UPPER MISSISSIPPI RIVER SYSTEM-

ENVIRONMENTAL MANAGEMENT PROGRAM

DEFINITE PROJECT REPORT (SL-2)

DRESSER ISLAND HABITAT REHABILITATION PROJECT

POOL 26
UPPER MISSISSIPPI RIVER
ST. CHARLES COUNTY, MISSOURI
FINAL

MAY 1989

US Army Corps of Engineers

St. Louis District

Leaders in Customer Care

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

DRESSER ISLAND
WETLAND HABITAT REHABILITATION

POOL 26, MISSISSIPPI RIVER, ST. CHARLES COUNTY, MISSOURI

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EXECUTIVE SUMMARY

The Dresser Island wetland complex, located in Mississippi River Pool 26, consists of approximately 940 acres of Federal lands and water. The area is managed for fish and wildlife purposes by the Missouri Department of Conservation under cooperative agreements between the State and the Department of Interior, and between the Department of Interior and the Corps of Engineers.

The Comprehensive Master Plan for the Management of the Upper Mississippi River System identified sedimentation as the most significant resource problem affecting the river system. Due to sedimentation effects from the Mississippi River, a once prime interior wetlands habitat on Dresser Island has deteriorated significantly in both quantity and quality. In addition, Brickhouse Slough, once a deep flowing chute between the mainland and Dresser Island, has been filled with sediment to such an extent that flows can pass only at higher pool stages. At the current rate of sediment deposition, it is estimated that all interior wetlands and much of the slough as well will be lost by the end of the next century. This continuing loss of habitat will further impact waterfowl populations already under stress due to a loss of habitat in the Midwest. Fish populations will be impacted by the continuing loss of critical backwater habitat.

The wetland complex is also affected by the periodic drops in pool stage that are characteristic of the lower section of navigation pools. These water elevations can often dip far below normal pool stages, and for extended periods of time. This flushing action lowers the utility of Brickhouse slough and the island's interior wetlands for fish spawning and rearing. Additionally, fish are at risk of becoming trapped in the interior wetlands during low water, and may subsequently die from low levels of dissolved oxygen, high summer water temperatures, or winter freeze-outs. Such water level fluctuations can also affect the production of aquatic plants, and its availability to waterfowl.

The primary objective of the project is to enhance the habitat value of the Dresser Island wetlands complex for wildlife, and to the extent compatible with this objective, enhance habitat for fish as well. These objectives would be attained by: (1) decreasing the river's sediment input into the complex (by at least 90 percent), (2) providing a means to control water levels within the island complex independent of river stage, (3) in combination with traditional management practices, increase the annual habitat units for waterfowl, and (4) provide water conditions of potential benefit to fish production.

Three project alternatives were considered: Alternative A, No Federal Action; Alternative B, Excavation; and Alternative C, Levee System. Alternative A was rejected, since it would do nothing to alter the sedimentation and water level problems that must be controlled, if habitat is to be improved. Large-scale excavation (Alternative B) was considered unacceptable; it would not alter future sedimentation, it would not permit any means of regulating water levels within the complex, and the potential for applying habitat management practices would be severely limited. Alternative C was found to be fully responsive to the project objectives, and

was chosen as the Selected Plan. It would significantly reduce the sedimentation rate, in combination with gated drains it would provide a reliable means of water control, and would provide greatly enhanced conditions for active habitat management. Specific Alternative C features considered in detail included: the levee, borrow areas, ditches, pumps, intake and outlet structures.

To retard the deposition of sediment in the complex, the Selected Plan calls for a 28,250 long levee to encircle most of Dresser Island with connections crossing upper Brickhouse Slough to high ground on the Missouri mainland. Most of the levee would consist of earthen material except for that portion that crosses the slough, which would consist of rock. Construction materials for the earthen portion of the levee would be excavated from borrow areas on the island. These areas, totaling 37 acres, would all be in the interior of the new levee system and run roughly parallel to the axis of the levee. Most borrow areas would be about 100-feet wide and excavated to a depth of 1 to 3 feet. The resulting borrow pits are expected to hold water and thus provide additional wetland habitat. Ditches excavated to establish water connections between the upper reach of Brickhouse Slough and the interior wetlands will provide an additional source of borrow material. Two sets of four 48-inch CMP drains would be placed near the upstream section of the island and would be used for water intake. These would be equipped with sluice gates. One set would be for warm water intake and would be installed in the rock dike at the far upper end of the entrance to Brickhouse Slough, approximately 2,000 feet directly downstream from the Union Electric power plant's cooling water discharge pipes (located on the Missouri shore). In order to deliver slightly cooler waters into the wetland complex, a second set of intake drains would be placed in the rock dike at the more riverside portion of the side channel's entrance. Four 48-inch diameter drains and four 30-inch diameter drains would be installed in the lower section of the island and side channel and used for water release and control of interior water level fluctuations. However, these would also be used during the summer to fill the interior wetlands with back-in water when the pool is at normal stage or higher. Cofferdams would be constructed to install the gravity drains. After project construction, the Missouri Department of Conservation would be responsible for the operations and maintenance.

Annual operating and maintenance costs are estimated to total $16,400 and would be cost shared 75 percent Federal and 25 percent non-Federal.

The project will eliminate by 90 percent the future input of sediment into the island complex. This will greatly extend the utility of this area as fish and wildlife habitat. The levee in combination with the gated drains will provide the controlled water levels needed to create a reliable food supply for migratory waterfowl in the fall. Acres affected by water level manipulation could range from a maximum of about 225 acres at 419 NGVD, to 475 acres at 420 NGVD and 700 acres at 422 NGVD. However, achieving elevations above 421 NGVD would be dependent on infrequent fall flood events or supplementation by MODOC provided portable pumps. Typically, water levels would be drawn down in June for the germination of natural or aerially seeded plants benefitting waterfowl (such as smartweed or Japanese millet). Water levels would later be raised allowing the seed heads of the plants to remain above the water. The levee will prevent the more frequent lower elevation

flood events from destroying the food crop, thus increasing the island complex's capacity to provide food. At least some flow will be maintained whenever possible in order to reduce the risk of waterfowl disease outbreaks.

Excavated ditches connecting the upper slough with the interior wetlands would improve fish dispersal within the levee system. The development of wetlands in borrow pits will provide additional acres of fish habitat. Management of flow, water levels, and water temperature would improve the aquatic habitat year round. The inflow of warmer water to previously isolated interior wetlands is expected to reduce the risk of any winter fish kill. Decreasing the inflow of warm water from the power plant into the wetland during the summer should help prevent extreme drops in dissolved oxygen levels and the potential for summer fish kills. Occasionally, water levels would, in the spring, flood sections of the bottomland forest; at such times resident fish populations would be able to move out of the open wetlands and borrow pits and spawn in the flooded forest. These areas might also serve as nursery areas for small fish. In late spring or early summer, water levels would be lowered, thus releasing fish to the riverine environment. Such management of the area for aquatic species would increase the overall productivity of the wetland complex.

It is proposed that the following information be collected to evaluate performance of the project: sediment surveys data, river stage data, interior water levels data, habitat appraisal data, vegetation data, and replacement costs data.

The District Engineer has reviewed the project outputs, and has determined that implementation of the identified plan is justified, and in the Federal interest. Approval for construction of the Dresser Island habitat rehabilitation project is recommended by the St. Louis District Engineer at a 100 percent Federal cost (under the provisions of PL 99-662) estimated to total $2,150,000. The District Engineer further recommends that funds in the amount of $105,000 be allocated as quickly as possible for the preparation of plans and specifications.

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1. INTRODUCTION.

a. Purpose. The purpose of this Definite Project Report (DPA) report is to present a detailed proposal for the rehabilitation of wetlands at Dresser Island. 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. Resource Problems and Opportunities. The Dresser Island complex is located along the right edge of the navigation channel in Mississippi River Pool 26 between river miles 206-209, St. Charles County (population: 191,000), Missouri (FIGURE 1 and PLATE 1). Brickhouse Slough separates the island from the Missouri shore. The project area consists of approximately 940 acres of Federal lands and water. The area is managed for fish wildlife purposes by the Missouri Department of Conservation (MODOC) under a cooperative agreement between the State and the Department of Interior, and between the Department of Interior and the Corps of Engineers. The existing Locks and Dam No. 26 at Alton, Illinois, is located 2.5 miles downstream of the island. The nearest townships are Portage Des Sioux, to the west, and West Alton, to the southeast of the island. St. Louis County (population: 999,700) and the city of St. Louis (population: 452,800) are situated about 5 and 12 miles, respectively, to the south. The island is not accessible by motorized vehicles. MODOC maintains a bank-side parking and access area located a short distance north of State Route 94, near the midpoint of Brickhouse Slough.

Past management efforts at the Dresser Island complex (primarily directed at waterfowl) have been hampered by both the effects of sedimentation and a lack of water level control. The Great River Environmental Action Team (GREAT II 1980) calculated that the backwaters of the Pool 26 reach of river have a sedimentation rate of 1 to 2 inches per year, with few backwaters exceeding 8 feet in depth. From this they estimated that most backwaters would be completely filled within the next century (i.e., 48 to 96 years). The St. Louis District recently used Brickhouse Slough as one of its models in estimating the total aggradation of sediment from 1970 to 1985 (Simons et al. 1988). These estimates indicated the sediment deposition rate to be about 0.5 inches per year. Assuming an average slough depth of 5 feet, and a constant deposition rate of 0.5 inches per year, the life expectancy of the slough is about 120 years. However, it is known that sediment loads increase at higher pool elevations, so that if a series of more severe flood events were to occur, the life expectancy could be much less than that projected. The result of this sedimentation is a rapid conversion of water cover to land

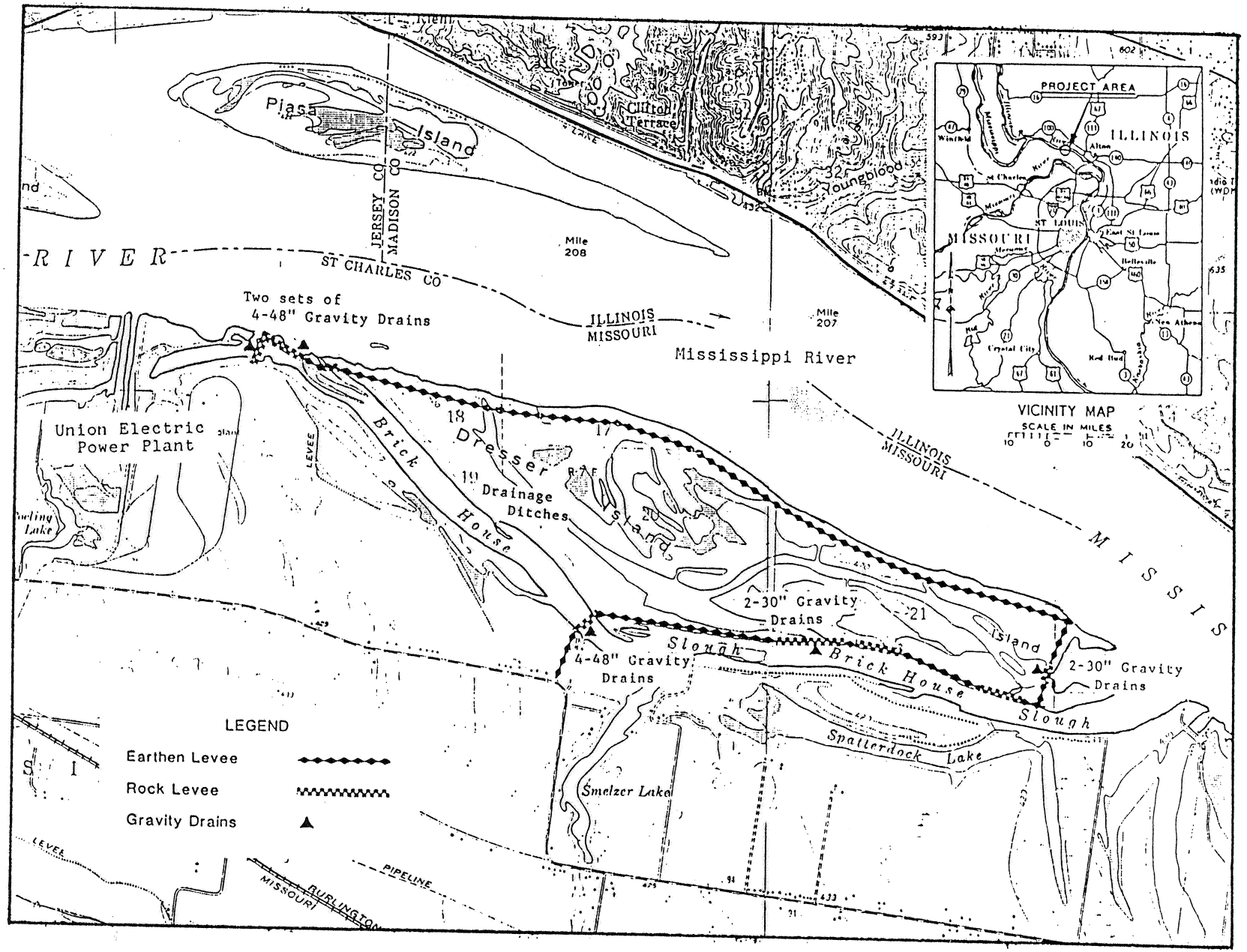


FIGURE 1. REGIONAL LOCATION AND RECOMMENDED PLAN: DRESSER ISLAND

cover. For waterfowl, this conversion translates at a minimum to a quantitative loss of habitat. In a similar manner, riverine fish are impacted by a loss of backwater spawning and rearing habitat.

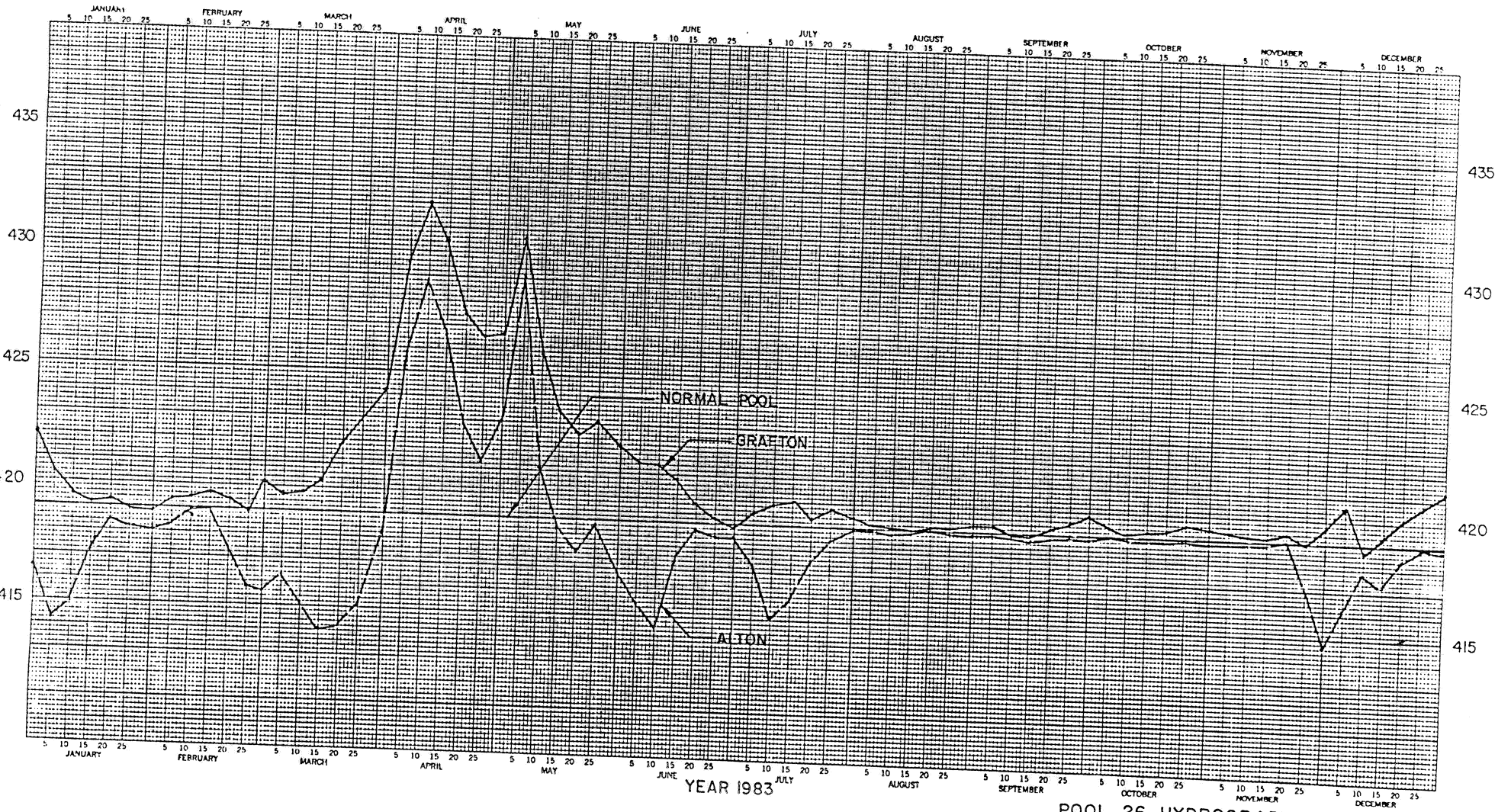
The wetland complex has also been affected by its location in the lower portion of the navigation pool. As the FIGURE 2 stage-hydrograph shows (1983 selected as representing a typical year for Pool 26), pool elevations in the Dresser Island area frequently dip far below normal pool stage, and for extended periods of time. By comparison, water elevations at Grafton (located near mid-pool) fluctuate nearly always above normal pool. The shifting water elevations, so dramatic in the lower pool, can have important implications for waterfowl management. Fluctuating levels can affect the success of moist soil plant species production as a food source, and it can affect the availability of that food to waterfowl if extreme water level conditions (too much or too little water) persist during the fall migration period. Major drops in water during the spring period diminishes the value of the island complex for fish spawning and rearing. Additionally, fish may become trapped in the interior wetlands during low water and subsequently die from low levels of dissolved oxygen, high summer water temperatures, or winter freeze-outs.

At present, there are no permanent facilities or habitat improvements on the island. Past attempts were made by MODOC to grow wildlife-preferred plants and to restore wetland habitat by blasting, have been unsuccessful. Blasting is not a permanent solution to sedimentation since the next flood brings additional sediment, and the lack of water control has made reliable plantings impossible.

Opportunities do exist to provide sediment and water level control at the Dresser Island site. The proposed project would include constructing a low levee (or sediment deflection dike) to control deposition of silt during the more frequent flood events, and the installation of gated drains to allow control of water levels on the interior wetlands, independent of river stages. The construction of a Moist Soil Management Unit (MSMU) at Dresser Island would allow: (1) the reliable production of waterfowl food during the summer months, and (2) increased availability of that food during the fall migration via water levels control. Management of flow, water levels and water temperature would improve the aquatic habitat year round, reducing the risk of fish kills and enhancing the conditions for fish reproduction.

c. Scope of Study. The geographical scope of the study area is shown in FIGURE 1 and PLATE 1. All project features considered would require Federal lands only, no State owned lands or private lands acquisition would be involved. Various field surveys were conducted during the study, these included a topographic survey, a baseline and profile survey, a hydrographic survey, a soil borings survey and a habitat survey.

d. Format of Report. As part of the General Plan Annual Addendum for the Upper Mississippi River Environmental Management Program (UMRS-EMP), a fact sheet was included to present a conceptual rehabilitation plan and a preliminary cost estimate for review and approval by the Assistant Secretary of the Army (Civil Works). Upon approval and availability of funds, general design was initiated. This DPR presents refinements to the original concept plan and has been organized to follow a general problem solving format. The study purpose and problems are presented in Section 1. Section 2 provides an



POOL 26 HYDROGRAPHS,
ALTON VS. GRAFTON IL.
FIGURE 2

overview of how and why Dresser Island was selected as a project within the UMRS-EMP. Section 3 establishes the baseline for existing resources. Section 4 provides the objectives of the project. Sections 5 and 6 propose and evaluate project alternatives. Sections 7 and 8 describe the Selected Plan. Section 9 is an assessment of environmental effects from the proposed plan pursuant to the National Environmental Policy Act. Section 10 is an assessment of the project's effects on Federally Endangered Species. Section 11 provides a summary of project accomplishments or benefits. Sections 12, 13, 14 describe estimated operation and maintenance considerations, performance monitoring, and detailed cost estimates for both initial construction and annual operation and maintenance. Sections 15, 16, 17, and 18 provide a summary of implementation requirements and coordination. Sections 19 and 20 provide the literature cited and a list of DPR/EA preparers. Sections 21, 22, and 23 present the conclusions, recommendations, and Finding of No Significant Impact.

Drawings (plates) have been furnished to provide sufficient detail to allow review of the existing features and the proposed plan. A project location and vicinity map is provided as PLATE 1. PLATE 2 shows the overall components of the Selected Plan. PLATE 3 and 4 provide the elevation profiles related to levee placement. PLATE 5 provides the plan for specific project features and appropriate cross-sections. PLATE 6 provides monthly elevation-duration curves for the Dresser Island area, and PLATE 7 provides a stage hydrograph for the pool and tailwater for the period 1972-1986. Additionally, various figures and tables have been included in the text of the DPR to enhance the readers understanding of the project.

e. 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 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...

2. GENERAL PROJECT SELECTION PROCESS.

a. Eligibility Criteria. A design memorandum (or implementation document) did not exist at the time of the enactment of Section 1103 of the Water Resources Development Act of 1986. 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 USFWS, Region 3, and the five affected states (Illinois, Iowa, Minnesota, Missouri, and Wisconsin) participated 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.

Coordination with the states and the USFWS during the preparation of the General Plan and Annual Addendums led to an examination of the Comprehensive Master Plan for the Management of the Upper Mississippi River System. The Master Plan, completed by the Upper Mississippi River Basin Commission in 1981, was the basis of the recommendations enacted into law in Section 1103. 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 has resulted in the following conclusions:

(1) 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....

(2) 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.

b. Selection Process. In the past, projects were 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. Although MODOC ranked the Dresser Island project of equal importance to the Clarksville Refuge project (for which construction has begun), plans for the Dresser Island project required more time to develop.

3. AFFECTED ENVIRONMENT AND FUTURE WITHOUT

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

a. Physiography-Topography. Dresser island lies in the floodplain of the Mississippi River and consists of alluvial material. It is relatively flat, with elevations ranging from about 419 to 424.5 feet NGVD (National Geodetic Vertical Datum). Normal pool level is approximately 419 NGVD. Maps from the first channel surveys document the island's existence as early as the 1820's, indicating the land mass is at least 165 years old.

The existing condition of the wetland area is anticipated to decline in the future if the project is not implemented. Additional filling of Brickhouse Slough and the island's backwaters would occur as a result of sediment deposition during each minor flood event eventually raising the elevation of the island and further filling in of the side channel.

b. Water Quality. Water quality is a significant item, primarily in terms of required compliance with the Clean Water Act. A Section 404 (b)(1) evaluation has been prepared for this project and is included as an attachment to the DPR/EA. Before construction, a public notice for Section 404 (b)(1) and Section 401 of the Clean Water Act will be circulated for public review and comment separately from DPR/EA.

The major water quality parameters affecting Dresser Island and its associated side channel are the suspended sediment load being carried by the Mississippi River, and the warm water outflow from the Union Electric Sioux Power Plant located immediately upstream of the island.

(1) Suspended Sediment Load. Daily suspended sediment and particle size of suspended material have been collected by the U.S. Geological Survey on the Mississippi River at Alton, Illinois (River Mile 207.8) since May 20, 1980. The water quality station at Alton recorded the following suspended sediment discharges for the period of record 1980-1985: Maximum load of 1,120,000 tons/day, minimum of 1,290 tons/day, with a mean of 112,000 tons/day (calculated from U.S. Geological Survey data).

Recent soundings indicate that the side channel's bottom is composed of 4-5 feet of muck. The St. Louis District used Brickhouse Slough as one of their models in estimating the total aggradation of sediment from 1970 to 1985 (see Simons et al. 1988). These estimates indicate that sediment deposition has changed the bed over the 15-year period by plus 1.7 and 0.5 feet at River Miles 209.5 and 209.1, respectively, near the entrance to the side channel. The estimated change was plus 0.5 feet at River Mile 205.7 near the exit to Brickhouse Slough (Simons et. al 1988).

In the future, suspended sediment loads may change depending on implementation of soil conservation practices in the Mississippi River System Basin. However, suspended sediment deposition is anticipated to remain a problem in the project area. Additional filling due to sediment deposition during each minor flood event would cause further degradation of the island's wetlands and the side channel. Without the project, complete blockage of the entrance to the side channel is expected within 10-years.

(2) Water Temperature. The effects of temperature on water quality are numerous; of particular importance, as water temperature increases, its capacity to hold oxygen decreases. Mean monthly temperatures of water released from the the Union Electric Power Plant ranges from 10 to 15 F above mean ambient river temperatures (FIGURE 3) (1987 data, Union Electric Company). FIGURE 3 gives the intake and effluent water temperatures of the power plant for 1987 and TABLE 1 provides mean monthly discharge volumes for that year. In general, the plant's warm water effluent flows into Brickhouse Slough and along the riverside shore of Dresser Island keeping much of these areas ice-free during even the coldest of winters. However, during low and moderate pool levels, many of the island's interior wetlands do not receive the warmer water due to their relative isolation. Plume studies indicate that the warm water from power plants moves far downstream before completely mixing with the cooler river water (EEH 1976). Except for water temperature, the quality of water leaving the plant is not significantly different from the ambient river water, therefore the effluent is not chemically treated.

c. Hydrology. Flooding of the island begins to occur at approximate elevation 420 feet NGVD, corresponding to a recurrence interval of about once in 2 years. A discharge rating curve was developed which related discharge along the mainstem Mississippi River to discharge along Brickhouse Slough (see FIGURE 7.3 in Simons et al. 1988). The daily discharges of record for the

FIGURE 3. MEAN MONTHLY TEMPERATURES OF INTAKE (ABMIENT) AND EFFLUENT (OUTFLOW) WATER FROM UNION ELECTRIC'S SIOUX POWER PLANT FOR 1987 (SOURCE: CALCULATED FROM 1987 RAW DATA, UNION ELECTRIC).

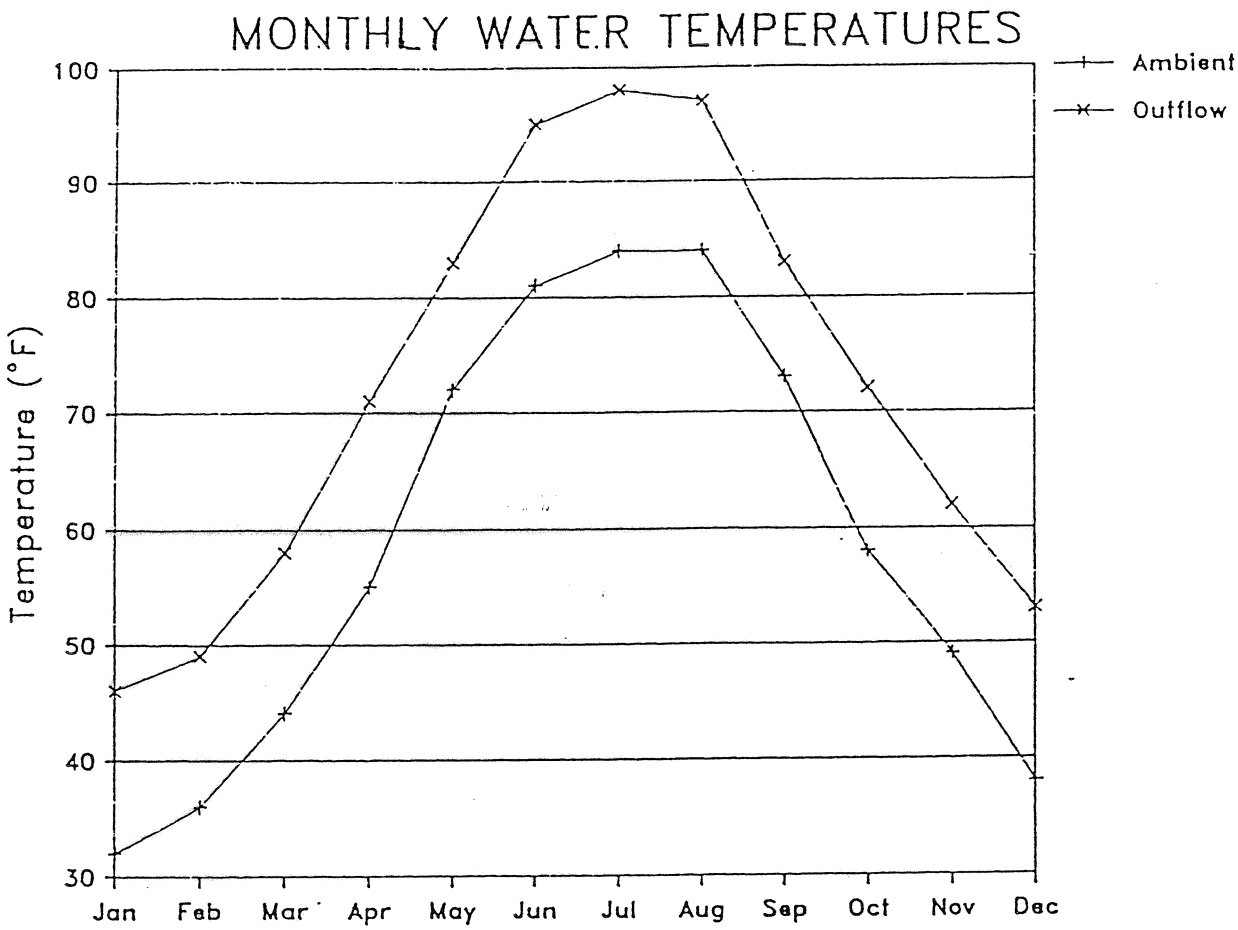


TABLE 1. MEAN MONTHLY WATER FLOW IN MILLIONS OF GALLONS PER DAY (MGD) AND CUBIC FEET PER SECOND (CFS) FROM UNION ELECTRIC'S SIOUX POWER PLANT FOR 1987 (SOURCE: CALCULATED FROM 1987 RAW DATA, UNION ELECTRIC).

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Discharge												
MGD:	662	595	582	672	573	645	653	662	624	369	458	540
CFS:	1024	920	900	1040	886	998	1010	1024	965	571	709	835

Mississippi River at Alton (1927 to 1981) are given in TABLE 2 showing the maximum, mean, and minimum discharges along with the corresponding flow volume through the side channel as derived from the curve.

d. Air Quality. The West Alton area has been classified as "unclassified" for particulate matter less than 10 microns, according to the Missouri Department of Natural Resources (Missouri Department of Natural Resources 1988). Most of the air pollutants consist of suspended particles from agricultural activities and navigation operations. No sources of air pollution exist on Dresser Island. The existing air quality conditions are expected into the future if the project is not implemented.

e. Noise. The major sources of ambient noise in the project area result from diesel power plants of tows passing in the main channel of the Mississippi River and the occasional motorboat navigating within the project area.

f. Prime Farmland. The area currently is a wetland and experiences frequent flooding. As such, the project area would not qualify as prime farmland.

g. Aquatic Resources. During high flow periods most of Dresser Island's wetlands are connected to the Mississippi River and function as spawning and nursery areas for fish during the spring and early summer. Based on life history information provided in Pflieger (1975) and Smith (1979), species such as carp, carpsuckers (*Carpiodes* spp.), buffalos (*Ictiobus* spp.), catfish, largemouth bass, sunfish (*Lepomis* spp.), and other fish species would be expected to use the area for spawning and feeding. During the winter, the warm water released from the upstream power plant (see FIGURE 3) probably benefits the local fish populations by preventing complete freeze over of the shallow waters and maintaining more optimal conditions for their food resources. During the summer the warm water release probably increases the temperature of the already warm river water causing a further drop in dissolved oxygen levels. Such conditions can stress fish. Nevertheless, there are no actual records of summer fish kills from the project area (T. LaRue, Missouri Dept. of Conservation, pers. comm. 1988).

Fishes can move into the side channel at both the upper and lower ends. During normal water levels, fishes have access to the interior wetlands of Dresser Island by any of four water passages, all along the lower half of the island (see FIGURE 1). These are all relatively shallow and narrow exit channels from the interior wetlands. Movement of fish within the interior wetlands is restricted since many of the interconnecting waterways have silted in and grown over by woody vegetation (e.g., willows and cottonwoods). The entrance, or upper end, of the side channel is braided as a result of sediment deposition. At the present rate of sediment deposition, the upper end of the side channel will be closed off completely. Moreover, entrances into the interior wetlands are also expected to slowly fill with sediment, become smaller, and some of these will probably fill completely. Thus, river fish access into the interior wetlands, as well as fish movement within the wetland complex, will be further restricted in the future if the project is not implemented.

TABLE 2. ESTIMATED WATER FLOW INTO BRICKHOUSE SLOUGH IN RELATION TO DISCHARGES MEASURED FOR TOTAL MISSISSIPPI RIVER AT ALTON ILLINOIS (1927-1981). (ESTIMATE FOR SIDE CHANNEL DERIVED FROM ENERGY CURVE USED BY SIMONS ET AL. [1988]. MAXIMUM RECORD FROM 1973, MINIMUM FROM 1948, SOURCE: U.S. GEOLOGICAL SURVEY DATA CITED BY U.S. DEPARTMENT OF AGRICULTURE 1982). (CFS=CUBIC FEET PER SECOND).

	Maximum CFS	Minimum CFS	Mean CFS
Mississippi River at Alton, Illinois	535,000	7,960	99,000
Brickhouse Slough	8,600	<<100	100

In the future, if the project is not constructed, it is expected that continued sedimentation will reduce water storage capacity even further. A raised topographic level would also reduce the depth of water in the side channel and interior wetlands thereby reducing the usefulness of the area as a spawning and nursery area. If no rehabilitation project is constructed the spawning and nursery function of the wetland complex will be greatly reduced or eliminated due to sedimentation and natural succession of the area.

h. Terrestrial/Wetland Resources.

(1) Floodplain Forest. Currently, about 500 acres of the island consists of bottomland forest. Additional bottomland forest is found on the main shore adjacent to the island, and patches of forest occur on the many small islands in the upper reach of Brickhouse Slough. The majority of these forested areas can be classified as wetland and falls within the Palustrine System, Forested Wetland Class and Broad-leaved Deciduous Subclass (see Cowardin et al. 1979). The water regime is intermittently flooded (i.e., the substrate is usually exposed, but surface water is present for variable periods without detectable seasonal periodicity). The dominant tree species are silver maple, eastern cottonwood, black willow, and sycamore. The lower end of the island has a large number of hardwoods, such as pin oak, pecan, and hackberry. Understory plants are typical of the Mississippi floodplain, and include such species as poison ivy, stinging nettles, and jewelweed.

(2) Interior Open Wetlands. About 225 acres of Dresser Island is made up of open wetlands. Additional backwaters and open wetlands are found along the main Missouri shore. These areas consist of mixed open water surrounded by emergent, floating-leafed and submergent aquatic plants. The majority of these habitats can be classified within the Palustrine Systems' classes of Aquatic Bed and Emergent Wetland (Cowardin et al. 1979). Typical rooted vascular plants include water lilies, smartweeds, sedges, cattails, arrowhead, and buttonbush. In the absence of the rehabilitation project, the open wetland habitat will continue to disappear.

(3) Brickhouse Slough. The Dresser Island side channel consists of roughly 230 acres of open water (100 acres at the upper end, 130 acres at the lower end). In its upper end, Brickhouse Slough is braided due to the recent formation of many small islands created by sediment deposition. Most of the upper end is very shallow - many areas are less than 1-foot deep during normal pool level (418-419 feet NGVD). Hydraulic modeling results indicate complete blockage of the entrance to Brickhouse Slough within 10 years.

(4) Wildlife. Game species that use the area include such species as white-tailed deer, and gray and fox squirrels. Furbearing mammals include red fox, coyote, raccoon, beaver, muskrat, and mink. Probable resident reptiles and amphibians include the northern spring peeper, bullfrog, and northern water snake. Passerine birds frequent the project area, and species such as the long-billed marsh wren and swamp sparrow may use the wetland as breeding habitat. Great blue herons and mallards are common, and wood ducks are often seen in the late spring with their young.

i. Historic Properties. Maps from the first channel surveys document the island's existence as early as the 1820's, indicating the land mass is at least 165 years old. There are no known historic sites of significance on the island.

j. Socioeconomic Resources. There are no human residences or other permanent improvements on Dresser Island. The only access to the island is by boat. A small area of riverfront near the downstream end of the island has been leased to a barge company and barges are occasionally moored at the site. On the Missouri mainland, near the lower half of the island, is the Brickhouse Slough subdivision consisting of 105 cabin sites. These are all on Federal land and leased by the Corps to the public as summer cabins.

k. Recreation. In the past, Dresser Island and Brickhouse Slough provided excellent waterfowl hunting opportunities with 41 blind sites annually available to the public. Some 34 duck blind sites remain active on the island but many are little used due to declining waterfowl numbers, assumed to be the result of the wetland habitat loss. Other recreational activities in the project area include fishing and boating, as well as trapping and hunting. In the future without condition, both duck hunting and fishing in the area would be expected to decline even further due to the continued loss of wetland habitat. Along with the continued sedimentation in the upper reach and shallower water depths, it is expected that there will also be a decrease in the usefulness of the MODOC boatramp as a boat launching site.

l. Aesthetics. The aesthetics of Dresser Island and Brickhouse Slough would be considered typical for a wetland area of the Mississippi River. From an aesthetic viewpoint, it is expected that if a project is not built, then the area would remain similar to the existing condition, with the exception of water storage capacity which would be reduced by sedimentation. Natural succession of vegetation would also occur. The magnitude would depend on measures taken to retard succession - such as, controlling willow growth.

4. PROJECT OBJECTIVES. The measurable goals and objectives for the Dresser Island project are outlined in TABLE 3.

5. ALTERNATIVES.

a. Alternative A - No Federal Action. No Federal action would consist of no Federal funds being provided to meet the project purposes. State and local funds would be required to restore and enhance aquatic habitat.

b. Alternative B - Excavation. This alternative would entail large-scale excavations to deepen the interior wetlands and the slough, thus rehabilitating the areas damaged by siltation.

c. Alternative C - Levee System. This alternative entails the construction of a low levee to reduce the frequency that silt-laden floodwater can enter the project area. It would also require provisions for the

TABLE 3

MEASURABLE GOALS AND OBJECTIVES FOR DRESSER ISLAND PROJECT

Goals	Objectives	Potential Enhancement Feature	Unit of Measure	Enhancement Potential	
				Existing	Target
Reduce Sedimentation	Decrease river sediment input into Dresser Island Interior Wetlands and Backhouse Slough	Levee	Inches per year	0.50	0.05
Water Level Control	Provide means to control water levels within complex independent of river stage	Levee/Gated Drains/Connecting Ditches	Graphed comparison between river stage and actual interior water levels achieved	No Difference	Difference
Enhance Wetland	Manage wetlands via seeding/planting & water control to increase food production areas for waterfowl (moist soil species)	Moist Soil Management Units (MSMU)	Annual Habitat Units	33	209 at 419 NGVD 276 at 420 NGVD 406 at 422 NGVD
	To extent compatable with MSMU operation - manage wetlands (water; flow, levels, temperatures, to enhance fish survival, reproduction and release to river	Levee/Gated Drains/ Connecting Ditches/ Borrow Pits	Acres	0	360+

management of water levels within the levee system to allow for the creation of a moist soil management unit (MSMU). The potential components of such a system are briefly described below.

(1) Levee. Key features of a levee requiring optimization include levee height and levee alignment.

(2) Borrow Areas. Borrow areas would be needed as a source of construction material. 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 tree vegetation.

(3) Interior Ditches. Shallow ditches would connect interior wetlands and also improve water circulation to and from Brickhouse Slough. Excavated material could be used for levee construction.

(4) Water Control Devices.

(a) Pumps. One means of obtaining control over interior water levels would be through the use of commercially available water pumps.

(b) Drains. Water intake structures consisting of gated drains placed along the upstream portion of the levee system, would permit control of of water flows into the leveed area without the need for pumping. This feature would also permit the control of water teperatures within the leveed system. Gated drains could also be used as water outlet structures. The drains would be located in topographic depressions along the downstream portion of the levee system and would be used primarily to discharge interior water. The drains could also be used to intake backwater when the pool is at normal or higher stages. Various types of gates and the number and of drains require consideration. Installation of gates and drains could be accomplished by cofferdam placement or by "in-the-wet" construction techniques.

(5) Fish and Wildlife Management. A number of fish and wildlife management practices could be utilized to increase the quality of the habitat within a leveed project area. Preliminary possibilities included aerial seeding of wildlife-preferred food and cover plants, clearing of less desirable vegetation (e.g. willows and cottonwood), planting mast-producing hardwoods, and placement of fish habitat structures.

6. EVALUATION OF ALTERNATIVES.

a. Alternative A - No Federal Action, would not meet the planning objectives of sediment and water control. The areas wetlands would continue to deteriorate as aquatic habitat succeeds to terrestrial habitat. Food production for waterfowl would continue to be unreliable--fluctuating depending upon season and river stage. The potential for fish kills would continue due to extreme low water effects on fish entrapment, low dissolved oxygen levels, high summer water temperatures, and winter freeze-outs. The loss of these wetland areas would be unacceptable from a fish and wildlife standpoint.

b. Alternative B - Excavation, was rejected since it would only partially address the planning objectives. Unacceptable features included: lack of

control over future sedimentation; lack of control over interior water levels; probable high costs and difficulties with disposal of excavated materials; little compatibility with current fish and wildlife management practices.

c. Alternative C - Levee System, would address all of the planning objectives, and was therefore accepted as the only viable project alternative. An evaluation of the various component features of a levee system follows (also see TABLE 4 summary):

(1) Levee.

(a) Levee Height. The maximum elevation for the project levee was selected by comparing levee height to cost-effectiveness (TABLE 5). In general, the higher the levee, the greater amount of sediment reduction. However, since sediments are more concentrated in the lower portion of the water column - with each additional foot of levee elevation, there is proportionally less and less sediment to be deflected. TABLE 5 shows the cost effectiveness of those levee heights that meet the stated planning objective of 90 percent or greater sediment reduction. The project's local sponsor, MODOC, has recommended a maximum design elevation of 426 NGVD. The Department's recommendation is based on many years of habitat management experience in the navigation pools, and takes into account historical flood events. Based on the TABLE 5 results, this recommendation appears to be reasonable. Above the elevation of 426 NGVD, levee costs begin to increase greatly with little increase in additional sediment reduction. While the levee cost for 426 NGVD is 34 percent higher than for 425 NGVD, this increase in cost does not appear to be exorbitant when it is expressed as a percentage of total project cost (i.e. 6 percent). In addition, the 426 NGVD elevation provides some additional assurance (4 percent) that our sediment reduction objective will be achieved.

