these models to the dominant soil

types on the lands identified as marginal farmland. Values for expected carbon stocks, the form of the tree growth equations for various tree species, and site qualities were derived from recent literature sources (Shabman and Zepp 2000, Amacher et al. 1997, Birdsey personal comm., Birdsey 1996, Row 1996, Mitsch and Gosselink 1993, STATSGO data base), previous models we have developed (King et al. 1999), and discussions with knowledgeable staff of federal agencies involved in carbon research.

We assumed linear accumulation of carbon in soil, litter and debris, and cottonwood and nuttall oak standing stock biomass up to a threshold value. The growth rate for mixed species in bottomland hardwood with no harvest was modeled with a logistic (s-curve) model (King et al. 1999). All models assumed some level of management and site preparation.

Initial soil values were based on data in the USDA STATSGO database (i.e. bulk density, %organic matter, soil depth). Maximum values were developed from measures of standing stocks for various scenarios. The soils were assumed to be greatly depleted in organic matter, so that soils required many years to reach a steady state at which increases in carbon sequestration would stop.

Cottonwood proved to be an unusual species in its ability to grow quickly, to resprout from cut trunks, and to leave little debris behind at harvest (Amacher et al 1997 and Russell (personal comm.). As a result we made novel assumptions about the carbon dynamics following harvest. Growth rates during the first 10 years were 4 times that of traditional pine species on similar sites based on data provided by Birdsey (personal comm.). Therefore, we also assumed that carbon "leaked" from the system for only 1/4 as long as in a natural pine site (based on data from Birdsey.1996). Since site preparation after harvest is minimal, we assumed only a 3-year decline in soil carbon (5%/yr) and litter (20%/yr) after the initial litter increase at harvest. We further assumed tree carbon harvest rates increased a few percent each year until tree growth rates were 15% above initial values during the fifth rotation cycle, based on Amacher et al.'s (1997) reporting that observed tree production was 10-20% of forest inventory values on restored farmland.

For the nuttall oak harvest, we assumed a more traditional loss of 20% loss of soil carbon by age 10 (Birdsey 1996). Debris following harvest was assumed to increase a net of 1 MT/acre before losses began. Measures taken to reduce disruption at harvest could lead to less leakage of carbon from the soil. The growth model before harvest was drawn from Shabman and Zepp (2000).

Results[13]

Our evaluation of carbon sequestration rates and stock values demonstrated that carbon sequestration varied dramatically between reforestation scenarios. Standing stock of carbon at year 70 of each scenario ranged from 34.7 MT/acre for the cottonwood scenario to 56.3 for the bottomland hardwood, no harvest scenario. Since the oak had not been harvested yet, its carbon

[13] The numbers representing rates of carbon sequestration in this section are expressed in metric tons per acre (MT/acre). Each ton of carbon sequestered is equivalent to a reduction of 3.667 tons of atmospheric carbon dioxide. This is important if one is using these numbers to estimate the potential market value of carbon emission credits that landowners may earn from reforestation.

was virtually the same as the no harvest scenario and the cottonwood-oak interplant scenario had an intermediate value of 47.2 (Table 15).

We have calculated rates of carbon storage with and without harvest years included (Tables 16 and 17). In the unharvested system, carbon sequestration rates peak in the 30-40th years of growth. In the oak with 80-year rotation harvests, carbon sequestration peaks shortly after the second thinning in year 55. Cottonwood carbon sequestration rates peaked during the 5th rotation and cottonwood – oak interplant during the 4th cottonwood rotation (after year 40).

We have not made any assumptions about the carbon retained in wood or paper products over the lifetime of the analysis, which would affect the net C sequestration dramatically. If we assume the cottonwood is being used to produce paper only 55% of the original carbon is likely to be retained in the final product, and after 10 years, less than 10% of the harvested carbon is likely to be sequestered (Row and Phelps 1996). It may be more realistic, therefore, to examine only the carbon retained in soil and litter for the short rotation scenarios.

The carbon stocks for each scenario (Figures 13, 14, 15 and16) show how the C stocks vary over the life of the scenario. Sharp declines in tree carbon stocks mark harvest times, but this drop in carbon in the standing stock of trees is partially offset by increases in litter carbon.

Actual C credit markets are still years away. When they begin, the price of C sequestration credits will depend primarily on the supply and demand of C emission credits. Models that predict C credit trading are very imprecise, but the most reliable ones forecast prices in the range of $5 to $150 per ton of carbon. Most analysts are using a price of $15 per ton for assessing potential costs and revenues associated with C credit trading.

Figure 17 displays the stream of expected revenues from C credits earned by reforesting cropland in the Mississippi Delta based on the C sequestration rates described above and C credit prices of $10, $15, and $25 per tC. At a price of $15 per tC and annual sequestration rates of 1 to 2 tC per acre after ten years, the annual accrual of C credit values is around $15 to $30 per acre.

5.3. Benefit Summary

We considered many types of benefits that might result from 100% reforestation of the marginal farmland we identified direct returns to the landowner and public goods in terms of improved condition of land and water resources. A summary of benefits from switching all 1.7 million acres of marginal soybean farms to forest is shown in Table 12. The benefits that we were able to quantify and distinguish to some degree between forest type scenarios included: financial returns from selling wood products, net reduction in sediment export from the land, net reduction in herbicides applications and herbicide quantity released to the environment, net reduction in nitrogen and phosphorus reaching the Mississippi, generalized habitat benefits, change in the core or interior area of forest which reflects an increase in rare habitat for terrestrial species, and the net increase in carbon sequestered by the system.

It is difficult to compare the advantages of reducing herbicide and nutrient flow to the Mississippi system. However, we have good reason to suspect that nitrogen is currently having a significant adverse impact on the Gulf of Mexico, its aquatic resources, and its commercial

fisheries (Goolsby et al., 1999, CAST 1999) so there are demonstrated environmental and economic benefits from nitrogen reduction. The expected maximum reduction of 9.7-18 million pounds of nitrogen entering the Gulf would represent a noticeable 4-8% reduction in nutrient flux from the Lower Mississippi River Basin (as defined by Goolsby et al. 1999). Whether the environmental and economic payoffs from reducing nutrient loading to the Gulf by this amount are large or small depends on threshold effects that are not fully understood. It is possible, for example, that the hypoxic conditions in the Gulf may be reduced by only slightly reducing rates of nutrient inputs.

5.3.1. Scenario Comparison

Although we did not always have adequate information to distinguish likely effects between tree planting scenarios, in the cases where we did more detailed modeling, we found interesting differences in scenarios. Financial returns varied considerably. Under the 4% discount rate, the cottonwood scenario scored only $1.71/acre/year in annual equivalent value as opposed to the highest return of $6.55/acre/year for seeded nuttall oak. The relative financial gains of the different scenarios varied under the 7% discount rate. Seeded nuttall oak achieved the lowest losses (best financial return), but the all cottonwood scenario ranked as the next best solution (Table 9). The seeded nuttall oak shows greater returns than the nuttall oak due to lower establishment costs.

For carbon sequestration, the highest sequestration was found in the bottomland hardwood no-harvest scenario. However, the nuttall oak scenario produced similar carbon sequestration at year 70, just before the first harvest. The cottonwood/oak interplant scenario achieved a carbon sequestration level of roughly 80% of the no-harvest scenario. And finally, we found that the all cottonwood scenario resulted in an overall reduction of 40% carbon relative to the no-harvest scenario (Figures 13, 14, 15 and 16).

In terms of sediment and nitrogen reduction, we assumed that the nuttall oak and natural reforestation scenarios would be largely equivalent over a 70-year period given the long rotation times of the nuttall oak. Based on soil carbon comparisons, we created a rough estimate of how nutrient and sediment sequestration might differ with the frequent harvesting of the cottonwood. Since soil carbon accumulation in the all-cottonwood scenario was roughly half that of the bottomland hardwood no-harvest scenario, we assumed sediment and nitrogen retention were also half of the no-harvest scenario for lack of better information. Sediment and nitrogen differ from carbon in their mobility; thus, this is only a crude estimate.

6. Conclusions

6.1. Quantity of Marginal Farmland

We estimate that roughly 2.6 million acres of marginal farmland is available for reforestation in the Mississippi Delta, which are about 7% of the 3-state Delta land area. Maps of deforestation between the 1950s and the 1970s were used to determine the probable location and extent of marginal farmland. Other estimates based on STATSGO data provided lower estimates and are likely to be underestimates of marginal farmland due to data accuracy issues.

All of the marginal farmland acreage estimates provided by our analysis required assumptions that put our results in the category of first-approximations. The best available data were not ideal for this analysis, which required us to evaluate and compare results from analyzing three different sets of information. The two data sets yielding lower estimates of marginal farmland had greater sources of error than the data used in the deforestation calculation, so we feel the higher number based on the later is the most accurate. For our estimate of marginal farmland from the deforestation data, we used only the portion of deforested area that was mapped in the 1990s as soybean farms and was not deforested area shown in any other land use. Since some of the marginal farmland is abandoned or may not have been farmed in any given year when images were taken, our choice will tend to lead to a conservative estimate of marginal farmland.

6.2. Benefits from Reforestation

We found that significant benefits would be derived from reforesting marginal farmland in the Delta, although many of our calculations are rough estimates of the specific changes that may occur. We considered financial and environmental benefits from 4 scenarios of reforestation plans that are shown in Table 12. Our benefit calculations assume that the entire 1.7 million acre area of marginal farmland would be reforested.

The financial benefits from switching to tree plantations from soybeans are small, although under the best conditions (4% discount rate, seeded nuttall oak plantation) they reach an average net financial return as high as $5.34/acre/year ($6.55 - $1.21 from Tables 10 and 4) from the sale of wood products alone. Other income from selling hunting licenses, for example, is not included in this figure. Under the 7% discount rate, net financial returns from switching to tree plantations were as low as -$5.96. However, none of these figures considered potential losses incurred under soybean farming as a result of changes in federal farm subsidy programs or long-term forecasts of international markets.

While the direct financial benefits of reforestation to private landowners were modest (or negative), the off-site public benefits associated with water quality, human health and terrestrial and aquatic habitats are significant. These stem from increases in the quality and diversity of terrestrial ecosystems and the prevention of nitrogen, sediment, herbicides, and other contaminants from reaching the River and Gulf. Further, the carbon that would be sequestered in restored wetlands would help offset the effects of deforestation and fossil fuel use on the buildup of greenhouse gases and global warming. The special characteristics of the soil and plants in bottomland hardwood forests give them the capacity to sequester relatively large amounts of nutrients, sediments, toxins and carbon. Their position adjacent to streams gives them a valuable advantage in protecting aquatic resources since they can prevent runoff constituents from entering the streams and reaching other water bodies. Denitrification commonly occurs in these types of wetlands where large amounts of nitrogen, phosphorus and sediments are typically trapped. Plant productivity is also high because plants are rarely water limited, allowing large amounts of carbon to be trapped in plant matter.

One of the most significant effects of the reforestation is that it would increase the proportion of forested land (based on reforestation of land in soybean only) to 17% in the upper Delta region, and 21 % in the lower Delta region (Section 5.2.1). A natural land cover of 25% is

thought to be an important threshold for maintaining certain wildlife species and water quality. Increasing the forested area in these areas by converting economically marginal cropland to forests would bring more sub-basins within both regions above this threshold value. This would increase habitat range for species, leading to potential increases in species survival rates and population levels. It would also improve water quality in small streams that should be expected to support more diverse aquatic ecosystems (Allan et al. 1997, Boward and Hurd 1996, Richards et al. 1996, Richards and Minshall 1992, Roth et al. 1996).

It is important to note that there would be a lag period between the time of reforestation and many of the environmental benefits described above. The response in the nitrogen content of the surface or ground water, for example, would depend on the pool of nitrogen already present in the basin (Goolsby et al. 1999). These lag effects highlight the fact that programs and policies aimed at improving problems related to habitat loss, species survival, excess nutrients, and climate change need to be put in place well in advance of critical conditions. Based on our analysis it seems that reforesting economically marginal cropland is a relatively low cost strategy for addressing many environmental problems that will be more difficult and more costly to address in any other way.

Since our ability to assign dollar-based measures of value to the many ecosystem services that would result from large-scale reforestation of marginal cropland in the Delta area is limited, it is not possible for us to assert, based on our analysis, that such a switch would put this land into its highest and best use. However, we believe our research provides evidence that this may be the case. Further analysis that emphasizes the increasing scarcity of environmental services, the increasing glut of soybeans on world markets, and the expected decline in farm subsidies could provide additional evidence that the value of this land in wetland forests exceeds its value in cropland.

Summary of Reforestation Benefits

In summary, reforesting economically marginal cropland in the Delta will result in a mix of commercial, recreational, and environmental benefits as follows:

Forest Products Benefits
- Timber Production
- Bioenergy Production

Recreational Benefits
- Hunting Rights
- Fishing Rights
- Other Recreational

Environmental Benefits
- Increased carbon sequestration
- Reduced nutrient deliveries
- Reduced sediment deliveries
- Reduced contaminant deliveries
- Improved terrestrial and aquatic habitat values
- Improved biodiversity support

The dollar value of some of these benefits are reflected in markets, and can be captured by the landowner as income (e.g., timber and hunting rights). Other benefits accrue to the general public, are not reflected in any market transactions, and result in landowner income only by way of government programs that provide "green payments" (e.g., CRP) or allow environmental credit trading (e.g., carbon and nutrient credit trading systems). Reforestation strategies that favor one category of benefits typically result in fewer benefits in other categories (e.g., habitat values vs. timber values).

Previous sections present dollar estimates of some types of benefits, and describe what is known about assigning dollar-based measures of value to others. Markets for hunting rights, for example, peg their value at roughly $10 to $30 per acre. There are no "official" carbon credit trading systems in place to establish the economic value of carbon sequestration. However, there have been some unofficial carbon trades in the Delta region, and most forecasting models are predicting that when carbon trading commences the likely market price will be around $15 per ton of Carbon. Similarly, there are no nutrient credit trading systems in place in the Delta, but there are several nutrient trading systems operating elsewhere in the Mississippi River watershed which estimate the market value of phosphorus and nitrogen reductions $4-$24 per pound on average. We view these as useful leading indicators of the economic value of some environmental services that will result from reforestation, and as possible leading indicators of the income landowners may earn in the future as a result of reforesting.

Table 18 provides a summary of the potential economic benefits from reforesting 25%, 50%, 75% and 100% of the 2.6 million acres of economically marginal cropland in the Delta area. Some of the dollar benefits provided are based on actual market observations (e.g., market value of hunting rights). Others are based on leading indicators of the potential market value of environmental "credits, if and when programs evolve that allow environmental credit trading. Table 19 provides a simple framework (an Excel spreadsheet) for further developing and refining estimates of public benefits and potential landowner revenues from reforestation as environmental markets evolve and establish actual market values.

Attachment A describes the approach we used to determine the potential market value of increased carbon sequestration that would result from reforesting economically marginal cropland in the Delta. Similar approaches could be used to establish: a) the net increase in other environmental services that would result from reforestation, b) their overall (social) economic value; and c) their potential financial value to landowners.

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December 11, 2000

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Re: Comments on draft Yazoo Backwater Area Reformulation Report

Dear Colonel Crear:

The Wildlife Management Institute (WMI) appreciates this opportunity to provide our comments on the U.S. Army Corps of Engineer's (Corps) draft Yazoo Backwater Area (YBA) Reformulation Report. These written comments are in addition to WMI's verbal comments provided at the Corps' November 11, 2000 public meeting in Rolling Fork, Mississippi.

Although WMI recognizes and appreciates the Corps' gesture toward reforesting some marginal cropland, we nonetheless believe the Corps' proposal overall is an expensive, short-sighted, obsolete and cosmetic treatment that solves no long-term problems and, in fact, is likely to make some problems worse in the long term. For such a simple project, the fundamental issues and the myriad problems with the proposal are exceedingly complex. WMI concludes that the proposed reformulation:

1. Does not even state the Corps' objectives for the project;
2. Is vintage, state-of-the-art 1941 vision and technology;
3. Sets the stage for even greater damages from future severe flood events;
4. Did not seriously evaluate non-structural alternatives;
5. Would eliminate or reduce wetland hydrology on some one-quarter million acres;
6. The project places YBA farmers at potential risk of losing farm program benefits;
7. Will promote agricultural intensification rather than reduce it;
8. Will induce clearing and farming of additional bottomland hardwood wetlands;
9. Will provide artificial economic benefits at taxpayers' expense;
10. Proposes a nonstructural reforestation feature that is infeasible and unimplementable;
11. Will impede reforestation rather than foster it;
12. Works at cross purposes with current U.S. agriculture cropland retirement policy; and
13. Is so permeated with inconsistent, inaccurate or misleading data as to lack credibility.

WMI's entire opinion of this proposal can be summed up with the observation that the Corps' proposal brings a 1941 solution to a 21st-century challenge. The Corps had a prime opportunity to demonstrate to the American people that the agency is serious about its recent ecosystem restoration awakening and, instead, dropped the ball. The recommended plan merely continues the same obsolete incremental-flood-control-for-agriculture measures that have failed the Delta and its people for a century. In so doing, it perpetuates and exacerbates the track record of unsustainable over-development and incompatible uses of the Mississippi River floodplain. WMI believes strongly that this plan would be a poor investment of a vast amount of public money.

1. The reformulation does not clearly state the Corps' objectives for the project.

Instead, the report substitutes plenty of generic Congressional authorizing language, Office of Management and Budget (OMB) study directives, and after-the-fact projected accomplishments. With no *a priori* defined end points of its own to strive for, it is little wonder the Corps could not muster enough long-range vision to devise a sound, sustainable proposal. With no objectives to meet, the proposal cannot possibly fail to meet its objectives. Likewise, with no stated project objectives against which to evaluate the proposal, proponents and critics, alike, are left in the dark about exactly what the Corps is attempting to achieve. Stakeholders consequently are relegated in many cases to debating apples and oranges. One of the first essential steps of planning is to develop the objectives that will catalyze, guide and validate all subsequent efforts.

What are the Corps' specific objectives for the project? Is it an objective to eliminate all flooding in the YBA? If so, much bigger levees and pumps will be needed. Or is it an objective to simply provide only a small increment of flood protection, that will provide false hopes and encourage further high-rick encroachment into the floodplain? Is it an objective to restore the dynamic floodplain ecosystem in balance with sustainable uses of the land? Is an objective to completely protect urban areas, or to provide incremental stimulus for further agricultural intensification, expansion and subsidy-based profitability? It appears to WMI that by declining to state clear objectives, the Corps did not just lower the bar; it removed the bar. Thus, the Corps apparently freed itself to develop whatever kind of plan it desired. *WMI recommends the Corps go back to the beginning of its planning process, by clearly stating meaningful, specific objectives for the YBA reformulation. If the Corps does, indeed, already have such objectives, they should be provided to the public, to better enable informed evaluation.*

2. The YBA Reformulation demonstrates little more than vintage 1941 vision and technology.

WMI is disappointed that the Corps demonstrates that it has learned little in 60 years about floodplain management, flood damage reduction and ecosystem restoration. Even as the nation finally is coming to terms with the long-term need to reduce alteration, encroachment and vulnerable land uses in floodplains, the Corps proposes a project that would actually promote these inappropriate activities. Further, even as the Corps professes that part of its mission is to promote ecosystem restoration, it proposes a project would have the effect of inhibiting wetland reforestation. Finally, even though the Corps claims to rely on a combination of non-structural and structural flood control measures, its non-structural proposal apparently contains so little substance as to be ineffectual.

The Corps chose to take the easy path, the one most trodden--it opted to build a huge pump to "control" floods. By the year 2000, the Corps should be able to do better. Even in 1941, Congress (House Report 4911) and the Corps (House Document 359, Flood Control Act of 1941) both understood the need for dedicated flood storage areas below the five-year floodplain, or the 90-foot contour. The Corps needs to once again acknowledge the unavoidable reality that not all land is suitable for agricultural production or urban development. The Corps already has played the leading role in irreversibly altering the Mississippi Alluvial Valley (MAV) far beyond the point of ecological, economic and societal sustainability. That approach has taken the Delta headlong into the social, economic and environmental dilemma that plagues it today, to no one's satisfaction. Another large project of the same kind will solve none of these long-term social, economic and environmental problems, but instead will put the people of the Delta and the nation deeper into a predicament that will be harder to get out of later.

How much further will the Corps insist on modifying the MAV before finally figuring out a better way? As demonstrated by the multi-billion Everglades restoration project approved this year by Congress, the rest of the country has learned some big lessons. The Vicksburg District has an opportunity to demonstrate that it, too, has learned some big lessons about long-term, sustainable management of floodplains. *WMI recommends that the Corps re-think its entire approach to the YBA reformulation, with the intent to incorporate long-term vision and sustainable approaches that better balance floodplain ecosystem restoration and societal sustainability.*

3. The proposed Reformulation sets the stage for even greater damages from future severe flood events.

In their eagerness to promote the project, the proponents have created the perception that the pumps will end flooding problems. Based on many comments at the November 11th public meeting in Rolling Fork, MS, many residents of the YBA have embraced that perception, with high hopes. The project-induced flood relief, they believe, will ignite a significant injection of corporate and government financial investment with a concurrent substantial economic stimulus. However, the reality is that the proposal will not make one single structure in the YBA safe and free from periodic flooding, especially during severe flood events. *All 630,000 acres* in the YBA still will be subject to 100-year flood events. Even though the Corps acknowledges and depicts this fact in its plan, the public rhetoric implies much more protection. Every new structure, every new development, and every new investment into the YBA resulting from the false hopes instilled by the proposed project is one more structure, development and investment that inevitably *will* be subjected to damaging floodwaters. Consequently, the future burden on U.S. taxpayers to continue bailing out flood-damaged residences and other investments will likely increase.

WMI reminds the Corps that it is obligated to ensure YBA residents understand precisely how much flood control the proposal will and will not provide.

4. The Corps did not seriously consider any viable nonstructural alternative.

The primary purpose of a *bona fide* nonstructural alternative should be flood damage reduction rather than flood control. Nonstructural flood control basically is the act of getting people out of harm's way, rather than vice versa. At the heart of a nonstructural approach is the acknowledgement

that some land is unsuited to human development and occupation, and should be dedicated to floodwater storage and natural ecological functions. The second step is to explicitly identify the land that is to be dedicated to floodwater storage, and for which flood control will not be provided. The third step in nonstructural flood damage reduction should be--on a voluntary basis--to help move flood damage-vulnerable human activities out of those most flood-prone lands, while facilitating the conversion of those lands to less intensive uses, such as reforestation. From that point on, human flood-vulnerable activities in the dedicated sump would be conducted at their own risk.

For the following reasons, WMI contends the Corps did not seriously attempt to devise a viable nonstructural alternative.

- The Corps did not attempt the above logical sequence of essential steps for a bona fide nonstructural flood damage reduction plan.

- The Corps proposed using expensive, unnecessary actions to quickly eliminate as economically infeasible virtually all nonstructural options in the second (Table 7) and third (Table 8) arrays of alternatives.

    - WMI contends that there is no flood damage reduction benefit to be gained from buying woodland preservation easements on all existing woodlands below 100.3 feet in the project area. Woodlands are a low-intensity land use that is not substantially vulnerable to flooding. Neither are remaining forested areas significantly threatened with clearing, under current conditions. As long as the remaining woodlands are subject to periodic flooding, and as long as the several other economic and policy constraints against clearing remain in place, significant additional conversion to cropland is highly unlikely. The Corps, itself, acknowledges (par. 103) that significant additional land clearing is unlikely. Nevertheless, the Corps then proposed spending $217 million to preserve remaining woodlands with easements. WMI further notes, with interest, that *after* determining the expense of woodland easements rendered the nonstructural options economically infeasible, the Corps once again reiterates the uselessness of purchasing woodland easements (par. 152).

    - Likewise, there is little flood damage reduction benefit to be gained from purchasing flowage easements on wooded and cleared land below 80 feet ($18.3 million) or 85 feet ($36.2 million). Woodlands are not significantly vulnerable to periodic floods. Further, YBA lands were cleared and currently are being used with the full knowledge that floods always have occurred there periodically during winter and early spring. Because these floods are not being caused by the government, there is no economic justification for this project expense. WMI notes that the Corps, too, reached this same conclusion (par. 151), but--as with woodland easements--not until *after* it used this expense to render nonstructural options economically infeasible, and eliminate most nonstructural alternatives from further consideration.

- The Corps used inflated costs for acquiring permanent easements on and reforesting cleared lands in the project area. The U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) has a decade of experience and proven success working with willing sellers to purchase permanent easements on and reforest marginal, wet cropland in the

MAV for only $1,000 per acre average. The Corps would charge $1,439 per acre. As with the other two types of easements, the supposed high cost was the basis upon which most nonstructural alternatives were eliminated from further consideration. *WMI recommends that the Corps utilize the superior expertise, experience and cost-efficiency of NRCS to implement the easement and reforestation features of the project.*

The result of these needless and inflated proposed expenses is that virtually all the nonstructural alternatives were quickly rejected from further consideration. WMI objects to this dubious procedure for rejecting nonstructural alternatives. *WMI strongly recommends that the Corps step back and conduct a serious analysis of bona fide nonstructural alternatives consistent with our comments here, as well as with the FWS's recommendations.*

5. The Corps' proposal apparently would eliminate or reduce wetland hydrology on as many as 269,525 acres of jurisdictional wetlands.

