UPPER MISSISSIPPI RIVER SYSTEM ENVIRONMENTAL MANAGEMENT PROGRAM DEFINITE PROJECT REPORT (SL-4) AND ENVIRONMENTAL ASSESSMENT

STUMP LAKE COMPLEX

HABITAT REHABILITATION AND ENHANCEMENT PROJECT

POOL 26, ILLINOIS RIVER
JERSEY COUNTY, ILLINOIS

MAIN REPORT

FINAL

JANUARY 1992

US Army Corps
of Engineers
St. Louis District

Partners in Progress

As revised by
NCD

CELMS-PM-M

30 January 1992

UPPER MISSISSIPPI RIVER SYSTEM ENVIRONMENTAL MANAGEMENT PROGRAM
FACT SHEET

STUMP LAKE COMPLEX, ILLINOIS
ILLINOIS RIVER, River Mile 7.2 to 12.7 (East Bank)

Location. The Stump Lake Complex (officially called the Stump Lake Waterfowl Management Area (WMA) extends from Illinois River mile 7.2 to mile 12.7 along the left (east) bank of the Illinois River. This 2,958 acre area includes Upper and Lower Stump Lakes, Fowler Lake, Flat Lake, Long Lake and Deep Lake and contains 1,221 acres of open wetlands, 252 acres of crop land and 1,485 acres of forest.

Resource Problem. Primary problems facing the Stump Lake Complex are sedimentation and water level fluctuation. The sedimentation rate is averaging .5 inch per year at the complex. Sedimentation results in a direct loss of wetland habitat for both waterfowl and fish due to the water-to-land conversion process and causes a decline in the quality of the remaining fishery habitat (primarily slough) due to shallower water levels which allow higher temperatures and reduced dissolved oxygen concentrations during the summer months. In addition, many management efforts are lost. Silt and lack of stable water levels are deleterious to aquatic and moist soil plant production. Inefficient water control structures and lack of protection from Illinois River waters at bank full and above stages allow for successful wildlife food production only 50 percent of the time on the average. Moist soil techniques are often foiled by flooding during the 50 to 90 days needed for development and maturity of food plants.

Project. The proposed project consists of construction of a low sediment deflection levee, 5.5 miles long, paralleling the Illinois River shoreline and the perimeter of the WMA to reduce siltation from frequent floods and to improve wetland unit water control. Seven low level interior levees will be constructed around the perimeters of the four main wetland compartments to allow effective water level management. Sluice gates and stop log structures will be constructed to control watering/dewatering of the four wet land compartments. A reversible pumping system will be constructed on the Illinois River to allow flooding or draining of the wetland compartments.

Project Outputs. Stump Lake Complex rehabilitation and enhancement, as a result of the project, include: a 79 percent reduction in sediment carrying waters into the project; 3 to 4-year flood frequency protection; capability to manipulate the water levels of the open wetlands in approximately 10 days for wildlife habitat management; improved fisheries spawning and rearing habitat in Long and Deep Lake sloughs and Upper and Lower Stump Lake; and restored fisheries access between Long and Deep Lake and the Illinois River.

Financial Data. Funds totaling $520,000 have been allocated for the general design phase of the project. Construction costs (including plans & specifications) are estimated to be $3,539,000. Annual operation, maintenance, and repair costs are estimated at $33,700. The project would be located on lands acquired for the navigation project that were identified in a General Plan and made available to the States through Cooperative Agreements between the Corps of Engineers and the Department of Interior (DOI), and between the DOI and each State. The Cooperative Agreements stipulate that the areas shall be maintained "in accordance with an annual management program. . . submitted to the Service." Under Section 906(e) of the 1986 Water Resources Development Act, the project area is "managed as a national wildlife refuge" and qualifies for 100 percent Federal funding of general design and construction. Operation, maintenance, repair, and rehabilitation costs would be shared 75 percent Federal/25 percent non-Federal. The non-Federal sponsor would be the Illinois Department of Conservation.

CELMS-PD-F (CELMV-PD-F/23 Oct 91) 2d End Mr. Hill/im/8486
SUBJECT: Transmittal of Revised Final Definite Project Report With Integrated EA and Signed FONSI, Stump Lake Complex, Illinois, Habitat Rehabilitation and Enhancement Project

Commander, U.S. Army Engineer District, St. Louis, 1222 Spruce, St. Louis, MO 63103-2833 31 Jan 92

FOR Commander, Lower Mississippi Valley Division, Vicksburg, MS 39181-0080

1. Enclosed is the subject report for approval and subsequent submittal through NCD to USACE for final review and approval. Forty copies of the report are provided as Enclosure 1.

2. This revised final document incorporates reevaluation/revisions requested in your 23 Oct 91 1st Endorsement. Pages in the revised final report, that have been changed as a result of CELMV-PD comments, are indicated with an "(R)" after the page number.

3. Specific responses to CELMV-PD 1st Endorsement comments are attached as Enclosure 2. Also enclosed is a revised PB-2a (Enclosure 3, 12 cys), the Stump Lake EMP-HREP M-CASES Cost Estimate (Enclosure 4, 40 cys), the original project fact sheet, the revised project fact sheet, and our explanation of the differences between the two (Enclosure 5, 12 cys).

FOR THE COMMANDER:

7 Encls
Added 5 Encls

Owen D. Dutt

OWEN D. DUTT
Chief, Planning Division

CELMV-PD-F (CELMS-PD-F/11 Sep 91) (1105-2-10c) 1st End
Mr. Arnold/bab/5836
SUBJECT: Transmittal of Final Definite Project Report with Integrated EA and Signed FONSI, Stump Lake Complex, Illinois, Habitat Rehabilitation and Enhancement Project

CDR, Lower Mississippi Valley Division, Vicksburg, MS 39181-0080
23 Oct 91

FOR Commander, St. Louis District, ATTN: CELMS-PD-F

1. Although we are in basic agreement with the components of the proposed plan, we remain concerned that project benefits appear low and the justification for the project is poorly presented including inconsistencies in project costs and errors in calculation of annual charges. Since this project is one of the first Habitat Rehabilitation Projects (HREP) that will require review by the Washington Level Review Center (WLRC) (and the first St. Louis District HREP), it is important that the report be accurate and makes the best case possible for project justification. Therefore, we are returning the report for revisions as described in the discussion to follow.

2. No data is given with Figure 3, page 9. The effectiveness of this presentation would be greatly enhanced by a better quality plate and data to indicate trends. Also, available hydrographic survey data (including recent LTRM efforts, if available) should be utilized to show existing conditions and projected trends.

3. Discussion on page 23 concerning selection of 426 as the levee elevation is inadequate. Neither Tables 6a nor 6b on page 27 nor the incremental cost analysis based on habitat units gained support the selection. As discussed in your response to LMVD comment 1.a., habitat benefits have been somewhat understated since year-to-year reliability was not assessed. Your discussion suggests a method for assessing that increased reliability with the project. There is further discussion about the appropriateness of this method in paragraph 5a below. It is suggested that the revised method chosen be used for evaluation of alternative levee benefits and presented in the report. Rationale for departure from the most cost effective height should be thoroughly explained.

4. Cost data in Tables 6A, 8, and 14 are inconsistent. Cost data used for comparison of alternatives should be complete and include annual O&M charges. The amortization factor cited is in error.

5. The habitat unit analysis as summarized in Table 8 and shown in detail in Appendix E does not appear to capture the total benefits of the project. The following changes are suggested:

a. Project Reliability. A factor must be derived to account for the increased reliability of the project to produce a high quality moist soil management unit. Although a factor of 1.33 was suggested in Appendix E, this factor seems to be overly conservative and simply reflects the percentage of increased flood control in the project area. The ability to manage food plots for 5 years out of 6 versus 1 out of every 2 years should result in a somewhat greater factor. Further, the ability to manage the crop year after year should also be reflected in O&M costs required to fulfill the management areas mission. It is recommended that the analysis team reconsider this factor for both waterfowl and fisheries analysis, and then apply it in the habitat analysis.

b. Forested Wetlands. It is recommended that the category "Forested Wetlands" be revisited by the analysis team. The habitat descriptions used in Appendix F for this habitat type indicate a fairly low quality bottomland hardwood; however, Table E-3 indicates moderate to good habitat quality. Most trees listed for the area are non-mast producing trees and considered generally of lower habitat value than mast-producing trees. Even descriptions of forested areas on higher ground in the project area indicate generally low-value woodlands. It is further recommended that the HSI's be revisited both for the without and with project condition. HSI's were assumed constant for the with and without condition (Table E-3); however, the discussion in Appendix C appears to be more realistic in terms of expectations with the project. The HSI's do not appear to reflect the ability to manage, hence, increase substantially, the habitat quality of the forested wetlands from non-mast to mast producing forest with the project.

c. Aquatic Analysis. The analysis appears to have only considered improved aquatic habitat for Deep and Long Lakes. It should be expanded to consider improved habitat conditions in Upper and Lower Stump Lakes due to decreased sedimentation, improved aquatic vegetative growth conditions; and, therefore, improved fisheries. The analysis should also consider other management units at Stump Lake which will increase the value of the project to aquatic species. Consideration should be given to assessing the effects of these areas on Group 4, Slackwater - Small Fishes and/or Group 5, Generalists. The ability to manage water levels, select water quality and produce high quality natural and managed food plots over a number of years must enhance the fishery. The without project condition should also take into account the loss of aquatic habitat due to conversion of water to land as shown in Figure 3. The progression of sedimentation should produce a loss of aquatic habitat value over time throughout the management area, not only as a result of lost water surface, but decreased depth, increased turbidity, lower dissolved oxygen, etc.

6. There is no discussion in the report of current O&M expenditures for the management area. It seems logical that the future without project condition would require increased expenditures to maintain the resource at some reasonable level of productivity. For example, as areas gradually silt in, aggressive control of woody vegetation, more pumping costs, and more intensive seeding operations would be required to provide waterfowl habitat. Such costs would be reduced with the project in place, particularly if native aquatic vegetation and moist soil plants can be established in the area and annual seeding discontinued. This is a potential project benefit which should be quantified.

7. Page 41, paragraph c. The District should avoid "formal consultation" on endangered species questions. Most problems with endangered species can be solved with informal consultation. In the case of the Stump Lake Project, there is no obvious need to rush to formal consultation.

8. As noted on page 56, Environmental Effects of the Selected Plan, the Stump Lake Project will require the destruction of bottomland hardwoods. Appropriate parts of the discussion found in Appendix C, beginning on page C-24, should be included in this discussion of forested lands. Discussions of bottomland hardwoods appropriately belong in the Main Report, particularly when they are scheduled for destruction. Mitigation of bottomland hardwoods must be specifically addressed.

9. Table 19, page 62. The District should be aware of the possible requirement for a National Pollutant Discharge Elimination System (NPDES) Permit. Preliminary guidance indicates that construction sites over 5 acres are subject to this new permit requirement.

10. The discussion on page C-14, Appendix C (response to Sierra Club comments), helps explain expected benefits of the project. It is recommended that a similar discussion along with the graphic appear on page 56, paragraph 8 of the Main Report.

11. In the District's responses to LMVD comment 2.0., it is indicated that a belt-driven angle pump similar to those manufactured by Couch Pump Company is desired by the Illinois Department of Conservation. However, Plate 18 continues to depict a pump/engine arrangement which is not feasible. If a belt-driven pump with the required horsepower is now functioning adequately at Stump Lake, Plate 18 should be revised to reflect that arrangement.

12. No explanation of the $12,000 real estate cost is given. Since there is no right-of-way to be acquired, the $12,000 for coordination appears excessive.

FOR THE COMMANDER:

2 Encls
wd 2 copies

JAMES R. HANCHEY
Director of Planning

CELMS-PD-F (1105) 11 September 1991

MEMORANDUM FOR Commander, Lower Mississippi Valley Division,
ATTN: CELMV-PD-F

SUBJECT: Transmittal of Final Definite Project Report with Integrated EA and Signed FONSI, Stump Lake Complex, Illinois, Habitat Rehabilitation and Enhancement Project.

1. Enclosed is the subject report for approval and subsequent submittal to NCD and other appropriate Corps elements. Fifteen copies of the report are provided as Enclosure 1.

2. This final document incorporates revisions resulting from public/interagency draft report comments received through February 1991 and comments submitted by CELMV-PD on 11 January 1991. Specific responses to CELMV-PD comments are attached as Enclosure 2.

3. The subject document has been simultaneously submitted to the U.S. Fish and Wildlife Service (USFWS), Region 3 headquarters and the Illinois Department of Conservation (IDOC) for preliminary review of the final. In Appendix A of subject report, Letters of Intent to support the project are submitted by the USFWS and the project sponsor (IDOC) and published in the final report. The IDOC Letter of Intent is published in Appendix A. However, by previous agreement, the USFWS Letter of Intent will not be submitted until the Agency conducts an expeditious review of the final report. Upon receipt of the USFWS letter, copies will be immediately forwarded for insertion in the copies of the report currently distributed.

4. Following receipt of USFWS Letter of Intent and LMVD submittal of the document to NCD, copies of the final document will be distributed to other interested agencies and the public. The public notice process for Section 404(b) of the Clean Water Act will begin at this time as well.

5. Also enclosed is a revised PB-2a (Enclosure 3) and a revised project fact sheet (Enclosure 4).

FOR THE COMMANDER:

Owen D. Dutt

Encls

OWEN D. DUTT
Acting Chief, Planning Division

CF:
CENCD-PD-PL (5 copies)

CELMS Responses To LMVD Comments On
Stump Lake Complex
Habitat Rehabilitation And Enhancement Project

1. <u>Response To General Comments.</u>

1.a. One reason the habitat benefits are numerically low is that the Stump Lake Complex is already managed. It is divided into management compartments that are served by an existing water distribution system. The habitat benefits to be gained at the project site are proportionately less than those to be gained at a similar-sized area without such features. Another reason is that the WHAG does not assess the year-to-year reliability of waterfowl food sources; a factor of great importance to the site manager. Such reliability will be improved through implementation of the project, but the improvement is not reflected in the number of habitat units gained (see discussion in Appendix E, pages E5-E6). The AHAG results show a very slight increase in habitat units attributable to dredging. This result is counter intuitive, and we believe the AHAG model appears to be "insensitive" to the proposed changes in depth (See discussion in Appendix E, page E15). We believe the recommended plan does not include any component that individually gives rise to "insignificant benefits."

1.b. Concur. Some additional data concerning historical and "future without" project use has been included in the Final. Historic changes to aquatic habitat are included in a new figure (Figure 3) which shows the extent of woody invasion at Stump Lake Complex over the period 1956-1989. We attempted to gather other information documenting habitat decline. We found that data on waterfowl hunter use and harvest vary with continental waterfowl population dynamics, and no firm conclusions could be drawn about changes to habitat quality. No similar data has ever been collected for fisherman use at the Stump Lake Complex. Results of electrofishing in Long Lake from 1965 to the present do not show any trend in total number of species or number of fish obtained per unit time.

1.c. Concur. CELMS-PD-E has been coordinated with and Table 8 has been revised.

1.d. Concur. A VE Study was conducted for the Stump Lake project in October 1990. Paragraph f. on Page 31 documents this study.

1.e. Concur. The DPR cover has been revised.

2. <u>Responses To Specific Comments.</u>

2.a. Documentation has been included in the Hydrology and Hydraulics sections of the report to verify the average sedimentation rate.

2.b. Concur. Correction has been made.

2.c. These concerns were considered during the preparation of the draft DPR. Several alternative structures were investigated which included structures with radial gates, roller gates and sluice gates. The construction cost for the fish passage structure is actually about 5% less than the cost of a gravity drainage structure where both structures have equal drainage capacity. The construction costs for the other alternative structures were substantially greater than for the fish passage structures. The selected structure meets the needs for both fish passage and water passage and is the most cost effective.

2.d. Concur. The DPR text and OM&R requirements commit the state to pursue further erosion control actions in the watershed. These actions will be entirely off project and funded separately by the IDOC and not considered as an OM&R cost for the EMP project.

2.e. The District will conduct additional borings at the project. Paragraph (1) has been revised as follows: Delete 3rd paragraph beginning with "Soils data .." and replace with the paragraph below.

Due to the subsequent raising of the project levee elevation from 424 to 426, additional soil borings will be required. As a minimum 22 auger borings 15 feet deep are required along the centerline of the new levee segment. In addition 6 overwater borings 40 feet deep and 2 borings (estimated 100 feet deep) down to rock are also required. The additional borings along with some testing will need to be done prior to or during Plans and Specifications.

2.f. Concur. Appropriate revisions have been made.

2.g. Concur. The Real Estate Cost estimate has been revised.

2.h. Concur. A PB-2A is enclosed as an enclosure in the Final DPR Transmittal Memorandum.

2.i. Concur. Appendix DPR-L provides additional justification for 50 percent contingencies.

2.j. Concur. Project milestone dates have been amended. However, they will most likely need to be revised again in the near future.

2.k. Appendix N provides the results of a habitat evaluation of bottomland hardwoods and forested wetlands at Stump Lake Complex. The methodology used for the evaluation is HES.

The analysis showed an overall improvement to these resources, and no habitat enhancement or mitigation measures were therefore proposed.

2.l. Concur. The paragraph has been revised per your comment.

2.m. Concur. The word "Tensar" has been eliminated and replaced with the word "geogrid."

2.n. Concur. However, the lessons learned from Dresser Island indicate a need for more detailed boring information. In addition, the possibility may exist that the culvert pipes to be installed could be done at a cheaper cost by installing them in the "wet."

2.o. Concur. We have explored the alternatives suggested in the comment. One alternative was to use a hydraulically operated pump powered from a portable diesel drive unit. A hydraulically operated pump and a belt driven angle pump, both powered by portable diesel drive units, are in use now at Stump Lake. There has been a considerable amount of maintenance work required on the hydraulic operator, so the Illinois Department of Conservation specifically requested a belt driven pump for ease of operation and maintenance. The other alternative suggested was to use removable submersible pumps if electrical power is available. Electrical power is not available for submersible pumps. The proposed pump is a belt driven angle pump similar to those manufactured by Couch Pump Company.

2.p. Concur.

2.q. Concur. Revisions have been made.

2.r. Concur. Revisions have been made.

2.s. Concur. The paragraph has been revised per your request.

2.t. Concur. The paragraph has been revised per your request.

2.u. Concur. The paragraph has been revised per your request.

DETAILED PROJECT SCHEDULE (PB-2A)
(000)

APPROPRIATION: B CONSTRUCTION GENERAL RUN DATE: 17SEP91
INLAND WW TRUST FUND: NO CLASS: 220 NAVIGATION PROJECTS - LOCKS AND DAMS
LEGEND: P=PLANS & SPECS D=DESIGN MEMO C=AE CONTRACT NO R=REVIEW A=ADVERTISE & AWARD E=EARNINGS -=NO EARNINGS H=HIRED LABOR

ACCT LII	NAME	F W C	PRJ EST NONCORP%	COST THRU FY 91	CURRENT FY 92 SCHED EXP	1Q	2Q	3Q	4Q	BUDGET FY 93 SCHED EXP	1Q	2Q	3Q	4Q	FUTURE FISCAL FY 94	FY 95	FY 96	YEARS FY 97 PROG UNPRG
017	STUMP LAKE, IL		4019	498	207	10	50	50	97	1876	275	450	600	551	1438			
************																		
01	LANDS AND DAMAGES		12		12				12									

0110	STUMP LAKE,IL LANDS/DAMA	E	12 0.00		12				12									
************																		
06	FISH & WILDLIFE FACILITIES		441							193	40	50	50	53	248			

0610	FISH & WILDLIFE FAC	E	441 0.00							193	40	50	50	53	248			
	B 5-01 01AUG92				RRRRRRRRRRRRRRRRAAAAAAEE					EEEEEEEEEEEEEEEEEEEEEEEE EEE								
************																		
08	ROADS, RAILROADS, & BRIDGES		22												22			

0810	ROADS,RR, & BRIDGES	E	22 0.00												22			
	B 5-02 01AUG92								--	----------------------- EEEEE								
************																		
11	LEVEES AND FLOODWALLS		1210		30				30	1000	150	300	300	250	180			

1110	LEVEES & FLOODWALLS	E	1210 0.00		30				30	1000	150	300	300	250	180			
	B 5-03 01AUG92				-----------------------E					EEEEEEEEEEEEEEEEEEEEEEEE EEEEE								
************																		
12	NAVIGATION PORTS & HARBORS		600							300			150	150	300			

1210	DREDGING	E	600 0.00							300			150	150	300			
	B 5-04 01AUG92								--	------------EEEEEEEEEEEE EEEEE								

DETAILED PROJEC, HEDULE (PB-2A)
(000)

APPROPRIATION: B CONSTRUCTION GENERAL RUN DATE: 17SEP91
INLAND WW TRUST FUND: NO CLASS: 220 NAVIGATION PROJECTS - LOCKS AND DAMS
LEGEND: P=PLANS & SPECS D=DESIGN MEMO C=AE CONTRACT NO R=REVIEW A=ADVERTISE & AWARD E=EARNINGS -=NO EARNINGS H=HIRED LABOR

					CURRENT FY 92					BUDGET FY 93					FUTURE FISCAL			YEARS
ACCT LII	NAME	F W C	PRJ EST NONCORP%	COST THRU FY 91	SCHED EXP	1Q	2Q	3Q	4Q	SCHED EXP	1Q	2Q	3Q	4Q	FY 94	FY 95	FY 96	FY 97 PROG UNPRG
13	PUMPING PLANTS		416												416			
1310	PUMPING PLANT		416												416			
		E	0.00						--	----------	----------	----------	----------	EEEEE				
B 5-05	01AUG92																	
30	PLANNING, ENGR, AND DESIGN		931	498	160	10	50	50	50	240	60	60	60	60	33			
3010	P,E&D		931	498	160	10	50	50	50	240	60	60	60	60	33			
		E	0.00															
31	CONSTRUCTION MANAGEMENT		387		5				5	143	25	40	40	38	239			
3110	S&I		387		5				5	143	25	40	40	38	239			
		E	0.00															

DETAILED PROJEL ⌐HEDULE (PB-2A)
(000)

APPROPRIATIUN: B CONSTRUCTION GENERAL
INLAND WW TRUST FUND: NO
CLASS: 220 NAVIGATION PROJECTS - LOCKS AND DAMS
RUN DATE: 17SEP91

LEGEND: P=PLANS & SPECS D=DESIGN MEMO C=AE CONTRACT NO R=REVIEW A=ADVERTISE & AWARD E=EARNINGS -=NO EARNINGS H=HIRED LABOR

ACCT LII	NAME	F W C	PRJ EST NONCORP%	COST THRU FY 91	CURRENT FY 92 SCHED EXP	1Q	2Q	3Q	4Q	BUDGET FY 93 SCHED EXP	1Q	2Q	3Q	4Q	FUTURE FISCAL FY 94	FY 95	FY 96	YEARS FY 97 PROG UNPRG
017	SUBPROJECT TOTAL STUMP LAKE, IL		4019	498	207	10	50	50	97	1876	275	450	600	551	1438			
	ADDITIONAL CONTRIBUTIONS																	
	AUTHORIZED PROJECT COST		4019	498	207	10	50	50	97	1876	275	450	600	551	1438			
	CORPS OF ENGINEERS		4019	498	207	10	50	50	97	1876	275	450	600	551	1438			

CELMS-PM-M 13 September 1991

Name of Project. Upper Mississippi River System--Environmental Management Program (UMRS-EMP), Stump Lake Habitat Rehabilitation Project

Location. The Stump Lake Complex (officially called the Stump Lake Waterfowl Management Area (WMA)) extends from Illinois River mile 7.2 to mile 12.7 along the left (east) bank of the Illinois River. This 2,958 acre area includes Upper and Lower Stump Lakes, Fowler Lake, Flat Lake, Long Lake and Deep Lake and contains 1,221 acres of open wetlands, 252 acres of crop land and 1,485 acres of forest.

Resource Problem. Primary problems facing the Stump Lake Complex are sedimentation and water level fluctuation. The sedimentation rate is averaging .5 inches per year at the complex. Sedimentation results in a direct loss of wetland habitat for both waterfowl and fish due to the water-to-land conversion process and causes a decline in the quality of the remaining fishery habitat (primarily slough) due to shallower water levels which allow higher temperatures and reduced dissolved oxygen concentrations during the summer months. In addition, many management efforts are lost. Silt and lack of stable water levels are deleterious to aquatic and moist soil plant production. Inefficient water control structures and lack of protection from Illinois River waters at bank full and above stages allow for successful wildlife food production only 50% of the time on the average. Moist soil techniques are often foiled by flooding during the 50 to 90 days needed for development and maturity of food plants.

Project. The proposed project consists of construction of a low sediment deflection levee, 5.5 miles long, paralleling the Illinois River shoreline and the perimeter of the WMA to reduce siltation from frequent floods and to improve wetland unit water control. Seven low level interior levees will be constructed around the perimeters of the four main wetland compartments to allow effective water level management. Sluice gates and stop log structures will be constructed to control watering/dewatering of the four wetland compartments. A reversible pumping system will be constructed on the Illinois River to allow flooding or draining of the wetland compartments.

Project Outputs. Project results will include a 79% reduction in sedimentation, 3-4 year flood frequency protection, capability to fill or drain the wetland unit waters in approximately 10 days, and restored fisheries habitat and access in Long and Deep Lake sloughs. The project is designed to provide habitat for approximately 50 years.

Financial Data. The general design cost is estimated at $480,000, and construction costs (including plans and specifications) are estimated at $3,539,000. Since the project is located on Cooperative Agreement lands managed by the Illinois Department of Conservation as a national wildlife refuge, implementation cost will be 100 percent Federal. The estimated annual O&M cost of the project is $25,500. The Illinois Department of Conservation is the local project sponsor and will operate and maintain the project after completion.

Status. The draft DPR was completed and released for public and interagency review and comment on 4 December 1990. A public workshop was conducted on 30 January 1991. Comments received were evaluated and coordinated. A final DPR was completed in August 1991. The Final DPR was submitted for approval in September 1991.

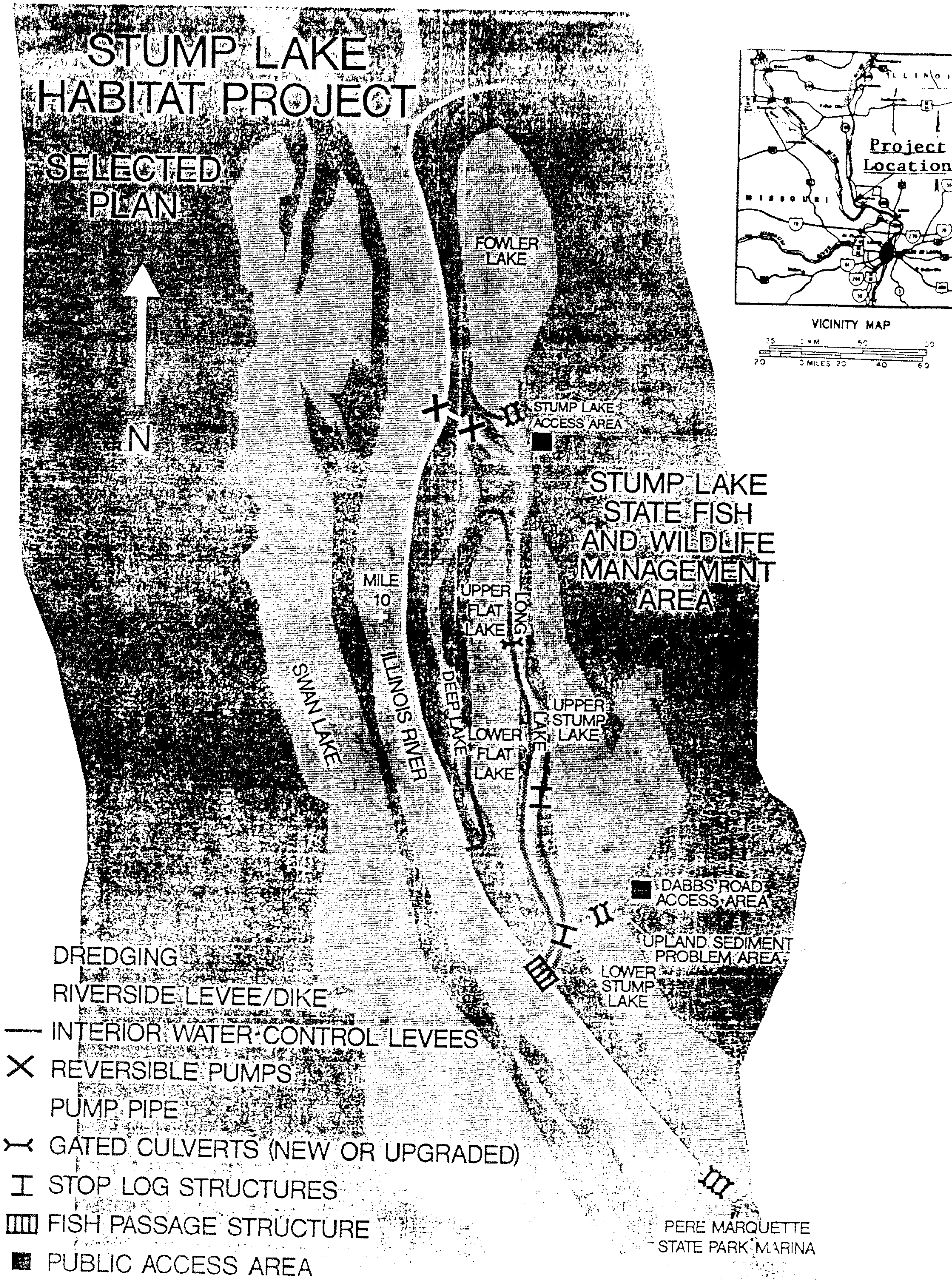

STUMP LAKE
HABITAT PROJECT
SELECTED
PLAN
N
FOWLER
LAKE
STUMP LAKE
ACCESS AREA
STUMP LAKE
STATE FISH
AND WILDLIFE
MANAGEMENT
AREA
MILE
10
UPPER
FLAT
LAKE
LONG LAKE
SWAN LAKE
ILLINOIS RIVER
DEEP LAKE
UPPER
STUMP
LAKE
LOWER
FLAT
LAKE
DABBS ROAD
ACCESS AREA
UPLAND SEDIMENT
PROBLEM AREA
LOWER
STUMP
LAKE
DREDGING
RIVERSIDE LEVEE/DIKE
INTERIOR WATER CONTROL LEVEES
REVERSIBLE PUMPS
PUMP PIPE
GATED CULVERTS (NEW OR UPGRADED)
STOP LOG STRUCTURES
FISH PASSAGE STRUCTURE
PUBLIC ACCESS AREA
PERE MARQUETTE
STATE PARK MARINA
Project
Location
MISSOURI
VICINITY MAP

FIGURE J-1

CELMS RESPONSES
TO CELMVD 23 OCT 91 COMMENTS
ON THE STUMP LAKE COMPLEX HABITAT REHABILITATION
AND ENHANCEMENT PROJECT
FINAL DEFINITE PROJECT REPORT

1. Concur. We have reevaluated project habitat benefits, project justifications, and project cost analysis and annualization calculations, and have made numerous revisions which should greatly strengthen the justification for the proposed project. Specific revisions are documented in other response paragraphs.

2. Data to indicate sedimentation/habitat loss trends has been expanded and further documented in Figure 3 on page 10 and in paragraph 2.d., Hydrology/Hydraulics, page 9 in the Revised Final Main Report. There are no hydrographic surveys of the Stump Lake Complex.

3. The discussion in paragraph 6.d.(1)., Dikes and Levees, on page 25 has been revised to clarify the rationale behind the selection of the 426 NGVD riverside levee elevation. While the cost calculations do not rate this levee height as the least expensive, the selection was made based primarily on achieving management objectives cost effectively. The added benefits and the proportionate cost increase of the selected levee height effectively maximizes protection needs with a reasonable cost investment.

Tables 6a and 6b have been significantly revised and combined into one Table 6 on page 29 of the revised Final. This table now reflects corrected incremental analysis data and other relevant data used in selecting the riverside levee height.

4. Concur. Tables 6, 8, 14 and 15 are now consistent and annual O&M charges are included for data comparison of alternatives. The Amortization factor has been corrected.

5a. Concur. The waterfowl analysis was modified by incorporating a factor to account for the effects of Illinois River flooding on reliability of food plant production during the summer months. The WHAG model currently does not assess this factor. In Appendix DPR-E, a new factor - "appraisal item No. 58" in revised Table E-2 - was added to the wetland characteristic matrix. The new factor is identical to appraisal item No. 5, except for season. Inclusion of this new factor lowered the mallard HSI's for existing and future without conditions considerably (see revised Tables E-3 and E-4). Consequently, the waterfowl habitat units have increased considerably (see revised Table E-5). The modifications in Appendix DPR-E necessitated changes to Tables 7, 8 and 9 of the Main Report.

The fisheries analysis was not modified by any such new factor because the AHAG has already taken into account "project reliability." The comment about O&M costs is addressed in our response to comment 6.

5b. Concur. The HSI's for forested wetlands in Appendix DPR-E have been revisited, and separate values have been calculated for the future without and future with project conditions (see revised Tables E-2, E-3 and E-4). Although the differences among the HSI's for these three project conditions are rather small, the WHAG analysis generates habitat benefits that reflect the expectations described in Appendix C. Note that the habitat benefits from the WES analysis in Appendix C are for wildlife species as a whole, while the benefits from the WHAG analysis are for the mallard only.

5c. Concur. The aquatic analysis in Appendix DPR-E has been expanded to include Upper and Lower Stump Lakes, the two management units in which water levels are kept relatively constant to promote the growth of submerged aquatic plants. Because the two remaining management units are dedicated to moist soil plant production, they were not included in the fisheries analysis. The analysis was also expanded beyond large slackwater fishes to include small slackwater fishes (see revised Tables E-8 and E-9). The generalist group of fishes were not pulled into the analysis because the AHAG model purposefully excluded them. Factors adversely impacting fisheries during the without project condition other than conversion of water to land, such as decreased depth, increased turbidity, and lower dissolved oxygen, were evaluated during the determination of appraisal guide ratings (see Table E-8).

Inclusion of Upper/Lower Stump Lake and small slackwater fishes generated substantial additional habitat benefits (see revised Table E-10 and new Table E-11).

6. Comment acknowledged. A General statement on current annual O&M expenditures for the Stump Lake Complex, and average percent increase in annual O&M in the without project condition, is now included in Paragraph 2.c.(e). on page 9 in the Revised Final Report.

7. Concur. The subject paragraph has been modified to indicate that informal consultation with the USFWS would occur, should the need so arise.

8. Concur. A discussion of bottomland hardwoods has been extracted from Appendix DPR-C and placed in the Revised Final Report on page 63 in the discussion of forested lands. The discussion addresses mitigation.

9. Comment Acknowledged. We will comply with NPDES requirements. The District is currently establishing a procedure to ensure compliance.

10. The recommended discussion from Appendix DPR-C has been included in the Revised Final Main Report in paragraph 8.a.(7). on page 62.

11. The Stump Lake EMP-HREP Study Team has consulted with the Couch Pump Co. and the pump/engine arrangement has now been revised on Plate 18 to depict proper angle, mounting and anchoring.

12. The Real Estate cost estimate is based primarily on cabin lease coordination and boundary verification, and possible renegotiation of some leases. Paragraph 7.f.(4.) on page 50 of the revised final main report documents real estate activities that are officially estimated to cost approximately $12,000.00.

DETAILED PROJEC SCHEDULE (PB-2A)
(000)

APPROPRIATION: B CONSTRUCTION GENERAL RUN DATE: 31JAN92
INLAND WW TRUST FUND: NO CLASS: 220 NAVIGATION PROJECTS - LOCKS AND DAMS
LEGEND: P=PLANS & SPECS D=DESIGN MEMO C=AE CONTRACT NO R=REVIEW A=ADVERTISE & AWARD E=EARNINGS -=NO EARNINGS H=HIRED LABOR

					CURRENT FY 92					BUDGET FY 93					FUTURE FISCAL			YEARS
ACCT LII	NAME	F W C	PRJ EST NONCORP%	COST THRU FY 91	SCHED EXP	1Q	2Q	3Q	4Q	SCHED EXP	1Q	2Q	3Q	4Q	FY 94	FY 95	FY 96	FY 97 PROG UNPRG
017	STUMP LAKE, IL		4059	485	382	23	70	160	129	1643	2	333	593	715	1000	549		
01	LANDS AND DAMAGES		12							12		12						
0110	STUMP LAKE,IL LANDS/DAMA	E	12 0.00							12		12						
06	FISH & WILDLIFE FACILITIES		441							341		91	125	125	50	50		
0610	FISH & WILDLIFE FAC	E	441 0.00							341		91	125	125	50	50		
B 5-01	01DEC92				RRRRRRRRRRRRRRRRRRRRRRR					AAAAAAEEEEEEEEEEEEEEEEEE EEE								
08	ROADS, RAILROADS, & BRIDGES		22												22			
0810	ROADS,RR, & BRIDGES	E	22 0.00												22			
B 5-02	01DEC92										------------------ EEEEE							
11	LEVEES AND FLOODWALLS		1210							762		100	300	362	379	69		
1110	LEVEES & FLOODWALLS	E	1210 0.00							762		100	300	362	379	69		
B 5-03	01DEC92										EEEEEEEEEEEEEEEEEE EEEEE							
12	NAVIGATION PORTS & HARBORS		600							350		100	100	150	250			
1210	DREDGING	E	600 0.00							350		100	100	150	250			
B 5-04	01DEC92										EEEEEEEEEEEEEEEEEE EEEEE							

EFF DATE DIV: BO LOWER MISS VALLEY DIV. PROJECT: UPPER MISS R. ENV MGT PROGRAM
31-JAN-92 DIST: B3 ST LOUIS PROJECT NO: BB005 LEVEL: 3 CWIS NO: 76150

LAST ACCESSED: 31-JAN-92

ENCLOSURE 3

DETAILED PROJECT SCHEDULE (PB-2A)
(000)

APPROPRIATION: B CONSTRUCTION GENERAL
INLAND WW TRUST FUND: NO

RUN DATE: 31JAN92

CLASS: 220 NAVIGATION PROJECTS - LOCKS AND DAMS

LEGEND: P=PLANS & SPECS D=DESIGN MEMO C=AE CONTRACT NO R=REVIEW A=ADVERTISE & AWARD E=EARNINGS -=NO EARNINGS H=HIRED LABOR

ACCT LII	NAME	F W C	PRJ EST NONCORP%	COST THRU FY 91	CURRENT FY 92 SCHED EXP	CURRENT FY 92 1Q	2Q	3Q	4Q	BUDGET FY 93 SCHED EXP	BUDGET FY 93 1Q	2Q	3Q	4Q	FUTURE FISCAL FY 94	FY 95	FY 96	YEARS FY 97 PROG UNPRG
13	PUMPING PLANTS		416												145	271		
1310	PUMPING PLANT	E	416 0.00												145	271		
	B 5-05 01DEC92										----	----	----	----	EEEEE			
30	PLANNING, ENGR, AND DESIGN		971	485	382	23	70	160	129	40			15	25	34	30		
3010	P,E&D	E	971 0.00	485	382	23	70	160	129	40			15	25	34	30		
31	CONSTRUCTION MANAGEMENT		387							138	2	30	53	53	120	129		
3110	S&I	E	387 0.00							138	2	30	53	53	120	129		

ENCLOSURE 3

DETAILED PROJ[illegible] [illegible]CHEDULE (FB-2A)
(000)

APPROPRIA[illegible]ON: B CONSTRUCTION GENERAL
INLAND WW TRUST FUND: NO

CLASS: 220 NAVIGATION PROJECTS - LOCKS AND DAMS

RUN DATE: 31JAN92

LEGEND: P=PLANS & SPECS D=DESIGN MEMO C=AE CONTRACT NO R=REVIEW A=ADVERTISE & AWARD E=EARNINGS -=NO EARNINGS H=HIRED LABOR

ACCT LII	NAME	F W C	PRJ EST NONCORP%	COST THRU FY 91	CURRENT FY 92 SCHED EXP	1Q	2Q	3Q	4Q	BUDGET FY 93 SCHED EXP	1Q	2Q	3Q	4Q	FUTURE FISCAL FY 94	FY 95	FY 96	YEARS FY 97 PROG	UNPRG
017	SUBPROJECT TOTAL STUMP LAKE, IL		4059	485	382	23	70	160	129	1643	2	333	593	715	1000	549			
	ADDITIONAL CONTRIBUTIONS																		
	AUTHORIZED PROJECT COST		4059	485	382	23	70	160	129	1643	2	333	593	715	1000	549			
	CORPS OF ENGINEERS		4059	485	382	23	70	160	129	1643	2	333	593	715	1000	549			

ENCLOSURE 3

DETAILED PROJ CHEDULE (PB-2A)

APPROPRIA N: B CONSTRUCTION GENERAL

INLAND WW TRUST FUND: NO

RUN DATE: 31JAN92

CLASS: 220 NAVIGATION PROJECTS - LOCKS AND DAMS

LEGEND: P=PLANS & SPECS D=DESIGN MEMO C=AE CONTRACT NO R=REVIEW A=ADVERTISE & AWARD E=EARNINGS -=NO EARNINGS H=HIRED LABOR

ACCT LII	NAME	F W C	PRJ EST NONCORP%	COST THRU FY 91	CURRENT FY 92 SCHED EXP	1Q	2Q	3Q	4Q	BUDGET FY 93 SCHED EXP	1Q	2Q	3Q	4Q	FUTURE FISCAL FY 94	FY 95	FY 96	YEARS FY 97 PROG UNPRG
GRAND TOTAL COST			4059	485	382	23	70	160	129	1643	2	333	593	715	1000	549		
ADDITIONAL CONTRIBUTIONS																		
AUTHORIZED PROJECT COST			4059	485	382	.23	70	160	129	1643	2	333	593	715	1000	549		
CORPS OF ENGINEERS			4059	485	382	23	70	160	129	1643	2	333	593	715	1000	549		

ENCLOSURE 3

APPROPRI... N: B CONSTRUCTION GENERAL

DETAILED PROJ... CHEDULE (PB-2A)

INLAND WW TRUST FUND: NO

RUN DATE: 31JAN92

CLASS: 220 NAVIGATION PROJECTS - LOCKS AND DAMS

LEGEND: P=PLANS & SPECS D=DESIGN MEMO C=AE CONTRACT NO R=REVIEW A=ADVERTISE & AWARD E=EARNINGS -=NO EARNINGS H=HIRED LABOR

ACCT LII	NAME	F W C	PRJ EST NONCORP%	COST THRU FY 91	CURRENT FY 92 SCHED EXP	CURRENT FY 92 1Q	CURRENT FY 92 2Q	CURRENT FY 92 3Q	CURRENT FY 92 4Q	BUDGET FY 93 SCHED EXP	BUDGET FY 93 1Q	BUDGET FY 93 2Q	BUDGET FY 93 3Q	BUDGET FY 93 4Q	FUTURE FISCAL FY 94	FUTURE FISCAL FY 95	FUTURE FISCAL FY 96	YEARS FY 97 PROG UNPRG
MULTI-COMPONENT CONTRACTS																		
B 5	MULTI COMPONENT F&W, RR&B, LV & FLDW, DRED 01DEC92		2689							1453		291	525	637	846	390		
	CORPS OF ENGINEERS	E	2689							1453		291	525	637	846	390		

ENCLOSURE 3

M-CASES

COST ESTIMATE

ENCLOSURE 4

Baseline Cost Estimate

STUMP LAKE

S U M M A R Y

15 January 1992

Cost Account No.	Description of Item		Estimated Cost
01.-.-.-	LANDS AND DAMAGES	$	12,000
06.-.-.-	FISH AND WILDLIFE FACILITIES		441,000
08.-.-.-	ROADS, RAILROADS AND BRIDGES		22,500
11.-.-.-	LEVEES AND FLOODWALLS		1,210,000
12.-.-.-	DREDGING		600,000
13.-.-.-	PUMPING PLANT		416,000
	SUBTOTAL	$	2,701,500
30.-.-.-	PLANNING, ENGINEERING AND DESIGN		970,800
31.-.-.-	CONSTRUCTION MANAGEMENT		387,000
	TOTAL PROJECT COST	**$**	**4,059,300**

Jack R. Niemi PE
Chairman, Project Review Board

Sharon R. Cotner
Project Manager

John W. Dierker
Chief Cost Engineering Branch.

SECTION I-BASIS OF ESTIMATE
STUMP LAKE

1-01. GENERAL.

This cost estimate has been developed using previous cost estimates, current designs and quantity take-offs, recent bid abstracts for projects in the area, detailed cost estimates and estimators judgment. The M-CACES program was used to prepare the baseline cost estimate and then item totals were carried over to a super calc. spreadsheet program to summarize the baseline cost estimate. An appropriate contingency was applied to each line item of cost. The Price Level for this estimate is October 1990.

1-02. DISCUSSION OF RELIABILITY OF DESIGNS, QUANTITIES, AND UNIT PRICES.

a. Fish and wildlife Facilities. This item received a higher contingency to account for uncertainties, such as soil conditions, and river stage elevations during construction. The cost of dewatering also adds additional uncertainty mainly because there is no detailed dewatering plan available at this stage of the project.

b. Channels and Canals. The most critical item is the channel excavation. This will be a hydraulic excavation using a small dredge to excavate Long Lake and the upper 2400 ft of Deep Lake. The assumed maximum length of discharge is 1500 ft. so a booster pump is not considered in our unit price per cubic yd. The existing high ground and interior dikes will be used to contain the dredged material. 24-inch drainage pipes and rough grading of disposal is also assumed in the unit price of $ 3.00 per cubic yard. Flat Lake will be used for disposal.

c. Levees and Floodwalls. There are two items that warrant discussion in this area:

(1). Levee Embankment. Even though a preliminary design has been accomplished for this item, it is the type of feature that is subject to numerous changes in the future stages of the project development. The wetness of the material and the difficulty in moving this material is one problem we feel would affect the cost. The haul distance based on preliminary plans averages 400-ft. We have based our unit price on the assumption that the construction season will be reasonably dry. If this assumption is incorrect then we would expect a significant increase to the construction item for this work. We have assigned the contingency of 15%, based on the above assumption

(2). Hydraulic Operators. The type of Hydraulic Operators have not been defined at this point and the price range is widely variable on this item. This uncertainty made us decide to assign the highest contingency in this project of 50% to this item.

d. Pumping Plant. In order to insure proper elevation in the environmental pool during low season, the pump must be used for 15-20 days in the year. Pump type and size has been discussed and price quotation was received on the desired pump; however, the price can fluctuate until the time of construction. We, therefore are using a 30% contingency on this major item.

1-03. DISCUSSION OF VARIABLE CONTINGENCIES.

The cost estimate on this project includes contingencies ranging in value from 10% to 50%. Assigned contingencies are based on the inherent difficulties in visualizing and quantifying certain types of work; such as dewatering, structural steel, embankment, etc. 50% contingency was assigned to the Hydraulic operator, since neither model or type of operator is determined at present stage of planning. Generally, a contingency of 20% was utilized for this project which was felt to be reasonable at this stage of the design.

Our Construction division has assumed that the construction contract plans and specifications have had sufficient time to have been thoroughly reviewed, and contain minimum of issues that have the potential to develop into claims. Based on this premise, all costs for CLAIMS AND LITIGATIONS are regarded as **contingency costs only.**

DATE: 15 January 19
PREPAIRED BY: S.DOM
& J.DIERK
REVIEWED BY: J.DIERK

Baseline Cost Estimate
STUMP LAKE

P.L. October 1990

Cost Acct. No.	Description	Quantity	Unit	Unit Price	Estimated Cost w/o Contingencies	% Cont	Contingency	Total Estimated Cost	PRICE LEVEL (October 19 =
01.-.-.-	LANDS AND DAMAGES								
01.B.-.-	POST-AUTHORIZATION PLANNING				0				
01.B.8.-	All Other				10,000	20	2,000	12,000	12,00
	SUBTOTAL..				10,000				
01.0.Z.-	CONTINGENCIES..						2,000		
	TOTAL (LANDS AND DAMAGES)..							12,000	12,00
	ROUNDED TOTAL (LANDS AND DAMAGES)..								12,00
06.-.-.-	FISH AND WILDLIFE FACILITIES								
	Fish passage (71+27) (Alternative to 6-42" CMP) (Site F)								
06.2.A.-	Mobilization/Demob.	SUM	JOB		49,000	10	4,900	53,900	53,90
06.2.B.-	Dewatering	SUM	JOB		56,250	35	19,688	75,938	75,93
06.4.C.-	Fish Passage Str.	42	CY.	200.00	8,400	30	2,520	10,920	10,92
06.4.C.-	Sluice Gate(42")	4	Ea.	15,000.00	60,000	20	12,000	72,000	72,00
06.4.C.-	Bedding Stone, 3" minus	730	TON	22.00	16,060	20	3,212	19,272	19,27
06.4.C.-	Excavation	1,060	CY.	1.50	1,590	20	318	1,908	1,90
06.4.C.-	Embankment	500	CY.	2.50	1,250	20	250	1,500	1,50
06.4.C.-	Geotextile	400	SY.	4.00	1,600	20	320	1,920	1,92
06.4.C.-	Riprap	10	TON	15.00	150	20	30	180	18
06.4.C.-	Cofferdam Earth	590	CY.	2.50	1,475	15	221	1,696	1,69
06.4.C.-	Guardrail	56	L.Ft.	22.00	1,232	20	246	1,478	1,47
06.4.C.-	"B" Stone	120	TON.	12.00	1,440	20	288	1,728	1,72
06.4.C.-	Seeding	.20	ACRE	1,200.00	240	20	48	288	28
06.4.C.-	Clearing	.50	ACRE	1,800.00	900	20	180	1,080	1,08
06.4.C.-	Geogrid	400	SY.	10.00	4,000	20	800	4,800	4,80
	Boat Passage Structures (2)								
06.2.B.-	Dewatering (2)	SUM	JOB		112,500	35	39,375	151,875	151,875
06.4.C.-	Concrete Reinforced	42	CY.	150.00	6,300	30	1,890	8,190	8,190
06.4.C.-	Bedding Stone, 3" minus	540	TON	22.00	11,880	20	2,376	14,256	14,256
06.4.C.-	Excavation	1,400	CY.	1.50	2,100	20	420	2,520	2,520
06.4.C.-	Clearing	.80	ACRE	1,800.00	1,440	20	288	1,728	1,728
06.4.C.-	Seeding	.40	ACRE	1,200.00	480	20	96	576	576
06.4.C.-	Riprap 12"	20	TON	15.00	300	20	60	360	360
06.4.C.-	Embankment	400	CY.	2.50	1,000	20	200	1,200	1,200
06.4.C.-	Riprap	20	TON	15.00	300	20	60	360	360
06.3.L.-	Gantry Crane w/chain h.	2	Ea.	780.00	1,560	20	312	1,872	1,872
06.4.C.-	Geogrid	750	SY.	10.00	7,500	20	1,500	9,000	9,000
	SUBTOTAL..				348,947				
06.0.Z.-	CONTINGENCIES..						91,598		
	TOTAL (FISH AND WILDLIFE FACILITIES)..							440,545	440,545
	ROUNDED TOTAL (FISH AND WILDLIFE FACILITIES)..								441,000

Continued on next sheet

Cost Acct. No.	Description	Quantity	Unit	Unit Price	Estimated Cost w/o Contingencies	% Cont	Contingency	Total Estimated Cost	PRICE LEV (October 1 =
-----	-----------	--------	----	-----	------------	----	----------	---------	----------
08.2.-.-	ROADS, RAILROADS AND BRIDGES								
08.2.A.-	Mobilization/Demob.	SUM	JOB		882	10	88	970	9
08.2.2.B	24" C.M.P.	100	LF.	25.00	2,500	20	500	3,000	3,0
08.2.2.B	24" End Sections	2	EA.	180.00	360	20	72	432	4
08.2.2.B	Crushed Stone	350	TON	12.00	4,200	20	840	5,040	5,0
08.2.2.B	Clearing and Grubbing	.50	ACRE	1,800.00	900	20	180	1,080	1,0
08.2.2.B	Quarry-run Stone(6"minus)	300	TON	15.00	4,500	20	900	5,400	5,4
08.2.2.B	Earth Fill (Semi-Comp.)	1,380	CY.	4.00	5,520	20	1,104	6,624	6,6
	SUBTOTAL..				18,862				
08.0.Z.-	CONTINGENCIES..						3,684		
	TOTAL (ROADS, RAILROADS AND BRIDGES)..							22,546	22,5
	ROUNDED TOTAL (ROADS, RAILROADS AND BRIDGES)..								22,5
11.-.-.-	LEVEES AND FLOODWALLS								
11.0.1.-	LEVEE EMBANKMENT								
11.0.A.-	Mobilization/demob.	SUM	JOB		72,000	10	7,200	79,200	79,2
11.0.1.B	Interior levee Emb. #1	1,928	CY.	2.50	4,820	15	723	5,543	5,5
11.0.1.B	Clearing	2.70	ACRE	1,800.00	4,860	20	972	5,832	5,8
11.0.1.B	Seeding	1.30	ACRE	1,200.00	1,560	20	312	1,872	1,8
11.0.1.B	Interior levee Emb. #2	7,189	CY.	2.50	17,973	15	2,696	20,668	20,6
11.0.1.B	Clearing	8.20	ACRE	1,800.00	14,760	20	2,952	17,712	17,7
11.0.1.B	Seeding	3.20	ACRE	1,200.00	3,840	20	768	4,608	4,6
11.0.1.B	Interior levee Emb. #3	2,450	CY.	2.50	6,125	15	919	7,044	7,0
11.0.1.B	Clearing	2.90	ACRE	1,800.00	5,220	20	1,044	6,264	6,2
11.0.1.B	Seeding	1.20	ACRE	1,200.00	1,440	20	288	1,728	1,7
11.0.1.B	Interior levee Emb. #4	226	CY.	2.50	565	15	85	650	65
11.0.1.B	Clearing	.50	ACRE	1,800.00	900	20	180	1,080	1,08
11.0.1.B	Seeding	.20	ACRE	1,200.00	240	20	48	288	28
11.0.1.B	Interior levee Emb. #5	552	CY.	2.50	1,380	15	207	1,587	1,58
11.0.1.B	Clearing	.70	ACRE	1,800.00	1,260	20	252	1,512	1,51
11.0.1.B	Seeding	.30	ACRE	1,200.00	360	20	72	432	43
11.0.1.B	Interior levee Emb. #6	1,070	CY.	2.50	2,675	15	401	3,076	3,07
11.0.1.B	Clearing	2.20	ACRE	1,800.00	3,960	20	792	4,752	4,75
11.0.1.B	Seeding	.80	ACRE	1,200.00	960	20	192	1,152	1,15
11.0.1.B	Interior levee Emb. #7	2,170	CY.	2.50	5,425	15	814	6,239	6,23
11.0.1.B	Clearing	2.40	ACRE	1,800.00	4,320	20	864	5,184	5,18
11.0.1.B	Seeding	.90	ACRE	1,200.00	1,080	20	216	1,296	1,29
11.0.1.B	Exterior levee @ PGL *426	125,500	CY.	2.50	313,750	15	47,063	360,813	360,81
11.0.1.B	Clearing (*)	79	ACRE	1,800.00	142,200	20	28,440	170,640	170,64
11.0.1.B	Seeding (*)	41	ACRE	1,200.00	49,200	20	9,840	59,040	59,04
11.0.1.B	Graded Stone (*)	2,100	TON	10.00	21,000	15	3,150	24,150	24,15
11.0.1.B	Quarry-runstone(6"minus)*	1,900	TON	15.00	28,500	15	4,275	32,775	32,77
	Gravity Drainage Structure (Sites A,C,E)								
11.0.G.B	Excavation	1,291	CY	1.50	1,937	20	387	2,324	2,32
11.0.G.B	Plastic Liner	1,170	SY	13.50	15,795	20	3,159	18,954	18,95
11.0.G.B	Geogrid	680	SY	10.00	6,800	20	1,360	8,160	8,16
11.0.G.B	Cofferdam Graded Stone"C"	1,565	TON	16.00	25,040	20	5,008	30,048	30,04
11.0.G.B	"C" Stone	760	TON	11.00	8,360	20	1,672	10,032	10,03
11.0.G.B	"B" Stone	798	TON	12.00	9,576	20	1,915	11,491	11,49
11.0.G.B	6"minus Bedding	430	TON	15.00	6,450	20	1,290	7,740	7,74
11.0.G.B	3"minus Bedding	1,030	TON	15.00	15,450	20	3,090	18,540	18,540
11.0.G.B	42" diameter CMP	212	LF	65.00	13,780	15	2,067	15,847	15,847
11.0.G.B	Geotextile	340	SY	4.00	1,360	20	272	1,632	1,632

* Lower Elevation point @ D.S. end net levee grade.

Continued on next sheet

Cost Acct. No.	Description	Quantity	Unit	Unit Price	Estimated Cost w/o Contingencies	% Cont	Contingency	Total Estimated Cost	PRICE LEV (October 1 =
	LEVEES AND FLOODWALLS CONT'D								
	Gravity Drainage Structures (Sites A,C,E)								
11.0.G.B	72" diameter riser structure (including sluice gates & appurtenances	6	EACH	23,000.00	138,000	25	34,500	172,500	172,
11.0.G.B	Hydraulic operator	1	EACH	10,000.00	10,000	50	5,000	15,000	15,
11.0.G.B	Gaging Station	1	EA	13,000.00	13,000	20	2,600	15,600	15,
11.0.R.B	Concrete pad	5.40	CY.	127.36	688	20	138	825	
11.0.R.B	Removal of 2-36"CMP	SUM	JOB		3,000	25	750	3,750	3,
11.0.R.B	Removal of Existing Str.	SUM	JOB		37,160	25	9,290	46,450	46,
	CULVERT EXT.Sta.292+60								
11.0.R.B	24" CMP Culvert	46	LF	25.00	1,150	25	288	1,438	1,
11.0.R.B	24"CMP End Section	1	EA	200.00	200	25	50	250	
	SUBTOTAL..				1,018,118				
11.0.Z.-	CONTINGENCIES...						187,599		
	TOTAL (LEVEES AND FLOODWALLS)..							1,205,717	1,205,
	RONDED TOTAL (LEVEES AND FLOODWALLS)..								1,210,
12.-.-.-	DREDGING								
12.0.2.-	Excavation (Channel)	160,027	CY.	3.00	480,081	25	120,020	600,101	600,
	SUBTOTAL..				480,081				
12.0.Z.-	CONTINGENCIES...						120,020		
	TOTAL (DREDGING)...							600,101	600,1
	ROUNDED TOTAL (DREDGING)..								600,0
13.-.-.-	PUMPING PLANT								
13.2.A.-	Mobilization/demob.	SUM	JOB		8,700	10	870	9,570	9,5
13.0.6.Q	Pump.(48000 GPM)	2	EACH	71,501.00	143,002	25	35,751	178,753	178,7
13.0.6.Q	Portable Pump.(5000 GPM)	1	EACH	27,950.00	27,950	30	8,385	36,335	36,3
13.0.6.Q	Pump driver(for 48000 GPM	1	EACH	27,692.00	27,692	30	8,308	36,000	36,0
13.0.B.Q	Mechanical								
13.0.B.Q	42" dia.steel pipe (3/8")	730	LF	100.00	73,000	20	14,600	87,600	87,6
13.0.B.Q	42" dia. flap gate	2	EACH	8,200.00	16,400	10	1,640	18,040	18,0
13.0.1.E	6'chain link fence w/ 3-strand barb wire	300	LF	20.00	6,000	15	900	6,900	6,9
13.0.1.E	Fence Gate (6' X 10')	2	EACH	150.00	300	15	45	345	3
13.0.1.E	Clearing	.70	ACRE	1,800.00	1,260	20	252	1,512	1,5
13.0.1.E	Seeding	.50	ACRE	1,200.00	600	20	120	720	7
13.0.D.B	Embankment	805	CY.	4.00	3,220	15	483	3,703	3,7
13.0.2.C	Concrete Curb	1.00	CY.	400.00	400	15	60	460	4
13.0.D.B	Riprap	480	TON	15.00	7,200	15	1,080	8,280	8,2
13.0.D.B	Excavation	705	CY.	2.00	1,410	20	282	1,692	1,6
13.0.D.B	Ditching	880	CY.	2.50	2,200	20	440	2,640	2,6
13.0.D.B	Cofferdam"C"stone & Remvl	1,200	TON	16.00	19,200	20	3,840	23,040	23,0
	SUBTOTAL..				338,534				
13.0.Z.-	CONTINGENCIES...						77,055		
	TOTAL (PUMPING PLANT)..							415,589	415,58
	ROUNDED TOTAL (PUMPING PLANT)..								416,00

Continued on next sheet

Cost Acct. No.	Description	Quantity	Unit	Unit Price	Estimated Cost w/o Contingencies	% Cont	Contingency	Total Estimated Cost	PRICE LEVEL (October 199 =
-----	-----------	--------	----	-----	-------------	----	-----------	---------	-------------
30.-.-.-	PLANNING, ENGINEERING AND DESIGN				894,500		76,300	970,800	970,80
30.A.-.-	PLANNING (Preparation of DPR)				520,000	0	0	520,000	520,00
30.B.-.-	ENGINEERING AND DESIGN PRIOR TO OCTOBER 1990				0				
30.C.-.-	MEMORANDUM OF AGREEMENT				5,000	0	0	5,000	5,00
30.D.-.-	ENVIRONMENTAL AND REGULATORY ACTIVITIES				10,000	0	0	10,000	10,00
30.D.9.-	CULTURAL RESOURCE SURVEYS AND STUDIES				21,500	20	4,300	25,800	25,80
30.E.-.-	DESIGN RELATED ENGINEERING				0				
30.F.-.-	GENERAL DESIGN MEMORANDUM (GDM)				0				
30.G.-.-	FEATURE DESIGN MEMORANDUM (FDM)				0				
30.H.-.-	PLANS AND SPECIFICATIONS				250,000	20	50,000	300,000	300,00
30.J.-.-	ENGINEERING DURING CONSTRUCTION				20,000	50	10,000	30,000	30,00
30.M.-.-	COST ENGINEERING				20,000	20	4,000	24,000	24,00
30.N.-.-	CONSTRUCTION AND SUPPLY CONTRACT ACTIVITIES				20,000	20	4,000	24,000	24,00
30.P.-.-	PROJECT MANAGEMENT				20,000	20	4,000	24,000	24,00
30.Z.-.-	MISCELLANEOUS ACTIVITIES				8,000	0	0	8,000	8,00
31.-.-.-	CONSTRUCTION MANAGEMENT				320,500		66,500	387,000	387,00
31.A.-.-	CONSTRUCTION MANAGEMENT (S&I)				0				
31.B.-.-	CONTRACT ADMINISTRATION				48,000		0	48,000	48,00
31.B.Z.-	Contingencies				0	**	7,000	7,000	7,00
31.C.-.-	BENCH MARKS AND BASE LINES				6,000		1,000	7,000	7,00
31.D.-.-	REVIEW OF SHOP DRAWING				29,000		0	29,000	29,00
31.D.Z.-	Contingencies				0	**	6,000	6,000	6,00
31.E.-.-	INSPECTION AND QUALITY ASSURANCE				21,000		0	21,000	21,00
31.E.Z.-	Contingencies				0	**	4,000	4,000	4,00
31.F.-.-	PROJECT OFFICE OPERATIONS				212,000		0	212,000	212,00
31.F.Z.-	Contingencies				0		28,000	28,000	28,00
31.G.-.-	DAMAGES ASSESSED CONTRACTORS				0				
31.G.Z.-	Contingencies				0				
31.H.-.-	CONTRACTOR INITIATED CLAIMS AND LITIGATIONS								
31.H.Z.-	Contingencies				0	**	15,000	15,000	15,00
31.J.-.-	GOVERNMENT INITIATED CLAIMS AND LITIGATIONS				0				0
31.J.Z.-	Contingencies				0	**	5,000	5,000	5,00
31.P.-.-	PROJECT MANAGEMENT				4,500		0	4,500	4,50
31.P.Z.-	Contingencies				0		500	500	50

TOTAL CONTINGENCY COST.. $624,757

TOTAL PROJECT COST.. $4,059,300

* Elevation of net levee grade at downstrem end of leve

** See Discussion Para 1-03

UPPER MISSISSIPPI RIVER SYSTEM
ENVIRONMENTAL MANAGEMENT
PROGRAM
STUMP LAKE COMPLEX
JERSEY COUNTY,ILLINOIS

Designed By: CORPS OF ENGINEERS,ST.LOUIS DIST
Estimated By: CORPS OF ENGINEERS,ST.LOUIS DIST

Prepared By: S.DOMBI AND J.W.DIERKER

Date: 01/14/92

M C A C E S G O L D E D I T I O N

SUMMARY REPORTS SUMMARY PAGE

No Detailed Estimate...

No Backup Reports...

* * * END TABLE OF CONTENTS * * *

** PROJECT OWNER SUMMARY - LEVEL 1 **

		QUANTY UOM	CONTRACT	CONTINGN	TOTAL COST	UNIT
01	LANDS AND DAMAGES		10,000	2,000	12,000	
06	FISH AND WILDLIFE FACILITIES		348,932	91,595	440,528	
08	ROARDS, RAILROADS AND BRIDGES		18,833	3,678	22,511	
11	LEVEES AND FLOODWALLS		1,018,176	191,278	1,209,454	
12	DREDGING		480,090	120,023	600,113	
13	PUMPING PLANT		338,554	77,058	415,613	
30	PLANNING, ENGINEERING AND DESIGN		894,500	76,300	970,800	
31	CONSTRUCTION MANAGEMENT		386,000	1,000	387,000	
	STUMP LAKE PROJECT		3,495,086	562,932	4,058,018	

		QUANTY	UOM	CONTRACT	CONTINGN	TOTAL COST	UNIT
01	LANDS AND DAMAGES						
01.B.8.-	All Others			10,000	2,000	12,000	
	LANDS AND DAMAGES			10,000	2,000	12,000	
06	FISH AND WILDLIFE FACILITIES						
06.2.4.C	Concrete			131,182	27,633	158,815	
06.2.A.-	Mobilization/Demob.			49,000	4,900	53,900	
06.2.B.-	Dewatering			168,750	59,063	227,813	
	FISH AND WILDLIFE FACILITIES			348,932	91,595	440,528	
08	ROARDS, RAILROADS AND BRIDGES						
08. 2.A.	Mobilization/Demob.			882	88	970	
08.2.2.-	Construct Roadbed to Subgrade			17,951	3,590	21,541	
	ROARDS, RAILROADS AND BRIDGES			18,833	3,678	22,511	
11	LEVEES AND FLOODWALLS						
11.0.1.A	EARTHEN LEVEE			710,414	130,414	840,829	
11.0.1.B	Gravity Drainage Structures			307,762	60,863	368,625	
	LEVEES AND FLOODWALLS			1,018,176	191,278	1,209,454	
12	DREDGING						
12.0.2.-	Excavation (Channel)	160027	CY	480,090	120,023	600,113	3.75
	DREDGING			480,090	120,023	600,113	
13	PUMPING PLANT						
13.0.3.Q	MECHANICAL			303,044	70,498	373,542	
13.0.B.B	SITE WORK			35,510	6,560	42,071	
	PUMPING PLANT			338,554	77,058	415,613	
30	PLANNING, ENGINEERING AND DESIGN						
30.A.-.-	PLANNING (Preparation of DPR)			520,000	0	520,000	
30.C.-.-	MEMORANDUM OF AGREEMENT			5,000	0	5,000	

		QUANTY UOM	CONTRACT	CONTINGN	TOTAL COST	UNIT
30.D.-.-	ENV.AND REGULATORY ACTIVITIES		10,000	0	10,000	
30.D.9.-	CULTURAL RESOURCE SURV.&STUDIES		21,500	4,300	25,800	
30.H.-.-	PLANS AND SPECIFICATIONS		250,000	50,000	300,000	
30.J.-.-	ENGINEERING DURING CONSTRUCTION		20,000	10,000	30,000	
30.M.-.-	COST ENGINEERING		20,000	4,000	24,000	
30.N.-.-	CONST. & SUPPLY CONTR.ACTIVITIES		20,000	4,000	24,000	
30.P.-.-	PROJECT MANAGEMENT		20,000	4,000	24,000	
30.Z.-.-	MISCELLANEOUS ACTIVITIES		8,000	0	8,000	
	PLANNING, ENGINEERING AND DESIGN		894,500	76,300	970,800	
31	CONSTRUCTION MANAGEMENT					
31.B.-.-	CONSTRUCTION ADMINISTRATION		48,000	0	48,000	
31.B.Z.-	Contingencies		7,000	0	7,000	
31.C.-.-	BENCH MARKS AND BASE LINES		6,000	1,000	7,000	
31.D.-.-	REVIEW OF SHOP DRAWING		29,000	0	29,000	
31.D.Z.-	Contingencies		6,000	0	6,000	
31.E.-.-	INSPECTION AND QUALITY ASSUARANE		21,000	0	21,000	
31.E.Z.-	Contingencies		4,000	0	4,000	
31.F.-.-	PROJECT OFFICE OPERATIONS		212,000	0	212,000	
31.F.Z.-	Contingencies		28,000	0	28,000	
31.H.Z.-	Contingencies		15,000	0	15,000	
31.J.Z.-	Contingencies		5,000	0	5,000	
31.P.-.-	PROJECT MANAGEMENT		4,500	0	4,500	
31.P.Z.-	Contingencies		500	0	500	
	CONSTRUCTION MANAGEMENT		386,000	1,000	387,000	
	STUMP LAKE PROJECT		3,495,086	562,932	4,058,018	

	QUANTY	UOM	CONTRACT	CONTINGN	TOTAL COST	UNIT
01 LANDS AND DAMAGES						
01.B.-.- POST-AUTHORIZATION PLANNING						
01.B.8.- All Others						
All Others			10,000	2,000	12,000	
LANDS AND DAMAGES			10,000	2,000	12,000	
06 FISH AND WILDLIFE FACILITIES						
06.2.4.C Concrete						
06.2.4.C. A Fish Passage (71+27) Site "F"			98,322	20,431	118,753	
06.2.4.C. B Boat Passage Structures (2)			32,860	7,202	40,062	
Concrete			131,182	27,633	158,815	
06.2.A.- Mobilization/Demob.						
Mobilization/Demob.			49,000	4,900	53,900	
06.2.B.- Dewatering						
06.2.B.-. 1A Dewatering (Fish passage Str.)			56,250	19,688	75,938	
06.2.B.-. 1B Dewatering (Boat Passage Str)(2)			112,500	39,375	151,875	
Dewatering			168,750	59,063	227,813	
FISH AND WILDLIFE FACILITIES			348,932	91,595	440,528	
08 ROARDS, RAILROADS AND BRIDGES						
08. 2.A. Mobilization/Demob.						
Mobilization/Demob.			882	88	970	
08.2.2.- Construct Roadbed to Subgrade						

			QUANTY	UOM	CONTRACT	CONTINGN	TOTAL COST	UNIT
08.2.2.-.	1	24: C.M.P.	100.00	LF	2,500	500	3,000	30.00
08.2.2.-.	2	24: C.M.P. End Sections	2.00	EA	360	72	432	216.00
08.2.2.-.	3	Crushed Stone	350.00	TN	4,198	840	5,037	14.39
08.2.2.-.	4	Clearing and Grubbing	0.50	AC	876	175	1,052	2103.19
08.2.2.-.	5	Quarry-run Stone (6"minus)	300.00	TN	4,501	900	5,401	18.00
08.2.2.-.	6	Earth Fill (Semi Compacted)	1380.00	CY	5,516	1,103	6,619	4.80
		Construct Roadbed to Subgrade			17,951	3,590	21,541	
		ROARDS, RAILROADS AND BRIDGES			18,833	3,678	22,511	

11 LEVEES AND FLOODWALLS

11.0.1.A EARTHEN LEVEE

			QUANTY	UOM	CONTRACT	CONTINGN	TOTAL COST	UNIT
11.0.1.A.	1	Mobilization/Demob.			72,000	7,200	79,200	
11.0.1.A.	2	Interior Levee Embankment. (#1)	1928.00	CY	4,813	722	5,535	2.87
11.0.1.A.	3	Claering	2.70	AC	4,859	972	5,831	2159.48
11.0.1.A.	4	Seeding	1.30	AC	1,560	312	1,872	1439.65
11.0.1.A.	5	Interior Levee Embankment. (#2)	7189.00	CY	17,947	2,692	20,639	2.87
11.0.1.A.	6	Clearing	8.20	AC	14,756	2,951	17,708	2159.48
11.0.1.A.	7	Seeding	3.20	AC	3,829	766	4,595	1435.98
11.0.1.A.	8	Interior Levee Embankment. (#3)	2450.00	CY	6,116	917	7,034	2.87
11.0.1.A.	9	Clearing	2.90	AC	5,219	1,044	6,262	2159.48
11.0.1.A.	10	Seeding	1.20	AC	1,436	287	1,723	1435.98
11.0.1.A.	11	Interior Levee Embankment. (#4)	226.00	CY	564	85	649	2.87
11.0.1.A.	12	Clearing	0.50	AC	900	180	1,080	2159.48
11.0.1.A.	13	Seeding	0.20	AC	239	48	287	1435.98
11.0.1.A.	14	Interior Levee Embankment. (#5)	552.00	CY	1,378	207	1,585	2.87
11.0.1.A.	15	Clearing	0.70	AC	1,260	252	1,512	2159.48
11.0.1.A.	16	Seeding	0.30	AC	359	72	431	1435.98
11.0.1.A.	17	Interior Levee Embankment. (#6)	1070.00	CY	2,671	401	3,072	2.87
11.0.1.A.	18	Clearing	2.20	AC	3,959	792	4,751	2159.48
11.0.1.A.	19	Seeding	0.80	AC	957	144	1,101	1376.14
11.0.1.A.	20	Interior Levee Embankment. (#7)	2170.00	CY	5,417	813	6,230	2.87
11.0.1.A.	21	Clearing	2.40	CY	4,319	864	5,183	2159.48
11.0.1.A.	22	Seeding	0.90	AC	1,080	216	1,296	1440.18
11.0.1.A.	23	Exterior Levee Embankment	125500	CY	313,851	62,770	376,622	3.00
11.0.1.A.	24	Clearing	79.00	AC	142,228	28,446	170,673	2160.42
11.0.1.A.	25	Seeding	41.00	AC	49,188	9,838	59,026	1439.65
11.0.1.A.	26	Graded Stone "C"	2100.00	TN	21,019	3,153	24,172	11.51
11.0.1.A.	27	Quarry-runstone (6"-minus)	1900.00	TN	28,489	4,273	32,763	17.24
		EARTHEN LEVEE			710,414	130,414	840,829	

11.0.1.B Gravity Drainage Structures

			QUANTY	UOM	CONTRACT	CONTINGN	TOTAL COST	UNIT
11.0.1.B.	1	Excavation	1291.00	CY	1,935	387	2,322	1.80
11.0.1.B.	2	Plastic liner	1170.00	SY	15,795	3,159	18,954	16.20
11.0.1.B.	3	Geogrid	680.00	SY	6,800	1,360	8,160	12.00
11.0.1.B.	4	Cofferdam Graded Stone "C"	1565.00	TN	25,040	5,008	30,048	19.20
11.0.1.B.	5	Cofferdam Graded Stone "B"	798.00	TN	9,576	1,915	11,491	14.40
11.0.1.B.	6	6"minus Bedding stone	430.00	TN	6,455	1,291	7,746	18.01
11.0.1.B.	7	3"minus Bedding stone	1030.00	TN	15,462	3,092	18,555	18.01
11.0.1.B.	8	42" diameter CMP	212.00	LF	13,780	2,067	15,847	74.75
11.0.1.B.	9	Geotextile	340.00	SY	1,360	272	1,632	4.80
11.0.1.B.	10	72"diameter riser gate system	6.00	EA	138,000	27,600	165,600	27600
11.0.1.B.	11	Hydraulic operator			10,000	2,000	12,000	
11.0.1.B.	12	Concrete pad	5.40	CY	688	138	826	152.89
11.0.1.B.	13	Removal of 2-36" CMP			3,000	600	3,600	
11.0.1.B.	14	Removal of Existing Conc.Str.			37,160	7,432	44,592	
11.0.1.B.	15	Culvert Ext.Sta.292+60 (24"CMP)	46.00	LF	1,150	230	1,380	30.00
11.0.1.B.	16	24"CMP End Section			200	40	240	
11.0.1.B.	17	Gaging Station			13,000	2,600	15,600	
11.0.1.B.	18	"C"Stone	760.00	TN	8,360	1,672	10,033	13.20
		Gravity Drainage Structures			307,762	60,863	368,625	
		LEVEES AND FLOODWALLS			1,018,176	191,278	1,209,454	
12		DREDGING						
12.0.2.-		Excavation (Channel)						
		Excavation (Channel)	160027	CY	480,090	120,023	600,113	3.75
		DREDGING			480,090	120,023	600,113	
13		PUMPING PLANT						
13.0.3.Q		MECHANICAL						
13.0.3.Q.	1	Mobilization and Demob.			8,700	870	9,570	
13.0.3.Q.	2	Pump.(48,000 GPM)	2.00	EA	143,002	35,751	178,753	89376
13.0.3.Q.	3	Portable Pump.(5000 GPM)			27,950	8,385	36,335	
13.0.3.Q.	4	Pump driver for 48000 GPM pump			27,692	8,308	36,000	
13.0.3.Q.	5	42"dia. steel pipe (3/8")	730.00	LF	73,000	14,600	87,600	120.00
13.0.3.Q.	6	42"dia. Flap Gate	2.00	EA	16,400	1,640	18,040	9020.00
13.0.3.Q.	7	6'Chain link fence w/barb wire	300.00	LF	6,000	900	6,900	23.00
13.0.3.Q.	8	Fence Gate (6' X 10')	2.00	EA	300	45	345	172.50
		MECHANICAL			303,044	70,498	373,542	

13.0.B.B SITE WORK

			QUANTY	UOM	CONTRACT	CONTINGN	TOTAL COST	UNIT
13.0.B.B.	1	CLEARING	0.70	AC	1,260	252	1,512	2160.53
13.0.B.B.	2	SEEDING	0.50	AC	601	120	721	1442.11
13.0.B.B.	3	EMBANKMENT	805.00	CY	3,222	483	3,705	4.60
13.0.B.B.	4	Concrete Curb			400	60	460	
13.0.B.B.	5	Riprap	480.00	TN	7,213	1,082	8,295	17.28
13.0.B.B.	6	Excavation	705.00	CY	1,413	283	1,695	2.40
13.0.B.B.	7	Ditching	880.00	CY	2,202	440	2,642	3.00
13.0.B.B.	8	Cofferdam "C" stone Removal	1200.00	TN	19,200	3,840	23,040	19.20
		SITE WORK			35,510	6,560	42,071	
		PUMPING PLANT			338,554	77,058	415,613	
30		PLANNING, ENGINEERING AND DESIGN						
30.A.-.-		PLANNING (Preparation of DPR)						
		PLANNING (Preparation of DPR)			520,000	0	520,000	
30.B.-.-		ENG. AND DESIGN PRIOR TO OCT.90						
30.C.-.-		MEMORANDUM OF AGREEMENT						
		MEMORANDUM OF AGREEMENT			5,000	0	5,000	
30.D.-.-		ENV.AND REGULATORY ACTIVITIES						
		ENV.AND REGULATORY ACTIVITIES			10,000	0	10,000	
30.D.9.-		CULTURAL RESOURCE SURV.&STUDIES						
		CULTURAL RESOURCE SURV.&STUDIES			21,500	4,300	25,800	
30.E.-.-		DESIGN RELATED ENGINEERING						
30.F.-.-		GENERAL DESIGN MEMORANDUM (GDM)						
30.G.-.-		FEATURE DESIGN MEMORANDUM (FDM)						
30.H.-.-		PLANS AND SPECIFICATIONS						

	QUANTY UOM	CONTRACT	CONTINGN	TOTAL COST	UNIT
PLANS AND SPECIFICATIONS		250,000	50,000	300,000	
30.J.-.- ENGINEERING DURING CONSTRUCTION					
ENGINEERING DURING CONSTRUCTION		20,000	10,000	30,000	
30.M.-.- COST ENGINEERING					
COST ENGINEERING		20,000	4,000	24,000	
30.N.-.- CONST. & SUPPLY CONTR.ACTIVITIES					
CONST. & SUPPLY CONTR.ACTIVITIES		20,000	4,000	24,000	
30.P.-.- PROJECT MANAGEMENT					
PROJECT MANAGEMENT		20,000	4,000	24,000	
30.Z.-.- MISCELLANEOUS ACTIVITIES					
MISCELLANEOUS ACTIVITIES		8,000	0	8,000	
PLANNING, ENGINEERING AND DESIGN		894,500	76,300	970,800	
31 CONSTRUCTION MANAGEMENT					
31.A.-.- CONSTRUCTION MANAGEMENT (S&I)					
31.B.-.- CONSTRUCTION ADMINISTRATION					
CONSTRUCTION ADMINISTRATION		48,000	0	48,000	
31.B.Z.- Contingencies					
Contingencies		7,000	0	7,000	

	QUANTY UOM	CONTRACT	CONTINGN	TOTAL COST	UNIT
31.C.-.- BENCH MARKS AND BASE LINES					
BENCH MARKS AND BASE LINES		6,000	1,000	7,000	
31.D.-.- REVIEW OF SHOP DRAWING					
REVIEW OF SHOP DRAWING		29,000	0	29,000	
31.D.Z.- Contingencies					
Contingencies		6,000	0	6,000	
31.E.-.- INSPECTION AND QUALITY ASSUARANE					
INSPECTION AND QUALITY ASSUARANE		21,000	0	21,000	
31.E.Z.- Contingencies					
Contingencies		4,000	0	4,000	
31.F.-.- PROJECT OFFICE OPERATIONS					
PROJECT OFFICE OPERATIONS		212,000	0	212,000	
31.F.Z.- Contingencies					
Contingencies		28,000	0	28,000	
31.G.-.- DAMAGES ASSESSED CONTRACTORS					
31.G.Z.- Contingencies					
31.H.-.- CONT.INITIATED CLAIMS&LITIGATION					
31.H.Z.- Contingencies					

	QUANTY UOM	CONTRACT	CONTINGN	TOTAL COST	UNIT
Contingencies		15,000	0	15,000	
31.J.-.- GOVERNMENT INITIATED CLAIMS&LOIT					
31.J.Z.- Contingencies					
Contingencies		5,000	0	5,000	
31.P.-.- PROJECT MANAGEMENT					
PROJECT MANAGEMENT		4,500	0	4,500	
31.P.Z.- Contingencies					
Contingencies		500	0	500	
CONSTRUCTION MANAGEMENT		386,000	1,000	387,000	
STUMP LAKE PROJECT		3,495,086	562,932	4,058,018	

No errors detected ....

* * * END OF ERROR REPORT * * *

COMPARISON: DPR SELECTED PLAN
VERSUS
ORIGINAL FACT SHEET CONCEPT

1. PROJECT LOCATION: No change.

2. RESOURCE PROBLEM: The original fact sheet did not identify the full range of problems affecting habitat conditions, especially those problems created by water level fluctuations.

3. PROPOSED PROJECT: The following project needs and proposed features were not foreseen during development of the original concept:

a. A riverside levee/dike to control alluvial sedimentation and water level influence of the Illinois River;

b. The fact that management units other than Fowler Lake could benefit from compartmentalization;

c. The number, size and type of gravity flow drainage structures necessary to ensure efficient water level management of the wetland units and to facilitate fish and boat access.

The original fact sheet called for compartmentalization of only Fowler Lake and constructing and/or installing unspecified ditches, drainage structures and pumping facilities at a design and construction cost of $295,000. The original project scope/fact sheet was identified in the 1985 EMP General Plan (one paragraph) and further defined as a fact sheet in 1986. The fact sheet was developed in less than one day by Illinois Department of Conservation personnel. No engineering and design or cost estimating expertise was utilized. Guidance on project identification and development was minimal when the original fact sheet was prepared; no WHAG and AHAG Analyses were required; no fisheries features were considered for the project; and no public input was solicited. Plan formulation formally began in 1989. At that time, it became readily apparent that the original project fact sheet did not fully address all resource problems, needs and opportunities at the Stump Lake Complex. Detailed studies and plan formulation as reflected in the Final DPR documents and justifies the revised habitat project as being superior to the original plan.

4. PROJECT OUTPUTS: The outputs originally envisioned will be achieved for the 1,200 acres of open wetlands. The original project concept would not have provided the same level of benefits as does the proposed project.

5. FINANCIAL DATA: The project cost estimates for the original fact sheet and the revised fact sheet are significantly different. The cost estimate to complete the original project scope was understated at the time it was developed. The original concept cost estimate was prepared by state personnel who were

unfamiliar with the construction techniques and costs associated with constructing projects in flood plain conditions. The initial fact sheet estimate was not adjusted to take into account costs associated with engineering and design, supervision and administration, contingencies, and inflation. The cost estimate for the project features, as outlined in paragraph 3. of the current fact sheet, has been fully developed, coordinated and finalized. All project changes were coordinated with, and approved by, the project sponsors. Due to the biological importance of this project, the sponsors have maintained its high priority in spite of higher than anticipated costs.

CELMS-PD-F

23 October 1987

UPPER MISSISSIPPI RIVER SYSTEM ENVIRONMENTAL MANAGEMENT PROGRAM
FACT SHEET

STUMP LAKE COMPLEX, ILLINOIS
ILLINOIS RIVER (Mississippi River Backwater)

LOCATION: The Stump Lake Complex is situated along the east bank of the Illinois River between river miles 8 and 12. The project site is part of an extensive fish and wildlife management area, administered by the State of Illinois under a cooperative agreement with the U.S. Fish and Wildlife Service.

RESOURCE PROBLEM: Silt deposited by prior floods has impaired internal drainage systems and inhibited the growth of aquatic vegetation to such an extent that the waterfowl habitat value has been seriously degraded.

PROPOSED PROJECT: The project would consist of constructing low levees to compartmentalize Fowler Lake, allowing management of water levels and thus promoting the growth of desireable vegetation and enhancing habitat conditions. Other features of the project would include constructing ditches and drainage control structures and installing pumping facilities.

PROJECT OUTPUTS: By improving the capability for manipulating water levels in the 1035 acre wetland portion of the 2958 acre complex, migratory waterfowl usage would increase and habitat would be enhanced for all resident fish and wildlife species.

FINANCIAL DATA: The estimated general design cost of the project is $20,000, and the estimated construction cost is $275,000. The project area was included in certain lands acquired for the navigation project that were identified in a General Plan and made available to the states, through Cooperative Agreements between the Corps of Engineers and the Department of Interior, and between the DOI and each state. These lands were made available "for use in the conservation and management of wildlife resources thereof, and its habitat thereon, in connection with the national migratory bird program." The Cooperative Agreements stipulate that the areas shall be maintained "in accordance with an annual management program...submitted to the Service." Under Section 906(e) of the 1986 WRDA, the project area is "managed as a national wildlife refuge" and qualifies for 100 percent Federal funding of general design and construction. The Illinois Department of Conservation would agree to be responsible for all operation and maintenance of the project after completion.

30 January 1992

Name of Project. Upper Mississippi River System--Environmental Management Program (UMRS-EMP), Stump Lake Habitat Rehabilitation Project

Location. The Stump Lake Complex (officially called the Stump Lake Waterfowl Management Area (WMA)) extends from Illinois River mile 7.2 to mile 12.7 along the left (east) bank of the Illinois River. This 2,958 acre area includes Upper and Lower Stump Lakes, Fowler Lake, Flat Lake, Long Lake and Deep Lake and contains 1,221 acres of open wetlands, 252 acres of crop land and 1,485 acres of forest.

Resource Problem. Primary problems facing the Stump Lake Complex are sedimentation and water level fluctuation. The sedimentation rate is averaging .5 inch per year at the complex. Sedimentation results in a direct loss of wetland habitat for both waterfowl and fish due to the water-to-land conversion process and causes a decline in the quality of the remaining fishery habitat (primarily slough) due to shallower water levels which allow higher temperatures and reduced dissolved oxygen concentrations during the summer months. In addition, many management efforts are lost. Silt and lack of stable water levels are deleterious to aquatic and moist soil plant production. Inefficient water control structures and lack of protection from Illinois River waters at bank full and above stages allow for successful wildlife food production only 50% of the time on the average. Moist soil techniques are often foiled by flooding during the 50 to 90 days needed for development and maturity of food plants.

Project. The proposed project consists of construction of a low sediment deflection levee, 5.5 miles long, paralleling the Illinois River shoreline and the perimeter of the WMA to reduce siltation from frequent floods and to improve wetland unit water control. Seven low level interior levees will be constructed around the perimeters of the four main wetland compartments to allow effective water level management. Sluice gates and stop log structures will be constructed to control watering/dewatering of the four wetland compartments. A reversible pumping system will be constructed on the Illinois River to allow flooding or draining of the wetland compartments.

Project Outputs. Stump Lake Complex rehabilitation and enhancement, as a result of the project, include: a 79% reduction in sediment carrying waters into the project; 3 to 4-year flood frequency protection; capability to manipulate the water levels of the open wetlands in approximately 10 days for wildlife habitat management; improved fisheries spawning and rearing habitat in Long and Deep Lake sloughs and Upper and Lower Stump Lake; and restored fisheries access between Long and Deep Lake and the Illinois River. The project has been designed to provide habitat benefits for approximately 50 years.

Financial Data. The estimated project cost is $4,059,300. Since the project is located on Cooperative Agreement lands managed by the Illinois Department of Conservation as a national wildlife refuge, implementation cost will be 100 percent Federal. The estimated annual O&M cost of the project is $33,700. The Illinois Department of Conservation is the local project sponsor and will operate and maintain the project after completion.

Status. The draft DPR was completed and released for public and interagency review and comment on 4 December 1990. A public workshop was conducted on 30 January 1991. Comments received were evaluated and coordinated. A final DPR was completed and submitted for approval in January 1992.

UPPER MISSISSIPPI RIVER SYSTEM
ENVIRONMENTAL MANAGEMENT PROGRAM
DEFINITE PROJECT REPORT (SL-4)
WITH INTEGRATED ENVIRONMENTAL ASSESSMENT

STUMP LAKE COMPLEX
WETLAND HABITAT REHABILITATION
AND ENHANCEMENT PROJECT

POOL 26, ILLINOIS RIVER, JERSEY COUNTY, ILLINOIS

FINAL

U.S. Army Corps of Engineers
St. Louis District
ATTN: Plan Formulation Branch, CELMS-PD-F
1222 Spruce Street
St. Louis, Missouri 63103-2833
Commercial Telephone Number: 314/331-8480

January 1992

UPPER MISSISSIPPI RIVER SYSTEM
ENVIRONMENTAL MANAGEMENT PROGRAM
DEFINITE PROJECT REPORT WITH
INTEGRATED ENVIRONMENTAL ASSESSMENT

STUMP LAKE COMPLEX
HABITAT REHABILITATION AND ENHANCEMENT PROJECT
POOL 26, ILLINOIS RIVER, JERSEY COUNTY, ILLINOIS

EXECUTIVE SUMMARY

The Stump Lake complex (officially called the Stump Lake Waterfowl Management Area) extends from Illinois River mile 7.2 to mile 12.7 along the left (east) bank of the Illinois River in Jersey County, Illinois. This 2,958 acre area includes Upper and Lower Stump Lakes, Fowler Lake, Flat Lake, Long Lake and Deep Lake and contains 1,221 acres of open wetlands and sloughs, 252 acres of cropland and 1,485 acres of forest. The complex floodplain is relatively flat with elevations form 420.0 to 425.0 NGVD. The Illinois River normal pool elevation is 419.0 NGVD.

Located on federal lands acquired in the 1930's for Navigation Pool 26, the Stump Lake Complex has been managed by the Illinois Department of Conservation (IDOC) since the 1950's under a general plan and cooperative agreement with the U. S. Fish and Wildlife Service (USFWS) and the Corps of Engineers.

The complex wetlands are managed primarily for migratory waterfowl habitat. Moist soil and aquatic vegetation management techniques are employed by manipulating water levels of the five open wetland units in the complex.

Primary problems facing the Stump Lake Complex are sedimentation and water level fluctuation. The sedimentation rate is averaging .5 inches per year at the complex. Sedimentation results in a direct loss of wetland habitat for both waterfowl and fish due to the water-to-land conversion process and causes a decline in the quality of the remaining fishery habitat (primarily slough) due to shallower water levels which allow higher temperatures and reduced dissolved oxygen concentrations during the summer months. In addition, many management efforts are lost. Silt and lack of stable water levels are deleterious to aquatic and moist soil plant production. Moist soil techniques require 50 to 90 days for development and maturity of food plants. Inefficient and aging water levels control structures and lack of protection from Illinois River waters at bank full and above stages allow for successful wildlife food production only 50% of the time on the average.

The Environmental Management Program Habitat Rehabilitation and Enhancement Project (EMP-HREP) goals and objectives for the Stump Lake Complex are as follows:

GOALS	OBJECTIVES
1. Enhance wetland habitat for resident and migratory wildlife	a. Decrease sedimentation b. Improve water level control
2. Enhance aquatic habitat for slackwater fish	a. Improve seasonal slackwater fish habitat in Long Lake & Deep Lake b. Improve fish spawning from Illinois River to Long & Deep Lake c. Reduce sedimentation in Long and Deep Lake d. Increase photic zone in project waters

The plan formulation process involved developing and evaluating alternatives to correct the sedimentation and water control problems at the Stump Lake Complex. Three alternatives were evaluated. They are: Alternative A, No Federal Action; Alternative B, Wetlands Excavation; Alternative C, Wetlands Protection System (Selected alternative).

A number of measures and options were identified and evaluated for Alternative C. The Alternative C measures considered include:

1. Riverside Levee/Dike
2. Wetland Unit Containment Levees
3. Wetland Unit Water Control Structures
4. Sediment Removal from Long and Deep Lake
5. Water Pumping System
6. Colluvial Sediment Control

The alternatives, measures, and options were evaluated for their completeness, effectiveness, efficiency, and acceptability. Key criteria included: ability to achieve objectives; Wildlife Habitat Appraisal Guide (WHAG) ratings; Aquatic Habitat Appraisal Guide (AHAG) ratings; cost; Operation and Maintenance concerns; and Environmental concerns. A Wetland Functions and Values Assessment (WET) and Habitat Evaluation (HES) of Bottomland Hardwoods and Forested Wetlands was conducted prior to the Final Report to further address Clean Water Act and Mitigation concerns.

The plan formulation process revealed that Alternative C, the Wetlands Protection System, provides the most habitat benefits and is most cost efficient. The selected plan will provide a net increase of 753 Average Annual Habitat Units (AAHU) at a project cost of $445.00 per AAHU.

The selected plan and proposed project will have a direct and positive affect on 2660 acres of the complex and consists of the following features:

1. Approximately 5.5 miles of a low sediment deflection levee at 426.0 NGVD (2 to 5 ft.) paralleling the Illinois River shoreline and the perimeter of the project area to reduce siltation that occurs from frequent floods and improve wetland unit water control;

2. Seven low level interior levees at 422.0 NGVD (2 ft.) in specific "low spots" around the perimeters of the four main wetland units to allow effective water level management capabilities and compensate for existing sedimentation;

3. Six sluice gated CMP structures, two stop log drainage structures and four sluice gated concrete "Fish Passage" structures to perform and control watering/dewatering of the four wetland management units;

4. Dredging 160,000 cubic yards from Long Lake and the upper portion of Deep Lake to improve water delivery and facilitate fish movement, spawning and rearing;

5. A reversible 48,000 gpm pumping system on the Illinois River to allow flooding or draining of the wetland compartments.

The total project cost is estimated at $4,059,300. Project construction is scheduled to be completed in December 1994. The estimated annual O&M cost of the project is $33,700.00.

Complex rehabilitation and enhancement, as a result of the project, includes: a 79% reduction in sediment carrying waters into the project; 3-4 year flood frequency protection; capability to manipulate the wetland units water levels in approximately 10 days for wildlife habitat management; improved fisheries spawning and rearing habitat in Long and Deep Lake sloughs and Upper and Lower

Stump Lake; and restored fisheries access between Long and Deep Lake and the Illinois River. The project has been designed to provide habitat benefits for approximately 50 years.

An Environmental Assessment for the project has been prepared in compliance with the National Environmental Policy Act. A Finding of No Significant Impact was determined and approved by the District Commander in January 1992.

A Project Performance Evaluation Monitoring Plan that complies with the scope and methodologies used for other HREP's and the Upper Mississippi River System-Long Term Resource Monitoring Program (UMRS-LTRM) has been developed. Preconstruction, construction and post-construction monitoring will be implemented at an annual cost of approximately $7000.00.

The Illinois Department of Conservation is the local project sponsor and will operate and maintain the project after completion. The USFWS and the IDOC will assure that all operation and maintenance will be accomplished in accordance with Section 906(e) of the 1986 Water Resources Development Act.

The USFWS Regional Director and the District Commander will sign a memorandum of agreement for Enhancing Fish and Wildlife Resources at the Stump Lake Complex addressing the specific relationships, arrangements, and general procedures under which the USFWS and Department of the Army will operate in constructing, operating, maintaining, repairing and rehabilitating the project.

A Supplement to the Operation, Maintenance and Rehabilitation Agreement will be developed during the construction phase of the project which will more specifically define the operation and maintenance and rehabilitation.

