DEPARTMENT OF THE ARMY
MISSISSIPPI VALLEY DIVISION, CORPS OF ENGINEERS
P.O. BOX 80
VICKSBURG, MISSISSIPPI 39181-0080

REPLY TO
ATTENTION OF:

CEMVD-PD-SP

6 JUN '16

MEMORANDUM FOR Commander, St. Louis District

SUBJECT: Upper Mississippi River Restoration (UMRR), Rip Rap Landing State Fish and Wildlife Area Habitat Rehabilitation and Enhancement Project (HREP) Final Feasibility Report with Integrated Environmental Assessment (EA)

1. References:

a. Memorandum, CEMVS-PM-F, 16 December 2014, subject as above (encl).

b. ER 1165-2-502, Delegation of Review and Approval Authority for Post-Authorization Decision Documents, 31 March 2014.

c. ER 1105-2-100, Planning Guidance Notebook, 31 January 2007.

d. ER 405-1-12, Change 31, Chapter 12, Real Estate Roles and Responsibilities for Civil Works: Cost Shared and Full Federal Projects, 1 May 1998.

2. The Mississippi Valley Division (MVD) has reviewed the revised Feasibility Report, with Integrated Environmental Assessment and Technical Appendices, for the Rip Rap Landing State Fish and Migratory Wildlife Management Area ("Rip Rap Landing") HREP and concurs with the current plan and supporting documentation. A Compatibility Use Authorization (CUA) letter with Natural Resources Conservation Service (NRCS) will be required to continue to move into the design phase.

3. The CUA letter should allow the Corps to have perpetual use of the land and have no termination at will clause to allow approval at this level; otherwise, it will require an exception

to policy review and concurrence by HQUSACE Real Estate. Once the District receives a CUA as described, the report can be resubmitted to MVD for approval provided all report requirements are updated as necessary.

4. MVD staff recommends that the project manager assist the non-federal project sponsor, Illinois Department of Natural Resources (IDNR) and the NRCS to develop a CUA, which will provide the minimum necessary real estate interest, prior to the signing of a Project Partnership Agreement. The IDNR owns 2,055 acres in-fee and manages an additional 283 acres, owned by the Corps, adjacent to and part of the project. NRCS has a restrictive Wetlands Reserve Program (WRP) easement on 793 of the 2,055 acres of the non-federal sponsor's owned property.

a. On 14 December 2001, the NRCS purchased a WRP easement in perpetuity over approximately 793 acres of land owned by the IDNR in a part of the project area. This area comprises a substantial part of the contemplated footprint for the HREP. The WRP easement grants access to the United States (NRCS) and places prohibitions for various activities over the land by IDNR, the landowner, to protect the wetland covered by the easement area.

b. Presently, the IDNR does not have the ability to provide the district with the needed assurance that they have or will be able to obtain the necessary interest in land. Based on the current WRP easement restrictions, a CUA is required on the 793 acres for the proposed HREP at Rip Rap Landing. In NRCS's letter dated 31 October 2012, NRCS states, " [w]hile the Habitat Rehabilitation and Enhancement Project proposal may be compatible with the purposes of WRP, we cannot support the project completely until we have specific details of items that will be installed on the property and when those items will be installed and/or managed." NRCS has indicated their willingness to provide a CUA.

c. As stated in ER 405-1-12, it is the policy of USACE for the sponsor to acquire the minimum interest in real property necessary to support the project. Since CUAs are typically granted for five years and are revocable at will, the minimum interest in the real property necessary for the project cannot be obtained.

5. With the partnership agreement currently in place between the ASA(CW)/Corps and the NRCS to promote collaborative efforts to improve the management of water and related natural resources, and realizing that there are common goals for the Rip Rap Landing HREP and the WRP, the communication at the district level with the non-federal project sponsor and NRCS should continue. There can be acknowledgement by all parties that the HREP project will not likely impact the existing WRP project. The IDNR, with the Corps project manager, should continue to coordinate with NRCS to develop a mutually agreeable CUA for Rip Rap to move this project forward. Any such CUA should provide for sufficient interest for the operations and requirements of the HREP for the life of the project, and should not be revocable at will.

6. MVD staff remains prepared to assist the district as may be determined necessary to facilitate the resolution of the CUA.

7. The MVD point of contact for this action is Mr. Philip Hollis, CEMVD-PD-SP, (601) 634-5293.

Encl

MICHAEL C. WEHR
Major General, USA
Commanding

DEPARTMENT OF THE ARMY
ST. LOUIS DISTRICT, CORPS OF ENGINEERS
1222 SPRUCE STREET
ST. LOUIS MO 63103-2833

DEC 1 6 2014

CEMVS-PM-F

MEMORANDUM FOR Commander, Mississippi Valley Division (CEMVD-PD-SP/ Mr. Phil Hollis), 1400 Walnut Street, P.O. Box 80, Vicksburg, Mississippi 39181-0080

SUBJECT: Upper Mississippi River Restoration (UMRR), Rip Rap Landing State Fish and Wildlife Area Habitat Rehabilitation and Enhancement Project (HREP) Final Feasibility Report with Integrated Environmental Assessment (EA)

1. St. Louis District, United States Army Corps of Engineers (CEMVS) has enclosed eight copies of the Rip Rap Landing HREP Feasibility Report with Integrated Environmental Assessment and technical appendices (Encl 1) for your review and final approval. Comments from the Mississippi Valley Division, United States Army Corps of Engineers (CEMVD's) Alternative Formulation Briefing Review completed 27 March 2014 (Encl 2) have been incorporated into the Report.

2. The Agency Technical Review Report of the Initial Draft Feasibility Report with the original cost certification from the Walla Walla District Cost Engineering Mandatory Center of Expertise was completed in March, 2011 (Encl 3). The Walla Walla District Cost Engineering Mandatory Center of Expertise (Encl 4) completed an updated cost certification on 02 February 2014. The Agency Technical Review Report of the Final Draft Feasibility Report was completed in August, 2014 (Encl 5).

3. Completion of District Quality Control was completed on 20 May 2014 (Encl 6) and on 18 August 2014 (Encl 7).

4. A programmatic Project Study Issue Checklist for the UMRR was approved by Headquarters, United States Army Corps of Engineers (HQUSACE) in a memorandum dated 5 June 2006. Both the Programmatic Review Plan and the Programmatic Project Study Issue Checklist are included in (Encl 8). The revised Project Study Issue Checklist (May 2014) is included in (Encl 9).

5. The approved Review Plan and Independent External Peer Review waiver is provided in (Encl 10). The Review Plan was updated in May 2014 and is provided in (Encl 11).

6. Lands, easement, relocation, right of way, and disposal costs exceed 25% of the total project cost. HQUSACE approved a policy waiver for the project on 20 February 2014 and is included in (Encl 12).

Encl

7. Certification of legal sufficiency is provided in (Encl 13).

8. The sponsor's letter of support is provided within (Encl 14).

9. In compliance with ER 1165-2-502, the checklist for delegation of review and approval authority for post-authorization decision documents is provided in (Encl 15).

10. The draft Project Partnership Agreement and draft Memorandum of Agreement are provided in Appendix O, but are also included separately in (Encl 16).

11. Comments received during public review have been incorporated into Appendix A, Correspondence.

12. CEMVS has met the full intent of EC 1165-2-214 and there is no risk to either public health or safety resulting from this HREP.

13. Electronic copies of the enclosures have been sent to Mr. Philip Hollis, CEMVD-PD-SP.

14. The points of contacts are Mr. Brian Markert, District Program Manager, (314) 331-8455, brian.j.markert@usace.army.mil or Mr. Tim Eagan, Project Manager, (314) 331-8368, timothy.p.eagan@usace.army.mil.

Encls

ANTHONY P. MITCHELL
COL, EN
Commanding

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UPPER MISSISSIPPI RIVER RESTORATION

FEASIBILITY REPORT

WITH INTEGRATED ENVIRONMENTAL ASSESSMENT

RIP RAP LANDING STATE FISH & MIGRATORY WILDLIFE MANAGEMENT AREA

HABITAT REHABILITATION AND ENHANCEMENT PROJECT

DRAFT Final Report

August 2015

US Army Corps of Engineers ®
St. Louis District

MISSISSIPPI RIVER POOL 25
RIVER MILES 260.5 TO 267
CALHOUN COUNTY, ILLINOIS

UPPER MISSISSIPPI RIVER RESTORATION

FEASIBILITY REPORT
WITH INTEGRATED ENVIRONMENTAL ASSESSMENT

RIP RAP LANDING
STATE FISH & MIGRATORY WILDLIFE MANAGEMENT AREA
HABITAT REHABILITATION AND ENHANCEMENT PROJECT

POOL 25, MISSISSIPPI RIVER MILES 260.5 THROUGH 267
CALHOUN COUNTY, ILLINOIS

EXECUTIVE SUMMARY

A. Purpose of Report. The purpose of this Final Feasibility Report with Integrated Environmental Assessment, including the signed Finding of No Significant Impact, is to evaluate and document the decision-making process for the proposed Upper Mississippi River Restoration (UMRR; formerly known as the Environmental Management Program) Habitat Rehabilitation and Enhancement Project (HREP) at the Rip Rap Landing State Fish and Migratory Wildlife Management Area. This report is being developed by the U.S. Army Corps of Engineers with the Illinois Department of Natural Resources (IDNR) serving as the project sponsor. This report provides planning (including National Environmental Policy Act compliance), engineering, and sufficient construction details of the Recommended Plan to allow final design and construction to proceed subsequent to document approval by the Mississippi Valley Division U.S. Army Corps of Engineers.

B. Project Location. The Rip Rap Landing HREP is located along the left-descending bank of the floodplain within the Upper Mississippi River Navigation Pool 25 between river miles (RM) 260.5 and 267 near the Village of Mozier in Calhoun County, Illinois. The historic Sny River channel, now known as Sny Creek traverses the project area from north to south and forms a portion of the east property boundary.

Rip Rap Landing (RRL) covers 2,338 acres of river bottomlands, of which 2,055 acres are owned by the IDNR and 283 acres are owned by the Corps of Engineers as General Plan Lands, known as Dog Island. The Natural Resource Conservation Service has a 792.8 acre Wetland Reserve Program (WRP) easement on a tract owned and managed by IDNR known as the Rust Land Trust tract. The entire project area is managed by IDNR as part of the Mississippi River State Fish and Wildlife Area, a complex of mostly wetland habitats along the Illinois and Mississippi Rivers. All project area lands are managed by IDNR. A private tract of land, within the site and near the entrance to the project area contains a duck club that is managed similarly to Rip Rap Landing.

C. Problem Identification. Historically, RRL provided high quality habitat for a diversity of plant and animal species, including migratory birds and other wetland species. However, in the late 1890s, the Sny Island Drainage and Levee District (Sny D&LD) was constructed along with a closure levee north of Waverly Lake that left a portion of the levee extending south for several miles. This stretch of levee has been coined the "Old Sny Levee". The Old Sny Levee extension

divides the project area with lands on the riverside being subject to flooding and over-bank scouring, while lands west are less impacted because this remnant levee acts as a sediment deflection berm reducing scouring flows and river-borne sedimentation. This creates a unique backwater flooding effect through the Sny Creek, east of the Old Sny Levee extension. This backwater flooding deposits progressively less silt as it inundates areas further north.

The main resource problem for the project area is altered hydrology resulting from the operation of navigation lock and dams. These dams have raised water levels on the Mississippi River and have altered much of the natural flooding and drying cycles experienced by historic wetlands. In addition, navigation pool formation has increased sedimentation within the pools and side channels. Sedimentation also impacts wetlands in the project area causing them to fill and degrade. RRL is the first opportunity for the Mississippi River to access its floodplain downstream of the Sny D&LD. Within the project area, during overbank flood events, Mississippi River floodwaters allow river-borne sediments to deposit into wetlands in some areas while scouring wetlands in other areas resulting in wetland degradation within the project area.

Land ownership, property use restrictions and levee protection varies throughout the site. Therefore, the site has been divided into zones (Figures 2.1-2.6) for project planning purposes:

Zone 1, Sny Island Area, is on the northern most end of the project area and is contained within the Sny Island Drainage and Levee District, and therefore, unlikely to be flooded by the river. This zone is owned and managed by IDNR.

Zone 2, State Natural Area, is not protected from Mississippi River flooding and has been designated a State Natural Area due to a significant historic forest composition of bottomland hardwood forest. This zone lost many trees during and after the flood of 1993, and currently the invasive species reed canary grass is becoming established throughout the zone. This zone is owned and managed by IDNR

Zone 3, Roadside and Waverly Lake Wetland Management Area, is part of the original IDNR acquisition and consists of wetlands managed primarily for migratory wildlife and has a small disconnected lake. IDNR attempts water level management in this zone with spring and early summer drawdowns to promote growth of moist soil vegetation followed by a fall flood to provide habitat during the fall migration. This zone has suffered due to insufficient water conveyance capability. This zone is owned and managed by IDNR.

Zone 4, Rust Land Company-Wetland Reserve Program (WRP) Easement, is located adjacent to the Mississippi River. The zone has a WRP easement that has accomplished some wetland restoration to date, and features implemented under the HREP will comply with the terms of the WRP easement. A natural levee has formed along the river but low spots within this levee allow for headwater flooding resulting in wetland scouring and river-borne sedimentation in the zone. Most of the zone was in agricultural production. The former agricultural fields are dominated by dense herbaceous vegetation preventing regeneration of trees. Furthermore, the invasive species reed canary grass is becoming established throughout the zone. Generally, insufficient water has been available for optimum wetland management. This zone is owned and managed by IDNR.

Zone 5, General Plan Lands-Dog Island, is the southernmost part of the project area, located at the confluence of Sny Creek with the Mississippi River. The Sny Creek channel has been impacted by sediment from both the river and the hillside watersheds that drain into the creek, reducing depth of the creek to two feet or less and cutting off fish access from the Mississippi River except during periods of flooding. The land in this zone is part of the lands acquired by the Corps for the nine foot navigation project. IDNR has an agreement to manage this land.

D. Project Goal and Objectives. The goal of this HREP is *to increase the quality and quantity of aquatic, non-forested wetland, and forested wetland habitats.* The following objectives and feasible restoration features were considered in detail to achieve the project goal:

Objective 1. Increase habitat available to fish over the period of analysis.

Zones 3, 4 and 5: Improve fish access into Sny Creek and Roadside Lake from the Mississippi River.

- No Action
- Roadside Lake excavation to Sny Creek
- Excavating from Roadside Lake to Dog Island
- Excavating along Dog Island to the Mississippi River
- Water control structure at Roadside Lake
- Portable pump

Objective 2. Increase native plant species diversity and reduce number of acres impacted by invasive plant species by improving water level management over the period of analysis.

Zone 1: Create a functional management unit by managing water level for enhancement of existing and restored habitats:

- No Action
- Install a 2,500 gpm well and pump
- Install a water control structure in the Sny Levee and Drainage District channel
- Excavate a channel to Goose Pasture Lake

Zones 3 and 4: Improve the water movement, availability, and water level management for Zone 3, Waverly Lake and associated wetlands, and construct a wetland management complex in Zone 4.

- No Action
- Widen and deepen channel to Waverly Lake
- Larger water control structure in channel
- Water control structures into north units
- 35,000 gpm pump station
- Pump channel widening
- Pipe and concrete under access road to channel
- Water control structure under Old Sny Levee extension
- Water control structure under road to Zone 4
- South spillway in Zone 4
- Water control structure in south spillway

Objective 3. Reduce impacts of headwater flooding and river-borne sedimentation over the period of analysis

- No Action
- Fill in scour areas in natural river levee in Zone 4

Objective 4. Increase quantity and quality of bottomland hardwood forest over the period of analysis

- No Action
- Restore 63 acres of cropland to bottomland forest as an enhancement to water control in Zone 1
- Restore 37 acres of cropland to bottomland forest in Zone 3

E. Plan Formulation, Evaluation, and Comparison. A variety of features to restore habitats in the project area were proposed as a result of a Value Engineering Study and hydrogeomorphic-based workshop. Feasible features that met the project goal and objectives, as well as the No Action Alternative, were evaluated through an environmental benefits analysis to determine the magnitude of ecosystem benefits to be expected if the features were implemented. Costs and benefits were estimated. The benefits were estimated using the Aquatic Habitat Appraisal Guide (AHAG) and Wildlife Habitat Appraisal Guide (WHAG) methodologies. The benefits were then combined with cost estimates for each feature. Cost-effectiveness and incremental analyses were conducted to identify cost-effective plans and reveal changes in cost for increasing levels of environmental benefits (i.e., average annual habitat unit). This analysis resulted in 40 cost effective alternatives, and a total of 10 that were considered "Best Buy" Alternatives, including the No Action Alternative. These 10 alternatives were then compared and assessed on their ability to meet project objectives, NEPA compliance, and achieving the USACE Planning and Guidance evaluation criteria of acceptability, completeness, effectiveness, and efficiency (ER 1105-2-100).

F. Plan Selection. The Recommended Plan (Alternative 8), shown in figure ES-1, for the Rip Rap Landing HREP consists of multiple features to meet the project goal and objectives by implementing the following proposed features within the project area:

- Improved water level management (drainage and delivery) on 713 acres of wetlands in Zones 1, 3, and 4
- Restoration of approximately 100 acres of cropland and former cropland to bottomland forest within Zones 1 and 3
- Riverside ridge scour embankment in Zone 4
- Excavation of Sny Creek to restore year-round access for fish from the Mississippi River to Roadside Lake in Zones 4 and 5.

The Recommended Plan is a best buy alternative that yields 431 net average annual habitat units (AAHUs) at an annual average cost of $1,648 per net habitat unit. It best meets the project objectives and has project sponsor support from IDNR. Implementation of the Recommended Plan would increase quality and quantity of ecosystem resources and meet the needs for a variety of native aquatic and floodplain species.

Based on October 2014 price levels, the estimated project first costs are $9,006,000. The recommended project features are located on both federally-owned lands (Zone 5, Dog Island)

and non-federally-owned lands (Zones 1, 3, and 4). As a result, first cost funding for features located on federally-owned land would be 100% federal while features located on non-federal lands would be cost-shared with 65% federal and 35% non-federal. The first cost for features located on federally-owned lands (i.e., Sny Creek excavation along Dog Island) would be $1,133,000. The remaining features are located on non-federal lands (Zones 1, 3, and 4), and would be subject to the cost-share provisions in Section 1103 of the Water Resources Development Act of 1986 (P.L. 99-662) as amended by Section 509 of the Water Resources Development Act of 1999 (P.L. 106-54). The estimated federal cost share (65%) for features located on non-federal lands would be $5,117,000. The estimated non-federal cost share (35%) for features located on non-federal lands would be $2,756,000. The non-federal costs include values of lands, easements, rights-of-way, relocations, and dredged or excavated material disposal areas (LERRD) estimated at $2,886,000. The total federal cost for the project would be $6,250,000, which includes features on federal and non-federal lands. Total project monitoring cost for the first 10 years is estimated at $26,000. IDNR would be responsible for project operations, maintenance, repair, rehabilitation, and replacement (OMRR&R) at an estimated average annual cost of $62,098.

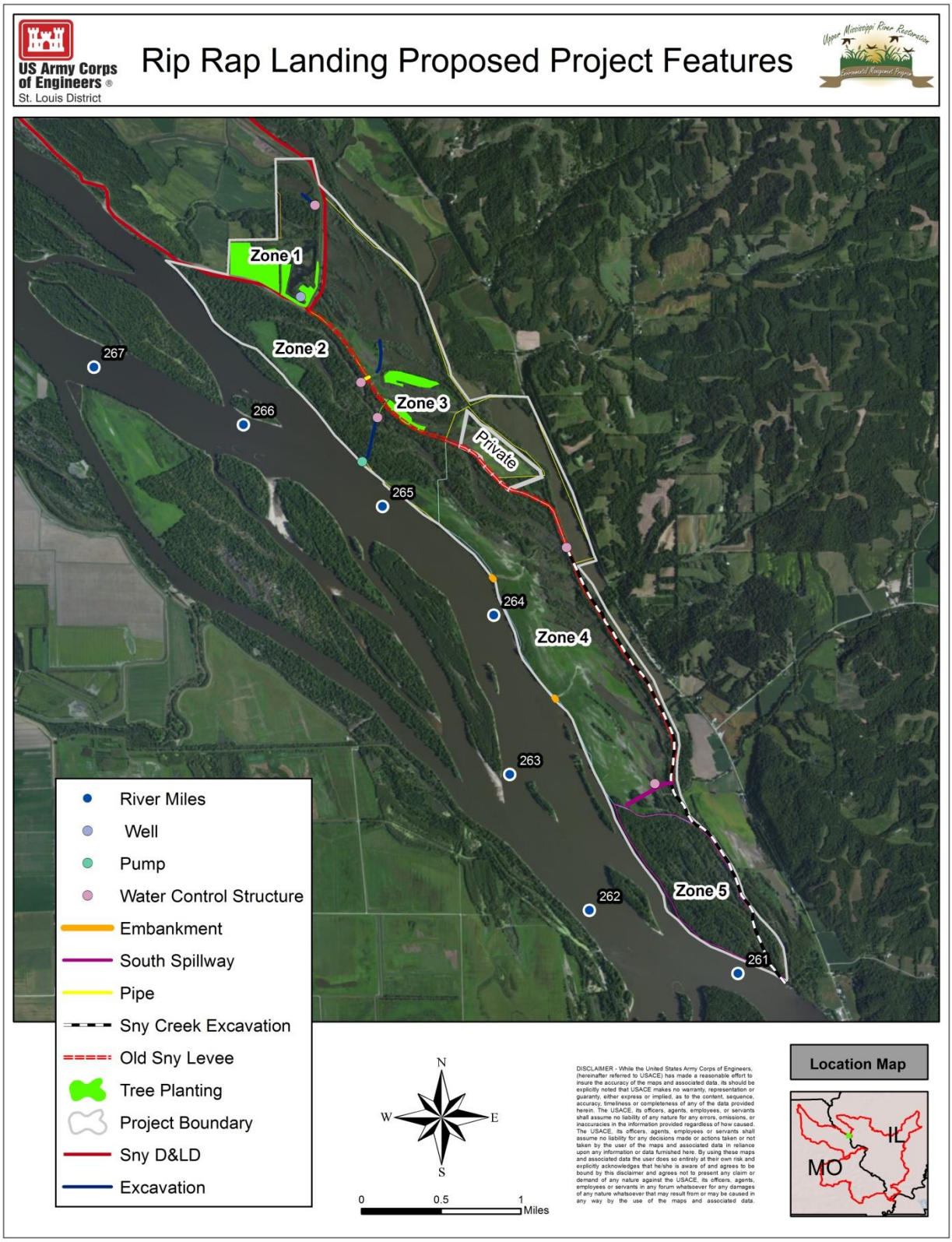

Figure ES-1. Features of the Recommended Plan at Rip Rap Landing

UPPER MISSISSIPPI RIVER RESTORATION

FEASIBILITY REPORT
WITH INTEGRATED ENVIRONMENTAL ASSESSMENT

RIP RAP LANDING STATE FISH & MIGRATORY WILDLIFE MANAGEMENT AREA
HABITAT REHABILITATION AND ENHANCEMENT PROJECT

POOL 25, MISSISSIPPI RIVER MILES 260.5 THROUGH 267
CALHOUN COUNTY, ILLINOIS
**NEPA Information can be found in Chapters 1, 2, 3, 4, 5, 6, 9, 13, 14, and 16 (FONSI)*

APPENDICES

PLATES

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UPPER MISSISSIPPI RIVER RESTORATION
FEASIBILITY REPORT WITH INTEGRATED ENVIRONMENTAL ASSESSMENT

RIP RAP LANDING
STATE FISH & MIGRATORY WILDLIFE MANAGEMENT AREA
HABITAT REHABILITATION AND ENHANCEMENT PROJECT

POOL 25, MISSISSIPPI RIVER MILES 260.5 THROUGH 267
CALHOUN COUNTY, ILLINOIS

1*. INTRODUCTION

A. Location. The Upper Mississippi River Restoration (UMRR; formerly known as the Environmental Management Program) Rip Rap Landing Habitat Rehabilitation and Enhancement Project (HREP) is located on the left descending bank of the Mississippi River in Pool 25 between Upper Mississippi River Miles (RM) 260.5 and 267, adjacent to the village of Mozier, in Calhoun County, Illinois. The project area is unique because it includes a large contiguous tract (2,338 acres) of primarily river bottomlands. All lands within Rip Rap Landing (RRL) are managed by the Illinois Department of Natural Resources (IDNR). The IDNR owns 2,055 acres of the project lands, while the remaining 283 acres Dog Island Complex is in federal ownership by the U.S. Army Corps of Engineers (Corps or USACE). The Dog Island Complex is part of the General Plan lands owned by the Corps, which is managed by IDNR through a three party agreement with the Corps, the US Fish and Wildlife Service (USFWS), and IDNR Corps-owned lands. Approximately 793 acres of the IDNR-owned land known as the Rust Land Company tract has an easement in place from the Natural Resource Conservation Service (NRCS) under the Wetland Reserve Program (WRP)[1]. IDNR purchased this acreage and incorporated it into the Rip Rap Landing Management Area. Restoration features already built on this portion of the management area under the WRP program are incorporated into the planning of the Rip Rap Landing HREP. Any features implemented under the HREP will comply with the terms of the WRP easement. A private tract of land, within the site and near the entrance to the project area contains a duck club that is managed similarly to Rip Rap Landing. Vicinity and location information for Rip Rap Landing HREP are provided in Figure 1.1.

B. Purpose. The purpose of this project is to restore degraded ecosystem conditions at the Rip Rap Landing State Fish and Wildlife Area. The need is for this action is further described in chapters 1, 2, and 3 detailing conditions of the ecosystem and project goals and objectives.

The purpose of this Feasibility Report is to present a detailed proposal for the rehabilitation and enhancement of fish and wildlife habitat resources at Rip Rap Landing State Fish and Migratory Wildlife Management Area (Rip Rap Landing) Habitat Rehabilitation and Enhancement Project (HREP). This report provides planning, engineering, and sufficient construction details of the Recommended Plan which will allow final design and construction to proceed subsequent to

[1] The WRP is a voluntary program that provides technical and financial assistance to landowners and Tribes to restore, protect, and enhance wetlands in exchange for retiring eligible land from agricultural production. Wetlands are protected under a WRP easement to provide habitat for fish and wildlife, including threatened and endangered species, improve water quality, reduce flooding, recharge groundwater, protect biological diversity, and provide opportunities for educational and scientific investigations and limited recreational activities.

approval of the document. The Environmental Assessment (EA) for the project is integrated within this feasibility report. There is also a section devoted to the Finding of No Significant Impact (FONSI). The preparation of the feasibility report followed Corps of Engineers planning guidance in ER1105-2-100.

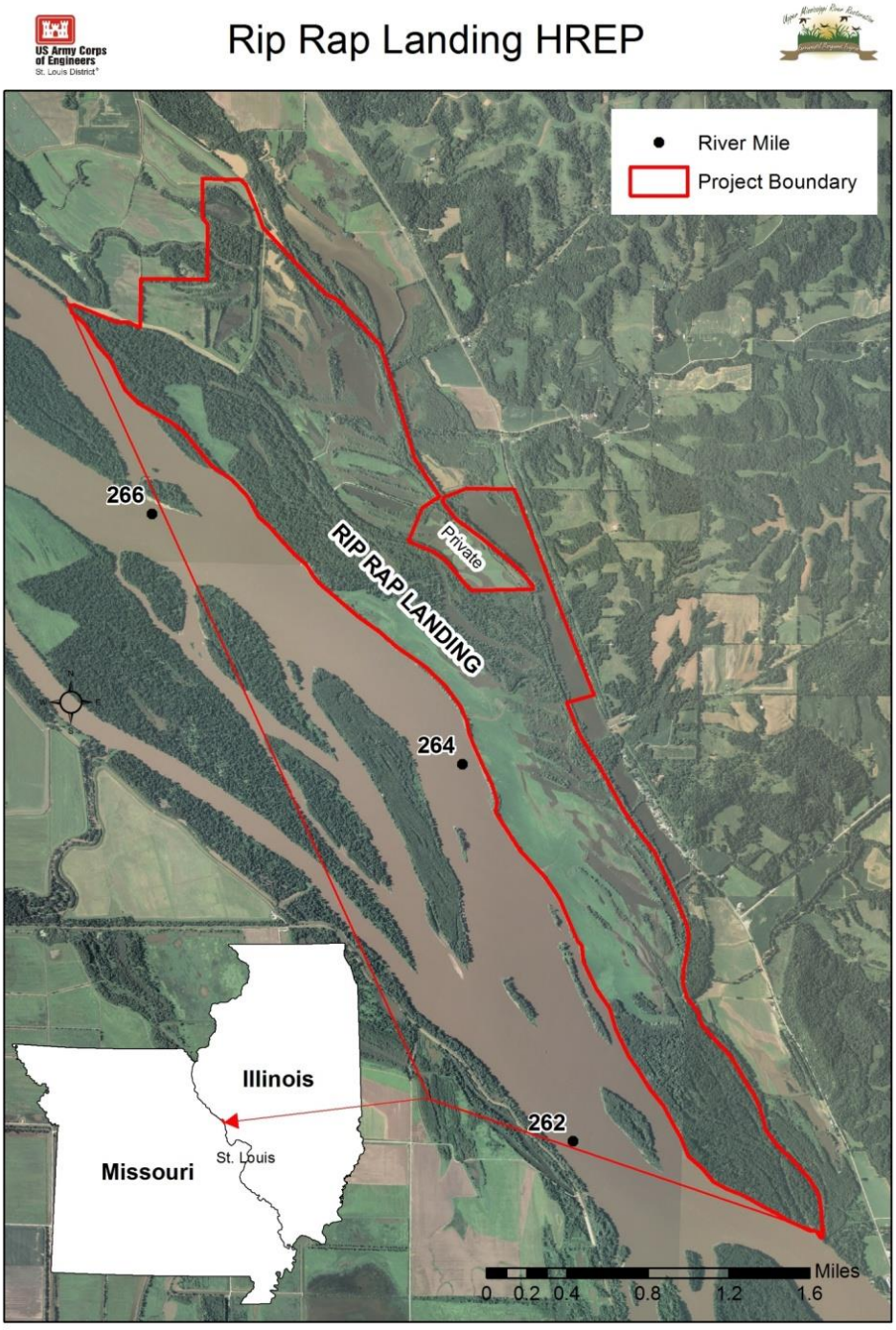

Figure 1. 1. Project Location Map

C. Project Selection. The IDNR identified the Rip Rap Landing HREP for inclusion in the St. Louis District's UMRR program. The River Resources Action Team (RRAT)[2] then ranked the project based on critical habitat needs along the Mississippi and Illinois Rivers. After considering resource needs and deficiencies, the RRAT recommended and supported the Rip Rap Landing HREP because it provides opportunities for significant aquatic, wetland, and floodplain ecosystem benefits; and the problems identified were considered to be within USACE's Ecosystem Restoration Mission.

D. Resource Problems and Opportunities. The aquatic and floodplain habitats within the Rip Rap Landing Fish and Migratory Wildlife Management Area have been diminished by sedimentation of wetlands and water bodies, loss of bottomland forest, disruption of the hydrologic cycle, loss of connection between water bodies and the river, and clearing for row crop agricultural production.

Historically, RRL provided high quality habitat for a diversity of plant and animal species, including migratory birds and other wetland species. When the Sny Island Drainage and Levee District (Sny D&LD) was originally constructed in the late 1890s, the main levee extended southward, west of Waverly Lake and along Sny Creek. Shortly after that, Sny D&LD constructed a closure levee north of Waverly Lake, but left the extension of the Sny Levee in place (coined "Old Sny Levee"), which is open at the southern end. Today, the existing Sny D&LD consists of 50 miles of riverside levee constructed to 100-year protection.

The project area's hydrology has been impacted by the operation of locks and dams for navigation purposes. The dams maintain an unnaturally high water level throughout the navigation pool during summer and other naturally low river seasons. This has severely altered the natural flooding and drying cycles necessary for natural wetland functions. The project area's proximity to the hinge point (located at RM 260.3L), or middle area of the navigation pool, results in frequent localized river level fluctuations that impact plant growth in neighboring wetlands.

The project area is also impacted by river-borne sediments. RRL is the first opportunity for the Mississippi River to widen and slowdown downstream of the Sny D&LD. With this slowdown, river-borne sediments are deposited within the project area during overbank flooding events degrading wetland habitats. RRL is unique because a portion of the original levee extended south along the west side of Sny Creek acting like a sediment deflection structure, buffering the impacts of overbank flows from the Mississippi River and creating a backwater flooding effect through Sny Creek. This backwater flooding deposits progressively less silt as it inundates areas further north.

[2] The RRAT is comprised of members from the Missouri Department of Conservation (MDC), USFWS (co-chairman), IDNR, participating NGO's, Corps (co-chair), and is the interagency coordination team for the St. Louis District to plan and implement habitat restoration projects on the Upper Mississippi River.

The original property was acquired by IDNR in the 1970s. Land purchases by IDNR in 2001 and 2003 increased the size of the state holdings by 836 acres, providing an opportunity to improve management capabilities in the project area. These additional acres were partially under the WRP easement and located in the central portion of the management area, south of the access road and bordering the Mississippi River. Water movement capabilities in the area are inadequate and the opportunity to manage additional areas of habitat has been greatly increased due to land acquisition.

A portion of the project area is designated as a State Natural Area. It was given this status because of the extensive bottomland hardwood forest composition that was present when the tract was acquired in the 1970s. The major Mississippi River flood in 1993, because of its timing and duration did a tremendous amount of damage to the natural area forest, as well as other wetland and aquatic habitats within the project area due. In addition, a breach in the Old Sny Levee extension resulted in extensive tree mortality, especially among mature pin oak trees, as well as sedimentation severely impacting the Sny Creek channel and associated backwater lakes. The flood of 1993 coupled with subsequent large flood events over the years have led to continued wetland and aquatic ecosystem degradation.

Significant opportunities exist to restore, rehabilitate, enhance, and increase wetland and aquatic habitat through reforestation of bottomland forest, enhanced water level management and supply, improved side channel and slough habitat, and improved aquatic depth diversity at RRL.

E. Resource Significance. The Mississippi River represents the largest riverine ecosystem in North America and the third largest in the world. The Upper Mississippi River is the portion of the Mississippi River upstream of Cairo, Illinois and its watershed encompasses over 2.6 million acres of aquatic, wetland, forest, prairie, and agriculture, supporting over 300 species of birds, 57 species of mammals, 45 species of amphibians and reptiles, 150 species of fish, and nearly 50 species of mussels. More than 40 percent of North America's migratory waterfowl and shorebirds depend on the food resources and other life requisites (shelter, nesting, rearing habitats, etc.) that the watershed provides and is well documented in the literature for its *technical significance* involving connectivity (*e.g.*, Mississippi River Flyway), biodiversity, and endangered species (*e.g.*, pallid sturgeon). In addition, Rip Rap Landing and other floodplain conservation areas located in the vicinity of the confluence of the Illinois, Missouri and Mississippi rivers provide mid-migration habitat for the Mississippi Flyway, one of the major flight corridors in North America for migratory birds. The Mississippi River and floodplain are the center of this flyway. This mid-migration habitat is recognized in the North American Migratory Wildlife Management Plan as a habitat of major concern. The proposed HREP at RRL has the opportunity to contribute to improving this mid-migration habitat, ecosystem structure and function of Pool 25, and the Upper Mississippi River System as a whole. Additionally, the National Research Council further recognized the technical ecological significance of large floodplain rivers and identified the Mississippi River and Illinois River as examples of two such rivers in the United States that could become healthy again with proper management and restoration.

Public recognition for the value of this ecosystem comes from several partnerships within the basin wanting to address resource needs and restore the Mississippi River (*e.g.*, Middle Mississippi River Partnership; Floodplain Science Network; River Partnership of Community Foundations; Fishers and Farmers Partnership for the Upper Mississippi River Basin, and many more).

The importance of these resources was recognized by Congress in the Water Resources Development Act of 1986 by their designation of the Upper Mississippi River System (UMRS) as a "nationally significant ecosystem" and a "nationally significant commercial navigation system"(Section 1103(a)(2)). *Institutional recognition* of this resource's significance was further recognized by Congress' initial and continued authorization of the Upper Mississippi River Restoration (UMRR) program for the planning, construction, and evaluation of features for restoration of fish and wildlife habitat in the UMRS. The Rip Rap Landing State Fish and Wildlife Area is part of this nationally significant ecosystem.

F. Scope of Study. This HREP focuses on proposed project features that would improve aquatic, wetland, and bottomland hardwood forest habitats, and enhance overall resource values of the project area. The project is consistent with IDNR, USFWS and UMRR management goals.

Aerial photography, topographic surveys, and habitat quantification procedures were completed to support the planning and assessment of proposed project alternatives. Soil borings will be taken to determine soil properties such as gradation, permeability and consolidation, which are required for the design of proposed water control features. Sediment profiles and characteristics will be obtained for Sny Creek and other wetlands where excavation is proposed, as needed.

IDNR has made wildlife observations within the study area. These observations, along with future studies and monitoring for fish and wildlife, will assist in evaluating project performance.

G. Format of Report. The feasibility report is organized to follow a general problem-solving format. The purpose, problems and project selection process are presented in Section 1. Section 2 establishes the baseline for existing resources. Section 3 presents the objectives of the project. Section 4 describes proposed project features and Section 5 evaluates alternatives for meeting the objectives. Section 6 describes the Recommended Plan and lists general design and construction considerations. Section 7 proposes the schedule for final design and construction. Section 8 contains cost estimates for initial construction and operations, maintenance, repair, rehabilitation, and replacement. Section 9 assesses the environmental effects of the Recommended Plan. Section 10 describes a plan for monitoring performance and evaluating progress. Section 11 describes real estate requirements. Section 12 summarizes the roles of each sponsoring agency. Section 13 records the coordination effort with local, state, and federal agencies and comments received through public outreach. Sections 14 and 15 present the conclusions and recommendations. Section 16 includes a Finding of No Significant Impact (FONSI) statement and References follow. Figures, plates and appendices have been furnished to provide sufficient detail to allow review of the existing features and the Recommended Plan.

H. Authority. The Upper Mississippi River Restoration (UMRR; formerly known as the Environmental Management Program) is currently a Federal-State partnership designed to (a) plan, construct and evaluate features for fish and wildlife habitat improvement through HREPs, and (b) monitor the natural resources of the river system through the Long Term Resource Monitoring (LTRM) as authorized in the Water Resources Development Act (WRDA) of 1986 (P.L. 99-662), Section 1103(e)(1). This states:

> *To ensure the coordinated development and enhancement of the Upper Mississippi River system, it is hereby declared to be the intent of Congress to recognize that system as a nationally significant ecosystem and a nationally significant commercial navigation system. Congress further recognizes that the system provides a diversity of opportunities and experiences. The system shall be administered and regulated in recognition of its several purposes (Section 1103(a)(2)).*

The original authorizing legislation has been amended three times since its enactment. The 1990 WRDA (P.L. 101-640), Section 405, extended the original EMP authorization an additional 5 years to FY 2002, which allowed for ramping up of the program. The 1992 WRDA (P.L. 102-580), Section 107, amended the original authorization by allowing limited flexibility in how funds are allocated between HREP and LTRMP. The 1992 WRDA also assigned sole responsibility for operations, maintenance, repair, rehabilitation, and replacement of habitat projects to the agency that manages the lands on which the project is located. The 1999 WRDA (P.L. 106-53), Section 509, reauthorized UMRR-EMP as a continuing authority with reports to Congress every 6 years and changed the cost sharing percentage from 25 percent to 35 percent. In addition, Section 509 of the 1999 Act established the following two elements as continuing authorities:

- Planning, construction, and evaluation of fish and wildlife habitat restoration and enhancement projects (known as Habitat Rehabilitation and Enhancement Projects (HREPs))
- Long-term resource monitoring, computerized data inventory and analysis, and applied research (known collectively as Long Term Resource Monitoring Program (LTRMP)).