This acreage, estimated by the U.S. Environmental Protection Agency, is a full degree of magnitude more than the 23,200 acres projected by the Corps to be affected between 87 and 88.5 feet. WMI strongly objects to such an extraordinary level of prospective wetland impacts from any source, but especially from the federal government.

Given the systematic, geographic information system-based analysis of wetland extent conducted by the EPA, the burden now is on the Corps to validate its claim of much lesser wetland impact. Where are the current wetlands and farmed wetlands in the project area? Where are the wetlands that will be affected? What is the basis for the Corps estimate of 23,200 acres of wetland impacts? What is the severity of those impacts? On how many acres will wetland hydrology and jurisdictional status be eliminated? On how many acres will wetland hydrology be reduced? How much on-site verification has the Corps conducted to support its assertion?

If the EPA estimate is even remotely in the ballpark, the Corps' estimate of needed mitigation is grossly inaccurate and completely unacceptable. Further, this possible level of impacts would be further evidence of the Reformulation's noncompliance with the OMB study directives. Especially when combined with the highly unlikely prospect of 62,500 acres of reforestation in the YBA, the Corps cannot credibly claim that impacts to more than 200,000 acres of wetlands qualifies as "reduced adverse impacts on the environment." *WMI strongly advises the Corps to account for this unacceptable disparity in wetland impact projections, and to modify both the project's impacts and the mitigation plan to* ***guarantee*** *no net loss of wetland acreage and functions in the YBA.*

6. The project places YBA farmers at potential risk of losing farm program benefits.

WMI believes the construction and operation of the proposed pumping station constitutes the act of converting wetland and of making production of an agricultural commodity possible, or more possible, on converted wetland. Thus, WMI contends that this project technically could constitute a massive violation of the Wetland Conservation ("Swampbuster") provision of the 1985 Food Security Act, as amended, for those farmers above the 87-foot contour.

WMI rejects the premise that this project is exempted from Swampbuster, simply because the wetland is being converted by the Corps, which is acting primarily on behalf of YBA farmers. WMI further believes this wetland-converting project does not meet the third-party statutory exemption under Swampbuster, since the project is sponsored by and is being done on behalf of the Board of Mississippi Levee Commissioners for the Mississippi Levee District, which is a legally constituted body of area farmers, similar to a drainage district. It also cannot be credibly argued that the conversions have a minimal effect on YBA wetlands, while the proposed mitigation for the impacts has been challenged by the EPA as being grossly inadequate. Likewise, it possibly can be argued that the entire YBA Reformulation qualifies under Swampbuster's "scheme or device" clause that would re-assert authority over actions that were taken to try to avoid compliance. *Consequently, WMI suspects that, if the pumps are constructed and operated below approximately the 88.5-foot contour, all YBA farmers below that level could be vulnerable to a legal challenge under Swampbuster, putting them at risk of losing their farm program benefits.*

7. This proposed reformulation is certain to *promote* agricultural intensification.

WMI contends that the overriding purpose of this entire project is to *enable* agricultural intensification, and that it would be successful, in the short term. In fact, the Corps explicitly acknowledges and assesses this reality (p. 7-101, 115, Table 7-54), to the point of entitling a chapter of *Appendix 7: Economic Analysis* as "INTENSIFICATION BENEFITS, AGRICULTURAL CROPS." Furthermore, the Corps actually attributes 68.9% of the structural feature's projected economic benefits to *increased* agricultural crop productivity and intensification (Table 7-59). This induced response by farmers will directly contradict both the OMB study directive to reduce agricultural intensification, as well as the Corps' premature claimed accomplishment of doing so.

The track record of American agriculture policy has combined with the modern history of the MAV to produce a repetitive, circular pattern whereby regional flood "control" is followed by intensified agriculture that is encouraged by false hopes of protection to encroach ever farther into flood-prone land. The mere promise of reduced flooding will fuel farmers' hopes of sustained maximized production. These hopes, in turn, will induce a willingness among landowners and farmers to increase their investments in the cropping operations by clearing more land and improving existing fields. This increased investment will logically and predictably lead to more intensive cropping efforts that will include additional field drainage, an expansion of double-cropping, and increased fertilizer and pesticide inputs.

Inevitably, this agricultural intensification will lead to expanded irrigation, increased groundwater withdrawals, widespread land leveling, and likely even new water diversion and distribution projects to replace the water the Corps and the U.S. taxpayers just spent hundreds of millions of dollars to remove. This over-reaching, unsustainable intensification inevitably will be followed by subsequent calls for yet more and better local flood control to protect vulnerable, newly cleared cropland. It is unreasonable and misleading and disingenuous for the Corps to claim that this situation will be any different from this proven track record throughout the MAV.

8. This proposal constitutes a "green light" for renewed landowner efforts to clear remaining tracts of bottomland hardwoods above the 87-foot contour.

WMI agrees with the Corps (par. 103 and 152) that it is unlikely that any further significant clearing of bottomland hardwoods would occur in the future *given current conditions*. However, this project would nullify several "current" conditions, thus destabilizing the fragile equilibrium in the YBA among commodity prices; federal agriculture subsidies; risk of flood-induced crop losses; the Clean Water Act's Section 404 regulatory program; and the Swampbuster disincentive provision of the 1985 Food Security Act, as amended. This project not only would remove or reduce wetland hydrology from more than 200,000 acres, but also would render moot three of the five major factors currently interacting to inhibit further wetland conversions. The perceived flood risk would be reduced or eliminated; Section 404 would no longer apply to much of the land, since wetland hydrology was removed; and conversions likewise probably would be exempt from Swampbuster.

Every new or improved flood control project upsets this equilibrium, providing enough false hopes to stimulate further encroachment of agriculture into lands that are fundamentally unsuited to cropping. The Secretary of Interior reported to Congress ("The Impact of Federal Programs on Wetlands: A Report to Congress by the Secretary of Interior, October 1988") on this well-documented pattern of drainage-induced agricultural development.

9. Much of the supposed economic gain from this project's agricultural intensification actually will come out of the pockets of U.S. taxpayers.

The U.S. has an excessive agriculture production capacity. In the 2000 crop year, for example, U.S. corn and soybean production set new records. Because domestic and foreign markets are and virtually always have been unable to absorb this country's high production levels, there exists a chronic, substantial surplus of agricultural commodities in the U.S. and the world, and farm prices perennially founder at long-term low levels. This perpetual oversupply is fostered by the agricultural policies of Congress and USDA. In response to the chronic low prices and excessive supplies, Congress and USDA have devised a complicated system of taxpayer-funded commodity subsidies, below-market loans, "disaster" relief, crop insurance and other forms of farm income supplements. Although the 1996 Freedom to Farm Act decoupled some farm program benefits from production and acreage bases, some programs--such as Loan Deficiency Payments--still are directly based upon production outputs. Collectively, these various taxpayer-funded subsidies and bailouts constitute an artificial economy for agriculture.

The proposed YBA Reformulation would exacerbate this chronically weak economic condition of American agriculture. The Corps' proposal would induce the intensification of farming on more than 300,000 acres of cropland, while enabling and encouraging the clearing of up to 115,000 acres of bottomland hardwoods remaining in private ownership in the project area. The last thing that farmers and the U.S. farm economy need is additional crop production capacity. WMI contends that the proposed YBA Reformulation will cause even greater economic hardship for farmers in the long run. The primary potential beneficiaries of further excess production capacity are the commodity processing industry and commodity exporters, both of whom thrive on low-cost, excessive supplies.

The end result, if this project is constructed, will be that U.S. taxpayers will have to pay repeatedly-- once to build the project, then again (and again, and again...) to underwrite the myriad

annual subsidies and bailouts to prop up the induced additional commodity production. In the end, all this public money will be spent for the sake of making even more of commodities that already are in excess supply, at the expense of the bottomland hardwood floodplain ecosystem.

10. The Corps' reforestation proposal appears to be fundamentally flawed and infeasible.

The FWS has exposed fundamental flaws in the Corps' proposed nonstructural feature, and has raised serious questions about the feasibility of implementing 62,500 acres of reforestation below the 87' contour. The Corps' lack of understanding about this feature is evident in its interchangeable use of various purposes for the reforestation feature--ecological restoration, reduced agricultural intensification, nonstructural flood control, and/or mitigation. The reforestation proposal's flaws are so basic and so pervasive that it appears to WMI to be designed to fail. Consider these points:

- Contrary to the Corps' proposal to achieve 62,500 acres of reforestation below the pump elevation, the FWS points out that only 9,091 acres of private cleared land even *exist* below the 87' contour. Although the Corps apparently intends to target the one-year floodplain, these two references are not synonymous.
- All the landowners above the 87' contour but still within the one-year floodplain will be encouraged to keep their land in cropping, and discouraged from agreeing to reforest. The false hopes given to them by the Corps that their land will be dried out enough to allow them to intensify their farming operation will greatly diminish the changes of success for achieving even a portion of the 62,500 acres.
- The Corps claims part of its purpose in reforestation is ecological restoration, yet it has made no credible attempt to design an ecologically functional restoration plan based on vital elevational, flood frequency and spatial criteria. The proposal is even written to allow the reforestation to occur outside the YBA, outside the state of Mississippi, or hardly at all. Merely planting trees at random across the Mississippi River Alluvial Valley does not constitute ecological restoration of the YBA.
- The Corps claims part of its reforestation purpose is to provide nonstructural flood control, yet it has not even done the basic analysis to determine and identify where such reforestation would be most beneficial in raising the damage-free elevation.
- The Corps claims it is going to rely on voluntary easements to achieve the reforestation, yet it is arbitrarily going to cease all efforts to secure the easements within one year of initial pump operation. At that point, the Corps proposes to abandon its attempts at ecological restoration, and revert to acquiring only enough land to meet minimum mitigation requirements. WMI concludes this half-hearted approach is intended to be little more than symbolic.
- The Corps claims its nonstructural feature will aid the threatened Louisiana black bear and the endangered shrub, pondberry. However, two fundamental failings of this proposal appear to nullify this worthy potential. The Corps does no credible spatial analysis to target its reforestation proposal to specific flood-event, elevational, or geographic locations that would optimize benefits to these listed species. Conversely, because this project would likely stimulate a resurgence of clearing of remaining bottomland hardwood forests in the YBA, it will cause more problems for these species than it will solve.

WMI insists on, and the public deserves, clear answers from the Corps in response to the FWS' analyses and questions regarding the apparent infeasibility of the nonstructural feature's 62,500 acres of reforestation. Further, WMI strongly recommends that the Corps start over in developing a credible nonstructural feature that is likely to provide meaningful benefits.

11. The Corps' reformulation would *impede* rather than achieve ecosystem restoration in the YBA basin.

Because the Corps incorrectly assumed that land use patterns and trends in the YBA would remain exactly the same for the next 50 years, they incorrectly assert that their reforestation would be a net gain above the "without-project conditions." In fact, however, land use patterns in the project area already are changing in fundamentally important ways that reflect the realities of flood-prone land that never should have been farmed. More than 50,000 acres of cleared, high-risk land have been reforested in the YBA since 1985. USDA's Conservation Reserve Program (CRP) and Wetlands Reserve Program (WRP) and have retired and reforested tens of thousands of acres of marginal cropland in the project area since 1985 and 1990, respectively. Specifically, USDA has enrolled 22,519 acres in the WRP and 7,826 acres in CRP *within just the two-year floodplain* of the project area. Given that this quantity of cropland retirement and reforestation has occurred in only the last 15 years, it is unreasonable to assume that land use trends will be frozen at current uses for the next 50 years. In fact, the FWS projects that some 43,432 acres of additional reforestation would occur in the YBA in the next 50 years *without* the project.

When the infeasibility of the Corps' proposed reforestation (see 8. above) is combined with the reality that land uses in the lower portions of the YBA already are moving away from cropping and into reforestation, WMI concurs with the FWS that the amount of reforestation that would occur with the proposed project is *less than* the amount that would occur without the project. *Consequently, WMI asserts that zero benefits should be attributed to the project-induced reforestation in all benefit:cost analyses.*

12. This proposal is fundamentally oriented at cross-purposes with current U.S. agriculture cropland retirement policy.

The U.S. Department of Agriculture is spending about $1.7 billion per year to *retire* about 34 million acres of surplus, marginal cropland--including flood-prone cropland--and establish permanent conserving covers. About 33 million acres of surplus, marginal cropland are enrolled in the Conservation Reserve Program, and about 1 million acres are in the Wetlands Reserve Program. WMI sees no rational basis for the Corps to spend $207 million of taxpayer money, plus an eternal $15 million maintenance fee, to counteract and undermine USDA by making more than 300,000 acres of marginal cropland slightly more productive and another 115,000 acres of marginal land susceptible to clearing.

WMI envisions a classic scenario of government ineptitude in which the Corps spends hundreds of millions of dollars to build this massive project to make more cropland available, after which USDA spends hundreds of millions more dollars to retire the unneeded cropland. These mutually negating actions of two federal agencies amounts to virtual folly. *WMI recommends that the*

YBA Reformulation be fundamentally revised to be compatible with the agriculture goals and current programs of USDA.

13. The myriad occurrences of inconsistent numbers, as well as confusing or misleading claims, throughout the Reformulation undermine its overall credibility.

Consider the following:

- Par. 101.: *"public use lands will continue to be at risk of flooding without a flood control project."* WMI asserts that reality is to the contrary. The public use lands within the project area are national wildlife refuges, state wildlife management areas and the Delta National Forest, all of which were acquired with taxpayers' and sportsmen's money precisely *because* those areas flood naturally and support viable bottomland hardwood habitats. There is no "risk of flooding" that needs to be addressed relative to public lands.
- The Corps' data on land uses by contour and flood frequency apparently are so inconsistent or poorly clarified, and so variable as to lack credibility and to cast doubt on all the data and analyses contained in the reformulation. Consider:
    - Par. 105, par. 7-52, and Table 7-3: The Corps claims in at least these three places that 231,450 agricultural acres are inundated on an average annual basis (one-year floodplain) in the YBA. Yet, in Table 7-1, the Corps cites only 79,000 acres of cleared land are present within the one-year floodplain. Indeed, in this table, there supposedly are only about 194,000 *total* acres in the one-year floodplain (excluding catfish farms). The FWS analysis indicates only 58,894 acres of private cleared land in the one-year floodplain.
    - In the two-year floodplain, the Corps variously claims there are 107,000 acres of agricultural land (e.g., par. 94); 136,000 acres of cleared land (Table 7-1); and 194,418 cleared acres (par. 7-52). Meanwhile, the FWS analysis indicates only 100,839 acres of cleared, private land in the two-year floodplain.
    - The Corps' recommended plan claims it will attempt to reforest 62,500 acres below the 87-foot contour line, yet the FWS analysis reveals there are only 9,091 acres total below the 87-foot contour even available to be reforested.

- Par. 101.: *"Lands successfully farmed for many years are at risk due to rising production costs and steady to decreasing commodity prices."* The problems cited are national problems for the entire farming economy, and have little or nothing to do with flooding in the YBA. Likewise, this project will do nothing to rectify either rising production costs or decreasing commodity prices. In fact, by making 300,000 acres of cropland more productive more reliably, and by exposing another 115,000 acres of bottomland hardwoods to being cleared and farmed, the project actually will *exacerbate* ongoing problems of commodity oversupply and depressed prices in the Delta and nationwide.

- The recommended plan supposedly will accomplish one of the following: "agricultural damages are reduced 39.4 percent." (Par. 216); or "a 71 percent reduction in agricultural flood damages...." (Par. 197), depending on which numbers one chooses to believe.

There is a better way.

Any set of solutions to the problems of the Yazoo Backwater Area is no more sound that its long-term viability. Any long-term solution must begin with the Corps, the residents, the farmers and the politicians coming to terms with some realities of the Mississippi River floodplain. The first reality is that flooding cannot and will not be "controlled" in the Yazoo Backwater Area. The second reality is that some land simply is not suited for agriculture, nor for urban or industrial development. Finally, people ultimately should be expected to accept responsibility for the risks they voluntarily accept when choosing to live, work or invest in the YBA.

Nonetheless, WMI does believe that it is appropriate for the federal government to provide assistance to residents and landowners of the YBA, for long-term solutions that reduce and manage flood damages. WMI endorses an approach that combines *bona fide* nonstructural flood damage reduction measures with precisely targeted structural measures that flood-proof the most developed urban areas. Such an approach would be built along the following lines:

1. A clear acknowledgement that the land below a certain level of flood frequency is unsuited for agriculture, urban development or industry, and should be dedicated to floodwater storage, ecosystem restoration and/or land uses that are not vulnerable to flooding. WMI suggests at least the two-year floodplain, up to possibly the five-year floodplain be so designated.

2. The precise areas of the designated flood-storage zone should be explicitly depicted geographically, for all to see and comprehend.

3. The government should help people who live, work or own land within the designated flood-storage zone to voluntarily evacuate or transition to flood-tolerant land uses. Anyone who knowingly refuses the government's offer of assistance would do so entirely at their own risk, and should be denied further government payments or subsidies. In the two-year floodplain, for example, all the private cleared land could be retired with perpetual easements and reforested by the Natural Resources Conservation Service for only $1,000 per acre, for a grand total of only $100 - 107 million.

4. The remaining $100 - 107 million of the Corps' proposed up-front costs could be used to provide structural or nonstructural flood-proofing protection for isolated individual structures, in combination with structural protection for precisely targeted, geographically limited areas that have been the most built up.

5. The Corps' proposed $15 million annual maintenance fee could instead be provided as an annual grant to help local communities make long-term adjustments to the fundamentally new economic challenges and opportunities. For example, if 107,000 acres of reforested land were added to the current 233,000 acres of forested land already in the YBA, the result could be 340,000 acres of bottomland hardwood ecosystem in close enough proximity to function as one ecological unit. This unique restored ecosystem could form the foundation for a vibrant, sustainable recreation-based economy. Stuttgart, Arkansas and the several towns in the vicinity of Arkansas' White River National Wildlife Refuge can attest to the very real and sustainable economic potential of such a vast, unique ecological attraction.

Conclusion

This proposal would cost $207 million up front, plus $15 million per year indefinitely, for a project that would solve no long-term problems, would not meet the directives set for it by OMB, would cause greater problems in the long term, and would actually impede ongoing ecosystem restoration efforts. In short, the Corps' proposal is poor public, fiscal, agricultural and natural resource policy. *WMI strongly advocates that the Corps' current Yazoo Backwater Area Reformulation proposal be withdrawn, and that a serious re-evaluation of bona fide, long-term nonstructural and carefully targeted structural measures be undertaken.*

Thank you for this opportunity to express these views.

Sincerely,

Donald F. McKenzie

Donald F. McKenzie
Field Representative

Cc: Senator Trent Lott
Senator Thad Cochran
Representative Benny Thompson
U.S. Fish and Wildlife Service Regional Director
Environmental Protection Agency Regional Administrator

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December 8, 2000

Colonel Robert Crear, Commander
Vicksburg District, US Army Corps of Engineers
ATTN: CEMVK-PP-PQ
4155 Clay Street
Vicksburg, MS 39183-3435

RE: Yazoo Backwater Area Project, Draft Reformulation Report

Dear Colonel Crear:

The National Wildlife Federation and Mississippi Wildlife Federation submit the following joint comments on the Draft Reformulation Report which includes the Main Report and Supplement No: 1 to the 1982 Yazoo Area Pump Project Final Environmental Impact Statement, September 2000 for the Yazoo Backwater Area Project (hereinafter collectively the Report). Because the Main Report is incorporated by reference into the EIS, our comments address both documents.

In addition to these comments, we concur with and incorporate by reference the comments submitted by Earthjustice Legal Defense Fund.

NWF is the nation's largest non-profit conservation organization, with more than 4 million members and supporters, 46 state affiliate organizations and eight regional offices. Among our members and supporters are many in Mississippi who live, work, and recreate in the Mississippi Delta, and many more throughout the Mississippi flyway who value the wildlife that live and winter here.

We have attached copies of letters from several other state organizations affiliated with NWF who in opposing this project have taken a rare step in taking a position on a matter outside their state borders. These are independent organizations and their comments should be considered as such.

NWF is strongly opposed to the Corps' recommended plan described in the Report. This expensive project, as currently proposed, would do great damage to the valuable natural resources of the area, dramatically changing the existing hydrology of the region and damaging important and increasingly rare bottomland and riverine ecosystems.

I. The Project Controverts the Law

A. Lack of Congressional Authorization for the Recommended Plan

Our concerns regarding the lack of authorization for the Corps' recommended plan were expressed in a March 20, 2000 letter written on behalf of NWF by Earthjustice Legal Defense Fund to Secretary Louis Caldera (copy attached for inclusion in the administrative record). These concerns remain. The Flood Control Act of 1941 authorized a plan to reduce backwater flooding in the Yazoo Backwater area by constructing a combination of drainage structures and pumping plants.[1] The Congressionally authorized plan carefully prescribes the scope of the projects that can be built. Projects are explicitly limited to those that will "prevent the sump level from exceeding 90 feet, mean Gulf level, at average intervals of less than 5 years."[2] Lands below the 90 foot elevation are to be "dedicated to sump storage." Thus, under the existing authorization, waters below the 90 foot elevation may not be pumped or otherwise drained.

The Corps's recommended plan, and indeed all of the alternatives that were seriously considered, exceed the project authorization. The recommended plan calls for pumping to 87 feet, well below the authorized 90 foot level. New Congressional authorization is required for any project that will drain lands below the 90 foot elevation. Without that new authorization, construction and operation of any project that drains lands below the 90 foot elevation is unauthorized.

B. NEPA Noncompliance

1. Numerous Omissions, and Discrepancies

The Report is seriously deficient in the amount, type and quality of information provided, particularly regarding environmental and hydrologic impacts. In many cases, notably in the hydrological analyses, missing information prevents the reader from being able to evaluate the Corps' statements regarding the effects of pump operation. The information presented also contains numerous discrepancies.

The hydrological models used by the Corps in the Report are critical to the calculation of the project's economic benefits and environmental impacts. NWF has identified numerous potentially fatal flaws and deficiencies in those models. For instance, flaws in the hydrological

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[1] 33 U.S.C § 702a-12(b).

[2] H.R. Doc. No. 359, 77th Congress, 1st Session, at 40 (1941)(March 7, 1941 Report of the Mississippi River Commission, also referred to as the Review Report on the Project for Flood Control of the Mississippi River in its Alluvial Valley, dated 7 March 1941.)

methods used by the Corps[3] have resulted in a severe undercounting of wetland impacts. In addition, a fundamental error is the apparent confusion of the 87 foot elevation with the 1 year floodplain.[4] The level at which the pump will be operated and at which water will be maintained is the basis for the calculation of economic and environmental impacts and benefits; therefore, it is critical that this target level be clearly defined, or a miscalculation of benefits and impacts results.

In addition, the Corps has stated that the pump trigger elevation for the recommended plan is 87 feet, but that some pumps may be turned on before stages reach elevation 87 feet, and that "refinements" to the pump operation trigger levels will be developed as part of the water control plan for the project.[5] The pump operation and its effects on the area's hydrology are the basis for calculating the project economic benefits and environmental impacts; therefore, a definitive pumping schedule must be developed before these analyses can be accurately performed.

The absence of a Fish & Wildlife Coordination Act (FWCA) report is extremely troubling, and renders the Report incomplete. Since the U.S. Fish and Wildlife Service (FWS) has expressed concerns about the project for a long time, and recently released additional comments detailing serious problems with the proposal, it is particularly disturbing that the Corps chose not to provide the public with the benefit of the Service's assessment of the project's fish and wildlife impacts in the FWCA report.

2. Failure to Adequately Evaluate Environmental Impacts

Both the FWS and the U.S. Environmental Protection Agency (EPA), agencies charged with the responsibility of protecting the nation's natural resources, have determined that the Corps' recommended plan does not satisfy the requirements of the National Environmental Policy Act (NEPA).

FWS states in its comments,

> "[W]e believe the Corps' document is inadequate and does not comply with the spirit and intent of the National Environmental Policy Act or the Implementing Regulations promulgated by the Council on Environmental Quality (CEQ).[6]

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[3] Technical Review of the Draft Reformulation Report, U.S. Environmental Protection Agency, November 2, 2000.

[4] U.S. Fish and Wildlife Service Summary Analysis of the Yazoo Backwater Area Reformulation Study.

[5] Yazoo Backwater Area Reformulation Report 6-39.

[6] USFWS Summary Analysis.

EPA in its review of the project has given the Report its lowest rating, Environmentally Unsatisfactory - Inadequate, and states that,

> "potential adverse environmental impacts are of sufficient magnitude that we believe the action must not proceed as currently described..."[7]

The Report does not adequately examine alternatives, such as one that could be developed under the Shabman/Zepp non-structural approach, that would avoid and minimize these impacts.

a. Wetlands and Water

The Report does not adequately assess project impacts to wetlands and other waters of the United States under Section 404 of the Clean Water Act, including Section 404(b)(1). EPA's hydrological analysis found that more than 200,000 acres of wetlands may be impacted, including some of the most valuable bottomland hardwoods in the region, raising concerns about significant degradation of the aquatic ecosystem.[8]

The Corps' failure to identify specific mitigation lands in the project area, especially when viewed together with the current backlog of unmet mitigation for other Corps projects in the Lower Mississippi River Basin (totaling in the thousands of acres), makes it highly unlikely that the mitigation offered in the Report will in fact be implemented successfully. The Report fails to demonstrate sufficiently compliance with the wetlands protection provisions of Section 404 and does not meet the informational requirements of Section 404(b)(1). However, based on the limited available data, the proposed alternative could not and would not satisfy the substantive requirements of Section 404(b)(1). Since the anticipated aquatic impacts would be largely avoidable with the implementation of a non-structural approach such as the one suggested by the Shabman study, these are particularly severe shortcomings in the Corps' analysis.

b. Fish and Wildlife Resources

It is problematic for citizens to analyze the report and environmental impacts of the project–and comment on those aspects of the project--without the benefit of the technical expertise of the federal agency whose primary function it is to protect natural resources. As both a procedural and substantive matter, the lack of inclusion of a Fish & Wildlife Coordination Act Report is a serious deficiency in this Report. Its absence renders the Report incomplete and constitutes noncompliance with the National Environmental Policy Act and Fish & Wildlife Coordination Act.

