APR 2 3 1987

Regional Refuge Supervisor, FWS, Twin Cities, MN (RF2)

Louisa District Marsh, Water and Moist Soil Management Plan

Refuge Manager, Mark Twain NWR, Quincy, IL

The subject plan was reviewed in this office and is approved as written. The plan is well written and provides sound direction for the management of the refuge's wetland habitat.

/s/ John W. Ellis

John W. Ellis

Attachment

cc: Louisa Dist.

RF2:JWEllis:bak:4/23/87:3701

Marsh and Water Management and Moist Soil Unit Plan

Louisa National Wildlife Refuge
Wapello, Iowa

Prepared by: _____ Date: 9/20/87

Complex Review: _____ Date: 3/31/87

Division Biologist Review: _____ Date: 4/13/87

Approved by: _____ Date: 4/21/87

Moist Soil Unit
Marsh and Water Management Plan

Louisa

I. Introduction

The District's water management program is designed to supplement the primary objectives of the Mark Twain National Wildlife Refuge as described in the Master Plan (1979) and District Management Plan (1986). These primary objectives include:

(1) Provide an undisturbed feeding and resting area for migrating waterfowl.
(2) Improve and maintain existing habitat to perpetuate optimum annual production of wood ducks.

Management strategies also provide habitat for other migratory birds, endangered species (bald eagles) and supplement Regional Resource Planning Strategies when applicable to the District.

The water management program is limited to the Louisa and Keithsburg Divisions. The Big Timber Division has no potential for water management and will not be discussed in the plan.

II. Description of the Area

The Louisa Refuge is located within the Mississippi River flood plain. The refuge is bounded on the east by the sand levee of the Mississippi River and on the north by the Michael Creek earthen levee. Each levee serves to protect the refuge from the Mississippi River flooding up to 12 feet above flood stage at Lock and Dam 17 with flood stage approximately 534.0 feet m.s.l. Each levee was constructed in the mid-30's for flood protection in conjunction with the lock and dam system. The U.S. Army Corps of Engineers owns and maintains the river levee. No party claims ownership of the Michael Creek levee system which appears to have been abandoned following construction of the Mississippi River flank levee during the 1965 flood. However, the refuge has maintained the south levee of the system since around 1970.

On the south, the refuge is bounded by the 4,000+ acre Lake Odessa Wildlife Area managed by the Iowa Department of Natural Resources. The Iowa River with its associated levee system forms the south boundary of the Odessa Wildlife Area. No dikes or levees separate the refuge and the Odessa Area.

Variance in elevations throughout the refuge is less than 13 feet ranging from 530 m.s.l. to 543 m.s.l. Existing marsh and water areas have a variance of less than seven feet ranging from 530 to 537 m.s.l.

Soils on the area are generally silty clay loams. The eastern 1/2 of the refuge generally has very poor internal drainage. The western 1/2 of the refuge has relatively good internal drainage.

A summary of current land types/uses on the Louisa Refuge is contained in the following table.

Land Type Inventory - Louisa Refuge

Type	Designation	Acreage	Remarks
MOIST SOIL	1	62	Dike and control structures
Acreage - 344	2	35	No control - managed w/Fox Pond
	3	40	No control - managed w/Fox Pond
	4	60	No control - managed w/Fox Pond
	5	62	No control - managed w/Fox Pond
	6	20	Dike and control structure
	7	15	Control structure
	8	20	Control structures (2)
	9	15	Control structure
	10	15	Control structure
SHALLOW FRESH MARSH	Fox Pond	65	Dike, control and pump
Acreage - 544	Little Fox Pond	20	No control - managed w/Fox Pond
	Prairie Pocket	45	Control structures (2)
	Muscatine Slough	200	No controls
	Goose Pond		No controls
	Swarms Pond		No controls
	Bee Bee Pond		No controls
ACTIVE CROPLAND	Fields 5, 9, 10, 14, 15, 17, 28, 23, 26	412	
IDLE CROPLAND	Fields 2, 3, 7, 21, 22 24, 25	165	
FORESTLANDS	NA	984	
GRASSLANDS (Native)	NA	65	6 stands
DNC (Cool Season)	Fields 7, 10, 27, 30	35	
ADMINISTRATIVE	Buildings, roads, levees, etc.	60	

III. Prior History

Prior to the construction of the river levee and lock and dam system in the 1930's, the area of the refuge was essentially a backwater area of the Mississippi dominated by Muscatine Slough. Following construction of the levees, the area became a formal drainage district. The area, including Lake Odessa, was extensively ditched and drained for agricultural purposes. The entire area was effectively drained with the aid of a large pumping station to the Mississippi River. Much of the land was cleared of bottomland timber as was the case with most of the east half of the Louisa Refuge. In the area of M.S. 2, 3, 4, and 5, quite extensive stands of pin oak timber was cleared for agriculture in the 1950's.

Prior to 1958, the area was managed on a post and patrol basis as part of the Upper Mississippi Refuge with very little active management. The District was formally established in 1958 and, except for the 40-acre headquarters site, is comprised entirely of General Plan Land of the U.S. Army Corps of Engineers. Management is currently by cooperative agreement (1963/64) with the COE.

In the early 1950's, inlet and outlet water control structures for Lake Odessa were constructed by the State of Iowa. The inlet structure is located on the Louisa Refuge while the outlet is located on the Lake Odessa Wildlife Area. These structures serve as the supply and drain for both the Louisa Refuge and Lake Odessa. As a result, water management has been a "cooperative" venture for over thirty years since water management and levels directly influence and impact refuge management programs, in particular, moist soil and cropland management. Historically, Lake Odessa water management has been geared toward public use activities, most notably waterfowl hunting and sport fishing.

From the mid-60's until the early 70's, most water management facilities were constructed on the refuge. Emphasis was placed on the development of self-contained moist soil units along the east 1/2 of the refuge. Construction included the diversion structure, Fox Pond pump, roads and dikes along the east and south boundaries, and a number of stoplog and screw gate structures constructed and installed force account. The first diked moist soil units (1, 2, and 3) were constructed in the early 70's.

No new development of moist soil areas took place until the early-mid 80's when Moist Soil 6 and 7 were developed. At the same time, dikes were abandoned and control structures removed on Moist Soil 2 and 3 and plans for additional dikes and controls on Moist Soil 4 and 5 were abandoned. Moist Soil 2 and 3 controls had proven ineffective and impossible to maintain. This was the result of uncontrollable seep water entering the refuge from the Mississippi and inadequate dike construction on the unit. For nearly seven consecutive years (1980-1986) the dikes were overtopped (spring and fall) by seep water and deteriorated to the point of no longer holding water. In 1985, the decision was made to manage M.S. 2, 3, 4, and 5 in conjunction with Fox Pond levels. This system had some advantages but many drawbacks as well i.e. less maintenance costs vs. less than desirable habitat conditions.

Limiting factors influencing the refuge water management program over the past 10 years have been:

1. Lack of adequate O & M funds.
2. Influence of the Mississippi River (seep water).
3. Inadequate initial construction of facilities.
4. Lake Odessa Wildlife Area water management.
5. Lack of adequate construction/development funds.

IV. Refuge Objectives

Waterfowl maintenance objectives for the Louisa Refuge include 5,000,000 duck use days and 300,000 goose use days annually. Duck use has averaged approximately 3.5 million use days over the past five years. Goose use, primarily Canada geese, has averaged nearly 450,000 over the past five years.

The major objectives of the water management program are to increase duck use days and waterfowl production to meet the objective levels on a sustained basis.

V. Problems

The key to a successful program on Louisa Refuge is water manipulation--the ability to add water and draw down water levels in a timely fashion. This has not been possible over the past several years due to:

1. Influence from the Mississippi River--seep water and high levels during the spring and early summer.
2. Odessa Wildlife Area Management--desire for high water levels to accommodate public use i.e. fishing, boating, and waterfowl hunting.