UPPER MISSISSIPPI RIVER SYSTEM
ENVIRONMENTAL MANAGEMENT PROGRAM
DEFINITE PROJECT REPORT
WITH INTEGRATED ENVIRONMENTAL ASSESSMENT

STUMP LAKE COMPLEX
WETLAND HABITAT REHABILITATION AND ENHANCEMENT PROJECT
POOL 26, ILLINOIS RIVER, JERSEY COUNTY, ILLINOIS

TABLE OF CONTENTS

TABLE OF CONTENTS (Cont'd)

TABLE OF CONTENTS (Cont'd)

TABLE OF CONTENTS (Cont'd)

LIST OF TABLES

TABLE OF CONTENTS (Cont'd)

LIST OF FIGURES

LIST OF PLATES

TABLE OF CONTENTS (Cont'd)

LIST OF APPENDICES
(Under Separate Cover)

UPPER MISSISSIPPI RIVER SYSTEM
ENVIRONMENTAL MANAGEMENT PROGRAM
DEFINITE PROJECT REPORT
WITH INTEGRATED ENVIRONMENTAL ASSESSMENT

STUMP LAKE WATERFOWL MANAGEMENT AREA
WETLAND HABITAT REHABILITATION
AND ENHANCEMENT PROJECT

POOL 26, ILLINOIS RIVER, JERSEY COUNTY, ILLINOIS

1. INTRODUCTION.

a. Purpose. The purpose of this Definite Project Report (DPR) is to present a detailed proposal for the rehabilitation of wetlands at Stump Lake Waterfowl Management Area. This report provides planning, engineering, and sufficient construction details of the Selected Plan to allow final design and construction to proceed subsequent to approval of this document. The Environmental Assessment (EA) for the project is integrated with the DPR.

b. Authority. Public Law (PL) 95-502 authorized the construction of a new dam and 1,200-foot lock at Alton, Illinois, and directed the Upper Mississippi River Basin Commission to prepare a Comprehensive Master Plan for the Management of the Upper Mississippi River System. The Upper Mississippi River Basin Commission (UMRBC) completed the Master Plan report and submitted it to Congress on 1 January 1982. The report recommended an environmental management program that included construction of habitat rehabilitation and enhancement projects.

The 1985 Supplemental Appropriations Bill (PL 99-88), signed into law by President Reagan on 15 August 1985, provided initial authorization and appropriations for that environmental management program. A more comprehensive authorization was later provided by Section 1103 of the Water Resources Development Act of 1986 (PL 99-662). Section 1103 is summarized as follows:

Section 1103. UPPER MISSISSIPPI RIVER PLAN

(a) (1) This section may be cited as the Upper Mississippi River Management Act of 1986.

(2) To ensure the coordinated development and enhancement of the Upper Mississippi River System (UMR), it is hereby declared to be the intent of Congress to recognize that system as a nationally significant ecosystem and a nationally significant commercial navigation system. Congress further recognizes that this system provides a diversity of opportunities and experiences. The system shall be administered and regulated in recognition of its several purposes.

(e) (1) The Secretary, in consultation with the Secretary of the Interior and the states of Illinois, Iowa, Minnesota, Missouri, and Wisconsin, is authorized to undertake, as identified in the Master Plan -

(a) a program for the planning, construction, and evaluation of measures for fish and wildlife habitat rehabilitation and enhancement...

c. Project Selection Process.

(1) Eligibility Criteria. The Master Plan, completed by the UMRBC in 1981, served as the basis for recommendations (including the UMRS-EMP) subsequently enacted into law by the Water Resources Development Act of 1986. A design memorandum (or implementation document) did not exist at the time of enactment of Section 1103. Therefore, the North Central Division, U.S. Army Corps of Engineers, completed a "General Plan" for implementation of the UMRS-EMP in January 1986. The U.S. Fish and Wildlife Service, Region 3, and the five affected states (Illinois, Iowa, Minnesota, Missouri, and Wisconsin) participated in the development of that plan through the Upper Mississippi River Basin Association (UMRBA). Programmatic updates of the General Plan for budget planning and policy development are accomplished through Annual Addendums.

The Master Plan report and the General Plan identified examples of potential habitat rehabilitation and enhancement techniques. Consideration of the Federal interest and Federal policies resulted in the following conclusions:

(a) First Annual Addendum. "The Master Plan report... and the authorizing legislation do not pose explicit constraints on the kinds of projects to be implemented under the UMRS-EMP. For habitat projects, the main eligibility criteria should be that a direct relationship should exist between the project and the central problem as defined by the Master Plan, i.e., the sedimentation of backwaters and side channels of the UMRS. Other criteria include geographic proximity to the river (for erosion control), other agency missions, and whether the condition is the result of deferred maintenance...."

(b) Second Annual Addendum. The types of projects that are definitely within the realm of Corps of Engineers implementation authorities include the following:

- backwater dredging
- dike and levee construction
- island construction
- bank stabilization
- side channel openings/closures
- wing and closing dam modifications
- aeration and water control systems
- waterfowl nesting cover (as a complement to one of the other project types)
- acquisition of wildlife lands (for wetland restoration and protection.) Note: By letter of February 5, 1988, the Office of the Chief of Engineers directed that such projects not be pursued.

A number of innovative structural and nonstructural solutions which address human-induced impacts, particularly those related to navigation traffic and operation and maintenance of the navigation system, could result in significant long-term protection of UMRS habitat. Therefore, proposed projects which include such measures will not be categorically excluded from consideration, but the policy and technical feasibility of each of these measures will be investigated on a case-by-case basis and recommended only after consideration of system-wide effects.

(2) Selection Process. In the past, projects have been nominated and ranked for inclusion in the St. Louis District's habitat projects program by the respective state conservation agencies, and the USFWS, based on agency management objectives. The Illinois Department of Conservation (IDOC) ranked the Stump Lake complex project first in importance.

d. Scope of Study. The geographical scope of the study is limited to the Stump Lake complex near Rosedale, Illinois. Various field surveys were conducted during the study. These studies included topographic, baseline and profile, hydrographic, soils (borings), water quality, habitat, and cultural resources surveys.

e. Coordination. The DPR report was developed in coordination with the USFWS (Mark Twain National Wildlife Refuge Office and Ecological Services Offices in both Rock Island and Marion, Illinois) IDOC (project sponsor), various other Federal and state agencies, and the public.

2. EXISTING ENVIRONMENTAL CONDITIONS AND FUTURE WITHOUT.

The following section presents information on the existing environment in the area affected by the project. Where relevant, a discussion is included on the environmental conditions if no project action is taken (i.e., the future without).

a. Location. The Stump Lake complex (officially called The Stump Lake Waterfowl Management Area [WMA]) extends from Illinois River mile 7.2 to mile 12.7 along the left (east) bank of the Illinois River in Jersey County, Illinois (see FIGURE 1). This 2,958 acre bottomland area includes Upper and Lower Stump Lakes, Fowler Lake, Flat Lake, Long Lake, and Deep Lake and contains 1,098 acres of open wetlands, 252 acres of cropland and 1,578 acres of forest (primarily forested wetland) and 30 acres of improvements such as roads, access areas, etc. (see FIGURE 2).

b. Physiography-Topography. The Stump Lake WMA Habitat Rehabilitation Project lies in the alluvial flood plain of the Illinois River. The flood plain is relatively flat, with elevations ranging from about 420 NGVD to 432 feet NGVD (National Geodetic Vertical Datum). Normal pool level is approximately 419 NGVD. The wetland areas are projected to change in the future if this project is not implemented. Sedimentation of the area interior wetlands will continue to occur at an average rate of .5 inch per year as a result of deposition during minor flood events, eventually raising the open wetland elevations to a level where they will succeed to flood plain forest. (Reference Paragraph d. on page 7 of this report for further documentation on sedimentation rates.)

c. Management Description. The Stump Lake Complex has been managed by the Illinois Department of Conservation (IDOC) since the 1950's. Public use and water control facilities for wetland management have been in place since the 1960's.

Access for fishing, hunting and other recreational activities in the area is available at the Stump Lake Boat Access Area (main access area) and Dabb's Road boat access and Deep Lake Boat Access (minor access areas).

Existing facility development includes two one-lane concrete boat ramps, two one-lane gravel boat ramps, auto/trailer parking areas, 8 vault toilets, 13 water control structures, two boat pullovers, various levees, and a stationary pump.

Located on Federal lands and waters originally acquired for the 9-foot navigation project (Pool 26), the Stump Lake WMA is managed as part of the Mississippi River State Fish and Wildlife Management Area (MRFWA) by the Illinois Department of Conservation (IDOC) under Cooperative Agreements between the Department of Interior and the Corps of Engineers. The MRFWA was established for conservation, maintenance, and management of wildlife resources and their habitats (16 U.S.C., Sect. 663(a)). The primary objectives of the MRFWA are to (1) provide migrating waterfowl with food, water, and protection during fall and spring months, (2) to improve and maintain existing habitat to perpetuate optimum annual production of resident mallards, woodducks, and Canada geese and (3) provide waterfowl hunting opportunities. Other objectives are to (1) provide food, water, and protection to wintering waterfowl, (2) maintain balanced populations of all resident wildlife species, (3) maintain the biodiversity of the aquatic habitats, (4) provide limited day-use recreation where and when such activities are compatible, and (5) protect and perpetuate existing or known threatened and endangered species.

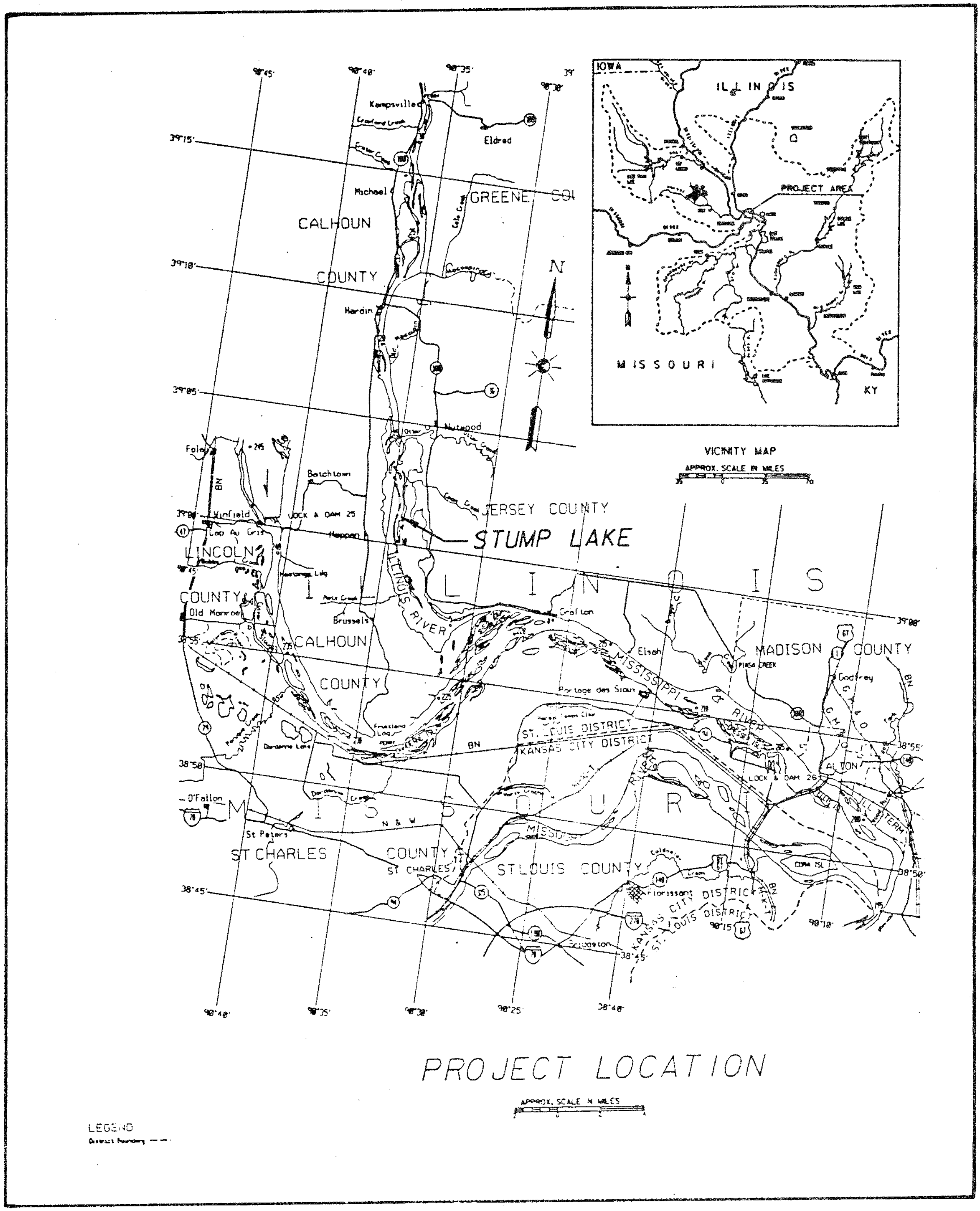

PROJECT LOCATION
APPROX. SCALE IN MILES
VICINITY MAP
APPROX. SCALE IN MILES
IOWA
ILLINOIS
PROJECT AREA
MISSOURI
KY
STUMP LAKE
CALHOUN COUNTY
GREENE CO
JERSEY COUNTY
LINCOLN COUNTY
MADISON COUNTY
ST CHARLES COUNTY
ST LOUIS COUNTY
ILLINOIS RIVER
MISSISSIPPI RIVER
MISSOURI RIVER
ST. LOUIS DISTRICT
KANSAS CITY DISTRICT
LOCK & DAM 25
LOCK & DAM 26
Kampsville
Eldred
Hardin
Nutwood
Batchtown
Winfield
Grafton
Brussels
Elsah
Godfrey
Alton
Old Monroe
Portage des Sioux
St Peters
O'Fallon
Florissant
LEGEND
District Boundary

FIGURE 1

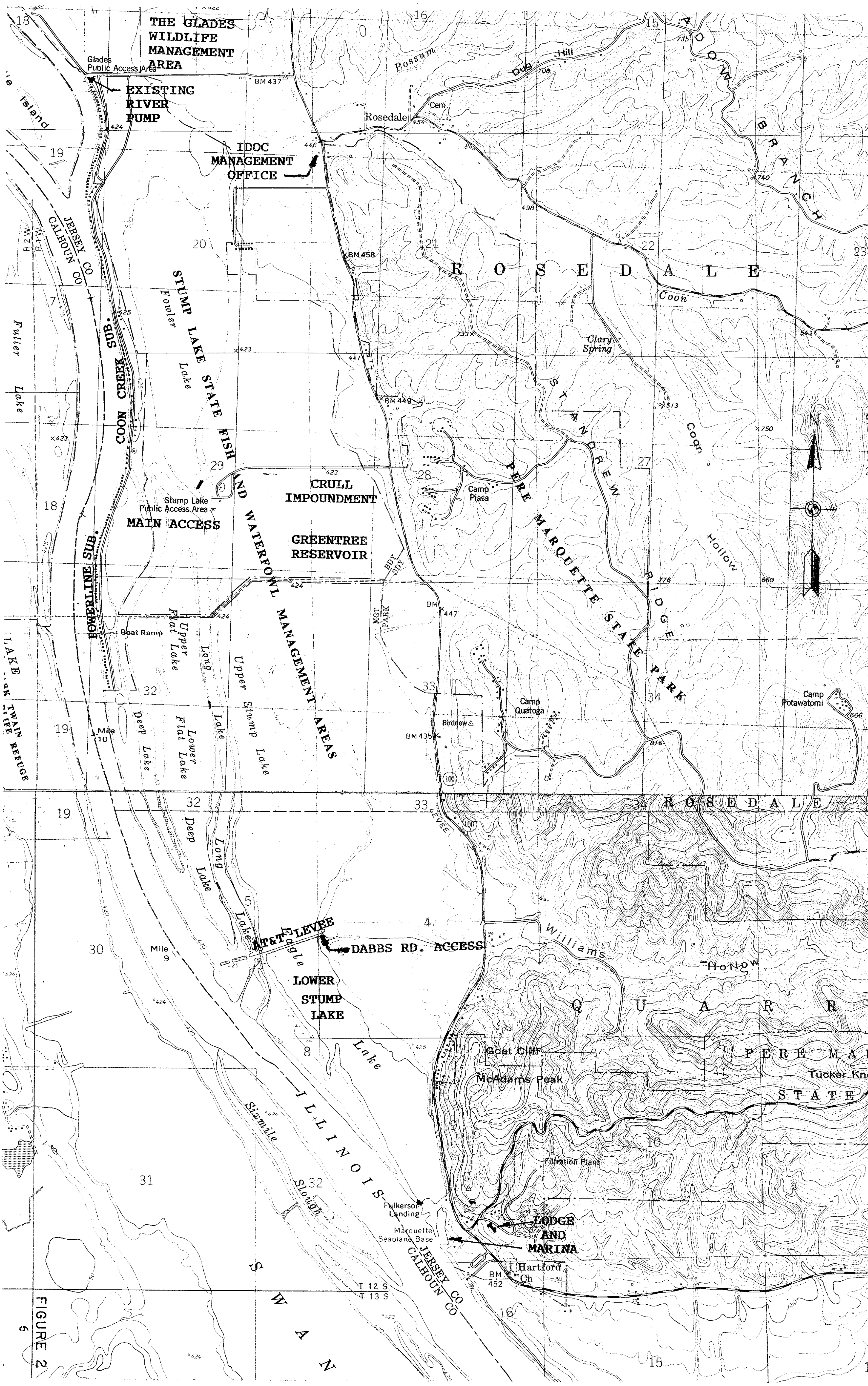

THE GLADES WILDLIFE MANAGEMENT AREA
Glades Public Access Area
EXISTING RIVER PUMP
IDOC MANAGEMENT OFFICE
Rosedale
Possum Dug Hill
MEADOW BRANCH
ROSEDALE
STUMP LAKE STATE FISH AND WATERFOWL MANAGEMENT AREAS
COON CREEK SUB.
POWERLINE SUB.
JERSEY CO
CALHOUN CO
Fowler Lake
Fuller Lake
Coon
Clary Spring
ST. ANDREW RIDGE
PERE MARQUETTE STATE PARK
Coon Hollow
Camp Piasa
Stump Lake Public Access Area
MAIN ACCESS
CRULL IMPOUNDMENT
GREENTREE RESERVOIR
Boat Ramp
Upper Flat Lake
Long Lake
Upper Stump Lake
Lower Flat Lake
Deep Lake
Camp Quatoga
Camp Potawatomi
Birdnow
Mile 10
MARK TWAIN REFUGE
LEVEE
AT&T LEVEE
DABBS RD. ACCESS
Eagle Lake
LOWER STUMP LAKE
Williams Hollow
QUARRY
Mile 9
Goat Cliff
McAdams Peak
PERE MARQUETTE STATE PARK
Tucker Knob
Filtration Plant
Sixmile Slough
ILLINOIS
Fulkerson Landing
Marquette Seaplane Base
LODGE AND MARINA
Hartford Ch
SWAN

FIGURE 2

FIGURE 2 - TOPO QUAD OF PROJECT AREA

(1) Complex Management. The Stump Lake complex EMP-HREP project includes 5 non-forested wetland management units; Fowler Lake, Flat Lake, Deep and Long Lakes (as one unit), Upper Stump Lake, and Lower Stump Lake (as two different management units). These open wetlands are the most critical type of habitat needed to ensure area objectives for waterfowl are met. The following paragraphs describe the existing management conditions and activities at the Stump Lake complex.

Flat Lake (171 acres)
Of the various units, Flat Lake offers water control capabilities for the longest period of time. Management is directed at dewatering annually and aerial seeding of Japanese Millet, in conjunction with the development of natural moist soil food plants through exposure of the substrate. Additional benefits include solidifying the flocculent substrate.

Dewatering is accomplished by closing the gated structure which connects Long Lake to Flat and pumping over the natural levee into Long Lake with a portable hydraulic pump. Filling the unit with water is accomplished via gravity flow from Long Lake through one 36" CMP gated structure.

Fowler Lake (210 acres)
The closure levee which made Fowler Lake a separate compartment was constructed in 1988; since that time, the area has been dewatered annually for the same management purpose as Flat Lake. Recharge is accomplished by the permanently placed 24,000 GPM Riverside Couch pump (installed in 1975) at the Glades access area, which can be directed to pump water into either the Glades WMA or the Stump Lake complex via a water transmission ditch which discharges into Fowler Lake. Two 36" CMP gated structures allow for water transfer between Fowler Lake and Long Lake.

Long and Deep Lakes (129 acres)
These units are basically static units that serve to convey water for the other 4 management units. Dewatering of Long and Deep Lakes is by gravity flow through an existing stop log structure across Long Lake by the AT&T Levee and is only done to remove overflow or discharge water from the other management units.

Lower Stump Lake (206 acres)
This unit has three gated 24" CMP culverts at the downstream end of the lake which facilitates water transfer with the Illinois River (by Pere Marquette harbor). Two gated 36" CMP culverts allow water transfer through the AT&T Levee which separates Lower and Upper Stump Lakes.

Although the Lower Stump unit is not perched, dewatering can be partially accomplished via gravity to the Illinois River when the river is at pool (Elev 419.0 NGVD). Pumping achieves additional water level reduction, but its effectiveness is limited by the lack of entrance channels to the pumps. Dewatering is done on a two to three year cycle for moist soil management, otherwise water levels are managed for production of desirable aquatic vegetation.

Upper Stump Lake (382 acres)
In addition to the gated structures through the AT&T Levee, there is one 36" CMP gated structure between Long Lake and Upper Stump, and an earthen plug seasonally installed or removed to allow water control and provide boat access from Long Lake to Upper Stump. This lake is generally managed for production of desirable aquatic vegetation. Dewatering is accomplished by pumping into either Lower Stump or Long Lake.

(2) Crull Impoundment Refuge and Greentree Refuge. These areas are not included in the Stump Lake complex EMP project; however, they are directly adjacent to the project and management capabilities will be improved if a viable HREP is developed and implemented.

The Crull Impoundment Refuge is a 40 acre leveed agriculture impoundment. As soon as spring water levels allow, this impoundment is first gravity drained and then pumped out by portable pump. If the dewatering is accomplished in time, strip plantings of corn, millet and buckwheat by conventional agricultural methods are implemented.

The Greentree Refuge is a 40 acre leveed bottomland hardwood impoundment which shares a levee with the Crull Impoundment. Dewatering is accomplished when water levels permit in the spring, by gravity drainage. The east side of both impoundments are adjacent to a leased agricultural field. As rent, 5 percent of the lease is left standing in this field on the low side near the levee.

Flooding of the two impoundments and a portion of an adjacent agricultural field is accomplished by using a portable pump to lift water from Upper Stump Lake into the agricultural field and gravity feed into the two impoundments, providing approximately 120 acres of refuge.

(3) Management Problems.

Dewatering efforts for moist soil production and aerial seeding occurs during the last week of June through the first three weeks of July. After dewatering, a period of 35 to 40 days becomes a critical time while the plants are developing. After 50 to 60 days low water levels can be raised slowly and as long as over topping is prevented, food plants will reach maturity.

The existing small pumping capacity often requires pumping to begin much earlier than ideal. It takes approximately 30-60 days to achieve management pool, i.e., an average 18" depth. The result is a loss of food production due to decreased growing period and overtopping of immature plants due to the demand for pump units at other locations. Increased and dedicated pumping and water control facilities will optimize water level management and the resulting food production.

Presently, management efforts are lost approximately 50 percent of the time due to lack of protection from the Illinois River. Attempts to reestablish aquatic vegetation fail from intrusion of silt-laden waters at levels above "bank full" condition. Silt, lack of stable water levels, and turbidity all are deleterious to aquatic production. Moist soil management techniques can be foiled by intrusion any time during the 60 to 90 days needed for development and maturity. Protection from Illinois River overflows 95 percent of the time would be desirable. However, overflow protection above 75 percent produces manageable conditions and will significantly extend the functional life of the open wetlands.

The open wetland areas are projected to continue to change detrimentally in the future if a HREP is not implemented. Sedimentation of the area open wetlands will continue to occur as a result of deposition during minor flood events eventually raising the open wetland elevations to a level where they will succeed to flood plain forest. Loss of desirable open wetland habitat at the Stump Lake Complex is further documented in the next paragraph (Paragraph d, page 9).

Long and Deep Lake sloughs are now so full of sediments that water conveyance to the complex wetland units is now significantly impeded. Historically, these sloughs have provided excellent backwater fisheries habitat. However, sedimentation, particularly the last 20 years, has now significantly reduced the biological productivity of this aquatic habitat. Shallow depths, turbidity, high water temperatures during the summer, lack of dissolved oxygen, lack of plant production, and hard winter freezes are just some of the negative impacts currently affecting fish survival. In addition, the design of the existing stoplog structure across Long Lake near the confluence with the Illinois River impedes fish movement between the sloughs and the river for spawning and rearing.

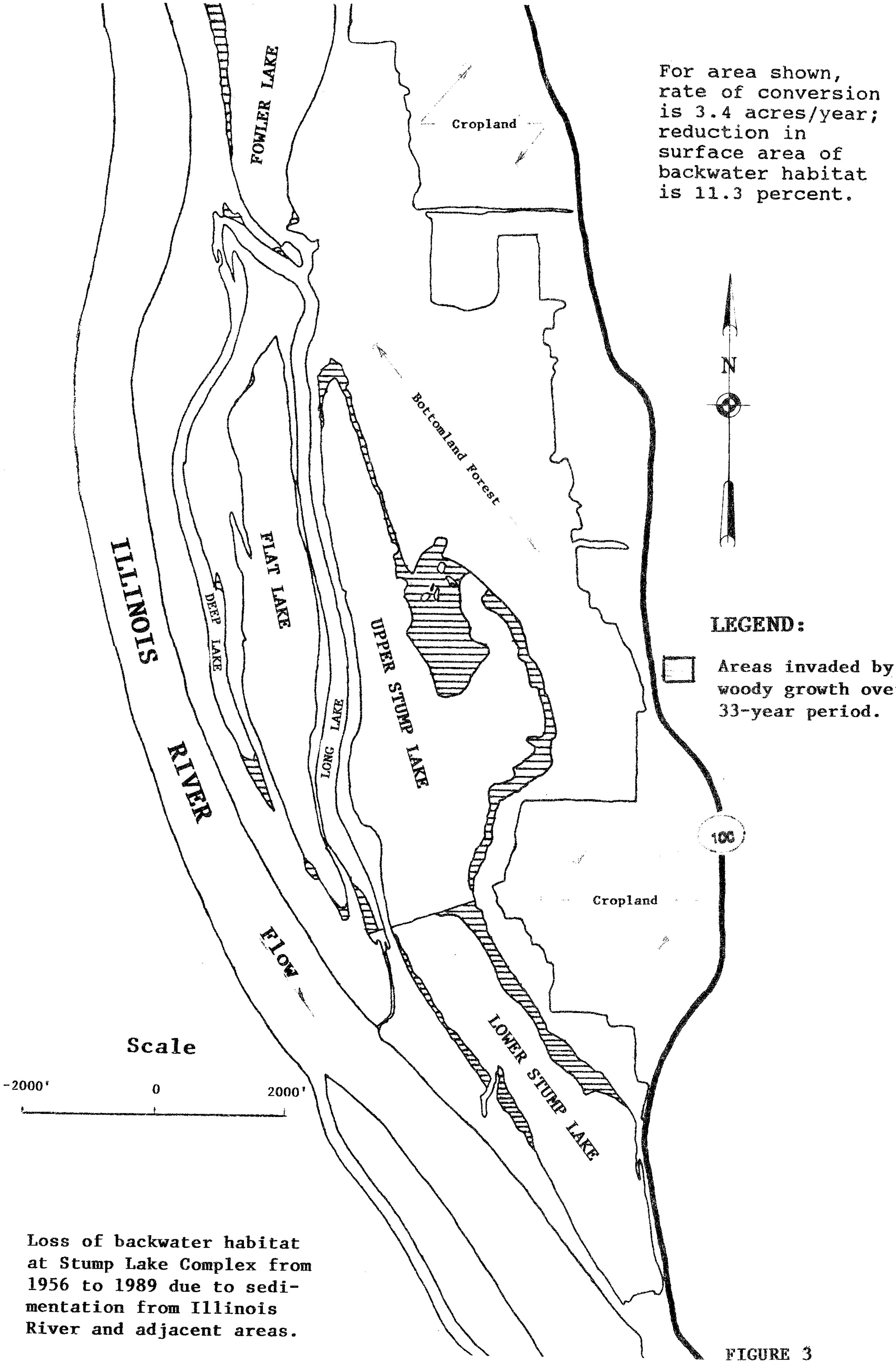
The existing operation and maintenance (O&M) expenditures by the IDOC at Stump Lake is currently approximately $25,000.00 per year. Control of open wetland habitat loss and inefficient water control management capabilities account for a significant portion of the annual O&M costs. Without a HREP project, O&M expenditures are expected to increase approximately 14% per year to conduct activities to retard or compensate for the continuing habitat degradation resulting from sedimentation and lack of efficient water control. (See Paragraph d, below, for documentation on rate of desirable habitat loss.) The Illinois Department of Conservation's budget cannot provide the additional increasing expenditures that will be needed annually to retard habitat loss. Therefore, it is anticipated that desirable habitat losses will continue and accelerate in the without project condition.

d. Hydrology/Hydraulics. Because of low river velocities in Pool 26 at normal flows, the river's sediment load consists of silts and clays which settle very slowly. During floods, when open-river conditions exist, the sand load increases significantly, and so too does sandbar building. Deposition in the pools occurs at all times, but is most severe during floods. The Comprehensive Master Plan for the Management of the Upper Mississippi River System (UMRBC, 1982) identified sedimentation as the most significant resource problem affecting the Mississippi River system. While no site-specific sedimentation data exists for the Illinois River in the project area, analysis of aerial photographs indicates that the site's wetlands are slowly filling. Some research has been conducted on Illinois River Backwater Lakes sedimentation. The data in these studies suggests an average annual sedimentation rate of .50 inches is applicable to the Stump Lake Complex (Reference Appendix D, paragraph 3b.). Evaluation of aerial photos of the Stump Lake Complex taken in 1956 and 1989 illustrate the conversion water to land. Figure 3 highlights the areas of woody growth over this 33 year period. For the area shown, the rate of conversion from open water to land is 3.4 acres/year; the corresponding reduction in surface area is 11.3 percent. Assuming a constant conversion rate in the future, by the year 2040 (future without condition), the reduction in surface area would be 30.3 percent.

In the future, suspended sediment loads may change, depending on the implementation of soil conservation practices in the Illinois River Basin. However, suspended sediment deposition is anticipated to remain a problem in the project area. Sediment deposition during flood events will cause further degradation of the Stump Lake wetlands complex.

Water stages on the Illinois River at Stump Lake are controlled by the operation of the Melvin Price Locks and Dam. The pool stage is 419 NGVD under normal conditions, and exceeds 419 NGVD only during flows approaching bankfull or greater. Stages at Grafton, about 7 miles downstream of the project, are less than 421 NGVD more than 90 percent of the time on an annual basis. Minimum stages occur during floods when the pool goes "on tilt" and proceeds to an open river condition. Minimum regulated stage is 414 NGVD at the dam, and about 418 NGVD at the downstream end of Stump Lake. At this point, all gates at Melvin Price Locks and Dam are out of the water. As flood flows continue to increase, the minimum regulated stage increases as well, with the only effect of the locks and dam being a small local swellhead just upstream of the dam. Exterior water surface elevations at the downstream end of Stump Lake less than 418 NGVD could only occur during a loss of pool, a situation which has not happened since the early 1950's. As the FIGURE 4 Stage Hydrograph shows (1978 selected as a "typical" year for Pool 26), pool elevations in the Stump Lake area can fluctuate by a number of feet above and below normal pool stage for extended periods of time (see also Appendix D, for stage hydrographs for the past 30 years).

Flood-frequency relationships at the downstream end of the complex are shown in TABLE 1. To determine the corresponding stage-frequency at the upstream end of the complex (R.M. 12.7), 1.1 feet of elevation must be added to the TABLE 1 values. The flood-of-record occurred in 1973 and reached an elevation of about 437.0 NGVD at Grafton, Illinois.



Loss of backwater habitat at Stump Lake Complex from 1956 to 1989 due to sedimentation from Illinois River and adjacent areas.

FIGURE 3

1978 TYPICAL STAGE HYDROGRAPH
GRAFTON GAGE

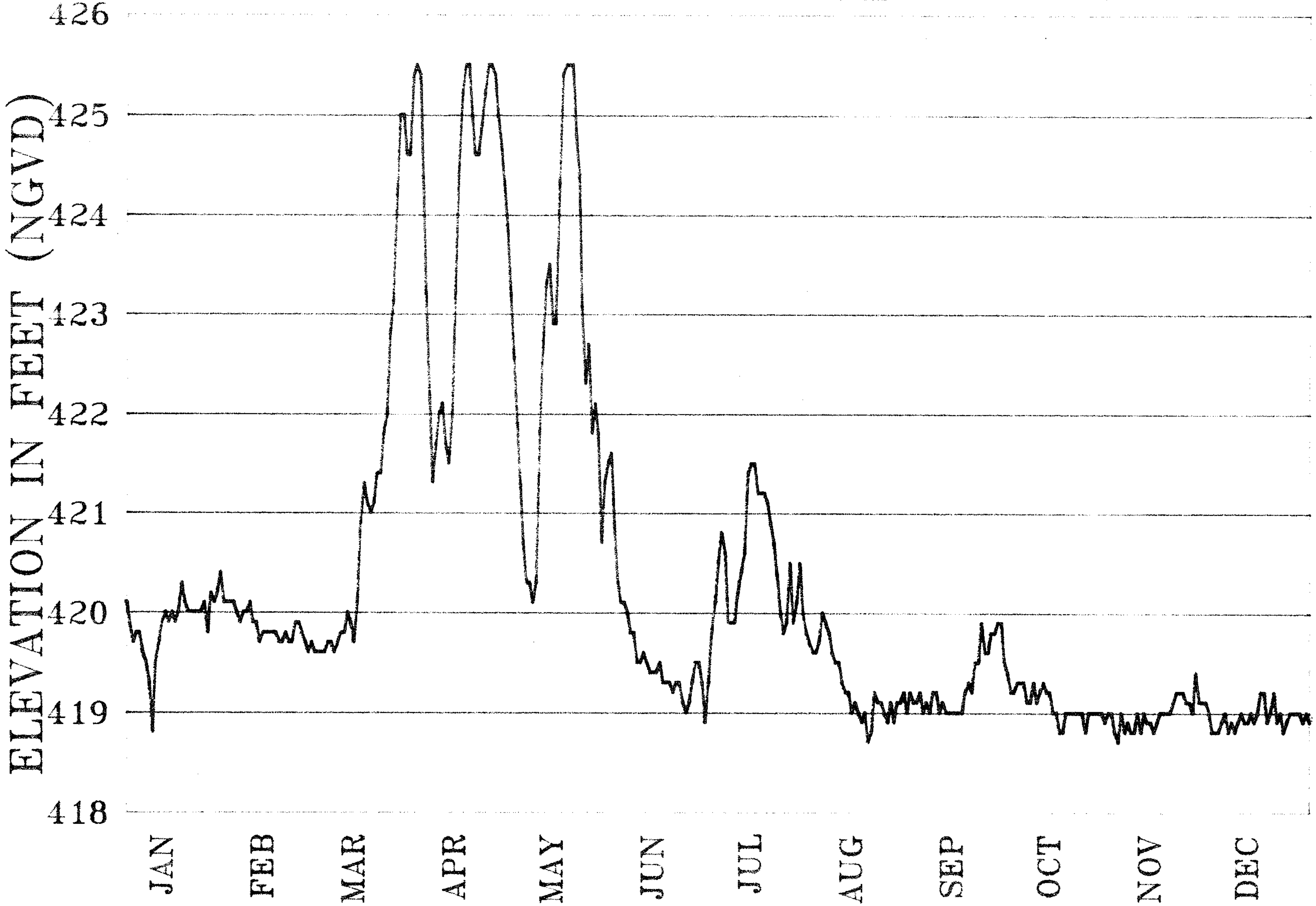


FIGURE 4

TABLE 1

STAGE-FREQUENCY AT RIVER MILE 7.2
DOWNSTREAM END OF STUMP LAKE

Frequency (Years)	Elevation (NGVD)
2	424.5
5	429.9
10	432.6
25	435.5
50	437.7
100	440.0

e. Water Quality. The quality of the water in all five units is deteriorating. Shallow water depth and stagnant conditions in summer months cause elevated water temperatures. At times, large alga blooms occur, causing large day/night changes in dissolved oxygen concentrations and pH. At times, the dissolved oxygen concentration and pH occur outside the tolerance limits of upper trophic level organisms. During winter months under ice cover, large areas may develop extremely depressed concentration of dissolved oxygen. In the future without condition, the area would remain similar to the existing condition, with the exception of progressively less water.

f. Air Quality. There are no major sources of pollutant emissions in the vicinity of the project area. Because of its low pollution potential, this area is not actively monitored. Most of the air pollutants in the area consist of suspended particles from agricultural activities and navigation operations. The existing air quality conditions are expected to continue into the future if the project is not implemented.

g. Noise. The major sources of ambient noise in the project area result from the diesel power plants of tows passing in the main channel of the Illinois River, occasional motorboats navigating in the vicinity of the project area, vehicle traffic along Highway 100 and public roads that access two riverfront cabin subdivisions and IDOC pumps used to manage the complex. No change in noise level is expected in a future without a project.

h. Prime Farmland. Stump Lake WMA is a wetland and experiences frequent flooding. As such, the project area would not qualify as prime farmland. Development of the area in the future as farmland is not anticipated.

i. Habitats. Two broad categories of habitat are present at 2,657-acre Stump Lake Complex - wildlife and fisheries. Wildlife habitat, including wetlands of various types, is important as migratory and wintering habitat to many species of waterfowl, especially the mallard. Fisheries habitat within the project area consists of backwater habitat, which serves an important role in the spawning and rearing of many species of riverine fish. Appendix F includes a detailed description of the importance of the Upper Mississippi River, and in particular Pool 26 and the Alton Pool, to migratory waterfowl and riverine fish. This appendix also presents details concerning the various wildlife and fisheries habitats of the project site, as well as the results of periodic waterfowl censusing and fish collecting.

The Stump Lake WMA illustrates well the ongoing conversion process of water-to-land habitat. Due to alluvial and colluvial sedimentation, it is anticipated that all of the complex's interior wetlands will eventually disappear. For waterfowl, this conversion translates into a loss of habitat in both quantity and quality. The estimated rate of sedimentation in the waterfowl management units is about 0.5 inches per year. This problem of gradual loss of land to water is exacerbated by the fact that compared to all other Upper Mississippi River System (UMRS) pools, Pool 26 and the Alton pool of the Illinois River proportionately have very little off-channel water habitat (TABLES 2 and 3).

Wetland and nonwetland habitats, as described below, were identified according to the Federal Manual for Identifying and Delineating Jurisdictional Wetlands (Federal Interagency Committee for Wetland Delineation, 1989).

TABLE 2

EXTENT OF UMRS OFF-CHANNEL WATER HABITAT BY RIVER REACH

Mississippi River Reach	Off-Channel Water Habitat 1/ Acres 2/	Acres Per River Mile	Acres As Percentage Of Total Reach Aquatic Acres 3/
Pools 1-10	105,737	454	77
11-13	40,389	439	74
14-19	43,538	274	62
20-25	16,558	136	35
26	5,098	128	30

1/ Off-channel water is here defined as including side channel, river lakes and ponds, and sloughs.

2/ Data Sources = CE (1977) and CE (1988).

3/ Total aquatic habitat is here defined as including all off-channel water habitat plus main channel border habitat.

TABLE 3
AQUATIC HABITAT IN THE ILLINOIS RIVER VALLEY BY POOL 1/

		Aquatic Habitat					
		Lakes (>20 acres)		Ponds (<20 acres) 3/		River	
Pool	River Miles	Acres	Acres Per River Mile	Acres	Acres Per River Mile	Acres	Acres Per River Mile
Alton 2/	0-80	3,759	47	737	9	9,807	122
LaGrange	80-160	14,981	187	1,204	15	7,781	97
Peoria	160-230	15,929	228	410	6	7,645	109
Starved Rock	230-245	1,505	100	0	0	1,367	91
Marseilles	245-270	2,481	99	105	4	1,995	80

1/ Data from Illinois Natural History Survey (1985); classification of aquatic habitats based on Cowardin et al. (1979); acreage derived from interpretation of aerial photography taken in 1978-80.

2/ Stump Lake Complex located in Alton Pool.

3/ Ponds and Sloughs

(a) Forested Wetland. There are 1,314 acres of forested wetland in the project area. Much of this habitat type consists of the silver-maple-cottonwood and silver-maple-cottonwood-pin oak communities. These communities can withstand limited annual flooding, and generally are located on the flood plain away from the riverbank. The willow community makes up the remainder of the forested wetland type. It can tolerate more frequent, prolonged flooding, and is located on the perimeter of the waterfowl management units.

Forested habitat adjacent to the river is used by bald eagles as resting habitat. Forest also provides habitat for wood ducks, raccoon, white-tailed deer, cottontail rabbit, foxes, tree squirrels, songbirds, turkey, salamanders, frogs, snakes, and turtles.

Sedimentation is accelerating the plant succession process by providing progressively higher and drier conditions suitable for the establishment of a drier forest community.

(b) Nonforested Interior Wetland. The waterfowl management units consist of about 1,098 acres of open interior wetlands. Most of this acreage was once forested, but was cleared and then inundated upon establishment of the Alton Pool on the Lower Illinois River in 1938, when old Lock and Dam 26 at Alton was completed. However, some of this area consists of sloughs or remnants of old river channels. These interior wetlands consist of open water surrounded by plant communities of submergent, floating-leaved, and emergent species.

Animals using nonforested interior wetland habitat include ducks, coots, rails, bitterns, herons, egrets, numerous songbirds, hawks, and osprey. Many species of insects, amphibians, reptiles, and furbearers (including muskrat, mink, fox, raccoon, opossum, and beaver) are found in these wetlands.

In the absence of a habitat rehabilitation project, the nonforested interior wetlands and the values they provide would eventually be displaced by forested habitat.

(c) Forested Nonwetland. About 245 acres of the Stump Lake Complex consists of nonwetland (upland) habitat. About 215 acres are forested, and about 30 acres consist of roads, cabin sites, parking lots, causeways, and levees. Most of the forested nonwetland habitat occurs as a narrow bank immediately adjacent to the river, extending from the north end of Fowler Lake to nearly the south end of Long Lake.

(2) Fisheries Habitat. Fisheries habitat at Stump Lake Complex includes all five waterfowl management units. These units provide habitat for spawning, rearing, and adult life stages of fishes adapted to slackwater conditions. The habitat quality of these units varies from poor to good depending upon the unit and season of year. Deep and Long Lakes, a continuous waterbody, were once active sidechannels of the Illinois River that turned into sloughs after they became cut off from the main channel over time. The other units were created when Lock and Dam 26 was built and the resulting pool permanently inundated previously forested areas.

Upper and Lower Stump Lakes are each managed for the production of submerged aquatic plant growth, and water levels are kept relatively constant. Flat and Fowler Lakes are each managed for moist soil plant production, and these units are dewatered every year in the summer. The average depth of these units is about 2-3 feet. Adjacent forested habitats can become inundated during periods of high water, providing spawning habitat for channel catfish, carp, and buffalo, plus marginal feeding habitat for other fish.

Conditions lowering the value of backwater habitat for slackwater fishes within the project area include high water temperatures in summer, low dissolved oxygen levels in summer and winter, and shallow water depth.

Backwater areas illustrate the ecological succession from aquatic to marsh habitat taking place in the flood plain. Biologists are concerned that the continuing loss of backwater habitat in the Illinois River could lead to a future reduction in the number and diversity of many slackwater fishes. Both commercial and sport fish have specific life requirements, and extensive backwaters are needed for their optimum feeding and reproduction.

(3) Endangered Species. The Stump Lake Complex provides suitable habitat conditions for seasonal use by the Bald Eagle and the Indiana Bat. Bald Eagles may be present during the winter months and the Indiana Bat may utilize the areas forested habitat during the summer months for maternity roosting.

j. Historic Properties. Archaeological and geomorphological investigation conducted adjacent to the project area suggests that the area may contain significant archaeological remains. Although no sites have been reported from within the project area boundaries, the surrounding flood plain has a long and complex culture history spanning at least 14,000 years.

k. Recreation. Approximately 25,000 visitors use the Stump Lake Complex each year for recreation. Recreational activities in the project area include hunting (mostly waterfowl), trapping, fishing, boating, picnicking, sightseeing and nature study. In the future without condition, waterfowl hunting, fishing, boating, trapping and nature study in the area would be expected to further decline due to the continued loss of open wetland habitat caused by sedimentation.

l. Aesthetics. The aesthetics of the Stump Lake WMA is considered typical for a wetland area on the Illinois River. From an aesthetic standpoint, it is expected that if a project is not built, then the area would remain similar to the existing condition, with the exception of progressively less open wetland and accelerated succession to woodland - a result of continuing sediment deposition as a result, the asthetic values associated with open weltands will be lost.

m. Socioeconomic Resources. There are two subdivisions (Coon Creek and Powerline subdivisions) of seasonal use cottages along the Illinois River bank parallel to the western boundary of the Stump Lake WMA. These cottages and their respective lots are on Federal property and are leased from the Federal Government. The leases are administered by the Corps of Engineers.

The Glades WMA, another IDOC managed public use area, is located directly north of the Stump Lake complex. Illinois State Hwy 100, private farms and Pere Marquette State Park (IDOC) lands are located along the eastern side of the Stump Lake complex. The southern end of the project area is bounded by the Pere Marquette State Park marina and resort complex. In the future without condition, these developments will remain as is, and any changes will be dictated by the owners independent of the status of the Stump Lake complex.

Existing public access to the Stump Lake complex is provided by public roads. The IDOC road and parking lot at the State Park marina provide access to the lower end of Lower Stump Lake. The IDOC managed Dabbs Road access area provides public access to the northern end of Lower Stump, the southern end of Upper Stump and the lower end of Long Lake. The main Stump Lake access area provides public access to Long Lake, Fowler Lake, Upper Stump Lake, Flat Lake and Deep Lake. The IDOC managed Deep Lake access site provides access to Deep Lake on the western side of the project area. In the future without condition, all public access by vehicle will continue to be provided to the project, however, boat access will eventually cease due to continuing sedimentation.

n. Mineral Resources. Significant mineral resources in Jersey County, Illinois, include limestone, sand and gravel, and coal.

3. RESOURCE PROBLEMS AND OPPORTUNITIES.

As documented in Section 2 of this report, sedimentation, and water level fluctuation have hampered past habitat management efforts at Stump Lake WMA. Sedimentation is causing a rapid conversion of water to land with a resulting long-term quantitative loss of fish and wildlife habitat. Unregulated fluctuating water levels at the site have also impacted the production of plants and their availability to waterfowl and other wildlife.

Opportunities do exist to provide sediment protection and improved water level control at the Stump Lake wetland complex. The various alternatives explored for addressing the sedimentation and water control problems are described in Section 5 of this report.

The potential for improved management of the 4 main wetland compartments at Stump Lake WMA would allow for a more reliable production of waterfowl food during the summer months, and an increased availability of that food during migration. Removing sediments and deepening Long Lake and Deep Lake will provide a restored off-channel water area that would improve the aquatic habitat, providing enhanced conditions for fish reproduction.

4. **PROJECT OBJECTIVES.** The specific project goals and objectives and potential enhancement measures of the project are described in TABLE 4.

TABLE 4

PROJECT GOALS, OBJECTIVES AND ALTERNATIVE ENHANCEMENT MEASURES

Goal	Objective	Potential Enhancement Measure
Enhance wetland habitat for migratory and resident wildlife	Reduce and control sedimentation into wetland compartments	Excavate sediments from wetland units
		Construct Riverside levee/ dike to deflect silt laden River waters during low level flood events.
		Construct Sediment basins for colluvial sedimentation from off-project uplands.
		Implement off project Soil Conservation Resource Plan to reduce upland erosion
	Improve water level control capabilities in wetland units independent of river stage	Construct Riverside levee/ dike that protects wetlands from inundation up to 5 yr. flood frequencies
		Construct Interior levees around each wetland unit to contain water up to elev. 421.
		Replace inefficient water control structures (gated culverts, stop logs)
		Install reversible riverside pump(s).

TABLE 4 (Continued)

Goal	Objective	Potential Enhancement Measure
		Excavate sediments from Long Lake and Deep Lake to deepen the lakes and improve water conveyance to and from wetland units
Enhance aquatic habitat for slackwater fishes	Increase Photic Zone	Excavate or dredge Long Lake and Deep Lake to ensure 3-5 foot of water depth.
		Construct Riverside levee/ dike.
	Improve access to backwater habitat (Long-Deep Lake) for spawning fish	Install fish passage structure at water control site at confluence of river and Long Lake.
	Reduce sedimentation in Long Lake and Deep Lake	Riverside levee/ dike.

5. PRELIMINARY PLAN FORMULATION.

a. Formulation and Evaluation Criteria. Four major criteria were considered in formulating a selected plan. They are:

(1) Completeness - The extent to which an alternative addresses all of the stated project objectives.

(2) Effectiveness - The extent to which an alternative alleviates the specified problems and achieves the specified opportunities. The Wildlife Habitat Appraisal Guide (WHAG) and the Aquatic Habitat Appraisal Guide (AHAG) was the primary method used to quantify effectiveness. Results are expressed in Average Annual Habitat Units (AAHU) gained. The mallard was selected by an interagency evaluation team as the species best representing the project areas' requirements for migratory waterfowl, and the large slackwater fish guild (including most of the commercially and recreationally important fishes) was selected as the preferred group for fisheries management emphasis. The entire WHAG and AHAG Report is contained in APPENDIX E.

(3) Efficiency - The extent to which an alternative is the most cost effective means of alleviating the specified problems and realizing the specified opportunities.

(4) Acceptability - The workability and viability of the alternative plan with respect to acceptance by state and others (i.e., cost, operation, maintenance, environmental concerns), compatibility with existing laws, regulations, policies and public concerns and USFWS compatibility requirements.

b. Alternatives Selected for the Study.

(1) Alternative A - No Federal Action. No Federal action would consist of no Federal funds being provided to meet the project purposes.

(2) Alternative B - Wetlands Excavation. This alternative would entail large-scale excavations to deepen the project's open wetlands, thus rehabilitating areas damaged by past siltation.

(3) Alternative C - Wetlands Protection System. This alternative would entail the construction of structures to reduce the frequency with which silt-laden floodwaters enter the project area, to provide features permitting the enhanced regulation of water levels on the interior wetland units and restore backwater fisheries habitat.

c. Measures Identified. Potential measures were identified during the project study to address one or more of the project objectives. The measures identified for Alternative C are described below.

(a) Riverside Levee/Dike. To reduce alluvial sedimentation and improve water level control from the Illinois River during frequent flood events, a levee/dike running parallel between the river and the wetland complex was evaluated at various elevations (424-428 NGVD) to determine a feasible sediment level reduction and improved water control into the wetlands.

(b) Wetland Unit Containment Levees and Water Control Structures. In combination with gated drainage structures, containment levees would permit the retention and release of water in a manner beneficial to waterfowl management. Flat, Fowler, Upper Stump and Lower Stump would be contained to a maximum water elevation of 421 NGVD to allow effective water level control for aquatic and/or moist soil management that takes existing sedimentation levels into account. Levees up to 422 NGVD would need to be constructed in certain low spots around the 4 main wetland units. Water control structures to allow for efficient watering or dewatering, via gravity flow and/or pumped water to the various wetland units, would be sized and installed (or replace existing worn out or inefficient structures) to meet management objectives.

(1) Borrow Areas. Borrow areas would be needed as a source of material for any earthen levee segments constructed. The location, depth and other parameters would need to be determined on the basis of contributions to wetland habitat and to minimize impacts to existing vegetation.

(2) Vegetation Removal. Woody vegetation clearing would be necessary for the placement of land-based levee segments, levee borrow areas, pumps and ditches and drainage structures. Any selected plan will be sensitive to minimizing any desirable vegetation removal - woody or herbaceous.

(c) Illinois River Water Pump. A pump (or pumps) on the Illinois River that is connected to Long Lake by pipe and ditching would be used to help ensure desired water level increases or decreases in the management units at times when most critically needed. The pump could be a fixed unit at the site, or a portable unit intended for use at one or more river sites. It could be used for watering the units only or have a reversible capability to assist in dewatering the wetland units as well. Upper Deep and Long Lake would serve as the main water conveyance channel to the 4 wetland units.

(d) Excavation of Sediments From Long and Deep Lake. Long and Deep Lake are now sloughs that had formerly been river side channels. As backwater habitat, they had been ideal areas for fish spawning and rearing. Alluvial sedimentation has now made these two long narrow bodies of water very shallow (6 inches to 3 feet at the deepest) and unsuitable as viable aquatic habitat. These two lakes (Long Lake particularly) also serve as the main water conveyance system for watering and dewatering the 4 wetland units for habitat management. The current sedimentation levels restrict water volumes and flows to and from the wetland units, thereby restricting management capabilities and limiting project objectives. To correct these problems, removal of sediments by drag line (clamshell) or hydraulic dredging is required. Depths considered should be a minimum of 3 feet (to Elev. 416 NGVD) down to 5 feet (to Elev. 414 NGVD) to ensure the viability of the project and widths considered should be a minimum of 60 feet and maximum of 300 feet. Use and/or disposal of removed sediments is a deciding factor in determining a feasible solution.

(e) Colluvial Sediment Control. Colluvial sedimentation from the Williams Hollow tributary that empties into the northeast side of Lower Stump Lake was identified as a site specific management problem. Sediments from this watershed are creating a peninsula of land extending into Lower Stump Lake, therefore reducing the size of the open wetland and replacing it with forested habitat. To control this problem, options to consider include constructing a sediment trap near the mouth of the stream or on the existing delta or reducing the erosion rate at its source in the uplands. Stopping erosion at the source would be an "off-project" solution and would require the

U. S. Soil Conservation Service (SCS) and Jersey County Soil and Water Conservation District (SWCD) to plan and implement any actions with the cooperation of the affected landowners.

6. DETAILED DEVELOPMENT OF PLAN.

The following paragraphs evaluate each plan alternative and their respective measures and options.

TABLES 7, 8 and 9 in this section provide summary data developed from the WHAG and AHAG Reports (see APPENDIX E) and cost estimates. TABLE 7 provides a summary comparison of the enhancement potential of each project alternative. A plan comparison summary of project alternatives is presented in TABLE 8, which shows for each option the cost, annual cost, net gain in AAHU's, and cost per AAHU gained. TABLE 9 presents a comparison of Alternatives A (No Action), B (Wetlands Excavation), and C (Wetlands Protection and Management) by habitat type in terms of average annualized acres and AAHU's.

a. Alternative A - No Federal Action. This alternative would not meet any of the planning goals and objectives for migratory waterfowl or slackwater fish habitat restoration. Wetlands would continue to deteriorate as aquatic habitat converts to terrestrial habitat. Food production for waterfowl would continue to be unreliable - strongly dependent upon the prevailing river stage conditions. Fish spawning/rearing habitats sheltered from the main river would continue to decline in a navigation pool already deficient in such habitat. The loss of such wetland areas is viewed as unacceptable from a fish and wildlife standpoint.

As shown in TABLE 9, the combined output of the no action plan for the mallard (1,114 AAHU's) and for slackwater fish (844 AAHU's) would be slightly more than Alternative B but much less than Alternative C.

b. Alternative B - Wetlands Excavation. This alternative was rejected, since it would only partially address the planning objectives. Unacceptable features include: a lack of control over future sedimentation; lack of control over the wetland units interior water levels; probable high costs and difficulties with the disposal of excavated materials; little compatibility with current fish and wildlife practices, and no provisions for an off-channel fisheries habitat. The net habitat gain for this plan (TABLE 9) was found to be essentially the same as that for the no action plan for the mallard, and the no action plan for slackwater fish. The cost of Alternative B, which would result in a net loss of habitat units (-19 AAHU's), is $8,655 per AAHU (TABLE 8).

c. Alternative C - Wetlands Protection System. This alternative consists of the combination of potential plan measures. A summary of the plan measures, options considered for each measure, and summary evaluation of each option is provided in TABLE 5. Alternative C addresses all of the planning goals and objectives and was determined to be the only viable project alternative. This Plan indicates substantial increases in the total habitat improvement for the mallard (1,503 AAHU's) and for slackwater fish (1,196 AAHU's). This alternative will entail the construction of an earthen levee/dike along the riverside shore and perimeter of the management area to reduce siltation and uncontrolled inundation of the wetland units from frequent flooding (3 to 4 year events). Other interior levees will be constructed to allow better management of water levels within each wetland unit. Other features will include dredging for water delivery, construction of drainage control structures, a fish passage structure, two permanently mounted pumps with a portable drive unit and a portable pump and motor. TABLE 8 indicates that Alternative C would provide a net gain of 753 AAHU's at a cost of $445.00 per AAHU.

d. Discussion on Selection of Alternative C Measures and Options. The following paragraphs discuss the selected project measures and the options evaluated for each project measure.

(1) Dikes and Levees. This feature will consist of a combination of a low riverside earthen levee/dike along the western perimeter of the area and seven interior wetland unit containment levees. The riverside levee/dike will raise the management area perimeter elevation to reduce siltation from frequent Illinois River flooding and improve water control. Riverside levee/dike elevations were evaluated from 424 NGVD through 428 NGVD to determine the most desirable levee height for project management. TABLE 6 provides critical levee elevation data. From this data, it was determined that a riverside dike at elev. 426 (or 425.9 at the lower end and 427 at the upper end to allow consistent protection due to elevation changes in the river gradient along the 5.5 miles of levee) would be most effective in pursuing project objectives from a sedimentation reduction, cost and management standpoint. The percent reduction change in sediment laden water protection increases significantly from elevation 424-425 (11%) and from 425 to 426 (8%). From 426 to 427 and again from 427 to 428 the percent increase for flood protection begins to decline (5% and 4% respectively). At the 426 elevation, a levee will provide the best flood protection per foot increase in levee height. Cost increases for various levee heights is proportionate. The cost for the 426 levee is in the mid-range ($816,000.00) for the various elevations evaluated. Consideration was also given the net habitat gain for each levee/dike elevation evaluated. The net gain in AAHU's and cost per AAHU net gain for each levee/dike elevation options is also presented in TABLE 6. The 426 structure provides a net gain of 167 AAHU's at a cost of $464.00 per AAHU. This data was calculated in TABLE 8. Selection of the riverside levee dike elevation for the Stump Lake Complex was coordinated with the Swan Lake EMP-HREP because of their close proximity to one another. The riverside levee proposed for Swan Lake is 426 as well. Identical levee heights for Swan and Stump are required to ensure equal protection and management capability during low level flood events. The riverside levee/dike profile is shown on PLATES 9, 10 and 11.

Seven interior wetland unit containment levees will compartmentize the management area and improve the capability of managing the water levels in Fowler Lake, Upper and Lower Stump Lake, Flat Lake, Deep Lake and Long Lake at elev. 421 to compensate for existing sedimentation. The interior levees will be graded to 422 NGVD. Managing anything less than the existing 4 wetland units for moist soil management was determined to be a reduction in project benefits and in direct conflict with project objectives due to historical and existing site management activities.

(2) Borrow Areas. Embankment material for the levees will be obtained from landside borrow areas adjacent to the levees within the management area. The borrow area locations and depth will be determined by the availability of material and the extent to which they minimize removal and damage to existing trees; particularly den, perch and mast producing trees. Borrow areas will stay at least 40 feet away from a known AT&T underground cable. The option of using dredge material from the Long Lake excavation was considered for embankment but was rejected. This alternative would not be feasible because a large containment area would be required and containment dikes would have to be constructed. The dredged material would be suitable for embankment only after an extensive amount of rehandling. Also, the material would have to be transported over soft ground at long haul distances which would require access road maintenance and additional clearing. The borrow areas will be managed as open wetlands. Borrow areas are shown on site plan PLATES 3 through 8.

(3) Sediment Removal in Long and Deep Lake. All of Long Lake and the upper portion of Deep Lake will be deepened. Removal of sediments will improve the water delivery and drainage within the interior wetlands and facilitate fish movement, spawning and rearing. The selected option for dredging will be a 60 ft. wide channel with a depth at two elevations (414.0 and 416.0) alternating at about 500 foot intervals (see PLATE 14 for details). The dredged material will be deposited in Flat Lake. By performing the dredging in this manner, the conditions necessary for desired fish habitat and water conveyance in Long Lake can be effectively achieved. At the same time, the capacity of Flat Lake will not be exceeded by the volume of dredged material and all of Flat Lake will remain available for moist soil management

TABLE 5

ALTERNATIVE C
SELECTION OF WETLANDS PROTECTION SYSTEM MEASURES AND OPTIONS

Measure	Option	Objectives	Planning Decision/Remarks
Riverside Levee/Dike	Riverside levee/dike Elev. 424	N	(D) Minimally efficient and least costly. 60% sediment reduction.
	426	T	(I) 80% sediment reduction. Cost effective and fully acceptable in regards to project objectives.
	428	T	(D) High efficiency (88% reduction) but cost prohibitive.
Wetland Unit Containment Levees	Interior Wetland Units containment levees at 422	T	(I) Maintain necessary water level control for wetland unit management.
	Independent Control for 4 of 4 units	T	(I) Ensures existing management objectives achieved
	3 of 4 units	N	(D) Reduces management capabilities. Unacceptable to project objectives.
	2 of 4 units	N	(D) Reduces management capabilities. Unacceptable to project objectives.
	No independent water control for wetland units	N	(D) Totally eliminates wetland capabilities and management objectives.
Sediment Removal in Long and Deep Lakes	Hydraulic Dredge Long and upper Deep Lake to 416 NGVD	N	(D) Improves water conveyance. Minimally acceptable for fisheries. Disposal site can easily contain sediment volume.
	to 414 NGVD	T	(D) Improves water conveyance. Acceptable for fisheries. Dredge disposal site will not handle volume
	Vary dredge depth between 414 to 416 NGVD (every 500 feet)	T	(I) Improves water conveyance. Acceptable for fisheries. Disposal site can contain sediment volume.

TABLE 5 (Continued)

Measure	Option	Objectives	Planning Decision/Remarks
	Implement dredging widths at either 300 ft., 150 ft., or 60 ft.	T	Only 60 ft. wide channel is feasible due to dredge disposal site capacity. Will allow for sufficient water conveyance. Most cost effective.
	Deposit dredge material in Flat Lake	T	(I) Contained, closely located most cost efficient disposal site. Will not negatively impact Flat Lake management objectives.
	Clamshell - dragline Long Lake and Upper Deep Lake	N	(D) Sediment material not suitable for side casting or for construction fill. Clearing would be required. Cost prohibitive.
Water Pumping	Riverside Pump for wetland unit water control	N	(D) Capability for filling wetland units only
	2 Riverside Pumps for interior water control (same location - Upper Long and Deep Lake)	T	(I) Capability to fill and empty wetland units. Less costly due to shared infrastructure features. Most efficient for O&M.
	2 Riverside Pumps - one at upper end (Long/Deep Lake) and one at lower end (Lower Stump Lake) for interior water control	T	(D) Capable of filling and draining wetlands. Cost prohibitive to install 2 isolated pumps and associated infrastructure. Less efficient for O&M.
	1 Riverside Pump with sluice gated chamber for interior water control	T	(D) Capable of filling and draining wetlands. Cost prohibitive to construct because of pilings and foundation preparations required. More costly for O&M.
	Portable pump for Flat Lake	T	(I) To provide wetland management capability over elevated dredge disposal site as a moist soil unit.

TABLE 5 (Continued)

Measure	Option	Objectives	Planning Decision/Remarks
Colluvial Sediment Control	Colluvial Sediment Trap	N	(D) Reduces sedimentation into Lower Stump Lake from Williams Hollow Watershed. Cost prohibitive and conflicts with area Goose Management objectives. Requires land acquisition.
	SCS colluvial sediment reduction plan	T	(D) Provides sediment protection for Lower Stump Lake from off project lands in the Williams Hollow Watershed. Cost effective.
	Accept colluvial sedimentation (no action)	N	(I) Provides no sure solution to sedimentation from Williams Hollow Watershed. IDOC will be responsible for corrective actions.
Drainage Structures	Sluice gates & corrugated metal pipes	T	(I) Most cost efficient, low maintenance water control structure.
	Tainter gates	N	(D) Cost prohibitive.
	Radial arm gates	N	(D) Cost prohibitive.
	Fish passage structure (sluice gated concrete chambers.)	T	(I) Located at water control structure at confluence of Long Lake and Illinois River to facilitate fisheries spawning/rearing in Long Lake and water control. Cost efficient.
	Stop Log structures for water control and boat passage (one for upper Stump Lake and one for lower Stump Lake)	T	(I) Provides water control and boat access to upper and lower Stump from Long Lake. Cost efficient.
Water Level Gauge	Electronic River gauge	T	(I) Provides accurate and efficient river and backwater level readings for project management

KEY: T = measure totally compatible
N = measure not totally compatible
I = measure used in selected plan
D = measure not selected; not further considered

TABLE 6

EVALUATION OF CONSIDERED RIVERSIDE LEVEE/DIKE ELEVATIONS

Crown[1/] Elev.	Total[2/] Cost	Total[2/] Annual Cost	Flood[3/] Frequency Protection In Years	% Reduction In Sediment Laden Waters	% Reduction Change	AAHU[2/] Gain	$/AAHU[2/]
424	447,000	42,200	2	60	+11	107	394
425	637,000	59,900	2	71	+8	149	402
426	816,000	77,490	3	79	+5	167	464
427	1,009,000	95,640	3	84	+4	187	511
428	1,357,000	128,060	4	88		212	604

1/ Net levee grade at downstream end of project

2/ Data is obtained from Table 8 of this report.

3/ At the Grafton, IL, gauge

and public use. The improved containment of Flat Lake for water control will provide the necessary conditions for the proper disposal of dredged material.

Options to dredge at either 414 NGVD or at 416 NGVD were also evaluated. Both options would provide adequate water conveyance capabilities. The 414 elevation option would also be most ideal for fisheries and would ensure a longer life for the slough because it would take longer for sediments to accumulate to an adverse level. However, the Flat Lake dredge disposal area cannot handle the volume of sediments without reducing the management capability of Flat Lake. Dredging costs would be very high and the fisheries AAHU benefit increase would be minimal compared to the other dredging options (TABLE 8). The 416 elevation option would provide adequate water conveyance. However, it would be the least favorable option for fisheries habitat and life duration of the slough. The selected option, dredging at the 414-416 alternate depths every 500 feet with a 60-foot wide channel, will cost approximately $250,000 more than the basic 416 option considered. This represents approximately a 5% increase in total project cost; however, it provides an additional net gain of 59 AAHU for fisheries at a cost of $385.00 per AAHU (see TABLE 8). The added relief provided to the lake bottom will provide better escape habitat and a less negative impact on fish when Long/Deep Lake levels are artificially fluctuated for waterfowl management purposes. The additional expense of the selected option is desirable in light of the improved conditions it will provide to the slough habitat.

Dredging channel widths considered for Long and Deep Lake were 300 feet (i.e., bank-to-bank), 150 feet and 60 feet wide. The 300 and 150 foot options would yield more disposal material than could be reasonably contained and/or used as fill for the project. The 60 foot option was selected because the disposal volumes were manageable, water conveyance needs would be fulfilled, and fisheries habitat would still be enhanced.

Another option that was considered for excavating Long Lake and Deep Lake would be by dragline or clamshell, using Flat Lake as a disposal area. This option would be very expensive and would disrupt the management area more than the dredge excavation option. The excavated material would have to be double handled and hauled over soft ground for placement in Flat Lake. Because the excavated material would have to be temporarily stockpiled at times during construction and haul roads would be required, several areas would have to be cleared, whereas excavation by dredge would require only a minimal clearing of trees. In addition to these disadvantages, it would be difficult to place the excavated material in Flat Lake at a uniform elevation throughout the whole lake. A third option considered for deepening Long Lake and Deep Lake was by side casting the excavated material with clamshell along both banks of Long Lake and Upper Deep Lake. The primary disadvantage to this option was the very large amount of surplus excavated material (about 140,000 c.y. which greatly exceeded the material required for the interior levee embankments at elevation 422.0). Construction of the adjacent interior levees to elevation 426.0 and a wider crown width was considered but would still leave a surplus of about 80,000 c.y. to dispose of. Alternative considerations for disposal of the surplus material were for riverside levee construction and for placement in Flat Lake. Side casting the excavated material generally would necessitate long haul distances over soft ground, double handling of material and reshaping after the material has dried sufficiently. Other disadvantages which made this option more expensive than dredging was the additional clearing and construction of a silt curtain for control of the water draining from the clamshelled material. TABLE 8 shows that adding the clamshell excavation option to the interior water control option (3B) provides a net gain of 204 AAHU's at a cost of $1,204.00 per AAHU, whereas, including hydraulic dredging with the interior water control option (3A) yields 210 AAHU's at a cost of $953.00 per AAHU.

Dredging could be done by hydraulic or mechanical dredging methods. Hydraulic dredging is preferable over mechanical dredging. The mechanical side casting of material would have problems in lacking containment, in being susceptible to bank slumping, and in its obstruction of wetland drainage. Hydraulic dredging, on the other hand, could be implemented in a manner that would avoid these problems. Only the upper part of Flat Lake was considered at first for disposal of dredge material. This alternative was rejected, since the bottom elevation of the lake would be raised too high to be of any practical use for management purposes. Furthermore, this alternative would be more expensive because the dredging distance would be greater and a dike would be required across Flat Lake to contain the dredge material in Upper Flat Lake.

(4) Drainage Structures. Sluice gated CMP gravity drainage structures will be used in combination with a concrete fish passage and two stop log structures to control water flow and water levels within the management area. In combination with Wetland Unit Containment levees and interior dredging, this measure is an integral part of water regulation.

The selection and design of sluice gate CMP drainage structures for the site is based upon such factors as cost, maintenance and operating convenience, function, and extended service life. Corrugated metal pipe gatewells are necessary to protect operating mechanisms and to facilitate maintenance. See PLATE 2 for drainage structure locations and PLATES 15, 16 and 17 for design typicals.

A fish passage structure will be located at the confluence of Long Lake and the Illinois River (river mile 8.5) and will consist basically of four concrete box culverts with wing walls and open above on both the landside and riverside of the levee crossing. Four 42-inch sluice gates on the riverside of the structure will control the water level and permit fish passage into the management area. Other alternative structures such as roller and radial arm gates were considered. However, due to soft soil and high water table conditions, the foundation preparation and treatment and pilings required to ensure the stability of these structures made them several times more expensive than the selected sluice gated structure. Based on discussions with an IDOC fisheries biologist, the CMP type gravity drainage structure with CMP riser gate well and sluice gate was felt to be unsuitable for the efficient passage of fish and was rejected as a viable solution.

Two stop log structures will be constructed and operated in a manner similar to the fish passage structure except the concrete box culvert will be free of obstructions for a clear width of 8 feet to allow for boat passage and water level control. A small manually operated gantry crane will be mounted on the structure for ease in placing and removing the stop logs. Radial arm and lift gate structures were evaluated but were cost prohibitive, did not allow for necessary clearance for boat passage and were very large and obtrusive structures.

(5) Pumps. Pumps will be permanently installed near the upstream end of Long Lake and connected to the Illinois River to ensure the necessary water levels in the wetland units within the management area. The pumps will be permanently mounted and will be powered by a diesel motor mounted on a trailer. In order to have the capability to either flood or drain the system, a reversible pumping system was designed. The pumping system, shown on PLATE 18, consists of two pumps, each with a capacity of 90 cubic feet per second (cfs). One pump would be used to flood the levee system to attract migrating waterfowl with a low river level, and the other to drain the system in the growing season with a high (but not overtopping) river level. This filling or emptying could be accomplished in about 10 days with the selected pumping capacity, assuming the existing 36-inch Couch pump at the Glades WMA was also used.

Other options considered for pumping included one riverside pump that would only be capable of filling the wetland units. Gravity drainage would be used to dewater the units. This option would not allow for dewatering the wetland units during critical planting/growth periods if the river stage is 420 or above. If local precipitation causes heavy runoff into the wetland units, flooding them during "dry" periods, gravity flow will not remove the water fast enough to protect the developing wildlife vegetation. Cost analysis of this option reveals that it will be 10% cheaper than the two pump option and would only partially achieve management objectives for the project. For these reasons, this option was not selected.

Another pumping option considered included the installation of two permanent pumps; one on the upstream end of the project to fill the wetland units and one on the downstream end to dewater the wetlands. This option would be slightly more expensive than installing two pumps at the same location, as proposed in the selected option. The mobilization and demobilization and the O&M costs would be higher than other options.

A fourth option for reverse pumping was considered. This option would consist of a single 90 cfs permanent pump and a sluice gated reinforced concrete structure. One side or chamber of the structure allows for either water intakes from the Illinois River or intake from Long Lake. The second chamber would permit discharge from the pump either into Long Lake or into the Illinois River. This option was not found to be cost effective because of the expensive reinforced concrete structure, and the pilings and foundation preparation necessary for the stability of the structure. The maintenance for this type of structure would exceed that required for the selected option.

A portable pump (5 cfs) will be provided in order to control the water level of the moist soil unit at Flat Lake. This is proposed because using Flat Lake as a dredge disposal area will create a perched lake. The pump capacity of 5,000 gallons per minute (gpm) is required for filling Flat Lake in about 2 weeks, as requested by IDOC. This portable pump unit will consist of a trailer mounted pump with a diesel motor.

(6) Vegetation Removal. Clearing of trees, brush, and other vegetation will be required within the limits of the levees, and levee borrow areas. Final levee construction limits and alignments will be established when plans and specifications are prepared to minimize damage and/or removal of important woody vegetation such as den, nest, perch and mast producing trees. All products of the clearing operations will be disposed of by burning or removal from the site. Any areas required for clearing during construction, that subsequently can support tree growth without interfering with project operations/structures, will be replanted to desirable bottomland hardwoods.

(7) Colluvial Sediment Reduction. Sediment carried by Williams Hollow Creek has been deposited in Lower Stump Lake for many years, reducing the size and depth of the lake. A sediment catchment basin was designed to trap 100 percent of the sediment load for a 10-year storm over the Williams Hollow basin. A rock overflow weir was designed to pass a 50-year flow without failure of the structure. However, due to the high cost of such a structure, the large area of private land required (40 to 80 acres), and the structure not conforming to the intended use of the area as a goose management area, the alternative was not included in the recommended plan. TABLE 8 shows that the sediment catchment basin (Option 2A) would yield 2 AAHU's at a cost of $66,401.00 per AAHU. As an alternate plan, the Soil Conservation Service was consulted on upland erosion control methods of reduce sedimentation. The SCS conducted a cropland survey of the watershed, identified problem sites and prepared a resource plan to significantly reduce upland erosion (75-80%) and thus sedimentation from runoff into Lower Stump Lake. The plan developed by SCS (Option 2B) would provide 12 AAHU's at a cost of $2,422.00 per AAHU (TABLE 8). During the study, 400 acres of erodible cropland were identified in the Williams Hollow watershed. Ninety acres is in ownership by one private farmer and the remaining 310 acres is owned by the Illinois Department of Conservation as part of Pere Marquette State Park. Since the state owns most of the cropland and woodlands in this watershed, it was determined that the

IDOC should work with the SCS to solve the erosion problem, thereby protecting the IDOC managed Lower Stump Lake. No EMP funds or actions are proposed to solve this site specific sedimentation problem, however the IDOC will be required to consult with SCS to develop a strategy to significantly reduce erosion in the watershed per the Operation, Maintenance and Rehabilitation Agreement.

e. Summary of Finding - Selected Measures and Options. Alternative C, The Wetlands Protection System, clearly provides the most benefits and is the selected Alternative Plan. The Plan measures and options selected based on the formulation and evaluation criteria are as follows:

(1) A 5.5 mile long Riverside levee/dike at elevation 426 NGVD.

(2) Wetland unit containment levees (7) at elevation 422 NGVD.

(3) Water Drainage Control Structures - A total of six 42 in. sluice gated CMP structures at three locations, two 8 ft. wide concrete stop log structures and a concrete fish passage/water control structure with four 42 in. sluice gates.

(4) Hydraulically dredge a 60 foot wide channel on Long Lake and Upper Deep Lake at elevations 414 and 416 NGVD alternated every 500 feet.

(5) Two 90 CFS Riverside permanent pumps to provide reversible pumping capabilities.

f. Value Engineering of Project Features.

A Value Engineering workshop was conducted on 9-10 October 1990 to examine the proposed HREP Project for Stump Lake. Project efficiency and cost reduction ideas were developed and evaluated by an interdisciplinary team comprised of members from the Corps of Engineers (SLD, NCR, NCD), the Illinois Department of Conservation, and the U.S. Fish and Wildlife Service. As a result of this study it was determined that 4 water control gates and culverts could be eliminated resulting in a $120,000.00 project cost reduction. Paragraph e. above, Summary of Findings - Selected Measures and Options reflects the results of the Value Engineering study.

TABLE 7

COMPARISON OF ALTERNATIVES - ENHANCEMENT POTENTIAL

Goal	Objective	Project Alternative Enhancement Feature	Unit of Measure	Potential (Annualized)			
				Existing	Without Project (Plan A)	Enhancement 2/ With Project	
						Plan B	Plan C
Enhance Wetland Habitat for Migratory Waterfowl	Decrease sedimentation into interior wetlands	Large-Scale Excavation	Inches/Year of Sedimentation	.33-.55 (Bellrose et al., 1983, Cahill & Steele, 1986)	.33-.55	.33-.55	-
		Sediment Barrier Levee				-	.06-.12
	Increase potential for reliable food production for waterfowl	Floodwater Barrier Levee	Likelihood of frequent flooding	Once every 1-2 years	Once every 1-2 years	Once every 1-2 years	Once every 5-6 years
	Increase total wetland value for migratory waterfowl (mallard)	All	Average Annual Habitat Units (AAHU's)	-	1114	1095	1503
Enhance Aquatic Habitat for Slackwater Fishes	Reduce potential for backwater sedimentation	Sediment Barrier Levee	Inches per year of sedimentation	.33-.55	.33-.55	.33-.55.	.06-.12
	Increase photic zone	Dredging	Percent increase in depth from present	-	0	0	117
	Increase total value for slackwater fishes	All	AAHU's	-	844	855	1196

TABLE 8

PLAN COMPARISON SUMMARY
FOR PROJECT COSTS AND HABITAT GAINS

Alternative	Evaluation Factors						
	Project Cost ($)[1/]	Annual Project Cost ($)[2/]	O&M[3/4/] Cost/ Interval($)	Annual O&M Costs($)	Total Annual Cost($)	AAHU[5/] Net Gain	$ per AAHU Net Gain (or Loss)
			Waterfowl (Mallard)				
Plan B (excavate Upper Stump Lake, 100ac, 1.5' deep)	1,851,000	164,443	0	0	164,443	-19	8,655
Plan C - Option 1A (riverside levee - 424)[6/]	447,000	39,711	2,560/1 Yr	2,560	42,271	107	395
Plan C - Option 1B (riverside levee - 425)[6/]	637,000	56,591	3,300/1 Yr	3,300	59,891	149	402
Plan C - Option 1C (riverside levee - 426)[6/]	816,000	72,493	5,000/1 Yr	5,000	77,493	167	464
Plan C - Option 1D (riverside levee - 427)[6/]	1,009,000	89,640	6,000/1 Yr	6,000	95,640	187	511
Plan C - Option 1E (riverside levee - 428)[6/]	1,357,000	120,556	7,500/1 Yr	7,500	128,056	212	604
Plan C - Option 2A (hillside sedimentation basin)	1,043,000	92,660	615,000/10 Yr	40,141	132,801	2	66,401
Plan C - Option 2B (hillside SCS plan)	254,000	22,565	6,500/1 Yr	6,500	29,065	12	2,422

TABLE 8 (continued)

PLAN COMPARISON SUMMARY
FOR PROJECT COSTS AND HABITAT GAINS

	Evaluation Factors						
Alternative	Project Cost ($)[1]	Annual Project Cost ($)[2]	O&M[3/4] Cost/ Interval($)	Annual O&M Costs($)	Total Annual Cost($)	AAHU[5] Net Gain	$ per AAHU Net Gain (or Loss)
Waterfowl (Mallard)							
Plan C - Option 3A (interior water control & hydraulic dredging)[7]	1,532,000 + 512,000	181,589	18,050/1 Yr 1,600/5 Yr 28,010/25 Yr	18,050 267 306	200,212	210	953
Plan C - Option 3B (interior water control & clamshell excavation)[7]	1,532,000 +1,024,000	227,075	18,050/1 Yr 1,600/5 Yr 28,010/25 Yr	18,050 267 306	245,698	204	1,204
Fisheries (Groups 3 & 4)							
Plan B (excavate Upper Stump Lake, 100ac, 1.5' deep)	(1,851,000)[8]	0	0	0	0	11	0
Plan C - Option 4A (dredge Deep & Long Lakes to 416 NGVD)							
Option 1: 60' wide channel bottom	(512,000)	0	0	0	0	59	0
Option 2: 150' wide channel bottom	1,280,000	113,715	0	0	113,715	60	1,895
Option 3: 300' wide channel bottom	2,560,000	227,430	0	0	227,430	62	3,668

TABLE 8 (continued)

PLAN COMPARISON SUMMARY
FOR PROJECT COSTS AND HABITAT GAINS

	Evaluation Factors						
Alternative	Project Cost ($)[1/]	Annual Project Cost ($)[2/]	O&M[3/4/] Cost/ Interval($)	Annual O&M Costs($)	Total Annual Cost($)	AAHU[5/] Net Gain	$ per AAHU Net Gain (or Loss)
Fisheries (Groups 3 & 4)							
Plan C - Option 4B (dredge Deep & Long Lakes to 414 and 416 NGVD, alternating)							
Option 1: 60′ wide channel bottom	256,000	22,743	0	0	22,743	59	385
Option 2: 150′ wide channel bottom	1,920,000	170,573	0	0	170,573	61	2,796
Option 3: 300′ wide	3,841,000	341,234	0	0	341,234	64	5,332
Plan C - Option 4C (dredge Deep & Long Lakes to 414 NGVD)							
Option 1: 60′ wide channel botto,	512,000	45,486	0	0	45,486	60	758
Option 2: 150′ wide channel bottom	2,560,000	227,441	0	0	227,441	62	3,668
Option 3: 300′ wide channel bottom	5,121,000	454,950	0	0	454,950	66	6,893
Waterfowl & Fisheries							
Plan C Preferred Alternative (options 1C, 2B, 3A, 4B1)	3,370,000	299,391	29,550/1 Yr 1,600/5 Yr 28,010/25 Yr	29,550 267 306	329,514	741 [9/]	445

TABLE 8 (Continued)

1/ Costs include construction item costs plus contingencies and E&D and S&A costs.

2/ Annual cost is cost multiplied by interest and amortization factor (which is 0.08884 for 1991 discount rate of 8.75%, amortized over 50 years)

3/ The estimated O&M cost and frequency with which activities and expenditures would be made. Note Options 3A and 3B have three different frequency intervals for O&M activities and thus are broken down as such to allow for a more accurate annualized O&M Cost and Total Annual Cost.

4/ All "O" values in the O&M column indicate that they will be project construction items only and no O&M is anticipated on these items during the life of the project.

5/ AAHU - average annual habitat unit.

6/ Elevation of net levee grade at downstream end of levee.

7/ Amount of dredging or excavation is minimum required for effective conveyance of water in and out of Deep/Long Lake.

8/ Costs within parentheses are waterfowl-related, and are given for comparison only.

9/ Includes 293 AAHUs in indirect benefits to slackwater fishes in Upper/Lower Stump Lake that result from construction of waterfowl features (426 riverside levee, hillside SCS plan, interior water control and hydraulic dredging) - see Appendix DPR-E, page E-15.

TABLE 9
STUMP LAKE COMPLEX HREP -
PLAN COMPARISONS
AVERAGE ANNUALIZED ACRES AND AVERAGE ANNUAL HABITAT UNITS (AAHUs)

Habitat Type	Existing Acres	Plan A [No Action] Ac	Plan A (AAHU)	Plan B [Wetlands Excavation] Ac	Plan B (AAHU)	Plan C [Wetlands Protection & Management] Ac	Plan C (AAHU)
Waterfowl (Mallard)							
Forested Wetland	1559	1943	(947)	1843	(920)	1487	(812)
Nonforested Wetland							
Sites A/C/D/E	969	630	(149)	730	(157)	1007	(620)
Site B	129	84	(18)	84	(18)	129	(71)
Levee	0	0	(0)	0	(0)	34	(0)
	2657	2657	(1114)	2657	(1095)	2657	(1503)
Fisheries (Large and Small Slackwater)							
Forested Wetland	1559	1943	(0)	1843	(0)	1487	(0)
Nonforested Wetland							
Sites A/D - Upper & Lower Stump Lake	588	384	(692)	484	(703)	614	(985)
Site B - Deep & Long Lake	129	84	(152)	84	(152)	129	(211)
Site C/E - Flat & Fowler Lakes	381	246	(0)	246	(0)	393	(0)
Levee	0	0	(0)	0	(0)	34	(0)
	2657	2657	(844)	2657	(855)	2657	(1196)

7. SELECTED PLAN WITH DETAILED DESCRIPTION.

a. Plan Features. Alternative C and the selected measures and options provides the most effective overall project enhancement. Once implemented, the plan will significantly reduce (79%) alluvial sedimentation from the Illinois River, greatly improve wetland unit water control capabilities to ensure optimum management conditions approximately 90% of the time, improve succession control (i.e., retard the conversion of open wetlands to forested wetlands) and restore backwater fisheries habitat. A general description of the Selected Plan is contained in the following TABLE 10. Structural features of the plan are depicted in Plates 2 through 18.

When project construction is completed, the Stump Lake complex will consist of a series of open wetland units within a riverfront levee. The wetland units will be separated by low earthen levees. Control of interior water levels will be accomplished by a system of gravity drains with sluice gates or stop logs, a portable pump for filling Flat Lake, and a reversible pumping system between the Illinois River and Long/Deep Lake for filling and draining the four managed wetland units. Long Lake will be used to convey water into or out of the individual wetland units by operating selected gravity drains within the complex. Selected wetland units could be drained by pumping or gravity flow during the growing season and planted with food for waterfowl, assuming the Illinois River level is below the riverfront levee crown. Water would be taken on to flood the mature crop at times when waterfowl are migrating. The total input or output of water is designed for about ten days. FIGURE 5 provides a theoretical water regulation plan for moist soil management of the wetlands. If Aquatic vegetation production is desired water levels can also be maintained at ideal levels throughout the year to maximize conditions for reproduction and growth. Fish spawning and rearing abilities will be improved in the Long and Deep Lake sloughs as a result of dredging, which creates more suitable habitat, and the specially designed fish passage/water control structure located at the confluence of Long Lake and the Illinois River.

TABLE 10

COMPONENTS OF THE SELECTED PLAN

---

1. Riverside Levee/Dike - Consists of a 5.5 mile low profile earthen levee (average elev. 426 NGVD) that parallels the Illinois River shoreline and the perimeter of the WMA area to reduce siltation that occurs from frequent floods (3-4 year flood frequency protection) and improve wetland unit water control. The levee will have a 10-foot crown width and 1 on 3 side slopes. Clearing, borrow and construction limits will not exceed 180 feet in width and will average about 120 feet. The levee grade will vary from 425.9 at the lower end of the project up to 427 at the upper end. Borrow areas (34 acres) will be managed as additional open wetland habitat. Vegetation removal will be restricted as much as possible. Special attention will be given to minimizing any removal or damage to den, nest, perch and mast trees.

2. Interior Wetland Unit Containment Levees. Seven low level interior levees (Elev. 422 NGVD) will be constructed in specific "low spots" around the perimeters of the 4 main wetland compartments (Fowler, Flat, Lower Stump, Upper Stump) to allow effective water level management capabilities and compensate for existing sedimentation. Borrow areas (14 acres) will be managed as additional open wetland habitat.

TABLE 10 (Continued)

3. Water Level Control Structures for Wetland Compartments. Provide adequate gravity flow sluice gated culverts or stop log structures to perform and control watering and dewatering of the wetland compartments as management objectives dictate.

Culverts are sized to handle capability for watering and/or dewatering wetland units within a 2 week period (dependent upon river level conditions). Basic data on water control structures is as follows:

a. Long Lake to Fowler Lake - 2-36" CMP with sliding gate culverts (use existing structures)

b. Long Lake to Flat Lake (Site A) - 1-42" CMP with sluice gates and gatewells (replacing 1-36" gated culvert)

c. Long Lake to Upper Stump Lake (Site B) - 8′ wide concrete stop log structure to allow boat passage and water control (new) (replacing 1-36" gated culvert)

d. Upper Stump to Lower Stump Lake (Site C) - 2-42" CMP with sluice gates and gatewells (replacing 2-36" gated culverts)

e. Long Lake to Lower Stump Lake (Site D) - 8′ wide concrete stop log structure and open channel to allow water control and boat passage (new)

f. Lower Stump Lake to Illinois River (Site E) - 3-42" CMP with sluice gates and gatewells (replacing 2-24" and 1-36" gated culverts)

g. Long Lake to Illinois River (Site F) (at the confluence) - Four chamber open concrete fish passage and water control structure, with four 42" sluice gates. Each chamber 5 feet wide and 9 feet high (new)

h. Remove existing stop log structure across Long Lake

i. An electronic river gauge station will be installed at the water control structure at the confluence on Long Lake and the Illinois River to improve water management decision making for the entire wetland complex.

4. Dredging Long Lake and Upper Deep Lake. Long and Deep Lake are very shallow due to sedimentation. Dredging is required to ensure adequate water conveyance between the riverside pump and the wetland compartments and to restore suitable backwater habitat for fish spawning and rearing and to allow

FIGURE 5

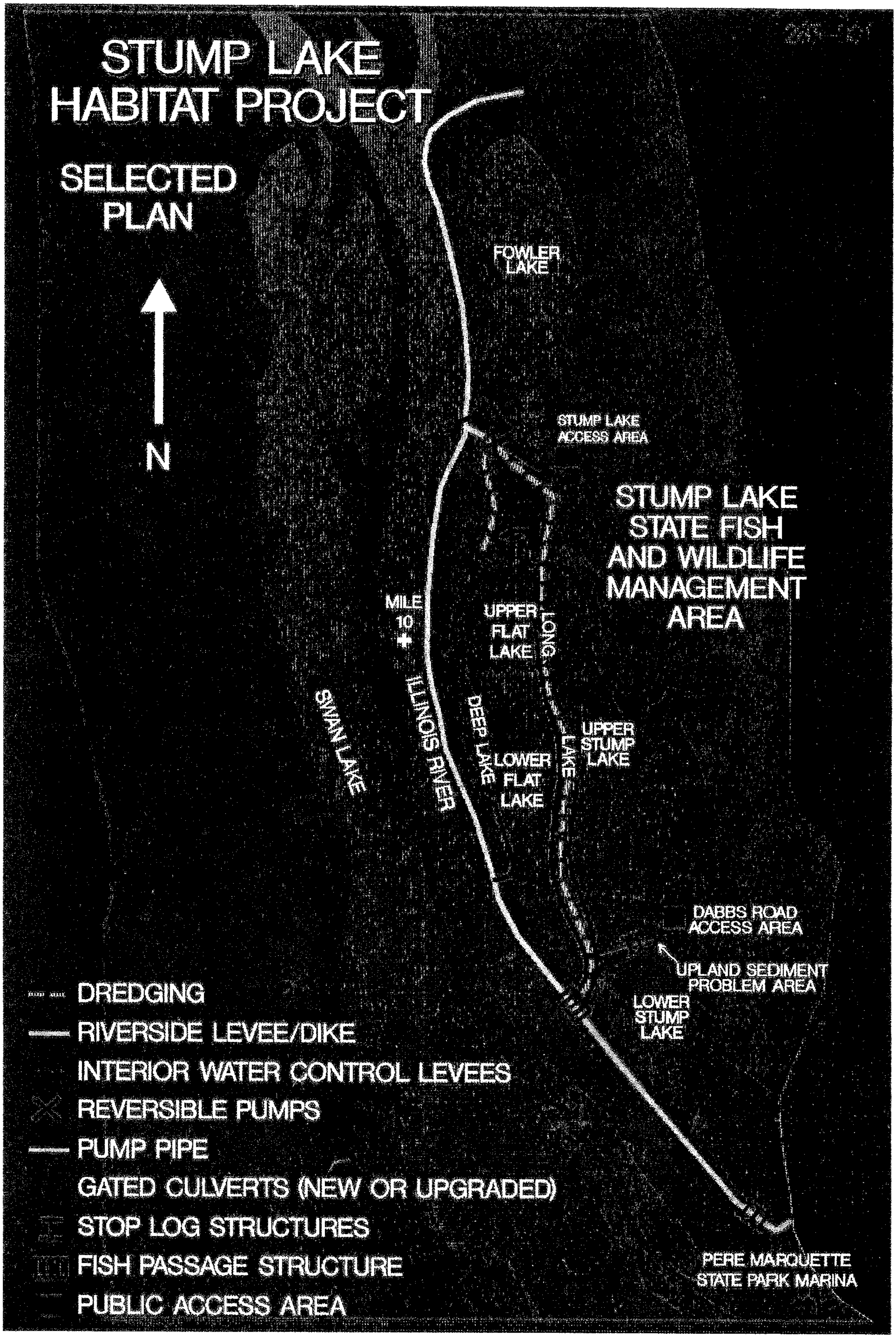

STUMP LAKE
HABITAT PROJECT
SELECTED PLAN
N
FOWLER LAKE
STUMP LAKE ACCESS AREA
STUMP LAKE STATE FISH AND WILDLIFE MANAGEMENT AREA
MILE 10
UPPER FLAT LAKE
LONG LAKE
SWAN LAKE
ILLINOIS RIVER
DEEP LAKE
LOWER FLAT LAKE
UPPER STUMP LAKE
DABBS ROAD ACCESS AREA
UPLAND SEDIMENT PROBLEM AREA
LOWER STUMP LAKE
PERE MARQUETTE STATE PARK MARINA
DREDGING
RIVERSIDE LEVEE/DIKE
INTERIOR WATER CONTROL LEVEES
REVERSIBLE PUMPS
PUMP PIPE
GATED CULVERTS (NEW OR UPGRADED)
STOP LOG STRUCTURES
FISH PASSAGE STRUCTURE
PUBLIC ACCESS AREA

FIGURE 6

PROJECT REGULATION PLAN

Month											
J	F	M	A	M	J	J	A	S	O	N	D
XXXXXXXXXXXXXXXXXXX All lakes maintained at Fall Management pool											
		XXXXXXXXXXXXXXXXXXX Spring River flows begin, let in river water to protect levees and allow fish passage									
				XXXXXXXXXXXXXX Maintain Management pool level							
						XXXXXXXXXXXXXXXXXXXXXXXXX Drawdown for moist soil food production					
									XXXXXXXXXXXXXXXXXXXXXXXXXX Recharge and maintain Fall Management pool		

for boat passage for waterfowl hunting and fishing. Dredging depths will vary approximately every 500 feet between elevation 414 and 416, making the lake average from 3-5 feet in depth. The upper 2,400 feet of Deep Lake and the entire 12,800 feet or 2.5 mile length of Long Lake will be dredged. A 60-foot wide channel will be dredged down the middle of these narrow sloughs. Approximately 160,027 cubic yards of sediment will be removed.

Dredged sediments will be deposited into the Upper and Lower Flat Lake wetland compartment. Sediment deposition will elevate the bottom of Flat Lake from approximately 417.5 to 419 (1.5 ft). This will still allow the wetland to be managed as a moist soil unit. However, a 5,000 GPM portable pump will be needed to supplement the gravity flow structure into Flat Lake because of the lack of head differential.

5. Riverside Reversible Pumps. A 90 CFS reversible pumping system on the Illinois River will be used to allow flooding or draining of the wetland compartments. Two permanently located pumps operated by one portable drive unit will be required. The outlets/ inlets for the wetland complex will be located at the upper end of Long Lake where Deep and Long Lakes merge. This is the closest (approximately 600 feet) and most efficient location to the Illinois River from the Wetland Complex.

---

b. Geotechnical Design Considerations.

(1) Subsurface Exploration Data. Forty-seven hand auger and overwater borings, ranging in depth of 2 to 10 feet, were taken at selected locations around the Stump Lake Complex (i.e., Long Lake, Flat Lake, Deep Lake, Upper and Lower Stump Lakes). The soils were generally clays (CL, CH) and silts (ML). Water contents of the soils range from 12% to 234.8%. The groundwater table varies, depending on the location of the borings, from 3-4 feet above ground surface to 13.5 feet below the ground surface. Water tables will vary depending on time of year and current climate conditions.

All field logs, along with lab test results, as well as a boring location map, will be presented in the Plans and Specifications.

Soils data was not obtained for the upper levee section due to subsequent raising of the project levee elevations. During the initial exploration program, the top of levee elevation was designed to elev. 424. When the top elevation of levee was raised to 426, an extension of the levee along Fowler Lake was required. Fourteen additional borings will be drilled along the levee extension of Fowler Lake. Each boring will be 15 feet deep. In additional six borings 40 feet deep will be taken at the locations Site "A" thru Site "F", and one boring will be drilled to rock for determining aquifer thickness. Results from all lab tests and all field logs will be presented in the Plans and Specifications.