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[7] November 3, 2000, Letter to Corps from John H. Hankinson, Jr., Regional Administrator, US Environmental Protection Agency.

[8] EPA Technical Review.

3. Failure to Adequately Evaluate Cumulative Impacts

The Corps has failed by a large margin to perform an adequate analysis of the cumulative environmental impacts of this project. Limitation of the considered impact zone to the backwater area fails to take into account the extensive draining and habitat alteration accomplished by the Corps throughout the Mississippi Delta (including in particular the Big Sunflower River Maintenance project) and Lower Mississippi River Basin under the Mississippi River and Tributaries project, and throughout the Gulf of Mexico watershed. The Corps must re-evaluate the cumulative impacts of this project with other activities in the Yazoo River basin, Lower Mississippi River basin, and Gulf of Mexico watershed.

4. Inadequate Alternatives Analysis

By failing to consider a nonstructural solution to flooding problems in the lower Delta, the Corps has violated the National Environmental Policy Act. A viable nonstructural alternative approach was proposed months before the Report was completed, and was evaluated by an independent economist commissioned by the EPA. The Shabman and Zepp research demonstrated that reforestation is an economically superior approach for the frequently flooded lands of the Yazoo Backwater area, as compared with enhancing row crop production.[9] Yet the Corps refused to seriously consider a nonstructural alternative, even after the Shabman study was presented.

EPA has now proposed an "alternative investment proposal" incorporating nonstructural flood damage reduction measures along with additional needs and priorities of the region as identified in the President's "Delta Initiative". The proposal would provide the infrastructure needed for local people to get the greatest economic advantage from this land use conversion by providing financial assistance (conservation easement payments) and technical assistance for landowners wishing to reforest. Additionally, this approach would support expanding recreational use of this land, promotional advertising about these reforestation opportunities, and addressing transportation needs. Flood damage reduction would be focused specifically on at-risk structures, roads and other infrastructure. Public health and environmental improvements, such as water and sewer infrastructure improvement projects, and investments in children's health efforts, also are included in the proposal.[10]

NWF would like to reiterate the support we expressed in a September 15, 1999 letter to Mr. James Wanamaker (attached), for the Corps, FWS, EPA, FEMA, and other agencies to "commit now to [develop] and [evaluate] a comprehensive, non-structural program for the region that

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[9] "An Approach for Evaluating Non-structural Actions with Application to the Yazoo River Backwater Area," Leonard Shabman and Laura Zepp, Virginia Tech University, February, 2000.

[10] EPA Letter.

would achieve these objectives: 1) reduction of flood risks to residences in the project area; 2) restoration and reforestation of a significant portion of the project area; and 3) reduction of nutrients, pesticides and other contaminants in surface waters in the project area." The proposal presented by EPA is a good start.

By increasing the acreage of forested wetlands in the basin, suspended sediments and nutrients will be trapped and removed from the water column, improving the water quality of the impaired waterways in the Basin, and enhancing downstream water quality, for example, reducing the hypoxia ("Dead Zone") problem in the Gulf of Mexico. Flood storage will be provided and the base flows of the rivers will be augmented. This alternative provides superior economic and public health benefits to the local citizens.

5. Public Participation

The Yazoo Backwater Pumps has for many years been viewed as one of the nation's most controversial Corps of Engineers projects. Local residents, Mississippians from across the state, members of the public across the nation, and natural resource agencies have voiced strong opposition to this project. Recently the Pumps were ranked the 4th worst project in the nation in a review conducted by the National Wildlife Federation and Taxpayers for Common Sense.[11]

Perhaps one of the most distressing aspects of this project is the overwhelming evidence that the public participation process required by NEPA has not been taken seriously by the Corps. At the Corps' single public hearing on the recommended plan, Colonel Crear made statements in his closing remarks that strongly suggested that the Corps had unilaterally determined that this was a good project and was going to proceed with it despite public testimony or comment.[12] Such a statement disregards the public comment process and violates NEPA. The evidence that the Corps had already made a conclusion about the process was further confirmed when the President of the Issaquena County Board of Supervisors, Lucius Bunton, in his testimony indicated that Colonel Crear had expressed exactly that sentiment to him, saying that "Colonel Crear has told us that we will prevail".[13]

Responses from the Corps received by persons sending comments on the project to the agency via the internet further evidence a disregard for public participation and a clear intention to proceed with the project regardless of the input received. One of these responses is attached for inclusion in the record. It strongly suggests that the Corps has already determined, in advance of the completion of the comment period and conclusion of the NEPA process, that it will build

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[11] Troubled Waters, Report by Taxpayers for Common Sense and National Wildlife Federation, March 2000, 20.

[12] Statement by Colonel Crear, Corps Public Hearing, November 9, 2000.

[13] Statement by Lucius Bunton, Corps Public Hearing, November 9, 2000.

the project it has selected. Throughout the process to date, the Corps has proactively and inappropriately advocated its preferred project, ignoring serious concerns expressed by federal agencies and the public.

C. Coordination Under Endangered Species Act and Fish and Wildlife Coordination Act

The Corps released the Report without completing coordination associated with the Endangered Species Act and Fish and Wildlife Coordination Act. As a result, the public has been asked to review the Corps' report without the benefit of FWS's analyses as required by those two statutes.

1. Endangered Species Act

FWS concurred with the Corps that formal consultation is not needed for the Louisiana black bear, a decision based on the fact that bears are not known to permanently inhabit or reproduce in the project area. In light of the recent sighting of a female black bear and cubs[14] in a county adjacent to the project area, NWF would encourage continued monitoring of the black bear population for signs of its establishment in the project area and the need for future consultation.

FWS has, however, disagreed with the Corps' conclusion that the project is not likely to adversely affect pondberry (Lindera melissafolia), a federally listed endangered species. Since pondberry communities depend on inundation, the magnitude of reduction in flooding caused by the project is likely to adversely affect pondberry, and the Corps should initiate formal consultation with the Service to insure that the project will not likely jeopardize the continued existence of pondberry, as required by section 7(a)(2) of the Endangered Species Act. If the Corps moves forward with this project without first completing formal consultation with FWS so that the project's impacts to the endangered pondberry can be thoroughly assessed, it risks jeopardizing the continued existence of this plant, in the face of viable alternatives that would reduce or eliminate project impacts on the plant.

Due to new information available regarding the elevation and floodplain of pondberry colonies on the Delta National Forest, which was not available during the review of the Big Sunflower River Maintenance Project, the Corps and FWS should immediately review and enter formal consultation if appropriate on the effects of that project on pondberry. In the meantime, to avoid irreversible impacts, all activities should immediately cease on the Big Sunflower project until questions regarding the project's impacts on pondberry are answered.

2. Fish and Wildlife Coordination Act

The primary purpose of the interagency coordination mandated under the Fish and Wildlife

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[14] Bears Begin to Show Up in Bolivar County, The Bolivar Commercial, October 3, 2000.

Coordination Act[15] is to "provide that wildlife conservation shall receive equal consideration and be coordinated with other features of water-resource development programs..." It requires consultation and coordination between the Corps and the Service on all aspects of water resource development, and requires that fish and wildlife conservation be treated as a co-equal project purpose along with flood control, navigation, and other purposes.

The administrative procedures developed under the FWCA require consultation, coordination, and equal consideration in all phases of the planning, construction, and operation of projects such as the Yazoo Pumps. Those requirements apply to each of the six basic steps of the Federal water project planning process detailed in "Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies".[16] The six steps are comprised of specification of water and related land resources problems and opportunities; inventory, forecast, and analysis of the water and related land resources conditions within the planning area relevant to the identified problems and opportunities; formulation of alternative plans; evaluation of the effects of the alternative plans; comparison of alternative plans; and selection of a recommended plan. The Corps has failed to comply with FWCA's procedural requirements or meet the FWCA standard of equal consideration for wildlife conservation in development of the Yazoo Backwater Pumps project and preparation of the Report.

D. Clean Water Act

EPA calculates that more than 200,000 acres of wetlands may be impacted by this project, raising concerns about significant degradation of the aquatic ecosystem.[17] The Corps' failure to identify specific lands for mitigation for even its much smaller claimed impacts in the project area, combined with the current backlog of unmet mitigation for other Corps projects in the Lower Mississippi River Basin (totaling in the thousands of acres), virtually ensure that the mitigation plan for the project will fail. The Corps has not shown in its Report that its project complies with Section 404 and has not met the informational requirements of Section 404(b)(1). Notwithstanding the insufficient amount of information presented, the limited available data has lead EPA to conclude that the recommended plan, even if fully discussed, would not satisfy the substantive requirements of Section 404(b)(1).[18] These concerns are further heightened by the fact that the anticipated aquatic impacts would be largely avoidable with the implementation of a non-structural approach.[19]

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[15] FWCA; 48 Stat. 401, as amended; 16 U.S.C. 661 et seq.

[16] P&G; WRC, 1983 (get full correct cite).

[17] EPA Letter.

[18] EPA Letter.

[19] EPA Letter.

II. The Project Controverts National Policy

The Corps' recommended plan controverts clearly expressed federal policy in a number of ways, including flood control and water resources development, floodplain management, wetlands, and agriculture. It also controverts federal and state directives and recommendations specifically regarding this project.

A. National Floodplain Management Policy

A host of federal policy directives in recent years has further clarified federal floodplain policy to favor approaches that would avoid flood risk by locating (and relocating) human habitation highly flood prone areas- and particularly such as the lower Yazoo basin. Methods of promoting these approaches regarding existing development include the use of voluntary property buyouts and relocation assistance, elevation of structures, and wet or dry floodproofing of buildings. Since the Great Midwest Flood and the subsequent December 1993 enactment of amendments to the Robert T. Stafford Disaster Relief and Emergency Assistance Act, FEMA's (Section 404) Hazard Mitigation Grants Program (HMGP) has assisted in the voluntary relocation or elevation of nearly 26,000 flood prone homes and buildings across the nation. Additional funds have been made available for such nonstructural mitigation through grants and loans from the Department of Housing and Urban Development, the Small Business Administration, FEMA and other agencies. In WRDA 1999, Congress also gave the Corps of Engineers critically important new authority in the agency's Section 205 program and the Flood Mitigation and Riverine Restoration program ("Challenge 21") to utilize nonstructural approaches. Where residents have chosen to relocate out of harm's way, the FEMA HMGP alone has since 1994 provided nearly $600 million in grant assistance funds to mitigate flood hazards. FEMA and Administration floodplain policy has greatly increased the emphasis on voluntary buyout and relocation for repetitively flooded properties. As just one dramatic example of where such funds were utilized in highly flood prone areas, in St. Charles County, MO, after the 1994 voluntary buyout of several hundred residential structures and associated lands being dedicated to open space management, in the subsequent large May, 1995 Missouri River flood, disaster relief costs were reduced by 99 percent, saving federal and state governments millions of dollars.

After the 1993 flood, the Federal Interagency Floodplain Management Review Committee found in the landmark report Sharing the Challenge - Floodplain Management Into the 21st Century ("Galloway Report") that:

> "Given the social and economic consequences of such flooding in affected communities, floodplain management activities need to focus on reducing the vulnerability of population concentrations to the most significant flood event expected to occur. Reducing the vulnerability of communities, where appropriate to the discharge associated

> with the standard project flood (SPF) provides a greater reduction in residual risk than is provided by the 1 percent annual chance flood (100-year) flood discharge."

The Galloway report recommends that a considerably higher level of flood protection - SPF protection - should be sought for the long term health and welfare of flood prone communities, including their critical infrastructure. The Yazoo Pumps plan, instead, continues to leave hundreds of structures and their inhabitants vulnerable to threats to public health, public access and safety, and damage to the environment caused by floods. The recommended plan fails to meet the objectives of current federal policy by leaving residents subject to significant flooding risk, and by further failing to place a much greater emphasis on nonstructural hazard mitigation and environmental protection.

The proposal to build a project which fails to fully protect existing development and which directly promotes future development in the 100-year floodplain fundamentally flies in the face of clearly established policy and federal fiscal priorities.

B. National Wetlands Policy

Wetland protection is the subject of a number of federal legislative and executive directives. Section 404 of the Clean Water Act requires permits for the discharges of dredged or fill materials into waters of the United States. The Swampbuster program removes incentives for wetland development by eliminating agricultural subsidies to parties that produce commodities on wetlands converted after enactment. Executive Order 11990 directs Federal agencies to avoid, to the extent possible, long- and short-term adverse impacts associated with the destruction or modification of wetlands and to avoid direct or indirect support of new construction in wetlands if a practical alternative exists. In addition, the Administration has in its Clean Water Action Plan a directive to avoid wetland loss and achieve wetland gains of 100,000 acres per year by the year 2005.

While the recommended plan includes a component reforestation of certain currently cleared wetlands, the primary thrust of the Yazoo Pumps plan constitutes one of the most damaging water resources development proposals in the nation regarding both direct adverse impacts to wetlands, promotion of future wetlands losses, and for the plan's failure to maximize potential for wetland restoration, as identified in alternatives identified by the EPA and the U.S. Fish and Wildlife Service.

C. National Agricultural Policy

The project controverts national agricultural policy, including major farm program reforms made in the late 1990s moving away from supporting increased production by farmers. Federal land set-aside programs such as the Conservation Reserve Program and Wetlands Reserve Program

are designed to increase prices and farm income by reducing overall production and have proven popular among farmers in the project area. Still, the U.S. Department of Agriculture reports that in 1999 that over 40% of total U.S. farm income came from government payments, which is at least in part due to emergency payments to boost farm income.[20] It is baffling that a federal agency plans to now invest millions of taxpayer funds in a project designed to intensify production on agricultural lands, and which may encourage clearing of additional lands for agricultural production, particularly marginal lands in low-lying floodplain areas.

D. National Water Resource Development Policy

In 1996 Congress enacted legislation in the Water Resources Development Act requiring local cost-share for water resource development projects such as this one. Political maneuvering has resulted in a special exemption from that requirement for this project, so that no local cost-share is being contributed.

E. Recommendations of Governor's Advisory Committee

On the state level the direction of this project has long been questioned. In 1989, a Governor's Advisory Committee on the Yazoo Basin Projects concluded that "the Projects were aimed to achieve purposes no longer completely relevant to the present needs of the people they were designed to benefit.... In Mississippi, the new reality takes increasingly into account urban and environmental interests. The Yazoo Basin Projects should do the same."[21]

F. OMB Directive

Largely in response to this report, in FY 1991, the Office of Management and Budget (OMB) provided to the Corps the following guidance for conducting the overall Yazoo Basin Reformulation Study:

> "Yazoo Basin Study (MS): The mark includes the requested funding for a restudy of the Yazoo Basin Project. However, in response to the request for review and redesign of the project by the Governor of Mississippi, a reformulation report shall be prepared to identify, display, and evaluate alternative plans for 1) greater levels of flood protection for urban areas; 2) reduced levels of agricultural intensification; and 3) reduced adverse impacts of the environment. The scope of the reformulation should encompass alternative reservoir operations, and flood damage reduction alternatives for the Yazoo Backwater Area in addition to the Yazoo Backwater Pumping Plant. Methodology of the report shall

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[20] U.S. Department of Agriculture Economic Research Service, Agricultural Outlook, AGO-267, December, 1999.

[21] Governor's Advisory Committee on the Yazoo Basin Projects, Final Report and Recommendations to Governor Ray Mabus, January 31, 1989.

be in accordance with the Principles and Guidelines including full consideration of predominately nonstructural and nontraditional measures. Compliance with the Fish and Wildlife Coordination Act and the National Environmental Policy Act shall be integrated with the preparation of the reformulation report. The reformulation report should be transmitted to OMB by the fourth quarter of FY 1991.

Consistent with existing Army guidance, no new contracts should be awarded until the reformulation report is approved by OMB."

Although in the Report the Corps has attempted to treat urban and environmental interests, the fact remains that 84% of the benefits of the recommended plan accrue to agriculture, comprehensive protection from flooding for urban areas is lacking, and the plan misses significant opportunities for long-term enhancement of environmental quality in the Delta.

III. The Corps' Recommended Plan Is Flawed as a Solution to Problems in the Project Area

The Corps proposes to spend over $181 million[22] on a recommended project of questionable effectiveness which will create significant environmental damage. The Corps' recommended plan does not further and in some cases may even undermine current federal investments in flood damage reduction, floodplain management, wetlands protection, and agricultural policy. But apart from other federal efforts, it also fails as a plan to provide real benefits to the residents of the Delta. As a fundamental matter, the hydrological modeling on which the entire project and its claimed benefits are based contains deep flaws and should be redesigned. Numerous flaws pervade the economic analyses as well, serious enough to call into question whether the project's actual cost to benefit ratio is even positive, let alone at the inflated ratio claimed by the Corps in the Report. And even at its high cost, the project is not designed to, and does not, fully protect residents in the project area from flooding. But there is no doubt that this expensive project presents a real threat to the ecosystems of the basin.

A. Project Benefits

1. Flaws in Hydrological Modeling

The Yazoo Backwater Area is complex hydrologically, for both natural and man-made reasons, and the modeling procedures used to simulate this watershed must be tailored to reasonably reflect this complexity. First, there are multiple subwatersheds which drain into the area: those of the Little and Big Sunflower Rivers, Deer Creek, and Steele Bayou. The problematic interior ponding behind the Mississippi and Yazoo levees which the pumps are proposed to address can be caused by water originating in one or more of these source streams. This has been amplified

[22] Report, S-3.

by the inter-connecting channels that the Corps has previously completed between all of these streams in the lower portions of their respective drainages near the levees. Also, the mild slopes of the landscape in the study area lead to broad overland flow with a gently sloped flood water surface.

The benefits that the Corps claims the Yazoo Backwater Pumps would provide to the lower Mississippi Delta area are highly doubtful because of serious problems in the hydrologic analyses the Corps has performed for this project. The hydrologic analyses are beset with a host of conceptual errors, undocumented procedures, and internal inconsistencies. The importance of these problems can not be overstated since the results of these analyses are used to forecast water levels and flooded acreage in the study area with and without the proposed pumps. Therefore, all project benefits derive from these hydrologic analyses. Included as part of NWF comments on the Report is an itemized listing and discussion of the many conceptual and procedural errors in the Corps hydrologic modeling and analyses.

2. Economic Benefits

NWF concurs with the independent economic analysis performed for the Shabman study, which raised serious questions about the agricultural damage reduction benefits that may be reported for a pump, and about possible flaws in the Corps' agricultural benefit analysis. The study found that the Corps' values on agricultural benefits had been overestimated by $144 million. Since agricultural benefits comprise the vast majority–approximately 84%–of the Corps' NED justification for the recommended plan, such serious error in determining agricultural benefits could and probably do negate that justification for the project. Among the errors that the Shabman study found was an overestimation of agricultural returns. Simply put, the economic justification for the project presented in the Report is not credible. Given recent findings by the Army's Inspector General that the Corps has in other regions of the country manipulated economic analyses to justify large and expensive water projects, it is imperative that the economic analysis for the Yazoo Backwater Pumps be independently reviewed and that the deficiencies in the Corps analysis identified in the Shabman study be addressed.

3. Flood Protection

Despite the significant public investment that is requested for this project, and the severe environmental damage that can be expected to result, the project is not designed to, and will not, eliminate flooding for all structures in the project area. As pointed out in the evaluation of the Corps hydrological analyses included in this letter, serious deficiencies in the Corps hydrology cast doubt on the ability of the recommended pumps to provide much of the envisioned flood protection. Also, in the Report the Corps states that the project will not protect structures from

flooding in the Standard Project Flood.[23] It will not eliminate flooding for many structures in the project area..[24] The pumps would provide no benefit whatsoever in a 1991-type headwaters flood.[25] It should also be noted that as part of the Mississippi Rivers and Tributaries Plan (MR&T), the area is designated to receive flood waters and store them in the "project flood" for which the MR&T project is designed.

4. Claimed Environmental Benefits

Even more dubious than the economic benefits claimed in the Report are the claimed environmental benefits. It is simply preposterous to assert, as the Corps does in the Report, that the Yazoo Backwater Pumps will provide "a net gain in environmental value."[26]

B. Environmental Impacts

The lower Mississippi River basin supports some of the richest wildlife habitat and unique natural systems in North America, driven largely by hydrologic cycles. Millions of waterfowl migrate the Mississippi flyway, and the region's forested wetlands, rivers and streams are home to bald eagles and other endangered species and diverse aquatic life, many of whom spawn in areas of seasonal overbank flooding. The Yazoo Backwater area is home to some of the last remaining tracts of the Big Woods bottomland hardwood ecosystem, 80% of which has already been cleared, and most of the rest of which exists only as scattered remnants.

The Corps' recommended plan threatens to cause significant adverse environmental impacts to the area. EPA in its review of the project has given the Report its lowest rating (Environmentally Unsatisfactory - Inadequate) and states that there will be "substantial and unacceptable adverse environmental consequences" from this project, and that "the action must not proceed..." The potential adverse environmental impacts from the project as proposed are of sufficient

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[23] Report 6-40. Under a Standard Project Flood, representing "the flood that can be expected from the most severe combination of meteorologic and hydrologic conditions that are considered reasonably characteristic of the geographic region involved, excluding extremely rare combinations", when the floodgates are closed, the inflows would be "of such magnitude that the [pump] capacity is greatly exceeded and the interior ponding area would rise significantly... A similar but smaller event by comparison was the 1991 flood event..." The Corps goes on to state that the extent and magnitude of flooding with the SPF would not be greatly affected by the pump because the inflow rates would be much in excess of pump capacity.

[24] Statement of Colonel Crear, town meeting, Mayersville, MS, December 2, 2000. Colonel Crear stated that some 400 structures would receive no flood protection under pump operation, and that any structures with more than 4 to 4 ½ feet of water in them during a "1973-type" 100-year flood would still flood under pump operation.

[25] Report 6-24 and 6-40.

[26] Report SEIS-92.

magnitude that the agency has taken the rare step of putting the Corps on notice that it considers the matter both a candidate for referral to the Council on Environmental Quality if EPA's concerns are not adequately resolved, and a candidate for further action under Section 404(c) of the Clean Water Act.[27]

1. Wetlands

One of the projects most alarming consequences is a massive loss of wetlands. According to EPA's and NWF's independent hydrological analyses, the Corps has used a method for calculating wetlands loss from the recommended plan that is inappropriate for assessing wetland impacts from a pumping plant at a site-specific scale[28]. The Corps has thus greatly underestimated the extent of wetland impact due to the recommended plan. EPA estimates that there may be as many as 96, 518 acres of forested wetland impacts and 76,827 acres of cropped wetland impacts within the two-year floodplain, and as many as 96,180 acres of wetland impacts above the two-year floodplain[29]. Well over 200,000 acres of wetlands will be impacted.[30] This is an incredible loss, and is particularly unacceptable in the face of an Administration goal of ensuring no net loss of wetlands and an annual net gain of 100,000 acres of wetlands per year by 2005.

With changes in hydrology would come shifts in wetland-adapted plant communities and the wildlife that relies on them.

Moreover, by failing to accurately assess the wetland impacts of the project, the Corps has vastly undercalculated the compensatory mitigation that should be required for this project.

2. Clearing of Bottomland Hardwood Habitat

The Report states that "The Vicksburg District has long advocated that sufficient laws and policies are available to prevent any substantial conversion of bottom-land hardwoods..."[31] While the District may advocate this position, there is little evidence that this is true. More frequently, as the hydrology of the area is changed, specifically the hydrology of jurisdictional wetlands, the jurisdictional status of these wetlands changes, leaving them open to clearing for agricultural or other development. Interestingly, in its cumulative impacts analysis, the Corps states that other

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[27] EPA Letter.

[28] EPA Technical Review 14, and NWF Hydrological Analysis, attached.

[29] Technical Review 12.

[30] EPA Technical Review.

[31] Report 66.

MR&T projects in the area have "reduced the historic hydrology in the Backwater Project Area," and that "[t]hese changes in hydrology have contributed to bottom-land hardwood clearing for agricultural production."[32] The Corps cannot have it both ways in the same Report, claiming that law and policies will protect bottomland hardwoods but also stating that its projects historically have contributed to draining of these wetlands for agricultural intensification. but not for this one.

3. Water Quality

By destroying wetlands and clearing bottomland hardwood forests, and intensifying agricultural production in frequently-flooded lands, this project promises to increase the use of pesticides and further degrade water quality in an area with one of the highest concentrations of pesticides in the country. Other potential impacts from this project are increased erosion and sedimentation and nutrient loading, contributing to the hypoxia problem in the Gulf of Mexico. The Corps has failed to adequately address these concerns.