As a result, moist soil and overall water management programs have progressed well below potential for the past 10-15 years. Optimum programs will not be possible on Louisa unless these two influences are resolved. Some progress has been made on the Odessa Area. Desired water levels by the DNR have come down by approximately 0.5 feet over the past two years. However, the lake levels are still too high for the refuge to manage moist soil programs adequately. In the spring and early summer it is not possible to drain moist soil areas to stimulate production of desirable moist soil plants. In the fall, the DNR raises the lake level to accommodate early season waterfowl hunters in September. This practice essentially floods out some refuge moist soil production before plants have matured and set seed. To resolve the Odessa influence will require the DNR to lower their planned spring through late summer water levels by approximately one foot.

As for the influence of the Mississippi River, little can be done, and it is expected the high spring and early summer levels will continue. Seep water will continue to be a problem for effective moist soil management. The only solution we can forsee would be the construction of a large pumping station on the refuge to pump the seep back to the river. However, this would be a very costly program in terms of initial investment and annual operating costs.

VI. Monitoring and Evaluation of Management Practices

In order to determine the effectiveness of the marsh and water management programs, a more intensive system of monitoring and evaluation must be implemented.

Monitoring and evaluation will be conducted by the refuge manager and the assistant manager, and findings reported to the Regional Office annually via the Annual Water Management Plan. The plan will include a summary of water management activities including projects, manipulations, vegetative response, and waterfowl use for the prior calendar year. In addition, the plan will outline planned water management and projects for the current calendar year. The annual water management format is summarized in Appendix 1.

Wildlife use and response with emphasis on waterfowl will be recorded at least once a week during summer and winter, and at least three times per week during migrational periods. Observations of wildlife activity will be noted and include such items as populations and whether waterfowl are loafing, feeding, or roosting in moist soil areas.

Vegetative transects will be conducted during the period of August - September in all moist soil areas. Vegetation species, height, density, and seed production will be recorded by the observer. Linear transects will be run using a square meter quadrant every 20 paces or approximately 60 feet.

Water gauge readings will be recorded for all moist soil areas on a weekly basis and charted on a graph at year's end.

VII. Management Strategies

On Louisa, water is supplied to the refuge by the Iowa DNR owned and maintained inlet water control structure. The supply is via gravity flow from the Mississippi River. The inlet control consists of three 48-inch screw gates installed in the 1950's and repaired following the levee break during the 1965 flood. Gravity flow is not reliable due to the unpredictable levels of the Mississippi. Water is diverted into the refuge's managed units via the diversion structure (3-bay stoplog structure).

Water is removed from the refuge via a single stoplog structure (4' bay) at Fox Pond. A diesel-powered pumping station is also utilized to dewater the east 1/2 of the refuge. The pump is capable of 14,000 gpm. Gravity flow or pumping is not feasible unless the levels on Lake Odessa are lower than refuge levels. The outlet to the lake and refuge consists of a control structure of three 48-inch screw gates that is owned and maintained by the Iowa DNR. The structure was constructed in the 1950's. In order for lake levels to be drawn down, Mississippi River levels in Pool 18 must be lower than the lake. In addition, the Iowa river empties into the Mississippi approximately one mile south of the outlet structure. When levels are high in the Iowa River, gravity flow from the lake is usually not possible.

Water is diverted into the refuge through a single 4' stoplog control structure into a series of ditches from which all managed moist soil areas can be filled from gravity flow. The only exceptions are M.S. 6 and M.S. 7 which require backfilling from Fox Pond. A series of 15 water control structures are located along the 20+ mile ditch system. M.S. 1, 8, 9, and 10 can be drained independently with the aid of a Crisafulli pump. The remaining areas must be drained in conjunction with Fox Pond. Fox Pond serves as a "sump" for the entire system with all areas designed to empty into Fox Pond. All moist soil areas and Fox Pond are dry when levels approach 531.0 m.s.l. Pumping is generally required to drain Fox Pond and M.S. 2 through 5. On average, it requires approximately one week of 24-hour pumping to drain the five units. An average of 600 gallons of diesel fuel are required for the project. In addition, due to high water tables in the area and the influence from Lake Odessa, periodic pumping is required to maintain the units dry. On average, pumping for 4-6 hours is required every other day.

The primary emphasis of the management program is natural food production for migrating waterfowl. This is most important for fall migrants since the spring migration has been limited to resting/loafing and short duration confined to a 2-3 week period in April/May. The program is also designed to provide breeding pair and brood habitat for nesting waterfowl--primarily wood duck and mallard. Other species benefitting from the program include other migratory birds--primarily shorebirds and marsh and water birds.

Drawdown of moist soil areas is very important to achieve the desired goal of "desirable" natural food production. However, due to the influences of the Mississippi River and Lake Odessa, timely drawdowns are often not possible. Over the past five years no drawdown has been possible prior to July 1. This appears to be much too late for production of desirables such as smartweed and millet. June 1-15 appears to be the target for optimum plant response. It is true that later drawdowns result in rather rank vegetative response, but the vegetation rarely sets seed prior to the first heavy frosts which generally occur in mid-late September.

Drawdowns should commence as early as possible in the spring and proceed at a slow pace until areas are "dry" on or about June 15. With the slow drawdown, habitat will be provided for breeding ducks as well

as marsh, water, and shorebirds. In addition, plant response should produce a good mix of smartweeds, burreeds, arrowhead, and millet. All areas will not be drawn down in any given year. It's important to remember M.S. 2-5 must be drawn down in conjunction with Fox Pond. M.S. 1 and 6-10 can be manipulated independently as these areas are capable of separate control. Ideally, the program should include the following strategy:

1. One-fourth of moist soil areas drawn down and manipulated. Manipulation to consist of one or more of the following techniques: prescribed burning, mowing, heavy discing, light discing, or farming. The degree of manipulation will be determined by monitoring and evaluation from prior years.
2. One-fourth of moist soil areas drawn down with no manipulation. This will provide for desirable plant production and provide additional nesting habitat for waterfowl--primarily mallards.
3. One-half of moist soil areas with no drawdown or manipulation. This will provide additional breeding pair and brood habitat for waterfowl in addition to that provided by such areas as Muscatine Slough, Goose Pond, and Swarms Pond.

Fall flooding of moist soil areas will hinge on the monitoring and evaluation of the annual production. Flooding should not commence until moist soil vegetation has produced viable seed. Generally, flooding will commence around September 1 to accommodate early migrants such as teal, wigeon, and Canada geese. Moist soil areas will be flooded gradually in order to provide a wide variety of water depths in each moist soil area in time for peak waterfowl populations around the first week of November. Water depths will vary from 4-5 feet in Fox Pond utilized by divers to a few inches in M.S. 2-5 and other moist soil areas utilized by mallards, pintail, black ducks, and gadwalls.

The timing of fall flooding, however, will be dependent on levels of the Mississippi and Lake Odessa.

VIII. Maintenance and Rehabilitation of Facilities

1. Inlet/Outlet Control Structures - These screw gate structures are each 30+ years of age and past their life expectancy. The DNR-owned structures have developed problems over the past two years. The outlet control appears to have one or more discharge CMP's leaking as cave-ins have occurred at the top of the sand levee supporting the structure. The inlet control has developed problems in opening and closing two of the three screw gates. It is believed it is only a matter of time until one or both of these structures fail entirely or become partially inoperative. These structures should be replaced as a cooperative project with the Iowa DNR. When replaced, the new structures should be designed to include some form of rough fish barriers in order to improve water quality, submergent vegetation, and fishing in the refuge and Lake Odessa.

2. Mississippi River Levee - The levee needs to be upgraded throughout the refuge and the Odessa Wildlife Area. The levee should be raised and sideslopes improved to match the condition of the levee in the area of Muscatine Island and Big Timber. Here the levee system affords more than 100-year flood protection and plans are to increase it to 200-year flood protection. The project would have to be undertaken by the Corps of Engineers and would have to be accomplished be dredging. Once upgraded, the levee should be seeded with grasses conducive to nesting--mallards.

3. Michael Creek Levee - This levee affords protection from flooding from Michael Creek and the Mississippi River. Michael Creek has silted in to a depth of approximately 10-15 feet from old County X-61 to its mouth at the Mississippi. This stretch requires cleaning in order to preserve the levee system. The levee requires reshaping along its entire length to afford improved routine maintenance on the levee. Slopes are presently 2:1 and should be improved to no less than 5:1. This project will require considerable coordination with local, State, and other Federal agencies.