The authority for this feasibility report is provided by the 1985 Supplemental Appropriations Act (Public Law 99-88) and 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. The RRL HREP has a cost sharing requirement for the state owned lands but not for the Dog Island Complex because those project features are located on federally, Corps-owned land managed by the IDNR as a fish and wildlife area. General Plan lands in this location are those lands purchased by the Corps for the nine-foot channel project in the late 1930s. The Fish and Wildlife Coordination Act of 1958 allowed for "General Plan and Cooperative Agreements", which were approved in the 1960s, providing for state participation in managing federal lands for wildlife resources and habitat through tripartite agreements among the states, USFWS, and the Corps.

I. Scoping and Coordination. Scoping is an early and open process for determining the scope of issues to be addressed and for identifying the significant issues related to a proposed action.

Scoping was conducted during the planning process using a variety of communication methods with the affected public, agencies, and organizations. The input received during scoping was incorporated in the process of making decisions for the RRL HREP; however, USACE must ultimately make the decision which direction the HREP will follow.

Development of this report was actively coordinated with IDNR, the project sponsor, and the USFWS and NRCS, federal stakeholders. Coordination occurred during visits to the project site, team meetings, phone conversations, and a hydrogeomorphic-based Value Engineering Study workshop at the site.

In accordance with NEPA, the draft report with integrated environmental assessment and unsigned draft FONSI were made available to interested members of the public during a 30-day public review period from 9 July to 9 August 2014. The draft report was made available on the St. Louis District's website along with a letter mailed to interested members of the public addressing where to find the report, how to provide comments, and the date for the public meeting/open house. A public meeting/open house was held on 22 July 2014 at the Mozier Junction Restaurant located near Rip Rap Landing. Comments received during public review were incorporated into the report as needed, and copies of comments received are provided in Appendix A, *Correspondence*.

J. Prior Reports and Existing Projects. The Corps and others have prepared numerous reports on the UMRS near the Rip Rap Landing area. The following reports contain the most relevant information for the current effort:

Upper Mississippi River Restoration-Environmental Management Program, Pools 25 and 26 Islands Habitat Rehabilitation and Enhancement Project. U. S. Army Corps of Engineers, St. Louis District, June 2008. Part of this UMRR-EMP HREP is located just downstream of Rip Rap Landing. The report recommended approval of the proposed project to include reforestation of 110 acres, dredging to restore slough and river connections, and dredging and control structures to improve depth in island sloughs. The project is currently under construction

Upper Mississippi River Restoration-Environmental Management Program, Batchtown Habitat Rehabilitation and Enhancement Project. U. S. Army Corps of Engineers, St. Louis District, 1997. This UMRR-EMP HREP is located just downstream of Rip Rap Landing. The report recommended approval of the proposed project to include the construction of low levees to reduce sediment influx, gravity drains, pumping facilities, hillside sediment control, and a chevron river training structure. The project is currently under construction.

Mozier Creek Streambank Investigation. R. W. Windhorn, 2000. This report examines the sedimentation and erosion rates for the seven creeks in the Mozier water shed which drains into the Rip Rap Landing site.

Scott and Benn 2011. This report discusses the cultural resources of the project area.

2*. ASSESSMENT OF EXISTING RESOURCES

Overall, RRL includes 2,338 acres of primarily river bottomlands along the Illinois bank of the Mississippi River. The area is managed mainly for migratory and resident wildlife and contains a State Natural Area. Rip Rap Landing is managed as part of the Mississippi River State Fish and Wildlife Area, a complex of mostly wetland habitats along the Illinois and Mississippi Rivers. The entire acreage of RRL included in this HREP is located along the Illinois bank extending between Mississippi River Miles 260.5 and 267. The area is bounded on the north by the Sny Island Drainage and Levee District (Sny D&LD), on the west and south by the Mississippi River, and on the east by the Sny Creek channel and wetlands and private land holdings. Land ownership, property use restrictions and levee protection varies throughout the site. Therefore, the site has been divided into zones for project planning purposes. An aerial view of RRL with the approximate project boundary outlined is provided in Figure 2.1, and key landscape zones identified in Table 2.1.

Table 2. 1. Acreage of each zone at Rip Rap Landing

Zone	Key Landscape Feature	Habitat Type				
		Cropland	Forested Wetland	Non-Forested Wetland	Misc. (Roads, levees)	Total
1	Sny Island Drainage & Levee District	62.9	90.8	42.3	13.7	209.7
2	State Natural Area	34.8	288.9	17.8	10.0	351.5
3	Roadside and Waverly Lakes	36.5	283.5	370.3	9.7	701.0
4	Rust Land Company - WRP	410.0	191.1	191.7	1.0	792.8
5	General Plan Lands - Dog Island	0	240.7	42.3	0	283

Zone 1 – Sny Island Area. Zone 1 lies at the northernmost end of the project area and is contained within the Sny Island Drainage and Levee District (Sny D&LD) and is subject to their regulations and pumping regimes (Figure 2.2).

Zone 2 – State Natural Area. Zone 2 lies at the north end of the project area and to the west and southwest of Zone 1, and west of the main Sny D&LD levee and the Old Sny Levee extension to the south (Figure 2.3). This zone has been designated a State Natural Area due to a significant historic forest composition of bottomland hardwood forest. The Mississippi River bounds the west side of the zone, and the river edge is accreting, forming a natural levee. Zone 2 is the first chance the Mississippi River is able to access its floodplain downstream of the extensive Sny D&LD.

Zone 3 – Roadside and Waverly Lake Wetland Management Areas. Zone 3 lies immediately south of Zones 1 and 2 occupying the middle portion of the project area (Figure 2.4). This zone is protected by the Old Sny Levee extension, which in recent history was breached during the floods of 1993 and 2008. The Waverly Lake Wetland Management Area does have limited water level management through a pump station located on the Mississippi River. This pump station is

functional and can supply water to Zone 3, but it currently lacks the capacity to supply water to adjacent zones (i.e., Zone 4).

Zone 4 – Rust Land Company – WRP Easement. Zone 4 occupies the southwest portion of the project area, adjacent to the Mississippi River (Figure 2.5). This area was formerly in row crop agriculture, but was last farmed in 2003. NRCS holds a WRP easement on this tract. IDNR manages this area, but management is difficult due to lack of sufficient water control abilities. It is subject to Mississippi River flooding from two breaks in the natural levee. This flooding is scouring out wetlands and depositing sediment in others within the zone.

Zone 5 – General Plan Lands – Dog Island. Zone 5 is the southernmost part of the project area, located at the confluence of Sny Creek (old Sny River channel) with the Mississippi River (Figure 2.6). This area is owned by the Corps as part of its General Plans lands, which are managed by IDNR under an agreement between the Corps, the USFWS, and IDNR.

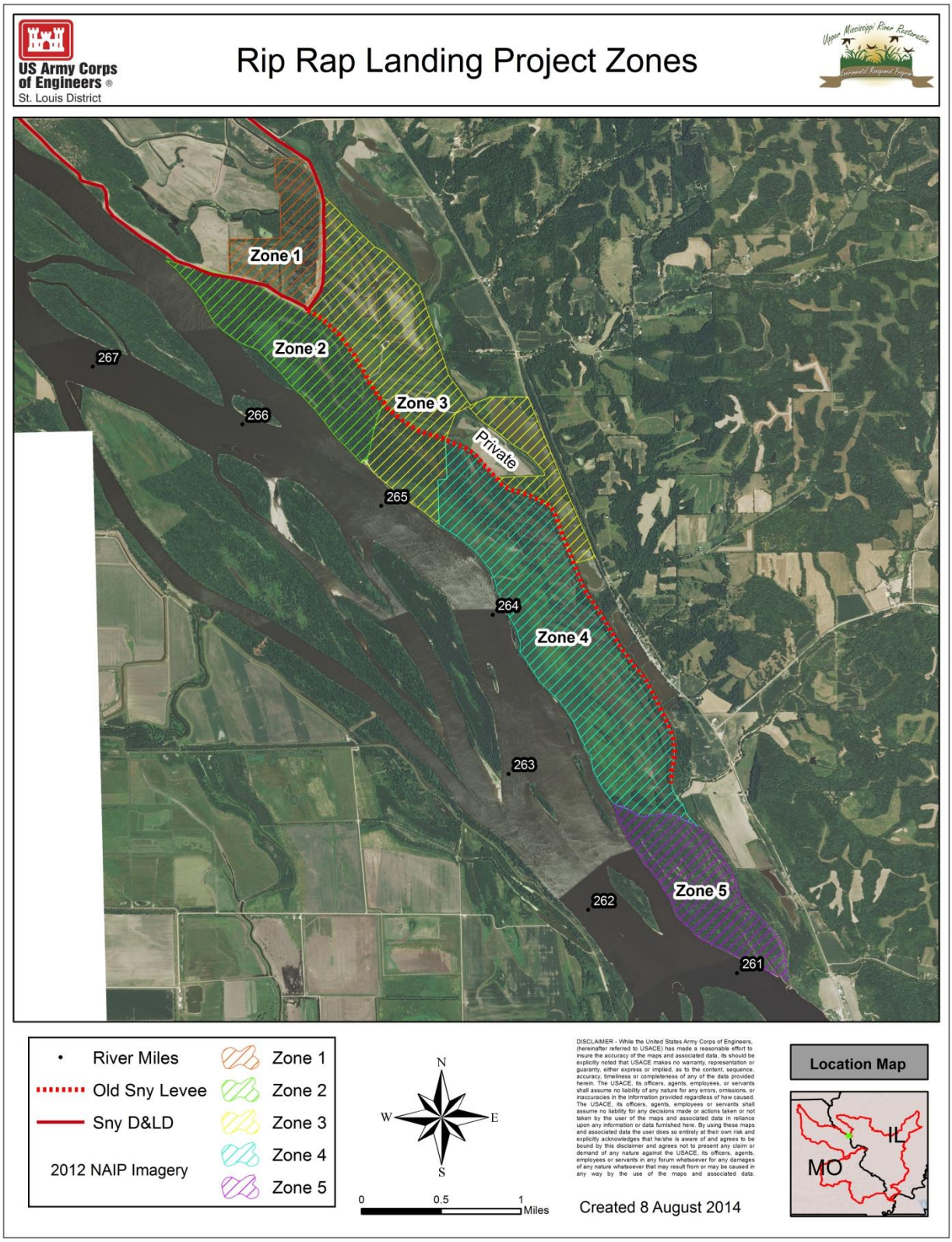

Figure 2.1. Project Zones at Rip Rap Landing (approximate boundaries depicted)

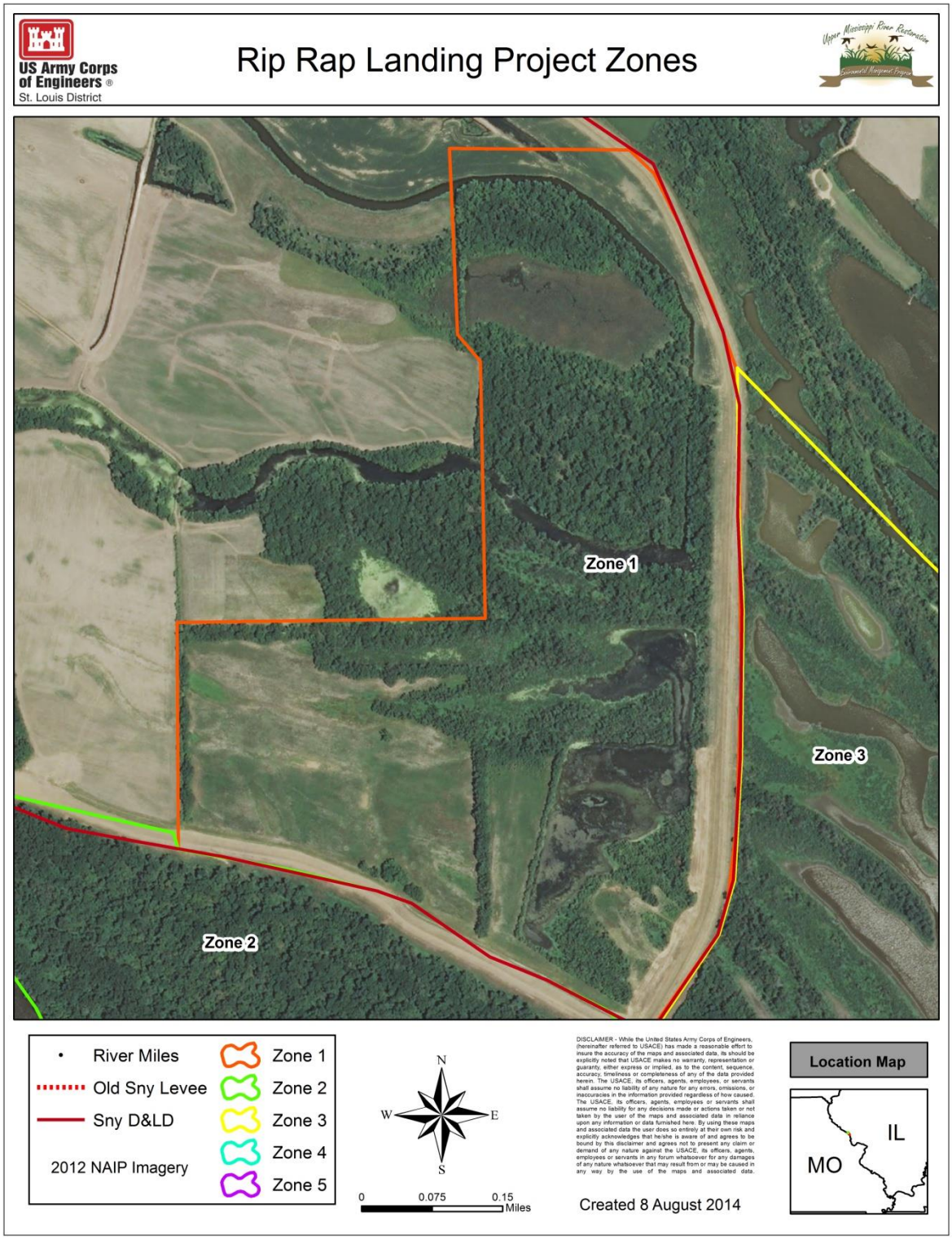

Figure 2.1. Rip Rap Landing Zone 1 – Sny Island Area (approximate boundaries depicted)

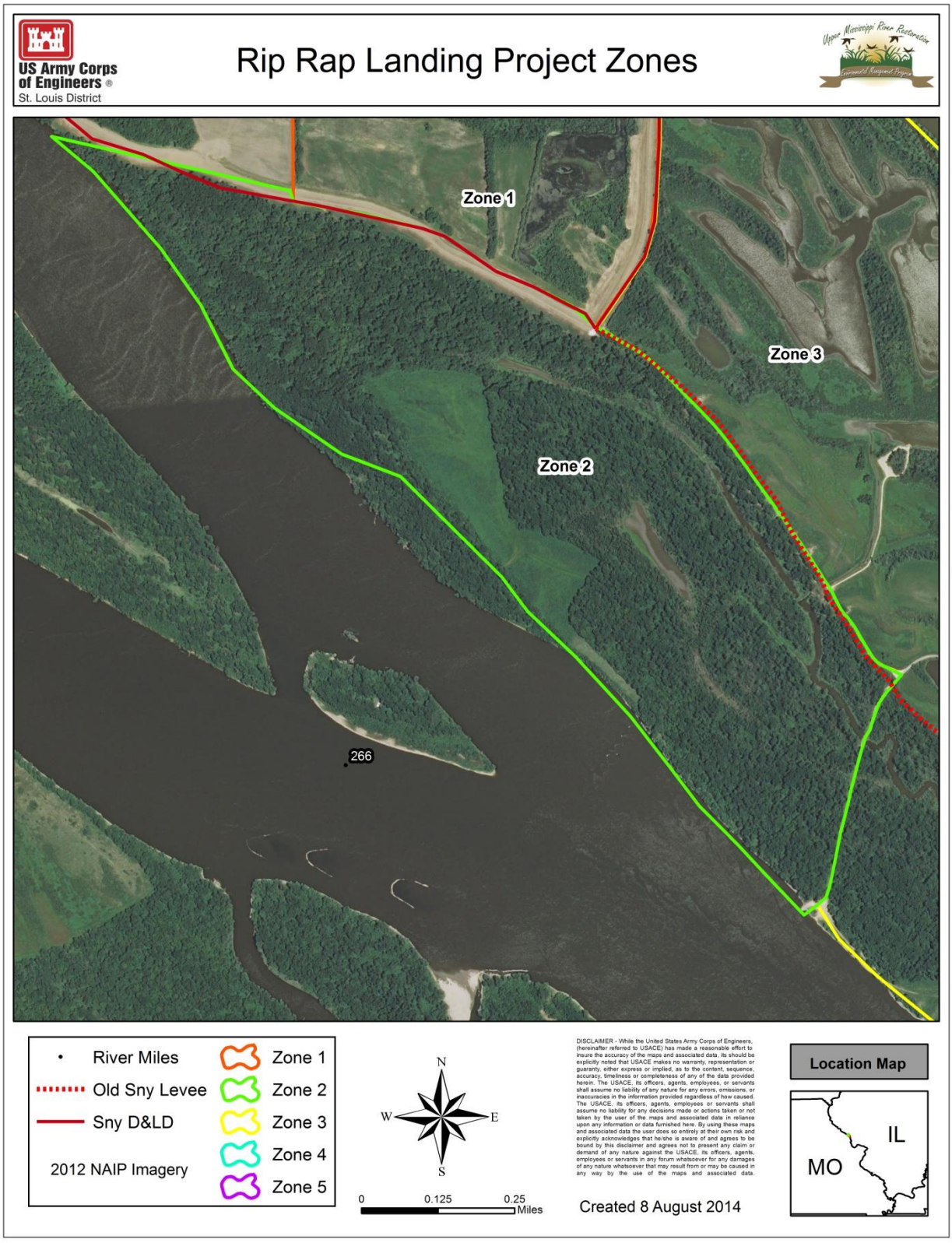

Figure 2.2. Rip Rap Landing Zone 2 – State Natural Area (approximate boundaries depicted)

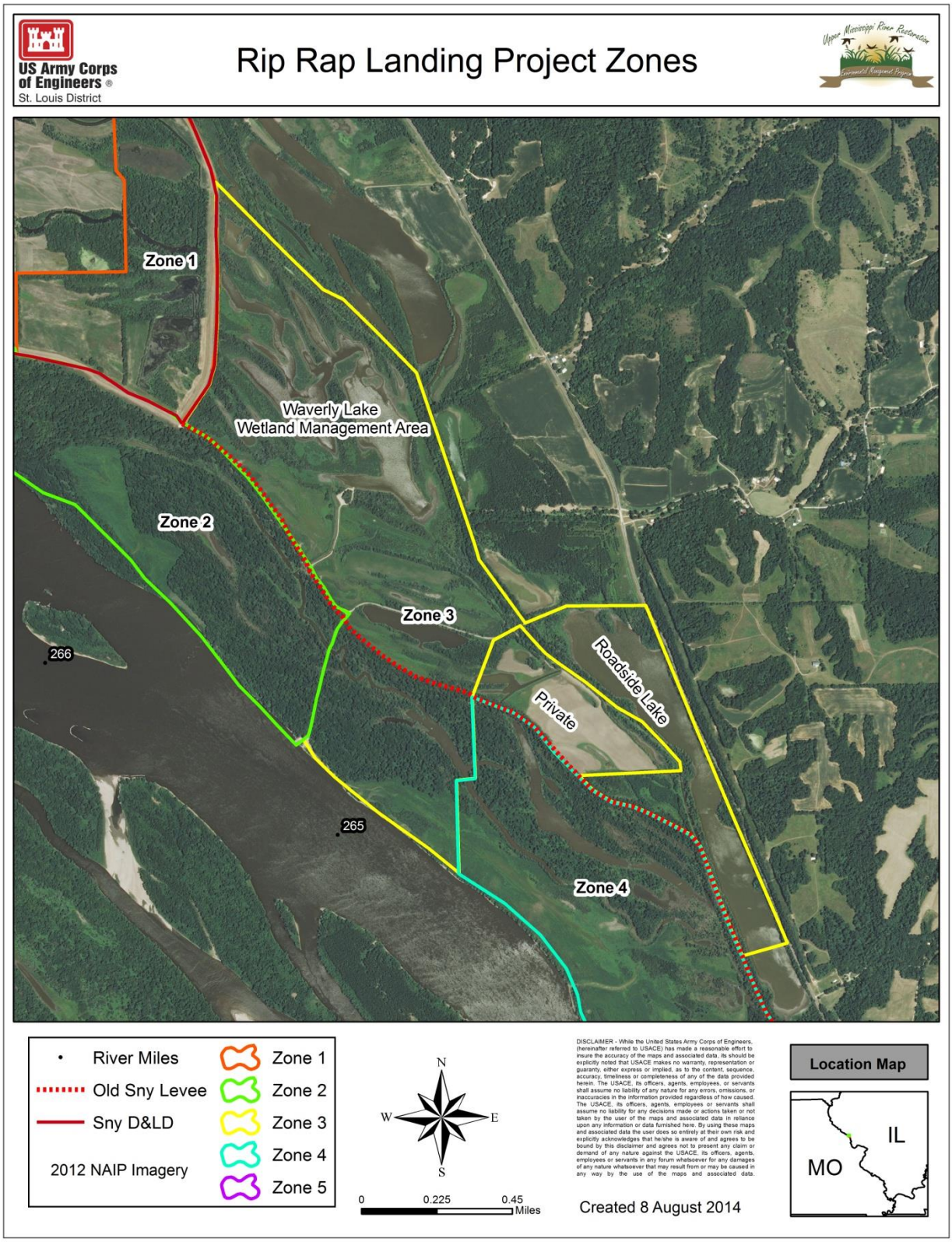

Figure 2.3. Rip Rap Landing Zone 3 (approximate boundaries depicted)

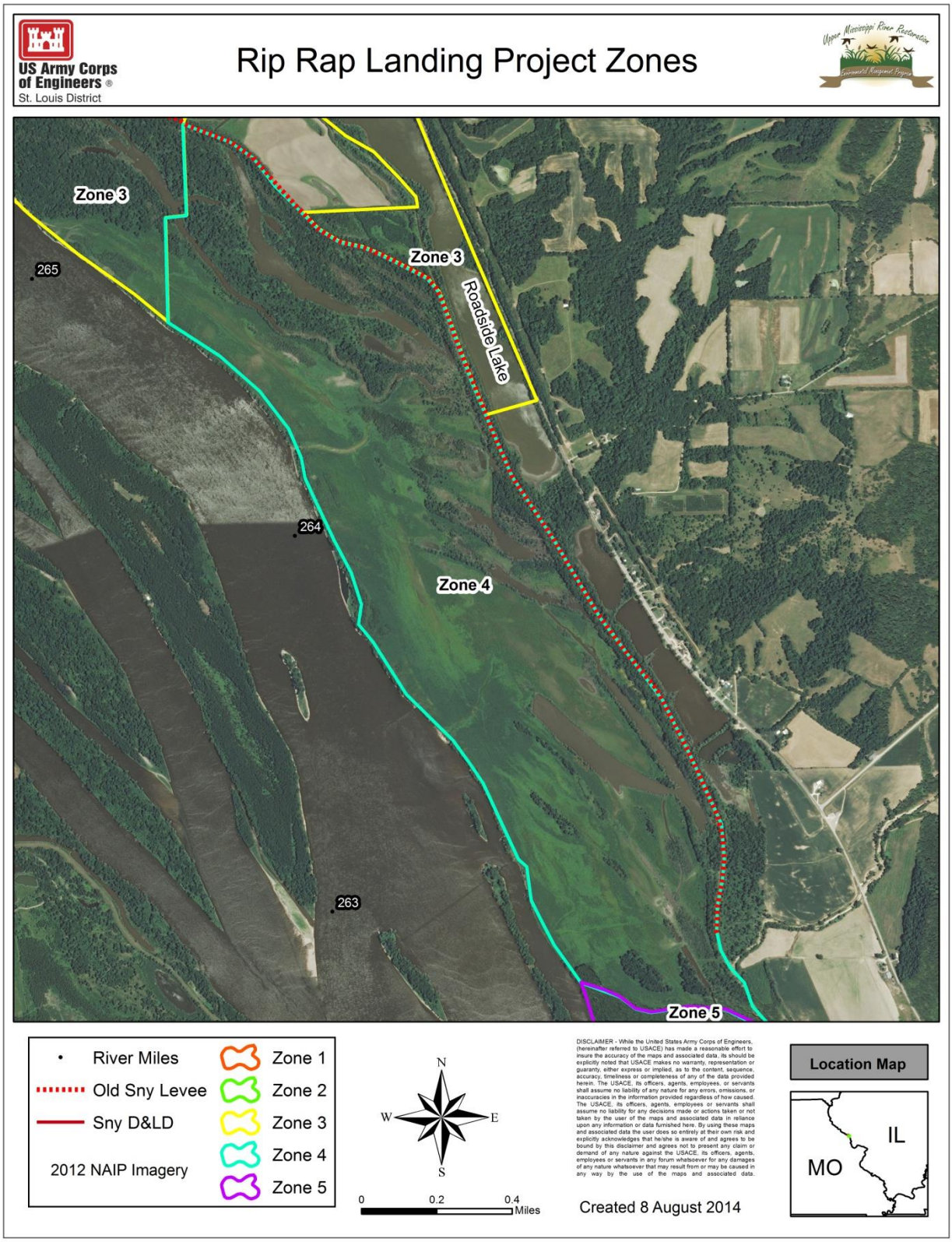

Figure 2.4. Rip Rap Landing Zone 4 (approximate boundaries depicted)

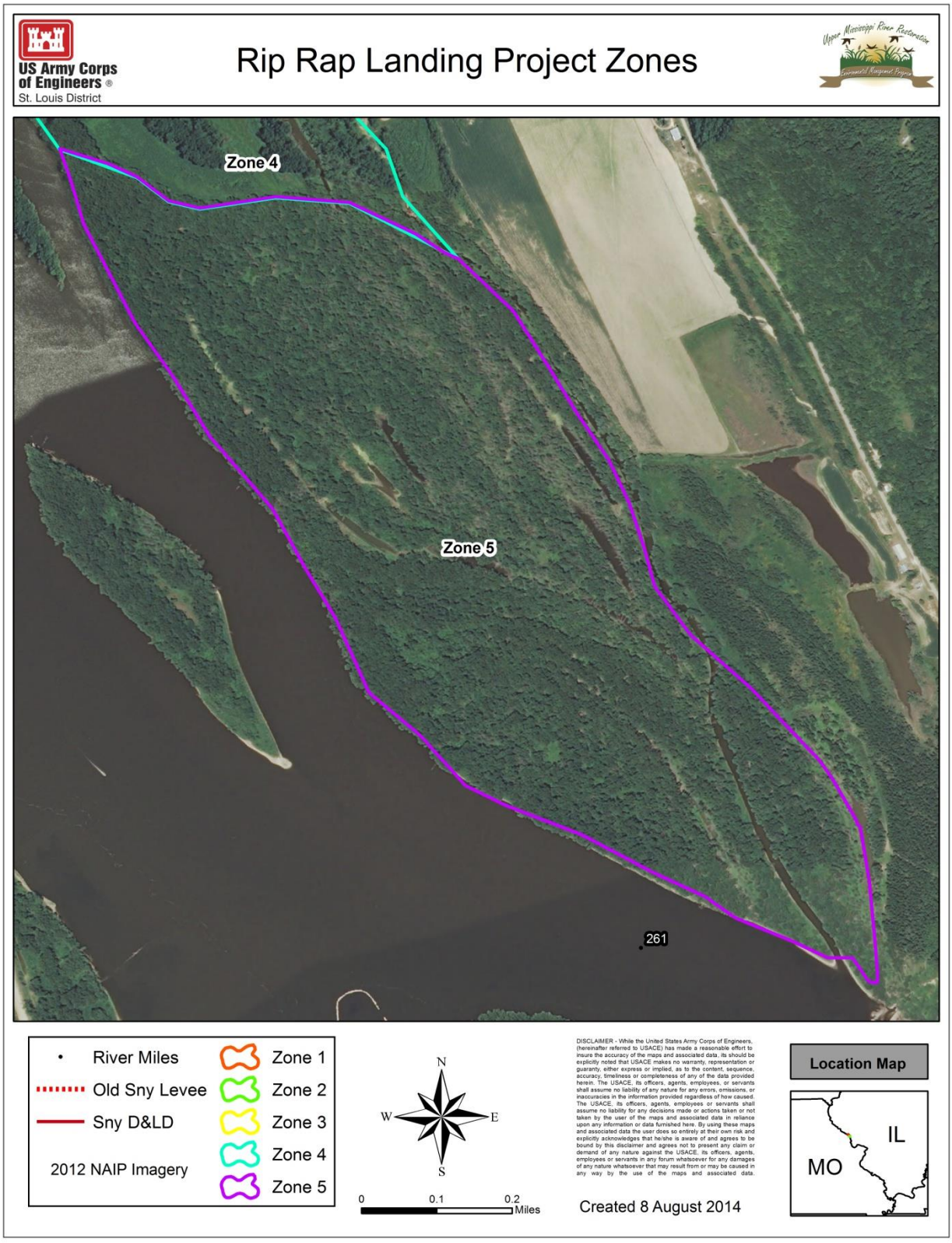

Figure 2.5. Rip Rap Landing Zone 5 (approximate boundaries depicted)

A. Resource History and Description of Existing Features. The RRL project area is in the alluvial floodplain of the Mississippi River (Hajic, 2000). Bottomland forests were extensive and were the dominant vegetation, although seasonal herbaceous wetlands and marshes were present adjacent to the forests and wetlands along the Sny Creek channel. The Mississippi River flooded the area frequently for short durations, rejuvenating and creating wetlands and providing nutrients for terrestrial vegetation (Heitmeyer, 2009).

By 1890, some higher ridge elevations on the area had already been cleared for agriculture (Figure 2.7). By 2000, much of Zones 1 and 4 were being farmed (Figure 2.8). Today, forest continues to occupy much of Zones 2, 3, and 5 with extensive areas of lower sloughs, swales, and Waverly Lake being occupied by seasonal herbaceous and shrub/scrub communities (Heitmeyer, 2009).

Construction of Lock and Dam 25 in 1939 and the initiation of hinge-point water management in Pool 25 affected the project area by raising the water table. Zones 3, 4, and 5 are impacted by the water control plan for Mississippi River Pool 25. The water management hinge point for Pool 25 is Mosier Landing which is located at the south end of the project area close to Dog Island and the lower end of Sny Creek. This operation of the pool can lead to fluctuating water levels at the southern end of RRL. The operation of the pool causes relatively stable water levels throughout the year over the rest of the site. This has eliminated the natural wet and dry cycles for these areas. The water control plan for the pool has been modified in recent years for the implementation of a program known as Environmental Pool Management. This method of management allows for seasonal fluctuations of the water level in the pool within normal operating ranges to benefit fish and wildlife. While management of the pool for navigation causes wider fluctuations in water levels for the southern end of the project, the use of Environmental Pool Management has little effect on the site itself. It primarily affects only the main channel border areas and does not affect the wetlands of the RRL.

IDNR purchased the first parcel of land in the project area in the 1970s with an acquisition of approximately 1,200 acres, which included Waverly Lake and 160 acres within the Sny D&LD. These acres are primarily in Zones 1, 2, and 3. Three wells were constructed to provide water to Waverly Lake for migratory wildlife management, but sands underlying the clay soils in the RRL region are extensive which prohibited efficient pumping. A pump station on the Mississippi River was later constructed along with a channeling system to provide water to Waverly Lake and restore wetland functions disrupted by the operation of the lock and dam system. In the early 2000s, IDNR acquired the 792.8 acre Rust Land Company tract which had a Wetland Reserve Program (WRP) easement held by the Natural Resources Conservation Service (NRCS). An additional 44 acres were acquired after the Rust Land Company addition, giving IDNR access to the Rust Land Company tract and enhancing the potential for wetland preservation and enhancement in the project area.

Sedimentation impacts RRL by filling lowland areas and thus depleting their capacity for holding water. This results in diminished aquatic habitat, reduction in surface area of wetlands, and reduced capability to withstand dry spells. The Mississippi River and, to a lesser extent, the adjacent uplands along the east side of the area contribute sediment to RRL. At the initiation of

planning, sedimentation from the hillsides was assumed to have a large effect on the wetlands of RRL. Further investigations have shown NRCS has already initiated steps to curb hillside sedimentation in the area. This has greatly reduced the amount of hillside sedimentation from what the assumed level was. NRCS has documented some of the changes in the adjacent watershed (Mozier Watershed Planning Committee, 2001; Windhorn, 2000). The source for most upland sedimentation in RRL is in stream (personal comm., Nance). While no detailed analysis exists, NRCS has said that they have used various programs and authorities in recent years to greatly reduce the amount of upland, out stream sources of sedimentation to RRL.

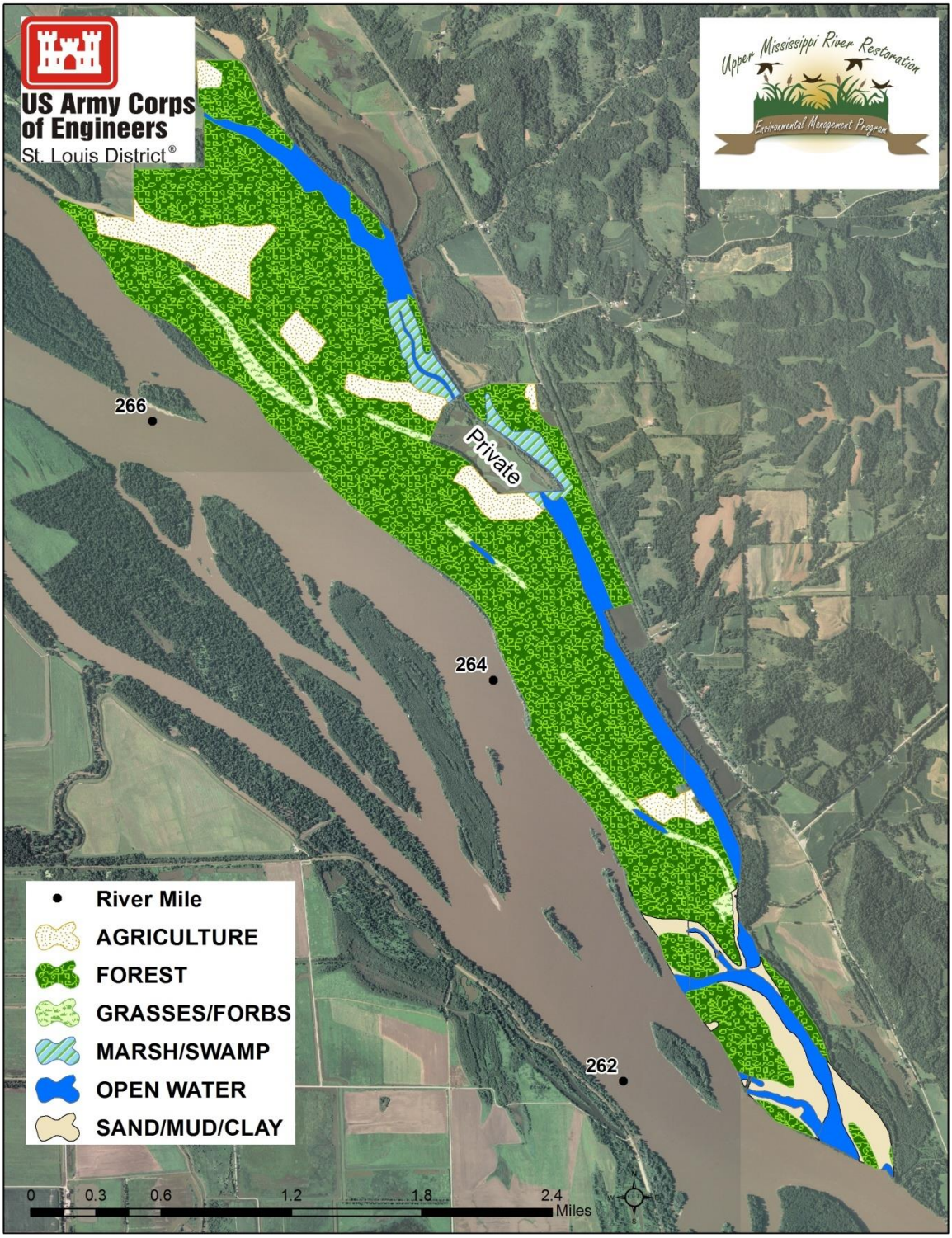

Figure 2.6. Rip Rap Landing Land Cover Classes 1890

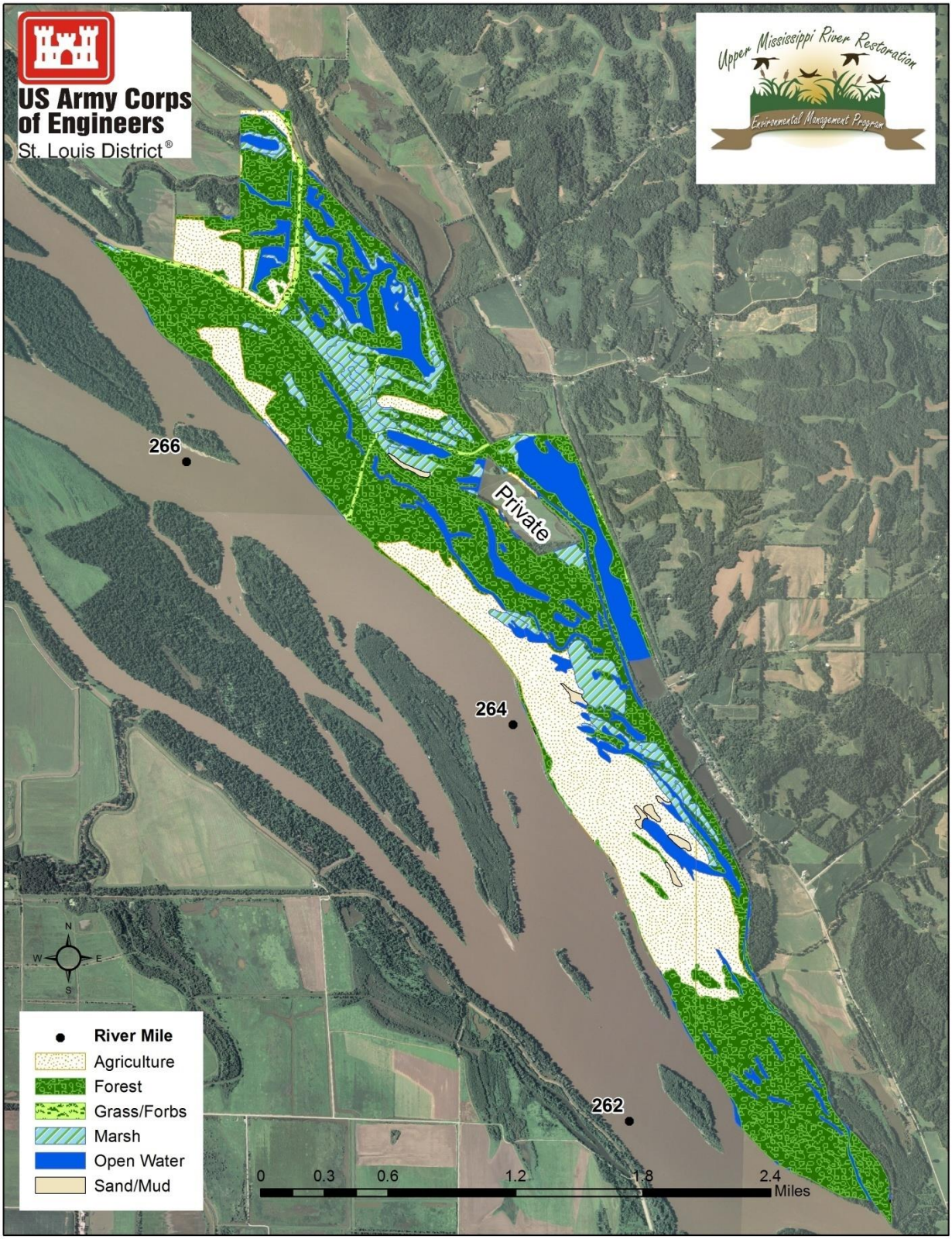

Figure 2.7. Rip Rap Landing Land Cover Classes 2000

B. Land Use and Current Area Management Objectives. The site is currently managed for resident and migratory wildlife and fish as water levels in the sloughs, backwaters and channels allow. Management within each of the management zones varies because each zone is affected by different laws, regulations and environmental conditions. Figure 2.9 depicts existing infrastructure within the project area.

