# MISSISSIPPI RIVER PROJECT MASTER PLAN
# WITH
# INTEGRATED ENVIRONMENTAL ASSESSMENT

## UPPER MISSISSIPPI RIVER WATERSHED
## POOLS 11-22
## 9-FOOT CHANNEL NAVIGATION PROJECT
## PLEASANT VALLEY, IOWA

## APPENDIX A

## APPROVAL DOCUMENTATION

CEMVR-PD-C (1130-2-550h)

MEMORANDUM FOR RECORD

SUBJECT: Mississippi River Master Plan 2021 Revision

The subject Master Plan for implementation including reclassification of U.S. Army managed lands is

_____ Approved

_____ Approved with comment

_____ Disapproved

_____

Steven M. Sattinger, P.E Date
Colonel, US Army
Commander & District Engineer

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## APPENDIX B

## AGENCY AND PUBLIC COORDINATION

# AGENCY COORDINATION AND PUBLIC INVOLVEMENT

On November 17, 2014, the team members from the Mississippi River Project Office and District office formed a Project Development Team (PDT) and began the process of revising the Master Plan. Large-scale revisions for the Mississippi River Project Master Plan had not been completed since the early 1970s. The most recent major update was the Land Use Allocation Plan (LUAP) in 1989. In January 2015, the PDT announced plans to update the Master Plan for distribution to the public, local Tribes, Federal, state, and local agencies and local communities through press releases, formal letters, and newsletter articles. At the beginning of the process, the PDT's intention was to update the Shoreline Management Plan (SMP) concurrently; however, the PDT determined it was prudent to complete the MP revision first and then address the SMP update separately. Completing the MP first allowed for the broad scope and general planning nature of the plan to be first given the SMP is a support document that feeds from the MP.

Personnel from the District held agency and public scoping meetings in the spring and summer of 2015. Public and agency input was obtained from the District's web page and Facebook page and via mailings, news releases, public input forms, interpretive programs, one-on-one communication, public meetings, and agency meetings.

Public involvement is critically important to the success of the overall master planning effort. The public involvement effort in developing this Master Plan occurred from January 2015 when Mississippi River Project Office personnel announced plans to revise the Master Plan through January 2016. Heavy agency involvement also occurred through December of 2017. During this time the public, affected tribes, stakeholders, and Federal, state, and local agencies were given the opportunity to comment and participate in defining the project issues and formulating resource use objectives.

The PDT held initial agency scoping meetings in March 2015 with state and local agencies directly involved with managing Project lands (General Plans and Cooperative Agreement Lands), which included members of the U.S. Fish & Wildlife Service, Iowa Department of Natural Resources, Missouri Department of Conservation, and Illinois Department of Natural Resources. These meetings were held to discuss the current state of Corps-managed lands, what future development may or may not occur, and expectations and concerns of partners and to describe the intent and purpose of the master planning processes. In August 2015, District personnel met again with agencies to define and discuss land classification designations of environmentally sensitive areas located on Project lands.

Public scoping meetings were conducted in June 2015. Comments were submitted in writing, email, or online to the Mississippi River Project Office through January 2016. All written comments received at the meetings are provided below. When conversing with the public regarding the MP or SMP, Corps staff did not routinely complete a conversation log but rather advised the interested party on how they could provide written comments on the plan. For written comments received that included an email address, the Corps typically emailed the party back, acknowledged the received comment, advised them that the comment would be

included with the documentation on Master Plan, added them to the email contact list for the MP and SMP for any future updates on the process, and thanked them for their time and input.

Public involvement is critically important to the success of the overall master planning effort. The public involvement effort in developing this Master Plan occurred from January 2015 when the PDT announced plans to revise the Master Plan through January 2016. Heavy agency involvement also occurred through December of 2017. During this time the public, affected tribes, stakeholders, and Federal, state, and local agencies were given the opportunity to comment and participate in defining the project issues and formulating resource use objectives.

This appendix is organized by the following sections:

1. **PRESS AND MEDIA – METHODS TO OBTAINING COMMENTS DURING THE MASTER PLANNING PROCESS**

2. **PUBLIC SCOPING AND PUBLIC MEETINGS**

3. **CONGRESSIONAL NOTIFICATION**

4. **AGENCY AND TRIBAL COORDINATION, MEETINGS AND COMMENT**

5. **ENVIRONMENTAL ASSESSMENT 30-DAY PUBLIC REVIEW COMMENTS**

# 1. PRESS AND MEDIA – METHODS TO OBTAINING COMMENTS DURING THE MASTER PLANNING PROCESS

## Website for Master Planning Effort


### Mississippi River Master Plan

The U.S. Army Corps of Engineers, Rock Island District, is revising its Mississippi River Master Plan and is seeking public input. The plan guides public use and management on 11 Corps operated campgrounds, 22 Corps managed day use areas, and approximately 55,000 acres of federal lands from Guttenberg, Iowa, to Saverton, Missouri, for environmental stewardship and recreational purposes.

Thank you for your continued support of the Mississippi River Project Master Plan revision. The initial input period for the Mississippi River Project Master Plan revision has now closed.

Four public open houses were held in June 2015 at the following locations: Dubuque, IA; Bettendorf, IA; and Quincy, IL. Ideas and/or concerns were received at those events, as well as on this website, and are currently being considered during drafting of the plan.

A draft of the document is currently being created. The Master Plan revision draft will be available to the public for review and comment in 2016 through posting on the web and another round of open houses. It is anticipated the final plan will be available for public comment in late 2016.

At each open house, the same overview presentation on the master planning process and facts about the Mississippi River Project were given. Recreation, Forestry, Shoreline Management, and general Project information areas were be set-up within the room displaying informational posters. Corps staff were available throughout the event to answer questions and discuss the environmental stewardship and recreation opportunities within the Project.

Tuesday, June 16, 2015 from 2:00pm to 5:00pm and 6:00pm to 8:00pm at
Scott Community College, Student Life Center – Door #5
500 Belmont Road, Bettendorf, Iowa 52722

Thursday, June 18, 2015 from 2:00pm to 5:00pm and 6:00pm to 8:00pm at
Comfort Inn & Suites Conference Center
1780 Stonegate Center Drive, Burlington, Iowa 52601

Tuesday, June 23, 2015 from 2:00pm to 5:00pm and 6:00pm to 8:00pm at
Grand River Center
500 Bell St, Dubuque, Iowa 52001, Port of Dubuque

Thursday, June 25, 2015 from 2:00pm to 5:00pm and 6:00pm to 8:00pm at
Town & Country Inn - Ballroom
110 North 54th St, Quincy, Illinois 62305

The Master Plan revision is anticipated to be drafted in early 2016. Its content will then be available for public review and comment through public notice, web posting, and open houses. The final Master Plan is anticipated to be completed in fall 2016. The Corps is reviewing the separate but related Shoreline Management Plan for potential revision in 2016. Public input on shoreline management and the current Shoreline Management Plan will be sought throughout 2015.

It is important to note that neither plan is for navigation (locks, dams and associated infrastructure), flood risk management projects (such as levees and floodwalls), Mississippi River water level management, dredging and channel maintenance, or environmental restoration (such as the Upper Mississippi River Restoration - Environmental Management Program).

For the latest information on the plans, to submit comments, or be added to an email list to receive updates and notifications, please visit www.missriver.org. The public can also contact the Corps' Mississippi River Project Office by mail at: Mississippi River Project, P.O. Box 534, Pleasant Valley, IA 52767; by email: missrivermp@usace.army.mil; or telephone: (309) 794-4527.

### Additional Information

Current Approved Plans

Mississippi River Project Fact Sheet

Master Planning Process Fact Sheet

Recreation Fact Sheet

Forestry Fact Sheet

Shoreline Management Fact Sheet

Along the River

### News Releases

Public Input Sought on Mississippi River Master Plan

Corps Hosts Open House Events for

### Contact Information

Mailing Address

Mississippi River Project Office
Attn: Master Plan
P.O. Box 534
Pleasant Valley, IA 52767

Phone: 309-794-4527

Email

missrivermp@usace.army.mil

If you are interested in being part of the Master Plan email list, please click Here

## News Release for Initial Public Input


HOME > MEDIA > NEWS RELEASES

2017 (22)
2016 (38)
2015 (64)
2014 (56)
2013 (120)
2012 (31)
2011 (31)
2010 (35)
2009 (9)
All Entries

# Public Input Sought on Mississippi River Master Plan

SHARE Email Print

*Posted 2/20/2015*

Release no. 15-014

ROCK ISLAND, Ill. - The U.S. Army Corps of Engineers, Rock Island District, is proposing to revise its Mississippi River Master Plan and is seeking public input. The plan guides public use and management of approximately 55,000 acres of federal lands and 314 Mississippi River miles from near Guttenberg, Iowa, to Saverton, Missouri, for environmental stewardship and recreational purposes.

Public input to help develop a draft Master Plan is critical throughout the revision process. Input can be provided through online input forms, by email or mail, and at upcoming focus groups. This effort also includes coordination with federal and state agencies, and non-governmental organizations.

The draft Master Plan is anticipated to be completed in 2016. Its content will then be available for public review and comment through public notice, web posting, and open houses. The final Master Plan is anticipated to be completed in fall 2016. The Corps is also reviewing the separate but related Shoreline Management Plan for potential revision in 2016 and is also seeking public input on shoreline management and the current Plan throughout 2015.

It is important to note that neither plan is for navigation (locks, dams and associated infrastructure), flood risk management projects (such as levees and floodwalls), Mississippi River water level management, dredging and channel maintenance, or environmental restoration (such as the Upper Mississippi River Restoration - Environmental Management Program).

For the latest information on the plans, to submit input, or be added to an email list to receive updates and notifications, please visit www.missriver.org. The public can also contact the Corps' Mississippi River Project Office by mail at: Mississippi River Project, P.O. Box 534, Pleasant Valley, IA 52767; by email: missrivermp@usace.army.mil; or telephone: (309) 794-4527.

## News Release for the Public Meetings Held in June of 2016

# Corps Hosts Open House Events for Public Input on Mississippi River Master Plan

SHARE Email Print

*Posted 6/5/2015*

Release no. 15-038

**Contact**
Joseph Lundh
(309) 794-4527
Joseph.S.Lundh@usace.army.mil

ROCK ISLAND, Ill. - The U.S. Army Corps of Engineers, Rock Island District, is revising its Mississippi River Master Plan and is hosting several public scoping open house events to gain public input. Each open house will offer brief overview presentations hourly, informational posters and Corps staff on hand to answer questions about the Master Plan as well as natural resource and recreational opportunities within the Mississippi River Project.

Open houses are being held at the following locations:

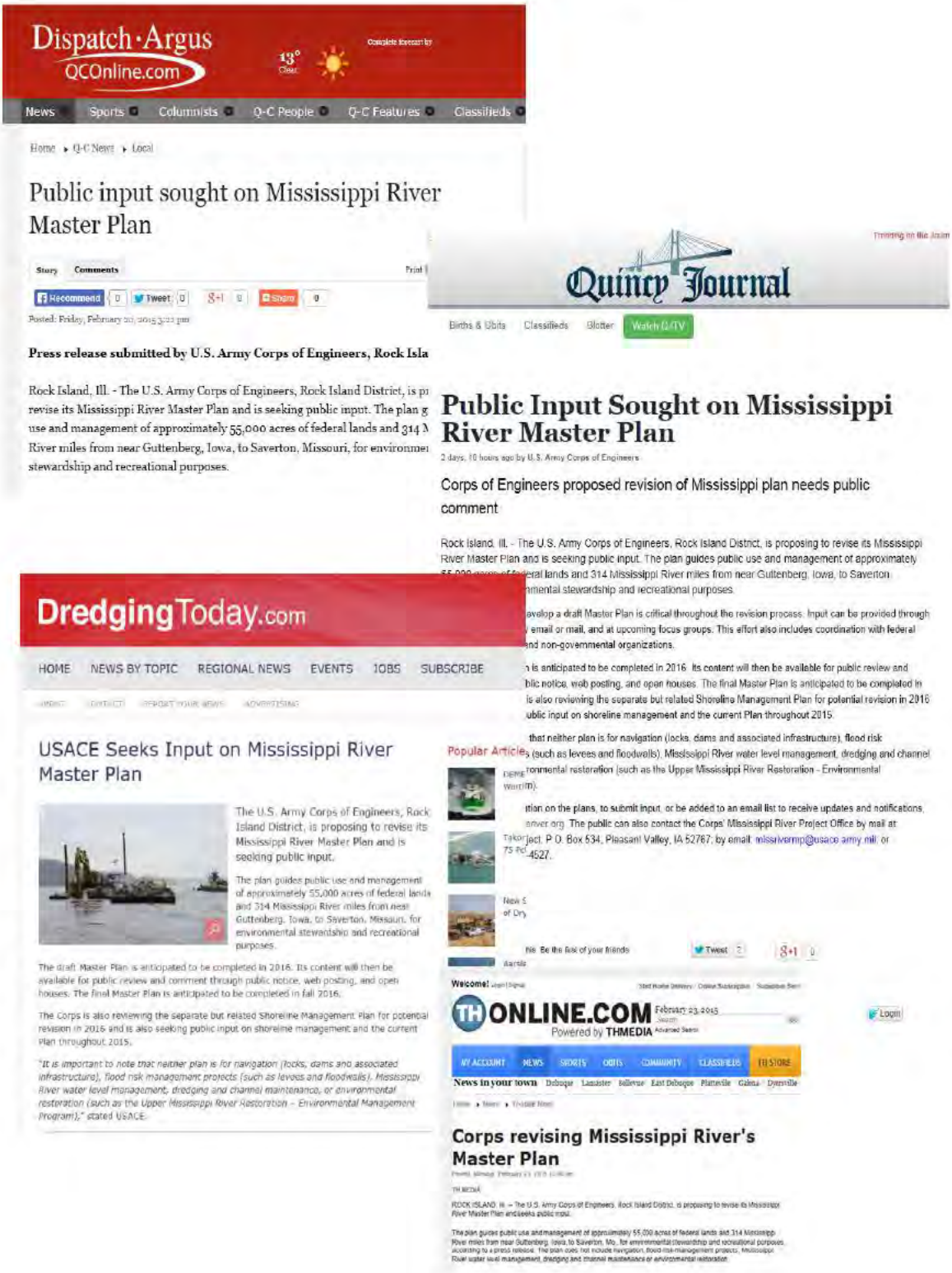
Tuesday, June 16, 2015
2-5 p.m. and 6-8 p.m.
Scott Community College
Student Life Center – Door #5
500 Belmont Road
Bettendorf, Iowa 52722

Thursday, June 18, 2015
2-5 p.m. and 6-8 p.m.
Comfort Inn & Suites Conference Center
1780 Stonegate Center Drive
Burlington, Iowa 52601

Tuesday, June 23, 2015
2-5 p.m. and 6-8 p.m.
Grand River Center
500 Bell St
Dubuque, Iowa 52001
Port of Dubuque

Thursday, June 25, 2015
2-5 p.m. and 6-8 p.m.
Town & Country Inn - Ballroom
110 North 54th St
Quincy, Illinois 62305

## Examples of Press Coverage of Master Planning Effort



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QCOnline.com

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### Public input sought on Mississippi River Master Plan

Story | Comments

Posted: Friday, February 20, 2015 3:23 pm

**Press release submitted by U.S. Army Corps of Engineers, Rock Isla**

Rock Island, Ill. - The U.S. Army Corps of Engineers, Rock Island District, is pr
revise its Mississippi River Master Plan and is seeking public input. The plan g
use and management of approximately 55,000 acres of federal lands and 314 M
River miles from near Guttenberg, Iowa, to Saverton, Missouri, for environmer
stewardship and recreational purposes.

Quincy Journal

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### Public Input Sought on Mississippi River Master Plan

2 days, 10 hours ago by U.S. Army Corps of Engineers

Corps of Engineers proposed revision of Mississippi plan needs public comment

Rock Island, Ill. - The U.S. Army Corps of Engineers, Rock Island District, is proposing to revise its Mississippi River Master Plan and is seeking public input. The plan guides public use and management of approximately
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ronmental restoration (such as the Upper Mississippi River Restoration - Environmental
Program)."

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anver.org. The public can also contact the Corps' Mississippi River Project Office by mail at
Takor ject, P.O. Box 534, Pleasant Valley, IA 52767; by email: mississippivmp@usace.army.mil; or
75 Pol 4527.

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### Corps revising Mississippi River's Master Plan

ROCK ISLAND, Ill. – The U.S. Army Corps of Engineers, Rock Island District, is proposing to revise its Mississippi River Master Plan and seeks public input.

The plan guides public use and management of approximately 55,000 acres of federal lands and 314 Mississippi River miles from near Guttenberg, Iowa, to Saverton, Mo., for environmental stewardship and recreational purposes, according to a press release. The plan does not include navigation, flood-risk management projects, Mississippi River water level management, dredging and channel maintenance or environmental restoration.

DredgingToday.com

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### USACE Seeks Input on Mississippi River Master Plan

The U.S. Army Corps of Engineers, Rock Island District, is proposing to revise its Mississippi River Master Plan and is seeking public input.

The plan guides public use and management of approximately 55,000 acres of federal lands and 314 Mississippi River miles from near Guttenberg, Iowa, to Saverton, Missouri, for environmental stewardship and recreational purposes.

The draft Master Plan is anticipated to be completed in 2016. Its content will then be available for public review and comment through public notice, web posting, and open houses. The final Master Plan is anticipated to be completed in fall 2016.

The Corps is also reviewing the separate but related Shoreline Management Plan for potential revision in 2016 and is also seeking public input on shoreline management and the current plan throughout 2015.

*"It is important to note that neither plan is for navigation (locks, dams and associated infrastructure), flood risk management projects (such as levees and floodwalls), Mississippi River water level management, dredging and channel maintenance, or environmental restoration (such as the Upper Mississippi River Restoration – Environmental Management Program)," stated USACE.*

Quad-City Times

## Army Corps of Engineers to update Mississippi River master plan

18 HOURS AGO • BY ED TIBBETTS

The U.S. Army Corps of Engineers is seeking input on a planned update to its Mississippi River Master Plan.

The plan's last major update was in 1989, and this revision is scheduled to be completed by late next year.

The Master Plan guides public use and management of 55,000 acres of federal lands and 314 miles along the river from Guttenberg, Iowa, to Saverton, Mo., for environmental stewardship and recreation purposes.

The Corps says it does not cover navigation, flood risk management, water level management, dredging and channel maintenance or environmental restoration in the plan.

Public input will be taken throughout the process, the Corps says, with the focus scoping meeting to take place this spring or early summer.

Federal and state agencies, as well as nongovernmental groups, are included.

The draft master plan is expected to be completed next year, after which it will be available for public review and comment through public notice, on the Internet and at open houses.

A final plan should be completed by the fall of 2016.

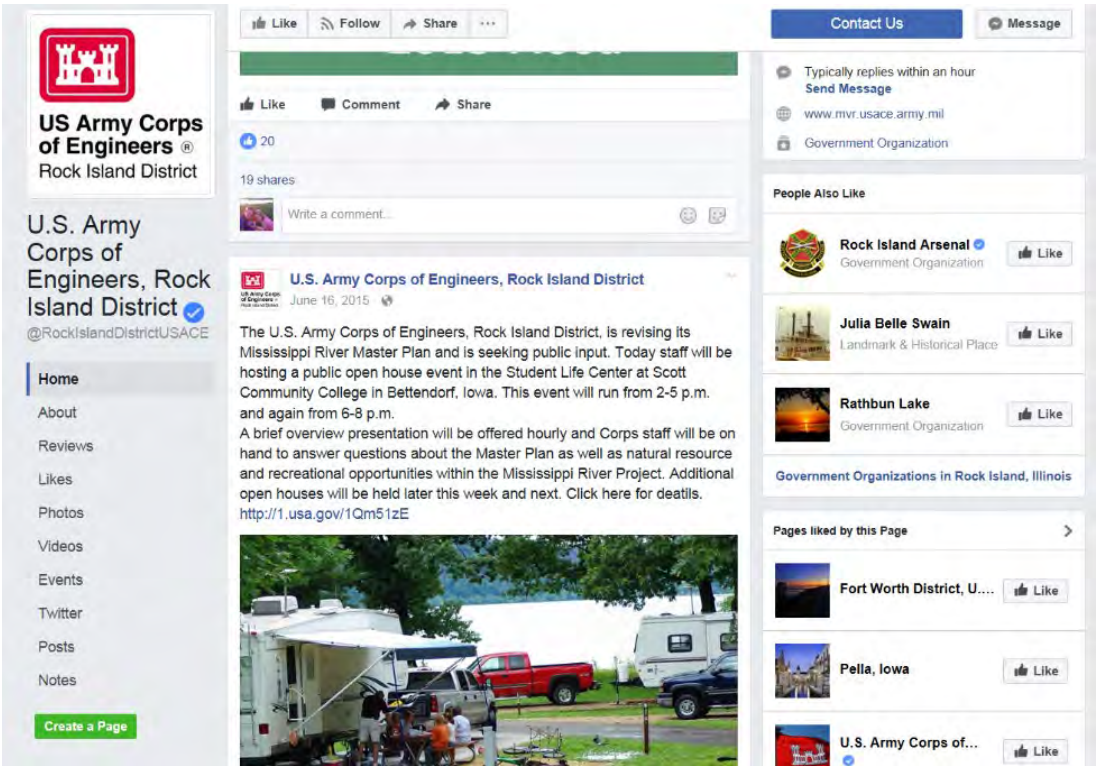
The Corps also is reviewing the separate but related Shoreline Management Plan for potential revision in 2016 and will be seeking input throughout this year.

**TO COMMENT**

People interested in more information on the plans or in submitting their input can go to the website missriver.org or contact the Corps of Engineers' Mississippi River project office by mail at: Mississippi River Project, P.O. Box 534, Pleasant Valley, IA 52767, by email at missrivermp@usace.army.mil or telephone at 309-794-4527.

**Interviews were held with the Quad City Times, Quincy Herald Whig, and WQAD. Below is a photo of Joseph Lundh attending a television interview on WQAD.**

**U.S. Army Corps of Engineers, Rock Island District, Facebook Page Also Hosted Information on The Master Plan Update.**



## 2. PUBLIC SCOPING AND PUBLIC MEETINGS

### Email Sent To 364 Interested Parties on The Master Plan Email List

**From:** MissRiverMP
**Bcc:** emails addresses removed for privacy
**Subject:** Mississippi River Project Master Plan Public Scoping Open Houses (UNCLASSIFIED)
**Date:** Wednesday, May 20, 2015 12:31:00 PM

Classification: UNCLASSIFIED Caveats: NONE

Dear interested party (on our Master Plan email list):

The U.S. Army Corps of Engineers, Rock Island District, is revising its Mississippi River Master Plan and is seeking public input. The Mississippi River Project Master Plan guides public use and management on 11 Corps operated campgrounds, 22 Corps managed day use areas, and approximately 55,000 acres of federal lands from Guttenberg, Iowa, to Saverton, Missouri, for environmental stewardship and recreational purposes.

During June, the Mississippi River Project Office, Rock Island District, will host four public scoping open houses. The purpose of the open houses are to informally meet with individuals and groups to discuss the Mississippi River Project Master Plan revision. This will provide the public the opportunity to learn about the status of natural resource activities along the river, provide comments on land management issues and resource objectives, and give feedback on their interests as it relates to natural resources and recreation along the Mississippi River from Pools 11 through 22.

At each open house, the same overview presentation on the master planning process and facts about the Mississippi River Project will be repeated at 2pm, 3pm, 4pm, 6pm, and 7pm. Recreation, Forestry, Shoreline Management, and general Project information areas will be set-up within the room displaying informational posters. Corps staff will be available throughout the event to answer questions and discuss the environmental stewardship and recreation opportunities within the Project. The open houses will include the same content and are provided in multiple locations for convenience.

These public scoping open houses will be held:

- Tuesday, June 16, 2015 from 2:00pm to 5:00pm and 6:00pm to 8:00pm at Scott Community College, Student Life Center – Door #5, 500 Belmont Road, Bettendorf, Iowa 52722
- Thursday, June 18, 2015 from 2:00pm to 5:00pm and 6:00pm to 8:00pm at Comfort Inn & Suites Conference Center, 1780 Stonegate Center Drive, Burlington, Iowa 52601
- Tuesday, June 23, 2015 from 2:00pm to 5:00pm and 6:00pm to 8:00pm at Grand River Center, 500 Bell St, Dubuque, Iowa 52001, Port of Dubuque
- Thursday, June 25, 2015 from 2:00pm to 5:00pm and 6:00pm to 8:00pm at Town & Country Inn - Ballroom, 110 North 54th St, Quincy, Illinois 62305

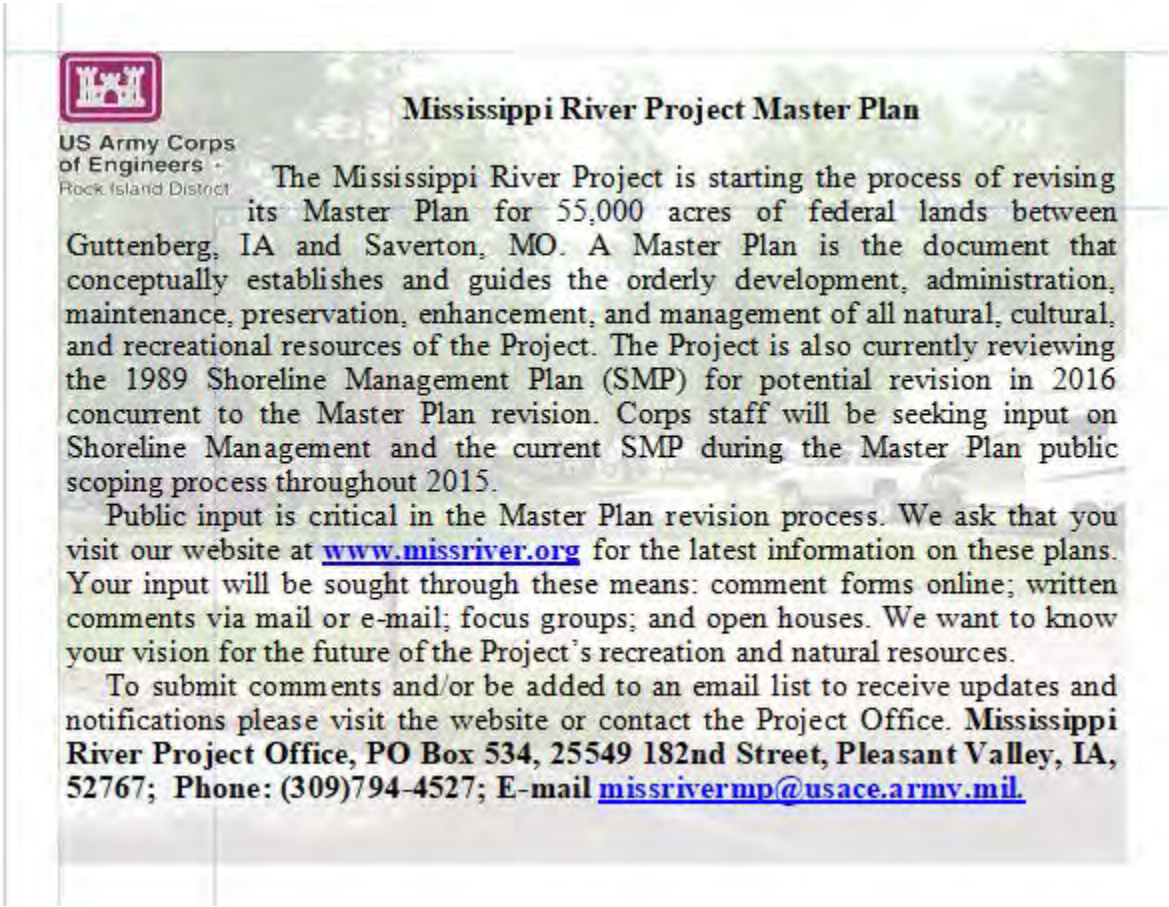
The Master Plan revision is anticipated to be drafted in early 2016. Its content will then be available for public review and comment through public notice, web posting, and open houses. The final Master Plan is anticipated to be completed in fall 2016. The Corps is reviewing the separate but related Shoreline Management Plan for potential revision in 2016. Public input on shoreline management and the current Shoreline Management Plan will be sought throughout 2015.

It is important to note that neither plan is for navigation (locks, dams and associated infrastructure), flood risk management projects (such as levees and floodwalls), Mississippi River water level management, dredging and channel maintenance, or environmental restoration (such as the Upper Mississippi River Restoration - Environmental Management Program).

For the latest information on the plans or to submit comments, please visit www.missriver.org. To UNSUBSCRIBE from future email notices or to add additional email addresses to the Master Plan email list, please email missrivermp@usace.army.mil. The public can also contact the Corps' Mississippi River Project Office by mail at: Mississippi River Project, P.O. Box 534, Pleasant Valley, IA 52767; by email: missrivermp@usace.army.mil; or telephone: (309) 794-4527.

Thanks,
Mississippi River Project

**Postcard Sent to All Cottage Site Lease Holders And Shoreline Management Permit/License Holders February 2015**



US Army Corps of Engineers
Rock Island District

**Mississippi River Project Master Plan**

The Mississippi River Project is starting the process of revising its Master Plan for 55,000 acres of federal lands between Guttenberg, IA and Saverton, MO. A Master Plan is the document that conceptually establishes and guides the orderly development, administration, maintenance, preservation, enhancement, and management of all natural, cultural, and recreational resources of the Project. The Project is also currently reviewing the 1989 Shoreline Management Plan (SMP) for potential revision in 2016 concurrent to the Master Plan revision. Corps staff will be seeking input on Shoreline Management and the current SMP during the Master Plan public scoping process throughout 2015.

Public input is critical in the Master Plan revision process. We ask that you visit our website at **www.missriver.org** for the latest information on these plans. Your input will be sought through these means: comment forms online; written comments via mail or e-mail; focus groups; and open houses. We want to know your vision for the future of the Project's recreation and natural resources.

To submit comments and/or be added to an email list to receive updates and notifications please visit the website or contact the Project Office. **Mississippi River Project Office, PO Box 534, 25549 182nd Street, Pleasant Valley, IA, 52767; Phone: (309)794-4527; E-mail missrivermp@usace.army.mil.**

**Presentation During Public Scoping Meetings**

## Mississippi River Project
## Master Plan Revision

Presented by Kelly Thomas
Chief, Natural Resource Section

Public Scoping Open Houses:
- Bettendorf, Iowa - Tuesday, June 16, 2015
- Burlington, Iowa - Thursday, June 18, 2015
- Dubuque, Iowa - Tuesday, June 23, 2015
- Quincy, Illinois - Thursday, June 25, 2015

US Army Corps of Engineers
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## Master Plan Defined

The document that guides the use and development of the natural and recreational resources of Mississippi River Project.

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## Purpose and Intent of Master Plans

The Corps defines a Master Plan as…..

" The strategic land use management document that guides the comprehensive management and development of all project recreational, natural and cultural resources throughout the life of the water resource development project."

Source: Chapter 3 of EP 1130-2-550 available at www.usace.army.mil/library/publications

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## Key Points

- Main focus is stewardship of natural and cultural resources and provision of high quality outdoor recreation facilities and opportunities
- Proposed effective life of 25-30 years
  - ► Reviews every 5 years

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## The Master Plan does NOT…

- The MP does not address the specifics plan for navigation (locks, dams and associated infrastructure for commercial barge traffic), flood risk management (such as levees in the PL84-99 Program), or water level management.
  - ► These have been addressed in separate guidance documents.
- The MP deals in concepts, not in details of design or administration.

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## Master Plan Topics

- Inventory of Project resources
- Objectives for resource use
- Land use classification and shoreline zoning
- Public facility demand
- Site specific plans for development and management of public lands and waters
- Environmental protection/compliance needs

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## Goals of the MP Revision

- Provide Best Management Practices to respond to regional needs, resource capabilities and sustainability, and expressed public interests.
- Protect and manage natural and cultural resources.
- Provide outdoor recreation opportunities based on public demands while sustaining Project natural resources.
- Recognize the particular qualities, characteristics, and potentials of the Project.
- Provide consistency and compatibility with other state and regional goals and programs.

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## Why do we need a Revision?

- Current Master Plan was completed in 1970s
- Land Use Allocation Plan (LUAP) was completed in 1989
- Shoreline Management Plan (SMP) was completed in 1989
- To ensure effective management practices and be responsive to existing and future needs
- To reflect user group changes in the region
- To better reflect current Corps policies, regulations, and processes

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## Master Plan Revision Process

- Will be accomplished by a team of Corps employees with input from other agencies
- Public and stakeholder input will be carefully considered by the team
- An Environmental Assessment of the Master Plan will be prepared and appended to the plan

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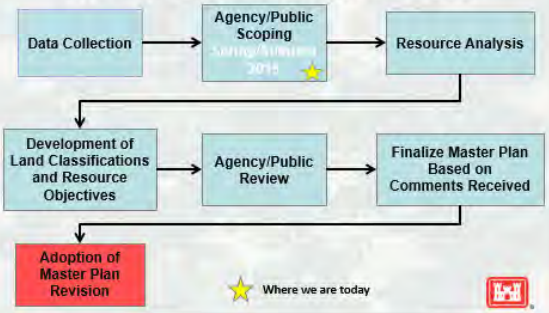
## The Master Planning Process

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## Natural Resources

- Upper Mississippi River
  - 314 Mississippi River Miles
  - Iowa, Wisconsin, Illinois, and Missouri

- ~55,000 Acres Project Lands
  - 80% Forested

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## Natural Resource Management

- Corps Direct Managed Lands
  13,523 Acres
- USFWS Cooperative Lands
  12,067 Acres
- Iowa DNR Cooperative Lands
  13,288 Acres
- Illinois DNR Cooperative Lands
  13,708 Acres
- Missouri DC Cooperative Lands
  2,414 Acres

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## Natural Resource Management Mission

*". . to manage and conserve those natural resources, consistent with ecosystem management principles, while providing quality public outdoor recreation experiences to serve the needs of present and future generations."*

*ER 1130-2-540*

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## Recreation

- Recreation areas
  - ►22 Boat Accesses
  - ►11 Campgrounds with 548 Campsites
- Mississippi River Visitor Center
- Trails – Hiking, Biking, Water, etc.
- Visitors Assistance

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## Environmental Stewardship

- Habitat Restoration & Management
  - ►Forest
  - ►Wetland
  - ►Prairie
- Resource Monitoring
- Endangered Species
- Invasive Species
- Geographic Information Systems (GIS)

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## Public Involvement

Public input and participation is critical

- Website: www.missriver.org
- Public Input Forms
- Informal public scoping meetings at several locations in Spring & Summer 2015
- Public Meetings for review of final document
  - ► Expected in Spring/Summer 2016
- Mailing and email lists
- Press releases through the general media

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## Shoreline Management Plan

- Shoreline Management Plan (SMP) was completed in 1989.
- Guidance for management, protection of shoreline while allowing for balanced use.
- Private exclusive use – docks, stairs
- Established protected area classifications where private recreational structures prohibited/allowed.
- Seeking input for possible concurrent revision with Master Plan.

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## SMP Continued

- Currently 326 Shoreline Use Permits and/or Special Use Licenses
- This plan does not apply to cottage sites, residential leases, commercial marina or navigation activities.

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## SMP Classifications

- Limited Development Area - The only classification where new permit/licenses may be issued to authorize private exclusive use.
- Public Recreational Area - Shorelines managed by a governmental entity, commercial concessionaire or non-profit organization. Private structures are prohibited within these areas.
- Prohibited Access Area - Shoreline areas allocated for the protection of the public's safety or security of government installations.
- Protected Shoreline Area - Shoreline areas designated to maintain or restore aesthetic, fish and wildlife, cultural or other environmental values. These areas also may be designated to protect unstable shorelines from erosion or to prevent development in areas that are subject to excessive erosion.

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## Project Land Classifications

| 1989 LUAP Classifications | Proposed Land Classifications |
|---|---|
| Project Operations | Project Operations |
| Recreation Intensive Use | High Density Recreation |
| Natural Area | Environmentally Sensitive Areas |
| Wildlife Management & Recreation Low Density Use | Multiple Resource Management: Low Density Recreation, Vegetation Management, or Wildlife Management |
| | Water Surface: Restricted, Fish & Wildlife Sanctuary, No Wake, or Open Recreation |

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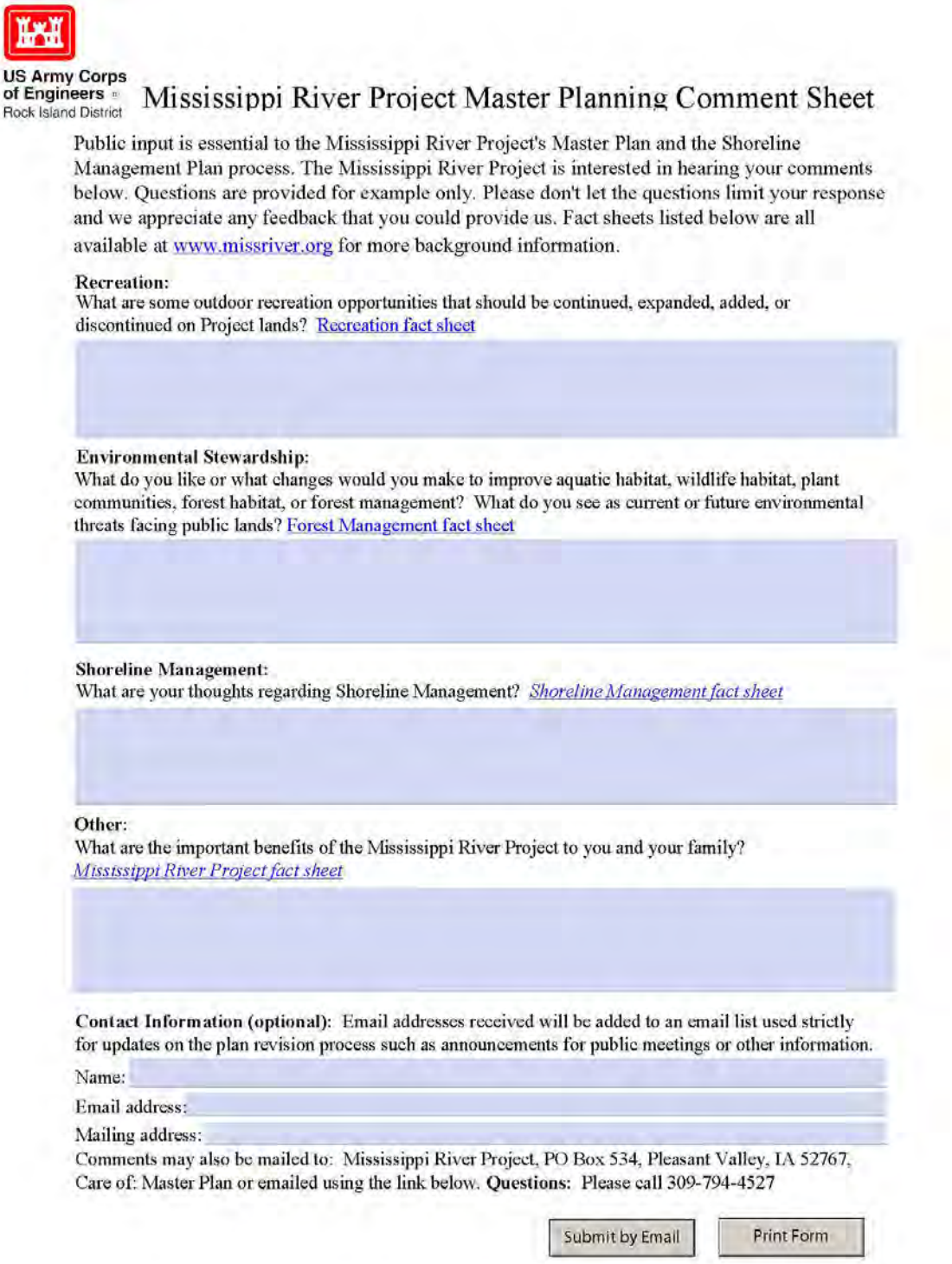
## Questions and/or Comments

Mississippi River Project Office
Attn: Master Plan
P.O. Box 534
Pleasant Valley, IA 52767
#309-794-4527
missrivermp@usace.army.mil

BUILDING STRONG®

21

Comments were submitted in writing, via email, or online to the Mississippi River Project Office in LeClaire, IA. All media efforts directed the public to the Master Planning Website and the Public Input Form (shown below). Over 180 comments were received from the general public. The planning team considered all written and verbal comments received.



US Army Corps of Engineers
Rock Island District

## Mississippi River Project Master Planning Comment Sheet

Public input is essential to the Mississippi River Project's Master Plan and the Shoreline Management Plan process. The Mississippi River Project is interested in hearing your comments below. Questions are provided for example only. Please don't let the questions limit your response and we appreciate any feedback that you could provide us. Fact sheets listed below are all available at www.missriver.org for more background information.

**Recreation:**
What are some outdoor recreation opportunities that should be continued, expanded, added, or discontinued on Project lands? Recreation fact sheet

**Environmental Stewardship:**
What do you like or what changes would you make to improve aquatic habitat, wildlife habitat, plant communities, forest habitat, or forest management? What do you see as current or future environmental threats facing public lands? Forest Management fact sheet

**Shoreline Management:**
What are your thoughts regarding Shoreline Management? *Shoreline Management fact sheet*

**Other:**
What are the important benefits of the Mississippi River Project to you and your family?
*Mississippi River Project fact sheet*

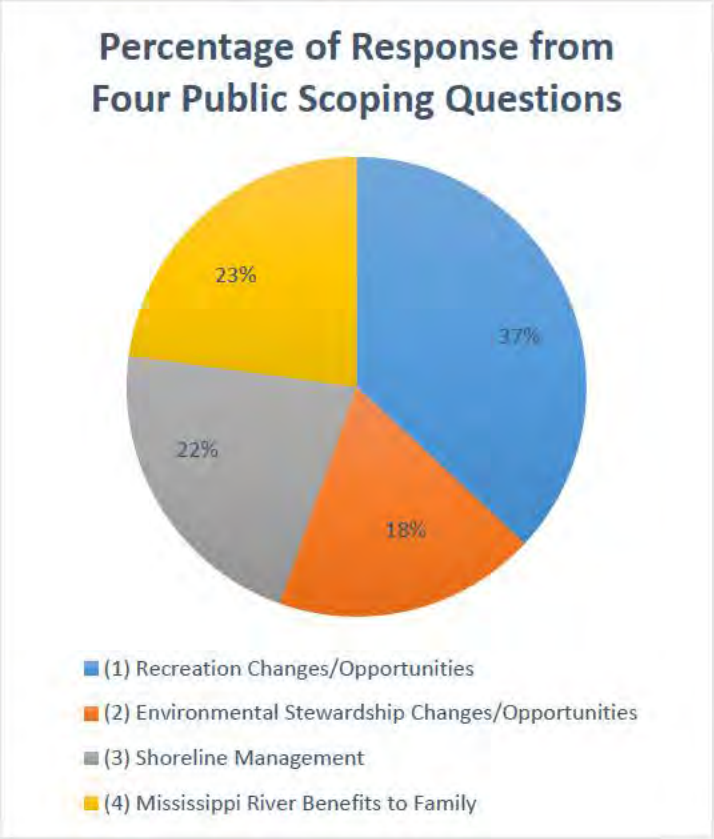
**Contact Information (optional):** Email addresses received will be added to an email list used strictly for updates on the plan revision process such as announcements for public meetings or other information.

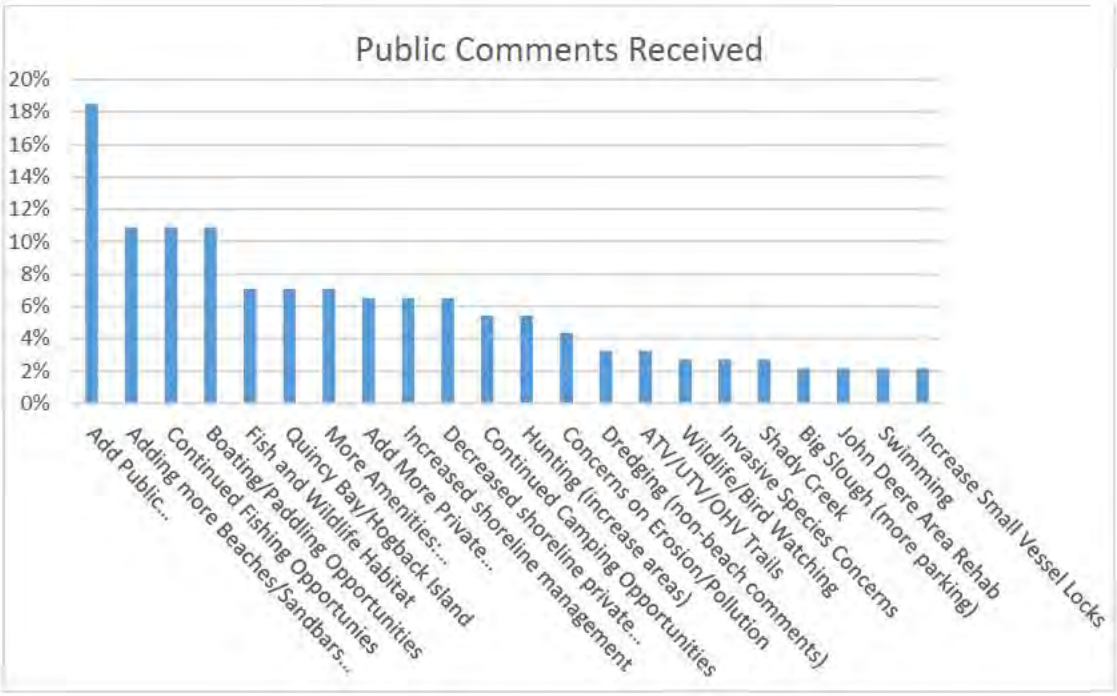
Name:
Email address:
Mailing address:
Comments may also be mailed to: Mississippi River Project, PO Box 534, Pleasant Valley, IA 52767, Care of: Master Plan or emailed using the link below. **Questions:** Please call 309-794-4527

Submit by Email  Print Form

**Comments Were Received on A Wide Range of Topics Including:**

- Requests to add Public Docks/Stairways/Access/Ramps
- Requests to add more sand to "Beaches" and/or "Sandbars" (dredge placement)
- Continued Fishing Opportunities
- Continued Boating/Paddling Opportunities
- Continue to support Fish and Wildlife Habitat
- Concern over future of Quincy Bay/Hogback Island
- Requests for more Amenities: Activities/Programs/WiFi/Hiking Trails
- Requests to allow more Private Docks/Stairways/Access (Shoreline)
- Requests for increased Shoreline Management
- Requests for decreased Private Shoreline Development




Public Comments Received
20%
18%
16%
14%
12%
10%
8%
6%
4%
2%
0%
Add Public...
Adding more Beaches/Sandbars...
Continued Fishing Opportunities
Boating/Paddling Opportunities
Fish and Wildlife Habitat
Quincy Bay/Hogback Island
More Amenities:...
Add More Private...
Increased shoreline management
Decreased shoreline private...
Continued Camping Opportunities
Hunting (increase areas)
Concerns on Erosion/Pollution
Dredging (non-beach comments)
ATV/UTV/OHV Trails
Wildlife/Bird Watching
Invasive Species Concerns
Shady Creek
Big Slough (more parking)
John Deere Area Rehab
Swimming
Increase Small Vessel Locks

## 3. CONGRESSIONAL NOTIFICATION

### Initial Congressional Notification Emails

**From:** Thomas, Kelly R MVR
**To:** **Email Addresses removed for privacy**
**Subject:** USACE Rock Island, Mississippi River Project Master Plan Update (UNCLASSIFIED)
**Date:** Friday, February 06, 2015 10:02:00 AM

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Classification: UNCLASSIFIED
Caveats: NONE

Good Afternoon,

I wanted to share with all of you our intentions to revise the U.S. Army Corps of Engineers, Mississippi River Project Master Plan in FY 15 and 16. We are currently reviewing the 1989 Shoreline Management Plan (SMP) for potential revision in 2016 concurrent to the Master Plan revision. We will be seeking input on Shoreline Management and the current SMP during the Master Plan public scoping process throughout 2015. Below are a few bulleted items providing: information on the plans and Project, why we are revising the plans, and goals of the revised plans. As we go through this process, your offices will be kept in the loop on our progress, on public workshops, etc. This information along with plan and Project fact sheets will be posted to our website: www.missriver.org.

What is a Master Plan?
A Master Plan (MP) is the document that conceptually establishes and guides the orderly development, administration, maintenance, preservation, enhancement, and management of all natural, cultural, and recreational resources of a Corps water resource project. It is not a plan for navigation (locks, dams and associated infrastructure for commercial barge traffic), flood risk management (such as levees in the PL84-99 Program), water level management, or other programs which have been addressed in separate guidance documents.

What is a Shoreline Management Plan?
The Shoreline Management Plan (SMP) provides guidance for the management, protection and preservation of the Mississippi River's environment, while allowing a balanced use of the shoreline. This plan is separate from the MP but references the MP land use classifications. It designates protected portions of the federal fee title lands under jurisdiction of the Corps of Engineers (Corps lands) as well as guiding private-exclusive use of other Corps lands. Private-exclusive use involves placing private recreational structures or pursuing certain activities that are limited to the individual and are usually not available to the general public. The SMP discusses conditions and restrictions of such private exclusive use. There are currently 329 Shoreline Use Permits and/or Special Use Licenses under management for shoreline and river access related private structures. The current plan does not apply to the Corps administered cottage sites, residential leases, commercial marina or navigation activities.

What Lands Are Affected?
-These plans are focused solely on the approximate 55,000 acres of Corps lands.
-The Project area extends 314 Mississippi River Miles near Guttenburg, Iowa to Saverton, Missouri. The privately owned lands and non-Corps lands within this reach are not included in the plan.

Why Revise the Master Plan and Shoreline Management Plan?
-To ensure effective management practices and be responsive to existing and future needs.
-Large scale revisions of the MP have not been completed since the early 1970s. The Land Use Allocation Plan (LUAP) was the latest update to a portion of the plan which was completed in 1989. The SMP was completed in 1989.
-User group changes in the region.

-To better reflect current Corps policies/regulations/processes.

Overall Goals of the Revising Master Plan and Shoreline Management Plan:
-Provide Best Management Practices to respond to regional needs, resource capabilities and sustainability, and expressed public interests.
-Protect and manage natural and cultural resources.
-Provide outdoor recreation opportunities based on public demands while sustaining Project natural resources.
-Recognize the particular qualities, characteristics, and potentials of the Project.
-Provide consistency and compatibility with other state and regional goals and programs.

We plan to seek direct involvement during the development of this plan from several agencies within your district or state. We will be hosting interagency coordination meetings in the near future. Public involvement will be solicited during the revision process through mailings, emails, and use of our website, www.missriver.org, to ensure development of the plans are successful. We will keep you informed on the status of this planning effort as it progresses.

If you have any questions, inquiries, or preferences on how we should coordinate with your office, please do not hesitate to contact me.

Kelly Thomas
Chief, Natural Resource Section
Mississippi River Project

**Scoping Meeting Elected Officials Email February 2015**

The following is the email content that was sent to all Governors, U.S. Senators, and U.S. Representatives of Wisconsin, Iowa, Illinois, and Missouri to announce the scoping meeting dates.

Good Afternoon,

I wanted to share with all of you our intentions to revise the U.S. Army Corps of Engineers, Mississippi River Project Master Plan in FY 15 and 16. We are currently reviewing the 1989 Shoreline Management Plan (SMP) for potential revision in 2016 concurrent to the Master Plan revision. We will be seeking input on Shoreline Management and the current SMP during the Master Plan public scoping process throughout 2015. Below are a few bulleted items providing: information on the plans and Project, why we are revising the plans, and goals of the revised plans. As we go through this process, your offices will be kept in the loop on our progress, on public workshops, etc. This information along with plan and Project fact sheets will be posted to our website: www.missriver.org.

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The Shoreline Management Plan (SMP) provides guidance for the management, protection and preservation of the Mississippi River's environment, while allowing a balanced use of the shoreline. This plan is separate from the MP but references the MP land use classifications. It designates protected portions of the federal fee title lands under jurisdiction of the Corps of Engineers (Corps lands) as well as guiding private-exclusive use of other Corps lands. Private-exclusive use involves placing private recreational structures or pursuing certain activities that are limited to the individual and are usually not available to the general public. The SMP discusses conditions and restrictions of such private exclusive use. There are currently 329 Shoreline Use Permits and/or Special Use Licenses under management for shoreline and river access related private structures. The current plan does not apply to the Corps administered cottage sites, residential leases, commercial marina or navigation activities.

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-To ensure effective management practices and be responsive to existing and future needs.
-Large scale revisions of the MP have not been completed since the early 1970s. The Land Use Allocation Plan (LUAP) was the latest update to a portion of the plan which was completed in 1989. The SMP was completed in 1989.
-User group changes in the region.
-To better reflect current Corps policies/regulations/processes.

Overall Goals of the Revising Master Plan and Shoreline Management Plan:
-Provide Best Management Practices to respond to regional needs, resource capabilities and sustainability, and expressed public interests.
-Protect and manage natural and cultural resources.
-Provide outdoor recreation opportunities based on public demands while sustaining Project natural resources.

At each open house, the same overview presentation on the master planning process and facts about the Mississippi River Project will be repeated at 2pm, 3pm, 4pm, 6pm, and 7pm. Recreation, Forestry, Shoreline Management, and general Project information areas will be set-up within the room displaying informational posters. Corps staff will be available throughout the event to answer questions and discuss the environmental stewardship and recreation opportunities within the Project. The open houses will include the same content and are provided in multiple locations for convenience.

These public scoping open houses will be held:

- Tuesday, June 16, 2015 from 2:00pm to 5:00pm and 6:00pm to 8:00pm at Scott Community College, Student Life Center – Door #5, 500 Belmont Road, Bettendorf, Iowa 52722

- Thursday, June 18, 2015 from 2:00pm to 5:00pm and 6:00pm to 8:00pm at Comfort Inn & Suites Conference Center, 1780 Stonegate Center Drive, Burlington, Iowa 52601

- Tuesday, June 23, 2015 from 2:00pm to 5:00pm and 6:00pm to 8:00pm at Grand River Center, 500 Bell St, Dubuque, Iowa 52001, Port of Dubuque

- Thursday, June 25, 2015 from 2:00pm to 5:00pm and 6:00pm to 8:00pm at Town & Country Inn - Ballroom, 110 North 54th St, Quincy, Illinois 62305

The Master Plan revision is anticipated to be drafted in early 2016. Its content will then be available for public review and comment through public notice, web posting, and open houses. The final Master Plan is anticipated to be completed in fall 2016. The Corps is reviewing the separate but related Shoreline Management Plan for potential revision in 2016. Public input on shoreline management and the current Shoreline Management Plan will be sought throughout 2015.

It is important to note that neither plan is for navigation (locks, dams and associated infrastructure), flood risk management projects (such as levees and floodwalls), Mississippi River water level management, dredging and channel maintenance, or environmental restoration (such as the Upper Mississippi River Restoration - Environmental Management Program).

For the latest information on the plans or to submit comments, please visit www.missriver.org. To UNSUBSCRIBE from future email notices or to add additional email addresses to the Master Plan email list, please email missrivermp@usace.army.mil. The public can also contact the Corps' Mississippi River Project Office by mail at: Mississippi River Project, P.O. Box 534, Pleasant Valley, IA 52767; by email: missrivermp@usace.army.mil; or telephone: (309) 794-4527.

Thanks,
Mississippi River Project

## 4. AGENCY AND TRIBAL COORDINATION, MEETINGS AND COMMENT

### Initial Agency Notification Emails with Attached Letter

**From:** Thomas, Kelly R MVR
**To:** Email addresses removed for privacy
**Subject:** USACE Rock Island, Mississippi River Project Master Plan Update (UNCLASSIFIED)
**Date:** Wednesday, February 18, 2015 1:16:00 PM
**Attachments:** Master Plan Initial Letter - MDC mailed feb_12.pdf

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Classification: UNCLASSIFIED
Caveats: NONE

Good Afternoon,

I wanted to share with all of you our intentions to revise the U.S. Army Corps of Engineers, Mississippi River Project Master Plan in Fiscal Year 2015 and 2016. We are currently reviewing the 1989 Shoreline Management Plan for potential revision in 2016 concurrent to the Master Plan revision. We will be seeking input on Shoreline Management Plan during the Master Plan scoping process throughout 2015. Attached is the letter mailed to your agency on February 12, 2015 explaining our intentions and an explanation of both the Master Plan and Shoreline Management Plan.

We will keep you informed on the status of this planning effort as it progresses. General information about master planning and fact sheets about the Mississippi River Project are available at www.missriver.org. This website will be updated periodically with additional information throughout the Master Plan process. Should you have any questions or concerns, my point of contact for this effort is Mr. Joseph Lundh. He can be reached at [redacted]

Thank you,

Kelly Thomas
Chief, Natural Resource Section
Mississippi River Project

DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS, ROCK ISLAND DISTRICT
PO BOX 2004 CLOCK TOWER BUILDING
ROCK ISLAND, ILLINOIS 61204-2004

REPLY TO
ATTENTION OF

February 12, 2015

Acting Director Wayne Rosenthal
Illinois Department of Natural Resources
One Natural Resource Way
Springfield, Illinois 62702-1271

Dear Acting Director Rosenthal:

The Mississippi River Project intends to revise its Master Plan (MP). We are also reviewing the 1989 Shoreline Management Plan (SMP) for potential revision in 2016 concurrent to the MP. We began the revision process this past October and we anticipate this will take two years to complete. We look forward to working with your agency and staff during this process.

The MP is the required U.S. Army Corps of Engineers (Corps) document that conceptually establishes and guides the orderly development, administration, maintenance, preservation, enhancement, and management of all natural, cultural, and recreational resources on the Project's 55,000 acres federal public lands and associated Project waters between Guttenberg, Iowa and Saverton, Missouri. Large scale revisions of the Mississippi River Project MP have not been completed since the early 1970s with the Land Use Allocation Plan (LUAP) being the latest update completed in 1989.

The SMP provides guidance for the management, protection and preservation of the Mississippi River's environment, while allowing a balanced use of the shoreline. This plan is separate from the MP but references the MP land use classifications. It designates protected portions of the federal fee title lands under jurisdiction of the Corps as well as guiding private-exclusive use of other Corps lands. Private-exclusive use involves placing private recreational structures or pursuing certain activities that are limited to the individual and are usually not available to the general public. The SMP discusses conditions and restrictions of such private exclusive use. The last SMP was approved in 1989.

General information about master planning, fact sheets, and public input forms for the MP revision along with the currently approved plans are available at www.missriver.org. This website will be updated periodically with additional information on public involvement and posting of plans for review when drafted.

We feel it's important to receive direct involvement from your agency to ensure that any interests you may have in the Mississippi River Project area are considered during this process. Please designate a point(s) of contact within your organization, as we plan to conduct interagency meetings in the near future.

We will keep you informed on the status of this planning effort as it progresses. Should you have any questions or concerns, my point of contact for this effort is Mr. Joseph Lundh. He can be reached at [redacted] or [redacted] Please advise Mr. Lundh if you would like him to use a particular point of contact with your agency. Please don't hesitate to contact me if there is anything I can assist with at [redacted]

Sincerely,

Original Signed By

Kelly R. Thomas
Natural Resource Section Chief
Mississippi River Project

Copy Furnished:

Ann Holtrop, Acting Chief Div of Natural Heritage

Michael Mason, Chief Division of Forestry

John Buhnerkempe, Chief Division of Wildlife Resources

Scott Schaeffer, Wildlife Biologist

Kevin Oller, Wildlife Biologist

Jeff Horn, Wildlife Biologist

Tim Krumwiede, Wildlife Biologist

## DISTRIBUTION LIST

| Addressed to: | Copy furnished: |
|---|---|
| Illinois | |
| Acting Director Wayne Rosenthal<br>Illinois Department of Natural Resources<br>One Natural Resource Way<br>Springfield, Illinois 62702-1271 | Ann Holtrop, Acting Chief Div of Natural Heritage<br>Michael Mason, Chief Division of Forestry<br>John Buhnerkempe, Chief Division of Wildlife Resources<br>Scott Schaeffer, Wildlife Biologist |
| Acting Director Geoffrey Levin<br>Illinois Natural History Survey<br>1816 South Oak Street, MC 652<br>Champaign, Illinois 61820 | Kevin Oller, Wildlife Biologist<br>Jeff Horn, Wildlife Biologist<br>Tim Krumwiede, Wildlife Biologist |
| Missouri | |
| Director Robert Ziehmer<br>Missouri Department of Conservation<br>P.O. Box 179<br>Jefferson City, Missouri 65101 | Janet Sternburg, Policy Coordinator<br>Mike Flaspohler, Wildlife Manager |
| Director Sara Parker Pauley<br>Missouri Department of Natural Resources<br>P.O. Box 176<br>Jefferson City, Missouri 65102 | |
| Iowa | |
| Director Chuck Gipp<br>Iowa Department of Natural Resources<br>Wallace State Office Building<br>502 East 9th Street, 4th Floor<br>Des Moines, Iowa 50319-0034 | Dale Garner, Wildlife Bureau Chief<br>Paul Tauke, Forestry Bureau Chief<br>Jim Jansen, Regional Supervisor NE District<br>Bill Ohde, Regional Supervisor SE District<br>Terry Haindfield, Upper Iowa Unit<br>Curt Kemmerer, Maquoketa Unit<br>Andy Robbins, Odessa Unit<br>Mike Steuck, Regional Supervisor Fisheries<br>Mike Griffin, Mississippi River Biologist |

## DISTRIBUTION LIST CONTINUED

Wisconsin

Secretary Cathy Steep
Wisconsin Department of Natural Resources
101 S. Webster Street
P.O. Box 7921
Madison, Wisconsin 53707-7921

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USFWS

Regional Director Tom Melius
U.S. Fish & Wildlife Service
5600 American Blvd. West, Suite 990
Bloomington, Minnesota 55437-1458

Sabrina Chandler, Upper Mississippi River National Wildlife & Fish Refuge Manager
Timothy Yager, Upper Mississippi River National Wildlife & Fish Refuge Assistant Refuge Manager
Rich King, McGregor District Manager
Ed Britton, Savanna District Manager
Cathy Henry, Port Louisa National Wildlife Refuge Manager
Jason Wilson, Great River National Wildlife Refuge Manager
Kraig McPeak, Field Office Supervisor
Robert Clevenstine, Fish and Wildlife Biologist

---

NRCS

State Conservationist Ivan Dozier
USDA Natural Resources Conservation Services
2118 West Park Court
Champaign, Illinois 61821

State Conservationist Jay Mar
USDA Natural Resources Conservation Services
210 Walnut Street, Room 693
Des Moines, Iowa 50309

State Conservationist J.R. Flores
USDA Natural Resources Conservation Services
Parkade Center, Suite 250
601 Business Loop 70 West
Columbia, Missouri 65203-2546

State Conservationist Jimmy Bramblett

USDA Natural Resources Conservation
Services
8030 Excelsior Drive
Madison, Wisconsin 53717-2906

Ms. Carleen Yocum
U.S. Forest Service
1992 Folwell Avenue
St. Paul, Minnesota 55108

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Director Colin Wellenkamp
Mississippi River Cities & Towns Initiative
St. Louis, Missouri

## Agency Scoping Meeting Invite

DEPARTMENT OF THE ARMY
ROCK ISLAND DISTRICT, CORPS OF ENGINEERS
CLOCK TOWER BUILDING - PO BOX 2004
ROCK ISLAND, IL 61204-2004

REPLY TO
ATTENTION OF

January 26, 2016

Regional Planning and Environmental
Division North (RPEDN)

SEE DISTRIBUTION LIST

The U.S. Army Corps of Engineers, Rock Island District (District) is revising its Mississippi River Project Master Plan (Master Plan). The Master Plan's most recent, large-scale revision occurred in the early 1970s. The planning team anticipates a draft Master Plan with Environmental Assessment (EA) to be completed in 2016.

In accordance with the National Environmental Policy Act (NEPA), the District is preparing an Environmental Assessment (EA) to address impacts associated with the Master Plan revision. Your agency is invited to provide comments and/or input to assist the District with developing the Master Plan and preparing the EA. The District looks forward to working together to ensure that other agency interests are considered and integrated into the final documents.

The Master Plan guides the coordination of project development and management of all natural, cultural, and modern man-made land and water resources on the Mississippi River Project's 55,000 acres of Federal public lands and associated waters between Guttenberg, Iowa, and Saverton, Missouri (Encl 1). The Master Plan identifies conceptual types and levels of activities but does not address designs or estimated costs. Public lands are classified into management categories called "land use classifications" (Encl 2). Classifications are based upon available resources and public needs and provide for full utilization while protecting Project resources. The 1989 Land Use Allocation Plan (LUAP) provided the most current update to mapping and classifications.

The purpose of the revision is to bring the Master Plan into compliance with current Corps' policies and regulations, identify management opportunities and constraints, determine user needs and characteristics, and balance all of the above while protecting cultural and natural resources, thus providing sound stewardship for the future.

The EA will address impacts associated with land use classification changes. Two alternatives will be evaluated:

1) No Action: There would be no revision to the existing Master Plan, management will continue as it stands currently. No new resource classification, resources objectives, or assessment would occur.
2) Revise the 1970s Master Plan and 1989 LUAP: This preferred alternative would:
   A. revise the existing master plan document;
   B. include changes in land classifications;
   C. recommend future actions at existing recreation areas; and
   D. recommend natural and cultural resource management improvements.

The primary benefit of revising the current Master Plan would be to reflect changes in recreation facilities, the environment, economic conditions, and visitation patterns. The District anticipates the preferred alternative will have no significant adverse impacts to the quality of the human environment. The District also anticipates that revising the Master Plan will have "no effect" to any threatened or endangered species since the plan serves as a guide for project development and management. The US Fish and Wildlife Service's endangered species website indicated there are 19 species listed as either candidate, threatened, or endangered in project area (Enclosure 3).

As a part of continued coordination, Master Plan and EA agency meetings will be held to review draft mapping classifications including Environmentally Sensitive Areas; discuss strategic portions of the draft plan; elicit feedback regarding management area sections; and answer questions. Read ahead portions of the plan and the maps will be provided at least 2 weeks prior to each meeting at the following direct web link:
http://www.mvr.usace.army.mil/Missions/Recreation/MississippiRiverProject/MasterPlan/Coordination.aspx.

Selected dates, times, and locations for Master Plan agency meetings are:

***February 25, 2016 - Pools 16-19***
9:00 a.m. – no later than 3:00 p.m. with lunch break
USFWS National Wildlife Refuge
Port Louisa Office
10728 County Road X61
Wapello, IA 52653

***March 9, 2016 - Pools 20-22***
9:00 a.m. – no later than 3:00 p.m. with lunch break
Quincy Army Reserve Center
2611 Weiss Lane
Quincy, IL 62301
Advanced Registration required by Feb 19, 2016
Contact Joe Lundh, missrivermp@usace.army.mil, 309-794-4528

***March 24, 2016, Pools 11-15***
9:00 a.m. – no later than 3:00 p.m. with lunch break
USFWS Upper Mississippi River National Wildlife & Fish Refuge
Savanna District Office
7071 Riverview Road
Thomson, IL 61285

The land classifications established through the Master Plan may have important implications for surrounding communities, parks, businesses, and natural areas. The District requests your comments to assist in developing the proposed Master Plan revision and preparing an EA. Comments should include any potential impacts land classification changes may have on any significant natural or manmade resources. Your comments will contribute to the Master Planning process as well as a thorough environmental evaluation.

The District would greatly appreciate your timely review of this information and a written response for inclusion in the Master Plan and EA. Please provide your written recommendations, comments, and concerns relative to resources in your area of expertise no later than May 11, 2016 to Wendy Frohlich of our Environmental Compliance Branch, [redacted] or write to our address, ATTN: Environmental Compliance Branch (Frohlich).

Public and Agency Review of the Final Master Plan and EA is scheduled for later in 2016. If you have any questions, we invite you to attend one of the agency meetings or contact Mrs. Frohlich.

Sincerely,

Kenneth A. Barr
Chief, Environmental Planning Branch (RPEDN)

# US Army Corps of Engineers
## Fee Title Lands Along the Mississippi River


ENCLOSURE 1

# The Master Planning Process

## What is a Master Plan?

A Master Plan (MP) is the document that conceptually establishes and guides the orderly development, administration, maintenance, preservation, enhancement, and management of all natural, cultural, and recreational resources of a U.S. Army Corps of Engineers (Corps) water resource project. It is not a plan for navigation (locks, dams and associated infrastructure for commercial barge traffic), flood risk management (such as levees in the PL84-99 Program), or water level management which are all addressed in other guidance documents. The existing Master Plan is available online at www.missriver.org.

## Why do we need a new Master Plan?

The current Mississippi River Master Plan was largely completed from 1969-1972 and is used as guide for recreational and environmental stewardship decisions. The Land Use Allocation Plan, the latest major update to the MP, was completed in 1989, along with Shoreline Management Plan which is a separate but related plan. Because of the age of the MP, it includes dated information on cultural resources, invasive species, endangered species, wildlife habitat value, jurisdictional wetlands, and other environmental features that are critical. The MP revision will focus on these important issues as well as focusing on updating the recreation analysis. A new plan will also provide an opportunity for current expressed public input.

## What are Master Plan Land Classifications?

The MP identifies management classifications for Project lands which provide for full utilization while protecting Project resources. This classification determines what types of developments are permitted (for instance campgrounds are permitted in recreation intensive use areas but not in wildlife management areas). Corps staff will reassess all Project land's environmental attributes, recreational features, public needs, etc. in context of current policies to determine revised land use classifications.

## How will public be involved?

Public input is critical throughout the MP revision process. This process began in January 2015 and completion is anticipated in the fall of 2016. We ask that you visit our website at www.missriver.org for the latest information on these plans. Public input will be sought through these means: comment forms online; written comments via mail or e-mail; and public scoping open houses. We want to know your vision for the future of the Project's recreation and natural resources. To submit comments and/or be added to an email list to receive updates and notifications please visit the website or

US Army Corps of Engineers
Rock Island District

**Mississippi River Project Office**
**PO Box 534, 25549 182nd Street, Pleasant Valley, Iowa, 52767**
**Phone: (309) 794-4527**
**Website: www.missriver.org**
**Email: missrivermp@usace.army.mil**

**ENCLOSURE 2**

contact the Project Office.

## Master Plan Land Classifications

**Project Operations**. This classification category should include those lands required for the dam, spillway, offices, maintenance facilities and other areas that are used solely for project operations.

**High Density Recreation.** Land developed for intensive recreational activities by the visiting public, including day use areas and/or campgrounds. These could include areas for concessions (marinas, resorts, etc.), and quasi-public development.

**Mitigation.** This will only include land acquired or designated specifically for mitigation.

**Environmental Sensitive Areas.** These are areas where scientific, ecological, cultural or aesthetic features have been identified. These areas must be considered by management to ensure the sensitive areas are not adversely impacted.

**Multiple Resource Management.** Lands managed for one or more of, but not limited to, these activities:

(a) Low Density Recreation – Lands with minimal development or infrastructure that support passive public recreational use (e.g. hiking, primitive camping, wildlife observation, hunting)

(b) Wildlife Management –Lands designated for stewardship of fish and wildlife resources

(c) Vegetative Management – Lands designated for stewardship of forest, prairie and other native vegetative cover

(d) Future or Inactive Recreation Areas - recreation areas planned for the future or that have been temporarily closed. These lands will be classified as multiple resource management in the interim

**Water Surface.** There are four possible sub-classifications.

(a) Restricted – Water areas restricted for project operations, safety, and security purposes

(b) Designated No-Wake – To protect environmentally- sensitive shoreline areas, recreational water access areas from disturbance, and/or public safety

(c) Fish and Wildlife Sanctuary – Annual or seasonal restrictions on areas to protect fish and wildlife species during periods of migration, resting, feeding, nesting, and/or spawning

(d) Open Recreation – Those waters available for year-round or seasonal water-based recreational use

**All information regarding land classification is derived from current regulations (EP 1130-2-550, 30 Jan 2013).*

US Army Corps of Engineers
Rock Island District

**Mississippi River Project Office**
**PO Box 534, 25549 182nd Street, Pleasant Valley, Iowa, 52767**
**Phone: (309) 794-4527**
**Website: www.missriver.org**
**Email: missrivermp@usace.army.mil**

**ENCLOSURE 2**

# United States Department of the Interior

FISH AND WILDLIFE SERVICE
Illinois-Iowa Ecological Services Field Office
Illinois & Iowa Ecological Services Field Office
1511 47th Ave
Moline, IL 61265-7022
Phone: (309) 757-5800 Fax: (309) 757-5807


In Reply Refer To: March 05, 2021

Consultation Code: 03E18000-2021-SLI-0286

Event Code: 03E18000-2021-E-02188

Project Name: Mississippi River Project Master Plan

Subject: Updated list of threatened and endangered species that may occur in your proposed project location or may be affected by your proposed project

To Whom It May Concern:

The attached species list identifies any federally threatened, endangered, proposed and candidate species that may occur within the boundary of your proposed project or may be affected by your proposed project. The list also includes designated critical habitat if present within your proposed project area or affected by your project. This list is provided to you as the initial step of the consultation process required under section 7(c) of the Endangered Species Act, also referred to as Section 7 Consultation.

Section 7 of the Endangered Species Act of 1973 requires that actions authorized, funded, or carried out by Federal agencies not jeopardize federally threatened or endangered species or adversely modify designated critical habitat. To fulfill this mandate, Federal agencies (or their designated non-federal representative) must consult with the Service if they determine their project “may affect” listed species or critical habitat.

Under 50 CFR 402.12(e) (the regulations that implement Section 7 of the Endangered Species Act) the accuracy of this species list should be verified after 90 days. This verification can be completed formally or informally. You may verify the list by visiting the ECOS-IPaC website http://ecos.fws.gov/ipac/ at regular intervals during project planning and implementation and completing the same process you used to receive the attached list. As an alternative, you may contact this Ecological Services Field Office for updates.

Please use the species list provided and visit the U.S. Fish and Wildlife Service’s Region 3 Section 7 Technical Assistance website at - http://www.fws.gov/midwest/endangered/section7/s7process/index.html. This website contains step-by-step instructions which will help you determine if your project will have an adverse effect on listed species and will help lead you through the Section 7 process.

For all wind energy projects, please contact this field office directly for assistance, even if no federally listed plants, animals or critical habitat are present within your proposed project or may be affected by your proposed project.

Although no longer protected under the Endangered Species Act, be aware that bald eagles are protected under the Bald and Golden Eagle Protection Act (16 U.S.C. 668 et seq.) and Migratory Bird Treaty Act (16 U.S.C. 703 et seq), as are golden eagles. Projects affecting these species may require measures to avoid harming eagles or may require a permit. If your project is near an eagle nest or winter roost area, see our Eagle Permits website at http://www.fws.gov/midwest/midwestbird/EaglePermits/index.html to help you determine if you can avoid impacting eagles or if a permit may be necessary.

We appreciate your concern for threatened and endangered species. Please include the Consultation Tracking Number in the header of this letter with any request for consultation or correspondence about your project that you submit to our office.

Attachment(s):

- Official Species List
- USFWS National Wildlife Refuges and Fish Hatcheries
- Wetlands

# Official Species List

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

Illinois-Iowa Ecological Services Field Office
Illinois & Iowa Ecological Services Field Office

1511 47th Ave

Moline, IL 61265-7022

(309) 757-5800

This project's location is within the jurisdiction of multiple offices. Expect additional species list documents from the following offices, and expect that the species and critical habitats in each document reflect only those that fall in the office's jurisdiction:

Green Bay Ecological Services Field Office
2661 Scott Tower Drive

New Franken, WI 54229-9565

(920) 866-1717

Missouri Ecological Services Field Office
101 Park Deville Drive

Suite A

Columbia, MO 65203-0057 (573)
234-2132

Southern Illinois Sub-Office
Southern Illinois Sub-office

8588 Route 148

Marion, IL 62959-5822

(618) 997-3344

## Project Summary

Consultation Code: 03E18000-2021-SLI-0286

Event Code: 03E18000-2021-E-02188

Project Name: Mississippi River Project Master Plan

Project Type: LAND - MANAGEMENT PLANS

Project Description: Master Plan revision Project
Location:

Approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/@41.03989509832543,-91.07848220585836,14z


Counties: Illinois, Iowa, Missouri, and Wisconsin

## Endangered Species Act Species

There is a total of 18 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries[1], as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

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1. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

## Mammals

| NAME | STATUS |
|---|---|
| Gray Bat Myotis grisescens | Endangered |

No critical habitat has been designated for this species.
Species profile: https://ecos.fws.gov/ecp/species/6329

Indiana Bat Myotis sodalis — Endangered

There is final critical habitat for this species. The location of the critical habitat is not available. Species profile: https://ecos.fws.gov/ecp/species/5949

Northern Long-eared Bat Myotis septentrionalis — Threatened

No critical habitat has been designated for this species.
Species profile: https://ecos.fws.gov/ecp/species/9045

## Birds

| NAME | STATUS |
|---|---|
| Whooping Crane Grus americana | Experimental |

Population: U.S.A. (AL, AR, CO, FL, GA, ID, IL, IN, IA, KY, LA, MI, MN, MS, MO, NC, NM, OH, SC, TN, UT, VA, WI, WV, western half of WY) — Population, Non-Essential

No critical habitat has been designated for this species.
Species profile: https://ecos.fws.gov/ecp/species/758

## Reptiles

| NAME | STATUS |
|---|---|
| Eastern Massasauga (=rattlesnake) Sistrurus catenatus | Threatened |

No critical habitat has been designated for this species.
Species profile: https://ecos.fws.gov/ecp/species/2202

## Fishes

| NAME | STATUS |
|---|---|
| Pallid Sturgeon Scaphirhynchus albus | Endangered |

No critical habitat has been designated for this species.
Species profile: https://ecos.fws.gov/ecp/species/7162

## Clams

| NAME | STATUS |
|---|---|
| Higgins Eye (pearlymussel) Lampsilis higginsii | Endangered |

No critical habitat has been designated for this species.
Species profile: https://ecos.fws.gov/ecp/species/5428

Sheepnose Mussel Plethobasus cyphyus — Endangered

No critical habitat has been designated for this species.
Species profile: https://ecos.fws.gov/ecp/species/6903

Spectaclecase (mussel) Cumberlandia monodonta — Endangered

No critical habitat has been designated for this species.
Species profile: https://ecos.fws.gov/ecp/species/7867

## Snails

| NAME | STATUS |
|---|---|
| Iowa Pleistocene Snail Discus macclintocki | Endangered |

No critical habitat has been designated for this species.
Species profile: https://ecos.fws.gov/ecp/species/534

## Insects

| NAME | STATUS |
|---|---|
| Hine's Emerald Dragonfly Somatochlora hineana | Endangered |

There is final critical habitat for this species. The location of the critical habitat is not available. Species profile: https://ecos.fws.gov/ecp/species/7877

Rusty Patched Bumble Bee Bombus affinis — Endangered

No critical habitat has been designated for this species.
Species profile: https://ecos.fws.gov/ecp/species/9383

## Flowering Plants

| NAME | STATUS |
|---|---|
| Decurrent False Aster Boltonia decurrens | Threatened |

No critical habitat has been designated for this species.
Species profile: https://ecos.fws.gov/ecp/species/7705

Eastern Prairie Fringed Orchid Platanthera leucophaea — Threatened

No critical habitat has been designated for this species.
Species profile: https://ecos.fws.gov/ecp/species/601

Mead's Milkweed Asclepias meadii — Threatened

No critical habitat has been designated for this species.
Species profile: https://ecos.fws.gov/ecp/species/8204

Northern Wild Monkshood Aconitum noveboracense — Threatened

No critical habitat has been designated for this species.

Species profile: https://ecos.fws.gov/ecp/species/1450

Prairie Bush-clover Lespedeza leptostachya — Threatened

No critical habitat has been designated for this species.

Species profile: https://ecos.fws.gov/ecp/species/4458

Western Prairie Fringed Orchid Platanthera praeclara — Threatened

No critical habitat has been designated for this species.

Species profile: https://ecos.fws.gov/ecp/species/1669

## Critical habitats

THERE ARE NO CRITICAL HABITATS WITHIN YOUR PROJECT AREA UNDER THIS OFFICE'S JURISDICTION.

# USFWS National Wildlife Refuge Lands And Fish Hatcheries

Any activity proposed on lands managed by the National Wildlife Refuge system must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

The following FWS National Wildlife Refuge Lands and Fish Hatcheries lie fully or partially within your project area:

| FACILITY NAME | ACRES |
|---|---|
| DRIFTLESS AREA NATIONAL WILDLIFE REFUGE<br>https://www.fws.gov/refuges/profiles/index.cfm?id=32595 | 28.194 |
| DRIFTLESS AREA NATIONAL WILDLIFE REFUGE<br>https://www.fws.gov/refuges/profiles/index.cfm?id=32596 | 912.029 |
| GREAT RIVER NATIONAL WILDLIFE REFUGE<br>https://www.fws.gov/refuges/profiles/index.cfm?id=33640 | 8,314.081 |
| PORT LOUISA NATIONAL WILDLIFE REFUGE<br>https://www.fws.gov/refuges/profiles/index.cfm?id=33630 | 17,958.272 |
| UPPER MISSISSIPPI RIVER NATIONAL WILDLIFE AND FISH REFUGE<br>https://www.fws.gov/refuges/profiles/index.cfm?id=32574 | 29,628.686 |
| UPPER MISSISSIPPI RIVER NATIONAL WILDLIFE AND FISH REFUGE<br>https://www.fws.gov/refuges/profiles/index.cfm?id=32579 | 48,135.931 |
| UPPER MISSISSIPPI RIVER NATIONAL WILDLIFE AND FISH REFUGE<br>https://www.fws.gov/refuges/profiles/index.cfm?id=32572 | 31,490.922 |

1

# Wetlands

Impacts to NWI wetlands and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

For more information please contact the Regulatory Program of the local U.S. Army Corps of Engineers District.

Please note that the NWI data being shown may be out of date. We are currently working to update our NWI data set. We recommend you verify these results with a site visit to determine the actual extent of wetlands on site.

Due to your project's size, the list below may be incomplete, or the acreages reported may be inaccurate. For a full list, please contact the local U.S. Fish and Wildlife office or visit https://www.fws.gov/wetlands/data/mapper.HTML

LAKE

- L1UBH
- L1UBHh
- L1UBHx
- L2ABGh
- L2UBG
- L2UBGx
- L2UBH
- L2USC
- L2USCh

FRESHWATER POND

- PABF
- PABFh
- PABFx
- PABG
- PABGh

FRESHWATER EMERGENT WETLAND

- PEM1A

## Mississippi River Project Master Plan
## Distribution List

| Organization | First Name | Last Name |
|---|---|---|
| City of Albany | Brian | Rowland |
| City of Bellevue | Loras | Herrig |
| City of Bettendorf | Decker | Ploehn |
| City of Burlington | Jim | Ferneau |
| City of Camanche | Tom | Roth |
| City of Clinton | Mark | Vulich |
| City of Cordova | Dean | Moyer |
| City of Davenport | Corri | Spiegel |
| City of Dubuque | Roy | Buol |
| City of East Moline | John | Thodos |
| City of Fulton | Larry | Russell |
| City of Guttenberg | Russell | Loven |
| City of Guttenberg | Mary | Willett |
| City of Hampton | Kevin | Irby |
| City of Hannibal | Douglas | Warren |
| City of Keokuk | Tom | Marion |
| City of Le Claire | Bob | Scannell |
| City of Moline | Lew | Steinbrecher |
| City of Port Byron | Kevin | Klute |
| City of Princeton | Roger | Woomert |
| City of Quincy | Kyle | Moore |
| City of Rapids City | Greg | Rankin |
| City of Rock Island | Thomas | Thomas |
| City of Sabula | Troy | Hansen |
| City of Savanna | Tony | McCombie |
| City of Thomson | Vicky | Trager |
| Clinton County Conservation Board | Walt | Wickham |
| Des Moines County Conservation Board | Joel | Behne |
| Des Moines County Conservation Board | Chris | Lee |
| Dubuque City Council | Ric | Jones |
| Dubuque County Conservation Board | Brian | Preston |
| Illinois Department of Com/Econ/Dev | Jacqui | Bevelheimer |
| Illinois Department of Natural Resources | Mark | Allessi |
| Illinois Department of Natural Resources | John | Buhnerkempe |
| Illinois Department of Natural Resources | Steve | Felt |
| Illinois Department of Natural Resources | Dave | Hahne |
| Illinois Department of Natural Resources | Jeff | Harris |
| Illinois Department of Natural Resources | Ann | Holtrop |
| Illinois Department of Natural Resources | Jeff | Horn |
| Illinois Department of Natural Resources | Kevin | Irons |
| Illinois Department of Natural Resources | Tim | Krumwiede |
| Illinois Department of Natural Resources | Scott | Lamer |
| Illinois Department of Natural Resources | Dan | Ludwig |
| Illinois Department of Natural Resources | Rob | Maher |
| Illinois Department of Natural Resources | Michael | Mason |

**ENCLOSURE 4**

| Organization | First Name | Last Name |
|---|---|---|
| Illinois Department of Natural Resources | Barrie | McVey |
| Illinois Department of Natural Resources | Tony | Newton |
| Illinois Department of Natural Resources | Kevin | Oller |
| Illinois Department of Natural Resources | Todd | Rettig |
| Illinois Department of Natural Resources | Wayne | Rosenthal |
| Illinois Department of Natural Resources | Scott | Schaeffer |
| Illinois Department of Natural Resources | Randy | Timmons |
| Illinois Department of Natural Resources | Ed | Zwicker |
| Illinois Department of Natural Resources | Palisades | |
| Illinois Historic Preservation Agency | Rachel | Leibowitz |
| Illinois Natural History Survey | Geoffrey | Levin |
| Iowa Department of Natural Resources | Dave | Asche |
| Iowa Department of Natural Resources | Dave | Bierman |
| Iowa Department of Natural Resources | Royce | Bowman |
| Iowa Department of Natural Resources | David | Bridges |
| Iowa Department of Natural Resources | Cody | Brothersen |
| Iowa Department of Natural Resources | Dale | Garner |
| Iowa Department of Natural Resources | Chuck | Gipp |
| Iowa Department of Natural Resources | Mike | Griffin |
| Iowa Department of Natural Resources | Scott | Gritters |
| Iowa Department of Natural Resources | Terry | Haindfield |
| Iowa Department of Natural Resources | Kirk | Hansen |
| Iowa Department of Natural Resources | Nate | Hoogeveen |
| Iowa Department of Natural Resources | Jim | Jansen |
| Iowa Department of Natural Resources | Curt | Kemmerer |
| Iowa Department of Natural Resources | Lisa | Louck |
| Iowa Department of Natural Resources | Bill | Ohde |
| Iowa Department of Natural Resources | Karen | Osterkamp |
| Iowa Department of Natural Resources | Kelly | Poole |
| Iowa Department of Natural Resources | Gwen | Prentice |
| Iowa Department of Natural Resources | Andy | Robbins |
| Iowa Department of Natural Resources | Joseph | Sanfilippo |
| Iowa Department of Natural Resources | Christine | Schwake |
| Iowa Department of Natural Resources | Jeff | Seago |
| Iowa Department of Natural Resources | Ken | Snyder |
| Iowa Department of Natural Resources | Mike | Steuck |
| Iowa Department of Natural Resources | Steve | Swinconos |
| Iowa Department of Natural Resources | Paul | Tauke |
| Iowa Department of Natural Resources | Mark | Vitosh |
| Jackson County Conservation Board | Daryl | Parker |
| Loud Thunder Forest Preserve | Ben | Mills |
| Louisa County Conservation Board | Katie | Hammond |
| Mississippi River Cities & Towns Initiative | Colin | Wellenkamp |
| Missouri Department of Conservation | Mike | Flaspohler |
| Missouri Department of Conservation | Travis | Moore |
| Missouri Department of Conservation | Sara | Parker Pauley |
| Missouri Department of Conservation | Janet | Sternburg |
| Missouri Department of Natural Resources | Bryan | Hopkins |

**ENCLOSURE 4**

| Organization | First Name | Last Name |
|---|---|---|
| Missouri State Historic Preservation Office | Dr. Toni | Prawl |
| Muscatine County Conservation Board | Curt | Weiss |
| Natural Resources Conservation Service | Rick | Ellsmore |
| Natural Resources Conservation Service | Jimmy | Bramblett |
| Natural Resources Conservation Service | Kevin | Dacey |
| Natural Resources Conservation Service | Ivan | Dozier |
| Natural Resources Conservation Service | J.R. | Flores |
| Natural Resources Conservation Service | Jay | Mar |
| O'Leary's Lake Recreation Area | | |
| Potosi Canal/Potosi Point | Frank | Fiorenza |
| Quincy Park District | Rome | Frericks |
| Bob Bangert Park c/o Quincy Park District | John | Frankenhoff |
| Riverview Park/City of Clinton | Joshua | Eggers |
| Riverview Park/City of Clinton | Greg | Obren |
| Rock Island County Forest Preserve Commission | Jeff | Craver |
| Rock Island County Soil & Water Conservation Dist | Sally | Ferguson |
| Scott County Conservation Board | Roger | Kean |
| Scott County Conservation Board | Dave | Murcia |
| State Historical Society of Iowa | Daniel | Higginbottom |
| Iowa Tribe of Kansas and Nebraska, THPO | Lance | Foster |
| US Department of Transportation | Floyd | Miras |
| US Department of Transportation | William | Paape |
| US Environmental Protection Agency | Kathleen | Kowal |
| US Environmental Protection Agency | Larry | Shepard |
| US Environmental Protection Agency | Kenneth | Westlake |
| US Fish and Wildlife Service | Ed | Britton |
| US Fish and Wildlife Service | Sabrina | Chandler |
| US Fish and Wildlife Service | Robert | Clevenstine |
| US Fish and Wildlife Service | Peter | Fasbender |
| US Fish and Wildlife Service | Cathy | Henry |
| US Fish and Wildlife Service | Aleshia | Kenney |
| US Fish and Wildlife Service | Rich | King |
| US Fish and Wildlife Service | Matthew | Mangan |
| US Fish and Wildlife Service | Kraig | McPeak |
| US Fish and Wildlife Service | Amy | Salveter |
| US Fish and Wildlife Service | Sarah | Schmucker |
| US Fish and Wildlife Service | Jason | Wilson |
| US Fish and Wildlife Service | Timothy | Yager |
| US Forest Service | Kathleen | Atkinson |
| US Forest Service | Jeremy | Peichel |
| US Geological Survey | Mark | Gaikowski |
| Village of Andalusia | Curtis | Morrow |
| Wisconsin Department of Natural Resources | Brenda | Kelly |
| Wisconsin Historical Society | Daina | Penkiunas |

**ENCLOSURE 4**

## Initial Tribal Notification Letters

DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS, ROCK ISLAND DISTRICT
PO BOX 2004 CLOCK TOWER BUILDING
ROCK ISLAND, ILLINOIS 61204-2004

May 1, 2015

Mr. Darrell "Curly" Youpee, THPO
Assiniboine and Sioux Tribes of the Fort Peck Indian Reservation
P.O. Box 1027
Poplar, MT 59255

Dear Mr. Youpee:

The Mississippi River Project intends to revise its Master Plan (MP). We are also reviewing the 1989 Shoreline Management Plan (SMP) for potential revision in 2016 concurrent to the MP. We began the revision process and we anticipate this will take two years to complete. We look forward to working with your tribe during this process.

The MP is the required U.S. Army Corps of Engineers (Corps) document that conceptually establishes and guides the orderly development, administration, maintenance, preservation, enhancement, and management of all natural, cultural, and recreational resources on the Project's 55,000 acres federal public lands and associated Project waters between Guttenberg, Iowa and Saverton, Missouri. Large scale revisions of the Mississippi River Project MP have not been completed since the early 1970s with the Land Use Allocation Plan (LUAP) being the latest update completed in 1989.

The SMP provides guidance for the management, protection and preservation of the Mississippi River's environment, while allowing a balanced use of the shoreline. This plan is separate from the MP but references the MP land use classifications. It designates protected portions of the federal fee title lands under jurisdiction of the Corps as well as guiding private-exclusive use of other Corps lands. Private-exclusive use involves placing private recreational structures or pursuing certain activities that are limited to the individual and are usually not available to the general public. The SMP discusses conditions and restrictions of such private exclusive use. The SMP was last approved in 1989.

General information about master planning, fact sheets, and public input forms for the MP revision along with the currently approved plans are available at www.missriver.org. This website will be updated periodically with additional information on public involvement and posting of plans for review when drafted.

We will be announcing dates and locations for public scoping open house meetings soon. We encourage involvement from your tribe in these and future opportunities to ensure that any interests you may have in the Mississippi River Project area are considered during this process.

We will keep you informed on the status of this planning effort as it progresses. Should you have any questions or concerns, the general point of contact for this effort is Mr. Joseph Lundh. He can be reached at [redacted] or [redacted] Please advise Mr. Lundh if you would like him to use a particular point of contact. Please don't hesitate to contact me if there is anything I can assist with at [redacted]

Sincerely,

ORIGINAL SIGNED BY

Kelly R. Thomas
Natural Resource Section Chief
Mississippi River Project

## DISTRIBUTION LIST

Mr. Darrell "Curly" Youpee, THPO
Assiniboine and Sioux Tribes of the Fort Peck Indian Reservation
P.O. Box 1027
Poplar, MT 59255

Mr. Floyd Azure, Chairman
Assiniboine and Sioux Tribes of the Fort Peck Indian Reservation
P.O. Box 1027
Poplar, MT 59255

John Barrett, Chairman
Citizen Potawatomi Nation
1601 S. Gordon Cooper Drive
Shawnee, OK 74801

Ms. Kelli Mosteller, THPO
Citizen Potawatomi Nation
1601 S. Gordon Cooper Drive
Shawnee, OK 74801

Chairman Harold Frank
Forest County Potawatomi Community
P.O. Box 340
Crandon, WI 54520

Chairperson Kenneth Meshigaud
Hannahville Indian Community
N14911 Hannahville B1 Rd.
Wilson, MI 49896

President Wilford Cleveland
Ho-Chunk Nation of Wisconsin
P.O. Box 667
Black River Falls, WI 54615

Mr. William Quackenbush, THPO
Ho-Chunk Nation of Wisconsin
West 9814 Airport Road
Black River Falls, WI 54615

Mr. Alan Kelley, THPO
Iowa Tribe of Kansas and Nebraska
3345 Thrasher Rd.
White Cloud, KS 66094

Chairman Timothy Rhodd
Iowa Tribe of Kansas and Nebraska
3345 Thrasher Rd.
White Cloud, KS 66094

Chairperson Janice Rowe-Kurak
Iowa Tribe of Oklahoma
Rt. 1, Box 721
Perkins, OK 74059

Chief John P. Froman
Peoria Tribe of Indians of Oklahoma
P.O. Box 1527
Miami, OK 74355

Chairperson Steve Ortiz
Prairie Band of Potawatomi Nation
16281 Q Road
Mayetta, KS 66509

Ms. Sandra Massey, NAGPRA Coordinator
Sac & Fox Nation of Oklahoma
Rt. 2, Box 246
Stroud, OK 74079

George Thurman, Principal Chief
Sac and Fox Nation
Rt. 2, Box 246
Stroud, OK 74079

Chairperson Twen Barton
Sac and Fox Nation of Missouri in Kansas and Nebraska
305 N. Main Street
Reserve, KS 66434

Chief Gailey Wanatee
Sac and Fox Tribe of the Mississippi in Iowa
349 Meskwaki Road
Tama, IA 52339

Chairman John Blackhawk
Winnebago Tribe of Nebraska
P.O. Box 687
Winnebago, NE 68071

Ms. Emily DeLeon, THPO
Winnebago Tribe of Nebraska
P.O. Box 687
Winnebago, NE 68071

## Historic Preservation Agency Letters

DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS, ROCK ISLAND DISTRICT
PO BOX 2004 CLOCK TOWER BUILDING
ROCK ISLAND, ILLINOIS 61204-2004

May 1, 2015

Dr. Rachel Leibowitz,
Illinois Historic Preservation Agency
1 Old State Capitol Plaza
Springfield, IL 62701-1507

Dear Dr. Leibowitz:

The Mississippi River Project intends to revise its Master Plan (MP). We are also reviewing the 1989 Shoreline Management Plan (SMP) for potential revision in 2016 concurrent to the MP. We began the revision process and we anticipate this will take two years to complete. We look forward to working with your agency and staff during this process.

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We encourage involvement from your agency to ensure that any interests you may have in the Mississippi River Project area are considered during this process.

We will keep you informed on the status of this planning effort as it progresses. Should you have any questions or concerns, my point of contact for this effort is Mr. Joseph Lundh. He can be reached at [redacted] Please advise Mr. Lundh if you would like him to use a particular point of contact with your agency. Please don't hesitate to contact me if there is anything I can assist with at [redacted]

Sincerely,

ORIGINAL SIGNED BY

Kelly R. Thomas
Natural Resource Section Chief
Mississippi River Project

**DISTRIBUTION LIST**

Dr. Rachel Leibowitz,
Illinois Historic Preservation Agency
1 Old State Capitol Plaza
Springfield, IL 62701-1507

Mr. John Doershuk, State Archaeologist
Office of the State Archaeologist
700 Clinton Street Building - UofI
Iowa City, IA 52242

Mr. Dan Higginbottom, Archaeologist
State Historic Preservation Office (Iowa)
600 East Locust Street
Des Moines, IA 50319

Dr. Toni Prawl,
State Historic Preservation Office (Missouri)
PO Box 176
Jefferson City, MO 65102

Ms. Kathy Gourley, Archaeologist
State Historical Society of Iowa
600 East Locust Street
Des Moines, IA 50319-0290

Mr. Chip Brown, Historic Preservation
State Historical Society of Wisconsin
816 State Street, Room 306
Madison, WI 53706-1482

DEPARTMENT OF THE ARMY
ROCK ISLAND DISTRICT, CORPS OF ENGINEERS
CLOCK TOWER BUILDING - PO BOX 2004
ROCK ISLAND, IL 61204-2004

REPLY TO
ATTENTION OF

September 28, 2015

Regional Planning and Environmental
Division North (RPEDN)

Mississippi River Project

Chairperson John Shotton
Otoe-Missouria Tribe
8151 Hwy 177
Red Rock, OK 74651

Dear Chairperson Shotton,

The U.S. Army Corps of Engineers (Corps), Rock Island District (District) is revising its Mississippi River Project (Project) Master Plan (Master Plan). The Master Plan's most recent, large-scale revisions occurred in the early 1970s. The planning team anticipates a draft Master Plan with Environmental Assessment (EA) to be complete late spring of 2016.

In accordance with the National Environmental Policy Act (NEPA), the District is preparing an EA to address impacts associated with the Master Plan revision. Your tribe is invited to provide comment to assist the District with developing the Master Plan and preparing the EA. The District looks forward to working together to ensure that tribal interests in the Project are considered and integrated into the final documents.

The Master Plan guides the coordination of project development and management of all natural, cultural, and modern man-made land and water resources on the Project's 55,000 acres of Federal public lands and associated Project waters between Guttenberg, Iowa, and Saverton, Missouri (Encl 1). The Master Plan identifies conceptual types and levels of activities but does not address designs or estimated costs.

The purpose of the revision is to bring the Master Plan into compliance with current Corps' policies and regulations, identify management opportunities and constraints and user needs and characteristics, and to balance all of the above while protecting cultural and natural resources, thus providing sound stewardship for the future.

Public lands are allocated into management categories called "land use classifications" (Encl 2). Classifications are based upon available resources and public needs and provide for full utilization while protecting Project resources. The EA will address impacts associated with land use classification changes. Two alternatives will be evaluated:

1) No Action: There would be no revision to the existing Master Plan. No new resource classification, resources objectives, or assessment would occur.

2) Revise the 1970s Master Plan: This preferred alternative would:
   a. revise the existing master plan document;
   b. include changes in land classifications;
   c. recommend future actions at existing recreation areas; and
   d. recommend natural and cultural resource management improvements.

General information about master planning, fact sheets, and public input forms for the Master Plan revision, along with the currently approved plans, are available at www.missriver.org. This website is updated periodically with additional information on public involvement and posting of draft plans for review.

The District also is reviewing the Project's 1989 Shoreline Management Plan (SMP) for potential revision concurrent with the Master Plan. The SMP guides the management, protection and preservation of the Mississippi River's environment, while allowing a balanced use of its shoreline. The SMP is separate from, but references, the Master Plan land use classifications (Encl 3). The SMP designates protected portions of the Federal fee title lands under jurisdiction of the District and guides private-exclusive use of other District lands.

Please note that the Master Plan is not the same as a Historic Properties Management Plan (HPMP). The most recent revision to the Project's HPMP occurred in 1995; an update to the HPMP is a separate matter that is critical to the Operations and Management of the Mississippi River Project and which will occur at a later date as funding allows. The Master Plan is not intended to serve as an update to the HPMP. Cultural resources are an element in the Master Plan's land classifications and as such, are considered during future developments of managed lands.

**Federal Undertaking**

Pursuant to the National Historic Preservation Act (NHPA) of 1966, as amended, and its implementing regulations, 36 CFR Part 800, the District has determined that these projects have potential to cause effects to archeological and architectural historic properties [36 CFR 800.3(a)(1)] and as a consequence will require a determination of effect within the Area of Potential Effect (APE).

**Area of Potential Effect**

The District has defined the APE as the same as the Mississippi River Project Area (Encl 1).

**Review of Existing Information on Historic Properties**

Preliminary review demonstrates at least 227 archaeological sites are recorded on the Project's Corps fee title lands in the Rock Island District, with many more known sites situated

just outside U.S. Government-owned parcels. Several recorded sites have poorly-defined boundaries or their locations are uncertain, based on archival data or poorly documented non-professional excavations. A spectrum of Upper Mississippi River valley cultural associations and periods are represented in or near the Project, including sites related to the Archaic and Woodland eras; the Oneota tradition; the Sauk and the Meskwaki tribes; and Europeans and Euro-Americans. Several sites have contained human remains.

Several archaeological sites have been recommended or determined National Register of Historic Places (NRHP)-eligible. There are NRHP-listed properties on the Project's fee titled land, including historic districts associated with the lock and dam system, the Rock Island Arsenal, and Mississippi-Palisades State Park. In addition to recorded sites, archival records suggest other important, unverified sites may exist near the Project, such as other historic era American Indian villages or camps and Euro-American industrial and town sites.

**Consulting Parties Invitation**

The Corps identified you as a consulting party for this undertaking (36 CFR 800.2) and invites you to participate in the Section 106 process. Ultimately, the goal of the consultation is to identify any concerns early in the Project planning process and reach mutually agreeable decisions while taking into account the interests of Tribal, State and Federal governments. The Distribution List (Encl 4) reflects other parties that received this mailing.

The District invites you to:

- identify any other consulting parties;
- comment on the District's plan to involve the public by using the District's normal procedures for public involvement under the NEPA; and
- provide input on issues relating to this undertaking's potential effects on historic properties.

With regards to this last point, your tribe is particularly encouraged to assist in identifying historic properties that may have religious and cultural significance [Section 101(d)(6)]. Consultation will inform Master and Shoreline Management Plans that seek to avoid impacting any such sites through their designation as Environmentally Sensitive Areas.

Concerns about confidentiality [36 CFR 800.11(c)] regarding property locations can be addressed under Section 304 of the NHPA, which provides withholding from public disclosure the location of properties under several circumstances, including in cases where it would cause a significant invasion of privacy, impede the use of a traditional religious site by practitioners, endanger the site, etc.

If your tribe is interested in consulting on the Mississippi River Project Master Plan and Shoreline Plan revision project, please provide the Corps with a letter, email, or phone call to that effect within 30 days of receipt of this letter. Please also provide the Corps with a point of contact for future consultation on the project.

If you have any questions regarding this matter, please contact Ms. Cindy Peterson of our Environmental Compliance Branch at [redacted] or in writing to our address, ATTN: Environmental Compliance Branch (Cynthia Peterson).

Sincerely,

ORIGINAL SIGNED BY

Encl (4)

Mark Cornish
Acting Chief, Environmental Planning
Branch (RPEDN)

**DISTRIBUTION LIST**

**Cheyenne River Sioux Tribe**
Chairperson Harold Frazier
Cheyenne River Sioux
PO Box 590
Eagle Butte, SD 57625

**Citizen Potawatomi Nation**
Chairperson John Barrett
Citizen Potawatomi Nation
1601 S. Gordon Cooper Dr.
Shawnee, OK 74801

Kelli Mosteller, THPO
Citizen Potawatomi Nation
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Shawnee OK 74801

**Crow Creek Sioux Tribe**
Chairperson Roxanne Sazue
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**Delaware Nation**
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NAGPRA Director
Delaware Nation
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Anadarko, OK 73005

Ms. Nekole Alligood, Director
Cultural Preservation Department
Delaware Nation
P.O. Box 825
Anadarko, OK 73005

Mr. Jason Ross
Section 106 Manager
Cultural Preservation Department
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**Flandreau Santee Sioux Tribe**
President Anthony Reider
Flandreau Santee Sioux
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Flandreau, SD 57028

Ms. Elise Montoya, THPO
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P.O. Box 283
Flandreau, SD 57028

**Forest County Potawatomi Community**
Chairperson Harold Frank
Forest County Potawatomi Community
P.O. Box 340
Crandon, WI 54520

Ms. Melissa Cook, THPO
Forest County Potawatomi Community
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P.O. Box 340
Crandon, WI 54520

**Fort Peck Assiniboine & Sioux Tribes**
Mr. Rusty Stafne, Chair
Fort Peck Assiniboine & Sioux Tribes
501 Medicine Bear Road
PO Box 1027
Poplar, Montana 58255

Mr. Darrell Youpee, THPO
Fort Peck Assiniboine & Sioux Tribes
501 Medicine Bear Road
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**Ho-Chunk Nation**
Mr. Bill Quackenbush, THPO
Ho-Chunk Nation
P.O. Box 667
Black River Falls, WI 54615

Mr. George Garvin, Repatriation Officer
Ho-Chunk Nation
P.O. Box 667
Black River Falls, WI 54615-0636

1

**ENCLOSURE 4**

President Wilfrid Cleveland
Ho-Chunk Nation
P.O. Box 667
Black River Falls, WI 54615

**Iowa Tribe of Kansas and Nebraska**
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Iowa Tribe of Kansas and Nebraska
3345 B Thrasher Rd.
White Cloud, KS 66094

Mr. Tim Rhodd, Chair
Iowa Tribe of Kansas and Nebraska
3345 B Thrasher Rd
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**Iowa Tribe of Oklahoma**
Dr. Bobi Roush, Cultural Preservation Associate
Cultural Preservation Office
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335588 E. 750 Rd.
Perkins, OK 74059

Dr. Robert Fields, Cultural Preservation Director
Cultural Preservation Office
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Mr. Gary Pratt, Chairperson
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**Lower Brule Sioux Tribe**
Mr. Scott Jones, Administrative Officer
Lower Brule Sioux Tribe
PO Box 187
Lower Brule, SD 57548-0187

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Lower Sioux Indian Community
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Ms. Grace Goldtooth-Campos, THPO
Lower Sioux Indian Community
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**Mendota Mdewakanton Dakota Community**
Chairperson Sharon Lennartson
Mendota Mdewakanton Dakota
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Mendota, MN 55150

**Menominee Indian Tribe of Wisconsin**
Mr. David Grignon, THPO
Menominee Indian Tribe of Wisconsin
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Keshena, WI 54135-0910

Mr. Chad Waukechon, THPO/Cultural Planner
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Keshena, WI 54135-0910

Chairperson Gary Besaw
Menominee Indian Tribe of Wisconsin
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**Miami Tribe of Oklahoma**
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Miami, OK 74354

Ms. Julie Olds, Cultural Resources Officer
Miami Tribe of Oklahoma
202 S. Eight Tribes Trail
Miami, OK 74354

Chief Douglas Lankford
Miami Tribe of Oklahoma
202 S. Eight Tribes Trail
Miami, OK 74354

**Oglala Sioux Tribe**
John Yellow Bird Steele, President
Oglala Sioux Tribe
P.O. Box 2070
Pine Ridge, SD 57770



**ENCLOSURE 4**

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**ENCLOSURE 4**

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**ENCLOSURE 4**

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Ms. Nancy Keller, Treasurer
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Chairperson Brigette Robidoux
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Principal Chief Elizabeth Kay Rhoads
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Tama, IA 52339-9629

Chief Gailey Wanatee
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Mrs. Suzanne Buffalo
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**Santee Sioux Tribe of Nebraska**
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Mr. Felix Kitto
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**Shakopee Mdewakanton Sioux Community of Minnesota**
Chairperson Charles R. Vig
Shakopee Mdewakanton Sioux Community of Minnesota
2330 Sioux Trail NW
Prior Lake, MN 55372

Mr. Leonard Wabasha, Director
Cultural Resources Department
Shakopee Mdewakanton Sioux Community of Minnesota
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**ENCLOSURE 4**

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Chairperson Bruce Renville
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**Spirit Lake Tribe**
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**Standing Rock Sioux Tribe**
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Ms. Waste Win Young, THPO
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**Upper Sioux Community, Minnesota**
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Mr. Marlowe LaBatte, Preservation Officer
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**Winnebago Tribe of Nebraska**
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Ms. Emily Smith-Deleon, THPO
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**Yankton Sioux Tribe**
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Yankton Sioux Tribe
P.O. Box 1153
Wagner, SD 57380

Chairperson Robert Flying Hawk
Yankton Sioux Tribe
P.O. Box 1153
Wagner, SD 57380



**ENCLOSURE 4**

## Correspondence from Pokagon Band of Potawatomi Indians

Pokégnek Bodéwadmik • Pokagon Band of Potawatomi
Department of Language and Culture

32142 Edwards Street • Dowagiac, MI 49047 • www.PokagonBand-nsn.gov
(269) 462-4325 • (269) 783-0452 fax

October 2, 2015

Cynthia Peterson
Department of the Army
U.S. Army Engineer District, Rock Island
Corps of Engineers
Clock Tower Building – PO Box 2004
Rock Island, IL 61201-2004
[redacted]

**RE: Mississippi River Project. Section 106**

Dear Ms. Peterson:

My name is Marcus Winchester and I am the Tribal Historic Preservation Officer for the Pokagon Band of Potawatomi Indians. My position is responsible for handling Section 106 consultation on behalf of the tribe. I am writing to inform you that after reviewing the Mississippi River Project details, we determined that we are unaware of any historical, religious, or culturally significant resources to the Pokagon Band of Potawatomi Indians in the vicinity of the project area. However, if any archaeological resources are uncovered during this undertaking, please contact me immediately. Should you have any other questions, please don't hesitate to contact me at your earliest convenience.

Sincerely,

Marcus Winchester
Tribal Historic Preservation Officer
Pokagon Band of Potawatomi Indians
[redacted]

A proud, compassionate people committed to strengthening our sovereign nation.
A progressive community focused on culture and the most innovative opportunities for all of our citizens.

## Correspondence from Iowa Tribe of Kansas and Nebraska

**From:** Peterson, Cynthia L MVP@MVR
**To:** "Lance Foster"
**Subject:** FW: [EXTERNAL] Mississippi River Project (UNCLASSIFIED)
**Date:** Tuesday, October 06, 2015 4:10:00 PM

---

Classification: UNCLASSIFIED
Caveats: NONE

Lance,

I immediately realized my response suggested that I didn't want to have a one-on-one meeting, instead preferring a group meeting. That is not the case. I actually meant, I hope you would participate in a group meeting, but if you prefer one-on-one, that can be arranged. Sorry for any confusion!

Best wishes (again),
Cindy

-----Original Message-----
From: Peterson, Cynthia L MVP@MVR
Sent: Tuesday, October 06, 2015 3:59 PM
To: 'Lance Foster'
Subject: RE: [EXTERNAL] Mississippi River Project (UNCLASSIFIED)

Hi Lance,

Thank you for agreeing to participate. As we receive more tribal and other consulting party responses, I hope to plan a meeting at a central location to discuss the Mississippi River Master Plan as a group. If we cannot find a group meeting date that works for you, a one-on-one meeting will be arranged.

The new job is good—far different than the OSA. I was disappointed I couldn't continue with the Good Earth/Blood Run project and hope that is going well. Looking forward to seeing you again.

Best wishes,
Cindy

-----Original Message-----
From: Lance Foster [redacted]
Sent: Tuesday, October 06, 2015 3:54 PM
To: Peterson, Cynthia L MVP@MVR
Subject: [EXTERNAL] Mississippi River Project

hi Cynthia

Yes, please include me as a consulting party and hopefully as a signatory at some point for your Mississippi River Project planning process. I hope to arrange a face-to-face with you at some point during the process.

Congratulations on your new position.

Lance Foster, THPO

Iowa Tribe of Kansas and Nebraska

## Correspondence from the Delaware Nation

From: Nekole Alligood
Sent: Wednesday, October 14, 2015 4:03 PM
To: Peterson, Cynthia L MVP@MVR
Subject:[EXTERNAL] RE: Mississippi River Project (UNCLASSIFIED)

Thank you, best of luck on the project.

-----Original Message-----

From: [redacted]
Sent: Wednesday, October 14, 2015 3:55 PM
To: Nekole Alligood
Cc: Corey Smith
Subject: RE: Mississippi River Project (UNCLASSIFIED)

Dear Director Alligood,

Thank you for your response. We will cease work and notify the proper authorities should any inadvertent discoveries occur.

We consider your email sufficient response, and do not need a hard copy letter.

Best wishes,
Cindy Peterson
Archeologist, MVR Environmental Compliance Branch

-----Original Message-----

From: Nekole Alligood [mailto:[redacted]
Sent: Wednesday, October 14, 2015 3:48 PM
To: Peterson, Cynthia L MVP@MVR
Cc: Corey Smith
Subject: [EXTERNAL] Mississippi River Project

Good afternoon. I have reviewed the letter and subsequent information pertaining to the above mentioned project and from I've ascertained from the provided maps, your project will take place further north than our area of historical concern in Missouri and I do not believe the part of the project scheduled to take place in Illinois is within any of our counties of interest located within that state. Therefore, the Delaware Nation has no concerns with regard to this undertaking. Although, I would ask that during development should any sites be inadvertently discovered, that work cease and the proper local, state and tribal authorities be contacted.

If you require a letter, I will have one sent out to you within the next few days, otherwise I hope this email will suffice for clearance to proceed. Thank you!

Nekole Alligood
Director of Cultural Preservation, Delaware Nation

## Correspondence from the Winnebago Tribe of Nebraska

From: Santita Medina
Sent: Tuesday, November 03, 2015 3:34 PM
To: Peterson, Cynthia L MVP@MVR
Subject:[EXTERNAL] Mississippi River Project Master Plan and Shoreline revision project

RE: Mississippi River Project Master Plan and Shoreline revision project

Dear Ms. Peterson,

Thank you for your recent letter to the Tribal Cultural Preservation Office of the Winnebago Tribe of Nebraska. The Office would like to inform you that the Winnebago Tribe of Nebraska has no cultural properties in the area of your proposed construction. According to oral tradition, the tribe has never lived in the area in the prehistoric period.

The tribe has no further comment. You may proceed with the construction, but if there are any burial sites or other cultural properties found, please notify the appropriate personnel right away. Thank you.

Sincerely,

Santita Medina
THPO Assistant
Tribal Historic Preservation Office
Winnebago Tribe of Nebraska

## Correspondence from the US Fish and Wildlife Service – Ecological Services

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Green Bay Ecological Services Field Office
2661 Scott Tower Drive
New Franken, WI 54229-9565
Phone: (920) 866-1717 Fax: (920) 866-1710

In Reply Refer To:
Consultation Code: 03E17000-2015-SLI-0302
Event Code: 03E17000-2018-E-02947
Project Name: Mississippi River Master Plan

July 24, 2018

Subject: Updated list of threatened and endangered species that may occur in your proposed project location, and/or may be affected by your proposed project

To Whom It May Concern:

The attached species list identifies any federally threatened, endangered, proposed and candidate species that may occur within the boundary of your proposed project or may be affected by your proposed project. The list also includes designated critical habitat if present within your proposed project area or affected by your project. This list is provided to you as the initial step of the consultation process required under section 7(c) of the Endangered Species Act, also referred to as Section 7 Consultation.

Section 7 of the Endangered Species Act of 1973 requires that actions authorized, funded, or carried out by Federal agencies not jeopardize federally threatened or endangered species or adversely modify designated critical habitat. To fulfill this mandate, Federal agencies (or their designated non-federal representative) must consult with the Service if they determine their project "may affect" listed species or critical habitat.

Under 50 CFR 402.12(e) (the regulations that implement Section 7 of the Endangered Species Act) the accuracy of this species list should be verified after 90 days. This verification can be completed formally or informally. You may verify the list by visiting the ECOS-IPaC website http://ecos.fws.gov/ipac/ at regular intervals during project planning and implementation and completing the same process you used to receive the attached list. As an alternative, you may contact this Ecological Services Field Office for updates.

Please use the species list provided and visit the U.S. Fish and Wildlife Service's Region 3 Section 7 Technical Assistance website at - http://www.fws.gov/midwest/endangered/section7/s7process/index.html. This website contains step-by-step instructions which will help you determine if your project will have an adverse effect on listed species and will help lead you through the Section 7 process.

# United States Department of the Interior

FISH AND WILDLIFE SERVICE
Illinois-Iowa Ecological Services Field Office
Illinois & Iowa Ecological Services Field Office
1511 47th Ave
Moline, IL 61265-7022
Phone: (309) 757-5800 Fax: (309) 757-5807

In Reply Refer To:
Consultation Code: 03E18000-2015-SLI-0465
Event Code: 03E18000-2018-E-03234
Project Name: Mississippi River Master Plan

July 24, 2018

Subject: Updated list of threatened and endangered species that may occur in your proposed project location, and/or may be affected by your proposed project

To Whom It May Concern:

The attached species list identifies any federally threatened, endangered, proposed and candidate species that may occur within the boundary of your proposed project or may be affected by your proposed project. The list also includes designated critical habitat if present within your proposed project area or affected by your project. This list is provided to you as the initial step of the consultation process required under section 7(c) of the Endangered Species Act, also referred to as Section 7 Consultation.

Section 7 of the Endangered Species Act of 1973 requires that actions authorized, funded, or carried out by Federal agencies not jeopardize federally threatened or endangered species or adversely modify designated critical habitat. To fulfill this mandate, Federal agencies (or their designated non-federal representative) must consult with the Service if they determine their project "may affect" listed species or critical habitat.

Under 50 CFR 402.12(e) (the regulations that implement Section 7 of the Endangered Species Act) the accuracy of this species list should be verified after 90 days. This verification can be completed formally or informally. You may verify the list by visiting the ECOS-IPaC website http://ecos.fws.gov/ipac/ at regular intervals during project planning and implementation and completing the same process you used to receive the attached list. As an alternative, you may contact this Ecological Services Field Office for updates.

Please use the species list provided and visit the U.S. Fish and Wildlife Service's Region 3 Section 7 Technical Assistance website at - http://www.fws.gov/midwest/endangered/section7/s7process/index.html. This website contains step-by-step instructions which will help you

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Missouri Ecological Services Field Office
101 Park Deville Drive
Suite A
Columbia, MO 65203-0057
Phone: (573) 234-2132 Fax: (573) 234-2181

In Reply Refer To:
Consultation Code: 03E14000-2015-SLI-1076
Event Code: 03E14000-2018-E-04555
Project Name: Mississippi River Master Plan

July 24, 2018

Subject: Updated list of threatened and endangered species that may occur in your proposed project location, and/or may be affected by your proposed project

To Whom It May Concern:

This response has been generated by the Information, Planning, and Conservation (IPaC) system to provide information on natural resources that could be affected by your project. The U.S. Fish and Wildlife Service (Service) provides this response under the authority of the Endangered Species Act of 1973 (16 U.S.C. 1531-1543), the Bald and Golden Eagle Protection Act (16 U.S.C. 668-668d), the Migratory Bird Treaty Act (16 U.S.C. 703-712), and the Fish and Wildlife Coordination Act (16 U.S.C. 661 et seq.).

**Threatened and Endangered Species**

The enclosed species list identifies threatened, endangered, proposed and candidate species, as well as proposed and final designated critical habitat, that may occur within the boundary of your proposed project and may be affected by your proposed project. The species list fulfills the requirement for obtaining a Technical Assistance Letter from the U.S. Fish and Wildlife Service (Service) under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*).

New information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list. **Note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days.** The Service recommends that verification be completed by visiting the ECOS-IPaC website at regular intervals during project planning and implementation for updates to species lists and information. An updated list may be requested through the ECOS-IPaC system by completing the same process used to receive the enclosed list.

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Southern Illinois Sub-Office
Marion Illinois Sub-office
8588 Route 148
Marion, IL 62959-5822
Phone: (618) 997-3344 Fax: (618) 997-8961
http://www.fws.gov/midwest/Endangered/section7/s7process/step1.html

In Reply Refer To:
Consultation Code: 03E18100-2015-SLI-0238
Event Code: 03E18100-2018-E-01398
Project Name: Mississippi River Master Plan

July 24, 2018

Subject: Updated list of threatened and endangered species that may occur in your proposed project location, and/or may be affected by your proposed project

To Whom It May Concern:

The attached species list identifies any federally threatened, endangered, proposed and candidate species that may occur within the boundary of your proposed project or may be affected by your proposed project. The list also includes designated critical habitat if present within your proposed project area or affected by your project. This list is provided to you as the initial step of the consultation process required under section 7(c) of the Endangered Species Act, also referred to as Section 7 Consultation.

Section 7 of the Endangered Species Act of 1973 requires that actions authorized, funded, or carried out by Federal agencies not jeopardize federally threatened or endangered species or adversely modify designated critical habitat. To fulfill this mandate, Federal agencies (or their designated non-federal representative) must consult with the Service if they determine their project "may affect" listed species or critical habitat. Under the ESA, it is the responsibility of the Federal action agency or its designated respresentative to determine if a proposed action "may affect" endangered, threatened, or proposed species, or designated critical habitat, and if so, to consult with the Service further. Similarly, it is the responsibility of the Federal action agency or project proponent, not the Service to make "no effect" determinations. If you determine that your proposed action will have "no effect" on threatened or endangered species or their respective critical habitat, you do not need to seek concurrence with the Service. Nevertheless, it is a violation of Federal law to harm or harass any federally-listed threatened or endangered fish or wildlife species without the appropriate permit.

Under 50 CFR 402.12(e) (the regulations that implement Section 7 of the Endangered Species Act) the accuracy of this species list should be verified after 90 days. This verification can be completed formally or informally. You may verify the list by visiting the ECOS-IPaC website

**From:** Schmuecker, Sara
**To:** Lundh, Joseph S CIV USARMY CEMVR (US)
**Subject:** [EXTERNAL] Re: chapter 2 again
**Date:** Tuesday, November 21, 2017 1:41:12 PM
**Attachments:** Chapter 2_ILIAFO Comments.pdf

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Hi Joe,

I've provided comments throughout the November 2017 version of the Chapter 2 document (attached). I did glance through all chapters, noting a few comments below, but will provide a more thorough review when in a more final form.

A few overall comments/questions:

* There are several inconsistencies within Chapter 2 with respect to formatting, specifically scientific names.

* There are acronym inconsistencies throughout all chapters, specifically with references to UMRR-HREP vs the outdated UMRR-EMP in Chapters 1, 4, and 6.

* Were the State Natural Heritage Databases consulted in the determination of environmentally sensitive areas? I didn't see them listed in Chapter 4 as a data reference. These would be much more updated than the FWS Natural Resource Inventory, although partially included within the NRI (through 2015).

* Are Refuges also conducting a review of the text at this time?

* Are the map plates that were provided in October in final form for review?

Please let me know if you have any questions or would like to discuss further.

- Sara

Sara Schmuecker
U.S. Fish and Wildlife Service
Illinois - Iowa Field Office
1511 47th Avenue, Moline, IL 61265
309-757-5800 x203

On Fri, Nov 17, 2017 at 4:07 PM, Lundh, Joseph S CIV USARMY CEMVR (US) [redacted] wrote:

> Here's a clean copy.
>
> Thanks again!
>
> joe

## Correspondence from Missouri Department of Conservation

-----Original Message-----
From: Frohlich, Wendy M MVP @ MVR
Sent: Friday, November 06, 2015 8:59 AM
To: Janet Sternburg
Subject: Missouri State T&E List (UNCLASSIFIED)

Good Morning, I was wondering if you have a list of Missouri State Listed Species in either a word or excel format? Do you have anything that lists the those species that may be found on, in around the river? I see a list on the website but I thought you may have something more specific to the river and in a more friendly format.
Thanks,
Wendy

Wendy Frohlich, Biologist
US Army Corps of Engineers
Environmental Compliance Branch

-----Original Message-----
From: Janet Sternburg
Sent: Friday, November 06, 2015 1:05 PM
To: Frohlich, Wendy M MVP @ MVR
Subject: [EXTERNAL] RE: Missouri State T&E List (UNCLASSIFIED)

Hi Wendy,
We have a checklist that includes all species tracked in the Natural Heritage Database, and it is available on the <MDC Website>. However, I see you would prefer it in a Word or Excel format. I believe the pdf is made from a Word document, so I could also get it in that format. I will ask for it and send it to you.

Now, for a list of tracked species that occur just in or near the MS River, we have never developed one for the entire river. Instead, we usually provide information based on a given project site. We could probably develop one if that would be helpful to your project. Do you want the entire river down Tennessee? Or just the Upper portion of the river? Also, are you interested in terrestrial and/or small stream species that would be up on the floodplain? It will take me some time to make the list, but it can be done. Please let me know what river miles you are interested in. Also, we will not have information for the species that may occur on the Illinois side of the river on the floodplain. That state has more floodplain than we do, and is likely to have more species.

Thanks,
Janet

-----Original Message-----
From: Frohlich, Wendy M MVP @ MVR
Sent: Friday, November 06, 2015 1:26 PM
To: Janet Sternburg
Subject: RE: Missouri State T&E List (UNCLASSIFIED)

I have attached what I put together today. I combined some county lists I found on the website for the Rock Island District boundary only (Clark, Lewis, Marion, and Ralls Missouri Counties). I was part way through it when I thought to ask you if you already had a listing of Miss River specific species. So maybe you could take a look at the "combined list" and see if we could pull some of those species that are not found in/on the river and pull them off the list. Or if you see that there are any obvious ones missing.

What do you think? Is it a good start? You are right Illinois has a bunch but I think I need to whittle those down as well...do you know who might be a good IL DNR contact that could scroll through the IL list? I attached that one too.

It has been interesting combining the counties lists and seeing the numbers of species for each state (along the river). For example: MO had about 73 for 4 counties, IL had about 129 for 10 counties, WI had about 190 for 1 county, IA had about 307 for 9 counties (I feel like this one has to be off)

Thanks Again! I am looking through the checklist website you just sent.
Wendy

-----Original Message-----
From: Janet Sternburg
Sent: Friday, November 06, 2015 2:23 PM
To: Frohlich, Wendy M MVP @ MVR
Subject: [EXTERNAL] RE: Missouri State T&E List (UNCLASSIFIED)

Hi Wendy,
Our database manager said she could create a MS River unique list by overlapping using a GIS search. We could further reduce it down by county as well. This would be easier then reviewing county lists and dropping off certain species. So are you only interested in the four county areas you mention below?
Do you only want plants/animals that occur in the river and its floodplain? Or just the river?

Janet

-----Original Message-----
From: Janet Sternburg
Sent: Friday, November 20, 2015 9:43 AM
To: Frohlich, Wendy M MVP @ MVR
Cc: Sternburg, Janet MVS External Stakeholder
Subject: [EXTERNAL] RE: Missouri State T&E List (UNCLASSIFIED)

Hi Wendy,
She did and I took a quick look at it and have a question for you. The information is for those three counties, but not split out by county. She made the unique list by overlapping the Big River GIS shape and the MS River Floodplain layer that is used for the flood insurance director, to capture the river and the floodplain, not the adjacent uplands in the county. Then she selected out Natural Heritage Program tracked species using the other two layers as the cookie cutter. The final list of species is attached. Information on county is not included.

I asked her to do the search again, but I will have to do some cleanout on the results, which will take about a half hour. I can do it, but just haven't had time, but could do it this weekend if the list attached is not sufficient.

Janet Sternburg, Policy Coordinator
MO Dept. of Conservation

## Correspondence from Wisconsin Department of Natural Resources

-----Original Message-----
From: Tumbleson, Melissa J - DNR
Sent: Tuesday, November 10, 2015 11:56 AM
To: Frohlich, Wendy M MVP @ MVR
Subject: NHI Data Options

Hi Wendy,

Here is the webpage I mentioned with the data options: http://dnr.wi.gov/topic/nhi/. Let me know if you have any questions.

Thanks,
Melissa

Melissa Tumbleson
Data Sharing Coordinator – Natural Heritage Conservation
Wisconsin Department of Natural Resources

## Correspondence from Port Louisa National Wildlife Refuge

**From:** Henry, Cathy
**To:** Frohlich, Wendy M MVP @ MVR
**Subject:** [EXTERNAL] Refuge HMP
**Date:** Monday, November 23, 2015 8:03:29 AM
**Attachments:** Port Louisa HMP Final May 2015.pdf

Hi Wendy - Here is the Port Louisa Habitat Management Plan with species lists. The species lists are in the appendices. I will send Great river HMP in a separate email. I guess I had Two Rivers refuge HMP, but it is 18 MB. Not sure that will go through to you?
--

Refuge Manager

U.S. Fish and Wildlife Service
Port Louisa National Wildlife Refuge
10728 County Road X61
Wapello, IA 52653

## Correspondence from the Upper Mississippi River National Wildlife and Fish Refuge

On Fri, Nov 6, 2015 at 3:42 PM, Lundh, Joseph S MVR [redacted] wrote:

Stephen-

We are undergoing our Master Plan update which is a general land use, recreation, and natural resource management plan from the 30,000 foot level. As part of that, we do need a lot of background and context. State and federal listed species being one of them. Currently one item is taking the entire state lists generated from the counties we have lands and are trying to remove the species that are not found in the floodplain.

I was wondering with your work on the habitat plans for upper miss, whether you could provide some insight to our narrowing of state listed species at least for Iowa, Illinois, and Wisconsin. Or perhaps there are some available products out there from the HMP or CCP for portions of our area. Any suggestions for folks we could hit up to review the lists?

Thanks,
Joe

From: Winter, Stephen
Date: Tue, Nov 17, 2015 at 1:37 PM
Subject: Re: FW: State Species of Concern, T&E (UNCLASSIFIED)
To: "Lundh, Joseph S MVR" , Frohlich, Wendy M MVP @ MVR

Hi Joe - Here are a bunch of files from out HMP process that might help you folks.

I attached a file from 2012 (120828 Kathy - UMNWR All District ROCs) that represents an accounting of all the species that potentially could be on the refuge as well as their status in various federal, state, and regional conservation plans or lists. Note that since it was done in 2012 there are probably a couple/few things that are out of date.

The file 130226 Refuge ROC Lists represents all of the species that we determined could reasonably be expected to be on the refuge and the respective federal, state, regional plans or lists they were addressed in. This represents the final version after additions and deletions were made according to some of the feedback we got from technical experts (see below).

The Partner Outreach file identifies all/most of the technical experts I contacted for help in determining if species had a reasonable chance of being on the refuge as well as their views on whether those species merited conservation attention/concern in the refuge planning context. For taxa-specific experts, I reached out to them with a letter asking for their assistance with evaluating only the portion of the previous ROC list that corresponded to their taxonomic specialty. These are the folks who often told us whether or not we could expect a species in the floodplain.

Next - the Upper Miss ROCSTAR 20130528 - modified by steve file is a tool we used, along with input from partners, to score each potential priority species according to criteria that are relevant to how FWS policy says we're supposed conduct Habitat Management Planning and how we're supposed to select priority resources of concern. The most important tab to pay attention to is tab #2. Note that we affiliated each species with a broad habitat type (or HNA Geomorphic Area in the case of fish).

Finally, I attached Table 3-2 from our current draft of the HMP which identifies the species that have survived all of the narrowing/prioritizing steps. I suspect our refuge leadership will narrow this a little more.

I'd be happy to talk on the phone if needed to help make sense of any of this.

Stephen Winter
Wildlife Biologist
Upper Mississippi River National Wildlife and Fish Refuge

**From:** Chandler, Sabrina
**To:** Lundh, Joseph S CIV USARMY CEMVR (US)
**Subject:** [EXTERNAL] Re: master plan comments
**Date:** Monday, November 27, 2017 11:00:49 AM

Joe,
The Service does not have any additional comments on the Master plan beyond what was discussed previously at our meeting in October. We are also still hopeful that we can pursue a mapping option (post Master Plan process) that would provide the Refuge with a clear determination of ownership and use of lands within the cooperative agreement.

Sabrina Chandler | Refuge Manager/Area Supervisor | Upper Mississippi River National Wildlife and Fish Refuge | 51 East 4th Street | Winona, MN 55987 | Office 507-494-6218 - Cell 507-458-0144

On Tue, Nov 7, 2017 at 5:25 AM, Lundh, Joseph S CIV USARMY CEMVR (US) [redacted] wrote:

Sabrina-

Thanks for your and your staff's time recently for the master plan meeting. Please have any informal comments back to me by Thanksgiving. Please contact me if I you have any questions or would like to discuss the draft plan further.

Regards,
Joe

Joseph Lundh
Supervisory Natural Resource Specialist
US Army Corps of Engineers
Mississippi River Project
PO Box 534
Pleasant Valley, IA 52767
[redacted]

## Correspondence from Iowa Department of Natural Resources

-----Original Message-----

From: Robbins, Andy [DNR]
Sent: Friday, February 26, 2016 3:44 PM
To: Lundh, Joseph S MVR; Frohlich, Wendy M MVP @ MVR
Attachment: USACE_MP_Odessa

Subject: [EXTERNAL] Odessa description/management

Joe and Wendy,

Attached are a few edits I made to the Odessa description for your master plan update. Feel free to edit further as needed. Let me know if you have any questions.

Have a good weekend!

Andy

ANDY ROBBINS Wildlife Management Biologist
Iowa Department of Natural Resources
Odessa Wildlife Unit

**From:** Robbins, Andy
**To:** Lundh, Joseph S CIV USARMY CEMVR (US)
**Subject:** [EXTERNAL] Odessa docks
**Date:** Tuesday, November 07, 2017 3:16:30 PM
**Attachments:** chapter 16.pdf

---

Joe,

The docks at Odessa WMA are administered as part of a designated Dock Management Area (DMA). The rules regarding DMA's can be found in Chapter 16 of Iowa Administrative Code 571.

I have attached a copy of the code for your information. DMA information is mostly found in Division II that begins on page 9.

