wooded wetlands within the project area of the Yazoo Backwater pumping plant project, in reliance on a study prepared by the Mississippi State University, Environmental Inventory and Assessment, Yazoo Area Pump Study, Mississippi - Contract No. DACE 38-67-C-0127 (1977), the U.S. Fish and Wildlife Service in its Fish and Wildlife Coordination Report estimates that over 40,000 acres of the remaining 190,000 acres of wooded wetlands would be cleared due to increased flood protection provided by the project. The richness of the remaining Basin fish and wildlife resources is described in the Yazoo Backwater Pumping Plant Project, Mississippi, a Fish and Wildlife Coordination Act Report submitted to the Vicksburg District by Stephen W. Forsythe, United States Fish and Wildlife Service, (February 1978). These impacts must therefore be carefully described.

21) Finally, the pumping of water accumulating on cleared agricultural land can only accentuate bad water quality downstream as agriculturally-related sediments, nutrients and pesticides are dumped below the backwater levee.

22) Because the proposed pumps would constitute point sources of pollution as defined in the 1977 Clean Water Act, 33 U.S.C. §1251, and Section 502(12), 33 U.S.C. §1352(12), it will be necessary for the Corps of Engineers to obtain National Pollutant Discharge Elimination System (NPDES) permits for future discharges into waters of the United States pursuant to Section 402 of the Clean Water Act, 33 U.S.C. §1342. The EIS on the pump project must therefore consider in detail the applicable water quality requirements and effluent limitations requirements which would apply to the discharges from the pumps and impact of the discharges on downstream water quality. In view of the high levels of sediments,

nitrates, phosphates and pesticides in runoff water, and the deteriorated condition of water quality in the receiving streams, we would have a serious question whether the proposed discharges could qualify for NPDES permits.

23) In view of the scope of the anticipated losses of fish and wildlife resources, due to destruction of habitat and changes in hydrology, sediment and water quality, and the paucity of habitat remaining, we doubt that an implementable mitigation plan for the pump project can be designed. Certainly, if the Fish and Wildlife Service put together a legally adequate mitigation plan for the flood control project, no other habitat would remain in the Basin which could serve to compensate for losses of the pump project. Thus, we must concur with the findings of the Fish and Wildlife Service in its 1978 Fish and Wildlife Coordination Report on the pump project that "the Yazoo portion of the Yazoo Backwater Project is now complete without mitigation for losses of fish and wildlife resources." As a result, the Fish and Wildlife Service has opposed the project as presently planned and recommends that the Corps of Engineers concentrates its "planning efforts towards mitigating past damages and improving the environmental quality of the Yazoo Backwater Area rather than designing a project which will contribute to further habitat degradation."

6. Alternatives

24) It is our understanding that the Corps of Engineers in its hearing Summary is proposing investigation of nine alternatives. All of these alternatives, other than the no-action alternative, include the construction of one or more pumps. Even the alternative which the Corps describes as an EQ plan includes construction of

one enormous pump. As a result, despite Corps nomenclature, none of the plans satisfies the requirements for an EQ Plan or non-structural and mitigation plan as required by NEPA, the 1974 Water Resources Development Act, CEQ, NEPA regulations and Executive Orders 11988 and 11990.

25) We can assume that the Corps will be able to devise a wide array of structural alternatives, mixing the number of pumps and the sizes of pumps designed, to achieve the flood control objective of the proposed project. However, in developing non-structural alternatives, the first task is to identify EQ objectives which should be maximized. We would expect that these would include but not be limited to:

(a) protection and conservation of all remaining bottomland hardwoods in the Yazoo Backwater Area;

(b) reforestation of areas which are now experiencing high rates of soil erosion or which are frequently flooded due to natural or man made conditions;

(c) upgrading of water quality, including abatement of sediment, nutrient and pesticide discharges from point and non-point sources;

(d) protection of habitats of all endangered species; and

(e) conservation of cultural resources.

26) The development of an EQ Plan is complicated in this case by the difficulty of analyzing what are the proper "with project" and "without project" conditions. The Corps seems to assume that the "without project" conditions assume completion of backwater levee with gates closed. We see no reason why these should be accepted as the "without project" conditions so long as the Corps considers

the pump project to be an authorized project and part of the overall Yazoo Basin flood control project.*

27) As far as we have been able to determine, the Corps of Engineers has not developed any alternative EQ Plans which would maximize the above objectives. We see no way that these objectives could be met without substantial stream restoration and reforestation. We understand that for different flood frequencies, the following amount of acreage would be flooded on the assumption that the levee is in place and the gates are closed.

Flood Frequency	Flood Elevation	Total Acreage Flooded	Number of Acres of Cleared Land Flooded
1 year	85	41,000	19,000
3 years	90.5	154,000	65,000
5 years	92.6	205,000	96,000
10 years	95.0	294,000	171,000
20 years	97.1	373,000	244,000
50 years	99.1	470,000	335,000
100 years	100.3	539,000	398,000

28) Non-structural, restoration EQ kinds of alternatives would necessarily include conservation of all of that acreage which remains wooded plus restoration of some portion of the cleared land which now gets flooded. The land that should logically be reforested, both to minimize flood damages, to improve fish and wildlife resources, and to meet water quality conditions, would be the cleared land most proximate to the closed gates which is most frequently flooded. For different EQ alternatives, therefore, the

* In determining the benefits of the project, the Corps should consider flooding "without project" conditions in the area behind the gates as though the backwater levee were not in place. Alternatively, insofar as the flooding behind the gates is caused by the backwater levee, all damage to farm production due to flooding induced by the flood control project should be considered as a cost of the overall flood control project basin. In other words, the "benefits" of the pump project should be equal to induced costs of the overall flood control project due to construction of the backwater levee.

land suitable for restoration would, for example, include 19,000, 65,000, 96,000 and 171,000 acres.

Needless to say, adoption of the Fish and Wildlife Service's recommended mitigation plan for the flood control project (as deficient as it is) could be used as a legal basis for implementing such non-structural, restoration alternatives.

7. Conclusion

The primary task for the three principal, responsible federal agencies, the Corps of Engineers, the U.S. Environmental Protection Agency and the U.S. Fish and Wildlife Service, should be to design and implement a lawful mitigation plan for the Yazoo Basin flood control project and an adequate water quality management and wetland protection plan under the Clean Water Act, as a prelude to any further consideration of the pump project. The Fish and Wildlife Service should prepare a supplemental Fish and Wildlife Coordination Act Report on the flood control project which contains adequate mitigation and compensation for fish and wildlife losses in the Basin due to destruction of habitat and deteriorating water quality and induced flooding conditions. EPA and the Corps should take action to halt further work on the flood control project and private drainage and clearing pending full compliance with all Clean Water Act requirements. Finally, the Corps should undertake the identification and investigation of legally required non-structural, restoration alternatives.

Dated: July 6, 1979

Response to Environmental Defense Fund Letter, 12 April 1982.

Comment 1.

No cleared land is currently being considered for mitigation purposes.

See response to State of Mississippi letter, Comment 8.

Comment 2.

Perpetual easements are recommended to mitigate the proposed pumping plant since impacts from the project will be perpetual in nature. If at some point in time after the project ceases to operate it is determined that any adverse project-induced impacts no longer exist, those rights acquired in easement could be reevaluated.

Comment 3.

The proposed plan for the pump project recommends purchase of easements inside the project area to preserve a majority of the last remaining sizable bottom-land hardwood forest. Although lands have not been specifically identified for mitigation, it is expected that the bulk of lands required would be below elevation 90 feet. The FWS and Corps are basically in agreement regarding the mitigation plan.

The acquisition of marginal cleared lands was considered as a possible mitigation alternative but was eliminated based on reasons provided in the mitigation report.

The stratification of cropping patterns by elevation was not developed for our analysis.

Comment 4.

See response to Department of the Interior Comment 2.

Comment 5.

The requirements of local cooperation for this project are specified in the Flood Control Act of 18 August 1941, as established by Congress. These require that the project sponsor perform minor maintenance of all flood control works after their completion. No means of cost recovery from local interests is required.

Comment 6.

Use of the 2-1/2 percent interest rate is as required by Congressional directive. The use of an interest rate of 2-1/2 percent has been well documented and the results presented to local interests. An analysis using the current Federal interest rate of 7-5/8 percent was also prepared and included in the report. Results of that evaluation indicate that benefits exceed cost by more than $4 million annually.

Comment 7.

The proposed pump project will produce absolutely no increase in stages affecting the grade of downstream levees.

Comment 8.

The authorized project for the Yazoo Backwater Area consists of a system of flood control features including levees, channels, drainage structures, and pumps. Although the completed levees, channels, and floodgates provide flood protection, their full potential would not be realized until pumps are in operation and the flood control system is complete.

Comments 9 and 10.

See response to Department of the Interior Comment 5.

Comment 11.

The magnitude and rate of area woodland clearing during the expected design life of the project for with- and without-project conditions are determined from extensive surveys of area landowners, land operators, and county agricultural workers as well as projections on future anticipated area woodland clearing. These sources provide the basis for projecting woodland clearing, reduced by the degree of protection provided by the project.

The fact that landowners would clear 27,000 acres of woodlands even without the project realistically reflects that woodland clearing has occurred and will continue to occur. It is incorrect to label all of the expected woodland clearing as wetlands, since the clearing will occur primarily in nonwetland areas and the overall impact on clearing of wetlands will be minimal.

Comment 12.

See response to Environmental Protection Agency letter, Comment 8.

The proposed pump project is not subject to an NPDES permit pursuant to Section 402 of the Clean Water Act.

Comments 13-14 and 17-18.

A nonstructural flood control program as suggested here would be impractical and would not be implementable. Although existing agricultural flood damages would be reduced by the conversion of cropland to woodlands, this plan would not provide the flood protection badly needed by residents of the Yazoo Area. Flood damage to residential structures would continue. Croplands above elevation 90 feet would also continue to be inundated by floods such as those experienced in recent years.

Of the 136,000 acres below elevation 90, approximately 60,000 cleared acres and 40,000 wooded acres are currently in private ownership. An acquisition program of the type described on these lands could easily cost in excess of $200 million for lands alone. Any reforestation or other management practices would add to this cost.

Comment 15.

The flood stage for the Yazoo Backwater Area begins at 80.1 feet, National Geodetic Vertical Datum (NGVD). The 1973 flood would have reached an elevation of 100.3 feet, NGVD, had the existing project been completed. The recommended plan would have prevented flooding on about 258,000 total acres or 52 percent of the total acres flooded by the 1973 flood.

Intensification benefits are claimed on agricultural lands flooded on an average of at least once every 20 years, or approximately 244,000 acres. Only 24 percent of the cleared lands lie below elevation 90 feet. This indicates that substantial damages occur above 90.0 feet, NGVD, the prevention of which constitutes significant project benefits. Therefore, one cannot conclude that most of the benefits would be incurred below elevation 90 feet.

Comment 19.

The flooding being experienced in the Yazoo Area is not project-induced flooding as it is labeled in the comment. The flooding is caused by ponded runoff which cannot be removed from the area due to the floodgates at Steele Bayou and Little Sunflower River being closed. However, if these floodgates were to remain open, flooding would be much more severe.

Also see response to Comment 7.

Comment 20.

The Vicksburg District has completed more detailed land use studies since the Mississippi State University Environmental Inventory and Assessment Report was completed. These studies, in combination with the mitigation analysis for the Yazoo Area Pump Project, show that approximately 900 acres of bottom-land hardwoods will be cleared for agricultural purposes as a result of implementing the recommended plan.

Comments 21-22.

See response to Comment 12 and EPA Comment 8.

Comment 23.

See response to Comment 3.

Comment 24.

A description of the alternatives evaluated throughout the course of the study is presented in the final report. These include an EQ plan, several nonstructural alternatives, and the proposed mitigation plan. These alternatives were developed in compliance with all laws and regulations governing water resources planning.

Comment 25.

Comment noted.

Comment 26.

Planning guidelines dictate that assessment and evaluation of alternatives be based on existing condition data. It would be inappropriate to use pre-levee conditions in evaluating the without-project condition.

Comment 27.

The EQ plan presented in the draft report was the plan which maximized the EQ objectives identified in the study without affecting implementability. Any plan which would consist of reforestation of a substantial acreage of cleared lands would probably not be implementable due to public acceptance.

Comment 28.

In developing EQ objectives for the Yazoo Area Pump Project, it was determined that the existing bottom-land hardwoods should be preserved before measures are taken to reforest cleared lands. Any plan which would involve the purchase of lands now being used for agricultural purposes would also be highly unacceptable to area landowners.

Wildlife Management Institute

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DANIEL A. POOLE
President
L. R. JAHN
Vice-President
L. L. WILLIAMSON
Secretary
JACK S. PARKER
Board Chairman

PLEASE REPLY TO:
Chester A. McConnell
Southeast Representative
Route 6, Wildwoods
Lawrenceburg, Tennessee 38464
615-762-7718

April 16, 1982

Colonel Samuel P. Collins, Jr.
District Engineer, Vicksburg District
U. S. Army Corps of Engineers
P. O. Box 60
Vicksburg, Mississippi 39180

Dear Colonel Collins:

We have reviewed the Draft Phase I General Design Memorandum (GDM)- Environmental Impact Statement (EIS) and the Fish and Wildlife Mitigation Report for the Yazoo Area Pump Project, Mississippi. We appreciate the opportunity to offer our comments.

General Comments :

We classify the GDM-EIS as inadequate for a variety of reasons. Several major concerns and issues have not been addressed in a sufficient manner, environmental trade-offs have not been accurately identified, the cumulative effects of this and other projects in the area were virtually ignored, and all of the alternatives discussed in depth are in violation of national laws and/or policy. Also we believe that other, more realistic alternatives should be considered.

1) Were were shocked and seriously concerned to learn that the proposed project cannot be justified economically based on current damages and needs. We learned this however after reading over half of the large document furnished us. Information in Appendix F, pages F-70-71 clearly spell out that none of the plans considered can be justified. Paragraph 108 states, "Evaluation of the plans of improvement, using the "existing development" analysis, indicated that existing development benefits (current year, 1978 benefits) do not justify the tentatively selected plan (without mitigation), nor any of the other alternative plans considered. Using the existing development analysis, excess benefits over costs are negative for all plans." Detailed economic data concerning this admission is contained in Table F-25 EXISTING DEVELOPMENT BENEFITS, ALL PLANS CONSIDERED and reveals that benefit-cost ratios are negative for all 10 plans evaluated. The largest benefit-cost ratio shown was 0.4 computed at a 2⅛% interest rate for Plan C-17,500 cfs, which is the tentative selected plan.

2) The method that the Corps devised to "justify" the proposed plan **did not simply** use protection of existing developments or prevention of flood damages to existing agricultural lands but relied greatly on claimed benefits for <u>future</u> expansion and intensification of agricultural development in frequently flooded floodplain areas. Approximately 79 percent of all claimed benefits will result from expansion and intensification of agricultural development while only 21 percent will result from preventing flood damages. These "benefits" are being claimed primarily in the sump area which is presently, and will remain, the most flood-prone portion of the entire Yazoo Delta. In addition the Corps used 2½% interest rates while computing project costs at 1980 price levels for benefits to be realized in 1990. By using such tactics the Corps could justify virtually any project if the U. S. Treasury remains solvent.

3) A large portion of the claimed benefits will be at the expense of extensive adverse environmental impacts including clearing of over 27,000 acres of forested wetlands, drainage of 3,400 acres of wetlands, degrading water quality and destruction of fish and wildlife habitats.

4) It is unbelievable that the proposed project will go foward in a time when farmers are presently suffering severe economic losses due largely to overproduction. By proposing the project, the Corps is encouraging clearing of forests to create even more agricultural land when there is currently a surplus of such land. Worse yet, this is being encouraged in an area that once supported an extensive forest, fish and wildlife resource base which has been virtually eliminated.

5) The tentatively selected plan and all alternative plans discussed are in contradiction with several Federal laws, policies and programs. The U. S. Fish and Wildlife Service has an ongoing program to purchase wetlands in the Lower Mississippi Valley while the Corps seems to work as rapidly as possible to drain and/or pump dry wetlands or make it possible for others to do so. Practically all of the approximate 77,000 acres of forest in the Yazoo Basin at or below 90 feet msl have been classified as jurisdictional wetlands by the Environmental Protection Agency. In seeming defiance of Section 404 of the Clean Water Act, the Yazoo Area Pump Project is designed to encourage agricultural development and expansion in these wetland areas.

6) Executive Order 11988, Floodplain Management directs Federal agencies "to avoid to the extent possible, the long-and short-term adverse impacts associated with the occupancy and modification of floodplains and to avoid direct or indirect support of floodplain development wherever there is a practical alternative." Clearly the Yazoo Pump Project is in violation of this Order. The Corps readily admits that it designed a project that cannot be justified unless benefits are claimed for expanded and intensified development in a floodplain area that experiences frequent flooding. To make matters worse, the proposed project will entice more development in the floodplain which will certainly result in many millions of dollars in damages and much suffering. And there are other practical alternatives.

7) The Corps is also violating the spirit and intent of Executive Order 11990, Protection of Wetlands, which directs Federal agencies to avoid,

to the extent possible the long-term and short term adverse impacts of wetlands. The project will directly alter or eliminate some wetlands and indirectly encourage destruction of thousands of acres of others. Again the project could not be justified economically unless wetland destruction is specifically planned for.

8) More blatantly, the Corps has defied the guiding principles in the specific legislation that authorized a flood control project for the area. Congress realized that it was impossible for all areas to receive flood protection and had the wisdom to determine that some areas should be dedicated for flood water storage. Concerning the Yazoo area, Congress specified, in House Document 359, that, "...land below the 90 foot contour would therefore be dedicated to sump storage." Now, however, the Corps is unwisely trying to get a project approved that would attempt to provide occasional protection of lands down to 80 feet msl, thereby eliminating much of the area dedicated to sump storage of flood waters.

9) The proposal to purchase land use easements on a mere 6,500 acres for mitigation of fish and wildlife losses is a mockery of the Fish and Wildlife Coordination Act. This and other Federal projects in the area have been responsible for the destruction of fish and wildlife habitats on several hundred thousand acres. The American public deserves much more than a bill demanding payment for an unsound and economically indefensible project.

We recommend that all alternatives considered in the GDM-EIS be abandoned and a new, more realistic project be designed. First the Corps should abandon the expensive pump scheme, realize that there is a definite need for flood water storage areas and then recognize the longterm benefits of encouraging sound landuse in the area. This would allow for clear thinking and concentration primarily on a non-structural approach.

10) The area at or below 90 feet msl originally designated by Congress as a flood water storage area is approximately 136,000 acres. According to the Corps, this is where frequent flooding occurs on one to five year intervals. Also this is where about 80 percent of project benefits are claimed. This land,or certain development rights,should be purchased from willing sellers in fee simple or by conservation easements. Under either option, all open lands should be reforested. Landowners selling easements only could manage timber and sell recreational leases. Landowners choosing to continue farming operations would be made aware of the consequences. The primary purpose for these lands would be to insure Congressional intent that flood water storage areas be maintained. They should be managed for compatible uses that can tolerate frequent flooding such as timber and wildlife production. Improved water quality and acquifer recharge would be additional benefits that would result. These lands, if properly managed, could also serve to mitigate the massive fish and wildlife losses in the basin.

11) All of the land below 90 feet msl could be purchased for much less than the cost of the tentatively selected plan's capital cost, according to Corps' data,and would be virtually free of maintenance and energy costs. The proposed pump projects will have relatively little effect on the larger floods such as the one in 1973 or those that occur on a 25 to 100 year frequency. In areas affected by these larger but less frequent floods, flood

proofing and zoning may have similar or greater benefits at less costs.

Specific Comments:

12) p. 5.- We believe the Corps should include operation and maintenance funds for the mitigation works for the life of the project just as it plans to for the other elements of the project.

13) p. 7, first line. The pumps are not "now economically justified" as admitted on pages F-70-71.

14) p. 18, line 13. We understand that the "61,300 acres are considered potential acreage for clearing" is where many of the project benefits are derived. We disagree with the method used to determine benefits.

15) p. 21, 3rd parg. It should be clearly pointed out that if the pump project had been in place during 1973 flooding, the flooding would not have been prevented.

16) p. 25, table. The table lists the number of buildings subject to flooding by a 100-year frequency flood under without-project conditions. We request that another column be added to the table to list the number of buildings that would be subject to flooding by a 100-year frequency flood with the proposed pump project in place. This would allow comparison.

17) p. 27. Water Quality. The need to improve water quality is identified but it is not stated here that the proposed project will cause a decline in water quality.

18) p. 27-28, Fish and Wildlife. Needs to retain bottom-land hardwood forest and to protect wildlife habitat is discussed but a sentence is needed at this point to advise that these needs will not be met.

19) p. 29 item d. In actuality the opposite of this planning objective will happen. The project is designed to encourage destruction of wetlands and bottomland hardwoods. If this were not so, the project could not be justified.

20) p. 33, first line. We strongly object to an interest rate of 2½ percent being used when benefits and costs are being calculated. If this rate is used it can only be considered as legal stealing from the American taxpayer.

21) p. 36, line 15. This sentence indicates that flooding will be prevented by the pumps which is completely false.

22) p. 37, first line. If it is true that more extensive agricultural development is expected even with a no-action alternative, the problem must not be as bad as the Corps describes or the Corps believes the landowners in the area are not intelligent.

23) p. 39, line 9. The Corps did not evaluate a nonstructural measure that would combine purchase of the sump areas and flood proofing and zoning. This alternative must be evaluated in depth before the EIS will be adequate.

24) p. 42, third paragraph. If the rationale used in this paragraph to justify greater pumping capacity is continued, the Corps will eventually have to place pumps in the Mississippi River to pressure water to the Gulf of Mexico more rapidly. We disagree with the rationale.

25) p. 46, Table 2. Here again we are opposed to the 2½% interest rate being used to justify the various alternative plans. We also request that our proposal of purchase of lands or easements on lands below the 90 feet msl contour and flood proofing and zoning above 90 feet msl be included in this table.

26) p. 58, line 11. The GDM claims 1,054 structures are subject to flooding from a 100-year frequency flood. A sentence should be included here to tell how many structures would be flooded during the same 100 year flood if the pump project were in operation.

27) p. 59, Table 4. The Annual Benefits column includes intensification benefits. A separate column should be added that shows current benefits only, such as on page F-71. This would place comparative data on the same table.

28) p. 62, line 2. We note here that the trend is to clear marginal lands for row crop production. We remain baffled as to why the Corps proposed such an expensive plan to the American taxpayer when this is the case.

29) p. 67, line 17. We note here that the average annual benefits are $22,072,000. Annual damages by flooding are claimed to be $3.9 million. Are the remaining $18.1 million annual benefits for expanding agricultural production into the floodplain and intensification benefits ?

30) p. 68, Table 6. What were the annual damages in 1941 when a flood control project was authorized to protect lands above 90 feet msl ? These damage figures should be used if the 2½% interest rate is used since this was the rate in 1941. Otherwise the Corps is trying to compare apples and oranges.

31) p. 83, Federal Responsibilities. Although the Corps is not responsible, we are appalled that the Federal Government will pay the entire construction, operation and maintenance costs for the authorized pump plan, except for portions of the minor maintenance. It is no wonder that local landowners and project sponsors are insensitive to costs if they share only in the benefits. Has the Corps seriously discussed this concept with the Congress ? What was the Congressional response ?

32) p. 88, line 9. We strongly object to the project mitigation feature which consist only of the purchase of land use easements to preserve 6,500 acres of bottom-land hardwood forest. Considering the $149,900,000 project cost and $1,021,000 annual costs for operation and maintenance and the loss of many thousands of acres of fish and wildlife habitat, the proposed mitigation package is a mere pittance. Enforcing easement agreements will be more trouble than they are worth. This proposal is totally inadequate.

33) p. 63, Energy Analysis. The following sentence should be included in this section to fully explain the situation: To reduce (not eliminate) the $3.9 million in annual damages by 68 percent ($2.7 million) will have an annual energy cost of $3.1 million in the year 1990 (base year). In other words, if all costs were accurately computed, the energy cost alone would be more than annual damage costs.

34) p. EIS-3. The same comment that we made for page 63 should be included in the fourth paragraph on this page to explain costs.

35) p. EIS-4 and 5, Flood Plain Management. We are amazed at the discussion and interpretation of E.O. 11988 and its implications as explained for the proposed project. In fact the EIS skirts any real discussion of the matter and tries to give the impression that the project is in compliance with the Order. The facts are that the proposed project and any of the alternatives seriously discussed violate E.O. 11988 and E.O. 11990. We urge the Corps to rewrite this section with an accurate assessment.

36) p. EIS-17. The EIS fails to discuss all reasonable alternatives. We request that our suggested alternative of land or easement purchase below 90 feet msl and flood proofing and zoning above 90 feet msl be discussed in this section. See page 3, paragraph 5 and 6 of this letter for more details concerning this suggestion. Such alternatives must be fully analyzed and discussed before the EIS will be adequate.

37) p. EIS-28. The annually flooded forest lands, wetlands and openlands listed on this page add up to a total of 52,160 acres. Forest and wetlands flooded make up 31,600 acres or 60 percent of the area that floods annually. The 20, 560 acres of openland that flood annually will in fact be the lands that receive primary benefits from the project and should be purchased, if possible, for mitigation. Also there seems to be a contradiction between the acreage figures on this page and those on page 70 of the GDM. Page 70 GDM, Table 7 states that "Flooding would be reduced by 92,600 total acres annually..." and EIS-28 indicates 52,160 acres.

38) p. B-47. Table B-8 shows an energy cost annually of $3.1 million for base year 1990. This is almost as much as the $3.9 million annual damages claimed for the project area. This needs additional explanation.

39) p. F-70-71. Information on these pages concerning existing development benefits proves that none of the 10 plans evaluated have a favorable benefit-cost ratio. We agree.

All of the proposed pump schemes rely on development and intensification of land use in frequently flooded areas, plus a 2½% interest rate for economic justification. All pump schemes evaluated will give landowners a false sense of security, despite full disclosure of the facts, and tend to entice them to continue encroachment into the frequently flooded areas. All the pump schemes will add to the burden of a currently over burdened flood control system. All will rely on an increasingly expensive energy source. And all will damage or destroy scarce natural resources needed to add balance to the total area community. On the other hand none of the pump schemes will prevent the massive flooding but only reduce duration of inundation.

The Corps has experts in all disciplines who know that there are better solutions to the problems in the area. The question is, does the Corps have the leadership and the will to select a sound project and seriously support it? We urge the Corps to seriously consider another plan.

Sincerely,

Chester A. McConnell

Chester A. McConnell
Southeast Representative
Wildlife Management Institute

Response to Wildlife Management Institute Letter, 16 April 1982.

Comment 1.

Economic prudence requires that appropriate consideration be given to anticipated changes which are likely to occur in an area during the period that a proposed project will be in operation. Tremendous changes have occurred in the Yazoo Area during the past decades, and numerous additional changes of major consequence will undoubtedly occur during the 50 years of the project's life. Congressional directives and specific planning guidelines have therefore been appropriately applied to estimating the impact of future conditions in the feasibility analysis.

Comment 2.

Benefits to future expansion associated with the project comprise approximately six-tenths of 1 percent of total benefits and, therefore, are essentially negligible. Intensification benefits result from or are based on existing development. Both benefits and costs reflect 1980 price levels in order that a true, valid comparison can be made. This procedure conforms to Federal policy in the evaluation of proposed water and related land resource developments.

Comment 3.

See responses to EPA Comment 1 and Department of the Interior Comment 2.

Comment 4.

See response to Department of the Interior Comment 1.

The vast majority of the project impacts are to the agricultural sector and therefore represent major economic and social benefits to the citizens of the area.

Comments 5-7.

The proposed project is designed to intensify agricultural development on existing cleared lands within the project area. Although some reduction in flooding will occur on lands designated by EPA as wetlands, less than 900 acres will be cleared since mitigation easement acquisition will preserve most of the bottom-land hardwoods and wetlands in the area.

As reflected in responses to Comments 2 and 3 above, the benefits to expanded development (project-induced land clearing) are relatively insignificant and have no effect on project feasibility. In addition, intensification aspects of the project are based on continued existing use of the lands.

Comment 8.

See response to Department of the Interior Comment 5.

Comment 9.

See response to Environmental Defense Fund Comment 3.

Comments 10-11.

See response to Environmental Defense Fund comments 13-14 and 17-18.

Comment 12.

No operation and maintenance is required for mitigation lands acquired in easements. In the event some fee acquisition of lands is authorized for mitigation purposes, adequate funds would be included to maintain and operate these lands for wildlife habitat. Also, see response to FWS Comment 28.

Comment 13.

The project is now justified, and justification includes anticipated growth in the area that can reasonably be expected.

Comment 14.

The 61,300 acres represents those nondedicated woodlands now existing in the project area which would be subject to clearing. This acreage was used only as a base condition on which to estimate project-induced clearing. Those "dedicated" areas are within national forests, refuges, etc. The general procedure for determining the relatively minor amount of benefits associated with the clearing is an established method which incorporates accepted guidelines for evaluating water resource developments.

Comments 15-18.

This particular section of the report is devoted to problems, needs, and the existing conditions of the project area. Project impacts are discussed in other portions of the report as appropriate.

Comment 19.

The recommended plan does meet the planning objective of minimizing destruction of wetlands and significant tracts of bottom-land hardwoods. Of the approximately 142,000 acres of area woodlands, less than 1 percent is projected to be cleared as a result of this project. Only a small portion of this would be wetlands. In addition, the mitigation features associated with this plan will preserve between 6,000 and 6,500 acres of area woodlands.

Benefits derived from project-induced land clearing account for less than 1 percent of the total annual benefits for the proposed pump and mitigation plan and therefore have no impact on economic justification.

Comment 20.

See response to Environmental Defense Fund Comment 6.

Comment 21.

This sentence has been changed to read, "Flooding in the Yazoo Area is historic and will continue to be a major problem under the no-action alternative."

Comment 22.

Although portions of this land flood as frequently as once in 5 years, it is still economically beneficial to clear this land for cultivation. It is more profitable in agricultural production than in woodlands, although it may not be as profitable as lands at higher elevation. It is this type of situation that leads to intensified production under with-project conditions.

Comment 23.

Combining floodproofing and zoning with sump acquisition, discussed in Comments 10 and 11, still would not produce an acceptable or economically feasible alternative. Floodproofing and zoning features are normally associated with urban flood control and are not effective measures in rural areas where structures are widely scattered (in this case, throughout an 800-square-mile project area). As stated in the response to Comment 11, the sump acquisition program would not be cost effective since the cost of purchasing lands far exceeds the reduction in flood damage and environmental benefits.

Comment 24.

The capacity of the proposed pumping plant is dictated by the overall engineering, economic, and environmental considerations under existing conditions.

Comment 25.

See responses to Comment 23 and Environmental Defense Fund Comment 6.

Comment 26.

This paragraph has been revised as suggested.

Comment 27.

The purpose of Table 4 is to provide data pertinent to economic justification. Total benefits are used to determine economic justification and therefore all benefits are included in this table.

Comment 28.

See para 4 of response to Department of the Interior Comment 1.

Comment 29.

Average annual benefits of $22.1 million include the effect of future growth in benefits that may occur. In contrast, the $3.9 million of annual damages represents the damages to development existing at the time of the evaluation. Of the $22.1 million in benefits, approximately $140,000 is to project-induced land clearing (expanded agricultural production) and $16.8 million reflects increased net returns on lands that are now in agricultural production.

Comment 30.

See response to Environmental Defense Fund Comment 6.

Comment 31.

See response to Environmental Defense Fund Comment 5.

Local requirements for this project were established by Congress.

Comment 32.

Mitigation is based on project-induced fish and wildlife losses and not the total cost of the project. This study was fully coordinated with FWS and the proposal fully compensates all fish and wildlife losses.

Comments 33-34.

Since this paragraph deals with energy consumption, the discussion of project impacts on existing flood damages would be inappropriate. It would also be inappropriate to compare projected energy cost with existing flood damages. The annual energy cost increase for 1990 conditions is projected based on estimates of rates for the next 10 years and was included only for the purpose of evaluating the various alternatives based on energy use. The energy cost for current price levels ($944,000 annually) was used as an annual cost in all economic evaluations. This makes energy cost comparable to benefits, from which inflationary impacts have also been removed.

Comment 35.

See response to Department of the Interior Comment 4.

Comment 36.

A discussion has been added to this section of the EIS to explain the elimination of nonstructural alternatives.

Comment 37.

Some of the acreages listed on page EIS-28 of the draft report are incorrect and revisions have been made in the report.

The 92,600-acre figure referenced on page 45 corresponds to the difference in average annual acres flooded with and without the pump project. Average annual acres flooded is not the same as acres flooded by the annual flood. Determination of average annual acres flooded is based on the acres flooded at all elevations in the area and takes into account the frequency of occurrence of those floods. The annual flood represents the 1-year frequency flood.

Also see Environmental Defense Fund Comment 28.

Comment 38.

See response to Comments 33-34.

Comment 39.

See response to Comment 1.

NATIONAL WILDLIFE FEDERATION
1412 Sixteenth Street, N.W., Washington, D.C. 20036 202—797-6800

May 6, 1982

Colonel Samuel P. Collins, Jr.
District Engineer
U.S. Army Engineer District, Vicksburg
Corps of Engineers
P.O. Box 60
Vicksburg, Mississippi 39180

Dear Colonel Collins:

We appreciate this opportunity to comment on the Yazoo Area Pump Project. The National Wildlife Federation is a non-profit citizens' conservation organization, with over 4.2 million members and supporters nationwide.

We have received the Yazoo Area Pump Project, Draft Phase I GDM-EIS, U.S. Army Corps of Engineers, Vicksburg District, and the Corps Fish and Wildlife Mitigation Report (March, 1982). These documents fail to address important problems associated with the proposed pump project. We have also reviewed the Fish and Wildlife Coordination Act Report of the U.S. Fish and Wildlife Service and will address some points raised therein. Based on our review of these documents, the National Wildlife Federation opposes the proposed pump project.

1) The proposed Yazoo Area Pump Project for the Yazoo Backwater Area is a continuation of a program to develop the 539,000 acres of the lower Yazoo area as farmland through an expensive system of drainage and levees. This creation of private wealth has been primarily at the Federal taxpayers' expense and with a concomitant loss of water quality, bottomland hardwoods, fish and game, vital habitat, and other valuable aspects of this critical ecosystem. The last major levee work was completed in 1977.

2) There were only 2,650 acres under cultivation below 90' elevation in 1941. There are now over 59,000 acres. In fact, nearly 80 percent of the 539,000 acres in the area is now under cultivation. The Corps and the would-be beneficiaries of the pump project appear to be unsatisfied with converting most of the area to farmland. The proposed plan would result in the conversion of even more bottomlands to agricultural uses.

3) The major adverse effects of this project are, first, the project area to be cleared is the last remaining bottomland habitat in the Basin Area. This makes its value much higher than when the basin was entirely bottomland, and indicates that this habitat should not be destroyed. Second, the proposed project would violate the original intent of Congress in authorizing the area as sump storage. Third, extension of agricultural clearing into an area that will continue to be flood-prone is unwise development in the interest of private benefit, and means that tax dollars will be paying for increased flood damages for years to come.

4) The Yazoo River Basin, once one of the most ecologically productive areas along the Mississippi, is already almost 80 percent cleared agricultural land. The remaining contiguous bottomland hardwood forests and wetlands are valuable fish and wildlife habitats, and cannot be mitigated by mixed (dry) hardwood forests. Previous clearing and flood control construction has resulted in the loss of 315,000 acres of bottomland hardwood forests. Clearing of this small fraction of overall Basin acreage, 40,000 acres, in the lower basin would be a great ecological loss. A reduction in ecological diversity, fish and wildlife habitat, the wetlands' filtering function, and the loss of the Basin's natural heritage will result. As the Corps states, "The continuing decline of fish and wildlife habitat constitutes a problem of local, state, and national significance," and "[t]he major needs for fish and wildlife are to retain the remaining bottomland hardwood forest in the area (emphasis added), retain some flooding during the winter for wintering and resident waterfowl, and improve the quality of lakes and streams for fishery production."

5) As each acre of wetlands and bottomland hardwoods is converted to farmland, the remaining natural areas become scarcer and thus increase in value. As demand rises over time for the non-market and market outputs of natural areas and the supply falls, the "shadow price," or imputed market price, rises. Because these conversions to other uses have occurred, and continue to take place throughout the nation, the number of bottomland hardwood areas has declined markedly. The small portion of the Yazoo area which remains as wetlands or bottomland hardwood sites thus has a high worth to society compared to its value as additional farmland. There are many substitutes for that potential farmland, but few substitues for these wetlands.

6) During the past 15 years, literature has appeared and a theory has been developed for dealing with scarce non-market natural resources and unique resources. In "Conservation Reconsidered" (American Economic Review, September 1967), John Krutilla outlined the basis of the theory and provided an example of the rationale for not placing hydroelectric dams on the unique scenic sites in the Hells Canyon of the Snake River. The basic ingredient of this approach is a perception of declining net benefits of development

and rising net benefits of wilderness preservation over time. These perceptions alter the shape of the benefit-cost analysis of potential project development. A summary of this approach was published recently by Richard C. Porter ("The New Approach to Wilderness Preservation through Benefit-Cost Analysis" Journal of Environmental Economics and Management, March 1982, pp. 59-80). This methodology should be utilized by the Corps in evaluating the Yazoo Area. Their use would conclude that the Yazoo Pump Project should not be recommended.

7) Solving the problem of water quality impacts is not addressed in the Corps mitigation report. The increased clearing and agricultural production expected will cause further water quality deterioration. The Corps does not proposed a solution. "This trend [intensive farming practices and subsequent agricultural runoff], which has significantly reduced the quality of the area fishery, is expected to continue with or without water control projects." The National Wildlife Federation feels that this water quality deterioration problem, partly resulting from previous flood control projects and agricultural intensification, must be solved regardless of whether or not the project is built.

8) The pumping project would eliminate overflow during the late winter and spring months, reducing spawning and nursery areas, thus decreasing the abundance of fish. No mention is made in the Corps report of maintaining some flooding for spawning purposes, nor is any mitigation for spawning areas proposed. Mitigation is proposed only for sport fishery by the Muddy Bayou area. Furthermore, waterfowl habitat would be destroyed, upsetting a most significant link in the chain of wintering habitat along the Mississippi Flyway.

9) The forested wetland area now serves an important function. As originally authorized by Congress in 1941, the area was intended as flood storage for floodwaters below 90 feet msl. In other words, the creation of the sump is a recognition by Congress that some low-lying backwater areas should be available to store flood waters. Within the Yazoo River Basin, the Congress has specifically recognized that those areas below 90 feet msl should serve this function and should not be drained or be provided with flood protection.

10) If the land is cleared and the flood waters pumped out, the original function of the sump is defeated. In fact, the proposed project will provide flood control for this very area. The project as designed therefore directly violates the congressional Yazoo Basin flood control concept and the original authorization.

11) In addition, there will likely be major flood problems downstream; the levee systems will be stressed and flood stages will increase. Thus, the costs of flood control will continue to rise in the Basin, or the costs will be shifted to downstream communities. The Corps has not calculated these costs in its

Phase I GDM. The Yazoo Area is an example of why flood damages continue to increase over time in this country. The Corps of Engineers builds a structure to protect existing property. This in turn encourages more investment in the floodplain, thus more damages, etc. Therefore, additional costs to taxpayers will be incurred by the expansion of flood-susceptible land use into a federally dedicated sump. Proposed land uses are incompatible with sump storage on lands below 90 feet msl. If agriculture is not expanded into the authorized sump, the project cannot be economically justified.

12) The estimate of average flood-free crop yields are much too high (page F-5, GDM). Interviews with farmers, who have a financial interest in construction of the project, are not an unbiased method of obtaining data. Seventy-one percent of the land is used for soybeans and the report states that the present average flood-free yield per acre is 29 bushels in the lower ponding area (page F-2, GDM) and 26 bushels in the upper ponding area. These estimates are at the high side of the plausible range of estimates and are best-condition estimates.

13) The study has calculated a sizeable portion of the benefits by making the assumption that yields will increase in the future because of technological improvements and increased dissemination of improved farming techniques. There are several methodological problems in calculating benefits resulting from increased yields which can be attributed to drainage projects. For example, what portion of the increased yields should be attributed to agricultural research and extension services?

14) If the benefits were calculated only on present yields and acreage, the Corps would find that only about one-third of the estimated benefits claimed from the recommended plan (page F.71, GDM) are legitimate. The basic benefit estimates have been increased threefold by including future yield increases, intensification, and new acreage.

15) The correct method is to compare the yields and costs in the with-project vs. the without-project situation. The study estimates greater percentage increases in output in the with-project than in the without-project condition. The increases in yields and the assumptions behind them for the without-project case should be documented further and should be at least as optimistic as for the with-project condition.

16) The Corps study expects yields to continue to increase in the future as has occurred in the past. These dramatic increases simply won't continue. Much of these increases in yields were caused by adding new inputs such as mechanization, fertilizers, and pesticides at increased cost. Some of the increased productivity was not free, but was a result of input substitution. Forecasted yields of 90 bushels of soybeans per acre in 2039 simply will not occur (Appendix F, GDM). The high price of energy fuels for

farm operations and fertilizer production places another cost constraint on increased yields. The law of diminishing marginal productivity applies to agricultural research as well as to farming. Therefore, a decline in increases in yields per acre in the future will occur and a decline in actual yields will occur where soil erosion is severe. Soil erosion is most severe on the highly cultivated row crops which are grown in the Yazoo area.

17) In summary, the with-project conditions are based on optimistic assumptions while the without-project conditions are based on pessimistic assumptions. Soybean yields per acre in Mississippi have shown a flat trend during the past decade. Thus, present yields should have been used in the analysis for future yields as well.