<u>Zone 1 – Sny Island Area.</u> Zone 1 is located in the southern portion of the Sny Island Drainage and Levee District, which is considered a 100-year levee. The land within this zone is subject to the pumping regime of the Sny D&LD and thus, the wetlands are usually drier than IDNR would prefer. Within this zone, IDNR utilizes agricultural production as a management tool to combat invasive species, and to keep the site available for tree plantings. Because of the levee protection and pumping by the Sny D&LD, bottomland hardwoods, primarily pin oaks, have not been as adversely affected by flooding as compared to the rest of the project area. Wetlands in this zone are managed for migratory wildlife where possible, and migratory wildlife hunting does occur.

Photo 1. Images of Zone 1 which include the old crop field proposed for reforestation (above left), the dry conditions of Goose Pasture Lake (above right), and the Sny Levee that surrounds Zone 1 (below right).

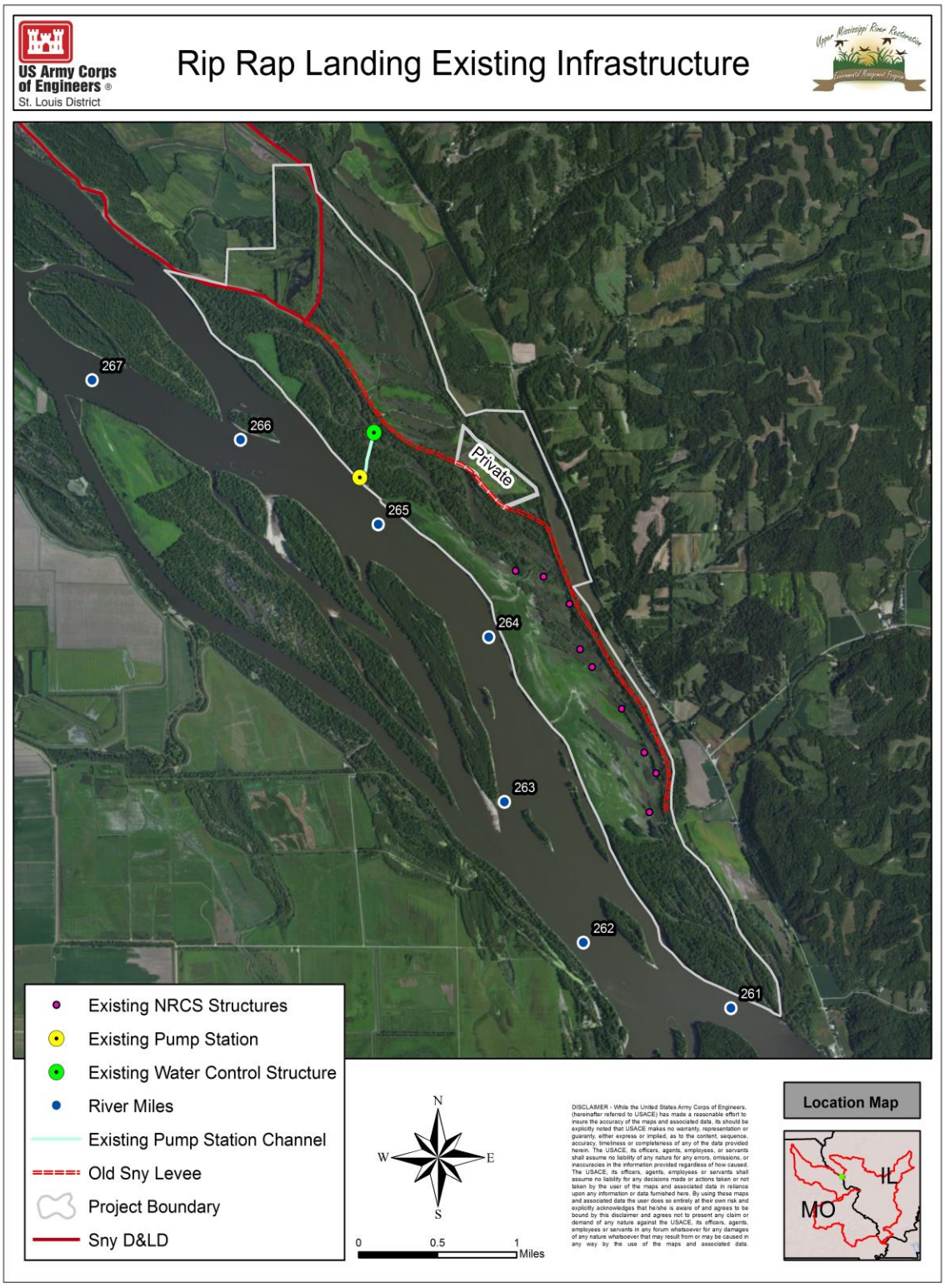

Figure 2.8. Existing Infrastructure on Rip Rap Landing

Zone 2 – State Natural Area. The State Natural Area is on the river side of the Old Sny Levee extension and subject to flooding from the Mississippi River. A natural levee has formed along the river in this zone with an elevation of approximately 445 feet above mean sea level (AMSL) (Photo 2). The name of the zone is derived from natural area status originally conveyed because of a significant historic forest composition of bottomland hardwood (BLH), especially pin oak and pecan on higher elevation ridges away from the river. A core portion of this area, approximately 20 acres, still meets criteria for State Natural Area status despite extensive damage to the forest resulting from the 1993 flood (IDNR, 2003). State Land and Water Reserve status has been proposed for the zone and would provide permanent protection for the area. However, the BLH forest was negatively impacted by the 1993 flood, and the BLH component is declining and being replaced by Box Elder and Silver Maple species, along with the establishment of reed canary grass. There is also a 35 acre crop field on some of the highest ground in the zone that is leased for agricultural production which IDNR uses as a management tool to combat invasive species. A channel was constructed at the southern edge of this zone, along Rip Rap Landing road, to move water from the pump station (Photo 2) at the landing to Waverly Lake in Zone 3, for migratory wildlife management purposes.

Photo 2. Existing pump station (upper left) and delivery channel (upper right) located at the border between Zone 2 and Zone 3 along the Mississippi River. Lower left shows the natural riverside levee in Zone 2. Lower right depicts the expanse of reed canary grass invading Zone 2.

<u>Zone 3: Roadside Lake and Waverly Lake Wetland Management Area.</u> Much of this zone is protected from Mississippi River headwater flows and sediment by the Old Sny Levee extension (Photo 3). The presence of the remnant levee causes the area to flood via a backwater action during high water through Sny Creek. When breaches (e.g., 1993 and 2008) occur in the levee extension, significant amounts of sediment can be deposited in the zone. Currently, all levee breaches have been repaired. Until the mid-1990s, the largest sediment influx into RRL came from uplands adjacent to this zone. Panther, Infidel, and Wildcat watersheds (19,000 acres) drain into the RRL project area through the Sny Creek channel which overflows into Waverly Lake. A watershed management group was formed in 1996 to look at ways to control sediment from the uplands, resulting in changes in land use in the watersheds (Mozier Watershed Planning Committee, 2001; Windhorn, 2000). IDNR has had some water management capabilities for the zone since 1996. Where possible, the area is managed primarily for annual flooding and drying regimes that encourage moist soil plant production (Photo 3).

Photo 3. Zone 3 Roadside Lake (upper left), Waverly Lake (upper right), the old Sny Levee extension (lower left), and the minimal water in Sny Creek (lower right).

Zone 4: Rust Land Company, WRP Easement. The Rust Land Company parcel contains the 792.8 acre WRP easement (Photo 4). The land parcel was enrolled in WRP in 2002 when the easement was granted by a private landowner. Shortly thereafter, IDNR purchased this land, which included the WRP Easement. Initially, IDNR could not gain land access to the parcel because of a private in-holding. They acquired the 44 acre private in-holding parcel between the WRP easement and the access road in 2005, enabling them to plan for more extensive management. NRCS, in partnership with IDNR, constructed nine water control structures in attempt to restore small wetlands (Photo 5, Figure 2.9 and Appendix B, *NRCS WRP Plans*). These structures are part of a passive system that relies on the river levels of the Mississippi River. While these can convey water into the system in parts of some years, they rely on an altered hydrograph associated with maintaining the 9-foot navigation channel and therefore cannot fully restore wetland functions and processes to this area. NRCS still proposes to plant 190 acres of grasses in this zone. IDNR would like to have greater water level management capabilities in Zone 4 and the existing structures lack the capacity for optimal water conveyance to restore natural wetland function and processes to the area. Any proposed project would have to work with and complement the terms of the WRP easement. NRCS supports efforts to expand ecosystem restoration on the site in order to supplement their work. Their plans for the WRP easement were designed with the intention that the Corps would be able to build a project in the larger area and incorporate their structures. When Zone 4 floods water initially backs up from the south end prior to overbank flooding along the Mississippi River. The overbank flooding creates a headwater scouring situation (Photo 5). This type of flooding also causes sediment deposition in wetlands in areas of zone 4. A natural levee has formed along the river with an elevation of about 445 AMSL, except for several scoured slough areas that breach the natural levee and allow headwater to enter the zone when backwater flooding is occurring. Most of the zone was formerly in row crop agriculture, but it has not been farmed since 2003. The previously farmed area grows up in herbaceous annuals each year, preventing most tree establishment, and reed canary grass is becoming established (Photo 4).

Photo 4. Zone 4 WRP area dominated by herbaceous annuals (upper left), and reed canary grass is becoming established (lower right).

Photo 5. Zone 4 scouring channel from headwater flooding (upper left); and southern most NRCS structure (lower right).

Zone 5: General Plan Lands – Dog Island. This zone is subject to Mississippi River flooding, resulting in significant sediment deposition in the zone. Approximately 100 acres of land has accreted in the island complex, interspersed by isolated sloughs that were old channels cut off from the river. Much of the land is forested with early successional tree species such as willow, silver maple, cottonwood and sycamore (Photo 6). There is no active management in this zone at the present time, although hunting is allowed. In 2012, a mist net survey was conducted, and several Indiana Bats (federally endangered) were found to be using this area. An acoustic survey conducted at the same time also detected the presence of the Northern Long-eared Bat (proposed for listing).

Photo 6. Zone 5 showing forest community (left), and poor aquatic conditions of Sny Creek (right)

C. Natural Resources. See Figure 2.8 above for locations of land cover types. Ninety-three percent of the project area is levee-unprotected and only 7% (the northern tip of the site) is levee-protected. The unprotected portion of the RRL HREP site is approximately 25% open water and herbaceous wetland habitats, and the remainder is in woody vegetation, predominantly bottomland forest, except for Zone 4 which was in agricultural production, but is being converted to herbaceous vegetation by NRCS. The protected portion of the site is about one-third open water and herbaceous wetland, about 5% cropland, and the remainder is forested. Zone 2's forested habitat was of exceptional quality prior to the flood of 1993, but this flood along with subsequent large flood events have been detrimental to this area.

1. Floodplain Forest. Species composition within the project area bottomland forest was dictated by the hydrology and elevation of the area. Historically, most of RRL was forest. Riverfront forest was composed of early succession species such as willow, cottonwood, sycamore and silver maple on newly deposited soil surfaces near the Mississippi River and along the Sny Creek confluence area. Floodplain forest dominated by mixed sugarberry, elm, cottonwood, box elder, and scattered oaks and pecans occurred on large areas of higher floodplain. Sugarberry, pin oaks and pecans were lost due to prolonged flooding, though they may have been impacted and stressed by wetter hydrology in the 1980s and early 1990s (Heitmeyer, 2008). Today much of the riverfront forest remains the same, and covers the areas identified, including most of Dog Island.

In Zone 2, most of the forest is considered wet-mesic floodplain forest or wet floodplain forest. Based on a forest inventory to this area conducted in 2003, silver maple and green ash were the two most common trees in the wet-mesic forest, even after about 20% of both species had died since the 1993 flood. Box elder and pecan suffered minimal mortality. Pin oak, which prior to the flood, was as common as pecan showed approximately 60% mortality. In the wet floodplain forest, silver maples comprised approximately 60% of all living trees. As in the wet-mesic forest, pin oak suffered the highest mortality of any species with 80% mortality. Additionally, many trees showed signs of root necrosis. These dead strips of bark occur directly above roots that have died as a consequence of prolonged flooding and fungus infection. Qualitative observations made since more recent floods have shown a lesser impact probably due to the timing and lesser duration of these floods.

2. Aquatic Habitat. Surface water features on or adjacent to RRL include the main channel of the Mississippi River, Sny Creek, side channels, backwater lakes, sloughs, wetlands and sand and mud flats (Figure 2.10). The Mississippi River adjacent to RRL is controlled by Lock and Dam 25. RRL is located in close proximity to the pool hinge point (RM 260.3L). The conditions of other named water features within the project area are described below.

Zone 1 - Goose Pasture Lake and wetlands - 47.8 acres of permanent and seasonal wetlands

Zone 2 - 5.9 acres of seasonal and permanent wetlands

Zone 3 - Waverly Lake and associated wetlands - 100.3 acres with depths ranging from a few inches to 6 feet. Submerged aquatic vegetation may establish some years. It may go completely dry in some years. The lake does provide fish habitat when the Mississippi River is flooding and may be an important spawning area for some species of fish.

Zone 3 - Roadside Lake - 99.1 acres with additional associated wetlands that total 18.8 acres, all are several inches to two feet deep with little habitat for fish, except for Roadside Lake which has a maximum depth of 6 feet. These lakes, ponds and sloughs may go completely dry in some years. The lake and associated wetlands do provide fish habitat when the Mississippi River is flooding and may be an important spawning area for some species of fish.

Zone 4 - WRP Impoundments and 191.7 acres of permanent and seasonal wetlands.

Zone 5 - There are several interior sloughs (former side channels) that cannot be accurately measured due to over-hanging trees. These are important areas for fish spawning and rearing depending upon river levels.

Several lakes and ponds along Route 96 are adjacent to Zones 3 and 4, but are not within the project area. They total 132.2 acres with maximum depths of several inches to a few feet. Habitat and fish populations are both regarded as "poor", but the lakes and ponds do hold water most of the year. These lakes and ponds are interconnected during periods of flooding and may be important fish spawning and rearing habitat.

Sny Creek (historic Sny River channel) traverses the site for 6.4 miles (33,917 linear feet), though it is currently shallow due to siltation and thought to be less than two feet deep throughout. During periods of high water, the creek and all of the aforementioned lakes and ponds are interconnected, providing fish habitat and may be important spawning and rearing areas when flooding occurs in spring and early summer.

When high water is present, all of the water areas may hold fish. Largemouth bass, bluegill, crappie, channel catfish, white bass, buffalo, gizzard shad, and bighead and silver carp are some of the fish species known to inhabit the area.

All aquatic resources within Zones 1-5 are shown in Figure 2.10. The minimum water surface elevation that can be experienced within the project area is approximately 433.0 ft NGVD at the extreme southern end of the project area (COE, 2008). Water elevations in the zone are usually higher because Pool 25's managed pool elevation is 434.0 NGVD and the interior wetlands respond to water elevations in the river. Minimum water surface elevations increase toward the upper end of RRL to approximately 436.0 ft NGVD. Water levels within the project area can fluctuate depending on river conditions, but the lower part of the project area is impacted to the largest degree because of its lower elevation and hinge point pool management.

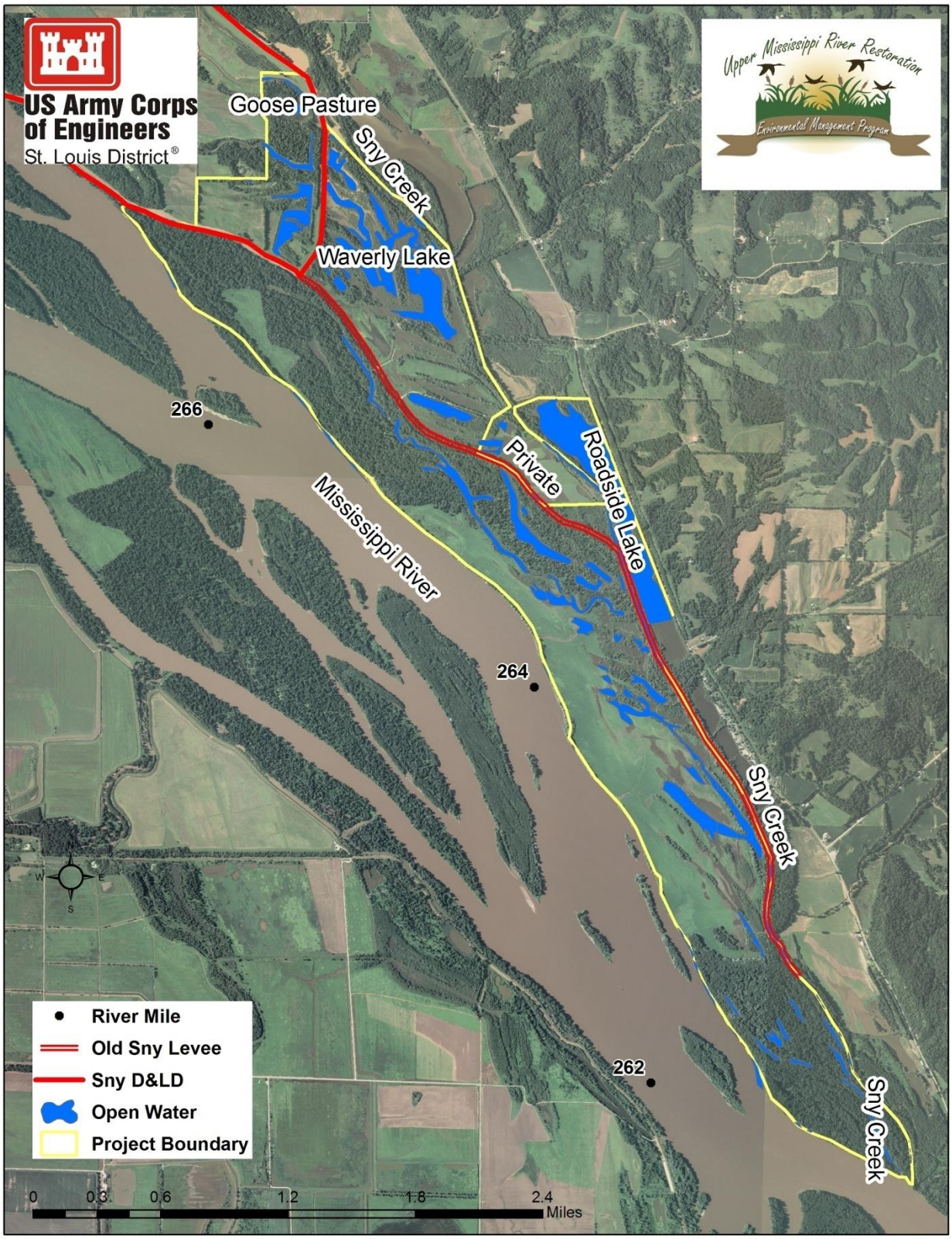

Figure 2.9. Rip Rap Landing Aquatic Habitat

3. Geology and Soils.

a. Geology. The project area is located entirely in bottomland composed of alluvium. The eastern and northern part of the site along the current Sny Creek channel and further northwest is early-middle Holocene channel belt with surfaces at least 7,000 years old. When the Mississippi River migrated west it deposited tributary fan-type surfaces known as the Yazoo Meander Belt and then late Holocene Channel Belt features along the current Mississippi River channel (Hajic, 2000).

b. Soils. The soils on the project area are mostly Beaucoup silty-clay loams in older landform sediment assemblages and Tice silt loam on Late Holocene areas along the Mississippi River (Figure 2.11). Beaucoup soils are poorly drained and very poorly drained, moderately slowly permeable soils on floodplains with 0-2% slope. They are similar and found in conjunction with Tice soils but on slightly lower elevations. Tice soils are somewhat poorly drained, moderately permeable and formed in silty alluvium with 0-2 % slope. Often associated with Beaucoup soils, they are slightly higher in elevation. Beaucoup and Tice soils can be classified as prime farmland if properly drained. Deeper clays and silts occur in the soil stratigraphy of older surfaces while thin veneers of silt and clay on late Holocene surfaces are underlain by coarse sands and some gravel near the Mississippi River. Hamburg silt loam soils occupy small alluvial fan areas on the margins of the floodplain east of the Waverly Lake area (USDA, 1989). Appendix C, *Geotechnical Considerations,* provides further detail.

c. Prime Farmland. According to the NRCS, the project site contains 617 acres that qualify as prime farmland and 1,105 acres that qualify as prime farmland if drained.

4. Wildlife. Rip Rap Landing and other floodplain conservation areas provide mid-migration habitat for the Mississippi Flyway, one of the major flight corridors in North America for migratory birds. The Mississippi River and floodplain are the center of this flyway. About 20 species of ducks and geese stop during fall and spring migrations to rest, feed and seek sanctuary in the wetlands and deepwater habitats of Pools 24, 25 and 26 and adjacent floodplain (Havera, 1985). In addition, approximately 285 species of birds including song birds, shorebirds and gulls, migratory wildlife, herons and egrets, and vultures and hawks are known to use or probably use the floodplain habitats of Pool 25 (Terpening et al., 1975).

Numerous reptiles, amphibians and mussels likely inhabit RRL. Approximately 50 species of mammals may inhabit the project area (Terpening et al., 1975). Common species include opossum, raccoon, muskrat, mink, and white-tailed deer.

5. Fisheries. When water is present, all of the water bodies may hold fish. The water bodies in the project interior are isolated from the river. There is no movement of fish between the river and interior water bodies except during periods of high water. Some areas such as Waverly Lake and Roadside Lake are connected less frequently to the river than other water bodies on the site. While no sampling information for the site is available, observations of local fisherman, similarity with other nearby conservation areas and studies on the Upper Mississippi River (Koel, 2004) suggest that largemouth bass, bluegill, crappie, channel catfish, yellow bass, buffalo, gizzard shad, and bighead and silver carp are known to inhabit the area.

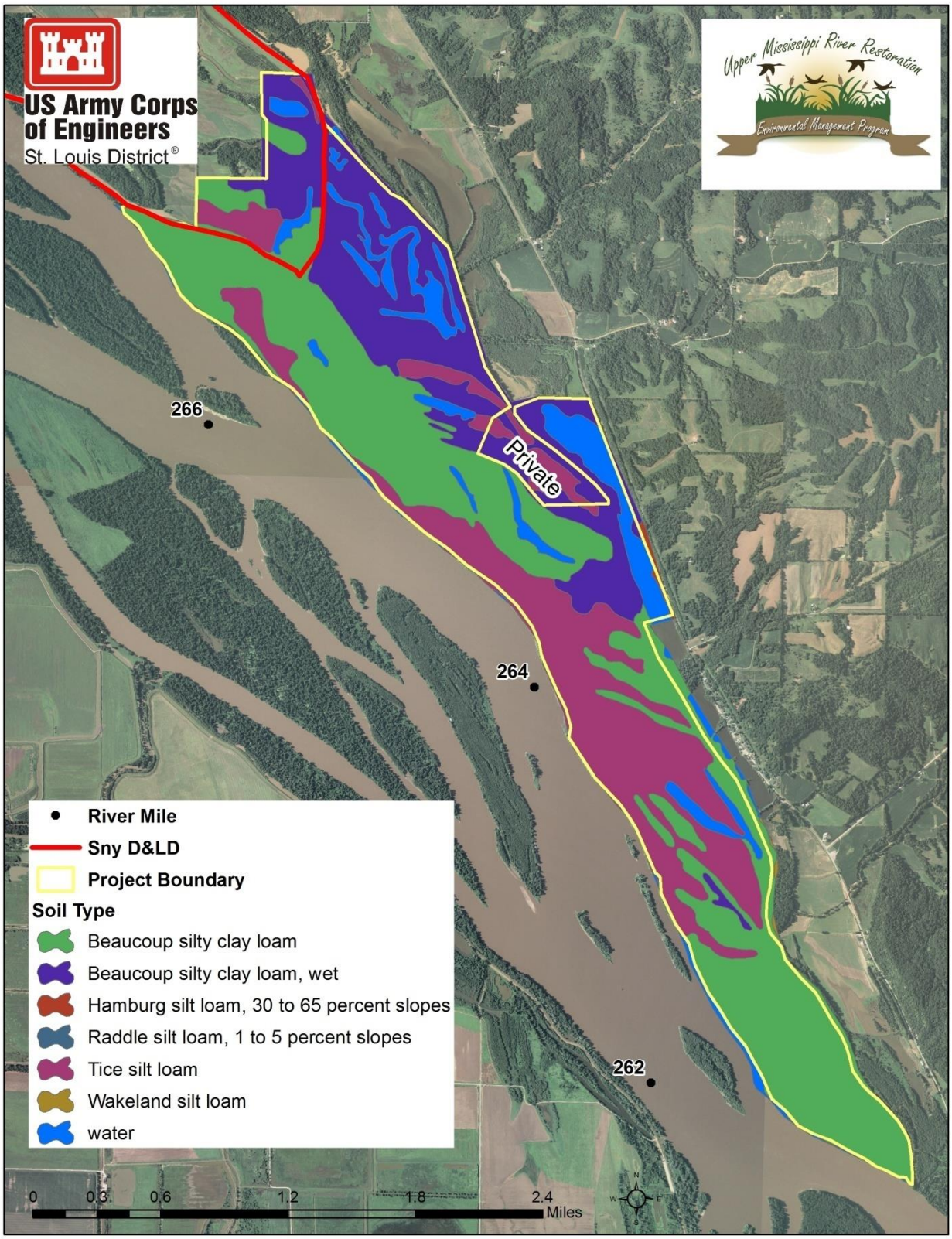

Figure 2. 10. Rip Rap Landing Soils

6. Endangered Species The list of animals and plants below was requested from the USFWS as required by section 7 of the Endangered Species Act. The most up to date information was provided by the USFWS Fish and Wildlife Coordination Act Report (Appendix D). This section and chapter 9 of the feasibility report are being used to satisfy the requirement of completing a Biological Assessment.

Endangered	Indiana Bat	*Myotis sodalis*
Threatened	Decurrent False Aster	*Boltonia decurrens*
Threatened	Eastern Prairie Fringed Orchid	*Platanthacon leucophaea*
Endangered	Spectaclecase	*Cumberlandia monodonta*
Proposed for Listing	Northern Long-eared Bat	*Myotis septentrionalis*

a. Indiana Bat. Indiana bats hibernate during winter in caves, or occasionally, in abandoned mines. For hibernation, they require cool, humid caves with stable temperatures, under 50°F but above freezing. Very few caves within the range of the species have these conditions. After hibernation the bats migrate to their summer habitat in wooded areas where they usually roost under loose tree bark on dead or dying trees. Males roost alone or in small groups, while females roost in larger groups of up to 100 bats or more. Indiana bats forage in or along the edges of forested areas, and especially prefer forest along rivers or small streams (USFWS, 2006). Mist net surveys on Dog Island in 2012 found several Indiana Bats using the area. Dog Island is forested, and future reforestation efforts throughout Rip Rap Landing should benefit the Indiana Bat.

b. Decurrent False Aster. This plant is found on moist, sandy floodplains and prairie wetlands along the Illinois River. It has been found along the Mississippi River in Madison County, Illinois. The plant relies on periodic flooding to scour away other plants that compete for the same habitat. Excessive silting seems to be a major cause of the plant's decline. Several communities of decurrent false asters have been found in areas of low-intensity agriculture (USFWS, 1997). This plant has not been found in the project area.

c. Eastern Prairie Fringed Orchid. This plant occurs in a wide variety of habitats, from mesic prairie to wetlands such as sedge meadows, marsh edges, and even bogs. It requires full sun and a grassy habitat with little or no woody encroachment for optimum growth and flowering. Flowering begins from late June to early July, with blossoms often rising just above the height of the surrounding grasses and sedges. The more exposed flower clusters are in great risk of being eaten by deer (USFWS, 2005). This plant is not known to occur in the project area.

d. Spectaclecase. This large mussel is greatly elongated, sometimes curved, and moderately inflated, with solid and moderately thick valves. Key characteristics for distinguishing the spectaclecase from other mussels are the large size, elongate shape, arcuate ventral margin, dark coloration, roughened surface, poorly developed teeth, and white nacre. No other North American mussel species has this suite of characters. The spectaclecase occurs in large rivers and is a habitat-specialist, relative to other mussel species, often occurring on outside river bends below bluff lines. It most often inhabits riverine microhabitats that are sheltered from the main force of current. It occurs in substrates from mud and sand to gravel, cobble, and

boulders in relatively shallow riffles and shoals (USFWS, 2007). The spectaclecase has not been found in or adjacent to the project area.

e. Northern Long-Eared Bat. The Northern long-eared bat has been proposed to be federally listed as an endangered species (USFWS 2013). Northern long-eared bats spend winter hibernating in large caves and mines. During summer, this species roosts singly or in colonies underneath bark, in cavities, in crevices of both live and dead trees. Foraging typically occurs in upland forested hillsides and ridges, but will occur less frequently over water and along roads. Rip Rap Landing does not have suitable hibernation habitat. Nighttime acoustic surveys in the summer of 2012 have documented the Northern long-eared bats using habitat on Dog Island for foraging. Areas of Dog Island may also have suitable summer roosting habitat.

f. Other. The IDNR EcoCat Natural Heritage Data Base lists the Bald Eagle and Black Sand Shell and Butterfly mussels as occurring in Calhoun County. The Bald Eagle is a frequent visitor to the site and may be nesting within the project area. Information on the Bald Eagle is covered in section 9.16 Bald and Golden Eagle Protection Act. The Black Sand Shell (*Liguma recta)* and Butterfly mussels (*Ellipsaria lineolata)* are State Listed, threatened large river species that have historically occurred in the Mississippi River. They favor small to large gravel substrate and strong current, habitat conditions that may be present in the river adjacent to the project area.

7. Water Quality. Flooding and the associated scouring and sedimentation have had the greatest impact on RRL. Many of the sloughs' channels and backwaters have lost much of their depth. Despite depth decreases, in most years, other water quality parameters such as dissolved oxygen remain at least at minimum levels to support aquatic life during much of the year. However, oxygen depletion has likely caused fish kills in some sloughs in both winter and summer, though no empirical data exists to confirm the cause of fish kills. Water temperature and pH are assumed to be generally conducive to the support of aquatic life, although high summer water temperatures can exacerbate low oxygen levels and contribute to fish kills. Water turbidity in the project area, as measured by secchi disc readings, is generally several inches to two feet. Qualitative observation show the highest turbidity levels generally occur in spring and the lowest levels during fall and winter. Turbidity increases during periods of flooding, but is higher in the southern portion of the project area and decreases as water extends north behind the old Sny levee extension due to settlement of particles from the water column. Appendix E, *Water Quality*, provides additional information.

The Mississippi River in Illinois is considered unlisted but impaired on the 2006 USEPA approved State of Illinois List of Impaired Waters. The entire length of the Mississippi River in Illinois is considered impaired and does not meet Total Maximum Dissolved Levels for chlordane and PCBs from non-point (runoff) source pollution (USEPA, 2006).

8. Air Quality. The Environmental Protection Agency (EPA) has identified standards for seven pollutants: lead, sulfur dioxide, carbon monoxide, nitrogen dioxide, ozone, and particulate matter less than 10 microns in diameter, and particulate matter less than 2.5 microns. Calhoun County, Illinois, currently meets all EPA air quality standards (EPA 2010 http://epa.gov/airquality/greenbk/ancl3.html).

9. Invasive Species The invasive reed canary grass (*Phalaris arundinacea*) is known to occur within the Project Area. This perennial grass aggressively spreads in disturbed wetland

environments and can persist in a wide range of flooding regimes. It can displace and suppress the establishment of native flora, especially the establishment and growth of woody species (Hovick and Reinartz 2007). This species eventually dominates a site by establishing a dense monoculture which adversely effects aquatic ecosystem quality (Kercher and Zedler 2004). This species is becoming prevalent at Rip Rap Landing. The proposed plan would buffer against reed canary grass population growth through managing water levels and promoting tree growth.

Invasive fish species such as common carp, silver carp, and bighead carp, most likely occur within the vicinity of the project area. With or without the project these species will continue to be present.

B. Hazardous, Toxic and Radioactive Waste. A hazardous, toxic, and radioactive waste (HTRW) compliance assessment has been completed for the site. It can be found in Appendix F, *HTRW*. Environmental database records and some historical information have been reviewed. No obvious indications of potential contamination sources or migration pathways from surrounding properties and no recognizable environmental conditions (REC) have been identified to date in connection with the project area. The environmental database information suggests that two underground storage tank (UST) sites (owned by William & Barbara Dahlbert and Rubin Marathon) are located on adjoining properties. Additional information for these UST sites was obtained on-line from the Office of the State of Illinois State Fire Marshal (OSFM), Office of Petroleum and Chemical Safety. OSFM indicates that the USTs were removed from these properties in 1989 and 1991, respectively, and no releases were suggested. Based on the information reviewed, the identified UST sites do not appear to be of concern to the project area.

C. Historic Properties. Minimal systematic archaeological work has been conducted within RRL. Only 82 acres of the 2,475 acres have been covered by four Phase I surveys. In 1978 Carl Udesen and Ann L. Koski performed an intensive spot survey of 52 small, widely separated tracts of Mississippi River shoreline zones. Two of the tracts are located within the RRL. Both were 25 feet wide, and one was 0.2 miles long and the other was 0.3 miles long (Udesen and Koski 1978). In 1984, another spot shoreline survey was completed by Kurt Moore as part of a bank stabilization project. Survey Item 3 of this survey was located within RRL. This item was surveyed from a boat due to a steep bank and old rip rap that covered the bank and shoreline. The length of this survey was 0.1 miles (Moore, 1985). The third known survey was in 1991 by Schroeder and Tankersley and was conducted in conjunction with channel construction to divert water from the Mississippi River to Waverly Lake on RRL. The fourth and final survey in 1999 recorded the only identified archaeological site within RRL (Moffat 1999). This site is a Late Woodland habitation site that has not been evaluated for determination of eligibility to the National Register of Historic Places.

A number of archaeological investigations have been conducted along the eastern side of the project area along the bluff line and uplands of Calhoun County (Cramer, 1995; James et al., 2000a, 2000b; Studenmund, 1990, 1998; Wells and Burns, 1999), and numerous archaeological sites have been reported within the vicinity. The land adjacent to the Mississippi River is rich in prehistoric archaeological sites representing many cultural traditions and stages. Archaeological sites may be abundant on the broad floodplain as well as on the tributary floodplains and surrounding uplands. Potentially the entire prehistoric cultural sequence may be present: Paleo-

Indian (10,000–8,000B.C.), Dalton (8,000–7,000 B.C.), Early Archaic (7,000–5,000 B.C.), Middle Archaic (5,000–3,000 B.C.), Late Archaic (3,000–1,000 B.C.), Early Woodland (1,000–200 B.C.), Middle Woodland (200B.C. –A.D. 400), Late Woodland (A.D. 400–900), and Mississippian (A.D. 900–1350). The most numerous archaeological sites were occupied during the Hopewell-influenced Middle Woodland, Late Woodland, and Mississippian period (Rusch et al., 1999).

During the historic period, a number of Native American tribes passed through the project vicinity and remained for various lengths of time. Calhoun County, where RRL is located, is a peninsula of land between the Mississippi River on the west and the Illinois River on the east. This peninsula separates the land areas judicially established by the findings of the Indian Claims Commission as being the aboriginal lands of the Sac and Fox on the western side of the Mississippi and the Kickapoo on the eastern side of the Illinois River (USGS, n.d.). In addition to these two tribes for which the project is in close proximity to their adjudicated aboriginal lands, twenty six other Native American tribes officially wish to be consulted on matters concerning prehistoric and historic Indian sites, as well as any Native American human remains, that may be encountered.

In accordance with Section 106 and Section 101 of the National Historic Preservation Act, and 36 CFR 800.4, the district's tribal coordination efforts were initiated in a letter sent to the tribes regarding this project on 10 July 2010 (Appendix A, *Correspondence*).

A Phase I archaeological and geomorphological investigation of the previously undisturbed acreage to be impacted by the planned project construction was conducted between November 8 and December 10, 2010. This investigation included archival research and landform evaluations in addition to subsurface testing. The subsurface testing of landforms that have the potential for containing intact cultural resources was performed using shovel and bucket auger tests spaced at a 5 to 15 meter intervals. This investigation identified three previously unrecorded archaeological sites: a prehistoric isolated find; a cluster of Euro-American silo foundations; and a Late Woodland base camp. Of the identified sites only the Late Woodland base camp is recommended potentially eligible for the National Register of Historic Places under Criterion D. The site appears to be a multi-component Late Woodland base camp that was occupied twice, once by early-late Late Woodland peoples (La Crosse phase) and once by Late Woodland peoples (Fall Creek or Poisson phases). Test unit excavations and bucket auger tests at the site yielded 528 historic and prehistoric artifacts, with many of the artifacts occurring within intact buried soil horizons. Additionally, a single feature was uncovered (Scott and Benn, 2011).