Thanks,
Andy

<Blockedhttps://lh5.googleusercontent.com/hVGhphWfCOGYrwOSMTe83KVIZp--oVgeMH_-gTAAP8eS1jJRbL19cDDNoGXUH-9HVilEdxJyjtq8M-Emd7B1s0eSO4LgfWJeM-HdmDnuw2KCJA2uVSxKmy0r9KWduCt6kt_jR7eO>

Andy Robbins | Wildlife Management Biologist

Odessa Wildlife Unit

Iowa Department of Natural Resources

(319) 551-8459 | 9726 County Road X61 | Wapello, IA 52653

Blockedwww.iowadnr.gov <Blockedhttp://www.iowadnr.gov/>

**From:** Kemmerer, Curt
**To:** Lundh, Joseph S CIV USARMY CEMVR (US)
**Cc:** Andy Robbins; Michael Griffin
**Subject:** Fwd: FW: [EXTERNAL] Refuge Boundary
**Date:** Tuesday, November 21, 2017 3:11:53 PM

---

Joe,

I have taken some time to look through parts of the draft Master Plan, but have not come across any other edits or recommendations at this time.

---------- Forwarded message ----------
From: Kemmerer, Curt <[redacted]>
Date: Wed, Nov 8, 2017 at 3:26 PM
Subject: Re: FW: [EXTERNAL] Refuge Boundary
To: "Lundh, Joseph S CIV USARMY CEMVR (US)" [redacted]
Cc: "Miller, Sarah B CIV USARMY CEMVS (US)" [redacted]

Joe and Sarah,

That looks to encompass all COE lands that fall within our seasonal waterfowl refuge.

For some reason I did not catch this before now...but why is the upper end of Densmore Lake listed as "COE easement on private land"? Is that because it is considered sovereign land??

On Wed, Nov 8, 2017 at 3:11 PM, Lundh, Joseph S CIV USARMY CEMVR (US) <[redacted]> wrote:

> Curt-
>
> How does this change look?
>
> Thanks,
> Joe
>
> -----Original Message-----
> From: Miller, Sarah B CIV USARMY CEMVS (US)
> Sent: Wednesday, November 08, 2017 3:07 PM
> To: Lundh, Joseph S CIV USARMY CEMVR (US) [redacted]
> Subject: RE: [EXTERNAL] Refuge Boundary
>
> I am on the terminal server working on digitizing the levee ROW, so I skipped over to do this change at Green Island. Let me know if something doesn't look right with it.
>
> Sarah

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 5
77 WEST JACKSON BOULEVARD
CHICAGO, IL 60604-3590

MAY 11 2016

REPLY TO THE ATTENTION OF: E-19J

Wendy Frohlich
Environmental Compliance Branch
Department of the Army
Rock Island District, Corps of Engineers
Clock Tower Building – P.O. Box 2004
Rock Island, Illinois 61204-2004

**Re: Revision of the Mississippi River Project Master Plan for the Rock Island District**

Dear Ms. Frohlich:

The U.S. Environmental Protection Agency received a request for early coordination comments dated January 26, 2016 (hereafter, scoping request). The scoping request indicates that the U.S. Army Corps of Engineers, Rock Island District (USACE) is planning to revise its Mississippi River Project Master Plan (Master Plan). This letter provides EPA's comments on portions of the draft Master Plan made available as part of USACE's scoping process, pursuant to our authorities under the National Environmental Policy Act (NEPA), the Council on Environmental Quality's NEPA Implementing Regulations (40 CFR 1500-1508), and Section 309 of the Clean Air Act.

According to the scoping request, the Master Plan guides the coordination of project development and management of all natural, cultural, and modern man-made land and water resources on the Mississippi River Project's 55,000 acres of Federal public lands and associated waters between Guttenberg, Iowa, and Saverton, Missouri within USACE's Rock Island District. The Master Plan identifies conceptual types and levels of activities but does not address designs or estimated costs. Public lands are classified into management categories called "land use classifications" based on available resources and public needs. The 1989 Land Use Allocation Plan (LUAP) provided the most current update to mapping and classifications. The purpose of the proposed revision is to bring the Master Plan into compliance with current USACE's policies and regulations, identify management opportunities and constraints, determine user needs and characteristics, and balance the above while protecting cultural and natural resources. The Master Plan will provide direction for project development and conservation through classifying lands, but does not provide permission for future management actions to move forward without further NEPA consideration and/or documentation.

The scoping request indicates USACE is preparing an Environmental Assessment (EA) to address impacts associated with land use classification changes. At this time, USACE has indicated it will evaluate two alternatives in the EA:

- No Action: no revision to the existing Master Plan and management will continue as currently delineated
- Action Alternative: revise the 1970s Master Plan and 1989 LUAP. This alternative would include the following:

    A. revise the existing Master Plan;
    B. include changes in land classifications;
    C. recommend future actions at existing recreation areas; and
    D. recommend natural and cultural resource management improvements.

The scoping request indicates the primary benefit of revising the current Master Plan would be to reflect changes in recreation facilities, the environment, economic conditions, and visitation patterns. USACE anticipates the preferred alternative will have no significant adverse impacts to the quality of the human environment. USACE also anticipates that revising the Master Plan will have "no effect" to any threatened or endangered species since the Master Plan serves as a guide for project development and management. The scoping request indicates this alternative is the preferred alternative.

Pursuant to a review of the draft chapters of the Master Plan, the following comments are provided from our Chicago and Kansas City offices (Regions 5 and 7) to assist in developing the Master Plan revision and the preparation of an EA.

**ALTERNATIVES ANALYSIS**

The information presented in the scoping request indicates that only one 'action' alternative is being considered at this time. The NEPA process is better supported if more than one 'action' alternative is analyzed. That is, since the 'no action' alternative would default to on-going management of project resources using the existing Management Plan, 'action' alternatives could include more than just one version of a revised Master Plan. For example, two versions of a revised Master Plan would optimally contrast two clearly different 'visions' for resource management (e.g., a higher percentage of environmental sensitive lands in one action alternative versus another). In addition, since the 'no action' alternative would not bring the Master Plan into compliance with current USACE's policies and regulations, it is unlikely to receive full consideration, resulting in an EA with only one viable alternative. A more robust range of alternatives, beyond 'action' and 'no action' would better serve the spirit of NEPA if not also the CEQ requirements for a "robust range of alternatives."

**Recommendations:** Because the NEPA process is not merely a mechanism to validate a pre-determined choice, it is necessary to document the process of selecting alternatives for analysis in order to produce a defensible NEPA analysis. A comprehensive range of alternatives does not predispose USACE to any one preferred alternative, but, instead, supports the final selection of the alternative with a comprehensive and inclusive range of options and descriptions of potential impacts. Therefore, EPA recommends the future EA include the following:

- A reasonable range of alternatives, each of which must satisfy the project purpose, but in differing ways with differing impacts and effectiveness, to compare and contrast between related impacts and resultant user conditions, including alternatives not within the lead

agency's jurisdiction or Congressional mandate or which might result in public controversy. The resulting reasonable range of alternatives carried forward for analysis might include different percentages for land use classifications (e.g., 10% v. 25% v. 50% recreational land use classifications), optimally contrasting two clearly different 'visions' for resource management.[1] Suggestions to the draft mapping products received during the three agency meetings held earlier this year can conceivably provide USACE with alternative classifications for further analysis in the Alternatives chapter of a NEPA document. An appendix can provide details and/or individual comments received from stakeholders, but the process for deriving alternatives and, eventually, the preferred alternative, should be provided to reviewers in the body of the NEPA document.

- The project's purpose and need, which should guide the development of a robust range of alternatives, each of which satisfying the project purpose, but in differing ways with differing impacts, sustainability, and effectiveness. The EA should identify alternatives considered but dismissed from further consideration (if applicable), and should provide elimination criteria and clear explanations for early elimination of alternatives.

**LAND USE CLASSIFICATIONS**

Section 4.1., Land Allocation, indicates "The entire 93,600 acres originally acquired for the Rock Island District portion of the Mississippi River Project are allocated for Operations as they were acquired primarily for river navigation. Those lands acquired since the original acquisition also relate to navigation through purchase of lands for or in mitigation of dredged material placement. Lands accreted to or acquired in addition to Project lands outside of the original footprint of acquisition are also allocated to Operations. **Since the original acquisition, Project and Corps missions have been added, such as Recreation and Environmental Stewardship, but are not reflected in the allocation as the lands were not originally specifically acquired for these purposes."** (Emphasis added)

**Recommendations:** EPA recommends the future EA clarify the meaning of the above sentence. In particular, this sentence in confusing in light of the Land Use classifications with include high and low density recreation areas, environmentally sensitive areas, and fish and wildlife sanctuary.

The data presented in Table 4-1, Land Use Classification Summary for Mississippi River Project, indicates proposed changes to land use classifications between the existing Master Plan and the proposed revision. Given that many of the proposed classifications did not exist under the existing Master Plan (e.g., Project Operations, Recreation/Intensive Use, Recreation/Low Density Use, Wildlife Management/Reserve Forest Land, and Natural Area), it is difficult to assess the significance of these changes to address potential impacts to project resources.

**Recommendations:** EPA recommends the future EA include the following:

- reason(s) for changing and increasing land use classifications from the 1989 Master Plan; and
- how the proposed land use classifications correspond to those identified in Engineer Pamphlet 1130-2-550 which identify the authorized purposes for which USACE lands were acquired – Operations, Recreation, Fish and Wildlife, and Mitigation.

[1] CEQ Regulations, 40 CFR 1502.14

The Water Surface land use classification states "However, the Master Plan has included water surface classification in some locations including two types of water surface classifications: 1) Restricted and 2) Fish and Wildlife Sanctuary."
**Recommendations:** EPA recommends the future EA clarify what is meant by "...included water surface classification in **some** locations..." (Emphasis added) How does this statement relate to the geographic area within the Rock Island District?

The Project Easement Lands section states "The possible Conservation Easement classification identified in Corps policy was not utilized for the Project."
**Recommendations:** EPA recommends the future EA clarify why this classification was not utilized for the project. For example, if the reason this classification is not utilized is because USACE has no conservation easement interests in the Rock Island District, this should be clarified in the EA.

**MEASURES OF SUCCESS**

The Master Plan is largely conceptual and outlines a process for developing specific action plans at a later time or in other documents to address these issues. The Master Plan describes the fundamental tools available to USACE for addressing issues and impacts potentially affecting project resource health and sustainability, yet there is no detail in the draft document concerning the methods by which success can be measured. For example, what does success look like for control of non-native, invasive species? What are the specific targets for universal accessibility in all aspects of the recreation mission? As stated in the draft Master Plan, an objective priority should be to increase the public's opportunity for high-quality recreation experiences; what is the baseline, what does success look like, and how will the opportunity for high-quality recreation experiences be tracked?
**Recommendations:** EPA recommends the Master Plan and future EA include indicators and metrics for the various aspects of the Master Plan (e.g., restoration, high-quality recreation experiences, etc.) which should be used to establish a "baseline" and provide quantitative and/or qualitative measures of success. We believe this information is necessary to inform USACE, resource agencies, and the public as to whether the management objectives are, in fact, maintaining a sustainable, healthy ecosystem and providing appropriate recreational experiences.

**INTEGRATION OF THE MASTER PLAN, WATER LEVEL MANAGEMENT PLAN, OPERATIONAL MANAGEMENT PLAN, ETC.**

The future EA should speak to how the proposed Master Plan dovetails with other USACE guidance documents/plans, focusing on how this Master Plan leads to implementation of those other guidance documents/plans (e.g., does the flood risk management dovetail with the Master Plan, and if so, in what manner?). Specifically, the Master Plan and its supporting EA should articulate clearly and, in as specific detail as possible, how it relates to, influences, and is influenced by, the Water Level Management Plan, Shoreline Management Plan, Operational Management Plan, Environmental Restoration, Forest Management Plan, and any other USACE management plans affecting the project area, and any other federal agency planning documents (e.g., General Plans) for the project. The EA should describe the function of each planning document and how they fit together either within or separate from the Master Plan. Furthermore, the timing of revisions to each of these interlocking plans appears to be important to the success of the overall management of natural resources.

Lastly, EPA recommends the future EA should explain how the Master Plan for the Rock Island District integrates with those of the St. Paul and St. Louis Districts, upstream and downstream of these lands. USACE should describe how its Master Plan development is coordinated with these other Districts and, if it is not coordinated, why coordination is not necessary and whether the lack of coordination affects the effectiveness of planning.

**THREATENED AND ENDANGERED SPECIES**

The Threatened & Endangered Species Section in chapter 2, indicates USACE personnel will cooperate in the management of state-listed and protected species where **feasible**. (Emphasis added)

**Recommendations:** EPA recommends the future EA clarify what is meant by "...will cooperate in the management of state-listed and protected species where **feasible**..." (Emphasis added) How will state-listed and protected species be acknowledged and considered in future proposed activities?

Section 3.1.1, Environmental Stewardship Resource Objectives, in Chapter 3 states "3. Proactively manage to sustain habitats or habitat conditions to protect, promote, and benefit federally and state listed Special Status Species."

**Recommendations:** EPA recommends the future EA clarify that threatened, endangered, and candidate species are included in this resource objective.

Section 3.1.1, Environmental Stewardship Resource Objectives, in Chapter 3 states "4. Monitor lands for invasive and exotic species and take action **when feasible** to prevent and/or reduce the spread." (Emphasis added)

**Recommendations:** EPA recommends the future EA clarify what is meant by "Monitor lands for invasive and exotic species and take action **when feasible** to prevent and/or reduce the spread."

As a general comment, EPA recommends non-native, invasive species management and prescribed fire be added to all Management Recommendations included in Chapter 5, as appropriate. We suggest Future Management Recommendations be augmented by explaining how the percentage of management was selected and whether U.S. Fish and Wildlife Service and appropriate state Departments of Natural Resources concur with this recommendation.

**WATER QUALITY**

The draft EA should provide a thorough characterization of water quality, including a description of significant impairments and causes/sources. Section 2.5 in the draft Master Plan provides superficial treatment of water quality and makes unusable and unsupportable statements about nonpoint sources (e.g., "tolerable levels") and point sources (e.g., "point source pollution discharges are not as prevalent as they were forty years ago") of pollution.

EPA appreciates the opportunity to review and comment on the Master Plan. Please send a hard copy and a CD of the draft EA and revised Master Plan to our office. If you have any questions

about this letter, please contact [redacted]

Sincerely,

Kenneth A. Westlake, Chief
NEPA Implementation Section
Office of Enforcement and Compliance Assurance

## First Round of Agency Coordination

## Mississippi River Project – Rock Island District
## 34th Annual Forestry Coordination Meeting and Master Plan Agency Meeting

Forestry Coordination Meeting for Pools 16-19 Rock Island District and Master Plan Partnering Agency Meeting

Port Louisa National Wildlife Refuge – Wapello, Iowa

10728 County Road X61

Wapello, IA 52653

March 17, 2015

9:00 – 12:30

9:00 Introductions

9:15-10:00 Rock Island District, Mississippi River Project Pools 16-19

2014 Accomplishments

Management

- Forest inventory and associated monitoring
  - Acoustic bat monitoring
- Bottomland forest restoration
  - Huron Island UMRR-EMP
  - Timber harvest within Big Timber Division
  - Timber stand improvement
  - Tree planting
    - Broadcast seeding
    - Containerized tree stock
    - Site preparation
    - Invasive species management

2015 Proposals

Management

- Forestry proposals for pools 16-19

10:00 Mississippi River Project Master Plan Update and Process Overview

Shoreline Management Plan

10:30 Master Plan Chapter 4 – Land Allocation, Land Classification, and Water Surface

Round Table Discussion

- Review 1989 Land Use Allocation Plan (LUAP) classification maps
- Seek agency input on classification updates and changes
- Initial draft attempt to designate Land Classification using current definitions and policy (Primary use for which project lands are managed.)
    - A project map will be provided to delineate land according to the classifications.

Resource Plans by Area

- Examples of area descriptions and proposed development

Dates and Locations of Public Scoping Meetings

- Bettendorf, IA - Tuesday, June 16, 2015 at Scott Community College
- Burlington, IA - Thursday, June 18, 2015 at Comfort Inn and Suites Conference Center
- Dubuque, IA - Tuesday, June 23, 2015 at Grand River Center
- Quincy, IL - Thursday, June 25, 2015 at Town and Country Inn

Dates for additional agency meeting

12:30 Agency updates - round the room

**Mississippi River Project – Rock Island District**
**34th Annual Forestry Coordination Meeting and Master Plan Agency Meeting**

Forestry Coordination Meeting for Pools 11-15 Rock Island District and Master Plan Partnering Agency Meeting

Mines of Spain/EB Lyons Interpretive and Nature Center – Dubuque, Iowa

8991 Bellevue Heights

Dubuque, IA 52001

March 31, 2015

9:00 – 12:30

9:00 Introductions

9:15-10:00 Rock Island District, Mississippi River Project Pools 11-15

2014 Accomplishments

Management

- Forest inventory and monitoring
- Bottomland forest restoration
  - Timber stand improvement
  - Tree planting
    - Broadcast seeding
    - Containerized tree stock
    - Site preparation
    - Invasive species management

2015 Proposals

Management

- Forestry proposals for pools 11-15

10:00 Mississippi River Project Master Plan Update and Process Overview

10:30 Master Plan Chapter 4 – Land Allocation, Land Classification, and Water Surface

Round Table Discussion

- Review 1989 Land Use Allocation Plan (LUAP) classification maps
- Seek agency input on classification updates and changes
- Initial draft attempt to designate Land Classification using current definitions and policy (Primary use for which project lands are managed.)
    - A project map will be provided to delineate land according to the classifications.

Resource Plans by Area

- Examples of area descriptions and proposed development

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- Burlington, IA - Thursday, June 18, 2015 at Comfort Inn and Suites Conference Center
- Dubuque, IA - Tuesday, June 23, 2015 at Grand River Center
- Quincy, IL - Thursday, June 25, 2015 at Town and Country Inn

Dates for additional agency meeting

12:30 Agency updates - round the room

**Mississippi River Project – Rock Island District**
**34th Annual Forestry Coordination Meeting and Master Plan Agency Meeting**

Forestry Coordination Meeting for Pools 20-22 Rock Island District and Master Plan Partnering Agency Meeting

Ted Shanks Conservation Area – Ashburn, Missouri

3643 Pike 145

Ashburn, MO 63433

March 19, 2015

9:00 – 12:30

9:00 Introductions

9:15-10:00 Rock Island District, Mississippi River Project Pools 20-22

2014 Accomplishments

Management

- Bottomland forest restoration
  - Timber stand improvement
  - Tree planting
    - Broadcast seeding
    - Containerized tree stock
    - Site preparation
    - Invasive species management

2015 Proposals

Management

- Forestry proposals for pools 20-22

10:00 Mississippi River Project Master Plan Update and Process Overview

10:30 Master Plan Chapter 4 – Land Allocation, Land Classification, and Water Surface

Round Table Discussion

- Review 1989 Land Use Allocation Plan (LUAP) classification maps
- Seek agency input on classification updates and changes
- Initial draft attempt to designate Land Classification using current definitions and policy (Primary use for which project lands are managed.)
    - A project map will be provided to delineate land according to the classifications.

12:30 Agency updates - round the room

# Mississippi River Project
# Master Plan Update

**Mississippi River Project Staff**

Partnering Agency Meeting Presentation

Wapello, Iowa

Quincy, Illinois

Savannah, Illinois

US Army Corps of Engineers
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# Agenda of this Meeting

- Powerpoint
  - Overview of Master Planning Process
  - Environmentally Sensitive Area (ESA) explanation
  - NEPA overview
  - Chapter 6 overview topics
  - Shoreline Plan deferred and protected area not changed
- Draft Chapter Discussion
  - Questions
- Draft Mapping Discussion
  - Review and mark-up pages

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# Purpose and Intent of Master Plans

The Corps defines a Master Plan as…..

" The strategic land use management document that guides the comprehensive management and development of all project recreational, natural and cultural resources throughout the life of the water resource development project."

Source: Chapter 3 of EP 1130-2-550 available at www.usace.army.mil/library/publications

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# Key Points

- Main focus is stewardship of natural and cultural resources and provision of high quality outdoor recreation facilities and opportunities
- Proposed effective life of 25-30 years
  - ► Reviews every 5 years

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# Master Plan Topics

- Inventory of Project resources
- Objectives for resource use
- Land use classification
- Public facility demand
- Site specific plans for development and management of public lands and waters
- Environmental protection/compliance needs

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## Master Plan Revision Process

- Will be accomplished by a team of Corps employees with input from other agencies
- Public and stakeholder input will be carefully considered by the team
- An Environmental Assessment of the Master Plan will be prepared and appended to the plan

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## Goals of the MP Revision

- Provide Best Management Practices to respond to regional needs, resource capabilities and sustainability, and expressed public interests.
- Protect and manage natural and cultural resources.
- Provide outdoor recreation opportunities based on public demands while sustaining Project natural resources.
- Recognize the particular qualities, characteristics, and potentials of the Project.
- Provide consistency and compatibility with other state and regional goals and programs.

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## The Master Plan does NOT…

- The MP does not address the specifics plan for navigation (locks, dams and associated infrastructure for commercial barge traffic), flood risk management (such as levees in the PL84-99 Program), or water level management.
  - ► These have been addressed in separate guidance documents.
- The MP deals in concepts, not in details of design or administration.

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## Why do we need a Revision?

- Current Master Plan was approved in the early 1970s.
- Land Use Allocation Plan (LUAP) was completed in 1989.
- Shoreline Management Plan (SMP) was completed in 1989.
- To ensure effective management practices and be responsive to existing and future needs.
- User group changes in the region.
- To better reflect current Corps policies, regulations, and processes.

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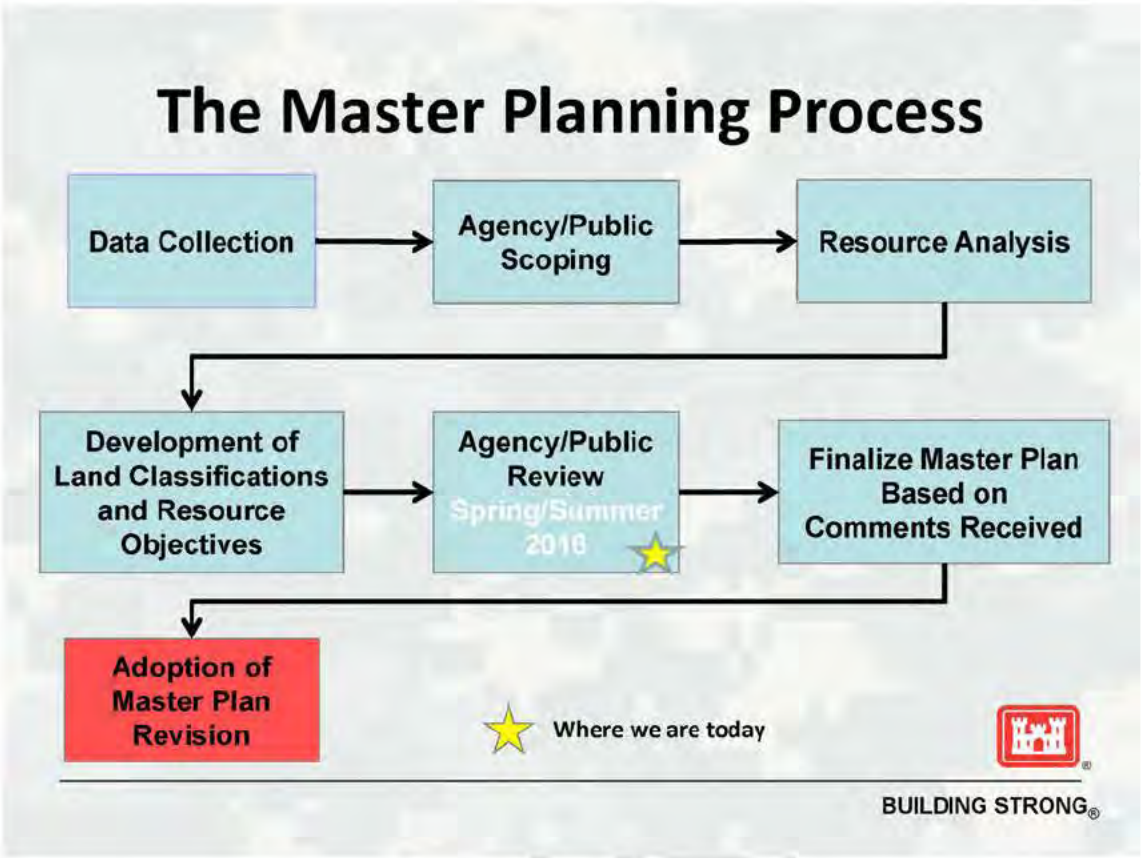


# Public Involvement

Public input and participation is critical

- Website: www.missriver.org
- Public Input Forms gathered in Summer 2015
- Completed informal public scoping open houses in Summer 2015 at 4 locations
- Final Review public open house at several locations in Summer 2016
- Mailing and email lists
- Press releases through the general media

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# Project Land Classifications

| 1989 LUAP Classifications | Proposed Land Classifications |
|---|---|
| Project Operations | Project Operations |
| Recreation Intensive Use | High Density Recreation |
| Natural Area | Environmentally Sensitive Areas |
| Wildlife Management<br>&<br>Recreation Low Density Use | Multiple Resource Management:<br>Low Density Recreation, Vegetation Management, or Wildlife Management |
| | Water Surface:<br>Restricted, Fish & Wildlife Sanctuary, No Wake, or Open Recreation |

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| Land Classification | Definition |
|---|---|
| Project Operations | Those lands required for the dam, operations center, office, maintenance compound and other areas that are used solely for project operations. |
| Recreation | Land developed for intensive recreational activities by the visiting public, including developed recreation areas and areas for marinas and related concessions, and resorts. |
| Multiple Resource Management | **Recreation–Low Density:** Lands with minimal development or infrastructure that support passive public recreational use. |
| | **Wildlife Management General:** Lands designated for stewardship of fish and wildlife resources. |
| | **Vegetative Management**: Lands designated for stewardship of forest, prairie, and other native vegetative cover. |
| | **Inactive and/or Future Recreation Areas**: Recreation areas planned for the future or that have been temporarily closed. |
| Environmentally Sensitive Areas | Areas where scientific, ecological, cultural or aesthetic features have been identified. These areas must be considered by management to ensure they are not adversely impacted |
| Easement Lands | All land for which USACE holds an easement interest but not fee title. Planned use and management of easement lands will be in strict accordance with the terms and conditions of the easement estate acquired for the project. |

Definitions from USACE Engineer Pamphlet 1130-2-550: Recreation Operations and Maintenance Guidance and Procedures

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| Water Surface Classification | Definition |
|---|---|
| Restricted | Water areas restricted for project operations, safety, and security purposes. |
| Designated No-Wake | To protect environmentally sensitive shoreline areas, recreational water access areas from disturbance, and for public safety. |
| Fish and Wildlife Sanctuary | Annual or seasonal restrictions on areas to protect fish and wildlife species during periods of migration, resting, feeding, nesting, and/or spawning. |
| Open Recreation | Those waters available for year round or seasonal water-based recreational use. |

Definitions from USACE Engineer Pamphlet 1130-2-550: Recreation Operations and Maintenance Guidance and Procedures

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# Environmentally Sensitive Areas

Areas where scientific, ecological, cultural or aesthetic features have been identified. Designation of these lands is not limited to just lands that are otherwise protected by laws such as the Endangered Species Act, the National Historic Preservation Act or applicable State statues. These areas must be considered by management to ensure they are not adversely impacted. Typically, ***limited or no development of public use is allowed on these lands.*** No agricultural or grazing uses are permitted on these lands unless necessary for a specific resource management benefit, such as prairie restoration.

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# General Area Descriptions Include

- Specific regulations for area
- Typical public use: hunt, fish, hike, camp, etc.
- Justification if designated as Environmentally Sensitive Area
- Description of forested areas (provided by Corps)
- Historical changes to the area (e.g. EMP, etc)
- Facilities at each location: boat ramps (# lanes & surface), courtesy docks, parking lot (size & surface type), fish cleaning stations, restroom type, etc.

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## Example of Proposed Development

- These are NOT guaranteed developments.
- Identify who (Corps or partner) will be funding development
- Potential repair/replacement of infrastructure
- Potential EMP-HREP identified projects
- Example text: Improvements to the parking lot and entrance road. Investigate the feasibility and implement of dredging a small area around the boat ramp to improve accessibility.

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## Questions and/or Comments

Mississippi River Project Office
Attn: Master Plan
P.O. Box 534
Pleasant Valley, IA 52767
#309-794-4527
missrivermp@usace.army.mil

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## Second Round of Agency Coordination

**Subject:** Master Plan Agency meetings and Shoreline Plan not concurrent with Master Plan (UNCLASSIFIED)
**Date:** Tuesday, December 15, 2015 4:33:00 PM

Classification: UNCLASSIFIED
Caveats: NONE

Hello agency partners-

Thanks to all who were able to make the initial agency coordination meetings last spring for the Rock Island District- Mississippi River Project Master Plan Revision or otherwise provided initial feedback. We are currently scheduling a second round of agency coordination meetings in January.

We are also advising that the Shoreline Plan update will not occur concurrently with the Master Plan. We reviewed the potential for concurrent drafting with the Master Plan but determined that completing revisions separately would be beneficial due to limited staff and funding resources. The designation of a start date for the Shoreline Plan update is pending completion of the Master Plan.

Selected dates/locations for Master Plan agency meetings (please advise if these don't work):

February 25th, Pools 16-19, Wapello, IA

March 9th, Pools 20-22, Quincy, IL

March 24th, Pools 11-15, Savanna, IL

Purpose of the meeting:

- -review draft mapping classifications to include Environmentally Sensitive Areas
- -feedback regarding management area writing section
- -discuss strategic portions of the draft plan
- -initial NEPA coordination

Read ahead portions of the plan as well as maps will be provided prior to the meetings. More formal invites, to a wider list, will be sent to agencies with confirmed meeting dates, locations, and times. Public meetings for the draft plan will be scheduled for later in 2016.

Please forward this email as appropriate within your agency. If you have any questions, please don't hesitate to contact me.

Thanks,

Joseph Lundh
Supervisory Natural Resource Specialist
US Army Corps of Engineers

CEMVR-OD-MN 22 Feb 2016

MEMORANDUM FOR RECORD

SUBJECT: Agenda for US Army Corps of Engineers - Master Plan Revision Agency Meeting 25 February 2016 at Port Louis NWR Office.

1) Location: USFWS Port Louisa National Wildlife Refuge Office, 10728 County Road X61, Wapello, IA 52653

2) Date: 25 February 2016

3) Attendees:

4) 0900-0915 Introductions, confirm agenda, discuss lunch orders and other house keeping

5) 0915-1015 Presentation
   a) Master Plan revision background and policy review
   b) Classifications – including Environmentally Sensitive Areas
   c) Example resource area descriptions
   d) Chapter 6 additional topics
   e) NEPA – overview, where we are now, commenting, timeline
   f) General Plan land proposed changes
   g) Questions

6) 1015-1030 Break

7) 1030-1200 Agency questions on writing portion and begin mapping review

8) 1200-1230 Lunch – bring your own or bring funds to participate in Casey's pizza order

9) 1230- Complete (NLT 1500) Mapping review of classification maps and managing agency maps.

**Wapello Master Plan Agency Meeting Pools 16-19 Attendance 2-25-16**

| Name | Affiliation | City, State | Email Address |
|---|---|---|---|
| Judy Borah | USACE-MRPO | Pleasant Valley, IA | [redacted] |
| Bob Clevenstine | USFWS-Refuge | Moline, IL | [redacted] |
| Bill Ohde | Iowa DNR | Brighton, IA | [redacted] |
| Andy Robbins | Iowa DNR | Wapello, IA | [redacted] |
| Mike Griffin | IA DNR | Bellevue, IA | [redacted] |
| Kyle Syfert | Iowa DNR | Wapello, IA | [redacted] |
| Adam Myers | USACE-MRPO | Rock Island, IL | [redacted] |
| Cathy Nigg | USFWS-Port Louisa NWR | Wapello, IA | [redacted] |
| Kelly Thomas | USACE-MRPO | Pleasant Valley, IA | [redacted] |
| Jeff Nelson | USACE-ODMN | Pleasant Valley, IA | [redacted] |

CEMVR-OD-MN 07 March 2016

MEMORANDUM FOR RECORD

SUBJECT: Agenda for US Army Corps of Engineers - Master Plan Revision Agency Meeting 9 March 2016 at Quincy.

1) Location: Quincy Army Reserve Center, 2611 Weiss Lane, Quincy, IL 62301

2) Date: 9 March 2016

3) 0900-0915 Introductions, confirm agenda, discuss lunch orders and other house keeping

4) 0915-1030 Presentation
   a) Master Plan revision background and policy review
   b) Background on Master Plan chapters
      i) Classifications – including Environmentally Sensitive Area
      ii) Example resource area descriptions
      iii) Special topics
   c) NEPA – overview, where we are now, commenting, timeline
   d) General Plan land proposed update
   e) Shoreline Management Plan deferred
   f) Questions

5) 1030-1045 Break

6) 1045-1200 Agency questions on writing portion and begin mapping review

7) 1200-1230 Lunch – bring your own or bring funds to participate in food order from Hy-Vee (box lunch or perhaps entrees)

8) 1230- Complete (NLT 1500) Mapping review of classification maps and managing agency maps.

**Quincy Master Plan Agency Meeting Pools 20-22 Attendance 3-9-16**

| Name | Affiliation | City, State | Email Address |
|---|---|---|---|
| Judy Borah | USACE-MRPO | Pleasant Valley, IA | [redacted] |
| Bob Clevenstine | USFWS-Refuge | Moline, IL | [redacted] |
| Sarah Miller | USACE | St. Louis, MO | [redacted] |
| Kevin Dacey | USDA-NRCS | Columbia, MO | [redacted] |
| Travis Moore | MO Dept. of Conservation | Hannibal, MO | [redacted] |
| Rome Frericks | Quincy Park District | Quincy, IL | [redacted] |
| Adam Myers | USACE-MRPO | Rock Island, IL | [redacted] |
| Jon Schultz | USACE-MRPO | Pleasant Valley, IA | |
| Kelly Thomas | USACE-MRPO | Pleasant Valley, IA | [redacted] |
| Wendy Frohlich | USACE-Environmental Compliance | Rock Island, IL | [redacted] |
| Janet Sternburg | MO Dept. of Conservation | Jefferson City, MO | [redacted] |

CEMVR-OD-MN 22 March 2016

MEMORANDUM FOR RECORD

SUBJECT: Agenda for US Army Corps of Engineers - Master Plan Revision Agency Meeting 24 March 2016 near Thomson, IL.

1) Location: USFWS Upper Mississippi River National Wildlife & Fish Refuge - Savanna District Office, 7071 Riverview Rd, Thomson, IL 61285

2) Date: 24 March 2016

3) 0900-0915 Introductions, confirm agenda, discuss lunch orders and other house keeping

4) 0915-1030 Presentation
   a) Master Plan revision background and policy review
   b) Background on Master Plan chapters
      i) Classifications – including Environmentally Sensitive Area
      ii) Example resource area descriptions
      iii) Special topics
   c) NEPA – overview, where we are now, commenting, timeline
   d) General Plan land proposed update
   e) Shoreline Management Plan deferred
   f) Questions

5) 1030-1045 Break

6) 1045-1200 Agency questions on writing portion and begin mapping review

7) 1200-1230 Lunch – bring your own or bring funds to participate in pizza lunch order.

8) 1230- Complete (NLT 1500) Mapping review of classification maps and managing agency maps.

| Name | Affiliation | City, State | Email Address |
|---|---|---|---|
| Judy Borah | USACE-MRPO | Pleasant Valley, IA | [redacted] |
| Tim Yager | USFWS-Refuge | Winona, MN | [redacted] |
| Ed Britton | USFWS-UMRNW & FR | Savanna, IL | [redacted] |
| Kathy Kowal | USEPA-NEPA Review | Chicago, IL | [redacted] |
| Mike Griffin | IA DNR | Bellevue, IA | [redacted] |
| David Reynolds | USACE-Rock Island District | Rock Island, IL | [redacted] |
| Adam Myers | USACE-MRPO | Rock Island, IL | [redacted] |
| Wendy Frohlich | USACE-Environmental Compliance | Rock Island, IL | [redacted] |
| Curt Kemmerer | IA DNR | Maquoketa, IA | [redacted] |
| Jim VanHecke | Rock Island Co. FP | Hampton, IL | |
| Loras Herrig | City of Bellevue | Bellevue, IA | [redacted] |
| Daryl Parker | Jackson County Conservation | Maquoketa, IA | [redacted] |
| Ben Vandermyde | USACE-ODMN | Pleasant Valley, IA | [redacted] |
| Jeff Nelson | USACE-ODMN | Pleasant Valley, IA | [redacted] |
| Russ Engelke | USFWS-Upper Miss Refuge | Savanna, IL | [redacted] |
| Scott Gritters | (by phone) | | |
| Jeremy Pickol | (by phone) | | |

CEMVR-OD-MN 04 Oct 2017

MEMORANDUM FOR RECORD

SUBJECT: Meeting Agenda with FWS on Master Plan Revision

10) Location: FWS Office Moline

11) Date: 5 October 2017

12) Attendees: Corps, FWS McGregor and Savanna Districts, Port Louisa and Great River NWR

13) General discussion on Master Plan.
    a) Purpose- Natural Resource and Recreation planning document
    b) Actions to date
    c) Timeline- early 2018 public/agency comment period, NEPA comment period 2018
    d) Informal review requested
    e) Relation to other plans
    f) Integrated EA

14) Written Plan
    a) Chapter 3- Goals and objectives
    b) Chapter 4- Classifications
        i) ESA areas (20,000 acres of 60,000)
    c) Chapter 5- area descriptions and future plans
        i) Cottage tables
    d) Chapter 6- special topics
        i) Outgrant policy
        ii) Barge fleeting
        iii) Cottages
        iv) Shoreline Management Plan
        v) Missed topics?
    e) Chapter 8- EA writing
        i) Public input
        ii) Alternatives
        iii) Changes from no action to preferred

15) Mapping
    a) General explanation
    b) Usage for General Plan update exhibits and changes
    c) State line issues
    d) PL84-99 levee ROW
    e) Map review per request

## 5. ENVIRONMENTAL ASSESSMENT 30-DAY PUBLIC REVIEW COMMENTS

The 30-day public review period is anticipated for spring 2021. The content in this section is forthcoming.

# MISSISSIPPI RIVER PROJECT MASTER PLAN
# WITH
# INTEGRATED ENVIRONMENTAL ASSESSMENT

## UPPER MISSISSIPPI RIVER WATERSHED
## POOLS 11-22
## 9-FOOT CHANNEL NAVIGATION PROJECT
## PLEASANT VALLEY, IOWA

## APPENDIX C

## DESIGN MEMORANDUMS

**Specific Design Memorandums for Master Planning**

| | |
|---|---|
| 1. Master Recreation Plan (Basic) | Jun 1948 |
| Supplement. Timber Resources and Management | Oct 1955 |
| 2. Master Plan (Revision) | Oct 1956 |
| A. Supplement No. 1, Thomson Causeway Public Use Area | Jun 1961 |
| B. Supplement No. 2, Dredging Access to State of IL Dept. of Conservation Public Facility at Miller's Hollow | |
| C. Supplement No. 3, Lock and Dam 21 Public Use Area | Sep 1962 |
| D. Supplement No. 4, Lock and Dam 20 Public Use Area | Jan 1965 |
| 3. Master Plan (Revision for Resource Management) | Dec 1969 |
| Chapter 1 – General | Dec 1969 |
| Chapter 2 – Pool 11 | Mar 1970 |
| Chapter 3 – Pool 12 | Aug 1970 |
| Chapter 4 – Pool 13 | Jan 1971 |
| Chapter 5 – Pool 14 | Jan 1971 |
| Chapter 6 – Pool 15 | Jan 1971 |
| Chapter 7 – Pool 16 | Jan 1971 |
| Chapter 8 – Pool 17 | Jan 1971 |
| Chapter 9 – Pool 18 | Dec 1971 |
| Chapter 10 – Pool 19 | Dec 1971 |
| Chapter 11 – Pool 20 | Oct 1972 |
| Chapter 12 – Pool 21 | Oct 1972 |
| Chapter 13 – Pool 22 | Dec 1969 |
| A. Supplement. Plans for Expansion of Public Use Areas (7) | Mar 1977 |
| B. Appendix A. Project Resource Management Pools 11-22 | Apr 1978 |
| C. Appendices B & D. Forest, Fish and Wildlife Management Pools 11-22. | Apr 1982 |
| D. Appendix C. Fire Protection Pools 11-22 | Feb 1980 |
| E. Appendix E. Project Safety Pools 11-22 | Feb 1980 |
| F. Land Use Allocation Plan for Pools 11-22 | Oct 1989 |
| G. Shoreline Management Plan for Pools 11-22 | Oct 1989 |
| H. Supplement No. 1 Land Reclassification from Operations: Recreation-Intensive Use to Operations: Wildlife Management/ Reserve Forest Land for the Smallpox Creek Recreation Area | Jun 2012 |

**Other Design Memorandums for Mississippi River**

| | |
|---|---|
| Jun 53 | Keokuk, IA; New Lock No. 19, Lift Gate Machinery Criteria, Rpt. No. 1 (19P5-1) |
| 1954 | Sny, Rpt No. 3, (GP171-23) |
| Feb 54 | Sny Basin, Flood Control, Hydrology and Hydraulics (GP115-10) |
| Feb 54 | Sny Basin, Flood Control, Sedimentation, Rpt. No. 2 (GP115-11) |
| Mar 54 | Sny Basin, Flood Control, General Design Memo, Rpt. No. 3 (GP115-12) |

May 54 Beardstown, Illinois Flood Control Project General Design Memorandum
May 54 Sny Basin, Flood Control, Coordination with Others, Rpt No. 5 (GP115-14)
Dec 54 Design of Levees, Report on Engineer Data (GP172-22)
Feb 55 Sny Basin, Flood Control, Soils, Rpt. No. 4 (GP115-13)
Dec 55 Sabula, Iowa (GP42-36)
May 56 Muscatine, Iowa, Mad Creek, LFP (2 copies) (GP41-34 or GP172-27)
June 56 Beardstown, Illinois Flood Control Project Adjoining Levees Station 0+00 to Station 138+00
Aug 56 Canton, MO; Flood Control, Quantity Estimate (20P2-52)
Aug 56 Canton, MO; Flood Control, South Side Levee and Diversion (20P2-55)
Aug 56 Canton, MO; Flood Control, Estimate Summary (20P2-51)
Aug 56 Canton, MO; Flood Control, Diversion Channel (20P2-53)
Feb 57 Campbells Island, IL; Local Flood Protection (15P3-39)
Feb 57 Hannibal, MO; Harbor Improvements (22P2-40)
May 57 Bear Creek Reservoir, Hannibal, MO; Local Protection, Revised Jun 58 (22P2-39)
Jul 57 Hunt DD and Lima Lake DD, LFP, Rpt. No. 1 (GP181-17)
Aug 57 Muscatine Island Levee District and DD No. 13, LFP, Rpt. No. 1 (GP41-18)
Sep 57 Fabius River DD, LFP, Rpt. No. 1 (GP42-19)
Apr 58 Fort Madison, IA; Harbor Improvements (19P5-33)
Apr 58 Beardstown, Illinois Flood Control Project Adjoining Levees Station 0+00 to Station 138+00
Dec 58 Muscatine Island Levee District & Muscatine-Louisa County DD No. 13, IA; Interior Drainage (GP41-19)
Jan 59 Revised Fort Madison, IA Harbor Improvements (19P5-33a)
Apr 59 Sny Basin, Flood Control, Hadley – McCraney Diversion, Rpt. No. 7a (GP115-16)
May 59 Des Moines & Miss Levee Dist No. 1, Missouri, LFP, Rpt No. 1 (2 copies) (GP42-10)
May 59 Drury DD, IL; Mississippi River, Flood Control Project (GP39-14)
Jul 59 Gregory Drainage District, MO; Flood Protection From Hill Streams (GP39-22)
Aug 59 Henderson River, LFP, Rpt. No. 1 (GP41-7)
Oct 59 Sny Basin, Flood Control, The Sny Cleanout, Rpt. No. 9
Jan 60 Sny Basin, Flood Control, Pumping Station No. 1, Rpt No. 8a (GP115-19)
Mar 60 Sny Basin, Flood Control, Pumping Station No. 3a, Rpt No. 8b (GP115-20)
Apr 60 Sny Basin, Flood Control, Concrete Aggregates & Protection Stone, Rpt No. 10
May 60 Sny Basin, Flood Control, Pumping Station No. 4, Rpt. No. 8c (GP115-21)
Jun 60 Sny Basin, Flood Control, Kiser Creek Diversion, Rpt. No. 7b (GP115-17)
Jul 60 Mississippi River at Davenport, IA, Lindsay Park; Harbor Improvements (GP39-13)
Dec 60 Dubuque, Iowa, Improvement Commercial Harbor, Rpt. No. 1 (GP114-1)
Feb 61 L/D 11, Mississippi River Nine Foot Channel, Foundation Protection (GP106-33)
Feb 61 Mississippi River, Clinton, IA; improvement of Beaver Slough, Rpt. No. 1 (GP39-12)
Sep 61 Sny Basin, Flood Control, Six Mile & Bay Creek Diversion & Closing Levee, Rpt No. 7c (GP115-18)
Oct 61 Red Rock Reservoir, Howell Dam Site, Des Moines River, IA; Relocations – Marion County

Oct 61 Sub District No. 1 of Drainage Union No. & Bay Island DD No. 1, Rpt. No. 1 (GP42-1)
Dec 61 Muscatine Island Levee District and DD No. 13, LFP, Downstream Flank Levee Supplement DM No. 1B (GP41-20)
May 62 Green Bay Levee and Drainage District No. 2, IA, Mississippi River, Design Memo No.1
Nov 62 Henderson County DD No. 1, Rpt. No. 1 (GP41-8)
Jan 63 S. Quincy Drainage and Levee District, Rpt. No. 1 (GP41-23)
Mar 63 Henderson County DD No. 2, Rpt. No. 1 (GP41-9)
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Oct 63 Hunt DD and Lima Lake DD, LFP, Rock Run Diversion (2 copies) (GP41-27)
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Jun 64 Sny Island Levee DD, LFP, Reach 3 Main Stem Levee Improvement (GP114-23)
Oct 64 Sny Island Levee DD, LFP, Reach 4, Main Stem Levee Improvement Rpt. No 4 (GP114-24)
Nov 64 Andalusia Small Boat Harbor (GP114-43)
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Mar 65 Indian Grave DD, LFP, Rpt. No 1 and Supplement No. 1 (GP121-57)
Oct 65 Gregory DD, MO; Local LFP, Rpt. No. 1 (GP39-24)
Oct 65 Savanna Small Boat Harbor (GP114-47)
Dec 65 L/Ds 2 – 10; Mississippi River 9-ft Navigation Project, Remedial Works, Rpt. No. 1
Feb 66 Indian Grave DD, LFP, Downstream Unit of District (GP42-16)
Mar 66 Horse Island and Crescent Bridge, Channel Improvement (GP42-34)
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Dec 69 Fort Madison, IA; Commercial Harbor (19P5-57)
Jan 70 Dubuque, IA, Mississippi River, LFP, No. 1

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Jun 73 Clinton, IA; Local Flood Protection, Supplement No. 1
Dec 73 Bettendorf, IA; Local Flood Protection, Rpt. No. 1 (GP39-8)
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Jun 86 South Quincy Drainage and Levee District, IL; Local Flood Protection (GP192C-25)
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Oct 87 Bettendorf, IA, Mississippi River, LFP
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## APPENDIX D

## APPLICABLE FEDERAL STATUTES

## APPLICABLE FEDERAL STATUTES

The following Public Laws (PL ) are applicable to Mississippi River Project Master Plan 2020 Revision.

**PL 59-209, Antiquities Act of 1906:** The first Federal law established to protect what are now known as "cultural resources" on public lands. It provides a permit procedure for investigating "antiquities" and consists of two parts: an Act for the Preservation of American Antiquities, and an Act for Uniform Rules and Regulations.

**The Migratory Bird Act of 1918 (16 USC 703-712) as amended:** The original 1918 statute implemented the 1916 Convention between the U.S. and Great Britain (for Canada) for the protection of migratory birds. Later amendments implemented treaties between the U.S. and Mexico, the U.S. and Japan, and the U.S. and the Soviet Union (now Russia) under multiple legislation.

**PL 74-292, Historic Sites Act of 1935:** Established national policy to preserve for (in contrast to protecting from) the public, historic (including prehistoric) sites, buildings, and objects of national significance. This Act provides both authorization and a directive for the Secretary of the Interior, through the National Park Service, to assume a position of national leadership in the area of protecting, recovering, and interpreting national archeological historic resources. It also establishes an "Advisory Board on National Parks; Historic Sites, Buildings, and Monuments, a committee of eleven experts appointed by the Secretary to recommend policies to the Department of the Interior".

**PL 74-409, The River and Harbor Act of 1935:** Approved 30 August 1935; determined that non-navigable types of dams would be used for the Nine-Foot Channel Navigation Project. Non-navigable dams are those which will not pass vessels without the use of locks. It also identified the improvements that were to be made on the Illinois River, which included dredging and the construction of modern locks and dams at Peoria and La Grange and the removal of the earlier navigation structures at La Grange and Kampsville. The construction of Lock and Dam 26 on the Mississippi at Alton, IL made the Illinois River navigable from its mouth to Illinois River RM 80.

**PL 78-534, Flood Control Act of 1944:** Section 4 of the Act, as last amended in 1962 by Section 207 of PL 87-874, authorizes the Corps to construct, maintain, and operate public parks and recreational facilities in reservoir areas and to grant leases and licenses for lands, including facilities, preferably to Federal, state or local governmental agencies.

**PL 79-526, The Flood Control Act of 1946:** Approved 24 July 1946. Section 4 (60 Stat. 641) amended PL 78-534 to include authority to grant leases of lands in reservoir areas and licensing of lands to Federal, state and local government agencies when in the public interest.

**PL 83-780, The Flood Control Act of 1954:** Section 209 of this Act amended the Flood Control Act of 1944. It authorized the Secretary of the Army to grant leases to Federal, state or local government agencies without monetary considerations for use and occupation of land

and water areas under the jurisdiction of the Department of the Army for park and recreation purposes when in the public interest (68 Stat 1256).

**PL 87-874, The Flood Control Act of 1962:** Section 207 of this Act amended Section 4 of the Flood Control Act of 1944, permitting recreational developments at non-reservoir projects (76 Stat. 1195).

**PL 85-500, River and Harbor Act of 1958:** Authorizes the construction, repair, and preservation of certain public works on rivers and harbors for navigation, flood control, and for other purposes.

**PL 85-624, Fish and Wildlife Coordination Act 1958:** Amended in 1965, this Act sets down the general policy that fish and wildlife conservation shall receive equal consideration with other project purposes and be coordinated with other features of water resource development programs. Opportunities for improving fish and wildlife resources and adverse effects on these resources shall be examined along with other purposes which might be served by water resources development.

**PL 86-523, The Archaeological and Historic Preservation Act:** Also called the Reservoir Salvage Act (16 USC 469 et seq.), this Act, approved 27 June 1960 as amended, provided for the preservation of historical and archaeological data which might otherwise be lost or destroyed as the result of flooding or any alteration of the terrain caused as a result of any Federal construction projects.

**PL 86-717, Forest Conservation:** Provides for the protection of forest cover for reservoir areas under this jurisdiction of the Secretary of the Army and the Chief of Engineers.

**PL 87-874, Rivers and Harbors Act of 1962:** Authorizes the construction, repair, and preservation of certain public works on rivers and harbors for navigation, flood control, and for other purposes.

**PL 88-578, Land and Water Conservation Fund Act of 1965:** Established a fund from which Congress can make –appropriations for outdoor recreation. Section 2(2) makes entrance and user fees at reservoirs possible by deleting the words "without charge" from Section 4 of the 1944 Flood Control Act as amended.

**PL 89-72, Federal Water Project Recreation Act of 1965:** Requires that not less than one-half the separable costs of· developing recreational facilities and all operation and maintenance costs at Federal reservoir projects shall be borne by a non-Federal public body. An OCE/OMB implementation policy made these provisions applicable to projects completed prior to 1965.

**PL 89-90, Water Resources Planning Act (1965):** Established the Water Resources Council and gives it the responsibility to encourage the development, conservation, and use of the Nation's water and related land resources on a coordinated and comprehensive basis.

**PL 89-665, National Historic Preservation Act of 1966:** Requires Federal agencies to consider the effects of its actions on historic properties. Provides for: (1) an expanded National Register of Historic Places to include significant sites and objects; (2) matching grants to states undertaking historic and archeological resource inventories; and (3) a program of grants-in aid to the National Trust for Historic Preservation; and (4) the establishment of an Advisory Council on Historic Preservation. Section 106 requires that the President's Advisory Council on Historic Preservation have an opportunity to comment on any undertaking which adversely affects properties listed, nominated, or considered important enough to be included on the National Register of Historic Places.

**PL 91-190, National Environmental Policy Act of 1969 (NEPA):** NEPA declared it a national policy to encourage productive and enjoyable harmony between man and his environment, and for other purposes. Specifically, it declared a "continuing policy of the Federal Government to use all practicable means and measures to foster and promote the general welfare, to create conditions under which man and nature can exist in productive harmony, and fulfill the social, economic, and other requirements of present and future generations of Americans." Section 102 authorized and directed that, to the fullest extent possible, the policies, regulations and public law of the US shall be interpreted and administered in accordance with the policies of the Act.

**PL 91-611, River and Harbor and Flood Control Act of 1970:** Section 234 provides that persons designated by the Chief of Engineers shall have authority to issue a citation for violations of regulations and rules of the Secretary of the Army, published in the Code of Federal Regulations.

**PL 92-500, Federal Water Pollution Control Act Amendments of 1972:** The Federal Water Pollution Control Act of 1948 (PL 845, 80th Congress), as amended in 1956, 1961, 1965 and 1970 (PL 91- 224), established the basic tenet of uniform State standards for water quality. PL 92-500 strongly affirms the Federal interest in this area. "The objective of this act is to restore and maintain the chemical, physical and biological integrity of the Nation's waters."

**PL 92-516, Federal Environmental Pesticide Control Act of 1972:** Completely revises the Federal Insecticide, Fungicide and Rodenticide Act. It provides for complete regulation of pesticides to include regulation, restrictions on use, actions within a single State, and strengthened enforcement.

**PL 93-81, Collection of Fees for Use of Certain Outdoor Recreation Facilities:** Amends Section 4 of the Land and Water Conservation Act of 1965, as amended to require each Federal agency to collect special recreation use fees for the use of sites, facilities, equipment, or services furnished at Federal expense.

**PL 93-205, The Endangered Species Act of 1973:** Requires that Federal agencies will, in consultation with the U.S. Fish and Wildlife Service, further conservation of endangered and threatened species and ensure that their actions are not likely to jeopardize such species or destroy or modify their critical habitat.

**PL 93-251, Water Resources Development Act of 1974:** Section 107 of this law establishes a broad Federal policy which makes it possible to participate with local governmental entities in the costs of sewage treatment plan installations.

**PL 93-291, Archeological Conservation Act of 1974:** The Secretary of the Interior shall coordinate all Federal survey and recovery activities authorized under this expansion of the 1960 act. The Federal Construction agency may transfer up to 1 percent of project funds to the Secretary of the Army with such transferred funds considered non-reimbursable project costs.

**PL 93-303, Recreation Use Fees:** Amends Section 4 of the Land and Water Conservation Act of 1965, as amended, to establish less restricted criteria under which Federal agencies may charge fees for the use of campgrounds developed and operated at Federal areas under their control.

**PL 93-523, Safe Drinking Water Act:** Assures that water supply systems serving the public meet minimum national standards for protection of public health. The Act (1) authorizes the Environmental Protection Agency to establish Federal standards for protection from all harmful contaminants, which standards would be applicable to all public water systems, and (2) establishes a joint Federal-State system for assuring compliance with these standards and for protecting underground sources of drinking water.

**PL 94-422, Amendment of the Land and Water Conservation Fund Act of 1965:** Expands the role of the Advisory Council. Title 2, Section 102a amends Section 106 of the Historical Preservation Act of 1966 to say that the Council can comment on activities which will have an adverse effect on sites either included in or eligible for inclusion in the National Register of Historic Places.

**Executive Order 11593**, **13 May 1971, Protection and Enhancement of the Cultural Environment** required Federal agencies to administer cultural properties under their control and direct their policies, plans, and programs in such a way that Federally owned sites, structures, and objects of historical, architectural, or archeological significance were preserved, restored, and maintained.

**PL 95-217, Clean Water Act of 1977, as amended:** Amends the Federal Water Pollution Control Act of 1970 and extends the appropriations authorization. The Clean Water Act is a comprehensive Federal water pollution control program that has as its primary goal the reduction and control of the discharge of pollutants into the nation's navigable waters. The Clean Water Act of 1977 was amended by the Water Quality Act of 1987, Public Law 100-4.

**Executive Order 11988:** Requires Federal agencies to avoid to the extent possible the long and short-term adverse impacts associated with the occupancy and modification of flood plains and to avoid direct and indirect support of floodplain development wherever there is a practicable alternative.

**PL 95-341, American Indian Religious Freedom Act of 1978:** Protects the rights of Native Americans to exercise their traditional religions by ensuring access to sites, use and

possession of sacred objections, and the freedom to worship through ceremonials and traditional rites.

**PL 95-632, Endangered Species Act Amendments of 1978:** Amends the Endangered Species Act Amendments of 1973. Section 7 directs agencies to conduct a biological assessment to identify threatened or endangered species that may be present in the area of any proposed project. This assessment is conducted as part of a Federal agency's compliance with the requirements of Section 102 of NEPA.

**PL 96-95, Archeological Resources Protection Act of 1979:** Protects archeological resources and sites that are on public and tribal lands and fosters increased cooperation and exchange of information between governmental authorities, the professional archeological community, and private individuals. It also establishes requirements for issuance of permits by the Federal land managers to excavate or remove any archeological resource located on public or Indian lands.

**PL 98-63, Supplemental Appropriations Act of 1983:** Authorized the Corps of Engineers' Volunteer Program. The United States Army Chief of Engineers may accept the services of volunteers and provide for their incidental expenses to carry out any activity of the Army Corps of Engineers except policy making or law or regulatory enforcement.

**PL 97-98, The Farmland Protection Policy Act:** Approved 22 December 1981, minimized the extent to which Federal programs contribute to the unnecessary and irreversible conversion of farmland to nonagricultural uses.

**PL 99-662, The Water Resources Development Act of 1986:** Provides for the conservation and development of water and related resources and the improvement and rehabilitation of the Nation's water resources infrastructure.

**PL 100-298, The Abandoned Shipwreck Act:** Approved 28 April 1988, asserts U.S. Government title to three categories of abandoned shipwrecks: those embedded in a state's submerged lands; those embedded in coralline formations protected by a state on its submerged lands, and those located on a state's lands that are included or determined eligible for inclusion in the National Register of Historic Places. The law then transfers title for a majority of those shipwrecks to the respective states, and provides that states develop policies for management of the wrecks so as to protect natural resources, permit reasonable public access, and allow for recovery of shipwrecks consistent with the protection of historical values and environmental integrity of wrecks and sites.

**PL 101-601, The Native American Graves Protection and Repatriation Act (NAGPRA):** Approved 16 November 1990, provides a process for museums and Federal agencies to return certain Native American cultural items—human remains, funerary objects, sacred objects, or objects of cultural patrimony—to lineal descendants, and culturally affiliated Indian tribes and Native Hawaiian organizations. NAGPRA includes provisions for unclaimed and culturally unidentifiable Native American cultural items, intentional and inadvertent discovery of Native

American cultural items on Federal and tribal lands, and penalties for noncompliance and illegal trafficking.

**PL 101-640, Water Resource Development Act of 1990:** Provides for the conservation and development of water and related resources and the improvement and rehabilitation of the Nation's water resources infrastructure.

**PL 101-676, Water Resource Development Act of 1988:** Provides for the conservation and development of water and related resources and the improvement and rehabilitation of the Nation's water resources infrastructure.

**PL 102-580, Water Resource Development Act of 1992:** Provides for the conservation and development of water and related resources and the improvement and rehabilitation of the Nation's water resources infrastructure.

**PL 104-303, Water Resource Development Act of 1996:** Provides for the conservation and development of water and related resources and the improvement and rehabilitation of the Nation’s water resources infrastructure.

**Executive Order 13007, 24 May 1996:** This Executive Order directs Federal land-managing agencies to accommodate Native Americans' use of sacred sites for religious purposes and to avoid adversely affecting the physical integrity of sacred sites.

**PL 106-53, Water Resource Development Act of 1999:** Provides for the conservation and development of water and related resources and the improvement and rehabilitation of the Nation’s water resources infrastructure.

**PL 106-541, Water Resource Development Act of 2000:** Provides for the conservation and development of water and related resources and the improvement and rehabilitation of the Nation’s water resources infrastructure.

**PL 109-58, Energy Policy Act of 2005:** Directed the Secretaries of Agriculture, Commerce, Defense Energy and Interior to identify corridors for oil, gas, and hydrogen pipelines and electrical transmission and distribution facilities on Federal lands and to schedule prompt action to identify, designate, and incorporate the corridors into the applicable land use plans.

**PL 110-114, Water Resource Development Act of 2007:** Provides for the conservation and development of water and related resources and the improvement and rehabilitation of the Nation's water resources infrastructure.

**PL 113-121, The Water Resources Reform and Development Act of 2014:** This Act authorizes the U.S. Army Corps of Engineers to carry out missions to develop, maintain, and support the nations vital ports and waterways infrastructure needs and support effective and targeted flood protection and restoration needs.

**PL 106-147, Neo-tropical Migratory Bird Conservation Act: 20 July 2000:** Promotes the conservation of habitat for neo-tropical migratory birds.

**Executive Order 13186,** Responsibilities of Federal Agencies to Protect Migratory Birds, 10 January 2001, directs Federal agencies, pursuant to its Memorandum of Understanding with the US Fish and Wildlife Service, to support the conservation intent of migratory bird conventions by integrating bird conservation principles, measures, and practices into agency activities and by avoiding or minimizing, to the greatest extent practicable, adverse impacts on migratory bird resources.

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## APPENDIX E

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# MISSISSIPPI RIVER PROJECT MASTER PLAN
# WITH
# INTEGRATED ENVIRONMENTAL ASSESSMENT

# UPPER MISSISSIPPI RIVER WATERSHED
# POOLS 11-22
# 9-FOOT CHANNEL NAVIGATION PROJECT
# PLEASANT VALLEY, IOWA

## APPENDIX F

## 2012 UPPER MISSISSIPPI RIVER SYSTEMIC FOREST STEWARDSHIP PLAN

# Upper Mississippi River

# Systemic Forest Stewardship Plan

US Army Corps of Engineers

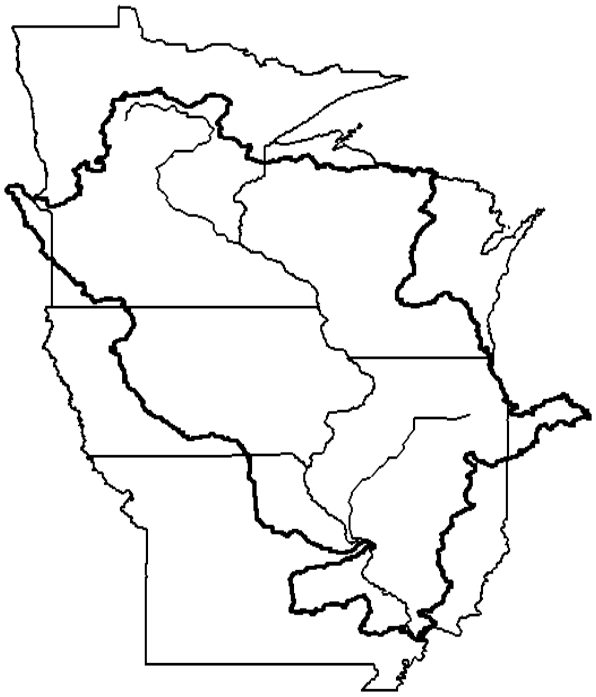
St. Paul District
Rock Island District
St. Louis District

Our Mississippi
PARTNERING TO KEEP AMERICA'S RIVER GREAT

August 2012

# Upper Mississippi River

# Systemic Forest Stewardship Plan



**U.S. Army Corps of Engineers**
**Forest Management Project Delivery Team**

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# I. Executive Summary

## Introduction

The Mississippi River is the largest riverine ecosystem in North America and third largest in the world. The Upper Mississippi River (UMR) floodplain ecosystem supports more than 300 species of birds, 57 species of mammals, 45 species of amphibians and reptiles, 150 species of fish, and nearly 50 species of mussels. It is the backbone of the Mississippi Flyway, which is used by more than 40 percent of North America's migratory waterfowl. The Upper Mississippi River also has a record of human history spanning over 12,000 years and is increasingly being documented as one of the most archeologically and historically significant regions in the country. The river has played a significant role in the development of the modern Midwestern economy and culture, and it continues to provide many benefits to the States and local communities along the river corridor.

The UMR Systemic Forest Stewardship Plan was developed to provide a guide for the sustainable management of Upper Mississippi River System (UMRS) forests, including opportunities for their restoration, and to ensure that the UMRS maintains its recognition as a nationally treasured ecological resource. The Plan accomplishes this by describing the current understanding of the state of the resource and its ecological stressors; providing guidance for forest restoration activities; establishing goals and objectives; identifying opportunities and data needs; establishing a monitoring strategy through an adaptive management framework; and developing additional recommendations that will ensure the long-term sustainability of this key component of the UMRS ecosystem.

Development of the Plan largely followed from agency and stakeholder recognition of the need for a framework of coordinated management at a system level to advance the overarching ecosystem goal of conserving, restoring, and maintaining the ecological structure and function of the UMRS. The coordinated effort was guided by a Product Delivery Team (PDT) consisting of members from the three UMRS Corps of Engineers Districts, five UMRS States, multiple Federal Agencies, non-governmental organizations, and additional stakeholders. The Plan establishes a foundation for the Corps and these partner agencies and stakeholders to more effectively collaborate on and implement environmental stewardship activities in UMRS forests.

## Designated Project Area

The Systemic Forest Stewardship Plan project area is designated as the Upper Mississippi River System (UMRS) 500-year floodplain, regardless of ownership. The UMRS itself is a subset of the larger Mississippi River system, and includes the Mississippi River from Minneapolis–St. Paul, Minnesota, to its confluence with the Ohio River; the Illinois River from Chicago to Grafton, Illinois; and navigable sections of the Minnesota, St. Croix, Black and Kaskaskia Rivers. The lateral extent of the 2.6 million acre UMRS floodplain ecosystem generally encompasses the river valley lands from bluff to bluff, and consists of a mosaic of land and water that contains bottomland forests, grasslands, islands, backwaters, side channels and wetlands.

## Resource Trends

Modern UMRS forests represent only a small portion of pre-settlement floodplain forests in some reaches. The development of the UMRS floodplain for agriculture, combined with extensive logging for fuel wood and lumber, resulted in widespread conversion of forest and prairie habitats. Today, contiguous forest cover is primarily confined to a relatively narrow strip on the riverward side of agricultural levees, although large portions of forest remain relatively intact in some protected refuge areas. In many river reaches, most natural floodplain communities have been replaced by agriculture. Species composition of the remaining forest has also become less diverse, due in part to altered hydrology, a loss of the seasonal "flood pulse," and the effects of periodic severe flooding, particularly the flood of 1993. This change is especially evident in the decline of mast producing species such as oaks and hickories, and corresponding increase in dominance by silver maple in many floodplain forest communities. Diseases, insects and invasive plant species also continue to have negative impacts throughout the UMRS.

## Future Trends in UMRS Floodplain Forests – *Without Management*

Some of the changes we might expect to see over the next 50 years, without active forest management, are outlined below:

- A reduction in pioneer species such as cottonwood and willow
- More open forest canopies as trees die and canopy gaps are invaded by herbaceous vegetation and/or grasses (e.g., reed canary grass)
- Continued loss of forest in the lower parts of navigation pools due to island erosion
- Conversion of forest to other vegetation types in mid-pools due to elevated water tables
- Fewer mast trees as species composition in intact forests continues to shift towards silver maple and other more shade and water tolerant trees

## Adaptive Management

Partners have agreed to include the incorporation of an adaptive management framework in forest management and restoration activities as a variety of uncertainties exist regarding the long-term trajectory of the forest resource. Restoration projects can then become learning opportunities by utilizing an experimental design or technique and effective monitoring strategies that in turn inform future management decisions.

## UMRS Floodplain Forest Ecosystem Services

*Water Quality* – Improvement to ground and surface water by promoting infiltration, recharge, detoxification, and nutrient cycling; natural flood and erosion/scour control by absorbing energy from floodwaters, reducing flood velocities and peaks, and reducing sediment loads.

*Living Resources* – Provision of fish and wildlife habitat, organic matter production, natural genetic diversity, pollination, protection of rare and endangered species, and creation of corridors for migration.

*Land Based Resources* – Establishment and enhancement of forests, harvests of natural products, wind breaks, and carbon sequestration.

*Education/Research* – Opportunities for environmental education and the scientific study of physical, biological and cultural resources.

*Cultural/Recreational Resources* – Consumptive and non-consumptive uses, open space, and aesthetic values.

## Desired Future Condition

Among the public lands in the UMRS floodplain, Corps-managed lands have become critical for the ecological sustainability of floodplain forests and associated terrestrial and aquatic ecosystems. The Corps forestry program will provide high-quality, sustainable bottomland forest on Corps lands along the UMRS, including a natural diversity of tree species, ages, canopy heights, and understory vegetation. The "ideal" floodplain forest will support floodplain ecosystem functions and sustainable habitat for wildlife. Therefore, the vision is to maintain a healthy, nearly contiguous forest that spreads across wide stretches of the floodplain and contains a sufficient diversity of tree species, size and age classes to provide a wide array of habitat structure and food (mast) resources.

**Box ES1. Floodplain Forest Restoration Tools**

- Timber stand improvement (TSI)
- Harvesting methods
    - Group selection, shelterwood, & seed tree
- Site preparation
- Forest establishment
    - Natural regeneration
    - Tree plantings
        - Containerized saplings, bare root seedlings, & direct seeding
- Prescribed burning
- Elevation modification
- Water level management

## System-Wide Goals

The UMR Systemic Forest Stewardship Plan is based upon a set of ecologically and socially desired future UMRS ecosystem conditions, summarized in the following vision statement endorsed by the Navigation Environmental Coordinating Committee (NECC) and in the overarching ecosystem goal developed by the Navigation and Ecosystem Sustainability Program (NESP) Science Panel:

*Vision Statement* – To seek long-term sustainability of the economic uses and ecological integrity of the Upper Mississippi River System

*Overarching Ecosystem Goal* – To conserve, restore, and maintain the ecological structure and function of the Upper Mississippi River System to achieve the vision.

The following system-wide goals were developed for inclusion in the UMR Systemic Forest Stewardship Plan:

- A functional, sustainable floodplain ecosystem that includes a mosaic of native vegetation communities sufficient to support important wildlife habitat
- Restore and maintain forest diversity, health, and sustainability on Federal lands
- Provide support for the restoration and maintenance of forest diversity, health and sustainability on non-Federal lands
- Adaptive management: science-based decision-making

**Box ES2. Desired Stand Conditions for UMRS Forests**

| Forest Variables | Desired UMRS Stand Structure | Conditions that may warrant active management |
|---|---|---|
| **Overstory canopy cover** | 70 – 80% | > 80% |
| **Overstory Species** | 2 or more species | Large blocks of single species |
| **Basal area** | 90-160 $ft^2$ per acre | > 200 $ft^2$ per acre |
| **Tree stocking** | 50% – 90% | < 50% or > 90% |
| **Emergent trees** | > 2 per acre | < 1 per acre |
| **Understory cover** | > 10 % | < 10% |
| **Regeneration** | > 10% of area | < 10% of area |
| **Coarse woody debris** | Present | Not present |
| **Small cavities** | ≥ 2 visible holes per acre | < 2 visible holes per acre |
| **Den trees/large cavities** | ≥ 1 visible hole per 10 acres | < 1 visible holes per 10 acres |
| **Standing dead trees** | ≥ 2 large trees per acre | < 2 large trees per acre |
| **Invasive (herbaceous)** | < 10% | > 10% of herbaceous layer |
| **Invasive (woody)** | < 10% | > 10% of any canopy layer |

## Recommended Priority Actions

*Development of a system-wide hydrogeomorphic model (HGM)* – Hydrogeomorphic modeling can provide a science-based approach to identifying ecosystem restoration options and developing recommendations for sustainable management of large river floodplain systems such as the UMRS. The HGM approach allows managers to determine historical conditions and ecological processes of an area, determine ecosystem alterations by comparing historic and current landscapes, and identify options and approaches to restore specific habitats and ecological conditions (Heitmeyer 2008).

*Data acquisition* **–** Data needs include extensive baseline vegetation inventories and fine-scale elevation contours (e.g., LIDAR).

*Identification and prioritization of "on-the-ground" forest restoration projects* **–** For example, the Reno Bottoms Forest Restoration Project, located in upper Pool 9, is focused on restoring forest species and age class diversity on up to 1,100 acres negatively impacted by tree mortality, altered hydrology, and invasion by reed canary grass.

*Coordinated system-wide data management* – There is a demonstrated need for coordinated database management and data archiving related to a variety of management and restoration efforts throughout the UMRS.

# II. Introduction

## A. Purpose

The purpose of this Systemic Forest Stewardship Plan is to provide a long-range plan of action for the sustainable management of Upper Mississippi River System (UMRS) forests so the UMRS can maintain its recognition as a nationally treasured ecological resource. Key components of this process are identifying goals and objectives; establishing a foundation to improve and enhance coordination with stakeholders; fostering a better understanding of the state of the resource and its ecological connection to adjacent watersheds; identifying problems, opportunities and data needs; and developing recommendations that will ensure the long-term sustainability of this critical component of the UMRS ecosystem. Specifically, this plan makes recommendations and provides implementation guidelines for the management of UMRS floodplain forests by:

- Providing guidance for forest and grassland restoration activities
- Identifying goals and objectives
- Establishing management standards and guidelines
- Identifying desired future conditions
- Recommending the use of standardized inventory, monitoring and evaluation guidelines
- Committing to a policy of adaptive management.

Designed as a systemic forest management plan to manage and restore the UMRS floodplain forests to healthy and sustainable levels, this plan includes management practices, restoration measures, and cost effective actions affecting the broad array of terrestrial habitat types within the floodplain. It recommends specific actions to communicate and coordinate systemic forest management goals, objectives, guidelines, and adaptive management concepts among all floodplain stakeholders. This plan is intended to function as a living document, and will be reviewed and updated every 5-10 years.

## B. Scope

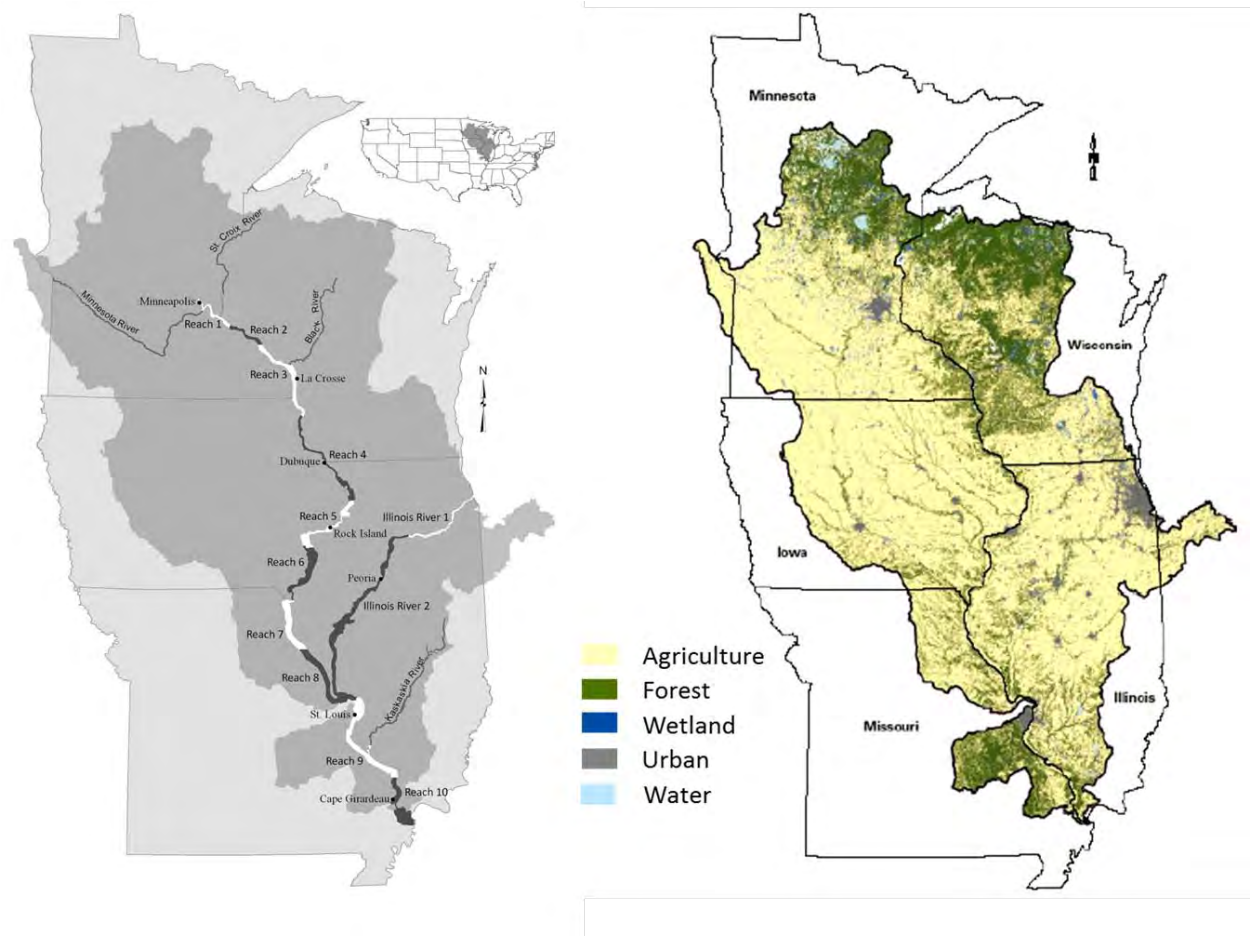
The Forest Stewardship Plan project area is designated as the UMRS 500-year floodplain, regardless of ownership. The lateral extent of the UMRS floodplain ecosystem is generally the river valley lands from bluff to bluff, or to elevated terraces. The primary intent of this plan is for the Corps, working with others, to improve management and restoration efforts along the UMRS, and to seek eventual sustainability of its floodplain forest and other terrestrial habitats.

The Mississippi River in its entirety is considered the largest riverine ecosystem in North America and the third largest in the world. The UMRS itself is a subset of this larger river system, and includes the Mississippi River from Minneapolis–St. Paul, Minnesota, to its confluence with the Ohio River; the Illinois River from Chicago to Grafton, Illinois; and navigable sections of the Minnesota, St. Croix, Black and Kaskaskia Rivers (USACE 2004) (figure 1).

The UMRS floodplain ecosystem covers 2.6 million acres of land and water and includes portions of five Midwestern States: Minnesota, Wisconsin, Iowa, Illinois, and Missouri. Major river communities along the banks of the Upper Mississippi River (UMR) include Minneapolis–St. Paul; La Crosse, Wisconsin; Dubuque, Davenport, and Keokuk, Iowa; Rock Island, Quincy, Alton, and Cairo, Illinois; and St. Louis and Cape Girardeau, Missouri. Major communities along the Illinois River include: Chicago, Peoria, Beardstown, and Grafton, Illinois.

Land cover in the Upper Mississippi River basin is primarily agriculture (figure 1). The majority of forestland occurs in the northern (Minnesota and Wisconsin) and southern (southwestern Illinois and southeastern Missouri) parts of the basin. A considerable amount of forestland in the central portions of the basin is associated with river and stream corridors, including floodplains and tributaries of the UMRS.

Figure 1. The UMRS project area and land cover in the UMRS basin.

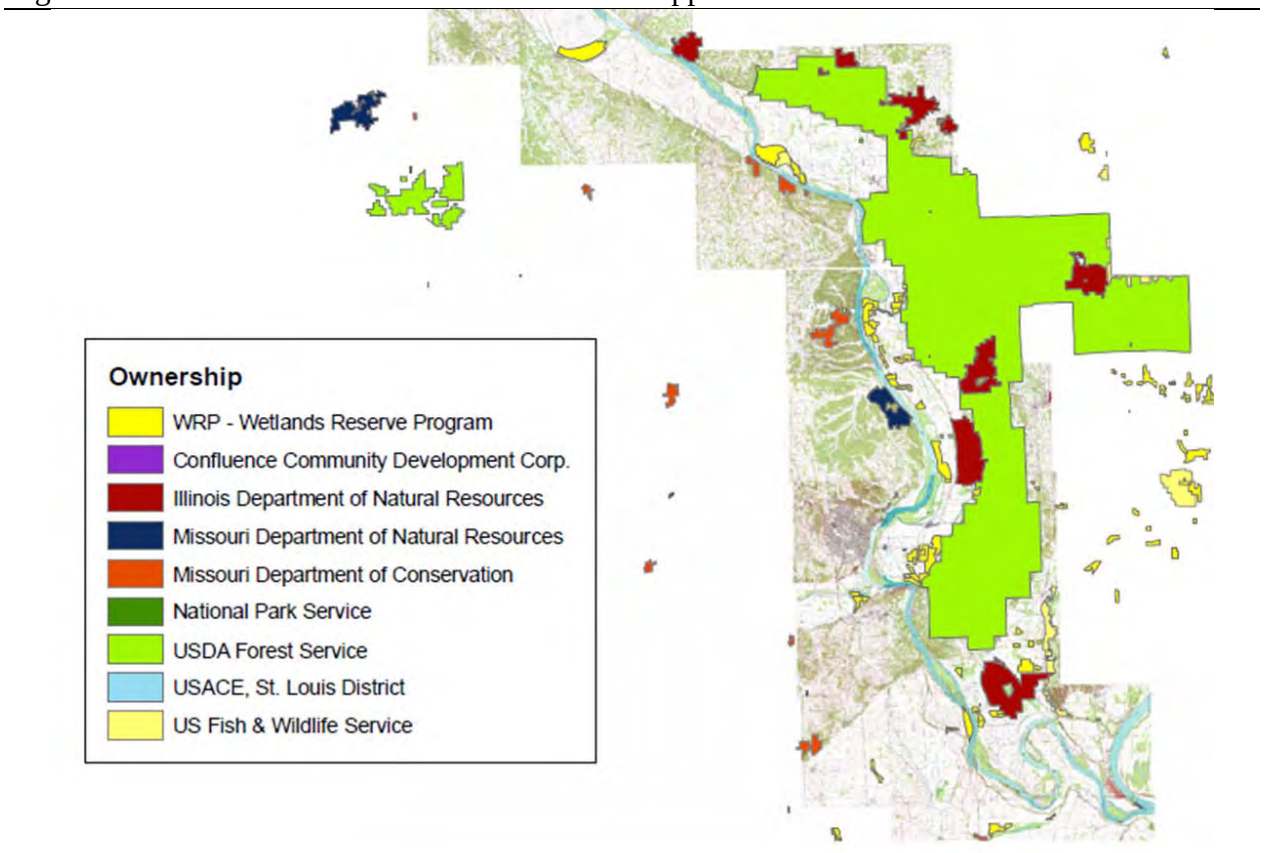



(Sources: USACE and Fry et al. 2011)

Public ownership and management patterns in the UMRS are complex, often overlapping, and therefore require a high degree of communication and collaboration between the multiple State, Federal, and Tribal entities involved (figure 2). For example, the U.S. Fish and Wildlife Service (USFWS) National Wildlife Refuge System contains over 240,000 acres of this floodplain ecosystem (figure 3). Many of these acres are Corps of Engineers General Plan (GP) lands purchased in support of the Upper Mississippi River-Illinois Waterway (UMR-IWW) navigation system which have been made available to the USFWS for wildlife management.

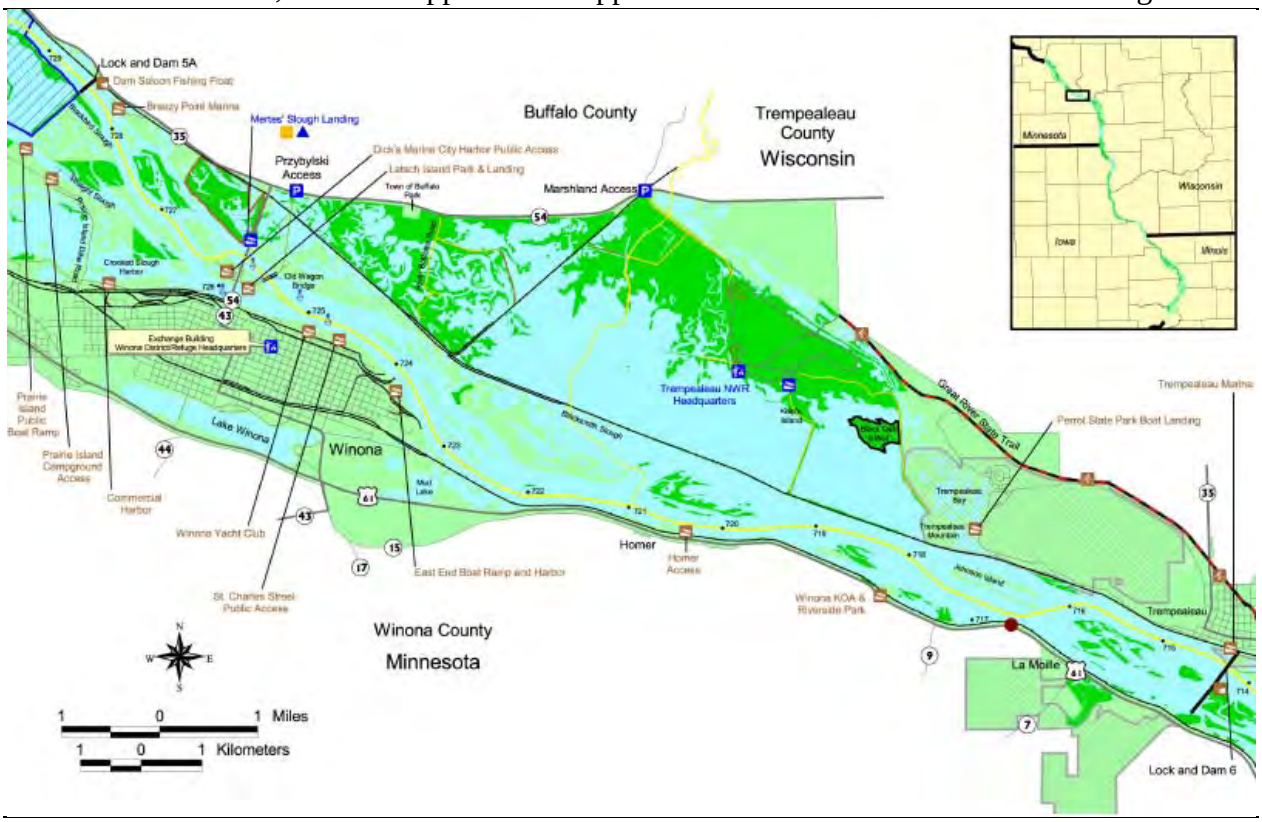
The amount of land in the UMRS floodplain contained in the USFWS National Wildlife Refuge System indicates the importance of coordinating management for wildlife habitat at the system level. Furthermore, the UMRS is the backbone of the Mississippi Flyway, which is used by more than 40 percent of North America's migratory waterfowl. A 261-mile portion of the Upper Mississippi River was designated a Globally Important Bird Area in 1998 because it harbors significant numbers of waterfowl, raptors, wading birds and song birds. Approximately 60 percent of all bird species and at least 25 percent of all fish species in North America have been observed in the UMRS. It is also important habitat for 286 State-listed or candidate species and 36 Federal-listed or candidate species of rare, threatened, or endangered plants and animals endemic to the Upper Mississippi River Basin (USACE 2004).

Figure 2. Conservation lands in the Middle Mississippi River Corridor.




(Source: Heitmeyer 2008)

Figure 3. Pool 6 in the UMRS. USFWS Refuge lands are shown in green. The inset illustrates the full extent of the 240,000-acre Upper Mississippi River National Wildlife and Fish Refuge.




(Source: USFWS)

It is important to understand the difference between the UMR-IWW navigation system and the larger UMRS floodplain ecosystem. The navigation system refers to the 1,200 miles of 9-foot deep navigation channel, 37 lock and dam sites (containing 43 locks), and thousands of channel training structures that are maintained in the Upper Mississippi and Illinois Rivers. The width of the navigation channel is maintained at approximately 300-500 feet and is delineated with red and green buoys maintained by the U.S. Coast Guard. By contrast, the UMRS floodplain ecosystem encompasses to the entire river-floodplain area. This includes all of the aquatic and terrestrial habitats and species associated with these large river floodplain ecosystems, and their associated physical, chemical, and biological components (figure 4).

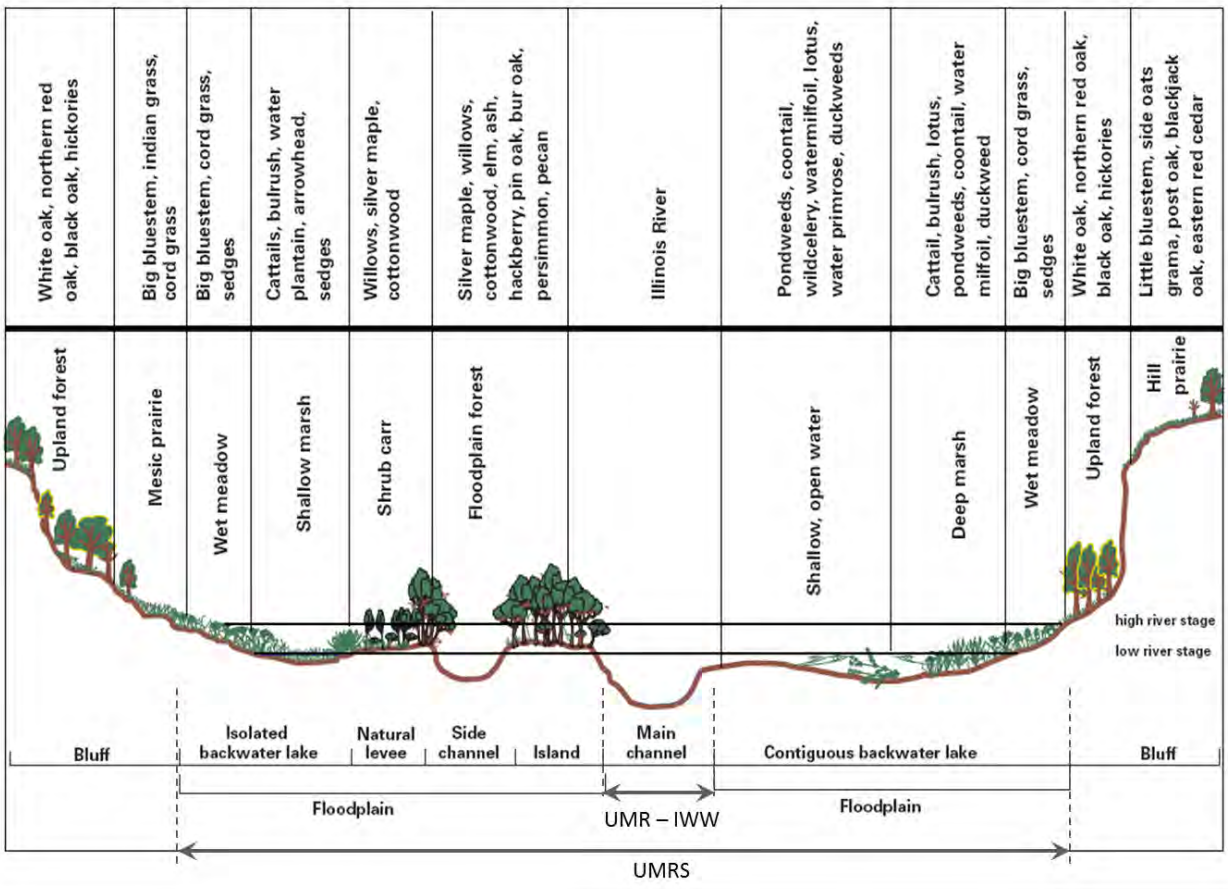
Due to the vast spatial scale of the UMRS it is often subdivided into smaller management units often described by a variety of different terms. For example, although the term “reach” can be used to describe any continuous stretch of river, in the UMRS it has a more specific meaning. The term “impounded reach” refers to that portion of the river system just above St. Louis, Missouri, that contains navigation locks and dams. Within the impounded reach are a series of “pools”, which refer to areas of water impounded behind navigation dams. Pool numbers correspond to the number of the lock and dam that created them, and are often used to describe the entire length of river between two sequential dams. For example, Pool 9 refers to the stretch of river between Lock and Dam 9 and Lock and Dam 8 just upriver. The term “unimpounded

reach", also described as the "open river reach", refers to the Mississippi River below its confluence with the Missouri River near St. Louis where navigation locks and dams are no longer needed for navigation. The term "Illinois River reach" refers simply to the Illinois River.

The scope of this plan encompasses the entire UMRS floodplain ecosystem, regardless of ownership. In addition, while the primary focus of this plan is related to forest management, it also addresses and provides management guidelines for other terrestrial habitats. Forests, grasslands, wet meadows, and shrublands often combine to form an interconnected mosaic of terrestrial and aquatic habitats within larger floodplain ecosystems and even smaller project-scale management units.

This plan recognizes the management limitations of addressing the vast 2.6-million-acre floodplain area, both ecologically and economically. Societal infrastructure, where present in the floodplain, is not at risk by any actions prescribed by this plan. Rather, this plan strives to achieve an improved balance and approach to ensuring both the ecologic and economic sustainability of the UMRS floodplain ecosystem.

Figure 4. Hypothetical illustrative cross section of the river valley showing the primary ecosystem habitat types and their representative species and the spatial differentiation between the UMR-IWW Navigation System and UMRS Ecosystem. (Adapted from: USGS 1999)



# III. The Floodplain Setting

## A. Background

The Mississippi River is the largest riverine ecosystem in North America and third largest in the world. The combined floodplains of the Upper Mississippi, Illinois, Kaskaskia, Minnesota, Black and St. Croix Rivers, which lie within the scope of this stewardship plan, cover approximately 2.6 million acres. The UMRS floodplain ecosystem consists of a mosaic of bottomland forests, grasslands, islands, backwaters, side channels and wetlands – all of which support more than 300 species of birds, 57 species of mammals, 45 species of amphibians and reptiles, 150 species of fish, and nearly 50 species of mussels. It is a migratory flyway for more than 40 percent of North America's migratory waterfowl and shorebirds, and a globally important flyway for 60 percent of all bird species in North America (USACE 2004).

The UMRS also has a record of human history spanning over 12,000 years and is increasingly being documented as one of the most archeologically and historically significant regions in the country. The abundant and diverse ecological resources found along the river have attracted and sustained human populations for thousands of years, providing food, water, shelter, and transportation. The UMRS has continued to play a significant role in the development of the modern Midwestern economy and culture. The presence of the river provides many benefits to the States and local communities along the river corridor. Benefits are derived from the employment and income generated from transportation of goods, recreation, hydropower production, and water supply for municipalities and commercial, industrial and domestic use (USACE 2004). The river system generates over $6.6 billion dollars in revenue annually from some 12,000,000 visitor-days of use by people who hunt, fish, boat, sightsee or otherwise visit the river and its local communities (Black et al. 1999).

### 1. Historic floodplain

Prior to European settlement, the Mississippi River fit the model of a free-flowing large-river ecosystem. Periodic flooding and drought were major forces responsible for maintaining the complex physical structure and rich plant and animal diversity of the river system. In addition, fire helped sustain prairie, wet meadow, and savanna habitats.

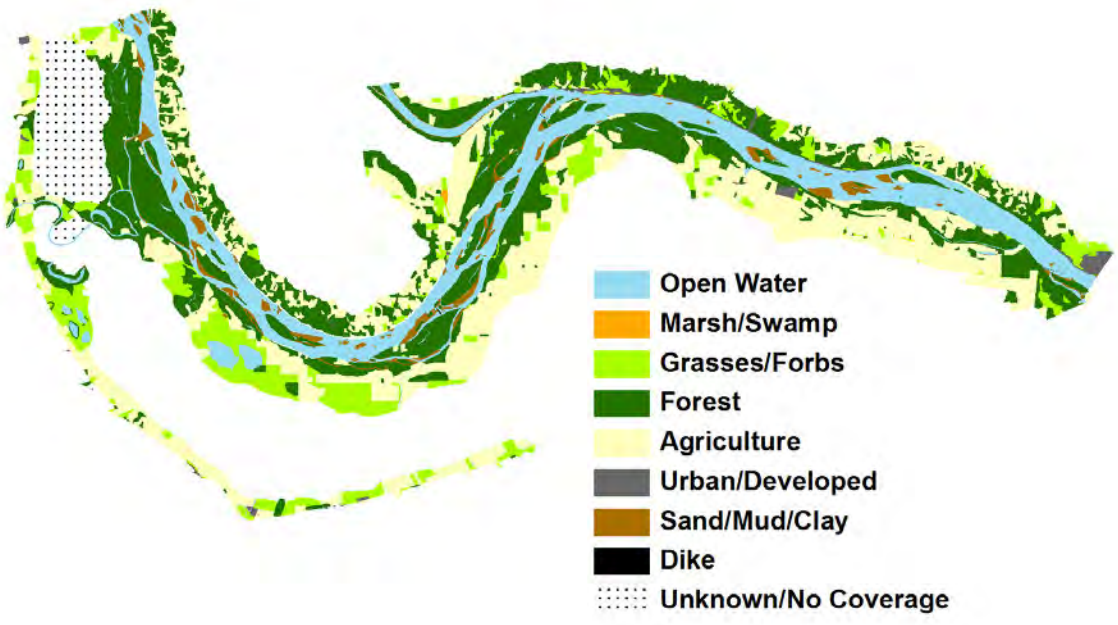
The Habitat Needs Assessment (HNA) Summary Report (USACE 2000) describes the early floodplain:

> *"At a system-wide scale there were natural gradients in habitat among river reaches. Northern river reaches were more forested and were composed of mixed silver maple forests, river channels, seasonally flooded backwaters, floodplain lakes, marsh, and prairie. Beginning around the northern Iowa border and along the lower Illinois River, grasslands and oak savanna dominated floodplain plant communities. Historic surveys reveal a higher proportion of oaks and other mast trees in the forest community than at present. Below the Kaskaskia River, the floodplain was heavily forested with species characteristic of southern bottomland hardwood communities*."

Maps of portions of the pre-European UMRS landscape have been reconstructed for parts of the UMRS using records gathered during early 1800s U.S. Government Land Office (GLO) surveys (Nelson et al. 1994, Yin and Nelson 1995, Nelson et al. 1996, and Nelson and Sparks 1998). GLO maps and survey notes are the primary source of information for reconstructing historic landscapes. The records contain, among other things, plat maps showing the location and extent of former prairies, timberlands, marshes, swamps, and rivers. Survey notes often also contain information on the composition and structure of former timberlands on islands, floodplains, and adjacent uplands. Although land cover area estimates must be carefully interpreted, this approach is very useful for mapping historic landscapes at a coarse scale.

A much more comprehensive set of historical land cover data exists for a time period in the late 1800s. In the late 1880's to early 1900's the Mississippi River Commission (MRC) conducted an extensive high-resolution survey of the Upper Mississippi River from Minneapolis to Cairo. These data were published as a series of 89 survey maps and indexes. In the 1990's, the Long Term Resource Monitoring (LTRM) component of the Corps of Engineers' Upper Mississippi River Restoration – Environmental Management Program (UMRR-EMP), in conjunction with the U.S. Geological Survey's Upper Midwest Environmental Sciences Center (UMESC), automated the maps land cover/land use symbology to create a fully digitized, geo-referenced turn of the century/pre-impoundment land cover/land use data set that is available online at http://www.umesc.usgs.gov/data_library/land_cover_use/1890s_lcu_mrc.html. Figure 5 was produced from this data and represents historical (circa 1890) land cover in Pool 26.

Figure 5. Historical (circa 1890) land cover in Pool 26 of the Mississippi River.

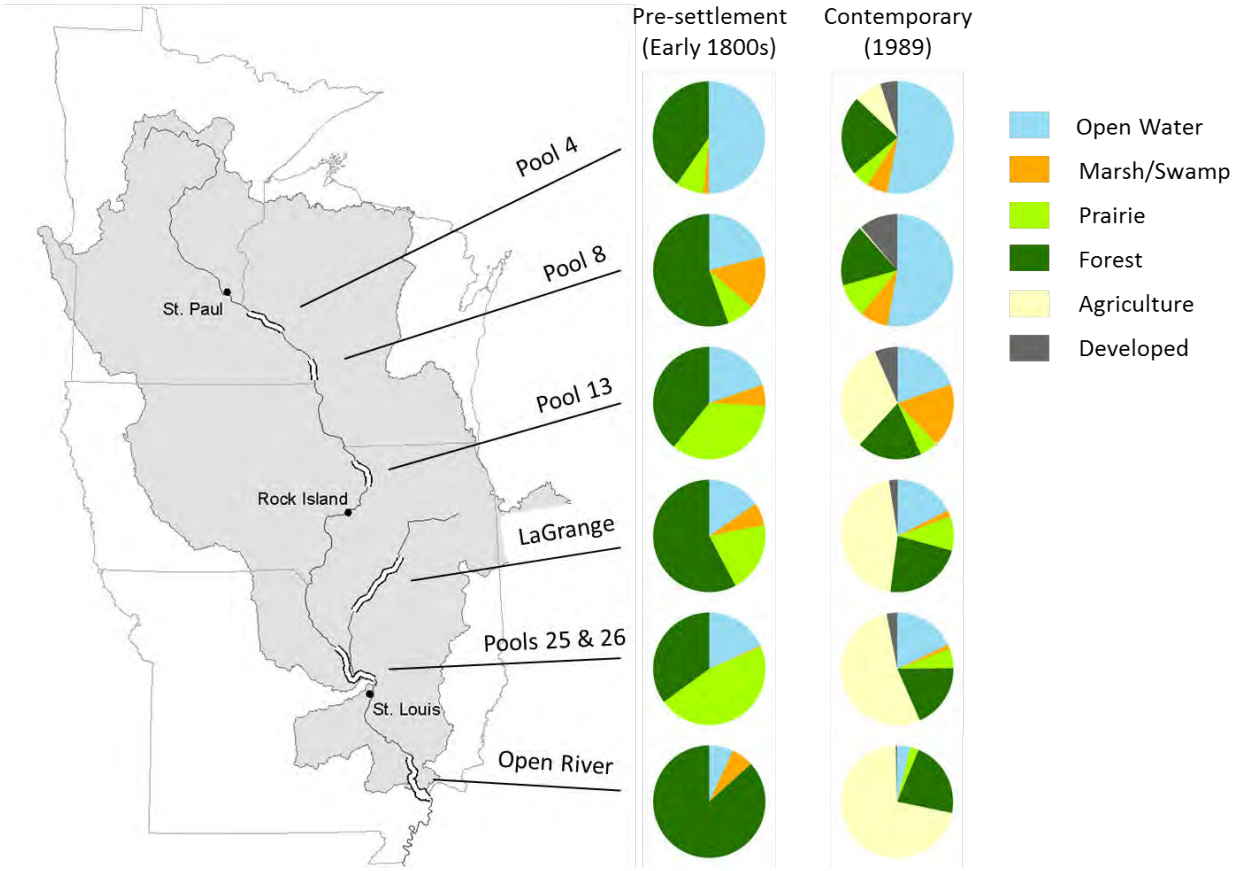



(Source: UMRR-EMP, LTRM Component)

## 2. Changes

European settlers who developed the Mississippi River valley during the 1800s brought many changes to the landscape and waterways. Prior to widespread European settlement of the region, the UMRS was a diverse landscape of tallgrass prairie, wetlands, savannas, and forests. Logging, agriculture, and urban development over the past 150-200 years have resulted in the present floodplain landscape, which is highly developed. Wetlands were drained and floodplain forests were extensively logged for lumber and fuelwood. Much of the fuel that heated the boilers of steamboats plying the waters of the UMRS was firewood cut from the river's forested islands and shorelines. During the same period, much of the floodplain (including native prairie areas) was cleared for agriculture. The hydrologic regime was also highly modified, with increased fluctuations in river discharge. Dams and river regulation throughout the basin also altered river flows. The modern landscape delivers large amounts of sediment, nutrients, and contaminants to the river. Since the construction of locks and dams, referred to herein as river impoundment, sediment accumulation and other processes in the navigation pools have greatly altered both aquatic and terrestrial habitats. Figure 6 shows the cumulative land cover changes in selected reaches of the UMRS from pre-settlement to contemporary times.

Figure 6. Land cover changes from the early 1800s to 1989 in selected pools in the UMRS.

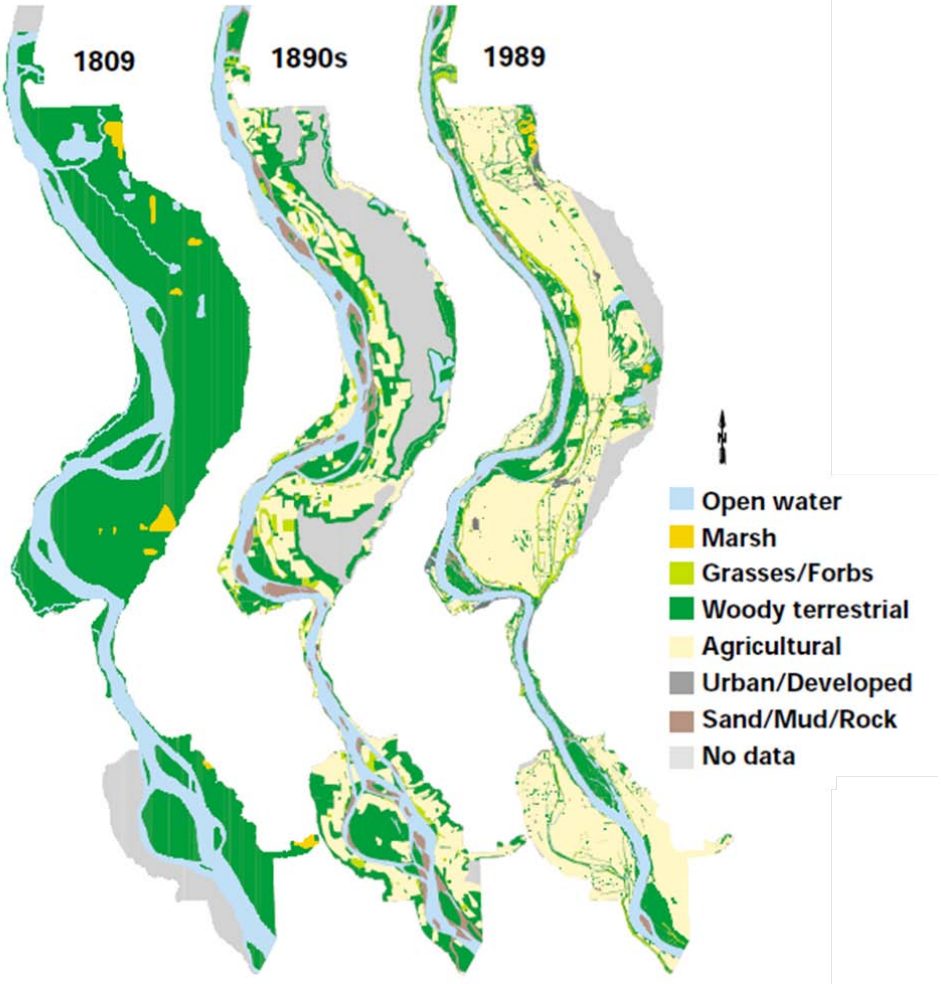



(Adapted from: Theiling et al. 2000)

Modern UMRS forests represent only a small portion of pre-European settlement floodplain forests in some reaches. The amount of bottomland forest within the Upper Mississippi River floodplain has been significantly reduced from historic levels by clearing of land for agriculture and development, primarily on the lower impounded, unimpounded, and Illinois River reaches. Although river impoundment flooded considerable forested area in northern reaches, large portions of forest remain relatively intact in Refuge areas. In other river reaches, most natural floodplain communities have been replaced by agriculture. Channel dynamics and water level fluctuations that support diverse, productive floodplain communities have been altered throughout the UMRS.

For example, forests covered 56 percent of the landscape at the confluence of the Illinois and Mississippi Rivers in 1817. By 1975, these forests were reduced to 35 percent of the landscape (Nelson et al. 1994). Similarly, floodplain forests covered 71.4 percent of the landscape in a 63-mile-long portion of the unimpounded reach in 1809, but by 1989 covered only 18.3 percent of the same landscape (figure 7) (Yin et al. 1995).

Figure 7. Landscape changes from 1809-1989 in the vicinity of Cape Girardeau, Missouri.




(Source: USGS 1999)

Table 1 shows pre-settlement to contemporary landcover changes in select reaches of the Upper Mississippi and Illinois Rivers. The dramatic loss of forested and prairie landcover throughout the majority of these reaches is immediately discernable. For example, forested landcover decreased by about 75 percent in the open river reach, where 68 percent of the floodplain is currently in agricultural production. Agriculture is the dominant landcover class throughout, except for the northernmost reaches where the lateral extent of the floodplain is much narrower.

Table 1. Percent composition of major landcover types in selected Upper Mississippi and Illinois River pools in pre-settlement and contemporary time periods.

| Pool | Land Cover Type | | | | | | |
|---|---|---|---|---|---|---|---|
| | **Open Water** | **Marsh** | **Prairie** | **Timber** | **Swamp** | **Agriculture** | **Developed** |
| | Pre-settlement (ca. early 1800s) | | | | | | |
| 4 | 49.8 | 1.5 | 7.9 | 40.2 | 0.2 | --- | --- |
| 8 | 21.0 | 14.8 | 8.0 | 55.5 | 0.6 | --- | --- |
| 13 | 19.7 | 4.5 | 35.1 | 39.1 | 1.6 | --- | --- |
| 17 | 14.6 | 0.7 | 57.0 | 25.8 | 1.9 | --- | --- |
| 22 | 13.3 | 0.0 | 35.0 | 51.7 | 0.0 | --- | --- |
| 24 | 13.2 | 0.1 | 46.4 | 40.3 | 0.0 | --- | --- |
| 25 & 26 | 18.3 | 0.4 | 46.3 | 35.0 | 0.0 | --- | --- |
| OR | 6.9 | 0.0 | 0.0 | 86.7 | 6.4 | --- | --- |
| LaGr | 15.3 | 2.4 | 20.3 | 57.5 | 4.1 | --- | --- |
| | Contemporary (1989) | | | | | | |
| 4 | 53.0 | 6.0 | 5.0 | 23.0 | 0.0 | 8.0 | 5.0 |
| 8 | 52.8 | 8.1 | 9.8 | 17.7 | 0.0 | 0.5 | 11.1 |
| 13 | 19.6 | 18.3 | 5.3 | 18.6 | 0.0 | 31.6 | 6.6 |
| 17 | 25.4 | 1.8 | 6.6 | 28.4 | 0.0 | 32.4 | 5.4 |
| 22 | 9.9 | 0.1 | 3.6 | 12.2 | 0.0 | 72.4 | 1.8 |
| 24 | 10.3 | 0.7 | 3.3 | 13.4 | 0.0 | 71.4 | 0.9 |
| 25 & 26 | 17.9 | 1.3 | 5.6 | 18.6 | 0.0 | 53.4 | 3.1 |
| OR | 3.6 | 0.0 | 2.4 | 20.9 | 0.0 | 68.0 | 0.4 |
| LaGr | 17.5 | 1.9 | 9.8 | 22.9 | 0.0 | 45.4 | 2.5 |
| | Percent change | | | | | | |
| 4 | 6.4 | 300.0 | -36.7 | -42.8 | --- | --- | --- |
| 8 | 151.4 | -45.3 | 22.5 | -68.1 | --- | --- | --- |
| 13 | -0.5 | 306.7 | -84.9 | -52.4 | --- | --- | --- |
| 17 | 74.0 | 157.1 | -88.4 | 10.1 | --- | --- | --- |
| 22 | -25.6 | --- | -89.7 | -76.4 | --- | --- | --- |
| 24 | -22.0 | 600.0 | -92.9 | -66.7 | --- | --- | --- |
| 25 & 26 | -2.2 | 225.0 | -87.9 | -46.9 | --- | --- | --- |
| OR | -47.8 | --- | --- | -75.9 | --- | --- | --- |
| LaGr | 14.4 | -20.8 | -51.7 | -60.2 | --- | --- | --- |

(Adapted from: Theiling et al. 2000)

In addition to landscape-level changes in land cover/land use, alterations in hydrological regimes and the isolation of large portions of the floodplain behind mainline levees have resulted in significant compositional shifts in floodplain forest communities. Many mast-producing species such as oaks and hickories have declined in importance, while silver maple has dramatically increased in importance throughout the UMRS. Importance values combine measures of relative density, relative frequency, and relative dominance into a single metric and indicate the overall abundance of a species in an ecological community. Table 2 illustrates these long-term shifts in importance values for many common floodplain tree species in a couple of selected reaches of the Upper Mississippi River. For the open river reach, the data also illustrate compositional differences between floodplain forests that remain connected to the river and those that are protected behind mainline levees.

## 3. Public Lands Management

### a. Corps of Engineers

As early as 1824, the Department of the Army began navigation improvements on the UMRS when it was directed to clear impediments from the river. Navigation projects such as dike construction, dredging and snag clearing continued throughout the 19th and early 20th centuries, culminating in the 1930's in construction of the nine-foot channel and locks and dam system still

Table 2. Pre-settlement and contemporary floodplain forest tree species importance values.

| Species | Open river - protected[1] | | Open river - unprotected[1] | | Pool 26 – impounded[2] | |
|---|---|---|---|---|---|---|
| | 1809 | 1993 | 1809 | 1993 | 1817 | 1996 |
| Elm | 28.5 | 14.8 | 15.4 | 7.5 | 22.1 | 7.8 |
| Hackberry/sugarberry | 25.4 | 8.6 | 9.4 | 3.2 | 30.4 | 0.3 |
| Ash | 21.6 | 21.5 | 3.7 | 1.6 | 11.0 | 29.4 |
| Hickory | 10.9 | 4.3 | 4.6 | --- | 30.0 | 10.9 |
| Sycamore | 7.4 | 4.3 | 51.2 | 11.8 | 2.8 | 0.6 |
| Silver maple | 6.5 | 3.4 | --- | 39.7 | 16.1 | 110.0 |
| Boxelder | 5.8 | 6.3 | 8.3 | 28.2 | 5.8 | 11.2 |
| Cottonwood | 3.4 | --- | 80.2 | 36.1 | 20.4 | 7.8 |
| Mulberry | 2.0 | --- | 4.1 | 3.2 | 3.5 | 0.1 |
| Black walnut | 1.5 | 1.1 | 0.6 | --- | --- | --- |
| Overcup oak | 1.3 | --- | 1.2 | --- | --- | --- |
| Pin oak | 1.1 | 30.6 | --- | --- | 11.5 | 3.7 |
| Willow | 1.0 | 9.0 | 3.3 | 60.3 | 20.7 | 12.1 |
| Persimmon | --- | 4.4 | --- | --- | --- | 1.7 |
| Bur oak | --- | 3.2 | --- | --- | 1.7 | 1.7 |
| White oak | 10.8 | 12.7 | --- | --- | 3.1 | --- |
| Sweetgum | 23.5 | 23.3 | 9.6 | 0.5 | --- | --- |
| River birch | --- | --- | --- | --- | 1.4 | 0.7 |
| Kentucky coffeetree | 1.0 | --- | --- | --- | --- | --- |

(Adapted from: Yin & Nelson 1996; Yin et al. 1997; Nelson & Sparks 1998)

[1] Importance values = the sum of relative frequency and relative basal area (scale of 0-200).

[2] Importance values = the sum of relative density and relative dominance (scale of 0-200).

in use today. The Corps of Engineers was also given flood control responsibilities and began building levees that protected agricultural and developed lands but decreased the lateral connectivity of the river.

The St. Paul, Rock Island, and St. Louis Districts contain project lands totaling 50,500 acres, 93,600 acres, and 49,247 acres, respectively. No lands were acquired on the Illinois River or on the unimpounded reach of the Mississippi River south of St. Louis. The majority of project lands are outgranted for a variety of purposes, though the Corps maintains primary administrative authority and a stewardship role. Each Corps District manages its respective natural resources through conservation, maintenance, and enhancement practices. Guidance for management is provided in Federal legislation such as the National Environmental Policy Act (NEPA), the Water Resources Development Act (WRDA), the Forest Cover Act, and the Historic Preservation Act. Additional guidance is dictated by agency policy and regulations. The Corps retains responsibility for protecting forest and other vegetative cover on these lands in compliance with the Forest Cover Act and to establish and maintain other conservation measures on these areas. Corps management programs are designed to promote the integrity of future resources and to increase the value of such areas for conservation, recreation, and other beneficial uses, provided that management is compatible with other uses of the project. Specific management goals and objectives are included in each District's Master Plans and Operational Management Plans (OMPs). Lands identified as particularly valuable for migratory waterfowl habitat are outgranted to the USFWS for fish and wildlife management purposes via cooperative agreements. Additional lands are sub-granted to State conservation agencies for similar purposes. The USFWS outgrants 83,638 acres in the Rock Island District, 43,400 acres in the St. Paul District, and 35,775 acres in the St. Louis District.

During construction of the nine-foot channel project, many acres of federally acquired land were cleared prior to impoundment of the navigation pools. For example, within the Rock Island District, over 40,000 acres (43 percent) of the original 93,600 acres acquired in fee title for the navigation project were permanently flooded. By 1947, approximately 20,000 acres were in agricultural use (crops or pasture) and 23,000 acres were in merchantable timber.

### b. U.S. Fish and Wildlife Service

The Upper Mississippi River National Wildlife & Fish Refuge (NWFR) was established in 1924 as a refuge and breeding place for migratory birds, fish, other wildlife, and plants. Today the refuge encompasses approximately 240,000 acres of Mississippi River floodplain in a more or less continuous stretch of 261 river miles from near Wabasha, Minnesota to near Rock Island. The refuge is divided into four separate districts: Winona, Minnesota (Pools 4 through 6); La Crosse (Pools 7 through 8); McGregor, Iowa (Pools 9 through 11); and Savanna, Illinois (Pools 12 through 14). Approximately 40 percent of the refuge is land acquired for the nine-foot navigation channel project. This land is owned by the Corps and managed by the USFWS through cooperative agreements. The remainder is owned and managed by the USFWS.

The Mark Twain National Wildlife Refuge (NWR) Complex originally was one refuge established in 1958 from lands purchased by the Corps for construction of the 9-foot navigation channel project. In 2000, the Mark Twain NWR Complex was separated into five refuges spread

out over 350 miles of the Upper Mississippi River south of Rock Island (Port Louisa NWR, Great River NWR, Clarence Cannon NWR, Two Rivers NWR, and the Middle Mississippi River NWR). In early 2009, the Mark Twain Refuge Headquarters in Quincy, IL, was closed and oversight for these five Refuges shifted back to the Upper Mississippi River National Wildlife and Fish Refuge in Winona, MN. Today, this refuge Complex contains approximately 45,000 acres, which the USFWS manages cooperatively with the Corps of Engineers and the states of Iowa, Illinois, and Missouri (table 3).

The Illinois River NWFR began with the purchase of the Chautauqua Drainage and Levee District by the USFWS in 1936. Today, the four Illinois River refuges span 125 miles of the Illinois River, and include Chautauqua NWR, Meredosia NWR, Emiquon NWR, and the Cameron/Billsbach Unit. Part of Two Rivers NWR is also located in the lower Illinois River.

### c. States

State lands in or adjacent to the project area are managed or designated for several purposes. These uses include recreation, wildlife/fisheries management, areas designated for research or habitat preservation, or for historic significance. State-managed parks and conservation areas include approximately 50,585 acres on the Illinois River. The States of Illinois, Iowa, Minnesota, Missouri, and Wisconsin manage over 192,230 acres for fish and wildlife purposes at more than 80 sites along the Upper Mississippi River. These sites often are Federal lands leased from the Corps of Engineers. Additional information on these areas may be found in the OMPs and Land Use Allocation Plans (LUAPs) for St. Paul and Rock Island District and in the St. Louis District's Rivers Project Master Plan (USACE 2001 and 2004).

Table 3. Summary of USFWS lands within the UMRS. (Adapted from: USACE 2004)

| Refuge Complex | Management Unit | Acres | Location |
|---|---|---|---|
| | **Mississippi River** | | |
| Upper Mississippi River National Wildlife and Fish Refuge | Winona District | 37,513 | Pools 4-6 |
| | La Crosse District | 46,648 | Pools 7-8 |
| | McGregor District | 91,662 | Pools 9-11 |
| | Savanna District | 64,397 | Pools 12-14 |
| Trempealeau NWR | | 5,733 | Pool 6 |
| Mark Twain National Wildlife Refuge Complex* | Port Louisa NWR | 8,375 | Pools 17-18 |
| | Great River NWR | 15,000 | Pools 20-24 |
| | Clarence Cannon NWR | 3,750 | Pool 25 |
| | Two Rivers NWR | 2,660 | Pools 25-26 |
| | Middle Mississippi NWR | 7,000 | Open River |
| *Total Mississippi River Acres:* | | *271,065* | |
| | **Illinois River** | | |
| Mark Twain NWR Complex* | Two Rivers NWR | 5,840 | Alton Pool |
| Illinois River National Wildlife and Fish Refuges | Cameron-Billsbach Unit | 1,709 | Peoria Pool |
| | Chautauqua NWR | 4,488 | La Grange Pool |
| | Emiquon NWR | 1,303 | La Grange Pool |
| | Meredosia NWR | 3,852 | Alton Pool |
| *Total Illinois River Acres:* | | *16,223* | |

* The Mark Twain NWR Complex has been reorganized, and no longer exists by that name

### d. Native American Land

The Prairie Island Indian Reservation, located in Pool 3 near Red Wing, Minnesota, is the only Native American landholding within the project area. The reservation contains about 1,200 acres along the river and is owned and managed by the Mdewakanton Dakota Sioux. The Department of the Interior also holds some land in trust for the tribe.

### e. Levee and Drainage Districts

Agricultural, municipal, and industrial levees and drainage districts are most prevalent in the Upper Mississippi River below Clinton, Iowa, and the lower Illinois River below Peoria. The percentage of the floodplain that is leveed varies as follows:

- 3 percent north of Pool 13
- 50 percent from Pool 14 through Pool 26
- 80 percent in the open river south of St. Louis
- 60 percent in the lower Illinois River below Peoria

The levees are generally designed to protect human life and property by reducing or eliminating the threat from recurrent annual flood events. The interior of leveed areas is often networked with a system of tile lines, ditches, and pumps designed to remove excess water from surface runoff and seepage, allowing for the production of agricultural row crops, corn, and soybeans. Agricultural levees are often of lower elevation than municipal and industrial levees and may be breached periodically. Roughly 15 percent of the area within levee districts contains natural habitats other than agriculture. The amount of forested and grassland habitat in leveed areas is approximately 38,000 and 71,000 acres, respectively. System-wide, approximately 23 percent of the contiguous floodplain remains connected to natural river hydrology and is susceptible to seasonal flooding. River islands, many of which are heavily forested, constitute another 8 percent of the total UMRS floodplain land area (USACE 2004). Table 4 shows total and relative distribution of leveed areas (and public lands) in each UMRS Pool.

### f. Public Lands

The total amount of public lands in the UMRS is approximately 530,000 acres (table 4). However, the distribution of these lands is highly variable and is heavily skewed towards the upper impounded reach. By comparison, public lands are much less prevalent in lower Mississippi River and Illinois River reaches. The percentage of the floodplain in public ownership in each of the four major river reaches is as follows (USACE 2004):

- Upper Impounded Reach: 57 percent pubic land
- Lower Impounded Reach: 11 percent public land
- Unimpounded Reach: 8 percent public land
- Illinois River: 12 percent public land

Table 4. Leveed area and public lands distribution in the UMRS.

| River/Pool/Reach | Total Floodplain Acres | Leveed Area | | Public Ownership | |
|---|---|---|---|---|---|
| | | Acres | Percent | Acres | Percent |
| **Upper Mississippi River (UMR)** | | | | | |
| Pool 2 | 21,620 | 1,013 | 4.7% | 4,723 | 21.8% |
| Pool 3 | 23,584 | 0 | 0.0% | 10,468 | 44.4% |
| Pool 4 | 70,062 | 188 | 0.3% | 19,893 | 28.4% |
| Pool 5 | 29,931 | 82 | 0.3% | 18,616 | 62.2% |
| Pool 5a | 16,887 | 5 | 0.0% | 12,399 | 73.4% |
| Pool 6 | 25,011 | 5,968 | 23.9% | 11,609 | 46.4% |
| Pool 7 | 41,543 | 0 | 0.0% | 19,834 | 47.7% |
| Pool 8 | 47,110 | 1,400 | 3.0% | 29,272 | 62.1% |
| Pool 9 | 52,166 | 2 | 0.0% | 45,944 | 88.1% |
| Pool 10 | 39,863 | 274 | 0.7% | 23,754 | 59.6% |
| Pool 11 | 31,959 | 222 | 0.7% | 25,387 | 79.4% |
| Pool 12 | 21,981 | 1,084 | 4.9% | 14,677 | 66.8% |
| Pool 13 | 85,287 | 8,408 | 9.9% | 52,228 | 61.2% |
| Pool 14 | 65,840 | 22,042 | 33.5% | 12,150 | 18.5% |
| Pool 15 | 10,307 | 2,067 | 20.1% | 1,040 | 10.1% |
| Pool 16 | 33,906 | 4,090 | 12.1% | 10,517 | 31.0% |
| Pool 17 | 80,554 | 59,925 | 74.4% | 7,820 | 9.7% |
| Pool 18 | 126,123 | 46,436 | 36.8% | 20,432 | 16.2% |
| Pool 19 | 123,312 | 37,156 | 30.1% | 842 | 0.7% |
| Pool 20 | 70,402 | 47,513 | 67.5% | 3,922 | 5.6% |
| Pool 21 | 61,081 | 39,918 | 65.4% | 12,024 | 19.7% |
| Pool 22 | 88,643 | 68,340 | 77.1% | 8,129 | 9.2% |
| Pool 24 | 88,774 | 65,245 | 73.5% | 14,062 | 15.8% |
| Pool 25 | 89,071 | 50,677 | 56.9% | 16,292 | 18.3% |
| Pool 26* | 138,382 | 32,290 | 23.3% | 3,633 | 2.6% |
| L&D 26 to Kaskaskia R. | 278,559 | 209,221 | 75.1% | 1,709 | 0.6% |
| Kaskaskia R. to Grand Tower | 130,399 | 87,492 | 67.1% | 27,471 | 21.1% |
| Grand Tower to Ohio R.* | 264,095 | 65,917 | 25.0% | 25,518 | 9.7% |
| *Total UMR* | *2,156,461* | *856,981* | 39.7% | *454,361* | 21.1% |
| **Illinois Waterway (IWW)** | | | | | |
| Lockport | 15,433 | 0 | 0.0% | 412 | 2.7% |
| Brandon | 1,855 | 0 | 0.0% | 0 | 0.0% |
| Dresden | 6,076 | 0 | 0.0% | 647 | 10.7% |
| Marseilles | 25,503 | 0 | 0.0% | 37 | 0.1% |
| Starved Rock | 13,956 | 0 | 0.0% | 0 | 0.0% |
| Peoria | 131,476 | 4,952 | 3.8% | 13,590 | 10.3% |
| La Grange | 221,226 | 119,590 | 54.1% | 39,599 | 17.9% |
| Alton | 196,652 | 133,563 | 67.9% | 21,104 | 10.7% |
| *Total IWW* | *612,177* | *258,105* | 42.2% | *75,389* | 12.3% |

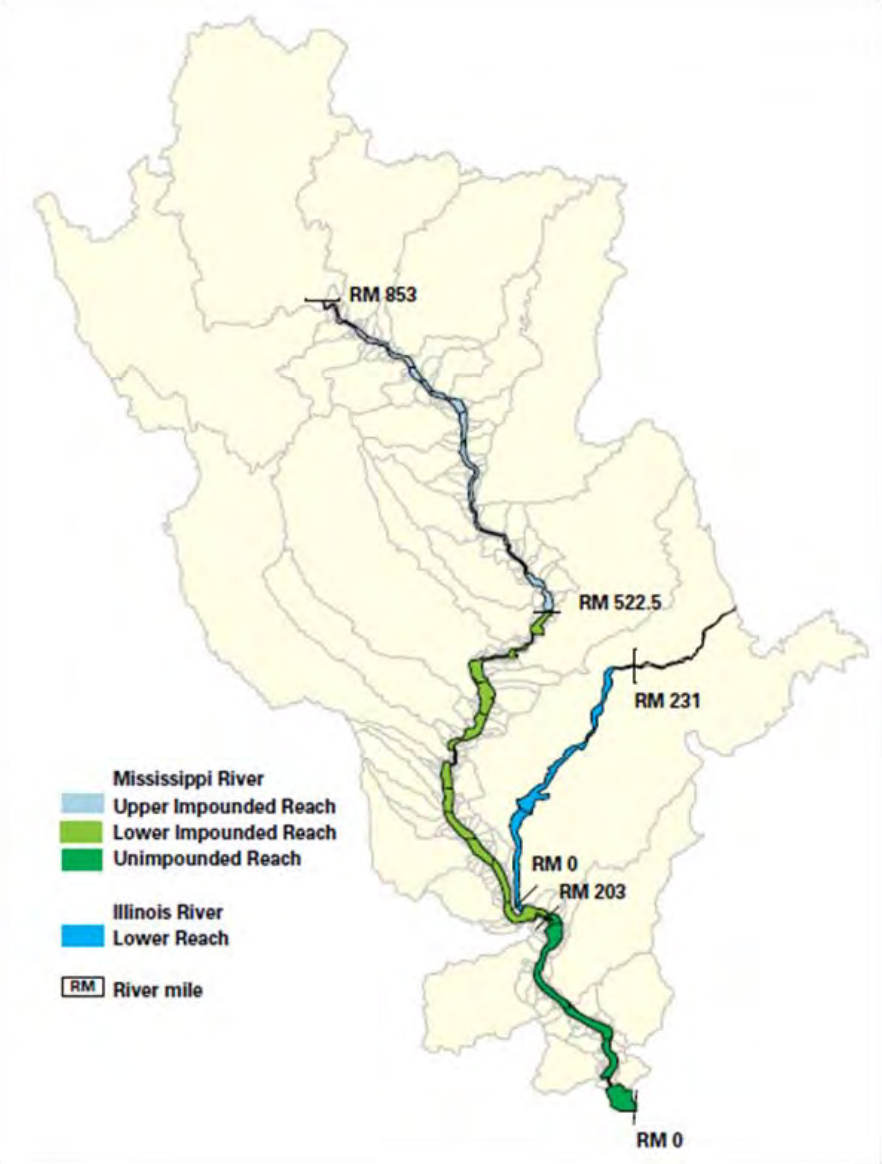
(Adapted from: USACE 2004)

*GIS levee coverage incomplete

## B. Define the Reaches

Spatial differences in floodplain geomorphology and modern land use provide an ecological basis to separate the UMRS into four distinct river reaches (figure 8). Changes in response to river and floodplain development differ among geomorphic reaches, as do habitats and the ecological communities they support. Thus resource opportunities, problems, and management will differ among the river reaches. The distribution of terrestrial land cover types in the four large-scale river reaches is illustrated in table 5 and figure 9. Following is a summary of reach characteristics.

Figure 8. The UMRS is classified into four major floodplain reaches.




(Source: USGS 1999)

## 1. The Upper Impounded Reach

The Upper Impounded Reach extends from Minneapolis (Pool 1) to Clinton (Pool 13). It is characterized by numerous islands and a narrow floodplain that terminates at steep bluffs. The relatively narrow lateral extent of the floodplain is reflected in the fact that only about 3 percent of it is protected by levees in this reach. Natural habitats in this portion of the UMRS are highly connected because of the abundance of public lands, much of which are managed as part of the Upper Mississippi River National Wildlife and Fish Refuge. Landcover diversity is also the highest of the four reaches. The pre-settlement landscape of the UMRS in the upper impounded reach was largely riparian forests interspersed with numerous marshes and wet prairies. Historic floodplain forests were commonly replaced by water due to impoundment by dams and subsequent erosion of islands and by development to a lesser degree. Although remaining forests have a species composition similar to the past, forest cover as a whole has been declining. The corresponding terrestrial shift toward wet meadow land cover is driven in large part by the widespread occurrence of reed canary grass (*Phalaris arundinacea*), an invasive species that dramatically limits tree recruitment in this reach. In general, aquatic vegetation is much more prevalent in the Upper Impounded Reach than in lower river reaches.

## 2. The Lower Impounded Reach

The Lower Impounded Reach lies between Clinton (Pool 14) and Alton (Pool 26). In the upper portion of this reach the river continues to flow through a relatively narrow floodplain, but islands are typically fewer and larger than in the Upper Impounded Reach. Floodplains in the lower portion of this reach (Pool 20 and southward) are highly developed for agriculture. Corresponding HNA habitat diversity scores are moderate in Pools 14 through 19 and 24 through 26, but are low from Pools 20 through 22. Overall, levees protect about 50 percent of the floodplain in this reach, and discontinuity in the distribution of levees and public lands has resulted in significant habitat fragmentation. The pre-settlement landscape in the Lower Impounded Reach was dominated by riparian forests that bordered more open savannas, which then graded into a significant amount of prairie habitat. Disturbance regimes were characterized by flooding in the lower elevation riparian habitats, and fire was likely an ecological driver in the higher savanna and prairie habitats. The riparian forest remains fairly contiguous in a relatively narrow band between levees and the river, but much of the open forests, savannas and grasslands were eliminated. The pre-settlement floodplain forest composition was relatively diverse, with hackberry, pecan, elm, willow and cottonwood occurring as co-dominants. The current forest is primarily dominated by silver maple. Floodplain soils in the Lower Impounded Reach are thick layers of silt, sand, and gravel deposited behind natural levees during floods occurring over thousands of years.

## 3. The Unimpounded Reach (Open River)

The Unimpounded Reach, also commonly referred to as the Open River Reach, occurs below the confluence of the Mississippi and Missouri Rivers near St. Louis. Flow increases by nearly 50 percent below this confluence, making the lock and dam system unnecessary for navigation. The Missouri River contributes vast quantities of sand and silt from the Great Plains and Rocky Mountains, and the river generally assumes a meandering pattern, resulting in numerous old

oxbow lakes and other backwaters as it has shifted course over the years. The river flows through alluvial lowlands to the confluence with the Ohio River, where the floodplain is up to 50 miles wide. About 80 percent of the floodplain is protected behind levees in this reach, agriculture is dominant land cover class, and Habitat Needs Assessment (HNA) habitat diversity scores are correspondingly low. Historically, the unimpounded reach below the Kaskaskia River supported extensive tracts of mature southern bottomland hardwood communities more typical of the Lower Mississippi Alluvial Valley. Today, the riparian forest remains fairly contiguous in a narrow band along the longitudinal gradient of the river, but open forests, savannas, and grasslands have been mostly eliminated, particularly above the Kaskaskia River.