4. Endangered Species

The Corps has also failed to adequately consider project impacts to the federally endangered pondberry, a wetland plant, in the project area. One of the two most viable populations of pondberry is in the project area, in the Delta National Forest, and it is imperative that the Report assess how changes in the hydrology in the basin affect these rare plants.

5. Mitigation

The Corps has offered an easement acquisition and reforestation plan to mitigate for wetlands that will be impacted by this project and provide a nonstructural component to the preferred plan. In addition to the Corps' severely inadequate estimate of the mitigation acreage that should be required for this project, major problems exist with the mitigation plan. The reforestation is to occur on 62,500 acres of agricultural land located below the 87 foot elevation, but there are only 9,100 available agricultural acres located below 87 feet[33]. If the Corps' intention is to reforest lands in the 1-year floodplain, rather than 87 feet, implementation still will fall short, since there are not sufficient acres available there.[34] This may explain the Report's failure to identify the acres to be reforested. The first 17,078 acres will count toward mitigation for the environmental damage from the project, but the Corps also improperly includes that acreage in its environmental benefits calculation for the project. In addition to the constraint of severely

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[32] Report SEIS-81.

[33] USFWS Summary Analysis.

[34] USFWS Summary Analysis.

limited acreage available, the chances of the easement acquisition program being implemented are additionally limited by the fact that it will be terminated one year after pump operation begins; after that time, the Corps will only attempt to reforest 17,078 acres, with no obligation that the acreage be acquired in the basin or even in the state where the vast majority of the damage will be done.

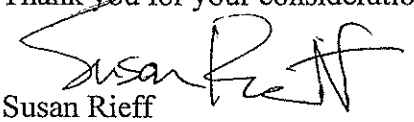
Given that the Vicksburg District currently owes the public more than 25,000 acres of promised mitigation for past Corps projects in the area that have destroyed habitat[35], the agency has little credibility regarding timely and effective implementation of mitigation plans. The Report fails both to properly calculate the amount of mitigation required for this project, and to present a mitigation plan that can reasonably be expected to be implemented concurrently with or in advance of project construction.

Conclusion and Recommendations

NWF has for many years objected strenuously to the Yazoo Backwater Pumps project because of its threat to valuable wetlands and wildlife. Our analysis of the Report confirms that the Corps preferred project is even more environmentally destructive than some previous proposals. Unfortunately, the Corps has attempted in the Report to justify this expensive agricultural drainage project with manipulated economic analyses, flawed hydrology, superficial biology, and false promises of mitigation. While nearly all project benefits will accrue to large agricultural operations, even these benefits are overstated. Contrary to the Corps assertions, the project will not meaningfully address the real need to provide assistance to homeowners in the project area who are harmed by periodic flood flows. The project will destroy more than 200,000 acres of wetlands, and mitigation for this loss is unlikely under the Corps plan. Contrary to progressive federal policies, the project avoids local cost-sharing and would intensify agricultural production within the floodplain.

The Corps Report on the Yazoo Backwater Pumps has been severely criticized by both the EPA and the Fish and Wildlife Service, by independent researchers, by national conservation and taxpayer groups, and by Mississippi groups and individuals. But refining the Report is not the remedy. The Corps should abandon its efforts to justify this outdated and ill-advised project, which would benefit only a few large landowners at great expense to federal taxpayers and the environmental resources of the Delta.

Thank you for your consideration of these comments.



Susan Rieff
Vice President, Southwest Region

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[35] Report, Appendix 1, p. 1-52, Table 1-25

People and Nature: Our Future is in the Balance
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National Wildlife Federation Evaluation of the U.S. Army Corps of Engineers Hydrologic Analyses in the Yazoo Backwater Area Reformulation Report

December 8, 2000

prepared by Norman D. Johns, PhD
Water Resources Scientist

The benefits that the Corps claims the Yazoo Backwater Pumps would provide to the lower Mississippi Delta area, including flood protection of residences and other structures, are highly doubtful because of serious problems in the hydrologic analyses for this project. Similarly, the Corps evaluation of the environmental impacts of the project are highly questionable. The hydrologic analyses are beset with a host of conceptual errors, undocumented procedures, and internal inconsistencies. The importance of these problems can not be overstated since the results of these analyses are used to forecast water levels and flooded acreage in the study area with and without the proposed pumps.

The Yazoo Backwater Area is complex hydrologicaly, for both natural and man-made reasons, and the modeling procedures used to simulate this watershed must be tailored to reasonably reflect this complexity. First, there are multiple subwatersheds which drain into the area: those of the Little and Big Sunflower Rivers, Deer Creek, and Steele Bayou. The problematic interior ponding behind the Mississippi and Yazoo levees which the pumps are proposed to address can be caused by water originating in one or more of these source streams. This has been amplified by the inter-connecting channels that the Corps has previously completed between all of these streams in the lower portions of their respective drainages near the levees. Also, the mild slopes of the landscape in the study area lead to broad overland flow with a gently sloped flood water surface.

The Corps employs a 2-step modeling process. First, a model known as HEC-IFH is used to generate inflows from the various subwatershed drainages by converting rainfall amounts into streamflows. Streamflows derived in this manner are conventionally deemed "synthetic streamflows" to differentiate them from real gauged streamflows. The second model uses the synthetic streamflows of the HEC-IFH model as input. The second model, a so-called 'routing' model, uses these inflows to predict water levels and flooded acreages in the study area on a daily basis for the 1943-97 period. Below is a listing of many conceptual and procedural errors which we have found in this modeling process.

At a global level, the hydrologic analyses are unduly burdened by, and extremely difficult to read and understand because of, the inconsistent and multiple use of the word "Plan" to refer to a particular structural (pump) or non-structural alternative. Thus the recommended Plan 2 as used on Page 7-31 through 7-152 of Appendix 7 is not the same as Plan 2 on any of the 50 pages of Appendix 6. In Appendix 6 the recommended plan is known as Plan 5. These sections are not wholly independent as the results of the hydrologic analyses in Appendix 6 have a direct bearing on the economic analyses of Appendix 7. Although chronicling the progression of these Plans through several stages of refinement may be useful as an introduction to the project, much of the discussion of older, "Initial Array" Plans is potentially outdated and only serves to obfuscate the Corps analyses of the current slate of alternatives. At the very least the Corps should renumber the Plans such that each is unique and consistent throughout the Reformulation Report.

1) HEC-IFH model, utility 1. The HEC-IFH model converts rainfall to stream runoff through the use of so-called unit hydrographs. On page 6-31 of Appendix 6 of the Reformulation Report, the Corps describes the development of separate hydrographs for the "lower ponding area" (Reach 1) and the "upper ponding area" (Reaches 2-4). These were derived from actual rainfall and streamflow data for respective points on Steele Bayou and the Big Sunflower River. However, the sole purpose of the HEC-IFH model is to compute synthetic stream inflows for the 2nd model, the period of record routing model (pages 6-28 and 6-33). The Corps should explain why the actual streamflow data was not used directly as input to the routing model rather than synthetically derived values. The implication of utilizing synthetic streamflows rather than actual measured values is that the resulting determination of flooded areas from the routing model and therefore project benefits are not adequately substantiated.

2) HEC-IFH model, utility 2. One of the potential reasons for utilizing the HEC-IFH model is to derive synthetic streamflows that may be required if the actual streamflows were not available for the entire period of record. If this is the case, then there should be a demonstration of the adequacy of the HEC-IFH model procedure by comparison of actual and synthetic values. In fact, the U.S. Army Corps of Engineers Publication No. 19[1] suggest the utilization of actual data when available for verification of such models to extend streamflow records. In other words, the Corps has not adequately followed their own recommended procedures. The implication of using an unverified model to derive synthetic streamflows for the period-of-record routing model simulations is that the resulting determination of flooded areas and therefore project benefits are not adequately substantiated.

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[1] page 135 in US Army Corps of Engineers. 1994. *Engineering and Design Guide No. 19- Flood-Runoff Analysis, EM 1110-2-1417*, reprinted in 1997 by American Society of Civil Engineers as "Flood-Runoff Analysis." ASCE Press, New York.

3) HEC-IFH model, utility 3. Given that the HEC-IFH model calculates synthetic streamflows, it would be advisable to utilize the actual streamflows when available, for such important steps as calibrating the 2nd model, the period of record routing model (see comments 19 & 20 below). The synthetic data should only be utilized as necessary. The implication of utilizing synthetic streamflows rather than actual measured values in the routing model calibration is that the resulting determination of flooded areas are not accurate enough to substantiate the project benefits.

4) HEC-IFH model, unit hydrograph accuracy. As described in the U.S. Army Corps of Engineers Publication No. 19[2], in the determination of a unit hydrograph it is necessary to make several assumptions about the watershed. These are known as the "basin-average", "linearity" and "time invariance" assumptions. The degree to which these assumptions are met will vary depending on the watershed characteristics and the particular storm duration of interest, i.e. short-term thunderstorms or long-duration storm events. The potential for the lack of watershed conformance with these assumptions is a source of hydrograph error even in the best of circumstances for a gauged watershed, in which actual precipitation and streamflow data are available, as was the case here. Also, the U.S. Army Corps of Engineers Publication No. 19 describes methodologies for verifying the determined hydrographs with actual data. No such verification of the HEC-IFH model is mentioned in the Reformulation Report. The implication of utilizing unverified hydrographs is that the resulting determination of flooded areas are not accurate enough to substantiate the project benefits.

5) HEC-IFH model, unit hydrograph and subwatershed conditions. On page 6-31 of Appendix 6 the Corps states that the unit hydrographs "reflect current conditions in the watershed and are also applicable to conditions assuming all currently approved Corps channel works in the watershed are completed." This is a major unsupported assumption since any change to a stream channel, not to mention the major changes which the Corps has proposed for the Sunflower Rivers, will affect the unit hydrographs. The initial statement is followed by several paragraphs explaining the Corps' belief that these modifications are small enough to proceed without modifying the hydrographs. The result of this is to ignore the potential amplification of flood magnitudes that the Corps' other projects in the Yazoo Backwater Area, such as the Sunflower River modifications, may have.

6) Rainfall- runoff coefficients. The text on pages 6-15 and 6-16 of Appendix 6 in the Reformulation Report describes "runoff factors" by month. Although these factors are not rigorously defined in the Report, standard hydrologic texts[3] would indicate that these

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[2] page 50-51 in US Army Corps of Engineers. *Flood-Runoff Analysis.*

[3] for example see page 139-40 in Chow, Maidment, and Mays. 1988. *Applied Hydrology.* McGraw-Hill, New York.

are relating inches of rainfall and equivalent inches of surface runoff at a very general level. As the Report text describes these are "monthly-generalized values" as the exact value will depend on "antecedent conditions, rainfall distribution, and rainfall intensity." Since the derivation of these values is based on actual data for rainfall and runoff over some chosen period of averaging, in this case monthly, it would be appropriate to indicate the range of these coefficient values by month. It should be stated whether these are average values or median values or some other value. The number of months of data that were used and an indication of data coverage for normal, wet, and dry years also should be given. These are important data which are critical parameters in the HEC-IFH hydrologic model used to relate rainfall and runoff (see note 6). It is not possible to judge the adequacy of these important values since the derivation is not explained. The implication of utilizing such generalized values is that the resulting determination of synthetic streamflows and hence flooded areas is not accurate and the project benefits are not substantiated.

7) Rainfall- runoff coefficients for HEC-IFH model. Page 6-33 list "runoff coefficients" as necessary input to the HEC-IFH model, but they are not given. It is not stated if these are the same as the "Monthly Percent Runoff" values given in Table 6-3. As stated on page 6-15 the exact value of the runoff from a given amount of rainfall depends on "antecedent conditions, rainfall distribution, and rainfall intensity." There is no indication in the description of the HEC-IFH model if these effects on runoff are taken into account in the process of converting the period-of-record rainfall into synthetic streamflows for use by the routing model. Again, as pointed out above, (comment 1) it is unclear why actual streamflows were not used. The adequacy of the runoff coefficients utilized here should be demonstrated with a verification procedure (see comment 2). The implication of utilizing such generalized and unverified values is that the resulting determination of synthetic streamflows and hence flooded areas are not accurate enough to substantiate the project benefits.

8) PDF Flood impact of Yazoo Backwater Area. The text on Appendix 6, pages 6-13 and 6-14 describes how the mainline Mississippi and Yazoo levees are designed to be overtopped during very large floods on the Mississippi River known as the Project Design Flood (PDF). This means that the Yazoo Backwater Area, in spite of the proposed pumps, would be used for flood detention storage in the event of such a flood "to reduce the level of the PDF, thus resulting in a lesser levee grade along the mainline levees." The text says that this would occur "prior to the Mississippi Project Design Flood (PDF)." However, this PDF event is undefined in terms of elevation and anticipated recurrence interval (e.g. 100 yr. or 500 yr. event). Since the entire Yazoo Pumps plan of the Reformulation Report is formulated with the goal of reducing the duration and magnitude of flooding in the Yazoo Backwater Area, it should be stated clearly that there is still the expectation that a very severe and totally non-preventable flood event is possible from the Mississippi PDF overtopping the levees. The expected elevation and recurrence interval for this event should be given for comparison to the many tabulations

of similar data used to compare scenarios with and without pumps. The implication of not presenting such data is the false impression that the Yazoo Pumps will prevent flooding in the Yazoo Backwater Area, whereas the area will still be subject to severe inundation due to the PDF.

9) Routing model 1. On page 6-28 of Appendix 6, the Reformulation Report briefly describes the period-of-record 'routing' model used in this evaluation of the proposed pumps. This model uses the daily results of the HEC-IFH model as input streamflows for the 1943-97 period. However, essentially no information is given regarding the specifics of this 'routing' model. It is described as being "developed and modified by the Vicksburg District" specifically for the Yazoo Backwater Area.

There are many different "routing" techniques, among them the so called 'level pool', 'dynamic wave', 'kinematic wave', and 'diffusion wave' methods[4]. Selection of an appropriate technique depends upon the drainage characteristics of the basin being modeled, such as geometry and slopes, and the types of flood events in the area. The U.S. Army Corps of Engineers Publication No. 19[5] provides a decision matrix for selecting a routing technique based on the characteristics of the basin being modeled. The routing technique used in this Report should be explained and justified especially since this appears to be a unique application and modification of existing modeling techniques to a "two-ponding area model." The implication of utilizing an inappropriate routing model is that the resulting determination of flooded areas are not accurate enough to substantiate the project benefits.

10) Routing model 2. Based on the types of data described as necessary for the routing model, (specifically the elevation-area and elevation-volume curves) it appears to be a so-called 'level-pool' type routing model. As explained in standard hydrologic text[6], such a modeling technique is "lumped flow routing," tracking the water surface elevation at a single point through time. A copy of the results of the routing model were supplied to the National Wildlife Federation by the Vicksburg District of the Corps.[7] A close inspection of the model results also suggest that the routing model is a "level pool" model in that the results of the routing procedure are reported at only one point in each simulated "sump", namely, the respective exits at the Steele Bayou and Little Sunflower River floodgates. This type of routing model would appear to be fundamentally inappropriate because of

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[4] pages 242-349 in Chow, Maidment, and Mays. *Applied Hydrology*.

[5] pages 99-102 in US Army Corps of Engineers. *Flood-Runoff Analysis*.

[6] for example see page 242 and 280-82 in Chow, Maidment, and Mays. *Applied Hydrology*.

[7] U.S. Army Corps of Engineers, Vicksburg District. October 2000, *Yazoo Backwater Project, Period of Record Routing Model Data.* supplied on CD-rom.

the large out-of-banks type floods in the Yazoo Backwater Area with a sloped water surface. Such a level pool model is incapable of accounting for the storage of considerable volumes in the watershed and the time delays in the transmittal of these waters to the basin outlets or the proposed pumps.

The ability of the routing model to adequately predict flood behavior (depths and areas of inundation) at positions in Reach 1 and Reaches 2-4 removed from the backwater area outlets is crucial. This is because any forecast change in the area of inundation due to the action of the Yazoo Pumps would be expressed first at the margins of the flooded area, not at the outlet. In fact, the water surface behavior at the floodgate exits of the Yazoo Backwater Area is of the least consequence when it comes to predicting potential economic benefits of the project; points more removed are where potential benefits would occur. The Corps should document that the chosen routing model can reasonably simulate flooded area behavior at such points The implication of utilizing an inappropriate routing model is that the resulting determinations of flooded areas are not accurate enough to substantiate the project benefits.

11) Area-Elevation Curves, derivation. Page 6-29 through 6-31 of Appendix 6 describe the procedure used to derive curves relating area inundated in the Yazoo Backwater Area versus elevation as measured at the Steele Bayou and Little Sunflower River Gages. The procedure estimated the areas inundated in ten recent floods (1973-87) by examining satellite photos. These were then plotted against the water surface elevations (stage) measured at the Steele Bayou and Little Sunflower floodgate gages using a "best fit curve routine." However, only a single line is presented on Plates 4-7 through 4-10. This one line represents the sum total results of this procedure to derive the 'stage-area' curves. The data points for the areas inundated should be presented and the assumptions about what constitutes a "best fit" documented. These assumptions and adequacy of the "fit" are critical to this modeling since these data are the representation in the model of the areas flooded. The implication of utilizing inappropriate flooded area curves is that the project benefits are not substantiated.

12) Area-Elevation Curves, lack of uniqueness 1. At a conceptual level, the approach utilized in the Report to derive the elevation-area curves, appears to be only approximate. Because the Yazoo Backwater Area is gently sloping down to the Steele Bayou and Little Sunflower exits of the ponding areas, the area inundated due to a given input of floodwaters from a 'headwaters event' would be a highly transient phenomena. Initially, a large area well upstream of the exit would be covered while the actual water levels at the gage would still be low since the water hasn't arrived there yet. After a few days, this floodwater would move down the basin covering less area as it pools and deepens near the levees. At this time the water level at the gage would be higher, but the area inundated would be much less. In other words there would be no unique relationship between the area inundated and gage elevation because of the slow movement of the flood wave. This sloped water surface and the time lags associated with storage and

movement of water in the Yazoo Backwater Area also has direct bearing on the choice of the appropriate routing technique (see comment 9 & 10). There is no indication in the Report of cognizance of this transient nature of the floodwater or how it was addressed in the curve fitting procedure for areas of inundation. The implication of utilizing inappropriate flooded area curves is that the project benefits are not substantiated.

13) Area-Elevation Curves, lack of uniqueness 2. There is another potential problem with the methodology of using satellite imagery for determining inundated areas and it is related to the temporal variation in area inundated discussed in the comment above. The Report does not indicate when the respective satellite coverages were taken relative to the peak area of flooding. The implication of utilizing inappropriate flooded area curves is that the project benefits are not substantiated.

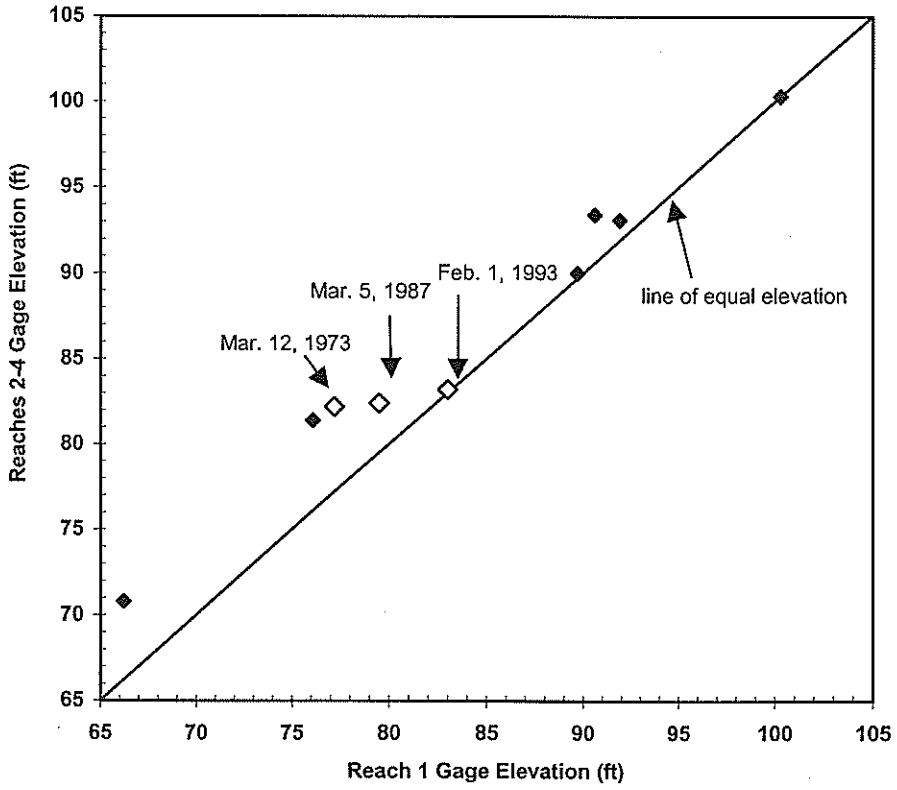
14) Area-Elevation Curves, lack of uniqueness 3. Determining areas of inundation for the Yazoo Backwater Area is also complicated by the fact that flooding can be caused by waters from multiple sources. Figure 1 of this document shows the gage elevation data as presented in Table 6-8 of the Report for 9 of the 10 satellite scenes utilized (data for Reach 1 missing for one scene). For 8 of these data points, the flood elevations in Reaches 2-4 were higher than those in Reach 1, and for the 9th point the elevations were equal. With the 200 foot bottom width connecting channel that the Corps created between these two ponding areas, water can move by gravity from Reaches 2-4 (the upper ponding area) to Reach 1 (the lower ponding area). This means that in the time immediately following the 'snapshot' of these 8 respective satellite scenes, in which Reach 2-4 water elevations were higher than those of Reach 1, the waters formerly inundating a given area in Reaches 2-4 were moving to Reach 1 and contributing to the ponding and inundation of area in Reach 1. This indicates that there is a lack of uniqueness between the measured area of inundation and gage elevation.

Furthermore, the 5.0 foot difference in elevation between the two ponding areas on March 12, 1973 indicates that the waters causing inundation in Reaches 2-4 at that time would have moved to Reach 1 through the connecting channel, possibly having a great influence on the area inundated there. For the similar flood in Reaches 2-4 of Feb. 1, 1993 there was only a gradient of 0.2 feet for waters to move to Reach 1 which was at 83.0 feet. Thus for these similar flood events in Reaches 2-4, there would have been totally different effects on Reach 1 and its area of inundation. This points to the inter-linkage of both spatial and temporal variability of the flooded areas and the lack of uniqueness between gage elevations and the area of inundation. The implication of utilizing inappropriate flooded area curves is that the project benefits are not substantiated.

15) Area-Elevation Curves, lack of uniqueness 4. As is also apparent in Figure 1 of this document, there is no unique relationship between the respective flood elevations of these two ponding areas. For example the elevation differences between these two ponding areas for the 3 highlighted floods (those of March 12, 1973; March 5, 1987; and Feb. 1,

1993) range from only 0.2 feet for the 1993 event to 5.0 feet for the 1973 event, even though these were quite similar events for Reaches 2-4 (elevations separated by only 1.0 foot) at the time of measurement. Although the Corps did not provide the actual area inundated data (see comment 11 above), the similarity in elevations in Reaches 2-4 in these three scenes means that areas of inundation in Reaches 2-4 should have been somewhat similar. However, the great difference in elevations for Reach 1, ranging from 77.2 to 83 feet, in the corresponding scenes would indicate much greater variability in area inundated there. Thus, seemingly similar events in Reaches 2-4, as indicated by gage elevation, were accompanied by totally different events in Reach 1. This again points to the lack of uniqueness between gage elevations and the area of inundation and the strong possibility that the project benefits are unsubstantiated.

Figure 1. Gauge Elevations for Floods as Presented in Table 6-8 of the Reformulation Report Yazoo Backwater Area.



16) Storage-elevation, not consistent with storage-area curves. Page 6-31 of Appendix 6 in the Reformulation Report states that the Corps used a numerical integration procedure to derive the respective stage-volume curves from the stage-area curves for Reaches 1 through 4. This would only be the case for a 'level-pool' routing model, although as presented above (see comment 9 & 10), the routing technique is not presented. However,

the values of the presented stage-volume curves (Plate 4-11) do not correspond to the numerical integration of the stage-area curves. The volumes presented on Plate 4-11 are much lower than the results of integrating the area-elevation curve in Plates 4-7 through 4-10. These data are not internally consistent. The storage volume data are absolutely critical in the modeling, because the ability of the pumps to prove viable is closely tied to the volume of water which must be removed. The method used to generate these storage values must be presented and justified. The implication of utilizing inappropriate volumes, especially the very low values presented, is that the forecast reductions in flooding due to the action of the pumps is over-predicted. Without adequate presentation of the procedures used to derive the volume-elevation curve, the model's results are highly suspect and the project benefits are not substantiated.

17) Storage-elevation and routing method. As discussed above, the routing technique used by the Corps is not explained. Pre-specifying the storage-elevation curve would be necessary for a 'level-pool' routing model. However, since the specified values are not consistent with the area-elevation data, this seems to indicate that the Corps used some alternate method to derive the volume curves. If so this, would also have to be justified in terms of the procedure's suitability vis-a-vis the routing technique utilized. For many routing techniques the volume of inundation would be determined during simulation and not pre-specified. The implication of inappropriately applying the storage volume-elevation information is that the forecast reductions in flooding are not accurate and the project benefits are not substantiated.