4. Main Ditch System - The existing ditch system serves a dual function of providing water to and dewatering moist soil areas, Prairie Pocket, and Fox Pond. Maintenance is basically cyclical whereby approximately 1.5 miles is cleaned on an annual basis. The cleaning removes accumulated silt and brush permitting efficient water movement throughout the system. The annual maintenance is generally done force account utilizing the Bantam truck-mounted crane. However, this piece of equipment requires replacement at an estimated cost of $150-200.0. Contracting is done when funds are available. However, contracting is a very "iffy" proposition at best since working conditions cannot be predicted with any regularity. In other words, the work must be done when conditions are right and not wait until it's convenient for a contractor to do the work. Often conditions are right for only a few days each summer.

5. Fox Pond Control - This stoplog control structure is approaching 30 years of age and requires replacement with a larger structure. The concrete stoplog bay and wing walls are cracked in a number of places and the CMP under the dike has corroded considerably. The structure should be replaced with a twin bay (4') stoplog structure. This will permit more efficient water release from Fox Pond and moist soil areas during draw down. In addition, the functional height of the structure needs to be increased by one foot in order to provide for maximum flooding of M.S. 2 through 7.

6. Fox Pond Pumping Station - The pumping station consists of a 14,000 gpm right-angle drive pump powered by a diesel engine. Maintenance requirements are unpredictable hinging on the degree of pumping in any given year. The pump has not been inspected by a qualified manufacturer's representative since it was installed. An inspection should be conducted every five years to insure efficient operation and head off major breakdowns and repairs.

The diesel engine requires little maintenance and replaced as needed instead of on a scheduled basis. A silt basin exists in front of the station. The basin extends approximately 100 yards into Fox Pond and is approximately 20' wide. The basin should be cleaned on a cyclical basis in conjunction with Fox Pond draw downs--on the average every 3-5 years.

7. Water Control Structures - Fifteen water control structures are utilized to distribute water to moist soil areas and Fox Pond. All but two of these structures are metal half-moon risers and 18" slide gate structures. The diversion structure consists of a 3-bay (5') concrete stoplog structure constructed in 1956, and a single bay (4') concrete stoplog structure constructed in 1960. Both structures are in excellent condition for their age and require little maintenance other than replacement stoplogs every few years.

   The half-moon riser stoplog structures (5) were constructed and installed force account from 1957 to 1978. No two structures are the same size and all are rusted quite badly and should be replaced with either slide gates or with standardized half-risers.

   The slide gate structures are all irrigation gates and are quite functional and inexpensive. These structures were installed since 1975 and require little maintenance other than oiling the mechanism annually. They range in size from 18" - 36" depending on the volume of water required to accommodate.

8. Moist Soil Areas - Moist soil areas were developed or designated along broad contour lines without regard to the feasibility of flooding potential on a regular basis. Land levelling to dependable contours or levels would have been desirable, especially in the areas of M.S. 1, 2, 3, 9, and 10.

9. Dikes - There are three formal dikes on the refuge - M.S. 1, M.S. 6, and Fox Pond. M.S. 1 dike has been a continual maintenance problem since constructed in the 1970's. The dike was constructed at inadequate elevations and with inadequate side slopes. As a result, the dike is overtopped almost annually and muskrats burrow continually. The dike should be raised to the same elevation as Fox Pond dike and the side slopes improved to no less than 6:1.

   M.S. 6 dike was constructed in 1985. Extreme high water conditions in 1985 and 1986 resulted in erosion from wave action and ice moved the structure. The dike requires reshaping and the structure should be reset.

   Fox Pond dike was rip-rapped in 1983 and is in good condition.

10. Roadways - Roadways also double as dikes for M.S. 8, 9, and 10. All three roadways require reshaping of road shoulders with 6:1 slopes. The roadway on M.S. 9 needs to be raised to the same level as Fox Pond dike, otherwise the roadway is flooded with 1½ feet of water at maximum pool level on M.S. 1 and Fox Pond with water spilling into M.S. 9.

Spillways in the vicinity of M.S. 10 and the south end of the refuge need to be raised by 1.5 feet to prevent water from flowing out of the refuge when elevations reach 537.0.

IX. Development

The potential exists for the development of several new impoundments with controls and moist soil areas. Refer to attached map.

1. Moist Soil 2 - Development will entail construction of approximately 0.3 miles of new dike. The new dike to be constructed with a minimum top elevation the same as the east road and minimum side slopes of 6:1. With these minimums, problems of overtopping and muskrat damage will be minimized. A new control structure will be required at the southwest corner of the unit to provide for gravity flow drawdowns. Water supplies will be via Fox Pond either by gravity flow or via pumping with a Crisafulli. The dike on the north boundary of the area will require rehabilitation to the same elevation and side slopes as the new dike. Drainage ditches should not be located immediately adjacent to dikes as this has proven in the past to be most conducive to muskrat damage to dikes.

   Total estimated development = $60.0

2. Moist Soil 3 - Development will entail construction of approximately 0.2 mile of new dike and rehabilitation of an additional 0.2 mile of old dike/road. The dikes to be constructed with a minimum top elevation the same as the east road and minimum side slopes of 6:1. With these specifications, overtopping and muskrat damage will be minimized. Drainage ditches should not be located immediately adjacent to dikes as this has proven in the past to be conducive to muskrat damage to dikes. A new control structure will be required at the southwest corner of the unit. Water supplies will be via gravity flow from Fox Pond or pumping with a Crisafulli.

   Total estimated development = $45.0

3. Moist Soil 5 - Development will entail construction of approximately 0.5 mile of new dike and installation of a control structure at the northwest corner of the unit. The new dike to be constructed with the same specs. as M.S. 2 and 3. Water supplies would be via pumping or gravity flow from Fox Pond.

   Total estimated development = $80.0

4. Muscatine Slough Unit (M.S. 11) - The potential exists to develop an approximately 60+ acre impoundment on Muscatine Slough along the northwest boundary of the refuge. Presently, this area is only seasonally flooded and the land is too wet to farm and too wet for other habitat development i.e. timber or nesting cover.

   Development would entail raising the existing slough crossing road by approximately two feet and replacing an existing drain culvert

with an 18" slide gate structure. This would provide water control on the area improving the diversity of water levels and providing additional waterfowl brood habitat.

Total estimated development = $10.0

5. Mollie Walker Unit (M.S. 12) - Potential exists to hold seasonal water on approximately 30 acres of the Mollie Walker Tract. This can be accomplished by installing a slide gate structure on the drain culvert at Muscatine Slough and removing the two other drain culverts along the Port Road. The Port Road, ideally, would need to be raised approximately two feet in order to provide for independent management of the tract during high levels in Lake Odessa.

   Not much potential exists for flooding the area on demand since no water supply is available other than Crisafulli pumping from Muscatine Slough. This would be a costly venture on a sustained basis.

   Total estimated development = $30.0

6. Door Yard Unit (M.S. 13) - Ten acres of marginal cropland could be transformed into moist soil by constructing a short low-level dike from existing ditch cleanout spoil along the west boundary of the unit. Estimated cost of the project is approximately $1000. Water supplies would be via pumping with a Crisafulli from the ditch along the west boundary. Dewatering would also be accomplished via a Crisafulli pump.

   Total estimated development = $1.0

7. M.S. 9 Expansion - Approximately 35 additional acres of moist soil could be incorporated into M.S. 9 via land levelling of Field 17. Contours are nearly such that over half the field can be flooded at high water periods on the refuge. With some land levelling, the west half of the field could be used to raise ground on the east half of Field 17 and the higher ground could support some form of nesting cover. In present condition, Field 17 is too wet to farm dependably and too "dry" to make a productive moist soil area. An extensive contour study would be required for the project.

   Total estimated development = $30.0

8. Stone House Unit (Unit 14) - Development will entail conversion of approximately 10 acres of retired cropland. Approximately 0.5 mile of new dike will be constructed to separate the area from the influence of Beebe Pond and water level fluctuation from Lake Odessa management. An 18-inch slide gate control structure will be required on the west side of the unit to accommodate gravity flow draw down/dewatering. Water supplies for the unit will be via pumping from a Crisafulli from the ditch to Beebe Pond.