18) Frequent three year floods occur only below 90 foot msl. Hundred year frequency flooding occurs rarely. Most of the benefits thus accrue to the land area below 90 foot msl. The Corps could buy or obtain easements on all of this land below the 90 foot contour for much less than the Tentatively Selected Plan's capital cost. The annual maintenance costs for the pump project will be over $1 million per year. A program of land acquisition and easements would have virtually no annual costs. Unwise development in flood-prone areas costs taxpayers millions of dollars a year in flood insurance and damages. In an area which would normally be prone to damaging floods, the clearing of valuable and unique habitat cannot be justified.

19) The Corps contends that even without the proposed pumping project, agricultural intensification and development in the flood plain will occur (page 30, Corps Mitigation Report). However, the project is justified by a "need" for agricultural development and intensification. If agriculture will continue to expand in the Basin even without the project, then the clearing of 40,000 more acres at a cost of $149 million is a massive waste of taxpayers' money and of this last remaining bottomland habitat in the Yazoo Basin.

It is our opinion that enough clearing and damage to ecological systems has occurred in the Yazoo Basin due to flood control structures. The long-term cumulative impacts of federal flood control projects on wetlands in the delta is never discussed. The problems that exist now are a result of previous construction. We feel the Corps should stop now, and instead concentrate its efforts on mitigating for the losses caused by previous projects in the Yazoo Basin.

Sincerely,

David Campbell

David C. Campbell
Resource Economist
Water Resources Program

Amy Rosenstein
Research Intern
Water Resources Program

cc: Ed Dickey, Economic Advisor, Assistant Secretary
of the Army for Civil Works
Al Clark, NWF Natural Resources Clinic
Terry Beckman, President
Mississippi Wildlife Federation
Joseph Keenan
James Tripp, Environmental Defense Fund
William Donovan, CWP-P, U.S. Army Corps
of Engineers
National Wetlands Technical Council

Both the level and the growth rate of this *TWP* are the lowest of the three rationing systems. Indeed, the growth rate in (A-6) may even be *negative*. For a variety of plausible growth rates (i.e., of v, h, and c) of demand and supply, the lengthening of the queue may erode all or more than all of the potential gains in *TWP*.

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(Signed) Roselle Coviello, Senior Vice President

Response to National Wildlife Federation Letter, 6 May 1982.

Comment 1.

Although the flood control program in the Yazoo Backwater Area has benefited individual landowners, it has also resulted in economic growth for the local communities, the state, and the nation. This particular portion of the Yazoo Basin has a tremendous potential as far as agricultural production is concerned. By reducing the flood threat on this land, the entire nation is benefited from the increased agricultural production.

Comment 2.

The recommended pumping plant project, which includes mitigation, would result in conversion of only 900 acres of woodlands to farm cropland. This amounts to less than 1 percent of the existing woodlands remaining in the project area.

Comment 3.

a. The Corps agrees with the point describing the remaining and therefore higher value area bottom-land habitat. The Corps also realizes that the high value area will continue to be cleared without a project. This is the reason that the proposed mitigation plan includes purchase of woodland inside the project area in easements--to protect greater amounts of valuable hardwood habitat resources in the project area.

b. See response to Department of the Interior Comment 5.

c. Since the project will result in only two-tenths of one percent increase in agricultural lands, increased flood damages will be negligible.

Comment 4.

The 40,000 acres of clearing mentioned in this comment is incorrect. Actual clearing resulting from the project includes 900 acres converted to agricultural lands and 300 acres for project rights-of-way. The proposed mitigation plan will preserve up to 40,000 acres of bottom-land hardwoods.

Comment 5.

See response to Comment 2.

Comment 6.

Evaluation of both the economic and environmental aspects of the proposed pump project has been conducted according to Corps guidelines and pertinent Federal regulations.

Comment 7.

The Vicksburg District is aware and concerned about the water quality problems in the Yazoo Area. The Muddy Bayou Control Structure was completed in 1978 as a feature of the Yazoo Backwater mitigation project for the purpose of improving the water quality in Eagle Lake. In developing possible mitigation alternatives, several measures to improve water quality were considered. These measures included diverting Mississippi River water into Eagle Lake; the construction of weirs in existing channels to improve water quality; and floodgate operational procedures on Steele Bayou and Little Sunflower River. With the exception of alternative floodgate operational procedures which were prohibitively expensive relative to the benefits produced, no justifiable structural measures were identified.

Comment 8.

Both fishery and waterfowl losses were evaluated during the mitigation analysis. The existing Muddy Bayou Control Structure and greentree reservoirs compensate for those losses.

Comments 9 and 10.

See response to Comment 3.

Comment 11.

The proposed pumping plant is a feature of the Mississippi River and Tributaries Projects. Completed portions of these projects include channel improvements on the Mississippi River, numerous flood control reservoirs throughout the basin, and the existing levees and floodgates. The combined effect of this work is a reduction of 6 to 10 feet in flood stages on the lower Yazoo River. The actual reduction depends on the specific flood. Of this 6- to 10-foot reduction, a maximum of three-tenths of 1 foot will be lost downstream with the proposed pumping plant operating at full capacity.

Comments 12-17.

See response to Economic Research Service letter.

Comment 18.

See responses to Environmental Defense Fund Comments 13-15 and 17-18.

Comment 19.

The agricultural intensification and development which will occur without the project consist of the conversion of 27,000 acres of area woodlands to

croplands. These lands are considered in evaluating the without-project condition against which all alternatives are compared.

As stated in the response to Comment 4, the project will not cause 40,000 acres to be cleared.

YAZOO BACKWATER PROJECT

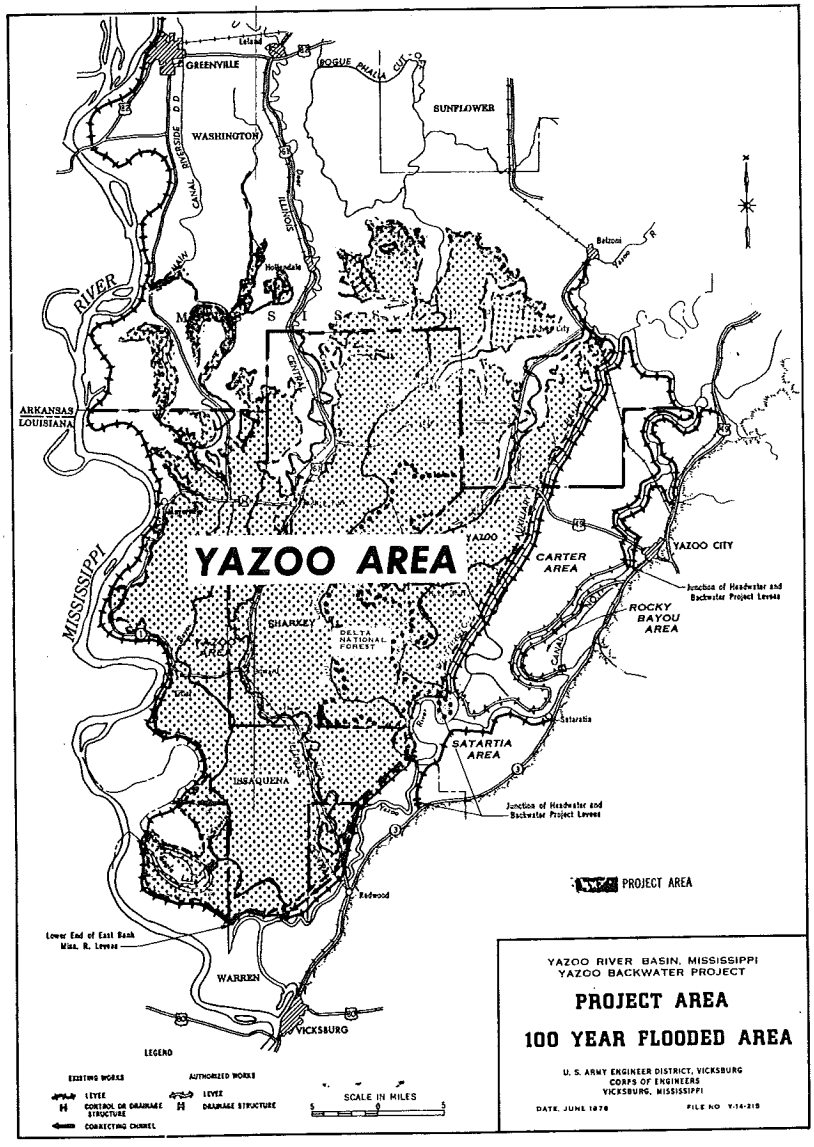
YAZOO AREA PUMP STUDY

PUBLIC MEETING

JULY 10, 1979 7:30 p.m. RAMADA INN VICKSBURG, MISSISSIPPI

CONDUCTED BY U. S. ARMY CORPS OF ENGINEERS, VICKSBURG DISTRICT

THE PURPOSE OF THIS MEETING IS TO DISCUSS
ALTERNATE PLANS TO REDUCE FLOODING IN
THE YAZOO AREA.



Attachment 1

YAZOO AREA PUMP STUDY

WHERE IS THE YAZOO AREA ?

The Yazoo Area is located in west-central Mississippi between the east bank Mississippi River levee and the Will M. Whittington Auxiliary Channel. The Yazoo Area comprises approximately 1.3 million acres, approximately 80 percent of which is cleared and in agricultural production. The project area is the area inundated by the 100-year flood and includes parts of Humphreys, Issaquena, Sharkey, Warren, Washington, and Yazoo Counties, Mississippi, and part of Madison Parish, Louisiana. Big Sunflower and Little Sunflower Rivers, Deer Creek, and Steele Bayou flow through the area. Interior drainage is evacuated by drainage structures at Little Sunflower River and Steele Bayou.

WHAT IS THE YAZOO AREA PUMP STUDY ?

We are studying the feasibility of installing pumps to relieve ponding in the Yazoo Area when Steele Bayou and Little Sunflower River floodgates are closed. This study involves consideration of various alternatives and their economic, engineering, and environmental consequences.

An information summary on the alternatives being considered will be available at the public meeting. This information will be provided upon request prior to the meeting.

WHAT IS THE PURPOSE OF THE MEETING ?

Various pump sizes, locations, and methods of operation for the area have been evaluated and will be discussed. Everyone interested will be given an opportunity to pose questions, express views, and furnish information on items of concern. All comments received, both oral and written, will become part of the official record of this meeting and will be made available for public examination. Written statements may be handed to the presiding officer at the meeting or mailed so as to be received no later than 30 days following the meeting.

WHAT ARE THE KEY CONCERNS ?

- Prevention of flood damages
- Retention of environmental resources

WHAT CAN YOU DO ?

Bring this notice to the attention of anyone you know who is interested in the project.

Provide us with any information you think is important.

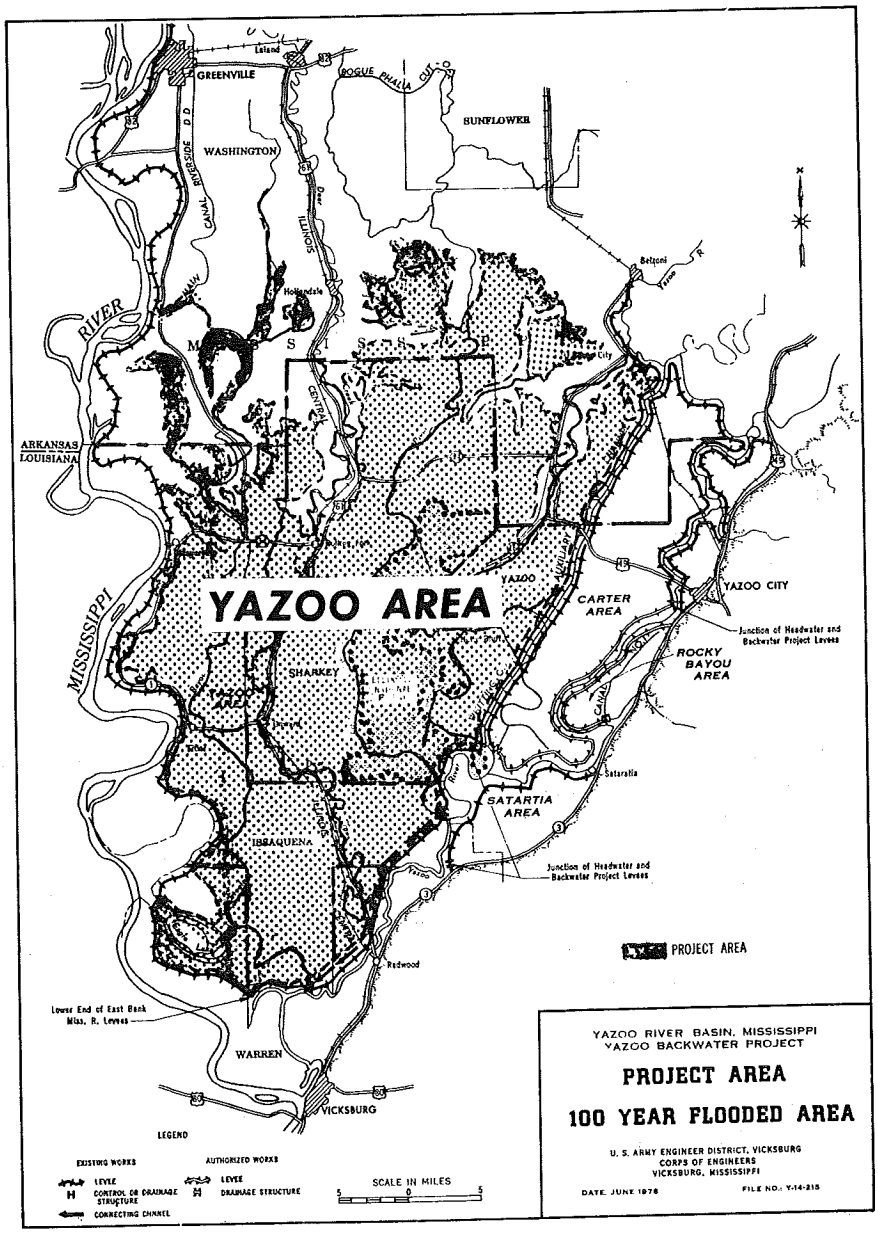
Attend the public meeting and present your views.

IF YOU CANNOT ATTEND

If you cannot attend the meeting, send your comments to us by 10 August 1979.

YAZOO BACKWATER PROJECT
YAZOO AREA PUMP STUDY

INFORMATION SUMMARY



Attachment 2

INFORMATION SUMMARY
YAZOO BACKWATER PROJECT
YAZOO AREA PUMP STUDY

Introduction

This information summary is provided for your convenience in preparing for the Public Meeting to be held in Vicksburg, Mississippi, on 10 July 1979 at 7:30 p.m. at the Ramada Inn. This material will also be presented at the meeting, and everyone will be given the opportunity to ask questions and comment on the plans and other information.

All persons will be afforded full opportunity to express their views and furnish specific data on matters pertinent to the various plans being considered, including technical, economic, ecological, and environmental material. Statements should be supported by factual information insofar as practicable. Oral statements will be heard, but for accuracy of record, all important facts and statements should be submitted in writing. Written statements may be handed to the presiding officer at the meeting or they may be mailed either beforehand or at such time as to be received no later than 30 days following the meeting. All statements, both oral and written, will become part of the official written record of this meeting and will be made available for public examination.

The Area

The Yazoo Backwater Area is located in west-central Mississippi, and lies between the east bank Mississippi River levee on the west and the hills on the east. The area comprises about 1,550 square miles of alluvial valley lands. Construction of the Will M. Whittington Auxiliary Channel divided the area west of the Yazoo River into separate areas. The larger, more westerly of the areas is known as the Yazoo Area. The project study area comprises approximately 539,000 acres subject to inundation by the 100-year flood and includes parts of Humphreys, Issaquena, Sharkey, Warren, Washington, and Yazoo Counties, Mississippi, and part of Madison Parish, Louisiana. This area is generally triangular in shape and extends northward from Vicksburg some 60 miles to the latitude of Hollandale and Belzoni, Mississippi. Big Sunflower and Little Sunflower Rivers, Deer Creek, and Steele Bayou flow through the area. Interior drainage is evacuated by drainage structures at Little Sunflower River (upper sump or ponding area) and Steele Bayou (lower sump or ponding area).

Authority

Work in the Yazoo Backwater Area was first authorized by the Flood Control Act of 1941, which authorized levees, channels, and pumps for the area. The Flood Control Act of 1965 modified the project to

include gravity drainage structures at Steele Bayou and Little Sunflower River, with pumps to be constructed if and when warranted by future conditions and economic justification.

Problems and Needs

A major concern to the residents of the Yazoo Area is flooding. Although flooding has always been a problem in the area, the consecutive floods of 1973, 1974, and 1975 caused hardships to the area residents and thousands of dollars in damages. The levee and drainage structures completed in December 1977 protect the area from outside floodwaters. However, flooding can result from ponding of interior runoff when the Steele Bayou and Little Sunflower drainage structures are closed due to prolonged high stages on the Mississippi River. This occurred in 1979, and again caused considerable hardship and damage in the area. Under existing conditions, a total of 539,000 acres of project lands are subject to flooding from a 100-year interior flood; of this acreage, 74 percent or 398,000 acres is cleared land (see Table 1). In addition, 750 rural residential, 244 recreational, and a small number of commercial, industrial, public and semipublic properties are subject to flooding. Present average annual flood damages in the project area are estimated at $3,241,000. These damages are distributed as follows: agricultural crops, 69 percent; agricultural noncrop, 12 percent; rural residential, 11 percent; and roads and bridges, 8 percent.

There are also environmental concerns that must be addressed. Land clearing in the project area has greatly reduced the bottom-land forest acreage available for wildlife habitat. This is considered a major problem with respect to conservation of the natural environment. The water quality of the lakes and streams located in the Yazoo Area has generally deteriorated in recent years. As land is cleared and converted to agriculture, the rainfall runoff increases in turbidity and agricultural chemicals are carried into the many lakes and streams in the project area.

Planning Considerations

Planning of water resource projects is governed by laws, policies, and regulations that require the development of plans that satisfy objectives ranging from National Economic Development (NED) to Environmental Quality (EQ). The NED Plan allows for maximum economic benefits, while the EQ Plan gives maximum consideration to the environment while still addressing the project objective of flood damage reduction. A broad range of alternative plans have been developed, including one which maximizes economic benefits (NED Plan) and one which makes net positive contributions to the environment (EQ Plan).

TABLE 1
ACRES FLOODED, BY ELEVATION

Elevation (mean sea level)	Total Acres	Cleared Acres
80.0	7,000	2,000
81.0	10,000	3,000
82.0	15,000	6,000
83.0	22,000	9,000
84.0	30,000	13,000
85.0	41,000	19,000
86.0	53,000	24,000
87.0	69,000	31,000
88.0	88,000	39,000
89.0	109,000	48,000
90.0	136,000	59,000
91.0	162,000	70,000
92.0	188,000	85,000
93.0	215,000	104,000
94.0	246,000	129,000
95.0	287,000	163,000
96.0	328,000	201,000
97.0	368,000	239,000
98.0	416,000	284,000
99.0	465,000	331,000
100.0	520,000	382,000
100.3	539,000	398,000

Possible Solutions

Because of the complexity of the problems and needs in the area, a broad range of plans were developed and considered. These plans, which are discussed in the following paragraphs, are by no means the only plans that could be developed; however, they do include a broad range of options.

Among the nonstructural plans considered were no-action, flood plain regulation, and floodproofing. These plans would provide little protection and would allow interior flooding to continue damaging crops and improvements. For these reasons, nonstructural plans are not considered viable.

A levee system along both sides of the Sunflower River from the Yazoo River to near the junction of Bogue Phalia was considered. However, this system is not considered a viable plan because it would require extensive lands for construction, and a pumping station would still be needed in the Steele Bayou area to provide protection from frequent floods.

Systems including more than two pumping stations were eliminated since the connecting channel between the upper and lower ponding areas allows drainage from the Sunflower Basin and from Deer Creek to the lower ponding area.

Of the plans that were considered initially, only pumping stations with 10,000 cfs and larger capacity will effectively meet the study area's flood damage reduction needs. Pump plans with 10,000 cfs and larger pump sizes are discussed in the following paragraphs. Pertinent information for comparison of the feasible plans is given in Tables 2 and 3.

Pump Plan A. The major feature of this plan is a pumping station located in the lower ponding area just west of the Steele Bayou drainage structure. Pumping would begin when interior ponding reaches an elevation of 80 feet, mean sea level (msl). Flooding conditions below elevation 80 feet, msl, would remain unchanged. Pumping capacities of 10,000, 15,000, 20,000, 25,000, and 30,000 cfs were evaluated in detail as a part of this plan. The floodgates would continue to be operated as they presently are. All pump sizes considered have benefits that exceed their cost, with the maximum benefits over cost occurring with the 25,000-cfs pump. Pump Plan A, with a 25,000-cfs pump, is the NED plan since it provides the greatest net economic benefits of all plans studied. However, it induces the second largest fish and wildlife losses. The estimated amount of lands needed to mitigate losses for this plan vary from about 20,000 acres (10,000-cfs pump) to about 24,500 acres (30,000-cfs pump), with about 24,300 acres for the 25,000-cfs pump.

Pump Plan B. This plan consists of two pumping stations, one in each of the interior ponding areas. One station would be located just west of the Steele Bayou drainage structure and the other southwest of the

TABLE 2
COMPARISON OF TOTAL AREAS FLOODED

Alternative	Year	15,000-cfs Pump		20,000-cfs Pump		25,000-cfs Pump	
		Total Acres	Cleared Acres	Total Acres	Cleared Acres	Total Acres	Cleared Acres
No Pump[a/]							
Pump Plan A	1973	328,000	202,000	271,000	151,000	191,000	87,000
	1974	222,000	110,000	171,000	74,000	127,000	49,000
	1975	111,000	46,000	49,000	20,000	38,000	15,000
Pump Plan B	1973	--	--	--	--	186,000	84,000
	1974	--	--	--	--	100,000	44,000
	1975	--	--	--	--	8,000	2,000
Pump Plan C	1973	328,000	202,000	271,000	151,000	191,000	87,000
	1974	232,000	117,000	188,000	85,000	152,000	62,000
	1975	110,000	46,000	56,000	25,000	52,000	23,000
Pump Plan D	1973	--	--	--	--	202,000	95,000
	1974	--	--	--	--	154,000	64,000
	1975	--	--	--	--	64,000	28,000
Pump Plan E	1973	--	--	--	--	182,000	82,000
	1974	--	--	--	--	152,000	62,000
	1975	--	--	--	--	64,000	28,000
Pump Plan F	1973	331,000	205,000	279,000	158,000	199,000	93,000
	1974	228,000	114,000	181,000	80,000	142,000	57,000
	1975	128,000	54,000	75,000	31,000	64,000	26,000
Pump Plans G and H	1973	333,000	207,000	284,000	163,000	206,000	98,000
	1974	232,000	117,000	189,000	86,000	154,000	64,000
	1975	142,000	60,000	95,000	40,000	85,000	35,000
Pump Plan I	1973	346,000	219,000	307,000	183,000	--	--
	1974	243,000	126,000	212,000	102,000	--	--
	1975	180,000	80,000	167,000	72,000	--	--

a/ Total areas flooded assuming completed levees and floodgates as currently exist are as follows:
1973 - 539,000 acres total; 397,000 acres cleared;
1974 - 264,000 acres total; 145,000 acres cleared;
1975 - 294,000 acres total; 170,000 acres cleared.

TABLE 3
COMPARISON OF PLANS

Alternative	Cost[a/] ($000)	Benefit-Cost Ratio	Excess Benefits Over Costs ($000)	Reduction in Damages %	Project-Induced Clearing (acre)	Fish and Wildlife Losses ($000)
Pump Plan A						
10,000 cfs	52,000	2.2	5,900	45	2,300	290
15,000 cfs	71,000	2.2	8,400	62	3,900	350
20,000 cfs	89,000	2.3	10,900	77	4,800	370
25,000 cfs[b/]	108,000	2.1	11,400	86	5,500	380
30,000 cfs	127,000	1.9	10,600	89	5,600	380
Pump Plan B						
10,000 cfs (U)[c/] 15,000 cfs (L)	124,000	1.9	10,500	89	5,800	430
15,000 cfs (U) 10,000 cfs (L)	124,000	1.9	10,400	89	5,800	440
18,000 cfs (U) 7,000 cfs (L)	125,000	1.9	10,300	89	5,900	440
Pump Plan C						
10,000 cfs	52,000	2.2	5,800	45	2,200	280
15,000 cfs	71,000	2.2	8,000	60	3,200	320
20,000 cfs	89,000	2.3	10,600	76	4,300	340
25,000 cfs	108,000	2.1	11,300	86	4,800	350
30,000 cfs	127,000	1.9	10,500	89	5,100	360
Pump Plan D[d/]						
25,000 cfs	143,000	1.5	6,300	75	3,800	130
Pump Plan E[e/]						
25,000 cfs	117,000	1.8	8,700	77	4,700	300
Pump Plan F						
15,000 cfs	70,500	1.8	5,600	50	2,400	220
20,000 cfs	88,500	1.9	7,400	61	3,200	240
25,000 cfs	107,500	1.9	8,000	72	3,600	250
Pump Plan G						
10,000 cfs	51,000	1.1	300	20	900	40
15,000 cfs	70,000	1.4	2,100	35	1,700	60
20,000 cfs	88,000	1.4	3,000	44	2,500	70
25,000 cfs	107,000	1.4	3,700	54	3,000	80
Pump Plan H[f/]						
25,000 cfs	138,000	1.1	1,000	54	3,000	-220

a/ All costs are exclusive of any mitigation costs.
b/ NED Plan.
c/ (U) = Upper site; (L) = Lower site.
d/ This plan causes 21 families to be relocated.
e/ This plan causes 8 families to be relocated.
f/ EQ Plan.

Little Sunflower drainage structure. Pumping for both of the stations would begin when interior ponding stages reach 80 feet, msl. Only combinations of structures to provide 25,000 cfs of pumping capacity were evaluated in detail for this alternative. Combinations evaluated are as follows: 15,000 cfs lower area and 10,000 cfs upper area; 10,000 cfs lower area and 15,000 cfs upper area; and 7,000 cfs lower area and 18,000 cfs upper area. This plan would provide the highest level of flood control benefits of any plan considered and the greatest fish and wildlife losses, and would induce some damages by increasing stages along the Yazoo River below the Little Sunflower River station.

Pump Plan C. This plan is the same as Plan A except that during the period 1 December - 15 March, pumping would be initiated only when the ponding level rises to 85 feet, msl. Pumping capacities of 10,000, 15,000, 20,000, 25,000, and 30,000 cfs were evaluated in detail. This modification reduces somewhat the fish and wildlife losses associated with Plan A, while economic benefits remain high.

Pump Plan D. This plan consists of a 25,000-cfs pumping plant near the Steele Bayou structure with pumping initiated when interior ponding reaches elevation 80 feet, msl, except between 1 December and 15 March when pumping would not be initiated until the ponding level reaches elevation 85 feet, msl. On 1 January, the floodgates could be closed and the sump level raised to 85 feet, msl, as water is available. The 85-foot, msl, elevation would be held until 15 March when the sump would be lowered to 80 feet, msl, and held until 15 April. During June, July, and August, the sump level would be held at 75 feet, msl (approximately the level of Eagle Lake). During all other periods, the floodgates would be operated as they are now, and pumping would begin when the interior ponding elevation reaches 80 feet, msl. This plan would require modification of the floodgates so as to structurally withstand the large differential in water levels inside and outside the structures.

This plan requires the relocation of 21 families, requires flood easements on approximately 68,000 acres, and increases annual cost of the project by more than $2 million while reducing fish and wildlife losses by only about $250,000 annually. However, the annual benefits of this plan exceed the annual costs.

Pump Plan E. This plan is the same as Plan D except that on 1 January, the floodgates would be closed and the sump level maintained at 80 feet, msl, as water is available, until 15 April. The annual cost of this plan is about $1.8 million lower than Plan D, but the annual fish and wildlife losses are about $270,000 higher.

Pump Plan F. This plan consists of a pumping station located in the lower ponding area just west of the Steele Bayou drainage structure, with pumping initiated when interior ponding reaches an elevation of

83 feet, msl. Pumping capacities of 15,000, 20,000, and 25,000 cfs were evaluated as a part of this plan. This plan would not affect flooding on the land below elevation 83 feet, msl. All pump sizes of this plan are economically sound and have fairly low environmental losses and mitigation requirements. The preliminary mitigation requirement for this plan is the purchase and development of 14,000 to 16,000 acres or land use easements on 52,000 to 60,000 acres.

Pump Plan G. The major feature of this plan is a pumping station located in the lower ponding area just west of the Steele Bayou drainage structure, with pumping initiated when interior ponding reaches an elevation of 85 feet, msl. Pumping capacities of 10,000, 15,000, 20,000, and 25,000 cfs were evaluated. The flooding below elevation 85 feet, msl, would not be changed by this plan. The annual benefits of all pump sizes of this plan exceed annual costs, although not as much as Plans A through F. This plan induces the least fish and wildlife losses of all the viable plans and therefore would require the purchase and development of approximately 2,000 (10,000-cfs pump) to 3,500 (25,000-cfs pump) acres or land use easements on about 7,500 to 13,000 acres of bottom-land hardwoods as mitigation.

Pump Plan H. This plan has net positive fish and wildlife contributions and is designated the EQ plan. It includes one 25,000-cfs capacity pumping station in the lower ponding area. Pumping would be initiated when interior ponding reaches elevation 85 feet, msl. During May, June, July, and August, the ponding or sump level will be held at 75 feet, msl, for the benefit of the fishery resource. Approximately 30,000 acres of bottom-land hardwoods in tracts of 100 acres and larger would be purchased and developed for the purpose of preserving bottom-land hardwoods and improving fish and wildlife resources. This plan is marginally economically justified.

Pump Plan I. This plan includes one pumping station, with pumping of interior ponding beginning at 90 feet, msl. Pumping capacities of 10,000, 15,000, and 20,000 cfs were evaluated in detail. This plan results in the fewest fish and wildlife losses of any structural alternative considered in detail. None of the capacities considered has economic benefits which exceed cost.

Social, Economic, and Environmental Effects

The additional flood damage reduction provided by pumping ponded water from this area would decrease the risk involved in farming the benefited area lands. Expanded and more efficient agriculture would result in increased farm income, a broader tax base, increased income tax revenues, and increased property values. It is not expected that the project measures will significantly affect existing population distribution and general trends or have a significant impact on social and cultural patterns in the Yazoo Area. However, many of the residents will be relieved of the inconveniences and insecurities of

residing in areas subject to flooding, including having to abandon their homes during high waters.

All plans were evaluated to determine the plan which would provide the greatest excess benefits over cost. The excess benefits over costs for the plans considered ranged from $11,400,000 (Pump Plan A, 25,000-cfs pump) to -$2,354,000 (Pump Plan I, 20,000-cfs pumps). Total average annual benefits compared to the total annual costs indicate that the 90-foot plan is the only plan that is not justified.

Habitat conditions conducive to an abundance of fish and wildlife resources in the area are directly associated with frequency and duration of overflow during the winter and spring months. Fishery resources, both sport and commercial, are favored by higher productivity and greater harvests as a result of the seasonable water level fluctuations. A lessening in the extent and duration of flooding occasioned by the operation of a pumping plant would reduce the food resources for fish provided by the inundation of terrestrial habitat, diminish spawning and nursery areas, and reduce the overall quality of the sport and commercial fishery throughout the interconnected system of backwater lakes, wetlands, and streams.

Changes in the water regime will have an important influence on waterfowl. During the course of spring and fall migration, ducks feed and rest in flooded woods and fields. Reducing the flooding on these lands will reduce waterfowl usage and result in a loss of waterfowl hunting and habitat. As acreages of flooded timber are converted to cropland, roosting and feeding areas will become a limiting factor.

Mitigation

Both the adverse and beneficial project impacts on fish and wildlife resources have been quantified with the net losses included in the annual costs for all plans evaluated. Mitigation requirements for each plan are directly related to the induced fish and wildlife losses. Preliminary mitigation requirements range from more than 25,000 acres of bottom-land hardwoods by fee title acquisition and development for Plan B, which induces the most losses to the fish and wildlife resources, to a low of 2,000 acres for the 10,000-cfs pumps of Plan G. Mitigation by environmental land use easements is another option, but it appears to require at least 3.5 times more land than that required by fee title, since fee title land can be developed for optimum fish and wildlife benefits. A detailed mitigation plan will be prepared for the selected plan, which must be forwarded to Congress for approval. Mitigation must be accomplished prior to or concurrently with construction of the project.

Local Responsibility

President Carter has initiated a new cost sharing policy for water resource projects. If this policy is determined to be applicable to this project, the State of Mississippi would pay 5 percent of the project cost, and the local sponsor would pay 20 percent of the project cost, plus all of the cost for operation and maintenance of the project and part of the operation and maintenance for mitigation.

The Next Step

After all comments regarding the public meeting have been received, we will carefully review and consider all data and make any changes deemed necessary. A draft report of the study will be completed this fall and will be circulated for state and Federal agency review. After evaluating the comments from these agencies, plans will be refined as necessary. Another public meeting will be held next spring to present the plan that offers the best solution to the area's problems. The final report, mitigation plan, and environmental impact statement will be completed in August 1980.

COMMENT SHEET

This detachable sheet is provided if you wish to submit comments in writing. You may either hand it in at the meeting or mail it to us (no postage is necessary). Additional instructions concerning written comments are found in the introduction to this brochure.

I favor Plan __ with a pump capacity of _____ because of the following reasons:_____

_____

_____

_____

_____

I am opposed to any of the listed alternatives because:_____

_____

_____

_____

_____

My ideas regarding the alternative plans and/or mitigation are as follows:_____

_____

_____

_____

Additional comments:_____

_____

_____

NAME_____

ADDRESS_____

YAZOO AREA PUMP STUDY
INFORMATION SUMMARY

U. S. ARMY CORPS OF ENGINEERS
VICKSBURG DISTRICT

NUMBER 2 OCTOBER 1979

On the evening of 10 July 1979, approximately 500 people met at Vicksburg, Mississippi, to discuss the Yazoo Area Pump Study. Attendees included area residents, farmers, businessmen, and environmental interest group representatives, and municipal, county, state, and Federal government officials.

Colonel Samuel P. Collins, Jr., District Engineer, noted that the Corps hoped to develop the final plan based on the views and opinions of the local people. All statements made at the meeting or submitted by 10 August 1979 have been incorporated into the official transcript of the meeting. Copies of the transcript are available through the Vicksburg District.

VIEWS AND OPINIONS OF THE PUBLIC

The District has received comments from 293 individuals plus 6 petitions containing 660 signatures and 9 resolutions concerning the pump study. Most of the responses pertained to the mitigation portion of the project. (Mitigation is any means of relieving, offsetting, or lessening damages to fish and wildlife and the environment caused by Federal water resource projects.) Approximately 50 percent of those responding oppose mitigation requiring fee title acquisition of land, while 15 percent oppose mitigation by any means. The preferred type of mitigation was land use (environmental) easements, with fee title acquisition of land from willing sellers second. Of those stating an opinion on the pumps, 88 percent are in favor of a pump plan and 12 percent are opposed.

Attachment 3

In summary, the public favors the construction of a pumping plant to relieve flooding and desires that the selected plan consider the environment and include mitigation by land use easements and/or fee title acquisition from willing sellers.

STUDY STATUS

Comments received on the plans presented at the public meeting have been evaluated and Plans C, E, F, and G with some modifications have been identified as having the best potential for the selected plan. Each of these plans involves the use of a single pumping station to relieve interior ponding of floodwater.

With Plan C, pumping is initiated when the water reaches 80 feet, except from 1 December to 1 March when pumping would be initiated at elevation 85. Plan E is similar to C; however, it includes modification of the drainage structures to pond water to a minimum elevation of 80 feet in the sumps from 1 January to 15 April and maintains an elevation of 75 feet during the summer months. Plan F initiates pumping at elevation 83, except from 1 December to 1 March when pumping is initiated at elevation 85. This plan would also maintain a 75-foot sump elevation from 1 May to 1 September. Plan G initiates pumping at elevation 85 all year. The costs and benefits of all four plans are being updated to 1 October 1979 price levels.

The environmental issue is of great significance, and considerable effort is being made to evaluate the project impacts and develop appropriate mitigation measures to offset losses to fish and wildlife resources. Close coordination is being maintained with the Fish and Wildlife Service on this issue.

The dates for the next public meeting and completion of the final report, as presented at the 10 July public meeting, will be delayed 3 to 4 months due to the additional effort required to refine the potential plans and develop associated mitigation features. Every effort is being made to minimize the delay; however, the extra time and effort are worthwhile toward providing a well-planned project.

THE NEXT STEP

Several plans have been eliminated from consideration and a tentatively selected plan with associated mitigation features for fish and wildlife losses will be identified this winter. A draft report will be completed and circulated for state and Federal agency review next spring. A public meeting will be held early in the summer of 1980 to present the plan which the Corps recommends as the best solution to the area's problems. After public input has been received and any necessary modifications to the plan have been made, a final report and environmental impact statement will be submitted through the Mississippi River Commission to the Chief of Engineers in late 1980.

QUESTIONS?

Contact Ken Bray, Study Manager, Yazoo Area Pump Study, Regional Planning Branch, Vicksburg District, Corps of Engineers, P. O. Box 60, Vicksburg, Mississippi 39180.

I, Polly W. Pritchett, Secretary of the Board of Mississippi Levee Commissioners, and Custodian of its records, do hereby certify that the attached two sheet(s) contain a true and correct copy of order of the Board adopted at its regular meeting January 12, 1981 same being on file in the office of the Board in Minute Book 16, page 268.

Given under my hand and official seal of the Board this , 11th day of February, 1981.

Polly W. Pritchett

Polly W. Pritchett, Secretary
and Custodian of the records
Board of Mississippi Levee
Commissioners

Attachment 4

RESOLUTION OF THE BOARD OF MISSISSIPPI

LEVEE COMMISSIONERS

Whereas the Corps of Engineers, by authority of the Flood Control Act of 1941, as amended, is engaged in flood control projects in the Yazoo Backwater area of the Yazoo Basin, and

Whereas the most significant work being considered at this time is a flood-water pumping station located near the Steele Bayou drainage structure; and

Whereas the Board of Mississippi Levee Commissioners is vitally interested in assuring that the Yazoo Area Pump Project is approved, funded, completed, and activated because it is the opinion of this Board that the economy of the area would be greatly enhanced by the installation of this long sought and much needed flood control project; and

Whereas it is the desire of the Commissioners of the Board of Mississippi Levee Commissioners to inform the Corps of Engineers and the Congressmen and Senators who represent the delta, of their wholehearted endorsement of this project which is critically needed to remove flood-water that collects in the south delta.

Therefore, be it resolved that the Board of Mississippi Levee Commissioners fully supports the Corps of Engineers' Plan C with a pumping capacity which the Corps determines to be the optimum size in light of engineering, economic, environmental, and social considerations within existing authority, specifically noting that the project would be constructed, maintained and operated at federal expense and there shall be no local cost-sharing responsibilities.

Be it further resolved that a copy of this resolution fully endorsing the Yazoo Area Pump Project be forwarded to the Senators and members of Congress who represent the people of the project area, and to the Corps of Engineers to be used by these officials in any way appropriate to assist in the funding and completion of the Yazoo Area Pump Project.

Resolution unanimously adopted this, the 12th day of January 1981.

/s/ F. H. Nance
President

/s/ Polly W. Pritchett
Secretary

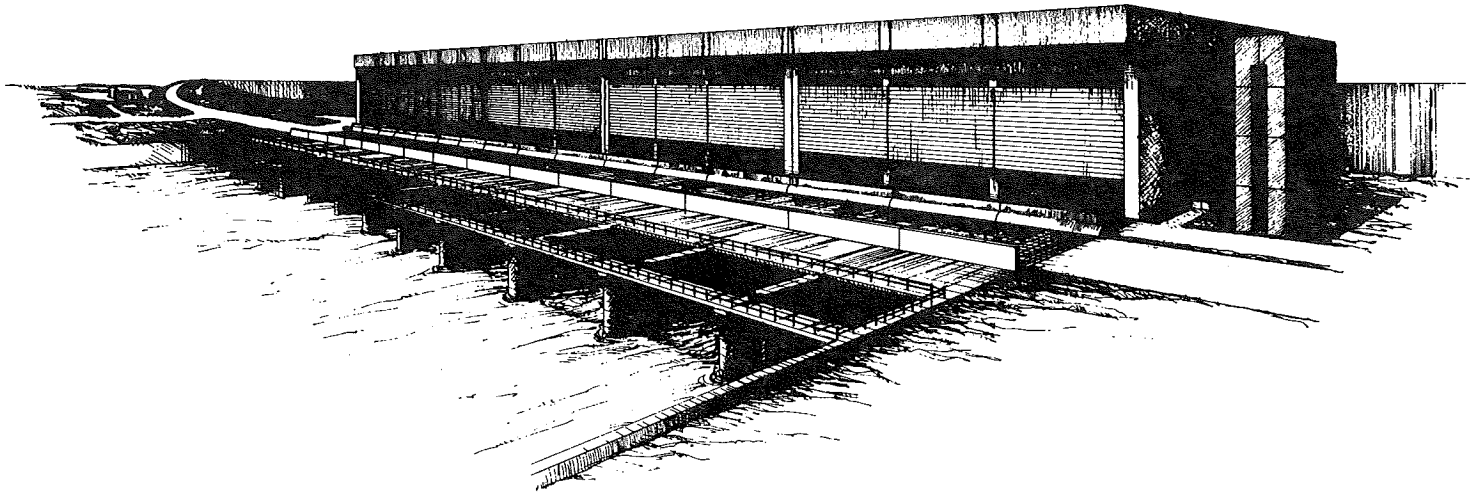
US Army Corps
of Engineers
Vicksburg District

PUBLIC MEETING NOTICE

AND

INFORMATION SUMMARY

THE YAZOO AREA PUMP PROJECT



MEETING WILL BE HELD:

6 APRIL 1982

7 P.M.

AUDITORIUM

ROLLING FORK HIGH SCHOOL
ROLLING FORK, MISSISSIPPI

Attachment 5

ANNOUNCEMENT OF PUBLIC MEETING
TO DISCUSS THE
TENTATIVELY SELECTED PLAN OF IMPROVEMENT FOR
THE YAZOO AREA PUMP PROJECT

In July 1979 we conducted a public meeting in Vicksburg, Mississippi, to present the various alternatives that had been identified to relieve flooding in that portion of the Yazoo Backwater known as the Yazoo Area. Since that meeting, detailed studies have been conducted to assess and evaluate the effectiveness of each of those alternatives. As a result, a draft report has been prepared which contains our recommendations as to the best solution to the area's problems. This report is currently being reviewed by various local, state, and other Federal agencies. In order to allow all interested individuals a chance to ask questions or express views and suggestions, a final public meeting will be held on 6 April 1982 in the Rolling Fork High School Auditorium at 7 p.m. Topics to be presented at the meeting include the background and authority for the project, the results of our evaluations, and a description of the tentatively selected plan. This information is provided in the information summary (Attachment 1).