The site's location in this public document is not specified. The location is not near any anticipated construction area nor expected to be impacted by any alternative.

In the event that any other cultural properties are located during construction, all activity in the immediate area will halt until the site can be evaluated. The site will be protected from construction impacts until its eligibility for the National Register is determined, in consultation with the Illinois SHPO, and appropriate mitigation measures are completed. Should an inadvertent discovery of human remains occur, then Section 3 of the Native American Graves

Protection and Repatriation Act (P.L. 101-601) will be followed on federal lands and the Illinois Human Skeletal Remains Protection Act (Illinois Comp. Stat. Ann. 20 ILCS 3440/0:01, et seq.) will be followed on state owned lands.

D. Socioeconomics and Human Use.

1. Socioeconomics and Environmental Justice (EO 12898). Under Executive Order 12898, a Federal agency "shall make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low income populations in the United States". Calhoun County is a rural area bordered by a river on three sides. Aside from traveling to Pike County, residents must use one of two ferries or a bridge to travel outside of the county. The average travel time to work is 40 minutes. Census tract 9512 in Calhoun County, where RRL is located, had a population of 2,681 based on the 2010 U.S. Census. Of this population, 50 percent were male, 99 percent were white, and the median age was 40. The median household income was $53,201. The main industries providing employment include education, healthcare, construction, manufacturing, arts and recreation. The unemployment rate is 5.2% percent. Approximately 14.7 percent of individuals are below poverty level (American Fact Finder August 17, 2012).

2. Aesthetic Resources. Aesthetic resources of the site consist primarily of the natural habitat found on the site. This includes forest, wetlands, and rivers that serve as scenery for visitors. It also acts as habitat for wildlife viewed by the public. Roads, levees, water control structures, and a pump are also present on the site and detract somewhat from the natural views.

3. Noise Levels. Noise levels surrounding the project area are varied depending on the time of day and climatic conditions. The current human activities causing elevated noise levels include diesel powered generators, trucks, and farming equipment. The sound of firearms during hunting seasons is also prevalent. Homes are located along State Route 96 about one tenth of a mile from parts of the project area. They are currently exposed to all of these sources of noise.

3*. PROJECT OBJECTIVES

A. Problem Identification. The extent and quality of forests and wetlands along the Mississippi River have been steadily declining due to pressure from floodplain development and agriculture. This is especially true for Pool 25 where levees were established before the 1900s to protect agricultural land converted from bottomland hardwood forest. Wetlands behind these levees have been drained and converted to agricultural land. Outside of the levee protected areas, conversion of bottomlands for agriculture and frequent flooding have taken their toll on bottomland forests and wetlands. The flood of 1993 in particular had a severe impact on the stressed trees and to forests and wetlands that could not be protected from the record flood heights. The result was the loss of high quality, mast bearing forest communities, and sedimentation in bottomland ponds, lakes and sloughs decreasing their area, volume and habitat value. Later floods have had some impact, but to a lesser degree due to their timing and lesser duration.

The degradation of these native habitats coupled with inadequate water level management also provided conditions suitable for the colonization and establishment of reed canary grass (*Phalaris arundinacea*), an invasive wetland grass species, resulting in further ecosystem degradation. Near the project area, the operation of the lock and dam contributes to a relatively stable river water level year round reducing the natural wet and dry cycles needed for wetland function. The invasive grass, reed canary grass, can take advantage of these conditions and eventually dominate a site by creating a dense monoculture which adversely effects habitat quality (Kercher and Zedler 2004). A lack of proper water level management abilities (e.g., fall pulse), contributes to the establishment and growth of reed canary grass (Pinkerton and Rice 1993; Miller and Zedler 2003; Kercher and Zedler 2004). Once this species forms a dense stand it prevents growth of other species and traps sediment during flood events, decreasing microtopography, and altering microhabitat conditions (*e.g.*, light, soil moisture, and nutrient acquisition). These changes further benefit reed canary grass (Aniteau 1998; Kercher and Zedler 2004). This species is a major threat to ecosystem resources at Rip Rap Landing and elsewhere.

Habitat quality at RRL has declined because of many of these issues. While sedimentation from the uplands has been reduced in recent years, its effects from past years have filled in many of the aquatic habitats on the site, reducing their quality. Sedimentation and scour in zone 4 wetlands resulting from flood events has amplified the problem. Much of the area was at one time forest; however, the majority of the forest on higher elevations had been cleared for agriculture. The forest that remains is located in lower elevations and therefore was not converted to agriculture in the past. Thus, these forests due to their low elevations were more susceptible to extensive damage by flooding that occurred in 1993 and more recent large flood events. Water management capabilities exist on the site, but are inadequate to manage the entire project area. The existing pump was designed to provide water to a much smaller area. NRCS structures are passive and rely on an unnatural hydrograph to supply water. Low spots in the natural levee along the western edge of the site allow overbank flooding to occur. This type of flooding scours out existing wetlands in Zone 4, reducing their quality and threatening their future. Existing aquatic habitat on the site has been reduced in quality by sediment and is no longer connected to the river, preventing year round use by aquatic species. A conceptual model showing the relationship between the drivers and stressors contributing to the habitat loss can be seen in Figure 3.1.

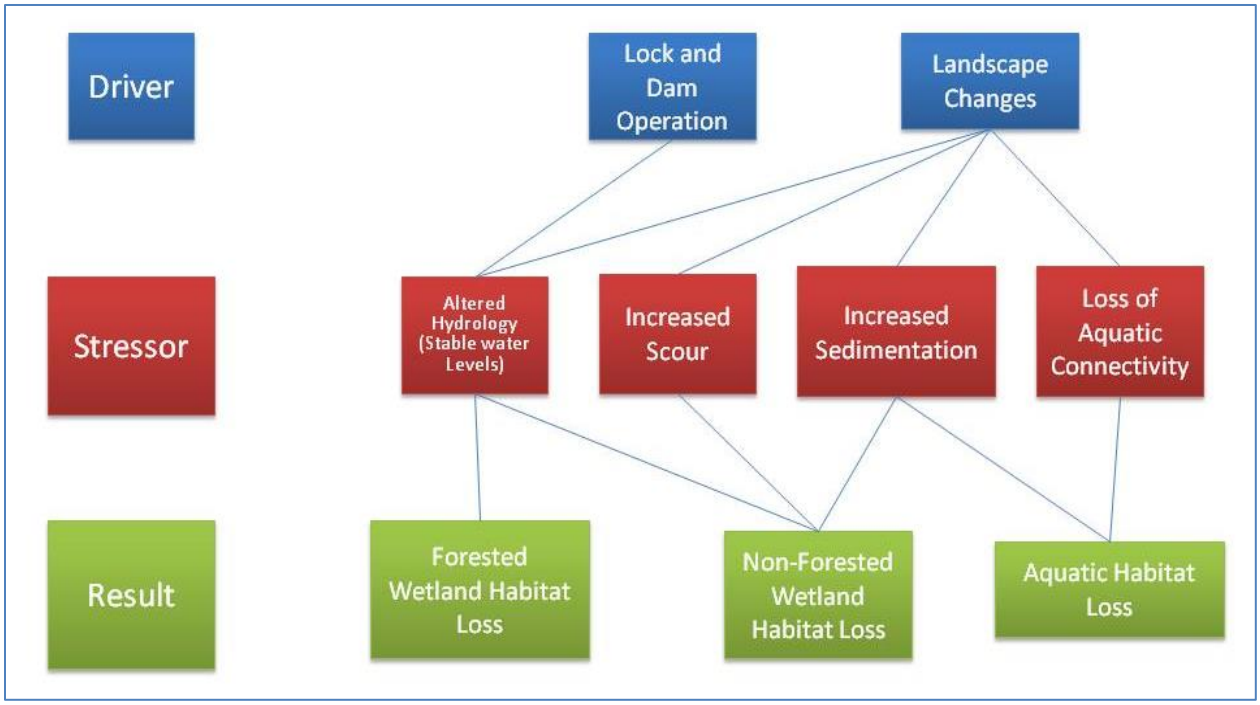

Figure 3.1. Conceptual model of the drivers and stressors of habitat loss in the Rip Rap Landing project area

B. Opportunities. Opportunities exist to restore, rehabilitate, enhance, and increase wetland and aquatic habitats through increasing forest acreage, improving wetland habitat conditions by providing dependable and controlled water movement that mimics a natural hydrograph, protecting existing wetlands from damaging overbank flows and river-borne sediments, improving aquatic habitat within Sny Creek and reestablishing connection with the Mississippi River. Opportunities to reestablish a historic connection between the river and Roadside Lake as well as for management of lake levels to promote aquatic habitat exist. Previous HREPs have successfully improved the river's floodplain structure and function. For example, HREPs have successfully altered sediment transport and deposition, water levels, and the connections between the river and its floodplain. These types of physical changes have improved aquatic habitat and increased habitat diversity. The RRL HREP has the opportunity to contribute to the ecological integrity of Pool 25 and the Upper Mississippi River System as a whole. Restoration of these habitats will benefit migratory birds that use the Mississippi River Flyway. Better water management capabilities will restore habitat and allow better control of invasive species, such as Reed Canary Grass.

C. Project Goals, Objectives, and Potential Enhancement Features. Rip Rap Landing was acquired to protect unique, high quality bottomland forest and to protect and enhance the existing wetlands for the benefit of migratory birds and resident wildlife. IDNR currently uses water level management to enhance growth of moist soil plants in low lying wetland areas. Based on the identified problems and general management goals, an overall project goal, objectives, and potential enhancement features were developed by the interagency planning team during the development of this feasibility report (Table 3.1). The goal of the RRL HREP is to increase quantity and quality of aquatic, non-forested wetland, and forested wetland habitats.

This goal would be achieved by the following objectives, which are to be met over the 50 year period of analysis:

Increase habitat available to fish– In Sny Creek, provide persistent depth and habitat diversity to support aquatic species. Restore seasonal connectivity between Roadside Lake and the Mississippi River via Sny Creek.

Increase native plant species diversity and reduce number of acres impacted by invasive plant species by improving water level management – By improving water conveyance throughout the project area (reach 441' in 10 days), management will be able to provide conditions suitable for native plants to thrive.

Reduce impacts of headwater flooding and river-borne sedimentation - Headwater flooding carries river-borne sediments and ultimately fills in wetlands. Protect wetlands from river-borne sediments by limiting areas of known scouring flow.

Increase quantity and quality of bottomland hardwood forest –Restore forest at suitable elevations, soils, and hydrology. This would protect and restore bottomland hardwood forest within RRL.

Table 3. 1. Project Goals, Objectives, and Potential Enhancement Features

PROBLEMS	OPPORTUNITIES	GOAL	OBJECTIVES	POTENTIAL ENHANCEMENT FEATURES
Sedimentation in backwater areas	Restore backwater areas to provide year-round aquatic habitat	Increase quantity and quality of aquatic, non-forested wetland, and forested wetland habitats.	Increase habitat available to fish	• Supplemental pump • Opening Roadside Lake to Sny Creek • Installing structure at Roadside Lake to manage connection with Sny Creek • Excavate creek • Hillside sediment retention
Lack of floodplain connectivity	Restore backwater/river connectivity by connecting Roadside Lake to Sny Creek and the Mississippi River			
Unnatural hydrograph reducing normal flooding and drying cycles	Improve water delivery and drainage to simulate pre-impoundment hydrograph preferred by native vegetation"			
Loss of native non-forested wetland habitat	Increase acreage of native vegetation while controlling invasive plant species		Increase native plant species diversity and reduce number of acres impacted by invasive plant species by improving water level management	• Larger pump and spillway • Structures in natural levee to allow capture of higher river flows for the site • Well • Supplemental pump • Tree planting • Levee • Hillside sediment retention • Natural Regeneration • Fill low spots in natural levee
Invasive plant species colonization				
River scouring is degrading wetland habitat	Protect wetlands from known scouring flow areas.		Reduce impacts of headwater flooding and river-borne sedimentation	
Sedimentation in non-forested wetland habitat	Restore forest to improve and reduce sedimentation in non-forested wetland habitats			
Loss of forested wetland habitat	Increase acreage of forest that have been lost to extreme high water and clearing		Increase quantity and quality of bottomland hardwood forest	• Tree Planting • Natural Regeneration

D. Constraints.

- Project features should not impact Zone 2's designation as a State Natural Area. It is designated a natural area because of it high quality, remnant forest. The project should strive to avoid negative effects to this area.
- Features, operation of a project, and construction should avoid impacting the Corps' operation of the 9-foot navigation channel on the Upper Mississippi River.
- There is a private inholding that currently operates as a duck hunting club. Any project should seek to avoid negative impacts on this property.
- Project features located on the WRP easement should be managed in accordance with WRP agreements

E. Future Without Project Condition (No Action Alternative).

Without the project, IDNR would continue to manage the site under their current plan. Without the project, it is assumed that IDNR will not have adequate water management capabilities for the entire site. Without additional water management capability, moist soil and other wetland vegetation is expected to be heavily degraded by year 25 (See Appendix G, *Habitat Evaluation & Quantification* for more details). It is assumed that sedimentation and scour will further damage existing wetlands. Additionally, inability to manage water levels across the entire site may favor establishment and spread of invasive reed canary grass resulting in a monoculture that has little benefit for wildlife and preventing trees from naturally establishing in some locations. Without the project, the former agricultural field in Zone 4 will continue to be dominated by weedy, herbaceous vegetation, inhibiting the natural regeneration of bottomland forest and other wetland vegetation. Agricultural leasing in others zones would continue to be farmed providing little benefit for wildlife. Sedimentation would continue to fill wetlands in Zone 4. Overbank scouring of wetlands would degrade and eventually destroy existing wetlands in zone 4 and potentially Zone 3. Aquatic habitats would remain disconnected from the river, providing limited value to native fish species based on the Aquatic Habitat Appraisal Guide evaluation (FWOP AAHUs = 26.9 as compared to With Project AAHUs = 69.2; Appendix G). Overall, the RRL habitat would degrade in quality and quantity.

Other assumptions made to determine the future without project conditions include:

1) Past land use of the site has detrimentally impacted the native plant communities and these communities will not naturally recover.
2) Current Environmental Pool Management of the Mississippi River which has led to an elevated water table at the site is assumed to be sustained during the 50-year period of project analysis.
3) No substantial increases to current operation and maintenance budget for the site would occur while efforts to maintain infrastructure would increase along with increases in projected prices of consumables (i.e., diesel fuel) which will take away from habitat management.
4) IDNR would not effectively be able to manage water in Zones 3 and 4.
5) NRCS would continue to work with willing upland landowners in the watershed to reduce upland sedimentation inputs.

6) Some of the negative effects that could occur without the project would be offset by NRCS implementing their current plan for planting 190 acres of grasses in Zone 4.

Without Corps action, the potential for having a long-term, self-sustaining, functioning ecosystem at Rip Rap Landing would be lost and rare wetland and bottomland hardwood habitat along the Mississippi River would be reduced. The No Action Alternative would not include any USACE project features and no additional costs to the USACE would be generated. No habitat units would be gained or lost from USACE activities. The NRCS WRP easement would remain in place in perpetuity. While additional planting by NRCS would occur on the site, water level management capabilities would not be great enough to properly manage the site for optimal ecosystem function. IDNR continued site management would have some limited positive effects while the continued degradation of ecosystem resources would likely have a negative effect on the habitat and thus habitat units over time.

4*. POTENTIAL PROJECT FEATURES

This section describes the features developed to address the problems and meet the goal of increasing quantity and quality of aquatic, non-forested wetland, and forested wetland habitats. Consideration to natural measures was given where possible. However, there are limited natural measures that would achieve the goals and objectives of the project. Examples of natural measures evaluated were tree planting that would help reduce sedimentation and the use of low spots in the natural levee to capture water to fill the wetlands during high flows of the Mississippi River.

A. Potential Features Not Evaluated.

Hillside Sediment Reduction. The desire to reduce sedimentation from the hillsides is strongly supported by USFWS and discussed in the Fish and Wildlife Coordination Act Report. Features to reduce the addition of hillside sediment to Sny Creek and Roadside Lake were initially discussed, but not evaluated for this HREP since it is outside the scope of the USACE mission. In addition, communications with the NRCS District Conservationist suggests that sedimentation input from the hillside was overestimated early in the planning process. Current hillside sediment input is primarily from within the streams. Programs addressing soil erosion in the surrounding watersheds have already been implemented by NRCS in a large majority of the upstream area. Initial planning efforts were unaware of the programs already implemented.

Zone 2 Tree Planting. Tree planting was considered for Zone 2, but was ultimately removed from further consideration because of concerns with potentially altering the area's designation as a State Natural Area. The state of Illinois has placed this designation on the area due to its significant historic forest composition of bottomland hardwood forest. IDNR will look to promote natural revegetation of hard mast species in the former agricultural field on its own.

Dog Island Backwater Slough Excavation. Excavating remnant sloughs on Dog Island (Zone 5) were removed from consideration after the presence of the federally endangered Indiana Bat was discovered. The number of trees needed to be removed to construct these features could have been detrimental to the bat while the gain in aquatic habitat would have been minimal and not sustainable.

Sny Levee Extension in Zones 2 and 4. This feature consisted of constructing a riverside ridge levee along Zone 2 and Zone 4 to elevation 450'. This feature could provide better protection to the area by reducing sedimentation and decreasing the potential impacts of headwater flooding. However this feature was not moved further due to preliminary assessment of the large cost and the relatively modest amount of habitat gains.

Supplemental Pump to Existing IDNR Pump Station. In the early stages of the analysis, it was determined that it was more cost effective and functional to utilize the current pump structure and place a new, larger pump on the existing pump structure than to a build a totally new pump station for Zone 4. The initial cost estimates of this feature would be more expensive then enlarging the existing pump station due to the need to construct new water channels and infrastructure for the supplemental pump. These additional construction needs would impact lands under the WRP easement. The existing infrastructure of the current pump station can be utilized with minor upgrades when replacing it with a larger pump. The PDT decided to exclude the supplemental pump from further analysis since there was a more cost effective and environmentally sustainable way of accomplishing the same goal.

Pump Size. An analysis of the pump determined that the minimum size needed to maintain water level management capabilities and have similar controls over the newly acquired tract was 35,000 gpm (See Appendix H, *Pump Size Analysis,* for additional detail). Smaller pump sizes would not allow the Zone 3 and Zone 4 to be managed at the same time. Larger pump sizes were not evaluated because they would not have any greater benefits than the 35,000 gpm pump, but have a larger cost. Larger pumps would only affect the time required to fill the area and not affect the benefits. Additionally, the PDT looked at a combination of wells, water control structures through the natural levee, and a smaller supplemental pump to provide water to the area; however the initial investigations and cost estimates showed that a 35,000 gpm pump placed on existing infrastructure was the most feasible and cost effective. Thus it was the only water supply feature carried forward for more detailed analysis.

B. Feasible Project Features.

Restoration and enhancement objectives for the project and, therefore, potential project features have been developed by zones within the project area because of the unique management constraints or opportunities within each zone. Consequently, project features will be discussed by zone. Figure 4.1 shows the locations of the feasible project features described below. Table 4.1 provides a brief description and the alpha-numeric identification code for the potential project features. Plates 5-1 through 5-6 show the locations of all feasible project features within the zones as described below.

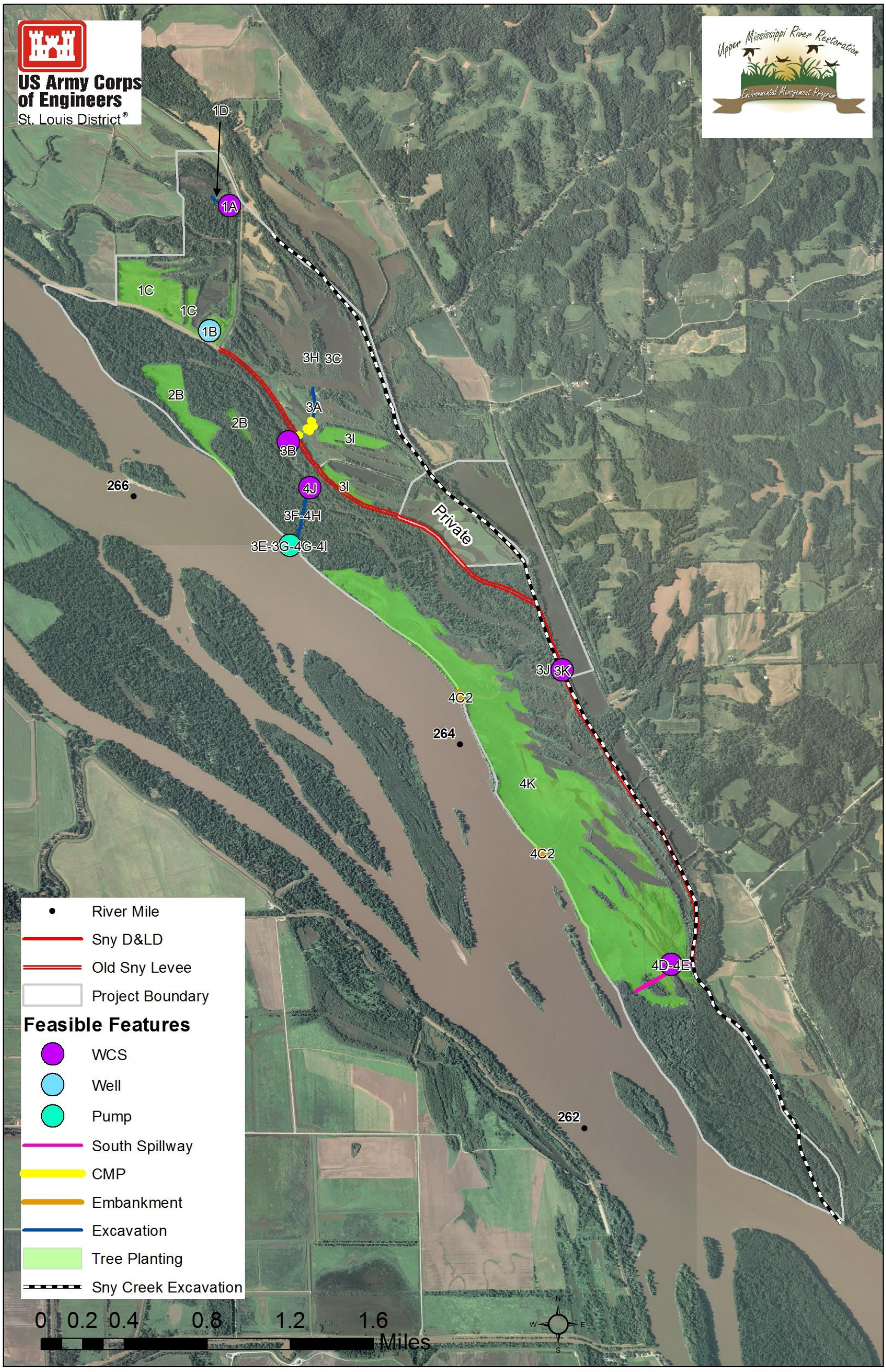

Figure 4. 1. Feasible Features Evaluated for Rip Rap Landing HREP. Note: Tree plantings in Zones 2 (2B) and 4(4K) were not moved forward in the analysis. All Sny Creek excavations (3D, 4A, 4B1, 4B2, and 5B) are shown together with the black-white line.

Table 4. 1. Brief description of feasible project features. The number in the identification code corresponds to the zone number. Note: no features in Zone 2 were considered feasible and therefore not presented in this table.

Feature Identification Code	Description
ZONE 1 – Sny Island Area	
1A	Water Control Structure
1B	2,500 gpm Well
1C	Reforestation
1D	Channel to Goose Pasture Lake
ZONE 3 – Roadside Lake and Waverly Lake Wetland Management Areas	
3A	Channel to Waverly Lake
3B	Water Control in Pump Station Channel
3C	WCS in North Units
3D	Sny Creek Excavation from Sny Levee to Bridge
3E	43% of Pump Station
3F	43% Pump Channel Widening
3G	43% Pump Station Pipe and Concrete for Road
3H	WCS Pipes Under Sand Levee
3I	Reforestation
3J	Roadside Lake Channel from Sny Creek
3K	Portable pump and water control structure for Roadside Lake
ZONE 4 – Rust Land Company - WRP	
4A	Sny Creek Excavation Bridge-Old Levee End
4B1	Sny Creek Excavation Old Levee to Roadside Lake Channel
4B2	Sny Creek Excavation Roadside to Dog Island
4C2	River Ridge Scour Embankments
4D	South Spillway
4E	WCS South Spillway
4G	57% of Pump Station
4H	57% Pump Channel Widening
4I	57% Pump Station Pipe and Concrete for Road
4J	WCS Pipes Under Road
ZONE 5 – Dog Island	
5B	Sny Creek Excavation @ Dog Island

Zone 1. Sny Island Area.

1A. Water Control Structure (Plate 5-7). Flooding to elevation 441' could be achieved by placing a water control structure across the existing drainage channel within the unit. This drainage channel is part of the overall drainage system utilized by the Sny D&LD to maintain water levels within the adjacent crop fields. By constructing this water control structure, water could be retained in Zone 1. Coordination with the drainage district would be required before implementation of this feature.

1B. 2,500 gpm Well (Plate 5-11). It has been proposed that this portion of the project area be isolated from the Sny D&LD water management and a separate source of water found. This could be accomplished by closing the existing channels that drain to the Sny D&LD and providing a separate water source from a well. Re-supplying the wetland units within Zone 1 would require pumping from the well during dry periods. For practical operation the pumping rates should be sufficient to fill these areas within approximately 10 days of constant, 24-hours per day, pumping. To achieve this time frame for filling the complex to elevation 441, the pump must deliver an average discharge of approximately 2,120 gpm assuming an initial 100% loss associated with absorption and evapotranspiration. Historical reviews of pumping operations along various locations with the Illinois Department of Natural Resources Mississippi River units have indicated that a 100% initial loss does indeed occur. The use of a well for a water supply rather than pumping out of the drainage channel would help insure that undesirable fish do not enter into the wetland management unit.

1C. Bottomland Hardwood Restoration. Reforestation is proposed for this zone, to the extent possible. Approximately 62.9 acres of open land within this zone could be replanted. Mast-producing trees would be planted over former cropland on higher ground on the northwest end of the zone. Planting stock would be container-grown stock from a local nursery. The planted trees would serve as a seed source for natural re-vegetation, improve terrestrial habitat for resident and migratory birds, and expand habitats for mast consuming species such as turkeys and squirrels. Proposed species include swamp white oak, pin oak, overcup oak, pecan, and persimmon (Table 4.2).

Table 4. 2. Rip Rap Landing Mast Tree Planting Rates for all Zones

Common Name	Scientific Name	Planting Rates Per Acre
Swamp White Oak	*Quercus bicolor*	10
Overcup Oak	*Quercus lyrata*	10
Pin Oak	*Quercus palustris*	10
Pecan	*Carya illinoinensis*	8
Persimmon	*Diopyros virginiana*	6
Total		**44**

1D. Channel to Goose Pasture Lake (Plate 5-7). Water contained behind the structure (1A) would be directed to existing wetlands or new moist soil and bottomland forest units by use of a channel system. A channel approximately 200 feet in length will be excavated to connect water control structure (1A) to Goose Pasture Lake. Impacts to existing trees will be minimized. Placement of excavated material will be placed on nearby areas to create elevated ridges which will be sites for tree plantings or to promote natural tree regeneration.

Zone 3. Roadside Lake and Waverly Lake Wetland Management Areas.

3A, 3B, 3C. Waverly Lake Wetland Management Area Water Control (Plate 5-7). To improve water level management within Waverly Lake several features are proposed which include excavation (to elevation 436.0) of a channel (3A) approximately 1,636 feet in length to improve water conveyance from the pump station delivery channel, and placement of water control structures within that channel (3C; bottom elevation 439.5), and corrugated metal pipes (3B; bottom elevation 436.0) to direct water to the wetland management units associated with Waverly Lake. It should be noted that the excavation of the channel is included with Zone 3 features based on where benefits are accrued, but it is technically on the southern edge of Zone 2. Placement of excavated material will be placed on nearby areas to create elevated ridges which will be sites for tree plantings or to promote natural tree regeneration.

3D. Sny Creek Excavation from Old Sny Levee to Bridge. Excavation of the historic Sny River (now called Sny Creek) is proposed for this zone, with deposition of the excavated material to the west of the creek channel to improve the existing Old Sny Levee extending from the Sny D&LD and further protect the area from headwater flooding.

3E, 3F, 3G. Pump Station and Delivery System (43%) (Plates 5-7, 5-9). A new riverside pump (35,000 gpm) would be placed on existing infrastructure (3E), along with widening the existing pump station channel (3F) to 18 feet bottom width, and approximately 1,400 feet in length, and increasing the size of existing pump station water control structure under the road (3G). Placement of excavated material will be placed on nearby areas to create elevated ridges which will be sites for tree plantings or to promote natural tree regeneration. Impacts to existing trees will be minimized. The cost of these features would be shared with Zone 4 (features 4G, 4H, and 4I), 43% of cost allocated to Zone 3 and 57% to Zone 4. The target elevation for management of water in Zone 3 would typically be 438 ft AMSL in most years. The infrastructure is planned to allow for up to 441 ft AMSL to be able to mimic larger floods on occasion.

3H. Water Control Pipe under Old Sny Levee (Plate 5-8). This sluice gate feature is associated with improving water level management within the Waverly Lake Wetland Management Area (3A,3B, 3C) by conveying water under the Old Sny Levee Extension into the Waverly Lake Area. The invert elevation of the sluice gate is at 436.0.

3I. Bottomland Hardwood Restoration. Approximately 36.5 acres of former agricultural land could be replanted with bottomland hardwoods (see Table 4.2 for planting rates). All tree plantings would be on areas above elevation 441.0, where successful reforestation has a greater chance of survival due to river flood events.

3J. Channel from Roadside Lake to Sny Creek (Plate 5-10). Excavation of channel (100 feet in length; Invert elevation of 433.5 ft) to reconnect Roadside Lake to Sny Creek is proposed for this zone which would improve water level management and connectivity. Impacts to existing trees will be minimized. Placement of excavated material will be placed on nearby areas to create elevated ridges which will be sites for tree plantings or to promote natural tree regeneration. Final placement will be determined during final design.

3K. Water Control to Channel from Roadside Lake to Sny Creek (Plate 5-10). In conjunction with 3J, a portable pump and water control structure is proposed to facilitate water level management within Roadside Lake and provide connection to Sny Creek and ultimately the Mississippi River.

Zone 4. Rust Land Company - WRP Easement.

4A, 4B1, 4B2. Sny Creek Excavation (Plate 5-8). Excavation of Sny Creek (2,880 feet in length) is proposed for this zone to improve aquatic habitat and connectivity. 4A proposed excavation of Sny Creek from the Bridge to the end of the Old Sny Levee. 4B1 proposed excavation of Sny Creek from the Old Sny Levee to the Roadside Lake Channel. 4B2 proposed excavation of Sny Creek from the Roadside Lake Channel to Dog Island. Desired water depth of 433.5. Mechanically excavated sediments from Sny Creek will be placed on adjacent bankline at or above flood elevation on the existing levee crown. Final placement will be determined during final design. (Note: features 4A and 4B1 were not moved forward after incremental cost analysis; see Section 5 below).

4C2. River Ridge Scour Embankment (Plate 5-10). To reduce headwater flooding and wetland scouring into this zone, the existing swales along the natural riverside levee are proposed to be filled at the river to the height of the natural levee.

4D, 4E. South Spillway and Corrugated Metal Pipe (Plates 5-8 and 5-10). To improve water level management within the southern portion of Zone 4, a spillway (top surface elevation 442.0) and associated water control structures (invert elevation 438.0) are proposed.

4G, 4H, 4I. Pump Station and Delivery System (57% (Plates 5-7, 5-9). A new riverside pump (35,000 gpm) would be placed on existing infrastructure (4G), along with widening (18 feet bottom width; 1,400 ft length) the existing pump station channel (4H) and increasing the size of existing pump station water control structure under the road (4I). Placement of excavated material will be placed on nearby areas to create elevated ridges which will be sites for tree plantings or to promote natural tree regeneration. Impacts to existing trees will be minimized. The cost of these features would be shared with Zone 3 (features 3E, 3F, 3G), 43% of cost allocated to Zone 3 and 57% to Zone 4. The target elevation for water management is generally 338 ft AMSL, but could be 441 ft AMSL in some years to mimic natural larger inundations.

4J. Water Control Pipes Under Road (Plate 5-8). This feature, in conjunction with 4G-4H-4I, provides water control at the road to manage water levels from the pump station to Zones 2, 3, and 4. Invert elevation of 436.0.

Zone 5. General Plan Lands- Dog Island.

5B. Sny Creek Excavation (Plate 5-10). Excavation is proposed to reconnect Sny Creek to the Mississippi River and provide sufficient depth (desired depth of 8.0 ft) and habitat diversity for a suite of aquatic species. Mechanically excavated sediments from Sny Creek will be placed on adjacent bankline at or above flood elevation on the existing levee crown. Final placement will be determined during final design.

5*. EVALUATION OF FEASIBLE PROJECT FEATURES AND FORMULATION OF ALTERNATIVES

This section describes the feasible features that met the goal and objectives of this project. Each feature or combinations of dependent features (i.e., pump station and delivery system) were evaluated through an environmental benefits analysis to determine the magnitude of ecosystem benefits to be expected if implemented. The benefits were then combined with cost estimates (FY12) for the Incremental Cost Analysis (ICA) to determine cost effectiveness. Alternatives were generated by creating all possible combinations of features. A full description of the environmental benefits analysis can be found in Appendix G, *Habitat Evaluation & Quantification*. The costs and design life of each feature can be seen in table 5.1

A. Environmental Output Evaluation. A habitat analysis was performed for the RRL HREP, with the goal to restore aquatic and wetland habitat quality and diversity. This analysis employed a multi-agency team approach with representatives from the Corps of Engineers, the USFWS, IDNR, and HDR, Inc. Analysis of existing study area conditions, future conditions without the project, and impacts of several proposed features and alternatives were completed using the Wildlife Habitat Appraisal Guide (WHAG) procedures developed by the Missouri Department of Conservation and the USDA Natural Resources Conservation Service. The WHAG is a numerical habitat appraisal methodology based on USFWS Habitat Evaluation Procedures (HEP) (1980). WHAG procedures evaluate the quality and quantity of particular habitats for animal species selected for evaluation by the WHAG team members. The qualitative component of the analysis is known as the Habitat Suitability Index (HSI) and is rated on a 0.1 to 1.0 scale. The quantitative component of the analysis is the measure of acres of habitat that are available for the selected evaluation species. From the qualitative and quantitative determinations, the standard unit of measure, the Habitat Unit (HU), is calculated using the formula HSI x Acres = HUs. Changes in the quality and/or quantity of HUs would occur as a habitat matures naturally or is influenced by development. Cumulative HUs are annualized and averaged. To facilitate comparison, target years were established at 0 (baseline or existing conditions), 1, 5, 25, and 50 years. HSIs and average annual habitat units (AAHUs), for each evaluation species, were calculated to reflect expected habitat conditions over the life of the project. Aquatic habitats were evaluated in a similar manner, but using the Aquatic Habitat Appraisal Guide (AHAG) developed by the Corps of Engineers, Waterways Experiment Station, and modified in 1996. Calculations of habitat units and annualized average habitat units were completed in the same manner as those for the WHAG. Table 5.2 provides a summary of the net AAHUs generated for each grouping of project features that produce habitat benefits. These groupings are referred to as functional units. The base year for analysis was assumed to be one year after construction completion, 2020. For a more detailed description of the habitat analysis, refer to Appendix G, *Habitat Evaluation & Quantification*.

Table 5. 1. Costs (FY2012) of Each Feasible Feature, rounded to nearest thousand dollar.

Code	Description	Design Life (yr)	Total Cost[1] ($)
1A	Water Control Structure	30	$110,000
1B	2,500 gpm Well	20	$1,166,000
1C	Reforestation	50	$208,000
1D	Channel to Goose Pasture Lake	30	$68,000
3A	Channel to Waverly Lake	30	$581,000
3B	Water Control in Pump Station Channel	30	$111,000
3C	WCS in North Units	30	$489,000
3D	Sny Creek Excavation from Sny Levee to Bridge	30	$5,007,000
3E	43% of Pump Station	30	$391,000
3F	43% Pump Channel Widening	30	$81,000
3G	43% Pump Station Pipe and Concrete for Road	30	$17,000
3H	WCS Pipes Under Sand Levee	30	$206,000
3I	Reforestation	50	$121,000
3J	Roadside Lake Channel from Sny Creek	30	$35,000
3K	Portable pump and water control structure for Roadside Lake	30	$199,000
4A	Sny Creek Excavation Bridge-Old Levee End	30	$2,790,000
4B1	Sny Creek Excavation Old Levee to Roadside Lake Channel	30	$1,572,000
4B2	Sny Creek Excavation Roadside to Dog Island	30	$2,376,000
4C2	River Ridge Scour Embankments	30	$461,000
4D	South Spillway	30	$1,072,000
4E	WCS South Spillway	30	$109,000
4G	57% of Pump Station	30	$518,000
4H	57% Pump Channel Widening	30	$108,000
4I	57% Pump Station Pipe and Concrete for Road	30	$22,000
4J	WCS Pipes Under Road	30	$155,000
5B	Sny Creek Excavation @ Dog Island	30	$1,914,000

[1]Total Costs includes Contingency, Engineering Fees, Construction Management, Construction Cost, Present Worth of Replacements, and OMRR&R costs. Does not include LERRDs

Model Certification Status: Per EC 1105-2-412: Assuring Quality of Planning Models (dated 31 March 2011), planning models such as the AHAG and WHAG are required to be certified. Under the UMRR-EMP, the model certification process for both of these models has begun with reviewer comments received and are currently being addressed. Consistent with guidance from the National Ecosystem Restoration Planning Center of Expertise (ECO-PCX), the Agency Technical Review (ATR) Team for the Rip Rap Landing HREP conducted an assessment of the models used for this project. This process evaluated the technical quality and appropriateness of the models utilized. A member of the ATR team evaluated the models during the 2010 ATR.

The models were found to be correctly applied and appropriately used for this study. In addition, the ECO-PCX recommended single-use approval of AHAG and WHAG models for use at CCNWR. This recommendation was logged with the Office of Water Project Review for consideration by the Model Certification Team with a memorandum dated 11 October 2013. As of 5 November 2013, the Headquarters Model Certification Team approved the use of AHAG and WHAG for Rip Rap Landing HREP.

B. Cost Effective and Incremental Cost Analysis of Alternatives. Cost effectiveness analysis and incremental cost analysis (CE/ICA) has been used to assist the decision-making process to determine which project features should be built. The decision is based upon the net habitat benefits (outputs) that meet the goals and objectives of the project in the most cost effective way. The cost effectiveness analysis is conducted to ensure that the least cost solution is identified for each possible level of environmental output. After the cost effectiveness of each alternative has been established, subsequent incremental cost analysis is conducted to reveal changes in costs for increasing levels of environmental output. In the absence of a common measurement unit for comparing the non-monetary benefits with the monetary costs of environmental plans, cost effectiveness and incremental cost analysis are valuable tools to assist in decision making.