   Total estimated development = $25.0

9. Swarms Unit (Unit 15) - Development will entail conversion of approximately 50 acres of cropland to moist soil management. Approximately 1.5 miles of new dike will be constructed to separate the area from the influence of Swarms and Beebe Ponds and water fluctuation on Lake Odessa. An 18-inch slide gate control structure will be required on the southeast corner to accommodate gravity flow draw down/dewatering. Water supplies for the unit will be via pumping from a Crisafulli on the ditch to Swarms Pond. Land levelling on the unit may be required.

Total estimated development = $85.0

10. Apple Tree Unit (Unit 16) - Development will entail conversion of approximately 10 acres of cropland to moist soil management. Approximately 0.5 mile of new dike will be required along the south and east side of the unit to separate the area from water level fluctuations on Lake Odessa. An 18-inch slide gate control structure will be required on the southeast corner of the unit for gravity flow draw down. Water supplies for the unit will be Crisafulli pumping from the ditch to Swarms Pond. Some land levelling on the unit may be required.

Total estimated development = $45.0

11. Observation Tower Unit (Unit 17) - Development entails conversion of 10 acres of retired cropland to moist soil management. Approximately 0.75 mile of new dike will be constructed on three sides of the unit to separate the area from the influence of Swarms Pond and Lake Odessa. An 18-inch slide gate control structure will be required on the northeast corner of the unit for gravity flow draw down. Water supplies for the unit will be via Crisafulli pumping from Swarms pond.

Total estimated development = $45.0

12. Unit 18 - Development entails conversion of 40 acres of cropland to moist soil management. Approximately 1.5 miles of new dike will be constructed on three sides of the unit to separate the area from the influence and water fluctuations of Lake Odessa. An 18-inch slide gate control structure will be required at the southeast corner of the unit. A sump will also be required at the site of the structure for water supplies. Water supplies for the unit will be via Crisafulli pumping from the sump at Swarms Pond.

Total estimated development = $85.0

X. Cyclical Maintenance

The ability to conduct an adequate cyclical maintenance program to include habitat, facilities, and equipment is most important. The maintenance program will depend a great deal on the effectiveness of the Maintenance Management System's reporting procedures and resulting funding. Upon completion of the initial inspection of facilities, habitat, and equipment, the inspection reports will be incorporated as a part of the plan as they pertain to water management.

Within cyclical maintenance, emphasis will be placed on habitat manipulation to achieve the best possible mix of wetland habitat conducive to waterfowl production and migrational habitat. The rotation discussed in the Management Strategy section should be adhered to as closely as possible, but some degree of flexibility is required. Manager discretion is needed to adjust management practices to meet existing conditions in any given year. For example, in order to maintain rotations it may be necessary to manipulate more than 1/4 of the area in a given year. Also, habitat conditions will dictate maintenance requirements. If, through field measurements and observations of waterfowl use areas are deemed productive, it may not be necessary to manipulate an area on rigid schedules.

Adequate O & M funding to conduct habitat maintenance/manipulation will also be required. In order to conduct an effective program, it is estimated the station will require an additional $3.0 annually on Louisa. The increased funds will be utilized solely for pumping ($1.0) costs and contract manipulation of habitat i.e. discing, mowing, farming, etc.

Following complete development rehabilitation as outlined previously, O & M costs will increase substantially with added maintenance costs associated with new dikes, water controls, ditches, habitat, and pumping. An additional figure is difficult to assess, but it is estimated an additional $10.0 will be required annually.

XI. Land Acquisition

Land acquisition is required in order for moist soil management to be developed to full potential on the Mollie Walker and Muscatine Slough units. Maintenance of "high" water levels on these units will result in flooding of private land on the northwest boundary of the refuge. Approximately 80 acres of private land is involved and held by five landowners. All but one parcel is presently in agricultural production. Refer to attached map.

FORMAT - ANNUAL WATER MANAGEMENT PLAN

The following format shall be followed when completing the annual water management plan.

Purpose - state purpose and give general introduction to plan.

Objectives - primary objectives as stated in Refuge Management Plan.

EACH DIVISION

General Information - area description, general management strategies.

Previous Year's Water Use Data - describe all water management activities, plans versus accomplishments, monitoring and evaluation of activities, results.

Annual Plan:

Primary Objectives for the Year - in regard to wildlife.

Water Manipulation - describe step by step procedures for each MSU, other water areas - what will it accomplish.

Rehabilitation, Cyclical Maintenance, and Development - describe planned projects - desired results, manpower, and equipment requirements.

Appendices:

1. Monthly precipitation chart
2. MSU evaluation forms
3. Project descriptions, cost analysis and maps for new projects.
4. Graph presenting the chronology of wildlife use for each MSU.

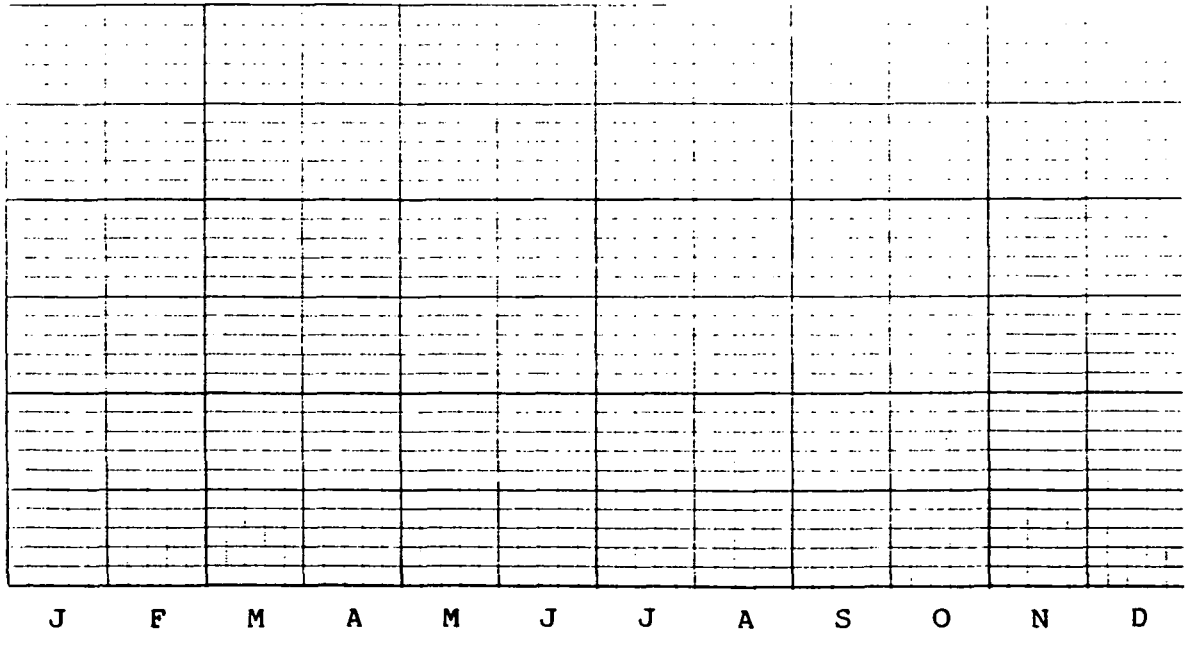
MARSH AND WATER MANAGEMENT PLAN - ANNUAL MSU EVALUATION

MSU # _____ YEAR 19____

VEGETATIVE TRANSECT DATE _____

DOMINANT VEGETATION	%

SKETCH



WILDLIFE USE

	Use Days	% Change from 19___
Ducks		
Geese		
Thr. spp.		
Other migr.		
WF Prod.		