(b) Levee Alignment. Four levee alignment configurations were considered (FIGURE 4). These were: Alignment A, a levee encircling the upper portion of Dresser Island; Alignment B, a levee capturing all of the upper island and also the upper portion of Brickhouse Slough; Alignment C, a levee capturing all of the upper island, the upper slough, and also the lower most portion of the island, and Alignment D, a levee capturing all of the upper island, upper slough, lower island and lower slough.

Alignments A and D were dropped from serious consideration. While Alignment A would make substantial contributions to sediment and water control on Dresser Island, it would do nothing to address the stated objective of controlling sediment input into Brickhouse Slough. Alignment D did address all of the planning objectives; however, it was eliminated due to its potential for adverse recreational impacts. A large number of cabin leaseholds are present on the Missouri shore, along the lower slough. Any closure of this reach would severely impact recreationists via blockage of boat access between public and private launch areas and the Mississippi River.

Both Alignments B and C were found to meet the planning objectives, and did not appear to reflect any significantly adverse impacts. TABLE 6 was prepared to compare levee length and cost effectiveness for these two alignments. While the total cost of levee construction (and in fact the cost of the entire project) would be greater for Alignment C than for Alignment B, the actual levee cost (in dollars) per acre managed was greater for

TABLE 4

EVALUATION OF LEVEE SYSTEM FEATURES

Measure	Planning Objectives	Decision/Remarks
Levee	T	(I) Select riverside crown elevation at 426 NGVD. Select levee alignment C.
Borrow Areas	T	(I) Borrow req'd for levee construction. Evaluation includes site and align'mt.
Interior Ditches	T	(I) Excavated mat'l also used for borrow.
Pumps	T	(d) Addn'l cost. Measure not needed with gravity drains.
Intake Structures	T	(I)
Outlet Structures	T	(I)
Habitat Management	T	(I) To be implemented by sponsor.

Key:

T = Measure is totally compatible.
I = Measure included in Selected Plan.
D = Measure deleted; not further considered.

TABLE 5

COMPARISON OF LEVEE HEIGHT VS COST-EFFECTIVENESS

[1] Maximum Riverside Levee Elevation	[2] Sediment Reduction (%)	[3] Levee Cost ($1,000)	[4] Levee Cost as Percentage of Total Project Cost
425	91 (0)	325 (0)	16 (0)
+426	95 (+4)	435 (+34)	21 (+6)
427	97 (+6)	565 (+74)	28 (+12)
428	99 (+8)	705 (+117)	35 (+19)

( ) = Percent Changes from 425 NGVD Value

+ Sponsor recommended levee crown elevation along riverside segment.

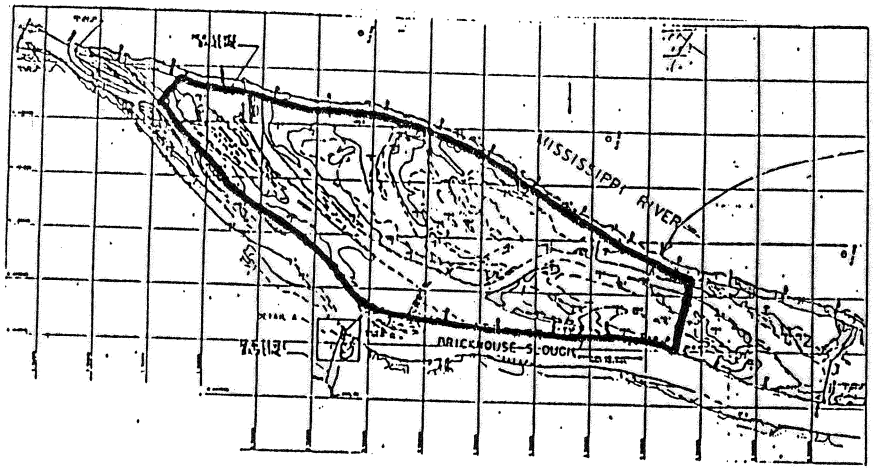
1 Only those levee elevations meeting the stated planning objective of at least 90% sediment reduction are included.

2 Sediment reduction based on a generalized relationship relating height of water column to sediment concentration.

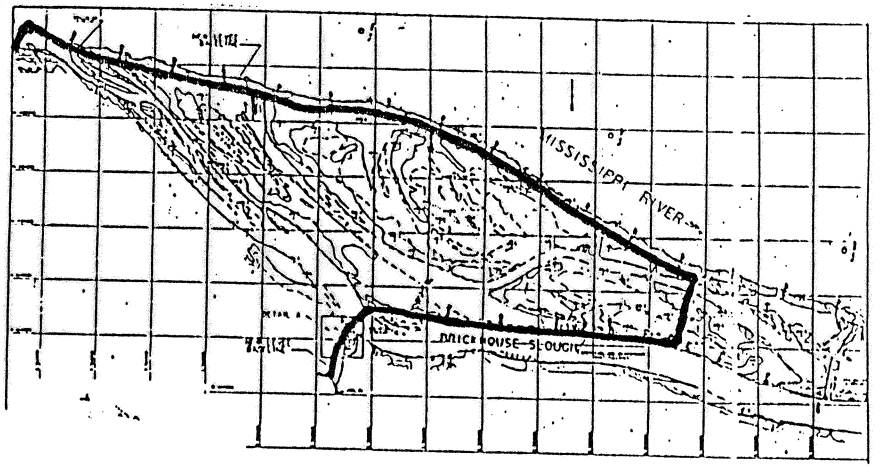
3 Levee cost based on a generalized relationship relating levee height to cross-sectional area, and on the known cost of constructing a levee to 426 NGVD.

4 For the purposes of this screening analysis a gross project cost of $2 million was assumed.

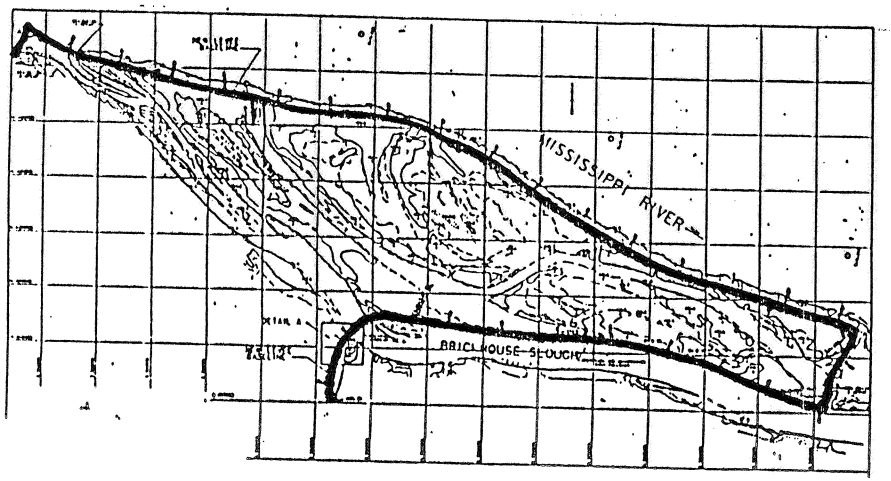
FIGURE 4. LEVEE ALIGNMENT OPTIONS



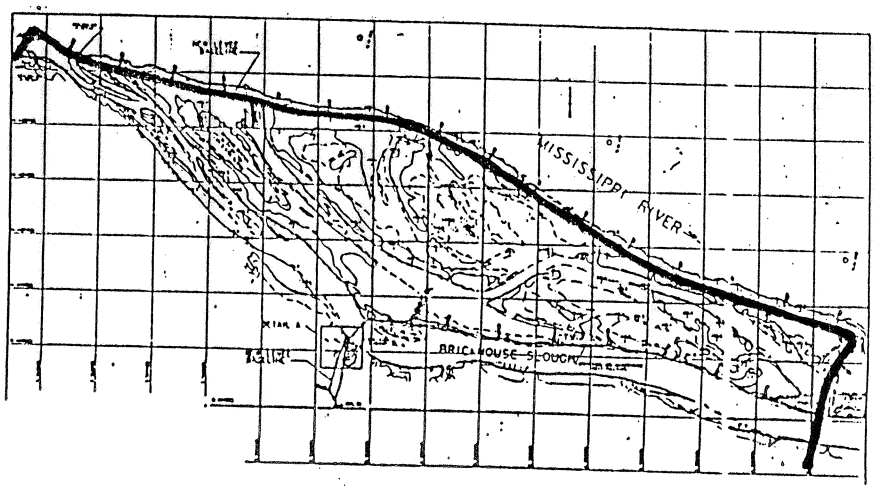
Alignment A



Alignment B



Alignment C



Alignment D

TABLE 6

COMPARISON OF LEVEE LENGTH VS COST-EFFECTIVENESS

Alignment	Total Management Acres	Levee Length (FT)	Total Levee Cost ($1,000)	Levee Cost Per Acre Managed ($ per ac)
B (Upper Island + Upper Slough)	580	Earth 17,625 Rock 4,600	385	664
C (Upper Island + Upper Slough + Lower Island)	695	Earth 23,650 Rock 4,600	430	619

* Costs assume a riverside levee height of 426 NGVD.

Alternative B than for Alternative C. In recognition that environmental management is the main intent of the UMRS-EMP, the District opted for Alignment C which provides a larger scale, but more cost effective management option.

It was determined that any levees constructed would need to be set-back approximately 200 feet from the river bank in order to provide a buffer for wave wash, to preserve riparian habitat and to retain the large trees which provide perches for wintering bald eagles.

(c) Levee Material/Slope. The Dresser Island Levee system will be a combination of earth embankment and rockfill dike section design. Based on preliminary geotechnical investigations, the upper most soils (i.e., top 5 feet) on the island are suitable for the earth embankment sections of the levee. For the sections of the levee to be constructred across Brickhouse slough or in depressed marshy areas, a rockfill dike section will be required. To minimize the amount of seepage through the rockfill dike sections, a core zone of quarry - run stone maximum size 200 lbs. to 300 lbs. will be used. As these rockfill dikes are subject to overtopping, ice flows, water velocities and floodborne debris the core zone will be protected using a layer of graded stone "C" or "B." All earthen sections of the levee would require standard 1 on 3 side slopes, while the rockfill dike sections could be constructed at a steeper 1 on 2 side slope.

(2) Borrow Pits. It was decided that borrow areas needed to be as close to the landside toe of the levee as possible to minimize haul costs. This would result in a series of long, narrow borrow excavations extending parallel to the axis of the levee. These sites could be easily converted for use as additional moist soil habitat areas.

(3) Interior Ditches. This low cost item ($3,400) would provide a technically and environmentally feasible way to improve water circulation and drainage between major sections of the interior wetlands. Only some 1,700 cubic yards of earth would have to be excavated to create the two 150-feet long shallow ditches, and the work could be accomplished concurrently with the levee construction.

(4) Water Control Devices.

(a) Pumps. Pumping equipment was excluded from a levee plan when it was determined that interior water levels could be adequately controlled with relatively lower cost and longer-lasting gravity drainage systems.

(b) Drains. These structures are capable of providing sufficient quantities of water for effective habitat management without requiring the use of pumping equipment.

1. Water Intake Structures. It was decided that the gated drains at the upper end of the project should be located to allow intake of warm water from the power plant discharges or somewhat cooler water from the riverside set of drains.

The selection of the designs for the gates was based upon such factors as maintenance and operating convenience, function and extended service life. Gates to be located in riverside areas exposed to ice flows and floodborne debris received special design consideration, resulting in the use of gatewells to protect operating mechanisms and to facilitate maintenance. Three types of gates were considered; sluice gates, flap gates and combination gates. Sluice gates were determined to be most suitable for controlling the volume and temperature of intake water.

The corrugated metal pipe (CMP) drains were sized on the basis of both capacity and ease of maintenance. The project sponsor, MODOC, established that a capacity of approximately 800 acre feet of water per day would be needed for managing the wetland areas. Water intake would normally be through either the warm water or cooler water set of drains, not through both sets at the same time. Due to the limited depths of water in the locations where the drains would be placed, a 48-inch diameter pipe was determined to be the largest practicable size. As a 48-inch diameter CMP can deliver 200 acre feet per day, it was apparent that two sets of four pipes each would be needed to achieve the required capacity. As an additional factor, it was believed that the sets of 48-inch diameter pipe would be easier to maintain than would an installation involving a larger number of smaller diameter pipes.

Construction techniques were considered whereby the drains would be emplaced without dewatering the site. As none of these would assure proper compaction of material around and under the pipes, these techniques were discarded in favor of conventional construction within cofferdams, thereby avoiding potential future maintenance costs.

2 Water Outlet Structures. In combination with the levee and intake structures, this feature would be needed to complete the water level control system. For the closure near the midpoint of Brickhouse Slough, it was determined that a set of four 48-inch diameter CMP's with sluice gates would be needed to balance inflows of oxygenated water through the upper slough. For management purposes, it was determined that dewatering time for the interior wetlands was not critical. Based on past experience, MODOC determined that two sets of two 30-inch diameter pipes, placed at lower elevations at the downstream end of the project, would provide an acceptable flow for management purposes. All pipes would be placed as close to the bottom of existing channels as possible in order for the drains to operate efficiently. While combination sluice/flap gates were believed to provide greater flexibility in discharging interior water or allowing intake of backwater, the less costly sluice gates were found to be adequate. All drainage structures would be constructed within cofferdams for the same reasons discussed previously.

(5) Fish and Wildlife Management. This feature was determined to be compatible with the stated objectives of the project. The measure complements structural improvements, is cost effective and would provide an important means for increasing habitat quality at the project site.

7. SELECTED PLAN WITH DETAILED DESCRIPTION.

a. General Description. The following is a description of the Selected Plan. Major features of the plan are listed in TABLE 7 and are depicted in FIGURE 1.

TABLE 7. MAJOR COMPONENTS OF THE SELECTED PLAN

1. Levees (total length: 28,250 feet)

   a. Earthen levee, average 2-5 feet high and approximately 23,650 feet long.

   b. Rock-filled closures about 4,600 feet long.

2. Borrow Areas - total of 37 acres to provide levee fill material.

3. Water Control Structures - Gravity Drains:

   a. Inlet - eight 48-inch diameter drains with pneumatically operated sluice gates.

   b. Outlet - four 48-inch, and four 30-inch diameter drains, pneumatically operated sluice gates for control of interior water levels.

4. Interior ditches - Two 150-feet long shallow ditches to improve water circulation and drainage by connecting interior wetlands and upper reach of side channel.
5. Fish and Wildlife Management - Seeding, tree planting, and controlling growth of willows and cottonwoods in open wetlands.

b. Levee. In order to retard deposition of sediment on interior wetlands and in the upper portion of Brickhouse Slough, a levee would be constructed encircling most of Dresser Island with connections to the Missouri mainland (FIGURE 1). Under the Selected Plan, the proposed levee would be two to five feet high, some 28,250 feet long, and cover approximately 35 acres, with its upstream end tying into high ground near the Union Electric Company's Sioux Power Plant on the Missouri shore. The levee would extend along the island's entire riverside shore and enclose the lower one-half of the island's shoreline facing Brickhouse Slough. At this approximate midpoint, the levee would encompass the proposed rock-fill closure across Brickhouse Slough and would then terminate at higher ground on the Missouri shore. On the island, the levee would be set back approximately 200 feet from the edge of normal pool in order to provide a timbered buffer zone to benefit wildlife and to reduce erosion by wave wash. The levee would be overtopped by flood events with recurrence intervals of once in seven years or greater. Side slopes of the earthen levee sections would be 1 on 3, while rockfill sections would have steeper, 1 on 2 slopes. The crown width would be 10 feet. After construction, earth slopes would be sown with a mixture of wildlife-preferred legumes and grasses.

c. Borrow Areas. Construction materials for the levee would be excavated from borrow areas on the island. These borrow areas would all be in the interior of the new levee system and run roughly parallel to the axis of the

levee. Specific borrow sites would be selected jointly by Corps and Missouri Department of Conservation personnel. Most borrow areas will be about 100-feet wide and excavated only 1 to 3 feet deep because of the high ground water table in the project area. Some reaches of the levee are along areas of especially low elevation and high water table (e.g., portions of the island's levee facing Brickhouse Slough). In these cases, borrow will be taken from adjacent higher ground, resulting in borrow pits of larger surface dimensions. Approximately 37 total acres will be used for borrow. Resulting borrow pits are expected to hold water and thus provide additional wetland habitat. Ditches excavated to establish water connections between the upper reach of Brickhouse Slough and interior wetlands will provide an additional source of borrow material.

d. Water Control Structures. The Selected Plan provides for the placement of twelve 48-inch diameter drains and four 30-inch diameter drains. These drains would be equipped with pneumatic-operated sluice gates on the inside of the gatewells. The purpose and configuration of gates would be to permit maximum flexibility in controlling water levels without the need for pumping, and to permit some control of water temperatures. The size of these drains would enable filling of the interior at the rate of a few cubic feet per second (CFS) to as high as 1,000-plus CFS depending upon head (difference between exterior and interior water surface elevations), and number of drains open at any particular time.

(1) Water Intake Structures. Two sets of four 48-inch diameter drains would be near the upstream section of the island and used for water intake. These would be equipped with sluice gates. One set would be for warm water intake and installed in the rock dike at the far upper end of the entrance to Brickhouse Slough, approximately 2,000 feet directly downstream from the Union Electric power plant's cooling water discharge pipes (located on the Missouri shore). The second set of intake drains would be placed in the rock dike at the more riverside portion of the side channel's entrance in order to deliver slightly cooler waters into the wetland complex.

(2) Water Outflow Structures. Four 48-inch diameter drains and four 30-inch diameter drains would be installed in the lower section of the island and side channel and used principally for water release. However, these could also be used when needed to fill the interior wetlands with back-in water when the pool is at normal stage or higher. All drains would be equipped with pneumatic-operated sluice gates.

8. DESIGN AND CONSTRUCTION CONSIDERATIONS.

a. Subsurface Exploration Data. Thirty three hand auger borings (5 feet deep) taken along the levee centerline, nine hand pushed grab samples (2 feet deep) and three hand auger borings (5 feet deep) taken at selected culvert installation locations around the island indicate the borrow and foundation soils to be generally clays (CL,CH) and silts (ML). The field logs and the boring locations will be presented in the Plans and Specifications. Additional hand auger borings will be taken in borrow areas where no boring information is currently available and several overwater borings are proposed at selected culvert locations.

b. Existing Site Conditions. Embankment construction and excavation equipment is dependent upon existing water elevations during the construction period. During normal dry seasons of the year and low river stages, conventional excavation equipment may be used for the construction and excavation work. However, when groundwater conditions are very high, excavation of some wet borrow material and the subsequent stockpiling and drying out of the material will be allowed. The cost of this operation is reflected in the cost estimate.

c. Borrow Sites Usage. 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 objectives of the project.

d. Earth Embankment Levee. The design for the earth embankment sections of the levee system around Dresser Island will be evaluated for stability, settlement, and seepage problems prior to Plans and Specifications. All earthen embankment sections of the levee will require at least 1 on 3 side slopes. The construction of the earthen embankment sections will probably be done with a combination of earth moving equipment and a dragline.

e. Rockfill Dike Levee. The design for the rockfill dike section of the levee system will meet stability and settlement, as well as specific project requirements. For this project, these requirements include thru seepage control to reduce sedimentation, maintaining a fluctuating water level at various times of the year, and withstanding overtopping, ice action and water velocities. To meet these requirements, the rock dike will be composed of a quarry-run stone 200 lb. to 300 lb. top size for seepage control capped with a layer of graded stone "C" and/or "B" stone to minimize damage resulting from overtopping wave action and water velocities. It is anticipated that the use of a dike core constructed of quarry-run stone will result in a tight structure with minimal seepage. Limited seepage is considered to be acceptable and will not affect the performance of the project. Siltation over time will tend to reduce seepage losses through the rockfill dikes as well. The construction of the rockfill sections will probably be done with a combination of earth moving equipment and a dragline. Some control of rock placement may be required to avoid large areas of rockfill being placed with little or no fines.

f. Construction Materials. Only common construction materials are required for this project. Construction of the lower closure across brickhouse slough will allow access to the island for management and maintenance purposes.

Stone sources are available from nearby river terminals and probably would be transported by floating barge to the project site.

After construction of the lower closure, construction materials can be transported over the lower closure to the island using conventional equipment.

Because of the significant quantity of stone, sources were investigated and are readily available within several miles of the project site. These materials could be transported to the project site by floating barge.

g. Erosion Control. 1 on 5 side slopes are proposed on both sides of the overflow section of the perimeter levee to protect against erosion during overflow. The levee would also be backfilled with water when severe flood conditions occur. This would reduce the head differential on the levee system.

An estimated width of approximately 200 feet of existing mature timber will remain in most reaches between the new levee and the Mississippi River to provide a natural buffer from Mississippi River high flood events. This natural undisturbed zone should adequately protect the new levee.

Seeding will be required immediately following the drainage ditch excavation and also on the proposed levee sections to ensure face stability from erosion forces.

h. Permits. Appendix DPR-D provides a Clean Water Act Section 404(b)(1) Evaluation Report for the Dresser Island project. This revised documentation is also being forwarded to the Missouri Department of Natural Resources along with a request for the state's Section 401 Water Quality Certification. The District is currently researching the question of whether or not the proposed levee would impact the Highway 94 right-of-way. If it does, the District will seek a permit from the state.

9. ENVIRONMENTAL EFFECTS. The following section presents a discussion of the environmental impacts of the Selected Plan. TABLE 8 is an environmental assessment matrix which summarizes most of the data.

a. Physiography-Topography. With the construction of the project, the topography of the island and side channel will be altered. The construction of levees and borrow material excavations represent permanent changes in the topography of the area.

b. Water Quality.

(1) Erosion and Sedimentation. The proposed levee will protect the wetland area from sediment deposition during minor flood events. Major flooding will overtop the levee and some sediment will be deposited during such events. This effect will be reduced, however, by allowing initial overtopping to occur at the lower end of the island (at 422.5 NGVD). Based on computer modeling, sediment deposition in the lower sections of the Brickhouse Slough side channel, outside the proposed levee system, would not be affected by the project.

It is also anticipated that construction activities will have little impact on the adjacent Mississippi River. Construction of the levee could cause short-term increases in suspended materials due to erosion if flooding should occur during the construction. However, construction will take place during a period when the probability of a flood event is low. Exposed and stripped areas will be seeded or revegetated to prevent erosion. Except for water temperature differences, the water quality of the effluent from the upstream power plant does not differ significantly from the ambient river water. The water effluent from the plant is not chemically treated and therefore water diverted into the island's wetlands should have no significant impact on the water quality of the project area.

TABLE 8. ENVIRONMENTAL IMPACT ASSESSMENT MATRIX

Parameter	Magnitude of Probable Impact: Increasing Beneficial Impact: Significant	Substantial	Minor	No Appreciable Effect	Increasing Adverse Impact: 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			

(2) Water Temperature. It is expected that the temperature of water flowing into Brickhouse Slough will be similar to that of existing conditions; however, the presence of one set of intake structures immediately below the Union Electric power plant, and a second set of intakes nearer the main river channel (FIGURE 1) will permit some control over temperatures (See FIGURE 5 Regulation Plan):

(a) Winter/Cold Weather Control. During the winter, the upstream gates can be opened to allow intake of warm water released from the power plant into Brickhouse Slough and circulation into the interior wetlands via the newly excavated ditches. This would reduce the ice cover and risk of total freeze over in the shallower waters.

(b) Summer/Warm Weather Control. During the warmer months of the year two possible methods of maintaining slightly cooler water temperatures in the closed system exist. These include: 1)completely shutting off the influx of heated waters at the upstream end of the island into the wetland complex by closing both sets of intake drains; or 2)opening only the set of drains nearer the main river channel to allow the inflow of slightly cooler ambient river water. Both methods would reduce the risk of extreme drops in dissolved oxygen levels.

c. Hydrology. The eight water intake drains and eight outflow drains would permit control of interior water levels and permit controlled drainage of interior water during the typical 2 or 3-day period that the pool is "on-tilt". The project is not expected to change profiles in the adjacent Mississippi River nor in adjacent floodplains. To improve water circulation within the levee, ditches will be excavated connecting the upper slough with the island's interior wetlands. This will also permit warm water diversion into the center of the island.

Under normal pool conditions, the upstream gate structures would operate to maintain flows through the slough and through the island's internal drainage system. The configuration of downstream gates would also permit maintenance of different water levels in the upstream and downstream reaches of Brickhouse Slough and within the interior wetlands. Section 12 of the DPR provides a tentative water regulation plan.

d. Air Quality. Urban, commercial, and industrial development will continue in the region. Subsequently, air quality is not expected to improve. Construction of the levees would result in a temporary increase in dust and exhaust fumes from construction equipment. Additional short-term impacts to air quality are expected from mining, hauling, and placing of the crushed stone for the rock dikes. No long-term impacts are expected.

e. 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 and the use of chain saws.

f. 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.

g. Aquatic Resources

Construction of the levee system will reduce free access by fishes to the upper half of Brickhouse Slough and most of the island's interior wetlands during low water periods. However, this should not result in lower reproductive output since large sections of the area would consist of permanent water and would maintain large resident populations of fish - even if isolated from the main river for long periods. Excavated ditches connecting the upper slough with interior wetlands would also improve fish dispersal within the levee system. Because the waterways presently connecting the island's interior wetlands to the river water and Brickhouse Slough are relatively narrow and shallow (see Section 3 - Aquatic Resources), the placement of 30-inch and 48-inch diameter gravity drains at these sites is not expected to significantly reduce movement of fish between the interior wetlands and the river. The large diameter gravity drains in the rock levees should also allow fish to travel between the river and the upper part of Brickhouse Slough. In addition, the development of wetlands in borrow pits will increase the acreage of shallow to moderately deep water areas (see section below on Terrestrial/Wetland Resources), thus, providing additional fish habitat.

Management of flow and water levels and water temperature would improve the aquatic habitat year round. The inflow of warmer water to previously isolated interior wetlands is expected to reduce the risk of any winter fish kill. Decreasing the inflow of warm water from the power plant into the wetland during the summer should prevent extreme drops in dissolved oxygen levels and the potential for summer fish kills (see U.S. EPA 1977). If water levels were manipulated in the spring to flood sections of the bottomland forest, resident fish populations would be able to move out of the open wetlands and borrow pits and spawn in the flooded forest. These areas would also serve as highly productive nursery areas for small fish. In late spring or early summer, water levels could be lowered, thus releasing fish to the riverine environment. Such management of the area for aquatic species would increase the overall productivity of the wetland complex.

h. Terrestrial/Wetland Resources

(1) Floodplain Forest. Construction activities will require clearing of approximately 72 acres of bottomland, primarily forested wetland, for levee and maintenance easements and for borrow sites. The terrestrial areas covered by levee, approximately 35 acres of the total 72 acres, represents a permanent loss of primarily bottomland forest. (note: approximately 5 acres of open water will be covered by portions of the rock levee). The levee will require maintenance by the Missouri Department of Conservation (MODOC), including annual mowing, which will preclude the establishment of woody vegetation. All exposed ground will be planted to reduce erosion. Disturbed ground away from the levee will be allowed to revegetate naturally or be revegetated by MODOC.

During finalization of plans, the St. Louis District will select clearing limits so as to avoid, as possible, hardwoods along the downstream end of the island. During the clearing operations, precautions will be taken so as not to damage trees left standing in adjacent areas. Future management of the

area will include planting of pin oaks and seeding with wildlife preferred plants. These measures will mitigate any construction-related losses of bottomland forest in compliance with the Water Resources Development Act of 1986 (P.L. 99-662-Nov.17) and EC 1165-2-146 (15 Mar 88).

(2) Interior Open Wetlands.

(a) Effects on Existing Interior Wetlands. Less than 5 acres of open wetland along the edge of the island would be lost from construction of rock closures. Approximately 205 acres of the islands total 225 interior wetlands would be within the newly constructed levee system. Additional wetlands on the Missouri shore will also be protected. Due to the reduction of the rate of sedimentation within these areas by the levees, the life span of the interior wetlands is expected to be extended. To further improve the quality of existing wetlands, future management of the area will include the control of willow and cottonwood along the fringes of open wetlands. The life span of wetlands outside the new levee system is not expected to change from the existing condition.

(b) Borrow Areas. Borrow material will be obtained from interior excavations, generally parallel to the axis of the levee. Borrow for levee construction would require the excavation of approximately 37 acres. Borrow will be excavated to a depth of approximately 1 to 3 feet because of high ground water tables within the construction site. The borrow pits should hold standing water and increase the value of the wetland complex behind the levee. Specific borrow sites would be selected jointly by Corps and Missouri Department of Conservation personnel (See section on Hydrology for future management of water levels).

(3) Brickhouse Slough. The upper half of Brickhouse Slough will be within the new levee system and its water levels would be controlled by the intake and outflow gated drains. The levee and dike would reduce the sedimentation rate in the upper reach of the side channel and prolong its life span. It is expected that sedimentation will continue in the lower section of Brickhouse Slough due to backwater from the main channel. However, computer modeling indicates that the sedimentation rate would not be increased by the project. About 5 acres of the open water in the side channel would be covered by the rock closures.

(4) Wildlife. It is expected that construction of the project and proper management of the area by the Department of Conservation will increase the use of the refuge by migrating waterfowl and improve conditions for other wetland species. The Missouri Department of Conservation also intends to maintain flow whenever possible in order to reduce the risk of waterfowl disease outbreaks. Should waterfowl disease occur, it is our opinion and that of the Missouri Department of Conservation that the incidence rate would be infrequent. As such, the benefits to waterfowl would far outweigh the chance that there might be an infection.

i. Historic Properties. An archaeological field inspection of the proposed project levee alignment was conducted on May 24, 1988. Dense woody vegetation and the presence of recent alluvial sediment on the ground surface

resulted in a decision to instate archaeological investigations coincidental with construction related earthmoving activities. A professional archaeologist will monitor all earthmoving activities for the presence of archaeological remains. If such remains are observed during this inspection, all earthmoving activities in the vicinity of the remains will be postponed until an archaeological investigation can be conducted. The written results of this evaluation will be forwarded to various state and Federal review entities.

j. Socioeconomic Resources. All summer cabins along Brickhouse Slough would be outside the new levee system and are not expected to be impacted by project-related construction activities. Any plans for lease extensions would not differ from those of the future without condition. Water access to the main Mississippi River channel would be limited to the channel's exit at the lower end of Brickhouse Slough.

k. Recreation. Area sport fishing and duck hunting are expected to improve as a result of improved management and water level control for the wetland complex. The levee alignment and borrow operations may require the relocation of several duck blinds. The closure across Brickhouse Slough would block boat access to the upper reach. Public access via the causeway would be discouraged by gates or barricades.

l. Aesthetics. Clearing of trees for borrow sites and levee construction will have a negative impact on the aesthetic value of the area. Construction activities would also have a short-term impact on the area's aesthetic quality. Disturbed areas along the levee will be seeded and plant cover should re-establish. The creation of additional acres of shallow standing water in borrow areas should enhance the wetland value of the area and directly and indirectly increase the aesthetic quality of the project area.

m. 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 designated to enhance and promote these land-use plans. The USFWS also has determined that the proposed project is compatible with existing refuge goals and objectives (See Appendix DPR-A.)

n. Adverse Effects Which Cannot Be Avoided. The clearing of approximately 72 acres of bottomland hardwoods during construction is unavoidable. The possible indirect loss of some additional trees within the leveed area from periodic flooding may be unavoidable if the project is managed as intended.

o. Short-Term Use Versus Long-Term Productivity. The proposed project will improve both the short- and long-term productivity in terms of fishery and waterfowl habitat. The newly leveed area will provide reliable long- term feeding for waterfowl, and long-term spawning and rearing habitat for fish.

p. Irreversible or Irretrievable Resource Commitments. Aside from the commitment of funds, labor and construction materials, there will be no permanent loss of natural resources except for the loss of habitat necessary for the installation of project features.

q. Compliance with Environmental Quality Statutes. The proposed project complies with all applicable laws and regulations listed in TABLE 9.

10. FEDERALLY ENDANGERED SPECIES: BIOLOGICAL ASSESSMENT

a. Introduction. In compliance accordance 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 could be present in the project area. The USFWS, in a letter dated April 4, 1988, provided the following list:

Common Name	Scientific Name	Classification
Bald eagle	Haliaeetus leucocephalus	Endangered
Decurrent false aster	Boltonia decurrens	Proposed

This Biological Assessment evaluates the environmental effects of the wetland rehabilitation of Dresser Island on those Federally endangered species.

b. Bald Eagle. The bald eagle (Haliaeetus leucocephalus) is a common winter inhabitant of the Mississippi River and they are often seen in and around Dresser Island. As winter arrives on the breeding grounds of northern Alaska and Canada, deep snows and sub-freezing temperatures cause waterways in the area to become icelocked. 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.

The construction of numerous dams and reservoirs in this century has altered the distribution of wintering eagles in the United States. Mankind's alteration of habitat has unintentionally increased potential wintering areas, attracting wintering populations to areas where eagles were previously only casual visitors. Concentrations of wintering bald eagles below locks and dams on the Mississippi River are a recent phenomena (Musselman, 1949). These man-made structures create areas of relatively warm, open water which provides feeding areas throughout the winter.

Ice cover on the river influences bald eagle distribution. During a relatively mild winter with little ice cover, such as the 1980-1981 season, eagles are generally scattered (e.g., Harper 1983). With increased ice cover on the river, eagles become more and more concentrated - foraging in and around the remaining open water areas. The warm-water discharge from the Union Electric power plant provides ice-free conditions around Dresser Island. Aerial photographs taken during the very severe winter of 1977 (February) show open water conditions extending 7/10ths of a mile downstream of the power plant discharge. In late January of 1985, St. Louis District biologists observed ice-free conditions extending as a 500-foot wide band along the entire east side of Dresser Island. Brickhouse Slough was also open. During the January visit, 20 eagles were counted along the outer shore of Dresser Island (U.S. Army Corps of Engineers 1985).

TABLE 9

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.	Full Compliance
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.	Full compliance
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

Stalmaster and Newman (1978) reported that high human activity, such as that occurring frequently in the sight of eagles, cause 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 to eagles if the activities did not regularly occur there. Harper (1983) reported disruptions of daily activities of eagles in the 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).

c. Decurrent False Aster. The false starwort or false aster (Boltonia decurrens) is endemic to the wet floodplains of the Illinois and Mississippi rivers and is known only from the states of Illinois and Missouri. It is a perennial herb in the family Asteraceae and grows up to 79 inches high. The plant inhabits wet meadows, bottomland fields, mudflats, and borders of ditches, streams, and sloughs, as well as riverbanks and lake shores (Schwegman and Nyboer 1985, U.S. Fish and Wildlife Service 1988a, 1988b). Much of the plant's native floodplain habitat has been significantly reduced due to extensive row crop agriculture within the watershed and alterations of natural water flow cycles by man-made levee systems. All known surviving populations are associated with man-disturbed habitats (Schwegman and Nyboer 1985). The main continuing threat is thought to be siltation. During extensive surveys from 1980 to 1985, state botanists identified a total of 12 surviving populations in Illinois and two populations in Missouri. Because of its decline and threats to its existing habitat, in 1988 the U.S. Fish and Wildlife Service proposed to list the decurrent false aster as Threatened (U.S. Fish and Wildlife Service 1988a, 1988b).

The false aster is found in St. Charles County, but is not currently documented as occurring on Dresser Island or along Brickhouse Slough. The Missouri Department of Conservation is planning to conduct a soil survey of the County in late 1988 in an attempt to locate undetected beds of the plant, as well as areas suitable for transplanting. Dresser Island may be included in this appraisal (U.S. Fish and Wildlife Service 1988b).

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

(1) Bald Eagle. Eagles commonly frequent the Dresser Island area during the winter, and they are known to use perches on the islands edge and to take fish from ice-free waters around the island. To avoid impacts to bald eagles, the St. Louis District would place special conditions on the contracted clearing work as follows:

(a) Construction activities are currently scheduled to take place outside the winter months in order to avoid potential conflicts with concentrations of wintering bald eagles. If, for any reason, construction had to be carried out during the winter, bald eagle usage would probably decrease temporarily in the immediate area of the construction. The impact would be short-term and not significant.

(b) Large trees, especially eastern cottonwoods, are the preferred perches used by eagles. On the island, the levee will be set back approximately 200 feet from the islands edge in order to maintain a riparian buffer zone. In addition to benefiting wildlife and reducing erosion by wave wash, avoiding removal of large mature trees along the shore would preserve perching habitat for the bald eagle.

(2) Decurrent False Aster. The decurrent false aster has not been documented as occurring on Dresser Island. The St. Louis District has been cooperating with the Missouri Department of Conservation in locating existing populations of the plant in the Locks and Dam No. 26 area. Should the species be found in the Dresser Island project area, the U.S. Fish and Wildlife Service would be contacted immediately. It is expected that the project would benefit any wetland plants within the new levee system by reducing sedimentation. If populations of the false aster are found within the levee alignment or areas earmarked for borrow, alternatives to protect the species could include either slightly realigning the levee and borrow pits, or transplanting individual plants to sites away from areas of impact.

e. Conclusions. It is the St. Louis District's conclusion that the wetland rehabilitation of Dresser Island - in conjunction with the described measures to avoid conflicts with bald eagles and the decurrent false aster - would have no significant effects on Federally endangered species or their critical habitat. The Service's September 13, 1988 letter (APPENDIX DPR-A) expressed no opinion contrary to this conclusion.

11. SUMMARY OF PROJECT ACCOMPLISHMENTS.

The proposed project will enhance fish and wildlife habitat by reducing sedimentation, by providing a means of water level control, and by implementing a variety of habitat management practices.

Construction of the project will reduce sediment input by at least 90 percent, which will greatly increase the life of the wetlands complex.

Construction of the moist soil unit will provide a reliable feeding area for migrating waterfowl. The MSMU will not only provide a readily available food source in existing open areas, but also an additional food source within the inundated "green tree" portions of the unit. At a minimum the habitat units for waterfowl are expected to increase from an existing 33 to 209.

Management of flow, water levels, and water temperature will improve the aquatic habitat year round, reducing the risk of fish kills and enhancing conditions for fish reproduction.

12. OPERATION, MAINTENANCE, AND REHABILITATION CONSIDERATIONS.

a. Project Summary. See DPR Section 7 description.

b. Operation. .The estimated costs for operation and maintenance (O&M) of the Selected Plan are presented in TABLE 10. A tentative site regulation plan for water and temperature control is provided by FIGURE 5. This plan will undergo further coordination and refinements during the plans and specifications stage of the project when the O&M manual is prepared. Prior to construction, an O&M agreement will be developed and signed between the involved parties (Fish & Wildlife Service, MODOC and Corps).

TABLE 10

DRESSER ISLAND ESTIMATE OF ANNUAL OPERATION, MAINTENANCE, AND REHABILITATION COSTS [1/]
(JANUARY 1989 PRICE LEVELS)

Item	Quantity	Unit	Unit Cost ($)	Total Cost ($)
Operation				
Performance Evaluation Monitoring	Sum	Job		3,700
Gate Operation	50	Hr	20.00	1,000
Subtotal-Operation				4,700
Maintenance				
Levee inspection & reporting	40	Hr	20.00	800
Levee mowing (2 mowings per year)	60	AC	40.00	2,400
Ditch cleanout	150	CY	3.50	525
Levee erosion repair	80	CY	5.00	400
Stone replacement	100	TN	10.00	1,000
Crushed stone surfacing	30	TN	11.00	330
Gatewell maintenance (debris and sediment removal, paint & lube)	100	Hr	20.00	2,000
Seeding/planting	Sum	Job		1,000
Subtotal-Maintenance				8,455
Rehabilitation [1/]			[1/]	
Subtotal				13,155
Contingencies				3,245
Total per year				16,400

[1/] Rehabilitation cannot be accurately estimated. Rehabilitation is reconstructive work that significantly exceeds the annual operation and maintenance requirements identified above and which is needed as the result of major storm or flood events.

FIGURE 5

SITE REGULATION PLAN
(Tentative)

Month

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

X----------X
If pool < 420 NGVD, open upper (warmer intake if exterior temp. < 70 F, colder intake if temp. > 70 F) and lower gates to let water levels fluctuate.

If pool > 420 & < 422.5 NGVD, upper and lower gates closed to eliminate sediment input.

If pool > 422.5 NGVD at this or any time of year, levee will overtop to allow head differential to stabilize. Open lower gates to release water as river stage again drops below 422.5.

X----------X
When pool is on tilt (< 419 NGVD), close upper gates and open lower gates, then close lower gates as pool again rises. Achieve greater drawdown as opportunity arises. Flushing area with cooler water permissible if it can be achieved without jeopardizing MSMU drawdown objective.

X----------X
Initiate planting or seeding as soil conditions become drier.

X----------X
Close lower gates, open upper gates (warmer intake if < 70 F, cooler intake if > 70 F) to raise pool to reach as close as possible the desired MSMU maximum interior water elevation (say 422 NGVD). Replenish with warmer water as needed when upper and lower gates can be opened without jeopardizing interior pool raise already achieved. MODOC, at its own discretion could mobilize portable pumps for supplemental water elevations.

NOTE: Water begins to move across the island at about 420 NGVD. The 70 F value was judged to be the optimal temperature for the fisheries, taking into account the life stages and preferred temperature ranges of those fish species expected to utilize the area. Summer drawdown is somewhat delayed so fish spawning & rearing benefits can be maximized. In general, flow will be maintained whenever possible - this will help reduce the risk of disease to waterfowl and to fish.

c. Maintenance and Rehabilitation. The proposed project features have been designed to ensure low annual maintenance requirements with the estimated annual maintenance and rehabilitation costs presented in TABLE 10. These quantities and costs may change during final design. The principal maintenance features consist of levee inspection, mowing, ditch cleanout, levee repair, and seeding/planting.

13. PROJECT PERFORMANCE ASSESSMENT.

The purpose of this section is to summarize monitoring aspects of the project. The principal types, purposes, and responsibility 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.

14. COST ESTIMATES.

A detailed estimate of initial construction costs is presented in TABLE 14. This estimate corresponds to a design which would be implemented using conventional, "in the dry" construction techniques. Costs have been reduced from prior estimates by altering the design to provide a lower levee on the side of the island facing Brickhouse Slough, by reducing the diameter of the outlet drains, by eliminating the combination gates in favor of sluice gates and by adjusting drain locations to reduce cofferdam quantities. A detailed estimate of operation, maintenance, and rehabilitation costs is presented in TABLE 10. Quantities may vary during final design and construction.