CE/ICA is basically a three-step procedure: (1) calculate the environmental outputs of each feature; (2) determine a cost estimate for each feature; and (3) combine the features to evaluate the best overall project alternative based on habitat benefits and cost. A description of habitat evaluation and benefit quantification is provided in Appendix G, *Habitat Evaluation & Quantification*. Costs were annualized by applying a 3.75% interest rate (FY 2012) to the construction cost over the period of analysis of 50 years for planning purposes. The 50 year-period of analysis was selected based on the expected time required to reach maximum environmental outputs from project features and the subsequent accrual of benefits leveling off past 50 years. The incremental analysis of alternatives was accomplished following guidance by the Corps' Institute of Water Resources and using the methodology described in Robinson et al. (1995). Refer to Appendix I, *Incremental Cost Analysis*, for the detailed results of the analysis.

The results of these analyses are displayed as graphs and tables (Tables 5.1 through 5.5 and Figure 5.1). They permit the decision makers to progressively compare alternative levels of environmental outputs and ask if the additional environmental output in the next level is worth its additional monetary costs. It is important to note that these analyses would not usually lead, and are not intended to lead, to a single best solution as in economic cost-benefit analysis. They would improve the quality of decision making by ensuring that a rational, supportable, focused, and traceable approach is used for considering and selecting alternative methods to produce environmental outputs.

Basis for Analysis

1. Net AAHUs for each individual feature are based on 50-year period of analysis.
2. The design life of individual features varies from 20 years to 50 years.
3. Functional Units are comprised of dependent individual features, with some having been analyzed at the request of project partners.

4. An interest rate of 3.75 percent was used in the analysis based on Economic Guidance Memorandum, 10-1, Federal Interest Rates for Corps of Engineers Projects for Fiscal Year 2012.
5. Initial Construction Costs of individual features include mobilization and demobilization (5%), contingency (25%), engineering fees (15%), and construction management (10%) above the actual estimated cost for construction. It was assumed that all these costs would occur at Year 0 and represent the present worth (PW).
6. OMRR&R Costs for the analysis represent the replacement costs of the individual enhancement features that will be incurred over the 50-year period of analysis. These future costs are assumed to be the same as initial construction cost, and were then converted to a present worth.
7. Annual Costs were determined by adding the present worth of the Initial Construction Costs and the O & M Costs, then annualizing over the 50-year period of analysis to produce an Equivalent Uniform Annual Cost (EUAC).
8. The Annual Cost for each Functional Unit was determined by summing the EUAC of each component feature.

Formulation of Combinations

Step 1: Display Outputs and Costs. See Table 5.2 for functional groups, their costs, and their net AAHUS.

Step 2: Identify Combinable Management Features. The following describes the functional units that were used during the ICA for each zone. Table 5.2 displays the outputs and costs of potential enhancement features grouped by functional units or as "stand alone" features within each zone, unless features must be combined with those in other zones to act as functional unit. Other features may be combined because of similarity. Outputs were determined using WHAG and AHAG and are presented as net Average Annual Habitat Units. Planning costs were developed in FY12 and annualized based upon a 50-year period of analysis and 3.75 percent interest rate (FY12).

Table 5. 2. Outputs and Costs of Functional Units

ICA Code	Feature Code	Brief Description	Net AAHU	Annual Cost[1]
A1	1A+1B+1D	Zone 1 Water Control	116	$61,000
A2	1C+(1A+1B+1D)	Zone 1 Water Control + Zone 1 Trees	159	$71,000
B1	1C	Zone 1 Trees	43	$19,000
W1	3A + 3B + 3C + (3E, 3F, 3G, 3H) + (4G, 4H, 4I)	Zone 3 Water Control	90	$129,000
W2	4D, 4E + (4G, 4H, 4I, 4J)+ (3E, 3F, 3G)	Zone 4 Water Control	97	$123,000
W3	3A + 3B + 3C + (3E, 3F, 3G, 3H) + 4D, 4E + (4G, 4H, 4I, 4J)	Zones 3 and 4 Water Control	147	$214,000
W4	3A + 3B + 3C + (3E, 3F, 3G, 3H) + (4G, 4H, 4I), 3I	Zone 3 Water Control + Zone 3 Trees	98	$136,000
W5	3A + 3B + 3C + (3E, 3F, 3G, 3H) + 4D, 4E + (4G, 4H, 4I, 4J), 3I	Zones 3 and 4 Water Control + Zone 3 Trees	156	$220,000

ICA Code	Feature Code	Brief Description	Net AAHU	Annual Cost[1]
C1	3I	Zone 3 Trees Only	8	$10,000
S1	4C2	Zone 4 Scour embankment	15	$16,500
D1	5B	Sny Creek Excavation at Dog Island	29	$58,000
D2	5B, 4B2	Sny Creek Excavation at Roadside-Dog Island & Sny Dredging @ Dog Island	59	$80,000
D3	5B, 4B2, 4B1	Sny Creek Excavation at Levee to Roadside L. Channel , Sny Excavation Roadside-Dog Island, & Sny Excavation @ Dog Island	60	$128,000
D4	5B, 4B2, 4B1, 4A	Sny Creek Excavation Bridge-Levee, Sny Excavation Levee to Roadside L. Channel, Sny Excavation Roadside-Dog Island, & Sny Excavation @ Dog Island	61	$213,000
D5	5B, 4B2, 4B1, 4A, 3D	Sny Creek Excavation to Bridge, Sny Excavation Bridge-Levee, Sny Excavation Levee to Roadside L. Channel, Sny Excavation Roadside-Dog Island, & Sny Excavation @ Dog Island	64	$336,000
R1	3K, 3J	Roadside Lake Water Control	40	$12,000
R2	3K, 3J, 5B, 4B2	Roadside Lake Water Control, Sny Excavation Roadside-Dog Island and Sny Excavation @ Dog Island	101	$92,000
R3	3K, 3J, 5B, 4B2, 4B1	Roadside Lake Water Control., Sny Excavation Levee to Roadside L. Channel , Sny Excavation Roadside-Dog Island, & Sny Excavation @ Dog Island	102	$140,000
R4	3K, 3J, 5B, 4B2, 4B1, 4A	Roadside Lake Water Control, Sny Excavation Bridge-Levee, Sny Excavation Levee to Roadside L. Channel, Sny Excavation Roadside-Dog Island, & Sny Excavation @ Dog Island	103	$225,000
R5	3K, 3J, 5B, 4B2, 4B1, 4A, 3D	Roadside Lake Water Control Sny Creek Excavation to Bridge, Sny Excavation Bridge-Levee, Sny Excavation Levee to Roadside L. Channel , Sny Excavation Roadside- Dog Island, & Sny Excavation @ Dog Island	106	$378,000

[1]Annual cost calculated from total cost in table 5.1 includes OMRR&R and value of land required

Zone 1. Sny Island Area. The zone will be a management unit without impacts from river flooding and management. Zone 1 features can be implemented exclusive of any other zone within Rip Rap Landing. Features within this zone have been combined to form functional units, which were then used during the ICA.

A1. Zone 1 Water Control. This functional unit consists of drilling a well in the southeast corner of the zone, installing a pump, closing the existing levee district channel with a water control structure, and excavating a channel to Goose Pasture Lake to enhance water level management (1A, 1B, 1D). The zone could be managed without the channel to Goose Pasture Lake (a net of 5 AAHUs), but the opportunity to manage the lake for submerged aquatic vegetation and moist soil plants would be lost. The well and pump (96 net AAHUs) could not function effectively without the water control structure (15 net AAHUs) at the levee and drainage district channel because their pumping requirements would continually remove water from the zone (Plate 5-1). Therefore, these features were grouped together into a function unit. This functional unit yields a net benefit of 116 AAHUs and provides water level management capability for the entire zone.

A2. Zone 1 Water Control + Zone 1 Trees. This functional unit consists of 1A plus the planting of bottomland hardwood trees on 62.9 acres (1C). This functional unit yields a net benefit of 159 AAHUs.

B1. Zone 1 Trees Only. This feature consists of planting bottomland hardwood trees on 62.9 acres (1C) without any proposed water control features. This functional unit yields a net benefit of 43 AAHUs.

Zones 3 – 5. Zones 3 through 5 are presented together because some features on one zone are also needed in another zone. For example, the proposed water control features in Zone 3 (W) are also needed to provide the water to manage wetlands in Zone 4.

W. Improved Water Distribution and Control to Waverly Lake. To improve water distribution and control to Waverly Lake the riverside pump would be upgraded to 35,000 gpm and the pump channel and water control structures would be upgraded and/or increased in size to handle the additional flow (3E, 3F, 3G). A total of 25 net AAHUs were allocated to these features from Zone 3. The cost of these features would be shared with Zone 4 wetland management, 43% of cost allocated to Zone 3 and 57% to Zone 4 based on the amount of water needed for each zone. This allocation made water movement to both zones more economical based upon the net AAHU outputs. Sluice gate water control structures would be located at the Rip Rap Landing road (4J) and at the Sny levee extension (3H) as a means of conveying water to Waverly Lake and associated wetlands. The channel from the Sny Levee extension (3A) would be improved to allow passage of additional water, and culverts (3B, 3C) would be placed in the channel to direct water to wetland management units associated with the lake. Features 3H, 3A, 3B, and 3C generated a total of 50 net AAHUs. The slough portion of the water conveyance to the Waverly Lake units would be held at a higher level during the fall by the water control structures under the Rip Rap Landing road (4J) and increased pumping capacity providing a benefit to the portion of the slough located in Zone 2 and generating 4 net AAHUs that were allocated to the water control structures under the road. The possible combinations of these features into ICA functional units are as follows:

W1. Zone 3 Water Control Only. To improve water distribution and control this functional unit [(3A + 3B + 3C + (3E, 3F, 3G, 3H) + (4G, 4H, 4I)] would require a water conveyance channel to Zone 3 and associated water control structures, the riverside pump station constructed to 35,000 gpm, and associated pump station channel widening and water control structures. This functional unit yields a net of 90 net AAHUs.

W2. Zone 4 Water Control Only. To improve water distribution and control this functional unit [4D, 4E + (4G, 4H, 4I, 4J)+ (3E, 3F, 3G)] requires the riverside pump station constructed to 35,000 gpm and associated channel excavation and water control structures along with a South Spillway and associated water control structure. This functional unit yields a net benefit of 97 net AAHUs.

W3. Zones 3 and 4 Water Control. To improve distribution and control this functional unit requires [3A + 3B + 3C + (3E, 3F, 3G, 3H) + 4D, 4E + (4G, 4H, 4I, 4J)] a water conveyance channel to Waverly Lake and associated water control structures, the

riverside pump station constructed to 35,000 gpm and associated channel and water control structures, and the South Spillway and associated water control structures. This functional unit yields a net benefit of 147 net AAHUs.

*W4. Zone 3 Water Control + Zone 3 Trees***.** This functional unit [3A + 3B + 3C + (3E, 3F, 3G, 3H) + (4G, 4H, 4I), 3I] includes W1 features plus tree plantings in Zone 3. This functional unit yields a net benefit of 98 net AAHUs.

W5. Zones 3 and 4 Water Control + Zone 3 Trees. This functional unit [3A + 3B + 3C + (3E, 3F, 3G, 3H) + 4D, 4E + (4G, 4H, 4I, 4J), 3I] includes W3 features plus tree plantings in Zone 3. This functional unit yields a net benefit of 156 AAHUs.

C1. Zone 3 Trees. This feature consists of planting bottomland hardwood trees on 36.5 acres (3I) on existing crop fields. This feature yields a net benefit of 8 net AAHUs.

S1. Zone 4 Scour Embankments. This feature (4C2) consists of constructing embankment segments across two scour locations in order to maintain normal river ridge control elevation. This feature generates a total of 15 net AAHUs.

D. Sny Creek Excavation. These functional units seek to reconnect Sny Creek to the Mississippi River and provide adequate depth and aquatic habitat diversity throughout the year.

D1. Sny Creek Excavation at Dog Island. This functional unit (5B) consists of excavating 6,257 ft at Sny Creek adjacent to Dog Island in Zone 5. This functional unit generates net 29 net AAHUs.

D2. D1+ Sny Creek Excavation Roadside Lake to Dog Island and at Dog Island. This function unit (5B+4B2) combines D1 with excavating 8,620 ft at Sny Creek from Roadside Lake to Dog Island (Zone 4). This functional unit generates 59 net AAHUs.

D3. D2 + Sny Creek Excavation Old Levee to Roadside Lake. This functional unit (5B+4B2+4B1) combines D2 with excavating 2,880 ft at Sny Creek from the sand levee to Roadside Lake (Zone 4). This functional unit generates 60 net AAHUs.

D4. D3+ Sny Creek Excavation from Bridge to Old Levee. This functional unit (5B+4B2+4B1+4A) combines D3 with excavating 4,516 feet at Sny Creek from the bridge to the sand levee (Zone 4). This functional unit yields 61 net AAHUs.

D5. D4+Sny Creek Excavation to Bridge. This functional unit (5B+4B2+4B1+4A+3D) combines D4 with excavating 8,670 ft at Sny Creek from the bridge to Waverly Lake (Zone 3). This functional unit yields 64 net AAHUs.

R. Roadside Lake and Sny Creek Excavation. These functional units seek to improve aquatic habitat within Roadside Lake and reconnect the lake to the Mississippi River via Sny Creek. The features combined allow for the management of submerged aquatic plants to benefit migratory wildlife. The Roadside Unit can be managed exclusive of any other features implemented in the RRL project area.

R1. Roadside Lake Water Control. This functional unit (3K+3J) includes a portable pump and fish friendly water control structure in Roadside Lake in Zone 3. The purpose of this feature is to be able to periodically manipulate water to foster the growth of submersed aquatic vegetation. This functional unit yields a net benefit of 40 AAHUs.

R2. R1+ Sny Creek Excavation Roadside Lake to Dog Island and at Dog Island. This functional unit (3K+3J+5B+4B2) combines R1 with excavating 6,257 feet at Dog Island (Zone 5) and excavating Sny from Roadside Lake to Dog Island (Zone 4) to provide fish passage to Roadside Lake from the Mississippi River. This functional unit yields 101 net AAHUs.

*R3. R2+ Sny Creek Excavation from Old Levee to Roadside Lake***.** This functional unit (3K+3J+5B+4B2+4B1) combines R2 with excavating 2,880 ft at Sny Creek from old levee to Roadside Lake (Zone 4). This functional unit yields 102 net AAHUs.

*R4. R3 + Sny Creek Excavation from Bridge to Old Levee***.** This functional unit (3K+3J+5B+4B2+4B1+4A) combines R3 with excavating 4,516 ft at Sny Creek from bridge to old levee (Zone 4). This functional unit yields 103 net AAHUs.

R5. R4+Sny Creek Excavation to Bridge. This functional unit (3K+3J+5B+4B2+4B1+ 4A+3D) combines R4 with excavating 8,670 ft from Sny Levee to Bridge (Zone 3). This functional unit yields 106 net AAHUs.

Step 3: Calculate Output and Costs of Combinations. Step 3 calculates the outputs and costs of each of the possible alternatives. For features with only one possible alternative other than No Action, incremental cost analysis is not necessary. Features were grouped into functional units seen in Table 5.2. These functional groups could all be standalone alternatives that would accomplish some measure of ecosystem restoration. The costs and outputs of each functional group were entered into IWR Planning Suite. The program combined all possible combinations of these functional groups and produced the incremental cost per AAHU for each.

Steps 4 and 5: Eliminate Economically Inefficient and Ineffective Solutions. Step 4 eliminates economically inefficient solutions and identifies the least cost solution for each level of output. For example, if two plans produce two AAHUs and one costs $3,000 while the other $4,000, the more expensive plan is eliminated. Step 5 eliminates the economically ineffective solutions by identifying and deleting those solutions that would produce less output at equal or greater cost than subsequently ranked solutions. For example, if one plan produces two AAHUs for $8,000 and the next plan produces four AAHUs for $6,000, the first plan would be eliminated because it is not economically effective. Table 5.3 displays the least cost alternatives for project area features with all zones combined. Alternatives that are not cost effective were eliminated in this process because of high cost per AAHU.

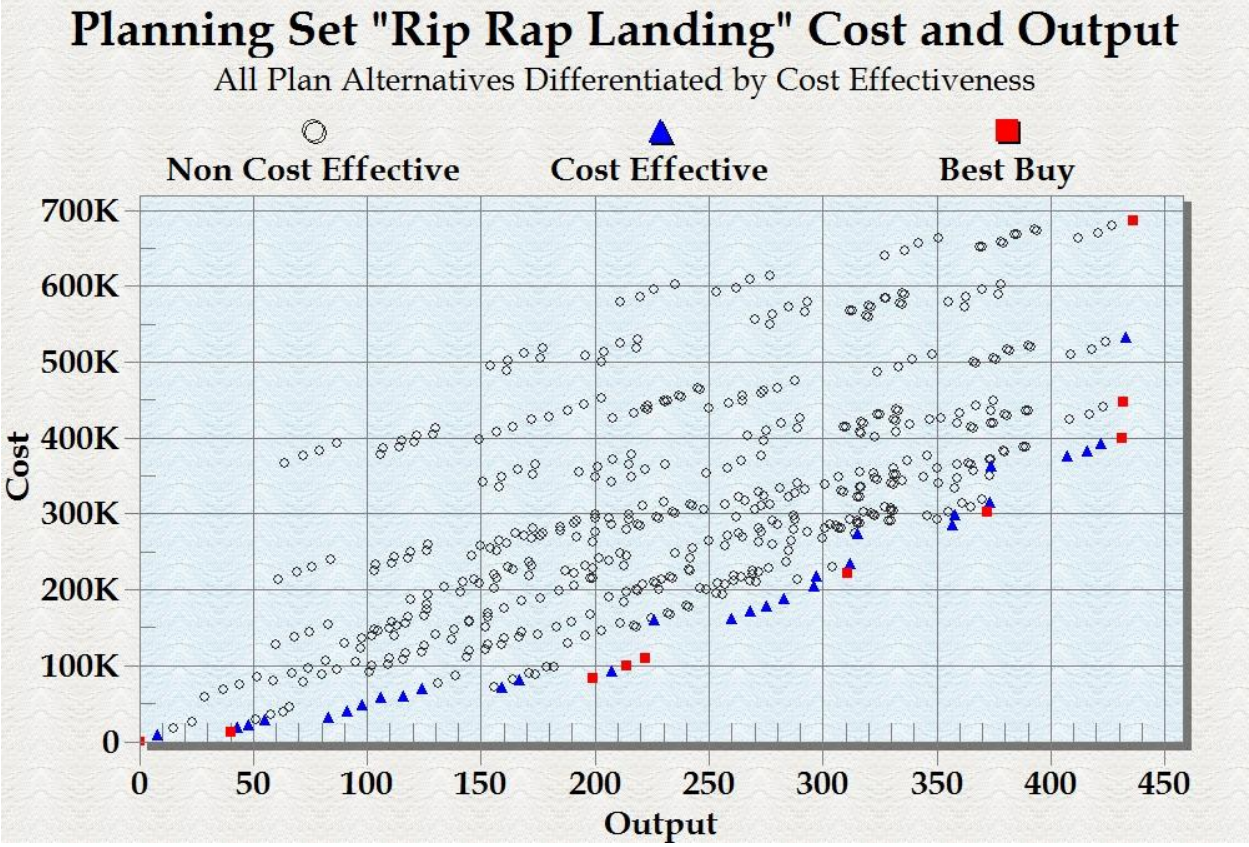

Figure 5. 3. Rip Rap Landing Planning Set.

Table 5. 4. Rip Rap Landing Cost Effective Plans and their Net AAHUs, Cost, and Cost Per Incremental Net AAHU

Total and Average Cost 4/25/2014 12:43:50PM

Cost Effective Plan Alternatives **Planning Set:** Rip Rap Landing

Counter	Name	Output HU	Cost $1000	Average Cost
1	No Action Plan	0.00	0.00	
2	A0B0W0C1S0D0R0	8.00	9,600.00	1,200.00
3	A0B0W0C0S0D0R1	40.00	12,000.00	300.00
4	A0B1W0C0S0D0R0	43.00	19,600.00	455.81
5	A0B0W0C1S0D0R1	48.00	21,600.00	450.00
6	A0B0W0C0S1D0R1	55.00	28,500.00	518.18
7	A0B1W0C0S0D0R1	83.00	31,600.00	380.72
8	A0B1W0C1S0D0R1	91.00	41,200.00	452.75
9	A0B1W0C0S1D0R1	98.00	48,100.00	490.82
10	A0B1W0C1S1D0R1	106.00	57,700.00	544.34
11	A1B0W0C0S0D0R0	116.00	60,500.00	521.55
12	A1B0W0C1S0D0R0	124.00	70,100.00	565.32
13	A2B0W0C0S0D0R0	159.00	71,200.00	447.80
14	A2B0W0C1S0D0R0	167.00	80,800.00	483.83
15	A2B0W0C0S0D0R1	199.00	83,200.00	418.09
16	A2B0W0C1S0D0R1	207.00	92,800.00	448.31
17	A2B0W0C0S1D0R1	214.00	99,700.00	465.89
18	A2B0W0C1S1D0R1	222.00	109,300.00	492.34
19	A2B0W0C1S0D2R0	226.00	160,700.00	711.06
20	A2B0W0C0S0D0R2	260.00	163,100.00	627.31
21	A2B0W0C1S0D0R2	268.00	172,700.00	644.40
22	A2B0W0C0S1D0R2	275.00	179,600.00	653.09
23	A2B0W0C1S1D0R2	283.00	189,200.00	668.55
24	A2B0W2C0S0D0R1	296.00	205,800.00	695.27
25	A2B0W4C0S0D0R1	297.00	218,900.00	737.04
26	A2B0W2C0S1D0R1	311.00	222,300.00	714.79
27	A2B0W4C0S1D0R1	312.00	235,400.00	754.49
28	A2B0W2C0S0D2R0	315.00	273,700.00	868.89
29	A2B0W2C0S0D0R2	357.00	285,700.00	800.28
30	A2B0W4C0S0D0R2	358.00	298,800.00	834.64
31	A2B0W2C0S1D0R2	372.00	302,200.00	812.37
32	A2B0W4C0S1D0R2	373.00	315,300.00	845.31
33	A2B0W4C0S1D0R3	374.00	363,300.00	971.39
34	A2B0W3C0S0D0R2	407.00	376,700.00	925.55
35	A2B0W5C0S0D0R2	416.00	382,900.00	920.43
36	A2B0W3C0S1D0R2	422.00	393,200.00	931.75
37	A2B0W5C0S1D0R2	431.00	399,400.00	926.68
38	A2B0W5C0S1D0R3	432.00	447,400.00	1,035.65
39	A2B0W5C0S1D0R4	433.00	532,800.00	1,230.48
40	A2B0W5C0S1D0R5	436.00	685,900.00	1,573.17

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Step 6: Calculate Average Costs. Average costs for each least-cost, cost-effective plan are determined by dividing the cost of the plan by the net AAHUs are shown in Table 5.3. Average costs are expressed in cost per net AAHU ($/AAHU). The plan with the lowest average cost is identified. Plans with less output at a higher average cost are eliminated.

Step 7: Recalculate Average Costs for Additional Outputs. This step asks the question "of the remaining levels of output, which has the lowest additional cost for additional output?" Using levels of output from Step 6, the average annual costs for additional output are calculated. The previous step's lowest average cost level of output was used as the "zero level." Levels of output less than the lowest average cost level are dropped from further analysis, while level of output greater than the lowest average cost level advance to the next recalculation. Recalculations are then made using the new lowest average cost level as the "zero level." Recalculations are made until the highest level of output is reached.

Step 8: Compare Successive Outputs and Incremental Costs. Table 5.3 and Figure 5.1 were used as decision making tools by progressively proceeding through available levels of output and asking if the next level was worth its additional monetary cost. This step examined the additional habitat value, as measured by increased net AAHU output, for an increase in monetary costs.

Table 5.5. Net AAHUs and Costs of Each Best Buy Alternative (Price Level July 2012). The Recommended Plan is bolded and shaded in gray

Alt. #	Alternative Symbol	Description – Additional Group Added	Output [1]	Annualized Cost[2]	Average Cost ($/AAHU)	Incremental Cost ($)	Incremental Net Output (AAHU)	Incremental Cost/Output ($/AAHU)	Real Estate Costs
1	No Action	None	0	0	0	0	0	0	0
2	A0B0W0C0S0D0R1	Zone 3 Roadside Lake Water Control	40	$12,000	$300	$12,000	40	$300	$125,235
3	A2B0W0C0S0D0R1	Zone 1 Water Control and Vegetation	199	$83,200	$418	$71,200	159	$448	$702,259
4	A2B0W0C0S1D0R1	Zone 4 Scour Protection	214	$99,700	$466	$16,500	15	$1,100	$714,909
5	A2B0W0C1S1D0R1	Zone 3 Vegetation	222	$109,300	$492	$9,600	8	$1,200	$800,009
6	A2B0W2C0S1D0R1	Water Control Zone 4	311	$222,300	$715	$113,000	89	$1,270	$1,718,054
7	A2B0W2C0S1D0R2	Roadside Lake Reconnection	372	$302,200	$812	$79,900	61	$1,310	$1,730,704
8	**A2B0W5C0S1D0R2**	**Water Control Zones 3 and 4**	**431**	**$399,400**	**$927**	**$97,200**	**59**	**$1,648**	**$2,886,000**
9	A2B0W5C0S1D0R3	Sny Creek to Levee	432	$447,400	$1,036	$48,000	1	$48,000	$2,991,817
10	A2B0W5C0S1D0R5	Sny Creek to Bridge	436	$685,900	$1,573	$238,500	4	$59,625	$3,015,852

[1]Outputs are calculated as Average Annual Habitat Units (AAHUs)

[2]Annualized cost (FY12) includes initial construction, monitoring, LERRDS, and OMRR&R costs based on a 50-year period of analysis, 3.75% (FY12) interest rate.

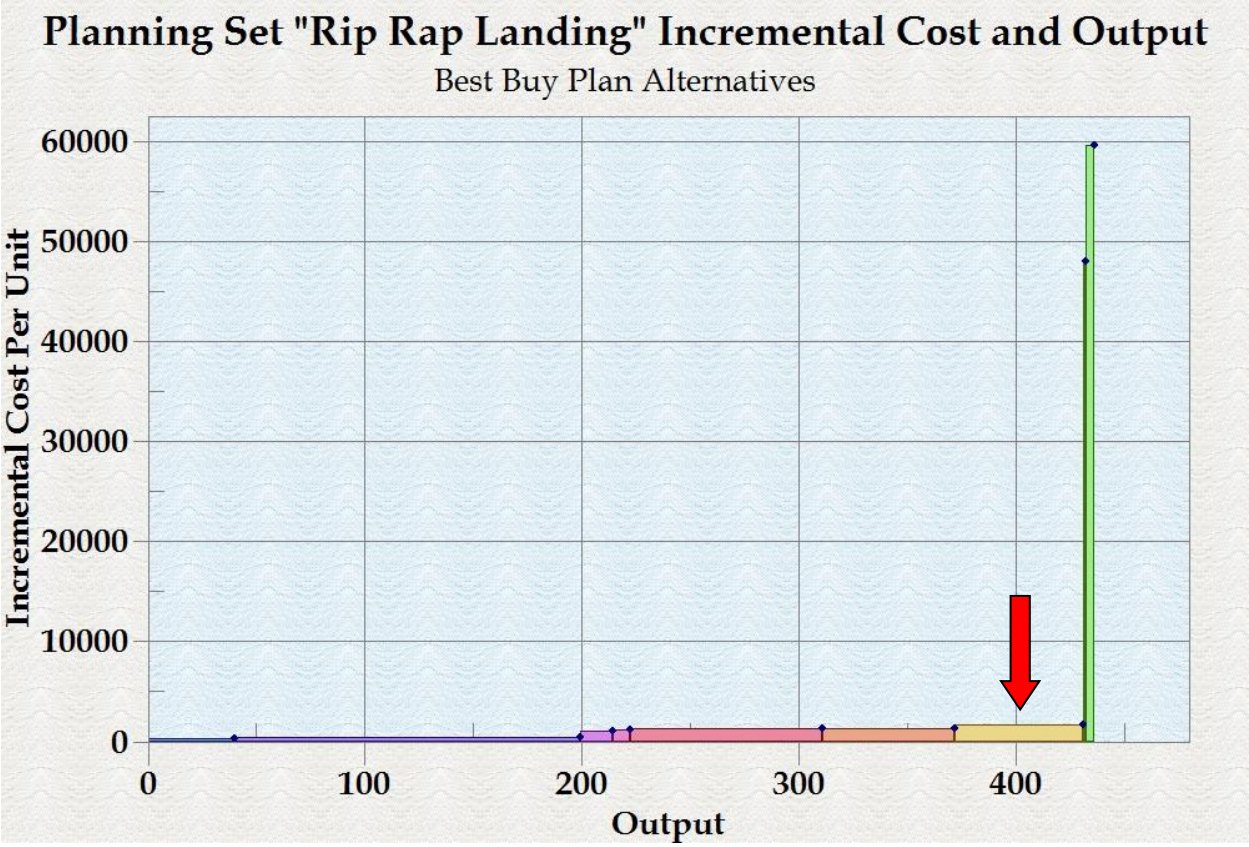

Figure 5. 6. Best Buy Plan Alternatives with Recommended Plan identified by red arrow

C. ICA Conclusions.

The best buy alternatives presented provide the information necessary to make well-informed decisions regarding desired project scale (Table 5.3, Figure 5.1). Progressing through the increasing levels of output for the alternatives in Table 5.3 helps determine whether the increase in Net AAHUs is worth the additional cost. As long as decision makers consider a level of output to be "worth it", subsequent levels of output are considered. When a level of output is determined to be "not worth it", then subsequent levels of output will also likely be "not worth it", and the final decision regarding desired project scale for environmental restoration planning will have been reached.

Typically in the evaluation of Best Buy Alternatives, 'break points' are identified in either the last column in Table 5.3, or in the stair step progression from left to right in Figure 5.1. Break points are defined as significant increase or 'jumps' in incremental cost per output, such that subsequent levels of output may/may not be considered 'worth it'. Identification of such breakpoints can be subjective. For Rip Rap Landing, the breakpoints are subjectively identified as occurring between Alternative 2 and 3, as well as Alternative 8 and 9. Alternative 3 generates substantially higher levels of output at 199 incremental AAHUs, making the decision to continue elevating and considering Best Buy Alternatives beyond this breakpoint logical.

Alternative 8 generates a total of 431 net AAHUs at an incremental cost of $1,648 per output (based July 2012 price levels). Alternative 9 only generates an additional 1 net AAHU at an incremental cost of $48,000 per output. This considerable higher incremental cost per unit was deemed "not worth it". Therefore, Alternative 8, generating a total 431 net AAHUs, is identified as the desired project scale. Additionally, Alternative 8 is recommended as the NER Best Buy Alternative.

D. Selection of the Recommended Plan. The ICA best buy alternatives were assessed by the PDT on their ability to meet project objectives and achieve the four Planning and Guidance evaluation criteria identified in ER 1105-2-100. The four evaluation criteria are acceptability, completeness, effectiveness, and efficiency. The definitions, as shown below, were provided to the PDT prior to evaluation.

During the evaluation, the PDT evaluated the best buy alternatives' ability to meet the project objectives over the period of analysis identified for RRL. Rip Rap Landing HREP objectives are:

1. Increase habitat available to fish
2. Increase native plant species diversity and reduce number of acres impacted by invasive plant species by improving water level management
3. Reduce impacts of headwater flooding and river-borne sedimentation
4. Increase quantity and quality of bottomland hardwood forest

Acceptability is the workability and viability of the alternative plan with respect to acceptance by federal and non-federal entities and the public and compatibility with existing laws, regulations, and public policies. Two primary dimensions to acceptability are implementability and satisfaction. Alternatives were assigned an acceptability of low, medium, or high. All alternatives were implementable. Ratings were based on the satisfaction provided to the government, sponsor, and public. Those alternatives not meeting all project objectives were rated low. The medium and high ratings were more subjective and based on discussions with the PDT, sponsor, and stakeholders.

Completeness is the extent to which an alternative plan provides and accounts for all necessary investments or other actions that ensure the realization of the planning objectives. All alternatives were complete because they did not require outside action to meet the planning objectives. They were all rated high.

Effectiveness is the extent an alternative plan alleviates the specified problems and achieves the specified objectives. Effectiveness ratings of low, medium, or high were assigned to alternatives. Alternatives not meeting all project objectives were assigned low. Those alternatives that met all project objectives were given a rating of at least a medium. Those alternatives that met objectives and allowed the site to be operated as one functioning system, rather than a collection of parts in the area, were rated high. The high rating was developed from guidance in ER 1105-2-100 and EP 1165-2-502 requiring USACE ecosystem restoration projects to be planned with a focus of operating as a system.

Efficiency is the extent to which an alternative plan is the most cost-effective means of alleviating the specified problems and realizing the specified opportunities, consistent with protecting the Nation's environment (P&G Section VI.1.6.2(c) (3)).

To allow for easier comparison, the PDT prepared a matrix for ranking each best buy alternative

according to how well the alternatives met the four evaluation criteria while considering the project objectives (Table 5.4). The following is a discussion of the factors considered when ranking the alternatives in Table 5.4.

Alternatives 1 – 3: These alternatives were not selected because they do not meet all of the project objectives. This resulted in low effectiveness and acceptability ratings.

Alternatives 4-5: These alternatives do meet all of the objectives. They were assigned a medium acceptability rating as a result. Their effectiveness ratings were also rated a medium. It was not given a higher effectiveness rating because there are alternatives that meet project objectives and more completely follow the USACE guidance requiring planning in a systems context. None of these alternatives improve water level management conditions in Zone 4 and a large part of Zone 3. This results in an area in the middle of the project area that would not be able to be managed to restore the ecosystem in some form. These alternatives would be a collection of individual managed areas and not a functioning ecosystem.

Alternative 6: This alternative is a collection of all of the features found in alternatives 2-5 with the addition of water level management capabilities for Zone 4. Its rating does not change from those for alternatives 4 or 5. While it meets objectives and introduces management capabilities to more of the area, it does not allow the site to be managed as one functioning ecosystem.

Alternative 7: This alternative introduces a reconnection of Roadside Lake with Sny Creek and the Mississippi River. This reconnection better meets the increase habitat available to fish objective because it allows fish year round access to the lake. The lake habitat is improved with previous alternatives, but they are reliant on high water events to enter and exit the lake. The addition of this feature gave this alternative a high acceptability rating. The effectiveness rating was only a medium however. This is because the area is still only able to be managed as a collection of individual parts under this alternative.

Alternative 8: This is the first alternative that fully meets the goal and objectives for the site and allows the site to be managed as one wholly function unit. It allows for water level management capabilities throughout the site with the addition of Zone 3 features. It was given a high effectiveness rating as a result. Economically it offers a large number of habitat units at a relatively low cost, giving it a high efficiency rating. Alternative 8 generates a total of 431 AAHUs at an incremental cost of $1,648 per AAHU.

Alternatives 9-10: These alternatives meet the goal of the project by restoring ecosystem function across all habitat types, but at a greater cost per habitat unit as compared to alternative 8. Excavating Sny Creek further past Roadside Lake would improve aquatic connectivity to the Mississippi River; but the PDT felt that the greater cost was not justified. For example, Alternative 9 only generates an additional 1 AAHU at an incremental cost of $48,000 per AAHU. These alternatives were rated low in efficiency as a result and were not chosen.

Table 5. 7. The best buy alternatives evaluated on their ability to achieve the four Planning and Guidance Evaluation criteria and achieve project objectives.

Best Buy Alt.	Alternative Symbol	Additional Feature Added[1]	P&G Evaluation Criteria				Features Meeting Project Objectives			
			Acceptability	Completeness	Effectiveness	Efficiency	Increase habitat available to fish	Increase native plant species diversity through water level management	Reduce impacts of headwater flooding and river-borne sedimentation	Increase quantity and quality of bottomland hardwood forest
1	No Action		L	H	L	L	None	None	None	None
2	A0B0W0C0S0 D0R1	Zone 3 Roadside Lake Water Control	L	H	L	L	R1	R1	None	None
3	A2B0W0C0S0 D0R1	Zone 1 Water Control and Vegetation	M	H	L	L	R1	R1, A2	None	A2
4	A2B0W0C0S1 D0R1	Zone 4 Scour Protection	M	H	M	M	R1	R1, A2	S1	A2
5	A2B0W0C1S1 D0R1	Zone 3 Vegetation	M	H	M	M	R1	R1, A2	S1	A2, C1
6	A2B0W2C0S1 D0R1	Water Control Zone 4	M	H	M	M	R1	R1, A2, W2	S1	A2, W2
7	A2B0W2C0S1 D0R2	Roadside Lake Reconnection	H	H	M	H	R2	R2, A2, W2	S1	A2, W2
8[2]	**A2B0W5C0S 1D0R2**	**Water Control Zones 3 & 4**	**H**	**H**	**H**	**H**	**R2**	**R2, A2, W5**	**S1**	**A2, W5**
9	A2B0W5C0S1 D0R3	Sny Creek to Levee	H	H	H	L	R3	R3, A2, W5	S1	A2, W5
10	A2B0W5C0S1 D0R5	Sny Creek to Bridge	H	H	H	L	R5	R5, A2, W5	S1	A2, W5

[1]Each alternative includes its functional group and the groups of the alternatives before it.
[2]Recommended Plan

E. Summary. The results of the incremental cost analysis in this section were considered with other factors, including physical features on the site, land ownership and easements or use restrictions, management objectives of the resource agencies, critical needs of the region, and ecosystem needs of the Upper Mississippi River System. In cooperation with USFWS, Illinois DNR, and NRCS, a cost effective project has been planned and designed that serves the needs of the site managers and project partners. The preferred alternative has an overall output of 431 AAHUs. These figures are summarized in Table 5.5. Several other alternatives were considered but eliminated during the ICA process because they did not meet one or more of the criteria: acceptability, completeness, effectiveness, or efficiency. Separate systems for water movement were originally thought to be the best approach for Zones 3 and 4 but were eliminated in steps 4 and 5 of the ICA because they were inefficient. The Recommended Plan was selected because it met the four criteria and best met the project goal of increasing quality and quantity of aquatic, non-forested wetland, *and* forested wetland habitats and the project objectives.

Recommended Plan. Alternative 8 was selected by the PDT as the Recommended Plan. This alternative best meets the study objectives and has the support from the USFWS and the IDNR. The plan improves internal and external water drainage, management, and supply. It improves aquatic habitat and increases the bottomland forest and non-forested wetlands on the site. The Recommended Plan was calculated to have an average annual cost of **$**399,400 in FY12 costs. When updated with FY14 costs, the average annual cost is $554,580.