VEGETATIVE TRANSECT REPORT

DIVISION________________________ DATE__________________

AREA____________________________ OBSERVER______________

TRANSECT ROUTE____

SAMPLE STATIONS__________

Species	No. of Stations Present	%	Total Stems	Avg. Hgt.	Overall Seed Production	% Overall Plant Composition

VEGETATIVE TRANSECT FIELD FORM

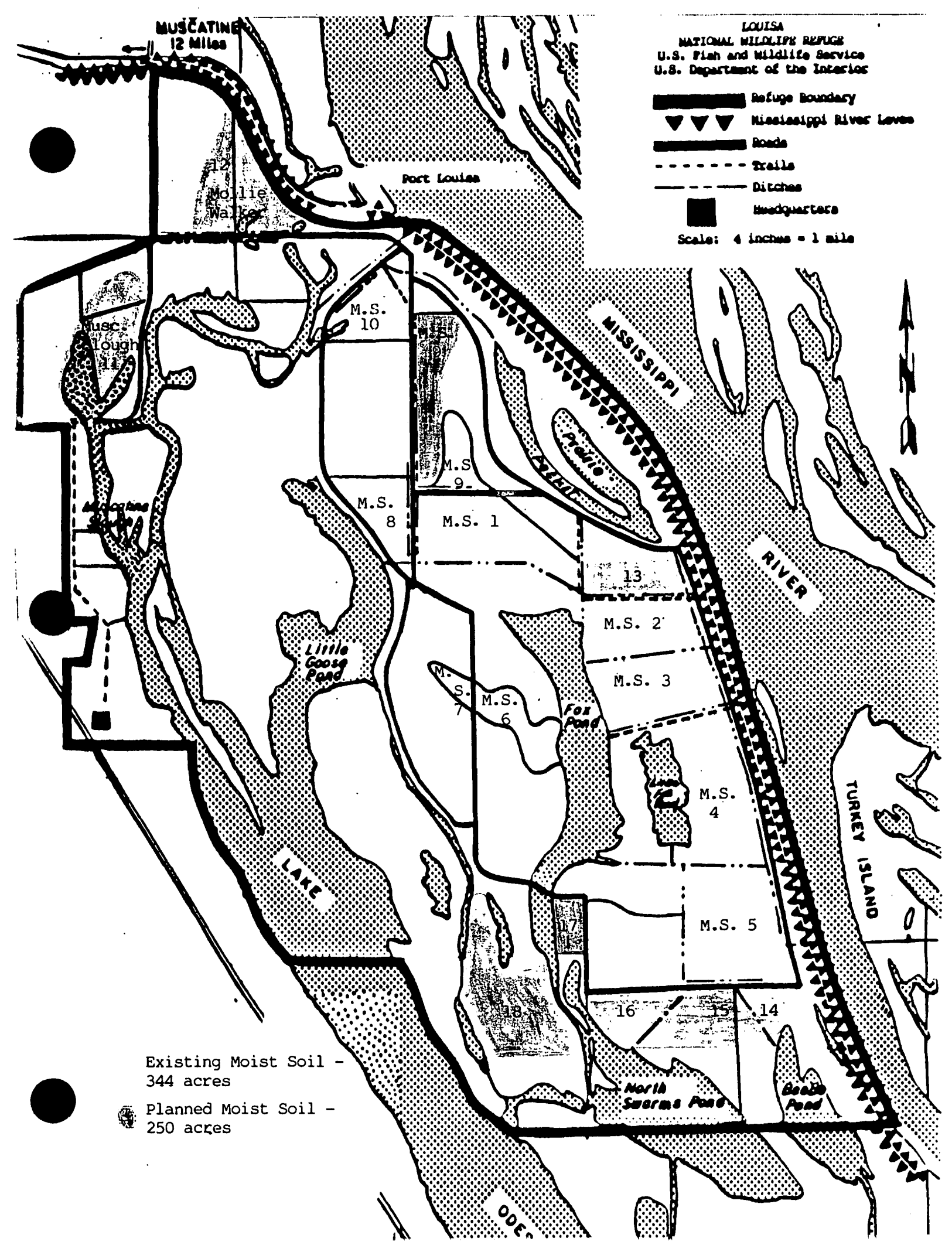
DIVISION _____ DATE _____

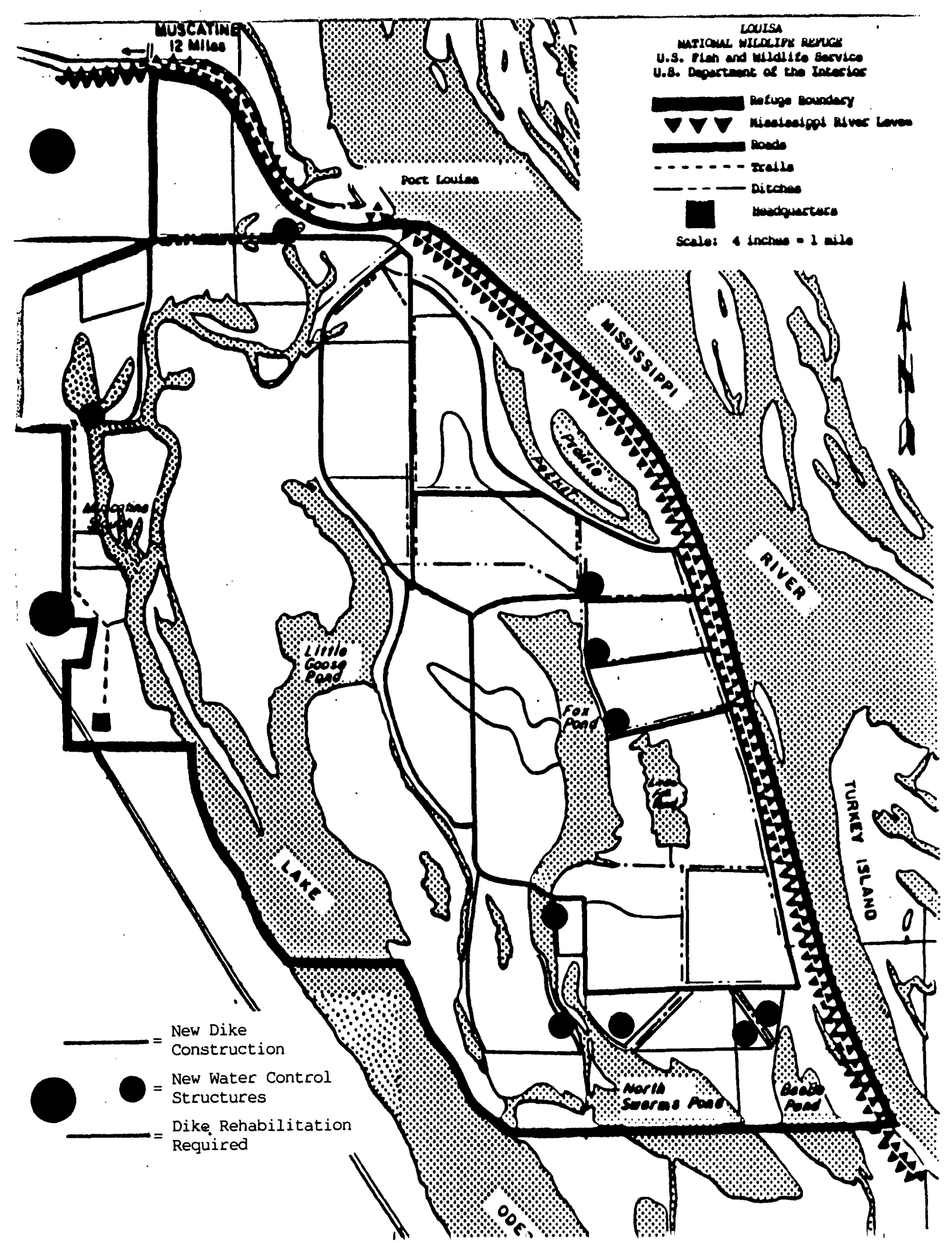
AREA _____ OBSERVER _____

TRANSECT ROUTE _____

SAMPLE STATIONS _____ DISTANCE BETWEEN STATIONS _____

STOP #	SPECIES	STEM/M^2	AVG HEIGHT(INCHES)	SEEDS PRESENT


LOUISA
NATIONAL WILDLIFE REFUGE
U.S. Fish and Wildlife Service
U.S. Department of the Interior
Refuge Boundary
Mississippi River Levee
Roads
Trails
Ditches
Headquarters
Scale: 4 inches = 1 mile
MUSCATINE
12 Miles
Port Louisa
Mollie Walker
Musc Slough
M.S. 10
M.S. 9
M.S. 8
M.S. 1
M.S. 2
M.S. 3
M.S. 4
M.S. 5
M.S. 6
M.S. 7
MISSISSIPPI
RIVER
Prairie
Little Goose Pond
Fox Pond
LAKE
TURKEY ISLAND
North Swarms Pond
Beaver Pond
13
17
18
16
15
14
Existing Moist Soil - 344 acres
Planned Moist Soil - 250 acres