In addition to the tentatively selected flood control plan, a fish and wildlife mitigation plan for the Yazoo Area Pump Project and the Yazoo Area and Satartia Area Backwater Levee Projects has been developed. A separate mitigation report has been prepared in draft form and is also being reviewed by various local, state, and Federal agencies. The tentatively selected mitigation plan as contained in this report will be discussed at the meeting.

Another purpose of the meeting is to discuss and provide the public an opportunity to comment on those activities associated with the project that involve the discharge of dredged or fill material into waters of the United States, pursuant to Section 404 of the Clean Water Act. In this regard, the meeting is intended to also serve as a "public hearing" as provided for by Section 404(a) of the Clean Water Act. Additional information concerning Section 404 activities is contained in Attachment 2.

At the end of the formal presentation, an opportunity will be provided for oral statements and a question-and-answer session. Written statements may be submitted at the meeting or mailed to the Vicksburg District. The proceedings of the meeting will be recorded and a transcript will be prepared. Mailed statements must be received within 30 days after the public meeting to be included in the official record.

2 Attachments

SAMUEL P. COLLINS, JR.
Colonel, Corps of Engineers
District Engineer

ATTACHMENT 1
INFORMATION SUMMARY
YAZOO AREA PUMP PROJECT

THE AREA

The Yazoo Backwater Area is located in west-central Mississippi and lies between the east bank Mississippi River levee on the west and the hills on the east. The area comprises about 1,550 square miles of alluvial valley lands. Construction of the Will M. Whittington Auxiliary Channel divided the area west of the Yazoo River into separate areas. The larger, more westerly of the areas is known as the Yazoo Area. The project study area, as shown on the inclosed map, comprises approximately 539,000 acres subject to inundation by the 100-year flood and includes parts of Humphreys, Issaquena, Sharkey, Warren, Washington, and Yazoo Counties, Mississippi, and part of Madison Parish, Louisiana. This area is generally triangular in shape and extends northward from Vicksburg some 60 miles to the latitude of Hollandale and Belzoni, Mississippi. Big Sunflower and Little Sunflower Rivers, Deer Creek, and Steele Bayou flow through the area. Interior drainage is evacuated by drainage structures at Little Sunflower River (upper ponding area) and Steele Bayou (lower ponding area).

AUTHORITY

Work in the Yazoo Backwater Area was first authorized by the Flood Control Act of 1941, which authorized levees, channels, and pumps for the area. The Flood Control Act of 1965 modified the project to include gravity drainage structures at Steele Bayou and Little Sunflower River, with pumps to be constructed if and when warranted by future conditions and economic justification.

PROBLEMS AND NEEDS

A major concern to the residents of the Yazoo Area is flooding. Although flooding has always been a problem in the area, the consecutive floods of 1973, 1974, and 1975 caused hardships to the area residents and thousands of dollars in damages. The levee and drainage structures completed in December 1977 protect the area from outside floodwaters. However, flooding can result from ponding of interior runoff when the Steele Bayou and Little Sunflower drainage structures are closed due to prolonged high stages on the Mississippi River. This occurred in 1979, and again caused considerable hardship and damage in the area. Under existing conditions, a total of 539,000 acres of project lands are subject to flooding from a 100-year interior flood; of this acreage, 74 percent or 398,000 acres is cleared land. In addition, 750 rural residential, 244 recreational, and a small number of commercial, industrial,

public and semipublic properties are subject to flooding. Present average annual flood damages in the project area are estimated at $3,888,000. These damages are distributed as follows: agricultural crops, 70 percent; agricultural noncrop, 12 percent; rural residential, 11 percent; and roads and bridges, 7 percent.

There are also environmental concerns that must be addressed. Land clearing in the project area has greatly reduced the bottom-land forest acreage available for wildlife habitat. This is considered a major problem with respect to conservation of the natural environment. The water quality of the lakes and streams located in the Yazoo Area has generally deteriorated in recent years. As land is cleared and converted to agriculture, the rainfall runoff increases in turbidity and agricultural chemicals are carried into the many lakes and streams in the project area.

POSSIBLE SOLUTIONS

Because of the complexity of the problems and needs in the area, a broad range of plans were developed and considered. Many of the alternatives, such as flood plain regulation, floodproofing, a levee system along the Sunflower River, pumps at more than two locations, and pumps at less than 10,000-cubic-foot-per-second capacity, were eliminated since they either provide very little flood protection or are not economically justified. The final group of feasible alternatives consisted of eight plans consisting of pumps at a single location and one plan consisting of pumps at two locations. Some of the differences in these plans include various pumping capacities, initiation of pumping at different elevations, and varied operation of the existing drainage structures.

TENTATIVELY SELECTED PLAN

The tentatively selected plan consists of a 17,500-cubic-foot-per-second pump located approximately 0.8 mile west of the Steele Bayou Drainage Structure. Pumping would be initiated when interior ponding reaches elevation 80 feet, National Geodetic Vertical Datum (NGVD), except during the period 1 December-1 March when pumping would be initiated at elevation 85 feet, NGVD. This modified wintertime operation would lessen the impacts of the project on waterfowl without significantly sacrificing flood reduction benefits during this period. Approximately 10,000 feet of inlet and outlet channel will be required with bottom widths varying from 300 to 800 feet. The tentatively selected plan includes the acquisition of land use easements on 6,500 acres of bottom-land hardwoods for mitigation of project-induced fish and wildlife losses.

The first cost of the tentatively selected plan is $149,900,000 including approximately $2,745,000 for mitigation. Annual operation and maintenance costs are approximately $1,021,000. These costs would be borne by the Federal Government. Non-Federal responsibilities include minor maintenance of the inlet and outlet channels at an annual cost of $13,000 to be borne by the project sponsor.

MITIGATION OF OTHER PROJECTS

A fish and wildlife mitigation plan has been developed for the Yazoo Area Pump Project as well as the completed Yazoo Area and Satartia Area Backwater Levee Projects.

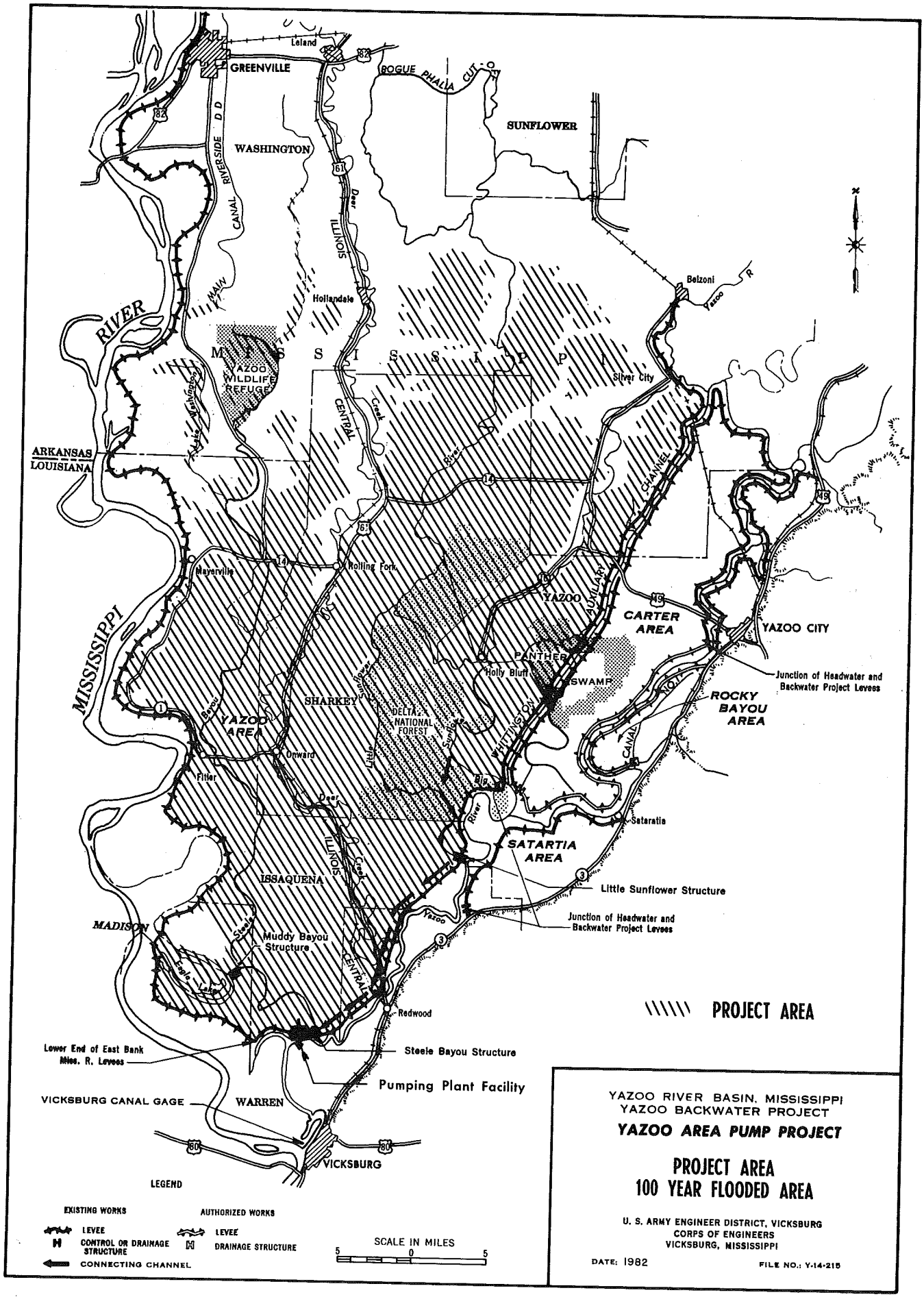
As stated above, mitigation requirements for the proposed pumping plant consist of the acquisition of 6,500 acres of bottom-land hardwoods in perpetual land use easements. Mitigation requirements for the completed levee projects would consist of the purchase and development of 5,400 acres of bottom-land hardwoods in fee simple title to expand the Panther Swamp National Wildlife Refuge and the acquisition of 26,900 acres of bottom-land hardwoods in perpetual easements.

The mitigation report will have to be submitted to Congress for authorization. If Congress authorizes mitigation for only one of the two projects, then mitigation requirements would be different than presented here.

WHAT'S NEXT?

Following the public meeting, a final report will be prepared incorporating the comments of local interests and those generated by the various local, state, and Federal agencies. The final report will be submitted to the Mississippi River Commission for approval in July 1982.

Any questions concerning the Yazoo Area Pump Project should be directed to Mr. Greg Ruff, Project Manager, telephone (601) 634-5457.



YAZOO RIVER BASIN, MISSISSIPPI
YAZOO BACKWATER PROJECT

YAZOO AREA PUMP PROJECT

PROJECT AREA
100 YEAR FLOODED AREA

U. S. ARMY ENGINEER DISTRICT, VICKSBURG
CORPS OF ENGINEERS
VICKSBURG, MISSISSIPPI

DATE: 1982

FILE NO.: Y-14-215

ATTACHMENT 2
SECTION 404 CONSIDERATIONS

Certain features associated with construction of the proposed work will involve the discharge of dredged or fill material into wetlands. Therefore, compliance with Section 404 of the Clean Water Act is necessary.

There are numerous streams, lakes, and wetlands within the project area, but most of these will not receive discharge of dredged or fill material. The Environmental Protection Agency has designated all woodlands below elevation 90 feet, National Geodetic Vertical Datum, as special case wetlands. The special case wetlands which are located along the proposed inlet and outlet channels will receive some discharge of dredged or fill material.

Activities which will involve the discharge of dredged or fill material into these wetlands include: excavation of inlet and outlet channels and pumping plant site, placement of riprap along channel banks, and various temporary and minor activities necessary during project implementation (ramps, soil borings, etc.).

A preliminary Section 404(b)(1) evaluation has been prepared for the tentatively selected plan. Copies of this evaluation are available upon request.

In accordance with the requirements of the Section 401 of the Clean Water Act, the Vicksburg District has requested a certification of compliance with state water quality standards from the Mississippi Department of Natural Resources.

YAZOO PUMP PROJECT
YAZOO BACKWATER AREA
MISSISSIPPI

REEVALUATION REPORT

APPENDIX I

REPORTS OF OTHER AGENCIES

PREPARED BY
THE UNITED STATES ARMY
VICKSBURG DISTRICT, CORPS OF ENGINEERS
VICKSBURG, MISSISSIPPI

REEVALUATION REPORT
YAZOO AREA PUMP PROJECT
YAZOO BACKWATER AREA, MISSISSIPPI

APPENDIX I
REPORTS OF OTHER AGENCIES

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PART 1

FISH AND WILDLIFE COORDINATION ACT REPORT

United States Department of the Interior

FISH AND WILDLIFE SERVICE

JACKSON MALL OFFICE CENTER

300 WOODROW WILSON AVENUE, SUITE 3185

JACKSON, MISSISSIPPI 39213

June 11, 1982

Colonel Samuel P. Collins, Jr.
District Engineer
U. S. Army, Corps of Engineers
P. O. Box 60
Vicksburg, Mississippi 39180

Dear Colonel Collins:

This letter and the accompanying substantiating report constitute the report of the U. S. Fish and Wildlife Service relative to the potential impacts of the authorized Yazoo Area Pump Project, Mississippi, on fish and wildlife resources and is intended to accompany the Phase I General Design Memorandum (GDM). This report has been prepared and is submitted in accordance with the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 et seq.). Comments of the Mississippi Department of Wildlife Conservation have been incorporated and their letter of June 8, 1982 (with attachment) is included as Appendix G.

Initiation of the Yazoo Area Pump Study was approved by the Mississippi River Commission on November 12, 1973, as provided for in the Flood Control Acts of 1941 and 1965. Our report reviews in depth the impacts of four alternatives; that is alternatives C with a 25,000 cubic foot per second (cfs) pumping plant, C (17,500 cfs pumping plant), H, and F; the National Economic Development Plan, the "Selected Plan", the Environmental Quality Plan, and the 83 Foot Plan, respectively. Appendices A and B to the substantiating report provide an impact analysis for alternatives. Additionally, an analysis of the completed Yazoo Backwater Features consisting of the Yazoo Area levee, its appurtenant connecting channel, and the Satartia Area levee was conducted.

The Yazoo Area Pump Study is typical of previous water resource planning in the Yazoo Basin and the Lower Mississippi River Valley. These planning efforts have attempted in a methodical manner (on a project by project basis), to solve one project areas's problems simply by pushing identifiable problems downstream. This process of solving one problem by creating another is the very foundation of the Yazoo Area Pump Project.

The proposed project is a response to previous flood control efforts in the Yazoo Basin that have, over a span of forty years, expended an estimated $800 million to create an extensive flood control system which deliberately expedites the drainage of over 4,000 square miles into the extreme lower Yazoo Basin for sump storage. Simply stated, the purpose of the Yazoo pumps is to evacuate, through pumping, the interior drainage that accumulates behind the Yazoo Area levee whenever high stages

on the Mississippi River prevent gravity drainage. Completion of the pumping plant would, however, eliminate this sump storage function and in the process insure a continuum of upstream and downstream flood control problems. Thus, the problem being addressed in the Yazoo Area Pump Study is very much a result of previous Federal flood control projects, and the proposed solution, a pumping plant, might well dictate a similar conclusion in future Federal planning efforts.

The enabling legislation for the Yazoo Pumps, the Flood Control Acts of 1941 and 1965, authorized substantial and expansive structural flood control features. However, these authorizations were predicated on a realization that "It cannot be claimed that the Government is under obligation to afford equal consideration to all alluvial valley lands. That is a physical impossibility. No great engineering project is ever carried through to completion without the destruction of some existing or prospective property values for the greater good of the general community" (House Document 359). Subsequently, extensive structural measures were authorized in the Yazoo Basin to provide flood protection to the lands above 90 feet msl; and those lands below 90 feet msl, predominately forested wetlands, were dedicated to flood storage and related benefits.

This designation was made with the recognition that all areas of the Yazoo Basin could not receive equal flood protection and that to accomplish the master plan for flood control of the Lower Mississippi River Valley, floodwater storage areas must be maintained. Unfortunately, Congress did not take actions necessary to maintain the Yazoo Area's flood storage role by precluding future development of land uses incompatible with flood storage. As a result, there have been continuing encroachment and intensification of flood susceptible land uses. The vast majority of these encroachments have been efforts to expand agriculture into the sump. However, the flood protection that would be provided by the proposed plan would encourage even more encroachment and intensification; and, in fact, without the "benefits" of such encroachment, the proposed plan is not economically justified. The Corps of Engineers proposes to address the complex water resource problems that are resulting from this encroachment by abolishing the Yazoo Area's flood storage role and, in the process removing the benefits previously defined by Congress.

This process of eliminating a flood storage area integrally related to projects upstream as well as downstream points out the lack of long-range planning inherent in the single purpose projects of the past. The removal of those waters deliberately forced into the Yazoo Area will be accomplished by transferring the problem to other people in other basins. Construction of the proposed plan would cause flood crests on the Mississippi River to be higher. Water quality of the Mississippi and Yazoo Rivers would be lowered by the introduction of insecticides and herbicides. Project benefits would be realized from the conversion of forested wetlands by an inconsistent application of the Corps' regulatory authorities. Maintenance dredging for mainstem navigation and

flood control would become more expensive due to increased levels of sediment. Associated with all these problems would be the creation of an energy intensive project when energy conservation is imperative.

It is our view that these very real and identifiable impacts can be avoided and that the intent of Congress expressed in the 1941 and 1965 Acts can be accomplished. A basic alternative embracing the 1941 and 1965 authorizations that would provide for protection to lands above 90 feet and preserve the flood water storage of those lands below 90 feet is being overlooked. This alternative would recognize the Corps of Engineers' responsibility of having created the sump, recognize the previous Congressional designation of the areas below 90 feet msl as a sump, and take the necessary action to federally dedicate the approximately 136,000 acres below 90 feet msl for sump storage. Associated with the creation of a federally dedicated sump, a 15,000 cubic foot per second (cfs) pumping plant with pumping initiated at 83 feet msl would provide the level of flood protection as authorized by Congress. Additionally, the artificial or enhanced flood regimen of the Yazoo Area that has resulted from deliberate and conscious decisions relative to upstream flood control projects would be adequately accommodated. Lastly, the ever increasing flood damages resulting from the unwise encroachment into a previously authorized sump would be replaced with land uses compatible with and dependent on flood water storage.

The issues of the Yazoo Area Pump Project are not those of weighing human health, safety, and welfare against fish and wildlife and related natural resources. A conclusion of this nature avoids the problem by instead concentrating on the symptoms. The issues are whether the remaining natural resources of the Yazoo Area will be foregone to expand flood susceptible land use into a federally dedicated sump for a Federal drainage system that extends over 4,000 square miles. Flood control in the Yazoo Area is a proper Federal role. Complex water resource problems exist. These problems need not, nor should not, however, be addressed in a single purpose fashion so prevalent in the past. The same or comparable level of flood control cannot be provided to the entire 4,000 square mile portion of the Yazoo Basin without in turn delivering these same problems downstream. The 1941 and 1965 Flood Control Acts acknowledged this. The creation of the Yazoo Area sump was the acknowledgement by Congress that an area must be available to store flood waters. To do otherwise was contrary to mainstem flood control objectives. These realities are as true today as they were in 1941.

The Fish and Wildlife Service is not opposed to construction of a Yazoo Area pumping plant. Associated with the creation of a federally dedicated sump, we would not object to the Corps' Alternative Plan F (a 15,000 cfs pumping plant with pumping initiated at 83 feet msl) or Plan G (a 17,500 cfs pumping plant with pumping initiated at 85 feet msl). Plan F is almost identical to previous Congressional authorizations and, with provisions for a federally dedicated sump, would completely fulfill

Federal responsibilities in the Yazoo Area. Of necessity, a plan such as this would ensure no additional encroachment of land uses incompatible with sump storage on lands below 90 feet. This would be accomplished by acquisition of those interests necessary to ensure sump storage and to prevent development that would be inconsistent with flood susceptibility. The continuation of a functioning ecosystem with associated timber production and fish and wildlife values and the retention of significant flood storage capacities would be preserved for the "greater good of the general community".

In keeping with our responsibilities under the Fish and Wildlife Coordination Act concerning the Yazoo Area Pump Project, the Fish and Wildlife Service recommends that Plan G or F be implemented, as previously described, with provisions for acquisition of those interests necessary to establish a federally dedicated sump. Further, since any pumping plant in the Yazoo Area depends on completed backwater features, acquisition of forested wetlands totaling approximately 27,100 acres in fee title, or 33,500 acres in easements, or a combination thereof to compensate for fish and wildlife losses that resulted from these completed features should be accomplished as an integral feature of the pumping plant project.

The Fish and Wildlife Service views the damages that would result from construction of the Corps' Selected plan to be of such magnitude that we do not support this plan. It is the position of the Fish and Wildlife Service that implementation of the Selected plan would not be in the best public interest. Implementation would result in the deliberate removal of an existing Congressionally authorized flood storage area vital to the master plan for flood control in the Lower Mississippi River Valley. Associated with the project as presently planned are inconsistencies with previous logic on the need to maintain flood storage and related benefits in backwater areas; inconsistencies with previous Congressional intent to dedicate the area below 90 feet msl for flood storage; contradictions to sound principles of floodplain management; contradictions to current energy conservation policies; and an approach to planning that "solves" the flood control problems of one area by moving them downstream to other areas.

Because of these planning inconsistencies, the Service does not support the implementation of the Selected plan. However, since an adequate and acceptable mitigation plan (Fish and Wildlife Mitigation Report) has been developed and agreed upon by this Service and the Corps of Engineers, we will not oppose the project, assuming that mitigation is authorized and implemented as an integral project feature. The Fish and Wildlife Mitigation Report, to be submitted to Congress for authorization, recommends land acquisition of 32,800 acres in fee title, or 40,000 acres in easements, or a combination thereof. The recommendation for fee title acquisition of all or a portion of the 32,800 acres of forested wetlands is contingent upon adequate funds, at project expense,

for development, operation, and maintenance. First cost for initial development would be approximately $3,604,600, with approximately $319,200 required for annual operation and maintenance, per 10,000 acres acquired. If provisions for these funds to provide intensive management are not obtained, an alternative to this recommendation should be fee title acquisition of approximately 38,900 acres of forested wetlands.

If, as a result of the review process, the mitigation plan is eliminated or substantially altered, the Service would oppose the project and consider it a candidate for referral to the Council on Environmental Quality (CEQ). The possibility of CEQ referral has been discussed on numerous occasions in formal coordination meetings and in preliminary, revised preliminary, and draft Fish and Wildlife Coordination Act reports officially transmitted on April 1, 1980, August 19, 1980, June 4, 1981, and January 7, 1982.

The accompanying substantiating report contains the rationale, justification, and discussion necessary to support our recommendations. Additional detail concerning our recommendations is also included. Please keep us informed of your actions relative to this report.

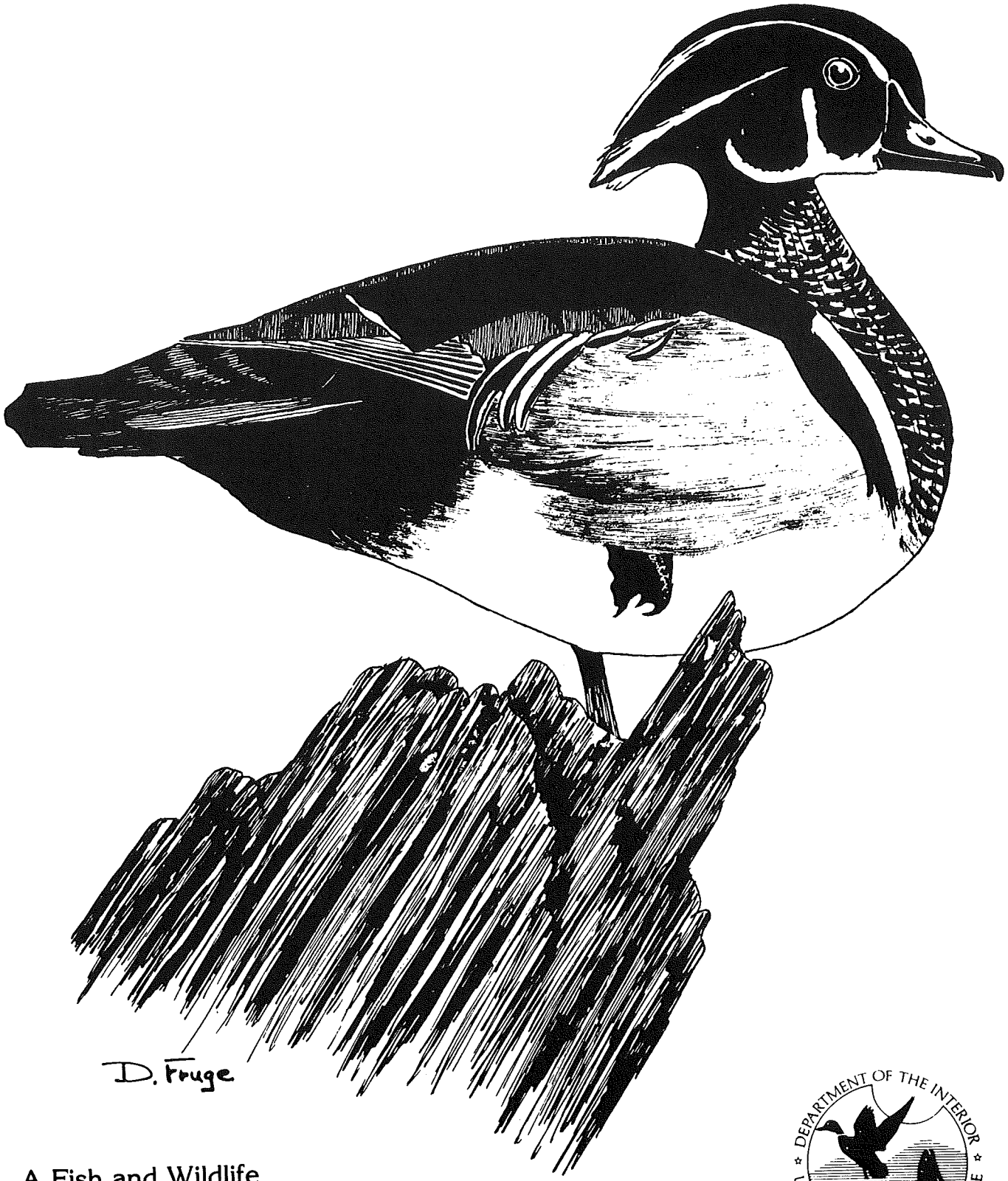
Sincerely yours,

for Robert Russo

Gary L. Hickman
Area Manager

YAZOO AREA PUMP STUDY

YAZOO BACKWATER PROJECT, MISSISSIPPI



A Fish and Wildlife
Coordination Act
Report

DEPARTMENT OF THE INTERIOR
U.S. FISH AND WILDLIFE SERVICE

YAZOO AREA PUMP STUDY

YAZOO BACKWATER PROJECT,

MISSISSIPPI

A FISH AND WILDLIFE COORDINATION ACT REPORT

SUBMITTED TO

THE VICKSBURG DISTRICT

U. S. ARMY, CORPS OF ENGINEERS

VICKSBURG, MISSISSIPPI

PREPARED BY

CHARLES A. MCCABE, H. DALE HALL, AND ROBERT C. BARKLEY

DIVISION OF ECOLOGICAL SERVICES

VICKSBURG, MISSISSIPPI

PRINCIPAL INVESTIGATOR

CHARLES A. MCCABE

UNDER THE SUPERVISION OF

CHARLES K. BAXTER

RELEASED BY

U. S. FISH AND WILDLIFE SERVICE

JACKSON AREA OFFICE

JACKSON, MISSISSIPPI

JUNE, 1982

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INTRODUCTION

Water resource planning in the Yazoo Basin, as well as throughout the Lower Mississippi Valley, has historically been project specific and narrow in scope. There has been a chronic tendency to inadequately consider very real hydrological, social, and environmental relationships between flood control projects planned in one area and their impacts upon other areas, both up and downstream.

The Yazoo Area Pump Project exemplifies these problems. A simplified explanation of the purpose of the Yazoo pumps is to evacuate, through pumping, the interior drainage that has accumulated behind the Yazoo Area levee when high stages on the Mississippi River prevent gravity drainage. This simplified view, however, does not take into account the relationship of this problem to forty years and an estimated $800 million of Federal flood control in the Yazoo Basin. While these previous projects have given flood protection to 80-90% of the Yazoo Delta, they have concomitantly created an extensive flood system which deliberately expedites the drainage of over 4,000 square miles into the extreme lower Basin for sump storage. From this standpoint, the problem being addressed is very much a result of previous Federal flood control.

Our concern is that the current planning effort for the Yazoo Area Pumping Station is progressing with the same lack of long-range planning necessary to place the project in proper perspective to the flood control features upstream as well as downstream. In fact, there is every indication that the current proposal is not consistent with existing authorization and, more importantly, that it contradicts previous assumptions, planning, and logic regarding the maintenance of areas for storage of flood waters in the Lower Mississippi Valley.

To put these concerns and our corresponding recommendations into perspective, it is necessary to briefly review the legislative history behind the Yazoo Area pumps and illuminate the reasoning, discussions, and authorization that limits flood protection in the Yazoo Area to 90 feet mean sea level (msl) with a pumping plant no larger than 14,000 cubic feet per second (cfs) and designates the area below 90 feet msl for flood storage/timberland benefits.

LEGISLATIVE HISTORY AND HISTORICAL PERSPECTIVE

Flood control in the Lower Mississippi alluvial valley began in the 1800's through local attempts to protect homes and crops against flood damage. Prior to the flood of 1927, the Federal government had taken the position that those who settled in floodplains should not expect the government to provide flood protection. However, due to losses incurred by floodplain settlements during the 1927 flood, Congress enacted into law the Flood Control Act of 1928. This was the first time the Federal government had accepted responsibility for the welfare of people in great floods.

Flood Control Acts of 1936 and 1938

A growing concern for the Federal government to become more involved in flood control led to the passage of the Flood Control Act of 1936. The Act designated certain areas in the Lower Mississippi Valley to receive specified levels of flood protection on a local cost-sharing basis. Local responsibilities included financial contributions, acquisition of lands and appurtenances, relieving the Federal government of any and all liabilities, and operation and maintenance of completed works. At this point, the Federal government was still quite reserved toward allocating large amounts of money to protect areas that chronically flooded yet continued to have an increase of new settlements. Several areas in the Lower Mississippi Valley were named in the Act to receive limited flood protection. Among these was the uppermost reach of the Yazoo Basin. Measures to be implemented included construction of seven floodwater storage reservoirs, various channelization works, or any combination at the discretion of the Chief of Engineers. The final plan was composed of four reservoirs, all of which were ultimately constructed (Arkabutla, Sardis, Enid, and Grenada) and numerous channelization projects, most of which have been completed.

The 1938 Flood Control Act removed many of the cost-sharing provisions of the 1936 Act. This was attributed, at least in part, to the Depression, which made non-federal participation in cost-sharing difficult. Moreover, many of the flood protection works constructed during the period were accomplished through federal work programs to provide jobs for the unemployed (Muckleston 1976). The emergency actions of Congress undertaken during the Depression laid the foundation for flood control at Federal expense; a situation that continues today.

Flood Control Act of 1941

During the period between enactment of the 1938 and 1941 Flood Control Acts, a great deal of thought and discussion went into determining what would be reasonable flood control for the Lower Mississippi alluvial valley. In House Document 359 (August 14, 1941), it was realized that

the planning of flood control projects must be accomplished through prudent judgment and wise actions. The Document stated that "It cannot be claimed that the Government is under obligation to afford equal consideration to all alluvial valley lands. That is a physical impossibility. No great engineering project is ever carried through to completion without the destruction of some existing or prospective property values for the greater good of the general community". The reasoning accompanying this statement was that certain areas in the subbasins adjacent to the Mississippi River performed a valuable function as flood storage areas. By permitting the floodwaters to spread into alluvial valley lands, the duration and depth of floods remained minimal. For these reasons, it was stated (in HD 359) that "The Department has consistently opposed the exclusion of great floods from the large backwater areas, since the elimination of the storage capacities in the backwaters would materially increase flood heights".

In testimony before the House Committee on Flood Control, Brigadier General Max Tyler, President, Mississippi River Commission (MRC), stated that "The leveeing off of any reservoir area is bound to raise the flood height for some distance upstream and for the entire distance downstream up to the level of the confining levees" (1941). Moreover, General Tyler stated that leveeing off the Yazoo backwater area would cause increased flood heights on the Louisiana side of the Mississippi River up to the point when the levees are overtopped. Congressman Allen of Louisiana, was very concerned over the prospective increase in flood levels to the downstream Red River backwater area of Louisiana as a result of Yazoo backwater protection. When confronted with this possibility, General Tyler stated that flood stages in the Red River backwater area would be increased by one-two feet.

The subsequent legislation of August 18, 1941, provided for protection in the backwaters of both the Red and Yazoo Rivers. The Yazoo backwater project was designed to protect more than 600,000 acres of alluvial lands through the installation of 14,000 cfs pumps to limit floodwater elevation to the 90 foot msl contour. The approximately 125,000 acres located below the 90 foot contour would be dedicated to floodwater storage.

The reasons for not providing flood protection to those lands below 90 feet msl (roughly the boundary of the 125,000 acre sump) were two-fold: (1) the need for flood storage was recognized and incorporated into the plan, and (2) the reason ellucidated in HD 359 that, "Experience shows that areas of the alluvial valley which have been given a reasonable degree of protection have been largely devoted to cultivation and support a relatively dense population for agricultural lands". Further, "To deny flood protection to the forested lands below 90 feet msl would leave unimpaired their values and use as timberland". The Corps contended that reasonable flood protection would provide for an equitable balance between the agricultural and timber interests of the Yazoo

Basin. House Document 359 further states that "It has been assumed in the cost figures that lands inundated more frequently on the average than once in five years are not suited to agriculture and that the land below the 90-foot contour would therefore be dedicated to sump storage" (Emphasis added). The authorization, therefore, 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.

The implementation of a pragmatic plan was thereby conceived in a manner such that both agriculture and timber production could be served. The authorization further included the stipulation that the Chief of Engineers was authorized to modify the plan of construction so as not to jeopardize the existing main river levees.

The most significant aspect of this law was the practical approach to attain reasonable flood control while still maintaining valuable sump functions such as floodwater storage and timber production. However, the trend of one flood control project precipitating another was also set into motion through subsequent authorization for flood protection to the downstream Red River backwater area of Louisiana. Further evidence of this trend was the admission by General Tyler that in order to protect the Yazoo backwater area against another 1927 flood, extensive improvements on the main line levees would have to be accomplished. The massive efforts to upgrade the mainline levees since their original construction clearly reflects the accuracy of General Tyler's testimony and casts obvious doubts over the wisdom of removing (from backwater flood storage) areas such as the Yazoo Basin in Mississippi. Even though it is clear that the removal of backwater storage has increased the flood protection burden on the mainline levee system, these impacts have not been taken into consideration during the benefit/cost analysis (or the environmental analysis) of the backwater project(s).

Flood Control Act of 1944

The Flood Control Act of 1944 contained little discussion of flood protection for the Lower Yazoo Basin. Included in this Act, however, were plans for flood protection of the Satartia Area and Satartia Extension. No discussion of further authorization was included for Yazoo Area flood protection.

Watershed Protection and Flood Prevention Act of 1954

The significant aspect of this law was the extension of Federal responsibility for flood abatement to encompass agricultural lands. Thus, the flood control function became an integral--if not leading--part of multipurpose projects and, in addition, a prominent part of basin-wide planning (Muckleston 1976).

The inclusion of agricultural lands in Federal flood control responsibilities was one of the major factors contributing to the divorce of flood control and water resource planning. No longer were the pragmatic factors of human health, safety, and welfare primary in flood control planning, but rather economic incentives to expand municipal and agricultural development into the floodplain prevailed. Muckleston (1976) stated that "a recent study set the current annual rate of urban expansion into floodplains at between 1.5 and 2.5 percent". An example of agricultural expansion can be seen in the Yazoo backwater area where, by 1951, "Land values (had) already reflect(ed) anticipated benefits of the proposed project" (Harrison 1951).

Concurrent with increased flood control responsibility in agricultural areas was the introduction of the soybean as a viable alluvial crop. The soybean was highly adapted to growth on alluvial lands and returned higher profits than corn and other grains. These factors, coupled with Federal flood control, led the way to massive destruction of previously "wet" lands for conversion to row-crop production. The expansive bottomland hardwood forests of the Lower Mississippi Valley were cleared at an alarming rate and converted to soybean production (Figure 1). This agricultural encroachment into the floodplain also created higher economic losses when the areas became inundated. The increased economic losses precipitated additional flood protection, and each of the areas receiving protection resulted in a substantial reduction in the flood storage capacity of the Lower Valley. This phenomenon is reflected in many of the Corps of Engineers economic justifications for flood control measures. In many instances, such as the Yazoo Area Pump Project, the vast majority of the benefits to be gained are attributed to "intensified agriculture".

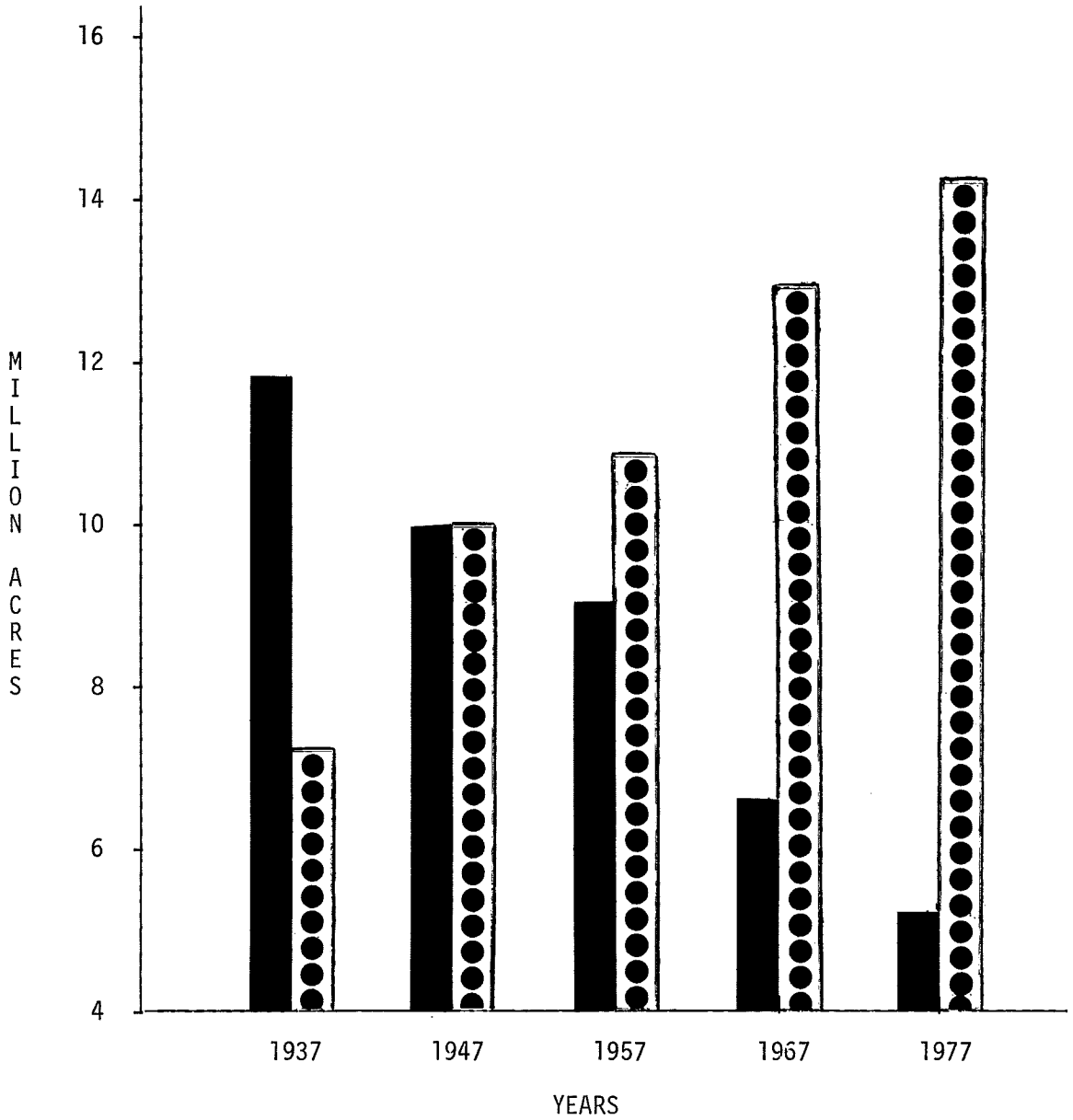
Flood Control Act of 1965

The Flood Control Act of 1965 represented in part a review of House Document 359, which led to the flood control authorizations in the 1941 Act. Construction authorization for the Yazoo Area levee was requested and subseqently granted in the 1965 Act. The plan included construction of the levee at Federal expense; however, the local sponsors agreed to give legal assurances that they would maintain the project within their respective districts and would not raise the grade of the levee above that established by the Chief of Engineers as required by law.