National Ecosystem Restoration (NER) Plan. Engineering Regulation 1105-2-100 directs that Corps of Engineers ecosystem restoration projects should contribute to national ecosystem restoration. The NER plan reasonably maximizes ecosystem restoration benefits compared to costs, considering the cost effectiveness and incremental cost of implementing other restoration options. The average annual habitat units utilized in the plan formulation process quantify the ecosystem restoration benefits. Refer to Appendix G, *Habitat Evaluation & Quantification*, for a detailed description of the habitat analysis process. Alternative 8 is also the NER Plan. It is a best buy alternative that yields 431 net AAHUs at an incremental cost of $1,648 per net habitat unit at FY12 estimates. The average annual cost per net habitat unit is $927. When adjusted to FY14 costs, the average annual cost per net habitat unit is $1,287.

6*. RECOMMENDED PLAN: DESCRIPTION WITH DESIGN, CONSTRUCTION, OPERATIONS, MAINTENANCE, REPAIR, REHABILITATION, AND REPLACEMENT CONSIDERATIONS

This section provides further information on the Recommended Plan. The Recommended Plan for ecosystem restoration at Rip Rap Landing includes the following features:

- Zone 1- All items within the Zone 1 plan were cost effective and created a functional management unit.
- Zone 3- All items in Zone 3 except for the excavation of the Sny north of the County highway bridge were cost effective and helped form functional units.
- Zone 4- All items within Zone 4 were cost effective and help form functional units, except for the excavation of Sny Creek north of the Roadside Lake connection channel and south of the county highway bridge.
- Zone 5- Excavation of Sny Creek within Zone 5 was the only item that was cost effective and an integral part of a functional unit with other features in Zones 3 and 4.

Figure 6.1 and Plates 5-1 through 5-5 illustrate the location of project features of Alternative 8, the Recommended Plan. The features of the Recommended Plan are designed to address the study goals (Table 6.1). A detailed description of the project features included in the Recommended Plan is given in section 4 above and are summarized in Table 6.2.

Table 6.1. Study goal and the features of the Recommended Plan that address them. Some features of the Recommended Plan address multiple objectives.

Zone	Enhancement Feature or Functional Unit	Increase quantity and quality of aquatic habitat	Increase quantity and quality of non-forested wetland habitat	Increase quantity and quality of forested wetland habitat
1	Install 2,500 gpm Well (1B) and Water Control Structures (1A) with Channel to Goose Pasture Lake (1D) Reforestation (1C)		X	X
3&4	Channel to Waverly Lake (3A), Water Control in Channel (3B), WCS in North Units (3C), Pump Station (3E/4G), Pump Channel Widening (3F/4H), Pipe and Concrete at Road (3G/4I), WCS Pipes Under Old Levee (3H), WCS Pipes Under Road (4J), South Spillway (4E), WCS South Spillway (4D) , River Ridge Scour Embankment (4C2) Trees in Zone 3 (3I)		X	X
3,4,&5	Water Control at Roadside Lake (3K), Roadside Lake Channel to Sny (3J), Sny Excavation Roadside Channel to Dog Island (4B2), Sny Excavation Along Dog Island (5B)	X		

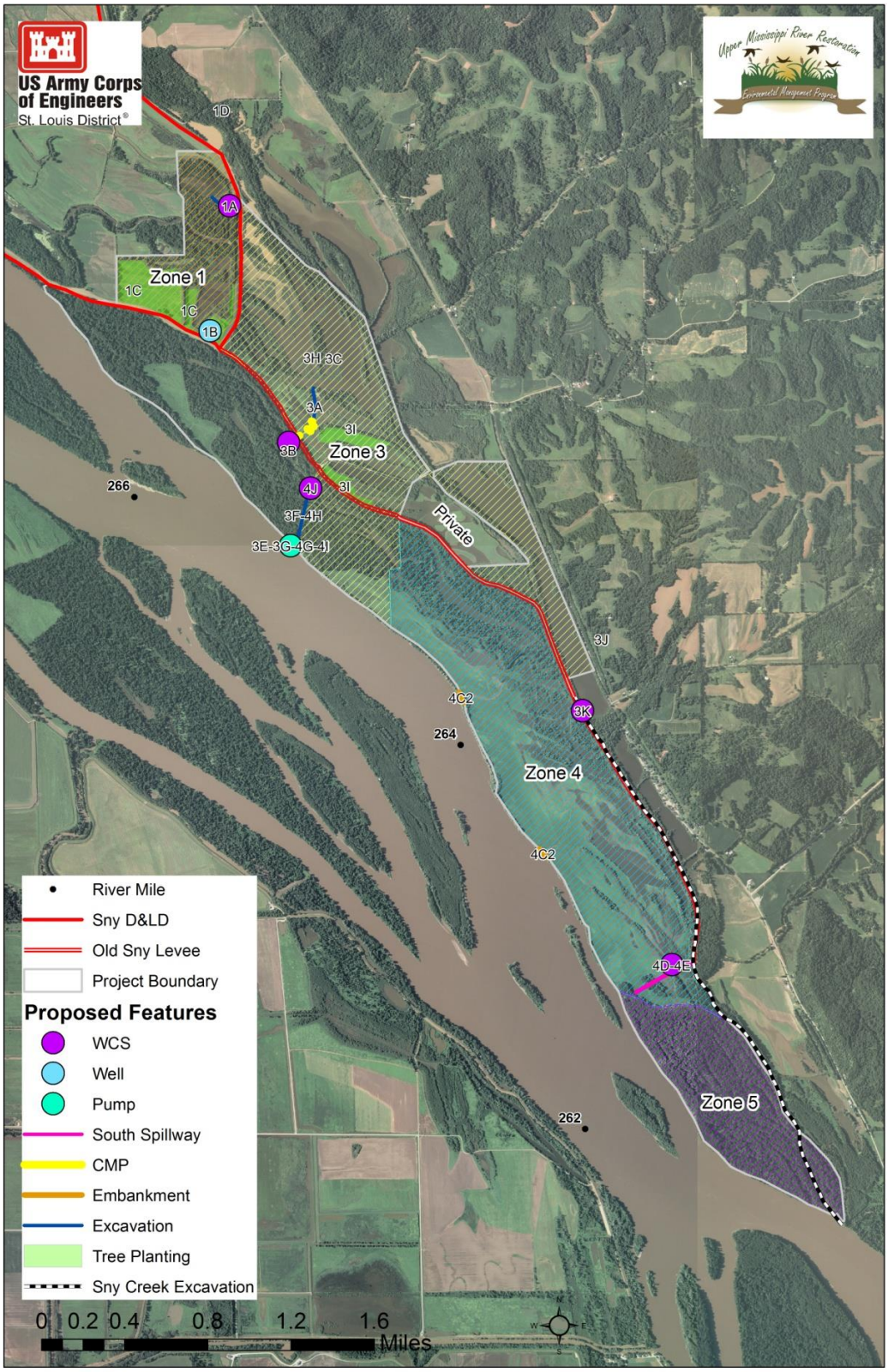

Figure 6. 1. Location of features of the Recommended Plan

Table 6. 2. Rip Rap Landing Project Feature Summary. Note all elevations are above mean seal level (AMSL). During Plans and Specifications all elevations will be referenced to NAVD88 per Corps Guidance EM 1110-2-6056).

Feature	Measurement	Unit of Measure
ZONE 1 – Sny Island Area		
Water Control Levee Structure (1A)		
Crown Width	12	Feet
Side slopes	3:1	H:V
Levee Length (new)	54	Feet
Compacted Embankment for levee	400	Cubic Yards
Sluice gate, 24"	1	Each
Corrugated metal pipe, 24"	1	Each
Wooden Catwalk	1	Each
Invert Elevation	438.0	Feet
Well (1B)		
Well Installation, 2,500 gpm	1	Each
Diesel Power system	1	Each
Mast Tree Planting (1C)	62.9	Acres
Channel to Goose Pasture Lake (1D)		
Channel Length	200	Feet
Side slopes	3:1	H:V
Bottom width	12	Feet
Depth	2	Feet
Channel Excavation	189	Cubic Yards
Bottom Channel Elevation	439.0	Feet
ZONE 3 – Roadside Lake and Waverly Lake Wetland Management Areas		
Pump Channel from Old Sny Levee to Waverly Lake, (3A)		
Side slopes	2:1	H:V
Bottom Width	10	Feet
Channel Length	1,636	Feet
Water Depth	5	Feet
Bottom Channel Elevation	436.0	Feet
Channel Excavation	3,500	Cubic Yards
Compacted Embankment for levee	12,500	Cubic Yards
Water Control Structure in Main channel from Old Sny Levee to Waverly Lake (3B)		
Crown Width	12	Feet
Side slopes	3:1	H:V
Levee Length (new)	40	Feet
Compacted Embankment for levee	425	Cubic Yards
Corrugated metal pipe, 36"	2	Each
Sluice Gate structure	2	Each
Invert elevation	436.0	Feet
Catwalk	2	Each
WCS in Main channel from Old Sny Levee to Waverly Lake to northern and southern moist soil units (3C)		
Water control pipe, 24"	44	Feet
Stop log structure	2	Each
Catwalk	2	Each

Feature	Measurement	Unit of Measure
Bottom Elevation	439.5	Feet
Pump station (3E) & (4G)		
Removal of existing pump	1	Each
Modifications to existing structure	1	Each
Securing and installing new pump	1	Each
Widening Pump Channel to Old Sny Levee, 35,000 gpm capacity (3F) & 4H)		
Side slopes	1:1	H:V
Bottom Width	18	Feet
Channel Length	1,400	Feet
Channel Excavation	4,000	Cubic Yards
Concrete access across pump channel to Zone 2 (3G) & (4I)		
Length	40	Feet
Width	20	Feet
Water Control Pipes & Structure Under Old Sny Levee (3H)		
Sluice gate, 36"	2	Each
Water control pipe, 36"	2	Feet
Water control pipe bands, 36"	4	Each
Wooden Catwalk	2	Each
Invert Elevation	436.0	Feet
Mast Tree Planting (3I) and/or natural regeneration	36.5	Acres
Roadside Lake Channel to Sny (3J)		
Length	100	feet
Width	40	Feet
Side slopes	1:1	H:V
Channel Excavation	720	Cubic Yards
Water Control Structure in channel from Sny to Roadside Lake (3K)	1	Each
Bottom Elevation	433.5	Feet
ZONE 4 – Rust Land Company - WRP		
Dredging of Sny from Roadside Lake access channel to Dog Island (4B2)		
Depth	8	Feet
Side slopes	3:1	H:V
Bottom Width	14	Feet
Channel Length	2,880	Feet
Channel Excavation	51,325	Cubic Yards
Desired Water Depth	433.5	Feet
Water Control Levee Structures in scoured areas along River ridge (4C2)		
Crown Width	12	Feet
Side slopes	3:1	H:V
Levee Length (new)	120	Feet
Compacted Embankment for levee	5,600	Cubic Yards
Water Control Spillway Structure Replacing NRCS Structure #1 (4D & 4E)		
Crown Width	12	Feet
Top Surface Elevation	442.0	Feet
Side slopes	1:1	H:V
Levee Length (new)	1,700	Feet

Feature	Measurement	Unit of Measure
Compacted Embankment for levee	380	Cubic Yards
Revetment mattresses	2,270	Sq Yds
Water Control pipe, 36"	2	Feet
Stop log structure	2	Each
Invert Elevation	438.0	Feet
Catwalk	2	Each
Water Control Structure in Main channel under access road to Zone 4 (4J)		
Water Control pipe, 36"	160	Feet
Stop log structure	1	Each
Catwalk	1	Each
ZONE 5 – Dog Island		
Excavation of Sny Creek from southern end of Zone 4 to the Mississippi River (5B)		
Depth	8	Feet
Side slopes	1:1	H:V
Water surface at top	30	Feet
Bottom Width	14	Feet
Channel Length	6,257	Feet
Channel Excavation	27,850	Cubic Yards

Zone 1. Re-supplying the wetland units within Zone 1 would require pumping during dry periods. The use of a well for a water supply rather than pumping out of the drainage channel was to insure that undesirable fish do not enter into the wetland management unit. Flooding to elevation 441' will be achieved by placing a water control structure (1A) across the existing drainage channel within the unit. This drainage channel is part of the overall drainage system utilized by the Sny D&LD to maintain water levels within the adjacent crop fields. By constructing this water control structure, water can be retained behind, south of the structure. Water contained behind structure 1A will then be directed to existing wetlands or new moist soil and bottomland forest units by use of a channel system created within Item 1D. With the improved water control, approximately 62.9 acres of cropland within this zone will be replanted with mast-producing trees (1C). The construction of feature 1A would require further coordination with the Sny L&DD and USACE. Further USACE coordination would be required after design to get 408 clearance for modification of a federal project.

Zones 3 & 4 Water Control. The cost of expanding the existing pump station from 11,000 gpm to 35,000 gpm and widening the pump channel from the pump station to the Old Sny Levee was divided between Zones 3 and 4 based upon a percentage using the original concept of 15,000 gpm for Zone 3 and 20,000 gpm for Zone 4. Having the ability to divert up to 35,000 gpm to either Zone will increase the management flexibility of the site and allow them to "move" water based upon the wetland conditions in either Zone. The cost associated with expanded pump station and widening the existing pump channel for Zone 3 are features 3E and 3F, respectively. For Zone 4 these features are 4G and 4H, respectively. Feature 3A (increasing capacity of channel to Waverly Lake) is needed to accommodate the flow from the new 35,000 gpm pump, along with expanding, moving and/or replacing the existing water control structures (Features 3B and 3C).

As part of the pump and channel analysis required in expanding the pump capacity, the pump supply pipe increased in size. In order to maintain existing water elevation, thus protecting the pump station and boat access road, it was necessary to reduce the amount of earthen cover over the pump supply pipe. While this might be an issue only if heavy equipment were to utilize the existing access road going along the river into Zone 2, it was determined that a concrete entrance slab should be placed along the roadway where it crossed the pump water supply pipe. This cost was split between Zones 3 and 4 as indicated above and are identified as Features 3G & 4I.

The increased water supply from the pump station will terminate in a backwater slough just to the west of the Old Sny Levee extension. At this location, water can then either be directed under the Old Sny Levee though the water control structure identified as Item 3H or it can be directed under the pump station and boat access road south to fill Zone 4 using Item 4J. Water within this slough will also be directed north into the backwater slough areas in Zone 2. The slough will be used as a water conveyance for Zones 2, 3 and 4.

Generally speaking, the intent of Zone 4 was to continue the water management plan previously developed within the NRCS' WRP project. This is accomplished by three major items within this zone. Feature 4C2 will fill in the low points that are part of the natural ridge along the river and cause periodic, scouring, overbank flooding in the area. Filling in these low points will help limit future overbank flood events and reduce scour associated with them. While the Zone will still flood, most flood events will back fill the site, thus reducing velocities and helping to reduce overbank scouring.

The reconnection of Roadside Lake to Sny Creek and the Mississippi River will be accomplished through a small channel from the creek to the lake separated by a stop log structure. The stop log structure would allow for management of the lake levels if a drawdown is desired to control invasive species as well as allow the lake to hold water in periods when the water stages in the creek are lower.

The flood events that have occurred because of the above mentioned low points were too large for NRCS Structure #1 to accommodate. Items 4D and 4E expand and install a larger water control structure. Revet mattresses will be used for the top of the spillway to provide a more even water control elevation across the spillway and to carry higher velocity flows, when encountered. The new water control structures will utilize sluice gates in lieu of stoplogs for water control as the spillway will be used to maintain water levels throughout the slough and associated wetlands in the zone.

Zones 3 Tree Plantings. Feature 3I consists of reforestation by the cultivation of high forage-value, mast-producing trees. There are currently about 36.5 acres of open land within Zone 3 that will be replanted.

Zone 4 & 5 Sny Creek Excavation. In Zone 4, excavation of Sny Creek from Roadside Lake access channel south to the northern edge of Zone was a cost-effective feature. The only element found to be cost effective within Zone 5 was the continuation of the dredging of the Sny between the southern edge of Zone 4 and Sny Creek's confluence with the Mississippi River.

A. Design Considerations

The Project has been developed to a feasibility level of design. Design details are included in the technical appendices and plates. As with all feasibility level studies, these details will be refined in the Plans and Specifications (P&S) stage.

Survey Needs. It is recommended that the following surveys be collected or resurveyed during P&S prior to construction in order to obtain more accurate quantities:

- Additional topographic data of the project area (field surveys or LiDAR). In accordance with EM 1100-2-6056, it is recommended to reference survey data back to NAVD 88.
- Water channel and creek surveys
- Additional geotechnical explorations and testing at excavation and structural locations

Hydrologic/Hydraulic. *Division Regulations DIVR 1110-1-403 "Mississippi Valley Division/ Mississippi River Commission Policy on River Diversions":* The Recommended Plan requires construction of a pump station to remove water (and some sediments) from the Mississippi River. Features were designed and constructed to minimize the local and system-wide impacts to hydrologic systems gaining and losing flow and sediments. The proposed diversion of Mississippi River water for operation of the proposed pump station is 35,000 gpm. Due to its size and localized area of effect, District technical experts have determined that the proposed pump station operation should not impact existing engineering features and projects, such as levees or other river training structures, nor is it expected to have any significant cumulative impacts on the system. Per *DIVR 1110-2-240 "Preparation of Water Control Plans and Manuals*", a water control plan for pump station operation will be developed during Plans and Specifications.

B. Construction Considerations

Storm Water Pollution / Erosion Control. The potential for storm water pollution during construction is minimal for this project with the possible exception of the excavation issues associated with the Sny Creek. Storm water runoff from nearly all construction activity would be contained within the confines of the project. Temporary stabilization measures would be employed on disturbed areas of the main pump channel, Sny Creek and Roadside Lake connection to the Sny Creek until stabilization occurs. Stabilization practices may include mulching, temporary seeding, and /or the erection of silt fencing. Overall, the long-term storm water runoff characteristics of the site would not be expected to change. All areas impacted by construction will re-seed through natural succession with similar vegetation types as before project conditions.

Permits. Public review and an application for water quality certification from the State of Illinois, as required by Section 404 and 401 of the Clean Water Act, was applied for through the Regulatory Branch of the Corps based upon the 404(b)(1) evaluation in Appendix J, *Clean Water Act*. The St. Louis District Regulatory Branch has determined that the proposed activity will have no affect on endangered species, and is authorized under Section 404 of the Clean Water Act by an existing Department of the Army Nationwide Permit 27 for *Aquatic Habitat*

Restoration, Establishment, and Enhancement Activities (Appendix J, *Clean Water Act*). This verification is valid until March 18, 2017 unless the District Engineer modifies, suspends, or revokes the nationwide permit authorization in accordance with 33 CFR 330.5(d). The Illinois Environmental Protection Agency Division of Water Pollution Control (IEPA/WPC) has conditionally issued general Section 401 Water Quality Certification for this nationwide permit, subject to the special conditions and three general conditions (see Appendix J, *Clean Water Act*). These conditions are part of the Corps permit. An application for a permit for construction under the Illinois Rivers, Lakes, and Streams Act has been submitted. This permit will be obtained before any construction begins.

The IDNR will also have an internal Comprehensive Environmental Review Process (CERP) which tracks potential impacts to Threatened and Endangered Species, Wetland and Cultural Resources (Appendix K, *IDNR CERP*).

Protected Species.
Bald Eagles – Consideration (in coordination with the USFWS) will be given during plans and specifications preparation sequencing construction activities in a manner that minimizes impacts. Specific restrictions relative to any sequencing will be included as part of the contract specifications. The contracting officer will ensure appropriate compliance.

Indiana and Northern Long-Eared Bats – Special conditions on the construction work will require that tree clearing activities be scheduled outside April 1 to September 30 when Indiana and Northern Long-eared bats are known to inhabit summer habitat. If tree clearing activities must occur during this period, coordination with the USFWS will occur. At a minimum, a site visit by a team of biologists will be required to determine if any roost trees are among those proposed for removal. If removal of a roost tree is proposed, then the District must enter into Section 7 consultation with the USFWS. This consultation will determine if the proposed action is likely to jeopardize the continued existence of the Indiana or Northern Long-eared Bat.

Migratory Wildlife – The development of plans and specifications will attempt to minimize disruption of migratory wildlife during fall and early winter.

Construction Sequence. The probable construction sequence is summarized in Table 6.3; however, no sequence will be required contractually.

Construction Equipment. No special construction methods or equipment are anticipated. All work will be land based using excavators, dozers, scrapers, cranes, etc. Access to most sites can be accomplished via existing site roads. Minor cofferdams and dewatering may be required for construction of water control structures.

C. Operational Considerations. A brief description of pump operation, water control structures, pumping station, inlet and outlet structures and fish friendly structures is given here. A complete list of Rip Rap Landing operation needs will be published in an OMRR&R Manual after construction completion.

Pump(s). One 35,000 gpm diesel engine pump is proposed that will be placed at the existing structure adjacent to the main access road and the boat ramp. The pump itself will remain on the

structure year round but the pump engine and fuel supply will be portable so they can be removed from the floodplain when not in use. The pump station will have to be operated by manpower from the site to keep it fueled and running.

Water Control Structures. Multiple water control structures are part of the Recommended Plan. The control structures generally include a gate (sluice) to control water movement. The gate on each pipe will have to be raised and lowered as required by site operation plan to supply water to the various wetland units within the facility. This operation plan will be developed during P&S phase when details associated with each feature have been designed. No water levels greater than 441 ft would be managed for in any zone. Zone 3 and 4 water levels would typically target 438 ft AMSL.

D. Maintenance Considerations. The proposed features have been designed to ensure low annual maintenance requirements. Routine maintenance would include periodic inspection and lubrication of the pumps and water control structures. The pump station would require monthly maintenance to include: lubricating flap gate hinges, pillow block bearings, sluice gate operators and stems. The following would need to be checked: lube level in the gear reducer, and diesel engine fluid levels, filters, and battery. To protect the engine and fuel tank, they would be shutdown, disconnected and hauled to and from storage each year. On an annual basis, water control structures would need grease added to the gate hoist operator gear housing, the gate stem threads greased, and debris removed. Berms would require inspection for erosion, mowing, and service road surfacing maintenance. Planted trees would be established prior to project completion and no OMRR&R should be needed. Additional activities that would not occur on an annual basis include pump station rehabilitation. This would involve removing the pump and likely shipping it to a shop. The shop would disassemble the pump rotating elements; blast them clean; inspect: intermediate shafts, impeller, pump column, flange register fits, suction bell and pump bowl; replace: bearings, sleeves, bushings, grease seals, packing, gaskets, pump shaft, enclosing tubes, fasteners, and flexible coupling; and paint and reassemble the pump components. The pump would then be reinstalled and tested. This likely would not be needed until at least 30 years after project construction. The estimated annual OMRR&R costs are presented in Table 8-2. These quantities and costs may change during final design. A complete list of Rip Rap Landing maintenance needs will be published in an OMRR&R Manual after construction completion.

Maintenance after a flood event would be more intensive. The portable pump and engine tanks used at Roadside Lake should be removed before a flood occurs. After a flood, all features must be inspected for erosion and structural damage. When a flood has inundated a pump, it must be examined and serviced according to the manufacturer's maintenance instructions. Water control structures must also be inspected to determine if gates seal tightly and operators are functional.

E. Repair, Rehabilitation, and Replacement Considerations.

Repair, rehabilitation, and replacement considerations may extend outside the typical 50-year period of analysis; as such, the project partner is expected to maintain the HREP project until it is no longer authorized and should expect to incur costs associated with this responsibility outside of the 50-year period of analysis.

Table 6. 3. Probable Construction Sequence

Sequence	Construction Work Item	Instructions	Purpose
BID PACKAGE #1			
1	Install erosion control features on all portions of the site within this bid package.	Silt fencing will be the most common technique used in Bid Package #1.	Insures construction operations are not allowing for silt to become deposited in water and natural habitats.
2	Fill in and armor low scoured areas along the river ridge in Zone 4.	Structures will be earthen embankment protected by riprap or revet mattresses. Control moisture content	This will eliminate head cutting and development of new swales in zone 4. Controlling moisture content will assist in securing required compaction.
3	Reconstruct and lengthen NRCS structure #1	Spillway water control elevation will be increased and spillway lengthened to provide more water control and less maintenance.	This spillway will set the water control elevation for all of the various potholes and swales within Zone 4.
4	Install new levee across drainage channel and cut channel to Goose Prairie Lake in Zone 1	The water control structure and the channel excavation can be undertaken in conjunction with the well development	Upon the completion of items 10 and 11, this area can be managed independently of the other Zones.
5	Install new well in Zone 1	Drill, test and install power supply to new well in Zone 1. Work can be done in almost any season as the area is protected from flooding.	Allows area to be flooded.
BID PACKAGE #2			
1	Install erosion control features on all portions of the site within this bid package.	Silt fencing will be the most common technique used in Bid Package #2, but coir logs will be used to stabilize the spoil deposition area adjacent to Sny Creek.	Insures construction operations are not allowing for silt to become deposited in water and natural habitats.
2	Prepare existing bank of Sny Creek Diversion Dike.	Material may be cleared during most weather conditions.	The bank must be cleared before or some brush material before the Sny Creek Excavation may be placed upon it.
3	Excavate Sny Creek from Roadside Lake to confluence on Mississippi River	Excavate during low river / groundwater levels and when material can be placed adjacent to Sny Creek high levee.	Material will be used to raise and strengthen the diversion dike.

Sequence	Construction Work Item	Instructions	Purpose
4	Excavation from Sny Creek to Roadside Lake and development of fish friendly stop log structure for water control. Purchase of a portable pump for water level management.	Excavate small channel and construct sheet pile control structure.	Excavating a channel form Roadside lake to the Sny Creek will provide over-wintering and spawning habitat for fish. The stop log structure will allow for water level control when required. The portable pump will assist in water level management when gravity conditions will not allow proper management
BID PACKAGE #3			
1	Install erosion control features on all portions of the site within this bid package.	Silt fencing will be the most common technique used in Bid Package #3.	Insures construction operations are not allowing for silt to become deposited in water and natural habitats.
2	Remove existing 11,000 gpm pump from sheet pile wall	Move and unload pump at MRA headquarters.	Pump will be used in future applications by IDNR.
3	Clear trees along existing pump channel from pump station to Sny Sand Levee.	Material may be cleared during most weather conditions.	The access must be cleared to allow for the expansion of the main pump channel
4	Reconstruct main pump channel.	Widen and deepen channel to carry more flow	Pump capacity will increase from 11,000 gpm to 35,000 gpm
5	Install / construct water control structures	Construct in a manner that minimizes damage to existing berms and maintains access.	Insure water can be controlled to the extent possible in all Zones.
BID PACKAGE #4			
1	Plant mast Trees in Zones 1 and 3	Plant during dormant season (Nov 5-Mar 5)	River levels need to be as low as possible to provide suitable conditions for planting

F. Value Engineering. A Value Engineering (VE) study was completed in February 2009 for this project in accordance with ER 11-1-321, Army Programs, Value Engineering, dated 28 February 2005 (formerly EC 11-1-114, Army Programs, Value Management/Value Engineering, dated 28 February 2003). The VE study recommendations have been reviewed for technical acceptance, compatibility with USACE authorities, and coordinated with the sponsor. The feasible recommendations have been incorporated into the features discussed in this feasibility report.

7. SCHEDULE FOR DESIGN AND CONSTRUCTION

Table 7. 1. The tentative schedule for the project and necessary completion steps

Requirement	Scheduled Date
Value Engineering Functional Analysis Study	Completed February 2009
Distribute Draft Feasibility Report	Completed February 2011
Complete Agency Technical Review of Draft Feasibility Report	Completed 09 March 2011
Submit Draft Feasibility Report for Public and Agency Review	June 2014
Submit Final Feasibility Report to Mississippi Valley Division	August 2014
Initiate Plans and Specifications	Phased, 2015-2018
Submit Plans and Specifications for Agency Technical Review	Phased, 2015-2018
Complete Plans and Specifications	Phased, 2016-2019
Advertise Contract	Phased, 2016-2019
Award Contract	Phased, 2016-2019
Complete Construction	Phased, 2019
Prepare OMRR&R Manual	Phased, 2016-2020

8. COST ESTIMATES

Table 8.1 compares the costs for the Total Project Cost (TPC) and the Project First Cost (PFC) (Appendix L, *Cost Estimate*). The TPC was calculated based upon the proposed construction schedule, expected escalation costs, and a contingency factor. It represents the money expected to be spent at the end of the project construction.

Based on October 2014 price levels, the estimated project first costs are $9,006,000 (Table 8.1). The recommended project features are located on both federally-owned lands (Zone 5, Dog Island) and non-federally-owned lands (Zones 1, 3, and 4). As a result, first cost funding for features located on federally-owned land would be 100% federal while features located on non-federal lands would be cost-shared with 65% federal and 35% non-federal. The first cost for features located on federally-owned lands (i.e., Sny Creek excavation along Dog Island) would be $1,133,000. The remaining features are located on non-federal lands (Zones 1, 3, and 4), and would be subject to the cost-share provisions in Section 1103 of the Water Resources Development Act of 1986 (P.L. 99-662) as amended by Section 509 of the Water Resources Development Act of 1999 (P.L. 106-54). The estimated federal cost share (65%) for features located on non-federal lands would be $5,117,000. The estimated non-federal cost share (35%) for features located on non-federal lands would be $2,756,000. The non-federal costs include values of lands, easements, rights-of-way, relocations, and dredged or excavated material disposal areas (LERRD) estimated at $2,886,000. The total federal cost for the project would be $6,250,000, which includes features on federal and non-federal lands.

Table 8. 1. Project Cost Summary, October 2014 Price level, rounded to the nearest thousand dollar

Account	Feature	Total Project Cost[1] (TPC) ($)	Project First Cost (PFC) ($)
01	Lands and Damages	$2,942,000	$2,942,000
02	Relocations	$0	$0
06	Fish and Wildlife Facilities	$4,988,000	$4,789,000
30	Planning, Engineering and Design	$845,000	$785,000
31	Construction Management	$536,000	$490,000
	Total Project Costs	$9,312,000	$9,006,000
[1] Fully funded estimate is marked up to midpoint of construction. Markup equals 4.9%			

The estimated operation, maintenance, repair, rehabilitation, and replacement (OMRR&R) requirements are provided in Table 8.2. For analysis purposes, the costs presented for OMRR&R used the 50-year period of analysis. However, the project sponsor, IDNR, is expected to operate and maintain the project until it is no longer authorized. As such, IDNR should expect to incur costs associated with this responsibility outside of the 50-year period of analysis. The estimated total average annualized OMRR&R costs of the Recommended Plan is $62,098. IDNR is 100% responsible for OMRR&R costs. These quantities and costs may change during final design. A

complete list of OMRR&R needs will be provided in the OMRR&R Manual following construction. OMRR&R costs are included in the annualized costs for alternative selection but are not included in the total project construction costs.

Table 8.2. Estimated OMRR&R costs for proposed plan (FY 14 Federal discount rate of 3.5%)

Feature	Average Annual OMRR&R	Cost	Frequency of Replacement
Zone 1			
Water Control Levee Structure (1A)	$669	$44,052	Every 30 years
Well (1B)	$11,263	$349,852	Every 20 years
Tree Planting (1C)	$1,585	$207,689	Every 50 years
Channel to Goose Pasture (1D)	$414	$27,245	Every 30 years
Zone 3			
Pump Channel from Sny Sand Levee to Waverly Lake (3A)	$3,527	$232,220	Every 30 years
Water Control Structure in main channel from Sny Sand levee to Waverly Lake (3B)	$676	$44,521	Every 30 years
WCS in main channel from Sny sand levee to Waverly Lake to northern and southern MSU (3C)	$2,974	$195,761	Every 30 years
Pump Station (3E)	$2,969	$195,444	Every 30 years
Widening Pump Channel (3F)	$493	$32,480	Every 30 years
Concrete access across pump channel (3G)	$103	$6,780	Every 30 years
Water control under Sny Sand Levee (3H)	$1,254	$82,569	Every 30 years
Tree Planting (3I)	$920	$120,519	Every 50 years
Roadside Lake Channel to Sny (3J)	$212	$13,943	Every 30 years
WCS in channel from Sny to Roadside Lake (3K)	$1,209	$79,583	Every 30 years
Zone 4			
Dredging Sny Creek to Dog Island (4B2)	$4,208	$277,043	Every 30 years
River Scour Embankment (4C2)	$3,503	$230,625	Every 30 years
Spillway Structure (4D)	$8,141	535,996	Every 30 years
Spillway Structure (4E)	$664	$43,689	Every 30 years
Pump Station (4G)	$3,935	$259,076	Every 30 years
Widening Pump channel (4H)	$137	$8,987	Every 30 years
Concrete access (4I)	$669	$44,052	Every 30 years
WCS in main channel under access road (4J)	$941	$61,977	Every 30 years

Zone 5			
Sny Creek Excavation (5B)	$11,630	$765,692	Every 30 years
Total Average Annual OMRR&R	**$62,098**		

Table 8.3 presents estimated total monitoring costs for pre-construction and 10 years post-construction. Quantities and costs may vary during final design. All costs are calculated using present worth (October 2014) and do not include future inflation escalation.

Table 8.4 shows the interest accumulated during construction of the project over 4 fiscal years using the FY14 discount rate of 3.5%.

Table 8.3. Estimated total monitoring costs for 10 years post construction

Item	**Cost**
Pre-construction Monitoring	$2,000
Construction	$0
Post-construction Monitoring[1]	$18,500
Subtotal	$20,500
Contingencies (25%)	$5,125
TOTAL	$26,000
Average Annual Cost	$700

[1]Includes cost of evaluation report

Table 8.4 Estimated interest during construction of the Recommended Plan

Construction Period	**Cost**	**Interest Factor**	**Interest**
1	$2,252,000	0.128	$288,500
2	$2,252,000	0.090	$202,600
3	$2,252,000	0.053	$119,600
4	$2,252,000	0.018	$39,400
		Total Interest During	**$650,200**

		Construction	

[1] Based on cost of $9,006,000 spent equally over a 4 year period of construction

[2] IDC calculation uses 2014 Federal discount rate of 3.5%

9*. ENVIRONMENTAL EFFECTS

The Recommended Plan would result in positive long-term benefits to non-forested wetland, forested wetland, and aquatic habitats in and around RRL (Table 9.1). The project would result in some conversions of cover types, but the resulting changes would provide habitat to a greater diversity of species. No federally protected species would be negatively affected. Due to construction, the project would result in short-term decreases in water quality, noise, air quality, and aesthetics and disturb area wildlife and public use. Long-term benefits to area habitats would far outweigh the short-term impacts. No significant negative social or economic impacts would result. No impacts to historic properties are anticipated.

Besides the No Action Alternative and Alternative 8 (the Recommended Plan), the effects of Alternatives 9 and 10 are examined. This is because they contain features that are not present in Alternative 8. Unless otherwise stated only these additional features' potential effects are described and other effects are assumed to be the same as Alternative 8. Alternative 9 includes excavation of Sny Creek from Bridge to Old Sny Levee. Alternative 10 includes the same features proposed in the other alternatives with the addition of Sny Excavation to Bridge. The effects of Alternatives 1-7 will not be discussed because Alternative 8 contains all of the features that would be in these alternatives. Unless specifically noted, it is assumed the effects would be the same. Impacts for each zone are evaluated collectively wherever they are expected to be the same.

Table 9. 1. Summary and Comparison of Alternative Environmental Impacts

	No Action	**Alternative 8 (Recommended**	**Alternative 9**	**Alternative 10**

			Plan)		
Historic & Cultural Resources		No Effect	No Effect	No Effect	No Effect
Natural Resources	**Floodplain Habitat**	Negative	Positive	Positive	Positive
	Geology & Soils	No Effect	Minor	Minor	Minor
	Wildlife	Negative	Positive	Positive	Positive
	Aquatic Resources	Negative	Positive	Positive	Positive
	Water Quality	Negative	Positive	Positive	Positive
	Fisheries	Negative	Positive	Positive	Positive
	Endangered Species	Negative	Positive	Positive	Positive
	HTRW	No Effect	No Effect	No Effect	No Effect
Socioeconomics		Negative	Positive	Positive	Positive

A. Natural Resources.

1. Floodplain Forest.

No Action: Overall, the quantity and quality of existing floodplain forest would continue to age. Approximately 540 acres of former cropland would remain, some to be planted to row crops with the remaining 410 acres planned for reversion to bottomland forest and the establishment of wetland vegetation. However, that acreage is currently covered with herbaceous vegetation that has prevented any re-establishment of bottomland forest even though the area has not been farmed since 2003.

Alternatives 8, 9, and 10: Zones 1, 2, 3, and 4: Positive impacts to floodplain forest would result from tree plantings and increased water control. Approximately 99 acres of bottomland hardwood forest would be planted in the following proportions: 62.9 acres in Zone 1 and 36.5 acres in Zone 3. Enhanced water management in wetland areas would promote greater plant diversity. As planted trees become established and natural regeneration continues, along with the aging of the forest, the project area will become one of the largest areas of contiguous forest in the immediate vicinity. Construction related impacts will be minimal since most of the features are situated in non-forested areas. The exception is the pump channel, located in Zone 2, proposed for widening that will clear a 13 foot-wide strip of bottomland forest, primarily silver maple and cottonwood, for approximately 4000 feet.

Zone 5: No impacts to floodplain forest would be expected.

2. Aquatic Habitat.

No Action: Currently, wetland habitat in the project area relies on river flooding and localized rain events to maintain water levels, except for Waverly Lake which is managed for emergent and moist soil plant production, though water management is frequently impeded by insufficient pump capacity. In general, the duration and severity of Mississippi River floods has increased with floodplain development, channel modifications on tributaries and changes in agriculture; and navigation pool formation has increased sedimentation within the pools and side channels. Backwater sloughs, lakes and ponds in the project area would continue to degrade as a result of siltation from Mississippi River floods. These sediments are generally fine silt and settle out of the flood waters impacting the deeper areas to a larger degree than the shallow areas. Use of the

wetlands and backwater lakes in the project area is currently limited for fish and other aquatic species due to the lack of access. High water events allow fish to use some sloughs and bottomland lakes that are in the project area, but no improvement in fish use is anticipated with this alternative.

Alternative 8: Zone 1: Aquatic resources would be improved by installation of a well to supplement water during dry periods and for migratory wildlife management in the fall. Construction of a small berm for a water control structure would impact less than a half of an acre of wetlands in an existing drainage channel. The water control structure in the Sny Levee and Drainage District channel will prevent most dewatering of the wetland areas in the zone, allowing Goose Pasture Lake to be managed as a permanent wetland and promoting the growth of emergent and submerged aquatic vegetation, thus benefitting a variety of aquatic species.

Zone 2: Work in Zone 2 would expand an existing 1,400' x 14' drainage channel to allow for the increased pumping capacity. The size of this channel would increase by a total of about 0.5 acres. The material excavated will be spread across the current agriculture field. Improved water control and movement will have a positive impact on the portion of the slough in this zone, resulting in higher water levels for longer periods in the fall and winter.

Zone 3: The pump channel being widened in Zone 2 would continue in Zone 3 and increase the size of the channel by an additional 0.23 acres. This material will be spread in current agricultural areas. Aquatic resources in Zone 3 would be improved by increased water movement and availability as a result of the replacement of the pump station, and improvements to the water delivery system that will provide additional water in the fall and could be used to supplement water during dry periods.