LOUISA
NATIONAL WILDLIFE REFUGE
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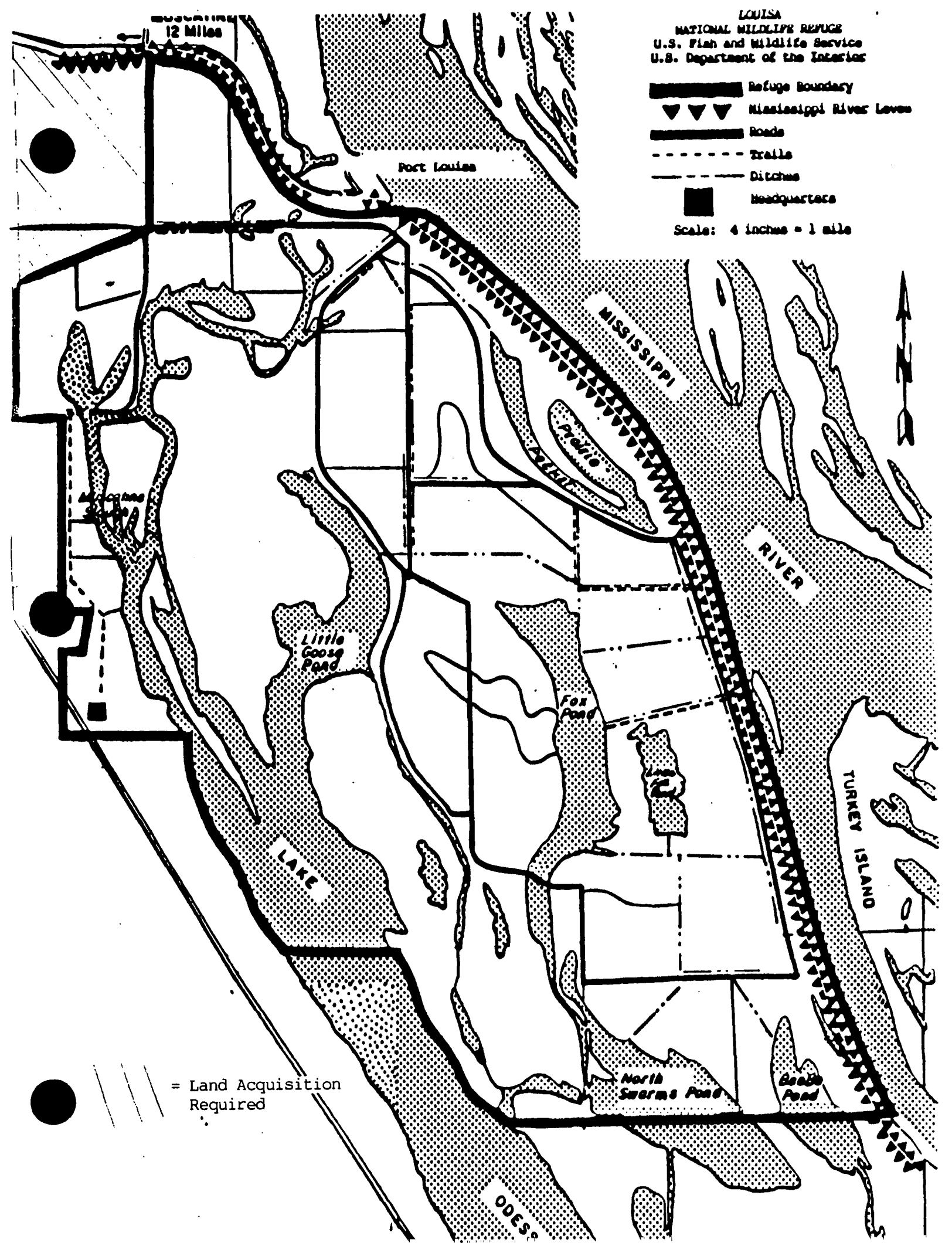
Refuge Boundary
Mississippi River Levee
Roads
Trails
Ditches
Headquarters
Scale: 4 inches = 1 mile
MUSCATINE
12 Miles
Port Louisa
MISSISSIPPI
RIVER
Prairie
Little Goose Pond
Fox Pond
LAKE
TURKEY ISLAND
North Swarms Pond
Beadle Pond
New Dike Construction
New Water Control Structures
Dike Rehabilitation Required


LOUISA
NATIONAL WILDLIFE REFUGE
U.S. Fish and Wildlife Service
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Refuge Boundary
Mississippi River Levee
Roads
Trails
Ditches
Headquarters
Scale: 4 inches = 1 mile
12 Miles
Port Louisa
MISSISSIPPI
RIVER
Little Goose Pond
Fox Pond
LAKE
TURKEY ISLAND
North Swarms Pond
= Land Acquisition Required

Rehabilitation and Development IPW's
Related to Marsh and Water Management

IPW No.	Title	Location	$
LSA/0001	D-7 Bulldozer Replacement	LSA/KTS	100.0
LSA/0020	Port Louisa Entrance Road Rehab.	LSA	20.0
LSA/0027	Mollie Walker Tract Development	LSA	50.0
LSA/0031	Crisafulli Pump Acquisition	LSA	15.0
LSA/0032	KTS Levee Rehabilitation	KTS	1,000.0
LSA/0033	KTS Levee Road Rehabilitation	KTS	40.0
LSA/0053	Replace Bantam Truck-mounted Crane	LSA/KTS	200.0
LSA/0056	Ditch Construction	LSA	15.0
LSA/0057	Ditch Cleanout - Little Fox	LSA	12.0
LSA/0058	Ditch Cleanout	LSA	30.0
LSA/0061	Michael Creek Cleanout	LSA	20.0
LSA/0062	Lateral Ditch Cleanout	LSA	10.0
LSA/0063	Inv. of Pesticides in Moist Soil	LSA	10.0
LSA/0064	Inv. Absence of Aquatic Vegetation - Prairie pocket	LSA	10.0
LSA/0070	Rehabilitate KTS Spillway	KTS	5.0
LSA/0072	KTS Railroad Grade Rehabilitation	KTS	10.0
LSA/0073	KTS Control Structure	KTS	5.0
LSA/0091	Reshape Road Shoulder - Little Goose Pond	LSA	10.0
LSA/0093	Rip-rap Inlet Ditch	LSA	10.0
LSA/0103	Rough Fish Control - Louisa	LSA	60.0
LSA/0104	M.S. 1 Dike Rehabilitation	LSA	10.0
LSA/0105	Contour Survey - Louisa	LSA	5.0
LSA/0121	Repair Fox Pond Control	LSA	10.0
LSA/0125	Mudcat Dredge	LSA	65.0
LSA/0126	Rip-rap Lateral Ditch	LSA	15.0
LSA/0128	Rough Fish Control - KTS	KTS	30.0
LSA/0132	Fill Levee Road Ditch	LSA	10.0
LSA/0133	M.S. 2 Development	LSA	60.0
LSA/0134	M.S. 3 Development	LSA	45.0
LSA/0135	M.S. 5 Development	LSA	80.0
LSA/0136	Stone House M.S. Development	LSA	25.0
LSA/0137	Swarms Unit M.S. Development	LSA	85.0
LSA/0138	Apple Tree M.S. Development	LSA	45.0
LSA/0139	Muscatine Slough M.S. Development	LSA	10.0
LSA/0140	Mollie Walker M.S. Development	LSA	30.0
LSA/0141	Door Yard M.S. Development	LSA	1.0
LSA/0142	M.S. 9 Expansion	LSA	30.0
LSA/0143	Observation Tower M.S. Development	LSA	45.0
LSA/0144	M.S. 18 Development	LSA	85.0
LSA/0145	River Levee Rehabilitation	LSA	1,500.0
LSA/0146	Michael Creek Levee Rehabilitation	LSA	50.0
LSA/0147	KTS Levee Break - Temporary Repair	KTS	8.0
		Total =	3,876.0

Moist Soil Unit
Marsh and Water Management Plan

Keithsburg National Wildlife Refuge
Keithsburg, Illinois

Moist Soil Unit
Marsh and Water Management Plan

Keithsburg

I. Description of the Area

Keithsburg is located within the Mississippi River flood plain with the refuge bounded on the north, west, and south by earthen levees for protection from the Mississippi River. The levees were constructed in the mid-30's for flood protection. The FWS owns and maintains the levee system.