(2) Existing Site Conditions. Embankment construction and excavation equipment is dependent upon existing water elevations during the construction period. When groundwater conditions are very high, excavation of wet borrow material and the subsequent stockpiling and drying out of the material will be necessary. A combination of track mounted earth moving and dragline equipment will be required for the construction of the earthen embankment sections.

(3) Borrow Sites. The borrow sites will be excavated to a depth and width to allow incorporation of their usage into the existing wetland management programs. The stripped borrow areas will be adjacent to and landside of the levee embankment. This will facilitate the most economical placement while meeting the objective of the project. The borrow material to be used for levee construction will be removed from areas, as shown on the

drawings (see PLATES 2 through 8). According to borings which are pertinent to borrow areas, the borrow material consists of wet, soft clay. Borings taken in the borrow areas indicate moisture contents of the clays that will limit use of conventional rubber tire excavation and hauling equipment.

(4) Earth Embankment Levee/Dike. The design for the earthen riverside and interior levees were evaluated for stability and gross settlement. Results of these evaluations will be presented in the geotechnical appendix supplement to the final DPR. An underseepage analysis and a detailed settlement analysis, will be performed prior to Plans and Specifications and it will be included in the geotechnical appendix supplement. All earthen embankment sections of the levee will require 1 on 3 side slope with 10 ft. crowns.

The earthen riverside levee will be built to an elevation of 427 or an average height of 4 ft., which includes a one-foot overbuild to accommodate settlement of embankment and foundation materials. See PLATE 16 for Typical Section of levee.

(5) Foundation for Embankments. The foundation beneath the proposed levee embankments will be cleared of trees, brush and other deleterious materials above the ground surface. All top roots, laterial roots, and trees within the embankment foundation areas will be removed to a depth 12 inches below natural ground surface. Compaction to specified densities will be made of the foundation prior to placement of the embankment structure.

(6) Foundation for Other Structures. Preparation of foundations for closure structures and control structures will be made by excavating to design grades, as shown on the drawings, followed by placement of select foundation material and geotextile, where required and identified on the drawings.

(7) Dewatering Requirements. A cursory dewatering analysis was performed for this project to determine both construction and economic impacts. Site "F" was chosen for the analysis because of the close proximity to the river. It is assumed the excavation will be on land and the contractor will have to dewater the excavation using sumps, wellpoints or some similar means to keep the area free from standing water. Because of limited soils information, gross assumptions were used to determine permeability of the excavated soils and the foundation soil. Ground water level were assumed to be equal to the river elevation. Based on these assumptions the anticipated pumping requirements for 60 foot square excavation was 600 gpm. A more detail dewatering analysis, will be performed prior to Plans and Specifications and will be included in the geotechnical appendix supplement.

c. Construction Considerations.

(1) Endangered Species. Adverse impacts to federally endangered species will be avoided provided the following restrictions are implemented. Bald Eagle: If bald eagle day use of Stump Lake Complex is observed to be more than sporadic and infrequent one week prior to or during construction, such construction activities will cease and informal consultation with the U.S. Fish and Wildlife Service (USFWS) will be initiated. Indiana bat: If for any reason tree felling activities have to occur during the period May 1 - August 31, then a site visit will be conducted by a team of biologists from the District, USFWS, and Illinois Department of Conservation prior to such felling to determine if any roost trees are among those proposed to be felled. If felling of a roost tree during this period is proposed, then the District will enter into informal consultation with the USFWS. The contracting officer will ensure appropriate compliance.

(2) Historic Properties. Prior to construction related earthmoving activities archaeological investigations will be conducted to locate, evaluate and protect any significant site in areas of ground disturbance. The necessary steps are set forth in a draft Programmatic Agreement to protect significant archaeological resources at all Environmental Management Projects in Illinois, including Stump Lake, which the District is preparing in coordination with the Illinois Historic Preservation and the U.S. Fish and Wildlife Service. All investigations will be conducted in a manner consistent with the Secretary of the Interior's Standards and Guidelines for Identification (43 FR 44720-39) and the Illinois State Historic Preservation Office Guidelines for Archaeological Reconnaissance Surveys/Reports. In the event that significant archaeological sites are located, measures shall be developed as specified in the Programmatic Agreement to either excavate the sites or alter the project design so as to avoid the archaeological sites.

(3) Permits. Appendix DPR-J provides a Clean Water Act Section 404(b)(1) Evaluation Report for the Stump Lake project. This documentation is also being forwarded to the Illinois Environmental Protection Agency (IEPA) along with a request for the state's Section 401 Water Quality Certification. A request for a permit to open air burn trees at the site will be submitted to the IEPA prior to construction.

(4) AT&T Cable Crossing. The AT&T cable crossings at Long Lake and Site C Gravity Drainage Structure were discussed in the field with a representative of AT&T during the preparation of the DPR. AT&T provided construction profiles of the cable crossing, which was installed in 1962. AT&T will make arrangements to provide exact locations and elevations of the cable during the Summer of 1991 or prior to preparation of plans and specifications. AT&T, when notified, will have a representative at the site during construction.

Two specific construction sites merit precautions to avoid damage to the AT&T cable. They are:

(a) Long Lake Crossing. The cable will not have to be relocated at this crossing, since the dredging will be restricted to a minimum of 20 feet from the cable.

(b) Site C Gravity Drain Crossing. Relocation of the cable does not appear to be necessary from the available data. Additional information on the exact location will be provided by AT&T during the preparation of plans and specifications. Adjustments in the new gravity drain pipes will be made as necessary at that time.

(5) Construction Sequencing. In order to minimize impacts to endangered species, site management and concentrated public use periods during project construction, a tentative schedule for sequencing construction activities has been prepared. FIGURE 7 illustrates a proposed construction sequence for the 24 month construction period. No vegetation clearing for levees will occur during the months of May through August to avoid potential Indiana bat maternity roosting. If possible, no construction activities will be conducted during the two month waterfowl hunting season to avoid conflicts. The only exception may be the water pumping station which is esolated from the hunting areas. The levees and interior control structures will be constructed prior to dredging so that the contained dredge disposal site will be completed prior to dredging. Construction of the fish passage water control structure and removal of the Long Lake Stop Log structure will be the last items completed to ensure the complex will be capable of water control management during the construction period.

FIGURE 7 - CONSTRUCTION SEQUENCE OF PROJECT FEATURES

Stump Lake Complex Construction Contract Duration (24 month)

1993 J	F	M	A	M	J	J	A	S	O	N	D	1994 J	F	M	A	M	J	J	A	S	O	N	D

Start construction (January)

3 mo. — No work

Finish construction (December)

3 mo. — Construct pump station

2 mo. — Avoid major work if possible

5 mo. — Upper Riverside levee clearing to pump station (along Fowler Lake) and interior levee clearing

3 mo. — Lower Riverside levee clearing

7 mo. — Construct upper riverfront levee and interior levees

6 mo. — Construct lower riverside levee

7 mo. — Construct water control structures

4 mo. — Dredge

4 mo. — Construct fish passage structure

2 mo. — Remove Long Lake stoplog structure

d. Operation, Maintenance and Rehabilitation (OM&R).

(1) General Discussion. The proposed project is located on lands managed as a National Wildlife Refuge by the IDOC under a Cooperative Agreement with the USFWS and a General Plan between the USFWS and Corps of Engineers, Department of the Army. It, therefore, qualifies under Section 906(e) of the 1986 WRDA, 100 percent Federal implementation funding.

The USFWS Regional Director and the District Commander will sign a memorandum of agreement for Enhancing Fish and Wildlife Resources at the Stump Lake Complex addressing the specific relationships, arrangements, and general procedures under which the USFWS and Department of the Army will operate in constructing, operating, maintaining, repairing and rehabilitating the project.

It should be noted that the EMP-HREP developed in this DPR is constructed as a demonstration and experimental area, and, as such, upon mutual agreement of both parties and if the cost of OM&R are substantially in excess of the DPR predictions, the project may be abandoned.

(2) OM&R Criteria and Responsibilities. The local sponsor (Illinois Department of Conservation) will operate and maintain the project after completion. The USFWS and IDOC will assure that operation and maintenance (including repair and replacement) will be accomplished in accordance with Section 906(e). Annual operation and maintenance costs are estimated at $33,700.00. A Supplement to the Operation, Maintenance and Rehabilitation Agreement will be developed during the construction phase of the project which will more specifically define the operation and maintenance and rehabilitation. In general, operation, maintenance and rehabilitation responsibilities shall include, but are not limited to, the following:

(a) The sponsor shall prepare annually a Management Plan which incorporates Operational Activities including water control and manipulation, plantings, day-to-day project observation, inspection, record keeping, visitor monitoring, vegetation control and planned maintenance activities. (This Plan shall be mutually agreed upon between the sponsor and the U.S. Army District Engineer in charge of the administration of the project and may be amended as necessary.) [A tentative project regulation plan for water control is provided by FIGURE 6.] This plan may undergo further coordination and refinement.

(b) The sponsor shall operate project features (such as gates and pumps) to insure accomplishment of the Management Plan.

(c) The sponsor shall not collect any fees for public use of these lands for hunting or fishing.

(d) The sponsor may use the project for the production of crops exclusively to provide food for wildlife, as permitted by current agreements regarding General Plan Lands.

(e) The sponsor shall provide all operation and maintenance of project features in accordance with manufacturer data and Corps of Engineers recommendations. (The Corps of Engineers will provide manufacturer O&M requirements of all manufactured components of the project, as well as "As Built" drawings and shop drawings for all facilities constructed, as soon as possible after construction is complete.)

(f) The sponsor will perform routine levee maintenance, which includes mowing the levee and 10 feet beyond the toe a minimum of 2 times per year; removal and/or control of all vegetation from the levees; removal of all debris, regardless of source, from the levees, reshaping of the surface of the existing levee slopes to eliminate gullies, and/or shallow depressions resulting from the normal "peeling action" that occurs from overtopping and/or wave action; rodent control; inspection; and litter removal.

(g) The sponsor shall provide routine structural maintenance, which includes painting of metal items; removal of vegetation from expansion, contraction, and monolith joints; day-to-day inspection; sealing and caulking of various joints; vandalism obliteration; and road grading.

(h) The sponsor shall provide routine mechanical/electrical maintenance, which includes lubrication, oil changes, inspections of equipment, gate slides, stems and operators, condition of gates, touch-up painting, testing of equipment, record-keeping, and vandalism repairs.

(i) The project sponsor shall provide routine sediment removal maintenance as necessary in the dredged channel and around project structures. Sediment removal is expected to be minimal, consisting of possible redredging of specific areas in the interior sloughs, the entrance to the off-channel water area at the downstream end of the project and around some water control structures and pumps. The interior sloughs around drainage structures and pumps (Long and Upper Deep Lake) may require redredging, perhaps once every 20-25 years, and then possibly only at limited locations. The off channel water area near the fish passage structure (confluence of Long Lake and Illinois River) may need redredging about once every 5-10 years because it is located in a bend in the river where sediment tends to settle out and accumulate.

(j) The project sponsor will consult with the Soil Conservation Service to develop and implement an erosion control plan on 310 acres of Pere Marquette State Park lands located in the Williams Hollow Watershed to significantly reduce run off and subsequent sedimentation in Lower Stump Lake.

(k) The Corps of Engineers will inspect the project at least annually to determine the status of operation and maintenance being performed by the sponsor. Representatives of the sponsor will be invited to attend. The inspection will follow procedures outlined in the latest issue of DIVR 1130-2-304 entitled "Project Operations - Maintenance by Local Interests." The report following this inspection will serve as a basis for the sponsor and/or Corps of Engineers (in the case of rehabilitation) to make required repairs and/or changes to the Operation and Maintenance procedures. In addition, the Corps of Engineers may also make periodic inspections at various intervals for the purpose of determining compliance with the approved Annual Management Plan by the sponsor.

(l) The Corps of Engineers will be responsible for the performance of any mutually agreed upon rehabilitation of the project. This rehabilitation will be accomplished in accordance with Section 903(e) of the Water Resources Development Act of 1986, which provides that the non-Federal share of rehabilitation costs shall be 25 percent. "Rehabilitation" is defined as reconstructive work needed in excess of estimated annual operation and maintenance as a result of specific storm or flood events.

(m) The final DPR (APPENDIX DPR-A) will provide the following:

1. A letter from the USFWS which expresses support for the project and assures that O&M will be accomplished;

2. a letter from the IDOC indicating support for the project, and a statement that the agency will cooperate with the USFWS to assure the O&M is accomplished as described in the DPR; and

3. a draft OM&R Agreement between the District Commander, St. Louis District and the Regional Director, USFWS.

(n) Upon completion of construction, an Operation and Maintenance Manual will be prepared and signed by both the USFWS and the District Commander. This Manual will provide specific requirements for operation, maintenance, repair, and rehabilitation of the project; as-built drawings; shop drawings; manufacturer's operation and maintenance manuals; and, specific procedures for project review and inspection, rehabilitation, abandonment, improvements or alteration.

e. Project Performance Evaluation Monitoring Plan.

The following TABLES 11, 12 and 13 summarize the monitoring aspects of the project. The principal types, purposes, and responsibilities of project monitoring are presented in TABLE 11. The plan for post-construction qualitative field observations and quantitative measurements are presented in TABLES 12 and 13, respectively. To the extent possible, methods will be standardized with the methods used for other Habitat Rehabilitation and Enhancement Projects, and with the Upper Mississippi River System - Long-Term Resource Management program, in general.

f. Real Estate Requirements.

(1) General. Project features are to be located on public lands originally acquired through the Corps of Engineers in fee and designated as General Plan lands. These lands are managed by IDOC in accordance with the General Plan, dated 8 March 1961, approved jointly by the Assistant Secretary of the Army, the Secretary of the Interior and the Director, IDOC; and as prescribed in a Cooperative Agreement dated 14 February 1963, between the Department of the Army and the Department of the Interior. The principal objective of this General Plan and Cooperative Agreement is to provide optimum habitat for wildlife species. Secondarily, the General Plan lands also provide water-related recreation opportunities, such as sport fishing, waterfowl hunting, and trapping.

(2) Access. Construction access will be made available on IDOC and Township/County Roads. No real estate actions will be required for construction access.

(3) AT&T Cable. Dredging and construction actions should not threaten an AT&T communications cable which crosses the project area. Preliminary data indicated that the cable is located several feet below the dredging elevation and is unlikely to be disturbed. However, location and marking of the cable will be required prior to dredging. Relocation of the cable on a temporary basis is not recommended by AT&T because it is a type of lead cable that would be extremely difficult and expensive to move.

(4) Cabin Leases. Levee construction will take place adjacent to two subdivisions where the Corps leases cabin sites; the Powerline Subdivision and Coon Creek Subdivision. These two subdivisions contain a total of 180 recreational lease lots, of which 157 are currently leased with cabins on them. Construction is not planned to take place on leased land, however, survey comparisons will need to be made to ensure that construction will not cross onto leased property. File research will be required during Post-authorization planning to verify property boundaries. It is anticipated that a project of this magnitude will generate a number of inquiries from the cabin tenants. Individual and group meetings, congressional inquiries and District correspondence will probably be required to resolve concerns.

Lessees will be unaffected by levee construction except during high water where some additional debris may collect on leased lands rather than wash into

Deep Lake. Construction of the levee is designed to reduce flood events into the Stump Lake Complex, which will decrease sedimentation and improve management capability for water control on the wetland units.

g. Project Cost Estimate.

(1) Construction.

(a) General. A summary of the detailed M-CACES estimate of the total project costs is presented in TABLE 14. Appendix DPR-L presents a detailed cost estimate for the Stump Lake Complex EMP-HREP. Project costs were optimized through careful consideration of construction costs versus the environmental benefits of each potential project feature. This process included consideration of dike and levee alignment, dike and levee height, water control method and drainage structure and pump placement. The total project construction cost differs from that indicated in the Fourth Annual Addendum. The reason for this difference is that the costs presented in the addendum were based on preliminary design information. The estimate presented in this plan was developed using previous cost estimates, current designs and quantity take-offs, recent bid abstracts for projects in the area, detailed cost estimates and estimator judgement. A PC spreadsheet program was used to prepare the baseline cost estimate with an appropriate contingency that was applied to each line item cost. The Price Level for this estimate is October 1990.

(b) Reliability of Designs, Quantities, and Unit Prices. For the most part, the channels and canals work has been adequately quantified. However, some aspects are inherently difficult to quantity, and for that reason they have been assigned a higher contingency value. Items falling into this category include dewatering, sluice gates, stop logs and embankments. Since the time of year for construction is not yet known, there is uncertainty as to the amount of dewatering that will be required. Sluice gates and embankments are features typically subject to many changes during project development. Embankment material wetness and difficulty of moving the material could affect cost. Only minimal design has been done for the stop log water control-boat passage structure. The pump types have been selected and the price quotations received, however, prices can fluctuate until the time of construction. The type of hydraulic operators have not been defined at this point and price range is widely variable on this item.

(c) Variable Contingencies. The cost estimate on this project includes contingencies ranging in value from 10 percent to 50 percent. Assigned contingencies are based on the inherent difficulties in visualizing and quantifying certain types of work such as dewatering, structural steel, embankment, etc. Generally a contingency of about 20 percent was utilized for this project, which was felt to be reasonable at this stage of design.

(2) Operation, Maintenance and Replacement. A detailed estimate of operation, maintenance, and replacement costs is presented in TABLE 15. These quantities and costs may change during final design.

Since this project is located on general plan lands where the USFWS has entered into a cooperative management agreement with the state of Illinois, the state will continue to be responsible for operation and maintenance in accordance with the cooperative agreement.

(3) Performance Evaluation Monitoring Plan. TABLE 16 provides an estimate of costs related to the project's performance evaluation monitoring.

h. Project Schedule. TABLE 17 presents a schedule of project completion steps.

TABLE 11

MONITORING AND PERFORMANCE EVALUATION MATRIX

Type of Activity	Purpose	Responsible Agency	Implementing Agency	Funding Source	Remarks
Sedimentation Problem Analysis	System-wide problem definition. Evaluates planning assumptions.	USFWS	USFWS (EMTC)	LTRM	Leads into pre-project monitoring; defines desired conditions for plan formulation.
Pre-project Monitoring	Identifies and defines problems at HREP site. Establish need for proposed project features.	Sponsor	Sponsor	Sponsor	Attempts to begin defining baseline.
Baseline Monitoring	Establishes baselines for performance evaluation.	Corps	Field station or sponsor thru Cooperative Agreements or Corps.	LTRM	Appendix DPR-K shows the locations of and sites for physical/chemical data collection. Actual data collection will be accomplished during P&S phase. For biological baseline information. See Appendix DPR-E.
Data Collection for Design	Includes identification of project objectives, design of project, and development of performance evaluation plan.	Corps	Corps	HREP	Comes after the fact sheet. This data aids in defining the baseline.
Construction Monitoring	Assesses construction impacts; assures permit conditions are met.	Corps	Corps	HREP	Environmental protection specifications to be included in construction contract documents. Inter-agency field inspections will be accomplished during project construction phase.
Performance Evaluation Monitoring	Determines success of project as related to objectives.	Corps (quantitative) sponsor (field observations).	Field station or sponsor thru Agreement, sponsor thru O&M, or Corps.	LTRM Cooperative	Comes after construction phase of project.
Analysis of Biological Responses to Projects	Evaluates predictions and assumptions of habitat unit analysis. Studies beyond scope of performance evaluation, or if projects do not have desired biological results.	USFWS	USFWS (EMTC)	LTRM	This item and first monitoring activity item are the linkage between LTRM and the HREP.

TABLE 12

ANNUAL POST-CONSTRUCTION FIELD OBSERVATIONS 1/
(Sponsor Contributions to Performance Evaluations)

Goals	Objectives	Unit of Measure	Enhancement Feature	Field Observation
Enhance Wetland Habitat for Migratory and Resident Wildlife	Decrease sedimentation into wetland units	Inches/Year	Levees Dike Upland Control	Evidence of recent sediment deposition
	Improve a means to control wetland unit water levels independent of river stage	Graphed comparison between river stage and actual interior water levels achieved	Levee, Gated Drains, Ditching, Pumps Dredging	Evidence of a water stage differential based on recorded stage data at the site
	Increase reliable food production for waterfowl	Acres	Waterfowl Management Wetland Units, Cooperative Agreement	Presence of waterfowl, survival of plantings
	Increase total wetland values for migratory waterfowl	Habitat Units (HU)	All	Annual presence of waterfowl
Enhance Aquatic Habitat for Slackwater Fishes	Reduce potential for backwater sedimentation	Inches/Year	Dike	Evidence of recent sediment deposition
	Increase photic zone	Percent change from present	Dike Dredging	Observed visual clarity of backwater as compared to adjacent river water
	Increase total habitat values for slackwater fishes	HU	All	Evidence of fishing success

1/ Observations to be submitted to the Corps of Engineers by the IDOC with the annual management report for the Cooperative Agreement Lands.

TABLE 13

POST-CONSTRUCTION QUANTITATIVE MEASUREMENTS

Goals	Objectives	Unit of Measure	Enhancement Feature	Monitoring Plan	Monitoring Intervals (Years) 1/
Enhance Wetland Habitat for Migratory and Resident Wildlife	Decrease sedimentation into wetland units	Inches/Year	Levees Dike Upland Control	Perform survey cross-sections for sedimentation	5
	Inprove means to control wetland unit water levels independent of river stage	Graphed comparison between river stage and actual interior water levels achieved	Levee, Gated Drains, Ditching, Pumps Dredging	Corps river stage data to be plotted against sponsor provided interior water stage data, and against project expected interior stage data	5
	Increase reliable food production for waterfowl	Acres	Waterfowl Management Wetland Unit, Cooperative Agreement	Perform vegetation survey	5
	Increase total wetland values for migratory waterfowl	Habitat Units (HU)	All	With assistance from IDOC, Corps will perform a habitat analysis using the Missouri WHAG methodology	1, 5, 15, 50

1/ First monitoring activity to occur in the first year after construction.

TABLE 13 (CONTINUED)

Goals	Objectives	Unit of Measure	Enhancement Feature	Monitoring Plan	Monitoring Intervals (Years) 1/
Enhance Aquatic Habitat for Slackwater Fishes	Reduce potential for backwater sedimentation	Inches/Year	Dike	Perform survey cross-sections for sedimentation (soundings)	5
	Increase photic zone	Percent change from present	Dike Dredging	Perform visibility readings with Secchi disk	5
	Increase total habitat values for slackwater fishes	HU	All	With assistance from IDOC, the Corps will perform a habitat analysis using the Corps developed AHAG	1, 5, 15, 50

TABLE 14
Baseline Cost Estimate

STUMP LAKE

S U M M A R Y

15 January 1992

Cost Account No.	Description of Item		Estimated Cost
01.-.-.-	LANDS AND DAMAGES	$	12,000
06.-.-.-	FISH AND WILDLIFE FACILITIES		441,000
08.-.-.-	ROADS, RAILROADS AND BRIDGES		22,500
11.-.-.-	LEVEES AND FLOODWALLS		1,210,000
12.-.-.-	DREDGING		600,000
13.-.-.-	PUMPING PLANT		416,000
	SUBTOTAL	$	2,701,500
30.-.-.-	PLANNING, ENGINEERING AND DESIGN		970,800
31.-.-.-	CONSTRUCTION MANAGEMENT		387,000
	TOTAL PROJECT COST	**$**	**4,059,300**

Jack R. Niemi PE
Chairman, Project Review Board

Sharon R. Cotner
Project Manager

John W. Dierker
Chief Cost Engineering Branch.

TABLE 15

STUMP LAKE COMPLEX
ESTIMATE OF ANNUAL OPERATION, MAINTENANCE, AND REPLACEMENT COST
(OCTOBER 1990 PRICE LEVEL)

OPERATING COST:

Item	Years	Quantity	Unit	Unit Price ($)	Annual Cost ($)
Fuel:Pump (48,000 GPM)	Annual	(1) 336	Hr.	0.00	0
Labor:Pump (48,000 GPM)	Annual	(1) 112	Hr.	0.00	0
Fuel:Port.Pump (5,000 GPM)	Annual	336	Hr.	5.00	1,680
Labor:Port.Pump (5,000 GPM)	Annual	112	Hr.	15.00	1,680
Fuel:Pump Drvr. (48,000 GPM)	Annual	336	Hr.	20.00	6,720
Labor:Pump Drvr. (48,000 GPM)	Annual	336	Hr.	15.00	5,040
		TOTAL ANNUAL OPERATING COST:			$ 15,120

MAINTENANCE COST: 1/

	Cost/Interval	Annualized Cost
Pump (48,000 GPM-Sed/Debris Rem.)	$16,000 1 in 25 Years	$ 175
Sluice Gate (Paint & Lub.)	2,800 1 in 1 Year	2,800
Fish Passage Structure (Cleanout)	1,600 1 in 5 Years	267
Boat Passage Structure (Cleanout)	3,200 1 in 25 Years	35
Gravity Drain Str. (3) (Cleanout)	8,810 1 in 25 Years	96
Levee Repair/Maintenance	5,000 1 in 1 Year	5,000
Pumps (48,000 GPM) (2)	5,000 1 in 1 Year	5,000
Pumps (Portable-5000 GPM)	250 1 in 1 Year	250
Pump Driver (For 48,000 GPM)	5,000 1 in 1 Year	5,000
	TOTAL ANNUALIZED COST:	$ 18,623

REPLACEMENT COST: 2/

				Annualized Cost
Fish Passage Str.	@	25 Years/Interval	$ 77,450	$ 845
Boat Passage Str.	@	" " "	2,049	23
Gravity Drainage Str.	@	" " "	135,000	1,473
Pump (48,000 GPM) (2)	@	" " "	143,000	1,560
Portable Pump (5,000 GPM)	@	" " "	27,950	305
Pump Driver (For 48,000 GPM)	@	" " "	27,692	302
TOTAL REPLACEMENT COST IN 25 YEAR INTERVALS:			$413,141	$ 4,508

1/ Maintenance costs are defined as those costs of repair and replacement associated with hydrologic events (including minor storm and flood events) that do not exceed the level of design for the project.

~~2/ Rehabilitation is defined as reconstruction work needed in excess of estimated annual O&M as a result of specific storm or flood events.~~

(1) The operating and fuel cost are included with the drive unit cost.

TABLE 16

STUMP LAKE ESTIMATE OF PERFORMANCE EVALUATION MONITORING COSTS (OCTOBER 1990 PRICE LEVELS)

Item	Interval Years	Quantity	Unit	Unit Price ($)	Total Price ($)	Average Annual Price ($)
Sediment Survey	1 in 5	7	X-Sections	3,571	25,000	4,200
Water Control Analysis	1 in 5	2	Days	240	240	240
Habitat Analysis						
WHAG/AHAG	1 in 5	4	Days	240	480	144
Cover Type Survey	1 in 5	1	Day	240	240	72
Water Quality Readings	Annual (i.e., Quarterly)	4	Days	240	960	960
				TOTAL		$5,616
			Total Contingencies (+1-25%)			1,404
				GRAND TOTAL		$7,020
						(Say $7,000)

TABLE 17

PROJECT IMPLEMENTATION SCHEDULE

Requirements	Scheduled Date
Submission of Draft Definite Project Report (DPR) to Corps of Engineers, Lower Mississippi Valley Division, North Central Division, agencies, and public for review	December 1990
Submit final DPR to North Central Division	December 1991
North Central Division submission of final report to Chief of Engineers	January 1992
Receive plans and specifications funds	February 1992
Obtain construction approval by Assistant Secretary of the Army (Civil Works)	June 1992
Submit final plans and specifications to Lower Mississippi Valley Division for review and approval, and to participating agencies for review	August 1992
Obtain approval of the plans and specifications	September 1992
Advertise contract	October 1992
Award Construction Contract	December 1992
Complete construction	December 1994

8. ENVIRONMENTAL EFFECTS OF THE SELECTED PLAN. The following section presents a discussion of the environmental impacts of the Selected Plan. TABLE 18 is an environmental assessment matrix which summarizes the analysis.

a. Natural Resource Effects.

(1) Physiography-Topography. With the construction of the project, the topography of the complex will be altered. The construction of borrow and disposal areas represent permanent changes to the topography of the area.

(2) Hydrology/Hydraulics. The Stump Lake complex consists of a series of open wetland units within a riverfront levee. The wetland units are separated by low earthen levees. Control of interior water levels will be accomplished by a system of gravity drains with sluice gates or stop logs, a portable pump for filling Flat Lake, and a reversible pumping system for filling and draining Long/Deep Lake. Long Lake will be used to convey water into or out of the individual wetland units by operating selected gravity drains within the complex. Selected wetland units could be drained during the growing season and planted with food for waterfowl, assuming the Illinois River level is below the riverfront levee crown. Water would be taken on to flood the mature crop at times when waterfowl are migrating. The total input or output would require about ten days. FIGURE 6 in Section 6 of this DPR provides a water regulation plan for the site. The project is not expected to change profiles in the adjacent Illinois River nor in the adjacent flood plains.

The riverfront levee would prevent sediment-carrying waters from entering the project area for about 79 percent of the time. Even when the levee overtops, only the top few feet of flood flow would enter the proposed area. This water would carry relatively low quantities of sediment (mainly silts and clays) compared to the entire water column. Little sand contribution to the complex is expected, since most of the sand load will be carried near the bottom as bed material load and would be prevented from entering the project area by the levee.

Structure overtopping will average about once every three to four years. Floods and overtopping would normally occur in the late winter-early spring of the year, due to upstream snowmelt and normal spring rains. No significant damage to the wetland protection structures is expected when overtopping occurs. The levee is protected during floods due to its gated culvert and pumping system, allowing for the safe backfilling of water into the interior before the main levee structure can be overtopped.

The effects of the project on upstream river elevations during floods are expected to be small for floods up to the 3-4 year recurrence interval event, and insignificant for rarer events, based on mathematical model results using "HEC-2, Water Surface Profile."

When the navigation pool is "on tilt", the project will cause river velocities to increase slightly, mainly on the right bank. This could be a concern, since the proposed Swan Lake project is on the right river bank. However, the proposed Swan Lake levee system is set back from the river and is expected to be protected by dense vegetative growth on the land between the river and the levee.

TABLE 18

ENVIRONMENTAL IMPACT ASSESSMENT MATRIX

	Magnitude of Probable Impact						
	Increasing Beneficial Impact			No Appreciable Impact	Increasing Adverse Impact		
Parameter	Significant	Substantial	Minor		Minor	Substantial	Significant
A. Social Effects							
1. Noise Levels					X		
2. Aesthetic Values					X		
3. Recreational Opportunities			X				
4. Public Health and Safety				X			
5. Transportation				X			
6. Community Cohesion				X			
7. Community Growth/Development				X			
8. Business/Relocations				X			
9. Controversy				X			
B. Economic Effects							
1. Property Values				X			
2. Tax Revenues				X			
3. Public Facilities/Services				X			
4. Regional Growth				X			
5. Employment				X			
6. Business Activity				X			
7. Farmland/Food Supply				X			
8. Commercial Navigation				X			
9. Energy Needs and Resources				X			
10. Flooding Effects					X		
C. Natural Resource Effects							
1. Air Quality					X		
2. Terrestrial Habitat					X		
3. Wetlands	X						
4. Aquatic Habitat		X					
5. Habitat Diversity and Interspersion	X						
6. Biological Productivity	X						
7. Surface Water Quality				X			
8. Water Supply				X			
9. Groundwater				X			
10. Soils				X			
D. Historic Properties				X			

(3) Water Quality. The effects of the project on the quality of the water within the Stump Lake complex are very beneficial. The use of interior water control structures, water drainage structures, and pumps produces the ability to flush or maintain deeper water in the four waterfowl management units. The dredging of the fifth unit (Long and Deep Lake) to enhance water conveyance into and out of the other four management units produces additional water quality benefits. The additional depth will greatly reduce the occurrence of depressed dissolved oxygen levels under ice cover. Also by use of the upstream pump and downstream water release structure, during summer stagnation, Long and Deep Lake can be flushed with fresh river water. This will increase dissolved oxygen levels and lessen problems associated with algal blooms. At present, the fifth unit will seldom support upper trophic level organisms (fish). The project will reduce sediment deposition in all five units, a water quality benefit in itself, and, when compatible with overall management plan, the fifth unit can be a fisheries unit.

(4) Air Quality. Regional development will continue in the future, and consequently, air quality may decline somewhat. Project construction would result in a temporary increase in exhaust fumes and dust from construction equipment. Additional short-term impacts to air quality are expected from operation of the diesel powered pumps. No long-term impacts are expected.

(5) Noise. During construction activities, there will be periodic increases in noise levels in the general vicinity of the project area. Factors affecting noise levels will include the operation of heavy equipment, the movement of earthen material, and the use of chain saws. Operation of permanent and portable pumps will increase noise levels in the project area approximately 15-20 days annually.

(6) Prime Farmland. The area currently does not qualify as prime farmland. As such, there would be no impacts to prime farmland associated with the project.

(7) Habitats. In Appendix DPR-E, the project's effect on waterfowl and fisheries habitat was evaluated using the WHAG (Wildlife Habitat Appraisal Guide) and AHAG (Aquatic Habitat Appraisal Guide) methodologies. Both habitat quality and quantity were assessed and quantified for future without and future with project conditions. Specifically, habitat quality and quantity were multiplied together to yield habitat units. The habitat units generated by each alternative were summed over the entire 50-year life of the project, and then an average was computed to obtain an average annual habitat unit (AAHU).

For Plan C (the proposed project), the WHAG and AHAG analyses show there will be a 35 percent increase and a 44 percent increase in the number of AAHUs for waterfowl and fisheries, respectively, when comparing the future with project condition with the future without project condition. These increases are average increases in habitat units over the 50-year project life. For example, the increase in habitat units for waterfowl within the first few years after project completion would be slight (about 1 percent), whereas at year 50 (2042) the increase would be the greatest (about 70 percent).

(a) Wildlife Habitat

1 Forested Wetland. Of the project area's 1,314 acres of forested wetland, 53 acres will be permanently lost to construction of the riverside and interior levees, and creation of borrow pits. About 10 additional acres of forested wetland cleared for construction right-of-way will be temporarily lost, and subsequently will be planted to mast trees.

The "forested wetland" habitat type of the WHAG analysis (see Appendix DPR-E) actually consists of the forested wetland (1,314 acres), forested nonwetland (215 acres), and "other" (30 acres) habitat types. The project will result in a net loss of 72 acres of "forested wetland" over a 50 year project life compared to a gain of 384 acres for the no action plan. For the mallard, the project's "forested wetland" habitat will yield a net loss of 149 average annual habitat units over that of the no action plan (1,114 AAHUs). Other species dependent on forested wetland, such as the green-backed heron, wood duck, beaver, northern parula, and prothonotary warbler probably will also be adversely affected to a similar degree by the loss of "forested wetland" habitat although these species were not included in the WHAG analysis.

It is not anticipated that there will be significant adverse impacts to interior bottomland forest-dwelling birds due to forest fragmentation. The existing landscape along the lower Illinois River is already fragmented, primarily because of agricultural activities. There are no remaining vast tracks of bottomland hardwoods. At Stump Lake, all of the timber proposed to be removed is located close to or at the edge of the river and open water wetlands, the clear zones are relatively narrow, and the unaffected area of bottomland hardwoods is relatively large.

Reptiles and amphibians (as well as many other kinds of animals) are expected to benefit from the water which will collect in the borrow pits located at the riverside levee's toe. Other positive effects include those attributable to the "edge effect" where wildlife diversity and abundance is often higher at the zone where two different habitat types meet.

<u>2</u> <u>Forested Nonwetland</u>. Of the project area's 215 acres of forested nonwetland, 33 acres will be permanently lost to creation of borrow pits and construction of the riverside levee. An additional 5 acres of forested nonwetland cleared for construction right-of-way will be temporarily lost, and subsequently will be planted to mast trees. As mentioned above, this habitat type was included in the WHAG analysis as "forested wetland."

This District and the IDOC applied the Habitat Evaluation System (HES) methodology to evaluate the environmental effect the project would have on bottomland hardwoods (see Appendix DPR-C). Bottomland hardwoods include the forested wetland and forested nonwetland at the complex. The HES is very similar to the WHAG in that habitat quality (and ultimately habitat units) are compared for existing, future without project, and future with project conditions. However, unlike the WHAG, which measures habitat quality for a particular species, the HES assesses general habitat characteristics to indicate quality for wildlife populations as a whole. The impact of a project feature is obtained by subtracting the habitat units of the future without condition from those of the future with condition.

The HES analysis shows that the clearing of bottomland hardwoods from 101 acres would represent a loss of 2778 habitat units over the 50-year project life [or -56 average annual habitat units (AAHUs)]. The analysis also shows that the reverside levee will improve habitat quality by protecting the "interior" bottomland hardwoods within the project area (1329 acres) from frequent flooding. Mast tree species (especially oaks) in this "interior" area are currently unable to regenerate apparently because the existing flooding regime is too wet. The impact on this "interior" area consists of an increase in 4462 habitat units (+89 AAHRs), and is due in part to the expected regeneration of mast ree species. According to the HES analysis, the overall impact of the project on bottomland hardwoods is positive, and consists of an increase of 33 AAHRs (89 AAHUs minus 56 AAHRs).

The Corps requirement for bottomland hardwoods specifies that mitigation will be required whenever project features cause an overall net loss in habitat quality. Because the HES analysis shows that overall habitat quality will increase over the 50-year project life, mitigation is not required.

<u>3</u> <u>Nonforested Interior Wetland</u>. When the project is completed, there will be an initial permanent gain of 34 acres of nonforested interior wetland (from 1098 to 1132 acres). This is due to the creation of borrow pits alongside the riverside levee and interior levees, and their connection to the

existing waterfowl management units. The disposal of dredged material from Deep and Long Lakes into Flat Lake (171 acres) will not result in any acreage loss because the project will allow for continued management of Flat Lake as a waterfowl unit.

For the waterfowl management units, the selected plan, over the 50-year project life, will result in a 377 acre increase over that of the no action plan (with a total of 630) (see TABLE E-4 in Appendix DPR-E). Without a project, the habitat suitability index (HSI) value of the waterfowl management units is low (0.18), but with a project it will increase significantly to 0.63. The project will also result in increases in HSI values for the Canada goose, least bittern, lesser yellowlegs, muskrat, and king rail. The green-backed heron and coot will show decreases in their HSIs. For Deep and Long Lakes, the HSI values for the Canada goose, yellowlegs, and muskrat will increase, whereas they will decrease for the other four species. For the mallard, the selected plan will result in a net gain of 463 average annualized habitat units (AAHUs) in the waterfowl management units over the no plan action. Likewise, there will be a net increase of 53 AAHUs in Deep and Long Lakes over the no action plan. Overall, the project should benefit the Canada goose, least bittern, lesser yellowlegs, muskrat, and king rail.

(b) <u>Fisheries Habitat</u>.

The project will reduce future sediment deposition within Deep and Long Lakes, which are <u>slough</u> habitat, by 79 percent. Little loss of water depth is anticipated over the life of the project because the interior levee system will provide the capability to raise the water surface elevation up to one foot (from 420 to 421 feet NGVD). With a project (including dredging down to 414/416 feet NGVD in Deep and Long Lakes), other beneficial changes are anticipated. Average dissolved oxygen levels in winter (January, February, March) and summer (June, July, August, September) are expected to increase. Average water temperature is expected to increase in the spring season (April, May). Average turbidity is expected to decrease in spring and increase in fall (October, November, December); the latter change is due to the capability to flush Deep and Long Lakes with the new pump to be installed near the north end of Long Lake. Average water depth for all seasons will increase, and percent of water surface area with cover is expected to increase for spring, summer, and fall as aquatic plant production increases. Average water velocity and dominant substrate composition will not change with the project.

According to the AHAG analysis (see Appendix DPR-E), the project will result in an overall 39 percent increase in habitat value for large slackwater fishes (from 74 to 103 average annual habitat units). Substantial habitat gains will occur to spawning (40 percent), rearing (44 percent), and adult (41 percent) stage fishes. Almost all (29 of 31 AAHUs, or 94 percent) of this habitat gain will result from the sediment and water level protection afforded by the riverside levee and interior water control system. Only 6 percent of the increase will result from deepening of Deep and Long Lakes from an average bottom elevation of 417.7 feet to 415 feet NGVD (alternating between 414 and 416 feet NGVD every 500 feet).

An open fish passage structure constructed at the confluence of Long Lake and the Illinois River will allow for the free movement of fish in and out of Long and Deep Lakes. The structure's sluice gates will be opened for fish passage at times which are compatible with waterfowl management.

The fisheries habitat value of Flat lake, the disposal site of material dredged from Deep and Long Lakes, will be adversely affected during the construction process. Because Flat Lake is drawn down annually from late spring until fall for moist soil management, it offers seasonal fisheries habitat of moderate quality. Fish unable to escape Flat Lake during spring draw down will be killed during the disposal process. Fisheries habitat is expected to become reestablished several years after dredging is completed.

(8) Historic Properties. The St. Louis District, in coordination with the Illinois Historic Preservation Agency, the Advisory Council on Historic Preservation and the U.S. Fish and Wildlife Service, is preparing a Programmatic Agreement to protect significant archaeological resources at all Environmental Management Projects in Illinois, including Stump Lake. This Programmatic Agreement will follow the Secretary of the Interior's Standards and Guidelines for Identification (48 FR 44720-39) and the Illinois State Historic Preservation Office Guidelines for Archaeological Reconnaissance Surveys/Reports. Archaeological investigations prior to construction related earthmoving activities will ensure that any significant site at Stump Lake will be located, evaluated and recovered. The District concludes that the effect of undertaking the project would not be adverse.

(9) Recreation. Area sport fishing and waterfowl hunting are expected to be enhanced as a result of improved sediment control, water level control and increased management capabilities on the wetland complex.

(10) Aesthetics. Once the project is completed, no visible changes should be evident from Illinois Route 100, located immediately east of the project area along the base of the floodplain's bluff. Likewise, features visible from the Illinois River by boat should be the two reversible pumps along the riverbank adjacent to the north end of Long Lake, and the clearzone along the riverside levee adjacent to Lower Flat Lake and Lower Stump Lake. Revegetation of disturbed areas with eventual succession of natural vegetation will tend to hide many project features from view. A slight but long-term negative impact on the project area will result from construction of the riverside levee.

(11) Mineral Resources. The project site is not located near any limestone quarry, sand and gravel deposits, or coal resources found in Jersey County. Therefore, there will be no effect on significant mineral resources.

b. Economic and Social Impacts. It is expected that recreational hunting and fishing will improve as a result of the project. As a result, economic impacts are expected to be positive as more hunters and fishermen visit the area, purchasing supplies locally available. The increase in local income would spread throughout the area, thus enhancing the local economy.

c. Relationship of the Proposed Project to Land-Use Plans. The present land use of the entire project area is the management of fish and wildlife resources. This project is compatible with this land use and is designed to enhance and promote these land-use plans. The USFWS has been requested to determine if the proposed project is compatible with existing refuge goals and objectives (see Appendix DPR-H).

d. Adverse Effects Which Cannot be Avoided. The clearing of approximately 101 acres of bottomland hardwood (63 acres of wetland, 38 acres of nonwetland) during construction is unavoidable. The filling of 21 acres of forested wetlands and 13 acres of forested nonwetlands is unavoidable to construct the riverside and interior levees. Fifty-two acres of nonforested interior wetland will be created after construction of borrow pits on 32 acres of forested wetland and 20 acres of forested nonwetland. Appendix DPR-N describes an assessment of the projects effect on wetland habitat and bottomland hardwoods at Stump Lake complex using the Habitat Evaluation System (HES) methodology. The assessment indicates that wetland and bottomland hardwood habitat will benefit wildlife more over the next 50 years with the proposed project than without any project. The assessment does not indicate the need to include compensatory measures as project features for loss of bottomland hardwoods or wetlands.

e. Short-Term Use Versus Long-Term Productivity. The proposed project would improve both the short- and long-term productivity of fish and waterfowl habitat by providing reliable food sources for waterfowl, and stable spawning and rearing habitat for fish.

f. <u>Irreversible or Irretrievable Resource Commitments</u>. Aside from the commitment of funds, labor and construction materials, there would be no permanent loss of natural resources except for the loss of habitat necessary for the installation of project features.

g. <u>Compliance with Environmental Quality Statutes</u>. Compliance with all applicable laws and regulations listed in TABLE 19 will be obtained before any ground disturbance begins.

TABLE 19

COMPLIANCE OF THE SELECTED PLAN WITH WRC-DESIGNATED ENVIRONMENTAL STATUTES

Federal Policies	Compliance
Archaeological and Historic Preservation Act, 16 U.S.C. 469, et seq.	Full compliance
Clean Air Act, as amended, 42 U.S.C. 1857h-7, et seq.	Full compliance
Clean Water Act (Federal Water Pollution Control Act) 33 U.S.C. 1251, et seq.	Partial compliance 1/
Coastal Zone Management Act, 16 U.S.C. 1451, et seq.	Not applicable
Endangered Species Act, 16 U.S.C. 1531, et seq.	Full compliance
Estuary Protection Act, 16 U.S.C. 1221, et seq.	Not applicable
Federal Water Protection Recreation Act, 16 U.S.C. 460-1(12), et seq.	Full compliance
Fish and Wildlife Coordination Act, 16 U.S.C. 1401, et seq.	Full compliance
Marine Protection Research and Sanctuary Act, 33 U.S.C. 1401, et seq.	Not applicable
National Environmental Policy Act, 42 U.S.C. 4321, et seq.	Full compliance
National Historic Preservation Act, 42 U.S.C. 4321, et seq.	Full compliance
Rivers and Harbors Act, 33 U.S.C. 403, et seq.	Partial compliance 1/
Watershed Protection and Flood Prevention Act, 16 U.S.C. 1001, et seq.	Full compliance
Wild and Scenic Rivers Act, 16 U.S.C. 1271, et seq.	Not applicable
National Farmland Protection Policy Act, 7 U.S.C. 4201, et seq.	Full compliance

1/ Full compliance will be achieved when the St. Louis District's Regulatory Branch completes the public interest review process for this process.

9. FEDERALLY ENDANGERED SPECIES: BIOLOGICAL ASSESSMENT

a. Introduction. In compliance with Section 7(c) of the Endangered Species Act of 1973, as amended, the St. Louis District requested that the U. S. Fish and Wildlife Service (USFWS) provide a listing of Federally threatened or endangered species, currently classified or proposed for classification, that may occur in the vicinity of Stump Lake Complex. The USFWS, in a letter dated 31 August 1990, provided the following list:

Common Name	Scientific Name	Classification	Habitat
Bald eagle	*Haliaeetus leucocephalus*	Endangered	winters along major rivers and reservoirs
Indiana bat	*Myotis sodalis*	Endangered	caves and riparian
Decurrent False Aster	*Boltonia decurrens*	Endangered	wet prairie, floodplain forest

This Biological Assessment evaluates the environmental effects of the habitat rehabilitation of Stump Lake Complex on these three Federally endangered species.

b. Bald Eagle. The Bald eagle (*Haliaeetus leucocephalus*) is a common winter inhabitant of the major river systems of Illinois and Missouri. As winter arrives on the breeding grounds of northern Alaska and Canada, deep snows and sub-freezing temperatures cause waterways to become icebound. This reduces the availability of fish, the preferred food of the Bald eagle. Eagles respond to this annual paucity of food by migrating south to milder climates and more accessible food sources. Eagles winter as far north as open water and food permit.

Wintering Bald eagles are often sighted in and around the Stump Lake Complex, but systematic year-to-year counts are apparently lacking. Although Havera, Crompton, and Bellrose (1984) summarized the results of nearly 30 years of aerial censusing of wintering Bald eagles on the major river systems of Illinois, no data were reported for the lower Illinois River. Census data most applicable to the Stump Lake Complex were gathered during 1972-1984 for the Mississippi River from Rock Island to St. Louis, and the Illinois River from Spring Valley to Naples. Aerial counts were conducted weekly from early October to mid-December, once in early to mid-January, and weekly from late February to mid-April.

According to Havera, Crompton, and Bellrose (1984), the earliest sighting of wintering Bald eagles on either river segment was on October 6. Eagles generally arrived during the period October 8 to 28. For the 13 years of census data, the average number of eagles observed weekly peaked in mid-December, and stayed elevated through mid-February. During the peak period, the average number of eagles was about 200-204 on the Illinois River segment, and about 318-369 on the Mississippi River segment. By late February, the average weekly counts declined. No eagles were observed after April 13 on the Illinois River segment, or April 20 on the Mississippi River segment. The highest count on the Illinois River from Spring Valley to Naples was 515 birds on March 18, 1980. Similarly, the highest count from Rock Island to St. Louis on the Mississippi River was 560 eagles on January 5, 1984.

Dunstan (1981) documented Bald eagle wintering areas and populations in Illinois. He considered Perre Marquette State Park, located on the bluff immediately east of Stump Lake Complex, and adjacent areas along the Illinois and Mississippi Rivers, to be a sanctuary or refuge because foraging, eating, resting, and roosting habitat were present. Eagles use Williams, Tucker, and Graham Hollows within the park as night roosts (Hindmarsh and McNamee, 1980; cited in Dunstan, 1981). These hollows are about one, two, and five miles east of Lower Stump Lake, respectively. Hindmarsh and McNamee (1980) considered Goat Cliff, which overlooks Lower Stump Lake, as a soaring area. They also reported that Gilbert Lake (immediately downriver of Stump Lake Complex), Swan Lake (on the opposite side of the river), The Glades (just upriver), Lock and Dam 25 at Winfield, Missouri (about six miles to the west), and Lock and Dam 26 at Alton, Illinois (about 22 miles to the southeast) are utilized as fishing (foraging) and loafing (resting) areas. Dunstan (1981) believed that from 80-150 eagles may be found in the vicinity of Marquette State Park. He also cited unpublished reports that indicate that as many as 50 eagles may roost in Williams Hollow per night (range 0-50, mean 8.3, 61 sample days).

Dunstan, Ives, and Harper (1982) believe that there are three types of impacts to wintering eagles: destruction or harm to the source of food on the wintering site, destruction of eagle wintering habitat, and disturbance of daily eagle behavior.

(1) Food Source. Eagles feed primarily upon fish, but also eat waterfowl and other birds, as well as carrion. To feed upon fish, eagles concentrate around areas of open water. During cold weather, open water on rivers is often found immediately below dams; portions of channels may stay open naturally, such as at the confluence of tributaries, or by the repeated passage of tows. Messinger (1990) indicated that only once in a recent 13-year period were eagles observed feeding within the Stump Lake Complex; this occurred on open water on Long Lake adjacent to the causeway dividing Upper and Lower Stump Lake. The project is not expected to impact food sources.

(2) Habitat. Eagles use perch trees at night for roosting, and during the day for foraging (when searching for food), feeding (when consuming food), and resting (when neither foraging or feeding). Dunstan, Ives, and Harper (1982) and Harper (1983) reported that trees used as foraging perch sites are 1) located along the shoreline (ideally adjacent to open water), and usually lean out toward the water or have limbs which jut out over the water, 2) are most often cottonwoods, and 3) are taller than adjacent trees. These authors state that foraging perches may sometimes serve as feeding perches, but preferred feeding perches consist of silver maples with dense branches which are located away from the shoreline; the use of such trees apparently reduces the chances of food being pirated by other eagles. During the day eagles may rest at foraging perches, but they may use other trees located away from the shoreline. Harper (1983) documented eagles resting in trees on top of bluffs near Lock and Dam 24 at Clarksville, Missouri.

According to Postelwaite (1990), Bald eagles occasionally may be observed during the winter perched in trees along the edge of the Illinois River at Stump Lake Complex. Eagles sometimes perch in cottonwoods located at the south end of Lower Stump Lake along Highway 100. However, a greater concentration of eagles during the day is usually found at Brussels Ferry, about 3 miles to the southeast of the project site, where eagles feed on fish in water kept free of ice.

Construction of the 31,500-foot-long riverside levee will require the clearing of about 85 acres of trees to create a corridor about 120 feet wide, on average. The average distance between this clearzone and the edge of the river will be about 200 feet for the segment of levee extending from the north end of Fowler Lake to the junction of Long Lake and the Illinois River (this segment is about three-fourths of the total levee distance along the Illinois River). For the segment of levee extending from the Long Lake juncture to the south end of Lower Stump Lake, the average distance between the clearzone and the edge of the river will be 60 feet. The clearing of selected trees along the riverbank will be required for construction of the pump station on the riverbank adjacent to the north end of Deep and Long Lakes. Likewise, trees will be removed from the riverbank for a distance of about 600 feet at the junction of Long Lake and the Illinois River to construct a water control structure and a portion of the riverside levee. About 16 acres of trees will be cleared to construct the seven segments of interior levee.

Currently, suitable perches are not in limited supply in the vicinity of Stump Lake Complex. The clearing of potential perching trees or trees occasionally used by Bald eagles for foraging, feeding, or resting appears to be limited to the areas where selected trees will be removed for construction of the proposed pump station, and the riverside levee and water control structure at the junction of Long Lake and the Illinois River. The loss of these trees will not constitute a significant negative impact.

(3) Eagle Disturbance. Although Bald eagles concentrate in large numbers in the winter near human activities, most observations indicate that certain types of human activities within certain distances will cause Bald eagles to leave an area. Stalmaster and Newman (1978) reported that high human activity, such as that occurring frequently in the sight of eagles, caused the birds to use less suitable habitat. They report that feeding behavior was the most sensitive activity observed. Activities directly on the channel of the river, such as boating and fishing, were most disturbing if the activities did not regularly occur there. Harper (1983) reported disruptions of daily activities of eagles at Lock and Dam No. 24 by hunters, fishermen in watercraft, and aircraft. If eagles are disturbed while on a feeding ground, they usually fly to nearby perch sites and do not resume feeding for long periods (Stalmaster, 1976).

Construction activities will likely occur at Stump Lake complex during the winter months. Day use of the complex by eagles is sporadic or infrequent. Construction activities should be completed within two years (including two winters). The project would probably cause such eagle use to cease temporarily in the immediate vicinity of construction.

c. Indiana Bat. In the central and southern portions of the eastern United States, Indiana bats (*Myotis sodalis*) hibernate during the winter in caves and mines (hibernacula) with cool and stable temperatures throughout the winter (Brady et al., 1983). Only seven hibernacula support about 85 percent of the entire known population (Brady et al., 1983). Two mines and 11 caves have been designated as critical winter habitat by the U.S. Fish and Wildlife Service. Although seven of these hibernacula occur in Missouri and Illinois, none of these are near the lower Illinois River. The most serious known cause of decline of the Indiana bat is human disturbance of hibernating bats (Clawson, 1987). Because there are no hibernacula in the project area, the proposed habitat rehabilitation work would not impact winter hibernating habitat of the Indiana bat.

In general, Indiana bats disperse from hibernacula in the spring and migrate to summer habitat in midwestern and eastern United States. They are entirely insectivorous. Clawson and Titus (1988) reviewed food habit studies and determined that this bat preys upon insects from eight or more orders. These include (in order of preference): Lepidoptera (moths), Coleoptera (beetles), Diptera (flies and mosquitos), Trichoptera (caddis flies), Plecoptera (stone flies), Homoptera (aphids and scale insects), Neuroptera (lacewings), and Hymenoptera (bees, wasps, and ants). The bat's foraging strategy is apparently dependent upon prey availability - when preferred prey species are abundant, it will feed selectively, whereas the bat becomes opportunistic and feeds on a wider variety of prey items when the preferred ones are less abundant (Clawson and Titus, 1988).

In general, summer habitat requirements are not well known. Foraging habitat usually consists of the tree canopy of riparian and upland forest, but this bat may also feed along forest edges and over old fields and pastures (Clawson and Titus, 1988). During the warm months, female Indiana bats give birth to young. Brady et al. (1983) stated that maternity colonies are established mostly in riparian and floodplain areas of small to medium-sized streams. However, Gardner (1990) recently discovered a maternity roost on an island in the Mississippi River near Quincy, Illinois. Such colonies are formed in holes in trees, or more commonly under the loose bark of live or dead trees. Tree species known to be used for roosting in Illinois include silver maple, cottonwood, shingle oak, slippery elm, northern red oak, bitternut hickory, sassafras, shagbark hickory, sugar maple, post oak, and white oak (Gardner, Hofmann, and Garner, 1988, 1989). Not every tree with cavities or loose bark provides the microclimate of a suitable roost; probably only a small portion of such trees possess the properties required to shelter maternity colonies from weather extremes (hot temperatures, early freezes, extended periods of rain, etc.) (Gardner, 1990). Recent studies of summer habitat use indicate that wooded uplands may be used more extensively for rearing of young than has been previously known (Clark, Bowles, and Clark, 1987; Clawson, 1987; Gardner, Hofmann, and Garner, 1989).

Studies of banded Indiana bats indicate they may return to the same summer locality in successive years. However, an individual tree may serve as a roost for only a relatively short time, perhaps 6 to 8 years. Thus, the bats seem to have the behavioral flexibility to move their homesite every few years, probably to nearby trees that permit them to use the same general foraging area (Humphrey, Richter, and Cope, 1977).

Essentially all of Illinois and Missouri are within the known and suspected range of the Indiana bat (Brady et al., 1983; Clawson and Titus, 1988). The species apparently has not been found in Jersey County, where the project site is located, but has been encountered in Madison, Macoupin, Morgan, Scott, and Pike Counties (Gardner, Hofmann, and Garner, 1989), which range from about 25 to 80 miles away. Jersey County undoubtedly supports suitable summer habitat, and the apparent absence of this species is most likely due to a lack of fieldwork to locate it. Indiana bats were captured by Gardner and Gardner (1980) along McKee Creek on the floodplain of the Illinois River in northern Pike County. This locality is about 50 miles north of the project site.

The proposed habitat rehabilitation work will involve the clearing of floodplain forest to construct the riverside and internal levees. These structures will require the clearing of about 101 acres (or 40 hectares) of trees, or about 6.4 percent of the 1578 acres of floodplain forest within Stump Lake Complex.

According to Gardner (1990), Indiana bats probably use the floodplain forests of the Illinois and Mississippi Rivers as summer habitat, including that found within the Stump Lake Complex. For this project it is assumed that the species does use the floodplain forest of Stump Lake Complex as foraging and maternity roost habitat. Impacts to maternity roosts can be avoided by scheduling tree clearing activities during the period of the year when bats are not present. According to the U. S. Fish and Wildlife Service, the time period when bats are assumed to be present is May 1 - August 31. Removal of 101 acres of floodplain forest to construct the riverside and interior levees may result in the loss of up to 101 acres of foraging habitat.

d. Decurrent False Aster

The following information is taken from Keevin et al. (1990).

The decurrent false aster (Boltonia decurrens), a perennial plant of the Aster family, is endemic to Illinois and Missouri. Its historical range includes a 400 km segment of the Illinois and Mississippi River floodplain extending from LaSalle, Illinois to the vicinity of St. Louis, Missouri. In 1989 the species was found in eight counties - Marshall, Tazewell, Fulton, Schuyler, Cass, Morgan, Scott, and Jersey - bordering the Illinois River. Along the Mississippi River, St. Clair County, Illinois, and St. Charles County, Missouri also supported populations in 1989.

This tall, bushy plant usually grows to a height of 1.5 meters, but sometimes exceeds 2 meters. From August to October it produces aster-like flower heads about the size of a quarter-dollar. The flower consists of yellow disks 7-14 mm wide, and white to pale violet rays about 1-1.8 cm long. The leaves, narrow and elongated, are about 5-15 cm long and about 5-20 mm wide. The leaves are decurrent - the base of each leaf extends downward along the stem to which it is attached, giving the plant's stem a winged appearance. B. decurrens reproduces both vegetatively (asexually) by producing basal shoots, and sexually by producing seeds.

The decurrent false aster grows in open wetland habitats, and it appears to require abundant light. Historical collection data indicates that this species once inhabited the shores of lakes and the banks of streams, including the Illinois River. Although it grows in these habitats today, it is most common in disturbed lowland areas where it appears to be dependant on human activity for survival. The species' decline appears to be caused by habitat destruction and modification: drainage of natural lakes, wet prairies and marshes with conversion to crop land; alteration of natural flood regimes by man-made levee systems; and high rates of silt deposition upon floodplain. Other threats to its existence may include severe floods and such agricultural practices as discing and the use of herbicides for weed control. However, almost all currently known populations are found in open habitats that are kept free of woody vegetation by occasional cropping.

The decurrent false aster is not currently documented as occurring within the Stump Lake Complex. A field inspection conducted by the District on 1 October 1990 did not reveal its presence within the project site. The closest known population is located just downriver at Gilbert Lake, which is part of the Mark Twain National Wildlife Refuge. Therefore, the proposed project apparently will not affect this species.

e. Efforts to Eliminate Adverse Impacts on Species and Habitats.

(1) Bald Eagle. During the winter, day use of Stump Lake complex by eagles is sporadic or infrequent. Sporadic use by eagles would probably cease temporarily in the immediate vicinity of construction activities. To avoid adverse impacts to Bald eagles, the St. Louis District has taken following efforts:

(a) If more than sporadic use is observed one week prior to or during construction activities, then construction will cease and informal consultation with the U.S. Fish and Wildlife Service will be initiated.

(b) The alignment of the riverside levee has been set back from the riverbank from about 60 to 200 feet in order to maintain a riparian zone that includes potential perching trees for the eagle, serves as a buffer zone for reducing erosion, and provides benefits to wildlife in general. Relatively few mature trees along the riverbank will need to be cut where the project meets the riverbank. Therefore, few potential eagle perches will be destroyed.

(2) Indiana Bat. Although this species' summer habitat requirements are not well known, the riparian habitat and floodplain forest within the Stump Lake Complex are assumed to provide foraging and roosting habitat. Special conditions on the contracted work will require that clearing activities be scheduled outside the period May 1 - August 31 when Indiana bats are known to inhabit summer habitat. If for any reason tree clearing activities have to be carried out during the period May 1 - August 31, a site visit will be conducted first by a team of biologists to determine if any roost trees are among those proposed to be removed. The team will consist of representatives from the Illinois Department of Conservation, U.S. Fish and Wildlife Service, and St. Louis District. The District will enter into informal consultation with the U.S. Fish and Wildlife Service if removal of a roost tree during the period May 1 - August 31 is proposed.

f. Conclusions. It is the St. Louis District's conclusion that the habitat rehabilitation of Stump Lake Complex, in conjunction with the described measures to avoid impacts to the Bald eagle and Indiana bat, will have no significant effects on Federally endangered species or their critical habitat.

10. IMPLEMENTATION RESPONSIBILITIES AND VIEWS.

a. Corps of Engineers. The St. Louis Corps District, is responsible for the Stump Lake Complex's overall management, and its coordination with other agencies. The St. Louis District prepares and submits the DPR; programs funds; finalizes the Plans and Specifications; completes all National Environmental Policy Act requirements; advertises and awards a construction contract; and performs construction contract supervision and administration. The District is also responsible for the gathering of quantitative measurements for the project's performance evaluation monitoring.

b. U.S. Fish and Wildlife Service. The USFWS has determined that the project is compatible with the purposes for which the Mark Twain National Wildlife Refuge was established (see APPENDIX H for the refuge compatibility statement). In the future, the USFWS will ensure that all O&M activities are conducted in a manner compatible with refuge objectives and management strategies and will ensure that the O&M is performed in accordance with Section 906(e) of the Water Resources Development Act of 1986 and the Operation, Maintenance and Rehabilitation Agreement. The views of the USFWS on implementation responsibilities, as understood by the North Central Division, are contained in the EMP Fourth Annual Addendum, III.A.1 page 9. The Service also has responsibilities for the HREP in terms of problem identification, the evaluation of planning assumptions, and the analysis of biological responses to the projects.

c. Illinois Department of Conservation. IDOC, the project's sponsor, has been responsible for the identification and definition of the problems at the HREP site, and for establishing the need for the proposed project features. IDOC will also provide field observations (via the annual management report for Cooperative Agreement Lands) for the project's performance evaluation monitoring. The sponsor is also responsible for the non-Federal share of operation and maintenance, as estimated in this report.

11. COORDINATION, PUBLIC VIEWS, AND COMMENTS.

The Federal, state and local agencies receiving the Definite Project Report and Environmental Assessment are listed in APPENDIX DPR-B.

Numerous joint field reconnaissance trips and study meetings have been conducted by representatives of the St. Louis District, U.S. Fish and Wildlife Service, and the Illinois Department of Conservation to coordinate plan formulation. The Illinois Environmental Protection Agency, the U.S. Environmental Protection Agency, the U.S. Soil Conservation Service and the Jersey County Soil and Water Conservation District have also been consulted with on the proposed project.

Additional coordination was carried out as a result of public and agency review of the Draft DPR/Environmental Assessment/Draft Finding of No Significant Impact. A 60-day public review period as held from December 1990 through January 1991. A public workshop was also conducted during this period. The general public was notified via news releases, public notices sent via mail and postings at key public facilities. Planning team members and the project sponsors were in attendance to discuss the project. Displays were provided to further enhance the public's understanding of the project.

Comments received on the Draft DPR and appropriate St. Louis District responses to the comments are provided as APPENDIX DPR-C of this report. The U.S. Fish and Wildlife Service has provided comments in a letter (see APPENDIX DPR-H), which constitutes its Fish and Wildlife Coordination Act Report, and a letter (See APPENDIX DPR-I), which constitutes its Endangered Species Act Coordination. Letters of Intent to support the project have also been received by the Fish and Wildlife Service and the Illinois Department of Conservation (see APPENDIX DPR-A).

12. CONCLUSIONS.

Sedimentation, and water level fluctuation has hampered past habitat management efforts at the Stump Lake WMA. Sedimentation is causing a rapid conversion of aquatic habitat to terrestrial habitat with a resulting long-term quantitative loss of fish, waterfowl, and other wetland wildlife habitat. Lack of efficient water level control at the site have impacted the productivity of the site via effects on fish spawning and rearing, and on production of plants and availability to waterfowl.

The Stump Lake Complex has been recommended to the Corps of Engineers, St. Louis District, by the Illinois Department of Conservatgion and the U. S. Fish and Wildlife Service for priority inclusion in the UMRS-EMP. The project would significantly reduce sedimentation into the Stump Lake wetland complex, and would thus greatly increase the area's longevity as a wetland. The project will also enhance migratory waterfowl habitat by providing an increased food source within a reliable water-control system, and will also improve the fisheries resource by providing restored and protected off-channel water habitat. Only Alternative C, a wetlands protection system, meets all planning objectives.

13. RECOMMENDATIONS.

I have weighed the accomplishments to be obtained by implementing this habitat rehabilitation project versus the costs, and have also considered the scope and the special locational factors associated with the project. In my judgment, implementing the proposed project would entail a justified expenditure of Federal funds.

I recommend that the Secretary of the Army, under the provisions of Public Law 99-662, approve this project for habitat rehabilitation at the Stump Lake Complex in Jersey County, Illinois. A Letter of Intent has been furnished by the Illinois Department of Conservation. I further recommend that an Operations, Maintenance, and Rehabilitation Agreement be approved for execution. The total estimated cost of this project is $4,059,300.00, which would be entirely a Federal cost according to the provisions of Public Law 99-662. Of this amount, I ask that $329,000.00 be allocated so that Plans and Specifications work can be initiated as soon as possible.

James D. Craig
Colonel, U.S. Army
District Engineer

14. LITERATURE CITED

Bellrose, F. 1976. Ducks, geese, and swans of North America. Stackpole Books, Harrisburg, Pennsylvania, 543 pp.

Brady, J. T., T. H. Kunz, M. D. Tuttle, D. E. Wilson, R. L. Clawson, and R. K. LaVal. 1983. Recovery plan for the Indiana bat. U. S. Fish and Wildlife Service, Twin Cities, Minnesota.

Clark, B. K., J. B. Bowles, and B. S. Clark. 1987. Summer status of the endangered Indiana bat in Iowa. American Midland Naturalist, 118(1): 32-39.

Clawson, R. L. 1987. Indiana bats: Down for the count. Endangered Species Technical Bulletin, 12(9): 9-11.

Clawson, R. L. and R. R. Titus. 1988. Species management plan for the Indiana bat and the gray bat in Missouri. Wildlife Division, Missouri Department of Conservation, 49 pp.

Cowardin, L. M., V. Carter, F. C. Golet, and E. T. LaRoe. 1979. Classification of wetlands and deepwater habitats of the United States. U. S. Department of the Interior. Fish and WIldlife Service Publication. FWS/OBS-79131, 103 pp. Washington, D. C.

Dunstan, T. C. 1981. Documentation of bald eagle wintering areas and populations in Illinois. Western Illinois University, Macomb. Prepared for the Illinois Department of Conservation. 113 pp.

Dunstan, T. C., J. D. Ives, and R. G. Harper. 1982. Quantitative description of wintering area, bald eagle behavioral ecology, and impact assessments at the C.I.E. Study Area (FAP 408), Pike County, Illinois. Western Illinois University, Macomb. Prepared for Illinois Department of Transportation.

Gardner, J. E. 1990. Personal communication (13 August 1990). Biologist, Illinois Natural History Survey.

Gardner, J. E., and T. L. Gardner. 1980. Determination of presence and habitat suitability for the Indiana bat (Myotis sodalis) and Gray bat (Myotis grisescens) for portions of the lower 6.6 miles of McKee Creek Drainage and Levee District, Pike County, Illinois. Report submitted to St. Louis District, U. S. Army Corps of Engineers, 22 pp.

Gardner, J. E., J. E. Hofmann, and J. D. Garner. 1988. Progress report: 1987 investigations of Myotis sodalis (Indiana bat) distribution, abundance, habitat use, and status in Illinois. Illinois Natural History Survey, technical report 1988(1), 13 pp.

Gardner, J. E., J. E. Hofmann, and J. D. Garner. 1989. Progress report: 1988 investigations of Myotis sodalis (Indiana bat) distribution, abundance, habitat use, and status in Illinois. Illinois Natural History Survey, technical report 1989(2), 14 pp.

Harper, R. G. 1983. An ecological investigation of wintering bald eagles at Lock and Dam 24, Mississippi River. Unpublished M.S. Thesis. Western Illinois University, Macomb. 117 pp.

Havera, S. P., R. D. Crompton, and F. C. Bellrose. 1984. Aerial inventories of bald eagles in Illinois, 1957-1984. Pp. 90-104. In: Proceedings Midwest Workshop on Bald Eagle Research and Management, Illinois Department of Conservation, 2-3 April 1984, Rock Island, Illinois.

Humphrey, S. R., A. R. Richter, and J. B. Cope. 1977. Summer habitat and ecology of the endangered Indiana bat, Myotis sodalis. Journal of Mammalogy, 58(3): 334-346.

Illinois Natural History Survey. 1985. Waterfowl of Illinois: their status and management. Final report as required by Federal aid in wildlife restoration act, Illinois. Federal Aid Project No. W-88-R-1-5.

Keevin, T. M., J. E. Schwegman, B. Stebbings, and V. K. Wallace. 1990. Technical/agency draft decurrent false aster (Boltonia decurrens) recovery plan. U. S. Fish and Wildlife Service, Twin Cities, Minnesota, 25 pp.

Messinger, R. Personal communication (7 August 1990). Biologist, Illinois Department of Conservation.

Missouri Botanical Garden. 1975. A vegetational study of Pools 24, 25, and 26 on the Upper Mississippi and Lower Illinois Rivers. Report prepared for the U. S. Army Corps of Engineers, St. Louis District. St. Louis, Missouri.

Postelwaite, K. Personal communication (7 August 1990). Stump Lake Complex, Illinois Department of Conservation.

Sparks, R. E. 1984. The role of contaminants in the decline of the Illinois River: implications for the upper Mississippi. Pp. 25-66, in (J. G. Wiener, R. V. Anderson, D. R. McConville, eds.) Contaminants in the upper Mississippi River. Proceedings of the 15th annual meeting of the Mississippi River research consortium. Butterworth Publishers, Boston.

Stalmaster, M. V. 1976. Winter ecology and effects of human activity on bald eagles in the Nooksack River Valley, Washington. M.S. Thesis. Western Washington University, Bellingham. 100 pp.

Stalmaster, M. V., and J. R. Newman. 1978. Behavioral responses of wintering bald eagles to human activity. Journal of Wildlife Management, 43: 506-513.

U. S. Army Corps of Engineers. 1988. Final environmental impact statement, second lock at Locks and Dam No. 26 (Replacement), Mississippi River, Alton, Illinois and Missouri. St. Louis District.

U. S. Fish and Wildlife Service and Canadian Wildlife Service. 1986. North American Waterfowl Management Plan - a strategy for cooperation.

U. S. Fish and Wildlife Service and Canadian Wildlife Service. 1987. Waterfowl for the future, the N. A. waterfowl management plan.

15. LIST OF PREPARERS.

The people primarily responsible for preparing this document are listed in TABLE 20.

TABLE 20

**DEFINITE PROJECT REPORT/
ENVIRONMENTAL ASSESSMENT PREPARERS
PRINCIPAL CONTRIBUTERS**

Name	Expertise/Discipline	Experience
Sandor Dombi	Cost Engineering	23-yrs Civil Engineer 1-yr cost estimating
Tim George	Wildlife Biologist	10-yrs Wildlife Biologist, SLD
James Hill	EMP-DPR Study Manager Outdoor Recreation Planner	3-yrs Park Ranger, 6-yrs Outdoor Recreation Planner, SLD
Clyde Hopple	Geotechnical Engineering	8-yrs Geotechnical Design, SLD
Rich Mills	Hydraulic/Hydrologic Engineer	21-yrs Hydrologic Engineering, SLD
Ida Morris	Secretary	16-yrs St. Louis District
John Poullain	Civil Engineering/Design	28-yrs Civil Engineering Design, SLD
Joe Schwenk	Geotechnical Engineering	12-yrs Geotechnical Engineering, SLD

TABLE 20 (CONTINUED)

Name	Expertise/Discipline	Experience
	OTHER CONTRIBUTERS	
Sharon Cotner	EMP Project Manager	9-yrs Study Mgmt, Planning Division, 1-yr Project Management
John Dierker	Cost Engineering	17-yrs Cost Engineering, SLD
Stan Ebersohl	Civil Engineer	18-yrs Engineering Design, Construction and Operations, SLD
Dave Gates	Wildlife Biologist	10-yrs Wildlife Biologist 1-yr Natural Resource Planner, SLD
Suzanne Harris	Archaeology/Historic Sites	7-yrs Archaeologist, SLD
Ben Hawickhorst	Asst. Division Chief	22-yrs Civil Engineer Planning, SLD
Michael Kruckeberg	Civil Engineering/Design	9-yrs Civil Engineering Design, SLD
David Leake	Chief, Plan Formulation	1-yr Structural Design 2-yrs Construction Contract Mgmt 16-yrs Planning - Study Mgmt SLD
Richard Mankus	Economic Analysis	Economist Planning Division, SLD
Roger Myhre	Hydrologist and Liminologist	16 yrs. Water Quality/ Environmental Quality
Doris Miano	Realty Specialist	2-yrs Real Estate and 3-yrs Operations, SLD
Riley Pope	Civil Engineering Technology	19 yrs Design, Civil & Structural Engineering 4 yrs Planning Division 4 yrs Planning Division; Plan Formulation Branch
George Postol	Geotechnical Engineer	28-yrs Geotechnical Design, SLD

TABLE 20 (CONTINUED)
Other Agency Contributors

The staff of other agencies making major contributions to the preparation of this document are listed in TABLE 20.

Name	Agency	Role
Butch Atwood	IDOC - Greenville, IL	Fisheries
Neil Booth	IDOC - Rosedale, IL	Field Office Manager
Mike Bornstein	USFWS - MTNWR	Refuge EMP Coordinator
Bill Donels	IDOC - Springfield, IL	Planning-EMP Coordinator
Tom Groutage	USFWS - ES, Marion, IL	Ecological Services
Jerry Kaiser	USSCS - Jerseyville, IL	District Conservationist
Patti Meyers	USFWS - MTNWR	Calhoun Division Site Manager
Bruce Stebbings	USFWS - ES, Marion, IL	Ecological Services
Bob Stratton	USFWS - MTNWR	MTNWR Manager
Bruce Yurdin	IEPA - Springfield, IL	Water Quality

16. DRAFT FINDING OF NO SIGNIFICANT IMPACT

UPPER MISSISSIPPI RIVER SYSTEM ENVIRONMENTAL MANAGEMENT PROGRAM

STUMP LAKE COMPLEX HABITAT REHABILITATION
POOL 26, ILLINOIS RIVER, JERSEY COUNTY, ILLINOIS

(1) I have reviewed and evaluated the documents concerning the proposed rehabilitation of Stump Lake Complex.

The purpose of the project is to enhance wetland habitat at the Stump Lake Complex for both migratory waterfowl and slackwater fishes. This is to be done primarily by reducing sediment deposition during frequent flooding, and by controlling interior water depths and flooding durations. The project would be funded under the 1985 Supplemental Appropriations Bill (PL 99-88).

(2) Prior to my decision, I evaluated other pertinent data and information which addresses the various practicable alternatives. As part of that evaluation, I considered:

a. The "No Action" alternative,

b. a "Wetlands Excavation" alternative,

c. the proposed or recommended plan, referred to as the "Wetlands Protection and Management" alternative, and

d. various alternative component features leading to the recommended plan (e.g., various levee heights, several measures to control hillside erosion).

(3) These alternatives have been studied, and major findings of this investigation include the following:

a. The "No Action" alternative was evaluated and it was concluded that in the absence of a rehabilitation project, continuing sedimentation in the wetlands complex would lessen the area's value as a wetland. The loss of this wetland is considered to be unacceptable from a fish and wildlife resource standpoint.

b. The "Wetlands Excavation" alternative was also found to be unacceptable. Large-scale excavation would not alter future sedimentation, it would not permit any means of regulating water depths and flooding durations, and the potential for improving existing habitat management practices would not be realized.

c. The "Wetlands Protection and Management" alternative represents an innovative approach to wetlands management, was found to be fully responsive to the project objectives, and was designated as the Selected Plan. Most importantly, it would significantly reduce the sedimentation rate, it would provide a reliable means of water control, and it would provide optimal conditions for traditional habitat management practices. Specific options considered in detail include: various riverside levee heights, structural and nonstructural measures to control hillside erosion in Williams Hollow, various types of water control structures, including one for fish passage, and various kinds of water pumping systems.

(4) The possible consequences of the recommended plan have been studied for physical, environmental, cultural, social, and economic effects. Major conclusions of this study are as follows:

a. The construction of the project represents a permanent change in the topography of Stump Lake Complex. These changes will present no significant adverse impacts and are necessary for interior water control and sediment deflection.

b. The project is in compliance with the requirements of the Section 404(b)(1) guidelines of the Clean Water Act. An application will be submitted for state water quality certification under Section 401 of the Act. The proposed project would have minimal adverse effects on water quality.

c. The effects of the project on upstream river elevations during floods would be insignificant. Any project-induced bank erosion is expected to be minimal.

d. The project would result in a net gain of 389 average annual habitat units (AAHU's) for waterfowl, and 352 AAHU's for slackwater fish. A total of 101 acres of bottomland hardwoods would be cleared as part of project construction; 63 of these acres are forested wetlands. Of these 63 acres of forested wetlands, 21 acres would be filled to construct the riverside and interior levees, 32 acres would be excavated for borrow material, and 10 acres would be reforested once the project is completed. The 53 acres filled for levee construction and excavated for borrow would represent a permanent loss of forested wetland.

e. A Programmatic Agreement among the St. Louis District, the Illinois State Historic Preservation Officer, the Advisory Council on Historic Preservation, and the U.S. Fish and Wildlife Service is being developed which will ensure that archaeological investigations are conducted to locate, evaluate and protect any significant sites prior to earthmoving activities. Site protection will enable either excavating the site(s) or altering the project design so as to avoid the archaeological site(s).

f. Waterfowl hunting and fishing are expected to improve as a result of the project.

g. It is anticipated that the proposed action will have minimal or no adverse impact on air quality, noise, prime farmland, socioeconomic resources and aesthetics.

h. No Federally listed endangered species will be adversely affected by the proposed action.

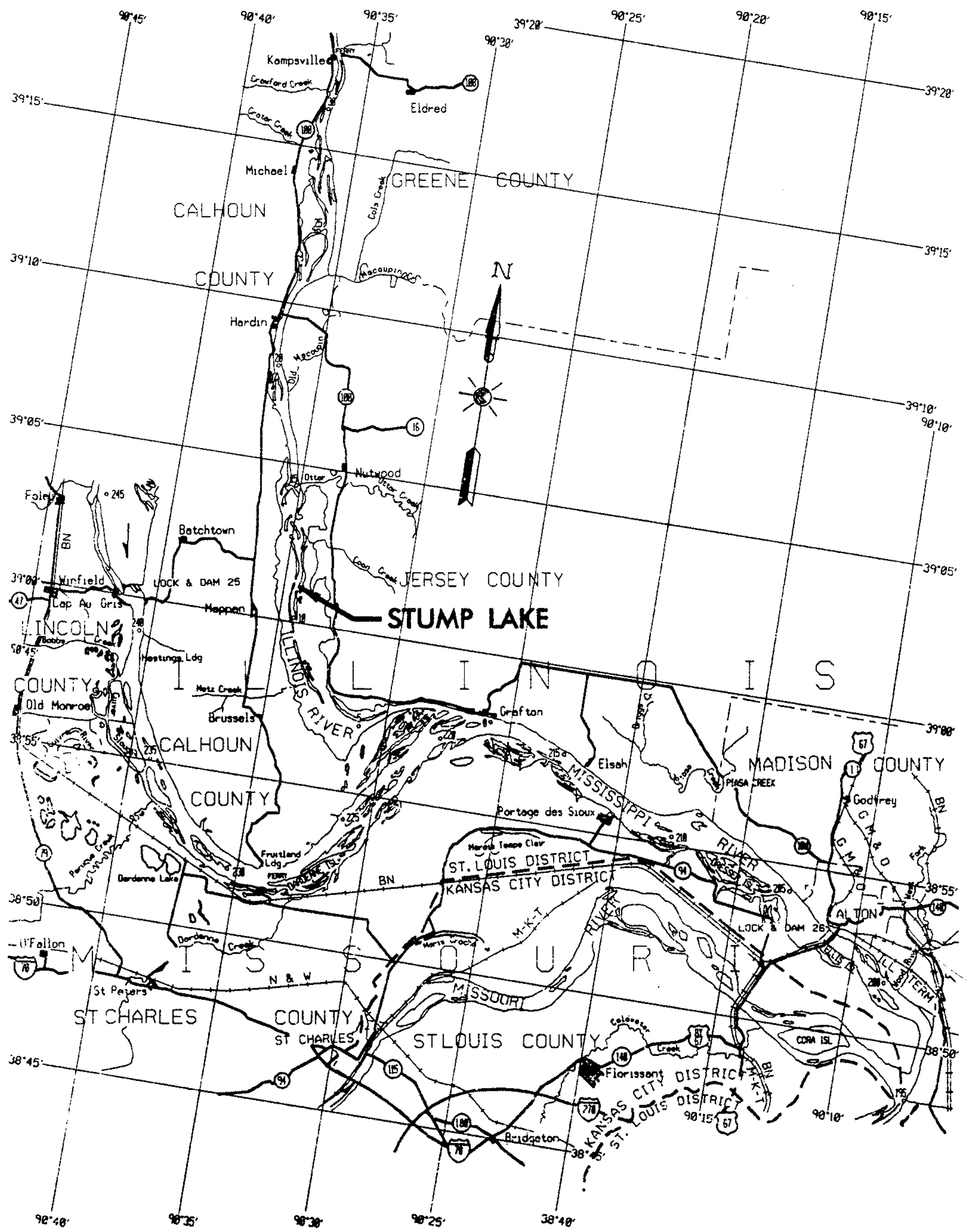
(5) Based on my analysis and evaluation of the alternative courses of action presented in the Environmental Assessment, I have determined that the rehabilitation of Stump Lake Complex will not have significant effects on the quality of the environment. Therefore, no Environmental Impact Statement will be prepared prior to proceeding with this action.

16 JAN 92
Date

James D. Craig
Colonel, U.S. Army
District Engineer

<u>ATTACHMENT 1</u>

PLATES



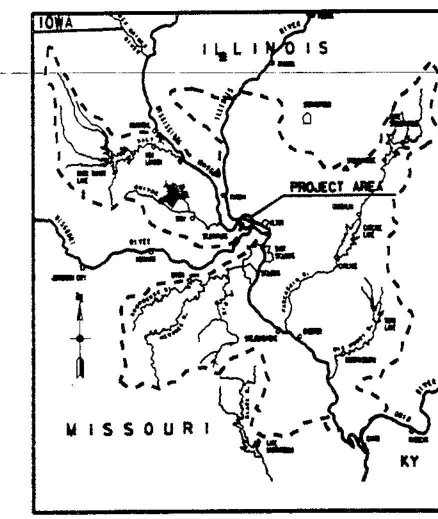
PROJECT LOCATION

APPROX. SCALE IN MILES

LEGEND
District Boundary

DRAWING INDEX

PLATE #	SHEET	TITLE
1	1 OF 18	PROJECT LOCATION, DRAWING INDEX AND VICINITY MAP
2	2 OF 18	GENERAL SITE PLAN
3	3 OF 18	SITE PLAN
4	4 OF 18	SITE PLAN
5	5 OF 18	SITE PLAN
6	6 OF 18	SITE PLAN
7	7 OF 18	SITE PLAN
8	8 OF 18	SITE PLAN
9	9 OF 18	EXTERIOR LEVEE PROFILE STA. 0+00 TO STA. 140+00
10	10 OF 18	EXTERIOR LEVEE PROFILE STA. 140+00 TO STA. 280+00
11	11 OF 18	EXTERIOR LEVEE PROFILE STA. 280+00 TO STA. 315+00
12	12 OF 18	INTERIOR LEVEE PROFILE
13	13 OF 18	INTERIOR LEVEE PROFILE
14	14 OF 18	CHANNEL PROFILE
15	15 OF 18	TYPICAL DRAINAGE STRUCTURE PLANS AND SECTIONS
16	16 OF 18	MISCELLANEOUS SECTIONS AND DETAILS
17	17 OF 18	MISCELLANEOUS SECTIONS AND DETAILS
18	18 OF 18	PUMP STATION DETAILS



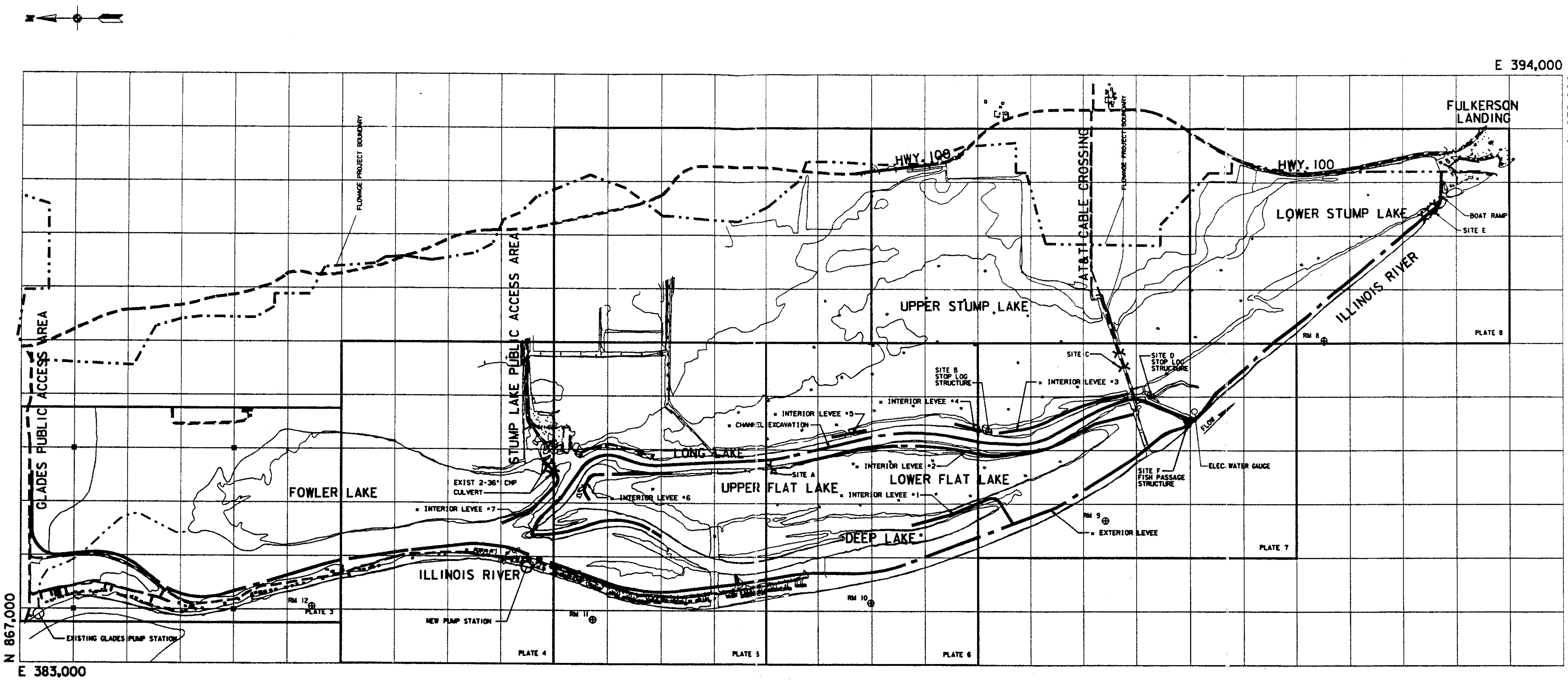
VICINITY MAP

APPROX. SCALE IN MILES

U.S. ARMY ENGINEER DISTRICT, ST. LOUIS
CORPS OF ENGINEERS
ST. LOUIS, MISSOURI

UPPER MISSISSIPPI RIVER BASIN
DEFINITE PROJECT REPORT
POOL 26, JERSEY COUNTY, ILLINOIS
ENVIRONMENTAL MANAGEMENT PROGRAM
STUMP LAKE
HABITAT REHABILITATION PROJECT
PROJECT LOCATION, DRAWING INDEX AND VICINITY MAP

DESIGNED BY: P. NELSON	DESIGN FILE: STUMPLOC.DGN	PLATE 1
DATE: 3-22-90 PLOT SCALE: 1	SHEET NO. 1 OF 18	



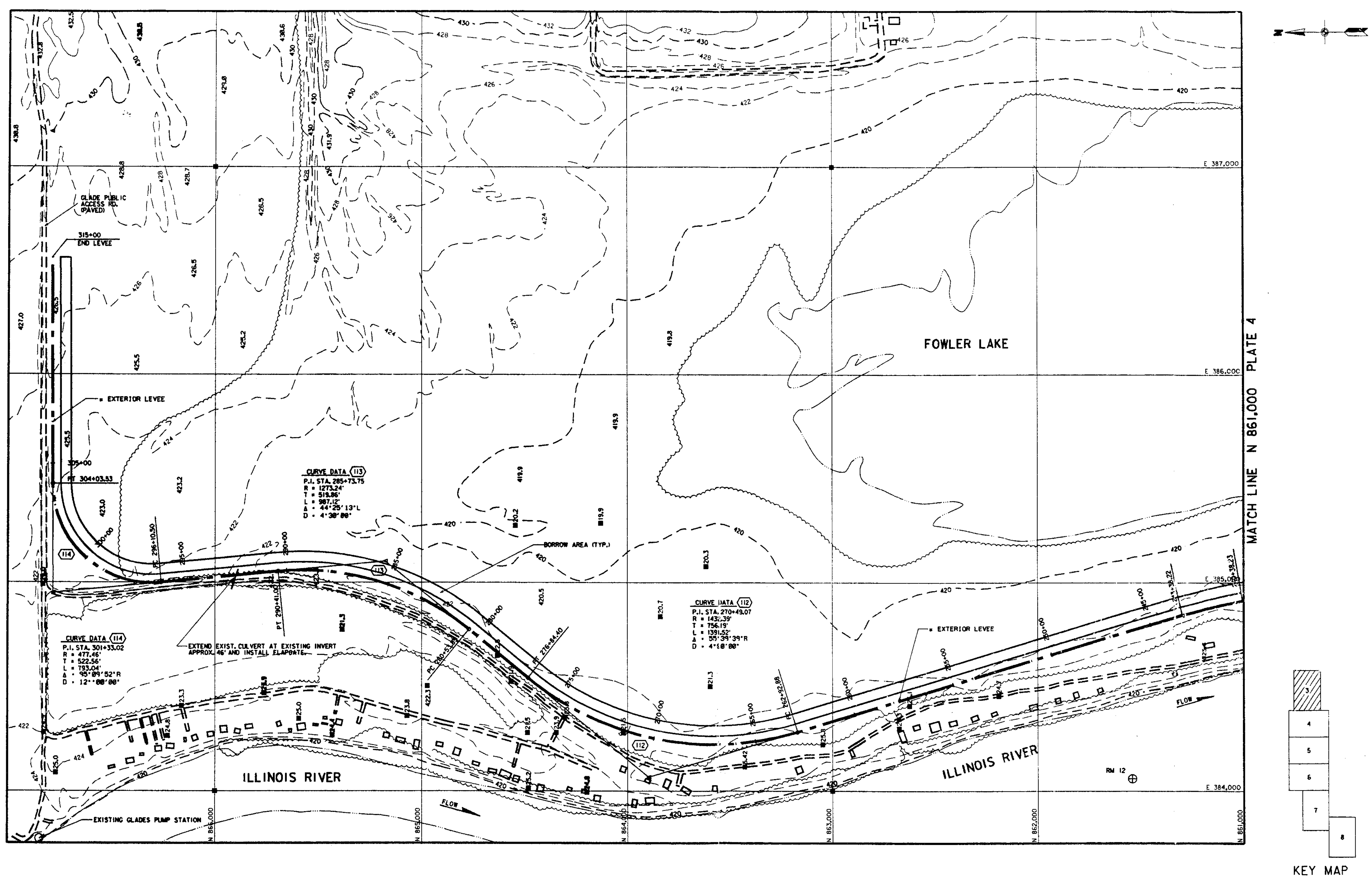
1. FOR DETAILS OF FISH PASSAGE AND STOPLOG STRUCTURES SEE PLATE 17.