18) Levee seepage flow. On page 6-32 of Appendix 6, the Report describes an algorithm included in the routing model to account for the process of water seeping through the levees which divide the Yazoo Backwater Area from the adjacent Mississippi and Yazoo Rivers. While this is valid conceptually, the implementation in the Corps' routing model is erroneous. A copy of the results of the routing model were supplied to the National Wildlife Federation by the Vicksburg District of the Corps.[8] A close inspection of the model results reveals that the Corps' implementation within the model is counter to a fundamental principal of hydrology: water moves through porous media, such as the soil of a levee, based on the direction of the head gradient (i.e. 'downhill'). Moreover the rate of water movement is proportional to the magnitude of the head gradient[9].

As currently implemented in the Corps' model, water from levee seepage can move in only 1 direction through the levees from the adjacent Mississippi and/or Yazoo Rivers into the Yazoo Backwater Area. This is erroneous, although it is consistent with the text on page 6-32 describing the development of a "seepage curve relating seepage inflow to the appropriate river gage." As a consequence of this uni-directional implementation,

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[8] U.S. Army Corps of Engineers, *Yazoo Backwater Project, Period of Record Routing Model Data.*

[9] see Bear, 1980. *Hydraulics of Groundwater*, McGraw-Hill, New York.

when ponded water in the Yazoo Backwater Area is higher that that on the river side, water is often still forced to move uphill through the levees and against the head gradient. Inspection of the Corps model results for the baseline simulation without the pumps, shows there are 313 days in the 1943-97 period of simulation in which the model has water seeping from the Mississippi and or Yazoo side of the levees into the Yazoo Backwater Area even though water levels on the interior are higher.

This seepage term should, at a minimum, be related to the actual driving force of water level difference on the two sides of the levee, and should include the possibility of water moving in both directions. Although termed 'seepage' the magnitude of this term as presently implemented can be substantial in the routing model. In the Corps formulation, seepage inflows of up to 2,606 cubic feet per second (cfs) occur. This is nearly 20% of the capacity of the proposed 14,000 cfs pumps. Clearly, an ill-formed implementation of this process could have a large impact on the model's results with the implication that the forecast reductions in flooding are not accurate and the project benefits are not substantiated.

19) Model calibration. The results of any mathematical model, such as the HEC-IFH rainfall/runoff model and the routing model of the Yazoo Backwater Area, are highly dependent on a host of data and parameters, each with some level of uncertainty. Because of these limitations, it is standard procedure to go through a process of 'calibration' to adjust many of the parameters till the model reasonably duplicates some benchmark event or events. The importance of this process is discussed in detail in many engineering texts.[10] Furthermore, U.S. Army Corps of Engineers Publication No. 19[11] discusses the particular importance of the calibration process for a continuous period of record model such as that used in the Reformulation Report. In view of the facts that, 1) the results of the hydrology simulations are actually the result of two linked models, and 2) the routing model is unique and applied to a difficult hydrologic modeling situation, the calibration results are especially important to present. The Reformulation Report is particularly deficient on this count since there is no description of the calibration process or presentation of any results of such a process. As discussed above (comment 10), the routing model should also be able to reproduce depth and area of inundation behavior at points removed from the floodgate exits of the basin. Without such a presentation it is impossible to conclude that the modeling is adequate and that the project benefits are substantiated.

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[10] see Fleming, 1975. *Computer Simulation Techniques in Hydrology*. Elsevier, New York.

[11] page 132-33 in US Army Corps of Engineers. *Flood-Runoff Analysis*.

20) Model verification. As described in the U.S. Army Corps of Engineers Publication No. 19[12], after a model is calibrated it is "good practice" to perform a model verification step "to compare the results with observed data" (emphasis added) . This is to "ensure that the calibration is not unique and limited to the data set employed for calibration". In the Reformulation Report, the text in the section titled "MODEL VERIFICATION" (page 6-35) says that such a comparison was made, to assess the model's predictive ability to simulate a series of historic flood events. However, there is no portrayal of these results against which one can assess the final model's adequacy. The referenced graph of Plate 4-21 only shows the results of two model simulations. It is therfore not a model verification in that it is not a comparison of model capability against observed data. Again the models' accuracy nor the project benefits are not adequately demonstrated.

21) Model sensitivity. Another critical element of hydrologic modeling is to perform a so-called 'sensitivity analysis'. In such an analysis, critical parameters of the model are varied by some fixed amount and the effects on the results presented[13]. In this way the relative importance of particular model parameters on the results are apparent. This is valuable since all model parameters are subject to some degree of inaccuracy. This can help focus efforts to refine certain methodologies as well as indicate the confidence level that can be placed in the model's results. The Report presents no such analysis. Without such a presentation it is not possible to conclude that the modeling is adequate and that the project benefits are substantiated. (also see comment 33)

22) Model results, stage-frequency curves. As discussed on page 6-35 of Appendix 6, the output from the routing model is utilized to determine stage-frequency curves "using a graphical plotting position method." However, no plots are presented for these determinations. As discussed in the U.S. Army Corps of Engineers Publication No. 19[14], there is a usual assumption that the data evaluated with such graphical procedures is distributed in a normal probability distribution. Publication No. 19 also presents methods of checking these data. The Corps should present all such critical data determinations; in this case they should present the plots used for determination of the stage-frequency curves.

This criticism is independent of the previously cited inadequacies of the routing model upon which the data used in the plotting procedure are based. These data are critical as they are used in many subsequent analyses of structural and agricultural damages and benefits (Appendix 7). As presented, it is not possible to ascertain the accuracy or levels of confidence that these stage-frequency data presented in Table 6-9 have.

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[12] page 133 in US Army Corps of Engineers. *Flood-Runoff Analysis.*

[13] see pages 242-250 of Fleming. *Computer Simulation Techniques in Hydrology.*

[14] page 118 in US Army Corps of Engineers. *Flood-Runoff Analysis.*

23) Inconsistency in Area-Elevation Curves. The area flooded versus frequency data given in Table 7-1 (page 7-35) are inconsistent with that given in Table 6-9 (page 6-36). For example, the 5-year event in Table 7-1 is given as a flood covering 419,000 acres, whereas this is given as 431,033 acres in Table 6-1. Analogously, the 50-year event in Table 7-1 is given as a flood covering 588,000 acres, whereas this is given as 592,934 acres in Table 6-1. A footnote to Table 7-1 explains that the areas of catfish farms were excluded. However, this does not appear to be the source of discrepancy between the data given. The difference in the data at the 5-year level is approximately 12,000 acres whereas it is about 5,000 acres at the 50-year level. If exclusion of a certain type of landuse could account for the difference, then the area excluded at the higher flood elevation (i.e. 50-year) would have to be greater than or equal to that excluded at the lower level (i.e. 5-year). This is not the pattern in these data. The Corps must explain how the data in Table 7-1 were derived since they are apparently not of the same origin as those in Appendix 6. The implication of utilizing inappropriate flooded area data is that the project benefits are not substantiated.

24) Determination of Average Annual Acres Flooded. On page 7-36 of Appendix 7, the Corps describes a procedure to derive the Average Annual Acres Flooded for each Reach. The text says that two previously derived types of data: the stage-frequency data and the stage-area data, are "integrated" to derive an area-frequency curve. The only details given in this critical determination are that "computer analyses facilitate measurement of the area under the area-frequency curve to determine the average annual acres flooded." However, it is not clear how this transformation leads to the desired end product: the Average Annual Acres Flooded values for each reach. These are extremely crucial data since the Average Annual Acres Flooded calculated here and elsewhere (eg. page 7-52 of Appendix 7) forms the basis of subsequent project benefit determinations for both structure and agricultural categories. The Corps has provided no documentation of this procedure. The Corps should clarify the rationale and application of this procedure.

25) Average Annual Acres Flooded are highly "synthetic." The determination of Average Annual Acres Flooded (page 7-36 of Appendix 7), which forms the basis of many subsequent project damage and benefit determinations, is based on two previously derived types of data with their own respective potential errors. The stage-area data and potential problems with its determination were discussed in comments 11 through 15. The stage-frequency curves are determined after the 2-step modeling procedure using the HEC-IFH and routing models. Each of these have their own attendant problems and potential sources of inaccuracy (in particular, see comments 4-5, 16-20, and 22). Thus the Average Annual Acres Flooded data as determined are highly synthetic, subject to the errors of several previous analytic steps, and far removed from any actual measured data. The implication of utilizing poorly documented Average Annual Acres Flooded data is that the project benefits are difficult to substantiate.

26) Inconsistent evaluation of local flood protection. In Appendix 7 (page 7-32) the evaluation of the economic feasibility of local flood protection measures (Plan 7 of the initial array) is inconsistent with the evaluation of other measures. As stated on page 7-32 the Corps evaluated the necessary measures to "eliminate the flooding problems in each area." Through the assumption of a 100% elimination of flooding "flood damages for existing conditions would be the flood control benefits." This is a completely inconsistent evaluation criteria for this alternative since the total elimination of flooding is not envisioned in the other structural (pump) plans, only an alteration of the flood frequency behavior in the Yazoo Backwater Area.

27) Flood damages in Reach 1, role of Corps hydrologic interconnections. In Appendix 7, Tables 7-5, 7-6, and 7-10 the Corps summarizes the structures receiving flood damages at the 100-year frequency under baseline (without project conditions). These data indicate that the majority of the structures are in Reach 1 (899 out of 1,555). The Corps also says that the majority of water drainage into the Yazoo Backwater Area (about 80%) is from the Sunflower River system (page 55 of Main Report). These two pieces of information taken in conjunction suggest that the Corps' previous work in the Yazoo Backwater Area has amplified the flooding problems in Reach 1. The Corps should evaluate the role that the 200 foot bottom width connecting channel that links the Reach 1 ponding areas (Steele Bayou sump) and Reach 2-4 ponding area (Deer Creek, Sunflower sump) plays in Reach 1 flooding. This was partially addressed in the Sunflower Levee Alternative presented in the "Initial Array" of the Main Report. The benefits for that Alternative were cited to be 77% of those of the recommended 14,000 cfs pumping plan.

28) Flood damages determination in Appendix 7, inconsistent with hydrologic modeling. The analysis of economic flood damages to structures with the proposed pumps as presented in Appendix 7 is not consistent with the results presented for the hydrologic modeling in Appendix 6. The recommended plan of Appendix 6 is Plan 5 with the 14,000 cfs pumping plant turned on at 87.0 feet. In Appendix 6 the areas of inundation are clearly depend on the particular trigger level for turning on the pumps (Table 6-9). In Appendix 7 the recommended plan is also a 14,000 cfs pumping plant (here deemed Plan 2 of the initial array). However, in Appendix 7 the area flooded-frequency behavior of the Yazoo Backwater Area is fixed in the "with project" condition (e.g. Table 7-4 or 7-12) and does not depend on the trigger level for pump activation. This fixed flooding-frequency behavior in Appendix 7 indicates that these analyses may have been performed independently of the hydrologic analyses in Appendix 6. The implication is that the project benefits calculated in Appendix 7 are not internally consistent with the hydrologic analyses of Appendix 6 and are therefore unsubstantiated.

29) Flood damages determination in Appendix 7, undocumented values. The cited multipliers at the base of Table 7-8 for calculating the value of "structure contents" as a function of the structure value are undocumented and unsubstantiated for the Yazoo

Backwater Area. The implication is that the project benefits calculated in Appendix 7 for structures are therefore unsubstantiated.

30) Appendix 7, inconsistent determination of flood depths. The text of Appendix 7, on page 7-43, says that "the URBAN computer program determines depth of flooding for each structure..." This does not seem possible since even the hydrologic routing model of Appendix 6 does not appear capable of calculating actual depths of inundation at specific locations (see comment 10) other than the outlets of the Yazoo Backwater Area at the Steele Bayou and Little Sunflower River floodgates. If depth of inundation is determined by the URBAN program, the Corps should demonstrate that these are consistent with the results of the hydrologic routing model. The implication of these undocumented depths of flooding at specific structures is that the project benefits calculated in Appendix 7 are not internally consistent with the hydrologic analyses of Appendix 6 and are therefore unsubstantiated.

31) Appendix 7, flood depths as inputs to URBAN. The text of Appendix 7, on page 7-43, says that the URBAN computer program evaluates structure damages "by hydrologic (water surface) profiles of actual structure location by hydraulic reach and source of flooding. Flooding depth data are then used in conjunction with depth-damage data for specific structure(s)..." As in the comment above, it is unclear if the URBAN computer program is calculating depths of inundation. The second sentence quoted here suggests that the depth of inundation are externally derived; they are "data" input to URBAN. If so, the Corps must demonstrate how these were derived. The routing model which is the heart of the hydrologic analyses of Appendix 6, appears to be incapable of such determination other than the outlets of the Yazoo Backwater Area at the Steele Bayou and Little Sunflower River floodgates (see comment 10). The implication of these undocumented depths of flooding for specific structures is that the project benefits calculated in Appendix 7 are not internally consistent with the hydrologic analyses of Appendix 6 and are therefore unsubstantiated.

32) Appendix 7, flood areas as inputs to agricultural crop damage program (CACFDAS) As described on page 7-87 of Appendix 7, the daily stage (elevation) information for the Yazoo Backwater Area is a principal input to the agricultural crop damage program (CACFDAS). This program integrates time of occurrence and duration of flooding to estimate crop damages. Although it is not explicitly stated here, this daily flood elevation input is presumably that determined in the 2-step HEC-IFH / routing model methodology of Appendix 6. As pointed out above, there are many uncertainties associated with the 2-step hydrologic modeling. The accuracy of the CACFDAS program is therefore highly suspect. (also see comment 33)

33) Appendixes 7 and 7A, risk and uncertainty in structure flood damage calculations. Beginning on page 7-55 in Appendix 7, and by reference to Appendix 7A, the Corps economic analysis begins to address the inherent uncertainty in many of the hydrologic

and economic parameters utilized in the Report. The Corps employs the "@Risk Program" in Appendix 7 and 7A to perform a "Monte Carlo" risk analysis in which an 'expected' range of key variables is used to randomly vary their values and to generate a frequency plot of potential outcomes. In particular, the Corps states that "Key variables identified as sources of uncertainty were structure value, contents value, first floor elevation (of a structure), depth-damage relationships, and stage-frequency data." While this analysis of uncertainty is certainly a valid and necessary component of the evaluation, the procedure used by the Corps is quite deficient. In this analysis the Corps evaluated the impact of varying key variables from "established ranges and distributions" (page 7A-13, Appendix 7A). However, the Corps did not present any of the ranges for the key variables, the distribution of the variables, or the methodology used in establishing the 'expected' range and distribution of these variables. Without a clear statement of these procedures it is not possible to deem the results of the risk and uncertainty analyses valid, and therefore the forecast damages and benefits from the proposed Plan are not substantiated.

34) Appendixes 7 and 7B, risk and uncertainty in agricultural flood damage calculations. In Appendix 7B, the Reformulation Report addresses the uncertainties inherent in determining the agricultural benefits of the proposed project. Since these are by far the larger benefits of the recommended plan (page 88 of Main Report), the uncertainty of this project benefit is especially important. The procedure used here is analogous to that for analyzing structure benefits in that key variables are identified and used in the "@Risk Program" (as above). The key variables that the Corps identified were "crop yields and the damage per acre flooded values from the CACFDAS program." The Corps goes on to say that the variation of the later variable encompasses the uncertainty in many others: "crop distributions, crop budgets, substitution of alternative crops, damage-duration data (flood), daily historical hydrologic data, and other physical and economic relationships" (page 7B-6). However, in spite of the complexity of the "damage per acre flooded" variable, the Corps did not present the range for this key variables, the distribution of the variable, or the methodology used in establishing the 'expected' range and distribution of this variable. Without a clear statement of these procedures it is not possible to deem the results of the risk and uncertainty analyses for the agricultural benefits valid, and therefore the forecast benefits from the proposed Plan are not substantiated.

EARTHJUSTICE
LEGAL DEFENSE FUND

BOZEMAN, MONTANA DENVER, COLORADO HONOLULU, HAWAI'I
JUNEAU, ALASKA NEW ORLEANS, LOUISIANA SAN FRANCISCO, CALIFORNIA
SEATTLE, WASHINGTON TALLAHASSEE, FLORIDA WASHINGTON, D.C.

December 8, 2000

Via Federal Express

Department of the Army
U.S. Army Corps of Engineers
Vicksburg District
4155 Clay Street
Vicksburg, Mississippi 39183-3435
ATTN: CEMVK-PP-D

Re: Comments on the Draft Yazoo Backwater Area Reformulation Report and Supplement No. 1 to the 1982 Yazoo Area Pump Project Final Environmental Impact Statement

Dear Sir:

These comments are submitted on behalf of: Earthjustice Legal Defense Fund; Sierra Club; Gulf Restoration Network; American Rivers; Center for Constitutional Rights (Mississippi); Concerned Parents of Leland County (Mississippi); Environmental Defense; Friends of the Earth; Mississippi River Basin Alliance; Mississippi Workers for Human Rights; Natural Resources Defense Council, and Taxpayers for Common Sense (collectively, the "Conservation, Taxpayer, and Citizen Groups").

Each of these organizations strongly oppose construction and operation of the Yazoo Backwater Pumping Plant (the "Yazoo Pumps" or the "Pumps").

The Yazoo Pumps are an environmentally devastating, enormously expensive, antiquated project designed to drain water from one of the most sparsely populated regions in the state of Mississippi. Though the U.S. Army Corps of Engineers (the "Corps") has not seen fit to proceed with this project for almost 60 years, it now wants to do so by building the world's largest hydraulic pumping plant so it can pump up to 6 million gallons of water a minute from one side of a Corps-built flood control structure to the other side of that structure. The Yazoo Pumps will cost federal taxpayers well over $181 million to construct. Taxpayers will then pay almost $1 million more each year for at least the next 50 years to operate the Pumps. Fully funded, the Yazoo Pumps will cost federal taxpayers well over $207 million.

The Yazoo Pumps will cause enormous and unacceptable environmental harm. The U.S. Environmental Protection Agency ("EPA") has determined that the Yazoo Pumps will drain and damage over 200,000 acres of ecologically significant wetlands, and will completely alter the hydrology of the project area. In addition to the appalling wetland losses and the resulting impacts on fish and wildlife, the Yazoo Pumps will

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degrade water quality, adversely affect water quantity, and promote increased pesticide use in an area already plagued by toxic contamination.

Construction and operation of the Yazoo Pumps would violate Section 404 of the Clean Water Act due to the magnitude and severity of the environmental impacts that would result from the project, the fact that those impacts could be entirely avoided by use of a wholly nonstructural flood damage reduction plan, and the failure of the Corps to require compensatory mitigation. By draining wetlands to increase agricultural production on marginal lands that have always flooded, the Yazoo Pumps also would undeniably violate the nation's wetlands, floodplain, and agricultural policies.

The Conservation, Taxpayer, and Citizens Groups strongly concur with EPA and the U.S. Fish and Wildlife Service ("Fish and Wildlife"), both of which have advised the Corps that this project must not proceed. The Conservation, Taxpayer, and Citizens Groups also agree with Secretary of the Interior Bruce Babbitt that the Yazoo Pumps are the "most cockamamie" project we have ever heard of, and with other federal employees who have described the Yazoo Pumps as "a boondoggle of the greatest magnitude," and the "worst of the worst" for the Corps.[1]

It is far past time for the Corps to stop repeating the disastrous mistakes of the past. At a time when the federal government is poised to spend billions of dollars to attempt to correct the devastating environmental impacts caused to the Everglades by the Corps' activities in the state of Florida, the Corps should not be recommending that federal taxpayers spend $207 million to completely alter the hydrology of yet another region of the country.

SUMMARY OF COMMENTS

For the reasons set forth below, the Conservation, Taxpayer, and Citizens Groups strongly urge the Corps to: (a) stop all planning for the Yazoo Pumps; (b) issue a notice in the Federal Register stating that all planning on the project has stopped, that no Record of Decision recommending construction and operation of the Yazoo Pumps will be signed, and that the plan recommended in the draft supplemental environmental impact statement is not authorized; and (c) formally recommend to Congress that the currently authorized project be deauthorized.

First, the Yazoo Pumps will cause environmental devastation on a scale that is both inconceivable and unacceptable. EPA has concluded that the Yazoo Pumps will

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[1] Editorial, *Big Muddy, Politics Soils Corps of Engineers*, Clarion Ledger , Oct. 1, 2000 (quoting Bruce Babbitt); David Quammen, *Backwater Boondoggle*, Audubon, January-February 1998, at 100 (quoting Ralph Pearce, U.S. Forest Service); Michael Grunwald, *Engineers of Power, Inside the Army Corps of Engineers, Working to Please Hill Commanders*, Washington Post, Sept. 11, 2000, at A1.

alter the hydrology of the entire project area, and will drain and damage over 200,000 acres of ecologically significant wetlands. Fish and Wildlife has concluded that the Pumps are likely to adversely affect the pondberry, a federally listed endangered species, and that formal consultation under the Endangered Species Act is necessary before the Corps may take any further action on the project. The Yazoo Pumps also will drain and damage wetlands in areas that currently are being managed by the federal government for fish and wildlife habitat.

The Corps' claim that the project will improve the environment is a sham. In an overt breach of trust, the Corps has based this claim on environmental benefits that are physically impossible to obtain.

Both EPA and Fish and Wildlife have concluded that the project will cause such substantial and unacceptable adverse environmental consequences that it must not proceed. The Yazoo Pumps are vehemently opposed by a host of national, regional, and state-wide environmental organizations; by the largest newspaper in the state of Mississippi, *The Clarion Ledger*, which has repeatedly and consistently editorialized against the project; by citizens within the project area and throughout the state of Mississippi; and by citizens from throughout the Nation.

Second, the Yazoo Pumps are an unwarranted agricultural drainage project designed to benefit large landowners; the Pumps will not provide real flood protection to people in need. The Yazoo Pumps are specifically designed to drain wetlands so that landowners can increase agricultural production on marginal lands that have always flooded. Indeed, the Corps acknowledges that over 83% of the project benefits are from agriculture. Significantly, the Draft SEIS does not identify even a single home that will be free from flooding once the project is built.

The $207 million that it will cost to build and operate the Pumps would be far better spent meeting real needs of the communities in the region that have been neglected for far too long. Those tax dollars should be used to improve basic services, provide targeted and real flood protection, reduce pesticide pollution, restore wetlands and other vital natural resources, and diversify the region's economy to increase opportunities in the region.

Third, the project violates the Clean Water Act, and the nation's wetlands, floodplain, and agricultural policies. The Yazoo Pumps violate Section 404 of the Clean Water Act because of the magnitude and severity of the environmental impacts that they will cause, the fact that those impacts could be entirely avoided by the use of a wholly nonstructural flood damage reduction plan, and the Corps' failure to require compensatory mitigation. By draining wetlands to increase agricultural production on marginal lands that have always flooded, and by draining lands currently enrolled in the

Conservation Reserve Program and the Wetlands Reserve Program, the Yazoo Pumps also undeniably violate the nation's wetlands, floodplain, and agricultural policies.

Fourth, the Corps' recommended alternative is not authorized, and may not proceed without new authorization. Any such authorization would be subject to the standard cost share requirements imposed by Section 2213 of the Water Resources Development Act. 33 U.S.C. § 2213. The Conservation, Taxpayer, and Citizens Groups will strongly oppose any such authorization. The Corps also has not prepared a post authorization change report as required by the Corps' engineering regulations. ER 1105-2-100, Appendix G, Section III.

Fifth, the project is not economically justifiable. An independent economic analysis commissioned by EPA concludes that the Yazoo Pumps cannot be economically justified, and that the Corps' economic analysis is severely and fundamentally flawed. Indeed, in addition to other flaws, that economic analysis concludes that the Corps has overestimated just the agricultural benefits of the Pumps by $144 million.

Sixth, the Corps' draft supplemental environmental impact statement ("Draft SEIS") is fundamentally and fatally flawed. It does not provide either a basis for making a reasoned choice among alternatives, or a full and objective assessment of the environmental impacts of the project as required by the National Environmental Policy Act ("NEPA"). Among numerous other deficiencies, the Draft SEIS bases its entire impacts analysis on a fundamentally flawed hydrologic assessment that severely underestimates the impacts of the project; contains a fatally flawed mitigation analysis; ignores the cumulative losses of wetlands in the region; fails to evaluate the impacts on two entire classes of animals, amphibians and reptiles; fails to adequately evaluate a wholly nonstructural alternative; omits critical supporting documentation and data; and is rife with inconsistencies and errors. It also appears that the Corps is not considering public comment in a manner consistent with the requirements of NEPA.

DETAILED COMMENTS

1. The Yazoo Pumps Will Cause Environmental Devastation On A Scale That Is Inconceivable And Unacceptable

The Yazoo Pumps will cause devastating environmental impacts that cannot be justified in any way, and that simply are not acceptable. The impacts are not acceptable to EPA and Fish and Wildlife, both of which have concluded that the Yazoo Pumps will cause such substantial and unacceptable adverse environmental consequences that it must not proceed.

