US Army Corps
of Engineers
St. Paul District

UPPER MISSISSIPPI RIVER SYSTEM

ENVIRONMENTAL MANAGEMENT PROGRAM

DEFINITE PROJECT REPORT/

ENVIRONMENTAL ASSESSMENT (SP-21)

SMALL SCALE DRAWDOWN

HABITAT REHABILITATION AND ENHANCEMENT PROJECT

POOLS 5 AND 9
UPPER MISSISSIPPI RIVER
WISCONSIN

MAY 1997

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POOLS 5 AND 9, UPPER MISSISSIPPI RIVER
BUFFALO AND VERNON COUNTIES, WISCONSIN

ST. PAUL DISTRICT, CORPS OF ENGINEERS
ARMY CORPS OF ENGINEERS CENTRE
190 FIFTH STREET EAST
ST. PAUL, MINNESOTA 55101-1638

MAY 1997

EXECUTIVE SUMMARY

Small Scale Drawdown
Habitat Rehabilitation and Enhancement Project

The sites considered for drawdown are located along the Mississippi River or its side channels from the lower end of pool 3 near Red Wing, Minnesota, to the middle of pool 10 near Prairie du Chien, Wisconsin. The sites are located on both sides of the navigation channel and are all less than 200 acres (80 hectares) in size. Many are in the Upper Mississippi River National Wildlife and Fish Refuge. Although the project area is important for many species of fish and wildlife, aquatic vegetation has declined in recent years. One factor in this decline is the effect of continuous impoundment due to the navigation reservoirs. After construction of the lock and dam system, the low water levels associated with summer low river discharge and periodic droughts no longer occur because the dams maintain minimum depths for navigation. Therefore, seeds in the bottom sediments are not afforded the opportunity to germinate in order to maintain adequate aquatic vegetation for high quality fish and wildlife habitat.

The ultimate goal is to preserve, restore, and enhance a backwater fish and migratory bird habitat on the Upper Mississippi River. The specific project objective is to implement a simple drawdown of a backwater area. This would allow bottom sediments to dry and consolidate, thereby, increasing the area of emergent and submerged aquatic vegetation by natural seed germination. Thirty-nine potential sites in pools 3 through 10 were submitted by the U.S. Fish and Wildlife Service and the Wisconsin, Minnesota, and Iowa Departments of Natural Resources for consideration.

During the plan formulation process, the potential sites were evaluated using 23 different criteria developed by the project team based on what constituted desirable conditions for a small scale drawdown. A scoring system was also developed in order to prioritize the sites. Site visits of the highest rated sites resulted in the final selection of two sites for implementation. A habitat analysis to quantify the expected benefits of drawdowns was done for each site.

The selected plan addresses the project objectives by providing a means to reduce water levels at the sites. This will allow seed germination and subsequent aquatic plant growth for a season. The plan includes the drawdown of Lizzy Pauls Pond in pool 5 near Buffalo City, Wisconsin, and Peck Lake in pool 9 at Blackhawk Park, Wisconsin. The outlet culverts at each of the sites would be closed with sandbags and electric pumps would be used to draw down the water level of the lakes at least 2 feet (0.6 meter) over a period of two to three weeks in order to dry bottom sediments. It is proposed to begin the drawdown around

the end of June and maintain it until mid-September. The lakes would then be permitted to gradually refill from natural inflows. At Peck Lake, a second year of drawdown may be done, pending an evaluation of the first year results by the project biologists. Monitoring during and after the drawdown would be done to document the physical and vegetation results. The total estimated implementation cost of the project with an optional second year of drawdown at Peck Lake is $87,200. After the drawdown operation is completed, all pumps and closures would be removed and no further operation and maintenance would be required at the sites.

The selected plan would positively affect 71 acres (29 hectares) of backwater habitat. The backwater habitat would be improved as a result of drying of the bottom sediments and the germination of the existing seed bank in the sediments. The growth of aquatic vegetation, especially emergent vegetation, would be enhanced for an estimated period of 10 to 15 years for improved fish and wildlife habitat. No historic properties would be affected by the proposed project.

The proposed project has been coordinated with the U.S. Fish and Wildlife Service, the Wisconsin, Iowa, and Minnesota Departments of Natural Resources, the State Historic Preservation Offices, and the public. Permits and water quality certification from the Wisconsin Department of Natural Resources will not be required. An environmental assessment and Finding of No Significant Impact have been prepared in accordance with the requirements of the National Environmental Policy Act.

The St. Paul District Engineer has weighed the proposed project accomplishments against its cost and has determined that implementation of the selected plan is a justified expenditure of Federal funds. Therefore, approval of implementation of the project is recommended by the District Engineer at a 100-percent Federal cost estimated to be $87,200.

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INTRODUCTION

AUTHORITY

The authority for this report is provided by Section 1103 of the Water Resources Development Act of 1986 (Public Law 99-662). The proposed project would be funded and constructed under this authorization. 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, it is hereby declared to be the intent of the Congress to recognize that system as a nationally significant ecosystem and a nationally significant commercial navigation system....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....

A design memorandum (or implementation document) did not exist at the time of the enactment of Section 1103. Therefore, the North Central Division, U.S. Army Corps of Engineers, completed a "General Plan" for implementation of the Upper Mississippi River System Environmental Management Program (UMRS-EMP) in January 1986. The U.S. Fish and Wildlife Service (USFWS), Region 3, and the five affected States (Illinois, Iowa, Minnesota, Missouri, and Wisconsin) participated through the Upper Mississippi River Basin Association. 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 conclusions below:

Project Eligibility Criteria -

a. (First Annual Addendum). The Master Plan report...and the authorizing legislation do not pose explicit constraints on the kinds of projects to be implemented under the UMRS-EMP. For habitat projects, the main eligibility criterion 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 Upper Mississippi River System (UMRS). Other criteria include geographic proximity to the river (for erosion control), other agency missions, and whether the condition is the result of deferred maintenance....

b. (Second Annual Addendum).

(1) 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)
- limited acquisition of wildlife lands (allowed per a 30 November 1994 letter from the Headquarters, U.S. Army Corps of Engineers)

(2) A number of innovative structural and nonstructural solutions that 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 the measures will be recommended only after consideration of system-wide effects.

PROJECT IMPLEMENTATION PROCESS

The major steps in the project implementation process include: project selection and fact sheet preparation; budgeting and funding of the project; planning and general design; public review and project approval; and project implementation and monitoring. The Small Scale Drawdown project is in the planning and general design phase. Since the proposed project is relatively low cost and a single operation, it is not subject to all of the requirements associated with other habitat projects; such as 50-year design life, etc.

PROJECT SELECTION PROCESS

Projects are nominated for inclusion in the District's habitat program by the respective State natural resource agency and the U.S. Fish and Wildlife Service based on agency management objectives. In September 1986, the States and USFWS agreed to utilize the expertise of the Fish and Wildlife Work Group (FWWG) of the River Resources Forum (RRF) to assist the District in the project selection process. The FWWG consists of field level biologists responsible for managing the river for their respective agency. The FWWG was directed to consider critical habitat needs along the Mississippi River and to prioritize nominated projects on a biological basis.

In phase one, the individual projects proposed by the various Federal and State agencies were ranked within each pool according to the prioritized resource problems that the individual projects addressed and other ranking factors. The resource problems identified and prioritized in a pool included (in order of importance): backwater sedimentation; water quality; shoreline erosion; lack of important habitat; lack of habitat protection; and lack of public land base. The other ranking factors included anticipated fishery benefits, wildlife benefits, habitat diversity, ease of implementation, potential for innovative or experimental construction techniques, project longevity, maintenance, and socioeconomic benefits. The second phase of the evaluation involved the development of a prioritized list of the top 20 projects from the entire river system within the St. Paul District. The prioritized list was based on the following factors: numerical ranking from phase one; the desire to implement and evaluate a variety of habitat rehabilitation and enhancement techniques; the application of the Long Term Resource Monitoring (LTRM) component to habitat project development; and the evaluation of existing habitat projects and those under construction. This biological ranking was forwarded to the RRF for consideration of the broader policy perspectives and river management objectives of the agencies involved. The RRF submitted the coordinated ranking to the District and each agency officially notified the District of its views on the ranking. The District then formulated and submitted a program consistent with the overall program guidance as described in the UMRS-EMP General Plan, Annual Addenda, and additional guidance provided by the North Central Division, Corps of Engineers. New habitat project proposals continue to be submitted to the FWWG for ranking, and the prioritized list is updated annually to guide the project selection process for each budget cycle.

Projects consequently have been screened by biologists closely acquainted with the river. Resource needs and deficiencies have been considered on a pool-by-pool basis to ensure that regional needs are being met and that the best expertise available is being used to optimize the habitat benefits created at the most suitable locations. Through this process, the Small Scale Drawdown project was recommended and supported as capable of providing significant habitat benefits.

The Small Scale Drawdown project was recommended for study by the Minnesota Department of Natural Resources (MDNR). In February 1996, the RRF listing of habitat project priorities for fiscal year 1998 ranked the Small Scale Drawdown project as a "Wildcard Project". These are projects that do not score well in the ranking process because of their single purpose nature, but produce significant habitat benefits and are considered to be high output projects. Table DPR-1 shows the RRF project priorities for fiscal year 1998.

Table DPR-1 - Priority Listing of Habitat Projects for FY 1998

RANK	POOL	PROJECT	SCORE
1	8	Pool 8 Phase III-IV, WI	38
2	5	Zumbro River Floodplain Restoration	35
3	9	Winneshiek Lake Island, WI	27
4	7	Black River Delta, WI	29
5	8	Running Slough, WI	35
6	9	Lower Pool 9 Island, IA	27
7	NA	UMR Natural River Restoration	38
8	9	Bluff Slough	35
9	7	Richmond Island, MN	26
10	7	Lake Onalaska Bar, WI	28
11	5	Fisher Island, MN	26
12	5	Half Moon Lake, MN	26
13	5	Kruger Slough, MN	25
14	4	Hershey Slough, MN	25
*	MM	Blackdog Lake, MN	27
*	10	Gremore Lake, WI	24
*	5A	Fishway Project, WI	22
*	3-10	Small Scale Drawdown	20

*Unranked (wildcard projects)

Based on the RRF priority list, public interest, the value of the resources, the opportunity for rehabilitation and enhancement, agency priorities, and program funding constraints, the Small Scale Drawdown project was placed on the habitat project schedule, replacing the Blackbird Slough project which was initially scheduled for general design in FY 1996. The MDNR requested that the Blackbird Slough project be deferred to place more emphasis on the Small Scale Drawdown project. The participating agencies concurred with this action. Funds were made available to begin general design of the project in fiscal year 1996. No other habitat projects on the priority listing for fiscal year 1998 were selected because all available program funds were scheduled through the last year of program funding (2002).

PARTICIPANTS AND COORDINATION

Direct participants in the planning process included the Upper Mississippi River Wildlife and Fish Refuge (Winona, La Crosse, and McGregor Districts) and Region 3 Office of the U.S. Fish and Wildlife Service (USFWS), the Iowa, Minnesota, and Wisconsin Departments of Natural Resources (IDNR, MDNR, and WDNR), the Environmental Management Technical Center (EMTC) of the U.S. Geological Survey, and the St. Paul District, U.S. Army Corps of Engineers (COE). The USFWS was a cooperating agency throughout the process as required by regulations developed by the Council on Environmental Quality for the implementation of the National Environmental Policy Act (40 CFR 1500-1508). The following study team members were involved in project meetings or visited one or more of the potential drawdown sites to discuss problems, objectives, and site characteristics. Most of the members were involved in the preparation and/or review of this report.

Team Member	Expertise	Agency
Don Powell	Technical Manager	COE
Dennis Anderson	Fisheries Biologist	COE
Michelle Schneider	Hydraulic Engineer	COE
Joel Face	Geotechnical Engineer	COE
Dick Otto	Recreation Planner	COE
Keith Beseke	EMP Coordinator	USFWS
Bob Drieslein	Winona District Mgr	USFWS
Jim Nissen	La Crosse District Mgr	USFWS
Doug Mullen	McGregor District Mgr	USFWS
Ken Lubinski	Biologist	USGS
Joe Wlosinski	Biologist	USGS
Jeff Janvrin	EMP Coordinator	WDNR
Scot Johnson	Hydrologist	MDNR
Mike Davis	EMP Coordinator	MDNR
Gary Ackerman	Fisheries Biologist	IDNR
Bob DeCook	Fisheries Biologist	IDNR
Mike Griffin	Miss River Biologist	IDNR

Information about each drawdown site was collected by the team to document the physical and habitat conditions and assess the suitability of drawing water levels down at the site. Several meetings and conference calls with the team were held during the planning phase to select sites to pursue for drawdowns. Correspondence was exchanged between the agencies to coordinate the project at various stages of development.

After the initial screening process was completed by the project team, initial public meetings were held at Blackhawk Park, Wisconsin, and Buffalo City, Wisconsin, on August 28, 1996, and September 5, 1996, respectively. These sites were selected based on the location of the proposed drawdown sites. A total of about 30 people attended the meetings to hear about the site selection process, the sites selected, and to provide input to the study. The public comments and the results of meetings with the agencies and the public were used to develop and select the final plan.

This draft report and/or public notice was sent to the agencies and the public listed in attachment 6 for review and comment. This report includes the environmental assessment, Finding of No Significant Impact (attachment 2), and public notice (attachment 4). During the public review period, public meetings were held at Buffalo City, Wisconsin, and DeSoto, Wisconsin, on April 8, 1997, and April 9, 1997, respectively. A total of about 15 members of the public attended the meetings to provide input. Additional information about the public meetings and the comments received are included in attachment 4.

PROJECT LOCATION AND PURPOSE

The potential drawdown sites in the study area are located along the Mississippi River or its side channels from the lower end of pool 3 near Red Wing, Minnesota, to the middle of pool 10 near Prairie du Chien, Wisconsin (see Plate 1). The sites are relatively small, isolated backwaters located on both sides of the Mississippi River channel. The sites considered are less than 200 acres (80 hectares) in size. Many are in the Upper Mississippi River National Wildlife and Fish Refuge. The Refuge includes about 200,000 acres (80,000 hectares) in Mississippi River pools 5 through 14. The portion of the Refuge included in this study extends to the downstream limit of the St. Paul District (just downstream of lock and dam 10).

The overall purpose or goal of this study and project is to preserve, restore and enhance backwater fish and migratory bird habitat on the Upper Mississippi River Refuge. This is consistent with the designated goals of the Refuge as described below.

EXISTING CONDITIONS

Although the potential sites were located in pools 3 through 10, only the existing conditions of the tentatively selected sites in pools 5 and 9 are presented in this report for brevity. In this manner, the tentatively selected sites could be better evaluated.

PHYSICAL SETTING

Pools 5 and 9 are part of the 9-foot channel project on the Upper Mississippi River system created in the 1930's by the completion of the locks and dams. Pool 5 is 14.6 miles (23.5 kilometers) long, extending from river mile 738.1 to river mile 752.7; pool 9 is 31.3 miles (50.4 kilometers) long, extending from river mile 647.9 to 679.2. The target pool elevation for pools 5 and 9 is 660.0 feet (201 meters) and 620.0 feet (189 meters) above mean sea level, respectively. At target pool elevation, the surface area is 10,836 acres (4,203 hectares) for pool 5 and 29,125 acres (11,787 hectares) for pool 9. The average long-term discharge at locks and dams 5 and 9 is approximately 30,000 cubic feet per second (cfs) (850 cubic meters per second (cms)). The Corps of Engineers administers about 7,550 acres (3,055 hectares) in pool 5 and 6,620 acres (2,679 hectares) in pool 9, most of which is aquatic.

WATER RESOURCES

Several tributaries empty into the Mississippi River within pools 5 and 9. Many of these tributaries are small, perennial to intermittent streams. Two of the larger tributaries in pool 5, the Whitewater and Zumbro Rivers, enter from Minnesota. In pool 9, the Upper Iowa River enters upstream of the Lansing Big Lake area from Iowa and the Bad Axe River enters from Wisconsin. These tributaries strongly influence the water quality within the pools. Through both pools, the river meanders across a broad floodplain with steep weathered bluffs located at the edge of the floodplain.

The annual hydrograph of Mississippi River discharges is characterized by spring peak flows following ice breakup, snowmelt, and spring rains. Spring runoff usually begins near the end of March and extends through April into May. The spring peak flow most typically occurs around mid-April. The highest recorded flow has ranged from 200,000 cfs (5,600 cms) at lock and dam 3 to over 300,000 cfs (8,500 cms) at lock and dam 10. Normal summer flows range from 20,000 to 30,000 cfs (560 to 850 cms). River discharges typically increase from fall rains in September and October. Winter discharge is relatively steady at about 20,000 cfs (560 cms).

During low to moderate levels of river discharge, the water surface profile in a pool is not a simple plane, but has a steeper gradient in the upper part of the pool. This change in water surface gradient is due to the impounding effect of the locks and dams and to intentional regulation. The water surface profile of the pools at higher levels of river discharge is very close to the pre-locks and dams water surface profile of the river. Water surface elevations in off-channel areas can be different from those in the adjacent main channel, especially at times of higher and changing flow as the off-channel areas of the pool fill and drain. The elevation differences have not been measured. The riverbed geometry of each off-channel area and the geometry of the inlets and outlets, along with the level and rate of change of river discharge, determine the head differential between off-channel areas and the main channel.

GEOLOGY

The most significant geological event explaining the nature of the Mississippi River within pools 5 and 9 occurred at the end of the Pleistocene glaciation approximately 10,000 years ago. As the ice sheet melted and receded, it formed glacial Lake Agassiz in northwestern Minnesota and south central Manitoba. High discharges of melting ice water flowed through the Minnesota River into the Mississippi River, carving out the gorge which is now the Mississippi Valley. As meltwaters diminished, the deeply eroded river valleys aggraded, filling with sediments to about present levels.

Most of pool 5 and pool 9 are in areas not covered by the last glaciation. The pools are underlain by relatively flat-lying Cambrian and Ordovician sandstone, limestone, and dolomite. These rocks were formed from sediment deposited by successive marine inundations occurring between 400 million and 600 million years ago. The sediments were later compacted and cemented,

forming sedimentary rock. The sandstones have a combined thickness of over 400 feet (122 meters). They typically are poorly cemented and are easily eroded. They have a high porosity and permeability and are important aquifers in the basin. The sandstones are usually overlain by massive limestone or dolomite rocks as much as 100 feet (30 meters) thick. The limestone and dolomite are more resistant to erosion and are found capping bluffs and cliffs.

In pool 5, the Minnesota bluffs are primarily north or east facing; thus, snow does not melt off during the winter. Because of the increased moisture, the bluffs are generally heavily timbered. By contrast, the Wisconsin bluffs are primarily south or west facing, causing drier conditions which support less timber and result in grassier slopes, known as goat prairies.

In pool 9, the bluffs are steep on both sides and highly dissected, with a maximum relief of 500 to 600 feet (152 to 183 meters) and elevations ranging from about 620 to 640 feet (189 to 195 meters) at river level to over 1,200 feet (366 meters) on the uplands. Steep-sided tributary valleys may widen abruptly as they debouch into the river to form "coves" or elevated deltaic areas filled with alluvial materials, mostly sand and silt. The valleys of such tributaries as the Upper Iowa River and Winnebago Creek display prominent, complex terrace systems up to more than 100 feet (30 meters) high. Lesser tributaries have terraces in proportion to size.

Prior to the impoundment of pools 5 and 9, the broad floodplain of the river was characterized by a stream system consisting of multiple channels, swampy depressions, sloughs, natural levees, islands, and shallow lakes.

SOILS

The principal parent materials of soils of pool 5 are alluvial and vary in texture from silty clay to sand, while the major historical parent material of pool 9 and associated uplands is loess over bedrock or over clay loam till. The most common soil associations of pool 5 include Abscota-Glendora-Kalmarville, Comfrey-Shiloh, Stony and Rocky Land-Seaton-Boone, and LaCrescent-Elbaville-Lamoille. The principal soil associations of the pool 9 area are the Fayette and Fayette-Dubuque-Stonyland. The uplands surrounding pools 5 and 9 are mantled with loess: a wind-blown silt deposit several tens of feet thick. The silt was eroded from glacial drift during the latter part of the Pleistocene Ice Age. Streambanks plainly show the varying thickness of the different materials and, in many places, the lack of continuity of the sand and gravel layers above low water level. The loess is easily eroded and thus large amounts are eroded by streams each year. Sand and gravel strips border most sloughs, but some of the larger, more elevated areas between the sloughs are covered with heavy silty loam which is underlain with sand or gravel.

The rolling topography and well entrenched streams which contribute to siltation in pools 5 and 9 also make the area very scenic and pleasurable for outdoor recreation.

The major soil type of islands and upland peninsulas in pool 9 is Dorchester silt loam with zero to 1 percent slope. This soil is light colored, lacks a B horizon, and is built up on black buried soil with layers of sand in some areas. The bottomland soils are flooded nearly every year during spring thaw or after heavy rains prior to the growing season. Soils developed under forest cover belong to the soil group referred to as the Gray-Brown Podzolics. These soils generally occur on gently rolling to steep topography along major streams.

WATER QUALITY

Pools 5 and 9 of the Mississippi River have generally good water quality. Except for isolated sloughs and backwater lakes, the dissolved oxygen content of the water remains high year-round and above levels required to sustain a quality fishery. In an isolated area immediately below lock and dam 4, aeration culverts were recently added to the lock and dam dike to correct problems with dissolved oxygen in the Finger Lakes. Because of its turbulent nature, the river is well aerated and it can assimilate a considerable biochemical oxygen demand (BOD) loading. Fertility levels (nitrogen, phosphorus, potassium, calcium, etc.) are ample to support luxuriant growth of rooted aquatics and algae. Meade, in investigations of contaminants in the Mississippi River from 1987 to 1992, found water quality to be generally better in this reach of the river than above Lake Pepin and in the reach downstream where tributaries that drain the Corn Belt begin to enter the Mississippi River (*Contaminants in the Mississippi River, 1987-92*. U.S. Geological Survey Circular 1133. Robert H. Meade, ed.). However, the Zumbro and Whitewater tributaries to pool 5 and the Upper Iowa River in pool 9 drain predominantly agricultural areas and add extensive loads of suspended solids and agricultural chemicals.

Sediment quality is generally good in pool 5. Main channel sediments are primarily medium to coarse sands with only trace amounts (generally less than 3 percent by weight) of silts and clays. Backwaters can consist of predominantly fine material. Levels of pesticides and other chlorinated hydrocarbons were generally below detection limits in all main channel and backwater samples that have been tested. Polychlorinated biphenyls (PCB's) have been detected in backwaters, but were generally less than 10 parts per billion. Selected heavy metals and nutrients were found in relatively low concentrations in the sediment samples that have been analyzed in pool 5. In pool 9, metals concentrations are low and most of the backwater metals concentrations are within expected ranges for backwater sediments on the Upper Mississippi River.

VEGETATION

Vegetation along pools 5 and 9 shows an overlapping of eastern and western species. Several high "sand prairie" areas are scattered along the river valley forests, offering habitat conditions normally found much farther west. The climate moderation also allows more southern plant species to extend their ranges up the river valley.

Forested areas in the region are of two types: upland xeric southern forests and lowland forests of the floodplain. The small amount of upland forest in pool 5 is found at the edge of the Richard J. Dorer Memorial State Forest, while pool 9 (with the exception of 12 acres (5 hectares)) is devoid of upland forest. Forested areas are primarily wetland forests found on river islands and riparian shorelines. Pool 5 contains 5,920 acres (2,396 hectares) of wetland forest habitat while pool 9 contains 13,870 acres (5,610 hectares). These forests are typically seasonally flooded. The soil is without standing water during most of the growing season, but is waterlogged within at least a few inches of the surface. Dominant tree species in the floodplain forest for pool 5 include river birch, cottonwood, silver maple, and black willow. Species that dominate in the better drained areas are silver maple, green ash, basswood, and black ash. American elm was once a dominant species in the floodplain and surrounding better drained areas; however, Dutch elm disease has greatly reduced the occurrence of this species. In pool 9, river birch and swamp oak are the dominant species at the upland edge of the floodplain. The mature wetland forest areas have an overstory dominated by green ash, silver and red maple, cottonwood, and river birch. The understory is dominated by tree seedlings, alder, wood nettle, poison ivy, wild grape, and woodbine. In the less successionally developed transitional zones between aquatic and terrestrial habitat (e.g., sandbars and mud flat areas), dense stands of alder, small black willow and cottonwood trees are usually found.

Inland fresh meadows are similar to wetland forests in that their soils are waterlogged. Vegetation typically found on fresh meadows includes sedges, rushes, redtop, reed grasses, cattails, manna grasses, prairie cordgrass and mints.

Three classes of fresh marsh wetlands (shallow, deep, and open water) can be found in the floodplain of the pools. They mostly occur along major tributaries, on islands, or on peninsulas located throughout the river segment and within the main channel of the Mississippi River. In the mid-1970's, pool 5 contained 3,854 acres (1,560 hectares) of marsh wetland, while pool 9 contained 9,953 acres (4,028 hectares). Fresh marsh soils are usually waterlogged during the growing season. Water depths vary from 0 to 10 feet. Since inundation, however, the amount of vegetation has fluctuated and gradually declined, reducing many backwater marshes to open, windswept, riverine lakes. Emergent vegetation in pools 5 and 9 includes sedges (*Carex spp.*), bulrushes (*Scirpus spp.*), spikerushes (*Eleocharis spp.*), cattails (*Typha latifolia*), arrowheads (*Sagittaria latifolia and rigida*), and smartweeds (*Polygonum* spp.). Phragmites also are present and provide important cover for wildlife. Submerged and floating leaved vegetation including coontail (*Ceratophyllum demersum*), water lilies (*Nuphar and Nymphaea* spp.), milfoil (*Myrophyllum* spp), pondweeds (*Potamogeton* spp.), elodea (*Elodea* spp.) and wild celery (*Vallisneria americana*) is common. Also, the lentic, open water portions of the pool have a relatively productive planktonic community dominated by diatoms and green algae.

FISH AND WILDLIFE

Pools 5 and 9 have a variety of high quality terrestrial and aquatic habitats. These habitats support a diverse and productive fishery and provide important waterfowl nesting, feeding, and resting areas. The most prevalent aquatic habitats include main channel, main channel border, secondary channel, sloughs, river lakes, and tailwater. The important characteristics of these habitat types relative to fish and wildlife uses are described below.

Main channel - The main channel conveys the majority of the river discharge and in most reaches includes the navigation channel. It has a minimum depth of 9 feet (2.7 meters) and a minimum width of 400 feet (122 meters). A current always exists, varying in velocity with water stages and width. The bottom type is mostly a function of current. The upper section usually has a sand bottom, changing to silt over sand in the lower section. Occasional patches of gravel are present in a few areas. No rooted vegetation is present. Pool 5 contains 578 acres (234 hectares) of main channel habitat while pool 9 contains 1,622 acres (656 hectares).

Main channel border - Main channel borders are the areas between the navigation channel and the riverbank. Channel borders contain the channel training structures: wing dams, closing dams, and revetted banks. Thus, a diversity of depths, substrates, and velocities can be found in this habitat type. The bottom is sand in the upper section of the pool and silt in the lower. Definable plant beds are frequently absent, but single species submerged plant clusters are sparsely scattered in areas of reduced current. Pool 5 contains 1,623 acres (657 hectares) of main channel border habitat, while pool 9 contains 2,500 acres (1,012 hectares).

Secondary channel - Secondary channels are large channels that carry less flow than the main channel. Unless they are former main channels, the banks are usually unprotected. Undercut or eroded banks are common along the channels' departure from the main channel. The bottom type usually varies from sand in the upper reaches to silt in the lower. In the swifter current there is no root vegetation, but vegetation is common in the shallower areas having silty bottoms and moderate to slight current. Pool 5 contains 1,110 acres (449 hectares) of secondary channel habitat while pool 9 contains 1,558 acres (631 hectares).

Sloughs - Sloughs are characterized by having no current at normal water stage, mud bottoms, and an abundance of submerged and emergent aquatic vegetation. Pool 5 includes 3,462 acres (1,401 hectares) and pool 9 includes 6,064 acres (2,454 hectares) of slough habitat. These areas provide excellent spawning, nesting, and rearing areas, although sedimentation, loss of vegetation, and periodic strong water currents cause a decline in the fish and wildlife habitat values of these areas.

River lakes and ponds - River lakes and ponds are distinct lakes formed by fluvial processes or are artificial (excavated or impounded). They may or may not have a slight current, depending on their location. Most of the bottoms are mud or silt, often consisting of a layer 2 or more feet (0.6 meter) thick. Vegetation abundance is highly variable. Emergents are

often restricted to the perimeter of the water body. These waters have an abundance of rooted aquatic vegetation, both submerged and emergent. Pool 5 contains 2,856 acres (1,156 hectares) of river lakes and pond habitat while pool 9 contains 12,295 acres (4,975 hectares).

Tailwaters - Tailwaters are the areas downstream of the navigation dams with deep scour holes, high velocity, and turbulent flow. The bottom is mostly sand. No rooted vegetation is present. Pool 5 contains 77 acres (31 hectares) of tailwater habitat while pool 9 contains 33 acres (13 hectares).

Fish. The continuum of aquatic habitats ranging from fast flowing main channel to lotic backwaters is present in pools 5 and 9, providing for great diversity and abundance of fish. There are 83 species of fish reported in pool 5 and 80 reported in pool 9. All are native except rainbow trout, brown trout, grass carp, carp, and goldfish. Most are warm-water species. Common game fish and panfish species include the walleye, sauger, northern pike, channel catfish, largemouth bass, white bass, bluegill, and white and black crappie. Common non-game fish include the freshwater drum, carp, redhorses, buffaloes, and a wide variety of minnows. The catfishes, buffaloes, and carp are the primary fish of commercial interest.

Game fish that use main channel habitat include walleye, sauger, smallmouth bass and white bass. Also, freshwater drum and channel catfish are common commercial fish which use this habitat type. Commercial species found in backwaters include carp, bigmouth buffalo and catfish, while typical sport fish include northern pike, largemouth bass, crappies and bluegill. Largemouth bass, smallmouth bass, bluegill, crappie and walleye use secondary channels and sloughs for all life functions. Rearing, wintering and spawning habitat is provided by sloughs and secondary channels for northern pike, white bass, carp, and buffalo. Tailwaters are particularly important areas for species like paddlefish and sturgeon, which were largely displaced by inundation of the natural river. Tailwaters provide spawning, rearing, and wintering areas for walleye, sauger, yellow perch, catfish, freshwater drum, and white bass.

Wildlife. The numerous backwater areas interspersed with forested islands in both pools provide good habitat for a variety of wildlife species. The pools contain a rich mixture of vertebrate animals from the northern and southern United States, as well as an overlapping of eastern and western species.

The great variety of bird species that use pools 5 and 9 can be attributed to its location within the Mississippi flyway. Areas such as the Lansing Big Lake, Weaver Bottoms, Belvidere Slough, Reno Bottoms, and Mozeman's Slough provide critical resting and foraging opportunities for these migratory waterfowl. Although pools 5 and 9 are not of great importance as nesting areas for waterfowl (other than wood ducks), they are an important resting area for waterfowl during spring and fall migration. In the fall and spring, ring-necked ducks, canvasbacks, and scaup use the deeper areas of the backwater, while mallards, widgeon, blue-winged teal, and wood duck use the shallower areas. Because of the reduced island landmass, less of the

backwater is protected from wave action. In general, use of the pools by waterfowl has declined in the past 15 years. While waterfowl populations have declined, the decline in use of pools 5 and 9 has seemed to mirror the erosion of the islands and the resulting reduction in protected backwater areas.

Both pools provide nesting and foraging habitat for many passerine bird species. Some of these species spend the entire year in the area, while others migrate into the area at various times of the year. Great egrets and blue herons are the most common wading birds to be found in the pools. Spotted sandpiper, killdeer, and black terns also nest within the pools. Other shorebirds and gulls that use the pools include sandpipers, herring gulls, and ring-billed gulls. Many varieties of raptors use the river valley as a flyway, and a number of these species, such as eagles, hawks, and owls, overwinter in these floodplain areas. Backwater areas and lakes provide important habitat for bald eagles and large migrations of waterfowl each year.

Pools 5 and 9 provide habitat to a wide variety of mammals. White-tailed deer is the most popular and abundant big game animal. Many small carnivores such as fox, raccoon, mink, and weasel are found within the pools, while larger carnivores such as bobcat and coyote are infrequent. Otters are present but their numbers are not abundant. Many smaller mammals, including beaver, muskrat, shrews, moles, bats, rabbits, squirrels, and numerous varieties of mice, are relatively common.

Reptiles and amphibians. The floodplains of pools 5 and 9 provide habitat for a wide variety of amphibians and reptiles. Common species typically found in marshes and aquatic areas of the pools include snapping turtle, map turtle, false map turtle, painted turtle, smooth softshell, spiny softshell, northern water snake, eastern garter snake, blue racer, bullsnake, eastern tiger salamander, American toad, gray treefrog, western chorus frog, green frog, and leopard frog. Pool 5 contains the largest known population of Blanding's turtles, an endangered species in Minnesota.

AQUATIC INVERTEBRATES

There is a large assemblage of invertebrate species within the pools. The varied invertebrate fauna is due to the wide variety of habitats. Lake-forms of invertebrates find suitable habitat in the lentic portions of the pools. Organisms which require running water find a wide range of water velocities in the tailwaters, main channel, along the wing dams, and in secondary channels. The rocks associated with wing dams and shoreline protection provide a suitable habitat for specialized invertebrates.

Mussels. Over 50 mussel species native to the Upper Mississippi River system are known to occur in pools 1 through 10. Pools 5 and 9 support various species of mussels. Species found in the pools include: threeridge, threehorn, pimpleback, deertoe, fawnfoot, fragile papershell, pocketbook, giant floater, deertoe, pigtoe, fawnfoot, and fat mucket. The Federally-endangered Higgins' eye pearly mussel (*Lampsilis higginsi*) is present in pool 9. A recent exotic introduction, the zebra mussel (*Dreissena*

polymorpha), has been observed in the pools and its numbers have been steadily increasing since its first reported occurrence. The impact of zebra mussels is still unclear, but it is generally thought to be deleterious.

Fingernail clams (*Musculium transversum*) have thrived in areas of pools 5 and 9 that have adequate dissolved oxygen and silt bottoms. They are important food items for waterfowl (especially diving ducks) and several species of fish.

Insects. In pools 5 and 9, the insect fauna is dominated by immature stages of mayflies, midges, and caddisflies, indicative of high dissolved oxygen levels. Being efficient converters of detritus, aquatic insects are an important link in the food web, providing food for both fish and waterfowl.

THREATENED AND ENDANGERED SPECIES

Twelve wildlife species in pools 5 and 9 have protective status from Federal or State agencies and are shown in table DPR-2. Five are birds, four are reptiles, one is a mammal, one is an amphibian, and one is an insect. The bald eagle and the peregrine falcon are Federally protected under the Endangered Species Act. The bald eagle is Federally-listed as threatened in Wisconsin, Iowa, and Minnesota. The other protected species are listed as threatened or endangered in one or more of the States bordering the river.

In recent years, bald eagle numbers have increased dramatically. Eagles use the pools year-round. In addition, the pools are a part of an important migration corridor. As of 1994, there are three active bald eagle nesting sites in pool 5 that have produced fledglings over a number of years. There are 25 known nesting locations within pool 9. Of these 25 sites, 19 are still considered active. These nests produced an average of 1 to 2 young a year per nest. The Reno Bottoms complex, located upstream of the Lansing Big Lake area, is one of the established breeding areas for the species. Also, a large amount of bald eagle use within the pool is during winter. Winter use is highest where the river is ice-free and adequate perch sites are available. Bald eagles also make use of the tailwaters as winter feeding areas.

The peregrine falcon was formerly found throughout the Upper Mississippi River basin, but was extirpated from the entire area. An historic peregrine falcon nesting site is located near pool 5 in John A. Latsch State Park in Minnesota. This site was last occupied in 1988. In pool 9, one mammal species, the river otter (Lutra canadensis), is listed by Iowa as threatened. Blanding's turtles have been reported within pool 5 near the McCarthy Lake Wildlife Management Area.

Table DPR-2 - Protected Mammals, Birds, Insects, Reptiles and Amphibians in Pools 5 and 9 of the UMR

State Protected Species	Federal Status	Minnesota Status	Wisconsin Status	Iowa Status	Occurrences in pools 5 and 9 by County
Acadian flycacther	--	SC	T	--	Goodhue,Houston, Crawford, La Crosse, Grant
American Peregrine Falcon	E	T	E	E	Buffalo, Vernon, Wabasha, Winona, Houston
Bald Eagle	T	T	T	E	All
Blanding's Turtle	--	T	T	--	Wabasha, Winona, Buffalo
Blue spotted salamander	--	--	--	E	Allamakee & Clayton
Bobcat	--	--	--	E	Allamakee & Clayton
Cerulean warbler	--	--	T	--	Buffalo, La Crosse, Grant, Houston, Wabasha, Allamakee
Great Egret	--	--	T	--	ALL
Henslow's sparrow	--	--	--	T	Winona
Massasauga Rattlesnake	--	--	E	E	Buffalo, Crawford
King Rail	--	--	--	E	Houston, Allamakee
Kentucky warbler	--	--	T	--	Crawford, Grant, Vernon, La Crosse
Loggerhead shrike	--	T	--	--	Wabasha
Lousiana waterthrush	--	SC	--	--	Houston, Washington, Winona
Mudpuppy	--	--	--	E	Allamakee, Grant, Goodhue & Houston
Northern cricket frog	--	E	E	--	Houston, Buffalo, Crawford, Grant, La Crosse, Trempealeau, Vernon
Osprey	--	--	T	--	All
Ottoe Skipper Butterfly	--	T	--	--	Wabasha
Timber Rattlesnake	--	T	--	--	Wabasha, Winona
Red Shouldered Hawk	--	--	T	E	Allamakee, Buffalo, Wabasha, Winona
River Otter	--	--	--	T	Buffalo, Wabasha, Winona
Worm-eating warbler	--	--	E	--	Grant & Vernon
Wood Turtle	--	T	T	--	Wabasha

T = Threatened, E = Endangered

Thirty aquatic species with protected status are present in this reach and are shown in table DPR-3. Fourteen of these species are fish and sixteen are mussels. The Higgins' eye pearly mussel is the only species with Federal protection under the Endangered Species Act. The remainder of the species are listed as threatened or endangered by Minnesota, Wisconsin and/or Iowa. However, the paddlefish and crystal darter have been identified by the USFWS as potential candidates. The Higgins' eye pearly mussel has not been recorded in recent times in pool 5 or in adjoining pools. However, it has been found in various areas throughout pool 9. Lansing Big Lake and Reno Bottoms provide important habitat for the Higgins' eye pearly mussel. Minnesota also lists five species of special concern.