LEGEND

- SLUICE GATED CMP CULVERTS
- STOP LOG STRUCTURE
- FISH PASSAGE STRUCTURE

SCALE: 1"=800'
800' 0 800'

U.S. ARMY ENGINEER DISTRICT, ST. LOUIS CORPS OF ENGINEERS ST. LOUIS, MISSOURI		
UPPER MISSISSIPPI RIVER BASIN DEFINITE PROJECT REPORT POOL 26, JERSEY COUNTY, ILLINOIS **ENVIRONMENTAL MANAGEMENT PROGRAM** STUMP LAKE HABITAT REHABILITATION PROJECT **GENERAL SITE PLAN**		
DESIGNED BY: D. MORRIS	DESIGN FILE: STSITE.DGN	PLATE 2
DATE: 10-22-90 PLOT SCALE: 800	SHEET NO. 2 OF 18	

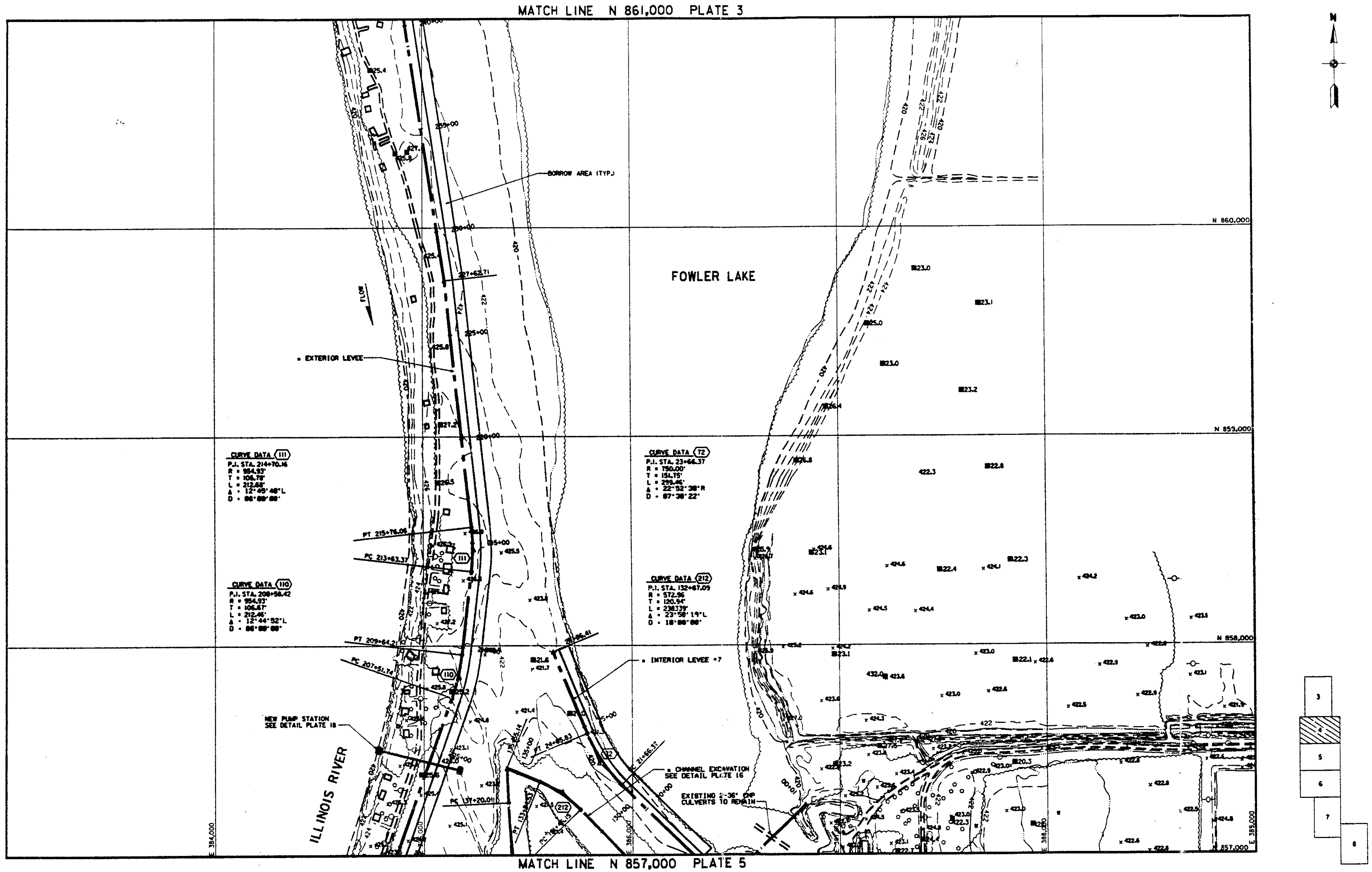


U.S. ARMY ENGINEER DISTRICT, ST. LOUIS
CORPS OF ENGINEERS
ST. LOUIS, MISSOURI

UPPER MISSISSIPPI RIVER BASIN
DEFINITE PROJECT REPORT
POOL 26, JERSEY COUNTY, ILLINOIS
ENVIRONMENTAL MANAGEMENT PROGRAM
STUMP LAKE
HABITAT REHABILITATION PROJECT

SITE PLAN

DESIGNED BY: D. MORRIS	DESIGN FILE: STPLN1.DGN	PLATE 3
DATE: 10-22-90	PLOT SCALE: 200	SHEET NO. 3 OF 18



KEY MAP

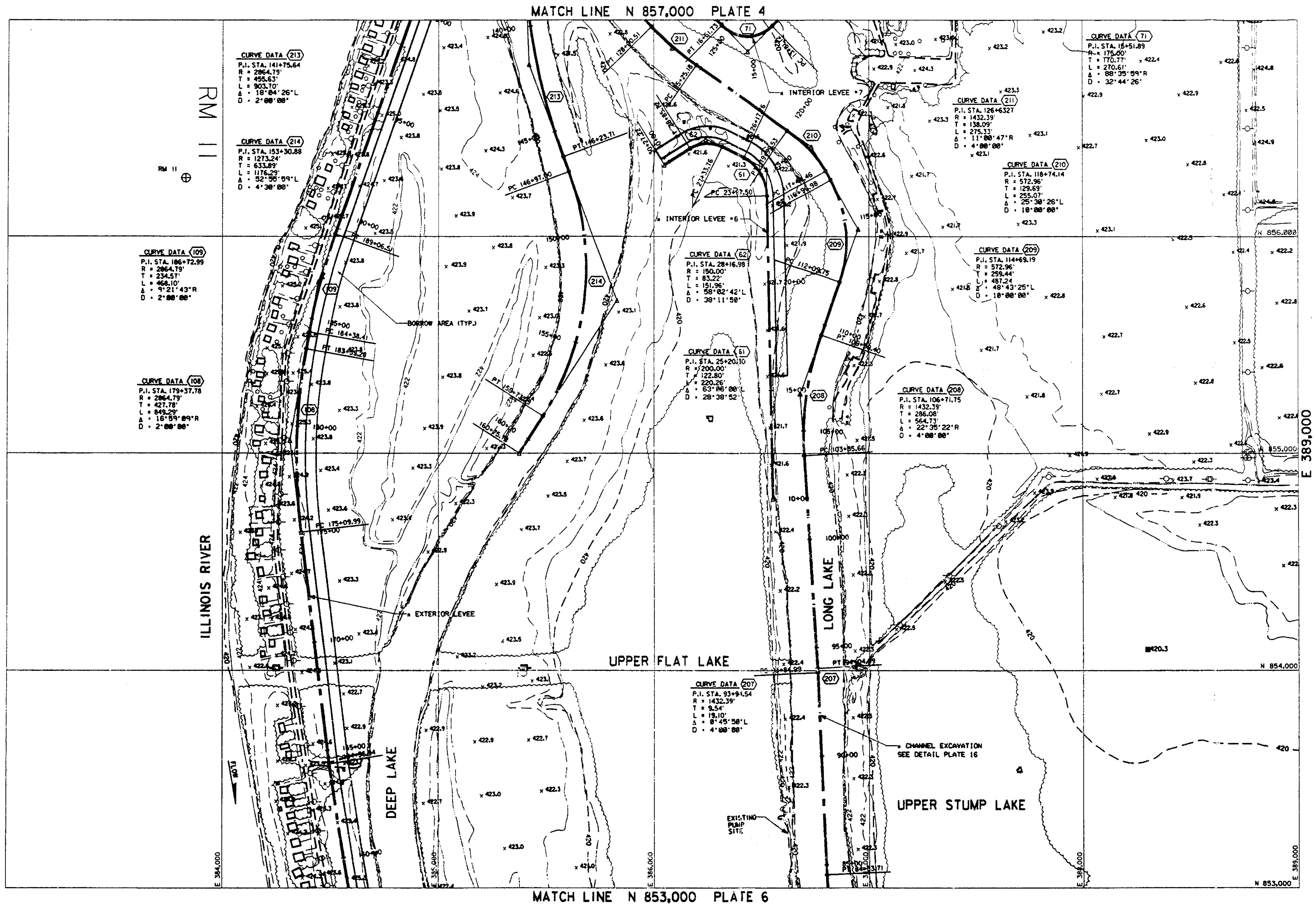
SCALE: 1"=200'
200' 0 200'

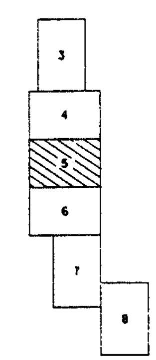
U.S. ARMY ENGINEER DISTRICT, ST. LOUIS
CORPS OF ENGINEERS
ST. LOUIS, MISSOURI

UPPER MISSISSIPPI RIVER BASIN
DEFINITE PROJECT REPORT
POOL 26, JERSEY COUNTY, ILLINOIS
ENVIRONMENTAL MANAGEMENT PROGRAM
STUMP LAKE
HABITAT REHABILITATION PROJECT

SITE PLAN

DESIGNED BY: D. MORRIS	DESIGN FILE: STPLN2.DGN	PLATE 4
DATE: 10-22-90 PLOT SCALE: 200	SHEET NO. 4 OF 18	





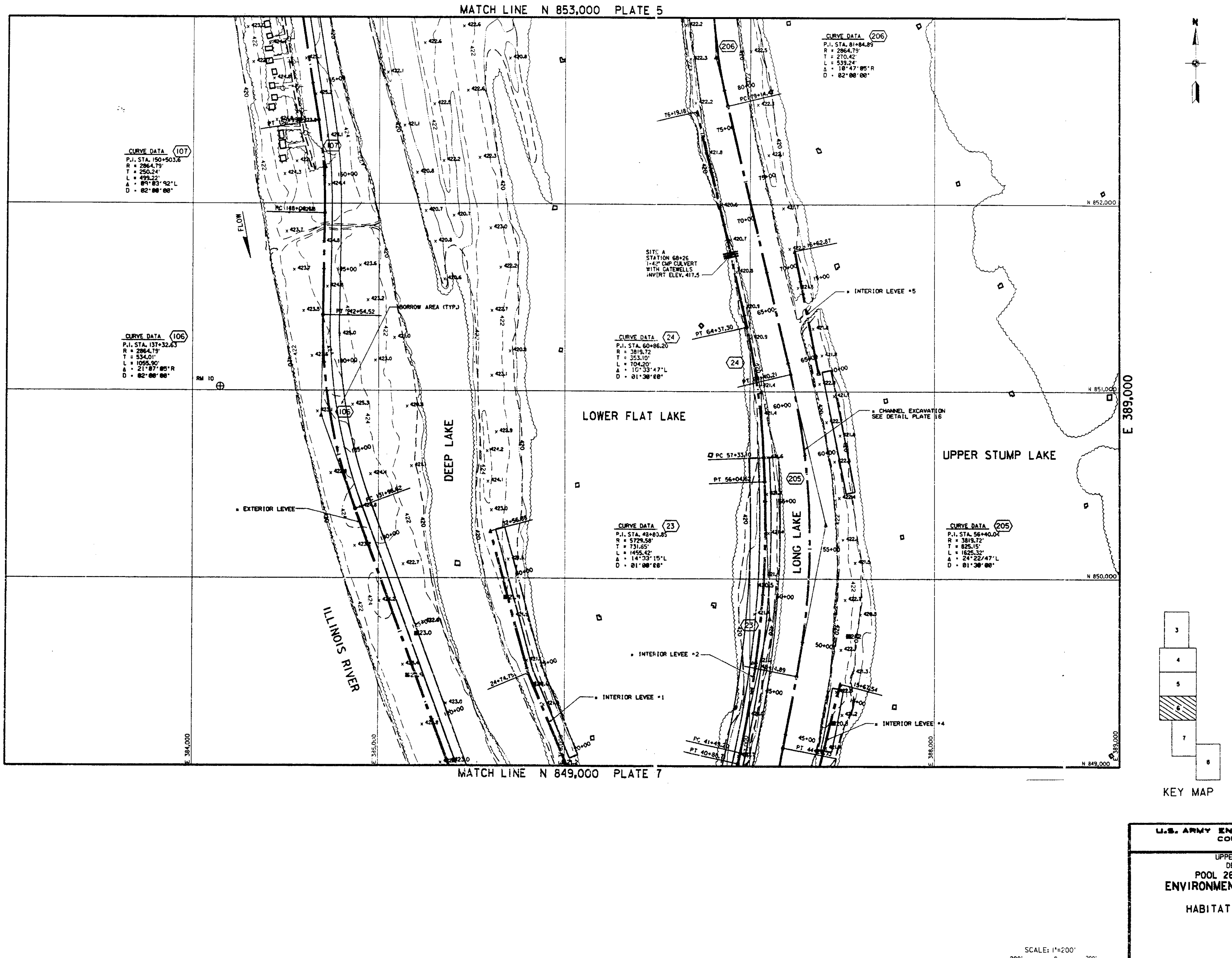
KEY MAP

U.S. ARMY ENGINEER DISTRICT, ST. LOUIS
CORPS OF ENGINEERS
ST. LOUIS, MISSOURI

UPPER MISSISSIPPI RIVER BASIN
DEFINITE PROJECT REPORT
POOL 26, JERSEY COUNTY, ILLINOIS
ENVIRONMENTAL MANAGEMENT PROGRAM
STUMP LAKE
HABITAT REHABILITATION PROJECT

SITE PLAN

DESIGNED BY: D. MORRIS	DESIGN FILE: STPLN3.DGN	PLATE 5
DATE: 10-22-90	PLOT SCALE: 200	SHEET NO. 5 OF 18

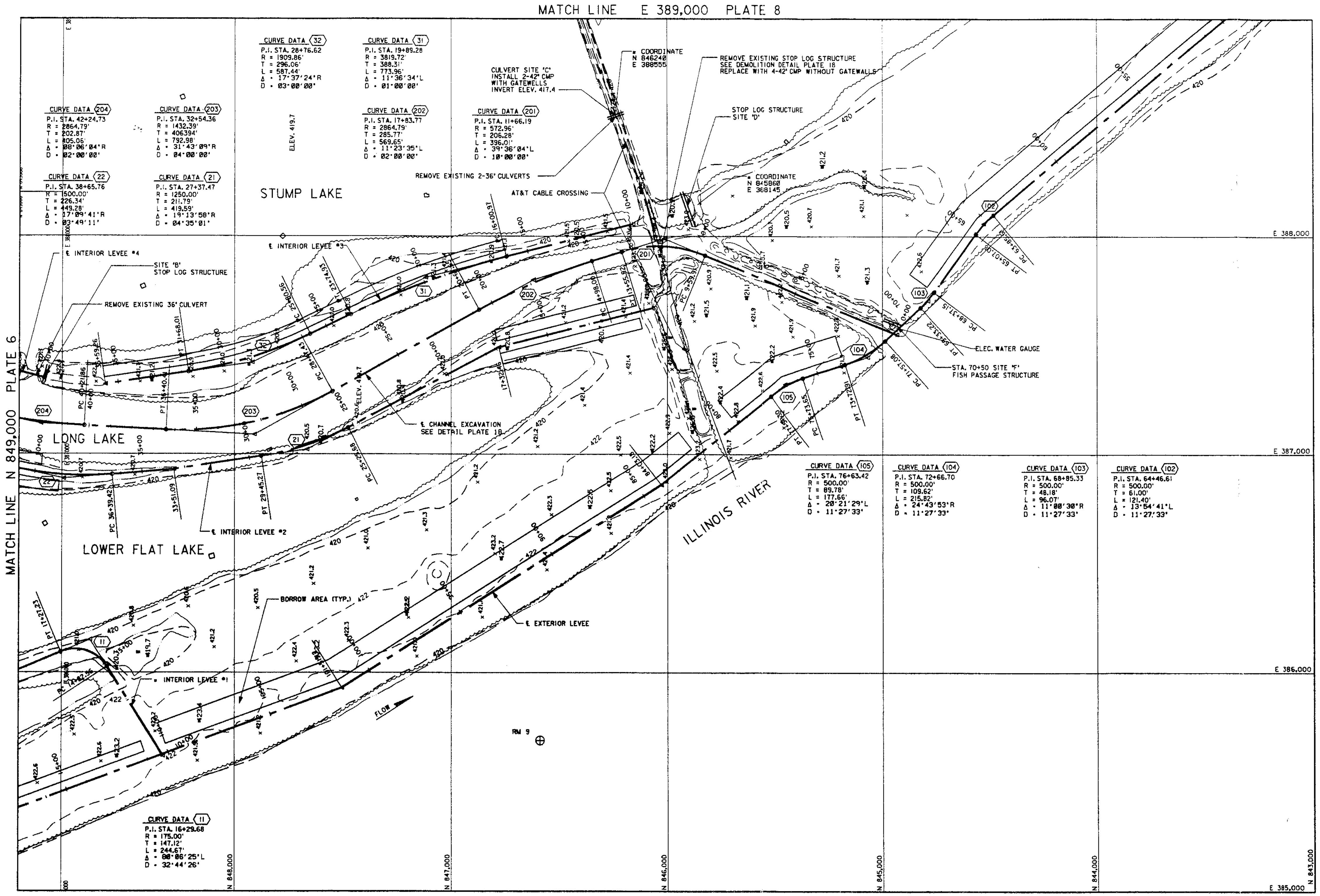


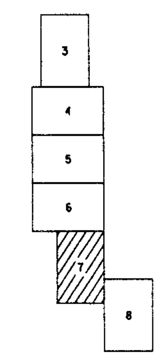
U.S. ARMY ENGINEER DISTRICT, ST. LOUIS
CORPS OF ENGINEERS
ST. LOUIS, MISSOURI

UPPER MISSISSIPPI RIVER BASIN
DEFINITE PROJECT REPORT
POOL 26, JERSEY COUNTY, ILLINOIS
ENVIRONMENTAL MANAGEMENT PROGRAM
STUMP LAKE
HABITAT REHABILITATION PROJECT

SITE PLAN

DESIGNED BY: D. MORRIS	DESIGN FILE: STPLN4.DGN	PLATE 6
DATE: 10-22-90 PLOT SCALE: 200	SHEET NO. 6 OF 18	





KEY MAP

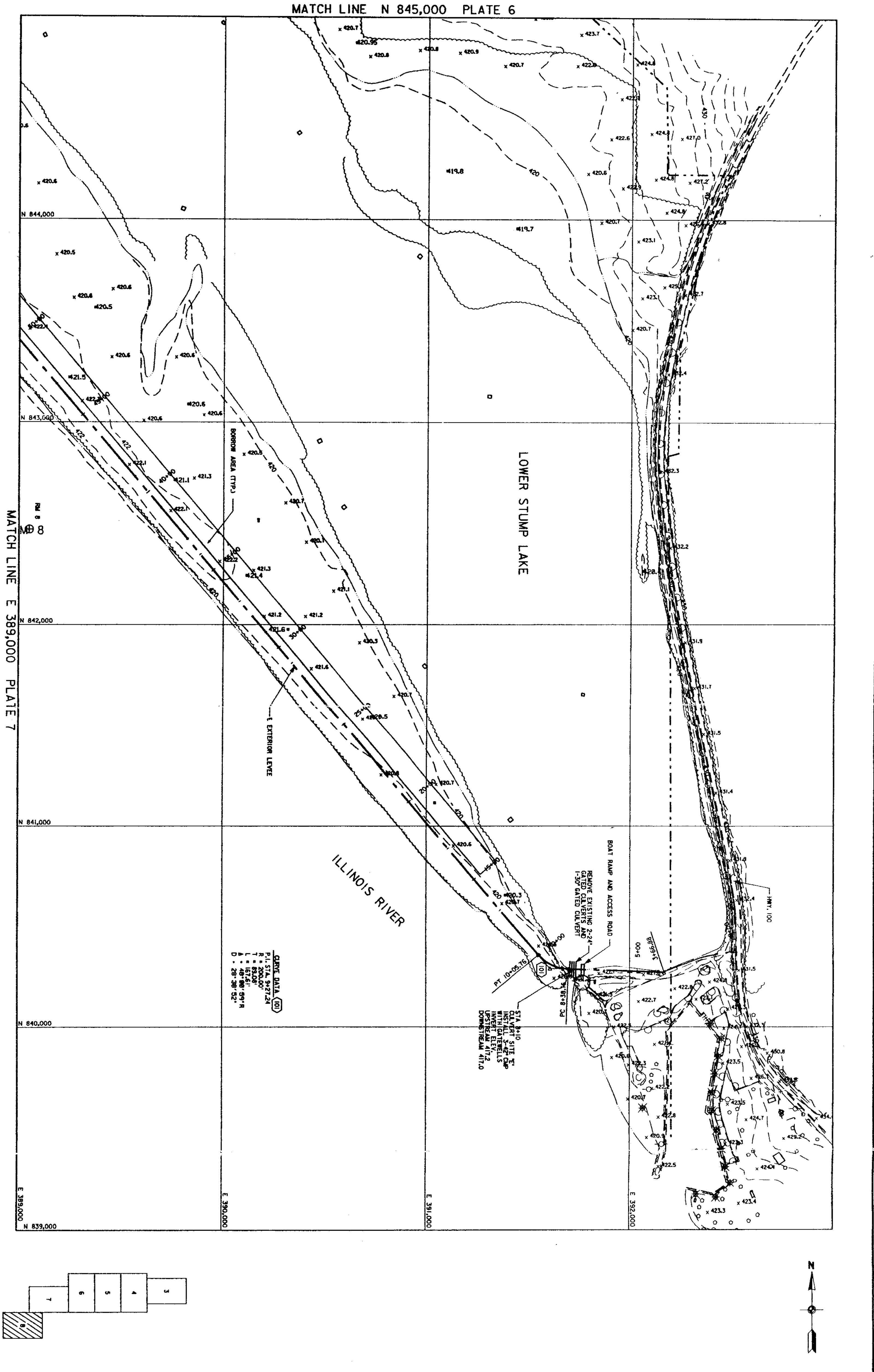
SCALE: 1"=200'
200' 0 200'

U.S. ARMY ENGINEER DISTRICT, ST. LOUIS
CORPS OF ENGINEERS
ST. LOUIS, MISSOURI

UPPER MISSISSIPPI RIVER BASIN
DEFINITE PROJECT REPORT
POOL 26, JERSEY COUNTY, ILLINOIS
ENVIRONMENTAL MANAGEMENT PROGRAM
STUMP LAKE
HABITAT REHABILITATION PROJECT

SITE PLAN

DESIGNED BY: D. MORRIS	DESIGN FILE: STPLN5.DGN	PLATE 7
DATE: 10-22-90 PLOT SCALE: 200	SHEET NO. 7 OF 18	



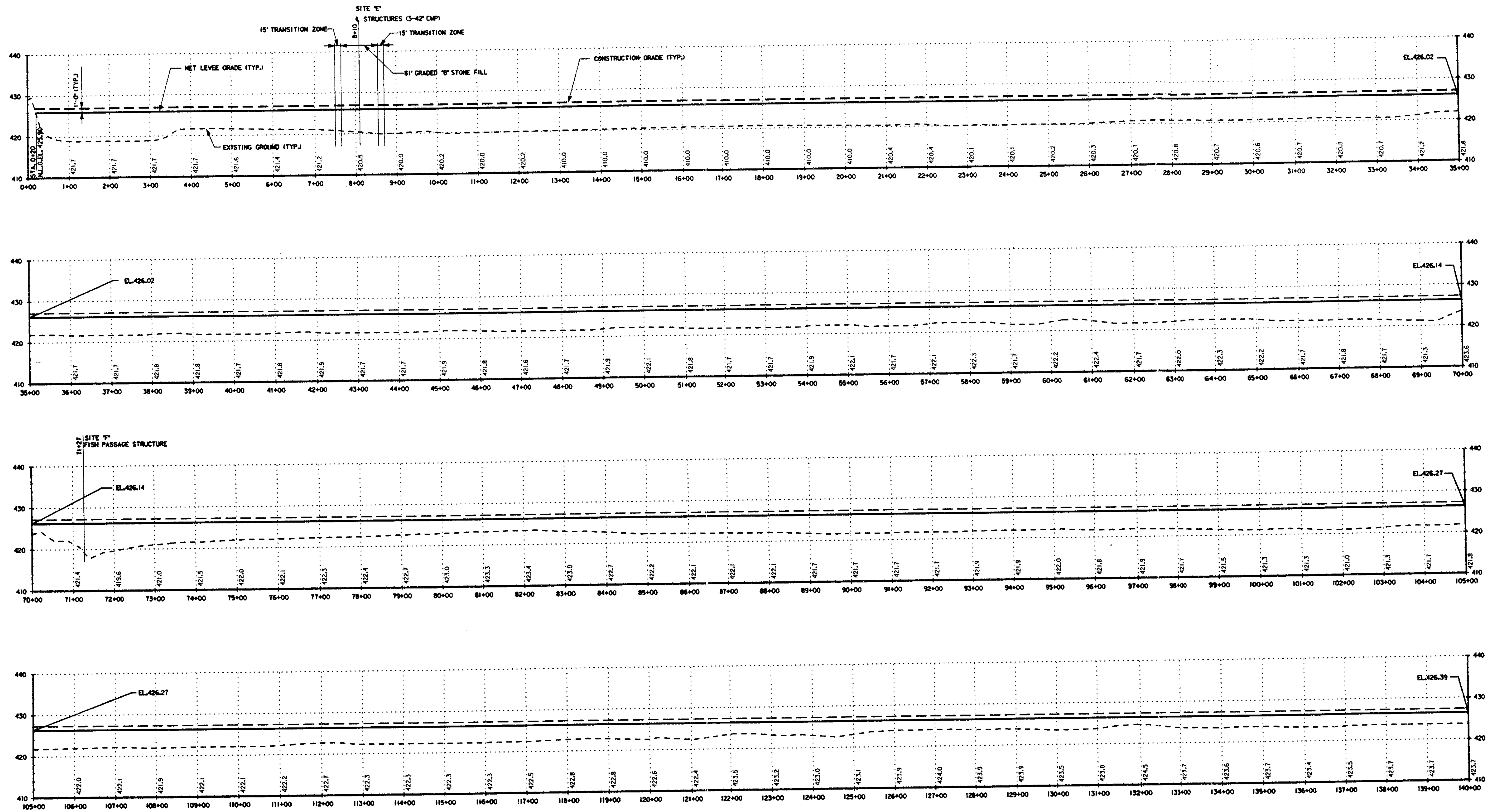
U.S. ARMY ENGINEER DISTRICT, ST. LOUIS
CORPS OF ENGINEERS
ST. LOUIS, MISSOURI

UPPER MISSISSIPPI RIVER BASIN
DEFINITE PROJECT REPORT
POOL 26, JERSEY COUNTY, ILLINOIS
ENVIRONMENTAL MANAGEMENT PROGRAM
STUMP LAKE
HABITAT REHABILITATION PROJECT

SITE PLAN

DESIGNED BY: D. MORRIS	DESIGN FILE: STPLN.DGN	
DATE: 10-22-90	PLOT SCALE: 200	SHEET NO. 8 OF 18

PLATE 8



HORIZONTAL SCALE: 1"=100'

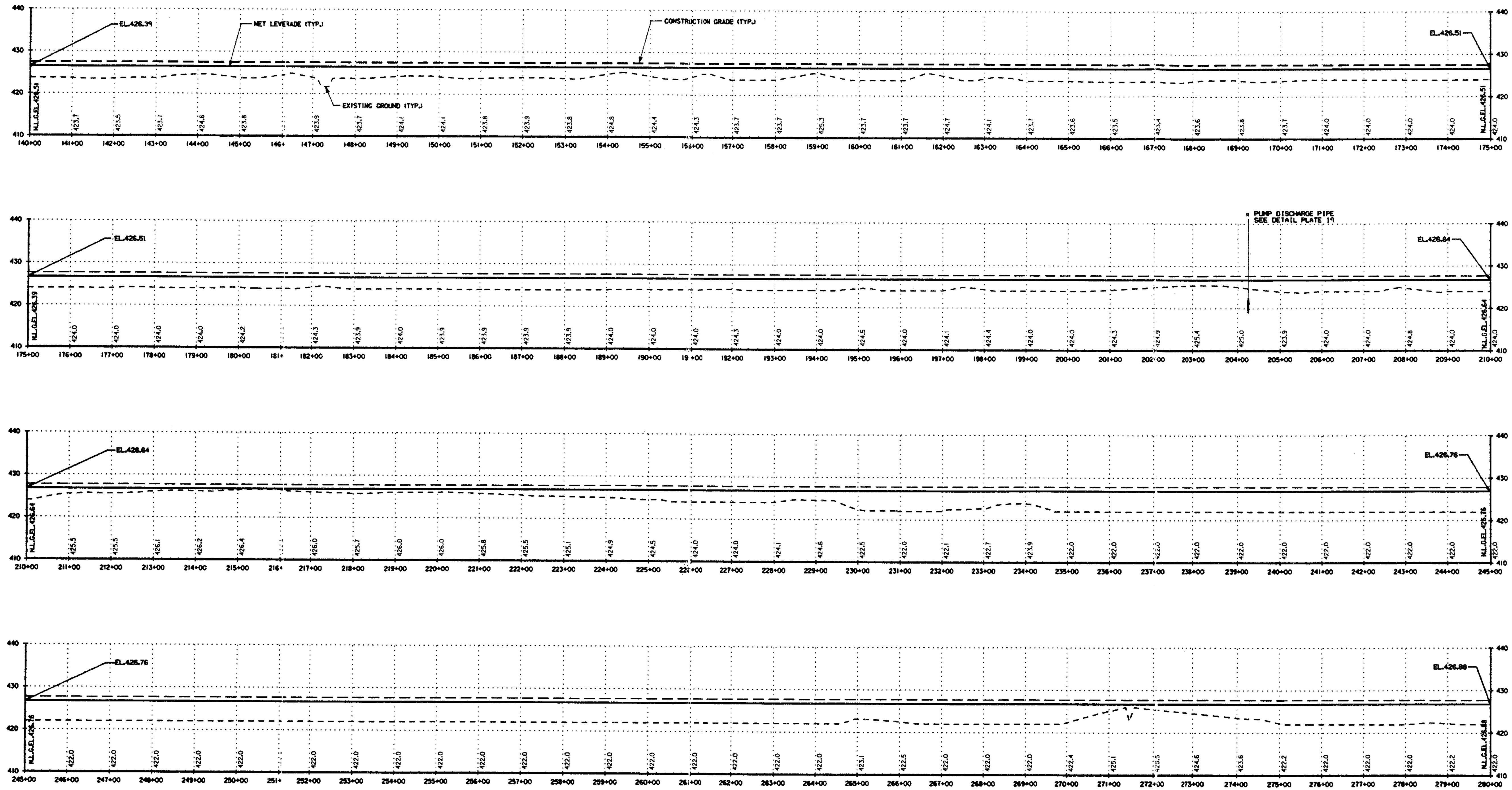
VERTICAL SCALE: 1"=10'

U.S. ARMY ENGINEER DISTRICT, ST. LOUIS
CORPS OF ENGINEERS
ST. LOUIS, MISSOURI

UPPER MISSISSIPPI RIVER BASIN
DEFINITE PROJECT REPORT
POOL 26, JERSEY COUNTY, ILLINOIS
ENVIRONMENTAL MANAGEMENT PROGRAM
STUMP LAKE
HABITAT REHABILITATION PROJECT

EXTERIOR LEVEE PROFILE
STA. 0+00 TO STA. 140+00

DESIGNED BY: J. FARAH	DESIGN FILE: PROIRVR	PLATE 9
DATE: 10-22-90 PLOT SCALE: 100	SHEET NO. 9 OF 18	



HORIZONTAL SCALE: 1"=100'

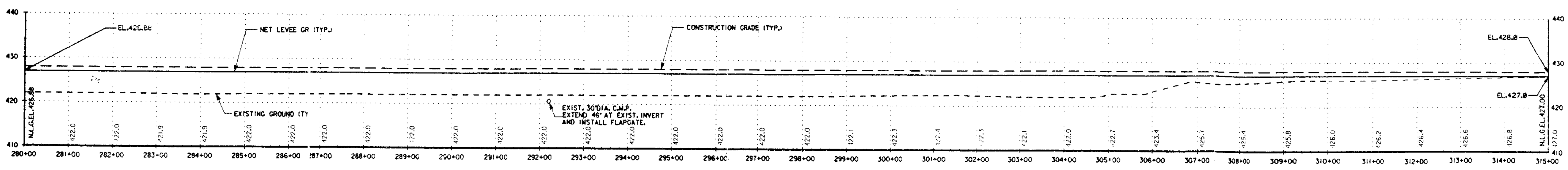
VERTICAL SCALE: 1"=10'

U.S. ARMY ENGINEER DISTRICT, ST. LOUIS
CORPS OF ENGINEERS
ST. LOUIS, MISSOURI

UPPER MISSISSIPPI RIVER BASIN
DEFINITE PROJECT REPORT
POOL 26, JERSEY COUNTY, ILLINOIS
ENVIRONMENTAL MANAGEMENT PROGRAM
STUMP LAKE
HABITAT REHABILITATION PROJECT

EXTERIOR LEVEE PROFILE
STA. 140+00 TO STA. 280+00

DESIGNED BY: J. FARAH	DESIGN FILE: PRO2RVR.DGN	PLATE 10
DATE: 10-22-90 PLOT SCALE: 100	SHEET NO. 10 OF 18	



HORIZONTAL SCALE: 1"=100'
100' 0 100'

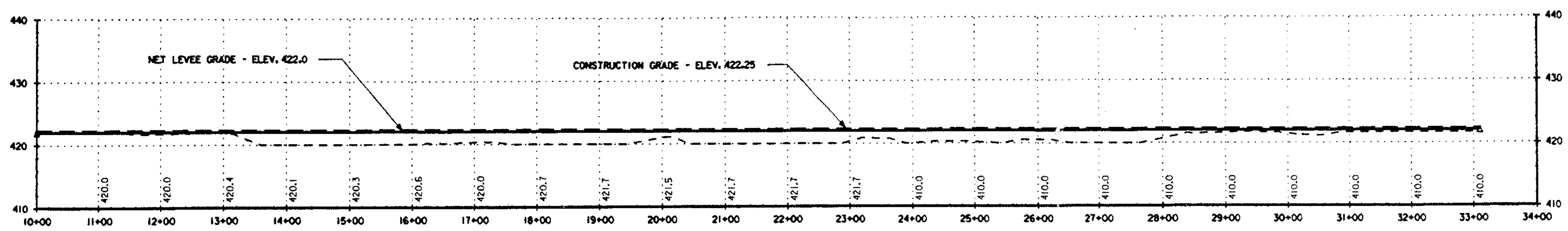
VERTICAL SCALE: 1"=10'
10' 0 10'

U.S. ARMY ENGINEER DISTRICT, ST. LOUIS
CORPS OF ENGINEERS
ST. LOUIS, MISSOURI

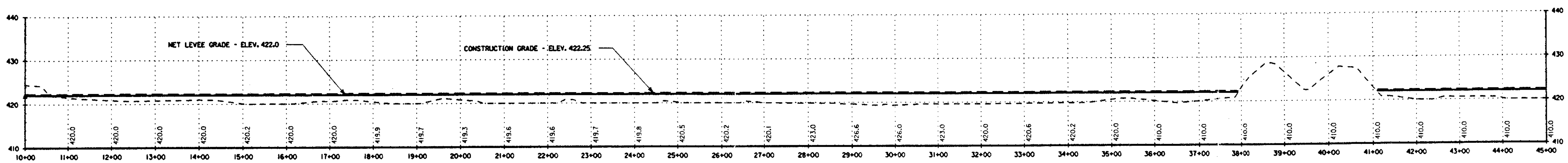
UPPER MISSISSIPPI RIVER BASIN
DEFINITE PROJECT REPORT
POOL 26, JERSEY COUNTY, ILLINOIS
ENVIRONMENTAL MANAGEMENT PROGRAM
STUMP LAKE
HABITAT REHABILITATION PROJECT

EXTERIOR LEVEE PROFILE
STA. 280+00 TO STA. 315+00

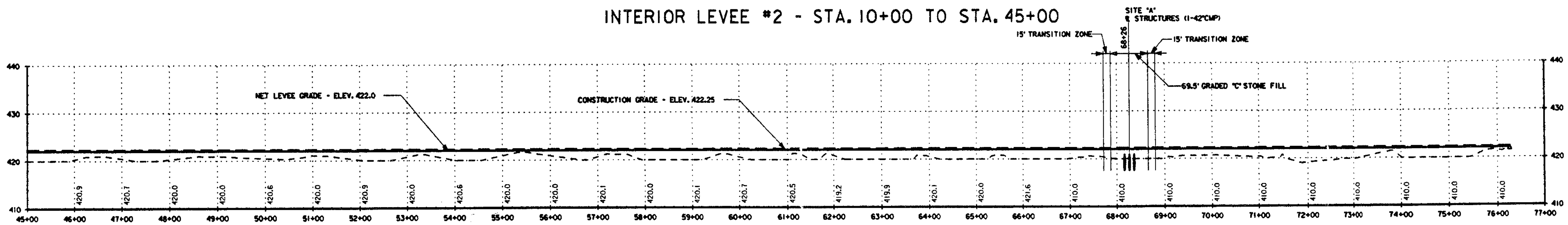
DESIGNED BY: J. FARAH	DESIGN FILE: PRO3RVR.DGN	PLATE 11
DATE: 10-22-90	PLOT SCALE: 100	SHEET NO. 11 OF 18



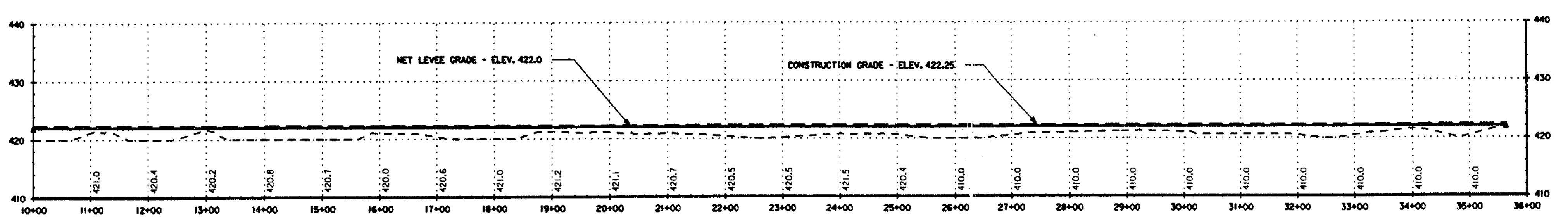
INTERIOR LEVEE #1



INTERIOR LEVEE #2 - STA. 10+00 TO STA. 45+00



INTERIOR LEVEE #2 - STA. 45+00 TO STA. 76+25



INTERIOR LEVEE #3

HORIZONTAL SCALE: 1"=100'

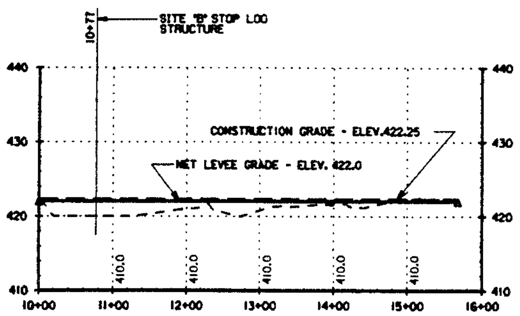
VERTICAL SCALE: 1"=10'

U.S. ARMY ENGINEER DISTRICT, ST. LOUIS
CORPS OF ENGINEERS
ST. LOUIS, MISSOURI

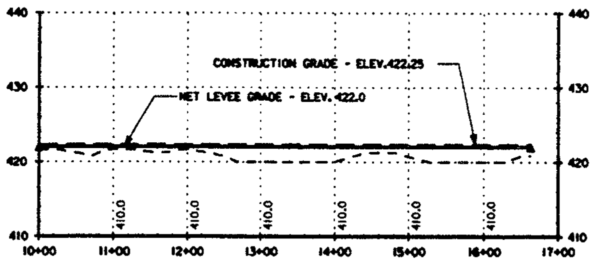
UPPER MISSISSIPPI RIVER BASIN
DEFINITE PROJECT REPORT
POOL 26, JERSEY COUNTY, ILLINOIS
ENVIRONMENTAL MANAGEMENT PROGRAM
STUMP LAKE
HABITAT REHABILITATION PROJECT

INTERIOR LEVEE PROFILES

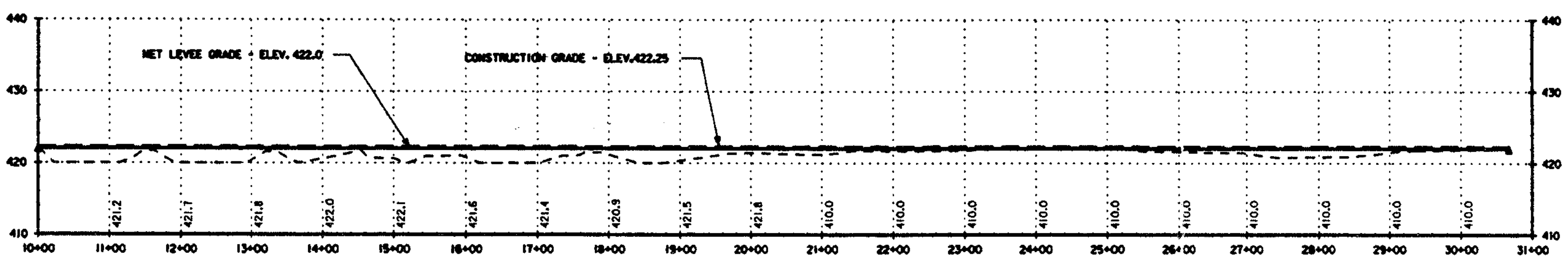
DESIGNED BY: J. FARAH	DESIGN FILE: PROIINLDGN	PLATE 12
DATE: 10-22-90 PLOT SCALE: 100	SHEET NO. 12 OF 18	



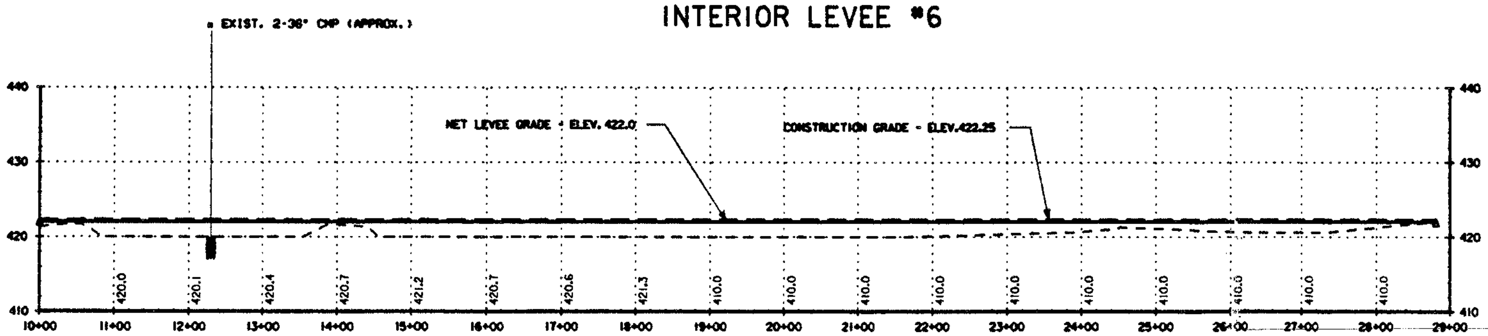
INTERIOR LEVEE #4



INTERIOR LEVEE #5



INTERIOR LEVEE #6



INTERIOR LEVEE #7

HORIZONTAL SCALE: 1"=100'
100' 0 100'

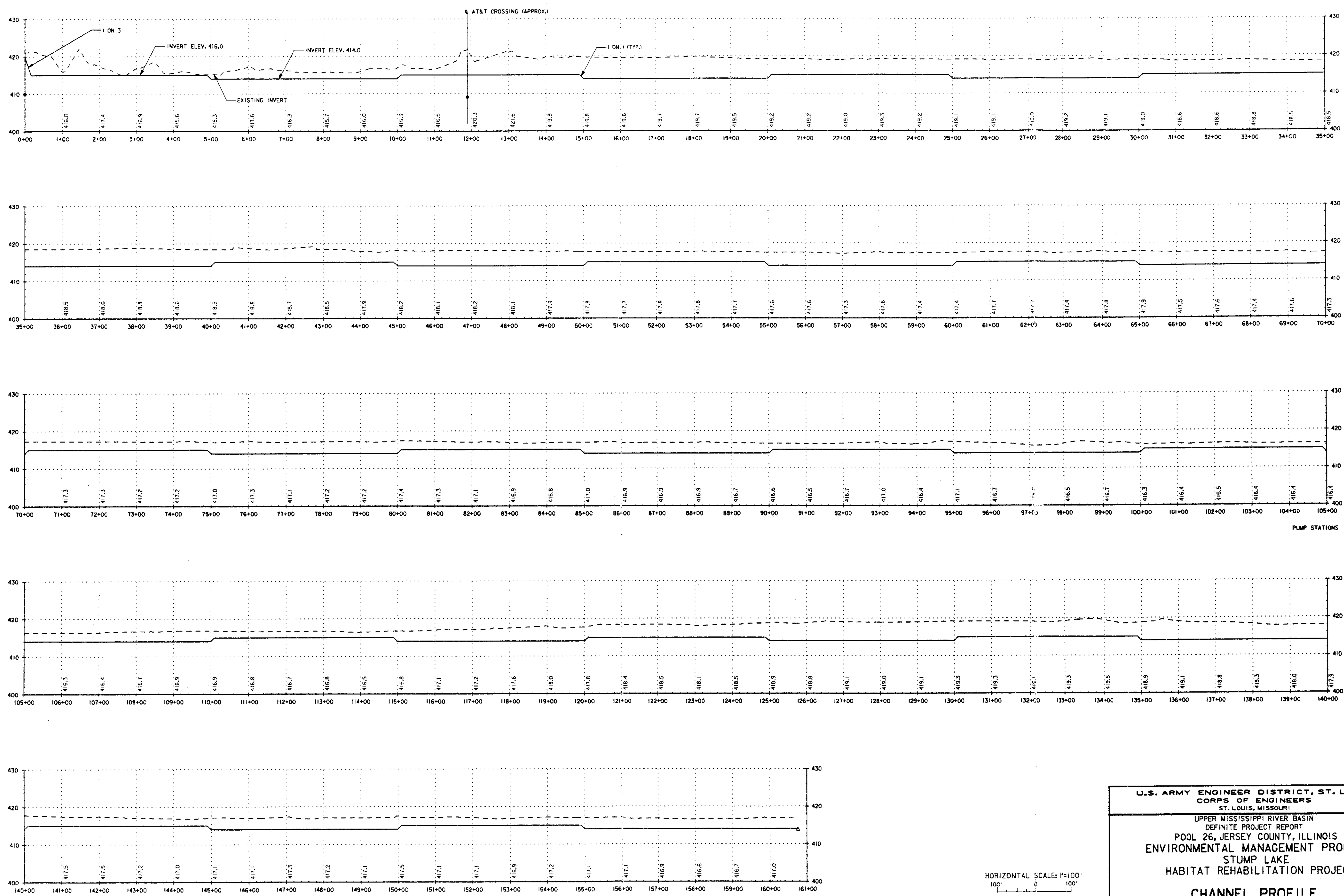
VERTICAL SCALE: 1"=10'
10' 0 10'

U.S. ARMY ENGINEER DISTRICT, ST. LOUIS
CORPS OF ENGINEERS
ST. LOUIS, MISSOURI

UPPER MISSISSIPPI RIVER BASIN
DEFINITE PROJECT REPORT
POOL 26, JERSEY COUNTY, ILLINOIS
ENVIRONMENTAL MANAGEMENT PROGRAM
STUMP LAKE
HABITAT REHABILITATION PROJECT

INTERIOR LEVEE PROFILES

DESIGNED BY: J. FARAH	DESIGN FILE: PRO2INN.DGN	PLATE 13
DATE: 10-22-90 PLOT SCALE: 100	SHEET NO. 13 OF 18	



HORIZONTAL SCALE: 1"=100'
100' 0 100'

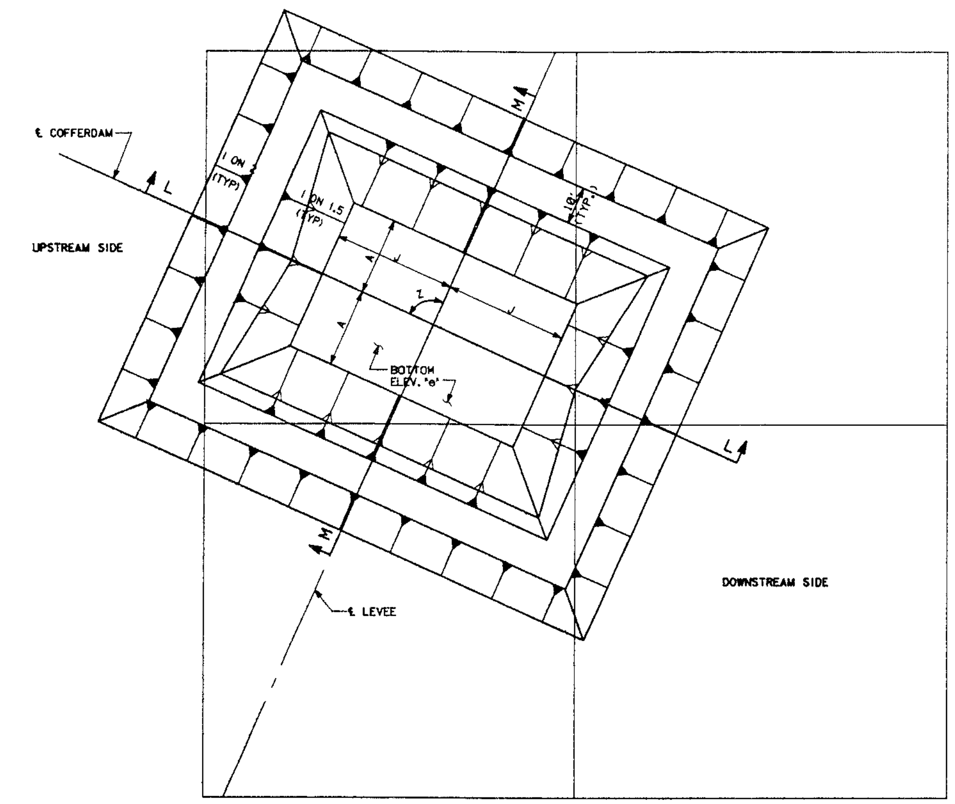
VERTICAL SCALE: 1"=10'
10' 0 10'

U.S. ARMY ENGINEER DISTRICT, ST. LOUIS
CORPS OF ENGINEERS
ST. LOUIS, MISSOURI

UPPER MISSISSIPPI RIVER BASIN
DEFINITE PROJECT REPORT
POOL 26, JERSEY COUNTY, ILLINOIS
ENVIRONMENTAL MANAGEMENT PROGRAM
STUMP LAKE
HABITAT REHABILITATION PROJECT

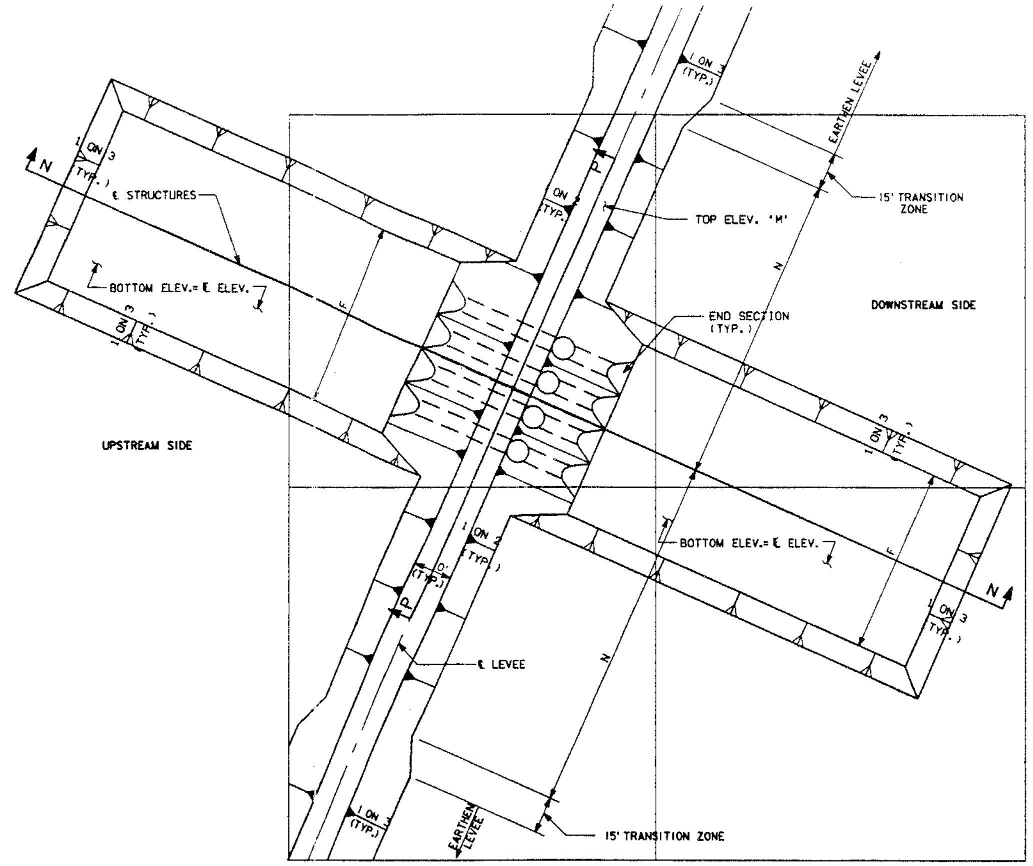
CHANNEL PROFILE
LONG LAKE AND UPPER DEEP LAKE

DESIGNED BY: J. FARAH	DESIGN FILE: CHANPRO.DGN	PLATE 14
DATE: 10-22-90 PLOT SCALE: 100	SHEET NO. 14 OF 18	



COFFERDAM PLAN

SCALE: 1" = 20'



STRUCTURE PLAN

SCALE: 1" = 20'

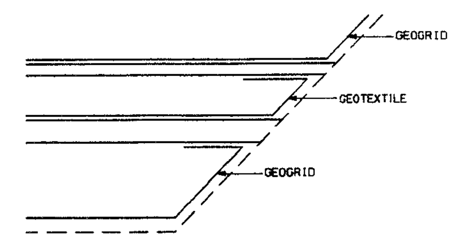
GENERAL NOTES

1. ALL SLOPES ARE 1 VERTICAL TO 2 HORIZONTAL UNLESS SHOWN OTHERWISE.
2. GRADED 'B' STONE, REQUIRED FOR THE LEVEE, WITHIN THE LIMITS OF THE COFFERDAM, MAY BE PLACED AFTER THE CONSTRUCTION OF THE DRAINAGE STRUCTURES IS COMPLETE EITHER AS A PART OF THE LEVEE WORK OR AS A PART OF THE DRAINAGE STRUCTURE INSTALLATION WORK.
3. GATEWELL RISER PIPE NOT SHOWN IN SECTION P-P FOR CLARITY. SEE DETAIL, PLATE 17.
4. THE COFFERDAM IS SHOWN IN SECTIONS N-N AND P-P FOR REFERENCE ONLY AND IS TO BE REMOVED AFTER INSTALLATION OF THE DRAINAGE STRUCTURES.
5. FOR LOCATION AND ℄ STATIONING OF SITES A,B,E AND F SEE PROFILE DRAWINGS, PLATES 9, 12, AND 13. FOR SITES C AND D SEE PLAN DRAWING, PLATE 7 FOR COORDINATE LOCATION.

TABLE I

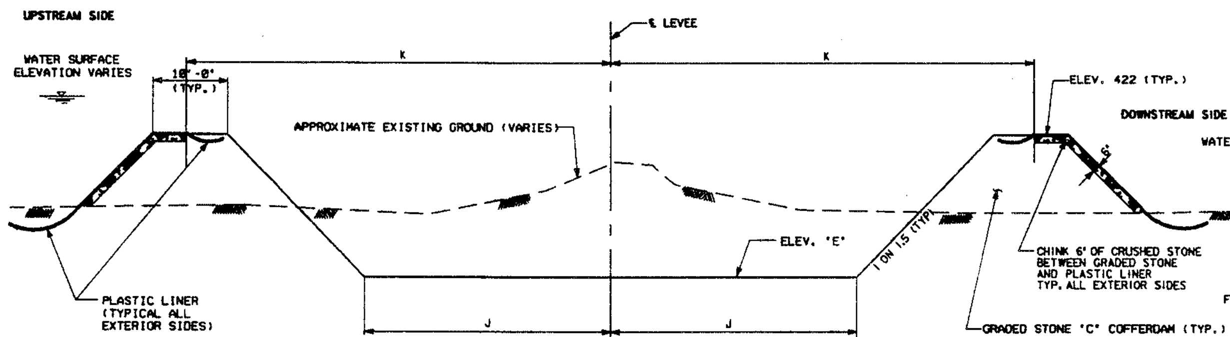
SITE	LEVEE PROFILE ELEVATION	NUMBER OF CMP / STRUCT.*	PIPE LENGTH	INVERT ELEVATION UP STRM.	INVERT ELEVATION D. STRM.	GRADED STONE TYPE	A	C	D	e	F	g	J	K	L	m	N	Z DEGREES
A	422	1	30	417.50	417.50	C	12	0	29.75	412.50	36	424.00	24	41.75	10	426.00	34.75	90
B	422	**	N/A	417.50	417.50	C	17	5	34.75	413.50	46	424.00	24	41.75	10	426.00	39.75	110
C	N/A	2	40	417.40	417.40	C	7	5	24.90	412.40	26	423.90	29	46.90	20	425.90	29.90	N/A
D	N/A	**	N/A	417.30	417.30	C	7	5	25.05	413.30	26	423.80	102	120.0	166	425.80	30.05	N/A
E	425.93	3	34	417.20	417.00	B	17	5	35.50	412.00	46	423.50	26	44.50	10	426.93	40.50	74
F	426.15	***	N/A	417.30	417.20	B	27	5	45.20	413.20	66	423.70	26	44.20	10	427.15	50.20	111

* ALL CMP PIPES ARE 42 INCH DIAMETER.
* ALL RISER STRUCTURES ARE 72" IN DIAMETER. SEE NOTE 6 FOR DRAINAGE STRUCTURE LOCATIONS.
** CONCRETE STOP LOG STRUCTURE
*** CONCRETE FISH PASSAGE STRUCTURE



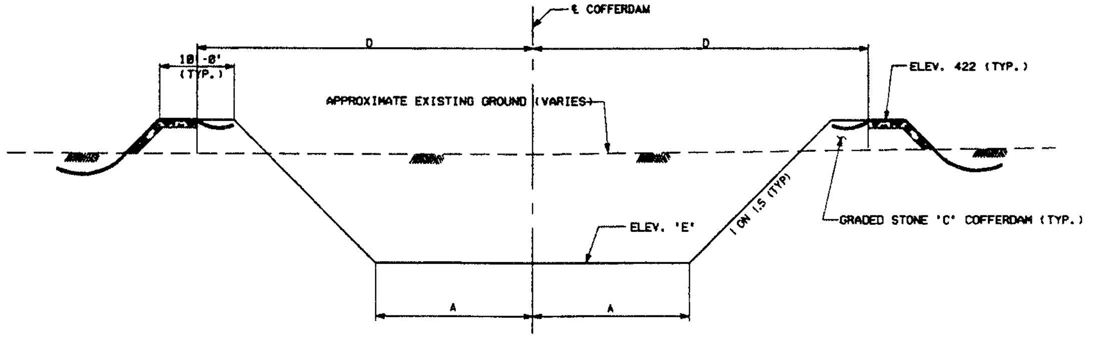
DETAIL

NO SCALE



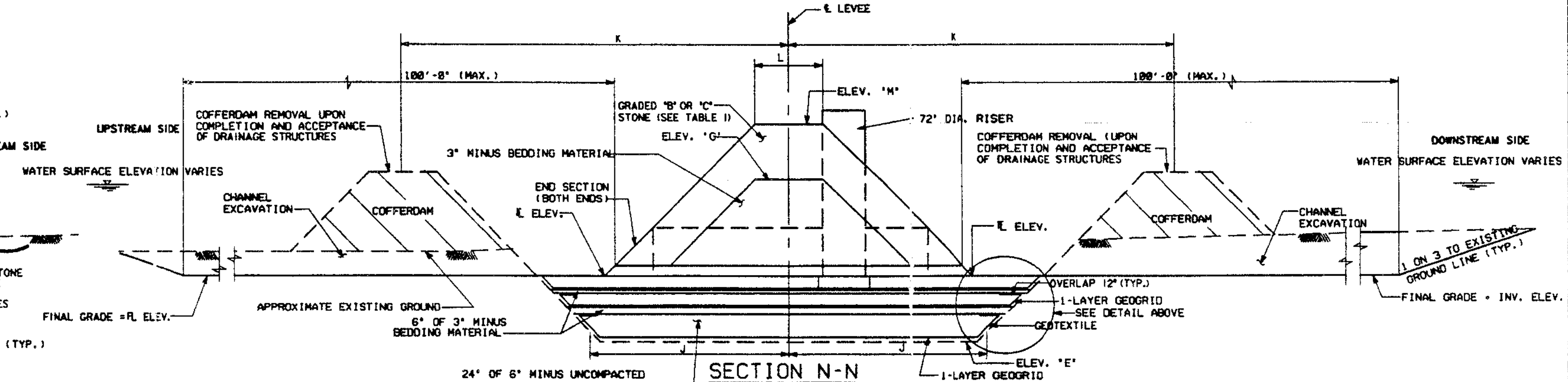
SECTION L-L

SCALE: 1" = 10' HORIZ. 1" = 5' VERT.



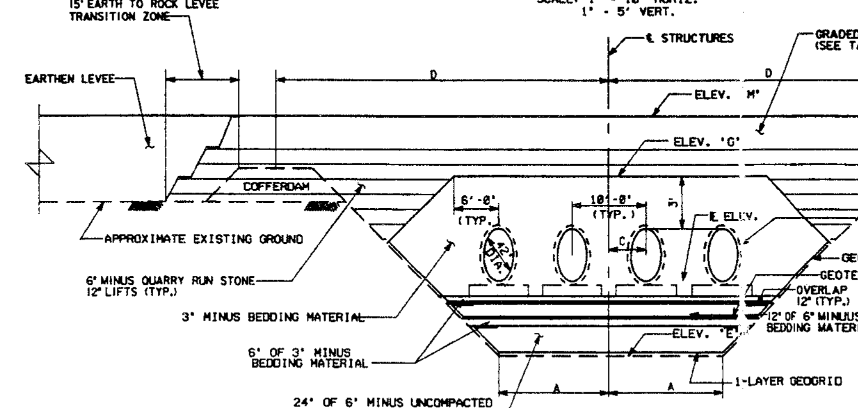
SECTION M-M

SCALE: 1" = 10' HORIZ. 1" = 5' VERT.



SECTION N-N

SCALE: 1" = 10' HORIZ. 1" = 5' VERT.



SECTION P-P

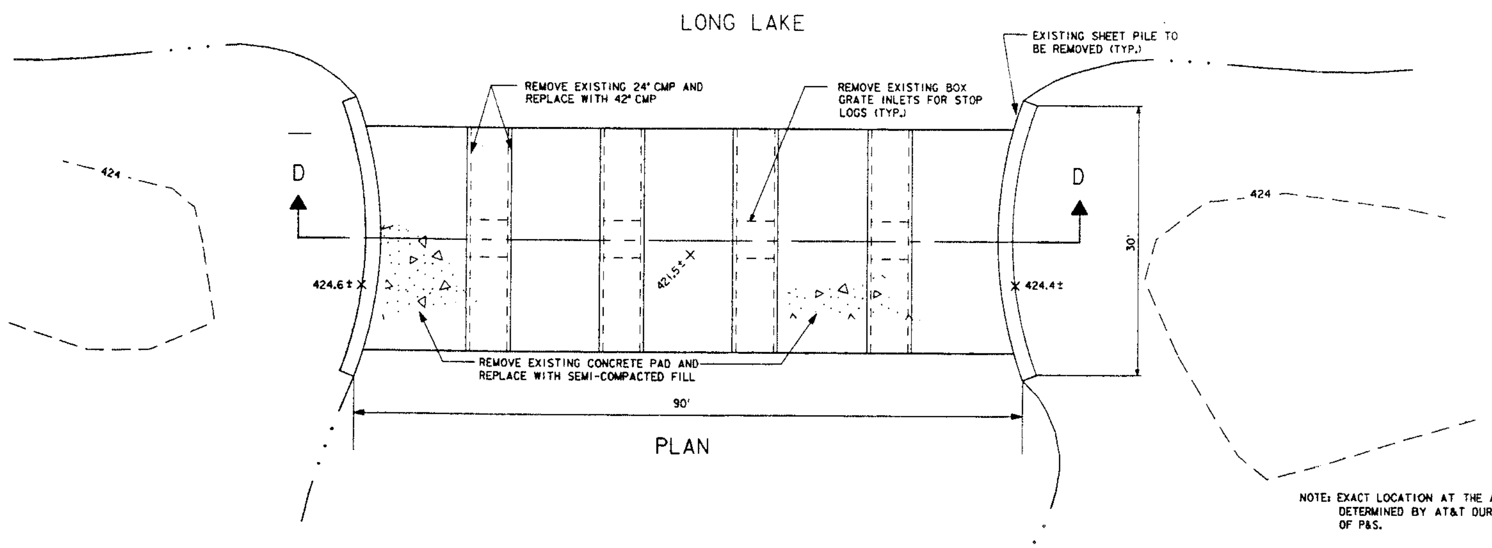
SCALE: 1" = 10' HORIZ. 1" = 5' VERT.

U.S. ARMY ENGINEER DISTRICT, ST. LOUIS
CORPS OF ENGINEERS
ST. LOUIS, MISSOURI

UPPER MISSISSIPPI RIVER BASIN
DEFINITE PROJECT REPORT
POOL 26, JERSEY COUNTY, ILLINOIS
ENVIRONMENTAL MANAGEMENT PROGRAM
STUMP LAKE
HABITAT REHABILITATION PROJECT

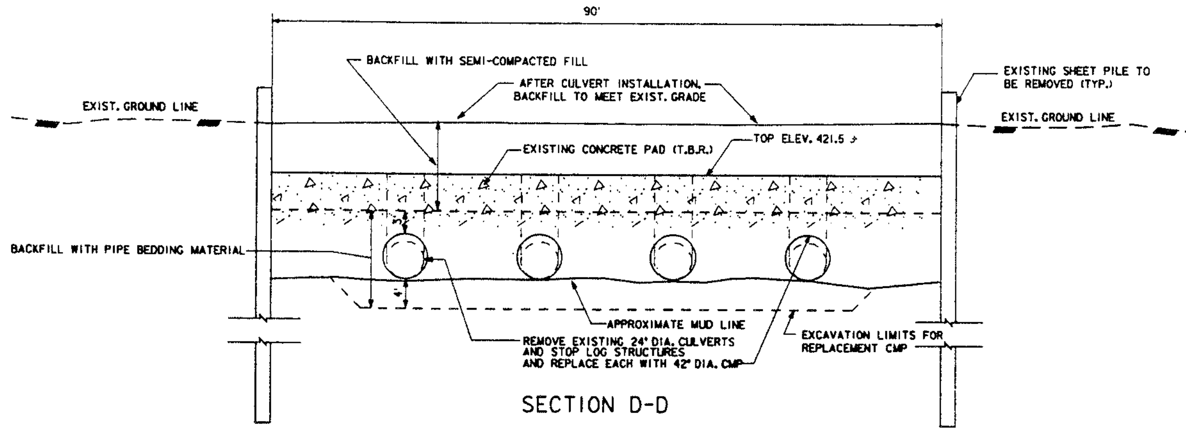
TYPICAL DRAINAGE STRUCTURE
PLANS AND SECTIONS

DESIGNED BY: J. FARAH	DESIGN FILE: STUDETI.DGN	PLATE 15
DATE: 10-22-90 PLOT SCALE: 20	SHEET NO. 15 OF 18	



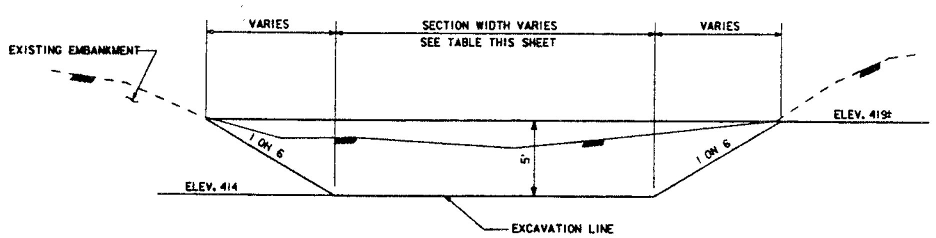
PLAN

NOTE: EXACT LOCATION AT THE AT&T CABLE WILL BE DETERMINED BY AT&T DURING PREPARATION OF P&S.



SECTION D-D

STOP LOG STRUCTURE
DEMOLITION & 42" CMP
REPLACEMENT INSTALLATION
NO SCALE

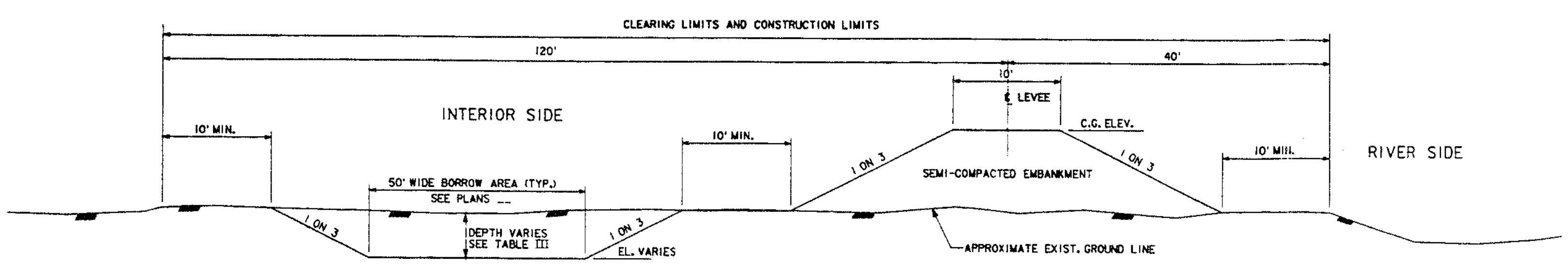


TYPICAL CHANNEL EXCAVATION
NO SCALE

TABLE II

CHANNEL EXCAVATION TRANSITION TABLE

STATION FROM	STATION TO	SECTION WIDTH
1+30	10+20	40
10+20	12+90	TRANSITION
12+90	131+45	60
131+45	133+50	TRANSITION
133+50	134+40	40
134+40	137+55	TRANSITION
137+55	154+16	60



TYPICAL SECTION
EARTHEN LEVEE
NO SCALE

TABLE III

BORROW AREA MAXIMUM DEPTH (EXTERIOR LEVEE)

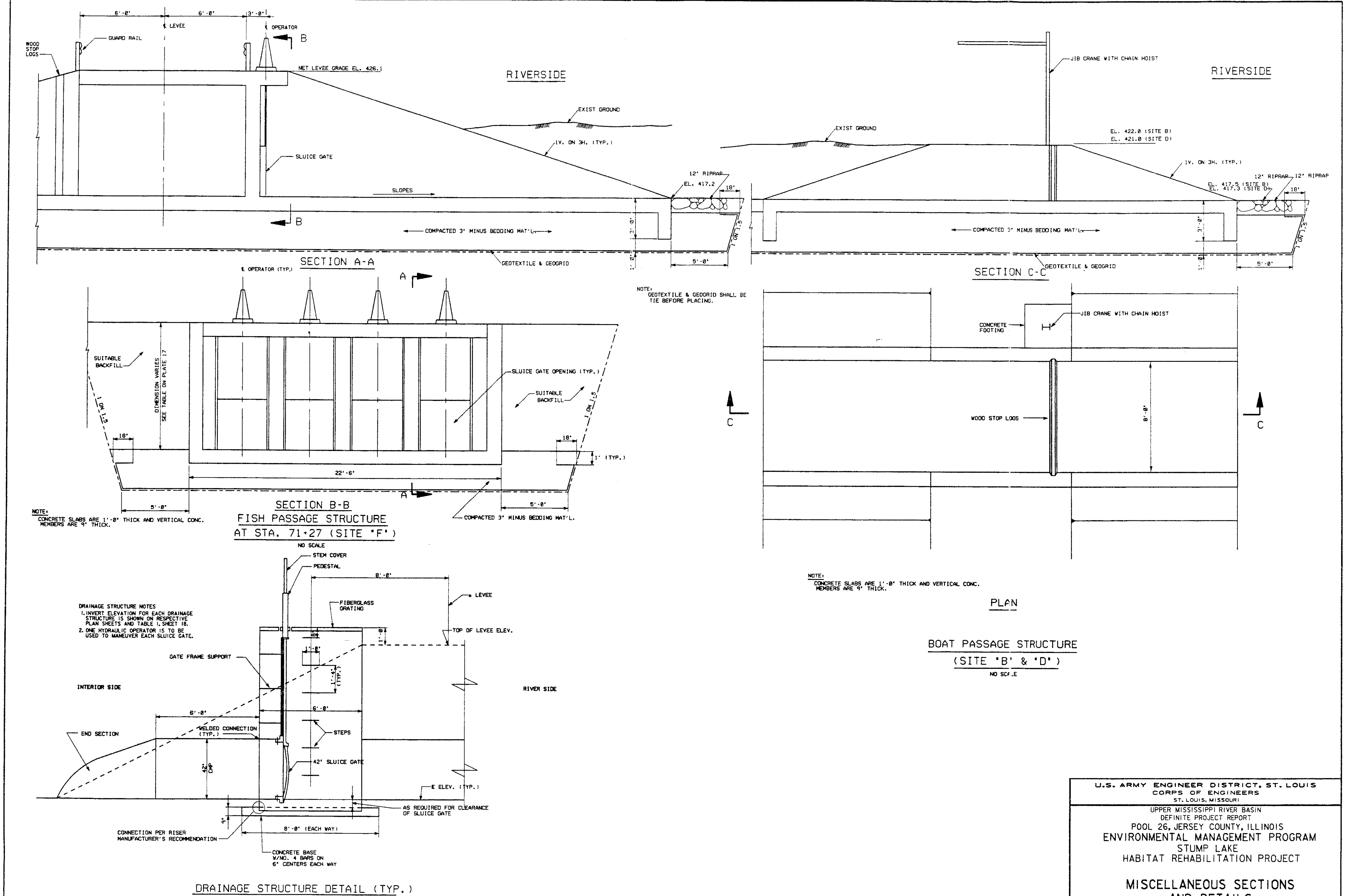
STATION FROM	STATION TO	MAXIMUM DEPTH (ft)
15+00	29+00	3
30+00	42+00	1.5
43+00	68+37	3
73+72	80+30	2
81+50	119+00	3
120+00	310+00	4

U.S. ARMY ENGINEER DISTRICT, ST. LOUIS
CORPS OF ENGINEERS
ST. LOUIS, MISSOURI

UPPER MISSISSIPPI RIVER BASIN
DEFINITE PROJECT REPORT
POOL 26, JERSEY COUNTY, ILLINOIS
ENVIRONMENTAL MANAGEMENT PROGRAM
STUMP LAKE
HABITAT REHABILITATION PROJECT

MISCELLANEOUS SECTIONS AND DETAILS

DESIGNED BY: J. FARAH	DESIGN FILE: STUDET3.DGN	PLATE 16
DATE: 10-22-90 PLOT SCALE: 10	SHEET NO. 16 OF 18	

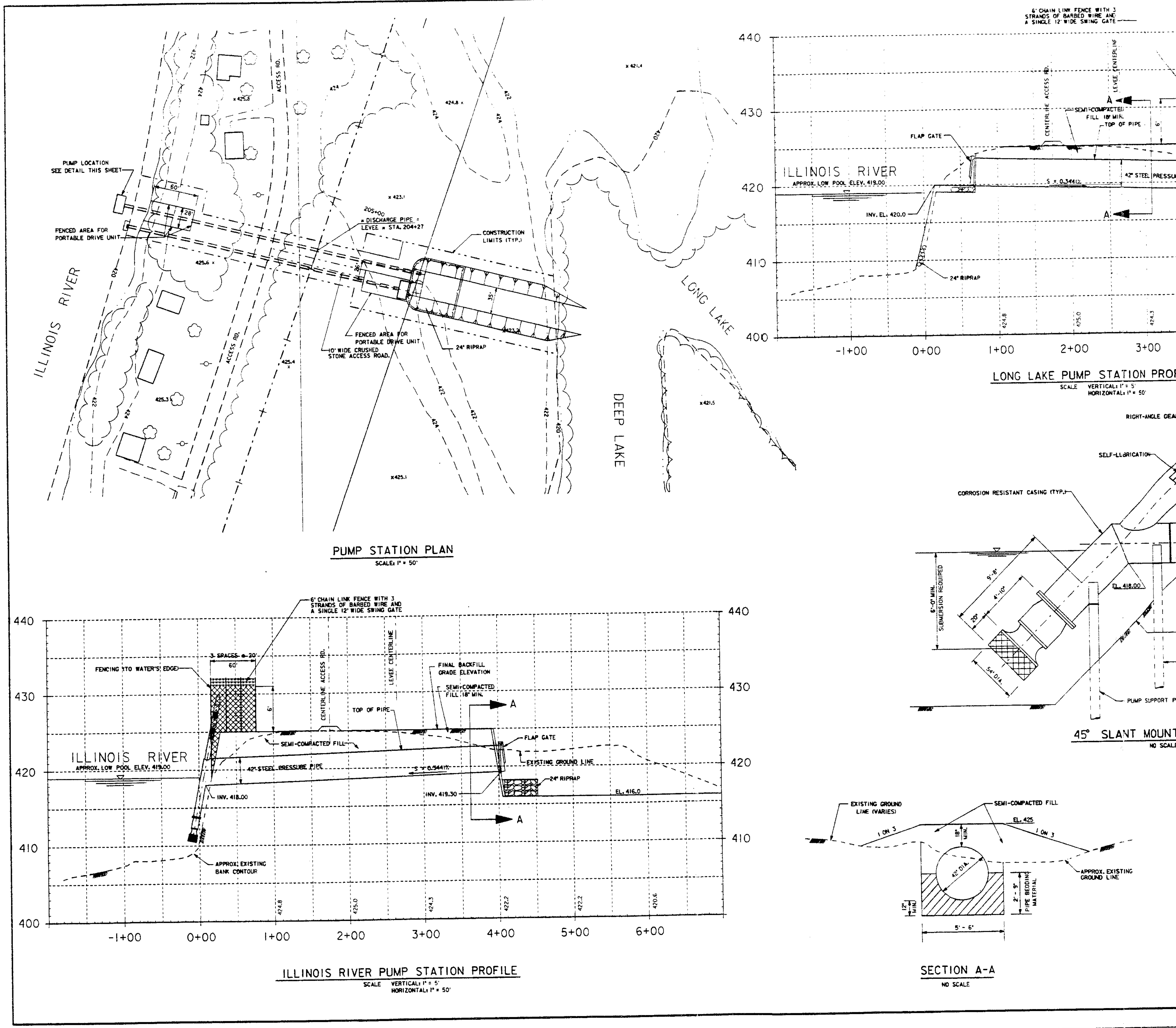


U.S. ARMY ENGINEER DISTRICT, ST. LOUIS
CORPS OF ENGINEERS
ST. LOUIS, MISSOURI

UPPER MISSISSIPPI RIVER BASIN
DEFINITE PROJECT REPORT
POOL 26, JERSEY COUNTY, ILLINOIS
ENVIRONMENTAL MANAGEMENT PROGRAM
STUMP LAKE
HABITAT REHABILITATION PROJECT

MISCELLANEOUS SECTIONS AND DETAILS

DESIGNED BY: J. FARAH	DESIGN FILE: STUMPL19.DGN	PLATE 17
DATE: 10-22-90 PLOT SCALE: 50	SHEET NO. 17 OF 18	



U.S. ARMY ENGINEER DISTRICT, ST. LOUIS
CORPS OF ENGINEERS
ST. LOUIS, MISSOURI

UPPER MISSISSIPPI RIVER BASIN
DEFINITE PROJECT REPORT
POOL 26, CALHOUN COUNTY, ILLINOIS
ENVIRONMENTAL MANAGEMENT PROGRAM
SWAN LAKE
HABITAT REHABILITATION PROJECT

PUMP STATION DETAILS

DESIGNED BW FARAH	DESIGN FILE:SWPL20	PLATE18
DATE 10-22-90	PLOT SCALE:60	SHEET NO8 OF8

UPPER MISSISSIPPI RIVER SYSTEM
ENVIRONMENTAL MANAGEMENT PROGRAM
DEFINITE PROJECT REPORT (SL-4)
AND
ENVIRONMENTAL ASSESSMENT

STUMP LAKE COMPLEX

HABITAT REHABILITATION AND ENHANCEMENT PROJECT

POOL 26, ILLINOIS RIVER
JERSEY COUNTY, ILLINOIS

TECHNICAL APPENDICES

FINAL

JULY 1991

US Army Corps
of Engineers
St. Louis District

Partners in Progress

DEFINITE PROJECT REPORT (SL-4)

UPPER MISSISSIPPI RIVER SYSTEM ENVIRONMENTAL MANAGEMENT PROGRAM
STUMP LAKE COMPLEX WETLAND HABITAT REHABILITATION AND ENHANCEMENT PROJECT
POOL 26, ILLINOIS RIVER, JERSEY COUNTY, ILLINOIS

APPENDICES

APPENDIX	**DESCRIPTION**
DPR-A	Letter of Intent and Draft Memorandum of Agreement for OM&R
DPR-B	Distribution List
DPR-C	Correspondence Pertaining to Draft DPR
DPR-D	Hydrology and Hydraulics
DPR-E	Project Habitat Quantification (WHAG and AHAG)
DPR-F	Biological Data
DPR-G	Cultural Resources Documentation
DPR-H	Fish and Wildlife Coordination Act Documentation
DPR-I	Endangered Species Act Documentation
DPR-J	Clean Water Act, Section 404(b)(1) Evaluation
DPR-K	Performance Evaluation Monitoring - Physical, Chemical Sampling Locations
DPR-L	Detailed Cost Estimate of Stump Lake Complex EMP-HREP
DPR-M	Wetland Functions and Values Assessment (WET)
DPR-N	Habitat Evaluation of Bottomland Hardwoods and Forested Wetlands (HES)

APPENDIX DPR-A

LETTERS OF INTENT AND DRAFT MEMORANDUM OF AGREEMENT FOR OM&R

FOREWORD

APPENDIX DPR-A provides a draft Memorandum of Agreement (MOA) between the St. Louis District and the U. S. Fish and Wildlife Service. In the Final, this appendix will also include signed letters from both the Illinois Department of Conservation and the Fish and Wildlife Service, indicating intent to accomplish the project's O&M activities in accordance with the provisions of the 1986 Water Resources Development Act.

DRAFT

MEMORANDUM OF AGREEMENT
BETWEEN
THE UNITED STATES FISH AND WILDLIFE SERVICE
AND
THE DEPARTMENT OF THE ARMY
FOR
ENHANCING FISH AND WILDLIFE RESOURCES
OF THE
UPPER MISSISSIPPI RIVER SYSTEM
AT THE
STUMP LAKE COMPLEX, ILLINOIS

I. PURPOSE

The purpose of this Memorandum of Agreement (MOA) is to establish the relationships, arrangements, and general procedures under which the U. S. Fish and Wildlife Service (FWS) and the Department of the Army (DOA) will operate in constructing, operating, maintaining, repairing, and rehabilitating the Stump Lake Complex, IL, separable element of the Upper Mississippi River System - Environmental Management Program (UMRS-EMP).

II. BACKGROUND

Section 1103 of the Water Resources Development Act of 1986, Public Law 99-662, authorizes construction of measures for the purpose of enhancing fish and wildlife resources in the Upper Mississippi River System. Under conditions of Section 906(e) of the Water Resources Development Act of 1986, Public Law 99-662, all construction costs of those fish and wildlife features on the Stump Lake Complex are 100 percent Federal, and all operation, maintenance, repair, and rehabilitation costs are to be cost shared 75 percent Federal and 25 percent non-Federal.

III. GENERAL SCOPE

The Project to be accomplished pursuant to this MOA shall consist of enhancing fish and wildlife habitat, by reducing sedimentation, by providing a means of water level control, and by implementing a variety of habitat management practices.

IV. RESPONSIBILITIES

a. DOA is responsible for:

(1) Construction: Construction of the Project, which consists of enhancing fish and wildlife habitat, by reducing sedimentation and by providing a means of water level control.

(2) Major Rehabilitation: Any mutually agreed upon rehabilitation of the project that exceeds the annual operation and maintenance requirements identified in the Definite Project Report and that is needed as a result of specific storm or flood events.

(3) Construction Management: Subject to and using funds appropriated by the Congress of the United States, DOA will construct the Stump Lake Complex Project as described in the Definite Project Report, "Stump Lake Complex Wetland Habitat Rehabilitation," dated September 1990, applying those procedures usually followed or applied in Federal projects, pursuant to Federal laws, regulations, and policies. The FWS will be afforded the opportunity to review and comment on all modifications and change orders prior to the issuance to the contractor of a Notice to Proceed. If DOA encounters potential delays related to construction of the Project, DOA will promptly notify FWS of such delays.

(4) Maintenance of Records: DOA will keep books, records, documents, and other evidence pertaining to costs and expenses incurred in connection with construction of the Project to the extent and in such detail as will properly reflect total costs. DOA shall maintain such books, records, documents, and other evidence for a minimum of three years after completion of construction of the Project and resolution of all relevant claims arising therefrom, and shall make available at its offices at reasonable times, such books, records, documents, and other evidence for inspection and audit by authorized representatives of the FWS.

b. FWS is responsible for:

(1) Operation, Maintenance, and Repair: Upon completion of construction, as determined by the District Engineer, St. Louis, the FWS shall accept the Project and shall operate, maintain and repair the Project as defined in the Definite Project Report entitled "Stump Lake Complex Wetland Habitat Rehabilitation," dated September 1990, in accordance with Section 906(e) of the Water Resources Development Act, Public Law 99-662.

(2) Non-Federal Responsibilities: In accordance with Section 906(e) of the Water Resources Development Act, Public Law 99-662, the FWS shall obtain 25 percent of all costs associated with the operation, maintenance, and repair of the Project from the Illinois Department of Conservation.

V. MODIFICATION AND TERMINATION

This MOA may be modified or terminated at any time by mutual agreement of the parties. Any such modification or termination must be in writing. Unless otherwise modified or terminated, this MOA shall remain in effect for a period of no more than 50 years after initiation of construction of the Project.

VI. REPRESENTATIVES

The following individuals, or their designated representatives, shall have authority to act under this MOA for their respective parties:

FWS: Regional Director,
U. S. Fish and Wildlife Service
Federal Building, Fort Snelling
Twin Cities, Minnesota 55111

DOA: District Engineer
U.S. Army Engineer District, St. Louis
1222 Spruce St.
St. Louis, Missouri 63103-2833

VII. EFFECTIVE DATE OF MOA

This MOA shall become effective when signed by the appropriate representatives of both parties.

THE DEPARTMENT OF THE ARMY	THE U. S. FISH AND WILDLIFE SERVICE
By:	By:
(Signature) JAMES D. CRAIG Colonel U.S. Army Engineer District St. Louis Corps of Engineers	(Signature) JAMES C. GRITMAN Regional Director U. S. Fish and Wildlife Service
Date ______________________	Date ______________________

DE
DP 6/4
PA Tues
PD

Illinois Department of Conservation
life and land together

LINCOLN TOWER PLAZA • 524 SOUTH SECOND STREET • SPRINGFIELD 62701-1787
CHICAGO OFFICE • ROOM 4-300 • 100 WEST RANDOLPH 60601

BRENT MANNING, DIRECTOR

May 31, 1991

Colonel James E. Corbin
District Engineer
St. Louis District, Corps of Engineers
1222 Spruce Street
St. Louis, Missouri 63103-2833

Cdl 4 Jun 91

Dear Colonel Corbin:

Members of my staff have worked closely with the St. Louis District, Corps of Engineers in preparation of the Definite Project Report for the Upper Mississippi River System Environmental Management Program, Stump Lake Habitat Rehabilitation Project. We are confident that construction of this project will result in a significant increase in both the quantity and quality of fish and wildlife habitat in the Stump Lake area.

The Department is prepared to serve as the non-federal sponsor and will cooperate with the U.S. Fish and Wildlife Service to assure that operation and maintenance activities, as described in the final Definite Project Report and any mutually agreed upon rehabilitation, will be accomplished in accordance with Section 906(e) of the Water Resources Development Act of 1986.

We look forward to a construction start on this project at the earliest possible date. Please do not hesitate to contact Mr. William R. Donels at the above address to further discuss this matter.

Sincerely,

Brent Manning

Brent Manning
Director

BM:WRD:gb

'91 MAY 31 A10:58
EXEC...
ST. LOUIS...

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Federal Building, Fort Snelling
Twin Cities, Minnesota 55111

TAKE PRIDE IN AMERICA

IN REPLY REFER TO:

FWS/ARW-SS

SEP 2 5 1991

Colonel James D. Craig
District Engineer
U.S. Army Engineer District, St. Louis
1222 Spruce Street
St. Louis, Missouri 63103-2833

Dear Colonel Craig:

The U.S. Fish and Wildlife Service (Service) has reviewed the Definite Project Report (SL-4) and Environmental Assessment dated July 1991 for the Stump Lake Complex Habitat Rehabilitation and Enhancement Project. This project, located in Pool 26 on the Illinois River, Jersey County, Illinois, is proposed under the Water Resources Development Act of 1986 (Public Law 99-662) as part of the Upper Mississippi River System Environmental Management Program.

The Stump Lake project has been coordinated with the Service and we approve and support the project as planned and described in the Definite Project Report. The Service agrees with the preferred alternative described in the Environmental Assessment, that of dike and containment levees, water control structures, sediment removal, water pumping, and sediment control. On January 22, 1991, the Refuge Manager, Mark Twain National Wildlife Refuge, found the project compatible with the purposes for which the Refuge was established, as required by the National Wildlife Refuge Administration Act.

The Service will assure operation and maintenance requirements of the project will be accomplished in accordance with Section 906(e) of the Water Resources Development Act of 1986. As stated in the Definite Project Report, the State of Illinois is responsible for any operation and maintenance.

We are anticipating meeting you on September 26 and the continued cooperative efforts of our two agencies in developing habitat rehabilitation and enhancement projects under the Environmental Management Program.

Sincerely,

James C. Gritman

James C. Gritman
Regional Director

APPENDIX DPR-B

DISTRIBUTION LIST

DISTRIBUTION LIST

STUMP LAKE COMPLEX
HABITAT REHABILITATION AND ENHANCEMENT PROJECT
POOL 26, ILLINOIS RIVER
JERSEY COUNTY, ILLINOIS

Distribution List	No. of Copies

ELECTED OFFICIALS (U.S.)

Honorable Alan J. Dixon
United States Senate
117 Post Office and Courthouse
Sixth and Monroe Streets
Springfield, Illinois 62701

Honorable Paul M. Simon
United States Senate
3 West Old State Capitol Plaza
Suite 1
Springfield, Illinois 62701

Honorable Richard J. Durbin
District No. 20
Representative in Congress
P.O. Box 790
Springfield, Illinois 62705

ELECTED OFFICIALS (IL STATE)

Honorable Tom Ryder
Representative, District 97
100 S. State
P.O. Box 385
Jerseyville, Illinois 62052

Honorable Vince Demuzio
Senator, District 49
237 E. First North
Carlinville, Illinois 62626

CORPS OFFICES

Commander, U.S. Army Engineer Division, Lower Mississippi Valley P.O. Box 80 Vicksburg, MS 39180-0080 ATTN: CELMV-PD-F	15
Commander, U.S. Army Engineer Division, North Central 536 Clark Street Chicago, IL 60605-1592 ATTN: CENCD-PD-PL	

CORPS OFFICES (Continued)

Commander, U.S. Army Engineer District,
Rock Island
P.O. Box 2004, Clock Tower Building
Rock Island, IL 61204-2004 ATTN: CENCR-PD

Commander, U.S. Army Engineer District,
St. Paul
1421 USPO and Custom House
180 East Kellogg Blvd.
St. Paul, MN 55101-1479 ATTN: CENCS-PD

FEDERAL AGENCIES (GENERAL)

Commander
Second Coast Guard District
1340 Olive Street
St. Louis, MO 63103

District Chief, WRD
U. S. Geological Survey
1400 Independence Survey
1400 Independence Road
Rolla, MO 65401

Mark Twain National Wildlife Refuge
U. S. Department of the Interior
311 North Fifth Street, Suite 100
Quincy, Illinois 62301

Regional Environmental Officer
U. S. Department of the Interior
Office of Environmental Project Review
175 West Jackson Boulevard
Chicago, Illinois 60604

Chairman, Advisory Council on
Historic Preservation
1100 Pennsylvania Avenue, Northwest
809 Old Post Office Building
Washington, DC 20004

Director, Office of Environmental 6
Project Review
Department of Interior, Room 4241
Washington, DC 20240

Regional Administrator 3
U. S. EPA, Region VII
230 South Dearborn
Chicago, Illinois 60604

Mr. William Franze, Chief
Environmental Review Branch
U.S. EPA, Region V
230 South Dearborn
Chicago, Illinois 60604

FEDERAL AGENCIES (GENERAL) - (Continued)

Ms. Patti Meyers
U. S. Fish and Wildlife Service
Mark Twain National Wildlife Refuge
Calhoun Division
P.O. Box 107
Brussels, Illinois 62013

Mr. Michael Bornstein
U.S. Fish and Wildlife Service
Mark Twain National Wildlife Refuge
Route 1 Box 75
Wapello, Iowa 52653

U. S. Fish and Wildlife Service
ATTN: Rick Nelson, LeRoy Sowl, Gail Carmody
1830 Second Avenue
Rock Island, Illinois 61201

Chief, Environmental Review Branch
U. S. Environmental Protection Agency
726 Minnesota Avenue
Kansas City, Kansas 66101

Mr. James C. Gritman — 5
Director, Region 3
U.S. Fish and Wildlife Service
ATTN: Chuck Gibbons
Federal Building, Ft. Snelling
Twin Cities, Minnesota 55111

Director — 2
Office of Federal Activities (A-104)
U. S. Environmental Protection Agency
401 M Street, Southwest
Washington, DC 20460

Director
FEMA
911 Walnut, Room 210
Kansas City, Missouri 64106

Deputy Assistant Secretary
for Environmental Affairs
U. S. Department of Commerce
Washington, DC 20230

U. S. Fish and Wildlife Service — 2
Southern Illinois Suboffice
ATTN: Tom Groutage
RR 3, Box 328
Marion, Illinois 62959

Mr. Gary Parker
State Conservationist
Soil Conservation Service
USDA
1902 Fox Drive
Champaign, Illinois 61820

FEDERAL AGENCIES (GENERAL) - (Continued)

Richard P. Macho
Area Conservationist
U. S. Soil Conservation Service
90 Kreige Farm Road
Edwardsville, Illinois 62025

Jerry Kaiser
U. S. Soil Conservation Service
604 East Franklin
Jerseyville, Illinois 62052

STATE AGENCIES (GENERAL)

Mr. Brent Manning, Director
Illinois Department of Conservation
524 South Second Street
Springfield, Illinois 62706

Director, Office of Planning
and Development
Illinois Department of Conservation
524 South Second Street
Springfield, Illinois 62706

Director
Illinois Department of Transportation
2300 S. Dirksen Parkway
Springfield, Illinois 62764

Mr. Jones Parks, Manager
Water Pollution Control Division
Illinois Environmental Protection Agency
2200 Churchill Road
Springfield, Illinois 62706

Mr. Don Vonnahme, Director
Division of Water Resources
Illinois Department of Transportation
2300 South Dirksen Parkway
Springfield, Illinois 62764

Mr. Rick Messinger
Illinois Department of Conservation
Region IV Headquarters
34 West Broadway
Alton, Illinois 62002

Mr. Thixton Miller
Illinois Department of Conservation
Division of Wildlife Resources
600 N. Grand Ave. West
Springfield, Illinois 62706

STATE AGENCIES (GENERAL) (Continued)

Mr. Norman Stucky Department of Conservation P.O. Box 180 Jefferson City, Missouri 65102	
Illinois Historic Preservation Agency ATTN: Thomas Emerson Union Station, 500 East Madison Springfield, Illinois 62656	
District Engineer, District 8 Illinois Department of Transportation 1100 Eastport Plaza Drive Collinsville, Illinois 62234	
Mr. Bill Donels Illinois Department of Conservation Division of Planning 524 South Second Street Springfield, Illinois 62706	2
Mr. Neil Booth Illinois Department of Conservation Mississippi River State Fish and Wildlife Area RR 1, Box 182 Grafton, Illinois 62037	2
Site Superintendent Pere Marquette State Park Illinois Department of Conservation Post Office Box 158 Grafton, Illinois 62037	
Mr. Butch Atwood Illinois Department of Conservation Division of Fisheries 1000 Killarney Drive Greenville, Illinois 62246	
Mr. Dave Harper Illinois Department of conservation 34 West Broadway Alton, Illinois 62002	
Dr. Steve Havera Illinois Natural History Survey Forbes Biological Station Box 599 Havana, Illinois 62644	

Distribution List	No. of Copies

JERSEY COUNTY OFFICIALS

Chairman
Jersey County Board
Jerseyville, Illinois 62052

Mr. William C. Halemeyer, Chairman
Jersey County Soil and
Water Conservation District
604 E. Franklin
Jerseyville, Illinois 62052

PRIVATE INDIVIDUALS AND ORGANIZATIONS (GENERAL)

Coalition for the Environment
6267 Delmar
University City, Missouri 63130

Missouri Botanical Garden
2315 Tower Grove Avenue
St. Louis, Misosuri 63110

Sierra Club, Ozark Chapter
1005A South Big Bend Boulevard
St. Louis, Missouri 63117

Izaak Walton League
c/o Mr. Paul Hansen
6601 Auto Club Road
Minneapolis, Minnesota 55438

Migratory Waterfowl Hunters,
Incorporated
ATTN: Dan Hudgins, Greg Franke and John Allen — 2
P.O. Box 8009
Alton, Illinois 62002

Director
Nature Conservancy
79 West Monroe, Suite 708
Chicago, Illinois

Conservation Chairperson
Sierra Club
Great Lakes Chapter
506 South Wabash, Room 525
Chicago, Illinois 60605

Mr. G. Tanner Girard
Illinois Nature Preserves Commission
Principia College
Elsah, Illinois 62028

Ms. Holly Stoerker
Upper Mississippi River Basin
Association
415 Hamm Building
408 St. Peter Street
St. Paul, Minneapolis 55102

PRIVATE INDIVIDUALS AND ORGANIZATIONS (GENERAL) (Continued)

Mr. Don Pierce
Vice Chairman of the Illinois Chapter,
Sierra Club
P.O. Box 1866
Fairview Heights, Illinois 62208

Mr. Jim Bensmen
Sierra Club
Piasa Palisades Group
301F Big Arch Road
Godfrey, Illinois 62035

Mr. Bob Freeman
Sierra Club, Piasa
Palisades Group
43 Kaskaskia
Godfrey, Illinois 62035

Mr. Wayne Freeman
Sierra Club, Piasa
Palisades Group
1006 Brown Street
Alton, Illinois 62002

Mr. Jack Norman
Sierra Club, Kaskaskia Chapter
906 North Metter
Columbia, Illinois 62236

Chairman
Upper Mississippi River Conservation
Committee
1830 Second Avenue
Rock Island, Illinois 61201

President
The Wildlife Society - Missouri Chapter
1110 College Avenue
Columbia, Missouri 65201

Director
Upper Mississippi River Basin
Association
415 Hamm Building
408 St. Peter Street
St. Paul, Minneapolis 55102

Dr. Bud Strotheide
1 Shirlwin
Granite City, Illinois 62040

Mr. Dale Ternaprovick
Mississippi Valley Duck Hunters Association
618 St. Clair Avenue
Belleville, Illinois 62220

Mr. Roland White
AT&T
RR 1, Box 15
Dow, Illinois 62022

PRIVATE INDIVIDUALS AND ORGANIZATIONS (GENERAL) (Continued)

Mr. James Balmer
AT&T
1 South Wacker Drive
Chicago, Illinois 60606

SVERDRUP Corporation
ATTN; RC West
801 North 11th Street
St. Louis, Misosuri 63101

Dr. David E. Wesley
Ducks Unlimited, Incorporated
101 Business Park Drive, Suite D
Jackson, Mississippi 39213

Dr. Roger Peterson
Ducks Unlimited
3720 Stonewood Ct.
Eagan, Minnesota 55123

Mr. David Kennedy
Ducks Unlimited
RR 2, Box 401
Anna, Illinois 62906

Mr. John Belz
Ducks Unlimited
Senior Vice President of Development
139 Victor Street
St. Louis, Missouri 63104

Mr. John Allen
429 Bartmer
Bethalto, Illinois 62010

Mr. Mark McClure
1061 Rhondell
East Alton, Illinois 62024

Messrs. David and Jim Cassens
Cassens Brothers Bait Shop
1406 West Main Street
Grafton, Illinois 62037

Mrs. Sylvia M. Schallenberg
Route 1 Box 193
Grafton, Illinois 62037

Single Copies Distributed Except as Indicated.