15. REAL ESTATE REQUIREMENTS.

a. Project Land Requirements. Project features are to be located on public lands originally acquired through the Corps of Engineers for the 9-foot navigation project, and later designated as General Plan lands. These lands are managed by MODOC 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, MODOC; 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 the agreement is to provide optimum habitat for wildlife species. This is accomplished by contract agricultural plantings, cooperative habitat manipulation or vegetative management programs, by manipulating water levels to promote natural food production, and by managing and protecting existing wetlands. Secondarily, the General Plan lands also provide water-related recreation opportunities, such as sport fishing, waterfowl hunting and trapping.

Land required for the levee to connect to high ground at the northwestern end of the project (in the vicinity of STA. 281+00, PLATE 2) is Federal property acquired in fee for the navigation project and which was designated as part of the General Plan lands. However, in the early 1960's, this land was removed from the General Plan and rezoned for industrial use consistent with the navigation purpose of the project. This property was then leased to the Union Electric Company to be used in conjunction with the development of a power plant in this area. Modifications to the lease will be required to make this property available.

TABLE 11

DRESSER ISLAND MONITORING PLAN

Type Monitoring	Purpose	Responsibility	Comments
Pre-project	Establish need for proposed project/ features	Sponsor (coordinated) w/Corps of Engineers	See DPR Sections 2 and 3
Design	Establish baseline conditions consistent with project goals and objectives and and meet specific permit/environmental requirements	Corps of Engineers	APPENDIX DPR-C, Section 2 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-C, Section 1
Construction	Assess construction impacts and meet permit requirements.	Corps of Engineers	Environmental protection specifications to be included in construction contract documents. Inter-agency field inspections will be accomplished during project construction phase.
Post-Construction	Assess performance of project relative to goals and objectives	Sponsor (qualitative) Corps of Engineers (quantitative)	See TABLES 12 & 13

TABLE 12

ANNUAL POST-CONSTRUCTION QUALITATIVE FIELD OBSERVATIONS 1/

Goals	Objectives	Field Observations
Reduce Sedimentation	Decrease river sediment input into Dresser Island interior wetlands and Brickhouse Slough.	As observed
Water Level Control	Provide means to control water levels within wetland complex independent of river stage.	As observed
Enhance Wetland Habitat	Manage wetlands via seeding & water control to increase reliable food production areas for waterfowl (moist soil species).	As observed
	To extent compatable with MSMU operation--manage wetlands to enhance conditions for fish.	As observed

TABLE 13

POST-CONSTRUCTION QUANTITATIVE MEASUREMENTS

Goals	Objectives	Unit of Measure	Monitoring Plan	Monitorin Interval (Years)
Reduce Sedimentation	Decrease river sediment input into Dresser Island interior and Brickhouse Slough	Acres/year	Perform survey of selected transects for sedimentation	5
Water Level Control	Provide means to control water levels within wetland complex independent of river stages	Graph	Corps river stage data to be plotted against sponsor provided interior levee stage data, and against project expected interior stage data.	1
Enhance Wetland Habitat	Manage wetlands via seeding/planting & water control to increase reliable food production areas for waterfowl	Habitat Units	With assistance from MODOC, the Corps will perform a habitat analysis using the Missouri WHAG methodology.	3
	To extent compatable with MSMU operation--manage wetlands to enhance conditions for fish	Acres	Corps to perform assessment of acres innundated versus time and duration of interior inundation.	3
		DO & Temp.	Within levee system, perform periodic DO testing during seasonal stress periods, and take temperature readings on a routine basis during the year.	3

TABLE 14

DRESSER ISLAND INITIAL CONSTRUCTION DETAILED ESTIMATE OF COST
(JANUARY 1989 PRICE LEVELS)

Item	Quantity	Unit Price	Total Amount
Embankment 77,000	64,000 C.Y.	$ 3.00	$ 192,000
C Stone (Levee)	9,000 Ton	10.00	90,000
C Stone (Cofferdam)	5,700 Ton	8.00	45,600
B Stone (Levee)	15,000 Ton	10.00	150,000
Plastic Liner	1,300 S.Y.	13.50	17,550
Tensar Geotextile	950 S.Y.	2.00	1,900
Crushed Stone			
(Hand Compacted)	3,450 Ton	15.00	51,750
(9-in. Loose Layer)	400 Ton	11.00	4,400
Clearing/Grubbing	72 Acre	2,500.00	180,000
Seeding	30 Acre	1,200.00	36,000
Cofferdam Removal	5,100 Ton	4.50	22,950
Excavation (Culvert)	4,600 C.Y.	2.50	11,500
Excavation (Ditch)	1,700 C.Y.	2.00	3,400
Dewatering (5-Sites)	Sum Job		150,000
Power Unit	1 Each	5,400.00	5,400
30-in. Sluice Gate - With Cylinder	4 Each	9,000.00	36,000
48-in. Sluice Gate - With Cylinder	12 Each	16,000.00	192,000
48-in Culvert	380 L.F.	70.00	26,600
30-in. Culvert	96 L.F.	40.00	3,840
48-in. End Sections	24 Each	800.00	19,200
30-in. End Sections	8 Each	300.00	2,400
60-in. Gatewell Pipe	35 L.F.	110.00	3,850
72-in. Gatewell Pipe	144 L.F.	150.00	21,600
T - Connection	16 Each	2,000.00	32,000
Misc. Metals	16 Each	1,000.00	16,000
Structural Steel	6,600 Lb.	2.00	13,200
Concrete	50 C.Y.	200.00	10,000
Reinforcement	2,400 Lb.	0.70	1,680
Crushed Stone Surfacing	600 Ton	11.00	6,600
Boat Pullover	Sum Job		5,000
Mobilization/Demob.	Sum Job		40,000
Water Level Gages	Sum Job		5,000
		Subtotal:	$1,397,420
		Contingencies:	349,580
		Subtotal:	1,747,000
		E&D:	263,000
		S&A	140,000
		TOTAL:	$2,150,000

The opposite end of the levee will adjoin the Missouri State Highway 94 right-of-way which will require approval of the plans and issuance of a permit from the Missouri Highway and Transportation Commission. It will be the responsibility of the Missouri Department of Conservation to acquire any additional right-of-way determined necessary for construction and/or operation and maintenance.

b. Local Cooperation Agreement/Cost Sharing. First costs for construction of the enhancement project will be a 100 percent Federal responsibility since the area involved is currently included as part of the General Plan lands for the navigation project. Operation and maintenance will be a joint responsibility. Operation and maintenance costs are estimated to be $16,400 on an average annual basis. Operation and maintenance costs will be shared 75 percent Federal and 25 percent non-Federal.

Appendix DPR-E provides a Letter of Intent from the Missouri Department of Conservation which indicates a willingness to participate as the local sponsor; a letter from the U.S. Fish and Wildlife Service assuring that operation and maintenance will be accomplished; and a draft letter of agreement for the operation and maintenance of the project.

16. SCHEDULE FOR DESIGN AND CONSTRUCTION.

TABLE 15 presents a schedule of project completion steps.

17. IMPLEMENTATION RESPONSIBILITIES AND VIEWS.

a. Corps of Engineers. The Corps of Engineers, St. Louis District, is responsible for project management and coordination with the USFWS, the MODOC, and other affected agencies. The St. Louis District will prepare and submit the subject DPR; program funds; finalize plans and specifications; complete all National Environmental Policy Act requirements; advertise and award a construction contract; perform construction contract supervision and administration; and perform post-construction project evaluations.

b. U.S. Fish and Wildlife Service. The USFWS should ensure that all proposed features are compatible with Refuge objectives and management strategies and ensure that the O&M is performed in accordance with Section 906(e) of the Water Resources Development Act of 1986.

c. Missouri Department of Conservation. The MODOC is responsible for the non-Federal share of operation and maintenance, as estimated in this report.

18. COORDINATION, PUBLIC VIEWS, AND COMMENTS.

The Federal, state and local agencies that will receive the Definite Project Report and Environmental Assessment are listed in APPENDIX DPR-G to the DPR.

A number of joint field reconnaissance trips were conducted by representatives of the St. Louis District, U.S. Fish and Wildlife Service, and the Missouri Department of Conservation. Additional coordination required for this project was carried out as a result of public review of the Environmental Assessment/Draft Finding of No Significant Impact, and the St. Louis District's response to review comments. The U.S. Fish and Wildlife Service has provided comments in a letter (13 September 1988) which constitutes their

TABLE 15

PROJECT IMPLEMENTATION SCHEDULE

Requirements	Scheduled Date
Submission of Draft Definite Project Report (DPR) to Corps of Engineers, North Central Division and participating agencies for review	Jul 88
Obtain Division approval of draft DPR	Aug 88
Formal Distribution of DPR for public and agency review	Jul 88
Submit final and public reviewed DPR to North Central Division	May 89
North Central Division submission of final report to Chief of Engineers	Jun 89
Receive plans and specifications funds	Jul 89
Obtain construction approval by Assistant Secretary of the Army (Civil Works)	Jul 89
Execution of local cost sharing agreement by the Corps and MODOC	Jan 90
Submit final plans and specifications to Lower Mississippi Valley Division for review and approval and to participating agencies for review	Jan 90
Obtain approval of the plans and specifications	Feb 90
Advertise contract	Mar 90
Complete construction	May 91

Fish and Wildlife Coordination Act Report. This letter and letters of comment from review of the DPR/EA/Draft FONSI are given in APPENDIX DPR-F to the DPR. Responses of the St. Louis District are also included.

19. CONCLUSIONS.

Dresser Island has been recommended to the Corps of Engineers, St. Louis District, by MODOC and the Fish and Wildlife Service for priority inclusion into the UMRS-EMP. The project will enhance migratory waterfowl habitat by providing an increased food source within a reliable water-control unit and will also improve the fisheries.

Sedimentation, and a lack of water control has hampered habitat management efforts at the site. Sedimentation has been causing a rapid conversion of aquatic habitat to terrestrial habitat with a resulting long-term quantitative loss of fish and waterfowl habitat. The dramatic changes in water level at the site have impacted the productivity of the site via effects on fish spawning and rearing and on plant production for waterfowl.

Only Alternative C, a levee system was found to meet all planning objectives and is compatible with the Refuge management objectives.

20. 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. These latter factors include the proximity of the site to the St. Louis urban area and the presence of a power generating plant immediately upstream, a unique situation which will permit intake water temperatures to be regulated to some degree. 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 Dresser Island in St. Charles County, Missouri. I further recommend the Letter of Intent furnished by the Missouri Department of Conservation be accepted and that the Operations and Maintenance Agreement be executed. The total estimated cost of this project is $2,150,000, which amount would be entirely a Federal cost according to the provisions of Public Law 99-662. I also recommend funds in the amount of $1,992,000 be allocated for project construction.

James E. Corbin
Colonel, U.S. Army
District Engineer

21. LITERATURE CITED

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22. LIST OF PREPARERS

The people primarily responsible for preparing this document are listed in TABLE 16.

TABLE 16: DEFINITE PROJECT REPORT/ ENVIRONMENTAL ASSESSMENT PREPARERS

Name	Expertise/Discipline	Experience
Phillip Eydmann	Hydraulic Engineering	14-yrs Hydraulic Engineering, SLD
David Gates	Wildlife Biologist/Plan Formulation/DPR Writing	10-yrs Wildlife Biologist, SLD
Clyde Hopple	Geotechnical	7-yrs Geotechnical Design, SLD
Michael Kruckeberg	Civil Engineering/Design	8-yrs Civil Engineering Design, SLD
Ronald V. Lindsay	Civil Engineering/Study Manager	16-yrs Study Mgt. SLD
Ted Moore	Civil Engineering/Project Manager	6-yrs Project Mgt.
Leo G. Nico	Fisheries/Ecology EA Coordinator	4-yrs Fishery Biologist, SLD; Ph.D. Candidate, Univ. of Florida
F. Terry Norris	Archaeology/Historic Sites	10-yrs Environmental Analysis Branch, SLD
Gerald Phelan	Civil Engineering/Project Manager	10-yrs Project Mgt. 15-yrs Geotechnical Design, SLD
Lee B. Robinson	Mechanical Engineering	25-yrs Mechanical Eng. Design, SLD

23. FINDING OF NO SIGNIFICANT IMPACT

UPPER MISSISSIPPI RIVER SYSTEM ENVIRONMENTAL MANAGEMENT PROGRAM

DRESSER ISLAND WETLAND HABITAT REHABILITATION
POOL 26, MISSISSIPPI RIVER, ST. CHARLES COUNTY, MISSOURI

(1) I have reviewed and evaluated the documents concerning the proposed rehabilitation of Dresser Island.

The purpose of the project is to rehabilitate a once-prime wetland habitat by controlling deposition of silt during frequent flooding and by providing a means for control of interior water levels and water temperatures so that wildlife and fishes are benefited throughout the year. 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 proposed or recommended plan,

b. Alternative technical designs (borrow pit design, levee heights and alignment, placement of gravity drains), and

c. The "No Action" alternative.

(3) The possible consequences of these alternatives have been studied for physical, environmental, cultural, social and economic effects, and engineering feasibility. Major findings of this investigation include the following:

a. Historically, Dresser Island has been an important wetland habitat used extensively by migrating waterfowl, wintering bald eagles, and as a spawning and nursery area by Mississippi River fishes.

b. The "No Action" alternative was evaluated. In the absence of the rehabilitation project, continuing sedimentation in the wetlands of the island, as well as in the island's side channel, would lessen the area's value as a wetland. The loss of this wetland area would be unacceptable from a wildlife resource standpoint.

c. The construction of levees and borrow material excavations will represent permanent changes in the topography of Dresser Island and Brickhouse Slough. These changes in topography will present no adverse impacts and are necessary for interior water control.

d. The project is in compliance with the requirements of the Clean Water Act Section 404(b)(1) guidelines. State water quality certification under Section 401 is being applied for. The proposed project would have minimal adverse impacts on water quality. Construction activities would take place during normal and low water periods which should reduce the potential for erosion. In addition, slopes would be seeded with wildlife-preferred grasses and legumes to reduce the potential for future erosion.

e. It is our conclusion that no Federally listed endangered species will be adversely affected by the proposed action.

f. A total of 72 acres of bottomland, primarily forested wetland, will be cleared for levee and maintenance easements and for borrow sites. The area covered by levee, approximately 35 of the total 72 acres, represents a permanent loss of bottomland forest.

g. It is expected that the 37 acres used for borrow will hold water and increase the value of the wetland complex by making more standing water habitat available to wildlife.

h. Analysis of 19th century Corps of Engineers' channel maps indicate that Dresser Island has existed as a land mass since before the 1820's. In order to document the existence of any significant historic property, an archaeologist will monitor all earthmoving activities for the presence of archaeological remains.

i. It is anticipated that the proposed action will have minimal adverse impact on hydraulics, air quality, socioeconomic resources, recreation, aesthetics, and biological resources.

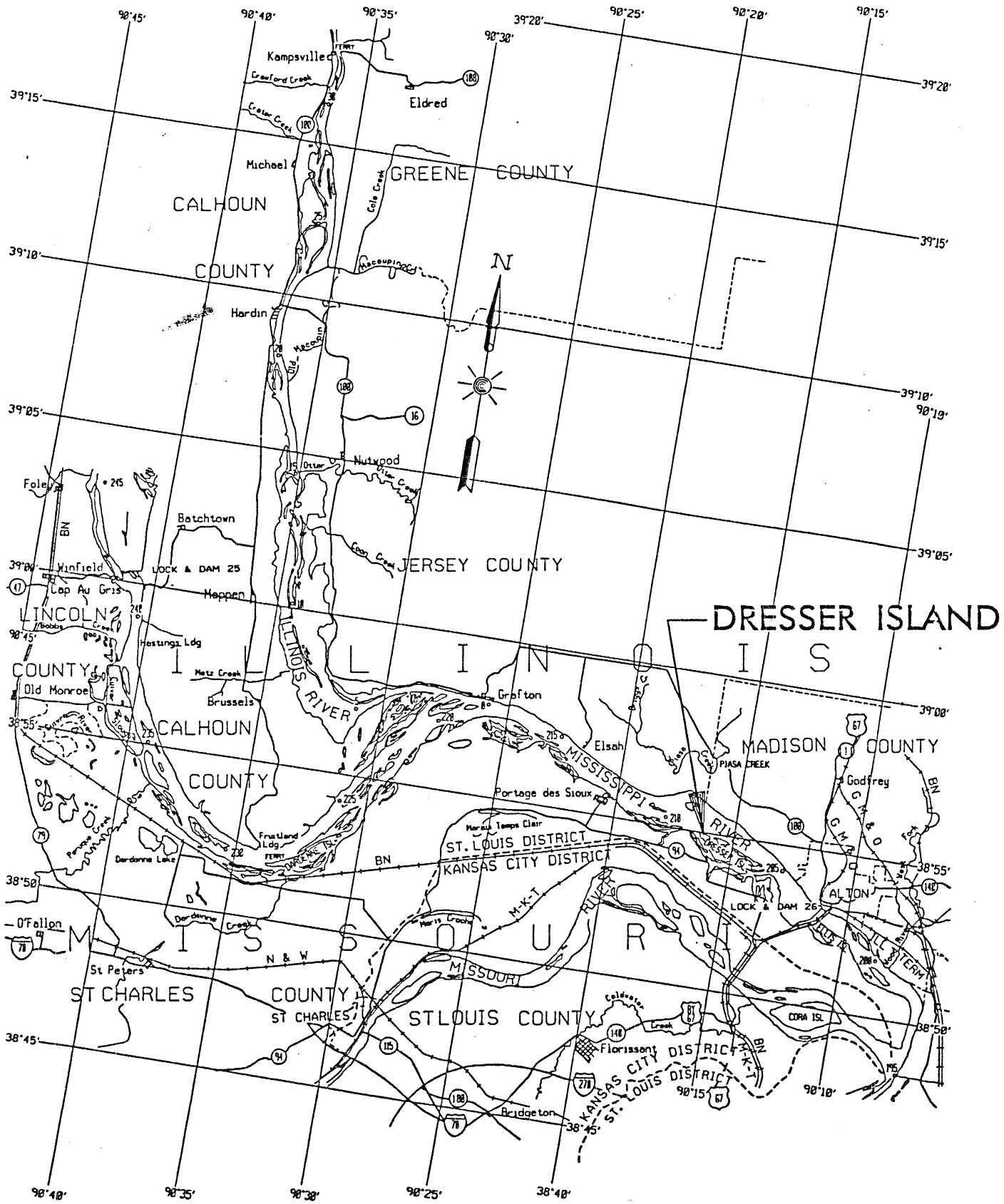
(4) Based on my analysis and evaluation of the alternative courses of action presented in the Environmental Assessment, I have determined that the rehabilitation of Dresser Island will not have significant effects on the quality of the environment. Therefore, No Environmental Impact Statement will be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

12 May 1989
Date

James E. Corbin
James E. Corbin
Colonel, U.S. Army
District Engineer

ATTACHMENT 1

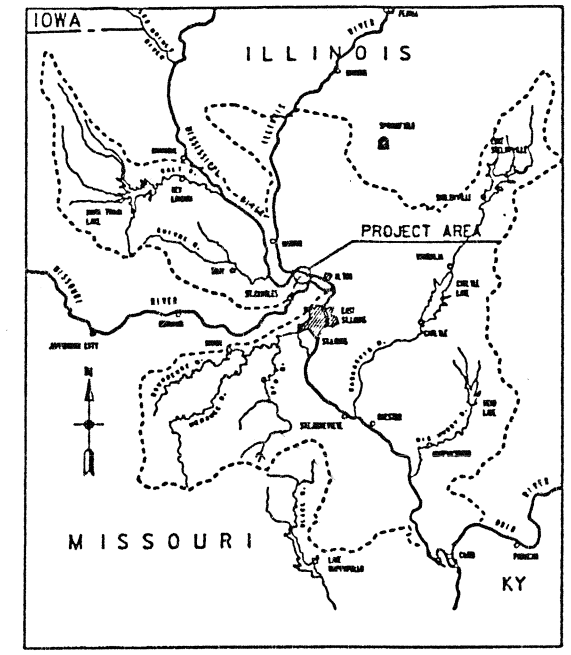
Plates



PROJECT LOCATION

APPROX. SCALE IN MILES

LEGEND
District Boundary ---



VICINITY MAP

APPROX. SCALE IN MILES

INDEX

PLATE	TITLE
1	PROJECT LOCATION AND VICINITY MAP
2	PLAN
3	PROFILES
4	PROFILES
5	PLAN AND SECTIONS
6	ELEVATION-DURATION CURVES
7	STAGE - HYDROGRAPH 1972 - 1986

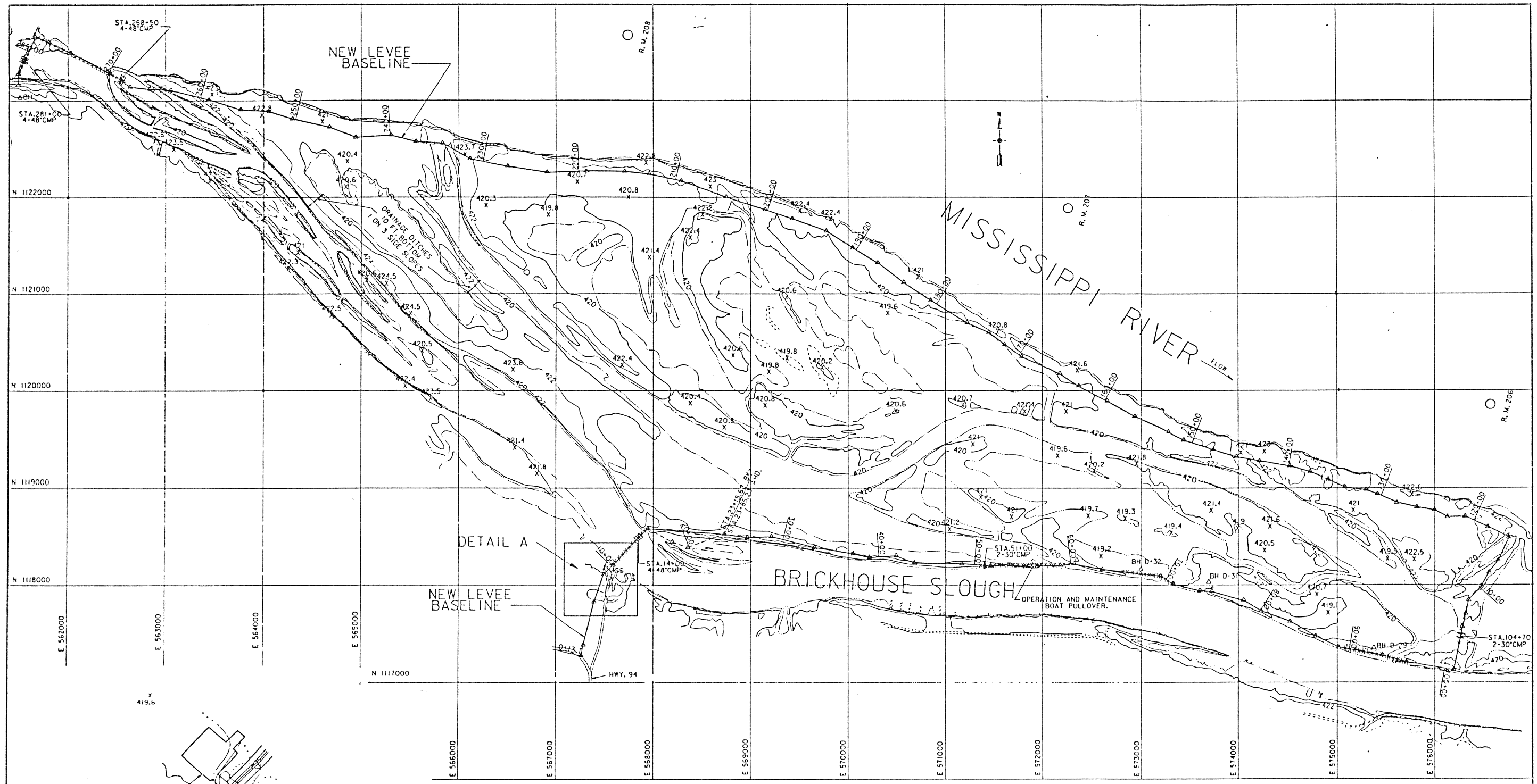
U.S. ARMY ENGINEER DISTRICT, ST. LOUIS
CORPS OF ENGINEERS
ST. LOUIS, MISSOURI

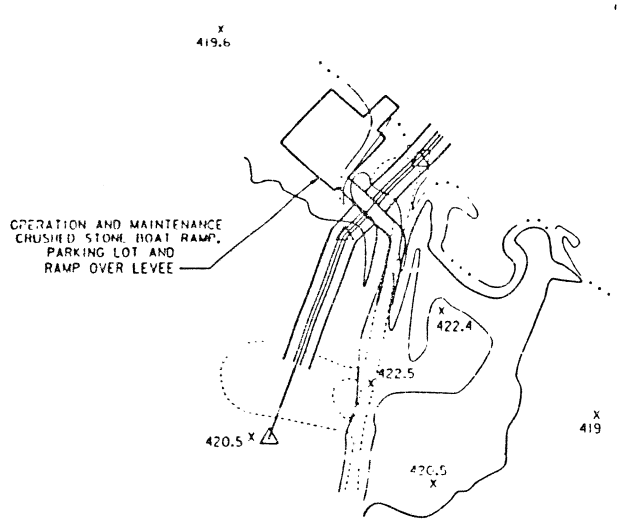
UPPER MISSISSIPPI RIVER BASIN
DEFINITE PROJECT REPORT
POOL 26, ST.CHARLES COUNTY, MISSOURI
ENVIRONMENTAL MANAGEMENT PROGRAM
DRESSER ISLAND
HABITAT REHABILITATION PROJECT

PROJECT LOCATION
AND
VICINITY MAP

COMPUTER AIDED DESIGN & DRAFTING

DESIGNED BY: M.G.KRUCKEBERG	DESIGN FILE: DRESLOC	PLATE I
DATE: FEB 89	PLOT SCALE: .003	SHEET NO. 1 OF 7





DETAIL A

SCALE: 1" = 100'

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PLAN

SCALE: 1" = 400'

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LEGEND:

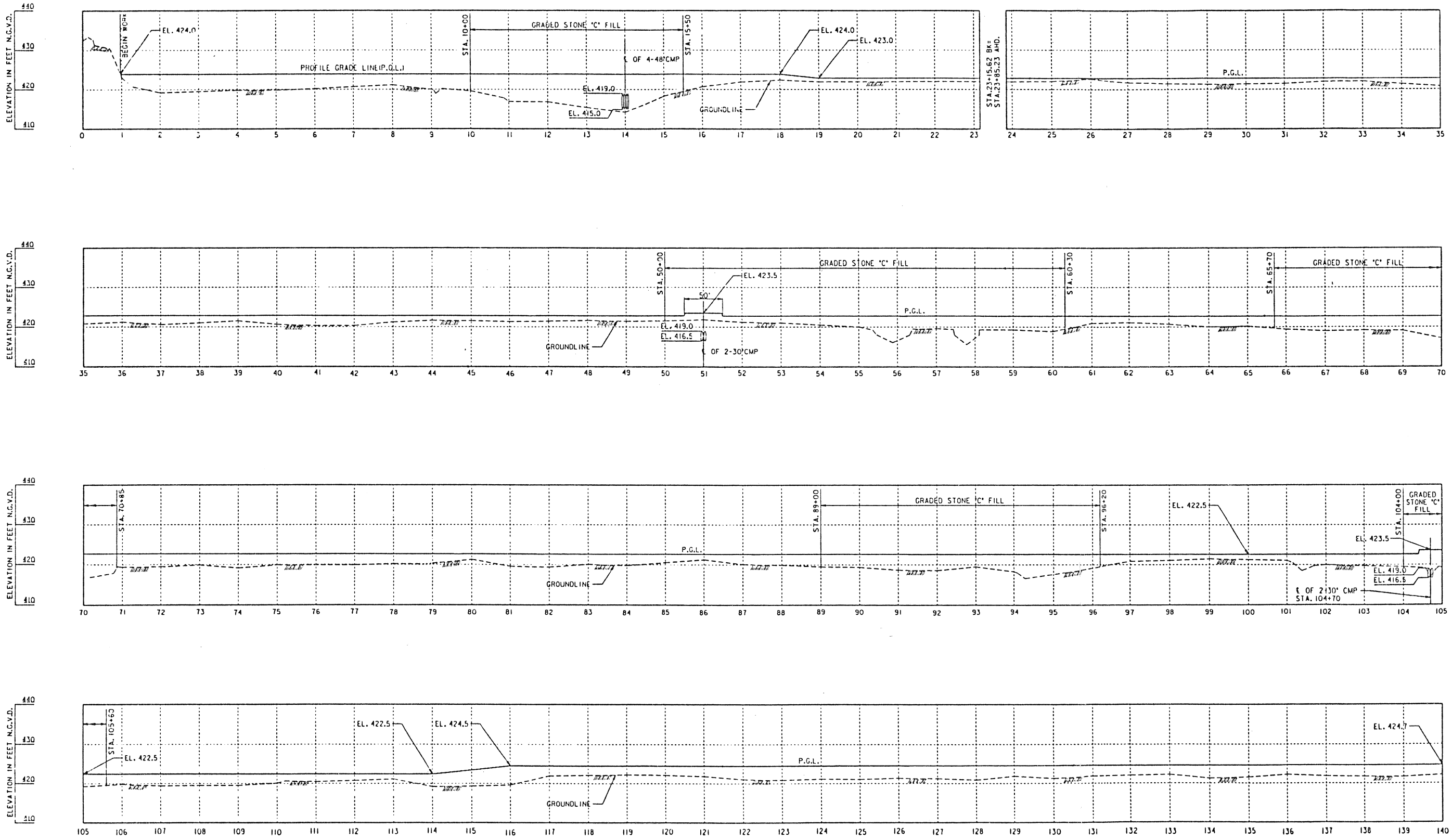
XXXXXXX STONE FILL SEE PLATE 3 AND 4 FOR STATION LIMITS

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

UPPER MISSISSIPPI RIVER BASIN
DEFINITE PROJECT REPORT
POOL 26, ST.CHARLES COUNTY, MISSOURI
ENVIRONMENTAL MANAGEMENT PROGRAM
DRESSER ISLAND
HABITAT REHABILITATION PROJECT

PLAN

DESIGNED BY: M.G.RUCKEBERG	DESIGN FILE: DRESPLAN	PLATE 2
DATE: FEB 89 PLOT SCALE: 400	SHEET NO. 2 OF 7	



U.S. ARMY ENGINEER DISTRICT, ST. LOUIS
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UPPER MISSISSIPPI RIVER BASIN
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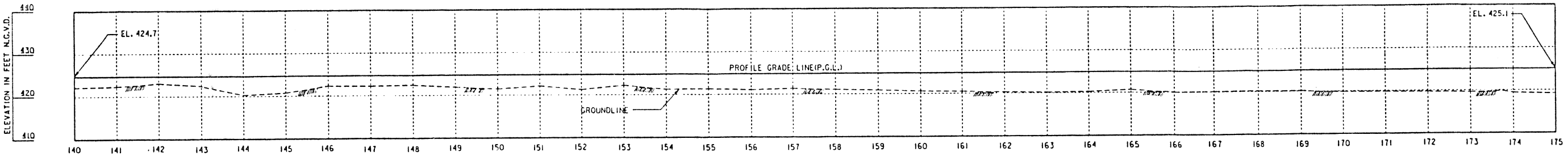
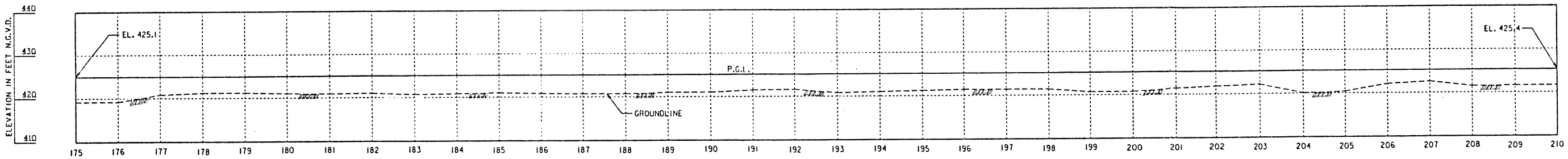
POOL 26, ST.CHARLES COUNTY, MISSOURI
ENVIRONMENTAL MANAGEMENT PROGRAM
DRESSER ISLAND
HABITAT REHABILITATION PROJECT

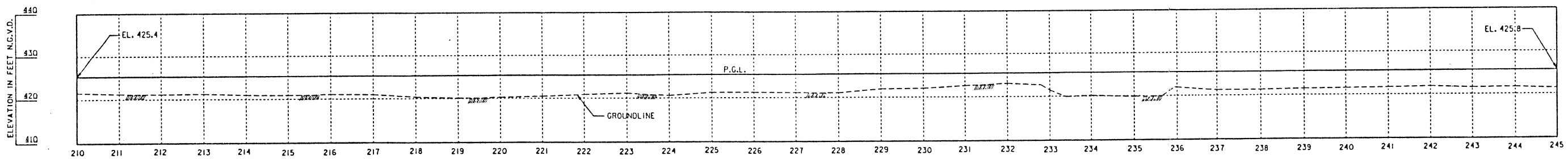
PROFILES

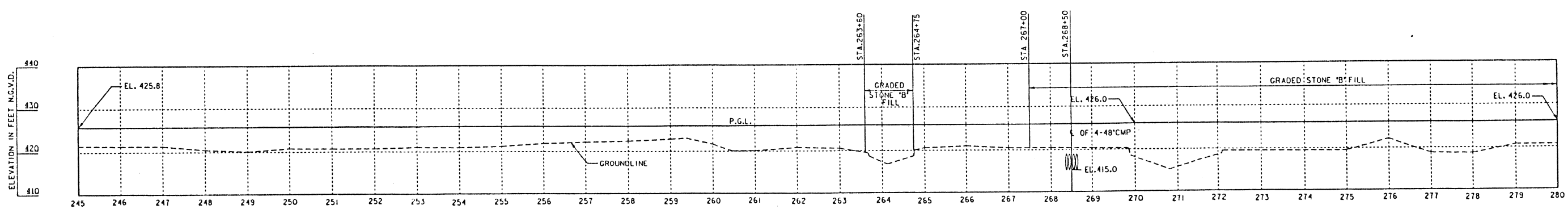
COMPUTER AIDED DESIGN & DRAFTING

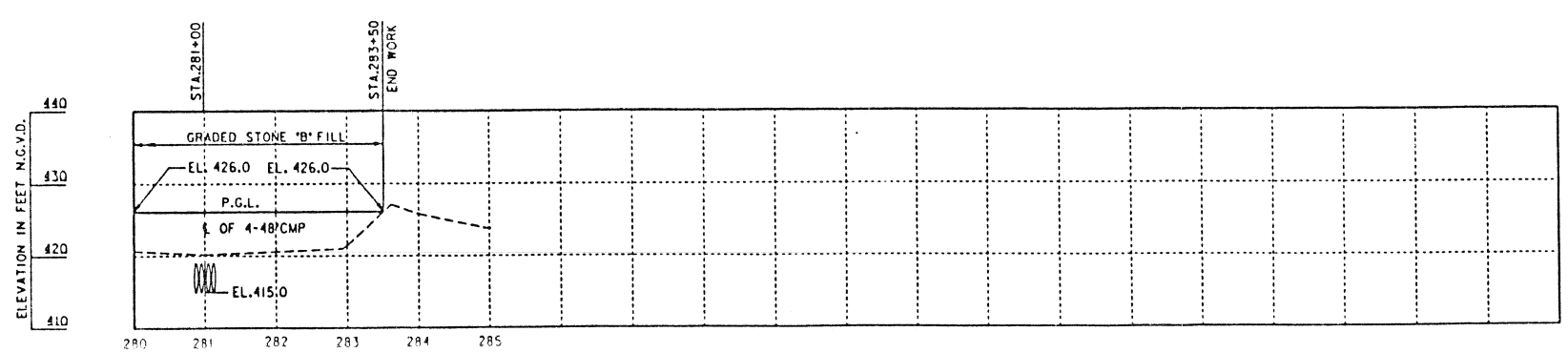
DESIGNED BY: M.G.BRUCKEBERG | DESIGN FILE: DRESPR01 | PLATE 3











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ST. LOUIS, MISSOURI

UPPER MISSISSIPPI RIVER BASIN
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POOL 26, ST.CHARLES COUNTY, MISSOURI
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PROFILES

COMPUTER AIDED DESIGN & DRAFTING

DESIGNED BY: M.G.KRUCKEBERG	DESIGN FILE: DRESPROZ	PLATE 4
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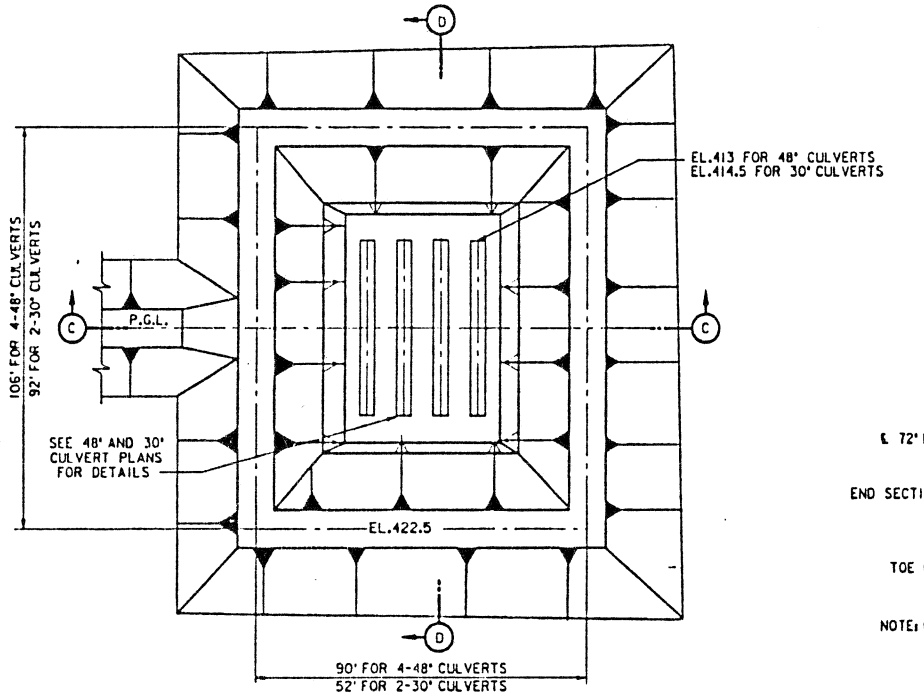

COFFERDAM PLAN (TYPICAL)

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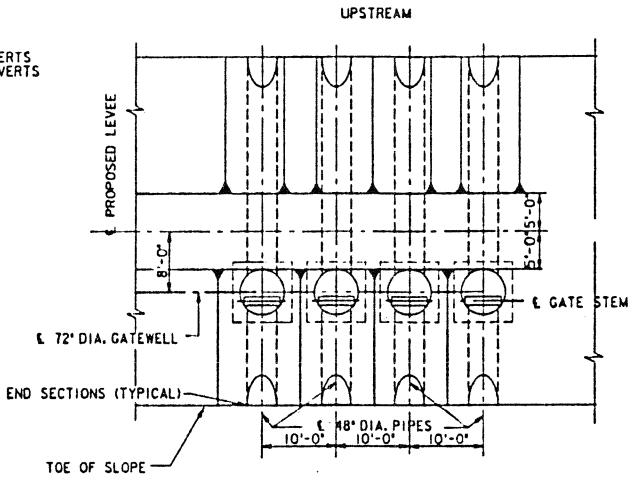

NOTE: GATEWELL COVER NOT SHOWN.