Additionally, the 1965 Act authorized a connecting channel between the smaller Big Sunflower sump and the larger Steele Bayou sump to facilitate internal drainage. In studies to determine the most desirable channel size, it was noted that "For purposes of the comparative study, plans were selected that would limit the elevation of the upper (Sunflower River) sump to about 90 feet mean sea level, the approximately lower limit of existing cleared lands, for a frequency of once in five years". The selection of the 90 foot contour as the lower limit of

FIGURE 1

CHANGES IN BOTTOMLAND HARDWOOD AND CROPLAND ACREAGES IN THE LOWER MISSISSIPPI RIVER ALLUVIAL PLAIN FROM 1937 TO 1977 1/



1/ Source: MacDonald et. al., 1979.

flood protection reflected an understanding by the Corps of Engineers that the land below this elevation had been dedicated to sump storage in the original plan as authorized by the Flood Control Act of 1941. It is relevant to note that all pumping alternatives considered were aimed at providing flood protection above 90 feet msl.

It is clear that, even through 1965, the original authorization of 14,000 cfs pumps and protection to the 90 foot contour were followed. Studies were performed by the Corps of Engineers to determine the feasibility of installing pumping facilities to alleviate interior drainage. The results stated that ". . . it may be noted that the 10,000-cubic-foot-per-second capacity pumping plant comes nearest to maintaining the most desirable sump elevation (about 90.0 feet mean sea level in the Sunflower River sump, which is about the point where the Yazoo Area Stage area curve begins to flatten) . . ." (HD 308, 1965). HD 308 went on to say that "Since the original authorization for Yazoo backwater protection, important hydraulic changes have taken place due to improvement in the Yazoo Basin headwater area. These have resulted in less frequent flooding, and shorter duration of flooding [above 90 feet msl.], which makes it feasible to develop a simplification of the authorized plan by eliminating pumping at a large saving in project cost" (Emphasis added).

This initial report was reviewed by various entities, including the Honorable Ross Barnett, Governor of Mississippi. In a letter to the Chief of Engineers, Governor Barnett requested that the pumps not be deauthorized, but rather postpone construction until a later date. The Chief of Engineers yielded and, in the final report to Congress, stated that even though he did not particularly agree with the Governor, continuing authorization for pumping facilities in the Yazoo Area would not affect the (then) presently desired authorization. Therefore, it was recommended that the pumps be continued under the 1941 authorization with the possibility that they may be deemed economically justifiable at a later date.

Our concern is that current planning does not reflect the need to sustain the previously recognized benefits associated with maintaining the area below 90 feet as sump storage. On the contrary, all alternatives under consideration are aimed at reducing the frequency of inundation within the sump for the primary benefit of intensification of flood susceptible land uses in a sump storage area.

AREA SETTING

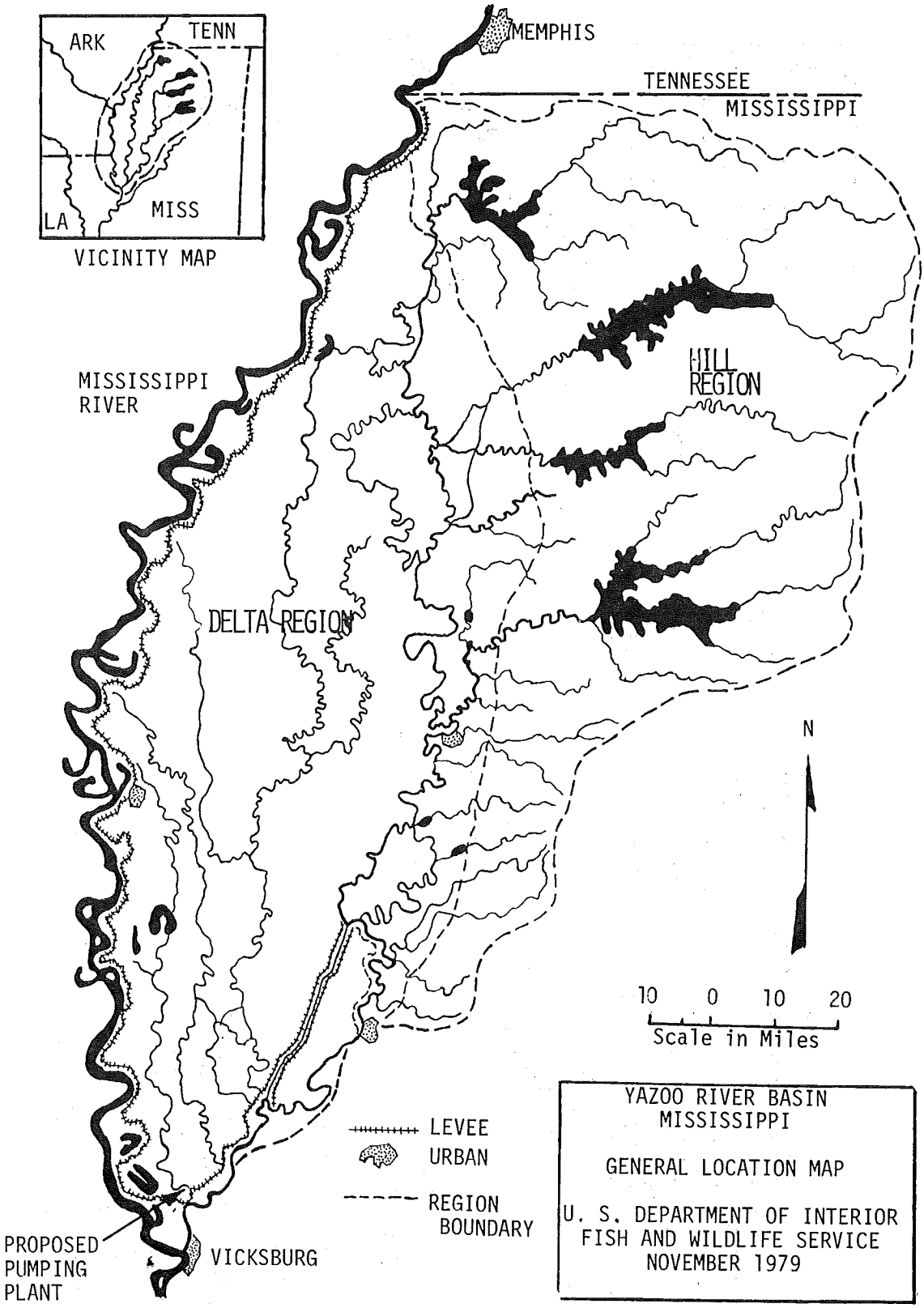
The Yazoo Area Pump Project would be located at the extreme lower end of the 13,400 square mile Yazoo Basin, which is in the Northwest section of Mississippi, between Memphis, Tennessee, and Vicksburg, Mississippi (Figure 2). Although several aspects remain to be constructed, the pumps culminate an extensive structural flood control system of reservoirs, channels, levees, and other drainage features.

The Yazoo Basin is almost equally divided between the upland "Hill" region to the east and the flat "Delta" region to the west. Rugged to rolling land typifies the 6,800 square mile Hill region with drainage south and west directly into the Delta. The Delta region, part of the Mississippi River alluvial plain, comprises the remaining 6,600 square miles in the Basin. Relatively flat topography, with a slope of about 0.5 feet per mile, characterized by ridges and depressions that represent ancient channels of the Ohio and Mississippi Rivers provide the only relief and dominate existing drainage patterns. Soils of the Delta consist of deposits of clay and fine sediments, which are generally poorly drained and are characteristic of a wetland situation.

For flood control purposes, the Corps of Engineers has divided the Yazoo Delta into three separate and distinct segments: Headwater, Backwater, and Big Sunflower Segments (Figure 3). The Backwater Segment, which would be the area most affected by a pumping plant project, is further divided into four areas: the Carter, Rocky Bayou, Satartia, and Yazoo Areas (Figure 4).

Prior to initiation of federal works in the Lower Valley, the Yazoo Basin had a Mississippi River storage potential of over 6,600 square miles. Normal peak flows generally occur in the Basin from January to May and are usually brought about by heavy winter and spring rains. The average annual discharge of streams originating in the Yazoo Basin is 17,000 cfs (approximately 13 percent of the runoff of the Lower Mississippi River Valley).

Historically, the Delta was covered by a vast wetland complex of semipermanently and seasonally flooded, palustrine, forested, broad-leaved deciduous wetlands and semipermanently flooded, palustrine, forested, needle-leaved and broad-leaved deciduous wetlands (Cowardin, et al., 1979), commonly referred to as bottomland hardwoods and wooded and shrub swamps. In the 1800's, the forest abounded with resident wildlife and served as the wintering ground for millions of migratory waterfowl. Black bear, wolves, and cougars were fairly common. The clear rivers, streams, lakes, and bayous teemed with fish and other aquatic life. It was one of the most productive fish and wildlife areas in North America.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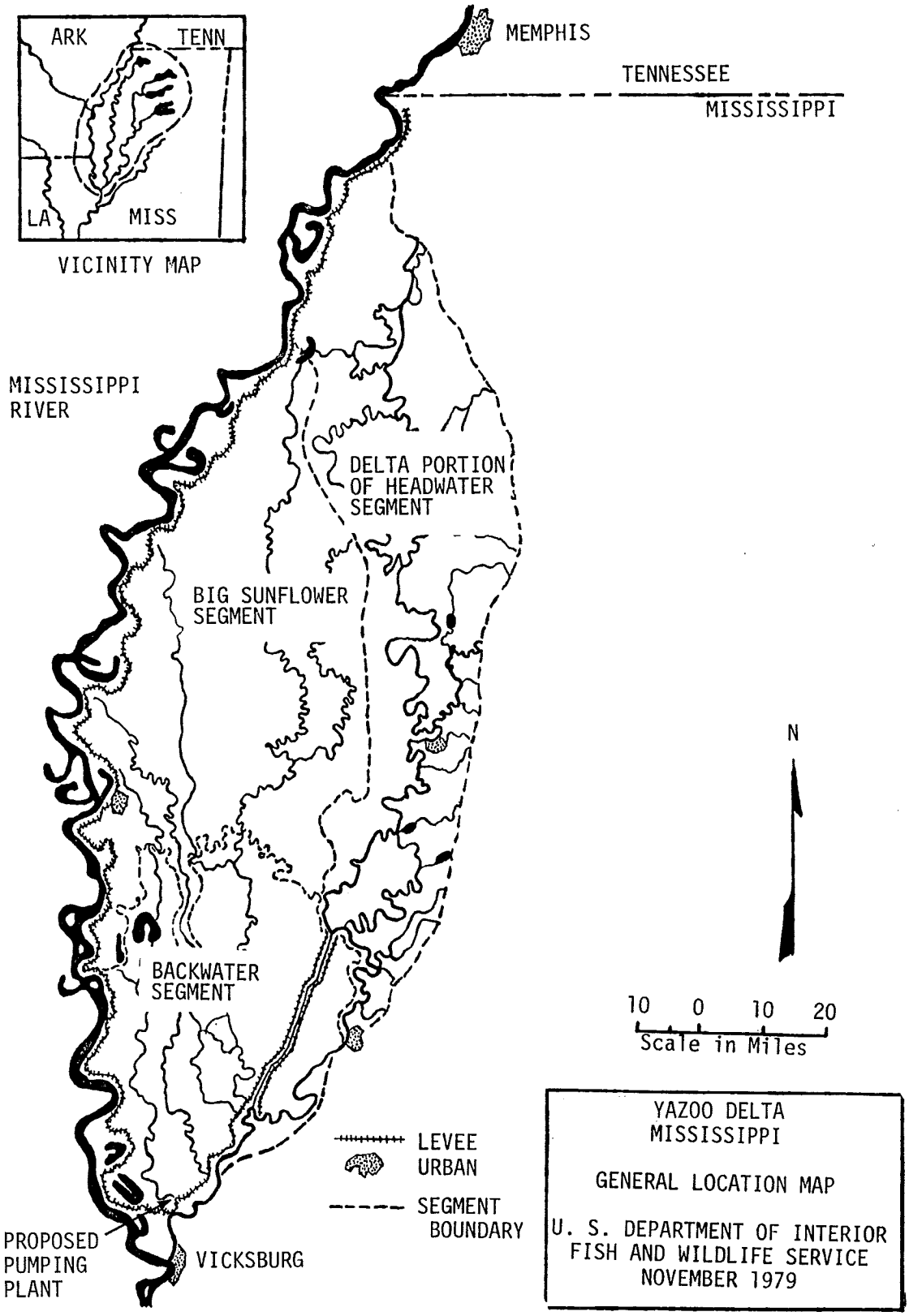
VICKSBURG
YAZOO RIVER BASIN
MISSISSIPPI
GENERAL LOCATION MAP
U. S. DEPARTMENT OF INTERIOR
FISH AND WILDLIFE SERVICE
NOVEMBER 1979

FIGURE 2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DELTA PORTION OF HEADWATER SEGMENT
BIG SUNFLOWER SEGMENT
BACKWATER SEGMENT
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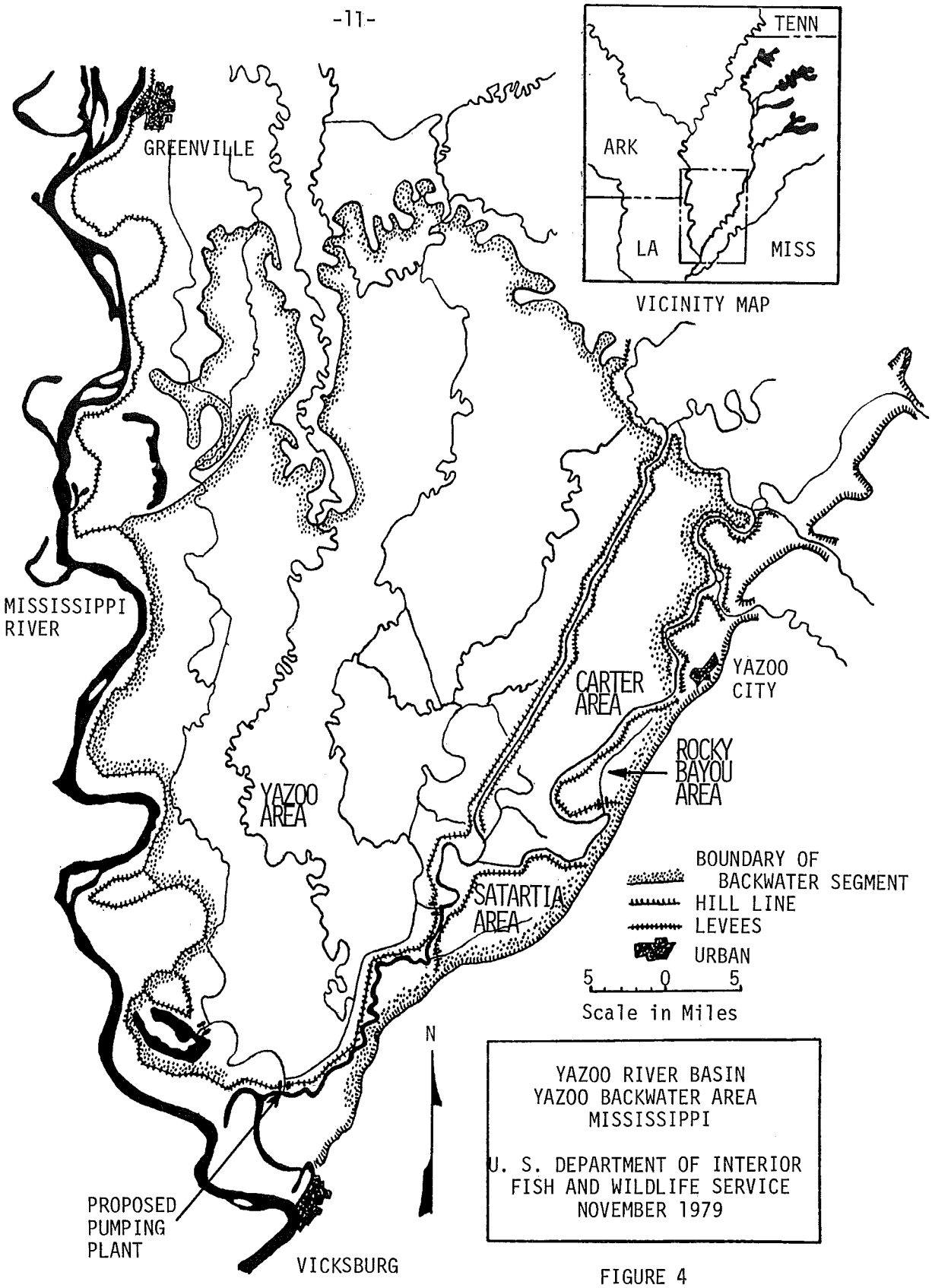
SEGMENT BOUNDARY
PROPOSED PUMPING PLANT
VICKSBURG
YAZOO DELTA
MISSISSIPPI
GENERAL LOCATION MAP
U. S. DEPARTMENT OF INTERIOR
FISH AND WILDLIFE SERVICE
NOVEMBER 1979

FIGURE 3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MISSISSIPPI RIVER
CARTER AREA
YAZOO CITY
ROCKY BAYOU AREA
YAZOO AREA
SATARTIA AREA
BOUNDARY OF BACKWATER SEGMENT
HILL LINE
LEVEES
URBAN
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Scale in Miles
N
PROPOSED PUMPING PLANT
VICKSBURG
YAZOO RIVER BASIN
YAZOO BACKWATER AREA
MISSISSIPPI
U. S. DEPARTMENT OF INTERIOR
FISH AND WILDLIFE SERVICE
NOVEMBER 1979

FIGURE 4

The fertile soil deposited by the overflow of the Mississippi and Yazoo Rivers was the primary reason for the high productivity of native vegetation and fish and wildlife resources. The Delta was so wild and remote it was referred to as the "Wilderness". In 1821, Audubon described the Yazoo River as ". . . a beautiful stream of transparent water covered by thousands of geese and ducks and filled with fish".

When local and Federal flood control work first began, vast acreages of bottomland hardwoods could still be seen throughout the Yazoo Basin. Because of this tremendous amount of fish and wildlife habitat, little concern was given to the gradually diminishing forest and swamp areas until well after the turn of the century.

However, extensive hydrologic modifications have been made by the Federal Government with devastating impacts on the Basin's fish and wildlife resources. Authorized by the Flood Control Act of 1928, the first major modification was extensive improvements on the inadequate mainline levee to prevent Mississippi River overflow. With these modifications, the upper two-thirds of the Delta is now fully protected from overflow by 270 miles of levee extending from near Memphis to the Yazoo Area levee near Vicksburg. This levee has denied the Mississippi River floodwater storage potential of the entire upper Delta. Confining the river and reducing storage resulted in increased flood stages on the Mississippi River upstream and downstream, to include the Backwater Segment in the lower Delta.

Following these efforts to protect the upper Delta from Mississippi River overflow, attention was turned to flooding problems originating from drainage within the Basin. In an effort to control or limit runoff from the Hill region, four major reservoirs (Arkabutla, Sardis, Enid, and Grenada Lakes) were constructed as features of the Yazoo Headwater Project. These dams (which inundate approximately 184,500 acres at flood pool level) control approximately 60 percent of the total drainage area of the Yazoo River by the time it flows past Greenwood, Mississippi. This was considered necessary to limit the flow from the Hill region to the extent that it could be handled by levees and channels in the Delta.

To further protect the upper Delta from overflow of the Yazoo River and its principle tributaries draining the Hill region, an extensive levee and channel system was developed. The main stem, local protection, and tributaries features of the system include over 30 authorized projects. These projects consist of over 570 miles of levees and 1,250 miles of channelization with over 245 miles of levees and 860 miles of channelization completed (Table 1). The completed system of levees and channels provides flood protection by containing water and rapidly evacuating the drainage of the Headwater Segment downstream and into the Backwater Segment.

To compliment the expansive flood control system in the Headwater Segment and on the Yazoo mainstem, an elaborate internal drainage system has been developed within the Delta itself. In the Big Sunflower Segment, nearly 740 miles of channelization were planned with almost 660 miles

TABLE 1

CHANNEL AND LEVEE CONSTRUCTION

YAZOO BASIN

Project	Levee (in miles)		Channelization (in miles)	
	Proposed	Constructed	Proposed	Constructed
Backwater Segment: 1/				
Yazoo Area	30.5	27.7	25.3	24.4
Carter Area (Temporarily Discontinued)	29.3	0.0	0.0	0.0
Satartia Area	19.4	20.2	13.6	1.7
Rocky Bayou	18.3	0.0	0.0	0.0
Muddy Bayou	0.0	0.0	1.0	1.0
	97.5	47.9	39.9	27.1
Big Sunflower Segment: 2/				
Big Sunflower River et al	0.0	0.0	509.0	509.0
Steele Bayou & Tribs.	0.0	0.0	76.0	76.0
Deer Creek	0.0	0.0	7.0	7.0
Additional Work Authorized:				
Steele Bayou & Tribs	0.0	0.0	125.7	45.2
Quiver River Extension	0.0	0.0	9.9	9.9
Gin & Muddy Bayou	0.0	0.0	12.3	12.3
	0.0	0.0	739.9	659.4
Headwater Segment: 1/				
Yazoo River	162.6	107.7	160.2	160.2
Bear Creek	0.0	0.0	23.3	10.0
Coldwater-Pompey	72.0	40.0	54.6	54.6
Tallahatchie River	30.4	0.0	73.5	73.5
4 Corps Lakes	159.0	25.0	459.0	244.0
Abiaca Creek	16.5	0.0	13.3	5.8
Alligator-Catfish B.	0.0	0.0	8.3	8.3
Arkabutla Canal	0.0	0.0	1.0	1.0
Ascalmore-Tippo	12.6	0.0	30.0	0.0
Big Sand Creek	8.5	0.0	0.0	0.0
Bobo Bayou	0.0	0.0	14.9	14.9
Cassidy Bayou	0.0	0.0	95.0	69.0
Chicopa Creek	3.0	0.0	3.0	0.0

(Continued)

TABLE 1

CHANNEL AND LEVEE CONSTRUCTION

YAZOO BASIN

Project	Levee (in miles) Proposed	Constructed	Channelization (in miles) Proposed	Constructed
Headwater Segment:				
David-Burrell B.	0.0	0.0	40.3	30.5
Hillside Floodway	11.0	11.0	6.1	6.1
Hurricane Bayou	0.0	0.0	6.5	0.0
Lake Cormorant	0.0	0.0	20.9	0.0
McKinney Bayou	(Coldwater)	(+ pump)	3.5	3.5
Opossum Bayou	0.0	0.0	15.8	15.8
Pelucia Creek	0.0	0.0	2.85	0.0
Petococowa Creek	4.1	0.0	0.0	0.0
Teoc Creek	11.3	0.0	0.0	0.0
Rocky Bayou	0.0	0.0	7.8	7.8
Tchula Lake	0.0	0.0	27.0	27.0
Tillatoba Creek	5.9	0.0	0.0	0.0
Tucker Bayou	0.0	0.0	4.0	4.0
Whiteoak Bayou	0.0	0.0	55.8	0.0
Yalobusha River	14.0	0.0	91.23	91.23
Yocona River	0.0	0.0	2.0	2.0
WAC	61.3	61.3	30.8	30.8
Belzoni Protection	.1	.1	0.0	0.0
Greenwood Protection	.1	.1 (+ pump)	0.0	0.0
Yazoo City Protection	.1	.1	0.0	0.0
Subtotal	572.5	245.3	1,250.68	860.03
TOTAL	670.0	293.2	2,030.48	1,546.53

1/ Source: Final Environmental Impact Statement, U.S. Army, Corps of Engineers, Vicksburg District, September 1975.

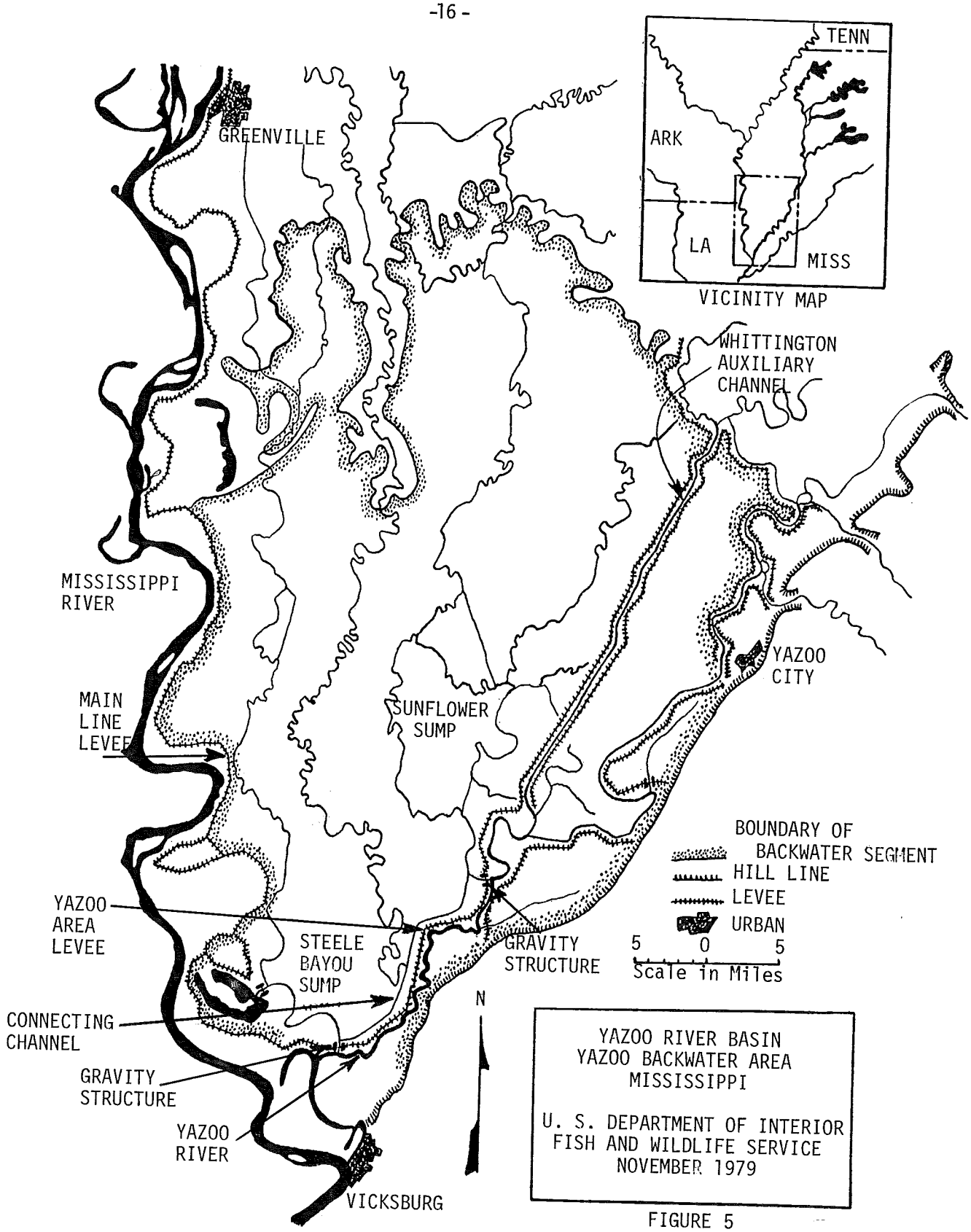
2/ Source: Project Maps, U.S. Army, Corps of Engineers, Vicksburg District, September 1978.

completed to date (Table 1). This extensive channel system is designed and constructed to protect the upper Delta from overflow of rivers and bayous draining the area and to rapidly move floodwaters downstream and into the Backwater Segment.

Notwithstanding this massive flood control/drainage system expediting drainage into the Backwater Segment, several other structural features have been planned or constructed that eliminate backwater storage. These features include three authorized ring levees in the Backwater Segment (Carter, Rocky Bayou, and Satartia) and a major levee nearly 28 miles in length that essentially spans the mouth of the Yazoo Basin. This Yazoo Area levee was designed to protect the Yazoo Area from all but the most extreme backwater floods from the Mississippi River (Figure 5). The Yazoo Area levee connects the mainline Mississippi River levee to the west levee of the Whittington Auxiliary Channel. Essentially, this resulted in what could be considered a ring levee around the Yazoo Delta from Memphis, Tennessee, to near Greenwood, Mississippi. A connecting channel was completed on the west side of the levee, between the Sunflower (upper) and Steele Bayou (lower) sumps which were formed by the levee. Interior water is released through the Yazoo Area levee via two gravity structures, located at Steele Bayou and the Little Sunflower River, except during high stages on the Mississippi River when these structures are closed to prevent backwater flooding.

Thus, previous flood control projects have created the current situation; a huge ring levee around the Delta with a highly developed interior drainage system. Water moves rapidly through this interior system to the mouth of the Basin. Extensive Corps of Engineers flood control projects have deliberately created a situation where the drainage from over 4,000 square miles of the Yazoo Delta is trapped and ponded behind the Yazoo Area levee whenever the structures are closed to prevent backwater flooding from the Mississippi River. The purpose of the proposed Yazoo Area pumping plant is to provide additional flood protection in the Yazoo Area by evacuating (pumping) this ponded water over the levee and into the Mississippi River. Thus, the problem being addressed by the Yazoo Area Pump Project is very much a product of previous water resource development throughout the entire Yazoo Basin.

This Federal flood control system has had major adverse impacts upon the fish and wildlife resources of the Yazoo Basin. As flood protection proceeded from the upper to the lower Delta, vast tracts of bottomland hardwoods were cleared and converted to agriculture. For example, in the ten year period, 1957 to 1967, more than 400,000 acres of forestlands were cleared in the Yazoo Basin (Beltz and Christopher, 1967). Clearing has resulted in the almost complete destruction of the wildlife resource base in the upper Delta. Additionally, these Federal projects resulted in extensive damages to fishery resource values locally as well as downstream.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VICKSBURG
YAZOO RIVER BASIN
YAZOO BACKWATER AREA
MISSISSIPPI
U. S. DEPARTMENT OF INTERIOR
FISH AND WILDLIFE SERVICE
NOVEMBER 1979

FIGURE 5

Water quality in many of the streams, old lakes, and bayous in the Delta has been reduced by previous channelization projects such that they are near the point where aquatic organisms cannot survive. This alarming situation highlighted the conclusion of a water quality study conducted by Mississippi State University (1977) under contract from the Corps of Engineers. They found that the general water quality is not conducive to the well being of the biota inhabiting the water nor to the users of the aquatic resource due to high turbidity levels and the widespread occurrence of various pesticides. Seasonal levels of pesticides exceeded the allowable concentration established by the Environmental Protection Agency. Pesticide contamination was found in all fish sampled with a maximum level of 45 parts per million of toxaphene in one fish collected alive. The study also concluded that many fish in the Yazoo Area likely possess pesticide levels that exceed the allowable limits for human consumption as established by the Food and Drug Administration.

Independent studies (Cotton and Herring, 1970) of the pesticide content of Wolf, Mossy, and Broad Lakes in the Yazoo Delta, although predating the Mississippi State study by seven years, show similar findings. Excessively high concentrations of pesticides in the water and sediment (bottom) samples were noted as well as a definite decline in the fisheries of these lakes. They concluded that the loss of game fish in Wolf and Broad Lakes and their decline in Mossy Lake was the result of agricultural runoff and the accompanying pesticide pollution.

Beginning in 1970, the U. S. Fish and Wildlife Service has operated a pesticide monitoring station, Number 80, on the lower Yazoo River near Redwood, Mississippi. The results of these studies show that extremely high concentrations of pesticides and derivatives are present in fish flesh (Table 2). Many of the concentrations found at this station are the highest recorded to date anywhere in the United States.

A current study (Howard et. al., 1980), funded by the Corps of Engineers sums up quite well the demise of the aquatic resources in the Yazoo Delta. It was found that due to high turbidity and pesticide levels many Delta lakes are under environmental stress. Additionally, many of the fish populations in the streams are comprised of rough fish, particularly shad, gar, and carp.

Paralleling this reduction of the Delta's fishery resources was the equally devastating destruction of the wooded wetlands upon which most of the resident and migratory wildlife species are dependent. General R. C. Marshall, President of the Mississippi River Commission, recently addressed the problems of natural resource losses in the Lower Mississippi Valley due to Federal flood control projects. In a newspaper article published June 16, 1979, General Marshall indicated that Corps of Engineers' flood control works in the Mississippi Valley have led to the conversion of some 20 million acres of bottomland hardwoods for agricultural use.

TABLE 2

NATIONAL PESTICIDE MONITORING PROGRAM DATA 1/
WHOLE FISH ANALYSIS, TISSUE
YAZOO RIVER AT REDWOOD, MISS. - STATION 80
OCTOBER 1, 1977

	Bigmouth Buffalo 2/	Bigmouth Buffalo 2/	Black Crappie 3/
Weight (pounds)	2.00	2.20	0.90
Length (inches)	15.00	15.50	9.30
Percent Fat	5.9	4.4	3.1
Moisture Content (%)	69	67	71
Total DDT (UG/G)	4.87	3.18	6.54
TOXAPHENE (MG/KG)	8.200	6.300	12.700
Total PCBS (MG/KG)	0.300	0.500	0.300
DIELDRIN (MG/KG)	0.040	0.060	0.050
ALDRIN (MG/KG)	0.000	0.000	0.000
ENDRIN (MG/KG)	0.060	0.050	0.040
ALPHABHC (MG/KG)	0.050	0.030	0.010
HCB (MG/KG)	0.000	0.190	0.000
HEPTCHLR (MG/KG)	0.000	0.000	0.000
HPCHLREP (MG/KG)	0.000	0.020	0.000
CHLORDAN C ISOMER (UG/G)	0.040	0.050	0.040
CHLORDAN T ISOMER (UG/G)	0.020	0.050	0.020
NONACHLR C ISOMER (UG/G)	0.000	0.000	0.000
NONCHLOR T ISOMER (UG/L)	0.040	0.040	0.040
LINDANE (MG/KG)	0.00	0.01	0.00
CADMIUM (MG/KG)	0.02	0.04	0.01
LEAD (MG/KG)	0.10	0.11	0.10K
MERCURY (MG/KG)	0.04	0.06	0.14
ARSENIC (MG/KG)	0.10	0.09	0.16
SELENIUM (MG/KG)	0.41	0.38	0.43

1/ Source: U. S. Fish and Wildlife Service, Columbia National Fisheries Research Laboratory, Columbia, Missouri.

2/ Ictiobus cyprinellus

3/ Pomoxis nigromaculatus

That the Yazoo Delta has been the site of a considerable portion of this loss of wooded wetlands is documented in the Final Environmental Statement for the Yazoo Basin Project. In this statement done by the Vicksburg District in 1975, the Corps stated that "The Yazoo Basin Project has had and will have considerable impacts on the basic biological habitat in the study area". The statement further states that over 315,000 acres of bottomland hardwood habitat in the basin have been destroyed due to Corps' flood control projects.

One of the most important factors that has led to the destruction of both the aquatic and terrestrial resource base in the Lower Mississippi River Valley, including the Yazoo Delta, is the failure to include as integral project features the measures necessary to mitigate for the loss of fish and wildlife resources resulting from Federal water resource projects. The Service recently reviewed 58 Corps of Engineers' projects in and adjacent to the Lower Mississippi Valley which were found to have significant Service recommendations (Gard, 1979). Thirty-nine requests by the Service for acquisition of land totaling 610,740 acres have been made to partially mitigate the losses of approximately 2,058,977 acres of bottomland hardwoods. Only 18 percent of the recommended acreage has been authorized, with only 6 percent actually acquired and under management for fish and wildlife conservation.

Throughout the review process of Corps of Engineers work in the Yazoo Basin alone, the Fish and Wildlife Service, with almost unanimous concurrence of the State game and fish agency, has requested the acquisition of 195,000 acres of wooded wetlands and construction of over 50 water control structures and nine greentree reservoirs as necessary to mitigate for the identifiable damages to fish and wildlife resources. To date, fewer than 8 percent of those land acquisition recommendations have been authorized and purchased. Structural mitigation authorized includes one control structure (completed), which cannot be operated to full potential, nine water control structures (no construction begun), and six greentree reservoirs and nine slough control structures (partially under construction) (Table 3). All structural features currently under construction are located entirely on Federal lands dedicated to fish and wildlife and multiple use management.

A more detailed explanation of the adverse impacts of previous structural flood control upon fish and wildlife resources in the Yazoo Basin may be found in The Yazoo Basin: An Environmental Overview (USDI, 1979) and can be obtained by writing to the cover address of this report. In that report, the Fish and Wildlife Service details previous flood control works in the Yazoo Basin, the impacts of those works to the basic biological community, and those measures, albeit few in number, that have been implemented to mitigate for fish and wildlife resource losses.

TABLE 3

MITIGATION FEATURES - YAZOO BASIN, MISSISSIPPI

Project Segment	Requested Mitigation	Authorized Mitigation
Headwater	70,500 Acres Fee Title	19,000 Acres Fee Title (Only 15,383 acres have been acquired)
	9 Water Control Structures	9 Water Control Structures (No construction begun)
Big Sunflower	54,500 Acres Fee Title	-0-
	9 Greentree Reservoirs (With O&M)	6 Greentree Reservoirs 1/ (Without O&M) (Under construction)
	30 Water Control Structures	18 Water Control Structures 1/ (4 under construction)
	5 Weirs	-0-
Backwater	70,000 Acres Fee Title	-0-
	2 Water Control Structures	-0-
	Muddy Bayou Control Structure	Muddy Bayou Control Structure (Completed)

1/ Six greentree reservoirs and nine waters control structures authorized as partial mitigation for Backwater Segment.

Although the loss of wooded wetlands has reached alarming levels, there are currently sizable woodland tracts (Plate 1) located in the lower Delta and these areas continue to maintain high wildlife populations. It is, however, this part of the lower Delta that would be most affected by installation of the Yazoo Area pumping plant. Past history documents quite well the destruction of privately owned woodlands (Plate 2) in an area where Federal actions provide protection from natural overflow conditions. We see no reason to expect the situation in the lower Delta to be different if the Yazoo Area pumping plant is constructed. Estimates by the Corps of Engineers indicate that by the year 2000 the 59,000 acre Delta National Forest will represent 50 percent of the woodlands remaining in the Yazoo Area. Based on this trend, it appears that Mississippi will suffer the same fate as Missouri; that is, that wooded wetlands in the Delta will remain only if preserved by Federal or State actions that dedicate woodlands to conservation for fish and wildlife and related purposes.

PLATE 1
WOODED WETLANDS

Sizable tracts of seasonally flooded bottomland hardwoods (above) and wooded swamp (below) currently remain in the Yazoo Area.

PLATE 2
DESTRUCTION OF WOODED WETLANDS

Wooded wetlands are drained (above) by use of ditches (below).

PLATE 2 - CONTINUED
DESTRUCTION OF WOODED WETLANDS

Bottomland hardwoods are windrowed and burned (above) for conversion to agricultural production (below).

PROJECT DESCRIPTION

The purpose of the Yazoo Area pumping plant is to provide additional flood protection to approximately 540,000 acres within the Yazoo Area which would be inundated by the 100-year frequency interior flood. When gravity evacuation of interior runoff through existing drainage structures is prevented due to high water stages on the Mississippi and Yazoo Rivers, the pumping plant would be operated to reduce the frequency and duration of flood waters. Current plans would locate the pumping plant near the existing Steele Bayou gravity structure as an integral feature of the Yazoo Area levee (Figure 4). This 27.7 mile levee and a parallel channel inside (or northwestward) the levee protect the entire 795,000 acre Yazoo Area from backwater flooding and provide for more efficient use of designated sump storage areas (within the protected area).

A broad range of alternative plans were developed by the Corps of Engineers to provide various degrees of flood protection. Plans that include two pumping stations have been eliminated. Non-structural plans considered included no action, floodplain regulations, and flood proofing. These alternatives have also been eliminated. It is our understanding that floodplain regulations and/or flood proofing were not considered in conjunction with structural plans.

Nine alternatives, with pump sizes generally consisting of 15,000 to 25,000 cfs, have been considered. Elevations at which pumping would be initiated range from 80 feet msl to 90 feet msl. Certain of these alternatives are displayed in Table 4 along with their expected first costs (exclusive of mitigation costs), benefit to cost ratio, and excess benefits over cost. Annual costs are based on a project life of 50 years and a 2.5 percent effective interest rate.