APPENDIX DPR-C

CORRESPONDENCE CONCERNING THE DRAFT DPR

FOREWORD

APPENDIX DPR-C includes the letters of comment received on the Draft DPR, and as appropriate, St. Louis District responses to those comments.

Illinois Department of Transportation
Division of Water Resources
2300 South Dirksen Parkway/Springfield, Illinois/62764

January 13, 1991

SUBJECT: Stump Lake Complex
Habitat Rehabilitation Project
Illinois River Floodplain
Jersey County

District Engineer
U.S. Army Engineer District, St. Louis
ATTN: Planning Division
1222 Spruce Street
St. Louis, Missouri 63103-2833

Gentlemen:

Thank you for your recent submittal of your draft Definite Project Report (SL-4) for the subject project.

The Illinois Department of Transportation, Division of Water Resources (IDOT/DWR) exercises jurisdiction over construction activities in the floodplain of the Illinois River. Since the proposed levees will be in the floodplain, an IDOT/DWR permit will be required.

Based on our review of the Definite Project Report, it does not appear that the proposed exterior and interior levees will have any appreciable effect on floodplain storage or conveyance capacity. However, to minimize their impacts, we request that the levees be constructed as low as practicable.

Dredging sediments from Long Lake will be permissible if the excavated material is deposited outside of the floodplain or placed in a manner that will not obstruct flood flows. We consider the corrugated metal pipe (CMP) drainage structures and 48,000 GPM pumping station to be minor permissible floodplain construction.

If you have any questions or comments, please feel free to contact Robert Pugh of my staff at 217/782-3862.

Sincerely,

Dennis L. Kennedy, P.E., Head
Technical Analysis and Permit Unit

DLK:RWP/3752r

United States Department of the Interior

OFFICE OF THE SECRETARY
OFFICE OF ENVIRONMENTAL AFFAIRS
230 S. DEARBORN, SUITE 3422
CHICAGO, ILLINOIS 60604

TAKE PRIDE IN AMERICA

ER-90/1077

January 17, 1991

Colonel James E. Corbin
District Engineer
U.S. Army Engineer District/St. Louis
210 Tucker Boulevard, North
St. Louis, Missouri 63101-1986

Dear Colonel Corbin:

The Department of the Interior (Department) has reviewed the Upper Mississippi River System Environmental Management Program, Definite Project Report with Integrated Environmental Assessment, Stump Lake Complex, Habitat Rehabilitation and Enhancement Project, Pool 26, Illinois River, Jersey County, Illinois, and concurs with the recommended plan.

Mineral Resources

The primary concern of the Bureau of Mines is potential project impacts to mineral resources and their development. Although the report does not mention mineral resources, this proposed project is of a type that we anticipate no significant impact to mineral resources in the area. Therefore, we suggest a statement to that effect be incorporated in subsequent versions of the document. Such an inclusion would provide users of the document with knowledge that mineral resources were considered during project planning.

We appreciate the opportunity to provide comments.

Sincerely,

Sheila Minor Huff

Sheila Minor Huff
Regional Environmental Officer

United States
Department of
Agriculture

Soil
Conservation
Service

604 E. Franklin
Jerseyville, Il
62052

February 8, 1991

Mr. Jim Hill
Stump Lake Complex EMP Coordinator
U.S. Army Engineer District, St. Louis
Planning Division, PD-R
1222 Spruce Street
St. Louis, Missouri 61013

Dear Mr. Hill:

This letter is a follow-up to our comments at the public meeting concerning the Stump Lake Project.

The Soil Conservation Service supports the alternative of plan C-Option 2B for colluvial sediment reduction in Stump Lake Watershed. Option 2B is a cost effective plan as illustrated in your report for control of the colluvial sediment problem.

Our concern is that no EMP Funds are allocated toward the colluvial sediment reduction plan; consequently this alternative may not receive priority for completion.

The Soil Conservation Service recommends completion of site specific erosion problems in this watershed. The state being the primary owner of land in the watershed and the Corps providing federal funding for the project needs a policy to implement the alternative C-Option 2B plan.

The Soil Conservation Service is willing to provide technical assistance on erosion control measures in the watershed effecting the Stump Lake Complex.

Sincerely,

Jerry Kaiser

Jerry Kaiser
District Conservationist SCS
Jerseyville Field Office

8 FEB. 1991

STUMP LAKE EMP-HREP DRAFT PLAN PUBLIC COMMENT SHEET

NAME: WAYNE FREEMAN

ADDRESS: (city, state, zipcode) 1006 Brown Street ALTON IL 62002

COMMENTS ON STUMP LAKE PLAN:

1. I AM GENERALLY Delighted with the corps effort of Redirecting funding into programs such as this.

2. I Personally would like to see the corps' self imposed restriction on aquisition of wildlife lands for wetland restoration and protection reevaluated. I find it Difficult to accept an unreasonable blanket requirement such as this. IT puts limits on The corps options for site specific studies such as this. Example: HAD your findings indicated a greater amount of sedimentation within the study Area occuring from immediately adjacent Areas, land acquisition may have proved a more cost effective and beneficial alternative.

3. Though it may be More of A IDOC responsibility, I would like to see greater effort Being placed on promoting Native plantings instead of concentrating on imported plantings.

4. Will There be outboard Motor size Restrictions Enforced within the study AREA? I would support/Encourage such A Restriction.

5. I Did Not Notice within The DPR, A Section on The effects of Disturbing 100 + years of Spent LEAD SHOT within The study AREA. IF This HASN'T Been [illegible] Already, I would Think could Be Relatively simple To study.

DATA REQUIRED BY PRIVACY ACT OF 1974

Authority: Paragraph 11, ER 1105-2-502.

Principal Purpose: To obtain information for use in distributing announcements of public meetings so as to create an atmosphere of public understanding, trust, and mutual cooperation among interested parties.

Routine Use: Information collected is used to compile official mailing lists and to record public participation.

Mandatory or Voluntary Disclosure and Effect on Individual Not Providing Information: Disclosure is voluntary. No effect on individual not providing information; however, individual may not receive future public meeting notices, fact sheets, or pertinent information.

Sierra Club-Piasa Palisades Group
Conservation Chairperson

Colonel James Corbin
US Army Corps. of Engineers
Attn: Plan Formulation Branch
1222 Spruce St.
St. Louis MO 63103-2833
February 22, 1991

Dear Colonel Corbin:

This constitutes the Sierra Club's comments on the Stump Lake Complex Habitat Rehabilitation Project. We appreciate the opportunity to comment on this proposal. We also would like to thank the ACOE for having a public meeting.

1 While the benefits to duck hunters are obvious, we see little real benefit to wildlife. 2 Nothing has been proposed to reduce the sedimentation that continues to destroy riverine habitat on the Mississippi River. The proposal merely treats the symptom not the disease. 3 The project would simply cause some other wetland to be filled in. 4 Many other options for spending the money exist such as watershed work and wetland restoration following acquisition. These latter projects would be a more prudent use of the limited funds.

5 The Sierra Club went to court and fought in Congress to get the EMP funding. We fought for restoration of wildlife habitat. Accordingly, we must oppose this project. 6 The public interest and wildlife will not be served by this project. We request the ACOE pursue other projects, similar to those at the new dam and on the Cache River.

7 We have nothing against spending money to improve duck habitat. We strongly support this. 8 The 3.7 million dollar project would only provide a 7% increase in duck habitat. 9 The project will harm the Federally endangered Bald Eagle and Indiana Bat. 10 Many other species that dwell in forest interior habitat will be harmed. 11 The project will destroy over 100 acres of bottomland forest. 12 The fisheries habitat in Flat Lake will be destroyed. 13 An insignificant increase in duck habitat does not justify all these adverse effects. 14 The over all loses greatly out weight any perceived gains.

15 This 3.7 million would provide much more benefits to wildlife, if the ACOE used it to purchase and convert farmland into wetlands. 16 Controlling sedimentation at the source, rather than simply diverting it would be a better use of funds. 17 The outstanding job the ACOE has done by the new Lock and Dam should serve as a model project. The ACOE should lift this prohibition on land acquisition. We would like to know why the ACOE has this prohibition?

(18) The Plan does not include any discussion of program goals. Does EMP have criteria to evaluate proposals based on system-wide goals? What are the ACOE's priorities? Does this project achieve them? The ACOE should develop criteria to evaluate proposals.

(19) Congress authorized spending money for "fish and wildlife habitat rehabilitation and enhancement". This proposal constitutes spending money for recreation. Congress has not yet authorized spending money for recreation. Thus, Federal law will be violated.

(20) The most disturbing aspect of this proposal is the lack of consideration of the cause of the sedimentation. Both the IDOC and the USFWS farm in Stump Lake's watershed. This part of the problem has not been addressed adequately. In our view, neither agency should farm in these areas. Farm fields do not provide quality wildlife habitat. Any proposal should begin by ending this unwarranted use of public land.

(21) Nothing has been proposed to reduce the sedimentation. The EA does not address where the soil would go. Obviously, another wetland will be filled in. The ruling on the L&D 26 lawsuit points out the ACOE must consider the effects that occur elsewhere.

(22) The National Environmental Policy Act (NEPA) requires agencies to consider "all reasonable alternatives". Many such alternatives exist. Agencies could perform watershed work. Wetland restoration also could be done.

(23) Land purchase should have also been considered. The proposal points out an ACOE policy that does not allow buying land. Federal law, however, allows it. NEPA requires agencies to allow citizens to explore alternatives that would require changes in policy or law.

(24) The EA lists two other alternatives. NEPA requires agencies to, "study, develop, and describes" alternatives. The EA merely has a short description of the alternatives. The EA only describes the selected plan in detail. Thus, the ACOE has not complied with NEPA.

(25) The wildlife and fisheries analysis misleads and confuses readers. The analysis fails to show the adverse effects the plan will have. Destroying 100 acres of forested wetlands, filling Flat Lake, and fragmenting the forest with a levee will adversely impact wildlife and fisheries.

(26) Clearing a 100 foot path for the levee will fragment the forest. Many species will be adversely effected. The analysis does not address these effects. The Plan will harm many forest interior song birds, such as the Cerulean Warbler, reptiles, amphibians, and insects. The 150' wide swath will provide a staging area for cowbirds. The ACOE must weigh the impact on these species against the claimed benefit to ducks. NEPA requires the ACOE to consider these effects.

27 The ACOE needs to address the destruction of over 100 acres of forested wetlands. The EA fails to discuss seriously this issue. The Plan does not even propose to mitigate this destruction. This is totally unacceptable. Agencies could convert their farm fields into forested wetlands. The ACOE also could purchase land.

28 The Plan calls for dredging Long and Deep Lakes under the guise of fisheries habitat improvement. The dredge spoil will then be deposited in Flat Lake. Flat Lake currently provides good fisheries habitat that will be destroyed. We see no logic in this. If anything, dredging Flat Lake instead of Long and Deep Lakes would constitute a reasonable alternative. In either case how long will it be before the Lake must be redredged? The real purpose appears to be duck hunter access. Fisheries' habitat should not be destroyed for hunter ease. The fisheries analysis does not even address the negative affects associated with filling in Flat Lake.

29 General ACOE regulations require:

> The benefits which reasonably may be expected to accrue from the proposal must be balanced against its reasonably foreseeable determinants.
> 33 CFR § 320.4

The Plan's analysis does not address the Plan's determinants. On the balance, the determinants will exceed the benefits. This does not consider that 3.7 million will be spent for the project.

30 The Regulations further state:

> Most wetlands constitute a productive and valuable public resource, the unnecessary alterations or destruction of which should be discouraged as contrary to public interests.
> 33 CFR § 320.4

The analysis does not show the destruction of these resources is necessary or justified.

31 The HEP wildlife analysis cannot be understood by an average person. Instead of informing the public, the analysis hides the effects with confusion. The analysis presents tables of confusing data. The analysis does not explain in "plain language" what impacts will occur. No one understands HSI and AAHU. The Plan does not even define these terms. The ACOE should translate these tables into a format that people can understand.

32 The Plan claims a "substantial increase" in duck habitat. One hundred twenty one AAHU would seem to be a substantial increase to a causal observer. It sounds like a lot. The increase, however, is insignificant. Only a 7% increase will occur. The public has not been accurately informed. The ACOE should give the public a basis to ascertain the signifiance of the increase.

33 While making it easier for hunters to shoot ducks, the Plan does not propose to make any additional refuge lands. A significant portion of the project area should be made into a refuge. Ducks need an area to escape the hunters.

34 The endangered species analysis does not comply with the ESA. 35 The Plan does not give the Bald Eagle and Indiana Bat the priority treatment that Federal law mandates. In deciding the snail darter case, the U.S. Supreme Court stated the ESA "indicates beyond doubt that Congress intended endangered species to be afforded the highest of priorities". TVA vs. Hill, 437 U.S. 153, 98 S. Ct. 2279, 57 L. Ed. 2d. 117 (1978). A primary goal of any project should be to benefit the endangered species. The Plan simply looks at the current needs instead of the species needs to recover from the brink of extinction. If all the habitat that the species do not currently use gets destroyed, where will they have to recover to?

36 The Plan acknowledges that the endangered species will be harmed by the project. We believe no adverse effects should be allowed to occur. 37 The Plan also fails to consider the impacts of better public access. Will people be able to drive down the levee and disturb the Eagles?

38 Research has also shown that Indiana Bats use the same maternity roost year after year. If a roost gets destroyed this will impact the bats. The ACOE should at least go and check for roost. The technology exists.

39 Allowing activities to occur when the eagles are present, does not comply with the Recovery Plan. Calling the effects "short term" does not relieve the ACOE of its legal responsibilities. In enacting the ESA, Congress rejected language that would have directed agencies to implement the ESA only "insofar as is practicable and consistent with their primary purposes . . . ". H.R. 4758, 93rd Congress, (1973). Instead, Congress mandated that agencies conserve endangered species using "[a]ll methods and procedures which are necessary to bring any endangered species to the point which the measures provided pursuant to this chapter are no longer necessary." 16 USC 1532(3). "Congress intended to halt and reverse the trend toward species extinction, whatever the cost." TVA vs. Hill, 437, U.S. at 184. (Emphasis in original.) Thus, the ACOE may not allow the short term impacts to occur.

40 The ESA does not allow the ACOE to place an endangered species in jeopardy. It does not seem likely the short term impacts would do this. The ESA, however, contains other restrictions. Agencies cannot "take" an endangered species. The Plan acknowledges adverse effects to endangered species. Thus, the Plan will "take" Bald Eagles and Indiana Bats.

Section 9 of the ESA provides that "it is unlawful for any person subject to the jurisdiction of the United States to . . . take any such species within the United States . . ." 16 USC § 1538(a)(1)(B). The ACOE falls within the meaning of a "person" for the purposes of the Act since the definition includes "[a]ny officer, employee, agent, department, or instrumentality of the Federal Government . . ." 16 USC § 1532(13).

The term "take" in the above cited provision means, "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct." 16 USC § 1532(19). The relevant part of the definition that is of concern in this appeal is the prohibition against "harming" an endangered species. The definition of harm is described in the US Fish and Wildlife Service Regulations as follows:

> "Harm in the definition of "take" in the Act means an act which actually kills or injures wildlife. Such an act may include significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding or sheltering.
> 50 CFR § 17.3 (Emphasis added.)

"Harm" does not necessarily require proof of the death of specific or individual members of the species. See Palila vs. Hawaii Dept. of Land and Natural Resources, 471 F. Supp. 985 (D. Hawaii 1979), aff'd, 639 F2d 495, 498 (9th Cir. 1981).

In Sierra Club vs. Lyng, No. L85-69-LA, (E.D. Tex. June 17, 1988) the court held that the Forest Service's Timber Management Program constituted a "taking" of an endangered species.

41 The 404 analysis does not meet the requirements of the Clean Water Act. The analysis neither considers all the practicable alternatives nor the lead shot in the sediment.

42 Stump Lake has been used for years as a duck hunting area. Obviously, the soil will be full of lead shoot. The dredged material will likely be toxic. The analysis does not even mention this!

43 The analysis only considered 3 alternatives. Any applicant must clearly demonstrate that no practical alternatives exists. The following alternatives did not get considered in violation of the CWA:

1) Undertaking projects to reduce the erosion, such as stopping the farming of government land in Stump Lake's watershed.

2) Land purchases to create a new wetland from farmland.

3) Placing the dredged material somewhere else besides Flat Lake.

4) Dredging Flat Lake instead of the other lakes. (This would not provide the duck hunters access, but 404 requires the consideration of environmental harm.)

Federal regulations state:

> No discharge of dredge or filled material shall be permitted if there is a practical alternative to the proposed discharge which would have less adverse impacts on the aquatic ecosystem . . .
> 40 CFR § 230.10

All the above cited alternatives would have fewer adverse effects. The 404 analysis does not adequately address these alternatives. The ACOE must "clearly demonstrate" no practical alternatives exist.

44 The ACOE cannot rule out the land acquisition option. The CWA regulations state:

> If it is otherwise a practical alternative, an area not presently owned by the applicant which could reasonably be obtained, utilized, expanded or managed in order to fulfill the basic purpose of the proposed activity may be considered.
> 40 CFR § 230.10 (2)

The ACOE could get land and restore it to provide additional duck habitat.

45 The CWA does not allow the ACOE to permit the filling in of Flat Lake. Flat Lake falls within the meaning of a "special aquatic site". The regulations do not allow a discharge into a special aquatic site unless the applicant "clearly demonstrates" the dredged material cannot be placed somewhere else. 40 CFR § 230.10 (3). The analysis does not clearly demonstrate the fill material cannot be placed somewhere else.

The CWA does not allow a discharge of dredge material that "will cause or contribute to a significant degradation of the waters of the United States." 40 CFR § 230.10 (c). The discharge into Flat Lake must be prohibited on these grounds. 46 The analysis does not address the loss of fisheries habitat in Flat Lake. It is arguable that this lake currently provides the best fisheries habitat as it appears to have the deepest channel. The discharge will cause a significant degradation of this habitat.

We hope this will provide a basis for the ACOE to review this project. The ACOE should pursue other options that would provide more wildlife benefits for the dollar. With limited funds, we must carefully choose our priorities.

Sincerely,

Jim Bensman
301F Big Arch RD.
Godfrey IL 62035
(618)466-7143

cc:
USFWS: Groutage & Meyers
IDOC
USEPA

TECHNICAL RESPONSES TO SIERRA CLUB COMMENTS

DRAFT

1. The St. Louis District and the Illinois Department of Conservation (IDOC), the project's sponsor, believe that the proposed project will achieve the overall goals of substantially reducing sedimentation within the complex and providing a means for better water control within the management units. Because the size of the complex will remain the same, achievement of these goals is expected to yield increases in habitat quality, such as a more productive and reliable food source for migrating waterfowl, more favorable summer and winter habitat for large slackwater fishes, and the maintenance of total wetland values for all wetland wildlife species. No project objective was directed at any recreational aspects of the complex - the recreational improvements which are proposed are incidental.

2. (also 16, 20, 21) Yes, you are right, we are not treating the disease. Addressing the source of the sedimentation problem is not within the purview of the EMP-HREP (Habitat Rehabilitation and Enhancement Program). The states of the Upper Mississippi River System are pursuing, individually and through the Upper Mississippi River Basin Association, an erosion and sediment control strategy to reduce sedimentation and complement the habitat projects to be implemented under the Habitat Rehabilitation and Enhancement Program. Although much of the

DRAFT

sediment entering the Stump Lake Complex comes from the Illinois River, we have addressed colluvial sedimentation from the Williams Hollow watershed draining into the complex from the east. As part of the project, IDOC has agreed to work with the Soil Conservation Service and Jersey County Soil and Water Conservation District to implement erosion control measures above and beyond those measures already implemented in the Williams Hollow watershed on IDOC land.

3. Sediment unable to enter the complex because of the project will not necessarily enter some other wetland area downriver. It may stay in the main channel. It would be interesting to try to model, either physically or mathematically, the ultimate disposition of the river sediments excluded from Stump Lake. However, doing this would be extremely expensive and would probably yield results limited to the reach of river immediately downstream.

4. (also 15) The EMP-HREP program as it exists now does not allow for the acquisition of wildlife lands. This is a policy established by Corps Headquarters in Washington in recognition of the vast amounts of publicly owned and managed lands within the river's corridor. Given the limited EMP funding available, it was decided that the cause could better be served by preserving and rehabilitating existing habitat rather than spending limited funds to buy additional land.

DRAFT

5. This project is a wetland restoration project.

6. We believe the public interest will be served and wildlife species will be benefitted by this project. In a collective effort to prioritize the EMP-HREP program, IDOC, the Missouri Department of Conservation (MDOC), the U. S. Fish and Wildlife Service (USFWS), and the St. Louis District ranked Stump Lake Complex as the highest priority for implementation for project sites within this District's portion of Illinois. Swan Lake and Batchtown are the projects that were ranked second and third. All of these projects address the need to remediate backwater habitats at areas important to wetland wildlife species as well as aquatic species.

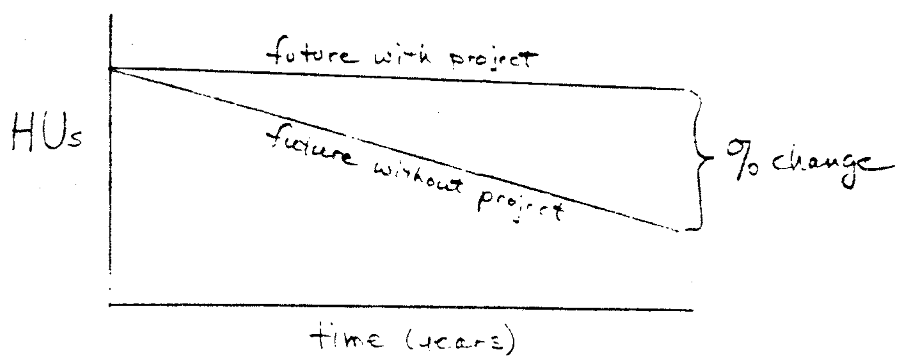
6A. First of all the St. Louis District does not choose the EMP-HREP projects it undertakes. The projects must initially be proposed by the sponsoring agency, either USFWS, MDOC or IDOC. Moreover, as discussed in paragraph 4, current policy prohibits the use of EMP funds for acquisition of fish and wildlife lands. The policy does not prohibit the states or the USFWS from acquiring lands with other funds and proposing the construction of wetland enhancement features as an EMP-HREP project. This would, in fact, be quite similar to the project being explored on the Cache River.

7. This District supports the goals of the North American

Waterfowl Management Program.

8. (also 32) You have a valid point about the significance of the 7 percent increase in "duck habitat." The report shows that there will be a 7 percent increase in the number of AAHUs (average annualized habitat units) when comparing the "future with project" condition with the "future without project" condition (1684 versus 1563 AAHUs).

This 7 percent increase is actually the average increase in habitat units over the 50-year project life. The increase in habitat units within the first few years after project completion would be slight (about 1 percent), whereas at year 50 (2042) the increase would be the greatest (about 15 percent). The graph below illustrates this.



Although the numbers generated by the analysis show a 7 percent increase in AAHUs, we want to point out that the increase is actually greater than 7 percent. A shortcoming of the procedure used to compute AAHUs for all project conditions (the WHAG analysis) is that the year-to-year reliability of waterfowl food sources - from moist soil management or submerged

DRAFT

aquatic plant production - is not assessed.

River stage records show that the Stump Lake Complex is subject to flooding about once every two years during 15 June - 1 December. This is the period when moist soil management techniques are implemented, aquatic plant production occurs, and food is eaten by waterfowl. Construction of the riverside levee to the proposed elevation of 426 feet NGVD will reduce that flooding frequency by a factor of three, to about once every six years. Accordingly, the number of AAHUs derived from the WHAG analysis needs to be multiplied by some factor to account for increased reliability of food production.

Another point to be made is that Stump Lake Complex is already managed - it is divided into management compartments that are served by an existing water distribution system. The habitat benefits to be gained here are proportionally less than those to be gained at an area without such features - such as Swan Lake.

9. (also 34-36, 38-40) The assertion that the project will harm the Bald eagle and Indiana bat, and that there is no compliance with the Endangered Species Act, is erroneous. The U. S. Fish and Wildlife Service (Marion suboffice) agrees with the content of the report's biological assessment for federally endangered species, and has made suggestions to improve the wording under "Efforts to Eliminate Adverse Impacts on Species and Habitats" (p. 69) to ensure that adverse impacts are avoided. We will incorporate the suggested changes into the document.

DRAFT

Adverse impacts to Indiana bats will be avoided by scheduling tree felling activities outside of the period May 1 - August 31. If, for any reason, tree felling activities have to occur during May 1 - August 31, then a site visit will be conducted by a team of biologists from the District, the IDOC, and the USFWS to determine if any roost trees are among those proposed to be felled. If felling of a roost tree during this period is proposed, then the District will enter into formal consultation with the USFWS.

With respect to the Bald eagle, frequent or regular use of the Stump Lake Complex by this species during the day has not been documented. Rather, day use is sporadic or infrequent. If more than sporadic day use is observed during construction activities, then construction will cease and formal consultation with the USFWS will be initiated.

10. See 26.

11. See 27.

12. (also 28, 46) Dredging of Deep and Long Lakes is needed to increase the efficiency of this waterbody to move water into and out of the management units. A larger cross-sectional area for this water "conduit" is required if the recharge and dewatering rates specified in the wetland management objectives are to be met. Dredging will also improve the quality of fisheries habitat in Deep and Long Lake. The water level in Deep and Long Lake is essentially static year-round. Upper and Lower Stump Lakes also provide year-round habitat because water levels are usually maintained constant to promote the establishment and maintenance of submerged aquatic plants. Fisheries habitat in Flat and Fowler Lakes is seasonal because these management units are annually drawn down for moist soil management in late June and refilled by October. Therefore, fisheries habitat in Flat Lake is not "good." We believe the fisheries habitat function that Flat Lake now serves will return soon after project completion. The negative impacts to fisheries in Flat Lake were not described in the report - we will modify the pertinent sections (p. 60-61, J-11) to reflect this.

13. Table 18 in the main report is an environmental impact assessment matrix describing the level of probable impact the project will have on a variety of social, economic, natural resource, and historic properties parameters. The set of parameters shown here is "standardized" - we use it for all projects. The matrix provides a quick way to visually assess the relative magnitude of probable beneficial versus probable adverse effects. We have no method to quantitatively assess the level of probable impacts associated with all parameters. The levels of impact that were chosen (designated by an "x") were arrived at "subjectively" through the application of professional opinion. We do not agree with you that adverse effects outweigh beneficial

DRAFT

effects. Were that the case, we would certainly reevaluate this project.

14. See 13.

15. See 4.

16. See 2.

17. The Stump Lake project and this District's Environmental Demonstration Area (EDA) are fundamentally the same, and hence share like features. There is a "riverside" levee at the EDA; one is proposed at Stump Lake. Wetland management units have been established on the land-side of the levee at the EDA; such units already exist at Stump Lake. A water distribution system to serve the wetland management units has been set up at the EDA; the existing water distribution system at Stump Lake is proposed to be improved.

17A. See 6A.

18. Neither the authorizing legislation nor the Corps of Engineers has established specific program-wide goals and objectives. However, in prioritizing and determining project eligibility, the St. Louis District, along with the U. S. Fish and Wildlife Service and the states of Illinois and Missouri, has placed high priority on addressing the central problem as defined by the Master Plan, i.e., the sedimentation of backwaters and sidechannels of the UMRS. The four agencies meet at least annually to review and prioritize the mix of projects that have been approved for study. In doing this, each agency brings to the table its perception of what the most serious problems and deficiencies are on this reach of the river.

19. The basic purpose of this project is to rehabilitate and enhance backwater habitat that is important to wetland wildlife species as well as aquatic species. We are not building a recreational project. Any project features that may improve public use are incidental to the project's basic purpose.

20. Farm fields can provide quality wildlife habitat. At Stump Lake during the fall some crop fields are flooded to provide food for migratory waterfowl. Also see item 2.

21. See 2,3

22. (also 24, 41, 43, 45) We examine "alternatives" from two points of view. First, there are "project alternatives." Our EMP-HREP program requires the development of a variety of ways to rehabilitate or enhance habitat. The required alternative of "no action" was examined so that a baseline condition was established. We considered dredging (only) as a means to counteract the sedimentation of backwater habitat. We also looked at a third alternative involving a variety of measures, including construction of structures (riverside and interior levees, water control structures, pumping station, upland sedimentation basin), dredging, and upland erosion control measures. Various options (levee heights, types of water control structures, methods of dredging) were further considered. It soon became obvious that dredging in and of itself is a very expensive way of gaining relatively few benefits. Likewise, the colluvial sedimentation control basin was infeasible.

There would be no sense in describing to the same level of detail all probable benefits and adverse effects for each of these three alternatives. Something needs to be done at Stump Lake to reverse the effects of sedimentation, and neither the "no action" nor "dredging only" alternatives are in the public interest or of real benefit to wildlife.

The other way we examine alternatives is via the Clean Water Act requirements. In this case we are looking for nonwetland sites for the placement of fill or dredged materials, or if there are no practicable upland sites, then wetland sites involving the least adverse impacts. When we looked for alternative sites for placement of sediment to be dredged from Deep and Long Lakes, we ruled out upland sites because they are relatively distant from the dredging site, and the costs associated with hauling this material were too great.

DRAFT

We examined wetland sites adjacent to Deep and Long Lakes, and ruled out Upper and Lower Stump Lakes because they serve as year-round fisheries habitat and provide for substantial growth of submerged aquatic plants. We checked for the possibility of using the dredged material for construction of proposed levees, but there were significant difficulties with this, and there would be a large amount of dredged sediments left over. We eliminated the use of bottomland hardwoods as a disposal site because the adverse impacts would be great. The IDOC site manager believed that if the sediments were placed in one of his moist soil management units (Fowler or Flat Lakes), he would still be able to practice such management techniques after project completion. Likewise, the seasonal fisheries function that such a management unit serves was viewed as highly likely to return after project completion. An additional requirement was the need for compliance with water quality standards through employment of a closed containment area for disposal of the dredged material. Flat Lake was chosen as the disposal site because it is the nearer of the two units.

23. See 4.

24. See 22.

25. The WHAG and AHAG analyses of Appendix E were not meant to include a discussion on adverse environmental impacts. Such a discussion is appropriately found in the section "Environmental Effects of the Selected Plan" (p.57-62). (See also items 26 and 31 for additional comments.)

26. We agree that the environmental assessment (p. 59-60) should have included a more in-depth discussion on the effects of "forest fragmentation" and we will make the necessary changes. However, we cannot conclude that there will be significant adverse impacts to interior forest-dwelling birds. The existing landscape along the lower Illinois River is already fragmented, primarily because of agricultural activities. There are no remaining vast tracks of bottomland hardwoods. At Stump Lake, all of the timber to be removed is located close to or at the edge of the river and open water wetlands, the clear zones are relatively narrow, and the unaffected area of bottomland hardwoods is relatively large. We do weigh expected adverse impacts against expected benefits, and we do not believe that the bulk of all animal species will be adversely affected. Reptiles and amphibians (as well as many other kinds of animals) are expected to benefit from the water which will collect in the borrow pits located at the riverside levee's toe. Other positive effects include those attributable to the "edge effect," where wildlife diversity and abundance is often higher at the zone where two different habitat types meet.

27. In the draft report we have not fully addressed the issue of forested wetland or bottomland hardwood mitigation. Thank you for bringing this to our attention. We have since addressed this issue, and our findings are presented below.

We address these two resources separately because forested wetlands and bottomland hardwoods differ to a degree. By definition forested wetlands occur on hydric soils, whereas bottomland hardwoods are supported by floodplain soils, whether hydric or not. Our requirement for mitigation of adverse effects to wetlands stems primarily from the Clean Water Act, and for bottomland hardwoods from the Water Resources Development Act of 1986.

The following table summarizes project impacts by acreage. (It does not include filling of Flat Lake, a 171-acre nonforested wetland, with about one foot of dredged material. The current practice of moist soil management in this wetland unit will continue after project completion.)

DRAFT

habitat type	existing total	clearing for fill	borrow pits	replant
wetland	(2412)			
forested	1314	20.5	32	10
open water	1098	.5	0	0
nonwetland	(245)			
forested	215	13	20	5
"other" (roads, buildings)	30	0	0	0
total	2657	34	52	15

BOTTOMLAND HARDWOODS

Our requirement for bottomland hardwoods states that adverse impacts to this resource shall be mitigated in-kind, to the extent possible. In-kind does not necessarily mean acre-for-acre, but may be restoration or the increased management of bottomland hardwood forests to compensate for the loss of biological productivity (habitat quality).

This District and the IDOC applied the Habitat Evaluation System (HES) methodology to evaluate the environmental effect the project would have on bottomland hardwoods. This methodology was developed by the Corps about a decade ago and is widely accepted. The HES is very similar to the WHAG and AHAG in that habitat quality (and ultimately habitat units) are compared for existing, future without project, and future with project conditions. However, unlike the WHAG and AHAG, which measure habitat quality for a particular species (or group of similar species), the HES assesses general habitat characteristics to indicate quality for fish and wildlife populations as a whole. The impact of a project feature is obtained by subtracting the habitat units of the future without condition from those of the future with condition.

The HES analysis shows that the clearing of bottomland hardwoods from 101 acres would represent a loss of 2778 habitat units over the 50-year project life [or -56 average annual habitat units (AAHUs)]. The analysis also shows that the riverside levee will improve habitat quality by protecting the "interior" bottomland hardwoods within the project area (1329 acres) from frequent flooding. Mast tree species (especially oaks) in this "interior" area are currently unable to regenerate apparently because the existing flooding regime is too wet. The impact on this "interior" area consists of an increase in 4462 habitat units (+89 AAHUs), and is due in part to the expected regeneration of mast tree species. According to the HES analysis, the overall impact of the project on bottomland hardwoods is positive, and consists of an increase of 33 AAHUs (89 AAHUs minus 56 AAHUs).

Our requirements for bottomland hardwoods specify that mitigation will be required whenever project features cause an overall net loss in habitat quality. Because the HES analysis shows that overall habitat quality will increase over the 50-year project life, mitigation is not required.

DRAFT

WETLANDS

The procedures to be used to determine the type and level of mitigation necessary to demonstrate compliance with the Clean Water Act Section 404(b)(1) guidelines were clarified in a Memorandum of Agreement (MOA) jointly signed about one year ago by the Corps and U. S. Environmental Protection Agency. The guidance in this MOA is applicable to civil works projects as well as the regulatory program. One of the fundamental principles presented in the MOA is mitigation sequencing. This concept specifies that impacts to wetlands shall be addressed in a sequenced approach. First, impacts will be avoided through the selection of the least damaging practicable alternative; second, impacts will be minimized by taking all appropriate and practicable steps; finally, any remaining unavoidable impacts will be compensated to the extent appropriate and practicable.

Recall that the 2,657-acre site includes 2,412 acres of wetlands. The nonwetland areas are located along the Illinois River toward the north end of the project area. Because of the nature of the project site and the project itself, it is not practicable to avoid certain impacts to wetlands. The chief unavoidable impact is construction of much of the 5.5-mile-long riverside levee in forested wetlands.

As shown in the table above, there are 63 acres of forested wetlands to be cleared; about 21 acres will be filled for construction of levees, 32 acres will be made into borrow pits, and 10 acres used for construction-right-of-way will be replanted. The forested wetlands that will be filled and made into borrow pits consist primarily of silver maple; other species include willow, hackberry, elm, cottonwood, and ash. One-half acre of open water wetlands will be filled to construct the riverside levee. Twenty acres of forested nonwetlands (bottomland hardwoods on nonhydric soils) will be used for borrow pits. The 52 acres of borrow pits will be connected to the wetland management units via ditching and will function as extensions of these units.

Note that once construction activities are completed, there will be a net loss of about 21 acres of forested wetland, and a net gain of 52 acres of open water wetland. The net change across all wetland habitat types is a loss of one acre (21 acres of forested wetland to be filled minus 20 acres of open water wetland to be created in nonwetland). More importantly, without the project there will be the continuing loss of open water wetland habitat due to sedimentation and encroachment of willow and silver maple. The WHAG analysis estimated this loss to be 35 percent over the next 50 years, from 1098 to 714 acres. With the project, the expected change over the next 50 years is a gain of about 3.5 percent, from 1098 to 1136 acres. This gain is attributable to the creation of new open water wetlands by construction of borrow pits, but also to the new capability of being able to increase water surface elevations within the management units by about one-half foot to compensate for future (reduced) sedimentation.

We have also applied the HES methodology to determine the project's effect on the quality of wildlife habitat of forested wetlands. As in the case of bottomland hardwoods, the same pattern of improvement over the 50-year project life is observed. Removal of trees from 63 acres of forested wetlands would represent a loss of 1732 habitat units (or -35 AAHUs), whereas the riverside levee would improve habitat quality by 3950 habitat units (+79 AAHUs) by protecting "interior" forested wetlands within the project area (1216 acres) from frequent flooding. Thus, there is an overall improvement of wildlife habitat by 44 AAHUs (79 minus 35). Mitigation for adverse impacts to wildlife habitat of forested wetlands is therefore not required.

We have examined wetland functions other than wildlife habitat that are served by Stump Lake Complex. These include ground water discharge/recharge, floodflow alteration, sediment stabilization, sediment/toxicant retention, nutrient removal transformation, production export, and aquatic diversity/abundance. We have also looked at the project site in terms of social significance - whether there are any special designations, potential economic value, or strategic location associated with the site. Obviously, the one function Stump Lake Complex performs too well is sediment retention, which we are trying to retard. Other than sediment retention, we do not believe the proposed project will impair the ability of the complex to perform the other functions.

In summary, we believe there will be no adverse impacts requiring compensatory mitigation.

Separate from this project, the IDOC is implementing several programs at Stump Lake to improve habitat quality of forested wetlands. One program is directed at forest stand improvements to increase diversity and productivity. Planting of mast species such as pin oak and pecan is a major component of this program. The IDOC intends to establish a Canada goose management area at the Dabbs Road Access area. Measures to be implemented to enhance the area for loafing and feeding by resident and migrating geese include the construction of small levees to create sheet water ponds. Lastly, the IDOC plans to reestablish forest on about 15 acres of herbaceous (grassy) wetlands at the main access area that are kept mowed.

28. See 12.

29. See 13.

30. See 22.

31. We agree that the "HSI" and "AAHU" concepts as presented in Appendix E (the WHAG and AHAG analysis) and the main report could have been defined in more easily understood terms, and we will make the necessary modifications to do so. But remember that the information included in the technical appendices is technical or specialized. Naturally not every reader is going to immediately grasp the information contained in these sections. Biologists familiar with AHAG and WHAG analyses find these methods valuable in the planning process because comparisons between "apples and oranges" can be made, and the decisions that follow are based on expected gains in habitat quality and/or quantity. Also, there has been no attempt to hide anything or confuse readers in the presentation of tables - these are the actual numbers that decisions have been based on.

32. See 8.

33. Immediately east of the EMP project site are the Crull Impoundment, Greentree Refuge, and adjacent (flooded) agricultural land totalling about 120 acres, which serve as a refuge where ducks can escape from hunters. Personnel of the Illinois Natural History Survey recently informed the District that during aerial census flights of the Stump Lake Complex, waterfowl are often observed to be concentrated in this area. There is a plan to create a new 100-acre waterfowl rest area between Route 100 and the Dabbs Road access area. It will be managed for Canada geese, and is not part of this EMP-HREP project. Swan Lake (4,833 ac) on the opposite side of the river and Gilbert Lake (736 ac) immediately downstream are USFWS-managed refuges.

34. See 9.

DRAFT

35. See 9.

36. See 9.

37. The proposed project does not include the construction of additional roads, trails, or paths. The riverside levee will be kept closed to the public.

38. See 9.

39. See 9.

40. See 9.

41. See 22.

42. We appreciate your comments on the accumulation of lead shot in Stump Lake sediments, and your pointing out the fact that the report did not include any discussion on whether there is a potential for the dredging operation to give rise to waterfowl poisoning. We will modify the report to include such a discussion.

Briefly, we do not think a lead problem will arise. As you know, the ingestion of lead shot during the feeding process can be lethal to waterfowl. The IDOC site manager at Stump Lake says that historically there has been very little hunting of waterfowl on Deep and Long Lakes. He also believes that the pattern of shooting on Upper and Lower Stump Lakes, Fowler Lake, and Flat Lake has lead to an accumulation of spent lead shot within or toward the center of these units; in other words, shooting has generally been directed away from Long and Deep Lakes. Based on this, one would expect relatively little lead shot in the bottom of Deep and Long Lakes. However, we have not sampled the bottom of the various management units to determine this.

During the hydraulic dredging of Deep and Long Lakes, sediment, including any lead shot, will spill out of the discharge pipe along with much water and be deposited into Flat Lake (a contained area). Being relatively heavy, the lead shot will fall out quickly and stay near the end of the discharge pipe. The dredging operation will require occasional repositioning of the end of the discharge pipe so that the sediment will be as spread out as possible across Flat Lake. As a result, we believe lead shot in Deep and Long Lake sediments will not become uniformly distributed across Flat Lake, but that lead shot will remain concentrated around the sites where the end of the discharge pipe was located. In fact, the sediment from Deep and Long Lakes will probably act as a "clean" cap, covering the existing Flat Lake sediments which would have higher concentrations of lead shot.

We have spoken with the waterfowl biologists of the Illinois Natural History Survey (INHS) about the potential for lead poisoning of waterfowl which eat plants grown on sediments

DRAFT

containing lead pellets. They tell us that there apparently is no danger; studies have shown that the concentrations of lead in plant tissues (stems, leaves, seeds) are not high enough to become toxic to waterfowl, i. e. the plants do not bioaccumulate lead.

One other point. Steel shot has been required at Stump Lake for waterfowl hunting since about 1985. INHS waterfowl biologists have periodically monitored shotgun-killed ducks and have observed a high rate of steel shot compliance. The deposition of "new" lead pellets into the wetland management units has apparently come to an end.

43. See 22.

44. See 4, 6A.

45. See 22.

46. See 12.

Sierra Club
Piasa Palisades Group
CONSERVATION CHAIRMAN

Colonel James Corbin
US Army Corps. of Engineers
1222 Spruce St.
St. Louis MO 63103-2833
May 7, 1991

Dear Colonel Corbin:

We appreciate being given a copy of the draft response to our comments. We understand these comments were just an unapproved draft.

We believe the ACOE should put this project on the back burner. The ACOE should conduct a scoping meeting for this project. Alternatives then should be developed and considered. Much of the work already done could be reused. There are too many problems with the original, the process needs to be started over.

The following is our response to the draft comments:

1) We disagree for the reasons presented elsewhere in this response and in our original letter.

2) We feel the ACOE did not adequately address this problem and possible solutions. The EA needs to consider more alternatives that address this problem.

3) The sediment has to go somewhere. It must either go into the Gulf of Mexico or some other wetland. The ACOE needs to address this and weigh this under adverse effects. The question is will the project produce any net gains in habitat quality in the Mississippi River ecosystem? A 7% increase would be meaningless if it is offset by increased sedimentation elsewhere. This is the problem of treating the symptom instead of the disease.

4) We do not agree that there are "vast amounts of publicly owned and managed lands" along the Mississippi River. There is a need to acquire additional lands. We are not convinced that rehabilitating existing areas is the best use of limited funds.

Wetlands are one of the shortest lived ecosystems. Mother nature deals with this by making new wetlands. The ACOE has prevented the river from performing its function of creating new wetlands. There are many places where the ACOE could make new wetlands such as agricultural fields and strip mines. This would have overall more net benefits. Wetlands succeed to other stages such as forested wetlands and bottomland hardwoods.

Could you have your Planning people do an analysis of the cost and benefits of rehabilitation versus restoration. For restoration (i.e., turning agricultural land into wetlands) the Riverlands project could be used. It could then be compared to the cost and benefits of the Stump Lake project. It would then give us a basis to determine what truly is the best use of limited funds.

Not only should the ACOE consider changing its policy prohibiting land purchases, it should activity seek projects which would use other funds to buy land, such as agricultural land and stripmines, and then use EMP funding to recreate a wetland. These types of projects should be given top priority for funding.

5) This project is rehabilitation not restoration.

6) See # 13.

6A) See # 4.

7) Ok.

8) The input of these projections can make them have any result. What assumptions did the ACOE make about the future without the project? The the ACOE assume the sedimentation rate would remain the same for the next 50 years? This would be an indefensible assumption. Surely with improved farming practices and other soil control measures sedimentation rates will decrease in the future. There are many laws that are being implemented that will make the situation better. If the ACOE assumed the rate would not change, it greatly overestimated the benefits to ducks. The draft response acknowledges IDOC will stop some sediment from entering the wetland. Did the analysis consider this?

9) Eagles. Please provide us with the USFWS suggestions that will be incorporated. The claim that the Eagle use of this area is "sporadic or infrequent" simply is not true. The project EA acknowledges this is a high use area. I have never gone to this area in the winter and not seen several eagles. The EA just claimed that they did not have to worry about short term impacts. The promise to consult if many eagles are observed misses the point entirely. If they disturb the eagles they will not be seen at all. No construction should be allowed when the eagles are present. Period.

Bats. The USFWS just commented on the proposal to dam Sugar Creek in southern Illinois:

> The felling of over 641 acres of trees when Indiana bats are not present will avoid direct-affect to this federally listed species. However, the losses of woodland and stream corridors caused by this project will not support the Recovery Plan for these species as these actions would eliminate potential roost trees and foraging habitat, respectively.
> Groutage at 2.

12) We wish to consult with fisheries experts before responding.

13) Impacts cannot adequately be considered simply by placing a "X" in a column. The ACOE must assess the impact of the project. If you only look at the positive effects they will out weight the adverse effects. We request the ACOE evaluate all the adverse effects of the proposed project.

17) Stump Lake is rehabilitation. The EDA is restoration. The EDA used to be agricultural fields. Stump Lake is currently a wetland. The projects are entirely different.

18) Contrary to NEPA, the ACOE has excluded the public from this process. The ACOE needs to develop criteria and allow the public to participate.

19) We disagree. We see the recreational benefits; we do not see the wildlife benefits.

20) Does the ACOE really want to say this? We all know the farming is done for money not to benefit wildlife.

22) This response indicates the ACOE has a fundamentally wrong understanding of its NEPA obligation. The NEPA process is suppose to help a decision maker make good decisions. The process requires the deciding official to consider the impacts of the action, to consider alternatives and to involve the public. The response indicates the NEPA process was used to attempt to justify an already made decision.

NEPA requires the ACOE to "study develop and describe" alternatives. Just doing it for the "preselected" alternative violates NEPA. If the ACOE does not study develop and describe the alternatives, how can it be determined that these alternatives are not in the public interest and have no wildlife values?

Many alternatives exist that the EA does not mention. Our comments point out some. At the Bacthtown meeting Tom Groutage suggested building the levees out side the tree line. Just making unsupported claims that other discharge sites are infeasible is not adequate. Prove it by considering the alternative.

I know I have raised many legal issues, but the Draft response makes it appear that the lack of NEPA compliance is the reason the ACOE proposed such a bad project. The NEPA process requires agencies to consider the consequences of their actions. The NEPA deficiency of excluding the public has also contributed to the problems. (Involving the agencies only is not enough to fulfill the NEPA mandate.) I am pleased the ACOE held the Batchtown meeting. If the ACOE had held a similar meeting on this project, I bet the proposed project would have been quite different.

The ACOE should go back to the drawing boards on this project. A scoping meeting should be held to gain public input and to assist in developing alternatives.

25) The purpose of NEPA is to weigh the adverse effects against the positive effects. The analysis should assess both the good and the bad. Only analyzing species that support the project is not fair.

26) How can the ACOE concluded there will be no significant adverse effects to forest interior birds without first analyzing the effects? Many bird species have minimum area requirements for nesting. The levee certainly could breach the threshold. The existing fragmented nature of the area makes the problem worse. Many species require biological corridors to connect them. These corridors allow for genetic interchange. Forested river and stream corridors are prime examples.

The levee will fragment habitat of many species not just birds. This will have adverse effects. The "edge effect" is an <u>adverse</u> effect! The edge effect increase some species, but the relative abundance of these species must be considered. Edge species are all abundant species. The ACOE should be concerned with species that require specialized habitat.

The levee will increase many species susceptibility to predation when they go to the river to drink. The levee will not provide any cover for these species. The levee may also provide an insurmountable obstacle to many species such as insects.

27) Quite frankly, we do not accept this explanation. These ecosystems have evolved with flooding for millions of years. Mother Nature does not need the ACOE to keep out flooding. What about greentree reservoirs? We do not accept the conclusion that the overall habitat quality will increase.

A large part of this claim seems to be based on the contention that the trees are not reproducing. What is the scientific basis for this? Has any stocking surveys been done? If so, what were the results? The only requirement for reproduction is that there be a new tree when an opening is created. These species can live for over 100 years. If these species cannot reproduce with flooding, how did they get there in the first place? Stopping natural process from occurring, does not increase the habitat value of forested wetlands and bottomland hardwoods.

The analysis contends there will be other benefits from keeping out the floods, what are they? Did the ACOE consider the adverse effects on some species?

We cannot accept the loss of any unmitigated bottomland hardwoods and forested wetlands. The ACOE should provide at the minimum acre for acre mitigation.

31) I have dealt with the use of these model on Forest Service projects for several years. I understand how they work. I could not make heads or tails out of the analysis in the Plan. The ACOE has an obligation to translate this data into a format people can understand in the EA.

I also know these model can be made to show whatever you want from the input. The assumptions of the program need to be analyzed.

42) We belive sampling of the sediments should be done. The past use justifies this.

Migratory waterfowl are not the only species the lead can impact. The impact to all species in the area must be assessed.

We do not understand the reasoning of the conclusion that all will be ok since the lead will be concentrated. What will keep the species away from these concentrated areas. It would seem concentrating the lead would be worse than having it spread out. These areas could contain toxic levels.

Sincerely,

Jim Bensman
301F Big Arch RD.
Godfrey IL 62035
(618)466-7143

DEPARTMENT OF THE ARMY
ST. LOUIS DISTRICT, CORPS OF ENGINEERS
1222 SPRUCE STREET
ST. LOUIS, MISSOURI 63103-2833

REPLY TO
ATTENTION OF:

Plan Formulation
Planning Division

Mr. Jim Bensman
Sierra Club
Piasa Palisades Group
301F Big Arch Rd.
Godfrey, Illinois 62035

Dear Mr. Bensman:

I am writing to you in response to the letter you sent to Colonel Corbin on May 7, 1991, regarding your review comments on the Stump Lake Environmental Management Program - Habitat Rehabilitation and Enhancement Project (EMP-HREP).

I agree with many of your concerns about the philosophy, direction, and scope of the Stump Lake project, and the Environmental Management Program (EMP) in general. The current EMP planning and implementation guidance and policies were developed as a result of complex political compromise and coordination with five states (the Upper Mississippi River Basin Association), the U.S. Fish and Wildlife Service, and the U.S. Environmental Protection Agency.

You are absolutely right that we are only treating "symptoms of the disease" that plagues the Mississippi River basin. I, too, wish the program involved basin-wide sediment reduction actions, and allowed for acquisition of additional lands for habitat restoration and resource protection efforts. However, the intent of the legislation as approved by Congress, and as further defined by Corps and administration policies, restrict these types of activities.

I appreciate your concern for federally endangered species. Mr. Tom Groutage of the U.S. Fish and Wildlife Service indicated that the Service agreed with the draft report's conclusion that the proposed project will not adversely affect either the bald eagle or Indiana bat. Mr. Groutage suggested some changes to the biological assessment to ensure that adverse effects will not occur, and those suggestions have been adopted. For the Indiana bat, they included changing "tree clearing" to "tree felling," and adding conditions under which a site inspection for roost trees would be required. For the bald eagle, the suggested change included summarizing what is known about day use of the project area - That such use is sporatic and infrequent - and stating that such use would cease temporarily during construction activities. For both species, it was suggested to add conditions under which formal consultation would be required.

I agree with your comments on the potential for lead poisoning of waterfowl by ingestion of lead shot contained in sediments dredged from Deep and Long Lakes. The disposal of hydraulically dredged material into Flat Lake may reexpose some lead pellets which could be consumed by waterfowl feeding in the Flat Lake area. I have requested my staff to carefully examine this potential problem. We plan to consult with waterfowl biologists from the Illinois Natural History Survey to determine the need for sampling concentrations of lead shot in sediments of Long and Deep Lakes, and we will request them to recommend measures to minimize lead exposure to waterfowl if a concern appears warranted.

We have fundamentally different views on National Environmental Policy Act (NEPA) process requirements, and I believe the divergence is due to different understandings of the intent of the EMP program's Habitat Rehabilitation and Enhancement Program. The purpose of the EMP-HREP program is to implement projects aimed at counteracting the degradation of diverse backwater areas of the Upper Mississippi River System (UMRS). Because the principal factor causing degradation in the UMRS is sedimentation, most of the proposed projects include one or more features to reduce sedimentation and prolong the life of the backwater/wetland resource at the project site. Initially, acquisition of land for restoration of wetland wildlife habitat was also viewed as a potential EMP-HREP measure, but policy from the Office of the Chief of Engineers was issued later directing that such projects not be pursued. Moreover, while strategies to reduce sedimentation by controlling erosion at its source complement the EMP-HREP program, they are outside the scope of our EMP-HREP projects.

At the Stump Lake Complex, the problem was defined as sedimentation and lack of reliable water control within the managed wetland units. Given the NEPA requirements, we needed to devise alternative strategies which would solve the problem. The draft report presents three such alternatives (including that of no action), and a range of measures and options for the preferred alternative. We performed an incremental analysis on the preferred alternatives range of measures and options, selected the "preferred alternative," and presented this alternative as the proposed project.

Public input from groups such as yours would have been beneficial earlier in the planning process, but I do not believe it would have resulted in a radically different project at Stump

Lake. As my EMP staff expressed to you recently, the Sierra Club is welcome to participate in the planning efforts for ongoing and future EMP-HREP projects in the District. In hindsight, we probably should have had input from groups such as yours in the early stages of the EMP-HREP program.

In the draft report we did not fully address the mitigation issue. As you know, we have since attempted to determine the magnitude of the adverse impacts to wildlife in general from clearing 101 acres of bottomland hardwoods. To do so we conducted a Habitat Evaluation System assessment of the project's impact on the wildlife habitat value of this resource. The assessment indicated the project would give rise to a net benefit over the 50-year project life. From the Corps' point of view, this result is sufficient to conclude that no compensatory mitigation is required.

Separate from this issue, the Illinois Department Of Conservation (IDOC) is implementing several programs at Stump Lake to improve habitat quality of bottomland hardwoods. One program is directed at forest stand improvements on approximately 1400 acres of bottomland forest at the Stump Lake complex to increase diversity and productivity. Planting of mast species such as pin oak and pecan is a major component of this program. Also, IDOC intends to establish a Canada goose refuge area at the Dabbs Road Access area. To enhance the area for loafing and feeding by resident and migrating geese, small levees will be constructed to create sheet water ponds and restore wetland habitat in what is now crop fields. Lastly, the IDOC plans to reestablish forest on about 15 acres of herbaceous (grassy) wetlands currently mowed near the main access area. Although these actions are not considered mitigation, they help in the total sense of things.

I think it would be very productive for myself and key staff members to get together and meet with you, Don Pierce, Bob Freeman, Jack Norman, and any other Sierra Club members you desire to specifically discuss the Stump Lake project. A field tour would probably be beneficial as well. We will meet at a time and location convenient to you and other club members. I will be calling you in the near future to establish a specific date for this meeting.

Thanks for your input.

Sincerely,

for Owen D. Dutt
Chief, Planning Division

Copy Furnished:

Mr. Don Pierce
Sierra Club, Vice Chairman of the Illinois Chapter
P.O. Box 1866
Fairview Heights, IL 62208

Mr. Bob Freeman
Sierra Club, Piasa Palisades Group
43 Kaskaskia
Godfrey, IL 62035

Mr. Jack Norman
Sierra Club, Kaskaskia Chapter
906 N. Metter
Columbia, IL 62236

Mr. Tom Groutage
U.S. Fish & Wildlife Service
Marion Suboffice (ES)
Rural Route 3, Box 328
Marion, IL 62959

Mr. Michael Bornstein
U.S. Fish & Wildlife Service
Mark Twain National Wildlife Refuge
Rt. 1 Box 75
Wapello, Iowa 52653

Mr. Neil Booth
Illinois Department of Conservation
Mississippi River Area Office
R.R. 1, Box 182
Grafton, IL 62037

Mr. Bill Donels
Illinois Department of Conservation
Division of Planning
524 S. Second St.
Lincoln Tower Plaza, Room 310
Springfield, IL 652701-1787

APPENDIX DPR-D

HYDROLOGY AND HYDRAULICS

FOREWORD

APPENDIX DPR-D presents the hydrologic/hydraulic effort leading to the proposed project. The appendix provides a discussion of climate, existing hydraulics and project hydraulics.

UPPER MISSISSIPPI RIVER SYSTEM
ENVIRONMENTAL MANAGEMENT PROGRAM
DEFINITE PROJECT REPORT

STUMP LAKE COMPLEX
REHABILITATION AND ENHANCEMENT
POOL 26, ILLINOIS RIVER MILES 7.2-12.7

APPENDIX D

HYDROLOGY AND HYDRAULICS

1. General. The Stump Lake project, shown on Plate 1 of the main report, is located on the Illinois River, between river miles 7.2 and 12.7. This appendix will present the hydrologic/hydraulic effort leading to the proposed improvements to the Stump Lake Waterfowl Management Area.

2. Climate. The climate of the Illinois region in which Stump Lake is located is typical midwestern, with warm, humid summers and cold, relatively-dry winters. Normal temperature extremes range from 100 degrees or more in mid-summer to below zero in mid-winter. The average annual temperature in the local area is 51 degrees.

Significant precipitation occurs in every month of the year, with the greatest amounts normally in April-May and the least in January-February. The area averages slightly under 35 inches precipitation per year, with about 24 inches of snowfall in a typical winter. Average annual evaporation is not available for this immediate area. Table D-1 gives average monthly precipitation totals at Grafton, Illinois, about seven miles downstream of Stump Lake, and average monthly evaporation totals at the National Weather Service gage at St. Louis.

TABLE D-1

Average Monthly Precipitation and Evaporation

Month	Precip. (in.)	Evap. (in.)	Month	Precip. (in.)	Evap. (in.)
January	1.66	0.69	July	3.69	5.85
February	2.05	1.01	August	3.15	4.87
March	3.25	2.00	September	3.04	3.48
April	3.70	3.24	October	2.42	2.32
May	3.90	4.59	November	2.65	1.22
June	3.56	5.24	December	2.22	0.69

3. Existing Hydraulics. Illinois River stages at Stump Lake are controlled by regulation at Melvin Price Locks and Dam. The pool stage is 419 NGVD under normal conditions, and exceeds 419 NGVD only during flows approaching bankfull or greater. As shown on FIGURE D-2, which gives annual stage-duration relationships at Grafton, Illinois (seven miles downstream), stages are less than 421 NGVD more than 90% of the time on an annual basis. Minimum stages occur during floods when the pool goes "on tilt" and proceeds to an open river condition. Minimum regulated stage is 414 NGVD at the dam and about 418 NGVD at the downstream end of Stump Lake. At this point all gates at Melvin Price

Locks and Dam are out of the water. As flood flows continue to increase, the minimum, regulated stage increases as well, with the only effect of the locks and dam being a small local swellhead just upstream of the dam. Exterior elevations at the downstream end of Stump Lake less than 418 could only occur during a loss of pool, a situation which has not happened since the early 1950's.

a. Floods. Illinois River discharge- and stage-frequency relationships for the reach have been well-established from previous analytical and physical model studies. Flood-frequency relationships at the downstream end of Stump Lake are shown on Table D-2. Add 1.1 feet to determine the corresponding stage-frequency at the upstream end of Stump Lake.

TABLE D-2

Stage-Frequency at Mile 7.2

Frequency (yrs)	Elevation (NGVD)
2	424.5
5	429.9
10	432.6
25	435.5
50	437.7
100	440.0

The flood-of-record occurred in 1973 and reached an elevation of about 437.0 NGVD at Grafton.

b. Sedimentation. Presently, no continuous sedimentation data have been taken on the Illinois River or it's tributaries. However, in 1976, the Illinois State Water Survey Division published a report entitled "Sediment Conditions in Backwater Lakes Along the Illinois River - Phase I", by Ming T. Lee and John B. Stall. In the report, reprinted in 1982, it was estimated that the annual accumulation of sediment in Illinois River backwater lakes was between 0.18 and 0.59 inches per year. This estimate was based on detailed cross section surveys taken in 1903 and 1975 at 4 backwater lakes. The estimated 0.18 inches of sediment accumulation occurred at Swan Lake, which has a high natural levee separating the river and lake, accounting for the low value. The average annual sediment accumulation for the other 3 lakes was 0.50. In 1983, the Illinois Natural History Survey published "The Fate of Lakes in the Illinois River Valley", by Frank C. Bellrose, Stephen P. Havera, Fred L. Paveglio, Jr. and Donald W. Steffeck. They found that between 1903 and 1976-1979, 21 large Illinois River backwater lakes had filled with sediments at rates varying from 0.10 to 0.74 inches per year. The average rate for all 21 lakes was 0.42 inches per year. However, it was found that this rate has been increasing in the past two decades. Therefore, for this study area, an average annual sedimentation rate of 0.50 was considered reasonable. During floods, when open-river conditions exist, the natural levees along the riverfront are overtopped and deposition is occurring in Lower Stump Lake as a result of hillside runoff from Williams Hollow Creek. Lakes comprising the Stump Lake Wildlife Management Area are known to be slowly filling, and the loss of water depth has been recognized as a problem for some time. Long Lake has become less desirable as fish habitat as the water depth has decreased substantially.

4. <u>Project Hydraulics.</u> To minimize continued sediment deposition from the Illinois River and Williams Hollow Creek, and to improve management of the system for wildlife habitat, a number of alternatives were evaluated. Primary components of the recommended plan are shown on Plates 2 and 3 through 8 of the main report and consist of a low riverfront earthen levee, low interior earthen levees which separate the lakes in the complex, a reversible pumping system for filling or draining the system, a portable pump for managing water levels in Flat Lake, a channel improvement in Long Lake for conveying water

and improving fish habitat, sluice gated gravity drains and/or boat passage structures with stop logs connecting the lakes, a fish passage structure with sluice gates at the downstream end of the system, and recommended land use practices in Williams Hollow watershed.

a. Riverfront Levee. A low earthen levee was designed to prevent frequent Illinois River floods from depositing sediments within the Stump Lake complex. The levee will extend from approximate river mile 7.2 to 12.7, tieing into higher ground at each end, forming a closed levee system.

(1) Crown elevation. A range of crown elevations for the riverfront levee were analyzed to determine appropriate elevations to exclude most of the sediment, while minimizing construction cost. Table D-3 shows the average annual duration associated with various levee crown elevations. Due to an absence of sediment data, it was assumed that the percent reduction in sediment inflow to the complex would be similar to the percent time reduction of complex inundation. This assumption is admittedly qualitative, the actual reduction could be somewhat higher or lower. The 426 levee/dike will prevent sediment-carrying waters from entering the Stump Lake complex about 79% of the time. The water column carries relatively low quantities of sediment (mainly silts and clays) and these fine grain particles should largely stay in suspension and pass out of the leveed area without settling. Little sand contribution to the complex is expected during the usual range of overtopping events, since much of the sand load will be carried near the bottom as bed material load, and will remain in the river channel. Deposited material within the levee, after the project is constructed, is expected to be minimal, with possible exceptions during a major, long duration event such as the 1973 flood. Therefore, even though much of the sediment is transported during floods, the assumption that sediment reduction to the project area is proportional to the time duration is judged reasonable and valid.

TABLE D-3
Average Annual Duration vs. Structure Elevation

Reference Point Near Downstream End (RM 7.7)		Reference Point Near Upstream end (RM 12.7)	
Crown Elev. (NGVD)	Ave. Annual Duration Reduction (%)	Crown Elev. (NGVD)	Ave. Annual Duration Reduction (%)
421	0	422	0
422	31	423	31
425	71	426	71
426	79	427	79
429	93	430	93

At the reference point at mile 7.7, the cost of levee construction above elevation 426 increased at a far greater rate than the incremental amount of sediment reduction. Consequently, minimum levee crown elevations of 425.9 NGVD at the downstream end of the complex and 427 NGVD at the upstream end of the island were selected. The differential allows for the approximate 1.1 feet drop in water level during floods over the 5.5 mile levee reach.

(2) Levee overtopping. Overtopping of these structures will be a fairly frequent occurrence. The levee crown elevations (427 NGVD upstream and 425.9 NGVD downstream) represent a stage that corresponds to a recurrence interval of 3 to 4 years. An evaluation of the past 51 years of record (1939-1989) on FIGURE D-1 shows 21 events greater than 425.9 NGVD, an elevation which would cause the levee to overtop. An HEC-2 Water Surface Profile model was used to evaluate the effect of the levees on the 100-year flood elevations. It was found that there was no appreciable increase in the 100-year flood elevations with the low levees proposed for both the Stump Lake and

Swan Lake complexes in place. Floods and overtopping would normally occur in the late winter-early spring of the year, due to upstream snowmelt and normal spring rains. When the low earthen levees are overtopped, some local damage may occur, but should be minimal. Any levee damage during most of these events would be repairable prior to the fall season, when higher interior water levels are required.

(3) Drainage Structure. Since the proposed riverfront levee forms a closed system, new structures were required to drain excess runoff in the system by gravity during low river conditions. Both concrete culverts and stoplog structures, located at the lower end of Long Lake and Stump Lake, were examined. The drains were designed to pass the runoff from a 24 hour, 50 year rainfall over the entire contributing drainage area in 2 days without backing water onto adjacent private property. A 4 chamber concrete box with sluice gates, as shown on Plate 17 was selected at Long Lake since fish would enter Long Lake for spawning through such a structure. At Lower Stump Lake, 3-42" gravity drains would be required. When overtopping of the levee from high Illinois River levels was imminent, the gates could be opened to allow backflooding at the lower end, reducing the chance of damage to the levee.

(4) Pumping. In order to have the capability to either flood or drain the system, a reversible pumping system was designed. The pumping system, shown on Plate 18, consists of two pumps, each with a capacity of 90 cubic feet per second (cfs). One pump would be used to flood the levee system to attract waterfowl in the migration system with a low river level, and the other to drain the system in the growing season with a high (but not overtopping) river level. This filling or emptying could be accomplished in about one week with the selected pumping capacity.

b. Interior levees.

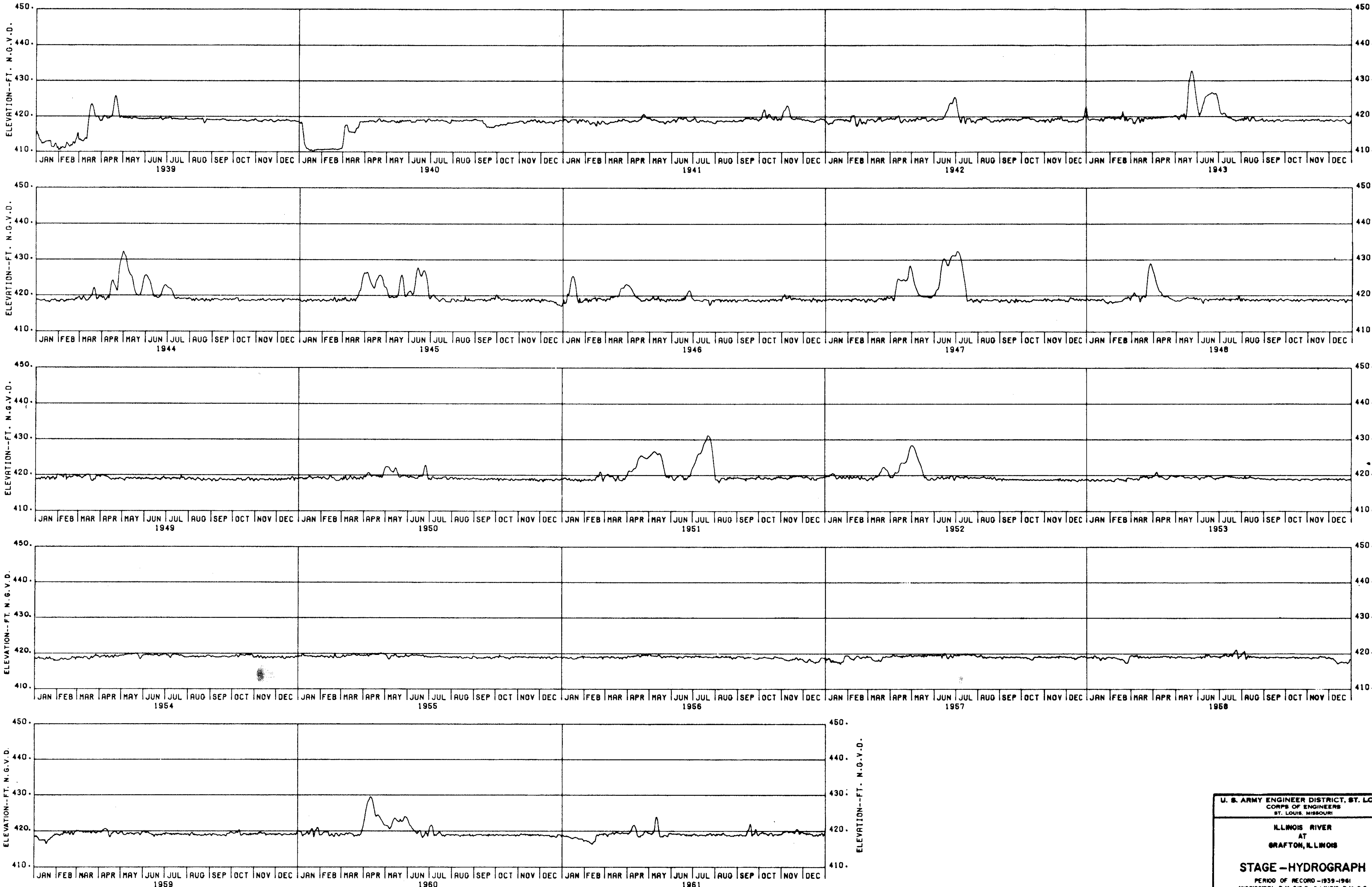
(1) Crown Elevation. The individual lakes comprising the Stump Lake complex include Fowler Lake, Upper and Lower Stump Lakes, Flat Lake, Long Lake, and Deep Lake. In order to more efficiently manage the complex for waterfowl, the levees separating the individual lakes will be raised to a uniform 422 feet NGVD. An elevation of 422 feet will allow for proper depth of flooding for waterfowl feeding.

(2) Drainage Structures. Gravity drains with sluice gates or stop log structures will allow individual lakes to be drained and planted during the growing season or flooded during the waterfowl migration season. Drains were designed to allow dewatering or flooding in a reasonable time (10 to 14 days). Drainage structures that allow boat passage to Upper and Lower Stump Lakes were requested by the Illinois Department of Conservation to provide access to waterfowl hunters from the main public access area on Long Lake.

(3) Pump. It is proposed to use Flat Lake as a dredge disposal area, which will create a perched lake. A pump with a capacity of 5,000 gallons per minute (gpm) is required for filling Flat Lake in about 2 weeks, as requested by IDOC.

c. Dredging. Sedimentation has reduced water depths severely in Long Lake and Deep Lake. Presently these lakes are only a few inches deep at their upstream ends, which is the location of the reversible pumps. In the past, Long Lake was a popular fishing lake, but has become so shallow because of siltation, its value as fish habitat has declined. Dredging of Long Lake and the upper end of Deep Lake is included in the recommended plan to insure adequate conveyance between the pump site and the interior lakes, and to provide a fish spawning area. Details of the dredging plan are shown on Plate 14.

d. Williams Hollow land treatment. Sediment carried by Williams Hollow Creek has been deposited in Lower Stump Lake for many years, reducing the size and depth of the lake. A sediment catchment basin was designed to trap 100% of the sediment load for a 10-year storm over the Williams Hollow basin. A rock overflow weir was designed to pass a 50-year flow without failure of the structure. However, due to the high cost of such a structure, the fact that a large area (40-80 acres) of private land would be required, and the structure conflicting with the intended use of the area as a goose management area, the alternative was not included in the recommended plan. As an alternate plan, the Soil Conservation Service was consulted on land use methods of reducing sediment runoff. Their recommendations will be forwarded to the IDOC and it will be their responsibility to pursue any further actions to resolve this specific problem area.



U. S. ARMY ENGINEER DISTRICT, ST. LOUIS
CORPS OF ENGINEERS
ST. LOUIS, MISSOURI

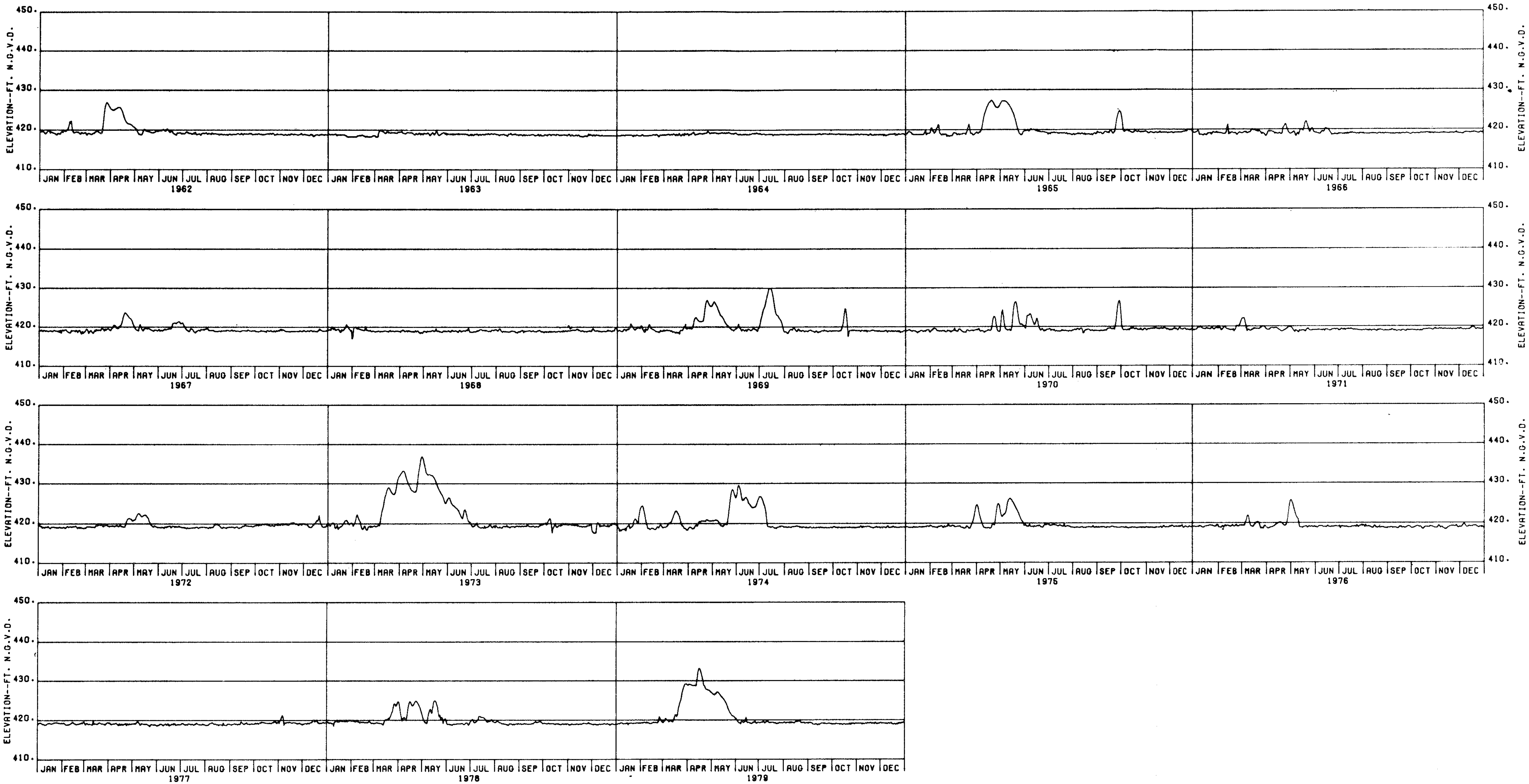
ILLINOIS RIVER
AT
GRAFTON, ILLINOIS

STAGE – HYDROGRAPH

PERIOD OF RECORD – 1939-1961
MISSISSIPPI R.M. 218.0 – ILLINOIS R.M. 0.0

F DACW 43

FIGURE D-1.a



U. S. ARMY ENGINEER DISTRICT, ST. LOUIS
CORPS OF ENGINEERS
ST. LOUIS, MISSOURI

ILLINOIS RIVER
AT
GRAFTON, ILLINOIS

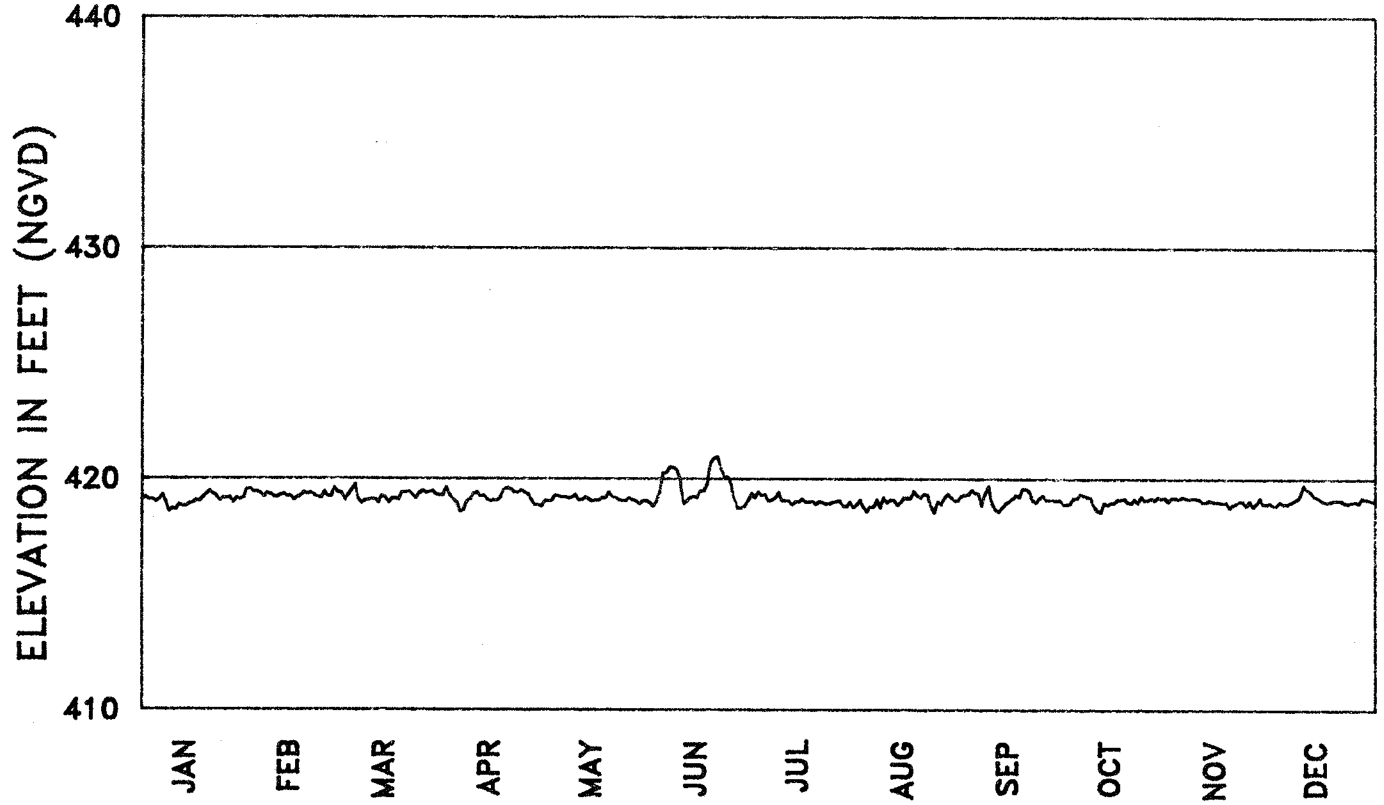
STAGE-HYDROGRAPH

PERIOD OF RECORD-1962-1979
MISSISSIPPI R.M. 218.0-ILLINOIS R.M. 0.0

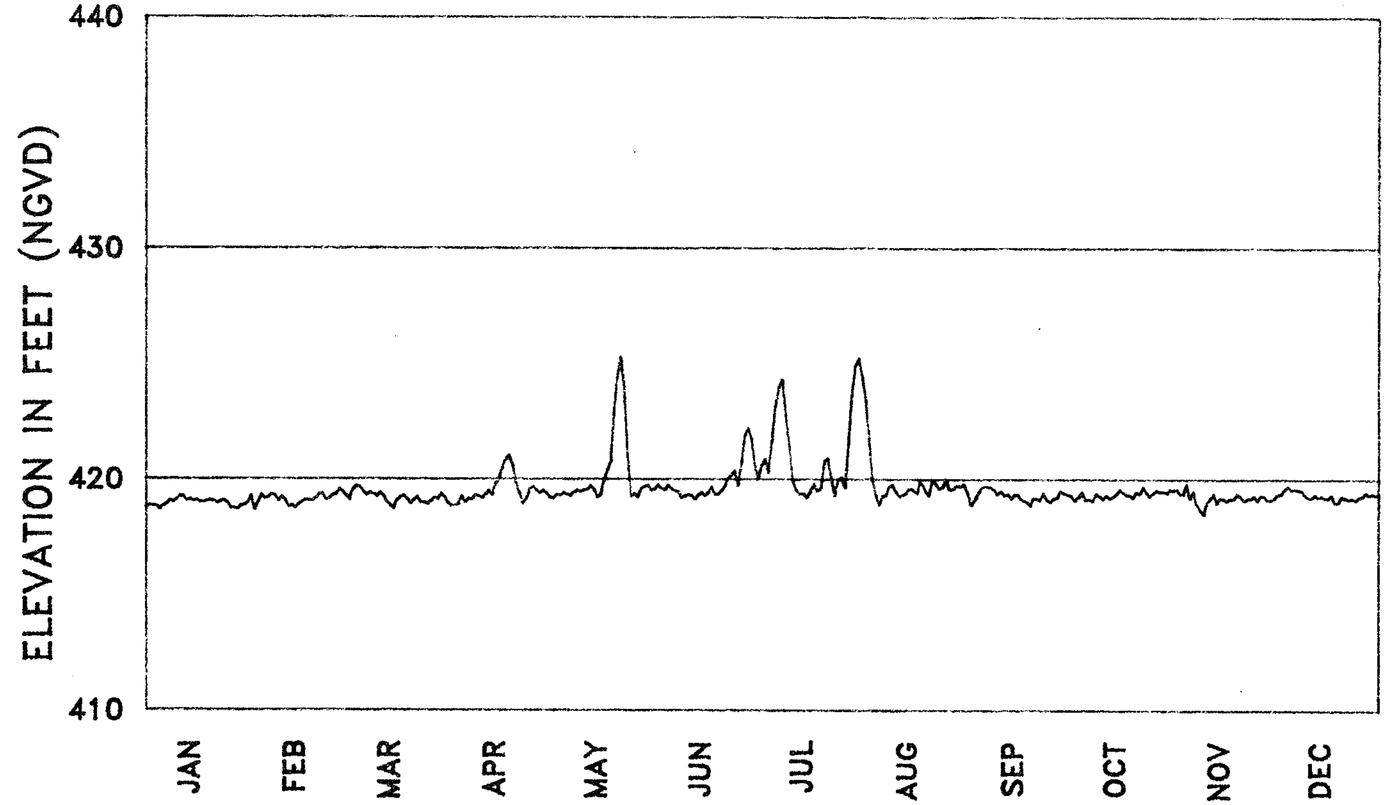
F DACW 43

FIGURE D-1.b

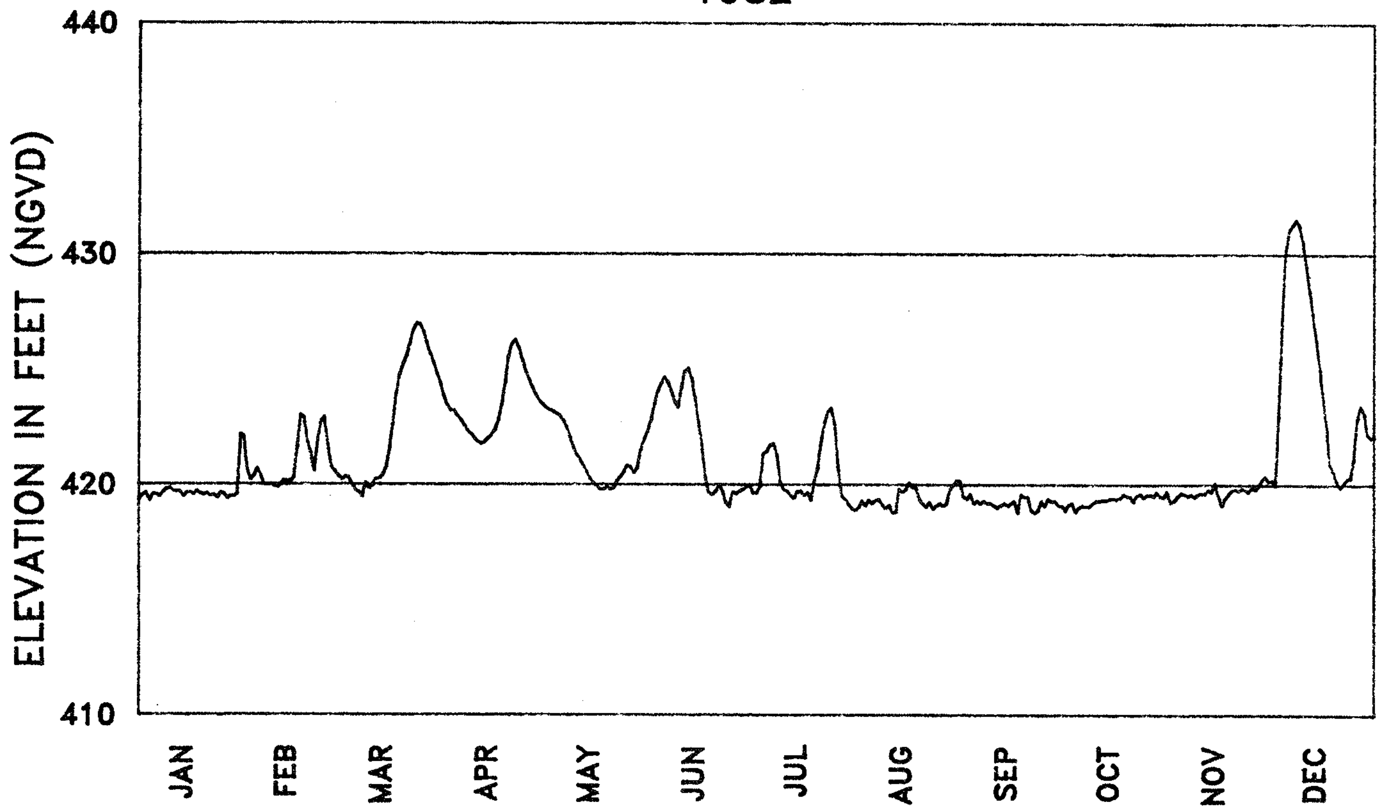
STAGE HYDROGRAPH AT GRAFTON
1980



STAGE HYDROGRAPH AT GRAFTON
1981



STAGE HYDROGRAPH AT GRAFTON
1982



STAGE HYDROGRAPH AT GRAFTON
1983

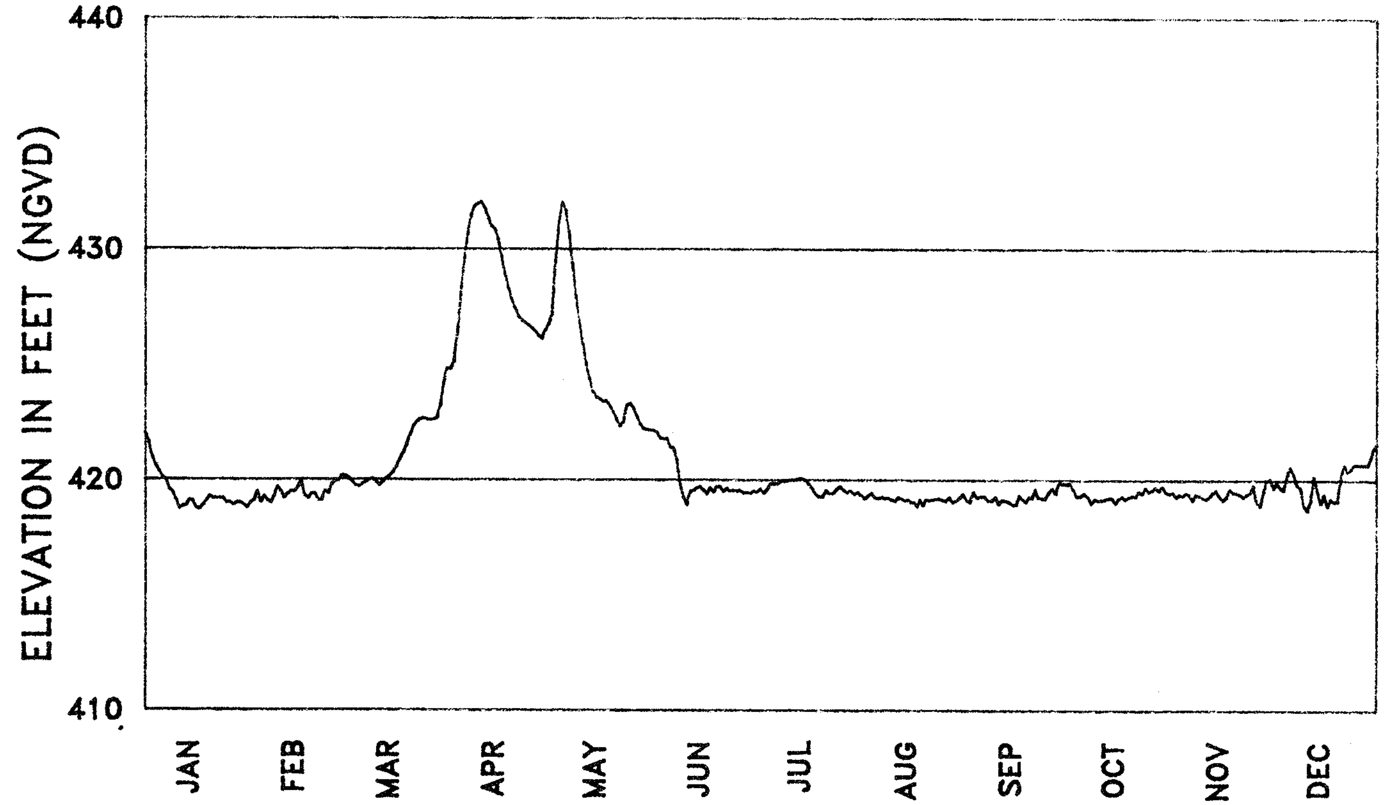


FIGURE D-1.c

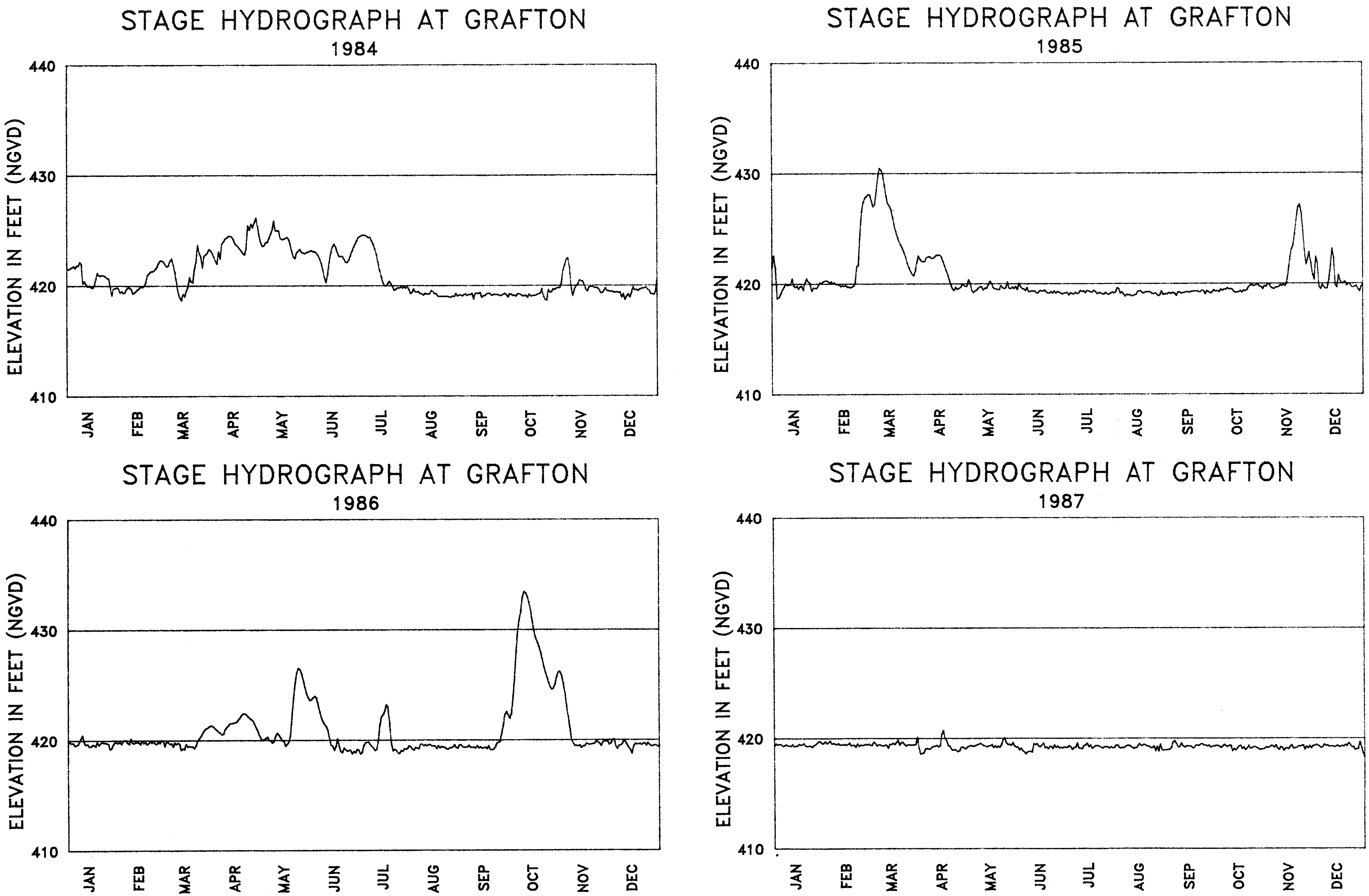
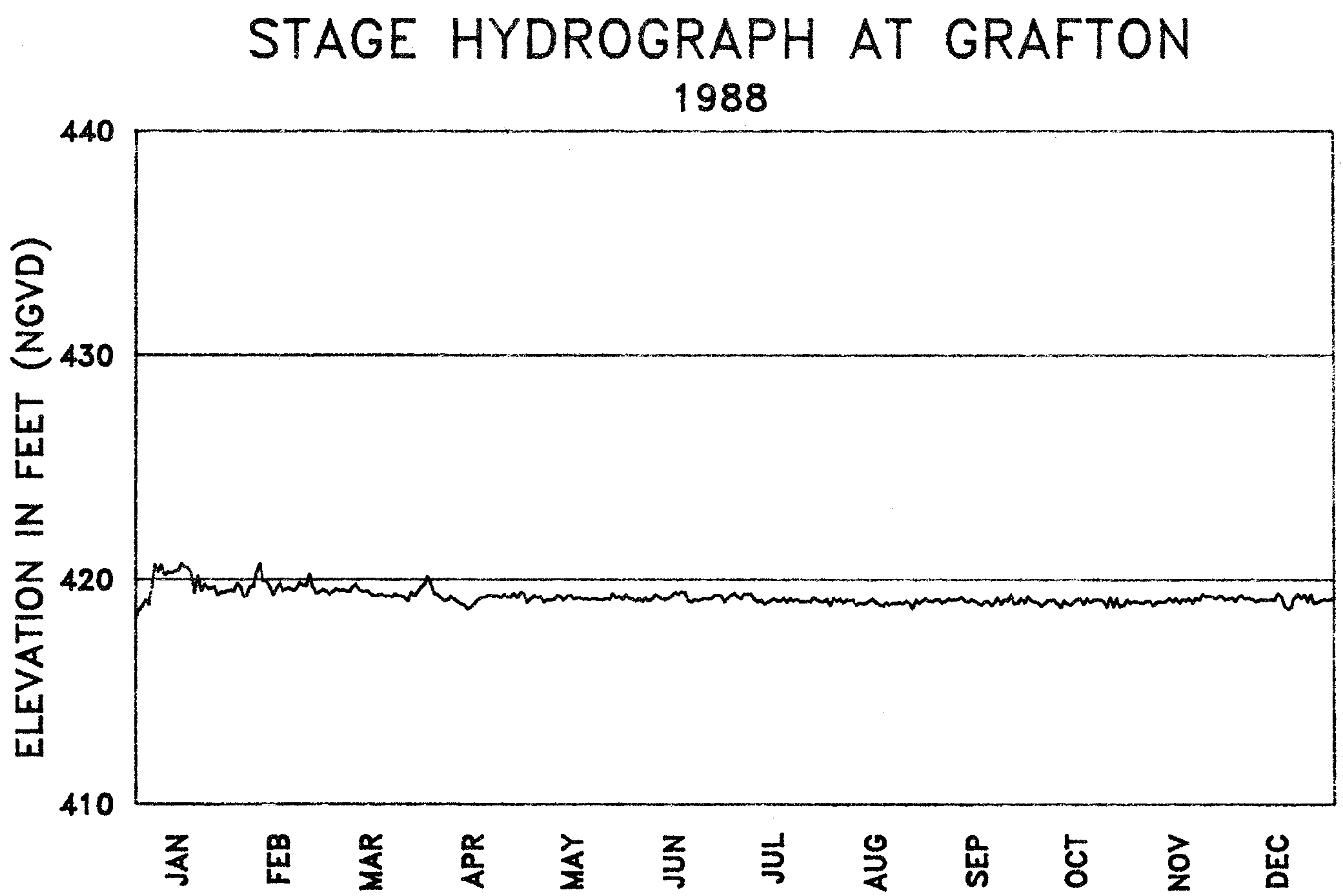

STAGE HYDROGRAPH AT GRAFTON
1984
STAGE HYDROGRAPH AT GRAFTON
1985
STAGE HYDROGRAPH AT GRAFTON
1986
STAGE HYDROGRAPH AT GRAFTON
1987
ELEVATION IN FEET (NGVD)
410
420
430
440
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC

FIGURE D-1.d


STAGE HYDROGRAPH AT GRAFTON
1988
ELEVATION IN FEET (NGVD)
440
430
420
410
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC

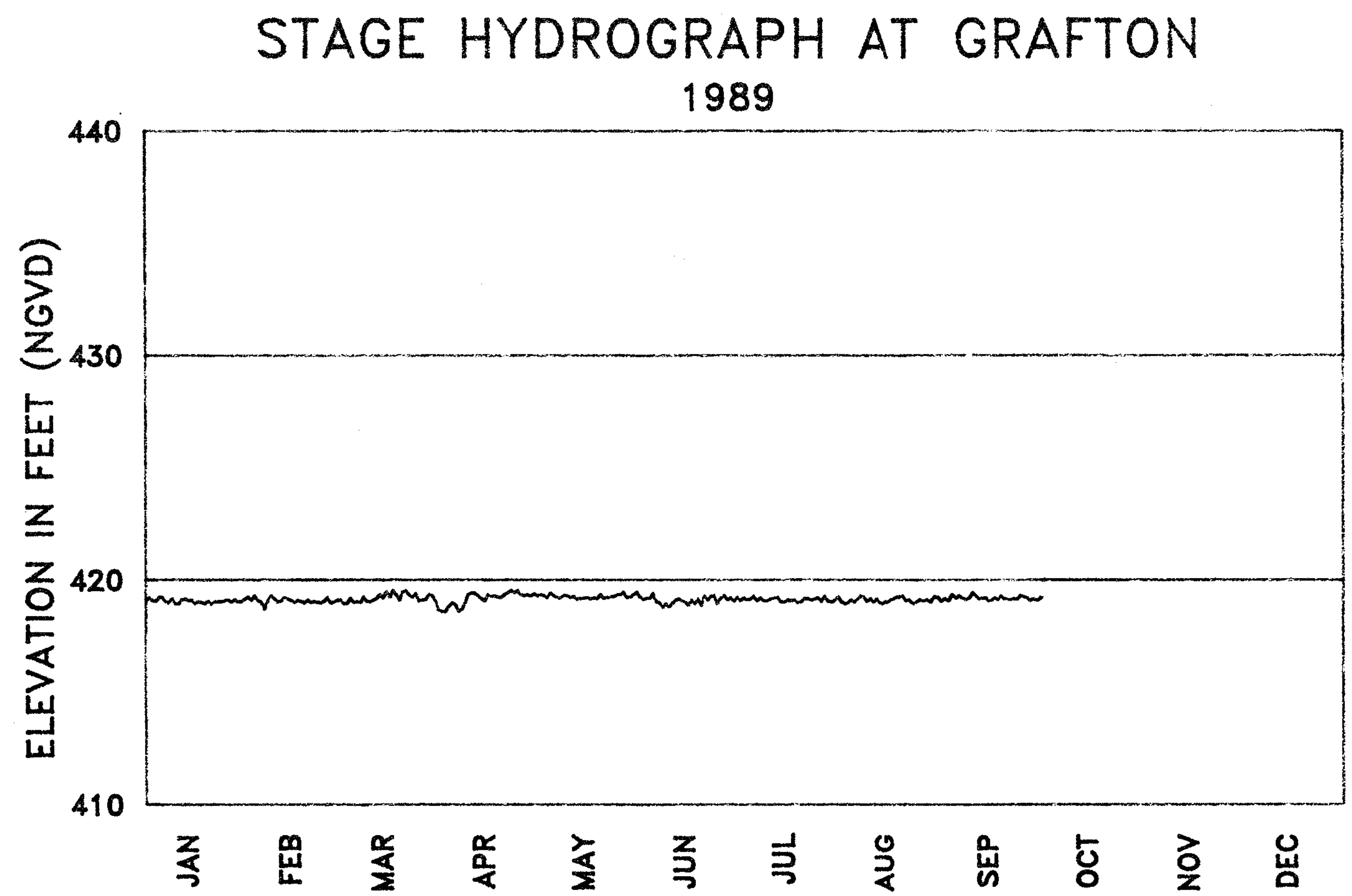
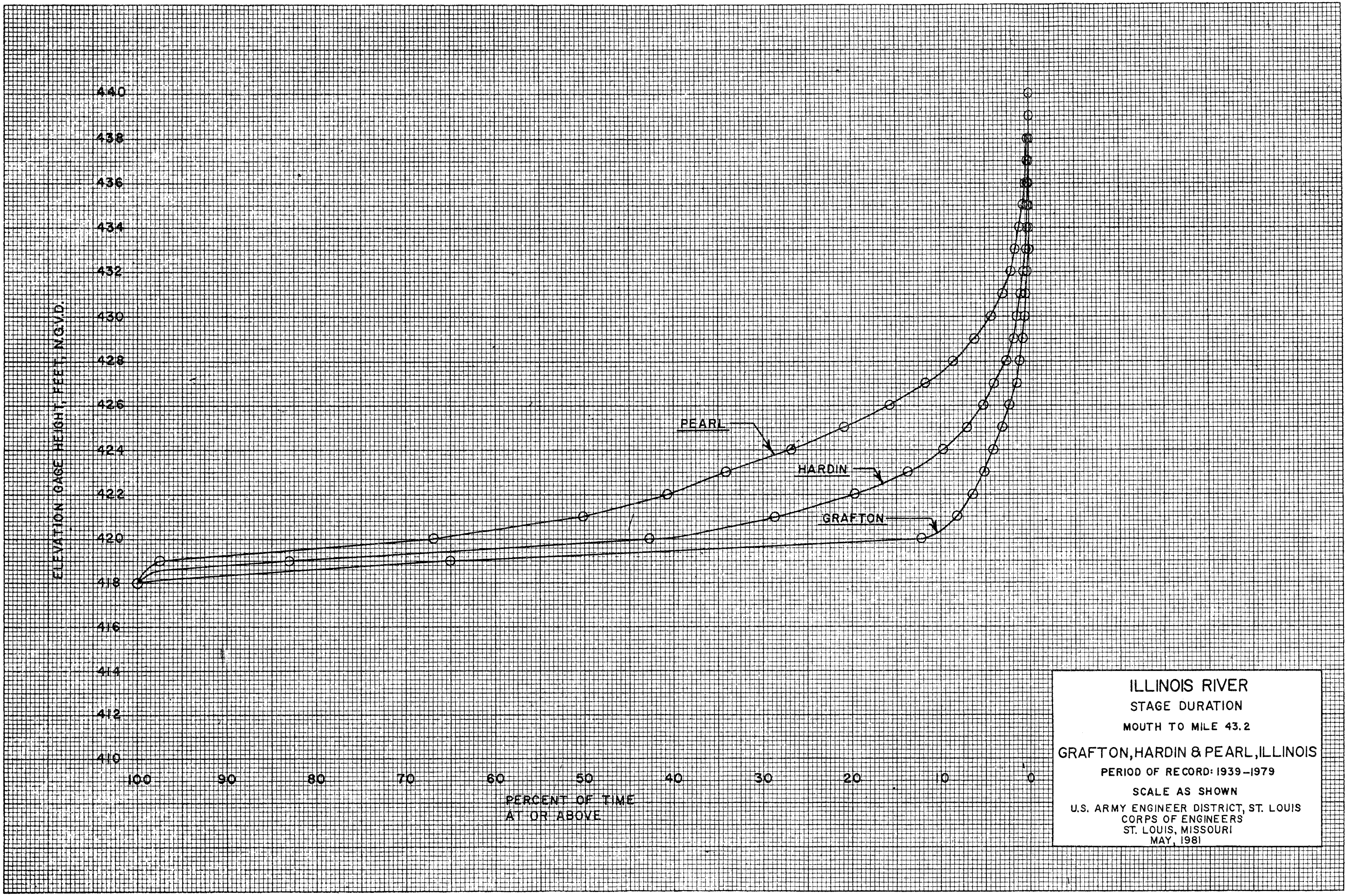

STAGE HYDROGRAPH AT GRAFTON
1989
ELEVATION IN FEET (NGVD)
440
430
420
410
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC

FIGURE D-1.e



ILLINOIS RIVER
STAGE DURATION
MOUTH TO MILE 43.2
GRAFTON, HARDIN & PEARL, ILLINOIS
PERIOD OF RECORD: 1939–1979
SCALE AS SHOWN
U.S. ARMY ENGINEER DISTRICT, ST. LOUIS
CORPS OF ENGINEERS
ST. LOUIS, MISSOURI
MAY, 1981

FIGURE D-2

APPENDIX DPR-E

PROJECT HABITAT QUANTIFICATION

APPENDIX DPR-E provides a quantification of habitat conditions using the Wildlife Habitat Appraisal Guide (WHAG) and the Aquatic Habitat Appraisal Guide (AHAG) for project planning. This appendix establishes a basis for evaluating the biological impacts of the various project alternatives, and provides a biological baseline for post-project performance evaluation monitoring.