## 4. The Illinois River

The Illinois River Reach can be, and commonly is, further divided into upper and lower reaches. The Lower Illinois Reach downstream of Starved Rock Lock and Dam is more characteristic of river-floodplain ecosystems in form and function than is the Upper Reach. It has a stable, low-gradient channel and numerous large lakes. Given the glacial origin of the Illinois River valley, the floodplains are much larger than would be expected for a river of its present size. Flood flows historically may have formed new channels and backwaters, but the trend was toward filling in the river valley because flow generally has been insufficient to transport the mass of sediment entering the broad floodplain. The average floodplain width in the lower 80 miles of the river is about 4 miles. The floodplain soils are a rich alluvium that overlay sandy glacial outwash. Forests, composed of a mix of hackberry (*Celtis occidentalis*), pecan (*Carya illinoinensis*), willow (*Salix*), elm (*Ulmus*) and cottonwood (*Populus deltoides*), were the dominant land cover class in the Lower Illinois Reach during pre-settlement times. Hydrological alterations due to the historical diversion of Lake Michigan and the construction of locks and dams raised the water level, killing lower lying forests and shifting overall dominance toward more flood tolerant species such as silver maple (*Acer saccharinum*). Today, levees protect about 60 percent of the lower Illinois River floodplain, in which agriculture is the dominant land cover class. Discontinuity in the distribution of public lands and levees has resulted in significant habitat fragmentation. HNA habitat diversity scores are moderate for much of the Illinois River valley except for the Alton Pool, which are significantly lower.

## 5. Geomorphic Reaches

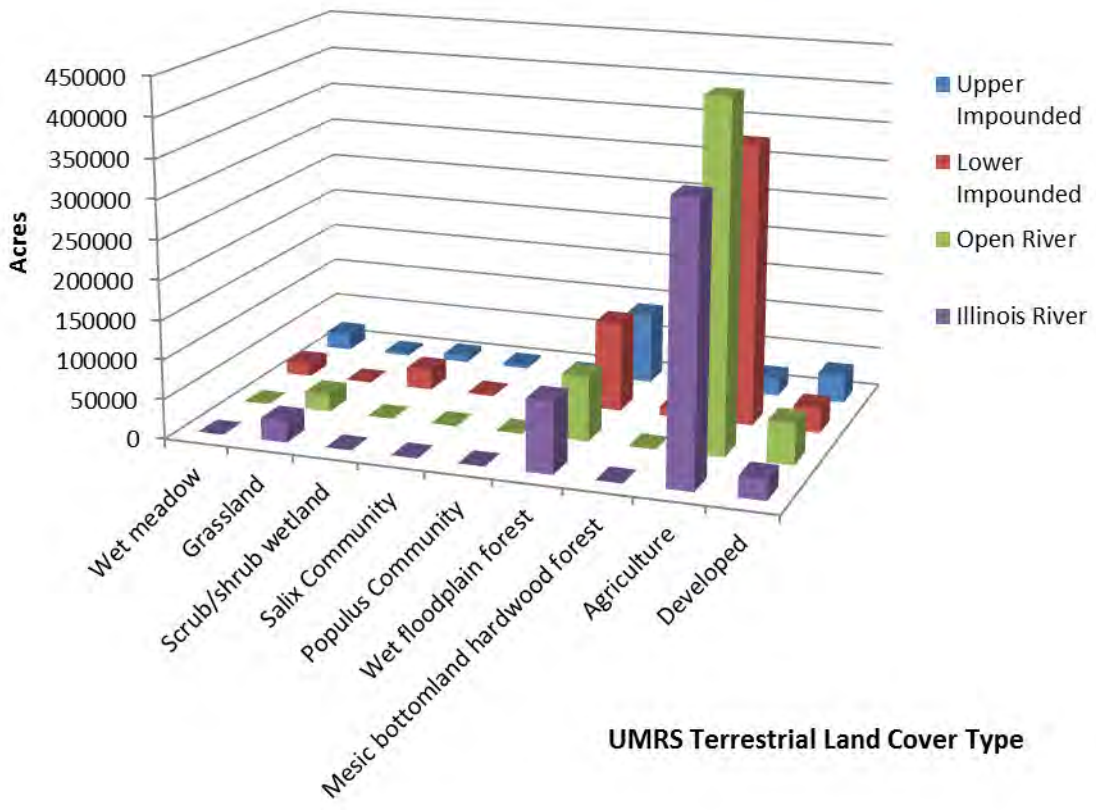
The UMRS can be described by a more detailed breakdown of twelve geomorphic sub-reaches within the four major UMRS reaches (*see figure 1*). Detailed descriptions of these geomorphic sub-reaches can be found in the HNA (Theiling et al. 2000); the Cumulative Effects Study (WEST 2000); and in the Upper Mississippi River System Ecosystem Restoration Objectives plan (USACE 2010). Detailed tables and figures describing the distribution of land cover types within these geomorphic reaches (and individual pools in the impounded reaches) can also be found in the HNA and the UMRS Ecosystem Restoration Objectives plan.

Table 5. Terrestrial land cover in UMRS reaches.

| Land Cover Type | Reach | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Upper Impounded | | Lower Impounded | | Open River | | Illinois River | |
| | Acres | % | Acres | % | Acres | % | Acres | % |
| Wet meadow | 21686 | 4.9 | 16764 | 1.8 | 0 | 0.0 | 0 | 0.0 |
| Grassland | 3206 | 0.7 | 858 | 0.1 | 22677 | 3.4 | 27713 | 4.5 |
| Scrub/shrub wetland | 8164 | 1.9 | 26229 | 2.9 | 0 | 0.0 | 0 | 0.0 |
| Salix Community | 4093 | 0.9 | 2265 | 0.2 | 0 | 0.0 | 0 | 0.0 |
| Populus Community | 417 | 0.1 | 2877 | 0.3 | 0 | 0.0 | 0 | 0.0 |
| Wet floodplain forest | 90449 | 20.5 | 114288 | 12.5 | 82219 | 12.2 | 91326 | 14.9 |
| Mesic bottomland hardwood forest | 7518 | 1.7 | 10471 | 1.1 | 0 | 0.0 | 0 | 0.0 |
| Agriculture | 22772 | 5.2 | 355581 | 38.8 | 439201 | 65.2 | 349136 | 57.0 |
| Developed | 35933 | 8.1 | 31839 | 3.5 | 52765 | 7.8 | 26740 | 4.4 |

(Adapted from: Theiling et al. 2000)

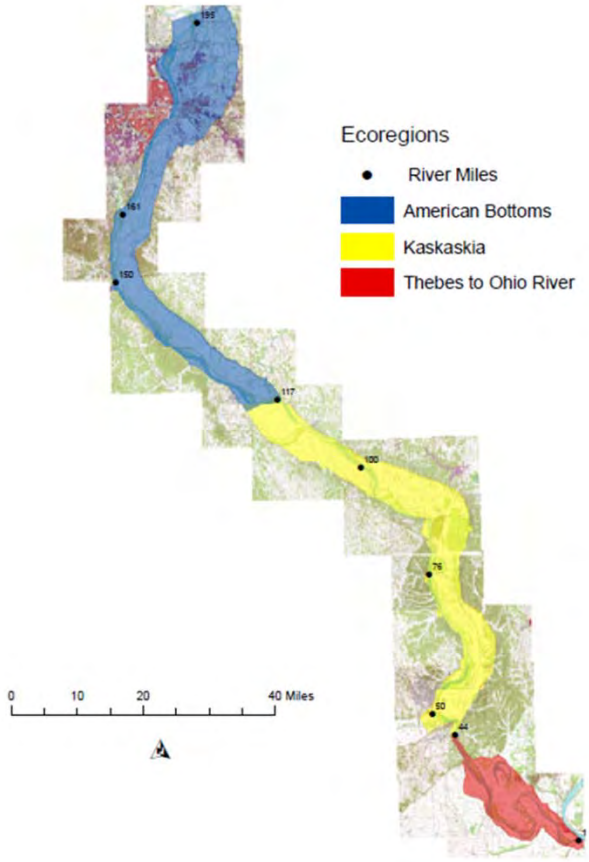
Figure 9. Terrestrial land cover in UMRS reaches. (Adapted from: Theiling et al. 2000)



## 6. Hydrogeomorphic (HGM) Ecoregions

A hydrogeomorphic modeling study conducted on the Unimpounded Reach of the UMRS (Heitmeyer 2008), referred to therein as the Middle Mississippi River Regional Corridor, revealed three distinct ecoregions that do not correspond exactly to the previous set of delineated geomorphic reaches in the open river (figure 10). The American Bottoms ecoregion extends from the confluence of the Mississippi and Missouri Rivers south to the Kaskaskia River, and was heavily influenced by sedimentation and flow from the Missouri River. The Kaskaskia ecoregion extends from the Kaskaskia River to a narrow constriction of the floodplain at Thebes Gap near Cape Girardeau. Geomorphic influences in this ecoregion include attenuation of sediments and flows from the American Bottoms ecoregion, influx of sediments and flow from the Kaskaskia River, and floodplain constriction at Thebes Gap. The third ecoregion extends from Thebes Gap to the confluence of the Mississippi and Ohio Rivers and is generally characterized as the northernmost extension of the historic Mississippi Embayment (Heitmeyer 2008). A study assessing the feasibility of conducting a series of hydrogeomorphic analyses in the Impounded Reaches of the Mississippi and Illinois Rivers has been completed (Heitmeyer 2007). As that project moves forward, it may very well provide a similarly distinct set of finer scale geomorphic classifications of the UMRS that will have wide applicability to floodplain restoration efforts throughout the system.

Figure 10. HGM ecoregions in the Middle Mississippi River Regional Corridor.




(Source: Heitmeyer 2008)

# C. UMRS Floodplain Ecosystem

The UMRS floodplain ecosystem is complex, spatially and temporally dynamic, and interspersed with a mosaic of habitat types differentiated by an interacting combination of environmental factors and gradients such as hydrology, soils, geomorphology, elevation, biological succession, and disturbance (figure 4). Various land classification efforts describing the multiple habitat types present in the UMRS have been developed over the years from a combination of historical, aerial, and satellite imagery (e.g., Dieck and Robinson 2004; Theiling et al. 2000; Heitmeyer 2008; Faber-Langendoen 2001). However, the most pertinent for the purposes of this report are likely the General Wetland Vegetation Classification System developed and used by the LTRMP program and the hydrogeomorphic classification system recently developed and used by Heitmeyer (2008) in the Middle Mississippi Regional Corridor, both of which are described in more detail below.

## 1. Floodplain Habitats

### a. General Wetland Vegetation Classification System

The General Wetland Vegetation Classification System (GWVCS) is a 31-class land cover/land use classification system developed and used by the EMP-LTRMP (table 6). It was developed from year 2000 color infrared aerial photography and was designed primarily for use in systemic level studies. It basically represents an integrated, coarser scale version of a 151-class system that can be used for more focused studies. A full description of the development of the GWVCS and all 31 land use/land cover types it encompasses can be found in the General Classification Handbook for Floodplain Vegetation in Large River Systems (Dieck and Robinson 2004). Following are brief descriptions of some of the terrestrial UMRS vegetation types most relevant to this report.

**Wooded Swamp (WS)** – Wooded Swamp represents areas in or around shallow lakes, ponds, oxbows, or backwaters that are more than 10 percent vegetated with semipermanently flooded forests. Common vegetation types include bald cypress (*Taxodium distichum*), water tupelo (*Nyssa aquatica*), sourgum (*Nyssa sylvatica*), and black ash (*Fraxinus nigra*). This general class is most common in southern reaches of the UMRS. It may have inclusions of submersed, nonrooted-floating aquatics, rooted-floating aquatics, or emergent vegetation. It is typically found growing in shallow water.

**Floodplain Forest (FF) –** Floodplain Forest represents areas on islands, near the shoreline, or around lakes, ponds, and backwaters that are more than 10 percent vegetated with seasonally flooded forests. These forests are predominantly silver maple, but also include elm, cottonwood, black willow (*Salix nigra*), and river birch (*Betula nigra*). This general class is typically found growing at or near the water table where it becomes inundated from spring flooding and high-water events.

**Populus Community (PC) –** Populus Community represents lowland areas that are more than 10 percent vegetated with seasonally flooded cottonwood trees. These forests are more than 50 percent cottonwood and may include other floodplain and lowland forest types. This general

class is typically a pioneering species of disturbed areas and is generally found growing on moist soils. Populus communities are tall and often grow monotypically, as well as adjacent to or along with floodplain forest or lowland forest types.

**Salix Community (SC)** – Salix Community represents areas near the shoreline or around lakes, ponds, and backwaters that are more than 10 percent vegetated with seasonally flooded willow trees or shrubs. These forests or shrub communities are more than 50 percent willow and may include other floodplain forest types. This general class typically grows with an emergent, grass, and/or forb understory on moist and saturated soils.

Table 6. General wetland vegetation classification system. (Source: Dieck and Robinson 2004)

| Map class | Map code | Hydrologic regime | Density* | Height* |
|---|---|---|---|---|
| Open Water | OW | Permanently Flooded | | |
| Submersed Vegetation | SV | Permanently Flooded | X | |
| Rooted-Floating Aquatics | RFA | Permanently Flooded | X | |
| Deep Marsh Annual | DMA | Semipermanently Flooded | X | |
| Deep Marsh Perennial | DMP | Semipermanently Flooded | X | |
| Shallow Marsh Annual | SMA | Seasonally Flooded | X | |
| Shallow Marsh Perennial | SMP | Seasonally Flooded | X | |
| Sedge Meadow | SM | Temporarily Flooded | X | |
| Wet Meadow | WM | Saturated Soil | X | |
| Deep Marsh Shrub | DMS | Infrequently Flooded | X | |
| Shallow Marsh Shrub | SMS | Infrequently Flooded | X | |
| Wet Meadow Shrub | WMS | Infrequently Flooded | X | |
| Scrub-Shrub | SS | Infrequently Flooded | X | |
| Wooded Swamp | WS | Semipermanently Flooded | X | X |
| Floodplain Forest | FF | Seasonally Flooded | X | X |
| Populus Community | PC | Temporarily Flooded | X | X |
| Salix Community | SC | Infrequently Flooded | X | X |
| Lowland Forest | LF | Seasonally Flooded | X | X |
| Agriculture | AG | Seasonally Flooded | | |
| Conifer | CN | Semipermanently Flooded | X | X |
| Plantation | PN | Seasonally Flooded | X | X |
| Upland Forest | UF | Temporarily Flooded | X | X |
| Developed | DV | Infrequently Flooded | | |
| Grassland | GR | Infrequently Flooded | X | |
| Levee | LV | Infrequently Flooded | X | |
| Pasture | PS | Infrequently Flooded | | |
| Roadside | RD | Infrequently Flooded | X | |
| Mudflat | MUD | Seasonally Flooded | | |
| Sand Bar | SB | Temporarily Flooded | | |
| Sand | SD | Infrequently Flooded | | |
| No Photo Coverage | NPC | No Photo Coverage | | |

* Indicates whether density and/or height modifiers apply to that map class

**Lowland Forest (LF) –** Lowland Forest represents areas along the riverbanks and within the floodplain that are drier than floodplain forest sites and are more than 10 percent vegetated with temporarily flooded forests. Common vegetation types include pecan, hickory (*Carya*), river birch, sycamore (*Platanus occidentalis*), and red/black oak (*Quercus*). This general class is most common in southern reaches of the Upper Mississippi and Illinois River Systems and is typically found growing on moist, well-drained soils.

**Wet Meadow Shrub (WMS)** – Wet Meadow Shrub represents lowland areas that are more than 25 percent vegetated with temporarily flooded shrubby vegetation. This general class tends to be drier than shallow marsh shrubs, but wetter than scrub-shrubs, and typically grows with a mix of sedges, grasses, and forbs. Common vegetation types include alder (*Alnus*), elder (*Sambucus*), false indigo (*Amorpha*), dogwood (*Cornus*), and willow. Wet meadow shrub is typically found growing on saturated soils.

**Scrub-Shrubs (SS)** – Scrub-Shrubs represent upland areas that are more than 25 percent vegetated with infrequently flooded shrubby vegetation. This general class is the driest of the shrub classes and typically grows with a mix of grasses and forbs on drier soils.

**Wet Meadow (WM) –** Wet Meadow represents lowland areas that are more than 10 percent vegetated with perennial grasses and forbs. Common vegetation types include reed canary grass, rice cut-grass (*Leersia*), and goldenrod (*Solidago*). This general class may have small inclusions of woody vegetation, sedges, or emergent vegetation, such as smartweed or purple loosestrife. It is typically found growing on saturated soils and is often considered the transition zone between aquatic communities and uplands.

**Grassland (GR) –** Grassland represents drier upland areas that are more than 10 percent vegetated with perennial grasses and forbs. This general class may include fallow fields, sand prairies, and shrubby vegetation. It generally exists near other upland types, such as scrub-shrubs or upland forest. Grasslands are infrequently flooded and are typically found growing where soils are dry.

### b. Hydrogeomorphic (HGM) Classification System

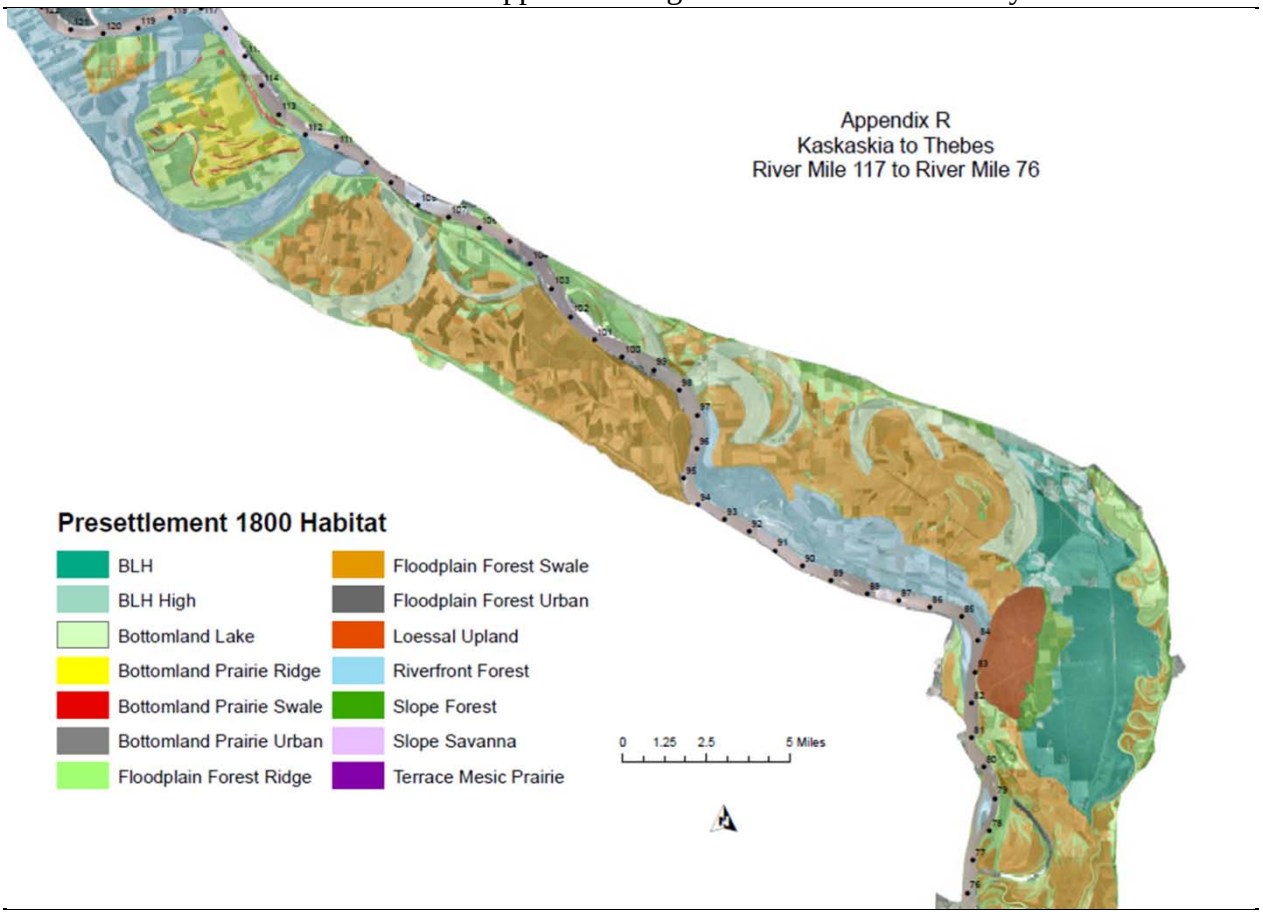
The HGM Classification System developed and used by Heitmeyer (2008) for the Middle Mississippi River Regional Corridor study used a discrete set of hydrogeomorphic data to classify ecosystems in that portion of the river system. The utility of this classification system for the entire UMRS is unknown at this time. However, the feasibility of using HGM analyses for the entire UMRS has been assessed and this study may be undertaken in the near future. Therefore, it is expected that a classification system with similar metrics will be developed for application to the entire system in the foreseeable future. An example of a map plate from the Middle Mississippi study showing the spatial distribution of areas that could potentially support the restoration of presettlement floodplain habitats is shown in figure 11. Terrestrial HGM habitat types described in the Mississippi study are summarized below.

**Riverfront Forest –** Riverfront forests primarily occurred on chute and bar surfaces, some point bar areas, and along the edges of some abandoned channels. Soils were generally young, well

drained sands, sandy loams and silt loams. Flood frequency was less than 1 year in swales, and 1 to 2 years on ridges. This forest type was dominated by early successional tree species, with willow and silver maple commonly occurring in lower elevations and a mix of elm, ash (*Fraxinus*), cottonwood, sycamore, pecan and sugarberry (*Celtis laevigata*) on ridges. Oak species such as swamp white oak (*Quercus bicolor*) and pin oak (*Quercus palustris*) occurred occasionally on higher elevations in small, scattered groups.

**Floodplain Forest –** Floodplain forests were fairly widespread, occurring on point bar surfaces and along tributaries. They typically developed in mixed silt loams in conjunction with older ridge and swale topography. Ridges commonly had a 2- to 5-year flood frequency, while swales had a 1- to 2-year flood frequency. This forest type represents a transition from early successional riverfront forests to older bottomland hardwood forest that occurred in backswamps and depressions contained clay soils. Composition was dominated by elm, ash, sweetgum (*Liquidambar styraciflua*), sugarberry, and boxelder (*Acer negundo*), but included a mix of other species depending on elevation and soils. For example, higher elevations often contained pecan, pin oak, swamp chestnut oak (*Quercus michauxii*), and scattered hickories. Lower elevations included more willow, cottonwood, maple and sycamore.

Figure 11. Map plate of areas that could potentially support restoration of pre-settlement communities from the Middle Mississippi River Regional Corridor HGM study.




(Source: Heitmeyer 2008)

**Bottomland Hardwood Forest (BLH) –** Bottomland hardwood forests were present in low elevation depressions, backswamps, larger point bar swales, and old braided river terraces. They typically occupied zones between floodplain forests and the edges of bluffs, primarily south of Kaskaskia in the Mississippi Alluvial Valley (MAV) portion of the UMRS. Soils in these areas were primarily silty clays, and flood frequency was typically on the order of 2 to 5 years. These vegetation communities were distributed along elevation and flood frequency gradients, with the lowest lying areas containing baldcypress-tupelo swamps. At slightly higher elevations, low bottomland hardwood forests contained trees such as overcup oak (*Quercus lyrata*), green ash (*Fraxinus pennsylvanica*), red maple (*Acer rubrum*), and pecan, with scattered pin oak on higher ridges. Intermediate bottomland hardwood forests, which occurred mostly in backswamp areas that typically flooded 1 to 2 months in the dormant season, contained a mix of pin oak, swamp chestnut oak, sugarberry, American elm (*Fraxinus americana*), sweetgum, and scattered swamp white and willow oak (*Quercus phellos*). The highest elevation bottomland hardwood forests typically contained a mix of pin oak, cherrybark oak (*Quercus pagoda*), willow oak, shagbark hickory (*Carya ovata*), shellbark hickory (*Carya laciniosa*), sweetgum, and American elm.

**Slope Forest –** Slope forests occupied alluvial fans and higher terraces along the edges of floodplains, were rarely flooded, and had soils that were a unique mix from both erosional sources and alluvium. These forests contained a diverse mix of species common to both upland and floodplain communities including hickories, sugarberry, swamp white oak, swamp chestnut oak, white oak (*Quercus alba*), bur oak (*Quercus macrocarpa*), various red oaks, black walnut (*Juglans nigra*), ash, mulberry (*Morus*), maple, pawpaw (*Asimina triloba*), persimmon, honey locust (*Gleditsia triacanthos*), hawthorn (Crataegus), Kentucky coffeetree (*Gymnocladus dioicus*), and slippery elm (*Ulmus rubra*). Fire may have been a regular occurrence in these habitats, particularly in the American Bottoms just south of St. Louis where savanna and prairie systems were more ubiquitous.

**Bottomland Prairie –** Bottomland prairie occupied extensive tracts of the Middle Mississippi River floodplain north of Kaskaskia, and typically occurred on older point bar surfaces with 2 to 5 year flood frequencies. Soils were variable, ranging from clay-silts to silty and sandy loams. Fire was likely an important factor in the maintenance of these systems. Higher elevation ridges commonly contained a mix of prairie grasses such as big bluestem (*Andropogon gerardii*), blue joint (*Calamagrostis Canadensis*), and switchgrass (*Panicum*). Lower elevation swales usually contained a mix of sedges (*Carex*) and plants more typical of wetlands, such as river bulrush (*Schoenoplectus fluviatilis*), floating manna grass (*Glyceria septentrionalis*), bur-reed (*Sparganium*), sweetflag (*Acorus*), and smartweeds (*Polygonum*).

**Mesic "Terrace" Prairie –** Higher elevation terraces in the Middle Mississippi River floodplain contained mesic prairies that were dominated by perennial upland-type grasses including little bluestem (*Schizachyrium scoparium*), switchgrass, Indian grass (*Sorghastrum nutans*), dropstem (*Sporobolus*), side-oats gramma (*Bouteloua curtipendula*), bunch grass, and panic grasses. Fire was likely a common disturbance factor in these ecosystems.

**Savanna –** Savannas typically occurred on higher elevation alluvial fans, colluvial aprons, and terrace "interface" zones between slope forest and prairie dominated ecosystems. Soils were usually a mix of silt loams, and flood frequency was generally on the order of 10 to 20 years.

Fire was also likely a common disturbance factor in these systems, which were most common in the American Bottoms region of the Middle Mississippi River.

## 2. Ecosystem Services

Society benefits from both the products and functions generated by large river floodplains. Since many of these resources cannot be measured on the same scale it is often difficult to assess their relative values and outputs. A system which uses a multiple-value approach must be used to evaluate the floodplain for both economic and natural resource worth. A generalized (and not all-inclusive) list of floodplain forest ecosystem outputs is listed in five broad categories below (USACE 1995).

- Water Quality – The improvement to ground and surface water, by promoting infiltration, recharge, detoxification, nutrient cycling, and natural flood and erosion/scour control by reducing flood velocities and peaks. Floodplain forests have the ability to absorb energy from floodwaters and reduce sediment loads.
- Living Resources – The supporting vegetation that provides fish and wildlife habitat, organic matter production, natural genetic diversity, pollination, protection of rare and endangered species, and creation of corridors for migration.
- Land Based Resources – The creation and enhancement of forests, natural product harvests, wind breaks, and carbon sequestration.
- Education – The opportunity for education and the scientific study of physical, biological and cultural resources.
- Cultural/Recreational Resources – Consumptive and nonconsumptive uses, open space and aesthetic values. For example, the river "… provides for over $6.6 billion dollars in revenue annually from some 12,000,000 visitor-days of use by people that hunt, fish, boat, sightsee or otherwise visit the river, its magnificent bluffs and communities" (McGuiness 1999).

Some floodplain forest lands have been converted into agro-systems which, depending on their location and conditions, have proven to be less stable and more susceptible to floods or other damage. When forests and other natural communities are restored in these areas, stability, diversity and potential for long-term sustainability are increased. In some instances agro-forestry practices (i.e., trees that work for agriculture) can be an answer for sustainable agriculture in floodplains by helping to control the natural forces of the river (Hershey et al. 1994). Even numerous small scale projects and actions taken by the Corps or partners through this plan, and/or independent private actions, can make a difference in natural resource values within the river corridor. However, when coupled with a few larger scale restoration projects, located at strategic sites within the corridor, sustainability will be enhanced for both ecological and economic systems.

**Floodplain Forest Functions –** The conversion of the present day UMRS floodplain from its historic natural ecosystem to its human-altered ecosystem requires a realignment of restoration thinking due to the incremental losses of naturally occurring functions and processes and their outputs of goods, services and societal values. It is not the intent of this plan to measure the magnitude of these effects, but rather to understand the existing floodplain's functional capability to produce those achievable benchmark services that are now valued by society.

Although research has revealed a basic understanding of the fundamental ecological processes of large river floodplains, it is the long-term effects of the many and cumulative human changes upon the UMRS floodplain ecosystem that remain uncertain. Ecosystems operate in such intricate and unexplored ways that most could not be replicated by today's technology. Human civilizations would cease to thrive, if it was not for natural ecosystems' fundamental life-support services, namely air and water purification, detoxification and decomposition of wastes (Daily et al. 1997). Still, present day UMRS floodplains perform their important basic hydrologic, geomorphic, and biological functions and processes as did their historic counterparts.

The UMRS floodplain ecosystem, located at the convergence of terrestrial and aquatic ecosystems, is a regional hot spot of biodiversity and exhibits a high rate of biological productivity in marked contrast to the larger landscape. Restoration of the UMRS floodplain will require a firm understanding of riparian structures and functions at even larger watershed scales.

The inherent benchmark ecological processes that floodplain ecosystems perform can be categorized into three major types: (1) hydrology and sediment dynamics, (2) biogeochemistry and nutrient cycling, and (3) habitat and food web maintenance. These functions have both on-site and off-site effects, some of which may be expressed as goods and services. Common examples of UMRS floodplain functions, their indicators and effects, and those goods and services produced are shown in table 7 (National Research Council 2002).

Knowledge of large river floodplain functions is sufficiently well developed that indicators can be used as shortcuts to judge whether the functions are occurring at appropriate levels. However, the exact relationship between indicators and current ecological functional benchmarks of the UMRS, together with proven methodologies for comprehensive measurements, will challenge restoration attempts at any scale until they are further refined.

Except for support of biodiversity, some environmental services of the UMRS floodplain can be produced by technologies. Reservoirs for flood peak reduction and wastewater treatment plants for pollutant removal are examples of process substitutions that are directed at single rather than multiple functions that riparian areas carry out simultaneously. Human activities that destroy or even modify the natural ecosystem may deteriorate ecological services whose long term value dwarfs short-term economic benefits gained by society from such activities (Daily et al. 1997).

**Hydrology and Sediment Dynamics –** The UMRS floodplain is characterized by a spatial and temporal mosaic of conditions reflecting variability in sediment type and particle size distribution, timing of water sources and water quality, and flood disturbances. Seasonal dynamics in flow and sediment transport constitute the foundation of the UMRS structure and thus influence many ecosystem functions. Moisture availability and anoxia in riparian soils are additional factors that are related to soil particle size and fluvial processes (National Research Council 2002). In the present day UMRS floodplain, the natural variability of flow has been regulated and sediment inputs have been altered by water regulating works including dikes, dams and levees. The influence of regulating these river flows has had overwhelming effects on ecological processes in the UMRS floodplain as a result of the disruption of flow seasonality, sediment dynamics and moisture availability.

**Hydrologic Processes –** Hydrologic fluxes in the UMRS floodplain are highly variable in both space and time, ranging from minutes to decades, and as a result it is entirely possible that a single area could function some of the time as a pathway for groundwater, at other times as a hyporheic zone, and at other times as a zone of bank storage. There is no universally acceptable approach to characterizing the water balance of riparian areas, and many studies employ significant simplifications, assumptions, or other qualifications (NRC 2002).

Table 7. UMRS ecosystem functions, indicators, effects, and goods and services.

| Examples of Functions | Indicators that Functions Exist | On- or Off-Site Effects of Functions | Goods and Services Examples |
|---|---|---|---|
| **Hydrology and Sediment Dynamics** | | | |
| Stores surface water over the short term | Floodplain connected to the stream channel | Attenuates downstream flood peaks | Water regulation; peak flood reduction; water detoxification; nutrient cycling |
| Maintains a high water table | Presence of flood-tolerant plant species | Maintains vegetation structure | Regional biodiversity |
| Accumulates and transports sediments | Riffle-pool sequences; point bars; other features | Contributes to fluvial geomorphology | Sediment load reduction; landform diversity |
| **Biogeochemistry and Nutrient Cycling** | | | |
| Produces organic carbon | A balanced biotic community | Provides energy to maintain aquatic and terrestrial food webs | Production of organic matter / food /fiber |
| Contributes to overall biodiversity | High species richness of plants and animals | Provides reservoirs for genetic diversity | Support of biodiversity; pollination; pest / disease regulation |
| Cycles and accumulates chemical constituents | Chemical and biotic indicators | Intercepts nutrients and toxicants from runoff | Pollutant removal |
| Sequesters carbon in soil | Organic-rich soils | Contributes to nutrient retention and carbon dioxide sequestration | Air quality regulation; carbon sequestration; climate regulation |
| **Habitat and Food Web Maintenance** | | | |
| Maintains streamside vegetation | Presence of forest canopy | Provides shade to stream | Thermal regulation |
| Supports characteristic terrestrial vertebrate populations | Appropriate species having access to riparian area | Allows daily movements to annual migrations | Education/scientific study; wildlife habitats |
| Supports characteristic aquatic vertebrate populations | Migrations and populations maintenance of fish | Allows migratory fish to complete life cycles | Education/scientific study; fish habitats |

(Adapted from: National Research Council 2002)

**Biogeochemical Processes –** The transport and transformation of chemical and particulate matter are key factors that affect the ecology of the UMRS floodplain. The major physical, chemical, and biological fate and transport processes associated with the UMRS floodplain include infiltration, deposition, filtration, adsorption, degradation, and assimilation. A greater portion of the water flow passes though the riparian areas of low-order streams in the Upper Mississippi River watershed before reaching the UMRS floodplain, making these upstream watershed areas more instrumental in removing pollutants from runoff. Today a smaller portion of the historic UMRS floodplain receives flood event flows now confined by levees, suggesting that if water-quality protection is a primary objective, priority might be given to restoration of functional riparian areas along ephemeral and first- and second-order streams over the UMRS floodplain.

**Habitat and Food Web Maintenance –** The biodiversity of both the historic and present day UMRS floodplain is well documented. The structural diversity of UMRS floodplain plant species creates a wide variety of feeding niches for herbivores and carnivores alike. Species dispersal, including immigration, emigration and/or migration, occurs for all species within the floodplain. The thermal regulation of streams and the supply of large woody debris afforded by the floodplain forest lead to its characteristically valuable invertebrate species habitat within both the aquatic and terrestrial environments.

**Valuation of Ecosystem Services –** Rivers have provided free ecosystem services to humans for thousands of years. Their ability to provide food, water, and transportation has been vital to the development of many civilizations. Unfortunately, civilizations have often only found out how valuable ecosystem services are when the service has been lost or degraded to the point where the sustainability of the socio-economic system is threatened. Then, the value of the service is reflected in the cost of artificial structures, substitute or imported resources, or ecosystem restoration measures needed to replace the lost service (Barko et al. 2006).

Understanding, identifying, and adopting a set of ecosystem services to be used for evaluating "balance" among the UMRS floodplain ecosystem and economic and social facets of the river system would benefit long-term river management decision-making. However, the objective and consistent valuation of these ecosystem services continues to challenge managers and stakeholders, as methods and assumptions for quantifying river ecosystem services are far from being standardized.

It has been suggested that we should follow the definition of ecosystem services from the U.N. Millennium Assessment Report (2005): "*Ecosystem services are the benefits people obtain from ecosystems.*" The Millennium Assessment Report's categorization scheme for ecosystem services includes provisioning, regulating, cultural, and supporting services. Provisioning services are those that generate products. Regulating services are associated with the regulation of ecosystem processes. Cultural services create nonmaterial benefits valued by society. Supporting services are necessary for the production of the other services. Their impacts on humans are often indirect and may influence the other services over long periods of time. Table 8 provides examples of large river ecosystem services under these respective headings.

Table 8. Large river ecosystem services.

| Provisioning Services | Regulating Services | Cultural Services | Supporting Services |
|---|---|---|---|
| ▪ Food<br>▪ Fresh Water<br>▪ Timber<br>▪ Fiber<br>▪ Genetic Resources<br>▪ Biochemicals<br>▪ Natural Medicines<br>▪ Pharmaceuticals<br>▪ Biodiversity | ▪ Air Quality Regulation<br>▪ Water Purification<br>▪ Water Regulation<br>▪ Waste Treatment<br>▪ Climate Regulation<br>▪ Pollination<br>▪ Disease Regulation<br>▪ Pest Regulation | ▪ Spiritual Enrichment<br>▪ Cognitive Development<br>▪ Recreation Enjoyment<br>▪ Aesthetic Appreciation<br>▪ Transportation | ▪ Soil Formation<br>▪ Photosynthesis<br>▪ Primary Production<br>▪ Nutrient Cycling<br>▪ Water Cycling |

(Source: Institute for Water Resources)

Some of the more promising attempts at the consistent standardization, quantification and valuation of ecosystem services have originated from current projects at the Corps' Institute for Water Resources (IWR). Several reports of the IWR capture these efforts toward ecosystem services evaluation, including Stakhiv et al. (2003) and Shabman and Stephenson (2007).

## D. UMRS Forests

### 1. Current forest condition and threats

The development of the UMRS floodplain for agriculture, combined with extensive logging for fuel wood and lumber, resulted in widespread conversion of the historic mosaic of forest and prairie habitats. Today, contiguous forest cover is primarily confined to a relatively narrow strip on the riverward side of agricultural levees (USACE 2004). Natural channel dynamics and water levels fluctuations have also been altered throughout the UMRS, thereby further reducing the natural diversity and productivity of floodplain ecosystems (Theiling et al. 2000). Species composition of the remaining forest has also become less diverse, due in part to altered hydrology, a loss of the seasonal "flood pulse," and the effects of periodic severe flooding, particularly the flood of 1993. This change is especially evident in the decline of mast-producing species such as oaks and hickories. Bank erosion also has affected floodplain forests to some degree (USACE 2004). Diseases, insects and invasive plant species also continue to negatively impact UMRS floodplain forests throughout the system.

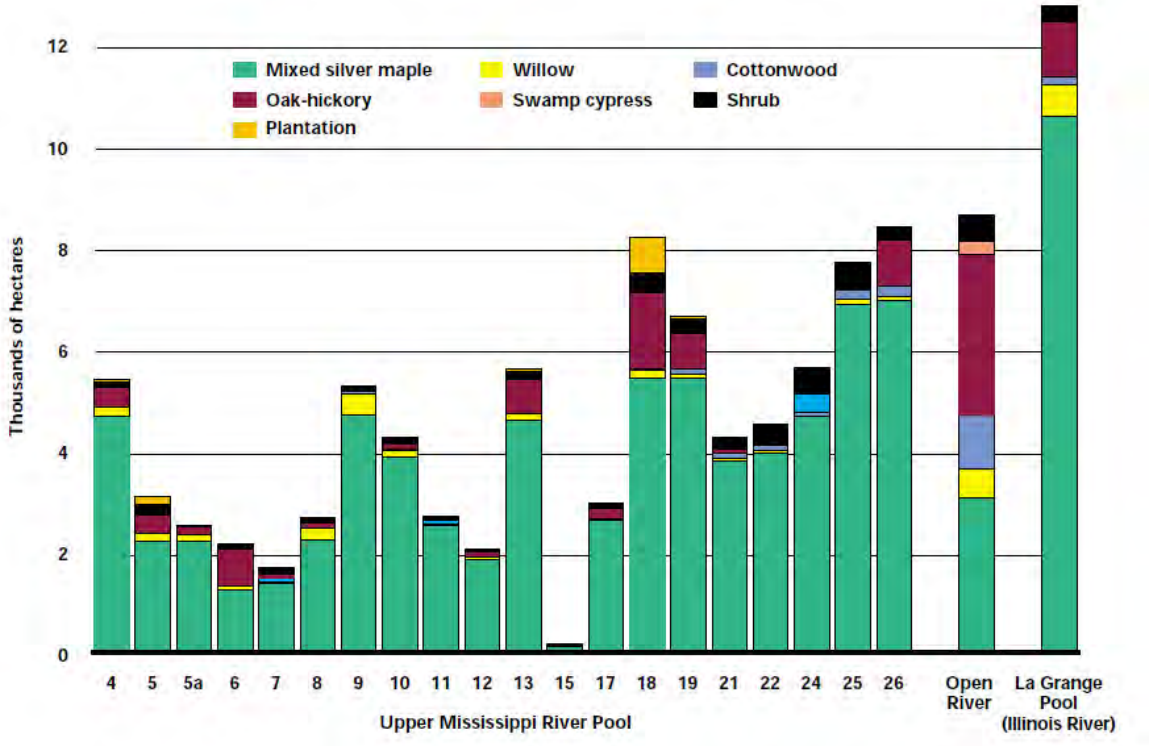
#### a. Diversity

A healthy, functioning floodplain forest requires a diversity of forest structural components including tree species, age classes, canopy heights, and understory composition. However, changes in flood frequency, duration, and depth resulting from river impoundment and channelization have reduced diversity within remaining Upper Mississippi River forests in all four river reaches (Yin and Nelson 1995). Much of the current floodplain forest is between 50 and 70 years old, consisting of three or four flood and shade tolerant species, and heavily dominated by silver maple (figure 12). With sustained high water levels, little germination takes

place and seedlings are unable to survive frequent floods. The closed canopy of these even-aged forests also prevents the reestablishment of other species that are shade intolerant such as cottonwood, black willow, and river birch. Hard mast species, such as oaks, have significantly declined and now occur on less than 10 percent of the floodplain (Urich et al. 2002).

Knutson and Klaas (1998) calculated tree species importance values and made comparisons between presettlement and 1992 floodplain forests of the Upper Mississippi River. In general, they found that all mast species except white oak declined in importance since presettlement. Early successional stands of cottonwood and willow have generally declined as a result of alterations in bank erosion and accretion processes, although the extreme flood of 1993 did result in the establishment of a significant amount of cottonwood and willow habitat in the lower river reach (Yin 1998). It is expected that significant canopy die-off will occur in many locations throughout the UMRS within about 50-70 years due to the mature, even-aged condition of the majority of the forest resource (USGS 1999). This will likely result in open conditions and promote undesirable species such as reed canary grass that make it difficult for floodplain forest trees to regenerate. Large scale die-off from floods or other disturbances could also result in a conversion of vegetation type. In addition to the wildlife habitat it provides, closed canopy forest limits the establishment and expansion of the invasive reed canary grass through shading. Partial forest canopy, to the point of a savanna, has the potential to provide high quality habitat if the understory vegetation consists of native, noninvasive species. However, this type of habitat is very difficult to maintain in areas where invasives are present.

Figure 12. Forest community distribution throughout the UMRS in 1989. (Source: USGS 1999)



Recent forest inventories on Corps lands show a heavy dominance by silver maple throughout St. Paul, Rock Island and St. Louis Districts (figure 12). Other common tree species of lesser frequency include cottonwood, green ash, black willow, river birch, sycamore, American elm, boxelder, swamp white oak, pin oak, bitternut hickory (*Carya cordiformis)*, black walnut, and pecan. Average tree age is generally between 50 and 70 years. Statistics on timber size class distribution from the Rock Island District (Pools 11 through 22) indicate that more than 40 percent of these forest stands are dominated by trees that are 18 inches or larger in diameter at breast height (DBH). Over 30 percent are dominated by trees between 12 and 18 inches DBH. These numbers indicate a maturing, even-aged forest with an insufficient number of replacement trees in the seedling/sapling layer. Yin (USGS 1999) provides additional information on the current structure of UMRS floodplain forest communities, stating that many stands are dominated by large trees, with silver maple or eastern cottonwood trees usually the largest in a community. Yin further states that many floodplain forests along the Upper Mississippi and Illinois Rivers appear to be similar in average tree size, basal area, density, and diversity.

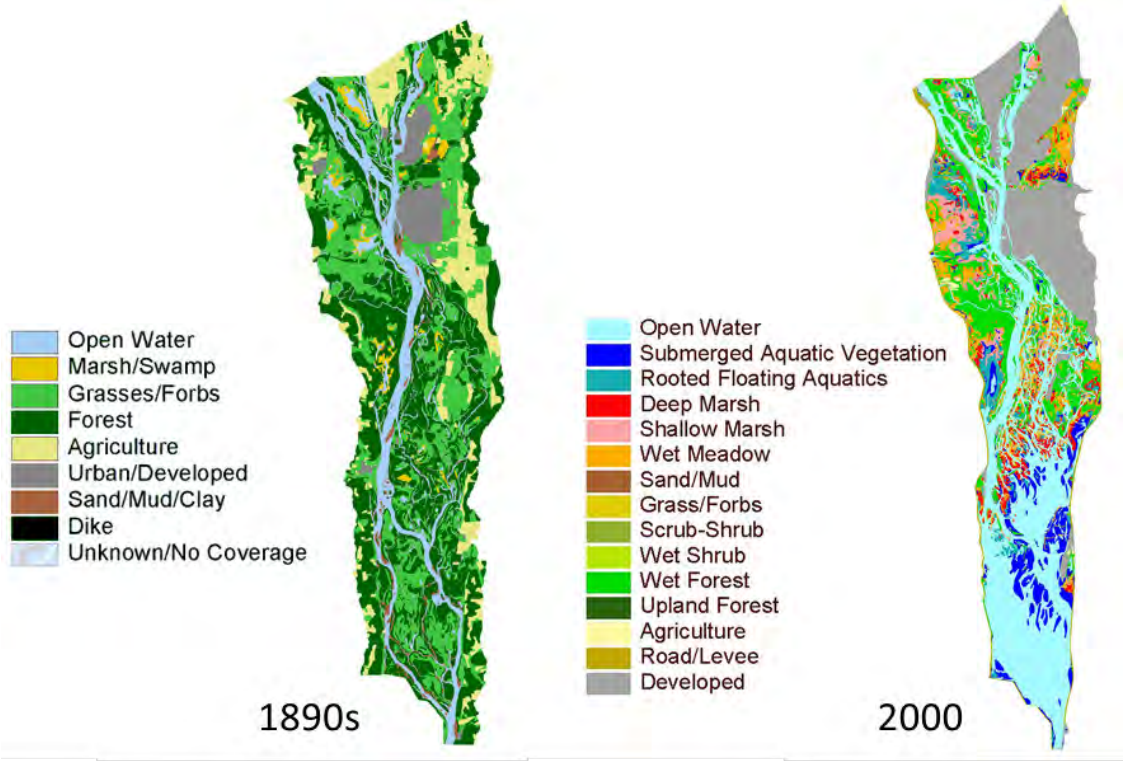
Upper Mississippi River floodplain forest tree species are distributed along ecological gradients defined mostly by their ability to survive various levels of flooding (Urich et al. 2002). Lower lying areas typically support the most flood-tolerant species, including willows, cottonwood, silver maple, and green ash. Trees located on higher elevations along ridges or terraces have less tolerance to flooding and high water tables. Such is the case with species like oaks and hickories that occupy formerly high points of land in the floodplain but are no longer able to reproduce successfully because of inundation and/or permanently elevated water tables. Just as an overhead view would show how acreage of forested land diminished following construction of the 9-foot Channel Project through clearing and inundation (figure 13), a side view would show how elevated water levels, caused by impoundment of each pool, have reduced the acreage available for less flood tolerant species (Yin et al. 1997).

**b. Distribution**

Modern UMRS forests represent only a small portion of pre-European settlement floodplain forests in some reaches. The amount of bottomland forest within the Upper Mississippi River floodplain has been significantly reduced from historic levels by clearing of land for agriculture and development, primarily on the Lower Impounded, Unimpounded, and Illinois River reaches. For example, forests covered 56 percent of the landscape at the confluence of the Illinois and Mississippi Rivers in 1817. By 1975, these forests were reduced to 35 percent of the landscape (Nelson et al. 1994). In 1809, floodplain forests covered 71.4 percent of the landscape in a 63-mile-long portion of the Unimpounded Reach but, by 1989, covered only 18.3 percent of the same landscape (Yin et al. 1995). (*See previous section on historic changes*)

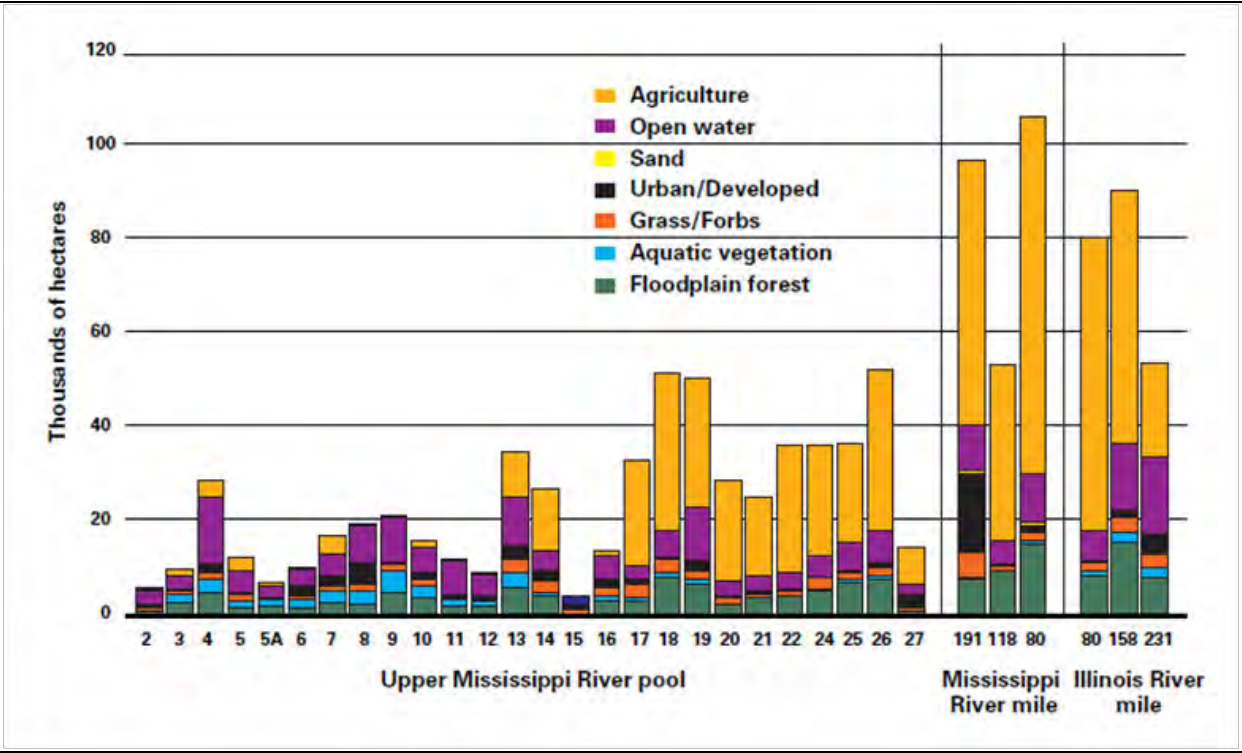
An analyses of 1989 satellite data showed that 303,933 acres of floodplain forests covered 18.6 percent of the land in the Upper Mississippi River valley (USGS 1999). An additional 78,467 acres of floodplain forests covered 17.6 percent of the land in the Illinois River valley (figure 14). The data also indicated that forests in the UMRS are unevenly distributed along floodplain areas. Forests are more often present in periodically flooded lands adjacent to the rivers. They are less often present in areas that are rarely flooded, such as terraces or levee protected land.

Figure 13. Loss of terrestrial landcover in lower Pool 8 from the 1890s – 2000.




(Source: UMRR-EMP, LTRM Component)

Figure 14. 1989 landcover in the Upper Mississippi and Illinois River floodplains.

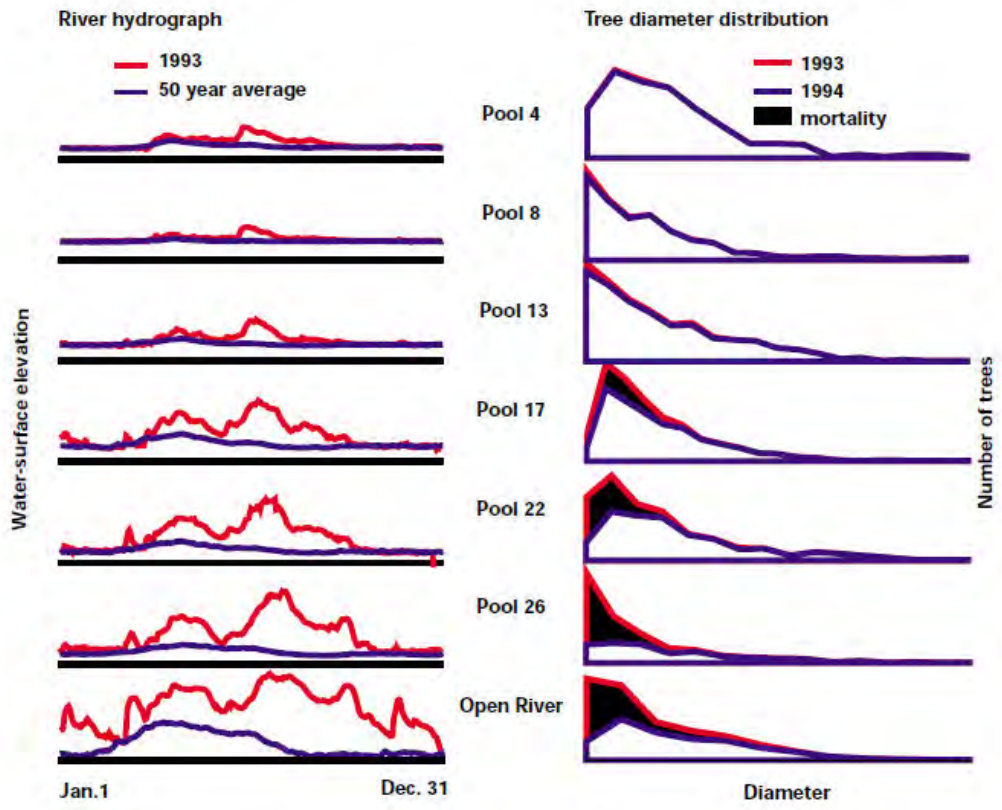



(Source: USGS 1999)

More recently, a large portion of floodplain forest area in the UMRS is recovering from natural disturbance caused by the Great Flood of 1993 (Yin et al. 1994; USGS 1999). Floodplain forests can endure brief inundation, but prolonged inundation can be deadly. While floodplain forests above Pool 13 only experienced slight mortality, that mortality increased markedly in downstream reaches that experienced much longer flood durations. In Pool 26, nearly 40 percent of trees 4 inches in diameter or greater were killed. A remarkable 80 percent of smaller trees less than 4 inches in diameter were killed. Mortality rates throughout were positively correlated with flood duration and negatively correlated with the diameter of the trees (figure 15).

Hackberry and pin oak were the two species most severely affected by the flood. In addition, the difference in post-flood cottonwood and willow regeneration between the Impounded and Unimpounded Reaches was notable. After the flood, willow and cottonwood seedlings occurred abundantly in the Unimpounded Reach but did not regenerate vigorously after the flood in the Impounded Reaches. It remains unclear why these specific floodplain forest communities regenerated well in the Unimpounded Reach but poorly in Pool 26, even though both reaches were equally disturbed. Willow and cottonwood communities in the impounded reaches will likely decline further in the future unless additional management actions are taken (USGS 1999).

Figure 15. Duration of 1993 flood and associated tree mortality.




(Source: USGS 1999)

Forest fragmentation occurs when large contiguous blocks of forest are divided into smaller patches by clearing of land for agriculture and development. During the past 150 years, much of the contiguous forest in the UMRS has been lost, resulting in fragmentation of remaining areas. Areas with large blocks of interior forest dominated by silver maple meet the needs of area-sensitive species, including red shouldered hawks, cerulean warblers, Acadian flycatchers, prothonotary warblers, veerys, wood thrushes, pileated woodpeckers, and eastern wood peewees (Knutson et al. 1996). Recent research in the Vermillion/Cannon River Bottoms in Pools 3 and 4 suggests that some floodplain bird assemblages may respond more to forest width than edge versus interior habitat or habitat patch size (Kirsch 2009). In addition, the concept of forest interior-dependent species may be less applicable in situations where forest "patches" are surrounded by a mosaic of other natural habitats rather than row crops. Nevertheless, it is generally agreed that floodplain forests support a greater number of bird species than other UMRS habitats (USGS 1999), and that conditions for UMRS floodplain birds will deteriorate as floodplain forests continue to decline, become more open-canopied, and disappear from the landscape (Knutson et al. 1996).

### c. Diseases and Insects

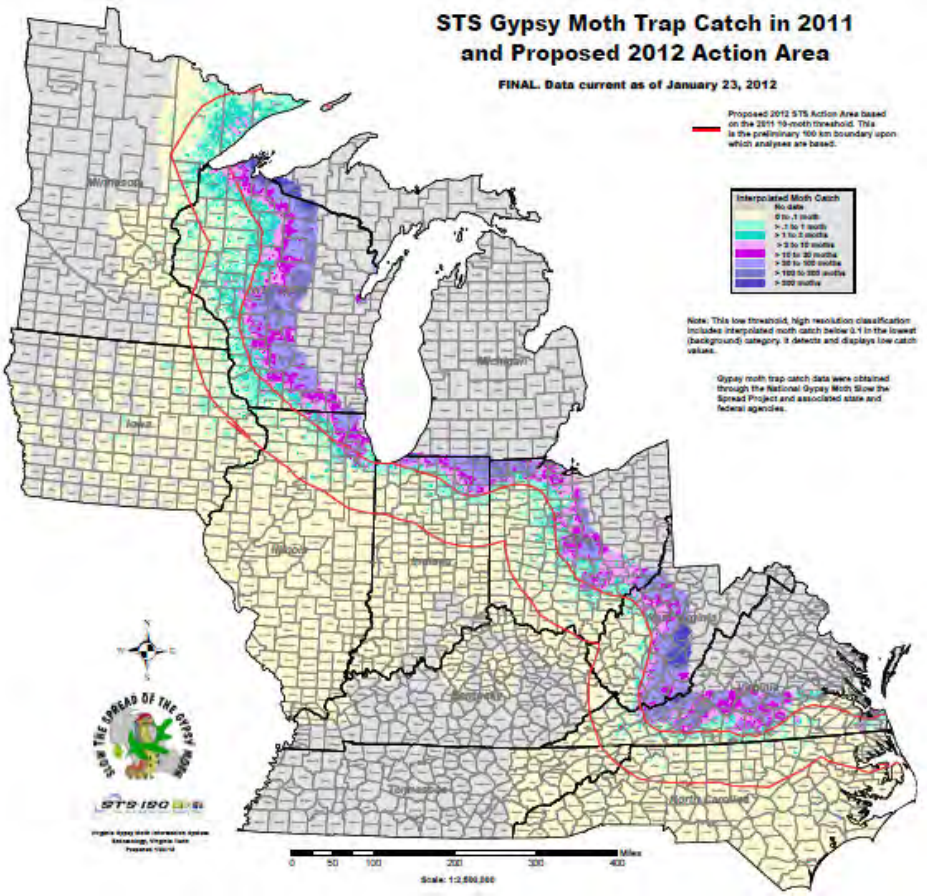
Forest health can be severely impacted by diseases, insects and other pests. In addition to more historic occurrences like Dutch elm disease, several contemporary forest pests and diseases could pose a significant threat to the UMRS floodplain forest, including gypsy moth (*Lymantria dispar*), emerald ash borer (*Agrilus planipennis)*, and oak wilt. (*See section IV.D.4 for additional information on forest health monitoring*)

**Gypsy Moth** – Gypsy moth is an exotic insect pest that can cause defoliation on a number of hardwood tree species and is of particular concern for oaks (GMSTS 2008). The moths were first introduced to North America approximately 120 years ago on the East Coast. They have been slowly spreading westward and southward since they arrived. As of 2010, the larger infestations were approximately 100 miles from the UMRS (figure 16).

Gypsy moths have been captured on the UMRS with pheromone traps under a U.S. Department of Agriculture (USDA) program. Typically only one or two moths have been found in the traps throughout the UMRS with a few areas near Brownsville, Minnesota, having traps catch as many as eight moths. An eradication treatment was used on the infestation near Brownsville in 2001. Follow-up trapping showed that it was successful with only a few traps catching moths, and only one or two moths per trap. Trapping continues throughout the UMRS floodplain, but there has been no significant catch to date. Some moths are still being caught but not enough for action. Large catches continue in Wisconsin approximately 100 to 150 miles east of the Upper Mississippi River. These catches are being treated with *Bacillus thuringiensus* (BT), which works by interfering with the caterpillar's digestive system.

Suppression, eradication, or "slow the spread" are actions that can be taken when these moths are discovered. Suppression can be used in areas where the gypsy moth caterpillar is already established to reduce high populations to prevent or minimize heavy defoliation. Eradication is an action that can be used to eliminate isolated infestations of the gypsy moth to prevent establishment in new areas. "Slow the Spread" is a USDA Forest Service program developed to

Figure 16. Gypsy moth "Slow the Spread" program areas. (Source: www.gmsts.org)



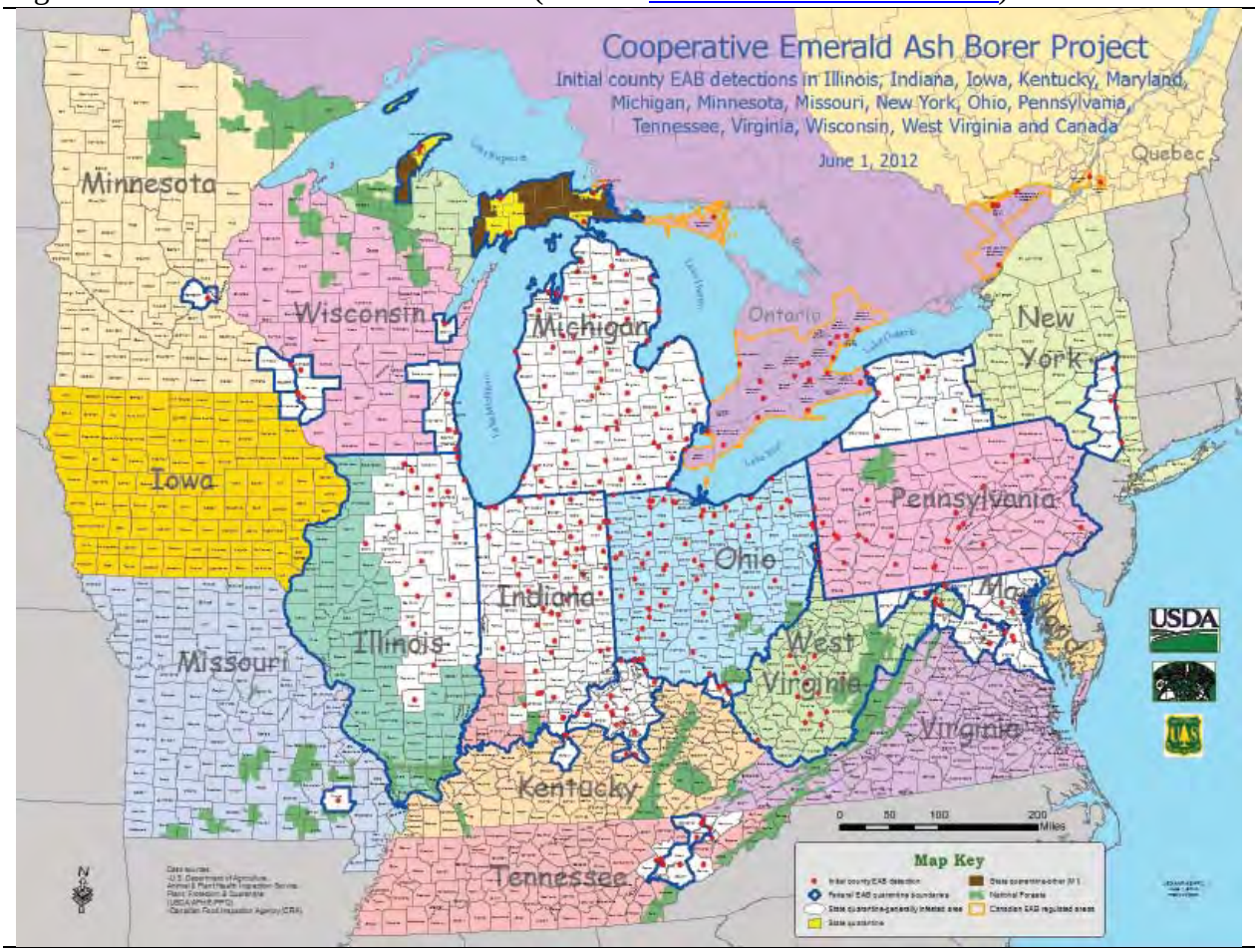

keep low-level populations of the gypsy moth from rapidly increasing and spreading from areas where it is already established. All three of these actions can be used independently or in combination. As a defoliator, the gypsy moth can effectively strip the foliage from a wide variety of trees. Significant defoliation over consecutive years will severely stress trees, and if it continues for multiple years will kill the tree.

**Emerald Ash Borer (EAB)** – The EAB is a beetle native to Asia that was first discovered in the U.S. near Detroit, Michigan, in 2002. The larvae feed on the inner bark of ash trees, causing near 100 percent mortality. More than 20 million ash trees have died so far in Michigan, Ohio, and Indiana (www.emeraldashborer.info). The EAB is present in Michigan, Indiana, Illinois, Minnesota and Wisconsin (figure 17). As of August 2008, it was present in the Corps of Engineer's Wappapello Lake – Greenville Recreation Area in southeast Missouri. More recently, in spring 2009, it was confirmed in the community of Victory, Wisconsin. This community lies in an upland location along the Mississippi River about 20 miles south of La Crosse. Also in 2009, it was found nearby within the Upper Mississippi River floodplain at Blackhawk Park, and in St. Paul and Minneapolis, Minnesota, within a half mile of the Mississippi River. In 2010, EAB was discovered on an island within the Upper Mississippi River National Wildlife and Fish Refuge in Pool 9 of the Mississippi River, about three miles from Blackhawk Park.

Foresters consider the eventual range expansion of EAB throughout this area to be inevitable. It is believed that it is most commonly spread by transporting firewood. State regulatory agencies and the USDA are enforcing quarantines in infested areas with fines to prevent potentially infested ash trees, logs or firewood from moving into new areas. Some areas in the UMRS are dominated by green ash trees so the effects of this insect pest could be devastating. Many areas in the UMRS are already eliminating ash trees from tree planting plans and are trying to diversify as much as they can. A large ongoing effort to mark and monitor trap trees will help aid in early discovery of infestations. Research is being conducted at universities to understand the beetle's life cycle and find ways to detect new infestations, control EAB adults and larvae, and contain the infestation.

Extensive monitoring for EAB was conducted within the upper part of the Pool 9 floodplain in 2009 and 2010. The Minnesota Department of Agriculture, with the cooperation of the USFWS, Corps of Engineers, and Minnesota Department of Natural Resources released a biological control agent (stingless predatory wasps) on the affected USFWS island in Pool 9 in September 2010 in an attempt to control the spread of EAB in that area. In response to recent EAB infestations, the Corps of Engineers and USFWS have implemented firewood restrictions on agency-owned lands within the Upper Mississippi River floodplain.

Figure 17. Emerald Ash Borer locations. (Source: [www.emeraldashborer.info](http://www.emeraldashborer.info))



**Oak Wilt –** Oak wilt infestations have been detected on the UMRS, specifically in areas ranging from pool 12, near Bellevue, Iowa, up river to pool 3 at Red Wing. These infestations have significantly affected red and black oaks. Most of the infected trees have died.

Oak wilt fungus is spread by two methods – overland spread and root graft transmission. Overland spread occurs via insect transmission of the fungus to fresh wounds on oak trees and establishes new infection centers. Fruity-smelling mats of fungal tissue are produced beneath the bark of trees killed by the oak wilt fungus. In the spring of the year, the mats attract nitidulid beetles, which acquire fungal spores in and on their bodies as they feed and walk in the mats. The infested nitidulids are then attracted to fresh wounds on uninfected trees, where the spores from their bodies infect the previously healthy trees. In addition to overland spread, root-graft transmission of the fungus expands the size of infection centers, especially if many oaks are concentrated in an area. Sandy soils, which increase the extent of the root systems, and therefore the number of root grafts, promote root graft transmission of the disease. Oak wilt control in a forest setting is possible if the fungus is detected early. Techniques include cutting infected trees and disposing of bark to control overland spread, or trenching around an infestation with a vibrating plow to sever roots and halt spread between trees through root grafts.

Although not an epidemic at this time, the oak wilt fungus can be locally severe with potential to impact the few black and red oaks that occur at higher elevations along the floodplain. Swamp white, bur, and pin oaks are less susceptible (Urich et al. 2002).

**Dutch Elm Disease –** Dutch elm disease (DED) changed the face of the bottomlands in the 1960's when it effectively eliminated the American elm as a dominant component of the floodplain forest (Urich et al. 2002). The American elm was once a major component of the floodplain forests along the Upper Mississippi River, providing important habitat for migratory songbirds and other wildlife. Currently, it typically only survives in younger age classes before eventually succumbing to the disease.

From the 1970s to the present, more than 100,000 American elm trees were tested for resistance to DED. Although no trees were found to be completely resistant, five exhibited a high tolerance to this disease. These five selections are now being used for a restoration project, which was started in 2003 by the U.S. Forest Service in cooperation with the Corps, USFWS and other agencies. Disease-tolerant elms were planted at five different locations in the UMRS in 2005, and again in 2007. These trees are being protected, measured and monitored with the goal of having them produce seedlings that are DED tolerant. The Bottomland Hardwood Working Group of the Upper Mississippi River Forestry Partnership is very interested in promoting an expansion of the project, including propagation of larger numbers of seedlings for transplanting in more locations. The limiting factor at this point appears to be funding for the Forest Service and/or other researchers to do additional monitoring and testing, increase the number of cultivars, and produce more seedlings. With proper funding, it may be possible to eventually re-establish healthy American elms across the floodplain.

### d. Invasive Plant Species

Infestations of invasive plants, diseases, animals, and insects are fast becoming one of the greatest threats to the earth's biological diversity and human health. Invasive species are defined as species that do not naturally occur in a specific area and whose introduction causes or is likely to cause economic or environmental harm or harm to human health. These exotic species did not evolve with the ecosystem they invade and their introduction usually irreversibly degrades the native ecosystem and may ultimately affect the survival of native species. A number of invasive plant species suppress regeneration in the floodplain forest. They do this by out-competing the native vegetation for water, sunlight, nutrients, and space. While the overall number of invasive plant species is very large and continues to grow, river managers along the UMRS have identified a select number of invasive and/or weedy species of special concern. These include reed canary grass, johnsongrass (*Sorghum halepense*), European buckthorn (*Rhamnus cathartica*), various species of honeysuckle (*Lonicera spp.*), white mulberry (*Morus alba*), black locust (*Robinia pseudoacacia*), garlic mustard (*Alliaria petiolata*), Japanese knotweed (*Polygonum cuspidatum*), oriental bittersweet (*Celastrus orbiculata*), Japanese hops (*Humulus japonicus*), crown vetch (*Coronilla varia*), bur cucumber (*Sicyos angulatus*), and trumpet creeper (*Campsis radicans*).

**Reed canary grass (RCG)** – Reed canary grass is likely the most damaging of all the invasive plant species in the UMRS floodplain forest at this time. This grass can establish itself quickly in floodplain forest openings and along forest edges, often forming dense monocultures. This dense growth can out-compete existing seedlings or even prevent germination of native species, resulting in a gradual loss of bottomland forest and the proliferation of monotypic grassland conditions.

RCG has been reported to be most problematic in the upper reaches of the UMRS through pool 18. Additionally, St Paul District has found that it is most aggressive in the middle reaches of each pool. It is also reported to be a major problem in pool 24 and is at least present throughout the rest of the UMRS.

In recognition of the severity of this management problem, the three UMRS Corps Districts have employed a number of forest restoration measures. These include planting larger root production method (RPM®) trees that already extend above the height of RCG, using tree mats and tubes to reduce root competition and limit damage by voles and other rodents, planting cuttings or bare-root stock where applicable, scarifying sites prior to planting or using natural seed catch, and/or using both pre- and post-emergent herbicides. These techniques have been met with varying degrees of success and are continually being refined.

**Johnsongrass** – Johnsongrass was introduced to the United States from the Mediterranean region in the early 1800s as a forage crop. It is currently present throughout the lower 48 states, and is a major problem in the in the Gulf Coast region. It spreads aggressively in open, disturbed, and cultivated areas, and can displace native vegetation and suppress tree seedling establishment. It is commonly found along river bottoms, riparian areas, and forest edges in the southern portion of the UMRS. Control methods primarily involve treatment with herbicides.

**European buckthorn and bush honeysuckle** – European buckthorn and bush honeysuckle are exotic shrubs that are becoming established in many areas. Their seed provides food for wildlife, including birds, which facilitate their spread. These plants grow in shade or sun and can form dense thickets in the forest understory, which can leave the forest floor underneath them devoid of other plants, thus preventing natural regeneration of desirable species and eventually creating a shrubby monoculture and loss of bottomland forest. These shrubs have been reported to be present in St. Paul, Rock Island and St. Louis Districts. Control methods include pulling, cutting, and herbicides.

**White mulberry** – White mulberry grows in partial shade to full sun and tolerates both extended flooding and droughty conditions. The seeds are spread by wildlife that feed on the mulberry fruits and it expands locally by producing root sprouts. Its negative impacts include hybridization with and replacement of native red mulberry (*Morus rubra*), to which it can also transmit a harmful root disease. White mulberry also competes with other desirable bottomland forest species. It occurs throughout the UMRS and active control measures have not yet been taken.

**Black locust** – Black locust was introduced to areas within the UMRS beginning in the early 1900s to aid in erosion control. It reproduces vigorously by root suckering and stump sprouting to form groves (or clones) of trees interconnected by a common fibrous root system. Physical damage to roots and stems often increases suckering and sprouting, making control difficult. These groves create shaded monocultures with little ground vegetation. Black locust is present throughout the UMRS. However, it is only reported to be a problem within the St. Paul District. Control measures used include cutting followed by herbicide treatment or basal bark treatment of smaller trees with an herbicide.

**Garlic mustard** – Garlic mustard, a biennial herb, poses a significant threat to the native floodplain forest herbaceous layer and the wildlife that depend on it by dominating the forest floor and displacing most native herbaceous species. In addition, it has been found that it disrupts a healthy relationship between hardwood tree seedlings and mycorrhizal soil fungi, with results that can be damaging for a forest. Garlic mustard is present throughout the UMRS. Control measures include fire and herbicides. Biological controls may eventually be available.

**Japanese knotweed** – Japanese knotweed spreads quickly to form dense thickets that exclude native vegetation and greatly alter natural ecosystems. It poses a significant threat to riparian areas, where it can survive severe floods, grow in full shade, and is able to rapidly colonize scoured shores and islands. Once established, populations are extremely persistent. It spreads primarily by vegetative means with the help of its long, stout rhizomes. It is transported to new sites as a contaminant in fill dirt, distributed by water, and carried to a lesser extent by the wind. Escapees from gardens and discarded cuttings are common routes of dispersal from urban areas. Japanese knotweed is present throughout the UMRS, though it is not yet widespread. Control methods include grubbing, mowing, and herbicides.

**Japanese hops, bur cucumber, oriental bittersweet, crown vetch, and trumpet creeper** – Some of these species are more widespread than others, but all are of major concern to managers throughout the UMRS. These weedy and/or invasive vines engulf other vegetation, sometimes

causing mortality. They accomplish this by enveloping plants in so much shade that they rob the plant of the sunlight required for proper photosynthesis. Woody plants such as oriental bittersweet can even reach a tree's crown. Capable of reaching four inches in diameter, oriental bittersweet vines wrap so tightly around their host trees that they can effectively girdle them. Uprooting can also occur, as the trees' root systems are unable to contend with the massive weight of entrenched vines. Trailing invasive vines such as Japanese hops form dense monocultures that overtop and outcompete native vegetation. It readily colonizes canopy gaps and other open areas and can inhibit tree regeneration. Other plants such as crown vetch create a thick mat over the ground and can provide cover for rodents that then girdle trees that have been planted as part of reforestation efforts. For all, control methods include pulling, mowing, and herbicide application.

The plants discussed above are but a handful of the hundreds of invasive species that have already infested and continue to arrive in the UMRS. These plants are thought to currently pose the greatest threat to the UMRS floodplain forests. This list will likely grow in the future and managers must remain vigilant and act quickly as new threats arise.

### e. Herbivory

Herbivory by deer and small mammals poses an additional threat to understory floodplain forest vegetation, and can be particularly problematic for both natural and artificial tree regeneration. Deer browse inhibits the survival and growth of understory vegetation due to the fact that in addition to consuming foliage, deer also commonly eat the terminal and lateral buds of tree seedlings and saplings. In areas that contain high deer population densities, damage to tree plantings can be extensive. Several ongoing deer exclosure studies are attempting to find out just how deer may be impacting the composition and distribution of vegetation in portions of the UMRS, as well as the specific tree planting sites.

Small mammals such as rabbits, voles, and beavers also cause browse damage to natural tree regeneration and artificial tree plantings. For example, rabbits eat the cambial tissue from around the lower stems of seedlings and small saplings and can effectively girdle them. This can be especially problematic in tree planting sites where small trees are interspersed with grasses and/or other ground cover that provides habitat for these animals. Voles and other rodents cause similar problems, and will also consume belowground portions of saplings. Beaver kill even larger trees in the process of foraging and construction of beaver dams.

The use of protective measures such as stem guards, ground mats, fencing, and other types of exclosures can limit browse damage in tree plantings, but options for controlling herbivory in established forest settings are of course very limited. However, managing wildlife populations (e.g., deer numbers) may be effective in some locations.

### f. Climate Change

The potential long-term impacts of climate change on floodplain forests in the Upper Mississippi River System are not well known at this time, but some inferences can be made based on predicted changes to temperature and precipitation patterns in the Upper Mississippi River Basin.

Warmer temperatures, a longer growing season, and increased atmospheric $CO_2$ levels all have the potential to increase productivity in forested ecosystems (Ryan et al. 2008). However, climate change may also affect the frequency of natural disturbances such as fires, floods, insect outbreaks, ice storms, and windstorms (CCSP 2008). Some climate models link projected increases in precipitation over the Upper Mississippi River Basin to increased runoff, but considerable uncertainty remains (Lettenmaier et al. 2008). Increased rates of precipitation and associated runoff could impose a greater degree of water stress on river floodplain ecosystems. In addition, climate change has the potential to affect biodiversity in the UMRS through changes to growing season length, species distributions and phenology, and other components of ecosystem function (Janetos et al. 2008).

**Box 1. Future UMRS Floodplain Forest Changes**

A general summary of some of the changes we might expect to see over the next 50 years, without active forest management, are outlined below (adapted from Urich et al. 2002):

***A reduction in cottonwood and willow***. These are typically pioneer species that become established on newly accreted islands or exposed substrates. They require open sunlight and will not regenerate in the shaded understory of an established forest.

***More open forest canopy***. Much of the current floodplain forest is closed canopy, where trees are spaced close enough together to create a continuous layer of upper tree crowns. As these trees age, die off and fall to the ground, openings will be created. If conditions are not present for regeneration of trees, these canopy gaps may be invaded by herbaceous vegetation (e.g., reed canary grass) and remain in an open condition for many years. Even if conditions are suitable for tree regeneration, maple and ash may continue to dominate.

***Continued loss of forest in the lower parts of pools***. Gradual loss of islands to erosion will also result in less overall forest area and fewer trees.

***Conversion from forest to other vegetation types in mid-pools***. As a result of dam construction and water level control, the water table is higher in islands and shorelines located within the lower and middle portions of each pool. Higher water tables create site conditions that may be less suitable for forest, but better for other species, such as reed canary grass. Thus, the trend may be a gradual replacement of forest species with herbaceous vegetation.

***Fewer mast trees***. Mast trees such as oaks and hickories are generally less tolerant of flooding and saturated soil conditions than other floodplain tree species. They also produce a heavy seed, which is not as widely dispersed as the lighter, wind-carried seed of cottonwood, willow, maple, and ash. These two factors may contribute to a continued reduction of mast within these floodplains.

***Increase in shade tolerant species***. Box elder and mulberry are highly shade tolerant. It is likely that these two species will increase through natural establishment in the understory of existing maple stands with dense canopies. Although there is some habitat value associated with them, box elder and mulberry are generally not considered as desirable as other floodplain tree species.

Scientists working in association with the U.S. Forest Service have accomplished a significant amount of work in mapping the potential response of tree and bird species in the eastern United States to various climate change scenarios (Prasad et al. 2009). Results of these analyses are available via the Climate Change Tree and Bird Atlases, interactive online tools maintained on the Forest Service's website: http://www.nrs.fs.fed.us/atlas/.

Relevant federal initiatives in response to the potential risk to U.S. ecosystems posed by climate change include the U.S. Fish and Wildlife Service's Climate Change Strategic Plan (USFWS 2010) and the U.S. Forest Service's Strategic Framework for Responding to Climate Change (USFS 2008). Both plans emphasize mitigation, adaptation, and advancing efforts to share knowledge and build collaborative partnerships as key strategies to address climate change.

## 2. Wildlife and the UMRS Forest

### a. Birds

**Songbirds and their allies (e.g., woodpeckers, swallows, jays and crows, blackbirds, icterids, hummingbirds, nightjars, and cuckoos) –** One notable feature of the breeding bird community in Upper Mississippi River floodplain forests is the dominance of the community by birds that breed here and winter elsewhere. Resident birds make up only a small portion of the breeding bird community. Two major classes of migrant birds are in the western hemisphere: neotropical and short distance migrants. Neotropical migrants are species whose winter range largely lies south of the U.S.-Mexico border, and short-distance migrants are species whose winter ranges are largely in the southern US but can extend into Mexico and Central America. Many neotropical and short distance migrant birds that use Upper Mississippi River floodplain forests and associated habitats are of management concern nationally, regionally, or for certain Upper Mississippi River States. Resident birds are those that are present all year. One species, the red-headed woodpecker (*Melanerpes erythrocephalus*), is more properly referred to as nomadic. Although they have a breeding range, their winter range and abundances vary from year to year as they follow food resources. Finally, some species do not breed on the Upper Mississippi River but occur here in the winter, such as the snow bunting (*Plectrophenax nivalis*), hoary redpole (*Acanthis hornemanni*), fox sparrow (*Passerella iliaca*), American tree sparrow (*Spizella arborea*), and purple finch (*Carpodacus purpureus*).

During the breeding season, in general, the same suite of birds can occur in what to human eyes might appear to be a wide variety of Upper Mississippi River forest types (Kirsch unpubl. manuscript). The birds one is likely to observe in a large forest patch are almost the same species one is likely to see in a small forest patch on an island, and birds in mature silver maple monocultures do not differ markedly from those occurring in more mixed stands (Kirsch unpubl. manuscript). Rather, the likelihood of observing a particular species is related to overall abundance of that species in the floodplain. However, the forest breeding bird community of the Upper Mississippi River is different from that occurring in upland forests adjacent to the river, particularly in supporting an abundance of 7 woodpecker species, 13 species of secondary cavity nesters, red-shouldered hawks (*Buteo lineatus*) and prothonotary warblers (*Protonotaria citrea*) (both floodplain obligates in this region), American redstarts (*Setophaga ruticilla*), and warbling vireos (*Vireo gilvus*) (Knutson et al. 1996).

In upland forests the effects of forest block size and amount of edge have been demonstrated to affect avian diversity and productivity. However, this has not been clearly demonstrated for riparian areas in the Midwest. It is important to keep in mind that floodplain forests of the UMR, even pre-impoundment, were fragmented and interspersed with aquatic areas, wet meadows, emergent wetlands, and shub carr (primarily sandbar willow). This natural fragmentation and aquatic habitat matrix probably has a great deal to do with the bird community we see on the river today. Effects of block size and edge observed in uplands (which largely are fragmented by agricultural or development) may not hold in a linear, naturally fragmented forest that is interspersed largely with aquatic areas and other somewhat naturally occurring habitat types.

The abundance of cavity nesters indicates the great importance of standing dead wood on the floodplain versus the uplands. The size and abundance of snags, dead trees and live trees with large dead limbs on the UMR floodplains versus the uplands are caused by differences in the types of tree species present, harvest practices, and hydrological regimes. Dead trees are also critical for nesting brown creepers (*Certhia americana*). Brown creepers are usually a northern nesting species in the Midwest (as far south as central Wisconsin), but the availability of dead trees with slip bark, underneath which brown creepers nest, has allowed them to nest on the UMR as far south as Pool 24.

**Raptors (migrating raptors, nesting bald eagles, and red-shouldered hawks) –** Bottomland forests along the UMR support migrating and nesting populations of bald eagles (*Haliaeetus leucocephalus*), ospreys (*Pandion haliaetus*), red-shouldered hawks, and other raptors. During the mid-1990s, raptor migration studies on the bluffs bordering Pool 10 of the UMRS revealed 17 species of raptors, totaling 14,000 to 30,000 individuals passing through the area during the fall season (Mandernack et al. 1997). The UMR is a major migration route and wintering area for bald eagles. Depending on river and ice conditions, large groups of wintering eagles may roost at sites near dams. During the spring migration, approximately 3,000 bald eagles have been tallied on single day counts on Pools 4 through 14, 2007 to 2009. Numbers of breeding bald eagles along the Upper Mississippi River have greatly increased over the past several decades, from 9 nests in 1986 to 250 active nests in 2009 (figure 18) (USFWS 2009a). Although the bald eagle was de-listed from the Endangered Species Act in 2007, it is still protected under the Bald and Golden Eagle Protection Act and the Migratory Bird Treaty Act (USFWS 2007).

The floodplain of the UMR provides habitat for nesting red-shouldered hawks. Nest territories of the floodplain typically are in blocks of mature timber greater than 500 acres in size (nests may be found on the edges of the blocks), include both floodplain and upland slope forest types within the tract, are within 200 yards of ponds or small streams, and are greater than 500 yards from the main channel (Stravers and McKay 1994). These investigators recommended restricting logging in nesting areas, avoiding fragmentation of large forest tracts, allowing some thinning of younger forest stands to assist in development of overhead canopy cover, and combating invasion of reed canary grass that might inhibit growth of cottonwood and silver maple.

The red-shouldered hawk is listed as endangered in Iowa, threatened in Wisconsin, and of special concern in Minnesota. The UMR floodplain contains a considerable amount of forested habitat and is thus important for maintaining red-shouldered hawk populations in these States and providing a corridor for linking the habitats of northern and southern populations. The ecology of

red-shouldered hawks has been studied along the UMR since 1983 and surveys have since been expanded to cover more of the river (USGS 1999).

**Colonial waterbirds –** Great blue herons (*Ardea herodias*), great egrets (*Ardea alba*), and double crested cormorants (*Phalacrocorax auritus*) are the most notable species in this community, and the species we know the most about. Not much is known about how colonial black-crowned night herons (*Nycticorax nycticorax*) and semi-colonial to solitary yellow-crowned night herons (*Nycticorax nycticorax*) and green-backed herons (*Butorides virescens*) use the floodplain forest. However, these three species require trees and shrubs to nest. Cattle egrets (*Bubulcus ibis*) have recently begun nesting in trees on islands in Pool 13.

The Upper Mississippi River is an important nesting and feeding area for great blue herons, double crested cormorants, and great egrets because extensive bottomland forests and diverse aquatic areas provide suitable nesting and foraging habitat. Herons require large mature trees for nesting (Butler 1992, McCrimmon et al. 2001). Silver maple is the dominant component of the Upper Mississippi River floodplain forest and most forest areas have relatively even-aged silver maple stands approaching maturity (Knutson and Klaas 1998; Yin 1999; UMRCC 2002). Other tree species usually co-occur with silver maple, and for herons cottonwood and swamp white oak seem to be important. Herons and egrets nest most frequently in silver maple trees along the Upper Mississippi River above Dubuque. Between Dubuque and Rock Island, they nest most frequently in large cottonwood and swamp white oak trees (Kinkel and Koehring 1992). Herons in a large, notable rookery on Eagle's Nest Island in Pool 26 have been observed to primarily use large cottonwoods for nesting sites.

Figure 18. Annual bald eagle production on the Upper Mississippi River National Wildlife and Fish Refuge, Pools 4-14, 1986 – 2009. (Source: USFWS)

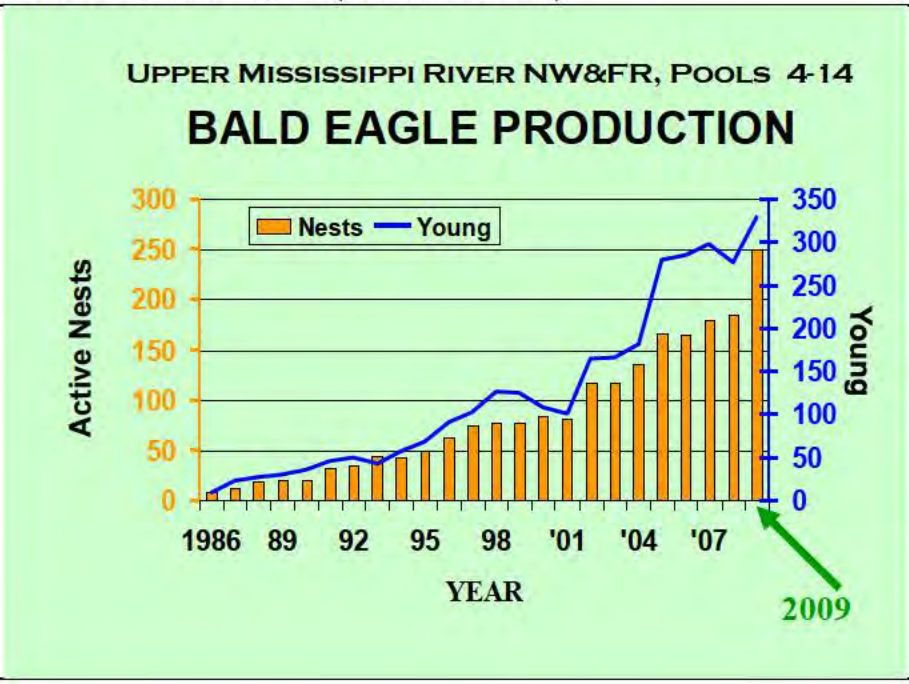
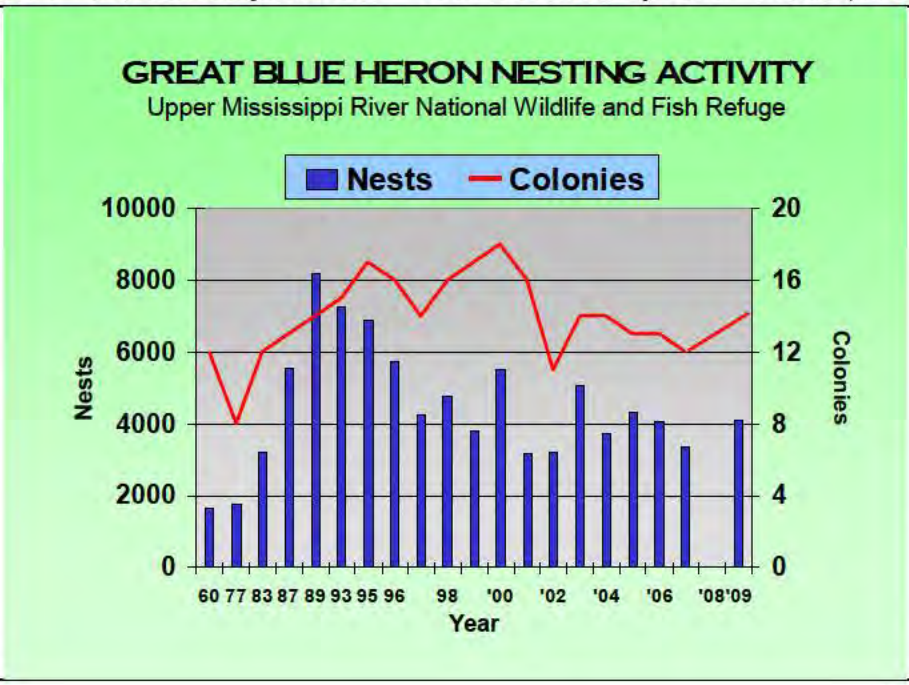


Figure 19. Number of active great blue heron colonies and nests on the Upper Mississippi River NW&FR, Pools 4 – 14, selected years 1960 – 1993 and annually 1995 – 2009. (Source: USFWS)




In general, herons and egrets on the Upper Mississippi River have declined since 1993, but the cause for the decline does not appear to be related to nesting or foraging habitat (Kirsch et al. in review). However, projected losses of large trees and forest habitat in general may limit these species in the future and cause greater declines. The number of active heron nests on the Upper Mississippi River NW&FR (Pools 4 through 14) increased between 1970 and 1990, peaking above 8,000 in 1989. Since the late 1990s, the number of heron nests has stabilized to between 3,000 and 5,000 (figure 19) (USFWS 2009b).

**Waterfowl –** Waterfowl are likely the most visible and certainly the most economically important group of bird species on the river system. Large numbers of diving and dabbling ducks migrate through the system, and some species are common nesters (e.g., mallard (*Anas platyrhynchos*), wood duck (*Aix sponsa*), hooded merganser (*Lophodytes cucullatus*), and Canada geese (*Branta canadensis*)) (USACE 2004). Nearly 60 percent of waterfowl hunting in the U.S. occurs in USFWS management areas that border the Mississippi Flyway (USGS 1999). Although waterfowl remain abundant, their numbers have declined since the 1950s, due primarily to habitat alteration, habitat loss, and pollution. These declines have been most evident on the Illinois River (USACE 2004).

Two species of forest nesting waterfowl can be found on the Upper Mississippi River – the wood duck and hooded merganser. Both of these species nest in large cavities in trees over or near water. Wood ducks are omnivorous but a large part of their diet consists of acorns, seeds and berries. Hooded mergansers are primarily piscivorous, supplementing their diet with crustaceans and aquatic insects. During fall staging and migration mallard and blue winged teal (*Anas discors*) can be found in small wetlands surrounded by floodplain forests.

**Terrestrial game birds –** Game birds that occur on the floodplain include the mourning dove (*Zenaida macroura*), ruffed grouse (*Bonasa umbellus*), wild turkey (*Meleagris gallopavo*), ring-necked pheasant (*Phasianus colchicus*), and in rare instances bobwhite quail (*Colinus virginianus*). Wild turkey, ruffed grouse, ring-necked pheasants and bobwhite quail are ground nesters and require a good amount of heavy ground cover for nest concealment. Wild turkeys are notably tied to forest habitat because acorns are a preferred food source and they roost in trees at night. Pheasants and bobwhites are probably not of concern for forest management because they typically do not occur in forest, although they can use forest edge and shrub habitat for shelter. Furthermore, only the mourning dove is fairly common in floodplain forests and all of these species are far more common in upland habitats than floodplains.

### b. Mammals

Historically, American Indians and European trappers capitalized on the diverse and abundant assemblage of terrestrial and aquatic furbearing mammals that inhabit the UMRS. They found a seemingly endless food supply consisting of large mammals such as elk (*Cervus canadensis*), bison (*Bison bison*), and white-tailed deer (*Odocoileus virginianus*) and small mammals such as squirrels (*Sciurus* spp.), raccoon (*Procyon lotor*), muskrat (*Ondatra zibethicus*), and beaver (*Castor canadensis*). European exploitation eventually led to the extirpation of the elk and bison; however, most of the remaining mammals have continued to thrive in and along the river (USACE 2004).

Terrestrial mammals such as the white-tailed deer, red fox (*Vulpes vulpes*), gray fox (*Urocyon cinereoargenteus*), coyote (*Canis latrans*), squirrels, raccoon, and opossum (*Didelphis virginiana*) are found in abundance, primarily inhabiting the river's floodplain and islands. Bobcat (*Lynx rufus*) and black bear (*Ursus americanus*) are occasionally observed in the upper reaches of the Upper Mississippi River, primarily above Pool 11. Aquatic mammals, such as the river otter (*Lontra canadensis*), beaver, and muskrat, are commonly observed along the riverbanks and/or backwaters. A few species of bats rely on cavities in the floodplain forests for shelter and the flying insects that are produced in and along the river for food.

Overall, mammal populations within the river corridor are considered abundant and healthy. However, there are relatively few sources from which to draw upon for a comprehensive systemic assessment. Dahlgren (1990) provides an assessment of trends in furbearer harvest within the Upper Mississippi River NW&FR and States along the corridor between 1940 and 1990. In general, most aquatic mammal populations showed a measurable increase in abundance following the creation of slackwater pools. Some declines noted in the early to late 1960s for mink (*Neovison vison*) and river otter were linked to polychlorinated biphenyl (PCB) contamination of fish, their primary food source. River otter numbers have increased since 2000, as reported by refuge trappers and State furbearer biologists. The number of muskrat harvested off the refuge has been fairly constant, while beaver harvest has declined in the past 10 years.

### c. Reptiles and Amphibians

The eastern massasauga (*Sistrurus catenatus catenatus*) is a reptile species closely tied to floodplain forests. This snake occurs in wetland complexes containing floodplain forest,

emergent wetlands and wet meadows, and has been documented at Trempealeau NWR (Pool 6), Nelson-Trevino Research Natural Area and adjacent Tiffany Bottoms State Wildlife Area in Wisconsin (Pool 4), and the Black River Bottoms of Pool 7. Massasaugas hibernate below ground in tree root balls, crayfish burrows, and small mammal holes. The interspersion of different floodplain habitat types may be important because primary prey are small mammals (e.g., voles, deer mice, meadow jumping mice, and shrews) that can occur in these habitats, and these snakes tend to have relatively large home ranges (1 to 25 hectares). However, eastern massasaugas prefer areas with large woody debris, high leaf cover and high herbaceous cover for concealment from predators (King et al. 2004).

A study documenting the amphibian use of the floodplain on the Upper Mississippi River was conducted by the USGS UMESC, in conjunction with the Amphibian Research and Monitoring Initiative (ARMI). This study documented ten species of frogs, one species of toad, and two species of salamanders in the Upper Mississippi River floodplain. These observed species of amphibians breed in wetlands among all habitat types in the floodplain, but most of the breeding sites studied were within the wet forest land cover type. In general, small, closed-canopy sites with less emergent vegetation and primary productivity are probably less productive for amphibians than more open canopy, often larger, wetlands.

It is challenging to think about how the Upper Mississippi River and its component habitat types support amphibian populations for their entire life cycle. Clearly, floodplain forest and other land cover types, in combination with wetlands, constitute the critical matrix that supports amphibian diversity in the floodplain. But how amphibians use forests and other habitats during the nonbreeding season is not well known.

Additional studies in other parts of the UMRS are ongoing. For example, the Illinois Natural History Survey maintains an amphibian and reptile collection and associated database, with species distributions throughout Illinois mapped by county.

### d. Fish

Terrestrial floodplain vegetation communities provide an important source of energy for aquatic food webs throughout the UMRS. This occurs both in the form of direct allochthonous inputs from riparian vegetation as well as inputs derived from groundcover and plant litter during inundation events. Floodplains are also important spawning grounds during seasonal spring floods for many fish species. In addition, floodplain forests provide important contributions to fish habitat in the form of large woody debris inputs to side channels, backwaters, and other aquatic zones near forested riparian areas.

A recent planning document published by the Fishers and Farmers Partnership Program (Steingraeber et al. 2009) included assessments of aquatic biodiversity, imperiled, and non-native fish species throughout the UMR Basin summarized by 8-digit hydrologic unit. The report raised the possibility that a longitudinal decline in species richness in the central portion of the UMR could be linked to a loss of seasonal floodplain habitat in that region.

### e. Federally Listed Threatened and Endangered Species

Comprehensive lists of Federal and State listed threatened and endangered species can be accessed from the U.S. Fish and Wildlife Service's website: www.fws.gov/endangered. These lists are even available at the county level. Several federally listed threatened and endangered species occur in conjunction with terrestrial habitats in the UMRS, including the decurrent false aster (*Boltonia decurrens*), interior least tern (*Sterna antillarum),* and Indiana bat (*Myotis sodalist).*

**Decurrent false aster** – The decurrent false aster is a federally listed, threatened floodplain species that occurs along a 400-kilometer (km) section of the lower Illinois River and nearby parts of the Mississippi River. It is an early successional species that occupies disturbed alluvial soils in the floodplains of these rivers and requires either natural or human disturbance to create and maintain suitable habitat. Its natural habitat was wet prairies, shallow marshes, and shorelines. In the past, the seasonal flood pulse of the Illinois River provided the open, high-light habitat required by this species and reduced competition by killing other less flood-tolerant early successional species. No critical habitat is listed for this species. Field observations indicate that in areas without disturbance, the species is eliminated by competition within 3 to 5 years.

**Interior least tern –** The interior least tern is a federally listed, endangered breeding migratory bird species that occurs in the Missouri River, Arkansas River, Mississippi River, Ohio River, Red River, and Rio Grande River systems. On the Mississippi River the least tern is most abundant on the Lower Mississippi River below Cairo, but is known to occur between St. Louis and the mouth of the Ohio River. In addition, the St. Louis District recently constructed a least tern nesting island in Pool 26 just above Melvin Price Locks and Dam that is showing promise as a nesting site. The wintering area of the interior least tern is unknown, but is believed to be in Central and/or South America (USFWS 1990). No critical habitat is listed for this species.

**Indiana bat –** The Indiana bat is an endangered species that has been found in 27 states throughout much of the eastern United States. Indiana bats are associated with the major cavernous limestone (karst) regions of the midwestern and eastern United States. They winter in caves or mines that satisfy their highly specific needs for cold, but not freezing, temperatures during hibernation. The fact that Indiana bats congregate in only a small percentage of known caves suggests that very few caves meet their requirements. Exclusion of Indiana bats from hibernacula by blockage of entrances, gates that do not allow for bat flight or proper air flow, and human disturbance of hibernating bats have been major documented causes of Indiana bat declines.

# IV. Management

The 2004 UMR-IWW Feasibility Study specifically includes the adoption of an adaptive management approach to both navigation improvements and ecosystem restoration (USACE 2004) and notes that:

> *Adaptive management identifies uncertainties, and then establishes methodologies to test hypotheses concerning those uncertainties. It uses management actions as tools to not only change the system, but as tools to learn about the system.*

Forest management is currently an authorized activity within the Corps of Engineers Civil Works Program and will remain an ongoing activity with implementation of NESP or other authorized programs. Partners have agreed to include incorporation of the adaptive approach to forest management and restoration as a variety of uncertainties exist regarding the long-term trajectory of the forest resource. These uncertainties arise from the competing and compounding effects of such drivers and stressors as altered hydrology, increased sedimentation, and invasive species.

The NESP Science Panel strongly endorsed adaptive management to advance learning and improve future ecosystem restoration on the Upper Mississippi River. According to the Science Panel Adaptive Management report (Barko et al. 2006):

> *Restoration projects can become learning opportunities by incorporating an experimental technique or technology, being part of a larger experimental design, and by incorporating effective monitoring. Exploiting these learning opportunities will result in fundamental knowledge gains, improved design criteria for future projects, and in widely adopted management innovations.*

One of the main benefits of adaptive management is the development of an iterative and flexible approach to management and decision-making. This iterative approach emphasizes the fact that management actions can be viewed as experimental manipulations of the system of interest. The results of the management actions can then be monitored and future management decisions can be informed by the outcomes of previous decisions. Another important benefit of adaptive management lies in the opportunity for scientists and managers to collaborate in the design of innovative solutions to the challenges of managing complex and incompletely understood ecosystems. Alternative management actions can be stated as hypotheses and addressed from the framework of experimental design. The outcomes of management alternatives and the values of such outcomes can be estimated in relation to management goals and objectives. The adaptive management approach recognizes that uncertainty is unavoidable in managing large-scale ecosystems. Importantly, uncertainty can be analyzed to identify key gaps in information and understanding. The results of such analyses can be used to efficiently allocate limited management resources to new research or monitoring programs (USACE 2004).

## A. Adaptive Management Framework

*Adaptive management is a process that promotes flexible decision-making that can be adjusted as outcomes from management actions and other events become better understood* (Williams et

al. 2007). The NESP Science Panel states that a system-based approach for UMRS restoration encompasses project-based planning and management and effective science within an adaptive management conceptual framework (Galat et al. 2007). A conceptual framework of adaptive ecosystem management for large river floodplain restoration is shown in figure 20 (Galat et al. 2007). The three loops of the figure represent scientific research (inner loop); bottom-up, project-based adaptive management (middle loop); and a top-down, system-wide approach (outer loop). Scientific hypotheses developed and tested in the inner loop can be transformed to knowledge for better project development in the middle loop and potential systemic forecasting on the outer loop. Alternatively, system-wide goals and objectives proposed in the outer loop can be translated into project design criteria in the middle loop and tested using the scientific approach outlined within the inner loop. (Galat et al. 2007)

Steps that are generic to many models of adaptive management include (1) Problem Definition, (2) Design, (3) Implementation, (4) Monitoring, (5) Evaluation, and (6) Adjustment. These steps provide an action sequence that is applicable at both the individual project scale and the program scale. They can assist interagency coordination groups and nongovernment stakeholders in developing their respective or collective management plans to optimize learning opportunities during plan or program implementation.

Figure 20. A conceptual framework of adaptive ecosystem management for large floodplain river restoration. (Source: Galat et al. 2007)

**Problem definition –** In the adaptive management process, problem definition documents baseline knowledge and provides the necessary justification for appropriately focusing and marshalling resources to address the issue of concern. As noted previously, the forest resources and associated terrestrial vegetation or landcover classes on the Upper Mississippi have declined in value over time. The future forecast condition, while uncertain, is assumed to be less than desirable and a number of factors are suspected to be responsible, some of which are within the scope of existing agency authorities to address. This assumption is based on historic changes in landcover classes over time and managers' observations of change at the site scale.

**Design –** The design step is a key point in the planning process that sets measurable goals and objectives, and provides implementation guidelines for projects under consideration. It may also provide for the development of models that document partners' understanding of the system in question. Modeling also informs development of forecasts and hypotheses about the system, actions or projects to test those hypotheses, and appropriate monitoring to evaluate the accuracy of forecasts and model assumptions. Adaptive management's emphasis on learning requires that monitoring efforts be designed to support decision-making.

**Implementation –** Although authority for management of much of the forest resource under consideration is retained by the Corps, implementation of forest management has been an ongoing collaborative effort directed at habitat improvement over the last several decades. Implementation of specific NESP projects should closely follow the implementation guidelines set forth in the design phase. Effective communication is necessary to ensure these collaborative efforts remain consistent with stated project goals, objectives and guidelines, because implementation often requires the cooperation of multiple agencies and/or stakeholders. Any alterations in the scope of projects that take effect during the implementation phase should be appropriately documented so that subsequent phases of the adaptive management process (i.e., monitoring) can be adjusted accordingly.

**Monitoring –** Monitoring is an integral component in the adaptive management process. In the monitoring stage, questions, indicators, and hypotheses are studied to determine the effectiveness of management actions in meeting the specific objectives of the project under consideration. Effective monitoring programs will also improve understanding of the driving factors influencing floodplain habitats. Monitoring coupled with research and use of models will help answer these key questions as well as assist in identifying gaps in knowledge. See section IV.D for more discussion and detailed information regarding specific UMRS forest resource monitoring programs currently in effect and/or under consideration.

**Evaluation –** As suggested by the Science Panel, evaluation should be a thorough performance review and comparison to forecasts at both the program and project scales. For example, the initial development of an indicator selection framework and draft indicator list by the first Science Panel resulted in the selection of mast trees as an indicator and the suggestion that the indicator metric of measurement would be percentage of mast trees present in aggregate landcover classes (Barko et al. 2006). The periodic change (e.g., positive, neutral, or negative) would become part of a proposed ecosystem restoration report card. Subsequent evaluations of forestry program success and lessons learned could be sought from an array of extant Upper Mississippi River coordination groups, as well as the newly proposed River Council.

**Adjustment** – Even if results are as desired or expected, new knowledge gained may redefine problem statements, hypotheses, or alternative practices leading to continuous improvement and efficiencies. This point may be the most contentious in an adaptive management process under NESP, as equitable geopolitical distribution of program resources may periodically need to be set aside in pursuit of answers to systemic problems. Additionally, at times the appropriate parties may not be fully engaged to implement program changes suggested by the learning process. Under current authorities, funding levels, and stakeholder involvement, it is anticipated that the annual Forestry Coordination Meetings will provide a functional venue for program direction and adjustment as necessary.

## B. Floodplain Forest Restoration Tools

The following section describes a number of common forest management tools available for restoration practices in UMRS floodplain forests. It includes general descriptions of harvesting methods; forest establishment methods, including specific tree planting techniques; and other considerations that often must go into restoration planning efforts such as site preparation, prescribed burning, and water level management. It also contains references to more detailed sources of silvicultural information and bottomland hardwood management guidelines.

### 1. Harvesting Methods

**Group Selection Method –** The group-selection harvest method is intended to mimic small openings in the canopy and regenerate small groups of trees within a stand. Species of intermediate shade tolerance are best regenerated under these conditions. The size of the openings is typically 1.5 to 2 times the height of the tallest tree (Smith 1986). The group selection method could be implemented in a few areas, with follow-up monitoring, to determine if this may be an effective method of regeneration for uncommon and hard-to-regenerate species such as oaks, hickories, sycamore, hackberry, and Kentucky coffeetree. For example, it has been noted that canopy openings created by tree mortality following the flood of 1993 have been colonized by intermediate intolerant tree species like silver maple, hackberry, elm, and to a lesser extent, sycamore (Urich et al. 2002). The group selection method may be an effective tool for increasing structural and compositional diversity in monotypic stands heavily dominated by over-mature silver maple. Inter-planting desirable and/or under-represented tree species (e.g., oaks) within small group selection harvests may be a viable option for increasing the diversity of forest stands.

**Shelterwood Harvest Method –** The shelterwood method allows for the establishment of forest regeneration in partial shade before the entire canopy is removed (Smith 1986). Part of the canopy is removed initially, the residual stand of trees is left as a shelter for regeneration, and then the remaining canopy is removed when regeneration is established. This method produces an even-aged forest stand. The advantage over full removal of the canopy (i.e., clearcutting) is that in clearcutting, annual and perennial herbaceous and grass species can shade out tree regeneration. It is possible that the partial shade created by the shelterwood method will eliminate much of the herbaceous competition that requires direct sunlight, thus giving regenerating trees a better chance for survival. Several variations of this method may be applicable to the Upper Mississippi River's forests, and could be tested. For example, it may

have advantages in areas where reed canary grass is predominant. A variation that may be readily adapted for present conditions is the "one-cut shelterwood" or "overstory removal" method. The entire canopy could be removed in one cutting if advance regeneration already existed under the canopy. These conditions may exist in areas where there was heavy thinning in the past, accomplished under a selective cutting forest management plan. These types of conditions may also be common in areas hard hit by the 1993 flood (Urich et al. 2002).

**Seed Tree Method –** The seed tree harvest method consists of removing most mature timber in one cutting except for a small number of seed trees left singly or in small groups. The remaining trees provide a source of tree seed to quickly regenerate the site, but do not create a significant shading condition that certain sun-loving species will not tolerate. This method also results in an even-aged forest stand and is likely to be most applicable when attempting to naturally regenerate light seeded species such as cottonwood (Urich et al. 2002). However, it may not be feasible if conditions favor invasion by reed canary grass or other groundcover species that may inhibit tree regeneration.

### 2. Site Preparation

The primary purpose of site preparation is to create optimal growing conditions for tree regeneration. The type and extent of site preparation is determined by the site itself and the regeneration methods planned. Preparing a site for bottomland hardwood regeneration can be relatively easy or rather complex. On some sites, sufficient soil scarification or other processes may have eliminated enough competing vegetation that no further site preparation is necessary. On sites where a thick litter layer or existing vegetation is present, disking or plowing may be necessary to expose mineral soil. Many abandoned agricultural fields have some degree of soil compaction that may need to be addressed by disking prior to planting. Herbicides or prescribed burning can also be effective tools for controlling competing vegetation in bottomland hardwood stands. Forestry mulchers have been used successfully to establish reforestation lanes in some bottomland sites, especially where reed canary grass is present. These lanes can then be planted or direct seeded, alone or in combination with natural seed fall. Hydrological restoration may be required where drainage ditches, field tiling, and other water control structures are present.

### 3. Forest Establishment

**Natural regeneration** – As a highly cost-effective measure, natural regeneration should be used whenever possible in reforestation or forest restoration projects. Although it is generally understood that natural regeneration will not be effective for re-establishing mast producing species in the UMRS except perhaps in limited situations, it may be quite effective for a variety of other floodplain tree species whose populations appear to be self-perpetuating. For example, it may be particularly effective when immediate colonization of abandoned agricultural land by light seeded species such as cottonwood is desirable.

**Tree Planting –** Hard mast trees such as oaks and hickories are much less abundant on the river than in the past, and they are not regenerating successfully. Efforts to restore mast trees are therefore likely to rely on tree plantings in the short term or until such time as these species are documented to be self-sustaining in the UMRS floodplain at acceptable levels. However, many

past tree plantings in the UMRS have been characterized by low survival rates which have limited their overall effectiveness as well as driven up associated costs. In all tree planting projects, viable stock should have a local seed source (within about 100 miles) that has been collected from the Upper Mississippi River bottomlands or areas with similar moisture regimes (Urich et al. 2002). Every effort should be made to use existing Geographic Information System (GIS) resources and HGM analyses to plant different species of trees in the areas most suited to their preferred microhabitats (elevation, soil type, etc.). Tree planting efforts may often be coupled with, or components of, larger scale habitat restoration projects, such as elevation modifications using dredged material from side channel improvements or navigation channel maintenance. Decisions on what type of planting methods to use (direct seeding, bare root seedlings, RPM trees, etc.) should be cost-effective over the long term and incorporated into an adaptive management-based monitoring program whenever possible.

**a. Containerized and RPM® Seedlings** – Containerized seedlings range in size from small seedlings to large saplings in pots or bags. They tend to have more extensive root systems and high survival rates due to their ability to capture nutrients and water. Recent advances have been made in improving the stock of containerized seedling trees, particularly with regard to root-prune methodologies (RPM®). Larger and faster growing stock has a better chance of survival against herbaceous competition and flooding. These root-pruned trees also produce seed at a considerably earlier age, sometimes within 5 years of planting. The use of tree tubes, tree mats, and other protective measures can further increase survival in areas where herbivory and competition from weedy ground cover are problems.

**b. Bare Root Seedlings** – Bare root seedlings are much less expensive and are easier to transport than containerized seedlings. They are removed from the planting bed they were grown in by a process known as "lifting," which involves cutting the tap root 6 to 12 inches below the soil surface and loosening the soil surrounding the roots. Bare root seedlings and can survive and grow well on sites that are not overly prone to flooding or drought. They must be planted during the dormant season, which may be the preferred time to access bottomland sites in the UMRS.

**c. Direct Seeding** – Direct seeding is relatively inexpensive and may be used in conjunction with tree planting and/or natural regeneration to achieve broad regeneration goals. The planting window is also much wider, allowing for more flexibility in scheduling site preparation and planting operations. However, direct seeding is largely restricted to large-seeded species such as oak, hickory, sycamore, and pecan, and there is a development period before measureable growth occurs. Direct seeding can be accomplished by hand or with a planting machine. Broadcast or aerial seeding is also an option for covering large areas.

Detailed technical information regarding specific tree planting techniques relevant to the UMRS can be found from a variety of sources such as the U.S. Forest Service Southern Research Station's published document, "A Guide to Bottomland Hardwood Restoration" (Allen et al., 2001). As an additional consideration, planting or allowing for the natural regeneration of fast-growing tree species (e.g., cottonwood) in conjunction with mast-producing species has been shown to encourage rapid avian colonization in the Lower Mississippi Alluvial Valley, and may therefore be preferred over monotypic plantings of oaks (Twedt and Portwood 1997; Wilson and Twedt 2005).

## 4. Additional Forest Management Options

**Timber Stand Improvement (TSI)** – Timber stand improvements may be an effective management technique for increasing the compositional and structural diversity, as well as the health and vigor of UMRS floodplain forests. When coupled with small selective cuts to open areas for less-shade tolerant species tree species, it could improve tree regeneration and increase the diversity of age classes. However, in some areas it could facilitate invasion by non-natives such as reed canary grass.

**Prescribed Burning –** Generally, fire is detrimental to most bottomland forest tree species due to their thin bark. Most oak species, however, do have suppressed buds and can sprout following fire. Fire could potentially be used to suppress more aggressive bottomland species, such as silver maple, in areas where oak and hickory species are present and have the potential to regenerate. A few sites have been tested in Lake Odessa, Pool 17. These areas will continue to be monitored for regeneration of oak and hickory species, and new potential sites could be identified and evaluated for possible prescribed burning (Urich et al. 2002).

**Elevation Modification** – The sedimentation that often occurs during floods can lead to gradual improvement of site conditions on bottomlands for forest growth. The accumulation of soil and organic material can increase elevation and cause a transition to less saturated soil conditions. Silts and clays may be deposited over sand, resulting in better soils for the germination and survival of forest species. Consideration should be given to the direct placement of sand and fine materials on low-lying islands and other areas from dredging or other alternate sources. Follow-up monitoring and additional management actions may also be required to ensure an effective vegetative response or to make additional changes such as planting of seedlings (Urich et al. 2002). The use of fine-scale LIDAR elevation data and detailed hydrogeomorphic models (HGM) is also recommended when planning elevation modifications.

**Water Level Management –** The concept of using drawdowns to temporarily reduce pool levels on the Upper Mississippi River to encourage growth of aquatic vegetation may also prove to be beneficial for promoting natural regeneration of floodplain forest species. Additional attention should be focused in this area and applied where possible (Urich et al. 2002).

## 5. Bottomland Forest Management Guides

**U.S. Forest Service North Central Region Bottomland Hardwood Forest Management Guide** – The bottomland hardwoods of the Lower Mississippi Alluvial Valley have received a great deal of attention over the past 100 years, and U.S. Forest Service publications dating back almost as far present early growth and yield information, planting recommendations, and management approaches. However, much less attention was given to the bottomland hardwood forests of the North Central States, and the U.S. Forest Service *Manager's Handbook for Elm-Ash-Cottonwood in the North Central States* was not published until 1984. This handbook was the first attempt at providing a comprehensive overview of the silvicultural techniques used to manage hardwood tree species growing on moist sites in the Lake States for timber production.

To provide a guide for managing bottomland hardwoods with multiple objectives in mind, a new guide was recently developed by a multidisciplinary team of public and private forestry professionals, researchers, and practitioners. The new Bottomland Hardwood Management Guide brings up-to-date information from many disciplines to address a wider range of management issues, and is available online from the U.S. Forest Service Northern Research Station at: http://nrs.fs.fed.us/fmg/nfmg/bl_hardwood/index.html.

**Forestry Best Management Practices** – Many states in the Upper Mississippi River basin have published forestry best management practices, which provide technical guidelines for implementing forestry practices while protecting forest, soil and water resources. These voluntary guidelines are directly applicable to the sustainable management of riparian and floodplain forests, and are geared towards private as well as public land owners and managers. Links to published forestry best management practices for the five UMRS States are listed below:

- Illinois (IDNR 2000): http://web.extension.illinois.edu/forestry/publications/index.html
- Iowa (IDNR 2004): http://www.iowadnr.gov/Environment/Forestry.aspx
- Minnesota (MFRC 2005): http://www.frc.state.mn.us/initiatives_sitelevel_management.html
- Missouri (MDC 2005): http://mdc4.mdc.mo.gov/Documents/441.pdf
- Wisconsin (WDNR 2010): http://dnr.wi.gov/topic/ForestManagement/

## C. Management Programs

A wide variety of land management programs are available in the UMRS. The following summary is adapted from the Middle Mississippi River Regional Plan. Further detail regarding specific programs, with reference to the appropriate management agencies, can be found in the Middle Mississippi River Regional Plan (available online at: http://www.swircd.org/mmrp/).

**Conservation Easement Programs –** One method of protecting valuable habitat is through the use of conservation easements on lands that private owners wish to protect. Conservation easements are agreements that set restrictions of varying levels on lands to protect their associated resources. They can restrict types of land use or even development. Easements are often in perpetuity but can often be effectual for only a limited period of time. Numerous types can be obtained through several agencies. Each easement type has unique attributes making it easier to find one that suits the landowners' interests and needs.

**Grant & Cost Share Programs –** Numerous grant and cost share programs are available for both agencies and private landowners. Agencies can use these programs to help fund their restoration projects. Landowners can also use these programs to help fund their own private restoration efforts if they choose to do so.

**Land Acquisition Programs** – Programs for land acquisition enable lands to be put into public ownership. Local, regional, and national land trusts and other private and/or nongovernmental organizations often play an important role in the acquisition of lands from private ownership and their transition to public ownership. Any land acquisition would be from willing sellers only.

**Technical Assistance Programs** – Many agencies and organizations have technical assistance programs that are applicable to public and private lands assistance. These programs allow agency personnel with technical knowledge to assist private landowners with natural resource questions, issues, or problems they may have on their property.

**Education Programs** – Education is likely to be an important element of success in attaining the goals of the Upper Mississippi River Systemic Forest Stewardship Plan. It is necessary to help the public understand what the regional issues are, and why this work is so important. The public is an integral part in working toward the completion of these goals.

**Land Banking Initiatives –** Private individuals have several options to benefit economically from the preservation of their land. Although the following summary includes some specific examples, it is not meant to be all inclusive. In addition, programs that support some of these types of initiatives are still under development at this time (e.g., carbon and nitrogen banks).

- Wetland Mitigation Banks – A wetland mitigation bank is a wetland, stream, or other aquatic resource area that has been restored, established, enhanced, or (in certain circumstances) preserved for the purpose of providing compensation for unavoidable impacts to aquatic resources permitted under Section 404 or a similar State or local wetland regulation. A mitigation bank may be created when a government agency, corporation, nonprofit organization, or other entity undertakes these activities under a formal agreement with a regulatory agency (such as the Environmental Protection Agency). Private landowners can convert their lands to a mitigation bank and then sell the rights to the land to an entity needing to compensate for their impacts to aquatic resources.

- Carbon Banks – The Illinois Conservation and Climate Initiative (ICCI) is a joint project of the State of Illinois, the Association of Illinois Soil and Water Conservation Districts, and the Delta Institute that allows farmers and landowners to earn greenhouse gas emissions credits when they use conservation tillage, plant grasses and trees, or capture methane with manure digesters. These practices keep carbon out of the atmosphere while providing other environmental benefits such as the creation of wildlife habitat and reduced runoff from fields.

  The Chicago Climate Exchange (CCX®) allows greenhouse gas benefits from conservation practices to be quantified, credited and sold. The credits are aggregated, or pooled, from many different producers and landowners by the Delta Institute, which is a nonprofit organization that is partnering with the State on ICCI. Credits are sold on the Chicago Climate Exchange trading platform to CCX® members that have made voluntary commitments to reduce their greenhouse gas contributions.

  Enrollment in ICCI is similar to other conservation programs, such as the Conservation Reserve Program (CRP), Conservation Stewardship Program (CSP) and Conservation Reserve Enhancement Program (CREP), and requires some of the same forms. Landowners can enroll by contacting the Delta Institute or their local Soil and Water Conservation District office.

- Nutrient Banks – Nutrient banks could be the operated under the same concept as a carbon bank program. An example of a project exploring the feasibility of this type of initiative can be found in a water quality trading program under research and development by the Wetlands Initiative (wetlands-initiative.org).

## D. Monitoring

### 1. Key Questions

**Why do the monitoring?** – Monitoring is an integral component of the adaptive management process. In the monitoring stage, key questions and indicators are studied to determine the effectiveness of specific management actions and to improve understanding of the driving factors influencing the habitat. These should be the "need to know" questions to steer management, not the "nice to know" questions. Monitoring coupled with research and use of models helps answer these key questions and assist in identifying gaps in knowledge.

Following are some of these key questions:

- What level of diversity of forest structure, age, and species is needed for a sustainable forest and what are the appropriate management actions?
- What are the physical drivers on tree survival, stand dynamics, and habitat potential? How do these drivers like flooding, water table depth, sedimentation, and/or geomorphology interact to enable different habitats?
- What are the scale and impact of invasive species and appropriate control measures?
- What is the relationship between patch size and wildlife usage and is there an appropriate minimum size?

**What monitoring is needed? –** Multiple types of monitoring are needed to help answer these questions and steer management, including a combination of baseline, status and trends, implementation, effectiveness, validation, and compliance monitoring as described in Table 9 below. The geographic scale of monitoring is also a consideration. Local scale monitoring necessitates finer detail and resolution. System-wide monitoring requires coarser data collection than the local scale. Otherwise, the data collection process would quickly become too costly and too cumbersome to analyze. Table 10 describes these different levels of monitoring.

**What monitoring techniques are available? –** Many of the monitoring techniques needed for adaptive management already are in use. For example, land use and land cover data collected by the EMP-LTRMP and served by USGS UMESC and forest inventory data collected by the Corps of Engineers and USFWS provide good examples of baseline monitoring. The Corps also uses site visits, photo points, regeneration surveys, plant surveys, tree survival monitoring, and some wildlife surveys on selected forest management sites. The USFWS along with many State agencies complete key wildlife monitoring to include waterfowl, shorebirds, eagles, neo-tropical migratory birds, colonial nesting birds, and other surveys. The U.S. Forest Service completes forest pest monitoring on the gypsy moth and emerald ash borer. State and Federal agencies also collect disparate information on invasive species like reed canary grass. The Corps and others are collecting longer-term forest and reference site data using permanently marked forestry plots.

Table 9. Monitoring categories applicable to the UMRS. (Source: Barko et al. 2006)

| Category | Scale of Monitoring[1] | Purpose |
|---|---|---|
| Baseline monitoring | L, P, R, S | Characterize existing conditions, including natural variability; establish a database for planning or future comparisons; use as a reference of either existing or undisturbed conditions. |
| Status & trend monitoring | P, R, S | Evaluate state of system over time, with emphasis on "trends". Key issue is change of conditions over time. May or may not be related to specific project or question. |
| Implementation monitoring | L | Evaluate whether the restoration practices were carried out as planned. Includes monitoring of construction impacts, constructed features, and characterizing immediate post-project conditions. |
| Effectiveness monitoring | L,P,R,S | Evaluate whether the restoration practices met stated objectives. May be directed at an individual project or a coordinated suite of multiple projects. Typically requires information about baseline and reference conditions, or desired state of system. |
| Validation monitoring | L,P | Advance knowledge of underlying causal relationships. Use demonstration projects to strengthen scientific basis for particular restoration approaches. Monitoring data used to validate models. |
| Compliance monitoring | None | Determine whether specific water quality or ecological integrity criteria are being met, as specified in some environmental standard, regulation, or law. |

[1] L = local or project scale; P = navigation pool or multiproject scale; R = floodplain reach; S = system wide.

Table 10. Monitoring levels applicable to the UMRS. (Source: Barko et al. 2006)

| Scale of monitoring | Type of objectives |
|---|---|
| Floodplain reach & System-wide | • Measure indicators of system health within major floodplain reaches. |
| Navigation Pool or Reach | • Measure indicators of system health within reaches of the system.<br>• Determine effect of multiple projects within a reach. |
| Multiple projects | • Determine interaction among multiple projects of different types.<br>• Assess incremental effects of multiple projects of the same type.<br>• Assess role of different factors in success of specific restoration techniques |
| Individual projects | • Determine if project was built as designed and is operating as designed<br>• Determine if project produced the anticipated local effects |

Although these monitoring efforts are a good start to adaptive management, many are piecemeal and do not cover the entire system. Additional baseline information is needed, such as the forest inventory data along the Mississippi River from Saverton, Missouri to the confluence with the Ohio River and on the Illinois River that St. Louis District is currently collecting. Land cover data are not as comprehensive on the Illinois River, where additional land use and land cover data would help clarify current baseline conditions. The 2010-2014 Strategic and Operational Plan for the LTRM component of the UMMR-EMP has identified floodplain forest monitoring as one of several priority components being considered for addition to the program.

Validation and effectiveness monitoring have been used by agencies but could benefit from a more focused and rigorous approach. Not every action needs full monitoring, but select sites should receive both pre- and post-monitoring efforts along with the study of control sites. Ideally, monitoring should be done 1 or 2 years prior to the management action to develop a baseline at the site. To allow for more thorough statistical analyses, the same methodology should be continued post action in both the affected and control sites. This type of monitoring should be targeted for pilot projects or areas as is feasible because of its cost and difficulty. For, example, designation of a pool or length of each reach within the system as an Adaptive Management Study Area for more intense monitoring and to test assumptions could help focus efforts. Using areas undergoing pool planning efforts such as in Pools 5, 9, and 18 is worth consideration as additional monitoring and modeling efforts are underway in those areas. Comparison of management options and their effects, such as harvesting techniques, may be one use of the study area concept. Pre-, post-, and control site data should be collected through plant, wildlife, regeneration, and other effectiveness/validation monitoring. Photo plots and site visits could also help document results.

Research and objective confirmation of management concepts through the use of model validation is another facet of adaptive management. The Regional Forestry Project Delivery Team (PDT) is examining the use of an HGM to determine terrestrial habitat capability. Completion of this type of model will help confirm, refine, or refute existing assumptions on the physical drivers of habitat. See Section VI.A for additional information on HGM and its applicability to the UMRS.

**Who determines the monitoring needs? –** Monitoring details will be set forth by the action agency/group concurrently with the management prescription. The monitoring results should be used in a direct feedback loop to the action and managing agencies/groups on a yearly basis.

**Who does the monitoring? –** Monitoring will be undertaken by the Corps of Engineers, USFWS staff, and cooperating partners as able. Pending funding availability, other agencies and/or nongovernmental organizations such as UMESC, the U.S. Forest Service, the National Great Rivers Research and Education Center (NGRREC), or even private contractors could be contracted to extend monitoring capabilities. Additional monitoring resources might be provided by universities through graduate study research, memorandums of understanding (MOUs), and funded research.

**Who funds the monitoring? –** Future NESP appropriations may provide additional funding to allow for a more comprehensive effort and enable more formalized adaptive management

monitoring. However, monitoring efforts will also continue to be implemented through multiple existing authorities including Corps of Engineers Operations and Maintenance funds, EMP (HREP and LTRM), USFWS refuge operations, and other sources. Standardizing methods at various spatial scales among and between these existing programs would be beneficial.

**Who keeps the data? –** Data should be centrally stored and accessible by all partners and managing agencies. Formalizing data storage outside of individual agencies and projects will help standardize data making it more comparable over a system wide basis. For example, UMESC could provide this service in addition to its current capabilities.

**Who analyzes the data? –** No one single agency is capable of all the analyses that might be required because of the complex nature of monitoring data. Therefore, this process should be flexible and analyses should be done in a collaborative manner using managing agencies, the USGS, universities, and even private contractors. Memorandums of agreement with one or more universities could provide a good source. The Regional Forestry PDT should be the central managers of analysis efforts using data derived from projects and/or directly related to UMRS forest ecosystems under Corps authorities.

**How is monitoring related to adaptive management? –** Good communication and sharing of information will be central to the success of this adaptive management effort. Closing the gap between monitoring of actions and baseline conditions and refining management prescriptions will be imperative. A formalized communication effort including centrally stored data as mentioned above is a good start. Secondly, annual coordination meetings to present information and adjust management will be necessary. Integrating Regional Forestry PDT coordination into existing Corps of Engineers annual Forestry Coordination Meetings would provide a good means of communicating with all members of the PDT and other partners.

## 2. Forest Monitoring Protocols

### a. Forest Inventory

A maintained inventory of bottomland forests on the Upper Mississippi and Illinois Rivers would provide baseline information for several key issues. Forest inventories currently exist for most of the Corps fee title lands in the St. Paul, Rock Island, and St. Louis Districts. Many additional USFWS lands have also been surveyed. The corresponding database, stored digitally in GIS format, includes detailed information on stand locations, canopy layers, species, size, and the age of trees and stands. The stands were delineated into nested geographic units starting at the stand level, which were then aggregated by compartment, and finally by Pool.

A new and systemic forest inventory protocol for Corps lands in the UMRS has been recently developed. This methodology harnesses new technologies in field data entry equipment, Global Positioning Systems (GPS), and computers for post processing power. After stand mapping, inventory plots are surveyed. For example, plots are randomly allocated in the field at an average rate of 1 plot per 2.5 acres. Using a variable radius plot with a Basal Area Factor (BAF) of 10, count tree information includes species, diameter, height, and canopy class. Additional information is collected on understory and ground layers, including data on invasive species. The position of the plots is recorded using a GPS unit. Tree age information is collected on every fifth plot.

The plot-level data that are gathered are stored in a GIS database and post processed to provide stand structure information in trees per acre format by size and species. Additional information such as Basal Area (BA) and the number of snags per acre can also be calculated. The plot data is available for summarization into larger stand aggregates, or other discrete landforms such as islands via the GIS software. Storing the plot-level data in an easily accessible database allows for future comparative analyses, such as when more detailed hydrogeomorphic data becomes available (including accurate elevation information).

It is recommended that forest landcover should be inventoried on a 10-year cycle. The forest can change radically from disturbance events such as prolonged floods, wind storms, or a pest outbreak. Continuing the inventory on a rotating basis will keep the information current for management decisions. Contracting forest inventory work to outside groups will be an option if funds are available. Forest inventory information from adjoining Federal, State, Tribal, and private lands could be incorporated as it becomes available for systemic planning efforts.

**b. Permanent Forest Inventory Plots**

Resurveying standard inventory plots on a recurring basis will provide information on changes over time. However, this approach will only provide accurate information on changes when summarized at larger spatial scales. To capture more detailed information on forest changes at local scales, one would need to permanently mark individual plots and revisit them using the same protocol. Currently, the three Upper Mississippi River Corps Districts have created a permanent plot methodology to capture such detailed plot information.

The U.S. Forest Service's Forest Inventory and Analysis (FIA) Program completes this type of inventory on a nationwide basis. The ability to access FIA data where it overlaps with UMRS floodplain forests may provide additional information useful to the Corps' Upper Mississippi River forest management programs.