48" DIA. CULVERT PLAN (TYPICAL)

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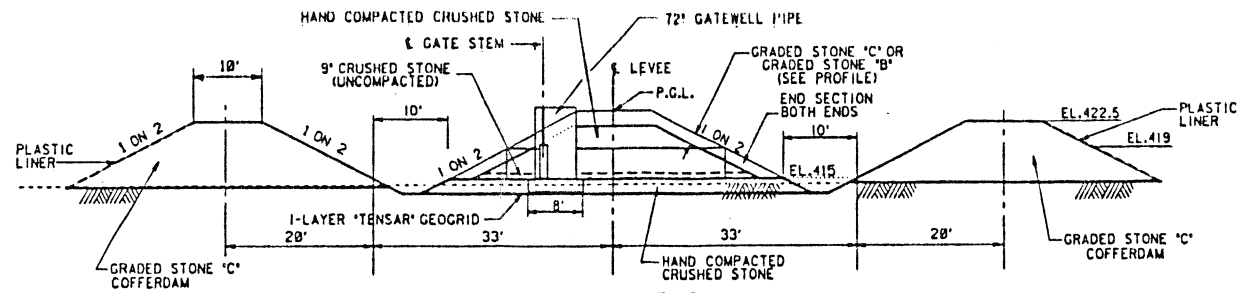

SECTION D-D

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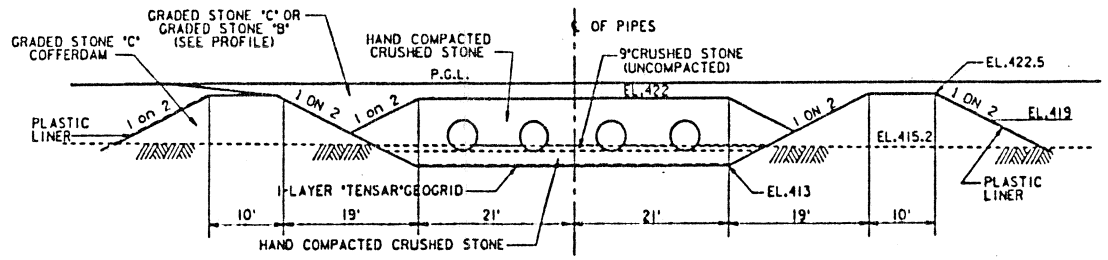

SECTION C-C

GATEWELL RISER PIPES NOT SHOWN

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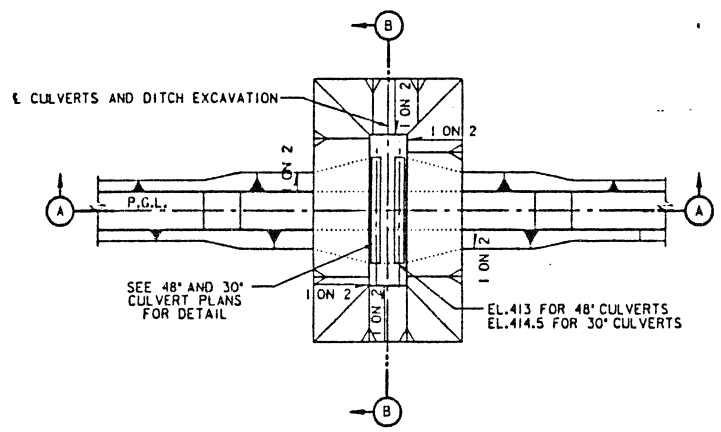

EXCAVATION PLAN (TYPICAL)

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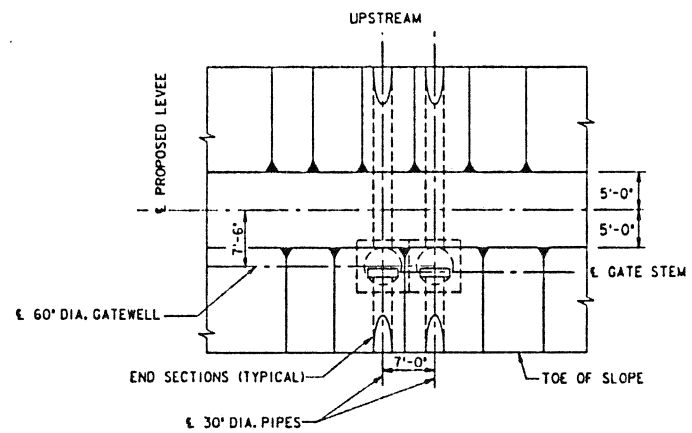

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30" DIA. CULVERT PLAN (TYPICAL)

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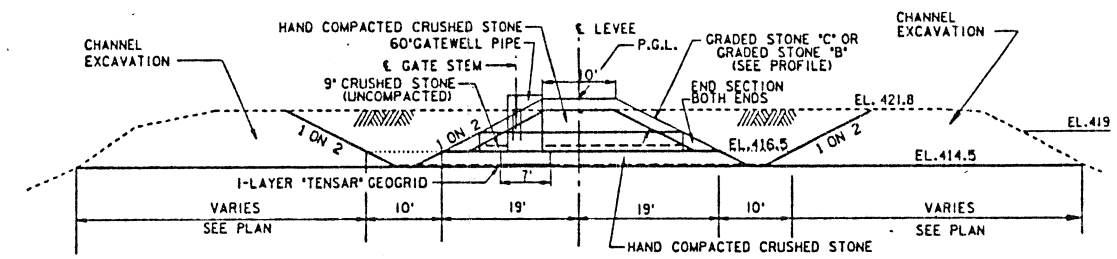

SECTION B-B

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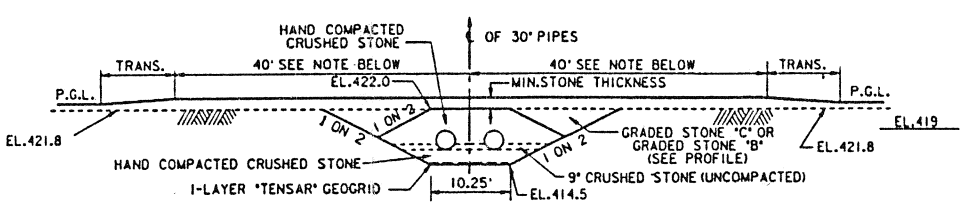
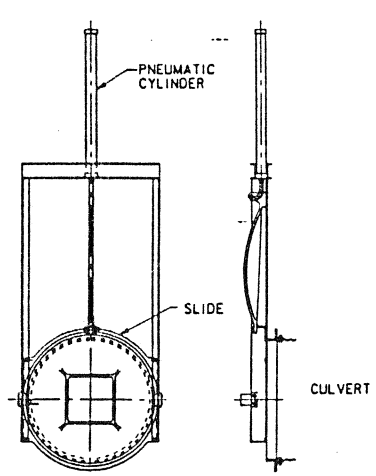


GATEWELL RISER PIPES NOT SHOWN

NOTE:
LIMITS OF INCREASE LEVEE HEIGHT DO TO MIN. STONE THICKNESS.

SECTION A-A

SCALE: 1" = 10'



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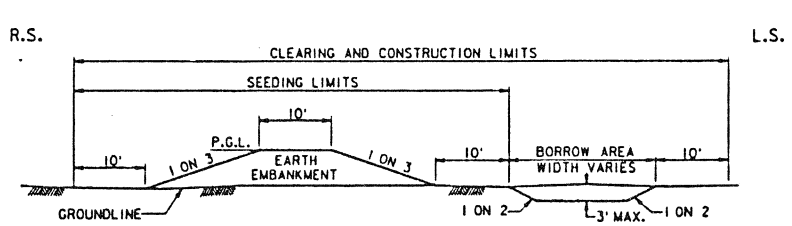
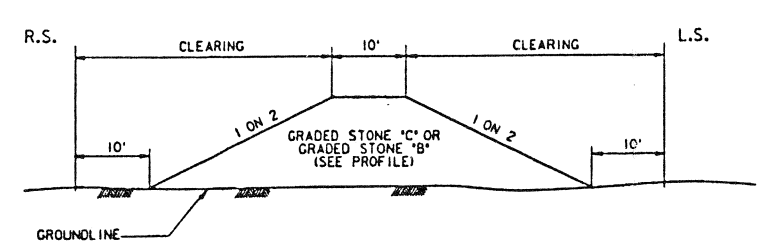
NO SCALE



TYPICAL SECTION

NO SCALE



TYPICAL SECTION

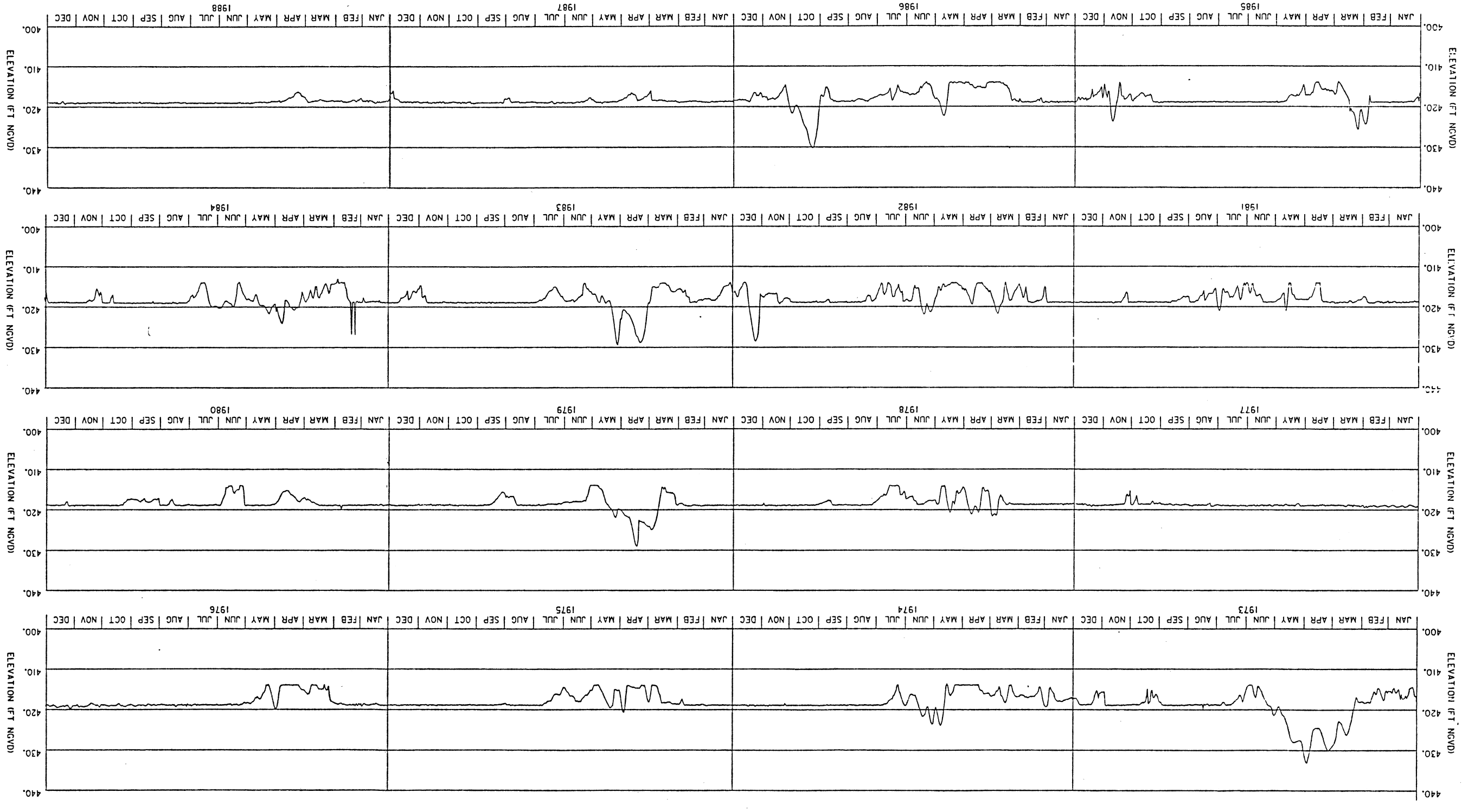
NO SCALE

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

UPPER MISSISSIPPI RIVER BASIN
DEFINITE PROJECT REPORT
POOL 26, ST.CHARLES COUNTY, MISSOURI
ENVIRONMENTAL MANAGEMENT PROGRAM
DRESSER ISLAND
HABITAT REHABILITATION PROJECT

PLAN AND SECTIONS

DESIGNED BY: M.G.KRUCKEBERG	DESIGN FILE: DRESTYP	PLATE 5
DATE: FEB 89	PLOT SCALE: 20	SHEET NO. 5 OF 7



NOTE:
FREQUENCY CURVE / PROFILE INFORMATION IS AVAILABLE BY PUBLICATION "UPPER MISSISSIPPI RIVER, WATER SURFACE PROFILE, RIVER MILE 0.0 TO RIVER MILE 847.5", THROUGH THE U.S. ARMY CORPS OF ENGINEERS, ST.LOUIS DISTRICT.

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

UPPER MISSISSIPPI RIVER BASIN
DEFINITE PROJECT REPORT
POOL 26, ST.CHARLES COUNTY, MISSOURI
ENVIRONMENTAL MANAGEMENT PROGRAM
DRESSER ISLAND
HABITAT REHABILITATION PROJECT
LOCK & DAM NO.26 (POOL)
ALTON, IL.
STAGE - HYDROGRAPH

DESIGNED BY: PHILLIP L. ETCHMANN
DATE: MAR 89
SHEET 1 OF 1

PLATE 7

ATTACHMENT 2

Appendices

FINAL DEFINITE PROJECT REPORT (SL-2)

UPPER MISSISSIPPI RIVER SYSTEM ENVIRONMENTAL MANAGEMENT PROGRAM
DRESSER ISLAND WETLAND HABITAT REHABILITATION
POOL 26, MISSISSIPPI RIVER, ST. CHARLES, MISSOURI

APPENDICES

APPENDIX	DESCRIPTION
DPR-A	FISH AND WILDLIFE COORDINATION ACT DOCUMENTATION
DPR-B	ENDANGERED SPECIES ACT DOCUMENTATION
DPR-C	PROJECT PERFORMANCE EVALUATION INFORMATION
DPR-D	CLEAN WATER ACT DOCUMENTATION
DPR-E	LETTER OF INTENT AND O&M AGREEMENT
DPR-F	PUBLIC COMMENTS AND ST. LOUIS DISTRICT RESPONSES TO DRAFT DPR
DRP-G	DISTRIBUTION LIST

APPENDIX DPR-A

FISH AND WILDLIFE COORDINATION ACT DOCUMENTATION

APPENDIX DPR-A

FISH AND WILDLIFE COORDINATION ACT DOCUMENTATION

FOREWORD

APPENDIX DPR-A provides the Fish and Wildlife Service's Fish and Wildlife Coordination Act Report (FWCAR), prepared by the FWS for the Dresser Island DPR. The Service (September 13, 1988 letter) is in agrement ith the project design and gives its full support, and has also (August 24, 1988 letter) determined that the project is compatible with the purposes for which the National refuge was establishes. Accordingly, the District has no comments to make regarding the Service's letters. The District will continue to involve the Service in all future phases of the project effort.

1-2-6

United States Department of the Interior

FISH AND WILDLIFE SERVICE
FEDERAL BUILDING, FORT SNELLING
TWIN CITIES, MINNESOTA 55111

TAKE PRIDE IN AMERICA

DX 5/8/89
DD
DF
DE
PD

IN REPLY REFER TO:
FWS/ARW

MAY 2 1989

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

Dear Colonel Corbin:

The U.S. Fish and Wildlife Service (Service) has reviewed the Definite Project Report (SL-2) for the Dresser Island Habitat Rehabilitation Project. This project located north of St. Louis in Pool 26, 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 Dresser Island 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 action described in the Environmental Assessment. A copy of the refuge compatibility statement as required by the National Wildlife Refuge Administration Act of 1966 is enclosed.

The Service will assure that operation and maintenance requirements of the project as defined in the Definite Project Report will be accomplished in accordance with Section 906 (e) of the Water Resources Development Act of 1986.

We look forward to our continued cooperative efforts in developing habitat rehabilitation and enhancement projects under the Environmental Management program. If we can be of further assistance, please let us know.

Sincerely,

James C. Gritman

James C. Gritman
Regional Director

Enclosure

COMPATIBILITY DETERMINATION

Station Name: Mark Twain National Wildlife Refuge Complex

Date Established: 1958

Estabishing Authority: Fish and Wildlife Coordination Act, Section 3 (48 Stat. 401)

Description of Proposed Use: Rehabilitation of the wetland complex within the Dresser Island Wildlife Management Area, Pool 24 - Upper Mississippi River, St. Louis County, Missouri. This is a habitat rehabilitation and enhancement project of the Missouri Department of Conservation.

Anticipated Impacts on Refuge Purpose (s): No negative impacts are anticipated.

Stipulations That Would Make a Use Compatible with Refuge Purpose (s): DNA

Justification: The proposed project will restore and enhance an important wetland complex for migratory waterfowl and provide important spawning and nursery areas for fish.

Determination: The proposed use is [redacted] compatible with the purposes for which the refuge was established.

Determined by: _____ LWD 7/20/88 Date: 8/04/88
Project Leader (Name/Title/Signature)

Reviewed by: _____ Date: 8/10/88
Regional Supervisor (Name/Title/Signature)

Concurred by: _____ Date: AUG 24 1988
Acting Regional Director

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:

TAKE PRIDE IN AMERICA

September 13, 1988

Colonel James E. Corbin
District Engineer
St. Louis District
Corps of Engineers
210 Tucker Boulevard, North
St. Louis, Missouri 63101-1986

Attn: PD-A

Dear Colonel Corbin:

We have reviewed the draft Definite Project Report and the Environmental Assessment and draft Finding of no Significant Impact for the Dresser Island, Missouri Habitat Rehabilitation Project, a component of the Upper Mississippi River System Environmental Management Program (EMP). The following comments constitute our Fish and Wildlife Coordination Act Report.

The project has been designed to rehabilitate a once prime wetland/backwater complex by constructing a low levee to control deposition of silt and installing gated drains to allow control of water levels. These measures should preserve interior wetlands and permit planting of wildlife food plots. In addition, water levels and temperatures may be manipulated to the benefit of fish through the innovative use of the warm water discharge from a power plant located immediately upstream.

These documents adequately address the fish and wildlife resources of the project area and the benefits of rehabilitating Dresser Island. The Missouri Department of Conservation has involved this office throughout the planning process and consequently, we have no comments or suggestions on the proposed project other than to give it our full support.

Please contact Bruce Stebbings of this office should you have any questions or comments on the content of this letter (618/997-5491).

Sincerely yours,

for Thomas M. Groutage
Assistant Field Supervisor

APPENDIX DPR-B

ENDANGERED SPECIES ACT DOCUMENTATION

APPENDIX DPR-B

ENDANGERED SPECIES ACT DOCUMENTATION

FOREWORD

The St. Louis District's Endangered Species Biological Assessment for the Dresser Island project was incorporated as Section IV to the Draft DPR (Page EA-17) when circulated for agency review. The Fish and Wildlife Service's September 13, 1988 letter (APPENDIX DPR-A) made no comments with regard to Federally endangered species. Accordingly, the District has concluded that the Service agrees with the District's perspective that the project along with described measures (Draft DPR Page EA-19) to avoid conflicts with bald eagles and the decurrent false aster -- would have no significant effects on Federally endangered species or their critical habitat. APPENDIX DPR-B provides various items of correspondence from the Service prior to the preparation of the Biological Assessment.

United States Department of the Interior

FISH AND WILDLIFE SERVICE
MARION ILLINOIS SUBOFFICE (ES)
Rural Route 3 - Box 328
Marion, Illinois 62959

IN REPLY REFER TO:

July 23, 1987

Jack F. Rasmussen, P.E.
Chief, Planning Division
St. Louis District
Corps of Engineers
210 Tucker Boulevard, North
St. Louis, Missouri 63101-1986

Attn: Environmental Analysis Branch
Planning Division

Dear Mr. Rasmussen:

This is in response to your July 17, 1987 letter requesting a listing of Federally endangered species that occur in the Dresser Island project area. This project is currently being planned under the authority of the 1985 Supplemental Appropriation Bill (PL 99-88) which provides authorization and appropriations for an Environmental Management Program for the Upper Mississippi River System.

The bald eagle, Haliaeetus leucocephalus, winters in the vicinity of Dresser Island. No other Federally endangered species is listed for St. Charles County, Missouri.

In this reach of the Mississippi River, bald eagles make heavy use of the warm water discharge canal from the Union Electric power plant located just upstream of Dresser Island. The heated effluent from the power plant not only keeps the canal from freezing over but attracts gizzard shad and other fish which sometimes supply an abundant food supply for the eagles.

We note that a stone dike at the upper end of the levee would be equipped with gated drains to allow intake of warm water from the power plant into Brickhouse Slough and interior wetlands. This may increase eagle use in the Dresser Island complex at a time when waterfowl blind sites are occupied by hunters. It might be well to evaluate this aspect of the proposed project in your biological assessment.

Please contact Bruce Stebbings of this office at (618) 997-5491 should you have any questions on the content of this letter.

Sincerely,

Thomas M. Groutage

Thomas M. Groutage
Assistant Field Supervisor

cc: MDC (Stucky)
IDOC (Donels, Atwood)

PO -

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:

April 4, 1988

Mr. Jack F. Rasmussen, P.E.
Chief, Planning Division
St. Louis District
Corps of Engineers
210 Tucker Boulevard, North
St. Louis, Missouri 63101-1986

ATTN: Planning Division

Dear Mr. Rasmussen:

This is in response to your March 29, 1988 letter requesting information on Federally endangered species, either listed or proposed, that may occur in the Dresser Island area, St. Charles County, Missouri. Work is being proposed on Dresser Island under the Environmental Management Program.

You have previously made this request by letter of July 17, 1987. As indicated by our response dated July 23, 1987, the bald eagle (Haliaeetus leucocephalus) winters in the vicinity of Dresser Island. Since that time, the false starwort (Boltonia decurrens) has been proposed for listing. This plant is found in St. Charles County and inhabits wet meadows, bottomland fields, mudflats, and borders of ditches, streams and sloughs. The Missouri Department of Conservation is planning to conduct a soil survey of St. Charles County later this year in an attempt to locate undetected beds of B. decurrens, as well as areas suitable for transplanting. Dresser Island may be included in this appraisal.

This letter provides comment only on the endangered species aspect of the project. Comments on other aspects under the authority of and in accordance with the provisions of the Fish and Wildlife Coordination Act (16 U.S.C. 661 et seq.; 48 Stat. 401), as amended, may be forwarded under separate cover.

Please contact Bruce Stebbings of this office at (618) 997-5491 should you have any questions on the contents of this letter.

Sincerely,

Thomas M. Groutage

Thomas M. Groutage
Assistant Field Supervisor

cc: MDC (Stucky)

APPENDIX DPR-C

PROJECT PERFORMANCE EVALUATION INFORMATION

APPENDIX DPR-C

PROJECT PERFORMANCE EVALUATION INFORMATION

FOREWORD

The DPR for the project indicates the District's intent to monitor the performance of the project for appropriate physical, chemical and biological indicators of habitat change over time. In pursuit of this objective, APPENDIX DPR-C, Section 1, provides (1) background information on the use of the Missouri Department of Conservation's Wildlife Habitat Appraisal Guide methodology (WHAG), (2) baseline field data from the application of WHAG to the Dresser Island wetlands complex, a map showing the locations of the sites sampled, and some of the preliminary habitat suitability calculations. Section 2 of the appendix provides the ranges for the future collection of sedimentation data, and the specific sampling locations for future water quality data gathering.

APPENDIX DPR-C

SECTION 1

MISSOURI WILDLIFE HABITAT APPRAISAL GUIDE ANALYSIS

Wildlife Habitat Appraisal Guide for Missouri

Background

The habitat appraisal guide is a field evaluation procedure designed to measure the quality of a habitat for a particular species of wildlife. It not only rates the quality of the existing vegetative cover, but also accounts for man's use and management of the habitat. The system will produce a habitat quality index for a specific field, woodland, or wetland as well as for an entire farm or operating unit of land.

The guide sheet breaks habitat into the most important characteristics which are rated on a 1-to-5 or 1-to-10 scale, depending on their importance. The resulting index ranges from a low of 0.1 to a high of 1.0. An adjective rating of Excellent, Good, Fair or Poor can then be applied to the numerical index.

The guide will identify weak or missing elements in the habitat as a basis for making improvements. For example, under Cropfield Management, fall tillage rates a point value of 1. By changing this tillage from fall to spring, a landowner could raise the value of his cropfield for that characteristic, from 1 to 10, a gain of 9 points.

Procedures

The following procedures describe the method for inventorying existing habitat conditions, rating each characteristic, and calculating the habitat type and farm habitat indexes.

Step 1: Habitat cover type determination

After completing the information called for at the heading of the guide sheet, divide the farm into the broad habitat types listed at the top of the appraisal form. The habitat types are defined as follows:

Cropland: Areas planted to small grains and row crops including fields with legumes or grass in the rotation as well as cropfields occasionally left idle in some years.

Pasture/Hayland: All pasture and hayfields including native prairie used for both forage and hay.

Old Field: Idle, overgrown agricultural land abandoned for at least two years but with less than 10 percent canopy coverage of overstory trees.

Woodland: Upland and bottomland forests or idle areas over grown with trees having canopy coverage greater than 10 percent.

Nonforested Wetland: This type includes marshes; potholes; sloughs; low, wet grassy areas; and shallow waterlogged depressions. Vegetation can consist of smartweeds, Reed canary grass, sedges, cattails and/or shrubs such as buttonbush or willow. These wetlands may have permanent water lasting all year or semi-permanent water lasting a portion of the growing season.

Bottomland Hardwoods: Wood swamps, forested bottomlands and tree lined oxbows characterize this type. Dominant trees may include silver maple, elm, sycamore, ash, pin oak, tupelo gum or cypress.

Step 2: Inventory procedure

Each sheet will accommodate several fields, woodlands or wetlands. Show the field number and the acres of that field or habitat type in the appropriate blanks at the top of the appraisal guide. Ratings for the majority of habitat characteristics will be made by visual estimate. Walk one or more transects across the field or through a woodland and note the existing characteristics called for in the guide sheet. Distance characteristics will be measured from the center of the field (habitat type) being appraised to the edge of the nearest different habitat type. This information can best be taken from an aerial photo, if available.

Step 3: Use of the guide sheet

Each vertical column of numbers represents one field, wetland or woodland of that habitat type. Move down this column, select the characteristic description that best fits the existing field or woodland condition and circle the appropriate numerical rating. Some judgement and interpretation will be required for conditions that do not exactly match the descriptions.

A habitat planning key is provided on the bottom of the form. The form is designed to: 1) appraise existing habitat conditions; 2) plan for habitat improvements; and 3) serve as a record of habitat improvements applied. The symbols used are as follows: 0 - indicates the existing conditions at the time of the appraisal. ⊕ - indicates the planned practices or management changes that the landowner has agreed to implement as part of the conservation plan. ● - indicates the planned practice or management change that was applied. Space at the end of the form is provided to record the existing habitat type index, a planned habitat type index resulting from practices or management changes agreed to by the landowner, and an applied habitat index resulting from the actual changes made by the landowner.

Step 4: Field, woodland or wetland index calculation

Staying within the same vertical column, add the scores for each habitat type (field) separately and enter the sum in the total block. Divide the total actual score by the maximum possible score and enter this figure in the block for existing habitat type index. The same procedure is used to calculate planned or applied indexes.

Always check the footnotes for special modifications that will change habitat type indexes. These modifications are designed to compensate for such factors as exceptionally large field and woodland size, lack of woodlands, or grazing pressure that reduce the capacity of the farm to support some species of wildlife.

Step 5: Farm habitat index calculation

All habitat types (fields, woodlands and/or wetlands), on the farm, must be rated to produce the farm habitat index. This index is a weighted average of all habitat type (field) indexes. Multiply each index by its acres for each of the fields appraised on the farm. Add each of these figures together and divide this sum by the total acres of all habitat types (fields) appraised. Enter the number in the appropriate blank. This procedure can be repeated to calculate a new farm habitat index based on planned practices the landowner has agreed to implement or has actually implemented.

Definitions of Habitat Characteristics For Upland Wildlife

1. **Edge configuration and border extent**

Edge is defined as the perimeter of the field, woodland or wetland being evaluated. The edge characteristic is divided into two components. First, the edge must be evaluated as straight or irregular and second, a determination must be made on the extent of a border. All evaluation sites will have either a straight or irregular edge but not all sites will have a border around the perimeter of the field being evaluated.

Irregular refers to the degree that the edge deviates from a straight line. Example: A cropfield with woody draws or a woodland with a pronounced irregular edge with a pasture. Score as irregular if the field is less than 20 acres in size with one side irregular or greater than 20 acres with two sides irregular. **Border** refers to woody (brush, windbreaks, hedgerows, etc.) or herbaceous (weeds, grasses, etc.) strips of vegetation between habitat types. The strips must be a minimum of 5 feet in width to be counted as a border. **Extent**—estimate the percent of the appraisal field surrounded by a woody or herbaceous border at least 5 feet wide. One side—25 percent; two sides—50 percent, etc.

Only edge configuration, either straight or irregular, is scored in the old field habitat type. Determining the extent of a border in a brushy field is difficult and cannot be consistently estimated.

2. **Concealment cover**

Estimate the percent of the field or woodland area that is covered by winter or escape cover. Some examples are dense brushy areas, rock piles, brush piles, rocky crevices, fallen logs, dense conifer areas, etc. Score the maximum point value (either 5 or 10 points) for fields less than 10 acres and with border around 75 percent or more of the edge. Concealment cover is not necessary in small fields (<10 acres) with a brushy, grassy or weedy border as cover for quail or rabbits. Add all types of concealment cover found within the field to obtain the total percent. Dense woody draws which are part of an irregular edge may also be scored as concealment cover when they extend more than 50 percent across the width of the field.

3. **Vegetative cover**

Estimate the percent canopy coverage of shrubs and herbaceous vegetation 6 inches to 4 feet tall for white-tailed deer and 6 inches to 18 inches tall for the other species. An area with more than 60 percent coverage will be difficult to walk through and is too thick for quail, rabbits and turkey to move through. Vegetative cover less than 20 percent coverage does not provide sufficient cover and food for these species.

4. **Woodland size class and canopy coverage**

Size class is defined as the diameter at breast height (DBH) category in which 50 percent or more of the trees occur. Size classes are (1) Sawtimber: Greater than 9" DBH; (2) Pole: 2" to 9" DBH; and (3) Reproduction: 0 to 2" DBH. Scattered sawtimber is defined as one or more trees per acre greater than 9" DBH. Canopy Coverage is defined as the degree to which foliage and branches of the forest overstory prevent sunlight from reaching the forest floor. An OPEN canopy is one having less than 50 percent coverage and a CLOSED canopy is one with greater than 50 percent coverage. The ungrazed open woodland has lots of sunlight and an abundant understory vegetation.

5. **Woodland tree species**

Estimate the percent of the forest overstory occurring in the black and white oak groups for deer and turkey. The other forest wildlife species, particularly squirrels, require a mix of overstory trees that produce a variety of nuts and fruits.

6. **Forest openings**

Estimate the percent of the woodland area occupied by openings or clearings having 0 to 10 percent canopy coverage. Score the maximum point value (either 5 or 10 points) for woodlands less than 40 acres in size because openings are not required in small wooded tracts to enhance food and cover. The same is true of linear or riparian woodlands which do not exceed 1/4 mile (1,320 feet) in width, regardless of acreage.

7. **Distance to conifers**

Conifers include planted pine plantations or thick red cedar stands two acres or greater in size. Ruffed grouse and many other species are attracted to conifers during harsh winter conditions.

8. **Percent woodland in old growth trees**

Estimate the percent overstory canopy coverage in the wooded tract composed of trees greater than 16" DBH. These larger trees provide nest cavities and increase food supplies for squirrels.

9. **Nest or roost trees**

Estimate the percent of the field border or edge occurring as woodland, treeline, shelterbelt or individual trees greater than 10 feet tall. This characteristic measures nest site availability for mourning doves.

10. **Coniferous nest trees**

Estimate the percent of the field border or edge occurring as pine or red cedar trees greater than 10 feet tall. Coniferous trees serve as the best nest sites for doves.

11. **Number of tree cavities per acre**

Note the number of trees, either live or dead, with cavities. Usually, live trees or snags with cavities large enough for squirrels are greater than 6" DBH. Diameter of cavity opening can be small as 2" across.

12. **Average density of shrub and tree reproduction >3 feet tall**

Estimate the density of woody understory plants. More than four stems per square yard throughout a stand is so thick that walking will be difficult. Generally, a thick understory is only found on north to east facing slopes or in recently harvested woodlands. Ruffed grouse prefer very dense understory vegetation for drumming and brood rearing habitat.

13. **Aspect**

Note the aspect (direction of slope) and circle the appropriate number. Use the category that corresponds to the predominant slope direction for woodlands with more than one aspect.

14. Woodland size

Estimate the percent of the woodland being appraised that is within the specified distance of any other habitat type (cropland, pasture/hayland, old field or nonforested wetland). Enter the percent figure in the block directly above the column of numbers for this characteristic. Exceptionally large woodlands are not attractive to bobwhite quail and rabbits.

15. Field Size

Estimate the percent of the field being appraised that is within the specified distance of dense winter cover or ungrazed woodland. Enter the percent figure in the block directly above the column of numbers for this characteristic. Exceptionally large fields are not attractive to bobwhite quail or rabbits.

16. Number of important food plants

A list of plant species important as a food source is printed on the back of each guide sheet. Record the occurrence of the plants found on this listing. Circle the point value given for that number of plants identified in the field. Some judgement is required in determing if a plant is available in sufficient abundance to provide an adequate food source.

17. Grazing or haying pressure (degree of use)

Estimate the annual grazing or haying intensity. Heavy use is defined as over-utilization of the forage. Moderate use is defined as acceptable use within SCS standards and specifications or 3"-6" over winter height of cool-season grasses and 8"-12" over winter height of warm-season grasses. Light use is under-utilization of forage. Example: three cuttings of cool-season grass hay is heavy use; two cuttings is moderate use; and one cutting is light use under normal moisture conditions.

18. Legume canopy coverage

Estimate the percent of ground covered or shaded by legumes both native and introduced. Legumes are an important food plant group and include alfalfa, clovers, tick trefoils, Korean lespedeza, etc.

19. Forb canopy coverage

Estimate the percent ground covered or shaded by broad-leaved plants (not grasses) including legumes. These plants, especially annual weeds, provide seeds for food important to quail and prairie chickens.

20. Grassland composition

Rank the pasture/hayland habitat to the closest description on the guide sheet. Any mixture of both cool-season grass(es) and legume(s) would be rated in the category, "Mixed Cool-Season Grasses; or Predominately Legumes."

21. Average height of herbaceous vegetation

Estimate the average plant height for the May 1 to July 1 period in the pasture/hayland habitat for the pheasant. This characteristic is important for pheasant nesting and fields mowed once during this period will usually have an average plant height of less than 9 inches. For the prairie chicken, estimate the average plant height for the May 1 to August 1 period.

22. Grassland management

Estimate grazing and haying pressure, burning frequency, and flooding periods of grassland types for the periods of the growing season indicated on the form. This characteristic is a measure of ring-necked pheasant and prairie chicken nesting habitat quality.

23. Woody invasion

Estimate the percent of the field covered by the canopy of trees, shrubs and vines. Both ring-necked pheasant and prairie chickens prefer fields without woody invasion.

24. Percent bare ground (May 1-October 1)

Estimate the percent of the ground occurring as bare ground and not covered by vegetation or litter. Mourning doves are seed eaters preferring to forage for food on bare ground.

25. Cropping practices, cropfield management and crop rotation

Discuss normal or past cropping practices with the landowner and select the most appropriate description.

Score the maximum point values (either 5 or 10 points) for cropfields, idle for 1 or 2 years in government sponsored set-aside programs under the Cropping Practices and Crop Rotation characteristics. Fields idle for more than two consecutive years should be appraised as old fields and not as cropfields.

26. Percent cropland, pasture/hayland or woodland within 2-mile wide circle

Estimate the percent of cropland, pasture/hayland or woodland within a 2-mile wide circle of the center of the field being rated. The amount of the cropland and pasture/hayland surrounding the farm will determine the farm's attractiveness to ring-necked pheasants, prairie chickens and mourning doves. Similarly, the amount of woodland in the vicinity of farm is important to white-tailed deer, wild turkey, squirrel and ruffed grouse abundance. An aerial photo is usually necessary for accurate estimation. Discussing surrounding land use with the landowner will also facilitate scoring these characteristics.

27. Percent native grass within 2-mile wide circle

Estimate the percent of grassland within 2-mile wide circle that is predominately native warm-season grasses or is native prairie. This characteristic is difficult to estimate from an aerial photo. Discussing the composition of surrounding hayfields and pastures with the landowner or noting this characteristic while driving to the farm may help.

28. Percent woodland use in 2-mile wide circle

Estimate the percent woodland within 2-mile wide circle that is ungrazed. This characteristic is very important to deer, turkey and ruffed grouse because grazed woodlands can degrade habitat quality for these species.

29. Percent pasture/hayland use in 2-mile wide circle

Estimate the percent pasture/hayland within 2-mile wide circle that is lightly to moderately used (forage utilization within SCS standards and specifications). The ring-necked pheasant and especially the prairie chicken require properly utilized grassland for nesting and brood rearing.

30. **Percent woodland within 660' of reproductive size class (>2 acres) stand**

Estimate the percent of the woodland (stand) that is within 660 feet of a recently havested forest tract (reproductive size class). Ruffed grouse perfer to drum and raise broods in thick resprouting woody vegetation.

31. **Cropland distribution within 2-mile wide circle**

Estimate the percent of all cropland within 2-mile wide circle of the field being rated that is within 660 feet (1/8 mile) of pasture/hayland. The ring-necked pheasant prefers land use consisting primarily of cropland but grass nesting sites must be in close proximity to cropland. Usually this characteristic will score the highest point value (10 points) except in areas of expansive cropfields without adjacent grasslands. Grass contour strips or grass terraces within cropfields, at least 30 feet wide, can also be scored as pasture/hayland within 660 feet of cropland.

32. **Percent Pasture/Hayland in grass areas >80 acres within 2-mile wide circle**

Estimate the percent pasture/hayland within a 2-mile wide circle of the field being evaluated that occurs as fields 80 acres or larger. This characteristic applies only to the prairie chicken because land use patterns consisting of small fields reduce habitat quality for this bird.

33. **Woodland distribution within 2-mile wide circle**

Estimate the percent of all forest cover within a 2-mile wide circle of the tract being rated that is within 660 feet (1/8 mile) of cropland, pasture/hayland or old field. Deer and turkey numbers are related to the size and distribution of forest cover.

34. **Distance measurements**

Measure distances from the center of the field or woodland being appraised to the edge of the nearest habitat type indicated on the guide sheet. For any habitat type exceeding the maximum distances, the score is 1 regardless of measurement or plant species composition.

A 1/4 acre or larger food plot consisting of annual grains or green browse (legumes) will substitute for distance to cropfield. Plant diversity in Distance to Pasture/Hayland refers to the number of different grasses, forbs and legumes. A pasture/hayland with high plant diversity should have legumes and forbs in addition to grasses. Generally, a heavily grazed or mowed pasture/hayland will have low plant diversity. Grass strips greater than 30 feet wide in cropfields (waterways, field borders, filter strips) qualify as Distance to Pasture/Hayland.

Definitions of Habitat Characteristics For Wetland Wildlife

1. **Fall and winter water conditions**

Water is an essential part of fall and winter habitat (October 1 to March 1). Water can be provided by pumping, flooding or runoff. Water must be present during the entire October to March period to receive a score higher than 1.

2. **Fall and winter flood conditions**

Fall and winter flooding can damage food sources by covering annual seeds with silt or covering food plants with debris. This situation generally occurs in wetlands along streams and rivers. The flood damage to wetland vegetation varies from year to year and this characteristic must be scored as an average condition by considering previous flooding and projecting future conditions. Score the lower point values if fall and winter floods damage important food sources most years. Score the higher point value if uncontrolled floods and siltation are rarely a problem.

3. **Water depth 1"-18" deep**

Mallards and geese have difficulty feeding in water more than 18" deep. Estimate the percent of the wetland or flooded cropland area with water 1"-18" deep and account for periodic fluctuations from flooding or runoff that may make water depths greater than 18".

4. **Important food plant coverage**

A listing of food plants important to mallards and geese are listed on the guide sheets. Percent coverage is more important than number of different food plants. Migrating waterfowl require a significant amount of food to support large numbers of birds over the 5 to 6 month fall-winter period.

5. **Number of important food plants**

Consult the list of food plants on the guide sheets and circle the appropriate number. Some judgement is required in determining if a plant is available in sufficient abundance to provide an adequate food source.

6. **Winter cover**

Migrating waterfowl prefer nonforested wetlands dominated by food producing plants, but a certain amount of protection from wind is desirable. Estimate the percent wetland covered by woody vegetation and/or persistent emergents (cattails, bulrush, smartweeds, or other herbaceous plants that remain erect for most of the winter).

7. **Loafing sites**

Loafing sites are areas without vegetation, or water less than 1 inch deep where waterfowl can rest.

8. **Sloughs and channels**

This characteristic applies to bottomland hardwoods and includes shallow depressions, sloughs, creek channels, oxbows, etc. that will have water during the fall-winter period. These areas may be dry during the summer months.

9. **Percent wetlands within 2-mile wide circle**

Estimate the percent of bottomland hardwoods and nonforested wetlands with a 2-mile wide circle of the field or wetland being rated. Mallards are attracted to large wetlands or groups of wetlands.

10. **Percent nonforested wetlands and/or open water within a 2-mile wide circle**

Estimate the total nonforested wetlands and/or open water within 2-mile wide circle of the wetland or field being rated. Canada geese will not use bottomland hardwoods, but they do prefer larger wetlands and open water areas.

11. **Distance measurements**

Measure distances from the center of the wetland or field to the edge of the nearest habitat type indicated on the guide sheet. The availability of water from October 1 to March 1 on a predictable and reliable basis in adjacent habitats must also be evaluated. Unpredictable or unreliable water availability will result in a low point value of 1 regardless of the distance between the sample site and the adjacent habitats.

12. **Distance to major river, lake or reservoir >100 acres**

Canada geese require access to open water during the winter. Major rivers are defined as watercourses greater than 100 feet wide and may include the following:

Missouri, Mississippi, Grand, Osage, Chariton, St. Francois and Black. All Corps of Engineers' impoundments will qualify as major reservoirs. Distances can be estimated from county or state road maps.

13. **Distance to major Canada goose winter area**

Canada geese are very traditional in selecting migration and wintering habitats and locations. These birds may not utilize suitable winter habitat if it is located too far from sites within historical use. Major wintering areas include only the following state wildlife management areas (WMA) and national wildlife refuges (NWR) and Corps of Engineers Reservoirs: Fountain Grove WMA (Linn County), Swan Lake NWR (Chariton County), Smithville Reservoir (Clay County), Thomas Hill WMA (Randolph County), Clarence Cannon Reservoir (Audrain County), Schell-Osage WMA (St. Clair County), Table Rock Reservoir (Stone County), Bull Shoals Reservoir (Taney County), Duck Creek WMA (Stoddard County), Mingo NWR (Stoddard County), Stockton Reservoir (Cedar County) and August Bush WMA (St. Charles County).