Zone 4: Sny Creek would be excavated from Roadside Lake to Zone 5. Material would be side-casted along an existing bench next to the Old Sny Levee remnant alignment. This would cover approximately 32.9 acres of previously disturbed habitat. Excavating of the Sny Creek channel will allow fish access to Roadside Lake in Zone 3, while providing fish habitat in the creek proper. Improved water movement and availability, coupled with water control structures, will allow management of the wetlands in the zone on an annual basis. This capability is not currently available. Migratory wildlife, especially migratory birds, will benefit from the increase in diversity and presence of emergent and moist soil plants associated with the wetlands, and over time better access to bottomland forest mast production. The buildup of the existing Sny Levee remnant would provide Zone 4 residual protection from flooding of the Sny and any possible sediment from the hillsides. This alternative would also impact 0.23 acres of wetland by filling in two low spots in the natural levee using rock and some of the material excavated from Sny Creek. This would protect Zone 4 from scouring over bank flows of the Mississippi River, but still allow back flooding. Approximately 0.83 acres of wetlands would be impacted by the expansion of the existing spillway at the south end of Zone 4 that would be necessary for new water control capabilities. A total 34 acres of wetland would potentially be impacted in Zone 4.

Zone 5: Approximately 9.5 acres of Sny Creek would be exposed to excavating the creek from Zone 4 to the Mississippi River. This material would be disposed of in the thalweg of the Mississippi River.

Overall, short-term negative impacts to wetlands would result from construction activities in all zones. However, the long-term impacts of the project would be positive. The areas where excavated material is to be placed along Sny Creek are previously disturbed areas that have been locations for material placement during earlier dredging and levee construction activities. No high-quality wetlands would be impacted. The proposed project features would provide year-round water source and water level control for the project area. Wetlands could be filled or drained for the benefit of migratory wildlife and other wetland species. Summer drawdowns would promote wetland plant germination and allow for sediment consolidation. Ultimately, predictable water control would facilitate the development of quality wetland habitat. The restoration of 355.2 acres of forested wetland and the ability to better manage existing wetlands would outweigh any wetland impacts from project construction.

Alternative 9: Zones 1-5: Impacts would be similar as Alternative 8, with the additional 0.50 acres of Sny Creek would be exposed to excavating the creek from Zone 4 to the Mississippi.

Alternative 10: Zones 1-5: Impacts would be similar as Alternative 9, with the additional 0.70 acres of Sny Creek would be exposed to excavating the creek from Zone 4 to the Mississippi.

3. Geology and Soils.

Geology
No Action: No impacts to the geology of the project site would occur.
Alternatives 8, 9, and 10: No impacts to the geology of the project site would occur.

Soils
No Action: No impacts to soils would occur.
Alternatives 8, 9, and 10: Zones 1-5: Minor impacts to soils would be expected due to construction activities and constructed project features. Construction of water control levee structures and excavation of channels would impact existing topography and drainage. Improved drainage would be expected but would have minimal effects on soil characteristics. Where possible existing terrain features have been utilized to the extent possible to assist with the development of project features.

Prime Farmland
No Action: No impacts to acres that qualify as prime farmland would be expected.
Alternatives 8, 9, and 10: Zones 1-5: Areas previously or currently being farmed are targeted for conversion to permanent land cover, such as bottomland forest or non-forested wetland. No actions are proposed that would affect their status as prime farmland because the project will not alter the chemical of physical properties that make them prime farmland.

4. Wildlife.

No Action: Wildlife would be negatively impacted through the continued degradation of habitat and natural resources in the project area, including wetlands, bottomland forests, and aquatic resources. There has already been a decline in migratory wildlife use and harvest in the project area since the 1993 flood and this trend is expected to continue if no habitat improvements are initiated.

Alternatives 8, 9 and 10: Zones 1-5: Impacts for each zone would be similar and will be discussed collectively. This alternative would restore the historic native plant community, increase habitat diversity, and improve habitat quality for a variety of resident and migratory wildlife. Mast-consuming species would benefit from tree plantings that will lead to improved forest diversity and an increase in seasonal mast production. Water level management would also improve food resources for migrating wildlife in spring and summer, and increase the presence of moist soil plants, an important food source for managing migratory birds in and around the project area. The long-term impacts of habitat enhancement would be an increase in wildlife populations and diversity. Neotropical migrant warblers especially should benefit from the large, unbroken tract of bottomland forest that will be created by the conversion of cropland to forest.

5. Fisheries.

No Action: Habitat would continue to degrade due to sediment deposits, lack of perennial water sources, and disconnected water features within the project area. More frequent summer and winter fish kills from low levels of dissolved oxygen would likely occur due to shallow depths. Fish access to aquatic areas would continue to be restricted except at high water levels.

Alternatives 8, 9, 10: Zones 1-5: The proposed features would have a positive impact on fish populations. Increased water level management may be utilized as species population controls. Optimizing water levels would restore habitat for fish species, spring flooding would provide habitat for spawning fish, and inundated emergent herbaceous and woody vegetation would provide beneficial habitat for many life stages of fish species as would submerged aquatic vegetation. Fish use of Zones 3, 4 and 5 would be greatly improved once the access (Sny Creek) to Roadside Lake is excavated. In addition, the use of the spoil to improve the Sny Levee extension would continue to insure that overbank scouring flows would impact the area infrequently, and most flood water from the river would continue to back into the higher quality lakes and wetlands. While alternatives 9 and 10 would excavate a longer segment of Sny Creek, the impacts to fisheries would be positive but not significantly different from the benefits of alternative 8.

6. Endangered Species.

In accordance with the Endangered Species Act (ESA) a list of Federally Threatened and Endangered animals and plants was obtained through the DFWCA. This satisfies the "request for species list requirements" for ESA Section 7 consultation (USFWS 2010). This section along with Section 2.C.6 will also serve as the effects determination portion of the Biological Assessment required by the Endangered Species Act.

The Indiana bat, decurrent false aster, eastern prairie fringed orchid, and spectaclecase are listed as federally threatened or endangered species for Calhoun County, Illinois. The Northern Long-eared Bat is proposed for listing in Calhoun County. Indiana Bats and the Northern Long-eared Bat have been documented to occur within the project area in Zone 5, Dog Island. The other listed species have not been documented to occur within the project area and will be discussed together.

Indiana Bats

No Action: Many habitats suitable for Indiana Bat exist within the project area and would continue to degrade if no action is taken. Thus Indiana bat habitat would be negatively impacted by the continued degradation of the existing natural resources in the project area.

Alternatives 8, 9, and 10: Zones 1-5. Mist net surveys on Dog Island (Zone 5) found several Indiana Bats using the area. The project may affect, but is not likely to adversely affect Indiana Bat due to construction activities associated with excavating Sny Creek at Dog Island. In order to avoid adverse effects to summer roosting Indiana bats, the USFWS guidance will be followed which includes: no tree clearing from April 1 to September 30. No tree clearing is proposed in Zone 5 so construction activities associated with excavation should only disturb any bats in the area temporarily. Existing bottomland forest habitat would benefit from the tree plantings providing additional summer roosting and foraging habitat.

Northern Long-eared Bat

No Action: Many habitats suitable for Northern Long-eared Bat exist within the project area and would continue to degrade if no action is taken. Thus Northern Long-Eared Bat habitat would be negatively impacted by the continued degradation of the existing natural resources in the project area.

Alternatives 8, 9, and 10: Zones 1-5. Acoustic surveys on Dog Island (Zone 5) detected several Northern Long-eared Bats using the area. The project may affect, but is not likely to adversely affect the Northern Long-eared Bat due to construction activities associated with excavating Sny Creek at Dog Island. In order to avoid adverse effects to summer roosting Northern Long-eared Bats, the USFWS guidance will be followed which includes: no tree clearing that could impact maternity colonies during the summer roosting season. No tree clearing is proposed in Zone 5 so construction activities associated with excavation should only disturb any bats in the area temporarily. Existing bottomland forest habitat would benefit from the tree plantings providing additional summer roosting and foraging habitat.

Other Listed Species

No Action: No impacts would be expected for these species.

Alternatives 8, 9, and 10: Zones 1-5: No direct impacts would be expected for these species since based on observations by the project partner; they are not known to occur within the project area. These species have been known to occur within the region and may potentially benefit from restoring the historic floodplain community, increasing habitat diversity, and improving habitat quality. Therefore, project alternatives are not likely to adversely affect these species.

7. Water Quality.

No Action: Water quality would continue to be impacted by a lack of water management capability and connection with the Mississippi River. Sny Creek would continue to remain shallow and filled with sediment. Roadside Lake would continue to be affected by suspended sediment and low dissolved oxygen levels.

Alternative 8:

Adjacent Water bodies. No major impacts to water quality would be expected for the Mississippi River though incoming tributaries to Sny Creek. Increased turbidity would occur in localized areas due to construction activities but impacts would be minor and temporary.

Sny Creek. Water quality in the creek might improve slightly after completion of the excavation proposed for Zones 4 and 5. Deeper water will be cooler and hold more oxygen than at present, allowing for increased fish use in summer.

Waverly and Roadside Lakes. Both lakes will be managed more intensively due to the availability of additional water and the opportunity to manipulate water levels seasonally or hold them steady. Management activities will be undertaken to promote the growth of emergent and submergent aquatic vegetation which can be beneficial in providing cover and food for aquatic organisms, while providing shade and oxygen. Water quality might improve slightly because of these activities.

Other Aquatic Resources. Zones 1-5: Impacts for each zone would be similar and will be discussed collectively. Water quality would improve over time as a result of improved water management, reduced sedimentation, sediment consolidation, consistent water levels, improved wetlands, improved forests, converted cropland, and excavation in some areas. Indirect benefits would include decreased turbidity, decreased nutrients, decreased suspended solids, and increased dissolved oxygen levels. Increased turbidity would occur in localized areas due to construction activities but impacts would be minor and temporary.

Alternative 9: This alternative would have the same effects as alternative 8 with the addition of improved habitat in the additional excavated area of Sny Creek from the Bridge to the Old Levee.

Alternative 10: This alternative would have the same impacts as alternative 9, with the addition of improved habitat in the additional excavated area of Sny Creek to the Bridge.

8. Air Quality.

No Action: No impacts to air quality would be expected.

Alternatives 8, 9, and 10: Zones 1-5: Fumes and dust generated by heavy equipment during the construction process would have a temporary negative effect on air quality. The pumps to be used to manage water levels will be diesel; consequently, air quality will be affected for a short time by diesel fumes during pumping activities. The project is not expected to have any long-term adverse affect on the air quality of Calhoun County.

9. Invasive Species

No Action: Invasive species would continue to be present within the project area and likely to expand. Reed canary grass will become more prevalent preventing natural regeneration of floodplain forest. Invasive fish species would continue to use the project area. With continued loss of depth in Sny Creek and other water bodies, invasive rooted aquatic plants may become established since light is able to penetrate to the bottom allowing for establishment.

Alternatives 8,9, and 10: The considered action alternatives would buffer against reed canary grass population growth through managing water levels and promoting tree growth. With increased depth of Sny Creek, invasive rooted aquatic plants will not likely become established. Invasive fish will likely use the aquatic components of the project as nursery areas. The additional habitat is unlikely to have a major effect on the abundance of these species because it comprises only a small component of the overall habitat in Pool 25. The considered action alternatives are consistent with Asian Carp Working Group's Management and Control Plan in the United States (Conover et al. 2007), which recommends that natural resource managers decide if the native biological communities are more sustainable with or without specific projects to enhance aquatic environments.

B. Hazardous, Toxic and Radioactive Waste. The Phase I Environmental Site Assessment revealed no obvious indications of potential contamination sources or migration pathways from surrounding properties and no recognizable environmental conditions (REC) in connection with the project area.

No Action: No HTRW impacts would be expected.
Alternatives 8, 9, and 10: Zones 1-5: No major impacts would be expected. A short-term risk for a fuel spill during construction activities would exist. The contractor would be required to have a spill cleanup plan and utilize best management practices during construction.

C. Socioeconomic Resources and Human Use.

1. Socioeconomic Resources and Environmental Justice (EO 12898).

No Action: No impacts to the growth of the community, region, businesses or industries; community cohesion; residences; property values; tax revenues; life, health and safety; or privately owned farms would be expected. Human use of the project area would decline along with the demise of the sport fishery and an expected decline in migratory wildlife use and harvest. No impacts to environmental justice would be expected.

Alternatives 8, 9, and 10: Zones 1-5: Impacts for each zone would be the same and will be discussed collectively. Minor positive impacts to the growth of the community, region, businesses or industries; community cohesion; residences; property values; tax revenues; life, health and safety; or privately owned farms would be expected. No public opposition has been expressed, nor is any expected. The long-term effects of habitat enhancement would increase wildlife populations and diversity, and thus enhance the opportunities for hunting, fishing and sightseeing. There could be an increase in short-term employment opportunities resulting from project construction. No differential impacts to minority or low income populations are expected with any of the action alternatives.

Employment opportunities were evaluated using the U.S Army Corps of Engineers (USACE) Institute for Water Resources and the Louis Berger Group regional economic impact modeling tool called RECONS (Regional Economic System). This modeling tool automates calculations and generates estimates of jobs and other economic measures such as income and sales associated with USACE's ARRA spending and annual Civil Works program spending. This model will be used as a means to document the performance of direct investment spending of the USACE as directed by the American Recovery and Reinvestment Act (ARRA).

The analysis evaluated economic impacts at three levels of geography: region, state, and nation. For this project, the region and state impact areas are as follows: Rural Area of the State of Illinois. USACE would plan on expending an average of $4,000,000 on this project annually for 4 years. Of this total project expenditure, $ 1,434,551 would be captured within the regional impact area. The remainder of the expenditure would be leaked out to the state or the nation. Construction funds expended on various services and products would be expected to generate additional economic activity measured in both output and jobs (Table 9.2).

Table 9. 2. Summary of economic impact of construction funding on the region, state and nation during project construction.

	Local Capture	Output	Jobs	Labor Income	GRP
Region	$1,434,551	$1,827,857	20.37	$675,742	$756,759
State	$2,227,159	$4,765,638	43.20	$1,862,485	$2,382,295
Nation	$2,708,201	$8,600,070	74.4	$3,185,923	$4,256,894

2. Aesthetic Resources

No Action: A decline in aesthetics may occur due to degrading habitat and declining wildlife populations.

Alternatives 8, 9, and 10: Zones 1-5: Impacts for each zone would be the same and will be discussed collectively. Aesthetic resources of the area would be improved as a result of tree plantings, higher quality habitat and increased wildlife.

3. Noise Levels

No Action: No change in noise levels would be expected.

Alternatives 8, 9, and 10: Zones 1-5: Impacts for each zone would be the same and will be discussed collectively. Project construction would generate a temporary increase in noise levels. This may lead to temporary displacement of some wildlife species. No long-term impacts would result.

D. Cumulative Impacts. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time." (40 CFR Section 1508.7). Cumulative effects are defined as, "…the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions".

The Council on Environmental Quality (CEQ) issued a manual entitled "Considering Cumulative Effects Under the National Environmental Policy Act". The manual addresses an 11 step procedure for addressing cumulative impact analysis. The 11 step procedure is broken down into three main components – scoping, describing the affected environment and determining the environmental consequences. Scoping entails identifying potential cumulative effects associated with the proposed project, defining the assessment goals, establishing spatial and temporal boundaries and identifying other actions affecting the resources, ecosystems and human communities of concern. The second main component, describing the affected environment, is directly related to the scoping component. To describe the affected environment, the baseline condition, response to change, and the capacity of resources, ecosystems and human communities identified in the scoping component to withstand stress must be characterized. The stresses must then be characterized along with their relation to regulatory thresholds. The third and possibly most important component of the cumulative impact analysis is determining the environmental consequences. Four key steps are recognized in determining the environmental consequences. First, the important effects of activities on the resources, ecosystems and human communities must be identified. Then the magnitude and significance of these cumulative effects must be determined. If significant cumulative effects occur, then project alternatives must be modified or new alternatives proposed that avoid, minimize or mitigate the effects or an environmental impact statement must be completed. Lastly, a monitoring plan must be constructed to appropriately monitor the cumulative effects of the selected alternative and establish adaptive management, if necessary. The following paragraphs will address the 11 step procedure in relation to the Rip Rap Landing Habitat Rehabilitation and Enhancement Project.

1. Scoping: Past and present actions.

The Pool 25 pre-European settlement floodplain historically consisted of 47% prairie, 35% timber, and 18% open water. Contemporary land cover consists of 53% agriculture, 19% timber, 18% open water, 6% prairie and other minor habitats (Theiling et al., 2000). Conversion to agriculture is due in part to farming practices changing dramatically in the mid-1970s because of record high prices for soybeans. Much of the landscape that had been in permanent cover was converted to row crops to take advantage of the high prices. The predominance of agriculture is likely to remain so for the foreseeable future. Additionally, 56.9% of the floodplain is leveed, and only 18.3% is in public ownership. The river has also been heavily modified through dredging, dam construction and the construction of river training structures and miles of revetment.

For the Rip Rap Landing HREP, the Master Plan for the Mississippi River, Mississippi River Miles 300 to 0 (USACE 2010) is used to identify all known plans for new channel improvement structures or modifications to existing structures within Pool 25 of the St. Louis District. There are 16,930 feet of revetment and 21 new dikes planned for future construction. There is one planned group of river training structures. One chevron and one dike are planned from RM 266 to 261 along the right descending bank. These structures will narrow the channel in this area. The chevron may also form additional island habitat. A bullnose chevron is proposed at the tip of Howard Island, adjacent to Rip Rap Landing, to protect it from erosion.

There are several environmental restoration projects proposed for Pool 25. Construction to improve habitat conditions on Batchtown State Fish and Wildlife Management Area is currently

underway. Restoration efforts at the B.K Leach State Conservation Area, Two Rivers National Wildlife Refuge and Stag and Keeton Islands and their associated side channels have already been completed. Restoration efforts are currently proposed for Clarence Cannon National Wildlife Refuge and islands in both Pools 25 and 26 under UMRR-EMP. Also efforts examining changing the control of water levels in Navigation Pool 25 from a hinge point control system to a dam point control system are underway. Dam point control would allow for greater flexibility in managing the navigation pool in a way that is more beneficial to fish and wildlife.

2. Scoping: Geographic and spatial boundary.

The Rip Rap Landing HREP is located between Mississippi RM 260.5 and 267 along the left descending bank of the Mississippi River. There are several additional protected areas upstream and downstream: Clarksville Island, Clarence Cannon National Wildlife Refuge, Prairie Slough State Wildlife Management Area, Red's Landing Migratory Wildlife Management Area, Two Rivers National Wildlife Refuge and Batchtown State Fish and Migratory Wildlife Management Area. All of these areas are in the floodplain of navigation pool 25. Pool 25 governs the hydrology of the floodplain and is thus a natural spatial boundary for cumulative effects analysis. To establish the temporal frame for analysis, the most commonly used practice is the length of the period of analysis. The length of the period of analysis has been estimated at approximately 50 years.

3. Determining the affected environment.

The essential components of determining the affected environment is the characterization of stressors and defining the baseline of the environment. Stressors result from natural events or human actions that cause a subsequent population, community or ecosystems level response. The goal of characterizing stressors is to determine whether the resources, ecosystems and human communities of concern are approaching conditions where additional stresses will have an important cumulative effect (CEQ 1997). Generally, those occurring for a short duration at a localized site, such as the Rip Rap Landing HREP, are of less concern than those occurring for an extended time over a wide geographical region. Stressors in the Pool 25 are discussed below.

A detailed description of the Upper Mississippi River Basin, and System, including Pool 25, in terms of formation over geological time; physical, environmental, and cultural characteristics; social and economic conditions; and multi-purpose management is included in several studies incorporated herein by reference:

Johnson, B.L. and K.H. Hagerty eds. 2008. Status and trends of selected resources of the Upper Mississippi River System. U.S. Geological Survey, La Crosse, WI. Technical Report LTRMP 2008-T002.

Theiling, C.H., C. Korschgen, H. DeHaan, T. Fox, J. Rohweder, and L. Robinson. 2000. Habitat Needs Assessment for the Upper Mississippi River System: Technical Report. U.S. Geological Survey, Upper Midwest Environmental Sciences Center, La Crosse, Wisconsin. Contract report prepared for U.S. Army Corps of Engineers, St. Louis District, St. Louis, MO.

UMRCC (Upper Mississippi River Conservation Committee). 2000. A river that works and a working river. UMRCC, Rock Island, IL

WEST Consultants, Inc. 2000. Upper Mississippi River and Illinois Waterway Navigation Feasibility Study – Cumulative Effects Study, Volumes 1-2. Prepared by WEST Consultants, Inc. for the U.S. Army Corps of Engineers, Rock Island District, Rock Island, IL.

Major stressors affecting Pool 25 include: agricultural use of the floodplain, dams, channel training structures, dredging, and levees. These factors combine to increase sedimentation, alter the hydrologic regime, disconnect the river from the floodplain, increase nutrient levels and impact floodplain plant communities (Johnson and Hagerty 2008). Land cover along the river is converting to more water tolerant disturbance adapted species while the floodplain levees and development result in more severe and frequent floods. Development and additional agricultural conversion in Pool 25 is minimal; thus, the severity of stressors may not increase. Water quality has improved since the passing of environmental legislation in the 1970s but remains impaired. The influx of sediment exceeds the transport capacity resulting in sediment filled back waters and channels. These factors combine to create an altered hydrologic regime with more frequent floods and fewer to no low water periods. Very little contiguous off-channel aquatic habitat remains and what does remain is greatly affected by sedimentation (WEST 2000). Much of the landscape that had been in permanent cover was converted to row crops in order for farmers to take advantage of the high prices. One of the results was more rapid runoff within the basin, causing increased turbidity in the rivers and streams with the associated sediment accelerating the deposition in lakes, sloughs, side channels and pooled portions of the Mississippi River. Scientists and natural resource professionals believe that Pool 25 will continue to see a decline in system ecological integrity and populations of native species, resulting from continued habitat loss and fragmentation, altered natural disturbance regimes, and continued invasive species colonization (USACE 2008).

4. Determining the environmental consequences.

The most crucial step in cumulative impact analysis is determining the environmental consequences. Many cumulative effects are discussed in the Navigation Study by WEST (2000) and will not be repeated here. In summary, the assessment acknowledges the tremendous changes brought about by construction of the 9-Foot Channel Project in conjunction with other impacts occurring throughout the watershed resulting in declines in fish, submerged aquatic vegetation, and backwaters/secondary channels. In general, these impacts could be offset by an adaptive environmental restoration approach that focuses on the re-creation or enhancement of key processes (periodic drawdown, connectivity) and habitat features such as island/side channel creation or restoration. Several restoration programs have been initiated to achieve this goal. However, current management and restoration levels have not prevented system-wide habitat degradation in the past and will likely not meet existing habitat needs in the future. Increased efforts to reverse impounded effects on aquatic habitats, vegetation succession and forest health will be required to sustain ecosystem values.

No Action: The density, diversity and quality of bottomland forest and moist soil plants would continue to decline. Backwaters in the project area would continue to degrade due to siltation. This would result in loss of deep-water fish habitat and fish kills due to low dissolved oxygen levels. The gradual deterioration of physical features described above would have a negative impact on the management of the project area and its contribution to natural resources within Pool 25. Public use of the project area would be expected to decline.

Alternative 8 (Recommended Plan), 9 and 10: No negative cumulative impacts would be expected. The proposed features should have positive long-term benefits to fish and wildlife using Rip Rap Landing. Resource managers have noted the continued decline and identified the

need for improved management of bottomland hardwood, floodplain forest, and side channels and backwaters in Pool 25 (Theiling et al. 2000). The Rip Rap Landing project will help address this need in the project area. This project, in concert with other UMRR HREPs on the Upper Mississippi River, should counter some of the long-term adverse impacts to the river ecosystem such as sedimentation, pollution, and general declines in riverine and floodplain habitat and species.

E. Probable Adverse Impacts Which Cannot Be Avoided. Temporary, unavoidable adverse impacts including increased turbidity, noise, and clearing of vegetation would result from construction activities. Turbidity and noise levels would return to normal when construction is completed and vegetation established. Approximately 34 acres of wetlands would be converted to non-wetland. However, benefits to floodplain habitat, wildlife, aquatic resources, water quality, fisheries and endangered species would outweigh these unavoidable adverse impacts.

F. Relevant Laws and Regulations. The following is a discussion of the additional laws that are applicable to this project and not discussed above.

1. Protection and Enhancement of the Cultural Environment, Executive Order 11593. Under this Executive Order, federal agencies "shall provide leadership in preserving, restoring and maintaining the historic and cultural environment of the Nation". A Phase I archaeological and geomorphological investigation of the previously undisturbed acreage to be impacted by the projects construction, as envisioned, will be conducted. In the event any cultural properties are located, these will be evaluated for National Register eligibility, in consultation with the Illinois Historic Preservation Officer and appropriate mitigation completed before construction. If sites will be impacted, the tribes who have indicated they have an interest in the area will be contacted, and consultation will take place. Should an inadvertent discovery of human remains occur, then Section 3 of the Native American Graves Protection and Repatriation Act (P.L. 101-601) will be followed on federal lands and the Illinois Human Skeletal Remains Protection Act (Illinois Comp. Stat. Ann. 20 ILCS 3440/0:01, et seq.) will be followed on state owned lands.

2. Floodplain Management, Executive Order 11988. Under this Executive Order, federal agencies are to "provide leadership and take action to reduce the risk of flood loss, to minimize the impacts of floods on human safety, health, and welfare, and to restore and preserve the natural and beneficial values served by floodplains". There are no practicable alternatives outside of the floodplain. This project seeks to reverse and prevent some of the impacts that have resulted from development of the floodplain. The project structures are designed to resist flood damage, especially overbank, scouring flows from the Mississippi River. Additionally, the proposed riverside structures would insure that backwater flooding would occur before overbank flooding in Zone 4, minimizing additional silt deposition in the existing wetlands. Tree plantings would serve to enhance the "natural and beneficial values served by floodplains."

3. Protection of Wetlands, Executive Order 11990. Under this Executive Order, federal agencies shall take action to minimize the destruction, loss or degradation of wetlands, and to preserve and enhance the natural and beneficial values of wetlands in carrying out the agency's responsibilities. Existing wetland habitat would be temporarily impacted by construction and up to 34 acres would be permanently converted to non-wetland. 1,760 acres of wetlands would be enhanced by the project and 354 acres would be converted from agriculture and low quality habitat to forested wetland.

4. Protection and Enhancement of Environmental Quality, Executive Order 11991. Under this Executive Order, federal agencies shall take action to provide leadership in protecting and enhancing the quality of the Nation's environment to sustain and enrich human life. Federal agencies shall initiate measures needed to direct their policies, plans and programs so as to meet national environmental goals." The proposed project is designed to protect, restore, and enhance the habitats of the Rip Rap Landing Project area. Thus, the project will protect and enhance the Nation's environment.

5. Environmental Justice, Executive Order 12898. Under this Executive Order, federal agencies "shall make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations in the United States." The unit of analysis for environmental justice was the boundary of Calhoun County, IL. The project area is contained within the county and the county is approximately 284 square miles. The county encompasses the project area, surrounding farmland, and the villages of Hamburg and Kampsville, Illinois. The population within the county is approximately 99% white. Approximately 9% of the population of the county is below the poverty level. No differential impacts to minority or low income populations are expected. Short-term increases in employment could be realized during construction. Additionally economic benefits could be realized from increased commercial and recreational fishing and migratory wildlife hunting due to the project's anticipated habitat enhancements.

6. Responsibilities of Federal Agencies to Protect Migratory Birds, Executive Order 13186. Under this Executive Order, federal agencies "taking actions that have, or likely to have, a measureable negative effect on migratory bird populations are directed to develop and implement, within two years, a Memorandum of Understanding (MOU) with the Fish and Wildlife Service (Service) that shall promote the conservation of migratory bird populations". The Rip Rap Landing project will have a positive effect on migratory bird populations, especially migratory wildlife and neotropical migrant songbirds. Other water birds will benefit as well. Any tree removal that would occur would not likely result in take, as defined by this Executive Order, because it would occur to a timeframe outside of the normal nesting period. This restriction is in place in order for the project to comply with the Endangered Species Act and avoid take of the Indiana and Northern Long-eared Bat. In addition, an MOU among the state, USFWS, and the Corps is already in place for the management of federal lands within the project area and all parties have been involved in the planning effort for the site.

7. Bald and Golden Eagle Protection Act of 1940. Bald Eagles (*Haliaeetus leucocephalus*) range over most of North America. They build large nests in the tops of large trees near rivers, lakes, marshes, or other aquatic areas. The staple food of most bald eagle diets is fish, but they will also feed on migratory wildlife, rabbits, snakes, turtles, other small animals, and carrion. In winter, eagles that nest in northern areas migrate south and gather in large numbers near open water areas where fish or other prey are plentiful (USFWS 2006).

On August 9, 2007, the bald eagle was removed from the federal list of threatened and endangered species. It remains protected under the Bald and Golden Eagle Protection Act and the Migratory Bird Treaty Act. The Bald and Golden Eagle Protection Act prohibits unregulated take of bald eagles. The U.S. Fish and Wildlife Service recently finalized a rule defining "take" that includes "disturb." "Disturb means to agitate or bother a bald or golden eagle to a degree that causes, or is likely to cause, based on the best scientific information available, 1) injury to an eagle, 2) a decrease in its productivity, by substantially interfering with normal breeding, feeding, or sheltering behavior, or 3) nest abandonment, by substantially interfering with normal breeding, feeding, or sheltering behavior." (USFWS 2007b). Based on this rule, the FWS developed the National Bald Eagle Management Guidelines in 2007. These guidelines indicate that in undisturbed areas no construction activities should occur within 660' of a visible eagle's nest and 330' of a non-visible nest during breeding season.

There may be active nests within the project area and eagles frequently utilize the site. Because new nests may be built or old nests abandoned, consultation with the USFWS will continue throughout the design and construction phase to ensure no eagles are impacted. During each design phase, site managers will be consulted and if necessary, site visits conducted to determine the location of all nests and determine if they are active as defined in the USFWS guidelines (USFWS 2007b). The plans and specs will include timelines (December - Aug.) to avoid the 660' area around all active nests. The contractor would be notified of these restrictions.

8. Clean Air Act, as amended. The Clean Air Act sets standards requiring the U.S. Environmental Protection Agency (EPA) to designate measurable targets for various air pollutants: National Ambient Air Quality Standards (NAAQS). They have identified standards for seven pollutants: lead, sulfur dioxide, carbon monoxide, nitrogen dioxide, ozone, particulate matter less than 10 microns in diameter, and particulate matter less than 2.5 microns. Calhoun County, Illinois, currently meets all EPA air quality standards. No aspect of the proposed project has been identified that would result in violations of air quality standards.

9. Rivers and Harbors Act. This Act regulates activities in, under, or over navigable water, such as the Mississippi River. The Section 404 permit process would address issues that could be regulated by this Act. Completing the Section 404 permit process would result in full compliance with Section 10 of the Rivers and Harbors Act. Section 10 activities include installation of the pump station pipes, raising low portions of the natural levee, and Sny Creek dredging/excavation. The pump station piping would extend from the pump station, under the access road, to the water conveyance channel for Zones 3 and 4. Stone protection may be placed along the bank of the water conveyance channel to protect the area from erosion. All required permits would be acquired prior to the initiation of project construction.

10. Clean Water Act, as amended. The Clean Water Act permit process will be initiated during or just prior to the release of this document for public review. All required permits will be acquired prior to the initiation of project construction.

Clean Water Act Section 401 - Section 401 requires the state to set water quality standards including designating water use and pollutant levels. The program is administered by the State of Illinois which reviews applications to ensure that the proposed project will not degrade water quality. The Section 401 water quality certification review process will begin when the public notice is released.

Clean Water Act Section 402 - Land disturbances of greater than 5 acres associated with this project require a National Pollutant Discharge Elimination System (NPDES) permit, or Section 402, for storm water discharges. This permit would be acquired prior to construction initiation.

Clean Water Act Section 404 - Section 404 of the Clean Water Act regulates the placement of fill, such as rock, in waters of the United States. This project would undergo the process for a nationwide permit, The public notice for this project will be released during or just before the release of this document for public review. A Section 404(b)(1) document has been prepared for this project and discusses the impacts of the project (Appendix J, *Clean Water Act*).

11. Fish and Wildlife Coordination Act, as amended. Project plans have been coordinated with the USFWS and IDNR. Coordination with these agencies, as well as others, is detailed in Appendix A, *Correspondence.* The final Fish and Wildlife Coordination Act Report is provided in Appendix D.

12. Air and Water Pollution Prevention and Control, Executive Order 11282. Under this Executive Order, federal agencies shall ensure that all necessary actions are taken for the prevention, control, and abatement of environmental pollution with respect to Federal facilities and activities under the control of the agency. Because no HTRW was found and the project area meets air quality standards, project construction activities are not expected to significantly contribute to air and water pollution. The project would result in dust and exhaust from equipment and slight increases in turbidity within the adjacent

waters. Therefore, a minor short-term reduction in air and water quality would occur. The pump station's diesel engines would be a permanent addition to the project area. However, the river pump station would be used to inundate an area that was inundated by another pump. Thus the overall level of pump station operation and thus diesel emissions should remain approximately the same for that location. The portable pump proposed for management of Zone 3, Roadside Lake would be an additional, minor source of diesel emissions for the project area.

13. Invasive Species, Executive Order 13112. This executive order aims "to prevent the introduction of invasive species and provide for their control and to minimize the economic, ecological, and human health impacts that invasive species cause".

The effect of this project on invasive species distribution and abundance were considered throughout the planning process. State and Federal natural resource agencies have weighed the benefits that this project will have on non-native organisms, as well as to the native communities that it is intended to help sustain, and fully support this project.

The proposed plan would buffer against reed canary grass population growth through agricultural production, managing water levels, and promoting tree growth as discussed in detail in Section 3, *Project Objectives*.

Invasive aquatic plants may colonize the bathymetric diversity components of this project as sedimentation reduces depths of dredged areas to the point where light can penetrate to the bottom and rooted aquatic plants can become established. This successional process occurs in most backwaters within the Upper Mississippi River as they fill with sediment over time and is unavoidable.

Invasive fish species such as the silver carp and bighead carp will likely use the aquatic components of the project as nursery areas. This additional habitat is unlikely to have a major effect on the abundance of these species because it comprises only a small component of the overall habitat available in Pool 25. The temporarily selected plan is consistent with Strategy 3.2.3 indentified in the Asian Carp Working Group's Management and Control Plan for Bighead, black, grass, and silver carps in the United States (Conover et al. 2007), which recommends that natural resource managers decide if the native biological communities are more sustainable with or without specific projects to enhance the aquatic environment.

Operation and maintenance of the project would include non-desirable vegetation control. Invasive species management costs are not anticipated to be significant over the life of this project as evidenced by previous backwater restoration projects on the Upper Mississippi River.

Natural resource managers recognize that there will always be some degree of risk that a project will unintentionally enhance the spread of invasive species because of the dynamic nature of dispersal and inter-specific competition that cannot be fully understood until after a nuisance species becomes prolific. Construction best management practices, such as cleaning equipment, would be in place and enforced to prevent the introduction of additional species to the project area and the transfer of species from the project area.

14. Migratory Bird Treaty Act of 1918, as amended. Under this law, federal agencies shall not take, kill or possess migratory birds. Migratory birds are recognized as being of great ecological and economic value. Millions of Americans study, watch, feed, or hunt migratory birds throughout the United States. The proposed project area is commonly used by migratory wildlife. Construction equipment and activities would cause temporary noise affecting and potentially disrupting migratory wildlife and other birds near the proposed project area. Additionally, tree removal for the expansion of the main water channel has the potential to negatively impact nesting birds. Tree removal would not occur from April 1 to September 30 to avoid impacts to Indiana Bat; this would also prevent impacts to nesting birds. The impact from noise would be temporary and cease following construction completion. In the long term,

the proposed project would create and enhance forested and emergent wetland habitat benefiting numerous species of migratory birds, especially with the conversion of cropland to forest.

15. Farmland Protection Policy Act, as amended. The proposed action would not result in the conversion of any prime, unique state or locally important farmland to non-agricultural uses. Under the Council on Environmental Quality Memorandum (11 Aug 80), prime farmland is defined as land that has the best combination of physical and chemical characteristics for producing food, feed, fiber, forage, oilseed, and other agricultural crops with minimum inputs of fuel, fertilizer, pesticides, and labor, and without intolerable soil erosion. Unique farmland is defined as land other than prime farmland that is used for the production of specific high-value food and fiber crops, such as, citrus, tree nuts, olives, cranberries, fruits, and vegetable (7 U.S.C. 4201(c)(1)(A) & (B)).

The Rip Rap Landing project area is classified as prime farmland if drained or prime farmland if drained and protected(NRCS 2006). Approximately 354.2 acres of cropland would be converted to bottomland hardwood forest. Tree planting would not alter the classification of the farmland because it will not alter the physical or chemical characteristics that give it this designation.

16. Noise Control and Quiet Communities Acts. Noise is usually defined as "unwanted sound", and is recognized as an environmental pollutant that can interfere with communication, work, rest, recreation, and sleep. Sound is represented on a logarithmic scale with a unit called the decibel (dB). The threshold of human hearing is approximately 0 dB, and the threshold of discomfort or pain is around 120 dB. A-weighted decibels (dBA) are used to express the relative loudness of sounds as perceived by the human ear because the human ear is less sensitive at low frequencies than high (Generac Power Systems, Inc. 2004). A 24-hour average of 55 dBA was identified by USEPA as a level below which there are effectively no adverse impacts (USEPA 1974).

Noise levels surrounding the project area are varied depending on the time of day and climatic conditions. The current human activities causing elevated noise levels include diesel powered generators, trucks, and farming equipment.

Project construction would generate a temporary increase in noise levels. Construction would occur during daylight hours. Noise levels would not be altered at night. Common construction equipment for this project generate noise levels of approximately 65 - 95 dBA. Attenuation from 90 dBA to 55 dBA occurs at a distance of approximately 2,600 ft. depending on climatic conditions, topography, vegetation, and man-made barriers (Generac Power Systems, Inc. 2004). There are homes located along State Route 96 about one tenth of a mile from parts of the project area. Construction noise levels would not be expected to be greater than noise levels experienced from current traffic along State Route 96. Increased noise may lead to temporary displacement of wildlife species. After construction completion, noise levels would return to current conditions.

17. National Environmental Policy Act, as amended. The completion of the EA and signing of the Finding of No Significant Impact (FONSI) would fulfill NEPA compliance. The environmental assessment is integrated into this feasibility report in Sections 1 - 5, 9, 13, 14 and 16. A draft version of the FONSI is provided at the end of this document. The FONSI would be finalized and signed into effect only after having carefully considered all comments on the environmental effects of this project and it is determined that an EIS is not required.