**3. Management Impacts / Effectiveness Monitoring**

Assessing implemented management actions involves additional monitoring. Although changes will be noted in periodic forest inventories after a management action, the timing and level of detail may not enough to determine success or failure. Monitoring will provide the assessment feedback loop that is integral to the adaptive management process, and it should be designed to assess how the outcome compares to the objectives. Different kinds of management actions such as harvesting, timber stand improvement, planting, or geomorphic changes will all require different monitoring protocols. Anecdotal observation is always part of post-project monitoring in addition to the more formalized measures discussed below.

**Harvesting –** In general, monitoring post-harvest sites should provide information on dominant ground cover along with coverage, species, and size of regenerating seedlings/saplings. Regeneration surveys should be conducted the first 2 years post-harvest and then once every 5 years until the site is captured by pole size trees. Depending on the goals of the harvest, the size of fixed plots for regeneration surveys will vary. For example, if the goal is to have 300 stems per acre established, then the plot size would be 1/300 acre. The plots would be established randomly throughout the harvest. The species and heights of trees within the plot along with the

dominant cover would be recorded. The percentage of those plots that had at least one tree would provide the coverage estimate. If trees are counted within the plots, this count would provide estimates of trees per acre. Because of the high level of variability of regeneration within and between plots, enough should be established to achieve a statistically valid sample.

**Planting –** The follow-up information needed on tree planting includes percent survival by species or planting method, coverage, height growth, dominant ground cover, cover crop success, and documentation of influencing factors such as animal predation, flooding, or invasive species colonization. As with harvest sites, tree plantings should be visited the first 2 years, and then at least once every 5 years until the trees reach pole timber size. On small plantings, or moderately sized RPM plantings, a 100-percent survey could be accomplished fairly quickly. On larger plantings, one could survey a subsample of the rows. On a very large planting, one could count and measure trees on subsection(s) of each row. If rows are not readily visible, one can monitor similar to a harvest site using fixed radius plots documenting woody and herbaceous ground cover.

**Timber stand improvement (TSI) –** Depending on the goals of the TSI, the monitoring will be different. A heavy TSI designed for regeneration should be monitored similar to the harvest protocols. A moderate TSI for encouragement of growth and health of desired species might be monitored more informally with site visits and anecdotal observations.

**Geomorphic changes (e.g., dredge placement, dredging) –** For topographic modifications such as creating large mounding or ridge and swale topography, the site should be monitored for pre- and post-construction vegetation.

### 4. Forest Health Monitoring

In addition to the suite of pests, diseases, and invasive species already present in the UMRS floodplain, new diseases and pests are being discovered or transported here all the time, so ongoing monitoring will be crucial. Monitoring efforts will consist of informal observation by field personnel during normal work activities. Documentation of invasive plants will occur as a part of regularly conducted vegetation surveys. Corps environmental stewardship staff will maintain awareness of signs and symptoms of potential pests and report infestations to the U.S. Forest Service, State and Private Forestry, Forest Health staff.

The Forest Service is the leading agency on forest pests, and its National Forest Health Monitoring Program has many facets related to monitoring forest health. Detection monitoring is done nationally through the use of aerial photos and a systematic grid of ground surveys and currently provides coverage of portions of the UMRS floodplain. In the advent of a serious pest outbreak, consultation with the Forest Service on additional monitoring would be appropriate. Transferring additional funding to the Forest Service to evaluate the outbreak and provide recommendations for control should also be considered as an option.

# V. Desired Future Condition

## A. Vision

Corps-managed lands have become critical for the ecological sustainability of UMRS floodplain forests and associated terrestrial and aquatic ecosystems. The Corps forestry program will provide high-quality, sustainable bottomland forest on Corps lands along the UMRS, including a natural diversity of tree species, ages, canopy heights, and understory vegetation. The "ideal" floodplain forest will support floodplain ecosystem functions and sustainable habitat for wildlife. Therefore, the vision is to maintain a healthy, nearly contiguous forest that spreads across wide stretches of the floodplain and contains sufficient diversity of tree species, size, and age classes to provide a wide array of habitat structure and food (mast) resources (Urich et al. 2002).

**Species Diversity** – The ideal floodplain forest should have a wide range of tree species present, including any that are known to have historically existed on the floodplain but may not be present today. For example, researchers and nurseries have been attempting to produce disease-resistant American elms, and some experimental plantings of this stock have already been done. In the future, it may be possible to reestablish healthy elms across the floodplain. A forest with more mast trees is also desirable. Hard mast, such as acorns, pecans, and hickory nuts, are important food sources for the wood duck, mallard, deer, beaver, blue jay, and other wildlife (Urich et al. 2002).

**Size and Age Diversity** – Size and age diversity is another key characteristic of the ideal floodplain forest. A forest with trees in all stages of development provides a wider range of habitat, while ensuring a source of replacement trees after older trees reach senescence. Age diversity automatically brings size diversity, which benefits wildlife as some species require younger trees for their various life stages. Others species, such as the bald eagle, require older trees to use as nest and roost areas (Urich et al. 2002).

**Structural Diversity** – Structural diversity is an important forest component. Forests can be categorized into different vertical layers or zones. The older, taller trees make up the highest layer, or the main forest canopy. Under these dominant trees there is often another layer of vegetative structure made up mostly of co-dominant or mid-story trees. The next layer might be saplings and shrub species. The lowest layer of vegetation is typically composed of tree seedlings, forbs, grasses, sedges, mosses, and other plants. The ideal forest would also include snag and cavity trees to provide nesting and feeding places for various wildlife species (Urich et al. 2002)

**Diversity of Vegetative Types** – At the landscape scale, floodplain forest is often interspersed with blocks of other vegetation types, such as savannas, wetlands, or open grasslands. These other habitats occur at different locations adjacent to the forest, providing additional variation in structure and species composition (Urich et al. 2002).

The full range of multiple use forest values (aesthetic, productive, recreational, cultural, protective, etc.) should be considered in the development of management prescriptions. The

underlying management philosophy should be to avoid any potential actions that might result in long-term harm to the ecosystem (Urich et al. 2002).

Successful management of UMRS floodplain forests will require effective Corps leadership and coordinated action between districts and programs (UMRR-EMP, NESP, O&M, etc.). In addition, strong partnerships and cooperation between Federal and State agencies, Tribal governments, nongovernmental organizations, private landowners, and additional stakeholders will be necessary for sustainable habitat restoration on the entire floodplain ecosystem. An essential component of this process will be prioritized restoration planning for the entire floodplain (bluff-to-bluff) with identified areas of focused effort. This planning will include a coordinated, landscape-scale program of restoration, management, monitoring, and research embraced by all agencies and the public. For example, current reach planning efforts included in the Upper Mississippi River System Ecosystem Restoration Objectives 2009 report (USACE 2010), additional efforts by the NESP Floodplain Restoration Team, and the ongoing development of a system-wide HGM model for the UMRS are also key elements. In the future, the floodplain management program on the UMRS will be an exemplary model for partnerships and science-based habitat and wildlife management.

## B. Sustainability

Most definitions of sustainability in common usage today are adapted from the 1987 Brundtland Commission Report (WCED 1987), which defined sustainable development as "… *development that meets the needs of the present without compromising the ability of future generations to meet their own needs*." Implicit in this definition of sustainable development is that the environment, society, and the economy are interrelated components of the same system and must all be addressed if sustainability is to be achieved. NESP also incorporated these common elements into its definition of sustainability, which is stated as: "*the balance of economic, environmental, and social conditions so as to meet the current, projected and future needs of the Upper Mississippi River System without compromising the ability of future generations to meet their needs*" (Upper Mississippi River Summit 1996; USACE 2004).

The term *sustainable forest management* also incorporates many of these same concepts, as described in great detail in the U.S. Forest Service's National Report on Sustainable Forests – 2003 (USFS 2004). This report and its second iteration (USFS 2008) adopt the following definition of sustainable forest management from the Dictionary of Forestry (Helms 1998):

> *The stewardship and use of forests and forest lands in such a way, and at a rate, that maintains their biodiversity, productivity, regeneration capacity, and vitality, and their potential to fulfill, now and in the future, relevant ecological, economic, and social functions at local, national, and global levels, and that does not cause damage to other ecosystems.*

The concept of sustainable forest management represents an extension of the earlier concept of multiple-use sustained-yield, which was primarily focused on outputs, by focusing on maintaining processes and sustaining communities, economies, and all aspects of a forest (USFS 2004).

Ultimately, the essential components of sustainable forest management, as well as a common framework for describing, assessing, and evaluating progress towards it, are contained in the Montreal Process Criteria and Indicators for the Sustainable Management of Temperate and Boreal Forests. The Montreal Process Criteria and Indicators have been adopted by the United States and the 11 other member countries of the Montreal Process Working Group, which together contain 90 percent of the world's temperate and boreal forests and 60 percent of all forests globally (USFS 2004). The seven Montreal Process criteria for the sustainable management of temperate and boreal forests are as follows:

(1) Conservation of biological diversity
(2) Maintenance of productive capacity
(3) Maintenance of forest ecosystem health
(4) Conservation and maintenance of soil and water resources
(5) Maintenance of forest contribution to global carbon cycles
(6) Maintenance and enhancement of long-term multiple socioeconomic benefits to meet the needs of society
(7) Legal, institutional, and economic frameworks for forest conservation.

The Montreal Process Criteria and Indicators are used to assess sustainable forest management at the national level by the U.S. Forest Service. They have also been considered and/or adapted for use at regional (e.g., Carpenter et al. 2003; GLFA 2004) and State levels (e.g., ODF 2007; Guyon and Edgington 2004).

Sustainable ecosystems must be resilient to natural and/or anthropogenic disturbances. The term *ecological resilience* refers to the ability of a system to absorb disturbance and still retain its basic function, structure, and feedbacks (Galat et al. 2007). The NESP Science Panel (Galat et al. 2007) contends that collective disturbances over the past two centuries have changed the UMRS enough to have forced it over a threshold and into a new ecological regime. This makes it difficult to predict when the river ecosystem might again become sustainable, which will occur when it becomes resilient enough to establish a new range of variation to which its biological communities will adapt (Galat et al. 2007).

A sustainable river system should maintain its capacity to provide the nation with the goods and services that support its expected quality of life. It should require less effort and funding for management and be able to withstand future threats. However, the navigation system is not self-sustaining, so society must determine the degree of sustainability desired and river managers such as the Corps of Engineers must reflect that in their ecosystem restoration goals and objectives (Galat et al. 2007).

## C. Restoration

Repairing the ecological damage inflicted on our nation's aquatic resources is the foremost challenge for the emerging science of restoration ecology in the 21st century (Barko et al. 2006). The National Research Council (NRC) defined ecological restoration as *returning an ecosystem to a close approximation of its condition prior to disturbance* (NRC 1992). Numerous revisions and synonyms for the term *restoration* have appeared since the original NRC definition in 1992.

**Box 2. Attributes of Restored Ecosystems (adapted from: SER 2004)**

(1) Contains a characteristic assemblage of the species that occur in the reference ecosystem and that provide appropriate community structure.
(2) Consists of indigenous species to the greatest practicable extent.
(3) Is represented by all functional groups necessary for its continued development and/or stability, or if not, they have the potential to colonize by natural means.
(4) Has a physical environment capable of sustaining reproducing populations of the species necessary for its continued stability or development along the desired trajectory.
(5) Functions normally for its ecological stage of development.
(6) Is suitably integrated into a larger ecological matrix or landscape with which it interacts through abiotic and biotic flows and exchanges.
(7) Has potential threats to its health and integrity from the surrounding landscape eliminated or reduced as much as possible.
(8) Is sufficiently resilient to endure the normal periodic stress events in the local environment that serve to maintain its integrity.
(9) Is self-sustaining to the same degree as its reference system and has the potential to persist indefinitely under existing environmental conditions, fluctuate in response to normal disturbance events, and evolve as environmental conditions change.

For example, Wohl et al. (2005) define river restoration as *assisting the establishment of improved hydrologic, geomorphic, and ecological processes in a degraded watershed system and replacing lost, damaged, or compromised elements of the natural system*. The NESP Science Panel recommends adopting the Society for Ecological Restoration's (SER) definition: *the process of assisting the "recovery" of an ecosystem that has been degraded, damaged, or destroyed* (SER 2004). Box 1 lists the nine attributes used by the SER as a basis for determining when restoration has been accomplished.

Early river restoration efforts typically addressed restoring riverine ecosystem structure (e.g., imperiled fishes and riparian vegetation). More recent efforts are addressing restoration of river functions and/or dynamics (e.g., nutrient cycling and hydrologic regime) (Barko et al. 2006).

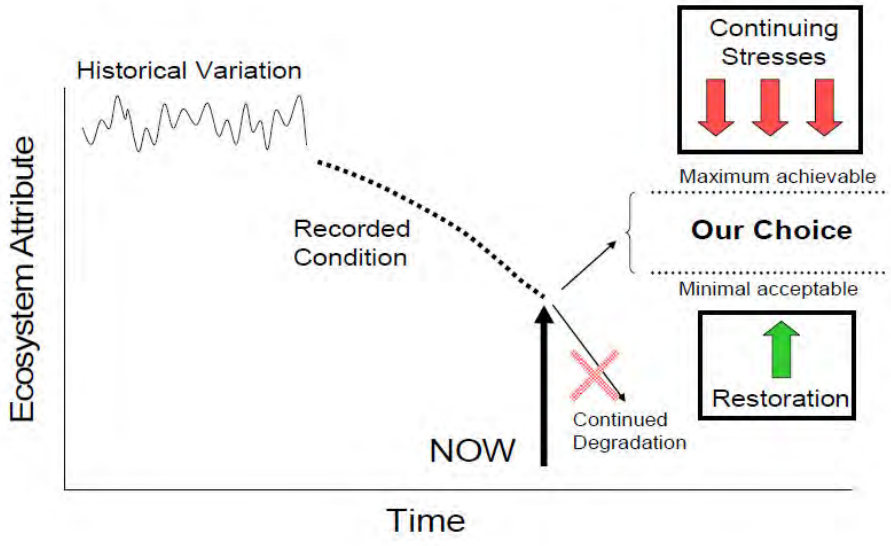
River restoration is intended to bring the level of the river's quality up to some desired level. However, if that state is not self-sustaining, restoration efforts will have to continue indefinitely. The "recovered" state of the Upper Mississippi River will likely be greater than what is minimally acceptable, but less than the historical quality of the river due to the ongoing impacts of ecological stressors to the system. The maximum achievable level of recovery will be constrained by these stressors and the amount of resources allocated to restoration activities (figure 21).

## D. Goals and Objectives

Broadly stated, specifying goals and objectives is an important task for restoration planning because it sets expectations for success, drives plans for implementation, and determines the types and extent of pre- and post-project monitoring (Ehrenfeld 2000). Similarly, goals and

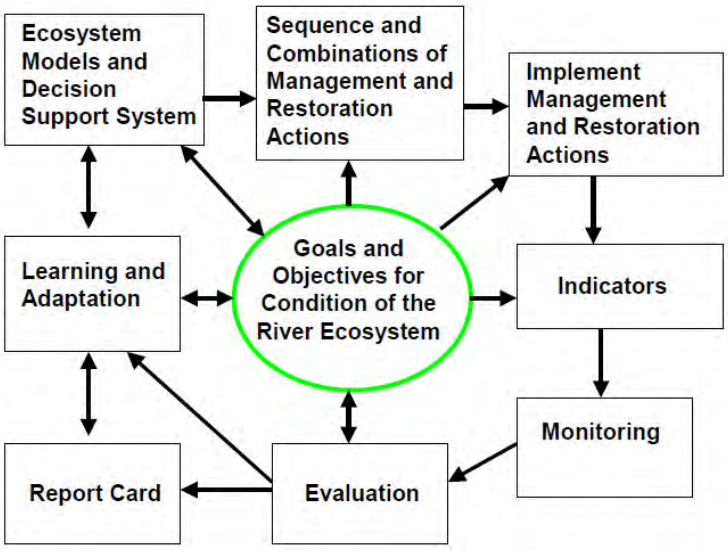
objectives for restoration of the Upper Mississippi River ecosystem are central to river management (figure 22). They are logically linked to management actions, action agencies, indicators of ecosystem conditions, monitoring activities, and ecosystem services (Barko et al. 2006).

Figure 21. The restoration state of the river as constrained by stresses and resources.




(Source: Galat et al. 2007)

Figure 22. Relationship among goals and objectives and other ecosystem restoration activities.

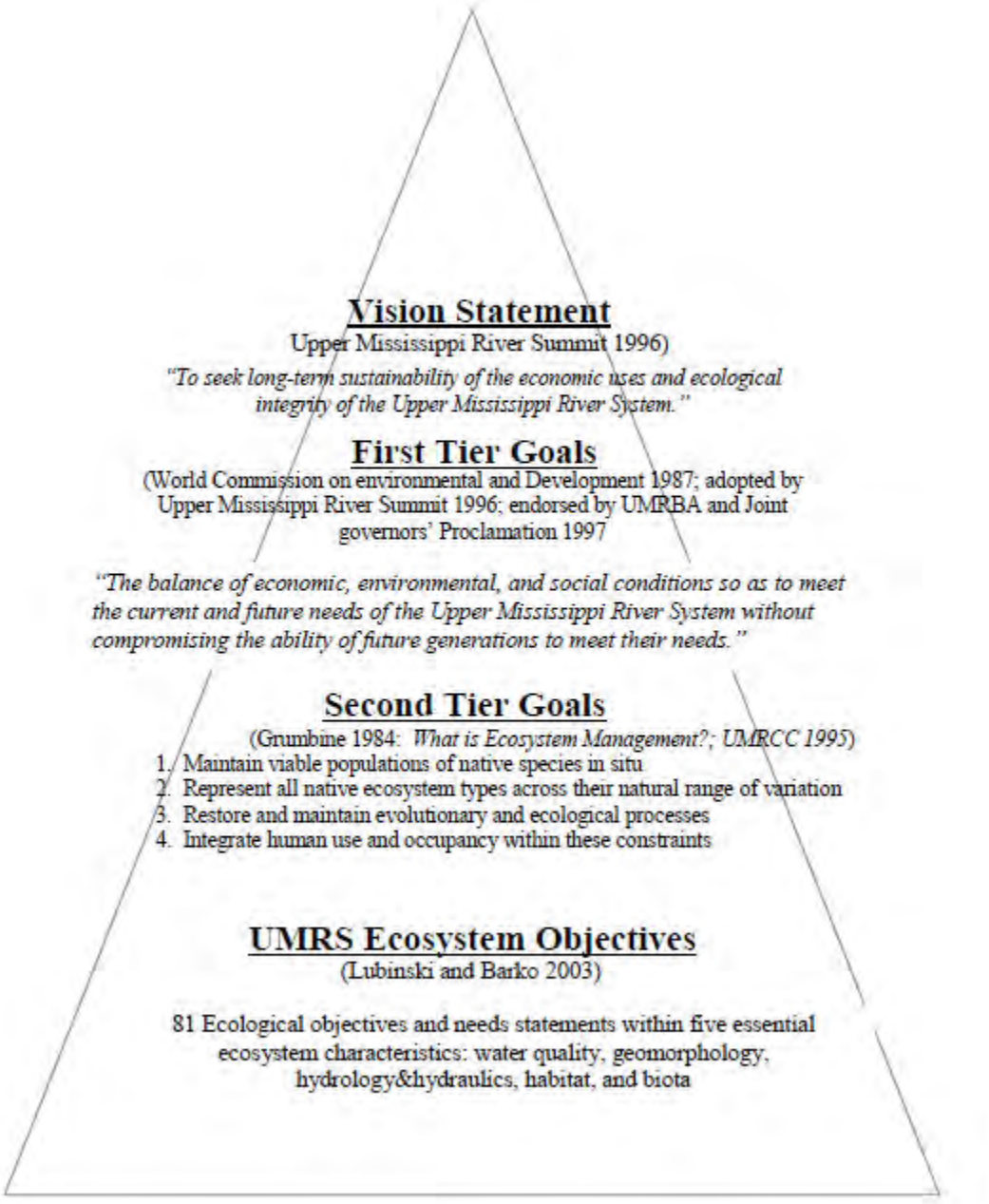



(Source: Barko et al. 2006)

## 1. Goals and Objectives Framework

Much effort has gone into establishing goals and objectives for the UMRS (e.g., Upper Mississippi River Summit 1996, DeHaan et al. 2003, Lubinski and Barko 2003, Barko et al. 2006, Galat et al. 2007). Barko et al. (2006) adopted the tiered approach for ecosystem restoration previously used by Lubinski and Barko (2003) for the UMR-IWW system. Arranging goals and objectives in a tiered approach emphasizes their hierarchical nature and the dependency of objectives on goals (figure 23).

Figure 23. UMRS Vision Statement and Tiered Goals and Objectives.




(Source: Barko et al. 2006)

The 2003 Navigation Study Science Panel compiled over 2,500 previous objectives for condition of the river system provided by stakeholders and synthesized them into 81 ecological objectives under five essential ecosystem characteristics: biogeochemistry (water quality), hydrology and hydraulics, geomorphology, habitat, and biota (Lubinski and Barko 2003). The ecosystem objectives were further refined by identifying their applicable spatial and temporal scales and linking them to management actions, action agencies, potential geographic ranges of application, performance indicators, monitoring activities, and ecosystem services (Barko et al. 2006). Ultimately, the Science Panel (Barko et al. 2006) and additional refinement efforts condensed the list of 81 ecological objectives to 42 goals and objectives.

The Science Panel (Galat et al. 2007) also developed an over-arching ecosystem goal for the UMRS and a series of ecosystem goals addressing the five essential ecosystem characteristics (EECs). The ecosystem goals were updated slightly from Galat et al. (2007) by the Navigation Environmental Coordinating Committee (NECC) and adopted by the NECC and Environmental Management Program Coordinating Committee (EMPCC) (USACE 2010 and 2010b).

Overarching Ecosystem Goal:

*To conserve, restore, and maintain the ecological structure and function of the Upper Mississippi River System to achieve the vision*

Ecosystem Goals:

1. Manage for a more natural hydrologic regime (hydrology and hydraulics)
2. Manage for processes that shape a physically diverse and dynamic river-floodplain system (geomorphology)
3. Manage for processes that input, transport, assimilate, and output material within Upper Mississippi River basin river floodplains: e.g. water quality, sediments, and nutrients (biogeochemistry)
4. Manage for a diverse and dynamic pattern of habitats to support native biota (habitat)
5. Manage for viable populations of native species within diverse plant and animal communities (biota)

**Relationship of UMRS Forest Stewardship Goals to NESP and Reach Planning Goals –** The goals and objectives contained in the UMRS Systemic Forest Stewardship Plan are meant to be program-neutral, and provide broad guidelines for sustainable forest management across agency and land ownership boundaries. However, many of the elements of these goals and objectives overlap considerably with those of other programs. Where overlap exists, this will hopefully provide opportunities to broaden support for the implementation of specific management and restoration practices.

The subset of NESP goals and objectives that are directly related to the Corps' Upper Mississippi River forest management programs include the following:

2.8) Increase topographic diversity and elevation of floodplain areas
4.3) Modify the extent, patch size, and successional variety of plant communities

4.6) Restore and maintain large contiguous patches of plant communities
4.9) Increase habitat corridor sizes and connectivity
4.10) Increase vegetated riparian buffers along tributaries and ditches in the floodplain
5.1) Maintain viable populations of native species throughout their range in the UMRS at levels of abundance in keeping with their biotic potential
5.2) Maintain the diversity and extent of native communities throughout their range in the UMRS
5.3) Reduce the adverse effects of invasive species on native biota

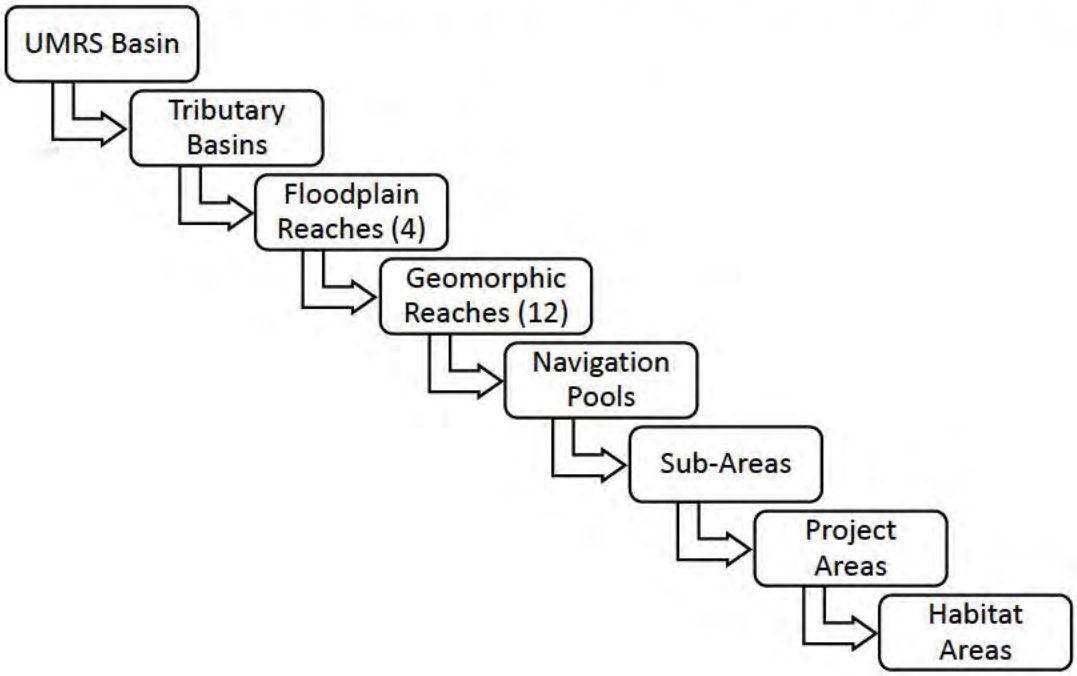
Although the majority of goals set by the NESP Environmental Science Panel do not directly apply to forests within the UMRS floodplain, the implementation and success of the forestry related goals will help achieve other systemic ecosystem objectives, including the additional NESP goals and objectives below:

1.1) Reduce contaminant loadings to the river
1.2) Reduce contaminants in the river
1.3) Reduce mobilization of sediment contaminants
1.4) Achieve State Total Maximum Daily Loads
1.5) Reduce, maintain, or increase sediment loadings to the rivers
1.6) Reduce nutrient loading from tributaries to rivers
1.7) Reduce nutrient export from the Upper Mississippi River to the Gulf of Mexico
1.8) Maintain adequate dissolved oxygen (DO) concentrations for fishes
1.9) Maintain water clarity sufficient to support submersed aquatic vegetation, aquatic invertebrates and fish species appropriate to location
2.11) Modify exchange between channels and floodplain areas
3.6) Increase storage and conveyance of flood water on the floodplain
4.2) Provide pathways for animal movement

The relationship of forest management goals to NESP goals and Reach Planning efforts (USACE 2010) illustrates the importance of focusing on ecosystem functions and processes. By creating a more sustainable forest, ecosystem functions and processes can be restored, especially pertaining to water quality. For example, although forest restoration alone will not solve water quality issues, it will greatly improve the ecosystem's natural ability to remove toxins, nutrients, and sediments from the UMRS, thereby creating a more sustainable system.

**Spatial Hierarchy –** A great deal of geomorphological and ecological variability is inherent to the UMRS due to its spatial and longitudinal scale. Effective management approaches must take this variability into account. Using an appropriate set of hierarchical levels of spatial analysis so that management activities can simultaneously target local issues and be integrated into analyses at the system-level will assist in the development of management prescriptions. The large-scale UMRS has been organized into a hierarchy of scales for program management, planning and implementation (figure 24).

Figure 24. Hierarchy of UMRS spatial scales for program management. (USACE 2010)




**Goals Applied to the System Level –** A system-wide approach generally emphasizes restoring ecosystem functions and processes over ecosystem structure (pattern of habitats, life forms) at individual project areas (USACE 2010b). At the system scale, an appropriate question might be: what is the current and desired future condition of the forest resource? The following metrics would likely be relevant at this scale:

- Total amount of forest landcover
- Percent cover of respective forest communities in the UMRS forest. For example:
  - Early successional (e.g., cottonwood – willow)
  - Riverfront (e.g., silver maple)
  - Floodplain (e.g., elm – ash – pecan)
  - Bottomland hardwoods (e.g., oak – hickory)

System-level analyses must also account for longitudinal differences in forest type due to climate and/or other ecosystem characteristics (i.e., desired future condition for northern and/or impounded reaches will likely be different than for southern open river reaches).

**Goals Applied to the Floodplain or Geomorphic Reach Level –** The goals developed by the Science Panel report(s) are system-wide goals. They provide a general direction for forest restoration, but prescribe no specific actions. According to Galat et al. (2007), "the cornerstone of UMRS sustainability is resilience." Resilience is achieved through diversity – diversity in geomorphology, hydrologic regimes, habitats, and species. The historical mosaic of land cover types varies from reach to reach, based on differing geomorphology, hydrologic regimes and species composition. Therefore the large spatial and temporal scales involved with the UMRS mean that desired future conditions may best be determined on a reach or ecoregion basis.

At an appropriate scale (e.g., floodplain reach, geomorphic reach, or ecoregion as defined by HGM), this will involve identifying target characteristics of representative communities based on a combination of historical and baseline inventory data, including the following:

- Historical landcover characteristics (e.g., total forest landcover)
- Relative forest cover by community type if available
- Diversity and structural characteristics of individual forest types
- Wildlife habitat requirements/concerns applicable at specific locations.

HGM will be very useful in developing goals and objectives across multiple spatial scales including the system, reach, ecoregion, and project site scale. These models incorporate historic and current geomorphology and hydrologic regimes by reach, and can determine the land cover types that have existed in the past and that are feasible to restore in the future. By using this type of model, land managers will be able to determine what sites can be successfully converted to which desired land covers (e.g., forest, wet meadow, etc.). Therefore, this model can be used to develop goals regarding the ideal mosaic of land cover types for a particular reach of the UMRS. Once goals are outlined for land cover proportions by reach, goals can then be established for the desired future conditions of stands. It is important to note that HGM models have only been completed for the unimpounded reach and several sections of the impounded reach of the UMRS. Expanding these models to cover the entire UMRS is therefore a key to the success of future restoration efforts.

**Goals for Desired Future Conditions at the Project or Habitat Level –** Once goals have been established, managers can develop objectives for individual sites. In terms of forests, these goals should include ideal species composition, stocking levels, canopy coverage, and size and age class distributions. The Lower Mississippi Valley Joint Venture (LMVJV) provides an excellent example of what forests should "look like" in that region. By developing standards similar to the LMVJV, land managers can use baseline data to determine what sites need restoration and measure the success of restoration activities. It is important to note that the LMVJV's larger goal is forest restoration for the benefit of priority wildlife species and therefore focuses solely on bottomland forests. The broader vision of this plan dictates that other land cover types such as prairie, marsh, and savanna not be ignored, and detailed compositional benchmarks will likely be useful for these types of land cover classifications as well.

At the project scale, the above should be cross-referenced with "on-the-ground" conditions (e.g., the current vegetation and hydrogeomorphic characteristics at a specific project site) to arrive at the goal of an ecologically functional forest community that is sustainable over the long term:

- Identify potential floodplain habitat (e.g., via HGM analysis)
- Identify current vegetation and ecosystem characteristics (e.g., silver maple and RCG)
- Identify appropriate silvicultural and/or other restoration techniques to move habitat towards desired future condition (e.g., tree plantings, TSI, and invasive species removal)

**Linking Project Goals to System Goals –** Finally, the results of management activities (e.g., reintroduction of hard mast species) at the project site level should be evaluated for their effects on (or contribution to) the entire system, consistent with the feedback mechanisms inherent to the adaptive management process.

## 2. Goals and Objectives

The following goals are generally open-ended, and fully realizing them will require ongoing efforts and substantial resource inputs for an indefinite period of time. Many of the objectives, particularly those associated with forest planning and adaptive management efforts, may also involve long-term time frames. Others, such as those associated with programmatic aspects or project implementation, may be accomplished over much shorter and discrete time frames and may benefit from additional prioritization.

### a. Goal 1: A functional, sustainable floodplain ecosystem that includes a mosaic of native vegetation communities sufficient to support important wildlife habitat.

Historically, the UMRS floodplain supported a mosaic of community types including riverfront forest, bottomland hardwood forest, bottomland slope forest, savanna, bottomland prairie, mesic prairie, seasonal herbaceous wetland, emergent wetland, and shrub/scrub. Plant community distribution varied according to abiotic site characteristics including geomorphology, soils, elevation, and hydrology. Boundaries between vegetation communities were dynamic, varying over time due to processes such as flooding, drought, sedimentation, erosion, and fire.

Human changes to the ecosystem (such as levees, dams, agriculture, and urban development) have negatively altered floodplain functions and native vegetation communities. Complete restoration of historic ecosystem conditions is not feasible given these modifications, although some level of restoration of forests, grasslands, wetlands and their associated functions within the UMRS floodplain is certainly possible and desirable. However, many questions remain about what has been lost and what still can be restored and sustained given the altered ecosystem conditions.

*Goal 1 Objectives:*

- Develop a system-wide, spatially explicit database/model containing both reference and current site conditions, among other attributes. This can be accomplished by conducting an HGM analysis of the entire UMRS, which is a recommended priority action (see below).

- Based on analyses of historical and current landcover and compositional studies, identify and prioritize habitats and/or species that are underrepresented in today's floodplain ecosystem.

- Using the results of HGM, combined with other efforts as applicable, establish priority focus areas where restoration efforts are likely to have the most impact.

- Use landscape-scale analyses to establish and maintain larger blocks of closed-canopy floodplain forest patches of at least 2500 acres, with width and length of at least 1/3 mile, where possible for nesting forest birds. The landcover matrix around these patches should be more than 50 percent forested, with more than 25 percent mature forest, and less than 15 percent open habitat.

- In reaches where optimum configuration is not currently achievable, forest restoration projects should be designed to maximize the amount of interior forest habitat for each tract.

**b. Goal 2: Restore and maintain forest diversity, health, and sustainability on Federal lands.**

*Goal 2 Objectives:*

- Restore and maintain a diversity and distribution of tree species on Federal lands at sustainable levels.
    - For example, determine the appropriate percent coverage of UMRS floodplain forests by hard mast trees by geomorphic reach or ecoregion and restore to that level.

- Use HGM and/or historical reference conditions to generate target levels of representative communities. These targets should be compared to site restoration potentials given current conditions.
    - For example – target percentages for landcover types by reach:
        - Silver maple dominated forest 50 to 80 percent
        - Cottonwood 5 to 10 percent
        - Willow 5 to 10 percent
        - Oak/hickory/pecan 5 to 10 percent
        - Shrub/scrub 5 to 10 percent
        - Grassland 0 to 5 percent
        - Sand prairie 0 to 10 percent
        - Savanna 0 to 10 percent

- Establish the ideal distribution of age and structure classes in UMRS floodplain forests.
    - For example:
        - 20 percent sapling (0 to 5 inches dbh)
        - 35 percent pole (5 to 12 inches dbh)
        - 45 percent mature/over-mature (more than 12 inches dbh).
    - Base goals for the abundance of different size classes partially on the average number of stems per acre in each size class. This will allow for comparison between reaches with extensive canopy openings (due to disturbance from wind, flooding, or pathogens) filling in with a mix of younger trees and reaches that are more even aged. For example:
        - more than 500 sapling size stems per acre
        - more than 75 pole size stems per acre
        - more than 25 mature stems per acre

- Establish targets for canopy coverage by forest type and successional stage.
    - For example: mature forests should have at least 70-percent canopy cover.

- Use a variety of management actions to achieve target percentages, including harvesting, planting, timber stand improvements (TSI), and/or passive management.

- Establish tree planting guidelines for Federal lands.

- Many hydrologic factors lie outside the scope of this plan, but the impact of this issue on forest restoration success is recognized. Every effort should be made to support restoration

of a more natural floodplain hydrology whenever possible. For example, efforts are underway through Environmental Pool Management to partially restore summer low-water periods, and the effects of these and similar actions on forest attributes should be monitored.

- A portion of lands should be designated for passive management only, including sensitive areas or those lands where site harvest access is deemed commercially unfeasible.

- Provide special consideration for Federal and State listed species in all management decisions.
    - Establish buffer zones around active bald eagle nests, heron colonies, known Indiana bat maternal roosts, etc.

- Tailor site specific management prescriptions to benefit the managing agency's wildlife goals
    - Adjust patch size, leave trees, snags, harvest type, etc.

- Reduce the adverse effects of invasive species on native biota.
    - For example, the suppression of native tree regeneration by reed canary grass.
    - See the Reno Bottoms Forest Restoration Project (a recommended priority action).

### c. Goal 3: Provide support for the restoration and maintenance of forest diversity, health and sustainability on non-Federal lands.

Funding arrangements for forest and grassland management and restoration activities under NESP authority are dependent on land ownership. For fee-title lands owned by the Federal Government within the UMRS project area, the arrangement is 100 percent Federal funding. A cost share arrangement of 65 percent Federal and 35 percent non-Federal applies on land that lies within the UMRS project area but is non-Federal in ownership. This authorization follows directly from the Water Resources Development Act of 2007 (WRDA 2007). A non-Federal partner and landowner cooperation would be required to implement projects on non-Federal lands. The Corps has the ability to work directly with States and nongovernmental organizations, but not private landowners. Proposed management actions on any project off Federal lands would follow traditional Corps planning guidance to determining a Federal interest and benefit with regard to NESP project cost share funding.

*Goal 3 Objectives:*

- Provide technical support for forest restoration efforts on non-Federal and private lands in the UMRS floodplain as needed and pursuant to relevant NESP authority, memorandums of understanding and/or agreement, etc.

- Provide financial support for forest restoration efforts on non-Federal land in the UMRS floodplain pursuant to the applicable NESP cost-share guidelines

### d. Goal 4: Adaptive management

The use of an adaptive management framework incorporating science-based decision-making in sustainable floodplain forest management efforts in the UMRS is highly recommended.

*Goal 4 Objectives:*

- Continue to acquire additional management information as necessary. For example:
  - Fine-scale elevation data (e.g., LIDAR)
  - Forest inventory data

- Develop a web-accessible GIS-based planning and decision-support database to include restoration, inventory data, habitat and wildlife monitoring, etc.

- Establish a partnership with the Lower Mississippi Valley Joint Venture (LMVJV).

- Implement adaptive management by:
  - Setting measurable benchmarks against which to gauge the success of projects
  - Monitoring the results of projects and use lessons learned in future project planning
  - Incorporating statistically valid methods in project planning whenever feasible
  - Linking project-level accomplishments back to system-level goals and objectives

## 3. Desired Future Landscape and Stand Conditions

The desired future landscape and stand conditions expressed in the following tables are general estimates based on the consensus of experienced land managers and other resource professionals familiar with UMRS floodplain forests. It is expected that these future desired conditions will be refined and updated over time as additional data (e.g., HGM) become available to support specific recommendations, particularly during the 5-year review cycles of this Plan.

Table 11. Desired landscape-level forest conditions within the UMRS.

| Metric | Proposed UMRS Forest Conditions[1] | Description[2] |
|---|---|---|
| **Forest Cover** | 70-90% | Large (>2,000-acre) contiguous forested areas are desired. At any point in time, 50% of the forest should meet the desired stand structure conditions (min. 33% ) |
| **Passively Managed Forest** | 40-50% | Forest areas that are not subjected to silvicultural manipulation (e.g., no-cut, wilderness, set-aside, and natural areas) |
| **Mature forest** | 40-50% | --- |
| **Pole forest** | 30-40% | --- |
| **Regenerating Forest** | 15-20%[3] | Forest regeneration on areas > 5 acres (e.g., clearcuts); or forest restoration on agricultural lands (i.e., reforestation). |
| **Shrub/scrub** | 5-10% | Shrubby vegetation (hydric or mesic) within bottomland forests, including forests in early successional stages |

[1] Should reflect historical variability, use HGM, and be different by reach

[2] Adapted from LMVJV (2007)

[3] Achieving increased forest cover via reforestation overrides the percentage limitation

Table 12. Historic, current, and potential landscape conditions for floodplain areas.[1]

| Land Cover | Historic (%) (ca. early 1800s) | Current (%) | Change (%) | Potential (%)[2] |
|---|---|---|---|---|
| | **Upper Impounded[3]** | | | |
| Forest | 43.4 | 20.1 | -53.7 | 25 |
| Shrub / scrub | --- | --- | --- | 5-10 |
| Wet meadow / marsh | 5.8 | 11.1 | 91.2 | 10-15 |
| Grasses / forbes | 18.0 | 6.3 | -65.3 | 5-10 |
| Water | 31.7 | 40.5 | 27.7 | 40 |
| | **Lower Impounded[4]** | | | |
| Forest | 37.7 | 17.9 | -52.6 | 20 |
| Shrub / scrub | --- | --- | --- | 5-10 |
| Wet meadow / marsh | 0.3 | 1.0 | 231.8 | 1-5 |
| Grasses / forbes | 45.9 | 4.9 | -89.3 | 5-10 |
| Water | 15.7 | 16.0 | 1.9 | 15-20 |
| | **Unimpounded[5]** | | | |
| Forest | 86.7 | 20.9 | -75.9 | 25 |
| Shrub / scrub | --- | --- | --- | 5-10 |
| Wet meadow / marsh | 0.0 | 0.0 | --- | 1-5 |
| Grasses / forbes | 0.0 | 2.4 | --- | 1-5 |
| Water | 6.9 | 3.6 | -47.8 | 3-5 |
| | **Illinois River[6]** | | | |
| Forest | 57.5 | 22.9 | -60.2 | 25 |
| Shrub / scrub | --- | --- | --- | 5-10 |
| Wet meadow / marsh | 2.4 | 1.9 | -20.8 | 1-5 |
| Grasses / forbes | 20.3 | 9.8 | -51.7 | 10-15 |
| Water | 15.3 | 17.5 | 14.4 | 15-20 |

[1] Historic and current data are derived from Theiling et al. (2000)

[2] Potential landscape conditions could be refined by hydrogeomorphic models

[3] Pools 4, 8, and 13; [4] Pools 17, 22, 24, 25 & 26; [5] Grand Tower – Ohio River; [6] LaGrange Pool

Table 13. Desired stand conditions for bottomland forests within the UMRS.

| Forest Variables[1] | Desired UMRS Stand Structure | Conditions that may warrant active management |
|---|---|---|
| **Overstory canopy cover** | 70 – 80% | > 80% |
| **Overstory Species** | 2 species or more | large blocks of single species |
| **Basal area** | 90-160 $ft^2$ / acre with ≥25% in older age classes[2] | > 200 $ft^2$ / acre |
| **Tree stocking** | 50% – 90% | < 50% or > 90% |
| **Emergent trees[3]** | > 2 / acre | < 1 / acre |
| **Understory cover** | > 10 % | < 10% |
| **Regeneration[4]** | > 10% of area | < 10% of area |
| **Coarse woody debris** | Present | Not present |
| **Small cavities (< 10 inch diameter)** | ≥ 2 visible holes/acre | < 2 visible holes/acre |
| **Den trees/large cavities (> 10 inch diameter)** | ≥ 1 visible hole / 10 acres mature timber | < 1 visible holes / 10 acres |
| **Standing dead and/or stressed trees** | ≥ 2 large trees / acre | < 2 large trees / acre |
| **Invasive herbaceous** | < 10% | > 10% of herbaceous layer |
| **Invasive woody** | < 10% | > 10% of any canopy layer |

[1] Promotion of species and structural diversity within stands is the underlying principle of management
[2] "Older age class" stems are those approaching biological maturity (i.e., senescence)
[3] Emergent trees make good perch/nesting sites and should have stronger consideration on diverse sites
[4] Advanced regeneration of trees in sufficient numbers (e.g., 400/acre) to ensure their succession to forest canopy

Table 14. Existing[1] and target terrestrial communities by land cover type, reach and percentage of floodplain.[2]

| Land Cover Type | Upper Impounded | | Lower Impounded | | Unimpounded | | Illinois River | |
|---|---|---|---|---|---|---|---|---|
| | Existing | Target | Existing | Target | Existing | Target | Existing | Target |
| Silver maple mix | 20.5 | 20 | 12.5 | 10-15 | 12.2 | 1-15 | 14.9 | 10-20 |
| Willow | 0.9 | 1-5 | 0.2 | 1-5 | 0.0 | 1-5 | 0.0 | 1-5 |
| Cottonwood/sycamore | 0.1 | 1-5 | 0.3 | 1-5 | 0.0 | 1-5 | 0.0 | 1-5 |
| Oak/hickory/pecan | 1.7 | 1-5 | 1.1 | 1-5 | 0.0 | 1-5 | 0.0 | 1-5 |
| Swamp cypress | --- | --- | --- | --- | --- | 1-5 | --- | --- |
| Shrub / scrub | 1.9 | 1-5 | 2.9 | 1-5 | 0.0 | 1-5 | 0.0 | 1-5 |
| Grasses / forbes | 0.7 | 1-5 | 0.1 | 1-5 | 3.4 | 1-5 | 4.5 | 1-10 |
| Wet meadow / marsh | 4.9 | 1-10 | 1.8 | 1-5 | 0.0 | 1-5 | 0.0 | 1-5 |

[1] Source: Theiling et al. (2000)
[2] Further spatial analyses would be required to limit this matrix to public lands only

# VI. Recommended Priority Actions

The following recommended priority actions are not presented in a prioritized order. For example, the acquisition of forest inventory and fine-scale elevation data would complement efforts to develop accurate hydrogeomorphic models (HGM). In addition, while additional data acquisition and the development of comprehensive hydrogeomorphic models would benefit specific on-the-ground restoration efforts, it is not recommended that these efforts be put on hold indefinitely while waiting for these acquisition and development programs to be completed system-wide.

## A. Hydrogeomorphic Model (HGM)

HGM can provide a solid science-based approach to identifying ecosystem restoration options and providing recommendations for sustainable management of large river floodplain systems such as the UMRS. The HGM approach includes three stages: (1) determining historical condition and ecological processes of an area from a variety of historical information such as geological, hydrological, and botanical maps and data; (2) determining ecosystem alterations by comparing historic versus current landscapes; and (3) identifying options and approaches to restore specific habitats and ecological conditions. The foundation of ecological history coupled with assessment of current conditions helps to determine which system processes and habitats can be restored or enhanced and where this is possible, if it is at all. For example, in the Mississippi-Missouri River Confluence Area, wet bottomland prairie that was dominated by prairie cordgrass historically occurred at elevations higher than 417 feet, on relict alluvial floodplain terrace surfaces, on Beaucoup silt loam soils, and between 2- and 5-year flood frequency zones. Contemporary areas that offer these conditions now offer the best potential sites for restoring wet bottomland prairie communities.

Hydrogeomorphic analysis is the critical first step in developing a landscape-scale restoration plan for the UMRS floodplain. A 2007 report sponsored by the Corps of Engineers (Heitmeyer 2007) assessed the feasibility of conducting such an analysis by examining the availability of historic and current data, identifying constraints and assumptions, and proposing a framework for evaluating the entire system (2.8 million acres). The report concluded that the evaluation is feasible and probably could be completed within 3 to 5 years. The UMRS would be separated into ecological units with a unique HGM "matrix" developed for each ecoregion. An important next step in this process was the identification of appropriate ecoregions for a section of the UMRS from the confluence of the Mississippi and Missouri Rivers at St. Louis north to the Quad Cities (Heitmeyer 2009). The final product would integrate these ecoregions into a comprehensive systemic framework for understanding the entire UMRS system and would provide recommendations and guidance for restoration and conservation at a truly systemic level based on ecology of the region, not political boundaries.

The Corps of Engineers St. Louis District together with the Middle Mississippi River Partnership has already supported an extensive HGM analysis of the unimpounded reach between St. Louis and Cairo in order to identify ecosystem restoration options and provide recommendations for development and sustainable management of the reach (Heitmeyer 2008). Site-specific HGM

analyses will be beneficial in developing detailed restoration plans for complex areas that include a diversity of potential habitat types. Examples of these types of HGM analyses include the Gilbert and Calhoun Divisions of Two Rivers National Wildlife Refuge in Pool 26 (Heitmeyer and Westphall 2007), Ted Shanks Conservation Area in Pool 24 (Heitmeyet 2008b), Rip Rap Landing Conservation Area in Pool 25 (USACE 2009), and the Keithsburg Division of Port Louisa NWR in Pool 18 (Heitmeyer et al. 2009b). These studies provide an important foundation for successful management of the UMRS, and the Regional Forestry PDT recommends continuing this effort as a highest priority until completed.

## B. Data Acquisition

### 1. Forest Inventory

Extensive inventories of forested lands within local landscapes (e.g., specific refuge or management areas) throughout the UMRS are recommended. These inventories will help to assess existing habitat conditions and aid in formulating and prioritizing silvicultural treatments. To assess forest change and region-wide progress towards desired forest conditions, the use of a continuous forest inventory (CFI) network that is monitored at 5- to 10-year intervals is also recommended. This process will require the design and implementation of inventory and monitoring programs coordinated throughout the three UMRS Corps Districts. Given the prevalence of USFWS refuge lands throughout the UMRS, this inventory and monitoring program should also evaluate wildlife habitat and use of forested and other lands to ensure relevant wildlife management goals are being met. The use of a multilevel protocol containing a network of permanent field plots as well as fine-scale stand mapping techniques is recommended.

### 2. Fine-Scale Elevation Data

Subtle differences in elevation in terrestrial floodplain zones can have a profound influence on the response of associated vegetation across elevational and hydrological gradients. Fine-scale elevation data are therefore generally required in the developmental and implementation stages of site-specific habitat restoration plans. Although ground-level surveys might be feasible to implement on a project by project basis, the procurement of LIDAR (Laser Imaging Detection and Ranging) data has the potential to address these data needs at the system level. Fortunately, this data acquisition need has been addressed and the Corps of Engineers has collected systemic UMRS bluff-to-bluff LIDAR. Some is already available, and the remainder is undergoing processing and quality review and should be available in 2012. These data will be served by USGS UMESC, along with systemic bathymetry. Eventually, these two data sets will be merged to create a seamless topographic layer for the entire UMRS floodplain.

## C. On-the-Ground Projects

### 1. Programmatic Implementation

On-the-ground forest restoration efforts would be guided by the development of a Forest Management Programmatic Implementation Report (PrIR). The PrIR would identify ecosystem

restoration goals and objectives for forest management. The PrIR would enable continuous implementation of site specific measures on Federal lands through the approval of annual Forest Management Plans. The PrIR would function on a continuous basis rather than expire upon completion of a specific project, would cover multiple local-scale projects rather than a single project site, and would focus more on processes than on ground-level restoration and construction guidelines for individual projects.

### 2. Example: Reno Bottoms Forest Restoration Project

The Reno Bottoms Forest Restoration Project is an excellent example of an "on-the-ground" forest restoration project that is recommended by the Regional Forestry PDT. Much of the current floodplain forest in the Reno Bottoms/Minnesota Slough subarea, located in upper Pool 9, is not regenerating. Flat topography, higher ground water levels caused by impoundment, increased frequency and duration of inundation, reduced creation of new islands and shoreline and subsequent plant succession, and increased competition from reed canary grass and other herbaceous vegetation have all adversely affected forest regeneration. Dutch elm disease has also eliminated most mature American elm, a historic component of the river corridor. Thus, the current forest is composed mainly of a few highly water tolerant species, such as silver maple, which are now approaching the end of their life span. A younger tree age class replacement component is generally lacking throughout the area. Reed canary grass competition is particularly problematic here because it effectively precludes the use of many conventional forest management (regeneration) practices. Proposed actions would focus on restoring forest species and age class diversity on up to 1,100 acres. See the project fact sheet attached in Appendix 3 for additional information regarding this project.

## D. Data Management

There is a demonstrated need for coordinated database management and data archiving related to a variety of management and restorations efforts throughout the UMRS. For example, see the following excerpt from the HGM Feasibility Report (Heitmeyer 2007):

> *ArcGIS and the geospatial data identified in this report can now be readily archived and housed in central and repository sites, assuming that some entity is willing and capable of managing the data. The availability of this data is increasing and an important outcome or product of an extensive HGM evaluation for the entire UMRS would be the collation of a comprehensive, readily available geospatial dataset(s) on the primary HGM datasets.*

The Long Term Resource Monitoring (LTRM) component of the UMRR-EMP currently supports a variety of monitoring, data serving, and research efforts. Monitoring data, results of various analyses and focused studies, decision-support tools, and UMRS GIS data layers are publicly available from the LTRM website (www.umesc.usgs.gov/ltrmp.html). The LTRM component of the UMMR-EMP would be a potential site for this type of centralized database management and data archiving effort.

# VII. Implementation

## A. OMPs, HMPs, and other existing programs

The Corps of Engineers develops and implements Master Plans (MPs) and Operational Management Plans (OMPs) for each Corps civil works project. Although separate documents, they work in tandem to set management direction for the project. The master plans primarily focus on three components: (1) regional and ecosystem needs, (2) project resource capabilities and suitabilities, and (3) expressed public interests and desires. Within this framework, a master plan addresses resources such as fish and wildlife, vegetation, recreation, cultural resources, and water. Corps projects also develop and implement an OMP to achieve the objectives outlined in the MP. OMPs contain a summary of natural resource inventories and evaluations, specific resource goals and objectives, and site specific prescriptions for resource management. Lands cooperatively managed by the USFWS and state natural resources agencies are included in the MP and OMP with significant input and coordination from those agencies during the planning process.

MPs provide the framework for compatible multiple-use forest management, and OMPs provide for the specific management prescriptions that strive for healthy and sustainable forests through techniques like timber stand improvement (TSI), harvest, reforestation, and accepted conservation practices where applicable. These specific prescriptions for forest and woodland management are applied to conserve and/or improve vegetation conditions for wildlife, timber, soils, recreation, water quality and other beneficial uses.

The USFWS has completed Comprehensive Conservation Plans (CCPs) for the National Wildlife and Fish Refuges on the Upper Mississippi River. These CCPs recognize the importance of forest and grassland resources, and guide management efforts by setting visions, goals, and measurable objectives, as well as outlining strategies for reaching those objectives. Strategies include vegetation inventories and active management through the preparation and implementation of step down plans, including Habitat Management Plans (HMPs). The USFWS CCPs and HMPs will be an integral part of the process for implementing UMRS systemic forest management goals and objectives on National Wildlife Refuge System lands addressed through this plan.

The Upper Mississippi River Restoration – Environmental Management Program (UMRR-EMP) is managed by the Corps of Engineers and implemented in cooperation with the USGS, USFWS, U.S. EPA, USDA NRCS and the five UMRS States of Illinois, Iowa, Minnesota, Missouri, and Wisconsin. The collaborative relationships among these Federal agencies, States, Tribal governments, and other stakeholders developed by the EMP provide a national model for large-scale restoration and monitoring work. The EMP consists of two principal components: (1) the Habitat Rehabilitation Enhancement Project (HREP); and (2) the Long Term Resource Monitoring (LTRM) Program. The HREP component is managed by the Corps in consultation with the USFWS and the natural resource agencies of the five UMRS States. Through HREP, the Corps and its partners rehabilitate aquatic habitats degraded by navigation development and other changes to the river and its basin. The LTRM component is a multipurpose program of

monitoring, applied research, and management evaluation designed to achieve the broad goals of developing a better understanding of the ecology of the UMRS and its resource problems, monitoring resource change, developing alternatives to better manage the UMRS, and providing for the proper management of monitoring information.

## B. Programmatic Implementation Report (PrIR)

The development of a Forest Management Programmatic Implementation Report (PrIR) or other NEPA compliance document would guide forest restoration projects on the UMRS at the local scale. The PrIR would guide the implementation of ecosystem restoration goals and objectives for forest management outlined in this plan. Program alternatives would be formulated with benefit-cost analyses where feasible. General planning details would be provided for measures that would be similar across different project sites (e.g., site preparation and tree planting recommendations). The development of performance indicators would allow for monitoring and evaluation of the attainment of objectives. A monitoring plan for performance measures would include both a timeline to achieve identified target goals and a timeline for the demonstration of program performance.

The PrIR would enable continuous implementation of site specific measures on Federal lands through the approval and implementation of annual Forest Management projects. The PrIR would be a feasibility level decision document, and its approval and authorization would allow the Forest Management Program to proceed to implementation.

The PrIR would be different from a traditional Project Implementation Report (PIR) in several fundamental ways. First, with respect to time, it would function on a continuous basis rather than expire upon completion of a specific project. Second, regarding restoration sites, it would cover multiple local-scale projects rather than a single project site. Third, the focus would be more on process (e.g., management, measures, priorizitation) than on ground-level restoration/ construction guidelines for individual projects. Finally, the development and authorization of a Forest Management PrIR would dramatically streamline the allocation of both time and resources.

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# IX. Appendixes

## Appendix A: Definitions and Acronyms

**Age-class** – A category into which the average age or age range of trees or other vegetation is divided for classification or use. It represents the dominant age of the main body of trees in a stand.

**Adaptive Management** – An approach to natural resources management that acknowledges the risk and uncertainty of ecosystem restoration and allows for modification of restoration measures to optimize performance. The process of implementing policy decisions as scientifically driven management experiments that test predictions and assumptions in management plans, and using the resulting information to improve the plans. A mechanism for integrating scientific knowledge and experience for the purpose of understanding and managing natural systems.

**Backwater** – A small, generally shallow body of water attached to the main channel, with little or no current of its own; shallow, slow-moving water associated with a river but outside the river's main channel.

**Bathymetry** – The measurement of water depth across a water body.

**Biodiversity** – The variety of living organisms considered at all levels of organization, from genetics through species, to higher taxonomic levels, and including the variety of habitats and ecosystems, as well as the process occurring therein. Biodiversity occurs at four levels; genetic diversity, species richness, ecosystem diversity, and landscape diversity.

**Biomass (woody) -** The mass of the woody parts (wood, bark, branches, twigs, stumps, and roots) of trees (alive and dead) and shrubs and bushes. Excludes foliage.

**Channel Training Structure** – A man-made flow obstruction (e.g., wing dam, closing dam or revetment) used to divert river flow to a desired location, usually toward the center of the main channel to increase flow and limit sedimentation or to protect the river bank from eroding.

**Co-dominant tree** – A tree that extends it crown into the canopy and receives direct sunlight from above but limited sunlight from the sides. One or more sides of a co-dominant tree are crowded by the crowns of dominant trees.

**Community** – A grouping of populations of different species found living together in a particular environment.

**Conservation** – Active management to ensure the survival of the maximum diversity of species, and the maintenance of genetic diversity within species; implies the maintenance of ecosystem functions; embraces the concept of long-term sustainability. A careful preservation and protection of something, especially planned management of a natural resource to prevent exploitation, destruction, or neglect.

**Corridor** – A relatively narrow strip of habitat that crosses an area of non-habitat land and serves to connect larger areas of habitat.

**Disturbance regime** – The spatial and temporal characteristics of disturbances affecting a particular landscape over a particular time (e.g., fire, flood, drought). Any relatively discrete event in time that disrupts the ecosystem, community or population structure and changes resources or the physical environment.

**Dominant trees** – Trees with crowns receiving full light from above and partly from the side; usually larger than the average trees or shrubs in the stand, with crowns that extend above the general level of the canopy and that are well developed but possibly crowded on the sides.

**Drawdown** – Lowering the level of the water in a selected portion of an aquatic system; conducted for habitat management purposes with dams or pumps.

**Dredged material** – The excavated material from dredging operations.

**Dredging** – The removal of underwater material (e.g., sediment) from the bottom of a harbor or waterway.

**Ecological (or biological) integrity** – The ability of an ecosystem to retain its complexity and capacity for sustainability (i.e., its health).

**Ecosystem** – Dynamic and interrelating complex of plant and animal communities and their associated nonliving environment; a biological community together with the physical and chemical environment with which it interacts.

**Ecosystem function** – Processes that drive the ecosystem; any performance attribute or rate function at some level of biological organization (e.g., energy flow, sedimentation, detritus processing, nutrient spiraling).

**Ecosystem management** – Protecting, conserving, or restoring the function, structure, and species composition of an ecosystem, recognizing that all components are interrelated.

**Ecosystem (or environmental) restoration** – Management actions that attempt to accomplish a return of natural areas or ecosystems to a close approximation of their conditions prior to human disturbance, or to less degraded, more natural conditions.

**Ecosystem services** – All of the goods and services provided to humanity by natural ecosystems; examples include wood products, fertile soils, genetic variation, clean water, and clean air.

**Environmental sustainability** – The ability of aquatic, wetland, and terrestrial complexes to maintain themselves as self-regulating, functioning systems.

**Floodplain** – Lowlands bordering a river that are subject to flooding. Floodplains are composed of sediments carried by rivers and deposited on land during flooding.

**Forest ecosystem** – A dynamic complex of plant, animal, and micro-organism communities, and their abiotic environment interacting as a functional unit, where the presence of trees is essential.

**Forest type** – A category of forest defined by its vegetation, particularly composition, and/or locality. The broadest general groups are broad-leaved (hardwoods), coniferous (softwoods), and mixed broad-leaved and coniferous

**General Plan Land** – Lands that the Corps outgrants to the USFWS through a Cooperative Agreement for fish and wildlife management purposes.

**Geographic Information Systems (GIS)** – A set of computer hardware and software for analyzing and displaying spatially referenced features, such as points, lines or polygons, with non-geographic attributes, such as species, age, etc., used for mapping and analysis.

**Geomorphology** – The science that deals with land and submarine relief features (landforms) of the earth's surface; the physical structure of the river floodplain environment.

**Habitat** – The living place of an organism or community, characterized by its physical or biotic properties; habitats can be described on many scales from microhabitat to ecosystems to biomes.

**Habitat fragmentation** – The process whereby a larger, continuous area is both reduced in area and divided into two or more pieces. The disruption of extensive habitats into isolated and small patches. Fragmentation has three negative components: loss of total habitat area and smaller, more isolated remaining habitat patches, increased potential for edge effects

**Hydrologic** – (1) Rise and fall of river crest; (2) Pertaining to the water cycle; through precipitation, runoff, storage and evaporation, and evapotranspiration and quantitatively as to distribution concentration, and quality.

**Hydrology** – A science dealing with the properties, distribution, and circulation of water on the surface of the land, in the soil and underlying rocks, and in the atmosphere.

**Importance Value** – The sum of relative density, relative frequency, and relative dominance (scale from 0 - 300). Indicates the overall abundance of a species in an ecological community.

**Impoundment** – In reference to rivers, the area of water that is captured and held back by a dam.

**Indicator** – A measurable surrogate for environmental end points, such as biodiversity, that is sensitive to changes in the environment and can warn that environmental changes are taking place.

**Invasive species** – Any species that has the tendency to invade or enter a new location or niche; an introduced species that outcompetes native species for space and resources; whose introduction does or is likely to cause economic or environmental harm or harm to human health.

**Landscape** – A heterogeneous land area composed of interacting ecosystems that are repeated in similar form throughout; landscapes are variable in size; usually overlaps governmental jurisdictions, thus requiring collaboration from a broad range of participants.

**Landscape ecology** – The study of the structure, function, and change in a heterogeneous land area composed on interacting ecosystems.

**Lateral connectivity** – The connection of a river and its floodplain, allowing access across aquatic and terrestrial habitats by organisms as well as flood waters.

**Levee** – An embankment constructed to prevent flooding.

**Levee district** – Cooperative quasi-governmental organizations that protect areas from floodwaters and serve as wildlife refuges.

**Life history** – An organism's patterns of growth, reproduction, and longevity that are related to specific demands for survival.

**Littoral** - area of a stream, river, wetland, lake or pond that can support rooted aquatic plant growth.

**Longitudinal connectivity** – Allows for the upstream and downstream movement and/or migration of aquatic organisms.

**Moist soil unit** – Areas where water levels are controlled to provide a desired mix of moist soil vegetation.

**Pool** – The area of water that is impounded and maintained at a higher level behind a navigation dam; generally refers to the entire length of river between sequential dams.

**Reach** – A continuous stretch or expanse. In reference to rivers, it can be used to define portions of rivers at different scales (i.e., floodplain reach, pool reach, and reach between two river bends).

**Resilience** – The ability of a system to maintain its structure and patterns of disturbance in the face of disturbance.

**Restoration** – The objective of ecosystem restoration is to restore degraded ecosystem structure, function, and dynamic processes to a less degraded, more natural condition (ER 1105-2-100). As defined under Section 519, in its broadest usage, restoration encompasses the following concepts: conservation, enhancement, naturalization, preservation, protection, rehabilitation, restoration, and stabilization.

**Riparian** – Areas that are contiguous to and affected by surface and subsurface hydrologic features of perennial or intermittent water bodies (e.g., rivers, streams, lakes, or drainage ways).

**Riparian corridor** – a corridor of habitat that is directly related to or situated along the banks of rivers or streams; a riparian corridor is in contact with the stream during annual floods.

**River stage** – The elevation of the water surface, usually above an arbitrary datum.

**Sapling** – A tree at least 4½ feet tall and up to 5 inches in diameter.

**Silviculture** – The art and science of controlling the establishment, growth, composition, health, and quality of forests to meet diverse needs and values of landowners and society on a sustainable basis.

**Species** – One or more populations of individuals that can interbreed, but cannot successfully breed with other organisms.

**Species diversity** – The richness, abundance, and variability of plant and animal species and communities.

**Species richness** – A simple count of the number of species in an area.

**Succession** – Sequential change in the vegetation at a particular location over time.

**Sustainable/sustainability** – A level and method of resource use that does not destroy the health and integrity of the systems that provide the resource; thus the long-term resource availability does not ever diminish due to such use.

**Sustainable forest management** – The stewardship and use of forests and forest lands in such a way, and at a rate, that maintains their biodiversity, productivity, regeneration capacity, and vitality, and their potential to fulfill, now and in the future, relevant ecological, economic, and social functions at local, national, and global levels, and that does not cause damage to other ecosystems.

**Threatened and endangered species** – Those species that are listed as threatened or endangered under the Federal Endangered Species Act (ESA) of 1973 and those species that are candidates or proposed as candidates for listing under the ESA; listing can occur at the Federal or State level or both.

**Upper Mississippi River – Illinois Waterway (UMR-IWW)** – The narrow (300- to 500-meter) 1,200 miles of 9- foot navigation channel, 37 lock and dam sites (43 locks), and thousands of channel training structures of the Upper Mississippi River and Illinois Waterway.

**Upper Mississippi River System (UMRS)** – The entire floodplain area and associated physical, chemical, and biological components of the Upper Mississippi and Illinois Rivers.

**Watershed** – The geographic area that naturally drains into a given watercourse such as a stream or river.

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|---|---|
| AEM | Adaptive Ecosystem Management |
| ANS | Aquatic Nuisance Species |
| BA | Biological Assessment |
| BIA | Bureau of Indian Affairs |
| BMP | Best Management Practices |
| BO | Biological Opinion |
| CEMVS | Corps of Engineers, St. Louis District |
| CEQ | Council on Environmental Quality |
| CFR | Code of Federal Regulations |
| DNR | Department of Natural Resources |
| DOC | Department of Conservation |
| DOD | Department of Defense |
| DOI | Department of the Interior |
| DOT | Department of Transportation |
| EA | Environmental Assessment |
| EEC | Essential Ecosystem Characteristic |
| EIA | Environmental Impact Assessment |
| EIS | Environmental Impact Statement |
| EMP | Environmental Management Program |
| EMPCC | Environmental Management Program Coordinating Committee |
| EMTC | Environmental Management Technical Center |
| EO | Executive Order |
| EPA | Environmental Protection Agency |
| EPM | Environmental Pool Management |
| EQ | Environmental Quality |
| ER | Engineering Regulation |
| ERDC | Engineering Research and Development Center |
| ESA | Environmental Site Assessment |
| FIA | Forest Inventory and Analysis |
| FONSI | Finding of No Significant Impact |
| FWCA | Fish and Wildlife Coordination Act |
| FWIC | Fish and Wildlife Interagency Committee |
| GIS | Geographic Information Systems |
| GREAT | Great River Environmental Action Team |
| HEP | Habitat Evaluation Procedures |
| HNA | Habitat Needs Assessment |
| HQUSACE | U.S. Army Corps of Engineers, Headquarters |
| HU | Habitat Unit |

| | |
|---|---|
| ICA | Incremental Cost Analysis |
| IDNR | Illinois Department of Natural Resources |
| ITR | Independent Technical Review |
| IWR | Institute for Water Resources |
| IWW | Illinois Waterway |
| | |
| L/D | Lock and Dam |
| LIDAR | Laser Imaging Detection and Ranging |
| LMAV | Lower Mississippi Alluvial Valley |
| LMVJV | Lower Mississippi Valley Joint Venture |
| LTRM | Long Term Resource Monitoring |
| | |
| MDOC | Missouri Department of Conservation |
| MDNR | Missouri Department of Natural Resources |
| MFL | Managed Forest Law |
| | |
| MNDNR | Minnesota Department of Natural Resources |
| MOA | Memorandum of Agreement |
| MSL | Mean Sea Level |
| MVD | Mississippi Valley Division |
| MVP | St. Paul District |
| MVR | Rock Island District |
| MVS | St. Louis District |
| | |
| NAS | National Academy of Sciences |
| NECC | Navigation Environmental Coordinating Committee |
| NEPA | National Environmental Policy Act |
| NESP | Navigation and Ecosystem Sustainability Program |
| NER | National Ecosystem Restoration |
| NHPA | National Historic Preservation Act |
| NRC | National Research Council |
| NRCS | Natural Resources Conservation Service |
| NWI | National Wetland Inventory |
| | |
| OASA(CW) | Office of Assistant Secretary of the Army-Civil Works |
| O&M | Operations and Maintenance |
| OMRR&R | Operation, Maintenance, Repair, Replacement, and Rehabilitation |
| | |
| P&G | Principles & Guidelines |
| PA | Programmatic Agreement |
| PDT | Project Delivery Team |
| PED | Preliminary Engineering and Design |
| PEIS | Programmatic Environmental Impact Statement |
| PCB | Polychlorinated biphenyl |
| PIR | Project Implementation Report |
| PMP | Project Management Plan |

| | |
|---|---|
| RC&D | Resource Conservation and Development |
| RED | Regional Economic Development |
| RM | River Mile |
| ROD | Record of Decision |
| RRCT | River Resources Coordinating Team |
| SEA | Supplemental Environmental Assessment |
| SHPO | State Historic Preservation Office |
| T&E | Threatened and Endangered Species |
| THPO | Tribal Historic Preservation Office |
| UMESC | Upper Midwest Environmental Sciences Center |
| UMR | Upper Mississippi River |
| UMR-IWW | Upper Mississippi River-Illinois Waterway System |
| UMRBA | Upper Mississippi River Basin Association |
| UMRCC | Upper Mississippi River Conservation Committee |
| UMRR-EMP | Upper Mississippi River Restoration – Environmental Management Program |
| UMRS | Upper Mississippi River System |
| USACE | U.S. Army Corps of Engineers |
| U.S.C. | United States Code |
| USDA | U.S. Department of Agriculture |
| USEPA | United States Environmental Protection Agency |
| USFWS | U.S. Fish and Wildlife Service |
| USFS | U.S. Forest Service |
| USGS | U.S. Geological Survey |
| WMA | Wildlife Management Area |
| WRDA | Water Resources Development Act |

## Appendix B. Scientific and Common Names of Plant Species

| Scientific Name | Common Name |
|---|---|
| Aster spp. | aster |
| Acer negundo | boxelder |
| Acer rubrum | red maple |
| Acer saccharinum | silver maple |
| Acer saccharum | sugar maple |
| Ambrosia trifida | great ragweed |
| Asimina triloba | pawpaw |
| Betula nigra | river birch |
| Boehmeria cylindrica | false-nettle |
| Carya alba | mockernut hickory |
| Carya cordiformis | bitternut hickory |
| Carya glabra | pignut hickory |
| Carya illinoinensis | pecan |
| Carya laciniosa | shellbark hickory |
| Carya ovata | shagbark hickory |
| Campis radicans | trumpet creeper |
| Carex spp. | sedge |
| Cercis canadensis | eastern redbud |
| Celtis laevigata | sugarberry |
| Celtis occidentalis | hackberry |
| Cephalanthus occidentalis | buttonbush |
| Cornus drummondii | rough leafed dogwood |
| Crataegus spp. | hawthorn |
| Diospyros virginiana | persimmon |
| Elymus virginiana | Virginia wildrye |
| Forestiera acuminata | eastern swampprivet |
| Fraxinus americana | white ash |
| Fraxinus pennsylvanica | green ash |
| Gleditsia aquatica | water locust |
| Gleditsia triacanthos | honeylocust |
| Gymnocladus dioicus | Kentucky coffeetree |
| Humulus japonicus | Japanese hops |
| Ilex decidua | deciduous holly |
| Impatiens capenis | jewelweed |
| Juglans nigra | black walnut |
| Laportea canadensis | Canadian woodnettle |
| Leersia oryzoides | rice cutgrass |
| Leersia virginica | whitegrass |
| Lindera benzoin | northern spicebush |
| Liquidambar styraciflua | sweetgum |

| | |
|---|---|
| Liriodendron tulipifera | tuliptree |
| Lonicera japonica | Japanese honeysuckle |
| Morus alba | white mulberry |
| Morus rubra | red mulberry |
| Nyssa sylvatica | blackgum |
| Parthenocissus quinquefolia | Virginia creeper |
| Phalaris arundinacea | reed canarygrass |
| Pilea pumila | Canadian clearweed |
| Plantanus occidentalis | American sycamore |
| Populus deltoides | cottonwood |
| Quercus alba | white oak |
| Quercus bicolor | swamp white oak |
| Quercus imbricaria | shingle oak |
| Quercus lyrata | overcup oak |
| Quercus macrocarpa | bur oak |
| Quercus michauxii | swamp chestnut oak |
| Quercus palustris | pin oak |
| Quercus pagoda | cherrybark oak |
| Quercus rubra | northern red oak |
| Quercus shumardii | Shumard's oak |
| Quercus velutina | black oak |
| Rosa multiflora | multiflora rose |
| Robinia pseudoacacia | black locust |
| Rubus spp. | blackberry |
| Sassafras albidum | sassafras |
| Saurunus cernuus | lizard's tail |
| Sambucus spp. | elderberry |
| Salix nigra | black willow |
| Secale cereale | cereal rye |
| Sicyos angulatus | oneseed bur cucumber |
| Smilax spp. | greenbrier |
| Solidago spp. | goldenrod |
| Toxicodendron radicans ssp. radicans | eastern poison ivy |
| Ulmus americana | American elm |
| Ulmus rubra | slippery elm |
| Urtica dioica | stinging nettle |
| Vitis spp. | grape |

# Appendix C: Legal, Policy, and Administrative Guidelines

## 1. NESP and Prior Forest and Ecosystem Management Authorities

Development of this Forest Stewardship Plan largely followed from recognition of the need for a framework of coordinated management at a system level to ensure long-term sustainability of the terrestrial communities of the UMRS floodplain. The original authority for the plan came from the Navigation and Ecosystem Sustainability Program (NESP), authorized in turn by the Water Resources Development Act of 2007 (H.R. 1495).

> *… the Secretary shall undertake navigation improvements and restoration of the ecosystem for the Upper Mississippi River and Illinois Waterway System… (H.R. 1495, Section 8002)*

NESP is a long-term program combining navigation improvements and ecological restoration for the UMRS over a 50-year period that will be implemented in increments through integrated, adaptive management. The Systemic Forest Stewardship Plan is one of 23 initial ecosystem restoration component projects potentially implemented under NESP. NESP is currently authorized, but it is unclear if it will be funded at this time, and the included references to future program capabilities are contingent on that funding. However, implementation of the plan is not solely contingent upon NESP, and other operational programs are also detailed below. Regardless, the plan is intended to establish a foundation for the Corps, partner agencies and stakeholders to more effectively collaborate on and implement environmental stewardship activities within UMRS forests.

The following assumptions and constraints were considered in this process:

- The 9-foot channel navigation project will continue to be operated and maintained throughout the UMRS and implementation of the Systemic Forest Stewardship Plan will not negatively affect navigation.
- Federal flood reduction projects will continue to be operated and maintained by the Corps and non-Federal sponsors.
- Partner, stakeholder and public involvement is critical for program and project success.
- Implementation is dependent on receiving adequate funding.
- If lands are acquired from willing sellers by the Corps or partner agency through the floodplain restoration project of NESP or other authorities, these floodplain areas will be evaluated for forest restoration in the context of this plan.
- The private land conservation programs of other agencies (e.g., USDA NRCS) will be continued, remain viable, and are an integral part of the plan.
- No single agency has sole management authority over the UMRS. Success of the plan is dependent upon collaboration among the various landowners, partners and stakeholders.
- There will continue to be other valuable land uses (e.g., agricultural, commercial, recreation) within the UMRS.
- Sediment and nutrient loading from upland sources will continue.
- Monitoring and adaptive management will be critical components of the plan.

- Assessment of environmental impacts will occur in later phases of planning and habitat project design.

The program presumptions contained in this plan are based on current NESP authorization, in material contained in the UMR-IWW System Navigation Feasibility Study Final Integrated Feasibility Report (USACE 2004), and in the authorities of the Upper Mississippi River Restoration – Environmental Management Program (EMP). One of the benefits of these programs is that the area in which the Corps is authorized to conduct direct and partner cost-share ecosystem restoration projects is not restricted to fee title lands associated with the 9-foot Navigation Project but includes all lands within the 500 year floodplain of the UMRS. The Illinois River Basin Restoration Program (Section 519 of WRDA 2000) has similar authority on the Illinois Waterway (IWW) but also includes all lands within the Illinois River watershed. Another significant emphasis in the WRDA 2007 authorization is the inclusion of language focused on ecosystem management attributes. This emphasis on ecosystem restoration authorization in WRDA 2007 is a critical component of NESP and EMP:

> *To ensure the environmental sustainability of the existing Upper Mississippi River and Illinois Waterway System, the Secretary shall modify, consistent with requirements to avoid adverse effects on navigation, the operation of the Upper Mississippi River and Illinois Waterway System to address the cumulative environmental impacts of operation of the system and improve the ecological integrity of the Upper Mississippi River and Illinois River. (H.R. 1495, Section 8004)*
>
> (and)
>
> *The Secretary shall carry out, consistent with requirements to avoid adverse effects on navigation, ecosystem restoration projects to attain and maintain the sustainability of the ecosystem of the Upper Mississippi River and Illinois River… (H.R. 1495, Section 8004)*

The primary legal authority informing Corps forest management on the Mississippi River for the past 51 years has been the Forest Cover Act. On September 6, 1960, Congress addressed the issue of forest management on Corps projects nationwide. Public Law 86-717 (16 USC 580m-n; 74 Stat. 817) spoke to the Corps' overall stewardship responsibility for forest resources on project lands. The Act states that,

> *...reservoir areas of projects for flood control, navigation... shall be developed and maintained so as to encourage, promote, and assure fully adequate and dependable future resources of readily available timber, through sustained yield programs, reforestation, and acceptable conservation practices, and to increase the value of such areas for conservation, recreation, and other beneficial uses: provided, that such development and management shall be accomplished to the extent practicable and compatible with other uses of the project. (16 USC 580m)*

For the General Plan lands along the Upper Mississippi River, the 9 foot Navigation Project and the National Wildlife Refuge System are both "other" designated uses in this context. Regarding vegetative cover, including forest, the Corps is to pursue:

*... the establishment and maintenance of other conservation measures... to yield the maximum benefit and otherwise improve such areas. Programs and policies developed pursuant to the preceding sentence shall be coordinated with the Secretary of [Interior], and with appropriate State conservation agencies. (16 USC 580n)*

The following excerpt is from Engineering Regulation (ER) 1130-2-540 (USACE 1996). Under this authority the Corps currently manages forest resources within the UMRS on Corps fee title lands purchased under the authority of the 9-foot Navigation Channel Project under the multiple-use paradigm:

*The Army Corps of Engineers is the steward of the lands and waters at Corps water resources projects. Its Natural Resources Management Mission is to manage and conserve those natural resources, consistent with ecosystem management principles, while providing quality public outdoor recreation experiences to serve the needs of present and future generations. In all aspects of natural and cultural resources management, the Corps promotes awareness of environmental values and adheres to sound environmental stewardship, protection, compliance and restoration practices. The Corps manages for long-term public access to, and use of, the natural resources in cooperation with other Federal, State, and local agencies as well as the private sector. The Corps integrates the management of diverse natural resource components such as fish, wildlife, forests, wetlands, grasslands, soil, air, and water with the provision of public recreation opportunities. The Corps conserves natural resources and provides public recreation opportunities that contribute to the quality of American life.*

EP 1130-2-540 further directs the Corps of Engineers operations element to prepare an Operational Management Plan (OMP) for natural resources management consistent with an approved Master Plan. The natural resources management component is based on a total ecosystem or compartment approach, and includes compartment descriptions, management objectives, and implementation plans.

Particularly during the past 20 years, during which Upper Mississippi River Districts have increased the level of forest management on the UMRS, the Corps has been committed to working with the USFWS, and States, on GP land activities in support of the goals of National Wildlife Refuges in the project area for wildlife management. Any economic value resulting from managed harvest has remained a secondary outcome realized from an active conservation-oriented program. Regularly scheduled coordination meetings among the Corps, USFWS and States have been effective in assuring that the activities of the forest management program are compatible with refuge wildlife goals and objectives. The Corps has also provided technical support to partner agencies involved in complimentary management actions on their own lands.

Forest restoration projects and measures would likely be modified and refined based on information gained through performance evaluations and the adaptive implementation feedback process. An updated feasibility report will be prepared using knowledge gained from the initial increment and will make recommendations for any necessary modifications to future increments of this ecosystem restoration authorization.

## 2. Partnerships

The Corps realizes that one agency cannot accomplish all the goals and objectives for an ambitious ecosystem restoration and sustainability program covering 2.6 million acres. The Corps therefore recognizes the importance of not only continuing to work with existing partners, but to establishing new partnerships as well. Cooperative agreements already exist for some partners, while others will need to be created, particularly where shared costs are involved.

**Collaboration** – Maintaining existing partnerships and establishing new ones is essential for the implementation of this Forest Stewardship Plan. Multiple Federal, State, Tribal and private organizations are currently involved in managing natural resources within the UMRS. This plan was developed with input from a multitude of agencies and organizations, which will facilitate future coordination on implementation strategies.

The value of partnerships goes beyond having all involved striving for common goals or sharing costs. Division of tasks can make the most of each organization's skills and talents. Private organizations, or nongovernmental organizations (NGOs), are often less encumbered by processes that may inhibit quick actions by governmental agencies. Likewise, actions that are difficult to perform by one agency may be relatively easy for another. By working together and dividing duties for a project, partners can more efficiently achieve mutual goals and objectives.

The following is a list of agencies/organizations known to be active within the UMRS. The Corps has formed direct partnerships with the majority of those listed. This list is not all-inclusive and new partnerships will be formed as opportunities arise.

### a. Federal Agencies

- U.S. Army Corps of Engineers (Corps)
- U.S. Fish and Wildlife Service (USFWS)
- National Park Service (NPS)
- Natural Resources Conservation Service (NRCS)
- U.S. Forest Service (FS)
- U.S. Geological Service (USGS)
- Bureau of Indian Affairs (BIA)
- Environmental Protection Agency (EPA)

### b. State Agencies

- Wisconsin Department of Natural Resources
- Minnesota Department of Natural Resources
- Iowa Department of Natural Resources
- Illinois Department of Natural Resources
- Missouri Department of Conservation
- Missouri Department of Natural Resources

A noteworthy State partnership is the Illinois Rivers 2020 initiative. The Illinois River basin has experienced a loss of ecological integrity due to sedimentation of backwaters and side channels, degradation of tributary streams, increased water level fluctuations, reduction of floodplain and tributary connectivity, and other adverse impacts caused by human activities. In 2000, the Illinois governor set the vision for Illinois Rivers 2020, a proposed $2.5 billion, 20-year State and Federal restoration program to restore the Illinois River basin. The program is a cooperative effort among the Corps of Engineers, the Illinois River Coordinating Council, the Illinois Department of Natural Resources, the Illinois Department of Agriculture, and the Environmental Protection Agency. This structure provides an excellent opportunity for focused input into activities and priorities.

### c. Non-Governmental and Quasi-Governmental Organizations

There are a large number of non-governmental and quasi-governmental organizations that have natural resource objectives and/or conservation operations in the plan's project area. The degree that each of these organizations has the potential to be involved in the strategies outlined in this plan varies considerably. Some may only wish to review and comment on this or subsequent "step-down" plans, while other may become specific project sponsors and cost share partners. Groups also vary in the scope of their interests. Some are national organizations that have an involvement in the entire UMRS, while others are organized around more local issues. This provides the Corps the opportunity of working with organizations within the project area at multiple scales. Although some cooperative agreements exist to work with larger organizations for system-wide interests, specific projects are administered at the District level where the project site is located. Cooperative agreements could be generated at any level necessary to ensure that both Corps and partner interests are defined and protected and so that the overlap of missions can create actionable opportunities.

Examples of groups in this category are land trust organizations, whose missions include acquisition and management of land for the purpose of habitat conservation; conservation organizations such as Ducks Unlimited and the Wild Turkey Federation, who often sponsor habitat projects; local conservation or sportsmen clubs, who often sponsor habitat projects and the volunteer labor to accomplish them; and quasi-governmental organizations, such as the Resource Conservation and Development Program (RC&D), which helps people protect and develop their economic, natural, and social resources. This program is administered by the Natural Resources Conservation Service (NRCS).

Another noteworthy example of an NGO actively working within the UMRS in a variety of capacities is The Nature Conservancy (TNC). TNC, with the support of donors, recently established the Great Rivers Partnership in support of conservation efforts targeting three of the world's largest river systems: the Mississippi, the Par-Paraguay-Parana in Brazil, and the Yangtze in China. In addition, the TNC's dedicated Upper Mississippi River Program works directly with a number of priority conservation and restoration sites throughout the UMRS, including the Illinois River.

### d. Private Partners

The vast majority of land within the 500-year floodplain of the UMRS is in private ownership. Each landowner is a potential partner in meeting the objectives of this plan. Many resources can be made available to landowners who are voluntarily managing their lands in a manner that would contribute to systemic forest management goals. For example, the USFWS can partner on private land projects and NRCS can restore habitat working with landowners on conservation easement areas. Corporate landowners usually have a specific focus, such as timber production. However, there are often common goals that overlap, such as disease and invasive species control in bottomland forests.

Although most activities outlined in this forest stewardship plan are focused on public lands within the UMRS as defined above, it is widely recognized that additional conservation treatment of uplands could dramatically reduce both nutrient and sediment loads entering the river system. Many landowners in the UMRS floodplain and larger basin independently maintain effective conservation practices on their private forest lands. Many other have enrolled in State programs such as Wisconsin's Managed Forest Law (MFL), or the Illinois Forestry Development Act (IFDA), which can result in tax benefits to the landowner. Typically these programs require that a forest management plan must be written for the parcel. The plans are based on sustainable forest management practices, primarily focusing on timber production, and a State forester must approve them. The expectation is that the land is managed to meet that objective, with other objectives secondary, such as wildlife enhancement or recreation.

These State land management programs could be a valuable tool in meeting the objectives of the UMRS Forest Stewardship Plan. By partnering with State foresters/landowners, it is possible that forest management plans developed by private landowners might better address UMRS forest management goals in the context of a larger system, rather than solely on a parcel by parcel basis. In addition, many States have published Forestry Best Management Practices (e.g., IDNR 2000), which are often primarily targeted toward private landowners and provide guidelines for implementing forestry practices directly applicable to sustainable floodplain and riparian forest management (IDNR 2000).

In addition to the types of State programs mentioned above, several Federal partner agencies have the authority to provide direct assistance to private landowners in the UMRS. One example is the NRCS, which implements the Wetlands Reserve Program (WRP), among other conservation programs that provide an incentive-based mechanism for private landowners to maintain or restore lands to natural conditions. Another is the Northeastern Area State and Private Forestry branch of the U.S. Forest Service, which provides a number of outreach programs and administers the Upper Mississippi River Forest Partnership.

### e. Existing Multiple Stakeholder Partnerships

A number of partnerships involving stakeholders across multiple agencies, organizations and spatial scales have been active within the UMRS for many years. The following examples are not meant to be all-inclusive but do provide a brief overview of the scopes and objectives of the many additional types of partnerships currently working within the UMRS. Representatives of

the Corps actively participate with many of them on a regular basis. Also included are a couple of examples from the Lower Mississippi Alluvial Valley (LMAV), which represent opportunities to broaden the range of interaction across an even greater range of experience and expertise throughout the entire Mississippi River system.

**The Upper Mississippi River Restoration – Environmental Management Program (UMRR-EMP)** – The UMRR-EMP was established by Section 1103 of the Water Resources Development Act of 1986. The UMRR-EMP is managed by the Corps of Engineers and implemented in cooperation with the USGS, USFWS, USEPA, USDA NRCS, and the five UMRS States of Illinois, Iowa, Minnesota, Missouri, and Wisconsin. The collaborative relationships among these Federal agencies, States, and other stakeholders developed by the UMRR-EMP provide a national model for large-scale restoration and monitoring work. The program area includes the bluff to bluff floodplain ecosystem on the Upper Mississippi River from Minneapolis, to Cairo; the Illinois Waterway from Chicago to Grafton; and navigable portions of the following rivers: Minnesota (15 miles), St Croix (24 miles), Black (1 mile), and Kaskaskia (36 miles), encompassing a total area of 2.6 million acres.

The UMRR-EMP consists of two principal components: (1) the Habitat Rehabilitation Enhancement Project (HREP); and (2) the Long Term Resource Monitoring (LTRM) component. The HREP component is managed by the Corps in consultation with the USFWS and the natural resource agencies of the five UMRS States. Through HREP, the Corps and its partners rehabilitate aquatic habitats degraded by navigation development and other changes to the river and its basin. The LTRM component is a multipurpose program of monitoring, applied research, and management evaluation designed to achieve the following broad goals (USGS 1997):

(1) Develop a better understanding of the ecology of the UMRS and its resource problems
(2) Monitor resource change
(3) Develop alternatives to better manage the UMRS
(4) Provide for the proper management of monitoring information.

The LTRM component is implemented by the USGS Upper Midwest Environmental Sciences Center (UMESC) and six field stations (Lake City, MN, Pool 4; La Crosse, WI, Pool 8; Bellevue, IA, Pool 13; Alton, IL, Pool 26; Havana, IL, La Grange Pool and Cape Girardeau, MO, Open River) operated by staff from the UMRS states. Overall program responsibility rests with the U.S. Army Corps of Engineers. The program supports a variety of monitoring, data serving, and research efforts. Monitoring data, results of various analyses and focused studies, and management tools and models developed under LTRM are publicly available on the internet (www.umesc.usgs.gov/ltrmp.html). For example, the LTRM component recently released an updated Status and Trends report on the ecological condition of the Upper Mississippi and Illinois Rivers (Johnson and Hagerty 2008).

The data and information generated by LTRM have been used in designing habitat rehabilitation projects and in developing various ecosystem restoration plans, including the Upper Mississippi River and Illinois Waterway Navigation Study and the Illinois River Basin Restoration Comprehensive Plan. The monitoring components of LTRM are not designed to evaluate

individual projects but to assess changes over time in response to larger scale influences such as natural fluctuations and cycles, multiple rehabilitation projects, or modifications to the watershed, as these effects become evident at the scale of a pool or river reach.

The core monitoring effort for LTRM currently samples three primary ecological components; fisheries, water quality, and aquatic vegetation, from six 30- to 60-mile river sections that embody the wide range of environmental gradients within the UMRS. Sampling of the fourth component, aquatic macroinvertebrates, has been suspended. Data on land cover, hydrology, and bathymetry are also collected, permitting the development of landscape indicators for comparison with biological and chemical indicators. LTRM is currently collecting LIDAR for the entire UMRS floodplain ecosystem, as well as systemic bathymetry and land cover data.

**Upper Mississippi River Basin Association (UMRBA) –** The Upper Mississippi River Basin Association (UMRBA) is a regional interstate organization formed by the governors of Illinois, Iowa, Minnesota, Missouri, and Wisconsin to coordinate the States' river-related programs and policies and work with Federal agencies that have river responsibilities. UMRBA is involved with programs related to ecosystem restoration, hazardous spills, and water quality, as well as floodplain management and flood control, commercial navigation, and water supply. Through its ecosystem restoration program, UMRBA is engaged in interagency efforts to restore and protect fish and wildlife habitat on the UMRS. UMRBA works closely with member States, Federal agencies, and others in planning, implementing, and managing these programs. (www.umrba.org)

**The Illinois River Basin Restoration Program –** The Illinois River Basin Restoration Program, authorized by Section 519 of WRDA 2000 seeks to restore and maintain ecological integrity, including habitats, communities, and populations of native species, and the processes that sustain them. The program also strives to develop, evaluate, and implement a collaborative and sustainable watershed-based approach to ecosystem restoration in the Illinois River basin. While a number of existing programs within the Corps and other Federal agencies are designed to plan and implement ecosystem restoration or environmental quality improvements at specific locations in the basin, no program was in place that allowed for watershed-wide comprehensive planning, evaluation, problem identification, and project selection within one authority. Existing programs are often limited in geographic extent or by available resources. The Illinois River Basin Restoration program meets that need by allowing for a comprehensive and collaborative watershed-based approach to solving the basin's problems and maximizing opportunities.

**The Upper Mississippi River Conservation Committee (UMRCC) –** The UMRCC was formed in 1943 to promote the preservation and wise use of the natural and recreational resources of the Upper Mississippi River and to formulate policies, plans and programs for cooperative studies. Its executive board includes voting members from each of the five Upper Mississippi River States (Minnesota, Wisconsin, Iowa, Illinois and Missouri). Nonvoting members include the five technical committee chairmen, an observer from the Upper Mississippi River National Wildlife and Fish Refuge, and the UMRCC Coordinator. Additional representatives from the EPA, Corps, USGS, and numerous other organizations are active participants within the UMRCC in various capacities. (www.mississippi-river.com/umrcc/)

**The Middle Mississippi River Partnership (MMRP) –** The MMRP is a collaboration of 20 Federal and State agencies and not-for-profit organizations that share a common goal of restoring and enhancing the natural resources of the Mississippi River corridor from its confluence with the Missouri River at St. Louis to its confluence with the Ohio River at Cairo. The partnership seeks to accomplish its goals and objectives through a combination of public and private resource management, compatible economic development, private lands conservation, and education and outreach to the citizens of the region. The MMRP developed a Regional Coordination Plan in 2005 and more recently released a report identifying ecosystem restoration options for the Middle Mississippi River Regional Corridor (MMRRC) using hydrogeomorphic (HGM) analyses (Heitmeyer 2008). (www.swircd.org/mmrp/index.htm)

**Upper Mississippi Forest Partnership (UMFP) –** A notable opportunity for collaboration is the Upper Mississippi Forest Partnership, which was formed in 2004 by State foresters from six states (Wisconsin, Minnesota, Iowa, Illinois, Missouri, and Indiana) and a forester from the USDA Forest Service Northeastern Area (St. Paul). The resulting action plan seeks to strengthen coordination among the Upper Mississippi River basin State forestry agencies, link State foresters directly to other agencies and groups working on common basin issues, develop and implement assessments and demonstration projects, and conduct educational efforts that will help address key watershed issues.
(www.na.fs.fed.us/watershed/upper_mississippi_partnership/)

**The Illinois River Coordinating Council (IRCC) –** The IRCC was created by the Illinois River Restoration Act of 1997 (20 ILCS 3967) and is chaired by the Illinois lieutenant governor. Among its responsibilities are the coordination of policy and initiatives within the Illinois River watershed for the preservation and restoration of the watershed, including a focus on the inter-related issues of economics, flooding, recreation, and tourism. Members include representatives from various State and Federal agencies and not-for-profit organizations working within the Illinois River watershed, appointed by the governor of Illinois.
(www.standingupforillinois.org/cleanwater/ircc.php)

**The Lower Mississippi Valley Joint Venture (LMVJV) –** The Lower Mississippi Valley (LMV) Joint Venture is a self-directed, non-regulatory private, State, and Federal conservation partnership that exists for the purpose of implementing the goals and objectives of national and international bird conservation plans within the Lower Mississippi Valley region. The LMVJV Forest Conservation Working Group actively focuses on issues such as defining desired future conditions for the Mississippi Alluvial Valley (MAV); developing coordinated forest inventory and monitoring protocols; developing web-based conservation planning, restoration, inventory and monitoring applications; and evaluating the effects of forest management on bird communities. (www.lmvjv.org/index.htm)

**The Lower Mississippi River Conservation Committee (LMRCC) –** The LMRCC is in many respects the Lower Mississippi River equivalent of the UMRCC. It is a cooperative, nonprofit organization of State and Federal agencies formed to address the challenges of renewing and effectively managing the natural resources of the Lower Mississippi River. Its mission is to promote the wise use of the natural resources of the Lower Mississippi River through cooperative efforts involving planning, management, information sharing, public education,

advocacy and research. Its members include representatives of the six Lower Mississippi River states (Missouri, Kentucky, Tennessee, Arkansas, Mississippi and Louisiana), and additional cooperating Federal agencies including the USFWS, USGS, Corps of Engineers, U.S. EPA, and NRCS. (www.lmrcc.org/index.htm)

### f. Cooperative Ecosystem Studies Units (CESU)

The Great Rivers CESU is part of a network of cooperative ecosystem studies units focusing on high-quality science, usable knowledge for resource managers, responsive technical assistance, continuing education, and cost-effective research programs. The Great Rivers CESU is a cooperative effort of 17 institutions (including universities and NGOs) and 7 Federal agencies, focused on the geographic area of the upper and middle Mississippi Valley. The mission of the Great Rivers CESU is to partner with Federal agencies in an effort to better understand and adaptively manage biophysical, cultural, economic and social resources and issues, especially those pertaining to large river ecosystems. (http://greatrivers-cesu.missouri.edu/)

## 3. Institutional Framework for Projects Off of Federally Owned Lands

**Funding Arrangements** – NESP funding arrangements for site specific forest and grassland management and restoration activities are dependent on land ownership. For fee-title lands owned by the Federal Government within the UMRS project area, the arrangement is 100 percent Federal funding. A cost share arrangement of 65 percent Federal and 35 percent non-Federal applies on land that lies within the UMRS project area, but is non-Federal in ownership. This authorization follows directly from WRDA 2007 (H.R. 1495, Section 8004). A non-Federal partner and landowner cooperation would be required to implement projects on non-Federal lands, and a Federal interest must be shown to justify expenditure for any project. Proposed management actions on any project off of Federal lands would follow traditional Corps planning guidance to determining a Federal interest and benefit with regard project cost share funding.

The rationale behind the recommendation of 100 percent Federal funding on such a large scale follows from three primary factors. The first is the extensive amount of Federal resources within the waterway, including almost 285,000 acres of National Wildlife and Fish Refuges. More than 40 percent of North America's migratory waterfowl and shorebirds depend on the food resources and other life requisites that the system provides. Furthermore, the health of the project area upon the system as a whole extends system-wide, benefitting not only the five UMRS States, but also the five lower Mississippi Valley States, the Gulf of Mexico, and multiple tributaries within the entire Mississippi River system. Therefore, the benefits accrue to the nation and not just any individual State or region. The second factor is the large impact that the operation of the 9-foot navigation project has had on the environmental conditions of the river system. There is a convincing body of research and documentation related to the direct and indirect effects of creating, operating and maintaining the navigation system. Congress has declared the UMR-IWW to be nationally significant both as a navigation system and as an ecosystem. Therefore it is appropriate that the majority of the costs of sustaining the ecosystem as well as the navigation system be borne by the nation. The third reason is that the interstate nature of the navigation system would significantly and unreasonably complicate resultant cost sharing arrangements.

## Appendix D: Relationship to other Plans

A number of existing planning and management documents are in place that are relevant to this systemic forest stewardship plan. Brief explanations of these and other key technical reports are provided below.

### 1. Upper Mississippi River-Illinois Waterway System Navigation Feasibility Study

The Upper Mississippi River-Illinois Waterway System Navigation Feasibility Study, Final Integrated Feasibility Report and Programmatic Environmental Impact Statement (USACE 2004) is a long-term planning document that forms the foundation of the Navigation and Ecosystem Sustainability Program. The goal of the feasibility study was to outline an integrated plan to ensure the economic and environmental sustainability of the UMR-IWW Navigation System to ensure it continues to be a nationally treasured ecological resource as well as an efficient national transportation system. Ultimately, the result was an integrated plan that was approved as a framework for modifications and operational changes to the Upper Mississippi River and Illinois Waterway System to provide for navigation efficiency and environmental sustainability and to add ecosystem restoration as an authorized project purpose. Also included was a long-term ecosystem restoration plan to be accomplished in cooperation with the USFWS, the five States, and private non-profit groups to improve the natural resources of the river through projects for habitat creation, water level management, fish passage, and floodplain restoration.

### 2. The Upper Mississippi River Restoration - Environmental Management Program (EMP)

The Upper Mississippi River Restoration – Environmental Management Program (UMRR-EMP) is authorized by the Water Resources Development Act (WRDA) of 1986 and managed by the Corps of Engineers. The collaborative relationship among the multiple Federal agencies, States, and other stakeholders involved in the implementation of the UMRR-EMP provides a national model for large-scale restoration and monitoring work. The EMP currently consists of two principal components: (1) Habitat Rehabilitation Enhancement Projects (HREP), and (2) the Long Term Resource Monitoring Program (LTRMP). HREPs are effectively preserving and improving fish and wildlife habitat on the UMRS, as well as providing new information regarding river ecology and physical processes. The HREP program has fostered interdisciplinary and collaborative planning for habitat restoration, preservation, and enhancement. The LTRMP provides resource managers and decision-makers with information necessary to maintain the UMRS as a sustainable multiple-use large river ecosystem. The long term goals of the LTRMP were established through extensive Federal and State agency participation, and include developing a better understanding of the ecology of the UMRS and its resource problems; monitoring resource change; developing alternatives to better manage the UMRS; and providing for the proper management of LTRMP information. The 2004 Report to Congress contains additional information about the accomplishments of the EMP (USACE 2004b).

## 3. Corps of Engineers Master Plans and Operational Management Plans.

It is the policy of the Corps of Engineers that Master Plans (MPs) and Operational Management Plans (OMPs) be developed and implemented for each Corps civil works project, and they are intended to work in tandem. The master plans cover a single project or several projects, depending on what is best for the management of the resources involved. Their primary focus is on three components: (1) regional and ecosystem needs, (2) project resource capabilities and suitabilities, and (3) expressed public interests and desires. Within this framework, a master plan addresses all resources, including but not limited to fish and wildlife, vegetation, cultural, aesthetic, interpretive, recreational, mineral, commercial, out-granted lands, easements, and water.

Based on an approved MP, projects develop and implement an OMP to achieve the objectives outlined in the MP. OMPs contain a summary of natural resources inventories and evaluations, the inventory methodologies used, resource objectives, and site specific prescriptions for the management of the resources.

**Forest and Woodland Management** – MPs provide for multiple-use forest management wherever practicable and compatible with other uses of project land. Where applicable, OMPs provide for the continued production and harvest of forest products through sustained yield programs, reforestation, and accepted conservation practices. OMPs also can provide site specific prescriptions for forest and woodland management. Forest and woodland management is to be applied to develop, maintain, protect, and/or improve vegetation conditions for timber, fish, wildlife, soils, recreation, water quality and other beneficial uses.

**Grassland Management** – The Corps provides for the protection and development of vegetative cover other than forests and woodlands as well as the establishment of conservation measures for its maintenance. Grassland management techniques are to be applied whenever the opportunity exists to protect native grasslands or prairie and/or improve vegetative conditions as a soil conservation, watershed protection, fish and wildlife habitat, or range management practice. The range and grassland management program must comply with the resource objectives and/or land use classifications stated in the MP and OMP. Where applicable, the OMP provides site specific prescriptions for range and grassland management.

MPs and OMPs for the St. Paul, Rock Island and St. Louis District portions of the Upper Mississippi River have been completed. In close collaboration with partners, Corps staff regularly develop, budget for and implement site specific forest and grassland management prescriptions on Corps fee title lands through the OMP 5-year planning process. This process will be maintained under NESP program authority and will serve as one of the primary vehicles for implementing systemic forest stewardship goals and objectives.

## 4. LTRM Strategic and Operational Plan – FY 2010-2014

The 2010-2014 Strategic and Operational Plan for UMRR-EMP LTRM builds upon previous experience and knowledge to focus the LTRM component and maximize benefits of the public investment. For example, full implementation of the plan will result in systemic coverage of the

2.7 million acres of the UMRS floodplain with high resolution topographic, bathymetric, and land cover data. These data can be combined with other data sets to help develop more effective models that improve our scientific understanding of processes that drive habitat patterns and ecological responses. This knowledge will increase the effectiveness of large river restoration efforts and greatly reduce costs for project planning and design. During 2010-2014, LTRM will maintain the commitment expressed in the 2005-2009 plan to a complete program, including monitoring, analysis, research, communication, and management and serving of data and products. In addition, the plan also addresses important new information needs resulting from data gaps that have been identified as understanding of the river ecosystem improves. For example, floodplain forest monitoring was identified as one of the priority additional components over the plan's 5-year time frame.

### 5. U.S. Fish and Wildlife Service Comprehensive Conservation Plans.

The USFWS has completed Comprehensive Conservation Plans (CCPs) for the Upper Mississippi River National Wildlife and Fish Refuge, Trempealeau National Wildlife Refuge, and the Mark Twain National Wildlife Refuge Complex. These CCPs guide management for 15 years, help the Refuges meet their original purpose, and contribute to the mission of the National Wildlife Refuge System. The CCPs set visions, goals, measurable objectives, and outline strategies for reaching the objectives.

**Floodplain Forest and Grassland Habitat** – The CCPs recognize the importance of forest and grassland resources and include goals and objectives for maintaining these habitats across wide stretches of the floodplain. Strategies include vegetation inventories and active management through the preparation and implementation of habitat management step-down plans.

The CCPs and associated step-down plans will be an integral part of the process for implementing systemic forest stewardship goals and objectives on National Wildlife Refuge System lands addressed through this plan.

### 6. Upper Mississippi River System Ecosystem Restoration Objectives 2009

The Upper Mississippi River System – Ecosystem Restoration Objectives 2009 report is the final product of a planning process initiated in 2008 for the purpose of identifying areas for new restoration projects and identifying knowledge gaps at a system scale. The Report is intended to serve as a technical basis for investment decisions through 2013, and as a backdrop for the formulation of specific restoration projects and their adaptive ecosystem management (AEM) components.

Reach Planning teams were established in the four major UMRS floodplain reaches to refine ecosystem restoration objectives and to develop Reach Plans for ecosystem restoration for the first NESP 4-year planning cycle. The reach planning process leads to the identification of high priority areas for restoration of natural river processes, and provides context for formulating project features, defining performance measures, and designing monitoring plans. Additional cycles of reach planning will be completed every 4 years as part of the AEM process. Lessons learned from each planning cycle will be incorporated into the following cycle.

## 7. Environmental Pool and Reach Plans.

Environmental Pool Plans were prepared by the St. Paul District's Fish and Wildlife Work Group and the Rock Island District's Fish and Wildlife Interagency Group. Environmental Pool and Reach Plans are currently being drafted by the St. Louis District's River Resource Action Team. These plans identify desired future habitat conditions for which resource agencies and other river interests can strive in the Mississippi River Pools 1 through 26 and the 200-mile unimpounded reach of the Middle Mississippi River. These plans identify management needs and opportunities for each pool or reach, including forest and grassland habitats.

## 8. Habitat Needs Assessment.

As part of the reauthorization of the UMRR-EMP in 1999, a Habitat Needs Assessment (HNA) was developed in 2000. This report was an effort to document broad habitat protection and restoration needs to assist in planning future UMRR-EMP habitat projects. The HNA begins to identify long-term system-wide habitat needs at the system, reach, and pool scales. It also serves to focus future monitoring and research activities under the UMRR-EMP. This report identifies broad restoration objectives by reach, and addresses prairie and forest habitats.

## 9. Illinois River Basin Restoration Comprehensive Plan

The Illinois River Basin Restoration Comprehensive Plan assesses the total basin restoration needs and makes recommendations regarding continuing implementation under the existing authority and conducting further evaluations of ways to improve implementation. The Corps of Engineers and Illinois Department of Natural Resources worked in close coordination with numerous other State and Federal agencies in developing the plan. The Comprehensive Plan provides the vision, goals, objectives, and desired future and identifies the preferred alternative plan to restore the ecological integrity of the Illinois River basin system. The plan documents the need for and potential scope of the four components called for in Sec 519 (b)(3) of the Water Resources Development Act (WRDA) 2000: a restoration program; a long-term resource monitoring program; a computerized inventory and analysis system; and a program to encourage sediment removal technology, sediment characterization, sediment transport, and beneficial uses of sediment. An implementation framework and criteria are also presented to guide the identification, selection, study and implementation of restoration projects, monitoring and adaptive management activities, and further system investigations. The report also identifies the organizational structure and proposed roles of the other agencies in implementation.

## 10. Upper Mississippi and Illinois River Floodplain Forests - Desired Future and Recommended Actions.

This report was completed in September 2002 by the Upper Mississippi River Conservation Committee (UMRCC) to speak specifically to the forested component of the UMRS. The document reviews some of the past practices that have shaped the nature of the existing forests, describes processes currently underway, and recommends management actions to shape the future of the Mississippi and Illinois River forests.

## 11. Partners in Flight Physiographic Areas Plans.

Partners in Flight is a cooperative effort involving partnerships among Federal, State, and local government agencies, philanthropic foundations, professional organizations, conservation groups, industry, the academic community, and private individuals. This coalition has developed Bird Conservation Plans for different physiographic areas within the United States. A number of these plans overlap areas encompassed by the UMRS. Each plan discusses bird species of that region that are of special concern, habitat needs of those species, and desired management actions that could help these species.

## 12. U.S. North American Bird Conservation Initiative.

The U.S. North American Bird Conservation Initiative (NABCI) Committee is a forum of government agencies, private organizations, and bird initiatives helping partners across the continent meet their common bird conservation objectives. Its strategy is to foster coordination and collaboration among the bird conservation community on key issues of concern. Through annual work plans, the committee focuses its efforts on advancing coordinated bird monitoring, conservation design, private land conservation, tri-national projects, and institutional support in State and Federal agencies for integrated bird conservation. Bird Conservation Plans have been prepared for each region of the country, including areas adjoining the UMRS, along with conservation/management objectives for selected priority species.

## 13. Middle Mississippi River Partnership (MMRP) Coordination Plan.

The Middle Mississippi River Partnership (MMRP) is a collaboration of Federal and State agencies and not-for-profit organizations that have a common goal of restoring and enhancing the natural resources of the river corridor from St. Louis to Cairo. In 2005, the group issued the Middle Mississippi River Partnership Coordination Plan. This plan highlights historical natural resource trends, identifies priority resource issues along the corridor, and outlines goals and strategies for addressing those resource needs. The partners aim to achieve their goals through public resource management, resource compatible economic development, private lands conservation, and education and outreach. A subsequent document, the Middle Mississippi River Regional Plan, was released in 2008.

## 14. Upper Mississippi River and Great Lakes Region Joint Venture Plans.

The North American Waterfowl Management Plan (NAWMP) is a conservation initiative that seeks to restore waterfowl populations to 1970 levels in Canada, the United States and Mexico. The Upper Mississippi River and Great Lakes Region Joint Venture is one of several areas determined to be priority habitat areas of concern to waterfowl under the NAWMP. The goal of the Joint Venture is to increase populations of waterfowl and other wetland wildlife by protecting, restoring and enhancing wetland and associated upland habitats within the Joint Venture region. Specific habitat restoration acreage objectives are identified for focus areas within the Joint Venture region. Many of these focus areas are included in the NESP project area and will be considered in forest and grassland restoration and management planning decisions to contribute to Joint Venture goals and objectives.

### 15. Upper Mississippi Watershed Partnership Action Plan.

The Upper Mississippi Watershed Partnership Action Plan (2009-2013) was developed by the Upper Mississippi Forest Partnership, which in turn was initiated by the U.S. Forest Service Northeastern Area State and Private Forestry and the State foresters from Wisconsin, Minnesota, Iowa, Illinois, Missouri, and Indiana. The goals of the action plan were to strengthen coordination among the Upper Mississippi River basin State forestry agencies, link State Foresters directly to other agencies and groups working on common basin issues, develop and implement assessments and demonstration projects, and conduct educational efforts that will help address key watershed issues.

### 16. Lower Mississippi Valley Joint Venture (LMVJV) Forest Resource Conservation Working Group Plan.

The LMVJV Forest Resource Conservation Working Group produced a final report in 2007 entitled "Restoration, Management, and Monitoring of Forest Resources in the Mississippi Alluvial Valley: Recommendations for Enhancing Wildlife Habitat." This planning document was developed to meet three specific goals: (1) to define desired forest conditions that result from management of bottomland hardwood forests where the primary objective is the conservation of wildlife, (2) to provide technical recommendations for the restoration of bottomland hardwood forest on areas that have been converted to non-forested land uses (e.g., agriculture) that reflect the cumulative knowledge and experiences of land managers and researchers from the past decades of active reforestation, and (3) to recommend protocols and procedures for coordinated inventory and monitoring of forest resources on public lands managed for wildlife conservation such that restoration and management can be implemented in an adaptive manner. Although the recommendations contained within this report were developed to specifically address issues related to forest resources in the MAV, the working group believed that these recommendations were applicable to other bottomland hardwood systems across the southeastern United States, and they likely have a high degree of applicability to floodplain systems in the UMRS as well.

### 17. State Comprehensive Wildlife Conservation Plans

To receive funds through the Wildlife Conservation and Restoration Program (WCRP) and the State Wildlife Grants Program (SWGP), Congress charged each State and territory with developing a wildlife action plan. These proactive plans, known technically as "comprehensive wildlife conservation strategies," assess the health of each State's wildlife and habitats, identify the problems they face, and outline the actions that are needed to conserve them over the long term. For example, the Illinois Wildlife Action Plan is administered by the Illinois Department of Natural Resources and went into effect in 2006. More information about wildlife action plans is available from the Association of Fish and Wildlife Agencies (www.fishwildlife.org), and links to individual state wildlife action plans can be found at: www.wildlifeactionplan.org.

## Appendix E: Project Fact Sheets

This section includes fact sheets for individual projects formulated at the time of report development. As indicated in the implementation plan, new projects will be developed on an annual cycle. Prior to being scheduled for implementation through this plan, project sponsors will coordinate with the PDT.

**NAVIGATION AND ECOSYSTEM SUSTAINABILITY PROGRAM**

# UMRS SYSTEMIC HYDROGEOMORPHIC (HGM) MODELING AND ANALYSIS PROJECT

**Upper Mississippi River System**
**Illinois, Missouri, Iowa,**
**Wisconsin, Minnesota**
**St. Paul, Rock Island &**
**St. Louis Districts**

**EXPECTED ECOLOGICAL OUTCOMES:**
Sustainable systemic natural community ecosystem restoration, management, and restoration performance.

**ADAPTIVE MANAGEMENT OPPORTUNITIES:**
Refinement of existing hydro-geomorphological science with applied research toward application of UMR-IWW lock and dam operations hydrologic modifiers.

## RESOURCE PROBLEM:

Design of sustainable system-wide floodplain forest ecosystem restoration in an ecological, economic and efficient manner.

## PROJECT FEATURES:

The project area extends from the Upper Mississippi River from Minneapolis, MN to Cairo, IL; and the Illinois Waterway from Chicago to Grafton, IL; and navigable portions of the Minnesota, St. Croix, Black and Kaskaskia Rivers. The project area floodplain is 2,787,629 acres, the Upper Mississippi River and Illinois Waterway having 2,156,452 and 612,177 acres respectively, and is divided into 5 reaches:

| Reach | Acres |
|---|---|
| UMR Upper Impounded | 507,004 |
| UMR Lower Impounded | 976,395 |
| UMR Un-Impounded | 673,053 |
| IWW Upper | 62,823 |
| IWW Lower | 549,354 |

The Project is a systemic measure for hydro geomorphic modeling and analysis of 2.8 million acres of the project area to provide an evaluation of ecosystem restoration options for the UMR floodplain. The analysis will be required to ascertain viable and sustainable sites for restoring native ecosystem natural communities, including forest, prairie, and emergent wetland habitats.

The analysis will produce referenced hypothetical historical natural communities in contrast to current existing landscapes and hydro-periods to arrive at restorable natural community sites. These restorable sites will be recommended toward prioritization and /or management actions in collaboration with all stakeholders and in coordination with the NESP Floodplain Restoration Projects to attain sustainable systemic floodplain forest ecosystems.

## FINANCIAL DATA:

The total estimated project cost is $675,000, with additional $100,000 for adaptive management. The project is 100% federal cost.

Phase I – HGM Modeling & Analysis – MVS – Middle Mississippi River – 900,000 Acres
- $225,000 - Analysis
- $225,000 - Total

Phase II – HGM Modeling & Analysis – MVS Lower Pools – 900,000 Acres
- $225,000 - Analysis
- $225,000 - Total

Phase III – HGM Modeling & Analysis – MVR & MVP Upper Pools – 900,000 Acres.
- $225,000 - Analysis
- $225,000 - Total

## STATUS and SCHEDULE:

Phase I - MVS Modeling & Analysis.
- BY1 – Plans and Specifications
- BY2-3 - Analysis

Phase II- MVS Modeling and Analysis.
- BY2 – Plans and Specifications
- BY3-4 - Analysis

Phase III - MVR & MVP Modeling & Analysis.
- BY3 - Plans, Specifications
- BY4-5 - Analysis

## INFORMATION NEEDS:

- BY1 – Scope of Work.

190 5th St. East, St. Paul, MN 55101

US Army Corps of Engineers
St. Paul District

# Information Paper

## M1. Reno Bottoms Forest Restoration

### Upper Mississippi River System - Navigation and Ecosystem Sustainability Program


### Contact

**Randy Urich**, Team Leader
[redacted] fax. (507) 895-4116
[redacted]

**Jeff DeZellar**, District Project Manager
[redacted] (651) 290-5258 (fax)
[redacted]


### Location/Description

Pool 9, Upper Mississippi River
Miles 671 - 681
Houston County, Minnesota
Vernon County, Wisconsin
Allamakee County, Iowa
St. Paul District

### Problem Statement

Much of the current floodplain forest in the Reno Bottoms / Minnesota Slough sub area is not regenerating. Flat topography, higher ground water levels caused by impoundment, increased frequency and duration of inundation, reduced creation of new islands and shoreline and subsequent plant succession, and increased competition from reed canary grass and other herbaceous vegetation all adversely affect regeneration. Dutch elm disease has also eliminated most American elm, an old growth component of the river corridor. Thus, the current forest is composed mainly of a few highly water tolerant species, such as silver maple, which are now approaching the end of their life span. A younger tree age class replacement component is generally missing throughout the area. Reed canary grass competition is particularly problematic here because it effectively precludes the use of many conventional forest management (regeneration) practices. Proposed actions would focus on restoring forest species and age class diversity on up to 1,100 acres.

Project Features :

- Backwater dredging and placement of fine material over 50 acres of low lying area at 1-2' additional elevation to improve site conditions for tree planting; plant and protect mast and other native tree species
- Eradication and control of reed canary grass with reforestation on up to 1,100 acres
- Control undesirable vegetation around seedlings for 3-5 growing seasons
- Monitor tree survival and growth for 3-5 years

Expected Ecological Outcomes:
The project would directly improve habitat conditions over approx. 1,100 acres by providing forest species, size, age, and structural diversity. Adjacent upland and lowland forest habitats would be improved for forest interior species by larger contiguous forest block size.

Adaptive Management Opportunities:
Project monitoring will enable learning for future forest restoration actions.

### Current Status

Environmental assessment, plans and specifications are scheduled to begin in FY10. Dredging and site preparation will start in Spring 2011. Reforestation will be completed by June 15, 2012. Vegetation control and monitoring will continue in CY12 through CY15.

### Authority

The Water Resources Development Act of 2007, TITLE VIII Upper Mississippi River and Illinois Water-Way System, authorized the project.

### Fiscal (FY11-15)

| | |
|---|---|
| Estimated Federal Cost | $660,000 |
| Allocation through FY 2010 | $80,000 |

The total estimated project implementation cost is $575,000, with an additional $5,000 for monitoring. The breakdown is $405,000 for dredging and site preparation, $125,000 for planting and materials, and $45,000 for follow-up vegetation control. The project is 100% federal cost.

## Appendix F: Plan Comments

The Upper Mississippi River Systemic Forest Stewardship Plan was developed by a team of federal, state and non-governmental (NGO) partners. The development process included multiple rounds of document review and comment by team members leading up to a draft report that was reviewed by the NESP Science Panel and the Upper Mississippi River Restoration – Environmental Management Program (UMRR-EMP) Management Team. The comments were incorporated into an updated draft plan which was then distributed widely for review and comment by many Upper Mississippi River (UMR) partners, stakeholders and the public. The vast majority of comments were positive and supportive of the plan. The following table summarizes the plan comment process.

| DATES | REVIEWERS | FOCUS OF COMMENTS |
|---|---|---|
| May 2005 | Agency and NGO Team | Revisions to the project management plan and general outline for system plan development |
| Aug 2005 | Agency and NGO Team | Revisions to plan goals and objectives |
| Jul 2006 | Agency and NGO Team | Technical review of plan components |
| Sep 2006 | NESP Science Panel | Technical review of plan components |
| Sep 2009 | UMRR-EMP Team | Programmatic review of plan |
| Jan 2010 | UMR Partners and Stakeholders | Comprehensive review of final draft. Results were positive and supportive of the planning effort. |
| Jun 2011 | Public | Comprehensive review of final draft. Received a total of 12 public comments, all from citizens of St. Charles County, MO and Madison County, IL who were not in support of the plan. The team agreed the public comments received were not directly related to systemic forest management planning, which does provide significant benefits to the public. |

## U.S. Army Corps of Engineers District Contact Information:

**Mississippi River Environmental Section - St. Paul District**
1114 South Oak Street, La Crescent, MN 55947-1560
Phone Number: 651-290-5894

**Mississippi River Project Office - Rock Island District**
25549 182nd Street, Pleasant Valley, IA 52767
Phone Number: 309-794-4528

**Rivers Project Office - St. Louis District**
301 Riverlands Way, West Alton, MO 63386
Phone Number: 636-899-2600

For additional copies of the complete Upper Mississippi River Systemic Forest Stewardship Plan please visit www.OurMississippi.org.

US Army Corps of Engineers

Our Mississippi

National Great Rivers Research and Education Center

USGS science for a changing world

Minnesota Department of Natural Resources

Wisconsin Dept. of Natural Resources

DNR

Illinois Department of Natural Resources

Missouri Conservation Department

Cover photo courtesy of Lewis & Clark Community College

# MISSISSIPPI RIVER PROJECT MASTER PLAN
# WITH
# INTEGRATED ENVIRONMENTAL ASSESSMENT

## UPPER MISSISSIPPI RIVER WATERSHED
## POOLS 11-22
## 9-FOOT CHANNEL NAVIGATION PROJECT
## PLEASANT VALLEY, IOWA

## APPENDIX G

## 1989 SHORELINE MANAGEMENT PLAN

Bollman/dmc/590

CENCR-PD-E

05 SEP 1989

MEMORANDUM FOR Commander, U.S. Army Engineer Division,
North Central, 536 South Clark Street,
Chicago, Illinois 60605-1592

SUBJECT: Mississippi River Final Land Use Allocation Plan (LUAP), Final Shoreline Management Plan (SMP), and Public Participation Documentation for LUAP, SMP, and Environmental Assessment (EA)

1. We have enclosed three sets of the subject documents for final approval and internal distribution. Please distribute one set each to Mr. Loesch (CENCD-CO-MO), Mr. Eitel (CENCD-PD-ER), and Mr. Hogan (CENCD-RE-M) for their concurrence.

2. The LUAP/SMP/EA were distributed for agency and public review on 24 March 1989. The public comment period ended on 10 May 1989. The enclosed Public Participation Documentation package explains the review process and details the Corps response to all comments received. Please refer to CENCD-CO-MO Memorandum dated 13 June 1989 for comments pertaining to the draft LUAP, SMP, and EA. We concur with the recommendations which have been documented and/or made to the final plans.

3. Upon your final approval of the LUAP, SMP, and Public Participation Documentation, the Finding of No Significant Impact will be signed. The moritorium on private recreational structures will end upon approval of the SMP and CENCR will begin implementing the LUAP and SMP. The public will be notified by news release that the plans have been approved. The LUAP, SMP, and the Public Participation Documentation package will then be printed, pending funding, and distributed to agencies and public libraries.

4. Please call Ms. Dorie Bollman, CENCR-PD-E, at [redacted], Ext. 590, if you require any additional information.

ORIGINAL SIGNED BY

3 Encls (3cys)

JOHN R. BROWN
Colonel, EN
Commanding

DEPARTMENT OF THE ARMY
NORTH CENTRAL DIVISION, CORPS OF ENGINEERS
536 SOUTH CLARK STREET
CHICAGO, ILLINOIS 60605-1592

REPLY TO
ATTENTION OF

CENCD-CO-MO

OCT 0 5 1989

MEMORANDUM FOR Commander, U.S. Army District, Rock Island,
Clock Tower Building, P.O. Box 2004,
Rock Island, Illinois 61204-2004

SUBJECT: Final Approval of the Mississippi River Land Use Allocation Plan (LUAP), Shoreline Management Plan (SMP), and Public Participation Documentation for LUAP, SMP, and Environmental Assessment (EA)

1. Reference 5 September 89 CENCR-PD-E Memorandum, subject as above.

2. Final approval is hereby given to the subject document. Previous NCD comments regarding the Draft versions of the subject documents have been satisfactorily addressed by your office. You may now proceed with the signing of the Finding of No Significant Impact.

3. We suggest that a coordination meeting between Planning, Operations, and Real Estate Divisions be held in the District Office prior to the preparation and distribution of news releases to develop an orderly method of implementing the Master Plan and SMP. The extended moratorium on new shoreline use permits will probably lead to a large influx of permit applications and many questions by adjacent landowners and members of the public. The subject meeting would also provide an excellent opportunity to update field personnel on the cabin lease rental situation which is a very sensitive issue. It is important that all Natural Resource Management personnel along the Mississippi River become aware of the potential controversy that the cabin rental issue may generate.

4. Copies of the final Master Plan and Public Participation Documentation have been distributed as requested in your 5 September 89 memorandum.

OCT 05 1999

CENCD-CO-MO
SUBJECT: Final Approval of the Mississippi River Land Use Allocation Plan (LUAP), Shoreline Management Plan (SMP), and Public Participation Documentation for LUAP, SMP, and Environmental Assessment (EA)

5. Request that you forward one additional copy of the final Master Plan and six (6) copies of the Shoreline Management Plan to CENCD-CO. The additional copy of the Master Plan will for forwarded to CECW-ON and the Shoreline Management Plans will be distributed both within NCD and HQUSACE.

FOR THE COMMANDER:

CARL C. CABLE, P.E.
Chief, Construction-
Operations Division

# SHORELINE MANAGEMENT PLAN

# MISSISSIPPI RIVER
# NINE-FOOT CHANNEL
# NAVIGATION PROJECT

## POOLS 11-22

SEPTEMBER 1989

US Army Corps
of Engineers
Rock Island District

DEPARTMENT OF THE ARMY
ROCK ISLAND DISTRICT. CORPS OF ENGINEERS
CLOCK TOWER BUILDING-P.O. BOX 2004
ROCK ISLAND. ILLINOIS 61204-2004

REPLY TO
ATTENTION OF:

CENCR-PD-E

# SHORELINE MANAGEMENT PLAN

## MISSISSIPPI RIVER
## NINE-FOOT CHANNEL NAVIGATION PROJECT
## POOLS 11-22

SEPTEMBER 1989

SHORELINE MANAGEMENT PLAN

MISSISSIPPI RIVER
NINE-FOOT CHANNEL NAVIGATION PROJECT
POOLS 11-22

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SHORELINE MANAGEMENT PLAN

MISSISSIPPI RIVER
NINE-FOOT CHANNEL NAVIGATION PROJECT
POOLS 11-22

## I. INTRODUCTION

A. Purpose. The purpose of this Shoreline Management Plan is to furnish guidance for the management, protection, and preservation of the Mississippi River's environment while allowing a balanced use of the shoreline. Within this plan, the Rock Island District will establish its policy concerning private exclusive use of Corps of Engineers-owned property from Guttenburg, Iowa, to Saverton, Missouri. Private exclusive use involves placing private recreational structures or pursuing certain activities along Corps shorelines that are limited to the individual and are usually not available to the general public. The plan discusses the conditions and restrictions of such private exclusive use(s).

B. Scope. This plan does not apply to Corps-administered cottage site and residential leases or to commercial marina or navigation activities. The cottage site and residential lease policies are based on the Water Resources Development Act of 1986 [Public Law 99-662, Section 1134(a, b, and c)] and other Corps policy statements.

The Corps of Engineers outgrants some project property to the u.S. Fish and Wildlife Service through a Cooperative Agreement for fish and wildlife management purposes. Much of this outgranted land is managed as part of the Upper Mississippi River National Wildlife and Fish Refuge or the Mark Twain National Wildlife Refuge. Lands outgranted under the Cooperative Agreement are referred to as General Plan lands. Private recreational structures are not compatible with the purposes of a refuge. An effort has been made to zone lands so that private recreational structures are not within the Cooperative Agreement/General Plan. The status of private recreational structures that are in proximity to General Plan lands are discussed in this plan.

C. Authorities.

1. Title 36, Code of Federal Regulations, Part 327.30, Shoreline Management at Civil Works Projects, Proposed rule, June 8, 1988.

2. The Water Resources Development Act of 1986 [Public Law 99-662, Section 1134(d)].

3. U.S. Army Corps of Engineers, North Central Division Regulation 405-3, Special Use Licenses, dated July 13, 1964.

4. U.S. Army Corps of Engineers, Rock Island District, Mississippi River Project, Land Use Allocation Plan, Spring 1989.

5. U.S. Army Corps of Engineers, Rock Island District, Mississippi River Project, Resource Management Master Plan, 1969.

6. U.S. Army Corps of Engineers, Engineering Regulation 405-1-12, Chapter 8, Real Estate Handbook, November 20, 1985.

7. Section 10, Rivers and Harbors Act of March 3, 1899.

8. Section 404, Clean Water Act {33 USC 1344).

9. Title 36, Chapter III, Part 327, Code of Federal Regulations, Rules and Regulations Governing Public Use of Corps of Engineers Water Resources Development Projects, May 1986.

10. Engineering Manual 385-1-1, Safety and Health Requirements Manual, October 1984.

D. Policy. It is the Chief of Engineers' policy to protect and manage shorelines of all civil works water resource development projects under Corps jurisdiction in a manner which will promote the safe and healthful use of these shorelines by the public, while maintaining environmental safeguards to ensure a quality resource for use by the public. The objectives of all management actions will be to achieve a balance between authorized private uses and resource protection for general public use. Public pedestrian access to and exit from these shorelines will be preserved.

The current Corps policy, as stated above, has evolved over time. In the past, individuals were allowed to place private recreational structures on Government land to access and enjoy the opportunities afforded by the Mississippi River. over time, the appropriateness of this philosophy has been re-evaluated. The fundamental argument against allowing private use of Government land is that it is inappropriate to grant exclusive use privileges to individuals upon lands acquired and maintained with public funds. Government lands should be available for equitable use by all members of the public. Allowing private structures on Government land creates an appearance of private property and discourages the use of these shorelines by the general public. Protection of the project's resource

values should dictate how use of public land is regulated and managed. While current policies allow existing private exclusive use to continue under certain circumstances, such use is prohibited at new projects or at projects where such use did not exist before 1975.

Therefore, it is the policy of this plan that:

1. Existing permits/licenses for authorized private recreational structures and activities will be continued within certain limitations.

2. New permits/licenses for private recreational structures and activities will be allowed only in Limited Development Areas.

3. Modification or replacement of existing structures, or addition of new structures to a valid permit/license may be allowed within certain limitations.

4. All unauthorized structures or activities will be removed from Corps administered lands.

Each of these four policy statements is subject to the provisions and intent of this plan.

## II. PRELIMINARY PLANNING

The regulation establishing the Corps of Engineers policy concerning lakeshore management dates back to 1969. A major revision to this regulation was made in 1974. Recently, however the Corps has taken a broader view of lakeshore management and on June 8, 1988 published a proposed rule change in the Federal Register. The rule addresses Shoreline Management at Civil Works Projects and clearly applies to the Mississippi River Project. This plan represents the project's first Shoreline Management Plan. The allowable zones for private recreational structures, as described in this plan, are based on the Rock Island District's Land Use Allocation Plan.

## III. OTHER RELATED PLANS

The original Resource Management Master Plan for the project was prepared in 1947, with revisions in 1954 and again in 1969 through 1971. In 1980, the District began a revision to the master plan concentrating most on the land use allocation portion. At the same time, the St. Paul District and the U.S. Fish and Wildlife Service were preparing land use plans for their areas of responsibility. The U.S. Fish

and Wildlife Service Land Use Allocation Plan was completed in September 1986. The St. Paul District Land Use Allocation Plan was completed in September 1983. Additionally, the st. Paul District completed a Shoreline Management Plan for the Mississippi River from Minneapolis, MN. to Guttenberg, IA. in June 1987.

## IV. PUBLIC INVOLVEMENT

At the start of the land use allocation process, public workshops were held to solicit input from the public and other agencies. Throughout the development of the plan, District representatives have worked very closely with representatives of the u.s. Fish and Wildlife Service and the State's of Wisconsin, Iowa, Illinois, and Missouri. The public and agency involvement process included the review the draft Shoreline Management Plan and the draft Land Use Allocation Plan. The review period ended May 10, 1989. After evaluating the comments received, the plans were finalized and sent to the North Central Division of the Corps of Engineers for approval. The results of the public review are provided in the report titled "Public Participation Documentation" dated September 1989.

## V. DEFINITIONS

For the purposes of this plan, the following terms are explained:

A. Shoreline: A strip of land and water that extends 100 feet waterward from the ordinary high water mark, and from there 300 feet landward or to the Federal property line, whichever is less.

B. Private Exclusive Use: Any use by an individual or group of individuals for more than 14 consecutive days that deters use of Corps-owned shorelines by the general public. The use may be through a structure or an activity.

C. Private Recreational Structures: A privately owned and maintained recreational structure on Corps-owned shoreline intended primarily for individual, family, or limited group use. This does not apply to structures intended for general public or commercial use. For the purposes of this plan, this definition does not apply to cottage site and residential leases.

D. Private Dock: One type of private recreational structure which has a pier-like platform, open and without sides, extending from Corps-owned shorelines in or over

waters of the Mississippi River, that is used to secure, protect, and provide access to private recreational boats.

E. Structure: Private recreational structures which may include boat docks, storage sheds, steps, or other structures which are acceptable as discussed in this plan.

F. Shoreline Use Permit: An instrument issued by the Natural Resource Manager or his/her designee that authorizes certain private recreational structures/activities on Corps-owned shorelines to a single individual and their spouse.

G. Special Use License: One type of real estate instrument that authorizes minor structures, activities, or changes in landform at a specified location of Corps-owned shoreline to an individual and his/her spouse. This license does not grant any real estate property rights or other exclusive privileges.