Missouri Department of Conservation
U.S.D.A.
Soil Conservation Service

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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	All												
	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 Water in 2 Mile Wide Circle	All												
	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	All												
	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 1" - 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 1" - 4" May-June	N												
	1. >90%					10						LF		
	2. 75 - 90%					8						2		
	3. 50 - 75%					6						4		
	4. 25 - 50%					4						7		
	5. <25%					1*						10		
8.	Water Depth 1 - 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%				1*	8			7					
	6. <10%				1*	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				1*		
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. 75 - 100 acres				8	6	6	6	10				8	
	4. 50 - 75 acres				6	4	4	4	10				6	
	5. 5 - 50 acres				4	1	2	2	10				4	
	6. <5 acres				1*	1*	1	1	1*				1*	
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	1	10	1	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													
	1. Substrate interspersed with shallow water	N				10								
	2. Shallow water occurring as one or few pools					1								
21.	Percent Open Water													
	1. <10%	N												
	2. 10 - 25%		5	5			10					6		
	3. 25 - 50%		3	3			8					10		
	4. 50 - 90%		1	1			6					8		
	5. >90%		1	1			4					4		
22.	Winter Water Depth (Oct. - March)		1	1			1					1		
	1. 15 - 24"	N												
	2. 10 - 15" or 24 - 30"						10							
	3. 6 - 10" or 30 - 36"						7							
	4. <6" or >36"						4							
23.	Sedge Canopy Coverage						1							
	1. <90%	N												
	2. 75 - 90%							8						
	3. 50 - 75%							10						
	4. 25 - 50%							6						
	5. 1 - 25%							4						
	6. Zero							2						
24.	Wetland Substrate							LF						
	1. Muddy	N												
	2. Sandy					5								
	3. Gravel					3								
25.	Percent Soil Waterlogged Substrate May-June					1								
	1. >90% of substrate waterlogged	N												
	2. 75 - 90% of substrate waterlogged				10									
	3. 50 - 75% of substrate waterlogged				8									
	4. 25 - 50% of substrate waterlogged				6									
	5. <25% of substrate waterlogged				4									
26.	Percent Exposed Wetland Substrate and 1-4" Shallow Water Covered by Vegetation May-June				1									
	1. <10%	N												
	2. 10 - 25%				10									
	3. 25 - 50%				8									
	4. 50 - 75%				6									
	5. 75 - 90%				4									
	6. >90%				2									
27.	Percent Channel with Aquatic Vegetation				LF									
	1. >10%	B												
	2. 5 - 10%								10	10				
	3. 1 - 5%								7	7				
	4. None								4	4				
28.	Average Water Fluctuation in Channel								1	1				
	1. Bank full <3 times per year	B												
	2. Bank full 3-5 times per year									10				
	3. Bank full 5-7 times per year									7				
	4. Bank full >7 times per year									4				
29.	Cropfield Management									1				
	1. No fall tillage	C												
	2. Winter Wheat		10	10										
	3. Chisel plowing		2	10										
	4. Chopped, baled, grazed		8	8										
	5. Fall disc		6	6										
	6. Fall moldboard		4	4										
			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.	Vegetative Cover (% ground covered by herbaceous and shrub cover 6"-18")	B												
	1. >25%									10				
	2. 10-25%									5				
	3. <10%									1				
36.	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			
37.	Permanent Water Within Woodland	B												
	1. >50%		1						10					10
	2. 25 - 50%		3						7					10
	3. 10 - 25%		5						4					7
	4. 5 - 10%		3						1					4
	5. <5%		2						1*					1
38.	Concealment Cover	B												
	1. >5%									5				
	2. 1 - 5%									3				
	3. Zero									1				
39.	Forest Openings (<2 ac. in size)	B												
	1. 15 - 30% scattered		1						10	10	5			
	2. 15 - 30% one or few		3						7	8	4			
	3. 5 - 15%		5						4	6	3			
	4. <5% or >30%		1						1	1	1			
40.	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 scattered sawtimber		6						10	6	6		7	7
	4. Reproduction with scattered sawtimber		4						8	4	8		2	2
	5. Reproduction		1						8	LF	10		1	1
	6. Pole		1						6	1	6		4	4
41.	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
42.	Woodland Overstory Canopy Height (feet)	B												
	1. >80'												10	10
	2. 65-80'												7	7
	3. 40-65'												4	4
	4. <40'												1	1
43.	Percent Subcanopy Closure	B												
	1. >75%												10	1
	2. 50-75%												7	4
	3. 25-50%												4	10
	4. <25%												1	7
44.	Woodland (Stand) Size													
	1. <25%												10	10
	2. 25-50%												7	7
	3. 50-75%												4	4
	4. >75%												1	1
45.	Percent Forest Canopy Adjacent to or Over Permanent Water	B												
	1. >25%													10
	2. 10-25%													7
	3. 5-10%													4
	4. <5%													1
46.	Number of Snags >9"dbh per Acre	B												
	1. >4													10
	2. 3-4													7
	3. 1-2													4
	4. <1													1
47.	Number of Cavity Trees Per Acre	B												
	1. >9								10					
	2. 3 - 9								7					
	3. 1 - 3								4					
	4. None								LF					
48.	Stems per Square Yard of Shrub and Tree Reproduction >3 Feet Tall													
	1. >4									10			10	1
	2. 3-4									7			6	4
	3. 2-3									4			4	10
	4. <2									1			1	7
49.	Percent Woodland Within 660' of Permanent Water	B							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
50.	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	10				
	3. 1/8-1 mi. water predictable		10	10				1	1	1				
	4. <250' water predictable 1 of 3 years		5	5				5	5	5				
	5. 250'-1/8 mi. water predictable 1 of 3 yrs.		5	5				5	5	5				
	6. 1/8-1 mi. flooding predictable 1 of 3 yrs.		5	5				1	1	1				
	7. >1 mi.; or <1 mi. water unpredictable		1	1				1	1	1				
51.	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
52.	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										
53.	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										
54.	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					
55.	Distance to Major River, Lake or Reservoir >100 Acres	N,C,G												
	1. <1 miles Missouri, Mississippi,			10										
	2. 1 - 5 miles Grand, St. Francis			7										
	3. 5 - 10 miles			4										
	4. >10 miles			1										
56.	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	80	85			80		
	B	105						100	105	95			
	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.
M = multiplier. Multiply HTSI by the appropriate value to calculate revised HTSI. Use lowest value if 2 multiplier values apply.

*Footnotes

	Character Number
Mallard - If Fall Winter Water Conditions in bottomland hardwood and nonforest wetland scores 1, HTSI = .1.	4
Canada goose - If Fall Winter Water Conditions in nonforest wetland scores 1, HTSI = .1.	4
Lesser yellowlegs - If Wetland Size and Water Depth 1" - 4" score 1, HTSI = .1.	14,7
Green-backed heron - If Wetland Size and Permanent Water Within Woodland score 1, HTSI = .1.	14,37
Wood duck - If Woodland Size Class or Number of Tree Cavities score 1, HTSI = .1.	40,47
Least bittern - If Wetland Size and Emergent Vegetation Coverage score 1, HTSI = .1.	14,12
American Coot - If Cattail and Bulrush Coverage and Wetland Size score 1, HTSI = .1.	13,14

Multiplier

Mallard - Fall Winter Flood Conditions	5
Important Food Plant Coverage	17
Canada goose - Fall Winter Flood Conditions	5
Distance to Major Canada Goose Winter Area	56
Important Food Plant Coverage	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
Northern Parula - Percent Woodland Within 660' Water	49
Prothonotary Warbler - Percent Woodland Within 660' Water	49

4/87

WILDLIFE HABITAT APPRAISAL GUIDE - WETLANDS - BOTTOMLAND HARDWOODS

WILDLIFE AREA Dresser Island DATE 10-12-88
SAMPLE SITE 1 ANIMAL HABITAT 26 27

LAND USE IN 2 MILE WIDE CIRCLE

1 4 PERCENT NONFOREST WETLANDS (1)>75 (2)50-75 (3)25-50 (4)10-25 (5)<10
2 3 PERCENT NONFOREST WETLANDS AND LAKES OR RESERVOIRS (1)>75 (2)50-75 (3)25-50 (4)10-25 (5)<10
3 3 PERCENT BOTTOML HARDW & NONFOREST WETL (1)>75 (2)50-75 (3)25-50 (4)10-25 (5)<10

SAMPLE SITE, TRACT OR STAND CHARACTERISTICS

4 4 FALL-WINTER WATER CONDITIONS (1)ANNUALLY-PREDICTABLE & CONTROLLED (2)MOST YEARS & CONTROLLED (3)EVERY OTHER YEAR & CONTROLLED (4)IRREGULAR, UNPREDICTABLE; DRY IN FALL; OR NO CONTROL WHEN PRESENT
5 2 FALL-WINTER FLOOD CONDITIONS (1)FOOD PLANTS UNAFFECTED BY FLOODS (2)REDUCED <25; OR 1 IN 4 YRS. (3)REDUCED 25-50; OR 2 IN 4 YRS. (4)REDUCED 50-75; OR 3 IN 4 YRS. (5)REDUCED >75; OR YEARLY
6 5 WATER DEPTH 1"-18" FALL WINTER (1)>90 (2)75-90 (3)50-75 (4)25-50 (5)<25
12 4 EMERGENT VEGETATION COVERAGE (1)>90 (2)75-90 (3)50-75 (4)25-50 (5)10-25 (6)<10
14 6 WETLAND SIZE-ACRES (1)>200 (2)100-200 (3)75-100 (4)50-75 (5)25-50 (6)<25
15 1 WETLAND EDGE (% ADJ. WATER OR NONFOREST WETL) (1)>75% (2)50-75 (3)25-50 (4)10-25 (5)<10
17 5 IMPORTANT FOOD PLANT COVERAGE (1)>75 (2)50-75 (3)25-50 (4)10-25 (5)<10
18 2 PLANT DIVERSITY (1)>7 (2)4-7 (3)<4
27 3 PERCENT CHANNEL WITH AQUATIC VEGETATION 1/4 MI FROM CENTER STAND (1)>10 (2)5-10 (3)1-5 (4)NONE
28 4 WATER FLUCTUATION IN CHANNEL-BANK FULL PER YEAR (1)<3 (2)3-5 (3)5-7 (4)>7
35 1 VEGETATIVE COVER (1)>30 (2)10-30 (3)<10
36 1 WOODLAND TREE SPECIES (1)>50% E,W,C,S,WI,M,A (2)25-50% E,W,C,S,WI,M,A (3)<25% E,W,C,S,WI,M,A; OR <25% PIN OAK (4)25-50% PIN OAK (5)>50% PIN OAK
37 5 PERMANENT WATER IN WOODLAND (% FOREST FLOOR) (1)>50 (2)25-50 (3)10-25 (4)5-10 (5)<5
38 2 CONCEALMENT COVER (1)>5 (2)1-5 (3)ZERO
39 1 FOREST OPENINGS (<2 AC) (1)15-30% SCATTER (2)15-30 ONE OR FEW (3)5-15 (4)<5 OR >50
40 2 WOODLAND SIZE CLASS (1)SAWTIMBER-OPEN CANOPY (2)SAWTIMBER-CLOSED CANOPY (3)POLE + 25% SAWTIMBER (4)REPROD + SAWTIMBER (5)REPROD (6)POLE
41 2 PERCENT CANOPY OLD GROWTH (DBH >16") (1)>25 (2)10-25 (3)5-10 (4)1-5 (5)ZERO
42 2 FOREST OVERSTORY CANOPY HEIGHT (1)>80' (2)65-80' (3)40-65' (4)<40'
43 3 PERCENT SUBCANOPY CLOSURE (1)>75 (2)50-75 (3)25-50 (4)<25
44 2 WOODLAND SIZE (W/IN 660' OPEN) (1)<25 (2)25-50 (3)50-75 (4)>75
45 4 PERCENT FOREST CANOPY ADJACENT OR OVER WATER (1)>25 (2)10-25 (3)5-10 (4)<5
46 2 NUMBER OF SNAGS PER ACRE (DEAD TREE >6" DBH & >10' TALL) (1)>4 (2)3-4 (3)1-2 (4)<1
47 2 NUMBER OF CAVITY TREES/ACRE (1)>9 (2)3-9 (3)1-3 (4)ZERO
48 4 STEMS PER SQ. YARD SHRUB & TREE REPRODUCTION >3' TALL (1)>4 (2)2-3 (3)1-2 (4)<1
49 1 PERCENT WOODLAND WITHIN 660' OF WATER (1)>75 (2)50-75 (3)25-50 (4)<25

DISTANCE BETWEEN HABITAT TYPES (INTERSPERSION)

50 1 DISTANCE NONFOREST WETL,OXBOW,SLOUGH (1)<250' WATER PREDICT (2)250'-1/8 MI WATER PREDICT (3) 1/8-1 MI WATER PREDICT (4) <250' WATER PREDICT 1 OUT OF 3 YEARS (5)250'-1/8 MI WATER PREDICT 1 OUT OF 3 YEARS (6)1/8-1 MI WATER PREDICT 1 OUT OF 3 YEARS (7)>1 MI; OR <1 MI WATER UNPREDICT

9/88FF

52 4 DISTANCE CROPLAND (1)1/4 MI UNHARV AND WATER PREDICT (2)1/4-1/2 MI UNHARV AND WATER PREDICT (3)1/2-1 MI UNHARV AND WATER PREDICT (4)<1/4 MI UNHARV AND WATER PREDICT 1 OUT OF 3 YEARS; OR <1/4 MI UNFLOODED RESIDUES UNDISTURB (5)1/4-1/2 MI UNHARV AND WATER PREDICT 1 OUT OF 3 YEARS; OR 1/4-1/2 MI UNFLOODED RESIDUES UNDISTURB (6)1/2-1 MI UNHARV AND WATER PREDICT 1 OUT OF 3 YEARS; OR 1/2-1 MI UNFLOODED RESIDUES UNDISTURBED (7)>1 MI TO CROPFIELD; OR <1 MI UNFLOODED DISC OR PLOW

54 1 DISTANCE STREAM OR RIVER (1)<1/4 MI (2)1/4-1/2 MI (3)>1/2 MI

IMPORTANT MALLARD AND CANADA GOOSE FOOD PLANTS

✓ Acrons	Cutgrass	✓ Ragweeds
Agricultural Crops	Duckweeds	✓ Sedges
✓ Beggar Tick, Biddens	Foxtails	✓ Smartweeds
Bulrush	Japanese Millet	Spikerushes
Chufa	Pigweeds	Wigeon Grass
Coontail	Pondweeds	Wild Millet

WILDLIFE HABITAT APPRAISAL GUIDE - WETLANDS - NONFOREST

WILDLIFE AREA Dresser Island DATE 10-12-88
SAMPLE SITE 2 ANIMAL HABITAT 27 28 29

LAND USE IN 2 MILE WIDE CIRCLE

1 4 PERCENT NONFOREST WETLANDS (1)>75 (2)50-75 (3)25-50 (4)10-25 (5)<10
2 3 PERCENT NONFOREST WETL AND LAKES OR RESERVOIRS (1)>75 (2)50-75 (3)25-50 (4)10-25 (5)<10
3 3 PERCENT BOTTOML HARDW & NONFOREST WETL (1)>75 (2)50-75 (3)25-50 (4)10-25 (5)<10

SAMPLE SITE, TRACT OF STAND CHARACTERISTICS

4 4 FALL AND WINTER WATER CONDITIONS (1)ANNUALLY - PREDICTABLE & CONTROLLED (2)MOST YEARS & CONTROLLED (3)1 OUT OF 3 YEARS & CONTROLLED (4)IRREGULAR, UNPREDICTABLE; DRY IN FALL; OR NO CONTROL WHEN PRESENT
5 2 FALL AND WINTER FLOOD CONDITIONS (1)FOOD PLANTS UNAFFECTED BY FLOODS (2)REDUCED <25; OR 1 IN 4 YRS. (3)REDUCED 25-50; OR 2 IN 4 YRS. (4)REDUCED 50-75; OR 3 IN 4 YRS. (5) REDUCED >75; OR YEARLY
6 3 WATER DEPTH 1"-18" FALL-WINTER (1)>90 (2)75-90 (3)50-75 (4)25-50 (5)<25
7 3 WATER DEPTH 1"-4" MAY-JUNE(1)>90 (2)75-90 (3)50-75 (4) 25-50 (5)<25
8 2 WATER DEPTH 1"-18" BY AUGUST (1)>75 (2)50-75 (3)25-50 (4)<25
9 4 PERMANENT WATER ENTIRE YEAR (1)>90 (2)75-90 (3)50-75 (4)25-50 (5)<25
10 4 PERCENT EMERGENT VEGETATION W/IN 2YDS WATER (1)>75 (2)50-75 (3)25-50 (4)<25
11 1 WOODY INVASION (1)<10 (2)10-25 (3)25-50 (4)50-75 (5)>75
12 3 EMERGENT VEGETATION COVERAGE (1)>90 (2)75-90 (3)50-75 (4)25-50 (5)10-25 (6)<10
13 5 CATTAIL AND BULLRUSH COVERAGE (1)>75 (2)50-75 (3)25-50 (4)10-25 (5)<10
14 6 WETLAND SIZE-ACRES (1)>200 (2)100-200 (3)75-100 (4)50-75 (5)25-50 (6)<25
15 1 WETLAND EDGE (% WOODY OR ADJ BOTTOML HARDW) (1)>75 (2)50-75 (3)25-50 (4)10-25 (5)<10
16 1 WATER REGIME - GRADUAL DRYING WITH % WATER REMAINING BY AUG. 1 (1) >75 (2)50-75 (3)25-50 (4)<25 (5)STABLE WATER (6)RAPID DRYING (7)NO WATER AFTER JUNE 1
17 3 IMPORTANT FOOD PLANT COVERAGE (1)>75 (2)50-75 (3)25-50 (4)10-25 (5)<10
18 2 PLANT DIVERSITY (1)>7 (2)4-7 (3)<4
19 3 PERSISTENT EMERGENT AND WOODY COVERAGE (1)5-15 (2)15-25 (3)25-50 (4)<5 OR >50
20 2 SUBSTRATE-SURFACE WATER INTERSPERSION (1)SUBSTRATE WATER INTERSPERSED (2)SHALLOW WATER AS 1 OR FEW POOLS
21 3 PERCENT OPEN WATER (1)<10 (2)10-25 (3)25-50 (4)50-90 (5)>90
22 1 WINTER WATER DEPTH OCT-MARCH (1)15-24" (2)10-15 (3)6-10" OR 30-36" (4)<6" OR >36"
23 5 SEDGE CANOPY COVERAGE (1) >90 (2)75-90 (3)50-75 (4)25-50 (5)1-25 (6)ZERO
24 1 WETLAND SUBSTRATE (1)MUDDY (2)SANDY (3) GRAVEL
25 4 PERCENT SOIL WATERLOGGED MAY-JUNE (1)>90 (2)75-90 (3)50-75 (4)25-50 (5)<25
26 4 EMERGENT VEGETATION COVERAGE IN MAY (1)<10 (2)10-25 (3)25-50 (4)50-75 (5)75-90 (6)>90

DISTANCE BETWEEN HABITAT TYPES (INTERSPERSION)

51 7 DISTANCE BOTTOMLAND HARDWOODS (1)<1/4 MI WATER PREDICT (2)1/4-1/2 MI WATER PREDICT (3)1/2-1 MI WATER PREDICT (4)<1/4 MI WATER PREDICT 1 OUT OF 3 YEARS (5)1/4-1/2 MI WATER PREDICT 1 OUT OF 3 YEARS (6)1/2-1 MI WATER PREDICT 1 OUT OF 3 YEARS (7)>1 MI; OR <1 MI WATER UNPREDICTABLE

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52 6 DISTANCE CROPLAND (1)<1/4 MI, UNHARV AND WATER PREDICT (2)<1/4-1/2 MI, UNHARV AND WATER PREDICT (3)1/2-1 MI UNHARV AND WATER PREDICT (4)<1/4 MI, UNHARV AND FLOODING PREDICT 1 OUT OF 3 YEARS; OR <1/4 MI UNFLOODED RESIDUES UNDISTURB (5)1/4-1/2 MI UNHARV AND WATER PREDICT 1 OUT OF 3 YEARS; OR 1/4-1/2 MI UNFLOODED RESIDUES UNDISTURB (6)1/2-1 MI UNHARV AND WATER PREDICT 1 OUT OF 3 YEARS; OR 1/2-1 MI UNFLOODED RESIDUES UNDISTURBED (7)>1 MI TO CROPFIELD; OR <1 MI UNFLOODED DISC OR PLOW

53 4 DISTANCE GRASSLAND (1)<1/2 MI <6" AND >40 AC (2)1/2-1 MI <6" AND >40 AC (3)<1 MI <6" AND <40 AC (4)>1 MI; OR >6"

54 1 DISTANCE STREAM OR RIVER (1)<1/4 MI (2)1/4-1/2 MI (3)>1/2 MI

55 1 DISTANCE MAJOR RIVER OR LAKE >100 AC (1)<1 MI (2)1-5 MI (3)5-10 MI (4)>10 MI

56 3 DISTANCE GOOSE WINTER AREA (1)<4 MI (2)4-10 MI (3)10-25 MI (4)>25 MI

IMPORTANT MALLARD AND CANADA GOOSE FOOD PLANTS

____Acrons
____Agricultural Crops
____Beggar Tick, Biddens
____Bulrush
____Chufa
____Coontail
____Cutgrass
____Duckweeds
____Foxtails
____Japanese Millet
____Pigweeds
____Pondweeds
____Ragweeds
____Sedges
____Smartweeds
____Spikerushes
____Wigeon Grass
____Wild Millet

WINTERING AREAS

Major wintering areas include only the following state wildlife management areas (WMA) and national wildlife refuges (NWR) the Corps of Engineers Reservoirs; Fountain Grove WMA (Linn County); Swan Lake NWR (Chariton County), Smithville Reservoir (Clay County), Thomas Hill WMA (Randolph County), Clarence Cannon Reservoir (Audrain County), Schell-Osage WMA (St. Clair County), Table Rock Reservoir (Stone County), Bull Shoals Reservoir (Taney County), Duck Creek WMA (Stoddard County), Mingo NWR (Stoddard County), Stockton Reservoir (Cedar County) and August Busch WMA (St. Charles County).

WILDLIFE HABITAT APPRAISAL GUIDE - WETLANDS - NONFOREST

WILDLIFE AREA Dresser Island DATE 10-12-88
SAMPLE SITE 3 ANIMAL HABITAT 27 28 29

LAND USE IN 2 MILE WIDE CIRCLE

1 4 PERCENT NONFOREST WETLANDS (1)>75 (2)50-75 (3)25-50 (4)10-25 (5)<10
2 3 PERCENT NONFOREST WETL AND LAKES OR RESERVOIRS (1)>75 (2)50-75 (3)25-50 (4)10-25 (5)<10
3 3 PERCENT BOTTOML HARDW & NONFOREST WETL (1)>75 (2)50-75 (3)25-50 (4)10-25 (5)<10

SAMPLE SITE, TRACT OF STAND CHARACTERISTICS

4 4 FALL AND WINTER WATER CONDITIONS (1)ANNUALLY - PREDICTABLE & CONTROLLED (2)MOST YEARS & CONTROLLED (3)1 OUT OF 3 YEARS & CONTROLLED (4)IRREGULAR, UNPREDICTABLE; DRY IN FALL; OR NO CONTROL WHEN PRESENT
5 2 FALL AND WINTER FLOOD CONDITIONS (1)FOOD PLANTS UNAFFECTED BY FLOODS (2)REDUCED <25; OR 1 IN 4 YRS. (3)REDUCED 25-50; OR 2 IN 4 YRS. (4)REDUCED 50-75; OR 3 IN 4 YRS. (5) REDUCED >75; OR YEARLY
6 3 WATER DEPTH 1"-18" FALL-WINTER (1)>90 (2)75-90 (3)50-75 (4)25-50 (5)<25
7 2 WATER DEPTH 1"-4" MAY-JUNE(1)>90 (2)75-90 (3)50-75 (4) 25-50 (5)<25
8 2 WATER DEPTH 1"-18" BY AUGUST (1)>75 (2)50-75 (3)25-50 (4)<25
9 4 PERMANENT WATER ENTIRE YEAR (1)>90 (2)75-90 (3)50-75 (4)25-50 (5)<25
10 1 PERCENT EMERGENT VEGETATION W/IN 2YDS WATER (1)>75 (2)50-75 (3)25-50 (4)<25
11 1 WOODY INVASION (1)<10 (2)10-25 (3)25-50 (4)50-75 (5)>75
12 5 EMERGENT VEGETATION COVERAGE (1)>90 (2)75-90 (3)50-75 (4)25-50 (5)10-25 (6)<10
13 4 CATTAIL AND BULLRUSH COVERAGE (1)>75 (2)50-75 (3)25-50 (4)10-25 (5)<10
14 5 WETLAND SIZE-ACRES (1)>200 (2)100-200 (3)75-100 (4)50-75 (5)25-50 (6)<25
15 1 WETLAND EDGE (% WOODY OR ADJ BOTTOML HARDW) (1)>75 (2)50-75 (3)25-50 (4)10-25 (5)<10
16 1 WATER REGIME - GRADUAL DRYING WITH % WATER REMAINING BY AUG. 1 (1) >75 (2)50-75 (3)25-50 (4)<25 (5)STABLE WATER (6)RAPID DRYING (7)NO WATER AFTER JUNE 1
17 1 IMPORTANT FOOD PLANT COVERAGE (1)>75 (2)50-75 (3)25-50 (4)10-25 (5)<10
18 3 PLANT DIVERSITY (1)>7 (2)4-7 (3)<4
19 1 PERSISTENT EMERGENT AND WOODY COVERAGE (1)5-15 (2)15-25 (3)25-50 (4)<5 OR >50
20 1 SUBSTRATE-SURFACE WATER INTERSPERSION (1)SUBSTRATE WATER INTERSPERSED (2)SHALLOW WATER AS 1 OR FEW POOLS
21 1 PERCENT OPEN WATER (1)<10 (2)10-25 (3)25-50 (4)50-90 (5)>90
22 3 WINTER WATER DEPTH OCT-MARCH (1)15-24" (2)10-15 (3)6-10" OR 30-36" (4)<6" OR >36"
23 5 SEDGE CANOPY COVERAGE (1) >90 (2)75-90 (3)50-75 (4)25-50 (5)1-25 (6)ZERO
24 1 WETLAND SUBSTRATE (1)MUDDY (2)SANDY (3) GRAVEL
25 1 PERCENT SOIL WATERLOGGED MAY-JUNE (1)>90 (2)75-90 (3)50-75 (4)25-50 (5)<25
26 2 EMERGENT VEGETATION COVERAGE IN MAY (1)<10 (2)10-25 (3)25-50 (4)50-75 (5)75-90 (6)>90

DISTANCE BETWEEN HABITAT TYPES (INTERSPERSION)

51 7 DISTANCE BOTTOMLAND HARDWOODS (1)<1/4 MI WATER PREDICT (2)1/4-1/2 MI WATER PREDICT (3)1/2-1 MI WATER PREDICT (4)<1/4 MI WATER PREDICT 1 OUT OF 3 YEARS (5)1/4-1/2 MI WATER PREDICT 1 OUT OF 3 YEARS (6)1/2-1 MI WATER PREDICT 1 OUT OF 3 YEARS (7)>1 MI; OR <1 MI WATER UNPREDICTABLE

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52 5 DISTANCE CROPLAND (1)<1/4 MI, UNHARV AND WATER PREDICT (2)<1/4-1/2 MI, UNHARV AND WATER PREDICT (3)1/2-1 MI UNHARV AND WATER PREDICT (4)<1/4 MI, UNHARV AND FLOODING PREDICT 1 OUT OF 3 YEARS; OR <1/4 MI UNFLOODED RESIDUES UNDISTURB (5)1/4-1/2 MI UNHARV AND WATER PREDICT 1 OUT OF 3 YEARS; OR 1/4-1/2 MI UNFLOODED RESIDUES UNDISTURB (6)1/2-1 MI UNHARV AND WATER PREDICT 1 OUT OF 3 YEARS; OR 1/2-1 MI UNFLOODED RESIDUES UNDISTURBED (7)>1 MI TO CROPFIELD; OR <1 MI UNFLOODED DISC OR PLOW

53 4 DISTANCE GRASSLAND (1)<1/2 MI <6" AND >40 AC (2)1/2-1 MI <6" AND >40 AC (3)<1 MI <6" AND <40 AC (4)>1 MI; OR >6"

54 1 DISTANCE STREAM OR RIVER (1)<1/4 MI (2)1/4-1/2 MI (3)>1/2 MI

55 1 DISTANCE MAJOR RIVER OR LAKE >100 AC (1)<1 MI (2)1-5 MI (3)5-10 MI (4)>10 MI

56 2 DISTANCE GOOSE WINTER AREA (1)<4 MI (2)4-10 MI (3)10-25 MI (4)>25 MI

IMPORTANT MALLARD AND CANADA GOOSE FOOD PLANTS

____Acrons	____Cutgrass	____Ragweeds
____Agricultural Crops	____Duckweeds	____Sedges
____Beggar Tick, Biddens	____Foxtails	____Smartweeds
____Bulrush	____Japanese Millet	____Spikerushes
____Chufa	____Pigweeds	____Wigeon Grass
____Coontail	____Pondweeds	____Wild Millet

WINTERING AREAS

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WILDLIFE HABITAT APPRAISAL GUIDE - WETLANDS - NONFOREST

WILDLIFE AREA Dresser Island DATE 10-22-88
SAMPLE SITE 4 ANIMAL HABITAT 27 28 29

LAND USE IN 2 MILE WIDE CIRCLE

1 4 PERCENT NONFOREST WETLANDS (1)>75 (2)50-75 (3)25-50 (4)10-25 (5)<10
2 3 PERCENT NONFOREST WETL AND LAKES OR RESERVOIRS (1)>75 (2)50-75 (3)25-50 (4)10-25 (5)<10
3 3 PERCENT BOTTOML HARDW & NONFOREST WETL (1)>75 (2)50-75 (3)25-50 (4)10-25 (5)<10

SAMPLE SITE, TRACT OF STAND CHARACTERISTICS

4 4 FALL AND WINTER WATER CONDITIONS (1)ANNUALLY - PREDICTABLE & CONTROLLED (2)MOST YEARS & CONTROLLED (3)1 OUT OF 3 YEARS & CONTROLLED (4)IRREGULAR, UNPREDICTABLE; DRY IN FALL; OR NO CONTROL WHEN PRESENT
5 2 FALL AND WINTER FLOOD CONDITIONS (1)FOOD PLANTS UNAFFECTED BY FLOODS (2)REDUCED <25; OR 1 IN 4 YRS. (3)REDUCED 25-50; OR 2 IN 4 YRS. (4)REDUCED 50-75; OR 3 IN 4 YRS. (5) REDUCED >75; OR YEARLY
6 5 WATER DEPTH 1"-18" FALL-WINTER (1)>90 (2)75-90 (3)50-75 (4)25-50 (5)<25
7 5 WATER DEPTH 1"-4" MAY-JUNE(1)>90 (2)75-90 (3)50-75 (4) 25-50 (5)<25
8 2 WATER DEPTH 1"-18" BY AUGUST (1)>75 (2)50-75 (3)25-50 (4)<25
9 2 PERMANENT WATER ENTIRE YEAR (1)>90 (2)75-90 (3)50-75 (4)25-50 (5)<25
10 1 PERCENT EMERGENT VEGETATION W/IN 2YDS WATER (1)>75 (2)50-75 (3)25-50 (4)<25
11 1 WOODY INVASION (1)<10 (2)10-25 (3)25-50 (4)50-75 (5)>75
12 2 EMERGENT VEGETATION COVERAGE (1)>90 (2)75-90 (3)50-75 (4)25-50 (5)10-25 (6)<10
13 5 CATTAIL AND BULLRUSH COVERAGE (1)>75 (2)50-75 (3)25-50 (4)10-25 (5)<10
14 5 WETLAND SIZE-ACRES (1)>200 (2)100-200 (3)75-100 (4)50-75 (5)25-50 (6)<25
15 1 WETLAND EDGE (% WOODY OR ADJ BOTTOML HARDW) (1)>75 (2)50-75 (3)25-50 (4)10-25 (5)<10
16 1 WATER REGIME - GRADUAL DRYING WITH % WATER REMAINING BY AUG. 1 (1) >75 (2)50-75 (3)25-50 (4)<25 (5)STABLE WATER (6)RAPID DRYING (7)NO WATER AFTER JUNE 1
17 1 IMPORTANT FOOD PLANT COVERAGE (1)>75 (2)50-75 (3)25-50 (4)10-25 (5)<10
18 3 PLANT DIVERSITY (1)>7 (2)4-7 (3)<4
19 4 PERSISTENT EMERGENT AND WOODY COVERAGE (1)5-15 (2)15-25 (3)25-50 (4)<5 OR >50
20 2 SUBSTRATE-SURFACE WATER INTERSPERSION (1)SUBSTRATE WATER INTERSPERSED (2)SHALLOW WATER AS 1 OR FEW POOLS
21 2 PERCENT OPEN WATER (1)<10 (2)10-25 (3)25-50 (4)50-90 (5)>90
22 1 WINTER WATER DEPTH OCT-MARCH (1)15-24" (2)10-15 (3)6-10" OR 30-36" (4)<6" OR >36"
23 6 SEDGE CANOPY COVERAGE (1) >90 (2)75-90 (3)50-75 (4)25-50 (5)1-25 (6)ZERO
24 1 WETLAND SUBSTRATE (1)MUDDY (2)SANDY (3) GRAVEL
25 1 PERCENT SOIL WATERLOGGED MAY-JUNE (1)>90 (2)75-90 (3)50-75 (4)25-50 (5)<25
26 1 EMERGENT VEGETATION COVERAGE IN MAY (1)<10 (2)10-25 (3)25-50 (4)50-75 (5)75-90 (6)>90

DISTANCE BETWEEN HABITAT TYPES (INTERSPERSION)

51 7 DISTANCE BOTTOMLAND HARDWOODS (1)<1/4 MI WATER PREDICT (2)1/4-1/2 MI WATER PREDICT (3)1/2-1 MI WATER PREDICT (4)<1/4 MI WATER PREDICT 1 OUT OF 3 YEARS (5)1/4-1/2 MI WATER PREDICT 1 OUT OF 3 YEARS (6)1/2-1 MI WATER PREDICT 1 OUT OF 3 YEARS (7)>1 MI; OR <1 MI WATER UNPREDICTABLE

9/88FF

52 4 DISTANCE CROPLAND (1)<1/4 MI, UNHARV AND WATER PREDICT (2)<1/4-1/2 MI, UNHARV AND WATER PREDICT (3)1/2-1 MI UNHARV AND WATER PREDICT (4)<1/4 MI, UNHARV AND FLOODING PREDICT 1 OUT OF 3 YEARS; OR <1/4 MI UNFLOODED RESIDUES UNDISTURB (5)1/4-1/2 MI UNHARV AND WATER PREDICT 1 OUT OF 3 YEARS; OR 1/4-1/2 MI UNFLOODED RESIDUES UNDISTURB (6)1/2-1 MI UNHARV AND WATER PREDICT 1 OUT OF 3 YEARS; OR 1/2-1 MI UNFLOODED RESIDUES UNDISTURBED (7)>1 MI TO CROPFIELD; OR <1 MI UNFLOODED DISC OR PLOW

53 4 DISTANCE GRASSLAND (1)<1/2 MI <6" AND >40 AC (2)1/2-1 MI <6" AND >40 AC (3)<1 MI <6" AND <40 AC (4)>1 MI; OR >6"

54 1 DISTANCE STREAM OR RIVER (1)<1/4 MI (2)1/4-1/2 MI (3)>1/2 MI

55 1 DISTANCE MAJOR RIVER OR LAKE >100 AC (1)<1 MI (2)1-5 MI (3)5-10 MI (4)>10 MI

56 3 DISTANCE GOOSE WINTER AREA (1)<4 MI (2)4-10 MI (3)10-25 MI (4)>25 MI

IMPORTANT MALLARD AND CANADA GOOSE FOOD PLANTS

____Acrons
____Agricultural Crops
____Beggar Tick, Biddens
____Bulrush
____Chufa
____Coontail
____Cutgrass
____Duckweeds
____Foxtails
____Japanese Millet
____Pigweeds
____Pondweeds
____Ragweeds
____Sedges
____Smartweeds
____Spikerushes
____Wigeon Grass
____Wild Millet

WINTERING AREAS

Major wintering areas include only the following state wildlife management areas (WMA) and national wildlife refuges (NWR) the Corps of Engineers Reservoirs; Fountain Grove WMA (Linn County), Swan Lake NWR (Chariton County), Smithville Reservoir (Clay County), Thomas Hill WMA (Randolph County), Clarence Cannon Reservoir (Audrain County), Schell-Osage WMA (St. Clair County), Table Rock Reservoir (Stone County), Bull Shoals Reservoir (Taney County), Duck Creek WMA (Stoddard County), Mingo NWR (Stoddard County), Stockton Reservoir (Cedar County) and August Busch WMA (St. Charles County).

WILDLIFE HABITAT APPRAISAL GUIDE - WETLANDS - NONFOREST

WILDLIFE AREA Dresser Island DATE 10-22-88
SAMPLE SITE 5 ANIMAL HABITAT 27 28 29

LAND USE IN 2 MILE WIDE CIRCLE

1 4 PERCENT NONFOREST WETLANDS (1)>75 (2)50-75 (3)25-50 (4)10-25 (5)<10
2 2 PERCENT NONFOREST WETL AND LAKES OR RESERVOIRS (1)>75 (2)50-75 (3)25-50 (4)10-25 (5)<10
3 3 PERCENT BOTTOML HARDW & NONFOREST WETL (1)>75 (2)50-75 (3)25-50 (4)10-25 (5)<10

SAMPLE SITE, TRACT OF STAND CHARACTERISTICS

4 4 FALL AND WINTER WATER CONDITIONS (1)ANNUALLY - PREDICTABLE & CONTROLLED (2)MOST YEARS & CONTROLLED (3)1 OUT OF 3 YEARS & CONTROLLED (4)IRREGULAR, UNPREDICTABLE; DRY IN FALL; OR NO CONTROL WHEN PRESENT
5 2 FALL AND WINTER FLOOD CONDITIONS (1)FOOD PLANTS UNAFFECTED BY FLOODS (2)REDUCED <25; OR 1 IN 4 YRS. (3)REDUCED 25-50; OR 2 IN 4 YRS. (4)REDUCED 50-75; OR 3 IN 4 YRS. (5) REDUCED >75; OR YEARLY
6 5 WATER DEPTH 1"-18" FALL-WINTER (1)>90 (2)75-90 (3)50-75 (4)25-50 (5)<25
7 5 WATER DEPTH 1"-4" MAY-JUNE(1)>90 (2)75-90 (3)50-75 (4) 25-50 (5)<25
8 2 WATER DEPTH 1"-18" BY AUGUST (1)>75 (2)50-75 (3)25-50 (4)<25
9 2 PERMANENT WATER ENTIRE YEAR (1)>90 (2)75-90 (3)50-75 (4)25-50 (5)<25
10 1 PERCENT EMERGENT VEGETATION W/IN 2YDS WATER (1)>75 (2)50-75 (3)25-50 (4)<25
11 1 WOODY INVASION (1)<10 (2)10-25 (3)25-50 (4)50-75 (5)>75
12 5 EMERGENT VEGETATION COVERAGE (1)>90 (2)75-90 (3)50-75 (4)25-50 (5)10-25 (6)<10
13 4 CATTAIL AND BULLRUSH COVERAGE (1)>75 (2)50-75 (3)25-50 (4)10-25 (5)<10
14 6 WETLAND SIZE-ACRES (1)>200 (2)100-200 (3)75-100 (4)50-75 (5)25-50 (6)<25
15 1 WETLAND EDGE (% WOODY OR ADJ BOTTOML HARDW) (1)>75 (2)50-75 (3)25-50 (4)10-25 (5)<10
16 1 WATER REGIME - GRADUAL DRYING WITH % WATER REMAINING BY AUG. 1 (1) >75 (2)50-75 (3)25-50 (4)<25 (5)STABLE WATER (6)RAPID DRYING (7)NO WATER AFTER JUNE 1
17 3 IMPORTANT FOOD PLANT COVERAGE (1)>75 (2)50-75 (3)25-50 (4)10-25 (5)<10
18 3 PLANT DIVERSITY (1)>7 (2)4-7 (3)<4
19 4 PERSISTENT EMERGENT AND WOODY COVERAGE (1)5-15 (2)15-25 (3)25-50 (4)<5 OR >50
20 2 SUBSTRATE-SURFACE WATER INTERSPERSION (1)SUBSTRATE WATER INTERSPERSED (2)SHALLOW WATER AS 1 OR FEW POOLS
21 4 PERCENT OPEN WATER (1)<10 (2)10-25 (3)25-50 (4)50-90 (5)>90
22 1 WINTER WATER DEPTH OCT-MARCH (1)15-24" (2)10-15 (3)6-10" OR 30-36" (4)<6" OR >36"
23 6 SEDGE CANOPY COVERAGE (1) >90 (2)75-90 (3)50-75 (4)25-50 (5)1-25 (6)ZERO
24 1 WETLAND SUBSTRATE (1)MUDDY (2)SANDY (3) GRAVEL
25 1 PERCENT SOIL WATERLOGGED MAY-JUNE (1)>90 (2)75-90 (3)50-75 (4)25-50 (5)<25
26 1 EMERGENT VEGETATION COVERAGE IN MAY (1)<10 (2)10-25 (3)25-50 (4)50-75 (5)75-90 (6)>90

DISTANCE BETWEEN HABITAT TYPES (INTERSPERSION)

51 7 DISTANCE BOTTOMLAND HARDWOODS (1)<1/4 MI WATER PREDICT (2)1/4-1/2 MI WATER PREDICT (3)1/2-1 MI WATER PREDICT (4)<1/4 MI WATER PREDICT 1 OUT OF 3 YEARS (5)1/4-1/2 MI WATER PREDICT 1 OUT OF 3 YEARS (6)1/2-1 MI WATER PREDICT 1 OUT OF 3 YEARS (7)>1 MI; OR <1 MI WATER UNPREDICTABLE

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52 4 DISTANCE CROPLAND (1)<1/4 MI, UNHARV AND WATER PREDICT (2)<1/4-1/2 MI, UNHARV AND WATER PREDICT (3)1/2-1 MI UNHARV AND WATER PREDICT (4)<1/4 MI, UNHARV AND FLOODING PREDICT 1 OUT OF 3 YEARS; OR <1/4 MI UNFLOODED RESIDUES UNDISTURB (5)1/4-1/2 MI UNHARV AND WATER PREDICT 1 OUT OF 3 YEARS; OR 1/4-1/2 MI UNFLOODED RESIDUES UNDISTURB (6)1/2-1 MI UNHARV AND WATER PREDICT 1 OUT OF 3 YEARS; OR 1/2-1 MI UNFLOODED RESIDUES UNDISTURBED (7)>1 MI TO CROPFIELD; OR <1 MI UNFLOODED DISC OR PLOW

53 4 DISTANCE GRASSLAND (1)<1/2 MI <6" AND >40 AC (2)1/2-1 MI <6" AND >40 AC (3)<1 MI <6" AND <40 AC (4)>1 MI; OR >6"

54 1 DISTANCE STREAM OR RIVER (1)<1/4 MI (2)1/4-1/2 MI (3)>1/2 MI

55 1 DISTANCE MAJOR RIVER OR LAKE >100 AC (1)<1 MI (2)1-5 MI (3)5-10 MI (4)>10 MI

56 3 DISTANCE GOOSE WINTER AREA (1)<4 MI (2)4-10 MI (3)10-25 MI (4)>25 MI

IMPORTANT MALLARD AND CANADA GOOSE FOOD PLANTS

____Acrons	____Cutgrass	____Ragweeds
____Agricultural Crops	____Duckweeds	____Sedges
____Beggar Tick, Biddens	____Foxtails	____Smartweeds
____Bulrush	____Japanese Millet	____Spikerushes
____Chufa	____Pigweeds	____Wigeon Grass
____Coontail	____Pondweeds	____Wild Millet

WINTERING AREAS

Major wintering areas include only the following state wildlife management areas (WMA) and national wildlife refuges (NWR) the Corps of Engineers Reservoirs; Fountain Grove WMA (Linn County), Swan Lake NWR (Chariton County), Smithville Reservoir (Clay County), Thomas Hill WMA (Randolph County), Clarence Cannon Reservoir (Audrain County), Schell-Osage WMA (St. Clair County), Table Rock Reservoir (Stone County), Bull Shoals Reservoir (Taney County), Duck Creek WMA (Stoddard County), Mingo NWR (Stoddard County), Stockton Reservoir (Cedar County) and August Busch WMA (St. Charles County).