18. Endangered Species Act. In accordance with the Endangered Species Act (ESA) a list of Federally Threatened and Endangered animals and plants was obtained through the DFWCA. This satisfies the "request for species list requirements" for ESA Section 7 consultation (USFWS 2010). Sections on endangered species in Chapters 2 and 9 serve as the biological assessment required by section 7 of the Act. Chapter 9 also serves as the effects determination portion of the Biological Assessment required by

the Endangered Species Act. The Corps has determined that the project would have no impact. Documentation of this coordination can be found in Appendix A, *Correspondence*.

19. Illinois Rivers, Lakes, and Streams Act. The Illinois Department of Natural Resources has the responsibility of regulating development in the floodplain to ensure preservation of the state's waters and hydrologic integrity. This project will not alter river flows and will restore the natural functions of several water bodies.

20. Compliance with Environmental Quality Statutes. A summary of the projects compliance status with respect to applicable statutes is provided in Table 9.3.

Table 9. 3. Summary of the Project's compliance status with respect to applicable statutes and laws.

Federal Policy	Compliance Status
National Environmental Policy Act, 42 USC 4321-4347	Partial[1]
Water Resources Development Acts of 1986, 1990, 2000 and 2007	Full
Migratory Bird Treaty Act of 1918, 16 USC 703-712	Full
Comprehensive Environmental Response, Compensation, and Liability Act, 42 USC 9601-9675	Full
Resource Conservation and Recovery Act, 42 USC 6901-6987	Full
Farmland Protection Policy Act, 7 USC 4201-4208	Full
Endangered Species Act, 16 USC 1531-1543	Full
National Historic Preservation Act, 16 USC 470 et seq.	Full
Noise Control Act, 42 USC 7591-7642	Full
Clean Air Act, 42 USC 7401-7542	Full
Prevention, Control, and Abatement of Air and Water Pollution at Federal Facilities (EO 11282 as amended by EO's 11288 and 11507)	Full
Protection and Enhancement of the Cultural Environment (EO 11593)	Full
Floodplain Management (EO 11988 as amended by EO 12148)	Full
Protection of Wetlands (EO 11990 as amended by EO 12608)	Full
Protection and Enhancement of Environmental Quality (EO 11991)	Full
Invasive Species, EO 13112	Full
Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations (EO 12898)	Full
Bald and Golden Eagle Protection Act, 42 USC 4151-4157	Full
Clean Water Act, 33 USC 1251-1375	Full
Rivers and Harbors Act, 33 USC 401-413	Full
Fish and Wildlife Coordination Act, 16 USC 661-666c	Full

1 Full compliance after signing of FONSI

G. Short-Term versus Long-Term Productivity.

Some construction activities may temporarily disrupt fish, wildlife, and human use of the immediate vicinity. However, the long-term health and productivity of the fish and wildlife resources of the area are anticipated to increase with the project. Short-term human use impacts would be offset by long-term fish and wildlife habitat gains and their associated benefits to human use.

H. Irreversible Resource Commitments.

Funds and labor for planning and the purchase of materials and the commitment of labor, fuel, and machinery to construct the project are considered irretrievable. Other than the aforementioned, none of the proposed actions is considered irreversible.

I. Relationship of the Proposed Project to Other Planning Efforts.

The project is consistent with the backwater restoration goal of the Habitat Needs Assessment (HNA) for the Upper Mississippi River developed by the U.S. Army Corps of Engineers and state and federal resource agencies (Theiling et al. 2000). The Illinois Department of Natural Resources nominated the Rip Rap Landing Habitat Rehabilitation and Enhancement Project for inclusion in the Upper Mississippi River Environmental Management program. The project was recommended and supported by the River Resource Action Team because it would provide significant aquatic, wetland, and terrestrial benefits. The Natural Resource Conservation Service purchased a Wetland Reserve Program easement on part of the project area to insure that the acres formerly converted to cropland would be returned to, and managed as wetlands. The general habitat area is recognized as one of a group of habitats of major concern under the Upper Mississippi River/Great Lakes Joint Venture of the North American Migratory Wildlife Management Plan.

10. PROJECT PERFORMANCE MONITORING & ADAPTIVE MANAGEMENT

This section outlines the project performance monitoring and adaptive management plan management needed to assess the habitat changes resulting from the implementation of the HREP. The primary project objectives have been summarized elsewhere in this document, and the performance assessment is designed to gauge progress toward meeting these objectives. Section 2039 of WRDA 2007 requires that when conducting a feasibility study for ecosystem restoration, the proposed project includes a plan for monitoring the success of the ecosystem restoration. The implementation guidance for Section 2039, in the form of a CECW-PB Memo dated 31 August 2009, also requires that an adaptive management plan be developed for all ecosystem restoration projects. At the programmatic level, knowledge gained from monitoring one project can be applied to other projects. Opportunities for this type of adaptive management are common within the UMRR.

The primary incentive for implementing an adaptive management program is to increase the likelihood of achieving desired project outcomes given the identified uncertainties, which can include incomplete description and understanding of relevant ecosystem structure functional imprecise relationships among project management actions and corresponding outcomes; engineering challenges in implementing project alternatives; and ambiguous management and decision-making processes.

The restoration features in the Recommended Plan have been operating successfully for over 20 years at several locations within the UMRS. Upstream within Pool 24, a similar project has been in construction. Using an adaptive management approach during project planning enabled better selection of appropriate design and operating scenarios to meet the RRL HREP project objectives. Lessons learned in designing, constructing, and operating similar restoration projects within the UMRS have been incorporated into planning and design of this HREP to ensure that the Recommended Plan represents the most effective design and operation to achieve the project

goal and objectives. As with other HREPs implemented through UMRR, a monitoring and performance assessment plan has been developed, and the results of this plan will be used to measure success of the project and determine whether adjustments in operation may be made to promote its success.

The monitoring and adaptive management plan was developed with input from state and federal resource agencies and is detailed in Appendix M, *Monitoring and Adaptive Management Plan*. Performance indicators were developed to measure the success of project objectives. The indicators were developed to be specific, measureable, attainable, realistic, and timely. The project objectives, performance indicators, monitoring target, time of effect, and responsibilities of monitoring and data collection for the RRL HREP are summarized in Table 10.1. Per Section 2039 guidance, monitoring costs (not to exceed 10 years after project construction) were considered as part of project cost (Table 10.2).

The monitoring information will be compiled, reviewed, and summarized in a Performance Evaluation Report that will be written 5 years after data collection has started. This report will evaluate the performance of the constructed features in meeting the objectives of the Rip Rap Landing HREP.

Table 10.1. Project objectives, indicators, and time before the effects become apparent at RRL HREP

Project-Wide Goal	Site-Specific Objective	Performance Indicator	Monitoring Target	Action Criteria (AM triggers)	Time of Effect	Responsible Party
Increase quantity and quality of aquatic, non-forested, and forested wetland habitats	Improve aquatic ecosystem resources	Roadside Lake connected to Sny Creek	365 days per year	Connectivity <50% of year for 3 consecutive years	Construction Completion	IDNR
	Increase native plant species diversity and reduce number of acres impacted by invasive plant species by improving water level management	Water delivery and drainage	Ability to drain or flood zones 3 and 4 in $\leq$ 10 days	Further identified during plans and specifications	Construction Completion	IDNR
		Species composition & quality of annual and perennial herbaceous vegetation (relative cover and frequency)	Diversity threshold = 30:70 ratio of annuals and perennials Species richness threshold = $\geq$ 8 species per management area Quality threshold = importance value score of $\geq$ 3.5 % invasive species = maintain below 5% relative cover and frequency per management area	Apply adaptive management actions if any of the monitoring targets fall outside the desired thresholds	4 year post construction	IDNR/ USACE
	Reduce impacts of headwater flooding and river-borne sedimentation	Site experiences only back flooding	4 out of 5 years	Further identified during plans and specifications	Construction completion	IDNR
	Increase quantity and quality of bottomland hardwood forest	Survival of planted trees	80% survival of trees	<50% survivability	5 years post construction	IDNR/ USACE

Table 10. 2 RRL conceptual monitoring plan. Construction is set at Year 0.

INDICATOR	-1	0	+1	+2	+3	+4	+5	+6	+7	+8	+9	+10
Connectivity*		Construction	X	X	X	X	X	X	X	X	X	X
Water*	X		X	X	X	X	X	X	X	X	X	X
Vegetation							X	X	X	X	X	X
Headwater*			X	X	X	X	X	X	X	X	X	X
Trees			X				X					
Estimated Cost ($)	2000		2500				3000	2000	2000	2000	2000	5000
SUBTOAL	$20,500											
Contingency (25%)	$5,125											
TOTAL	$26,000											
Average Annual Cost	$700											

*** No additional monitoring costs would be required since these observations are part of normal site management**

11. REAL ESTATE REQUIREMENTS

The Rip Rap Landing Habitat Rehabilitation and Enhancement Project will be constructed on land owned by the Federal Government (Dog Island, 283 acres) and the Illinois Department of Natural Resources (2,055 acres). The Illinois DNR manages all of the property. Dog Island is managed under a Cooperative Agreement originating on 2 Nov 1954 between Department of Interior, USFWS, and the Corps. The USFWS and IDNR then executed a subsequent Cooperative Agreement conveying management responsibility of Dog Island to IDNR (Appendix O, *Draft PPA and Draft MOA*). The detailed Real Estate Plan is provided in Appendix N, *Real Estate*.

12. IMPLEMENTATION RESPONSIBILITIES AND VIEWS

A. Corps of Engineers. The U.S. Army Corps of Engineers, St. Louis District, is responsible for project management and coordination with the USFWS, the State of Illinois, and other affected agencies. The St. Louis District will submit the subject feasibility report; program funds; finalize plans and specifications; complete all NEPA requirements; advertise and award a construction contract; and perform construction contract supervision and administration. Section 906(e) of WRDA 1986 states that first cost funding for enhancement features will be 65 percent Federal and 35 percent local cost on project lands not in Federal ownership. Any mutually agreed upon major rehabilitation of the project that exceeds the identified annual operations, maintenance, repair, rehabilitation, and replacement cost requirements will be the Corps of Engineers' responsibility[3]. Major rehabilitation would be considered as a result of specific storm

[3] Major rehabilitation is defined as reconstructive work needed in excess of estimated O&M as a result of specific storm or flood events. Repair and Replacement are considered part of maintenance. Per 4th Annual Addendum, Upper Mississippi River System, Environmental Management Program dated June 1989, Section III.A.1.c.

or flood events and is not included in the project cost estimate (Table 8-2). The USACE has agreed to support the HREP's monitoring and data collection needs as outlined in Section 10.

B. U.S. Fish and Wildlife Service. The USFWS has provided a Coordination Act Report (CAR) for this project. The proposed project lands at Dog Island (283 acres) are currently managed under a cooperative agreement between the USFWS and USACE (Appendix O). Management of Dog Island has been assumed by IDNR under a successive cooperative agreement with USFWS; however USFWS is still ultimately responsible for overseeing management of Dog Island.

C. Illinois Department of Natural Resources. The non-Federal sponsor shall, prior to implementation, agree to perform all of the local cooperation requirements and non-Federal obligations. Local cooperation requirements are detailed below and summarized in the draft Project Partnership Agreement (PPA) (Appendix O). The PPA will be modified to reflect guidance received from USACE Headquarters. The guidance dated February 20, 2014 states that the non-federal sponsor will not be reimbursed for any excess LERRDs. Through successive cooperative agreement with USFWS, OMRR&R of the project is the responsibility of IDNR as described in Section 6.3 and Table 8.2. This is in accordance with WRDA 1992 Public Law 102-580. The Corps will further specify these functions in the Projects OMRR&R Manual, which will be provided prior to the sponsor's final acceptance of the project.

Federal implementation of the Recommended Plan would be subject to the sponsor agreeing to comply with applicable Federal laws and policies, including but not limited to:

a. Provide 35 percent of total project costs (on features located on state-owned land) as further specified below:

1. Provide, during the first year of construction, any additional funds necessary to pay the full non-Federal share of design costs;
2. Provide all lands, easements, and rights-of-way, including those required for relocations, the borrowing of material, and the disposal of dredged or excavated material; perform or ensure the performance of all relocations; and construct all improvements required on lands, easements, and rights-of-way to enable the disposal of dredged or excavated material all as determined by the Government to be required or to be necessary for the construction, operation, and maintenance of the project;
3. Provide, during construction, any additional funds, work in kind, necessary to make its total contribution equal to 35 percent of total project costs;

b. The non-Federal sponsor shall not use funds from other Federal programs, including any non-Federal contribution required as a matching share therefore, to meet any of the non-Federal obligations for the project unless the Federal agency providing the Federal portion of such funds verifies in writing that expenditure of such funds for such purpose is authorized.

c. The non-Federal sponsor shall prevent obstructions or encroachments on the project (including prescribing and enforcing regulations to prevent such obstructions or encroachments) such as any new developments on project lands, easements, and rights-of-way or the addition of

facilities which might reduce the outputs produced by the project, hinder operation and maintenance of the project, or interfere with the project's proper function.

d. The non-Federal sponsor shall not use the project or lands, easements, and rights-of-way required for the project as a wetlands bank or mitigation credit for any other project.

e. The non-Federal sponsor shall comply with all applicable provisions of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, Public Law 91-646, as amended (42 U.S.C. 4601-4655), and the Uniform Regulations contained in 49 CFR Part 24, in acquiring lands, easements, and rights-of-way required for construction, operation, and maintenance of the project, including those necessary for relocations, the borrowing of materials, or the disposal of dredged or excavated material; and inform all affected persons of applicable benefits, policies, and procedures in connection with said Act.

f. For so long as the project remains authorized, the non-Federal sponsor shall operate, maintain, repair, rehabilitate, and replace the project, or functional portions of the project, including any mitigation features, shall be performed at no cost to the Federal Government, in a manner compatible with the project's authorized purposes and in accordance with applicable Federal and State laws and regulations and any specific directions prescribed by the Federal Government except as laid out in the 4th Annual Addendum of the Upper Mississippi River System - Environmental Management Program (USACE 1989).

g. The non-Federal sponsor shall give the Federal Government a right to enter, at reasonable times and in a reasonable manner, upon property that the non-Federal sponsor owns or controls for access to the project for the purpose of completing, inspecting, operating, maintaining, repairing, rehabilitating, or replacing the project.

h. The non-Federal sponsor shall hold and save the United States free from all damages arising from the construction, operation, maintenance, repair, rehabilitation, and replacement of the project and any betterments, except for damages due to the fault or negligence of the United States or its contractors.

i. The non-Federal sponsor shall maintain and keep books, records, documents, or other evidence pertaining to costs and expenses incurred pursuant to the project, for a minimum of 3 years after completion of the accounting for which such books, records, documents, or other evidence are required, to the extent and in such detail as will properly reflect total project costs, and in accordance with the standards for financial management systems set forth in the Uniform Administrative Requirements for Grants and Cooperative Agreements to State and Local Governments at 32 Code of Federal Regulations (CFR) Section 33.20;

j. The non-Federal sponsor shall comply with all applicable Federal and State laws and regulations including, but not limited to: Section 601 of the Civil Rights Act of 1964, Public Law 88-352 (42 U.S.C. 2000d) and Department of Defense Directive 5500.11 issued pursuant thereto; Army Regulation 600-7, entitled "Nondiscrimination on the Basis of Handicap in Programs and Activities Assisted or Conducted by the Department of the Army"; and all applicable Federal labor standards requirements including, but not limited to, 40 U.S.C. 3141- 3148 and 40 U.S.C. 3701 – 3708 (revising, codifying and enacting without substantial change the provisions of the Davis-Bacon Act (formerly 40 U.S.C. 276a *et seq.*), the Contract Work Hours and Safety

Standards Act (formerly 40 U.S.C. 327 *et seq.*), and the Copeland Anti-Kickback Act (formerly 40 U.S.C. 276c *et seq.*);

k. The non-Federal sponsor shall perform, or ensure performance of, any investigations for hazardous substances that are determined necessary to identify the existence and extent of any hazardous substances regulated under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), Public Law 96-510, as amended (42 U.S.C. 9601-9675), that may exist in, on, or under lands, easements, or rights-of-way that the Federal Government determines to be required for construction, operation, and maintenance of the project. However, for lands that the Federal Government determines to be subject to the navigation servitude, only the Federal Government shall perform such investigations unless the Federal Government provides the non-Federal sponsor with prior specific written direction, in which case the non-Federal sponsor shall perform such investigations in accordance with such written direction.

l. The non-Federal sponsor shall assume, as between the Federal Government and the non-Federal sponsor, complete financial responsibility for all necessary cleanup and response costs of any hazardous substances regulated under CERCLA that are located in, on, or under lands, easements, or rights-of-way that the Federal Government determines to be required for construction, operation, and maintenance of the project.

m. The non-Federal sponsor shall agree, as between the Federal Government and the non-Federal sponsor, that the non-Federal sponsor shall be considered the operator of the project for the purpose of CERCLA liability, and to the maximum extent practicable, operate, maintain, repair, rehabilitate, and replace the project in a manner that will not cause liability to arise under CERCLA.

n. The non-Federal sponsor shall comply with Section 221 of Public Law 91-611, Flood Control Act of 1970, as amended (42 U.S.C. 1962d-5b), and Section 103(j) of the Water Resources Development Act of 1986, Public Law 99-662, as amended (33 U.S.C. 2213(j)), which provides that the Secretary of the Army shall not commence the construction of any water resources project or separable element thereof, until each non-Federal interest has entered into a written agreement to furnish its required cooperation for the project or separable element.

13*. COORDINATION, PUBLIC VIEWS AND COMMENTS

Coordination has been made throughout the planning and design process with the following State and Federal agencies:

Illinois Department of Natural Resources
U.S. Natural Resource Conservation Service
U.S Fish and Wildlife Service.

IDNR has coordinated with the private inholding. The site is managed as a duck hunting club and should benefit from the increased surrounding habitat resulting from an implemented project.

A. Coordination Meetings. Coordination with project sponsors occurred during the meetings listed in Table 13.1.

Table 13. 1. Rip Rap Landing Coordination Meetings

Date	Subject	Attendance
29-Jan-09	Kickoff Meeting, Stage I	Corps, Illinois DNR, NRCS,HDR
24-Feb-09	Value Engineering & HGM Meeting	Corps, USF&WS, Illinois DNR, HDR
14-May-09	Sponsor Progress Meeting	Corps, USF&WS, Illinois DNR, HDR
29-Jul-09	Sponsor Progress Meeting	Corps, USF&WS, Illinois DNR, HDR
1-Oct-09	Kickoff Meeting, Stage I	Corps, USF&WS, Illinois DNR, HDR
25-Mar-10	Sponsor Progress Meeting	Corps, USF&WS, Illinois DNR, HDR
26-Apr-10	Sponsor Progress Meeting	Corps, USF&WS, Illinois DNR, HDR

B. Coordination by Correspondence. See Appendix A.

C. Public Views and Comments

The *Draft Feasibility Report with Integrated Environmental Assessment* was distributed for a 30-day public, state, and agency review on 9 July 2014. During the public review, the District received comments from US EPA, NRCS, and USFWS. These agencies had several comments with the report and the Project. The comments were taken into consideration in the preparation of the Final Feasibility Report. See Appendix A, *Correspondence*, for more details on their comments.

During the public review period the District and IDNR held an open house on 22 July 2014, at the Mozier Junction Restaurant, near the project site. Representatives from the District and IDNR were present to talk one-on-one with attendees about the draft tentatively selected plan and to gather public input. Maps of the Recommended Plan and copies of the report were arranged around the room. In addition, hand-outs of the Executive Summary, a project amp, and a comment sheet were available for each attendee. Twenty-five members of the public attended the evening session. Only 2 comment sheets were returned. Respondents indicated they use the area for recreation, fishing, and hunting. The most common responses from the open house was uncertainty on how project features may impact their property and were encouraged with the project feature of excavating Sny Creek.

During the public review period, the District received the following phone calls and letters from the public (see Appendix A, *Correspondence* for details):

- Public open house comment card returned: Patti Pranger
- Email from NRCS: Dave Hiatt
- Public open house comment card returned: Frank Webster
- Phone messages from 2 unidentified parties requesting hard copies of report
- Phone message from unidentified party inquiring about boat ramp access during construction
- Phone message from Alton Motorboat Club
- Phone message from Robert Wessel
- Letter from USFWS dated 30 July 2014
- Final Coordination Act Report from USFWS dated 01 August 2014

- Letter from US EPA dated 8 August 2014

D. Response to Public Comments

The District responded to comments received and have taken into consideration recommendations provided while preparing the *Final Feasibility Report with Integrated Environmental Assessment*.

1. Response to NRCS email dated 24 July 2014:

Comments: NRCS is concerned about several portions of the proposal as it relates to the Wetlands Reserve Program easement, Zone 4, in the proposal. Dredging of Sny Creek seems to be a temporary fix at best if no upland treatment is proposed. Placement of the Sny Creek dredge spoil cannot be on the WRP easement. O&M of the project post-construction must be frequent and vigilant. The NRCS spent considerable funds installing multiple wetland management structures back in 2004 as a considerable cost. Very little if any O&M was performed on these structures, which ultimately rendered them obsolete.

District Response: In terms of the dredging being a temporary fix, local NRCS office has indicated that much of the hillside sediment has been addressed through current and ongoing NRCS programs. The feasibility report estimates that the Sny Creek would need to be excavated again in year 30 post-construction. In response to the dredge spoil placement, similar UMRR projects have used excavated material to benefit topographic diversity and elevated planting sites. Additional alternative placement of material may be explored during plans and specifications development. In response to O&M, an OMRR&R manual will be prepared and provided to the sponsor. IDNR has experience with operating and maintaing similar features at other UMRR projects. Communications between RRL PDT and NRCS staff has occurred and will continue to occur as the project progresses.

2. Response to USFWS letters:

USFWS recommends continued coordination regarding the potential to improve habitat conditions for the Indiana bat and fisheries resources on Dog Island; and recommends ongoing coordination with NRCS to address any remaining hillside and instream sediment issues. The District will continue coordination with the partners and stakeholders.

3. Response to US EPA letter dated 08 August 2014 (for full comments see Appendix A):

Project Purpose and Need

Recommendation: EPA recommends the EA be revised to include a clearly-articulated project purpose and need(s).

District Response: The Upper Mississippi River Restoration program has addressed over 50 habitat restoration projects/environmental assessments over the last 25 years. A brief project purpose has been added section 1.2. The reader is instructed to further read chapters 1, 2, and 3 for an explanation on the need of the project. Other sections in Chapters 1, 2, and 3 provide a more in-depth look at why habitat restoration and enhancement is needed at Rip Rap Landing.

Project Features

General Recommendation: EPA recommends clarification on project features to assist the reviewer in understanding the project features and potential impacts (See Appendix A for detailed list)

District Response: Concur. Per EPA's list of recommendations, additional project feature descriptions have been added to text, tables, and figures. In addition, the feature in Zone 2 (2B-tree plantings) were determined not the responsibility of the USACE and therefore were not moved forward for habitat and incremental cost analyses. See Section 4.A for discussion. Since no features were proposed for Zone 2, a detailed description of Zone 2 was determined not necessary.

Measurable Outcomes – Fisheries

Recommendation: While EPA acknowledges that increased connectivity is a typical USACE metric, EPA recommends USACE, along with its project partner IDNR, consider biological metrics to measure the success of this objective [Objective 1]. EPA recommends the Final EA discuss the possibility of adding biological metrics for fish species, including pre-construction sampling to provide baseline information of fish species using this habitat and post-construction monitoring as project features. We request any correspondence related to coordination with IDNR pertaining to this request be included as an appendix to the EA.

District Response: At this time the District and project sponsor, IDNR, agree the most suitable metric for connectivity to be days of connectivity. As resources allow, a fish monitoring metric may be considered in the future, but this monitoring effort would be an IDNR responsibility.

Measurable Outcomes – Non-native Invasive Plant Species

Recommendation: While EPA acknowledges that restoring hydrology is a typical USACE metric, EPA recommends USACE consider an additional metric to measure the success of this objective [Objective 2]. … EPA recommends the Final EA discuss the possibility of adding a metric to measure the amount of invasive plant species remaining in the infested area, including pre-construction sampling to provide baseline information for reed canary grass in the infested areas and post-construction monitoring as project features.

District Response: Vegetation monitoring will follow the standardized protocol developed for UMRR HREPs (McCain, *in review*). The *Monitoring and Adaptive Management Plan* Appendix has been revised to include the monitoring targets outlined in the standardized protocol.

Measureable Outcomes – Desirable Moist Soil Plants

Recommendation: EPA recommends additional explanation regarding "some mechanical disturbance" be incorporated into the Final EA. Additionally what type of adaptive management might be considered if the 85% moist soil plan cover is not achieved?

District Response: Vegetation monitoring will follow the standardized protocol developed for UMRR HREPs (McCain, *in review*). The *Monitoring and Adaptive Management Plan* Appendix has been revised to include the monitoring targets and adaptive management outlined in the standardized protocol. Mechanical disturbance refers to, but not limited to mowing, disking, rolling, and/or prescribed fire.

Measureable Outcomes – Bottomland Hardwood Forest

Recommendation: EPA recommends a detailed discussion focused on Zone 2 and the State Natural Area be included in the Final EA.

District Response: The feature in Zone 2 (2B- tree plantings) was determined not the responsibility of the USACE and therefore were not moved forward for habitat and incremental cost analyses. See Section 4.A for discussion. Since no features were proposed for Zone 2, a detailed description of Zone 2 was considered, but was determined not necessary.

Sedimentation

Recommendation: EPA recommends the Final EA clarify several items regarding sedimentation (see Appendix A for detailed list). EPA recommends the Final EA discuss additional actions that Federal and/or state agencies or watershed groups plan to implement in the foreseeable future to reduce hillside sedimentation to levels that will not negatively impact the success of the proposed project.

District Response: We concur that information on sedimentation rates should be included. If the project is approved and moves to Plans and Specifications Phase, additional analyses will be performed on sedimentation rates and an assessment of the effect upon the proposed excavation will be made. Section 4.A provides discussion on Hillside Sediment Reduction. In addition, communications with the NRCS District Conservationist suggests that sedimentation input from the hillside was overestimated early in the planning process. Current hillside sediment input is primarily from within the streams. Programs addressing soil erosion in the surrounding watersheds have already been implemented, and plan to continue into the foreseeable future, by NRCS in a large majority of the upstream area. We believe the current hillside sedimentation levels will not negatively impact the success of the proposed project.

Federally-listed species

Recommendation: EPA recommends the Final EA include the time period when surveys for these three species [decurrent false aster, eastern prairie fringed orchid, and spectaclecase mussel] were conducted at the project area and whether the area needs to be re-surveyed per USFWS' recommendations regarding endangered species.

District Response: No formal surveys were conducted for these three species. Based on observations by the project sponsor, no documentation of these species has occurred in the project area. USFWS has not recommended the project area be surveyed regarding these endangered species.

Indiana Bat

Recommendation: EPA recommends the Final EA clarify the tree-clearing restriction period per USFWS guidelines for the Indiana Bat.

District Response: The tree-clearing restriction period (April 1 to Sept 30) has been updated to reflect the current guidelines.

State-listed species

Recommendation: EPA recommends the Final EA discuss whether thalweg placement was selected for sediment excavated from sloughs on Dog Island. If so, EPA recommends USACE coordinate with IDNR and commit to conducting surveys for these two mussel species [black sandshell and butterfly] if requested by IDNR. Please provide correspondence regarding this issue as an appendix to the EA.

District Response: Thalweg placement will be used until it no longer becomes cost effective due to distance. The majority of the Sny Creek excavation is anticipated to be on-site disposal. To date, IDNR has not requested a mussel survey for these two state-listed species. In addition, based on the Illinois Natural Heritage Database, the last observance of butterfly mussel in Calhoun County, Illinois occurred 03 October 2003 and for black sandshell on 19 September 2006. Appendix A, *Correspondence*, will be updated as appropriate.

Migratory Species:

Recommendation: EPA recommends the Final EA discuss the possibility of work restrictions during the spring migratory period due to the importance of this flyway. We request any correspondence related to coordination with USFWS pertaining to this request be included as an appendix to the EA.

District Response: Consideration (in coordination with the USFWS) will be given during plans and specifications preparation sequencing construction activities in a manner that minimizes impact. Specific restrictions relative to any sequencing will be included as part of the contract specifications. The contracting officer will ensure appropriate compliance.

Invasive Fish Species

Recommendation: Consideration of invasive species, both terrestrial and aquatic, should occur during all phases of the environmental process to fulfill requirements of NEPA. The EA should be amended to include a robust discussion on the potential for invasive terrestrial and aquatic animal or plant species can negatively impact native habitats within the study area.

District Response: The District, IDNR, and most Project partners recognize the introduction of invasive species as a project concern. The effect of this project on invasive species distribution and abundance were considered throughout the planning process. The District has enhanced discussion concerning invasive species impacts in several locations in the report (see Sections 2.9 and 9.9, *Invasive Species*). The proposed project is in compliance with EO 13112 (See full discussion in Section 9.F.13).

Other – Project Endorsement

Recommendation: While it can be presumed from the Draft EA that the USFWS supports the proposed project as a project stakeholder, EPA recommends that, in the Final EA, correspondence indicating whether USFWS supports this project as proposed in the Draft EA be included.

District Response: USFWS provided a letter dated 30 July 2014 stating no objection to a Finding of No Significant Impact for this activity, and supports the completion of planning for this proposed project, and its subsequent construction. This letter is provided in Appendix A, *Correspondence.*

Other – Borrow Material

Recommendation: EPA recommends the Final EA include a discussion focused on borrow areas. In particular, where are potential areas located (including maps of potential areas would be useful for reviewers), any necessary testing to ensure borrow materials are suitable for the proposed uses, how borrow materials will be used to bring these materials to the project area, and what effects transport might have on traffic patterns?

District Response: Borrow areas have not been identified during feasibility since it is anticipated the excavated material from Sny Creek will be suitable fill to be used elsewhere within the project area. No borrow outside of the project area is anticipated. For additional information on proposed dredged and fill material refer to the Section 404(b)1 evaluation located in Appendix J, *Clean Water Act.*

Other – Construction Impacts

Recommendation: EPA recommends the Final EA recommend specific measures and best management practices (BMPs) that will be undertaken to minimize construction impacts to air quality, water resources, soil, and other regulated resources. The Draft EA should discuss proposed construction measures, including a discussion of staging area and their location and access to worksites.

District Response: Actions taken to minimize water resources are detailed in the 404(b)1 evaluation. Section 6.D, *Construction Considerations*, discusses considerations taken during construction to minimize impacts. Specific best management practices (which may include but not limited to silt fencing, mulching, and/or temporary seeding) will be included as part of the contract specifications to minimize impacts to air quality, water resources, soil, and other regulated resources.

Adaptive Management

Recommendation: EPA recommends the Final EA include a discussion that explains the rationale for selecting desirable plants comprising only >50% and 80% survivability of trees. We recommend a list of native herbaceous and woody species appropriate for this ecoregion, maintenance and monitoring information, including the duration that monitoring will occur to determine project success; and more detailed and more stringent success criteria. Revised success criteria should be added to the Final EA.

District Response: Vegetation monitoring will follow the standardized protocol developed for UMRR HREPs (McCain, *in review*) which has received endorsement from the UMRR Analysis Team. The *Monitoring and Adaptive Management Plan* Appendix has been revised to include the monitoring targets, duration, and success criteria.

14*. CONCLUSIONS

The natural habitat value on the Rip Rap Landing Fish and Migratory Wildlife Management Area has been diminished by sedimentation of wetlands and water bodies, loss of bottomland forest, and clearing for row crop agricultural production. Reestablishing terrestrial food sources and reliable wetland habitats and reconnecting backwater lakes and Sny Creek to the Mississippi River would benefit migratory birds, local wildlife, and fish. The recommended project features for the Rip Rap Landing HREP are designed to meet the project's goal to increase quality and quantity of aquatic, non-forested wetland, and forested wetland habitats. These goals would be met by reducing forest fragmentation and enhancing forest diversity; enhancing, improving and expanding existing wetlands; and by restoring fish access from the river to Sny Creek and Roadside Lake.

The future with-project scenario shows increased habitat value over the 50-year period of analysis for the target species. This increase represents measurable outputs of improved habitat

quality and preferred habitat quantity. The project is consistent with and fully supports the overall goals and objectives of the Upper Mississippi River Restoration-Environmental Management Program, the North American Migratory wildlife Management Plan, and the Partners in Flight Program.

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UPPER MISSISSIPPI RIVER RESTORATION
FEASIBILITY REPORT WITH INTEGRATED ENVIRONMENTAL ASSESSMENT

RIP RAP LANDING HABITAT REHABILITATION AND ENHANCEMENT PROJECT
POOL 25

15. RECOMMENDATIONS

I have weighed the outputs to be obtained from the full implementation of this habitat rehabilitation and enhancement project against its estimated cost and have considered the various alternatives proposed, impacts identified, and overall scope. In my judgment, this project, as proposed, justifies expenditure of Federal funds. I recommend that the Mississippi Valley Division Engineer approve the proposed project to include: converting 99 acres of cropland and former cropland to bottomland forest; installing water supply and control facilities for enhancement of 713 acres of wetland habitat; excavating and reconnecting Sny Creek to the Mississippi River to provide fish access to the creek and backwater lakes; and constructing embankment in low spots along the natural levee to reduce scouring of wetlands. The wetland enhancement facilities would include three water supply pumps, eight culverts, three water control structures, excavation, and embankment.

The recommended project features are located on both federally-owned lands (Zone 5, Dog Island) and non-federally-owned lands (Zones 1, 3, and 4). As a result, first cost funding for features located on federally-owned land would be 100% federal while features located on non-federal lands would be cost-shared with 65% federal and 35% non-federal. The total first cost for features located on federally-owned lands (i.e., Sny Creek excavation along Dog Island) would be $1,133,000. The remaining features are located on non-federal lands (Zones 1, 3, and 4), and would be subject to the cost-share provisions in Section 1103 of the Water Resources Development Act of 1986 (P.L. 99-662) as amended by Section 509 of the Water Resources Development Act of 1999 (P.L. 106-54). The estimated federal cost share (65%) for features located on non-federal lands would be $5,117,000. The estimated non-federal cost share (35%) for features located on non-federal lands would be $2,756,000. The non-federal costs include values of lands, easements, rights-of-way, relocations, and dredged or excavated material disposal areas (LERRD) estimated at $2,886,000. The total federal cost for the project would be $6,250,000, which includes features on federal and non-federal lands. Total project monitoring cost for the first 10 years is estimated at $26,000. IDNR would be responsible for project operations, maintenance, repair, rehabilitation, and replacement (OMRR&R) at an estimated average annual cost of $62,098.

The recommendations contained herein reflect the information available at this time and current Departmental policies governing formulation of individual projects. They do not reflect program and budgeting priorities inherent in the formulation of a national Civil Works construction program nor the perspective of higher review levels within the Executive Branch. Consequently, the recommendations may be modified before they are transmitted to the Congress as proposals for authorization and implementation funding. However, prior to transmittal to the Congress, the sponsor, the States, interested Federal agencies, and other parties will be advised of any modifications and will be afforded an opportunity to comment further.

_____ _____

(Date)

ANTHONY P. MITCHELL
COL, EN
Commanding

16*. FINDING OF NO SIGNIFICANT IMPACTS (FONSI)

Significant opportunities exist to restore, rehabilitate, enhance and increase wetland and aquatic habitat for migratory birds, aquatic species, amphibians, and terrestrial species through re-forestation of bottomland forest, enhanced water conveyance and supply, improved aquatic habitat and improved depth diversity at the Rip Rap Landing Fish and Migratory Wildlife Management Area.

The Rip Rap Landing Habitat Rehabilitation and Enhancement Project is authorized by the 1985 Supplemental Appropriations Act (Public Law 99-88) and 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.

An array of enhancement features and alternatives were considered for habitat enhancement, including: No Action, wetland enhancement, reforestation, river reconnection, riverside levees, excavation of channels and sloughs, and river scour embankment.

Alternative 8, the preferred alternative includes: Reforestation, wetland enhancement through improved water level management, and river scour embankment, and river reconnection. This alternative includes 99 acres of cropland and former cropland converted to bottomland forest, 713 acres of wetland enhancement, excavation of Sny Creek to Roadside Lake for fish access to the Mississippi River, and constructing embankment in low spots along the natural levee to reduce scouring of wetlands. The reforestation would convert current open cropland into bottomland forest planting of containerized trees. The wetland enhancement includes development of a new water source, increased pumping capacity at an existing pump station, and portable pumping capabilities along with construction of water control structures and channels to improve water movement capabilities and better manage water levels in the project area. The improvements would provide the capability to lower water levels in the spring and early summer to promote plant growth that would provide additional forage for migrating birds when wetlands are re-charged in the fall. Excavation of Sny Creek to Roadside Lake would allow fish passage from the Mississippi River to off-channel areas for spawning, rearing and over-wintering. Filling in low spots along the natural riverside levee would reduce scouring of wetlands and river-borne sedimentation.

Approximately 34 acres of wetland would be converted to non-wetland with the construction of an earthen spillway, filling of scour breaches in the natural riverside levee, and the excavation of the Sny Creek channel from Roadside Lake to the lower end of Zone 4 and associated excavated material placement. However, these impacts would be offset by the reforestation of over 99 acres of cropland, restoration of over 700 acres of wetlands through improved water level management and reconnection of over 150 acres of aquatic habitat to the Mississippi River.

Factors considered in making a determination that an Environmental Impact Statement was not required are as follows:

A. The project is anticipated to improve the value of Rip Rap Landing Fish and Migratory Wildlife Management Area for migratory and resident wildlife, including aquatic species.
B. Aside from temporary disturbance, no long-term adverse impacts to natural or cultural resources are anticipated. No endangered or threatened species, either State or Federal, would be adversely impacted by the proposed action.
C. The project is in compliance with Sections 401 and 404 of the Clean Water Act.
D. The project is in compliance with Section 106 of the National Historic Preservation Act.
E. No significant social or economic impacts are expected to occur as a result of this action.
F. No hazardous and toxic waste issues are expected.
G. No adverse significant cumulative impacts are anticipated.

I have also evaluated other pertinent data and information on the habitat rehabilitation and enhancement project. As part of this evaluation, I have considered the following project alternatives:

a. No Federal Action ("No Action" Alternative). This alternative would be unacceptable to recommend as it does not meet the project goal to restore as much of the historic ecological functions and values that current conditions and constraints of the project area will allow.

b. Constructing the preferred alternative of the habitat rehabilitation and enhancement project. All feasible combinations of features (10 best buy alternatives) were analyzed for environmental benefits and costs. The proposed project provided the most environmental benefits and best met the four plan formulation criteria of acceptability, completeness, effectiveness, and efficiency.

I have reviewed the information provided by this Environmental Assessment, along with data obtained from Federal and State agencies having jurisdiction by law or special expertise, and from the interested public. Based on my analysis and evaluation of the alternative courses of action presented in the Environmental Assessment I find that the proposed rehabilitation and enhancement project at Rip Rap Landing Fish and Wildlife Area would not significantly affect the quality of the human environment. Therefore, it is my determination that an Environmental Impact Statement is not required prior to proceeding with this action. This determination may be reevaluated if warranted by further developments.

_____ _____

Date

ANTHONY P. MITCHELL
COL, EN
Commanding