Table DPR-3 - Protected Fish and Mussels in Pools 5 and 9 of the UMR

State Protected Species	Fed Status	MN Status	WI Status	IA Status	Occurrences in pools 5 and 9
Black Buffalo	--	SC	T	--	pools 4-10
Blue Sucker	--	SC	T	--	pools 2-10
Bluntnose Darter	--	--	E	E	pools 8 & 9
Burbot	--	--	--	T	poos 2-5, 7-10
Chestnut Lamprey	--	--	--	T	pools 3-5, 7-10
Crystal Darter	--	SC	E	--	pools 4-6, 8
Goldeye	--	--	E	--	pools 2-10
Greater Redhorse	--	--	T	--	pools 2-5, 8-10
Mud Darter	--	--	SC	--	pools 4-10
Paddlefish	--	T	T	--	Pools 2-10
Pallid Shiner	--	SC	E	--	Pools 3-5, 7-10
Pugnose minnow	--	--	--	SC	Pools 1-10
River Redhorse	--	--	T	--	Pools 2-5, 6-10
Skipjack Herring	--	SC	E	--	Pools 1-10
Speckled Chub	--	--	T	--	Pools 2-10
Weed Shiner	--	--	--	E	Pools 3-10
Western Sand Darter	--	--	--	T	Pools 3-10
Buckhorn Mussel	--	T	T	E	Pools 3,4, & 9
Butterfly Mussel	--	T	E	--	Pools 5, 5A, 6,7,9, & 10
Ebonyshell Mussel	--	E	E	--	Pools 3,4.9, & 10
Elephant Ear Mussel	--	E	E	--	Pools 3,4,9, & 10
Higgins' Eye Pearly Mussel	E	E	E	E	Pools 7-10
Mucket Mussel	--	T	--	--	Pools 1-10
Monkeyface Mussel	--	T	T	--	Pools 3-10
Ohio River Pigtoe Mussel	--	T	--	--	?
Purple Wartyback Mussel	--	T	E	T	Pools 3-5,9, & 10
Rock Pocketbook Mussel	--	E	T	--	Pools 5-10
Salamander Mussel	--	T	T	--	Pools 9 & 10
Sheepnose Mussel	--	E	--	--	Pools 3-5
Spectacle Case Mussel	--	T	E	E	Pools 9, 10
Wartyback Mussel	--	E	T	--	Pools 8-10
Washboard Mussel	--	T	--	--	Pools 8-10

T = Threatened, E = Endangered, SC = Special Concern

Twenty-three protected plant species are found in counties bordering the two pools as shown in table DPR-4. The northern monkshood is Federally listed as threatened. The others are designated for State protection by Iowa, Minnesota, and/or Wisconsin. Five species are listed as endangered in Minnesota and 9 are listed as threatened. Minnesota also lists one species of special concern. The threatened listed Illinois tick-trefoil has been observed in the State forest west of Reno Village in Houston County, Minnesota, and on the Prairie Island Natural Area north of Winona in Winona County, Minnesota. The endangered listed sweet-smelling Indian-plantain is found within the floodplain forest in the Upper Mississippi River National Wildlife and Fish Refuge in Houston County, Minnesota. The rough-seeded flameflower is found in Wabasha, Minnesota. Eight of the species including the Federally-listed northern monkshood are listed in Wisconsin: two species are listed as endangered and six species are listed as threatened. Iowa lists two species as threatened and two species as endangered. Many of the species listed, including the one Federally-listed species, are not floodplain species and are not present at the two proposed drawdown sites.

CULTURAL RESOURCES

In pool 5, the floodplain (defined as the area between Highway 61 on the Minnesota side and Highway 35 on the Wisconsin side) has 49 recorded sites. Thirty of these are historic Euro-American, including a log rafting site, farmstead sites, and standing structures. The 19 prehistoric sites include three mound sites, four large Woodland/Oneota period village sites, and a number of smaller occupation sites. The great majority (85 percent) of both historic and prehistoric sites are located on the Buffalo City/Cochrane terrace.

The proposed drawdown area of Lizzy Pauls Pond lies between the northern end of the higher Buffalo terrace on the river side and the high river bluffs on the east. The pond now covers some 50 acres. Before the construction of the locks and dams on the Mississippi River in the 1930's, the pond was a long low marshy area. The Mississippi River Commission map made in the 1890's shows that the northern end was under cultivation, with the rest shown as marsh or swamp. Several historic properties are recorded on the terrace south of the pond. Site 47 BF 129 (Fetting site) is a historic artifact scatter and foundation (ca. 1865-1932) some 800 feet (250 meters) south of the pond. Two other historic sites (47 BF 64 and a house with partial log construction) are nearby. An archeological site (47 BF 64) lies some 2,500 feet (750 meters) south of the pond. The site is listed as a 2.5-acre (1-hectare) village site with Oneota and possible Late Woodland components.

In the pool 9 floodplain, 43 sites are known, almost all of which were located during a 1994 survey. Of these, 21 are historic sites, including shell middens, a fish-pond complex, and the remains of houses and cottages. Four boat wrecks are known for this part of the river. The prehistoric sites range from the Early Woodland (ca. 500 B.C.) through Middle and Late Woodland and include an unusual late Oneota (contact period) site. Many are associated with substantial shell middens.

Table DPR-4 - Protected Plants in Counties Bordering Pools 5 and 9 of the UMR

State Protected Species	Federal Status	Minnesota Status	Wisconsin Status	Iowa Status	Occurrences in pools 5 and 9 by County
Beached heather	--	SC	--	E	Wabasha
Beaked snakeroot	--	SC	--	--	Winona
Black Holly	--	--	--	E	Allamakee
Catail sedge	--	SC	--	--	Winona, Houston, Wabasha
Catchfly grass	--	SC	--	--	Houston, Wabasha, Winona
Clustered Broomrape	--	--	T	--	Buffalo
Davis Sedge	--	T	--	--	Houston, Wabasha
Hairy Meadow Parsnip	--	--	E	--	Crawford
Illinois Tick-Trefoil	--	T	--	--	Houston, Winona
Lance-leaved Violet	--	T	--	--	Winona
Marginal Shield-fern	--	T	--	--	Houston
Montia	--	E	--	--	Winona
Narrow-leaved Spleenwort	--	T	--	--	Winona
Northern Monkshood	T	--	T	T	Vernon
Ovate-leaved Skullcap	--	T	--	--	Winona
Prairie Thistle	--	--	T	--	Buffalo
Purple Cliff-Brake	--	SC	--	E	Houston
Purple sand-grass	--	SC	--	--	Houston, Wabasha
Purslane Species	--	E	--	--	Houston, Wabasha
Rough-Seeded Flameflower	--	E	--	--	Wabasha
Rock Clubmass	--	T	--	T	Houston, Winona
Snowy Campion	--	T	--	--	Winona
Sweet-Smelling Indian-Plantain	--	E	--	--	Houston, Wabasha
Upland Boneset	--	T	--	--	Houston
Tubercled Orchid	--	--	T	--	Buffalo
White Lady's Slipper	--	--	T	--	Buffalo
Wild Petunia	--	E	E	--	Crawford
Yellow Giant Hyssop	--	--	T	--	Crawford

T = Threatened, E = Endangered, SC = Special Concern

The proposed drawdown area of Peck Lake lies in the ridge and swale area of the floodplain delta formed by Battle Creek emerging from the Wisconsin uplands. The pre-lock and dam configuration of the lake and its surroundings were roughly similar to what they are today. The Battle Creek delta is the site of the Battle of Bad Axe, the last Indian-American battle fought east of the Mississippi River. Here the Sauk leader, Black Hawk, fought the American army in August 1832, while he and some 500 of his people were attempting to escape across the Mississippi River. There is considerable historic

documentation of the battle, and two archaeological reports have addressed the issue (William J. Yourd and Scott F. Anfinson. 1982. *Archaeological and Historical Cultural Resource Reconnaissance of Blackhawk Park, Vernon County, Wisconsin*; Robert F. Boszhardt. 1992. *Archaeological, Geomorphological, and Historical Investigations at the Bad Axe Battle Site, Vernon County, Wisconsin*. Reports of Investigations No. 143, Mississippi Valley Archaeology Center at the University of Wisconsin-La Crosse).

The 1982 survey of Blackhawk Park found no sites and no physical remains of the Battle of Bad Axe. On this basis the Corps determined that no significant historic properties would be affected by any activities in the park. The State Historic Preservation Office concurred, and the Corps has been using the park for dredged material placement. However, in view of the additional research since then (as discussed in Boszhardt's 1992 report), a formal evaluation of the site for eligibility for the National Register of Historic Places may be appropriate.

SOCIOECONOMIC RESOURCES

Alma and Buffalo City, Wisconsin, are the largest communities on pool 5. The village of Minneiska is the largest Minnesota community bordering the pool. Adjacent larger Minnesota communities are Wabasha, located 10 miles (16 kilometers) upstream, and Winona, located 25 miles (40 kilometers) downstream. The pool is adjacent to Buffalo County on the Wisconsin side of the river. Despite the sparsity of river communities, pool 5 is not isolated. Primary highways either closely parallel the shorelines for considerable distances along both sides of the pool or follow the nearby high-terraced areas within the valley in the same general north-to-south direction. Networks of secondary, county, and township roads connect with the primary roads to service the areas adjacent to the pool and to provide access from outlying areas. Railroads closely parallel the primary highways on both sides of the pool. No highway or railroad crossings from Minnesota to Wisconsin are located in pool 5. No commercial airline service is available in the immediate area. There is a small municipal airport at Winona, about 10 miles (16 kilometers) from pool 5. There are two commercial navigation facilities in pool 5, both in Wisconsin: one is just downstream from Alma at river mile 751.5, and the second is near Indian Point at river mile 748.0. Agriculture encompasses the largest single land use in this reach. Large tracts of agricultural land are found in Buffalo County, Wisconsin, and between the river and the Richard J. Dorer Memorial State Forest in Minnesota. The only commercial dock in pool 5 handles coal for an electric utility company, the Dairyland Power Cooperative. More significantly, pool 5 serves as a thoroughfare for river traffic between the region south of pool 5 and Minneapolis-St Paul.

Pool 9 has little industrialization along its banks and is the origin or destination of only a minor portion of the commodities that move through the pool. The two commercial docks in pool 9 are used for coal traffic exclusively (Interstate Power Company at Lansing, Iowa, and the Dairyland Power Cooperative at Genoa, Wisconsin). Agricultural products are not received or shipped from pool 9. Blackhawk Park is the largest public facility in pool 9. The park is located approximately 25 miles (40

kilometers) downstream from La Crosse, Wisconsin. There are approximately 15 to 20 seasonal and/or year-round private dwellings contiguous to the north end of the park.

RECREATIONAL RESOURCES

Recreation activities in pools 5 and 9 include fishing, boating, picnicking, camping, swimming, canoeing, hunting, trapping, camping, birdwatching, island beach use, and sightseeing. Observation decks are located at the locks and dams and at the Weaver Landing.

Pools 5 and 9 contain Federal and State management areas, parks, refuges, and recreation areas. The recreation, management, and natural areas are summarized in tables DPR-5 and DPR-6. There is a large amount of Federal land in pools 5 and 9; most of this land is managed for fish and wildlife as part of the Upper Mississippi River Wildlife and Fish Refuge.

Two major parks near pool 5 are John A. Latsch State Park in Minnesota and Buena Vista Park in Wisconsin. John A. Latsch State Park, developed and operated by the State of Minnesota, overlooks pool 5 from the bluff area just upstream from lock and dam 5. An overlook at the Buena Vista City Park near Alma, Wisconsin, provides a scenic view of the pool 4 tailwaters. The 900-acre (367-hectare) Kellogg-Weaver Dunes Minnesota State Natural Area located in Wabasha County is a significant sand prairie grassland ecosystem. Many of the surrounding bluffs and valleys in Minnesota are part of the Richard J. Dorer Memorial State Forest, which covers 43,000 acres (17,400 hectares) in Wabasha County.

In pool 9, the Pool Slough Wildlife Management Area near New Albin, Iowa, provides opportunities for hunting of waterfowl and deer. Just below Pool Slough is Blackhawk Point Wildlife Management Area, which is used for hunting of wildlife such as deer, grouse, turkey, and woodcock. Lansing State Wildlife Area, below the Iowa River, is home to deer, squirrel, grouse, turkey, and woodcock. West of Kains Lake is the Fish Farm Mounds Wildlife Area, which offers hunting and viewing of various wildlife species. The Chain of Lakes Natural Area features open water habitat where canvasbacks aggregate to feed on wild celery. The area serves as a rookery for herons and egrets. Eagle roosting and nesting sites are also present. Wisconsin-endangered reptiles, fish, and shorebirds are found here.

Blackhawk Park, the largest developed recreation facility in pool 9, is operated by the Corps of Engineers. This recreation facility is located on the Wisconsin side. It offers boat access facilities, day-use facilities, and a large campground. Mt. Hosmer Park, located in Lansing, offers the public picnicking and scenic overlook facilities. Accordingly, the Lansing Big Lake area is an important recreational resource offering opportunities for fishing, boating, and hunting. A canoeing route that passes through the Big Lake area has been designated on the Upper Iowa River. This route enters the Big Lake area at Big Slough, meanders through the backwater sloughs, and continues downstream into Big Lake.

Table DPR-5 - Pool 5 Recreation, Management, and Natural Areas

Areas	State	County	Acres/Hectares	Type
Richard J. Dorer Memorial State Forest	MN	Wabasha	43,000/17,400	S
John A. Latsch State Park	MN	Winona	336/136	S
Buena Vista Park	WI	Buffalo	ND	L
Kellogg-Weaver Dunes State Natural Area	MN	Wabasha	907/367	S
Upper Miss. River National Wildlife & Fish Refuge	MN, WI	All	13,240/5,358	F
Whitewater State Wildlife Mgmt. Area	MN	Wabasha/Winona	27,500/11,128	S
McCarthy Lake Wildlife Area	MN	Wabasha	2,850/1,153	ND

Type: Federal (F), State (S), Local (L) ND = No Data

Table DPR-6 - Pool 9 Recreation, Management, and Natural Areas

Areas	State	County	Acres/Hectares	Type
Fish Farm Mounds Wildlife Area	IA	Allamakee	576/233	L
Mt. Hosmer Park	IA	Allamakee	ND	L
Blackhawk Memorial Park	WI	Vernon	ND	L
Battle Island Park	WI	Vernon	ND	L
Sugar Creek Park	WI	Crawford	ND	L
Chain of Lakes Marsh Natural Area	WI	Crawford	ND	ND
Pool Slough State Wildlife Mgmt. Area	IA	Allamakee	453/183	S
Blackhawk Point State Wildlife Mgmt. Area	IA	Allamakee	186/75	S
Fish Farm Mounds State Wildlife Mgmt. Area	IA	Allamakee	449/182	S
Lansing State Wildlife Area	IA	Allamakee	1,921/777	S
Lansing Big Lake State Wildlife Mgmt. Area	IA	Allamakee	752/304	S
New Albin Wildlife Area	IA	Allamakee	200/81	ND
Lansing Wildlife Area	IA	Allamakee	ND	ND
McGregor State Wildlife Mgmt. Area	IA	Clayton	133/54	S

Type: State (S), Local (L) ND = No Data

A number of high quality recreational beaches, public day-use and camping recreation facilities, and private marina facilities are available to recreationists in both pools. Pool 5 provides 11 boat accesses with a total of 13 launching lanes (7 in Wisconsin and 6 in Minnesota), 227 parking spaces, 12 marina slips, 16 rental boats, 141 camping units, and 43 picnic units. Pool 9 provides seven boat landing/parking areas which are scattered

throughout the pool. In the summer, the public and private access facilities adequately serve the public. These boat access points also facilitate winter hunting, trapping, snowmobiling, and ice fishing. The dredged material placement islands along the main channel throughout the pools are also popular with recreational boaters.

FISH AND WILDLIFE MANAGEMENT GOALS IN THE PROJECT AREA

The USFWS, WDNR, MDNR, IDNR, and COE have direct management responsibilities for the Upper Mississippi River National Wildlife and Fish Refuge. The following describes the resource management goals of each agency that are applicable to the project area.

U.S. Fish and Wildlife Service - Fish and wildlife management goals for the area are defined in the Upper Mississippi River Wildlife and Fish Refuge Master Plan. The Master Plan specifically recommended that action be taken to upgrade existing wildlife and fish habitat through selected development and/or management options. The management goals listed in the Master Plan that most directly apply to the study area include:

* Reduce the adverse impacts of sedimentation and turbidity entering the river system.
* Eliminate or reduce adverse impacts of water quality degradation.
* Preserve unique and/or representative ecotypes.
* Restore species that are in critical condition and achieve the national population or distribution objectives.
* Maintain or improve habitat of migrating waterfowl using the UMR.
* Maintain or increase the populations and distribution of colonial nesting birds.
* Increase production of historically nesting waterfowl.
* Contribute to the achievement of the national population and distribution objectives identified in the North American Waterfowl Management Plan and flyway management plans.
* Maintain and enhance, in cooperation with the States, the habitat of fish and other aquatic life on the UMR.
* Maintain or increase the species diversity and abundance of wildlife.
* Maintain and enhance habitat used by threatened and endangered species.
* Carry out endangered species recovery plans.
* Maintain furbearer populations at levels compatible with fisheries and waterfowl management and other management objectives to provide a resource for recreation.
* Provide outdoor recreation opportunities.

Wisconsin, Minnesota, and Iowa Departments of Natural Resources - The State DNR's manage the fisheries in the study area in cooperation with the USFWS. State DNR conservation officers regulate hunting, fishing, and recreational boating on their respective portions of the Mississippi River. They also manage water quality and regulate activities that affect waters of their State. State DNR management goals for the study area include:

* Improve water quality.
* Improve fish and wildlife habitat conditions.
* Improve opportunity for all recreational uses of fish and wildlife (fishing, hunting, trapping, etc).
* Maintain access for recreational boating.
* Limit redistribution of in-place pollutants.
* Avoid increases in flood stages.

Corps of Engineers - The St. Paul District, Corps of Engineers has responsibility for operation and maintenance of the 9-foot channel navigation system within the study area. The COE also has management responsibilities for project lands and the Environmental Management Program. COE management goals for the study area that are applicable to the proposed project objectives include:

* Manage resource capabilities wisely in relation to multiple-purpose resource demand.
* Minimize user conflicts and optimize public safety and access.
* Maximize COE management actions for the greatest economic, social, or environmental benefit to the public.
* Conserve and enhance river-related natural resources.
* Improve fish and wildlife habitat and water quality conditions.

These management objectives, together with additional input from State and Federal agency natural resource managers, were used to guide the development of specific project objectives. These objectives are presented in a subsequent section of this report. However, this project forms only one part of a much larger cooperative natural resource management effort on the river.

FUTURE WITHOUT PROJECT CONDITIONS

HISTORICALLY DOCUMENTED CHANGES IN HABITAT

Without argument, the most dramatic change in the UMR in recent history has been the construction of the locks and dams, permanently raising the water levels. This is most pronounced immediately upstream of each dam where large pools were created. Areas that were originally high and dry during normal flows are now permanently inundated or have become islands. Within the lower area of the pools, the water is open and deep. While aquatic vegetation may grow, there is practically no marsh development. Island habitat was once dynamic in nature along the UMR. Prior to the construction of the locks and dams, when water currents eroded an island in one area, it deposited material elsewhere in the channel, forming sandbars. The sandbars would eventually

form into an island as more sediment was deposited and as the vegetation became more established. However, since construction of the locks and dams, island habitat along the UMR is being lost and it is not being replaced naturally.

Although the project area is important for many species of fish and wildlife, declines in habitat values have been noted in recent years. Aquatic vegetation has generally declined in abundance and extent. Initially abundant with "new reservoir" productivity in the decades following dam construction and impoundment of the navigation reservoirs, aquatic vegetation has declined in part due to the effects of continuous impoundment. The low water levels associated with summer low river discharge and periodic droughts have not occurred since construction of the dams because minimum project pool depths are maintained for navigation. Aquatic vegetation declined significantly during the 1988-89 drought period, probably due to a combination of factors having to do with the underwater light climate and availability of plant nutrients in the sediments. Submerged vegetation has rebounded in recent years, but the extent of emergent aquatic vegetation remains limited compared to past years.

FACTORS INFLUENCING HABITAT CHANGE

The factors affecting habitat quality in the study area are numerous, complex, and interrelated, but the dominant factors influencing habitat change result from: flood events; flow conditions; location within a pool; location of tributaries and islands; and erosion of islands, side channels, and uplands. Sedimentation causes changes in depths, producing a more uniform, flocculent bottom which leads to decreased plant species diversity. Gradual conversion from open water to marsh because of sedimentation also changes habitat conditions. Aquatic vegetation is influenced by climatic conditions, light, and the availability of plant nutrients in the sediments.

Wind-induced waves and the feeding activity of rough fish can resuspend the flocculent bottom sediment and increase turbidity. Restriction of light penetration is the greatest impact of turbid waters. Light transmission to the lake bottom is essential for the growth of submerged aquatic plants, especially early in the growing season. High turbidity indirectly affects fish and wildlife by depressing the growth of aquatic vegetation and directly affects fish community diversity by favoring rough fish over game fish. It affects game fish through diminished sight feeding ability, depression of planktonic food resources, and loss of shelter.

ESTIMATED FUTURE HABITAT TYPES AND DISTRIBUTION

Habitat changes can be expected to occur over the next 50 years that will result in a continued decrease in habitat value for fish and wildlife in the study area. These physical changes would affect geomorphology, hydrology, sediment transport, water quality, vegetation, and various types of aquatic and terrestrial habitat.

Geomorphology - Wave action, normal flow, and flood events will continue to erode the islands that remain, further flattening the topographic relief of the area. The deep aquatic areas can be expected to gradually fill in. Wave action will level the bottom, eroding the high spots and filling in the deep areas, and resuspend fine sediments. Existing low or small islands and beds of emergent aquatic plants will become large, shallow flats.

Hydrology - Lacking any unforeseen change in dam operation, the water level regime in the study area will remain the same. The flow pattern through the study area will probably change, though, as the existing islands continue to erode and side channel openings become larger. However, studies are currently underway to evaluate the effects of fluctuating pool elevations beyond the current operating limits and constraints. This could lead to significant short-term changes to the future hydrologic regime.

Sediment Transport - Suspended sediment will continue to be carried into the backwater areas as the side channel openings erode and become larger. A reduction in sediment input from upland erosion may occur as a result of improved upland soil conservation and land use practices, but the input will still be the primary source of fine sediments in the river. Bedload movement is expected to continue at the same rate and is dependent on flow conditions and the frequency of floods.

Water Quality - Suspended solids concentration in the backwaters will increase due to the greater influence of inflowing water through eroding side channel openings and increased resuspension of bottom sediment by wave action as barrier islands and islands within a pool erode and disappear. Winter water temperature in the backwater areas will decrease because of increased flows.

Vegetation - Floodplain forest vegetation (bottomland hardwoods) will decline as island erosion continues. Less desirable willows and shrubs will appear on the downstream end of islands as sandbars develop and become terrestrial habitat. As the islands along the main channel erode, the aquatic vegetation now protected by the islands will be subjected to increased wave action. Aquatic plant beds will become increasingly limited by light penetration and can be expected to decrease over time. Uprooting of aquatic plants will occur with increased wave action in the backwaters.

Habitat Types and Distribution - Habitat conditions in the backwater areas will be characterized by increased shallow open water areas with higher flows and reduced island and aquatic plant bed areas. Areas of desirable winter fishery habitat will be reduced as current velocities increase, depths decrease, and water temperature decreases. Habitat variability will gradually decrease as the topographic relief and water quality decline, and shallow open water area predominates. Aquatic vegetation will become less diverse because of consistent water levels, especially in the lower reaches of the pools.

PROBLEM IDENTIFICATION

EXISTING HABITAT DEFICIENCIES

Habitat deficiencies must be viewed in the context of the desired conditions or management goals of a particular area. What may be viewed as a deficiency for one species may be excellent habitat for another. Management goals for the Upper Mississippi River National Wildlife and Fish Refuge vary by management area or pool. These management goals were discussed previously in this report.

The loss and degradation of high quality fish and wildlife habitat on the Upper Mississippi River is evident and well documented. There are many causes, including: shoreline erosion; sedimentation; changed land use patterns within the drainage system; impoundment of the river for navigation; increased river traffic; changes in flow conditions due to floods; and point and non-point input of contaminants.

Existing habitat conditions in the study area are deficient in meeting management goals. Winter water quality in some of the backwater areas limits suitable fish habitat. A primary fish and wildlife habitat deficiency is the increasing lack of aquatic vegetation, especially emergent vegetation due to the consistent water levels afforded by the locks and dams.

ESTIMATED FUTURE HABITAT DEFICIENCIES

The continuation of static water levels in the backwater areas under normal flow conditions will limit vegetation diversity for aquatic species. The reduced photic zone due to increased turbidity associated with reduced depths will further limit growth of aquatic plants. Future fish habitat conditions will include areas with high flows deficient in aquatic vegetation and their interspersion with open water. The loss of wildlife habitat will continue due to reduced light penetration caused by the resuspension of fine sediment. Wave action will have a greater effect on vegetation because of shallower depths. The decreases in aquatic vegetation, water:land interspersion, light penetration, and water depth diversity will cause a similar decrease in the fish and wildlife use of the area. The land to water ratio and aquatic vegetation acreage will need to be increased for wildlife habitat.

PLANNING OPPORTUNITIES

The principal purpose of plan formulation is to develop a plan that provides the best use, or combination of uses, of water and land resources to meet the project objectives. The plan formulation process must also consider the identified planning opportunities and constraints.

Planning opportunities are physical conditions, plans by others, and available resources considered in formulating alternative plans to address the management objectives for the project area. Characteristics of the study area are considered during the design of alternative plans to address the objectives. Whenever possible, existing physical conditions and material availability and operational flexibility should be used to conserve non-renewable resources and in the design of project features.

PLANNING CONSTRAINTS

A plan to maintain or improve habitat in the study area must be compatible with a number of constraints.

HYDROLOGIC

1. Structures must be designed with consideration of the hydrologic regime and water regulation of each pool. Any structures should be designed to withstand forces of water currents and wave action.

2. Interference with current pool operating procedures must be minimized. Any operational modifications must be approved by all applicable interests.

ENGINEERING

1. Any dredged material must be placed at an approved placement site or used beneficially.

2. Construction access must be possible for normal construction equipment.

3. Operation and maintenance requirements should be minimized.

ECOLOGICAL

1. Construction and pumping during the drawdown should be conducted to minimize redistribution of existing unconsolidated fine sediments and contaminants.

2. Plans for improvement should maximize the areal extent and quality of aquatic vegetation.

3. Efforts to improve migratory bird, furbearer, and fishery habitat should not adversely affect Upper Mississippi River National Wildlife and Fish Refuge objectives of higher priority.

4. Any modifications to existing backwater inlets or outlets should be temporary and not result in long-term water quality degradation in the Mississippi River.

RECREATION

1. Existing recreational access should be maintained after the drawdown is completed or, if unavoidable negative impacts occur, possibly mitigated.

LEGAL

1. The plan must comply with all Federal and State laws and regulations.

2. Project features must be constructed on lands owned by the Federal Government or a local sponsor. Long-term easements must be acquired by a local sponsor for construction on private property.

ECONOMIC

1. The cost of project features must be reasonable for the specific site when compared to the habitat improvements estimated. Tools used to quantify economic efficiency will be the application of incremental analysis and habitat evaluation procedures.

2. A recommended plan has to be incorporated into the overall EMP funding limitations.

CULTURAL RESOURCES

1. A cultural resource evaluation would have to be made of any sites selected for drawdown.

2. Any known important cultural resource sites would have to be avoided or, if disturbed, appropriate mitigation measures would have to be provided.

INSTITUTIONAL

1. The project would likely be located within the Upper Mississippi River National Wildlife and Fish Refuge or on Federal lands and, as such, must be compatible with the primary purposes of the lands and be consistent with the Refuge's management objectives.

PROJECT OBJECTIVES

The ultimate goal of the project is to preserve, restore, and enhance backwater fish and migratory bird habitat on the Upper Mississippi River National Wildlife and Fish Refuge. This could be accomplished by promoting the growth of aquatic vegetation using water level management techniques in selected backwater areas. The overall habitat improvement objectives follow.

Fisheries Habitat Improvement Objectives - Aquatic habitat improvement objectives to meet fisheries management goals are:

* Increase the areal extent, interspersion, density, and species composition of macrophyte beds.
* Decrease suspended solids concentrations.

Migratory Bird Habitat Improvement Objectives - The target species for management are migratory birds including waterfowl, marsh birds, and songbirds. Management for these species would provide habitat for a variety of wildlife. Habitat improvement objectives to meet wildlife management goals are:

* Increase the areal extent, interspersion, density, and species composition of macrophyte beds.
* Decrease suspended solids concentrations.

Specific goals are required for an engineered solution to the habitat problems at a specific site. The specific objective is to implement a drawdown of a backwater area to dry and consolidate bottom sediments and, thereby, increase the area of emergent and submerged aquatic vegetation by natural seed germination. The physical and vegetation information gained will be useful for future considerations of other small scale drawdowns for habitat improvement.

PLAN FORMULATION

The principal purpose of plan formulation is to develop a plan that would provide the best use, or combination of uses, of water and land resources to meet the project objectives. Early in the plan formulation process, the USFWS and States were asked to identify sites on the UMR where a drawdown of the water level could potentially produce significant improvements to fish and/or wildlife habitat. Many such sites exist in the study area. Not all sites that had potential for a drawdown were investigated for this study. Each agency did its own initial screening of the potential drawdown sites and submitted only the sites deemed to have the highest potential and applicability for a small scale drawdown. This resulted in 39 sites to be considered. Many of the sites have degrading fish and wildlife habitat. A name was assigned to each site, and the pool, river mile, and State location were identified. Table DPR-7 lists the potential sites submitted for each pool. The general locations of the sites are shown on Plate 1.

Table DPR-7 - Potential Drawdown Sites

Pool	River Mile	State	Site Name
3	797	MN	Lock 3 Backwater
4	793	WI	Lake North 63
4	792	WI	Upper Mud Lake
4	791	WI	Lower Mud Lake
4	790	WI	Lake Wisc Channel
4	787	WI	Pierce County Island
4	759	MN	Hershey Island
4	755	WI	Tank Ponds Bay
5	749	MN	Martin Lake
5	748	MN	West Newton Lake
5	748	MN	Small Bay West
5	748	MN	Upper Halfmoon Lake
5	748	MN	Island 42
5	747	MN	Halfmoon Lake
5	747	WI	Probst Lake
5	747	MN	Paulson's Pond
5	747	WI	Lizzy Pauls Pond
5	746	MN	Weaver East
5A	737	WI	Kieselhorse Bay
5A	735	MN	Island 60
5A	735	MN	Island 58
5A	734	MN	Island 58 Daymark
5A	731	WI	Island 63
5A	730	WI	Betsy Slough Bay
6	721	WI	Homer Island
6	717	WI	Perrot Island
7	711	WI	Pigeon Island
7	708	WI	Island 91
7	707	WI	Abrams Island
7	705	WI	Dresbach Island
7	704	WI	Sailboat Club
8	698	WI	Long Slough
8	692	WI	Goose Island Entrance
9	677	MN	Millstone Lake
9	672	IA	Duck Lake
9	670	WI	Peck Lake
9	668	IA	Conway Lake
10	638	WI	Effigy Bay
10	634	WI	McGregor Lake

ALTERNATIVES CONSIDERED

A detailed alternatives study or evaluation for each site was not done because of the nature and small scale of the proposed project. However, it was necessary to develop a process that would result in selection of the best sites for a drawdown. The decisions concerning the actions needed at selected sites would be made by the project team based on their overall technical expertise. Since the project objective has been specifically stated, it was not necessary to investigate and analyze other alternatives as they relate to the water level drawdowns. The physical process of implementing a drawdown consists of features that would isolate the area from inflows and then pumping the water level down. Much discussion between the project proponents and designers centered around achieving the desired project objective with the lowest first costs and minimal operation and maintenance requirements. The method of preventing inflows would depend on the site specific conditions and would not be determined until the appropriate sites were chosen for the drawdowns. Blocking openings could include the use of sandbags, earthen dikes, or mechanical methods of closing culverts. The types of pumps considered would include electric, tractor-driven, gasoline, and a hydraulic dredge. The first choice for pumps to be used would be those available through existing Corps of Engineers' inventory. Otherwise, pumps would be purchased or rented.

The no action alternative was also considered. With this alternative, no drawdown would be implemented using Federal funds. Habitat conditions at the sites would continue to decline or be marginal (depending on existing conditions at the sites) as described in previous sections of this report. The project objective would not be met. This plan would be selected only if no feasible drawdown sites could be found.

SITE EVALUATIONS

The sites submitted by the agencies had to be evaluated based on criteria of what constituted a desirable site for a small scale drawdown. The project team developed a list of criteria to be used for the evaluation of each potential site. The criteria and aspects that would be desired are as follows:

1. Located on public land - Sites on Federally owned lands would be the easiest to implement because no acquisition, easements, or cost sharing would be needed. If the site was not located on Federal lands, a local sponsor would be necessary for cost sharing. The State of Wisconsin was willing to cost share.

2. Average depth - Highest probability of success for sites less than 5 feet (1.5 meters) deep; 2 to 3 feet (0.75 meter) is desirable.

3. Size - The area to be drawn down should be less than 200 acres (80 hectares) but greater than 5 acres (2 hectares). The larger areas would be better for comparison to larger scale drawdowns, but it would be more difficult to draw down the water levels with pumps.

4. Lack of desired vegetation - The desire is to promote the growth of emergent aquatic vegetation where it currently does not exist. However, it may also be desirable to promote the growth of different species of vegetation where there is already abundant or submerged vegetation.

5. Flocculent substrate - A loose, flocculent substrate over the entire site would provide more opportunity for sediment consolidation and the associated reduction of turbidity.

6. Existing data - A large amount of existing physical, chemical, and biological data would lower the cost of monitoring existing conditions for comparison to post-drawdown conditions.

7. Fluctuating summer water levels - Small water level fluctuations (less than 2 feet (0.6 meter)) would make it simpler to close off an area so that outside water levels would not influence the drawdown. Normally, the lower portions of a pool do not fluctuate as much as the upper portions, so the lower portions would be preferred.

8. Convenience - Operating and monitoring the drawdown would have a significant impact on the drawdown cost. A site that is easy to access and close to operating personnel would be desirable. Therefore, sites near natural resource agency field offices (pools 4, 5, 7, and 8) would be preferred.

9. Ease of access - Access via land would be preferred over water-only access. Nearby roadways would also be desirable.

10. Size of inlet/outlet - Small inlet and outlet openings (less than 50 feet (15 meters) or culverts) would be easier and less costly to close.

11. Desired seed bank - A site with existing or historical presence of the desired plant species would likely contain a seed bank for germination during a drawdown and would be preferred.

12. Control site availability - A similar site nearby for use as a control site for comparison during and after a drawdown may be desirable.

13. Connectivity to river - A direct connection to river water levels would drain during a larger scale drawdown and would be more comparable. An isolated area may not be affected by a larger pool-scale drawdown.

14. Impact on endangered species - No or low impact is desired. Any impact would increase the amount of coordination prior to a drawdown.

15. Animal/fish use - An area that has experienced lower animal use but has high potential is desired, rather than affecting an already valuable fishery area.

16. Available power source - Nearby electrical service (3-phase preferred) would make the drawdown possible using electric pumps, rather than gasoline or diesel which would require more maintenance.

17. Size of local watershed - A watershed of less than 100 acres (40 hectares) is desired. A small watershed would reduce the pumping required to counter the effects of local rainfall events during a drawdown operation.

18. Canopy/shading - Minimal tree canopy or shading of the site is desired to allow sunlight penetration for the germination of the natural seed bank when the water level is drawn down.

19. Bathymetry - Mostly flat bottom with some minimal diversity is desired. A gradual bottom slope to a low point would be preferred.

20. Public desires/interest - Strong public support of a drawdown at the site would be preferred.

21. Public visibility - A high visibility site would be preferred so that the public would have ample opportunity to monitor the drawdown, be educated on the process, and observe the results.

22. Natural dewatering - A drawdown should not occur naturally on a periodic basis with normal fluctuating river water levels. Pumping should be necessary to draw down the water level.

23. Exotic plants - No exotic vegetation (purple loosestrife) should be present. This would interfere with the growth of desired vegetation.

A site scoring system was developed using the above criteria. Scores for each criterion ranged from zero to 3, with a score of 3 assigned for the most desirable condition at a drawdown site for each criterion. Table DPR-8 shows how the score was determined for each criterion.

Table DPR-8 - Site Scoring Criteria

CRITERIA	SCORE			
	3	2	1	0
1) Located on public land	Federal	WI	Other	Private
2) Average depth	<3'	<5'	<7'	>7'
3) Size	10-50A	50-200A	<10A	>200A
4) Lack of desired vegetation	devoid	limited	submerged	abundant
5) Flocculent substrate	entire	some	limited	firm
6) Existing data	abundant	some	little	none
7) Fluctuating water levels	<2'	2-4'	unknown	>4'
8) Convenience (oper.& monitor)	p4,5,7,8	p3,5A,6,9	p2,10	p1,MN
9) Ease of access	land	land/water	water	hi water
10) Size of inlet/outlet	<50'/culv	50-100'	100-300'	>300'
11) Desired seed bank	present	hist pres	unknown	seed req
12) Control site availability	nearby	in pool	unknown	none
13) Connectivity to river	main flow	@ hi water	landlock	n/a
14) Impact on endangered spec	none	no Fed	possible	high
15) Animal/fish use (summer)	lo-hi pot	lo-lo pot	unknown	high
16) Available power source	on site	close	install	none
17) Size of local watershed	<1A	<100A	<1 sq mi	>1 sq mi
18) Canopy/shading	none	50% edge	100% edge	heavy
19) Bathymetry	sloping	flat	flat/hole	extreme
20) Public desires (interest)	high	mod	low	oppose
21) Public visibility	high	med	low	not
22) Natural dewatering	never	lo water	drought	each yr
23) Exotic plants	none	sparse	minor	abundant

The project team used the above scoring system to evaluate each of the submitted drawdown sites. The river managers' knowledge of the sites was used to accomplish the initial evaluation of the sites, with adjustments made for scoring criteria limitations. The results of the evaluation are shown in table DPR-9. The sites are listed in order of high score.