H. Department of the Army Permit: An instrument used to authorize structures or work in or affecting navigable waters andjor the discharge of dredged or fill material into waters of the United States regardless of land ownership.

## VI. SHORELINE USE CLASSIFICATIONS

This plan allocates the Corps-owned shoreline of the Upper Mississippi River, Pools 11-22, into four classifications where additional private recreational structuresjactivities will either be prohibited or allowed. These shoreline classifications have been incorporated into the Rock Island District's Land Use Allocation Plan (LUAP) definitions. The interrelationship between the four shoreline use classifications and the six land use classifications are explained below.

A. Limited Development Areas. Shoreline areas where private recreational structuresjactivities may be authorized. This is the only classification where new permits/licenses may be issued to authorize private exclusive use(s). The corresponding LUAP classification is Recreation Low Density - Special Use.

B. Public Recreational Areas. Shorelines within designated or developed recreation areas managed by a governmental entity, commercial concessionaire, or non-profit organization. Private recreational structures/activities are not compatible within or near designated or developed public recreational areas. The corresponding LUAP classification is Recreation Intensive Use. Existing authorized structures in recreation intensive

zones will be allowed to remain provided they comply with certain limitations.

C. Prohibited Access Areas. Shoreline areas allocated for the protection of the public's physical safety or security of government installations. For these reasons, public access is not allowed within these areas. No private recreational structuresjactivities will be allowed in these areas. The corresponding LUAP classification is Project Operations. However, not all project operations zoned land is prohibited from public access. Prohibited access areas are generally located around locks, dams, spillways, or government storage areas. These areas are prohibited to public access because of the safety hazards involved or the need for security. Prohibited access areas are signed, fenced, or marked by warning lights. Both land and water access is prohibited.

D. Protected Shoreline Areas. Shoreline areas designated to maintain or restore aesthetic, fish and wildlife, cultural, or other environmental values. These areas also may be designated to protect an unstable shoreline from erosion or to prevent development in areas that are subject to excessive erosion, exposure to high wind, wave, or current action, or where development would interfere with navigation. No private exclusive use will be allowed in these areas except where authorized use currently exists. This use will be subject to certain limitations. Physical protection of the shoreline to prevent erosion may be allowed. Department of the Army permits may be required as part of the approval process. Some vegetative modification may be allowed only if the District Engineer determines that the activity will not adversely impact the environmental or physical characteristics for which the area was designated as protected. With the required coordination, the Corps may actively manage the forest resource in these areas. The corresponding LUAP classifications are Recreation Low Density - Public Use, Wildlife Management/Reserve Forest Land, Project Operations, or Natural Area.

## VII. LOCATIONS WHERE PRIVATE EXCLUSIVE USE WILL BE ALLOWED

Private exclusive use will be allowed within Limited Development Areas and in selected locations where valid permits/licenses authorize specific existing structures.

A. Limited Development Areas. Private exclusive use will be allowed within the limited development areas identified in Attachment 1. The corresponding LUAP classification is Recreation Low Density - Special Use.

The designation of limited development areas was determined by evaluating several aspects of the Mississippi River shoreline. All areas having historic private recreational structuresjactivities were considered. These locations designated as limited development areas were those that could sustain the placement of private structures and use without conflicting with other uses or detrimentally affecting on the area's environmental and physical resources. Those locations that could create user conflicts in the surrounding area or have detrimental effects on the sites natural resources were not designated as limited development areas.

Private recreational use is incompatible with public recreation area designation. Normally, limited development areas would not be permitted in close proximity to developed or designated recreation areas. However, some of the limited development areas that have been designated are near public recreation areas. Private structures within these limited development areas will be allowed due to the historic use and the lack of an identified environmental effect. This lenient view of limited development area designation was taken in an effort to achieve a balance between historic use and natural resource protection.

Within designated limited development areas, all existing legally authorized and properly maintained structures will be allowed to remain as long as they conform to the permit/license conditions. Permits/licenses are non-transferable. However, new owners of existing structures will be allowed to renew the existing permits/licenses to continue their use. New owners of existing structures must apply for a permit/license within 14 days of the private sale. If the new owner wishes to add structures or replace or modify existing structures, permission must be granted prior to any work. New structures and new permits/licenses will be allowed provided they meet the density and design criteria as explained in Section X.A. of this plan. A variance from these criteria may be allowed after district representative(s) consider the site-specific circumstances.

All existing structures within limited development areas that are currently authorized by a valid permit/license will be exempted from conforming to the density and design criteria until such time as the structure requires replacement or modification. Upon these conditions, all replacement, modified, or new structures must conform to the density and design criteria to be allowed.

The District Engineer or his representative may terminate a permit/license authorizing existing structuresjactivities if one of the following conditions occurs:

a. A structure is not in a usable and safe condition;

b. A structure occasions a threat to life or property;

c. The holder of the permit/license violates the terms of the permit/license; or

d. The site of the structure/activity is needed for immediate use for public purposes or higher public use.

Whenever a permit/license is terminated by the Corps for these four reasons, or the holder voluntarily relinquishes the permit/license, or the holderjspouse both die prior to sale, the continuation of authorized private use ceases. In addition, the holder of the permit/license is required, upon termination to remove the structures from the area.

The physical dimensions of the limited development areas will be determined on site by the Natural Resource Manager or hisjher designee. This is necessary since the scale of the LUAP mapping prevents the display of multiple land use designations of small tracts and exact area dimensions.

B. Authorized Private Exclusive Use Outside Limited Development Areas. Permits/licenses will be renewed only to allow the continuation of those site-specific, individual cases of private exclusive use which are currently authorized and existing as of the date of the approval of this plan. No new permits/licenses will be issued nearby or in proximity to these specific cases. The locations of these private uses are identified in Attachment 2. These structuresjactivities generally take place in Protected Shoreline or Public Recreation Areas. The corresponding LUAP zoning is Recreation Intensive, Recreation Low Density - Public Use, or Wildlife Management/Reserve Forest. Some of the structures will be located along shorelines managed under the Cooperative Agreement.

An existing permit/license authorizing specific structuresjactivities becomes null and void upon the sale of legal ownership. The new owner must apply within 14 days of the private sale for a permit/license renewal to continue use of the existing structures/activities. If the new owner wishes to add structures or replace or modify existing structures, permission must be granted prior to any work. To be allowed, additions, changes, or modifications must conform to the density and design criteria.

The District Engineer or his representative may terminate a permit/license authorizing existing structuresjactivities if one of the following conditions occurs:

a. A structure is not in a usable and safe condition;

b. A structure occasions a threat to life or property;

c. The holder of the permit/license violates the terms of the permit/license; or

d. The site of the structure/activity is needed for immediate use for public purposes or higher public use.

Whenever a permit/license is terminated by the Corps for these four reasons, or the holder voluntarily relinquishes the permit/license, or the holderjspouse both die prior to sale, the continuation of authorized private use ceases and no permit/license shall be issued under any circumstances for private structures/activities in that location. In addition, the holder of the permit/license is required, upon termination to remove the structures from the area.

## VIII. INSTRUMENTS FOR PRIVATE USE

A. Shoreline Use Permit. Shoreline use permits will be required for private recreational structures (primarily boat docks and other water-based features). Vegetative modification activities on project lands may be authorized under a Shoreline Use Permit provided they do not disrupt or change the land form. Vegetative modifications that would create or exacerbate erosion problems will not be allowed. Vegetative modification includes planting, trimming, cutting, or use of pesticides andjor herbicides. Prior to vegetative modification, a Shoreline Use Permit will be issued which outlines the conditions of any such work.

B. Special Use License. Private recreational structures or activities in support of boat moorage which involve grades, cuts, fills, or other changes to the landform and/or land-based support facilities will require a Special Use License. Typical structures/activities or changes in landform authorized under the Special Use License and regulated by this plan include:

| | |
|---|---|
| Steps | Walkways |
| Boat Ramps | Storage Sheds |
| Boat Winches and Rollers | Safety Fences |
| Boat Storage Racks | Pumps |
| Marine Rails | Utility Lines |

Conditions of the Special Use License will be provided upon its issuance.

C. Department of the Army Permits. Any structure (e.g., a boat dock) or work in or affecting navigable waters of the United States requires a Section 10 permit under the authority of the Rivers and Harbors Act. Any discharge of dredged or fill material into waters or wetlands of the

United states requires a permit authorized under Section 404 of the Clean Water Act. If a proposal involves work subject to both Section 10 and Section 404 jurisdiction, a single Department of the Army Permit will be considered. Conditions of the Department of the Army Permit will be provided upon its issuance.

D. State and Local Requirements. In addition to the Corps of Engineers issued permits mentioned above, it may be necessary to obtain additional permits as required by State and local law for the construction, operation, or maintenance of the allowed structures. Laws and regulations of State and local governments apply to actions taken along Corps shorelines. Compliance with these rules will be a condition of Corps-issued permits/licenses.

## IX. APPLICATIONS

The Corps must grant permission prior to the start of any new construction andjor replacement or modification of any existing structures. New owners of previously authorized structures must also apply to renew an existing permit/license. Application for all necessary Corps of Engineers-issued permits/licenses will be made by writing to:

District Engineer
U.S. Army Engineer District, Rock Island
ATTN: Real Estate Division
Clock Tower Building - P.O. Box 2004
Rock Island, Illinois 61204-2004

An application package will be provided to the applicant. The applicant will be required to complete the consolidated application form and provide all information as requested to allow the District representatives to make a comprehensive review. If this review determines that the request is compatible with the provisions of this plan, all necessary permits/licenses will be processed and provided to the applicant. Replacement or modification of any existing structures or the construction of any new private structures will not be allowed until the applicant has been issued all the necessary Corps of Engineers permits/licenses. Obtaining Corps authorizations does not preclude the need for the applicant to obtain any or all other necessary Federal, State and local authorizations. If the Corps application is denied, copies of the denial will be furnished to the applicant and any other involved entities.

## X. CONDITIONS OF PRIVATE EXCLUSIVE USE

A. Density and Design Criteria. Size, spacing, and design criteria will be applicable to all new boat docks. New docks will be required to be no less than 3 feet nor more than 6 feet in width, no closer than 50 feet to the next dock, and will extend no more than 100 feet from the ordinary high water mark. Variably shaped docks are authorized, provided that no portion of the dock exceeds 16.5 feet in dimension and that the total dock surface area does not exceed 600 square feet. Attachment 3 illustrates these criteria. Variance from these criteria may be authorized after consideration of the site-specific circumstances by the park manager or hisjher designee. All existing structures which are authorized by a currently valid permit will be exempted from conforming to the density and design criteria until such time as the structure requires replacement or modification. To be allowed, all replacement, modified, or new structures must conform to the density and design criteria. At the discretion of the District Engineer or his representative, docks that pose an obstruction or a hazard to navigation will not be allowed, regardless of size or spacing.

B. Construction Standards. The following construction standards apply to new, replacement, or modified structures of any type:

1. Structures must be constructed in accordance with the plans and specifications approved by District representative(s).

2. All docks must be securely anchored in place using posts, deadman, or other suitable means. Altering the natural terrain or vegetation, anchoring to trees, or obstructing general public use of the shoreline will not be allowed.

3. Electrical installations must be weatherproof and meet all current applicable electric codes and regulations. In addition, electrical installations must be certified in writing by a state registered electrician. The written certification must be submitted to the Corps upon request.

4. Boat mooring bouys and dock flotation units shall be constructed of materials that are clean and free of pollutants and will not become waterlogged or sink when punctured. Flotation units and devices must be composed of low density, closed cell, rigid plastic foam. Flotation units of any type will not be allowed unless filled with flotation foam. Pesticide and other harmful containers will not be allowed.

5. Only quick-disconnect temporary electric lines, waterlines, and telephone lines to the vessel will be allowed. No permanent utility hookups will be allowed.

6. Installation of structures conducive to human habitation such as sleeping accommodations, cooking facilities, heating facilities, toilet or shower facilities, refrigeration, television, etc., is prohibited.

C. Habitation. No structure shall be used for human habitation. Enclosed structures such as a storage shed are allowed. However, the interior of the structure will be subject to inspections at unscheduled intervals. The presence of facilities conducive to human habitation will be treated as presumptive evidence of such use and will be cause for termination of the permit/license.

D. Posting of Permits. Each license/permittee will be assigned an identifying number. The individual shall post the plate provided by the government which bears the number at the site.

## XI. DURATION AND RENEWAL

All licenses/permits are nontransferable and become null and void upon the sale of legal ownership or the death of the permittee and his/her legal spouse. Anyone purchasing structures authorized under an existing licensejpermit must apply to renew a license/permit in their name. An application does not guarantee approval.

Licenses/permits will be renewed for periods of 1 to 5 years. The District will send existing licenseesjpermitees a renewal notice to their permanent address informing them of the upcoming renewal. Prior to the expiration of the licensejpermit, the holder will be required to submit a renewal application to continue authorized use of the site.

Prior to finalizing the sale of any authorized structures, the permittee/licensee will notify the District. The new owner must apply to renew the permit/license within 14 days of the sale. Otherwise, the structures must be removed and the area restored within 30 days of the sale.

## XII. COMPLIANCE AND TERMINATION

A. compliance. Corps representatives will periodically inspect structuresjactivities to ensure compliance with the terms of the permit/license. In the

event that the construction or use does not conform to approved plans or licensejpermit conditions, the work or use will be halted until such time as the terms are met. Noncompliance with the terms of the permit/license will result in termination.

B. Facility Maintenance. Authorized structures must be operated, used, and maintained in a safe, healthful condition at all times. If determined to be unsafe, the hazard will be corrected within 60 days or removed at the owner's expense. If the hazard is not corrected or removed within that timeframe, termination of the permit/license will result.

c. Termination. Permits/licenses may be termination when it is determined that the public interest requires such termination or when the owner fails to comply with the terms and conditions of the permit/license. Failure to maintain a permitted/licensed structure is a violation of the terms. Upon termination, the permittee/licensee must remove the structure(s) within 30 days at hisjher expense and restore the shoreline to a condition acceptable to the Corps representative. If the permittee/licensee fails to comply to the satisfaction of the Corps representative, the structure may be removed by the Corps and the permittee/licensee held responsible for all costs incurred.

D. Appeal Rights. Upon notice of termination, the permittee/licensee will have up to 30 days to make a written request for a hearing. The District Engineer will grant the request at the earliest possible convenience. After the hearing, a final decision will be rendered in writing and mailed to the permittee/licensee by certified mail.

E. Emergency Termination. In spite of paragraphs C and D above, if, in the opinion of the District Engineer, emergency circumstances dictate otherwise, the District Engineer may summarily terminate the permit/license.

F. Unauthorized Structures. Only structures authorized by permit/license will be allowed to remain on corps shorelines. Any unauthorized use or structures will be considered an encroachment on public property under the authority of Title 36 Chapter III, Part 327.20, of the Code of Federal Regulations.

## XIII. ENFORCEMENT

The prov1s1ons contained within this plan are supported by the authorities and statutes indicated in Section I.e.

A violation of these mandates will be subject to enforcement under Title 36, Chapter III, Part 327, Code of Federal Regulations, or other civil laws, as necessary.

## XIV. **PLAN** IMPLEMENTATION

This plan represents the Rock Island District's policy concerning use of Corps shoreline for Mississippi River Pools 11-22. This plan becomes effective upon approval by the Division Engineer, North Central Division, Corps of Engineers.

It is the policy of the U.S. Fish and Wildlife Service that private exclusive use is not compatible with refuge management objectives. Therefore, limited development areas are excluded from project lands administered by the U.S. Fish and Wildlife Service as part of the Upper Mississippi River National Wildlife and Fish Refuge and the Mark Twain National Wildlife Refuge.

Existing authorized structures located outside the boundaries of the Limited Development Areas but within the Cooperative Agreement/General Plan areas, will be allowed to stay, subject to the conditions specified in this plan. No new authorizations will be issued within such areas. At these locations, the management of the permits/licenses will be retained by the Corps while the adjacent lands or water will be managed under the Cooperative Agreement/General Plan.

ATTACHMENT 1

Limited Development Areas

| Pool No. | River Mile | Real Estate Tract No. | Existing Licenses |
|---|---|---|---|
| 11 | 607.4 | FW-262 | 1 |
| 11 | 599.2 | FIA-64 | 1 |
| 12 | 578.0 | FI-78 | 1 |
| 12 | 577.8 | FI-77 | 5 |
| 12 | 577.7 | FI-76 | 2 |
| 12 | 574.4 | FIA-28 | 9 |
| 12 | 562.3 | FIA-8 | 1 |
| 12 | 558.2 | FIA-54 | 3 |
| 12 | 558.1 | FIA-53 | 2 |
| 12 | 557.9 | FIA-52 | 2 |
| 12 | 557.8 | FIA-51 | 4 |
| 12 | 557.6 | FIA-50 | 6 |
| 13 | 555.0 | FIA-288 | 0 |
| 13 | 554.5 | FIA-287 | 8 |
| 13 | 544.1 | FI-229 | 3 |
| 13 | 531.3 | FI-126 | 20 |
| 13 | 531.2 | FI-123 | 11 |
| 13 | 530.8 | FI-120 | 33 |
| 13 | 530.6 | FI-119 | 3 |
| 13 | 530.5 | FI-118 | 3 |
| 13 | 529.6 | FI-113 | 25 |
| 13 | 529.0 | FI-195 | 2 |
| 13 | 528.2 | FI-194 | 8 |
| 14 | 501.2 | FIA-160 | 8 |
| 14 | 497.0 | FI-61 | 1 |
| 16 | 466.0 | FI-38 | 3 |
| 16 | 465.2 | FI-37 | 4 |
| 16 | 460.1 | FIA-16 | 1 |
| 16 | 460.1 | FIA-21 | 1 |
| 16 | 459.1 | FIA-9 | 4 |
| 16 | 458.6 | FIA-7 | 2 |
| 17 | 442.5 | FIA-13A | 2 |
| 17 | 442.1 | FIA-10 | 4 |
| 18 | 421.4 | FI-79 | 5 |
| 18 | 421.3 | FI-78 | 1 |
| 18 | 420.9 | FI-75 | 14 |
| 18 | 420.7 | FI-74 | 15 |
| 18 | 419.0 | FI-73 | 0 |
| 18 | 419.9 | FI-72 | 0 |
| 18 | 419.8 | FI-71 | 6 |
| 18 | 419.0 | FI-70 | 13 |
| 18 | 418.5 | FI-69 | 4 |
| 21 | 330.0 | FI-128 | 6 |
| 21 | 329.7 | FI-125 | 0 |
| 21 | 329.3 | FI-121 | 8 |
| 21 | 329.2 | FI-120 | 8 |

ATTACHMENT 1 (Cont'd)

Limited Development Areas

| Pool No. | River Mile | Real Estate Tract No. | Existing Licenses |
|---|---|---|---|
| 21 | 329.0 | FI-119 | 4 |
| 22 | 305.1 | FM-15 | 1 |
| 22 | 305.0 | FM-6 | 3 |
| 22 | 301.6 | FI-1 | 2 |
| 22 | 301.5 | A-2 | 2 |
| TOTAL | | 51 AREAS | 275 LICENSES |

NOTE:

1. All Limited Development Areas are zoned Recreation Low Density - Special Use in the Corps Land Use Allocation Plan.

2. New structures and new permits/licenses may be allowed in limited development areas provided they meet the conditions described in this plan.

3. The physical dimensions of a tracts Limited Development Area will be determined on site by the Natural Resource Manager or his/her designee. This is necessary since the scale of the LUAP mapping prevents the display of exact area dimensions and multiple land use designations for small tracts.

ATTACHMENT 2

Authorized Existing Private Use
Outside Limited Development Areas

| Pool No. | River Mile | Real Estate Tract No. | Existing Licenses | LUAP Classification (Administration) |
|---|---|---|---|---|
| 12 | 573.7 | FIA-26M | 3 | RI (COE) |
| 12 | 573.5 | FIA-26B-L | 5 | RI (COE) |
| 13 | 531.8 | FI-136 | 9 | RLD/PU (COE) *1 |
| 13 | 525.8 | FIA-69 | 1 | RI (COE) *1 |
| 14 | 499.7 | FIA-135 | 1 | RLD/PU (COE) |
| 14 | 499.5 | FIA-134 | 2 | RLD/PU (COE) |
| 14 | 498.8 | FIA-125 | 1 | RLD/PU (COE) |
| 14 | 497.3 | FI-64-83 | 1 | RLD/PU (COE) |
| 14 | 496.5 | FI-53 | 1 | RLD/PU (COE) |
| 14 | 494.0 | FIA-8 | 2 | RLD/PU (COE) |
| 16 | 471.0 | FI-48 | 1 | WM/RF (GP) |
| 18 | 432.0 | FI-107 | 10 | WM/RF (GP) |
| 18 | 425.7 | FI-95 | 12 | WM/RF (GP) |
| TOTAL: | | | 49 | |

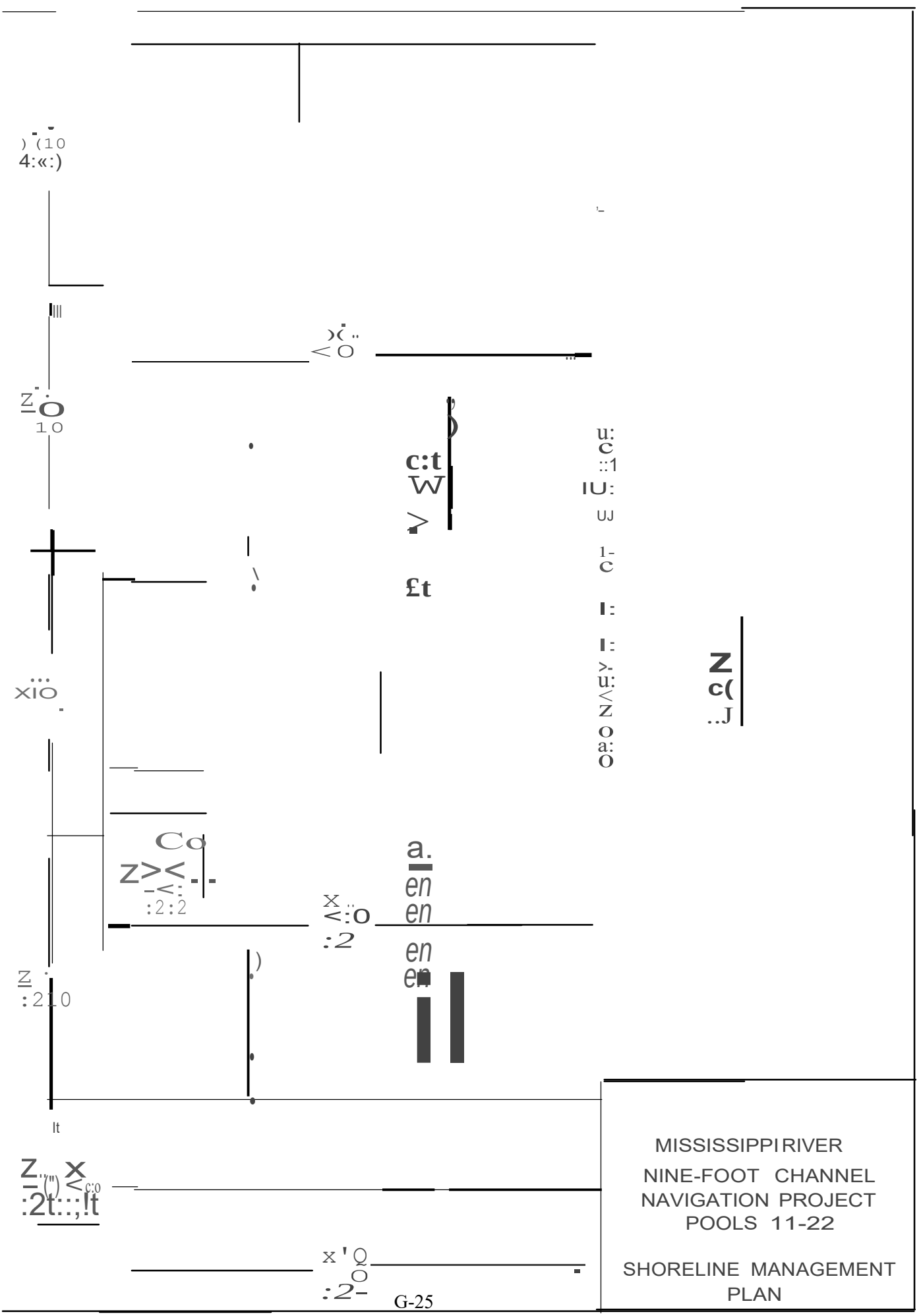
CODES:

| | |
|---|---|
| RI | Recreation Intensive |
| RLD/PU | Recreation Low Density/Public Use |
| WM/RF | Wildlife Management/Reserve Forest |
| COE | Area is to be administered by the Corps. |
| GP | Area is to be administered under the General Plan. However, permits or licenses will be managed by the Corps. |
| * 1 | Refuge begins at shoreline. |

NOTE:

1. The existing licenses described above are not contained within the limited development areas described in this plan.

2. The existing licenses described above will be allowed to remain and renewal permits/licenses may be granted subject to the provisions of this plan. However, no new permits/licenses will issued nearby or in proximity to these specific cases.



MISSISSIPPI RIVER
NINE-FOOT CHANNEL
NAVIGATION PROJECT
POOLS 11-22

SHORELINE MANAGEMENT
PLAN

ATTACHMENT 3

DISTRIBUTION LIST

| NAME: | NO. OF COPIES: |
|---|---|
| Mr. Kevin Szcodronski<br>Iowa Department of Natural Resources<br>Wallace State Office Building<br>Des Moines, Iowa 50319 | 1 |
| Messrs. Bill Aspelmeier/Bernie Schonhoff<br>Iowa Department of Natural Resources<br>Rural Route 3<br>Fairport Hatchery<br>Muscatine, Iowa 52761 | 1 |
| Mr. Dick Lutz<br>Illinois Department of Conservation<br>Statewide Planning Section<br>524 S. 2nd Street, Room 310<br>Springfield, Illinois 62706 | 4 |
| Messrs. David Kennedy/Terry Moe<br>Wisconsin Department of Natural Resources<br>3550 Mormon Coulee Road<br>State Office Building<br>LaCrosse, Wisconsin 54601 | 2 |
| Mr. Jack Boyles<br>Missouri Department of Conservation<br>P.O. Box 13<br>Ashburn, Missouri 63433 | 1 |
| Mr. Bill Dieffenbach<br>Missouri Department of Conservation<br>Box 180<br>Jefferson City, Missouri 65102 | 1 |
| Mr. Rick Berry, Complex Manager<br>Upper Mississippi River Refuge<br>U.S. Fish and Wildlife Service<br>Box 2484<br>LaCrosse, Wisconsin 54601 | 1 |
| Mr. Jim Lennartson, Project Leader<br>U.S. Fish and Wildlife Service<br>Room 101<br>51 East Fourth Street<br>Winona, Minnesota 55987 | 1 |

Mr. John Lyons, District Manager 1
U.S. Fish and Wildlife Service
P.O. Box 460
McGregor, Iowa 52157

Mr. Larry Wargowsky, District Manager 1
U.S. Fish and Wildlife Service
Post Office Building
Savanna, Illinois 61074

Mr. Bob Stratton, Project Leader 1
U.S. Fish and Wildlife Service
311 North 5th, Suite 100
Quincy, Illinois 62301

Mr. Rick Nelson, Field Supervisor 1
U.S. Fish and Wildlife Service
1830 Second Avenue
Rock Island, Illinois 61201

East Dubuque Public Library 1
218 Sinsinawa Avenue
East Dubuque, Illinois 61025

East Moline Public Library 1
740 - 16th Avenue
East Moline, Illinois 61244

Henderson County District Library 1
Biggsville, Illinois 61418

Quincy Public Library 1
526 Jersey Street
Quincy, Illinois 62301

Savanna Township Public Library 1
326 - 3rd Street
Savanna, Illinois 61074

Warsaw Free Public Library 1
Fourth & Clay Streets
Warsaw, Illinois 62379

Davenport Public Library 1
321 Main Street
Davenport, Iowa 52801

Carnegie-Stout Public Library 1.
11th & Bluff Streets
Dubuque, Iowa 52001

Cattermole Memorial Library 1
614 - 7th Street
Fort Madison, Iowa 52627

Keokuk Public Library 1
210 North 5th Street
Keokuk, Iowa 52632

Wapello Public Library 1
119 North Second Street
Wapello, Iowa 52653

Clinton Public Library 1
306 - 8th Avenue
Clinton, Iowa 52732

Guttenberg Public Library 1
Guttenberg, Iowa 52052

LeClaire Public Library 1
LeClaire, Iowa 52753

Ficke-Laird Library 1
University of Dubuque
2050 University Avenue
Dubuque, Iowa 52001

Hannibal Free Public Library 1
200 South Fifth Street
Hannibal, Missouri 63401

Andalusia Township Library 1
P.O. Box 365
Andalusia, Illinois 61232

Cordova Township Library 1
402 Main Street
Cordova, Illinois 61242

Schrnaling Memorial Library 1
P.O. Box 125
501 - lOth Avenue
Fulton, Illinois 61252

Hampton Public Library 1
Box 347
Hampton, Illinois 61256

Hamilton Public Library 1
861 Broadway Street
Hamilton, Illinois 62341

Moline Public Library **1**
504 - 17th Street
Moline, Illinois 61265

Nauvoo Public Library **1**
Mulholland Street
Nauvoo, Illinois 62354

Port Byron Township Library **1**
P.O. Box 10
106 North High Street
Port Byron, Illinois 61275

Rock Island Public Library **1**
4th Avenue & 19th Street
Rock Island, Illinois 61201

York Township Public Library **1**
West Main Street
P.O. Box 91
Thompson, Illinois 61285

Bellevue Public Library **1**
106 North Third Street
Bellevue, Iowa 52031

Bettendorf Public Library **1**
2950 - 18th Street
Bettendorf, Iowa 52722

Burlington Public Library **1**
501 North 4th Street
Burlington, Iowa 52601

Wahlert Memorial Library **1**
Loras College
Dubuque, Iowa 52001

Lansing Public Library **1**
Main Street
Lansing, Iowa 52151

McGregor Public Library **1**
334 Main Street
McGregor, Iowa 52157

Montrose Public Library **1**
Montrose, Iowa 52635

Musser Public Library **1**
304 Iowa Avenue
Muscatine, Iowa 52761

Sabula Public Library **1**
Sabula, Iowa 52070

# MISSISSIPPI RIVER PROJECT MASTER PLAN
# WITH
# INTEGRATED ENVIRONMENTAL ASSESSMENT

# UPPER MISSISSIPPI RIVER WATERSHED
# POOLS 11-22
# 9-FOOT CHANNEL NAVIGATION PROJECT
# PLEASANT VALLEY, IOWA

## APPENDIX H

## LISTED SPECIES

| Common Name | Scientific Name | Class | IA State Status | IL State Status | MO State Status | WI State Status | Federal Status | Listed in UMR Habitat Plan? | Listed in Great Rivers CCP/Habitat Plan? |
|---|---|---|---|---|---|---|---|---|---|
| Black Sandshell | *Ligumia recta* | **MUSSEL** | | Threatened | Imperiled | | | Y | |
| American Bittern | *Botaurus lentiginosus* | **BIRD** | | Endangered | Endangered | | | Y | Y |
| American Brook Lamprey | *Lampetra appendix* | **FISH** | Threatened | Threatened | | | | Y | |
| American Eel | *Anguilla rostrata* | **FISH** | | Threatened | | Special Concern | | y | |
| Amethyst Shooting Star | *Primula fassettii* | **PLANT** | | | Imperiled | | | | |
| Bald Eagle | *Haliaeetus leucocephalus* | **BIRD** | Special Concern | | Vulnerable | | | Y | |
| Barn Owl | *Tyto alba* | **BIRD** | Endangered | Endangered | Vulnerable | | | Y | |
| Beardgrass Skipper | *Atrytone arogos* | **INSECT** | Special Concern | | | | | Y | |
| Bell's Vireo | *Vireo bellii* | **BIRD** | | | | Threatened | | y | |
| Bewick's Wren | *Thryomanes bewickii* | **BIRD** | | Endangered | | | | | |
| Big Brown Bat | *Eptesicus fuscus* | **MAMMAL** | | | | Threatened | | y | |
| Black Buffalo | *Ictiobus niger* | **FISH** | | | | Threatened | | y | |
| Black Tern | *Chlidonias niger* | **BIRD** | | | | Endangered | | Y | |
| Black-crowned Night-Heron | *Nycticorax nycticorax* | **BIRD** | | Endangered | | | | y | |
| Black-footed Quillwort | *Isoetes melanopoda* | **PLANT** | Endangered | | | | | y | |
| Blanchard's Cricket Frog | *Acris blanchardi* | **AMPHIBIAN** | Threatened | Endangered | Endangered | Endangered | | y | |
| Blue Mud-plantain | *Heteranthera limosa* | **PLANT** | Special Concern | | | | | y | |
| Blue Sucker | *Cycleptus elongatus* | **FISH** | | | | Threatened | | y | |
| Bluntnose Darter | *Etheostoma chlorosoma* | **FISH** | Endangered | | | Endangered | | Y | |
| Bristly Sedge | *Carex comosa* | **PLANT** | | | Imperiled | | | N | |
| Brittle Prickly Pear | *Opuntia fragilis* | **PLANT** | | | | Threatened | | Y | |
| Broad-winged Skipper | *Poanes viator* | **INSECT** | Special Concern | | | | | Y | |
| Bullsnake | *Pituophis catenifer sayi* | **REPTILE** | Special Concern | | Imperiled | | | y | |

| Common Name | Scientific Name | Class | IA State Status | IL State Status | MO State Status | WI State Status | Federal Status | Listed in UMR Habitat Plan? | Listed in Great Rivers CCP/Habitat Plan? |
|---|---|---|---|---|---|---|---|---|---|
| Bulrush | *Scirpus pedicellatus* | **PLANT** | Special Concern | Threatened | | | | | |
| Butterfly Mussel | *Ellipsaria lineolata* | **MUSSEL** | Threatened | Threatened | | Endangered | | y | |
| Byssus Skipper | *Problema byssus* | **INSECT** | Threatened | | | | Endangered | y | |
| Central Mudminnow | *Umbra limi* | **FISH** | | | Endangered | | | Y | Y |
| Central Newt or Eastern Newt | *Notophthalmus viridescens* | **AMPHIBIAN** | Threatened | | | | | y | |
| Cerulean Warbler | *Setophaga cerulea* | **BIRD** | | Threatened | Imperiled | Threatened | | y | |
| Chestnut Lamprey | *Ichthyomyzon castaneus* | **FISH** | Threatened | | | | | Y | |
| Chinquapin Oak | *Quercus muehlenbergii* | **PLANT** | | | | Special Concern | | N | |
| Cinnamon Fern | *Osmunda cinnamomea* | **PLANT** | Endangered | | | | | | |
| Clustered Broomrape | *Orobanche fasciculata* | **PLANT** | Endangered | | | Threatened | | y | |
| Cobweb Skipper | *Hesperia metea* | **INSECT** | | Threatened | | | | y | |
| Columbine Dusky Wing | *Erynnis lucilius* | **INSECT** | Special Concern | | | | | y | |
| Common Moorhen | *Gallinula chloropus* | **BIRD** | | Endangered | | | | | |
| Common Musk Turtle | *Sternotherus odoratus* | **REPTILE** | Threatened | | | | | y | |
| Common Tern | *Sterna hirundo* | **BIRD** | | Endangered | | Endangered | | y | |
| Copperbelly Water Snake | *Nerodia erythrogaster neglecta* | **REPTILE** | Endangered | | | | | N | |
| Creeper | *Strophitus undulatus* | **MUSSEL** | Threatened | | | | | n | |
| Crested Fern | *Dryopteris cristata* | **PLANT** | | | Critically Imperiled | | | N | |
| Crystal Darter | *Crystallaria asprella* | **FISH** | | Threatened | | Endangered | | y | |
| Curved-pod Corydalis | *Corydalis curvisiliqua ssp grandibracteata* | **PLANT** | Endangered | | | | | | |
| Decurrent False Aster | *Boltonia decurrens* | **PLANT** | | Threatened | | | Threatened | | |
| Diamondback Water Snake | *Nerodia rhombifer* | **REPTILE** | Threatened | | | | | N | |
| Dusted Skipper | *Atrytonopsis hianna* | **INSECT** | Special Concern | | | | | Y | |
| Dwarf Dandelion | *Krigia virginica* | **PLANT** | Endangered | | | | | | |
| Earleaf Foxglove | *Tomanthera auriculata* | **PLANT** | Special Concern | Threatened | | | | | |

| Common Name | Scientific Name | Class | IA State Status | IL State Status | MO State Status | WI State Status | Federal Status | Listed in UMR Habitat Plan? | Listed in Great Rivers CCP/Habitat Plan? |
|---|---|---|---|---|---|---|---|---|---|
| Eastern Foxsnake | *Pantherophis vulpinus* | **REPTILE** | | | Critically Imperiled | | | | |
| Eastern Massasauga | *Sistrurus catenatus* | **REPTILE** | Endangered | Endangered | | Endangered | Threatened | y | |
| Eastern Pipistrelle | *Perimyotis subflavus* | **MAMMAL** | | | | Threatened | | y | |
| Eastern Prairie Fringed Orchid | *Platanthera leucophaea* | **PLANT** | | Endangered | | | Threatened | | |
| Eastern Red Damsel | *Amphiagrion saucium* | **INSECT** | | | Imperiled | | | | |
| Eastern Tiger Salamander | *Ambystoma tigrinum* | **AMPHIBIAN** | | | Vulnerable | | | Y | Y |
| Ebonyshell | *Fusconaia ebena* | **MUSSEL** | | Threatened | Endangered | Endangered | | y | |
| Edward's Hairstreak | *Satyrium edwardsii* | **INSECT** | Special Concern | | | | | y | |
| Elephant-ear | *Elliptio crassidens* | **MUSSEL** | | Threatened | | Endangered | | y | |
| Elusive Clubtail | *Stylurus notatus* | **PLANT** | | | Imperiled | | | N | |
| Evening Primrose | *Oenothera clelandii* | **PLANT** | | | Imperiled | | | N | |
| False Heather | *Hudsonia tomentosa* | **PLANT** | | Endangered | | | | | |
| False Mallow | *Malvastrum hispidum* | **PLANT** | | Endangered | | | | | |
| Fat Pocketbook | *Potamilus capax* | **MUSSEL** | Special Concern | Endangered | Endangered | | Endangered | n | |
| Fawnsfoot | *Truncilla donaciformis* | **MUSSEL** | | | | Threatened | | Y | |
| Flat Floater | *Anodonta suborbiculata* | **MUSSEL** | | | Imperiled | | | N | |
| Forster's Tern | *Sterna forsteri* | **BIRD** | | Endangered | | Endangered | | y | |
| Four-toed Salamander | *Hemidactylium scutatum* | **AMPHIBIAN** | | Threatened | | | | y | |
| Fragile Prickly Pear | *Opuntia fragilis* | **PLANT** | | Endangered | | | | y | |
| Ghost Shiner | *Notropis buchanani* | **FISH** | | | Imperiled | | | Y | Y |
| Glandular Wood Fern | *Dryopteris intermedia* | **PLANT** | Threatened | | | | | | |
| Globe Mallow | *Malvastrum hispidum* | **PLANT** | Special Concern | | | | | | |
| Glomerate Sedge | *Carex aggregata* | **PLANT** | Special Concern | | | | | | |
| Golden Aster | *Heterotheca villosa* | **PLANT** | Special Concern | | | | | | |
| Goldeye | *Hiodon alosoides* | **FISH** | | | | Endangered | | y | |

| Common Name | Scientific Name | Class | IA State Status | IL State Status | MO State Status | WI State Status | Federal Status | Listed in UMR Habitat Plan? | Listed in Great Rivers CCP/Habitat Plan? |
|---|---|---|---|---|---|---|---|---|---|
| Gorgone Checker Spot | *Chlosyne gorgone* | **INSECT** | | | | Special Concern | | y | |
| Grass Pickerel | *Esox americanus* | **FISH** | Threatened | | | | | N | |
| Gray Bat | *Myotis grisescens* | **MAMMAL** | | Endangered | Endangered | | Endangered | n | |
| Gray Ratsnake | *Pantherophis spiloides* | **REPTILE** | | | | Special Concern | | y | |
| Great Egret | *Ardea alba* | **BIRD** | | | | Threatened | | y | |
| Great Plains Ladies'-tresses | *Spiranthes magnicamporum* | **PLANT** | Special Concern | | | | | | |
| Green Trillium | *Trillium viride* | **PLANT** | | Endangered | | | | | |
| Henslow's Sparrow | *Ammodramus henslowii* | **BIRD** | Threatened | | | Threatened | | Y | |
| Hickorynut | *Obovaria olivaria* | **MUSSEL** | | | Vulnerable | | | N | |
| Higgins Eye | *Lampsilis higginsii* | **MUSSEL** | Endangered | Endangered | Endangered | Endangered | Endangered | y | |
| Hooded Warbler | *Wilsonia citrina* | **BIRD** | | | | Threatened | | y | |
| Horsemint | *Monarda punctata var. villicaulis* | **PLANT** | | | | | | | |
| Indiana Bat | *Myotis sodalis* | **MAMMAL** | Endangered | Endangered | Endangered | | Endangered | Y | |
| Interior Least Tern | *Sterna antillarum athalassos* | **BIRD** | Endangered | Endangered | Endangered | | Endangered (Proposed for Delisting) | N | Y |
| James' Clammyweed | *Polanisia jamesii* | **PLANT** | Endangered | Endangered | | | | y | |
| Jeweled Shooting Star | *Dodecatheon amethystinum* | **PLANT** | Threatened | | | | | | |
| Kentucky Coffee-tree | *Gymnocladus dioicus* | **PLANT** | | | | Special Concern | | N | |
| King Rail | *Rallus elegans* | **BIRD** | Endangered | Endangered | Endangered | | | Y | |
| Kirtland's Snake | *Clonophis kirtlandii* | **REPTILE** | | Threatened | Critically Imperiled | | | N | Y |
| Kitten Tails | *Besseya bullii* | **PLANT** | Threatened | Threatened | | | | y | |
| Lake Sturgeon | *Acipenser fulvescens* | **FISH** | Endangered | Endangered | Endangered | | | Y | |
| Lanced-leaved Buckthorn | *Rhamnus lanceolata ssp. glabrata* | **PLANT** | | | | Special Concern | | N | |
| Large Water Starwort | *Callitriche heterophylla* | **PLANT** | | | | Endangered | | Y | |
| Least Bittern | *Ixobrychus exilis* | **BIRD** | | Threatened | Vulnerable | | | y | |

| Common Name | Scientific Name | Class | IA State Status | IL State Status | MO State Status | WI State Status | Federal Status | Listed in UMR Habitat Plan? | Listed in Great Rivers CCP/Habitat Plan? |
|---|---|---|---|---|---|---|---|---|---|
| Least Shrew | *Cryptotis parva* | **MAMMAL** | Threatened | | | | | y | |
| Ledge Spikemoss | *Selaginella rupestris* | **PLANT** | Special Concern | | | | | | |
| Little Brown Bat | *Myotis lucifugus* | **MAMMAL** | | | | Threatened | | y | |
| Loesel's Twayblade | *Liparis loeselii* | **PLANT** | | | Imperiled | | | | |
| Loggerhead Shrike | *Lanius ludovicianus* | **BIRD** | | Endangered | | Endangered | | y | |
| Long-eared Owl | *Asio otus* | **BIRD** | Threatened | | | | | Y | |
| Long-tailed Weasel | *Mustela frenata* | **MAMMAL** | | | Vulnerable | | | N | Y |
| Marsh Bellflower | *Campanula aparinoides var. aparinoides* | **PLANT** | | | Critically Imperiled | | | N | |
| Marsh Skullcap | *Scutellaria galericulata* | **PLANT** | | | Critically Imperiled | | | N | |
| Marsh-speedwell | *Veronica scutellata* | **PLANT** | Special Concern | | | | | y | |
| Mississippi Kite | *Ictinia mississippiensis* | **BIRD** | | Threatened | | | | | |
| Mississippi Silvery Minnow | *Hybognathus nuchalis* | **FISH** | | | Vulnerable | | | Y | Y |
| Monkeyface | *Quadrula metanevra* | **MUSSEL** | | | | Threatened | | Y | |
| Mud Darter | *Etheostoma asprigene* | **FISH** | | | | Special Concern | | y | |
| Mudpuppy | *Necturus maculosus* | **AMPHIBIAN** | Threatened | Threatened | | | | y | |
| North American Racer | *Coluber constrictor* | **REPTILE** | | | | Special Concern | | y | |
| Northern Harrier | *Circus cyaneus* | **BIRD** | Endangered | Endangered | Endangered | | | Y | |
| Northern Long-eared Bat | *Myotis septentrionalis* | **MAMMAL** | Endangered | Threatened | Endangered | Threatened | Endangered | y | |
| Olympia White | *Euchloe olympia* | **INSECT** | Special Concern | | | | | y | |
| Ornate Box Turtle | *Terrapene ornata* | **REPTILE** | Endangered | Threatened | | Endangered | | y | |
| Osprey | *Pandion haliaetus* | **BIRD** | | Endangered | | | | y | |
| Ottoe Skipper | *Hesperia ottoe* | **INSECT** | Special Concern | Endangered | | Endangered | | y | |
| Oval Ladies'-tresses | *Spiranthes ovalis* | **PLANT** | Threatened | | | | | | |
| Paddlefish | *Polyodon spathula* | **FISH** | | | | Threatened | | y | |
| Pallid Shiner | *Hybopsis amnis* | **FISH** | | Endangered | | Endangered | | y | |

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|---|---|---|---|---|---|---|---|---|---|
| Patterson's Bindweed | *Stylisma pickeringii* | **PLANT** | | Endangered | | | | | |
| Paw Paw | *Asimina triloba* | **PLANT** | Special Concern | | | | | | |
| Pearly Everlasting | *Anaphalis margaritacea* | **PLANT** | Special Concern | | | | | | |
| Peregrine Falcon | *Falco peregrinus* | **BIRD** | Special Concern | Threatened | | Endangered | | Y | |
| Phacelia | *Phacelia gilioides* | **PLANT** | | Endangered | | | | | |
| Phlox Moth | *Schinia indiana* | **INSECT** | | | | Endangered | | y | |
| Pickerel Frog | *Lithobates palustris* | **AMPHIBIAN** | | | | Special Concern | | y | |
| Pin Oak | *Quercus palustris* | **PLANT** | | | | Special Concern | | N | |
| Pipevine Swallowtail | *Battus philenor* | **INSECT** | Special Concern | | | | | Y | |
| Pirate Perch | *Aphredoderus sayanus* | **FISH** | Special Concern | | | | | Y | |
| Pistolgrip | *Tritogonia verrucosa* | **MUSSEL** | Endangered | | | | | y | |
| Plains Hog-nosed Snake | *Heterodon nasicus* | **REPTILE** | | Threatened | | | | y | |
| Plains Pocket Mouse | *Perognathus flavescens* | **MAMMAL** | Endangered | | Critically Imperiled | | | N | |
| Powesheik Skipperling | *Oarisma powesheik* | **INSECT** | Threatened | | | Endangered | Endangered | y | |
| Prairie Ring-necked Snake | *Diadophis punctatus arnyi* | **REPTILE** | | | | Special Concern | | y | |
| Prairie Vole | *Microtus ochrogaster* | **MAMMAL** | | | | Special Concern | | y | |
| Prothonotary Warbler | *Protonotaria citrea* | **BIRD** | | | | Special Concern | | y | |
| Pugnose Minnow | *Opsopoeodus emiliae* | **FISH** | Special Concern | | | Special Concern | | Y | |
| Purple Angelica | *Angelica atropurpurea* | **PLANT** | Special Concern | | | | | | |
| Purple Cliff-brake Fern | *Pellaea atropurpurea* | **PLANT** | Endangered | | | | | | |
| Purple Wartyback | *Cyclonaias tuberculata* | **MUSSEL** | Threatened | Threatened | | Endangered | | y | |
| Purplish Copper | *Lycaena helloides* | **INSECT** | Special Concern | | | | | y | |
| Red-berried Elder | *Sambucus racemosa ssp. Pubens* | **PLANT** | | Endangered | Critically Imperiled | | | | |
| Red-shouldered Hawk | *Buteo lineatus* | **BIRD** | Endangered | | | Threatened | | Y | |

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|---|---|---|---|---|---|---|---|---|---|
| Regal Fritillary | *Speyeria idalia* | **INSECT** | Special Concern | Threatened | Vulnerable | Endangered | | y | |
| River Darter | *Percina shumardi* | **FISH** | | | Vulnerable | | | N | |
| River Redhorse | *Moxostoma carinatum* | **FISH** | | Threatened | | Threatened | | y | |
| Rock Elm | *Ulmus thomasii* | **PLANT** | | Endangered | | | | | |
| Rock Pocketbook | *Arcidens confragosus* | **MUSSEL** | | | Vulnerable | Threatened | | Y | Y |
| Rose Turtlehead | *Chelone obliqua* | **PLANT** | Special Concern | | Imperiled | | | | |
| Round Pigtoe | *Pleurobema sintoxia* | **MUSSEL** | Endangered | | | | | y | |
| Round-fruited St. John's-wort | *Hypericum sphaerocarpum* | **PLANT** | | | | Threatened | | Y | |
| Salamander Mussel | *Simpsonaias ambigua* | **MUSSEL** | | Endangered | | Threatened | | Y | |
| Sand Grasshopper | *Psinidia fenestralis* | **INSECT** | | | Imperiled | | | | |
| Sand Heather | *Hudsonia tomentosa* | **PLANT** | Endangered | | | | | Y | |
| Schweinitz's Flatsedge | *Cyperus schweinitzii* | **PLANT** | | | Vulnerable | | | N | |
| Sedge Skipper | *Euphyes dion* | **INSECT** | Special Concern | | | | | y | |
| Sedge Sprite | *Nehalennia irene* | **PLANT** | | | Critically Imperiled | | | N | |
| Shadbush | *Amelanchier interior* | **PLANT** | | Threatened | | | | | |
| Sheepnose | *Plethobasus cyphyus* | **MUSSEL** | Endangered | Endangered | Endangered | | Endangered | y | |
| Shoal Chub | *Macrhybopsis hyostoma* | **FISH** | | | | Threatened | | y | |
| Short-eared Owl | *Asio flammeus* | **BIRD** | Endangered | | | | | Y | |
| Short's Rock-cress | *Boechera dentata* | **PLANT** | | | | Special Concern | | N | |
| Showy Lady's Slipper | *Cypripedium reginae* | **PLANT** | Threatened | Endangered | | | | y | |
| Silphium Borer Moth | *Papaipema silphii* | **INSECT** | | | | Endangered | | y | |
| Silver Chub | *Macrhybopsis storeriana* | **FISH** | | | | Special Concern | | y | |
| Silvery Blue | *Glaucopsyche lygdamus* | **INSECT** | Threatened | | | | | Y | |
| Skipjack Herring | *Alosa chrysochloris* | **FISH** | | | | Endangered | | y | |
| Slender Fimbry | *Fimbristylis autumnalis* | **PLANT** | Special Concern | | | | | | |

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|---|---|---|---|---|---|---|---|---|---|
| Slender Sedge | *Carex tenera* | **PLANT** | Special Concern | | | | | | |
| Small Morning Glory | *Ipomoea lacunosa* | **PLANT** | Special Concern | | | | | | |
| Smooth Green Snake | *Liochlorophis vernalis* | **REPTILE** | Special Concern | | | | | y | |
| Smooth Rose | *Rosa blanda* | **PLANT** | | | Critically Imperiled | | | N | |
| Smooth Softshell | *Apalone mutica* | **REPTILE** | | Endangered | | Special Concern | | y | |
| Snow Trillium | *Trillium nivale* | **PLANT** | | | Vulnerable | | | N | |
| Snowberry | *Symphoricarpos albus* | **PLANT** | Special Concern | Endangered | | | | | |
| Snowy Egret | *Egretta thula* | **BIRD** | | Endangered | Endangered | | | N | Y |
| Snuffbox | *Epioblasma triquetra* | **MUSSEL** | | Endangered | | Endangered | | Y | |
| Sora | *Porzana carolina* | **BIRD** | | | Imperiled | | | Y | Y |
| Southern Bog Lemming | *Synaptomys cooperi* | **MAMMAL** | Threatened | | | | Threatened | y | |
| Southern Flying Squirrel | *Glaucomys volans* | **MAMMAL** | Special Concern | | | | | Y | |
| Spectaclecase | *Cumberlandia monodonta* | **MUSSEL** | Endangered | Endangered | Endangered | Endangered | Endangered | y | |
| Spike | *Elliptio dilatata* | **MUSSEL** | | Threatened | | | | y | |
| Spinulose Shield Fern | *Dryopteris carthusiana* | **PLANT** | | | Imperiled | | | N | |
| Spotted Joe-pye Weed | *Eupatorium maculatum var. bruneri* | **PLANT** | | | Critically Imperiled | | | N | |
| Summer Grape | *Vitis aestivalis* | **PLANT** | Special Concern | | | | | y | |
| Swamp Metalmark | *Calephelis mutica* | **INSECT** | Special Concern | Endangered | | | | y | |
| Timber Rattlesnake | *Crotalus horridus* | **REPTILE** | | Threatened | | | | y | |
| Trumpeter Swan | *Cygnus buccinator* | **BIRD** | | | | Special Concern | | y | |
| Tufted Loosestrife | *Lysimachia thyrsiflora* | **PLANT** | | | Critically Imperiled | | | N | |
| Two-spotted Skipper | *Euphyes bimacula* | **INSECT** | Special Concern | | | | | Y | |
| Upland Boneset | *Eupatorium sessilifolium* | **PLANT** | Special Concern | | | | | | |
| Upland Sandpiper | *Bartramia longicauda* | **BIRD** | | Endangered | | Threatened | | y | |

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|---|---|---|---|---|---|---|---|---|---|
| Wartyback | *Quadrula nodulata* | **MUSSEL** | | | Vulnerable | Threatened | | Y | Y |
| Washboard | *Megalonaias nervosa* | **MUSSEL** | | | | Special Concern | | Y | |
| Water Starwort | *Callitriche heterophylla* | **PLANT** | Special Concern | | | | | Y | |
| Waxleaf Meadowrue | *Thalictrum revolutum* | **PLANT** | Endangered | | | | | | |
| Weed Shiner | *Notropis texanus* | **FISH** | Endangered | Endangered | | Special Concern | | Y | |
| Western Hognose Snake | *Heterodon nasicus* | **REPTILE** | Endangered | | | | | y | |
| Western Sand Darter | *Ammocrypta clara* | **FISH** | Threatened | Endangered | Imperiled | Special Concern | | y | |
| Western Worm Snake | *Carphophis amoenus* | **REPTILE** | Threatened | | | | | y | |
| Willow Herb | *Epilobium leptophyllum* | **PLANT** | | | Critically Imperiled | | | N | |
| Winged mapleleaf | *Quadrula fragosa* | **MUSSEL** | | | | Endangered | | Y | |
| Wood Frog | *Lithobates sylvaticus* | **AMPHIBIAN** | | | Vulnerable | | | N | Y |
| Wood Turtle | *Clemmys insculpta* | **REPTILE** | | | | Endangered | | y | |
| Woodland Vole | *Microtus pinetorum* | **MAMMAL** | | | | Special Concern | | y | |
| Yellow & Slough Sandshells | *Lampsilis teres* | **MUSSEL** | | | | Endangered | Candidate Species | Y | |
| Yellow Mud Turtle | *Kinosternon flavescens* | **REPTILE** | Endangered | Endangered | Endangered | | | N | |
| Yellow Sandshell | *Lampsilis teres* | **MUSSEL** | Endangered | | | | Candidate Species | y | |
| Yellowbanded Bumble Bee | *Bombus terricola* | **INSECT** | | | | Special Concern | | y | |
| Yellow-crowned Night-Heron | *Nyctanassa violacea* | **BIRD** | | Endangered | | Threatened | | y | |
| Yellow-headed Blackbird | *Xanthocephalus xanthocephalus* | **BIRD** | | Endangered | | | | y | |
| Yellow-throated Warbler | *Dendroica dominica* | **BIRD** | | | | Endangered | | y | |
| Zabulon Skipper | *Poanes zabulon* | **INSECT** | Special Concern | | | | | Y | |

# MISSISSIPPI RIVER PROJECT MASTER PLAN
# WITH
# INTEGRATED ENVIRONMENTAL ASSESSMENT

# UPPER MISSISSIPPI RIVER WATERSHED
# POOLS 11-22
# 9-FOOT CHANNEL NAVIGATION PROJECT
# PLEASANT VALLEY, IOWA

## APPENDIX I

## 1982 FOREST, FISH, AND WILDLIFE MANAGEMENT PLAN

16 MAR 1982
NCDCO-MO (Undated) 1st Ind
SUBJECT: Forest, Fish and Wildlife Appendices

DA, North Central Division, Corps of Engineers, 536 South Clark Street,
Chicago, Illinois 60605 9 April 1982

TO: Commander, Rock Island District
ATTN: NCROD-R

1. In reference to your letter, the subject Master Plan is approved subject to the following correction. Change the reference to expiration of cottage site leases from "1988" to "1989". Recent legislation will require extension of these leases to 31 December 1989. This correction may be made via an errata sheet, if desired.

2. Although not required, it is suggested that a brief "foreword" be added to the plan, explaining that the primary emphasis on management is focused upon management of habitat for enhancement of wildlife and recreation resources and that the production and utilization of commercial forest products is ancillary to these main management objectives.

3. You are commended for preparation of a well-written and comprehensive forest management plan with management prescriptions that should serve to implement wise resource stewardship.

FOR THE COMMANDER:

5 Incl
wd

CARL C. CABLE, P.E.
Chief, Construction-Operations Division

DEPARTMENT OF THE ARMY
ROCK ISLAND DISTRICT, CORPS OF ENGINEERS
CLOCK TOWER BUILDING
ROCK ISLAND, ILLINOIS 61201

REPLY TO
ATTENTION OF:

NCROD-R

16 MAR 1982

SUBJECT: Forest, Fish and Wildlife Appendices

Commander, North Central Division
ATTN: NCDCO-MO

Inclosed please find 5 copies of the Forest, Fish and Wildlife Appendices B and D to the Master Plan for Mississippi River Pools 11-14, 16-18, 21 and 22. Copies of this management plan are provided for final review and approval.

FOR THE COMMANDER:

5 Incl
as

HENRY G. PFIESTER, P.E.
Chief, Operations Division

APPENDICES B AND D TO THE MASTER PLANS
FOR MISSISSIPPI RIVER POOLS 11-14, 16-18, 21 AND 22

FORESTRY AND FISH AND WILDLIFE

MANAGEMENT PLAN

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4. FOREST, VEGETATIVE, AND WETLAND COVER TYPES
5. MANAGMENT PRACTICES

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ADDENDUM 22

1. INTRODUCTION
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3. PRIORITIES LIST - POOL 22
4. ESTIMATED COST
5. INVENTORY DATA

## ATTACHMENTS

1. Cover typed - aerial photos are included as a separate attachment to this document. The aerial photos with cover types are labeled by Mississippi River Pool and will be used in conjunction with the management prescriptions described in this document.

2. Coordination.

# FOREST AND FISH AND WILDLIFE MANAGEMENT PLAN

## 1. PURPOSE AND POLICY.

### 1.1 Purpose.

The purpose of these management appendices is to present a flexible management guide for the forest and fish and wildlife resources on the Mississippi River, River Miles 614-300 (as required by ER 1130-2-400). The objective of this plan is to assure a long term healthy and diverse forest and fish and wildlife resource while achieving the multiuse management goals as expressed in the Master Plans.

Forestry and Fish and Wildlife appendices for Mississippi River Pools 15, 19, and 20 will not be written. Managable forestry resources or fish and wildlife resources do not exist in significant amounts on project lands in these pools.

### 1.2 Policy.

Management responsibilities of the natural resources on lands acquired for the 9-foot navigation project involves multiple Federal and State agencies. Principal administrative authority, however, remains under the Corps of Engineers with regard to the primary project purpose of navigation. National policies establish general administrative authority for the preservation, conservation, and recreational uses of project related resources. Management and development objectives concerning the natural resources are to assure such use is directed toward the continued enjoyment and maximum sustained use of both present and future generations, on a basis that is equal for all potential users. Priority is not assigned to any specific resource use objective, therefore, individual management actions seek to achieve mutually acceptable and compatible measures.

Intensive management programs on project lands concerning fish and wildlife conservation are primarily administered by either the US Fish and Wildlife Service (USFWS) or adjacent state agencies. A Cooperative Agreement made between the Department of the Army and the Department of Interior provides a large portion of project lands for fish and wildlife conservation programs. The Cooperative Agreement lands are managed by the US Fish and Wildlife Service as a part of the national refuge system or by the individual state conservation agencies through third party agreement.

The management plan outlined in this report represents a program to direct management actions for all project lands. The plan emphasizes forestry management objectives for all project lands, and represents the wildlife management objectives for lands not included in the Cooperative Agreement. Intensive management plans concerning fisheries and wildlife on Cooperative Agreement lands remain the responsibility of the USFWS and the respective state interest. Coordination during both preparation and implementation of Corps management actions on Cooperative Agreement lands is required with the USFWS and state agencies to assure compatibility with their respective fish and wildlife management goals.

The forestry management plan is directed to enhance the overall quality of wildlife habitat for both game and nongame species along with other project purposes. Production of fiber products is not to be a principal management objective. The basic goal of the plan is to establish and maintain a healthy timber resource to increase the value of such lands for beneficial uses including conservation, fish and wildlife habitat, and recreation. Wildlife management, as described in this plan, consists of those means by which the Corps of Engineers can use vegetation and/or forest manipulation to promote and maintain a diverse population of wildlife species on project lands. Strict wildlife management per se is not within the realm nor the intention of this plan, i.e., species stocking, construction of nest boxes, hunter control, etc. Our intentions do support, however, the cooperative venture of this management plan with the concerns and practices of other interested and affected State and Federal agencies for the benefit of all natural resources of the Mississippi River.

ADMINISTRATIVE AUTHORITY

Public Law 79-732, Fish and Wildlife Coordination Act of 1946. This act provides for a general plan to be developed with the Department of Interior to use designated Corps project lands and waters for wildlife conservation and management.

Public Law 85-634, The Fish and Wildlife Coordination Act of 1954. This law, amended in 1958, provides that fish and wildlife conservation shall receive equal considerations with other project purposes, and that such considerations be included in other aspects of water resources development programs.

Public Law 86-717, Conservation of Forest Land Act of 1960. This act requires that where applicable, timber resource management be carried out on Corps lands to increase the value of forest areas for conservation, recreation, and other beneficial uses.

Public Law 89-669, Protection of Rare and Endangered Species Act of 1966. This act provides for the conservation, protection, and propagation of the native species of fish and wildlife, including migratory birds, that are threatened by extinction.

Public Law 93-205, Endangered Species Act of 1973. This act provides for Federal agencies to use their authority to administer programs for the conservation of endangered and threatened species. Federal agencies are to insure that actions authorized by them do not jeopardize the continued existence of such endangered or threatened species to result in the destruction or modification of their habitat.

Public Law 93-251, The Water Resources Development Act of 1974. Section 77 of this act provides a 75-25 percent cost sharing between the Federal Government and State and local governments to enhance fish and wildlife on project lands as amendment to P.L. 89-72 authority.

2. NATURAL SETTING.

2.1 Location.

2.1.1 The Upper Mississippi River drains an area of 180,100 square miles. It is bounded on the north by the watershed of the Great Lakes, Lake of

the Woods, and the Red River of the North; on the east by the Great Lakes and the Ohio River basins; on the west by the Missouri River Basin; and on the south by the Arkansas and Lower Mississippi River drainage area. The Upper Mississippi River Basin includes major portions of Minnesota, Wisconsin, Iowa, and Illinois; a portion of Missouri; and minor portions of South Dakota and Indiana. Terrain consists principally of rolling land, with elevations ranging between 280 and 1,940 feet above sea level.

2.1.2 The Master Plan, and these appendices, cover 90,000 acres of project lands along a 315 mile stretch from Guttenberg, Iowa, to Saverton, Missouri.

2.2 Climate.

The average annual precipitation over the basin is 31.7 inches. Of this, 24.2 inches return to the atmosphere by the processes of evaporation and evapo-transpiration. The remaining 7.5 inches pass out of the basin as surface runoff via the Mississippi River, a basin-wide ratio of 24 percent. Average annual snowfall ranges from a high of 96 inches in the northern section to a low of 8 inches in the southern section.

The average annual temperature ranges from 40 degrees in the north to 59 degrees in the south. January has the lowest temperature, and July the highest. Basin winds generally blow from the northwest from January to April, and from the south during the remaining months. Mean wind speeds are 11 miles per hour in July and 10 miles per hour in October.

2.3 Soils and Geology.

2.3.1 The bedrock consists of nearly horizontal layers of sedimentary rock formed during geologic periods from the Ordovician (about 450 million years ago) to the Pennsylvanian (about 310 million years ago). The Ordovician, Silurian, Devonian, and Mississippian rocks consist mainly of dolomite, sandstone, and limestone; the Pennsylvanian rocks are mainly shales.

2.3.2 The Upper Mississippi River began its modern development about 10,000 years ago, at the close of the last (Wisconsinan) glaciation of North America. The receding ice left enormous quantities of crushed material debris in unsorted deposits of pebbles, sand, silt, and clay. Meltwaters collected in a great northern basin, called Lake Agassiz by geologists; it covered much of the area presently know as the Dakotas, Minnesota, Manitoba, and Saskatchewan. Serving as this lake's outlet, the Mississippi grew to a torrent of sediment-laden meltwater, eventually cutting a gorge. Agassiz slackened and sediments that formerly were carried to the sea filled the newly scoured Mississippi Valley. Today, the riverbed lies on top of as much as 200 feet of sand and silt.

2.3.3 A pliant bed of silt and sand is one key to the Mississippi's changeable character. The riverbed easily rearranges itself to pass around some obstacles and to obliterate others.

2.3.4 Flood plain soils are alluvial deposits primarily of silt and clay texture. Occassionally sand deposits of 2 - 20 feet in depth can overlay the silt or clay.

2.4 Topography.

2.4.1 From Guttenburg, Iowa (River Mile 614, the upper limit of the Rock Island District), to Saverton, Missouri (River Mile 300), the Mississippi River flows within a flood plain one to five miles wide bordered by wooded hills and bluffs. The bluffs closely restrict the watercourse in the northern section in many places. In the southern portion the river often divides and meanders through an extensive flood plain, most of which is now devoted to agriculture.

2.4.2 Project lands consist mostly of a strip of land along each bank, together with islands or parts of islands in the river. The most important flow characteristics of this meandering river are the relatively regular annual flood. A system of levees provides flood protection for a major portion of Mississippi River flood plain lands. The river is confined by agricultural levees in the southern reach, while bluffs confine the river in the northern reach above Savanna, Illinois.

3. FOREST RESOURCE.

3.1 The movement and presence of the Mississippi River has created several forest species associations that change with site microclimates along its bank and on its islands. Sloughs are being filled in and shorelines are being constantly changed, creating pioneer species associations. High water periods and low site elevation maintain silver maple or willow associations in many areas. Silt deposition and forest species succession lead to more modest moisture conditions that favor other species associations.

3.2 Soon after the creation of bare soil or sand by river or human activity, the bare medium is often colonized by sandbar willow (Salix interior), followed by or in combination with black willow (S. nigra) and cottonwood (Populus deltoides). Commonly growing among tree seedlings are usually such plants as cocklebur (Xanthium spp.), wormwood (Artemisia spp.), and grasses. Ideally, this initial phase of sandbar stabilization usually requires 2-5 years. However, this model may not occur so neatly in nature, and may take much longer than 2 years to stabilize. If, for instance, the bare soil was created by dredge spoil, initial colonization may take many decades and may be characterized by grasses as the initial vegetation. Woody species other than willow may follow the grasses such as cottonwood, black locust (Robinia pseudoacacia) or boxelder (Acer negundo). On lower river border sites, succession is generally held at the silver maple or willow stage by excessively moist conditions.

3.3 Pioneer stands mature rapidly, with the short-lived black willow competing vigorously in the overstory for about 20 years. Cottonwood may then dominate for one or two additional decades. The groundlayer is marked by areas of sand that alternate with thick stands of annual and perennial grasses and forbs. Accumulating leaf fall, twigs, and animal materials combine with silt trapped among the trees during floods to build up and enrich the soil. The seedlings of both willow and cottonwood are

poorly adapted to shady conditions. Eventually species such as silver maple (Acer saccharinum), green ash (Fraxinus pennsylvania), black ash (F. nigra), river birch (Betula nigra), and mulberry (Morus spp.), seed into the declining willow-cottonwood stands, especialy as large openings are created, supplanting both species in the stand. Dutch elm disease has reduced American elm, once important in this region, from the main canopy of the forest to the midstory or understory. The understory is often dominated by the seedlings of such shade-tolerants, with the intolerant cottonwood and willow saplings competing in canopy openings. The ground layer becomes densely overgrown with poison ivy (Toxicodendron radicans), trumpet vine (Campsis radicans), grapes (Vitis), bur cucumber (Sicyos angulatus), and wood nettle (Laportea canadensis).

3.4 In areas where sediment accumulation has raised the site, providing better drainage, species that require more moderate moisture conditions have become established. A list of such species would include sycamore (Platanus occidentalis), hackberry (Celtis occidentalis), hickories (Carya spp., especially C. cordiformis and C. ovata or C. laciniosa), pin oak (Quercus palustris), black walnut (Juglans nigra), honey locust (Gleditsia triacanthos), bur oak (Quercus macrocarpa), and pecan (Carya illinoensis). The understory sometimes contains persimmon (Diospyros virginiana), Red-Osier dogwood (Cornus stolonifera), flowering dogwood (Cornus florida), redbud (Cercis canadensis), hackberry, American elm and tall pawpaw (Asimina trilofa). The ground layer in such sites often becomes densly overgrown with poison ivy, miscellaneous weedy spp., bur cucumber and wood nettle.

3.5 Even though a slight increase in elevation provides better drainage for more valued species, such species are few or nonexistent on many higher sites. One reason, for instance, may be that bur oak, swamp white oak, hickory, and black walnut were logged on much of the pool. The logging operation left little or no seed source for regeneration. Because some species are at the edge of their range in the northern pools or grow in a favorable microclimate, the Mississippi River flood plain nut production may be more infrequent than in more favorable parts of their range. White oak, pin oak, hickory, and black walnut grow at the northern edge of their range along some of the Upper Mississippi River, while pecan and persimmon grow in favorable microclimates. When mast is produced, spring or summer floods often wash away the seeds before they can germinate and take root. Seedlings are often killed by extended inundation periods. Additionally, heavy growths of ground layer vegetation, squirrel consumption of the mast produced, and insect nut parasitism also contribute to the rarity of valuable species on better sites. For the above reasons, valuable species for wildlife and timber may need planting, burning, or other silvicultural practices to help establish and/or increase their numbers in the overstory, and to thus produce a self sustaining stand.

3.6 A few sites, such as Smith's Island above Lock and Dam #14, are never flooded. In this microclimate, species that grow on site out of the flood plain such as; sugar maple Acer saccharum, black cherry, Prunus serotina, white oak, Quercus alba, and red oak, Quercus rubra have become established and thrive. Sumac; Rhus sp.; dogwood; strawberry bush, Euonymus americanus;

and redbud are small shrub species or small trees found in the midstory. Ground cover includes bloodroot, Sanguinaria canadensis L; Solomon's seal, Polygonatum biflorum; and may apple, Podophyllum peltatum L.

## 4. FISH AND WILDLIFE RESOURCES.

### 4.1 Mammals.

4.1.1 Mammalian species occurring in the Mississippi River basin are diverse, with their real abundance limited by habitat. Unfortunately, most official attention has been paid in the past to mammals important to hunters and trappers. Habitat needs of species such as the western harvest mouse, meadow vole, little brown bat, and short-tailed shrew are of equal importance in wildlife management on the river. Many of these species are as abundant as their habitat is available and probably together do much to shape the natural environment of the Upper Mississippi. In the past, mammals important to hunters or trappers received systematic attention from agencies of State and Federal Government. The annual narrative reports of the two Federal refuges controlling land within the Rock Island District contain statistical information on these mammal species vary greatly in abundance from Pool 11 south to Pool 22. Such distributional differences are related to climate, existing land use, availability of suitable habitat, and degree of interspecific competition. Table 1 is a list of mammal species which occur naturally in the river valley.

4.1.2 The largest mammal dwelling along the upper river, the white-tailed deer, is now common in all but the most urbanized areas. The zone between wooded areas and cultivated fields provides shrubs, grasses, and other food plants, which the deer exploit in combination with waste grains, forest tree foliage, twigs, and fruits. The nuts of such forest trees as oaks, hickories, walnuts, and pecans are also important food sources. Low island and shoreline areas are usually accessible to deer and provide important foods and cover, however, the less diverse plant communities of the riverside sites are generally less crucial to the deer herd's nutrition than are forests and fields more distant, elevated, and thus protected from the influence of the river. The mobility of the deer permits them to take the best of each natural habitat in the river valley. Deer seek the protective cover and the food of dense shoreline forests in the fall after crops have been harvested. After wintering in the sheltered bottom lands, the deer are normally driven to higher ground by spring floods. A cycle of herd movement thus may be established by the interaction of human, climatic, and hydrologic circumstances. Predators, such as the coyote, dogs, and cats, are generally unable to overpower healthy adult deer, but may on rare occassion kill and feed on very young or diseased and downed animals.

4.1.3 Small bottom land herbivores are the six mouse, three rat, and three vole species. They feed primarily on the seeds, leaves and bulbs of plants but also consume insects, grubs, and other invertebrates when possible. They occupy every terrestrial habitat, building nests in dense grass, in tree hollows and in the ground. They are heavily preyed upon by such carnivores as owls, snakes, foxes, raccoon, mink, and skunk.

Populations near the river are frequently decimated by high waters. Survival of these species under such severe conditions is ensured only by high reproductive rates.

4.1.4 One species of cottontail rabbit inhabit the river valley with small existing populations being frequently decimated by high water. Rabbits consume grasses, forbs, and other tender foliage, much of which is most abundant in open meadows or along fence rows. Federal refuge records indicate that, except for the Ted Shanks Wildlife Area, relatively few rabbits live along the shores of the river because of a lack of adequate habitat free from the flooding danger.

4.1.5 Gray, fox, red, and flying squirrels inhabit a broad range of habitats within the river valley. Most frequently noticed and most heavily hunted is the fox squirrel. Past conversion of river valley forest to farm and open woodland greatly favored the fox squirrel, which prefer open areas and easy access to cultivated crops. The gray squirrel does best in excessive stands of mature hardwood forest and is therefore limited in numbers by lack of suitable habitat. Refuge records indicate that squirrels living near the river are not normally displaced or killed by flooding and their populations remain relatively stable despite predation by larger carnivorous mammals, birds, snakes, and man. Squirrels commonly eat acorns, fruits, buds, grains, and some invertebrates. Through the characteristic habit of burying nuts, squirrels contribute to the propagation of oaks, hickories, walnut, and pecan. The regeneration of populations of such species is of major importance to the animal community as a whole, since their seeds are a major food of many herbivores.

4.1.6 Beaver and muskrat are semiaquatic herbivores that complete most of their life cycles in the marshes, ponds, and backwaters of the river. Beaver construct lodges of sticks, and commonly excavate dens in the banks of sloughs and backwaters. Young thickets and forest stands, especially of willow and maple, provide food and construction materials. Beavers do not hibernate in winter, and must therefore store a supply of food underwater sufficient to last through periods of ice cover. Within the river valley, beavers have experienced great population fluctuations, related more to flooding and consequent denial of adequate habitat than to predation or recent trapping. Because beavers often interfere with drainage and other water control activities, trapping of Federal refuge lands has occasionally been authorized as a control measure. However, fur trapping intensity varies with the price of fur, and if price is low, trapping will generally be light. Present trapping pressure does not threaten beaver populations in the river valley.

4.1.7 Muskrat prefer shallow ponds and marshes that support dense stands of floating and emergent plants. Lodges are constructed of available vegetable material, and dens may be excavated in muddy banks. Muskrat feed on marsh vegetation and are exposed to light predation by hawks and owls, and heavy predation by mink and man. They provide many pelts to trappers. However, the marked fluctuations in muskrat populations during the period that Federal refuge statistics have been kept, reflect decimations during high water, rather than variations due to predation

and trapping. High reproductive capacity permits rapid replenishment of muskrat populations when habitat is restored to a favorable condition.

4.1.8 Skunk, raccoon, opossum, fox, coyote, weasel, mink, and feral cats and dogs are major predators in many portions of the Upper Mississippi River. While the life habits and abundance of these animals vary greatly, their food habits are somewhat similar and they all, to some degree, function to control populations of rodents, shrews, songbirds, snakes, lizards, amphibians, crustaceans, fishes, and insects. In order to satisfy their high energy needs, these predators roam over large areas, in some cases embracing island and shore forest, and do not hesitate to sample almost any food source. Each species is subject to predation, especially when young, and most are sought by trappers. Within the Upper Mississippi River valley, however, populations appear to be controlled more by floods and suitable habitat than by direct predation. Floods have periodically decimated predator populations living near the river; they suffer because flooding severely decreases the small animal populations upon which they feed. Striped or spotted skunk, river otter, weasel, and mink have been most affected by destruction of their hatitat. Statistics compiled during the past decade reveal either steady declines or maintenance of populations at very low levels. Trapping success, another measure of furbearer abundance, has generally declined since the early 1960's. Of the two fox species found in the valley, the forest-loving gray fox has suffered most from conversion of bottom land forests to farmland. The red fox, on the other hand, has found farmland and adjacent forests highly suitable. However, due to vectors, this species has suffered a serious population decline. Raccoon and opossum, which have adapted completely to the influence of man in the river valley, thrive throughout all rural areas and are also common in the urban suburbs. The coyote is increasingly reported in the Upper Mississippi River valley.

4.1.9 Moles and shrews daily consume enormous quantities of insects, earthworms, and other invertebrates. Shrews and moles experience heavy losses from predation, these losses are compensated for through a combination of high reproductive rates and adaptability to most habitats in the river valley. Except for areas recently flooded, all terrestrial habitats of the river valley host examples of these groups.

4.1.10 Bat species of the Upper Mississippi River valley are insectivores that seek their prey in the nighttime skies and rest throughout the day. Little brown bats, eastern pipistrels, big brown bats, and grey myotis bats are "cave bats," which seek shelter in caves during the day and may hibernate in caves through the winter. Indiana bats are cave bats and do hibernate in caves during winter. During the summer they roost in trees and have nursery colonies under the loose bark of large trees. Red bats and hoary bats do not use caves but rest in trees during the day; such "tree bats" migrate south for the winter. Bats are voracious consumers of flying insects and have few predators thus allowing individuals to survive many years. Nonetheless, bats are threatened by human activities that deny them preferred resting and wintering habitat. Timber removal and conversion of forest to farmland limits the daytime resting habitat of tree bats. Recreational development, urbanization, and other disturbances reduce the resting habitat of cave bats. The Indiana bat is probably rare

within the river valley and has suffered severe losses from damage to its highly centralized cave wintering sites; it has been placed on the Federal register of rare and endangered wildlife.

4.2 Resident and Migratory Birds.

4.2.1 Ducks, coots, and geese primarily use this upper portion of the river during the migratory seasons. These periods vary in response to natural variations in the arrival of spring and winter, and with variations in the supply of food and shelter along the flyway. Peak populations in the spring migration are generally recorded at the arrival of spring. Fall peaks may occur any time between mid-October and November. Favorable conditions along portions of the river may cause the flocks to linger until driven south by the advance of winter. Waterfowl tend to migrate with other of their species, and because responses of different species to seasonal changes in their environments vary, the peaks of river use by individual species may vary significantly. Certain species normally spend a longer period on the northern breeding grounds; and they typically precede other species in the spring and follow them in the fall.

4.2.2 Of all the birds, except blackbirds (various species including grackle and red winged), ducks use the river valley during seasonal migrations the most. Ducks may be categorized either as "dabblers" (surface feeding) or "divers" (seeking their food underwater). Among the dabblers, mallard, wood ducks, and green-winged teal are generally the most abundant during the migratory seasons. Other dabblers that are observed consistently include baldpate, black duck, gadwall, pintail, shoveler, and blue-winged teal. Diving duck numbers are dominated by scaup, with ring-necked ducks and canvasback also heavily represented. Other divers consistently using the flyway include mergansers, goldeneye, bufflehead, redhead, and ruddy ducks.

The diet of ducks varies by species, but all adults consume some plant and animal matter. Vegetable matter dominates the diet of most ducks; animal matter is the principal food of only a few species, such as goldeneye and mergansers. Dabbling ducks graze on leaves, seed heads, acorns, and bulbs of smartweed, pondweed, waterlilies, grasses, sedges, and many other plants that grow in or near shallow marshes and ponds. Waste grains also attract these ducks. Insects and aquatic invertebrates are eaten when possible. Dabbling ducks naturally congregate in marshes and sloughs where most of their food is available. Diving ducks find submerged plants, fish, and invertebrates in deeper water and therefore concentrate in open areas of the river. Areas that support a rich diversity of bottom organisms, such as the lake formed by Keokuk Dam, become favored feeding grounds and receive millions of duck visits each year. Other areas of the river, less fertile because of bottom disturbance or other reasons, may be visited by few or no diving ducks. Adult ducks are threatened by relatively few predators, and hunter management is federally and state controlled thereby minimizing damage to their populations in the Upper Mississippi River Valley. In contrast, losses are very severe on their more northerly breeding grounds, where owls, hawks, eagles, raccoon, fox, skunks, turtles, and other predators destroy eggs and kill ducklings. In addition, gradual

drainage of prairie breeding potholes for farming has combined with adverse weather to cause serious reproductive failure in recent years. Therefore, while distribution of ducks along the river during migration is heavily influenced by local habitat conditions, the total number of each species using the flyway is controlled by both reproduction habitat outside the Upper Mississippi River valley, and the river habitat that allows the mating pairs to reach the breeding area.

Wood duck, mallard, and blue-winged teal nest in many areas of the river valley. The wood duck is a versatile bird, able to use a variety of deep water, marsh, and woodland food sources. Acorns and the fruits of hickory, dogwood, and elm form important parts of its diet. Favored aquatic plants include pondweed, smartweed, arrow-arum, and water lily. Insects form only about 10 percent of the adult wood duck diet. Wood ducks nest in cavities in forest trees where some protection is afforded from such predators as raccoon, opossums, and snakes. The availability of suitable nesting cavities is crucial to the reproductive success of these birds. Young wood ducks are led from the nest to a marsh brooding area within a day of hatching. Ideal brooding areas offer an abundant invertebrate population, upon which the ducklings feed extensively, as well as concealment from hawks, owls, fox, mink, snapping turtles, and other predators. Land-locked ponds within islands frequently supply such ideal habitat. Unfortunately, marsh habitat is being steadily lost along the river because of river siltation and development.

Relatively small numbers of mallard and blue-winged teal nest in the river valley. Both species build nests in widely varied locations. Although most often hidden among bulrushes and reeds near the water's edge, nests may also be constructed hundreds of yards into the forest and are placed under logs, on piles of debris, and in tree cavities. Like wood ducks, the young of these species feed on insects and convert to the mostly vegetarian adult diet after the fledgling stage. Mallards and blue-winged teal obtain most of their nourishment from marsh plants, acorns, and cultivated crops. Eggs, ducklings, and occasional adults do fall prey to predators.

Canada geese pass through the river valley early in the spring and late in the fall. Canada geese have extended their breeding and wintering ranges to embrace most of the contiguous United States, and nesting has been reported in this portion of the Upper Mississippi valley. Canada geese are almost entirely vegetarian and graze on a wide variety of grasses, marsh plants, and cultivated crops. Snow and blue geese nest in the far north and share most habitat needs with Canada geese. Along the Mississippi River refuge planting are used by geese during years of good yield. Adult geese are generally protected by size from heavy predation but suffer some natural losses from accident and disease. Geese are extremely wary birds and during the hunting season, hunting pressures generally force them into "closed areas" of Federal and State wildlife refuges.

4.2.3 Coots are common migratory users of the river valley, usually migrating in large flocks, stopping frequently to rest and feed upon surface and underwater vegetation. Some animal matter, such as insects,

tadpoles, snails, and worms, is consumed also. Major predators of coots are raccoon, mink, turtles, hawks, owls, and eagles. Coots move southward slowly depending on climatic and habitat conditions and may stop over in suitable northern navigation pools.

4.2.4 Many species of shore birds and wading birds pass through the upper river valley during annual migrations, and several remain there each spring to nest (Table 2 lists these birds). The crayfish, tadpoles, small fish, insects, and other small creatures that comprise the diet of the predatory shore and wading birds abound in shallow water, among marsh plants, on beaches and grassy shoreline areas, and mud flats. Shore birds such as the sora rail and common gallinule, that feed on plant matter, find most of the leaves, fruits, grasses, and forbs on or near marsh areas. Shore birds that nest in the river valley may build their nests on marsh fringes (Sora rail), on a sandy or pebble shoreline (least tern), or on the forest floor (woodcock). Depending upon camouflage for protection, the nests are exposed to raids by a wide variety of predators, and to damage by recreationists.

4.2.5 Wading birds nesting throughout most of the upper river valley include great blue herons, common egrets, black-crowned night herons, bittern, little blue heron, and green herons. These birds like other wading birds present in the valley, stalk their prey of small fish, crayfish, amphibians, and invertebrates in shallow marsh waters. Great blue herons typically nest in the tops of large mature forest trees near the river. They are frequently joined by common egrets and black-crowned night herons. Nesting factors, such as specific species mix, tree spacing, and understory condition, are under study. Green herons nest singly or in small colonies, building nests about 20 feet from the ground in small trees near water. Eleven rookeries have been noted along the Mississippi River between Dubuque, Iowa, and Hannibal, Missouri. Mortality in herons and egrets is greatest on the nest and during the first six months of life. Older herons, egrets, and bitterns face much less danger from predators and may survive for many years.

4.2.6 Upland gamebirds are mostly excluded from riverside natural areas by frequent flooding. Incomplete records indicate that gray partridge, turkey, grouse, pheasant, and bobwhite quail are widespread but sparsely represented throughout the rural areas bordering the upper river. Hunting records applicable only to low-lying refuge lands reinforce this conclusion. In contrast, mourning doves make rather heavy use of areas near the river, feeding upon waste grains found in fields and weed seeds, which grow thickly on railroad embankments and roadsides, along levees, near navigation dams, on field margins, and in most forest clearings. Doves frequent sandy areas along the river to dust themselves and obtain grit. They prepare nests in the forest, occassionally on the ground. Eggs and chicks are destroyed by a wide variety of predators, but adults are swift flyers that can escape most predators. Doves are sought by hunters in this region, but records indicate that, due to the cyclic nature of dove populations, the hunters harvest is limited.

4.2.7. Hawks are present in the river valley usually as migrants and consume large quantities of rodents, rabbits, reptiles, amphibians, insects, other birds, and fish. Most commonly observed are red-tailed, marsh, red-shouldered, and Cooper's hawks. Hawks and falcons have been reduced in number through thoughtless shooting, nest disturbance, destruction of nesting habitat, and by pesticide-related reproductive failure. Osprey, peregrine falcon, and bald eagle are considered to be rare or endangered. Osprey are fish-eating predators that are seen in very small numbers during the migratory period. However, captive release and propagation programs have restored some peregrine nesting success in several northeastern US states. Peregrine falcons apparently have been eliminated as a breeding population east of the Rocky Mountains, primarily as a result of pesticide poisoning. Adult birds may occasionally be observed within the Mississippi River valley for years to come, but they are already quite rare. Bald eagles pass through the upper river valley as migrants, and many winter over in favorable areas. Numerous observations indicate that bald eagles winter where powerplants, industries, navigation dams, or natural conditions discourage ice forma-tion on the river. In such open areas, bald eagles have continuous access to the fish that comprise most of their diet. Like hawks and falcons, bald eagles have suffered from shooting, nest disturbance, and habitat destruction and may be suffering reproductive losses due to pesticide poisoning. Considerable public interest in the fate of the bald eagle in this region is reflected in able amateur research and the current interest of the city of Burlington, Iowa, in obtaining an easement for the protection of bald eagle habitat on Otter Island.

4.2.8 Owls are year-round residents of the upper Mississippi River Valley. Most common are great horned owls, screech owls, and barred owls with occasional long eared owls. These owls are residents of forest lands along the Mississippi River. Great Horned Owls build nests on branches of mature trees, generally as far from human habitation as possible, while both the screech and barred owls prefer nesting in tree cavities. Clutch size usually is from 1-3 eggs, except for the screech owl's, which is 3-7 eggs in size. Incubation of the eggs averages 3-4 weeks. Owls are aggressive predators that rest in trees during the day and awaken at sunset to hunt for mice, shrews, squirrels, rabbits, pheasants, crows, songbirds, fish, and almost any other small animal. Owl nests are raided by crows and occasional raccoons, but adult birds are virtually immune to predation.

4.2.9 Songbirds are widely distributed along the Upper Mississippi River. This is a large, diverse group of birds including such unmelodious species as shrikes, grackles, and blackbirds. Most of the songbirds are migraters, nuthatches, and occassionally cardinals, winter wrens, and red headed woodpeckers, being year-round residents of the river valley. As noted earlier, this group includes the blackbirds, probably the most numerous of the seasonal migrants, and the adaptable crow whose most serious predator is the great horned owl. The diets of this group include nectar (humming birds); fruits, carrion, berries, grains, and mammals (crows); seeds (cardinals); fish, frogs, and lizards (kingfishes); insects (whippoorwills); and fruits and insects (wood thrush). Nesting habits are as variable as their diets. Crows nest in the tops of tall hardwoods, nuthatches build their nests in tree cavities or on branches, while thrushes build their

nests in holes in the ground, among rocks, or on open sites among vegetation. These facets and more reveal the diversity of this group that lives along the Mississippi River.

4.2.10 A highly aggressive songbird is the starling, introduced from England during the last century. Having few natural predators on this continent, starlings have reproduced rapidly and are competing heavily with native wildlife. Flocks of over 200,000 birds have been reported in annual narrative reports of Upper Mississippi River refuges. The starlings compete directly with ducks and geese for waste grain and threaten to frustrate some refuge management efforts directed to the support of those birds. Starlings also threaten native songbird populations through takeover of nesting sites, especially of those species that use natural cavities in nesting.

4.3 Reptiles and Amphibians.

4.3.1 At least 86 species of snakes, turtles, lizards, frogs, salamanders, and toads are known to inhabit the Upper Mississippi River valley. There are 36 species of snakes, 20 species of turtles, and 4 lizard or skink species. Amphibians are represented by 8 species of salamanders and 18 species of frogs and toads. Virtually every habitat from high bluffs to deep water supports reptiles and amphibians. The numbers of these small animals make them a significant part of the total ecosystem. However, their economic importance is less than that of many other organisms of the river system.

4.3.2 Grass and sparse shrubby cover provide home and feeding territories to the garter snake, rat snake, bullsnake, and prairie kingsnake, while the massasauga prefers wetter grass areas. Frogs, such as the chorus frog and leopard frog, also prefer these grassy sites. Where grass edge meets water, and in the marshy slough vegetation, reptiles and amphibians abound. Marshes support garter, racer, water, and massasauga snakes, mudpuppies, eastern tiger salamanders, and most of the frog species. Even the more open waters provide suitable feeding for the northern water snake, map turtles, snapping turtles, Blandings turtle, smooth softshell, and the bullfrog.

4.3.3 The only commercially important species is the snapping turtle, harvested for soups and stews. In 1970 commercial catches reported were 10,527 pounds. The snapping turtle is a major predator, feeding on aquatic invertebrates, fish, reptiles, birds, mammals, and carrion. Snappers are considered a threat to ducklings. Snapping turtles also feed on vegetation. Females lay eggs on sandy beaches each fall; young emerge in the spring.

4.3.4 Possibly the most severe human disturbance to reptiles and amphibians occurs when marshes are destroyed. The destruction of marshes reduces habitat needed for a variety of species. Conversion of wet habitat to dry sand will replace aquatic species with terrestrial organisms such as the Fowler toad. Reptiles, particularly those laying eggs in sand, could benefit from such changes. However, conversion from wet to dry would limit amphibian populations, since all amphibians need water for breeding

and to maintain skin moisture. Prolonged high water conditions have the opposite effect of favoring amphibian populations and harming reptiles. Sedimentation, which creates more shallow water habitat, generally benefits amphibious animals but could in some cases destroy eggs.

4.4 Fishes.

4.4.1 In general, the standing crop of Mississippi River fish species is regulated by a combination of factors, including: (1) the fertility of the surrounding and underlying soils, (2) the accumulation rate of nutrients, (3) depth of water, (4) mean temperature and rainfall, (5) availability of preferred habitat, and (6) the competition among fish species. These factors are impacted by dams, dikes, dredging, and other development. Human intervention in the operation of any of these factors is likely to cause changes in the composition and distribution of fish populations.

4.4.2 Most fish species are widely distributed throughout the Rock Island District (Table 4).

Others are more commonly found in either the northern or southern pools. The chestnut lamprey is found only below Pool 19, and the black buffalo is more common below Pool 13. Smallmouth buffalo are generally found below Pool 11. Northern pike, black crappie, smallmouth bass, and log perch occur throughout the district. The weed shiner occurs in the Rock Island District only in Pools 11 and 12. The white sucker more common north of Pool 12, and the pumpkinseed occurs more commonly north of Pool 14. Pool 18 is the most sourthern location where the spotted sucker and pugnose minnow is commonly found. Yellow perch are most common between Pools 12 and 17, and mooneye and walleye occur more frequently north of Pool 20. Some species such as the lake sturgeon and the burbot are extremely rare and have been collected only a few times anywhere within the District.

4.4.3 The main channel includes the maintained portions of the nine-foot navigation channel. The shovelnose sturgeon lives part of its life almost exclusively in this habitat. Other species that frequently occur there are the channel catfish, flathead catfish, freshwater drum, sauger, walleye, and bigmouth and smallmouth buffalo. Mooneye also occur there in the spring.

4.4.4 The main channel border includes the wing dam and the bins between these dams and various riprap structures used in bank protection. These areas are good habitat and fishing areas for white bass, largemouth bass, bigmouth and smallmouth buffalo, carp, sauger, walleye, channel catfish, flathead catfish, and freshwater drum. This habitat also supports an abundance of small fishes eaten by larger fishes.

4.4.5 Tailwaters support most of the fishes already mentioned but are especially good habitat for freshwater drum, white bass, walleye, sauger, channel catfish, shovelnose sturgeon, and goldeye.

4.4.6 River lakes and ponds support both species of crappie, sunfishes, largemouth bass, carp, the buffalo, freshwater drum, paddlefish, bullheads, and various suckers. Stump fields, which occur in the downstream portions of most pools, are especially good spawning habitat for channel catfish and are considered very good fishing places for largemouth bass, white bass, crappies, flathead catfish, carp, and bluegills. Sloughs, in which dissolved oxygen levels of the water are high enough to support diverse animal populations, are practically the only place inhabited by bowfin and northern pike. However, they also support good populations of paddlefish, the sunfishes, crappies, and most forage species.

4.4.7 Records of the commercial catch in the Upper Mississippi River during the years 1960 to 1970 indicate that the buffalo species comprised the greatest percentage of the catch on a weight basis, followed by catfish, carp, and drum. Catfish was the most valuable species in the commercial catch. The total price brought by each of these species in 1970 fell in the same order as the total poundage; however, a ranking of the species caught according to the value per pound of fish sold was as follows: catfish, sturgeon, eel, buffalo, bullhead, and sucker. Carp and drum were among the lowest priced fish on a per-pound basis.

The sport fishing catch is mostly sunfishes and crappies although channel catfish, flathead catfish, white bass, freshwater drum, and sauger are also important sport species.

4.5 Aquatic Invertebrates.

The Upper Mississippi River supports an abundant dynamic population of aquatic insects and other benthic animals that varies according to stage, temperature, and turbidity. They are eaten by the majority of the fish species and some waterfowl. One hundred and seventeen (117) genera distributed among 46 families and 14 classes live along the river within and immediately north of the Rock Island District (Table 5). The zooplankton support several fish species of the river, including the commercially important buffalo and paddlefish. Zooplankton are also an important element in the diet of the notably important fingernail clams. One study done since the formation of the nine-foot navigation system provides some information about the diversity, abundance, and dynamics of the river's zooplankton populations. Samples of zooplankton were collected on seven occasions between late March and late July 1973 at six points near the navigation channel and in sloughs along the five-mile stretch of the river north of the Quad Cities (Table 7).

5. PLAN MANAGEMENT.

5.1 Management Objectives: "General, Forestry, and Wildlife."

5.5.1 General Management Objectives.

To manage for a healthy diverse forest resource with emphasis on maintaining habitat that supports the greatest variety and numbers of self-sustaining wildlife species while considering other resource demands such as recreation, aesthetics, and fiber production.

To tailor management of the Mississippi bottom land forests to meet the habitat demands of more specific wildlife species as management objectives become known during coordination with the US Fish and Wildlife Services or appropriate states. Management of the bottom land forests must still be consistent with sound forest management principles, including maintaining optimum size class diversity, sound stand structure, and tree species site compatibility on an overall unit basis. During the interim period, the bottom land forest will be managed to obtain the widest diversity of wildlife habitat, except at sites where specific wildlife demands have been pointed out during coordination. Examples of this included in the plan are heron nesting sites, eagle roosting and perching areas, and wood duck nesting habitat.

5.1.2 Forest Management Objectives.

To promote and maintain a regulated flood plain forest resource by striving for a biologically sound optimum mix of tree size class distribution and species.

To attain a sustained and regulated yield of forest products.

To develop a detailed comprehensive data base, from stand mapping and field experience to be used in future forest management decisions.

5.1.3 Wildlife Management Objectives.

To protect habitat for all endangered species found occurring on land covered by this plan. Enhancement of the habitat, such as providing perching and roosting trees for feeding and resting Bald Eagles, will be done using a special management zone in cooperation with appropriate state and US Fish and Wildlife Service personnel.

To manage habitat to provide resting and feeding sites for migratory birds, and resting, feeding, and nesting sights for resident/migratory birds, such as the wood duck.

To maintain, through protection specific management prescriptions, colonial nesting sites for such wildlife as the Great Blue Heron.

To maintain habitat that will support the greatest variety of naturally occurring game and nongame mammals.

5.2 Management Problems of the Upper Mississippi River.

5.2.1 Introduction.

In the next few pages we will briefly discuss many of the resource management problems that exist along the upper Mississippi River. These are not complete discussions of all the problems nor have all the problems been addressed here. However, this will acquaint the reader with some of the difficulties encountered in managing the river bottom land resource.

5.2.2 Installation of the locks, dams, and levees in the 1940's raised the ground water level of the pools. As a result of this pool elevation, we presently have a more moist soil regime which favors silver maple and other such water-tolerant woody species. In contrast, only areas directly below the lock and dam retain some resemblance to the pre-lock and dam era.

Without increasing land elevation, nothing can be done to resolve this problem of increased soil moisture. Increased moisture has made natural oak, pecan, and hickory stand regeneration difficult on many sites.

5.2.3 Higher areas will support mast species, but many such areas do not. Historically, logging removed the trees which provided the seed sources for regeneration, and as a result, less desirable species have been able to gain a foothold. Harsh growing conditions, especially wetter soil regimes and flooding, inhibit reestablishment of mast species in many areas where there is an inadequate or no seed source. Specific planting procedures, associated vegetative control techniques, and appropriate silvicultural practices, can help to establish mast tree species association where site and soil conditions warrant. Such reestablishment of mast tree stands will provide more food for wildlife.

5.2.4 The Dutch elm disease eliminated the American elm as an important species in the bottom land forest. Some larger trees can still be found and American elm still commonly occurs in the understory. Elm in the understory and the few larger trees should be left in the hope that genetic resistance to the disease will develop over time.

5.2.5 Ground vegetation, such as bur cucumber and wood nettle, grows luxuriantly in all pools. In many areas, summer ground layer vegetation is so thick that regeneration of trees is highly unlikely. Benefits in reestablishing woody vegetation would include the provision of more den and nesting cavities, more food, and more cover for wildlife that inhabit the bottom land forests.

5.2.6 Silver maple and cottonwood commonly seed quickly in any open area. These species usually form dense monocultures over wide areas. At certain stages of development, too many trees may occupy a site resulting in the formation of a dense canopy and the reduction of understory diversity.

Evenaged stands of silver maple, cottonwood, and ash are the dominant vegetation on most low bottom land sites. Management of these areas as evenaged stands in different stages of growth, and maintenance of a desirable stocking level through thinning will best provide diversity. More diverse habitat will result in the formation of a more suitable environment for wildlife species inhabiting the river bottom land, especially for species that prefer a forest of varied size classes.

5.2.7 Shoreline erosion is caused by wind and current, as well as by commercial and recreational traffic on the river. Removal of healthy trees next to the shoreline will speed erosion. Proper silvicultural practices can aid in rejuvenation of shoreline vegetative conditions.

5.2.8 Cavity development is a major concern in the existing forests. No treatment zones will reserve existing cavity trees for the present in that area; however, special management zones with longer rotations will maintain cavity tree development for future habitat needs. Silver maple "thinning cuts" to achieve faster growth, and very limited harvest cuts in silver maple and cottonwood stands will encourage nest cavities for wood ducks, owls, and squirrels. Woodpecker habitat, as well, will be enhanced through the establishment of special management zones.

5.2.9 In many areas, rare or unique tree species occur. These unique trees, exemplified by the strain of northern pecan in Mississippi River Pool 14, do not seem to be regenerating. Such stands should be monitored and data gathered for further understanding of the silvics of these unique species. Silvicultural practices, such as improvement cuts, and planting, may be applied to ensure regeneration and survival of these species, as well as to maintain the diversity which they give to woodlands.

5.2.10 Winter cover is lacking or very limited in much of the bottom land forest. An absence of thick woody growth, a result of either dense monocultures or the small amount of sapling sized stands of timber, seems to be the core of the problem. Dense monocultures favor a herbaceous understory that is lost in winter. Young sapling sized stands can furnish good winter cover for wildlife. However, these stands do not exist to any measureable amount in the total river land area. The abundance of pole to sawtimber size stands result in lack of adequate wildlife winter cover. On a very limited basis brush piles, created when silvicultural practices are applied to the forest, would furnish winter cover for mammals such as cottontail rabbits. Flooding in much of the flood plain forest would make the brush pile death traps and therefore unusable. Therefore, brush piles will provide winter cover on sites that are elevated enough so that the brush piles will be relatively undisturbed by flooding. In addition to the elevation of the site, a land bridge to an adjacent extensive unflooded area must be available.

5.2.11 In stands composed of mast hardwood species, mast production is too often low at such sites. Overstocked stands limit the amount of nutrients and light available for each tree, and therefore greatly restricts the amount of mast produced. Because of spring and summer floods that inundate much of the bottom land forest, many mast hardwood trees do not grow under optimal conditions. This will reduce the amount of mast produced by the trees. Another factor in low mast production, though of lesser impact, is overmaturity in bottom land forest stands.

5.2.12 Diseases such as oak wilt have taken their toll of trees in scattered parts of the midwest. Pin oak and the other red oaks are particularly susceptible to this disease. When an oak wilt pocket is located, the most practical control of disease transmission via root grafting may be to cut or kill all trees adjacent to infected trees. The chance of oak wilt infection from airborne spores can be greatly reduced by scheduling no logging activities in oak stands during the months of April, May, and June.

Updates of this management plan will cover any pathological and entomological problems of forest tree species discovered while working in the management units. All agencies should be aware of potential problems in the field and be responsible for reporting them. The Dutch elm disease creates a problem which is basically insolvable in most areas. In contrast, few other diseases or insects presently infect the trees. When disease infects trees, appropriate fungicides, pesticides, current biological controls, and/or sanitation cuttings to remove the infected trees will be implemented to hinder spread of the contagion.

5.2.13 On the Odessa area, the Iowa Conservation Commission maintains the water at a height suitable to the maintenance of good quality wildlife habitat. Any increase in water level would create a wildlife management problem, by reducing the number of oak and other mast hardwood trees growing on the Odessa area and an excellent food source for wildlife would be diminished.

5.2.14 Approximately 600 recreational cottage sites have been leased to private individuals on project lands. These cottage site leases will expire in 1988 and will not be extended. Other sites on project lands have been leased for various commercial, public, recreational, and other purposes. Prescriptions were made by timber stand type for all the wooded areas in each pool. Management prescriptions were based on the condition of the forestry resource in each area and the objectives of this plan. On many areas, especially in the case of the cottage lease sites, the management prescriptions will not be implemented at this time. However, when the leases expire and are not renewed, management prescriptions will be implemented. Openings at vacated lease sites and cover types 53 and 52 will be revegetated through natural succession or planting.

5.2.15 Often eroded soil sediments, primarily from agricultural land in the basin, are carried to the Mississippi River by its tributaries, then by the river as it flows to the Gulf of Mexico. When the river current slows, especially in backwaters and sloughs, the sediments fall out of suspension and are deposited on the riverbed. This process, sedimentation, gradually fills in the backwaters and sloughs, creating more shallow water and marshes, then mud flats, until the process reaches its culmination in dry land. Flushing action during high water may reverse the action temporarily in a few wetland areas, but the heavy load of sediments gradually fills in even the sloughs and backwaters that may be flushed out during floods. Shallow waters created by the deposition may temporarily increase the spawning habitat for fish and amphibians and resting habitat for migrating waterfowl. However, the overall quality of habitat available to fish and wildlife is greatly reduced. Sedimentation converts deeper aquatic habitat to shallow wetland, and shallow wetland to dry land, reducing the habitat available for wildlife that use those areas, especially migrating waterfowl. More shallow water eliminates the aquatic habitat for many juvenile and mature fish populations, because many of these fish species need deeper aquatic habitat.

5.2.16 The heavier suspended materials are often deposited in the main channel of the river when, for instance, the current slows or another

tributary enters the Mississippi River. In order to maintain the navigation channel, vital to the efficient bulk transport of commodities, dredging is necessary to remove the material deposited by the river. That presents a problem of where to put the material dredged from the river. The dredge material is a sterile sand in which vegetation takes a long period, perhaps several decades, to become reestablished. Deposition of the material reduces the quality of wildlife habitat by eliminating the habitat present at the disposal site before the material is put there. Additionally, the quality of wildlife habitat is reduced to practically nothing at the dredge site. Placing the dredge material on the shoreline of bottom land areas has created recreational beaches. However, this practice creates a much greater problem for wildlife by burying terrestrial and aquatic life and sterilizing a biologically productive area. Another possible problem with the dredged material is that it may not stay at the disposal site. Subsequent floods may resuspend the material that may then settle out and close side channels and sloughs to backwater areas or settle again in the main channel.

5.2.17 The water level of the Mississippi River changes during spring thaw, heavy rains, or drought. Before the levees were built, the Mississippi River could spread out onto wide flood plains after a heavy snowmelt upriver or heavy rains, but often was reduced to a trickle at the rapids at Rock Island during droughts. With the building of levees to contain the flooding, spring thaws and heavy rains produced a higher and swifter water level. Then in the late 1930's and early 1940's, locks and dams were constructed to maintain a minimum nine-foot channel so transportation of goods could continue at all times except when the river was frozen. The locks and dams created vast, relatively stable backwater areas that replaced seasonally flooded marshes, bogs, and lowlands. This enhanced fishery and wildlife productivity. However, the fluctuations of pool levels have created a host of wildlife problems including nest exposure or inundation at critical times and an inconsistent littoral zone.

Additionally, wooded areas are subjected to more frequent and larger flooding. Consequently, plants in the understory of the forests that are less tolerant of inundation are much less common or nonexistent. Unfortunately, these plants were replaced by wood nettle and other plants less valuable to wildlife as food and shelter.

5.2.18 Development of the river, its flood plain, and shores by man has its own impact on fish and wildlife resources. As man uses the river, flood plain and shoreline areas are developed for agricultural, industrial, recreational, and residential use. As this process proceeds, whether by small or large acreages, fish and wildlife habitat is lost. Increased erosion as a result of land disturbance and intensive agriculture increases the problems of sedimentation, discussed earlier, and water pollution from agricultural chemicals. Additionally, commercial towboat operation and recreational boat use on the river produce a propwash that induces turbidity and shoreline erosion. Unfortunately, the resuspended material again settles out in the process of sedimentation, covering and eliminating benthic communities, fish spawning grounds, and mussel beds.

5.2.19 Barge fleeting impacts the aquatic habitat. Both the barge bottoms and propwash of the towboats disturb or destroy the mussels and other benthic organisms. Because of a complex life cycle and immobility, mussels are most vulnerable to this disturbance. Additionally, large trees can be girdled and killed or uprooted by cables that secure the barges to the shore. Barge fleeting interferes with many of the recreational pursuits of people living along the Mississippi River. Many hunting and fishing sites are usurped by barge fleeting. The fleeting areas interfere with the use and enjoyment of adjacent park and wildlife refuge areas, and may block public access to the river for boating and other recreational pursuits.

5.3 Inventory Methodology.

In formulating this forestry plan, it was decided that an inventory would be needed to furnish information to properly evaluate the forestry resource. After careful consideration and completion of sampling two test areas, we decided to use the Illinois Forest Inventory Data Processing System. The system produced forestry and wildlife data useful in writing a sound forest management plan, however it may not reflect diversity of woodland characters in total and stand characters specifically. Future stand mapping will alleviate these shortcomings.

It was decided that we would inventory various areas in each pool as independent units with the exception of Pools 13 and 14, which were inventoried as a unit. Fish and wildlife resources are managed on different areas in several pools by the Iowa Conservation Commission, Illinois Department of Conservation, Missouri Department of Conservation, or the US Fish and Wildlife Service. It was decided that an inventory of separate areas in each pool would give better data to use in writing the management plan for each pool. Each area was also delineated based on geographical location and inventory logistics. Next, we decided to sample to a statistical accuracy of $\pm$30% with a confidence level of two standard deviations and a minimum stand variability of 60% uniformity in each area (or pool). These two values gave the number of points (plots) in each area (or pool) to be sampled to give an adequate inventory. With the exception of Pool 16, where transects ran east and west, all transects ran north-south. Uniform systematic point spacings on transect lines were selected to provide an adequate sample in each unit (pool). Systematic sampling allowed a statistical analysis to be developed for each area or pool sampled.

Data was then collected using a 10 BAF prism which indicates the appropriate trees to measure at each point. At each point, measurements were taken of tree height, diameter, and volume; as well as indicating dens, squirrel nests, or other wildlife characteristics of each tree measured.

Inventory of Pool 22 was completed in the late fall of 1978. That following winter, C. Hardzinki, then refuge forester for the US Fish and Wildlife Service, completed an inventory of Pool 13. The remaining Pools 11-14, 16-18, and 21 took from July to December of 1979 for their completion.

After collecting the data, it was checked for errors and key punched on standard key punch cards. A computer then processed the data and produced concise organized printouts of inventory information. Some important inventory information is subsequently documented in the addendum for each pool, including the wildlife data collected during the inventories.

Each pool addendum contains wildlife-related inventory data to be used in making site specific management decisions on the Mississippi River project lands. The inventory system classifies various trees in a particular stand relative to its condition as it provides wildlife food and cover. The following tree condition classes are represented:

| | |
|---|---|
| Class 1-4 | Tree form class in relation to wood quality (not represented) |
| Class 5 | Upper cavity |
| Class 6 | Lower cavity |
| Class 7 | Standing dead tree |
| Class 8 | Leaf nest |
| Class 9 | Grapevine |
| Class 10 | Mast tree and mast production |

## 6. IMPLEMENTATION OF PLANS

### 6.1 Organization and Responsibility.

6.1.1 The Recreation Resource Management Branch, Operations Division was responsible for preparation of the Forest Management Appendix and Fish and Wildlife Appendix to the Master Plan. Preparation of the Appendices was done in cooperation with the Environmental Analysis Section, Planning and Reports Branch - Engineering Division. The Recreation Resource Management Branch - Operations Division is responsible for implementing the plan and updating it as necessary. The updating of the plan every 5 years and subsequent timber inventories performed every 10 years will be coordinated with Environmental Analysis Section, Planning Branch.

6.1.2 Appropriate ranger field offices, located at L/D 14, Dubuque, Iowa; L/D 13, Fulton, Illinois; L/D 16, Muscatine, Iowa; L/D 21, Quincy, Illinois; in coordination with appropriate Corps foresters, will implement this plan within existing Corps public use areas. The field station will be responsible for:

* Preparation of all vegetative management work plans.

* Supervision of all contracts dealing with vegetative management such as grass mowing, but excluding timber management.

* Maintenance of accurate records on materials, equipment, and labor costs involved in carrying out work plans.

Additionally, ranger field stations are charged with the inspection of all lands to insure that timber trespass and encroachments do not occur. Corps rangers will assist in onsite timber sale contractual compliance inspection.

6.2 Annual Management Plans.

6.2.1 Appropriate ranger field offices will prepare annual management plans on all Corps public use areas, coordinating their preparation with appropriate Corps project and District elements. These plans will detail ground work needed to implement management plans. These work plans will include the materials needed, man-hours to be used, costs, layout maps or drawings, dates for starting and completing the work, establishing priorities for use of funds which are made available, etc. Completed annual management plans for the next fiscal year will be forwarded to the park manager for approval prior to its implementation. The Corps park manager or the designated ranger field offices will be responsible for implementation of the approved work plans, with the input of Corps district forestry personnel, and other Federal and State personnel as directed in this plan. Any harvests, thinnings, improvement cuts, or timber stand improvements will be marked by Corps foresters. Cutting timber will be done internally or contracted to commercial logging crews.

6.2.2 Annual plans for all project forest lands will be prepared each year. The specific prescriptions and locations where they will be implemented will be determined based on funds, logistics, manpower, and resource need. The annual forest management plans will be prepared by the Corps foresters with additional support from the Mississippi Project Office. Any plans which involve Cooperative Agreement lands will be coordinated at an annual meeting with the US Fish and Wildlife Service and appropriate state agencies. The US Fish and Wildlife Service and the appropriate state agencies will have an additional 45 days to comment on the annual plans. After this comment period, the annual plan will be implemented. During this annual meeting, changes in management prescriptions may be discussed. However, under normal circumstances, changes will usually not be made until the management plan is updated in five years. The work plans will include the materials needed, man-hours to be used, costs, layout maps or drawings, dates for starting and completing the work, establishing priorities for use of funds which are made available, etc. Completed annual management plans for the next fiscal year will be forwarded by the Corps foresters to the park manager for approval prior to its implementation. The Corps foresters supervise the implementation of the approved work plans with the input and assistance of Mississippi River Project Office, ranger field stations, and other Federal and State personnel as directed in this plan. Any harvests, thinnings, improvement cuts, or timber stand improvements will be marked by the Corps foresters. Cutting timber will be done internally or contracted to commercial logging crews.

6.3 Management Prescriptions.

In Addendum 1, the specific forestry and fish and wildlife practices that will be prescribed in the plan are listed and explained. These practices will be applied on a "management" unit basis as explained in Addendum 1. The forestry and fish and wildlife individual prescriptions will be presented pool by pool in succeeding Addendums.

Under the Cooperative Agreement, management of the fish and wildlife resources on the majority of project land is the responsibility of the US Fish and Wildlife Service or appropriate state agencies. For Cooperative Agreement lands in each pool, the managing agency sends annual management plans to the Corps district office. Now, as in the past, these plans will constitute the wildlife management plan for that area with our approval. This management plan is to be used as a guide for all project woodlands in the Rock Island District. It is written in cooperation with the US Fish and Wildlife Service and concerned state forestry and fish and wildlife Management agencies. This plan is based on sound forest management principles that will provide diverse woodlands to produce general and specialized wildlife habitat, recreational opportunities, and fiber. Woody vegetative management practices prescribed should not be superceded, however, during the interim years between scheduled five-year updates, it is realized that wildlife species habitat and/or management goals may change. Additionally, various agents of change, both biotic and abiotic, have the potential of badly damaging forested areas. In the event of such unpredictable changes, prescriptions may be changed during the annual coordination meeting, or thereafter if specially approved in writing by the Corps. Changes will be approved only in keeping with sound biological and silvicultural practices.

The Annual Wildlife Management Plans submitted by the managing agencies for Cooperative Agreement lands may prescribe certain timber management practices to be performed by the manager's agency in order to enhance wildlife management. Any such plans will be reviewed by the Corps for inclusion into the Corps annual forestry plan.

6.4 Management Priority.

6.4.1 A priority list is included in the addendum for each pool. The area most needing attention and the silvicultural practice(s) is listed as item A, the area and silvicultural practice(s) next needing attention as item B, etc.

This priority list has been included to indicate those areas where silvicultural practices need to be implemented the most based on resource need. However, monetary and budgetary constraints may limit funding necessary to fully implement this plan over the next five-year period. In this case, the priority list should be checked and those silvicultural practices should be given priority over any other prescriptions included in the plan. Because the priority items in the appendices are listed based on resource need, they should, even under normal operating procedure, be implemented in the order they are listed. First priority in any pool (addendum) is to type map the entire management unit in which a practice will be implemented. For example, in Addendum 22 in the Ward Island management unit, the clear cutting (harvesting) of small areas and planting suitable higher areas have been discussed. The entire management area will be stand mapped to determine the best locations to implement the practices.

6.4.2 Money budgeted for forest management will be allotted to implement the prescriptions in the addendums to this appendix. If the opportunity

occurs to implement a silvicultural prescription, it will be taken, however, prescriptions should be implemented in the order they are listed.

6.5 Timber Sales and Inspection.

6.5.1 The Corps of Engineers Real Estate Division will handle timber sale and contractural silvicultural operations after the timber is marked and the total volume and minimum bid is determined. Real Estate Division and the Corps foresters will handle contract compliance inspection and contract supervision. Measuring and marking of timber on Cooperative Agreement lands will be done in coordination with the US Fish and Wildlife Service, or appropriate state management agency, by the Corps foresters. The Corps foresters will determine total volume and minimum bid. After a bid is accepted, the contractor, appropriate Corps personnel, and if Cooperative Agreement lands are involved, representatives from the US Fish and Wildlife Service, and/or the appropriate state agency will meet onsite to discuss the contractual obligations as they are applied to the site.

6.5.2 Inspections, as well as fines and/or penalties for incomplete compliance with the contract, will be necessary to insure maximum benefit from all silvicultural operations contracted out.

6.6 Cost of Plan Implementation.

6.6.1 Due to the potential cost variability of this forestry plan relative to economic conditions, forest products marketability, logging access, environmental fluctuations, and other extrinsic factors, a total implementation cost of this plan cannot be reasonably assessed. Also, a forest management plan is characteristically administered over several years to provide a well-regulated forest ecosystem for indefinite existence. The cost breakdowns described per pool represent the expense incurred by the Corps if all forest management prescriptions proposed were completed at one point in time by Corps personnel in that pool. This, however, is not the case. Resource need is the major factor involved in determining time and location for funding apportionment. Available funds will generally be applied to those units in order as stated in the priority lists; however, annual coordination meetings will provide useful information and updated additions or deletions to this list.

6.6.2 Initially, costs for most of the silvicultural prescriptions in the appendix will have to be financed through a line item in the fiscal year budget. Upgrading of the timber resource through thinning, improvement cuts, timber stand improvement, and planting will be priority items. However, when timber is harvested in the future, a percentage of the sales recripts will be invested back into the resource. The line item in the budget could then be set at a minimal amount.

6.6.3 As a guide to establishing and funding an active resource management plan on the Mississippi River, the approximate cost of implementing the forestry and fish and wildlife management prescriptions over the initial five-year period were estimated. For each silvicultural practice the approximate acreage to which it will be applied was totaled. The total

cost per silvicultural practice was then computed, and the total cost per pool determined. This data is listed in tabular form in the addendum for each pool. As the price of fuel increases, so does the demand for firewood for homes, and fuel chips for industry. This could result in improved cost effectiveness for commercial logging operations and would ultimately result in increased feasibility of silvicultural improvement cutting on the Mississippi River flood plain. Also, other practices may be done by logging contractors when they harvest timber in the same area, thus reducing projected costs. As an example, a harvest contract might provide for the harvest of some mature timber, the thinning of an overstocked pin oak stand (increasing mast production), and disking of an area of cucumber vines.

The cost of applying each silvicultural practice was computed as an approximate figure. Cost breakdowns are based on past Corps silvicultural operations on recreation areas, input from other sources such as Illinois Department of conservation and the Iowa Conservation Commission, and based on the premise all silvicultural practices except harvesting will be done by Corps personnel. Costs will be updated annually to allow for economic influences. The cost per silvicultural practice per acre is as follows:

| Practice | Costs/Acre |
|---|---|
| Thinning | $150 |
| Improvement Cutting | $150 |
| Timber Stand Improvement | $ 30 |
| Monitoring | $ 15 |
| Planting | $ 50 |
| Harvesting | $ 60 |
| Site Preparation | $110 |
| Type Mapping | $ 2 |

The costs are approximate figures. All costs for thinning and improvement cuttings were figured assuming Corps personnel would mark and cut the trees. The downed timber would be left in the woods, used as wildlife cover, or used by the public for firewood. Local or regional timber markets and silvicultural considerations could make some commercial thinning and improvement cutting practical. This could reduce the cost for those silvicultural practices. However, the prescription will be implemented based on silvicultural considerations, not economic reasons.

## 7. RELATED PROGRAMS.

### 7.1 Hunting and Hunter Control.

In general, hunting is permitted on project land and water areas and is regulated by the appropriate State conservation agencies. The primary exception is those Cooperative Agreement lands which are designated as wildlife refuges. In the refuges, the US Fish and Wildlife Service or the appropriate state agency determines which State regulated seasons can be permitted in the refuge areas without conflicting with the species targeted for protection. In general, any hunting season which coincides

with the time of waterfowl migration is not permitted within the confines of the refuge. Other non-hunting areas are located in the vicinity of the lock and dam structures and within 300 feet of any developed recreation area. All non-hunting areas will be adequately posted as such.

7.2 Vector Control.

Control of insects or other organisms that transmit pathogens will be implemented upon documented need as determined by state or local public health departments. All vector control measures will be coordinated with the respective health departments prior to implementation. Licensed commercial pesticide applicators will be utilized for vector control measures.

7.3 Pest Control.

7.3.1 All uses of pesticides are reviewed by the Corps District Pesticide Officer and submitted to the North Central Division for approval prior to use. Mechanical or physical control of pests is used when practical. Pesticide selection is based on effectiveness, toxicity, safety to the applicator, and other relevant environmental considerations.

7.3.2 Burrowing mammals such as groundhogs (Marmota monax) and muskrat (Ondatra zibethica) may significantly affect the integrity of flood control levees or lock and dam structures. If burrows create a structural problem, either mechanical trapping or suffocant gas bombs will be used. The gas bombs may be obtained from the US Fish and Wildlife Service.

7.3.3 Pigeon and starling control on the lock and dam structures has become necessary due to the health and safety factor caused by the large amount of bird droppings. Use of food bait treated with the chemical Avitrol has proven both safe and effective. When ingested by a bird, Avitrol produces a nervous muscular reaction which frightens the entire flock away. In most cases, the affected bird will survive. When ingested, the chemcial breaks down and therefore does not affect secondary non-target host species.

7.4 Endangered and Threatened Species.

7.4.1 According to the Federal Register containing a list of Endangered and Threatened Wildlife and Plants (17 January 1979), the following endangered and/or threatened species may be found within the project area:

American Peregrine Falcon (Falco peregrinus anatum)
Artic Peregrine Falcon (Falco peregrinus tundrius)
Bald Eagle (Haliaeetus leucocephalus)
Higgin's Eye Pearly Mussel (Lampsilis higginsii)
Indiana Bat (Myotis sodalis)
Gray Bat (Myotis grisescens)

7.4.2 Numerous state listed endangered or threatened species and some other federally listed species may be present within the study area, but they have not been identified, as yet.

7.4.3 Research on the occurrence and habitat needs of the endangered species is being carried on by the US Fish and Wildlife Service and the US Army Corps of Engineers, Rock Island District. Some good vegetative and wildlife management programs will aid many of the species. As knowledge of endangered and threatened wildlife in the area evolves, we will alter our management practices as indicated. Before we implement any practices, we will consult with the endangered species office of the US Fish and Wildlife service, as described in Section 8.2.

## 8. COORDINATION.

### 8.1 Management Plan Coordination.

Coordination of the Forestry and Fish and Wildlife Appendices for Pools 11-14, 16-18, 21, and 22 was begun early and is a continuing process. In preliminary meetings with the US Fish and Wildlife Service, the Missouri Department of Conservation, the Iowa Conservation Commission, and the Illinois Department of Conservation, it became evident that an inventory of present resources was necessary before a management plan could be written. The US Fish and Wildlife Service and the appropriate state agencies were invited to participate in the inventory. The inventories were completed in late 1979. Then computer printout tabulations of the data were distributed to the Illinois Department of Conservation, Iowa Conservation Commission, Missouri Department of Conservation, and the US Fish and Wildlife Service. Informal coordination with state agencies and the US Fish and Wildlife Service was begun with the resource inventories and will be continued as the management plan is developed and implemented. A draft of the Forestry and Fish and Wildlife Appendices to the Master Plan for Pools 11-14, 16-18, 21, and 22 was completed and distributed to the US Fish and Wildlife Service, Iowa Conservation Commission, Illinois Department of Conservation, Missouri Department of Conservation, and Wisconsin Department of Natural Resources. Later, at formal conferences, type maps were refined and management unit prescriptions discussed and finalized. Informal response to the draft plan was requested. After all comments are received, a final draft and environmental assessment are prepared and distributed. After comments are received on the final draft, the final document is prepared, approved, and implemented. Coordination with the US Fish and Wildlife Service and the states that we initiated at the beginning of writing this management plan will continue as the plan is implemented.

### 8.2 Continuing Annual Coordination.

Coordination will be done at annual meetings between the Rock Island District and the US Fish and Wildlife Service, and appropriate state agencies. Endangered species consultation, cultural resources coordination, and any water quality 404 coordination will be done after the meeting when the prescriptions to be implemented and the location at which they will be located have been selected. The first year after approval of this document, some coordination may have to be done individually with the US Fish and Wildlife Service and appropriate state agencies until the timing of the coordination meeting has been worked out.

A copy of the annual management plan in regards to cultural resources will be submitted to the State Historic Preservation Officer for review and comment prior to the implementation of any practices on specific sites. The management units and practices are small enough and simple enough that changes in implementation procedures can be accommodated.

9. LITERATURE CITED.

Environmental Impact Statement for the 9-foot navigation channel project; Environmental Analysis Section, Planning Branch, Rock Island District Corps of Engineers.

Recreation Use Projections and Needs Report; Recreation Work Group, GREAT II; Don Brazelton, Chairman.

Inventory Computer Printout Summaries, 1979 Inventory.

Fish and Wildlife Management Work Group Appendix, GREAT II, Final Report, December 1980.

TABLE 1

MAMMALS OF THE UPPER MISSISSIPPI

| Common Name | Scientific Name | Region Pools 11-15 | Region Pools 16-22 |
|---|---|---|---|
| Virginia opossum | Didelphis marsupialis | C | C |
| Masked shrew | Sorex cincercus | C | U |
| Short-tailed shrew | Blarina brevicauda | C | C |
| Least shrew | Cryptotis parva | C | C |
| Eastern mole | Scalopus aquaticus | C | C |
| Starnose mole | Condylura cirstata | R | |
| Little brown bat | Myotis lucifugus | C | C |
| Keen's bat | Myotis keenii | C | R |
| Eastern pipistrel (bat) | Pipistrellus subflavus | U | U |
| Big brown bat | Eptesicus fusucs | C | C |
| Red bat | Lasiurus borealis | C | C |
| Hoary bat | Lasiurus cinereus | R | R |
| Indiana bat | Myotis sodalis | D | D |
| White-tailed jackrabbit | Lepus townsendii | R | |
| Eastern cottontail rabbit | Sylvilagus floridanus | C | C |
| Woodchuck | Marmota monax | C | C |
| Thirteen-lined ground squirrel | Citellus tridecemlineatus | C | R |
| Franklin's ground squirrel | Citellus franklinii | R | R |
| Eastern Chipmunk | Tamias straitus | C | C |
| Eastern gray squirrel | Sciurus carolinensis | C | C |
| Eastern fox squirrel | Sciurus niger | C | C |
| Red squirrel | Tamiasciurus hudsonicus | C | U or R |
| Southern flying squirrel | Glaucomys volans | C | R |
| Plains pocket gopher | Geomys bursarius | C | C |
| Beaver | Castor canadensis | C | C |
| Western harvest mouse | Reithrodontomys megalotis | U | U |
| Deer mouse | Peromyscus maniculatus | C | C |
| White-footed mouse | Peromyscus leucopus | C | C |
| Prairie white-footed mouse | Peromyscus maniculatus | | C |
| Eastern wood rat | Neotoma floridana | | R |
| Black rat | Battus rattus | C | C |
| Meadow vole | Microtus pennsylvanicus | C | |
| Prairie vole | Pedomys ochrogaster | C | C |
| Pine vole | Pitymys pinetorum | C | |
| Muskrat | Ondtra zibethicus | C | C |
| Norway rat | Rattus norvegicus | C | C |
| House mouse | Mus musculus | C | C |
| Meadow jumping mouse | Zapus hudsonius | C | R |
| Nutria | Myocaster coypus | R | |
| Coyote | Canis latrans | U | C |
| Red fox | Vulpes fulva | C | C |
| Gray fox | Urocyon cinereoargenteus | C | C |
| Raccoon | Procyon lotor | C | C |

(Letter Key at End of Table)

| Common Name | Scientific Name | Region | |
|---|---|---|---|
| | | Pools 11-15 | Pools 16-22 |
| Least weasel | Hustela rixosa | U | |
| Mink | Mustela vison | U | C |
| Badger | Taxidea taxus | U | R |
| Spotted skunk | Spilogale putorius | C | R |
| Striped skunk | Mephitis mephitis | C | C |
| River otter | Lutra canadensis | R | R |
| Lynx | Lynx canadensis | R | |
| Bobcat | Lynx rufus | R | R |
| White-tail deer | Odocoileus virginianus | C | C |
| Silver-haired bat | Lasionycteris noctivagans | | C |

Source: Upper Mississippi River Wildlife and Fish Refuge, Winona, Minnesota.
Mark Twain National Wildlife Refuge, Quincy, Illinois.

Key: C - Common
U - Uncommon
R - Rare
D - Endangered

No letter indicates that a particular species has not been recorded.