In October, 1979, the Vicksburg District identified plans C, E, F, and G, with a pumping capacity of 25,000 cfs and certain modifications, as having the best potential for becoming the Selected plan. These plans are displayed in Table 5 along with the average annual benefits of each plan attributable to prevention of inundation and land-use intensification. Early in 1980, Plan C, with a design capacity of 25,000 cfs, became the tentatively Selected plan. Review by the Office of the Chief of Engineers determined that a pumping capacity of 25,000 cfs was probably not within the extent of the Chief's discretionary authority. However, it was believed that the authority might be extended to a pumping plant of 17,500 cfs capacity.

Thus, Corps of Engineers Selected plan is Alternative C, with a design capacity of 17,500 cfs. This pumping plant, appurtenant to the Yazoo Area levee, would be located near the existing Steele Bayou gravity drainage structure in the lower sump. Proposed work would also include

TABLE 4

COMPARISON OF PLANS

Alternative	Elevation Pumping Initiated (feet, msl)	Cost 1/ ($000)	Benefit/ 1/ 6/ Cost Ratio	Excess Benefits Over Costs ($000)
Pump Plan A				
25,000 cfs	80	212,900	2.9	18,525
Pump Plan B (Two Sites)				
10,000/15,000	80	239,600	2.6	18,249
Pump Plan C				
17,500 cfs	80 2/	147,200	3.3 7/	16,970
25,000 cfs	80 2/	210,900	3.0	18,661
Pump Plan D				
25,000 cfs	80 4/ 5/	251,100	2.3	13,967
Pump Plan E				
25,000 cfs	80 3/ 5/	220,200	2.7	15,809
Pump Plan F				
15,000 cfs	83 2/	124,900	2.5	8,178
Pump Plan G				
25,000 cfs	85	202,300	2.1	9,149
Pump Plan H				
15,000 cfs	85	162,800	1.8	4,662
Pump Plan I				
15,000 cfs	90	114,200	1.3	1,302

1/ Exclusive of any mitigation costs.

2/ Pumping initiated at 85 feet: December 1 - March 1.

3/ Interior ponding held at 80 feet: January 1 - April 15.

4/ Interior ponding held at 85 feet: January 1 - March 15.

5/ Pumping initiated at 85 feet: December 1 - March 15.

6/ Based on an interest rate of 2 1/2 percent.

7/ Benefit/Cost Ratio is 1.3 based on the current interest rate of 7 5/8 percent.

TABLE 5

COMPARISON OF PLANS

Alternative	Elevation Pumping Initiated (feet, msl)	Benefit/ Cost Ratio 1/ 5/	Average Annual Benefits (%) Inundation/Intensification	
Pump Plan C				
15,000 cfs	80 2/		21.2	78.8
17,500 cfs	80 2/	3.3	21.0	79.0
25,000 cfs	80 2/	3.0	20.5	79.5
Pump Plan E				
25,000 cfs	80 3/ 4/	2.7	20.8	79.2
Pump Plan F				
15,000 cfs	83 2/		23.3	76.7
17,500 cfs	83 2/		23.1	76.9
25,000 cfs	83 2/	2.4	22.5	77.5
Pump Plan G				
15,000 cfs	85		22.9	77.1
17,500 cfs	85		22.7	77.3
25,000 cfs	85	2.1	21.9	78.1

1/ Exclusive of any mitigation costs.

2/ Pumping initiated at 85 feet: December 1 - March 1.

3/ Interior ponding held at 80 feet: January 1 - April 15.

4/ Pumping initiated at 85 feet: December 1 - March 15.

5/ Based on an interest rate of 2 1/2 percent.

an inlet channel from Steele Bayou and an outlet channel to the Yazoo River. Pumping would be initiated when interior water in the sump reaches an elevation of 80 feet msl, except from December 1 to March 1 when pumping would be initiated at 85 feet msl. Proposed mitigation for the pumping plant consists of acquiring Congressional authorization to purchase 6,000 acres of woodlands in fee title or land use easements on 6,500 acres of woodlands or a combination of both. Since the completed features of the Yazoo backwater area and the pumping plant function as a unit, the Corps is preparing a separate report recommending Congressional authorization for the acquisition of 32,800 acres of woodlands in fee title or land use easements on 40,000 acres of woodlands or a combination thereof as mitigation for completed Yazoo Backwater Features and the Yazoo Area pumping plant, to be funded concurrently with project construction.

Total first costs including mitigation are estimated to be $149.9 million and the benefit/cost ratio is 1.3 based on a 7 5/8 percent interest rate or 3.3 based on a 2.5 percent interest rate. Average annual benefits of the Selected plan amounts to only 21 percent for flood damage reductions. The remaining 79 percent of the benefits are derived from land-use intensification, which includes increased production on lands presently in cultivation and agricultural production on lands anticipated to be converted from woodland to cropland.

PROJECT IMPACTS

Methodology

Field investigations of the Yazoo Area Pumping Plant project were performed from October through December, 1976, by an interagency team of biologists representing the Mississippi Game and Fish Commission (now the Mississippi Department of Wildlife Conservation), the Vicksburg District, Corps of Engineers, and the U. S. Fish and Wildlife Service. These investigations were conducted in accordance with the 1976 Habitat Evaluation Procedures (HEP) developed by the Fish and Wildlife Service. Three terrestrial habitat types were evaluated: bottomland hardwoods, wooded swamp, and agricultural lands. Bottomland hardwoods and agricultural lands were further evaluated as occurring below (wet) and above (dry) the one-year frequency flood. Benefits and losses to fish and wildlife resources were developed by comparing with and without the project land use changes utilizing data developed by the Corps. Results of the HEP study and supportive data are detailed in Appendix A.

The HEP measures project impacts in terms of biological productivity by randomly sampling and evaluating selected sites in each habitat type. Each site sampled is assigned a habitat unit value (HUV), a numerical rating from 0-10, representing the ability of that particular site to support wildlife populations. Enough sites are sampled to provide a statistically reliable mean HUV for each habitat type in the project area. These HUV's are then used to establish a base condition from which project impacts can be measured. Table 6 depicts the HUV assigned to each habitat type evaluated in the project area.

Project impacts were also measured by the Corps in terms of user days (man-days of recreation) and the worth of these days in dollars. Table 6 displays the number of man-days of recreation on each acre of habitat type. Monetary and man-day project losses associated with sport and commercial fishery, wildlife-oriented recreation, furbearers, timber resources; and waterfowl, big game, and small game hunting were computed and supplied by the Corps and are included in Appendix B.

It is the opinion of the Fish and Wildlife Service that impacts to fish and wildlife resources must be expressed and evaluated in terms of losses and gains in biological productivity. Man-days (and dollars) cannot accurately quantify the intangible biological values inherent in any functioning ecosystem. We have included this monetary evaluation to fulfill the reporting requirements of the Fish and Wildlife Coordination Act and to provide the identifiable and easily quantifiable dollar impacts necessary for project cost determinations. This evaluation does not represent endorsement by the Service for basing compensatory measures on monetary evaluations. It is our view that basing or linking compensatory measures to man-days represents the continuation of single-purpose project methodology that is not responsive to the mandates of the Principles and Standards For Planning Water and Related Land Resources.

TABLE 6

QUALITY OF HABITAT (BASE CONDITIONS) EXPRESSED AS ANNUALIZED HUV AND MAN-DAYS PER ACRE

Habitat Type	Habitat Unit Values	Man-Days Per Acre
01--Wet Bottomland Hardwoods	71.8	2.72
02--Dry Bottomland Hardwoods	75.0	2.02
03--Wooded Swamp	76.8	2.00
04--Wet Agricultural Lands	31.3	0.54
05--Dry Agricultural Lands	25.6	0.24

As previously described, the problem being addressed in the Yazoo Area Pump Project is clearly a result of previous flood control projects throughout the Yazoo Basin. These completed projects had a significant adverse impact upon the environmental resources. While it is difficult to separate adverse impacts in the different segments of the Yazoo Basin, it is impossible to separate the various features, and associated environmental losses, of the Backwater Segment. Consequently, in conjunction with the Corps of Engineers' Fish and Wildlife Mitigation Report, we have included the completed features of the Backwater Segment (Yazoo Area levee, connecting channel, and Satartia Area) in the review of the Yazoo Area Pump Project.

Impacts Analysis of Alternatives

Fisheries

Spring flooding is the major factor responsible for fishery productivity by providing reproductive and nursery habitat outside the stream channels. Flooding of bottomland hardwoods provides a suitable substrate for egg deposition and increases the food and cover available for maturing young fish. During the overflow season, forested wetlands are utilized by many fresh water fishes for spawning and nursery areas. Species such as buffalo, carp, shad, and gar lay their eggs over newly inundated vegetation where the eggs adhere to the plants and are thus maintained above the surface of the soil. This enables the eggs to develop without being attended by the adult. Other species such as bass, crappie, and sunfish build nests in the shallow water of the floodplain and guard the eggs against predation and keep the nest clean of silt.

The surge of invertebrate production in the floodplain makes a ready source of food for the fish larvae upon hatching and subsequent feeding. These invertebrates lay eggs that overwinter in the leaf debris (detritus) of the forest floor and, upon inundation, hatch and recharge the system with aquatic food organisms. In addition, the detritus is washed into adjacent water bodies through recession of floodwater and rainfall runoff, thus serving as the base link in the aquatic food chain. A more detailed discussion of the functional values of bottomland hardwoods to fisheries is included in Appendix C.

All pumping plant alternatives would result in adverse impacts to project area fisheries by reducing the available fish spawning and nursery area. The amount of reduction (and therefore impacts) is directly related to the elevation at which pumping is initiated. Plans which initiate pumping at 80 feet msl would adversely effect the largest acreages of spawning and nursery area. Losses decrease as pumping elevations increase with the fewest losses resulting from the 90 Foot plan. None of the plans developed by the Corps provides for holding water out of banks during the spawning season to mitigate for the reduction of spawning areas. Additionally, all pumping plant alternatives

would have an adverse impact upon water quality (and fishery resources) due to increased sediment, turbidity, and agricultural chemical levels. These changes would be brought about by land clearing, increased erosion, and intensified agricultural activities.

For purposes of this report, the fishery losses from reduced interior flooding utilized data and methodology supplied by the Corps. This methodology assumes that under current conditions, the value of commercial fishing is $10 per acre per year for lakes and $5 per acre per year for streams and wetlands. Existing sport fishing was estimated at 7, 2, and 1 man-days per acre for lakes, streams, and wetlands, respectively. These values were then reduced by the percent reduction in flooding for each habitat type multiplied by the percentage by which production is reduced when all flooding is eliminated (69% for commercial fishing and 39% for sport fishing, Lambou, 1959 and 1961). Thus, the monetary fishery losses resulting from reduction in flooding associated with each alternative could be evaluated. These losses are displayed in Table 7. For a more detailed explanation of methodology, see Appendix B.

Wildlife

The Endangered Species Act Amendments of 1978 require that an official list of endangered and threatened species be requested for any Federal construction project. Our Atlanta Regional Office, responded to your January 8, 1980, request on February 11, 1980 (Appendix D). In that letter we stated that the American alligator (Alligator mississippiensis) is the only listed species known to occur within the project area. Additional correspondence, dated August 14, 1980 (Appendix D), stated that it is the biological opinion of the U. S. Fish and Wildlife Service that this project is not likely to jeopardize the continued existence of the American alligator. Further assistance may be obtained from Mr. Fred Bagley, Endangered Species Specialist, U. S. Fish and Wildlife Service, Jackson Mall Office, Suite 3185, 300 Woodrow Wilson Avenue, Jackson, Mississippi, telephone FTS 490-4912, or commercial 601/960-4912.

The major feature of all project alternatives is a pumping plant to evacuate interior flood waters from the Yazoo Area. Alternatives considered in this study consist of a pumping station varying in size from 15,000 to 25,000 cfs. The direct loss of terrestrial habitat associated with installation of the pumping plant would vary from 200 to 400 acres of forested wetlands depending on the size of the pumps (Table 8). Estimates of the project induced land clearing vary depending upon the source. For example, one study (Mississippi State University, 1977) funded by and developed for the Vicksburg District projected that, assuming that pumps would become operational when the interior water level reached 80 feet msl, induced clearing of 41,888 acres of forest land would occur with the installation of a 25,000 cfs pump. Subsequent studies conducted by the Corps estimated that the induced clearing of 13,500 acres of forested wetlands would occur with the

TABLE 7

MONETARY LOSSES OF FISHERY RESOURCES ASSOCIATED WITH PROJECT ALTERNATIVES 1/

	Dollar Losses (Sport Fishery)	Dollar Losses (Commercial Fishery)	Total Dollar Losses
Alternative A 25,000 cfs	23,300	42,800	66,100
Alternative C 17,500 cfs 25,000 cfs	17,400 21,500	31,700 39,200	49,100 60,700
Alternative F 15,000 cfs	11,000	19,400	30,400
Alternative G 25,000 cfs	14,300	26,200	40,500
Alternative H 15,000 cfs	9,400	16,700	26,100
Alternative I 15,000 cfs	2,800	5,000	7,800

1/ Source: U. S. Army, Corps of Engineers, Vicksburg District

TABLE 8

FORESTED WETLAND LOSSES
ASSOCIATED WITH PROJECT ALTERNATIVES

Alternative	Pump Size (cfs)	Elevation Pumping Initiated (feet, msl)	Direct Loss Of Wetlands	Induced Land Clearing	Total Loss Of Wetlands
A	25,000	80	400	5,000	5,400
C	15,000	80	200	3,000	3,200
	17,500 2/	80	300	3,400	3,700
	20,000	80	300	4,000	4,300
	25,000 1/	80	400	4,400	4,800
E	25,000	80	400	4,300	4,700
F	15,000	83	200	2,000	2,200
	20,000	83	300	2,700	3,000
	25,000	83	400	3,200	3,600
G	25,000	85	400	2,600	3,000
H	15,000 3/	85	200	300	500
I	15,000	90	200	400	600
	20,000	90	300	500	800

1/ Corps' NED Plan

2/ Corps' Selected Plan

3/ Corps' EQ Plan

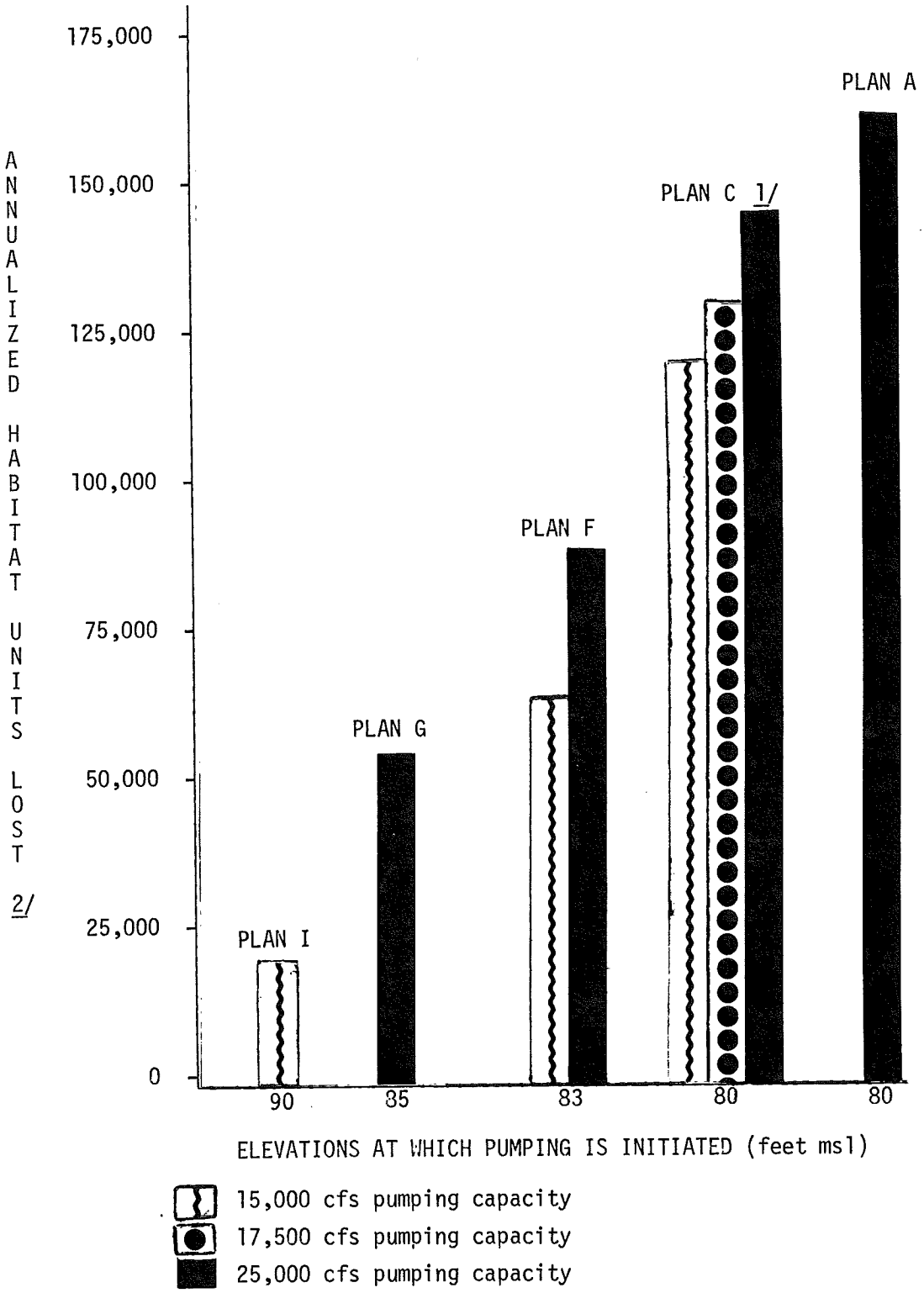
installation of Plan C (pumping initiated at 80 feet msl with a 25,000 cfs pump). Currently, induced land clearing for the same alternative is estimated by the Corps to be 4,400 acres. The Service has no reasonable explanation for this reduction, however, for purposes of this report, we will evaluate the impacts associated with an array of specific alternatives and will use the current induced clearing figures provided by the Corps (Table 8).

We are gravely concerned that these projections, though they may appear to be representative of the current situation, badly underestimate the cumulative impact of federally planned and financed flood control projects upon the unique and greatly diminished forested wetlands of the project area and the Mississippi River alluvial valley in general. A cursory review of the pattern of land clearing which has historically occurred throughout the Delta reveals that far less of this once extensive forested wetlands would have been destroyed without the myriad of federally financed and planned flood control projects. We believe, therefore, that your analysis of the "future without project" clearing pattern does not adequately consider the cumulative impact of the clearing trend's relationship to past flood control projects and the speculative anticipation of future flood control features.

As indicated earlier, the major differences in project alternatives are the size of the pumping station and the elevations at which pumping is initiated. These two factors have a direct relationship to the environmental losses associated with each alternative, since periodic inundation is largely responsible for the high productivity of terrestrial resources. As the pumping plant capacity increases, the environmental losses also increase (Figure 6). The elevation at which pumping is initiated is even more important from an environmental standpoint. When pumping is begun at higher elevations the environmental losses are far less than where pumping is initiated at lower elevations (Figure 6).

These very direct relationships reflect the fact that flooding is a major factor responsible for the high productivity of the terrestrial resources associated with wooded wetlands. The sediments that are captured by these wetlands during flooding serve that community and the wildlife species that utilize these areas. The rich inorganic nutrients that are housed in the sediments feed the wetland plants and aid in mast (acorn, fruit, etc.) production. Wildlife species such as resident and migratory waterfowl utilize these wetlands for nesting, resting, feeding, and brooding of young. Healthy mast production helps feed many wildlife species such as white-tailed deer; cottontail and swamp rabbit; wild turkey; gray and fox squirrels; raccoon; and others. These wetlands further provide important cover and protection for mink, otter, beaver, muskrat, numerous songbirds, and woodcock. For a more detailed discussion of the relationships between flooding and terrestrial productivity see Appendix C.

FIGURE 6. ANNUALIZED TERRESTRIAL HABITAT UNIT LOSSES ASSOCIATED WITH PLANS A, C, G, F, AND I FOR VARIOUS PUMP CAPACITIES AND ELEVATIONS AT WHICH PUMPING IS INITIATED



1/ With Corps' proposed structural mitigation features.
2/ Utilizing methodology in Appendix A.

The following is a brief analysis of the terrestrial impacts that would result from the implementation of alternatives C (25,000 cfs), C (17,500 cfs), H, and F, the National Economic Development (NED) plan, the Selected plan, the Environmental Quality (EQ) plan, and the 83 Foot plan, respectively.

Alternative C (25,000 cfs) - This is the National Economic Development plan and by definition it is designed to maximize the optimum contributions to the economic development objective. The 25,000 cfs pumping station with pumping initiated at 80 feet msl has a benefit/cost ratio of 3.0 based on an estimated total first cost of $210.9 million. Installation of this alternative would result in the direct loss of 400 acres of forested wetlands and the induced clearing of an additional 4,400 acres. Pumping would be initiated at 85 feet msl from December 1 to March 1 in an attempt to benefit migratory waterfowl. Interior flooding would be reduced on 532,000 acres. Terrestrial resource values would be decreased due to the reductions in seasonal flooding and subsequent intensification of agricultural practices.

Alternative C (17,500 cfs) - This alternative (the Selected plan) is intended to reflect the significant trade-offs between the NED and EQ objectives. The 17,500 cfs pumping plant also initiates pumping at 80 feet msl and reduces interior flooding on 532,000 acres. Based on an estimated first cost of $147.2 million, this alternative has a 3.3 benefit/cost ratio. Induced clearing resulting from this alternative is estimated to be 3,400 acres, which is 1,000 acres less than the NED plan. Pumping would be initiated at 85 feet msl from December 1 - March 1 in an attempt to benefit migratory waterfowl. This alternative represents an improvement over the NED plan, however, it does not provide environmental benefits equal to the EQ plan or that approximate existing conditions. Perpetual land use easements of forested wetlands that would prohibit alteration of existing community structure and provide for private control of access or fee title acquisition of forested wetlands or a combination of both are being considered as a mitigation feature.

Alternative H - Designated by the Corps as the Environmental Quality plan, this alternative has a 15,000 cfs pumping capacity with pumping initiated at 85 feet msl and is intended to emphasize contributions to the environmental quality objective. This plan would result in the direct loss of 200 acres of forested wetlands and the induced clearing of 300 acres. Interior flooding would not be reduced from existing conditions on the 41,000 acres below 85 feet msl. Flooding would, however, be reduced on approximately 498,000 acres with a resulting decrease in terrestrial resource values. The benefit/cost ratio for this plan is 1.8 based on an estimated total first cost of $162.8 million. A positive contribution associated with this plan is the acquisition in fee title and development of approximately 30,000 acres of wooded wetlands for the purpose of preserving and improving wildlife resources.

Alternative F - With a 15,000 cfs pump and pumping initiated at 83 feet msl, this alternative is almost identical to what was authorized by Congress since it provides protection to lands above 90 feet msl from the five-year frequency flood. The estimated total first cost is $124.9 million with a benefit/cost ratio of 2.5. The direct loss of 200 acres of forested wetlands and the induced clearing of an additional 2,000 acres would result from installation of this alternative. Reduced flooding would occur on approximately 517,000 acres with a resulting decrease in terrestrial resource values.

Shrub and Wooded Swamps

An area of particular concern to this Service is the shrub and wooded swamps which are located in the Yazoo Area. Estimates by the Corps indicate that there are approximately 21,500 acres of this habitat type present in the project area. The Corps' without project land use projections estimate that 3,000 acres will be destroyed prior to project construction. During the project life, beginning in 1990, 1,800 acres would be lost. An additional 200 acres would be destroyed during the project life as a result of the Selected plan. Adverse impacts to wetland areas have also occurred due to the reduction of backwater flooding caused by the Yazoo Area levee and additional impacts would occur as a result of reduced interior flooding associated with the pumping plant.

Section 404 Wetlands

In November, 1979, the Service requested that the Corps make an administrative delineation of the wetlands in the Yazoo Area specific enough for planning purposes, so that the impacts associated with the completed and proposed works could be adequately evaluated. To date, we have not received this information. The Corps did, however, requested the Environmental Protection Agency (EPA) to make a wetland determination in the Yazoo Area as required by their Geographic Memorandum of Understanding (MOU) dated April 23, 1980. In response to this request, EPA (letter dated July 15, 1981, Appendix F) has determined that all forested areas on the pumping plant site (to include inlet and outlet channels) are jurisdictional wetlands and would be directly impacted by construction activities. Additionally, EPA determined that, with minor exceptions, all forested areas in the Yazoo Area at or below 90 feet msl are wetlands which may be indirectly impacted by the project.

Completed Features of the Backwater Segment

Reduction of flooding caused by the Yazoo and Satartia levees has had and will continue to have an adverse effect on aquatic habitat. The elimination of backwater flooding within the project area has reduced the available fish spawning areas and eliminated the flushing and restocking process which is so essential to a productive aquatic ecosystem. Elimination of backwater flooding has also reduced the value of

the remaining bottomland hardwood resource by the reduction of tree growth, mast production, and the dispersion of mast for hardwood reproduction. Decreased water stages and nutrient interchange in other wetlands has also occurred as a result of the elimination of backwater flooding. The elimination of backwater flooding to project area croplands has resulted in a reduction of waste grain currently available to waterfowl. Destruction of woodlands due to increased land clearing and the acreage required for construction of the channel and levees has resulted in additional environmental losses.

Data recently became available from the Corps concerning the reduced frequency of flooding attributable to the completed features of the Backwater Segment. As a result, this report will attempt to incorporate the losses to terrestrial resources which resulted from the reduction in backwater flooding associated with the completed levees and connecting channel. The one-year frequency backwater flood was completely eliminated on 13,900 acres of bottomland hardwoods. However, due to ponded water behind the levee, the total one-year flood reduction amounted to 2,540 acres. Direct losses due to construction and losses resulting from induced land clearing from these completed projects (Table 9) will also be incorporated. Benefits attributable to the greentree reservoirs and slough control structures, currently under construction on the Delta National Forest as partial mitigation of completed features, will also be analyzed.

Downstream Impacts

In addition to the adverse project impacts thus far discussed, the completed projects in the Backwater Segment have had and will continue to have adverse impacts to downstream aquatic resources. These impacts will result primarily from the decreased efficiency of the natural wetland filtering system and an increase in intensified agricultural practices. Installation of a pumping plant would result in additional land being brought into agricultural production and intensification of farming practices on existing acreages. These increased agricultural activities would result in additional erosion, sedimentation, and pesticide usage. As the natural filtration systems become less numerous and less efficient, more and more chemicals and sediment will then be introduced into the receiving waters. Since the movement of sediment downstream is the major mechanism for pesticide transport (Robinson, 1973), the downstream systems will then receive additional concentrations of agrichemical pollutants. There is no question that the Yazoo Area Pump Project will intensify the dangerously high contamination levels and critical water quality problems in the Yazoo River and adversely impact other downstream systems.

TABLE 9

ACREAGE OF WILDLIFE HABITAT LOST DUE TO COMPLETED PROJECTS IN THE BACKWATER SEMENT 1/

Project	Direct Construction Losses (Acres)		Induced Clearing (Acres)
	Wetlands /	Cropland	
Satartia Area Levees	304	1,590	100
Yazoo Area Levee and Connecting Channel	5,548	494	1,600
TOTAL	5,852	2,084	1,700

1/ Source: U. S. Army, Corps of Engineers, Vicksburg District

DISCUSSION

As discussed previously, the Flood Control Acts of 1941 and 1965 authorized a plan for flood control in the Yazoo Area that acknowledged the wisdom for maintenance of flood storage, timber values, and agricultural production. Maintenance of these competing interests was to be accomplished by providing flood protection to lands above 90 feet msl, predominately agricultural lands; and dedication of those lands below 90 feet msl, predominately forested wetlands, for sump storage and timber production.

The designation of those lands below 90 feet for sump storage was a deliberate recognition by Congress that maintenance of the integrity of the Yazoo Area would protect not only the timber, natural resources, and agricultural values, but also the continuation of flood storage benefits. The Congress did not, however, restrict future development to insure that uses of the sump area would be compatible with the Yazoo Area's flood storage role.

This inaction has allowed the encroachment and intensification of flood susceptible land uses into the previously dedicated sump area. Further, encroachment has continued and intensified to the point that currently over 97 percent of the benefits to be derived from the proposed plan are attributable to agricultural interests. It is becoming increasingly obvious that the Yazoo Area's problems and, correspondingly, the solutions being addressed in the Pumping Plant study are largely a result of unrestricted attempts to intensify and expand agricultural operations in an area previously identified for sump storage.

Whereas previous Federal planning acknowledged the flood storage function of the sump and approached the pumps as a mechanism for reducing flooding damages above 90 feet msl, current planning has made a subtle but dramatic departure from this approach. All planning is now being focused on the removal of the flood storage function in order to intensify agricultural encroachments into the sump.

Without the economic benefits from encroachment of agricultural practices in the authorized sump, the project cannot be justified. The role of the sump for storage of water is being viewed as an impediment to the economics of a pumping plant. In the process, the planning efforts have focused not on implementing the authorized plan, but rather on pump sizes and pumping elevations contrary to the Congressional legislations of 1941 and 1965. These efforts would, should the Selected plan be implemented, largely eliminate the flood storage and timber and related benefits (including fish and wildlife) of the sump storage area.

The Selected plan would be highly energy consumptive during a time when energy conservation is a national imperative. Average annual energy use is estimated to be 14.9 million kilowatt hours.

Additionally, the forced removal of interior flood waters previously directed into the Yazoo Area sumps will aggravate problems outside the project area. Flood heights of the Mississippi and Yazoo Rivers will increase in downstream areas. The Mississippi River will experience an increase in turbidity and sediment rates which will increase the maintenance dredging costs necessary to maintain navigation and flood control. Lastly, the increased levels of insecticides and herbicides will lower existing water quality in both rivers.

The Service has several fundamental concerns about this approach to water resource planning. First, we view the current planning effort as inconsistent with the expressed need to maintain the Yazoo Area for flood storage and related benefits as outlined or defined in the 1941 and 1965 Flood Control Acts. The attempt to provide flood protection to those lands below 90 feet is contrary to the previously expressed Congressional intent. Furthermore, we view the existing planning direction as inconsistent with current mandates relating to floodplain management and objectives.

Secondly, the Service is concerned with the disparity between the expressed intent of the project and what will actually be the result of the project. On the surface, the purpose of the pumping plant is to reduce flood damages resulting from the ponding of internal drainage behind what is essentially a ring levee surrounding the project area. However, a closer examination of the alternatives indicates that almost 79 percent of anticipated benefits will be derived not from flood protection, but rather from the expansion and intensification of flood susceptible agricultural land uses into a very flood susceptible environment. To date only 21 percent of projected identifiable benefits would result from flood damage reduction or prevention. This disparity between purpose and result has significant ramifications to the evaluation of trade-offs between fish and wildlife and other project purposes.

Thirdly, by concentrating planning efforts toward achieving maximum economic benefits, the Corps has overlooked a very basic alternative for flood control in the Yazoo Area. It must be recognized that previous Federal projects in the Yazoo Basin have resulted in an extensive and complex flood control system deliberately designed to expedite movement of water from the upper Delta into the Yazoo Backwater Area. As a result, the internal drainage from over 4,000 square miles is forced into the Yazoo Area; and when stages on the Mississippi River preclude gravity drainage of this interior runoff, the water is ponded behind the Yazoo Area levee. This deliberate, enhanced movement of water has progressed to the point that an artificial flooding regime has been created. The alternative being overlooked is for the Corps to acknowledge the Federal responsibility for having created this flood regime and, through various nonstructural means, preserve the beneficial functions of sump storage by federally dedicating the area below 90 feet for sump storage.

The following is a more indepth discussion and analysis of these concerns. Additionally, recommendations will be provided which, if adopted, would address the complex water and related land resource problems in the Yazoo Area. These recommendations combine the respective strengths and weaknesses of structural and nonstructural flood control measures in an environmentally sound manner. More importantly, these recommendations are consistent with previous Congressional actions.

The past practice of implementing single-purpose projects that maximized economic returns and provided enhanced flood water outlet channels for upstream flood control were predicated on utilization of the Yazoo Area for sump storage. The beneficial functions of this sump, particularly the storage of floodwaters, were essential for upstream projects to function. As such, Federal planning acknowledged the wisdom of the 1941 and 1965 Flood Control Acts, and took full advantage of a 136,000-acre downstream sump. In addition to providing the economic basis for upstream projects in the Yazoo Basin, the sump storage function was also vital to the integrity of the mainstem flood control plan for the Lower Mississippi River.

This is evidenced in testimony presented in 1941 by Brigadier General Max Tyler, President, Mississippi River Commission, before the House Committee on Flood Control relative to flood control for the Lower Mississippi alluvial valley. General Tyler stated that "The leveeing off of any reservoir area is bound to raise the flood height for some distance upstream and for the entire distance downstream up to the level of the confining levees". Specifically referring to the Yazoo Backwater Area, General Tyler stated that " . . . leveeing off the Yazoo backwater area would cause increased flood heights on the Louisiana side of the Mississippi River up to the point where the levees are overtopped". To avoid this situation, the 1941 (and 1965) Flood Control Act provided for floodwater storage inside the levee; that is, the land below the 90-foot contour would be dedicated to sump storage.

To remove the flood storage benefits (to the entire Mississippi River alluvial valley below Vicksburg, Mississippi) by installation of a pumping plant is contrary to the master plan for flood control of the Lower Mississippi alluvial valley. Flood crests will be higher. Water quality of the Mississippi River will be lowered by the increased introductions of insecticides and herbicides. Maintenance dredging for navigation will become more expensive due to increased levels of sediment. It is our view that these very real and predictable costs (including environmental costs) must be assigned to the Yazoo Area pumping plant if the benefits of floodwater storage areas are removed.

This is particularly significant when we consider that the downstream controlled flood storage capacity can not presently contain the expected volume of flow under flood conditions. Indicative of this grave situation is the planning effort for improvement of floodwater transmission capability currently underway for the Atchafalaya Basin Floodway System. The first cost of any plan to result from this planning effort is expected to exceed one billion dollars. To intentionally increase stage heights via a Yazoo Basin project while knowing of the critical problem already in existence downstream should be carefully questioned.

The issues, problems, and needs currently being addressed in the Yazoo Pumping Plant study are very much a result of the failure to insure the integrity of the previously identified sump area. The problems and needs, at least the problems and needs being addressed by the national economic development account, are not those of flood damage reduction or an issue of human safety and welfare. This was pointed out in the Vicksburg District's Information Summary in July, 1979, where project benefits were described as ". . . provided by pumping ponded water from this area would decrease the risk involved in farming the benefited area lands". The Summary goes on to say "expanded and more efficient agriculture would result in increased farm income. . .". This approach to the pumps is resulting in the formulation of a "flood control" project that depends upon intensified encroachment into a sump for its economic benefit. Such a project is in our view inconsistent with the wise use of floodplains in general and E. O. 11988 in specific and contradicts your administration of the 404 regulatory program.

The stated objective of E. O. 11988 is "to avoid to the extent possible, the long and short-term adverse impacts associated with the occupancy and modification of floodplains and to avoid direct or indirect support of floodplain development wherever there is a practicable alternative". Contrary to this national objective, the Selected plan would deliberately stimulate floodplain encroachment at the expense of the natural, beneficial values of floodplains. It is the position of the Service that the Selected plan does not comply with E. O. 11988 in that it requires for its economic justification, the deliberate stimulation of flood susceptible land uses into a flood susceptible environment.

Contradictions between project planning and the 404 regulatory program relate to the fact that benefits are being credited to the project from the conversion of forested wetlands to agricultural lands. Although there is currently some disagreement between the Corps and this Service regarding the inclusion of bottomland hardwood wetlands in Mississippi as subject to Corps regulatory authorities, there is no question that alteration of wooded swamp wetlands are subject to and in fact are being regulated under the authority of Section 404 of the Clean Water Act of 1977. Assigning benefits to land use conversions anticipated prior to project construction and the project induced land use changes is inconsistent with Corps' regulatory authorities.

We believe it is inappropriate for a Corps of Engineers, Civil Works District to adhere to established Federal policies in its Operations Division (Regulatory Functions Branch) and implement opposing practices in its Planning Division. We view this as a serious issue and one which is contrary to the mandates of the Clean Water Act of 1977. It is particularly relevant considering the recent Corps decision that Section 404 applies to the alteration of wooded swamp wetlands (more appropriately to lands below 89 feet mean sea level) in the case of works performed by Messrs. Murray and Larry Crowe located approximately five miles from the proposed site of the Yazoo Area Pumping Plant. This case is currently in litigation in Federal Court. Simply stated, the Corps is claiming blanket benefits for land use conversion of wetlands which must be addressed on a case by case basis.

The validity of this statement is further supported by an example concerning a Cease and Desist Order issued by the Vicksburg District to Mr. C. F. Evans for ditching and clearing activities located within the protected area of the Tensas-Cocordie Pumping Plant Project, Louisiana. The Corps had previously claimed benefits for conversion of wooded wetlands (induced clearing) and then questioned that conversion as a possible 404 violation. The Evans property, currently within the three-year floodplain, will be protected from the 100-year flood when the pumping plant becomes a reality.

Additionally, substantive issues were recently addressed in the Western District of Louisiana Federal Court concerning the interpretation of the Federal definition of wetlands and thus the extent of the Corps' regulatory authority. The decision of the Federal Court was that bottomland hardwoods in the Lake Long Tract were indeed wetlands. The court granted a permanent injunction to prohibit further clearing, except by a Section 404 permit. This will have a pronounced effect on the appropriateness of assigning benefits for conversion of bottomland hardwood wetlands to agricultural lands. Within the jurisdiction of the United States Court for the Western District of Louisiana (which lies as close as one mile to the project area), the Vicksburg District regulates the conversion of forested wetlands. Under this regulatory program, the intensification benefits claimed on the 27,000 acres of existing forested wetlands would be premature and would lack an acceptable level of certainty. Within the project area, however, the Vicksburg District does not regulate the conversion of forested wetlands since the District does not feel that land clearing per se involves discharges of dredged or fill material. Thus, we have a situation in which "feelings" contradict the legal findings of a Federal Court in an immediately adjacent area.

Under the current MOU between the Corps and EPA, the Corps must request from EPA a wetland determination in areas where EPA has expressed special interest (special case areas). The bottomland hardwoods in the Yazoo Area are located within a special case area as defined by EPA, Atlanta, Georgia. In a letter dated July 15, 1981 (Appendix F), EPA

stated their determination that all forested areas on the pumping plant site are jurisdictional wetlands and would be directly impacted by construction activities. EPA also determined that all forested areas in the Yazoo Area at or below 90 feet msl, with minor exceptions, are wetlands which may be indirectly impacted by the project. Based on the determination that the pumping plant site would be located in wetlands, the Corps developed a draft Section 404(b)(1) evaluation. Service review of the draft indicated that the evaluation contained significant and substantial inadequacies. These inadequacies stem from the fact that the evaluation addresses only the wetland impacts that would result from the deposition of fill during construction. However, the operation of the project to be placed upon that fill has far-reaching impacts upon wetlands. These impacts are neither recognized nor addressed in the 404(b)(1) evaluation. The benefits and the impacts of the Yazoo Area Pump Project are a function of project operation rather than construction. In fact, construction impacts to wetlands are relatively insignificant when compared to operational impacts.

One of the major impacts of project operation would be the induced conversion of 3,700 acres of wetland to non-wetland uses. This conversion and the associated deposition of fill is a direct result of the project and should be considered as such and included in the 404(b)(1) evaluation. Likewise, the operation of the project would have substantial impacts on extensive wetland areas as a result of reduced flooding and major alterations of the hydrologic regime. Until these impacts are recognized and evaluated under the guidelines of Section 404(b)(1) and a justifiable determination is made that there are no other practical alternatives to such action, the Service is of the position that the Yazoo Area Pump Project does not comply with the legal requirements of the Clean Water Act. Additionally, this Service contends that until the conversion of regulated wetlands are properly assessed, an accurate benefit to cost ratio for the project cannot be computed.

Another major issue which we view as inconsistent with current mandates concerning water resource planning is the treatment given nonstructural alternatives. There is no question that nonstructural plans, including floodplain regulation and floodproofing, have been considered. What we do question, however, is the failure of the Corps' to adequately consider or present an alternative that represents a combination of structural and nonstructural features. We view this omission as contrary to the principles contained in Executive Order 11988 "Floodplain Management" and, due to the project induced destruction of wetlands, as also inconsistent with Executive Order 11990 "Protection of Wetlands". Furthermore, the December 11, 1978, injunction preventing further work on the Corps' Cooper Lake and Channels project specifically cited the failure to consider a comprehensive plan integrating structural and nonstructural measures as a major deficiency in that Federal planning effort. We view this decision as equally applicable to the Yazoo Area Pump Project planning efforts.

Alternatives

Implementation of any plan for providing flood protection to the Yazoo Area will have beneficial and adverse impacts to fish and wildlife resources. Those benefits and losses have been identified in terms of impacts to biological productivity and in terms of user days and dollar values. Additionally, we have included those measures necessary to compensate for losses to fish and wildlife resources that resulted from construction of the Yazoo Area levee, it's appurtenant connecting channel, and the Satartia Area levee. These measures are included because the Yazoo Area pumping plant is dependent on the existing Yazoo Area levee and because of Corps requests in association with the Fish and Wildlife Mitigation Report.

Benefits resulting from the greentree reservoirs and slough control structures, currently under construction on the Delta National Forest, have also been included in the analysis. Construction of nine greentree reservoirs and nine slough control structures was approved by the Chief of Engineers in 1976 as partial compensation for fish and wildlife losses resulting from flood control projects in the Yazoo backwater area. This authorization has since been modified to include only six greentree reservoirs with a total capacity of approximately 4,420 acres and five slough control structures designed to hold water on approximately 91 acres. The beneficial value of those structural measures are included in the Habitat Evaluation Procedures (Appendix A).