Table DPR-9 - Drawdown Site Scores

POOL	RIVER MILE	STATE	SITE NAME	CRITERIA 1) located on public land*	2) average depth	3) size****	4) lack of desired vegetation	5) flocculent substrate	6) existing data	7) fluctuating summer water levels****	8) convenience (oper. & mon.)*	9) ease of access****	10) size of inlet/outlet	11) desired seed bank*	12) control site availability*	13) connectivity to river*	14) impact on endgrd. spec.	15) animal/fish use (summer)	16) available power source**	17) size of local watershed	18) canopy/shading	19) bathymetry	20) public desires***	21) public visibility	22) natural dewatering	23) exotic plants****	SCORE
8	692	WI	Goose Island Entranc	3	3	2	2	3	3	3	3	3	3	3	3	3	3	3	1	2	2	2	1	3	3	3		44
5	748	MN	Small Bay West	3	3	1	2	3	2	2	3	3	3	3	3	3	3	2	0	2	2	3	1	3	3	3		40
9	670	WI	Peck Lake	3	3	2	2	3	2	2	2	3	2	3	3	3	3	1	1	2	2	3	1	3	3	3		40
3	797	MN	Lock 3 Backwater	3	2	3	3	3	1	3	2	2	2	1	2	3	3	2	1	3	2	1	1	3	3	2		39
4	759	MN	Hershey Island	3	3	3	2	3	3	3	3	1	2	3	3	3	3	3	0	3	1	3	1	1	3	2		39
5	747	MN	Halfmoon East	3	3	3	2	2	2	2	3	1	3	3	3	3	3	3	0	2	3	3	1	1	3	3		39
5	747	MN	Paulson's Pond	0	3	1	2	3	2	2	3	1	3	3	3	3	3	3	1	3	2	3	1	1	3	3		39
5	747	WI	Lizzy Pauls Pond	2	2	3	2	3	1	3	3	3	3	3	2	3	3	1	1	1	3	1	1	3	3	3		39
4	792	WI	Upper Mud Lake	2	3	3	1	3	3	1	3	3	3	3	3	3	1	2	1	3	2	2	1	3	1	3		38
5	746	MN	Weaver East	3	3	3	2	3	2	2	3	1	1	3	3	3	3	3	0	3	2	3	1	1	3	3		38
7	708	WI	Island 91	2	3	3	2	2	2	2	3	1	3	3	3	3	3	3	0	3	1	3	1	1	3	3		38
4	755	WI	Tank Ponds Bay	3	3	3	1	3	3	3	3	1	1	3	3	3	3	1	0	3	2	2	1	2	3	3		37
5A	731	WI	Island 63	3	3	3	2	3	2	3	2	1	1	3	3	3	2	3	0	3	2	2	1	1	3	3		37
7	711	WI	Pigeon Island	2	3	3	2	2	2	2	3	1	1	3	3	3	3	3	0	3	2	3	1	1	3	3		37
7	707	WI	Abrams Island	2	3	3	2	2	2	2	3	1	2	3	3	3	3	3	0	3	1	3	1	1	3	3		37
5	748	MN	West Newton Lake	3	3	1	2	3	2	2	3	1	2	3	3	3	3	3	0	2	2	3	1	1	3	3		36
7	704	WI	Sailboat Club	2	3	3	1	2	2	2	3	3	0	3	3	3	3	0	1	2	2	3	1	3	3	3		36
4	793	WI	Lake North 63	1	3	3	0	3	3	3	3	3	3	3	3	0	1	1	1	3	2	2	1	2	1	1		35
4	791	WI	Lower Mud Lake	1	3	2	2	3	3	1	3	2	1	3	3	3	1	1	1	3	2	2	1	3	2	3		35
4	790	WI	Lake Wisc Channel	2	3	3	2	3	3	1	3	1	2	3	3	3	1	3	0	3	1	2	1	1	3	3		35
5	748	MN	Island 42	3	3	2	2	3	2	2	3	1	1	3	3	3	3	3	0	2	1	3	1	1	3	3		35
5A	730	WI	Betsy Slough Bay	3	3	2	2	3	2	3	2	2	1	3	3	3	2	1	0	0	3	3	1	3	3	2		35
6	721	WI	Homer Island	3	3	2	3	3	1	2	2	1	1	3	3	3	3	3	0	3	2	3	1	1	3	1		35
5	748	MN	Upper Halfmoon Lak	3	2	3	2	2	2	2	3	1	0	2	3	3	3	3	0	2	2	3	1	1	3	3		34
4	787	WI	Pierce County Islands	2	3	2	2	3	3	2	3	2	0	3	3	3	1	1	0	3	2	3	1	1	2	3		33
5	747	WI	Probst Lake	3	2	3	2	2	2	2	3	1	1	3	3	3	3	0	0	3	1	3	1	1	3	3		32
6	717	WI	Perrot Island	2	3	3	1	3	1	3	2	1	1	3	3	3	3	2	0	3	1	2	1	1	3	1		32
7	705	MN	Dresbach Island	2	3	1	0	2	2	2	3	1	2	3	3	3	3	1	0	3	2	2	1	1	3	3		31
5A	735	MN	Island 58	3	2	3	1	2	1	2	2	1	2	3	3	3	3	1	0	2	1	1	1	1	3	3		29
5A	734	MN	Island 58 Daymark	3	2	1	1	2	1	2	2	1	1	3	3	3	3	1	0	2	1	1	1	1	3	3		26
10	638	WI	Effigy Bay	3	3	3	2	3	0	0	1	0	1	3	3	3	1	2	0	2	2	2	1	1	3	1		26
10	634	WI	McGregor Lake	3	3	0	2	3	0	0	1	0	0	3	3	3	3	2	0	2	2	3	1	1	3	1		25
9	668	IA	Conway Lake	3	2	0	1	3	1	2	2	2	0	3	2	3	2	1	0	1	1	3	1	2	3	0		24
5A	735	MN	Island 60	3	2	0	1	3	1	2	2	1	0	3	2	3	1	0	0	2	1	3	0	1	3	3		24
9	677	MN	Millstone Lake	3	3	2	1	3	0	2	2	0	1	3	3	3	1	1	0	1	1	2	1	1	3	1		23
9	672	IA	Duck Lake	3	3	0	1	3	1	1	2	1	0	3	1	3	2	0	0	2	1	3	1	1	3	1		23
5	749	MN	Martin Lake	0																			0				0
5A	737	WI	Kieselhorse Bay	0																							0

* Values not included in scoring. Scores of 0 or 1 result in site deletion.

** Power source available= 1; power source not available= 0.

*** Values not included in total score. No known opposition= 1; opposition= 0 and results in site deletion.

**** Score of 0 results in site deletion.

Shading indicates that site was deleted during initial analysis.

SITE SELECTION PROCESS

In order to reduce the number of sites to investigate in the field, the team decided to defer the sites that did not score a "1" for public visibility. Only the top 10 remaining sites would be investigated further, with some adjustments made for sites that individual team members felt should still be investigated based on professional judgments. The ten sites were: Goose Island Entrance and Long Slough (pool 8); Small Bay West, Halfmoon East, West Newton Lake, and Lizzy Pauls Pond (pool 5); Peck Lake (pool 9); Lock 3 Backwater (pool 3); Upper Mud Lake (pool 4); and Betsy Slough Bay (pool 5A).

Specific information about the sites was collected by a smaller task force of the team in May 1996. The data sheets for each of the 10 sites are included in attachment 5. The data were used to rank each site by the eight criteria that the team determined to be the most important to implementation of a successful drawdown. These criteria are shown in table DPR-10.

Table DPR-10 - Top 10 Site Ranking

Pool	RM	State	Site Name	RANK								Total Score
				(3) size	(4) lack of desired veg.	(5) floc. sub-strate	(7) fluct. summer water levels	(10) size of inlet/ outlet	(17) size of local water-shed	(18) canopy/ shading	(19) bathy-metry	
5	747	WI	Lizzy Pauls Pond	7.5	5	10	10	9	1.5	5.5	4	52.5
9	670	WI	Peck Lake	2.5	9.5	9	6	9	9	4	2	51
4	792	WI	Upper Mud Lake	7.5	3	4	9	9	9	5.5	1	48
3	797	MN	Lock 3 Backwater	9	9.5	2	7.5	1.5	9	5.5	3	47
5A	730	WI	Betsy Slough Bay	10	7	8	7.5	1.5	1.5	5.5	6	47
5	748	MN	Small Bay West	1	6	6	4	5	6	2.5	9	39.5
5	747	MN	Halfmoon East	5.5	2	7	1	4	6	5.5	7	38
8	692	WI	Goose Isl Entr.	5.5	1	3	4	6	3	5.5	10	38
5	748	MN	West Newton Lake	2.5	4	5	4	3	6	2.5	8	35
8	698	WI	Long Slough	4	8	1	2	7	6	1	5	34

The information gathered by the task force was used by the team to further discuss and screen the sites. Based on time and cost considerations, the project team decided to select three sites to be investigated in the field by the team. This process resulted in the three highest ranked sites being Lizzy Pauls Pond, Peck Lake, and Upper Mud Lake (see table DPR-10). However, it was necessary to also consider other factors in the selection of the final three sites. The Upper Mud Lake site would require a cost sharing agreement with a local sponsor (WDNR). This could potentially delay implementation of a drawdown and would require significant coordination and review time. The next two sites on the list, Lock 3 Backwater and Betsy Slough Bay, were tied as far as total score. However, Lock 3 Backwater is located immediately downstream of a nuclear power plant. It was felt that warm water discharges from the plant could skew the results of a drawdown, making it difficult to quantify the habitat benefits from a drawdown and also making the site atypical of a normal backwater area. Therefore, Betsy Slough Bay was selected as the third site to investigate further.

In June 1996, the project team investigated the three sites in order to decide which to pursue for implementation. As a result of the field investigations, data collection, and further discussions by the team, the two sites that received consensus to implement drawdowns are Lizzy Pauls Pond in pool 5 and Peck Lake in Blackhawk Park (pool 9). The locations of the sites are shown on Plates 2 and 4. Additional information about the two proposed sites is shown in table DPR-11. The main reasons for not pursuing Betsy Slough Bay are:

1) size of the site (145 to 180 acres (60 to 70 hectares)). Depending on the actual area to draw down, it would require a pumping capacity of more than 10,000 gal/min (630 l/s). A small hydraulic dredge was considered, but operation costs would exceed $50,000 to pump the volume of water at the site (not including seepage, rainfall, and springs). These other factors could significantly increase the quantity needed to be pumped.

2) watershed (2,200 acres (890 hectares)). This size of watershed could require significant pumping after a rainfall event; as much as the original drawdown requirements.

3) size of the opening to close (525 feet (160 meters)). There are also several additional smaller openings or low spots ranging from 30 to 100 feet (9 to 30 meters) wide.

4) proximity of the railroad. Significant coordination with the railroad (review, approval, temporary easement, etc) would be necessary, both to tie-in the closure and to lower the water level adjacent to the railroad embankment.

5) relatively good existing aquatic vegetation. The habitat gain with a drawdown may be small, even though the area is large.

Table DPR-11 - Drawdown Site Characteristics

Feature	LIZZY PAULS POND	PECK LAKE
Navigation pool	5	9
River mile	747	670
State	Wisconsin	Wisconsin
Area of drawdown	52 acres (21 hectares)	19 acres (6.1 hec)
Watershed	970 acres (390 hectares)	2 acres (1 hectare)
Average depth	1.5 feet (0.46 meter)	1.7 feet (0.52 meter)
Outlet culvert	6-ft (1.8-m) dia. CMP	7x12-ft (2.1x3.7-m) arch CMP
Inlet culvert	Approx 6 - 2-ft (0.6-m) CMP	2-ft (0.6-m) gated CMP
Existing vegetation	Coontail, Canadian waterweed, lily, flatstem pondweed	Limited; some lotus and emergents
Vegetation coverage	89% floating/submergent 11% emergent	<5% floating ~2% emergents
Canopy shading	<5%	10%
Substrate	Fine silty muck	Fine muck
Exotic plants	None	None
Access	State Hwy 35 & Co Rd OO	Park campground road
Property ownership	Corps of Engineers	Corps of Engineers
Flooding potential	None in July	13% chance in July
Electrical power	3-phase within 400 feet	1-phase within 1500 ft
Control site	North lobe downstream	Green Lake downstream

SPECIFIC OBJECTIVES

Current guidance on project evaluation indicates the prime focus should be on measurable chemical and physical parameters, with limited monitoring of biological features (i.e., vegetation studies only). Therefore, the stated project objectives were narrowly defined to reflect the aspects of the project that could be designed for future monitoring and evaluation. Meeting these objectives will also produce positive effects in other aspects and outside the project area. Based on design factors that affect project area habitats and future project performance assessment, the specific project objectives for the two potential sites described above are summarized in table DPR-12.

Table DPR-12 - Project Objectives and Alternative Enhancement Features

Site Name	Project Objective	Potential Enhancement Alternative	Unit of Measure	ENHANCEMENT POTENTIAL Existing	Future w/o Project (2011)	Future with Project
Lizzy Pauls Pond	Expose bottom sediments to promote growth of emergent aquatic plants	Water level drawdown	feet	0	0	2
Peck Lake	Expose bottom sediments to promote growth of emergent aquatic plants	Water level drawdown	feet	0	0	2

HABITAT AND INCREMENTAL ANALYSES

In highly managed areas, drawdowns are frequently conducted every 8 to 10 years to maintain the aquatic vegetation community. For this evaluation, it was assumed that the vegetation would be maintained at a similar quality for the first 8 years. Afterward, the vegetative community would begin a slow decline and would approximate the future without project conditions at around year 15.

Approximately 11 percent of the surface area of the Lizzy Pauls Pond study area contains herbaceous emergent plants. The emergent plant community is dominated by arrowheads (*Sagittaria latifolia and rigida*), cattail (*Typha latifolia*) and sedges (*Carex* spp). Other emergents present include bulrushes (*Scirpus* spp), rushes (*Juncus* spp), buttercups (*Ranunculus* spp), wild rice (*Zizania aquatica*), and bur reed (*Sparganium* spp). Submerged species and floating leaf plants cover much of the remaining area. The prevalent submergent species are coontail (*Ceratophyllum demersum*), Canada waterweed (*Elodea canadensis*), and flatstem pondweed (*Potamogeton zosteriformis*). Other submerged species present include river pondweed (*Potamogeton nodosus*), Eurasian milfoil (*Myriophyllum spicatum*), sago pondweed (*Potamogeton pectinatus*), and curly-leaf pondweed (*Potamogeton crispus*). White water lily (*Nymphaea tuberosa*) and yellow lotus (*Nelumbo lutea*) are present in the lake.

A small band of emergents is located in the south end of Peck Lake, covering approximately 2 percent of the surface area of the Peck Lake study area. The emergent community is dominated by arrowheads, bulrushes, and rice cut-grass (*Leersia* sp.). Over a third (38 percent) of Peck Lake is open water. Floating leaf plants, yellow lotus and water lily, sparsely cover some of the remaining area. A very limited amount of submerged plants are also occasionally present. However, submergent plants were not present in 1996.

The zone where herbaceous emergent vegetation is likely to be established was estimated to be between 0.5 foot (0.15 meter) above to 1 foot (0.3 meter) below summer normal water levels. Above 0.5 foot (0.15 meter) and below 1 foot (0.3 meter), woody vegetation and submerged and floating leaf vegetation, respectively, are likely to dominate the aquatic plant community. The drawdown will kill many of the existing submersed plants that are present, especially for Lizzy Pauls Pond. However, most seeds of submerged plants are

resistant to desiccation. In addition, submerged plants in the areas that will not be dewatered are likely to survive. Consolidation and oxidizing of the sediments during the drawdown should improve water quality by reducing biotic and abiotic disturbances of the sediments and should also create more favorable and stable substrate conditions. This should create favorable conditions for the subsequent quick establishment of submerged aquatic plant species upon reflooding. Most herbaceous emergent species present at the proposed drawdown sites are capable of surviving reduced soil moisture for a relatively long time (1 or 2 growing seasons), as would occur under the drawdown conditions. Aquatic plants at both sites are well adapted to summer drawdowns which occurred on the river backwaters prior to lock and dam construction in the 1930's. If long-term changes in water levels were done, these herbaceous emergents would likely be replaced by terrestrial species.

The vegetation that develops will depend on a variety of factors including the seed bank available in the sediments, the substrate characteristics of the individual sites, timing of the drawdown, and climatic conditions. The float activated pumps that would be employed at the two drawdown sites should reduce the potential for unintentional reflooding from seepage, rainfall events, and moderate increases in river discharge, which could significantly limit the vegetation response. Because of the paucity of the existing emergent vegetation at Peck Lake, it is likely that the vegetation response in much of the dewatered zone would be dominated by annuals and terrestrial perennial plants. However, some perennial herbaceous emergents seedlings would be established because of the better flora available in the contiguous Green Lake. Some of these young perennial emergents would be lost upon reflooding. However, the oxidized and consolidated sediments should allow some of the surviving emergents to expand over time. With a second year of drawdown, the perennial herbaceous emergents should develop more vigorous rootstock, allowing a greater degree of survival upon reflooding. Additional areas would also be colonized by seedlings and through vegetative expansion by rhizomes. Lizzy Pauls Pond has small patches and bands of perennial herbaceous emergents. As such, it has many of the emergent vegetative characteristics that are expected after one year of drawdown on Peck Lake. The response of herbaceous emergents should be relatively good after one year of drawdown. It would improve with 2 consecutive years of drawdowns.

The annuals that would develop in the dewatered zone would probably include both terrestrial species (like ragweed, etc) and moist soil species (like smartweeds). Reflooding these annuals in the fall could have very short-term positive benefit on migrating waterfowl by providing an attractive food source. The woody plants that would colonize the dewatered zone include cottonwood, willows, and red-osier dogwoods. Most of these would be killed upon reflooding, except willows near the water edges. The undesirable exotic purple loosestrife could be one of the plants to colonize the dewatered zone. However, one of the reasons Lizzy Pauls Pond and Peck Lake were selected was because of the absence of purple loosestrife. This should limit the potential for this invader to become established.

Without the project, as these areas slowly fill, the emergent vegetative community should respond somewhat. Therefore, for the future without project conditions, the vegetative community is projected to improve slightly over time, but much less than is possible with a drawdown.

Most of Peck Lake and Lizzy Pauls Pond contain water depths less than 3 feet (0.9 meter). The average depths for Lizzy Pauls Pond and Peck Lake are 1.5 feet (0.46 meter) and 1.7 feet (0.52 meter), respectively (see Plates 3 and 5 and attachment 3). Past sedimentation rates were not determined for the study areas, which would allow a more precise prediction of future sedimentation. Calculation of backwater sedimentation rates has been highly variable, and the rates have ranged from greater than 2.54 to 0.18 cm (1 to 0.07 inch) per year. The more recent of these studies reported values between 0.18 and 0.37 cm (0.07 to 0.15 inch) per year. Therefore, a sedimentation rate value of 0.25 cm (0.1 inch) per year was estimated for the two backwaters, with an average loss of 3.75 cm (1.5 inches) over the next 15 years. Without the project, a very small area would be lost or changed, as a result of sedimentation.

The degree of sediment compaction with the drawdown is uncertain at this time. It was conservatively assumed that compaction would offset the estimated sedimentation that would occur over the next 15 years, approximately 3.75 cm (1.5 inches). If compaction exceeds this rate, then the water depths would be preserved for longer than the 15-year project life, but would not be a factor in the calculation of benefits for a 15-year project life.

Three alternatives were evaluated for each of the two study areas: no action, with 1 year of drawdown, and with 2 years of drawdown. Analysis of more than 2 consecutive years of drawdowns was not done because it would require numerous estimates and assumptions, resulting in questionable habitat projections. It is also unlikely that a future larger scale drawdown would be possible for more than 2 years.

Enhancement/restoration of marsh and shallow aquatic habitat through drawdowns would benefit a variety of fish and wildlife species. To represent the broad community and guilds that would benefit from the proposed drawdowns, habitat suitability modeling was completed for two fish species (bigmouth buffalo and northern pike); two bird species (American coot and red-winged blackbird); and one aquatic mammal species (muskrats) (see attachment 3). The benefits were then averaged to obtain a community response (table DPR-13). This reduces the benefits value over what could have been obtained by selecting the single species model that was most sensitive to the proposed drawdowns. However, it strengthens the benefits qualitatively by demonstrating the diverse fish and wildlife community that would benefit from the proposed drawdowns. All five organisms evaluated showed positive responses to the drawdowns. The fish species showed the least positive responses.

Table DPR-13 - Habitat Analyses - Average Annual Habitat Unit Gain or Loss

Area	Alternative	Species Habitat Evaluation Procedures Models					Community
		BM Buffalo	N. Pike	A. Coot	Blackbird	Muskrat	
Lizzy Pauls Pond	No action	48.0	41.3	2.1	19.0	12.0	24.5
	First Year	48.3	44.0	9.6	33.1	21.8	31.4
	Gain or loss	0.3	2.7	7.5	14.1	9.8	6.9
	Second Year	47.7	42.5	12.1	33.6	23.1	31.8
	Gain or loss	-0.6	-1.5	2.5	0.5	1.3	0.4
Peck Lake	No action	5.7	3.8	0.6	4.9	1.8	3.3
	First Year	14.3	7.9	2.9	9.5	6.1	8.1
	Gain or Loss	8.6	4.1	2.4	4.6	4.3	4.8
	Second Year	14.6	11.5	4.0	11.0	7.3	9.7
	Gain or loss	0.3	3.7	1.1	1.5	1.2	1.6

Analyses of one and two years of drawdown and the corresponding estimated habitat unit gains were done for each of the two sites. The results of the incremental analysis are shown in table DPR-14. One year of drawdown on Lizzy Pauls Pond and 1 and 2 years of drawdown on Peck Lake showed similar incremental average annual costs per average annual habitat unit. With the existing relatively high quality habitat at Lizzy Pauls Pond, a very good vegetative response was estimated to occur after only 1 year of drawdown. A second year of drawdown at Lizzy Pauls Pond would increase the vegetative response only slightly. Therefore, a second year of drawdown on Lizzy Pauls Pond yielded much higher average annual costs per average annual habitat unit. Even though the habitat suitability indices were estimated to increase slightly or stay the same for both species of fish with another year of drawdown at Lizzy Pauls Pond, the loss of another year of fish use caused an incremental loss in average annual habitat units for the two fish species. However, the coot and muskrat models did show a reasonable cost per average annual habitat unit gain for a second year of drawdown at Lizzy Pauls Pond. Based on the community incremental analysis, one year of drawdown at both Peck Lake and Lizzy Pauls Pond appears to be justified. In addition, a second year of drawdown to increase habitat values at Peck Lake appears to be justified.

Table DPR-14 - Incremental Analysis - Cost per Average Annual Habitat Unit

	BM Buffalo	N. Pike	A. Coot	Blackbird	Muskrat	Community
Lizzy Pauls 1-year	$12,512	$1,196	$431	$232	$333	$473
Lizzy Pauls 2-year	($1,984)	($749)	$468	$2,176	$899	$2,676
Peck Lake 1-year	$501	$1,060	$1,835	$939	$1,004	$902
Peck Lake 2-year	$3,155	$294	$1,008	$728	$892	$694

Note: At Lizzy Pauls Pond, both fish species showed a loss in habitat units with a second year of drawdown. As a result, the numbers are negative.

SELECTED PLAN OF ACTION

Plan Description - The plan that best satisfies the immediate agency and public goals, habitat improvement objectives, and planning opportunities and constraints includes the drawdown of Lizzy Pauls Pond in pool 5 and Peck Lake in pool 9 (see Plates 2 and 4 for location and table DPR-11 for information).

At Lizzy Pauls Pond, the outlet culvert would be closed and electric pumps used to draw down the water level at least 2 feet (0.6 meter) to dry out bottom sediments around the perimeter of the lake. Water would be discharged into the lobe of Lizzy Pauls Pond on the downstream side of County Road OO. It is proposed to begin the drawdown around June 24. Pumps were selected based on availability from existing Corps' inventory and the size that could be handled with available equipment. It is estimated that two 4-inch pumps would be used for 21 days of continuous pumping at 500 gallons per minute to reach the desired drawdown. Small trenches may need to be excavated to drain any pooled areas. The drawdown would be maintained by periodic pumping until about September 17. It is estimated that a single pump would need to be operated for 8 hours every other day to maintain the water level drawdown. In September, the lake would then be permitted to gradually refill from natural inflows. After the water level reaches the normal elevation, the culvert closure would be removed and the drawdown operation would be ended. Monitoring during and after the drawdown would be accomplished as described later in this report.

At Peck Lake, the inlet and outlet culverts would be closed and electric pumps would be used to draw down the water level at least 2 feet (0.6 meter) to dry out as much of the lake bottom sediments as possible. Water would be discharged into the existing outlet channel that connects to Green Lake. It is proposed to begin the drawdown around June 24. It is estimated that two 4-inch pumps would be used for 14 days of continuous pumping at 500 gallons per minute to reach the desired drawdown. Small trenches may need to be excavated to drain any pooled areas. It is estimated that a single pump would need to be operated for 8 hours every other day to maintain the water level drawdown. The drawdown would be maintained by periodic pumping until about October 15. The culverts would remain closed throughout the winter, if possible. The lake would be allowed to refill over the winter and spring. Pending an evaluation of the results by project biologists in the spring of the second year, the drawdown could be conducted again the second year beginning around June 9 and be maintained until about September 17. Implementation of this option would depend on whether perennials had become established. The possibility of planting aquatic species such as Arrowhead tubers, bulrush roots, and wild rice seed (see attachment 3) at small selected test sites would be discussed with the project team while the drawdown is in progress. In September, the lake would be permitted to gradually refill from natural inflows and the inlet culvert. After the water level reached the normal elevation, the outlet culvert closure would be removed and the drawdown operation would be ended. Monitoring during and after the drawdown would be accomplished as described later in this report.

Implementation Methods - The installation and drawdown operation at both sites would be performed by personnel from the Corps' Mississippi River Project Office at Fountain City, Wisconsin. At Lizzy Pauls Pond, the outlet culvert would be closed by using either sandbags, timbers, or an inflatable plug. Two 4-horsepower, single-phase electric, 500 gal/min (30 l/s) trash pumps would be used. A float system would be installed to control the pump operation. Single-phase power would be run to the pump site by the Buffalo Electric Cooperative. A sump would be excavated and a suitable base placed for the pumps, if necessary. If large areas of the lake do not drain naturally to the pump location, narrow trenches would be excavated by hand to provide drainage.

At Peck Lake, the inlet culvert would be closed with stop logs or some other solid barrier. The outlet culvert would be closed using sandbags or timber. Two 4-horsepower, single-phase electric, 500 gal/min (30 l/s) trash pumps would be used. A float system would be installed to control the pump operation. Single-phase power would be run to the pump site by the Vernon Electric Cooperative. It may be possible to place the pumps in the existing outlet culvert because of the invert elevation and size. If the culvert is not low enough, a suitable base would be placed in a deep area near the culvert inlet for the pumps. If large areas of the lake do not drain naturally to the pump location, narrow trenches would be excavated by hand to provide drainage.

Project Support - The participants in the planning process provided written and verbal comments that were considered fully during plan selection and formulation. Attendees at the public meetings held during the review period did not voice any objections to the selected plan and several offered verbal support for the plan. Written comments and letters received are included in attachment 4.

Project Accomplishments - The proposed project has been designed to meet or address the project objectives as shown in table DPR-15.

Real Estate Requirements - No non-Federal lands would be required because the selected sites for the project are located on land owned by the COE. Peck Lake is managed by the COE as a recreation area and Lizzy Pauls Pond is managed by the USFWS as part of the National Wildlife Refuge. An appropriate agreement would be made with the USFWS for implementation at the Lizzy Pauls Pond site.

Table DPR-15 - Project Objectives and Enhancement Features

Objectives	Project Accomplishments	Potential Enhancement Feature	Units	Existing	Future Without	Future With
Consolidate Sediments	Increase Water Depths	Drawdown	centimeters(cm)		Mean loss of 3.75 cm/15 years	Offset sedimentation
	Reduce erodibility of sediments	Drawdown	Part. Size (%finer)	Variable	Variable	Variable
			Lizzy Pauls			
			% Moisture*	Mean 61%	Mean 60%	Mean 50%
			% Organic*	Mean 12%	Mean 12%	Mean 10%
			Bulk Density*	0.58 g/mL	0.59 g/mL	0.64 g/mL
			Peck Lake			
			% Moisture*	Mean 39%	Mean 38%	Mean 30%
			% Organic*	Mean 4%	Mean 4%	Mean 3%
			Bulk Density*	1.01 g/mL	1.02 g/mL	1.10 g/mL
Reduce Turbidity	Reduce sediment resupension	Drawdown	Suspended solids**	Mean 50 mg/L	Mean 50 mg/L	Mean 30 mg/L
Increase Areal Extent of Aquatic Vegetation	Increase emergent aquatic plants	Drawdown	% Coverage	2 to 11%	3 to 14%	34 to 44%

* Mean value of actual measurements made in October 1996 (James and Barko 1997).
** Concentrations for suspended solids are the mean 1994 summer values for the backwater, Weaver Bottoms, and main stem of the river (Anderson 1996).

ENVIRONMENTAL ASSESSMENT

An environmental assessment has been conducted for the proposed action, and a discussion of the impacts on habitat conditions follows. As specified by Section 122 of the 1970 Rivers and Harbors Act, the categories of impacts in the impact assessment matrix (table DPR-16) were reviewed and considered in arriving at the final determination. The proposed actions would be covered under the conditions of a general nationwide 404 permit, including applicable regional conditions. Therefore, a Section 404(b)(1) evaluation was not prepared. Application will be made to the State of Wisconsin for water quality certification under section 401 of the Clean Water Act during the development of the final implementation plan. The Finding of No Significant Impact (attachment 2) will be signed after the public review period has elapsed and any issues have been resolved. If the public review uncovers significant impacts, a revised National Environmental Policy Act (NEPA) document may be prepared.

Table DPR-16 - Environmental Assessment Matrix

Section 122 of the River and Harbor and Flood Control Act of 1970 (P.L. 91-611)

SMALL SCALE DRAWDOWN - LIZZY PAULS POND AND PECK LAKE

PARAMETER	MAGNITUDE OF PROBABLE EFFECTS						
	BENEFICIAL EFFECT			NO APPRECIABLE EFFECT	ADVERSE EFFECT		
	SIGNIFICANT	SUBSTANTIAL	MINOR		MINOR	SUBSTANTIAL	SIGNIFICANT
A. SOCIAL EFFECTS							
1. Noise Levels					X		
2. Aesthetic Values					X		
3. Recreational Opportunities					X		
4. Transportation				X			
5. Public Health and Safety				X			
6. Community Cohesion (Sense of Unity)				X			
7. Community Growth & Development				X			
8. Business and Home Relocations				X			
9. Existing/Potential Land Use				X			
10. Controversy				X			
B. ECONOMIC EFFECTS							
1. Property Values				X			
2. Tax Revenue				X			
3. Public Facilities and Services				X			
4. Regional Growth				X			
5. Employment				X			
6. Business Activity				X			
7. Farmland/Food Supply				X			
8. Commercial Navigation				X			
9. Flooding Effects				X			
10. Energy Needs and Resources				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				
11. Threatened or Endangered Species				X			
D. CULTURAL RESOURCE EFFECTS							
1. Historic Architectural Values					X		
2. Pre-Historic & Historic Archeological Values					X		

RELATIONSHIP TO ENVIRONMENTAL REQUIREMENTS

The proposed action would comply with all applicable Federal environmental laws, executive orders, and policies, and State and local laws and policies including the Clean Air Act, as amended; the Clean Water Act of 1977, as amended; the Endangered Species Act of 1973, as amended; the Land and Water Conservation Fund Act of 1965, as amended; the National Environmental Policy Act of 1969, as amended; the Fish and Wildlife Coordination Act of 1958, as amended; the National Wildlife Refuge System Administration Act; Executive Order 11988 - Floodplain Management; and Executive Order 11990 - Protection of Wetlands. The proposed action would not result in the conversion of farmland to non-agricultural uses. Therefore, the Farmland Protection Policy Act of 1981 does not apply to this project.

NATURAL RESOURCES

Habitat - The proposed actions would improve fish and wildlife habitat on the Upper Mississippi River. In terms of a quantified habitat evaluation, about 15 average annual habitat units would be gained from implementation of the selected project, affecting about 71 acres. One habitat unit is defined as 1 acre of optimum habitat. A detailed discussion of the habitat evaluation procedures conducted for this project is included in the Habitat and Incremental Analyses section of this report and in attachment 3.

Terrestrial Habitat - Short-term impacts on terrestrial habitat would be negligible. Implementation of the project could result in some disturbance impacts resulting from closing of the culverts, placement of the pumps, and installation of electrical cables for power supply.

Aquatic Habitat - Approximately 71 acres (29 hectares) of shallow water wetland habitat would be positively affected by the selected plan.

Water Quality - Potential construction related negative effects on water quality would be from the pumping of water from the drawdown site into the receiving bodies of water. The initial pumping to draw down the two sites may mobilize some of the flocculent sediments, resulting in an increase of suspended solids in the effluent water. However, substantial elevations in suspended solids are not likely to occur because the slow rate of drawdown should allow the flocculent sediments to settle. Subsequent maintenance pumping to account for seepage and rainfall should be of higher quality. Any excavation and placement of material from the installation of the pumps would be done mechanically and would involve very small quantities.

Areas within the two proposed sites that are not completely dewatered during the drawdown, could experience high summer water temperatures, dissolved oxygen depletions, and possibly unionized ammonia toxicity. These conditions would be stressful to any remaining animals.

Consolidation and oxidation of the sediments should increase the critical sheer stress of the sediments after reflooding. The increase in resistance to sediment resuspension and the increased quantity of vegetation should reduce wave and bioturbation of the sediments, resulting in increased water clarity. Upon reflooding, sediments in the dewatered zone may release phosphorus, which could trigger an algal bloom. However, reflooding is scheduled for the fall, when algal productivity is very low. The areas would be flushed during the following normal spring high water, prior to normal peak algal productivity. This should reduce the potential for significant algal blooms.

Although short-term adverse impacts on water quality would occur during and immediately after the drawdown, the long-term impact on water quality is expected to be positive.

Fish and Wildlife - The project is designed to benefit fish and wildlife habitat, and the benefits associated with the project have been discussed previously in this report. Therefore, this discussion will only briefly summarize the anticipated benefits and discuss the unavoidable trade-offs. The closure of the outlet culverts would temporarily restrict fish use of the area. Use of the area by fish would be nearly eliminated during the drawdown. No toxic effects are expected on fish or other aquatic organisms as a result of the effluent discharge. Overall, fish spawning, nursery, and wintering habitat values would be improved after the drawdown with the growth of emergent vegetation. The long-term impacts are expected to be positive. Because of the fine-grained nature of the substrate, the shallow water, and the absence of much current velocity, it is unlikely that either of the drawdown sites support very extensive mussel populations. Habitat generalists, like threeridge (*Amblema plicata*), and thin-shelled species, like papershells, heelsplitters, and floaters, could be present in low numbers at the drawdown sites, and most would die during the drawdown. Other benthic macroinvertebrates present would also perish during the drawdown. However, improving the aquatic plant community and reducing the flocculent nature of the sediments should increase substrate stability and improve water quality. This should allow a more diverse and abundant benthic macroinvertebrate community to develop upon reflooding. Use by bird and mammal species that normally use marsh and shallow aquatic habitat would be curtailed during the drawdown, but should improve in the long-term with improvements in habitat quality. Species like blue heron may receive a short-term positive benefit during the drawdown because of the increased fishing opportunities that the trapped fish may offer. Migrating shorebirds may find good foraging habitat on exposed mud flats in late summer prior to reflooding. Adult reptiles and amphibians would be able to either continue to use the partially dewatered drawdown sites or escape to nearby similar habitat. Anticipated improvements in the aquatic plant and macroinvertebrate community with the drawdown should benefit most species of reptiles and amphibians.

Air Quality - The proposed actions would have no negative effects on air quality. The electric pumps would not directly affect air quality, so the overall effect on people, vegetation, and wildlife would be negligible.

Threatened and Endangered Species - The proposed project would have no impacts on threatened or endangered species. No State-listed or Federally-listed threatened or endangered species would be adversely affected by the project. No bald eagle nesting or winter roosting sites are located within a mile of the two proposed sites. Although bald eagles may use the nearby bluff areas and floodplain, the drawdown activities would not affect their habitat. The immediate project area does not provide the kind of habitat preferred by peregrine falcons, and no impacts are expected. Critical habitat for the State-listed wood turtle and the Blanding's turtle would not be affected by the proposed activities. Plant surveys completed in 1996 by the Environmental Management Technical Center did not find any State-listed plant species. The fine-grained nature of the substrate and the absence of appreciable current preclude the presence of the Federally-listed Higgins' eye pearly mussels. Most or all of the other State-listed threatened or endangered freshwater mussel species are thick-shelled species that prefer coarser sediments and greater water flow than what is present at the proposed sites. No impacts on any of these species are anticipated. No Federally-listed fish species occur within the general area. However, several State-listed species may occur in pools 5 and 9. Many of these species, like the blue sucker and crystal darter, are more commonly associated with flowing water habitat and are not likely to be present at the proposed sites. However, species like bluntnose darter, pallid shiner, and weed shiner frequently inhabit shallow water marshes and could be present at the project sites. The District is unaware of any State-listed species being present at either of the two drawdown sites that would be adversely impacted by the proposed drawdowns. In the long-term, improvements in habitat quality from the drawdowns could increase habitat values for some of the State-listed species. The USFWS supports the determination of no impacts on Federally-listed species (see attachment 4).

CULTURAL RESOURCES

The proposed drawdown of Lizzy Pauls Pond would have no effect on any historic properties. The nearest known site is 800 feet (250 meters) away, and the draining and refilling of the gradual-sloped pond would probably not constitute an effect in any case.

The proposed drawdown of Peck Lake would have no effect on any historic property. Although the area is known through historic research as the site of an important historic battle in 1832, archaeological surveys in 1982 and 1992 found no physical remains of the battle in Blackhawk Park. Although the area around Peck Lake has important historic associations, the drawing down and refilling of the lake would have no effect on the area's characteristics. In fact, the drawdown would afford a unique opportunity for archaeological examination of the lake bottom.

The project and these cultural resource findings have been coordinated with the Wisconsin State Historic Preservation Office (see letter of concurrence in attachment 4).

SOCIOECONOMIC FACTORS

The proposed project would have minimal or no impacts on the following Section 122 (1970 Rivers and Harbors Act) socioeconomic categories: transportation, public health and safety, community cohesion, community growth and development, business or home relocations, land use, property values, tax revenues, regional growth, employment, business activity, food supply, navigation, flooding effects, or energy resources.

Noise Pollution - The immediate vicinity around the project areas would be temporarily disrupted by drawdown activities. Some disturbance may occur from noise and human activity, although these impacts are temporary, and adverse impacts to the general public would be short-term. Electric pumps would be used, so the noise generated by the pumps would be minimal.

Recreation and Aesthetic Values - The presence of pumps, construction equipment, and mud flats and decaying vegetation created by the drawdowns would have a temporary negative effect on aesthetic values in the area. Drying of the sediments and decaying vegetation during the drawdown may produce objectionable odors, especially during the early stages of the drawdown. The areas would not support a sport fishery during the drawdown period. The handicapped accessible fishing dock that is normally placed in Peck Lake by Blackhawk Park personnel would be placed in nearby Green Lake to accommodate the demand for dock fishing. Recreational boat use of these areas is limited to non-motorized or small craft because of the shallow water. This would be eliminated during the drawdowns.

PROJECT REQUIREMENTS

OPERATION AND MAINTENANCE

Implementation of the project would be the responsibility of the COE and includes the operation of the drawdown. After the drawdown operation was completed, all pumps and closures would be removed and no further operation and maintenance would be required at the sites. Therefore, no future operation and maintenance costs or responsibilities would be incurred.

COST ESTIMATE

A cost estimate for the project is shown in table DPR-17. Extensions and column totals are rounded to the nearest $100. The estimate assumes that personnel from the Corps' Mississippi River Project Office will implement the drawdowns.

Table DPR-17 - Cost Estimate for the Selected Plan

Feature	Quantity	Unit	Unit Price	Amount	Contingency Amount	(%)	Total Amount
LIZZY PAULS POND							
INSTALLATION							
Electrical service	350	LF	$ 10.00	$ 3,500	$ 2,500	70	$ 6,000
Transformer & meter	1	JB	1000.00	1,000	700	70	1,700
Electric pump	2	EA	0	0	0	0	0
Electric controls	2	EA	150.00	300	100	25	400
Pump materials	1	JB	500.00	500	500	100	1,000
Install pump	32	MH	75.00	2,400	1,200	50	3,600
Closure materials	1	JB	100.00	100	100	100	200
Close culvert	32	MH	75.00	2,400	1,200	50	3,600
Pump & closure removal	16	MH	75.00	1,200	300	25	1,500
Subtotal for installation				11,400	6,600		18,000
OPERATION							
Electric Power							
8KW/hr for 21 days	4,000	KWH	0.07	300	200	50	500
4KW/hr for 32 days	3,100	KWH	0.07	200	100	50	300
Pump maintenance	14	MH	75.00	1,100	300	25	1,400
Excavation by hand	30	MH	75.00	2,300	2,300	100	4,600
Administration	50	MH	75.00	3,800	1,900	50	5,700
Subtotal for operation				7,700	4,800		12,500
SUBTOTAL Lizzy Pauls Pond				19,100	11,400		30,500
PECK LAKE							
INSTALLATION							
Electrical service	2,700	LF	$ 4.50	$12,200	$ 3,100	25	$15,300
Transformer & meter	1	JB	700.00	700	200	30	900
Electric pump	2	EA	0	0	0	0	0
Phase converter	2	EA	2000.00	4,000	2,000	50	6,000
Electric controls	2	EA	150.00	300	100	25	400
Pump materials	1	JB	500.00	500	500	100	1,000
Install pump	30	MH	75.00	2,300	1,200	50	3,500
Closure materials	1	JB	300.00	300	300	100	600
Close culvert	48	MH	75.00	3,600	1,800	50	5,400
Pump & closure removal	20	MH	75.00	1,500	400	25	1,900
Subtotal for installation				25,400	9,600		35,000
OPERATION (1st Year)							
Electric Power							
8KW/hr for 11 days	2,100	KWH	0.08	200	100	50	300
4KW/hr for 45 days	4,300	KWH	0.08	300	200	50	500
Pump maintenance	18	MH	75.00	1,400	400	25	1,800
Excavation by hand	24	MH	75.00	1,800	900	50	2,700
Aquatic vegetation (option)	1	JB	100.00	100	0	0	100
Administration	50	MH	75.00	3,800	1,900	50	5,700
Subtotal for 1st year operation				7,600	3,500		11,100
SUBTOTAL Peck Lake for 1st year				33,000	13,100		46,100
OPERATION (2nd Year Option)							
Reinstall pumps/closure	12	MH	75.00	900	500	50	1,400
Electric Power							
8KW/hr for 11 days	2,200	KWH	0.08	200	100	50	300
4KW/hr for 38 days	3,600	KWH	0.08	300	200	50	500
Pump maintenance	16	MH	75.00	1,200	300	25	1,500
Excavation by hand	12	MH	75.00	900	500	50	1,400
Pump & closure removal	10	MH	75.00	800	200	25	1,000
Administration	40	MH	75.00	3,000	1,500	50	4,500
Subtotal for 2nd year operation				7,300	3,300		10,600
SUBTOTAL Peck Lake for 2-year operation				40,200	16,400		56,600
TOTAL for Lizzy Pauls Pond and Peck Lake				$59,400	$27,800		$87,200

The reasons for the contingencies shown are as follows: quantity unknowns (based on available information); unit price unknowns; unknown site conditions; and undefined requirements. General design (planning) totaled $28,000. Future monitoring costs are shown in table DPR-19.