The environmental impacts are not acceptable to a host of national, regional, and state-wide environmental organizations, including, but by no means limited to, American

Rivers, Audubon Society, Delta Land Trust, Earthjustice Legal Defense Fund, Environmental Defense, Gulf Restoration Network, Mississippi River Basin Alliance National Wildlife Federation, Natural Resources Defense Council, and Sierra Club all of whom have publicly opposed this project.[2]

The environmental impacts of this project are not acceptable to citizens within the project area and throughout the state of Mississippi, and they are not acceptable to citizens from throughout the Nation. As of the date of this letter, we are aware that over 1,700 citizens already have submitted electronic comments telling the Corps and President Clinton that the Yazoo Pumps must not be built.

The environmental impacts of this project are not acceptable to the largest newspaper in the state of Mississippi, *The Clarion Ledger*, which has repeatedly and consistently editorialized against the Pumps. These editorials, along with letters to the editor opposing the project (which we request be included as formal comments in opposition to the Yazoo Pumps), and articles discussing the Yazoo Pumps are attached at Tab A.

The Draft SEIS makes much of an alleged consensus process to identify options for the Yazoo Pumps. None of the Conservation, Taxpayer, or Citizen Groups were involved in that process. And clearly, that process did not produce an acceptable plan.

(a) The Yazoo Pumps Will Cause Ecosystem-Wide Destruction

EPA has determined that the Yazoo Pumps will alter the hydrology of the entire project area, and will drain and damage over 200,000 acres of wetlands.[3] This is twice as many wetlands as are destroyed in a year by all public and private projects nationwide. It

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[2] Environmental organizations also have made numerous requests for a thorough and independent review of the Corps' evaluation of the Yazoo Pumps. *E.g.*, Letter from Earthjustice Legal Defense Fund, Sierra Club, National Wildlife Federation, and the Gulf Restoration Network to Secretary of the Army Louis Caldera (March 20, 2000) (requesting an independent review of the Yazoo Pumps planning process); Letter from Earthjustice Legal Defense Fund, Sierra Club, National Wildlife Federation, Environmental Defense Fund, Izaak Walton League, and American Rivers to William J. Clinton, President (April 28, 1999) (requesting an interagency review of the Yazoo Pumps, the Big Sunflower River Maintenance Project and the St. Johns Bayou/New Madrid Floodway project); Letter from Earthjustice Legal Defense Fund, Gulf Restoration Network, and Sierra Club to Joseph W. Westphal, Assistant Secretary of the Army (Civil Works); Bruce Babbitt, Secretary, Department of the Interior; Charles Fox, Assistant Administrator, U.S. Environmental Protection Agency; Maj. Gen. Philip R. Anderson, Commander, Mississippi Valley Division (July 20, 1999) (restating the need for an immediate interagency review of the Yazoo Pumps and requesting establishment of a Federal Advisory Committee to assist in that review).

[3] As is discussed in more detail in Section 6 below, the Corps' analysis of impacts is fatally flawed, and inaccurate.

is six times as many wetlands as the Corps permits all private developers to destroy in an entire year.

The seminal textbook on wetlands makes clear that significant and ecosystem-wide changes can occur as a result of even small alterations in wetlands hydrology: "**When hydrologic conditions in wetlands change even slightly, the biota may respond with massive changes in species composition and richness and in ecosystem productivity.**" William J. Mitsch and James G. Gosselink, *Wetlands* (2nd ed.) (1993) at 68 (emphasis added). This happens because:

> Hydrology affects the species composition and richness, primary productivity, organic accumulation, and nutrient cycling in wetlands. . . . Water depth flow patterns, and duration and frequency of flooding, which are the result of all the hydrologic inputs and outputs, influence the biochemistry of the soils and are major factors in the ultimate selection of the biota of wetlands. . . . Hydrologic conditions can directly modify or change chemical and physical properties such as nutrient availability, degree of substrate anoxia, soil salinity, sediment properties, and pH.

Id. at 67-68. In short, "[h]ydrology is probably the single most important determinant of the establishment and maintenance of specific types of wetlands and wetland processes," and even "small changes in hydrology can result in significant biotic changes." *Id.* at 68.

EPA has advised the Corps that the most severe impact of the Pumps will be the complete elimination of wetland hydrology (*i.e.*, the wetlands will be entirely drained and destroyed). Even where the wetlands are not completely destroyed, EPA has concluded that the Pumps will so alter their hydrology as to significantly and adversely affect fisheries, wildlife habitat, water quality, water quantity, soil moisture recharge, deposition of sediments and nutrients, and flood pulse conditions. Fish and Wildlife has concluded that the Pumps are likely to adversely affect the pondberry, a federally listed endangered species, and that formal consultation under the Endangered Species Act is necessary before the Corps takes any further action. EPA Comments on the Draft SEIS; Fish and Wildlife Comments on the Draft SEIS.

The Yazoo Pumps will harm wetlands that federal taxpayers currently are paying to protect. For example, the Pumps will impact wetlands managed as mitigation for previously constructed projects in the region, and will impact tens of thousands of acres of forested wetlands on national forest, national wildlife refuge, and state lands. Lands enrolled in the Wetlands Reserve Program (approximately 22,500 acres in the project area) and the Conservation Reserve Program (approximately 9,000 acres in the project area) also will be impacted. EPA Comments on the Draft SEIS; Fish and Wildlife Comments on the Draft SEIS.

The 200,000 acres of wetlands that will be drained and damaged by the Yazoo Pumps are vital to the health, economy, and way of life of the residents of the Yazoo Backwater Area. It is well recognized -- and indeed codified in the Corps' own regulations -- that wetlands serve many important functions. Wetlands help reduce flood levels, filter pollutants from water, and provide vital habitat for fish and wildlife. *See* 33 C.F.R. §320.4(b)(2).

As importantly, by draining wetlands to increase agricultural production, the Yazoo Pumps will promote increased pesticide and fertilizer use in an area already plagued by toxic contamination. Pesticides and fertilizers have made waterways in the region unfit for fishing, swimming, and drinking, and virtually every farm field in the area is contaminated with at least the deadly pesticide DDT. Exposure to pesticides has been linked to some cancers and other diseases, including birth defects.

(b) The Yazoo Pumps Will Not Improve The Environment, And The Corps' Claims To The Contrary Are An Overt Breach Of Trust

The Corps claims that the Yazoo Pumps will provide "substantial environmental benefits." Draft SEIS ¶5 at SEIS-2. According to the Corps, these benefits will be realized by its plan to purchase conservation easements on 62,500 acres of agricultural land located below 87 feet NGVD and within the project area.[4] Any such purchases are to be from willing sellers only. Draft SEIS ¶ 65a at SEIS-26. According to the Corps, these conservation easements will result in environmental benefits that will completely obviate the need for any compensatory mitigation, and that will produce $2.96 million in annual benefits.[5] Draft SEIS Table 6 at SEIS-36.

These promised environmental benefits, however, are a total sham. In an overt breach of trust, the Corps has claimed benefits for reforesting agricultural lands that do not exist. Fish and Wildlife has determined that in the project area there are fewer than 9,100 acres of agricultural land in private ownership below 87 feet NGVD. Thus, the Corps has improperly claimed environmental and economic benefits for reforesting 53,400 acres of privately owned agricultural land that do not exist. **In short, it is physically impossible to obtain the environmental benefits claimed by the Corps.** As is discussed in detail below, the Corps' claims of economic benefits from the nonstructural reforestation component also violate the *Principles and Guidelines*.

Even assuming for the sake of argument that the Corps' acreage analysis is correct (which, it is not), the Corps still would have no hope of achieving the claimed

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[4] The Corps does not attribute any environmental benefits to the Pumps themselves.

[5] The Corps claims these benefits consist of insurable losses. Draft SEIS Table SEIS-6 at SEIS-36. As is discussed below, this benefit claim is not proper under the Corps' Principles and Guidelines.

"benefits" from this nonstructural reforestation component. According to the Corps, the 62,500 acres of reforestation "is based on the amount of open acres that currently exist within the 1-year frequency flood plain."[6] Draft SEIS, Appendix 1 Mitigation ¶ 59 at 1-28. Thus, underlying the entire impacts analysis of this project is the Corps' assumption that it can purchase conservation easements on each and every acre of what it believes to be the currently existing agricultural land below 87 feet. This assumption is wholly irrational. There is not a single piece of evidence in the Draft SEIS to suggest that the Corps will be 100% successful in this endeavor.

Quite to the contrary, the Corps has placed significant constraints on its ability to implement this nonstructural plan component, virtually ensuring failure. One year after the Pumps begin operation (currently scheduled for 2008), the Corps will stop all efforts to obtain conservation easements, **even if not a single easement has been purchased.**[7] Constraining itself even further, the Corps will not begin to purchase those easements until the Record of Decision is signed, the real estate documentation is finalized, and funds are **sought and appropriated.**[8] Draft SEIS, Appendix 1 Mitigation ¶ 91 at 1-42.

Just as importantly, even if all 62,500 acres of conservation easements were purchased (which they cannot be), they still would not create the environmental benefits

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[6] Fish and Wildlife also has advised the Corps that there are not 62,500 acres of available agricultural land in private ownership within the 1 year floodplain in the project area. The 1 year floodplain is often referred to as being at the 87 feet NGVD level, even by the Corps. But in reality, in many areas the 1 year floodplain is above 87 feet due to the progressive upward slope of the basin. According to Fish and Wildlife, there are only 58,894 privately owned agricultural acres within the 1 year floodplain of the project area. Fish and Wildlife Comments on the Draft SEIS.

[7] If by that time, the Corps has purchased 17,028 acres of conservation easements below 87 feet -- which is physically impossible -- the conservation easement program will end. If the Corps has purchased fewer than 17,028 acres of conservation easements by that time, it will convert the conservation easement program to a mitigation program that will attempt to obtain up to a total of 17,028 acres for mitigation purposes. Thus, the first 17,028 acres of conservation easements are to be counted towards mitigating the impacts of the Yazoo Pumps. As a result, the Corps cannot properly claim any additive environmental benefits from the first 17,028 acres of conservation easements. The Corps likewise cannot properly claim any monetary benefits for any of these 17,028 acres (though it appears that they have). The failure of the Corps' plan to satisfy mitigation requirements is discussed in detail below.

[8] "The process of securing conservation easements could begin in 2001 or after the Record of Decision is signed. Purchasing of the easements will be undertaken as quickly as the real estate process can be completed and **as funds become available.**" Draft SEIS, Appendix 1 Mitigation ¶ 91 at 1-42 (emphasis added). Each of these steps will take time to complete, further limiting the potential success of the Corps' conservation easement efforts. For example, the real estate documentation step will include preparation of a Real Estate Design Memorandum, approval by higher authorities of the estimated values of the easements included in that memorandum, completion of a cultural resource survey and an HTRW survey on those lands showing the most potential for easement purchase, and negotiations with the landowner over price. Main Report ¶ 207 at 97-98.

claimed by the Corps. Planting tree seedlings on frequently flooded agricultural lands does not create wetlands, and the conservation easements will not require landowners to modify the hydrology of their lands to help ensure the existence of wetland hydrology. Moreover, the Yazoo Pumps will inalterably change the hydrology of the very areas that are to be reforested through the conservation easements. In addition, any trees planted pursuant to the conservation easements can be harvested via normal silvicultural practices, including clear cutting. It is important to recognize that "the use of wetlands for any purpose involving the harvesting of the vegetation is bound to have a significant effect on the way the system functions." *Wetlands* at 517. Finally, there is to be no monitoring of individual conservation easements to ensure that they are in fact providing the environmental benefits claimed by the Corps, or even that the terms of the conservation easements are being complied with.[9] *See* Main Report ¶ 222 at 111 ("mitigation monitoring will not be part of the recommended plan")

2. The Yazoo Pumps Are An Unwarranted Agricultural Drainage Project Designed To Benefit Large Landowners; The Pumps Will Not Provide Real Flood Protection To People In Need

The Yazoo Pumps are an unwarranted agricultural drainage project designed to benefit large landowners in the project area; the Pumps will not provide real flood protection to people in need.[10] Indeed, the Yazoo Pumps are specifically designed to drain wetlands so that landowners can increase agricultural production on marginal lands that have always flooded. The Corps makes clear that over 83% of the project benefits are from agriculture.[11]

As of 1992, there were only 234 farms in the entire project area, with an average size of 1,250 acres.[12] SEIS ¶ 94 at SEIS-43. The Draft SEIS does not provide farm ownership information, so it is not possible to discern whether some landowners or

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[9] The Draft SEIS, however, seems to suggest that some limited monitoring may be undertaken to ensure initial tree seedling survival (historically conducted by the Corps in the Vicksburg District for only up to three years), but that will not ensure that the environmental benefits claimed by the Corps are actually being achieved.

[10] EPA's hydrologic analysis makes it clear that the effectiveness of the Pumps at reducing flood levels at higher elevations where most of homes in the project area located must be severely questioned. EPA Comments on the Draft SEIS.

[11] According to the Corps, 67% of annual project benefits are agricultural crop benefits, while other agricultural benefits constitute another 16.5% of project benefits. Main Report at Table 15.

[12] The Conservation, Taxpayer, and Citizens Groups note that the Main Report contradicts this number, claiming that as of 1992 there were 234 farms in the project area having an average size of 736 acres. Main Report ¶ 66 at 27. Using either figure, however, it is proper to say that on average the farms in the project area are quite large. The Corps does not provide any later information on farm size or numbers.

corporations own multiple farms in the project area. It is possible to discern from the Corps' data, however, that at least some of these large landowners currently are growing crops only to earn farm subsidy payments. The net agricultural returns in the project area "are negative $21.06" per acre (in the base year of 2006 without the Pumps). Even with the Pumps in operation, net agricultural returns would grow to only $5.16 per acre. If the Corps' data is in fact correct, the Corps in essence is recommending that federal taxpayers spend an additional $207 million to help these landowners receive even more farm subsidy payments. Shabman and Zepp Review Comments on "Yazoo Backwater Reformulation" dated September 24, 2000 ("Shabman Review Comments").

Only 15.6% of the project benefits are attributed to non agricultural benefits. These benefits include such things as avoided Federal Insurance Administration costs, avoided emergency costs, and benefits for the protection of roads, bridges, urban streets, and structures. As Dr. Leonard Shabman and Laura Zepp from the Department of Agricultural and Applied Economics at Virginia Tech have stated, the Corps' benefits calculations make clear that the Yazoo Pumps plan "**is formulated principally to protect the owners of farm land from predictable and minor seasonal flooding.**" Shabman Review Comments (emphasis in original).

Significantly, neither the Main Report nor the Draft SEIS (or its Appendices), identify even a single home that will be free from flooding once the project is built. Nor could they. For example, during some significant flood events, the Pumps will not even be turned on. The Pumps can only be turned on when the water levels on the landside of the Steele Bayou Control Structure are higher than the water levels of the Mississippi River, and the Steele Bayou floodgates are closed. Draft SEIS Appendix 6 ¶¶ 34, 35, 51(e) at 6-27, 6-35. Thus, the Pumps could not be turned on during a flood like the one that happened in 1991, because the Steele Bayou floodgates would not be closed and the Pumps would be torn apart by the volume of water passing through them. Draft SEIS Appendix 6 ¶ 30 at 6-24.

As importantly, the Corps does not have the necessary hydrologic data, and has not done the necessary level of analysis, to make any assurances that the Pumps will prevent homes from flooding. As is discussed more detail in Section 6 below, the Corps has used layers of inappropriate, simplistic, and coarse models to attempt to determine the impacts of the Yazoo Pumps on the complex hydrology of the project area. To make claims that specific homes will be protected by the Pumps, the Corps would need to use a decidedly more complex hydrologic model, and analyze significantly more data than it has to date. Moreover, EPA's hydrologic analysis also makes it clear that the effectiveness of the Pumps at reducing flood levels at higher elevations where most of the structures are located must be severely questioned. EPA Comments on the Draft SEIS.

In evaluating whether the Yazoo Pumps project should proceed, it also is extremely important to recognize that the federal government has already built significant

structural flood control projects in the region. The Corps has constructed the Mississippi River Mainline Levees, the Yazoo Area and Satartia Area Levees, the original Big Sunflower River project, the 28 mile connecting channel between the Little Sunflower River and Steele Bayou, the 65 mile Will Whittington Canal Auxiliary Channel and Levees, the 6 mile connecting channel between the Big Sunflower River and the Little Sunflower River, the Steele Bayou Control Structure, the Muddy Bayou Control Structure, and the Little Sunflower River floodgate. In historic dollars, the Corps has spent $2.4 billion on structural flood control projects just within the Yazoo Basin (this does not include the costs of the Mississippi River Mainline Levees).

As importantly, the Corps advised Congress 41 years ago that the flood control structures then in place would allow the Corps to provide the level of flood protection authorized for the Yazoo Backwater Area by the Flood Control Act of 1941, without the need for a pumping plant (*i.e.*, without the Yazoo Pumps):

> Since the original authorization for Yazoo Backwater Protection, important hydraulic changes have taken place due to improvement of channel efficiency in the Mississippi River and to reservoirs and channel improvement in the Yazoo Basin headwater area. These have resulted in less frequent flooding, and shorter duration of flooding, which makes it feasible to develop a simplification of the authorized plan by eliminating pumping at a large saving in project cost. . . . It is apparent that a protection plan for the Yazoo Backwater Area involving levees and floodgates only, which was not feasible under earlier conditions, is now feasible, and will provide a high degree of protection for the foreseeable future without the necessity of pumping.

U.S. Army Corps of Engineers, Vicksburg District, Mississippi River and Tributaries Comprehensive Review Report, Annex L, Yazoo Backwater Project Mississippi at 20 (November 1959).

The Draft SEIS presents no evidence to suggest that the hydrology of the project area has changed so that the authorized level of flood protection is no longer being provided. The Draft SEIS does note that since the project was first authorized, additional lands have been cleared below the 90 foot elevation. But, as is discussed in detail below, the Corps is not authorized to pump water from lands located below 90 feet.

Moreover, it is clear that the Corps is recommending that lands below 90 feet be drained of water only to allow increased agricultural use of those lands. **There is not a single structure located below the 90 foot level in the entire project area.** And, in the entire project area there is only one structure located between the 90 foot and 91 foot level. That structure is a commercial building (metal construction); it is not a home. Yazoo Backwater Reformulation Study Structural Data Base, June 2000, provided

pursuant to Freedom of Information Act Request submitted by Earthjustice Legal Defense Fund.

While the Corps has stated that "an estimated 1,555 structures are affected by flooding," we have been advised that only about 100 structures in the entire area impacted by the Pumps have filed more than one flood loss claim under the National Floodplain Insurance Program. Moreover, the Draft SEIS does not contain any actual structure damage data to guide the Corps' analysis of project need. Instead the Corps estimated the values of structures and their contents in the project area, and ran those estimates through a model that itself estimates how much damage the structures might suffer in certain flood events. Draft SEIS Economic Analysis Appendix, Attachment 7A. The Corps should obtain actual structure damage data, and National Flood Insurance repetitive loss claims data, to determine whether the benefits the Corps has claimed for structure protection in the project area have any validity whatsoever.

The $207 million that it will cost to build and operate the Pumps would be far better spent meeting real needs of the communities in the region that have been neglected for far too long. Those tax dollars should be used to provide targeted and real flood protection, improve basic services, reduce pesticide pollution, restore wetlands and other vital natural resources, and diversify the region's economy to increase opportunities in the region.

The Conservation, Taxpayer, and Citizens Groups strongly support an alternative investment strategy for the region, and the use of a wholly nonstructural approach to flood damage reduction in lieu of the Pumps, both as proposed by EPA.

3. The Yazoo Pumps Violate The Clean Water Act, And Federal Wetlands, Floodplain, And Agricultural Policies

The Yazoo Pumps violate the Clean Water Act, and the nation's wetlands, floodplain, and agricultural policies. The Yazoo Pumps also violate the Corps' mitigation mandates and policies, and are an affront to the Corps' Congressionally mandated mission to protect the environment. The Corps' failure to comply with NEPA and its implementing regulations is discussed in detail in Section 6, below. The Corps may not proceed with a project that violates the law and longstanding, sound policy.

(a) The Yazoo Pumps Violate The Clean Water Act

In carrying out its civil works activities, the Corps must comply with the mandates of Section 404 of the Clean Water Act, and the Section 404(b)(1) Guidelines. 33 U.S.C. § 1323; 33 C.F.R. § 336.1(a). The 404(b)(1) Guidelines prohibit the Corps from proceeding with the Yazoo Pumps if it "will cause or contribute to significant

degradation of the waters of the United States." 40 C.F.R. § 231.10(c). Under the Guidelines, effects that contribute to significant degradation include:

> (1) Significantly adverse effects of the discharge of pollutants on human health or welfare, including but not limited to effects on . . . fish, shellfish, wildlife, and special aquatic sites.
>
> (2) Significantly adverse effects of the discharge of pollutants on life stages of aquatic life and other wildlife dependent on aquatic ecosystems . . . .
>
> (3) Significantly adverse effects of the discharge of pollutants on aquatic ecosystem diversity, productivity, and stability. Such effects may include, but are not limited to, loss of fish and wildlife habitat or loss of the capacity of a wetland to assimilate nutrients, purify water, or reduce wave energy; or
>
> (4) Significantly adverse effects of discharge of pollutants on recreational, aesthetic, and economic values.

Id. In addition, no discharge shall be permitted "unless appropriate and practicable steps have been taken which will minimize potential adverse impacts of the discharge on the aquatic ecosystem." 40 C.F.R. § 230.10(d).

Critically, the 404(b)(1) Guidelines prohibit the Corps from proceeding with a civil works projects that will adversely impact wetlands if a less damaging practicable alternative is available. 40 C.F.R. § 230.10(a).

As discussed throughout these comments, the Yazoo Pumps clearly violate the 404(b)(1) Guidelines due to the magnitude and severity of the adverse impacts on virtually every one of the factors identified above. The Yazoo Pumps also violate the Guidelines because each of those impacts could be entirely avoided by the use of a wholly nonstructural flood damage reduction plan, and because the he Corps has failed to require any compensatory mitigation.

EPA already has advised the Corps that the Yazoo Pumps are a candidate for the exercise of EPA's Section 404 veto authority. Clean Water Act Section 404(c) allows EPA to prohibit the Corps from proceeding with the Yazoo Pumps if EPA determines that the project "will have an unacceptable adverse effect on municipal water supplies, shellfish beds and fishery areas (including spawning and breeding areas), wildlife, or recreational areas." 33 U.S.C. § 1344(c).

The Conservation, Taxpayer, and Citizens Groups urge EPA to exercise that veto authority if the Corps elects to proceed with this project.

(b) The Yazoo Pumps Violate The Nation's Wetlands Protection Laws And Policies

Since 1977, the Corps, and every other federal agency, has been directed to provide leadership and take action to minimize the destruction, loss, or degradation of wetlands, and to preserve and enhance the natural and beneficial values in carrying out agency responsibilities. Protection of Wetlands Executive Order (Executive Order 11990), *reprinted in* 42 U.S.C. § 4321. As importantly, Executive Order 11990 provides that each federal agency:

> shall avoid undertaking or providing assistance for new construction located in wetlands unless the head of the agency finds (1) that there is no practicable alternative to such construction, and (2) that the proposed action includes all practicable measures to minimize harm to wetlands which may result from such use.

Id. at Section 2(a). The term "new construction" is defined to include "draining, dredging, channelizing, filling, diking, impounding and related and any structures or facilities begun or authorized after the effective date" of the Executive Order. *Id.* at Section 7(b).

The courts have held that Executive Order 11990 is judicially enforceable and should be given the full force and effect of law. *City of Carmel By-The-Sea v. United States Dep't of Transportation*, 123 F.3d 1142, 1166 (9th Cir. 1997); *City of Waltham v. United States Postal Service*, 786 F. Supp. 105, 131 (D. Mass. 1992). The courts also have found that this Executive Order imposes duties on federal agencies beyond those of NEPA. It requires a specific finding that no practicable alternative to the proposed action exists. *City of Carmel*, 123 F.3d at 1167.

The Yazoo Pumps clearly violate this enforceable Executive Order, and the findings necessary to allow the Corps to proceed with this project have not been, and cannot be, made.

This country also has a well established policy of no net loss of the nation's wetlands. This policy was first established by the Bush Administration. The Clinton Administration added to this policy a goal of achieving a net gain of 100,000 acres of wetlands each year beginning in the year 2005 -- the very year construction of the Pumps is scheduled to begin. This goal is codified for the Corps in the Water Resources Development Act of 1990, which states:

> There is established, as part of the Corps of Engineers water resources development program, an interim goal of no overall net loss of the Nation's remaining wetlands base, as defined by acreage and function, and a long-term goal to increase the quality and quantity of the Nation's wetlands, as defined by acreage and function.[13]

33 U.S.C. § 2317(a)(1). In addition, one of the Corps' primary missions is protection of the environment:

> The Secretary shall include environmental protection as one of the primary missions of the Corps of Engineers in planning, designing, constructing, operating, and maintaining water resources projects.

33 U.S.C. § 2316(a).

The Corps also must comply with its clear and existing mitigation mandates and policies. The NEPA implementing regulations, and the Section 404(b)(1) Guidelines require mitigation for wetland impacts that cannot be avoided. These regulations call for avoiding the wetland impact altogether if the proposed project is not water dependent or if alternatives exist. If the project is water dependent and no alternatives exist, the impact should be minimized by modifying the project. If modification is not possible, the impact should be rectified by restoring the environment. 40 C.F.R. § 1508.20; 40 C.F.R. § 230.10(d). In 1990, The Corps and EPA signed a Memorandum of Agreement on mitigation that establishes policies and procedures to be used in implementing mitigation under Section 404 of the Clean Water Act.