In the project area, additional major structural measures to increase or improve biological productivity on existing public lands could not be identified. This conclusion was reached after discussions with Fish and Wildlife Service's Division of (National Wildlife) Refuges, Forest Service representatives, and representatives of the Mississippi Department of Wildlife Conservation. As a result, compensation measures were limited to land acquisition by fee title purchase and easements. Appendix E outlines a plan for intensive management and use of lands acquired in fee title.

A HEP analysis was conducted to determine project impacts to terrestrial resources and those compensatory measures necessary to offset impacts. The Corps and this Service agreed that, to the extent possible, the "In-Kind" concept should be utilized in determining the compensation requirements for the Yazoo Area Pumping Plant and completed Yazoo Backwater Features. In-Kind compensation refers to the replacement of losses by acquisition of habitat similar to that which is lost or replacement of the losses of one wetland type with another type where the animal assemblages is common to both. Thus, it was agreed the migratory waterfowl losses on flooded agricultural land would be compensated by waterfowl gains due to the greentree reservoirs and slough control structures. Also, it was agreed that due to the abundance of dry agricultural lands in the project area, that any habitat gains or losses should be written

off and that compensation measures should focus on the preservation of bottomland hardwoods because of their high value, state and national priorities, irreplaceability, and the desire for maintenance of the existing biological integrity.

The in-kind mitigation concept is based upon the understanding that construction of the greentree reservoirs and slough control structures, to include installation of pumps to fill all reservoirs, would be completed in Fiscal Year (FY) 1982. Furthermore, the concept is based upon the assumption that one-half of the greentree reservoirs and slough control structures would be pumped or filled naturally each year. A very substantial increase in habitat units is obtained based upon this assumption. The Service has recently been informed that Corps funding is not available in FY-82 or FY-83 for construction of the remaining two reservoirs and installation of the pumping plant. Until such time as construction is completed, the greentree reservoirs will be virtually useless as waterfowl habitat. Additionally, since the losses to be mitigated are a result of the project, the operation and maintenance costs associated with pumping should be at project expense. Operation and maintenance costs are currently not at project expense and it is anticipated that the U. S. Forest Service will be required to provide the necessary funds. It is the opinion of the Service that to obtain valid habitat unit increases, the recommendations of the mitigation report should include provisions to obtain adequate funding at project expense to assure that at least one-half of the greentree reservoirs and slough control structures have water pumped into them each year.

Completion of the Yazoo Area levee, the appurtenant connecting channel, and the Satartia Area levee resulted in the loss of 7,552 acres of forested wetlands and the loss of 2,084 acres of agricultural lands (see Project Impacts, Table 9). Except for the most extreme floods, backwater flooding was completely eliminated on approximately 811,500 acres. Compensatory requirements were calculated utilizing the same basic field data, assumptions, and methodology developed for the Yazoo Area Pumping Plant. The necessary compensation for these completed projects alone is shown in Table 10 as acreages to be acquired by easements, fee title with intensive management, or fee title without management.

Implementation of the NED plan would have the most severe impact on fish and wildlife resources of any alternatives studied, with the exception of Alternative A. With pumping initiated at 80 feet msl, the 25,000 cfs pumping plant would result in the direct loss of 400 acres of bottomland hardwoods, the induced clearing of 4,400 acres of wooded wetlands, and a combined sport and commercial fishery loss of $60,700 annually. Compensation for terrestrial resource losses would require the fee title acquisition and intensive management of 11,900 acres of woodlands, or 14,100 acres in fee title without management, or 14,700 acres in easements, or a combination thereof (Table 10).

TABLE 10

IN-KIND COMPENSATION REQUIREMENTS 1/

Alternative	Habitat Type	Easements (Acres)	Fee Title (Acres)	
		Without Mgt.	With Mgt.	Without Mgt.
Satartia/Yazoo Area Levee and Connecting Channels	Bottomland Hardwoods and Wooded Swamps	33,800	27,100	32,900
C, 25,000 cfs	"	14,700	11,900	14,100
C, 17,500 cfs	"	11,300	9,200	10,900
H, 15,000 cfs	"	0	0	0
F, 15,000 cfs	"	6,600	5,300	6,300
Satartis/Yazoo Area Levee and Connecting Channel, Concurrent with C, 17,500	"	40,000	32,800	38,900

1/ Methodology for compensation requirements are contained in Appendix A.

The Selected plan is simply the NED plan with a smaller pump capacity. The direct and induced clearing losses which would result from implementation of this alternative amounts to 3,700 acres of wooded wetland. Sport and commercial fishery losses would annually amount to $49,100. The necessary compensation for the Selected plan alone, as shown in Table 10, is 11,300 acres in easements, 9,200 acres in fee title with intensive management, 10,900 in fee title with no management, or a combination thereof.

The Corps proposed mitigation for the Selected plan and the completed Yazoo Backwater Features consists of seeking Congressional authorization for the purchase of land use easement on 40,000 acres of woodlands, or the fee title acquisition of 32,800 acres with management, or a combination thereof, to be funded concurrently with project construction. In terms of initial costs, fee simple estates would be more expensive than easements. Fee acquisition does, however, provide for unlimited control, provides for unencumbered intensive management for fish and wildlife and related resources, and the assurance of public use for consumptive and nonconsumptive recreational utilization. Easement estates could also prevent unwise development and would have a lower first cost than fee title. Since easement estates represent an encumbrance of clear title, they would conceivably degrade the value of the remaining estates maintained by the owner. Although little first hand experience exists relative to the estimated costs of various easement estates, it is estimated that easements for forested wetlands would cost from 50 percent to 80 percent of fee simple. Subsequent administrative requirements would result in the final costs approximating fee simple. Thus, land acquisition in fee title would be the most cost-effective method to achieve compensation in the project area.

It is our understanding that the Corps is currently considering, "a perpetual and assignable easement to restrict any change in existing land use from that of a mixed hardwood forest to a monocultural forest or cropland use, without the approval of the duly authorized managing agency." Under this concept the easement is not biologically sound since the "managing agency" could approve conversion to cropland or monocultural forest, thus completely circumventing the reasons for which the easements were taken. To assure that the necessary interests are acquired to maintain biological values, an easement must totally restrict conversion to a monoculture forest or cropland use and include provisions for maintaining the water regime by prohibiting additional drainage. It should be pointed out that the easement being proposed to prevent conversion of forested lands to non-forest uses will maintain only the projected future without project habitat values and not necessarily the existing conditions. Furthermore, future management capability will not be present nor will the right to provide for public access. Habitat values could be lowered by detrimental trends in forest management which are not a result of the project and thus cannot be controlled by project-related easements.

Because of the advantage of fee title acquisition over easement estates, the Service believes emphasis should be placed on purchase in fee title from willing sellers where it is publically acceptable. Since the situation may occur in the project area that all acreage could not be acquired in fee title, a biologically sound easement as previously described could be acceptable. Therefore, the Service believes that the Corps should seek Congressional authorization to acquire the necessary acreage in fee title or easements or a combination of both. Thus, the authority would not limit the option to acquire either type of estate or a combination thereof when acquisition begins.

The EQ plan, Alternative H, includes a 15,000 cfs pumping plant with pumping initiated at 85 feet msl and as an integral EQ feature, the purchase and preservation of 30,000 acres of bottomland hardwoods. Construction and operation of the NED feature (the pumping plant) would result in significant adverse impacts to fish and wildlife resources. An annual sport and commercial fishery loss of $26,100 would occur and a direct loss of 200 acres and the induced clearing of 300 acres of wooded wetlands would result. However, considering the EQ feature of Plan H (acquisition of 30,000 acres of wooded wetlands), these adverse impacts would be offset, and the project would result in net positive contributions to the EQ account.

Alternative F, with pumping initiated at 83 feet msl and a 15,000 cfs pumping plant, is essentially the plan authorized by Congress, since it provides protection to lands above 90 feet msl from the five-year frequency flood. Project implementation would result in the direct loss of 200 acres of bottomland hardwoods and the induced clearing of an additional 2,000 acres. Sport and commercial fishery losses would annually be $30,400. A total of 5,300 acres of woodlands acquired in fee title and intensively managed, or 6,300 acres in fee title with no management, or 6,600 acres in easements would be required to compensate for terrestrial resource losses associated with this alternative (Table 10).

Frequently, decision makers are faced with an evaluation of trade-offs that involve project benefits in the form of flood damage reduction and protection of human health, safety, and welfare against adverse impacts to the environmental quality of the project area. This is not the case nor the issue in the Yazoo Area Pump Project. The issue in this instance is the expenditure of almost $150,000,000 to enable continued encroachment and development of flood susceptible land uses into a previously identified sump storage area. Reclamation, not flood control, is the issue.

To more fully understand the rationale that the issue is subsidized encroachment into an identifiable sump storage area requires only a brief review of the Corps Selected plan. As indicated earlier, reduction of flood damages accounts for only about 21 percent of total project benefits. Approximately 79 percent of the benefits result from

agricultural intensification. Furthermore, only 2.5 percent of the flood damage reduction benefits are attributable to the protection of residences, roads, bridges, and other non-crop related activities. According to data supplied by the Corps, the present need for flood damage reduction does not justify the project. Based on the benefits that would accrue to existing development, the project would have a benefit cost ratio of 0.4 (2 1/2 percent interest rate).

It is particularly relevant that the Selected plan would flood 8 residences with its provision to allow water to reach 85 feet msl (one-year frequency flood) from December 1 to March 1. Clearly, the "flood control" benefits will result from more intensive use of the lands identified for sump storage since the one-year frequency flood does not inundate county, state, or Federal highways or commercial or industrial buildings. The only substantial benefits result from a guarantee that a one-year frequency flood will not occur during the crop growing season, since the project contains provisions for continuation of a one-year frequency flood during the non-growing season.

Thus the trade-off to be considered is not extensive flood damages versus the loss of wetlands, water quality, fish and wildlife, and timber production. The trade-off is this--will flood storage, timberland, wetland, water quality, and fish and wildlife benefits of high public value, that emanate far beyond the boundaries of 90 feet msl, be foregone in order to expand flood susceptible land use into an area that is a sump for a Federal drainage system that extends over 4,000 square miles. It is the position of the Fish and Wildlife Service that such a trade-off is not in the public interest and that the loss of fish and wildlife resources inherent in this trade-off are unacceptable. We therefore do not support the Selected plan or the other alternatives that are designed to intensify agricultural encroachment into the Yazoo Area sump.

We do not intend with this opposition to dismiss the Corps of Engineers' responsibility to address the complex water resource problems that are resulting from encroachments of intensified land uses into the sump. The Service's opinion reflects a belief that the solution to the complex problems resulting from this encroachment is not to destroy the sump function and remove the flood storage/timberland related benefits it is providing. On the contrary, the solution is to recognize the Corps of Engineers' responsibility for having created the sump, recognize the previous Congressional designation of the area below 90 feet msl as a sump, and take the necessary action to federally dedicate the area below 90 feet for sump storage. Associated with the creation of a federally dedicated sump, we could support Plan G (17,500 cfs pumping plant with pumping initiated at 85 feet msl) or Plan F (15,000 cfs pumping plant with pumping initiated at 83 feet msl).

A plan such as this would ensure that no additional encroachment of land uses incompatible with sump storage would be permitted on lands below 90 feet. This would be accomplished by acquisition of fee and/or easement estates. Existing landowners would be permitted to continue existing land-use practices or they could sell their lands should they desire. First and foremost, however, all lands below 90 feet would be dedicated to sump storage, and acquisition of either estate would not allow for additional development that would be inconsistent with flood susceptibility. Thus, in association with an established sump, a 15,000 cfs or a 17,500 cfs pumping plant, with pumping initiated at 83 feet msl or 85 feet msl respectively, would provide protection to lands above 90 feet msl from the five-year frequency flood and would provide for the storage of flood waters authorized in the 1941 and 1965 Flood Control Acts. Flood protection would be provided. Human safety and welfare would be protected. Environmental quality would be preserved. Water quality would be improved. Adverse downstream impacts would be lessened. Only 21 permanent residences would be affected and these structures could be floodproofed or relocated in the same manner as eight of them should be with construction of the Selected plan. A federally dedicated sump would prevent continued encroachment into a wetland (sump) area and would ensure the continuation of widespread public benefits. A flood control plan embracing the previously authorized structural measures, a pumping plant, and the previously identified nonstructural features, a sump storage area, would be implemented. In short, the master plan for flood control of the Lower Mississippi River alluvial valley would be closer at hand rather than farther away.

It is the position of the Service that the Selected plan is not in the best public interest. This position is based on several fundamental concerns with the approach to water resource planning embodied in the Yazoo Area Pump Project. These include inconsistencies with previous logic on the need to maintain flood storage and related benefits in backwater areas; inconsistencies with previous Congressional intent to dedicate the area below 90 feet msl for flood storage; contradictions to sound principles of floodplain management in general and E. O. 11988 and E. O. 11990 specifically; contradictions to the regulatory program created by Section 404 of the Clean Water Act; and the continuation of an approach to planning that requires for its justification the continued encroachment of flood susceptible land uses into a flood prone environment.

The Service has identified two alternatives (Plan G, 17,500 cfs and Plan F, 15,000 cfs), consistent with Congressional authorization, which would receive our support. Associated with the creation of a federally dedicated sump, either of these plans would maintain the Congressionally recognized flood storage and related beneficial functions of the sump and provide flood protection above 90 feet msl from the one in five year storm.

Because of the planning inconsistencies previously documented, the Service does not support the implementation of the Selected plan. However, we will not oppose the project assuming the Fish and Wildlife Mitigation Report, currently being developed by the Corps, is authorized and implemented as an integral project feature.

RECOMMENDATIONS

The Fish and Wildlife Service views the following recommendations as essential for providing the authorized level of flood control, protection of health, safety, and welfare, providing restitution to landowners, preserving environmental quality, and in keeping with the public interest. Therefore, in view of the above, it is the recommendation of the Fish and Wildlife Service that:

1. The Corps of Engineers should acquire the necessary Federal interest to establish a federally dedicated sump below 90 feet msl in the Yazoo Area. All such interests should prevent future development of flood susceptible land uses; allow a continuation of any existing land uses deemed compatible with flood storage; insure that forested wetlands are harvested and managed to preserve existing community structure; and preserve flood storage benefits.

2. Plan F (15,000 cfs pumping plant with pumping initiated at 83 feet msl) or Plan G (17,500 cfs pumping plant with pumping initiated at 85 feet msl) should be implemented to provide protection to lands above 90 feet msl from the five-year frequency flood, in association with the federally dedicated sump recommended in 1. above.

3. Not less than 27,100 acres of forested wetlands should be purchased from willing sellers in fee title, with provisions for development, operation, and maintenance costs, or 32,900 acres in fee title with no management, or 33,800 acres in easements, or a combination thereof, to compensate for fish and wildlife losses resulting from the completed Satartia and Yazoo Area levees and connecting channel projects. Such acquisition could be an integral feature of the establishment of a federally dedicated sump. First cost for initial development, if all lands are purchased in fee title, would be approximately $9,768,000 with annual operation and maintenance costs of approximately $862,000.

4. Funding for acquisition should be at least concurrent with project construction.

5. Administration and management of lands acquired in fee simple should be in accordance with the General Plan process contained in Section 3b. of the Fish and Wildlife Coordination Act.

6. Funding for initial development as well as operation, maintenance, and replacement costs for lands acquired in fee simple should be provided with the same cost sharing provisions as other project features.

7. The Corps of Engineers, in consultation with the Fish and Wildlife Service and Mississippi Department of Wildlife Conservation, should administer interests acquired for establishment of the federally dedicated sump.

8. In association with Plan F, pumping should be initiated at 85 feet msl from December 1 to March 1 for the operational life of the project.

To fulfill the requirements of the Fish and Wildlife Coordination Act, the following recommendations relate specifically to the Corps Selected plan. Our studies to date have concluded that construction of the Selected plan, with or without necessary compensatory measures, is not, in our view, in the public interest. We view the basic concept of the Selected plan, that is the deliberate removal of an existing flood storage area vital to the master plan for flood control in the Lower Mississippi River alluvial valley, as contrary to sound water resource planning. However, the Service will not oppose the project assuming an acceptable mitigation plan remains as an integral project feature. If, as a result of the review process, the mitigation plan is eliminated or substantially altered, the Service would oppose the project and consider it a candidate for referral to the Council on Environmental Quality (CEQ). The possibility of CEQ referral has been discussed on numerous occasions in formal coordination meetings and in preliminary, revised preliminary, and draft Fish and Wildlife Coordination Act reports officially transmitted on April 1, 1980; August 19, 1980; June 4, 1981; and January 7, 1982. In the event the Selected plan should be authorized for construction, the following measures should become a part of the authorized plan.

1. The Corps should seek Congressional authorization to acquire 32,800 acres of forested wetlands in fee title, based upon a willing seller proposition, or 40,000 acres in easements, or a combination thereof to compensate for the completed Yazoo Backwater Features and the Selected plan. Emphasis should be placed on fee title purchase from willing vendors where publicly acceptable with biologically sound easements acquired as a secondary approach where fee title lands of necessary acreage is not available. Lands purchased in fee title should include provisions for development, operation, and maintenance.

2. Any easements which are acquired should be perpetual and assignable to restrict any change from existing woodland use to monoculture forest or cropland and preserve the flooding regime by prohibiting additional drainage. Since these easements are to be taken for fish and wildlife mitigation, there should be no exceptions to these restrictions except for fish and wildlife purposes.

3. Funding for acquisition should be at least concurrent with project construction.

4. Administration and management of lands acquired should be in accordance with the General Plan process contained in Section 3b. of the Fish and Wildlife Coordination Act.

5. Funding for initial development as well as operation, maintenance, and replacement costs for lands acquired in fee simple should be provided with the same cost sharing provisions as other project features.

6. If provisions for adequate funds to provide intensive management are not obtained, an alternative should be fee title acquisition of 38,900 acres of forested wetlands, or 40,000 acres in easements, or a combination of both.

7. The Corps of Engineers, in consultation with the Fish and Wildlife Service and Mississippi Department of Wildlife Conservation, should administer interests acquired for establishment of the federally dedicated sump.

8. Pumping should be initiated at elevation 85 feet from December 1 to March 1 for the operational life of the project.

CONCLUSIONS

The Flood Control Acts of 1941 and 1965 established a plan for flood control in the Yazoo Area that included extensive structural features to protect the area above 90 feet msl and dedication of the area below 90 feet msl for sump storage. However, since this time there have been extensive encroachments of flood susceptible land uses into the sump.

The Corps of Engineers proposes to address the problems resulting from these encroachments by removing, through pumping, the flood storage functions of the sump. The Selected plan and its principle alternatives focus on removing the flood storage function in order to intensify agricultural encroachments. In fact, the Selected plan requires for its economic justification the intensification of flood susceptible land uses into what is and will be a very flood susceptible environment.

The Service has detailed several fundamental concerns with this approach to water resource planning. These include: inconsistencies with previous logic on the need to maintain flood storage and related benefits in backwater areas; inconsistencies with previous Congressional intent to dedicate the area below 90 feet msl for flood storage; contradictions to sound principles of floodplain management in general and E. O. 11988, "Floodplain Management" and E. O. 11990, "Protection of Wetlands" specifically; contradictions to the regulatory program created by Section 404 of the Clean Water Act; and the continuation of an approach to planning that "solves" the flood control problems of one area by moving them downstream to other areas.

Two alternatives, consistent with Congressional authorization, have been identified by this Service which would receive our support. Either of these alternatives, associated with the creation of a federally dedicated sump, would maintain the flood storage and related benefits of the sump, as recognized by Congress, and provide flood protection above 90 feet msl from the five-year frequency flood.

Based upon the planning inconsistencies documented in this report, it is the position of the Service that the Selected plan is not in the best public interest. The Service does not support the implementation of the Selected plan. We will not, however, oppose the project assuming an adequate and acceptable mitigation plan is authorized and implemented as an integral project feature.

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APPENDIX A

HABITAT EVALUATION PROCEDURES

(TERRESTRIAL)

APPENDIX A

YAZOO AREA PUMPING PLANT

HABITAT EVALUATION PROCEDURES

The Habitat Evaluation Procedures (HEP) developed by the U. S. Fish and Wildlife Service in 1976 offer a methodology for evaluating project impacts on the fish and wildlife resources of the area. With HEP the project area is divided into areas of similar vegetative communities or habitat types. Sample sites are randomly selected in each habitat type and rated for their biological productivity by an interagency team of biologists. The result is a numerical value of 0 to 10 for each habitat type, with 10 representing the maximum biological productivity for that particular habitat type. This numerical value is expressed in terms of habitat units (HU) per acre, and is referred to as the habitat unit value (HUV) of that habitat type.

Once these baseline values have been determined for each habitat type, they can be applied to existing and predicted future conditions (both with and without the project) revealing the total habitat units available in the project area. These future conditions include quantitative changes in acreage figures and qualitative changes in habitat unit value for each habitat type. Comparing future without the project conditions to future with the project conditions will yield project induced habitat unit changes for each habitat type. Because the baseline habitat unit value is an annual figure, the end result (project induced habitat unit change) is also an annual figure. Once the project induced habitat unit change has been calculated and assuming this change is a loss of habitat units, this figure along with the management (or natural) potential can be used to determine a compensation requirement.

Management potential is the potential increase in habitat unit value a habitat type will realize with fee title acquisition and the initiation of an intensive fish and wildlife management program. Natural potential is the potential increase in habitat unit value a habitat type will realize with fee title acquisition only. These potentials are extremely important in developing compensation requirements and must be realistic and biologically attainable levels if the resultant compensation requirements are to be valid. The management potential for habitat preserved by easements will be zero since it is assumed that the existing management practices will continue. Potentials are usually developed by the interagency team of biologists while performing the field investigation. Once the potentials for each habitat type have been developed, they are then divided into the project induced habitat unit loss for the corresponding habitat type, yielding an acreage requirement for each habitat type necessary to compensate project induced losses in that habitat type.

The potential used (natural or management) and the resultant compensation requirements is dependent upon the construction agency's desire to fund development, operation, and maintenance expenses as a part of project cost.

Further modification of the above procedures is necessary with this project because of the desire to replace all project induced habitat unit losses with habitat unit gains "In-Kind" to the extent possible. In-Kind Compensation refers to the replacement of losses by acquisition and management of habitat similar to that which was lost or replacement of one wetland type with another type where the animal assemblage is common to both. Thus, it was agreed that migratory waterfowl losses on wet agricultural land (November 1 to March 31) would be compensated for by waterfowl gains due to the greentree reservoirs and slough control structures. Additionally, any net gains as a result of the greentree reservoirs and slough control structures would be written off so that gross out-of-kind compensation would not result. Thus, habitat unit gains to waterfowl in woodlands would not be utilized to compensate for habitat unit losses to other species or habitat types. Because of the abundance of dry openland in the Lower Mississippi River Delta and the desire for In-Kind Compensation, the Corps of Engineers and this Service are in agreement to write off habitat unit gains on dry agricultural lands.

Compensation for project induced losses of bottomland hardwoods and wooded swamp were determined assuming that compensation would take place in areas of generally the same habitat unit value as those sampled. A two-step approach was utilized to calculate the compensation requirements for these habitat types. Step I involved calculating the requirements to satisfy losses resulting from Rights-of-Way and reduced flooding. Assuming that acquisition of lands necessary for compensation in Step I would occur, those lands would become dedicated, thus reducing the project induced land clearing. The calculations in Step II involve determining the compensation requirements resulting from project induced land clearing.

Because of the complex relationship of the various projects in the Backwater Area and the inability to determine exactly how compensation will occur, it became necessary to develop three scenarios to determine all possible options. Scenario I assumes that Congress will authorize concurrent compensation for the completed works and the pumping plant within the project area. If Congress does not authorize compensation for the completed works and the pumping plant as a system, Scenario II outlines the requirements to compensate independently. Scenario III was developed to show compensation requirements if land acquisition occurs outside the project area. Compensation was computed for preservation easements and fee title (with and without management). Preservation easements on woodlands, although not having a management potential, do have value from the standpoint of precluding future land clearing.

This appendix presents the detailed application of the procedures described above to various alternatives of the Yazoo Area Pumping Plant project, the completed Satartia and Yazoo Area levee and connecting channel projects, and the greentree reservoirs and slough control structures currently under construction. The results of this application are displayed in the form of compensation requirements. The acreage figures presented here will offer complete compensation for both intangible and tangible losses resulting from the project. The following introduces as well as explains the attached tabular information for Scenario I:

WATERFOWL

I. Assumptions

A. The following shows the average annual acres of agricultural land at the one-year frequency flood that would be available to waterfowl during the period November 1 to March 31.

Without completed features	14,938 Acres
With completed features/without pumping plant	14,977 Acres
With completed features/with pumping plant, Alternative C, 17,500 cfs (including project-induced clearing)	12,004 Acres

B. Six greentree reservoirs and five slough control structures are currently under construction on the Delta National Forest. One-half of the greentree reservoirs (2,210 acres) and one-half of the slough control structures (46 acres) will be filled and available to waterfowl each year.

C. The habitat unit (HU) value for these types are as follows:

	Agriculture	Slough Control Structures	Greentree Reservoirs
Wet	40	75	80
Dry	10	20	20
Difference	30	55	60

II. Calculations

A. Determination of habitat units lost.

1. Reduced flooding:

Without completed features	14,938 Acres
With completed features and pumping plant	12,004 Acres
Difference in acres	2,934 Acres

2. Habitat units lost:

2,934 acres x 30 HU = -88,020 HU

B. Determination of habitat units gained.

1. Greentree reservoirs and slough control structures:

2,210 acres x 60 HU = +132,600 HU
46 acres x 55 HU = + 2,530 HU

Total HU gains +135,130 HU

C. Difference.

Habitat units gained	+135,130
Habitat units lost	- 88,020
Habitat units	+ 47,110

III. Conclusions

The greentree reservoirs and slough control structures have compensated for the migratory waterfowl losses due to reduced flooding on agricultural lands. The 47,110 annual habitat unit gains attributable to the greentree reservoirs and slough control structures have been written off in order to compensate In-Kind to the extent possible. These gains will not be applied to offset, credit, or reduce any other segment of the analysis.

SCENARIO I, STEP I

ALTERNATIVE C, 17,500 CFS

I. Assumptions

A. Future without the project.

1. The project area, 539,000 acres, is divided into three habitat types; Bottomland Hardwoods inundated by the one-year flood (BLH Wet), Bottomland Hardwoods not inundated by the one-year flood (BLH Dry), and Wooded Swamp.

2. Land use changes over the project life, beginning in 1990, are as follows:

Target Year	BLH Wet	BLH Dry	Wooded Swamp
0	18,300	90,100	18,500
10	17,300	85,200	17,500
20	17,100	84,100	17,300
30	16,900	83,000	17,100
40	16,700	82,000	16,900
50	16,500	81,100	16,700

B. Future with the project.

1. Two new habitat types resulting from project implementation are project Rights-of-Way (300 acres) which has no habitat unit value due to In-Kind approach and Bottomland Hardwoods inundated by the one-year flood without the project and not inundated by the one-year flood with the project (BLH Wet/Dry).

2. Land use changes for the future with the project, beginning in 1990, are as follows:

Target Year	BLH Wet	BLH Dry	BLH Wet/Dry	Wooded Swamp
0	4,900	90,100	13,100	18,500
10	4,500	85,200	12,500	17,500
20	4,400	84,100	12,400	17,300
30	4,300	83,000	12,300	17,100
40	4,200	82,000	12,200	16,900
50	4,100	81,100	12,100	16,700

C. Habitat unit values (See Table A1).

D. Management Potentials (See Table A2).

Management potential is defined as the habitat unit value a habitat type can be expected to increase due to the application of realistic and biologically sound management practices while still retaining the same general habitat type characteristics. Purchase of land is responsible for an increase if this action protects the area from indiscriminate timber practices, etc. Table A2 provides the expected increases in habitat unit value with and without management. Management will consist primarily of improvements to existing timber stands for bottomland hardwoods and wooded swamps.

II. Calculations

A. The existing or base line habitat unit values were assigned to the habitat types during field investigations of the project area. Habitat unit values at the target years were based upon expected project impacts resulting from land use changes and restricting the existing water regimen.

Table A3 presents the annualized habitat units available under future without, and future with project conditions. The differences between these conditions can be attributed to the project and are also presented. The annualized habitat units are the result of multiplying the habitat unit values in Table 1 by the corresponding acreage figure presented earlier for each target year, and annualizing these figures over the project life. Project induced losses are the difference between the future with, and future without project conditions.

B. Determination of Compensation Requirements (See Tables A4 and A5).

1. Table A4 displays the per acre habitat unit value of purchasing land use easements and fee title acquisition (with and without management). The with project, without compensation value is based on the ratio of projected cleared woodlands to the total estimated non-dedicated acres of woodlands remaining, multiplied by the annualized habitat unit value for woodlands remaining and cleared to the total estimated non-dedicated acres of woodlands remaining, multiplied by the annualized unmanaged habitat unit value for woodlands. These values allow for the determination of a preservation value for the purchase of compensation lands. The following example shows how this was calculated for Bottomland Hardwoods, Wet:

TABLE A1

HABITAT UNIT VALUES

Without Levees and Connecting Channel

	Years					
Habitat Types	0	10	20	30	40	50
BLH Wet	71.8	71.8	71.8	71.8	71.8	71.8
BLH Dry	75.0	75.0	75.0	75.0	75.0	75.0
Wooded Swamp	76.8	76.8	76.8	76.8	76.8	76.8
Wet Ag	31.3	31.3	31.3	31.3	31.3	31.3
Dry Ag	25.6	25.6	25.6	25.6	25.6	25.6

With Levees and Connecting Channel/Without Pumps

	Years					
Habitat Types	0	10	20	30	40	50
BLH Wet	71.8	71.8	71.8	71.8	71.8	71.8
BLH Dry	75.0	75.0	75.0	75.0	75.0	75.0
Wooded Swamp	76.8	76.8	76.8	76.8	76.8	76.8
Wet Ag	31.3	31.3	31.3	31.3	31.3	31.3
Dry Ag	25.6	25.6	25.6	25.6	25.6	25.6

With Levees and Connecting Channel/With Pumps

	Years					
Habitat Types	0	10	20	30	40	50
BLH Wet	71.8	71.8	71.8	71.8	71.8	71.8
BLH Dry	75.0	73.5	72.0	70.5	69.0	67.5
Wooded Swamp	76.8	76.8	76.8	76.8	76.8	76.8
Wet Ag	31.3	31.3	31.3	31.3	31.3	31.3
Dry Ag	25.6	25.6	25.6	25.6	25.6	25.6
BLH Wet/Dry	71.8	70.9	70.0	69.1	68.3	67.5
ROW	0.0	0.0	0.0	0.0	0.0	0.0

TABLE A2

MANAGEMENT POTENTIALS

Habitat Unit Values - With Easements

Habitat Types	Years 0	10	20	30	40	50	Annualized	Mgt. Poten.
BLH Wet	71.8	71.8	71.8	71.8	71.8	71.8	71.8	0.0
BLH Dry	75.0	73.5	72.0	70.5	69.0	67.5	71.3	0.0
Wooded Swamp	76.8	76.8	76.8	76.8	76.8	76.8	76.8	0.0
Wet Ag	31.3	31.3	31.3	31.3	31.3	31.3	31.3	0.0
Dry Ag	25.6	25.6	25.6	25.6	25.6	25.6	25.6	0.0
BLH Wet/Dry	71.8	70.9	70.0	69.1	68.3	67.5	69.6	0.0

Habitat Unit Values - Fee Title With Natural Potential (No Management)

Habitat Types	Years 0	10	20	30	40	50	Annualized	Mgt. Poten.
BLH Wet	71.8	72.0	72.2	72.4	72.6	72.8	72.3	0.5
BLH Dry	75.0	75.0	75.0	75.0	75.0	75.0	75.0	0.0
Wooded Swamp	76.8	77.4	78.0	78.6	79.2	79.8	78.3	1.5
Wet Ag	31.3	33.7	35.8	37.4	40.4	50.0	37.6	6.3
Dry Ag	25.6	27.6	29.3	30.6	33.0	40.9	30.8	5.2
BLH Wet/Dry	71.8	71.1	70.4	69.7	69.1	68.5	70.1	0.5

Habitat Unit Values - Fee Title With Intensive Management

Habitat Types	Years 0	10	20	30	40	50	Annualized	Mgt. Poten.
BLH Wet	71.8	76.8	83.3	86.2	90.5	92.0	83.7	11.9
BLH Dry	75.0	76.0	77.0	78.0	79.0	80.0	77.6	6.4
Wooded Swamp	76.8	78.4	80.0	81.6	83.2	84.8	80.8	4.0
Wet Ag	31.3	60.0	60.0	60.0	60.0	60.0	57.0	25.8
Dry Ag	25.6	49.1	49.1	49.1	49.1	49.1	46.8	21.2
BLH Wet/Dry	71.8	73.5	75.2	76.8	78.4	80.0	76.0	6.4

TABLE A3

ANNUALIZED HABITAT UNIT LOSSES OR GAINS

Alternative: C; 17,500 cfs

	Future W/O Project (HU)	Future With Project (HU)	Project Induced Losses or Gains
BLH Wet	1,226,344	314,484	- 911,860
BLH Dry	5,988,555	5,988,555	0
BLH Wet/Dry	0	863,221	+ 863,221
Wooded Swamp	1,327,104	1,327,104	0
Total Losses			- 48,639

TABLE A4

ANNUALIZED HABITAT UNIT VALUES

Habitat Type	With Project, Without Compensation Value	Easements	Fee Title Without Mgt.	Fee Title With Mgt.
BLH Wet	58.0	71.8	72.3	83.7
BLH Dry	56.7	71.2	71.8	77.5
BLH Wet/Dry	58.3	69.6	70.1	76.0
Wooded Swamp	66.9	76.8	78.3	80.8

Target Year	0	10	20	30	40	50
Acres to be Cleared, Remaining	800	400	300	200	100	0

Annualized

800 - 400 x 10 x 0.5	=	2,000
400 - 300 x 10	=	1,000
400 - 300 x 10 x 0.5	=	500
300 - 200 x 20	=	2,000
300 - 200 x 10 x 0.5	=	500
200 - 100 x 30	=	3,000
200 - 100 x 10 x 0.5	=	500
100 - 0 x 40	=	4,000
100 - 0 x 10 x 0.5	=	500
		14,000

14,000 ÷ 50 years = 280 Annualized Acres

800 Acres
-280 Annualized Acres
520 Annualized Acres Cleared

Habitat Unit Value
BLH Wet = 71.8
BLH Wet (Cleared) = 0.0

280 x 71.8 = 20,104
520 x 0.0 = 0
Total 20,104

20,104 ÷ 800 = 25.13 Annualized Habitat Unit Value of BLH Wet and Cleared

800 ÷ 2,700	= 0.2963	x 25.1	=	7.44
1,900 ÷ 2,700	= 0.7037	x 71.8	=	50.53
Total				57.97
Use				58.0

By subtracting the with project without mitigation value from the value for easements, or fee title without management or fee title with management; a factor is obtained which can be utilized to determine the weighted benefit values, by multiplying the factor by the percent of each habitat type that could be expected to occur on any one acre. The following calculation shows how the weighted value is obtained for fee title with management:

BLH Wet	83.7 - 58.0 = 25.7 x 0.058 =	1.5
BLH Dry	77.5 - 56.7 = 20.8 x 0.664 =	13.4
BLH Wet/Dry	76.0 - 58.3 = 17.7 x 0.093 =	1.6
Wooded Swamp	80.8 - 66.9 = 13.9 x 0.205 =	2.8
Total weighted value for all woodlands		= 19.3

2. Table A5 displays the results of the habitat units lost divided by the weighted value to determine acreage requirements for compensation.

TABLE A5

COMPENSATION REQUIREMENTS

	HU Loss	Weighted Value	Compensation Requirement Acres
Easements	- 48,639	13.2	3,700
Fee Title Without Mgt.	- 48,639	14.3	3,400
Fee Title With Mgt.	- 48,639	19.3	2,500

SCENARIO I, STEP I

SATARTIA/YAZOO AREA LEVEES AND CONNECTING CHANNEL

I. Assumptions

A. Future without the project.

1. The project area, 757,000 acres, is divided into three habitat types; Bottomland Hardwoods inundated by the one-year flood (BLH Wet), Bottomland Hardwoods not inundated by the one-year flood (BLH Dry), and Wooded Swamp.

2. Land use for the project(s) life are as follows:

Target Year	BLH Wet	BLH Dry	Wooded Swamp
0	19,500	95,800	23,000
10	18,300	89,900	21,600
20	18,000	88,600	21,300
30	17,700	87,300	21,000
40	17,500	86,200	20,700
50	17,300	85,200	20,400

B. Future with the project.

1. Two new habitat types resulting from project implementation are project Rights-of-Way (5,900 acres) which have no habitat unit values due to In-Kind approach and Bottomland Hardwoods inundated by the one-year flood without the project and not inundated by the one-year flood with the project (BLH Wet/Dry).

2. Land use for the project(s) life are as follows:

Target Year	BLH Wet	BLH Dry	BLH Wet/Dry	Wooded Swamp
0	17,600	91,200	1,100	21,900
10	16,500	85,300	900	20,500
20	16,200	84,000	800	20,200
30	15,900	82,700	800	19,900
40	15,700	81,600	800	19,600
50	15,500	80,600	800	19,300

C. Habitat unit values (See Table A1).

D. Management potentials (See Table A2).

II. Calculations

A. The methodology for the calculations are the same as for Scenerio I, Step I, Alternative C, 17,500 cfs.

B. Tables A6, A7, and A8 show the Annualized Habitat Unit Losses or Gains, Annualized Habitat Unit Values and Weighted Values, and Compensation Requirements, respectively. The remainder of this example will address fee title acquisition with management only. Calculations were completed for all acquisition options and are shown in Table A15.

TABLE A6

ANNUALIZED HABITAT UNIT LOSSES OR GAINS

Alternative: Satartia/Yazoo Area Levees and Connecting Channel

Habitat Type	Future W/O Project (HU)	Future With Project (HU)	Project Induced Losses or Gains
BLH Wet	1,290,964	1,161,006	- 129,958
BLH Dry	6,637,500	6,292,500	- 345,000
BLH Wet/Dry	0	56,390	+ 56,390
Wooded Swamp	1,632,768	1,548,288	- 84,480
Total Losses			- 503,048

TABLE A7

ANNUALIZED HABITAT UNIT VALUES AND WEIGHTED VALUE

Habitat Type	With Project Without Compensation Value	Weighted Value
BLH Wet	56.3	3.6
BLH Dry	57.3	12.3
BLH Wet/Dry	38.3	0.1
Wooded Swamp	66.4	3.7
Total		19.7

TABLE A8

COMPENSATION REQUIREMENTS

	HU Loss	Weighted Value	Compensation Requirement (Acres)
Fee Title With Mgt.	503,048	19.7	25,500

SCENARIO I, STEP II

ALTERNATIVE C, 17,500 cfs

I. Assumptions

A. Future without the project

1. Land use changes on the remaining non-dedicated wooded acreages over the project life for fee title with management only are as follows:

Target Year	BLH Wet	BLH Dry	Wooded Swamp
0	2,900	14,300	2,900
10	2,500	12,200	2,500
20	2,400	11,800	2,400
30	2,300	11,400	2,300
40	2,200	10,900	2,300
50	2,100	10,600	2,200

B. Future with the project

1. Land use changes are as follows:

Target Year	BLH Wet	BLH Dry	Wooded Swamp
0	2,900	14,300	2,900
10	2,300	11,600	2,400
20	2,200	11,000	2,200
30	2,100	10,400	2,100
40	2,000	9,900	2,000
50	1,900	9,500	2,000

C. Habitat Unit Values (See Table A1).

D. Management Potentials (See Table A2).

II. Calculations

A. The methodology for the calculations are the same as previously discussed.

B. The Annualized Habitat Unit Losses or Gains, Annualized Habitat Unit Values and Weighted Value, and the Compensation Requirements are shown in Table A9, A10, and A11, respectively.

TABLE A9

ANNUALIZED HABITAT UNIT LOSSES OR GAINS

Alternative: C, 17,500 cfs

Habitat Type	Future W/O Project (HU)	Future With Project (HU)	Project Induced Losses or Gains
BLH Wet	170,884	157,960	-12,924
BLH Dry	839,220	783,555	-55,665
Wooded Swamp	185,088	171,264	-13,824
Total			-82,413

TABLE A10

ANNUALIZED HABITAT UNIT VALUES AND WEIGHTED VALUE

Habitat Type	With Project Without Compensation Values	Weighted Value
BLH Wet	54.4	4.2
BLH Dry	54.6	16.3
Wooded Swamp	58.5	3.2
Total		23.7

TABLE A11

COMPENSATION REQUIREMENTS

	HU Loss	Weighted Value	Compensation Requirements (Acres)
Fee Title With Mgt.	82,413	23.7	3,500

SCENARIO I, STEP II

SATARTIA/YAZOO AREA LEVEES AND CONNECTING CHANNEL

I. Assumptions

A. Future without the project

1. Land use changes on the remaining non-dedicated wooded acreage over the project life for the fee title with management only are as follows:

Target Year	BLH Wet	BLH Dry	Wooded Swamp
0	3,200	15,600	3,800
10	2,700	13,300	3,200
20	2,600	12,800	3,100
30	2,500	12,300	3,000
40	2,400	11,900	2,800
50	2,300	11,500	2,700

B. Future with the project

1. Land use changes are as follows:

Target Year	BLH Wet	BLH Dry	Wooded Swamp
0	3,200	15,700	3,700
10	2,700	13,200	3,100
20	2,500	12,600	3,000
30	2,400	12,100	2,900
40	2,300	11,600	2,800
50	2,200	11,200	2,700

C. Habitat Unit Values (See Table A1).

D. Management Protentials (See Table A2).

II. Calculations

A. The methodology for the calculations are the same as previously discussed.

B. Tables A12, A13, and A14 show the Annualized Habitat Unit Losses or Gains, Annualized Habitat Unit Values and Weighted Value, and Compensation Requirements, respectively.