PERFORMANCE EVALUATION

The principal types, purposes, and responsibilities of project monitoring and performance evaluation are shown in table DPR-18.

Table DPR-18 - UMRS-EMP Monitoring and Performance Evaluation Matrix

Type of Activity	Purpose	Responsible Agency	Implementing Agency	Funding Source	Remarks
Sedimentation Problem Analysis	Sedimentation Research Strategy /1	USFWS	USGS (EMTC)	LTRM	Lead into pre-project monitoring; define desired conditions for plan form.
Pre-project Monitoring	Identify and define problems at specific sites	Sponsor	Sponsor	Sponsor	Should attempt to begin defining baseline
Baseline Monitoring	Establish baseline for perf. eval. and inventory basic habitat conditions for project planning	Corps of Engineers	Field stations or sponsors thru Coop Agreements or Corps /2	HREP	Over several years to reconcile perturbations. Project should be in "Active" portion of spreadsheet
Data Collection for Design	1. Identify project objectives 2. Design of project 3. Develop performance evaluation plan	Corps of Engineers	Corps of Engineers	HREP	
Performance Evaluation Monitoring	Determine success of projects	Corps of Engineers	Field stations or sponsors thru Coop Agreements, sponsor thru O&M, /3 or Corps /2	HREP	After construction
Analysis of Biological Responses to Projects	1. Species abundance monitoring and internal UMRS cause-effect relationships. Reevaluate design criteria assumptions	Corps of Engineers	Corps/USGS(EMTC) /Others	HREP	Biological Response Study tasks beyond scope of Performance Evaluation, Problem Analysis, and Trend Analysis
	2. System-wide applicability of Level 1 results	USFWS	USGS(EMTC) /Others	LTRM	Problem Analysis and Trend Analysis studies of habitat projects

1/ Refers to Sedimentation Research Strategy 1.2.1, Final Draft LTRM Operating Plan.

2/ Choice depends on logistics. When done by States under a Coop Agreement, the role of the EMTC will be to: (1) advise and assist in assuring QA/QC consistency; (2) review & comment on reasonableness of the cost estimate; and (3) be the financial manager. If a private firm or State is funded by contract, coordination with the EMTC is required to assure QA/QC consistency.

3/ Some limited reporting of information for some projects (e.g., waterfowl management areas) could be furnished by on-site personnel as part of O&M.

Pre- and post-construction plans to monitor the project performance were designed to directly measure the degree of attainment of project objectives. For each objective, an appropriate monitoring parameter was chosen. The parameter to be measured for each objective is shown in table DPR-19. Monitoring would be done before, during, and after the drawdown. Monitoring activities would be closely coordinated with any similar efforts by the Environmental Management Technical Center, the USFWS, and the WDNR. The activities could be modified in the future based on field observations. Some limited biological monitoring (fish and migratory bird response) would likely be done by USFWS and WDNR personnel as part of their normal management activities. However, biological monitoring is not part of formal performance evaluation activities proposed for the project and is not included in the estimated cost.

Elevation surveys

Sediment surface elevations would be measured at randomly selected permanent stations within the sediment texture/depth strata defined below. In addition, water surface elevations would be recorded during the drawdown periods using gages installed prior to the drawdowns.

Sediment physical and chemical properties

Randomized sampling with a corer would be conducted within defined sediment depth strata (greater and less than 1 foot (0.3 meter) of water depth). The sediment core samples would be analyzed for the set of physical properties listed in table DPR-19. The physical properties were selected to evaluate changes in physical sediment structure and erosion resistance as a result of the drawdown. The erodibility of fine-grained sediments is strongly related to its bulk wet density and other related parameters specified in table DPR-19. A limited amount of sediment nutrient monitoring would also be performed (nitrates and phosphates) to evaluate plant nutrient availability.

Water quality

With the consolidation of the sediments and increase in the areal extent of aquatic plants, sediment erodibility is expected to be reduced. This should result in an improvement in water clarity. The primary measurement of this would be accomplished with the evaluation of sediment erodibility above. However, a limited amount of spot checking would be performed in May/June, a critical time for the establishment of aquatic vegetation. In addition to measuring suspended solids, continuous in situ monitoring of turbidity, light penetration, light extinction, and temperature would be performed.

Aquatic vegetation

The standard general qualitative/semi-quantitative surveys conducted for Habitat Rehabilitation and Enhancement projects will be completed pre, during, and post project. This type of survey method involves a combination of aerial photo interpretation and ground truthing. Semi-quantitative information on species presence and relative abundance would be gathered during these surveys. Vegetation surveys would be completed during the 2 years of drawdown and annually post project to evaluate colonization and successional sequences.

Table DPR-19 - Pre- and Post-Construction Measurements

Goal	Project Objective	Enhancement Feature	Unit of Measure	Measurement Plan	Monitoring Interval	Projected Cost per Effort
Improve Fish and Wildlife Habitat Conditions	Consolidate Sediments	Drawdown	Water depths (feet) Soils - texture, % moisture, organic, etc	Elevation - Stratified Soils Survey - stratified random	Pre, 1, 5 years post Pre, 1, 5 years post	$3,000 $10,000
	Reduce Turbidity	Drawdown	Suspended Solids (mg/l) Turbidity (NTU)	Spot checks on SS - continuous turbidity	Pre, 1, 5 years post	$5,000
	Increase Aquatic Vegetation	Drawdown	Aquatic vegetation (% cover)	Aquatic Plant Surveys	1989, 1994, 0,1,2,3,5,10 years post	$4,000

* Assumes 1 year of drawdown at Lizzy Pauls Pond and 2 years of drawdown at Peck Lake.

PROJECT IMPLEMENTATION

DIVISION OF PLAN RESPONSIBILITIES

The responsibilities for plan implementation and designated performance evaluation fall to the COE as the lead Federal agency. Some project performance monitoring (field observations) would be accomplished by the Environmental Management Technical Center, USFWS, and the WDNR as described earlier.

COST APPORTIONMENT

Construction - All project implementation activities would be conducted on lands owned by the COE and managed for recreation or as part of a National Wildlife Refuge. Therefore, in accordance with Section 906(e)(3) of Public Law 99-662, the first costs for implementation of the project would be 100-percent Federal and would be borne by the COE.

Operation and Maintenance - Most of the operation and maintenance of the drawdown would be conducted by the COE as part of the project implementation responsibilities. After the drawdown has been terminated, no operation and maintenance would be required, only post-drawdown performance monitoring.

Rehabilitation - Rehabilitation of the project is not applicable because of the short-term nature of the project.

STEPS PRIOR TO PROJECT IMPLEMENTATION

After submittal of the final report to higher authority, the preparation of detailed plans for implementation of the drawdown would begin. This work would include: checking bathymetry at the sites and final design/coordination of the culvert closing, pumping methods, and electrical installation.

The current schedule is to finalize the implementation plan in May 1997 and begin the drawdowns the last week of June 1997. The sites would be allowed to refill naturally in September 1997. A second consecutive year of drawdown at Peck Lake may be implemented, pending an evaluation of the first year results by the project team.

RECOMMENDATIONS

I have weighed the accomplishments to be obtained from construction of this habitat improvement project against its cost and have considered the alternatives, impacts, and scope of the proposed project. In my judgment, the proposed project is a justified expenditure of Federal funds. I recommend that the Small Scale Drawdown project at Lizzy Pauls Pond and Peck Lake in Wisconsin for habitat rehabilitation and enhancement be approved for implementation. The total estimated implementation cost with an optional second year drawdown at Peck Lake is $87,200, which amount would be a 100-percent Federal cost according to Section 906(e)(3) of Public Law 99-662.

J. M. Wonsik
Colonel, Corps of Engineers
District Engineer

Attachments:
1. Plates (5)
2. Finding of No Significant Impact
3. Habitat Evaluation
4. Coordination
5. Site Physical Data
6. Distribution List

Attachment 1

Plates

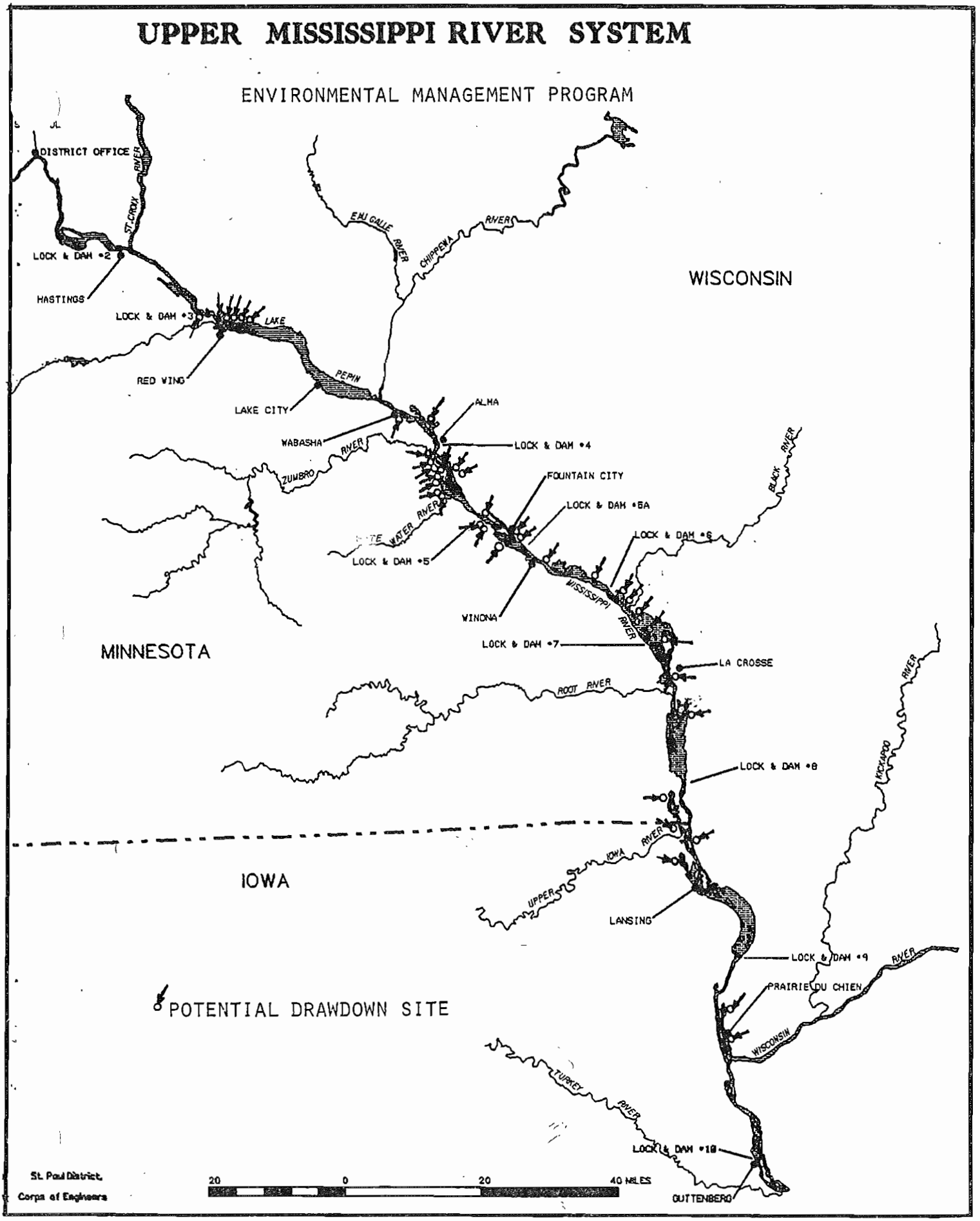


PLATE 1

General Location Map

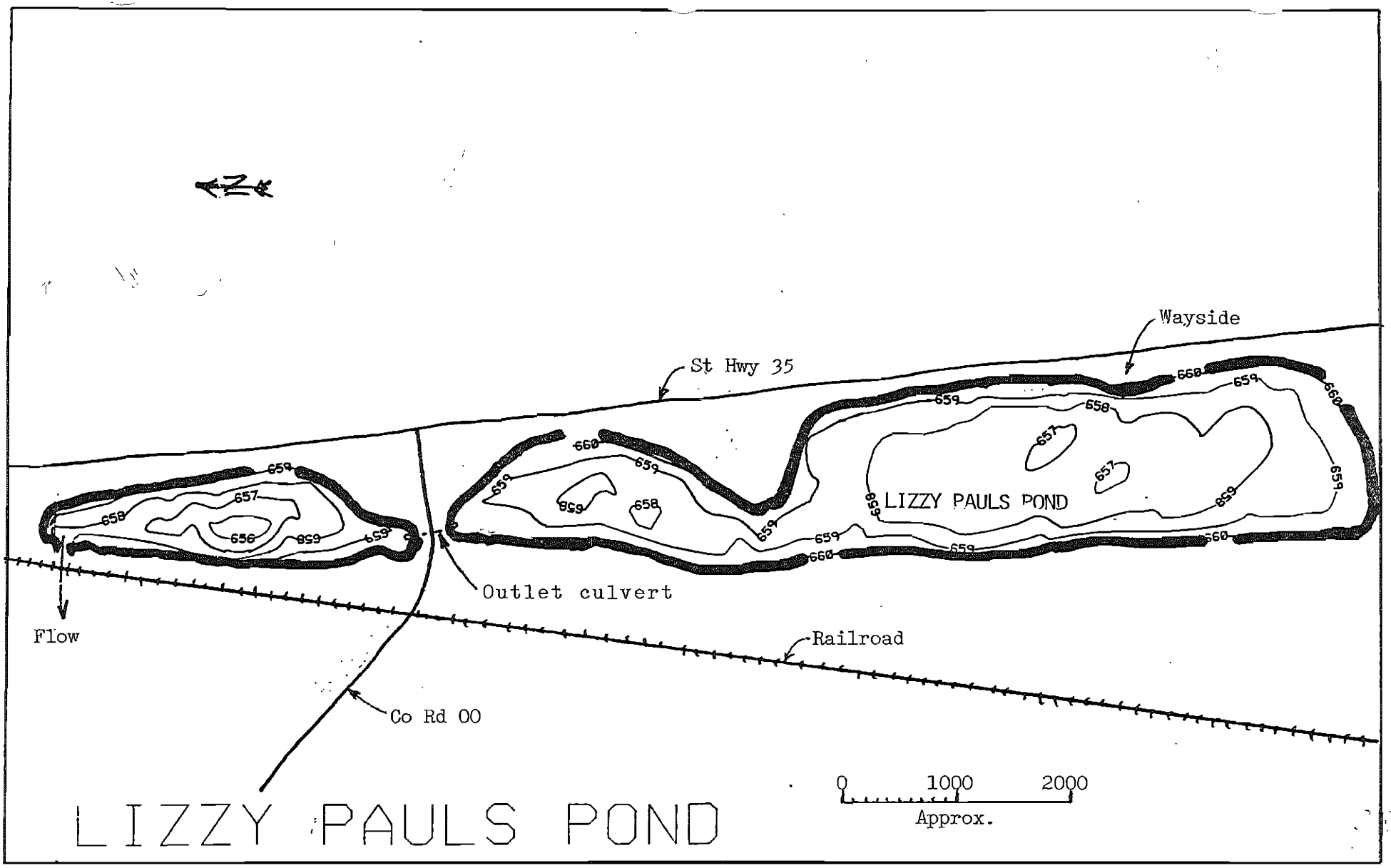

Wayside
St Hwy 35
LIZZY PAULS POND
Outlet culvert
Flow
Railroad
Co Rd 00
0
1000
2000
Approx.
LIZZY PAULS POND

PLATE 3

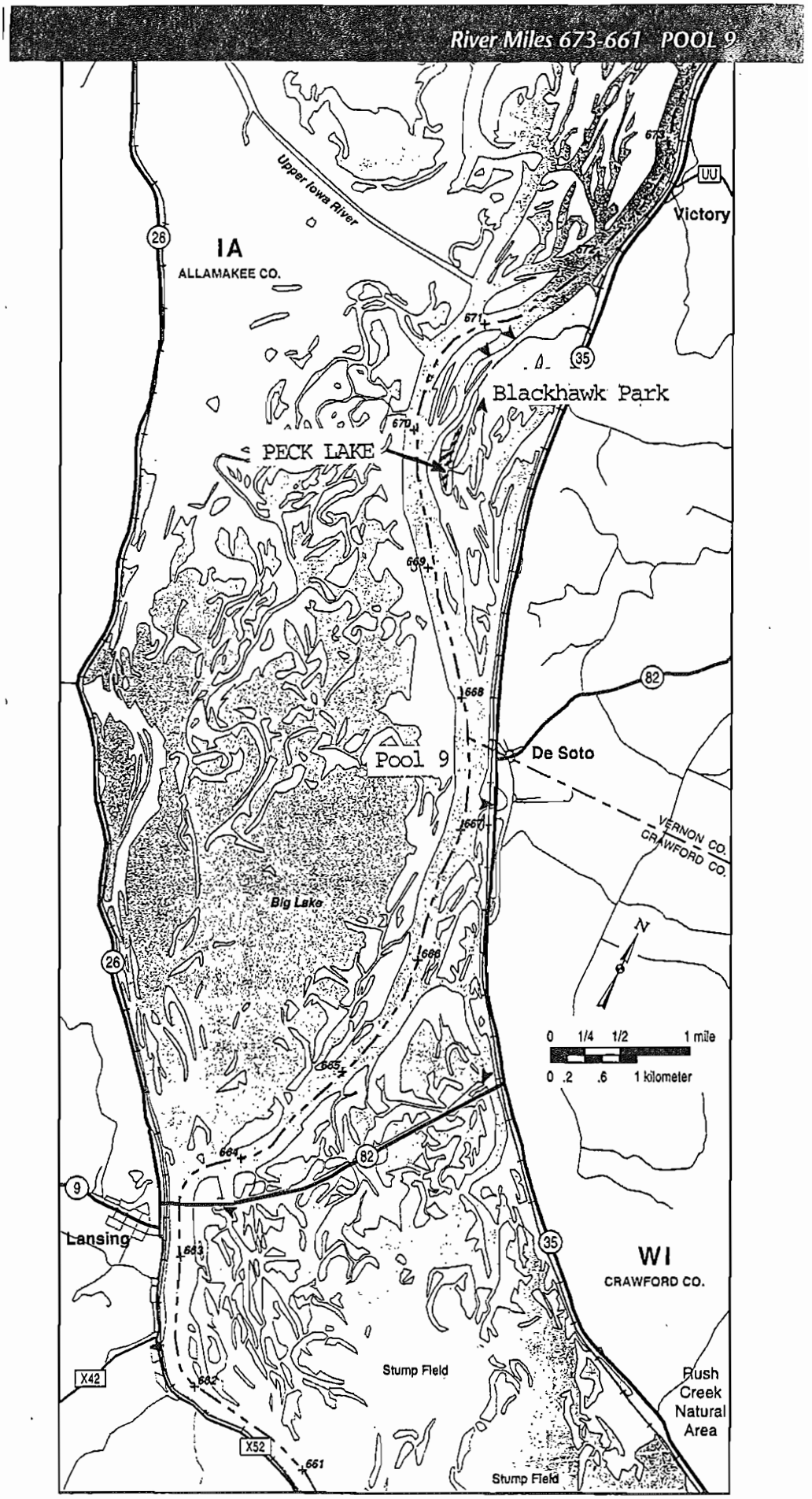
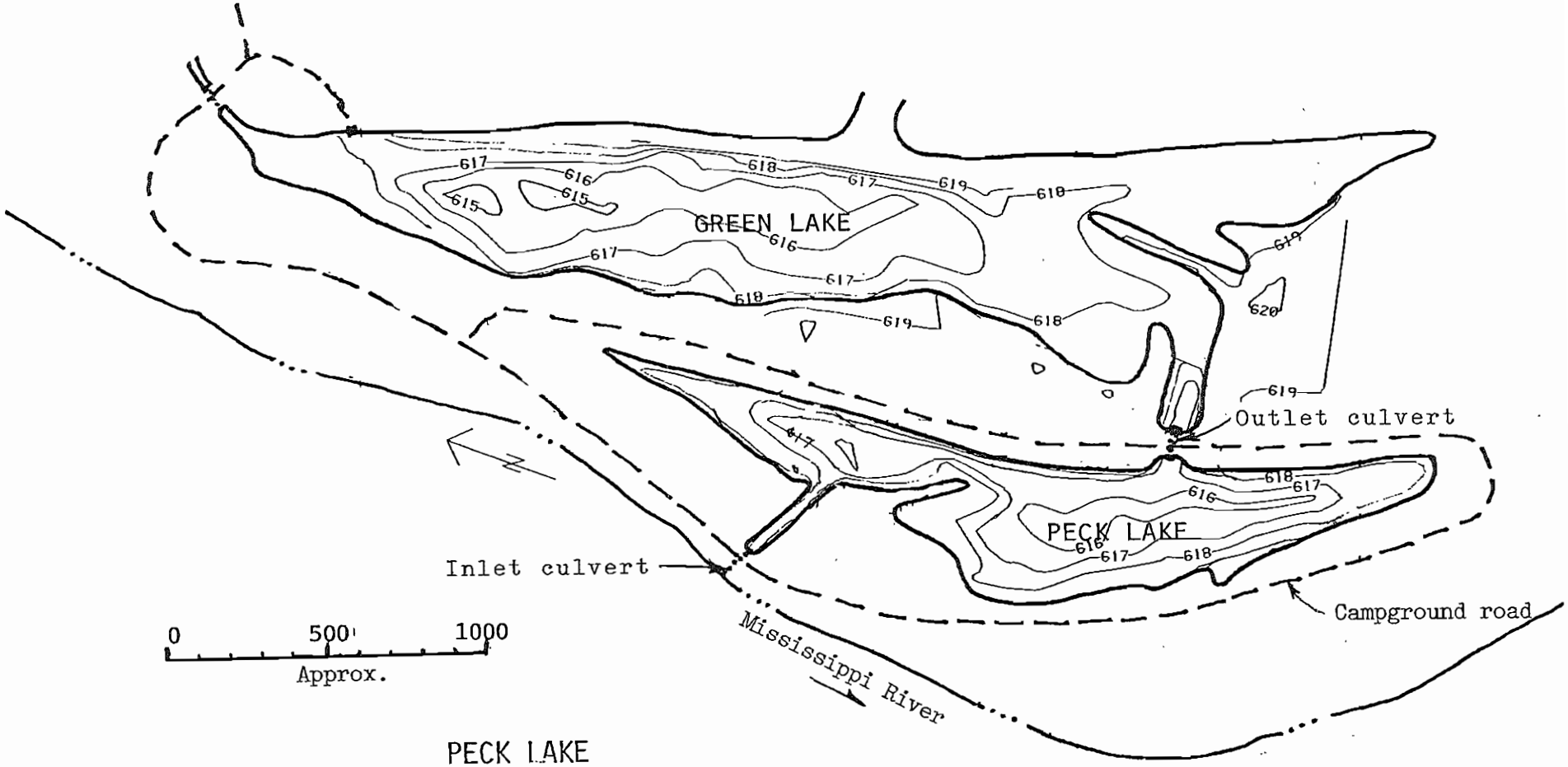

River Miles 673-661 POOL 9
Upper Iowa River
IA
ALLAMAKEE CO.
Victory
UU
Blackhawk Park
PECK LAKE
Pool 9
De Soto
VERNON CO.
CRAWFORD CO.
Big Lake
Lansing
WI
CRAWFORD CO.
Stump Field
Rush Creek Natural Area
Stump Field
X42
X52
26
9
35
82
673
672
671
670
669
668
667
666
665
664
663
662
661
N
0 1/4 1/2 1 mile
0 .2 .6 1 kilometer

PLATE 4.



PECK LAKE

PLATE 5

Attachment 2

Finding of No Significant Impact

DEPARTMENT OF THE ARMY
ST. PAUL DISTRICT, CORPS OF ENGINEERS
ARMY CORPS OF ENGINEERS CENTRE
190 FIFTH STREET EAST
ST. PAUL, MN 55101-1638

REPLY TO
ATTENTION OF
Environmental Resources Section
Planning/Engineering Division

FINDING OF NO SIGNIFICANT IMPACT

In accordance with the National Environmental Policy Act of 1969, the St. Paul District, Corps of Engineers has assessed the environmental impacts of the following project.

SMALL SCALE DRAWDOWN
HABITAT REHABILITATION AND ENHANCEMENT PROJECT
POOLS 5 & 9, UPPER MISSISSIPPI RIVER
WISCONSIN

The proposed action involves isolating and drawing down the water level at two backwater areas of the Upper Mississippi River: Lizzy Pauls Pond in pool 5 and Peck Lake in pool 9. The existing outlets would be closed and pumps would be used to lower the water levels at least 2 feet beginning in late June 1997. The drawdowns would be maintained throughout the growing season. Pumping would be stopped in the fall. Lizzy Pauls Pond would be allowed to refill. Peck Lake may be drawn down again during the growing season in 1998. The purpose of the project is to simulate a naturally occurring drought condition, resulting in a consolidation of sediments and an increase in the quality and quantity of emergent and submergent aquatic vegetation. This would improve about 71 acres of habitat for migratory birds, marsh wildlife, and fisheries. A detailed description of the proposed action is contained in the plan formulation section of the Definte Project Report/Environmental Assessment.

The finding of no significant impact is based on the following factors: (1) the proposed project would have long-term substantial beneficial impacts on wildlife and fishery resources; (2) the project would only have a minor adverse impact on natural resources during the drawdown; (3) the project would have no appreciable effects on cultural and social resources; (4) the project would have a temporary adverse effects on the aesthetic/recreation environment during the drawdown; and (5) continued coordination will be maintained with the appropriate State and Federal agencies. The environmental effects of the proposed project are discussed in the environmental assessment section of the Definte Project Report/Environmental Assessment.

The environmental review process indicates that the proposed action does not constitute a major Federal action significantly affecting the quality of the human environment. Therefore, an environmental impact statement will not be prepared.

29 May 97
Date

J. M. Wonsik
Colonel, Corps of Engineers
District Engineer

Attachment 3

Habitat Evaluation

ATTACHMENT 3

HABITAT EVALUATION OF THE SMALL SCALE DRAWDOWN EMP PROJECTS.

BACKGROUND AND METHODS

In highly managed areas, drawdowns are frequently conducted every 8 to 10 years to maintain the aquatic vegetation community. For this evaluation, it was assumed that the vegetation would be maintained at a similar quality for the first 8 years. Afterward the vegetative community would begin a slow decline and would approximate the future without project conditions at around year 15.

Three alternatives were evaluated for each of the two study areas; no action, with one year of drawdown, and with two years of drawdown.

Past sedimentation rates were not determined for the study areas, which would allow a more precise prediction of future sedimentation. Calculation of backwaters sedimentation rates have been highly variable and have ranged from greater than 2.54 to 0.18 cm/year (McHenry and Ritchie 1978, Fremling et al. 1976, Korschgen et al. 1987, Anderson et al. 1992). The more recent of these studies have reported values between 0.18 and 0.37 cm/year. Therefore, a sedimentation rate of value of 0.25 cm/year was estimated for the two backwaters, with an average loss of 3.75 cm (0.125 feet) over the next 15 years.

Tables 1 and 2 summarize the acres in each of the water depth categories. The number of acres in the 0 to 0.5 feet above normal summer pool elevation is included in the table to indicate the wetland area that presently has permanently saturated soil conditions and that does or likely could contain herbaceous emergent vegetation upon completion of the drawdown. Most of Peck Lake and Lizzy Pauls Pond contains water depths less than 3 feet. Without the project, a very minor amount of acres would be lost or changed, as a result of sedimentation. With the drawdowns, sediment consolidation should offset the estimated future minor loss of wetland habitat without the project (an average of 3.75 cm loss in depth over the 15 year project life). If compaction exceeds this rate, then the water depths would be preserved for longer than the 15- year project life, but would not be a factor in the calculation of benefits for a 15-year project life.

Table 3 summarizes the vegetation surveys that were completed by EMTC based on 1994 photographs and point surveys completed in 1996. Approximately, 11% of the surface area of the Lizzy Pauls Pond study area contains herbaceous emergent plants. The emergent plant community is dominated by arrowheads (*Sagittaria latifolia and rigida*), cattail (*Typha latifolia*) and sedges (*Carex* spp). Other emergents present included bul-rushes (*Scirpus* spp), rushes (*Juncus* spp), buttercups (*Ranunculus* spp), wild rice (*Zizania aquatica*), and bur-reed (*Sparganium* spp). Submergent species and floating leaf plants cover much of the remaining area. The prevalent submergent species are coontail (*Ceratophyllum demersum*), canada

waterweed (*Elodea canadensis*), and flatstem pondweed (*Potamogeton zosteriformis*) . Other submergent species present include river pondweed (*Potamogeton nodosus*), Eurasian milfoil (*Myriophyllum spicatum*), sago pondweed (*Potamogeton pectinatus*), curly-leaf pondweed (*Potamogeton crispus*). White water lily (*Nymphaea tuberosa*) and yellow lotus (*Nelumbo lutea*) are present in the lake.

A small band of emergents is located in the northern end of Peck Lake, covering approximately 2% of the surface area of the Peck Lake study area. The emergent community is dominated by arrowheads, bul-rushes, and rice cut-grass (*Leersia* sp.). Over a third (38%) of Peck Lake is open water. Floating leaf plants, yellow lotus and water lily, sparsely cover some of the remaining area. A limited amount of submergent plants are also present in some years, however, were absent in 1996.

The zone where herbaceous emergent vegetation is likely to be established was estimated to be between 0.5 foot above to 1 foot below summer normal water levels. Above 0.5 foot and below 1 foot, woody vegetation and submersed and floating leaf vegetation, respectively, are likely to dominate the aquatic plant community. The drawdown will kill some of the existing submersed plants that are present, especially for Lizzy Pauls Pond. However, most seeds of submersed plants are resistant to desiccation. In addition, at Lizzy Pauls Pond only a 2-foot drawdown would be completed, which should allow some of the submersed plants to survive. Consolidation and oxidizing of the sediments during the drawdown should improve water quality by reducing biotic and abiotic disturbances of the sediments and should also create more favorable and stable substrate conditions. This should create favorable conditions for the subsequent quick re-establishment of submersed aquatic plant species, upon re-flooding. Most herbaceous emergent species that are present at the proposed drawdown sites are capable of surviving reduced soil moisture, for a relatively long period of time (1 or 2 growing seasons) that would occur under the drawdown conditions. If long-term changes in water levels were done these herbaceous emergents would likely be replaced by terrestrial species.

The vegetation that develops will depend on a variety of factors including the seed bank available in the sediments, the substrate characteristics of the individual sites, and climatic conditions. It is very difficult to acurately predict the vegetative responses. The float activated pumps that would be employed at the two drawdown sites should reduce the potential for unintentional re-flooding from seepage, rainfall events, and moderate increases in river discharge, which could significantly limit the vegetation response. Because of the paucity of the existing emergent vegetation at Peck Lake, it is likely that the vegetation response in much of the de-watered zone will be dominated by annuals and terrestrial perennial plants. However, some perennial herbaceous emergents seedlings will be established because of the relatively rich flora available in the contiguous Green Lake. Some of these young perennial emergents will be lost upon re-flooding. However, the oxidized and consolidated sediments should allow some of the surviving emergents to expand over time. With a second year of drawdown, the perennial herbaceous emergents should

develop more vigorous rootstock, allowing a greater degree of survival upon re-flooding. Additional areas will also be colonized by seedlings and through vegetative expansion by rhizomes. Lizzy Pauls Pond has small patches and bands of perennial herbaceous emergents, as such it has many of the emergent vegetative characteristics that are expected after one year of drawdown on Peck Lake. The response of herbaceous emergents should be relatively good after one year of drawdown. It will improve slightly with two consecutive years of drawdowns.

The annuals that will develop in the de-watered zone will probably include both terrestrial species, like ragweed etc. and moist soil species, like smartweeds. Re-flooding these annuals in the fall could have very short-term positive benefit on migrating waterfowl. The woody plants that will colonize the de-watered zone include cottonwood, willows, and red-ozier dogwoods. Most of these will be killed upon re-flooding, except willows near the water edge.The undesirable exotic purple loosestrife could be one of the plants to colonize the dewatered zone. However, one of the reasons Lizzy Pauls Pond and Peck Lake were selected was because of the absence of purple loosestrife. This should limit the potential for this invader to become established.

Without the project, as these areas slowly fill, the emergent vegetative community should respond in a positive manner. Therefore, for the future without project conditions, the vegetative community is projected to improve slightly over time.

Enhancement/restoration of marsh and shallow aquatic habitat through drawdowns will benefit a variety of fish and wildlife species. To represent the broad community and guilds that will benefit from the proposed drawdowns, habitat suitability modelling was completed for two fish species, bluegill and northern pike; two bird species, american coot and red-winged blackbird; and one aquatic mammal species, muskrats (tables 4 through 33). The benefits were then averaged to obtain a community response (tables 34-37). This dilutes the benefits value, over what could have been obtained by selecting the single species model that was most sensitive to the proposed drawdowns. However, it strengthens the benefits qualitatively, by demonstrating the diverse fish and wildlife community that will benefit from the proposed drawdowns.

RESULTS

Tables 4 through 33 summarize the habitat evaluation modeling that was performed for bigmouth buffalo, northern pike, american coot, red-winged blackbird, and muskrat. Major assumptions used in the evaluation are also summarized in the tables. During the drawdown, it was assumed that the habitat would be un-available for the species evaluated and the habitat suitablity index was assigned a 0 value. Tables 34 and 37 summarize the results of the HEP analyses that were performed for Lizzy Pauls Pond and Peck Lake. All five of the organisms evaluated showed positive responses to the drawdowns. The fish showed the least positive response. One year

of drawdown on Lizzy Pauls Pond and one and two years of drawdown on Peck Lake showed similar incremental average annual costs per average annual habitat unit. With the existing relatively high quality habitat at Lizzy Pauls Pond, a very good vegetative response was estimated to occur after only one year of drawdown. A second year of drawdown at Lizzy Pauls Pond would increase the vegetative response only slightly. Therefore, a second year of drawdown on Lizzy Pauls Pond yielded much higher average annual costs per average annual habitat unit. Even though the habitat suitablity indices were estimated to increase slightly for both species of fish with another year of drawdown at Lizzy Pauls Pond, the loss of another year of fish use caused an incremental loss in average annual habitat units for the two fish species. The availability of seed or root stock of emergents is questionable at Peck Lake. Table 38 presents the potential species of emergent plants that could be planted at Peck Lake to increase the potential for the establishment of desired emergent vegetation.