Variance in elevations throughout the refuge is less than 10 feet ranging from 530 m.s.l. to 540 m.s.l. Existing marsh and water areas have a variance of less than two feet.

Soils on the area are generally silty clay loam and the entire refuge has very poor internal drainage.

A summary of current land types/uses is contained in the following table:

Land Type/Use	Acreage
Forestland	900
Open Water/Marsh	431
Administrative Use	21
Moist Soil Units	--
Grasslands	--
Cropland	100
	1,452

The area, prior to acquisition by COE, was extensively farmed with the aid of a pumping station located near the south end of the area. The pumping station washed away in the early 50's floods. At the time FWS acquired the refuge, over 1,000 acres were being farmed productively compared with no farming activities today.

II. Management History

Water management facilities consist of an electric pumping station (2-way 20,000 gpm), 2-bay stoplog/screw gate (36") water control structure and emergency spillways built into the 3-mile long river levee. The only ditch on the area is a 90' stretch from the pumping station to the Mississippi River.

Up until the 1970's, management centered around the refuge farming program with water levels manipulated to accommodate activities of cooperative farmers. Little emphasis was placed on moist soil plant

production. During the 70's, the fishery on the area developed into a quality fishery and draw downs were made infrequently for fear of damaging the fishery resource and drawing the wrath of the using public.

Due to the energy crisis of the mid-70's, the pumping station was converted from a diesel powered unit to an electric unit in 1981. The system proved to be very costly to operate ($500/week) and has not been used for draw downs or reflooding since installation. Management has relied on the water control structure and gravity flow with very poor results due to the influence of the Mississippi River.

Draw downs that have been achieved have resulted in very dense, rank moist soil vegetation developing on all exposed areas. Waterfowl use has shown considerable increases following such draw downs. For the past ten years, O & M funding has not been sufficient to conduct any draw downs using the pumping station.

III. Refuge Objectives

Waterfowl maintenance objectives for Keithsburg include 1,000,000 duck use days and 3,000 goose use days annually. Duck use has averaged approximately 3,000,000 use days and geese 12,000 use days over the past five years.

The major objectives of the water management program are to increase duck and goose use as well as waterfowl production through production of natural foods from moist soil management.

IV. Problems

The key to a successful program on Keithsburg is timely water manipulation. This has not been possible over the past 10-15 years due to:

1. Lack of adequate O & M funding to operate the pumping station to draw down and flood the area. Adequate additional funding would amount to approximately $3,600 annually.
2. Influence of the Mississippi River--seep water and high river levels during draw down periods.
3. Fear of adverse reaction and public comments from the sport fishing public.

Seep is not near the problem it is on Louisa. Adequate O & M funds for pumping would offset seep water problems. In addition, the earthen levee is less prone to seepage than the sand levees elsewhere in the District.

Item 3 will need to be addressed in order to maintain an efficient program. Determinations will need to be made if the sport fishery is important enough to warrant reduced moist soil and water management which will in turn likely result in a decrease of waterfowl use on the

area. A public education program will need to be implemented to reinform the using public of the primary objectives of the refuge and required management practices to achieve those objectives. This has been neglected in the past.

V. Monitoring and Evaluation of Management Practices

Same as Louisa.

VI. Management Strategies

On Keithsburg, water is supplied by the 2-bay (4') control structure and/or the 20,000 gpm pumping station. Gravity flow is not reliable due to unpredictable levels of the Mississippi. The unit essentially backfills via gravity flow from the river or from the pumping station. The unit is dewatered by gravity flow or by pumping. The unit cannot be dewatered entirely. A sizeable amount of water remains in the area of Spring Slough and in front of the cabin development during complete draw downs. On the average it requires approximately two weeks of 24-hour pumping to draw down the refuge.

The primary emphasis of the management program is natural moist soil food production for migrating waterfowl. This must be balanced with available breeding pair and brood habitat for optimum waterfowl production--primarily wood duck and mallard. Other species benefitting from the program include other migratory birds--primarily shorebirds and marsh and water birds.

June 1 appears to be the optimum target date for draw down for moist soil plant response. Draw downs should commence as early as possible in spring and proceed slowly until areas are "dry" on or about June 1-15. With slow draw downs, habitat will be provided for breeding ducks as well as marsh, water, and shorebirds. Plant response should produce a good mix of smartweeds, millets, arrowhead, and sedges.

Fall flooding timing will hinge on the year's monitoring and evaluation of plant production. Flooding should not commence until vegetation has produced viable seed. Generally, flooding will commence around September 1 to accommodate early migrants such as teal, wigeon, and Canada geese. The area should be flooded gradually in order to provide a variety of water depths and timed to reach maximum depths at the time of peak waterfowl populations around the first week of November.

Ideally, the program should include the following strategy:

Year 1 - Draw down to expose 1/4 of the unit. No manipulation.

Year 2 - Draw down to expose 1/2 of the unit. Manipulate 1/4 of the unit. Manipulation to consist of one or more of the following: farming, heavy or light discing, mowing, or prescribed burning.

Year 3 - Draw down to expose 3/4 of the unit. Manipulate 1/4 of the unit.
Year 4 - Complete draw down. Manipulate 1/4 of the unit.
Year 5 - No draw down.
Year 6 - Start the sequence from Year 1.

VII. Maintenance and Rehabilitation of Facilities

1. River Levee - The 3.6 mile earthen levee requires extensive rehabilitation from erosion damage over the past several years. Side slopes have eroded to less than 2:1 along most of the levee. The record fall flood in 1986 resulted in a levee break which requires repair. The levee road which serves as access to the pumping station and also as a census route requires extensive repair and regravelling. The entire levee needs reshaping to 6:1 side slopes and rip-rapped along the river side. If not done, levee breaks will be a frequent occurrence during annual high water periods on the river.

   Total rehabilitation costs = $1,300.0

2. Pumping Station - The electric pump has not been inspected since construction in 1981. The 1986 flood may have damaged the pump. An inspection is required to avoid future damage and extensive repairs. The pump should also be inspected by a qualified manufacturer's representative every five years.

   Total cost = $30.0

3. Control Structure - Requires protective grate, railing, and steps to the structure.

   Total cost = $5.0

4. North Emergency Spillway - Requires refilling with gravel and a concrete grout to hold rock in place.

   Total cost = $5.0

5. South Emergency Spillway - Requires replacing rip-rap lost during the 1986 flood.

   Total cost = $8.0

6. Railroad Grade - Currently in private ownership but acquisition nearly finalized. Requires rip-rap on the Pope Creek side to prevent erosion from Pope Creek flooding. Also requires reshaping of top for vehicle access and brush clearing from side slopes. The railroad grade forms the south levee of the unit.