TABLE 2

BIRD SPECIES OF THE REGION

| Common Name | Scientific Name | Region: Pools 11-15 Sp | Su | F | W | Pools 16-22 Sp | Su | F | W |
|---|---|---|---|---|---|---|---|---|---|
| Turkey | Meleagris gallopavo | | | | | U | U | U | U |
| Osprey | Pandion haliaetus | O | O | O | O | U | | U | |
| Peregrine falcon* | Falco peregrinus | R | R | R | | O | | | |
| Pigeon hawk | Falco columbrius | R | | R | | | | | |
| Sparrow hawk | Falco sparverius | O | O | O | R | C | C | C | U |
| Ruffed grouse* | Bonasa umbellus | C | C | C | C | | | | |
| Greater prairie chicken | Tympanuchus cupiod | | | | R | | | | |
| Sharp-tailed grouse | Pedioecetes phasianellus | | | | | | | | |
| Bobwhite* | Colinus virginianus | O | O | O | O | C | C | C | C |
| Ring-necked pheasant* | Phasianus colchicus | C | C | C | C | O | O | O | O |
| Gray partiridge | Perdix perdix | O | O | O | O | | | | |
| King rail* | Rallus elegans | U | U | | | O | | | |
| Virginia rail* | Rallus limicola | U | U | O | | U | | | |
| Sora* | Porzana carolina | A | A | C | | C | U | C | |
| Common gallinule* | Ballinula chloropus | R | R | | | - | O | O | - |
| American coot* | Fulica amricana | A | C | A | R | C | U | A | U |
| Semipalmated plover | Charadrius semipalmatus | C | O | C | | | | U | |
| Killdeer* | Charadrius vociferus | C | C | C | R | C | C | C | O |
| American golden plover | Pluvialis dominica | O | | U | | U | | | |
| Black-bellied plover | Squatarola aquatarola | O | O | | | C | | | O |
| Ruddy turnstone | Arenaria interpres | R | | | | | | | |
| American woodcock | Philohela minor | R | R | R | | C | C | C | |
| Common snipe | Capella gallinago | C | O | C | R | C | | C | O |
| Long-pilled curlew | Numenius americanus | | | R | | | | | |
| Upland plover | Bartramia longicauda | O | O | | | O | | | |
| Spotted sandpiper* | Actitis macularia | C | C | C | | C | C | C | |
| Solitary sandpiper | Fringa solitaria | C | | C | | C | C | C | |
| Willet | Catoptrophorus semipalmatus | R | | R | | R | | | |
| Greater Yellowlegs | Totanus melanoleucus | U | | U | | C | C | C | |
| Lesser yellowlegs | Totanus flavipes | A | O | A | | C | C | C | |
| Pectoral sandpiper | Erolia melanotos | O | O | O | | C | C | C | |
| White-rumped sandpiper | Erolia fuscicollis | O | | O | | | | | |
| Baird sandpiper | Erolia bairdii | O | O | O | | | | | |
| Least sandpiper | Erolia minutilla | C | O | C | | C | C | C | |
| Dunlin | Erolia alpina | O | O | O | | | | U | |
| Long-billed dowitcher | Limnodromus scolopaceus | O | | O | | | | U | |
| Stilt sandpiper | Micropalama himantopus | O | O | O | | | | U | |
| Western sandpiper | Ereunetes mauri | | | | | | U | | |
| Semipalmated sandpiper | Ereunetes pusillus | C | C | C | | | U | U | |
| Sanderling | Crocethia alba | O | O | O | | | | | |
| Wilson's phalarope | Steganopus tricolor | O | O | O | | | | | O |
| Northern phalarope | Lobipes lobatus | O | | O | | | | | |
| American avocet | Recurvirostra americana | | | | | | | | R |
| Herring gull | Larus argentatus | C | O | C | U | U | | U | C |

(Letter Key at End of Table)

| Common Name | Scientific Name | Region | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Pools 11-15 | | | | Pools 16-22 | | | |
| | | Sp | Su | F | W | Sp | Su | F | W |
| Ring-billed gull | Larus delawarensis | C | O | C | U | C | | C | C |
| Franklin's gull | Larus pipixcan | O | | O | | O | | O | |
| Bonaparte's gull | Larus philadelphia | U | | U | | R | | R | |
| Forster's tern | Sterna forsteri | C | O | C | | U | | U | |
| Common tern | Sterna hirundo | C | O | C | | O | | O | |
| Least tern | Sterna albifrons | O | O | O | | | | O | |
| Capian tern | Hydroprogne caspia | O | | O | | U | O | U | |
| Black tern* | Chlidonias niger | O | O | O | | O | | U | |
| Mourning dove* | Zenaidura macroura | C | C | C | O | C | C | C | U |
| Yellow-billed cuckoo* | Coccyzus americanus | C | C | | | C | C | C | |
| Black-billed cuckoo* | Coccyzus erythropthalmus | C | C | | | R | | R | |
| Screech owl* | Otus asio | C | C | C | C | C | C | C | C |
| Great horned owl* | Bubo virginianus | C | C | C | C | C | C | C | C |
| Snowy owl | Nyctea scandiaca | | | | O | | | | R |
| Barred owl* | Strix varia | C | C | C | C | C | C | C | C |
| Common loon | Gavia immer | R | | R | | | | | O |
| Red-necked grebe | Podiceps grisegena | R | | R | | | | | |
| Norned grebe | Podiceps auritus | R | | R | | | | O | O |
| Pied billed grebe* | Podilymbus podiceps | C | C | C | | C | U | C | U |
| White pelican | Pelecanus erythrorhynchus | O | | O | | | | R | |
| Double-crested cormorant* | Phalacrocorax auritus | C | C | C | | C | | C | |
| Great blue heron* | Ardea herodias | C | C | C | R | C | C | C | C |
| Green heron* | Butorides virenscens | C | C | C | | C | C | C | |
| Little blue heron | Florida caerulea | | R | | | U | C | C | |
| Common egret* | Casmerodius albus | C | C | O | | C | C | C | |
| Snowy egret | Leucophoyx thula | R | R | | | | U | | |
| Cattle egret | Bubulcus ibis | | | | | R | | | |
| Black-crowned night heron* | Nycticorax nycticorax | C | C | C | | C | U | U | |
| Yellow-crowned night heron* | Nyctanassa violacea | U | U | U | | U | U | U | |
| Least bittern* | Ixobrychus exilis | O | O | O | | U | U | | |
| American bittern* | Botaurus lentiginosus | C | C | C | | U | R | U | |
| Whistling swan | Olor columbianus | C | | C | | O | | R | |
| Canada goose* | Branta canadensis | C | O | C | O | C | | C | C |
| White-fronted goose | Anser albifrons | R | | R | | U | | U | O |
| Snow goose | Chen hyperborea | C | | C | | C | | C | C |
| Blue goose | Chen caerulescens | C | | C | | C | | C | C |
| Mallard* | Anas platyrhynchos | A | C | A | C | C | C | A | A |
| Black duck* | Anas rubripes | C | O | C | O | C | | C | C |
| Gadwall | Anas strepera | C | | C | | C | | C | O |
| Pintail | Anas acuta | A | R | A | R | C | | A | C |
| Green-winged teal* | Anas carolinensis | C | R | C | R | C | U | C | U |
| Blue-winged teal* | Anas discors | A | U | A | | C | U | C | |
| American widgeon | Mareca americana | A | | A | | C | | C | U |
| Shoveler | Spatula clypeata | C | | C | | C | | C | U |
| Wood duck* | Aix sponsa | C | C | C | | C | A | A | O |
| Redhead | Aythya americana | C | O | C | R | U | | U | U |
| Ring-necked duck | Aythya collaris | A | | A | R | C | | C | C |

| Common Name | Scientific Name | Region | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Pools 11-15 | | | | Pools 16-22 | | | |
| | | Sp | Su | F | W | Sp | Su | F | W |
| Canvasback | Aythya valisneria | C | | C | R | U | | U | C |
| Greater scaup | Aythya marila | U | | U | | O | | O | O |
| Lesser scaup | Aythya affinis | A | R | A | R | A | | C | C |
| Common goldeneye | Bucephala clangula | C | | C | O | U | | U | C |
| Bufflehead | Bucephala albeola | O | | O | R | U | | U | U |
| Oldsquaw | Clangula hyemalis | R | | R | R | | | O | |
| White-winged scoter | Melanitta fusca | R | | R | R | | | | |
| Common scoter | Oidemia nigra | | | R | R | | | | |
| Ruddy duck | Oxyura jamaicensis | C | R | C | | A | | C | U |
| Hooded merganser* | Lophodytes cucullatus | C | O | C | R | U | U | U | U |
| Common merganser | Mergus merganser | C | | C | | U | | U | A |
| Red-breasted merganser | Mergus serrator | R | | R | R | U | | U | |
| Turkey vulture | Cathartes aura | O | O | O | R | C | C | O | |
| Goshawk | Accipiter gentilis | | | | O | | | O | |
| Sharp-skinned hawk | Accipiter striatus | U | U | U | O | U | U | U | U |
| Cooper's hawk* | Accipiter cooperii | U | U | U | O | O | O | O | O |
| Red-tailed hawk* | Buteo jamaicensis | C | C | C | C | C | C | C | C |
| Red-shouldered hawk | Buteo lineatus | O | O | O | U | U | U | U | U |
| Broad-winged hawk* | Buteo platypterus | O | O | | | O | O | O | |
| Rough-legged hawk | Buteo lagopus | | | O | O | | | O | O |
| Golden eagle | Aquila chrysaetos | R | | R | R | | | | R |
| Bald eagle* | Haliaeetus leucocephalus | O | O | O | C | U | | U | C |
| Marsh hawk* | Circus cyaneous | C | C | C | O | U | | C | C |
| Harlan's hawk | Buteo harlani | | | | | R | | | R |
| Water pipit | Anthus spinoletta | | | | | O | | | |
| Bohemian waxwing | Bombycilla garrulus | | | | O | | | | |
| Cedar waxwing* | Bombycilla cedrorum | C | C | C | O | U | U | U | U |
| Northern shrike | Lanius excubitor | | | O | O | | | | |
| Loggerhead shrike | Lanius ludovicianus | C | C | C | | O | O | O | O |
| Starling* | Sturnus vulgaris | A | A | A | A | C | C | C | C |
| White-eyed vireo* | Vireo griseus | C | C | | | C | C | C | |
| Bell's vireo* | Vireo bellii | U | U | | | | | | |
| Yellow-throated vireo* | Vireo flavifrons | C | C | C | | U | | | |
| Solitary vireo | Vireo solitarius | O | | O | | | | | |
| Red-eyed vireo* | Vireo olivaceus | C | C | O | | C | C | C | |
| Warbling vireo* | Vireo gilvus | A | A | O | | C | C | | |
| Black-and-white warbler | Mniotilta varia | C | | C | | U | | U | |
| Prothonotary warbler* | Protonotaria citrea | C | C | | | C | C | C | |
| Blue-winged warbler* | Vermivora pinus | O | O | | | | | | |
| Golden-winged warbler | Vermivora chrysoptera | O | O | | | O | | | O |
| Tennessee warbler | Vermivora peregrina | C | | C | | U | | U | |
| Orange-crowned warbler | Vernivora celata | O | | O | | U | | U | |
| Nashville warbler | Vernivora ruficapilla | O | | O | | U | | U | |
| Parula warbler | Parula americana | R | | R | | U | U | | |
| Yellow warbler* | Dendrocia petechia | A | A | O | | U | U | U | |
| Magnolia warbler | Dendroica magnolia | C | | C | | U | | | |
| Cape May warbler | Dendroica tigrina | O | | O | | | | | |
| Black-throated blue warbler | Dendroica caerulescens | A | | A | | | | | |

| Common Name | Scientific Name | Region | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Pools 11-15 | | | | Pools 16-22 | | | |
| | | Sp | Su | F | W | Sp | Su | F | W |
| Cerulean warbler | Dendroica cerulea | R | | | | U | U | | |
| Blackburnian warbler | Dendrocia fusca | C | | C | | | | | |
| Chestnut-sided warbler | Dendroica pennsylvanica | O | | O | | U | | U | |
| Bay-breasted warbler | Dendroica castanea | O | | O | | | | | |
| Blackpoll warbler | Dendroica striata | C | | C | | U | | | |
| Pine warbler | Dendroica pinus | O | | O | | | | | |
| Palm warbler | Dendroica palmarum | C | | C | | U | | | |
| Ovenbird | Seiurus aurocapillus | O | O | O | | | | U | |
| Northern waterthrush | Sieurus noveboracensis | C | | C | | C | | U | |
| Louisiana waterthrush | Seiurus motacilla | O | O | O | | | | | U |
| Kentucky warbler | Oporornis formosus | R | R | | | U | U | U | |
| Connecticut warbler | Oporornis agilis | R | | R | | | | | |
| Mourning warbler | Oporornis philadelphia | O | | O | | | | | |
| Yellowthroat* | Geothlypis trichas | A | A | O | | C | C | C | |
| Yellow-breated chat | Icteria virens | R | R | | | U | U | U | |
| Hooded warbler | Wilsonia citrina | R | R | | | | | | |
| Wilson's warbler | Wilsonia pusilla | C | | C | | U | | | |
| Canada warbler | Wilsonia canadensis | C | | C | | | | U | |
| Worm-eating warbler | Helmitheros vermivorus | | | | | | | U | |
| Yellow-throated warbler | Dendroica dominica | | | | | O | | | |
| American redstart* | Setophaga ruticilla | A | A | O | | C | C | C | |
| House sparrow* | Passer domesticus | A | A | A | A | C | C | C | C |
| Bobolink* | Dolichonyx oryzivorus | O | O | O | | U | | | |
| Eastern meadowlark* | Sturnella magna | C | C | C | O | C | C | C | U |
| Western meadowlark* | Sturnella neglecta | O | O | O | O | | | | |
| Yellow-headed blackbird* | Zanthocephalus xanthocephalus | O | O | O | | | | | |
| Red-winged blackbird* | Aglaius phoeniceus | A | A | A | O | A | A | A | C |
| Orchard oriole* | Icterus spurius | U | U | | | U | U | | |
| Baltimore oriole* | Icterus galbula | C | C | | | C | C | | |
| Rusty blackbird | Euphagus carolinus | C | | C | O | U | | U | |
| Brewer's blackbird | Euphagus cyanocephalus | U | O | U | R | | | | R |
| Common grackle* | Quiscalus quiscula | A | A | A | U | A | A | A | C |
| Brown-headed cowbird* | Molothrus ater | A | A | A | | C | C | C | |
| Scarlet tanager* | Piranga olivacea | O | O | O | | C | C | C | |
| Cardinal* | Richmondena cardinalis | C | C | C | C | C | C | C | C |
| Long-eared owl | Asio otus | U | U | U | U | | | | O |
| Short-eared owl | Asio flammeus | U | U | U | U | | | | O |
| Saw-whet owl* | Aegolius acadicus | U | U | U | U | | | | |
| Chuck-will's-widow | Caprimulgus carolinensis | | | | | O | | | |
| Whip-poor-will* | Caprimulgus vociferus | C | C | | | C | C | | |
| Common nighthawk* | Chordeiles minor | A | A | O | | O | O | O | |
| Chimney swift | Chaetura pelagica | A | A | | | C | C | C | |
| Ruby-throated hummingbird* | Archilochus colubris | C | C | | | | C | | |
| Belted kingfisher* | Megaceryle alcyon | C | C | O | U | C | C | C | O |
| Yellow-shafter flicker* | Colaptes auratus | C | C | C | U | C | C | C | C |
| Pileated woodpecker* | Dryocopus pileatus | O | O | O | O | C | C | C | C |
| Red-bellied woodpecker* | Centurus carolinus | C | C | C | C | C | C | C | C |
| Red-headed woodpecker* | Melanerpes erythrocephalus | C | C | C | R | C | C | C | C |

| Common Name | Scientific Name | Region | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Pools 11-15 | | | | Pools 16-22 | | | |
| | | Sp | Su | F | W | Sp | Su | F | W |
| Yellow-bellied sapsucker | Sphyrapicus varius | C | | C | | C | | C | |
| Hairy woodpecker* | Dendrocopus villosus | C | C | C | C | U | U | U | U |
| Downy woodpecker* | Dendrocopus pubescens | C | C | C | C | C | C | C | C |
| Eastern kingbird* | Tyrannus tyrannus | A | A | | | C | C | C | |
| Western kingbird | Tyrannus verticalus | | | | | | | | |
| Great crested flycatcher* | Myiarchus crinitus | C | C | | | C | C | C | |
| Eastern phoebe* | Saynornis phoebe | C | C | O | | U | U | U | |
| Yellow-bellied flycatcher | Empidonax flaviventris | U | U | U | | U | | | U |
| Acadian flycatcher | Empidonax virescens | O | O | | | C | C | C | |
| Traill's flycatcher* | Empidonax traillii | C | C | O | | | O | | |
| Least flycatcher* | Empidonax minimus | A | A | U | | | | | |
| Eastern wood pewee* | Contopus virens | C | C | U | | C | C | C | |
| Olive-sided flycatcher | Nuttallornis borealis | O | O | | | | | | |
| Horned lark* | Eremophila alpestris | C | C | C | O | C | C | C | C |
| Tree swallow* | Iridoprocne bicolor | A | A | U | | C | C | A | |
| Bank swallow* | Riparia riparia | C | C | U | | C | C | C | |
| Rough-winged swallow | Stelgidopteryx ruficollis | O | O | | | C | C | C | |
| Barn swallow* | Hirundo erythrogaster | A | A | U | | C | C | C | |
| Cliff swallow* | Petrochelidon pyrrhonota | O | O | U | | C | C | C | |
| Purple martin* | Progne subis | A | A | U | | C | C | C | |
| Blue jay* | Cyanocitta cristata | C | C | C | C | C | C | C | C |
| Common crow* | Corvus brachyrhynchos | A | A | A | O | C | C | C | C |
| Black-capped chickadee* | Parus atricapillus | C | C | C | C | C | C | C | C |
| Tufted titmouse* | Parus bicolor | C | C | C | C | C | C | C | C |
| White-breated nuthatch* | Sitta carolinensis | C | C | C | C | C | C | C | C |
| Red-breated nuthatch | Sitta canadensis | | | | R | O | | O | |
| Brown creeper | Certhia familiaris | C | | C | C | U | | U | O |
| House wren* | Troglodytes aedon | A | A | O | | C | C | | |
| Winter wren | Troglodytes troglodytes | O | | O | | | | O | O |
| Bewick's wren | Thryomanes bewickii | O | | O | | | | | |
| Carolina wren | Thryothorus ludovicianus | O | O | O | | C | C | C | C |
| Long-billed marsh wren* | Telmatodytes palustris | C | C | | | U | U | U | |
| Short-billed marsh wren* | Cistothorus | O | O | | | U | | | |
| Mockingbird | Mimus polyglottos | | | | | C | C | C | O |
| Catbird* | Dumetella carolinensis | C | C | O | | C | C | C | |
| Brown thrasher* | Toxostoma rufum | C | C | O | | C | C | C | O |
| Robin | Turdus migratorius | C | C | C | R | C | C | C | O |
| Wood thrush* | Hylocichla mustelina | C | C | C | | | O | | |
| Hermit thrush | Hyocichla guttata | C | | C | | | | | |
| Swainson's thrush | Hylocichla ustulata | C | | C | | U | | U | |
| Gray-cheeked thrush | Hylocichla minima | C | | C | | U | | U | |
| Veery | Hylocichla fuscescens | C | | C | | U | | | |
| Eastern bluebird* | Sialia sialis | C | C | C | R | U | U | U | U |
| Blue-gray gnatcatcher | Poloiptila caerulea | U | U | | | C | C | | |
| Golden-crowned kinglet | Regulus satrapa | O | | O | O | U | | U | O |
| Ruby-crowned kinglet | Regulus calendula | C | | C | | U | | U | |
| Rose-breasted grosbeak* | Pheucticus ludovicianus | C | C | | | C | C | U | |
| Indigo bunting* | Passerina cyanea | C | C | O | | C | C | C | |
| Dickcissel* | Spiza americana | C | C | | | C | C | C | |

| Common Name | Scientific Name | Region | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Pools 11-15 | | | | Pools 16-22 | | | |
| | | Sp | Su | F | W | Sp | Su | F | W |
| Evening grosbeak | Hersperiphona vespertina | | | | O | | | | R |
| Purple finch | Carpodacus purpureus | O | | O | O | U | | U | C |
| Common redpoll | Acanthis flemmea | | | | U | | | | |
| Pine siskin | Spinus pinus | O | | O | O | | | | R |
| American goldfinch* | Spinus tristis | A | A | A | C | C | C | C | C |
| Red crissbill | Loxia curvirostra | | | | R | | | | |
| Rufous-sided towhee* | Pipilo erythrophthalmus | O | O | O | | U | U | U | |
| Savannah sparrow | Passerculus sandwichensis | O | O | O | | U | | U | |
| Grasshopper sparrow | Ammodramus savannarum | O | O | O | | U | U | U | |
| Henslow's sparrow | Passerherbulus henslowii | R | R | U | | | | | |
| Le Conte's sparrow | Passerherbulus caudacutus | U | U | U | | | | | |
| Vesper sparrow* | Pooecetes gramineus | C | C | C | | U | | U | |
| Lark sparrow | Chondestes grammacus | O | O | | | O | | | |
| Slate -colored junco | Junco hyemalis | C | | C | C | C | | C | C |
| Tree sparrow | Spizella arborea | C | | A | A | C | | C | C |
| Chipping sparrow* | Spizella passerina | A | A | A | | | | O | |
| Clay-colored sparrow | Spizella pallida | U | U | U | | | | | |
| Field sparrow* | Spizella pusilla | C | C | C | R | C | C | C | O |
| Harris' sparrow | Zonotrichia querula | C | | C | | | | | |
| White-crowned sparrow | Zonotrichia leucophrys | O | | O | R | U | | U | O |
| White-throated sparrow | Zonotrichia albicollis | A | | A | R | C | | C | U |
| Fox sparrow | Passerella iliaca | O | | O | | U | | U | O |
| Lincoln's sparrow | Melospiza lincolnii | C | | C | | O | | | |
| Swamp sparrow | Melospize georgiana | C | C | O | | C | | C | C |
| Song sparrow | Melospize melodia | A | A | C | R | C | C | C | C |
| European tree sparrow | Passer montanus | | | | | U | U | U | C |
| Lapland longspur | Calcarius lapponicus | O | | O | O | | | | |
| Snow bunting | Plectrophenax nivalis | | | | U | | | | |

Key

Sp - March to May
Su - June to August
F - September to November
W - December to February
* - Nests within study area

A - abundant
C - common
U - uncommon
O - occasional
R - rare

No letter indicates that a particular species has not been recorded in the region.

SOURCE: Upper Mississippi Wildlife and Fish Refuge, Winona, Minnesota
Mark Twain National Wildlife Refuge, Quincy, Illinois

TABLE 3

REPTILES AND AMPHIBIANS OF THE AREA

| Common Name | Scientific Name | Region: Pools 11-15 | Region: Pools 16-22 |
|---|---|---|---|
| Graham's water snake | Natrix grahami | * | U |
| Diamond-backed water snake | Natrix rhombifera | | U |
| Eastern garter snake | Thamnophis sirtalis sirtalis | C | C |
| Eastern plains garter snake | Thamnophis radix radix | | C |
| Red-sided garter snake | Thamnophis sirtalis parietalis | | R |
| Ribbon snake | Thamnophis sauritus | * | R |
| Western ribbon snake | Thamnophis sauritus proximus | * | |
| Eastern hognose snake | Heterodon platyrhinos | | R |
| Ringneck snake | Diadophis punctatus | U | R |
| Prairie ringneck snake | Diadophis punctatus arnyi | | U |
| Blue racer | Coluber constrictor foxi | C | C |
| Fox snake | Elaphe vulpina | U | |
| Western fox snake | Elaphe vulpina vulpina | | U |
| Blackrat snake | Elaphe vulpina obsoleta | C | C |
| Bullsnake | Pituophis melanoleucus sayi | C | C |
| Eastern milk snake | Lampropeltis doliata triangulum | U | U |
| Red milk snake | Lampropeltis traingulum triangulum | | U |
| Northern lined snake | Tropidoclonion lineatum lineatum | | U |
| Prairie kingsnake | Lampropeltis calligaster calligaster | | C |
| Midwest Worm snake | Carphophis amoenus ameonus | | U |
| Western worm snake | Carphophis amoenus vermis | | U |
| Western smooth green snake | Opheodrys vernali blanchardi | | U |
| Midland brown snake | Storeria dekayi wrightorum | | U |
| Northern water snake | Natrix sipedon sipedon | C | C |
| Yellow-bellied water snake | Natrix erythrogaster flavigaster | | U |
| Midland water snake | Natrix sipedon pleuralis | | U |
| Northern red-bellied snake | Storeria occiptomaculata occiptomaculata | | R |
| Water moccasin | Agkistrodon piscivorus | | U |
| Massasauga (swamp rattlesnake) | Sistrurus catenatus | C | U |
| Timber rattlesnake | Crotalus horridus horridus | C | U |
| Copperhead | Agkistrodon contortrix | | U |
| Mud turtle | Kinosternon subrubrum subrubrum | | U |
| Wood turtle | Clemmys insculpta | R | |
| Ornate box turtle | Terrapene ornata | C | C |
| Eastern box turtle | Terrapene carolina carolina | | C |
| Map turtle | Graptemys geographica | C | C |
| Missouri map turtle | Graptemys kohni | | U |
| Quachita map turtle | Graptemys pseudogeographica ouachitensis | | R |
| False map turtle | Graptemy pseudogeogrpaphica | C | C |
| Smalling turtle | Chelydra serpentina | C | C |
| Blanding's turtle | Emydoidea blandingi | C | C |

(Letter Key at End of Table)

| Common Name | Scientific Name | Region: Pools 11-15 | Region: Pools 16-22 |
|---|---|---|---|
| Painted turtle | Chrysemys picta | C | |
| Western painted turtle | Chrysemys picta belli | | C |
| Smooth softshell | Trionyx muticus | C | C |
| Eastern spiny softshell | Trionyx spinifer spinifer | | U |
| Western spiny softshell | Trionyx spinifer hartwegi | | C |
| Spiny softshell | Trionyx spinifer | C | |
| Stinkpot turtle | Sternothaerus odoratus | * | C |
| Yellow-nud turtle | Linosternon flavescens | | * |
| Alligator snapping turtle | Macroclemys temmincki | | R |
| Six-lined racerunner | Cnemidophorus sexlineatus | C | |
| Broad-headed skink | Eumesces laticeps | | U |
| Live-lined skink | Eumesces fasciatus | | R |
| Mudpuppy (salamander) | Necturus maculosus | C | C |
| Eastern tiger salamander | Ambystoma tigrinum | C | C |
| Small-mouth salamander | Ambystoma texanum | | C |
| Central newt (salamander) | Diemictylus viridescens louisianensis | * | U |
| Hellbender (salamander) | Cryptobranchus alleganiensis allenganiensis | | U |
| Marbled salamander | Ambystoma opacum | | R |
| Blanchard's cricket frog | Acris crepitans blanchardi | C | C |
| Spring peeper | Hyla crucifer | C | |
| Gray treefrog | Hyla versicolor | C | |
| Northern spring peeper | Hyla crucifer crucifer | | C |
| Easter gray treefrog | Hyla cersicolor versicolor | | C |
| Western chorus frog | Pseudacris triseriata triseriata | C | C |
| Bullfrog | Rana catesbeiana | C | C |
| Green frog | Rana clamitans melanota | C | |
| Leopard frog | Rana pipiens | C | C |
| Pickerel frog | Rana palustris | R | |
| Wood frog | Rana sylvatica | C | |
| Northern crayfish frog | Rana areolata | | U |
| American toad | Bufo americanus | C | C |
| Dwarf american toad | Bufo americanus charlesmithi | | U |
| Fowler's toad | Bufo woodhousei fowleri | | C |
| Eastern narrow-mouthed toad | Gastrophyne carolinensis carolinensis | | U |

KEY

C - Common U - Uncommon R - Rare
* - Recorded in counties bordering the Upper Mississippi River Refuge
- No letter indicates that a particular species has not been recorded in the region.

Source: Upper Mississippi River Wildlife and Fish Refuge, Winona, Minnesota
Mark Twain National Wildlife Refuge, Quincy, Illinois

TABLE 4

DISTRIBUTION AND RELATIVE ABUNDANCE OF UPPER MISSISSIPPI RIVER FISHES BY POOLS*

| Species | Pool Number | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 |
| Chestnut lamprey *Ichthyomyzon castaneus* | R | R | | | | | | | | O | O | O |
| Silver lamprey *Ichthyomyzon unicuspis* | O | O | O | O | O | O | O | O | O | O | O | O |
| Lake sturgeon *Acipenser fulvescens* | R | | | | | R | H | | H | H | R | H |
| Shovelnose sturgeon *Scaphirhynchus platorynchus* | O | O | O | O | O | O | O | O | O | O | O | O |
| Paddlefish *Polyodon spathula* | O | C | C | C | C | C | C | C | C | C | C | C |
| Longnose gar *Lepisosteus osseus* | C | C | C | C | C | C | C | C | C | C | C | C |
| Shortnose gar *Lepisosteus platostomus* | C | C | C | C | C | C | C | C | C | C | C | C |
| Bowfin *Amia calva* | C | C | C | C | C | C | C | C | C | C | C | C |
| American eel *Anguilla rostrata* | O | O | O | O | O | O | O | O | O | O | O | O |
| Skipjack herring *Alosa chrysochloris* | | | H | | O | O | O | O | O | O | O | O |
| Gizzard shad *Dorosoma cepedianum* | A | A | A | A | A | A | A | A | A | A | A | A |
| Goldeye *Hiodon alosoides* | H | U | H | H | | U | U | U | O | C | C | C |
| Mooneye *Hiodon tergisus* | C | C | C | C | C | C | C | C | C | O | O | O |
| Rainbow trout *Salmo gairdneri* | | | | X | | | | | | | | |
| Grass pickerel *Esox americanus* | | | | X | | | X | X | | | | |
| Northern pike *Esox lucius* | O | O | O | O | O | O | O | O | O | O | O | O |
| Stoneroller *Campostoma anomalum* | X | | | | | X | H | | X | | X | X |
| Goldfish *Carassius auratus* | | | | | | | | | | X | | |
| Carp *Cyprinus carpio* | A | A | A | A | A | A | A | A | A | A | A | A |
| Grass carp *Ctenopharyngodon idella* | | | | | O | | O | | | O | | O |
| Silvery minnow *Hybognathus nuchalis* | C | C | C | C | | | | | | | | |

| Species | Pool Number 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Speckled chub *Hybopsis aestivalis* | C | C | C | C | C | C | C | C | C | C | C | C |
| Silver chub *Hybopsis storeriana* | C | C | C | C | C | C | C | C | C | C | C | C |
| Golden shiner *Notemigonus crysoleucas* | H | O | O | O | H | H | O | O | O | H | O | |
| Pallid shiner *Notropis amnis* | H | | R | | | | | | | | H | |
| Pugnose shiner *Notropis anogenus* | | X | | | | | | | | | | |
| Emerald shiner *Notropis atherinoides* | A | A | A | A | A | A | A | A | A | A | A | A |
| River shiner *Notropis blennius* | A | A | A | A | A | A | A | A | A | A | A | A |
| Bigeye shiner *Notropis boops* | | | | | | | | X | | | X | |
| Ghost shiner *Notropis buchanani* | R | R | R | O | C | C | C | C | C | C | C | C |
| Common shiner *Notropis cornutus* | H | | | | | | | | | | | |
| Bigmouth shiner *Notropis dorsalis* | O | O | O | O | O | O | O | O | O | O | O | O |
| Pugnose minnow *Notropis emiliae* | O | O | O | O | O | O | O | O | | | | |
| Spottail shiner *Notropis hudsonius* | C | C | C | C | C | C | C | C | C | C | C | C |
| Red shiner *Notropis lutrensis* | | | | | | | | C | C | C | C | C |
| Rosyface shiner *Notropis rubellus* | X | | | | | | | | | | | |
| Spotface shiner *Notropis spilopterus* | C | C | C | C | C | C | C | C | O | O | O | O |
| Sand shiner *Notropis stramineus* | O | O | O | O | O | O | O | O | O | O | O | O |
| Weed shiner *Notropis texanus* | U | U | | | | | | | | | | |
| Redfin shiner *Notropis umbratilis* | | | | | X | | | | | | | |
| Mimic shiner *Notropis volucellus* | H | | | | | | | | | | | |
| Suckermouth minnow *Phenacobius mirabilis* | U | | U | | U | U | | U | U | | U | U |
| Southern redbelly dace *Phoxinus erythrogaster* | X | | | | | | | | | | | |
| Bluntnose minnow *Pimephales notatus* | O | O | O | O | O | O | O | O | O | O | O | O |
| Flathead minnow *Pimephales promelas* | U | U | U | U | U | U | U | U | U | U | U | U |

| Species | Pool Number | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 |
| Bullhead minnow *Pimephales vigilax* | A | A | A | A | A | A | A | A | A | A | A | A |
| Creek chub *Semotilus atromaculatus* | H | | | | | | | | | | | |
| River carpsucker *Capiodes carpio* | C | C | C | C | C | C | C | C | C | C | C | C |
| Quillback *Carpiodes cyprinus* | C | C | C | C | C | C | C | C | C | C | C | C |
| Highfin carpsucker *Carpiodes velifer* | O | O | O | | | | | U | U | | | |
| White sucker *Catostomus commersoni* | C | | X | X | X | X | | X | X | X | X | |
| Blue sucker *Cycleptus elongatus* | H | | | U | H | H | | | U | U | H | |
| Northern hog sucker *Hypentelium nigricans* | R | R | | | X | X | | | X | | | |
| Smallmouth buffalo *Ictiobus bubalus* | R | C | C | C | C | C | C | C | C | C | C | C |
| Bigmouth buffalo *Ictiobus cyprinellus* | C | C | C | C | C | C | C | C | C | C | C | C |
| Black buffalo *Ictiobus niger* | H | H | R | C | C | C | C | C | C | C | C | C |
| Spotted sucker *Minytrema melanops* | O | O | O | O | O | O | O | U | | | | |
| Silver redhorse *Moxostoma anisrum* | U | R | R | R | R | R | R | R | R | R | | |
| Golden redhorse *Moxostoma erythrurum* | U | U | U | R | R | R | R | R | R | R | | |
| Shorehead redhorse *Moxostoma macrolepidotum* | O | O | O | O | O | O | O | O | O | O | O | O |
| White catfish *Ictalurus catus* | | | | | | X | | | | | | |
| Blue catfish *Ictalurus furcatus* | | | H | H | H | H | H | H | H | H | H | H |
| Black bullhead *Ictalurus melas* | O | O | O | O | O | O | O | O | O | O | O | O |
| Yellow bullhead *Ictalurus natalis* | O | O | O | | | O | O | O | O | O | O | |
| Channel catfish *Ictalurus punctatus* | C | C | C | C | C | C | C | C | C | C | C | C |
| Stonecat *Noturus flavus* | H | | U | | | H | | | | O | O | |
| Tadpole madtom *Noturus gyrinus* | U | U | U | U | | | | | U | | H | |
| Freckled madtom *Noturus nocturnus* | | | | | | | | | | U | U | |
| Flathead catfish *Pylodictis olivaris* | C | C | C | C | C | C | C | C | C | C | C | C |

| Species | Pool Number 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Pirate perch *Aphredoderus sayanus* | H | | | | | | | | | | | |
| Trout-perch *Percopsis omiscomaycus* | | | | | | | | U | | | | |
| Burbot *Lota lota* | H | | | | | R | | | | | | |
| Blackstripe topminnow *Fundulus notatus* | | | | | | | U | U | | O | O | O |
| Mosquitofish *Gambusia affinis* | | | | | | | | | | | X | |
| Brook silverside *Labidesthes sicculus* | C | C | C | C | C | C | C | C | C | C | C | C |
| Brook stickleback *Culaea inconstans* | | X | | | | | | | | | | |
| White bass *Morone chrysops* | C | C | C | C | C | C | C | C | C | C | C | C |
| Yellow bass *Morone mississippiensis* | O | O | O | O | O | O | O | O | O | O | O | O |
| Rock bass *Ambloplites rupestris* | R | O | R | R | R | R | R | R | R | R | R | R |
| Green sunfish *Lepomis cyanellus* | O | O | O | O | O | O | O | O | O | O | O | O |
| Pumpkinseed *Lepomis gibbosus* | C | C | C | C | | H | H | U | H | | | |
| Warmouth *Lepomis gulosus* | U | U | U | U | | U | U | U | U | | U | U |
| Orangespotted sunfish *Lepomis humilis* | C | C | C | C | C | C | C | C | C | C | C | C |
| Bluegill *Lepomis macrochirus* | A | A | A | A | A | A | A | A | A | A | A | A |
| Redear sunfish *Lepomis microlophus* | | | | | | | | | X | | | |
| Smallmouth bass *Micropterus dolomieui* | U | U | U | U | U | U | U | R | R | R | R | R |
| Largemouth bass *Micropterus salmoides* | C | C | C | C | C | C | C | C | C | C | C | C |
| White crappie *Pomoxis annularis* | C | C | C | C | C | C | C | C | C | C | C | C |
| Black crappie *Pomoxis nigromaculatus* | C | C | C | C | C | C | C | C | C | C | C | C |
| Crystal darter *Ammocrypta asprella* | H | | | | | | | | | | | |
| Western sand darter *Ammocrypta clara* | O | O | O | O | O | O | O | O | O | O | O | O |
| Mud darter *Etheostoma asprigene* | H | | O | | | | | | | | | |
| Fantail darter *Etheostoma flabellare* | H | | | | | | | | | | | |

| Species | Pool Number | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 |
| Johnny darter *Etheostoma nigrum* | U | U | U | U | U | U | | U | U | | U | U |
| Banded darter *Etheostoma zonale* | X | | | | | | | | | | | |
| Yellow perch *Perca flavescens* | C | O | O | O | O | O | O | O | O | | | H |
| Logperch *Percina caprodes* | C | C | C | C | C | C | C | | | O | O | O |
| Slenderhead darter *Percina phoxocephala* | H | | | | | | | | | R | R | |
| River darter *Percina shumardi* | C | C | C | C | C | C | C | C | C | C | C | C |
| Sauger *Stizostedion canadense* | C | C | C | C | C | C | C | C | C | C | C | C |
| Walleye *Stizostedion vitreum* | C | C | C | C | C | C | C | C | C | C | O | O |
| Freshwater drum *Aplodinotus grunniens* | C | C | C | C | C | C | C | C | C | C | C | C |

KEY TO THE STATUS OF A SPECIES:

X - Probably occurs in the pool only as a stray from a tributary water.
H - Records of occurrence are available for this pool, but the species has not been recorded in UMRCC collections in the last 10 years.
R - Considered to be rare in this pool. Some species in this category may be on the verge of extirpation.
U - Uncommon, does not usually appear in sample collections, populations are small, but the species in this category do not appear to be on the verge of extirpation.
O - Occasionally collected, not generally distributed, and local concentrations may occur.
C - Commonly taken in most sample collections through the pool, can make up a large portion of some samples.
A - Abundantly taken in all river surveys.

*Mississippi River pools are numbered according to US Army, Corps of Engineers nomemclature in which a pool carries the same number as the dam which has impounded it.

TABLE 5

INVERTEBRATES FOUND IN THE UPPER MISSISSIPPI RIVER (EXCEPT FRESHWATER MUSSELS)

| Common Name | Scientific Name |
|---|---|
| Flatworms | Platyhelminthes |
| | Turbellaria |
| | Planariidae |
| | Dugesia |
| Roundworms | Nemathelmithes |
| | Nematoda |
| | Diplogasterdae |
| | Diplogaster |
| Aquatic earthworms | Annelida |
| | Oligochaeta |
| | Nadidae |
| | Dero |
| | Nais |
| | Uncinais |
| | Plesiopora |
| | Tubificidae |
| | Branchuira |
| | Ilyodrilus |
| | Limnodrilus |
| | Tubifex |
| | Peloscolex |
| Leaches | Mirudinea |
| | Glossiphoniidae |
| | Helobdella |
| | Glossiphonia |
| | Placobaella |
| | Theromyzon |
| | Halotaxidae |
| | Haplotaxis |
| | Pisicolidae |
| | Illinobdella |
| | Erpobdellidae |
| | Erpobdella |
| | Nephelopsis |
| | Arthropoda |
| | Arachnida |
| Spiders | Araneida |
| Mites and Ticks | Acarina |
| | Crustacea |

| Common Name | Scientific Name |
|---|---|
| Sideswimmers | Amphipoda |
| | Talitridae |
| | Hyallelo |
| Sowbugs | Isopoda |
| | Asellus |
| Crayfish | Decapoda |
| | Orconectes |
| | Insecta |
| | Diptera |
| Midges | Tendipedidae |
| | Coelotanypus |
| | Glyptotendipes |
| | Pentaneura |
| | Procladius |
| | Orthocladius |
| | Pelopia |
| | Cricotopus |
| | Lauterborniella |
| | Smitta |
| | Ablabesmyia |
| | Tendipedini |
| | Tenipes |
| | Chironomus |
| | (Cryptochironomus) |
| | Cryptochironomus |
| | Demicryptochironomus |
| | Leptochironomus |
| | Stenochironomus |
| | Polypedilum |
| | Microcricotopus |
| | Nicrotendipes |
| | Tanypus |
| | Tanytarus |
| | Dicrotendipes |
| | Epoic |
| | Harnishchia |
| | Rheotanytarus |
| | Thienamanniyia |
| | Trissocladius |
| | Xenochironomus |
| | Endochironomus |
| | Parachironomus |
| | Diamesa |
| | Paracladopelma |
| | Paralauterborniella |

45a

| Common Name | Scientific Name |
|---|---|
| Midges | Chaoboridae |
| | *Chaoborus* |
| | Ceratopogonidae |
| | *Bezzia* |
| | *Palpomyia* |
| | Tabanidae |
| | *Chrysops* |
| Mayflies | Ephemeroptera |
| | Caenidae |
| | *Tricorythodes* |
| | *Caenis* |
| | Ephemeridae |
| | *Hexagenia* |
| | *Potamanthus* |
| | *Pentagenia* |
| | Heptageniidae |
| | *Stenonema* |
| | Baetidae |
| | *Ephemerella* |
| | *Isonychia* |
| Damselflies and dragonflies | Odonata |
| | Libellulidae |
| | *Dorococrodulia* |
| | Agrionidae |
| | *Agrion* |
| | Gomphidae |
| | *Gomphus* |
| | Coenagrionidae |
| | *Ischnura* |
| | *Enallagma* |
| | Aeschnidae |
| | *Anax* |
| Stoneflies | Plecoptera |
| | Perlodidae |
| | *Isoperla* |
| True bugs (water boatmen) | Heteroptera |
| | Corixidae |
| | *Sigara* |
| Caddisflies | Trichoptera |
| | Hydropsychidae |
| | *Cheumatopsyche* |
| | *Hydropsyche* |
| | *Potamyia* |
| | Leptoceridae |
| | *Mystacides* |
| | *Leptocella* |
| | *Leptocerus* |

| Common Name | Scientific Name |
|---|---|
| Caddisflies | Oecetis |
| | Psychomyiidae |
| | Neureclipsis |
| | Nyctionphylax |
| | Hydroptilidae |
| | Hydropolita |
| | Cyrnellus |
| | Arthripsodes |
| Beetles | Coleoptera |
| | Elmidae |
| | Stenelmis |
| | Promoresia |
| Dobsonflies | Megaloptera |
| | Sialidae |
| | Sialis |
| | Chrysomelidae |
| | Donancia |
| | Limnephilidae |
| | Hesperophylax |
| | Neophylax |
| | Oecetis |
| Snails | Mollusca |
| | Gastropoda |
| | Ctenobranchiata |
| | Amnicolidae |
| | Amnicola |
| | Viviparidae |
| | Campeloma |
| | Lioplax |
| | Viviparus |
| | Valvatidae |
| | Valvata |
| | Amnicolidae |
| | Somatogyrus |
| | Amnicola |
| | Physidae |
| | Menetus |
| | Physa |
| | Lymnaeidae |
| | Lymnaeda |
| | Pulmonata |
| | Ancylidae |
| | Ferrissia |
| | Pleuroceridae |
| | Pleurocera |
| | Heliosoma |

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TABLE 6

FRESHWATER MUSSELS OF THE UPPER MISSISSIPPI RIVER DRAINAGE AND DISTRIBUTION BY POOL (SINCE 1965)

| Species | Pool 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Spectacle Case *Cumberlandia monodonta* | | | | | X | X | X | | X | | | |
| Monkey-face *Quadrula metanevra* | X | X | X | X | X | X | X | X | X | X | X | X |
| Mapleleaf *Quadrula quadrula* | X | X | X | X | X | X | X | X | X | X | X | X |
| Warty-back *Quadrula nodulata* | X | X | X | X | X | X | X | X | X | X | X | X |
| Pimple-back *Quadrula pustulosa* | X | X | X | X | X | X | X | X | X | X | X | X |
| Buckhorn *Tritogonia verrucosa* | | X | | | | X | X | X | | | | |
| Purple Warty-back *Cyclonaias tuberculata* | | | | X | | X | | | | | | |
| Pig-toe *Fusconaia flava* | X | X | X | X | X | X | X | X | X | X | X | X |
| Ebony Shell *Fusconaia ebena* | | | | X | X | X | X | | | | | |
| Washboard *Megalonaias gigantea* | X | X | X | X | X | X | X | X | X | X | | X |
| Three-ridge *Amblema plicata* | X | X | X | X | X | X | X | X | X | X | X | X |
| Bullhead *Plethobasus cyphyus* | | | | | | X | X | X | | | | |
| Pond-horn *Uniomerus tetralasmus** | | | | | | | | | | | | |
| Ohio Pigtoe *Pleurobema cordatum* | | | | | | | | | | | | |
| Elephant ear *Elliptio crassidens* | | | | | | | | | | | | |
| Spike *Elliptio dilatata* | X | X | X | | X | | | | | | | |
| Threehorn *Obliquaria reflexa* | X | X | X | X | X | X | X | X | X | X | X | X |
| Pink heelsplitter *Proptera alata* | X | X | X | X | X | X | X | X | X | | | X |
| Pink paper shell *Proptera laevissima* | X | X | X | X | X | X | X | X | X | X | | |
| Fat pocketbook *Proptera capax* | | | | | | | | | | | | |
| Fragile paper shell *Leptodea fragilis* | X | X | X | X | X | X | X | X | X | X | X | X |

| Species | Pool 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Narrow paper shell *Leptodea letodon* | | | | | | | | | | | | |
| Butterfly *Plagiola (=Ellipsaria) lineolata* | X | X | X | X | X | X | X | X | X | X | X | X |
| Deer Toe *Truncilla turncata* | X | X | X | X | X | X | X | X | X | X | X | |
| Fawn Foot *Truncilla donaciformis* | X | X | X | X | X | X | X | X | X | X | X | |
| Hickory nut *Obovaria olivaria* | X | X | X | X | X | X | X | X | X | X | X | X |
| Mucket *Actinonaias carinata* | | | X | X | X | X | X | X | X | | | |
| Ellipse *Actinonaias ellipsiformis*** | | X | | | | | | | | | | |
| Black Sandshell *Ligumia recta* | X | X | X | X | X | X | X | X | X | X | | |
| Western Pondmussel *Ligumia subrostrata* | | | | | | | | | | | | |
| Lilliput *Carunculina parva* | X | | X | | X | X | | | X | | | |
| Yellow Sandshell *Lampsilis anodontoides (=teres)* | | | | X | X | | X | | X | X | X | |
| Higgins' eye *Lampsilis higginsi* | X | | | X | X | X | X | | | | | |
| Fat Mucket *Lampsilis radiata siliquoidea* | | X | | X | | | | | | | | |
| Pocketbook *Lampsilis ovata ventricosa* | X | X | X | X | X | X | X | X | X | X | X | X |
| Rainbow Shell *Villosa iris** | | | | | | | | | | | | |
| Snuffbox *Dysnomia triquetra*** | | | | | | | | | | | | |
| Rock Pocketbook *Arcidens confragosus* | X | X | X | X | X | X | X | X | X | X | X | X |
| White Heelsplitter *Lasmigona complanta* | X | X | X | X | | X | X | | X | X | | |
| Fluted Shell *Lasmigona costata*** | | | | | | | | | | | | |
| Creek Heelsplitter *Lasmigona compressa*** | | | | | X | | | | | | | |
| Elktoe *Alasmidonta marginata*** | | | | | | | | | | | | |
| Slipper-shell *Alasmidonta calceolus* | | | | | | | | | | | | |
| Salamander Mussel *Simpsoniconcha ambigua* | | | | | | | | | | | | |

| Species | Pool 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Cylindrical Paper Shell *Anodontoides ferussacianus*** | | | | | | X | | | | | | |
| Flat Floater *Anodonta suborbiculata* | | | | | X | | | | | X | | |
| Paper Floater *Anodonta imbecillis* | X | X | | | | X | | | X | | | |
| Floater *Anodonta grandis* | X | X | X | X | X | X | X | X | X | X | | X |
| Squaw-foot *Strophitis undulatus* | X | X | X | X | X | X | X | | | | | |

*Lives mainly in ponds or lakes; not usually found in streams.
**Lives mainly in small to medium streams.

TABLE 7

ZOOPLANKTON FOUND ALONG ONE FIVE-MILE STRETCH
OF THE UPPER MISSISSIPPI RIVER NORTH OF THE QUAD CITIES

Hydrozoa
- Genera unidentified

Crustacea
- Copepoda
  - Cyclops
  - Diaptomus
  - Eucyclops
  - Harpacticoidia
  - Macrocyclops
  - Mesocyclops
  - Tropocyclops
- Cladocera
  - Alona
  - Alonella
  - Bosmina
  - Ceriodaphnia
  - Chydorus
  - Daphnia
  - Diaphanosoma
  - Eurycercus
  - Ilyocryptus
  - Leptodora
  - Leydigia
  - Macrothrix
  - Moina
  - Pleuroxus
  - Scapholeberis
  - Sida
  - Simmocephalus
- Amphipoda
  - Hyalella
- Ostracoda
  - Several unidentified species

TABLE 8

SPECIES LIST FOR TRAIL PLANTING

| Species | Scientific Name | Pool | Site | Characteristics |
|---|---|---|---|---|
| Flowering dogwood | Cornus florida | 22, 21, 18-16 | Higher | Attractive flowers, interesting fruits & persistent |
| Red Osier Dogwood | Cornus stolonifera | 18-16, 14-11 | Lower wet areas | Same as above |
| Redbud | Cercis canadensis | 22, 21, 18-16 | Higher | Same as above |
| Spicebush | Lindera benzoin | 22, 21, 18 | Higher | Fragrant foliage |
| Gray (red-panicle) Dogwood | Cornus racemosa | 22, 21, 18-16 | Higher | Attractive flowers |
| Nannyberry | Viburnum lentago | 22, 21, 18-16 | Higher | Attactive fruits, flowers |
| Black Jetbead | Phodo typos scanden | 22, 21, 18-16, 14-11 | Higher | White flowers, blackberry |
| Tartarian honeysuckle | Lonicera Tatarica | 22, 21, 18-16, 14-11 | Higher | Flowers - fragrant |
| Oregon Grape Holly | Mahoma aginfolinum | 14-11 | Lower (wet) | Purple foliage, flowers |

TABLE 9

SELECTED
UPPER MISSISSIPPI RIVER BOTTOM LAND TREES
AND THEIR WILDLIFE VALUE

| Name | Food Value | Winter Cover Value | Cavity Value | Abundance | Water Tolerance |
|---|---|---|---|---|---|
| Ash, green (Fraxinus pennsylvania) | Seed (M) | L | L | V | V |
| Baldcypress (Taxodium distichum) | (L) | L-M | L | R | V |
| Birch, river (Betula nigra) | Leaf Bark (L) | L | E | M | V |
| Boxelder (Acer negundo) | Flower Buds Seeds (M) | L | E | V | V |
| Butternut (Juglans cinerea) | *Nut (M) | L | L | L | L |
| Cherry, Wild Black (Prunus serotina) | Fruit (E) | | | | |
| Cottonwood, eastern (Populus deltoides) | Buds, Catkins (L) | L | M | V | V |
| Coffee tree, Kentucky (Gymnocladus dioicus) | Pod (L) | L | N | M | V-M |
| Dogwood (Cornus spp.) | Fruit (E) | M | N | M-V | L |
| Elm, American or Slippery (Ulmus spp.) | Seeds, Buds (L) | L | E | V | V |
| Elm, Chinese (Introduced) (Ulmus parvifolia) | Seeds, Buds (L) | L | L | V | V |
| Hackberry (Celtis Occidentalis) | *Fruit (E) | L | L | L | M-L |
| Hackberry, Mississippi (Celtis laevigata) | *Fruit (E) | L | L | M-V | M |
| Hawthorne (Crataegus spp.) | Seed (M) | L | N | M | M-L |
| Hickory, Shagbark (Carya ovata) | *Nut (E) | L | L | M-L | M-L |
| Hickory, Shellbark (Carya laciniosa) | *Nut (E) | L | L | M-L | M-L |

(Letter Key at End of Table)

| Name | Food Value | Winter Cover Value | Cavity Value | Abundance | Water Tolerance |
|---|---|---|---|---|---|
| Locust, Black (Robinia pseudoacacia) | Seeds (L) | L | L | M | M-L |
| Locust, Honey (Gleditsia triacanthos) | Seeds (L) | L | L | L | L |
| Maple, Silver (Acer saccharinum) | Flower Buds, Seeds (M) | L | E | V | V |
| Mulberry, White (Morus alba) (Introduced) | Fruit (F) | L | L | L | M |
| Mulberry, Red (Morus Rubra) | Fruit (E) | L | L | M | M |
| Oak, Bur (Quercus macrocarpa) | *Nut (E) | L | G | M-L | M-L |
| Oak, Pin (Quercus palustris) | *Nut (E) | L | G | M | M-L |
| Oak, Red (Quercus rubra) | *Nut (E) | L | G | L | L |
| Oak, White (Quercus alba) | *Nut (E) | L | G | L | L |
| Oak, Swamp White (Quercus bicolor) | *Nut (E) | L | G | M | M-L |
| Pawpaw (Asimina triloba) | Fruit (L) | L | N | L | L |
| Pecan (Carya illinoensis) | Nut (E) | L | L | L | M-L |
| Persimmon, Common (Diopsyros virginiana) | Fruit (E) | L | N-L | L | M-L |
| Sweetgum (Liquidambar styraciflora) | Seeds (L) | L | L | L | M |
| Tupelo gum (Nyssa aquatica) | Fruit (G) | L | L | R | M-V |
| Sycamore (Platanus occidentalis) | - (L) | L | E | M-L | M |
| Walnut, Black (Juglans nigra) | *Nut (M) | L | L | L | L |
| Willow, Almond (Salix amygdaloides) | Bud, Browse (M) | M | N | L | V |
| Willow, Black (Salix nigra) | Bud, Browse (M) | M | L | V | V |
| Willow, Sandbar (Salix interior) | Bud, Browse (M) | M | N-L | V | V |

| Food, Cavity, Cover Value | Abundance | Water Tolerance | *Provides Winter Food |
|---|---|---|---|
| E = Excellent | V = Very | V = Very | |
| G = Good | M = Moderate | M = Moderate | |
| M = Moderate | L = Low | L = Low | |
| L = Low | R = Rare | I = Intolerant | |
| N = None | | | |

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Compiled by David A. Nelson, Environmental Analysis Section, Rock Island District Corps of Engineers

ADDENDUM 1

## ADDENDUM 1

## Vegetative Cover Typing and Management Practices

### 1. INTRODUCTION

1.1 The fish and wildlife resources on the Mississippi River flood plains are abundant and diverse. Many different woody and ground cover or wetland associations in different stages of growth occur in the river flood plain forests. Each association in each stage of growth meets some needs of different species of wildlife. From that diversity of vegetation, from young silver maple-ash-cottonwood stands to mature pin oak-pecan stands to wetlands of American lotus (Nelumbo lotuea), comes the rich variety of wildlife native to the flood plain.

1.2 The vegetation of the flood plain is divided into specific associations of species, and is expressed as cover types. In this addendum vegetative management practices are listed and discussed. Since we will be dealing with vegetative management in the flood plain forests, the vegetative management practices are accepted silvicultural techniques.

1.3 Forest management, whether by private company, a Government agency, or a private individual, is the management of the forestry resource to fulfill the owner's purpose. In this case the purpose of the owner of this flood plain land is to hold the greatest number and variety of self sustaining species of wildlife while considering recreation, aesthetics, and wood products. Forest management practices will be used to maintain and encourage the greatest diversity of wildlife habitat along the river, especially habitat of endangered and threatened species. At the same time, other desirable management goals; such as, recreation, aesthetics, and forestry products for local industries will not be ignored. These goals will be met in varying degrees as diverse wildlife habitat is developed and enhanced along the Mississippi River.

1.4 Project lands not in forest, and not included in other sections of this management plan, such as agriculture leases administered by the Corps, will be administered as they are now. If agriculture leases are not renewed, management of these areas will be considered on a case by case basis and site plans will be added as changes to this plan.

### 2. COVER TYPE AND MANAGEMENT UNIT DELINEATION

As this management plan was developed, forested areas in each Mississippi River pool were examined. The US Fish and Wildlife Service had previously identified cover types in the Mississippi River pools. Cover types included in their cover type 2b (mixed lowland hardwoods >20 feet) were then identified and delineated. Each cover type is a specific association of dominant woody vegetation, associated woody species, and ground cover that occupies a forest site. We used information from the forest inventory completed in late 1979, color infrared aerial photographs, ground truthing of the photographic interpretations, and on-the-ground experience gained from working in the forests to determine cover types.

After determining the cover types for each area, each pool was divided into management units and silvicultural practices were prescribed for cover types in each unit. Management units allow the forest resources to be managed more effectively. One reason the use of management units is a good management tool is because different agencies manage the fish and wildlife resources on different tracts in the Mississippi River pools. Prescriptions in each unit can be designed to mesh with the wildlife management objectives of each area during coordination with the US Fish and Wildlife agency or state agency that manages the wildlife on each area. Geographical circumstances of different areas was also a factor in delineating unit boundaries. For instance, often large islands such as Beaver Island in Pool 14 are considered separate units. Finally, areas with distinctive resources or attributes are considered as separate units. For instance, the Wapsipinicon River in Pool 14 is one of the finest recreational rivers in Iowa and Armstrong Island in Pool 22 has an active Heron rookery on it. Each area is considered as a separate management unit.

3. KEY TO COVER TYPES AND FEATURES

Using the previously discussed classification scheme, the US Fish and Wildlife Service delineated cover types and features for Pools 22-11. The Fish and Wildlife Service interpreters made field notes on selected sites. Using this knowledge, the interpreters simultaneously viewed CIR photographs with streoscopes and identified the cover types found in the pools. To fit their cover types into our classification scheme and make this plan as workable as possible, we consolidated and selected those cover types necessary to a forestry and fish and wildlife plan and changed those symbols to numbers.

We then typed out mixed lowland hardwoods greater than 20 feet in height in the lands owned by the Rock Island District Corps of Engineers. The dominant species are those found as a major species in the overstory. Associated species are found in the understory or as occasional species in the overstory. Ground cover when it occurs is many times an indication of a certain stand type. Because of favorable microclimate occurences in the Mississippi bottom lands, oaks and other valuable trees may be found in stand types that, according to general bottom land cover typing, should not contain them.

For plan cover typing purposes all mature trees have a DBH greater than 20 inches, while immature species have a DBH up to and including 20 inches. Such classifications indicated on the cover typed maps (Attachment 1) as a small letter beside the class number, will help indicate what treatment to prescribe. Cover types are listed as numbers 1-56. (Addendum 1, Section 4)

4. FOREST, VEGETATIVE, AND WETLAND COVER TYPES

| Type | Dominant Species | Associated Species | Ground Cover |
|---|---|---|---|
| 1 | Silver Maple and/or Willow, River Birch, Cottonwood. | none | wood nettle or nothing |
| 2 | Monocultures of Silver Maple, Cottonwood or a mixed stand of those two species | none | bur cucumber, wood nettle, or nothing |
| 3 | Silver Maple, Cottonwood, Ash | Sycamore, Hackberry some Oak and/or Hickory, Pecan and Walnut widely scattered singly or in groups | wood nettle, bur cucumber |
| 4 | Silver Maple, Oak and/other mast trees | Elm, Hackberry | wood nettle, poison ivy, tall meadow rue |
| 5 | Silver Maple, Cottonwood, Ash, open stand | Kentucky Coffeetree, Sycamore, Elm | wood nettle, bur cucumber |
| 6 | Silver Maple, Cottonwood, Oak | Ash, Hackberry, plus Pecan or Hickory or Walnut | wood nettle, poison ivy, tall meadow rue |
| 7 | Either Silver Maple or River Birch dominate the stand but not both | Oak and/or Pecan scattered singly or in groups | wood nettle |
| 8 | Ash | Silver Maple, Cottonwood | wood nettle or nothing |
| 9 | Silver Maple, Cottonwood, Ash | Sycamore, Elm, Mulberry | wood nettle, bur cucumber |
| 10 | Hackberry, Kentucky Coffeetree, and Honey Locust | Pin Oak (rare) | wood nettle |
| 11 | River Birch, Willow, Buttonbush | none | wetland species |
| 12 | Shagbark Hickory | Bur Oak, Black Walnut | wood nettle |

| | | | |
|---|---|---|---|
| 13 | Pin Oak with some Bur or Swamp White Oak intermixed with lower areas of Maple | Ash, Willow | wood nettle and areas of nothing or wetland plants |
| 14 | Silver Maple, Cottonwood, Oak, and Pecan open stand | Persimmon, Elm, Hackberry, Ash | wood nettle, cucumber vine, greenbriar |
| 15 | Pin Oak | Bur or Swamp White Oak | wood nettle or nothing |
| 16 | Pin Oak, Bur Oak, Swamp White Oak, Pignut Hickory, Shagbark Hickory | Silver Maple, Ash | wood nettle, grass |
| 17 | Wind damaged area of Silver Maple, Cottonwood | Elm, Ash | none |
| 18 | Pin Oak, Persimmon, Swamp White Oak, Silver Maple | Pecan | wood nettle, greenbriar |
| 19 | Pin Oak, Pecan | Elm | wood nettle |
| 20 | Silver Maple, Cottonwood, Ash, open stand | Sycamore | wood nettle, cucumber vine, and some area of forest regeneration |
| 21 | Silver Maple, Willow, Ash | none | wetland plants |
| 22 | Pin Oak and/or Bur Oak | none | none |
| 23 | Silver Maple, Ash, Cottonwood, open stand | Hackberry, Oak, Shellbark Hickory, Pin Oak | wood nettle, bur cucumber grasses |
| 24 | Hard Maple, Red Oak, White Oak | Hackberry, Black Cherry, Ash, Bur Oak, Shagbark Hickory, Bitternut Hickory | true soloman seal, false solomon seal bloodroot |

Forest Stand Age Indication

| | | |
|---|---|---|
| i | Immature | 1 - 20" DBH |
| m | Mature | 20" DBH+ |
| im | Immature, mature - both ages present | |

| Type Symbol | Description |
|---|---|
| **Open Water Habitat** | |
| 25 | All Forms of open water including main river channel, side channels, lakes, ponds, streams, and sloughs. |
| **Alluvial Areas** | |
| 26 | Water-deposited sand. |
| 27 | Water-deposited mud (sometimes includes wet sand which was difficult to distinguish from mud). |
| **Wetland vegetation** | |
| 28 | Submergent aquatics. |
| 29 | Submergent aquatics and duckweed: Ceratophyllum demersum (coontail) is often the dominant submergent species in this type. |
| 30 | Floating-leaf pondweeds such as Potamogeton americanus: this type was rarely encountered. |
| 31 | Lemnaceae (duckweeds) is characteristic of small, stagnant water bodies. In some cases, submergents may have been present but not discernible. |
| 32 | Nymphaea (water lilly) was rarely encountered. |
| 33 | Nelumbo lutea (American lotus). |
| 34 | Nelumbo lutea and duckweed. |
| 35 | Sagittaria spp. - primarily latifolia (duck potato). |

| | |
|---|---|
| 36 | Sparganium spp. - (bur reeds) were uncommon. |
| 37 | Scirpus fluviatilis (river bulrush). |
| 38 | Jussiaea sp. (water primrose) - very localized occurrence |
| 39 | Polygonum spp. (smartweeds) - a diverse class including emergents and marsh species, annuals and perennials. |
| 40 | Typha latifolia and T. angustifolia. |
| 41 | Eragrostis spp. (love grasses). |

Herbaceous vegetation

| | |
|---|---|
| 42 | Mixed grasses (other than 42, 45, or 41). Not a major type: some overlaps into the marsh category. |
| 43 | Forbs - mixed broadleaf weed species mostly of Eurasian origins: the most common genera include Amaranthus. Zanthium and Ambrosia. Some overlap into the marsh category. |
| 44 | Leersia oryzoides (rice cut-grass) considerable overlap into marsh category. |
| 45 | Phalaris arundinacea (reed canary grass). |
| 46 | Echinocystis lobata (wild cucumber). |

Woody vegetation

| | |
|---|---|
| 47 | Buttonbrush (Cephalanthus occidentalis). |
| 48 | Shrub species and/or woody vines which normally do not attain a height of greater than 20 feet. |

Developed and agricultural vegetated areas

| | |
|---|---|
| 49 | Agruculture - all areas appearing to have been tilled or pastured within the past year; includes areas tilled and planted for wildlife foods. Abandoned fields are usually typed 43. |

| | |
|---|---|
| 50 | Developed grass - all areas such as most levees which are covered largely by grasses and which are mowed at least once per year; also includes lawns over two acres in size. |
| 51 | Developed parks - includes campgrounds, picnic areas, golf courses, and other recreation areas with developed user facilities. Inclusions such as parking lots or open lawns over two acres in size would be typed as 52 or 50, respectively. |
| 52 | Developed - all areas which are essentially nonvegetated due to man's activities (excluding plowed croplands). |
| 53 | Residential - typically comprised of streets, houses, lawns, shrubs, and trees. |

Dredged material sites

| | |
|---|---|
| 54 | All dredged material sites. |

Planted Areas

| | |
|---|---|
| 55 | Coniferous species. |
| 56 | Hardwood species. |

Manmade structures

| | |
|---|---|
| __••__••__ ••__••__ | Levee. |
| __xx__xx xx__xx__ | Dam. |
| __+__+__+ __+__+__ | Powerline through nonforested area. |
| __+__+__+ __+__+__<br>__+__+__+ +__+__+__ | Powerline right-of-way through forested area. |

## 5. MANAGEMENT PRACTICES

### 5.1 Introduction.

Vegetative management practices are listed and described in this section. The management practices listed will be used to maintain a diverse bottom land forest ecosystem, and so maintain quality wildlife habitat.

Rotation age is chosen to best fit the biological and economical factors impacting the life of that species in a stand coupled with management objectives. Because of the lack of past regulated management and consistent recordkeeping, rotation length for the Oak-Hickory and Silver Maple-Cottonwood associations have not been permanently established. They will evolve as this vegetative management plan is implemented and updated in five years.

Rotation lengths will be determined by the following criteria: (1) stand mapping and unit acreage, (2) growth data, (3) species composition, (4) wildlife objectives, and (5) timber harvest feasibility.

The amount of acreage of each association in each management unit, number or timing of thinnings, and age of diameter at which stand will need to be regenerated will determine the rotations for each association. The current rotation we used for determining regeneration cut limits was 60 years in much of the Silver Maple-Cottonwood-Ash stands. In Corps fee title lands where management of wildlife resources is the responsibility of the US Fish and Wildlife Service, a rotation of 100 years in length was used in determining harvest limits in Silver maple and Cottonwood Ash stands.

The amount of existing mature Silver-Maple Cottonwood-Ash stands was first determined by using aerial photographs, US Fish and Wildlife Service cover type overlays, and on-the-ground survey. We determined the maximum harvest cut by dividing the total amount of acreage of mature Silver Maple, Cottonwood, and Ash in each unit, excluding the approximate amount of woodlands included in special management or no management types, by the number of years in rotation. The figure obtained was then multiplied by the total number of years selected for reentry (cutting cycle). Admittedly, this method could result in a large percentage of timber in a management unit becoming overmature at one time if it were carried on indefinitely. It is realized that a good distribution of timber in a whole spectrum of age classes is necessary to develop a healthy self-sustaining forest stand. However, it is felt that the harvesting limit determined by this method will provide a good beginning for scientific management on the river. As the management units are stand mapped, the method of determining the maximum allowable harvest (regeneration cut) will be changed or developed to meet specific management objectives. At that time, all immature and mature stands of Silver Maple, Cottonwood, and Ash, except those in special or no management zones, will be included in the total acreage figure. So as the management prescriptions are implemented, a diverse bottom land forest resource with a fully regulated distribution of tree size and age classes will be developed over time that will provide a variety of wildlife habitat and other benefits from what started as a conservative beginning.

Harvest cuts are based on area regulation. No regeneration cuts were recommended for Oak-Hickory stands in the next five years. As previously suggested, stands keyed as ash, cottonwood, silver maple, may contain some oaks, etc., not found when the cover types were delineated. If this occurs, regeneration cuts will be changed to practice V, U, or J, not practice I, and the oak, pecan, and other mast species should be left.

Planting these species back into these areas should be done only if there is a reasonable chance the trees will grow and become a self-sustaining stand. If thinning is prescribed, oaks and other mast trees will be favored. These practices will be applied to groups of tracts (management units) by stand type pool by pool by succeeding addendums. The appropriate total amount of wooded acreage in each unit and the type maps that the unit can be found on will be included as well in the each management unit's prescription.

5.2 Practices.

Practice A. Reforestation - Planting.

a. Plant balled and burlapped, containerized and/or bare rooted native deciduous tree species. Plant native species to regenerate individual trees lost to death or removed because of disease or insect infestations. Additionally this practice will be implemented to provide mast producing stands for wildlife in public use areas or to accomplish plantings detailed in the MP.

b. (Recreation areas) Plant the species that emphasize sound, touch and smell, as well as visual interest. This practice will be implemented along nature trails. Plant species which produce unique sounds, display varying textures on the leaves and bark, and/or exude odors either through natural pores or wounds from minor injuries. Select those species which are the most tolerant of soil compaction. A list of species that display attractive fruit and flowers, and fragrant leaves is included as Table 8.

c. (Recreation areas) Plant balled and burlapped containerized, and/or bare rooted species to accomplish the aesthetic screening of park facilities, screening of operation and mainenance facilities, and sewage lagoons.

d. Plant balled and burlapped containerized, and/or bare rooted species to improve mast production for wildlife. A list of trees and their wildlife value is included as Table 9.

e. Plant balled and burlapped, containerized and/or bare rooted species to reintroduce species that have been cut out by past logging practices. Plant these species in areas with conditions supporting their reintroduction. These species may be planted after the stand is harvested and proper site preparation done, or two-five years before the stand is harvested so they will be established and they will be ready to overcome the herbaceous bloom after the timber is harvested. Such species are as follows:

| | |
|---|---|
| persimmon | Diospyros virginiana |
| bur oak | Quercus macrocarpa |
| swamp white oak | Quercus bicolor |
| shagbark hickory | Carya ovata |

| | |
|---|---|
| shellbark hickory | Carya laciniosa |
| black walnut | Juglans nigra |
| pecan | Carya illinoiensis |
| tall pawpaw | Asimina triloba |

f. Plant a cover crop of grasses or forbs up to two years before planting seedlings to eliminate competition from fast growing woody and herbaceous vegetation.

g. Artificially seed, whether by air or hand, to reestablish the desired species in an opening created by a silvicultural practice; the opening may result from the inability of tree species to reestablish themselves.

Site preparation: The general maintenance practices of weed and vegetative competition control will be followed for two-four years (by contract or internal personnel) until the plantings have become established. Suggested application of herbicides will be as follows:

(1) For rapid knockdown without residual control use Roundup.

(2) For residual control around nursery plantings established for one or more years use Amizine, and other herbicides as approved.

(3) For broadleaf control use a preemergent herbicide.

Practice B. Tree Maintenance. (Recreation Areas.)

a. Remove hazardous trees in or adjacent to recreation areas.

b. Prune to improve the aesthetical appeal of individual trees.

c. General maintenance practices; such as fertilizing, spraying, removing disease or insect infected portions, fill-in voids, and sealing mechanical injuries, will be accomplished to improve growth and maintain healthy condition in existing tree species in the intensively maintained areas.

Practice C. Vista. (Recreation Areas.) Trees that obstruct a scenic vista adjacent to devel-oped recreation areas will be thinned to 50 feet basal area. When possible, lower branches or the remaining trees will be pruned up to half the total height. Only branches that are less than one-fourth the diameter of the trunk at the point of attachment will be removed. Branches larger than this size will remain to avoid an unsightly scar or a deformed tree. This pruning will cause adventitious sprouting of branches. These branches will be removed periodically. Pruning cuts may be sprayed for aesthetic reasons.

Practice D. Vista Thinning. (Recreation Areas.) Trees that are adjacent to developed recreation areas but don't obstruct a scenic vista will be thinned to 80 feet basal area.

Practice E. Shade Selection. (Recreation Areas.) Selection of species to be thinned will be governed by shade producing qualities. Mast producers will be given secondary consideration. Recreation areas should be no more than 50% shaded to encourage grass growth.

Practice F. Canopy Selection. (Recreation Areas.) Selection of species in relation to canopy position to be removed will be as follows: first - suppressed understory species; second - intermediate, excluding shade tolerant species; third - codominant and dominant species.

Practice G. Screening. (Recreation Areas.) Screening will be provided between developed recreation areas and adjacent roads and railroad tracks where space permits. The screening will be established by planting seedlings in 3 or 4 rows. The row adjacent to the road will contain red osier dogwood and red cedar spaced 6 feet apart. The next row will contain cherry or autumn olive spaced 10 feet apart. The middle row will contain silver maple spaced 12 feet apart. The next row will contain green ash spaced 10 feet apart; this is optional depending on space limitations. All rows will be 15 feet apart. These row plantings will provide both screening from users of the recreation area from the road user and will provide reduced noise level in the campground caused from vehicular traffic. The dust created on gravel roads adjacent to recreation areas will be collected in the row plantings.

Practice H. Cleaning. A cutting is made in a young stand, not past the sapling stage, for the purpose of freeing trees from other individuals of similar age that are of less desirable species or are likely to overtop them. Sapling stands should be cut to provide 4-5 feet of opening between crowns of the trees that will form the future stand.

Practice I. Clearcutting. The harvest of all timber in a mature stand in one cut. As this practice is implemented, the site will be scarified as much as possible with the equipment available, so that a good seedbed will be provided for the desired regeneration. If desired, scarification using specific equipment after the logging operation may be specified in the contract. Clearcutting will be used to maintain different stages of growth in the maple monocultures found on the flood plain. Deer and other wildlife will benefit from the vegetational diversity. Higher areas in elevation may be harvested with a clearcut if hardwood mast trees, important in providing food for wildlife, cannot reproduce themselves or should be reestablished in the area. After logging, the slash may be piled, windrowed, or scattered depending on the site and conditions involved and will be specified in the contract. Clearcuts done in the same area will be designed to leave travel lanes of 100 feet between areas of older timber so wildlife can safely travel to and from resting cover and food.

Removal of all timber in a silver maple or cottonwood stand will be done in a 1-10 acre "patch." The patch will be irregularly or cylindrically shaped to obtain a maximum of edge ecotone. In order to insure vigorous regeneration of harvested stands, we feel that the size of regeneration cuts should be from 5 to 10 acres when practical. Research indicates that very small regeneration harvests do not result in adequate restocking of the stand, and does not yield strong wildlife benefits.

The timing of clearcuts will be determined in coordination with the US Fish and Wildlife Service and the appropriate states. If regeneration does not occur in three years because ground vegetation takes over, the impeding vegetation will be removed via manual or chemical means.

Practice J. Improvement Cut. A cutting made in a stand past the sapling stage for the purpose of improving its composition and character, but removing trees of less desirable species, form and condition in the main crown canopy.

Practice K. Liberation. A cutting made in a young stand, not past the sapling stage, for the purpose of freeing the young trees from older individuals that are overtopping them.

Practice L. Timber stand improvement. Noncommercial improvement of the composition and quality of the timber stand by various methods including the following.

a. Cull tree removal (including girdling and liberation cut): girdling will provide potential denning or woodpecker trees.

b. Crop tree release.

c. Clearing of vines and herbaceous growth - manual or herbicidal.

d. Thinning or weeding.

e. Release cut - hand or herbicidal treatment.

f. Sanitation cut.

g. Pruning - high value trees.

Practice M. No Treatment Zone. No treatment will be provided in a small area or extended zone of 100-200 feet due to overriding wildlife or aesthetic considerations, where such a practice is considered useful; such as along some heavily traveled shoreline areas. The extent of the zone will be determined based on environmental and ecological factors, human usage of the area, and sensitivity of wildlife using the area.

Practice N. Natural or Unique Areas. Unique areas are to have no prescriptions applied to them. The areas will have research or educational significance or be habitat for very sensitive or endangered wildlife.

Monitoring will be applied with this practice to acquire hard data on the unique areas. The data will be used to determine future status of the area and any management needed.

Practice O. Sanitation Salvage. A cutting made to remove trees killed or injured by wind, fire, insects, fungi, or other harmful agencies (and sometimes trees susceptible to such injuries), for the purpose of preventing the spread of insects or disease.

Practice P. Selection. Selection harvesting of mature timber as single trees or small groups and repeated indefinitely at short intervals to stimulate reproduction and create or maintain an unevenaged stand.

Group removal opening will be equal to or greater than the height of the overstory trees, but no opening will be created larger than one acre. Any opening larger than one acre is a clearcut and will be done only when that practice is prescribed.

Practice Q. Thinning. A cutting made in an immature stand for the purpose of increasing the rate of growth, and the form of the trees that remain. The cutting should increase the total production of the stand by increasing understory growth for wildlife. The thinning may be cut to an accepted basal area which is currently 90-100 BA per acre in Silver Maple-Cottomwood and 70 square feet per acre BA in Oak-Hickory stands. Thinning will be based on stand mapping, silvicultural considerations, and wildlife habitat needs.

As the practice of thinning is applied, the forester marking the timber to be removed must look at the trees in two ways: tree product quality of the residual stand and stand composition for future wildlife habitat.

A forest consists of trees of varying species, quality, form, and often age. In considering tree product quality, forest trees can be placed in three general classes: good growing stock, reserve growing stock, or poor growing stock. Most of the trees remaining after cutting should consist of good growing stock, and some reserve growing stock. Trees will generally be thinned from reserve growing stock and poor growing stock.

While looking at product quality, in the decision of what trees to cut and what trees to leave, the composition of stand as it provides wildlife habitat in the future must be considered. An appropriate number of den trees, potential den trees, and mast bearing trees, for instance, should be a part of the residual stand after thinning.

Practice R. Lopping and scattering. Lopping the slash soon after logging and spreading it more or less evenly over the ground, without burning (lopping may be done without scattering).

Practice S. Slash or Prescribed Burning. Slash burning - burning slash in windrows, in piles, or in an area to reduce it or remove it from the harvested or damaged area. Nutrients will be released more quickly for use by the regenerating stand, and the amount of flash fuels will be reduced, decreasing potential for wildfire occurrence.

Prescribed burning - burning an area after properly constructed firelines have been established. Fuel moisture content of the different fuels present, air temperature, wind speed and direction, atmosphere relative humidity, and the number of days since the last rain are all factors that

must be considered in the decision making process involved in a prescribed burn. Additionally, properly constructed firelines are necessary to insure positive control of the fire. Smoke management is also a part of conducting a prescribed burn. The effect of smoke on pleasure craft, commercial craft, nearby recreation, and any nearby residential areas must be noted. Because of the sensitivity of burning, coordination must be complete. Prescribed burning must be coordinated with all interested and affected parties.

Practice T. Monitor. Monitor the area or stand for any change in the stand indicating a need for the implementation of management practices. A significant change in the overstory or continued absences of regeneration leading to a change of species are two situations that may call for monitoring. Monitoring will be done over a 10-20 year period, unless a storm or other conditions necessitate immediate action.

As a result of the monitoring process, hard data will be acquired. Two or more plots, as well as a control plot, will be established and measured each year to gather hard data on which to base a sound management decision at the end of the monitoring period. The plots will be at least 1/5 acre in size, except for reproduction test plots which may be smaller. All plots will be systematically installed and located so data can be gathered for the entire monitoring period. Data acquired during the monitoring process will be kept on file in the Mississippi River Project office of Recreation Resources, Box 34, Pleasant Valley, Iowa 52767.

Practice U. Shelterwood. The stand is removed in two cuts over a period of several years. The residual stand left after the first cut will be composed of species such as hardwood mast trees, if such trees are present, that will help to meet the management needs of the area in the interim period.

Underplanting after the first cut may be used to regenerate Oaks or Hickory, etc., where natural regeneration may be hindered by a lack of seed source, etc. From 50-70 percent of the Basal Area will be removed in the first cut. The final cut removes the Shelterwood trees.

Practice V. Seed Tree Modified. A cutting in which 6-10 trees are left per acre in a 1-10 acre irregularly shaped "patch." As this practice is implemented with the equipment available, the site will be scarified as much as possible with the equipment available, so that a good seedbed will be provided for the desired regeneration. If desired, scarification using specific equipment after the logging operation may be specified in the contract. The "leave" trees should be windfirm and of the more desirable species and form for seeding the area back in. The trees left standing can be girdled or harvested once the new stand is established. Pile brush after harvesting if wildlife using the site will benefit. Brush piles will be six feet in height and have a surface area of from 500-2,000 square feet.

Practice W. Special Management Zones. Special management practices will be practiced in designated zones. A different rotation may be necessary to accomplish this.

In a zone 100-400 feet wide or in large areas, management practices including some clearcuts will be made over a different or perhaps longer rotation; such as 150 years. These zones will provide for special management purposes, such as to sustain wood duck nesting cavities in silver maple. Sloughs, ponds, or lakes that are stagnant or have little current are preferred by wood ducks for nesting. Conditions as this result in prime habitat, and as such the widest zone (400 feet) may be aplied along these water areas. Where oak and/or hickory occupies sites in this zoning, only improvement cuts will be done to reduce the basal area per acre to 70 square feet per acre and to encourage mast production and natural regeneration. In silver maple stands, shelterwood, seed tree, and small clearcuts, up to two acres, may be done at the end of the rotation. Thinnings down to 90-100 square feet per acre will be done when the stand is overstocked to increase growth speed cavity formation. Squirrel and/or wood duck nesting boxes can be put up to (1) provide more nesting opportunity for target species, and (2) developing or maintaining a squirrel population in an area. The nest boxes must be predator-proof, durable, and provide weather protection.

Practice X. Stand Mapping. Map the unit perhaps on north-south or east-west transects 10 to 20 chains apart for large homogenous areas. Smaller areas, areas which have good representative aerial photos, or areas having easily followed terrain features will be stand mapping using individual transect lines. The lines will be set up to adequately cover different stand types down to two acres in size. It is essential that the stand mapping collect the necessary information in an efficient manner. The following is a brief description of the method we will use.

a. Stand number - to be assigned to each stand, marked on the map and indexed to a set of stand descriptions.

b. The stand description is to contain the following information:

(1) Stand and unit number and name, and pool number.

(2) A list of the three dominant overstory species in order of dominance.

(3) The basal area per acre.

(4) The average age of the overstory stand.

(5) The dominant understory species, its height and crown coefficient factor in percent.

(6) The secondary understory species, its height and crown coefficient factor in percent.

(7) Any seed source present for mast bearing trees.

(8) Diameter growth rates of the dominant overstory.

(9) Average diameter or range of diameters of the dominant overstory species.

(10) The acreage of the stand.

ADDENDUM 11

ADDENDUM 11

1. INTRODUCTION

Pool 11 extends 32.1 miles from Guttenberg, Iowa, to Dubuque, Iowa. The pool contains 15,000 acres of water, 275 miles of shoreline (including islands), and 7,163 acres of public land. Project lands comprise the majority of the total public land area.

Approximately 3,745 acres of project woodlands are located in this pool. Mast tree associations occur rarely on higher areas.

In this pool the fish and wildlife resources are managed on Cooperative Agreement lands by the US Fish and Wildlife Service. Dago Slough and 12 Mile Island have been designated as closed wildlife sanctuaries by the US Fish and Wildlife Service.

2. PRESCRIPTIONS FOR POOL 11

| Unit Title | Tract No. |
|---|---|
| Dago Slough Closed Wildlife Sanctuary | FW 217-230, 232-234 |

720.4 acres. UNIT NO. I

Photos No. 11-19 to 11-16. River mile 600-604.

Apply practice W (Special Management) along river shores and sloughs.

Apply practice X (Stand Mapping) before applying any other practices.

In Type $2_i$ and $9_i$ apply practice Q (Thinning).

In this unit harvest no more timber.

The Long Term Goal - Maintain the unit's valuable wetland habitat.

---

| | |
|---|---|
| From Lock and Dam 11 to River Mile 600 (Most of the Dage Slough Wildlife Area owned by US Fish and Wildlife Service land) | FW 1, 2, 27-31, 52-57, 62, 64, 68, 70-192, 194-196, 200-203, 205-207, 211-216 FIA 1-37, 41-67 |

314.6 acres. (II)

Photos No. 11-15 to 11-1. River Mile 583-600.

Apply practice W (Special Management) along river shores and sloughs.

Apply practice X (Stand Mapping) before applying any other practices.

In Types $9_i$ and $2_i$ apply practice Q (Thinning).

In Type 51 apply practice $A_{a-c}$ and B (Planting and Tree Maintenance).

Practice N (Unique Area) delineates the rookery.

A Heron rookery is located at about river mile 600. It is marked as a unique area on the type maps. All of the Corps-owned lands in this area will be in a special management zone status.

The Long Term Goal - maintain the aesthetic and wildlife qualities of the area.

---

Bunker Chute and Nearby Islands — FIA 68-73, IAIS 6-8

292.9 acres. (III)

Phots No. 11-18 and 11-17. River mile 601-603.

Apply practice W (Special Management) along river and island shores and sloughs.

Apply practice X (Stand Mapping) before applying any other practice.

In Type $9_i$ and $2_i$ apply practice Q (Thinning).

In Type 5 apply practices $L_a$ and $L_c$ (Timber Stand Improvement).

The Long Term Goal - Maintain a mix of evenaged stands in different stages of growth.

---

Jack Oak Island Area — IAIS 9, 10, WIS 19, 22

408 acres. (IV)

Photos No. 11-19 and 11-20. River mile 603-606.

Apply practice W (Special Management) along river shore and sloughs.

Apply practice X (Stand Mapping) before applying any other practices.

In Type $6_{im}$ apply practice J (Improvement Cut).

In Type $2_i$ $9_i$ apply practice Q (Thinning). If majority of the stand is willow, practice Q will not be applied.

The Long Term Goal - Maintain a mix of evenaged stands in different stages of growth. On the few higher areas we will maintain and, if practical, diversify mast tree associations.

---

Turkey River Area FIA 81-97, 102

879 acres. (V)

Photos No. 11-19 to 11-23. River mile 605-609.

Apply practice W (Special Management) along river shore and sloughs shores.

Apply practice X (Stand Mapping) before applying any other practices.

In Types $9_i$ and $2_i$ apply practice Q (Thinning).

In Type 20 treat the area as a wetland.

In Type 5 apply practices $L_a$ and $_c$ (Timber Stand Improvement) if feasible.

In Type $3_{im}$ apply practice J (Improvement Cut). Release the few pin oaks found growing there. If oak responds, further planting and fertilization will establish a better species mix on this ridge of higher ground generated by dredge spoil.

In Type $9_{im}$ apply practice V (Seed Tree Cut).

Apply practice S (Prescribed Burn) on sites where rice cut-grass is the dominant ground vegetation, but not in standing timber because of damage to the timber that will result from any fire. though not put in the type maps, this prescription will be applied at the discretion of the Wildlife Managers.

In this unit, harvest no more than 20 acres every 5 years.

The Long Term Goal - Establish some mast tree associations on the higher ridge area. Otherwise a mix of evenaged stands in different stages of growth will be maintained.

---

Muddy Creek Area and North FW 264, 268 269, 273-282

664.5 acres. (VI)

Photos No. 11-25 to 11-27. River mile 610-615.

Apply practice W (Special Management) along river shores, sloughs, and lakes.

Apply practice X (Stand Mapping) before applying any other practices.

In Types $2_i$, $9_i$ and apply practice Q (Thinning). If willow is 70%+ do not apply this practice.

In Type $3_{im}$, apply practice J (Improvement Cut).

In Type 51 apply practices $A_{a-c}$ and B (Planting and Tree Maintenance).

In Type 49 on selected areas apply practice S (Prescribed Burn).

In this unit harvest no acreage.

The Long Term Goal - Maintain a mix of evenaged stands in different stages of growth.

---

Goetz Area — FIA 112-122, IAIS 15

527.4 acres. (VII)

Photos No. 11-24 to 11-27. River mile 611-614.5.

Apply practice W (Special Management) along river shore.

Apply practice X (Stand Mapping) before applying any other practices.

In Type $6_{im}$, $3_{im}$, apply practice J (Improvement Cut), then practice T (Monitor) for oak regeneration.

In Type $2_i$ and $9_i$, apply practice Q (Thinning).

In Type $9_{im}$, $9_m$, apply practice V (Seed Tree Cut).

In this unit harvest no more than 10 acres every 10 years.

The Long Term Goal - Maintain the oak association and a mix of evenaged stands in different stages of growth.

3. PRIORITIES LIST - POOL 11

| | |
|---|---|
| A | Thin, young silver maple, ash, and cottonwood stands north and south of Turkey River. |
| B | Plant some mast trees in the higher sandy area where a few pin oak trees are now growing (near the powerline), and release the pin oak trees there now. |
| C | Thin silver maple, ash, cottonwood areas landward Bunker Chute. |

4. ESTIMATED COST

| Silvicultural Practice | Acreage to be Treated | Cost Per Acre | Total per Practice |
|---|---|---|---|
| Thinning | 1,900 | $150 | $285,000 |
| Improvement cut | 108 | $150 | $ 26,200 |
| Timber stand improvement | 10 | $ 30 | $ 300 |
| Harvest (contractural preparation) | 32 | $ 60 | $ 1,920 |
| Site Preparation | 32 | $110 | $ 3,520 |
| Planting | 50 ± 30 | $ 50 | $ 2,500 ± $ 1,500 |
| Type mapping | 2,050 | $ 2 | $ 4,100 |
| | Total Cost for Pool 11 | | $323,540 ± $ 1,500 |

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Pool 11 - Inventory Data

AREA SOUTH OF TURKEY RIVER (IA) UNIT NO. V

Total Stand Summary

| Sp. | Ba/Aft$^2$ | # Trees/A | Vol/ABd.ft. | Av. Diameter (in.) |
|---|---|---|---|---|
| Ash Sp | 4.29 | 38.88 | 146.68 | 4.50 |
| Cottonwood | 4.29 | 1.33 | 468.45 | 24.32 |
| Elm Sp | 5.71 | 23.66 | 98.76 | 6.66 |
| Silver Maple | 82.86 | 241.19 | 3338.53 | 7.94 |
| Willow Sp | 21.43 | 118.14 | 634.33 | 5.77 |
| Misc | 0.00 | 1.00 | 0.00 | 0.00 |
| TOTAL | 118.58 sq.ft. | 424.20 | 4686.75 Bd.ft. | |

| Variable of Interest | Mean/A | 95% Confidence Interval | |
|---|---|---|---|
| Int 1/4 Bd Ft | 4686.6 | 2496.94 | 6876.17 |
| Sq. Ft. Basal Area | 132.9 | 98.94 | 166.78 |
| Number of Trees | 439.9 | 162.85 | 717.01 |

Average Annual Growth Per Acre Int. 1/4 Bd. Ft. 111.4
Sq. Ft. Basal Area .63

FOR CLASSES 5-9 Wildlife Related Inventory Data
Per Acre Figures

| SPECIES LISTING | | BASAL AREA (sq.ft./A) | NO. TREES/A | AVERAGE DIAMETER (inches) |
|---|---|---|---|---|
| Class 5 Den Tree - Upper Cavity (Upper 1/4 Bole) | | | | |
| SILVER MAPLE | | 1.43 | 1.41 | 13.63 |
| | TOTAL | 1.43 sq.ft./A | 4.41/A | |
| Class 6 Den Tree - Lower Cavity (Lower 3/4 Bole) | | | | |
| SILVER MAPLE | | 2.86 | 1.76 | 17.23 |
| | TOTAL | 2.86 sq.ft./A | 1.76/A | |
| Class 7 Standing Dead Tree | | | | |
| ELM SP | | 2.14 | 1.83 | 14.67 |
| SILVER MAPLE | | 1.43 | 3.72 | 8.39 |
| WILLOW SP | | 7.14 | 9.43 | 11.78 |
| MISCELLANEOUS | | 3.57 | 1.77 | 19.25 |
| | TOTAL | 14.28 | 16.75/A | |
| Class 9 Grapevine | | | | |
| ASH SP | | 2.14 | 33.48 | 3.43 |
| COTTONWOOD | | 2.86 | 1.09 | 21.90 |
| ELM SP | | 1.43 | 11.82 | 4.71 |
| SILVER MAPLE | | 7.14 | 5.48 | 15.46 |
| WILLOW SP | | 1.43 | 1.42 | 13.58 |
| MISCELLANEOUS | | 1.43 | .49 | 23.21 |
| | TOTAL | 16.43 sq.ft./A | 53.78/A | |

AREA NORTH OF TURKEY RIVER (IA) UNIT NO. V

Total Stand Summary

| Sp. | Ba/Aft$^2$ | # Trees/A | Vol/ABd.ft. | Av. Diameter (in.) |
|---|---|---|---|---|
| Ash Sp | 11.67 | 8.35 | 637.80 | 16.01 |
| Cottonwood | 11.67 | 3.47 | 1897.31 | 24.82 |
| Elm Sp | 13.33 | 41.35 | 304.99 | 7.69 |
| Silver Maple | 50.00 | 251.45 | 1248.02 | 6.04 |
| Willow Sp | 18.33 | 21.04 | 705.60 | 12.64 |
| Misc | 0.00 | 1.00 | 0.00 | 0.00 |
| TOTAL | 105.00 sq.ft. | 326.66 | 4793.72 Bd.ft. | |

| Variable of Interest | Mean/A | 95% Confidence Interval | |
|---|---|---|---|
| Int 1/4 Bd Ft | 4829.7 | 12.78 | 9646.65 |
| Sq. Ft. Basal Area | 120.0 | 64.86 | 175.14 |
| Number of Trees | 348.4 | 0.00 | 852.14 |

Average Annual Growth Per Acre Int. Bd. Ft. 69.6
Sq. Ft. Basal Area .47

FOR CLASSES 5-9 Wildlife Related Inventory Data
Per Acre Figures

| SPECIES LISTING | BASAL AREA (sq.ft./A) | NO. TREES/A | AVERAGE DIAMETER (inches) |
|---|---|---|---|
| Class 6 Den Tree - Lower Cavity (Lower 3/4 Bole) | | | |
| SILVER MAPLE | 1.67 | .19 | 40.00 |
| TOTAL | 1.67 sq.ft./A | .19/A | |
| Class 7 Standing Dead Tree | | | |
| ELM SP | 3.33 | 4.99 | 11.07 |
| SILVER MAPLE | 3.33 | 9.25 | 8.13 |
| WILLOW SP | 3.33 | 6.90 | 9.41 |
| MISCELLANEOUS | 5.00 | 1.56 | 24.23 |
| TOTAL | 14.99 sp.ft./A | 22.70/A | |

FOR CLASSES 5-9
Per Acre Figures

Wildlife Related Inventory Data (Cont'd)

| SPECIES LISTING | BASAL AREA (sq.ft./A) | NO. TREES/A | AVERAGE DIAMETER (inches) |
|---|---|---|---|
| Class 9 Grapevine | | | |
| ASH SP | 6.67 | 3.16 | 19.66 |
| COTTONWOOD | 1.67 | .63 | 22.00 |
| ELM SP | 3.33 | 3.68 | 12.88 |
| SILVER MAPLE | 20.00 | 1.26 | 12.99 |
| MISCELLANEOUS | 3.33 | 1.26 | 22.00 |
| TOTAL | 34.67 sq.ft./A | 20.47/A | |

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BUNKER CHUTE (IA) UNIT NO. III

Total Stand Summary

| Sp. | Ba/Aft$^2$ | # Trees/A | Vol/ABd.ft. | Av. Diameter (in.) |
|---|---|---|---|---|
| Ash Sp | 1.43 | 5.68 | 0.00 | 6.79 |
| Cottonwood | 5.00 | 2.53 | 512.22 | 19.05 |
| Elm Sp | 2.86 | 37.80 | 67.68 | 3.72 |
| Silver Maple | 70.71 | 204.35 | 1397.53 | 7.97 |
| Willow Sp | 27.86 | 25.39 | 1682.88 | 14.18 |
| TOTAL | 107.86 sq.ft. | 275.75 | 3660.31 Bd.ft. | |

| Variable of Interest | Mean/A | 95% Confidence Interval | |
|---|---|---|---|
| Int 1/4 Bd Ft | 3609.3 | 2233.22 | 4985.35 |
| Sq. Ft. Basal Area | 122.9 | 96.80 | 148.91 |
| Number of Trees | 292.5 | 163.29 | 421.61 |

Average Annual Growth Per Acre Int. 1/4 Bd. Ft. 510.7
Sq. Ft. Basal Area 3.19

FOR CLASSES 5-9 Wildlife Related Inventory Data
Per Acre Figures

| SPECIES LISTING | | BASAL AREA (sq.ft./A) | NO. TREES/A | AVERAGE DIAMETER (inches) |
|---|---|---|---|---|
| Class 7 Standing Dead Tree | | | | |
| COTTONWOOD | | 1.43 | .60 | 20.93 |
| SILVER MAPLE | | 3.57 | 4.27 | 12.39 |
| WILLOW SP | | 10.00 | 11.84 | 12.44 |
| | TOTAL | 15.00 sq.ft./A | 16.71/A | |
| Class 9 Grapevine | | | | |
| COTTONWOOD | | 2.14 | 1.30 | 17.41 |
| ELM SP | | .71 | 32.74 | 2.00 |
| SILVER MAPLE | | 9.29 | 15.99 | 10.32 |
| WILLOW SP | | 4.29 | 3.52 | 14.95 |
| | TOTAL | 16.43 sq.ft./A | 53.55/A | |

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MUDDY CREEK (WI) UNIT NO. VI
Total Stand Summary

| Sp. | Ba/Aft$^2$ | # Trees/A | Vol/ABd.ft. | Av. Diameter (in.) |
|---|---|---|---|---|
| Ash Sp | 9.38 | 15.0 | 638.14 | 10.70 |
| River Birch | .63 | .58 | 41.57 | 14.00 |
| Cottonwood | 15.00 | 15.08 | 1555.78 | 13.51 |
| Elm Sp | 4.38 | 3.20 | 342.91 | 15.83 |
| Silver Maple | 71.25 | 159.88 | 3304.66 | 9.04 |
| Willow Sp | 7.50 | 7.62 | 624.42 | 13.43 |
| Misc | 0.00 | 1.00 | 0.00 | 0.00 |
| TOTAL | 108.14 sq.ft. | 202.36 | 6507.48 Bd.ft. | |

| Variable of Interest | Mean/A | 95% Confidence Interval | |
|---|---|---|---|
| Int 1/4 Bd Ft | 6464.4 | 4143.50 | 8785.28 |
| Sq. Ft. Basal Area | 118.1 | 97.70 | 138.55 |
| Number of Trees | 212.2 | 136.03 | 288.39 |

Average Annual Growth Per Acre Int. Bd. Ft. 141.9
Sq. Ft. Basal Area .59

FOR CLASSES 5-9 **Wildlife Related Inventory Data**
Per Acre Figures

| SPECIES LISTING | BASAL AREA (sq.ft./A) | NO. TREES/A | AVERAGE DIAMETER (inches) |
|---|---|---|---|
| **Class 5 Den Tree - Upper Cavity (Upper 1/4 Bole)** | | | |
| RIVER BIRCH | .63 | .45 | 16.00 |
| SILVER MAPLE | 1.88 | .29 | 34.47 |
| TOTAL | 2.51 sq.ft./A | .74/A | |
| **Class 6 Den Tree - Lower Cavity (Lower 3/4 Bole)** | | | |
| SILVER MAPLE | 1.88 | .21 | 40.00 |
| MISCELLANEOUS | .63 | .11 | 32.00 |
| TOTAL | 2.51 sq.ft./A | .33/A | |
| **Class 7 Standing Dead Tree** | | | |
| RIVER BIRCH | 2.50 | 2.20 | 14.43 |
| ELM SP | 1.25 | 1.59 | 12.00 |
| SILVER MAPLE | .63 | 1.79 | 8.00 |
| WILLOW SP | 2.50 | 3.11 | 12.14 |
| MISCELLANEOUS | 3.13 | 2.16 | 16.30 |
| TOTAL | 10.00 sq.ft./A | 10.85/A | |
| **Class 9 Grapevine** | | | |
| ELM SP | 1.88 | 1.55 | 14.89 |
| SILVER MAPLE | 8.75 | 8.36 | 13.85 |
| WILLOW SP | .63 | .58 | 14.00 |
| MISCELLANEOUS | 1.88 | 1.25 | 16.59 |
| TOTAL | 13.14 sq.ft./A | 11.74/A | |

ADDENDUM 12

ADDENDUM 12

1. INTRODUCTION

Pool 12 extends from Dubuque, Iowa, to Bellevue, Iowa, a distance of 26.3 miles. The pool contains 19,000 acres of water, 280 miles of shore (including islands), and 5,865 acres of public land. Project lands comprise the majority of the total public land area.

Approximately 4,200 acres of project woodland are located in this pool. The mast tree associations that can be found in this pool are small stands on higher areas.

Fish and wildlife resources on Cooperative Agreement lands in this pool are managed by the US Fish and Wildlife Service.

2. PRESCRIPTIONS FOR POOL 12

| Unit Title | Tract No. |
|---|---|
| Lock and Dam 12 to River Mile 564 | iisl, 9b, 13, 14<br>FIa 1-8<br>IAIS 1, 2, 15, 17<br>FI 9, 1, 9A, 9B, 13, 14, 18-20, 22-29, 30-33, 35 |

630.7 acres. UNIT NO. I

Photos No. 12-1 to 12-9. River mile 557-563.

Apply practice W (Special Management Zone) along river shore, sloughs, and wetlands.

Apply practice X (Stand Mapping) before applying any other practice.

In Type $9_1$ apply practice Q (Thinning).

Most of the area is too wet to manage as a timber type.

In the Bellevue and Crooked Slough recreation areas apply practices $A_{a-c}$ (Plant) and B (Tree Maintenance).

The Long Term Goal - Maintain sufficient den trees and some variety of vegetation in the stone slough area.

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Menominee Slough South
River Mile (about) 571.5 to 563
and islands and Stone Lake

IIs 5-11, 18, 20, 21-29, 32A, 32B, 32C
FI 7, 38-44, 48A, 48B, 49-59

1,638 acres. (II)

Photos No. 12-9 to 12-15. River mile 571.5-563.

Apply practice M (No Treatment Zone) along all shore lines and sloughs.

Apply practice X (Stand Mapping) before applying any other practices.

In Types $4_{im}$ and $6_{im}$, apply practice J (Improvement Cut), then T (Monitor).

In Types $2_i$ and $9_i$ apply practice Q (Thinning).

In Type $3_{im}$ apply practice J (Improvement Cut), V (Seed Tree), or U (Shelterwood), then $A_{d-f}$ (Plant).

In Type $9_{im}$ apply practice I (Clearcut) then $A_{d-f}$ (Reforestation).

In this unit harvest no more than 50 acres every 5 years.

The Long Term Goal - Maintain the higher areas in the oak complex dominating those areas, and if feasible diversify area by planting hickory, walnut, and other species of oak. The lower areas will be a mix of evenaged stands in different stages of growth.

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Nine Mile Island
Shawon Sasse Slough Area

IAIS 4A, 4B, 4C, 6, 9
FIa 25, 26, 28

671 acres. (III)

Photos No. 12-14 to 12-16. River Mile 571.5-574.5.

Apply practice W (Special Management) along all shores and sloughs.

Apply practice X (Stand Mapping) before applying any other practices.

In Types $9_i$ apply practice Q (Thinning).

In Type 5 apply practices $L_a$ and $L_c$ (TSI) then $A_{d-f}$ (Reforestation) in appropriate areas. If walnuts or oaks are found on the edge or in this type do not deaden them.

In Type $4_{im}$ and $6_{im}$ follow practice J (Improvement Cut).

In this unit harvest no more timber.

The Long Term Goal - Diversify and maintain the oak, hickory, or walnut now established on higher areas. Other higher areas in this unit that can support an oak, hickory, and/or walnut association will be planted in those species. Lower areas will be a mix of evenaged stands in different stages of growth.

---

South of the Menominee River and offshore islands — FI 62-64 and part 61 iis 37-39

326.7 acres. (IV)

Photos No. 12-15 and 12-16. River mile 573-574.5.

Apply practice W (Special Management) along the Mississippi and Menominee River, around lakes, and sloughs.

Apply practice X (Stand Mapping) before applying any other practices.

Leave the islands alone.

In Type $6_{im}$ apply practice J (Improvement cut).

In Types $6_i$, $9_i$ and $1_i$ apply practice Q (Thinning). A small ridge line dominated by oak was located during the inventory, and then approximately on the photograph. If the area extends into Type $9_i$ or $1_i$, thin to release these trees. Do not thin areas 70%+ willow.

In this unit harvest no more timber.

The Long Term Goal - Maintain and diversify the higher areas that support oak. The lower areas should be a mix of evenaged stands in different stages of development. Management of this area will be difficult due to the wetness of the area and poor access.

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Bowfin - Fentress - Julien Dubuque Bridge and associated islands — FI 65-69, 74-84 iis 41

664.6 acres. (V)

Photos No. 12-17 to 12-20. River mile 574.5-579.8.

Apply practice W (Special Management) along slough, river shore, and Fentress Lake.

Apply practice X (Stand Mapping) before applying any other practices.

Apply practice N (Unique Area) to Heron rookery area and a 1,500-foot zone around the rookery.

In Types $9_i$, $2_i$, and $1_i$ apply Q (Thinning).

In Type 48, 5 and 46 apply practice $L_c$ (TSI).

In Type $6_{im}$ apply practice J (Improvement Cut).

In this unit harvest no more timber.

The Long Term Goal - Maintain and diversify the higher areas that support oak. The lower areas will be a mix of evenaged species in different stages of growth.

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River Mile 581
to Eagle Point Bridge — FW 1-7, 8A, 10

260 acres. (VI)

Photos No. 12-22 and 12-23. River mile 581-583.

Apply practice W (Special Management) along river shores, sloughs, and lakes.

Apply practice X (Stand Mapping) before applying any other practice.

In Type $9_i$ apply practice Q (Thinning).

The Long Term Goal - Maintain a mix of evenaged stands in different stages of development.

3. PRIORITIES LIST - POOL 12

A — In the Menominee river area, conduct an improvement cut to release oak found during the inventory. This is a small ridge that may not be easily distinguished on the aerial photographs.

B — Thin, young, overcrowded silver maple, ash, and cottonwood stands on Nine Mile Island.

C — Improvement cuts should be made to aid in mast production and perhaps tree regeneration where mast trees occur in the pool. In the Menominee slough and south, a special effort should be made to insure continued reestablishment of mast tree areas in this area if indications over the next few years are that the trees cannot reestablish themselves.

D Thin, young overcrowded silver maple, ash, cottonwood stands south and west of Bowfin Lake (FI 78), south and west of Fentris Lake (FI 65-69), south of the Menominee River, finally, along west and south of the Menominee Slough (river mile 572-565).

4. ESTIMATED COST

| Silvicultural Practice | Acreage to be Treated | Cost Per Acre | Total per Practice |
|---|---|---|---|
| Thinning | 1,700 | $150 | $255,000 |
| Improvement cut | 235 | $150 | $ 35,250 |
| Timber stand improvement | 30 | $ 30 | $ 900 |
| Harvest (contractural preparation) | 70 | $ 60 | $ 4,200 |
| Site preparation | 70 | $110 | $ 7,700 |
| Planting | 100 ± 70 | $ 50 | $ 5,000 ± $ 3,000 |
| Type mapping | 2,035 | $ 2 | $ 4,070 |
| | Total Cost for Pool 12 | | $312,120 ± $ 3,500 |

Pool 12 - Inventory Data

NINE MILE ISLAND (IA) UNIT NO. III

Total Stand Summary

| Sp. | Ba/Aft$^2$ | # Trees/A | Vol/ABd.ft. | Av. Diameter (in.) |
|---|---|---|---|---|
| Ash Sp | 1.11 | .23 | 137.51 | 30.00 |
| Boxelder | 1.11 | 5.66 | 0.00 | 6.00 |
| Elm Sp | 10.00 | 31.79 | 303.35 | 7.59 |
| Hackberry | 4.44 | 21.22 | 0.00 | 6.20 |
| Silver Maple | 65.56 | 233.46 | 1956.69 | 7.18 |
| Willow Sp | 10.00 | 19.67 | 130.30 | 9.65 |
| Misc | 0.00 | 1.00 | 0.00 | 0.00 |
| TOTAL | 92.22 sq.ft. | 313.03 | 2527.86 Bd.ft. | |

| Variable of Interest | Mean/A | 95% Confidence Interval | |
|---|---|---|---|
| Int 1/4 Bd Ft | 2527.9 | 53.11 | 5002.62 |
| Sq. Ft. Basal Area | 104.4 | 51.87 | 157.02 |
| Number of Trees | 322.9 | 0.00 | 654.23 |

Average Annual Growth Per Acre Int. 1/4 Bd. Ft. 100.3
Sq. Ft. Basal Area .50

FOR CLASSES 7-9
Per Acre Figures

Wildlife Related Inventory Data

| SPECIES LISTING | BASAL AREA (sq.ft./A) | NO. TREES/A | AVERAGE DIAMETER (inches) |
|---|---|---|---|
| **Class 7 Standing Dead Tree** | | | |
| ELM SP | 4.44 | 7.14 | 10.69 |
| SILVER MAPLE | 1.11 | .14 | 38.00 |
| WILLOW SP | 2.22 | 2.08 | 14.00 |
| MISCELLANEOUS | 6.67 | 3.62 | 18.39 |
| TOTAL | 14.44 sq.ft./A | 12.98/A | |
| **Class 9 Grapevine** | | | |
| ELM SP | 5.56 | 25.89 | 6.27 |
| HACKBERRY | 2.22 | 2.83 | 12.00 |
| SILVER MAPLE | 14.44 | 18.02 | 12.12 |
| WILLOW SP | 7.78 | 8.35 | 13.06 |
| TOTAL | 30.00 sq.ft./A | 55.09/A | |

MENOMINEE RIVER SOUTH TO RIVER MILE 573 (IL) UNIT NO. IV

Total Stand Summary

| Sp. | Ba/Aft$^2$ | # Trees/A | Vol/ABd.ft. | Av. Diameter (in.) |
|---|---|---|---|---|
| Ash Sp | .63 | .29 | 36.53 | 20.00 |
| Boxelder | 1.88 | 4.73 | 0.00 | 8.53 |
| Cottonwood | 8.75 | 14.93 | 618.96 | 10.37 |
| Elm Sp | 5.00 | 20.32 | 44.53 | 6.72 |
| Silver Maple | 53.75 | 252.73 | 959.73 | 6.24 |
| Pin Oak | 0.00 | 1.00 | 0.00 | 0.00 |
| Willow Sp | 33.13 | 37.07 | 1219.17 | 12.80 |
| Misc | 0.00 | 1.00 | 0.00 | 0.00 |
| TOTAL | 103.13 sq.ft. | 332.06 | 2878.92 Bd.ft. | |

| Variable of Interest | Mean/A | 95% Confidence Interval | |
|---|---|---|---|
| Int 1/4 Bd Ft | 2878.9 | 1551.71 | 4206.12 |
| Sq. Ft. Basal Area | 130.0 | 103.12 | 156.88 |
| Number of Trees | 363.2 | 127.85 | 598.62 |

Average Annual Growth Per Acre Int. Bd. Ft. 159.5
Sq. Ft. Basal Area .76

FOR CLASSES 5-9 Wildlife Related Inventory Data
Per Acre Figures

| SPECIES LISTING | BASAL AREA (sq.ft./A) | NO. TREES/A | AVERAGE DIAMETER (inches) |
|---|---|---|---|
| Class 5 Den Tree - Upper Cavity (Upper 1/4 Bole) | | | |
| SILVER MAPLE | .63 | .07 | 40.00 |
| PIN OAK | .63 | .15 | 28.00 |
| WILLOW SP | 1.25 | .55 | 20.36 |
| TOTAL | 2.51 sq.ft./A | .77/A | |
| Class 7 Standing Dead Tree | | | |
| SILVER MAPLE | 3.75 | 2.20 | 17.68 |
| PIN OAK | .63 | .15 | 28.00 |
| WILLOW SP | 15.00 | 20.96 | 11.45 |
| MISCELLANEOUS | 7.50 | 9.86 | 11.81 |
| TOTAL | 26.88 sq.ft./A | 33.17/A | |

FOR CLASSES 5-9 Wildlife Related Inventory Data (Cont'd)
Per Acre Figures

| SPECIES LISTING | | BASAL AREA (sq.ft./A) | NO. TREES/A | AVERAGE DIAMETER (inches) |
|---|---|---|---|---|
| Class 9 Grapevine | | | | |
| COTTONWOOD | | 1.25 | 1.29 | 13.32 |
| ELM SP | | .63 | 7.16 | 4.00 |
| SILVER MAPLE | | 6.88 | 19.58 | 8.02 |
| MISCELLANEOUS | | 1.25 | 1.38 | 12.88 |
| | TOTAL | 10.01 sq.ft./A | 29.41/A | |

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MENOMINEE RIVER NORTH TO FENTRIS LAKE (IL) UNIT NO. V
Total Stand Summary

| Sp. | Ba/Aft$^2$ | # Trees/A | Vol/ABd.ft. | Av. Diameter (in.) |
|---|---|---|---|---|
| Ash Sp | 20.00 | 25.50 | 703.69 | 11.99 |
| River Birch | 0.00 | 1.00 | 0.00 | 0.00 |
| Cottonwood | 1.43 | .54 | 176.31 | 22.00 |
| Elm Sp | 5.71 | 14.21 | 135.36 | 8.59 |
| Hackberry | 5.71 | 65.48 | 0.00 | 4.00 |
| Silver Maple | 67.14 | 123.77 | 1150.27 | 9.97 |
| Pin Oak | 4.29 | 2.22 | 457.30 | 18.82 |
| White Oak | 2.86 | .68 | 209.41 | 27.79 |
| Willow Sp | 8.57 | 6.99 | 248.31 | 14.99 |
| Misc | 0.00 | 1.00 | 0.00 | 0.00 |
| TOTAL | 115.71 sq.ft. | 241.39 | 3080.66 Bd.ft. | |

| Variable of Interest | Mean/A | 95% Confidence Interval | |
|---|---|---|---|
| Int 1/4 Bd Ft | 3080.7 | 774.25 | 5387.08 |
| Sq. Ft. Basal Area | 134.3 | 89.98 | 178.60 |
| Number of Trees | 327.8 | 151.29 | 504.36 |

Average Annual Growth Per Acre Int. 1/4 Bd. Ft. 12.3
Sq. Ft. Basal Area .34

FOR CLASSES 5-10 Wildlife Related Inventory Data
Per Acre Figures

| SPECIES LISTING | BASAL AREA (sq.ft./A) | NO. TREES/A | AVERAGE DIAMETER (inches) |
|---|---|---|---|
| **Class 5 Den Tree - Upper Cavity (Upper 1/4 Bole)** | | | |
| ASH SP | 1.43 | 1.82 | 12.00 |
| SILVER MAPLE | 1.43 | .16 | 40.00 |
| TOTAL | 2.86 sq.ft./A | 1.98/A | |
| **Class 6 Den Tree - Lower Cavity (Lower 3/4 Bole)** | | | |
| PIN OAK | 1.43 | .23 | 34.00 |
| WHITE OAK | 1.43 | .39 | 26.00 |
| TOTAL | 2.86 sq.ft./A | .62/A | |
| **Class 7 Standing Dead Tree** | | | |
| ASH SP | 2.86 | 9.09 | 7.59 |
| RIVER BIRCH | 1.43 | 1.82 | 12.00 |
| ELM SP | 4.29 | 9.42 | 9.13 |
| SILVER MAPLE | 5.71 | 41.84 | 5.00 |
| WILLOW SP | 1.43 | 2.62 | 10.00 |
| MISCELLANEOUS | 2.86 | 23.65 | 4.71 |
| TOTAL | 18.58 sq.ft./A | 88.44/A | |
| **Class 9 Grapevine** | | | |
| ASH SP | 2.86 | 3.64 | 11.99 |
| ELM SP | 1.43 | .81 | 18.00 |
| SILVER MAPLE | 1.43 | .54 | 22.00 |
| PIN OAK | 1.43 | .65 | 20.00 |
| WILLOW SP | 2.86 | 1.31 | 20.00 |
| MISCELLANEOUS | 2.86 | 23.65 | 4.71 |
| TOTAL | 12.87 sq.ft./A | 30.60/A | |

FOR CLASSES 5-10 Wildlife Related Inventory Data (Cont'd)
Per Acre Figures

| SPECIES LISTING | BASAL AREA (sq.ft./A) | NO. TREES/A | AVERAGE DIAMETER (inches) |
|---|---|---|---|
| Class 10 | | | |
| PIN OAK | 4.29 | 2.22 | 18.82 |
| WHITE OAK | 2.86 | .68 | 27.79 |
| TOTAL | 7.15 sq.ft./A | 2.90/A | |

AVERAGE ACORNS AND NUT YIELD BY SPECIES

| SPECIES LISTING | POUNDS/ACRE | TOTAL POUNDS |
|---|---|---|
| PIN OAK | 6.29 | 1,005.71 |
| WHITE OAK | 10.58 lbs./A | 1,691.42 lbs. |

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BOWFIN AREA (IL) UNIT NO. V
Total Stand Summary

| Sp. | Ba/Aft$^2$ | # Trees/A | Vol/ABd.ft. | Av. Diameter (in.) |
|---|---|---|---|---|
| Ash Sp | 15.00 | 46.92 | 182.67 | 7.66 |
| River Birch | 3.00 | 3.26 | 133.39 | 12.98 |
| Boxelder | 4.00 | 8.28 | 0.00 | 9.41 |
| Cottonwood | 24.00 | 27.56 | 2270.64 | 12.63 |
| Elm Sp | 14.00 | 125.21 | 133.88 | 4.53 |
| Silver Maple | 17.00 | 97.42 | 371.35 | 5.66 |
| Pin Oak | 1.00 | 5.09 | 0.00 | 6.00 |
| Willow Sp | 31.00 | 66.38 | 813.51 | 9.25 |
| TOTAL | 109.00 sq.ft. | 380.13 | 3905.44 | |

| Variable of Interest | Mean/Ac | 95% Confidence Interval | |
|---|---|---|---|
| Int 1/4 Bd Ft | 3905.4 | 1104.23 | 6706.65 |
| Sq. Ft. Basal Area | 114.0 | 80.25 | 147.75 |
| Number of Trees | 387.4 | 161.17 | 613.66 |

Average Annual Growth Per Acre Int. Bd. Ft. 340.6
Sq. Ft. Basal Area 1.66

FOR CLASSES 7-9 **Wildlife Related Inventory Data**
Per Acre Figures

| SPECIES LISTING | | BASAL AREA (sq.ft./A) | NO. TREES/A | AVERAGE DIAMETER (inches) |
|---|---|---|---|---|
| Class 7 Standing Dead Tree | | | | |
| RIVER BIRCH | | 1.00 | .94 | 14.00 |
| COTTONWOOD | | 1.00 | .94 | 14.00 |
| ELM SP | | 1.00 | 2.86 | 8.00 |
| WILLOW SP | | 2.00 | 2.55 | 11.99 |
| | TOTAL | 5.00 sq.ft./A | 7.29/A | |
| Class 9 Grapevine | | | | |
| ASH SP | | 4.00 | 4.42 | 12.88 |
| BOXELDER | | 2.00 | 2.55 | 12.00 |
| ELM SP | | 1.00 | 1.27 | 12.00 |
| SILVER MAPLE | | 1.00 | 5.09 | 6.00 |
| WILLOW SP | | 1.00 | 2.86 | 8.00 |
| | TOTAL | 9.00 sq.ft./A | 16.19/A | |
| Class 10 | | | | |
| PIN OAK | | 1.00 | 5.09 | 6.00 |
| | TOTAL | 1.00 | 5.09/A | |

ADDENDUM 13

ADDENDUM 13

1. INTRODUCTION

Pool 13 extends from Clinton, Iowa, to LeClaire, Iowa, a distance of 34.2 miles. The pool contains 29,103 acres of water, 503 miles of shoreline (including islands), and 25,160 acres of public land. Public lands purchased for other than project purposes and administered by the USFWS and the Department of the Army comprise a large portion of public land in this pool.

Approximately 5,920 acres of project woodlands are located in this pool. 31.3 + 3.0 = 5954.3 - includes reforested Ag leases
Fish and wildlife resources on Cooperative Agreement lands in the Green Island drainage district area are managed by the State of Iowa under a third party agreement. Fish and wildlife resources are managed on the remaining Cooperative Agreement lands by the US Fish and Wildlife Service. The Elk River, Spring Lake, and Pleasant Creek areas have been designated as closed wildlife areas by the US Fish and Wildlife Service. Extensive wetland areas are maintained in this pool; such as the Green Island area which has 1,228 acres of wetland, compared to 391 acres of woodland.

2. PRESCRIPTIONS FOR POOL 13

| Unit Title | Tract No. |
|---|---|
| Spring Lake Wildlife Area and Savanna Slough Area | FI 13, 13a, 162-175 IIS 4-6, 8-16B |

591.7 acres. UNIT NO. I

Photos No. 13-14 to 13-19. River mile 531-536.8.

Apply practice W (Special Management) along the Mississippi and Plum River, and sloughs.

Apply practice X (Stand Mapping) before applying any other practices.

In Type $9_1$ apply practice Q (Thinning).

In Type $6_{im}$ apply practice J (Improvement Cut), then apply practice T (Monitor).

In Type 51 apply practices $A_{a-c}$ (Plant) and B (Tree Maintenance).

Along the upriver levee of the Spring Lake Wildlife Area in 15 acres of type $9_{im}$ apply practive I (Clearcut).

Up to 90% of the area will be under special management zoning.

The Long Term Goal - Maintain the wetland habitat and waterfowl it supports.

---

| | |
|---|---|
| Lock and Dam 13 to Cook's Island<br>Iowa side of the river channel only | A 3, 5, 10 -B FIa 3, 14,<br>FIA 3, 14, 30, 42,<br>67-69, 81, 83, 84, 86,<br>87, 91, 93, 94, 148-154,<br>155B, 166-178<br>IAIS 40, 42, 44-46 |

392.8 acres. (II)

Photos No. 13-1 to 13-15. River mile 533-583.

Apply practice W (Special Management) along river shoreline and sloughs.

Apply practice X (Stand Mapping) before applying any other practices.

In Type $9_i$ and $2_i$ $1_i$ apply practice Q (Thinning).

In Type $1_{im}$ and $9_{im}$ apply practice I (Clearcut).

In the recreation area in Tract FIa 67-69 apply practice $A_{a-c}$ (Plant) and B (Tree Maintenance).

In this unit harvest no more than 10 acres every 5 years.

The Long Term Goal - Maintain the quality wildlife habitat and improve it. The area is composed of slender islands and peninsulas of shoreline. For that reason much of this unit will be left alone.

---

| | |
|---|---|
| Lock and Dam 13 to River Mile 531.5<br>(Southern border of Spring Lake<br>Wildlife Area)<br>Illinois side of the Channel Only<br>in Thompson Causeway Recreation Area | R 4, 5<br>FI 1-6B, 37, 64-68, 73,<br>104, 105, 109, 110,<br>112-155, 185-190,<br>193-195 |

531.5 acres. (III)

Photos No. 13-1 to 13-15. River mile 531-583.

Apply practice W (Special Management) along river and slough shores.

Apply practice X (Stand Mapping) before applying any other practices.

In Type $3_i$, $9_i$, and $1_i$ practice Q (Thinning) will be applied.

In Type 48 apply practice S (Prescribed Burning) to maintain wetland areas. The amount of Type 48 to burn will be determined by the US Fish and Wildlife Service biologists in Savanna, Illinois.

In Type 51 apply practice $A_{a-c}$ and B (Planting and Tree Maintenance).

In Type $4_{im}$, $3_{im}$ and $6_{im}$ apply practice J (Improvement Cut) and practice P (Group Selection) in patches of undesirable tree species along the hunter access road. Then apply practice $A_{d-f}$ (Reforestation) to a limited extent to patch cuts showing poor response or producing undesirable species reproduction.

The Long Term Goal - Maintain and enhance the recreational experience and wildlife experience that the area provides for users.

---

Savanna Bay, Hickory Lake Area + Santa Fe, Indian Little Soupbone, Big Soupbone, and Miscellaneous Island and river shore to the proving grounds

FIa 202-221, 229
IIS 28-33
IAIS 31, 33-35

684.9 acres. (IV)

Photos No. 13-20 to 13-24 and 13-26. River mile 538.5-545.

Apply practice W (Special Management) along river and slough shorelines.

Apply practice X (STand Mapping) before applying any other practices.

In Types $4_i$, $9_i$, $2_i$, and $1_i$ apply practice Q (Thinning).

In Type $6_{im}$ apply practice J (Improvement Cutting).

In Type 51 apply practice $A_{a-c}$ (Plantings) and B (Tree Maintenance).

In Type $9_{im}$ apply practice V (Seed Tree), then $A_{d-f}$ (Reforestation) in suitable areas.

In this unit harvest no more than 10 acres every 5 years.

The Long Term Goal - Maintain the higher areas in oak, hickory, or walnut. Most areas are too low to support the preceeding species and will be managed as a mix of evenaged stands in different stages of growth.

---

Browns Lake Area

FIA 136-146, 292, 293

368 acres. (V)

Photos No. 13-24 to 13-26. River mile 543-546.

Apply practice W (Special Management) along lake and river shore.

Apply practice X (Stand Mapping) before applying any other practices.

In Types $9_i$, $2_i$, and $1_i$ apply practice Q (Thinning).
As a part of thinning on Corps fee titled areas on the Browns Lake unit, an adjacent area on US Fish and Wildlife land may also be thinned at the same time. The thinning indicated on the type map was put there at the request of the US Fish and Wildlife Service, so that thinning on their land can be done in conjunction with and fully coordinated with thinning on Corps land.

In Type $6_{im}$ apply practice J (Improvement Cutting) to encourage regeneration and development of better mast production.

The Long Term Goal - Maintain this area as high quality wildlife habitat by maintaining a mix of evenaged stands in different stages of development, and higher areas in oak and other mast producing species.

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Green Island Area + Southeastern shore of Maquoketa River — FIA 295-318, 349-355

391.1 acres. (VI)

Photos No. 13-25 to 13-29. River mile 546-548.5.

Apply practice W (Special Management) along river shore, lake shores, sloughs, and selected wetland areas.

Apply practice X (Stand Mapping) before applying any other practices.

In Types $9_i$ and $1_i$ apply practice Q (Thinning). Coordinate the thinning in the lower right hand corner of the Green Island Wildlife Management Area with the US Fish and Wildlife Biologists Office from Savanna, Illinois.

In two small tracts of type $9_i$ apply practice I (Clearcut) to regenerate wetland.

In Type $9_{im}$, $4_{im}$, and $6_{im}$ apply practice J (Improvement Cutting) to encourage regeneration and increase mast production.

In In 5 apply practice $L_a$ or $L_b$ (Timber Stand Improvement), then practice $A_{d-f}$ (Reforestation) if feasible.

In this unit harvest no timber for the next 5 years.

The Long Term Goal - Maintain and enhance species association on higher areas and maintain a mix of evenaged stands in different stages of development to maintain and enhance the wildlife habitat for a variety of wildlife. The Woodduck and other waterfowl, deer, raccoon, squirrel, and raptors are wildlife species whose habitat needs are of priority to the Iowa Conservation Commission.

---

1,244.3 acres. (VII)

Photos No. 13-13, 33, 35, 37, and 39. River mile 548.5-554.5.

Apply practice W (Special Management) along river shore, lakeshores, and sloughs.

Apply practice X (Stand Mapping) before applying any other practices.

Apply practice N (Unique Area) to the one heron rookery and a 1,500-foot zone around it.

Two heron rookeries occur in this management unit. Both are denoted by management practice N, even though both are on US Fish and Wildlife Service fee title lands. Silvicultural practices should be coordinated closely with the US Fish and Wildlife Service so as disturbances to the rookeries are minimized.

In Types 46, 48, 5, and $14_{im}$ apply practice $L_a$, $L_b$, and/or $L_c$ (Timber Stand Improvement). Do not deaden any oaks, hickory, or walnut. Apply practice $A_{d-f}$ (Reforestation) to suitable areas.

In Types $9_i$ and $3_{im}$ apply practice Q (Thinning). Favor mast producing trees such as oak when thinning Type $3_{im}$.

In Type $6_{im}$ apply practice J (Improvement Cutting).

In Type $9_{im}$ apply practice I (Clearcut) or V (Seed Tree Cut) and $A_{d-f}$ (Reforestation) in suitable areas.

In Type 51 apply practices $A_{a-c}$ and B (Planting and Tree Maintenance).

In this unit, a large area is owned by the US Fish and Wildlife Service.

In this unit harvest no more than 10 acres every 5 years.

The Long Term Goal - Maintain and enhance the higher areas that can or do support oak, hickory, and/or walnut associations. The lower areas will be a mix of unevenaged stands in different stages of growth. Maintain the active rookeries, principally by minimizing any disturbance to the rookeries.

---

1,470 acres. (VIII)

Photos No. 13-15, 13-17, and 13-29 to 22. River mile 531-541.

Apply practice W (Special Management) along river and lake shores and sloughs.

Apply practice X (Stand Mapping) before applying any other practices.

Practice N (Unique Area) has been used to denote the heron rookery. Even though the rookery occurs entirely on US Fish and Wildlife Service fee title areas, any silvicultural practice on nearby Corps lands should be coordinated very closely with the Fish and Wildlife Service so as disturbance to the rookery is minimized.

In Types $6_i$, $9_i$, and $1_i$ apply practice Q (Thinning).

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3. PRIORITIES LIST - POOL 13

A Thin young, overstocked, silver maple, ash, cottonwood stands.

4. ESTIMATED COSTS

| Silvicultural Practice | Acreage to be Treated | Cost Per Acre | Total per Practice |
|---|---|---|---|
| Thinning | 2,100 | $150 | $315,000 |
| Improvement cut | 300 | $150 | $ 45,000 |
| Timber stand improvement | 90 | $ 30 | $ 2,700 |
| Harvest (contractural preparation) | 45 | $ 60 | $ 2,700 |
| Site preparation | 45 | $110 | $ 4,950 |
| Planting | 70 ± 40 | $ 50 | $ 3,500 ± $ 2,000 |
| Type mapping | 2,535 | $ 2 | $ 5,070.00 |
| | Total Cost for Pool 12 | | $378,920.00 ± $ 2,000 |

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Pool 13 - Inventory Data

Total Stand Summary

| Sp. | Ba/Aft$^2$ | # Trees/A | Vol/ABd.ft. | Av. Diameter (in.) |
|---|---|---|---|---|
| Ash Sp | 3.58 | 27.45 | 231.64 | 4.89 |
| River Birch | 6.42 | 12.31 | 401.64 | 9.78 |
| Boxelder | 1.13 | 18.57 | 38.01 | 3.34 |
| Catalpa | 0.19 | 0.04 | 16.14 | 30.00 |
| Cottonwood | 7.74 | 18.41 | 837.44 | 8.78 |
| Elm Sp | 4.34 | 33.95 | 32.36 | 4.84 |
| Shagbark Hickory | 0.19 | 0.11 | 23.84 | 18.00 |
| Black Locust | 0.00 | 1.00 | 0.00 | 0.00 |
| Silver Maple | 46.98 | 110.32 | 2720.42 | 8.84 |
| Bur Oak | 0.19 | 0.54 | 0.00 | 0.00 |
| Pin Oak | 1.89 | 1.05 | 180.20 | 18.12 |
| Red Oak | 1.89 | 1.34 | 151.09 | 16.80 |
| Swamp White Oak | 0.38 | 1.31 | 5.45 | 7.28 |
| White Oak | 0.38 | 0.17 | 45.59 | 19.97 |
| Black Walnut | 0.19 | 0.14 | 21.89 | 16.00 |
| Willow Sp | 9.25 | 65.91 | 476.25 | 5.07 |
| TOTAL | 84.72 sq.ft. | 292.61 | 5181.95 Bd.ft. | |

| Variable of Interest | Mean/A | 95% Confidence Interval | |
|---|---|---|---|
| Int 1/4 Bd Ft | 5181.9 | 3912.82 | 6451.07 |
| Sq. Ft. Basal Area | 110.6 | 93.42 | 127.71 |
| Number of Trees | 336.2 | 212.47 | 459.84 |

Average Annual Growth Per Acre Int. 1/4 Bd. Ft. 132.7
Sq. Ft. Basal Area 0.67

FOR CLASSES 5-10 Wildlife Related Inventory Data
Per Acre Figures

| SPECIES LISTING | BASAL AREA (sq.ft./A) | NO. TREES/A | AVERAGE DIAMETER (inches) |
|---|---|---|---|
| Class 5 Den Tree - Upper Cavity (Upper 1/4 Bole) | | | |
| ASH SP | 0.19 | 0.11 | 18.00 |
| CATALPA | 0.19 | 0.04 | 30.00 |
| COTTONWOOD | 0.75 | 0.28 | 22.06 |
| SILVER MAPLE | 3.40 | 5.57 | 10.57 |
| WILLOW SP | 0.19 | 2.16 | 4.00 |
| MISCELLANEOUS | 1.70 | 0.53 | 24.13 |
| TOTAL | 6.42 sq.ft./A | 8.69/A | |

FOR CLASSES 5-10
Per Acre Figures

## Wildlife Related Inventory Data (Cont'd)

| SPECIES LISTING | BASAL AREA (sq.ft./A) | NO. TREES/A | AVERAGE DIAMETER (inches) |
|---|---|---|---|
| **Class 6 Den Tree - Lower Cavity (Lower 3/4 Bole)** | | | |
| SILVER MAPLE | 0.94 | 3.64 | 6.90 |
| WILLOW SP | 0.19 | 0.11 | 18.00 |
| MISCELLANEOUS | 0.75 | 0.24 | 23.93 |
| TOTAL | 1.88 sq.ft./A | 3.99/A | |
| **Class 7 Standing Dead Tree** | | | |
| RIVER BIRCH | 0.94 | 1.18 | 12.11 |
| COTTONWOOD | 0.57 | 0.18 | 24.17 |
| ELM SP | 0.38 | 0.25 | 16.70 |
| BLACK LOCUST | 0.38 | 0.69 | 10.00 |
| SILVER MAPLE | 0.57 | 0.76 | 11.67 |
| PIN OAK | 0.19 | 0.05 | 26.00 |
| RED OAK | 0.19 | 0.24 | 12.00 |
| WILLOW SP | 0.57 | 2.40 | 6.57 |
| MISCELLANEOUS | 5.85 | 3.83 | 16.73 |
| TOTAL | 9.64 sq.ft./A | 9.58/A | |
| **Class 8 Leaf Nest** | | | |
| WILLOW SP | 0.19 | 0.09 | 20.00 |
| TOTAL | 0.19 sq.ft./A | 0.09/A | |
| **Class 9 Grapevine** | | | |
| ASH SP | 0.75 | 11.01 | 3.55 |
| RIVER BIRCH | 0.38 | 0.22 | 17.67 |
| COTTONWOOD | 1.32 | 0.61 | 19.98 |
| ELM SP | 0.94 | 6.59 | 5.12 |
| SHAGBARK HICKORY | 0.19 | 0.11 | 18.00 |
| SILVER MAPLE | 6.42 | 11.94 | 9.92 |
| PIN OAK | 0.19 | 0.14 | 16.00 |
| WILLOW SP | 0.57 | 0.40 | 16.15 |
| MISCELLANEOUS | 0.75 | 0.47 | 17.17 |
| TOTAL | 11.51 sq.ft./A | 31.49/A | |

FOR CLASSES 5-10 Wildlife Related Inventory Data (Cont'd)
Per Acre Figures

| SPECIES LISTING | | BASAL AREA (sq.ft./A) | NO. TREES/A | AVERAGE DIAMETER (inches) |
|---|---|---|---|---|
| Class 10 | | | | |
| SHAGBARK HICKORY | | 0.19 | 0.11 | 18.00 |
| BUR OAK | | 0.19 | 0.54 | 8.00 |
| PIN OAK | | 1.89 | 1.05 | 18.12 |
| RED OAK | | 1.70 | 1.20 | 16.10 |
| SWAMP WHITE OAK | | 0.38 | 1.31 | 7.28 |
| WHITE OAK | | 0.38 | 0.17 | 19.97 |
| BLACK WALNUT | | 0.19 | 0.14 | 16.00 |
| MISCELLANEOUS | | 0.19 | 0.14 | 16.00 |
| | TOTAL | 5.11 sq.ft./A | 4.66/A | |

AVERAGE ACORN AND NUT YIELD BY SPECIES

| SPECIES LISTING | | POUNDS PER ACRE | TOTAL POUNDS |
|---|---|---|---|
| BUR OAK | | 0.43 | 2,842.45 |
| PIN OAK | | 3.94 | 25,829.22 |
| RED OAK | | 8.89 | 58,208.45 |
| WHITE OAK | | 0.91 | 5,932.07 |
| | TOTAL ACORNS | 14.17/lbs./A | 92,812.19 lbs. |
| SHAGBARK HICKORY | | 0.25 | 1,606.60 |
| | TOTAL NUTS | 0.25 lbs./A | 1,606.60 lbs. |

ADDENDUM 14

ADDENDUM 14

1. INTRODUCTION

Pool 14 extends from Clinton, Iowa, to LeClaire, Iowa, a distance of 29.2 miles. The pool contains 10,450 acres of water, 277 miles of shoreline (including islands), and 4,953 acres of public land. Project lands comprise the majority of public land in this pool.

Approximately 4,460 acres of project woodlands are located in this pool. The great majority of mast tree associations in this pool can be found on the Wapsipinicon River Basin area and Beaver Island. A stand of bottom land mixed species including pecan can be found on an island offshore of the mouth of the Wapsipinicon River. This is unique because it is one of the most northerly stands of bottom land forest that contains pecan in the Mississippi River basin.

The Wapsipinicon River is one of the most valued recreational areas in the State of Iowa. A special management zone of 200 feet will be left on both banks of the river to preserve one of the few prime canoeing and boating waterways in Iowa.

Fish and wildlife resources on Cooperative Agreement lands in the Princeton area are managed by the State of Iowa under a third party agreement. Fish and wildlife resources on the remaining Cooperative Agreement lands are managed by the US Fish and Wildlife Service as a part of the Upper Mississippi River Wildlife and Fish Refuge System.

2. PRESCRIPTIONS FOR POOL 14

| Unit Title | Tract No. |
|---|---|
| Lock and Dam #14 to Princeton including Smith's Island | Plat #1-5, LS 1-10<br>IAIS 1-3,<br>FIA 1, 7, 8,<br>20-57, 88, 89, 115, 116,<br>121, 125, 134, 135, 160,<br>161, 164<br>A1, FI 1-10, 52-55, 55A,<br>60-83<br>IIS 4 |

Photos No. 14-1 to 14-9. River mile 493-502. UNIT NO. I

Apply practice W (Special Management) along river and slough shores.