Table 1. Summary of water depths for Lizzy Pauls Pond

Elevation range (Feet)	Water Depth (Feet)	Existing Conditions & Future with Project		Future W/O project - Year 15 *	
		Acres	% of total area	Acres	% of total area
660.5 to 660	0 to 0.5 above	6.7	13%	7.7	15%
<660 to 659	>0 to 1	14.6	28%	14.8	29%
<659 to 658	>1 to 2	15.9	31%	15.7	31%
<658 to 657	>2 to 3	14.4	28%	12.7	25%
<657	>3	0.4	1%	0.3	1%
Total		52		51.2	

* Assumptions:

1. A sedimentation rate of 0.25cm/year or an average of 0.125 feet of fill over 15 years
2. Drawdown would offset sedimentation over the 15 years (approximately an average of 3.75 cm)
3. Normal pool elevation is around 660

Table 2. Summary of water depths for Peck Lake

Elevation range feet	Water Depth (Feet)	Existing Conditions & Future with Project		Future W/O project - Year 15 *	
		Acres	% of total area	Acres	% of total area
619.5 to 619	0 to 0.5 above	1.5	8%	1.8	10%
<619 to 618	>0 to 1	4.2	22%	4.5	24%
<618 to 617	>1 to 2	6.8	36%	6.6	35%
<617 to 616	>2 to 3	4.8	25%	4.6	25%
<616	>3	1.7	9%	1.3	7%
Total		19		18.8	

* Assumptions:

1. A sedimentation rate of 0.25cm/year or an average of 0.125 feet of fill over 15 years
2. Drawdown would offset sedimentation over the 15 years (approximately an average of 3.75 cm)
3. Normal pool is around 619

Table 3. Summary of land use/land classification (1994) for Lizzy Pauls Pond and Peck Lake

Classification	Lizzy Pauls Pond		Peck Lake	
	Acres	Percent	Acres	Percent
Open water	0	0.0%	6.8	37.8%
Submergents	0.6	1.2%	0	0.0%
Submergents - rooted/floating leaf	45.9	88.1%	2.5	13.9%
Rooted Floating leaf	0	0.0%	8.3	46.1%
Emergents - Sagittaria	3.4	6.5%	0	0.0%
Emergents - Scirpus/Sagittaria	1	1.9%	0	0.0%
Emergents - Typha	0.2	0.4%	0	0.0%
Emergents - Typha/Scirpus/Sparganium	1	1.9%	0	0.0%
Emergents - Sagittaria/Scirpus/Leersia	0	0.0%	0.4	2.2%
Total	52.1		18	

Table 4. Bigmouth Buffalo Model - Lizzy Pauls Pond - No Action Alternative for Years 1, 8, & 15

Habitat Suitability Index Model for Bigmouth Buffalo

Variable	Description	YEAR 1 HSI	ASSUMPTIONS Area = 82 acres	Year: 8 HSI	ASSUMPTIONS Area = 81.8 acres	Year: 15 HSI	ASSUMPTIONS Area = 81.2 acres
V1	% Pools/backwater/marsh area	1.00	Assumed to be maximum	1.00	Assumed to be maximum	1.00	Assumed to be maximum
V2	Average max. turbidity	0.90	Turbid water from biotic factors and wind	0.90	Turbid water from biotic factors and wind	0.90	Turbid water from biotic factors and wind
V3	pH levels	1.00	Assumed to be maximum	1.00	Assumed to be maximum	1.00	Assumed to be maximum
V4	Ave. max. summer temperatures	1.00	Assumed to be maximum	1.00	Assumed to be maximum	1.00	Assumed to be maximum
V5	Ave. max. Water Temp. (Spawning)	1.00	Assumed to be maximum	1.00	Assumed to be maximum	1.00	Assumed to be maximum
V6	Min. D.O. spring/summer	1.00	Assumed to be maximum	1.00	Assumed to be maximum	1.00	Assumed to be maximum
V7	Ave. current velocity	1.00	Assumed to be maximum	1.00	Assumed to be maximum	1.00	Assumed to be maximum
V9	Dominant substrate spawning	0.80	Fairly abundant vegetation - mostly submergent	0.80	Fairly abundant vegetation - mostly submergent	0.80	Fairly abundant vegetation - mostly submergent
V11	Water level fluc. spawning	1.00	Assumed to be maximum	1.00	Assumed to be maximum	1.00	Assumed to be maximum
V13	% vegetative cover	1.00	Assumed to be maximum	1.00	Assumed to be maximum	1.00	Assumed to be maximum
	Food & Cover(Cf-c)	1.00		1.00		1.00	
	Water Quality (Cwq)	0.98		0.98		0.98	
	Reproduction (Cr)	0.84	Note: if V5 or V9 is < or = 0.4 then Cr = lowest	0.84		0.84	
	Other (Cot)	1.00		1.00		1.00	
	HSI	0.93	Note: if Cr is < or = 0.4 then HSI = lowest	0.93		0.93	

Table 6. Bigmouth Buffalo Model - Lizzy Pauls Pond - 1 Year of Drawdown for Years 1, 8, & 15

Habitat Suitability Index Model for Bigmouth Buffalo

Variable	Description	YEAR 1 HSI	ASSUMPTIONS Area = 82 acres	Year: 8 HSI	ASSUMPTIONS Area = 82 acres	Year: 15 HSI	ASSUMPTIONS Area = 82 acres
V1	% Pools/backwater/marsh area	1.00	Assumed to be maximum	1.00	Assumed to be maximum	1.00	Assumed to be maximum
V2	Average max. turbidity	1.00	Consolidated sediments reducing turbidity	1.00	Consolidated sediments reducing turbidity	0.90	Turbid water from biotic factors and wind
V3	pH levels	1.00	Assumed to be maximum	1.00	Assumed to be maximum	1.00	Assumed to be maximum
V4	Ave. max. summer temperatures	1.00	Assumed to be maximum	1.00	Assumed to be maximum	1.00	Assumed to be maximum
V5	Ave. max. Water Temp. (Spawning)	1.00	Assumed to be maximum	1.00	Assumed to be maximum	1.00	Assumed to be maximum
V6	Min. D.O. spring/summer	1.00	Assumed to be maximum	1.00	Assumed to be maximum	1.00	Assumed to be maximum
V7	Ave. current velocity	1.00	Assumed to be maximum	1.00	Assumed to be maximum	1.00	Assumed to be maximum
V9	Dominant substrate spawning	0.80	Increased flooded emergents	0.80	Increased flooded emergents	0.80	Fairly abundant vegetation - mostly submergent
V11	Water level fluc. spawning	1.00	Assumed to be maximum	1.00	Assumed to be maximum	1.00	Assumed to be maximum
V13	% vegetative cover	1.00	Assumed to be maximum	1.00	Assumed to be maximum	1.00	Assumed to be maximum
	Food & Cover(Cf-c)	1.00		1.00		1.00	
	Water Quality (Cwq)	1.00		1.00		0.98	
	Reproduction (Cr)	0.93	Note: if V5 or V9 is < or = 0.4 then Cr = lowest	0.93		0.84	
	Other (Cot)	1.00		1.00		1.00	
	HSI	0.97	Note: if Cr is < or = 0.4 then HSI = lowest	0.97		0.93	

Table 6. Bigmouth Buffalo Model - Lizzy Pauls Pond - 2 Years of Drawdown for Years 2, 8, & 15

Habitat Suitability Index Model for Bigmouth Buffalo

Variable	Description	YEAR 1 HSI	ASSUMPTIONS Area = 82 acres	Year: 8 HSI	ASSUMPTIONS Area = 82 acres	Year: 15 HSI	ASSUMPTIONS Area = 82 acres
V1	% Pools/backwater/marsh area	1.00	Assumed to be maximum	1.00	Assumed to be maximum	1.00	Assumed to be maximum
V2	Average max. turbidity	1.00	Consolidated sediments reducing turbidity	1.00	Consolidated sediments reducing turbidity	0.90	Turbid water from biotic factors and wind
V3	pH levels	1.00	Assumed to be maximum	1.00	Assumed to be maximum	1.00	Assumed to be maximum
V4	Ave. max. summer temperatures	1.00	Assumed to be maximum	1.00	Assumed to be maximum	1.00	Assumed to be maximum
V5	Ave. max. Water Temp. (Spawning)	1.00	Assumed to be maximum	1.00	Assumed to be maximum	1.00	Assumed to be maximum
V6	Min. D.O. spring/summer	1.00	Assumed to be maximum	1.00	Assumed to be maximum	1.00	Assumed to be maximum
V7	Ave. current velocity	1.00	Assumed to be maximum	1.00	Assumed to be maximum	1.00	Assumed to be maximum
V9	Dominant substrate spawning	1.00	Abundant inundated emergents & submergents	1.00	Abundant inundated emergents & submergents	0.80	Fairly abundant vegetation - mostly submergent
V11	Water level fluc. spawning	1.00	Assumed to be maximum	1.00	Assumed to be maximum	1.00	Assumed to be maximum
V13	% vegetative cover	1.00	Assumed to be maximum	1.00	Assumed to be maximum	1.00	Assumed to be maximum
	Food & Cover(Cf-c)	1.00		1.00		1.00	
	Water Quality (Cwq)	1.00		1.00		0.98	
	Reproduction (Cr)	1.00	Note: if V5 or V9 is < or = 0.4 then Cr = lowest	1.00		0.84	
	Other (Cot)	1.00		1.00		1.00	
	HSI	1.00	Note: if Cr is < or = 0.4 then HSI = lowest	1.00		0.93	

Table 7. Bigmouth Buffalo Model - Peck Lake - No Action Alternative for Years 1, 8, & 16

Habitat Suitability Index Model for Bigmouth Buffalo

Variable	Description	YEAR 1 HSI	ASSUMPTIONS Area = 19 acres	Year 8 HSI	ASSUMPTIONS Area = 18.9 acres	Year 15 HSI	ASSUMPTIONS Area = 18.9 acres
V1	% Pools/backwater/marsh area	1.00	Assumed to be maximum	1.00	Assumed to be maximum	1.00	Assumed to be maximum
V2	Average max. turbidity	0.90	Turbid water from biotic factors and wind	0.90	Turbid water from biotic factors and wind	0.90	Turbid water from biotic factors and wind
V3	pH levels	1.00	Assumed to be maximum	1.00	Assumed to be maximum	1.00	Assumed to be maximum
V4	Ave. max. summer temperatures	1.00	Assumed to be maximum	1.00	Assumed to be maximum	1.00	Assumed to be maximum
V5	Ave. max. Water Temp. (Spawning)	1.00	Assumed to be maximum	1.00	Assumed to be maximum	1.00	Assumed to be maximum
V6	Min. D.O. spring/summer	1.00	Assumed to be maximum	1.00	Assumed to be maximum	1.00	Assumed to be maximum
V7	Ave. current velocity	1.00	Assumed to be maximum	1.00	Assumed to be maximum	1.00	Assumed to be maximum
V9	Dominant substrate spawning	0.30	Limited inundated emergents	0.30	Limited inundated emergents	0.30	Limited inundated emergents
V11	Water level fluc. spawning	1.00	Assumed to be maximum	1.00	Assumed to be maximum	1.00	Assumed to be maximum
V13	% vegetative cover	1.00	Assumed to be maximum	1.00	Assumed to be maximum	1.00	Assumed to be maximum
	Food & Cover(Cf-c)	1.00		1.00		1.00	
	Water Quality (Cwq)	0.98		0.98		0.98	
	Reproduction (Cr)	0.30	Note: if V5 or V9 is < or = 0.4 then Cr = lowest	0.30		0.30	
	Other (Cot)	1.00		1.00		1.00	
	HSI	0.30	Note: if Cr is < or = 0.4 then HSI = lowest	0.30		0.30	

Table 8. Bigmouth Buffalo Model - Peck Lake - 1 Year of Drawdown for Years 1, 8, & 16

Habitat Suitability Index Model for Bigmouth Buffalo

Variable	Description	YEAR 1 HSI	ASSUMPTIONS Area = 16 acres	Year 8 HSI	ASSUMPTIONS Area = 16 acres	Year 15 HSI	ASSUMPTIONS Area = 16 acres
V1	% Pools/backwater/marsh area	1.00	Assumed to be maximum	1.00	Assumed to be maximum	1.00	Assumed to be maximum
V2	Average max. turbidity	1.00	Consolidated sediments reducing turbidity	1.00	Consolidated sediments reducing turbidity	0.90	Turbid water from biotic factors and wind
V3	pH levels	1.00	Assumed to be maximum	1.00	Assumed to be maximum	1.00	Assumed to be maximum
V4	Ave. max. summer temperatures	1.00	Assumed to be maximum	1.00	Assumed to be maximum	1.00	Assumed to be maximum
V5	Ave. max. Water Temp. (Spawning)	1.00	Assumed to be maximum	1.00	Assumed to be maximum	1.00	Assumed to be maximum
V6	Min. D.O. spring/summer	1.00	Assumed to be maximum	1.00	Assumed to be maximum	1.00	Assumed to be maximum
V7	Ave. current velocity	1.00	Assumed to be maximum	1.00	Assumed to be maximum	1.00	Assumed to be maximum
V9	Dominant substrate spawning	0.60	Fairly abundant vegetation - mostly submergent	0.60	Fairly abundant vegetation - mostly submergent	0.60	Fairly abundant vegetation - mostly submergent
V11	Water level fluc. spawning	1.00	Assumed to be maximum	1.00	Assumed to be maximum	1.00	Assumed to be maximum
V13	% vegetative cover	1.00	Assumed to be maximum	1.00	Assumed to be maximum	1.00	Assumed to be maximum
	Food & Cover(Cf-c)	1.00		1.00		1.00	
	Water Quality (Cwq)	1.00		1.00		0.98	
	Reproduction (Cr)	0.84	Note: if V5 or V9 is < or = 0.4 then Cr = lowest	0.84		0.30	
	Other (Cot)	1.00		1.00		1.00	
	HSI	0.93	Note: if Cr is < or = 0.4 then HSI = lowest	0.93		0.30	

Table 9. Bigmouth Buffalo Model - Peck Lake - 2 Years of Drawdown for Years 2, 8, & 16

Habitat Suitability Index Model for Bigmouth Buffalo

Variable	Description	YEAR 2 HSI	ASSUMPTIONS Area = 16 acres	Year 8 HSI	ASSUMPTIONS Area = 16 acres	Year 15 HSI	ASSUMPTIONS Area = 16 acres
V1	% Pools/backwater/marsh area	1.00	Assumed to be maximum	1.00	Assumed to be maximum	1.00	Assumed to be maximum
V2	Average max. turbidity	1.00	Consolidated sediments reducing turbidity	1.00	Consolidated sediments reducing turbidity	0.90	Turbid water from biotic factors and wind
V3	pH levels	1.00	Assumed to be maximum	1.00	Assumed to be maximum	1.00	Assumed to be maximum
V4	Ave. max. summer temperatures	1.00	Assumed to be maximum	1.00	Assumed to be maximum	1.00	Assumed to be maximum
V5	Ave. max. Water Temp. (Spawning)	1.00	Assumed to be maximum	1.00	Assumed to be maximum	1.00	Assumed to be maximum
V6	Min. D.O. spring/summer	1.00	Assumed to be maximum	1.00	Assumed to be maximum	1.00	Assumed to be maximum
V7	Ave. current velocity	1.00	Assumed to be maximum	1.00	Assumed to be maximum	1.00	Assumed to be maximum
V9	Dominant substrate spawning	1.00	Abundant inundated emergents & submergents	1.00	Abundant inundated emergents & submergents	0.30	Limited inundated emergents
V11	Water level fluc. spawning	1.00	Assumed to be maximum	1.00	Assumed to be maximum	1.00	Assumed to be maximum
V13	% vegetative cover	1.00	Assumed to be maximum	1.00	Assumed to be maximum	1.00	Assumed to be maximum
	Food & Cover(Cf-c)	1.00		1.00		1.00	
	Water Quality (Cwq)	1.00		1.00		0.98	
	Reproduction (Cr)	1.00	Note: if V5 or V9 is < or = 0.4 then Cr = lowest	1.00		0.30	
	Other (Cot)	1.00		1.00		1.00	
	HSI	1.00	Note: if Cr is < or = 0.4 then HSI = lowest	1.00		0.30	

Table 10. Northern Pike Model - Lizzy Pauls Pond - No Action Alternative for Years 1, 8, & 15

Habitat Suitability Index Model for Northern Pike

Variable	Description	YEAR 1 HSI	ASSUMPTIONS Area = 52 acres	Year 8 HSI	ASSUMPTIONS Area = 51.8 acres	Year 15 HSI	ASSUMPTIONS Area = 51.2 acres
V1	Ratio Spawning/summer habitat	0.80	Ratio>0.3 - B-curve (veg coverring much of bottom)	0.80	Ratio>0.3 - B-curve (veg over much of bottom)	0.80	Ratio>0.3 - B-curve (veg over much of bottom)
V2	Water level drop early develop	0.90	Assumed to be less than 1 foot	0.90	Assumed to be less than 1 foot	0.90	Assumed to be less than 1 foot
V3	% Cover (Vegetation)	0.90	Value around 80%	0.90	Value around 80%	0.90	Value around 80%
V4	Log of total dissolved solids	1.00	Assumed to be maximum	1.00	Assumed to be maximum	1.00	Assumed to be maximum
V5	Least suitable pH	1.00	Assumed to be maximum	1.00	Assumed to be maximum	1.00	Assumed to be maximum
V6	Ave. length frost-free	1.00	Assumed to be maximum	1.00	Assumed to be maximum	1.00	Assumed to be maximum
V7	Max. weekly avg. Temperature	1.00	Assumed to be maximum	1.00	Assumed to be maximum	1.00	Assumed to be maximum
V8	Summer Area with < 5cm/sec	1.00	All < 5cm/sec	1.00	All < 5cm/sec	1.00	All < 5cm/sec
V9	Stream Gradient	N/A		N/A		N/A	
	HSI = Lowest of V1 - V9	0.80		0.80		0.80	

Table 11. Northern Pike Model - Lizzy Pauls Pond - With 1 Year of Drawdown for Years 1, 8, & 15

Habitat Suitability Index Model for Northern Pike

Variable	Description	YEAR 1 HSI	ASSUMPTIONS Area = 52 acres	Year 8 HSI	ASSUMPTIONS Area = 52 acres	Year 15 HSI	ASSUMPTIONS Area = 52 acres
V1	Ratio Spawning/summer habitat	1.00	Ratio>0.3 - A-curve (Veg obscures bottom)	1.00	Ratio>0.3 - A-curve (Veg obscures bottom)	0.80	Ratio>0.3 - B-curve (veg over much of bottom)
V2	Water level drop early develop	0.90	Assumed to be less than 1 foot	0.90	Assumed to be less than 1 foot	0.90	Assumed to be less than 1 foot
V3	% Cover (Vegetation)	0.90	Value around 80%	0.90	Value around 80%	0.90	Value around 80%
V4	Log of total dissolved solids	1.00	Assumed to be maximum	1.00	Assumed to be maximum	1.00	Assumed to be maximum
V5	Least suitable pH	1.00	Assumed to be maximum	1.00	Assumed to be maximum	1.00	Assumed to be maximum
V6	Ave. length frost-free	1.00	Assumed to be maximum	1.00	Assumed to be maximum	1.00	Assumed to be maximum
V7	Max. weekly avg. Temperature	1.00	Assumed to be maximum	1.00	Assumed to be maximum	1.00	Assumed to be maximum
V8	Summer Area with < 5cm/sec	1.00	All < 5cm/sec	1.00	All < 5cm/sec	1.00	All < 5cm/sec
V9	Stream Gradient	N/A		N/A		N/A	
	HSI = Lowest of V1 - V9	0.80		0.80		0.80	

Table 12. Northern Pike Model - Lizzy Pauls Pond - With 2 Years of Drawdown for Years 2, 8, & 15

Habitat Suitability Index Model for Northern Pike

Variable	Description	YEAR 2 HSI	ASSUMPTIONS Area = 52 acres	Year 8 HSI	ASSUMPTIONS Area = 52 acres	Year 15 HSI	ASSUMPTIONS Area = 52 acres
V1	Ratio Spawning/summer habitat	1.00	Ratio>0.3 - A-curve (Veg obscures bottom)	1.00	Ratio>0.3 - A-curve (Veg obscures bottom)	0.80	Ratio>0.3 - B-curve (veg over much of bottom)
V2	Water level drop early develop	0.90	Assumed to be less than 1 foot	0.90	Assumed to be less than 1 foot	0.90	Assumed to be less than 1 foot
V3	% Cover (Vegetation)	0.90	Value around 80%	0.90	Value around 80%	0.90	Value around 80%
V4	Log of total dissolved solids	1.00	Assumed to be maximum	1.00	Assumed to be maximum	1.00	Assumed to be maximum
V5	Least suitable pH	1.00	Assumed to be maximum	1.00	Assumed to be maximum	1.00	Assumed to be maximum
V6	Ave. length frost-free	1.00	Assumed to be maximum	1.00	Assumed to be maximum	1.00	Assumed to be maximum
V7	Max. weekly avg. Temperature	1.00	Assumed to be maximum	1.00	Assumed to be maximum	1.00	Assumed to be maximum
V8	Summer Area with < 5cm/sec	1.00	All < 5cm/sec	1.00	All < 5cm/sec	1.00	All < 5cm/sec
V9	Stream Gradient	N/A		N/A		N/A	
	HSI = Lowest of V1 - V9	0.90		0.90		0.80	

Table 13. Northern Pike Model - Peck Lake - No Action Alternative for Years 1, 8, & 15

Habitat Suitability Index Model for Northern Pike

Variable	Description	YEAR 1 HSI	ASSUMPTIONS Area = 19 acres	Year 8 HSI	ASSUMPTIONS Area = 18.9 acres	Year 15 HSI	ASSUMPTIONS Area = 18.8 acres
V1	Ratio Spawning/summer habitat	0.20	Ratio>0.3 - D-curve (Thinly scattered vegetation)	0.20	Ratio>0.3 - D-curve (Thinly scattered vegetation)	0.20	Ratio>0.3 - D-curve (Thinly scattered vegetation)
V2	Water level drop early develop	0.90	Assumed to be less than 1 foot	0.90	Assumed to be less than 1 foot	0.90	Assumed to be less than 1 foot
V3	% Cover (Vegetation)	0.90	Value around 20%	1.00	Value around 25%	1.00	Value around 30%
V4	Log of total dissolved solids	1.00	Assumed to be maximum	1.00	Assumed to be maximum	1.00	Assumed to be maximum
V5	Least suitable pH	1.00	Assumed to be maximum	1.00	Assumed to be maximum	1.00	Assumed to be maximum
V6	Ave. length frost-free	1.00	Assumed to be maximum	1.00	Assumed to be maximum	1.00	Assumed to be maximum
V7	Max. weekly avg. Temperature	1.00	Assumed to be maximum	1.00	Assumed to be maximum	1.00	Assumed to be maximum
V8	Summer Area with < 5cm/sec	1.00	All < 5cm/sec	1.00	All < 5cm/sec	1.00	All < 5cm/sec
V9	Stream Gradient	N/A		N/A		N/A	
	HSI = Lowest of V1 - V9	0.20		0.20		0.20	

Table 14. Northern Pike Model - Peck Lake - With 1 Year of Drawdown for Years 1, 8, & 15

Habitat Suitability Index Model for Northern Pike

Variable	Description	YEAR 1 HSI	ASSUMPTIONS Area = 19 acres	Year 8 HSI	ASSUMPTIONS Area = 19 acres	Year 15 HSI	ASSUMPTIONS Area = 19 acres
V1	Ratio Spawning/summer habitat	0.50	Ratio>0.3 - C-curve (veg over some of bottom)	0.50	Ratio>0.3 - C-curve (veg over some of bottom)	0.20	Ratio>0.3 - D-curve (Thinly scattered vegetation)
V2	Water level drop early develop	0.90	Assumed to be less than 1 foot	0.90	Assumed to be less than 1 foot	0.90	Assumed to be less than 1 foot
V3	% Cover (Vegetation)	1.00	Value around 50%	1.00	Value around 50%	1.00	Value around 50%
V4	Log of total dissolved solids	1.00	Assumed to be maximum	1.00	Assumed to be maximum	1.00	Assumed to be maximum
V5	Least suitable pH	1.00	Assumed to be maximum	1.00	Assumed to be maximum	1.00	Assumed to be maximum
V6	Ave. length frost-free	1.00	Assumed to be maximum	1.00	Assumed to be maximum	1.00	Assumed to be maximum
V7	Max. weekly avg. Temperature	1.00	Assumed to be maximum	1.00	Assumed to be maximum	1.00	Assumed to be maximum
V8	Summer Area with < 5cm/sec	1.00	All < 5cm/sec	1.00	All < 5cm/sec	1.00	All < 5cm/sec
V9	Stream Gradient	N/A		N/A		N/A	
	HSI = Lowest of V1 - V9	0.50		0.50		0.20	

Table 15. Northern Pike Model - Peck Lake - With 2 Years of Drawdown for Years 2, 8, & 15

Habitat Suitability Index Model for Northern Pike

Variable	Description	YEAR 2 HSI	ASSUMPTIONS Area = 19 acres	Year 8 HSI	ASSUMPTIONS Area = 19 acres	Year 15 HSI	ASSUMPTIONS Area = 19 acres
V1	Ratio Spawning/summer habitat	0.80	Ratio>0.3 - B-curve (veg over much of bottom)	0.80	Ratio>0.3 - B-curve (veg over much of bottom)	0.20	Ratio=>0.3 - D-curve (Thinly scattered vegetation)
V2	Water level drop early develop	0.90	Assumed to be less than 1 foot	0.90	Assumed to be less than 1 foot	0.90	Assumed to be less than 1 foot
V3	% Cover (Vegetation)	0.90	Value around 80%	0.90	Value around 80%	1.00	Value around 30%
V4	Log of total dissolved solids	1.00	Assumed to be maximum	1.00	Assumed to be maximum	1.00	Assumed to be maximum
V5	Least suitable pH	1.00	Assumed to be maximum	1.00	Assumed to be maximum	1.00	Assumed to be maximum
V6	Ave. length frost-free	1.00	Assumed to be maximum	1.00	Assumed to be maximum	1.00	Assumed to be maximum
V7	Max. weekly avg. Temperature	1.00	Assumed to be maximum	1.00	Assumed to be maximum	1.00	Assumed to be maximum
V8	Summer Area with < 5cm/sec	1.00	All < 5cm/sec	1.00	All < 5cm/sec	1.00	All < 5cm/sec
V9	Stream Gradient	N/A		N/A		N/A	
	HSI = Lowest of V1 - V9	0.80		0.80		0.20	

Table 16. American Coot Model - Lizzy Pauls Pond - No Action Alternative for Years 1, 8, & 15

Habitat Suitability Index Model for American Coot

HSI AMERICAN COOT MODEL		YEAR 1	ASSUMPTIONS	Year 8	ASSUMPTIONS	Year 15	ASSUMPTIONS
Variable	Description	HSI	Area = 52 acres	HSI	Area = 51.6 acres	HSI	Area = 51.2 acres
V1	% Persistent emergent	0.15	Around 3% (25% of total 11% emergent cover)	0.15	Around 3% (25% of total 12% emergent cover)	0.15	Around 3% (25% of total 14% emergent cover)
V2	Edge index-Emergent/open water	0.10	Edge index estimated to be less than 1	0.10	Edge index estimated to be less than 1	0.10	Edge index estimated to be less than 1
V3	Water Regime	0.30	Value = Permanently flooded	0.30	Value = Permanently flooded	0.30	Value = Permanently flooded
	HSI= (v1*v2)^1/2 * v3	0.04		0.04		0.04	

Table 17. American Coot Model - Lizzy Pauls Pond - With 1 Year of Drawdown for Years 1, 8, & 15

Habitat Suitability Index Model for American Coot

HSI AMERICAN COOT MODEL		YEAR 1	ASSUMPTIONS	Year 8	ASSUMPTIONS	Year 15	ASSUMPTIONS
Variable	Description	HSI	Area = 52 acres	HSI	Area = 52 acres	HSI	Area = 52 acres
V1	% Persistent emergent	0.35	Around 11% (33% of total 33% emergent cover)	0.35	Around 11% (33% of total 33% emergent cover)	0.15	Around 3% (25% of total 14% emergent cover)
V2	Edge index-Emergent/open water	0.20	Edge index calculated to be 1.4	0.20	Edge index calculated to be 1.4	0.10	Edge index estimated to be less than 1
V3	Water Regime	0.90	Value = Interimenttently flooded	0.90	Value = Interimenttently flooded	0.30	Value = Permanently flooded
	HSI= (v1*v2)^1/2 * v3	0.24		0.24		0.04	

Table 18. American Coot Model - Lizzy Pauls Pond - With 2 Years of Drawdown for Years 2, 8, & 15

Habitat Suitability Index Model for American Coot

HSI AMERICAN COOT MODEL		YEAR 2	ASSUMPTIONS	Year 8	ASSUMPTIONS	Year 15	ASSUMPTIONS
Variable	Description	HSI	Area = 52 acres	HSI	Area = 52 acres	HSI	Area = 52 acres
V1	% Persistent emergent	0.50	Around 15% (33% of total 43% emergent cover)	0.50	Around 15% (33% of total 43% emergent cover)	0.15	Around 3% (25% of total 14% emergent cover)
V2	Edge index-Emergent/open water	0.25	Edge index calculated to be 1.5	0.25	Edge index calculated to be 1.5	0.10	Edge index estimated to be less than 1
V3	Water Regime	0.90	Value = Interimenttently flooded	0.90	Value = Interimenttently flooded	0.30	Value = Permanently flooded
	HSI= (v1*v2)^1/2 * v3	0.32		0.32		0.04	

Assumptions:

1. Estimated that after drawdown emergent vegetation would occupy zone from +0.5 to -1 foot under normal pool.
2. Drawdown would simulate conditions referred to in the Model as Interimenttently Flooded water regime (does not contain water only in extreme drought years)

Table 19. American Coot Model - Peck Lake - No Action Alternative for Years 1, 8, & 15

Habitat Suitability Index Model for American Coot

HSI AMERICAN COOT MODEL		YEAR 1	ASSUMPTIONS	Year 8	ASSUMPTIONS	Year 15	ASSUMPTIONS
Variable	Description	HSI	Area = 19	HSI	Area = 19.9	HSI	Area = 19.9
V1	% Persistent emergent	0.10	Around <1% (10% of total 2% emergent cover)	0.10	Around <1% (10% of total 3% emergent cover)	0.10	Around <1% (15% of total 5% emergent cover)
V2	Edge index-Emergent/open water	0.10	Edge index estimated to be less than 1	0.10	Edge index estimated to be less than 1	0.10	Edge index estimated to be less than 1
V3	Water Regime	0.30	Value = Permanently flooded	0.30	Value = Permanently flooded	0.30	Value = Permanently flooded
	HSI= (v1*v2)^1/2 * v3	0.03		0.03		0.03	

Table 20. American Coot Model - Peck Lake - With 1 Year of Drawdown for Years 1, 8, & 15

Habitat Suitability Index Model for American Coot

HSI AMERICAN COOT MODEL		YEAR 1	ASSUMPTIONS	Year 8	ASSUMPTIONS	Year 15	ASSUMPTIONS
Variable	Description	HSI	Area = 19	HSI	Area = 19	HSI	Area = 19
V1	% Persistent emergent	0.20	Around 6% (33% of total 20% emergent cover)	0.20	Around 6% (33% of total 20% emergent cover)	0.10	Around <1% (15% of total 5% emergent cover)
V2	Edge index-Emergent/open water	0.25	Edge index calculated to be 1.6	0.25	Edge index calculated to be 1.6	0.10	Edge index estimated to be less than 1
V3	Water Regime	0.90	Value = Interimenttently flooded	0.90	Value = Interimenttently flooded	0.30	Value = Permanently flooded
	HSI= (v1*v2)^1/2 * v3	0.20		0.20		0.03	

Table 21. American Coot Model - Peck Lake - With 2 Years of Drawdown for Years 2, 8, & 15

Habitat Suitability Index Model for American Coot

HSI AMERICAN COOT MODEL		YEAR 2	ASSUMPTIONS	Year 8	ASSUMPTIONS	Year 15	ASSUMPTIONS
Variable	Description	HSI	Area = 19	HSI	Area = 19	HSI	Area = 19
V1	% Persistent emergent	0.35	Around 11% (33% of total 34% emergent cover)	0.35	Around 11% (33% of total 34% emergent cover)	0.10	Around <1% (15% of total 5% emergent cover)
V2	Edge index-Emergent/open water	0.30	Edge index calculated to be 1.7	0.30	Edge index calculated to be 1.7	0.10	Edge index estimated to be less than 1
V3	Water Regime	0.90	Value = Interimenttently flooded	0.90	Value = Interimenttently flooded	0.30	Value = Permanently flooded
	HSI= (v1*v2)^1/2 * v3	0.29		0.29		0.03	

Assumptions:

1. Estimated that after drawdown emergent vegetation would occupy zone from +0.5 to -1 foot under normal pool.
2. Drawdown would simulate conditions referred to in the Model as Interimenttently Flooded water regime (does not contain water only in extreme drought years)

Table 22. Red-winged Blackbird Model - Lizzy Pauls Pond - No Action Alternative for Years 1, 8, & 15

Habitat Suitability Index Model for Red-winged Blackbird

HSI Red-winged Blackbird MODEL		YEAR 1	ASSUMPTIONS	Year 8	ASSUMPTIONS	Year 15	ASSUMPTIONS
Variable	Description	HSI	AREA = 52 ACRES	HSI	AREA = 51.8 ACRES	HSI	AREA = 51.2 ACRES
V1	Type of Emergent herbaceous	0.20	Limited (mostly narrow-leaved - some broad-leaved)	0.25	Limited (mostly narrow-leaved - minor increase in broad-leaved)	0.30	Limited (mostly narrow-leaved - minor increase in broad-leaved)
V2	Water Regime	0.90	Permanent	0.90	Permanent	0.90	Permanent
V3	Clarity of water - carp, etc	0.40	Carp & wind - distrurbance of floculant sediments	0.40	Carp & wind - distrurbance of floculant sediments	0.40	Carp & wind - distrurbance of floculant sediments
V4	Abundance of emergent insects	0.30	Limited insects with floculant sediments & reduced plants	0.30	Limited insects with floculant sediments & reduced plants	0.30	Limited insects with floculant sediments & reduced plants
V5	% Emergent Canopy	0.20	Wetland contains some patches of emergents	0.25	Wetland contains few patches of emergents	0.30	Wetland contains few patches of emergents
	HSI= (v1*v2*v3*v4*v5)^(1/5)	0.34		0.37		0.40	

Table 23. Red-winged Blackbird Model - Lizzy Pauls Pond - With 1 Year of Drawdown for Years 1, 8, & 15

Habitat Suitability Index Model for Red-winged Blackbird

HSI Red-winged Blackbird MODEL		YEAR 1	ASSUMPTIONS	Year 8	ASSUMPTIONS	Year 15	ASSUMPTIONS
Variable	Description	HSI	AREA = 52 ACRES	HSI	AREA = 52 ACRES	HSI	AREA = 52 ACRES
V1	Type of Emergent herbaceous	0.90	Emergents 33% of area - Many broad-leafed	0.90	Emergents 33% of area - Many broad-leafed	0.30	Limited (mostly narrow-leafed - minor amount of broad-leaved)
V2	Water Regime	0.90	Permanent	0.90	Permanent	0.90	Permanent
V3	Clarity of water - carp, etc	0.70	Reduced distrubance of sediments, except carp	0.70	Reduced distrubance of sediments, except carp	0.40	Carp & wind - distrurbance of floculant sediments
V4	Abundance of emergent insects	0.50	Improved aquatic plants & substrate conditions	0.50	Improved aquatic plants & substrate conditions	0.30	Limited insects with floculant sediments & reduced plants
V5	% Emergent Canopy	0.80	1/3 to 2/3 mix of emergents/open water	0.80	1/3 to 2/3 mix of emergents/open water	0.30	Wetland contains few patches of emergents
	HSI= (v1*v2*v3*v4*v5)	0.74		0.74		0.40	

Table 24. Red-winged Blackbird Model - Lizzy Pauls Pond - With 2 Years of Drawdown for Years 2, 8, & 15

Habitat Suitability Index Model for Red-winged Blackbird

HSI Red-winged Blackbird MODEL		YEAR 2	ASSUMPTIONS	Year 8	ASSUMPTIONS	Year 15	ASSUMPTIONS
Variable	Description	HSI	AREA = 52 ACRES	HSI	AREA = 52 ACRES	HSI	AREA = 52 ACRES
V1	Type of Emergent herbaceous	1.00	Emergents 44% of area - Many broad-leafed	1.00	Emergents 33% of area - Many broad-leafed	0.30	Limited (mostly narrow-leafed - minor amount of broad-leaved)
V2	Water Regime	0.90	Permanent	0.90	Permanent	0.90	Permanent
V3	Clarity of water - carp, etc	0.70	Reduced distrubance of sediments, except carp	0.70	Reduced distrubance of sediments, except carp	0.40	Carp & wind - distrurbance of floculant sediments
V4	Abundance of emergent insects	0.50	Improved aquatic plants & substrate conditions	0.50	Improved aquatic plants & substrate conditions	0.30	Limited insects with floculant sediments & reduced plants
V5	% Emergent Canopy	1.00	Approximate equal mix of emergents/open water	1.00	Approximate equal mix of emergents/open water	0.30	Wetland contains few patches of emergents
	HSI= (v1*v2*v3*v4*v5)	0.79		0.79		0.40	

Assumptions:

1. Estimated that after2 years of drawdown emergent vegetation would occupy zone from +0.5 to -1 foot under normal pool.
2. Modifications were made to the variable values in the model to allow assignment of values between maximum and minimum

Table 25. Red-winged Blackbird Model - Peck Lake - No Action Alternative for Years 1, 8, & 15

Habitat Suitability Index Model for Red-winged Blackbird

HSI Red-winged Blackbird MODEL		YEAR 1	ASSUMPTIONS	Year 8	ASSUMPTIONS	Year 15	ASSUMPTIONS
Variable	Description	HSI	AREA = 19 ACRES	HSI	AREA = 18.8 ACRES	HSI	AREA = 18.8 ACRES
V1	Type of Emergent herbaceous	0.10	Limited emergents - mostly narrow-leaved	0.10	Limited emergents - mostly narrow-leaved	0.10	Limited emergents - mostly narrow-leaved
V2	Water Regime	0.90	Permanent	0.90	Permanent	0.90	Permanent
V3	Clarity of water - carp, etc	0.40	Carp & wind - distrurbance of floculant sediments	0.40	Carp & wind - distrurbance of floculant sediments	0.40	Carp & wind - distrurbance of floculant sediments
V4	Abundance of emergent insects	0.30	Limited insects with floculant sediments & reduced plants	0.30	Limited insects with floculant sediments & reduced plants	0.30	Limited insects with floculant sediments & reduced plants
V5	% Emergent Canopy	0.10	Wetland contains few patches of emergents	0.10	Wetland contains few patches of emergents	0.10	Wetland contains few patches of emergents
	HSI= (v1*v2*v3*v4*v5)	0.28		0.28		0.26	

Table 26. Red-winged Blackbird Model - Peck Lake - With 1 Year of Drawdown for Years 1, 8, & 15

Habitat Suitability Index Model for Red-winged Blackbird

HSI Red-winged Blackbird MODEL		YEAR 1	ASSUMPTIONS	Year 8	ASSUMPTIONS	Year 15	ASSUMPTIONS
Variable	Description	HSI	AREA = 19 ACRES	HSI	AREA = 19 ACRES	HSI	AREA = 19 ACRES
V1	Type of Emergent herbaceous	0.50	Emergents 20% of area - Many broad-leafed	0.50	Emergents 20% of area - Many broad-leafed	0.10	Limited emergents - mostly narrow-leaved
V2	Water Regime	0.90	Permanent	0.90	Permanent	0.90	Permanent
V3	Clarity of water - carp, etc	0.70	Reduced distrubance of sediments, except carp	0.70	Reduced distrubance of sediments, except carp	0.40	Carp & wind - distrurbance of floculant sediments
V4	Abundance of emergent insects	0.50	Improved aquatic plants & substrate conditions	0.50	Improved aquatic plants & substrate conditions	0.30	Limited insects with floculant sediments & reduced plants
V5	% Emergent Canopy	0.50	Mix of emergents/open water	0.50	Mix of emergents/open water	0.10	Wetland contains few patches of emergents
	HSI= (v1*v2*v3*v4*v5)	0.60		0.60		0.28	

Table 27. Red-winged Blackbird Model - Peck Lake - With 2 Years of Drawdown for Years 2, 8, & 15

Habitat Suitability Index Model for Red-winged Blackbird

HSI Red-winged Blackbird MODEL		YEAR 2	ASSUMPTIONS	Year 8	ASSUMPTIONS	Year 15	ASSUMPTIONS
Variable	Description	HSI	AREA = 19 ACRES	HSI	AREA = 19 ACRES	HSI	AREA = 19 ACRES
V1	Type of Emergent herbaceous	0.90	Emergents 33% of area - Many broad-leafed	0.90	Emergents 33% of area - Many broad-leafed	0.10	Limited emergents - mostly narrow-leaved
V2	Water Regime	0.90	Permanent	0.90	Permanent	0.90	Permanent
V3	Clarity of water - carp, etc	0.70	Reduced distrubance of sediments, except carp	0.70	Reduced distrubance of sediments, except carp	0.40	Carp & wind - distrurbance of floculant sediments
V4	Abundance of emergent insects	0.50	Improved aquatic plants & substrate conditions	0.50	Improved aquatic plants & substrate conditions	0.30	Limited insects with floculant sediments & reduced plants
V5	% Emergent Canopy	0.80	1/3 to 2/3 mix of emergents/open water	0.80	1/3 to 2/3 mix of emergents/open water	0.10	Wetland contains few patches of emergents
	HSI= (v1*v2*v3*v4*v5)	0.74		0.74		0.28	

Assumptions:

1. Estimated that after 2 years of drawdown emergent vegetation would occupy zone from +0.5 to -1 foot under normal pool.