TABLE A12

ANNUALIZED HABITAT UNIT LOSSES OR GAINS

Alternative: Sartartia/Yazoo Area Levees and Connecting Channel

Habitat Type	Future W/O Project (HU)	Future With Project (HU)	Project-Induced Losses or Gains
BLH Wet	185,962	180,936	- 5,026
BLH Dry	957,750	944,250	-13,500
Wooded Swamp	235,776	230,400	- 5,376
Total			-23,902

TABLE A13

ANNUALIZED HABITAT UNIT VALUES AND WEIGHTED VALUE

Habitat Type	With Project Without Compensation Values	Weighted Value
BLH Wet	56.5	3.8
BLH Dry	60.1	12.2
Wooded Swamp	62.3	3.0
Total		19.0

TABLE A14

COMPENSATION REQUIREMENTS

	HU Loss	Weighted Value	Compensation Requirements (Acres)
Fee Title With Mgt.	23,902	19.0	1,300

III. Conclusions

A. By totaling the compensation requirements calculated in Steps I and II, it is possible to determine the total wooded acreage necessary to compensate for terrestrial losses as follows;

1. Alternative C, 17,500 cfs

Step I	2,500 acres
Step II	3,500 acres
TOTAL	6,000 acres

2. Satartia/Yazoo Area Levee and Connecting Channel

Step I	25,500 acres
Step II	1,300 acres
TOTAL	26,800 acres

B. Table A15 shows the compensation requirements calculated for Scenarios I, II, and III.

Table A15

COMPENSATION REQUIREMENTS

Alternative	Scenario I			Scenario II			Scenario III		
	Easements	Fee W/O Mgt.	Fee With Mgt.	Easements	Fee W/O Mgt.	Fee With Mgt.	Easements	Fee W/O Mgt.	Fee With Mgt.
Levees	33,500	32,600	26,800	33,800	32,900	27,100	34,100	33,200	27,300
C, 25,000 cfs				14,700	14,100	11,900			
C, 17,500 cfs	6,500	6,300	6,000	11,300	10,900	9,200	13,000	12,600	9,500
H				0	0	0			
F				6,600	6,300	5,300			

APPENDIX B

MAN-DAY AND MONETARY EVALUATION

Prepared by:

U. S. Army, Corps of Engineers

Vicksburg District

Vicksburg, Mississippi

1981

ATTACHMENT 1
YAZOO AREA PUMP STUDY
METHODOLOGY FOR QUANTIFICATION OF FISH AND WILDLIFE LOSSES

1. Sport Fishing.

a. Assume 7 man-days/acre for lakes (1-year), 2 man-days/acre for streams (100-year), and 1 man-day/acre for wetlands (1-year).[a/]

b. Reduce this by a factor of 0.39 which is the percent reduction in total sport fish production when all flooding is eliminated (based on "Fish Populations of Mississippi River Oxbow Lakes in Louisiana," Lambou).

c. Further reduce the losses in lakes and streams by the percent reduction in total acres flooded, and reduce the wetlands by reduction in flooding of wooded acres.

d. Dollar value = Ac X MD/Ac X % reduction in flooding X 0.39 x $2.25.

e. Example: 80 foot, 10,000 cubic feet per second (Plan A).

	Lower Ponding Area		Upper Ponding Area	
Lakes	905 Ac X 7 MD X 0.299 X 0.39 X $2.25 =	$ 1,662	1,450 Ac X 7 MD X 0.420 X 0.39 X $2.25 =	$ 3,741
Streams	3,394 Ac X 2 MD X 0.299 X 0.39 X $2.25 =	$ 1,781	3,844 Ac X 2 MD X 0.420 X 0.39 X $2.25 =	$ 2,833
Wetlands	2,800 Ac X 1 MD X 0.244 X 0.39 X $2.25 =	$ 600	2,500 Ac X 1 MD X 0.380 X 0.39 X $2.25 =	$ 834
Total Lower Ponding Area		$ 4,043	Total Upper Ponding Area	$ 7,408
	TOTAL BOTH PONDING AREAS	$11,451		
	USE	$11,500		

2. Commercial Fishing.

a. Assume $10 per acre per year value for lakes, $5/Ac/yr for streams and wetlands.

b. Reduce this by a factor of 0.69 which is the percent reduction in total commercial fish production when all flooding is eliminated (based on "Fish Populations of Mississippi River Oxbow Lakes in Louisiana," Lambou).

c. Further reduce the losses in lakes and streams by the percent reduction in total acres flooded and reduce the wetlands by the reduction in flooding of wooded acres.

d. Dollar value = Ac X % reduction in flooding X 0.69 X $/Ac.

e. Example: 80 foot, 10,000 cubic feet per second (Plan A).

	Lower Ponding Area		Upper Ponding Area	
Lakes	905 Ac X $10 X 0.299 X 0.69 =	$ 1,867	1,450 Ac X $10 X 0.420 X 0.69 =	$ 4,202
Streams	3,394 Ac X $5 X 0.299 X 0.69 =	$ 3,501	3,844 Ac X $5 X 0.420 X 0.69 =	$ 5,570
Wetlands	2,800 Ac X $5 X 0.244 X 0.69 =	$ 2,357	2,500 Ac X $5 X 0.380 X 0.69 =	$ 3,278
Total Lower Ponding Area		$ 7,725	Total Upper Ponding Area	$13,050

TOTAL BOTH PONDING AREAS $20,775

USE $20,800

3. Furbearer Losses.

a. Based on 1979 fur prices and furbearer populations per acre, a value/acre of $2.60 for wetland species and $2.14 for bottom-land hardwoods was developed.

b. A reduced flooding loss to furbearers was developed using the wooded acres in the 1-year flood reduced by each alternative.

c. Dollar loss per acre as a result of reduced flooding ($2.60 - 2.14 = $0.46).

d. Example: 80 foot, 10,000 cubic feet per second (Plan A).

Lower Ponding Area			Upper Ponding Area		
Condition	1-Year Flood	Acres Reduced	Condition	1-Year Flood	Acres Reduced
Existing	10,600		Existing	14,700	
80 foot, 10,000	5,600	5,000 Ac X $0.46 = $2,300	80 foot, 10,000	4,740	9,980 X $0.46 = $4,591

TOTAL LOSS TO REDUCED FLOODING $6,891

e. A furbearer loss to induced clearing was developed using $2.60/Ac for induced clearing of wetlands and $2.14/Ac for bottom-land hardwoods.

Lower Ponding Area		Upper Ponding Area	
Induced loss of bottom-land hardwoods[b/]	1,111 Ac X $2.14 = $2,378	Induced loss of bottom-land hardwoods	396 Ac X $2.14 = $847
Induced loss of wooded swamp	119 Ac X $2.60 = $ 309	Induced loss of wooded swamp	24 Ac X $2.60 = $ 62
Total Lower Ponding Area	$2,687	Total Upper Ponding Area	$909

TOTAL FURBEARER LOSS = $6,891 + $2,687 + $909 = $10,487

4. Waterfowl Losses to Reduced Flooding.

a. Assume 5-year flood, both cleared and wooded, is the area influencing waterfowl, migratory and resident.

b. Each acre of woods has 0.7 MD/yr at $9.00/MD or $6.30/Ac. Each acre of cleared land has 0.3 MD/Ac/yr or $2.70/Ac/yr.

c. The number of acres removed from the 5-year flood by each alternative X $6.30 (or $2.70) = waterfowl loss to reduced flooding. (Average acres flooded per day for the 28-year period of record from 1 December-15 January.)

d. Example: 80-foot, 10,000 cubic feet per second (Plan A).

Lower Ponding Area

	Wooded			Cleared	
Existing 80-foot, 10,000 cfs	10,520 9,914		Existing 80-foot 10,000 cfs	8,708 7,907	
Acres reduced	606 Ac X $6.30	= $3,818	Acres reduced	801 Ac X $2.70	= $2,163

Upper Ponding Area

	Wooded			Cleared	
Existing 80-foot, 10,000 cfs	9,790 9,594		Existing 80-foot, 10,000 cfs	7,090 6,961	
Acres reduced	196 Ac X $6.30	= $1,235	Acres reduced	129 Ac X $2.70	= $348

TOTAL LOSS BOTH PONDING AREAS $7,564

5. Big Game, Small Game, Wildlife-Oriented Recreation.

a. Assume 0.62 MD and $5.58/Ac for big game. This was developed using deer and turkey hunting data from the Mississippi Bureau of Fisheries and Wildlife Mail Harvest Survey. A harvest potential of 1 deer per 30 acres with a hunter effort of 14.7 days per deer gave a 0.49 man-day per acre value for deer.

A harvest potential of 1 turkey per 60 acres with 7.8 hunter days per harvest gave a 0.13 man-day value for turkey.

0.49
0.13

0.62 = MD/Ac value for big game for bottom-land hardwood

b. Using a similar method, the following small game values were developed.

	Harvest Potential	Days Effort/One	MD/Ac
Rabbit	1/4 acres	0.56	0.14
Squirrel	1/2 acres	0.41	0.21
Raccoon	1/16 acres	0.76	0.05
			0.40 MD/Ac value for small game

Small game = 0.40 MD and $0.90/Ac bottom-land hardwood.

c. Wildlife-oriented recreation was given a value of 1 man-day and $2.25 per acre of bottom-land hardwood.

d. Similar methods were used to develop losses for wooded swamp.

Big Game = 0.2 man-day and $1.80 per acre value

Small Game = 0.1 man-day and $0.23 per acre value

Wildlife-oriented recreation = 1 man-day and $2.25 per acre value

e.

	Lower Ponding Area			Upper Ponding Area		
	Induced Acres			Induced Acres		
Bottom-land hardwoods	1,111 ac	X $8.73	= $ 9,699	396 ac	X $8.73	= $3,457
Wooded swamp	119 ac	X $4.28	= $ 509	24 ac	X $4.28	= $ 103
	TOTAL LOSS BOTH PONDING AREAS			$13,768		

a/ Mississippi Bureau of Fisheries and Wildlife studies show average standing crop of sport fish of 57.9 lb/Ac in Wasp Lake. Assume 75 percent of these available size, 50 percent catchability, 3 lb/man-day caught.

57.9 X 0.75 ÷ 2 ÷ 3 = 7 MD/Ac/yr

b/ Annualized induced clearing acres plus rights-of-way.

c/ Reference: "Shallow-Water Impoundment Increases Soil Moisture and Growth of Hardwoods," Broadfoot.

DOLLAR VALUE PER ACRE PER YEAR[a/]
YAZOO AREA PUMP STUDY

Category	Bottom-land Hardwoods and Wooded Wetlands	Wooded Swamp	Cleared Land
Big Game	5.58	1.80	0.09
Small Game	0.90	0.23	0.29
Waterfowl	6.30	6.30	2.70
Wildlife-Oriented Recreation	2.25	2.25	0.23
Furbearers[b/]	2.14	2.60	0.00
Total	5-yr and below - 17.17 Above 5-yr - 10.87[c/]	5-yr - 13.18 Above 5-yr - 6.88	5-yr - 3.31 Above 5-yr - 0.61

a/ Dollar values based on Principles and Standards.
9.00/Day, Big Game and Waterfowl.
2.25/Day, Small Game and Fishing.

b/ Fur values based on 1979 fur values provided by Mississippi Fur Cooperative.

c/ Difference in 5-year above and below is availability of water for waterfowl utilization.

VALUE OF BOTTOM-LAND HARDWOODS
YAZOO DELTA 1976-1977
(MISSISSIPPI DEPARTMENT OF WILDLIFE CONSERVATION)

Species	Population	Harvest Potential	Days Hunted	Harvest	Success	Day Effort For One	MD/Ac	$ Value/ Ac	Cleared Land Value	
									MD Effort	$ Value
Deer	1/10 Ac	1/30 Ac								
Gun			155,800	11,503	1/13.5	13.5	.45			
Archery			26,345	816	32.3	32.3	1.08			
Primitive Gun			5,084	407	12.5	12.5	.42			
Total			187,229	12,726	14.7	14.7	.49	4.41	.01	.09
Turkey	1/20 Ac	1/60 Ac	22,785	2,917	7.8	7.8	.13/62	1.17		
Small Game										
Rabbit	1/2 Ac	1/4 Ac	144,657	258,246	1.79/1	.56	.14			
Squirrel	1/1 Ac	1/2 Ac	128,316	314,775	2.45/1	.41	.21			
Raccoon	1/4 Ac	1/16 Ac	29,519	38,678	1.31/1	.76	.05			
Total							.40	.90	.13	.29
Waterfowl	1/.105	1/.5	107,394	285,392	2.7/1	.37	.7 on 1-yr freq flood	6.30	.7	6.30
Wildlife-Oriented Recreation							1.00	2.25	.10	.23
Total							2.76	15.03	.94	6.91

TABLE G-4
ENVIRONMENTAL LOSSES FOR ALTERNATIVES
YAZOO PUMP STUDY

Elevation and Pump Size	(1) Sport Fishery Loss ($)	(2) Commercial Fishery Loss ($)	(3) Furbearer Loss ($)	(4) Waterfowl Loss From Reduced Flooding ($)	(5) Forest Game and Wildlife Oriented Loss ($)	(6) Total Value Loss ($)	(7) Total Gain Cleared Land Value ($)	(8) Net Losses ($)	(9) Terrestrial Wildlife Losses ($)
Plan A									
10,000 cfs	11,500	20,800	10,500	7,600	13,800	64,200	1,000	63,200	31,900
15,000 cfs	17,100	31,200	13,500	41,800	21,300	124,900	1,600	123,300	76,600
17,500 cfs	19,000	34,800	14,300	55,700	24,400	148,200	1,800	146,400	94,400
20,000 cfs	21,200	38,800	15,200	71,300	27,800	174,300	2,000	172,300	114,300
25,000 cfs	23,300	42,800	16,200	88,000	31,400	201,700	2,300	199,400	135,600
30,000 cfs	24,000	44,000	16,400	88,000	32,200	204,600	2,300	202,300	136,600
Plan B									
15-10,000 cfs[a/]	25,500	46,900	18,300	92,000	34,500	217,200	2,500	214,700	144,800
10-15,000 cfs[a/]	26,400	48,600	18,400	92,000	34,800	220,200	2,500	217,700	145,200
7-18,000 cfs[a/]	26,600	49,000	18,500	92,000	35,300	221,400	2,600	218,800	145,800
Plan C									
10,000 cfs	11,700	21,200	10,400	2,600	13,500	59,400	1,000	58,400	26,500
15,000 cfs	15,500	28,200	12,700	8,000	20,200	84,600	1,500	83,100	40,900
17,500 cfs	17,400	31,700	13,500	10,600	23,100	96,300	1,700	94,600	47,200
20,000 cfs	19,500	35,600	14,300	13,500	26,300	109,200	2,000	107,200	54,100
25,000 cfs	21,500	39,200	15,200	17,000	29,600	122,500	2,200	120,300	61,800
30,000 cfs	22,000	40,400	16,000	17,000	35,000	130,400	2,300	128,100	68,000
Plan D									
25,000 cfs	16,000	29,000	7,700	0	22,600	75,300	1,700	73,600	30,300
Plan E									
25,000 cfs	19,700	35,700	13,600	13,300	27,800	110,100	2,000	108,100	54,700

TABLE G-4 (Cont)

Elevation and Pump Size	(1) Sport Fishery Loss ($)	(2) Commercial Fishery Loss ($)	(3) Furbearer Loss ($)	(4) Waterfowl Loss From Reduced Flooding ($)	(5) Forest Game and Wildlife Oriented Loss ($)	(6) Total Value Loss ($)	(7) Total Gain Cleared Land Value ($)	(8) Net Losses ($)	(9) Terrestrial Wildlife Losses ($)
Plan F									
10,000 cfs	7,200	12,600	4,900	2,600	8,800	36,100	700	35,400	16,300
15,000 cfs	11,000	19,400	6,200	8,000	14,400	59,000	1,000	58,000	28,600
17,500 cfs	12,500	22,000	6,800	10,600	16,700	68,600	1,200	67,400	34,100
20,000 cfs	14,200	25,000	7,500	13,500	19,300	79,500	1,400	78,100	40,300
25,000 cfs	15,400	28,000	8,400	17,000	22,700	91,500	1,600	89,900	48,100
30,000 cfs	16,200	29,000	8,500	17,000	23,300	94,000	1,700	92,300	48,800
Plan G									
10,000 cfs	5,400	9,300	1,700	2,600	6,500	25,500	500	25,000	10,800
15,000 cfs	9,400	16,700	2,700	8,000	10,200	47,000	700	46,300	20,900
17,500 cfs	10,800	19,300	3,300	10,600	12,700	56,700	900	55,800	26,600
20,000 cfs	12,400	22,200	4,000	13,500	15,600	67,700	1,100	66,600	33,100
25,000 cfs	14,280	26,200	4,900	17,000	18,500	80,880	1,400	79,480	40,400
Plan H (EQ)									
15,000 cfs[b/]	9,400[b/]	16,700[b/]	2,700[b/]	8,000[b/]	10,200[b/]	-252,000[c/]	700	-252,700[c/]	-279,500[c/]
Plan I									
10,000 cfs	2,000	3,000	800	0	3,200	9,000	200	8,800	4,000
15,000 cfs	2,800	5,000	1,200	0	4,400	13,400	300	13,100	5,600
20,000 cfs	3,800	6,000	1,600	0	6,000	17,400	400	17,000	7,600

a/ The first number indicates the pump capacity in the lower ponding area; the second number indicates the pump capacity in the upper ponding area.

b/ Losses excluding benefit resulting from the purchase of 30,000 acres of forested land.

c/ Net gain including benefit of $299,000 associated with purchase, preservation, development, and management of 30,000 acres of forested land.

ATTACHMENT 1

YAZOO BACKWATER AREA PUMP PROJECT AND
YAZOO BACKWATER AREA LEVEE [1/] AND SATARTIA AREA LEVEE PROJECTS
MAN-DAY (USER) ANALYSIS
FISHERY MITIGATION PLAN

GENERAL

FISH AND WILDLIFE LOSSES

Fishery Losses

1. Sport and commercial fishery resource evaluations are based on biological considerations concerning the effects of the project on about 15,000 acres of area lakes, streams, sloughs, and rivers, as well as the intermittent ponding area. Based on the man-day analysis, estimated average annual fishery resources valued at $49,100 are expected to be lost as a result of implementation of the tentatively selected pumping plant project for Scenario I (Table 1), while fishery resource losses as a result of the levee projects are valued at $26,500 (Table 2).

Wildlife Losses

2. Wildlife losses are based on an analysis of with- and without-project land use data, the per-acre sustained annual production of wildlife resources, man-day utilization, and annual commercial harvests of wildlife. Land use

1/ Includes connecting channel in levee projects.

TABLE 1
ENVIRONMENTAL LOSSES TO FISH AND WILDLIFE
TENTATIVELY SELECTED PLAN, SCENARIO I, STEP I AND II
YAZOO AREA PUMP PROJECT, MISSISSIPPI

Item	Annual Value			
	Step I		Step II	
	($)	($)	($)	($)
Wildlife				
Furbearers	9,552		193	
Forest game and wildlife	2,619		786	
Waterfowl	10,600			
Less gain to cleared land value	183		55	
Total Wildlife		22,588		924
Fishing				
Sport	17,400			
Commercial	31,700			
Total Fishing		49,100		
TOTAL		71,871		924

TABLE 2
ENVIRONMENTAL LOSSES TO FISH AND WILDLIFE
INSTALLED PLAN, SCENARIO I, STEP I AND II
YAZOO BACKWATER AREA LEVEE PROJECTS, MISSISSIPPI

Item	Annual Value			
	Step I		Step II	
	($)	($)	($)	($)
Wildlife				
Furbearers	15,741		0	
Forest game and wildlife	50,926		0	
Waterfowl	21,000			
Less gain to cleared land value	4,087		0	
Total Wildlife		83,580		0
Fishing				
Sport	9,500			
Commercial	17,000			
Total Fishing		26,500		—
TOTAL		110,080		0

information was compiled on the 757,000-acre levee project area and the 539,000-acre pumping plant project area. The amount of induced clearing was used to compile acreages of forest lands and cleared lands with and without the levee project and the proposed pumping plant. Sustained annual production of wildlife resources on a per-acre basis was calculated for wildlife in the categories of Big Game, Small Game, Waterfowl, Wildlife-Oriented Recreation, and Furbearers, based on available wildlife survey information.

3. Annual man-day use of wildlife (hunting and wildlife-oriented recreational use) and annual commercial harvests expected to be lost as a result of the tentatively selected pumping plant facility were estimated at $23,512 (Table 1) and for the levee projects, $83,580 (Table 2). The methodology for computing the man-day (user) losses is presented in Appendix G, Environmental Analysis. Man-day per-acre benefits and acreage derivation analyses for Scenario I are presented in this attachment.

4. In the Yazoo Area, the completed Muddy Bayou structure is estimated to provide an annual benefit of 22,000 man-days of sport fishing and 74,000 pounds of commercial fish harvest in Eagle Lake (FWS Report Annex L., Volume IV, page 30, House Document 308, 88th Congress, 2d Session).

FISHERY MITIGATION

5. The combined annual fishery losses, both sport and commercial, as a result of the completed Yazoo Backwater Levee Projects and the proposed Yazoo Backwater Area Pumping Plant are estimated at $75,600. The completed Muddy Bayou structure is estimated to provide annual fishery benefits of $71,700 (see display below), resulting in remaining fishery losses from both flood control projects of $3,900.

	Sport Fish		Commercial Fish		Total
	Value ($)	Man-Days	Value ($)	Pounds (lb)	Value ($)
Steele Bayou Structure Benefits	49,500	22,000	22,200	74,000	+71,700
Yazoo Area Pump Losses	17,400	7,733	31,700	105,667	-49,100
Yazoo Backwater Levees Losses	9,500	2,667	17,000	39,150	-26,500
					- 3,900

6. In an effort to offset the remaining area fishery resource losses from both flood control projects, numerous investigations of the project areas and coordination efforts with other Federal and state agencies were undertaken in an effort to identify possible structural mitigation measures to mitigate, preserve, and enhance fishery resources. These included diversion of Mississippi River water into Eagle Lake and the construction of lakes which would be protected against surface drainage; the construction of weirs in existing channels to improve water quality; and modification of floodgate operational procedures on Steele Bayou and Little Sunflower River drainage structures.

7. Modification of the existing rule curve operation of the Steele Bayou drainage structure to pond water to elevation 75 feet, National Geodetic Vertical Datum, from 1 May to 1 September would provide some minor benefits to the sport and commercial fishery resources; however, the damage induced to the

area terrestrial resources would be much greater than the benefit to the existing fishery resources. 2/

8. No additional feasible structural measures were identified to improve the area fishery resources. The limiting factors affecting water quality and, therefore, the sport and commercial fishery are suspended sediments and associated pesticides. To improve the aquatic resources, it would be necessary to reduce the influx of these pollutants. Since the watersheds of lakes, streams, and wetlands are often cleared and used in intensive agricultural production, renovation of these waters is economically and physically impractical. The problem is not localized in the project areas but is basinwide. These basinwide water quality problems flow into the project area.

9. The remaining fishery losses ($3,900 in unmitigated fishery losses) were considered unpreventable damages that could not be offset or significantly reduced at any reasonable cost and will be charged as a cost to the project.

2/ Benefits refer to the lessening of fish and wildlife losses as a result of implementation of the flood control projects; these benefits do not relate to net positive mitigation benefits.

APPENDIX C

This Appendix was originally written as part of
The Yazoo Basin: An Environmental Overview

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FLOODING IN BOTTOMLAND HARDWOODS

Bottomland hardwood wetlands, floodplain grassbeds, and other extensions of the riparian habitat constitute the primary factors involved in the rejuvenation and continuation of the fish and wildlife resources. The periodic inundation of floodplain habitat initiates a sequence of events that allows bottomland hardwoods to be one of the most productive habitats in the United States.

The sequence is begun by the annual dropping of leaves in autumn in the sub-tropical, deciduous forests of the Yazoo Basin. As the leaves fall to the ground and create a cover for the forest floor, they are colonized by various bacteria and fungi and, thus, decomposition begins. The decomposition of the leaf material "recycles" the nutrients available and releases them for use by a wide variety of organisms. This is commonly referred to as the "base link" of the food chain.

The heavy winter and spring rains that are characterictic of sub-tropical forests cause the adjacent streams and bayous to swell and overflow their banks. As the water begins to spread across the forest floor the next step in the rejuvenation process is begun. The bacteria and fungi that are already present on the detritus (leaf material) of the forest floor grow in number and the decomposition process is accelerated. While these microorganisms are removing nutrients essential for their growth, the water also acts to help break down the leaves by leaching, or soaking, some of the inorganic nutrients that are easily given up from the detritus. A portion of the released nutrients are taken up for growth by microscopic plants, called phytoplankton, and the remainder is destined for use in the adjacent stream when the water recedes.

As the water gradually covers the forest floor and begins to warm, invertebrates such as water fleas, that have been "resting" in eggs through the harsh winter conditions, begin to hatch and feed upon the bacteria and fungi colonizing the detritus (Pennak 1953). The general process of this feeding activity has been compared to eating peanut butter on crackers. Very little nutrient is derived from the cracker, however, the nutrient rich peanut butter is taken in with the cracker and serves to feed the needs of the body.

A similar situation occurs in the process of invertebrates feeding upon the detritus. The leaf material itself adds little to the food needs of the organism, but the bacteria and fungi that are present on the material are a rich source of nutrients. The nutrients are removed during the digestive process and the "waste" leaf material is expelled. New bacteria and fungi recolonize the expelled leaf material and the process begins again. In this process, therefore, a single particle of detritus can be the source of food for several organisms. As the leaf break down continues, the feeding invertebrates increase in numbers, thus providing food for a large number of predators.

At approximately the same time as the above processes are taking place, the factors that trigger the spawning sequence in fishes are occurring. Reproduction in fishes has evolved so that sites for spawning and development of the young provide the necessary biological havens, or nursery areas, that are conducive to the survival of the offspring. The sequence of events that culminate in the introduction of new life into the species community begins with the spawning process.

The factors that initiate the mating act in fishes are not clearly understood, however, it is commonly accepted that temperature, day-length, and the rise in water level are important in the process. As a result of competition for spawning habitat among the various kinds of fishes, a system has evolved whereby maximum use is made of available habitat. The results of this competition have been the evolution of an array of spawning techniques. Some fishes, such as bass and sunfish, build nests and guard the eggs and young while others, such as shad, buffalo, and carp, merely broadcast, or spray their eggs over vegetation. In the latter, the eggs possess an adhesive (or sticky) coating that allows them to cling to the vegetation during egg development. By doing this, the eggs are kept suspended above the bottom and, therefore, clean of silt and debris. In addition, the eggs are aerated by water movement which provides oxygen needed by the developing embryo and allows free movement of waste gases out of the egg. The deposition of these eggs upon vegetation also provides cover and protection against predation. Essentially, the suspension above the forest floor supplies the same functions that are received by eggs laid in nests, where the adult fans the eggs to keep them clean and protects the nest against predatation.

Upon hatching, most freshwater fishes possess a yolk sac that consists of material that was the nutrient source for the embryo. The yolk sac remains, depending upon the species, for several days after hatching. During this period the fish is still developing functional organs such as the mouthparts and circulatory system. Until the mouth is fully developed, the fish recieves nutrient totally from the yolk material. By the time the yolk is absorbed, or "used up", the mouth parts and primitive digestive system are developed and ready to function in external

feeding. This point in the life of the fish has been described as the "critical period". It is so designated because studies have shown that if food is not encountered in a very short period of time the fish will die of starvation (May, 1974 after Hjort 1926, Ahlstrom 1954). The main factors involved in this feeding transition are (1) the density of food organisms and (2) the capability of the larva to capture its food (Hempel 1965, Schuamnn 1965).

One can now easily see the dramatic importance of leaf decomposition and the ensuing increase in the invertebrate population to fishes. Flooded hardwoods and the abundance of food they produce enable the fish larvae to encounter the critical food supply necessary for survival and growth. As the amount of flooded hardwoods increase, the supply of spawning and nursery habitat and the associated invertebrate populations also increase. The result is an acceleration in the productivity of the habitat and, therefore, greater survival and growth in the fishery populations.

Fish growth in a productive nursery habitat is extremely rapid as the young explode with new-found energy. With each capture of a prey organism the fish improves its ability to recognize and capture food (Schuamnn 1965). Swimming ability develops at an extremely rapid rate and, within a month, the young fish may grown from slightly over one-tenth of an inch to more than two inches. The rapid growth rate has evolved through adaptations by the fish to make maximum use of the period of overbank flooding and exposure to the extremely productive habitat that is made available.

When the water returns to the stream beds in late spring, it carries with it the results of nature's renewal of life for the fishery populations. However, the flooding of adjacent wetlands not only benefits the invertebrate and fishery populations, but rather the entire ecosystem.

During the period of low water, when stream flow is confined to the main channels, organic nutrients (i.e. leaf debris) that have entered as a result of previous floods are consumed by the biological communities in the aquatic ecosystem. Just as with any organism, when food is taken into the system a portion of the food is used for nutrient and the remaining is expelled as waste product. In the aquatic community, the general trend is to consume organic material and expell the by-products in the form of inorganic compounds. As this process continues through time, the amount of organic material begins to diminish while the amount of inorganic material increases. When floodwaters cover the bottomland hardwood forest floor, a recharge of organic material (leaf debris) is introduced into the system in exchange for the inorganic material contained in the rising floodwaters. The inorganic material introduced can be utilized by the bottomland hardwood forests as a source of nutrient

for that community. As the floodwaters enter the hardwood habitat, a natural "water break" occurs due to the physical obstruction by the trees. When this takes place, the water is slowed and silt particles are dropped out of the water column. This phenomenon creates a habitat within the bottomland hardwoods that is high in water quality and conducive to high rates of productivity. Further filtration occurs as the floodwaters recede and pass through the understory vegetation of the forest. Therefore, returning floodwaters carry with them purified water and leaf material from the forest that will assure a nutrient supply for yet another year. In return, the forests have also received essential nutrients for growth and food production that will benefit the wildlife inhabitants of that community. Thus, the flooding sequence has succeeded in giving new life to both the aquatic and terrestrial biota of the area while improving the water quality of the aquatic ecosystem.

Mast is a generalized term used to identify the composite production of fruit (i.e. acorns, hickory nuts) in a forest community. According to the Forest Service Handbook, "Normally, trees on moist, fertile sites produce larger yields (of mast) than trees on fertile, droughty sites". The flooding sequence previously described contributes to conditions of saturated soils in bottomland hardwoods and ultimately to mast production. Mast provides a valuable food source for several wildlife species, including resident and migratory waterfowl.

One of the most commonly discussed resident waterfowl is the wood duck. McGilvery (1966) outlined the habitat requirements for wood duck breeding, brooding, and nesting. Wood duck survival is closely linked to bottomland hardwood forests with trees of sufficient size to contain usable nest cavities and water areas that satisfy food and cover requirements.

Little is known concerning the spring food requirements, however, successful overwintering is highly dependent upon acorns, corn, and other domestic grains, smartweed, buttonbush, bulrush, pondweed, cypress, ash, sweetgum, burreed, and arrow-arum seeds. During periods of flooding, bottomland hardwoods offer expanded feeding and nesting areas. According to Fredrickson (1979), wood ducks forage throughout the flooded zones. They feed on mast and invertebrates, with important feeding areas being less than 12 inches in depth. Wood ducks concentrate along the edge of the flooded zones where new areas are constantly being flooded as water levels rise. Although wood ducks often nest near open water, they meet their nutritional demands for breeding by exploiting food resources in the constantly shifting zone of temporarily flooded timber. Successful reproduction (egg-laying) in the wood duck is dependent upon the female's ability to acquire adequate protein both before and during egg-laying (Drolney, 1977).

A great deal of the protein is received through feeding on invertebrates that were replenished during spring floods. This food source, supplemented by the mast, provides the wood duck populations with adequate food and nutrients to successfully reproduce and survive.

Migratory waterfowl also make use of flooded bottomland hardwoods as wintering habitat. Due to its location in the Mississippi Flyway, the Yazoo Basin has historically served as wintering grounds for large numbers of mallards. Mallards are commonly called "dabbling" ducks in that they feed in relatively shallow waters protected by bottomland hardwoods. Their diet may consist entirely of acorns found in the shallow waters of the advancing flood. Recent studies indicate that the quality of reproduction in mallards may be controlled to a great extent by the quality of the overwintering habitat. The denial of adequate protein from acorns and invertebrates could have serious impacts on reproduction.

The recharge of the forest community through periodic flooding also benefits wildlife that commonly inhabit bottomland hardwoods. The raccoon occurs throughout the southeastern United States with bottomland hardwoods consistently supporting higher populations than upland areas (Forest Service Handbook 1974). They feed upon a variety of plants and animals with acorns as a staple food from late fall to early spring. Their daily requirement for water demands that they remain close to ponds, streams, or inundated areas. During spring flooding they are afforded access to such delicacies as crawfish, snails, insects, and fish while remaining in the protected area of flooded hardwoods.

Wild turkey has historically inhabitated forests of the southeastern United States in large numbers. The turkey prefers mature stands of mixed hardwoods with relatively open understories. Turkeys depend a great deal on mast for food during winter and spring months and supplement their fall diet of grass seed with mast. Brooding and nesting cover is provided by woodland/grassland margins with sparse brushland. The dependence of wild turkey on mast production for food further illustrates the value of periodic inundation of bottomland hardwoods. Although flooding creates a temporary inconvenience for wild turkey, the benefits derived through increase food production supercede temporary displacement by flooding.

The white-tailed deer is a common inhabitant of southern hardwood forests and constitutes the most sought-after big game species in the south. The most productive habitat for deer populations are oak-hickory and oak-gum-cypress forests. Bottomland hardwoods, due to their high productivity, provide a wide variety of food material and cover that

supports among the highest populations of deer in the United States. Estimates of carrying capacity for deer in bottomland hardwoods have been as high as one deer per 5-15 acres, as opposed to best deer populations in upland areas estimated at one deer per 20-35 acres (Glasgow and Noble, 1971). The productivity of this habitat for deer is greatly dependent upon the normal flooding cycle. Alteration of the cycle or clearing of forestland removes valuable food for winter survival. The ability of a given area to support a healthy deer herd is determined largely by the average amount of palatable and available browse. Food, more often than water and cover, is the limiting factor (Miller, 1961). According to Halls and Ripley (1961), acorns are considered to be the most important game food in the south. On the Bankhead National Forest in Alabama, acorns and leaves made up over 50 percent of early winter food for deer. In Missouri, the seasonal contribution of acorns to deer diet reached levels as high as 80 percent over a five year period. Although acorns are low in protein, they contain high levels of carbohydrates (fats) and, therefore, allow the deer to attain a layer of fat that supplements low winter browse and leads to healthy reproduction the following spring.

Deer also browse on the leaves, stems, and fruits of box elder and receive high amounts of protein that is produced by this species. The essential protein derived from box elder, and browse of other species of bottomland hardwoods, in conjunction with acorn mast containing fatty material, provide the resident deer populations with ample nutrients to sustain them through the winter. The importance of appropriate food material cannot be overemphasized. Instances have occurred where deer have starved while having large amounts of twigs and branches in their stomach. Therefore, the amount of food material a deer consumes is not as important as the quality of the food. The deer is an extremely adaptable animal and can adjust to changes in the environment more readily than most wildlife. The tremendous loss of bottomland hardwoods has led to alterations in deer diet to include agricultural crops. These crops, however, are absent during the essential winter months and the reduction in mast production has created severe problems for deer herds in the Mississippi Delta. Yancey (1969) reported that, in North Louisiana, deer populations have been reduced from their estimated original number of 280,000 to 165,000 in 1961, and 126,000 by 1968. Estimates of carrying capacity in 1985 predict the deer populations will be reduced to 31,000 if current trends of land clearing continue.

It can readily be seen that periodic inundations of bottomland hardwoods, grassbeds, and other extensions of the riparian habitat has far-reaching affects upon both the aquatic and terrestrial ecosystems. Water purification, invertebrate and fish production, and enhancement of wildlife habitat are but a few of the benefits to be derived from the periodic flooding of hardwood wetlands. Indeed, the continuation and nutrition of the entire ecosystem depends upon it.

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APPENDIX D

ENDANGERED SPECIES CORRESPONDENCE

United States Department of the Interior

FISH AND WILDLIFE SERVICE
75 SPRING STREET, S.W.
ATLANTA, GEORGIA 30303

FEB 11 1980

Baxter
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Colonel Samuel P. Collins, Jr.
District Engineer
U.S. Army Corps of Engineers
P.O. Box 60
Vicksburg, Mississippi 39180

Dear Colonel Collins:

We have reviewed the Yazoo Pumping Plant project (Log number 4-3-80-A-70) as requested in your letter of January 8, 1980. It appears that some endangered species may be present in the area of influence of this action.

The American alligator (Alligator mississippiensis) is the only listed species that is known to occur within the project area. They could be expected in open bodies of water such as lakes, ponds, and larger streams.

In future correspondence please refer to the appropriate log number.

Once it is determined that listed or proposed species may be present, Section 7(c) requires Federal agencies to provide a biological assessment for the species which are likely to be affected. The biological assessment shall be completed within 180 days on which initiated, before any contracts are entered into, and before construction is begun. We do not feel that we can adequately assess the effects of the proposed action on listed and proposed species or Critical Habitat without a complete assessment. The following information should be included:

1. Results of a comprehensive survey of the area.

2. Results of any studies undertaken to determine the nature and extent of any impacts on identified species.

3. Agency's consideration of cumulative effects on the species or its Critical Habitat.

4. Study methods used.

5. Difficulties encountered in obtaining data and completing the proposed study.

cc: ES, FWS, Vicksburg, Mississippi

6. Conclusions of the agency including recommendations as to further studies.

7. Where an impact is identified to proposed and listed species or Critical Habitat, a discussion of efforts that will be taken to eliminate any adverse effects.

8. Any other relevant information.

The Fish and Wildlife Service representative who will provide you with assistance is Mr. Ernest Douglas, Endangered Species Specialist, U.S. Fish and Wildlife Service, 200 East Pascagoula Street, Suite 300, Jackson, Mississippi 39201, telephone FTS 490-4900, or commercial 601/946-4900.

After your agency has completed and reviewed the assessment, you should send a copy of the assessment with your determination of "no effect" or "may affect" on any of the listed species or Critical Habitat. If the determination is "may affect," you shall initiate consultation by a written request to the Regional Director, Fish and Wildlife Service, Richard B. Russell Federal Building, 75 Spring Street, S.W., Suite 1282, Atlanta, Georgia 30303.

Your attention is also directed to Section 7(d) of the 1978 Amendment to the Endangered Species Act, which underscores the requirement that the Federal agency and the permit or license applicant shall not make any irreversible or irretrievable commitment of resources during the consultation period which in effect would deny the formulation or implementation of reasonable alternatives regarding their actions on any endangered or threatened species.

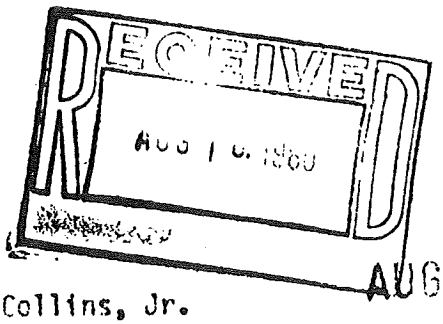
For your information and assistance we have enclosed a copy of the interim definitions and two "step down processes" for general guidance.

Sincerely yours,

/s/ Richard N. Smith

Acting Deputy
Regional Director

Enclosures



AUG 1 6 1980

Colonel Samuel P. Collins, Jr.
District Engineer
U.S. Army Corps of Engineers
Post Office Box 60
Vicksburg, Mississippi 39180

Dear Colonel Collins:

This letter presents the Biological Opinion of the U.S. Fish and Wildlife Service pertaining to the possible effects of the Yazoo Area Pump Project (log number 4-3-80-A-70), on the American alligator (Alligator mississippiensis). The consultation has been conducted on the selected plan (C). This plan provides for a 25,000 cubic foot per second pumping station to be activated when interior ponding reaches an elevation of 80 feet, NGVD, with the exception of the period December 1 through March 1, when pumping would be initiated as the ponding elevation reaches 85 feet, NGVD.

It is our Biological Opinion that this project is not likely to jeopardize the continued existence of the American alligator.

This Biological Opinion is based on the Environmental Inventory and Assessment, Yazoo Pump Study, Mississippi (August 26, 1977); the Yazoo Area Pump Project, Phase 1, General Design Memorandum - Environmental Impact Statement (March 1980); the Status of the American Alligator in Louisiana, and in Baldwin and Mobile Counties, Alabama, by R. H. Chabreck; information provided in your Biological Assessment; and a meeting and field trip with members of your staff (June 2 and 4, 1980).

The determination that this project is not likely to jeopardize the continued existence of the alligator is based upon the alligators' improved status across much of its historical range and the failure of this project to significantly impact that status. Detailed studies of the population's status have not been conducted in Mississippi. However, alligators in Louisiana and coastal Alabama are maintaining healthy populations which have demonstrated drastic increases in recent years (Status of the American Alligator in Louisiana, and in Baldwin and Mobile Counties, Alabama, by R. H. Chabreck, prepared for the U.S. Fish and Wildlife Service in January 1980). Service biologists believe the status of the population in southern Mississippi is similar to that of Louisiana and coastal Alabama.