Apply practice $A_{a-c}$ (Plant) and B (Tree Maintenance) on tract A-1.

Apply practice X (Stand Mapping) before applying any other practices.

Plant experimental plantings on Type 54.

In Type $3_i$, $24_{im}$, on Smith's island immediately above L's/D 14, apply practice J (Improvement Cut). This is near a heavily used recreation site. Because of its historic structure and unique upland vegetation, this is an area with high interpretive potential.

The Long Term Goal - Maintain the aesthetic quality and interpretive potentials because of the upland vegetation found there.

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South of the Princeton Wildlife area and Steamboat Slough area

FIA 218, 219, 221, 222
IAIS 4, 5, 8, 20-37

339.7 acres. (II)

Photos No. 14-9 and 14-10. River mile 502-505.8.

Apply practice W (Special Management) along river shores, island shores and slough.

Apply practice X (Stand Mapping) before applying any other practices.

In Type $1_i$ and $9_i$ apply practice Q (Thinning).

In Type $9_{im}$ apply practice I (Clearcut) and then $A_{d-f}$ (Reforestation).

Much of Steamboat Island area will be in the special management zones.

In this unit harvest no more than 10 acres every 5 years.

The Long Term Goal - Develop and maintain a mix of evenaged stands in different stages of growth. Eagles have been seen roosting along steamboat slough.

---

Princeton Wildlife area

FIA 224-226, 228, 513
Part 227

351.2 acres. (III)

Photos No. 14-9 to 14-11a. River mile 504-506.

Apply practice W (Special Management) along shoreline, sloughs, and lakes.

Apply practice X (Stand Mapping) before applying any other practices.

In Type $9_i$ and $1_i$ apply practice Q (Thinning). If $1_i$ is predominantly willow leave area alone. Thin above elevation (contour) lines 780 feet only. Do not thin below river mile 505.5.

In this unit harvest no more timber.

The Long Term Goal - Maintain and enhance the wildlife habitat in this unit by maintaining a mix of evenaged stands in different stages of development. Woodduck and other waterfowl and deer are priority wildlife species designated by the Iowa Conservation Commission in this unit.

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Wapsipinicon River area and Schricker Slough area

FIA 227, 229-237, 239, 243, 247, 248, 250, 251, 269, 277-281, 292-294, 296-300, 316

1,510 acres. (IV)

Photos No. 14-11A to 14-15. River mile 506-509.

Apply practice W (Special Management) along the Wapsipinicon River and the Mississippi River.

Apply practice X (Stand Mapping) before applying any other practices.

In Type $4_i$, $15_i$, $3_i$, $1_i$, $2_i$, and $9_i$ apply practice Q (Thinning).

In Type $6_{im}$, $4_{im}$, apply practice J (Improvement Cut) to release oak in the understory.

In Type $9_{im}$ apply practice I (Clearcut) then $A_{d-f}$ (Reforestation).

In Type $13_{im}$ and $3_{im}$ apply practice J (Improvement Cut) where scattered oaks occur. In higher openings apply practice $L_c$ (TSI) and then $A_{d-f}$ (Reforestation). In all other areas apply practice Q (Thinning) where the stand is stagnated and desirable species are present, or I (Clearcut) and $A_{d-f}$ where such species are mature or not present on the site.

In type 21 apply practice T (Monitor) to determine if this area has become a wetland naturally or if poor management created the situation. Very small (100-square-foot) blocks of timber may be improved in the study by applying practice L (TSI).

In type $16_{im}$ apply practice W (Special Management).

In type 5 apply practice $L_a$ and $L_c$ (TSI) then $A_{d-f}$ (Reforestation).

In this unit harvest no more than 5 acres every 5 years.

The Long Term Goal - Enhance and/or maintain the higherareas and the understory found on many of the areas. On higher areas where oaks are overtopped by silver maple, ash, or cottonwood the oaks will be released and other mast-producing species may be planted there to diversify the timber type. Lower area will be a mix of evenaged stands in different stages of growth. The recreational experience and aesthetic qualities will be maintained with the special management zone while wildlife is maintained and enhanced by applying silvicultural practice.

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Adams, Coes and next northern island, offshore of Adams — IAIS 11-15 small island

189 acres. (V)

Photos No. 14-12 to 14-14. River mile 507-509.5.

Apply practice W (Special Management) along island shores and sloughs.

Apply practice X (Stand Mapping) before applying any other practices.

In Type $3_{im}$ apply practice J (Improvement Cut) then T (Monitor). Release pecan trees and use some of the pecans as a seed source for maintaining this northern pecan strain.

In Type $9_{i}$ apply practice Q (Thinning).

In Type $6_{im}$ apply practice J (Improvement Cut) then T (Monitor) for regeneration of oaks and hickories.

The Long Term Goal - Increase nut production from the pecan trees and use the nuts as a seed source for maintaining this northern hardy strain of pecans. The remaining associations of oak and hickory will be maintained. The lower areas will be a mix of evenaged stands in different stages of development.

---

Meredosia Island, areas below Albany, north and south of Meredosia, Swan Island and nearby land area and islands — IIS 12-18, 20 and islands; IAIS 18, FI 217; IAIS 17-19, 41; FIA 323

302.4 acres. (VI)

Photos No. 14-15 and 14-16. River mile 510-513.

Apply practice W (Special Management) along shorelines and along sloughs.

Apply practice X (Stand Mapping) before applying any other practices.

On Swan Island, In Type $3_{im}$ apply practice J (Improvement Cut) to release any mast-producing trees.

In Type $9_{i}$ apply practice Q (Thinning).

The Long Term Goal - Maintain a mix of evenaged stands in different stages of development. In order to maintain a quality aesthetical boating experience, much of this area will have to be left alone.

---

Beaver Island area — IAIS 43, 44-70, 72, 73, 92

1,050 acres. (VII)

Photos No. 14-17 to 14-20. River mile 513-517.

Apply practice W (Special Management) along island shoreline, lakes, ponds, and sloughs.

Apply practice X (Stand Mapping) before applying any other practices.

Apply no practice to the heron rookery and a 1,500-foot zone around it.

In Type $2_i$, $9_i$, and $2_i$ apply practice Q (Thinning).

In Type $3_{im}$, $15_{im}$, $6_{im}$, and $4_{im}$ apply practice J (Improvement Cut).

In Type $9_{im}$ apply practice I (Clearcut) then $A_{d-f}$ (Reforestation).

In this unit harvest no more than 10 acres every 5 years.

The Long Term Goal - Maintain the areas dominated by oak and other mast-producing trees and diversify those areas. The lower areas will be a mix of evenaged stands in different stages of development.

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Cattail Slough Area — FIA 254-260, 283-320, 326, 327, 331-353

340 acres. (VIII)

Photos No. 14-19 to 14-21. River mile 516-518.

Apply practice W (Special Management) along sloughs and river.

Apply practice X (Stand Mapping) before applying any other practices.

In Type $9_i$ apply practice Q (Thinning).

In Type $6_{im}$ apply practice N (Unique Area) or J (Improvement Cut). In most areas of pin oak apply practice N. In area where young trees could be helped apply practice J.

In the recreation area apply practice $A_{a-c}$ (Plant) and B (Tree Maintenance).

In this unit harvest no acreage for the first 5 years.

The Long Term Goal - Maintain the areas already supporting good populations of pin oak in pin oak. Other areas will be a mix of evenaged stands in different stages of development.

---

| | |
|---|---|
| Willow Island, Joyce's Island, and below Lock and Dam 13 | IAIS 125, 126<br>FI 388-395, 406A, 407A, 409A, 410 |

467 acres. (IX)

Photos No. 14-20 to 14-25. River mile 519-523.

Apply practice W (Special Management) along sloughs and river shore.

Apply practice X (Stand Mapping) before applying any other practices.

Leave Willow and Joyce's Islands alone.

No practice will be applied on a 1,500-foot zone around the rookery. However, because only one nest exists, the area will be monitored for change.

In Type $2_i$, $9_i$, and $1_i$ apply practice Q (Thinning) if feasible.

In Type 5 apply practice $L_a$ and $L_c$ (TSI).

In Type $4_{im}$ and $6_{im}$ apply practice J (Improvement Cut).

In this unit harvest no more timber.

The Long Term Goal - Maintain a mix of evenaged stands in different stages of growth.

3. PRIORITIES LIST FOR POOL 14

| | |
|---|---|
| A | Release oak in the Wapsipinicon River management unit. |
| B | Thin the pin oak area in the Wapsipinicon River management unit. |
| C | Release oak in areas where oak may be overtopped or in competition with maple or other non-mast hardwoods in the Cattail Slough and Beaver Island areas. |
| D | Conduct an improvement cut on class $6_{im}$ and $4_{im}$ stands on Beaver Island. |
| E | Thin the overcrowded silver maple and cottonwood area in Cattail Slough area and Beaver Island areas. |
| F | Plant "mast" trees in Wapsipinicon River management unit. |

4. ESTIMATED COSTS

| Silvicultural Practice | Acreage to be Treated | Cost Per Acre | Total per Practice |
|---|---|---|---|
| Thinning | 2,200 | $150 | $330,000 |
| Improvement cut | 1,200 | $150 | $180,000 |
| Timber stand improvement | 20 | $ 30 | $ 600 |
| Harvest (contractural preparation) | 25 | $ 60 | $ 1,500 |
| Site preparation | 25 | $110 | $ 2,750 |
| Planting | 20 ± 20 | $ 50 | $ 1,000 ± $ 1,000 |
| Type mapping | 3,445 | $ 2 | $ 6,890 |
| | Total Cost for Pool 14 | | $522,740 ± $ 1,000 |

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Pool 14 - Inventory Data

Total Stand Summary

| Sp. | Ba/Aft$^2$ | # Trees/A | Vol/ABd.ft. | Av. Diameter (in.) |
|---|---|---|---|---|
| Ash Sp | 3.46 | 17.44 | 168.73 | 6.03 |
| River Birch | 4.87 | 10.04 | 231.50 | 9.43 |
| Cottonwood | 8.21 | 7.29 | 862.78 | 14.36 |
| Elm Sp | 5.38 | 57.64 | 80.55 | 4.14 |
| Hackberry | .90 | 10.52 | 13.38 | 3.96 |
| Hickory Sp | .13 | 1.47 | 0.00 | 4.00 |
| Silver Maple | 68.46 | 203.70 | 3951.08 | 7.85 |
| Mulberry Sp | .90 | 9.30 | 0.00 | 4.21 |
| Pin Oak | 9.23 | 21.24 | 886.65 | 8.80 |
| Swamp White Oak | .90 | .48 | 95.30 | 18.59 |
| Pecan | .13 | .07 | 20.89 | 18.00 |
| Sycamore | .26 | .06 | 35.10 | 29.21 |
| Willow Sp | 6.41 | 61.59 | 378.41 | 4.37 |
| Misc | .26 | 5.92 | 15.61 | 2.82 |
| TOTAL | 109.49 sq.ft. | 406.94 | 6739.99 Bd.ft. | |

| Variable of Interest | Mean/A | 95% Confidence Interval | |
|---|---|---|---|
| Int 1/4 Bd Ft | 6740.0 | 5822.12 | 7657.86 |
| Sq. Ft. Basal Area | 118.8 | 108.20 | 129.49 |
| Number of Trees | 416.6 | 286.43 | 546.83 |

Average Annual Growth Per Acre Int. 1/4 Bd. Ft. 107.7
Sq. Ft. Basal Area .53

FOR CLASSES 5-10 Wildlife Related Inventory Data
Per Acre Figures

| SPECIES LISTING | BASAL AREA (sq.ft./A) | NO. TREES/A | AVERAGE DIAMETER (inches) |
|---|---|---|---|
| **Class 5 Den Tree - Upper Cavity (Upper 1/4 Bole)** | | | |
| RIVER BIRCH | .38 | .24 | 17.22 |
| COTTONWOOD | .13 | .01 | 40.00 |
| SILVER MAPLE | 1.41 | .58 | 21.18 |
| PIN OAK | .38 | .07 | 31.21 |
| WILLOW SP | .26 | .12 | 19.70 |
| MISCELLANEOUS | 1.03 | .30 | 24.92 |
| TOTAL | 3.59 sq.ft./A | 1.32/A | |
| **Class 6 Den Tree - Lower Cavity (Lower 3/4 Bole)** | | | |
| ASH SP | .13 | .03 | 30.00 |
| COTTONWOOD | .51 | .07 | 37.75 |
| SILVER MAPLE | 2.18 | .75 | 23.06 |
| PIN OAK | .38 | .06 | 35.65 |
| WILLOW SP | .13 | .07 | 18.00 |
| MISCELLANEOUS | .90 | .18 | 29.87 |
| TOTAL | 4.23 sq.ft./A | 1.16/A | |
| **Class 7 Standing Dead Tree** | | | |
| ASH SP | .13 | .24 | 10.00 |
| RIVER BIRCH | 1.41 | .94 | 16.63 |
| COTTONWOOD | .13 | .02 | 38.00 |
| SILVER MAPLE | 2.95 | 4.99 | 10.40 |
| PIN OAK | .26 | .05 | 30.83 |
| WILLOW SP | 1.67 | 2.11 | 12.04 |
| MISCELLANEOUS | 2.82 | 1.35 | 19.54 |
| TOTAL | 9.37 sq.ft./A | 9.70/A | |

FOR CLASSES 5-10
Per Acre Figures

## Wildlife Related Inventory Data (Cont'd)

| SPECIES LISTING | | BASAL AREA (sq.ft./A) | NO. TREES/A | AVERAGE DIAMETER (inches) |
|---|---|---|---|---|
| **Class 8 Leaf Nest** | | | | |
| RIVER BIRCH | | .13 | .07 | 18.00 |
| COTTONWOOD | | .13 | .09 | 16.00 |
| PIN OAK | | .51 | .34 | 16.52 |
| SWAMP WHITE OAK | | .13 | .03 | 26.00 |
| | TOTAL | .90 sq.ft./A | .53/A | |
| **Class 9 Grapevine** | | | | |
| ASH SP | | .64 | .66 | 13.34 |
| RIVER BIRCH | | .64 | .29 | 20.12 |
| COTTONWOOD | | 1.54 | .84 | 18.27 |
| ELM SP | | .64 | 9.02 | 3.61 |
| HACKBERRY | | .13 | .37 | 8.00 |
| SILVER MAPLE | | 7.56 | 13.19 | 10.25 |
| MULBERRY SP | | .38 | 1.47 | 6.93 |
| PIN OAK | | 1.67 | 1.34 | 15.12 |
| SWAMP WHITE OAK | | .26 | .03 | 40.00 |
| SHAGBARK HICKORY | | .13 | .16 | 12.00 |
| WILLOW SP | | .51 | .47 | 14.12 |
| MISCELLANEOUS | | .26 | .08 | 24.94 |
| | TOTAL | 14.36 sq.ft./A | 27.92/A | |
| **Class 10** | | | | |
| HICKORY SP | | .13 | 1.47 | 4.00 |
| PIN OAK | | 8.97 | 21.24 | 8.80 |
| SWAMP WHITE OAK | | .90 | .48 | 18.59 |
| PECAN | | .13 | .07 | 18.00 |
| SHAGBARK HICKORY | | .26 | .18 | 16.25 |
| | TOTAL | 10.39 sq.ft./A | 23.44/A | |

AVERAGE ACORN AND NUT YIELD BY SPECIES

| SPECIES LISTING | | POUNDS/ACRE | TOTAL POUNDS |
|---|---|---|---|
| PIN OAK | | 15.23 | 56,034.00 |
| | TOTAL ACORNS | 15.23 lbs./A | 56,043.00/lbs. |
| HICKORY SP | | .17 | 613.17 |
| | TOTAL NUTS | .17 lbs./A | 613.17/lbs. |

ADDENDUM 16

ADDENDUM 16

1. INTRODUCTION

Pool 16 extends from the Quad City area to Muscatine, Iowa, a distance of 25.6 miles. The pool contains 12,047 acres of water, 202.5 miles of shorelines (including islands), and 4,843 acres of public land. Project lands comprise the majority of public land area in the pool.

Approximately 3,690 → 3,709.7 acres of project woodlands are located in this pool. Mast tree species ~~can~~ 19.7 be found on Andalusia islands, and Milan Bottoms. Included among those found in these areas are red oak and hickory. On much of Andalusia Island, however, young mast tree species are not common.

Fish and wildlife resources on Cooperative Agreement lands in this pool are managed by the Illinois Department of Conservation and the Iowa Conservation Commission through third party agreement.

2. PRESCRIPTIONS FOR POOL 16

| Unit Title | Tract No. |
|---|---|
| Hog Island, Lock and Dam 16 area, Iowa shoreline to River Mile 472 nearby small island | IIS 1-4, 46<br>A1, 2<br>D 2<br>L 1, 2<br>FIA 1-3, 5, 7-11, 13-17, 21, 22, 24, 25, 30-37, 41, 43-60 |
| + | |
| Islands and Illinois shoreline to River Mile 463 | FI 17-31<br>IAIS 1-47, 49 |

513.9 acres. UNIT NO. I

Photos No. 16-1 to 16-12. River mile 457-463 (Illinois) and 457-472 (Iowa).

Apply practice W (Special Management) along shorelines, sloughs, and wetlands.

Leave this area alone.

The Long Term Goal - Maintain aesthetic recreational values. The Iowa Conservation Commission has designated the eagle and the wood duck as priority wildlife species in this unit.

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| | |
|---|---|
| Above Dead Slough and from River Mile 463 to River Mile 474 | FI 31-48, 61-66, 69-71 |
| plus | |
| Martin and Scisco Islands, Illinois side of the river | IIS 6, 7 |

580.1 acres. (II)

Photos No. 16-5 to 16-13. River mile 463-472 (Illinois).

Apply practice W (Special Management) along shorelines and sloughs and wetland areas.

Apply practice X (Stand Mapping) before applying any other practice.

In Type $9_i$ apply practice Q (Thinning).

At the developed recreational areas practices $A_{a-c}$ (Plant) and B (Tree Maintenance) may be applied.

The Long Term Goal - Provide a more pleasing recreational experience along this area.

---

| | |
|---|---|
| Andalusia and assorted iles (including Smiths Island) | IIS 8-34 47-50 |

1,734.9 acres. (III)

Photos No. 16-6 to 16-14. River mile 464-475.6.

Apply practice W (Special Management) on the islands' shores, and main and side channel shorelines.

Apply practice X (Stand Mapping) before applying any other practices.

In Type $2_i$, $3_i$, and $9_i$ apply practice Q (Thinning). Where oak, pecan or hickory is found, release those species (in type $3_i$).

In Type 5 and 46 apply practice $L_a$ and/or $L_c$ (TSI).

In Type $3_{im}$ apply practice J (Improvement Cut) or I (Clearcut). Where the maple is not mature and mast trees present make an improvement cut favoring and releasing oak, hickory, black walnut, then silver maple and sycamore. Where the maple or cottonwood is mature and no mast trees present, harvest (practice I) then apply practice $A_{d-f}$ (Reforestation).

In Type $4_{im}$, $6_{im}$, apply practice J (Improvement Cut).

In Type 10 apply practice I (Clearcut) then $A_{d-f}$ (Reforestation).

In Type $9_{im}$ apply practice I (Clearcut) $A_{d-f}$ (Reforestation).

In this unit harvest no more than 45 acres every 5 years.

The Long Term Goal - Maintain and restore oak, hickory, and walnut to suitable areas. The lower areas will be a mix of unevenage stands in different stages of growth. Our long term goals will enhance this area for wildlife habitat and a recreational area.

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Milan Bottoms and below — FI 72-87, IIS 51-63

693 acres (about). (IV)

Photos No. 16-14 to 16-16. River mile 472-478.

Apply practice W (Special Management) along river shore, sloughs, lakes, and ponds.

Apply practice X (Stand Mapping) before applying any other practices.

In Type $2_i$, $1_i$, and $9_i$ apply practice Q (Thinning).

In Type $9_{im}$ apply practice I (Clearcut) then $A_{d-f}$ (Reforestation).

In Type $4_{im}$, $6_{im}$ apply practice J (Improvement Cut). Do not remove any red oaks.

In Type $3_{im}$ apply practice U (Shelterwood) or V (Seed Tree), then $A_{d-f}$ (Reforestation) where oak, hickory, or walnut occur. In other areas apply practice I (Clearcut).

Apply practice W (Special Management) and T (Monitor).

In this unit harvest no more than 30 acres every 5 years.

Our Long Term Goal - Maintain the higher areas in oak, hickory, and walnut. The red oak area should be monitored to see if it is reestablishing itself. In lower areas, a mix of evenaged stands in different stages of development will be maintained.

3. PRIORITIES LIST FOR POOL 16

| | |
|---|---|
| A | Thin overcrowded stands of maple and cottonwood on Andalusia, and in Milan Bottoms. |
| B | Encourage young oak, hickory, and black walnut stands on the Andalusia islands and Milan Bottoms units. On higher areas where they may or may not now occur, conduct improvement cuts, or harvest and plant. |

4. ESTIMATED COSTS

| Silvicultural Practice | Acreage to be Treated | Cost Per Acre | Total per Practice |
|---|---|---|---|
| Thinning | 780 | $150 | $117,000 |
| Improvement cut | 655 ± 300 | $150 | $ 98,250 ± 45,000 |
| Timber stand improvement | 10 | $ 30 | $ 300 |
| Harvest (contractural preparation) | 75 | $ 60 | $ 4,500 |
| Site preparation | 75 | $110 | $ 8,250 |
| Planting | 75 ± 50 | $ 50 | $ 3,750 ± $ 2,500 |
| Type mapping | 1,820 | $ 2 | $ 3,640 |
| | Total Cost for Pool 16 | | $280,690 ± $ 47,500 |

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Pool 16 - Inventory Data

MILAN BOTTOMS - TOP HALF SWIFT ILE (IL) UNIT NO. IV

Total Stand Summary

| Sp. | Ba/Aft$^2$ | # Trees/A | Vol/ABd.ft. | Av. Diameter (in.) |
|---|---|---|---|---|
| Ash Sp | 5.24 | 5.51 | 398.09 | 13.20 |
| Boxelder | .95 | 5.61 | 28.65 | 5.58 |
| Cottonwood | 6.67 | 1.51 | 960.65 | 28.45 |
| Elm Sp | 5.71 | 40.47 | 103.93 | 5.09 |
| Hackberry | 5.71 | 22.64 | 66.68 | 6.80 |
| Shagbark Hickory | .48 | .22 | 48.94 | 20.00 |
| Silver Maple | 92.38 | 181.49 | 6710.68 | 9.66 |
| Red Oak | 2.86 | .58 | 354.56 | 30.05 |
| White Oak | 1.90 | 1.14 | 179.24 | 17.51 |
| Black Walnut | 1.43 | .73 | 181.24 | 18.99 |
| Willow Sp | 1.90 | .94 | 190.27 | 19.30 |
| Misc | .48 | 1.36 | 0.00 | 8.00 |
| TOTAL | 126.19 sq.ft. | 263.07 | 9222.91 Bd.ft. | |

| Variable of Interest | Mean/A | 95% Confidence Interval | |
|---|---|---|---|
| Int 1/4 Bd Ft | 9222.9 | 7505.28 | 10940.53 |
| Sq. Ft. Basal Area | 135.7 | 117.14 | 154.29 |
| Number of Trees | 272.7 | 123.24 | 422.14 |

Average Annual Growth Per Acre Int. 1/4 Bd. Ft. 174.0
Sq. Ft. Basal Area .88

FOR CLASSES 5-10 Wildlife Related Inventory Data
Per Acre Figures

| SPECIES LISTING | BASAL AREA (sq.ft./A) | NO. TREES/A | AVERAGE DIAMETER (inches) |
|---|---|---|---|
| **Class 5 Den Tree - Upper Cavity (Upper 1/4 Bole)** | | | |
| ASH SP | .95 | .35 | 22.42 |
| COTTONWOOD | .48 | .08 | 34.00 |
| SILVER MAPLE | 6.67 | 2.46 | 22.30 |
| RED OAK | .48 | .11 | 28.00 |
| WILLOW SP | .95 | .40 | 20.93 |
| MISCELLANEOUS | 1.43 | .36 | 26.82 |
| TOTAL | 10.96 sq.ft./A | 3.76/A | |
| **Class 6 Den Tree - Lower Cavity (Lower 3/4 Bole)** | | | |
| SILVER MAPLE | 4.76 | 1.98 | 21.02 |
| TOTAL | 4.76 sq.ft./A | 1.98/A | |
| **Class 7 Standing Dead Tree** | | | |
| ASH SP | 1.90 | 1.41 | 15.72 |
| COTTONWOOD | .48 | .18 | 22.00 |
| SILVER MAPLE | 3.33 | 6.38 | 9.79 |
| RED OAK | .48 | .11 | 28.00 |
| WILLOW SP | .95 | .61 | 16.91 |
| MISCELLANEOUS | 1.90 | .71 | 22.25 |
| TOTAL | 9.04 sq.ft./A | 9.40/A | |

FOR CLASSES 5-10
Per Acre Figures

## Wildlife Related Inventory Data (Cont'd)

| SPECIES LISTING | | BASAL AREA (sq.ft./A) | NO. TREES/A | AVERAGE DIAMETER (inches) |
|---|---|---|---|---|
| Class 8 Leaf Nest | | | | |
| SILVER MAPLE | | 1.43 | .65 | 20.00 |
| | TOTAL | 1.43 sq.ft./A | .65/A | |
| Class 9 Grapevine | | | | |
| ASH SP | | 1.43 | 1.07 | 15.64 |
| COTTONWOOD | | .48 | .06 | 38.00 |
| ELM SP | | 1.43 | 3.52 | 8.63 |
| HACKBERRY | | .95 | 1.49 | 10.81 |
| SILVER MAPLE | | 15.24 | 10.58 | 16.25 |
| RED OAK | | .48 | .09 | 32.00 |
| WHITE OAK | | .48 | .15 | 24.00 |
| BLACK WALNUT | | .95 | .28 | 24.94 |
| WILLOW SP | | .48 | .18 | 22.00 |
| MISCELLANEOUS | | .48 | .13 | 26.00 |
| | TOTAL | 22.40 sq.ft./A | 17.55/A | |
| Class 10 | | | | |
| HICKORY SP | | .48 | .87 | 10.00 |
| SHAGBARK HICKORY | | .48 | .22 | 20.00 |
| RED OAK | | 2.86 | .58 | 30.05 |
| WHITE OAK | | 1.90 | 1.14 | 17.51 |
| BLACK WALNUT | | 1.43 | .73 | 18.99 |
| | TOTAL | 7.14 sq.ft./A | 3.54/A | |

AVERAGE ACORN AND NUT YIELD BY SPECIES

| SPECIES LISTING | | POUNDS/ACRE | TOTAL POUNDS |
|---|---|---|---|
| RED OAK | | 2.86 | 1,811.43 |
| WHIE OAK | | 4.67 | 2,958.67 |
| | TOTAL ACORNS | 7.53 lbs./A | 4,770.10 lbs. |
| HICKORY SP | | .62 | 392.48 |
| SHAGBARK HICKORY | | .62 | 392.48 |
| | TOTAL NUTS | 1.24 lbs./A | 784.96 lbs. |

ANDALUSIA ISLAND - RIVER MILE 469-473 UNIT NO. III

Total Stand Summary

| Sp. | Ba/Aft$^2$ | # Trees/A | Vol/ABd.ft. | Av. Diameter (in.) |
|---|---|---|---|---|
| Ash Sp | 4.62 | 5.71 | 239.93 | 12.17 |
| Cottonwood | 7.69 | 3.45 | 1014.74 | 20.22 |
| Elm Sp | 6.15 | 30.98 | 0.00 | 6.03 |
| Hackberry | 15.38 | 56.38 | 221.96 | 7.07 |
| Silver Maple | 88.46 | 178.40 | 4644.34 | 9.54 |
| Pin Oak | 3.08 | 2.84 | 313.38 | 14.09 |
| Pecan | .77 | .24 | 109.27 | 24.00 |
| Black Walnut | .77 | 3.92 | 0.00 | 6.00 |
| Willow Sp | .77 | .35 | 0.00 | 20.00 |
| Misc | 0.00 | 1.00 | 0.00 | 0.00 |
| TOTAL | 127.69 sq.ft. | 283.28 | 6543.61 Bd.ft. | |

| Variable of Interest | Mean/A | 95% Confidence Interval | |
|---|---|---|---|
| Int 1/4 Bd Ft | 6543.6 | 4363.86 | 8723.36 |
| Sq. Ft. Basal Area | 143.8 | 100.79 | 186.90 |
| Number of Trees | 319.7 | 85.90 | 553.44 |

Average Annual Growth Per Acre Int. Bd. Ft. 51.7
Sq. Ft. Basal Area .20

FOR CLASSES 5-10 Per Acre Figures

Wildlife Related Inventory Data

| SPECIES LISTING | BASAL AREA (sq.ft./A) | NO. TREES/A | AVERAGE DIAMETER (inches) |
|---|---|---|---|
| Class 5 Den Tree - Upper Cavity (Upper 1/4 Bole) | | | |
| SILVER MAPLE | 6.15 | .95 | 34.40 |
| MISCELLANEOUS | 1.54 | 9.06 | 5.58 |
| TOTAL | 7.69 sq.ft./A | 10.01/A | |
| Class 6 Den Tree - Lower Cavity (Lower 3/4 Bole) | | | |
| SILVER MAPLE | 3.08 | 1.06 | 23.11 |
| TOTAL | 3.08 sq.ft./A | 1.06/A | |

FOR CLASSES 5-10 Wildlife Related Inventory Data (Cont'd)
Per Acre Figures

| SPECIES LISTING | | BASAL AREA (sq.ft./A) | NO. TREES/A | AVERAGE DIAMETER (inches) |
|---|---|---|---|---|
| Class 7 Standing Dead Tree | | | | |
| ASH SP | | 1.54 | 1.76 | 12.65 |
| ELM SP | | .77 | 3.92 | 6.00 |
| HACKBERRY | | .77 | 1.41 | 10.00 |
| SILVER MAPLE | | 8.46 | 17.22 | 9.49 |
| MISCELLANEOUS | | 4.62 | 13.09 | 8.04 |
| | TOTAL | 16.16 sq.ft./A | 37.40/A | |
| Class 9 Grapevine | | | | |
| ASH SP | | 1.54 | 1.62 | 13.20 |
| COTTONWOOD | | 2.31 | .60 | 26.59 |
| ELM SP | | 2.31 | 19.04 | 4.71 |
| HACKBERRY | | 3.08 | 14.63 | 6.21 |
| SILVER MAPLE | | 33.85 | 27.65 | 14.98 |
| PIN OAK | | 2.31 | .64 | 25.76 |
| PECAN | | .77 | .24 | 24.00 |
| BLACK WALNUT | | .77 | 3.92 | 6.00 |
| MISCELLANEOUS | | 2.31 | 12.00 | 5.94 |
| | TOTAL | 49.24 sq.ft./A | 80.34/A | |
| Class 10 | | | | |
| PIN OAK | | 3.08 | 2.84 | 14.09 |
| PECAN | | .77 | .24 | 24.00 |
| BLACK WALNUT | | .77 | 3.92 | 6.00 |
| | TOTAL | 4.62 sq.ft./A | 7.00/A | |

AVERAGE ACORN AND NUT YIELD BY SPECIES

| SPECIES LISTING | | POUNDS/ACRE | TOTAL POUNDS |
|---|---|---|---|
| PIN OAK | | 5.31 | 2,797.15 |
| | TOTAL ACORNS | 5.31 lbs./A | 2,797.15 lbs. |

ADDENDUM 17

ADDENDUM 17

1. INTRODUCTION

Pool 17 extends from Muscatine, Iowa, to New Boston, Illinois, a distance of 20.1 miles. The pool contains 8,312 acres of water, 202.5 miles of shoreline (including islands), and 7,179 acres of public land. Project lands comprise the majority of public lands in the pool.

Approximately 6,150 acres of project woodlands are located in this pool. All of the Odessa area is protected by a levee, and many fine stands of mast trees can be found in this area. The only area where oak regeneration is common and often numerous can be found in the southern end of the Odessa area. Finally, on many sites in the Odessa area oak and/or pecan are establishing themselves under silver maple stands. Fine associations of hickory and pin oak can also be found in the Big Timber area. But, as in other pools, past logging practices have removed valuable species such as hickory from much of the woodland. Additionally, ground vegetation is a problem, and becoming a major hindrance to the growth and reestablishment of the forest stands on some sites.

North of Odessa Lake, on Cooperative Agreement lands at the Louisa Refuge, the Big Timber area, and the Turkey and other Island areas, the fish and wildlife resources are managed by the US Fish and Wildlife Service. The Iowa Conservation Commission and the Illinois Department of Conservation manage the fish and wildlife resources on the remaining Cooperative Agreement lands.

2. PRESCRIPTIONS FOR POOL 17

| Unit Title | Tract No. |
|---|---|
| Land between the levee, the Iowa River on the south and the Mississippi River on the east. | FIA 114, part<br>FIA 113 (10%) |

229.2 acres. UNIT NO. I

Photos No. 18-19 to 18-21. River mile 434-435.

Apply practice W (Special Management) along the Iowa River and Mississippi River.

Apply practice X (Stand Mapping) before applying any other practices.

In Type 5 and 23, apply practice $L_a$ or $L_c$ (TSI). Do not deaden any hardwood mast trees in the area.

In Type $2_i$ apply practice Q (Thinning).

In Type $9_{im}$ and $2_m$ apply practice I (Clearcut) and then $A_{d-f}$ (Reforestation) in higher areas.

In Type $4_{im}$ apply practice J (Improvement Cut).

In Type $3_{m}$ apply practice U (Shelterwood Cut). Leave swamp white and bur oaks after the first cut. Apply practice $A_{d-f}$ (Reforestation) to higher areas.

In this unit harvest no more than 15 acres every 5 years.

The Long Term Goal - Maintain the associations of bur oak and shellbark hickory and the scattered hickory and pin oaks in other areas. Lower areas of silver maple, cottonwood, and ash will be maintained in a mix of evenaged stands in different stages of development. The Iowa Conservation Commission has designated the eagle, woodduck, deer, and turkey as priority wildlife in this unit.

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Land south of the Blackhawk Slough — FIA 97-112, 113 (90%) 115, 117-122

615.7 acres. (II)

Photos No. 18-21 and 18-22. River mile 435-436.

Apply practice W (Special Management) along all sloughs, lakes, and waterways.

All areas in this unit have been stand mapped by the ICC.

In Type $2_{i}$, $1_{i}$, $3_{i}$, and $9_{i}$ apply practice Q (Thinning). Favor pecan, oak, and hickory. Favor silver maple when mast trees are not present.

In Type $15_{im}$, $15_{m}$, $4_{im}$, $4_{m}$, $6_{im}$, and $3_{im}$ apply practice J to open up the stand, increase mast production, and create den trees. Deaden some of the trees rather than removing all the trees to be cut out of the stand when applying practice J (Improvement Cut).

The Long Term Goal - Maintain the mast-producing stands, and help succession in young stands from silver maple, cottonwood, ash into oak, pecan, and hickory. Lower areas will be a mix of evenaged stands in different stages of growth. Iowa Conservation Commission field personnel have stand mapped much of the area. Coordination with them will eliminate the need for additional stand mapping. The Iowa Conservation Commission has designated the deer, turkey and woodduck as priority wildlife in this unit.

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Land between Sand Run and Blackhawk Slough — FIA 123-126, 128-130

272.9 acres. (III)

Photos No. 18-22 and 18-23. River mile 435.5-436.5.

Apply practice W (Special Management) along sloughs.

In Type $9_i$, $3_i$ and $7_i$ follow practice Q (Thinning). Release oak and pecan in the stands.

In Type $15_{im}$, $7_{im}$, $4_{im}$, $6_{im}$, and $3_{im}$ follow practice J (Improvement Cut). Release oak and pecan in the stands. Then favor silver maple, sycamore, and river birch for cavity production after the oak and pecan.

In Type 5 apply practice $L_a$ and $L_c$ (TSI) if cucumber vine and nettle are suppressing regeneration. If the ground cover is wetland plants treat the area as a wetland, and apply practice $L_a$ to create den trees.

In this unit harvest no more timber the first 5 years.

The Long Term Goal - Help natural succession to develop oak and pecans where they are beginning to occur naturally. Lower areas that stay in silver maple will be maintained in a mix of evenaged stands in different stages of development. Iowa Conservation Commission field personnel have stand mapped this area. Coordination with them should eliminate the need for additional stand mapping. Wood duck is the priority wildlife species in this unit.

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Odessa Lake Island Unit — FIA 133, 138, part of 132, 138, 141-145

415.5 acres. (IV)

Photos No. 18-23 and 17-1. River mile 436 to 438.

Apply practice W (Special Management) along shorelines and along inland sloughs.

In Type $4_{im}$, $6_{im}$ apply practice J (Improvement Cut).

In Type $16_m$ apply practice J then T (Monitor).

On selected sites in type $9_{im}$ apply practice I (Clearcut).

In Type $15_{im}$, $21_i$, $2_i$, $1_i$, and $9_i$ apply practice Q (Thinning). When the stand is predominantly willow, leave the area alone.

In Type $11_i$ apply practice T (Monitor) to determine reason for tree damage, and alternatives to reestablish tree cover.

The Long Term Goal - Maintain and diversify the associations of mast-producing trees such as bur oak, pin oak, and pecan. Lower areas should be maintained in a mix of evenaged stands in different stages of development. The Iowa Conservation Commission personnel have stand mapped this area. Coordination with them will eliminate the need for additional stand mapping. The priority wildlife species in this unit are the eagle, wood duck, deer, and songbirds.

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Shoreline (western) from Sand Run to Odessa

FIA 127, 128, 133 134-137, 148-157, 163

Photos No. 18-23 to 17-3. River mile 436-438. (V)

Leave alone.

The Long Term Goal - Allow natural succession of upland species above Sand Run launching area and bottomland species below it to preserve aesthetic and recreational value. The priority wildlife in this unit are songbirds.

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Area north of Horseshoe Slough - East of Goose Pond Remaining Odessa area under state Fish and Wildlife Management in conjunction with the US Fish and Wildlife Service

FIA 131,139,140, 144, A1, 1 A-C part of 132, 138, 141-143, 145

598.4 acres. (VI)

Photos No. 18-23 to 17-2. River mile 436-438.

Apply practice W (Special Management) along lake and slough shorelines, and ponds.

In Type $6_i$, $9_i$, $3_i$, $1_i$, and $2_i$ apply practice Q (Thinning). Favor mast-producing trees and future den trees. Do not apply any practice where the stand is 70%+ willow.

In Type $16_m$, $6_{im}$, $4_{im}$ apply practice J (Improvement Cut).

In Type 5 apply practice $L_a$, $L_c$ (TSI).

In Type $9_m$, $2_{im}$, apply practice I (Clearcut)

In this unit harvest no more than 10 acres every 5 years.

The Long Term Goal - Maintain areas of mast-producing trees such as oak, hickory, and pecan in those species; increase mast production; and increase species diversity. Lower areas will be a mix of evenaged stands in different stages of growth to maintain a diversity of habitat. Iowa Conservation Commission personnel have stand mapped much of this area. Coordination with them should eliminate the need for additional stand mapping. The priority wildlife species in this unit are eagle, wood duck, deer, and songbirds.

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Louisa Refuge — FIA 146, 159-162, 164-180, 2-9, part 145

670.9 acres. (VII)

Photos No. 17-2 to 17-4. River mile 438-441.

Apply practice W (Special Management) along lake shorelines, river shorelines, and ponds; and along levee.

Apply practice X (Stand Mapping) before applying any other practices.

In Type $4_{im}$ apply practice J (Improvement Cut).

In Type $4_i$, $6_i$, $3_i$, $2_i$, $1_i$, and $9_i$ apply practice Q (Thinning).

The Long Term Goal - Implement Fish and Wildlife practices that will maintain the maximum amount of quality wildlife habitat in the sanctuary. The lower areas should be maintained in a mix of evenaged stands in different stages of growth. Higher areas should be maintained in mast-producing species and diversified through planting of desirable mast-producing species.

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Turkey, Otter, and Otter Tail Islands — D1, D2

377.4 acres. (VIII)

Photos No. 18-23 to 17-2. River mile 436.5-439.

Apply practice W (Special Management) along river shorelines and sloughs.

Apply practice X (Stand Mapping) before applying any other practices.

In Type $2_i$ and $1_i$ apply practice Q (Thinning).

In Type $6_{im}$ and $4_{im}$ apply practice J (Improvement Cut).

In Type $9_{im}$, $2_{im}$, apply practice I (Clearcut), or V (Seed Tree) and then in Type $3_{im}$ apply practice $A_{d-f}$ (Reforestation). Where oak and other hardwood mast trees occur apply practice J, U (Shelterwood), or V where such trees do not occur apply practice I.

In this unit harvest no more than 10 acres every 5 years.

The Long Term Goal - Plant higher areas with mast-producing trees. Lower areas should be a mix of evenaged stands in different stages of growth.

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| | |
|---|---|
| Lock and Dam area and Illinois shoreline up to River Mile 440.5 and Jonas Johnson Island | LS 1, 2<br>Fl 1-5<br>iis 1 |

Photos No. 17-1 to 17-4. River mile 437-439. (IX)

Apply practices $A_{a-c}$ (Plant) and B (Tree Maintenance) in the immediate area of Lock and Dam 17.

Leave the shoreline and island alone.

The Long Term Goal - Provide a good recreational and aesthetic experience for users along this shore of the pool.

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| | |
|---|---|
| Bogus, Coleman Islands, and landward Bogus on the Illinois side and miscellaneous islands | irs 1-7<br>Fl 6-9 |

895.2 acres. (X)

Photos No. 17-4 to 17-6. River mile 439-444.5.

Apply practice W (Special Management) along river shore, sloughs and levee.

Apply practice X (Stand Mapping) before applying any other practices.

In Type $3_{im}$ and $6_{im}$ apply practice J (Improvement Cut) then T (Monitor) for regeneration of desired species.

Apply practice $A_{d-f}$ (Reforestation) to small openings and understory to determine if planting of some mast-producing trees and such wildlife food trees such as dogwood will survive and grow in diminished light conditions.

In Type $2_i$, $9_i$ apply practice Q (Thinning).

In Type $9_{im}$ apply practice I (Clearcut), and then practice $A_{d-f}$ (Reforestation).

In Type 5 and 46 apply practice $L_a$ and/or $L_c$ (TSI).

In this unit harvest no more than 60 acres every 5 years.

The Long Term Goal - Maintain and diversify the oak, hickory, hackberry, and pecan association and establish other such associations on higher areas of the island. Lower areas will be a mix of evenaged stands in different stages of growth.

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Big Timber FIA 18-73

837.9 acres. (XI)

Photos No. 17-5 to 17-8. River mile 445.

Apply practice W (Special Management) along river shore, along lakes, sloughs, and the levee.

Apply practice X (Stand Mapping) before applying any other practices.

In Type selected areas of $15_{im}$, $2_i$, $3_i$, and $9_i$ apply practice Q (Thinning). When oaks, walnut, or other mast trees are located release the trees.

In Type 52 apply practice $A_{a-c}$ and B (Planting and Tree Maintenance).

On the designated sites in Type $4_{im}$, $6_{im}$ apply practice J (Improvement Cutting).

Reduce Basal Area to 70-80 square feet per acre to provide more light for young pin oak and/or pecan saplings.

Over most of the unit apply practice T (Monitor). Though not put on the cover type map, monitoring will be applied where other specific practices are not.

Practices have been primarily applied where valuable young mast trees such as black walnut will be released and where young silver maple or cottonwood stands are overstocked. On selected sites in the rest of the unit, we will put in test plots.

At a minimum the following test plots should be put in to acquire data.

1. Mow wood nettle in mid or early summer promptly after nettles reach a height of 4 to 5 feet. Nettles should be cut to within 1 to 2 feet off the ground or above the height of oak regeneration.

2. Mow nettles as in the plot above. However, mow nettle to within 6 inches of the ground. Cutting oak regeneration will promote better root growth, and therefore allow better growth of the oak when released.

3. Thin bottom land hardwoods from below to a basal area of 70-90 square feet per acre. Interplant paw paw, persimmon, dogwood, hawthorne, or other understory trees listed in table 9.

4. Thin from below to a basal area of 60-90 square feet per acre, then interplant oaks and other nut producing hardwoods. Plant largest seedling stock possible, preferable at least 1/4 caliper inch in diameter at the root collar.

5. Underplanting of largest oak seedling stock possible preferably at least 1/4 inch in diameter at the root collar. Thin 3-5 years from below after seedlings have become well established.

6. Measure mast production on thinned sites in the Big Timber Unit.

7. Measure mast production on immature and mature areas in the lower Odessa area.

8. Monitor areas of type 5 occupied by cucumber vines, nettle, poison ivy, and poor growth timbers for any signs of stand regeneration and wildlife use.

9. Set up growth rate plots in several DBH size classes of silver maple-cottonwood and measure in comparison with several thinned stand plots.

In this unit harvest no timber.

The Long Term Goal - Maintain the hickory grove, pin oak grove, and other areas of hickory, pecan, and oak. Higher areas will be planted in mast-producing trees and other species to diversify species association. Understory will be encouraged through thinning and planting. Lower areas will be a mix of evenaged stands in different stages of growth.

The main goal for the next 10 years is to acquire data about flood plain forests from scientific studies conducted in this unit and to maintain its high recreational value. Logging was done in this unit in the 1940's but since then no timber has been harvested. This will give the Corps and the US Fish and Wildlife Service a good opportunity to evaluate the growth of a flood plain forest, even while valuable young mast trees are released and young overstocked maple stands are thinned.

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Kilpeck Island, IA, and
Barkis Islands, IL — IAIS 3, 10, 11

263 acres. (XII)

Photos No. 17-7 to 17-9. River mile 445-447.5.

Apply practice W (Special Management) along shoreline along sloughs.

Apply practice X (Stand Mapping) before applying any other practices.

In Type $2_i$ apply practice Q (Thinning).

In Type $2_{im}$ apply practice I (Clearcut).

In type 5 apply practice $L_a$ and $L_c$ (TSI).

In this unit harvest no more than 15 acres every 5 years.

The Long Term Goal - Maintain a mix of evenaged stands in different stages of development.

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| | |
|---|---|
| Below powerline crossing above River Mile 447 on Illinois shoreine including Little Bogus Island and small island south of Little Bogus | iis 8, 8A, and 9 and Fl 9-14 |

260 acres. (XIII)

Photos No. 17-6 to 17-9. River mile 444.5-447.

Apply practice W (Special Management) along river shoreline, sloughs, and levee.

Apply practice X (Stand Mapping) before applying any other practices.

In Type $2_i$ and $9_i$ apply practice Q (Thinning).

In Type $3_{im}$ apply practice I (Clearcut), V (Seed Tree), or U (Shelterwood), then A in appropriate areas. Oaks, pecans and walnut are irregularly spotted. In most areas apply practice I. Where walnuts, oaks, and pecans occur apply practice U. Leave such species, then apply practice $A_{d-f}$ (Reforestation) where possible and practical.

In this unit harvest no more than 20 acres every 10 years.

The Long Term Goal - Maintain and develop oak, pecan, walnut, silver maple associations on suitable areas. Lower areas will be a mix of evenaged stands in different stages of development.

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Mississippi River shoreline (IA)
River Mile 442.6 to 443 — FIA 10, 13A, 13B
River Mile 447 to 449 — FIA 75-79

Photos No. 17-1 to 17-11. (XIV)

This unit will be under practive W (Special Management).

The Long Term Goal - Leave the area alone to enhance the recreational experience.

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Blanchard, Willow and
Bass Islands — iis 15-34

648.2 acres. (XV)

Photos No. 17-9 to 17-12. River Mile 448.

Apply practice W (Special Management) along island shorelines and along sloughs.

Apply practice X (Stand Mapping) before applying any other practices.

In Type $2_i$ apply practice Q (Thinning).

In Type 5 apply practice $L_a$ and/or $L_c$ (TSI).

In Type $6_{im}$ and $4_{im}$ apply practice J (Improvement Cut). Oak regeneration observed there during inventory. Oak regeneration survival should be helped by applying practice.

In Type $3_{im}$ apply practice V (Seed Tree) or U (Shelterwood). Leave pecans and silver maple as seed trees. Apply practice $A_{d-f}$ (Reforestation) to insure adequate reestablishment of pecan if practical and possible.

In Type $9_{im}$ and $2_{im}$ apply practice I (Clearcut), the $A_{d-f}$ (Reforestation) to suitable areas.

In this unit harvest no more than 40 acres every 5 years.

The Long Term Goal - Maintain and develop more diverse associations of oak, pecan, hickory and walnut on the higher areas of this unit. Lower areas will be a mix of evenaged stands in different stages of development.

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North and south of the recreation area landward of Blanchard on the Illinois shore — Fl 15-23

186 acres. (XVI)

Photos No. 17-9 to 17-11. River mile 447-457.

Apply practice W (Special management) along river shore, sloughs, and the levee.

Apply practice X (Stand Mapping) before applying any other practices.

In Type $2_i$ apply practice Q (Thinning).

In Type 51 apply practice $A_{a-c}$ (Plant) and B (Tree Maintenance).

In Type $9_{im}$ apply practice I (Clearcut) in smallest patches (1-4 acres).

In this unit harvest no more than 10 acres every 5 years.

The Long Term Goal - Maintain a mix of evenage stands in different stages of growth. (Narrow width of the land and proximity of the recreation area may restrict management options on this unit.)

3. PRIORITIES LIST FOR POOL 17

A — Thin Oak stands on the Louisa Refuge unit (FIA 132, 133, 138, 142) especially, young stands on the upper end.

B — Release oak, pecan, hickory under or as a part of the overstory in the lower end of the Louisa Refuge area (FIA 124, 129, 115, 113).

C — Thin silver maple, river birch area as oak and pecan is released in FIA 124, 129, on the land between Sand Run and Blackhawk slough.

D — Remove larger mature individuals to provide growing space for younger trees that will provide an annual mast crop on the land south of Blackhawk slough (Tract #FIA 119).

E — Harvest and plant suitable higher areas on Blanchard Island, Bogus Island, and in the Big Timber area.

F — Release black walnut in Big Timber unit (in FIA 70) and decrease BA in the pin oak and oak associations in Big Timber area to 70 sq. ft. BA per acre.

G — Thin silver maple, cottonwood stands in Big Timber, Blanchard, and in Odessa area for better growth and quicker development of den cavities and timber.

H Conduct an improvement cut in landward Bogus area to allow more crown development and nut production of pecan trees.

4. ESTIMATED COSTS

| Silvicultural Practice | Acreage to be Treated | Cost Per Acre | Total per Practice |
|---|---|---|---|
| Thinning | 1,570 | $150 | $235,500 |
| Improvement cut | 1,120 | $150 | $168,000 |
| Timber stand improvement | 180 | $ 30 | $ 5,400 |
| Harvest (contractural preparation) | 230 | $ 60 | $ 13,800 |
| Site preparation | 230 | $110 | $ 25,300 |
| Planting | 190 ± 50 | $ 50 | $ 9,500 ± $ 2,500 |
| Type mapping | 3,100 | $ 2 | $ 6,200 |
| | Total Cost for Pool 17 | | $436,730 ± $ 2,500 |

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Pool 17 - Inventory Data

SOUTH OF RECREATION AREA AT RIVER MILE 447 (IL) UNIT NO. XII

Total Stand Summary

| Sp. | Ba/Aft$^2$ | # Trees/A | Vol/ABd.ft. | Av. Diameter (in.) |
|---|---|---|---|---|
| Ash Sp | 6.67 | 2.10 | 747.27 | 24.15 |
| Coffeetree | 1.33 | .46 | 81.45 | 22.93 |
| Cottonwood | 2.67 | 2.06 | 152.28 | 15.40 |
| Elm Sp | 11.33 | 32.89 | 149.78 | 7.95 |
| Hackberry | 2.67 | 12.26 | 84.22 | 6.31 |
| Silver Maple | 68.67 | 35.44 | 5245.75 | 18.85 |
| Mulberry Sp | 3.33 | 27.54 | 0.00 | 4.71 |
| Bur Oak | 1.33 | .25 | 127.57 | 31.26 |
| Pecan | 4.67 | 1.32 | 398.37 | 25.44 |
| Black Walnut | .67 | .62 | 0.00 | 14.00 |
| Willow Sp | .67 | .48 | 76.28 | 16.00 |
| Misc | 0.00 | 1.00 | 0.00 | 0.00 |
| TOTAL | 104.00 sq.ft. | 116.43 | 7062.97 Bd.ft. | |

| Variable of Interest | Mean/A | 95% Confidence Interval | |
|---|---|---|---|
| Int 1/4 Bd Ft | 7063.0 | 4591.01 | 9534.93 |
| Sq. Ft. Basal Area | 116.0 | 93.38 | 138.62 |
| Number of Trees | 118.2 | 61.80 | 174.70 |

Average Annual Growth Per Acre Int. 1/4 Bd. Ft. 16.2
Sq. Ft. Basal Area .09

FOR CLASSES 5-10 Wildlife Related Inventory Data
Per Acre Figures

| SPECIES LISTING | BASAL AREA (sq.ft./A) | NO. TREES/A | AVERAGE DIAMETER (inches) |
|---|---|---|---|
| **Class 5 Den Tree - Upper Cavity (Upper 1/4 Bole)** | | | |
| SILVER MAPLE | .67 | .08 | 40.00 |
| MISCELLANEOUS | 2.00 | .34 | 32.75 |
| TOTAL | 2.67 sq.ft./A | .42/A | |
| **Class 6 Den Tree - Lower Cavity (Lower 3/4 Bole)** | | | |
| SILVER MAPLE | 6.67 | 1.37 | 29.86 |
| MISCELLANEOUS | 1.33 | .26 | 30.83 |
| TOTAL | 8.00 sq.ft./A | 1.63/A | |
| **Class 7 Standing Dead Tree** | | | |
| ASH SP | .67 | .25 | 22.00 |
| SILVER MAPLE | 3.33 | 1.09 | 23.70 |
| MISCELLANEOUS | 8.00 | 1.48 | 31.46 |
| TOTAL | 12.00 sq.ft./A | 2.82/A | |
| **Class 8 Leaf Nest** | | | |
| SILVER MAPLE | .67 | .31 | 20.00 |
| TOTAL | .67 sq.ft./A | .31/A | |

FOR CLASSES 5-10 Wildlife Related Inventory Data (Cont'd)
Per Acre Figures

| SPECIES LISTING | | BASAL AREA (sq.ft./A) | NO. TREES/A | AVERAGE DIAMETER (inches) |
|---|---|---|---|---|
| Class 9 Grapevine | | | | |
| ASH SP | | 2.67 | 1.15 | 20.61 |
| ELM SP | | 2.67 | 7.00 | 8.36 |
| HACKBERRY | | .67 | 7.64 | 4.00 |
| SILVER MAPLE | | 22.67 | 9.64 | 20.77 |
| MULBERRY SP | | 1.33 | 8.86 | 5.25 |
| PECAN | | 1.33 | .46 | 23.02 |
| BLACK WALNUT | | .67 | .62 | 14.00 |
| MISCELLANEOUS | | 2.67 | .73 | 25.90 |
| | TOTAL | 34.68 sq.ft./A | 36.11/A | |
| Class 10 | | | | |
| BUR OAK | | 1.33 | .25 | 31.26 |
| PECAN | | 4.67 | 1.32 | 25.44 |
| BLACK WALNUT | | .67 | .62 | 14.00 |
| | TOTAL | 6.67 sq.ft./A | 2.19/A | |

AVERAGE ACORN AND NUT YIELD BY SPECIES

| SPECIES LISTING | | POUNDS PER ACRE | TOTAL POUNDS |
|---|---|---|---|
| BUR OAK | | 2.33 | 813.40 |
| | TOTAL ACORNS | 2.33 lbs./A | 813.40 lbs. |

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KILPECK, BARKIS ISLAND UNIT NO. XII
Total Stand Summary

| Sp. | Ba/Aft$^2$ | # Trees/A | Vol/ABd.ft. | Av. Diameter (in.) |
|---|---|---|---|---|
| Cottonwood | 5.00 | .82 | 500.75 | 33.42 |
| Elm Sp | 15.00 | 73.46 | 194.14 | 6.12 |
| Hackberry | 4.00 | 8.58 | 65.32 | 9.25 |
| Silver Maple | 88.00 | 111.67 | 4676.81 | 12.02 |
| Mulberry Sp | 3.00 | 62.39 | 0.00 | 2.97 |
| Willow Sp | 6.00 | 5.29 | 488.38 | 14.43 |
| Misc | 1.00 | .72 | 0.00 | 16.00 |
| TOTAL | 122.00 sq.ft. | 262.92 | 5925.39 Bd.ft. | |

| Variable of Interest | Mean/A | 95% Confidence Interval | |
|---|---|---|---|
| Int 1/4 Bd Ft | 5925.4 | 2865.61 | 8985.17 |
| Sq. Ft. Basal Area | 142.0 | 102.27 | 181.73 |
| Number of Trees | 289.4 | 131.50 | 447.39 |

Average Annual Growth Per Acre Int. Bd. Ft. 70.0
Sq. Ft. Basal Area .29

FOR CLASSES 5-9 Wildlife Related Inventory Data
Per Acre Figures

| SPECIES LISTING | BASAL AREA (sq.ft./A) | NO. TREES/A | AVERAGE DIAMETER (inches) |
|---|---|---|---|
| Class 5 Den Tree - Upper Cavity (Upper 1/4 Bole) | | | |
| COTTONWOOD | 1.00 | .11 | 40.00 |
| SILVER MAPLE | 4.00 | 2.26 | 18.00 |
| WILLOW SP | 2.00 | 2.40 | 12.36 |
| MISCELLANEOUS | 1.00 | .72 | 16.00 |
| TOTAL | 8.00 sq.ft./A | 5.49/A | |
| Class 6 Den Tree - Lower Vavity (Lower 3/4 Bole) | | | |
| COTTONWOOD | 2.00 | .39 | 30.83 |
| SILVER MAPLE | 8.00 | 2.40 | 24.71 |
| TOTAL | 10.00 sq.ft./A | 2.79/A | |
| Class 7 Standing Dead Tree | | | |
| SILVER MAPLE | 8.00 | 10.64 | 11.74 |
| WILLOW SP | 7.00 | 11.01 | 10.80 |
| MISCELLANEOUS | 4.00 | 4.76 | 12.42 |
| TOTAL | 19.00 sq.ft./A | 26.41/A | |

FOR CLASSES 5-9 Wildlife Related Inventory Data (Cont'd)
Per Acre Figures

| SPECIES LISTING | BASAL AREA (sq.ft./A) | NO. TREES/A | AVERAGE DIAMETER (inches) |
|---|---|---|---|
| Class 9 Grapevine | | | |
| COTTONWOOD | 2.00 | .39 | 30.83 |
| ELM SP | 5.00 | 7.96 | 10.73 |
| HACKBERRY | 2.00 | 6.93 | 7.28 |
| SILVER MAPLE | 30.00 | 24.60 | 14.95 |
| MULBERRY SP | 3.00 | 62.39 | 2.97 |
| TOTAL | 42.00 sq.ft./A | 102.27/A | |

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BOGUS, COLEMAN, LAND BOGUS, ILLINOIS UNIT NO. X
Total Stand Summary

| Sp. | Ba/Aft$^2$ | # Trees/A | Vol/ABd.ft. | Av. Diameter (in.) |
|---|---|---|---|---|
| Ash Sp | .56 | .18 | 57.03 | 24.00 |
| Cottonwood | 5.56 | 1.10 | 706.19 | 30.41 |
| Elm Sp | 11.67 | 76.10 | 52.87 | 5.30 |
| Hackberry | 3.33 | 13.34 | 36.78 | 6.77 |
| Honey Locust | .56 | 1.02 | 16.04 | 10.00 |
| Silver Maple | 87.22 | 73.95 | 4897.67 | 14.71 |
| Willow Sp | 6.11 | 4.18 | 323.63 | 16.37 |
| Misc | 0.00 | 1.00 | 0.00 | 0.00 |
| TOTAL | 115.00 sq.ft. | 170.87 | 6090.20 Bd.ft. | |

| Variable of Interest | Mean/A | 95% Confidence Interval | |
|---|---|---|---|
| Int 1/4 Bd Ft | 6090.2 | 4115.92 | 8064.49 |
| Sq. Ft. Basal Area | 130.0 | 106.86 | 153.14 |
| Number of Trees | 206.4 | 129.28 | 283.55 |

Average Annual Growth Per Acre Int. Bd. Ft. 30.4
Sq. Ft. Basal Area .20

FOR CLASSES 5-9 **Wildlife Related Inventory Data**
Per Acre Figures

| SPECIES LISTING | | BASAL AREA (sq.ft./A) | NO. TREES/A | AVERAGE DIAMETER (inches) |
|---|---|---|---|---|
| Class 5 Den Tree - Upper Cavity (Upper 1/4 Bole) | | | | |
| ASH SP | | .56 | .71 | 12.00 |
| SILVER MAPLE | | 5.56 | 1.88 | 23.28 |
| MISCELLANEOUS | | 4.44 | 1.36 | 24.51 |
| | TOTAL | 10.56 sq.ft./A | 3.95/A | |
| Class 6 Den Tree - Lower Cavity (Lower 3/4 Bole) | | | | |
| ELM SP | | .56 | .06 | 40.00 |
| SILVER MAPLE | | 8.33 | 2.52 | 24.60 |
| MISCELLANEOUS | | 2.22 | .49 | 28.90 |
| | TOTAL | 11.11 sq.ft./A | 3.07/A | |
| Class 7 Standing Dead Tree | | | | |
| ASH SP | | .56 | .71 | 12.00 |
| ELM SP | | .56 | 1.59 | 8.00 |
| SILVER MAPLE | | 5.00 | 3.59 | 15.98 |
| WILLOW SP | | .56 | .40 | 16.00 |
| MISCELLANEOUS | | 7.78 | 30.19 | 6.87 |
| | TOTAL | 14.46 sq.ft./A | 36.48/A | |
| Class 8 Leaf Nest | | | | |
| SILVER MAPLE | | 1.67 | .36 | 28.77 |
| | TOTAL | 1.67 sq.ft./A | .36/A | |

FOR CLASSES 5-9 Wildlife Related Inventory Data (Cont'd)
Per Acre Figures

| SPECIES LISTING | BASAL AREA (sq.ft./A) | NO. TREES/A | AVERAGE DIAMETER (inches) |
|---|---|---|---|
| Class 9 Grapevine | | | |
| ASH SP | .56 | .18 | 24.00 |
| COTTONWOOD | 1.11 | .33 | 24.94 |
| ELM SP | 5.00 | 45.49 | 4.49 |
| HACKBERRY | 1.11 | 1.54 | 11.51 |
| SILVER MAPLE | 41.67 | 26.87 | 16.86 |
| MISCELLANEOUS | 3.89 | 1.94 | 19.15 |
| TOTAL | 53.34 sq.ft./A | 76.35/A | |

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BIG TIMBER (IA) UNIT NO. XI
Total Stand Summary

| Sp. | Ba/Aft$^2$ | # Trees/A | Vol/ABd.ft. | Av. Diameter (in.) |
|---|---|---|---|---|
| Ash Sp | 3.16 | 26.07 | 229.33 | 4.71 |
| River Birch | 5.79 | 3.08 | 333.46 | 18.57 |
| Coffeetree | 1.05 | 3.35 | 19.10 | 7.59 |
| Cottonwood | 3.68 | 1.19 | 495.51 | 23.78 |
| Elm Sp | 6.84 | 20.14 | 41.56 | 7.89 |
| Hackberry | 6.84 | 37.98 | 69.51 | 5.75 |
| Shagbark Hickory | 2.11 | 1.49 | 106.73 | 16.11 |
| Honey Locust | 3.16 | 2.27 | 222.98 | 15.96 |
| Silver Maple | 52.63 | 105.15 | 3097.26 | 9.58 |
| Mulberry Sp | 3.16 | 57.72 | 0.00 | 3.17 |
| Bur Oak | 1.05 | .20 | 121.02 | 31.26 |
| Pin Oak | 2.63 | 1.17 | 295.78 | 20.26 |
| Pecan | 2.11 | 1.02 | 140.25 | 19.41 |
| Sycamore | .53 | .20 | 81.45 | 22.00 |
| Black Walnut | 2.11 | 3.41 | 90.77 | 10.63 |
| Misc | 0.00 | 1.00 | 0.00 | 0.00 |
| TOTAL | 96.84 sq.ft. | 265.45 | 5344.70 Bd.ft. | |

| Variable of Interest | Mean/A | 95% Confidence Interval | |
|---|---|---|---|
| Int 1/4 Bd Ft | 5344.7 | 3630.22 | 7059.18 |
| Sq. Ft. Basal Area | 126.3 | 101.16 | 151.48 |
| Number of Trees | 299.4 | 154.21 | 444.59 |

Average Annual Growth Per Acre Int. 1/4 Bd. Ft. 70.5
Sq. Ft. Basal Area .48

FOR CLASSES 5-10 Wildlife Related Inventory Data
Per Acre Figures

| SPECIES LISTING | | BASAL AREA (sq.ft./A) | NO. TREES/A | AVERAGE DIAMETER (inches) |
|---|---|---|---|---|
| Class 5 Den Tree - Upper Cavity (Upper 1/4 Bole) | | | | |
| RIVER BIRCH | | .53 | .20 | 22.00 |
| COTTONWOOD | | .53 | .07 | 38.00 |
| SILVER MAPLE | | .53 | .14 | 26.00 |
| PIN OAK | | .53 | .20 | 22.00 |
| MISCELLANEOUS | | 2.11 | 1.33 | 17.02 |
| | TOTAL | 4.23 sq.ft./A | 1.94/A | |
| Class 6 Den Tree - Lower Cavity (Lower 3/4 Bole | | | | |
| SILVER MAPLE | | 1.05 | .54 | 18.92 |
| PECAN | | .53 | .14 | 26.00 |
| BLACK WALNUT | | .53 | .20 | 22.00 |
| MISCELLANEOUS | | .53 | .30 | 18.00 |
| | TOTAL | 2.64 sq.ft./A | 1.18/A | |
| Class 7 Standing Dead Tree | | | | |
| ELM SP | | 1.58 | 5.36 | 8.15 |
| SHAGBARK HICKORY | | 1.58 | 1.17 | 15.75 |
| HONEY LOCUST | | .53 | 6.03 | 4.00 |
| SILVER MAPLE | | 4.21 | 6.45 | 10.94 |
| PIN OAK | | 3.16 | 1.51 | 19.56 |
| PECAN | | .53 | .14 | 26.00 |
| MISCELLANEOUS | | 17.37 | 15.16 | 14.49 |
| | TOTAL | 28.96 sq.ft./A | 34.82/A | |
| Class 8 Leaf Nest | | | | |
| PECAN | | .53 | .12 | 28.00 |
| | TOTAL | .53 sq.ft./A | .12/A | |

FOR CLASSES 5-10 Wildlife Related Inventory Data (Cont'd)
Per Acre Figures

| SPECIES LISTING | | BASAL AREA (sq.ft./A) | NO. TREES/A | AVERAGE DIAMETER (inches) |
|---|---|---|---|---|
| Class 9 Grapevine | | | | |
| ASH SP | | .53 | .14 | 26.00 |
| RIVER BIRCH | | .53 | .17 | 24.00 |
| COFFEETREE | | .53 | 2.68 | 6.00 |
| COTTONWOOD | | 1.05 | .24 | 28.24 |
| ELM SP | | .53 | .96 | 10.00 |
| HACKBERRY | | 2.63 | 6.61 | 8.54 |
| SHAGBARK HICKORY | | 1.05 | .67 | 16.91 |
| HONEY LOCUST | | .53 | .07 | 36.00 |
| SILVER MAPLE | | 12.11 | 65.35 | 5.83 |
| MULBERRY SP | | 1.58 | 3.44 | 9.18 |
| BUR OAK | | .53 | .12 | 28.00 |
| PIN OAK | | 1.05 | .26 | 27.15 |
| PECAN | | 1.58 | .86 | 18.38 |
| MISCELLANEOUS | | 5.26 | 4.23 | 15.11 |
| | TOTAL | 29.49 sq.ft./A | 85.80/A | |
| Class 10 | | | | |
| SHAGBARK HICKORY | | 2.11 | 1.49 | 16.11 |
| BUR OAK | | 1.05 | .20 | 31.26 |
| PIN OAK | | 2.11 | 1.10 | 18.73 |
| PECAN | | 2.11 | 1.02 | 19.41 |
| BLACK WALNUT | | 2.11 | 3.41 | 10.63 |
| | TOTAL | 9.49 sq.ft./A | 7.22/A | |

AVERAGE ACORN AND NUT YIELD BY SPECIES

| SPECIES LISTING | | POUNDS PER ACRE | TOTAL POUNDS |
|---|---|---|---|
| BUR OAK | | 1.84 | 3,427.61 |
| PIN OAK | | 4.95 | 9,205.57 |
| | TOTAL ACORNS | 6.79 lbs./A | 12,633.18 lbs. |
| SHAGBARK HICKORY | | 2.74 | 5,092.44 |
| | TOTAL NUTS | 2.74 lbs./A | 5,092.44 lbs. |

TRACT #119 (IA) UNIT NO. II

Total Stand Summary

| Sp. | Ba/Aft$^2$ | # Trees/A | Vol/ABd.ft. | Av. Diameter (in.) |
|---|---|---|---|---|
| River Birch | 13.85 | 12.49 | 765.12 | 14.26 |
| Cottonwood | 3.08 | .80 | 308.27 | 26.49 |
| Elm Sp | 6.92 | 63.05 | 48.87 | 4.49 |
| Hackberry | .77 | 1.41 | 26.66 | 10.00 |
| Hickory Sp | 5.38 | 24.78 | 224.02 | 6.31 |
| Shagbark Hickory | 3.08 | 18.02 | 109.53 | 5.60 |
| Honey Locust | 3.85 | 3.54 | 30.82 | 14.12 |
| Silver Maple | 23.08 | 34.80 | 1560.67 | 11.03 |
| Bur Oak | 2.31 | .42 | 175.71 | 31.66 |
| Pin Oak | 44.62 | 74.52 | 2267.27 | 10.48 |
| Swamp White Oak | 9.23 | 7.51 | 615.34 | 15.02 |
| Pecan | .77 | .21 | 79.80 | 26.00 |
| White Walnut | 2.31 | 14.94 | 0.00 | 0.00 |
| Misc | 0.00 | 1.00 | 0.00 | 0.00 |
| TOTAL | 119.23 sq.ft. | 257.48 | 6212.08 Bd.ft. | |

| Variable of Interest | Mean/A | 95% Confidence Interval | |
|---|---|---|---|
| Int 1/4 Bd Ft | 6212.1 | 4651.17 | 7772.99 |
| Sq. Ft. Basal Area | 143.1 | 123.75 | 162.41 |
| Number of Trees | 292.2 | 213.11 | 371.38 |

Average Annual Growth Per Acre Int. Bd. Ft. 360.4
Sq. Ft. Basal Area 2.19

FOR CLASSES 5-10 Wildlife Related Inventory Data
Per Acre Figures

| SPECIES LISTING | BASAL AREA (sq.ft./A) | NO. TREES/A | AVERAGE DIAMETER (inches) |
|---|---|---|---|
| Class 5 Den Tree - Upper Cavity (Upper 1/4 Bole) | | | |
| RIVER BIRCH | .77 | .18 | 28.00 |
| MISCELLANEOUS | 1.54 | 1.01 | 16.70 |
| TOTAL | 2.31 sq.ft./A | 1.19/A | |

FOR CLASSES 5-10
Per Acre Figures

Wildlife Related Inventory Data (Cont'd)

| SPECIES LISTING | | BASAL AREA (sq.ft./A) | NO. TREES/A | AVERAGE DIAMETER (inches) |
|---|---|---|---|---|
| Class 6 Den Tree - Lower Cavity (Lower 3/4 Bole) | | | | |
| RIVER BIRCH | | 2.31 | .98 | 20.82 |
| COTTONWOOD | | .77 | .16 | 30.00 |
| PIN OAK | | 4.62 | .89 | 30.88 |
| SWAMP WHITE OAK | | .77 | .16 | 30.00 |
| MISCELLANEOUS | | .77 | .72 | 14.00 |
| | TOTAL | 9.24 sq.ft./A | 2.91/A | |
| Class 7 Standing Dead Tree | | | | |
| RIVER BIRCH | | 3.85 | 3.07 | 15.16 |
| PIN OAK | | 7.69 | 7.29 | 13.91 |
| SWAMP WHITE OAK | | .77 | 3.92 | 6.00 |
| MISCELLANEOUS | | 11.54 | 21.48 | 9.92 |
| | TOTAL | 23.85 sq.ft./A | 35.76/A | |
| Class 9 Grapevine | | | | |
| RIVER BIRCH | | .77 | .44 | 18.00 |
| SILVER MAPLE | | 1.54 | 1.53 | 13.58 |
| BUR OAK | | .77 | .16 | 30.00 |
| PIN OAK | | 3.08 | 1.98 | 16.86 |
| SQAMP WHITE OAK | | .77 | .98 | 12.00 |
| | TOTAL | 6.93 sq.ft./A | 5.09/A | |
| Class 10 | | | | |
| HICKORY SP | | 5.38 | 24.78 | 6.31 |
| SHAGBARK HICKORY | | 3.08 | 18.02 | 5.60 |
| BUR OAK | | 2.31 | .42 | 31.66 |
| PIN OAK | | 44.62 | 74.52 | 10.48 |
| SWAMP WHITE OAK | | 9.23 | 7.51 | 15.02 |
| PECAN | | .77 | .21 | 26.00 |
| WHITE WALNUT | | 2.31 | 14.94 | 5.32 |
| | TOTAL | 67.70 sq.ft./A | 140.45/A | |

AVERAGE ACORN AND NUT YIELD BY SPECIES

| SPECIES LISTING | | POUNDS PER ACRE | TOTAL POUNDS |
|---|---|---|---|
| PIN OAK | | 76.54 | 15,307.69 |
| | TOTAL ACORNS | 76.54 lbs./A | 15,307.69 lbs. |
| HICKORY SP | | 7.00 | 1,400.00 |
| SHAGBARK HICKORY | | 4.00 | 800.00 |
| | TOTAL NUTS | 11.00 lbs./A | 2,200.00 lbs. |

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BETWEEN LEVEE AND IOWA RIVER (IA) UNIT NO. I
Total Stand Summary

| Sp. | Ba/Aft$^2$ | # Trees/A | Vol/ABd.ft. | Av. Diameter (in.) |
|---|---|---|---|---|
| Ash Sp | 2.22 | .55 | 162.89 | 27.26 |
| Coffeetree | 1.11 | 2.04 | 0.00 | 10.00 |
| Cottonwood | 4.44 | .93 | 510.84 | 29.59 |
| Elm Sp | 1.11 | .63 | 80.64 | 18.00 |
| Hackberry | 4.44 | 12.65 | 80.64 | 8.02 |
| Hickory Sp | 1.11 | .13 | 162.34 | 40.00 |
| Shagbark Hickory | 0.00 | 1.00 | 0.00 | 0.00 |
| Honey Locust | 1.11 | .20 | 138.76 | 32.00 |
| Silver Maple | 54.44 | 50.78 | 2917.05 | 14.02 |
| Bur Oak | 4.44 | .77 | 557.56 | 32.56 |
| Pin Oak | 2.22 | .33 | 138.76 | 32.00 |
| Pecan | 1.11 | .51 | 133.69 | 20.00 |
| Misc | 0.00 | 1.00 | 0.00 | 0.00 |
| TOTAL | 77.78 sq.ft. | 71.51 | 4883.18 Bd.ft. | |

| Variable of Interest | Mean/A | 95% Confidence Interval | |
|---|---|---|---|
| Int 1/4 Bd Ft | 4883.2 | 1303.81 | 8462.56 |
| Sq. Ft. Basal Area | 90.0 | 48.78 | 131.22 |
| Number of Trees | 76.4 | 9.85 | 142.88 |

Average Annual Growth Per Acre Int. 1/4 Bd. Ft. 179.7
Sq. Ft. Basal Area 1.26

FOR CLASSES 5-10 Wildlife Related Inventory Data
Per Acre Figures

| SPECIES LISTING | | BASAL AREA (sq.ft./A) | NO. TREES/A | AVERAGE DIAMETER (inches) |
|---|---|---|---|---|
| Class 5 Den Tree - Upper Cavity (Upper 1/4 Bole) | | | | |
| SILVER MAPLE | | 1.11 | .80 | 16.00 |
| | TOTAL | 1.11 sq.ft./A | .80/A | |
| Class 6 Den Tree - Lower Cavity (Lower 3/4 Bole) | | | | |
| SILVER MAPLE | | 2.22 | .92 | 21.01 |
| | TOTAL | 2.22 sq.ft./A | .92/A | |
| Class 7 Standing Dead Tree | | | | |
| SHAGBARK HICKORY | | 1.11 | .35 | 24.00 |
| SILVER MAPLE | | 5.56 | 4.08 | 15.79 |
| PIN OAK | | 1.11 | .13 | 40.00 |
| MISCELLANEOUS | | 4.44 | 2.29 | 18.87 |
| | TOTAL | 12.22 sq.ft./A | 6.85/A | |
| Class 9 Grapevine | | | | |
| ELM SP | | 1.11 | .63 | 18.00 |
| HACKBERRY | | 2.22 | 6.29 | 8.05 |
| SILVER MAPLE | | 18.89 | 30.97 | 10.57 |
| MISCELLANEOUS | | 2.22 | .98 | 20.36 |
| | TOTAL | 24.44 sq.ft./A | 38.87/A | |
| Class 10 | | | | |
| HICKORY SP | | 1.11 | .13 | 40.00 |
| BUR OAK | | 4.44 | .77 | 32.56 |
| PIN OAK | | 1.11 | .20 | 32.00 |
| PECAN | | 1.11 | .51 | 20.00 |
| | TOTAL | 7.77 sq.ft./A | 1.61/A | |

AVERAGE ACORN AND NUT YIELD BY SPECIES

| SPECIES LISTING | POUNDS PER ACRE | TOTAL POUNDS |
|---|---|---|
| BUR OAK | 3.89 | 1,244.44 |
| TOTAL ACORNS | 3.89 lbs./A | 1,244.44 lbs. |

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BLANCHARD ISLAND UNIT NO. XV

Total Stand Summary

| Sp. | Ba/Aft$^2$ | # Trees/A | Vol/ABd.ft. | Av. Diameter (in.) |
|---|---|---|---|---|
| Ash Sp | 2.63 | 21.07 | 41.99 | 4.79 |
| Coffeetree | .53 | .11 | 0.00 | 30.00 |
| Cottonwood | 12.11 | 12.83 | 1250.45 | 13.15 |
| Elm Sp | 14.74 | 255.22 | 143.79 | 3.25 |
| Hackberry | 2.11 | 2.46 | 87.49 | 12.52 |
| Silver Maple | 88.95 | 105.29 | 5342.13 | 12.45 |
| Mulberry Sp | 1.05 | 1.34 | 16.68 | 11.99 |
| White Oak | .53 | .06 | 66.95 | 40.00 |
| Pecan | 1.05 | .87 | 99.33 | 14.90 |
| Willow Sp | .53 | .17 | 64.08 | 24.00 |
| Misc | .53 | .67 | 36.29 | 12.00 |
| TOTAL | 124.74 sq.ft. | 400.09 | 7149.18 Bd.ft. | |

| Variable of Interest | Mean/A | 95% Confidence Interval | |
|---|---|---|---|
| Int 1/4 Bd Ft | 7149.2 | 5415.34 | 8883.03 |
| Sq. Ft. Basal Area | 134.2 | 111.93 | 156.49 |
| Number of Trees | 408.7 | 192.19 | 625.30 |

Average Annual Growth Per Acre Int. 1/4 Bd. Ft. 212.5
Sq. Ft. Basal Area .96

FOR CLASSES 5-10 Wildlife Related Inventory Data
Per Acre Figures

| SPECIES LISTING | BASAL AREA (sq.ft./A) | NO. TREES/A | AVERAGE DIAMETER (inches) |
|---|---|---|---|
| Class 5 Den Tree - Upper Cavity (Upper 1/4 Bole) | | | |
| SILVER MAPLE | 2.63 | 1.49 | 17.98 |
| MISCELLANEOUS | 2.63 | .74 | 25.55 |
| TOTAL | 5.26 sq.ft./A | 2.23/A | |

FOR CLASSES 5-10 Wildlife Related Inventory Data (Cont'd)
Per Acre Figures

| SPECIES LISTING | BASAL AREA (sq.ft./A) | NO. TREES/A | AVERAGE DIAMETER (inches) |
|---|---|---|---|
| **Class 6 Den Tree - Lower Cavity (Lower 3/4 Bole)** | | | |
| SILVER MAPLE | 2.63 | .60 | 28.34 |
| MISCELLANEOUS | 1.05 | .81 | 15.41 |
| TOTAL | 3.68 sq.ft./A | 1.41/A | |
| **Class 7 Standing Dead Tree** | | | |
| COTTONWOOD | .53 | 1.51 | 8.00 |
| SILVER MAPLE | 1.05 | .28 | 26.12 |
| WILLOW SP | 1.05 | .44 | 20.93 |
| MISCELLANEOUS | 6.84 | 6.42 | 13.97 |
| TOTAL | 9.47 sq.ft./A | 8.65/A | |
| **Class 8 Leaf Nest** | | | |
| SILVER MAPLE | .53 | .20 | 22.00 |
| TOTAL | .53 sq.ft./A | .20/A | |
| **Class 9 Grapevine** | | | |
| ASH SP | 1.58 | 18.09 | 4.00 |
| COFFEETREE | .53 | .11 | 30.00 |
| COTTONWOOD | 1.05 | .73 | 16.22 |
| ELM SP | 6.32 | 70.65 | 4.05 |
| HACKBERRY | 2.11 | 2.46 | 12.52 |
| SILVER MAPLE | 23.68 | 14.21 | 17.48 |
| MULBERRY SP | .53 | .38 | 16.00 |
| WHITE OAK | .53 | .06 | 40.00 |
| PECAN | .53 | .67 | 12.00 |
| WILLOW SP | .53 | .30 | 18.00 |
| MISCELLANEOUS | 1.58 | 1.04 | 16.66 |
| TOTAL | 38.97 sq.ft./A | 108.7/A | |

FOR CLASSES 5-10 Wildlife Related Inventory Data (Cont'd)
Per Acre Figures

| SPECIES LISTING | | BASAL AREA (sq.ft./A) | NO. TREES/A | AVERAGE DIAMETER (inches) |
|---|---|---|---|---|
| Class 10 | | | | |
| WHITE OAK | | .53 | .06 | 40.00 |
| PECAN | | 1.05 | .87 | 14.90 |
| | TOTAL | 1.58 sq.ft./A | .93/A | |

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ODESSA LAKE ISLAND (IA) UNIT IV
Total Stand Summary

| Sp. | Ba/Aft$^2$ | # Trees/A | Vol/ABd.ft. | Av. Diameter (in.) |
|---|---|---|---|---|
| Ash Sp | 6.00 | 74.73 | 70.94 | 3.84 |
| River Birch | 8.00 | 26.64 | 106.78 | 7.42 |
| Coffeetree | 1.00 | 11.46 | 0.00 | 4.00 |
| Cottonwood | 0.00 | 1.00 | 0.00 | 4.00 |
| Shagbark Hickory | 2.00 | 5.73 | 0.00 | 8.00 |
| Silver Maple | 17.00 | 196.70 | 197.36 | 3.98 |
| Bur Oak | 8.00 | 32.15 | 0.00 | 6.75 |
| Pin Oak | 25.00 | 29.96 | 1271.85 | 12.37 |
| Swamp White Oak | 6.00 | 12.32 | 249.30 | 9.45 |
| Misc | 0.00 | 1.00 | 0.00 | 0.00 |
| TOTAL | 73.00 sq.ft. | 391.69 | 1796.23 Bd.ft. | |

| Variable of Interest | Mean/A | 95% Confidence Interval | |
|---|---|---|---|
| Int 1/4 Bd Ft | 1796.2 | 75.73 | 3516.74 |
| Sq. Ft. Basal Area | 108.0 | 68.85 | 147.15 |
| Number of Trees | 443.0 | 110.14 | 775.91 |

Average Annual Growth Per Acre Int. Bd. Ft. 208.6
Sq. Ft. Basal Area 1.30

FOR CLASSES 5-10 Wildlife Related Inventory Data
Per Acre Figures

| SPECIES LISTING | | BASAL AREA (sq.ft./A) | NO. TREES/A | AVERAGE DIAMETER (inches) |
|---|---|---|---|---|
| Class 5 Den Tree - Upper Cavity (Upper 1/4 Bole) | | | | |
| MISCELLANEOUS | | 1.00 | .32 | 24.00 |
| | TOTAL | 1.00 sq.ft./A | .32/A | |
| Class 7 Standing Dead Tree | | | | |
| RIVER BIRCH | | 1.00 | 5.09 | 6.00 |
| COTTONWOOD | | 8.00 | 17.90 | 9.05 |
| SILVER MAPLE | | 2.00 | .73 | 22.42 |
| PIN OAK | | 12.00 | 11.61 | 13.76 |
| MISCELLANEOUS | | 11.00 | 15.14 | 11.54 |
| | TOTAL | 34.00 sq.ft./A | 50.47/A | |
| Class 8 Leaf Nest | | | | |
| PIN OAK | | 1.00 | .20 | 30.00 |
| | TOTAL | 1.00 sq.ft./A | .20/A | |
| Class 9 Grapevine | | | | |
| SILVER MAPLE | | 1.00 | .13 | 38.00 |
| PIN OAK | | 4.00 | 2.95 | 15.76 |
| | TOTAL | 5.00 sq.ft./A | 3.08/A | |
| Class 10 | | | | |
| SHAGBARK HICKORY | | 2.00 | 5.73 | 8.00 |
| SILVER MAPLE | | 1.00 | 2.86 | 8.00 |
| BUR OAK | | 8.00 | 32.15 | 6.75 |
| PIN OAK | | 23.00 | 28.23 | 12.22 |
| SWAMP WHITE OAK | | 6.00 | 12.32 | 9.45 |
| | TOTAL | 40.00 sq.ft./A | 81.29/A | |

AVERAGE ACORN AND NUT YIELD BY SPECIES

| SPECIES LISTING | | POUNDS PER ACRE | TOTAL POUNDS |
|---|---|---|---|
| BUR OAK | | 14.00 | 6,790.00 |
| PIN OAK | | 49.40 | 23,959.00 |
| | TOTAL ACORNS | 63.40 lbs./A | 30,749.00 lbs. |
| SHAGBARK HICKORY | | 2.60 | 1,261.00 |
| | TOTAL NUTS | 2.60 lbs./A | 1,261.00 lbs. |

ADDENDUM 18

ADDENDUM 18

1. INTRODUCTION

Pool 18 extends from New Boston, Illinois, to north of Burlington, Iowa, a distance of 26.6 miles. The pool contains 13,600 acres of water, 279 miles of shoreline (including islands), and 9,953 acres of public land. Project lands comprise the majority of public area in the pool.

Approximately 6,000 acres of project woodlands are located in this pool. Stands of oak and walnut can be found on Huron Island. Some of the remaining areas in the pool have some small stands of scattered oak; however, most of the areas are forested by silver maple, cottonwood, and ash.

Fish and wildlife resources on the Cooperative Agreement lands are managed by the Iowa Conservation Commission and the Illinois Department of Conservation under third party agreements, except for the Keithsburg Reguge which is managed by the USFWS.

2. PRESCRIPTIONS FOR POOL 18

| Unit Title | Tract No. |
|---|---|
| Above Lock and Dam 18 | D1-D3, A1, A2<br>RW 1-7 |

266.6 acres. UNIT NO. I

Photos No. 18-1. River mile 410-412.

Apply practice W (Special Management) along the river, sloughs, and lakes.

Apply practice X (Stand Mapping) before applying any other practices.

In Type $2_i$, $9_i$, $3_{im}$ apply practice Q (Thinning).

In Type $3_{im}$ apply practice J (Improvement Cut).

The Long Term Goal - Maintain the refuge wooded cover along the inland water areas and agricultural fields.

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| | |
|---|---|
| Mississippi Shorelines | F1 68-84 |
| Illinois Shorelines 421-414 R.M. | F1A 6-21, |
| Iowa Shoreline 422-413 R.M. | 23-31 |

Photos No. 18-1 to 81-12. River mile 421-414 and 422-413 (IA). II

Leave all cottage leased areas alone.

Apply practice W (Special Management) along shorelines and sloughs.

In Type $4_{im}$ apply practice J (Improvement Cut).

The Long Term Goal - Provide aesthetic appeal to people using the river for recreation. This area has steep shorelines with sandy soils. Any improvement cutting done in this area should be done with consideration of the sensitive erodable soil conditions.

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Benton Island, IL — iis 5, 6
Camp and Jacoby Islands, IA — iis 11, 12, 13

190.3 acres. (III)

Photos No. 18-6 to 18-8. River mile 419-420.5.

Apply practice W (Special Management) along slough and river shores.

In type $9_i$ apply practice $L_a$ (TSI).

The Long Term Goal - Leave it alone and provide some den trees along the inland wetland areas, otherwise leave the area alone to provide widlife habitat, and retain aesthetic values for receational boating. Wood duck is the priority wildlife species in this unit on Iowa managed areas.

---

Campbell Island — iais 10, 19-28

616 acres. (IV)

Photos No. 18-7 to 18-10. River mile 420-423.5.

Apply practice W (Special Management) along the river shore and all sloughs and lakes.

Apply practice X (Stand Mapping) before applying any other practices.

In Type $9_i$ apply practice Q (Thinning).

In Types $3_{im}$, apply practice J (Improvement Cut) near oaks to produce den trees to increase mast production. Apply practice T (Monitor) for regeneration.

In Type $9_{im}$ apply practice I (Clearcut) then $A_{d-f}$ (Reforestation) to higher areas.

In this unit harvest no more than 20 acres every 5 years.

The Long Term Goal - Diversify the habitat while maintaining a mix of evenaged stands in different stages of development. The area is low and wet. Conversion of habitat through the planting of mast-producing hardwoods is very limited.

---

North of Campbells Chute
to River Mile 427 — F1 85-96

219.2 acres. (V)

Photos No. 18-10 and 18-11. River mile 423.5-427.

Apply practice W (Special Management) along river shoreline, sloughs, and Campbell Chute.

Apply practice X (Stand Mapping) before applying any other practices.

In Type $9_i$ and $2_i$ follow practice Q (Thinning).

In Type $9_{im}$ follow practice I (Clearcut) and $A_{d-f}$ (Reforestation) in higher areas.

In Type $6_{im}$ follow practice J (Improvement Cut).

In Type $3_i$ follow practice $L_c$ (TSI) or I, then follow with practice $A_{d-f}$.

Where oaks are dying to oak wilt apply practice $L_a$, I or O.

In this unit harvest no more than 10 acres every 5 years.

Our Long Term Goal - Develop a mix of evenaged stands in different stages of development. Few higher areas suitable for planting oaks, pecans, etc., are present.

---

Huron Island Area
including Johnson Island, Big Cody,
and assorted islands — iais
14-17, 19-21, 23-27
29,31-36, 38-40,44, 46

1,633.7 acres. (VI)

Photos No. 18-9 to 18-12. River mile 420.5-425.2.

Apply practice W (Special Management) along river shore, sloughs, and lakes.

Apply practice X (Stand Mapping) before applying any other practices.

In Types $2_i$ and $9_i$ apply practice Q (Thinning).

In Type 5 apply practice $L_a$ and $L_c$ (TSI).

In Type $4_{im}$ and $6_{im}$ apply practice J (Improvement Cut) to develop den trees and increase mast production. Otherwise apply practice T (Monitor). Black walnut association should be monitored to assure it is replacing itself on the area.

In Type $9_m$, $9_{im}$, and $2_m$ apply practice I (Clearcut) then $A_{d-f}$ (Reforestation).

In this unit harvest no more than 25 acres every 5 years.

The Long Term Goal - Maintain the black walnut association. Other higher areas will be replanted in mast-producing species. Lower areas will be a mix of evenaged stands in varying stages of development. The priority wildlife species in this unit are the deer, wood duck, raccoon, songbirds, and raptors.

---

Landward Huron on the Iowa Shoreline — FM 31-42

157 acres. (VII)

Photos No. 18-11 and 18-12. River mile 425-426.

Apply practice W (Special Management) to the river shoreline and along slough and levees except in Type 5.

Apply practice X (Stand Mapping) before applying any other practices.

In Type $9_m$ apply practice I and then $A_{d-f}$ (Reforestation).

In this unit harvest no more than 10 acres every 5 years and create two 5-acre openings.

The Long Term Goal - Maintain a mix of unevenaged stands in different stages of growth. The few higher areas will be planted and maintained in mast-producing species. Wood duck is the priority wildlife species in this unit.

---

Mapes Island
Willow Bar — iis 34, 35A, 35B, 36, 37

182.7 acres. (VIII)

Photos No. 18-10 to 18-13. River mile 425-427.

Apply practice W (Special Management) along shorelines of the island and along sloughs.

Apply practice X (Stand Mapping) before applying any other practices.

In Type $9_i$, $1_i$, and $2_i$ apply practice Q (Thinning).

In Type $9_{im}$ and $2_m$ apply practice I (Clearcut).

In Type $3_m$ apply practice J (Improvement Cut).

In this unit harvest no more than 5 acres every 5 years.

The Long Term Goal - maintain a mix of evenaged stands in different stages of growth.

---

Blackhawk Island — iais 51, 52

538.7 acres. (IX)

Photos No. 18-12 to 18-14. River mile 426.5-429.

Apply practice W (Special Management) along river shoreline of the island and sloughs.

Apply practice X (Stand Mapping) before applying any other practices.

In Type $9_i$ apply practice Q (Thinning).

In Type 5 apply practice $L_a$ and $L_c$ (TSI).

In Type $9_{im}$ and $2_{im}$ apply practice I (Clearcut).

In this unit harvest no more than 30 acres every 5 years.

The Long Term Goal - Develop and maintain a mix of evenaged stands in different stages of development. Priority wildlife in this unit include wood duck, deer, songbirds, and small mammals.

---

Landward Blackhawk and Iowa Shore North and Assorted Islands — F1A 45-51A iais 61-65

368.7 acres. (X)

Photos No. 18-13 to 18-17. River mile 426-430.8.

Apply practice W (Special Management) along the river shore, along the slough, and the levee.

Apply practice X (Stand Mapping) before applying any other practices.

In Type $6_m$ apply practice J (Improvement Cut).

In Type $9_{im}$ apply practice I (Clearcut).

In Type $2_i$ apply practice Q (Thinning).

In this unit harvest no more than 15 acres every 10 years.

The Long Term Goal - Develop and maintain a mix of evenaged stands in different stages of development.

---

Keithsburg — Fl 98-104

863.8 acres. (XI)

Photos No. 18-13 to 18-16. River mile 428-431.

Apply practice W (Special Management) along river shore, sloughs, levees, and lakes.

Apply practice X (Stand Mapping) before applying any other practices.

In Types $4_i$, $6_i$, $3_i$, $9_i$, and $1_i$ apply practice Q (Thinning). Where willow occupies 70%+ of the stand, leave the parcel alone.

In Type $9_{im}$ apply practice V (Seed Tree), then $A_{d-f}$ (Reforestation).

In Type $4_{im}$, $6_{im}$, and $3_{im}$ apply practice J (Improvement Cut).

In Type $19_{im}$ apply practice N (Unique Area) and T (Monitor).

In this unit harvest no more than 5 acres every 5 years.

The Long Term Goal - Manage for the maximum production of wildlife resources.

---

Boston Bay Area — Fl 170, 171, 172A, 172B, 172C, 173A

555 acres. (XII)

Photos No. 18-18 and 18-19. River mile 433-434.

Apply practice W (Special Management) along river shores and Boston Bay shores.

Apply practice X (Stand Mapping) before applying any other practices.

In Type 5 apply practice $L_a$ and $L_c$ (TSI).

In Type $2_i$ apply practice Q (Thinning).

In type $2_{im}$ apply practice I (Clearcut).

Apply practice W and T (Monitor) heron rookery and to a 1,500-foot buffer zone around it. Monitor for heron usage of the rookery.

In this unit harvest no more than 35 acres every 5 years.

Some oak were noticed during iventory. In any harvest or thinning leave these trees. Change harvest to V (Seed Tree) or U (Shelterwood) where the few oaks, etc., exist.

The Long Term Goal - Maintain a mix of evenaged stands in different stages of development. Herons are the priority wildlife in this unit.

---

| | |
|---|---|
| From Pipeline River Mile 430.8 to Iowa River on Iowa Side of the River and Islands | FIA 52-62 |
| From River Mile 431 to New Boston on the Illinois Side of the River and Nearby Islands | IAIS 67-71<br>Fl 105-107A<br>iais 72-74 |

277 acres. (XIII)

Photos No. 18-16 to 18-23. River mile 438.0-434 (IA), 431-434 (IL).

Apply practice W (Special Management) along river and island shores the levee.

Apply practice X (Stand Mapping) before applying any other practices.

Leave the cottage sites on the shoreline north of the recreation area along the Iowa River alone.

In Type 51 apply practices $A_{a-c}$ (Plant) and B (Tree Maintenance) (Ferry Landing Recreational Area).

In Type $2_i$ apply practice Q (Thinning).

In Type $9_{im}$ apply practice I (Clearcut).

In this unit harvest no more than 10 acres every 10 years.

The Long Term Goal - Maintain a mix of evenaged stands in different stages of growth south of the recreation area on the Iowa side of the Mississippi River.

3. PRIORITIES LIST FOR POOL 18

A Cut oaks dying or dead because of oak wilt. Plant white oak and hickory in their place.

B Thin overstocked pin oak silver maple, cottonwood stands on all island areas (such as IAIS 68, Huron Island, etc.).

C Make regeneration (harvest) cuts and thinning on Blackhawk and Mapes Island and plant suitable areas.

D Closely examine Huron Island, walnut stands, and make improvement cuts.

E Apply improvement cuts or thinning to Illinois shoreline between Oquawka and Keithsburg (Tract #FI68-96).

4. ESTIMATED COSTS

| Silvicultural Practice | Acreage to be Treated | Cost Per Acre | Total per Practice |
|---|---|---|---|
| Thinning | \$ 1,990 | \$150 | \$298,500 |
| Improvement cut | 325 | \$150 | \$ 48,700 |
| Timber stand Improvement | 160 | \$ 30 | \$ 4,800 |
| Harvest (contractural preparation) | 160 | \$ 60 | \$ 9,600 |
| Site preparation | \$ 160 | \$110 | \$ 17,600 |
| Planting | 150 ± 50 | \$ 50 | \$ 7,500 ± \$ 2,500 |
| Type mapping | 2,635 | \$ 2 | \$ 5,270 |
| | Total Cost for Pool 18 | | \$391,970 ± \$ 2,500 |

HURON ISLAND - UPPER 1/3 UNIT NO. VI

Total Stand Summary

| Sp. | Ba/Aft$^2$ | # Trees/A | Vol/ABd.ft. | Av. Diameter (in.) |
|---|---|---|---|---|
| Ash Sp | 1.67 | .91 | 182.36 | 18.30 |
| River Birch | 1.67 | .67 | 153.46 | 21.41 |
| Coffeetree | .83 | .47 | 66.49 | 18.00 |
| Cottonwood | 9.17 | 6.01 | 1193.69 | 16.72 |
| Elm Sp | 2.50 | 40.79 | 0.00 | 3.35 |
| Hackberry | 6.67 | 14.32 | 116.77 | 9.24 |
| Honey Locust | 3.33 | 2.11 | 268.09 | 17.01 |
| Silver Maple | 71.67 | 167.67 | 3000.71 | 8.85 |
| Pin Oak | 1.67 | 2.54 | 119.74 | 10.98 |
| Pecan | .83 | .32 | 85.71 | 22.00 |
| Black Walnut | .83 | .60 | 96.69 | 16.00 |
| Willow Sp | 1.67 | .55 | 223.45 | 23.53 |
| Misc | 0.00 | 1.00 | 0.00 | 0.00 |
| TOTAL | 102.50 sq.ft. | 237.94 | 5507.18 Bd.ft. | |

| Variable of Interest | Mean/A | 95% Confidence Interval | |
|---|---|---|---|
| Int 1/4 Bd Ft | 5507.2 | 4152.35 | 6862.01 |
| Sq. Ft. Basal Area | 113.3 | 87.02 | 139.65 |
| Number of Trees | 255.9 | 104.55 | 407.15 |

Average Annual Growth Per Acre Int. 1/4 Bd. Ft. 231.4
Sq. Ft. Basal Area 1.05

FOR CLASSES 5-10 Wildlife Related Inventory Data
Per Acre Figures

| SPECIES LISTING | BASAL AREA (sq.ft./A) | NO. TREES/A | AVERAGE DIAMETER (inches) |
|---|---|---|---|
| Class 5 Den Tree - Upper Cavity (Upper 1/4 Bole) | | | |
| SILVER MAPLE | 5.83 | 1.63 | 25.62 |
| PIN OAK | .83 | .23 | 26.00 |
| WILLOW SP | .83 | .17 | 30.00 |
| MISCELLANEOUS | 1.67 | .39 | 28.00 |
| TOTAL | 9.16 sq.ft./A | 2.42/A | |

FOR CLASSES 5-10 Wildlife Related Inventory Data (Cont'd)
Per Acre Figures

| SPECIES LISTING | BASAL AREA (sq.ft./A) | NO. TREES/A | AVERAGE DIAMETER (inches) |
|---|---|---|---|
| **Class 6 Den Tree - Lower Cavity (3/4 Lower Bole)** | | | |
| SILVER MAPLE | 5.00 | 1.31 | 26.47 |
| WILLOW UP | .83 | .17 | 30.00 |
| TOTAL | 5.83 sq.ft./A | 1.48/A | |
| **Class 7 Standing Dead Tree** | | | |
| ELM SP | .83 | .27 | 10.00 |
| SILVER MAPLE | 6.67 | 16.67 | 8.56 |
| PIN OAK | .83 | .23 | 26.00 |
| MISCELLANEOUS | 1.67 | .39 | 28.00 |
| TOTAL | 10.00 sq.ft./A | 18.82/A | |
| **Class 8 Leaf Nest** | | | |
| HONEY LOCUST | .83 | .27 | 24.00 |
| TOTAL | .83 sq.ft./A | .27/A | |
| **Class 9 Grapevine** | | | |
| ASH SP | .83 | .32 | 22.00 |
| RIVER BIRCH | 1.67 | .67 | 21.41 |
| COFFEETREE | .83 | .47 | 18.00 |
| COTTONWOOD | .83 | .27 | 24.00 |
| ELM SP | 1.67 | 2.59 | 10.86 |
| HACKBERRY | 1.67 | 5.31 | 7.59 |
| HONEY LOCUST | 2.50 | 1.64 | 16.71 |
| SILVER MAPLE | 10.00 | 26.10 | 8.38 |
| PIN OAK | .83 | .15 | 32.00 |
| BLACK WALNUT | .83 | .60 | 16.00 |
| WILLOW SP | .83 | .38 | 20.00 |
| TOTAL | 22.49/sq.ft./A | 38.50/A | |

FOR CLASSES 5-10 Wildlife Related Inventory Data (Cont'd)
Per Acre Figures

| SPECIES LISTING | BASAL AREA (sq.ft./A) | NO. TREES/A | AVERAGE DIAMETER (inches) |
|---|---|---|---|
| Class 10 | | | |
| PIN OAK | 1.67 | 2.54 | 10.98 |
| PECAN | .83 | .32 | 22.00 |
| BLACK WALNUT | .83 | .60 | 16.00 |
| TOTAL | 3.33 sq.ft./A | 3.46/A | |

AVERAGE ACORN AND NUT YIELD BY SPECIES

| SPECIES LISTING | POUNDS/ACRE | TOTAL POUNDS |
|---|---|---|
| PIN OAK | 1.42 | 680.00 |
| TOTAL ACORNS | 1.42 lbs./A | 680.00 lbs. |

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BLACKHAWK, MAPES ISLANDS UNITS NO. VIII, IX
Total Stand Summary

| Sp. | Ba/Aft$^2$ | # Trees/A | Vol/ABd.ft. | Av. Diameter (in.) |
|---|---|---|---|---|
| Ash Sp | 1.54 | 1.96 | 0.00 | 11.99 |
| River Birch | .77 | .21 | 0.00 | 26.00 |
| Cottonwood | 3.85 | .99 | 519.20 | 26.72 |
| Elm Sp | 3.08 | 30.36 | 0.00 | 4.31 |
| Silver Maple | 118.46 | 173.42 | 5945.53 | 11.19 |
| Willow Sp | 9.23 | 12.29 | 328.84 | 11.73 |
| Misc | 0.00 | 1.00 | 0.00 | 0.00 |
| TOTAL | 136.92 sq.ft. | 220.23 | 6793.56 Bd.ft. | |

| Variable of Interest | Mean/A | 95% Confidence Interval | |
|---|---|---|---|
| Int 1/4 Bd Ft | 6793.6 | 3298.95 | 10288.18 |
| Sq. Ft. Basal Area | 150.8 | 114.05 | 187.49 |
| Number of Trees | 239.4 | 116.71 | 362.03 |

Average Annual Growth Per Acre Int. Bd. Ft. 68.4
Sq. Ft. Basal Area .35

FOR CLASSES 5-9 Wildlife Related Inventory Data
Per Acre Figures

| SPECIES LISTING | | BASAL AREA (sq.ft./A) | NO. TREES/A | AVERAGE DIAMETER (inches) |
|---|---|---|---|---|
| Class 5 Den Tree - Upper Cavity (Upper 1/4 Bole) | | | | |
| SILVER MAPLE | | 7.69 | 2.87 | 22.15 |
| WILLOW SP | | .77 | .35 | 20.00 |
| | TOTAL | 8.46 sq.ft./A | 3.22/A | |
| Class 6 Den Tree - Lower Cavity (Lower 3/4 Bole) | | | | |
| SILVER MAPLE | | 6.92 | 2.27 | 23.65 |
| | TOTAL | 6.92 sq.ft./A | 2.27/A | |
| Class 7 Standing Dead Tree | | | | |
| ELM SP | | .77 | 2.20 | 8.00 |
| SILVER MAPLE | | 6.92 | 12.31 | 10.15 |
| WILLOW SP | | 4.62 | 4.08 | 13.03 |
| MISCELLANEOUS | | .77 | .09 | 40.00 |
| | TOTAL | 13.08 sq.ft./A | 19.68/A | |
| Class 9 Grapevine | | | | |
| COTTONWOOD | | .77 | .24 | 24.00 |
| SILVER MAPLE | | 15.38 | 13.66 | 14.37 |
| | TOTAL | 16.15 sq.ft./A | 13.90/A | |

LANDWARD BLACKHAWK - IOWA UNIT NO. X
Total Stand Summary

| Sp. | Ba/Aft$^2$ | # Trees/A | Vol/ABd.ft. | Av. Diameter (in.) |
|---|---|---|---|---|
| Ash Sp | 10.00 | 17.26 | 514.44 | 10.31 |
| Cottonwood | 2.50 | .43 | 414.38 | 32.59 |
| Elm Sp | 3.75 | 9.45 | 45.72 | 8.53 |
| Hackberry | 8.75 | 115.29 | 0.00 | 3.73 |
| Honey Locust | 7.50 | 2.45 | 145.56 | 23.71 |
| Silver Maple | 48.75 | 26.15 | 2643.65 | 18.49 |
| Pin Oak | 2 50 | .40 | 313.69 | 33.94 |
| Willow Sp | 2.50 | 1.41 | 39.26 | 18.00 |
| Misc | 0.00 | 1.00 | 0.00 | 0.00 |
| TOTAL | 86.25 sq.ft. | 173.85 | 4116.70 Bd.ft. | |

| Variable of Interest | Mean/A | 95% Confidence Interval | |
|---|---|---|---|
| Int 1/4 Bd Ft | 4116.7 | 1476.13 | 6757.27 |
| Sq. Ft. Basal Area | 108.8 | 90.63 | 126.87 |
| Number of Trees | 185.8 | 0.00 | 377.60 |

Average Annual Growth Per Acre Int. 1/4 Bd. Ft. 85.9
Sq. Ft. Basal Area .48

FOR CLASSES 5-10 Wildlife Related Inventory Data
Per Acre Figures

| SPECIES LISTING | BASAL AREA (sq.ft./A) | NO. TREES/A | AVERAGE DIAMETER (inches) |
|---|---|---|---|
| Class 5 Den Tree - Upper Cavity (Upper 1/4 Bole) | | | |
| SILVER MAPLE | 1.25 | .90 | 16.00 |
| MISCELLANEOUS | 1.25 | .47 | 22.00 |
| TOTAL | 2.50 sq.ft./A | 1.37/A | |
| Class 7 Standing | | | |
| HONEY LOCUST | 1.25 | .25 | 30.00 |
| SILVER MAPLE | 11.25 | 5.54 | 19.29 |
| MISCELLANEOUS | 10.00 | 7.14 | 16.03 |
| TOTAL | 22.50 sq.ft./A | 12.93/A | |

FOR CLASSES 5-10 Wildlife Related Inventory Data (Cont'd)
Per Acre Figures

| SPECIES LISTING | | BASAL AREA (sq.ft./A) | NO. TREES/A | AVERAGE DIAMETER (inches) |
|---|---|---|---|---|
| Class 9 Grapevine | | | | |
| ASH SP | | 1.25 | 3.58 | 8.00 |
| ELM SP | | 1.25 | 3.58 | 8.00 |
| HACKBERRY | | 5.00 | 29.35 | 5.59 |
| HONEY LOCUST | | 5.00 | 1.13 | 28.42 |
| SILVER MAPLE | | 35.00 | 18.84 | 18.46 |
| PIN OAK | | 2.50 | .40 | 33.94 |
| MISCELLANEOUS | | 2.50 | 3.92 | 10.81 |
| | TOTAL | 52.50 sq.ft./A | 60.80/A | |
| Class 10 | | | | |
| PIN OAK | | 2.50 | .40 | 33.94 |
| | TOTAL | 2.50 sq.ft./A | .40/A | |

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BOSTON BAY AREA (IL) UNIT NO. XII
Total Stand Summary

| Sp. | Ba/Aft$^2$ | # Trees/A | Vol/ABd.ft. | Av. Diameter (in.) |
|---|---|---|---|---|
| Ash Sp | 6.00 | 3.08 | 406.16 | 18.89 |
| River Birch | 1.00 | .16 | 0.00 | 34.00 |
| Elm Sp | 1.00 | 1.27 | 34.38 | 12.00 |
| Hackberry | 3.00 | 2.59 | 167.42 | 14.58 |
| Silver Maple | 121.00 | 72.89 | 7602.75 | 17.45 |
| Misc | 0.00 | 1.00 | 0.00 | 0.00 |
| TOTAL | 132.00 sq.ft. | 80.99 | 8210.70 Bd.ft. | |

| Variable of Interest | Mean/A | 95% Confidence Interval | |
|---|---|---|---|
| Int 1/4 Bd Ft | 8210.7 | 6737.81 | 9883.59 |
| Sq. Ft. Basal Area | 146.0 | 115.43 | 176.57 |
| Number of Trees | 90.5 | 49.24 | 131.75 |

Average Annual Growth Per Acre Int. Bd. Ft. 133.4
Sq. Ft. Basal Area .72

FOR CLASSES 5-9 **Wildlife Related Inventory Data**
Per Acre Figures

| SPECIES LISTING | | BASAL AREA (sq.ft./A) | NO. TREES/A | AVERAGE DIAMETER (inches) |
|---|---|---|---|---|
| Class 5 Den Tree - Upper Cavity (Upper 1/4 Bole) | | | | |
| SILVER MAPLE | | 4.00 | .50 | 38.21 |
| | TOTAL | 4.00 sq.ft./A | .50/A | |
| Class 6 Den Tree - Lower Cavity (Lower 3/4 Bole) | | | | |
| ASH SP | | 1.00 | .46 | 20.00 |
| SILVER MAPLE | | 7.00 | 1.21 | 32.51 |
| | TOTAL | 8.00 sq.ft./A | 1.67/A | |
| Class 7 Standing Dead Tree | | | | |
| SILVER MAPLE | | 12.00 | 8.52 | 16.07 |
| MISCELLANEOUS | | 2.00 | 1.99 | 13.58 |
| | TOTAL | 14.00 sq.ft./A | 10.51/A | |
| Class 8 Leaf Nest | | | | |
| SILVER MAPLE | | 1.00 | .32 | 24.00 |
| | TOTAL | 1.00 sq.ft./A | .32/A | |
| Class 9 Grapevine | | | | |
| ELM SP | | 1.00 | 1.27 | 12.00 |
| HACKBERRY | | 2.00 | 1.87 | 14.00 |
| SILVER MAPLE | | 9.00 | 4.20 | 19.82 |
| | TOTAL | 12.00 sq.ft./A | 7.34/A | |

ADDENDUM 21

ADDENDUM 21

1. INTRODUCTION

Pool 21 extends from Canton, Missouri, to Quincy, Illinois, a distance of 18.4 miles. The pool contains 6,350 acres of water, 146.6 miles of shoreline (including islands), and 8,536 acres of public land. Project lands comprise the majority of public land area in the pool.

Approximately 7,100 acres of project woodlands are located in this pool. The Long Island and Pecan Grove areas contain some fine mast tree associations ranging from pure pecan to a general mixture of species with paw paw or persimmon in the understory.

As in Pool 22, the Illinois Department of Conservation and the Missouri Department of Conservation manage the fish and wildlife resources on most Cooperative Agreement lands in Pool 21. The Gardner unit of the Mark Twain Refuge is managed by the US Fish and Wildlife Service and designated as a wildlife refuge.

2. PRESCRIPTIONS FOR POOL 21

| Unit Title | Tract No. |
|---|---|
| Around Quincy Memorial Highway Bridge | Fl 39-56<br>FM 1-5B |

275 acres. UNIT NO. I

Photos No. 22-21 and 21-2. River mile 325-328.

Apply Practice M (No Management) along river shoreline, levee, and slough.

Leave area on Illinois shore below Quincy, Illinois, alone.

Apply practice X (Stand Mapping) before applying any other practices.

In Type 5 apply practice $L_a$ and/or $L_c$ (TSI).

In Type $9_i$ and $2_i$ apply practice Q (Thinning).

In Type $9_{im}$ and $2_m$ apply practice I (Clearcut).

In this unit harvest no more than 5 acres every 5 years.

The Long Term Goal - Develop a mixed bottom land forest of silver maple, ash, and cottonwood. The area will be a mix of evenage stands in different stages of development.

---

| | |
|---|---|
| Missouri Shoreline from R.R. Bridge to Below Canton, Missouri | Mis 3<br>FM 6-11 |

Photos No. 21-3, 4, and 6. River mile 328-334.8 and 335.5-341.5. (II)

Leave area alone to preserve aesthetic values of recreational experience.

The Long Term Goal - Allow natural development of the timber to provide habitat for wildlife using the bordering agricultural fields and preserve aesthetic river values for boaters.

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| | |
|---|---|
| Quincy Bay Area, Illinois Shore along Bay and Above and Below Railway | Fl 134-139, 141-145, 147, 117-130 iis 50<br>Fl 63, 64 |

Photos No. 21-3 to 21-5. River mile 329-330. (III)

Leave the area alone except in tracts 141, 143-145, and 147.

In those tracts apply practice W (Special Management) along river shore.

Most of the area left is under lease. If leases are terminated these areas will probably be used for recreation.

Apply practice X (Stand Mapping) before applying any other practices.

In Type $9_i$ and $1_i$ apply practice Q (Thinning).

The Long Term Goal - Allow the timber to develop naturally. Small persimmons in Tract Fl 147 may be used as seed stock for reestablishing persimmon in other areas.

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| | |
|---|---|
| Libby, Hogback, Teal, Deadman Island, and North and South Knapheide | iis 1-4<br>Fl 30-36, 38, 94, 96, 98<br>Fl 2-29, 63, 64 |

1,225 acres. (IV)

Photos No. 21-3 and 4, and 21-6 to 21-8. River mile 329-334.

Apply W (Special Management) along the river shore, sloughs, and lakes.

Apply practice X (Stand Mapping) before applying any other practices.

In Type $9_i$ and $2_i$ apply practice Q (Thinning).

In Type 5 apply practice $L_a$ and/or $L_b$ (TSI).

In Canton Chute campgrounds apply practices $A_{a-c}$ (Plant) and B (Tree Maintenance).

In Type $9_{im}$ apply practice I, then practice $A_{e-g}$ to suitable higher areas. Apply practice $L_a$ or K where younger timber may be overtopped by older timber.

In Type $3_{im}$ and 6im apply practice J (Improvement Cut), I (Clearcut), V (Seed Tree), or U (Shedterwood, then practice $A_{d-f}$ (Reforestation) in suitable higher areas. Where a good association of oak, hickory, and pecan is found apply practice J, U, or V. Where no such tree occupies the site, apply practice I.

In type 5 on Hogback Island apply practice S (Prescribed Burn).

In this unit harvest no more than 55 acres every 5 years.

Some very limited reproduction and young trees noted. These should be released and more mast trees established in the area.

The Long Term Goal - Develop and maintain higher areas in oak and other mast-producing trees. The lower areas will be a mix of evenaged stands in different stages of development. An understory will be developed on the higher areas by planting such trees as dogwood and persimmon. Thinnings should help to develop an understory in lower areas.

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Cottonwood Island — Mis 2, 2A, 2B

319.7 acres. (V)

Photos No. 21-3, 4, and 6. River mile 328.5-330.5.

Apply practice M (No Treatment) along island shoreline.

Apply practice X (Stand Mapping) before applying any other practices.

In Type $9_i$ apply practice Q (Thinning).

In Type 5 apply practice $L_a$ and $L_c$ (TSI).

In Type $9_{im}$ and $2_{im}$ apply practice I (Clearcut) then apply practice $A_{d-f}$ (Reforestation).

In this unit harvest no more than 20 acres every 5 years.

Our Long Term Goal - Develop a mix of evenaged stands in different stages of development.

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| | |
|---|---|
| Gardner<br>Long Island | iis 7, 15-20, 10, 10A<br>10B, 23-28, 31, 32,<br>36, 38-40 |

3,117.8 acres. (VI)

Photos No. 21-7 to 21-14. River mile 333.5-340.5.

Apply practice W (Special Management) along river, lake, and slough shores, and high use inland eagle areas.

Apply practice X (Stand Mapping) before applying any other practices.

In Type $4_{im}$ apply practice T (Monitor) for 10 years. If mast production is low due to overstocked condition, apply practice J (Improvement Cut).

In Type $6_{im}$ apply practice J.

In Type $3_{im}$ apply practice J, or U (Shelterwood) or V (Seed Tree) and then $A_{d-f}$.

In Type $9_i$ and $2_i$ apply practice Q (Thinning).

In Type $9_{im}$ apply practice V (Seed Tree) or U (Shelterwood), then apply practice $A_{d-f}$ (Reforestation) in higher areas.

In this unit harvest no more than 66 acres every five years.

Our Long Term Goal - Preserve higher areas that are supporting good mast producing tree associations that are regenerating themselves. The lower areas should be a mix of different evenaged stands at different stages of development. Applying practice V as a harvesting measure will allow den trees to be left in younger stands. Planting dogwood, persimmon, and other smaller trees should help develop an understory on the higher areas.

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| | |
|---|---|
| Bear Creek Area, Pecan Grove<br>Barns Island, Chatton Island | iis - 41, 41A, 44, 46, 47<br>Fl 72, 76, 77, 80, 81, 83<br>84, 86, 87, 89, 157, 158, 160 |

890 acres. (VII)

Photos No. 21-12 and 21-13. River mile 339-342.

Apply practice W (Special Management) along river shoreline and along sloughs and lake.

Apply practice X (Stand Mapping) before applying any other practices.

In Type $4_{im}$ and 3 apply practice J (Improvement Cut) to release desired trees and promote mast production.

In Type $9_i$ and $2_i$ apply practice Q (Thinning).

In Types $9_m$, $9_{im}$, and $3_{im}$ apply practice I (Clearcut) or V (Seed Tree) and $L_c$ (TSI), then $A_{d-f}$. When mast hardwood trees are present apply practice V or U and leave mast trees as seed trees. Otherwise apply practice I, then $A_{d-f}$.

In Types 23, $16_{im}$ apply practice T (Monitor) for low mast production and species regeneration.

In this unit harvest no more than 85 acres every 5 years. Harvest areas of overmature or highgraded timber first.

The Long Term Goal - Maintain the pecan groves and the association of species along on branch of the road leading back into the unit. The higher areas will be restored to a diverse association of mast-producing trees and the lower areas will be managed so a mix of evenaged stands in different stages of growth will be maintained. Thinning will maintain as much understory as possible in the lower areas.