Table 28. Muskrat Model - Lizzy Pauls Pond - No Action Alternative for Years 1, 8, & 15

EXISTING HSI Muskrat MODEL Variable	Description	YEAR 1 HSI	ASSUMPTIONS AREA = 52 ACRES	Year 8 HSI	ASSUMPTIONS AREA = 51.6 ACRES	Year 15 HSI	ASSUMPTIONS AREA = 51.2 ACRES
V1	% canopy - herbaceous emergent	0.20	Around 11%	0.22	Estimated to be around 12%	0.25	Estimated to be around 14%
V2	% of year with surface water	1.00	All years	1.00	All years	1.00	All years
V8	% bulrush and cattail	0.25	Assumed to be around 25%	0.25	Assumed to be around 25%	0.25	Assumed to be around 25%
	Cover = (v1*v2)^1/2	0.45		0.47		0.50	
	Food = (v1*v8)^1/2	0.22		0.23		0.25	
	HSI = Lowest food or cover	0.22		0.23		0.25	

Table 29. Muskrat Model - Lizzy Pauls Pond - With 1 Year of Drawdown for Years 1, 8, & 15

EXISTING HSI Muskrat MODEL Variable	Description	YEAR 1 HSI	ASSUMPTIONS AREA = 52 ACRES	Year 8 HSI	ASSUMPTIONS AREA = 52 ACRES	Year 15 HSI	ASSUMPTIONS AREA = 52 ACRES
V1	% canopy - herbaceous emergent	0.65	Estimated to be around 33 %	0.65	Estimated to be around 33 %	0.25	Estimated to be around 14%
V2	% of year with surface water	1.00	All years	1.00	All years	1.00	All years
V8	% bulrush and cattail	0.40	Assumed to be around 1/3	0.40	Assumed to be around 1/3	0.25	Assumed to be around 25%
	Cover = (v1*v2)^1/2	0.81		0.81		0.50	
	Food = (v1*v8)^1/2	0.51		0.51		0.25	
	HSI = Lowest food or cover	0.51		0.51		0.25	

Table 30. Muskrat Model - Lizzy Pauls Pond - With 2 Years of Drawdown for Years 2, 8, & 15

EXISTING HSI Muskrat MODEL Variable	Description	YEAR 1 HSI	ASSUMPTIONS AREA = 52 ACRES	Year 8 HSI	ASSUMPTIONS AREA = 52 ACRES	Year 15 HSI	ASSUMPTIONS AREA = 52 ACRES
V1	% canopy - herbaceous emergent	0.80	Estimated to be around 43%	0.80	Estimated to be around 43 %	0.25	Estimated to be around 14%
V2	% of year with surface water	1.00	All years	1.00	All years	1.00	All years
V8	% bulrush and cattail	0.40	Assumed to be around 1/3	0.40	Assumed to be around 1/3	0.25	Assumed to be around 25%
	Cover = (v1*v2)^1/2	0.89		0.89		0.50	
	Food = (v1*v8)^1/2	0.57		0.57		0.25	
	HSI = Lowest food or cover	0.57		0.57		0.25	

Table 31. Muskrat Model - Peck Lake - No Action Alternative for Years 1, 8, & 15

EXISTING HSI Muskrat MODEL Variable	Description	YEAR 1 HSI	ASSUMPTIONS AREA = 19 ACRES	Year 8 HSI	ASSUMPTIONS AREA = 19.0 ACRES	Year 15 HSI	ASSUMPTIONS AREA = 19.0 ACRES
V1	% canopy - herbaceous emergent	0.05	Around 2%	0.10	Estimated to be around 3%	0.10	Estimated to be around 5%
V2	% of year with surface water	1.00	All years	1.00	All years	1.00	All years
V8	% bulrush and cattail	0.10	Assumed to be less than 10%	0.10	Assumed to be equal to 10%	0.15	Assumed to be equal to 15%
	Cover = (v1*v2)^1/2	0.22		0.32		0.32	
	Food = (v1*v8)^1/2	0.07		0.10		0.12	
	HSI = Lowest food or cover	0.07		0.10		0.12	

Table 32. Muskrat Model - Peck Lake - With 1 Year of Drawdown for Years 1, 8, & 15

EXISTING HSI Muskrat MODEL Variable	Description	YEAR 1 HSI	ASSUMPTIONS AREA = 19 ACRES	Year 8 HSI	ASSUMPTIONS AREA = 19 ACRES	Year 15 HSI	ASSUMPTIONS AREA = 19 ACRES
V1	% canopy - herbaceous emergent	0.40	Estimated to be around 20%	0.40	Estimated to be around 32%	0.10	Estimated to be around 5%
V2	% of year with surface water	1.00	All years	1.00	All years	1.00	All years
V8	% bulrush and cattail	0.40	Assumed to be around 1/3	0.40	Assumed to be around 1/3	0.15	Assumed to be equal to 15%
	Cover = (v1*v2)^1/2	0.63		0.63		0.32	
	Food = (v1*v8)^1/2	0.40		0.40		0.12	
	HSI = Lowest food or cover	0.40		0.40		0.12	

Table 33. Muskrat Model - Peck Lake - With 2 Years of Drawdown for Years 2, 8, & 15

EXISTING HSI Muskrat MODEL Variable	Description	YEAR 2 HSI	ASSUMPTIONS AREA = 19 ACRES	Year 8 HSI	ASSUMPTIONS AREA = 19 ACRES	Year 15 HSI	ASSUMPTIONS AREA = 19 ACRES
V1	% canopy - herbaceous emergent	0.65	Estimated to be around 34%	0.65	Estimated to be around 32%	0.10	Estimated to be around 5%
V2	% of year with surface water	1.00	All years	1.00	All years	1.00	All years
V8	% bulrush and cattail	0.40	Assumed to be around 1/3	0.40	Assumed to be around 1/3	0.15	Assumed to be equal to 15%
	Cover = (v1*v2)^1/2	0.81		0.81		0.32	
	Food = (v1*v8)^1/2	0.51		0.51		0.12	
	HSI = Lowest food or cover	0.51		0.51		0.12	

Table 34. Summary of Habitat Evaluation for Lizzy Pauls Pond

No Action Alternative		Bigmouth Buffalo		Northern Pike		American Coot		Red-winged blackbird		Muskrat		Community
Target Year	Acres	HSI	AAHU	HSI	AAHU	HSI	AAHU	HSI	AAHU	HSI	AAHU	AAHU
0	52	0.93		0.8		0.04		0.34		0.22		
1	52	0.93	48.4	0.8	41.6	0.04	2.1	0.34	17.7	0.22	11.4	
8	51.6	0.93	48.2	0.8	41.4	0.04	2.1	0.37	18.4	0.23	11.7	
15	51.2	0.93	47.8	0.8	41.1	0.04	2.1	0.4	19.8	0.25	12.3	
Total			**48.0**		**41.3**		**2.1**		**19.0**		**12.0**	**24.5**

With 1-year drawdown		Bigmouth Buffalo		Northern Pike		American Coot		Red-winged blackbird		Muskrat		Community
Target Year	Acres	HSI	AAHU	HSI	AAHU	HSI	AAHU	HSI	AAHU	HSI	AAHU	AAHU
0	52	0		0		0		0		0		
1	52	0.97	25.2	0.9	23.4	0.24	6.2	0.74	19.2	0.51	13.3	
8	52	0.97	50.4	0.9	46.8	0.24	12.5	0.74	38.5	0.51	26.5	
15	52	0.93	49.4	0.8	44.2	0.04	7.3	0.4	29.6	0.19	18.2	
Total			**48.3**		**44.0**		**9.6**		**33.1**		**21.8**	**31.4**

With 2-year drawdown		Bigmouth Buffalo		Northern Pike		American Coot		Red-winged blackbird		Muskrat		Community
Target Year	Acres	HSI	AAHU	HSI	AAHU	HSI	AAHU	HSI	AAHU	HSI	AAHU	AAHU
0	52	0		0		0		0		0		
2	52	1	26.0	0.9	23.4	0.32	8.3	0.79	20.5	0.57	14.8	
8	52	1	52.0	0.9	46.8	0.32	16.6	0.79	41.1	0.57	29.6	
15	52	0.93	50.2	0.8	44.2	0.04	9.4	0.4	30.9	0.19	19.8	
Total			**47.7**		**42.5**		**12.1**		**33.6**		**23.1**	**31.8**

Table 35. Summary of Average Annual Costs per Habitat Unit for Lizzy Pauls Pond

		Model					
	Unit	BM Buffalo	N. Pike	A. Coot	Blackbird	Muskrat	Community
No action	AAHU	48.0	41.3	2.1	19.0	12.0	24.5
1-YEAR	AAHU	48.3	44.0	9.6	33.1	21.8	31.4
Change	AAHU	0.3	2.7	7.6	14.1	9.8	6.9
	$/AAHU	**$12,512**	**$1,196**	**$431**	**$232**	**$333**	**$473**
2-YEAR	AAHU	47.7	42.5	12.1	33.6	23.1	31.8
Change	AAHU	-0.6	-1.6	2.5	0.5	1.3	0.4
AA$/AAHU	$/AAHU	**($1,984)**	**($749)**	**$468**	**$2,176**	**$899**	**$2,676**

Const/oper $ - with 1 year of drawdown $29,000
Average Annual Costs (7 3/8% interest) = $3,260

Operation $ - 2nd year drawdown $10,400
Average Annual Costs (7 3/8% interest) = $1,169

Table 36. Summary of Habitat Evaluation for Peck Lake

No Action Alternative		Bigmouth Buffalo		Northern Pike		American Coot		Red-winged blackbird		Muskrat		Community
Target Year	Acres	HSI	AAHU	HSI	AAHU	HSI	AAHU	HSI	AAHU	HSI	AAHU	AAHU
0	19	0.3		0.2		0.03		0.26		0.07		
1	19	0.3	5.7	0.2	3.8	0.03	0.6	0.26	4.9	0.07	1.3	
8	18.9	0.3	5.7	0.2	3.8	0.03	0.6	0.26	4.9	0.1	1.6	
15	18.8	0.3	5.7	0.2	3.8	0.03	0.6	0.26	4.9	0.12	2.1	
Total			**5.7**		**3.8**		**0.6**		**4.9**		**1.8**	**3.3**

With 1-year drawdown		Bigmouth Buffalo		Northern Pike		American Coot		Red-winged blackbird		Muskrat		Community
Target Year	Acres	HSI	AAHU	HSI	AAHU	HSI	AAHU	HSI	AAHU	HSI	AAHU	AAHU
0	19	0		0		0		0		0		
1	19	0.93	8.8	0.5	4.8	0.2	1.9	0.6	5.7	0.4	3.8	
8	19	0.93	17.7	0.5	9.5	0.2	3.8	0.6	11.4	0.4	7.6	
15	19	0.3	11.7	0.2	6.7	0.03	2.2	0.26	8.2	0.12	4.9	
Total			**14.3**		**7.9**		**2.9**		**9.5**		**6.1**	**8.1**

With 2-year drawdown		Bigmouth Buffalo		Northern Pike		American Coot		Red-winged blackbird		Muskrat		Community
Target Year	Acres	HSI	AAHU	HSI	AAHU	HSI	AAHU	HSI	AAHU	HSI	AAHU	AAHU
0	19	0		0		0		0		0		
2	19	1	9.5	0.8	7.6	0.29	2.8	0.74	7.0	0.51	4.8	
8	19	1	19.0	0.8	15.2	0.29	5.5	0.74	14.1	0.51	9.7	
15	19	0.3	12.4	0.2	9.5	0.03	3.0	0.26	9.5	0.12	6.0	
Total			**14.6**		**11.5**		**4.0**		**11.0**		**7.3**	**9.7**

Table 37. Summary of Average Annual Costs per Habitat Unit for Peck Lake

		Model					
	Unit	BM Buffalo	N. Pike	A. Coot	Blackbird	Muskrat	Community
No action	AAHU	5.7	3.8	0.6	4.9	1.8	3.3
1-YEAR	AAHU	14.3	7.9	2.9	9.5	6.1	8.1
Change	AAHU	8.6	4.1	2.4	4.6	4.3	4.8
	$/AAHU	**$501**	**$1,060**	**$1,835**	**$939**	**$1,004**	**$902**
2-YEAR	AAHU	14.6	11.5	4.0	11.0	7.3	9.7
Change	AAHU	0.3	3.7	1.1	1.5	1.2	1.6
AA$/AAHU	**$/AAHU**	**$3,155**	**$294**	**$1,008**	**$728**	**$892**	**$694**

Const/oper $ - with 1 year of drawdown	$38,400	Operation $ - 2nd year drawdown	$9,600
Average Annual Costs (7 3/8% interest) =	$4,317	Average Annual Costs (7 3/8% interest) =	$1,079

Table 38. Potential Emergent Plants for Peck Lake.

Total area (acres)	Planting Plan	Water depth (feet)	Vegetation	Quantity
0.2	Band	-0.5 to 0	Prairie cord grass - roots	200
0.2	Band	-0.5 to 0	Rice cutgrass - plants	200
0.3	Patches-band	-0.5 to 1	Cattails roots (Typha)	300
0.5	Patches-band	-0.5 to 1	River Bulrush roots	600
0.3	Patches	-0.5 to 1	Phragmites roots	300
0.2	Patches	-0.5 to 1	Three-square bulrush roots	200
1.0	Patches - band	0.5 - 1.5	Arrowhead - tubers	1000
0.2	Patches	0.5 - 1.5	Pickerel weed - sprouted roots	200
0.5	Scattered	>1	Wild rice seed	1 bu
0.3	Patches	>1	Hardstem bulrush roots	300
0.3	Scattered	>1	Softstem bulrush roots	300
4.00			Total	

Attachment 4

Coordination

US Army Corps of Engineers
St Paul District

Public Notice

Project: Small Scale Drawdown - Habitat Rehabilitation and Enhancement Project, Pools 5 and 9, Upper Mississippi River

Date: March 17, 1997

In Reply Refer to: Management & Evaluation Branch, Engineering & Planning Division

1. Project Location. The proposed project is located at Lizzy Pauls Pond and Peck Lake in the Upper Mississippi River backwaters. Lizzy Pauls Pond is 52 acres (21 hectares) in size and is located at State Highway 35 and County Road 00 near Buffalo City, Wisconsin, in pool 5. Peck Lake is 19 acres (6 hectares) in size and is located within Blackhawk Park near Victory, Wisconsin, in pool 9. Lizzy Pauls Pond currently has good vegetation coverage with mostly floating and submerged vegetation. Peck Lake has almost no vegetation, limited primarily to a few emergents and floating plants. Flow at both sites is controlled by culverts.

2. Project Authority. Section 1103 of the Water Resources Development Act of 1986 (Public Law 99-662) provides authorization and appropriations for an environmental management program for the Upper Mississippi River system that includes fish and wildlife habitat rehabilitation and enhancement projects. The proposed project would be funded and implemented under this authorization.

3. Project Purpose. The proposed project would promote the growth of aquatic vegetation using water level management techniques at the selected backwater sites. A decrease in suspended solids concentrations is also expected to occur. The intent is to preserve, restore, and enhance backwater fish and migratory bird habitat on the Upper Mississippi River system.

4. Proposed Project. The selected plan of action would consist of temporarily closing the outlet culverts at each site and using electric pumps to draw down the water level at least 2 feet (0.6 meter) so that the bottom sediments would dry out around the perimeter of the sites. A power supply would need to be run to the site, a small sump provided for each pump, and some minor ditching by hand may be required. The drawdown would begin in late June of 1997 and be maintained throughout the growing season until about mid-September. The areas would then be allowed to refill slowly. An increase in the area of emergent aquatic vegetation is expected following the drawdowns. The drawdowns are planned to be performed only a single season. However, because of the very poor vegetation conditions at Peck Lake, a second year of drawdown would be considered in order to more firmly establish the desired vegetation. This decision would be based on the results of the first year drawdown. Pertinent information about each site is shown on the back of this notice. A total of about 71 acres of shallow water wetland habitat would be positively affected by the selected plan. The estimated total direct implementation cost of the project is $84,000.

5. Permits/Coordination.

a. General. The proposed project has been coordinated with the U.S. Fish and Wildlife Service and the Wisconsin, Iowa, and Minnesota Departments of Natural Resources.

b. State. No special permits will be required from the State of Wisconsin.

c. Federal. An environmental assessment and Finding of No Significant Impact have been prepared in accordance with the requirements of the National Environmental Policy Act. The U.S. Fish and Wildlife Service was a cooperating agency throughout the process required by the Fish and Wildlife Coordination Act. A Section 404(b)(1) evaluation has not been prepared because of the minor nature of fill activity.

6. Summary of Environmental Impacts.

a. General. Stated in Project Purpose Section.

b. Water Quality. The proposed project would have short-term implementation related adverse effects from the pumping of water from the drawdown site into the receiving bodies of water. The initial pumping may mobilize some flocculent sediments, resulting in a small increase in suspended solids in the effluent water. No increase in contaminants in the aquatic environment is expected from the closing of the outlet culverts. During the drawdown period, water temperature and quality in the remaining wetted area will be poor. Long-term beneficial impacts on water clarity in the backwater areas should occur because consolidation and oxidation of the sediments should increase the critical sheer stress of the sediments after reflooding.

c. Benthos. The small scale drawdown project would cause the existing benthos in dried areas to perish. These losses would be offset with the development of a more abundant and diverse benthic community upon reflooding.

d. Fish. Closure of the outlet culverts would temporarily restrict fish use of the area during the drawdown. No toxic effects are expected on fish or other aquatic organisms as a result of the effluent discharge. Overall, fish spawning, nursery, and wintering habitat values would be improved after the drawdown with the growth of emergent vegetation. Long-term impacts are expected to be positive.

e. Wildlife. Use by bird or mammal species that normally use marsh and shallow aquatic habitat would be curtailed during the drawdown, but should improve in the long-term with improvements in habitat quality.

f. Archaeological-Historical. No archaeological or historical sites listed on or eligible for the National Register would be affected by the proposed project.

g. Noise Pollution, Air Quality. Very minor short-term noise impacts would occur during installation of pumps and power supplies. Electric pumps are quiet and clean so no adverse impacts to air quality is expected.

7. Applicable Federal Laws and Regulations.

National Historic Preservation Act of 1966, as amended
Clean Air Act, as amended
Clean Water Act of 1977, as amended
National Environmental Policy Act of 1969, as amended
Fish and Wildlife Coordination Act of 1958, as amended
Endangered Species Act of 1973, as amended
National Wildlife Refuge System Administration Act
Land and Water Conservation Fund Act of 1965, as amended
Executive Order 11988, Floodplain Management, May 24, 1977
Executive Order 11990, Protection of Wetlands, May 24, 1977

8. Report. A Definite Project Report/Environmental Assessment is available to the public that describes the project and environmental impacts in detail. The report includes project drawings, a Finding of No Significant Impact, and letters of coordination with the U.S. Fish and Wildlife Service and the Wisconsin, Iowa, and Minnesota Departments of Natural Resources. A free copy of this report or additional information can be obtained by writing to the address below or contacting Mr. Don Powell at (612) 290-5402.

9. Request for a Public Hearing. Any person may request a public hearing on the project. The request must be submitted in writing to the District Engineer within 30 days of the date of this notice. The request must clearly set forth the interest that may be affected and how the interest may be affected by this activity. Public meetings to discuss the proposed project have been scheduled for Tuesday, April 8th at the Buffalo City Municipal Building (245 - 10th Street, Buffalo City, Wisconsin) and Wednesday, April 9th at the De Soto High School (De Soto, Wisconsin). The meetings will begin at 7:00 pm. Anyone that wants to know more about the proposed project or that would like to provide input is invited to attend.

10. Public Comment Period. Interested parties are invited to submit to this office written facts, arguments, or objections to this project within 30 days of the date of this notice. These statements should bear upon the suitability of the location and the adequacy of the plans and should, if appropriate, suggest any changes deemed desirable. All statements, oral or written, will become part of the official project file and will be available for public examination. All replies should be addressed to the District Engineer, Corps of Engineers, St. Paul District, 190 Fifth Street East, St. Paul, Minnesota 55101-1638, ATTN: CENCS-PE-M/Powell.

J. M. Wonsik
Colonel, Corps of Engineers
District Engineer

DEPARTMENT OF THE ARMY
ST. PAUL DISTRICT, CORPS OF ENGINEERS
190 FIFTH STREET EAST
ST. PAUL, MINNESOTA 55101-1638

OFFICIAL BUSINESS

CENCS-PE-M/POWELL

Drawdown Site Characteristics

Feature	LIZZY PAULS POND	PECK LAKE
Navigation pool/river mile	5/747	9/670
State	Wisconsin	Wisconsin
Area of drawdown	52 acres (21 hectares)	19 acres (6.1 hec)
Watershed	970 acres (390 hectares)	2 acres (1 hectare)
Average depth	1.5 feet (0.46 meter)	1.7 feet (0.52 meter)
Outlet culvert	6-ft (1.8-m) dia. CMP	7x12-ft (2.1x3.7-m) arch CMP
Inlet culvert	Approx 6 - 2-ft (0.6-m) CMP	2-ft (0.6-m) gated CMP
Existing vegetation	Coontail, canadian waterweed, lily, flatstem pondweed	Limited; some lotus and emergents
Vegetation coverage	89% float/submerged; 11% emergent	<5% floating; ~2% emergents
Canopy shading	<5%	10%
Substrate	Fine silty muck	Fine muck
Exotic plants	None	None
Access	State Hwy 35 & Co Rd OO	Park campground road
Property ownership	Corps of Engineers	Corps of Engineers
Property management	U.S. Fish & Wildlife Service	Corps of Engineers
Flooding potential	None in July	13% chance in July
Electrical power	3-phase within 400 feet	1-phase within 3000 ft
Control site	North lobe downstream	Green Lake downstream

STATE OF IOWA

TERRY E. BRANSTAD, GOVERNOR

DEPARTMENT OF NATURAL RESOURCES
LARRY J. WILSON, DIRECTOR

February 27, 1997

Colonel J.M. Wonsik
Corps of Engineers, St. Paul District
190 E. Fifth Street
St. Paul, MN 55101-1638

ATTN: Don Powell

RE: Small Scale Drawdown EMP Project

Dear Colonel Wonsik:

Iowa Department of Natural Resources staff reviewed the January 1997 draft of the definite project report for the Small Scale Drawdown habitat rehabilitation and enhancement project in Pools 5 and 9 under the Environmental Management Program. Water level manipulation may be a very useful and valuable tool in managing the Upper Mississippi River to help sustain its ecological integrity. This habitat project involving Lizzy Pauls Pond in Pool 5 and Peck Lake in Pool 9 will provide information to help evaluate the impacts, both positive and negative, of slightly drawing down water levels to achieve fish and wildlife management benefits. The project will also be a useful demonstration for the public to witness so it can better understand what to expect from larger scale drawdowns.

The Iowa DNR supports this project because of its contributions to habitat rehabilitation and enhancement, public information, and practical research to further our combined knowledge of the Mississippi River. Thank you for the opportunity to provide comments on this small scale drawdown project.

Sincerely,

LARRY J. WILSON
DIRECTOR

WALLACE STATE OFFICE BUILDING / DES MOINES, IOWA 50319 / 515-281-5145 / TDD 515-242-5967 / FAX 515-281-8895

WHS PE 435/1

State of Wisconsin \ DEPARTMENT OF NATURAL RESOURCES

Tommy G. Thompson, Governor
George E. Meyer, Secretary

PO Box 7921
101 South Webster Street
Madison, Wisconsin 53707-7921
TELEPHONE 608-266-2621
FAX 608-267-3579
TDD 608-267-6897

May 8, 1997

Colonel J. M. Wonsik
St. Paul District, U.S. Army Corps of Engineers
190 Fifth Street East
St. Paul MN 55101-1638

Mike

Dear Colonel Wonsik:

The Wisconsin Department of Natural Resources supports construction of the Small Scale Drawdown Habitat Rehabilitation and Enhancement Project, Pools 5 and 9, Upper Mississippi River.

Upon completion and final acceptance of the project by the Corps of Engineers and the Fish and Wildlife Service, the Wisconsin Department of Natural Resources will cooperate with the Fish and Wildlife Service to assure that operation and maintenance, and any mutually agreed upon rehabilitation, will be accomplished in accordance with Section 906(e) of the Water Resources Development Act of 1986 and the current guidance contained in the Sixth Annual Addendum, May 1991, Appendix D, Section III.A.9 (pp. 21-22).

This project will greatly benefit a variety of Mississippi River fish and wildlife. I look forward to completion of the Small Scale Drawdown Habitat Rehabilitation and Enhancement Project and the benefits it will provide to the Upper Mississippi River System.

Sincerely,

George

George E. Meyer
Secretary

Thank you.

cc: William Hartwig, Regional Director, USFWS
Terry Moe, Wisconsin DNR, La Crosse

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Upper Mississippi River National Wildlife and Fish Refuge
51 E. Fourth Street - Room 101
Winona, Minnesota 55987

IN REPLY REFER TO:

February 20, 1997

Mr. Don Powell
St. Paul District, Corps of Engineers
NCS-PE-M
190 Fifth Street East
St. Paul, Minnesota 55101

Dear Mr. Powell:

This provides U.S. Fish and Wildlife Service (Service) comments on the preliminary draft Definite Project Report (DPR) and Environmental Documentation (SP-21) for the Small Scale Drawdown Habitat Rehabilitation and Enhancement Project. This project will benefit the biological resources of the Upper Mississippi River National Wildlife and Fish Refuge (Refuge).

Part of this project (Lizzy Pauls Pond) is being built on federal lands managed as part of the Refuge, therefore, a Refuge compatibility determination and Refuge approval is required before the project can be constructed. Enclosed is a signed compatibility determination for the alternative discussed in this draft report. As discussed in the Definite Project Report there is no Service operation and maintenance required. No formal approval of the Regional Director will be needed.

The FWS supports your conclusion to drawdown Lizzy Pauls Pond one growing season and Peck Lake as many as two. We should reserve the final determination to proceed with the second year drawdown at Peck Lake until after the results of the first year are determined.

The Service does not support the concept of planting four acres of aquatic vegetation in Peck Lake. The planting of any vegetation would make the results of the drawdown more difficult to monitor.

It is our understanding that Blackhawk Park personnel are thinking about burning vegetation around the lake this summer. We feel this should be delayed until this project is completed.

Endangered Species Act

Based on information contained in the Preliminary Draft Definite Project Report and the nature of the proposed project, its location, and the habitat requirements of the federally threatened bald eagle (*Haliaeetus leucocephalus*), endangered peregrine falcon (*Falco peregrinus*), and Higgins' eye pearly mussel (*Lampsilis higginsi*), we concur with your determination that the proposed project is not likely to adversely affect federally listed threatened or endangered species. Should this project be modified or new information indicated that listed species may be affected, consultation with the Service's Twin Cities Field Office should be reinitiated.

These comments have been prepared under the authority of the Fish and Wildlife Coordination Act (16 U.S.C. 661 et seq.), the National Environmental Policy Act of 1969 (42 U.S.C. 4321-4327), the Endangered Species Act of 1973, (16 U.S.C. 1531-1543), as amended, and the U.S. Fish and Wildlife Service's Mitigation Policy.

This report illustrates the cooperation evident between the Corps and the Service. The cooperative efforts on this project and the Environmental Management Program as a whole ensure that progress in this area will continue on the Upper Mississippi River System.

Sincerely,

James R. Fisher

James R. Fisher
Complex Manager

Enclosures

cc: TCFO
La Crosse FRO
MN DNR/ WI DNR
La Crosse District
McGregor District
Winona District
RO -- SS

Upper Mississippi River National
Wildlife and Fish Refuge
Established 1924
Compatibility Determination

Rehabilitation and Enhancement Project

Establishment Authority:

Public Law No. 268, 68th Congress, The Upper Mississippi River Wild Life and Fish Refuge Act.

Purposes for Which the Refuge was Established:

"... (a) as a refuge and breeding place for migratory birds ... (b) ...as a refuge and breeding place for other wild birds, game animals, fur-bearing animals, and for the conservation of wild flowers and aquatic plants, and (c) ...as a refuge and breeding place for fish and other aquatic animal life." 43 Stat. 650, dated June 7, 1924

"... shall be administered by him (Secretary of the Interior) directly or in accordance with cooperative agreements... and in accordance with such rules and regulations for the conservation, maintenance, and management of wildlife resources thereof, and its habitat thereon, ..." 16 U.S.C. 664 (Fish and Wildlife Coordination Act)

"... suitable for -- (1) incidental fish and wildlife-oriented recreational development, (2) the protection of natural resources, (3) the conservation of endangered species or threatened species ..." 16 U.S.C. 460k-1 "... the Secretary ... may accept and use ... real ... property. Such acceptance may be accomplished under the terms and conditions of restrictive covenants imposed by donors..." 16 U.S.C. 460k-2 [Refuge Recreation Act (16 U.S.C. 460k-460k-4), as amended]

"... particular value in carrying out the national migratory bird management program." 16 U.S.C. 667b (An act Authorizing the Transfer of Certain Real Property for Wildlife, or other purposes)

Description of Proposed Use:

The proposal is a Habitat Rehabilitation and Enhancement project authorized by the Water Resource Development Act of 1986 (Pub. L. 99-662). The proposed project includes the drawdown of Lizzy Pauls Pond in Pool 5.

At Lizzy Pauls Pond, the outlet culvert would be closed and two electric pumps used to draw down the water level at least 2 feet (0.6 meter) to dry out bottom sediments around the perimeter of the lake. Water would be discharged into the lobe of Lizzy Pauls Pond on the downstream side of County Road OO. It is proposed to begin the drawdown around June 24th. It is estimated that the two pumps would be used for 21 days of continuous pumping to reach the desired drawdown. Small trenches may need to be excavated to drain any pooled areas. The drawdown would be maintained by periodic pumping until about September 17th. It is estimated that a single pump would need to be operated for 8 hours every other day to maintain the water level drawdown. In September, the lake would then be permitted to gradually refill from natural

inflows. After the water level reaches the normal elevation, the culvert closure would be removed and the drawdown operation would be ended. Monitoring during and after the drawdown would be accomplished.

More details of the project, including maps and engineering drawings, are contained in the draft report entitled, "Upper Mississippi River System Environmental Management Program Definite Project Report With Integrated Environmental Assessment (SP-21) Small Scale Drawdown, Habitat Rehabilitation and Enhancement, Upper Mississippi River, Wisconsin, and Minnesota," prepared by the St. Paul District, Corps of Engineers.

Justification:

The project is designed to benefit fish and wildlife habitat, and work toward the accomplishment of the stated objectives of the Refuge by improving habitat conditions. The closure of the outlet culverts would temporarily restrict fish use of the area. Use of the area by fish would be nearly eliminated during the drawdown. A fish rescue may be attempted by the Wisconsin DNR or USFWS if substantial numbers of fish or other aquatic organisms are stranded as a result of the effluent discharge. Overall, fish spawning, nursery, and wintering habitat values would be improved after the drawdown with the growth of emergent vegetation. The long-term impacts are expected to be positive. Because of the fine-grained nature of the substrate, the shallow water, and the absence of much current velocity, it is unlikely that the drawdown site support very extensive mussel populations. Habitat generalists, like threeridge (*Amblema plicata*), and thin-shelled species, like papershells, heelsplitters, and floaters, could be present in low numbers at the drawdown sites, most of which would die during the drawdown. Other benthic macroinvertebrates present will also perish during the drawdown. However, improving the aquatic plant community and reducing the flocculant nature of the sediments should increase substrate stability and improve water quality. This should allow a more diverse and abundant benthic macroinvertebrate community to develop upon reflooding. Use by bird and mammal species that normally use marsh and shallow aquatic habitat would be curtailed during the drawdown, but should improve in the long-term with improvements in habitat quality. Species like blue heron may receive a short-term positive benefit during the drawdown because of the increased fishing opportunities that the trapped fish may offer. Migratory shorebirds will find good foraging habitat and exposed mudflats in the summer prior to reflooding. Adult reptiles and amphibians would be able to either continue to use the partially dewatered drawdown site or escape to nearby similar habitat. Anticipated improvements in the aquatic plant and macroinvertebrate community with the drawdown should benefit most species of reptiles and amphibians.

Determination: The proposed use is X is not ___ compatible with the purposes for which the Refuge was established.

Determined by: James R. Fisher Date 2/20/97
Complex Manager

Concurred by: Walter M. Fuller Date 2/21/97
Assistant Regional Director

concur D. Hultman RFO 2/21/97

WLMTF

WATER LEVEL MANAGEMENT TASK FORCE

Wisconsin Department of Natural Resources Phone - 608/785-9982
3550 Mormon Coulee Road FAX - 608/785-9990
La Crosse, Wisconsin 54601

October 31, 1996

TO: Water Level Management Task Force

From: Gretchen Benjamin, Chair, WLMTF

Re: Just a note about the November 5, meeting

- November 5, 1996
- Lake City, MN
- MNDNR office
- 9:30 A.M.

Here are the letter I have received to date. I also have a verbal message from Kent Pehler that parallels the letters of Ellen Fisher and Dick Lambert

Here are some things to consider for the November 5, 1996 meeting.

We may need to stress four points in the letter to the RRF

1) We need to assure that the small scale drawdown is completed next year along with all the monitoring necessary.
2) We need to develop a public information implementation plan
3) We need to make sure that the additional information needed for a large scale is being collected at the same time we are documenting the results of the small scale drawdown and that work to do an actual implementation is continuing as we collect additional data.
4) We need to look into the feasibility of doing water level management in all the pools of the St. Paul District.

See you on Election Day!

Wisconsin Department of Transportation

BUREAU OF RAILROADS AND HARBORS
4802 Sheboygan Avenue
P.O. Box 7914
Madison, WI 53707-7914

Telephone: (608) 267-7348
FAX: (608) 267-6748
TTY: (608) 266-3351

October 24, 1996

Gretchen Benjamin
Chair, Water Level Management Task Force
Wisconsin Department of Natural Resources
3550 Mormon Coulee Road
LaCrosse, Wisconsin 54601

Dear Gretchen:

Thank you for the opportunity to comment on the draft letter to the River Resources Forum. I share the enthusiasm of the Task Force on the results of the "Problem Appraisal Report for Water Level Management on Pool 8" and am encouraged by the possibility that limited drawdowns in this pool may be possible without creating adverse effects on commercial and recreational uses of the river. I believe, however, the proposed recommendation to implement a pool drawdown is premature at this time for the following reasons:

1. Results of the two small-scale drawdown projects are needed to be able to evaluate, quantify and explain (to all potentially affected publics) the benefits of a drawdown in our portion of the Upper Mississippi River.

2. We haven't, to my knowledge, developed an organized public outreach effort to lay the groundwork for an action as significant and non-traditional as lowering the water level of an entire pool by one to three feet. I believe this activity is critical and needs to be carefully thought out and conducted as a cooperative effort of all participating agencies.

3. We haven't, to my knowledge, consulted directly with tow boat operators to assess operational safety issues that could result from a pool drawdown of one to three feet, i.e. potential increased conflicts with recreational boaters/fishers in search of deeper water, ability to maneuver around bends, etc.

Unfortunately, I can't make the meeting on November 5th and will be unable to attend the next Forum meeting on December 3-4. I'd feel more comfortable if we took the time as a Task Force to develop a public outreach plan to present to the Forum along with the report and I'd prefer we wait until the April Forum meeting to seek any action on them.

Sincerely,

Ellen

Ellen Fisher, Chief
Harbors and Waterways Section

Mr. Don Powell

8-19-96

US Corps of Engineers
St. Paul District
190 Fifth St. East
St. Paul, Mn. 55101

Dear Mr. Powell: Re. Peck Lake Drawdown

I would appreciate receiving detailed info re both the Peck Lake & Lizzy Lake Ponds drawdown projects. There is a good possibility that I cannot attend the public meetings.

As a retired waterfowl manager I find these projects to be of real interest and potential.

Also do you have an executive summary type report that would describe each Edvior. Mgt. Project that has been initiated, the status re construction or completion and relative success re objectives.

Are studies being carried out to evaluate impacts / benefits of various pool levels. I can recall at least a couple of recent fall periods when Pool 9 water levels were pulled down — out of a great deal of prime waterfowl feeding zones. Thus impacting, negatively, several hundred acres of key habitat.

4-13 pm

Looking forward to hearing from you.

Regards

Carl Carlson

Rt 1

Stoddard, Wi. 54658

(Mailed to 520 addresses)

PUBLIC MEETINGS SCHEDULED
for the
SMALL SCALE DRAWDOWN
HABITAT REHABILITATION AND ENHANCEMENT PROJECT

UPPER MISSISSIPPI RIVER SYSTEM
ENVIRONMENTAL MANAGEMENT PROGRAM

Public meetings will be held to discuss possible habitat improvements at Peck Lake in Blackhawk Park and Lizzy Pauls Pond near Buffalo City, Wisconsin. The meeting near the Peck Lake site is scheduled for Wednesday, August 28, 1996, at 7:00 pm at the maintenance building in Blackhawk Park near Victory, Wisconsin. The meeting near the Lizzy Pauls Pond site is scheduled for Thursday, September 5, 1996 at 7:00 pm at the Buffalo City Municipal Building at 245 - 10th Street. This will be an opportunity to learn about the Environmental Management Program and be involved in the planning for the Small Scale Drawdown habitat rehabilitation and enhancement project. You will be able to hear what has been accomplished to date, ask questions, and provide your input to representatives from the U.S. Corps of Engineers, U.S. Fish and Wildlife Service, the Environmental Management Technical Center, and the Minnesota, Wisconsin, and Iowa Departments of Natural Resources.

Peck Lake and Lizzy Pauls Ponds have been selected as sites for the Small Scale Drawdown habitat project. This project is part of the Environmental Management Program, a partnership program designed to protect the resources of the Upper Mississippi River and guide future river management. The goal of the proposed project is to implement a temporary drawdown of a small backwater area to consolidate bottom sediments. As a result, the area of desirable emergent aquatic plants should be increased. The project would show the value of using water level management to improve both fish spawning and migratory bird habitat. The results could also lead to more extensive use of water level drawdowns for habitat rehabilitation and enhancement. The agencies listed above have been involved in the initial planning efforts to select specific sites for implementation of a drawdown. The drawdown plan would involve temporarily closing the outlet culvert at each site and then pumping to reduce the water level for the summer. This would expose the bottom sediments, permitting the natural seed bank to germinate and grow during the summer. After the vegetation becomes established, the culverts would be opened, allowing normal water levels to return. The emergent vegetation would provide improved habitat for fish and migratory birds.

We encourage you to attend one of the meetings, either at Blackhawk Park on August 28th or at the Buffalo City Municipal Building on September 5th. Please tell others who might be interested in providing input or hearing about plans to implement water level drawdowns for the improvement of habitat. If you are unable to attend the meeting, please send your comments to the District Engineer, St. Paul District, Corps of Engineers, 190 Fifth Street East, St. Paul, Minnesota 55101-1638, ATTN: PE-M/Powell. You may also contact Mr. Don Powell directly at (612) 290-5402.

8/9/96

ATTENDANCE LIST

SMALL SCALE DRAWDOWN
PUBLIC MEETING – 8/28/96 Blackhawk Park

NAME (Please Print)	ADDRESS (optional for mailing)
Milan Kumlin	Box 51 DeSoto, Wis 54624
Donald Ruffcorn	Box 30A-R.R.#1-DeSoto Wi 54624
GREG KIDD	S3126 N. Shore Dr. Fountain City 54629
Eugene R. [illegible]	552 Court Road, Onalaska, Wis 54650
Les [illegible]	R.1 Hillpoint, wis 53937
Ronald P. Gast	505 S. Ellwood St. Dodgeville Wi. 53533
BRUCE SWANCUTT	P.O. BOX 96 STODDARD wi 54658
William A Howe	Box 145 Prairie du Chien 53821
monty Berger	129 Vista Pl. Boscobel, Wi 53805
Gerald Ender	3333 East ave So. La Crosse apt 220 Wi 54601
Ronald Hutschenreuter	RR 1 Desoto wis Box V29A 54624
Bob Mullally	W65956 DS Ong Minn/Wis Boundary Comm
Mary Ann "	"

PUBLIC MEETING RECORD OF ATTENDANCE

Small Scale Drawdown Habitat Project at Buffalo City, Wisconsin Date – Sept 5, 1996

This information will be used for the purpose of knowing who attended this meeting.
Please include your address if you wish to be on the project mailing list. Thank you.