UPPER MISSISSIPPI RIVER SYSTEM ENVIRONMENTAL MANAGEMENT PROGRAM
DEFINITE PROJECT REPORT WITH INTEGRATED ENVIRONMENTAL ASSESSMENT
STUMP LAKE COMPLEX HABITAT REHABILITATION PROJECT
ILLINOIS RIVER, JERSEY COUNTY, ILLINOIS

APPENDIX E

PROJECT HABITAT QUANTIFICATION

SECTION I. INTRODUCTION

This appendix provides a quantification of habitat conditions for project planning. Such quantification is needed to evaluate project features where traditional benefit: cost evaluation procedures are not applicable. To date, the unit of measure that has gained the widest acceptance among technical and policy elements, both within and outside the Corps, is the habitat unit (HU). This unit has been applied to the evaluation of the Stump Lake Complex HREP. A habitat unit is the product of habitat quality and habitat quantity. Habitat quality is described by a habitat suitability index (HSI), and habitat quantity by number of habitat acres. HSIs result from the numeric ranking of site characteristics at sample sites for a habitat throughout a given project area. HUs can be annualized for specific target years to project changes in habitat values over time. The effects of various plans or plan features can than be compared by applying the HSIs to the acreage of habitats for each alternative considered.

For the Stump Lake Complex HREP there is a need for both wildlife and fisheries based HU accounting methodologies. At the present time a number of such methodologies are available. These include the U. S. Fish and Wildlife Service's (USFWS) Habitat Evaluation Procedures or HEP, the U. S. Army Corps of Engineers' Habitat Evaluation System or HES, and the U. S. Bureau of Reclamation's Habitat Management Evaluation Method. Among the Federal and state agencies, the HEP procedure is the most familiar to all participants in the UMRS-EMP. The Missouri Department of Conservation (MDOC) and the Soil Conservation Service, U. S. Department of Agriculture, have developed an appraisal system based on the USFWS's HEP. The system, referred to as the Missouri Wildlife Habitat Appraisal Guide (WHAG) method, represents a regional fine tuning of HEP and is structured to more efficiently input field data. The WHAG is accepted by UMRS agencies as the method of choice for EMP wildlife habitat analysis, and for this reason it was applied to the Stump Lake Complex project.

To date, HU methodologies for wildlife evaluation have received greater support and acceptance among biologists than have fisheries evaluation methods. The most promising fisheries evaluation developed thus far for use on the EMP is one developed by the Corps' Rock Island District and the Corps' Waterways Experimental Station (WES). The HSI models for the methodology, referred to here as the Aquatic Habitat Appraisal Guide (AHAG) method, follow the format of the Missouri WHAG. The AHAG is still evolving, and it has not yet been field verified; however, the procedure does represent the state-of-the-art. For that reason, the AHAG with some site-specific modifications made by WES, has been applied to the Stump Lake Complex HREP. The specific details of the application of the WHAG and AHAG procedures to the Stump Lake Complex are described in the next two sections of this appendix.

SECTION II. WILDLIFE HABITAT APPRAISAL GUIDE (WHAG) METHOD

1. BACKGROUND

The WHAG is a field evaluation procedure designed to measure the quality of a habitat for a particular species of wildlife, and also accounts for land management practices. The method provides HSI values for areas classified into broad land-use types such as forested wetland and nonforested wetland. WHAG is based on the assumption that habitat quality can be numerically described by HSIs calculated from species-habitat models.

WHAG utilizes checklist-type appraisal guides for each habitat type. The guide breaks habitat into the most important characteristics which are rated on a 1-to-5 or 1-to-10 scale, depending on their importance. Field data values are entered into a computer program which rates habitat types based on life requisite requirements for a variety of species. The resulting index ranges from a low habitat suitability value of 0.1 to a high of 1.0.

Computer results are provided for estimated total HUs and HSIs. The results can be used to assess the value of various proposed habitat improvements on habitat quality. HUs are annualized for target years in order to evaluate changes due to project features over time. In the Stump Lake Complex project, dredging, levees, pumps, and water control structures are some of the habitat improvement measures considered. Because habitat units can change over time, a number of target years were selected for the life of the project. These target years were year 0 (existing conditions), year 2 (early post-construction), and year 50 of the project life.

Habitat can be potentially improved by: (1) increasing the acreage of habitat types in short supply, (2) altering a habitat limiting factor, such as unpredictable water levels, (3) altering a management strategy, such as food crop composition, or (4) a combination of the above.

The major wildlife project goal for the management of Stump Lake Complex was the enhancement of wetland values for migratory waterfowl. Therefore, the WHAG team selected the appraisal guides for wetland habitats and selected the mallard as a target species of emphasis. The WHAG team included representation from the USFWS, Illinois Department of Conservation, and the Corps. Prior to site sampling, the study team reviewed aerial photography, topographic maps, and preliminary design drawings to select representative sample sites for WHAG application.

2. ASSUMPTIONS

During the WHAG analysis, certain assumptions were developed regarding existing conditions and future conditions. These assumptions are listed below.

a. Existing Conditions

(1) Although Stump Lake Complex is currently managed for waterfowl, water levels within the complex may fluctuate greatly during the growing season and during waterfowl migrations because the complex is not protected from Illinois River flooding. Unstable water conditions result in food production that is either unreliable or unavailable to waterfowl.

(2) The target water surface elevation for all flooded management units in the fall and spring is 420 feet NGVD. This provides an average water depth of 12-18 inches in each unit.

(3) The current rate of sedimentation within the complex is 0.51 inches per year. This value is the same as that used for the Swan Lake HREP. Swan Lake is located on the other side of the Illinois River, and its rate of sedimentation was estimated by several investigators using various field methods. About 91 percent of the sediment (by volume) received by Stump Lake Complex comes from the Illinois River, and the remaining 9 percent from an upland watershed (Williams Hollow).

b. Future Conditions

(1) General. The following general assumptions were applied to the analysis of all future changes in habitat during the 50-year project life.

(a) Target years of 0, 2 and 50 are sufficient to annualize the analysis of all future changes over the life of the project.

(b) The mallard is a suitable species of emphasis and adequately characterizes the life requisite requirements of the migratory waterfowl group for the purposes of the incremental analysis of this project.

(c) No comparative evaluation of project-related changes in wetland values was developed for species other than the mallard (such as the Canada goose, muskrat, green-backed heron, wood duck, beaver, northern parula, or prothonotary warbler). Although informative, evaluations for additional species would not assist in the development of an array of alternative features to improve waterfowl management at Stump Lake Complex.

(2) Specific. Specific assumptions employed in evaluating alternative Plans A, B, and C are given below.

(a) Alternative Plan A, No Action Plan (also represents future without project conditions).

1 Moderate to severe water level fluctuations within the management units will continue to limit the complex's value for waterfowl food production.

2 Over the next 50 years, the complex's nonforested wetlands (Upper and Lower Stump Lake, Flat Lake, and Fowler Lake) will become functionally lost or of little value for waterfowl management. For this time period, the WHAG team assumed that 35 percent of the surface area of these nonforested wetlands would disappear to continuing sedimentation and encroachment of woody vegetation. Likewise, the average depth of the management units would be about halved.

3 The HSI values developed from the field data are a fair representation of the habitat quality of unprotected habitat in all target years, and for all future conditions with or without a project.

(b) Alternative Plan B, Wetlands Excavation.

1 Moderate to severe water level fluctuations will continue to limit the complex's value for waterfowl food production, even with deliberate plant seeding.

2 Even though 1.5 feet of sediment and earthen material would be initially excavated from a 100-acre area of nonforested wetlands (in Upper Stump Lake), all of the unexcavated nonforested wetlands would continue to collect sediment during the life of the project, and would become functionally lost or of little value.

3 The habitat quality of Flat Lake, the (onsite) disposal area for the excavated material, would not be diminished with respect to the mallard. The material would be spread out evenly within the unit so that waterfowl management could continue.

(c) Alternative Plan C, Wetlands Protection and Management.

1 Most years water levels will be predictable and better controlled than at present. This improved management capability will increase the reliability of plant production, and ensure that food that is produced is inundated in the proper manner, and thus available to waterfowl during migration.

2 Sedimentation from the Illinois River will be reduced, on the average, by 79 percent from its existing rate. Likewise, the efficiency of trapping hillside sediment from Williams Hollow under the Soil Conservation Service's plan will be 62.5 percent. Little loss of wetland depth or acreage will occur over the next 50 years due to sedimentation. The maximum water level at which the units could be managed is 421 feet NGVD. This flexibility will allow the water levels in the units to be raised to compensate for sedimentation that does occur.

3 The increase in water level stability within the management units will allow for the reestablishment of submergent aquatic plants, such as sago pondweed (Potamogeton pectinatus) or curlyleaf pondweed (Potamogeton crispus), that are highly desirable by waterfowl as natural plant foods.

4 The borrow pits created during construction of the riverside and interior levees will be physically connected to the management units by several ditches. As such the borrow pits will constitute an increase in the acreage of nonforested wetland habitat. The habitat quality of these new depressions with respect to the mallard will be the same as that of all of the management units combined. Therefore, the HSI values applied to the borrow pit acreage will be the same as those used for the combined acreage of Upper and Lower Stump Lake, Fowler Lake, and Flat Lake.

5 The habitat quality of the riverside and interior levees with respect to the mallard is negligible, and the HSI value associated with these structures is zero.

3. RESULTS

Sample plot locations assigned by the WHAG team are shown in FIGURE E-1. The number and placement of these plots were judged by the team to be sufficient and representative of the prevailing habitat conditions. TABLE E-1 provides a listing of the appraisal guide items and potential ratings used in the WHAG for wetlands evaluation.

TABLE E-2 lists the specific appraisal items used in evaluating the project's forested and nonforested wetland habitats, and the values assigned for each habitat type and project condition. In this table as well as all successive WHAG tables, nonforested habitat is divided into two types. The first category consists of the management units: Upper Stump Lake, Fowler Lake, Lower Stump Lake, and Flat Lake (sites A, C, D, and E, respectively). The second grouping includes Long and Deep Lakes (site B); these water bodies are currently used for conveying water in and out of the management units.

TABLE E-3 depicts the HSI values resulting from the application of the WHAG software to the TABLE E-2 ratings; for comparative purposes, the HSI values are for the mallard as well as other species. TABLE E-4 presents a tabulated prediction of habitat acreage changes expected for the project area over the next 50 years for various alternative plans and plan features. This table also includes HSI values within parentheses for the mallard for each alternative plan and feature. Some of the HSI values in TABLE E-4 for combined sites A, C, D and E are different from those in TABLE E-3 because they have been adjusted. The adjustment accounts for the effect of adding that particular project alternative or feature to the future without condition. The magnitude of the adjustment is directly proportional to the weighting assigned to each feature by the WHAG team in accomplishing the various project objectives.

TABLE E-5 is a plan comparison summary in annual habitat units for the mallard resulting from the application of the Corps' HES software to the mallard HSI values and acreage in TABLE E-4.

4. DISCUSSION

The mallard was selected by the team as the species best characterizing the life requisite requirements for migratory waterfowl. The improvement of the Stump Lake Complex for migratory waterfowl is a primary purpose of this project. TABLE E-5 shows the incremental effects of the various study options on the mallard duck. Plan B, the wetland excavation alternative, shows no overall improvement in mallard habitat over that of the no project condition. The greatest single contribution to habitat improvement (79 habitat units) comes from the water control and depth control afforded by Plan C - Option 3A, called "interior water control-hydraulic dredging." This feature includes the new interior levees, improved pumps and water control structures, additional depth in Deep and Long Lake, and improved management capability resulting from the addition of these items. The next greatest contribution to habitat improvement (from 27 to 52 HUs) comes from the sediment control and water control afforded by the riverside levee options. Increasing the crown elevation of this structure from 424 to 425 feet NGVD results in an increase of 9 HUs; from 425 to 426 the difference in HUs is 6, and from 426 to 427 it is 4 HUs, and from 427 to 428 it is 6 HUs. Each of the hillside erosion control options resulted in an increase in HUs of 10.

5. CONCLUSION

Substantial benefits to migratory waterfowl would result from implementation of the riverside levee and interior water control options. A few HUs would accrue from control of hillside erosion from Williams Hollow. No benefit would result from dredging of Upper Stump Lake. Without giving consideration to cost, the optimal riverside levee height appears to be 426 feet NGVD.

In preparation of the Draft DPR, a shortcoming of the WHAG methology was noted. The WHAG does not assess the year-to-year reliability of waterfowl food sources - from either moist soil management or submerged aquatic plant production. Currently, optimal waterfowl food production at Stump Lake

Complex is not reliable from year to year because of the harmful effects of river flooding abbout once every two years during 15 June - 1 December. This is the period when moist soil management techniques are implemented, most aquatic plant production occurs, and food is eaten by waterfowl. Consequently, an optimal food source is currently produced on average only once every two years. Construction of the riverside dike/levee to the elevation of 426 feet NGVD will reduce the flooding frequency by a factor of three, to about once every six years. Accordingly, the 426 dike/levee should provide an optimal food crop on average every five of six years. Therefore, the habitat benefits attributable to this dike/levee (42 AAHUs) should be increased by some factor to account for the structure's positive effect on reliability of optimal food production. The factor should be the difference between the current reliability with the riverside dike/levee (5 of 6 years or 83 percent), which is 33 percent. Therefore, the adjusted habitat benefits are 56 AAHUs (42 AAHUs X 1.33). Table E-5 does not show this adjusted value. Adjustment factors for the other dike/levee elevations have not been calculated.

FORESTED WETLAND SITES : 1-5
NONFORESTED WETLAND SITES :

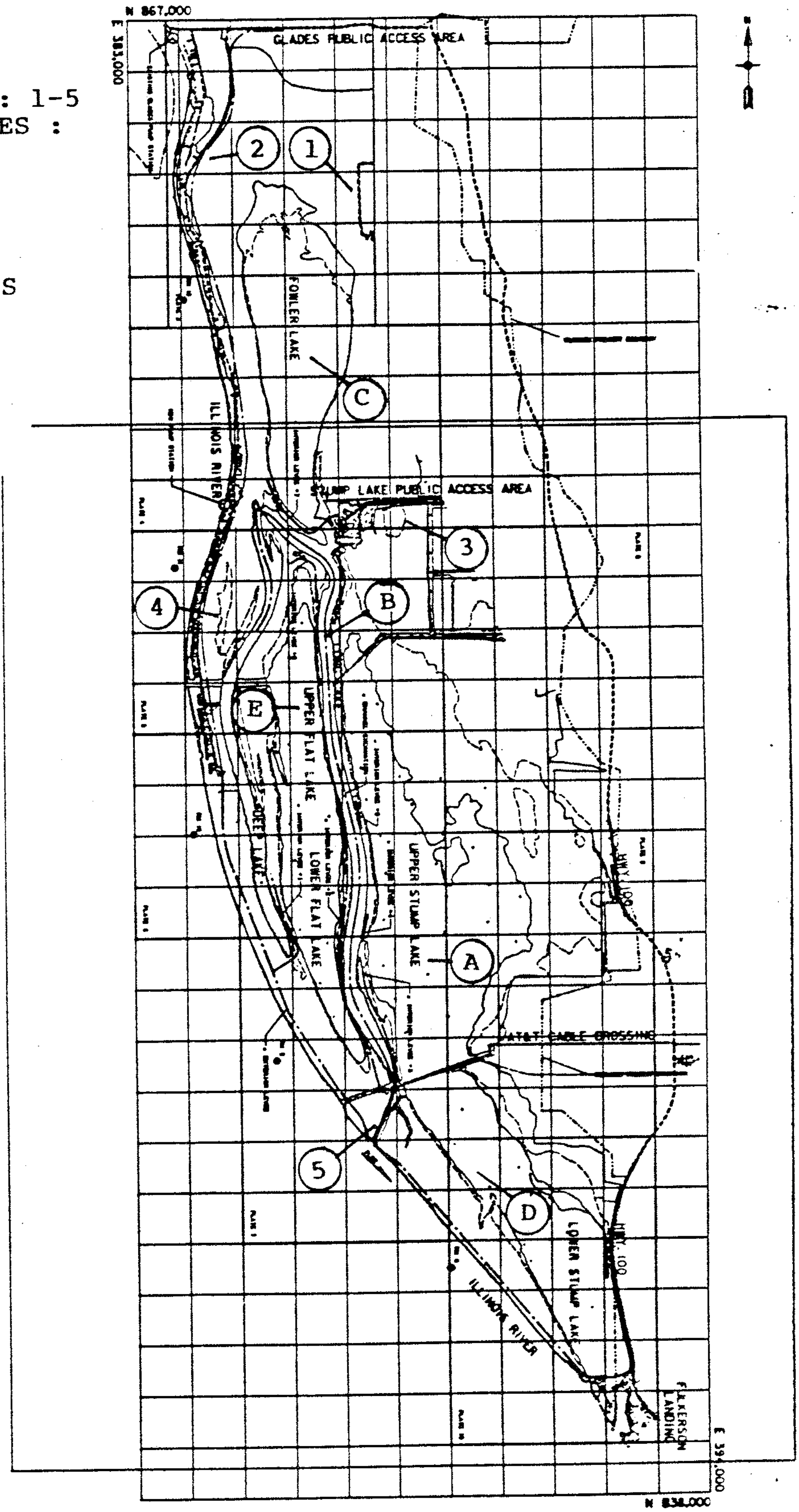
A - UPPER STUMP LAKE

B - LONG AND DEEP LAKES

C - FOWLER LAKE

D - LOWER STUMP LAKE

E - FLAT LAKE



WETLAND SAMPLE SITE LOCATIONS

FIGURE E-1

TABLE E-1

Wetland Species Characteristic Matrix

Wildlife Area: ______________

Date: ______________

Habitat Type: ______________

	CHARACTERISTIC	Habitat Type	Mallard	Canada Goose	Least Bittern	Lesser Yellowlegs	Muskrat	King Rail	Green-backed Heron	Wood Duck	Beaver	American Coot	Northern Parula	Prothonotary Warbler
1.	**Percent Nonforest Wetlands in 2 Mile Wide Circle**	N												
	1. >75%				10	10	10	10				10		
	2. 50 - 75%				8	8	8	8				8		
	3. 25 - 50%				6	6	6	6				6		
	4. 10 - 25%				4	4	4	4				4		
	5. <10%				1	1	1	1				1		
2.	**Percent Nonforest Wetlands and Lakes or Reservoirs in 2 Mile Wide Circle**	N,C,G												
	1. >75%			10										
	2. 50 - 75%			8										
	3. 25 - 50%			6										
	4. 10 - 25%			4										
	5. <10%			LF										
3.	**Percent Bottomland Hardwoods and Nonforest Wetlands in 2 Mile Wide Circle**	N,B,C												
	1. >75%		10						10	10	10			
	2. 50 - 75%		8						8	8	8			
	3. 25 - 50%		6						6	6	6			
	4. 10 - 25%		4						4	4	4			
	5. <10%		LF						1	1	1			
4.	**Fall Winter Water Conditions**	N,B,C												
	1. Water present annually (predictable & water levels controlled		10	10										
	2. Water present most years with occasional lapse & water levels controlled		7	7										
	3. Water present 1 out of 3 years (opportunistic) & water levels controlled		4	4										
	4. Water unpredictable; dry during fall and winter; or no control when present		LF	LF										
5.	**Fall-Winter Flood Conditions (food plant availability)**	N,B	M	M										
	1. Food plants unaffected		10	10										
	2. Reduced 1 - 25% (Multiply index by .75)		8	8										
	3. Reduced 25 - 50% (Multiply index by .50)		6	6										
	4. Reduced 50 - 75% (Multiply index by .25)		4	4										
	5. Reduced >75% (Multiply index by .25)		1	1										
6.	**Water Depth 4" - 18" Fall - Winter**	N,B,C												
	1. >90%		10	10										
	2. 75 - 90%		8	8										
	3. 50-75%		6	6										
	4. 25 - 50%		4	4										
	5. <25%		1	1										
7.	**Water Depth <4" During May**	N												
	1. >90%					10						LF		
	2. 75 - 90%					8						2		
	3. 25 - 75%					6						4		
	4. 1 - 25%					4						7		
	5. ZERO or all >4" Deep					1						10		
8.	**Water Depth 4 - 18" By August**	N												
	1. >75%				1		10	1	10			10		
	2. 50 - 75%				7		7	7	7			7		
	3. 25 - 50%				10		4	10	4			4		
	4. <25%				4		1	4	1			1		
9.	**Permanent Water Entire Year**	N					M							
	1. >90%						10							
	2. 75 - 90% (Multiply index by .90)						8							
	3. 50 - 75% (Multiply index by .75)						6							
	4. 25 - 50% (Multiply index by .50)						4							
	5. <25% (Multiply index by .25)						1							
10.	**Percent Emergent Vegetation Within 2 yds. of Water**	N												
	1. >75% of emer. veg. within 2 yd. of water				10							10		
	2. 50-75% of emer. veg. within 2 yd. of water				7							7		
	3. 25-50% of emer. veg. within 2 yd. of water				4							4		
	4. <25% of emer. veg. within 2 yd. of water				1							1		

Wetland Species Characteristic Matrix

	CHARACTERISTIC	Habitat Type	Mallard	Canada Goose	Least Bittern	Lesser Yellowlegs	Muskrat	King Rail	Green-backed Heron	Wood Duck	Beaver	American Coot	Northern Parula	Prothonotary Warbler
11.	Woody Invasion	N												
	1. <10%				10		5	6	1					
	2. 10 - 25%				8		4	8	6					
	3. 25 - 50%				6		3	10	8					
	4. 50 - 75%				4		2	4	10					
	5. >75%				1		1	1	4					
12.	Emergent Vegetation Coverage	N,B												
	1. >90%				6	LF			1					
	2. 75 - 90%				10	2			2					
	3. 50 - 75%				8	4			4					
	4. 25 - 50%				4	6			10					
	5. 10 - 25%				2	8			7					
	6. <10%				LF	10			1					
13.	Cattail and Bulrush Coverage	N												
	1. >75%						10	LF				8		
	2. 50 - 75%						8	2				10		
	3. 25 - 50%						6	4				6		
	4. 10 - 25%						4	7				4		
	5. <10%						1	10				LF		
14.	Wetland Size	N,B												
	1. >200 acres				10	10	10	10	10			10		
	2. 100 - 200 acres				10	8	8	8	10			10		
	3. 50 - 100 acres				8	6	6	6	10			8		
	4. 25 - 50 acres				6	4	4	4	10			6		
	5. 5 - 25 acres				4	1	2	2	5			4		
	6. <5 acres				LF	LF	1	1	LF			LF		
15.	Wetland Edge	N,B												
	1. >75% Bottomland H. - % adj. to water								10					
	2. 50-75% Nonforest w.-% woody or adj. to bottomland hardwoods								8					
	3. 25 - 50%								6					
	4. 10 - 25%								4					
	5. <10%								1					
16.	Water Regime	N												
	1. Gradual drying with >75% water remaining by Aug. 1				4	4	8	2	10			8		
	2. Gradual drying with 50 - 75% water remaining by Aug. 1				6	6	6	6	6			6		
	3. Gradual drying with 25 - 50% water remaining by Aug. 1				10	10	4	10	4			4		
	4. Gradual drying with <25% water remaining by Aug. 1				8	8	2	8	2			2		
	5. Stable water				2	4	10	4	10			10		
	6. Rapid drying; or no water after June 1				LF	LF	LF	LF	LF			LF		
17.	Important Food Plant Coverage	N,B	M	M										
	1. >75%		10	10										
	2. 50 - 75% (Multiply index by .75)		8	8										
	3. 25 - 50% (Multiply index by .50)		6	6										
	4. 10 - 25% (Multiply index by .25)		4	4										
	5. <10% (Multiply index by .25)		1	1										
18.	Plant Diversity	N,B												
	1. >7		5	5										
	2. 4 - 7		3	3										
	3. <4		1	1										
19.	Persistent Emergent and Woody Vegetation Coverage	N												
	1. 5 - 15%		5	5										
	2. 15 - 25%		4	4										
	3. 25 - 50%		2	2										
	4. <5% or >50%		1	1										

Wetland Species Characteristic Matrix

	CHARACTERISTIC	Habitat Type	Mallard	Canada Goose	Least Bittern	Lesser Yellowlegs	Muskrat	King Rail	Green-backed Heron	Wood Duck	Beaver	American Coot	Northern Parula	Prothonotary Warbler
20.	Substrate - Surface Water Interspersion	N												
	1. Substrate interspersed with shallow water					10								
	2. Shallow water occurring as one or few pools					1								
21.	Percent Open Water	N												
	1. <10%		5	5			10					6		
	2. 10 - 25%		3	3			8					10		
	3. 25 - 50%		1	1			6					8		
	4. 50 - 90%		1	1			4					4		
	5. >90%		1	1			1					1		
22.	Winter Water Depth (Oct. - March)	N												
	1. 15 - 24"						10							
	2. 10 - 15" or 24 - 30"						7							
	3. 6 - 10" or 30 - 36"						4							
	4. <6" or >36"						1							
23.	Sedge Canopy Coverage	N												
	1. <90%							8						
	2. 75 - 90%							10						
	3. 50 - 75%							6						
	4. 25 - 50%							4						
	5. 1 - 25%							2						
	6. Zero							LF						
24.	Wetland Substrate	N												
	1. Muddy					5								
	2. Sandy					3								
	3. Gravel					1								
25.	Percent Soil Waterlogged Substrate May-June	N												
	1. >90% of substrate waterlogged					10								
	2. 75 - 90% of substrate waterlogged					8								
	3. 50 - 75% of substrate waterlogged					6								
	4. 25 - 50% of substrate waterlogged					4								
	5. <25% of substrate waterlogged					1								
26.	Percent Exposed Wetland Substrate and 1-4" Shallow Water Covered by Vegetation May-June	N												
	1. <10%					10								
	2. 10 - 25%					8								
	3. 25 - 50%					6								
	4. 50 - 75%					4								
	5. 75 - 90%					2								
	6. >90%					LF								
27.	Percent Channel with Aquatic Vegetation	B												
	1. >10%									10	10			
	2. 5 - 10%									7	7			
	3. 1 - 5%									4	4			
	4. None									1	1			
28.	Average Water Fluctuation in Channel	B												
	1. Bank full <3 times per year										10			
	2. Bank full 3-5 times per year										7			
	3. Bank full 5-7 times per year										4			
	4. Bank full >7 times per year										1			
29.	Cropfield Management	C												
	1. No fall tillage		10	10										
	2. Winter Wheat		2	10										
	3. Chisel plowing		8	8										
	4. Chopped, baled, grazed		6	6										
	5. Fall disc		4	4										
	6. Fall moldboard		1	1										

Wetland Species Characteristic Matrix

	CHARACTERISTIC	Habitat Type	Mallard	Canada Goose	Least Bittern	Lesser Yellowlegs	Muskrat	King Rail	Green-backed Heron	Wood Duck	Beaver	American Coot	Northern Parula	Prothonotary Warbler
30.	Cropping Practice	C												
	1. >50 unharvested		10	10										
	2. 25-50% harvested		7	7										
	3. 10 - 25% unharvested		4	4										
	4. <10% unharvested		1	1										
31.	Crop Rotation	C												
	1. SG - RC - L			5										
	2. SG - RC; or idle some years			3										
	3. Continuous SG - RC			1										
32.	Field Size (% w/in 660' Woodland or Treeline)	C,G												
	1. <25%			10										
	2. 25 - 50%			6										
	3. 50 - 75%			3										
	4. >75%			1										
33.	Grassland Composition	G												
	1. Bluegrass, clover, alfalfa			10										
	2. Timothy, orchardgrass or mixed CSG			5										
	3. Fescue or WSG			1										
34.	Average Height Herbaceous Vegetation (Fall)	G												
	1. <6"			10										
	2. >6"			1										
35.	Woodland Tree Species	B												
	1. >50% trees as elm, walnut, cottonwood, sycamore, willow, maple, ash		1							8	10			
	2. 25 - 50% trees as elm, walnut, cottonwood, sycamore, willow, maple, ash		4							10	8			
	3. <25% trees as elm, walnut, cottonwood, sycamore, willow, maple, ash; or <25% pin oak		6							1	6			
	4. 25 - 50% pin oak		8							4	4			
	5. >50% pin oak		10							6	1			
36.	Permanent Water Within Woodland	B												
	1. >25%		1						10	10				10
	2. 10 - 25%		3						7	7				7
	3. 5 - 10%		5						4	4				4
	4. 1 - 5%		3						2	2				2
	5. Zero		2						1	1				1
37.	Forest Openings (<2 ac. in size)	B												
	1. 15 - 30% scattered		1						10	10	5			
	2. 15 - 30% one or few		3						7	7	4			
	3. 5 - 15%		5						4	4	3			
	4. <5% or >30%		1						1	1	1			
38.	Woodland Size Class	B												
	1. Sawtimber - open canopy		10						4	10	4		10	10
	2. Sawtimber - close canopy		8						1	8	1		10	10
	3. Pole with 25-50% sawtimber		6						10	6	6		7	7
	4. Regeneration with 25-50% sawtimber		4						8	4	8		2	2
	5. Regeneration		1						8	LF	10		LF	LF
	6. Pole		1						6	2	6		4	4
39.	Percent Canopy From Old Growth (>16" dbh)	B												
	1. >25%									10	1			
	2. 10 - 25%									8	4			
	3. 5 - 10%									6	6			
	4. 1 - 5%									4	8			
	5. Zero									1	10			

Wetland Species Characteristic Matrix

	CHARACTERISTIC	Habitat Type	Mallard	Canada Goose	Least Bittern	Lesser Yellowlegs	Muskrat	King Rail	Green-backed Heron	Wood Duck	Beaver	American Coot	Northern Parula	Prothonotary Warbler
40.	Woodland Overstory Canopy Height (feet)	B												
	1. >80'												10	10
	2. 65-80'												7	7
	3. 40-65'												4	4
	4. <40'												1	1
41.	Percent Subcanopy Closure	B												
	1. >75%												10	1
	2. 50-75%												7	4
	3. 25-50%												4	10
	4. <25%												1	7
42.	Woodland (Stand) Size													
	1. <25%												10	10
	2. 25-50%												7	7
	3. 50-75%												4	4
	4. >75%												1	1
43.	Percent Forest Canopy Adjacent to or Over Permanent Water	B												M
	1. >25%													10
	2. 10-25%													7
	3. 5-10%													4
	4. <5%													1
44.	Number of Snags >9"dbh per Acre	B												
	1. >4									5				10
	2. 3-4									5				7
	3. 1-2									3				4
	4. <1									1				1
45.	Number of Cavity Trees Per Acre	B												
	1. >9									10				10
	2. 3 - 9									7				7
	3. 1 - 3									4				4
	4. None									IF				1
46.	Stems per Square Yard of Shrub and Tree Reproduction >3 Feet Tall													
	1. >3									1	10		10	1
	2. 1-3									3	7		6	4
	3. .5-1									5	4		4	10
	4. <.5									2	1		1	7
47.	Percent Woodland Within 660' of Permanent Water	B							M	M	M			
	1. >75%								10	10	10		10	10
	2. 50 - 75% (Multiply Index by .75)								6	6	6		7	7
	3. 25 - 50% (Multiply Index by .50)								4	4	4		4	4
	4. <25% (Multiply Index by .25)								1	1	1		1	1
48.	Distance to Nonforest Wetland, Oxbow or Slough	B,C,G												
	1. <250' water predictable		10	10					10	10	10			
	2. 250'-1/8 mi. water predictable		10	10					10	10	5			
	3. 1/8-1 mi. water predictable		10	10					1	1	1			
	4. <250' water predictable 1 of 3 years		5	5					5	5	3			
	5. 250'-1/8 mi. water predictable 1 of 3 yrs.		5	5					5	5	2			
	6. 1/8-1 mi. water predictable 1 of 3 yrs.		5	5					1	1	1			
	7. >1 mi.; or <1 mi. water unpredictable		1	1					1	1	1			
49.	Distance to Bottomland Hardwoods	C,N												
	1. <1/4 mi. water predictable		10						5					
	2. 1/4-1/2 mi. water predictable		10						3					
	3. 1/2-1 mi. water predictable		8						1					
	4. <1/4 mi. water predictable 1 of 3 yrs.		6						5					
	5. 1/4-1/2 mi. water predictable 1 of 3 yrs.		6						3					
	6. 1/2-1 mi. water predictable 1 of 3 yrs.		4						1					
	7. >1 mi.; or <1 mi. water unpredictable		1						1					

Wetland Species Characteristic Matrix

	CHARACTERISTIC	Habitat Type	Mallard	Canada Goose	Least Bittern	Lesser Yellowlegs	Muskrat	King Rail	Green-backed Heron	Wood Duck	Beaver	American Coot	Northern Parula	Prothonotary Warbler
50.	**Distance to Cropland**	N,B,G												
	1. <1/4 mi., unharvested or partially unharvested and water predictable		10	10										
	2. 1/4-1 mi. unharvested or partially unharvested and water predictable		8	8										
	3. 1/4-1 mi. unharvested or partially unharvested and water predictable		6	6										
	4. <1/4 mi., unharvested or partially unharvested and water predictable 1 of 3 years; or adjacent, unflooded with residues undisturbed		5	5										
	5. 1/4-1 mi. unharvested or partially unharvested and water predictable 1 of 3 years; or 1/4-1 mi. unflooded with residues and undisturbed		4	4										
	6. <1/4-1 mi. unharvested or partially unharvested and water predictable 1 of 3 yrs; or 1/2-1 mi. unflooded with residues undisturbed; or winter wheat		2	2										
	7. >1 mi. to any cropfield; or <1 mi. unflooded cropfield with residues disced or plowed		1	1										
51.	**Distance to Grassland**	N,C												
	1. <1/2 mi. with winter height <6" and field size >40 acres			10										
	2. 1/2-1 mi. with winter height <6" and field size >40 acres			7										
	3. <1 mi. with winter height <6" and field size <40 acres			4										
	4. >1 mi. to any grassland with winter height <6"; or grassland with winter height>6"			1										
52.	**Distance to Stream or River (permanent flow or pools)**	N,B												
	1. <1/4 mi.								10					
	2. 1/4 - 1/2 mi.								5					
	3. >1/2 mi.								1					
53.	**Distance to Major River, Lake or Reservoir >100 Acres**	N,C,G												
	1. <1 miles — Missouri, Mississippi, Grand, St. Francis			10										
	2. 1 - 5 miles			7										
	3. 5 - 10 miles			4										
	4. >10 miles			1										
54.	**Distance to Major Canada Goose Winter Area**	N,C,G		M										
	1. <4 miles			10										
	2. 4 - 10 miles (Multiply Index by .75)			7										
	3. 10 - 25 miles (Multiply Index by .50)			4										
	4. >25 miles (Multiply Index by .25)			1										

Wetland Species Characteristic Matrix

	Habitat Type	Mallard	Canada Goose	Least Bittern	Lesser Yellowlegs	Muskrat	King Rail	Green-backed Heron	Wood Duck	Beaver	American Coot	Northern Parula	Prothonotary Warbler
Total													
Maximum Possible													
HTSI													
Multiplier													
Revised HTSI													
	N	85	105	70	85	85	70	85			80		
	B	105						100	110	95		60	100
	C	70	105										
	P		80										

Abbreviations

C = cropfield, G = grassland, N = nonforest wetland, B = bottomland hardwoods,
LF - limiting factor, score Habitat Type Suitability Index (HTSI) as .1 if characteristic scores .1.
M = multiplier. Multiply HTSI by the appropriate value to calculate revised HTSI. Use lowest value if 2 multiplier values apply.

Limiting Factors

	Character Number
Mallard - If Percent in Bottomland Hardwood and Nonforest Wetland or Fall Winter Flood Conditions score 1, HTSI = .1.	3
Canada goose - If Percent in Nonforest Wetland or Fall Winter Flood Conditions score 1, HTSI = .1.	2,4
Lesser yellowlegs - If Wetland Size, Water Regime or Percent Wetland Substrate score 1, HTSI = .1.	14,16
Green-backed heron - If Wetland Size Water Regime HTSI = .1.	40,47
Wood duck - If Woodland Size Class or Number of Tree Cavities score 1, HTSI = .1.	14,12,16
Least bittern - If Wetland Size, Emergent Vegetation Coverage, or Water Regime score 1, HTSI = .1.	13,14,16
American Coot - If Cattail and Bulrush Coverage, Wetland Size or Water Regime score 1, HTSI = .1.	
King Rail - If Sedge Canopy Coverage Water Regime	
Northern Parula - If Woodland Size Class	40
Prothonotary Warbler - If Woodland Size Class	40

Multiplier

Mallard - Important Food Plant Coverage (Nonforest wetland)	17
Canada goose - Distance to Major Canada Goose Winter Area	56
Important Food Plant Coverage (Nonforest wetland)	17
Muskrat - Percent Permanent Water Entire Year	9
Wood duck - Percent Woodland Within 660' of Permanent Water	49
Beaver - Percent Woodland Within 660' of Permanent Water	49
Green-backed Heron - Percent Woodland Within 660' of Permanent Water	49
Northern Parula - Percent Woodland Within 660' Water	49
Prothonotary Warbler - Percent Forest Canopy Adjacent to or Over Permanent Water	45

3/89

TABLE E-2

WILDLIFE HABITAT APPRAISAL GUIDE RATINGS

NON-FORESTED WETLAND

	Site					
	A/C/D/E Combined			B		
Appraisal Item	Existing 1/	Future Without 1/	Future With	Existing	Future Without	Future With
1	3	4	3	3	4	3
2	2.7	4	2.7	2	3	2
3	2	2	2	1	1	1
4	1	2	1	1	1	1
5	2	2	1	2	2	2
6	2.7	2	2	5	3	5
7	1	3	1	5	3	5
8	2	1	2	4	3	4
9	4.7	5	4.7	1	3	1
10	1.7	1.7	1.7	4	3	4
11	2	3	1	1	3	1
12	1.7	3	1.7	6	4	6
13	4.3	3	4.3	5	3	5
14	1.7	3	1.7	2	3	2
15	1.3	1.3	1.3	1	1	1
16	4	4	4	5	4	5
17	1	1	1	1	2	1
18	3	3	2	2	2	2
19	1.3	3	1	1	3	1
20	2	2	2	2	2	2
21	5	3	5	5	5	5
22	1.3	3	1	3	3	4
23	5	5	5	6	5	6

TABLE E-2 (Continued)

Appraisal Item	Site: A/C/D/E Combined: Existing 1/	Future Without 1/	Future With	B: Existing	Future Without	Future With
24	1	1	1	1	1	1
25	1	2	1	1	2	1
26	1	2	1	1	2	1
49	1	1	1	1	1	1
50	1	1	1	2	2	2
51	2	2	2	2	2	2
52	1.7	1.7	1.7	1	1	1
53	1	1	1	1	1	1
54	4	4	4	4	4	4

1/ Average of values for sites A, C, D, and E.

TABLE E-2 (Continued)

FORESTED WETLAND

Appraisal Item	Existing [1/]	Future Without	Future With
1	3.4		
2	2.8		
3	1.8	Same	Same
4	1	as	as
5	2	Existing	Existing
6	5		
12	6		
14	1		
15	2		
17	4.8		
18	2		
27	4		
28	1		
35	2.2		
36	5		
37	3		
38	3.8		
39	2		
40	1.6		
41	2.2		
42	1		
43	4		
44	1		
45	1.2		
46	4		

TABLE E-2 (Continued)

Appraisal Item	Existing [1/]	Future Without	Future With
47	2		
48	1		
50	2.6		
52	1		

1/ Average of values for sites 1, 2, 3, 4 and 5.

TABLE E-3

HABITAT SUITABILITY INDICE (HSI) VALUES

	Forested Wetland					
	Species 1/					
Condition	Mall	Hero	Duck	Beav	Paru	Prot
All (existing, future without, and future with)	.59	.50	.48	.47	.57	.15

	Non-Forested Wetland							
	Species 1/							
Condition	Mall	Goos	Bitt	Yleg	Musk	Rail	Hero	Coot
Existing								
Sites A/C/D/E	.61	.13	.80	.71	.13	.66	.65	.10
Site B	.58	.13	.10	.65	.54	.10	.68	.10
Future Without								
Sites A/C/D/E	.57	.12	.60	.59	.12	.50	.73	.61
Site B	.44	.10	.63	.61	.21	.63	.81	.41
Future With								
Sites A/C/D/E	.88	.19	.83	.71	.13	.63	.59	.10
Site B	.58	.13	.10	.65	.51	.10	.68	.10

1/ Mall - Mallard, Goos - Canada goose, Bitt - Least bittern, YLEG - Lesser yellowlegs, Musk - muskrat, Rail - King rail, Hero - Green-backed heron, Duck - Wood duck, Beav - Beaver, Coot - American coot, Paru - Northern Parula, Prot - Prothonotary warbler

TABLE E-4

PLAN COMPARISON SUMMARY
IN WILDLIFE HABITAT ACRES
(HSI Values Within Parentheses)

Plan A (Future Without)

Habitat Condition	1990	1992	2040
Forested Wetland	1559 (.59)	1575 (.59)	1943 (.59)
Non-Forested Wetland			
Sites A/C/D/E	969 (.61)	955 (.61)	630 (.57)
Site B	129 (.58)	127 (.57)	84 (.44)
TOTAL	2657	2657	2657

Plan B (Excavate Upper Stump Lake, 100 AC, 1.5 Feet Deep)

Habitat Condition	1990	1992	2040
Forested Wetland	1559 (.59)	1575 (.59)	1843 (.59)
Non-Forested Wetland			
Sites A/C/D/E	969 (.61)	955 (.61)	730 (.57)
Site B	129 (.58)	127 (.57)	84 (.44)
TOTAL	2657	2657	2657

Plan C - Option 1A (Riverside Levee - 424 Feet NGVD)

Habitat Condition	1990	1992	2040
Forested Wetland	1559 (.59)	1503 (.59)	1674 (.59)
Non-Forested Wetland			
Sites A/C/D/E	969 (.61)	1000 (.61)	848 (.68)
Site B	129 (.58)	127 (.57)	108 (.44)
Levee	0	27 (0)	27 (0)
TOTAL	2657	2657	2657

TABLE E-4 (Continued)

Plan C - Option 1B (Riverside Levee - 425 Feet NGVD)

Habitat Condition	1990	1992	2040
Forested Wetland	1559 (.59)	1503 (.59)	1636 (.59)
Non-Forested Wetland			
Sites A/C/D/E	969 (.61)	1000 (.61)	882 (.70)
Site B	129 (.58)	127 (.57)	112 (.44)
Levee	0	27 (0)	27 (0)
TOTAL	2657	2657	2657

Plan C - Option 1C (Riverside Levee - 426 Feet NGVD)

Habitat Condition	1990	1992	2040
Forested Wetland	1559 (.59)	1503 (.59)	1608 (.59)
Non-Forested Wetland			
Sites A/C/D/E	969 (.61)	1000 (.61)	907 (.71)
Site B	129 (.58)	127 (.57)	115 (.44)
Levee	0	27 (0)	27 (0)
TOTAL	2657	2657	2657

Plan C - Option 1D (Riverside Levee - 427 Feet NGVD)

Habitat Condition	1990	1992	2040
Forested Wetland	1559 (.59)	1503 (.59)	1591 (.59)
Non-Forested Wetland			
Sites A/C/D/E	969 (.61)	1000 (.61)	922 (.72)
Site B	129 (.58)	127 (.57)	117 (.44)
Levee	0	27 (0)	27 (0)
TOTAL	2657	2657	2657

Plan C - Option 1E (Riverside Levee - 428 Feet NGVD)

Habitat Condition	1990	1992	2040
Forested Wetland	1559 (.59)	1503 (.59)	1576 (.59)
Non-Forested Wetland			
Sites A/C/D/E	969 (.61)	1000 (.61)	935 (.73)
Site B	129 (.58)	127 (.57)	119 (.44)
Levee	0	27 (0)	27 (0)
TOTAL	2657	2657	2657

TABLE E-4 (Continued)

Plan C - Option 2A (Hillside Sedimentation Basin)

Habitat Condition	1990	1992	2040
Forested Wetland	1559 (.59)	1575 (.59)	1927 (.59)
Non-Forested Wetland			
Sites A/C/D/E	969 (.61)	955 (.61)	644 (.59)
Site B	129 (.58)	127 (.57)	86 (.44)
TOTAL	2657	2657	2657

Plan C - Option 2B (Hillside SCS Plan)

Habitat Condition	1990	1992	2040
Forested Wetland	1559 (.59)	1575 (.59)	1923 (.59)
Non-Forested Wetland			
Sites A/C/D/E	969 (.61)	955 (.61)	648 (.59)
Site B	129 (.58)	127 (.57)	86 (.44)
TOTAL	2657	2657	2657

Plan C - Option 3A
(Interior Water Control - Hydraulic Dredging)

Habitat Condition	1990	1992	2040
Forested Wetland	1559 (.59)	1489 (.59)	1487 (.59)
Non-Forested Wetland			
Sites A/C/D/E	969 (.61)	1007 (.62)	1007 (.86)
Site B	129 (.58)	127 (.57)	129 (.44)
Levee	0	34 (0)	34 (0)
TOTAL	2657	2657	2657

TABLE E-4 (Continued)

Plan C - Option 3B (Interior Water Control - Clamshell Excavation)

Habitat Condition	1990	1992	2040
Forested Wetland	1559 (.59)	1489 (.59)	1487 (.59)
Non-Forested Wetland			
Sites A/C/D/E	969 (.61)	1007 (.62)	1007 (.86)
Site B	129 (.58)	127 (.57)	129 (.44)
Levee	0	34 (0)	34 (0)
TOTAL	2657	2657	2657

Plan C (Riverside Levee-426 and (Interior Water Control - Hydraulic Dredging)

Habitat Condition	1990	1992	2040
Forested Wetland	1559 (.59)	1489 (.59)	1487 (.59)
Non-Forested Wetland			
Sites A/C/D/E	969 (.61)	1007 (.62)	1007 (.86)
Site B	129 (.58)	127 (.57)	129 (.44)
Levee	0	34 (0)	34 (0)
TOTAL	2657	2657	2657

TABLE E-5

**PLAN COMPARISON SUMMARY
FOR MALLARD
IN ANNUAL HABITAT UNITS**

Alternative	Forested Wetland			Nonforested Wetland Sites A/C/D/E			Nonforested Wetland Site B			Total		
	FWO	FW	Net	FWO	FW	Net	FWO	FW	Net	FWO	FW	Net
Plan B (excavate Upper Stump Lake, 100 ac, 1.5 feet deep)	1033	1005	-28	475	503	28	55	55	0	1563	1563	0
Plan C - Option 1A (riverside levee -424)	1033	936	-97	475	594	119	55	60	5	1563	1590	27
Plan C - Option 1B (riverside levee -425)	1033	925	-108	475	613	138	55	61	6	1563	1599	36
Plan C - Option 1C (riverside levee -426)	1033	917	-116	475	626	151	55	62	7	1563	1605	42
Plan C - Option 1D (riverside levee -427)	1033	912	-121	475	635	160	55	62	7	1563	1609	46
Plan C - Option 1E (riverside levee -428)	1033	908	-125	475	644	169	55	63	8	1563	1615	52
Plan C - Option 2A (hillside sedimentation basin)	1033	1029	-4	475	489	14	55	55	0	1563	1573	10
Plan C - Option 2B (hillside SCS plan)	1033	1028	-5	475	490	15	55	55	0	1563	1573	10
Plan C - Option 3A (interior water control-hydraulic dredging)	1033	995	-38	475	589	114	55	58	3	1563	1642	79
Plan C - Option 3B (interior water control-clamshell excavation)	1033	989	-44	475	589	114	55	58	3	1563	1636	73
Plan C (Options 1C, 3A)	1033	879	-154	475	740	265	55	65	10	1563	1684	121

SECTION III. AQUATIC HABITAT APPRAISAL GUIDE (AHAG) METHOD

1. BACKGROUND

An Aquatic Habitat Appraisal Guide (AHAG) was developed by the Corps' Waterways Experimental Station (WES) for the Corps' St. Louis District to evaluate changes in fishery habitat resulting from the Stump Lake Complex project. As noted earlier, the AHAG is based on the concept of the Habitat Evaluation Procedure (USFWS, 1980), and followed the format of the Missouri WHAG (Baskett et al., 1980). Like the WHAG, AHAG quantifies habitat benefits for various project features. Habitat units are the product of habitat quality (expressed in terms of habitat suitability index) and Habitat quantity (habitat acres).

Subsection 2 below provides a description by WES of the overall AHAG methodology, including its assumptions, use of guilds, habitat quality ratings and usage. In subsection 3, WES provides the supporting documentation used in developing the AHAG method. Subsection 4 provides the results of the District's application of the AHAG to the Stump Lake Complex HREP.

2. DESCRIPTION OF AHAG METHOD

There were two phases of AHAG development: prepare habitat guilds of fishes that have been collected in the Illinois River near its confluence with the Mississippi River, and rate the quality of the habitat for each guild according to habitat preference and life history stage. Each phase is discussed below, including assumptions made in the development of this guide.

a. <u>Assumptions</u>

Habitat-based assessment techniques make specific assumptions on species-habitat relationships (Terrell, 1984; O'Neil, 1985). Each assumption may be intuitively correct, but can only be verified from field studies. This guide was developed specifically for fishes of the lower Illinois River based on literature reviews (see Literature Cited section) and makes the following assumptions:

(1) The abundance and distribution of species respond in a predictable and measurable fashion to changes in habitat quality.

(2) Species within a guild have similar habitat requirements which can be described by the same set of habitat variables.

(3) At least one of the habitat variables used in the guide can potentially limit the distribution and abundance of the guild members.

It should be recognized that due to limited life history information on many species, influence of competition and predation on habitat preferences, and variation in temporal distribution patterns of fishes, this guide may not necessarily represent a causal relationship. Although seasonal effects are partially accounted for by separating fishes into three life history stages (i.e., spawning, rearing, and adults), it is beyond the scope of this guide to incorporate all temporal environmental influences on fish distribution and abundance. As new information becomes available from field studies, components of the AHAG should be more rigorously defined.

b. Guild Development

A list of fish species that occur in the Pool 26 section of the Illinois River was compiled from Sternberg (1971) and Van Vooren (1983) and were separated into guilds (TABLE E-6). A guild is defined as a group of species that exploit the same environmental resources (e.g., habitats) in a similar way (Root, 1967), therefore members of a guild should be affected similarly by the alteration of those resources (Roberts and O'Neil, 1985).

Water velocity is a major habitat axis along which fish species segregate in riverine environments (Leonard and Orth, 1988; Baker et al., 1989). Therefore, fish species that occur in the Pool 26 section of the Illinois River were classified as either slackwater or swiftwater inhabitants. The classification was also based on the premise that tolerance to habitat alteration varies with size of the species, while some species utilize a wide range of conditions (generalists). These criteria result in the formation of five guilds: swiftwater-large fishes (Group 1), swiftwater-small fishes (Group 2), slackwater-large fishes (Group 3), slackwater-small fishes (Group 4), and generalists (Group 5). Although there are exceptions, most members of a guild share important morphological similarities (e.g., fusiform shape for swiftwater fishes and laterally compressed for slackwater fishes) and exhibit the same ontogenetic shifts in preferred habitat (e.g., shallow vegetated areas to open water).

Most species in Groups 1 and 2 are uncommon or occur only on a seasonal basis. These fishes prefer swiftwater habitats usually associated with coarse grain substrate. Their presence is indicative of good riverine habitat. Groups 3 and 4 are usually found in slackwater, although they occasionally enter swiftwater areas for feeding, dispersal, or spawning. Many of these species are economically important. Species in Group 5 are ubiquitous and can tolerate a wide range of habitat conditions. Since they have no well-defined habitat preference, no guides were developed for Group 5.

c. Habitat Quality Ratings

The AHAG uses Habitat Suitability Index (HSI) scores to relate the value of selected habitat variables to a defined guild. Physical and water quality variables used in the guides (TABLE E-7) have been identified as important in structuring fish communities in a variety of stream ecosystems (Baker et al., 1990; Barnickol and Starrett, 1951; Becker, 1983; Gorman and Karr, 1978; Leonard and Orth, 1988; Ross, 1986; Smith, 1979). Furthermore, they characterize physical changes associated with high sedimentation rates and altered water level regimes that have influenced habitat quality in the lower Illinois River. Each variable may limit the abundance and distribution of guild members, is directly affected by the engineering objectives of the project, is readily measured in the field, and can be predicted for future environmental conditions. Methods to measure most of these variables are described by Hamilton and Bergersen (1984).

For each guild, the range of habitat values were divided into classes and an HSI score was assigned to each class by life history stage (spawning, rearing, and adults). Each variable class is rated as excellent (1), good (.75), fair (.5), poor (.25), or unusable (0) habitat. The rating is based on information found in the Habitat Suitability Index Models published by the U.S. Fish and Wildlife Service and other data sources cited in the Reference Section. A final HSI score is obtained using either an arithmetic mean of all variable scores (compensatory relationships) or taking the lowest HSI score (limiting factor or threshold value). Habitat Units (HU) can be determined by multiplying HSI times area (e.g., acres) of interest. The AHAG data forms allow the user to enter all habitat measurements and calculate HSI values directly in the field.

d. Discussion

AHAG is a community-level evaluation technique that should be used as a general planning tool to rate habitat quality for guilds of species. It provides a qualitative assessment of the effects of habitat alteration on fishes and can be used without extensive field data collection. However, efforts should be made to evaluate the validity of AHAG. This should include sampling fish in both swiftwater and slackwater habitats to more rigorously define the guilds. Further classification of swiftwater and slackwater fishes into functional feeding (e.g., insectivores, piscivorous) or reproductive groups (e.g., nest builders) may increase the predictive capability of AHAG. Also, the relationships between habitat quality and fish abundance should be reviewed by biologists familiar with habitat requirements of the fish. Only through critical review of AHAG components combined with monitoring studies will the validity of AHAG be determined.

3. LITERATURE CITED AND REFERENCES

Baker, J. A., K. J. Killgore, and R. L. Kasul. 1989. Aquatic habitats and fish communities in the Lower Mississippi River. Critical Reviews in Aquatic Sciences (In Press).

Barnickol, P.G. and W.C. Starrett. 1951. Commercial and sport fishes of the Mississippi River between Caruthersville, Missouri and Dubuque, Iowa. Illinois Natural History Survey Bulletin 25.

Baskett, T.S. et al. 1980. A Handbook for Terrestrial Habitat Evaluation in Central Missouri. U. S. Dept. Int., Fish Wildl. Serv., Resource Publication 133, Washington, D. C.

Becker, G. C. 1983. Fishes of Wisconsin. The University of Wisconsin Press, Madison.

Brooks, M., and M. L. Warren. 1986. A Distributional Atlas of Kentucky Fishes. Kentucky Nature Preserves Commission, Scientific and Technical Series Number 4.

Canter, L. W. 1985. Environmental impacts of water resources projects. Lewis Publishers, Inc., Chelsea, Michigan.

Carlander, K. D. 1969. Handbook of Freshwater Fishery Biology-Volume One. The Iowa State University Press, Ames.

Carlander, K. D. 1977. Handbook of Freshwater Fishery Biology-Volume Two. The Iowa State University Press, Ames.

Edwards, E. A. 1982. Habitat suitability index models: Bigmouth Buffalo. U. S. Dept. Int., Fish Wild. Ser. FWS/OBS-82/10.34. 23 pp.

Edwards, E. A., and K. Twomey. 1982. Habitat suitability index models: Smallmouth Buffalo. U. S. Dept. Int., Fish Wild. Ser. FWS/OBS-82/10.13. 23 pp.

Edwards, E. A., D. A. Krieger, M. Bacteller, and O. E. Maughan. 1982. Habitat suitability index models: Black Crappie. U. S. Dept. Int., Fish Wild. Ser. FWS/OBS-82/10.6. 25 pp.

Edwards, E. A., D. A. Krieger, G. Gebhart, and O. E. Maughan. 1982. Habitat suitability index models: White Crappie. U. S. Dept. Int., Fish Wild. Ser. FWS/OBS-82/10.7. 22 pp.

Edwards, E. A., G. Gebhart, and O. E. Maughan. 1982. Habitat suitability index models: Smallmouth bass. U. S. Dept. Int., Fish Wild. Ser. FWS/OBS-82/10.36. 47 pp.

Edwards, C. J., B. L. Griswold, R. A. Tubb, E. C. Weber, and L. C. Woods. 1984. Mitigating effects of artificial riffles and pools on a fauna of a channelized warmwater stream. North American Journal of Fisheries Management 4: 194-203.

Gore, J. A. 1985. Mechanisms of colonization and habitat enhancement for benthic macroinvertebrates in a restored river channels. Pages 81-102 In J. A. Gore, Editor, The Restoration of Rivers and Streams, Butterworth Publishers, Boston.

Gorman, O. T., and J. R. Karr. 1978. Habitat structure and stream fish communities. Ecology 59:507-515.

Hamilton, K., and E. P. Bergensen. 1984. Methods to estimate aquatic habitat variables. Bureau of Reclamation, Denver.

Hamilton, K., and P. C. Nelson. 1984. Habitat suitability index models and instream flow suitability index curves. U. S. Dept. Int. Fish Wild. Ser. Biological Report 82 (10.89).

Hubert, W. A., S. H. Anderson, P. D. Southall, and J. H. Carnce. Habitat suitability index models and instream flow suitability curves: Paddlefish. U. S. Dept. Int., Fish Wild. Ser. FWS/OBS-82/10.80. 32pp.

Inskip, P. D. 1982. Habitat suitability index models: northern pike. U. S. Dept. Int., Fish Wild. Ser. FWS/OBS-82/10.17. 40 pp.

Krieger, D. A., J. W. Terrell, and P. C. Nelson. 1983. Habitat suitability index models: Yellow perch U. S. Dept. Int., Fish Wild. Ser. FWS/OBS-83/10.55. 37 pp.

Lee, L. A., and J. W. Terrell. 1987. Habitat suitability index models: flathead catfish. U. S. Fish Wildl. Serv. Biol. Rep. 82(10.152). 39 pp.

Leonard, P. M., and D. J. Orth. 1988. Use of habitat guilds of fishes to determine instream flow requirements. North American Journal of Fisheries Management 8:399-409.

McMahon, T. E., and J. W. Terrell. 1982. Habitat suitability index models: Channel catfish. U. S. Dept. Int., Fish Wild. Ser. FWS/OBS-82/10.2. 29 pp.

McMahon, T. E., J. W. Terrell, and P. C. Nelson. 1984. Habitat suitability index models: Walleye. U. S. Dept. Int., Fish Wild. Ser. FWS/OBS-82/10.56. 43 pp.

McMahon, T. E., G. Gebhart, O. E. Maughan, and P. C. Nelson. 1984. Habitat suitability index models and instream flow suitability curves: warmouth. U. S. Dept. Int., Fish Wild. Ser. FWS/OBS-82/10.67. 21 pp.

Miller, A. C., K. J. Killgore, R. H. King, and T. J. Naimo. 1988. Biological and physical conditions at a newly placed gravel bar in the Tombigbee River. Miscellaneous Paper EL-88-4, U.S. Army Engineer Waterways Experiment Station, Vicksburg, Miss.

Neuhold, J. M. 1981. Strategy of stream ecosystem recovery. Pages 262-265 In G. W. Barrett and R. Rosenberg, editors, Stress Effects on Natural Ecosystems, John Wiley and Sons, New York.

O'Neil, L. J. 1985. Habitat evaluation methods notebook. Instruction Report EL-85-3, U.S. Army Engineer Waterways Experiment Station, Vicksburg, Miss.

Pflieger, W. L. 1975. The Fishes of Missouri. Missouri Dept. of Conservation.

Roberts, T. H., and L. J. O'Neil. 1985. Species selection for habitat assessments. Miscellaneous Paper EL-85-8, U.S. Army Engineer Waterways Experiment Station, Vicksburg, Miss.

Root, R. B. 1967. The niche exploitation pattern of the blue-gray gnatcatcher. Ecology 37:317-350.

Ross, S. T. 1986. Resource partitioning in fish assemblages: a review of field studies. Copeia 352.

Scott, W. B., and E. J. Crossman. 1979. Freshwater fishes of Canada. Bulletin 184, Fisheries Research Board of Canada, Ottawa 1973.

Smith, P. W. 1979. The Fishes of Illinois. University of Illinois Press, Urbana.

Sternberg, R. B. 1971. Upper Mississippi River habitat classification survey, Minnesota Dept. of Natural Resources.

Stuber, R. J. 1982. Habitat suitability index models: Black Bullhead. U. S. Dept. Int., Fish Wild. Ser. FWS/OBS-82/10.14. 25 pp.

Stuber, R. J., G. Gebhart, and O. E. Maughan. 1982. Habitat suitability index models: Bluegill. U. S. Dept. Int., Fish Wild. Ser. FWS/OBS-82/10.8. 26 pp.

Stuber, R. J., G. Gebhart, and O. E. Maughan. 1982. Habitat suitability index models: Green sunfish. U. S. Dept. Int., Fish Wild. Ser. FWS/OBS-82/10.15. 28 pp.

Stuber, R. J., G. Gebhart, and O. E. Maughan. 1982. Habitat suitability index models: Largemouth bass. U. S. Dept. Int., Fish Wild. Ser. FWS/OBS-82/10.16. 32 pp.

Terrell, J. W. 1984. Proceedings of a workshop on fish habitat suitability index models. Biological Report 85(6), U. S. Fish and Wildlife Service, Washington, D.C.

Trautman, M. B. 1981. The Fishes of Ohio. Ohio State University Press.

Twomey, K. A., K. L. Williamson, and P. C. Nelson. 1984. Habitat suitability index models and instream flow suitability curves: white sucker. U. S. Dept. Int., Fish wild. Ser. FWS/OBS-82/10.64. 56 pp.

USCE. 1989. Upper Mississippi River System-Environmental Management Program Definite Project Report: Pharrs Island Habitat Rehabilitation Project. USCE, St. Louis District, St. Louis, Missouri.

USFWS. 1980. Habitat Evaluation Procedures. ESM 102, U. S. Fish and Wildlife Service, Washington, D.C.

Van Vooren, A. 1983. Distribution and relative abundance of Upper Mississippi River Fishes. Upper Mississippi River Conservation Committee, Fish Technical Section.

Williamson, K. L., and P. C. Nelson. 1985. Habitat suitability index models and instream flow suitability curves: Gizzard shad. U. S. Fish Wildl. Serv. Biol. Rep. 82(10.112). 33 pp.

4. STUMP LAKE COMPLEX AHAG

a. General

The major fisheries goal of the project was to enhance aquatic habitat conditions for slackwater fish, particularly large slackwater fish. Many of these species are important commercial fish (e. g., buffalo and catfish) and recreational fish (e. g., bullhead, catfish, bass and crappie). Thus AHAG guild 3 was targeted for emphasis by the AHAG team. The AHAG team included representation from the USFWS, IDOC, WES, and the St. Louis District. Prior to the evaluation, the team reviewed topographic maps and existing hydrological and biological data for the project area.

b. Assumptions

During the AHAG analysis, certain assumptions were developed regarding existing conditions and projected future conditions. These assumptions are listed below.

(1) Existing Conditions

(a) Fowler and Flat Lakes relatively shallow, and offer seasonal fisheries habitat because they are drawn down in late spring for moist soil management and recharged in the late fall. Upper and Lower Stump Lakes are also relatively shallow, but offer more permanent fisheries habitat because water levels are kept relatively constant to promote growth of submerged aquatic plants. These units were not given any consideration in the development of measures to improve fisheries habitat.

(b) Long and Deep Lakes - which are essentially one long continuous waterbody - are currently used to convey water between the Illinois River and the management units during the recharge and dewatering periods of waterfowl management. These two lakes join the Illinois River at the lower end of Long Lake where a water control structure is located. Except during flood conditions or the recharge or dewatering phases, these lakes are not connected to the Illinois River. Because of these physical conditions, and because the average depth of Long and Deep Lakes at normal pool on the Illinois River is only 2 to 3 feet, the WHAG team considered them as shallow slough habitat. Conditions currently lowering the value of this habitat for large slackwater fish include high water temperature in the summer, low dissolved oxygen levels in summer and winter, and shallow water depth.

(2) Future Conditions

(a) General. The following general assumptions were applied to the analysis of all future changes in habitat during the 50-year project life.

1 Target years of 0, 2, and 50 are sufficient to annualize habitat units (HUs) and to characterize habitat changes over the life of the project.

2 Slackwater fish guild 3 is a suitable guild for management emphasis and the life requisite requirements of the slackwater fish group are adequately characterized for the purposes of the incremental analysis of this project.

3 No comparative evaluation of project-related changes in habitat values was developed for other fish guilds. The swiftwater fishes were not considered because there is no current in Deep and Long Lakes for much of the year. The small slackwater fishes were not addressed because many of them are not commercially or recreationally important.

(b) Specific. Specific assumptions employed in evaluating alternative Plans A, B, and C are given below.

1 Alternative Plan A, No Action Plan

a The Pool 26 section of the Illinois River will lose much of its remaining backwater fisheries habitat during the next century.

b Shallow slough habitat within the project area (Deep and Long Lakes) will become reduced in areal extent by 35 percent over the next 50 years, and these habitats will be decreased in depth by about half.

c All of the habitat quality limiting factors described for existing conditions will apply to the future without project condition.

2 Alternative Plan B, Wetlands Excavation

Excavation of Upper Stump Lake (100 acres, 1.5 feet deep) would initially expand the shallow slough habitat for a short period of time, but this excavated area would be isolated from Long and Deep Lakes except during periods of flood conditions or water recharge and discharge of Upper Stump

Lake. However, in the long term the project under this alternative would be subject to the same sedimentation effects and outcome as that described for the no action plan.

3 Alternative Plan C, Wetlands Protection and Management

The options under Plan C were expanded beyond those considered in the WHAG analysis to include various options to dredge Deep and Long Lakes in order to increase depth. The average bottom elevation of this waterbody is 417.7 feet NGVD. The additional options include dredging down to 416 feet NGVD (option 4A), down to 414 feet NGVD (option 4C), and down to 416 and 414 feet NGVD by alternating every 500 feet of "channel" length (option 4B). In addition, the bottom width of Deep and Long Lakes to be dredged was considered as an option.

These width options are 60, 150, and 300 feet. For example, option 4C3 consisted of dredging down to 414 feet NGVD at a width of 300 feet.

The AHAG analysis consisted of evaluating the effects of the various dredging options on fisheries habitat while using the preferred alternative identified from the WHAG analysis as the "base" condition. The "base" condition consists of the 426 riverside levee, and interior water control and management.

a The protection afforded by the riverside levee will increase water level stability within Deep and Long Lakes and allow for the reestablishment of submergent aquatic vegetation. This will provide additional cover as well as feeding and spawning habitat.

b Sedimentation from the Illinois River will be reduced by 79 percent from its existing rate. Little loss of water depth is anticipated over the life of the project. The capability will exist to maintain the water surface elevation at 421 feet NGVD instead of the current 420 elevation. This flexibility will allow for up to one foot of additional depth.

c. Results

TABLE E-8 presents the team's appraisal guide ratings for existing, future without, and future with project conditions. TABLE E-9 provides the HSI values for each life stage, season, and project condition. No table is presented showing a plan comparison summary in fisheries habitat acres with HSI values in parentheses as was the case in TABLE E-4 for the WHAG analysis. Because of all the dredging options considered (depth and width) and the fisheries variables included (life stage and season), such a table would be too large. However, the acreage used in all analyses for the future without condition was 129, 127, and 84 for the 0, 2, and 50 year projections. Likewise, the corresponding acreage for the future with condition was 129, 127, and 129. Also, some HSI values from TABLE E-4 were adjusted to account for the effect of adding a particular dredging option to the future without condition. The magnitude of the adjustment is directly proportional to the weighting assigned to that option by the AHAG team in accomplishing the objective of improving habitat by increasing depth.

A plan comparison summary in average annual habitat units (AAHUs) is presented in TABLE E-10. Dredging to 414 feet NGVD at a bottom width of

300 feet results in an increase of 31 AAHUs, whereas 29 AAHUs arise from dredging to 416 feet NGVD at a bottom width of 60 feet.

d. Discussion

The analysis indicates that the small increase in benefits (2 AAHUs) resulting from dredging is due only to a small increase in habitat quality; the acreage of Deep and Long Lakes remains constant over the 50-year project life under the "base" condition. The most benefits to large slackwater fishes - 29 AAHUs - accrue from the "base" condition - the 426 riverside levee, and interior water control and management. These results are counterintuitive. It seems logical to assume that deepening Deep and Long Lakes by dredging would provide more fisheries benefits than retarding the rate of sedimentation and preventing frequent flooding from occuring in this unit by construction of the riverside dike/levee. The only parameter related to water depth is percent area with depth greater than one meter. The area classes of this parameter are 0-25, 25-50, 50-75, and greater than 75 percent. Perhaps classes could have been subdivided further to detect changes in area with depth greater than one meter.

e. Conclusion

According to the analysis, dredging of Deep and Long Lakes to provide increased depth (up to 5 feet) for large slackwater fishes yields very few benefits. It is the professional opinion of fisheries biologists involved with this project that there will be more fisheries benefits from dredging than identified in the analysis. Although the cost of dredging is high, it seems justified to do some dredging for fisheries beyond that required for conveyance of water in and out of Deep and Long Lakes.

TABLE E-6

. Fishes of the Illinois River and their respective size/habitat guild: 1=swiftwater, large fish, 2=swiftwater, small fish, 3=slackwater, large fish, 4=slackwater, small fish, and 5=generalist).

Family and Species	Group
Lepisosteidae	
Longnose gar (*L. osseus*)	5
Shortnose gar (*L. platostomus*)	5
Amiidae	
Bowfin (*Amia calva*)	3
Anguillidae	
American eel (*Anguilla rostrata*)	1
Clupeidae	
Skipjack herring (*Alosa chrysochloris*)	1
Gizzard shad (*Dorosoma cepedianum*)	5
Threadfin shad (*D. petenense*)	3
Hiodontidae	
Goldeye (*Hiodon alosoides*)	1
Mooneye (*H. tergisus*)	1
Esocidae	
Grass pickerel (*Esox americanus*)	3
Northern Pike (*E. lucius*)	3
Cyprinidae	
Common carp (*Cyprinus carpio*)	5
Goldfish (*Carrasius auratus*)	5
Golden shiner (*Notemigonus crysocleucas*)	4
Suckermouth minnow (*Phenacobius mirabilis*)	2
Central stoneroller (*Campostoma anomalum*)	2
Silver chub (*Hybopsis storeriana*)	2
Emerald shiner (*N. atherinoides*)	5
River shiner (*N. blennius*)	2
Striped shiner (*N. chrysocephalus*)	2
Bigmouth shiner (*N. dorsalis*)	2
Ribbon shiner (*N. fumeus*)	4
Blacknose shiner (*N. heterolepis*)	2
Spottail shiner (*N. hudsonius*)	4
Red shiner (*N. lutrensis*)	5
Silverband shiner (*N. shumardi*)	2
Spotfin shiner (*N. spilopterus*)	2
Redfin shiner (*N. umbratilis*)	2
Steelcolor shiner (*N. whipplei*)	2
Bullhead minnow (*Pimephales vigilax*)	5
Bluntnose minnow (*P. notatus*)	5
Fathead minnow (*P. promelas*)	5

Table 1. (con't)

Family and Species	Group
Catostomidae	
River carpsucker (*Carpiodes carpio*)	5
Quillback (*C. cyprinus*)	3 (1 for spawning)
Highfin carpsucker (*C. velifer*)	1
White sucker (*Catostomus commersoni*)	1
Smallmouth buffalo (*Ictiobus bubalus*)	3
Bigmouth buffalo (*I. cyprinellus*)	3
Black buffalo (*I. niger*)	3
S. H. redhorse (*Moxostoma macrolepidotum*)	1
Silver redhorse (*M. anisurum*)	1
River redhorse (*M. carinatum*)	1
Golden redhorse (*M. crythrurum*)	1
Black redhorse (*M. duquesnei*)	1
Ictaluridae	
Black bullhead (*I. melas*)	5
Yellow bullhead (*I. natalis*)	5
Brown bullhead (*I. nebulosus*)	3
Channel catfish (*I. punctatus*)	3
Flathead catfish (*Pylodictis olivaris*)	3
Cyprinodontidae	
Starhead minnow (*Fundulus notti*)	4
Blackstripe topminnow (*F. notatus*)	4
Poeciliidae	
Mosquitofish (*Gambusia affinis*)	5
Atherinidae	
Labidesthes sicculus (*Brook silverside*)	4
Percichthyidae	
White bass (*Morone crysops*)	1
Yellow bass (*M. mississippiensis*)	3 (1 for spawning)
Centrarchidae	
Rock bass (*Ambloplites rupestris*)	4
Green sunfish (*Lepomis cyanellus*)	5
Pumpkinseed (*L. gibbosus*)	4
Warmouth (*L. gulosus*)	4
Orangespotted sunfish (*L. humilis*)	5
Bluegill (*L. macrochirus*)	5
Longear sunfish (*L. megalotis*)	4
Redear sunfish (*L. microlophus*)	4
Largemouth bass (*Micropterus salmoides*)	3
Smallmouth bass (*M. dolomieui*)	1
White crappie (*Pomoxis annularis*)	3
Black crappie (*P. nigromaculatus*)	3

Table 1. (Continued)

Family and Species	Group
Percidae	
Logperch (*Percina caprodes*)	5
Blackside darter (*P. maculata*)	2
Sauger (*Stizostedion canadense*)	1
Walleye (*S. vitreum*)	1
Sciaenidae	
Freshwater drum (*Aplodinotus grunniens*)	5

DESCRIPTION OF GROUPS

Group 1
Swiftwater-Large Fishes

This group is represented by large, pelagic-oriented fish that prefer rather clear, fast-flowing water over a sand or gravel substrate. Most species are migratory, travel in schools, and often constitute an important commercial fishery. Spawning occurs over sand or gravel shoals in the spring. The fry of this group are usually pelagic and move into shallower water as they grow feeding on plankton and small invertebrates. The adults feed on large invertebrates or fishes.

Group 2
Swiftwater-Small Fishes

This group is comprised of small minnows and darters. Species in this group are important forage fishes and their presence generally indicates good riverine habitat. They often travel in schools and occupy similar habitat as described for species in Group 1, but generally occur in shallower water and do not migrate great distances. Reproduction behavior is variable, but spawning usually occurs during the spring over sand or gravel in flowing water. Their diet consists of plankton and small invertebrates.

Group 3
Slackwater-Large Fishes

These fishes inhabit slackwater areas and generally avoids strong current. Because of their large size and relative high abundance, many of these species are important commercial and recreational fish. They often associate with vegetation, woody debris, or other forms of cover in deeper parts of pools, occasionally entering flowing water to feed. The majority of the species in this group are piscivorous as adults, except for the suckers and bullheads which feed on mollusks, insects, and plankton. Spawning occurs during the spring and early summer in shallow, non-flowing water over vegetation, logs, or prepared nests. One notable exception is the American eel which spawns around the Sargossa Sea.

Table 1. (concluded)

Group 4
Slackwater-Small Fishes

This group of relatively small fish that are common in slackwater habitats. They are typically found in shallow, clear to moderately turbid water with little current. Most species associate with some form of submerged cover. Spawning occurs in spring and early summer in shallow water. Sunfish deposit eggs in prepared nests, while others spawn along a sandy or clay substrate without parental care. The young often school and become pelagic, but return to shallow areas with submerged timber or aquatic vegetation as they grow. The fry consume plankton and later small crustaceans and insects. Fish are also eaten, particularly by the adult sunfish.

Group 5
Generalists

This group of species are considered generalists because they tolerate a wide range of environmental conditions including high turbidity, low dissolved oxygen, and high water temperatures. They are often the first inhabitants of disturbed habitats and can survive in isolated pools, but generally prefer shallow, sluggish waters with vegetation. Most have an extended spawning season throughout the spring and summer over a variety of substrates. Sunfish and bullheads prepare nests and guard the eggs, while others broadcast their eggs with no parental care. Mosquitofish eggs are fertilized internally and females give birth to living young. The young of this group are usually confined to shallow, protected areas. The diet consists of plankton and invertebrates. Bullheads and sunfish will also consume small fishes.

TABLE E-7

AQUATIC HABITAT APPRAISAL GUIDES
FISHES OF THE ILLINOIS RIVER

Sample site:____________________ Date:__________

Season: Winter Spring Summer Fall

Comments:____________________

Scoring Criteria: Excellent=1 Good=.75 Fair=.5 Poor=.25 Unusable=0

Habitat Variable	HSI Score by Species Group and Life Stage*											
	Group 1			Group 2			Group 3			Group 4		
	S	R	A	S	R	A	S	R	A	S	R	A
Average water temperature (C)												
1. >30	0	0	.25	0	0	.5	0	.25	.5	.25	.25	.75
2. 20-30	.5	.75	.75	.75	.75	.75	1	1	1	1	1	1
3. 15-20	1	1	1	1	1	1	.75	.5	.75	.75	.5	.75
4. 10-15	.75	.75	1	.75	.75	1	.5	.5	.75	.5	.5	.75
5. 4-10	.25	.25	.5	.25	.25	.5	0	.25	.5	0	.25	.5
6. 0-4	0	0	.25	0	0	.25	0	0	.25	0	0	.25
Average dissolved oxygen (mg/l)												
1. 0-1	0	0	0	0	0	0	0	0	0	0	0	0
2. 1-3	0	.25	.25	0	.25	.25	.25	.25	.25	.25	.25	.25
3. 3-5	.5	.5	.5	.5	.5	.75	.5	.5	.75	.5	.75	1
4. > 5	1	1	1	1	1	1	1	1	1	1	1	1
Average turbidty and secchi depth												
1. 0-10 NTU, >3 m	1	1	1	1	1	1	.75	.75	1	1	1	1
2. 10-50 NTU, 2-3 m	.75	.75	1	.75	.75	1	1	1	1	1	1	1
3. 50-100 NTU, 1-2 m	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.75
4. >100 NTU, <.5 m	.25	.25	.25	.25	.25	.25	.25	.25	.25	.25	.25	.5
Percent of area with water depth greater than 1 m												
1. 0-25	.5	.25	.5	.75	.75	.75	1	.5	.25	1	.75	.75
2. 25-50	.75	.75	1	1	1	1	.75	1	.75	1	1	1
3. 50-75	1	1	1	1	1	1	.75	1	1	.5	.75	1
4. >75	.5	.75	1	.75	.75	.75	.5	1	1	.25	.25	.75
Average water velocity (cm/sec)												
1. 0-20	.25	.25	.25	.25	.25	.25	1	1	1	1	1	1
2. 20-30	.5	.5	.5	.75	.75	.75	.5	.5	.75	.25	.5	.5
3. 30-40	1	1	1	1	1	1	.25	.5	.75	.25	.5	.5
4. 40-50	1	1	1	1	1	1	.25	.5	.75	.25	.5	.5
5. >50	1	1	1	1	1	1	0	.25	.5	0	.25	.25

Habitat Suitablity Index (HSI) score for S=Spawning, R=Rearing, and A=Adults

AQUATIC HABITAT APPRAISAL GUIDES
FISHES OF THE ILLINOIS RIVER

Habitat Variable	**HSI Score by Species Group and Life Stage**											
	Group 1			Group 2			Group 3			Group 4		
	S	R	A	S	R	A	S	R	A	S	R	A
Percent of surface area with cover (aquatic plants, logs, inundated timber and brush)												
1. 0-10	1	1	1	1	1	1	.25	.5	.5	.25	.25	.25
2. 10-25	1	1	1	1	1	1	.75	.75	1	.5	.5	.5
3. 25-50	.75	.75	.5	.75	.75	1	1	1	1	.75	.75	1
4. 50-75	.5	.5	.5	.5	.75	.5	.75	.75	.5	1	1	1
5. >75	.25	.25	.25	.25	.25	.25	.5	.25	.25	.75	.75	.5
Dominant substrate compostion												
1. Vegetation/detritus	.5	.75	.5	.75	1	.75	1	1	1	1	1	1
2. Clay and silt (<1.0 mm)	.25	.5	.5	.25	.5	.5	.5	.5	.75	.5	.5	.75
3. Sand (1-2 mm)	.75	1	1	1	1	1	.75	.75	.75	.75	.75	.75
4. Gravel 2-64 mm)	1	1	1	1	1	1	.75	.5	.75	.75	.5	.75
5. Rocks (>64 mm)	1	1	1	1	1	1	.5	.25	.5	.5	.5	.5
Calculations												
Total Score												
Average HSI Value (Total score/number of variables)												
Minimum HSI Value/1 (optional)												
Total Hectares												
Habitat Units (HSI x Total Hectares)												

TABLE - E-8

AQUATIC HABITAT APPRAISAL GUIDE RATINGS - GROUP 3

Appraisal Item	Ratings											
	Existing				Future Without				Future With			
	W	SP	S	F	W	SP	S	F	W	SP	S	F
Av. Water Temp	6	3	2	4	6	3	1	4	6	4	2	4
Av. D.O.	3	4	3	4	3	4	2	4	4	4	4	4
Av. Turbidity	1	3	1	1	1	3	1	1	1	2	2	2
% Water Depth	1	2	1	1	1	1	1	1	3	4	2	3
Av. Water Velocity	1	1	1	1	1	1	1	1	1	1	1	1
% Cover	1	2	2	2	1	1	1	1	1	3	3	3
Dominant Substrate	2	2	2	2	2	2	2	2	2	2	2	2

W Winter (January, February, March)
SP Spring (April, May)
S Summer (June, July, August, September)
F Fall (October, November, December)

TABLE - E-9

HABITAT SUITABILITY INDICE (HSI) VALUES

Condition	Life Stage	Winter	Spring	Summer	Fall
	S	-	.75	.79	-
Existing	R	.54	.75	.71	.71
	A	.64	.82	.82	.82
	S	-	.71	.54	-
Future Without	R	.54	.64	.54	.68
	A	.64	.68	.61	.75
	S	-	.79	.89	-
Future With	R	.68	.86	.93	.86
	A	.79	.93	.93	.93

S - Spawning, R - Rearing, A - Adult

TABLE E-10

PLAN COMPARISON SUMMARY
FOR GROUP 3 (LARGE SLACKWATER) FISHES
IN AVERAGE ANNUAL HABITAT UNITS

ternative	Life Stage	Season	Future Without	Width of Deep and Long Lakes to be Dredged: 60' Future With	60' Net	150' Future With	150' Net	300' Future With	300' Net
Plan C - Option 4A (dredging to 416 feet NGVD)	Spawning	SP	78	99	21	99	21	100	22
		S	73	109	36	109	36	111	38
	Rearing	W	57	79	22	80	23	80	23
		SP	75	104	29	105	30	105	30
		S	68	106	38	107	39	108	40
		F	74	102	28	102	28	103	29
	Adult	W	68	92	24	93	25	93	25
		SP	81	113	32	113	32	114	33
		S	78	113	35	113	35	115	37
		F	84	113	29	113	29	114	30
	Average		74	103	29	104	30	104	30
Plan C - Option 4B (dredging to 414 and 416 feet NGVD - alternating)	Spawning	SP	78	99	21	100	22	100	22
		S	73	109	36	110	37	112	39
	Rearing	W	57	79	22	80	23	80	23
		SP	75	104	29	105	30	106	31
		S	68	106	38	108	40	109	41
		F	74	102	28	102	28	103	29
	Adult	W	68	92	24	93	25	94	26
		SP	81	113	32	114	33	115	34
		S	78	113	35	114	36	116	38
		F	84	113	29	113	29	114	30
	Average		74	103	29	104	30	105	31
Plan C - Option 4C (dredging to 414 feet NGVD)	Spawning	SP	78	99	21	100	22	100	22
		S	73	109	36	111	38	112	39
	Rearing	W	57	79	22	79	22	80	23
		SP	75	104	29	105	30	107	32
		S	68	106	38	108	40	110	42
		F	74	102	28	103	29	103	29
	Adult	W	68	93	25	93	25	94	26
		SP	81	113	32	114	33	116	35
		S	78	113	35	115	37	117	39
		F	84	113	29	114	30	115	31
	Average		74	103	29	104	30	105	31

APPENDIX DRP-F

BIOLOGICAL DATA

FOREWORD

APPENDIX DPR-F provides vegetation, wildlife and fisheries data for the Stump Lake area and the Lower Illinois River.