WILDLIFE HABITAT APPRAISAL GUIDE - WETLANDS - NONFOREST

WILDLIFE AREA Dresser Island DATE 10-12-85
SAMPLE SITE 6 ANIMAL HABITAT 27 28 29

LAND USE IN 2 MILE WIDE CIRCLE

1 4 PERCENT NONFOREST WETLANDS (1)>75 (2)50-75 (3)25-50 (4)10-25 (5)<10
2 2 PERCENT NONFOREST WETL AND LAKES OR RESERVOIRS (1)>75 (2)50-75 (3)25-50 (4)10-25 (5)<10
3 3 PERCENT BOTTOML HARDW & NONFOREST WETL (1)>75 (2)50-75 (3)25-50 (4)10-25 (5)<10

SAMPLE SITE, TRACT OF STAND CHARACTERISTICS

4 4 FALL AND WINTER WATER CONDITIONS (1)ANNUALLY - PREDICTABLE & CONTROLLED (2)MOST YEARS & CONTROLLED (3)1 OUT OF 3 YEARS & CONTROLLED (4)IRREGULAR, UNPREDICTABLE; DRY IN FALL; OR NO CONTROL WHEN PRESENT
5 2 FALL AND WINTER FLOOD CONDITIONS (1)FOOD PLANTS UNAFFECTED BY FLOODS (2)REDUCED <25; OR 1 IN 4 YRS. (3)REDUCED 25-50; OR 2 IN 4 YRS. (4)REDUCED 50-75; OR 3 IN 4 YRS. (5) REDUCED >75; OR YEARLY
6 2 WATER DEPTH 1"-18" FALL-WINTER (1)>90 (2)75-90 (3)50-75 (4)25-50 (5)<25
7 2 WATER DEPTH 1"-4" MAY-JUNE(1)>90 (2)75-90 (3)50-75 (4) 25-50 (5)<25
8 2 WATER DEPTH 1"-18" BY AUGUST (1)>75 (2)50-75 (3)25-50 (4)<25
9 4 PERMANENT WATER ENTIRE YEAR (1)>90 (2)75-90 (3)50-75 (4)25-50 (5)<25
10 1 PERCENT EMERGENT VEGETATION W/IN 2YDS WATER (1)>75 (2)50-75 (3)25-50 (4)<25
11 2 WOODY INVASION (1)<10 (2)10-25 (3)25-50 (4)50-75 (5)>75
12 1 EMERGENT VEGETATION COVERAGE (1)>90 (2)75-90 (3)50-75 (4)25-50 (5)10-25 (6)<10
13 4 CATTAIL AND BULLRUSH COVERAGE (1)>75 (2)50-75 (3)25-50 (4)10-25 (5)<10
14 5 WETLAND SIZE-ACRES (1)>200 (2)100-200 (3)75-100 (4)50-75 (5)25-50 (6)<25
15 1 WETLAND EDGE (% WOODY OR ADJ BOTTOML HARDW) (1)>75 (2)50-75 (3)25-50 (4)10-25 (5)<10
16 3 WATER REGIME - GRADUAL DRYING WITH % WATER REMAINING BY AUG. 1 (1) >75 (2)50-75 (3)25-50 (4)<25 (5)STABLE WATER (6)RAPID DRYING (7)NO WATER AFTER JUNE 1
17 1 IMPORTANT FOOD PLANT COVERAGE (1)>75 (2)50-75 (3)25-50 (4)10-25 (5)<10
18 2 PLANT DIVERSITY (1)>7 (2)4-7 (3)<4
19 4 PERSISTENT EMERGENT AND WOODY COVERAGE (1)5-15 (2)15-25 (3)25-50 (4)<5 OR >50
20 2 SUBSTRATE-SURFACE WATER INTERSPERSION (1)SUBSTRATE WATER INTERSPERSED (2)SHALLOW WATER AS 1 OR FEW POOLS
21 1 PERCENT OPEN WATER (1)<10 (2)10-25 (3)25-50 (4)50-90 (5)>90
22 4 WINTER WATER DEPTH OCT-MARCH (1)15-24" (2)10-15 (3)6-10" OR 30-36" (4)<6" OR >36"
23 5 SEDGE CANOPY COVERAGE (1) >90 (2)75-90 (3)50-75 (4)25-50 (5)1-25 (6)ZERO
24 1 WETLAND SUBSTRATE (1)MUDDY (2)SANDY (3) GRAVEL
25 1 PERCENT SOIL WATERLOGGED MAY-JUNE (1)>90 (2)75-90 (3)50-75 (4)25-50 (5)<25
26 5 EMERGENT VEGETATION COVERAGE IN MAY (1)<10 (2)10-25 (3)25-50 (4)50-75 (5)75-90 (6)>90

DISTANCE BETWEEN HABITAT TYPES (INTERSPERSION)

51 7 DISTANCE BOTTOMLAND HARDWOODS (1)<1/4 MI WATER PREDICT (2)1/4-1/2 MI WATER PREDICT (3)1/2-1 MI WATER PREDICT (4)<1/4 MI WATER PREDICT 1 OUT OF 3 YEARS (5)1/4-1/2 MI WATER PREDICT 1 OUT OF 3 YEARS (6)1/2-1 MI WATER PREDICT 1 OUT OF 3 YEARS (7)>1 MI; OR <1 MI WATER UNPREDICTABLE

9/88FF

52 6 DISTANCE CROPLAND (1)<1/4 MI, UNHARV AND WATER PREDICT (2)<1/4-1/2 MI, UNHARV AND WATER PREDICT (3)1/2-1 MI UNHARV AND WATER PREDICT (4)<1/4 MI, UNHARV AND FLOODING PREDICT 1 OUT OF 3 YEARS; OR <1/4 MI UNFLOODED RESIDUES UNDISTURB (5)1/4-1/2 MI UNHARV AND WATER PREDICT 1 OUT OF 3 YEARS; OR 1/4-1/2 MI UNFLOODED RESIDUES UNDISTURB (6)1/2-1 MI UNHARV AND WATER PREDICT 1 OUT OF 3 YEARS; OR 1/2-1 MI UNFLOODED RESIDUES UNDISTURBED (7)>1 MI TO CROPFIELD; OR <1 MI UNFLOODED DISC OR PLOW

53 4 DISTANCE GRASSLAND (1)<1/2 MI <6" AND >40 AC (2)1/2-1 MI <6" AND >40 AC (3)<1 MI <6" AND <40 AC (4)>1 MI; OR >6"

54 1 DISTANCE STREAM OR RIVER (1)<1/4 MI (2)1/4-1/2 MI (3)>1/2 MI

55 1 DISTANCE MAJOR RIVER OR LAKE >100 AC (1)<1 MI (2)1-5 MI (3)5-10 MI (4)>10 MI

56 3 DISTANCE GOOSE WINTER AREA (1)<4 MI (2)4-10 MI (3)10-25 MI (4)>25 MI

IMPORTANT MALLARD AND CANADA GOOSE FOOD PLANTS

____Acrons	____Cutgrass	____Ragweeds
____Agricultural Crops	____Duckweeds	____Sedges
____Beggar Tick, Biddens	____Foxtails	____Smartweeds
____Bulrush	____Japanese Millet	____Spikerushes
____Chufa	____Pigweeds	____Wigeon Grass
____Coontail	____Pondweeds	____Wild Millet

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WILDLIFE HABITAT APPRAISAL GUIDE - WETLANDS - BOTTOMLAND HARDWOODS

WILDLIFE AREA Dresser Island DATE 12 Oct. 88
SAMPLE SITE 7 ANIMAL HABITAT 26 27

LAND USE IN 2 MILE WIDE CIRCLE

1 4 PERCENT NONFOREST WETLANDS (1)>75 (2)50-75 (3)25-50 (4)10-25 (5)<10
2 3 PERCENT NONFOREST WETLANDS AND LAKES OR RESERVOIRS (1)>75 (2)50-75 (3)25-50 (4)10-25 (5)<10
3 3 PERCENT BOTTOML HARDW & NONFOREST WETL (1)>75 (2)50-75 (3)25-50 (4)10-25 (5)<10

SAMPLE SITE, TRACT OR STAND CHARACTERISTICS

4 4 FALL-WINTER WATER CONDITIONS (1)ANNUALLY-PREDICTABLE & CONTROLLED (2)MOST YEARS & CONTROLLED (3)EVERY OTHER YEAR & CONTROLLED (4)IRREGULAR, UNPREDICTABLE; DRY IN FALL; OR NO CONTROL WHEN PRESENT
5 2 FALL-WINTER FLOOD CONDITIONS (1)FOOD PLANTS UNAFFECTED BY FLOODS (2)REDUCED <25; OR 1 IN 4 YRS. (3)REDUCED 25-50; OR 2 IN 4 YRS. (4)REDUCED 50-75; OR 3 IN 4 YRS. (5)REDUCED >75; OR YEARLY
6 5 WATER DEPTH 1"-18" FALL WINTER (1)>90 (2)75-90 (3)50-75 (4)25-50 (5)<25
12 6 EMERGENT VEGETATION COVERAGE (1)>90 (2)75-90 (3)50-75 (4)25-50 (5)10-25 (6)<10
14 6 WETLAND SIZE-ACRES (1)>200 (2)100-200 (3)75-100 (4)50-75 (5)25-50 (6)<25
15 2 WETLAND EDGE (% ADJ. WATER OR NONFOREST WETL) (1)>75% (2)50-75 (3)25-50 (4)10-25 (5)<10
17 4 IMPORTANT FOOD PLANT COVERAGE (1)>75 (2)50-75 (3)25-50 (4)10-25 (5)<10
18 2 PLANT DIVERSITY (1)>7 (2)4-7 (3)<4
27 2 PERCENT CHANNEL WITH AQUATIC VEGETATION 1/4 MI FROM CENTER STAND (1)>10 (2)5-10 (3)1-5 (4)NONE
28 4 WATER FLUCTUATION IN CHANNEL-BANK FULL PER YEAR (1)<3 (2)3-5 (3)5-7 (4)>7
35 1 VEGETATIVE COVER (1)>30 (2)10-30 (3)<10
36 1 WOODLAND TREE SPECIES (1)>50% E,W,C,S,WI,M,A (2)25-50% E,W,C,S,WI,M,A (3)<25% E,W,C,S,WI,M,A; OR <25% PIN OAK (4)25-50% PIN OAK (5)>50% PIN OAK
37 5 PERMANENT WATER IN WOODLAND (% FOREST FLOOR) (1)>50 (2)25-50 (3)10-25 (4)5-10 (5)<5
38 1 CONCEALMENT COVER (1)>5 (2)1-5 (3)ZERO
39 4 FOREST OPENINGS (<2 AC) (1)15-30% SCATTER (2)15-30 ONE OR FEW (3)5-15 (4)<5 OR >50
40 3 WOODLAND SIZE CLASS (1)SAWTIMBER-OPEN CANOPY (2)SAWTIMBER-CLOSED CANOPY (3)POLE + 25% SAWTIMBER (4)REPROD + SAWTIMBER (5)REPROD (6)POLE
41 3 PERCENT CANOPY OLD GROWTH (DBH >16") (1)>25 (2)10-25 (3)5-10 (4)1-5 (5)ZERO
42 3 FOREST OVERSTORY CANOPY HEIGHT (1)>80' (2)65-80' (3)40-65' (4)<40'
43 3 PERCENT SUBCANOPY CLOSURE (1)>75 (2)50-75 (3)25-50 (4)<25
44 4 WOODLAND SIZE (W/IN 660' OPEN) (1)<25 (2)25-50 (3)50-75 (4)>75
45 4 PERCENT FOREST CANOPY ADJACENT OR OVER WATER (2)>25 (2)10-25 (3)5-10 (4)<5
46 1 NUMBER OF SNAGS PER ACRE (DEAD TREE >6" DBH & >10' TALL) (1)>4 (2)3-4 (3)1-2 (4)<1
47 3 NUMBER OF CAVITY TREES/ACRE (1)>9 (2)3-9 (3)1-3 (4)ZERO
48 2 STEMS PER SQ. YARD SHRUB & TREE REPRODUCTION >3' TALL (1)>4 (2)2-3 (3)1-2 (4)<1
49 1 PERCENT WOODLAND WITHIN 660' OF WATER (1)>75 (2)50-75 (3)25-50 (4)<25

DISTANCE BETWEEN HABITAT TYPES (INTERSPERSION)

50 7 DISTANCE NONFOREST WETL,OXBOW,SLOUGH (1)<250' WATER PREDICT (2)250'-1/8 MI WATER PREDICT (3) 1/8-1 MI WATER PREDICT (4) <250' WATER PREDICT 1 OUT OF 3 YEARS (5)250'-1/8 MI WATER PREDICT 1 OUT OF 3 YEARS (6)1/8-1 MI WATER PREDICT 1 OUT OF 3 YEARS (7)>1 MI; OR <1 MI WATER UNPREDICT

9/88FF

52 5 DISTANCE CROPLAND (1)1/4 MI UNHARV AND WATER PREDICT (2)1/4-1/2 MI UNHARV AND WATER PREDICT (3)1/2-1 MI UNHARV AND WATER PREDICT (4)<1/4 MI UNHARV AND WATER PREDICT 1 OUT OF 3 YEARS; OR <1/4 MI UNFLOODED RESIDUES UNDISTURB (5)1/4-1/2 MI UNHARV AND WATER PREDICT 1 OUT OF 3 YEARS; OR 1/4-1/2 MI UNFLOODED RESIDUES UNDISTURB (6)1/2-1 MI UNHARV AND WATER PREDICT 1 OUT OF 3 YEARS; OR 1/2-1 MI UNFLOODED RESIDUES UNDISTURBED (7)>1 MI TO CROPFIELD; OR <1 MI UNFLOODED DISC OR PLOW

54 / DISTANCE STREAM OR RIVER (1)<1/4 MI (2)1/4-1/2 MI (3)>1/2 MI

IMPORTANT MALLARD AND CANADA GOOSE FOOD PLANTS

✓ Acrons	Cutgrass	Ragweeds
Agricultural Crops	Duckweeds	Sedges
✓ Beggar Tick, Biddens	Foxtails	Smartweeds
Bulrush	Japanese Millet	Spikerushes
Chufa	Pigweeds	Wigeon Grass
Coontail	Pondweeds	Wild Millet

X

WILDLIFE HABITAT APPRAISAL GUIDE - WETLANDS - NONFOREST

WILDLIFE AREA Dressar Island DATE 10-12-87
SAMPLE SITE 8 ANIMAL HABITAT 27 28 29

LAND USE IN 2 MILE WIDE CIRCLE

1 4 PERCENT NONFOREST WETLANDS (1)>75 (2)50-75 (3)25-50 (4)10-25 (5)<10
2 3 PERCENT NONFOREST WETL AND LAKES OR RESERVOIRS (1)>75 (2)50-75 (3)25-50 (4)10-25 (5)<10
3 3 PERCENT BOTTOML HARDW & NONFOREST WETL (1)>75 (2)50-75 (3)25-50 (4)10-25 (5)<10

SAMPLE SITE, TRACT OF STAND CHARACTERISTICS

4 4 FALL AND WINTER WATER CONDITIONS (1)ANNUALLY - PREDICTABLE & CONTROLLED (2)MOST YEARS & CONTROLLED (3)1 OUT OF 3 YEARS & CONTROLLED (4)IRREGULAR, UNPREDICTABLE; DRY IN FALL; OR NO CONTROL WHEN PRESENT
5 2 FALL AND WINTER FLOOD CONDITIONS (1)FOOD PLANTS UNAFFECTED BY FLOODS (2)REDUCED <25; OR 1 IN 4 YRS. (3)REDUCED 25-50; OR 2 IN 4 YRS. (4)REDUCED 50-75; OR 3 IN 4 YRS. (5) REDUCED >75; OR YEARLY
6 3 WATER DEPTH 1"-18" FALL-WINTER (1)>90 (2)75-90 (3)50-75 (4)25-50 (5)<25
7 3 WATER DEPTH 1"-4" MAY-JUNE(1)>90 (2)75-90 (3)50-75 (4) 25-50 (5)<25
8 2 WATER DEPTH 1"-18" BY AUGUST (1)>75 (2)50-75 (3)25-50 (4)<25
9 4 PERMANENT WATER ENTIRE YEAR (1)>90 (2)75-90 (3)50-75 (4)25-50 (5)<25
10 3 PERCENT EMERGENT VEGETATION W/IN 2YDS WATER (1)>75 (2)50-75 (3)25-50 (4)<25
11 2 WOODY INVASION (1)<10 (2)10-25 (3)25-50 (4)50-75 (5)>75
12 1 EMERGENT VEGETATION COVERAGE (1)>90 (2)75-90 (3)50-75 (4)25-50 (5)10-25 (6)<10
13 4 CATTAIL AND BULLRUSH COVERAGE (1)>75 (2)50-75 (3)25-50 (4)10-25 (5)<10
14 5 WETLAND SIZE-ACRES (1)>200 (2)100-200 (3)75-100 (4)50-75 (5)25-50 (6)<25
15 1 WETLAND EDGE (% WOODY OR ADJ BOTTOML HARDW) (1)>75 (2)50-75 (3)25-50 (4)10-25 (5)<10
16 2 WATER REGIME - GRADUAL DRYING WITH % WATER REMAINING BY AUG. 1 (1) >75 (2)50-75 (3)25-50 (4)<25 (5)STABLE WATER (6)RAPID DRYING (7)NO WATER AFTER JUNE 1
17 3 IMPORTANT FOOD PLANT COVERAGE (1)>75 (2)50-75 (3)25-50 (4)10-25 (5)<10
18 2 PLANT DIVERSITY (1)>7 (2)4-7 (3)<4
19 4 PERSISTENT EMERGENT AND WOODY COVERAGE (1)5-15 (2)15-25 (3)25-50 (4)<5 OR >50
20 2 SUBSTRATE-SURFACE WATER INTERSPERSION (1)SUBSTRATE WATER INTERSPERSED (2)SHALLOW WATER AS 1 OR FEW POOLS
21 1 PERCENT OPEN WATER (1)<10 (2)10-25 (3)25-50 (4)50-90 (5)>90
22 4 WINTER WATER DEPTH OCT-MARCH (1)15-24" (2)10-15 (3)6-10" OR 30-36" (4)<6" OR >36"
23 5 SEDGE CANOPY COVERAGE (1) >90 (2)75-90 (3)50-75 (4)25-50 (5)1-25 (6)ZERO
24 1 WETLAND SUBSTRATE (1)MUDDY (2)SANDY (3) GRAVEL
25 1 PERCENT SOIL WATERLOGGED MAY-JUNE (1)>90 (2)75-90 (3)50-75 (4)25-50 (5)<25
26 3 EMERGENT VEGETATION COVERAGE IN MAY (1)<10 (2)10-25 (3)25-50 (4)50-75 (5)75-90 (6)>90

DISTANCE BETWEEN HABITAT TYPES (INTERSPERSION)

51 7 DISTANCE BOTTOMLAND HARDWOODS (1)<1/4 MI WATER PREDICT (2)1/4-1/2 MI WATER PREDICT (3)1/2-1 MI WATER PREDICT (4)<1/4 MI WATER PREDICT 1 OUT OF 3 YEARS (5)1/4-1/2 MI WATER PREDICT 1 OUT OF 3 YEARS (6)1/2-1 MI WATER PREDICT 1 OUT OF 3 YEARS (7)>1 MI; OR <1 MI WATER UNPREDICTABLE

52 5 DISTANCE CROPLAND (1)<1/4 MI, UNHARV AND WATER PREDICT (2)<1/4-1/2 MI, UNHARV AND WATER PREDICT (3)1/2-1 MI UNHARV AND WATER PREDICT (4)<1/4 MI, UNHARV AND FLOODING PREDICT 1 OUT OF 3 YEARS; OR <1/4 MI UNFLOODED RESIDUES UNDISTURB (5)1/4-1/2 MI UNHARV AND WATER PREDICT 1 OUT OF 3 YEARS; OR 1/4-1/2 MI UNFLOODED RESIDUES UNDISTURB (6)1/2-1 MI UNHARV AND WATER PREDICT 1 OUT OF 3 YEARS; OR 1/2-1 MI UNFLOODED RESIDUES UNDISTURBED (7)>1 MI TO CROPFIELD; OR <1 MI UNFLOODED DISC OR PLOW

53 4 DISTANCE GRASSLAND (1)<1/2 MI <6" AND >40 AC (2)1/2-1 MI <6" AND >40 AC (3)<1 MI <6" AND <40 AC (4)>1 MI; OR >6"

54 1 DISTANCE STREAM OR RIVER (1)<1/4 MI (2)1/4-1/2 MI (3)>1/2 MI

55 1 DISTANCE MAJOR RIVER OR LAKE >100 AC (1)<1 MI (2)1-5 MI (3)5-10 MI (4)>10 MI

56 3 DISTANCE GOOSE WINTER AREA (1)<4 MI (2)4-10 MI (3)10-25 MI (4)>25 MI

IMPORTANT MALLARD AND CANADA GOOSE FOOD PLANTS

____Acrons
____Agricultural Crops
____Beggar Tick, Biddens
____Bulrush
____Chufa
____Coontail
____Cutgrass
____Duckweeds
____Foxtails
____Japanese Millet
____Pigweeds
____Pondweeds
____Ragweeds
____Sedges
____Smartweeds
____Spikerushes
____Wigeon Grass
____Wild Millet

WINTERING AREAS

Major wintering areas include only the following state wildlife management areas (WMA) and national wildlife refuges (NWR) the Corps of Engineers Reservoirs; Fountain Grove WMA (Linn County), Swan Lake NWR (Chariton County), Smithville Reservoir (Clay County), Thomas Hill WMA (Randolph County), Clarence Cannon Reservoir (Audrain County), Schell-Osage WMA (St. Clair County), Table Rock Reservoir (Stone County), Bull Shoals Reservoir (Taney County), Duck Creek WMA (Stoddard County), Mingo NWR (Stoddard County), Stockton Reservoir (Cedar County) and August Busch WMA (St. Charles County).

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WILDLIFE HABITAT APPRAISAL GUIDE - WETLANDS - BOTTOMLAND HARDWOODS

WILDLIFE AREA Dresser Island DATE 10-12-87
SAMPLE SITE 9 ANIMAL HABITAT 26 27

LAND USE IN 2 MILE WIDE CIRCLE

1 4 PERCENT NONFOREST WETLANDS (1)>75 (2)50-75 (3)25-50 (4)10-25 (5)<10
2 2 PERCENT NONFOREST WETLANDS AND LAKES OR RESERVOIRS (1)>75 (2)50-75 (3)25-50 (4)10-25 (5)<10
3 3 PERCENT BOTTOML HARDW & NONFOREST WETL (1)>75 (2)50-75 (3)25-50 (4)10-25 (5)<10

SAMPLE SITE, TRACT OR STAND CHARACTERISTICS

4 4 FALL-WINTER WATER CONDITIONS (1)ANNUALLY-PREDICTABLE & CONTROLLED (2)MOST YEARS & CONTROLLED (3)EVERY OTHER YEAR & CONTROLLED (4)IRREGULAR, UNPREDICTABLE; DRY IN FALL; OR NO CONTROL WHEN PRESENT
5 2 FALL-WINTER FLOOD CONDITIONS (1)FOOD PLANTS UNAFFECTED BY FLOODS (2)REDUCED <25; OR 1 IN 4 YRS. (3)REDUCED 25-50; OR 2 IN 4 YRS. (4)REDUCED 50-75; OR 3 IN 4 YRS. (5)REDUCED >75; OR YEARLY
6 5 WATER DEPTH 1"-18" FALL WINTER (1)>90 (2)75-90 (3)50-75 (4)25-50 (5)<25
12 6 EMERGENT VEGETATION COVERAGE (1)>90 (2)75-90 (3)50-75 (4)25-50 (5)10-25 (6)<10
14 5 WETLAND SIZE-ACRES (1)>200 (2)100-200 (3)75-100 (4)50-75 (5)25-50 (6)<25
15 5 WETLAND EDGE (% ADJ. WATER OR NONFOREST WETL) (1)>75% (2)50-75 (3)25-50 (4)10-25 (5)<10
17 5 IMPORTANT FOOD PLANT COVERAGE (1)>75 (2)50-75 (3)25-50 (4)10-25 (5)<10
18 3 PLANT DIVERSITY (1)>7 (2)4-7 (3)<4
27 4 PERCENT CHANNEL WITH AQUATIC VEGETATION 1/4 MI FROM CENTER STAND (1)>10 (2)5-10 (3)1-5 (4)NONE
28 4 WATER FLUCTUATION IN CHANNEL-BANK FULL PER YEAR (1)<3 (2)3-5 (3)5-7 (4)>7
35 3 VEGETATIVE COVER (1)>30 (2)10-30 (3)<10
36 1 WOODLAND TREE SPECIES (1)>50% E,W,C,S,WI,M,A (2)25-50% E,W,C,S,WI,M,A (3)<25% E,W,C,S,WI,M,A; OR <25% PIN OAK (4)25-50% PIN OAK (5)>50% PIN OAK
37 5 PERMANENT WATER IN WOODLAND (% FOREST FLOOR) (1)>50 (2)25-50 (3)10-25 (4)5-10 (5)<5
38 3 CONCEALMENT COVER (1)>5 (2)1-5 (3)ZERO
39 4 FOREST OPENINGS (<2 AC) (1)15-30% SCATTER (2)15-30 ONE OR FEW (3)5-15 (4)<5 OR >50
40 6 WOODLAND SIZE CLASS (1)SAWTIMBER-OPEN CANOPY (2)SAWTIMBER-CLOSED CANOPY (3)POLE + 25% SAWTIMBER (4)REPROD + SAWTIMBER (5)REPROD (6)POLE
41 5 PERCENT CANOPY OLD GROWTH (DBH >16") (1)>25 (2)10-25 (3)5-10 (4)1-5 (5)ZERO
42 4 FOREST OVERSTORY CANOPY HEIGHT (1)>80' (2)65-80' (3)40-65' (4)<40'
43 4 PERCENT SUBCANOPY CLOSURE (1)>75 (2)50-75 (3)25-50 (4)<25
44 4 WOODLAND SIZE (W/IN 660' OPEN) (1)<25 (2)25-50 (3)50-75 (4)>75
45 4 PERCENT FOREST CANOPY ADJACENT OR OVER WATER (2)>25 (2)10-25 (3)5-10 (4)<5
46 4 NUMBER OF SNAGS PER ACRE (DEAD TREE >6" DBH & >10' TALL) (1)>4 (2)3-4 (3)1-2 (4)<1
47 4 NUMBER OF CAVITY TREES/ACRE (1)>9 (2)3-9 (3)1-3 (4)ZERO
48 4 STEMS PER SQ. YARD SHRUB & TREE REPRODUCTION >3' TALL (1)>4 (2)2-3 (3)1-2 (4)<1
49 1 PERCENT WOODLAND WITHIN 660' OF WATER (1)>75 (2)50-75 (3)25-50 (4)<25

DISTANCE BETWEEN HABITAT TYPES (INTERSPERSION)

50 7 DISTANCE NONFOREST WETL,OXBOW,SLOUGH (1)<250' WATER PREDICT (2)250'-1/8 MI WATER PREDICT (3) 1/8-1 MI WATER PREDICT (4) <250' WATER PREDICT 1 OUT OF 3 YEARS (5)250'-1/8 MI WATER PREDICT 1 OUT OF 3 YEARS (6)1/8-1 MI WATER PREDICT 1 OUT OF 3 YEARS (7)>1 MI; OR <1 MI WATER UNPREDICT

52 5 DISTANCE CROPLAND (1)1/4 MI UNHARV AND WATER PREDICT (2)1/4-1/2 MI UNHARV AND WATER PREDICT (3)1/2-1 MI UNHARV AND WATER PREDICT (4)<1/4 MI UNHARV AND WATER PREDICT 1 OUT OF 3 YEARS; OR <1/4 MI UNFLOODED RESIDUES UNDISTURB (5)1/4-1/2 MI UNHARV AND WATER PREDICT 1 OUT OF 3 YEARS; OR 1/4-1/2 MI UNFLOODED RESIDUES UNDISTURB (6)1/2-1 MI UNHARV AND WATER PREDICT 1 OUT OF 3 YEARS; OR 1/2-1 MI UNFLOODED RESIDUES UNDISTURBED (7)>1 MI TO CROPFIELD; OR <1 MI UNFLOODED DISC OR PLOW

54 2 DISTANCE STREAM OR RIVER (1)<1/4 MI (2)1/4-1/2 MI (3)>1/2 MI

IMPORTANT MALLARD AND CANADA GOOSE FOOD PLANTS

____Acrons	____Cutgrass	____Ragweeds
____Agricultural Crops	____Duckweeds	____Sedges
____Beggar Tick, Biddens	____Foxtails	____Smartweeds
____Bulrush	____Japanese Millet	____Spikerushes
____Chufa	____Pigweeds	____Wigeon Grass
____Coontail	____Pondweeds	____Wild Millet

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WILDLIFE HABITAT APPRAISAL GUIDE - WETLANDS - BOTTOMLAND HARDWOODS

WILDLIFE AREA Drewer [illegible] DATE 12 Oct 90
SAMPLE SITE 10 ANIMAL HABITAT 26 27

LAND USE IN 2 MILE WIDE CIRCLE

1 4 PERCENT NONFOREST WETLANDS (1)>75 (2)50-75 (3)25-50 (4)10-25 (5)<10
2 3 PERCENT NONFOREST WETLANDS AND LAKES OR RESERVOIRS (1)>75 (2)50-75 (3)25-50 (4)10-25 (5)<10
3 3 PERCENT BOTTOML HARDW & NONFOREST WETL (1)>75 (2)50-75 (3)25-50 (4)10-25 (5)<10

SAMPLE SITE, TRACT OR STAND CHARACTERISTICS

4 4 FALL-WINTER WATER CONDITIONS (1)ANNUALLY-PREDICTABLE & CONTROLLED (2)MOST YEARS & CONTROLLED (3)EVERY OTHER YEAR & CONTROLLED (4)IRREGULAR, UNPREDICTABLE; DRY IN FALL; OR NO CONTROL WHEN PRESENT
5 2 FALL-WINTER FLOOD CONDITIONS (1)FOOD PLANTS UNAFFECTED BY FLOODS (2)REDUCED <25; OR 1 IN 4 YRS. (3)REDUCED 25-50; OR 2 IN 4 YRS. (4)REDUCED 50-75; OR 3 IN 4 YRS. (5)REDUCED >75; OR YEARLY
6 5 WATER DEPTH 1"-18" FALL WINTER (1)>90 (2)75-90 (3)50-75 (4)25-50 (5)<25
12 5 EMERGENT VEGETATION COVERAGE (1)>90 (2)75-90 (3)50-75 (4)25-50 (5)10-25 (6)<10
14 5 WETLAND SIZE-ACRES (1)>200 (2)100-200 (3)75-100 (4)50-75 (5)25-50 (6)<25
15 1 WETLAND EDGE (% ADJ. WATER OR NONFOREST WETL) (1)>75% (2)50-75 (3)25-50 (4)10-25 (5)<10
17 5 IMPORTANT FOOD PLANT COVERAGE (1)>75 (2)50-75 (3)25-50 (4)10-25 (5)<10
18 3 PLANT DIVERSITY (1)>7 (2)4-7 (3)<4
27 1 PERCENT CHANNEL WITH AQUATIC VEGETATION 1/4 MI FROM CENTER STAND (1)>10 (2)5-10 (3)1-5 (4)NONE
28 4 WATER FLUCTUATION IN CHANNEL-BANK FULL PER YEAR (1)<3 (2)3-5 (3)5-7 (4)>7
35 1 VEGETATIVE COVER (1)>30 (2)10-30 (3)<10
36 1 WOODLAND TREE SPECIES (1)>50% E,W,C,S,WI,M,A (2)25-50% E,W,C,S,WI,M,A (3)<25% E,W,C,S,WI,M,A; OR <25% PIN OAK (4)25-50% PIN OAK (5)>50% PIN OAK
37 5 PERMANENT WATER IN WOODLAND (% FOREST FLOOR) (1)>50 (2)25-50 (3)10-25 (4)5-10 (5)<5
38 1 CONCEALMENT COVER (1)>5 (2)1-5 (3)ZERO
39 4 FOREST OPENINGS (<2 AC) (1)15-30% SCATTER (2)15-30 ONE OR FEW (3)5-15 (4)<5 OR >50
40 3 WOODLAND SIZE CLASS (1)SAWTIMBER-OPEN CANOPY (2)SAWTIMBER-CLOSED CANOPY (3)POLE + 25% SAWTIMBER (4)REPROD + SAWTIMBER (5)REPROD (6)POLE
41 2 PERCENT CANOPY OLD GROWTH (DBH >16") (1)>25 (2)10-25 (3)5-10 (4)1-5 (5)ZERO
42 3 FOREST OVERSTORY CANOPY HEIGHT (1)>80' (2)65-80' (3)40-65' (4)<40'
43 2 PERCENT SUBCANOPY CLOSURE (1)>75 (2)50-75 (3)25-50 (4)<25
44 4 WOODLAND SIZE (W/IN 660' OPEN) (1)<25 (2)25-50 (3)50-75 (4)>75
45 4 PERCENT FOREST CANOPY ADJACENT OR OVER WATER (2)>25 (2)10-25 (3)5-10 (4)<5
46 2 NUMBER OF SNAGS PER ACRE (DEAD TREE >6" DBH & >10' TALL) (1)>4 (2)3-4 (3)1-2 (4)<1
47 2 NUMBER OF CAVITY TREES/ACRE (1)>9 (2)3-9 (3)1-3 (4)ZERO
48 2 STEMS PER SQ. YARD SHRUB & TREE REPRODUCTION >3' TALL (1)>4 (2)2-3 (3)1-2 (4)<1
49 1 PERCENT WOODLAND WITHIN 660' OF WATER (1)>75 (2)50-75 (3)25-50 (4)<25

DISTANCE BETWEEN HABITAT TYPES (INTERSPERSION)

50 7 DISTANCE NONFOREST WETL,OXBOW,SLOUGH (1)<250' WATER PREDICT (2)250'-1/8 MI WATER PREDICT (3) 1/8-1 MI WATER PREDICT (4) <250' WATER PREDICT 1 OUT OF 3 YEARS (5)250'-1/8 MI WATER PREDICT 1 OUT OF 3 YEARS (6)1/8-1 MI WATER PREDICT 1 OUT OF 3 YEARS (7)>1 MI; OR <1 MI WATER UNPREDICT

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52 5 DISTANCE CROPLAND (1)1/4 MI UNHARV AND WATER PREDICT (2)1/4-1/2 MI UNHARV AND WATER PREDICT (3)1/2-1 MI UNHARV AND WATER PREDICT (4)<1/4 MI UNHARV AND WATER PREDICT 1 OUT OF 3 YEARS; OR <1/4 MI UNFLOODED RESIDUES UNDISTURB (5)1/4-1/2 MI UNHARV AND WATER PREDICT 1 OUT OF 3 YEARS; OR 1/4-1/2 MI UNFLOODED RESIDUES UNDISTURB (6)1/2-1 MI UNHARV AND WATER PREDICT 1 OUT OF 3 YEARS; OR 1/2-1 MI UNFLOODED RESIDUES UNDISTURBED (7)>1 MI TO CROPFIELD; OR <1 MI UNFLOODED DISC OR PLOW

54 3 DISTANCE STREAM OR RIVER (1)<1/4 MI (2)1/4-1/2 MI (3)>1/2 MI

IMPORTANT MALLARD AND CANADA GOOSE FOOD PLANTS

✓ Acrons	___ Cutgrass	___ Ragweeds
___ Agricultural Crops	___ Duckweeds	✓ Sedges
___ Beggar Tick, Biddens	___ Foxtails	✓ Smartweeds
___ Bulrush	___ Japanese Millet	___ Spikerushes
___ Chufa	___ Pigweeds	___ Wigeon Grass
___ Coontail	___ Pondweeds	___ Wild Millet

Filenam= Dresser

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WILDLIFE HABITAT APPRAISAL GUIDE - WETLANDS - NONFOREST

WILDLIFE AREA Dresser Island DATE 10-12-88
SAMPLE SITE 11 ANIMAL HABITAT 27 28 29

LAND USE IN 2 MILE WIDE CIRCLE

1 4 PERCENT NONFOREST WETLANDS (1)>75 (2)50-75 (3)25-50 (4)10-25 (5)<10
2 2 PERCENT NONFOREST WETL AND LAKES OR RESERVOIRS (1)>75 (2)50-75 (3)25-50 (4)10-25 (5)<10
3 3 PERCENT BOTTOML HARDW & NONFOREST WETL (1)>75 (2)50-75 (3)25-50 (4)10-25 (5)<10

SAMPLE SITE, TRACT OF STAND CHARACTERISTICS

4 4 FALL AND WINTER WATER CONDITIONS (1)ANNUALLY - PREDICTABLE & CONTROLLED (2)MOST YEARS & CONTROLLED (3)1 OUT OF 3 YEARS & CONTROLLED (4)IRREGULAR, UNPREDICTABLE; DRY IN FALL; OR NO CONTROL WHEN PRESENT
5 2 FALL AND WINTER FLOOD CONDITIONS (1)FOOD PLANTS UNAFFECTED BY FLOODS (2)REDUCED <25; OR 1 IN 4 YRS. (3)REDUCED 25-50; OR 2 IN 4 YRS. (4)REDUCED 50-75; OR 3 IN 4 YRS. (5) REDUCED >75; OR YEARLY
6 3 WATER DEPTH 1"-18" FALL-WINTER (1)>90 (2)75-90 (3)50-75 (4)25-50 (5)<25
7 5 WATER DEPTH 1"-4" MAY-JUNE(1)>90 (2)75-90 (3)50-75 (4) 25-50 (5)<25
8 2 WATER DEPTH 1"-18" BY AUGUST (1)>75 (2)50-75 (3)25-50 (4)<25
9 3 PERMANENT WATER ENTIRE YEAR (1)>90 (2)75-90 (3)50-75 (4)25-50 (5)<25
10 1 PERCENT EMERGENT VEGETATION W/IN 2YDS WATER (1)>75 (2)50-75 (3)25-50 (4)<25
11 3 WOODY INVASION (1)<10 (2)10-25 (3)25-50 (4)50-75 (5)>75
12 5 EMERGENT VEGETATION COVERAGE (1)>90 (2)75-90 (3)50-75 (4)25-50 (5)10-25 (6)<10
13 5 CATTAIL AND BULLRUSH COVERAGE (1)>75 (2)50-75 (3)25-50 (4)10-25 (5)<10
14 5 WETLAND SIZE-ACRES (1)>200 (2)100-200 (3)75-100 (4)50-75 (5)25-50 (6)<25
15 1 WETLAND EDGE (% WOODY OR ADJ BOTTOML HARDW) (1)>75 (2)50-75 (3)25-50 (4)10-25 (5)<10
16 2 WATER REGIME - GRADUAL DRYING WITH % WATER REMAINING BY AUG. 1 (1) >75 (2)50-75 (3)25-50 (4)<25 (5)STABLE WATER (6)RAPID DRYING (7)NO WATER AFTER JUNE 1
17 3 IMPORTANT FOOD PLANT COVERAGE (1)>75 (2)50-75 (3)25-50 (4)10-25 (5)<10
18 1 PLANT DIVERSITY (1)>7 (2)4-7 (3)<4
19 2 PERSISTENT EMERGENT AND WOODY COVERAGE (1)5-15 (2)15-25 (3)25-50 (4)<5 OR >50
20 1 SUBSTRATE-SURFACE WATER INTERSPERSION (1)SUBSTRATE WATER INTERSPERSED (2)SHALLOW WATER AS 1 OR FEW POOLS
21 4 PERCENT OPEN WATER (1)<10 (2)10-25 (3)25-50 (4)50-90 (5)>90
22 1 WINTER WATER DEPTH OCT-MARCH (1)15-24" (2)10-15 (3)6-10" OR 30-36" (4)<6" OR >36"
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25 1 PERCENT SOIL WATERLOGGED MAY-JUNE (1)>90 (2)75-90 (3)50-75 (4)25-50 (5)<25
26 2 EMERGENT VEGETATION COVERAGE IN MAY (1)<10 (2)10-25 (3)25-50 (4)50-75 (5)75-90 (6)>90

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51 7 DISTANCE BOTTOMLAND HARDWOODS (1)<1/4 MI WATER PREDICT (2)1/4-1/2 MI WATER PREDICT (3)1/2-1 MI WATER PREDICT (4)<1/4 MI WATER PREDICT 1 OUT OF 3 YEARS (5)1/4-1/2 MI WATER PREDICT 1 OUT OF 3 YEARS (6)1/2-1 MI WATER PREDICT 1 OUT OF 3 YEARS (7)>1 MI; OR <1 MI WATER UNPREDICTABLE

9/88FF

52 7 DISTANCE CROPLAND (1)<1/4 MI, UNHARV AND WATER PREDICT (2)<1/4-1/2 MI, UNHARV AND WATER PREDICT (3)1/2-1 MI UNHARV AND WATER PREDICT (4)<1/4 MI, UNHARV AND FLOODING PREDICT 1 OUT OF 3 YEARS; OR <1/4 MI UNFLOODED RESIDUES UNDISTURB (5)1/4-1/2 MI UNHARV AND WATER PREDICT 1 OUT OF 3 YEARS; OR 1/4-1/2 MI UNFLOODED RESIDUES UNDISTURB (6)1/2-1 MI UNHARV AND WATER PREDICT 1 OUT OF 3 YEARS; OR 1/2-1 MI UNFLOODED RESIDUES UNDISTURBED (7)>1 MI TO CROPFIELD; OR <1 MI UNFLOODED DISC OR PLOW

53 4 DISTANCE GRASSLAND (1)<1/2 MI <6" AND >40 AC (2)1/2-1 MI <6" AND >40 AC (3)<1 MI <6" AND <40 AC (4)>1 MI; OR >6"

54 2 DISTANCE STREAM OR RIVER (1)<1/4 MI (2)1/4-1/2 MI (3)>1/2 MI

55 1 DISTANCE MAJOR RIVER OR LAKE >100 AC (1)<1 MI (2)1-5 MI (3)5-10 MI (4)>10 MI

56 3 DISTANCE GOOSE WINTER AREA (1)<4 MI (2)4-10 MI (3)10-25 MI (4)>25 MI

IMPORTANT MALLARD AND CANADA GOOSE FOOD PLANTS

____Acrons	____Cutgrass	____Ragweeds
____Agricultural Crops	____Duckweeds	____Sedges
____Beggar Tick, Biddens	____Foxtails	____Smartweeds
____Bulrush	____Japanese Millet	____Spikerushes
____Chufa	____Pigweeds	____Wigeon Grass
____Coontail	____Pondweeds	____Wild Millet