NAME (please print)	ADDRESS (optional)	REPRESENTING
Ralph Duellman	Fountain City, Wi: 5309 4 St Rd 35	
BOB SIEKER	530 S MAIN FOUNTAIN CITY WI 54629	
TONY BATYA	U.S. FISH AND WILDLIFE 51 E 4th St WINONA, MN 55987	
John Medinger JOHN MEDINGER	425 STATE ST - RM 205 LACROSSE, WIS. 54601	U.S. SENATOR FEINGOLD
HR GOELDNER	280 N. ST. Rd 35 ALMA WI	
MATT GOELDNER	280 North State Road 35 ALMA WI 54610	
Dan McGuiness	MWBAC 619 2nd ST Hudson WI 54016	
CLIFFORD BURMEISTER	281 W 12th St. BUFFALO CITY	
GREG KIDD	53126 N Shore Dr. Fountain City WI	
ALLEN FARNER	W1163 BADGER Rd. FOUNTAIN CITY, WI 54629	
JIM BAMBENEK	209 W Mill St WINONA, MN 55987	
A.E. HELMUELLER	W1733 INDIAN POINT LANE COCHRANE, WI. 54622	

PUBLIC MEETING RECORD OF ATTENDANCE

Small Scale Drawdown Habitat Project at Buffalo City, Wisconsin Date – Sept 5, 1996

This information will be used for the purpose of knowing who attended this meeting.
Please include your address if you wish to be on the project mailing list. Thank you.

NAME (please print)	ADDRESS (optional)	REPRESENTING
Reggie McLeod	PO Box 741 Winona MN 55987	Big River
Harry Buech	611 S. 2nd St. Alma, WI 54610	Timber Summit Limited
STEVEN BURMEISTER	165 W 9th BUFFALO CITY WIS 54622	
NICK PROVLX	53126 N. Shore Dr. Fountain City	
Michelle Marron	Buffalo Co Courthouse WDNR Alma, WI	WDNR
JEFF JANVRIN	LAX	WDNR
Richard L Liesch	1313 S Lawn Rd Buffalo city, WI	
ED HELMUELLER	17383 INDIAN PT COCHRANE, WI 54622	
Bob Drieslein	~~DLS~~ W23113 Druelgen Rd Trempealeau WI	FWS
Jeff Stanek		Corps of Engineers
Donald Gray	341 Emmerst St. Winona, MN 55987	Citizen
NEIL KELLER	1325 SO. RIVER ROAD	
Tim Schlagenhaft	~~Otto~~ 1801 S. Oak Lake City	
	4-18	

Comments & Questions Received at the Public Meeting
Small Scale Drawdown EMP Project
Blackhawk Park, Victory, Wisconsin
August 28, 1996

Q. Do you have any reason why Peck Lake doesn't have any vegetation? Twenty years ago before the culverts were put in, there was vegetation.
A. There are several possible causes. 1) Sunlight doesn't reach the bottom because of turbidity. 2) These areas have never dried out. Before the Locks & dams were put in, there was a natural cycle. What we have now is an aging reservoir system. 3) Right now we have a mucky mess because of the unconsolidated bottom sediments.

Q. How much are you going to drawdown?
A. Undecided, but could simulate a large scale drawdown. Drawdown at the same rate as we could on the Mississippi River. The other possibility would be to drawdown to dry out as much as possible. Drawdown at least 2 feet.

Q. What would be the length of the drawdown? There's a lot of use through the summer.
A. The length is yet to be determined. It could be for one season or two, starting after the Spring high water.

Q. How many agencies are involved?
A. 3 Federal (COE, USFWS, & EMTC) and 2 State (Wisconsin & Iowa DNR's).

Q. Who's in charge?
A. COE

Q. What are you going to when you become part of the National Park Service?
A. Don't know of any plans for that to happen.

Q. Won't we use the loss of the lake?
A. We're talking about losing a 15 acre lake for 1-2 seasons. There have been lakes lost in Wisconsin and Michigan that were poisoned. The plants came back after 1 year and the fish came back after 2 years, and now the fishing is tremendous. We will have a short term loss and there may be complaints, but the fishing will be improved greatly. There is a direct relationship between the plants starting to grow and the fish coming back.

Q. How will we be kept informed?
A. There will be another public meeting once the DPR and the design details have been finalized.

Comment: I really want to see this project go through and not have financing get in the way. Please look at the cost of installing and using electricity versus the cost of personnel and fuel and try to balance it out ahead of time.

Q. What about vegetation on the rest of the river?
A. The river hasn't been this low since 1989 and vegetation is growing like crazy on the edges.

Q. How much water depth do you expect to gain?
A. Hard to say, but we'll probably gain about 1-2 inches through consolidation.

Comment: We've been losing water depth to muck and we've really been losing winter fisheries. This project is important to gain water depth and improve the winter fisheries.

Comments & Questions Received at the Public Meeting
Small Scale Drawdown EMP Project
Buffalo City, Wisconsin
September 5, 1996

Q. Are you going to draw Lizzy Pauls Pond down, or might you draw it down?
A. Might. Until the proposed project has been reviewed by the public and approved and funded by higher authority of the COE, it is a might.

Q. Why mess with something that isn't broken? This is one of the few places that is good. There are plenty of places that could really use a project like this.
A. This area does have some good vegetation right now, but we are also looking at promoting the growth of different types of vegetation for diversity and to actually improve habitat conditions in the area.

Q. This site has enough vegetation. If you draw it down there won't be anything left afterwards. Everything will die and there won't be any spawning.
A. The drawdown will take place after spring spawning has occurred. Conditions will not be worsened by the drawdown, just improved.

Q. I don't see how it's going to be a benefit. You can't run a motor through there without running into weeds.
A. There is a public concern that this will kill all of the vegetation. We don't believe that will happen. If we want to revitalize the river, we need to try water level management. This is the first step. There are a lot of economic factors too.

Q. I hunt & fish from Bay City to Iowa. The projects you're talking about haven't benefitted me. I can't run a boat through Indian Slough anymore because of the closing structure.
A. The projects constructed to date primarily improve habitat in localized areas. The river is a big system and Mother Nature has a larger impact.

Q. There's a degree of mismanagement at Spring Lake Peninsula. It seems to me that the parking lot & dikes should have been the same elevation. We had high water this spring and the dike was overtopped and the water went over the parking lot before it overtopped the dike.
A. The project was designed so that the adjacent areas would be overtopped prior to the new structure so that the difference in water levels would minimal before overtopping of the new structure. We are also designing projects to work with the river instead of against it.

Q. How was Lizzy Pauls Pond chosen?
A. Cost, land ownership, and public visibility were major factors as well as other factors explained earlier.

Q. The river would be a perfect location, but you want to draw down Lizzy Pauls Pond where you have to destroy something to do it.
A. We haven't completely decided on it. We will do a habitat evaluation and cost effectiveness analysis. If those analyses indicate that the site is reasonable, we will pursue it. If you and everyone else here feel that we should not do it, then we would not consider it further.

Q. What is the historical vegetation in this area?
A. Wild rice has been present (other vegetation also mentioned).

USFWS Comment: When you have a drawdown, it is similar to what happened when the locks & dams were newly built. Before they were in place, a lot of the ground was dry, like it would be in a drawdown situation. Then the locks & dams were put in and the area was flooded. The habitat created right after the locks & dams were built was terrific. When we complete our drawdown, we will reflood the area and expect a similar vegetative response.

Q. Is there pre- and post-project research information on drawdowns?
A. There has been a lot of research on moist soil management for waterfowl food/vegetation. That is very different from water level management on a large river system. This project is going to be monitored a lot. We expect to learn some things from this and to be able to apply that knowledge to a large scale drawdown or other drawdowns.

Q. My understanding is that vegetation types that used to be here will come back when you do a drawdown. Does that mean that the plants that are there now will disappear?
A. The current ones will still be there because the seed bank or root system will remain. The amount they'll be there, we don't know exactly. We would expect the lake to return to existing conditions after about 15 years.

Q. Is there a natural cycling for lotus & wildrice?
A. It takes the right condition.

Q. For Minnesota DNR - Why did you pick the Small Bay West site?
A. It was really small and we don't have a large staff. There was some good vegetation there already, but we wanted to see what kind of response would occur with minimal effort and cost.

Q. Is it the mandate by Congress for the COE to provide for navigation?
A. Yes, it is part of our mandate.

Q. What kind of reaction would Cargill & etc. have if you did a large scale drawdown?
A. A Water Level Management Task Force has been formed to investigate the pros and cons of a large scale drawdown. The Task Force includes industry representatives. (Discussion of Large Scale Drawdown & WLMTF)

Q. Is this a preliminary program to dike off all the backwaters and keep the main channel open?
A. No, that was an option that was considered by the WLMTF and on-going studies, but it would be much too costly.

Comment: I would like to speak in favor of having the drawdown at Lizzy Pauls Pond. You have to start somewhere. I don't think we'll lose anything. In fact, I think we'll gain. The proximity to the highway and having the wayside rest is great for the educational process that it will provide for the general public. This is a way to get more and more people familiar with the drawdown process and get them talking.

PUBLIC MEETING RECORD OF ATTENDANCE

Small Scale Drawdown Habitat Project — Buffalo City, WI - April 8, 1997

This information will be used for the purpose of knowing who attended this meeting. Please include your address if you wish to be on the project mailing list. Thank you.

NAME (please print)	ADDRESS (optional)	REPRESENTING
ROBERT SIEKER	530 S MAIN FOUNTAIN CITY	
Brian Brecka	P.O. Box 88 Alma, WI 54610	WI DNR
JEFF JANYRIN		WI DNR
Harry/Katie Beck	W5.2 Alma, WI 54610	
ALLEN FARNER	W1163 BADGER RD FOUNTAIN CITY, WI 54629	
Emmick	450 W24 ST BUFFALO CITY 54622	
A.E. Helmueller	W1733 Indian Point Lane COCHRANE, WI 54622	
Herb Faudrey	1372 S River Rd Buffalo City 54622	owner
Joe Wasinski	575 LESTER AVE ONALASKA WI 54650	USGS
JACK HILT	1400 So RIVER RD BUFFALO CITY, WI 54622	HIMSELF
Ralph Dueltman	530 PY ST Rd 35 Fountain City Wis.	
ED HELMUELLER	1733 INDIAN POINT COCHRANE, WI 54622	

PUBLIC MEETING RECORD OF ATTENDANCE

Small Scale Drawdown Habitat Project — De Soto, WI - April 9, 1997

This information will be used for the purpose of knowing who attended this meeting. Please include your address if you wish to be on the project mailing list. Thank you.

NAME (please print)	ADDRESS (optional)	REPRESENTING
Joe Wosnik	RT 1 Box 1A Dakota MN 55925	WCS
Tom Ranola LL	Genoa WI	
Ray Nickelotti	Genoa WI	
Bill Howe	Box 149 Prairie du Chien	WI S BAC Com Coop
Doug Mullen	Box 460 McGregor, Iowa USFWS →	
JEFF JANVRIN		WDNR
KEVIN BERG	1114 S. Oak St. La Crescent, MN 55947	COE
Mike Griffin	IA DNR 206 Rose ST Bellevue IA 52031	IA DNR
GARY WEGE	FWS 4101 E 80th St Bloomington, MN 55425	FWS
Jenny Yager	District Office	COE

Small Scale Drawdown
Public Meeting - 8 April 1997
Buffalo City, Wisconsin

QUESTIONS AND COMMENTS

Q: What is the reason for using the southern end of Lizzy Pauls Pond for the drawdown? Is it because of County Road OO?
A: The outlet culvert is located in County Road OO. The culvert is only 6 feet in diameter and would be relatively easy to close in order to pump water out of the southern end of Lizzy Pauls Pond. The outlet culvert in the railroad embankment at the northern end is much larger.

Q: What about the fish?
A: They probably would not survive. Although the fish in the pond now would die, the fish habitat should improve after the drawdown in the future. Some of the fish could be transferred to the northern pond as the southern pond is drawn down, but this is not going to be required and the Wisconsin DNR would have to approve this procedure.

Q: Are there any plans for educating the drive-by public on this project?
A: The Wisconsin DNR is considering placing a sign at the wayside rest adjacent to the pond to explain what is happening. Peck Lake at Blackhawk Park would have specific programs put on by the WDNR, dedicated to public education because of the high public use area adjacent to the lake.

Public Comment: I think this would be a good opportunity to educate the public about the drawdown plan.
A: We agree.

Q: Why would sediment buildup occur over the 15-year period?
A: During the drawdown, the sediment would consolidate to some degree. However, after the drawdown, flocculant sediment would redeposit on the bottom of the pond and continue to buildup.

Q: Is it possible to determine how many different kinds of seeds are already in the pond before it is drawn down?
A: An analysis of grab samples from different parts of the pond has been done. The samples were allowed to dry in ice cream buckets. Most of the samples showed that 1 to 4 different plant species germinated. However, there probably are more species in the pond. The time that the samples were taken may have missed some plant's germination period.

Q: Will the late June drawdown miss some plant's seed germination period?
A: Yes, it could.

Government Comment: The project will be gathering information that will show what may happen on a larger scale drawdown, an entire pool, for example. A large scale drawdown of an entire pool is being considered and evaluated, with no decisions made on an actual pool or timetable. The data collected from the small scale drawdown would be used to help make those decisions.

Q: What is the proposed drawdown in the pond?
A: 2 feet.

Q: How much of Lizzy Pauls Pond will be exposed during the drawdown?
A: About 2/3 of the pond bottom will show. It also depends on what the water level is when the drawdown is started. Some vegetation will also grow in the shallow areas during the drawdown.

Public Comment: Start pumping!

Q: Can we go out and scoop up the fish in the pond and put them in the northern pond to save them?
A: The workers who would be drawing down the pond won't be doing this, but if you want to do it to help same some fish, check the the Wisconsin DNR before doing anything.

Small Scale Drawdown
Public Meeting - 9 April 1997
DeSoto, Wisconsin

QUESTIONS AND COMMENTS

Q: Would the lake be drawn down completely?
A: No. 2 feet - about the maximum we would go for a full pool drawdown because of navigation concerns..

Q: How much land would be exposed?
A: 2/3 - Lizzy Pauls Pond
1/2 - Peck Lake

Q: Would the fish die?
A: Yes! The fish would die. The fishery is questionable in Peck Lake now and with the drawdown it would probably get better.

Q: What kind of pumps would be used?
A: The pumps would be large trash pumps that are used for dewatering.

Q: How great a distance would the electrical wiring be?
A: 1/2 mile at Peck Lake - Power Company will run single phase to the pump site.

Q: Who furnishes the wire?
A: Vernon Electric.

Public Comment: Vernon Electric supplies power to the recreation area now, but after talking with the parent company, Dairyland Power, they may be willing to reduce the installation costs for this type of project..
A: Mississippi River Project Office has made an initial contact with the power company to get an idea of the costs.

CENCS-PE-M 21 May 1996

MEMO FOR THE RECORD

SUBJECT: Small Scale Drawdown

1. A conference call of the team for the subject habitat project was held on 20 May 1996. The participants included: Joe Wlosinski, NBS; Mike Griffin, IDNR; Mike Davis, MDNR; Jeff Janvrin, WDNR; Keith Beseke, USFWS; and Dennis Anderson, Michelle Schneider, and Don Powell, COE. The ranking and screening of potential drawdown sites from the 13 May meeting were discussed. The list sorted by score (with adjustments in the scoring criteria as suggested by Don Powell) was used as the base list (see attachment). Keith Beseke asked that Long Slough be considered as an additional site. The Long Slough site is located in pool 8 near river mile 698 in Wisconsin. The team agreed to include the site and it will be scored during an initial site visit.

2. In order to reduce the number of sites to investigate in the field, the team decided to delete the sites that do not have good public visibility (a score of 1). Then, only the top half dozen remaining sites would be further investigated (Goose Island Entrance, Small Bay West, Blackhawk Park, Lock 3 Backwater, Lizzie Paul Ponds, and Upper Mud Lake). It was pointed out that some of these sites may not be acceptable to some of the agencies, pending site investigations and further coordination. The USFWS has reservations about the Goose Island Entrance site because of good existing vegetation. The Blackhawk Park site as initially proposed is not acceptable to the COE because of high public use (a reduced size area for drawdown is being considered). The Lizzie Paul Ponds and Upper Mud Lake sites would be complicated by being on non-Federal land (WDNR cost sharing required), but will still be considered. By team consensus, Halfmoon East, West Newton Lake, Betsy Slough Bay, and Long Slough were also chosen for further investigation because of the desire to field check site features. In summary, the sites that are being considered for further field investigation include:

3/797/MN	Lock 3 Backwater	5/747/WI	Lizzie Paul Ponds
4/792/WI	Upper Mud Lake	5A/730/WI	Betsy Slough Bay
5/748/MN	Small Bay West	8/698/WI	Long Slough
5/748/MN	West Newton Lake	8/692/WI	Goose Island Entrance
5/747/MN	Halfmoon East	9/670/WI	Blackhawk Park (reduced)

3. Joe Wlosinski and some college students will go out to look at the sites and collect some preliminary information about the sites on 21, 28, and 29 May. Jeff Janvrin, the appropriate USFWS district managers, and Mike Davis will also be included in some or all of the initial site visits. A follow-up meeting and conference call will be made on Thursday, 30 May, at 0930 at the USFWS in Winona to discuss the results and decide on a course of action.

4. A discussion of potential monitoring tasks (bottom sediment analyses, aerial photos, water quality, etc) and who will do them needs to take place soon.

Don Powell

Attachment

Don Powell
Technical Manager

4-27

United States Department of the Interior

NATIONAL BIOLOGICAL SERVICE
Environmental Management Technical Center
575 Lester Avenue
Onalaska, Wisconsin 54650-8552

IN REPLY REFER TO:

May 7, 1996

Memorandum

To: Small-Scale Drawdown Team

From: Joe Wlosinski

Subject: Draft Scope of Work

At our April 18 meeting EMTC agreed to assist in planning a monitoring study for a small scale drawdown(s) HREP. EMTC staff have discussed this project with the idea that information gained must be usable for planning a large scale drawdown. Major conclusions from the EMTC meeting were: 1) Each drawdown site must have a control site; 2) The same set of parameters must be measured on both the drawdown and control site(s); 3) If the drawdown will take place during the summer of 1997 monitoring should commence immediately; and 4) Only a rough estimate of costs can be made until the number, size, and location of drawdown sites has been finalized.

A draft Scope of Work is included with this memo. EMTC staff are currently discussing cost sharing of the monitoring with other agencies including the EPA. For those of you on the site selection group, please be prepared to discuss this draft at the May 13 meeting.

Joe

CENCS-PE-M 19 April 1996

MEMO FOR THE RECORD

SUBJECT: Small Scale Drawdown

1. A team meeting for the subject habitat project was held on 17 April 1996 at the U.S. Fish and Wildlife Service office in Winona. A list of the participants is attached. The project scope, schedule, and funding were discussed. A preliminary draft Definite Project Report (DPR) is scheduled to be completed by 16 August 1996 and a drawdown implemented in 1997, with the possibility of continuing the drawdown into 1998. Scheduled funding for preparation of the DPR is $33K and $157K for the implementation phase (including preparation of plans and specs, etc). The monitoring and data collection responsibilities will need to be resolved. The EMTC will assist in planning the monitoring.

2. The project objectives are to consolidate bottom sediments and to reduce turbidity, thereby increasing the aerial extent of desired emergent/submergent aquatic plants. This would be accomplished by a drawdown of water levels at one or more selected backwater sites. It is proposed to try to keep the implementation costs low enough so that two sites could be accomplished. At one site, the natural river hydrographic conditions would be simulated by the drawdown; i.e. water levels would be drawn down after the spring high water to the levels that would have occurred naturally prior to the construction of the locks and dams and kept at the low level until the following spring. The other site would be drawn down to a level that could be achieved if the pool was allowed to fall for a short period of time; i.e. water levels would be reduced from the end of June through August. The number of sites and the method of drawdown will be determined after potential sites are evaluated.

3. Project constraints include the following: low cost implementation (less than $100K); short-term, temporary construction features; small area (5 to 200 acres); pump size and power requirements; land ownership (WDNR would consider cost sharing sites on Wisconsin lands, otherwise Federal lands are necessary); minimal water level fluctuations adjacent to the drawdown site; pump discharge water quality (permitted as a cofferdam in Wisconsin, MPCA involved in Minnesota); minimal adverse impacts on endangered species, spawning habitat, etc; minimal seepage; vandalism; manpower to operate equipment; safety; and accessibility.

4. For site selection, the following criteria will be used: primarily shallow area (less than 5 feet deep); 5 to 200 acres in size (the larger the better); diminished emergent/submergent vegetation (stay away from good quality areas); substrate diversity that includes loose, flocculent material; located on Federal or Wisconsin lands; quantity and quality of existing physical, chemical, & biological data; small water level fluctuations (in the lower half of the pool); convenient location for monitoring and operating agencies; land access for implementation; small size outlet/inlet to control; plant species present or historically present (available seed bank); diminished animal use (valuable fishery effects); comparability to a larger scale drawdown (connectivity to the river); no or low impact on threatened and endangered species; available power source; small local watershed; minimal

tree canopy or shading; includes both flat and diverse bathymetry; availability of a similar site for use as a control site; public desires/concerns after preliminary site selection; visibility to the public; area not normally or naturally dewatered; minimal exotic plant species. It was recognized that no one site will meet all these criteria. A matrix using these criteria will be prepared by Joe Wlosinski to assist in the site selection process.

5. The agencies were asked to develop lists of potential sites in all the pools (similar to the list of sites in pool 5 that was developed by the UMRCC Pool 8 Ecosystem Planning participants) that would meet some of the criteria. These lists are to be submitted to Don Powell by 30 April so that the criteria can be weighted appropriately and an initial screening of the sites can be done by a site selection task force consisting of: Keith Beseke, Joe Wlosinski, Mike Davis, Jeff Janvrin, Mike Griffin, Dennis Anderson, Michelle Schneider, and Don Powell. They will meet on 13 May (tentative) to apply the selection criteria and do the initial screening. Once the number of sites have been narrowed down, the entire team will meet again. Ken Lubinski said that the EMTC and students from St. Mary's University could be used to prepare GIS maps and possibly do other limited studies. The cost of this work may be covered using EMP Baseline Monitoring funds.

5. A discussion of potential monitoring tasks generated the following list: bottom sediment analyses (Atterberg limits, density, consolidation, mechanical analysis, vane shear, void/pressure ratio, penetrometer, oxygen demand, nutrient analysis, moisture, seed bank composition), aerial photos (infrared & true color), and water quality (turbidity, temperature, dissolved oxygen, conductivity, etc).

Don Powell

Attachment

Don Powell
Technical Manager

US Army Corps of Engineers Saint Paul District	PROJECT TITLE: Small Scale Drawdown	COMPUTED BY:	DATE: 4/18/96	SHEET:
	SUBJECT TITLE: Team meeting	CHECKED BY:	DATE:	CONTRACT NO.:

Name	Agency	Phone
Don Powell	Corps of Engrs.	612-290-5402
JEFF JANVRIN	WDNR	608-785-9005
Gregory Kidd	St. Marys RSC	507-454-7284
Shawn Weick	St. Mary's RSC	507-453-0941
Nick Proulx	St Mary's RSC	507-453-0941
Doug Muller	US FWS	319-873-3423
Dave McConville	SMU-RSC	507-457-1542
Scott Johnston	MDNR	(612)345-5601
Bob DeGolr	IDNR	319-252-1156
KEITH BESEKE	USFWS	507-452-4232
Amy Ackerman	IA DNR	319-252-1156
Bob DeCook	IA "	"
Joe Wlosinski	NBS	(608) 783 7550x56
Jim Fischer	FWS	507-452-4232
Mike Davis	MN DNR	612 345-3331
Dennis Anderson	COE	612-290-5272
KEN LUBINSKI	EMTC/NBS	608-783-7550x61
Bob Drieslein	FWS - Winona	507-454-7351

DEPARTMENT OF THE ARMY
ST. PAUL DISTRICT, CORPS OF ENGINEERS
ARMY CORPS OF ENGINEERS CENTRE
190 FIFTH STREET EAST
ST. PAUL, MN 55101-1638

REPLY TO
ATTENTION OF

March 5, 1996

Management and Evaluation Branch
Engineering and Planning Division

Mr. Robert Delaney
Environmental Management Technical Center
575 Lester Drive
Onalaska, Wisconsin 54650

Dear Mr. Delaney:

We have received approval to begin general design of the Small Scale Drawdown habitat project on the Upper Mississippi River. The project is being pursued as part of the Environmental Management Program. A fact sheet describing the proposed project is enclosed. On the basis of discussions at Water Level Task Force meetings, it is anticipated that your office will play an active role in the development and monitoring of the project. The planning and general design phase is scheduled to be completed this year, with project implementation in 1997.

Please contact Mr. Don Powell at 612-290-5402 to designate a point of contact in your office so that we can begin the general design process. We look forward to working with you and your staff in the development of this project.

Sincerely,

Enclosure
Fact sheet

Robert F. Post, P.E.
Chief, Engineering and Planning Division

State Historical Society of Wisconsin
Division of Historic Preservation
816 State Street • Madison, Wisconsin 53706-1488
☎ (608) 264-6500 • FAX (608) 264-6404

May 14, 1997

Mr. Robert Whiting
U.S. Army Corps of Engineers
190 Fifth Street East
St. Paul, Minnesota 55101-1638

SHSW#: 97-0153/BF/VE
RE: Small Scale Drawdown at Lizzy Paul's Pond and Peck Lake

Dear Mr. Whiting,

We have received the additional information for the above referenced project. Based on the nature and scope of the proposed undertaking we do not believe that an archeological survey is warranted for the project on Lizzy Paul's pond and Peck Lake. We concur with your finding that the proposed undertaking will have no effect on the Bad Axe Battlefield Site.

We also concur with your previous recommendation to re-evaluate the Bad Axe Battlefield to determine if it is eligible for inclusion in the National Register of Historic Places as a historic battlefield. We look forward to reviewing the report when it becomes available.

We remind you that 36 CFR 800.4 includes the requirement that you seek information, as appropriate to the undertaking, from parties likely to have knowledge of or concerns with historic properties in the project area-such as Indian tribes, local governments, and public and private organizations. In this case, we recommend that you contact the Tribal chairman of the Fox and Sauk to determine if they have any specific concerns regarding the proposed undertaking.

It is always possible that an accidental discovery of archaeological material may occur during construction. If archeological material is discovered, please stop all construction in that area and call me at (608) 264-6507.

If you have any questions concerning these matters, please call me at (608) 264-6507.

Sincerely,

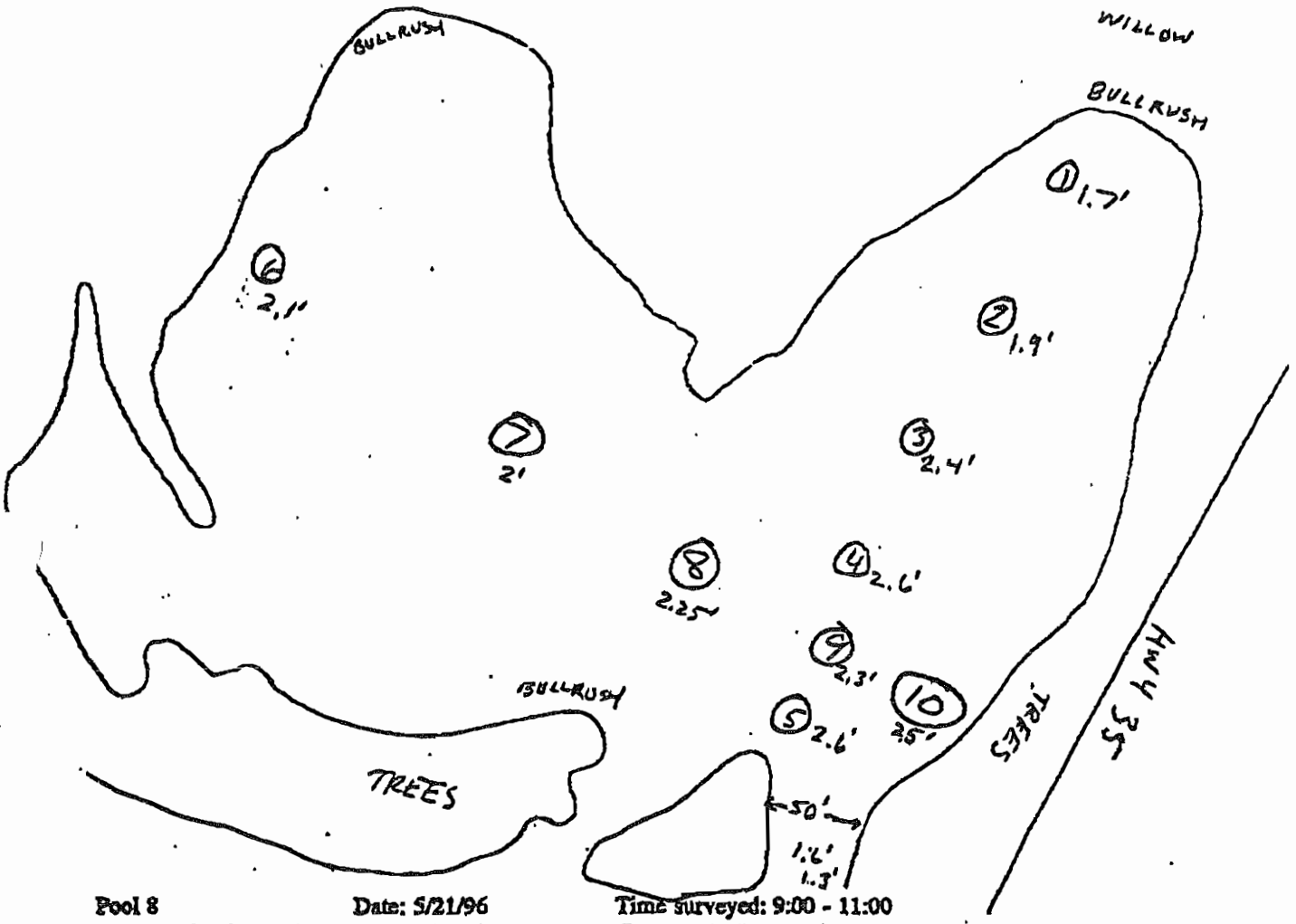
Sherman Banker

Sherman Banker
Compliance Archeologist

Attachment 5

Site Physical Data

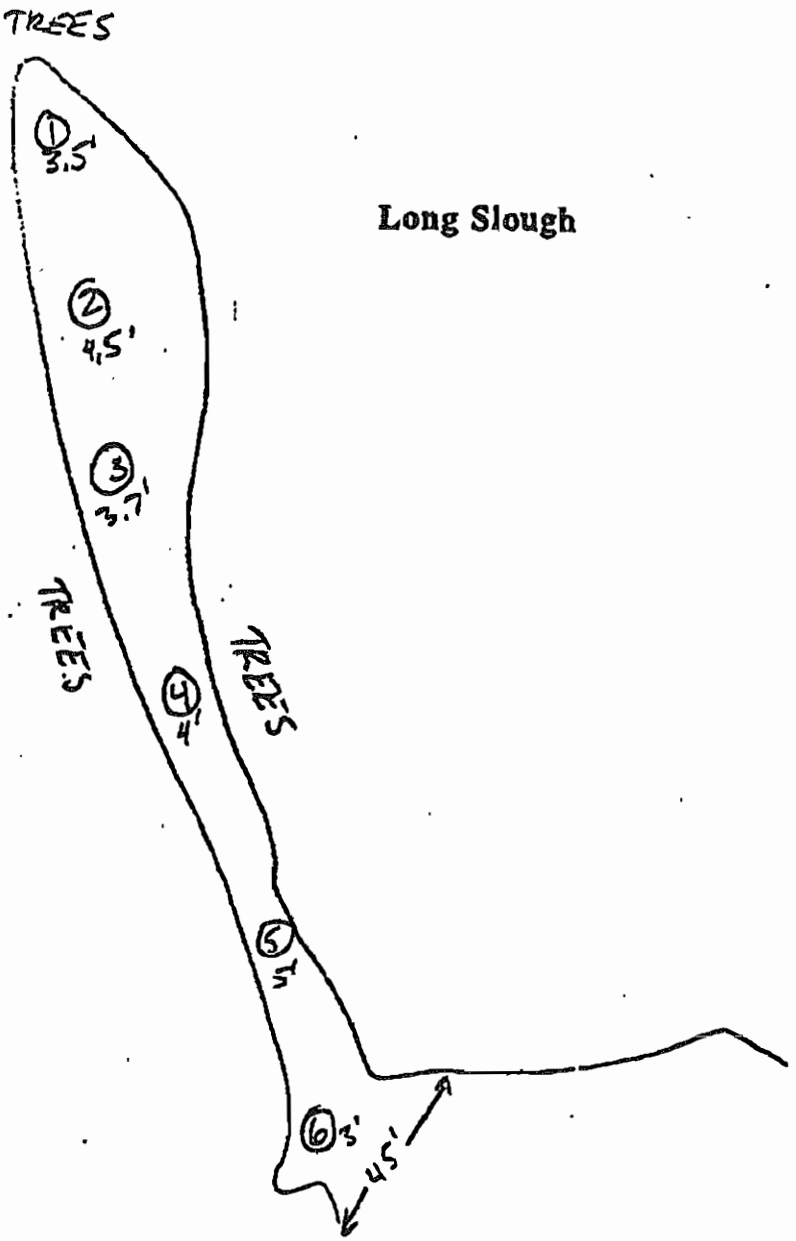
Goose Island



Pool 8 Date: 5/21/96 Time surveyed: 9:00 - 11:00
Average depth: 2.2 ft Size of inlet/outlet 50' Canopy shading: <5%
Exotic plants: none

	Substrate		
	I	II	III
Mean	2.7	12.1	12.2
Max	3.6	18.2	15.9
Min	1.8	6.1	8.4
Std Dev:	.48	3.8	3.0

Overall Ave. = 9
Chance of July flooding: 14%
Vegetation: bullrush, coontail, pondweed, lily, bladderwort; PI - 99% lily, some submergents
Estimated size: 15 acres
Estimated size of local watershed: minimal
Comments
good vegetation



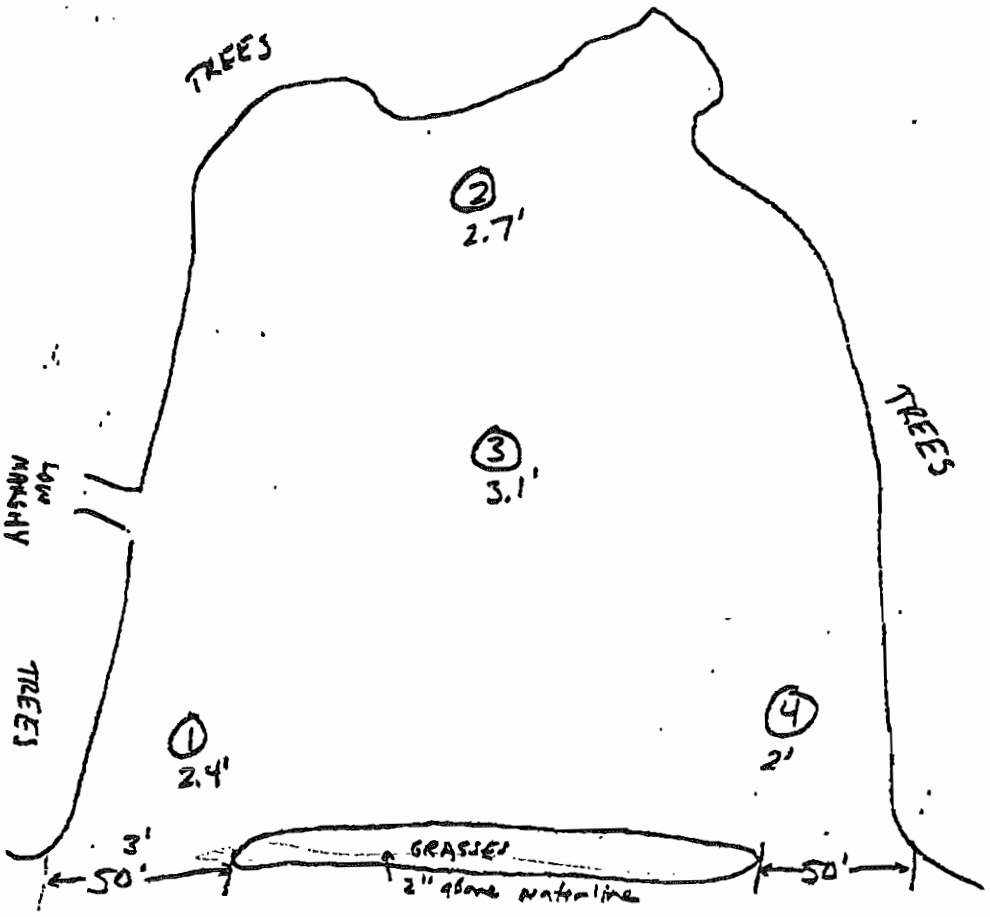
Long Slough

Pool 8 Date: 5/21/96 Time surveyed: 12:00 - 1:00
Average depth: 4.0 ft Size of inlet/outlet: 45' Canopy shading: 50%
Exotic plants: none

	Substrate		
	I	II	III
Mean	1.6	28.1	17.4
Max	1.9	36.8	32.6
Min	1.3	24.1	9.3
Std Dev:	.26	6.0	10.4

Overall Ave. = 4.1
Chance of July flooding: 17%
Vegetation: coontail; PI - 50% submergents
Estimated size: 6 acres
Estimated size of local watershed: minimal
Comments
canopy coverage is substantial

Weaver Bottoms - Small Bay West

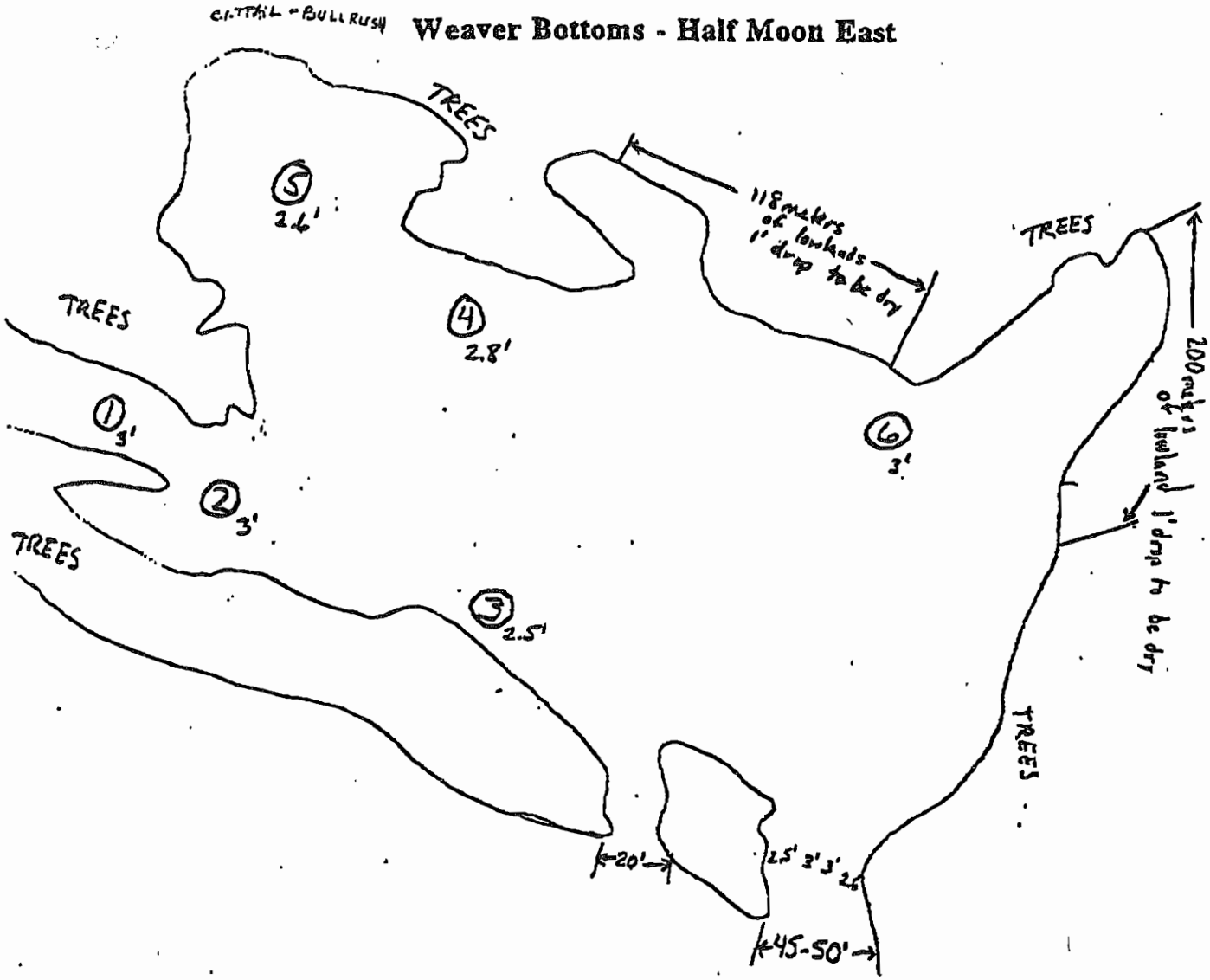


Pool 5a Date: 5/28/96 Time surveyed: 10:00 - 10:40
Average depth: 2.6 ft Size of inlet/outlet: 2 X 50' Canopy shading: 5%
Exotic plants: none