UPPER MISSISSIPPI RIVER SYSTEM ENVIRONMENTAL MANAGEMENT PROGRAM
DEFINITE PROJECT REPORT WITH INTEGRATED ENVIRONMENTAL ASSESSMENT
STUMP LAKE COMPLEX HABITAT REHABILITATION PROJECT
ILLINOIS RIVER, JERSEY COUNTY, ILLINOIS

APPENDIX F

BIOLOGICAL DATA

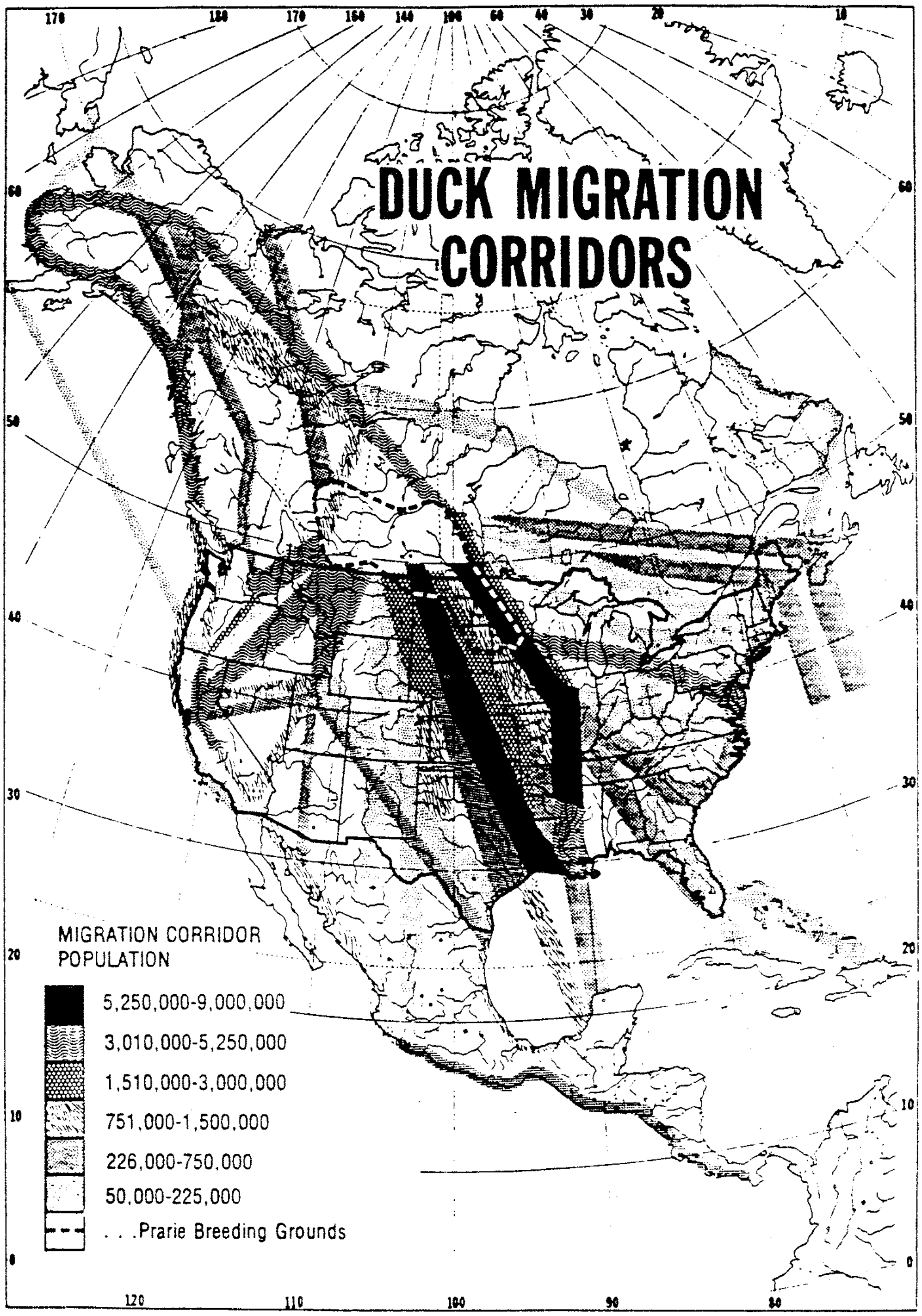
SECTION I. WILDLIFE HABITAT.

Pool 26 and the Alton Pool of the Illinois River are located within a major flight corridor for millions of migrating waterfowl (FIGURE F-1). The most abundant duck in the Mississippi flyway is the mallard (FIGURE F-2), and within the Upper Mississippi River, Pool 26 is one of the most important areas for this species. The importance of this area is highlighted by the North American Waterfowl Management Plan's (NAWMP) designation of the Upper Mississippi River as one of the waterfowl habitat areas of major concern in the U.S. (FIGURE F-3). Since 1970, trend analysis data shows a decreasing trend nationwide for duck populations in general, and also specifically for mallards (FIGURE F-4). The major factor attributed to this decline is deterioration of northern breeding grounds. However, habitat loss has also been noted to be of concern in areas used by waterfowl for rest stops during migration and for wintering. Waterfowl concentrate more during these periods, and the effects of habitat loss and degradation or disease outbreaks in such areas can be important. These areas have been lost to agriculture, and other land and water uses and the quality of much of the remaining habitat has decreased substantially. The aim of the NAWMP is to ensure the preservation of enough high quality waterfowl habitat to sustain waterfowl populations at levels for a fall flight of more than 100 million ducks (i.e., the 1970 level). For the mallard, the goal is to return to 1970-1979 population levels (or approximately 15 million birds in the fall flight).

From 1979-1982, moist soil plants made up over half of the diet of mallards collected in the area along the lower Illinois River from Kampsville to Grafton and the Mississippi River from Lock and Dam 22 to St. Louis (Illinois Natural History Survey, 1985:457). These plants start from seed (artificially or naturally) on exposed mud flats during the summer, but must become subsequently inundated by 0.5 to 1.5 feet of water in the fall to enable waterfowl to feed upon the seeds produced. Moist soil plants are especially sensitive to water levels during early growth when inundation can drown them. When water levels are dropped in the fall, as a result of navigation pool operations, the moist soil plants may be left stranded on mud flats. These plants then become inaccessible to waterfowl. To avoid this problem, some private and public organizations have built low levees adjacent to the pools to artificially control water levels. These areas are not affected by changes in river stage unless the levee is overtopped by flooding. The Stump Lake Complex is one of these types of areas.

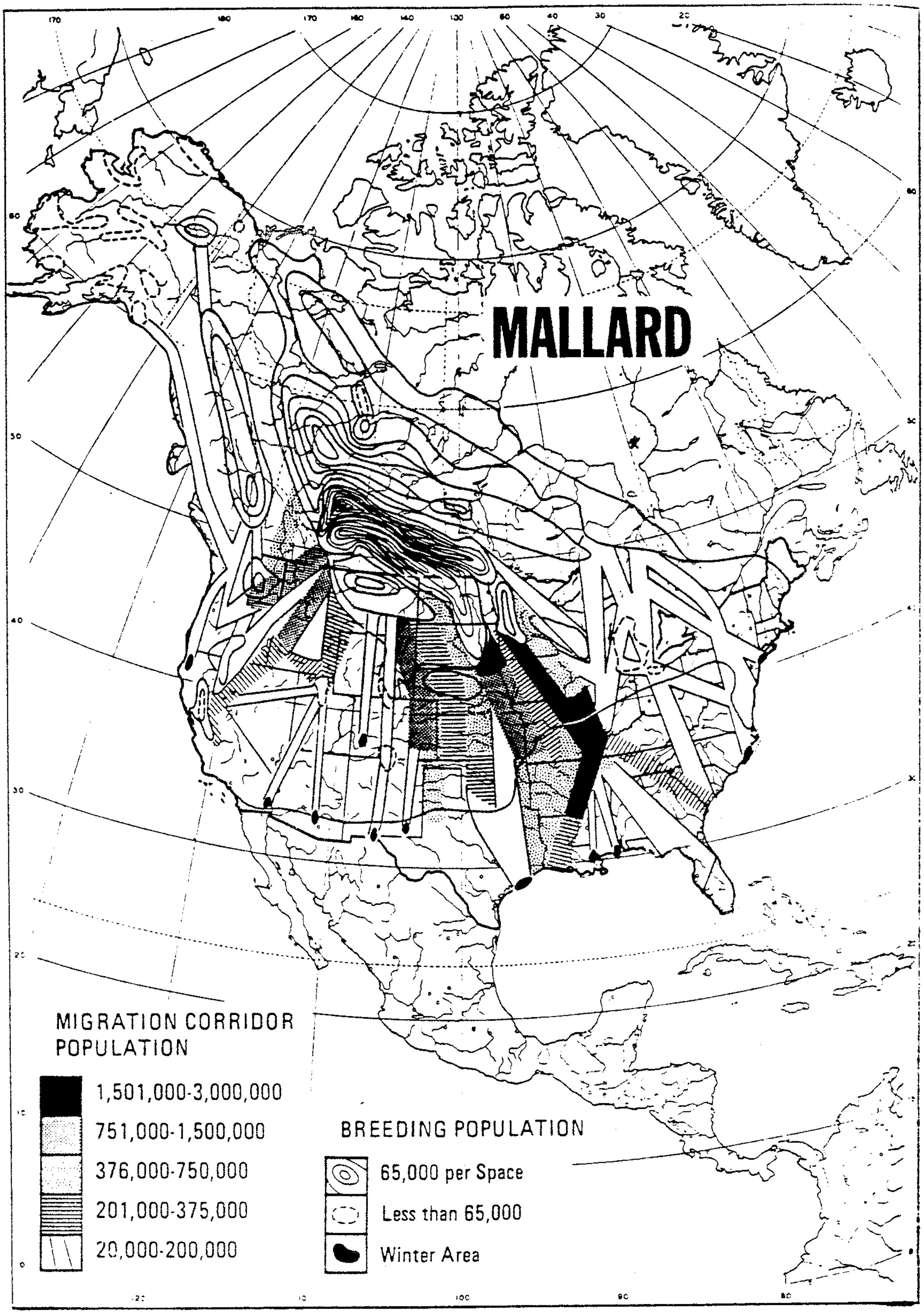
Where applicable, the following habitat descriptions include plant community types identified by Missouri Botanical Garden (1975) in a vegetational study of Pools 24, 25, and 26 of the Mississippi River and the Alton Pool of the Illinois River. The description also includes a cross-reference to the U. S. Fish and Wildlife Service's (USFWS) classification of wetlands and deepwater habitats (Cowardin et al., 1979) of the project area using aerial photography taken in 1986.

- DUCK MIGRATION CORRIDORS



FROM: BELLROSE, 1976

FIGURE F-1

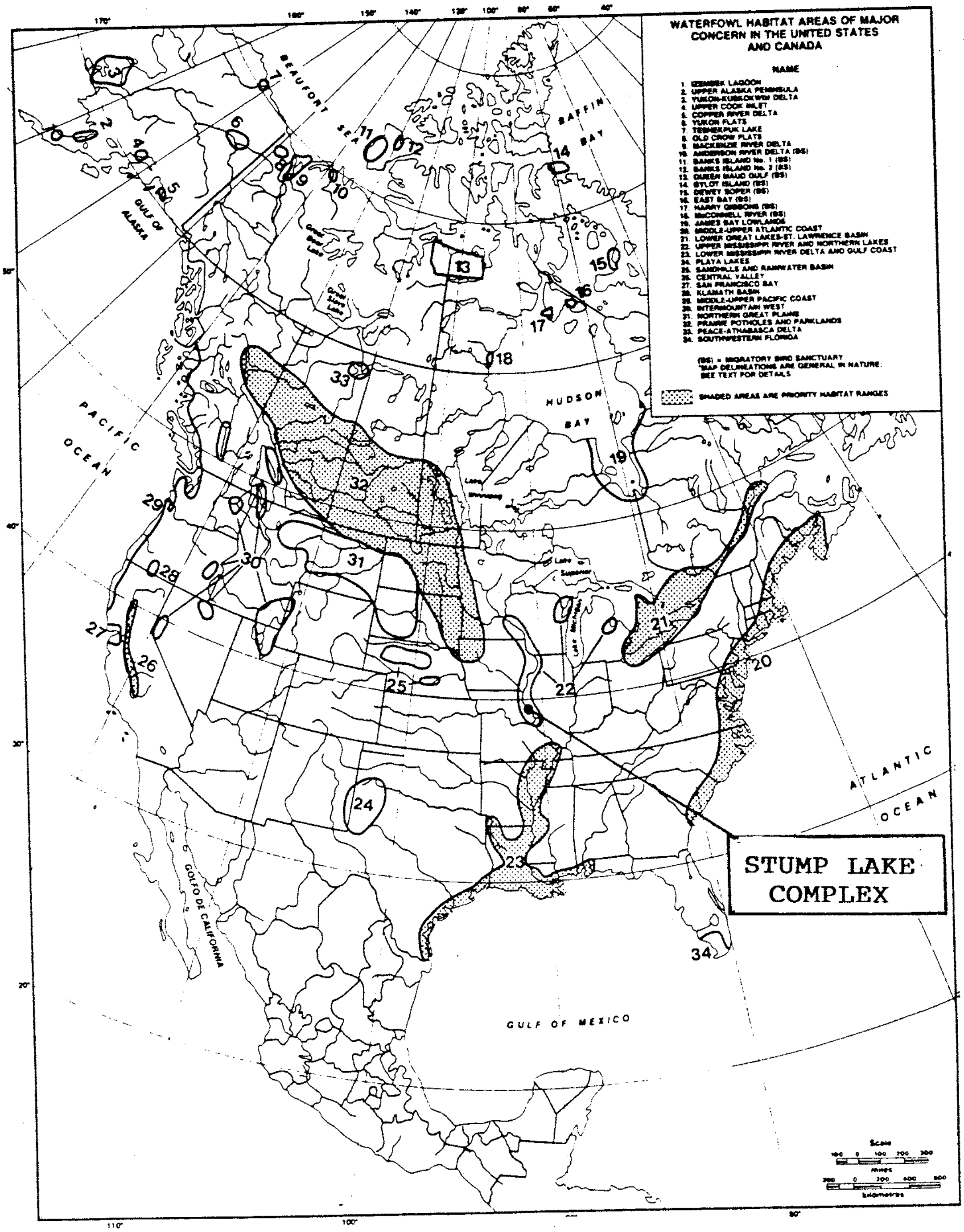


FROM: BELLROSE, 1976

FIGURE F-2

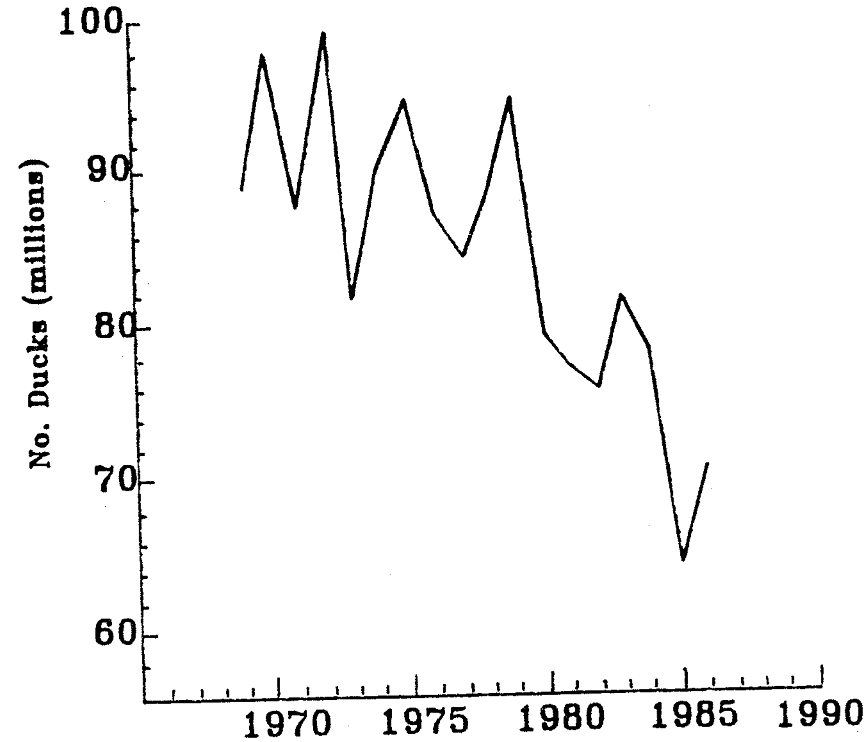
WATERFOWL HABITAT AREAS OF MAJOR CONCERN IN CANADA AND IN U.S. (1985)

Waterfowl habitat areas of major concern in Canada and in U.S. (1985)

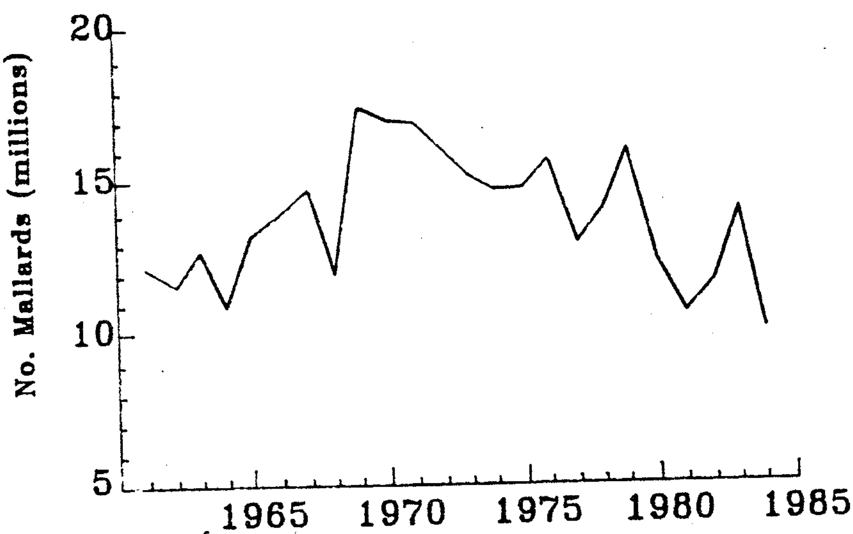


FROM: USFWS/CWS, 1986

FIGURE F-3



DUCKS, 1969–1986 (From USFWS/CWS, 1987).



MALLARDS, 1961–1984 (From INHS, 1985).

FIGURE F-4

a. Forested Wetland. The 1,314 acres of this habitat type are classified by the USFWS as broad-leaved deciduous, forested paulstrine wetland (PF01A and PF01C map symbols).

The forested wetland includes several communities. The willow community occurs most often as a narrow band along the Illinois River shoreline and sloughs. At Stump Lake Complex, it occurs to some degree along the riverbank but is very evident in the transition zone between the open water of the waterfowl management units and the somewhat higher areas covered by bottomland timber. The willow community is subject to more frequent, prolonged periods of flooding. Willow species present are *Salix nigra* (black willow), *S. interior* (sandbar willow), and *S. rigida*. As willows invade new land, they slow flood waters, causing the deposition of sediments and the building of land. Young willow stands are often very dense, and for the first eight to ten years usually do not include any other tree species. This gives the typical banded appearance to the willow community.

The bulk of the forested wetland consists of the silver maple-cottomwood and silver maple maple-cottonwood-pin oak communities. The communities do not tolerate flooding to the degree the willow community does, but can withstand limited annual flooding. Silver maple (*Acer saccharinum*), cottonwood (*Populus deltoides*), and pin oak (*Quercus palustris*) are the dominant tree species. Other common tree species include green ash (*Fraxinus pennsylvanica*), box elder (*Acer negundo*), sugarberry (*Celtis laevigata*), willow (*Salix* spp.), American elm (*Ulmus americana*), persimmon (*Diospyros virginiana*), bur oak (*Quercus marilandica*), and deciduous holly (*Ilex decidua*).

Vines are typically present, but their cover is low. Wild grape (*Vitis* spp.), poison ivy (*Toxicodendron radicans*), trumpet creeper (*Campsis radicans*), catbriar (*Simlax* spp.), and Virginia creeper (*Parthenocissus quinquefoilia*) are often observed.

The groundcover is sparse, covering only 5 to 25 percent of the area. The most common herbacious plants include lizard's tail (*Saururus cernus*), tall white aster (*Aster simplex*), stinging nettle (*Laportea canadenis*), smartweed (*Polygonum* spp.), and arrowhead (*Saggitaria latifolia*).

b. Norforested Interior Wetland.

The typical successional pattern for wetlands of this type in the Alton Pool of the Illinois River is from a lotus community to an arrowhead community to a graminoid-dominated community. The Missouri Botanical Garden (1975:31-32) provided the following account of physiognomic changes that take place along the moisture gradient in a forb-dominated wetland located "near Perre Marquette State Park":

> "The first section of this wetland was dominated by American lotus (*Nelumbo lutea*). It had approximately one meter of standing water in it on the day examined (27 September 1974). Lotus covered an estimated 75 percent of the area and was the only common species. Big duckweed (*Spirodela polyrhiza*) and pondweed (*Potomogeton pectinatus*) were the only other species observed in this stand. Their combined cover was less than five percent. In shallow water (less than 10 centimeters), mud plantain (*Heteranthera latifolia*) was found. Adjacent to this

area, an arrowhead (Saggitaria latifolia and S. graminea) community was sampled with 10 random quadrats. Total cover was estimated as 57 percent. The second most important species, by cover, was again big duckweed with only about six percent cover. No other species covers as much as five percent of the stand.

Closer to shore, grasses and sedges, as well as smartweed replaced the arrowhead. Ricecut grass (Leesia oryzoides) and yellow nut grass (Cyperus esculentus) were the dominant species. Primrose (Jussiaea repens) was also common.

In this area the successional pattern was clearly from the lotus community to the arrowhead community which in turn will be supplanted by the graminoid community."

The bulk of the management units - Fowler Lake, Upper and Lower Stump Lake, Flat Lake, as well as Deep and Long Lakes - have been classified by the USFWS as limnetic lacustrine deepwater habitat with an unconsolidated bottom (L1UBH map symbol). Other habitat types identified by the USFWS include littoral lacustrine wetland having aquatic beds, aquatic bed palustrine wetlands, unconsolidated bottom palustrine wetlands, emergent palustrine wetlands, and deciduous-leaved scrub-scrub palustrine wetlands (L2ABG, PABG, PUBF, PEMA, PEMC, PEMF, PSS1A, and PSS1F map symbols). (The only riverine habitat identified by the Service in the vicinity of the project area is the Williams Hollow creek channel which leads into the upper end of the Lower Stump Lake and the Illinois River.)

c. Forested Nonwetland. This habitat type is higher and thus drier because it occurs on the natural levee created by overbank flooding (large-sized sediment such as sand and sandy silt drops out first along this area). Typical trees of this area are cottonwood, pecan (Carva illinoensis), and box elder.

SECTION 2. FISHERIES HABITAT.

Commercial fishing was once a very important activity on the Illinois River. Over 2,000 commercial fishermen worked on the Illinois River in 1908, the peak year of the river's commercial fishery, and in that year the value of the catch exceeded that of any other river in America, excluding rivers with anadromous fishes (Sparks, 1984). In 1976 there were only two full-time commercial fishermen on the Illinois River (Sparks, 1984). Carp, channel catfish, buffalo, and drum have been the important commercial species. Commercial fishermen and market operators along the river in 1977 indicated in interviews that the local demand for fish could not be met by the Illinois River fishery; they believed the river had fewer large fish than in the past, and that the remaining fish were in relatively poor condition (Sparks, 1984). Sparks (1984) attributed the decline in size and condition of commercial fish to two factors. The primary factor was a decline in food sources - fingernail clams and other benthic organisms - found in the river and its connecting backwater lakes; he attributed the decline in benthos to an unidentified toxic factor in the river's sediments. As a secondary factor, Sparks cited the loss of backwater habitat due to drainage activities and sedimentation.

The commercial fishery harvest reached its lowest point in 1979, and by 1984 had shown improved harvests. The increased harvests have been attributed to improved water quality (U.S. Army corps of Engineers, 1988).

The sport fishery on the Illinois River has also declined since the turn of the century. This is attributable to loss of backwater habitat caused by drainage activities and leveeing, and also to pollution, including sedimentation, toxic wastes, and high organic loads. In general, the most abundant fish species are those that exist in degraded environments. They include species that are able to feed by the sense of smell, and that are able to withstand low dissolved oxygen levels. They also must be adapted to spawning in silty conditions (Herndon, 1983). Bullhead, bluegill, largemouth bass, white crappie, black crappie, white bass, channel catfish, and various sunfishes are common sport fish in the Illinois River.

Slough habitat, the only fisheries habitat present within the study area, is part of a broader category of habitat referred to as backwater habitat. Backwater habitat also includes river lakes and ponds, and is characterized by having no current at normal water stage and muck bottoms. Sloughs generally have an abundance of aquatic vegetation. The species diversity and density of aquatic macrophytes, phytoplankton, zooplankton, benthic fauna, and fish are usually higher in backwater areas than in main channel habitats.

SECTION 3. CENSUS DATA.

a. Waterfowl. At Stump Lake Complex, waterfowl have been aerially inventoried during fall migration by the Illinois Natural History Survey for many years. Data for the period 1967-1977 (excluding 1974) are provided in TABLE F-1. For comparison, similar data are shown in TABLE F-2 for Swan Lake, located directly across the Illinois River from Stump Lake Complex. The data show that eight species of dabblers and seven species of divers regularly or occasionally use Swan Lake. However, at Stump Lake Complex, divers very rarely were censused, and dabblers were observed less regularly. Canada geese and blue and snow geese were also regularly observed at Swan Lake, but not at Stump Lake Complex.

b. Fisheries. The Illinois Department of Conservation has periodically collected fish from Long Lake by annual electrofishing during the period 1965-1990. A cumulative total of 33 species have been recorded, with a median catch of 14 species per collection effort (range, 12 to 20). Species collected during all 11 collection trips include carp, bigmouth buffalo, bluegill, largemouth bass, black crappie, and freshwater drum. See TABLE F-3.

TABLE F-1

Average weekly count of waterfowl species aerially inventoried from 1967-1989 by Illinois Natural History Survey during fall migration (September 1 - December 15) on the Illinois River at **Swan Lake**, river miles 5 - 12, Calhoun County, Illinois. Counts rounded to nearest whole number. Number of weekly counts = n.

n	10	10	13	11	11	9	10	13	14	13	14
species	**1967**	**1968**	**1969**	**1970**	**1971**	**1972**	**1973**	**1975**	**1976**	**1977**	**1978**
mallard	5,962	5,567	10,973	5,008	22	17,821	6,272	17,012	18,096	18,001	16,445
black	36	87	48	37		511	144	448	203	268	207
pintail	21	1,410	1,176	27	6	1,334	118	445	235	956	1,622
blue-winged teal	46	16	57	11	27	71	196	231	393	669	521
green-winged teal	244	1,701	779	127	10	143	272	396	323	296	459
wigeon	5,712	6,316	2,973	549	54	318	398	385	859	816	3,104
gadwall	248	174	562	32		46	132	55	36	138	186
shoveler	2	4	9	5	<1	6		52	15	32	13
DABBLERS	**12,271**	**15,275**	**16,577**	**5,796**	**119**	**20,250**	**7,532**	**19,024**	**20,160**	**21,177**	**22,558**
scaup	1,026	3,592	438	405		1,361	140	179	105	444	524
ring-necked	790	1,400	2,042	136		197	36	67	42	236	350
canvasback	50	43	276	32		11	20	25	16	115	134
redhead	12	4	6	13		1		4		31	23
ruddy	212	940	829	266				32	11	26	30
goldeneye				2		17	12	11	105	79	179
bufflehead	2	2	6			8		7		6	51
DIVERS	**2,092**	**5,981**	**3,597**	**854**	**0**	**1,595**	**208**	**325**	**279**	**937**	**1,291**
common merganser			73	3		22	2	6	41	44	72
red-breasted merganser											3
hooded merganser	1		5					2	2	3	16
ALL DUCKS	**14,364**	**21,256**	**20,252**	**6,653**	**119**	**21,867**	**7,742**	**19,357**	**20,482**	**22,161**	**23,940**
Canada goose	348	10	77	100	10	13	76	290	267	408	1,576
blue & snow goose	3,850	4,286	1,169	454	<1	756	1,085	2,652	1,781	2,260	3,440
ALL GEESE	**4,198**	**4,296**	**1,246**	**554**	**10**	**769**	**1,161**	**2,942**	**2,048**	**2,718**	**5,016**
coot	9,810	9,280	2,512	1,836		439	1,044	756	925	3,190	8,648

TABLE F-1 (continued)

n	14	14	14	12	14	9	7	8	11	12	12
species	**1979**	**1980**	**1981**	**1982**	**1983**	**1984**	**1985**	**1986**	**1987**	**1988**	**1989**
mallard	13,964	9,366	7,848	5,958	7,828	7,922	9,714	9,750	20,727	23,062	25,617
black	204	100	151	139	106	107	98	145	327	336	464
pintail	1,498	922	277	242	436	630	3,628	2,538	2,682	1,690	2,980
blue-winged teal	405	191	136	188	323	353	1,088	944	418	426	236
green-winged teal	593	398	214	158	275	392	2,100	850	849	563	1,159
wigeon	2,660	1,351	898	452	520	1,221	1,725	3,309	3,454	1,681	2,654
gadwall	198	114	87	51	83	171	457	356	1,068	229	706
shoveler	40	15	20	25	34	20	277	120	372	114	834
DABBLERS	**19,562**	**12,455**	**9,628**	**7,214**	**9,606**	**10,818**	**22,089**	**18,012**	**29,898**	**28,102**	**34,651**
scaup	561	393	312	210	193	362	1,807	656	1,200	1,077	1,940
ring-necked	194	355	186	60	93	88	918	284	616	426	1,258
canvasback	98	75	91	72	55	135	454	189	320	281	896
redhead	16	26	16	16	21	26	96	42	150	79	148
ruddy	21	35	30	13	42	80	265	274	514	271	339
goldeneye	175	44	166	38	60	58	422	232	131	269	279
bufflehead	47	13	16	16	26	33	161	116	127	86	72
DIVERS	**1,113**	**941**	**818**	**425**	**490**	**832**	**4,124**	**1,793**	**3,060**	**2,490**	**4,932**
common merganser	51	13	56	12	19	22	115	76	45	76	76
red-breasted merganser	3				4		8	5			
hooded merganser	13	4	26	3	8	8	38	14	13	19	26
ALL DUCKS	**20,743**	**13,414**	**10,528**	**7,654**	**10,126**	**11,679**	**26,374**	**19,899**	**33,015**	**30,687**	**39,686**
Canada goose	664	470	607	478	265	500	1,264	488	1,154	1,200	2,821
blue & snow goose	2,176	2,531	1,106	1,462	344	828	589	594	1,070	776	1,110
ALL GEESE	**2,840**	**3,001**	**1,713**	**1,940**	**609**	**1,328**	**1,853**	**1,082**	**2,224**	**1,976**	**3,931**
coot	3,829	1,923	1,788	426	1,196	1,728	13,332	7,070	10,877	4,896	4,586

TABLE F-2

Average weekly count of waterfowl species aerially inventoried from 1967-1989 by Illinois Natural History Survey during fall migration (September 1 - December 15) on the Illinois River at **Stump Lake**, river miles 7 - 12, Jersey County, Illinois. Counts rounded to nearest whole number. Number of weekly counts = n.

n	10	10	13	11	11	9	10	14	14	13	14
species	**1967**	**1968**	**1969**	**1970**	**1971**	**1972**	**1973**	**1975**	**1976**	**1977**	**1978**
mallard	371	13	183		37	349	21	49	132	213	453
black	4		<1			49		5	5	9	10
pintail		135			34	114	10	2	8	38	17
blue-winged teal	13	6	13	4	45	30	51	108	55	158	59
green-winged teal	175				45	67	30	36	20	78	56
wigeon	3,572	2,610	1,102		40	68	188	21	4	37	54
gadwall	1,074	253	82			10	5	3		16	1
shoveler		4						3		2	1
DABBLERS	**5,209**	**3,021**	**1,380**	**4**	**201**	**687**	**305**	**227**	**224**	**551**	**652**
scaup			6								
ring-necked											
canvasback											
redhead											
ruddy											
goldeneye											9
bufflehead	<1										
DIVERS	**<1**	**0**	**6**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**9**
common merganser											3
red-breasted merganser											
hooded merganser											
ALL DUCKS	**5,209**	**3,021**	**1,386**	**4**	**201**	**687**	**305**	**227**	**224**	**551**	**664**
Canada goose				3		4		1	5	17	76
blue & snow goose						178					54
ALL GEESE	**0**	**0**	**0**	**3**	**0**	**182**	**0**	**1**	**5**	**17**	**130**
coot	1,320	509	1,362	<1		132	26	31	77	842	284

TABLE F-2 (continued)

n	14	14	14	12	14	9	7	8	11	12	12
species	**1979**	**1980**	**1981**	**1982**	**1983**	**1984**	**1985**	**1986**	**1987**	**1988**	**1989**
mallard	412	1,093	812	640	514	461	950	628	954	734	2,194
black	11	10	15	12	7	9	14	12	18	12	18
pintail	32	235	198	62	103	81	163	128	273	173	936
blue-winged teal	88	302	116	95	227	130	420	312	184	146	97
green-winged teal	104	461	226	108	131	144	728	259	330	231	306
wigeon	72	399	498	156	178	156	443	329	538	320	1,014
gadwall	4	58	78	14	21	14	97	38	268	31	164
shoveler		16	20	3	15	9	100	41	134	33	233
DABBLERS	**724**	**2,573**	**1,963**	**1,091**	**1,197**	**1,004**	**2,915**	**1,747**	**2,700**	**1,680**	**4,963**
scaup					6		61	32	10		12
ring-necked							21	5			
canvasback							50				
redhead							4				
ruddy							12		21		<1
goldeneye	10		21	9		12	76	39	23	17	17
bufflehead							6	3			
DIVERS	**10**	**0**	**21**	**9**	**6**	**12**	**231**	**79**	**54**	**17**	**29**
common merganser	2		7	2		3	28	12	4	3	5
red-breasted merganser											
hooded merganser						1	10				<1
ALL DUCKS	**736**	**2,573**	**1,991**	**1,102**	**1,203**	**1,020**	**3,184**	**1,839**	**2,759**	**1,700**	**4,998**
Canada goose	11	20	28	25	17		298	19	46	32	27
blue & snow goose	3	11	8	15			168	8	9	3	3
ALL GEESE	**14**	**31**	**36**	**40**	**17**		**466**	**27**	**55**	**35**	**30**
coot	646	4,322	1,242	375	568	592	5,332	1,284	4,852	1,902	1,530

TABLE F-3, SPECIES COMPOSTION OF FISHES COLLECTED BY BOAT ELECTROFISHING (A.C. 230V, 180 CYCLES) AT LONG LAKE, ILLINOIS RIVER, 1965-1990
SAMPLING CONDUCTED BY ILLINOIS DEPARTMENT OF CONSERVATION (CATCH DATA IN NUMBER OF FISH PER 30 MIN ELECTROFISHING)

Fish Species		CATCH DATA										
	sample date sampling time(min)	9Jun65 75	2Aug74 240	15Sep76 65	1Aug77 30	21Aug78 60	14Nov80 30	28Aug85 60	9Sep86 30	28Jul87 60	5Jul88 30	21Aug90 60
Spotted gar				0.46								
Shortnose gar		1.20	0.38	0.46	2.00			0.50				
Bowfin		0.80	1.25	2.31	7.00	2.00	1.00		1.00		3.00	4.00
Gizzard shad		40.40	17.13	11.08	143.00	26.50	27.00	40.00	57.00	2.50		669.00
Goldfish												6.50
Carp		7.60	10.00	32.77	36.00	9.50	76.00	9.50	43.00	32.50	27.00	8.00
Carp X goldfish				0.92								
Golden shiner		0.80										
Emerald shiner									1.00			0.50
Minnow spp		0.40										
River carpsucker				0.46								
Quillback							1.00		2.00	0.50		
Smallmouth buffalo			1.25	2.77		2.00	8.00	16.00		4.50	3.00	20.00
Bigmouth buffalo		1.20	1.25	15.23	28.00	3.50	26.00	3.50	4.00	8.50	7.00	19.00
Black buffalo				2.31				0.50		3.50	4.00	
Black bullhead			1.25	1.38	6.00	0.50			3.00			6.00
Yellow bullhead		0.40	1.38	0.46		0.50				1.00	3.00	0.50
Brown bullhead				12.92				1.00				
Channel catfish				5.08	5.00					0.50		0.50
Starhead topminnow		2.00										
Mosquitofish		2.00		23.08					1.00		90.00	
Brook silverside												2.00
White bass							1.00					
Yellow bass		0.80							1.00	1.50	3.00	
Green sunfish					4.00				1.00	0.50	6.00	0.50
Warmouth		0.40	3.13			1.50			8.00		4.00	2.00
Orangespotted sunfish		0.40					1.00		2.00			1.00
Bluegill		10.80	6.13	79.38	18.00	23.00	22.00	46.00	46.00	27.00	105.00	49.00
Redear sunfish												0.50
Largemouth bass		5.20	9.00	1.38	20.00	11.00	30.00	4.00	13.00	10.50	14.00	20.00
White crappie		0.40	2.25	0.92		2.00		2.50	6.00			
Black crappie		3.60	7.50	37.38	8.00	11.50	16.00	6.00	19.00	12.50	14.00	8.50
Freshwater drum		0.40	3.25	31.38	7.00	4.00	14.00	5.00	50.00	13.00	4.00	10.50
Total no. species		18	14	20	12	13	12	12	17	14	14	19
Total fish/30 min EF		78.80	65.13	262.15	284.00	97.50	223.00	134.50	258.00	118.50	287.00	828.00

FILE: LONGLAKE.WK1

APPENDIX DPR-G

CULTURAL RESOURCES DOCUMENTATION

FOREWORD

Investigations directed by a professional archaeologist will be conducted to locate, evaluate and protect any significant sites in areas of ground disturbance prior to construction related earthmoving activities. In the event that significant archaeological sites are located, measures shall be developed to either excavate the sites or alter the project design so as to avoid the archaeological sites as set forth in an agreement document described below.

A Programmatic Agreement was initiated in response to the concern of Illinois State Historic Preservation Officer that identification of historic properties had not been initiated before the draft D.P.R. was sent for review (letter dated December 27, 1991 from Theodore W. Hild, Deputy State Historic Preservation Officer to the District Engineer, St. Louis District see attached).

The St. Louis District in coordination with the Illinois State Historic Preservation Officer, the Advisory Council on Historic Preservation and the U.S. Fish and Wildlife Service, is preparing a Programmatic Agreement to protect significant archaeological resources at projects of the Habitat Rehabilitation and Enhancement Program (HREP) of the Upper Mississippi Environmental Management Program on St. Louis District lands including Stump Lake. Copies of draft Coordination letter to Susan Magerman, Illinois State Historic Preservation Officer; Valerie DeCarlo, Advisory Council on Historic Preservation and Chuck Gibbons, U.S. Fish and Wildlife Service are attached.

This Programmatic Agreement will follow the Secretary of the Interior's Standards and Guidelines for Identification (48 FR 44720-39) and the Illinois State Historic Preservation Office Guidelines for Archaeological Reconnaissance Surveys/Reports. The Programmatic Agreement will ensure that any significant sites at Stump Lake will be located, evaluated and recovered. The District concludes that the effect of undertaking the project would not be adverse.

PROGRAMMATIC AGREEMENT

AMONG THE U.S. ARMY CORPS OF ENGINEERS, ST. LOUIS DISTRICT, THE U.S. FISH AND WILDLIFE SERVICE, THE ADVISORY COUNCIL ON HISTORIC PRESERVATION, AND THE ILLINOIS STATE HISTORIC PRESERVATION AGENCY HABITAT REHABILITATION AND ENHANCEMENT PROGRAM (HREP) UPPER MISSISSIPPI RIVER SYSTEM - ENVIRONMENTAL MANAGEMENT PROGRAM (UMRS-EMP) ILLINOIS

WHEREAS, the U.S. Army Corps of Engineers, St. Louis District (Corps) has determined that the construction of the Habitat Rehabilitation and Enhancement Program (HREP) of the Upper Mississippi River - Environmental Management Program in St. Louis District lands in Illinois may have an effect upon properties potentially eligible for the National Register of Historic Places (NRHP) and has consulted with the Advisory Council on Historic Preservation (Council) and the Illinois State Historic Preservation Officer (SHPO) pursuant to Section 800.13 of the regulations (36 CFR Part 800) implementing 106 of the National Historic Preservation Act (16 U.S.C. Section 470f);

WHEREAS, the Fish and Wildlife Service (FWS) proposes to manage Corps lands at the HREP projects including any historic properties eligible or potentially eligible for the NRHP which are being preserved in place as a treatment to avoid adverse impacts from this project;

NOW, THEREFORE, the Corps, the FWS, the Illinois SHPO, and the Council agree that the project shall be implemented in accordance with the following stipulations to satisfy the Corps' Section 106 responsibilities for the project.

Stipulations

The Corps will ensure that the following measures are carried out:

I. ARCHAEOLOGICAL SURVEY

A) The Corps shall ensure that an archaeological reconnaissance survey (Phase I) will be performed in all project areas not previously surveyed. The Phase I survey shall be conducted in consultation with the Illinois SHPO and a report of the survey shall be submitted to the Illinois SHPO for review. An archaeological intensive survey (Phase II) will be performed at all historic properties within the project area to evaluate their National Register eligibility, except any sites that the Corps and the SHPO agree are ineligible on the basis of Phase I findings. Phase II testing methodologies shall be formulated in consultation with the Illinois SHPO. A report of the Phase II findings shall be submitted to the Illinois SHPO for review.

B) The Phase I and Phase II surveys will be conducted in a manner consistent with the Secretary of the Interior's <u>Standards and Guidelines for Identification</u> (48 FR 44720-23) and taking into account the National Park Service publication <u>The Archaeological Survey: Methods and Uses</u> (1978) and the Illinois State Historic Preservation Office Guidelines for Archaeological Reconnaissance Surveys/Reports. The Phase I and Phase II investigations will be implemented by the Corps and monitored by the Illinois SHPO.

C) In consultation with the Illinois SHPO, the Corps shall evaluate properties identified through the Phase II survey against the National Register criteria (36 CFR Part 60.4).

1. For those properties which the Corps and the Illinois SHPO agree are not eligible for inclusion in the National Register, no further archaeological investigations will be required, and the proposed project may proceed in those areas.

2. If the survey results in the identification of properties that the Corps and the Illinois SHPO agree are eligible for the National Register, such properties shall be treated in accordance with Part II below.

3. If the Corps and the Illinois SHPO do not agree on National Register eligibility, or if the Council or the National Park Service so request, the Corps shall request a formal determination of eligibility from the Keeper of the National Register, National Park Service, whose determination shall be final.

II. TREATMENT (PHASE III)

A) Those sites which the Corps and the Illinois SHPO have agreed are potentially eligible or eligible for the National Register and for which preservation is determined to be the appropriate mitigation action will be treated in the following manner:

1. The Corps shall insure that these sites will not be impacted during project construction.

2. The FWS, in consultation with the Corps and the Illinois SHPO, shall develop a management plan for the protection of these sites while they are managed by the FWS. This plan shall be approved annually by the Corps.

B) Those sites which the Corps and the Illinois SHPO agree are eligible for the National Register and for which data recovery rather than avoidance is necessary will be treated in the following manner:

1. The Corps shall ensure that a data recovery plan addressing substantive research questions is developed in consultation with the Illinois SHPO for the recovery of relevant archaeological data. The plan shall be consistent with the Secretary of the Interior's <u>Standards and Guidelines for Archaeological Documentation</u> (48 FR 44734-37) and take into account the Council's publication, <u>Treatment of Archaeological Properties</u>. It shall specify, at a minimum, the following:

a, the property, properties, or portions of properties where data recovery is to be carried out;

b, the research questions to be addressed through the data recovery, with an explanation of their relevance and importance;

c, the methods to be used, with an explanation of their relevance to the research questions;

d, proposed methods of disseminating results of the work to the interested public; and

e, a proposed schedule for the submission of progress reports to the Illinois SHPO.

2. The data recovery plan shall be submitted by the Corps to the Illinois SHPO for thirty (30) days review. After comments are received from the SHPO, the Corps shall then ensure that the data recovery plan is implemented. The Illinois SHPO shall monitor this implementation.

3. The Corps shall ensure that the data recovery plan is carried out by or under the direct supervision of an archaeologist(s) who meets, at minimum, the Secretary of the Interior's <u>Professional Qualifications Standards</u> (48 FR 44738-9).

4. The Corps shall ensure that adequate laboratory time and space are available for analysis of artifacts recovered from the excavations, including osteological, cultural, and biological materials.

5. The Corps shall ensure that a program of site security from vandalism during data recovery is developed in consultation with the Illinois SHPO, and then implemented by the Corps.

III. ARCHAEOLOGICAL MONITORING

A) If any portions of the project areas are inaccessible prior to project implementation and if historic properties are likely to be present, archaeological monitoring during construction will be conducted.

B) The Corps shall ensure that monitoring will take place according to the following specifications:

1. All construction excavations will be monitored by or under the direct supervision of an archaeologist(s) who meets, at minimum, the Secretary of the Interior's Professional Qualifications Standards (48 FR 44738-9).

2. If deposits from prehistoric or historic occupations are encountered, the archaeologist will be provided sufficient time and access to evaluate, record and conduct data recovery of features and artifact concentrations.

3. Adequate laboratory time and space will be available as set forth in section II. B) 4. of this agreement.

4. A program of site security will be developed as set forth in secton II. B) 5. of this agreement.

IV. CURATION AND DISSEMINATION OF INFORMATION

A) In consultation with the Illinois SHPO, the Corps shall ensure that all materials and records resulting from the data recovery and/or construction monitoring conducted for the UMRS-EMP projects are curated at the Illinois State Museum and in accordance with 36 CFR Part 79.

B) The Corps shall ensure that copies of all final archaeological reports resulting from actions pursuant to this Agreement will be provided to the Illinois SHPO, the National Park Service and to the National Technical Information Service (NTIS). The agency official shall ensure that all such reports are responsive to contemporary standards, and to the Department of the Interior's Format Standards for Final Reports of Data Recovery Programs (42 FR 5377-79). Precise locational data may be provided only in a separate appendix if it appears that its release could jeopardize archaeological sites.

V. PROVISION FOR UNDETECTED ARCHAEOLOGICAL RESOURCES DISCOVERED DURING IMPLEMENTATION

In accordance with 36 CFR Section 800.11(a), if previously undetected archaeological resources are discovered during project activities, the Corps will immediately cease, or cause to stop, an activity having an effect on the resource and consult with the Illinois SHPO to determine if additional investigation is required.

If further archaeological investigations are required, any data recovery will be performed in accordance with Part II TREATMENT (PHASE III) and Part IV CURATION AND DISSEMINATION OF INFORMATION of this Agreement. If further investigation is not necessary, activities may resume with no further action required. Any disagreement between the Corps and the Illinois SHPO concerning the need for further investigations will be handled pursuant to Part VI. DISPUTE RESOLUTION of this Agreement.

VI. DISPUTE RESOLUTION

The Corps and the Illinois SHPO shall together attempt to resolve any disagreement arising from implementation of this Agreement. If the Corps determines that the disagreement cannot be resolved, the Corps shall request the further comments of the Council in accordance with 36 CFR Part 800.6(b). Any Council comment provided in response will be taken into account by the Corps in accordance with 36 CFR Part 800.6(c)(2), with reference only to the subject of the dispute. The Corps' responsibility to carry out all actions under this Agreement that are not the subjects of the dispute will remain unchanged.

Execution and implementation of this Programmatic Agreement evidences that the U.S. Army Corps of Engineers, St. Louis District, has satisfied its Section 106 responsibilities for all individual undertakings of the project.

ADVISORY COUNCIL ON HISTORIC PRESERVATION

_______________________________ Date: __________

Executive Director

ILLINOIS STATE HISTORIC PRESERVATION OFFICER

_______________________________ Date: __________

State Historic Preservation Officer

U.S. ARMY CORPS OF ENGINEERS, ST. LOUIS DISTRICT

_______________________________ Date: __________

Title:

UNITED STATES DEPARTMENT OF INTERIOR, FISH AND WILDLIFE SERVICE

_______________________________ Date: __________

Title:

PD

Illinois Historic Preservation Agency

Old State Capitol Springfield, Illinois 62701 (217) 782-4836

Suite 4-900 State of Illinois Center 100 W. Randolph Chicago, IL 60601 (312) 814-1409

'90 DEC 28 AM 1:54

EXECUTIVE OFFICE
ST. LOUIS DISTRICT

December 27, 1990

JERSEY COUNTY
Stump Lake Complex
Habitat Rehabilitation Project
Draft Environmental Management Program
Definite Project Report (SL-4)

District Engineer P.E.
U.S. Army Engineer District, St. Louis
ATTN: Planning Division
1222 Spruce Street
St. Louis, Missouri 63103-2833

Dear Sir or Madam:

Thank you for the opportunity to review the draft Definite Project Report (DPR) with integrated Environmental Assessment (EA) for the Stump Lake Complex, Habitat Rehabilitation and Enhancement Project (HREP).

As noted in your report, the project area has a high potential for the presence of significant archaeological resources (page 13), yet no provisions are provided for the identification of these resources prior to project implementation or for consultation with the Illinois State Historic Preservation Office as required pursuant to 36 CFR Part 800: Protection of Historic Properties (see Part 800.4: Identifying historic properties). The proposed identification process involves monitoring by a professional archaeologist during construction activities (page 40). Typically, this is not an acceptable field methodology and is used only in cases where there are no alternatives to field work prior to actual project implementation. If through consultation between the Corps of Engineers and the Illinois State Historic Preservation Office, no other alternative is possible, a Memorandum of Agreement will be required to ensure that the Section 106 process of the National Historic Preservation Act of 1966 is fulfilled.

Further, we cannot concur with your statement on page 61 "that the effect of undertaking the project would not be adverse." Since no effort has been made to identify significant historic properties, it is not possible to make such a generalization. Again, this is not in compliance with the Section 106 process.

Our final concern involves the inclusion of a Draft Finding of No Significant Impact within the report. Again, a finding of no significant impact cannot be made unless there has been an identification of historic properties within the project area or provisions have been made through consultation with the Illinois State Historic Preservation Officer to ensure compliance with the Section 106 process.

We would be happy to discuss these issues with your staff in more detail. Please contact Paula Cross, Senior Staff Archaeologist, Illinois Historic Preservation Agency, Old State Capitol, Springfield, Illinois 62701 at 217/785-4998.

Sincerely,

Theodore Hild

Theodore W. Hild
Deputy State Historic
Preservation Officer

cc: Colonel Corbin, COE-St. Louis
Callahan, IHPA

DEPARTMENT OF THE ARMY
ST. LOUIS DISTRICT, CORPS OF ENGINEERS
1222 SPRUCE STREET
ST. LOUIS, MISSOURI 63103-2833

REPLY TO
ATTENTION OF:

Environmental & Recreational Resources Branch
Planning Division

Ms. Susan Mogerman
Illinois State Historic Preservation Officer
Acting Director
Illinois Historic Preservation Program
Old State Capitol
Springfield, Illinois 62701

Dear Ms. Mogerman:

This letter is to advise the Illinois State Historic Preservation Officer that the U. S. Army Corps of Engineers is initiating a Programmatic Agreement to insure that no adverse effects will occur to historic properties in Illinois as a result of projects included in the Upper Mississippi River System-Environmental Management Program (UMRS-EMP). A draft Programmatic Agreement is attached for comment. This action is taken in accordance with the National Historic Preservation Act, Section 106 (as amended) and its implementing regulation 36CFR800.

The UMRS-EMP was authorized by the Water Resources Development Act of 1986, Public Law 99-662 and involves construction of measures for the purpose of enhancing fish and wildlife resources in the Upper Mississippi River System. The purpose of the UMRS-EMP is to rehabilitate and enhance fish and wildlife habitat by reducing sedimentation and by implementing a variety of habitat management practices. The Corps is responsible for constructing these habitat projects. The project sponsor (usually the U S. Fish and Wildlife Service on the Illinois Department of Conservation) will manage the completed projects. Nearly all projects will be on Federally owned lands.

The Programmatic Agreement specifies the processes by which all significant historic properties will be located, evaluated, and treated prior to construction, by which construction monitoring may be conducted and by which archaeological remains will be curated. The consulting parties in addition to the Corps will be the Advisory Council on Historic Preservation, the Illinois State Historic Preservation Officer, the U. S. Fish and Wildlife Service and project specific parties, if any.

The Corps requests that any comments which the Illinois State Historic Preservation Officer has concerning this draft document be forwarded by July 31, 1991. If you have any questions regarding this matter, please contact either Ms. Suzanne Harris at (314) 331-8467 or Mr. Terry Norris at (314) 331-8468.

Sincerely,

Owen D. Dutt
Acting Chief, Planning Division

Copy Furnished:

Ms. Paula Cross
Preservation Service Division
Illinois Historic Preservation Agency
Old State Capitol
Springfield, Illinois 62701

DEPARTMENT OF THE ARMY
ST. LOUIS DISTRICT, CORPS OF ENGINEERS
1222 SPRUCE STREET
ST. LOUIS, MISSOURI 63103-2833

REPLY TO
ATTENTION OF:

Environmental & Recreational Resources Branch
Planning Division

Ms. Valerie DeCarlo
Advisory Council on Historic Preservation
1100 Pennsylvania Avenue, Rm 803
Washington, D. C. 20004

Dear Ms. DeCarlo:

As we discussed during our telephone conversation on April 2, 1991, the U.S. Army Corps of Engineers, St. Louis District (Corps) is initiating a Programmatic Agreement to insure that no adverse effects will occur to historic properties on St. Louis District lands in Illinois as a result of projects included in the Habitat Rehabilitation and Enhancement Program (HREP) portion of the Upper Mississippi River System-Environmental Management Program (UMRS-EMP). A draft Programmatic Agreement, which was developed in close coordination with the Illinois State Historic Preservation Officer's staff (Ms. Paula Cross), is attached for comment. This action is taken in accordance with the National Historic Preservation Act, Section 106 (as amended) and its implementing regulation 36 CFR 800. A separate Programmatic Agreement is being prepared for UMRS-EMP projects in Missouri and the draft will be forwarded for comment at a later date.

The HREP was authorized by the Water Resources Development Act of 1986, Public Law 99-662 and involves construction of measures for the purpose of enhancing fish and wildlife resources in the Upper Mississippi River System. The purpose of the HREP is to rehabilitate and enhance fish and wildlife habitat by reducing sedimentation and by implementing a variety of habitat management practices. The Corps is responsible for constructing these habitat projects. The project sponsor (usually the U.S. Fish and Wildlife Service) will manage the completed projects. Nearly all projects will be on Federally owned lands.

The Programmatic Agreement specifies the processes by which all significant historic properties will be located, evaluated, and treated prior to construction, by which construction monitoring may be conducted and by which archaeological remains will be curated. The consulting parties in addition to the Corps will be the Advisory Council on Historic Preservation, the Illinois State Historic Preservation Officer, the U.S. Fish and Wildlife Service and project specific parties, if any.

The Corps requests that any comments which the Advisory Council on Historic Preservation has concerning this draft document be forwarded by July 31, 1991. If you have any questions regarding this matter, please contact either Ms. Suzanne Harris at (314) 331-8467 or Mr. Terry Norris at (314) 331-8468.

Sincerely,

Owen D. Dutt
Acting Chief, Planning Division

Copy Funished:

Ms. Paula Cross
Preservation Services Division
Illinois Historic Preservation Agency
Old State Capitol
Springfield, Illinois 62701

DEPARTMENT OF THE ARMY
ST. LOUIS DISTRICT, CORPS OF ENGINEERS
1222 SPRUCE STREET
ST. LOUIS, MISSOURI 63103-2833

REPLY TO
ATTENTION OF:

Environmental & Recreational Resources Branch
Planning Division

Mr. Chuck Gibbons, Chief
Special Services
U.S. Fish and Wildlife Service
Federal Building
Fort Snelling
Twin Cities, MN 55111

Dear Mr. Gibbons:

This letter is to advise the U.S. Fish and Wildlife Service that the U.S. Army Corps of Engineers is, St. Louis District (Corps) initiating a Programmatic Agreement to insure that no adverse effects will occur to historic properties on St. Louis District lands in Illinois as a result of projects included in the Habitat Rehabilitation and Enhancement Program (HREP) portion of the Upper Mississippi River System-Environmental Management Program. A draft Programmatic Agreement, which was developed in close coordination with the Illinois State Historic Preservation Officer's staff, is attached for comment. This action is taken in accordance with the National Historic Preservation Act, Section 106 (as amended) and its implementing regulation 36CFR800.

The Corps is initiating this Programmatic Agreement as the agency responsible for constructing these habitat projects. The Corps requests that the U.S. Fish and Wildlife Service be a signatory to the document since that agency will usually manage the completed projects. As part of the agreement (Part II, 2.) the Corps is requesting that the Fish and Wildlife Service will include in their annual HREP management plans a plan for the protection of any archaeological sites that remain undisturbed following the completion of investigations.

In addition, the Programmatic Agreement specifies the processes by which all significant historic properties will be located, evaluated, and treated prior to construction, by which construction monitoring may be conducted and by which archaeological remains will be curated. The consulting parties in addition to the Corps and FWS will be the Advisory Council on Historic Preservation, the Illinois State Historic Preservation Officer, and project specific parties, if any.

The Corps requests that any comments which the U.S. Fish and Wildlife Service has concerning this draft document be forwarded by July 31, 1991. If you have any questions regarding this matter, please contact either Ms. Suzanne Harris at (314) 331-8467 or Mr. Terry Norris at (314) 331-8468.

Sincerely,

Owen D. Dutt
Acting Chief, Planning Division

Copy Furnished:

Ms. Paula Cross
Preservation Services Division
Illinois Historic Preservation Agency
Old State Capitol
Springfield, Illinois 62701

APPENDIX DPR-H

FISH AND WILDLIFE COORDINATION ACT DOCUMENTATION

FOREWORD

APPENDIX DPR-H provides the Fish and Wildlife Service's Fish and Wildlife Coordination Act Report (dated October 2, 1990) and Compatibility Statement (dated March 13, 1991), prepared by the FWS for the Stump Lake Complex DPR. The District will continue to involve the Service in all future phases of the project effort.

10/10 (EMP) (EMP)

Good letter!

United States Department of the Interior

FISH AND WILDLIFE SERVICE

MARION SUBOFFICE (ES)
Rural Route 3, Box 328
Marion, Illinois 62959

IN REPLY REFER TO:

October 2, 1990

9 Oct 90

RECEIVED
EXECUTIVE OFFICE
ST. LOUIS DISTRICT
90 OCT -9 AM 1 03

Colonel James E. Corbin
U.S. Corps of Engineers
St. Louis District
1222 Spruce Street
St. Louis, MO 63103-2833

ATTN: Master Planning Branch
Planning Division

Dear Colonel Corbin:

The Fish and Wildlife Service (Service) has reviewed the plans for the Stump Lake project being proposed under the Environmental Management Program (EMP). The project is located in Jersey County near the confluence of the Illinois and Mississippi Rivers. It will be constructed on land acquired in fee title by the Department of the Army and is administered by the Illinois Department of Conservation (IDOC) as part of a Cooperative Agreement, dated May 5, 1954, with the U.S. Department of the Interior, through the Service.

These comments have been prepared under the authority of the Fish and Wildlife Coordination Act and the Endangered Species Act, and are consistent with the intent of the National Environmental Policy Act, the Service's Mitigation Policy, and Presidential Executive Orders 11988 and 11990.

The primary purpose of the project is to rehabilitate once prime wetland habitat by controlling deposition of silt during frequent flooding and improving control of interior water levels so that wildlife food plantings can be established. Fishery benefits will also accrue through creation of deepwater habitat and provisions for interchange of aquatic organisms between the wetland complex and the Illinois River.

We understand the components of the selected plan to be as follows.

1. Riverside Sediment Deflection Levee (Dike). Consists of a 5.5 mile low profile earthen levee (average elevation 426 NGVD) that parallels the Illinois River shoreline and the perimeter of the WMA area to reduce siltation that occurs from frequent floods (2 year flood frequency protection). The levee will have a 10-foot crown width and 1 on 3 side slopes. Clearing, borrow, and construction limits will not exceed 120 feet in width. The levee grade will vary from 425.9 at the lower end of the project up to 427 at the upper end.

2. Interior Wetland Unit Containment Levees. Seven low level interior levees (elevation 422 NGVD) will be constructed in specific "low spots" around the perimeters of the four main wetland compartments (Fowler, Flat, Lower Stump, Upper Stump) to allow effective water level management capabilities and compensate for existing sedimentation.

3. Water Level Control Structures for Wetland Compartments. Provide adequate gravity flow sluice gated culverts or stop log structures to perform and control watering and dewatering of the four wetland compartments as management objectives dictate. Culverts are sized to handle capability for watering and/or dewatering wetland units in a two-week time period (dependant upon river level conditions). An electronic river gauge station will be installed at the water control structures at the confluence on Long Lake and the Illinois River to assist in water management decision making for the entire wetland complex.

4. Dredging Long Lake and Upper Deep Lake. Long and Deep Lakes are very shallow due to sedimentation. Dredging is required to ensure adequate water conveyance between the riverside pump and the wetland compartments, and to restore suitable habitat for backwater fish spawning and rearing, and to allow for boat passage. Dredging depths will vary approximately every 500 feet, between elevation 414 and 416, making the lake average from 3 to 5 feet in depth. The upper 2,400 feet of Deep Lake and the entire 12,800 feet length of Long Lake will be dredged. A 60-foot wide channel will be dredged down the middle of these narrow sloughs. Approximately 213,370 cubic yards of sediment will be removed. Dredged sediments will be deposited into the Upper and Lower Flat Lake Wetland compartment. Sediment deposition will elevate the bottom of Flat Lake from approximately 417 to 418.5 (1.5 feet). This will still allow the wetland to be managed as a moist soil unit. However, a 5,000 GPM portable pump will be needed to supplement the gravity flow structure into Flat Lake because of the lack of head differential.

5. Riverside Reversible Pumps. A 90 CFS reversible pumping system on the Illinois River will be used to allow flooding or draining of the wetland compartments. Two permanently located pumps will be required. The outlets/inlets for the wetland complex will be located at the upper end of Long Lake where Deep and Long Lakes merge. This is the closest (approximately 600 feet) and most efficient location to the Illinois River from the Wetland Complex.

6. Colluvial Sediment Reduction Plan - Williams Hollow Creek. Sedimentation from the Williams Hollow watershed is a site-specific problem that is reducing the area of aquatic habitat on the northeast end of lower Stump Lake. The U.S. Soil Conservation Service (SCS) and the Jersey County Soil and Water Conservation District have agreed to contact the landowners in the watershed and develop and implement a Resource Plan to control upland erosion if the landowners are willing to cooperate. An effective resource plan could effectively reduce sedimentation generated from the Watershed by 85 percent. The Corps, in coordination with the IDOC and SCS, is pursuing the feasibility of using EMP funds to implement soil conservation measures in the off-project uplands affecting lower Stump Lake.

Without the wetland restoration work, the Stump Lake area would eventually fill with sediment and its value to waterfowl, shorebirds, and other forms of wildlife greatly reduced. Similarly, fishery habitat would probably be limited to a few shallow water areas cut off from the river.

The project will be compatible with the goals of the North American Waterfowl Management Plan as it will provide important mid-migration habitat. The work will not affect federally listed endangered species.

The Service is very supportive of this EMP project and is anxious to assist in getting Habitat Rehabilitation and Enhancement Projects (HREP) funded and constructed. Please advise us if there is anything further we can do in this regard. We look forward to working with your agency in the future on this and other HREP's.

Sincerely,
Tom
Thomas M Groutage

Thomas M. Groutage
Assistant Field Supervisor

cc: IDOC (Donels, Atwood, Glosser)
IESPB (Lauzon)

PD-AM

United States Department of the Interior
Fish and Wildlife Service
Mark Twain National Wildlife Refuge
Great River Plaza
311 N. 5th Street, Suite 100
Quincy, Illinois 62301

TAKE PRIDE IN AMERICA

In Reply Refer to:

March 13, 1991

'91 MAR 15 A10:31

Colonel James Corbin
Army Corps of Engineers
St. Louis District
1222 Spruce Street
St. Louis, Missouri 63101

15 Mar 91

Attn: James M. Hill, Planning Division

Dear Colonel Corbin:

The compatibility study for the Stump Lake Rehabilitation Project has been reviewed by appropriate officials in our Regional Office, signed, and is being forwarded to your office for use in preparing the necessary project documents.

After your review, any questions may be directed to our EMP Coordinator Michael Bornstein at our Wapello, Iowa, District Office (319/523-6982).

Sincerely,

Robert H. Stratton, Jr.
Project Leader

United States Department of the Interior

Fish and Wildlife Service
Mark Twain National Wildlife Refuge
Great River Plaza
311 N. 5th Street, Suite 100
Quincy, Illinois 62301

TAKE PRIDE IN AMERICA

In Reply Refer to:

MARK TWAIN NATIONAL WILDLIFE REFUGE
Established 1958

Compatibility Study
STUMP LAKE REHABILITATION

Establishment Authority:

Mark Twain National Wildlife Refuge was established in 1958 under authority of the Fish and Wildlife Coordination Act (48 Stat. 401).

Purpose for Which Established:

The lands acquired under the Act were purchased for mitigation and enhancement of fish and wildlife in connection with water use projects on the Mississippi River. The primary purpose of the refuge is management of migratory waterfowl; other wildlife management responsibilities have been transferred to the State of Illinois.

Description of Proposed Use:

The proposal is a Habitat Rehabilitation and Enhancement Project (HREP) authorized by the Water Resource Development Act of 1986 (Public Law No. 99-262). The Army Corps of Engineers, as part of the environmental management program derived from construction of a new dam and enlarged lock at Alton, Illinois, has proposed to construct an HREP project located on the Stump Lake Waterfowl Management Area, Jersey County, Illinois, adjacent to the Illinois River between river miles 7.2 and 12.7.

The project area is extensively used by migratory waterfowl, and habitat management of this valuable wetland complex is currently hindered by problems with sedimentation and water level fluctuation. These problems are addressed by design features of this HREP.

Approximately 5.5 miles of low sediment deflection levee are to be constructed parallel to the Illinois River to reduce siltation from floods and improve water management capabilities.

Seven low level interior levees will be constructed around the perimeter of the four wetland units to further enhance wetland management capabilities.

Six sluice gated CMP structures, two stoplog drainage structures, and four sluice gated concrete fish passage structures will be constructed to provide the ability to perform watering and dewatering of the four wetland management units.

Approximately 3.0 miles of dredging will be performed from Long Lake and the upper portion of Deep Lake to improve water delivery and facilitate fish movement, spawning, and rearing.

A reversible pumping system will be installed on the Illinois River to further enhance water management capabilities.

Anticipated Impacts on Refuge Purposes:

As a result of the project, waterfowl and fish habitat will be improved and increased, which should subsequently result in increased waterfowl and fish populations. This will be a direct benefit toward maintaining and accomplishing refuge purposes.

Justification:

The proposed project works toward the accomplishment of the stated objectives of the refuge.

Determination:

The proposed project is compatible with the purpose for which the refuge was established.

Determined by: ____________________ 01/22/91
Project Leader — Date

Reviewed by: ____________________ 2.5.91
Wildlife Associate Manager — Date

Concurred by: ____________________ 2-12-91
Regional Director — Date

APPENDIX DPR-I

ENDANGERED SPECIES ACT DOCUMENTATION

APPENDIX DPR-I provides the August 31, 1990 letter from the USFWS listing Federally threatened and endangered species which may occur in the area of the proposed project. Impacts to Endangered Species identified in the area have to be considered during the design, construction and operational phases of the Stump Lake Complex HREP.

United States Department of the Interior

TAKE PRIDE IN AMERICA

FISH AND WILDLIFE SERVICE

MARION SUBOFFICE (ES)
Rural Route 3, Box 328
Marion, Illinois 62959

IN REPLY REFER TO:

August 31, 1990

Mr. Jack F. Rasmussen, P.E.
U.S. Corps of Engineers
St. Louis District
210 Tucker Boulevard, North
St. Louis, MO 63101-1986

ATTN: Master Planning Branch
Planning Division

Dear Mr. ~~Rasmussen~~ Jack:

As requested by your August 29, 1990, letter, the following federally listed endangered species may be found in the area of the proposed Environmental Management Program project at Stump Lake Complex, Jersey County, Illinois.

Classification	Common Name	Scientific Name	Habitat
Endangered	Bald eagle	Haliaeetus leucocephalus	Winters along major rivers and reservoirs
Endangered	Indiana bat	Myotis sodalis	Caves and riparian
Endangered	Decurrent False Aster	Boltonia decurrens	Wet prairie, floodplain forest

There is no designated critical habitat in the project area at this time.

Sincerely,
Tom
Thomas M Groutage

Thomas M. Groutage
Assistant Field Supervisor

cc: IDOC (Glosser)
IESPB (Lauzon)

APPENDIX DPR-J

CLEAN WATER ACT, SECTION 404(B)(1) EVALUATION

FOREWORD

APPENDIX DPR-J provides the Clean Water Act Section 404(b)(1) Evaluation Report for the Stump Lake Complex project. This documentation will also be forwarded to the Illinois Environmental Protection Agency along with a request for the state's Section 401 Water quality Certification under Section 401 of the Clean Water Act.

UPPER MISSISSIPPI RIVER SYSTEM ENVIRONMENTAL MANAGEMENT PROGRAM
STUMP LAKE COMPLEX REHABILITATION PROJECT
POOL 26, ILLINOIS RIVER, JERSEY COUNTY, ILLINOIS

SECTION 404(b)(1) EVALUATION REPORT
ON THE EFFECTS OF THE DISCHARGE OF DREDGED OR FILL MATERIAL INTO WATERS OF THE UNITED STATES

I. PURPOSE OF THIS EVALUATION

The proposed habitat rehabilitation project at Stump Lake Complex, Pool 26, Illinois River, Jersey County, Illinois, will involve placement of dredged and fill materials into waters of the United States. Section 404 of the Clean Water Act established a permit program for the purpose of regulating discharges of dredged or fill material into such waters. Under Section 404(b) of the Act, proposed discharges of dredged or fill material must conform to guidelines which are to be developed by the Administrator, Environmental Protection Agency. On 5 September 1975, in accordance with Section 404(b)(1), the Environmental Protection Agency published regulations, 40 CFR 230, which outline criteria and procedures for evaluating activities subject to Section 404. On 24 December 1980, revised Section 404(b)(1) guidelines were published which became effective 30 March 1981. It is mandatory that the guidance be applied to all proposed discharges of dredged or fill material subject to approval under Section 404. This evaluation will address proposed discharges of dredged and fill material required for the habitat rehabilitation of Stump Lake Complex.

II. PROJECT DESCRIPTION

a. Location. The Stump Lake Complex (officially called the Stump Lake Waterfowl Management Area) is located on the left (east) bank of the Illinois River in Jersey County, Illinois. The project area extends along the Illinois River from river mile 12.7 at the north boundary down to river mile 7.2 at the south end. This section of the Illinois River is within Pool 26 - commonly called the Alton pool.

b. General Description. The project area consists of about 2,657 acres of Federal land originally acquired for the 9-foot navigation project on the Illinois River. Stump Lake Complex is now managed as part of the Mississippi River State Fish and Wildlife Area by the Illinois Department of Conservation under cooperative agreements between the Department of the Interior and the Corps of Engineers. The primary objective of the complex is to provide habitat for migratory and resident waterfowl and waterfowl hunting opportunities.

The project area consists of five management units. Four of them - the waterfowl management units, consisting of Fowler Lake, Flat Lake, Upper Stump Lake, and Lower Stump Lake - were created upon impoundment of the Mississippi and Illinois Rivers when old Lock and Dam 26 at Alton, Illinois, was completed in 1938. The area occupied by these four units was forested prior to inundation. These units currently consist of open shallow water with encroaching willows at the margins. The fifth management unit - Deep and Long Lakes - is a continuous waterbody. It was once part of the Illinois River channel, but is now a shallow slough, isolated for most of its length from the river by a thin strip of land. This management unit currently serves as fisheries habitat. Long Lake joins the Illinois River at its southern end, where a water control structure currently is located. Deep and Long Lakes serve as a conduit for movement of water in and out of the four waterfowl management units.

Sedimentation has been identified as the most significant resource problem affecting the Upper Mississippi River System (UMRS). Compared to other UMRS pools, Pool 26 of the Mississippi River has the least amount of off-channel water habitat for fish spawning and rearing. Likewise for the Illinois River, the Alton pool has the least amount of such habitat in comparison to the LaGrange, Peoria, Starved Rock, and Marseilles pools. The continuing loss of off-channel water habitat is affecting waterfowl populations also.

Stump Lake Complex has been steadily filling in with sediment carried primarily by floodwaters of the Illinois River. The complex is also adversely affected by fluctuations in river stage. Production of waterfowl food plants within the four management units is often not reliable because the units are unprotected from floods, which can drown growing food plants. In addition, if floodwater inundates the units, they often cannot be dewatered efficiently to ensure an optimum 60-90 day water-free growing season so that fall-migrating waterfowl will encounter mature food sources.

The following is a general description of the Selected Plan. Specific features of the project are presented in TABLE J-1, and those components of the project which are subject to Section 404 are so indicated. The Selected Plan is depicted in FIGURE J-1.

A riverside levee/dike will be constructed parallel to the Illinois River shoreline and along the perimeter of the complex to reduce siltation that occurs from frequent floods. The levee/dike is a 6-mile-long low profile earthen structure that will be set back from the riverbank about 200 feet (or more) for about two-thirds of its distance, and about 60 feet for the remainder of its distance.

"Low spots" around the perimeter of the management units will be brought up to a uniform height through the construction of seven interior levee segments. These segments will have a crown elevation of 422 NGVD, and will provide for more effective water control. Likewise, the 422 elevation will provide the capability of gradually raising water surface elevations within the units to compensate for future sedimentation.

Deep and Long Lakes, the conduit for conveyance of water into and out of the waterfowl management units, will be hydraulically dredged to remove sediment to increase the unit's water-carrying capacity, enhance its fisheries habitat value, and provide the opportunity for boat passage by waterfowl hunters and fisherman. The average depth will be increased from 2 to 5 feet. Dredged material will be deposited into Flat Lake.

Pumping capability will be improved by the addition of a permanent reversible pumping system on the Illinois River bank adjacent to the north end of Deep and Long Lakes. A portable pump will be needed at Flat Lake to augment gravity flow during recharge periods because of the increased head differential created after disposal of dredged sediment.

TABLE J-1

COMPONENTS OF THE SELECTED PLAN AND THEIR RELATION TO SECTION 404 JURISDICTION

Feature	404 Approval Needed
1. <u>Levees</u> - Low-profile earthen structures	
a. <u>Riverside Levee/dike</u> - 31,000 feet long; crown elevation 426 NGVD at upper (north) end, 425.9 NGVD at lower (south) end; average height 4-6 feet; 10-foot crown width; 1 on 3 side slopes. Levee serves to deflect river-borne sediment, and keeps water from frequent flood events out of management units.	Yes
b. <u>Interior Levees</u> - Seven segments totaling about 16,500 feet long (range 570 to 6620 feet), constructed in specific "low spots" around perimeter of Fowler, Flat, Upper Stump, and Lower Stump Lakes; crown elevation 422 NGVD; average height 1-2 feet; 10-foot crown width; 1 on 3 sideslopes. Levees permit effective water level management and offer the ability to compensate for future sedimentation.	Yes
2. <u>Water Level Control Structures</u> - Provide control over watering and dewatering of the four waterfowl management units. Culverts are sized to recharge/dewater management units via gravity flow in a 10-14 day time period.	
a. <u>Long Lake to Fowler Lake</u> - use existing 2-36" CMP sliding gated culverts.	No
b. <u>Long Lake to Lower Flat Lake</u> - replace 2-36" gated culverts with 3-42" CMP sluice-gated culverts	Yes
c. <u>Long Lake to Upper Stump Lake</u> - new 8-foot wide stop log structure (also serves for boat passage)	Yes
d. <u>Long Lake to Lower Stump Lake</u> - new 8-foot wide stop log structure (also serves for boat passage)	Yes
e. <u>Upper Stump Lake to Lower Stump Lake</u> - replace 2-36" gated culverts with 2-42" CMP sluice-gated culverts with guidewalls	Yes
f. <u>Long Lake to Illinois River (at confluence)</u> - remove stop log structure across Long Lake; construct one five-chamber open concrete fish passage and water control structure, with a 42" sluice gate in each chamber (each chamber is 5' wide by 9' high)	Yes
g. <u>Lower Stump Lake to Illinois River</u> - replace 2-24" and 1-30" gated culverts with 4-42" CMP sluice-gated culverts	Yes

TABLE J-1 (Continued)

Feature	404 Approval Needed
h. Cofferdams - a temporary stone cofferdam will be constructed at water control structure sites (b), (e), and (g), and will be removed upon completion	Yes
3. Dredging - 160,027 cubic yards of sediment will be hydraulically dredged from Deep and Long Lakes to ensure adequate cross-sectional area for conveyance of water to and from the management units, to enhance the unit's habitat value for fisheries, and to allow for boat passage for hunting and fishing. The entire 12,800-foot long Long Lake and upper 2,400 feet of Deep Lake will be dredged down to 414 and 416 NGVD (alternating every 500 feet), thereby increasing the unit's average depth from 2 feet to 5 feet. A 60-foot wide channel will be dredged down the middle of the unit. Dredged sediments will be deposited into Upper and Lower Flat Lake, raising the bottom elevation by about 1.5 feet (417 to 418.5 NGVD).	Yes
4. Pumps - needed to recharge/dewater the management units	
a. Riverside Reversible Pumps - a 90 CFS reversible pumping system will be constructed on the bank of the Illinois River adjacent to the upper end of Deep and Long Lakes; this system will be used to flood or drain the management units; a 730-foot long 42" steel pipe placed in a shallow trench will carry water to the outlet/inlet in Deep and Long Lake; temporary stone cofferdams will be constructed around both ends of the pipe, and will be removed upon completion	Yes
b. Flat Lake Portable Pump - a 5,000 GPM portable pump will be required to supplement gravity flow into Flat Lake because of the head differential created after sediment disposal	No
5. Vegetative Clearing - about 63 acres of forested wetland will be cleared with mechanized equipment for construction purposes	Yes
6. Borrow Areas - about 52 acres of forested habitat (of which 32 acres are wetland) will be excavated for earthen material to be used to construct levees	No
7. Runoff From Dredging Operation - runoff water from hydraulically-dredged sediment (removed from Deep and Long Lakes and placed into Flat Lake) will return to Long Lake after adequate retention	Yes
8. Gaging Station - an electronic river gaging station will be installed at the confluence of Long Lake and the Illinois River to assist in making decisions concerning water management within the complex	No

TABLE J-1 (Continued)

Feature	404 Approval Needed
9. <u>Project Operation and Management</u> - after construction, the Illinois Department of Conservation (IDOC) would be responsible for the project's operation and maintenance. The discharge of sediment from maintenance dredging may require a permit. Any Section 404 approvals required during the project's life would be the responsibility of IDOC	Yes

283-001

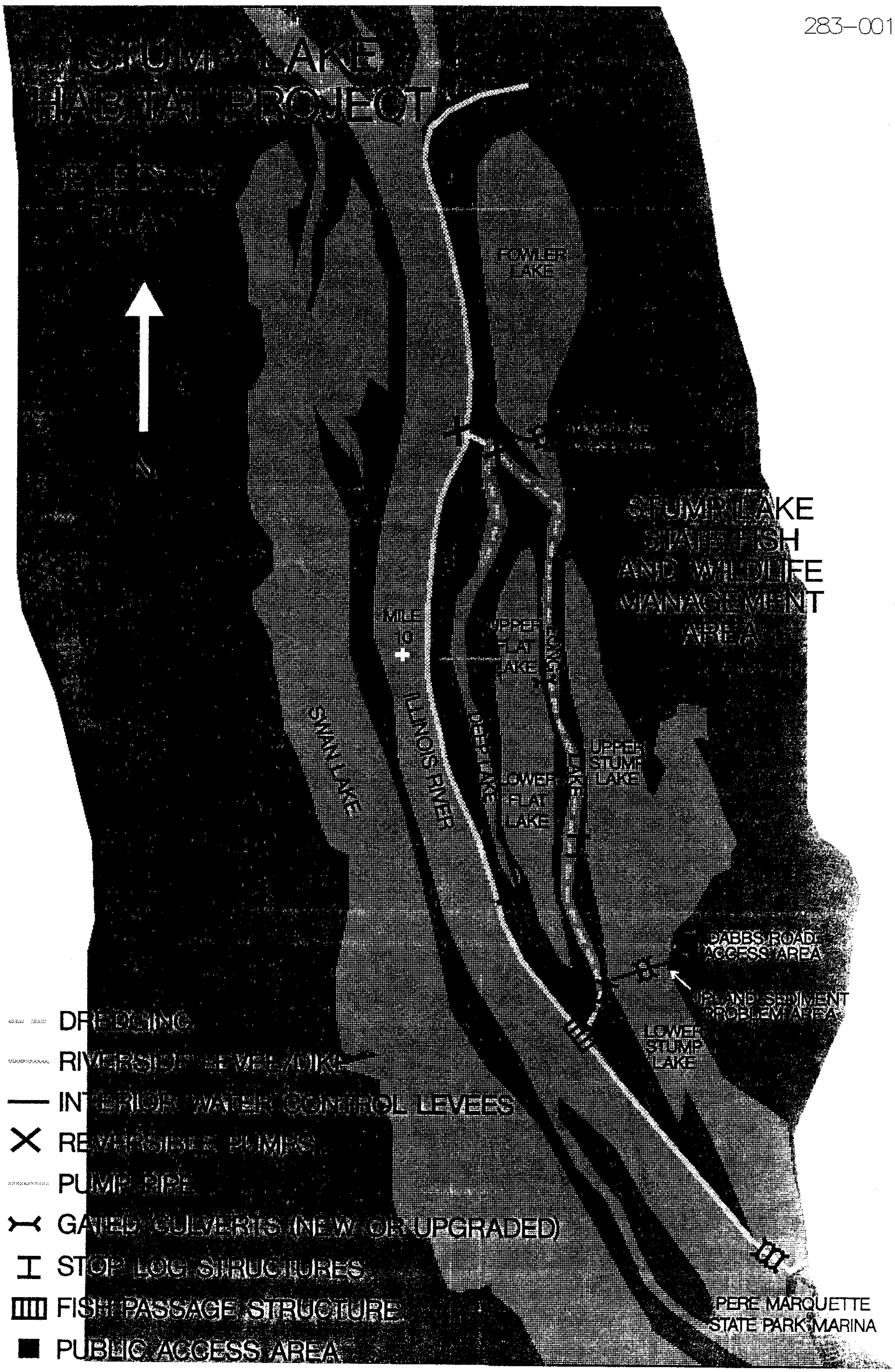


FIGURE J-1

Six new water control structures will be added where existing structures are inadequate. The structure located at the junction of Long Lake and the Illinois River will be used for both fish passage and water control, and will consist of an open concrete box culvert with 5 sluice gates. Two new stop log structures will be constructed at Upper and Lower Stump Lakes to allow for boat passage, thus eliminating the need for annually excavating (and backfilling) an opening into Upper Stump Lake from Long Lake.

c. Alternatives. Three project alternatives were considered: Alternative A, No Federal Action; Alternative B, Wetlands Excavation; and Alternative C, Wetlands Protection and Management. Alternative A was rejected because it would do nothing to alleviate the sedimentation and flooding duration and depth problems that must be addressed if habitat is to be improved. Large-scale excavation (Alternative B) also was considered unacceptable because it would not reduce future sedimentation, nor would it give rise to any improvement over current practices to manage water within the management units. Alternative C was found to be fully responsive to the project objectives, and was designated as the Selected Plan. It would significantly reduce the sedimentation rate, and would yield a considerable improvement over current water management capabilities.

The planning process took into consideration the avoidance of placement of dredged or fill material into waters of the United States in conjunction with the construction of project features. Alinement alternatives for the riverside levee/dike were limited primarily because of two factors; 1) the strip of land between the river and the management units is narrow, and 2) numerous cabins and an access road are located along the river for about half the distance of the riverside levee/dike, and the structure would have to be located landward of these residences and the road. The chosen alinement parallels the access road and is on the average about 100 feet distant. For much of the northern half of its length, the footprint of the levee/dike is located in forested nonwetland on the natural levee paralleling the river. The footprint of the levee/dike for its southern half is located in forested wetland because there is no nonwetland (upland). The interior levee segments are all located in wetland because their purpose is to raise "low spots" within the complex. The rock cofferdams are water-dependent, as are the water control structures. Dredged sediment from Deep and Long Lakes was considered as a source of material for construction of levee structures, but a considerable excess of sediment would be left requiring disposal. Hauling away the excess material to an upland site was considered too expensive. Disposal into Flat Lake was considered practical because the unit is surrounded by Deep and Long Lakes, it is an independent unit, it has the capacity to hold the dredged sediment, and it can still be managed as it is now after construction with the addition of a portable pump.

The results of a Wetland Evaluation Technique (WET) analysis for the project area are found in Appendix DPR-M. The analysis serves as a preproject baseline for wetland functions and values. Post-project analyses using WET will be performed at first year and then five-year intervals, corresponding to the time intervals for the Missouri Wildlife Habitat Appraisal Guidelines (WHAG) reevaluation. The U.S. Environmental Protection Agency has required these evaluations to monitor project effects on wetland function and values.

d. Authority and Purpose. Public Law (PL) 95-502 authorized the construction of a new dam and 1,200-foot lock at Alton, Illinois, and directed the Upper Mississippi River Basin Commission to prepare a Comprehensive Master Plan for the Management of the Upper Mississippi River System. The Basin

Commission completed the Master Plan report and submitted it to Congress on 1 January 1982. The report recommended an environmental management program that included construction of habitat rehabilitation and enhancement projects.

The 1985 Supplemental Appropriations Bill (PL 99-88), signed into law by President Reagan on 15 August 1985, provided initial authorization and appropriations for an environmental management program for the Upper Mississippi River System. A more comprehensive authorization was later provided by the Water Resources Development Act of 1986 (PL 99-662).

The two goals of the project are to enhance migratory waterfowl habitat and to enhance habitat for large slackwater fishes. Specific objectives for attaining the waterfowl goal are (1) decreasing sedimentation into the complex's management units, (2) providing stable water levels within the management units, (3) increasing reliable food production for waterfowl (particularly moist soil plant species), and (4) increasing total wetland values for migratory waterfowl.

Objectives for the fisheries goal are (1) decreasing sedimentation into Deep and Long Lakes, (2) increasing the photic zone, (3) increasing available cover, and (4) increasing the total habitat values for large slackwater fishes.

e. General Description of Dredged or Fill Material

(1) General Characteristics of Material (grain size, soil type).

(a) Dredged Material. Material to be hydraulically dredged from Deep and Long Lakes and placed into Flat Lake consists of sediment deposited by floodwaters of the Illinois River. This sediment is composed mainly of silts and clays with some sand.

(b) Fill Material. Material to be used as fill includes earthen material, quarry run stone, and concrete. Various sizes of stone will be used, including graded "C" stone, graded "B" stone, 6" minus, 1" minus, and riprap.

(2) Quantity of Material (cubic yards). The following quantities of materials will be required to construct the project:

Earthen material	142,365 cubic yards
Graded "C" stone	11,425 tons
Graded "B" stone	2,959 tons
Six-inch minus stone	2,768 tons
One-inch minus stone	1,179 tons
Riprap	480 tons
Concrete	98 cubic yards
Sediment (dredged)	160,027 cubic yards

(a) Levees.

(1) Riverside. The proposed plan includes the permanent placement of 125,500 cubic yards of earthen material, 2,100 tons of graded "C" stone, and 1,900 tons of 6-inch minus stone for embankment.

(2) Interior. About 15,585 cubic yards of earthen material will be permanently placed to construct embankment for the seven segments of interior levee. The quantities in cubic yards for segments one through seven are as follows: 1,928; 7,189; 2,450; 226; 552; 1,070; 2,170.

(b) Pumping Plant. Construction of the pumping plant along the Illinois River bank adjacent to the northern end of Deep and Long Lakes will require the permanent placement of 805 cubic yards of earthen material for embankment, 480 tons of riprap, and one cubic yard of concrete. Construction of two temporary cofferdams will require 1,200 tons of graded "C" stone.

(c) Water Control Structures. Construction of water control structures (b), (e), and (g) from TABLE J-1 will require the permanent placement of 475 cubic yards of earthen material, 1,050 tons of graded "C" stone, and 939 tons of graded "B" stone for embankment; 868 tons of 6-inch minus stone and 639 tons of 1-inch minus stone as pipe bedding material; and about 6 cubic yards of concrete. About 1945 tons of graded "C" stone will be used to construct three temporary cofferdams.

(d) Fish Passage Structure. The fish passage and water control structure proposed at the confluence of Long Lake and the Illinois River will require the permanent placement of 49 cubic yards of concrete, 1,080 tons of graded "B" stone, and 300 tons of 1-inch minus stone as bedding. A temporary cofferdam constructed of 940 tons of graded "B" stone will be employed.

(e) Stop Log Structures. The two boat passage structures will require the permanent placement of 42 cubic yards of concrete, 3,580 tons of graded "C" stone, and 240 tons of 1-inch minus stone for bedding. Construction of these structures will also require two temporary cofferdams consisting of 1,550 tons of graded "C" stone.

(3) Source of Material. Stone used for the project will be obtained from commercial stone quarries in the vicinity of Jersey County. Earthen material used to construct levee embankments will be obtained from within the project area - specifically from areas directly adjacent to the landside toe of the levee.

f. Description of the Proposed Discharge Sites

(1) Location. The location of the riverside levee/dike and seven interior levee segments, pumping plant, water control structures, fish passage structure, and boat passage structures is shown in FIGURE J-1. With regard to the pumping plant, one cofferdam will be constructed in the Illinois River around the pump site, and the other cofferdam will be constructed in Deep Lake where the discharge pipe outlet/inlet is located. The proposed riprap will be placed on the Illinois River bank and river bottom to protect from erosion the substrate in the vicinity of the submerged end of the pump. Likewise, riprap will be placed around the end of the discharge pipe in Deep Lake.

The plane of ordinary high water of the Illinois River at the complex (river mile 9) is at the elevation of 421 feet NGVD. Wetlands subject to Section 404 are in general those areas within the complex below the 423 contour line.

(2) Size (acres) and Types of Habitat.

(a) Levees. Construction of the riverside levee/dike embankment will require 27 acres; 13 acres consist of forested nonwetland, 13.5 acres of forested wetland, and 0.5 acre of nonforested wetland (edge of Lower Stump Lake). Construction of the seven segments of interior levee will require 7 acres, all of which are forested wetland.

(b) Pumping Plant. Placement of riprap at both ends of the discharge pipe will require about 0.1 acre, which consists of nonforested wetland (Deep Lake) and riverine habitat (Illinois River). Backfilling of the trench for the pipe will require about 0.15 acre, about two-thirds of which is forested wetland, and the remainder forested nonwetland.

(c) Water Control Structures. In general, areas to be occupied by water control structures are included in the acreage estimates for levee embankment. Each temporary cofferdam will occupy about 0.15 acre. Cofferdams will be located in nonforested wetland in the case of interior structures, and in the Illinois River (in part) for the structure at the lower end of Lower Stump Lake.

(d) Fish Passage Structure. The temporary cofferdam will occupy about 0.25 acre; most of this area is aquatic (nonforested wetland and riverine habitat).

(e) Stop Log Structures. These two structures will occupy areas that are considered as forested wetland; each structure will occupy about 0.1 acre. The temporary cofferdam at each site will occupy about 0.25 acre in nonforested wetland (waterfowl management unit).

(3) Type of Site (confined, unconfined, open water).

(a) Permanent Deposits of Dredged and Fill Material. Flat Lake, the site for permanent deposit of hydraulically dredged material from Long and Deep Lakes, will be a confined disposal site; it generally consists of open water. All sites for the permanent placement of fill material will be unconfined. The structures for which fill is needed are designed to remain immobile after construction. Nearly all sites designated for placement of fill are not in open water; only about 0.5 acre of Lower Stump Lake will be filled for construction of the riverside levee/dike.

(b) Temporary Deposits of Fill Materials. The cofferdams to be constructed in conjunction with the construction of water control structures, the fish passage structure, the boat passage structures, and the pumping plant, will be temporary, and will be removed upon completion. These cofferdams will for the most part be placed into open water in unconfined sites. The structures are designed to remain immobile.

(4) Timing and Duration of Discharge. A construction start has been tentatively scheduled for Fiscal Year 1992. Depending on local weather and flooding conditions, the estimated duration of the construction period is 24 months.

g. Description of Disposal Method (hydraulic, drag line, etc.). Sediment removed from Deep and Long Lakes and placed into Flat Lake will be hydraulically dredged. Earthen material used for embankment will be hauled to the disposal site and worked with mechanical equipment. Likewise, stone will be similarly treated.

II. FACTUAL DETERMINATIONS

a. Physical Substrate Determination.

(1) Substrate Elevations and Slope. The project area consists of the Illinois River floodplain, and is generally flat. Elevations of the existing substrate within the project area range from about 420 to 430 feet NGVD for the forested (terrestrial) areas, and from 415 to 420 feet NGVD within the nonforested areas, which include the waterfowl management units and Deep and Long Lakes. The natural levee along the Illinois River lies between the management units and the river channel. Consequently, the management units are a depression in the landscape, and thus act as sinks for river-borne sediment. Much of the project site is sloped no greater than 1-2 percent.

(2) Sediment Type. The existing substrate within the forested nonwetland area consists generally of silt loams, whereas that of the forested wetland area consists generally of silty clay loams. For the open interior wetlands, the substrate consists of fine silts and clays as well as organic matter.

(3) Dredged/Fill Material Movement. Stone used for the construction of levee embankments and as revetment is not expected to move, nor is earthen material, which will be compacted. The hydraulically dredged sediment will not move because it will be disposed into a confined site.

(4) Physical Effects on Benthos (burial, changes in sediment type, etc.). Dredging in Deep and Long Lakes will lower the substrate's elevation by about 2.5 feet. Disposal of dredged material into Flat Lake will raise the bottom elevation by about 1.5 feet. Construction of the riverside levee/dike will raise the substrate an average of 4-6 feet. Placement of fill for the interior levee segments will raise the substrate by about 2 feet.

Construction of the water control structures, fish passage and boat passage structures, and temporary cofferdams will result in the burial and loss of some benthic organisms. However, most of these areas will be recolonized within 1 year or so, possibly with different assemblages of benthic organisms. The rock material will provide a different but favorable substrate for benthic recolonization. Reducing the sedimentation rate within the interior wetland area should also benefit the benthic fauna. Dredging in Deep and Long Lakes will result in a short-term loss of benthic organisms. Likewise, disposal of sediment into Flat Lake will bury the existing substrate, but the dredged sediment will be similar to the substrate of Flat Lake. Deep and Long Lakes, as well as Flat Lake, are expected to quickly recolonize with organisms adapted to the same substrate type.

(5) Other Effects. No other effects are expected.

(6) Actions Taken to Minimize Impacts. The primary actions taken to avoid adverse effects on the substrate are elimination of clamshell excavation of sediment from Deep and Long Lakes (with proposed sidecasting of sediment into unconfined adjacent areas, and resulting movement of sediment into the waterfowl management units), the retention of dredged material in Flat Lake, designing stable slopes on structures, the use of immobile stone for constructing structures (rather than earthen material), and stone adequately sized to withstand the force of floodwaters.

b. <u>Water Circulation, Fluctuation and Salinity Determinations</u>

(1) <u>Water</u>

(a) <u>Salinity</u>. Not applicable.

(b) <u>Water Chemistry</u>. To ascertain potential water quality impacts, preproject water samples were taken from Deep and Long Lakes and tested to determine the presence of contaminants (lead, zinc, and ammonia) in the water column. Hydraulic dredging in Deep and Long Lakes will resuspend sediment particles and may release ammonia to the water column at the disposal site. Based on sufficient retention time within the confines of Flat Lake, any elevated levels of ammonia should disapate. During dredging operations, should the sampling for Ammonia indicates there is insufficient retention time, dredging operation may be slowed down to increase retention, or dredging operations may be rescheduled for cold weather months of the year. Ammonia will monitored daily during dredging operations. Test results do not currently show unacceptable levels of lead or zinc in the water column.

(c) <u>Clarity</u>. Water samples from Deep and Long Lakes indicate that the hydraulic dredging process will give rise to high levels of resuspended sediment at Flat Lake, the disposal site. The anticipated levels are high enough to require that the disposal operation be regulated in accordance with state water quality standards. Return water from Flat Lake will be allowed to reenter Deep and Long Lakes only after it has been retained long enough for concentrations of resuspended sediment to fall below the required standard. Elevated suspended sediment levels are expected to occur at the construction sites of cofferdams (for water control structures, the fish passage and boat passage structures, and the pumping plant). These elevated turbidity levels will be short-term.

(d) <u>Color</u>. No significant change.

(e) <u>Odor</u>. The project is not expected to have a significant impact on water odors.

(f) <u>Taste</u>. The project is not expected to impact water taste.

(g) <u>Dissolved Gas Levels</u>. Construction activities associated with the project will have no significant long-term adverse impact on dissolved gas levels. Minor short-term impacts will probably occur as a result of water disturbances during dredging.

(h) <u>Nutrients</u>. Some nutrients will be released to the water column during dredging; however, this will represent a temporary increase and is not considered significant.

(i) <u>Eutrophication</u>. The project is not expected to have a significant impact on eutrophication of the water column. The project is designed to enhance the interior waters.

(j) <u>Water Temperature</u>. The project is not expected to cause a significant change in water temperature.