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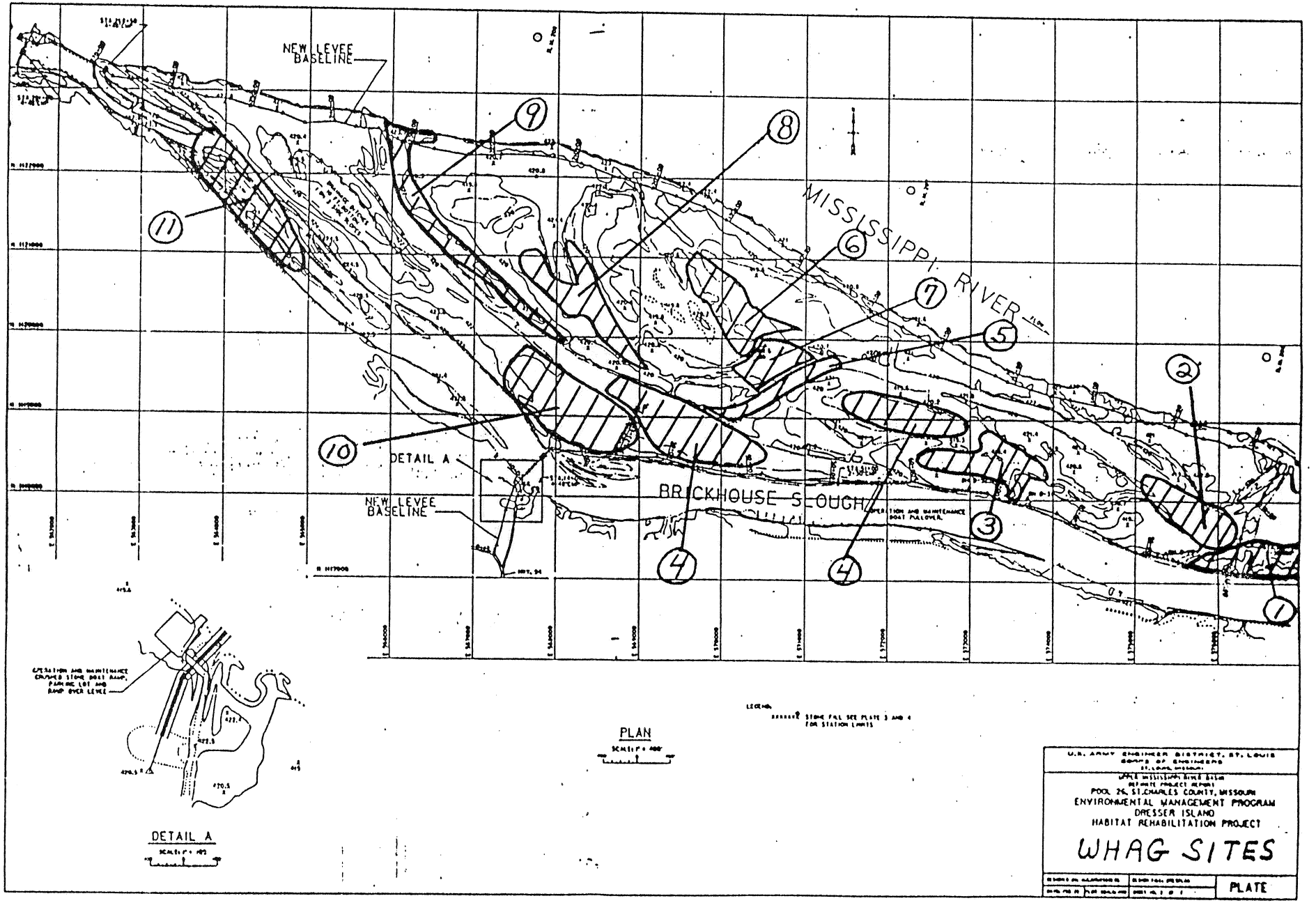

NEW LEVEE BASELINE
MISSISSIPPI RIVER
BRICKHOUSE SLOUGH
DETAIL A
NEW LEVEE BASELINE
1
2
3
4
4
5
6
7
8
9
10
11
PLAN
DETAIL A
U.S. ARMY ENGINEER DISTRICT, ST. LOUIS
CORPS OF ENGINEERS
ST. LOUIS, MISSOURI
LOWER MISSISSIPPI RIVER BASIN
REPORT PROJECT REPORT
POOL 26, ST. CHARLES COUNTY, MISSOURI
ENVIRONMENTAL MANAGEMENT PROGRAM
DRESSER ISLAND
HABITAT REHABILITATION PROJECT
WHAG SITES
PLATE

MISSOURI DEPARTMENT OF CONSERVATION & SOIL CONSERVATION SERVICE

WILDLIFE HABITAT APPRAISAL GUIDE

HABITAT TYPE ABREVIATIONS

1	N	NONFOREST WETLAND
2	B	BOTTOMLAND HARDWOODS-WETLAND
3	C	CROPLAND-WETLAND
4	G	GRASSLAND-WETLAND

SPECIES ABREVIATIONS

1	MALL	MALLARD	7	HERO	GREEN-BACKED HERON
2	GOOS	CANADA GOOSE	8	DUCK	WOOD DUCK
3	BITT	LEAST BITTERN	9	BEAV	BEAVER
4	YLEG	LESSER YELLOWLEGS	10	COOT	AMERCIAN COOT
5	MUSK	MUSKRAT	11	PARU	NORTHERN PARULA
6	RAIL	KING RAIL	12	PROT	PROTHONOTARY WARBLER

PROJECT NAME DRESSER ISLAND

MATRIX NAME NEWWET A MATRIX THAT YOUR CREATED OR MODIFIED
DATA FILE NAME DRESSPLN

PLANNING CONDITION ~~PRES~~ FUT

DATE FIELD WORK 10-12-88
TODAYS DATE 04-20-1989

SAMPLE SITE HABITAT INDEXES

HAB	SITE	MALL	GOOS	BITT	YLEG	MUSK	RAIL
N	11	.57	.25	.56	.1	.25	.59
		HERO	DUCK	BEAV	COOT	PARU	PROT
		.69			.1		
HAB	SITE	MALL	GOOS	BITT	YLEG	MUSK	RAIL
B	10	.56					
		HERO	DUCK	BEAV	COOT	PARU	PROT
		.64	.78	.64		.55	.13
HAB	SITE	MALL	GOOS	BITT	YLEG	MUSK	RAIL
B	9	.55					
		HERO	DUCK	BEAV	COOT	PARU	PROT
		.49	.1	.56		.3	.1
HAB	SITE	MALL	GOOS	BITT	YLEG	MUSK	RAIL
N	8	.59	.26	.56	.1	.12	.51
		HERO	DUCK	BEAV	COOT	PARU	PROT
		.66			.52		
HAB	SITE	MALL	GOOS	BITT	YLEG	MUSK	RAIL
B	7	.56					
		HERO	DUCK	BEAV	COOT	PARU	PROT
		.1	.69	.66		.55	.13
HAB	SITE	MALL	GOOS	BITT	YLEG	MUSK	RAIL
N	6	.57	.26	.7	.1	.12	.57
		HERO	DUCK	BEAV	COOT	PARU	PROT
		.64			.58		
HAB	SITE	MALL	GOOS	BITT	YLEG	MUSK	RAIL
N	4	.56	.25	.7	.1	.47	.1
		HERO	DUCK	BEAV	COOT	PARU	PROT
		.66			.1		
HAB	SITE	MALL	GOOS	BITT	YLEG	MUSK	RAIL
N	3	.55	.24	.1	.1	.42	.1
		HERO	DUCK	BEAV	COOT	PARU	PROT
		.1			.1		
HAB	SITE	MALL	GOOS	BITT	YLEG	MUSK	RAIL
N	3	.61	.26	.59	.1	.14	.43
		HERO	DUCK	BEAV	COOT	PARU	PROT
		.72			.63		
HAB	SITE	MALL	GOOS	BITT	YLEG	MUSK	RAIL
N	2	.55	.24	.1	.1	.14	.46
		HERO	DUCK	BEAV	COOT	PARU	PROT
		.1			.1		
HAB	SITE	MALL	GOOS	BITT	YLEG	MUSK	RAIL
B	1	.63					
		HERO	DUCK	BEAV	COOT	PARU	PROT
		.1	.69	.48		.65	.55

THIS DATA SET CONTAINS:
7 NONFOREST WETLAND SAMPLE SITES
4 BOTTOMLAND HARDWOODS-WETLAND SAMPLE SITES
0 CROPLAND-WETLAND SAMPLE SITES
0 GRASSLAND-WETLAND SAMPLE SITES

MEAN HABITAT INDEXES BY SAMPLE SITE

HAB	MALL	GOOS	BITT	YLEG	MUSK	RAIL	HERO	DUCK	BEAV	COOT	PARU	PROT
N	.57	.25	.47	.1	.24	.39	.51			.3		
B	.58						.33	.57	.59		.51	.23
C												
G												

One future alternative, full flooding was combined into the program and changed habitat values for base conditions

MISSOURI DEPARTMENT OF CONSERVATION & SOIL CONSERVATION SERVICE

WILDLIFE HABITAT APPRAISAL GUIDE

HABITAT TYPE ABREVIATIONS

1	N	NONFOREST WETLAND
2	B	BOTTOMLAND HARDWOODS-WETLAND
3	C	CROPLAND-WETLAND
4	G	GRASSLAND-WETLAND

SPECIES ABREVIATIONS

1	MALL	MALLARD	7	HERO	GREEN-BACKED HERON
2	GOOS	CANADA GOOSE	8	DUCK	WOOD DUCK
3	BITT	LEAST BITTERN	9	BEAV	BEAVER
4	YLEG	LESSER YELLOWLEGS	10	COOT	AMERCIAN COOT
5	MUSK	MUSKRAT	11	PARU	NORTHERN PARULA
6	RAIL	KING RAIL	12	PROT	PROTHONOTARY WARBLER

PROJECT NAME DRESSER ISLAND

MATRIX NAME NEWWET A MATRIX THAT YOUR CREATED OR MODIFIED
DATA FILE NAME DRESSER

PLANNING CONDITION PRES

DATE FIELD WORK 10-12-88
TODAYS DATE 04-20-1989

SAMPLE SITE HABITAT INDEXES

HAB	SITE	MALL	GOOS	BITT	YLEG	MUSK	RAIL
N	11	.1	.1	.56	.1	.25	.39
		HERO	DUCK	BEAV	COOT	PARU	PROT
		.65			.1		
HAB	SITE	MALL	GOOS	BITT	YLEG	MUSK	RAIL
B	10	.1					
		HERO	DUCK	BEAV	COOT	PARU	PROT
		.55	.7	.6		.55	.13
HAB	SITE	MALL	GOOS	BITT	YLEG	MUSK	RAIL
B	9	.1					
		HERO	DUCK	BEAV	COOT	PARU	PROT
		.4	.1	.52		.3	.1
HAB	SITE	MALL	GOOS	BITT	YLEG	MUSK	RAIL
N	8	.1	.1	.56	.1	.12	.51
		HERO	DUCK	BEAV	COOT	PARU	PROT
		.61			.49		
HAB	SITE	MALL	GOOS	BITT	YLEG	MUSK	RAIL
B	7	.1					
		HERO	DUCK	BEAV	COOT	PARU	PROT
		.1	.61	.62		.55	.13
HAB	SITE	MALL	GOOS	BITT	YLEG	MUSK	RAIL
N	6	.1	.1	.7	.1	.12	.57
		HERO	DUCK	BEAV	COOT	PARU	PROT
		.59			.51		
HAB	SITE	MALL	GOOS	BITT	YLEG	MUSK	RAIL
N	4	.1	.1	.7	.1	.47	.1
		HERO	DUCK	BEAV	COOT	PARU	PROT
		.61			.1		
HAB	SITE	MALL	GOOS	BITT	YLEG	MUSK	RAIL
N	5	.1	.1	.1	.1	.42	.1
		HERO	DUCK	BEAV	COOT	PARU	PROT
		.1			.1		
HAB	SITE	MALL	GOOS	BITT	YLEG	MUSK	RAIL
N	3	.1	.1	.59	.1	.14	.43
		HERO	DUCK	BEAV	COOT	PARU	PROT
		.67			.59		
HAB	SITE	MALL	GOOS	BITT	YLEG	MUSK	RAIL
N	2	.1	.1	.1	.1	.14	.46
		HERO	DUCK	BEAV	COOT	PARU	PROT
		.1			.1		
HAB	SITE	MALL	GOOS	BITT	YLEG	MUSK	RAIL
B	1	.1					
		HERO	DUCK	BEAV	COOT	PARU	PROT
		.1	.69	.54		.65	.55

THIS DATA SET CONTAINS:
7 NONFOREST WETLAND SAMPLE SITES
4 BOTTOMLAND HARDWOODS-WETLAND SAMPLE SITES
0 CROPLAND-WETLAND SAMPLE SITES
0 GRASSLAND-WETLAND SAMPLE SITES

MEAN HABITAT INDEXES BY SAMPLE SITE

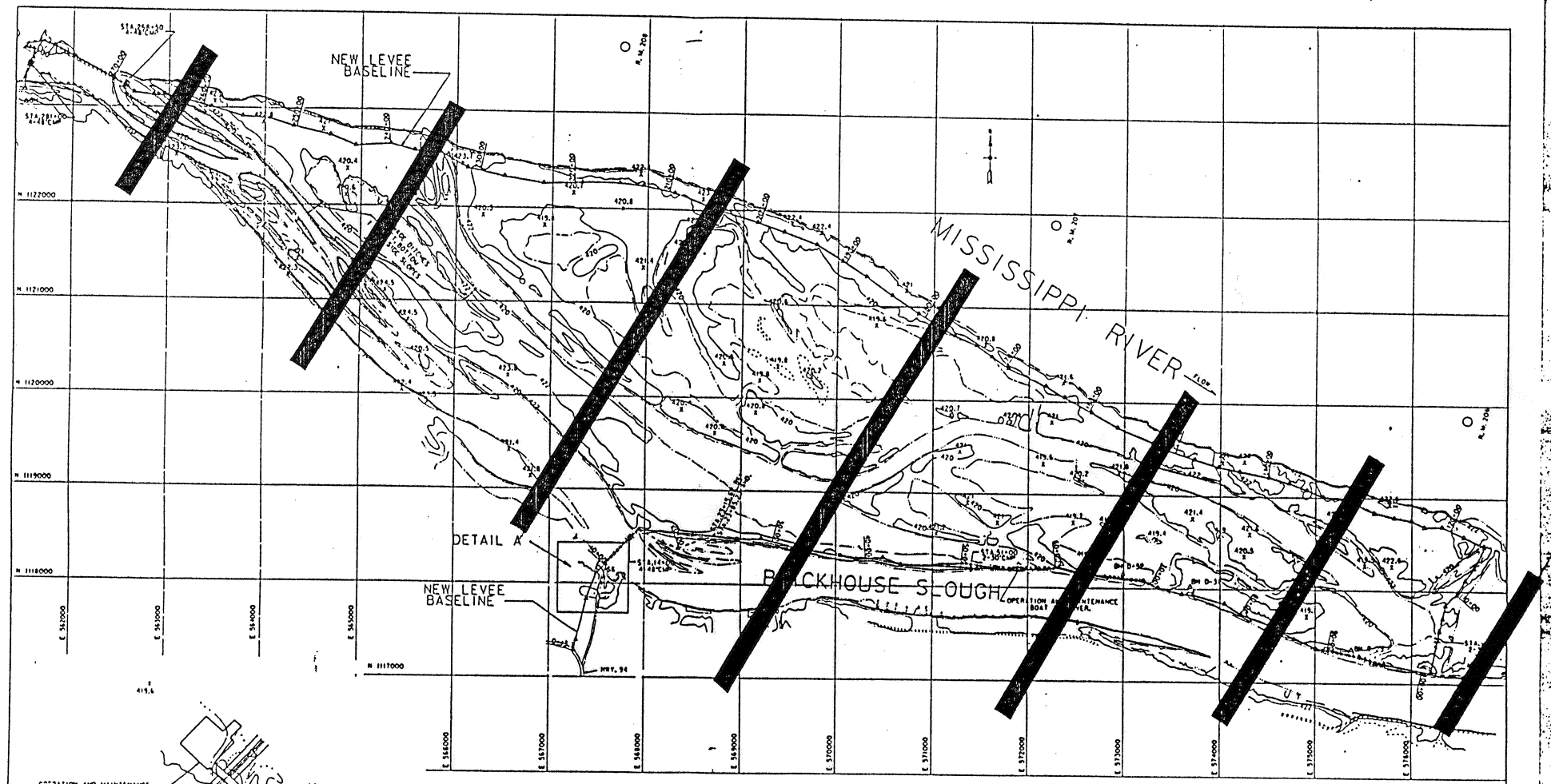
HAB	MALL	GOOS	BITT	YLEG	MUSK	RAIL	HERO	DUCK	BEAV	COOT	PARU	PROT
N	.1	.1	.47	.1	.24	.39	.48			.28		
B	.1						.29	.53	.57		.51	.23
C												
G												

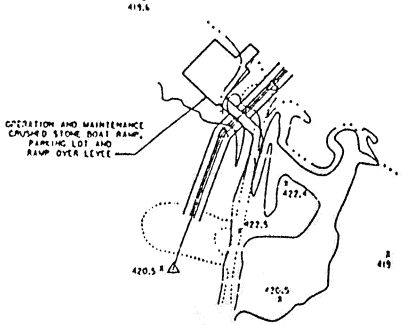
These are base conditions w/o project.

APPENDIX DPR-C

SECTION 2

PHYSICAL, CHEMICAL SAMPLING LOCATIONS





DETAIL A

SCALE: 1" = 100'

LEGEND:
XXXXXXX STONE FILL SEE PLATE 3 AND 4 FOR STATION LIMITS

PLAN

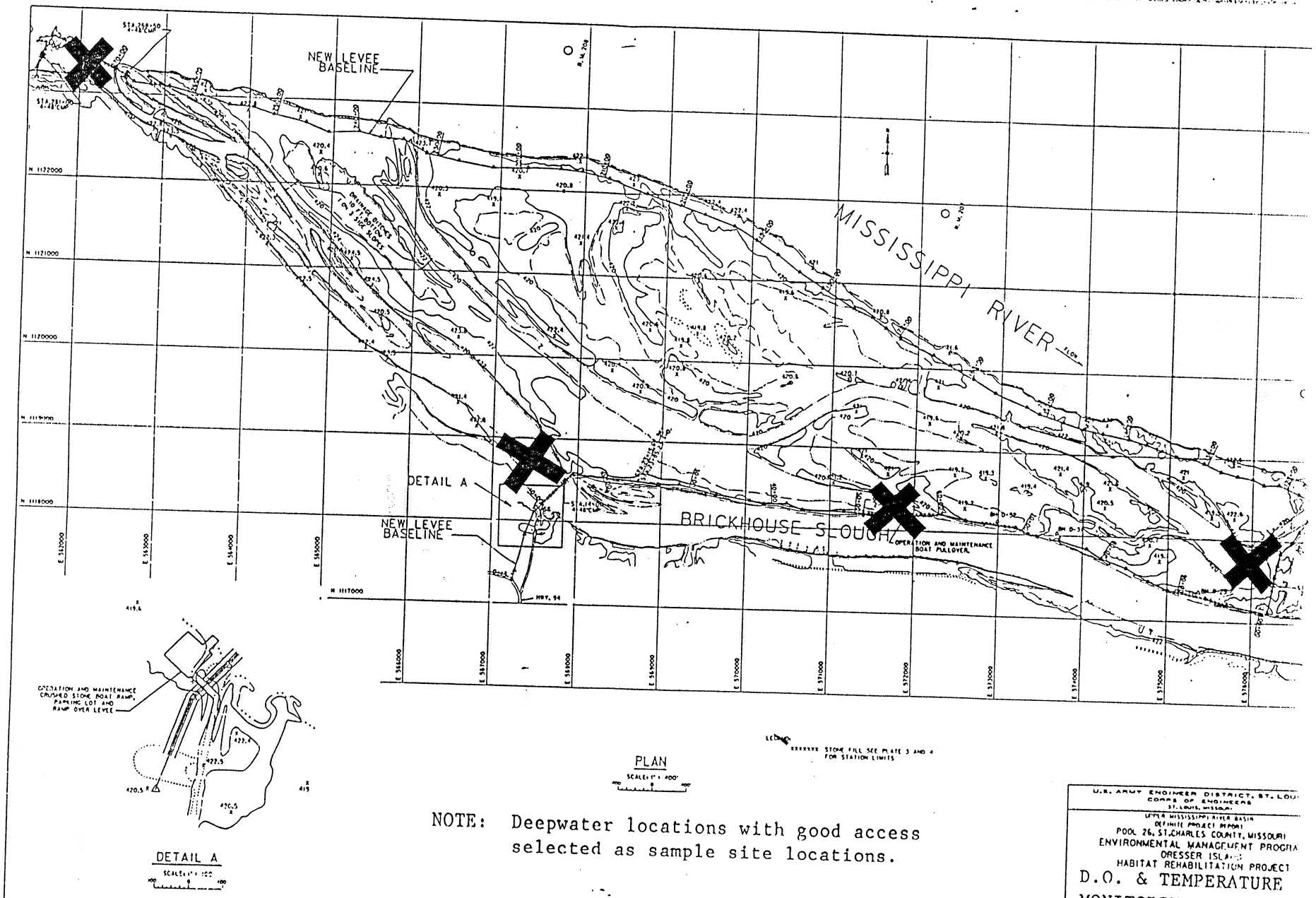
SCALE: 1" = 400'

NOTE: Sediment monitoring ranges to be field located using state coordinates system during P & S phase of project. No more than 7 stations to be established.

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

UPPER MISSISSIPPI RIVER BASIN
DEFINITE PROJECT REPORT
POOL 26, ST. CHARLES COUNTY, MISSOURI
ENVIRONMENTAL MANAGEMENT PROGRAM
DRESSER ISLAND
HABITAT REHABILITATION PROJECT

SEDIMENT MONITORING RANGES



NOTE: Deepwater locations with good access selected as sample site locations.

APPENDIX DPR-D

CLEAN WATER ACT DOCUMENTATION

APPENDIX DPR-D

CLEAN WATER ACT DOCUMENTATION

FOREWORD

ATTACHMENT 4 to the Draft DPR provided a Clean Water Act Section 404 (b)(1) Evaluation Report for the Dresser Island project. Since the time of the Draft DPR, many of the project features have been scaled down. APPENDIX DPR-D contained herein provides a revised evaluation report for the project plan as it now exists. This revised documentation is also being forwarded to the Missouri Department of Natural Resources along with a request for the State's Section 401 Water Quality Certification.

UPPER MISSISSIPPI RIVER SYSTEM ENVIRONMENTAL MANAGEMENT PROGRAM
DRESSER ISLAND WETLAND HABITAT REHABILITATION
POOL 26, MISSISSIPPI RIVER, ST. CHARLES COUNTY, MISSOURI

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 wetland habitat rehabilitation at Dresser Island in Mississippi River Pool 26, St. Charles County, Missouri, would 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 wetland habitat rehabilitation of Dresser Island.

II. PROJECT DESCRIPTION

A. Location. Dresser Island is located along the right edge of the navigation channel in Mississippi River Pool 26 between river miles 206-209, St. Charles County, Missouri (Plate 1). Brickhouse Slough separates the island from the Missouri shore. The project area is situated on Corps-owned lands that are presently managed for wildlife purposes by the Missouri Department of Conservation. The existing Locks and Dam No. 26 at Alton, Illinois, is located 2.5 miles downstream of the island. The nearest townships are Portage Des Sioux, to the west, and West Alton, southeast of the island. The city of St. Louis is situated about 12 miles to the south. Access to the Missouri shore is provided by roads off Highway 94.

B. General Description. The Dresser Island complex consists of approximately 940 acres of Federal land, managed for wildlife purposes by the Missouri Department of Conservation. Historically, Dresser Island (including its side channel known as Brickhouse Slough) was a prime wetland/backwater area used extensively by migratory waterfowl, wintering bald eagles and other wetland wildlife species. The wetlands also provided important spawning and nursery areas for river fishes.

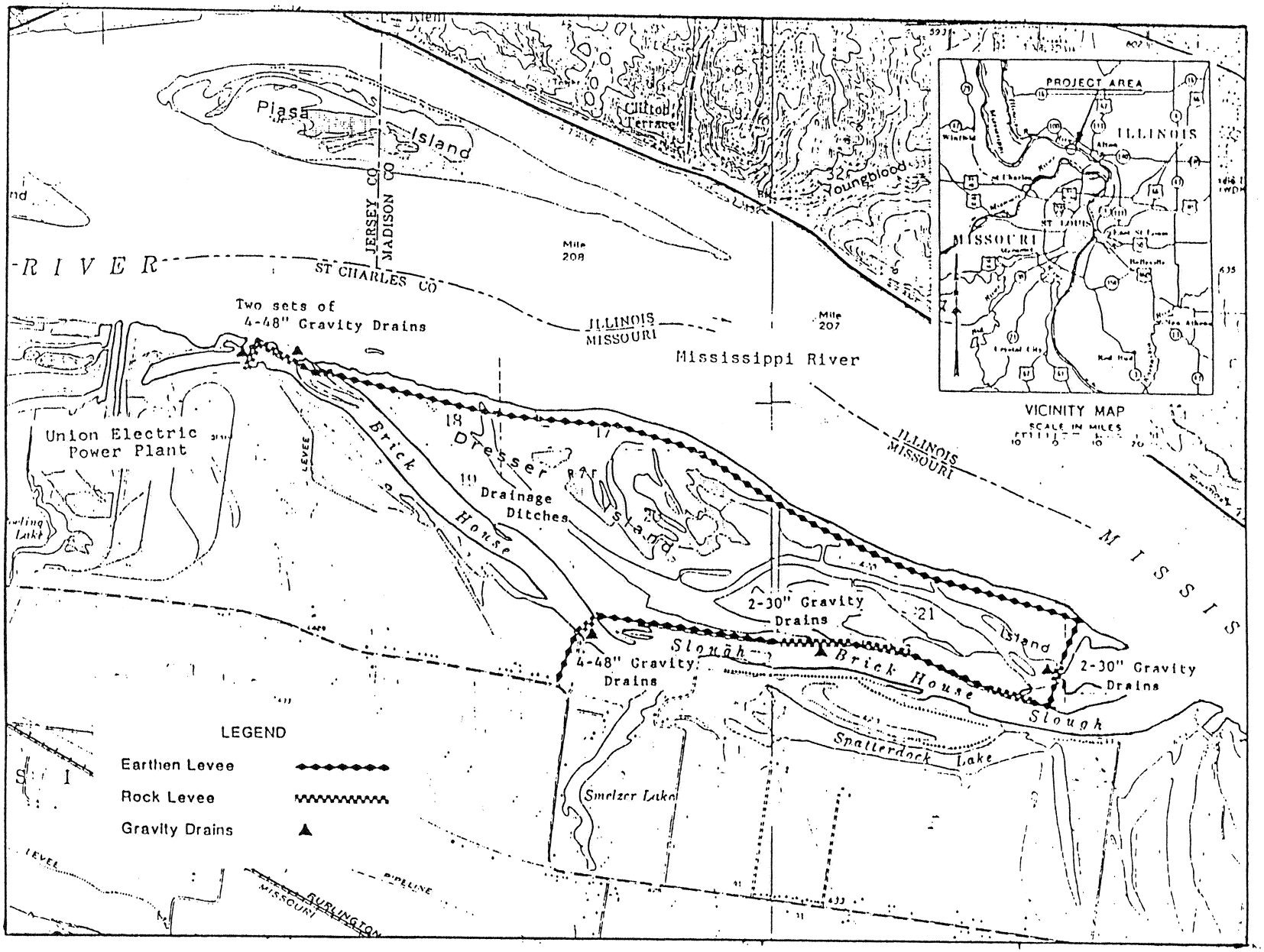


Plate 1. Regional Location and Recommended Plan: Dresser Island

Due to sedimentation, the interior wetland complex on Dresser Island has deteriorated significantly in both quantity and quality. Expedient measures for reopening the interior wetlands have been ineffectual and there are no existing means of controlling water levels in the interior of the island. In addition, Brickhouse Slough, once a deep flowing chute between the mainland and Dresser Island, has been filled with sediment to such an extent that only minimal flows pass through the side channel during normal pool stages.

Following is a description of the recommended plan. Major features of the project are presented in Table 1 with those components of the project which are subject to Section 404 jurisdiction so indicated. The recommended plan is depicted in Plate 1.

TABLE 1

Components of the Recommended Plan Subject to 404 Jurisdiction

Feature	404 Jurisdiction
1. Levees (total length: 28,250 feet)	
a. Earthen levee, average 2-5 feet high and approximately 23,650 feet long.	Yes
b. Rock-filled closures about 4,600 feet long.	Yes
2. Borrow Areas - total of 37 acres to provide levee fill material.	No
3. Water Control Structures - Gravity Drains:	
a. Inlet - eight 48-inch CMP drains with pneumatically operated sluice gates.	Yes
b. Outlet - four 48-inch and four 30-inch CMP drains with pneumatically operated sluice gates for control of interior water levels.	Yes
c. Cofferdams used for placing of gravity drains. To be removed after culver placement.	Yes
4. Interior ditches - Two 150-feet long shallow ditches to improve water circulation and drainage by connecting interior wetlands and the upper reach of side channel.	No

5. Boat ramp of crushed stone for maintenance access. Yes

---

1. Levees. In order to retard deposition of sediment on interior wetlands and in the upper portion of Brickhouse Slough, a 28,250-foot long levee would be constructed encircling most of Dresser Island and connecting it to the Missouri mainland (Plate 1). This includes the rock levees or closures crossing the upper end and middle of Brickhouse Slough.

2. Borrow Areas. Construction materials for the levee would be excavated from borrow areas on the island. These borrow areas, totalling 37 acres, would all be in the interior of the new levee system and run roughly parallel to the axis of the levee. Most borrow areas will be about 100-feet wide and excavated only 1 to 3 feet deep because of the high groundwater table in the project area. Some reaches of the levee are along areas of especially low elevation and high water table (e.g., portions of the island's levee facing Brickhouse Slough). In these cases, borrow will be taken from adjacent higher ground, resulting in borrow pits of larger surface dimensions. Resulting borrow pits are expected to hold water and thus provide additional wetland habitat. Ditches excavated to establish water connections between the upper reach of Brickhouse Slough and interior wetlands will provide an additional source of borrow material.

3. Water Control Structures.

a. Water Intake Structures. Two sets of four 48-inch CMP drains would be near the upstream section of the island and would be used for water intake. These would be equipped with sluice gates. One set would be be for warm water intake and installed in the rock dike at the far upper end of the entrance to Brickhouse Slough, approximately 2,000 feet directly downstream from the Union Electric power plant's cooling water discharge pipes (located on the Missouri shore). The second set of intake drains would be placed in the rock dike at the more riverside portion of the side channel's entrance in order to deliver slightly cooler waters into the wetland complex.

b. Water Outflow Structures. Four 48-inch diameter drains and four 30-inch diameter drains would be installed in the lower section of the island and side channel and used for water release and control of interior water level fluctuations. However, these would also be used during the summer to fill the interior wetlands with back-in water when the pool is at normal stage or higher. Cofferdams would be constructed to install the gravity drains.

4. Project Operation and Management. After construction, the Missouri Department of Conservation would be responsible for the operations, and maintenance.

5. Alternatives. Previous management efforts by the Missouri Department of Conservation have included cropping portions of the island to provide a food source for wildlife, and blasting interior chutes and sloughs with dynamite in an effort to restore wetland habitat lost to sedimentation. Cropping was limited due to lack of control over water levels. Blasting was also unsuccessful.

Several structural alternatives were considered. These primarily included variations in: levee location and heights, type of gates to be used, gravity drain locations and placement methods, and borrow pit design and location.

C. 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 purpose of this project is to rehabilitate the area's wetland/backwater habitat and improve the fishery by constructing a low levee encircling most of the island and the upper half of Brickhouse Slough, providing facilities for controlling interior water levels, and improving conditions in the side channel. The proposed levee would reduce the amounts of sediment being carried into the wetland complex and side channel during floods. The habitat improvements would benefit migratory waterfowl, wintering bald eagles, and the river fishery.

D. General Description of Dredged or Fill Material

1. General characteristics of Material (grain size, soil type).

a. Levees. The proposed plan calls for the construction of a low levee, average 2-5 feet high, and approximately 28,250 feet long: consisting of 23,650 feet of earthen levee and 4,600 feet of rock levee. Material placed in the wetland to construct the earthen levee would be alluvial in nature and consists of sands, silts and clays. Those portions of the levee constructed with stone fill include areas around the drains and the low, marshy areas where the island's interior wetlands presently discharge into Brickhouse Slough. Rock-filled closures would also be constructed across the upper and middle section of Brickhouse Slough. (Plate 1). The areas exposed to Mississippi River currents, ice scour and wavewash would be

constructed with Grade "B" limestone consisting of a 1,200-pound maximum size material which includes fines. The less exposed sections would be constructed with Grade "C" limestone; a 400-pound maximum size material. A stone-fill causeway, connecting the island with the Missouri shore, would be included in this latter category. Most muck, composed of soft organics and fine silts, would be excavated from the foundation of the gravity drains to provide a firm base.

b. Water Control Structures. The proposed plan calls for the installation of twelve 48-inch and four 30-inch diameter gravity drains. Each drain will consist of a pipe (probably of corrugated metal) with a sluice gate. All drains would be installed in rock-filled sections of the new levee (Plate 2). Gravity drains would be backfilled with hand-compacted fill underlain by a 9-inch layer of crushed stone and one layer of "Tensar" Geotextile. Cofferdams would be constructed in order to install the gravity drains "in-the-dry". Cofferdams would be rock with plastic liners to control thru seepage.

2. Quantity of Material (cubic yards).

The following quantities of fill materials will be required to construct the project:

Embankment:	64,000 Cubic Yards
Levee Stone Fill:	24,000 Tons
Cofferdam Fill (Temporary):	5,700 Tons
Crushed Stone:	4,450 Tons

a. Levees. The proposed plan calls for the permanent placement of 64,000 cubic yards of earthen material for construction of the levee. Rock sections of the levee would require 16,000 cubic yards (24,000 tons) of material stone. Approximately 14,000 cubic yards of earthen material and 10,700 cubic yards (16,000 tons of stone would be below the plane of ordinary high water (elevation 421) for Pool 26. It is anticipated that approximately 4,600 cubic yards of muck will be excavated from Brickhouse Slough. Presently, the St. Louis District is considering three possible alternatives relating to the muck: 1) deposit on upland site; 2) deposit in bottomland near excavation site and confined with low berm; and 3) open water disposal downstream of cofferdams. Open water disposal would first require analysis of the excavated material to determine if it is contaminated with heavy metals and oil products.

b. Water Control Structures. All gravity drains would be below ordinary high water. The construction of gravity drains would require approximately 50 cubic yards of concrete. The drain pipes and the total 50 cubic yards of the concrete will be below the plane of ordinary high water. Cofferdams used for installation "in-the-dry" of gravity drains would require the temporary placement of 3,300 cubic yards (5,000 Tons) of rock fill below the plane of ordinary high water.

c. Boat Ramp. The boat ramp will require 30

cubic yards of crushed stone, all of which would be below the plane of ordinary high water.

3. Source of Material. Alluvial material placed in the wetland to construct the levee would be obtained from interior excavation, generally parallel to the axis of the levee. The muck would be excavated from the bottom of Brickhouse Slough. Rock and crushed stone used for the rock dikes and boat ramp will be obtained from commercial stone quarries in the St. Charles County area.

E. Description of the Proposed Discharge Sites

1. Location.

a. Levees. The proposed levee would be 2 to 5 feet high, and some 28,250 feet long, with its upstream end tying into high ground at the Union Electric Company's Sioux Power Plant on the Missouri shore (Plate 1). The levee would extend along the island's entire riverside shore and enclose the lower one-half of the island's shoreline facing Brickhouse Slough. At this approximate midpoint, the levee would encompass the proposed rock-fill closure across Brickhouse Slough and would then terminate at higher ground on the Missouri shore. On the riverside of the island, the levee would be set back approximately 200 feet from the edge at normal pool.

b. Water Control Structures. The location of gravity drains is depicted in Plate 1. Two sets of four 48-inch CMP drains would be near the upstream section of the island and used for water intake. One set would be for warm water intake and installed in the rock dike at the far upper end of the entrance to Brickhouse Slough, approximately 2,000 feet directly downstream from the Union Electric power plant's cooling water discharge pipes (located on the Missouri shore). The second set of intake drains would be placed in the rock dike at the more riverside portion of the side channel's entrance in order to deliver slightly cooler waters into the wetland complex.

Four additional 48-inch and four 30-inch diameter drains would be installed in the lower section of the island and side channel and used for water release and interior water level fluctuations. However, these would also be used during the summer to fill the interior wetlands with back-in water when the pool is at normal stage or higher. All eight drains would be equipped with sluice gates for water control.

c. Boat Ramp. A boat ramp would be constructed to provide maintenance access. The ramp would be situated in Brickhouse Slough on the Missouri mainland adjacent to, and upstream of, the proposed rock closure/causeway structure (Plate 1).

2. Size (acres). A total of approximately 72 acres will be required for the rock and earthen levee, maintenance easements, and for borrow sites. Of the total 72 acres, about 37 acres would be for borrow, 5 acres for the rock dikes or closures, 30 acres for the earthen levee.

3. Type of Site (confined, unconfined, open water).

a. Permanent Deposits of Dredged and Fill Material. The area covered by earthen and rock levees, approximately 35 of the total 72 acres, represents a permanent placement of fill material. 5 of the 35 acres mentioned above, represents permanent placement of fill material in open water. Although these sites would be categorized as unconfined, they have been designed to remain immobile after placement. Presently, the St. Louis District is considering four possible alternatives relating to the muck excavated from Brickhouse Slough: 1) deposit on upland site; 2) deposit in bottomland near excavation site and confined with low berm; and 3) open water disposal downstream of cofferdams.

b. Temporary Deposits of Fill Materials. Cofferdams constructed for placement of gravity drains "in-the-dry" represent a temporary placement of fill material. All cofferdam material will be removed from below ordinary high water as soon as gravity drain installation is complete.

4. Types of Habitat. The area covered by the earthen levee and part of the rock levee represents a permanent loss of bottomland forest. Rock-filled closures and gravity drains would be constructed in Brickhouse Slough and in the low, marshy areas where the island's interior wetlands presently discharge into the side channel.

5. Timing and Duration of Discharge. A construction start has been tentatively scheduled for Fiscal Year 1990. Depending on local weather and flooding conditions, the estimated period of construction for the entire project is 6 to 12 months.

F. Description of Disposal Method (hydraulic, drag line, etc.). The contract specifications would not require specific types of equipment or methods for excavation in borrow areas or placement of the levee embankment. However, excavation "in-the-dry" will be required and compaction of the resulting fill material will be accomplished by tamping rollers or approved alternative equipment. Cofferdams will be constructed in order to install gravity drains and gates. Muck taken from Brickhouse Slough would be excavated by drag line and disposal method would depend on disposal site selected (e.g., deposited directly in adjacent waters, transferred by barge to bottomland site, etc.). Rock fill will probably be trucked in and dumped, and pushed into place by dozer or large back hoe.

II. FACTUAL DETERMINATIONS

A. Physical Substrate Determination.

1. Substrate Elevations and Slope. The project consists of constructing a low levee, 2 to 5 feet high with a maximum elevation of 426 feet NGVD (National Geodetic Vertical Datum). Side slopes of the earthen levee would be 1 on 3, while rockfill sections would have

steeper, 1 on 2 slopes. The crown width would be 10 feet.

2. Sediment Type. The existing bed of the side channel and those of the island's wetlands consists of a mixture of clay, sands, silts, and organics. Recent soundings found that sections of Brickhouse Slough are covered by up to 4 feet of "muck" consisting of fine silts and organics. The excavated material used to construct the earthen levee would be alluvial in nature and consist of sands, silts and clays.

3. Dredged/Fill Material Movement. The excavated material used to construct the earthen levee will be promptly compacted and revegetated to avoid erosion into the Mississippi River. Rock and crushed stone used for rock dikes is not expected to move.

4. Physical Effects on Benthos (burial, changes in sediment type, etc.). Construction of the rock dikes and cofferdams, and installation of gravity drains (including muck excavation and deposition), will most likely result in the loss and burial 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 of the dikes will provide a different but favorable substrate for benthic recolonization. Reducing the sedimentation rate within the wetland complex should also benefit the benthic fauna. Based on the location and timing of the work activities, the proposed construction of the earthen levee should have no significant physical effect on benthos.

5. Other Effects. Borrow material for levee construction will be obtained from interior excavation, generally parallel to the axis of the levee. Borrow will be excavated to a depth of approximately 1 to 3 feet. After construction is completed, it is anticipated that borrow pits will hold standing water and increase the value of the wetland complex.

6. Actions Taken to Minimize Impacts. 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 of cleared and grubbed material, 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.

The primary actions to avoid adverse impacts on the substrate include confining construction activities to dry weather periods and promptly compacting and revegetating to avoid runoff into adjacent waterways.

B. Water Circulation, Fluctuation and Salinity Determinations

1. Water

a. Salinity. Not applicable.

b. Water Chemistry. The water chemistry is not expected to be impacted to any significant degree by this work. All excavation and fill will be performed during dry summer conditions. Levee fill will be compacted and seeded to minimize erosion. Some erosion might occur during summer thunderstorm events, but this impact should be minimal. Muck, if deposited in open water, will be analyzed for presence of heavy metals and oil products.

c. Clarity. Possible short-term increases in turbidity during flood events but no significant difference compared to normal water clarity.

d. Color. Same as c.

e. Odor. The project is not expected to have a significant impact on water odors.

f. Taste. The project is not expected to significantly impact water taste.

g. Dissolved Gas Levels. Construction activities associated with the project will have no significant impact on dissolved gas levels since most activities will be performed during dry conditions. After construction, it is expected that dissolved oxygen levels may periodically increase in the wetland complex during the summer due to improved water circulation and from some control in maintaining slightly cooler water temperatures in the side channel.

h. Nutrients. Some nutrients will be released to the water column during the excavation of muck from the bed of Brickhouse Slough. This would represent a temporary increase and is not considered significant.

i. Eutrophication. The project is not expected to have a significant impact on eutrophication of the water column.

j. Water Temperature. The effects of temperature on water quality are numerous; of particular importance, as water temperature increases, its capacity to hold oxygen decreases. Mean monthly temperatures of water released from the the Union Electric Power Plant ranges from 10 to 15 F above mean ambient river temperatures (Table 2). Table 2 gives both the intake and effluent water temperatures of the power plant for 1987 and the plant's discharge volume. In general, the plant's warm water effluent flows into Brickhouse Slough and along the riverside shore of Dresser Island keeping most of the area ice-free during even the coldest of winters. However, during low and moderate pool levels, many of the island's interior wetlands do not receive the warmer water due to their relative isolation. Plume studies generally indicate that the warm water from power plants moves far downstream before completely mixing with the cooler river water.