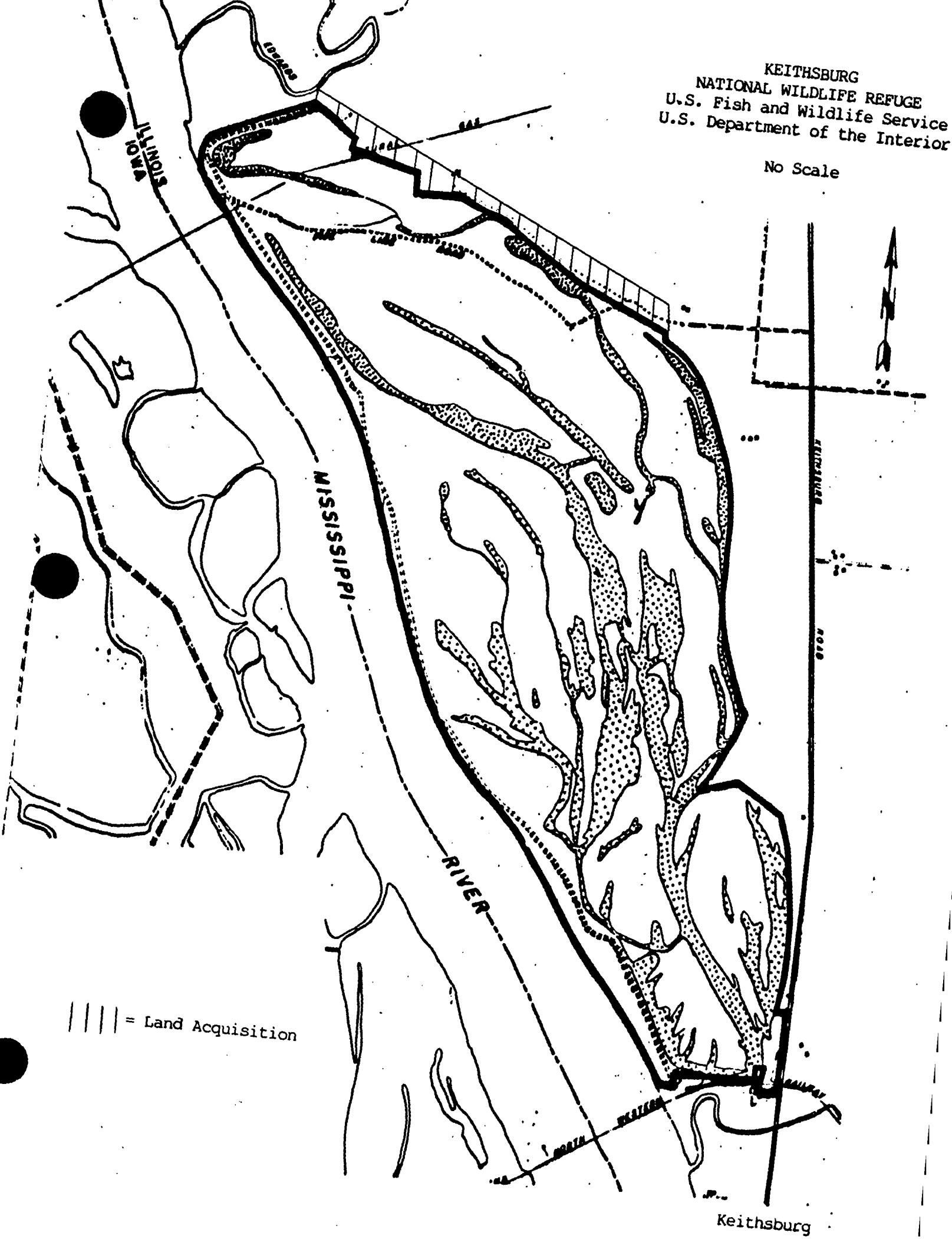
   Total cost = $20.0

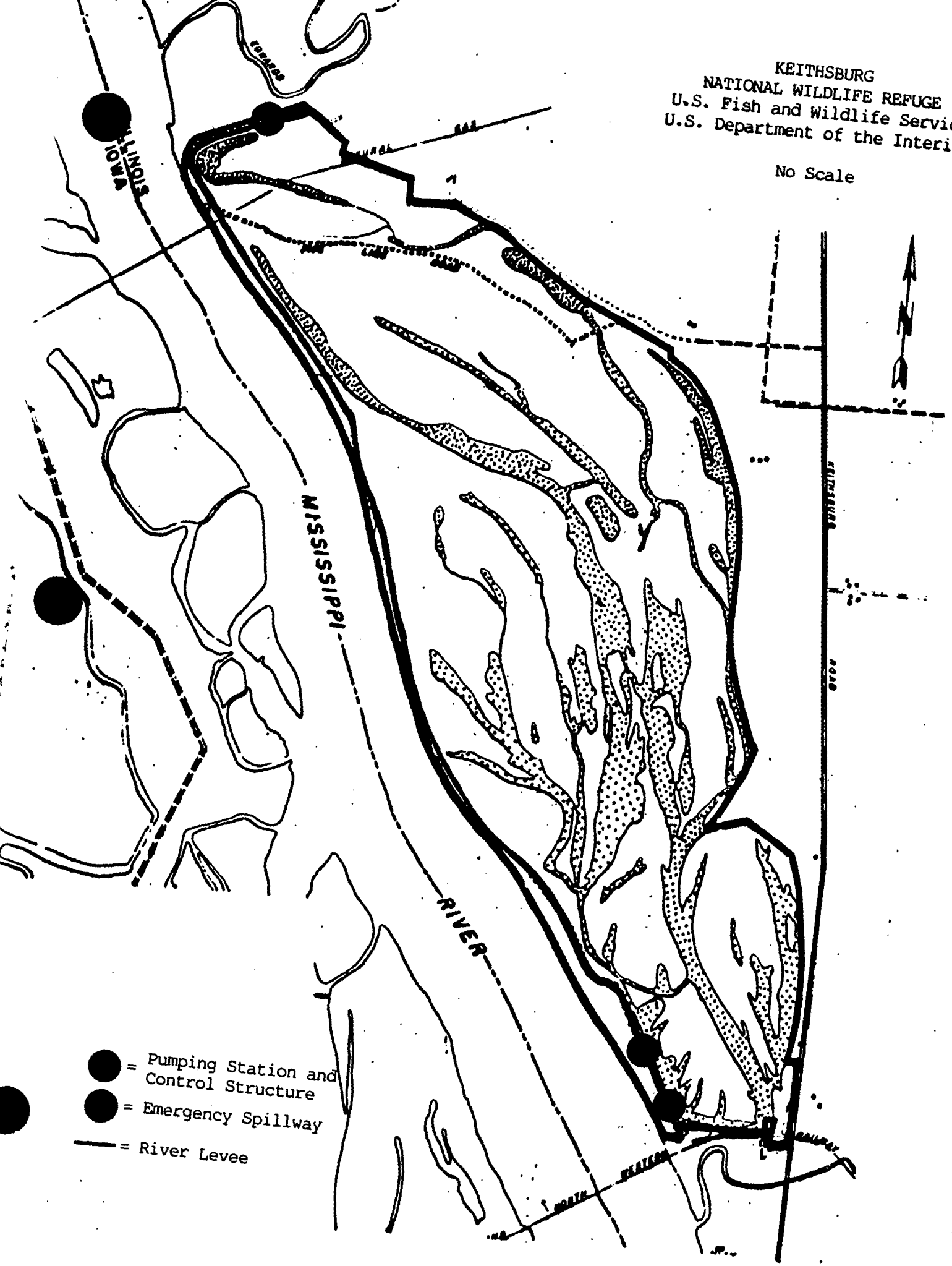
VIII. Cyclical Maintenance

Same as Louisa.

IX. Land Acquisition

Land acquisition is required in order for moist soil management to be developed to full potential. Private land on the northeast boundary of the unit is prone to flooding with maintenance of "high" water levels on the refuge. Approximately 40 acres is involved and held by two land owners (Wagner and Brown). Both are presently in agricultural production. Refer to attached map.


KEITHSBURG
NATIONAL WILDLIFE REFUGE
U.S. Fish and Wildlife Service
U.S. Department of the Interior
No Scale
ILLINOIS
IOWA
MISSISSIPPI
RIVER
= Land Acquisition
Keithsburg


KEITHSBURG
NATIONAL WILDLIFE REFUGE
U.S. Fish and Wildlife Service
U.S. Department of the Interior
No Scale
ILLINOIS
IOWA
MISSISSIPPI
RIVER
= Pumping Station and Control Structure
= Emergency Spillway
= River Levee
Keithsburg