Although the project cannot be said to jeopardize the existence of the species, it should be recognized that it will have certain negative impacts upon the population within the project area. Increased land clearing and reduction of seasonal overflow resulting from the project will negatively impact fishery resources by lowering water quality and reduction of spawning habitat. This will ultimately lower the value of the habitat for the alligator. The amount of induced land clearing as a result of the project is uncertain. The estimates range from 4,400 to 41,888 acres. (All of this land is not alligator habitat, however, the clearing of this land will affect the value of such habitat.) The alligator will also be impacted by reduction in acreage of shallow water areas important for young alligators and drainage of small woodland ponds, which may be a factor bearing upon overall carrying capacity of the area. It should also be recognized that the open water area of the larger lakes (e.g., Eagle Lake, Cypress Lake, Greasey Lake) will not be affected by the project and will continue to be available to the species.

The cumulative effects of this project and related projects (e.g., the Tensas-Cocodrie pumping plant) will reduce and degrade alligator habitats. However, these cumulative effects do not, at this time, support a determination of jeopardy to the existence of the species due to the abundance of habitat and the increasing abundance of the species in other areas. In future Biological Assessments on other projects, the Corps should fully address the cumulative impacts to avoid development of a situation which will jeopardize the continued existence of the species.

This Opinion is intended to assist your agency in meeting its Section 7 responsibilities. If we may be of further assistance, please advise.

Sincerely yours,

Regional Director

cc: Area Manager, FWS, Jackson, Mississippi (SE)
Ecological Services, FWS, Vicksburg, Mississippi
Department of Wildlife Conservation, Jackson, Mississippi

APPENDIX E

PLAN FOR MANAGEMENT AND USE OF FISH AND WILDLIFE COMPENSATION LANDS

PLAN FOR MANAGEMENT AND USE OF FISH AND WILDLIFE COMPENSATION LANDS

For the purpose of this plan, it is assumed that the lands will be located in the general vicinity of the Yazoo Area with habitat types (wet and dry bottomland hardwoods and wooded swamp) and the amount of each type similar to that of the forested wetlands in the project area. The location of these lands will be agreed upon by the Corps of Engineers, the U. S. Fish and Wildlife Service, and the Mississippi Department of Wildlife Conservation.

Need for Management

Currently, the United States is experiencing an increase in demand for fish and wildlife-oriented recreation. This increase is the result of the realization by the public of a historically untapped and valuable recreational opportunity. Forested wetlands, such as those proposed for compensation, are among the most productive fish and wildlife habitat types in the Nation. The value of forested wetlands to wildlife, such as deer, squirrel, rabbit, turkey, furbearers, waterfowl, passerine birds, etc., is unmatched by any other habitat type. In addition, they are extremely valuable for both consumptive and nonconsumptive recreational utilization.

Unfortunately, as the increasing demand for this valuable habitat type continues, the area available for public utilization is decreasing. Land clearing activities are being carried out on hundreds of thousands of acres of forested wetlands annually to facilitate further agricultural exploitation of the Lower Mississippi River alluvial valley.

Federally funded water development projects, completed and under construction, are continually offering more and more forested wetlands as available croplands by reducing the frequency and duration of natural flooding. If the demands on forested wetlands for agricultural exploitation continue, the Nation can expect a future where the existing excess of demands for utilization of fish and wildlife resources will place additional stress on an ever decreasing supply or resource base.

The solution to this problem is habitat preservation and management. The acquisition of biologically productive forested wetlands, as compensation for environmentally damaging projects coupled with intensive management to increase the biological productivity, will offer more recreational opportunities on less available habitat.

Objective of the Management Plan

The objective of the Management Plan is to increase the productivity, and thereby the habitat unit value, to its maximum practical level in as short a time as possible. Not only will this plan protect the area from future degradation, it will also employ biologically sound principles of fish and wildlife management aimed at providing the maximum possible yield of fish and wildlife resources without endangering the available food sources.

Management Potential

Bottomland Hardwoods

Management techniques are available for use in bottomland hardwoods that can improve existing timber stands for wildlife. Such stand improvement involves leaving desirable den trees and removal of undesirable species of little or no value to wildlife and in competition with desirable mast producers. Food plantings in natural or created openings and in edge areas where open fields exist is also beneficial. Dedication of such habitat to intensive wildlife management with public ownership will provide an annualized habitat unit value of 83.7 on wet bottomland hardwoods as compared to a value of 71.8 under existing conditions or the annualized habitat unit value of 72.3 with natural potential. Bottomland hardwoods (wet/dry) will provide an annualized value of 76.0 as compared to a value to 69.6 under existing conditions or a 70.1 value with natural potential. Dry bottomland hardwoods' annualized value with management would be 77.6 as compared with 71.3 under existing conditions or a value of 71.8 with natural potential.

Wooded Swamp

These water base areas also lend themselves to management. Timber stand improvement is practical in wooded areas bordering this habitat. Aquatic plantings useful to waterfowl and shoreline seeding of wet soil tolerant species such as smartweed and wild millet in open areas is practical. Water level manipulations can be used to increase the shoreline zone suitable for such plantings. Use of wood duck boxes where suitable nesting sites are not available will increase use by this species. Intensive wildlife management under public ownership will result in an annualized habitat unit value of 80.8 as compared to a value of 76.8 under existing conditions or a value of 78.3 with natural potential.

Management Plan

Timber stand improvement will be the major tool utilized in this management plan. Where necessary and compatible with identifiable management restricted to existing openings, however, particular attention will be

directed towards waterfowl plantings in areas that can expect early winter flooding. This activity will provide an additional waterfowl food source for the migratory population. High ground planting will be exceptionally beneficial when wildlife populations are concentrated during extended periods of high water.

Wood duck boxes will be placed throughout the permanently wet areas. This will provide additional wood duck nesting habitat, thereby increasing the resident waterfowl populations. These boxes will be maintained annually and usage surveys will be performed to determine if additional boxes are necessary. Access roads will be developed to facilitate management and utilization of the area. Check stations will be utilized and records kept on man-days of recreation and harvest data to be used as one of the elements in determining possible modification to management practices. Slough control structures will be installed to assure the continuance of water level fluctuations. The timber management practices which will be employed and their value to wildlife are as follows:

1. Selective cutting

   Selective cutting favoring mast producers and den trees will yield direct improvement to deer, squirrel, turkey, and waterfowl with increased food supplies. Selection will be aimed at providing a balance between the red and white oak groups, which will insure the availability of mast if one of these groups should experience a mast failure. Squirrels, wood ducks, raccoons, raptors, and songbirds will benefit from increased available nesting habitat. Indirectly, this practice will open up the overstory and midstory canopy allowing increased understory development, offering year-round food supplies. Raptors and predator mammals will also benefit from this activity with increased food sources. Selective cutting on the area will be continual on a 10 year rotation schedule. This rotation schedule will maintain the productivity of the understory by restricting successional development. In addition, selective cutting allows increased light penetration to the forest floor which will enhance the quantity and quality of available browse for deer.

2. Maintained openings

   Selected sites of 2-5 acres will be cleared to a 20-30 percent overstory and midstory canopy cover. The remaining overstory canopy will be selected on the basis of mast production and den sites. Natural replacement of the overstory will be the criteria for selection of a midstory canopy. The understory will be maintained in an early successional stage with areas of bare soil available. These sites will be located on the highest available ground and as close to the permanently wet areas as possible. Preference in site selection will be toward existing openings.

These areas will enhance small mammal and game bird populations, especially turkey during the brood rearing season due to increased cover and insect populations. These openings will serve as refuge areas during high water periods, offering sufficient food supplies to sustain wildlife populations until the high water recedes. Raptors and predator mammals will also be attracted to feed and nest. Food supplies and available dusting areas will make the openings expectially attractive to songbird populations. These sites will be maintained on a 3-4 year rotation to assure they do not become too overgrown to be useful.

3. No activity

Selected areas of exceptional esthetic value, such as mature oak forest or cypress/tupelo brakes, will be set aside as natural areas with no management practices installed.

Expected Results

The implementation of the previously mentioned management practices will enhance the habitat unit value of the acquired lands. A summary of the expected results at the specific target years follows:

Target Year 0 - The acreage has been acquired however no management has taken place. The weighted average habitat unit value of all bottomland hardwoods and wooded swamp is 74.8.

Target Year 10 - At least one selective cutting on the entire area has taken place. A slight increase in mast production has occurred due to a decrease in competition with low value trees. The annual production of mast is beginning to stabilize as the red oak/white oak balance is realized. Approximately half of the slough control structures are in place. At least half of the maintained openings and proposed food plantings are in place. The wood duck boxes are in place and experiencing moderate utilization. The weighted average habitat unit value is now 76.1.

Target Year 20 - Due to selective cutting a substantial increase in mast production has occurred. All slough control structures, maintained openings, and food plots are in place. Waterfowl plots and wood duck boxes are receiving a high degree of utilization. The weighted average habitat unit value is 77.5 for all habitat types.

Target Year 30 - Selective cutting is continuing on a regular rotation. As a result, mast production is continuing to increase both because of decreased competition, and young trees released from earlier cuts are coming into production. An optimum balance between red oaks and white oaks is occurring, offering a more dependable mast crop. The understory has developed into a high quality food supply. Maintained openings and food plantings are undergoing scheduled maintenance. Wildlife populations are responding to the improved habitat. Wood duck box utilization is at an optimum. The weighted average habitat unit value is 78.7.

Target Year 40 - Mast production continues to increase due to timber stand improvement and the desirable uneven-aged timber growth is evident. A balance between red oaks and white oaks has become a reality. Food plots and wood duck boxes are being heavy utilized. The weighted average habitat unit value is now 80.0.

Target Year 50 - Mast production is greatly increased. Seedlings at acquisition have developed into more vigorous producers because of lack of competition. Dependable mast crops yield a more dependable food supply. Older trees are producing more den sites. Understory growth is offering optimum food and cover. Maintained openings are experiencing maximum utilization. Food plantings on high ground are able to maintain congested animal populations during extended periods of high water. Waterfowl food plantings are being utilized by both waterfowl and aquatic mammals. The weighted average habitat unit value has risen to 81.2.

Indirect results which can be expected from this management are:

1. The fishery resource will be slightly improved due to water level fluctuations and a reduction in pesticide and sediment transport.

2. Recreational utilization will be higher due to the increased available resource and the access to this resource. This will improve the economic conditions of the surrounding areas.

3. Maintained natural areas will have a lower value to wildlife then surrounding areas, but a high esthetic value.

4. The area will be utilized for educational purposes such as research and outdoor classroom exercises.

Management Implementation Costs

The first costs and annual costs associated with the management plan are summarized in Table E-1. These costs are based on a 10,000 acre tract. To convert to differing acreage, either more or less than 10,000 acres, merely multiply by the appropriate factor. Not included in the total first costs are the purchase price of the area, which is estimated to be $750 per acre, associated acquisition cost (approximately $1,500 per tract), and contingencies.

TABLE E-1

SUMMARY OF MANAGEMENT COSTS 1/

Activity	Quantity 2/	Unit	Unit Cost 3/ (Dollars)	Total Cost 4/ (Dollars)
First Costs				
Initial Development:				
Food plots	85	acre	50	4,300
Timber stand improvement	8,500	acre	25	212,500
Wood duck boxes	100	each	25	2,500
Slough control structures	3	each	60,000	180,000
Waterfowl plots	150	acre	35	5,300
Access roads	15	mile	125,000	1,875,000
Contingencies (25% ±)				569,900
Subtotal				2,849,500
Engineering and Design				427,400
Supervision and Administration				327,700
Total First Costs				3,604,600
Annual Costs				
Interest @ 7.375 percent 5/				265,800
Sinking fund @ 0.216 percent 5/				7,800
Operation and maintenance:				
Wooded wetlands	8,500	acre	3	25,500
Food plots	85	acre	50	4,300
Slough control structures	3	each	1,000	3,000
Waterfowl plots	150	acre	35	5,300
Access roads	15	mile	500	7,500
Subtotal				45,600
Total Annual Costs				319,200

1/ Assuming fee title acquisition of 10,000 acres (8,500 acres of bottomland hardwoods and 1,500 acres of wooded swamp). Multiply by the appropriate factor for acreages larger or smaller than 10,000 acres.

2/ Source: Fish and Wildlife, Jackson, Mississippi.

3/ Source: U. S. Army Corps of Engineers, Vicksburg District.

4/ Values are rounded to nearest hundred dollars.

5/ Based on October, 1980 interest rate of 7 3/8 percent and a development period of 50 years.

APPENDIX F

JURISDICTIONAL WETLANDS CORRESPONDENCE

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IV
345 COURTLAND STREET
ATLANTA, GEORGIA 30365

4E-ER/AL

JUL 15 1981

Colonel Samuel P. Collins
District Engineer
U.S. Army Corps of Engineers, Vicksburg
P.O. Box 60
Vicksburg, Mississippi 39180

ATTENTION: Ken Bray

SUBJECT: Yazoo Area Pump Project
(LMKPD-Y Special Case Wetlands)

Dear Colonel Collins:

This is in response to a request from your agency for a determination of the jurisdictional extent of waters and wetlands that occur in the Yazoo Pump Project Study area. A member of my staff inspected the pump facility and channel site located near the confluence of Steel Bayou and the Yazoo River in Issaquena County, Mississippi, on April 29, 1981. Based on his inspection, we have determined that all forested areas on the diversion channel alignment and the pump facility site are jurisdictional wetlands. For the purposes of this project, we are also classifying all forested areas at or below the 90-foot elevation as jurisdictional wetlands. This information was conveyed by telephone to Ken Bray, of your staff, on May 21, 1981.

The project construction site is located in an area in which Sharkey and Dowling soils predominate. These clay soils are poorly drained. Core samples of the soil had characteristics which indicate a history of periodic saturation to within several inches of the surface. Vegetation consisted primarily of bottomland hardwood tree species tolerant of flooded or saturated soil conditions for at least 30 days into the growing season. Hackberry, sweetgum, green ash, cedar elm, box elder, nuttal oak, American elm, and cottonwood were predominant. Mature and immature trees on the site exhibited morphological adaptations to saturated soil conditions. Because of these factors, we consider all forested areas on the project site to be wetlands. These wetlands will be directly impacted by construction activities.

Based on our finding at the pump site and on a wetland determination made by your Regulatory Functions Branch staff near Eagle Lake, Mississippi, we consider all forested areas within the drainage boundaries of the Yazoo Area Pump Project at or below elevation 90 feet to be wetlands. These wetlands may be indirectly impacted by the pump project. There may be some minor exceptions to our determination as small areas of forested uplands may be located below elevation 90 feet and scattered wetlands may exist above it. Because of these possible minor discrepancies, this jurisdictional wetland determination does not hold for individual landowners in the basin seeking Section 404 permits. In these instances, the extent of wetlands will be made on a case-by-case basis.

Sincerely yours,

E. T. Heinen, Chief
Ecological Review Office
Enforcement Division

cc: Mr. Charles McCabe
U.S. Fish and Wildlife Service
Vicksburg Field Office

APPENDIX G

MISSISSIPPI DEPARTMENT OF WILDLIFE CONSERVATION CORRESPONDENCE

WILLIAM WINTER
Governor

MISSISSIPPI DEPARTMENT OF WILDLIFE CONSERVATION

Southport Mall
P.O. Box 451
Jackson, MS 39205
(601) 961-5300

June 8, 1982

Mr. Charles K. Baxter
U. S. Fish and Wildlife Service
Room 409
Merchants National Bank Building
820 South Street
Vicksburg, Mississippi 39180

Dear Mr. Baxter:

Reference is made to your letter of June 2, 1982 concerning comments relative to the Yazoo pump project. I am attaching a copy of a letter of comment to Charlie L. Blalock, Executive Director, Mississippi Department of Natural Resources, for your review.

If we can be of further assistance, please let us know.

Sincerely,

Lon Strong
Executive Director

LS:mjw

cc: Mr. Benny Herring, Director
Bureau of Fisheries and Wildlife

Attachment

April 5, 1982

WILLIAM WINTER
Governor

MISSISSIPPI
DEPARTMENT
OF WILDLIFE
CONSERVATION

Southport Mall
P.O Box 451
Jackson, MS 39205
(601) 961-5300

Commissioners:

L. C. "Billy" Gollott
Biloxi, MS

Dr. Edmund Keiser
Oxford, MS

Jim Hunter McCaleb
Cleveland, MS

Fred K Rogers
Clinton, MS

Lonnie E. Tadlock
Morton, MS

LON STRONG
Executive Director

Charlie L. Blalock, Executive Director
Department of Natural Resources
P. O. Box 20305
Jackson, MS 39209

Dear Mr. Blalock:

Reference is made to your letter of March 5, 1982 soliciting comments on the Draft General Design Memorandum concerning the Yazoo Area Pump Project, Yazoo Basin, Mississippi.

The Department of Wildlife Conservation is not opposed to flood protection for our citizens. But, as the agency charged with the protection and management of Mississippi's wildlife resources, we feel obligated to comment on this project. In the Flood Control Acts of 1941 and 1965, which authorized the pumping project, Congress acknowledged the needs for flood water storage and timber benefits in the sump area. The FCA authorized protection for those lands above 90 feet mean sea level (MSL) and dedicated the area below 90 feet MSL to flood water storage. In the Corps' selected plan, the 17,500 cubic feet per second (cfs) pumping plant and the initiation of pumping at 80 feet MSL were not authorized by Congress. If the protection of the selected plan is necessary for the people of Mississippi and the United States, we feel that the decision should be made by Congress and not the Corps of Engineers.

The Corps acknowledges the fact that the plan will be detrimental to both fisheries and wildlife. We agree with this statement. The sump area is one of the last bastions of the delta bottomland hardwood resource. If the pump project leads to the conversion of this timberland to intensive agriculture, the wildlife resource in the area will be lost to our posterity. Although the aesthetic value of our wildlife cannot compete with the economic value of agriculture, I'm not sure our children's children will forgive us the debt we leave. The decision will and should be made by our nation's leaders, but we would like to go on record as making a plea for our natural heritage.

In reviewing the mitigation report, we see the potential to recoup some of our environmental losses. Of course we would like to see additional lands acquired and dedicated to wildlife. The Corps' plan appears to us to be too rigid. We would like to see the Corps obtain general authority to acquire mitigation lands by fee title from willing vendors when and if such lands become available. We would also like to see the proposal include fee title acquisition for lands which the State may wish to administer.

We feel that the mitigation plan should only include willing vendors. It is not in the best interest of our wildlife resources to force those landowners who have left their land in timber and wildlife habitat to relinquish any rights to their property. The Department of Wildlife Conservation strongly supports private ownership, even if the land use is not in the best interest of wildlife.

Thank you for the opportunity to comment.

Sincerely,

Lon Strong
Executive Director

/ce

PART 2

VICKSBURG DISTRICT RESPONSE TO U. S. FISH AND WILDLIFE SERVICE CONCERNS

VICKSBURG DISTRICT RESPONSE TO U. S. FISH AND WILDLIFE SERVICE CONCERNS

INTRODUCTION

1. Various concerns were raised by the U. S. Fish and Wildlife Service (FWS) within the draft Fish and Wildlife Coordination Act (FWCA) Report concerning the development of the tentatively selected plan. The purpose of this section is to address some of these specific concerns and hopefully to resolve some of the issues presented in the draft FWCA report. These concerns are addressed in more detail, along with the comments of other Federal and state agencies, in Appendix H.

LANDS BELOW ELEVATION 90 FEET, NATIONAL GEODETIC VERTICAL DATAUM

2. One of the key concerns raised by FWS was the question of lands below elevation 90 feet, National Geodetic Vertical Datum (NGVD), being a Federally dedicated sump. In order to assess this question, the language in the original Corps report and authorizing document must be examined. At the time of the initial study, the project area contained only 2,650 acres of cleared land below elevation 90. This was approximately 2 percent of the total 125,000 acres at that elevation. The Mississippi River Commission report, referenced in the 1941 Flood Control Act (FCA), stated that due to the small amount of cleared land below elevation 90 there does not seem to be much advantage in holding the sump to lower levels. There are now 59,000 acres of cleared land below elevation 90. Current investigations must recognize this development since they are conducted based upon existing conditions. It is apparent that the 1941 FCA provided for the extension of the authorized project and improvements to protect the project area, rather than a specific pump size and sump area. Therefore, one cannot conclude that by the term "dedicated" Congress intended that a real estate acquisition program be a part of the project, since this would have been expressly set forth.

FLOOD PLAIN MANAGEMENT

3. Some concern was expressed by FWS as to the project's compliance with Executive Order 11988. The Vicksburg District feels that the tentatively selected plan is in compliance with Executive Order 11988, Floodplain

Management, which directs all agencies to assert Federal leadership in order to reduce the risk of flood losses; minimize the impact of floods on human safety, health, and welfare; and restore and preserve the natural beneficial functions served by flood plains. A real need has been identified for providing additional flood protection in the Yazoo Backwater Area. Because of the very nature of the project area, no practical alternative exists to the proposed action in the flood plain; however, during the study, several possible means of minimizing adverse impacts were developed and evaluated, including a no-action alternative, nonstructural alternatives, and various structural alternatives. The plan being considered reduces the risk of flood losses and minimizes the impact of floods on human safety and welfare while minimizing adverse impacts associated with the use of the flood plain. Although some additional residential and industrial development may occur in the future with or without the project, the plan being considered is not expected to induce structural development within the predominantly agricultural flood plain. In addition, several counties now have zoning regulations to prevent construction below the 100-year flood elevation.

INTENSIFICATION BENEFITS

4. FWS has expressed concern over the fact that 79 percent of anticipated benefits will be derived from expansion and intensification of flood-susceptible lands. The project justification includes anticipated growth that can reasonably be expected in the area based on past trends; however, over 99 percent of project benefits relate to presently developed lands. Flooding conditions in the Yazoo Area render this area ideally suited for the accrual of intensification benefits. The ever-present threat of flooding in the Yazoo Area places farmers in a situation where they are limited in their ability to plan for the desired and most efficient operation. Due to the soil wetness problems caused by ineffective drainage systems and by the high risk of flooding, farmers are unable to plan and select highest-yielding varieties or to plant on optimum dates. The majority of the benefits for this project are derived from intensification of agricultural production throughout the project area, not only the lands below elevation 90 feet, NGVD. Intensification benefits will be realized by approximately 1,600 landowners in the project area.

CLEARING OF WETLANDS

5. There is currently some disagreement between the Vicksburg District and FWS regarding the benefits claimed as a result of project-induced clearing of area wetlands. Although the Corps shares the concern of FWS regarding unnecessary losses of wetlands, the authority granted the Corps under

Section 404 of the Clean Water Act cannot be used to protect wetlands from all forms of potential destruction. The Vicksburg District's authority to regulate activities affecting wetlands clearly extends only to work involving discharges of dredged or fill material into wetlands or other waters of the United States. The Vicksburg District policy is that land clearing is not subject to the provisions of Section 404 of the Clean Water Act. However, to the extent that all aspects of a project are evaluated under other legislation such as NEPA when reviewing such a permit application, the effects of land clearing are considered and may contribute to the denial of a permit. The Corps fully intends to comply with all statutes and guidelines affecting wetlands and is of the opinion that the proposed project does meet all requirements.

YAZOO PUMP PROJECT
YAZOO BACKWATER AREA
MISSISSIPPI

REEVALUATION REPORT

SECTION 404(B)(1) EVALUATION

APPENDIX J

PREPARED BY
THE UNITED STATES ARMY
VICKSBURG DISTRICT, CORPS OF ENGINEERS
VICKSBURG, MISSISSIPPI

REEVALUATION REPORT
YAZOO AREA PUMP PROJECT
YAZOO BACKWATER AREA, MISSISSIPPI

APPENDIX J

SECTION 404(B)(1) EVALUATION

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LIST OF ATTACHMENTS

REEVALUATION REPORT
YAZOO AREA PUMP PROJECT
YAZOO BACKWATER AREA, MISSISSIPPI

APPENDIX J

SECTION 404(B)(1) EVALUATION

1. PROJECT DESCRIPTION

a. Location. The proposed pumping plant would be located adjacent to the Yazoo Backwater Levee approximately 0.8 mile west of the Steele Bayou Drainage Structure in Issaquena County, Mississippi, at approximately 70 feet, National Geodetic Vertical Datum (NGVD) (see attached map).

b. General Description. The major feature of the recommended plan is a 17,500-cubic-foot-per-second pumping station. Integral to the pumping plant construction and operation would be an inlet channel to convey floodflows to the plant and an outlet channel to the receiving Yazoo River. The inlet channel will vary in bottom width from 355 feet where it leaves Steele Bayou to a maximum of 765 feet at the pumping plant. It will be approximately 4,000 feet long and will vary in depth from 10 to 30 feet as the lay of the land varies. The outlet channel will be about 6,000 feet long and will vary in bottom width from 765 feet at the pumping plant to 300 feet at its confluence with the Yazoo River. Depth of the outlet channel will vary from approximately 7 to 22 feet as the lay of the land varies. Both channels are designed with 4 horizontal on 1 vertical side slopes. Pumping would be initiated when interior ponding reaches elevation 80 feet, NGVD, except during the period 1 December-1 March when pumping would be initiated at elevation 85 feet, NGVD. Flooding conditions below elevation 80 feet, NGVD, would be unchanged. Detailed operational procedures are discussed in Appendix C, Hydrology and Hydraulics, Reevaluation Report.

c. Authority and Purpose. Flood protection for the project area was authorized by Section 3 of the Flood Control Act of 18 August 1941. The purpose of the authorized Yazoo Area Pump Project is to reduce interior ponding within the Yazoo Area when the Little Sunflower River and Steele Bayou drainage structures (see map) are closed because of high stages on the Mississippi and Yazoo Rivers. The primary benefits of the project are intensification of agricultural production, and reduction of flood damage to agricultural crops, noncrop items, rural residential property, and public roads and bridges.

d. General Description of Dredged or Fill Material.

(1) General characteristics of material (grain size, soil type). The material consists of fine-grained top stratum composed of clays, silts, and silty fine sands and a coarse-grained substratum of fine sands that grade downward into coarser sands and gravels. The point bar topstratum at the proposed pump site is 25 to 35 feet thick and consists of 3 to 10 feet of clay underlain by about 10 feet of silt, which is underlain by silty sand. Pervious substratum sands and gravels should be encountered near elevation 52, NGVD, and extend down to the top of Tertiary near elevation 60, NGVD. Inlet and outlet channels will be excavated in clays, silts, and fine sands. Grade will be well below ground water. Ground water levels should range from within 15 feet of the ground surface to within 1 to 2 feet of the surface. Steady seepage will exist throughout both channels during construction.

(2) Quantity of material (cubic yards). Approximately 3.4 million cubic yards of material will be excavated from the inlet and outlet channels. Although some of this material may be used for fill at the proposed pump site and access roads, the majority will be deposited along top bank on dry ground. Approximately 100,000 tons of riprap will be placed (in the dry) along the inlet and outlet channels and around the pump site.

(3) Source of material. The dredged material will be excavated from forested areas as shown on the location map. The riprap will probably be obtained from an upland source; however, this rock is composed of sedimentary material that is formed in aquatic environments.

e. Description of the Proposed Discharge Site(s).

(1) Location. The discharge sites are located along top bank of the inlet and outlet channels. The Environmental Protection Agency (EPA) special case wetlands delineation corresponds to the forested lands within the 90 foot, NGVD, elevation, as shown on the attached map.

(2) Size. Approximately 14 acres of cleared land and 26 acres of woodland will be acquired in fee title for the pump site. Inlet and outlet channels will require easements on an additional 270 acres of woodlands. An additional 270 acres of easements on woodlands will be acquired for disposal sites.

(3) Type of site. Placement of the excavated and fill material will be adjacent to the inlet and outlet channels in unconfined sites. The sites will be revegetated with bottom-land hardwoods immediately after construction.

(4) Type(s) of habitat. The EPA special case wetland determination encompasses approximately 76,400 acres of forest land subject to the provisions of this Section 404 evaluation. Of this total, approximately 11,000 acres are cypress-tupelogum wetlands. The better drained natural levees and ridges

which have loamy or sandy clay soils support a water oak-sweetgum timber type. Extensive flats of slightly lower elevation, with tighter clay soils, are forested by hackberry, elm, ash, and Nuttall oak. Lower-lying backwater areas support an overcup oak-water hickory type. Lake margins, sloughs, and swamps support cypress, tupelogum, willow, and water elm.

(5) Timing and duration of discharge. The time of discharge is dependent upon the completion of preconstruction planning and construction approval. Construction is proposed to begin in 1986; approximately 2 years will be required for the actual earthwork.

f. Description of Disposal Method. The material will be excavated and discharged by the use of a dragline.

2. FACTUAL DETERMINATIONS

a. Physical Substrate Determinations.

(1) Substrate elevation and slope. Excavation of inlet and outlet channels will occur between elevation 60 and 90 feet, NGVD, natural ground to the dimensions described in Section 1e(2). Material will be placed on top bank about 20 feet high. Excavation slopes will range from 1 vertical on 2 horizontal to 1 vertical on 3 horizontal which is located on point bar deposits, except for inlet and outlet channels where slopes would be 1 vertical on 4 horizontal. A high ground water elevation and approximately 120 feet of substratum sand thickness will make construction unwatering necessary. Inlet and outlet channels will be excavated in clays, silts, and fine sands. Piping and sluff sides will probably cause minor problems in the bottom of the inlet channel, dependent on channel elevations, structure lengths, and differential heads between river and sump; however, no significant channel stability problems are anticipated. All riprap placement will be associated with the pumping plant structure. Riprap will be placed in the channel bottom and on the channel slopes to existing ground elevations in a portion of the inlet transition channel, from the approach slab to upstream of the retaining walls. Similarly, in the outlet transition channel, it will be placed from the stilling basin to downstream of the retaining walls. Specific dimensions of limits will be determined during detailed design.

(2) Sediment type. Sediments will consist of fine-grained clays, silts, and silty fine sands.

(3) Dredged/fill material movement. The excavated material will remain rough and irregularly shaped and will be revegetated as soon as possible to minimize erosion. At the pump site, earthfill material will be protected with riprap. Once construction operations are complete, the soils of the top bank and substrate will vary from undifferentiated sands and gravels to fine sands and silty clays. Annual flooding of these disposal areas will resuspend fine-grained sediments somewhat in the return flow to the channels and Steele Bayou in a similar manner as existing sediments.

(4) Physical effects on benthos. There would be no direct effect; however, placement of dredged material in the flood plain would preclude to a minor degree the area available for temporary colonization during flood periods. The riprap should provide additional area for benthos colonization.

(5) Actions taken to minimize impacts. The revegetation of the disposal area will minimize erosion and subsequent return of sediments to receiving waters. Inlet and outlet channel excavation will be performed from one side. Excavated material will be placed adjacent to the channel on one side.

b. Water Circulation, Fluctuation, and Salinity Determinations.

(1) Water.

(a) Salinity. Not applicable.

(b) Water chemistry. No significant effect.

(c) Clarity. Water bodies in the area are highly turbid year-round. The discharge should have no noticeable effect.

(d) Color. No significant effect.

(e) Odor. No effect.

(f) Taste. Not applicable.

(g) Dissolved gas levels. No appreciable change should be detectable. Increased organic loading will increase BOD and reduce dissolved oxygen periodically; however, based on the quantities expected to return to aquatic areas, this should be insignificant due to the large mixing zone.

(h) Nutrients. There could be some localized temporary increases in nutrients released to the water column during periods of rainfall and flooding from the long-term deposition of agricultural fertilizers at the excavation sites.

(i) Eutrophication. Temporary nutrient increases are not expected to result in appreciable increases in the degree of eutrophication in adjacent stream segments and permanent water wetlands (cypress-tupelogum).

(2) Current patterns and circulation.

(a) Current patterns and flow. The placement of dredged and/or fill material at the construction site will modify flow patterns by obstructing flow during the initiation of flooding and excavation of floodflows to a minor extent. The result of this alternation of circulation would be a change in substrate erosion and deposition rates and the rate and extent of mixing of dissolved and suspended components of the water body.

(b) Velocity. The flood pool should be flat with little or no current or turbulence.

(c) Stratification. No effect.

(d) Hydrologic Regime. Runoff potential will be increased at the excavation and disposal sites. However, due to the very small portion of the catchment involved, these changes would produce very minor effects.

(3) Normal water level fluctuations. No effect.

(4) Salinity gradients. Not applicable.

(5) Actions that will be taken to minimize impacts. No actions will be taken to minimize impacts.

c. Suspended Particulate/Turbidity Determinations.

(1) Expected changes in suspended particulates and turbidity levels in vicinity of disposal site. Suspended particulate levels will increase to a minor degree in the channels, adjacent streams and brakes during rainfall and high water stages, primarily during late winter and spring months, as a result of erosion, inundation, and wave wash on the disposal sites adjacent to the channels.

(2) Effects (degree and duration) on chemical and physical properties of the water column.

(a) Light penetration. Sediments released during rainfall and flood stages may periodically reduce light penetration somewhat and lower the rate of photosynthesis and primary productivity to a very minor degree in the immediate aquatic area.

(b) Dissolved oxygen. BOD should increase in the affected area to a minor degree with the exposure to the water column of dredged organic matter. Reductions in photosynthesis would reduce dissolved oxygen to a minor degree.

(c) Toxic metals and organics. The biological and chemical content of the suspended material may react with the dissolved oxygen during flood conditions; however, the elutriate tests performed indicate that this effect will be insignificant.

(d) Pathogens. Pathogenic organisms and viruses would not be prevalent in this isolated area.

(e) Esthetics. Small turbid plumes could be created by rainwater runoff, and floodwater wave wash. It is unlikely that these plumes would be distinctly visible, considering the turbid nature of the streams affected, and should not result in any significant esthetic impacts.

(f) Pesticides. Agricultural chemicals have been used widely for many years in the drainage area. DDT and its metabolites, toxaphene, dieldrin, endrin and others are present in bottom sediments and aquatic organisms within the project area. They may be present occasionally in the water column.

(3) Effects on biota.

(a) Primary production, photosynthesis. The periodic reduction in light transmission as a result of dredged material erosion and suspension of sediments will periodically reduce photosynthesis and primary production somewhat in portions of aquatic areas.

(b) Suspension/filter feeders. No significant effect.

(c) Sight feeders. No significant effect.

(4) Actions taken to minimize impacts. All disturbed areas will be revegetated as soon as possible following construction.

d. Contaminant Determinations.

(1) Contaminant determination studies conducted in the area of the proposed Yazoo Area Pump Project indicated several constituents in excess of EPA's criteria for chemical concentrations.

Parameters	EPA's Water Quality Criteria	Yazoo Area Pump Project Water Analysis
Ammonia Nitrogen	0.02 mg/l	0.86 mg/l
Chromium	0.1 mg/l	0.272 mg/l
Iron	1.0 mg/l	110.00 mg/l
Manganese	0.1 mg/l	1.00 mg/l
Nickel	0.1 mg/l	0.120 mg/l
Zinc	0.050 mg/l	0.491 mg/l

Although these chemical concentrations are at elevated levels, many related factors must be considered to determine the probable impact.

(2) The following rationale was used to determine if there was any major concern over chemical contaminants.

(a) The project was compared to a similar aspect of another project, the Upper Yazoo Project, which has received more extensive biological and chemical testing. The concentrations of chemical parameters and soil types are similar between both projects, and the Upper Yazoo Project has not produced any major problems during the past several years of dredging.

(b) Soil and water samples for analysis were obtained so as to be indicative of the project area and not limited to the project site. The chemical testing consisted of a water analysis, core material analysis and a soil-water interface analysis (elutriate). The soil analysis indicated moderate concentrations of several chemical constituents. The elutriate analysis indicated that a range of 0.007 percent to 0.1 percent release of the chemical concentration could be expected in the water column by dredging activities. Ammonia nitrogen was the only exception to the above percentage range with a 23 percent probable release to the water column.

(c) Alternatives to construction methodology such as chemical flocculation would further limit the impact of project construction; however, cost would be excessive.

(3) Based on the above factors, the chemical concentrations that exceed EPA's criteria should not prove an excessive detrimental environmental impact.

e. Aquatic Ecosystem and Organism Determinations.

(1) Plankton effects. No significant effects are expected to occur to plankton within the area affected by the discharges. Water clarity in flood waters and adjacent streams in the immediate vicinity of the disposal sites will be reduced somewhat temporarily and will in turn reduce photosynthetic production somewhat.

(2) Benthos effects. There should be no benthic organisms in the proposed disposal areas during the time the materials will be discharged.

(3) Nekton effects. No mortality to free swimming species is expected. During rains and flood stages, temporary minor reductions in dissolved oxygen concentrations and photosynthetic production, minor increases in carbon dioxide and other gas concentrations, increased turbidity, suspended sediments, and possible minor increases of toxic substances in the immediate area could result in temporary minor increased stresses on fishes and other aquatic species.

(4) Aquatic food web effects. No significant effects are expected.

(5) Special aquatic sites effects.

(a) Sanctuaries and refuges. Not applicable.

(b) Wetlands. Less than 900 acres of wetlands will be cleared as a result of project-induced land clearing and rights-of-way. Another

16,500 acres will be adversely impacted as a result of reduction in annual flooding, which would preclude such wetland functions as water filtration and purification; nesting, rearing and resting places for aquatic and terrestrial species; food chain production; etc.

(c) Mudflats. Not applicable.

(d) Vegetated shallows. Not applicable.

(e) Riffle and pool complexes. Not applicable.

(6) Threatened and endangered species. In accordance with Section 7 of the Endangered Species Act of 1973, formal consultation with the Department of the Interior concerning impacts to the American alligator has been completed. The proposed dredge and fill activities will not jeopardize the continued existence or modify the critical habitat of any threatened or endangered species.

(7) Other wildlife. The direct loss of forest habitat and the loss of waterfowl habitat as a result of the reduction of flooding on openland and forest land have been recognized, categorically identified and quantified in the EIS, and compensated for as described in the mitigation appendix.

(8) Actions to minimize impacts. A feature of the recommended plan allows flooding from 80 feet, NGVD, to 85 feet, NGVD, from 1 December to 1 March to mitigate waterfowl losses and impacts on wetlands.

f. Proposed Disposal Site Determinations.

(1) Mixing zone determinations. There is no open water disposal or point-source discharge from the disposal areas. The disposal sites would be subject to flooding during late winter-early spring depending on the frequency of flood occurrence. The temporary mixing zones that will be required to initially dilute somewhat higher concentrations of dissolved materials added to aquatic areas are not expected to be large in size.

(2) Determination of compliance with applicable water quality standards. Based on information presented, the discharges are not expected to violate the State of Mississippi Water Quality Criteria.

(3) Potential effects on human use characteristics.

(a) Municipal and private water supply. Not applicable.

(b) Recreational and commercial fisheries. No significant effect.

(c) Water-related recreation. Not applicable.

(d) Esthetics. No significant effect.

(e) Parks, national and historical monuments, national seashores, wilderness areas, research sites, and similar preserves. Not applicable.

g. Determination of Cumulative Effects on the Aquatic Ecosystem. The addition of a minimal amount of pollutants to the existing poor water quality, as a result of the discharges discussed previously, should not have a significant adverse effect on the aquatic ecosystem.

h. Determination of Secondary Effects on the Aquatic Ecosystem. Both the primary and secondary effects on the aquatic ecosystem are considered to be minimal due to the dry excavation disposal and the already degraded existing water quality.

FINDING OF COMPLIANCE FOR
YAZOO AREA PUMP PROJECT
YAZOO BACKWATER AREA, MISSISSIPPI

1. No significant adaptations of the guidelines were made relative to this evaluation.

2. The proposed pumping plant is engineeringly located to benefit from the topography of the land to minimize excavation necessary for inlet and outlet channel construction. No other sites were evaluated during detailed studies presented in the Reevaluation Report. Confined disposal sites and removal of material to upland sites were considered cost-prohibitive and not carried forward to detailed planning.

3. The discharges of the various materials are not expected to violate the State of Mississippi Water Quality Criteria.

4. The discharge of the various materials should not result in the violation of the applicable toxic effluent standard or prohibition under Section 307 of the Clean Water Act.

5. The discharges will be in compliance with the requirements of the Endangered Species Act of 1973.

6. The project is located in inland fresh waters, and no impacts are expected to occur to environments covered by the Marine Protection, Research, and Sanctuaries Act of 1972.

7. The discharge of material should not result in any significant adverse effects on municipal and private water supplies, recreation and commercial fisheries, plankton, shellfish, wildlife, or any special aquatic sites and should not have any significant adverse effects on human health and welfare. The discharges should not result in any significant adverse effects on aquatic ecosystem diversity, productivity, and stability, and should not have any significant adverse effects on recreational, esthetic, and economic values.

8. Revegetation of disposal areas will minimize potential adverse impacts of the discharges on the aquatic ecosystem.

9. On the basis of the guidelines, the proposed disposal sites for the discharge of dredged material are specified as complying with requirements of these guidelines.

1 Attachment
Map

YAZOO PUMP PROJECT
YAZOO BACKWATER AREA
MISSISSIPPI

REEVALUATION REPORT

APPENDIX K

PERTINENT PLATES

PREPARED BY
THE UNITED STATES ARMY
VICKSBURG DISTRICT, CORPS OF ENGINEERS
VICKSBURG, MISSISSIPPI

PLATES 1-4 ARE PRESENTED AT THE BACK OF THE MAIN REPORT. PLATES 5-11, WHICH ARE PERTINENT TO THE ENTIRE PROJECT, ARE PRESENTED IN THIS APPENDIX.