	Substrate		
	I	II	III
Mean	3.3	19.3	24.3
Max	1.7	10	13
Min	2.6	17	18.1
Std Dev:	0.66	6.0	5.0

Overall Ave. = 12.6
Chance of July flooding: 14%
Vegetation: lily, pondweed; PI = 95% Lemna, some submergents
Estimated size: 3 acres
Estimated size of local watershed: minimal
Comments
muck substrate, grass spit would need to be raised

Weaver Bottoms - Half Moon East



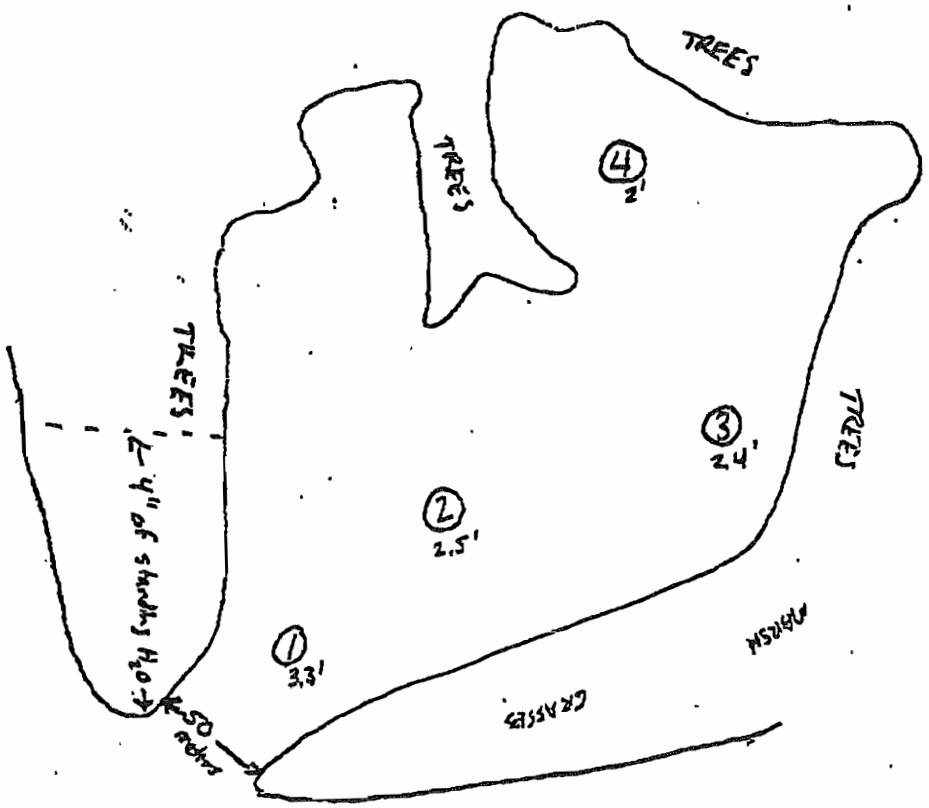
Pool 5a | Date: 5/28/96 | Time surveyed: 8:00 - 9:00
Average depth: 2.8 | Size of inlet/outlet: 50' | Canopy shading: < 5%
Exotic plants: none

	Substrate		
	I	II	III
Mean	5.6	21.7	30.7
Max	2	10	13
Min	3.4	15.6	19.3
Std Dev.	1.3	4.0	6.6

Overall Ave. = 12.8
Chance of July flooding: 48% or 14% with 1 foot repair
Vegetation: coontail, lily, pondweed; PI = 100% lily and lotus, some submergents, Sagittaria border
Estimated size: 15 acres
Estimated size of local watershed: minimal
Comments

sandy muck, large stretch along south very low,

Weaver Bottoms - West Newton Lake

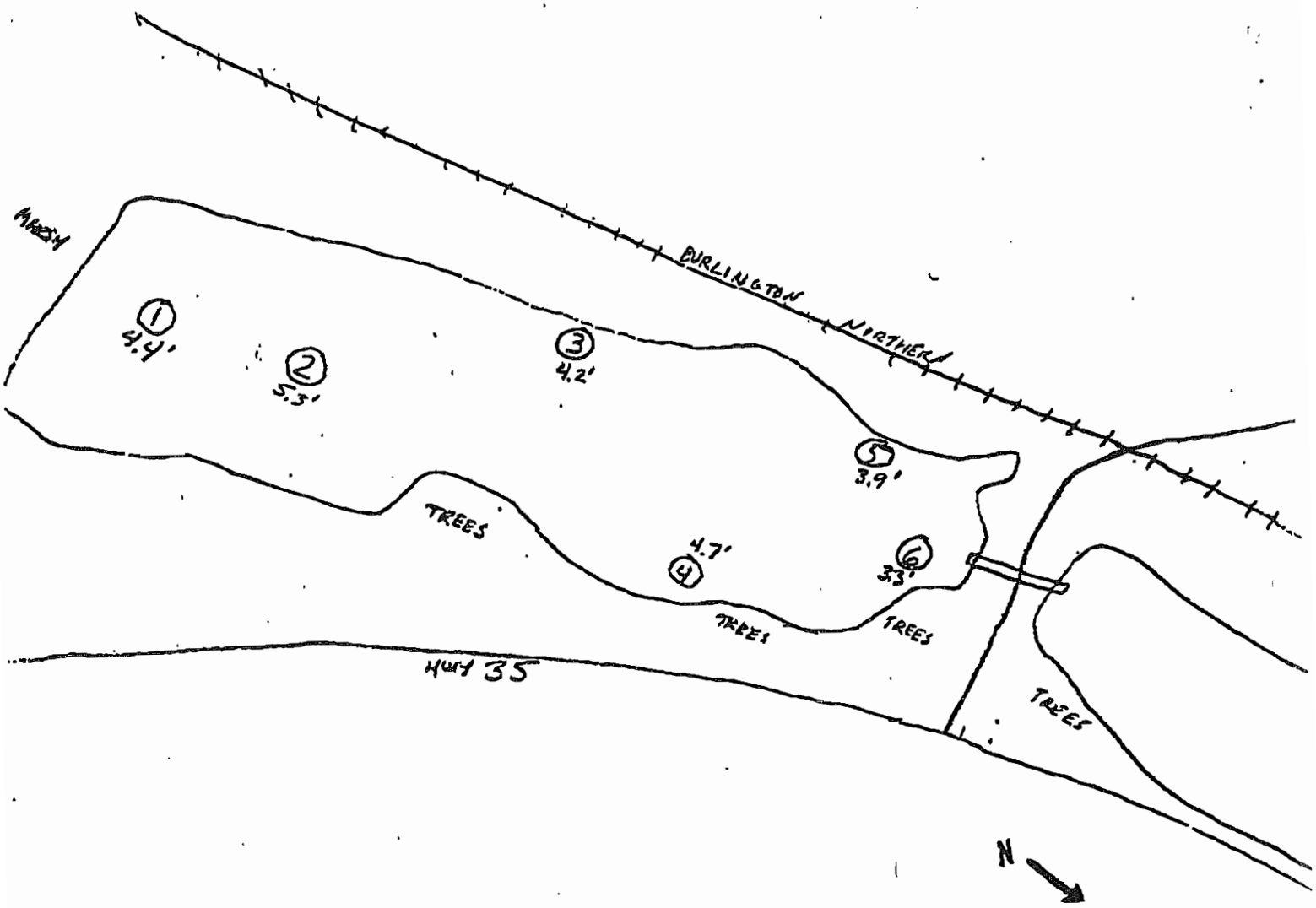


Pool 5a Date: 5/28/96 Time surveyed: 9:30 - 10:00
Average depth: 2.6 ft Size of inlet/outlet: 150' Canopy shading: 5%
Exotic plants: none

	Substrate		
	I	II	III
Mean	3.3	19.7	18.7
Max	2	11.3	13.7
Min	3.4	15.1	16.9
Std Dev:	.56	3.5	2.2

Overall Ave. = 11.8
Chance of July flooding: 14%
Vegetation: coontail, lily, PI = 99% lily, some Lemna some intermittent submergents
Estimated size: 5 acres
Estimated size of local watershed: minimal
Comments
muck substrate, 4" standing water along northwest side

Lizzie Paul Ponds



Pool 5a | Date: 5/28/96 | Time surveyed: 4:30 - 5:30
Average depth: 4.3' | Size of inlet/outlet: 5' | Canopy shading: < 5%
Exotic plants: none

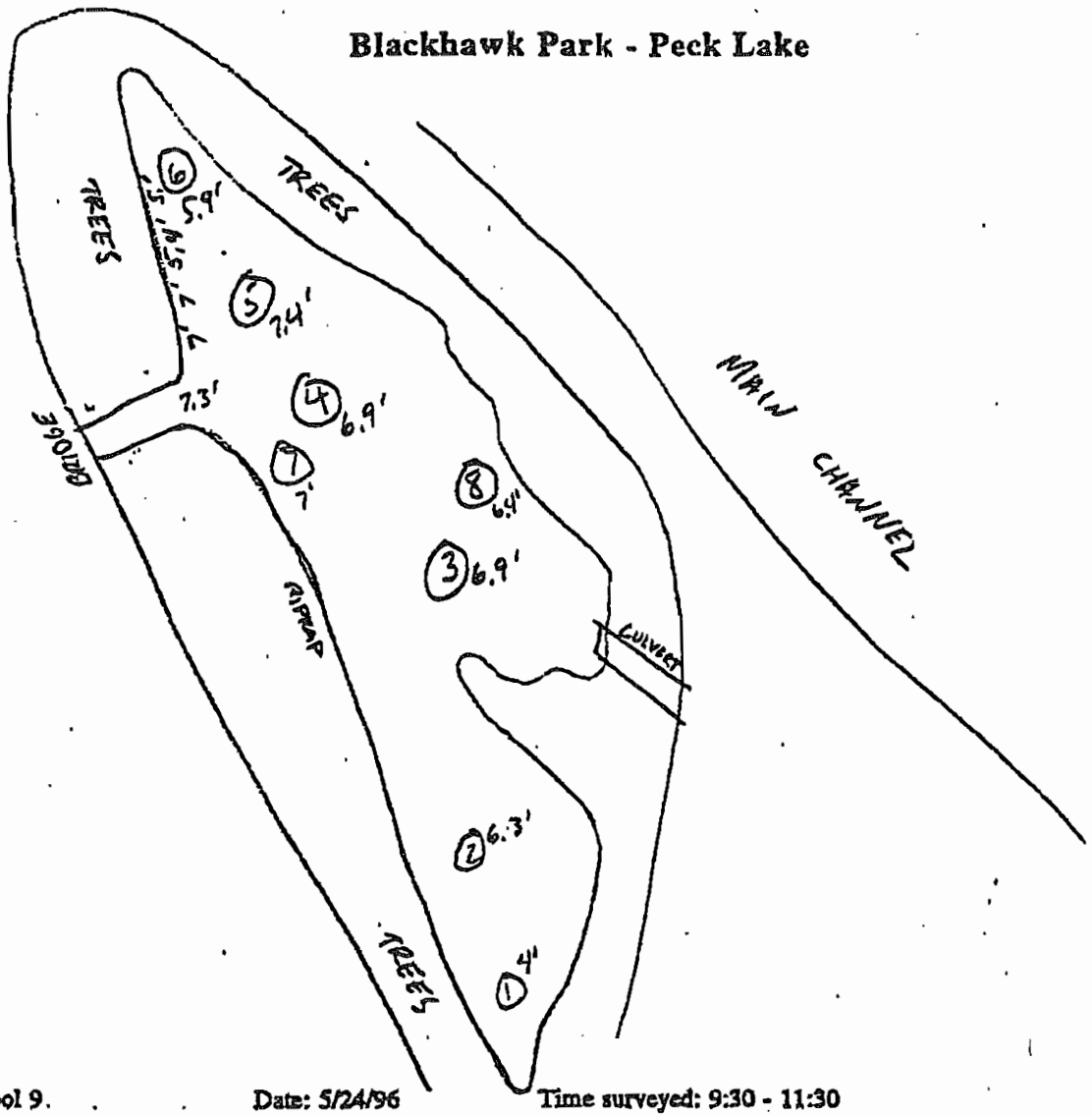
	Substrate I	II	III
Mean	4.6	25.5	30.7
Max	5.7	34	37
Min	2	13	12
Std Dev.	1.7	7.3	9.4

Overall Ave. = 20.3
Chance of July flooding: 0%:
Vegetation: coontail, elodea, lily, pondweed; PI, north area 15% floating aquatics, 80% submergents
Estimated size: ~~26 acres~~ 52 acres
Estimated size of local watershed: 3 square km 972 acres

comments

fine silty muck, RR tracks and roads surround the waterbodies, resulting in low instance of flooding, large mats of vegetation on the bottom (coontail), large amount of outflow through culvert

Blackhawk Park - Peck Lake

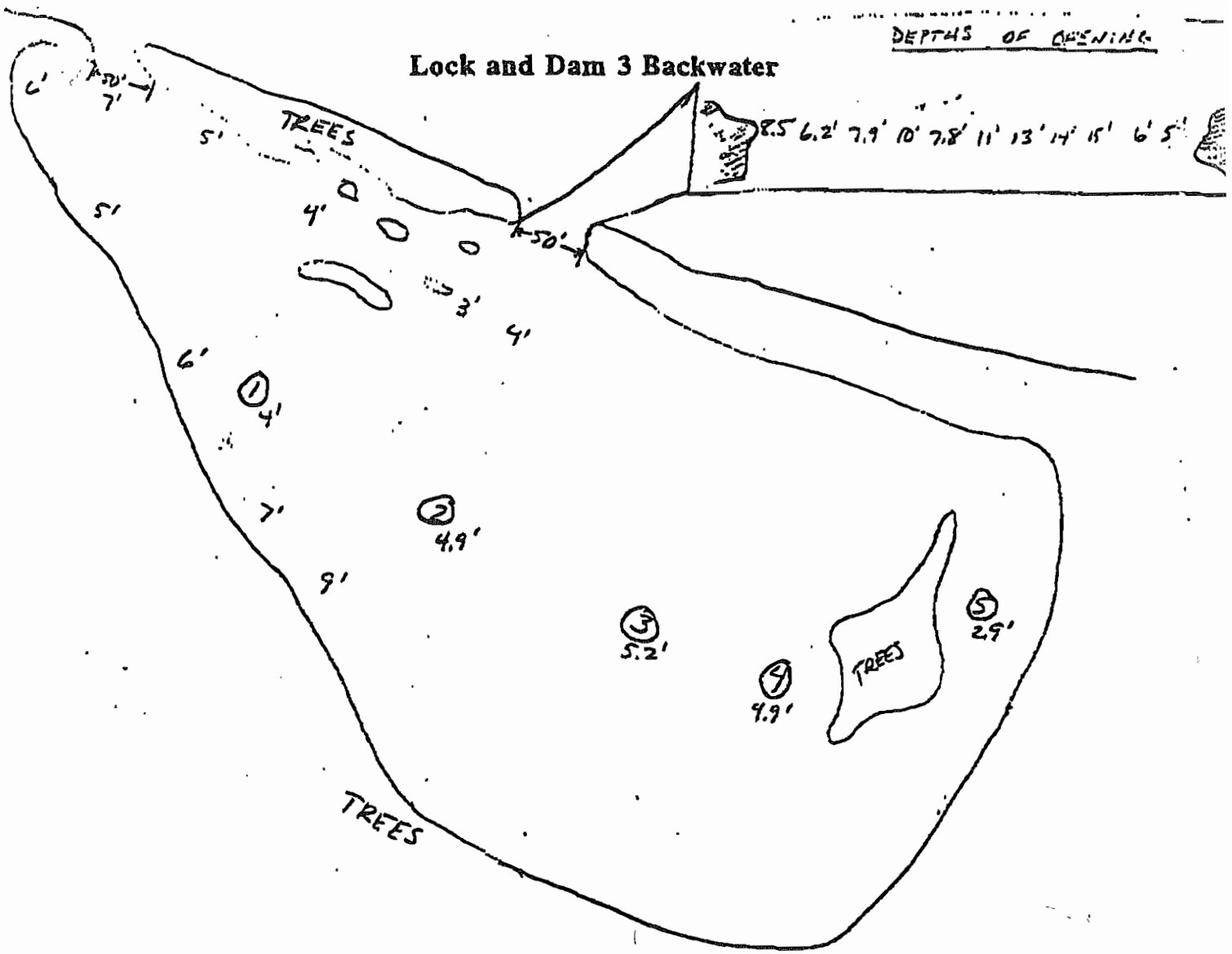


Pool 9. Date: 5/24/96 Time surveyed: 9:30 - 11:30
Average depth: 6.3 ft Size of inlet/outlet 5' Canopy shading: 10%
Exotic plants: none

	Substrate		
	I	II	III
Mean	1.9	16.3	23
Max	3	22.7	32.7
Min	1	5.3	14.3
Std Dev:	.70	6.5	7.1

Overall Ave. = 13.7
Chance of July flooding: 13%
Vegetation: none; PI - some submergents in small area
Estimated size: ~~8 acres~~ 19 acres
Estimated size of local watershed: minimal
Comments
fine muck, surrounded by road and trees, culvert only inlet and outlet, high angler use

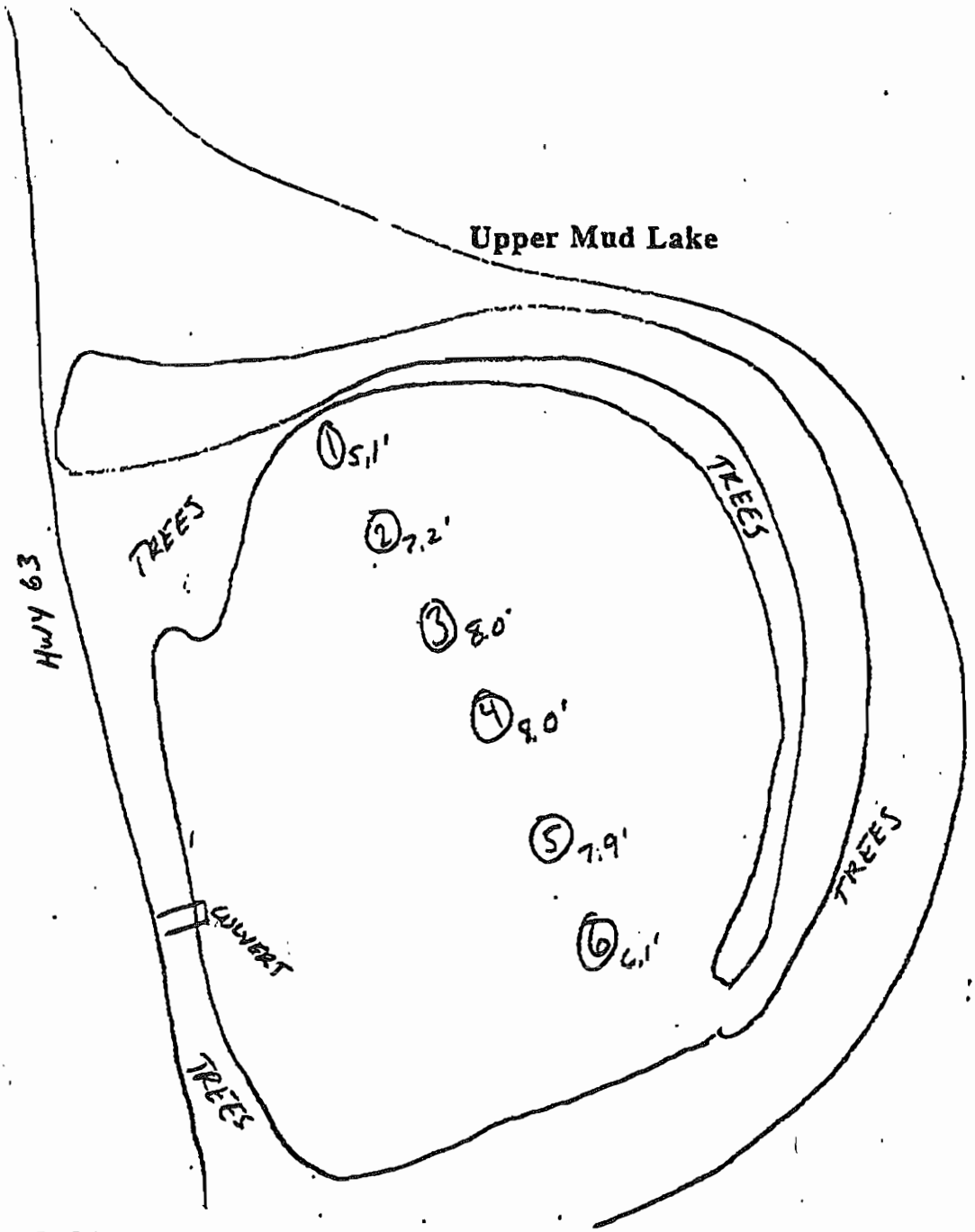
Lock and Dam 3 Backwater



Pool 3 Date: 5/23/96 Time surveyed: 1:30 - 2:45
Average depth: 4.5 ft Size of inlet/outlet2 X 50' Canopy shading: < 5%
Exotic plants: none

	Substrate		
	I	II	III
Mean	1.0	9.3	14.8
Max	2	16.2	27.7
Min	0	3	4.7
Std Dev:	0.82	5.6	8.8

Overall Ave. = 8.4
Chance of July flooding: 9%
Vegetation: none; PI very little
Estimated size: 25 acres
Estimated size of local watershed: minimal
Comments
no veg. found, hot water effluent may have effect, directly above lock and dam

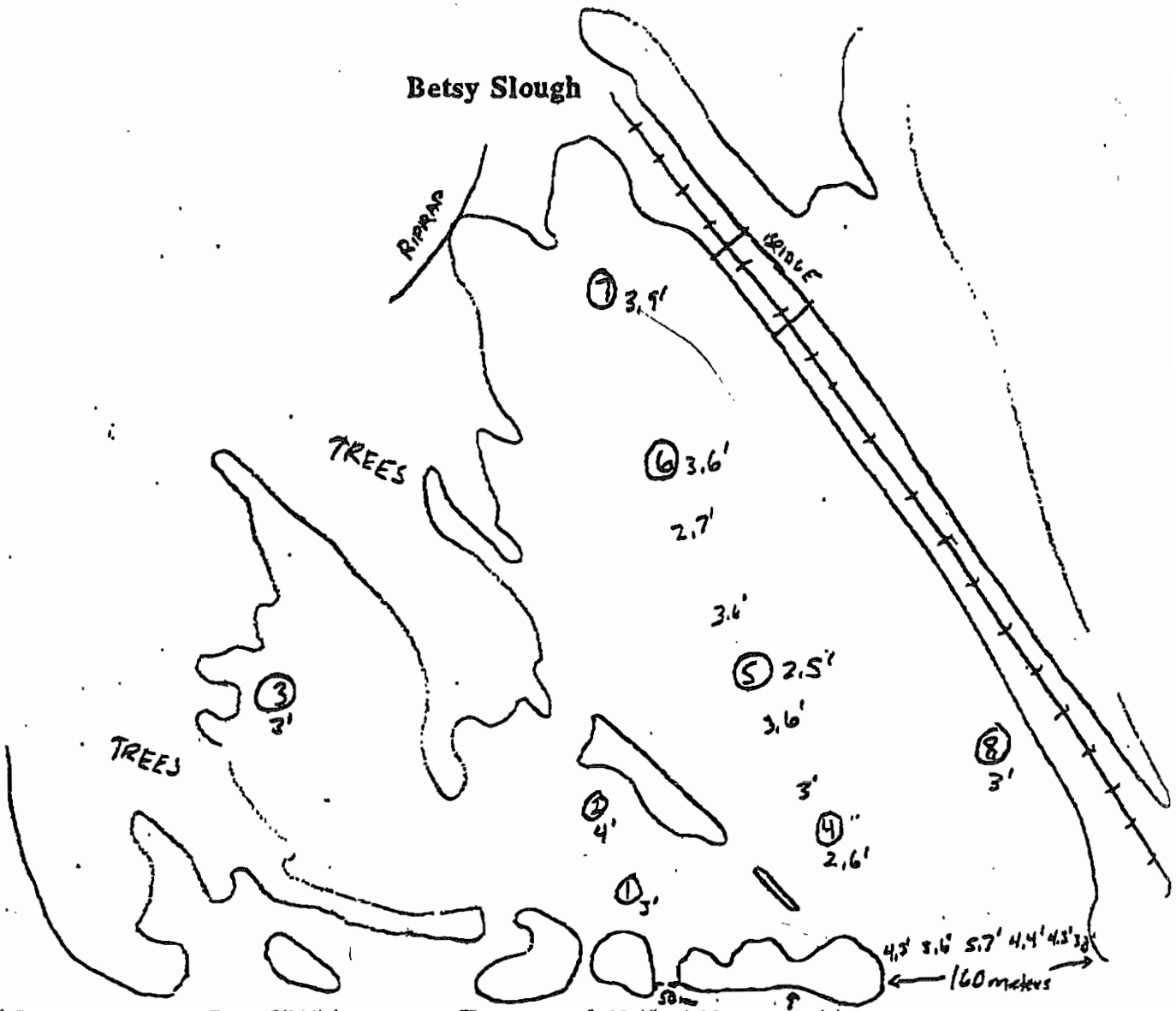


Pool 4 Date: 5/23/96 Time surveyed: 11:15 - 12:00
Average depth: 7.1 ft Size of inlet/outlet 5' Canopy shading: < 5%
Exotic plants: none

	Substrate		
	I	II	III
Mean	2.0	9.4	16.7
Max	3.2	13	22.5
Min	1.2	1	10.8
Std Dev:	0.77	4.8	4.7

Overall Ave. = 9.4
Chance of July flooding: 4%
Vegetation: coontail, pondweed, lily; PI - 99% submergents
Estimated size: 20 acres
Estimated size of local watershed: minimal
Comments
coarse organic matter on bottom, surrounded by road and trees, culvert only inlet and outlet

Betsy Slough



Pool 5a Date: 5/28/96 Time surveyed: 12:45 - 1:30
Average depth: 3.2 ft Size of inlet/outlet: 500'+, 50' Canopy shading: < 5%
Exotic plants: none

	Substrate		
	I	II	III
Mean	2.7	17.0	19.4
Max	4.7	21.7	30.3
Min	1.7	4.3	5.7
Std Dev	1.1	6.6	9.1

Overall Ave. = 13.0
Chance of July flooding: 100% or 9% with 1 foot repair
Vegetation: lily, pondweed; PI = 80% lily, intermittent submergents
Estimated size: 50 acres
Estimated size of local watershed: about 3 square km
Comments
varied substrate, several areas along south would need patching as well as riprap along northwest

Attachment 6

Distribution List

The Draft Definite Project Report/Environmental Assessment and/or Public Notice was sent to the following agencies and interests:

Congressional

Sen. Paul Wellstone (St. Paul)* Sen. Russell Feingold (Middletown)* Sen. Tom Harkin (Des Moines)*
Sen. Rod Grams (Anoka)* Sen. Herb Kohl (Madison)* Sen. Charles Grassley (Davenport)*
Rep. Gil Gutknecht (Rochester)* Rep. Ron Kind (Bl Riv Falls)* Rep. Jim Nussle (Wash DC)*

Federal

U.S. Fish and Wildlife Service (Bloomington-Lewis*; Winona-Fisher*, Beseke, Drieslein*; Fort Snelling-Hartwig*, Dobrovolny; McGregor-Mullen*, Onalaska-Nissen*)
Corps of Engineers (LMS-Cotner*; LMVD-Arnold*; NCD-Albert; NCR-Kowalczyk*; NCS-Fountain City-Peterson, Gulan; LaCrescent-Otto; St. Paul-Anderson, Cin*, Face, D.Foley*, Johannessen, Powell, Schneider, Smith, Williams; Winona-Morris*)
U.S. Geological Survey (La Crosse-Korschgen*; Madison*; Moundsview*; Onalaska-Wlosinski, Lubinski)
Department of Transportation (Chicago)* Environmental Protection Agency (Chicago)
U.S. Coast Guard (St. Louis)* National Park Service (Omaha; St. Paul)*
Advisory Council on Historic Preservation (Wash DC) Soil Conservation Service (Madison, St. Paul)*
Office of Environmental Compliance-DOE (Wash DC)* Office of Environ. Project Review-DOI (Wash DC)

State of Minnesota

Department of Natural Resources (Lake City-Davis; St. Paul-Johnson; Winona-Gulden*)
Pollution Control Agency Department of Administration*
Department of Transportation* State Historic Preservation Officer
Department of Energy, Economics, and Development* State Archeologist
State Planning Agency* Water and Soil Resources Board*

State of Wisconsin

Department of Natural Resources (Madison-Besadny*; La Crosse-Janvrin, Moe*; Alma-Brecka; Prairie du Chien-Welke; Eau Claire-Bourget)
Governor Tommy Thompson (Madison)* Department of Administration (Madison)*
Department of Agriculture (Madison)* Department of Health and Social Services (Madison)*
Department of Transportation (La Crosse)* State Historic Preservation Officer (Madison)
State Archeologist (Madison) Bureau of Water Reg & Zoning (Madison)*

State of Iowa

Department of Natural Resources (Bellevue-Griffin; Des Moines-Szcodronski; Guttenberg-Ackerman)
State Archaeologist (Iowa City)* Department of Transportation (Ames)*
State Historic Preservation Officer (Des Moines)* Department of Administration (Des Moines)*

Local

Allamakee Co Engineer*	Alma Post Office*	Alma Public Library	Brownsville Post Office*
Buffalo City Bait Shop*	Buffalo City Clerk*	Buffalo Co Cnsvtnist*	Cochrane Post Office*
Crawford Co Engineer*	Desoto Post Office*	Ferryville Post Office*	Fountain City Clerk*
Fountain City Post Office*	Galesville Public Library	Genoa Post Office*	Guttenberg Post Office*
Guttenberg Public Library	LaCrescent City Clerk*	La Crosse Post Office*	La Crosse Public Library
Lansing City Clerk*	Lansing Marina*	Lansing Post Office*	Lansing Public Library
Larry's Landing*	Marquette Clerk*	Marquette Post Office*	Mathy Construction*
McGregor Clerk*	McGregor Post Office*	McGregor Public Library	Stoddard Post Office*
Trempealeau Cham Commer*	Trempealeau Co Clerk*	Trempealeau Co Hiway*	Trempealeau Post Office*
Winona Post Office*	Winona Public Library		

Other Interests

Allamekee Jrnl/Lansing Mirror*	Badger State Sportsmen (LaX)*	Bass Masters (La Crosse)*
Big River (Winona)*	Burlington Northern Railroad*	Cochrane-Fountain City Recorder*
Courier Press (Prairie du Chien)*	Ducks Unlimited (La Crosse)*	Galesville Republican*
Guttenberg Press*	Houston County News*	Izaak Walton Lg (Mpls, StevePt)*
KAGE, KWNO, KQAL Radio (Winona)*	KNEI Radio (Waukon)*	La Crosse Co Ext Office(LaCrosse)*
La Crosse Tribune*	Larry's Landing	MN/WI Boundary Area Comm (Hudson)
Miss Riv Reg Plan Comm(La Crosse)*	National Audubon Society (St.Paul)*	Nature Conservancy (Madison,Mpls)*
North Iowa Times*	Peoples State Bank	Perrot State Park*
St. Mary's College (Winona)*	Sierra Club (Madison, Mpls)*	U of Wisc Extension Office*
Univ of Wisc (La Crosse)	Upper Miss R Basin As (St.Paul)*	Upper Miss Riv Cons Com (Rock Isl)
Vernon Co Broadcaster*	Vernon Co Cons Alliance(Stoddard)*	Waukon Newspapers*
Whitehall Times*	Winona Daily News*	Winona State University*
Wisc Winnebago Business Comm*	WKBT, WLAX, WXOW TV (La Crosse)*	WKTY, WLSU, WLXR Radio(La Crosse)*
WPRE Radio (Prairie du Chien)*		

*Public Notice Only

Individuals*

Alma- Harry Buck; Matt Goeldner
Blaine-Anne Powell
Boscobel- Monty Berger
Brownsville-Rick Denstad; Keri Schaller
Buffalo City-Edward Anniuk; Warren Barth; Dave Becker; Willard Blank; David Brandon; Cliff Burmeister; Roger Burmeister; Steve Burmeister; Larry Comero; Jack Deneff; Steven Engler; Herb Fandrey; David Fritsch; Wes Herbst; Milford Herreid; John Hilt; Dan Jacquart; Neil Keller; William Krause; Ralph Leahy; Richard Lietha; Alfred Lorenz; Bill Meyer; Gary Nissalke; Dave Olson; Sandra Piechowski; Aaron Reuter; Peter Rothering; Dennis Schmidtknecht; Kevin Solem; Jack Walz; Randy Wieczorek
Cochrane-Clifton Adler; Barry Auer; Rich Baures; Brian Bjorke; Clifford Burmeister; Randy Dienger; Steven Duellman; Gerald Earney; John Fandrey; David Fettling; Dick Graettinger; Ed Helmueller; Carl Hinz; Gordon Jensen; Marceda Jensen; Kermit Keller; George Kletzke; Allen Kochenderfer; Tom Krumholz; Alvin Lieth; Dick Lieth; Duane Loewenhagen; Bob Lovas; John Matson; Robert Miller; Curtis Morem; John Moss; Harvey Paul; William Powell; Myron Schwanke; Edward Squires; Henry Stankiewicz; Ardine Steckling; Virgil Stinocher; John Weber; Rudy Zeller
Desoto-Delmer Backhaus; Ronald Hutschenreuter; Milan Kumlin; Donald Ruffcorn; Gerald Sindy
Dodgeville- Ronald Gast
Dyersville-Kurt Burbach; Joseph Ertl
Eastman-Peter Biermenapp; Allen Christensen; DuWayne Jonsrud
Eau Claire-Jack Mettler
Elm Grove-Jim Kexel
Fayette-Bernard Pattison
Ferryville-Truman Anderson; Fritz Bechtel; W.A. Dean; John Diehl; Don Hempy; Stuart Johnston; Larry Knutson; William McCormick; George Olson; Paul Sampson; James Volk
Fountain City-Kirsten Almo; Ralph Czaplewski; Roger Czaplewski; Ralph Duellman; Allen Farner; Greg Kidd; Eve O'Brien; Nick Provix; Robert Sieker
Galesville-Rebecca Barnes; George Walski
Gays Mills-Ron Leys; Leonard Olson; Minnie Olson; Thomas Olson
Genoa-Jack & George Blask; Raymond Klafke; Raymond McKelatti; John Wilber
Guttenberg-Charles Cain; Laird Cline; Clem Demuth; Doug Geuder; Mickey Healy; Joe Ihm; John Kuempel; Howard Miller; Ray Nitzki; Gary Stirn; Leland Tomkins; Michael Tujetsch; Eldon Vorwald; Chris Zach; Roger Zach; Donald Zerley
Harpers Ferry-Carl Lund
Hazelton-Leo Howard
Hillpoint- Les Neefe
Hokah-Arnold Idecker
Holmen-Joni Jackson; Jerry Pryor; Virgil Roberts; Sue Strano
Houston-Phil Moen
La Crosse-Joe Bronk; William Buckner; Lynne Bulman; Claude Deck; Gerald Ender; Frank Hodge; Fred Lesher; Art Lotz; Harry Meinking; Neil Pomeroy; John Russell; Scott Schellhaass; Bill Steinmetz; Kathy Tabbert; Marty Venneman; Blair Voter; Dean Young
LaCrescent-Jerry Kathar; Don Krohn
Lansing-Barr; J.W. Bowker; Bill Burke; D.J. Delaney; Gus Kerndt; Leslie Livingood; C.E. Loomis; Orville Meyers; Mohn; Sloan; Ray Taylor; Donald Weymiller
Lynxville-Nathan Burgin; Ron Coleman; Bob Hagensick; Stan Hagensick; Lawrence Henkel; Mark Withey
Marion-Harold Bogert; Kenneth Fry; Douglas Hutchins; Kent Lofton
McGregor-Carl Lund
Minnesota City-Warren Matzke; Wayne Purtzer; Don Riedeman; Henry Rollinger; Leroy Tibesar; Ed Tomashek; Rich Twait
Oakdale-Carl Stephan
Onalaska-Robert Baldsizzi; Carl Behringer; Russ Brinkman; Eugene Dally; Mike Dvorack; Harlan Edmunds; Willis Fernholz; David Fonger; Fred Funk (DPR); Glen Gran; Ed Gray; Wm Hawkins; Bill Heinz; Tom Laufenverg; Charles Lukwitz; Timothy Maier; Leif Marking; Bob Mullally; Jim Noel; Ronald Page; Merlin Pandler; Gene Pankonien; Leonard Pralle; Patrick Smith; Chuck Vogel; Darrel Washa; Al Wernecke; David Wilson
Prairie du Chien-Allen Ackerson, Donald Higgin, William Howe (DPR); David Miller; Carl Noel; Glen Palmer; Paul Porvaznik
Stoddard-Calvin Barstow; Paul Gettelman; Tom Gianoli; Kevin Gobel; George Goodsell; Clarence Haydysch; Richard Jensen; Norm Krause; Eugene Loeffler; Pat Middleton; David Peterson; Gary Raabel; Daryl Steinke; Bruce Swancutt; Jim Willenberg; Bob Woodhouse; Rudy Wopat
Trempealeau- Orville Auseth; Jonathon Bald; Archie Chase; Dale Critzman; Hubert Drugan; Jeff Duncan; Herman Eichman; Phillip Foss; Alvin Gilberg; Kenneth Hovell; Tom Hunter; Sanford Ilstrup; Lynda James; Steve Kiedrowski; Bob Koba; Ruth Lamke; Pete Leavitt; Forest Mason; Morgan McDonah; Harvey Neilson; Blake Nelson; Gordon P. Olson; Dan Peplinski; John Reynolds; George Richtman; Doris Schindler; Grant Shorrel; John Siger; Al Skroska; Bea Stellpflug; Wendell Stephan; David Tranberg; Terry Uhl; Randy Van Vleet; Nate Vernon; Kenneth Wilber; James Wojciechowski; John Zimmerman
Winona-Jim Bambenek; Jon Bitu; Helen Davis; William Drazkowski; James Drier; Pam Eyden; Bruce Fuller; Dick Gordon; Donald Gray; Bill Green; Lloyd Livingstone; John Kane; Mike Kolstad; Charles Kubicek; Scott Lee; Reggie McLeod; James Nowlan; Robert Olson; Bob Pohl; Nancy Reynolds; Joanne Riska; Michael Rompa; John Ruggeberg; Solomon Simon; Charles Smith; Leo Smith; Will Snyder; Eric Sorensen; Eugene Sxeazy; John Tweedy

*Public Notice Only, unless noted