In addition, for each civil works project proposed to Congress, the Corps also must include a mitigation plan or explain why the project will have negligible effects on fish and wildlife. 33 U.S.C. § 2283(d)(2).

The Yazoo Pumps will drain and damage over 200,000 acres of wetlands, undeniably causing irreparable harm to the environment. Indeed, the very purpose of the Pumps is to drain wetlands. The Corps has required no compensatory mitigation for the damage caused by the Pumps, nor could any compensatory mitigation make up for the ecosystem-wide hydrological alterations that the Pumps will cause. In short, the Yazoo Pumps are an affront to the nation's wetlands protection laws and polices, and to the Corps' environmental protection mission.

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[13] The Corps is not the only federal agency charged with promoting the conservation of the nation's wetlands in order to maintain the public benefits they provide. For example, the North American Wetlands Conservation Act provides a broad variety of measures to the Department of the Interior to promote wetland conservation and offset or prevent wetland losses. 16 U.S.C. § 4401 *et seq.*

(c) The Yazoo Pumps Violate The Nation's Agricultural Policies

The federal government is spending billions of dollars to take excess and environmentally sensitive croplands out of production. The Food Security Act of 1985 and the Erodible Land and Wetland Conservation Program, 16 U.S.C. § 3801 *et seq.*, encourage the removal of fragile lands from production and provide various opportunities for wetland habitat protection and restoration.

A special conservation provision in this Act, known as "Swampbuster," removes incentives for draining wetlands by eliminating most agricultural subsidies to farmers who drain wetlands to enhance crop production, or who produce commodities on wetlands converted after 1985. That the Corps will be doing the draining does not alter the fact that the Pumps violate the very purpose of the Swampbuster provision. Nor does it alter the impacts of the Swampbuster provision on farmers who take advantage of the Yazoo Pumps by increasing or initiating agricultural production on newly drained wetlands. Where the Yazoo Pumps cause wetlands to entirely lose their wetland jurisdictional status, the entire purpose of Swampbuster will be thwarted.

As importantly, an independent economic analysis of the Yazoo Pumps strongly suggests that at least some of the large landowners in the project area currently are growing crops only to earn farm subsidy payments. Based on data provided by the Corps, the net agricultural returns in the project area "are negative $21.06" per acre (in the base year of 2006 without the Pumps). Even with the Pumps in operation, net agricultural returns would grow only to $5.16 per acre. If the Corps' data is in fact correct, the Corps is recommending that the federal government spend $207 million "**to help landowners grow crops on land that is farmed only to earn farm subsidy payments.**" Shabman Review Comments (emphasis in original). Such a use of federal tax dollars clearly violates agricultural policies and common sense.

Moreover, while increased production as a result of the Pumps may help the large landowners in the project area, such increased production is unlikely to help other American farmers. Increased production causes overall prices to drop. As Senator Thad Cochran recently told the New York Times, agricultural "overproduction not just here but all over the world" is a significant problem.[14] Indeed it is a problem that compelled him to sponsor a $7 billion aid package to American Farmers. The Corps does a severe disservice to the nation by recommending that federal taxpayers pay $207 million to increase agricultural production when overproduction already is devastating farm communities.

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[14] Tim Weiner, *Parties in 'Political Bidding Contest' Over Aid to Farmers*, New York Times (National ed). Aug. 4, 1999 at A-14.

(d) The Yazoo Pumps Violate The Nation's Floodplain Policies

Since 1977, the Corps along with all other federal agencies have been directed to take action to "restore and preserve the natural and beneficial values served by floodplains" in carrying out their water resources activities, and "to avoid direct or indirect support of floodplain development wherever there is a practicable alternative." Floodplains are defined to include the 100 year floodplain. Executive Order on Floodplain Management (Executive Order 11988). This executive order was passed to help reduce flood damages by protecting the natural values of floodplains and reducing unwise land use practices in the nation's floodplains.

The National Flood Insurance Program also provides incentives for wise floodplain use. The National Flood Insurance Program allows property owners to purchase flood insurance at subsidized rates. To participate in the National Flood Insurance Program, each county or community is required to adopt and enforce floodplain management ordinances that require that residential buildings be elevated to or above the level of the 100-year flood. Main Report ¶136 at 55; National Flood Insurance Program Website.

All 7 counties/parishes and 19 communities in the project area are participants in the National Flood Insurance Program. Main Report ¶136 at 55; Draft SEIS Appendix 7 ¶ 6 at 7-2 and ¶ 8 at 7-3. Consequently, no residential building in the project area that was built or substantially improved after the date of entry into the National Flood Insurance Program should be below the 100 year flood elevation. Sharkey County, Rolling Fork, Cary, and Anguilla joined the National Flood Insurance Program in 1986, Mayersville joined in 1987, and the unincorporated areas of Issaquena County joined in 1990. National Flood Insurance Program Community Status Book.

The Yazoo Pumps project could not be more at odds with the policies embodied in the Executive Order on Floodplains and in the National Flood Insurance Program. Instead of taking minimal, cost effective, and legally mandated steps to prevent flood damages by ensuring that homes are either not built in the 100 year floodplain, or are elevated above the level of the 100 year floodplain, the Corps has proposed an enormously expensive, mammoth project that will attempt to avoid flood damages to structures by draining water off the 100 year floodplain, and altering the floodplain's natural and beneficial values.

The Draft SEIS does not consider the impacts of the National Flood Insurance Program or its underlying purpose in evaluating the need and justification for the Yazoo Pumps. For example, the Corps has not considered whether residential structures that it is seeking to protect from the 100 year flood are out of compliance with local ordinances. Indeed, the Corps has not even determined the dates of construction of the residential buildings it has evaluated. Yazoo Backwater Reformulation Study Structural Data Base,

June 2000, provided pursuant to Freedom of Information Act Request submitted by Earthjustice Legal Defense Fund (dates of construction not included). The Corps also has not analyzed whether it is appropriate under the *Principles and Guidelines* to claim economic benefits for any such residential buildings that are out of compliance.

4. As A Matter Of Law, The Corps May Not Construct Or Operate The Yazoo Pumps Because They Are Not Authorized By Congress

The Corps may not construct and operate the Yazoo Pumps pursuant to its recommended plan, because that plan is not authorized. As a result, explicit Congressional authorization is required before the Corps may proceed. Any such authorization would be subject to the standard cost share requirements imposed by Section 2213 of the Water Resources Development Act. 33 U.S.C. § 2213. The Conservation, Taxpayer, and Citizens Groups will strongly oppose any such authorization, and will strongly oppose any attempts to waive the local cost share requirement if new authorizing legislation is proposed.

The Flood Control Act of 1941 authorized a plan to reduce backwater flooding in the Yazoo Backwater area by constructing a combination of drainage structures and pumping plants.[15] The authorized plan carefully prescribes the scope of the projects that can be built. Projects are explicitly limited to those that will "prevent the sump level from exceeding 90 feet, mean Gulf level, at average intervals of less than 5 years."[16] Lands below the 90 foot elevation are to be "dedicated to sump storage."[17] Thus, under the existing authorization, waters below the 90 foot elevation may not be pumped or otherwise drained. These limitations have never been removed or altered. A copy of the authorizing language is attached at Tab B.

The Corps has completely ignored this unambiguous limit to the scope of the operation of any pumping facility that may be built for the Yazoo Backwater Area.[18] The

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[15] Specifically, the 1941 Act states: "the extension of the authorized project and improvements contemplated in plan C of the report of March 7, 1941, of the Mississippi River Commission are authorized . . . ." 33 U.S.C § 702a-12(b).

[16] H.R. Doc. No. 359, 77th Congress, 1st Session, at 40 (1941) (March 7, 1941 Report of the Mississippi River Commission, also referred to as the Review Report on the Project for Flood Control of the Mississippi River in its Alluvial Valley, dated 7 March 1941). A copy of the relevant portions of this document are attached at Tab B.

[17] *Id.* The directive that the "land below the 90-foot contour would therefore be dedicated to sump storage" applies to both Plans B and C.

[18] The Corps also has ignored its 41 year old conclusion that no pumps are needed to provide the authorized level of flood protection. As discussed above, in 1959, the Corps concluded that the authorized level of flood protection could be provided without pumps because the significant hydraulic

recommended plan unquestionably exceeds the scope of that authorization. The recommended plan will drain lands well below the 90 foot level, since the Yazoo Pumps will be turned on whenever water levels reach 87 feet NGVD.[19] *E.g.*, Main Report ¶ 160e at 71. The Draft SEIS also makes clear that even this unauthorized plan could be made far worse. The Corps retains the right to revise the operation of the Yazoo Pumps at the "discretion of the Commander, U.S. Army Corps of Engineers." Main Report 188, ¶ 235.

A careful reading of the Corps' documentation also makes clear that in reality, the Corps will turn the Pumps on when water levels are lower than 87 feet. Buried in the Main Report is the statement that the Pumps will be turned on as soon as water levels "are **predicted** to exceed 87 feet." Main Report ¶ 179 at 86 (emphasis added). The Main Report and Appendix 6 of the Draft SEIS also state that at least some of the 12 individual pumps that comprise the Yazoo Pumps project may be turned on **before** the water levels reach 87 feet. Main Report ¶ 214 at 100-01; Draft SEIS Engineering Appendix 6 ¶55 at 6-39.

Moreover, as EPA's comments and analysis make clear, the Pumps will in fact drain lands well below even the unauthorized 87 foot elevation. EPA Comments on the Draft SEIS.

Significantly, the Draft SEIS seriously evaluates **only** those alternatives that unquestionably exceed the scope of the authorized project. Those alternatives call for operating the pumps -- and thus draining lands -- at levels well below 90 feet. For example, the Corps' National Economic Development ("NED") plan calls for pumping flood waters from all lands above the 80 foot level during the cropping season (1 March to 1 December), and pumping flood waters from all lands above the 85 foot level during the rest of the year.

By draining lands below 90 feet, this unauthorized project will cause significantly more ecological harm than the Congressionally authorized project. The unauthorized draining of lands below 90 feet also significantly distorts the Corps' economic analysis.

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changes had occurred as a result of improvements to the channel efficiency in the Mississippi River, and as a result of reservoirs and channel improvements in the Yazoo Basin headwater area. U.S. Army Corps of Engineers, Vicksburg District, Mississippi River and Tributaries Comprehensive Review Report, Annex L, Yazoo Backwater Project Mississippi at 20 (November 1959).

[19] The Corps has not suggested that it is necessary to operate the Pumps at 87 feet to maintain the sump elevation at 90 feet. For example, the Corps' hydrologists have advised the U.S. Fish and Wildlife Service that operation of the Pumps at the 88.5 foot elevation will maintain a two-year frequency wetlands event at 88.6 feet. Letter from Charles K. Baxter, Yazoo Backwater Team Leader, U.S. Fish and Wildlife Service to Douglas J. Kaimen, Planning, Programs, and Project Management Division, Vicksburg District, U.S. Army Corps of Engineers at 3 (December 15, 1999).

For example, in its cost-benefit analysis, the Corps has claimed benefits for the unauthorized draining of lands below 90 feet. As discussed below, such benefits could more than double the total agricultural benefits of an authorized project.

The Corps was advised that it was not complying with the authorizing legislation for flood protection in the Yazoo Backwater Area in a March 20, 2000 letter to Secretary of the Army Louis Caldera (and copied to, among others, Joseph W. Westphal, Assistant Secretary of the Army for Civil Works) from Earthjustice Legal Defense Fund. A copy of that letter is attached at Tab C. The Corps has not addressed its lack of authorization in any way in the Draft SEIS or Main Report, and has not otherwise substantively responded to the issues raised in that March 20 letter. To our knowledge, the Corps has not advised the Office of the Assistant Secretary, EPA, Fish and Wildlife, the Office of Management and Budget, the Council on Environmental Quality, or the public that new Congressional authorization is required.

The Corps also has not prepared a post authorization change report as required by the Corps' engineering regulations. ER 1105-2-100, Appendix G, Section III.

It is critical that the Corps pay close attention to the legal limits under which it is required to operate. Unfortunately, it appears that the Corps has not done so for this project.

5. The Yazoo Pumps Are Not Economically Justified

An independent and extensive economic review of the Yazoo Pumps clearly demonstrates that the Pumps are not economically justified, and that there are no circumstances under which the they could become economically justified.[20] As a result, the Corps may not build the Yazoo Pumps.

The Shabman Study concludes that even if the Pumps guaranteed that it would **never** again flood anywhere within the 1 to 100-year floodplain in the Backwater Area -- a level of flood protection that the Pumps clearly do not, and cannot, provide -- the Pumps still could not generate more than $25.6 million (net present value) in agricultural flood reduction benefits. Shabman Review Comments and Shabman Study at 89. This is **"far below what would be necessary to NED justify such a project, even accepting**

[20] Leonard Shabman & Laura Zepp, An Approach for Evaluating Nonstructural Actions with Application to the Yazoo River (Mississippi) Backwater Area (February 7, 2000) (prepared in cooperation with the U.S. Environmental Protection Agency, Region 4) (the "Shabman Study"). Dr. Shabman and Ms. Zepp also reviewed and analyzed the economic analysis contained in the Draft SEIS. Shabman and Zepp Review Comments on "Yazoo Backwater Reformulation" dated September 24, 2000 ("Shabman Review Comments"). Both the Shabman Study and the Shabman Review Comments are included with the EPA Comments on the Draft SEIS.

all of the other benefit claims and the reported costs presented in the EIS." Shabman Review Comments (emphasis in original).

Because the Yazoo Pumps clearly will not stop all flooding in the Backwater Area, any agricultural benefits actually obtained from the Yazoo Pumps would be far less than $25.6 million. As importantly, of the $25.6 million in agricultural benefits that could be achieved by eliminating all flooding in the Yazoo Backwater area, $14.1 million are attributable to the elimination of all flooding within the 2-year floodplain (*i.e.*, by draining lands below the 91 foot elevation).[21] Shabman Study at 89, 104. As discussed above, however, the Corps is not authorized to drain lands below the 90 foot elevation. Thus, constructing and operating a pumping plant that complies with the Corps' existing authorization could provide little more than $11.5 million (net present value) in agricultural benefits.

The Shabman Study and Shabman Review Comments document a host of significant analytical flaws in the Corps' economic analysis. **Perhaps most egregiously, Dr. Shabman has concluded that the Corps' economic analysis overestimates agricultural benefits by $144 million.**

The Shabman Study shows that the Corps reached its vastly erroneous conclusion on agricultural benefits by utilizing grossly inflated agricultural return rates. For example, the Shabman Study shows that the Corps has substantially inflated the flood-free cotton return rates by comparing the capitalized value of those net returns to actual land prices.[22] *Id.* at 84. If the Corps' cotton return rates were correct, cotton land in the project area would have to sell today for more than $5,000 per acre. *Id.* at 88-89. The highest reported price for cotton land in the project area, however, is only $1,300 per acre.[23] *Id.* at 89. The Shabman Study concludes that these return rates "simply cannot be reconciled with land market prices," and "greatly exceed" the actual rates of returns. *Id.* at 88.

The Corps is overestimating the benefits of the Yazoo Pumps in other ways as well. For example:

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[21] The total net present value of all agriculture benefits that could accrue by eliminating all flooding within the 3 to 100-year floodplain is $11.5 million. *Id.* at 104.

[22] By overestimating the flood-free net returns, "the Corps' calculations of flood damages begin with a higher potential income loss from flooding and so would yield greater flood reduction benefits." Shabman Study at 84.

[23] The Shabman Study relies on Federal Land Bank Prices reported in Black, Unsworth and Ott (1997) in this analysis. Shabman Study at 89.

(a) The Corps is overestimating the potential agricultural benefits by claiming benefits for the unauthorized draining of lands below the 90 foot elevation (see discussion above).

(b) The Corps is overestimating the potential agricultural benefits by basing its benefits analysis on a discredited projection of land use in the project area. The agricultural benefits provided by the Yazoo Pumps are determined by comparing the agricultural returns that would be expected if the Pumps are built, to those that would be expected if the Pumps are not built. As a result, if the Corps overestimates the amount of land in the project area that will remain in agricultural production if the Pumps are not built, it also will overestimate the potential agricultural benefits. This is precisely what the Corps has done.

The Corps' economic analysis is based on the assumption that land use in the project area will not change if the Pumps are not built. Fish and Wildlife, however, has advised the Corps that this baseline assumption is entirely incorrect.[24] A detailed analysis conducted by Fish and Wildlife projects that land use in the project area will in fact change significantly over the 50 year project life. If the Pumps are not built, Fish and Wildlife projects that over 43,400 acres of cleared agricultural lands in the project area will be restored to wetlands, with 83 percent of that restoration taking place within the 2-year floodplain.[25] Overall, more than 86 percent of the 2-year floodplain will be restored to forested wetlands, with an additional 13,100 acres restored to wetlands elsewhere in the project area if the Pumps are not built.[26] Though the Corps included this information in the Draft SEIS, it nevertheless bases its economic analysis on its erroneous assumption of no change in land use in the project area. By claiming agricultural benefits for draining lands that would be taken out of agricultural production if the Pumps were not built, the Corps is overstating the potential agricultural benefits of the project.

(c) The Corps is overestimating the potential agricultural benefits by claiming agricultural crop benefits from the nonstructural conservation easement component of the Yazoo Pumps. The Corps is claiming $2.96 million in annual benefits for these easements based on alleged reductions in insurable flood losses. Main Report Table 15 at 88. As the Shabman Review Comments point out, however, the *Principles and Guidelines* prohibit the Corps from claiming these benefits. Moreover, as discussed

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[24] U.S. Fish and Wildlife Service, Fish and Wildlife Coordination Act Planning-Aid Report on the Yazoo Backwater Area Project at 1 (September 1999) ("Fish and Wildlife Planning Aid Report").

[25] Fish and Wildlife Planning Aid Report at 12. This "ongoing restoration reflects a realignment of land use and land capability that will continue into the future, absent major hydrologic and hydraulic interventions." *Id.* at 14.

[26] *Id.* at 13.

above, the nonstructural conservation easement component of the Yazoo Pumps project is completely illusory. In addition, no benefits can be claimed for the 17,028 acres of these conservation easements that are actually being used to satisfy mitigation requirements, because mitigation only ensures no net loss to the environment. *See* Draft SEIS, Appendix 1 Mitigation ¶ 91 at 1-42.

The Shabman Review Comments conclude that by improperly counting benefits for these easements, the Draft SEIS clearly overstates the annual benefits of the recommended plan by $2.96 million. Eliminating just these benefits immediately reduces the cost benefit ration to 1.24 (and the Corps' estimates of project benefits will exceed project costs by only $3.66 million).

The Corps also is underestimating the costs of the Yazoo Pumps in a number of significant ways. For example:

(a) The Corps appears to be severely underestimating the costs of constructing the Yazoo Pumps. Despite significant price level increases since 1982 (as documented in the Corps' Civil Works Construction Cost Index), the Corps contends that: the structural first costs for the Pumps are less than the structural first costs projected for this project in 1982; the annual costs are less than those projected in 1982; and the operations and maintenance costs are less than those projected in 1982. Main Report ¶¶ 197, 198 at 93-94. The reader is also referred to the critique of costs in the March 20, 2000 letter to Secretary of the Army Louis Caldera, which is attached to these comments at Tab C.

(b) The Corps has not included the costs of mitigation in its economic analysis. In light of the ecosystem-wide impacts that will be caused by the Pumps, the cost of mitigation to compensate for those impacts would be substantial. As is discussed above, compensatory mitigation for the Yazoo Pumps is required by law and policy. Accordingly, mitigation costs must be included as costs of the project.

In short, the Corps' economic analysis contains significant analytical flaws, and cannot be relied on to justify this project.[27] The Yazoo Pumps are not economically justified, and must not be built.

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[27] This is not the first time that an economic analysis conducted by the Corps' Vicksburg District has been severely criticized and shown to be strongly biased towards justifying a project that undeniably would "grow" the Corps' civil works program. In 1997, the U.S. Fish and Wildlife Service had such overwhelming concerns with the economic methodology used by the Vicksburg District to analyze the relative costs of purchasing flowage easements for the Big Sunflower River Maintenance Project that it undertook its own economic analysis of those costs. That economic study shows that the Corps significantly overestimated the costs of utilizing nonstructural alternatives to meet the objectives of the Big Sunflower project. U.S. Fish and Wildlife Service, Considerations in the Pricing of Flowage Easements: A Case Study of Non-Structural Flood Control in the Big Sunflower River Basin (October 1997). Fish and Wildlife's economic analysis of the Big Sunflower River Maintenance Project compels a

6. The Draft SEIS Is Fundamentally And Fatally Flawed

The Draft SEIS is fundamentally and fatally flawed. In addition to each of the points raised in the previous sections of these comments, the Draft SEIS contains numerous other critical and fundamental deficiencies.

Among other things, the Draft SEIS bases its entire impacts analysis on a fundamentally flawed hydrologic assessment that severely underestimates the impacts of the project; contains a fatally flawed mitigation analysis; ignores the cumulative losses of wetlands in the region; fails to evaluate the impacts on two entire classes of animals, amphibians and reptiles; fails to adequately evaluate a wholly nonstructural alternative; omits critical supporting documentation and data; and is rife with inconsistencies and errors. It also appears that the Corps is not considering public comment in a manner consistent with the requirements of NEPA.

For all of these reasons, the Draft SEIS does not provide either a basis for making a reasoned choice among alternatives, or a full and objective assessment of the environmental impacts of the project, both as required by NEPA.

(a) The Corps Has Based Its Entire Analysis On A Fundamentally Flawed And Scientifically Inappropriate Hydrologic Analysis

The hydrologic analysis in the Draft SEIS forms the foundation for all other analyses in the Draft SEIS, including its analysis of wetlands impacts, mitigation, fisheries, waterfowl, endangered and threatened species, and economic costs and benefits. As is set forth in detail in the comments on the Draft SEIS submitted by EPA and the National Wildlife Federation, the Corps' hydrologic analysis is fundamentally flawed.

Both EPA and National Wildlife Federation's hydrology expert conclude that the hydrologic models used by the Corps are not scientifically appropriate for use with this project. Those models are far too simplistic and coarse to evaluate the impacts of the Yazoo Pumps on the complex hydrology of the project area. For example, EPA points out that the Corps' hydrologic model does not include basin wide channel cross-section information that is critical for accurately predicting flood profiles.

Both EPA and National Wildlife Federation's hydrology expert also conclude that the data used by the Corps to run its simplistic and inappropriate models also is extremely limited and coarse. For example, EPA points out that the Corps appears to have used

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reevaluation of the Corps' decision to dredge the Big Sunflower River (at undeniably devastating environmental cost), just as Dr. Shabman's economic analysis mandates a reevaluation of the Yazoo Pumps.

data points from just 10 satellite images to generate the elevation area curves that form the basis for all other hydrologic analyses in the Draft SEIS. And, despite the importance of those curves, the Corps has not provided either the data points or the model used to fit the curve to those data points.

Both EPA and National Wildlife Federation's hydrology expert conclude that the Corps' stage-frequency analysis also is fundamentally flawed. That analysis, summarized in Table 14 of the Main Report (at page 85), is completely unsubstantiated. It also is subject to a high degree of error because that analysis is itself based on two highly questionable analytic analyses; it is not based on any measured date. In short, there is absolutely no data or analysis of any kind in the Draft SEIS to support the stage-frequency analysis that forms the basis of all the Corps' claims of flood reduction benefits.

It is clear from the EPA and National Wildlife Federation comments that the Corps' Draft SEIS is more akin to a house of cards than to the valid and objective environmental impact statement required by NEPA. If even one component of the Corps' numerous models is incorrect, if even one assumption underlying those models is wrong, if even one of the ten data points is inaccurate or an aberration -- and the experts have pointed out many such examples -- then, just like a house of cards when the bottom card is removed, the Corps' entire analysis of flood protection benefits, economic benefits, and environmental impacts also must fall.

For example, the Corps concludes that the Yazoo Pumps will not alter the hydrology of the one year floodplain (*i.e.*, those lands below 87 feet), even though the Yazoo Pumps will be turned on when the water levels are at or below 87 feet. On the basis of its conclusion of no hydrologic harm to the 1 year floodplain, the Corps also concludes that the Pumps will not cause any harm whatsoever to wetlands within the 1 year floodplain. From that the Corps concludes that the Pumps will not cause any impacts to fish and wildlife in the 1 year floodplain.

However, as EPA has demonstrated, these conclusions, all of which are based on the Corps' faulty hydrology analysis, are incorrect. EPA has determined that the Yazoo Pumps will alter the hydrology of the entire one year floodplain, and thus will impact all of the wetlands located below 87 feet. As dramatically, the Corps' hydrologic model has caused it to conclude that "only" 23,200 acres of wetlands will be affected by the Pumps, while EPA makes clear that over 200,000 acres of wetlands will be drained and damaged.

Because the Corps' models are fundamentally inappropriate for the project, they cannot form the basis of a valid and objective impacts analysis. Should the Corps persist in its plans to proceed with this project it should reevaluate the impacts of the Yazoo Pumps using a legitimate foundation for its analysis.