Table 2. Mean Monthly Temperatures (in degrees Farenheit) of Intake (Ambient) and Effluent (Outflow) Water from Union Electric's Sioux Power Plant for 1987. Mean Monthly water Flow in Millions of Gallons per Day (mgd) and Cubic Feet Per Second (CFS) is also provided. (source: calculated from 1987 raw data, Union Electric).

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Temp (F)												
Ambient:	32	36	44	55	72	81	84	84	73	58	49	38
Outflow:	46	49	58	71	83	95	98	97	83	72	62	53
Discharge												
mgd:	662	595	582	672	573	645	653	662	624	369	458	540
CFS:	1024	920	900	1040	886	998	1010	1024	965	571	709	835

It is expected that the temperature of water flowing into Brickhouse Slough will be similar to that of existing conditions. However, the presence of one set of intake structures immediately downstream of the Union Electric power plant, and of a second set of intakes nearer the main river channel, will permit some control over temperatures:

During the winter, the upstream gates can be opened to allow intake of warm water released from the power plant into Brickhouse Slough and circulation into the interior wetlands via the newly excavated ditches. This would reduce the ice cover and risk of total freeze over in the shallower waters.

During the warmer months of the year, two possible methods of maintaining slightly cooler water temperatures in the closed system exist. These include: 1)completely shutting off the influx of heated waters at the upstream end of the island into the wetland complex by closing both sets of intake drains; or 2)opening only the set of drains nearer the main river channel to allow the inflow of slightly cooler ambient river water. Both methods would reduce the risk of extreme drops in dissolved oxygen levels.

2. Current Patterns and Circulation

a. Current Patterns and Flow. The project would alter circulation and flow patterns. The upper half of Brickhouse Slough side channel would be closed off by rock closures at its upstream entrance and near its middle section. These closure structures would prevent flow through the side channel during minor flood events except by way of the water control structures. The levee would be overtopped

by flood events with recurrence intervals of once in 7 years or greater, protecting the wetland area from sediment deposition during minor flood events. To improve water circulation within the levee system, ditches will be excavated connecting the upper slough with the island's interior wetlands. This will also permit warm water diversion into the center of the island. (Refer to section 3 below for additional information).

b. Velocity. The levee will eliminate uncontrolled flow across Dresser Island and through Brickhouse Slough during flood events up to a 7-year exceedance frequency (also refer to section 3, below, on Normal Water Level Fluctuations).

c. Stratification. Stratification does not normally occur in the wetland complex or in the adjacent Mississippi River.

d. Hydrologic Regime. Without the levee, filling due to sediment deposition during each minor flood event would cause further degradation of the wetland complex. Major flooding will overtop the levee (and sediment will continue to be deposited during these events). However, no changes in profiles in the adjacent Mississippi River are believed likely.

The recommended plan provides for the placement of twelve 48-inch and four 30-inch diameter drains equipped with hydraulically-operated sluice gates with gatewells. The purpose and configuration of gates would be to permit maximum flexibility in controlling water levels without the need for pumping. The size of these drains would enable filling of the interior at the rate of a few cubic feet per second (CFS) to as high as 1,000-plus CFS depending upon head (difference between exterior and interior water surface elevations), and number of drains open at any particular time. Changes in profiles within the wetland complex are discussed below.

3. Normal Water Level Fluctuations (tides, river stage, etc.). The construction of the levee would protect the wetland area from flood events up to a 7-year exceedance frequency. The eight water intake drains and eight outflow drains would permit control of interior water levels and allow complete drainage of interior water during the typical 2- or 3-day period that the pool is "on-tilt". The project is not expected to change profiles in the adjacent Mississippi River nor in adjacent floodplains.

Under normal pool conditions, the upstream gate would operate to maintain flows through the slough and through the island's internal drainage system. The downstream sluice gate would be raised under this condition. The configuration of gates would also permit maintenance of different water levels in the upstream and downstream reaches of Brickhouse Slough and within the interior wetlands. The Missouri Department of Conservation has provided information on plans to regulate water levels for the Clarksville Refuge habitat rehabilitation project and they expect to use a somewhat similar schedule with the Dresser Island project (N. Stuckey, Missouri Dept. of Conservation, pers. comm. 1988):

December 15 to May 15 - Allow interior pool to fluctuate either by seep or gravity flow through structures (gates may be left open depending on river silt load).

May 15 to June 15 - Occasionally, early drawdown may be desirable when and if river is on tilt. During this time the goal would be to keep higher ground of island interior as dry as possible. If a higher stage is forecast, the gates would be opened to allow the head differential to stabilize.

June 15 to July 15 - About same as May-June except moving toward August system.

July 15 to August 15 - Maintain high ground as dry as possible, forgoing any unexpected raises. Any planting or seeding will be done July 1 to July 25.

August 15 to September 15 - Stop drainage and allow water to gradually increase either by seep, rainfall, or gravity flow.

September 15 to November 1 - Increase as needed to full pool by November 1.

November 1 to December 15 - Overfill as desired by taking advantage of a rise in river or by closing downstream gates and ponding water.

4. Salinity Gradients. There are no salinity gradients in the project area.

5. Actions That Will Be Taken to Minimize Impacts. Construction activities would take place during the low water season which should reduce the potential for erosion. Earthen levees will be seeded to prevent erosion.

C. Suspended Particulate/Turbidity Determinations

1. Expected Changes in Suspended Particulates and Turbidity Levels in Vicinity of Disposal Site. There should be no changes in suspended matter or turbidity in the vicinity of the disposal site. There should be no runoff associated with this project except during storm events. These impacts should be short lived and cause very minimal localized impacts.

2. Effects (degree and duration) on Chemical and Physical Properties of the Water Column. The project would have a minimal impact on the water column in the vicinity of the construction activities. Most movement of material would occur in the dry, and during low-flow periods to minimize erosion and speed construction.

a. Light Penetration. There will be minimal impact on the water column as most work will be performed in the dry and then only during low flow, dry periods. All measures will be taken to minimize erosion during construction.

b. Dissolved Oxygen. Construction activities associated with the project will have no significant impact on dissolved gas levels because most activities will be performed in the dry and then only during low water conditions. After construction, it is expected that dissolved oxygen levels may increase in the wetland complex in the summer because the configuration of drains and ditches would improve water circulation and provide some control in maintaining slightly cooler water temperatures in the wetland complex.

c. Toxic Metals and Organics. There has not been any analysis for toxic metals or organics. However, there is no reason to believe that high concentrations of organic chemicals or toxic metals occur in the material to be used for levee construction. If muck excavated from Brickhouse Slough is deposited in open water, the material would first be analyzed to determine if it is contaminated with heavy metals and oil products.

d. Pathogens. There are no reasons to believe any pathogens exist in any of the proposed areas of excavation.

e. Aesthetics. Clearing of trees for borrow material and levee construction will have a negative impact on the aesthetic quality of the area. Construction activities would also have a short-term impact on the aesthetic value of the area. The creation of shallow standing-water sites in borrow areas should enhance the wetland value of the area and increase the aesthetic quality of these areas.

f. Water Temperature. See discussion on water temperatures above (Section II.B.1.j)

3. Effects on Biota

a. Primary Production, Photosynthesis. The newly constructed levee would be promptly compacted and revegetated to avoid erosion into the Mississippi River. As such, impacts are expected to be minor.

b. Suspension/Filter Feeders. The newly constructed levee would be promptly compacted and revegetated to avoid erosion into the Mississippi River. As such, impacts are expected to be minor. Placement of rock fill for closure structures is not expected to significantly impact suspension/filter feeders.

c. Sight Feeders. The newly constructed levee would be promptly compacted and revegetated to avoid erosion into the Mississippi River. As such, impacts are expected to be minor.

4. Actions taken to Minimize Impacts. The majority of construction activities would take place in the dry and then only during the low water season which should reduce the potential for erosion. Earthen levees will be seeded to prevent erosion.

D. Contaminant Determinations. There has not been any analysis for contamination of the borrow material. However, there is

no reason to believe that the material to be used for levee construction is contaminated with anything harmful to the local biota or humans. If muck excavated from Brickhouse Slough is deposited in open water, the material would first be analyzed to determine if it is contaminated with heavy metals and oil products.

E. Aquatic Ecosystem and Organism Determinations

1. Effects on Plankton. The project is not expected to adversely impact plankton. Plankton may be benefited due to the creation of additional permanent wetlands in borrow areas.

2. Effects on Benthos. Benthic organisms in the immediate vicinity of the rock dikes and cofferdams will probably be destroyed by excavation of muck and burial by rock fill during the construction activities. Any disturbance would be short term. Benthic organisms are expected to rapidly recolonize the rock dike. In the long term, the rocky substrate should provide for different benthic assemblages and possibly increase the diversity of the local diverse benthic fauna. Reduction of the sedimentation rate in the wetland complex should also benefit benthic organisms by providing for more stable habitats.

3. Effects on Nekton. The term "nekton" refers basically to larger, free-swimming aquatic organisms, such as fishes. During high flow periods most of Dresser Island's wetlands are connected to the Mississippi River and function as spawning and nursery areas for fish during the spring and early summer. During the winter, the warm water released from the upstream power plant probably benefits the local fish populations by preventing complete freeze over of the shallow waters and maintaining more optimal conditions for their food resources. During the summer the warm water release probably increases the temperature of the already warm river water causing a further drop in dissolved oxygen levels. Such conditions can stress fish. Nevertheless, there are no records of summer fish kills from the project area (T. LaRue, Missouri Dept. of Conservation, pers. comm. 1988).

In the future, if the project is not constructed, it is expected that continued sedimentation will continue to reduce water storage capacity. A raised topographic level would further reduce the depth of water in the side channel and interior wetlands, thereby reducing the usefulness of the area as a spawning and nursery area. If no rehabilitation project is constructed the spawning and nursery function of the wetland complex will be greatly reduced or eliminated due to sedimentation and natural succession of the area.

Construction of the levee system will reduce free access by fishes to the upper half of Brickhouse Slough and most of the island's interior wetlands. However, this should not result in lower reproductive output since large sections of the area would consist of permanent water and would maintain large resident populations of fish - even if isolated from the main river for long periods. Excavated ditches connecting the upper slough with interior wetlands would also improve fish dispersal within the levee system; limited access of fish

to the area from the river would still exist through the water control gates. The development of wetlands in borrow pits will increase the acreage of shallow to some moderately deep water areas, providing additional fish habitat.

Management of flow and water levels and water temperature would improve the aquatic habitat year round. The inflow of warmer water to previously isolated interior wetlands is expected to reduce the risk of winter fish kills. Decreasing the inflow of warm water from the power plant into the wetland during the summer should prevent extreme drops in dissolved oxygen levels. If water levels were manipulated in the spring to flood sections of the bottomland forest, resident fish populations would be able to move out of the open wetlands and borrow pits and spawn in the flooded forest. These areas would also serve as highly productive nursery areas for small fish. In late spring or early summer, water levels could be lowered, thus releasing fish to the riverine environment. Such management of the area for aquatic species would increase the overall productivity of the wetland complex.

4. Effects on Aquatic Food Web. Loss or disruption of the benthic community would result from construction of rock sections of the dike in Brickhouse Slough and in the low areas where the discharge from Dresser Island's interior wetlands enter the lower half of the side channel. However, recovery following construction should occur rapidly. Placement of structure and stone would benefit some benthic species important in the food chain. Overall long-term impacts are expected to be positive.

5. Effects on Special Aquatic Sites.

a. Sanctuaries and Refuges. No sanctuaries or refuges would be effected by the project.

b. Wetlands. A total of approximately 72 acres will be required for the rock and earthen levee, maintenance easements, and for borrow sites (of the total 72 acres, about 37 acres would be for borrow, 5 acres for the rock dikes or closures, 30 acres for the earthen levee. The area covered by the earthen levee and part of the rock levee, approximately 30 of the total 72 acres, represents a permanent loss of primarily bottomland forest. Approximately 5 of the total 72 acres include open water, lost due to the placement of the rock sections of the levee across Brickhouse Slough and in the low areas where the island's interior wetlands discharge into Brickhouse Slough.

Borrow material will be obtained from interior excavations, generally parallel to the axis of the levee. It is anticipated that the roughly 37 acres used for borrow will hold standing water and increase the value of the wetland complex.

c. Mud Flats. The project will not impact mud flats.

d. Vegetated Shallows. The project is not expected

to impact vegetated shallows.

e. Coral Reefs. None 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 plant or animal species or their critical habitat would be adversely affected by the proposed action.

7. Other Wildlife. Levee construction activities would disturb wildlife in the immediate project area. The clearing of approximately 72 acres of bottomland, mostly forest wetland, for levee construction and maintenance easements represents a loss of habitat and the wildlife which it supports. In the long term, wildlife associated with the wetland are expected to benefit due to the rehabilitation of the wetland complex and its increased lifespan.

8. Actions to Minimize Impacts. The effects on the aquatic ecosystem would be minimized by promptly compacting and revegetating newly constructed earthen levees to avoid erosion.

F. Proposed Disposal Site Determinations

1. Mixing Zone Determination. A mixing zone is not needed because there will be no return water to the water column.

2. Determination of Compliance with Applicable Water Quality Standards. The project would comply with applicable water quality standards.

3. Potential Effects on Human Use Characteristic

a. Municipal and Private Water Supply. No municipal water supply will be adversely impacted by project construction.

b. Recreational and Commercial Fisheries. Commercial fisheries are not expected to be significantly impacted by the project. Area sport fishing is expected to improve as a result of improved management and water level control for the wetland complex. The closure across Brickhouse Slough would block boat access to the upper reach. However, the St. Louis District and Missouri Department of Conservation are currently investigating the possible use of small boat portages (e.g., boat pull-overs) around or over the closure to provide access to the upper side channel and interior wetlands. Public access via the top of the rock dikes would be discouraged by gates or barricades.

c. Water Related Recreation. Water related recreation (i.e., boating, fishing, etc.) are not expected to be significantly impacted by the authorized project.

d. Aesthetics. Clearing of trees for borrow material

and levee construction will have a negative impact on the aesthetic quality of the area. The creation of shallow standing water in borrow areas should enhance the wetland value of the area and increase the aesthetic quality of these areas. The increased usage of the area by waterfowl would be perceived as enjoyable to those viewing the waterfowl feeding in the site.

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.

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. It is expected that sedimentation will continue in the lower section of Brickhouse Slough due to backwater from the main channel. However, computer modeling indicated that the sedimentation rate would not be increased by the project.

IV. FINDINGS OF COMPLIANCE OF THE RESTRICTIONS ON DISCHARGE

In our evaluation of discharges proposed in connection with the Dresser Island Wetland Habitat 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 not required since the proposed placement would consist of soils and sand taken from within the floodplain, and our review of the work disclosed no "reason to believe" that contaminants would be released to the waterway. However, muck excavated from Brickhouse Slough will be analyzed for heavy metals and oil products if the material is to be disposed of in open water. Materials proposed for use in levee construction on Dresser Island will be obtained from borrow areas that are well removed from potential sources of contamination. The placement activities would not violate the toxic effluent standards of Section 307 of the Clean Water Act.

The wetland rehabilitation project would not jeopardize the existence of Federally listed endangered or threatened species or their critical habitat.

The proposed construction of levees and installation of water control structures would 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. 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 Dresser Island and Brickhouse Slough will be increased in the future due to a reduction in sedimentation and creation of wetlands in borrow areas. The quality and quantity of habitat for migratory waterfowl and other wetland 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. These measures include compaction and seeding of the newly constructed levee to avoid erosion into the project area and the adjacent Mississippi River.

On the basis of the guidelines, the proposed levee construction 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.

29 March 1989
Date

James E. Corbin
James E. Corbin
Colonel, Corps of Engineers
District Engineer

APPENDIX DPR-E

LETTERS OF INTENT AND O&M AGREEMENT

APPENDIX DPR-E

LETTERS OF INTENT AND O&M AGREEMENT

FOREWORD

APPENDIX DPR-E provides a letter indicating the Missouri Department of Conservation's intent to participate as the local sponsor for the Dresser Island project. Public Law 99-662 requires that the project's O&M be cost-shared as 75 percent Federal and 25 percent local sponsor. The appendix also provides a draft letter of agreement on the operations and maintenance of the project. A statement indicating the Service's intent to assure that O&M requirements of the project will be accomplished is provided in the APPENDIX A letter dated April 1989.

MISSOURI DEPARTMENT OF CONSERVATION

MAILING ADDRESS:
P.O. Box 180
Jefferson City, Missouri 65102-0180

STREET LOCATION:
2901 West Truman Boulevard
Jefferson City, Missouri

Telephone: 314 751-4115
JERRY J. PRESLEY, Director

March 21, 1989

Colonel James E. Corbin
District Engineer
St. Louis District, Corps of Engineers
210 Tucker Blvd., North
St. Louis, Missouri 63101

Dear Colonel Corbin:

This is to confirm that the Missouri Department of Conservation intends to serve as nonfederal sponsor for the Upper Mississippi River Environmental Management Program Dresser Island Project, located along the right bank of Pool 26 in St. Charles County, Missouri. This project is proposed for construction in Fiscal Year 1989.

The project would be constructed on federal land which is leased to this Department for wildlife management purposes. Though the primary benefit of the project would accrue to migratory waterfowl, all other wetland wildlife species and fisheries will also benefit. In accordance with the Water Resources Development Act of 1986, it is understood that 100 percent of the engineering and design and construction costs would be borne by the federal government. Operation and maintenance costs, however, would be the responsibility of the nonfederal sponsor.

It is therefore agreed that the Missouri Department of Conservation will:

a. provide without cost to the federal government all lands, easements and rights-of-way required for construction of the project;

b. hold and save the United States free from damages due to the construction, operation or maintenance of the project, excluding damages due to the fault or negligence of the United States or its contractors; and

c. operate and maintain all the works after completion.

COMMISSION

JEFF CHURAN JAY HENGES JOHN POWELL RICHARD REED

Please direct future coordination on this matter to Mr. Norman P. Stucky at the above address.

Sincerely,

JERRY J. PRESLEY
DIRECTOR

cc: Mr. G. Tracy Mehan, III
Department of Natural Resources

DRESSER ISLAND, MISSOURI

AGREEMENT FOR OPERATIONS, MAINTENANCE
AND REHABILITATION

This agreement is to formally consolidate all operation, maintenance, and rehabilitation responsibilities and obligations for the Dresser Island, Missouri, Habitat Rehabilitation and Enhancement Project. It is agreed:

1. Estimated annual operation and maintenance requirements and costs for this project have been outlined in the Definite Project Report, Dresser Island Rehabilitation and Enhancement, dated March 1989.

2. The U.S. Fish and Wildlife Service will assure that operation and maintenance requirements of the project as defined in the Definite Project Report will be accomplished in accordance with Section 906 (e) of the Water Resources Development Act of 1986.

3. The non-Federal sponsor of the project, the Missouri Department of Conservation, has agreed to cooperate with the U.S. Fish and Wildlife Service to assure that operation and maintenance will be accomplished in accordance with Section 906 (e) of the Water Resources Development Act of 1986.

4. The U.S. Army Corps of Engineers will be responsible for 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.

James E. Corbin Colonel, Corps of Engineers District Engineer	James C. Gritman Regional Director U.S. Fish and Wildlife Service
Date	Date

APPENDIX DPR-F

PUBLIC COMMENTS AND ST. LOUIS DISTRICT RESPONSES TO DRAFT DPR

APPENDIX DPR-F

PUBLIC COMMENTS AND ST. LOUIS DISTRICT RESPONSES TO DRAFT DPR

FOREWORD

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

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION VII
726 MINNESOTA AVENUE
KANSAS CITY, KANSAS 66101

August 9, 1988

Colonel Daniel M. Wilson, USA
U.S. Army Engineer District, St. Louis
ATTN: Environmental Analysis Branch
(CELMS-PD-A)
210 Tucker Blvd., North
St. Louis, Missouri 63101-1986

Dear Colonel Wilson:

RE: Dresser Island Habitat Rehabilitation, Upper Mississippi River Pool 26, St. Charles County, Missouri

In accordance with our responsibiities under the National Environmental Policy Act and Section 309 of the Clean Air Act, we have reviewed the draft Definite Project Report including Environmenal Assesment, Finding of No Significant Impact (FNSI) and 404(b)(1) Evaluation Report for the project referenced above.

We concur with your intent to issue a FNSI for this project, but suggest that you consider expanding your analysis of the material from Brickhouse Slogh to include the 129 Priority Pollutants <u>if</u> this material is to be disposed of in open water.

Thank you for the opportunity to comment on this project. Any question on our comment should be directed to Mr. Mike Bronoski of may staff at 913/236-2823.

Sincerely yours,

Michael J. Bronoski

for Lawrence M. Cavin
Chief, Environmental Review
and Coordination Section

SLD RESPONSE TO DRAFT DPR
COMMENTS FROM
U.S. ENVIRONMENTAL PROTECTION AGENCY
AUGUST 9, 1988

ST. LOUIS DISTRICT RESPONSE

The District will give consideration to the expansion of pollutant factors analyzed as it proceeds to seek Section 401 Water Quality Certification from the Missouri Department of Natural Resources.

United States
Department of
Agriculture

Soil
Conservation
Service

555 Vandiver Drive
Columbia, Missouri
65202

July 25, 1988

Mr. Jack F. Rasmussen, P.E.
Chief, Planning Division
Department of the Army
St. Louis District, Corps of Engineers
210 Tucker Blvd., North
St. Louis, Missouri 63101-1986

Dear Mr. Rasmussen:

Our office has reviewed the Dresser Island, Missouri Habitat Rehabilitation Project. As the area is currently a wetland and has no prime farmland we have no comments on the project. All other items appear to be covered in the report.

Sincerely,

Russell C. Mills
State Conservationist

JOHN ASHCROFT
Governor

FREDERICK A. BRUNNER
Director

STATE OF MISSOURI
DEPARTMENT OF NATURAL RESOURCES

OFFICE OF THE DIRECTOR
P.O. Box 176
Jefferson City, Missouri 65102
Telephone 314-751-4422

Division of Energy
Division of Environmental Quality
Division of Geology and Land Survey
Division of Management Services
Division of Parks, Recreation,
and Historic Preservation

August 10, 1988

Colonel James Corbin
Distric Engineer
St. Louis District, Corps of Engineers
210 Tucker Blvd., North
St. Louis, MO 63101-1986

Dear Colonel Corbin:

The Missouri Department of Natural Resources has reviewed the Definite Project Report/Environmental Assessment and draft Finding of No Significant Impact for the proposed Dresser Island Habitat Rehabilitation Project.

Our review causes us to have no objection to the determination that an Environmental Impact Statement should not be required and we concur with the Finding of No Significant Impact. We support the proposed rehabilitation of this historically important wetland habitat, which is increasingly scarce in this urbanized area of the state.

Thank you for the opportunity to review and comment on this matter.

Sincerely,

DEPARTMENT OF NATURAL RESOURCES

Frederick A. Brunner, Ph.D., P.E.
Director

FAB:tlb

John Ashcroft
Governor

John A. Pelzer
Commissioner

State of Missouri
OFFICE OF ADMINISTRATION
Post Office Box 809
Jefferson City
65102

Stan Perovich
Director
Division of General Services

August 1, 1988

District Engineer
St. Louis District, Corps of Engineers
210 Tucker Boulevard, North
St. Louis, Missouri 63101-1986

ATTN: Environmental Analysis Branch (CELMS-PD-A)

Dear Sir:

Subject: 88070018 - Dresser Island Habitate Rehabilitation Project

The Missouri Federal Assistance Clearinghouse, in cooperation with state and local agencies interested or possibly affected, has completed the review on the above project application.

None of the agencies involved in the review had comments or recommendations to offer at this time. This concludes the Clearinghouse's review.

A copy of this letter is to be attached to the application as evidence of compliance with the State Clearinghouse requirements.

Sincerely,

Lois Pohl

Lois Pohl, Coordinator
Missouri Clearinghouse

LP:cm

cc: East-West Gateway Coordinating Council

JOHN C. COZAD, *Chairman*
1700 Bryant Building
1102 Grand Avenue
Kansas City 64106

HELEN T. SCHNARE, *Vice Chairman*
3016 Bluffwood Drive
St. Charles 63301

C. R. JOHNSTON, *Member*
Springfield 65803

PAUL L. EBAUGH, *Member*
1553 Lexington
Cape Girardeau 63701

DON WALSWORTH, *Member*
306 North Kansas Avenue
Marceline 64658

HARRY T. MORLEY, *Member*
1227 Fern Ridge Parkway
St. Louis 63141

MISSOURI
HIGHWAY AND TRANSPORTATION COMMISSION

WAYNE MURI
Chief Engineer

RICH TIEMEYER
Chief Counsel

WALTER F. VANDELICHT
Ass't. Chief Engineer

MARI ANN WINTERS
Secretary

P.O. Box 270
Jefferson City, Missouri 65102
Telephone (314) 751-2551

July 19, 1988

SURVEYS AND PLANS
Route 94, St. Charles County
Dresser Island
Missouri Habitat Rehabilitation Project

District Engineer
St. Louis District, Corps of Engineers
210 Tucker Boulevard, North
St. Louis, Missouri 63101-1986
Attn: Environmental Analysis Branch (CELMS-PD-A)

Gentlemen:

We have reviewed the draft Definite Project Report and its attachments on the above project and offer the following comment. We note in the plan view shown on page EA-3 that the levee will begin near Route 94. However, we are unable to determine the exact location in relation to Route 94. Plate C-3 indicates the work will end at Station 283+60. The text indicates that 28,360 feet of levee will be constructed which means that the work would begin at Station 0+00 but the profile on Plate C-2 shows the work beginning near Station 0+80. Since we are unable to establish the relationship to Route 94, we would point out that any work necessary on state highway right-of-way would require prior approval of the plans and issuance of a permit to cover any work.

If our approval is necessary, the plans should be sent to Mr. J. T. Yarnell, District Engineer, 329 South Kirkwood Road, Kirkwood, Missouri 63122.

Very truly yours,

James F Roberts

James F. Roberts
Division Engineer
Surveys and Plans

jfr/lfh/ph

cc: Mr. J. T. Yarnell

SLD RESPONSE TO DRAFT DPR
COMMENTS FROM
MISSOURI HIGHWAY AND TRANSPORTATION COMMISSION
JULY 19, 1988

ST. LOUIS DISTRICT RESPONSE:

The District's real estate office is currently researching the question of whether or not the proposed levee would impact the Highway 94 right-of-way. If it will impact the right-of-way, the District will then seek a permit from the state. Please note that the levee work is now planned to terminate at station 0+50, and the total levee length is 28,250 feet.

MISSOURI DEPARTMENT OF CONSERVATION

MAILING ADDRESS:
P.O. Box 180
Jefferson City, Missouri 65102-0180

STREET LOCATION:
2901 West Truman Boulevard
Jefferson City, Missouri

Telephone: 314 751-4115
JERRY J. PRESLEY, Director

August 15, 1988

Colonel James E. Corbin
District Engineer
St. Louis District, Corps of Engineers
210 Tucker Blvd., North
St. Louis, Missouri 63101

Col Corbin
18 Aug 88

Dear Colonel Corbin:

We have reviewed the Dresser Island, Habitat Rehabilitation Project, Definite Project Report (SL-2). The Missouri Department of Conservation remains committed to the Upper Mississippi River, Environmental Management Program and intends to serve as the local sponsor for the Dresser Island Project.

Several questions/comments were raised during our review of this document:

- Operation and Maintenance costs (page 5) per the present interpretation of P.L. 99-662 would be 75% federal, 25% local sponsor.

- The levee along Brickhouse Slough (approximate Station 20+00 to Station 115+00) is not deemed necessary to achieve the habitat rehabilitation/management objective. A significant cost savings could be realized by eliminating this levee section. To retain water level management capability on the island's interior sloughs, it will be necessary to construct closing structures to elevation 420 N.G.N.D. at the following outlets: Approximate Station 55+20 to Station 60+30 (include two 48" CMP); Station 65+70 to Station 72+00; Station 89+00 to Station 96+20; and Station 104+00 to Station 105+60 (include two 48" CMP).

- To further reduce total project cost, we urge that special attention be given to constructing the water control structures without the use of cofferdams.

- The report states (page 4) that a boat pullover will be located at approximate Station 56+00 to provide access to the interior sloughs. We are not familiar with this technique and thus our staff will be researching this approach to determine whether it will be functional and adequate for Dresser Island.

If you have questions or wish to further discuss these comments, please contact Mr. Norman P. Stucky at the above address.

The opportunity to work with the St. Louis District in implementing the Upper Mississippi River Environmental Management Program is appreciated.

Sincerely,

JERRY J. PRESLEY
DIRECTOR

SLD RESPONSE TO DRAFT DPR
COMMENTS FROM
MISSOURI DEPARTMENT OF CONSERVATION
AUGUST 15, 1988

ST. LOUIS DISTRICT RESPONSES:

While Public Law 99-662 is clear in regard to cost-sharing for habitat projects as being 75-percent Federal and 25-percent local sponsor, it is unclear at this time whether this 75/25 cost-sharing split will be met for each individual project, or for all projects in general.

Your agencies comments regarding the levee along Brickhouse Slough generated subsequent coordination leading to a reduction in the height of that structure. At the lower end of the island levee height was reduced from 426.0 NGVD to 422.5 NGVD; at the lower closure of upper brick house slough, the levee height was reduced from 427.0 NGVD to 424.0 NGVD.

No feasible wet placement techniques could be found that would provide a constructable project with a reasonable life expectancy.

Subsequent to your comment, our agencies visited locations along the Illinois River where similar boat pullovers exist. This District believes that this feature would work.

THE BRICK HOUSE SLOUGH IMPROVEMENT ASSOCIATION

P.O. Box 207

West Alton, Missouri 63386

Fred Springmeyer, President
Vernon Houchin, Vice President

Marie Feldman, Treasurer
Kathleen Howard, Secretary

AUGUST 8, 1988

DEPARTMENT OF THE ARMY
ST. LOUIS DISTRICT CORP
OF ENGINEERS
210 TUCKER BLV.D, NORTH
ST. LOUIS, MO 63101-1986

ATTENTION: MR. JACK F. RASMUSSEN
CHIEF, PLANNING DIVISION

DEAR JACK:

I WOULD LIKE TO THANK YOU, ALONG WITH RON LINDSAY AND PHIL EYDMANN, FOR KEEPING US INFORMED, AS WELL AS EXPLAINING THE DRESSER ISLAND PROJECT. YOUR COOPERATION WAS GREATLY APPRECIATED.

ALTHOUGH THERE ARE STILL SOME QUESTIONS TO BE ANSWERED, WE, OF THE ASSOCIATION, WOULD LIKE TO THANK YOU FOR YOUR PAST AND FUTURE HELP IN RESOLVING PROBLEMS.

BELOW, PLEASE FIND A LISTING OF SOME OF THE QUESTIONS AND CONCERNS FOR YOUR FILES, SO THAT WHEN AND IF CONSTRUCTION BEGINS YOU MIGHT BE ABLE TO LOOK AT SOME OF THESE PROBLEM AREAS.

1. IT IS OUR UNDERSTANDING THAT THE 48 INCH PIPES WILL BE PUT IN DEEP ENOUGH AT THE POWER PLANT AND THE RIVER TO AT NORMAL POOL TO INCREASE THE PRESENT FLOW FROM 50 TO 100 CFS TO ALLOW A PROJECTED FLOW OF 100 TO 200 CFS WHEN OPEN.

2. IT IS OUR HOPE THAT DUE TO THIS INCREASE IN WATER PRESSURE THE POSSIBILITY EXISTS THAT THERE MIGHT BE SOME ADDITIONAL WASHING OF THE SILT OUT OF BRICK HOUSE SLOUGH AND DRESSER ISLAND.

3. WHEN CONSTRUCTION BEGINS, WE WOULD HOPE THAT THE POSSIBILITY EXISTS THAT YOU MAY BE LOOKING AT DREDGING OR BUILDING AN EDDY OR DYKE OR SOMETHING ELSE TO DEEPEN AND WASH OUT THE BOTTOM OPENING OF THE SLOUGH AS, AT PRESENT, IT IS VERY SHALLOW- SEE SKETCH ATTACHED.

4. AS WE UNDERSTAND IT, IT WILL BE THE RESPONSIBILITY OF THE MISSOURI DEPARTMENT OF CONSERVATION TO MAINTAIN WATER LEVELS AND FLOW THROUGH THE ISLAND AND SLOUGH. THERE IS SERIOUS CONCERN THAT THERE IS MORE PRESSURE FOR WATER FOWL PRESERVATION THAN FOR FISH. WE MIGHT ALSO ADD THAT THE CONSTANT FLOW OF WATER IS CRITICAL IN ORDER TO KEEP DOWN THE INSECT POPULATION.

   THERE IS CONCERN THAT IF NOT PROPERLY MAINTAINED, WE WILL NOT HAVE A SLOUGH BUT A SWAMP.

5. SINCE 98 PERCENT OF THE ASSOCIATION MEMBERS ARE FISHERMEN AND SINCE THE CONSERVATION DEPARTMENT TAKES IN MORE FROM FISHING THAN THEY WILL FROM WATER FOWL, WE FEEL THESE CONCERNS SHOULD BE ADDRESSED ACCORDINGLY.

WE ARE EXTREMELY HAPPY THAT YOU HAVE KEPT US INFORMED, AND LOOK FORWARD TO MEETING WITH YOU AGAIN AS THIS PROJECT PROCEEDS.

IF WE MAY BE OF ANY SERVICE; PLEASE CONTACT THE UNDERSIGNED.

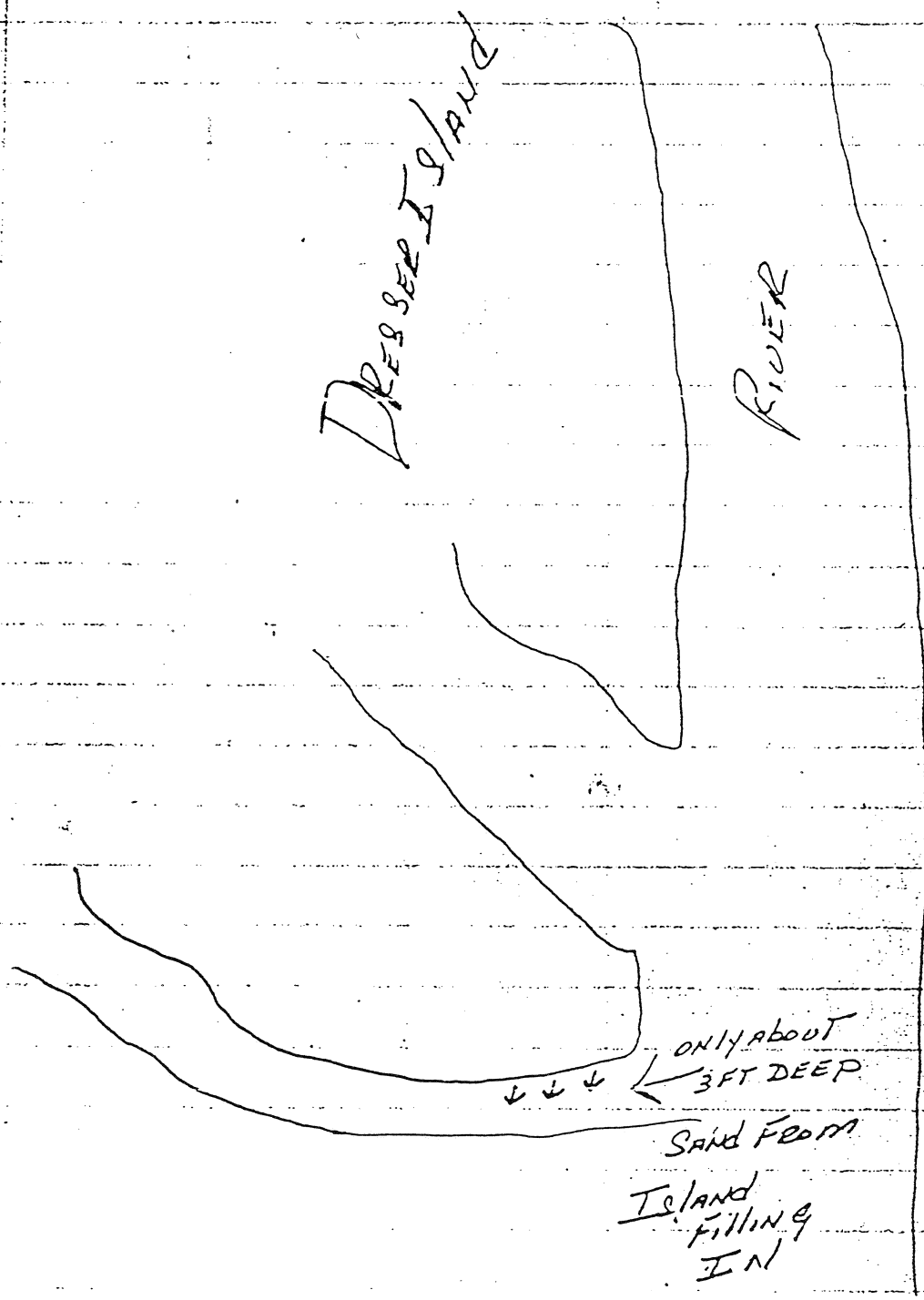
SINCERELY,

FRED SPRINGMEYER

FS/KLS

ENCLOSURE

P.S. PLEASE DO NOT FORGET THE BOAT PULLOVER RAMP. THIS IS AN IMPORTANT ISSUE WITH THE MEMBERS.


DRESSER ISLAND
RIVER
ONLY ABOUT 3 FT DEEP
SAND FROM ISLAND FILLING IN

SLD RESPONSE TO SDEIS
COMMENTS FROM
THE BRICK HOUSE SLOUGH IMPROVEMENT ASSOCIATION
AUGUST 8, 1988

ST. LOUIS DISTRICT RESPONSES:

1. The pipes are of sufficient capacity to maintain existing normal flows through the side channel. If while there is increased head upstream, and management operations permit the gates to be left open, the flow could increase beyond normal conditions.

2. It is possible that there could be some increased flushing of sediment, but to what extent we don't know for certain.

3. The District has no planned features that would alter the existing depositional pattern at the lower opening to Brick House Slough.

4. Although the construction of the levee will restrict fish movement between the river and the wetland complex, it is our opinion that the project will generally benefit riverine fishes by extending the expected life of the area wetland and thus its value as a fish spawning and nursery habitat area. This conclusion is based on several lines of reasoning. First, many of the existing interior wetlands have deteriorated due to sedimentation. This process has reduced both water levels and total surface water area, and often isolates the wetlands from the main river except during the higher flood stages. Without the project, it is expected that continued sedimentation will exacerbate this problem--with the result that both the interior wetlands and the side channel would be little used by river fishes for spawning.

The gravity drains for the project will limit the movement of fishes; however, the drains will periodically be opened. The Missouri Department of Conservation will regulate water levels and manage the drains so that fishes will have access to the site during periods throughout the year. Thus, there will be fish movement during parts of each and every year and not just when the levee is overtopped (a once in 7-year event along the river front levee and more frequently than this along other sections of the levee). Water passing through the open drains should guide fishes to these passages. In addition, movement of fishes into and within the island's interior wetlands would be improved as a result of ditches which will be excavated in order to improve water circulation. These ditches will also help shunt warm water from the Union Electric power plant into the interior wetlands during the winter which is expected to reduce the chances of

complete water freezes and thus reduce winter fish kills. As part of the overall management plan, the Missouri Department of Conservation will regulate water levels so that low areas of the island have permanent water, thus providing habitat for young fish the year round. It is also expected that borrow pits will quickly fill with water which would give fish additional pool habitat of moderate depth.

Properly managed, the Dresser Island complex is expected yield to a healthy ecosystem in which high populations of nuissance insects will not be a problem.

5. Fisheries concerns have very much been an aspect considered in the design of this project. See SLD response #4 above.

UNION ELECTRIC

1901 Gratiot Street, St. Louis

August 17, 1988

Jack F. Rasmussen
Chief, Planning Division
St. Louis District
Corps of Engineers
210 Tucker Blvd., North
St. Louis, MO 63101-1986

Attn: Environmental Analysis Branch (CELMS-PD-A)

RE: Proposed Dresser Island
Habitat Rehabilitation Project

Dear Mr. Rasmussen,

This letter is written as a follow up to our telephone conversation of August 10, 1988, concerning the Dresser Island project. Union Electric would like to thank you for the opportunity to comment on the proposal, Definite Project Report (SL-2), dated June 1988.

We support the project goal, to rehabilitate the wetland/backwater habitat of Dresser Island and Brickhouse Slough. With careful planning and management, we agree with your conclusion that the construction project would have no significant adverse environmental effects.

We do have one concern however. Wintertime operation of the proposed facility must not create fragile conditions with fish or wildlife survival entirely dependent on our Sioux Plant thermal plume. The principal goal of the operation of Sioux Plant is to provide economical generation of electric power for our customers. Plant load, and the magnitude of our thermal release, is dependent upon many factors including load management, system wide economics, and both scheduled and unanticipated maintenance activities. While operation of Sioux Plant at high capacity levels is planned, to meet daily winter peak demand, some interruptions should be anticipated. This variability is evident in the thermal reports and records which we previously provided. We believe you should recognize this potential, and thus plan to utilize the thermal plume without creating a critical dependence on it.

One additional comment may be valuable. The project report accurately states that there are no records of summer fish kills resulting from the peak thermal discharge and associated reduced dissolved oxygen levels. However, natural changes in ambient river conditions infrequently result in fish kills, typically gizzard shad. Operation of the plant's intake and the discharge configuration, sometimes results in accumulation and retention of the dead shad. We do not believe this condition will impact the project. However, public exposure may increase as a result, and either the Corps or Union Electric should be prepared to explain this phenomenon.

As we discussed, we will make reports available to you, when issued, on biomonitoring conducted by Union Electric at the Sioux Plant. If you have any questions please call.

Sincerely,

Michael F. Bollinger

Michael F. Bollinger
Supervising Environmental Scientist
Environmental Services

MFB/dml

SLD RESPONSE TO DRAFT DPR
COMMENTS FROM
UNION ELECTRIC
AUGUST 17, 1988

ST. LOUIS DISTRICT RESPONSES:

The District agrees that the management scheme for the Dresser Island project must acknowledge the limitations and inherent variability of the thermal conditions created by the power plant.

We appreciate your point of clarification between fish kills caused by peak thermal discharge (and no such records exist), and those caused by changes in river ambient conditions that are subsequently released in numbers from the power plant due to subtlties in the internal water flowage characteristics of the power plant. We agree that such periodic release of dead gizzard shad would not impact the project, but that the public should be informed of the meaning of such fish release events.

Your offer to provide the District with future reports on biomonitoring conducted by the power plant is greatly appreciated.

APPENDIX DPR-G

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POOL 26, UPPER MISSISSIPPI RIVER
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