(2) Current Patterns and Circulation

(a) Current Patterns and Flow. The project will alter circulation and flow patterns. The riverside levee will prohibit minor (up to a 3 to 4-year frequency) Illinois River floods from entering the management units. Higher flood events will overtop the levee. The overall management of the complex will not change with the project. Deep and Long Lakes will continue to be used to distribute water to the waterfowl management units. The only new "connections" between waterbodies are the new pumping station on the Illinois River bank to move water into and out of Deep and Long Lakes, and the new boat passage structure between Long Lake and Lower Stump Lake. The water control structure near the lower end of Long Lake will be removed and replaced with a fish passage/water control structure at the lake's confluence with the Illinois River. All new and modified water control structures have been designed to reduce the recharge/dewater period to about 10 days. Exclusion of minor flood events from the management units will give rise to more stable water conditions and therefore more reliable waterfowl food sources, as well as better fisheries habitat.

(b) Velocity. Water velocities within the complex will not change significantly. When the navigation pool is "on tilt", the project will cause river velocities to increase slightly, mainly on the right bank at the site of the proposed Swan Lake project. This is not a concern because the Swan Lake's levee system is set back from the bankline and is expected to be protected by a buffer of dense vegetative growth.

(c) Stratification. Stratification does not normally occur in the Stump Lake Complex or in the adjacent Illinois River.

(d) Hydrologic Regime. The project is not expected to change profiles in the adjacent Illinois River or in the adjacent floodplain. The complex will no longer experience minor flood events from the river. Greater flood events will continue to enter the complex by overtopping the levee.

(3) Normal Water Level Fluctuations (tides, river stage, etc.). The project will not affect normal fluctuations in the Illinois River. Seasonal fluctuations in water levels within the complex as dictated by waterfowl management practices will also not change.

(4) Salinity Gradients. There are no salinity gradients in the project area.

(5) Actions Taken to Minimize Impacts. Flat Lake, an independent waterfowl management unit, will be used as a containment area for disposal of hydraulically-dredged sediment from Deep and Long Lakes. Return water will be detained in Flat Lake for sufficient time to allow for settling of suspended sediments to levels in accordance with state water quality regulations. Return water will not enter the Illinois River, but will reenter Deep and Long Lakes. Dredging operations will comply with state water quality standards for ammonia, and may be confined to cold-weather months if the results of water quality monitoring during dredging so indicate. During dredging operations, the water control structure regulating water movement between the Illinois River and Long Lake will be kept closed during dredging operations so as to isolate Deep and Long Lakes at normal pool stages.

c. Suspended Particulate/Turbidity Determinations

(1) Expected Changes in Suspended Particulates and Turbidity Levels in Vicinity of Disposal Site. Increases in suspended particulates and turbidity due to hydraulic dredging operations will be confined to Flat Lake and Deep and Long Lakes, and are anticipated to be in significant and short-term. Construction impacts within the complex and in the Illinois River due to the placement of rock materials in open water (pumping plant, fish passage/ water control structure) will be very localized and minor. In the long-term, the project is expected to protect the complex from much river-borne particulate matter. Deep and Long Lakes should experience an overall reduction in suspended particulate matter and lowered levels of turbidity.

(2) Effects (degree and duration) on Chemical and Physical Properties of the Water Column. Stone materials to be placed at the margin of the Illinois River will give rise to minimal and localized impacts on the river's water column. Impacts within the complex are addressed below.

(a) Light Penetration. Flat and Deep and Long Lakes should experience reduced light penetration due to elevated levels of suspended particulates and increased turbidity levels. These impacts will be short-term. In the long-term, light penetration within the management units will increase.

(b) Dissolved Oxygen. Short-term decreases in dissolved oxygen levels are expected to occur during dredging operations in Deep and Long Lakes and Flat Lake. Over the long-term, dissolved oxygen levels during the winter and summer months - when many fish may experience stress because of low levels - are expected to increase with the project.

(c) Toxic Metals and Organics. Background water quality testing in Deep and Long Lakes for lead, zinc, and ammonia showed the potential for elevated levels of ammonia to be present in the water column during the dredging process. Compliance with state water quality standards may require that dredging operations be conducted during cold-weather months to alleviate this potential.

(d) Pathogens. There is no reason to believe any pathogens exist in any of the proposed areas of construction.

(e) Aesthetics. Construction activities will have a short-term impact on the aesthetic quality of Deep and Long Lakes and Flat Lake, especially during dredging operations. Water within these units will appear more turbid than that prior to construction. Access to these units by the public will be limited but some areas may be visible at a distance.

(f) Water Temperature. No short-term changes in water temperature are expected to occur within the complex. In the long-term, average spring-time temperatures in Deep and Long Lakes are expected to lower somewhat due to the increased depth after dredging.

(3) Effects on Biota

(a) Primary Production, Photosynthesis. Minor short-term impacts to primary production and photosynthetic processes are expected to occur at the construction sites involving the placement of fill materials into open water. The impacts associated with dredging operations in Deep and Long Lakes and disposal into Flat Lake should be much more pronounced, but also of short-term. In the long-term, primary production and photosynthesis will be enhanced because of the more stable and deeper water conditions resulting from the project.

(b) Suspension/Filter Feeders. A short-term impact on filter feeders is expected to be minor. In the long-term, turbidity levels should be reduced in the interior wetlands, leading to an overall increased productivity.

(c) Sight Feeders. Impacts to sight-feeders that are associated with placement of fill materials into open water are expected to be short-term and minor. Such impacts associated with dredging activities in Deep and Long Lakes and Flat Lake are expected to be more pronounced because turbidity levels will remain high for the duration of the work. In the long term, water clarity will be enhanced in Deep and Long Lake.

(4) Actions taken to Minimize Impacts. Actions appropriate for minimizing impacts associated with suspended particulates and turbidity include those specified in the preceding section on minimizing impacts to water circulation and fluctuation [paragraph b.(5)].

d. Contaminant Determinations. Background water quality sampling of Deep and Long Lakes, the site of hydraulic dredging, was conducted and contaminant analyses focused on lead, zinc, and ammonia. Results showed that levels of lead and zinc in the water column were within state water quality standards. The testing also showed that levels of ammonia may exceed state water quality standards during dredging operations if water temperatures are too warm; daily water quality monitoring during dredging will assess the level of ammonia, and if unacceptable levels are found, then dredging will need to be confined to cold-weather months.

The potential for the dredging operation to give rise to waterfowl poisoning because of the accumulation of lead shot in Stump Lake sediments was examined. Our findings indicate that a lead problem will not arise. The ingestion of lead shot during the feeding process can be lethal to waterfowl. The IDOC site manager at Stump Lake says that historically there has been very little hunting of waterfowl on Deep and Long Lakes. He also believes that the pattern of shooting on Upper and Lower Stump Lakes, Fowler Lake, and Flat Lake has lead to an accumulation of spent lead shot within or toward the center of these units; in other words, shooting has generally been directed away from Long and Deep Lakes. Based on this, on would expect relatively little lead shot in the bottom of Deep and Long Lakes. However, the St. Louis District has not sampled the bottom of the various management units to determine this.

During the hydraulic dredging of Deep and Long Lakes, sediment, including any lead shot, will spill out of the discharge pipe along with much water and be deposited into Flat Lake (a contained area). Being relatively heavy, the lead shot will fall out quickly and stay near the end of the discharge pipe. The dredging operation will require occasional repositioning of the end of the discharge pipe so that the sediment will be as spread out as possible across Flat Lake. As a result, we believe lead shot in Deep and Long Lake sediments will not become uniformly distributed across Flat Lake, but that lead shot will remain concentrated around the sites where the end of the discharge pipe was located. In fact, the sediment from Deep and Long Lakes will probably act as a "clean" cap covering the existing Flat Lake sediments which would have higher concentrations of lead shot.

The District has contacted waterfowl biologists of the Illinois Natural History Survey (INHS) about the potential for lead poisoning of waterfowl which eat plants grown on sediments containing lead pellets. There apparently is no danger; studies have shown that the concentrations of lead in plant tissues (stems, leaves, seeds) are not high enough to become toxic to waterfowl, i.e. the plants do not bioaccumulate lead.

e. Aquatic Ecosystem and Organism Determinations.

(1) Effects on Plankton. Increased suspended sediments and turbidity levels within Deep and Long Lakes and Flat Lake associated with dredging operations will adversely impact phytoplankton production. This impact will be short-term and last for the duration of dredging operations.

(2) Effects on Benthos. Benthic organisms in the immediate vicinity of open-water sites designated for the placement of stone materials probably will be buried. Recolonization of stone structures is expected to occur rapidly. In the long term, new rocky substrates should provide for different benthic assemblages and possibly increase the diversity of the local benthic fauna. Short-term loss of benthos will also occur as a result of dredging operations. Reduction of the sedimentation rate in the complex should benefit benthic organisms in the long-term by providing for more stable habitats.

(3) Effects on Nekton. The term "nekton" refers basically to larger, free-swimming aquatic organisms, such as fishes. In Deep and Long Lakes, elevated turbidity levels and suspended sediments occurring during dredging operations are expected to adversely impact the foodchain and impair sight-feeding fish in the short-term. In the long-term, fish populations in Deep and Long Lakes would benefit from the improved spawning, rearing, feeding, and wintering conditions afforded by the project. The disposal of dredged material into Flat Lake will result in the loss of fish unable to escape during dewatering. Fisheries habitat quality in Flat Lake is low to fair because water is shallow and seasonal. The management unit is drawn down for moist soil management in late June and refilled by October. Fish habitat in Flat Lake is expected to return soon after project completion.

(4) Effects on Aquatic Food Web. Some loss or disruption to the aquatic food web would result from construction of structures requiring the placement of stone materials into open water. However, following construction, recovery and replacement is expected. Placement of stone would benefit some benthic species important in the food chain. Adverse impacts associated with dredging operations will be more pronounced, but also are expected to be short-term. Overall, the long-term impacts are expected to be beneficial.

(5) Effects on Special Aquatic Sites.

(a) Sanctuaries and Refuges. The project area is managed by the Illinois Department of Conservation as a waterfowl rest area. The project is expected to benefit migrating and resident waterfowl, fisheries, and other wetland wildlife.

(b) Wetlands. The project area consists of 2,657 acres, 2,412 acres of which are wetland subject to Section 404 of the Clean Water Act. The project will result in the loss of about 21 acres of wetland (20.5 acres forested, and 0.5 acre nonforested) to construction of the riverside and interior levees. Also, 32 acres of forested wetland will be used for borrow, and changed to nonforested wetland (these borrow areas will be connected by ditches to the waterfowl management units). Beyond the vegetation clearing required for the activities mentioned above, 10 additional acres of forested wetland will have been cleared within the right-of-way for construction activities; these 10 acres will be planted with mast-producing trees. Flat Lake (171 acres) will be used as the disposal site for hydraulically dredged material from Deep and Long Lakes. The disposal operation will raise the bottom of Flat Lake about 1.5 feet. This unit will continue to be managed for waterfowl in the same manner as it is now. A portable pump will be used as a lift station during recharge periods to augment the shallow water depth obtained by gravity flow from Long to Flat Lake.

Most producing trees (such as the oaks) located in forested wetland are not regenerating at Stump Lake Complex, according to the Illinois Department of Conservation site manager. The lack of regeneration is attributed to hydrological conditions that are too wet for successful regeneration. The riverside dike/levee will prevent frequent low-level flooding of forested wetland. Regeneration of mast species (such as pin oak) is expected to occur with the project.

Appendix DPR-N describes an assessment of the proposed project's effect on wetland habitat at Stump Lake Complex using the Habitat Evaluation System (HES) methodology. The assessment indicates that wetland habitat will benefit more over the next 50 years from the proposed project than without any project.

(c) Mud Flats. When dewatered, the waterfowl management units consist of exposed mud flats and some standing water. One of these units, Flat Lake, will be used as a disposal site for hydraulically dredged sediment from Deep and Long Lakes. After the project is completed, Flat Lake will continue to be managed as it is now for waterfowl, including annual dewatering and exposure of the substrate.

(d) Vegetated Shallows. The management units often support rooted submergent aquatic vegetation during prolonged periods of stable water conditions (flooding from the river often harms this vegetation). In the long-term, the project should benefit the establishment and maintenance of this type of habitat due to the effects of the riverside levee. Flat Lake, the disposal site of hydraulically dredged sediment, is usually dewatered annually for the production of artificially planted waterfowl foods. Any natural submerged vegetation in Flat Lake will be lost to disposal activities. After construction, renewed water management practices will allow for the natural reestablishment of submerged vegetation.

(e) Coral Reefs. None are in the project area.

(f) Riffle and Pool Complexes. The project will not impact riffle and pool complexes.

(6) Threatened and Endangered Species. No Federally threatened or endangered species or their critical habitat will be adversely affected by this project. Construction timing requirements will be implemented to avoid adverse impacts to the bald eagle and Indiana bat. If bald eagle day use of Stump lake Complex is more than sporadic and infrequent one week prior to or during construction activities, such construction activities will cease and formal consultation with the U.S. Wildlife Service (USFWS) will be initiated. For the Indiana bat, if for any reason tree felling activities have to occur during the period May 1 - August 31, then a site visit will be conducted by a team of biologists from the District, USFWS, and Illinois Department of Conservation prior to such felling to determine if any roost trees are among those proposed to be felled. If felling of a roost tree during this period is proposed, then the District will enter into formal consultation with the USFWS.

(7) Other Wildlife. Forested wildlife habitat - 101 acres - will be cleared for construction right-of-way. Vegetation clearing and other construction activities will destroy some wildlife, whereas other wildlife in the immediate vicinity will be displaced to adjacent areas. In the long term, wildlife associated with the complex (particularly waterfowl) are expected to benefit due to the rehabilitation of the project site and its increased lifespan.

(8) Actions to Minimize Impacts. Actions appropriate for minimizing impacts associated with the aquatic ecosystem and organisms include those specified in the section on minimizing impacts to water circulation and fluctuation [paragraph b.(5)]. Contractors will be required to submit an

environmental protection plan to include protection methods and procedures for avoiding landscape defacement, providing for water and air pollution prevention, for disposal of solid and chemical waste, and for protecting fish and wildlife resources. In addition, the contractor shall be required to conduct a training course emphasizing environmental protection. Government inspectors will oversee construction projects to ensure that personnel, equipment, and construction techniques meet all contract specifications, including environmental requirements.

f. Proposed Disposal Site Determinations

(1) Mixing Zone Determination. A mixing zone is not needed because there will be no return water to the Illinois River.

(2) Determination of Compliance with Applicable Water Quality Standards. The project will comply with applicable water quality standards.

(3) Potential Effects on Human Use Characteristics

(a) Municipal and Private Water Supply. No municipal water supply will be adversely impacted by project construction.

(b) Recreational and Commercial Fisheries. Fishing in Deep and Long Lakes should improve as a result of the project.

(c) Water Related Recreation. Water-related recreation (hunting, boating, fishing, etc.) is not expected to be adversely impacted by the project in the long-term. Certain facilities or opportunities may be closed or unavailable during the construction period.

(d) Aesthetics. The construction site will not be highly visible to the public. Construction activities will not be visible except by those individuals directly accessing the site by land or by those on the river.

(e) Parks, National and Historical Monuments, National Seashores, Wilderness Areas, Research Sites, and Similar Preserves. The project will not impact any of these resources.

g. Determination of Cumulative Effects on the Aquatic Ecosystem. The Environmental Management Program should have a positive impact on the Upper Mississippi River System. No other work in the aquatic environment is proposed for Stump Lake Complex.

h. Determination of Secondary Effects on the Aquatic Ecosystem. There are no known significant secondary impacts to the aquatic ecosystem that will be caused by the project.

IV. FINDINGS OF COMPLIANCE OF THE RESTRICTIONS ON DISCHARGE

In our evaluation of discharges proposed in connection with the Stump Lake Complex Rehabilitation Project, the Environmental Protection Agency's Section 404(b)(1) Guidelines of 24 December 1980 were applied without significant adaptation. Testing procedures outlined in subpart G of the guidelines were performed, since the proposal will involve dredging of sediment from Deep and Long Lakes. Upon review of test results, it is believed that the potential for release of any contaminants to the aquatic environment will be minimal.

The habitat rehabilitation project will not jeopardize the existence of Federally listed endangered or threatened species or their critical habitat.

The proposed project will not result in significant adverse effects on human health and welfare, including municipal and private water supplies, recreation and commercial fishing, plankton, fish, shellfish, wildlife, and special aquatic sites. The life stages of aquatic life and other wildlife would not be adversely affected in a significant manner. Significant adverse effects on aquatic ecosystem diversity, productivity and stability, and recreational, aesthetic and economic values would not occur.

It is expected that river fishes and other wetland species will benefit from the proposed activities. The fish spawning and nursery function of Deep and Long Lakes will be improved and will increase the overall productivity of this reach of the Illinois River. The quality of habitat for migratory waterfowl and other wetland wildlife species is also expected to increase.

All appropriate and practicable measures have been taken through application of procedures contained in Subpart H of the Guidelines to insure minimal adverse effects of the proposed discharges.

On the basis of the guidelines, the proposed rehabilitation work is specified as complying with the requirements of these guidelines with the inclusion of appropriate and practical conditions to minimize pollution or adverse effects to the affected aquatic ecosystem.

20 AUG 91
Date

James D. Craig
James D. Craig
Colonel, Corps of Engineers
District Engineer

APPENDIX DPR-K

PERFORMANCE EVALUATION -
PHYSICAL, CHEMICAL SAMPLING LOCATIONS

FOREWORD

APPENDIX DPR-K provides the proposed ranges for post-project sedimentation monitoring and the proposed locations for limited water quality testing (i.e., water temperature, dissolved oxygen, Secchi disk).

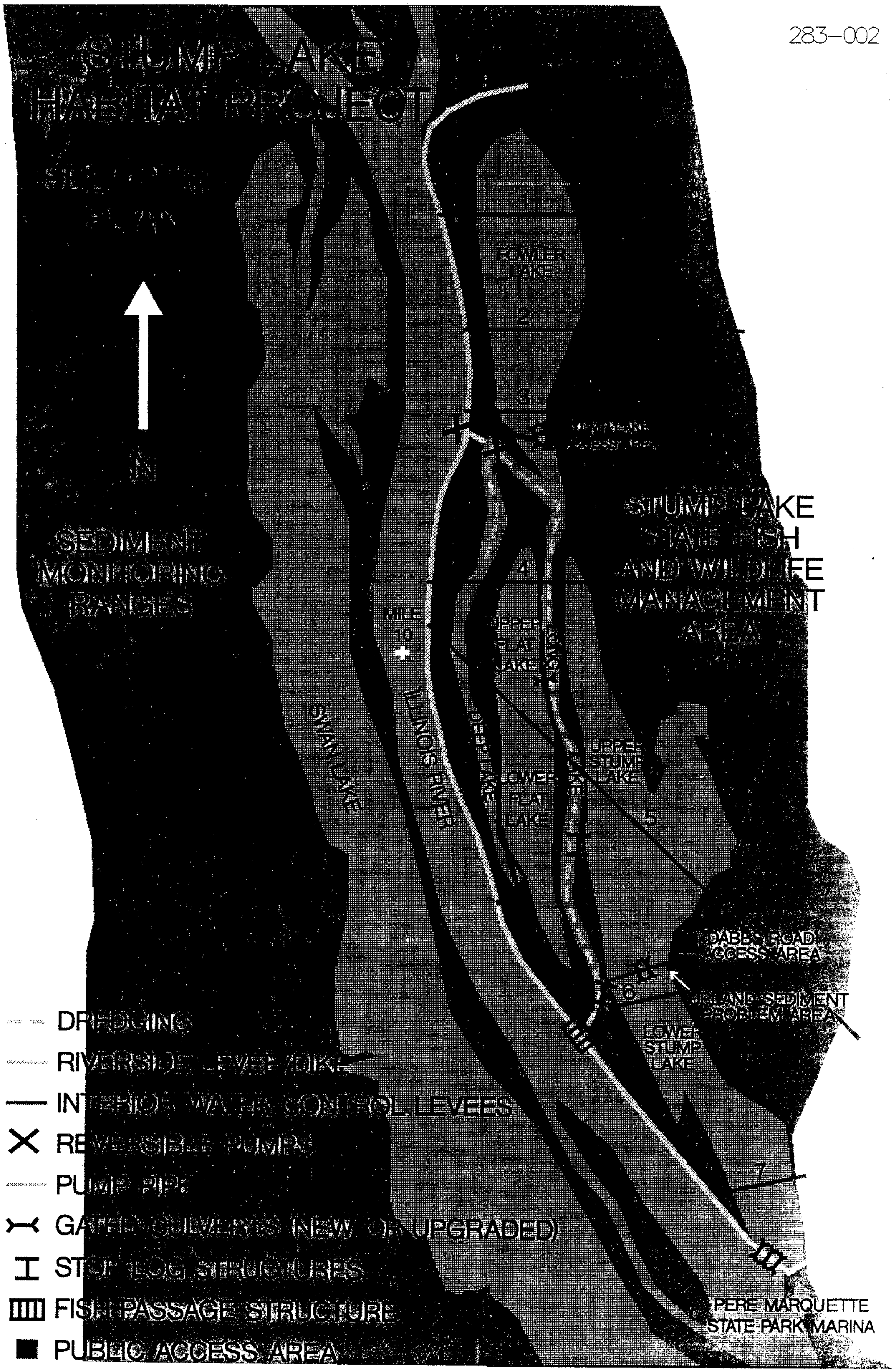

283-002
STUMP LAKE HABITAT PROJECT
N
SEDIMENT MONITORING RANGES
1
FOWLER LAKE
2
3
STUMP LAKE STATE FISH AND WILDLIFE MANAGEMENT AREA
4
MILE 10
UPPER FLAT LAKE
SWAN LAKE
ILLINOIS RIVER
DEEP LAKE
LOWER FLAT LAKE
UPPER STUMP LAKE
5
DABBS ROAD ACCESS AREA
6
UPLAND SEDIMENT PROBLEM AREA
LOWER STUMP LAKE
7
PERE MARQUETTE STATE PARK MARINA
DREDGING
RIVERSIDE LEVEE/DIKE
INTERIOR WATER CONTROL LEVEES
REVERSIBLE PUMPS
PUMP PIPE
GATED CULVERTS (NEW OR UPGRADED)
STOP LOG STRUCTURES
FISH PASSAGE STRUCTURE
PUBLIC ACCESS AREA

FIGURE K-1

283–003

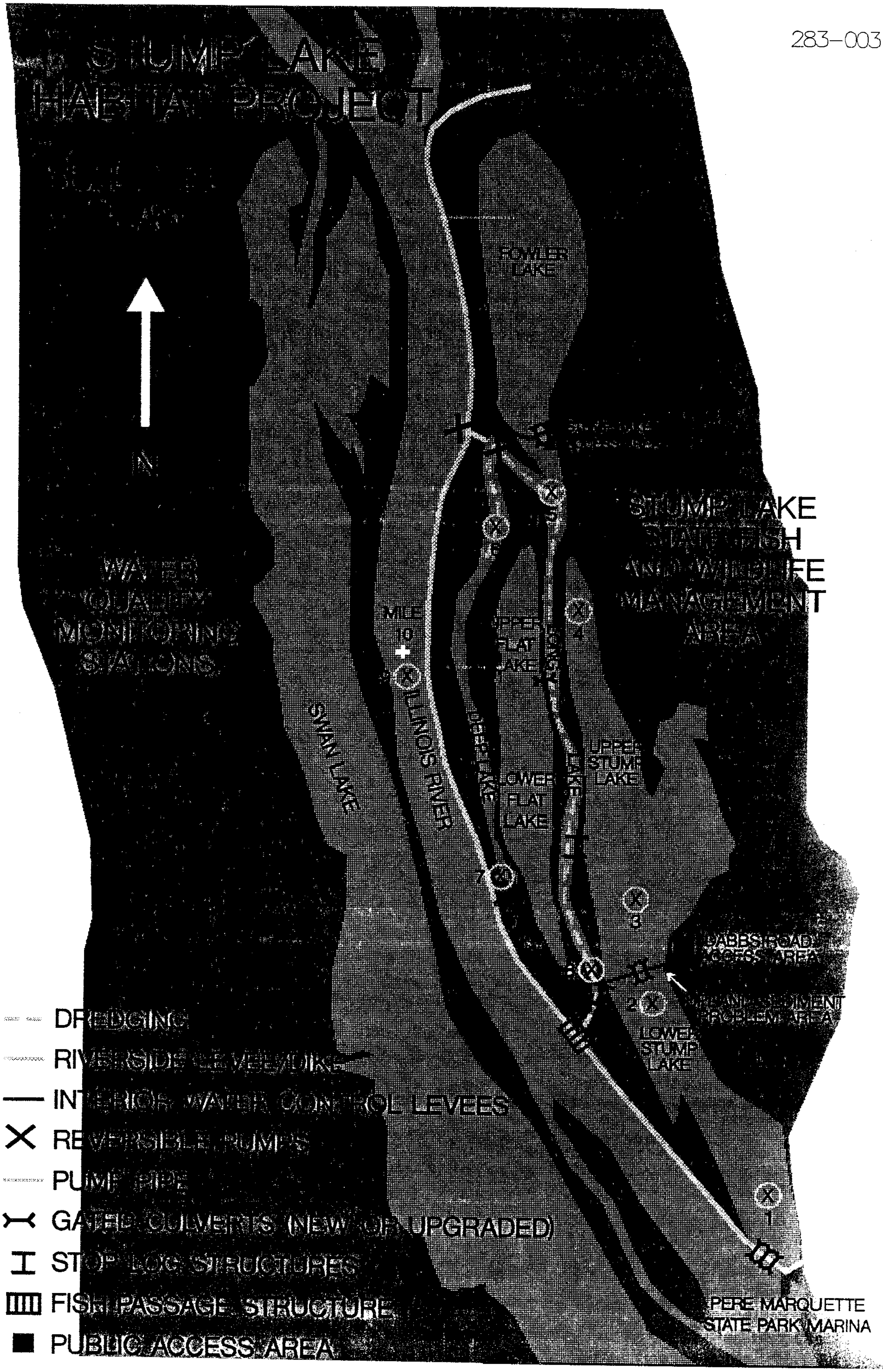


FIGURE K-2

APPENDIX DPR-L

DETAILED COST ESTIMATE OF
STUMP LAKE COMPLEX EMP-HREP

FOREWORD

APPENDIX DPR-L provides a detailed project cost estimate for the Stump Lake Complex EMP-HREP.

Baseline Cost Estimate

STUMP LAKE

S U M M A R Y

24 July 1991

Cost Account No.	Description of Item		Estimated Cost
01.-.-.-	LANDS AND DAMAGES	$	12,000
06.-.-.-	FISH AND WILDLIFE FACILITIES		441,000
08.-.-.-	ROADS, RAILROADS AND BRIDGES		22,500
11.-.-.-	LEVEES AND FLOODWALLS		1,210,000
12.-.-.-	DREDGING		600,000
13.-.-.-	PUMPING PLANT		416,000
	SUBTOTAL	$	2,701,500
30.-.-.-	PLANNING, ENGINEERING AND DESIGN		930,800
31.-.-.-	CONSTRUCTION MANAGEMENT		387,000
	TOTAL PROJECT COST	**$**	**4,019,300**

Jack R. Niemi

Jack R. Niemi PE
Chairman, Project Review Board

Sharon R. Cotner

Sharon R. Cotner
Project Manager

Dawayne E. Sanders

FOR John W. Dierker
Chief Cost Engineering Branch.

SECTION I-BASIS OF ESTIMATE
STUMP LAKE

1-01. GENERAL.

This cost estimate has been developed using previous cost estimates, current designs and quantity take-offs, recent bid abstracts for projects in the area, detailed cost estimates and estimators judgment. The M-CACES program was used to prepare the baseline cost estimate and then item totals were carried over to a super calc. spreadsheet program to summarize the baseline cost estimate. An appropriate contingency was applied to each line item of cost. The Price Level for this estimate is October 1990.

1-02. DISCUSSION OF RELIABILITY OF DESIGNS, QUANTITIES, AND UNIT PRICES.

a. Fish and wildlife Facilities. This item received a higher contingency to account for uncertainties, such as soil conditions, and river stage elevations during construction. The cost of dewatering also adds additional uncertainty mainly because there is no detailed dewatering plan available at this stage of the project.

b. Channels and Canals. The most critical item is the channel excavation. This will be a hydraulic excavation using a small dredge to excavate Long Lake and the upper 2400 ft of Deep Lake. The assumed maximum length of discharge is 1500 ft. so a booster pump is not considered in our unit price per cubic yd. The existing high ground and interior dikes will be used to contain the dredged material. 24-inch drainage pipes and rough grading of disposal is also assumed in the unit price of $ 3.00 per cubic yard. Flat Lake will be used for disposal.

c. Levees and Floodwalls. There are two items that warrant discussion in this area:

(1). Levee Embankment. Even though a preliminary design has been accomplished for this item, it is the type of feature that is subject to numerous changes in the future stages of the project development. The wetness of the material and the difficulty in moving this material is one problem we feel would affect the cost. The haul distance based on preliminary plans averages 400-ft. We have based our unit price on the assumption that the construction season will be reasonably dry. If this assumption is incorrect then we would expect a significant increase to the construction item for this work. We have assigned the contingency of 15%, based on the above assumption

(2). Hydraulic Operators. The type of Hydraulic Operators have not been defined at this point and the price range is widely variable on this item. This uncertainty made us decide to assign the highest contingency in this project of 50% to this item.

d. Pumping Plant. In order to insure proper elevation in the environmental pool during low season, the

pump must be used for 15-20 days in the year. Pump type and size has been discussed and price quotation was received on the desired pump; however, the price can fluctuate until the time of construction. We, therefore are using a 30% contingency on this major item.

1-03. DISCUSSION OF VARIABLE CONTINGENCIES.

The cost estimate on this project includes contingencies ranging in value from 10% to 50%. Assigned contingencies are based on the inherent difficulties in visualizing and quantifying certain types of work; such as dewatering, structural steel, embankment, etc. 50% contingency was assigned to the Hydraulic operator, since neither model or type of operator is determined at present stage of planning. Generally, a contingency of 20% was utilized for this project which was felt to be reasonable at this stage of the design.

Our Construction division has assumed that the construction contract plans and specifications have had sufficient time to have been thoroughly reviewed, and contain minimum of issues that have the potential to develop into claims. Based on this premise, all costs for CLAIMS AND LITIGATIONS are regarded as **contingency costs only.**

DATE: 24 July 1991
PREPAIRED BY: S.DOMBI
& J.DIERKER
REVIEWED BY: J.DIERKER

Baseline Cost Estimate
STUMP LAKE

P.L. October 1990

Cost Acct. No.	Description	Quantity	Unit	Unit Price	Estimated Cost w/o Contingencies	% Cont	Contingency	Total Estimated Cost	PRICE LEVEL (October 1990 = 1
01.-.-.-	LANDS AND DAMAGES								
01.B.-.-	POST-AUTHORIZATION PLANNING				0				
01.B.8.-	All Other				10,000	20	2,000	12,000	12,000
	SUBTOTAL..				10,000				
01.0.Z.-	CONTINGENCIES..						2,000		
	TOTAL (LANDS AND DAMAGES)..							12,000	12,000
	ROUNDED TOTAL (LANDS AND DAMAGES)..								12,000
06.-.-.-	FISH AND WILDLIFE FACILITIES								
	Fish passage (71+27) (Alternative to 6-42" CMP) (Site F)								
06.2.A.-	Mobilization/Demob.	SUM	JOB		49,000	10	4,900	53,900	53,900
06.2.B.-	Dewatering	SUM	JOB		56,250	35	19,688	75,938	75,938
06.4.C.-	Fish Passage Str.	42	CY.	200.00	8,400	30	2,520	10,920	10,920
06.4.C.-	Sluice Gate(42")	4	Ea.	15,000.00	60,000	20	12,000	72,000	72,000
06.4.C.-	Bedding Stone, 3" minus	730	TON	22.00	16,060	20	3,212	19,272	19,272
06.4.C.-	Excavation	1,060	CY.	1.50	1,590	20	318	1,908	1,908
06.4.C.-	Embankment	500	CY.	2.50	1,250	20	250	1,500	1,500
06.4.C.-	Geotextile	400	SY.	4.00	1,600	20	320	1,920	1,920
06.4.C.-	Riprap	10	TON	15.00	150	20	30	180	180
06.4.C.-	Cofferdam Earth	590	CY.	2.50	1,475	15	221	1,696	1,696
06.4.C.-	Guardrail	56	L.Ft.	22.00	1,232	20	246	1,478	1,478
06.4.C.-	"B" Stone	120	TON.	12.00	1,440	20	288	1,728	1,728
06.4.C.-	Seeding	.20	ACRE	1,200.00	240	20	48	288	288
06.4.C.-	Clearing	.50	ACRE	1,800.00	900	20	180	1,080	1,080
06.4.C.-	Geogrid	400	SY.	10.00	4,000	20	800	4,800	4,800
	Boat Passage Structures (2)								
06.2.B.-	Dewatering (2)	SUM	JOB		112,500	35	39,375	151,875	151,875
06.4.C.-	Concrete Reinforced	42	CY.	150.00	6,300	30	1,890	8,190	8,190
06.4.C.-	Bedding Stone, 3" minus	540	TON	22.00	11,880	20	2,376	14,256	14,256
06.4.C.-	Excavation	1,400	CY.	1.50	2,100	20	420	2,520	2,520
06.4.C.-	Clearing	.80	ACRE	1,800.00	1,440	20	288	1,728	1,728
06.4.C.-	Seeding	.40	ACRE	1,200.00	480	20	96	576	576
06.4.C.-	Riprap 12"	20	TON	15.00	300	20	60	360	360
06.4.C.-	Embankment	400	CY.	2.50	1,000	20	200	1,200	1,200
06.4.C.-	Riprap	20	TON	15.00	300	20	60	360	360
06.3.L.-	Gantry Crane w/chain h.	2	Ea.	780.00	1,560	20	312	1,872	1,872
06.4.C.-	Geogrid	750	SY.	10.00	7,500	20	1,500	9,000	9,000
	SUBTOTAL..				348,947				
06.0.Z.-	CONTINGENCIES..						91,598		
	TOTAL (FISH AND WILDLIFE FACILITIES)..							440,545	440,545
	ROUNDED TOTAL (FISH AND WILDLIFE FACILITIES)...								441,000

 Continued on next sheet

Cost Acct. No.	Description	Quantity	Unit	Unit Price	Estimated Cost w/o Contingencies	% Cont	Contingency	Total Estimated Cost	PRICE LEVEL (October 1990 = 1
08.2.-.-	ROADS, RAILROADS AND BRIDGES								
08.2.A.-	Mobilization/Demob.	SUM	JOB		882	10	88	970	970
08.2.2.B	24" C.M.P.	100	LF.	25.00	2,500	20	500	3,000	3,000
08.2.2.B	24" End Sections	2	EA.	180.00	360	20	72	432	432
08.2.2.B	Crushed Stone	350	TON	12.00	4,200	20	840	5,040	5,040
08.2.2.B	Clearing and Grubbing	.50	ACRE	1,800.00	900	20	180	1,080	1,080
08.2.2.B	Quarry-run Stone(6"minus)	300	TON	15.00	4,500	20	900	5,400	5,400
08.2.2.B	Earth Fill (Semi-Comp.)	1,380	CY.	4.00	5,520	20	1,104	6,624	6,624
	SUBTOTAL..				18,862				
08.0.Z.-	CONTINGENCIES..						3,684		
	TOTAL (ROADS, RAILROADS AND BRIDGES)..							22,546	22,546
	ROUNDED TOTAL (ROADS, RAILROADS AND BRIDGES)..								22,500
11.-.-.-	LEVEES AND FLOODWALLS								
11.0.1.-	LEVEE EMBANKMENT								
11.0.A.-	Mobilization/demob.	SUM	JOB		72,000	10	7,200	79,200	79,200
11.0.1.B	Interior levee Emb. #1	1,928	CY.	2.50	4,820	15	723	5,543	5,543
11.0.1.B	Clearing	2.70	ACRE	1,800.00	4,860	20	972	5,832	5,832
11.0.1.B	Seeding	1.30	ACRE	1,200.00	1,560	20	312	1,872	1,872
11.0.1.B	Interior levee Emb. #2	7,189	CY.	2.50	17,973	15	2,696	20,668	20,668
11.0.1.B	Clearing	8.20	ACRE	1,800.00	14,760	20	2,952	17,712	17,712
11.0.1.B	Seeding	3.20	ACRE	1,200.00	3,840	20	768	4,608	4,608
11.0.1.B	Interior levee Emb. #3	2,450	CY.	2.50	6,125	15	919	7,044	7,044
11.0.1.B	Clearing	2.90	ACRE	1,800.00	5,220	20	1,044	6,264	6,264
11.0.1.B	Seeding	1.20	ACRE	1,200.00	1,440	20	288	1,728	1,728
11.0.1.B	Interior levee Emb. #4	226	CY.	2.50	565	15	85	650	650
11.0.1.B	Clearing	.50	ACRE	1,800.00	900	20	180	1,080	1,080
11.0.1.B	Seeding	.20	ACRE	1,200.00	240	20	48	288	288
11.0.1.B	Interior levee Emb. #5	552	CY.	2.50	1,380	15	207	1,587	1,587
11.0.1.B	Clearing	.70	ACRE	1,800.00	1,260	20	252	1,512	1,512
11.0.1.B	Seeding	.30	ACRE	1,200.00	360	20	72	432	432
11.0.1.B	Interior levee Emb. #6	1,070	CY.	2.50	2,675	15	401	3,076	3,076
11.0.1.B	Clearing	2.20	ACRE	1,800.00	3,960	20	792	4,752	4,752
11.0.1.B	Seeding	.80	ACRE	1,200.00	960	20	192	1,152	1,152
11.0.1.B	Interior levee Emb. #7	2,170	CY.	2.50	5,425	15	814	6,239	6,239
11.0.1.B	Clearing	2.40	ACRE	1,800.00	4,320	20	864	5,184	5,184
11.0.1.B	Seeding	.90	ACRE	1,200.00	1,080	20	216	1,296	1,296
11.0.1.B	Exterior levee @ PGL 427	125,500	CY.	2.50	313,750	15	47,063	360,813	360,813
11.0.1.B	Clearing	79	ACRE	1,800.00	142,200	20	28,440	170,640	170,640
11.0.1.B	Seeding	41	ACRE	1,200.00	49,200	20	9,840	59,040	59,040
11.0.1.B	Graded Stone "C"	2,100	TON	10.00	21,000	15	3,150	24,150	24,150
11.0.1.B	Quarry-run Stone(6"minus)	1,900	TON	15.00	28,500	15	4,275	32,775	32,775
	Gravity Drainage Structure (Sites A,C,E)								
11.0.G.B	Excavation	1,291	CY	1.50	1,937	20	387	2,324	2,324
11.0.G.B	Plastic Liner	1,170	SY	13.50	15,795	20	3,159	18,954	18,954
11.0.G.B	Geogrid	680	SY	10.00	6,800	20	1,360	8,160	8,160
11.0.G.B	Cofferdam Graded Stone"C"	1,565	TON	16.00	25,040	20	5,008	30,048	30,048
11.0.G.B	"C" Stone	760	TON	11.00	8,360	20	1,672	10,032	10,032
11.0.G.B	"B" Stone	798	TON	12.00	9,576	20	1,915	11,491	11,491
11.0.G.B	6"minus Bedding	430	TON	15.00	6,450	20	1,290	7,740	7,740
11.0.G.B	3"minus Bedding	1,030	TON	15.00	15,450	20	3,090	18,540	18,540
11.0.G.B	42" diameter CMP	212	LF	65.00	13,780	15	2,067	15,847	15,847
11.0.G.B	Geotextile	340	SY	4.00	1,360	20	272	1,632	1,632

Continued on next sheet

Cost Acct. No.	Description	Quantity	Unit	Unit Price	Estimated Cost w/o Contingencies	% Cont	Contingency	Total Estimated Cost	PRICE LEVEL (October 1990 = 1
	LEVEES AND FLOODWALLS CONT'D								
	Gravity Drainage Structures (Sites A,C,E)								
11.0.G.B	72" diameter riser structure (including sluice gates & appurtenances	6	EACH	23,000.00	138,000	25	34,500	172,500	172,500
11.0.G.B	Hydraulic operator	1	EACH	10,000.00	10,000	50	5,000	15,000	15,000
11.0.G.B	Gaging Station	1	EA	13,000.00	13,000	20	2,600	15,600	15,600
11.0.R.B	Concrete pad	5.40	CY.	127.36	688	20	138	825	825
11.0.R.B	Removal of 2-36"CMP	SUM	JOB		3,000	25	750	3,750	3,750
11.0.R.B	Removal of Existing Str.	SUM	JOB		37,160	25	9,290	46,450	46,450
	CULVERT EXT.Sta.292+60								
11.0.R.B	24" CMP Culvert	46	LF	25.00	1,150	25	288	1,438	1,438
11.0.R.B	24"CMP End Section	1	EA	200.00	200	25	50	250	250
	SUBTOTAL..				1,018,118				
11.0.Z.-	CONTINGENCIES..						187,599		
	TOTAL (LEVEES AND FLOODWALLS)..							1,205,717	1,205,718
	RONDED TOTAL (LEVEES AND FLOODWALLS)..								1,210,000
12.-.-.-	DREDGING								
12.0.2.-	Excavation (Channel)	160,027	CY.	3.00	480,081	25	120,020	600,101	600,101
	SUBTOTAL..				480,081				
12.0.Z.-	CONTINGENCIES..						120,020		
	TOTAL (DREDGING)...							600,101	600,101
	ROUNDED TOTAL (DREDGING)..								600,000
13.-.-.-	PUMPING PLANT								
13.2.A.-	Mobilization/demob.	SUM	JOB		8,700	10	870	9,570	9,570
13.0.6.Q	Pump.(48000 GPM)	2	EACH	71,501.00	143,002	25	35,751	178,753	178,753
13.0.6.Q	Portable Pump.(5000 GPM)	1	EACH	27,950.00	27,950	30	8,385	36,335	36,335
13.0.6.Q	Pump driver(for 48000 GPM	1	EACH	27,692.00	27,692	30	8,308	36,000	36,000
13.0.B.Q	Mechanical								
13.0.B.Q	42" dia.steel pipe (3/8")	730	LF	100.00	73,000	20	14,600	87,600	87,600
13.0.B.Q	42" dia. flap gate	2	EACH	8,200.00	16,400	10	1,640	18,040	18,040
13.0.1.E	6'chain link fence w/ 3-strand barb wire	300	LF	20.00	6,000	15	900	6,900	6,900
13.0.1.E	Fence Gate (6' X 10')	2	EACH	150.00	300	15	45	345	345
13.0.1.E	Clearing	.70	ACRE	1,800.00	1,260	20	252	1,512	1,512
13.0.1.E	Seeding	.50	ACRE	1,200.00	600	20	120	720	720
13.0.D.B	Embankment	805	CY.	4.00	3,220	15	483	3,703	3,703
13.0.2.C	Concrete Curb	1.00	CY.	400.00	400	15	60	460	460
13.0.D.B	Riprap	480	TON	15.00	7,200	15	1,080	8,280	8,280
13.0.D.B	Excavation	705	CY.	2.00	1,410	20	282	1,692	1,692
13.0.D.B	Ditching	880	CY.	2.50	2,200	20	440	2,640	2,640
13.0.D.B	Cofferdam"C"stone & Remvl	1,200	TON	16.00	19,200	20	3,840	23,040	23,040
	SUBTOTAL..				338,534				
13.0.Z.-	CONTINGENCIES..						77,055		
	TOTAL (PUMPING PLANT)..							415,589	415,589
	ROUNDED TOTAL (PUMPING PLANT)..								416,000

3

Continued on next sheet

Cost Acct. No.	Description	Quantity	Unit	Unit Price	Estimated Cost w/o Contingencies	% Cont	Contingency	Total Estimated Cost	PRICE LEVEL (October 1990 = 1
30.-.-.-	PLANNING, ENGINEERING AND DESIGN				854,500		76,300	930,800	930,800
30.A.-.-	PLANNING (Preparation of DPR)				480,000	0	0	480,000	480,000
30.B.-.-	ENGINEERING AND DESIGN PRIOR TO OCTOBER 1990				0				
30.C.-.-	MEMORANDUM OF AGREEMENT				5,000	0	0	5,000	5,00[illegible]
30.D.-.-	ENVIRONMENTAL AND REGULATORY ACTIVITIES				10,000	0	0	10,000	10,0[illegible]
30.D.9.-	CULTURAL RESOURCE SURVEYS AND STUDIES				21,500	20	4,300	25,800	25,800
30.E.-.-	DESIGN RELATED ENGINEERING				0				
30.F.-.-	GENERAL DESIGN MEMORANDUM (GDM)				0				
30.G.-.-	FEATURE DESIGN MEMORANDUM (FDM)				0				
30.H.-.-	PLANS AND SPECIFICATIONS				250,000	20	50,000	300,000	300,000
30.J.-.-	ENGINEERING DURING CONSTRUCTION				20,000	50	10,000	30,000	30,000
30.M.-.-	COST ENGINEERING				20,000	20	4,000	24,000	24,000
30.N.-.-	CONSTRUCTION AND SUPPLY CONTRACT ACTIVITIES				20,000	20	4,000	24,000	24,000
30.P.-.-	PROJECT MANAGEMENT				20,000	20	4,000	24,000	24,000
30.Z.-.-	MISCELLANEOUS ACTIVITIES				8,000	0	0	8,000	8,000
31.-.-.-	CONSTRUCTION MANAGEMENT				320,500		66,500	387,000	387,000
31.A.-.-	CONSTRUCTION MANAGEMENT (S&I)				0				
31.B.-.-	CONTRACT ADMINISTRATION				48,000		0	48,000	48,000
31.B.Z.-	Contingencies				0	*	7,000	7,000	7,000
31.C.-.-	BENCH MARKS AND BASE LINES				6,000		1,000	7,000	7,000
31.D.-.-	REVIEW OF SHOP DRAWING				29,000		0	29,000	29,000
31.D.Z.-	Contingencies				0	*	6,000	6,000	6,000
31.E.-.-	INSPECTION AND QUALITY ASSURANCE				21,000		0	21,000	21,000
31.E.Z.-	Contingencies				0	*	4,000	4,000	4,000
31.F.-.-	PROJECT OFFICE OPERATIONS				212,000		0	212,000	212,000
31.F.Z.-	Contingencies				0		28,000	28,000	28,000
31.G.-.-	DAMAGES ASSESSED CONTRACTORS				0				
31.G.Z.-	Contingencies				0				
31.H.-.-	CONTRACTOR INITIATED CLAIMS AND LITIGATIONS								
31.H.Z.-	Contingencies				0	*	15,000	15,000	15,000
31.J.-.-	GOVERNMENT INITIATED CLAIMS AND LITIGATIONS				0				0
31.J.Z.-	Contingencies				0	*	5,000	5,000	5,000
31.P.-.-	PROJECT MANAGEMENT				4,500		0	4,500	4,500
31.P.Z.-	Contingencies				0		500	500	500

TOTAL CONTINGENCY COST.. $624,757

TOTAL PROJECT COST.. $4,019,300

* See Discussion Para 1-03

APPENDIX DPR-M

WETLAND FUNCTIONS AND VALUES ASSESSMENT

APPENDIX DPR-M provides the results of a wetlands functions and values assessment for the Stump Lake Complex. The methodology used for the assessment is the Wetland Evaluation Technique (WET),, version 2.0. The evaluation procedure for version 2.0 is outlined the following publication:

Adamus, P.R., Clairain, E.J., Smith, R.D., and Young, R.E. 1987. "Wetland Evaluation Technique (WET) - Volume II," Operational Draft TR Y-87-____, US Army Engineer Waterways Experiment Station, Vicksburg, MS.

A computer program written by R.D. Smith for use with version 2.0 of WET was used to produce the summary of evaluation results and answer datasets.

FORM A: SITE DOCUMENTATION (Page 1 of 2)

Part 1 - Background Information

Evaluation Site: Stump Lake Complex Date: 11 Dec 1990

Site Location (Section, Range, and Township): Sect. 17, 20, 21, 28, 29, 32, 33 T7N, R13W } 3rd P.M.
Brussels + Nutwood quads Sect. 4, 5, 8, 9 T6N, R13W

Has the evaluator taken a training course in WET Version 2.0? yes

Agencies/Experts Contacted:

Circle the assessment levels to be completed? SS-1 SS-2 E/O-1&2 E/O-3 HS

Is the wetland tidal or nontidal? If the wetland is nontidal, indicate the month(s) that represent wet, dry, and average conditions, or if only average annual condition will be used, give rationale. Also, indicate if the previous 12 months of precipitation has been above, below, or near normal.
nontidal Wet - Apr, May, Jun, Jul; Dry - Oct., Dec., Jan., Feb.; Ave. - Mar, Aug., Sep., Nov. previous 12 mos. - about average

Is this evaluation an estimate of past conditions or a prediction of future conditions? (If answer is yes, explain nature and source of predictive data.)
no - existing conditions

Will alternative ratings be used to evaluate any of the functions or values (if yes, explain)? yes - WHAG (Wildlife Habitat Evaluation Guidelines) and AHAG (Aquatic Habitat Assessment Guidelines)

Part 2 - Identification and Delineation of Evaluation Areas

Sketch a map on the following page, or attach a suitable map (photocopy of topgraphic map) that shows the following information:

-- Boundaries of the AA, IA, and IZ, and the location of service areas.
-- Watershed boundaries of AA, and service areas. (not entirely delineated - too large)
-- Extent of surface water in the AA during the wet and dry seasons. (no real difference on this map scale)
-- Open water (channels and pools) within and adjacent to the AA.
-- Normal direction of channel or tidal flow (parallel to channel)
-- Normal direction of wind-driven waves or current. (waves - wind usually from south to west, sometimes north)
-- Impact area(s).
-- Scale of distance and north compass direction.

Explain the procedures used to identify or delineate the AA, IA, IZ, service areas, and the watersheds of these areas if they differed from the guidelines outlined in Section 2.7. did not differ

-- Continued --

FORM A: SITE DOCUMENTATION (Page 2 of 2)

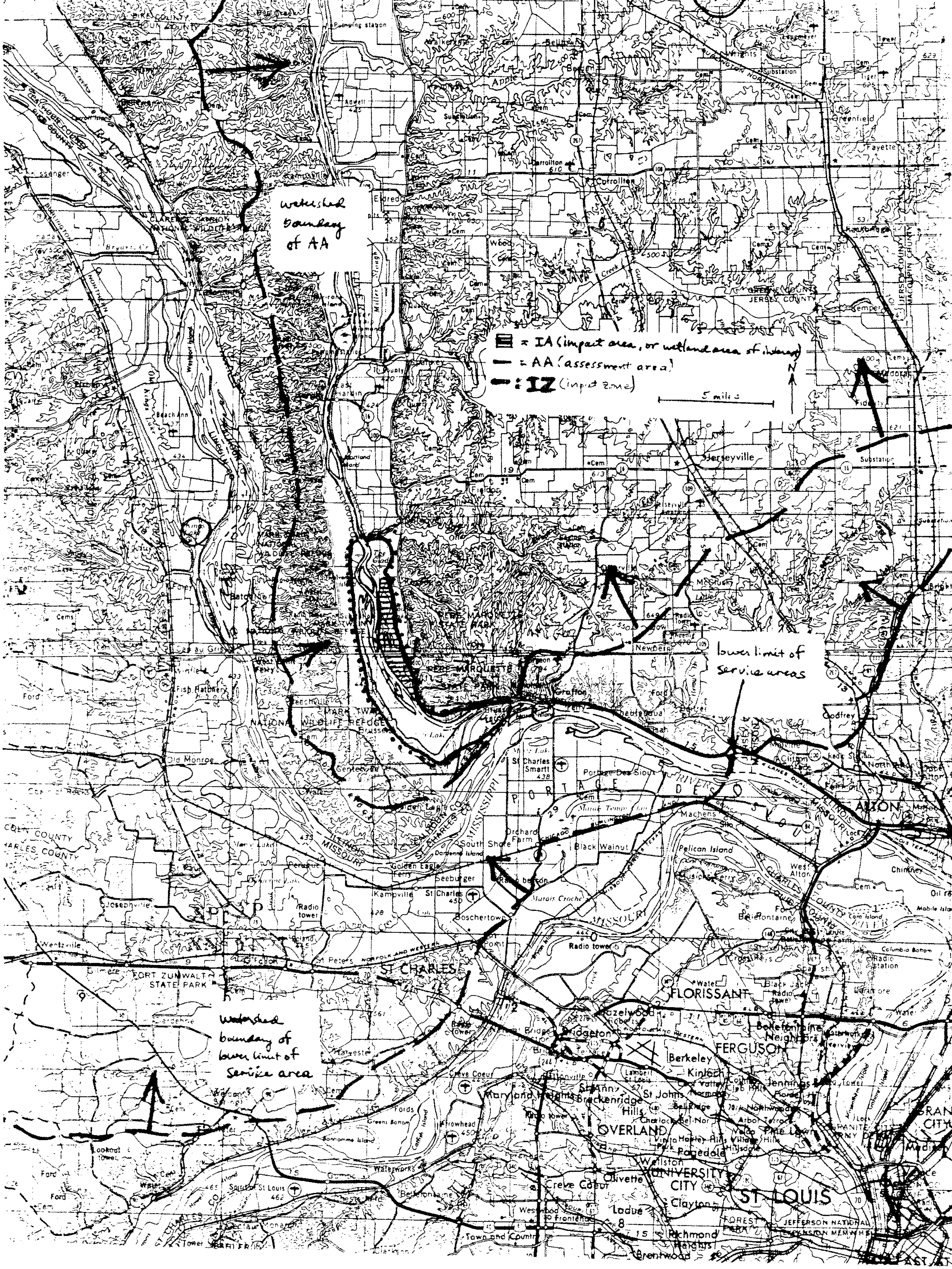
Part 2 (Cont.)

Estimate the extent of the following areas:

Assessment Area = ~15,000 acres
Impact Area = 2,657 acres (only if applicable)
Watershed of AA = ______ acres/>2500 miles^2 (acres x 0.0016 = miles)
Wetlands in AA = ~5,000 acres
Wetlands in the watershed of closest service area = ~65,000 acres
Wetlands and deepwater in the watershed of closest service area = ~97,000 acres

How were locality and region defined for this evaluation?
locality = Pool 26 (Alton pool) of Mississippi River
region = Illinois River floodplain

Sketch of Evaluation Areas (or attach map):


watershed boundary of AA
= IA (impact area, or wetland area of interest)
= AA (assessment area)
= IZ (input zone)
N
5 miles
lower limit of service areas
Watershed boundary of lower limit of Service area
Jerseyville
Grafton
PERE MARQUETTE STATE PARK
MARK TWAIN NATIONAL WILDLIFE REFUGE
Carrollton
Eldred
Greenfield
Fayette
Kemper
Fidelity
Godfrey
ALTON
West Alton
Portage Des Sioux
PORTAGE DES SIOUX
MISSISSIPPI
ILLINOIS
MISSOURI
Old Monroe
Winfield
Wentzville
ST CHARLES
FORT ZUMWALT STATE PARK
FLORISSANT
Hazelwood
Bridgeton
FERGUSON
Berkeley
Kinloch
Jennings
Maryland Heights
OVERLAND
UNIVERSITY CITY
Clayton
Creve Coeur
Olivette
Ladue
Richmond Heights
Brentwood
Town and Country
ST LOUIS
GRANITE CITY
Black Walnut
Pelican Island
Orchard Farm
Golden Eagle
Kampville
Boschertown
Josephville
Clarksville

****

Summary of Evaluation Results for "stumpia" Impact area (=Stump Lake ...

****

	Social Significance	Effectiveness	Opportunity
Ground Water Recharge	M	L	*
Ground Water Discharge	H	M	*
Floodflow Alteration	L	H	M
Sediment Stabilization	M	H	*
Sediment/Toxicant Retention	M	H	H
Nutrient Removal/Transformation	M	H	H
Production Export	*	M	*
Wildlife Diversity/Abundance	H	*	*
Wildlife D/A Breeding	*	H	*
Wildlife D/A Migration	*	H	*
Wildlife D/A Wintering	*	H	*
Aquatic Diversity/Abundance	M	M	*
Uniqueness/Heritage	H	*	*
Recreation	H	*	*

Note: "H" = High, "M" = Moderate, "L" = Low, "U" = Uncertain, and "*"'s identify conditions where functions and values are not evaluate

WET Answer Dataset for "stumpia"

s1 - y
s2 - y
s3 - n
s4 - n
s5 - n
s6 - y
s7 - n
s8 - y
s9 - n
s10 - n
s11 - n
s12 - n
s13 - n
s14 - n
s15 - y
s16 - n
s17 - n
s18 - n
s19 - n
s20 - n
s21 - y
s22 - y
s23 - n
s24 - n
s25 - y
s26 - n
s27 - y
s28 - y
s29 - n
s30 - y
s31 - y
1.1 - n
1.2 - n
1.3 - n
2.1.1 - n
2.1.2 - y
2.1.3 - y
2.2.1 - n
2.2.2 - y
3.1 - y
3.2 - y
3.3 - n
4.1 - y
4.2A - n
4.2B - n
4.2C - n
4.2D - y
5.1.1 - y
5.1.2 - n
5.2 - n
blank - u
6.1 - n
6.2 - y
7 - i
8.1 - n
8.2 - y
8.3 - n
8.4 - y
9.1 - y
9.2 - y
9.3 - n
10A - n
10B - y
10C - n
10D - n
10E - n
10F - n
11(x) - n
11(w) - n
11(d) - n
12A(x) - y
12A(w) - y
12A(d) - y
12Aa(x) - n
12Aa(w) - n
12Aa(d) - n
12Ab(x) - n
12Ab(w) - n
12Ab(d) - n
12Ac(x) - n
12Ac(w) - n
12Ac(d) - n
12Ad(x) - n
12Ad(w) - n
12Ad(d) - n
12Ae(x) - y
12Ae(w) - y
12Ae(d) - y
12B(x) - y
12B(w) - y
12B(d) - y
12Ba(x) - n
12Ba(w) - n
12Ba(d) - n
12Bb(x) - n
12Bb(w) - n
12Bb(d) - n
12Bc(x) - n
12Bc(w) - n
12Bc(d) - n
12Bd(x) - n
12Bd(w) - n
12Bd(d) - n
12Be(x) - y
12Be(w) - y
12Be(d) - y
12C(x) - n
12C(w) - n
12C(d) - n
12Ca(x) - n
12Ca(w) - n
12Ca(d) - n
12Cb(x) - n
12Cb(w) - n
12Cb(d) - n
12Cc(x) - n
12Cc(w) - n
12Cc(d) - n
12Cd(x) - n
12Cd(w) - n
12Cd(d) - n
12D(x) - y
12D(w) - y
12D(d) - y
12Da(x) - y
12Da(w) - y
12Da(d) - y
12Db(x) - n
12Db(w) - n
12Db(d) - n
12E(x) - n
12E(w) - n
12E(d) - n
13A(x) - y
13A(w) - y
13A(d) - y
13Aa(x) - n
13Aa(w) - n
13Aa(d) - n
13Ab(x) - n
13Ab(w) - n
13Ab(d) - n
13Ac(x) - n
13Ac(w) - n
13Ac(d) - n
13Ad(x) - n
13Ad(w) - n
13Ad(d) - n
13Ae(x) - y
13Ae(w) - y
13Ae(d) - y
13B(x) - y
13B(w) - y
13B(d) - y
13Ba(x) - n
13Ba(w) - n
13Ba(d) - n
13Bb(x) - n
13Bb(w) - n
13Bb(d) - n
13Bc(x) - n
13Bc(w) - n
13Bc(d) - n
13Bd(x) - n
13Bd(w) - n
13Bd(d) - n
13Be(x) - y
13Be(w) - y
13Be(d) - y
13C(x) - y
13C(w) - y
13C(d) - y
13Ca(x) - n
13Ca(w) - n
13Ca(d) - n
13Cb(x) - n
13Cb(w) - n
13Cb(d) - n
13Cc(x) - y
13Cc(w) - y
13Cc(d) - y
13Cd(x) - n
13Cd(w) - n
13Cd(d) - n
13D(x) - y
13D(w) - y
13D(d) - y
13Da(x) - y
13Da(w) - y
13Da(d) - y
13Db(x) - y
13Db(w) - y
13Db(d) - y
13E(x) - n
13E(w) - n
13E(d) - n
14.1(x) - n
14.1(w) - n
14.1(d) - n
14.2(x) - n
14.2(w) - n
14.2(d) - n
15.1A - y
15.1B - n
15.1C - n
15.2 - n
16A(x) - y
16A(w) - y

WET Answer Dataset for "stumpia"

16A(d) - y
16B(x) - n
16B(w) - n
16B(d) - n
16C(x) - n
16C(w) - n
16C(d) - n
17 - y
18 - n
19.1A - i
19.1B - n
19.2 - y
19.3 - y
20.1 - i
20.2 - i
21A - n
21B - n
21C - y
21D - n
21E - n
22.1.1 - y
22.1.2 - i
22.2 - y
22.3 - n
23 - y
24.1 - i
24.2 - y
24.3 - n
24.4 - n
24.5 - n
25.1 - y
25.2A - n
25.2B - y
25.3 - n
26.1 - y
26.2 - n
26.3 - y
27.1 - n
27.2 - i
27.3 - i
28 - n
29.1 - y
29.2 - y
30(x) - n
30(w) - n
30(d) - n
31.1(x) - y
31.1(w) - y
31.1(d) - y
31.2(x) - y
31.2(w) - y
31.2(d) - y
31.3(x) - n
31.3(w) - n
31.3(d) - n
31.4(x) - n
31.4(w) - n
31.4(d) - n
31.5(x) - y
31.5(w) - y
31.5(d) - y
31.6A(x) - n
31.6A(w) - n
31.6A(d) - n
31.6B(x) - y
31.6B(w) - y
31.6B(d) - y
31.6C(x) - n
31.6C(w) - n
31.6C(d) - n
31.6D(x) - n
31.6D(w) - n
31.6D(d) - n
31.6E(x) - n
31.6E(w) - n
31.6E(d) - n
32A - n
32B - n
32C - n
32D - y
32E - n
32F - n
32G - n
32H - n
32I - n
32J - n
32K - n
33A - y
33B - n
33C - n
33D - n
33E - n
33F - n
33G - n
33H - n
33I - n
33J - n
33K - n
34.1 - n
34.2 - n
34.3.1 - y
34.3.2 - n
35.1 - n
35.2 - i
36.1.1(x) - n
36.1.1(w) - n
36.1.1(d) - n
36.1.2(x) - y
36.1.2(w) - y
36.1.2(d) - y
36.2.1(x) - y
36.2.1(w) - y
36.2.1(d) - y
36.2.2(x) - y
36.2.2(w) - y
36.2.2(d) - y
36.2.3(x) - n
36.2.3(w) - n
36.2.3(d) - n
37 - y
38.1 - n
38.2 - n
38.3 - n
38.4 - n
38.5 - y
38.6 - n
38.7 - n
38.8 - i
39 - y
40.1 - n
40.2 - y
41.1 - y
41.2 - n
42.1.1(x) - y
42.1.1(w) - y
42.1.1(d) - y
42.1.2(x) - n
42.1.2(w) - n
42.1.2(d) - n
42.1.3(x) - n
42.1.3(w) - n
42.1.3(d) - n
42.2.1(x) - y
42.2.1(w) - y
42.2.1(d) - y
42.2.2(x) - y
42.2.2(w) - y
42.2.2(d) - y
42.2.3(x) - n
42.2.3(w) - n
42.2.3(d) - n
43A(x) - n
43A(w) - n
43A(d) - n
43B(x) - n
43B(w) - n
43B(d) - n
43C(x) - n
43C(w) - n
43C(d) - n
43D(x) - y
43D(w) - y
43D(d) - y
43E(x) - n
43E(w) - n
43E(d) - n
43F(x) - n
43F(w) - n
43F(d) - n
43G(x) - n
43G(w) - n
43G(d) - n
43H(x) - n
43H(w) - n
43H(d) - n
43I(x) - n
43I(w) - n
43I(d) - n
44A(x) - y
44A(w) - y
44A(d) - y
44B(x) - y
44B(w) - y
44B(d) - y
44C(x) - y
44C(w) - y
44C(d) - y
44D(x) - y
44D(w) - y
44D(d) - y
44E(x) - y
44E(w) - y
44E(d) - y
44F(x) - y
44F(w) - y
44F(d) - y
44G(x) - y
44G(w) - y
44G(d) - y
44H(x) - y
44H(w) - y
44H(d) - y
44I(x) - y
44I(w) - y
44I(d) - y
45A - y
45B - n
45C - n

WET Answer Dataset for "stumpia"

45D - n
45E - n
45F - n
45G - n
46A(x) - y
46A(w) - y
46A(d) - y
46B(x) - n
46B(w) - n
46B(d) - n
46C(x) - n
46C(w) - n
46C(d) - n
47A - y
47B - n
47C - n
48A(x) - y
48A(w) - y
48A(d) - y
48B(x) - n

48B(w) - n
48B(d) - n
48C(x) - n
48C(w) - n
48C(d) - n
48D(x) - n
48D(w) - n
48D(d) - n
48E(x) - n
48E(w) - n
48E(d) - n
48F(x) - n
48F(w) - n
48F(d) - n
49.1.1(x) - y
49.1.1(w) - y
49.1.1(d) - y
49.1.2(x) - n
49.1.2(w) - n
49.1.2(d) - n

49.2(x) - y
49.2(w) - y
49.2(d) - y
49.3(x) - y
49.3(w) - y
49.3(d) - y
50(x) - y
50(w) - y
50(d) - y
51.1 - u
51.2 - u
52.1 - u
52.2 - u
53.1 - u
53.2 - u
54(x) - u
54(w) - u
54(d) - u
55.1 - u
55.2 - u

55.3 - u
55.4 - u
56.1 - u
56.2 - u
57.1 - u
57.2 - u
58 - u
59.1 - u
59.2 - u
60 - u
61 - u
62 - u
63.1 - u
63.2 - u
64 - u
CR - u
1 - u
2 - u
3 - u
4 - u

****

Summary of Evaluation Results for "stumpaa" Assessment area

****

	Social Significance	Effectiveness	Opportunity
Ground Water Recharge	M	U	*
Ground Water Discharge	H	L	*
Floodflow Alteration	L	H	M
Sediment Stabilization	M	H	*
Sediment/Toxicant Retention	M	H	H
Nutrient Removal/Transformation	M	H	H
Production Export	*	M	*
Wildlife Diversity/Abundance	H	*	*
Wildlife D/A Breeding	*	H	*
Wildlife D/A Migration	*	H	*
Wildlife D/A Wintering	*	H	*
Aquatic Diversity/Abundance	H	L	*
Uniqueness/Heritage	H	*	*
Recreation	H	*	*

Note: "H" = High, "M" = Moderate, "L" = Low, "U" = Uncertain, and "*"'s identify conditions where functions and values are not evaluate.

WET Answer Dataset for "stumpaa"

s1 - y
s2 - y
s3 - n
s4 - n
s5 - n
s6 - y
s7 - n
s8 - y
s9 - n
s10 - n
s11 - n
s12 - n
s13 - n
s14 - n
s15 - y
s16 - n
s17 - n
s18 - y
s19 - n
s20 - y
s21 - y
s22 - y
s23 - n
s24 - y
s25 - y
s26 - n
s27 - y
s28 - y
s29 - n
s30 - y
s31 - y
1.1 - n
1.2 - n
1.3 - n
2.1.1 - n
2.1.2 - y
2.1.3 - y
2.2.1 - n
2.2.2 - y
3.1 - y
3.2 - y
3.3 - n
4.1 - y
4.2A - n
4.2B - n
4.2C - n
4.2D - y
5.1.1 - y
5.1.2 - n
5.2 - n
blank - u
6.1 - y
6.2 - y
7 - i
8.1 - y
8.2 - n
8.3 - y
8.4 - n
9.1 - y
9.2 - n
9.3 - n
10A - y
10B - n
10C - n
10D - n
10E - n
10F - n
11(x) - y
11(w) - y
11(d) - y
12A(x) - y
12A(w) - y
12A(d) - y
12Aa(x) - n
12Aa(w) - n
12Aa(d) - n
12Ab(x) - n
12Ab(w) - n
12Ab(d) - n
12Ac(x) - n
12Ac(w) - n
12Ac(d) - n
12Ad(x) - y
12Ad(w) - y
12Ad(d) - y
12Ae(x) - n
12Ae(w) - n
12Ae(d) - n
12B(x) - n
12B(w) - n
12B(d) - n
12Ba(x) - n
12Ba(w) - n
12Ba(d) - n
12Bb(x) - n
12Bb(w) - n
12Bb(d) - n
12Bc(x) - n
12Bc(w) - n
12Bc(d) - n
12Bd(x) - n
12Bd(w) - n
12Bd(d) - n
12Be(x) - n
12Be(w) - n
12Be(d) - n
12C(x) - n
12C(w) - n
12C(d) - n
12Ca(x) - n
12Ca(w) - n
12Ca(d) - n
12Cb(x) - n
12Cb(w) - n
12Cb(d) - n
12Cc(x) - n
12Cc(w) - n
12Cc(d) - n
12Cd(x) - n
12Cd(w) - n
12Cd(d) - n
12D(x) - y
12D(w) - y
12D(d) - y
12Da(x) - y
12Da(w) - y
12Da(d) - y
12Db(x) - n
12Db(w) - n
12Db(d) - n
12E(x) - n
12E(w) - n
12E(d) - n
13A(x) - y
13A(w) - y
13A(d) - y
13Aa(x) - n
13Aa(w) - n
13Aa(d) - n
13Ab(x) - n
13Ab(w) - n
13Ab(d) - n
13Ac(x) - n
13Ac(w) - n
13Ac(d) - n
13Ad(x) - n
13Ad(w) - n
13Ad(d) - n
13Ae(x) - y
13Ae(w) - y
13Ae(d) - y
13B(x) - y
13B(w) - y
13B(d) - y
13Ba(x) - n
13Ba(w) - n
13Ba(d) - n
13Bb(x) - n
13Bb(w) - n
13Bb(d) - n
13Bc(x) - n
13Bc(w) - n
13Bc(d) - n
13Bd(x) - n
13Bd(w) - n
13Bd(d) - n
13Be(x) - y
13Be(w) - y
13Be(d) - y
13C(x) - y
13C(w) - y
13C(d) - y
13Ca(x) - n
13Ca(w) - n
13Ca(d) - n
13Cb(x) - n
13Cb(w) - n
13Cb(d) - n
13Cc(x) - y
13Cc(w) - y
13Cc(d) - y
13Cd(x) - n
13Cd(w) - n
13Cd(d) - n
13D(x) - y
13D(w) - y
13D(d) - y
13Da(x) - y
13Da(w) - y
13Da(d) - y
13Db(x) - y
13Db(w) - y
13Db(d) - y
13E(x) - n
13E(w) - n
13E(d) - n
14.1(x) - y
14.1(w) - y
14.1(d) - y
14.2(x) - n
14.2(w) - n
14.2(d) - n
15.1A - y
15.1B - n
15.1C - n
15.2 - n
16A(x) - y
16A(w) - y

WET Answer Dataset for "stumpaa"

16A(d) - y
16B(x) - n
16B(w) - n
16B(d) - n
16C(x) - n
16C(w) - n
16C(d) - n
17 - y
18 - i
19.1A - y
19.1B - n
19.2 - y
19.3 - y
20.1 - n
20.2 - n
21A - n
21B - n
21C - y
21D - n
21E - n
22.1.1 - y
22.1.2 - n
22.2 - y
22.3 - n
23 - n
24.1 - i
24.2 - y
24.3 - n
24.4 - n
24.5 - n
25.1 - y
25.2A - n
25.2B - y
25.3 - y
26.1 - y
26.2 - n
26.3 - y
27.1 - n
27.2 - i
27.3 - i
28 - n
29.1 - y
29.2 - y
30(x) - n
30(w) - n
30(d) - n
31.1(x) - y
31.1(w) - y
31.1(d) - y
31.2(x) - y
31.2(w) - y
31.2(d) - y
31.3(x) - n
31.3(w) - n
31.3(d) - n
31.4(x) - n
31.4(w) - n
31.4(d) - n
31.5(x) - y
31.5(w) - y
31.5(d) - y
31.6A(x) - n
31.6A(w) - n
31.6A(d) - n
31.6B(x) - y
31.6B(w) - y
31.6B(d) - y
31.6C(x) - n
31.6C(w) - n
31.6C(d) - n
31.6D(x) - n
31.6D(w) - n
31.6D(d) - n
31.6E(x) - n
31.6E(w) - n
31.6E(d) - n
32A - y
32B - n
32C - n
32D - n
32E - n
32F - n
32G - n
32H - n
32I - n
32J - n
32K - n
33A - y
33B - n
33C - n
33D - n
33E - n
33F - n
33G - n
33H - n
33I - n
33J - n
33K - n
34.1 - n
34.2 - n
34.3.1 - y
34.3.2 - n
35.1 - n
35.2 - y
36.1.1(x) - n
36.1.1(w) - n
36.1.1(d) - n
36.1.2(x) - y
36.1.2(w) - y
36.1.2(d) - y
36.2.1(x) - y
36.2.1(w) - y
36.2.1(d) - y
36.2.2(x) - y
36.2.2(w) - y
36.2.2(d) - y
36.2.3(x) - n
36.2.3(w) - n
36.2.3(d) - n
37 - y
38.1 - n
38.2 - y
38.3 - n
38.4 - n
38.5 - y
38.6 - n
38.7 - n
38.8 - i
39 - y
40.1 - n
40.2 - y
41.1 - y
41.2 - n
42.1.1(x) - y
42.1.1(w) - y
42.1.1(d) - y
42.1.2(x) - n
42.1.2(w) - n
42.1.2(d) - n
42.1.3(x) - n
42.1.3(w) - n
42.1.3(d) - n
42.2.1(x) - y
42.2.1(w) - y
42.2.1(d) - y
42.2.2(x) - y
42.2.2(w) - y
42.2.2(d) - y
42.2.3(x) - n
42.2.3(w) - n
42.2.3(d) - n
43A(x) - n
43A(w) - n
43A(d) - n
43B(x) - n
43B(w) - n
43B(d) - n
43C(x) - n
43C(w) - n
43C(d) - n
43D(x) - n
43D(w) - n
43D(d) - n
43E(x) - n
43E(w) - n
43E(d) - n
43F(x) - n
43F(w) - n
43F(d) - n
43G(x) - n
43G(w) - n
43G(d) - n
43H(x) - y
43H(w) - y
43H(d) - y
43I(x) - n
43I(w) - n
43I(d) - n
44A(x) - y
44A(w) - y
44A(d) - y
44B(x) - y
44B(w) - y
44B(d) - y
44C(x) - y
44C(w) - y
44C(d) - y
44D(x) - y
44D(w) - y
44D(d) - y
44E(x) - y
44E(w) - y
44E(d) - y
44F(x) - y
44F(w) - y
44F(d) - y
44G(x) - y
44G(w) - y
44G(d) - y
44H(x) - y
44H(w) - y
44H(d) - y
44I(x) - y
44I(w) - y
44I(d) - y
45A - y
45B - n
45C - n

WET Answer Dataset for "stumpaa"

45D - n
45E - n
45F - n
45G - n
46A(x) - y
46A(w) - y
46A(d) - y
46B(x) - n
46B(w) - n
46B(d) - n
46C(x) - n
46C(w) - n
46C(d) - n
47A - y
47B - n
47C - n
48A(x) - y
48A(w) - y
48A(d) - y
48B(x) - n
48B(w) - n
48B(d) - n
48C(x) - n
48C(w) - n
48C(d) - n
48D(x) - n
48D(w) - n
48D(d) - n
48E(x) - n
48E(w) - n
48E(d) - n
48F(x) - n
48F(w) - n
48F(d) - n
49.1.1(x) - y
49.1.1(w) - y
49.1.1(d) - y
49.1.2(x) - n
49.1.2(w) - n
49.1.2(d) - n
49.2(x) - y
49.2(w) - y
49.2(d) - y
49.3(x) - y
49.3(w) - y
49.3(d) - y
50(x) - y
50(w) - y
50(d) - y
51.1 - u
51.2 - u
52.1 - u
52.2 - u
53.1 - u
53.2 - u
54(x) - u
54(w) - u
54(d) - u
55.1 - u
55.2 - u
55.3 - u
55.4 - u
56.1 - u
56.2 - u
57.1 - u
57.2 - u
58 - u
59.1 - u
59.2 - u
60 - u
61 - u
62 - u
63.1 - u
63.2 - u
64 - u
CR - u
1 - u
2 - u
3 - u
4 - u

APPENDIX DPR-N

HABITAT EVALUATION OF BOTTOMLAND HARDWOODS AND FORESTED WETLANDS

Appendix DPR-N provides the results of a habitat evaluation of bottomland hardwoods and forested wetlands for the Stump Lake Complex. The methology used for the evaluation is the Habitat Evaluation System (HES) developed by the Corps of Engineers. The results were used to determine if habitat enhancement or creation measures were needed to offset the initial loss of bottomland hardwoods and forested wetlands due to construction of the proposed project at Stump Lake Complex.

APPENDIX N

HABITAT EVALUATION OF BOTTOMLAND HARDWOODS AND FORESTED WETLANDS

SECTION I. INTRODUCTION

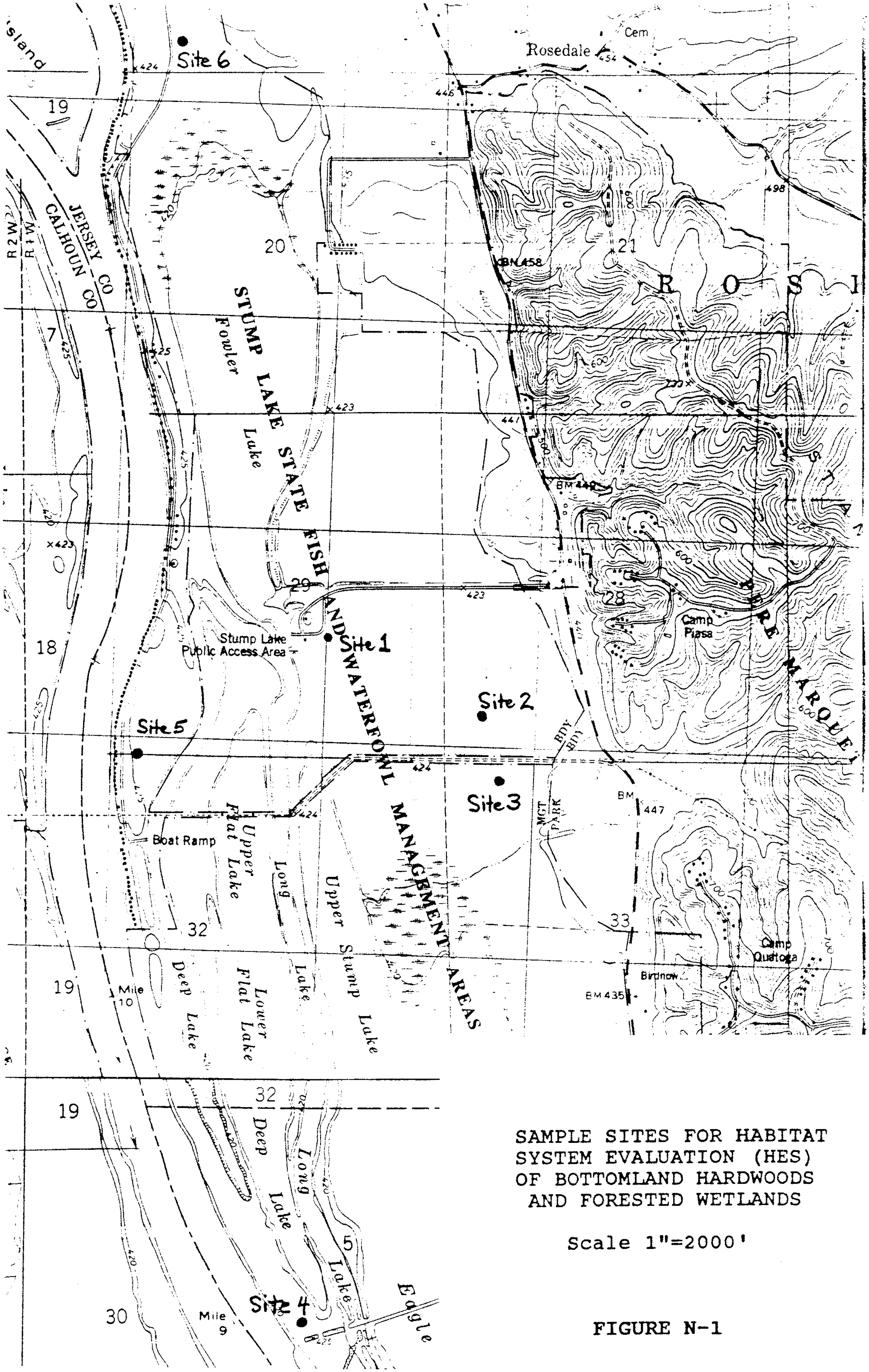
This District and the IDOC applied the Habitat Evaluation System (HES) methodology to evaluate the environmental effect the project would have on bottomland hardwoods and forested wetlands. This methodology was developed by the Corps about a decade ago and is widely accepted. The HES is very similar to the WHAG and AHAG (see APPENDIX DPR-E) in that habitat quality (and ultimately habitat units) are compared for existing, future without project, and future with project conditions. However, unlike the WHAG and AHAG, which measure habitat quality for a particular species (or group of similar species), the HES assesses general habitat characteristics to indicate quality for fish and wildlife populations as a whole. The impact of a project feature is obtained by subtracting the habitat units of the future-without condition from those of the future-with condition.

Forested wetlands and bottomland hardwoods are treated separately because they differ to a degree. By definition, undisturbed forested wetlands occur on hydric soils, whereas bottomland hardwoods are supported by floodplain soils, whether hydric or not.

The following table summarizes project impacts by acreage. (It does not include filling of Flat Lake, a 171-acre nonforested wetland, with about one foot of dredged material. The current practice of moist soil management in this wetland unit will continue after project completion.)

Habitat Type	Existing Total	Clearing for Fill	Clearing for Borrow Pits	Clearing for Replant
wetland	(2412)			
forested	1314	20.5	32	10
open water	1098	.5	0	0
nonwetland	(245)			
forested	215	13	20	5
"other" (roads, buildings)	30	0	0	0
total	2657	34	52	15

Field sampling was conducted at six sites at Stump Lake Complex to obtain HQI scores for bottomland hardwoods and forested wetlands combined. Three wooded sites were chosen along the Illinois River at locations coinciding with the footprint of the riverside dike/levee. Another three locations were selected away from the river in the interior of the project area (see FIGURE N-1).



SAMPLE SITES FOR HABITAT SYSTEM EVALUATION (HES) OF BOTTOMLAND HARDWOODS AND FORESTED WETLANDS

Scale 1"=2000'

FIGURE N-1

Seven key variables were used to assess overall habitat quality of bottomland hardwoods and forested wetlands at each site. These parameters are: 1) tree species composition (on .20 acre plot), 2) number of mast trees (12 inches DBH or greater on .20 acre plot), 3) percent cover for overstory (2 to 12 feet above ground on .04 acre plot), 4) percent cover for groundcover (on .01 acre plot), 5) number of trees (with DBH of 18 inches or greater on .20 acre plot), 6) tract size, 7) number of snags (8 feet tall or higher on .20 acre plot).

At each site, the value of each key variable was converted into a HQI score using a functional curve specific for that key variable and the bottomland hardwood habitat type. The HQI value was based on a scale of 0 to 1.0, with 1.0 being the maximum value. The HQI score for each variable was then weighted to reflect the relative importance of that key varible to overall habitat quality. The product of the HQI score and associated weighting factor gave a weighted HQI score for that key variable. The weighted HQI scores were summed for all key variables and divided by 100 to yield an aggregate HQI score for bottomland hardwoods at each site.

A completed data form for each of the six sites is presented at the end of this appendix. Computations are presented in Section IV. Results are given in Sections II and III.

SECTION II. BOTTOMLAND HARDWOODS

The project will involve the clearing of 101 acres of bottomland hardwoods, and the replanting of 15 of these acres.

The HES analysis (see computations in Section IV) shows that the clearing of bottomland hardwoods from 101 acres would represent a loss of 2778 habitat units over the 50-year project life [or -56 average annual habitat units (AAHUs)]. The analysis also shows that the riverside levee will improve habitat quality by protecting the "interior" bottomland hardwoods within the project area (1372 acres) from frequent flooding. Mast tree species (especially oaks) in this "interior" area are currently unable to regenerate apparently because the existing flooding regime is too wet. The impact on this "interior" area consists of an increase in 4459 habitat units (+89 AAHUs), and is due in part to the expected regeneration of mast tree species. According to the HES analysis, the overall impact of the project on bottomland hardwoods is positive, and consists of an increase of 33 AAHUs (89 AAHUs minus 56 AAHUs).

Because the HES analysis shows that overall habitat value will increase over the 50-year project life, habitat enhancement or creation measures will not be taken to offset the initial loss of 86 acres of bottomland hardwoods.

SECTION III. FORESTED WETLANDS

The project will include the clearing of 63 acres of forested wetlands, and the replanting of 10 of these acres.

The HES methodology has also been applied to determine the project's effect on the quality of wildlife habitat of forested wetlands. As in the case of bottomland hardwoods, the same pattern of improvement over the 50-year project life is observed. Removal of trees from 63 acres of forested wetlands would represent a loss of 1732 habitat units (or -35 AAHUs), whereas the riverside levee would improve habitat quality by 3950 habitat units (+79 AAHUs) by protecting "interior" forested wetlands within the project area (1216 acres) from frequent flooding. Thus, there is an overall improvement of wildlife habitat by 44 AAHUs (79 minus 35).

Measures for enhancement or creation of forested wetlands will not be taken due to the initial loss of 53 acres of forested wetlands.

SECTION IV. COMPUTATIONS

A. BOTTOMLAND HARDWOODS

Composite HQI under existing condition
- -for interior area (sites 1,2,3): (.61+.67+.66)/3 = .65
- -for levee footprint (sites 4,5,6): (.48+.57+.52)/3 = .52

1. Project impact for levee footprint
levee footprint: 86 acres (riverside levee) + 15 acres (interior levees) = 101 acres total

habitat units for levee footprint
- -under existing condition: 101 acres (to be cleared) x .52 HQI = 52.52 HU
- -under future-without condition: 101 acres x .58 HQI = 58.68 HU
- -under future-with condition: 101 acres x .0 HQI = O HU

difference in HU between future-without and existing conditions for levee footprint: 58.58 HU - 52.52 HU = 6.06 HU

annual habitat units for levee footprint (50-year project life)
- -under future-without condition:

(50 years x 52.52HU) + 1/2(50 years x 6.06HU) = 2777.5 AHU
- -under future-with condition: (50 years x O HU) = O AHU

project impact for levee footprint
- -for 50-year project life: AHU(future-with) + AHU (future-without) = 0-2777.5 = -2777.5 AHU
- -for average year: -2777.5 AHU/50 years = -55.55 average AHU

2. Project impact for interior area

Interior area: [1314 acres (forested wetland)+215 acres (forested non-wetland)-101 acres (to be cleared for levee foot-print)-56 acres (BLH unprotected by riverside levee)]=1372 acres habitat units for interior area
- -under existing condition: 1372 acres (to be protected by riverside levee) x .65 HQI = 891.8 HU
- -under future-without condition: 1372 acres x .61 = 836.92 HU
- -under future-with condition: 1372 acres x .74 = 1015.28 HU

difference in HU between future-without and existing conditions for interior area: 891.8 HU - 836.92 HU = 54.88 HU

difference in HU between future-with and existing conditions for interior area: 1015.28 HU - 891.8 HU = 123.48 HU

annual habitat units for interior area (50-year project life)
- -under future-without condition: (50-years x 836.92 HU)+1/2 (50 years x 54.88 HU) = 43.218 AHU
- -under future-with condition: (50 years x 891.8 HU)+1/2 (50 years x 123.48 HU) = 47,677 AHU

project impact for interior area
- -for 50-year project life: 47,677 AHU-43,218 AHU = 4,459 AHU
- -for average year: 4,459 AHU/50 years = 89.18 average AHU

3. Overall impact of project on bottomland hardwoods

average AHU (interior area) + average AHU (levee footprint) = 89.18 AAHU - 55.55 AAHU = +33.63 AAHU

B. FORESTED WETLANDS

Composite HQI under existing condition
-for interior area (sites 1,2,3): (.61+.67+.66)/3 = .65
-for levee footprint (sites 4,5,6): (.48+.57+.52)/3 = .52

1. Project impact for levee footprint
levee footprint: 101 acres (bottomland hardwoods) - 38 acres (forested non-wetlands) = 63 acres

habitat units for levee footprint
-under existing condition: 63 acres(to be cleared) x .52 HQI =32.76 HU
-under future-without condition: 63 acres x .58 HQI = 36.54 HU
-under future-with condition: 63 acres x .0 HQI = O HU

difference in HU between future-without and existing conditions for levee foorprint 36.54 HU-32.76 HU = 3.78 HU

annual habitat units for levee footprint (50-year project life)
-under future-without condition: (50 years X 32.76 HU) + 1/2 (50 years X 2.78 HU) = 1732.5 AHU
-under future-with condition: (50 years X O HU) = O AHU

project impact for levee footprint
-for 50-year project life: AHU (future-with) + AHU (future-without) = 0-1732.5 AHU = - 1732.5 AHU
-for average year: -1732.5 AHU/50 years = -34.65 aerage AHU

2. Project impact for interior area

interior area: 1314 acres (forested wetland) - 63 acres (to be cleared for levee footprint) - 35 acres (forested wetlands unprotected by riverside levee) = 1216 acres

habitat units for interior area
-under existing condition: 1216 acres (to be protected by riverside levee) x .65 HQI = 790.4 HU
-under future-wtihout conditions: 1216 acres .61 HQI = 741.8 HU
-under future-with condition: 1216 acres x .74 HQI = 899.8 HU

difference in HU between future-without and existing conditions for interior area: 790.4 HU - 741.8 HU = 48.6 HU

difference in HU between future-with and existing conditions for interior area: 899.8 HU - 790.4 HU = 109.4 HU

annual habitat units for interior area (50-year project life)
-under future-without condition: (50 years x 741.8 HU) + 1/2(50 years x 48.6 HU) = 38,305 AHU
-under future-wtih condition: (50 years x 790.4 HU) + 1/2(50 years x 109.4 HU) = 42,255 AHU

project impact for interior area
-for 50-year project life: 42,255 AHU - 38,305 AHU = 3,950 AHU
-for average year: 3950 AHU/50 years = 79 average AHU

3. Overall impact of project on forested wetlands

average AHU (interior area) + average AHU (levee footprint) = 79 AAHU - 34.65 AAHU = +44.35 AAHU

HES DATA FORM: BOTTOMLAND HARDWOOD FOREST

Project: Stump

Date: 22 March 91

Site No.: 1

Location: Interior Area

Condition: Existing

KEY VARIABLE	DATA	HQI SCORE	KEY VARIABLE WEIGHT	WEIGHTED HQI SCORE
1. Species Assoc.	PECAN	.82	17	13.9
2. Number Mast trees	1 SP, 5>12"	.70	16	11.2
3. Percent cover-understory	0%	.00	14	0.0
4. Percent cover-groundcover	100% palatable	.70	14	9.8
5. No.>18" trees	1>18", None>24"	.46	14	6.4
6. Tract Size	1000 ac 70% open	.96	14	13.4
7. Number Snags	0	.60	11	6.6

HQI = .61

HES DATA FORM: BOTTOMLAND HARDWOOD FOREST

Project: Stump — Date: 22 March 91

Site No.: 2

Location: Interior Area

Condition: Existing

KEY VARIABLE	DATA	HQI SCORE	KEY VARIABLE WEIGHT	WEIGHTED HQI SCORE
1. Species Assoc.	Hackberry, elm, ash	.94	17	16.0
2. Number Mast trees	1>12", overcup	.60	16	9.6
3. Percent cover-understory	60% emergent	.80	14	11.2
4. Percent cover-groundcover	10% emergent	.12	14	1.7
5. No.>18" trees	1>18", <24"	.46	14	6.4
6. Tract Size	1000ac, 20%	.96	14	13.4
7. Number Snags	1 snag	.76	11	8.4
			HQI =	.67

HES DATA FORM: BOTTOMLAND HARDWOOD FOREST

Project: Stump   Date: 22 March 91

Site No.: 3

Location: Interior Area

Condition: Existing

KEY VARIABLE	DATA	HQI SCORE	KEY VARIABLE WEIGHT	WEIGHTED HQI SCORE
1. Species Assoc.	Hackberry, elm, ash	.96	17	16.3
2. Number Mast trees	0	.00	16	0.0
3. Percent cover-understory	60% emergent	.80	14	11.2
4. Percent cover-groundcover	25% emergent	.24	14	3.4
5. No. > 18" trees	1>18",1>24"	.54	14	14.5
6. Tract Size	1000ac, 10% wooded	.90	14	12.6
7. Number Snags	1 snag	.76	11	8.4

HQI= .66

HES DATA FORM: BOTTOMLAND HARDWOOD FOREST

Project: Stump

Date: 22 March 91

Site No.: 4

Location: Riverside Levee Footprint

Condition: Existing

KEY VARIABLE	DATA	HQI SCORE	KEY VARIABLE WEIGHT	WEIGHTED HQI SCORE
1. Species Assoc.	Maple	.75	17	12.8
2. Number Mast trees	0	0	16	0.0
3. Percent cover-understory	30%	.44	14	6.2
4. Percent cover-groundcover	30%	.40	14	5.6
5. No. > 18" trees	0	.00	14	0.0
6. Tract Size	1000+ac	1.00	14	14.0
7. Number Snags	2	.90	11	9.9
			HQI=	.48

HES DATA FORM: BOTTOMLAND HARDWOOD FOREST

Project: Stump

Date: 22 March 91

Site No.: 5

Location: Riverside Levee Footprint

Condition: Existing

KEY VARIABLE	DATA	HQI SCORE	KEY VARIABLE WEIGHT	WEIGHTED HQI SCORE
1. Species Assoc.	Hackberry-elm-ash	.82	17	13.9
2. Number Mast trees	0	.00	16	0.0
3. Percent cover-understory	20%	.30	14	4.2
4. Percent cover-groundcover	70%	.80	14	11.2
5. No. > 18" trees	1>18",<24"	.46	14	6.4
6. Tract Size	1000a, 10%	.80	14	11.2
7. Number Snags	2	.90	11	9.9
			HQI=	.57

HES DATA FORM: BOTTOMLAND HARDWOOD FOREST

Project: Stump

Date: 22 March 91

Site No.: 6

Location: Riverside Levee Footprint

Condition: Existing

KEY VARIABLE	DATA	HQI SCORE	KEY VARIABLE WEIGHT	WEIGHTED HQI SCORE
1. Species Assoc.	Maple	.75	17	12.8
2. Number Mast trees	0	.00	16	0.0
3. Percent cover-understory	30%	.44	14	6.2
4. Percent cover-groundcover	90%	.66	14	9.2
5. No. > 18" trees	0	.00	14	0.0
6. Tract Size	1000+, 10%	.90	14	12.6
7. Number Snags	3	1.0	11	11.0
		TOTAL	HQI=	.52

HES DATA FORM: BOTTOMLAND HARDWOOD FOREST

Project: Stump

Date: 22 March 91

Site No.: 2,3,1 composite

Location: Interior Area

Condition: Future Without

KEY VARIABLE	DATA	HQI SCORE	KEY VARIABLE WEIGHT	WEIGHTED HQI SCORE
1. Species Assoc.	Ash, Hack-berry, pecan	.90	17	15.3
2. Number Mast trees	0	.00	16	0.0
3. Percent cover-understory	60%	.80	14	11.2
4. Percent cover-groundcover	10%	.14	14	2.0
5. No. > 18" trees	2>18",1>24"	.80	14	11.2
6. Tract Size	1000ac, no openings	.80	14	11.2
7. Number Snags	2	.90	11	9.9
			HQI=	.61

HES DATA FORM: BOTTOMLAND HARDWOOD FOREST

Project: Stump | Date: 22 March 91

Site No.: 2,3,1 composite

Location: Interior Area

Condition: Future with Project

KEY VARIABLE	DATA	HQI SCORE	KEY VARIABLE WEIGHT	WEIGHTED HQI SCORE
1. Species Assoc.	Ash-Hack-berry	.96	17	16.3
2. Number Mast trees	0.5 trees>12" 4 species	.40	16	6.4
3. Percent cover-understory	60%	.80	14	11.2
4. Percent cover-groundcover	30%	.40	14	5.6
5. No. > 18" trees	3>18",1>24"	.90	14	12.6
6. Tract Size	1000ac, no openings	.80	14	11.2
7. Number Snags	3	1.00	11	11.0
			HQI=	.74

HES DATA FORM: BOTTOMLAND HARDWOOD FOREST

Project: Stump

Date: 22 March 91

Site No.: 6,5,4 Combined

Location: Riverside Levee Footprint

Condition: Future Without (2040)

KEY VARIABLE	DATA	HQI SCORE	KEY VARIABLE WEIGHT	WEIGHTED HQI SCORE
1. Species Assoc.	Maple-Ash Hackberry	.80	17	13.6
2. Number Mast trees	0	.00	16	0.0
3. Percent cover-understory	10%	.16	14	2.2
4. Percent cover-groundcover	70%	.80	14	11.2
5. No. > 18" trees	2,<24"	.70	14	9.8
6. Tract Size	1000+ no openings	.80	14	11.2
7. Number Snags	5	.90	11	9.9
			HQI=	.58