(b) The Corps' Wetlands Impacts Analysis Is Fundamentally Flawed

The Corps' severe underestimation of wetland impacts caused by its flawed hydrologic analysis, is compounded by additional problems with the Corps' wetlands impacts analysis. For example, the Corps has limited its evaluation of wetland impacts to wetlands located between the 87 foot elevation (below which it claims there will be no hydrologic harm) and the 88.5 foot elevation, which the Corps claims is the "maximum elevation at which backwater flooding influences the jurisdictional delineation of wetlands in the study area." See Draft SEIS ¶ 113 at SEIS-53. Though it has not documented the underlying assumptions, the Corps has thus limited the scope of its impacts analysis to those wetlands located above the 1 year floodplain and below the 2 year floodplain.

This limitation is wholly unfounded. First, as EPA concludes, all wetlands below the 87 foot elevation will be impacted by the Pumps. Second, wetlands clearly exist above the 88.5 foot elevation. Third, there is no basis for limiting the impacts analysis to wetlands influenced by backwater flooding since the very purpose of the project is to reduce headwater flooding (not backwater) flooding. Fourth, the Corps is clearly asserting that the Pumps will drain water from, and thus will drain wetlands in, the entire 100 year floodplain. The Corps must analyze the impacts of this project on all the area's wetlands.

In addition, the Corps has used a wetlands impacts assessment methodology that EPA has determined is both "flawed and incomplete."[28] That methodology is scientifically indefensible because there is no data to support the assumptions upon which it is based, no data to support acreage impacts or impacts to wetland functional values, and no data or information upon which to evaluate the Corps' mitigation proposals.[29] As importantly, because that methodology is not designed to assess impacts to wetlands caused by hydrologic change -- the principal impact caused by operation of the Pumps -- it is not appropriate for evaluating the impacts of the project.[30]

Other problems with the Corps' wetlands impacts analysis abound, and are documented in detail in the EPA Comments on the Draft SEIS. As EPA long ago advised the Corps, the magnitude of the anticipated wetland impacts from the Yazoo Pumps and the extensive cumulative losses of wetlands in the Yazoo Basin mandate use

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[28] Letter from Tom Welborn, Chief, Wetlands, Coastal and Nonpoint Source Branch, Region 4, U.S. Environmental Protection Agency to John Meador, U.S. Army Corps of Engineers at 4 (October 12, 1999). A copy of this letter is included with the EPA Comments on the Draft SEIS.

[29] *Id.* at 1-4.

[30] *Id.* at 1-2.

of the "utmost care and scientific rigor" to assess impacts and to plan for, and implement, compensatory mitigation.[31] Unfortunately, the Corps did not heed that counsel.

Instead, the Corps persisted in using a methodology that was guaranteed to underestimate, and that in fact did underestimate, the impacts of the Yazoo Pumps on the region's wetlands. As a result, the Corps also has severely underestimated the amount of needed mitigation. This is borne out by the Corps' claim that only 12,980 acres of reforestation of frequently flooded agricultural land (with no hydrological modification) would be necessary to compensate for the hydrologic impacts of the Pumps, when EPA's analysis shows that the Yazoo Pumps will drain and damage over 200,000 acres of wetlands. *See* Main Report ¶ 192 at 91.

The wetlands impacts analysis in the Draft SEIS is wholly inaccurate, and does not satisfy the mandates of NEPA. Without an accurate understanding of the impacts of the Yazoo Pumps, the Corps cannot make a reasoned decision as to whether or not the project should proceed. Without an accurate understanding of the impacts of the Yazoo Pumps, the Corps also cannot properly analyze whether mitigation can in fact offset those impacts, how much mitigation would be required to do so, or what kind of mitigation would be required.

(c) The Corps' Mitigation Analysis Is Wholly Inadequate

In direct violation of law and policy, compensatory mitigation is **not** a part of the Corps' recommended plan for the Yazoo Pumps. *E.g.*, Main Report ¶ 191 at 91; Draft SEIS ¶¶ 82 at SEIS-39 and ¶ 84 at SEIS-40.

As discussed above, the Corps claims that compensatory mitigation is not necessary due to its plan to purchase conservation easements on those none-existent 62,500 acres of available agricultural land located within the project area and below 87 feet. According to the Corps, those conservation easements will result in environmental benefits that will completely obviate the need for any compensatory mitigation, and that will produce $2.96 million in annual benefits. Draft SEIS Table 6 at SEIS-36. The wholly illusory nature of these claims is discussed in detail in Section 1(b) of these comments.

Even though it expressly states that compensatory mitigation is not part of the recommended plan, the Corps nevertheless claims that it has calculated what would be the necessary mitigation. According to the Corps, a total of 17,028 acres of reforestation of frequently flooded agricultural land will fully compensate for the impacts of this

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[31] *Id.* at 4.

project (12,980 acres to compensate for hydrologic changes, and 4,048 to compensate for past project impacts and direct impacts). Main Report ¶ 195 at 92.

Recognizing at least the need for this completely unsatisfactory amount of mitigation, the Corps has asserted that the first 17,028 acres of conservation easements will be counted towards mitigating the impacts of the Yazoo Pumps.[32] If the Corps does not purchase at least 17,028 acres of conservation easements before it stops its conservation easement purchase efforts, the Draft SEIS says that the Corps will revert to a compensatory mitigation program that will have a goal of obtaining up to a total of 17,028 acres for mitigation purposes.

The Corps' mitigation analysis is wholly inadequate. The very purpose of the mitigation analysis under NEPA is to "discuss the extent to which adverse effects can be avoided" by mitigation measures. *Robertson v. Methow Valley Citizens Council*, 490 U.S. 332, 352 (1989). Essential to such a discussion, is a recognition of the actual ability of mitigation to compensate for the environmental harms caused by a project. A mitigation analysis that assumes that mitigation will in fact work when all evidence is to the contrary does not satisfy NEPA.

The Corps' mitigation analysis is fundamentally flawed because it does not honestly evaluate the inherent difficulties and uncertainties associated with mitigation, let alone those associated with mitigation on the scale that would be necessary for the Yazoo Pumps. A fundamental change in the Corps' approach to mitigation will be necessary before the Corps can hope to prepare a meaningful and objective mitigation analysis.

First and foremost, the Corps must recognize that it is impossible, under the Corps' current mitigation practices, to compensate either for the ecosystem-wide devastation that this project will cause, or for the 200,000 acres of wetlands that will be drained and damaged. The Corps has not even calculated (let alone proposed) any mitigation whatsoever for the ecosystem-wide hydrologic changes that this project will cause. And, the calculated mitigation for wetlands impacts is utterly inadequate to compensate for 200,000 acres of wetland impacts. Critically, it is virtually inconceivable that any amount of proposed mitigation could compensate for impacts on the scale of those that will be caused by the Yazoo Pumps. As a result, the Corps must not proceed with this project.

Second, the Corps must recognize that wetlands mitigation is extremely difficult and often fails. As a consequence, impacts that can be avoided should be, even if that

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[32] As a result, the Corps cannot properly claim any additive environmental benefits from the first 17,028 acres of conservation easements. The Corps likewise cannot properly claim any monetary benefits for any of these 17,028 acres.

requires the Corps to say no to a project. Mitigation should not be viewed as a panacea that makes all project impacts "disappear."

The scientific literature clearly and undeniably demonstrates that wetlands mitigation is extremely difficult and often fails. Copies of the studies cited below are attached at Tab D. For example, a 1996 study published in *Ecological Applications* concludes that "[b]ased on over a decade of survey results, the cumulative record of past mitigation projects remains undeniably poor overall, with disappointingly few examples of success."[33] The "sober reality [is] that under present mitigation policies and practices 'losses are likely to be uncompensated for and that what we call mitigation has a high chance of failure.'"[34]

The National Research Council has concluded that:

> Attempts to restore forested wetlands of the Southeast (e.g., bottomland hardwoods and cypress swamps) have encountered difficulties related to the time required to replace mature trees, the lack of material to transplant, the lack of knowledge of how and when to carry out seeding or transplantation, (Clewell and Lea, 1989) and altered hydrology (drainage for conversion to agriculture) of the wetland area.[35]

Even the Corps' top policymakers recognize -- and have testified to Congress -- that the success of wetlands mitigation is questionable at best. According to Michael L. Davis, Deputy Assistant Secretary of the Army for Civil Works, (and Robert H. Wayland, Director of the Office of Wetlands, Oceans and Watersheds, U.S. Environmental Protection Agency):

> Many mitigation projects have, in fact, failed due to one or more of the following reasons: poor siting and project design; inadequate monitoring programs; lack of adequate maintenance or remedial activities; and in some cases, failure of permittees to comply with the conditions of their permits.[36]

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[33] Margaret S. Race and Mark S. Fonesca, *Fixing Compensatory Mitigation: What Will It Take*, Ecological Applications (1996) pp. 94-101 at 97.

[34] *Id.*

[35] National Research Council, *Restoration of Aquatic Ecosystems*, (National Academy Press 1992) at 311.

[36] Complete Joint Statement of Michael L. Davis, Deputy Assistant Secretary of the Army for Civil Works and Robert H. Wayland III, Director, Office of Wetlands, Oceans and Watersheds, Environmental Protection Agency, Before the Transportation and Infrastructure Committee, Subcommittee on Water

Scientific studies also demonstrate that there is a wholesale lack of data regarding the ability to fully restore the lost functional values of a complex bottomland hardwood wetland through mitigation. For example, the National Research Council has concluded that: "[t]he short time period within which forest restoration attempts have been monitored precludes an evaluation of their functional equivalency with natural reference systems."[37] As a result, "mitigation efforts cannot yet claim to have duplicated lost wetland functional values."[38] A 1996 study concludes that "there are few satisfactory methods for assessing replacement of the functions lost with the original wetland."[39] Moreover, when monitoring to assess the success of mitigation is based on a relatively simple set of criteria, those criteria may or may not accurately reflect wetland function.[40]

Contrary to the Corps' suggestion that it has a mitigation monitoring program up and running in the project area, no monitoring data has yet been generated from that program. Response To Freedom of Information Act Request submitted by Earthjustice Legal Defense Fund for the Monitoring Program and Results Identified in ¶ 223 of the Main Report at 111.

Third, the Corps must recognize that planting tree seedlings or seeds on frequently flooded farmlands is not wetlands mitigation. To mitigate for a lost wetland, the Corps must create, restore, or enhance a wetland. This is particularly true where, as here, the Corps bases its wetlands mitigation acreage figure on lost wetland functions and values. Planting tree seedlings on frequently flooded farmland does not guarantee the replacement of all lost wetland functions and values. These functions include short-term water storage, long-term water storage, water velocity reduction, sediment detention, onsite erosion control, nutrient and dissolved substance removal, and organic carbon export.

Fully compensating for such lost values requires far more than attempts to plant trees. Hydrological modification, in particular, is a critical component of successful

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Resources and Environment, United States House of Representatives, Wetlands Protection and Mitigation Banking, December 9, 1997.

[37] *Restoration of Aquatic Ecosystems* at 311-312.

[38] *Fixing Compensatory Mitigation: What Will It Take* at 95 (summarizing findings in *Restoration of Aquatic Ecosystems).*

[39] William J. Mitsch and Renee F. Wilson, *Improving the Success of Wetland Creation and Restoration With Know-How, Time, and Self-Design*, Ecological Applications (1996) pp. 77-83 at 77.

[40] *Id.*

wetlands restoration efforts. As the National Research Council has concluded, correct hydrology and species diversity are critical elements in restoring wetlands:

> Natural forested wetlands may support hundreds of plant species, many of which thrive in the understory (91 percent of 409 species in one riverine forest were understory species). Old-growth forests are dominated by trees that gradually achieve a dominant role in the canopy and that are self-sustaining through their ability to reproduce in their own shade. It is not clear that such climax species can be successfully established in open sites, or whether their introduction must await development of seral (intermediate successional stage) plant communities. . . . In many cases, restoration of suitable hydrologic conditions will be necessary.[41]

Fourth, the Corps must recognize that wetlands mitigation requires long term monitoring to ensure that the mitigation is ecologically successful, and is in fact replacing the wetland functions and values lost as a result of a project. Monitoring to ensure tree seedling survival is not sufficient to ensure ecological success. The Corps is must require meaningful monitoring of all mitigation it commits to in a Record of Decision, as required by law. 40 C.F.R. §§ 1505.2, 1505.3; 33 C.F.R. § 230.15.

Fifth, the Corps must recognize that its existing substantial backlog of mitigation is strong evidence that the Corps will have difficulty in carrying out additional mitigation responsibilities. By its own admission, as of June 24, 1999, the Corps' Vicksburg District was legally obligated to implement compensatory mitigation on well over 25,000 acres that had yet to be purchased.[42] This backlog did not include the mitigation that would be required in the Vicksburg District for the Mississippi River Mainline Levee Project, which includes the purchase and reforestation of an additional 5,200 acres of frequently flooded agricultural lands. The Corps should not approve projects requiring additional mitigation until it fully implements its existing mitigation backlog.

Sixth, the Corps must recognize that it has not proposed anything even close to an acceptable amount of mitigation for this project. At an absolute minimum, the Corps should be required to implement one acre of mitigation for each acre of wetlands impacted. Only in that way can the Corps have any hope of meeting its statutorily established "interim goal of no overall net loss of the Nation's remaining wetlands base, as defined by acreage and function." 33 U.S.C. § 2317(a)(1). Acreage calculations for all components of the mitigation requirements are flawed, and not properly justified.

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[41] *Restoration of Aquatic Ecosystems* at 311.

[42] Letter and Attachments from Joseph W. Westphal, Assistant Secretary of the Army (Civil Works) to Melissa A. Samet, Attorney, Earthjustice Legal Defense Fund (August 9, 1999).

Moreover, by so severely underestimating the hydrologic impacts of the project, the Corps has certainly underestimated the impacts to fisheries from the Yazoo Pumps. An accurate analysis of fisheries impacts almost certainly will result in significantly higher mitigation requirements than have been proposed. The same holds true for accurate assessments of wetlands impacts, water quality impacts, wildlife impacts, and cumulative impacts.

Seventh, the Corps must recognize that there are significant differences between a meaningful compensatory mitigation plan and the Corps' conservation easement program. As a result, no portion of conservation easement lands should be counted towards compensatory mitigation. For example, as discussed above, planting tree seedlings on frequently flooded agricultural lands does not create wetlands, and the conservation easements will not require landowners to modify the hydrology of their lands to help ensure the existence of wetland hydrology. Trees planted pursuant to the conservation easements can be harvested via normal silvicultural practices, including clear cutting, but no harvesting of mitigation lands is allowed. In addition, there is to be no monitoring of individual conservation easements to ensure that they are in fact providing the environmental benefits claimed by the Corps, or even that the terms of the conservation easements are being complied with. But monitoring to ensure mitigation success is required by law.

(d) The Corps' Threatened And Endangered Species Analysis Is Inadequate And The Corps Must Formally Consult With Fish And Wildlife On The Pondberry Before It May Proceed Any Further With This Project

The Fish and Wildlife Service disagrees with the Corps' conclusion that the recommend Yazoo Pumps plan is not likely to adversely affect pondberry, a federally listed endangered plant species. Fish and Wildlife has concluded that the magnitude of the hydrologic impacts of the Yazoo Pumps is likely to adversely affect the pondberry. As a result, Fish and Wildlife has recommended that the Corps initiate formal consultation to ensure that the project will not likely jeopardize the continued existence of the pondberry, as required by Setion 7(a)(2) of the Federal Endangered Species Act. Fish and Wildlife Comments on the Draft SEIS.

The Corps must not proceed with this project until it has completed this formal consultation and taken the results of that consultation into account in determining whether or how to proceed.

(e) The Corps Has Abjectly Ignored The Cumulative Losses Of Wetlands And The Cumulative Impacts Of Significant Hydrologic Alterations In The Project Area

Though the Draft SEIS includes a nominal cumulative impacts discussion, that discussion most definitely does not satisfy NEPA.

As discussed above, the Corps has spent $2.4 billion (in historical dollars) on structural flood control projects just within the Yazoo Basin. The projects built with these monies include: the Yazoo Area and Satartia Area Levees, the original Big Sunflower River project, the 28 mile connecting channel between the Little Sunflower River and Steele Bayou, the 65 mile Will Whittington Canal Auxiliary Channel and Levees, the 6 mile connecting channel between the Big Sunflower River and the Little Sunflower River, the Steele Bayou Control Structure, the Muddy Bayou Control Structure, and the Little Sunflower River floodgate. In addition, the Corps has built the Mississippi River Mainline Levees, which also have significantly altered the hydrology of the project area.

These projects have had enormous impacts on the hydrology, wetlands, fish, and wildlife in the project area. The Corps also is currently building projects that are causing, and will continue to cause additional significant adverse impacts on these same resources. These include the Mississippi River Mainline Levee Enlargement Project, the Big Sunflower River Maintenance Project, and the Upper Steele Bayou Project.

Though the Draft SEIS mentions some of these projects by name, it does little else in its cumulative impacts discussion. The Corps also did not discuss at all the cumulative impacts of such activities as private levee building in the project area, or the cumulative impacts of Clean Water Act Section 404 permits issued in the area. In response to a Freedom of Information Act request submitted by Earthjustice Legal Defense Fund, the Corps acknowledged that it has permitted at least 1,069 acres of wetland impacts in the project area in just the last 5 years. These wetland losses, and the likely future losses from granting additional permit requests must be evaluated. A copy of the documents evidencing these Section 404 permitted activities is attached at Tab E.

Despite these many significant activities in the project area, the Draft SEIS nevertheless concludes that:

> The incremental impact of the proposed action, when added to former, present, and foreseeable future actions, results in a net gain in nationally significant habitat and environmental values in the study area. . . . The recommend plan provides a net increase in terrestrial, wetland, and aquatic resource values such that no significant cumulative adverse environmental

> impact results on an ecosystem, landscape or regional scale when the proposed action is considered in conjunction with other activities.

Draft SEIS ¶ 190 at SEIS-86. The Corps could only reach this conclusion by completely ignoring all of the impacts of each of the past, present, and reasonably foreseeable future actions that have or will impact the project area, and by wholly ignoring the devastating ecosystem-wide impacts of the Yazoo Pumps themselves. This is abjectly unacceptable under NEPA.

(f) The Corps Has Not Evaluated The Human Health, Economic, And Social Impacts Of Increased Pesticide Use On Minority And Low Income Communities In The Project Area As Required By The Executive Order On Environmental Justice

The 1994 Executive Order on Environmental Justice (Executive Order 12898) requires the Corps to analyze the human health, economic and social effects of the Pumps, including the effects on minority communities and low-income communities, in order to help achieve the goal of environmental justice and to promote nondiscrimination in federal programs substantially affecting human health and the environment.

The Mississippi Delta (including the project area) is subject to pervasive use of agricultural chemicals, particularly pesticides. This persistent use of agriculture chemicals has caused significant impairment of local waterbodies. Of the river miles assessed in the Yazoo Basin, 78% are contaminated by pesticides, and 83% are contaminated by nutrients. Additionally, concentrations of DDT and toxaphene persist in the Delta at levels considerably higher than those found elsewhere in the nation.

The Mississippi Delta also suffers high rates of poverty, and many low-income and minority residents of the Delta rely on fish caught from local waterbodies contaminated by agricultural chemicals to supplement their diets. As a result, any increase in the use of these chemicals disproportionately impacts these populations.

As previously discussed, the Yazoo Pumps are specifically designed to drain wetlands so that landowners can increase agricultural production on marginal lands that have always flooded. Increased agricultural use, whether through an extended cropping season or an increase in cropped acreage, will result in an increase in the use of agricultural chemicals. This in turn, may create disproportionate impacts on low-income and minority communities throughout the project area.

The Corps must evaluate the potential for disproportionate impacts on minority and low-income residents before it may decide whether or how to proceed with this project.

(g) The Corps Has Not Adequately Evaluated The Impacts On Aquatic Species And Has Failed Entirely To Evaluate The Impacts On Two Entire Classes Of Animals, Amphibians And Reptiles

Because the Corps' hydrologic and wetlands impacts analyses are fundamentally flawed, it cannot properly have evaluated the impacts of the project on fisheries. Fish and Wildlife also has pointed out other analytical problems with the Corps' fisheries impacts analysis. The Corps must properly evaluate these impacts before it may proceed with the project.

There is no analysis whatsoever of the impacts of this project on amphibians (frogs, toads, newts), and reptiles (snakes, turtles). Wetlands are extremely important to these species, and many endangered and threatened amphibian and reptile species are especially linked to wetlands.[43] The Corps must evaluate the impacts of the Yazoo Pumps on amphibians and reptiles before deciding whether or how to proceed with this project.

(h) The Corps Has Not Adequately Evaluated The Impacts On Water Quality

The Water Quality analysis does not evaluate the impacts on water quality that will arise from the significant wetland losses that will be caused by the Pumps. As discussed above, wetlands have well-recognized water purifying functions. The Water Quality analysis also does not evaluate the impacts on water quality from the increased use of pesticides that will result from the project. These impacts must be analyzed before the Corps decides whether or how to proceed with the project.

(i) The Corps' Analyses Of Air And Noise Impacts Are Inadequate

The Corps has provided no analysis of air quality impacts from the Yazoo Pumps. The only mention of these impacts in the Draft SEIS states in its entirety: "The pumps would be powered by diesel engines. There would be periodic emissions at the pump site. The project would not affect long-term air quality." Draft SEIS ¶ 205 at SEIS-91.

This is not an adequate analysis of the potential air quality problems that could be caused by the Yazoo Pumps. According to the Corps, on average, the Pumps will burn 212,000 gallons of diesel fuel over a 31 day period each year. This means that the Pumps will burn 6,839 gallons of diesel fuel each day that they are operating. Main Report ¶ 212 at 100. The potential clearly exists for adverse air quality impacts from burning this

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[43] *E.g.*, *Wetlands* at 517.

amount of diesel fuel, and the Corps must fully evaluate those potential air quality impacts.

The Corps' analysis of noise impacts is similarly truncated. The only mention of noise impacts in Draft SEIS states in its entirety: "Except for agricultural activities and recreational vehicles, the study area is a relatively noise-free rural environment. There would be minimal noise associated with the operation of the pump. There would be no significant change in noise levels in the project area." Draft SEIS ¶ 196 at SEIS-89.

This is not an adequate analysis of the potential noise impacts that could be caused by the Yazoo Pumps. The Pumps will be the world's largest hydraulic pumping plant and will be run on noisy diesel generators. The potential noise impacts are considerable, and the Corps must fully evaluate those potential noise impacts.

(j) The Draft SEIS Fails To Adequately Consider A Wholly Nonstructural Alternative

Despite repeated requests from EPA, Fish and Wildlife, and the environmental and conservation community -- and despite substantial documentation supporting the economic and environmental benefits of such an alternative -- the Draft SEIS does not adequately consider a wholly nonstructural alternative to the Yazoo Pumps. Such an alternative would avoid all of the environmental harm that the Pumps will cause, it would promote the environmental and economic health of the citizens in the project area, and it would bring significant benefits to the fish and wildlife in the region. The Corps must properly evaluate a wholly nonstructural alternative before proceeding with this project.

(k) The Draft SEIS Fails To Contain Critical Supporting Documentation And Data, And Is Rife With Inconsistencies And Errors

Both EPA and Fish and Wildlife have identified a host of critical errors and inconsistencies in the Draft SEIS, and have pointed out where documentation essential to a reasoned evaluation of the Draft SEIS has not been provided. For example, much of the data provided by the Corps is more than ten years old; cost/benefit analyses have been conducted using inconsistent interest rates; and key data is totally missing. The Corps must reevaluate the impacts of the project using proper, timely, and consistent data.

(l) The Corps Is Not Considering Public Comment In A Manner Consistent With The Requirements Of NEPA

During the public comment period ending December 11, 2000, the Corps has been responding to electronically filed comments with a form response that states that a significant amount of false and incorrect information has been provided to the public, and

specifically identifies as false, information provided by EPA. Samples of these responses are attached at Tab F.

By sending this information out during the public comment period, the Corps appears to be attempting to persuade citizens to retract public comments that they properly and validly submitted. It also bodes ill for the Corps seriously considering the comments received. This does not comply with the public comment mandates of NEPA, and is inappropriate behavior for a federal agency.

CONCLUSION

For the reasons set forth above, the Conservation, Taxpayer, and Citizens Groups strongly oppose construction and operation of the Yazoo Pumps, and urge the Corps not to proceed with the project.

Should you require additional information, or have any questions, please do not hesitate to me at 415-627-6700 ext. 209.

Very truly yours,

Melissa A. Samet
Attorney

Attachments

cc:
Joseph W. Westphal, Assistant Secretary of the Army for Civil Works
Michael L. Davis, Deputy Assistant Secretary of the Army for Civil Works
Jack Lew, Director, Office of Management and Budget
Carol M. Browner, Director, U.S. Environmental Protection Agency
W. Michael Mccabe, Deputy Director, U.S. Environmental Protection Agency
Robert H. Wayland, Director, Office of Wetlands, Oceans & Watersheds,
U.S. Environmental Protection Agency
John H. Hankinson, Regional Administrator, U.S. Environmental Protection Agency
Sam Hamilton, Regional Director, U.S. Fish and Wildlife Service
George T. Frampton, Jr., Chairman, Council on Environmental Quality
Bill Leary, Associate Director for Natural Resources, Council on Environmental Quality