3. PRIORITIES LIST FOR POOL 21

| | |
|---|---|
| A | Conduct an improvement cut in the pin oak area in the upper part of Pecan Grove unit. |
| B | Thin appropriate stands in Knapheide and Bear Creek-Chatton-Barnes units (stands that average about 10" DBH). |
| C | Harvest areas in Bear Creek-Chatton-Barnes and Pecan Grove management units that have reached the indicated basal area and plant mast trees into suitable areas. |

4. ESTIMATED COSTS

| Silvicultural Practice | Acreage to be Treated | Cost Per Acre | Total per Practice |
|---|---|---|---|
| Thinning | 600 | $150 | $ 90,000 |
| Improvement cut | 150 ± 100 | $150 | $ 22,500 ± $ 15,000 |
| Timber stand Improvement | 100 | $ 30 | $ 3,000 |
| Harvest (contractural preparation) | 250 | $ 60 | $ 15,000 |
| Site preparation | 250 | $110 | $ 27,500 |
| Monitoring | 400 | $ 15 | $ 6,000 |
| Planting | 200 ± 75 | $ 50 | $ 10,000 ± $ 3,750 |
| Type mapping | 1,500 | $ 2 | $ 3,000 |
| | Total Cost for Pool 21 | | $195,750 ± $ 18,750 |

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Pool 21 - Inventory Data

CANTON CHUTE RECREATION AREA, SOUTH (IL) UNIT NO. IV

Total Stand Summary

| Sp. | Ba/Aft$^2$ | # Trees/A | Vol/ABd.ft. | Av. Diameter (in.) |
|---|---|---|---|---|
| Ash Sp | 3.64 | 2.50 | 96.04 | 16.32 |
| Coffeetree | .91 | .65 | 36.49 | 16.00 |
| Cottonwood | .91 | .10 | 78.91 | 16.00 |
| Elm Sp | 2.73 | 5.16 | 0.00 | 9.84 |
| hackberry | 6.36 | 22.99 | 126.42 | 7.12 |
| Silver Maple | 48.18 | 103.04 | 1597.31 | 9.26 |
| Bur Oak | 1.82 | 1.10 | 153.39 | 17.43 |
| Pecan | 2.73 | .84 | 256.50 | 24.34 |
| Sycamore | .91 | .10 | 0.00 | 40.00 |
| Willow Sp | 2.73 | 3.67 | 65.43 | 11.67 |
| Misc | 0.00 | 1.00 | 0.00 | 0.00 |
| TOTAL | 70.91 sq.ft. | 141.18 | 2410.50 Bd.ft. | |

| Variable of Interest | Mean/A | 95% Confidence Interval | |
|---|---|---|---|
| Int 1/4 Bd Ft | 2410.5 | 739.35 | 4081.66 |
| Sq. Ft. Basal Area | 75.5 | 90.08 | 100.83 |
| Number of Trees | 143.8 | 0.00 | 300.21 |

Average Annual Growth Per Acre Int. 1/4 Bd. Ft. 120.2
Sq. Ft. Basal Area 1.20

FOR CLASSES 5-10 Wildlife Related Inventory Data
Per Acre Figures

| SPECIES LISTING | BASAL AREA (sq.ft./A) | NO. TREES/A | AVERAGE DIAMETER (inches) |
|---|---|---|---|
| **Class 5 Den Tree - Upper Cavity (Upper 1/4 Bole)** | | | |
| ASH SP | .91 | .51 | 18.00 |
| TOTAL | .91 sq.ft./A | .51/A | |
| **Class 6 Den Tree - Lower Cavity (Lower 3/4 Bole)** | | | |
| ASH SP | .91 | 1.67 | 10.00 |
| SILVER MAPLE | 2.73 | .49 | 31.92 |
| TOTAL | 3.64 sq.ft./A | 2.16/A | |
| **Class 7 Standing Dead Tree** | | | |
| ASH SP | .91 | .51 | 18.00 |
| BUR OAK | .91 | .85 | 14.00 |
| PECAN | .91 | 1.16 | 12.00 |
| MISCELLANEOUS | 1.82 | 1.14 | 17.10 |
| TOTAL | 4.55 sq.ft./A | 3.66/A | |
| **Class 9 Grapevine** | | | |
| ELM SP | .91 | .12 | 38.00 |
| HACKBERRY | 2.73 | 13.75 | 6.03 |
| SILVER MAPLE | 33.64 | 96.11 | 8.01 |
| PECAN | 1.82 | 1.34 | 15.76 |
| WILLOW SP | 2.73 | 3.67 | 11.67 |
| TOTAL | 41.83 sq.ft./A | 114.99/A | |

FOR CLASSES 5-10 Wildlife Related Inventory Data (Cont'd)
Per Acre Figures

| SPECIES LISTING | | BASAL AREA (sq.ft./A) | NO. TREES/A | AVERAGE DIAMETER (inches) |
|---|---|---|---|---|
| Class 10 | | | | |
| BUR OAK | | 1.82 | 1.10 | 17.43 |
| PECAN | | 2.73 | .84 | 24.34 |
| | TOTAL | 4.55 sq.ft./A | 1.94/A | |

AVERAGE ACORN AND NUT YIELD BY SPECIES

| SPECIES LISTING | | POUNDS PER ACRE | TOTAL POUNDS |
|---|---|---|---|
| BUR OAK | | 5.45 | 2,270.18 |
| | TOTAL ACORNS | 5.45 lbs./A | 2,270.18 lbs. |

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NORTH OF THE CANTON CHUTE RECREATION AREA (IL) UNIT NO. IV
Total Stand Summary

| Sp. | Ba/Aft$^2$ | # Trees/A | Vol/ABd.ft. | Av. Diameter (in.) |
|---|---|---|---|---|
| Ash Sp | 1.11 | .37 | 22.26 | 23.53 |
| Boxelder | .56 | 2.83 | 0.00 | 6.00 |
| Coffeetree | 1.67 | 4.87 | 0.00 | 7.92 |
| Cottonwood | 12.22 | 13.94 | 723.68 | 12.68 |
| Elm Sp | 5.56 | 57.42 | 0.00 | 4.21 |
| Hackberry | .56 | 6.37 | 0.00 | 4.00 |
| Honey Locust | .56 | .31 | 40.32 | 18.00 |
| Silver Maple | 70.00 | 158.21 | 2623.08 | 9.01 |
| Bur Oak | 1.11 | .24 | 40.11 | 29.10 |
| Pecan | 1.67 | .33 | 0.00 | 30.49 |
| Willow Sp | 1.67 | 8.36 | 44.60 | 6.05 |
| Misc | 0.00 | 1.00 | 0.00 | 0.00 |
| TOTAL | 96.67 sq.ft. | 254.24 | 3494.05 Bd.ft. | |

| Variable of Interest | Mean/A | 95% Confidence Interval | |
|---|---|---|---|
| Int 1/4 Bd Ft | 3471.7 | 1801.92 | 5141.57 |
| Sq. Ft. Basal Area | 102.2 | 77.82 | 126.62 |
| Number of Trees | 268.3 | 122.29 | 414.34 |

Average Annual Growth Per Acre Int. Bd. Ft. 327.4
Sq. Ft. Basal Area 2.77

FOR CLASSES 5-10 Wildlife Related Inventory Data
Per Acre Figures

| SPECIES LISTING | | BASAL AREA (sq.ft./A) | NO. TREES/A | AVERAGE DIAMETER (inches) |
|---|---|---|---|---|
| Class 5 Den Tree - Upper Cavity (Upper 1/4 Bole) | | | | |
| SILVER MAPLE | | .56 | .06 | 40.00 |
| | TOTAL | .56 sq.ft./A | .06/A | |
| Class 7 Standing Dead Tree | | | | |
| SILVER MAPLE | | 1.67 | 2.43 | 11.21 |
| MISCELLANEOUS | | 2.22 | 1.86 | 14.81 |
| | TOTAL | 3.89 sq.ft./A | 4.29/A | |
| Class 9 Grapevine | | | | |
| ASH SP | | .56 | .25 | 20.00 |
| BOXELDER | | .56 | 2.83 | 6.00 |
| COFFEETREE | | 1.67 | 4.87 | 7.92 |
| COTTONWOOD | | 2.78 | 4.30 | 10.89 |
| ELM SP | | 5.00 | 51.05 | 4.24 |
| HACKBERRY | | .56 | 6.37 | 4.00 |
| HONEY LOCUST | | .56 | .31 | 18.00 |
| SILVER MAPLE | | 29.44 | 58.64 | 9.60 |
| PECAN | | 1.11 | .24 | 29.10 |
| WILLOW SP | | 1.11 | 7.96 | 5.06 |
| | TOTAL | 43.35 sq.ft./A | 136.82/A | |
| Class 10 | | | | |
| BUR OAK | | 1.11 | .24 | 29.10 |
| PECAN | | 1.67 | .33 | 30.49 |
| | TOTAL | 2.78 sq.ft./A | .57/A | |

AVERAGE ACORN AND NUT YIELD BY SPECIES

| SPECIES LISTING | POUNDS PER ACRE | TOTAL POUNDS |
|---|---|---|
| BUR OAK | 1.94 | 305.86 |
| TOTAL | 1.94 lbs./A | 305.86 lbs. |

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PECAN GROVE (IL) UNIT NO. VII

Total Stand Summary

| Sp. | Ba/Aft$^2$ | # Trees/A | Vol/ABd.ft. | Av. Diameter (in.) |
|---|---|---|---|---|
| Ash Sp | 6.28 | 5.02 | 446.74 | 15.15 |
| River Birch | 1.16 | .39 | 73.93 | 23.37 |
| Boxelder | 1.86 | 8.07 | 0.00 | 6.50 |
| Cottonwood | 8.14 | 3.19 | 831.53 | 21.63 |
| Elm Sp | 2.33 | 23.00 | 8.68 | 4.31 |
| Hackberry | 1.40 | 4.40 | 24.50 | 7.62 |
| Hickory Sp | 1.16 | 1.02 | 75.37 | 14.43 |
| Shagbark Hickory | 1.16 | .62 | 78.68 | 18.58 |
| Silver Maple | 65.58 | 46.72 | 3720.66 | 16.04 |
| Pin Oak | 9.30 | 3.47 | 931.51 | 22.19 |
| Swamp White | 1.86 | 1.54 | 94.16 | 14.87 |
| Pecan | 1.63 | .58 | 120.04 | 22.75 |
| Persimmon | .93 | 5.76 | 43.87 | 5.44 |
| Sycamore | 1.16 | .54 | 131.04 | 19.94 |
| Willow Sp | 2.56 | 46.65 | 34.20 | 3.17 |
| Misc | .23 | .05 | 24.27 | 28.00 |
| TOTAL | 106.74 sq.ft. | 151.01 | 6639.16 Bd.ft. | |

| Variable of Interest | Mean/A | 95% Confidence Interval | |
|---|---|---|---|
| Int 1/4 Bd Ft | 6639.2 | 5311.63 | 7966.70 |
| Sq. Ft. Basal Are | 114.7 | 96.19 | 133.11 |
| Number of Trees | 156.0 | 86.76 | 225.17 |

Average Annual Growth Per Acre Int. 1/4 Bd. Ft. 258.8
Sq. Ft. Basal Area 1.76

FOR CLASSES 5-10 Wildlife Related Inventory Data
Per Acre Figures

| SPECIES LISTING | BASAL AREA (sq.ft./A) | NO. TREES/A | AVERAGE DIAMETER (inches) |
|---|---|---|---|
| **Class 5 Den Tree - Upper Cavity (Upper 1/4 Bole)** | | | |
| ASH SP | .47 | .24 | 18.92 |
| RIVER BIRCH | .23 | .06 | 26.00 |
| BOX ELDER | .23 | .09 | 22.00 |
| SILVER MAPLE | 1.16 | .51 | 20.51 |
| PIN OAK | .70 | .30 | 20.59 |
| TOTAL | 2.79 sq.ft./A | 1.20/A | |
| **Class 6 Den Tree - Lower Cavity (Lower 3/4 Bole)** | | | |
| SILVER MAPLE | 1.86 | .39 | 29.58 |
| PIN OAK | .23 | .03 | 36.00 |
| PECAN | .23 | .11 | 20.00 |
| MISCELLANEOUS | .23 | .22 | 14.00 |
| TOTAL | 2.56 sq.ft./A | .75/A | |
| **Class 7 Standing Dead Tree** | | | |
| ASH SP | .70 | .94 | 11.67 |
| RIVER BIRCH | .47 | .10 | 29.81 |
| HACKBERRY | .23 | .22 | 14.00 |
| SILVER MAPLE | 3.72 | 2.32 | 17.14 |
| PIN OAK | .70 | .33 | 19.75 |
| MISCELLANEOUS | 1.16 | .84 | 15.94 |
| TOTAL | 6.98 sq.ft./A | 4.75/A | |
| **Class 8 Leaf Nest** | | | |
| SILVER MAPLE | 1.40 | .56 | 21.34 |
| PIN OAK | .47 | .14 | 25.09 |
| TOTAL | 1.87 sq.ft./A | .70/A | |

FOR CLASSES 5-10 Wildlife Related Inventory Data (Cont'd)
Per Acre Figures

| SPECIES LISTING | | BASAL AREA (sq.ft./A) | NO. TREES/A | AVERAGE DIAMETER (inches) |
|---|---|---|---|---|
| Class 9 Grapevine | | | | |
| ASH SP | | .70 | .28 | 21.38 |
| RIVER BIRCH | | .93 | .25 | 25.94 |
| BOXELDER | | .70 | 4.52 | 5.32 |
| COTTONWOOD | | .93 | .20 | 28.87 |
| ELM SP | | 1.40 | 16.79 | 3.90 |
| HACKBERRY | | .93 | .86 | 14.06 |
| HICKORY SP | | .93 | .86 | 14.06 |
| SILVER MAPLE | | 17.21 | 14.64 | 14.68 |
| PIN OAK | | 5.58 | 2.05 | 22.35 |
| SWAMP WHITE OAK | | .93 | .86 | 14.07 |
| PECAN | | .47 | .14 | 24.94 |
| PERSIMMON | | .23 | .30 | 12.00 |
| SYCAMORE | | .93 | .45 | 19.51 |
| WILLOW SP | | .47 | 21.32 | 2.00 |
| MISCELLANEOUS | | .47 | .27 | 17.71 |
| | TOTAL | 32.58 sq.ft./A | 63.57/A | |
| Class 10 | | | | |
| HICKORY SP | | 1.16 | 1.02 | 14.43 |
| SHAGBARK HICKORY | | 1.16 | .62 | 18.58 |
| PIN OAK | | 9.30 | 3.47 | 22.19 |
| SWAMP WHITE OAK | | 1.86 | 1.54 | 14.87 |
| PECAN | | 1.63 | .58 | 22.75 |
| MISCELLANEOUS | | .23 | .05 | 28.00 |
| | TOTAL | 15.34 sq.ft./A | 7.28/A | |

AVERAGE ACORN AND NUT YIELD BY SPECIES

| SPECIES LISTING | | POUNDS PER ACRE | TOTAL POUNDS |
|---|---|---|---|
| PIN OAK | | 17.02 | 12,052.47 |
| | TOTAL ACORNS | 17.02 lbs./A | 12,052.47 lbs. |
| HICKORY SP | | 1.51 | 1,070.23 |
| SHAGBARK HICKORY | | 1.51 | 1,070.23 |
| | TOTAL NUTS | 3.02 lbs./A | 2,140.46 lbs. |

COTTONWOOD ISLAND (MO) UNIT NO. V

Total Stand Summary

| Sp. | Ba/Aft$^2$ | # Trees/A | Vol/ABd.ft. | Av. Diameter (in.) |
|---|---|---|---|---|
| Ash Sp | 1.67 | 2.00 | 31.41 | 12.36 |
| Boxelder | 2.50 | 3.19 | 33.45 | 11.99 |
| Coffeetree | .83 | .78 | 0.00 | 14.00 |
| Cottonwood | 9.17 | 5.11 | 843.25 | 18.13 |
| Elm Sp | 5.00 | 17.85 | 125.85 | 7.17 |
| Silver Maple | 75.83 | 90.06 | 2323.34 | 12.42 |
| Sycamore | 5.83 | 6.19 | 257.21 | 13.15 |
| Willow Sp | 2.50 | 1.79 | 33.45 | 16.00 |
| Misc | 0.00 | 1.00 | 0.00 | 0.00 |
| TOTAL | 103.33 sq.ft. | 127.97 | 3647.97 Bd.ft. | |

| Variable of Interest | Mean/A | 95% Confidence Interval | |
|---|---|---|---|
| Int 1/4 Bd Ft | 3648.0 | 2145.62 | 5150.32 |
| Sq. Ft. Basal Area | 110.8 | 89.94 | 131.72 |
| Number of Trees | 135.5 | 79.04 | 191.90 |

Average Annual Growth Per Acre Int. 1/4 Bd. Ft. 296.5
Sq. Ft. Basal Area 2.62

FOR CLASSES 5-9 Wildlife Related Inventory Data
Per Acre Figures

| SPECIES LISTING | BASAL AREA (sq.ft./A) | NO. TREES/A | AVERAGE DIAMETER (inches) |
|---|---|---|---|
| Class 5 Den Tree - Upper Cavity (Upper 1/4 Bole) | | | |
| SILVER MAPLE | 2.50 | .96 | 21.86 |
| TOTAL | 2.50 sq.ft./A | .96/A | |
| Class 6 Den Tree - Lower Cavity (Lower 3/4 Bole) | | | |
| SILVER MAPLE | 1.67 | .89 | 18.58 |
| MISCELLANEOUS | .83 | .47 | 18.00 |
| TOTAL | 2.50 sq.ft./A | 1.36/A | |

FOR CLASSES 5-9 Wildlife Related Inventory Data (Cont'd)
Per Acre Figures

| SPECIES LISTING | BASAL AREA (sq.ft./A) | NO. TREES/A | AVERAGE DIAMETER (inches) |
|---|---|---|---|
| Class 7 Standing Dead Tree | | | |
| SILVER MAPLE | 4.17 | 6.24 | 11.06 |
| WILLOW SP | 2.30 | 1.79 | 16.00 |
| MISCELLANEOUS | .83 | .47 | 18.00 |
| TOTAL | 7.50 sq.ft./A | 8.50/A | |
| Class 9 Grapevine | | | |
| BOXELDER | 1.67 | 2.59 | 10.86 |
| COTTONWOOD | .83 | .32 | 22.00 |
| ELM SP | 3.33 | 16.56 | 6.07 |
| SILVER MAPLE | 29.17 | 50.08 | 10.33 |
| SYCAMORE | 1.67 | .61 | 22.42 |
| WILLOW SP | .83 | .60 | 16.00 |
| MISCELLANEOUS | .83 | .47 | 18.00 |
| TOTAL | 38.33 sq.ft./A | 71.23/A | |

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BARNS ISL. - BEAR CREEK - CHATTON ISL. (IL) UNIT NO. VII
Total Stand Summary

| Sp. | Ba/Aft$^2$ | # Trees/A | Vol/ABd.ft. | Av. Diameter (in.) |
|---|---|---|---|---|
| Ash Sp | 10.53 | 29.31 | 384.74 | 8.11 |
| River Birch | 0.00 | 1.00 | 0.00 | 0.00 |
| Boxelder | 1.05 | 1.64 | 0.00 | 0.00 |
| Cottonwood | 12.63 | 16.95 | 1039.97 | 11.69 |
| Elm Sp | 3.68 | 61.48 | 0.00 | 3.31 |
| Silver Maple | 96.84 | 181.61 | 4585.65 | 9.89 |
| Mulberry Sp | 1.05 | 8.71 | 0.00 | 4.71 |
| Swamp White Oak | 2.11 | .75 | 236.42 | 22.73 |
| Pecan | 1.58 | .60 | 153.39 | 21.88 |
| Sycamore | 1.05 | .27 | 125.75 | 26.94 |
| Willow Sp | 1.05 | .97 | 28.65 | 14.12 |
| Misc | 0.00 | 1.00 | 0.00 | 0.00 |
| TOTAL | 131.58 sq.ft. | 304.29 | 6554.58 Bd.ft. | |

| Variable of Interest | Mean/A | 95% Confidence Interval | |
|---|---|---|---|
| Int 1/4 Bd Ft | 6554.6 | 4984.63 | 8124.52 |
| Sq. Ft. Basal Area | 148.4 | 127.95 | 168.89 |
| Number of Trees | 355.0 | 195.78 | 514.27 |

Average Annual Growth Per Acre Int. Bd. Ft. 176.0
Sq. Ft. Basal Area 1.25

FOR CLASSES 5-10 Wildlife Related Inventory Data
Per Acre Figures

| SPECIES LISTING | BASAL AREA (sq.ft./A) | NO. TREES/A | AVERAGE DIAMETER (inches) |
|---|---|---|---|
| Class 5 Den Tree - Upper Cavity (Upper 1/4 Bole) | | | |
| SILVER MAPLE | .53 | .17 | 24.00 |
| SWAMP WHITE OAK | .53 | .11 | 30.00 |
| TOTAL | 1.06 sq.ft./A | .28/A | |
| Class 6 Den Tree - Lower Cavity (Lower 3/4 Bole) | | | |
| SILVER MAPLE | 2.63 | 1.17 | 20.31 |
| PECAN | .53 | .06 | 40.00 |
| TOTAL | 3.16 sq.ft./A | 1.23/A | |
| Class 7 Standing Dead Tree | | | |
| ASH SP | .53 | 24.12 | 2.00 |
| RIVER BIRCH | .53 | .20 | 22.00 |
| ELM SP | 1.05 | .54 | 18.83 |
| SILVER MAPLE | 8.95 | 17.65 | 9.64 |
| PECAN | .53 | .14 | 26.00 |
| MISCELLANEOUS | 4.21 | 8.14 | 9.74 |
| TOTAL | 15.80 sq.ft/A | 50.79/A | |

FOR CLASSES 5-10 Wildlife Related Inventory Data (Cont'd)
Per Acre Figures

| SPECIES LISTING | | BASAL AREA (sq.ft./A) | NO. TREES/A | AVERAGE DIAMETER (inches) |
|---|---|---|---|---|
| Class 9 Grapevine | | | | |
| ASH SP | | 1.05 | .37 | 22.77 |
| BOXELDER | | .53 | .67 | 12.00 |
| COTTONWOOD | | 4.21 | 5.62 | 11.72 |
| ELM SP | | 2.63 | 53.95 | 2.99 |
| SILVER MAPLE | | 38.95 | 112.43 | 7.97 |
| SWAMP WHITE OAK | | 1.58 | .64 | 21.27 |
| PECAN | | 1.05 | .52 | 19.27 |
| SYCAMORE | | .53 | .14 | 26.00 |
| MISCELLANEOUS | | 1.58 | 4.39 | 8.12 |
| | TOTAL | 52.11 sq.ft./A | 178.73/A | |
| Class 10 | | | | |
| SILVER MAPLE | | 1.05 | 1.93 | 10.00 |
| SWAMP WHITE OAK | | 2.11 | .75 | 22.73 |
| PECAN | | 1.58 | .60 | 21.88 |
| | TOTAL | 4.74 sq.ft./A | 3.28/A | |

LONG ISLAND, FLANAGAN, SHANDREW, LAGRANGE - REFUGE AREA UNIT NO. VI

Total Stand Summary

| Sp. | Ba/Aft$^2$ | # Trees/A | Vol/ABd.ft. | Av. Diameter (in.) |
|---|---|---|---|---|
| Ash Sp | 10.59 | 21.72 | 1033.82 | 9.45 |
| Basswood | .15 | .42 | 0.00 | 8.00 |
| River Birch | .74 | .36 | 43.91 | 19.39 |
| Boxelder | 1.76 | 5.55 | 57.36 | 7.63 |
| Coffeetree | .59 | .90 | 23.82 | 10.94 |
| Cottonwood | 8.82 | 4.96 | 1134.31 | 18.06 |
| Elm Sp | 6.76 | 49.84 | 92.67 | 4.99 |
| Hackberry | 9.12 | 39.86 | 413.83 | 6.48 |
| Hawthorn | .44 | 2.53 | 0.00 | 5.66 |
| Hickory Sp | .44 | .41 | 33.76 | 14.08 |
| Shagbark Hickor | 1.18 | 1.05 | 126.86 | 14.31 |
| Honey Locust | 2.21 | 1.26 | 188.89 | 17.90 |
| Silver Maple | 78.53 | 91.28 | 5957.62 | 12.56 |
| Bur Oak | .74 | .34 | 76.76 | 19.90 |
| Pin Oak | 3.09 | .85 | 379.30 | 25.86 |
| White Oak | .29 | .15 | 33.36 | 18.83 |
| Pecan | 2.35 | .73 | 270.36 | 24.25 |
| Persimmon | .15 | .27 | 9.99 | 10.00 |
| Sycamore | 1.32 | .94 | 129.54 | 16.08 |
| Black Walnut | .15 | .07 | 14.91 | 20.00 |
| White Walnut | .15 | .07 | 14.91 | 20.00 |
| Willow Sp | 2.94 | 2.86 | 186.73 | 13.72 |
| Misc | .44 | .56 | 8.46 | 11.99 |
| TOTAL | 132.94 sq.ft. | 227.00 | 10231.19 Bd.ft. | |

| Variable of Interest | Mean/A | 95% Confidence Interval | |
|---|---|---|---|
| Int 1/4 Bd Ft | 10231.2 | 8902.20 | 11560.18 |
| Sq. Ft. Basal Area | 147.8 | 135.94 | 159.64 |
| Number of Trees | 244.3 | 197.33 | 291.20 |

Average Annual Growth Per Acre Int. 1/4 Bd. Ft. 66.6
Sq. Ft. Basal Area .27

FOR CLASSES 5-10 Wildlife Related Inventory Data
Per Acre Figures

| SPECIES LISTING | BASAL AREA (sq.ft./A) | NO. TREES/A | AVERAGE DIAMETER (inches) |
|---|---|---|---|
| **Class 5 Den Tree - Upper Cavity (Upper 1/4 Bole)** | | | |
| ASH SP | 1.47 | .63 | 20.62 |
| RIVER BIRCH | .15 | .06 | 22.00 |
| BOXELDER | .15 | .11 | 16.00 |
| COTTONWOOD | .74 | .19 | 26.32 |
| ELM SP | .15 | .42 | 12.00 |
| HACKBERRY | .88 | .97 | 12.91 |
| HAWTHORN | .15 | .42 | 8.00 |
| HONEY LOCUST | .74 | .20 | 26.24 |
| SILVER MAPLE | 13.68 | 5.05 | 22.28 |
| PIN OAK | .44 | .11 | 26.75 |
| PECAN | .29 | .05 | 34.62 |
| SYCAMORE | .29 | .05 | 14.00 |
| WILLOW SP | .74 | .65 | 14.37 |
| MISCELLANEOUS | 2.50 | 1.37 | 18.26 |
| TOTAL | 22.37 sq.ft./A | 10.05/A | |
| **Class 6 Den Tree - Lower Cavity (Lower 3/4 Bole)** | | | |
| ASH SP | 1.32 | .51 | 21.89 |
| RIVER BIRCH | .15 | .05 | 24.00 |
| SILVER MAPLE | 9.71 | 2.64 | 25.95 |
| PIN OAK | .44 | .09 | 30.49 |
| PECAN | .29 | .05 | 31.88 |
| SYCAMORE | .59 | .27 | 20.00 |
| WILLOW SP | .15 | .19 | 12.00 |
| MISCELLANEOUS | .88 | .39 | 20.32 |
| TOTAL | 13.53 sq.ft./A | 4.19/A | |

FOR CLASSES 5-10 Wildlife Related Inventory Data (Cont'd)
Per Acre Figures

| SPECIES LISTING | BASAL AREA (sq.ft./A) | NO. TREES/A | AVERAGE DIAMETER (inches) |
|---|---|---|---|
| Class 7 Standing Dead Tree | | | |
| ASH SP | .44 | .14 | 23.83 |
| RIVER BIRCH | .15 | .06 | 22.00 |
| COTTONWOOD | .59 | .36 | 17.25 |
| ELM SP | .15 | .11 | 16.00 |
| HACKBERRY | .88 | .63 | 16.00 |
| HICKORY SP | .15 | .14 | 14.00 |
| SHAGBARK HICKORY | .15 | .08 | 18.00 |
| HONEY LOCUST | .29 | .05 | 34.62 |
| SILVER MAPLE | 16.47 | 5.04 | 24.48 |
| PIN OAK | .88 | .22 | 27.11 |
| PECAN | .88 | .21 | 27.80 |
| SYCAMORE | .15 | .03 | 28.00 |
| WHITE WALNUT | .15 | .07 | 20.00 |
| WILLOW SP | .15 | .19 | 12.00 |
| MISCELLANEOUS | .44 | .51 | 12.58 |
| TOTAL | 21.92 sq.ft./A | 7.81/A | |
| Class 8 Leaf Nest | | | |
| ASH SP | .44 | .22 | 19.26 |
| COTTONWOOD | .15 | .04 | 26.00 |
| HACKBERRY | .15 | .27 | 10.00 |
| SHAGBARK HICKORY | .15 | .08 | 18.00 |
| SILVER MAPLE | .44 | .12 | 25.96 |
| PIN OAK | .29 | .09 | 24.94 |
| PECAN | .15 | .02 | 38.00 |
| SYCAMORE | .15 | .03 | 28.00 |
| WILLOW SP | .15 | .08 | 18.00 |
| TOTAL | 2.08 sq.ft./A | .95/A | |

FOR CLASSES 5-10
Per Acre Figures

Wildlife Related Inventory Data (Cont'd)

| SPECIES LISTING | | BASAL AREA (sq.ft./A) | NO. TREES/A | AVERAGE DIAMETER (inches) |
|---|---|---|---|---|
| Class 9 Grapevine | | | | |
| ASH SP | | .88 | .62 | 16.20 |
| RIVER BIRCH | | .15 | .06 | 22.00 |
| COTTONWOOD | | .29 | .23 | 15.41 |
| ELM SP | | .88 | 3.64 | 6.67 |
| HAWTHORN | | .15 | .42 | 8.00 |
| HONEY LOCUST | | .44 | .33 | 15.75 |
| SILVER MAPLE | | 3.97 | 7.59 | 9.79 |
| PIN OAK | | .59 | .17 | 25.12 |
| WILLOW SP | | .15 | .11 | 16.00 |
| MISCELLANEOUS | | 4.26 | 3.81 | 14.32 |
| | TOTAL | 11.76 sq.ft./A | 16.98/A | |
| Class 10 | | | | |
| HICKORY SP | | .44 | .41 | 14.08 |
| SHAGBARK HICKORY | | 1.18 | 1.05 | 14.31 |
| BUR OAK | | .74 | .34 | 19.90 |
| PIN OAK | | 3.09 | .85 | 25.86 |
| WHITE OAK | | .29 | .15 | 18.83 |
| PECAN | | 2.35 | .73 | 24.25 |
| BLACK WALNUT | | .15 | .07 | 20.00 |
| WHITE WALNUT | | .15 | .07 | 20.00 |
| | TOTAL | 3.67 sq.ft./A | 3.68/A | |

AVERAGE ACORN AND NUT YIELD BY SPECIES

| SPECIES LISTING | | POUNDS PER ACRE | TOTAL POUNDS |
|---|---|---|---|
| BUR OAK | | 1.34 | 3,037.79 |
| PIN OAK | | 4.47 | 10,148.24 |
| WHITE OAK | | 1.24 | 2,804.12 |
| | TOTAL ACORNS | 7.05 lbs./A | 15,990.15 lbs. |
| HICKORY SP | | .57 | 1,301.91 |
| SHAGBARK HICKORY | | 1.53 | 3,471.76 |
| | TOTAL NUTS | 2.10 lbs./A | 4,773.67 lbs. |

ADDENDUM 22

ADDENDUM 22

1. INTRODUCTION

Pool 22 extends south from Quincy, Illinois, to Saverton, Missouri, a distance of 23.6 miles. The pool contains 8,540 acres of water, 126 miles of shoreline (including islands), and 6, 592 acres of public land. Project lands comprise the majority of public land area in the pool.

Approximately 6,200 acres of project woodlands are located in this pool. Historical harvest practices and recent harsh growing conditions have limited mast tree association. However, stands of pecan and oak; persimmon, oak, and pecan; and oak can be found on a few scattered sites. In a portion of the Bay D. Charles area, heavy ground layer vegetation hinders regeneration.

The Missouri Department of Conservation and the Illinois Department of Conservation manage fish and wildlife resources on the Cooperative Agreement lands. The most sensitive wildlife resources in this pool are the active Heron rookery on Armstrong Island, and the Bald eagle and songbirds on Fabius Island. Both areas will be carefully monitored and studied. Vegetative management practices on either island will not be implemented now and should be carefully considered if and when they are implemented in either area.

2. PRESCRIPTIONS FOR POOL 22

| Unit Title | Tract No. |
|---|---|
| Ward Island and Landward of Ward Island | Tracts iis 30-35 FI 61, 63, 64, 66, 68, 70, 72 |

775 acres. UNIT NO. I

Photos No. 22-18 to 22-20. River mile 321-324.

Apply practice W (Special Management) along river shore and Texas chute.

Apply practice X (Stand Mapping) before applying any other practices.

In Type $2_i$ apply practice Q (Thinning) to two plots of 3 acres each. Reduce BA/acre to 100 in one and 70 square feet/acre in the other. Monitor results noting understory development and tree growth for 4 years, and then apply practice Q over the remaining area. Present stocking is 133.96 BA/acre.

In Types $3_{im}$ and $9_{im}$ apply practice V (Seed Tree) or I (Clearcut), then $L_a$ or $L_c$ (TSI) to areas where mast hardwood trees don't occur. After harvesting apply practices, $A_{d-f}$ on the areas suitable for planting. Where mast producing trees occurs apply practice V (Seed Tree) or U (Shelterwood), then $A_{d-f}$ (Reforestation).

A few young pecans can be found on the northern end of ward. Release these young trees.

In Type $2_m$ apply practice I (Clearcut) and the $A_{d-f}$ (Reforestation).

In Types 5 and 43 apply practice $L_a$ or $L_c$ (TSI), then $A_{e-g}$ on the area suitable for planting. In Type 43 there are some areas of massive silver maple reproduction. Apply practice Q to these areas.

In this unit harvest no more than 45 acres every 5 years.

Apply practice N (Unique Area) in areas under lease as cottage sites. When leases are discontinued in 1989, manage as a recreation area.

The Long Term Goal - Plant in higher areas capable of supporting them, oak, pecan, walnut, and hickory. Smaller understory trees should be encouraged as well, such as hawthorne, dogwood, persimmon, and hackberry. The lower areas should be in maple and other species which should seed in naturally. Stands in different stage of growth should be maintained to enhance diversity in these stands. The river shore area now under cottage leases may be used as a recreation park area in the future.

---

Lock area and opposite shore A-1, LS 1

58.7 acres. (II)

Photos No. 22-20 and 21. River mile 324-325.

Apply practice M (No Treatment) along river shoreline and along levee.

This area has been noted as an eagle feeding and roosting area.

Apply practice X (Stand Mapping) before any other practice is applied.

Apply practice Q (Thinning) on Type $2_1$.

Apply practice T (Monitor) to the entire area for eagle useage.

Apply practice to $A_{a-c}$ (Plant), and B (Tree Maintenance) to the lock area.

The Long Term Goal - Maintain eagle useage in the area opposite the lock and maintain grounds attractive and pleasing for visitors in the immediate lock area.

---

Landward of Orton and Fabius Islands

MIS 9, 10
FM 87, 88, 152, 154, 156, 157, 159-162

348.4 acres. (III)

Photos No. 22-18 to 22-20. River mile 321.5-324.

Apply practice M (No Treatment) along the levee and river shorelines.

Apply practice X (Stand Mapping) before any other practices are applied.

In Type 5 apply practice La and/or $L_c$ (TSI) to encouraged regeneration of tree species by natural seeding.

In Type $2_i$ apply practice Q (Thinning).

In Type $9_{im}$ apply practice I (Clearcut). Do not apply this practice where land width is less then 400 feet or in areas where eagle perching and feeding occurs in winter.

In this unit harvest no more than 10 acres every 5 years.

The Long Term Goal - Maintain maple stands in different stages of growth. However, due to the eagle use of the area, and the long linear nature of the area, management and vegetational diversity may be limited. The area north of the North River (FM 87, 88, 152) may be used as a recreation area in the future. The present diversity of vegetation around the pond will be maintained.

---

Orton Island

MIS 11

52.5 acres. (IV)

Photos No. 19 and 20. River mile 323-324.

Apply practice M (No Treatment) along shoreline of the island.

Practice X (Stand Mapping) will be applied to aid in the monitoring of songbird use.

In all types apply practice T (Monitor) for 10 years.

Monitor for eagle and songbird use. If usage declines, silvicultural practices may be useful in maintaining habitat.

The Long Term Goal - Maintain eagle and songbird use of the area. Eagle use will have priority in the area.

---

Fabius Island — MIS 8

313.3 acres. (V)

Photos No. 22-18 and 19. River mile 321-323.

This has been noted as an active winter eagle feeding and roosting area, as well as a songbird haven.

Practice X (Stand Mapping) will be applied to aid in monitoring of songbird and eagle use.

The US Fish and Wildlife has advised against implementing any practices in this area.

Apply practice T (Monitor) to the island for 10 years. Monitor for eagle and songbird useage. This will provide information on existing vegetative conditions as related to eagle and songbird use of the area. If eagle and songbird usage decreases, practices to aid in maintaining eagle habitat will be implemented.

The Long Term Goal - Maintain eagle and songbird usage through vegetative manipulation or nonmanipulation of the forest cover.

---

Landward Goose Island and North Shore of Mill Creek — FI 57-60, 94, 95, 98

183 acres. (VI)

Photos No. 22-15 to 22-17. River mile 318-321.

Apply Practice W (Special Management) along shoreline.

In Type 17, apply practice O (Sanitation/Salvage) if wood is salvagable. Otherwise apply practices La and $L_c$ (TSI) to encourage reproduction of the stand.

Leave remaining area alone. Width of this land that borders the river is no more than 300 feet.

The Long Term Goal - Allow maples and other trees to naturally seed in and to maintain widlife cover and aesthetic appeal of the area.

---

Horseshoe in North River and South of the North River — FM 76-81, FM 84

298 acres. (VII)

Photos No. 22-17 and 22-18. River mile 320-321.

Apply Practice M (No Treatment) along waterways and levee.

Apply practice X (Stand Mapping) before applying any other practices.

In Type $6_{im}$ apply J (Improvement Cut) then practice T (Monitor) for regeneration and mast production.

In Type $9_{im}$ apply practice I (Clearcut).

In Types $2_i$ and $9_i$ apply practice Q (Thinning).

In this unit harvest no more than 5 acres every 5 years.

The Long Term Goal - Maintain the area in overmature oak and perhaps diversify that area by planting hickory, persimmon, dogwood, etc. The remaining forest lands will seed in naturally to silver maple, cottonwood, etc. These should be maintained so a variety of stands in different age classes occur in this area.

---

Goose Island — iis 26-28

322.1 acres. (VIII)

Photos No. 22-15 to 22-17. River mile 318.5-320.5.

Apply practice W (Special Management) along the river and sloughs.

Apply practice X (Stand Mapping) before applying any other practices.

In Type 17, apply practice O (Sanitation/Salvage) if the timber is salvageable. If the timber is not salvageable, apply practice $L_c$ (TSI) and $A_{d-f}$ (Reforestation) to suitable higher areas. Practice $L_c$ will be necessary if regeneration becomes suppressed by ground cover. At this time, no oak, pecan, walnut, or hickory was recorded in the inventory total stand summary. When mast hardwood trees are reestablished in the unit, squirrel nest boxes may be put up to encourage repopulation of the area by squirrels.

In Type $2_i$ and $9_i$ apply practice Q (Thinning).

In Type 5 apply practices $L_a$ and $L_c$ (TSI).

In Type $9_{im}$ apply practice I (Clearcut) then apply $A_{d-f}$ (Reforestation) in suitable higher areas.

In this unit, harvest no more than 10 acres every 5 years.

The Long Term Goal - Restore oaks and other mast producing hardwoods to suitable higher areas. Understory should be encouraged in the area. The lower areas will naturally seed into silver maple, ash, etc. Maintain these areas in different stages of growth.

---

Mill Creek Shore South — FI 88, 90-92, 96, 97

322 acres. (IX)

Photos No. 22-14 and 15. River mile 317-318.5.

Apply practice M (No Treatment) along shorelines and sloughs.

Apply practice X (Stand Mapping) before applying any other practices.

In Type $20_{im}$ apply practice $L_a$ or $L_c$ (TSI) to appropriate areas to encourage development of the young stand.

In Type $9_i$ apply Q (Thinning).

In Types $9_{im}$ and $9_m$ apply practice I (Clearcut) then $L_c$ (TSI), finally $A_{d-f}$ (Reforestation).

In this unit harvest no more than 10 acres every 5 years.

The Long Term Goal - Plant higher areas into oak and other mast-producing trees. Lower areas that should seed into silver maple, cotton-wood and other such species will be a mix of stands in different stages of growth.

---

Whitney Islands — MIS 2-5, 6

252.8 acres. (X)

Photos No. 22-11 to 22-14. River mile 314-317.

Apply practice M (No Treatment) along all shorelines.

Apply practice X (Stand Mapping) before applying any other practices.

In Types $9_{im}$, $9_m$, and $2_i$ practice V (Seed Tree) or I (Clearcut) in 2 years except in areas left for mature growth. Silver maples should be left as seedtrees to encourage their reestablishment over cottonwood. If V is applied, seed trees may be girdled to provide den trees after regeneration is established.

On south island, lower half of the island, in $2_i$ and $9_i$ apply practice Q (Thinning).

In this unit harvest no more than 15 acres every 5 years.

The Long Term Goal - Manage this area for multiple resources. No areas are high enough to support oak and other mast trees. A mix of silver maple, cottonwood, and ash stands in different stages of growth will provide a more diverse woodland than exists in the present monoculture.

---

Beebe Island — iis 36

140.2 acres. (XI)

Photos No. 22-14. River mile 317.

Apply practice W (Special Management) to the shoreline of the island.

Apply practice X (Stand Mapping) before applying any other practice.

In Type $20_{im}$ apply practices $L_a$ or $L_c$ (TSI) to aid young growing trees and develop den trees or to remove ground cover preventing regeneration.

The Long Term Goals - Maintain the area of silver maple, cottonwood, and ash in a mix of stands in different stages of development.

---

Sny North, IL — iis 25; Fl 53, 78-87, and 89

620 acres. (XII)

Photos No. 22-11 to 22-14. River mile 315-317.

Apply practice W (Special Management) along all shore areas, sloughs, levees, inland lakes, and ponds.

Apply practice X (Stand Mapping) before applying any other practices.

In Type $19_m$ apply practice T (Monitor) for 10 years with the option of applying practice $A_{d-f}$ (Reforestation) in some of the more open areas. Monitor for mast production of the pecans and pin oaks, and seedling establishment.

In Type $3_{im}$: 1) apply either practice V (Seed Tree) or U (Shelterwood) where oaks, pecans, hickorys, and walnuts occur, then practice $L_a$ and $L_c$ (TSI), then practice $A_{e-g}$; 2) apply practice J (Improvement Cut) to young stand of silver maple, ash, cottonwood, hackberry of DBH 10-20 being overtopped by a few older larger individuals; or 3) apply practice I (Clearcut) to mature stands of silver maple cottonwood.

Preserve current pawpaw population found in the understory.

In Type $9_i$, apply practice Q (Thinning).

In this unit harvest no more than 20 acres every 5 years.

The Long Term Goal - Plant mast-producing trees such as oak, hickory, pecan, and walnut on higher areas and diversify the understory that consists of some pawpaw. Plants such as persimmon, dogwood, and serviceberry should be planted to diversify the understory. On lower areas silver maple, cottonwood, and ash should seed into the areas. These lower areas will be a mix of even age stands in different stages of growth. The pecan, pin oak, and elm grove will be maintained in those species by monitoring the groves growth and reestablishment. Reestablishment will only be aided by practices such as harvest cuttings and/or planting if it is absolutely necessary.

---

Sny South, IL

iis 22A, 22B
FI 45B, 45D, 46, 47, 48b, 49-52

560.7 acres. (XIII)

Photos No. 22-11 and 12. River mile 313-315.

Apply practice W (Special Management) along all river shoreline and slough areas.

Apply practice X (Stand Mapping) before applying any other practices.

In Type 10 follow practice V (Seed Tree) or I (Clearcut), then practice $A_{e-g}$ (Reforestation). In making the harvests preserve some of the mature hackberry and all pin oak. In any adjacent lower areas included in this type follow practice I.

In Type $6_{im}$ follow practice V or U (Shelterwood) leaving oak and other mast-producing trees. Then follow practice $A_{e-g}$ to diversify the stand.

In types $3_{im}$ and $9_{im}$ follow practice I, V, or U and then practice $A_{e-g}$. On areas where pecan, oak, hickory, or walnut occur apply practice V or U. On areas where such trees do not occur apply practice I.

In type $2_i$ apply practice Q (Thinning).

In this unit harvest no more than 40 acres every 5 years.

The inventory total stand summary shows much more hackberry per acre than in Sny North and only a very little pecan and no other mast-producing trees. Hackberry is the second dominant species, but should not be.

The Long Term Goal - Plant suitable mast-producing species such as oak and hickory on the higher areas dominated by Kentucky coffeetree, honey locust, and hackberry. Some mature hackberry would be a part of these areas overstory. Understory will be developed by planting species such as persimmon, pawpaw, etc., to provide a wildlife food source. Lower areas will be seeded back in silver maple. Lower areas will be a mix of evenage stands in different stages of development.

---

Armstrong Island — iis 11, 15, 17

269.5 acres. (XIV)

Photos No. 22-10 and 11. River mile 312-314.

Apply practice M (No Treatment) along the islands shoreline and along the sloughs.

Apply practice X (Stand Mapping) before applying any other practices.

Apply practice N (Unique Areas) on active heron rookery area, and 1,500-foot zone around the rookery area. Encourage study of the rookery area to determine if future practices can aid in development of rookery areas on Corps lands.

In all areas apply practice T (Monitor) for 10 years.

The Long Term Goal - To maintain the Heron rookery, which is the priority wildlife species in this unit.

---

Glaucus Island — MIS 1
Turtle, Idlewild and Unnamed Iles — iis 7-10

231.5 acres. (XV)

Photos No. 22-9 and 10. River mile 310.5-312.5.

Apply practice M (No Treatment) along islands shoreline.

Apply practice X (Stand Mapping) before applying any other practices.

In Type $9_i$ and $2_i$ apply practice Q (Thinning) on Glaucus Island only.

Turtle, Idlewild, and Unnamed Iles should be left alone.

The Long Term Goal - Allow the areas to develop naturally. Glaucus should have a limited mix of stands in different stages of growth.

---

Clear Creek, Bay D. Charles, MO — FM 39, 41-45, 48, 51, 52

597.8 acres. (XVI)

Photos No. 22-9 and 10. River mile 311-313.

Follow practice M (No Treatment) along the river shore, sloughs, and levee.

Apply practice X (Stand Mapping) before applying any other practices.

In Type $14_m$ apply practice practice $L_a$, $L_c$ (TSI), and then $A_{e-g}$ (Reforestation). Leave oak and pecan trees.

In Types $1_i$, $9_i$, and $2_i$ apply practice Q (Thinning), favor silver maple and sycamore.

In Type $4_{im}$ and $9_{im}$ apply practice J (Improvement Cut).

The Long Term Goal - Reestablish a pecan, oak, and hickory stand in all of Type 14, and maintain Type 4. An understory should be encouraged by planting such trees as persimmon and paw paw. The lower areas will be a mix of even aged silver maple, cottonwood, ash, and perhaps sycamore stands in several stages of growth.

---

North & South of the John Hay Recreation Area, IL — FI 11, 12, 13, 17, 17a, and 18

339 acres. (XVII)

Photos No. 22-6 and 7. River mile 308-309.8.

Follow practice M (No Treatment) along river shore and along levee.

Apply practice X (Stand Mapping) before applying any other practices.

In type $18_{im}$ apply practice J (Improvement Cut) then T (Monitor) for increased regeneration of the oaks. An on site visit in 1979 indicated this was happening.

In type $2_i$ apply practice Q (Thinning).

In type $6_{im}$ apply practice J.

In type 5 apply practice $L_a$ and $L_c$ (TSI) to aid regeneration of stand type.

In Type $9_{im}$, apply practice I (Clearcut) and then $A_{e-g}$ (Reforestation) on an elevated old wing dam or water control structure is regenerating into silver maple, ash. Plantings of oak and hickory on this area will add more diversity.

In this unit harvest no more than 10 acres on the wing dam.

The Long Term Goal - Maintain the higher areas in oak, pecan, and persimmon. The lower areas will be a mix of evenaged stands in different stages of developments.

---

| | |
|---|---|
| Shucks, King, Glassock, Harris Iles | FM 133, 135, 139, 140 |
| IL Shore 309-301.5 | FM 1-15, 18-27, 102, 107-137 |
| MO shore 309-301.5 | LS1-3 |

Photos No. 22-1 to 22-6. River mile 301.5-309. (XVIII)

Leave this area alone, except for Shucks Island.

Most of this area is land 100-400 feet between river and levee.

The islands are small, the largest, Shucks Island is 64.7 acres. On Shucks Island apply practice Q (Thinning).

The Long Term Goal - Allow natural succesion along a natural strip of vegetation between the agricultural fields and levee and the Mississippi River. This should be left to preserve aesthetic values of the river and cover for animals using the agricultural fields.

---

| | |
|---|---|
| Above Railroad Bridge, IL | FI 19A, 19B, 20, 23, 25-45A |

Photos No. 22-8 and 9. River mile 309.8-312. (XIX)

Apply Practice W (Special Management) along river and slough shores.

Much of this land is in cottage leases, with some in industrial lease. Leave it alone until the leases have expired.

Pecans and oaks can be found on higher sites in this area.

The Long Term Goal - Develop this area as a recreation or wildlife area when the area is not under lease.

3. PRIORITIES LIST FOR POOL 22

A Thin plots in overstocked stands on Ward Island - as indicated in forestry plan.

B Do timber stand improvement in the areas currently dominated by hackberry, honey locust, cucumber vine and herbaceous vegetation in Clear Creek (Bay D Charles) and restore pecan-oak-hickory-persimmon to the area (only a few larger individuals are present now).

C Salvage, if possible, wood felled by storm on Goose Island and landward Goose Island. At the same time, do TSI in stands and thin stands north of the damaged area. Plant suitable areas in mast trees (oak, hickory, walnut, and pecan).

D Do TSI on Ward's Island to remove competing herbaceous vegetation and establish mast trees, maple, and mixed hardwood stands in suitable areas.

E Harvest some mature timber on Ward Island and plant suitable areas in mast trees.

F Harvest higher ridge areas in South Sny and convert these areas to oak, hickory, walnut, and/or pecan stands.

G Do TSI on Beebe Island and south Mill Creek.

H Conduct an improvement cut to release small pecan at northern (upriver) end of Ward Island.

4. ESTIMATED COSTS

| Silvicultural Practice | Acreage to be Treated | Cost Per Acre | Total per Practice |
|---|---|---|---|
| Thinning | 940 | $150 | $141,000 |
| Improvement cut | 500 | $150 | $ 7,500 |
| Timber stand Improvement | 400 | $ 30 | $ 12,000 |
| Monitoring | 320 | $ 15 | $ 4,800 |
| Planting | 170 ± 50 | $ 50 | $ 8,500 ± $ 2,500 |
| Harvest (contractural preparation) | 250 | $ 60 | $ 15,000 |
| Site preparation | 250 | $110 | $ 27,500 |
| Type mapping | 2,330 | $ 2 | $ 4,660 |
| | Total Cost for Pool 22 | | $220,960 ± $ 2,500 |

Pool 22 - Inventory Data

WARD I (IL) UNIT NO. I
Total Stand Summary

| Sp. | Ba/Aft$^2$ | # Trees/A | Vol/ABd.ft. | Av. Diameter (in.) |
|---|---|---|---|---|
| Ash | 1.33 | 3.81 | | 8.00 |
| Coffeetree | 2.00 | 1.62 | 156.09 | 15.02 |
| Cottonwood | 65.33 | 55.08 | 6273.33 | 14.72 |
| Elm | 1.33 | 33.95 | | 2.68 |
| Hackberry | 1.33 | 3.13 | 45.28 | 8.83 |
| Silver Maple | 54.66 | 143.34 | 3493.68 | 8.36 |
| Sycamore | .66 | .37 | | 18.00 |
| Willow | .66 | .30 | | 20.00 |
| Misc. | 6.66 | 43.30 | | 5.14 |
| TOTAL | 133.96 sq.ft. | 287.95 | 9968.39 Bd.ft. | |

| Statistical Analysis | Mean/A | 95% Confidence Level | |
|---|---|---|---|
| Int 1/4" Bd Ft | --- | 7027.04 | 12910.00 |
| Sq. Ft. Basal Area | 134 | 112.37 | 155.63 |
| # of Trees | 287.95 | 155.00 | 420.89 |

Average Annual Growth Per Acre Int. 11/4" Bd Ft 308.33
Sq. Ft. Basal Area 1.32

FOR CLASSES 5-9 Wildlife Related Inventory Data
Per Acre Figures

| SPECIES LISTING | BASAL AREA (sq.ft./A) | NO. TREES/A | AVERAGE DIAMETER (inches) |
|---|---|---|---|
| Class 5 Den Tree - Upper Cavity (Upper 1/4 Bole) | | | |
| COTTONWOOD | 66.67 | 7.64 | 40.00 |
| TOTAL | 66.67 sq.ft./A | 7.64/A | |
| Class 7 Standing Dead Tree | | | |
| COTTONWOOD | 886.67 | 1,019.58 | 12.48 |
| SILVER MAPLE | 66.67 | 18.08 | 26.00 |
| MISCELLANEOUS | 466.67 | 1,193.00 | 8.47 |
| TOTAL | 1,400.00 sq.ft./A | 2,230.66/A | |

FOR CLASSES 5-9
Per Acre Figures

## Wildlife Related Inventory Data (Cont'd)

| SPECIES LISTING | BASAL AREA (sq.ft./A) | NO. TREES/A | AVERAGE DIAMETER (inches) |
|---|---|---|---|
| Class 9 Grapevine | | | |
| COTTONWOOD | 1,133.33 | 862.92 | 15.52 |
| SILVER MAPLE | 1,533.33 | 2,276.01 | 11.11 |
| MISCELLANEOUS | 200.00 | 398.10 | 9.60 |
| TOTAL | 2,866.67 sq.ft./A | 3,537.02/A | |

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WARD II (IL) UNIT NO. I

Total Stand Summary

| Sp. | Ba/Aft$^2$ | # Trees/A | Vol/ABd.ft. | Av. Diameter (in.) |
|---|---|---|---|---|
| Ash | 13.57 | 49.92 | 970.59 | 7.06 |
| Boxelder | .71 | .27 | 73.46 | 22.00 |
| Cottonwood | 5.71 | 2.10 | 731.02 | 22.32 |
| Elm Sp | 4.29 | 9.37 | 148.39 | 9.16 |
| Hackberry | 5.71 | 16.11 | 284.46 | 8.06 |
| Honey Locust | 1.43 | .66 | 132.56 | 19.97 |
| Silver Maple | 62.86 | 38.18 | 4773.15 | 17.37 |
| Mulberry Sp | 1.43 | 4.95 | 20.62 | 7.28 |
| Sycamore | .71 | .19 | 0.0 | 26.00 |
| Black Walnut | .71 | .17 | 76.17 | 28.00 |
| Misc | 3.57 | 3.34 | 80.55 | 14.00 |
| TOTAL | 100.70 sq.ft. | 125.26 | 7290.97 Bd.ft. | |

| Statistical Analysis | Mean/A | 95% Confidence Interval | |
|---|---|---|---|
| Volume | --- | 4752.2 | 9829.8 |
| Sq. Ft. Basal Area | 100.714 | 82.39 | 119.03 |
| # of Acres | 125.268 | 50.52 | 200.02 |

Average Annual Growth Int. 1/4" Bd. Ft. 193.88
Sq. Ft. Basal Area .787

FOR CLASSES 5-9 Wildlife Related Inventory Data
Per Acre Figures

| SPECIES LISTING | | BASAL AREA (sq.ft./A) | NO. TREES/A | AVERAGE DIAMETER (inches) |
|---|---|---|---|---|
| Class 5 Den Tree - Upper Cavity | | | | |
| SILVER MAPLE | | 1,071.43 | 400.15 | 22.16 |
| SYCAMORE | | 71.43 | 19.37 | 26.00 |
| MISCELLANEOUS | | 71.43 | 22.74 | 24.00 |
| | TOTAL | 1,214.29 sq.ft./A | 442.26/A | |
| Class 6 Den Tree - Lower Cavity | | | | |
| SILVER MAPLE | | 357.14 | 77.58 | 29.05 |
| | TOTAL | 357.15 sq.ft./A | 77.58/A | |
| Class 7 Standing Dead Tree | | | | |
| COTTONWOOD | | 71.43 | 66.82 | 14.00 |
| SILVER MAPLE | | 71.43 | 16.70 | 28.00 |
| SYCAMORE | | 71.43 | 19.37 | 26.00 |
| MISCELLANEOUS | | 142.86 | 45.47 | 24.00 |
| | TOTAL | 357.14 sq.ft./A | 148.37/A | |
| Class 8 Leaf Nest | | | | |
| ASH SP | | 71.43 | 90.95 | 12.00 |
| ELM SP | | 71.43 | 363.78 | 6.00 |
| SILVER MAPLE | | 71.43 | 204.63 | 8.00 |
| | TOTAL | 214.29 sq.ft./A | 659.36/A | |

FOR CLASSES 5-9 Wildlife Related Inventory Data (Cont'd)
Per Acre Figures

| SPECIES LISTING | | BASAL AREA (sq.ft./A) | NO. TREES/A | AVERAGE DIAMETER (inches) |
|---|---|---|---|---|
| Class 9 Grapevine | | | | |
| ASH SP | | 357.14 | 932.19 | 8.38 |
| BOXELDER | | 71.43 | 27.06 | 22.00 |
| COTTONWOOD | | 285.71 | 60.97 | 29.31 |
| ELM SP | | 214.29 | 436.94 | 9.48 |
| HACKBERRY | | 285.71 | 318.94 | 9.48 |
| SILVER MAPLE | | 1,642.86 | 1,072.78 | 12.82 |
| MULBERRY SP | | 142.86 | 494.74 | 7.28 |
| MISCELLANEOUS | | 142.86 | 197.78 | 11.51 |
| | TOTAL | 3,142.86 sq.ft/A | 3,541.40/A | |

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WARD III (IL) UNIT NO. I
Total Stand Summary

| Sp. | Ba/Aft$^2$ | # Trees/A | Vol/ABd.ft. | Av. Diameter (in.) |
|---|---|---|---|---|
| Ash | 6.67 | 3.01 | 699.03 | 20.16 |
| Cottonwood | 10.00 | 2.87 | 832.83 | 25.27 |
| Hackberry | 4.16 | 8.14 | 103.36 | 9.69 |
| Honeylocust | .83 | .15 | 0.0 | 32.00 |
| Silver Maple | 40.83 | 52.46 | 2308.88 | 11.95 |
| Sycamore | 2.50 | .57 | 445.49 | 28.35 |
| Misc | 1.67 | .74 | 0.0 | 20.36 |
| TOTAL | 66.66 | 67.94 | 4389.59 | |

| Statistical Analysis | Mean/A | 95% Confidence Level | |
|---|---|---|---|
| Volume | --- | 949.31 | 7830 |
| Sq. Ft. Basal Area | 66.667 | 28.80 | 104.53 |
| # of Trees | 67.934 | 14.06 | 121.81 |

Average Annual Growth Per Acre Int. 11/4" Bd Ft 8.29
Sq. Ft. Basal Area .06

FOR CLASSES 5-9 Wildlife Related Inventory Data
Per Acre Figures

| SPECIES LISTING | | BASAL AREA (sq.ft./A) | NO. TREES/A | AVERAGE DIAMETER (inches) |
|---|---|---|---|---|
| Class 5 Den Tree - Upper Cavity (Upper 1/4 Bole) | | | | |
| COTTONWOOD | | 83.33 | 10.58 | 38.00 |
| SILVER MAPLE | | 250.00 | 131.16 | 18.69 |
| | TOTAL | 333.33 sq.ft./A | 141.74/A | |
| Class 6 Den Tree - Lower Cavity (Lower 3/4 Bole) | | | | |
| HONEY LOCUST | | 83.33 | 14.92 | 32.00 |
| SILVER MAPLE | | 83.33 | 26.53 | 24.00 |
| | TOTAL | 166.67 sq.ft./A | 41.45/A | |
| Class 7 Standing Dead Tree | | | | |
| ASH SP | | 83.33 | 38.20 | 20.00 |
| COTTONWOOD | | 83.33 | 47.16 | 18.00 |
| SILVER MAPLE | | 83.33 | 152.79 | 10.00 |
| MISCELLANEOUS | | 166.67 | 73.68 | 10.36 |
| | TOTAL | 416.67 sq.ft./A | 311.83/A | |
| Class 9 Grapevine | | | | |
| ASH SP | | 166.67 | 49.13 | 24.94 |
| COTTONWOOD | | 250.00 | 64.05 | 26.75 |
| HACKBERRY | | 166.67 | 391.52 | 8.83 |
| SILVER MAPLE | | 666.67 | 601.47 | 14.26 |
| SYCAMORE | | 166.67 | 42.09 | 26.94 |
| | TOTAL | 1,416.67 sq.ft./A | 1,148.26/A | |

WARD IV (IL) UNIT NO. I
Total Stand Summary

| Sp. | Ba/Aft$^2$ | # Trees/A | Vol/ABd.ft. | Av. Diameter (in.) |
|---|---|---|---|---|
| Ash | 10.67 | 9.02 | 693.95 | 14.73 |
| Boxelder | 0.67 | 1.91 | 0.0 | 8.00 |
| Cottonwood | 4.67 | 1.46 | 267.50 | 24.19 |
| Elm Sp | 5.33 | 20.43 | 216.84 | 6.92 |
| Hackberry | 3.33 | 10.12 | 145.15 | 7.77 |
| Honey Locust | 4.00 | 32.45 | 413.51 | 17.31 |
| Silver Maple | 77.33 | 57.38 | 5058.08 | 15.72 |
| Sycamore | 1.33 | 0.51 | 120.64 | 21.83 |
| Misc | 2.67 | 2.80 | 0.0 | 13.21 |
| TOTAL | 110.00 sq.ft. | 106.08 | 6915.68 Bd.ft. | |

| Statistical Analysis | Mean/A | 95% Confidence Interval | |
|---|---|---|---|
| Int. 1/4" Bd. Ft. | 6915.7 | 5088.18 | 8742.13 |
| Sq. Ft. Basal Area | 110.0 | 92.24 | 127.76 |
| # Of Trees | 106.1 | 65.27 | 146.89 |

Average Annual Growth Per Acre Int. 1/4" Bd. Ft. 193.88 81.1
Sq. Ft. Basal Area 0.58

FOR CLASSES 5-9 Wildlife Related Inventory Data
Per Acre Figures

| SPECIES LISTING | BASAL AREA (sq.ft./A) | NO. TREES/A | AVERAGE DIAMETER (inches) |
|---|---|---|---|
| Class 5 Den Tree - Upper Cavity (Upper 1/4 Bole) | | | |
| HONEY LOCUST | .67 | .31 | 20.00 |
| SILVER MAPLE | 3.33 | 1.65 | 19.23 |
| TOTAL | 4.00 sq.ft./A | 1.96/A | |
| Class 6 Den Tree - Lower Cavity (Lower 3/4 Bole) | | | |
| ASH SP | .67 | .31 | 20.00 |
| COTTONWOOD | .67 | .08 | 40.00 |
| SILVER MAPLE | .67 | .25 | 22.00 |
| TOTAL | 2.00 sq.ft./A | .63/A | |

FOR CLASSES 5-9 Wildlife Related Inventory Data (Cont'd)
Per Acre Figures

| SPECIES LISTING | | BASAL AREA (sq.ft./A) | NO. TREES/A | AVERAGE DIAMETER (inches) |
|---|---|---|---|---|
| Class 7 Standing Dead Tree | | | | |
| ASH SP | | .67 | .48 | 16.00 |
| COTTONWOOD | | .67 | .48 | 16.00 |
| ELM SP | | .67 | 1.91 | 8.00 |
| SILVER MAPLE | | 3.33 | 2.33 | 16.18 |
| MISCELLANEOUS | | 2.67 | 2.80 | 31.21 |
| | TOTAL | 8.00 sq.ft./A | 8.00/A | |
| Class 9 Grapevine | | | | |
| ASH SP | | 2.67 | 2.08 | 15.32 |
| COTTONWOOD | | 1.33 | .31 | 28.24 |
| ELM SP | | 2.67 | 2.39 | 14.30 |
| HONEY LOCUST | | 3.33 | 1.82 | 18.30 |
| SILVER MAPLE | | 27.33 | 17.27 | 17.03 |
| MISCELLANEOUS | | .67 | .62 | 15.00 |
| | TOTAL | 38.00 sq.ft./A | 24.50/A | |

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FABIUS ISLAND UNIT NO. V
Total Stand Summary

| Sp. | Ba/Aft$^2$ | # Trees/A | Vol/ABd.ft. | Av. Diameter (in.) |
|---|---|---|---|---|
| Ash Sp | 2.63 | 2.66 | 270.38 | 13.46 |
| Boxelder | 7.89 | 32.84 | 198.65 | 6.64 |
| Cottonwood | 46.32 | 23.00 | 5,865.87 | 19.22 |
| Elm Sp | 5.79 | 47.81 | 119.76 | 4.71 |
| Hackberry | 2.11 | 48.62 | 64.83 | 2.82 |
| Honey Locust | .53 | .38 | 83.80 | 16.00 |
| Silver Maple | 64.74 | 76.65 | 4,966.39 | 12.44 |
| Sycamore | 2.43 | 1.40 | 276.18 | 18.58 |
| Misc | 2.11 | 4.22 | 52.64 | 9.56 |
| TOTAL | 134.40 sq.ft. | 237.58 | 11,898.51 Bd.ft. | |

| Statistical Analysis | Mean/A | 95% Confidence Level | |
|---|---|---|---|
| Int. 1/4" Bd. Ft. | 11,898.5 | 9,252.07 | 14,544.95 |
| Sq. Ft. Basal Area | 135.3 | 109.94 | 160.58 |
| # of Trees | 237.7 | 114.08 | 361.29 |

Average Annual Growth Per Acre Int. 1¼" Bd Ft 181.9
Sq. Ft. Basal Area .96

FOR CLASSES 5-9 Wildlife Related Inventory Data
Per Acre Figures

| SPECIES LISTING | BASAL AREA (sq.ft./A) | NO. TREES/A | AVERAGE DIAMETER (inches) |
|---|---|---|---|
| **Class 5 Den Tree - Upper Cavity (Upper 1/4 Bole)** | | | |
| BOXELDER | 1.05 | .54 | 18.83 |
| SILVER MAPLE | 4.74 | 1.58 | 23.48 |
| MISCELLANEOUS | .53 | .67 | 12.00 |
| TOTAL | 6.32 sq.ft./A | 2.79/A | |
| **Class 6 Den Tree - Lower Cavity (Lower 3/4 Bole)** | | | |
| BOXELDER | .53 | .30 | 18.00 |
| COTTONWOOD | .53 | .17 | 24.00 |
| SILVER MAPLE | 3.68 | 1.31 | 22.69 |
| TOTAL | 4.74 sq.ft./A | 1.78/A | |
| **Class 7 Standing Dead Tree** | | | |
| COTTONWOOD | 2.63 | 2.72 | 13.31 |
| SILVER MAPLE | .53 | .49 | 14.00 |
| MISCELLANEOUS | 1.05 | 1.16 | 12.88 |
| TOTAL | 4.21 sq.ft./A | 4.38/A | |
| **Class 8 Leaf Nest** | | | |
| SILVER MAPLE | .53 | .17 | 24.00 |
| TOTAL | .53 sq.ft./A | .17/A | |

FOR CLASSES 5-9 Wildlife Related Inventory Data (Cont'd)
Per Acre Figures

| SPECIES LISTING | | BASAL AREA (sq.ft./A) | NO. TREES/A | AVERAGE DIAMETER (inches) |
|---|---|---|---|---|
| Class 9 Grapevine | | | | |
| BOXELDER | | 2.11 | 1.08 | 18.87 |
| COTTONWOOD | | 12.63 | 4.93 | 21.67 |
| ELM SP | | 1.58 | 8.21 | 5.94 |
| SILVER MAPLE | | 15.79 | 23.08 | 11.20 |
| SYCAMORE | | 1.58 | .37 | 27.86 |
| MISCELLANEOUS | | 1.05 | .87 | 14.90 |
| | TOTAL | 34.74 sq.ft./A | 38.55/A | |

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GOOSE ISLAND UNIT NO. VIII
Total Stand Summary

| Sp. | Ba/Aft$^2$ | # Trees/A | Vol/ABd.ft. | Av. Diameter (in.) |
|---|---|---|---|---|
| Ash Sp | 1.54 | .54 | 122.77 | 22.93 |
| Boxelder | 2.31 | 9.25 | 0.00 | 6.76 |
| Cottonwood | 32.31 | 11.42 | 1,564.29 | 22.77 |
| Elm Sp | 6.15 | 54.53 | 59.36 | 4.55 |
| Honey Locust | .77 | 35.26 | 0.00 | 2.00 |
| Silver Maple | 70.77 | 95.57 | 4,299.62 | 11.65 |
| Willow Sp | 1.54 | 4.90 | 0.00 | 7.59 |
| Misc | 5.38 | 4.97 | 0.00 | 14.09 |
| TOTAL | 120.77 sq.ft. | 216.44 | 6,036.04 Bd.ft. | |

| Statistical Analysis | Mean/A | 95% Confidence Level | |
|---|---|---|---|
| Int. 1/4" Bd. Ft. | 6,036.0 | 2,705.64 | 9,366.45 |
| Sq. Ft. Basal Area | 120.8 | 84.81 | 156.73 |
| # of Trees | 216.4 | 83.58 | 349.30 |

Average Annual Growth Per Acre Int. 11/4" Bd Ft 154.6
Sq. Ft. Basal Area .74

FOR CLASSES 5-9 **Wildlife Related Inventory Data**
Per Acre Figures

| SPECIES LISTING | | BASAL AREA (sq.ft./A) | NO. TREES/A | AVERAGE DIAMETER (inches) |
|---|---|---|---|---|
| Class 5 Den Tree - Upper Cavity (Upper 1/4 Bole) | | | | |
| SILVER MAPLE | | 1.54 | .39 | 26.94 |
| | TOTAL | 1.54 sq.ft./A | .39/A | |
| Class 6 Den Tree - Lower Cavity (Lower 3/4 Bole) | | | | |
| SILVER MAPLE | | 1.54 | .33 | 29.10 |
| MISCELLANEOUS | | 1.54 | .53 | 23.01 |
| | TOTAL | 3.08 sq.ft./A | .87/A | |
| Class 7 Standing Dead Tree | | | | |
| COTTONWOOD | | 6.15 | 1.68 | 25.95 |
| ELM SP | | .77 | .44 | 18.00 |
| SILVER MAPLE | | 2.31 | 1.37 | 17.59 |
| MISCELLANEOUS | | 4.62 | 4.25 | 14.11 |
| | TOTAL | 13.85 sq.ft./A | 7.73/A | |
| Class 9 Grapevine | | | | |
| COTTONWOOD | | 8.46 | 2.77 | 23.68 |
| ELM SP | | 1.54 | 37.46 | 2.74 |
| HONEY LOCUST | | .77 | 35.26 | 2.00 |
| SILVER MAPLE | | 8.46 | 8.46 | 13.54 |
| | TOTAL | 19.23 sq.ft./A | 83.95/A | |

NORTH SNY (IL) UNIT NO. XII

Total Stand Summary

| Sp. | Ba/Aft$^2$ | # Trees/A | Vol/ABd.ft. | Av. Diameter (in.) |
|---|---|---|---|---|
| Ash | 15.65 | 37.43 | 1215.18 | 8.76 |
| Basswood | 0.65 | 3.88 | 14.20 | 5.55 |
| River Birch | 3.26 | 4.17 | 171.94 | 11.98 |
| Boxelder | 1.52 | 6.74 | 6.89 | 6.43 |
| Coffeetree | 0.22 | 0.08 | 31.87 | 22.00 |
| Cottonwood | 11.30 | 5.52 | 1090.46 | 19.37 |
| Elm Sp | 5.87 | 56.69 | 114.09 | 4.36 |
| Hackberry | 12.61 | 41.50 | ******* | 7.43 |
| Honey Locust | 2.61 | 1.29 | 120.74 | 19.26 |
| Sugar Maple | 0.22 | 0.20 | 12.05 | 14.00 |
| Silver Maple | 66.30 | 127.75 | 4909.11 | 9.75 |
| Black Oak | 0.22 | 0.12 | 8.19 | 18.00 |
| Pin Oak | 4.78 | 2.92 | 522.72 | 17.33 |
| Swamp White Oak | 1.74 | 4.72 | 119.47 | 8.22 |
| Pecan | 0.43 | 0.13 | 50.82 | 24.94 |
| Sycamore | 3.04 | 4.22 | 414.21 | 11.50 |
| Willow Sp | 1.30 | 2.14 | 25.23 | 10.56 |
| Misc | 6.98 | 35.10 | 138.39 | 5.98 |
| TOTAL | 138.70 sq.ft. | 335.65 | ******* Bd.ft. | |

| Statistical Analysis | Mean/A | 95% Confidence Level | |
|---|---|---|---|
| Int. 1/4" Bd. Ft. | ******* | ******* | ******** |
| Sq. Ft. Basal Area | 135.3 | 127.42 | 151.28 |
| # of Trees | 345.9 | 225.48 | 466.28 |

Average Annual Growth Per Acre Int. 11/4" Bd Ft 225.39
Sq. Ft. Basal Area 1.21

FOR CLASSES 5-10 Wildlife Related Inventory Data
Per Acre Figures

| SPECIES LISTING | BASAL AREA (sq.ft./A) | NO. TREES/A | AVERAGE DIAMETER (inches) |
|---|---|---|---|
| Class 5 Den Tree - Upper Cavity | | | |
| ASH SP | 1.09 | .49 | 20.08 |
| COTTONWOOD | .22 | .02 | 40.00 |
| HACKBERRY | .43 | .52 | 12.36 |
| HONEY LOCUST | .65 | .19 | 25.14 |
| SILVER MAPLE | 4.13 | 1.59 | 21.82 |
| SYCAMORE | .22 | .02 | 40.00 |
| TOTAL | 6.74 sq.ft./A | 2.84/A | |

FOR CLASSES 5-10 Wildlife Related Inventory Data (Cont'd)
Per Acre Figures

| SPECIES LISTING | BASAL AREA | NO. TREES/A | AVERAGE DIAMETER |
|---|---|---|---|
| **Class 6 Den Tree - Lower Cavity** | | | |
| ASH SP | .43 | .29 | 16.70 |
| RIVER BIRCH | .22 | .03 | 38.00 |
| HACKBERRY | .22 | .20 | 14.00 |
| SILVER MAPLE | 2.83 | .87 | 24.39 |
| SYCAMORE | .22 | .03 | 34.00 |
| TOTAL | 3.91 sq.ft./A | 1.42/A | |
| **Class 7 Standing Dead Tree** | | | |
| ASH SP | .22 | .12 | 18.00 |
| RIVER BIRCH | .22 | .04 | 30.00 |
| BOXELDER | .22 | .20 | 14.00 |
| COTTONWOOD | .87 | .28 | 23.93 |
| HONEY LOCUST | .87 | .39 | 20.12 |
| SILVER MAPLE | 1.30 | .61 | 19.72 |
| PIN OAK | .22 | .07 | 24.00 |
| WILLOW SP | .22 | .62 | 8.00 |
| MISCELLANEOUS | 1.96 | 1.37 | 16.18 |
| TOTAL | 6.09 sq.ft./A | 3.72/A | |
| **Class 8 Leaf Nest** | | | |
| ASH SP | .22 | .20 | 14.00 |
| COFFEETREE | .22 | .08 | 22.00 |
| HACKBERRY | .43 | .29 | 16.70 |
| ELM SP | .22 | .20 | 14.00 |
| SILVER MAPLE | .65 | 10.44 | 3.38 |
| PIN OAK | .65 | .40 | 17.23 |
| TOTAL | 6.09 sq.ft./A | 11.61/A | |

FOR CLASSES 5-10 Wildlife Related Inventory Data (Cont'd)
Per Acre Figures

| SPECIES LISTING | | BASAL AREA (sq.ft./A) | NO. TREES/A | AVERAGE DIAMETER (inches) |
|---|---|---|---|---|
| Class 9 Grapevine | | | | |
| ASH SP | | 3.04 | 2.14 | 16.13 |
| BASSWOOD | | .22 | .28 | 12.00 |
| RIVER BIRCH | | .87 | .18 | 29.62 |
| BOXELDER | | .22 | .16 | 16.00 |
| COFFEETREE | | .22 | .08 | 22.00 |
| COTTONWOOD | | 4.13 | .89 | 29.23 |
| ELM SP | | 1.09 | 2.33 | 9.24 |
| HACKBERRY | | 3.91 | 10.94 | 8.10 |
| HONEY LOCUST | | .87 | .62 | 15.98 |
| SILVER MAPLE | | 19.13 | 19.58 | 13.38 |
| PIN OAK | | 1.09 | .70 | 16.89 |
| SWAMP WHITE OAK | | .43 | .18 | 20.93 |
| SYCAMORE | | .87 | .74 | 14.72 |
| MISCELLANEOUS | | 1.74 | 11.45 | 5.28 |
| | TOTAL | 37.83 sq.ft./A | 50.28/A | |
| Class 10 | | | | |
| BUR OAK | | .22 | .12 | 18.00 |
| PIN OAK | | 4.57 | 2.85 | 17.14 |
| SWAMP WHITE OAK | | 1.74 | 4.72 | 8.22 |
| PECAN | | .43 | .13 | 24.94 |
| | TOTAL | 6.96 sq.ft./A | 7.82/A | |

AVERAGE ACORN AND NUT YIELD BY SPECIES

| SPECIES LISTING | | POUNDS PER ACRE | TOTAL POUNDS |
|---|---|---|---|
| BUR OAK | | .59 | 270.00 |
| PIN OAK | | 10.57 | 4,860.00 |
| | TOTAL ACORNS | 11.15 sq.ft./A | 5,130.00 lbs. |

SOUTH SNY (IL) UNIT NO. XIII

Total Stand Summary

| Sp. | Ba/Aft$^2$ | # Trees/A | Vol/ABd.ft. | Av. Diameter (in.) |
|---|---|---|---|---|
| Ash Sp | 6.80 | 3.04 | 651.42 | 20.26 |
| Boxelder | 0.40 | 0.37 | 22.17 | 14.00 |
| Cottonwood | 3.60 | 3.82 | 284.20 | 13.14 |
| Elm Sp | 6.80 | 40.35 | 103.98 | 5.56 |
| Hackberry | 24.00 | 75.17 | 708.75 | 7.65 |
| Honey Locust | 2.80 | 1.17 | 312.62 | 20.90 |
| Silver Maple | 86.80 | 112.99 | 5763.02 | 11.87 |
| Pecan | 1.20 | 0.41 | 148.99 | 23.16 |
| Sycamore | 1.60 | 19.03 | 148.29 | 3.93 |
| Willow Sp | 0.80 | 0.35 | 48.99 | 19.27 |
| Misc | 2.40 | 6.01 | 0.0 | 8.55 |
| TOTAL | 137.20 sq.ft. | 262.81 | 8192.02 Bd.ft. | |

| Statistical Analysis | Mean/A | 95% Confidence Interval | |
|---|---|---|---|
| Int. 1/4" Bd. Ft. | 8192.0 | 6322.07 | 10061.95 |
| Sq. Ft. Basal Area | 137.2 | 118.80 | 155.60 |
| # of Trees | 262.8 | 174.98 | 350.65 |

Average Annual Growth Per Acre Int. 1/4" Bd. Ft. 224.6
Sq. Ft. Basal Area 1.38

FOR CLASSES 5-10 Wildlife Related Inventory Data
Per Acre Figures

| SPECIES LISTING | BASAL AREA (sq.ft./A) | NO. TREES/A | AVERAGE DIAMETER (inches) |
|---|---|---|---|
| Class 5 Den Tree - Upper Cavity (Upper 1/4 Bole) | | | |
| ASH SP | .40 | .09 | 28.00 |
| HACKBERRY | 1.20 | 18.80 | 3.42 |
| HONEY LOCUST | .80 | .33 | 20.93 |
| SILVER MAPLE | 6.40 | 1.85 | 25.20 |
| MISCELLANEOUS | .40 | .05 | 40.00 |
| TOTAL | 9.20 sq.ft./A | 21.13/A | |

FOR CLASSES 5-10 Wildlife Related Inventory Data (Cont'd)
Per Acre Figures

| SPECIES LISTING | | BASAL AREA (sq.ft./A) | NO. TREES/A | AVERAGE DIAMETER (inches) |
|---|---|---|---|---|
| Class 6 Den Tree - Lower Cavity (Lower 3/4 Bole) | | | | |
| HACKBERRY | | .40 | .29 | 16.00 |
| SILVER MAPLE | | 2.40 | .68 | 25.45 |
| | TOTAL | 2.80 sq.ft./A | .97/A | |
| Class 7 Standing Dead Tree | | | | |
| COTTONWOOD | | .40 | .15 | 22.00 |
| HACKBERRY | | .40 | .37 | 14.00 |
| SILVER MAPLE | | 3.20 | 2.37 | 15.74 |
| MISCELLANEOUS | | 1.60 | 1.38 | 14.56 |
| | TOTAL | 5.60 sq.ft./A | 4.28/A | |
| Class 8 Leaf Nest | | | | |
| SILVER MAPLE | | .40 | .06 | 36.00 |
| | TOTAL | .40 sq.ft./A | .06/A | |
| Class 9 Grapevine | | | | |
| ASH SP | | 4.00 | 1.11 | 25.65 |
| BOXELDER | | .40 | .37 | 14.00 |
| COTTONWOOD | | 2.00 | 1.91 | 13.86 |
| ELM SP | | 2.00 | 5.02 | 8.54 |
| HACKBERRY | | 12.00 | 38.51 | 7.56 |
| HONEY LOCUST | | 1.20 | .43 | 22.61 |
| SILVER MAPLE | | 30.40 | 14.13 | 19.86 |
| PECAN | | .80 | .28 | 22.77 |
| SYCAMORE | | .80 | .51 | 16.91 |
| MISCELLANEOUS | | .80 | .14 | 32.44 |
| | TOTAL | 54.40 sq.ft./A | 62.43/A | |
| Class 10 | | | | |
| PECAN | | 1.20 | .41 | 23.16 |
| | TOTAL | 1.20 sq.ft./A | .41/A | |

ARMSTRONG ISLAND UNIT NO. XIV

Total Stand Summary

| Sp. | Ba/Aft$^2$ | # Trees/A | Vol/ABd.ft. | Av. Diameter (in.) |
|---|---|---|---|---|
| Ash | 8.89 | 7.92 | 934.95 | 14.35 |
| Boxelder | 1.67 | 6.06 | 0.0 | 7.10 |
| Cottonwood | 22.78 | 6.91 | 2816.49 | 24.58 |
| Elm Sp | 5.56 | 28.50 | 104.56 | 5.98 |
| Hackberry | 4.44 | 7.12 | 162.71 | 10.70 |
| Honey Locust | 0.56 | 0.18 | 94.70 | 24.00 |
| Silver Maple | 85.56 | 124.80 | 5547.40 | 11.21 |
| Pecan | 0.56 | 0.25 | 67.61 | 20.00 |
| Sycamore | 1.11 | 0.34 | 143.95 | 24.46 |
| Willow Sp | 1.67 | 1.94 | 59.91 | 12.56 |
| Misc | 3.33 | 3.03 | 0.0 | 14.20 |
| TOTAL | 136.11 sq.ft. | 187.04 | 9931.91 Bd.ft. | |

| Statistical Analysis | Mean/A | 95% Confidence Level | |
|---|---|---|---|
| Int. 1/4" Bd. Ft. | 9931.9 | 7032.07 | 12831.73 |
| Sq. Ft. Basal Area | 136.1 | 116.28 | 155.94 |
| # of Trees | 187.0 | 113.52 | 260.56 |

Average Annual Growth Per Acre Int. 11/4" Bd Ft 262.4
Sq. Ft. Basal Area 1.24

FOR CLASSES 5-10 Per Acre Figures

Wildlife Related Inventory Data

| SPECIES LISTING | BASAL AREA (sq.ft./A) | NO. TREES/A | AVERAGE DIAMETER (inches) |
|---|---|---|---|
| Class 5 Den Tree - Upper Cavity (Upper 1/4 Bole) | | | |
| SILVER MAPLE | 4.44 | 1.06 | 27.66 |
| TOTAL | 4.44 sq.ft./A | 1.06/A | |
| Class 6 Den Tree - Lower Cavity (Lower 3/4 Bole) | | | |
| COTTONWOOD | .56 | .11 | 30.00 |
| SILVER MAPLE | 3.33 | 4.38 | 11.81 |
| TOTAL | 3.89 sq.ft./A | 4.49/A | |

FOR CLASSES 5-10 Wildlife Related Inventory Data
Per Acre Figures

| SPECIES LISTING | | BASAL AREA (sq.ft./A) | NO. TREES/A | AVERAGE DIAMETER (inches) |
|---|---|---|---|---|
| Class 7 Standing Dead Tree | | | | |
| COTTONWOOD | | .56 | .10 | 32.00 |
| SILVER MAPLE | | .56 | .21 | 22.00 |
| WILLOW SP | | .56 | .52 | 14.00 |
| MISCELLANEOUS | | 3.33 | 3.03 | 14.20 |
| | TOTAL | 5.00 sq.ft./A | 3.86/A | |
| Class 9 Grapevine | | | | |
| ASH SP | | 4.44 | 3.56 | 15.13 |
| BOXELDER | | 1.67 | 6.06 | 7.10 |
| COTTONWOOD | | 5.56 | 1.63 | 25.02 |
| ELM SP | | 2.78 | 16.84 | 5.50 |
| HACKBERRY | | 1.11 | 1.11 | 13.58 |
| SILVE MAPLE | | 45.56 | 58.27 | 11.97 |
| SYCAMORE | | 1.11 | .34 | 24.46 |
| WILLOW SP | | .56 | 1.02 | 10.00 |
| MISCELLANEOUS | | 1.11 | .65 | 17.67 |
| | TOTAL | 63.89 sq.ft./A | 89.46/A | |
| Class 10 | | | | |
| PECAN | | .56 | .25 | 20.00 |
| | TOTAL | .56 sq.ft./A | .25/A | |

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WHITNEY ISLANDS UNIT NO. X
Total Stand Summary

| Sp. | Ba/Aft$^2$ | # Trees/A | Vol/ABd.ft. | Av. Diameter (in.) |
|---|---|---|---|---|
| Ash Sp | 1.00 | 0.38 | 154.75 | 22.00 |
| Boxelder | 3.00 | 18.39 | 28.88 | 5.47 |
| Cottonwood | 66.00 | 27.63 | 5400.51 | 20.93 |
| Elm Sp | 4.00 | 17.99 | 0.0 | 6.38 |
| Silver Maple | 96.00 | 135.01 | 7098.41 | 11.42 |
| Sycamore | 3.00 | 3.26 | 305.54 | 12.98 |
| Willow Sp | 4.00 | 4.05 | 36.29 | 13.46 |
| TOTAL | 177.00 sq.ft. | 206.71 | 17024.37 Bd.ft. | |

| Statistical Analysis | Mean/A | 95% Confidence Interval | |
|---|---|---|---|
| Int. 1/4" Bd. Ft. | 17024.4 | 11547.45 | 22501.27 |
| Sq. Ft. basal Area | 177.0 | 132.57 | 121.49 |
| # of Trees | 206.7 | 112.02 | 301.41 |

Average Annual Growth Per Acre Int. 1/4" Bd Ft. 550.2
Sq. Ft. Basal Area 2.56

FOR CLASSES 5-10 Wildlife Related Inventory Data
Per Acre Figures

| SPECIES LISTING | BASAL AREA (sq.ft./A) | NO. TREES/A | AVERAGE DIAMETER (inches) |
|---|---|---|---|
| Class 5 Den Tree - Upper Cavity (Upper 1/4 Bole) | | | |
| WILLOW SP | 1.00 | .57 | 18.00 |
| TOTAL | 1.00 sq.ft./A | .57/A | |
| Class 7 Standing Dead Tree (Lower 3/4 Bole) | | | |
| COTTONWOOD | 1.00 | .72 | 16.00 |
| SILVER MAPLE | 1.00 | 1.83 | 10.00 |
| WILLOW SP | 1.00 | 1.27 | 12.00 |
| TOTAL | 3.00 sq.ft./A | 3.82/A | |
| Class 9 Grapevine | | | |
| BOXELDER | 1.00 | 1.83 | 10.00 |
| COTTONWOOD | 7.00 | 3.15 | 20.20 |
| SILVER MAPLE | 17.00 | 21.52 | 12.03 |
| SYCAMORE | 1.00 | 1.27 | 12.00 |
| TOTAL | 26.00 sq.ft./A | 7.77/A | |

BAY D CHARLES I (MO) UNIT NO. XVI

Total Stand Summary

| Sp. | Ba/Aft$^2$ | # Trees/A | Vol/ABd.ft. | Av. Diameter (in.) |
|---|---|---|---|---|
| Ash | 5.00 | 33.66 | 33.66 | 358.91 |
| Basswood | 0.83 | 2.39 | 0.0 | 8.00 |
| River Birch | 1.25 | 1.36 | 28.73 | 12.93 |
| Boxelder | 0.42 | 1.19 | 0.09 | 8.00 |
| Cottonwood | 34 58 | 26.35 | 4131.53 | 15.51 |
| Elm Sp | 10.42 | 123.81 | 240.81 | 3.93 |
| Hackberry | 1.67 | 29.84 | 0.0 | 3.20 |
| Honey Locust | 0.42 | 0.24 | 49.16 | 18.00 |
| Silver Maple | 62.08 | 197.21 | 2668.81 | 7.60 |
| Pin Oak | 0.83 | 0.28 | 51.57 | 23.53 |
| Pecan | 1.67 | 0.58 | 238.55 | 22.98 |
| Sycamore | 1.25 | 5.01 | 15.24 | 6.76 |
| Willow Sp | 8.75 | 15.15 | 272.18 | 10.28 |
| Misc | 4.17 | 4.68 | 0.07 | 12.78 |
| TOTAL | 133.33 sq.ft | 441.79 | 8054.72 Bd.ft. | |

| Statistical Analysis | Mean/A | 95% Confidence Level | |
|---|---|---|---|
| Int. 1/4" Bd. Ft. | 8.054.7 | 6145.05 | 9964.37 |
| Sq. Ft. Basal Area | 133.7 | 113.52 | 153.98 |
| # of Trees | 442.6 | 307.62 | 577.49 |

Average Annual Growth Per Acre Int. 11/4" Bd Ft 368.3
Sq. Ft. Basal Area 1.57

FOR CLASSES 5-10 Wildlife Related Inventory Data
Per Acre Figures

| SPECIES LISTING | BASAL AREA (sq.ft./A) | NO. TREES/A | AVERAGE DIAMETER (inches) |
|---|---|---|---|
| Class 5 Den Tree - Upper Cavity (Upper 1/4 Bole) | | | |
| COTTONWOOD | .42 | .05 | 40.00 |
| SILVER MAPLE | 1.67 | .45 | 26.08 |
| TOTAL | 2.08 sq.ft./A | .50/A | |

FOR CLASSES 5-10 Wildlife Related Inventory Data (Cont'd)
Per Acre Figures

| SPECIES LISTING | | BASAL AREA (sq.ft./A) | NO. TREES/A | AVERAGE DIAMETER (inches) |
|---|---|---|---|---|
| Class 6 Den Tree - Lower Cavity (Lower 3/4 Bole) | | | | |
| SILVER MAPLE | | 1.25 | .59 | 19.73 |
| | TOTAL | 1.25 sq.ft./A | .59/A | |
| Class 7 Standing Dead Tree | | | | |
| RIVER BIRCH | | .42 | .53 | 12.00 |
| COTTONWOOD | | 2.50 | 4.07 | 10.61 |
| SILVER MAPLE | | 2.50 | 2.61 | 13.26 |
| PIN OAK | | .42 | .19 | 20.00 |
| WILLOW SP | | 1.25 | 3.42 | 8.19 |
| MISCELLANEOUS | | 3.33 | 2.72 | 14.98 |
| | TOTAL | 10.42 sq.ft./A | 13.54/A | |
| Class 8 Leaf Nest | | | | |
| ASH SP | | .42 | .24 | 18.00 |
| SILVER MAPLE | | 1.25 | 1.92 | 10.94 |
| | TOTAL | 1.67 sq.ft./A | 2.15/A | |
| Class 10 | | | | |
| PIN OAK | | .42 | .08 | 30.00 |
| PECAN | | 1.67 | .58 | 22.98 |
| | TOTAL | 2.08 sq.ft./A | .66/A | |

AVERAGE ACORN AND NUT YIELD BY SPECIES

| SPECIES LISTING | | POUNDS PER ACRE | TOTAL POUNDS |
|---|---|---|---|
| PIN OAK | | .96 | 343.08 |
| | TOTAL ACORNS | .96 lbs./A | 343.08 lbs. |

BAY D CHARLES II (MO) UNIT NO. XVI
Total Stand Summary

| Sp. | Ba/Aft$^2$ | # Trees/A | Vol/ABd.ft. | Av. Diameter (in.) |
|---|---|---|---|---|
| Ash Sp | 4.12 | 14.06 | 312.77 | 7.33 |
| River Birch | 0.59 | 0.12 | 0.0 | 30.00 |
| Boxelder | 1.76 | 60.67 | 0.0 | 2.31 |
| Cottonwood | 8.82 | 3.55 | ******* | 21.35 |
| Elm Sp | 5.88 | 70.20 | 0.0 | 3.92 |
| Hackberry | 4.12 | 32.91 | 103.14 | 4.79 |
| Silver Maple | 38.82 | 132.21 | 2199.78 | 7.34 |
| Pin Oak | 10.00 | 2.71 | 802.84 | 25.99 |
| Pecan | 10.00 | 5.02 | 849.27 | 19.10 |
| Persimmon | 0.59 | 1.08 | 0.0 | 10.00 |
| Misc | 3.53 | 2.01 | 0.0 | 17.96 |
| TOTAL | 88.24 sq.ft. | 324.54 | ******** Bd.ft. | |

| Statistical Analysis | Mean/A | 95% Confidence Interval | |
|---|---|---|---|
| Int. 1/4" 80. Ft. | 5399.2 | 2849.70 | 7948.70 |
| Sq. Ft. Basal Area | 95.2 | 68.13 | 123.63 |
| # of Trees | 326.7 | 60.86 | 492.63 |

Average Annual Growth Per Acre Int. 1/4" Bd. Ft. *******
Sq. Ft. Basal Area 1.13

FOR CLASSES 5-10 Wildlife Related Inventory Data
Per Acre Figures

| SPECIES LISTING | BASAL AREA (sq.ft./A) | NO. TREES/A | AVERAGE DIAMETER (inches) |
|---|---|---|---|
| Class 5 Den Tree - Upper Cavity (Upper 1/4 Bole) | | | |
| SILVER MAPLE | 1.18 | .34 | 25.30 |
| PECAN | 1.18 | .25 | 29.10 |
| TOTAL | 2.35 sq.ft./A | .59/A | |

FOR CLASSES 5-10 Wildlife Related Inventory Data (Cont'd)
Per Acre Figures

| SPECIES LISTING | BASAL AREA (sq.ft./A) | NO. TREES/A | AVERAGE DIAMETER (inches) |
|---|---|---|---|
| **Class 6 Den Tree - Lower Cavity (Lower 3/4 Bole)** | | | |
| COTTONWOOD | .59 | .19 | 24.00 |
| SILVER MAPLE | .59 | .07 | 38.00 |
| PIN OAK | 2.35 | .37 | 33.94 |
| PECAN | 1.18 | .30 | 26.94 |
| MISCELLANEOUS | .59 | .19 | 24.00 |
| TOTAL | 5.29 sq.ft./A | 1.12/A | |
| **Class 7 Standing Dead Tree** | | | |
| RIVER BIRCH | .59 | .12 | 30.00 |
| COTTONWOOD | 1.76 | .43 | 27.50 |
| HACKBERRY | .59 | 1.08 | 10.00 |
| PIN OAK | 1.76 | .52 | 24.84 |
| PECAN | 1.18 | .64 | 18.30 |
| MISCELLANEOUS | 3.53 | 2.01 | 17.96 |
| TOTAL | 9.41 sq.ft./A | 4.80/A | |
| **Class 8 Leaf Nest** | | | |
| SILVER MAPLE | 1.18 | .62 | 18.69 |
| PIN OAK | .59 | .27 | 20.00 |
| PECAN | 2.35 | .93 | 21.57 |
| TOTAL | 4.12 sq.ft./A | 1.81/A | |
| **Class 9 Grapevine** | | | |
| ASH SP | 2.35 | 10.62 | 6.37 |
| RIVER BIRCH | .59 | .12 | 30.00 |
| COTTONWOOD | 2.94 | 1.75 | 17.55 |
| ELM SP | 3.53 | 56.92 | 3.37 |
| HACKBERRY | 2.35 | 1.87 | 15.20 |
| SILVER MAPLE | 20.59 | 67.44 | 7.48 |
| PIN OAK | 7.06 | 1.84 | 26.54 |
| PECAN | 8.82 | 4.38 | 19.22 |
| MISCELLANEOUS | .59 | .42 | 16.00 |
| TOTAL | 48.82 sq.ft./A | 145.36/A | |

FOR CLASSES 5-10 Wildlife Related Inventory Data (Cont'd)
Per Acre Figures

| SPECIES LISTING | | BASAL AREA (sq.ft./A) | NO. TREES/A | AVERAGE DIAMETER (inches) |
|---|---|---|---|---|
| Class 10 | | | | |
| PIN OAK | | 8.82 | 2.26 | 26.77 |
| PECAN | | 8.82 | 4.38 | 19.22 |
| | TOTAL | 17.65 sq.ft./A | 6.64/A | |

AVERAGE ACORN AND NUT YIELD BY SPECIES

| SPECIES LISTING | | POUNDS PER ACRE | TOTAL POUNDS |
|---|---|---|---|
| PIN OAK | | 12.88 | 824.47 |
| | TOTAL | 12.88 lbs./A | 824.47 lbs. |

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NORTH OF THE JOHN RECREATION AREA ON THE ILLINOIS SHORE
BETWEEN RAILROAD BRIDGE AND JOHN HAY RECREATION AREA UNIT NO. XVII
Total Stand Summary

| Sp. | Ba/Aft$^2$ | # Trees/A | Vol/ABd.ft. | Av. Diameter (in.) |
|---|---|---|---|---|
| Ash | 6.67 | 12.43 | 378.38 | 9.91 |
| Cottonwood | 0.83 | 4.24 | 0.0 | 6.00 |
| Hackberry | 4.17 | 9.42 | 111.96 | 9.00 |
| Silver Maple | 73.33 | 80.29 | 4496.56 | 12.94 |
| Mulberry Sp | 1.67 | 47.75 | 0.0 | 2.53 |
| Pecan | 1.67 | 0.77 | 114.41 | 19.97 |
| Sycamore | 0.83 | 0.17 | 150.24 | 30.00 |
| Willow Sp | 0.83 | 1.06 | 76.39 | 12.00 |
| Misc | 4.17 | 1.87 | 0.0 | 20.20 |
| TOTAL | 94.17 sq.ft. | 4158.01 | 5327.93 Bd.ft. | |

| Statistical Analysis | Mean/A | 95% Confidence Level | |
|---|---|---|---|
| Int. 1/4" Bd. Ft. | 5327.9 | 2360.21 | 8295.66 |
| Sq. Ft. Basal Area | 94.2 | 65.31 | 123.02 |
| # of Trees | 158.0 | 49.81 | 266.21 |

Average Annual Growth Per Acre Int. 1¼" Bd Ft 73.4
Sq. Ft. Basal Area 0.35

FOR CLASSES 5-10 Wildlife Related Inventory Data
Per Acre Figures

| SPECIES LISTING | BASAL AREA (sq.ft./A) | NO. TREES/A | AVERAGE DIAMETER (inches) |
|---|---|---|---|
| Class 5 Den Tree - Upper Cavity (Upper 1/4 Bole) | | | |
| SILVER MAPLE | 3.33 | 2.67 | 15.13 |
| TOTAL | 3.33 sq.ft./A | 2.67/A | |
| Class 6 Den Tree - Lower Cavity (Lower 3/4 Bole) | | | |
| HACKBERRY | .83 | 1.53 | 10.00 |
| SILVER MAPLE | 1.67 | .75 | 20.24 |
| TOTAL | 2.50 sq.ft./A | 2.27/A | |
| Class 7 Standing Dead Tree | | | |
| MISCELLANEOUS | 4.17 | 1.87 | 20.20 |
| TOTAL | 4.17 sq.ft./A | 1.87/A | |
| Class 8 Leaf Nest | | | |
| SILVER MAPLE | 1.67 | .85 | 18.92 |
| TOTAL | 1.67 sq.ft./A | .85/A | |

FOR CLASSES 5-10 Wildlife Related Inventory Data (Cont'd)
Per Acre Figures

| SPECIES LISTING | | BASAL AREA (sq.ft./A) | NO. TREES/A | AVERAGE DIAMETER (inches) |
|---|---|---|---|---|
| Class 9 Grapevine | | | | |
| ASH SP | | .83 | 4.24 | 6.00 |
| HACKBERRY | | 3.33 | 5.18 | 10.86 |
| SILVER MAPLE | | 22.50 | 33.16 | 11.15 |
| PECAN | | 1.67 | .77 | 19.97 |
| MISCELLANEOUS | | 2.50 | 1.17 | 19.76 |
| | TOTAL | 30.83 sq.ft./A | 44.53/A | |
| Class 10 | | | | |
| PECAN | | 1.67 | .77 | 19.79 |
| | TOTAL | 1.67 sq.ft./A | .77/A | |

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SOUTH OF THE JOHN HAY RECREATION AREA ON ILLINOIS SHORE
BETWEEN RECREATION AREA AND RIVER MILE 308 UNIT NO. XVII

Total Stand Summary

| Sp. | Ba/Aft$^2$ | # Trees/A | Vol/ABd.ft. | Av. Diameter (in.) |
|---|---|---|---|---|
| Ash Sp | 7.22 | 10.40 | 449.33 | 11.28 |
| River Birch | 1.67 | 1.81 | 69.16 | 13.01 |
| Cottonwood | 6.11 | 2.58 | 977.45 | 20.83 |
| Elm Sp | 4.44 | 17.31 | 128.76 | 6.88 |
| Hackberry | 5.00 | 14.89 | 40.90 | 7.85 |
| Silver Maple | 65.00 | 191.74 | 3884.58 | 7.88 |
| Pin Oak | 2.22 | 1.09 | 234.66 | 19.30 |
| Willow Sp | 3.33 | 3.21 | 319.95 | 13.79 |
| Misc | 1.67 | 7.33 | 0.0 | 6.46 |
| TOTAL | 96.67 sq.ft. | 250.38 | 6104.77 Bd.ft. | |

| Statistical Analysis | Mean/A | 95% Confidence Interval | |
|---|---|---|---|
| Int. 1/4" 80. Ft. | 6104.8 | 3598.91 | 8619.63 |
| Sq. Ft. Basal Area | 96.7 | 74.36 | 118.97 |
| # of Trees | 250.4 | 105.86 | 394.89 |

Average Annual Growth Per Acre Int. 1/4" Bd. Ft. 551.5
Sq. Ft. Basal Area 3.07

FOR CLASSES 5-10 Wildlife Related Inventory Data
Per Acre Figures

| SPECIES LISTING | BASAL AREA (sq.ft./A) | NO. TREES/A | AVERAGE DIAMETER (inches) |
|---|---|---|---|
| **Class 5 Den Tree - Upper Cavity (Upper 1/4 Bole)** | | | |
| ASH SP | .56 | .21 | 22.00 |
| SILVER MAPLE | 1.11 | .49 | 20.36 |
| TOTAL | 1.67 sq.ft./A | .70/A | |
| **Class 6 Den Teee - Lower Cavity (Lower 3/4 Bole)** | | | |
| SILVER MAPLE | 1.11 | .61 | 18.30 |
| TOTAL | 1.11 sq.ft./A | .61/A | |
| **Class 7 Standing Dead Tree** | | | |
| ASH SP | .56 | .71 | 12.00 |
| SILVER MAPLE | .56 | .13 | 28.00 |
| PIN OAK | .56 | .25 | 20.00 |
| MISCELLANEOUS | .56 | .25 | 20.00 |
| TOTAL | 2.22 sq.ft./A | 1.35/A | |
| **Class 8 Leaf Nest** | | | |
| COTTONWOOD | .56 | .40 | 16.00 |
| HACKBERRY | 1.11 | 2.11 | 9.82 |
| SILVER MAPLE | 1.11 | .71 | 16.91 |
| TOTAL | 2.78 sq.ft./A | 3.22/A | |

FOR CLASSES 5-10 Wildlife Related Inventory Data
Per Acre Figures

| SPECIES LISTING | BASAL AREA (sq.ft./A) | NO. TREES/A | AVERAGE DIAMETER (inches) |
|---|---|---|---|
| Class 9 Grapevine | | | |
| ASH SP | 2.78 | 2.58 | 14.05 |
| RIVER BIRCH | .56 | .06 | 40.00 |
| COTTONWOOD | 4.44 | 1.88 | 20.81 |
| ELM SP | 3.33 | 11.65 | 7.24 |
| HACKBERRY | 4.44 | 14.18 | 7.58 |
| SILVER MAPLE | 26.67 | 63.24 | 8.79 |
| PIN OAK | 2.22 | 1.09 | 19.30 |
| MISCELLANEOUS | 1.11 | 7.07 | 5.37 |
| TOTAL | 45.56 sq.ft./A | 101.75/A | |

AVERAGE ACORN AND NUT YIELD BY SPECIES

| SPECIES LISTING | POUNDS PER ACRE | TOTAL POUNDS |
|---|---|---|
| PIN OAK | 5.22 | 731.11 |
| TOTAL ACORNS | 5.22 lbs./A | 731.11 lbs. |

LETTERS OF COORDINATION

ATTACHMENT 1 - Cover type/Prescription Aerial Photos

ATTACHMENT 2 - Letters of Coordination

| Agency | Date | Subject |
|---|---|---|
| Missouri Dept. of Conservation | 27 Jan 82 | Final Draft App. |
| Corps of Engineers, RID | | (Response) |
| Illinois Dept. of Conservation | 29 Jan 82 | Final Draft App. |
| Corps of Engineers, RID | | (Response) |
| Iowa Conservation Commission | 16 Feb 82 | Final Draft App. |
| Iowa Conservation Commission | 22 Feb 82 | Final Draft App. |
| Missouri Dept. of Conservation | 13 Aug 81 | Draft App. |
| Missouri Dept. of Conservation | 2 Sep 81 | Draft App. |
| Illinois Dept. of Conservation | 17 Sep 81 | Draft App. |
| Iowa Conservation Commission | 5 Oct 81 | Draft App. |
| US Fish and Wildlife Service | 15 Oct 81 | Draft App. |
| Iowa Office of Planning & Programming | 6 Jan 82 | E. Assessment |
| USDA SCS Iowa | 12 Jan 82 | E. Assessment |
| USDA SCS Illinois | 27 Jan 82 | E. Assessment |
| USDA SCS Wisconsin | 1 Feb 82 | E. Assessment |
| USDA SCS Missouri | 1 Feb 82 | E. Assessment |
| Corps of Engineers, RID | | (Response) |
| National Wildlife Federation | 2 Feb 82 | E. Assessment |
| Corps of Engineers, RID | | (Response) |
| US Fish and Wildlife Service | 4 Feb 82 | E. Assessment |
| Corps of Engineers, RID | | (Response) |
| Corps of Engineers, RID | 4 Mar 82 | Finding of No Significant Impact |

# MISSOURI DEPARTMENT OF CONSERVATION

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

STREET LOCATION:
2901 North Ten Mile Drive
Jefferson City, Missouri

Telephone 314/751-4115
LARRY R. GALE, Director

January 27, 1982

Colonel Bernard P. Slofer
District Engineer
Rock Island Corps of Engineers
Clock Tower Building
Rock Island, Illinois 61201

Re: NCROD-R-MR
Master Plan for Mississippi
River Pools 21 and 22

Dear Colonel Slofer:

Members of my staff have reviewed the formal draft of the Forestry, Fish and Wildlife Appendices to the Master Plan for certain Mississippi River pools. We appreciate the good working relationship we have had with Mr. Ralph Montrone of your staff during the development of these documents. The final draft represents a great deal of effort by your staff and we believe it will provide a good basis for managing forest resources. In addition, the plan will assist in the management of wildlife resources associated with forested lands.

The plan provides a good description of how the forest management objectives will be achieved (page 16). However, four wildlife management objectives are listed with little discussion on the strategies or management prescriptions for achieving the nonforest wildlife portion of these objectives. Relating management prescriptions outlined in the plan to the objectives would demonstrate the need to develop plans for aquatic and other wildlife resources and result in a more complete document. We would be interested in working with you and your staff in developing meaningful plans for the aquatic and other wildlife resources not covered in this document. Your thoughts or suggestions on how we might best meet that need would be appreciated.

Again, thank you for the opportunity to offer comments on this document.

Sincerely,

Larry R. Gale

LARRY R. GALE
DIRECTOR

cc: Office of Administration
A-95

U. S. Fish and Wildlife Service
Rock Island, Illinois

U. S. Fish and Wildlife Service
Quincy, Illinois

DEPARTMENT OF THE ARMY
ROCK ISLAND DISTRICT, CORPS OF ENGINEERS
CLOCK TOWER BUILDING
ROCK ISLAND, ILLINOIS 61201

REPLY TO
ATTENTION OF:

NCROD-R

Larry R. Gale, Director
Missouri Department of Conservation
P. O. Box 180
Jefferson City, Missouri 65102

Dear Mr. Gale,

We appreciate the comments on the Forestry, Fish and Wildlife Management Plan for the Mississippi River Pools 11-14, 16-18, 21 and 22, in your letter to our office dated 29 January 1982.

Regarding your request about developing meaningful plans for aquatic and wildlife resources, we view the authority and responsibility to write these plans as belonging to the US Fish and Wildlife Service (FWS) and appropriate state agencies.

We want to reemphasize that we will work closely with all involved state resource management agencies and the Fish and Wildlife Service to implement this plan. We hope this letter has clarified any confusion you have regarding the draft Forestry, Fish and Wildlife plan. If you have any questions they may be directed to our District Staff Forester, Ralph Montrone, at [redacted]

Sincerely,

BERNARD P. SLOFER
Colonel
Commander and District Engineer

CF: OD (Dist File)
OD-R
ED-PB
DD
DE

Illinois Department of Conservation

January 29, 1982

Bernard P. Slofer, Colonel
District Engineer
U.S. Army Engineer District, Rock Island
Clock Tower Building
Rock Island, Illinois 61201

Dear Colonel Slofer:

The Department of Conservation has completed its review of the Environmental Assessment and the final draft of the Forestry, Fish and Wildlife Appendice to the Master Plan for Pools 11-14, 16-18 and 21 and 22 of the Mississippi River. The following comments concerning the above documents are provided for your consideration:

Environmental Assessment

1. As stated under the Purpose Section "The plan emphasizes forestry management objectives for all project lands and represents the wildlife management objectives only for lands directly under Corps administration". The forestry management objectives must be in conjunction with all management objectives of the project, thus the objectives can benefit the project as a whole. Presently, we are not sure if a management objective complements or conflicts with the objective of another. The specific wildlife objectives and practices are not defined for the entire project area.

2. The first objective includes maintaining habitat that supports the greatest variety and numbers of self-sustaining wildlife species. While a laudable objective, there are certain species which depend more upon this major river corridor than others (e.g. Bald Eagle, waterfowl, river otter, Higgin's eye pearly mussel, colony nesting birds such as the great egret -- primarily those associated with large forests and large bodies of water and associated communities). Therefore, the management should emphasize directives for these species rather than providing equal weight to less restricted species.

3. Fifth Management Objective -- This objective should also include "nesting" habitat conditions for the species groups mentions; feeding and resting areas do not necessarily imply inclusion of nesting habitat.

4. Last Management Objective -- See comment on first objective.

5. Page 10 -- Item "e" should be added, discussing the impact of the use and management of areas that are recognized by the individual states as Natural Areas in that State.

6. Page 13 V. Environmental Consequences of Preferred Action, A. Social Impacts., 1. Noise. We are concerned about noise and disturbance during the waterfowl hunting season. Many of the areas referred to throughout the plan are adjacent to public duck blinds.

7. Page 18 -- Wood duck is not a notable exception -- they feed primarily on mast during fall.

8. The assessment should state the disposition of the wood material derived from the silvicultural practice. This is implied but not stated directly.

9. Great blue heron and/or egret rookeries have not all been identified. Reference is made to one or more under the Pool discussion portion of the Environmental Assessment. Many more rookeries exist and should be identified as soon as possible. The Assessment states that rookeries will be mapped prior to any management practices, but there would be benefits in mapping locations whether or not management practices are contemplated.

10. Some supposedly non-corps lands in the upper portion of Pool 16 (Milan Bottoms Area) are shown as Corps-owned and are coded on the accompanying photos. Corps boundaries should be re-examined to substantiate or disprove this.

Draft Report

1. Page 7 (Top of Page) -- This section (4.1.3) implies that river otters feed heavily on small herbivores; river otters feed primarily on fish and crayfish, and have been found at times to feed heavily on waterfowl. This suggests capture of prey is in water; there are few small herbivores which spend much time in the water.

2. Page 8 -- Fifth line from the bottom of this paragraph says "other vectors" -- drop "other".

3. Page 8, 4.1.10 -- Indiana bats are "cave bats" only during the winter when they use caves for hibernacula. During the summer they roost in trees and have nursery colonies under the loose bark of large trees. Also, bats are preyed upon by screech owls and snakes when conditions are proper. We are sure many mammalian predators (e.g. cats, dogs, and raccoons) will also prey upon these animals during day roosting.

4. Page 9, Section 4.2 -- Resident and Migratory Birds. Reference is made in the last paragraph to hunting being Federally controlled thereby minimizing damage to duck populations in the Upper Mississippe River Valley. A statement should be added that waterfowl and hunter management in many cases is a state Conservation Department responsibility and that waterfowl hunting is a very important part of public use on the Upper Mississippi River.

5. Page 11, 4.2.4 -- The nesting habitat noted for the black tern is incorrect; the author may be referring to the least tern.

6. Page 12, 4.2.6 -- Nesting by peregrine falcons was eliminated east of the Rocky Mountains in the United States. Through captive propagation and release programs, there are records of nesting success occurring in several northeast U.S. states.

7. Page 16, 5.1.2 -- Forest Management also includes wildlife, recreation, protection, etc.

8. Page 16, 5.1.3 -- The second paragraph fails to mention nesting sites for Wood ducks. This should be one of the primary wildlife management objectives.

9. Page 24, 6.4.2 -- A budget should be developed for a given management unit covering costs for all practices recommended prior to initiating any one component of the management prescription.

10. Page 25, 6.4.2 -- That specific portions of the funds generated from the sales of forest products should return to the natural resource base.

11. Page 26, 7.2 -- It is suggested that the Department and the U.S. Fish and Wildlife Service be involved in the review of any control programs.

Page 27, 7.24 -- Table 1, 2 and 3 need to be reorganized and corrected. As an example, the white-tailed jackrabbit is endangered in Illinois and is found along Pool 12; the river otter is threatened and is being considered for change to endangered in Illinois; Black tern is also endangered in Illinois. For additional references, we would suggest the following publications:

a. "An Annotated Check-List of the Birds of Illinois" by H. David Bohn, Illinois State Museum, 1978

b. "Fieldbook of Illinois Mammals", D.F. Hoffmeister and Carl O. Mohr, Dover Publication, Inc., New York, 1972

c. "The Wild Mammals of Missouri", by C. Schwartz and E. Schwartz, University of Missouri Press, 1981

d. "Distribution and Biogeography of Mammals of Iowa", by J. Bowles, Special Publications, The Museum Texas Tech University, 1975

Also, enclosed is a copy of the publication entitled: "Endangered and Threatened Vertebrate Animals and Vascular Plants of Illinois", by The Natural Land Institute, January 1981. The Department is accumulating additional information on eagle wintering areas along the Mississippi River. As this information is compiled it can be made available to the Corps of Engineers to update this plan.

12. Page 34, Table 2 -- Bird species of the Region show that presently the Canvasback is an uncommon visitor in Pools 16-22 during the spring and fall. The status should be changed to common during these periods.

13. Page 67, Practice I -- The last sentence of that page should be restated. Burnell C. Fischers paper entitled "Managing Light in the Selection Method" which appears in the 1979 John S. Wright Forestry Conference publication "Proceedings Regenerating Oaks in Upland Hardwood Forests" concludes that on level land four tree height openings will provide sufficient light for regeneration.

14. Page 68, Practice L -- Paragraph b under this practice really describes a site preparation activity rather than a TSI operation. Also practice Y (Crop Tree Release) is a timber stand improvement operation and could be combined under this practice.

15. Page 69, Practice Q -- Thinning -- There seems to be a lot of discussion dealing in specifics instead of a general practice objectives and descriptions. Some of the details mentioned here are really marking guidelines. These should be established and discussed on a unit by unit basis prior to actual marking procedures rather than defined here as a general practice description.

    In the 4th paragraph trees with cavities or potential wood duck nesting sites should be mentioned as well.

16. Page 71, Practice W -- Special Management Zones -- We would like to see the 100-200 foot wide area talked about be enlarged to at least 200-400 feet along water areas. This zone is more important along water areas composed of interior and land-locked sloughs inside islands, side channels, and other quality wood duck nesting habitat than those water areas next to open river.

    The item about fish collectors using brush piles or felling trees into the water for such purposes may have a valid biological use in certain areas. However, under Illinois Conservation Laws, we have an obligation to keep streams and rivers free from "logging" debris and even keep such debris far enough away to prevent such debris from washing into these channels. This could pose a problem in regards to this portion of the practice as well as in the establishment of brushpiles created for wildlife cover. This should only be carried out under the appropriate Department of Conservation biologist's recommendation and supervision.

17. Page 192, Pool 22 -- Addendum -- On the accompanying Upper Mississippi River Habitat Inventory Map Sheets, Sheet #282-22-11 shows a narrow area of forest cover type 2, mature along a small slough running north-south. This area is slated for Practice I (Clear Cutting). This practice is inconsistent with Practice W (Special Management) which specifies for slough shorelines to be undisturbed for Wood Duck nesting habitat management and other wildlife objectives.

18. General Comments

    A. In northwest Illinois, several species of plants and animals are associated with sandy areas of no or open forest conditions. Forest management practices and harvests techniques should be reviewed and presented at that time which recognize the fragility of these areas and their importance.

B. While we appreciate the desire to not disturb forest habitat where colony nesting species occur, we believe an effort should be made to assure no disturbance of similar forest conditions within five to ten miles of these colonies. When the present colony sites become inadequate, colonies will shift to similar areas nearby, as has happened in southwest Illinois.

C. The river otter needs large forested tracts along the Mississippi River. Its only real viable population appears to be in northwest Illinois. Old forest habitat should be developed and maintained along Pools 11-14 for this species.

D. A reference should be made between the prescription for each pool and the inventory data for that pool. Some of the areas are listed in such a way that you cannot compare the prescription with the inventory.

E. In addition, in Attachment #1 the islands and other landmarks should be noted to assist in locating project areas.

F. Within the plan management activities have been identified on several areas that are significantly important to the natural community of Illinois. Nine areas have been identified by the Illinois Natural Area Inventory to be significant to our natural heritage. Therefore, these areas should be managed to protect the valuable resources.

In conclusion, we appreciate the opportunity to review and comment on the subject documents and offer the assistance of Department personnel in further resource management planning efforts on the Mississippi River. Only through continued cooperation, may the valuable natural resources of the Mississippi River be conserved and protected for our future generations.

If you have any questions concerning the above comments, please contact me.

Sincerely,

David Kenney

DK:JM:la

Enclosures

DEPARTMENT OF THE ARMY
ROCK ISLAND DISTRICT, CORPS OF ENGINEERS
CLOCK TOWER BUILDING
ROCK ISLAND, ILLINOIS 61201

REPLY TO
ATTENTION OF:

NCROD-R

David Kenney, Director
Illinois Department of Conservation
605 Wm. G. Stratton Building
400 South Spring Street
Springfield, Illinois 62705

Dear Mr. Kenney,

We appreciate the detailed comments on the Forestry, Fish and Wildlife Management Plan for the Mississippi River Pools 11-14, 16-18, 21 and 22, in the letter to our office dated 29 January 1982.

Your comments furnished us with useful input to the final Forestry, Fish and Wildlife Management Plan. All the tables were based on the most recent data available. We will update those tables using the most accurate sources possible as implementation and update occurs.

Regarding your comment on the Forestry Management objectives, we believe the Forestry Management objectives to be in conjunction with all the management objectives of the project. We feel that at meetings held in July and August of 1981 with the US Fish and Wildlife Service and appropriate states, that management prescriptions in each unit were discussed and changed, if needed, to compliment other objectives. Additionally we believe that through the stand mapping process and the flexibility of the plan, prescriptions can be changed as the plan is implemented (see section 6.2.2 and Addendum 1, section 4.1). Finally we want to emphasize that the goal of continuing a sustained and regulated yield of forest products is not included as a source of revenue. Rather, we believe that by attaining a sustained yield regulated by our ability to meet all management objectives, we will be better able to implement the overall silvicultural practices that will meet wildlife species and population needs.

Our coordination efforts on the preliminary draft were meant to obtain needed information on objectives for wildlife species composition and population for cooperative agreement lands from those agencies that manage them on a day-to-day basis. Significant input was received from those participating in the meetings and, subsequently, general wildlife objectives and wildlife management species priorities were added to the final draft of the appendix. We view the authority to write specific wildlife objectives and practices for cooperative agreement lands as belonging to the US Fish and Wildlife Service (FWS) and appropriate state agencies.

NCROD-R
Mr. David Kenney

As per your desire to have the management plan emphasize directives for species which depend upon the river corridor, we agree with you. However, we feel the overall management objective in section 5.1.1 expresses that intention. During the coordination process, the management prescriptions in each unit were tailored to emphasize those species that depend upon the river corridor as stated to us by the meeting's participants. As stand mapping is completed, we will continue to tailor each management unit prescription to those wildlife species emphasized by the appropriate state or the US Fish and Wildlife Service. (See section 5.1.1 and Addendum 1, Section 4.1).

We appreciate your suggestion that an effort be made to assure that no disturbance of similar forest conditions within five to ten miles of present colonial nesting sites take place. However, we believe that by maintaining an optimum mix of tree size class distribution and species in each management unit and by leaving a special or no management zone up to 1500 feet around each rookery, similiar sites will always be available nearby for nesting. We feel a sustained and regulated supply of the mature stands in nearby management units of the tree size, density, and species desired by the birds could be developed through active management. During the meetings held in July and August of 1981, the maximum zone of land that should be left minimally or completely undisturbed around a colonial rookery was extensively discussed. A figure of 1500 feet was determined to be the maximum zonal limit. However, Mr. Stan Tate, District Forester for the Iowa Conservation Commission, noted that he had implemented silviculture practices up to 400 feet from rookeries in Pool 19 when the birds were absent from the nests. He made the points that the rookeries were not disturbed and that by maintaining a sound biological mix of tree sizes, species, and density in similiar timber near the colonial nesting birds, similiar mature timber would always be available nearby.

Concerning your comment about the Milan Bottoms Area, some non-Corps lands were coded to assist us in the management of adjacent Corps-owned lands. As stated in the introduction provided with the maps, no silviculture practices will be implemented on lands that are not owned in fee title status by the Corps of Engineers.

Finally we want to reemphasize that we will work closely with all involved state resource management agencies and the Fish and Wildlife Service to implement this plan. We hope this letter has addressed the concerns you had regarding the draft Forestry, Fish and Wildlife plan. If you have any questions they may be directed to our District Staff Forester, Ralph Montrone at [redacted].

Sincerely,

BERNARD P. SLOFER
Colonel
Commander and District Engineer

CF: OD-R
OD-R-MR
ED-PB
OD (Dist File)
DD
DE

Larry J. Wilson — Director
Wallace State Office Building, Des Moines, Iowa 50319
515/281-5145



Fairport Hatchery Feb. 16, 1982

Ralph Montrone
Army Corps of Engineers
Mississippi River Project
P.O. Box 34
Pleasant Valley, IA 52767

Dear Ralph:

Selected field staff of the Iowa Conservation Commission are in reciept of the final draft of the Forest, Fish & Wildlife Appendices B&D to the Master Plan for the Mississippi River.

We have reviewed this document as time has allowed. We do not have any comments to make relative to the final draft of this document and do agree with the general philosophy and intended activities outlined therein.

We do appreciate the inclusion of our comments that were submitted relative to the first draft of the appendice.

Also, please include a copy of any correspondence concerning this project to me at the address shown below. I am responsible for the cooridination of river projects and if I am to be effective I must be included in all notices and material handouts.

Sincerely yours,

William H. Aspelmeier
Fairport Hatchery
R.R. Box 434
Muscatine, IA 52761

OD-R



Larry J. Wilson — Director
Wallace State Office Building, Des Moines, Iowa 50319
515/281-5145



February 22, 1982

Colonel Bernard P. Slofer
Rock Island Corps of Engineers
Clocktower Building
Rock Island, Illinois 61201

Dear Colonel Slofer:

My staff has reviewed the final draft of the Forestry, Fish, and Wildlife appendices to the Corps Master Plan for Mississippi River Pools 11-14, 16-18, 21, and 22. I understand that my state biologists and foresters have worked closely with your staff during the preparation of the appendices. Since all of their comments have been incorporated in the final draft, we do not have any further comments at this time.

I like the idea of the March Coordination Meeting. Let know when you schedule the meeting and I will make sure the appropriate staff from my agency attend.

I appreciate the opportunity for the Iowa Conservation Commission to review the appendices.

Sincerely,

LARRY J. WILSON, DIRECTOR
IOWA CONSERVATION COMMISSION

LJW/KS/mll

# MISSOURI DEPARTMENT OF CONSERVATION

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

STREET LOCATION:
2901 North Ten Mile Drive
Jefferson City, Missouri 65101

Telephone 314/751-4115
LARRY R. GALE, Director


August 13, 1981

Colonel Bernard P. Slofer
District Engineer
U. S. Army Engineer District
Rock Island Corps of Engineers
Clock Tower Building
Rock Island, Illinois 61201

Re: Forest, Fish and Wildlife Management Plan

Dear Colonel Slofer:

My staff reported on the meetings with the Rock Island District personnel involved in review of the draft appendices for Forest, Fish and Wildlife Management, Mississippi River Pools 11-14, 16-18 and 21 and 22. We appreciate having the opportunity for indepth involvement in preparation of the draft appendices. Following are our major comments on this early draft:

1. The draft is entitled "Forestry and Fish and Wildlife Management Plan" for Mississippi River Pools 11-14, 16-18, 21 and 22. While the draft includes adequate forest resource coverage, there is little relating to fish and wildlife resources. As the state fish and wildlife agency with both direct and indirect management responsibilities for the lands and waters in and adjacent to the pools, we look forward to having a big role in planning for those resources. The long range planning needs must be addressed in this type of document; they cannot be met by our short term "Annual Management Plans." The scope of each type of plan varies significantly. Our staff has expressed an eagerness to provide meaningful assistance to more adequately plan for the fish and wildlife resources.

2. There is a need to establish 20 percent of each forest unit as old growth to meet den cavity and other requirements of wildlife. Much of this objective can be

achieved by leaving a timber strip at least 200 feet wide adjacent to all permanent water. The strips would provide erosion control, have aesthetic values and be located in areas where access is often difficult.

We define old growth as (1) sawlog stands with more than 50 percent of the sawlog basal area in trees in excess of the diameter objective for the site, (2) less than 30 feet of basal area in saplings and poles, and (3) at least "C" level stocking of mature and/or acceptable growing stock. In addition, some old growth stands are characterized by a well developed mid-story of tolerant species and/or well developed forage component on the forest floor.

Primary consideration with respect to old growth is to allow unique conditions to develop in the understory and at canopy level which would not otherwise occur in stands harvested at normal rotation age. To allow these unique conditions to develop, it is imperative that in each designated stand all cultural practices, including timber stand improvement and thinning, be curtailed indefinitely or until a decision is made to regenerate and place the stand back in rotation. Rotation age for old growth stands will vary depending on species composition, however, with bottomland hardwoods it could approach 150 years.

3. Past experiences on Mississippi River lands indicate some difficulty in reestablishing desired tree cover. It is imperative that the Rock Island District establish a policy that where clear cutting is prescribed to be followed by cultural practices such as planting, vegetative control, etc., there be no cutting unless funds are committed for completion of the follow-up work to accomplish the prescribed revegetation within three years of the cut.

In the next week to ten days, my staff will provide detailed comments on the draft. Questions regarding our comments may be directed to Mr. William H. Dieffenbach of this office.

Sincerely,

Larry R. Gale

LARRY R. GALE
DIRECTOR

cc: U. S. Fish and Wildlife Service
Rock Island, Illinois

U. S. Fish and Wildlife Service
Quincy, Illinois

# MISSOURI DEPARTMENT OF CONSERVATION

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

STREET LOCATION:
2901 North Ten Mile Drive
Jefferson City, Missouri 65101

Telephone 314/751-4115
LARRY R. GALE, Director

September 2,1981

Mr. Ralph Montroni
Mississippi River Project
P. O. Box 34
Pleasant Valley, Iowa 52767

Dear Mr. Montroni:

As promised in Mr. Gale's letter of August 13, 1981, we are providing detailed comments on the draft Master Plan for Mississippi River Pools. A major concern that remains centers around the need to include fish and wildlife in the plan.

In our more detailed review, there appears to be real value in your using the products of GREAT II. The Fish and Wildlife Management Work Group Appendix dated December 1980 would be a good source of problem statements, as well as detailed lists of animals by pool. I'd highly recommend you use as much of that report as possible.

I hope the attached photocopied pages are self-explanatory. If you have questions, please call me.

Sincerely,

W. H. Dieffenbach

WILLIAM H. DIEFFENBACH
ENVIRONMENTAL SERVICES SUPERVISOR

WHD:jct
Attachment

Illinois Department of Conservation
life and land together

605 WM. G. STRATTON BUILDING • 400 SOUTH SPRING STREET • SPRINGFIELD 62706
CHICAGO OFFICE – ROOM 100, 160 NO. LASALLE 60601
David Kenney, Director • James C. Helfrich, Assistant Director

September 17, 1981

RALPH MONTRONE WAS TOY TO OD - NOW (WAT RES MGMT SECT, MISS RIVER). SUPERVISOR ROGER BOLLMAN. ASST PARK MANAGER.

Mr. Ralph Montrone
District Forester
COE-IRD
Clock Tower Bldg.
Rock Island, IL 61201

Dear Ralph:

This is in reference to Mr. Roger Bollman's letter regarding the preliminary draft copy of the Corps Forestry, Fish and Wildlife Management Plan.

After reviewing the comments from our District Foresters and reviewing the subject draft myself, the following are my comments. I hope these can be incorporated in your next draft before full agency review.

1. There are strong objections by the fish and wildlife interests, and rightfully so, in referring to this as a Forestry, Fish and Wildlife Management Plan. As stated in the plan's objectives, wildlife is the primary consideration. However, there are no specific wildlife management objectives defined. Long-term wildlife management goals or objectives need to be defined and then the appropriate forestry prescriptions can be chosen to achieve those goals. The purpose of the plan appears to be unclear and inadequate. With the U.S. Fish and Wildlife Service and the state conservation agencies responsible for the management of the fish and wildlife resources which includes, without question, the habitat, why is the Corps of Engineers attempting again to alter the resource without taking into consideration the total resource? The plan appears to be interested in commercial timber harvesting and not necessarily the management of the entire ecosystem of the river. Forest management and wildlife habitat development and protection can be compatible and will enhance the total resource, however, they cannot be separated.

2. During the development of this plan, consideration should not only be given to the wildlife game species but also to our precious few (the heritage species). The plan will then allow for the impact on threatened and endangered plant and animal species.

3. In Section 6 of the draft, pertaining to implementation of the

plan, there are numerous concerns raised. First of which is the right of the Corps to implement practices on cooperative agreement lands. Assuming you may and we agree to the practices, the Department has additional restrictions imposed on lands managed by the Department with our current tree cutting policy ordered by the court.

In regards to the personnel, as it relates to the implementation and administration of the various forestry practices, the appropriate state wildlife and forestry field people should be involved in the layout work of each practice within a unit or compartment. This would also include developing marking guidelines and possibly assisting in the marking procedures. The administration, "or enforcement", of a federal contract with a contractor (to carry out a specific forestry practice) by state agency personnel will undoubtedly cause problems.

In Section 6.2, 6.3 and 6.4, the plan emphasizes the ranger's responsibility as to the implementation of the subject plan. It is not clear if the ranger responsibilities for implementation covers only the Corps recreation areas or the entire system. I think this needs to be clarified in the plan. Furthermore, the plan should spell out very definitely who would implement the plan, who will do the marking and administering the contracts of any products and most obvious, who will receive the dollar value for such activities. Also, the term "district forester" should be defined in the plan. Does it mean Corps of Engineers or Conservation District Forester?

4. In regards to implementation costs of the various practices, a budget should be developed for a given management unit covering costs for all practices recommended prior to initiation of any one component of the management prescription. For example, in Ward Island on Pool 22, various harvesting techniques are being recommended followed by a TSI and/or planting operation. Therefore, money should be available to cover the followup TSI and/or planting costs before harvesting operations are initiated.

5. Money generated through the selling of firewood from thinning operations or timber sales should be reinvested into the resource. Item 6.7.1.2. covers this to a degree. However, a specific percentage of sale receipts should be specified. I suggest 100 percent.

6. The estimated costs for implementing the specific practices are low in some cases. I would suggest a timber stand improvement operation cost of $40 per acre and a tree planting cost of $100 per acre, which would include chemical weed control but not site preparation. Also, I think clean cultivation as a weed control practice in plantations should be considered.

7. I am not clear as to what is covered as a cost in the item designated: harvesting (contractual). These figures will need to be adjusted upward as costs rise in future years.

8. The following information should be added to the full addendum description and proposed prescription.

a. Include the wildlife information (den trees, upper and lower cavities, mast production, grapevines, etc.) in the write up for each

area as it should be available from printouts from your computerized inventory.

b. For reference purposes, each unit should also be identified by the state which the unit is in.

c. The proposed practices should be spelled out instead of a letter or group of letters. Also replace type number with the type association name or dominant species.

d. For each unit, the management objection should be stated.

e. List soil types for each unit or mention soil somewhere in the plan if they are the same throughout the plan.

f. There is a need for a priority statement of our overviews on which specific species of wildlife the unit is being managed for. Habitat requirements vary greatly among species.

9. Practice A - Planting seedlings should be carried out with discretion due to cost and associated risks involved in establishing a successful plantation. When implemented, proper site preparation and followup weed control will be essential to establishing a successful planting. If herbicides will be used, a pre-emergent for broadleaf control should be included with those already mentioned in the practice description. Clean cultivation may be an alternative to herbicides and may be cheaper in the long run in terms of application and success in establishing a well stocked stand.

In areas where cottonwood, silver maple, sycamore and ash is desired, natural reproduction should be encouraged. This should be done by creating openings with scarified soil conditions to promote ideal seed bed conditions for these species.

Fertilizers are not recommended or needed for the type of sites that will be available for tree planting. Therefore, this practice should be omitted in terms of reforestation work.

Practice H - This practice can be interpreted more than one way. It is suggested that sapling stands be thinned to provide 4-5 feet of opening between crowns of potential crop trees.

Practice L - This definition has a problem in that it is being defined by the technique to be used in treating the area rather than by a specific objective, as in practices H. J and K. Also, scarification of soil seems to me to be a site preparation practice for reforestation purposes. Perhaps rather than a "tree planting" practice we should define it as a reforestation practice, which would include natural and artificial regeneration methods. Soil scarification and prescribed burning might be lumped under this category.

Practice Q - Thinning under this prescription relates to improving growth rates or in other words crop tree release. Thinning young sawtimber stands (12" dbh plus) usually produces low levels of growth response. Therefore, this practice should be restricted to well-stocked stands of

pole size timber (4-10" dbh).

Practice I - In the areas where a clearcut harvest method would be necessary, I think a 5-acre maximum should be the guideline with one acre being the minimum. These figures can be adjusted in the future to achieve the desired results pending observations on the results of this type of practice as it is implemented on a limited basis.

Clearcut layouts were recommended to provide travel lanes between timbered areas. One hundred feet was suggested to be included as a specification. Also, the piling of logging residue for wildlife habitat was questioned especially on the floodplain. It was felt that this activity in those areas would be negated at the first high water stage. This activity could be carried out based on the wildlife biologists' evaluation as to the benefit it would create and placement and numbers could then be specified.

In the last sentence of this practice description covering regeneration, it was proposed that if regeneration does not occur within 3 years, then impeting vegetation will be removed.

Practice P - It is recommended that the size openings created through group or individual tree selection method of harvesting to be equal to the height of overstory trees or greater. With the exception of cottonwood, this size opening should be adequate to promote good growing conditions for most of the desirable species. A more detailed description of this practice would be more beneficial.

Practice R - Lopping could be done on those areas where aesthetics is a concern. This would minimize visual impact. However, I do not see the need for spreading logging residue evenly over the ground, especially if the site is slated for tree planting.

Practice U - The description of this practice appears to be inadequate and too simplistic. The practice can be interpreted differently by users and therefore, could create problems.

Also on floodplain areas, logging residue could be moved around easily during flood stages of the river. In these situations, efforts should be made to reduce or eliminate the chance of logging debris moving into the main channel.

Practice X - Type mapping is to be done within an area prior to any silvicultural treatment. This would be an ideal time for biologists and foresters to coordinate design and placement of silviculture prescriptions for an area.

If a version of this proposed plan is adopted, the various practices should be initiated on a limited basis and monitored to ensure the objectives of the site are met. It is my understanding the plan will be implemented as accepted. I feel a plan of this type must be written so that it is flexible to change or alter the objectives, prescriptions or purposes as needed. The practices which you proposed are acceptable methods on management. However, the one factor that will affect these practices will be the river. Before a final draft is prepared, the wildlife considerations and objectives must be discussed and incorporated into the plan.

With these considerations, some practices for a unit may need to be altered.

I hope the above comments will be helpful in your review and evaluation. If you have any questions, please advise.

Sincerely,

Dick R. Little
Section Manager
Division of Forest Resources
and Natural Heritage

DRL:jmm

cc: Al Mickelson
Dave Cooper
Kurt Bobsin
Reuben Laverdiere
Matt Siemert
Dick Thom

Larry J. Wilson — Director
Wallace State Office Building, Des Moines, Iowa 50319
515/281-5145



5 October 1981

Mr. Frank Collins
Department of the Army
Rock Island District, Corps of Engineers
Clock Tower Building
Rock Island, Illinois 61201

Dear Frank:

Attached please find comments and response to the draft of the Forestry Fish and Wildlife Appendix to the Corps Master Plan for Mississippi River Pools 11-14, 16-18, and 22.

This response was prepared by field staff of the Forestry and Wildlife Sections, Iowa Conservation Commission.

Our comments on the Draft Plan are in two parts. First, general comments on the entire Draft Plan; and secondly, specific comments relative to the Draft Plan by section number.

The field staff of the Forestry and Wildlife Sections, Iowa Conservation Commission, commend the Rock Island District for the initiation of timber management planning. The river's timber resource is an important habitat component with high management potential. We do appreciate the opportunity to participate in the development of the plan and anticipate continued cooperation with the Rock Island District as woodland management is pursued.

Sincerely,

W.H. Aspelmeier

W.H. Aspelmeier
Wildlife Biologist

WHA:sk
cc: Dean Dalziel
Don Pfeiffer
Stan Tate
Art Roseland
Jim Ripple
Bob Sheets
file

# United States Department of the Interior

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

IN REPLY REFER TO:
OP - G - 360.45
Master Plan

OCT 15 1981

Colonel Fredrick W. Mueller, Jr.
District Engineer
Corps of Engineers
Rock Island District
Clock Tower Building
Rock Island, IL 61201

Dear Colonel Mueller:

This letter provides comments that we feel are pertinent to the Forestry and Fish and Wildlife Appendix to the pool Master Plans for your District. We appreciate the opportunity for our field and regional office personnel to participate in the coordination meetings and discuss both the general and specific provisions of the Appendix. Our comments will be limited to the general sections of the Appendix; specific pool comments will be discussed at the annual coordination meetings as proposed in Section 6.4.2, a section which was added between the Wappello and Green Island meetings.

General Comments

1. We would like to see an expanded discussion of wildlife and fish management in the Appendix. Other than the species lists and sections on occurrence there is a lack of quantified objectives for both species composition and populations. Forest management, i.e. habitat manipulation, can impact significantly on wildlife species and populations; the timber management practices proposed can be designed to meet quantified species and population objectives.

2. The division of the Appendix between forestry and fish and wildlife does create some other difficulties. Because the fish and wildlife portion applies only to those lands under complete Corps management, application of the forest management portion to all Corps owned lands appears to limit the flexibility of both the States and the Service in intensive wildlife management activities on General Plan lands.

3. Another major concern is that site-specific prescriptions are already included in the plan, yet the master plans for the individual pools are not completed. It would be preferable for the States, Service, and Corps to cooperatively develop long range wildlife and fish objectives first, then tailor the Appendix to meet those objectives.

4. As presently prepared, the annual management plans required by the General Plan and Cooperative Agreement will be difficult to mesh with the Appendix. The reason for this is the time frame--five years for the Appendix and one year for the annual plans. Annual plans as currently written are not the intensive plans discussed in the policy section. We recommend that an effort be made to revise the Cooperative Agreement, Condition 1. The purpose of the revision would be to add forest management planning to the State and Service responsibilities on the General Plan Lands.

5. During the field meetings all agencies agreed that cooperating agency personnel would be involved in the field activities resulting from plan implementation. We would like to insure that all pertinent parts of the Appendix reflect this level of participation.

6. We have concerns about some of the forest management practices that are proposed. Our view is that a number of the practices should be field tested in small areas and evaluated for the first five years that the Appendix is in effect to insure that the desired results are obtained before the practices are adopted for widespread use in the river bottoms. The clear cutting practice is the subject of considerable concern to our field people. Some type of assurance is necessary to allay the fear that these sites would become logical candidates for dredge spoil sites if they are within reach of dredging equipment. The potential for loss of habitat to such a use is sufficient to cast doubts on the wisdom of using this practice on areas close to the navigation channel.

In summary, we want to thank the members of your staff for their cooperation in the series of meetings held to discuss the Appendix. Their willingness to discuss the issues that concerned field people from all of the agencies was very much appreciated.

If we can be of further assistance, do not hesitate to contact us again.

Sincerely,

James W. Pulliam, Jr.
Acting Regional Director

STATE OF IOWA

# Office for Planning and Programming

523 East 12th Street, Des Moines, Iowa 50319 Telephone 515/281-3711

ROBERT D. RAY
Governor
EDWARD J. STANEK, PhD
Director

STATE CLEARINGHOUSE

PROJECT NOTIFICATION AND REVIEW SIGNOFF

Date Assigned: January 6, 1982 STATE APPLICATION IDENTIFIER: IA820105-412

Review Completed: January 6, 1982

APPLICANT PROJECT TITLE:
Final Draft, Environmental Assessment, Forestry, Fish and Wildlife Plan

APPLICANT AGENCY: Department of the Army Rock Island, Illinois 61201
Address Rock Island District
Corps of Engineers
Clock Tower Building Bernard P. Slofer

FEDERAL PROGRAM TITLE, AGENCY AND CATALOG NUMBER: Department of Defense
Department of the Army
Office of the Chief of Engineers

AMOUNT OF FUNDS REQUESTED:
NA

PROJECT DESCRIPTION:
Environmental Assessment and draft state of "Finding of No Significant Impact" for the Forestry, Fish and Wildlife Plan, Mississippi River, Pools 11-22. The proposed actions presented in the plan are intensive forest management practices to be undertaken initially over a period of five years on lands that were acquired for the Nine-Foot Navigation Project.

The State Clearinghouse makes the following disposition concerning this application:

[X] No Comment Necessary. The application must be submitted as received by the Clearinghouse with this form attached as evidence that the required review has been performed.

[ ] Comments are Attached. The application must be submitted with this form plus the attached comments as evidence that the required review has been performed.

STATE CLEARINGHOUSE COMMENTS:

CH-14

A. Thomas Wallace
Federal Funds Coordinator

United States
Department of
Agriculture

Soil
Conservation
Service

693 Federal Building
210 Walnut Street
Des Moines, Iowa 50309

January 12, 1982

Bernard P. Slofer
Colonel, Corps of Engineers
Rock Island District
Clock Tower Building
Rock Island, Illinois 61201

Dear Colonel Slofer:

We have received and reviewed the Environmental Assessment and draft statement of "Finding of No Significant Impact" for the Forestry, Fish and Wildlife Plan, Mississippi River, Pools 11-22.

We have no comments.

Sincerely,

William J. Brune
State Conservationist

United States
Department of
Agriculture

Soil
Conservation
Service

Springer Federal Building
301 North Randolph Street
Champaign, Illinois 61820

January 27, 1982

Colonel Bernard P. Slofer
District Engineer
US Army Engineer District, Rock Island
ATTN: ED-PB-FP
Clock Tower Building
Rock Island, IL 61201

Dear Colonel Slofer:

Your request regarding the Environmental Assessment and draft statement of "Finding of No Significant Impact" (FONSI) for the Forestry, Fish and Wildlife Plan, Mississippi River, Pools 11-22, has been reviewed by our field office.

We have no comments on the document at this time.

Sincerely,

Earl E. Voss acting

August J. Dornbusch, Jr.
Acting State Conservationist

cc:
Roger Rowe, AISWCD, Marseilles, IL
John Rowley, IDOA, Springfield, IL
Ron Darden, IDOA, Springfield, IL
Don Manecke, Orion, IL
W. Hartman, AC, Macomb, IL

United States
Department of
Agriculture

Soil
Conservation
Service

4601 Hammersley Road
Madison, Wisconsin 53711

February 1, 1982

Colonel Bernard P. Slofer
District Engineer
Corps of Engineers
Rock Island District
Clock Tower Building
Rock Island Illinois 61201

Dear Colonel Slofer:

We have reviewed the final draft of the environmental assessment of the Mississippi River Forestry, Fish and Wildlife Plan, Pools 11-22, dated December 1981.

We have no further comment on the assessment as presented. It appears to be adequate and complete.

Sincerely,

Kenneth M. Cohen for

Cliffton A. Maguire
State Conservationist

555 Vandiver Drive
Columbia, Missouri
65201

February 1, 1982

Col. Bernard P. Slofer
Rock Island District, Corps
of Engineers
Attn: ED-PB-FP
Clock Tower Building
Rock Island, IL 61201

Dear Colonel Slofer:

We have reviewed the Findings of No Significant Impact for the Forestry Fish and Wildlife Plan, Mississippi River, Pools 11-22 and have the following recommendations:

The thinning cuts and improvement cuts appear to be too severe for best management. The recommended basal area for optimum growth and tree form is 60-70 sq. ft. per acre. If the average tree size, Diameter Breast High (DBH), is 8", the plan recommends a basal area of 24. Thinning to such a low stocking rate could degrade tree form by causing epicormic branching, wolf trees, or crook and on wet soils could cause wind-throw problems. The soils in the management area are highly productive, and an open stand will increase plant competition of the understory to the detriment of tree growth.

The following table suggests stocking rates based on tree diameter and is displayed for oak and cottonwood. This information is based on a recommended basal area of 60-70 sq. ft./acre for oak and 70-90 sq. ft./acre for cotton wood.

| Average Tree Size (DBH, inches) | Recommended Stocking Level (Trees/Acre) | |
|---|---|---|
| | Oak | Cottonwood |
| 6 | 305-356 | 356-458 |
| 8 | 172-200 | 200-258 |
| 10 | 110-128 | 128-165 |
| 12 | 76-89 | 89-127 |
| 14 | 56-65 | 84-94 |
| 16 | 43-50 | - - |

Regeneration efforts should include consideration of intensive site preparation and weed control.

We appreciate this opportunity to review and comment on the proposed plan.

Sincerely,

Robert J. Graham ACTING

Paul F. Larson
State Conservationist

DEPARTMENT OF THE ARMY
ROCK ISLAND DISTRICT, CORPS OF ENGINEERS
CLOCK TOWER BUILDING
ROCK ISLAND, ILLINOIS 61201

REPLY TO
ATTENTION OF:

NCROD-R

Paul F. Larson, State Conservationist
United States Department of Agriculture
Soil Conservation Service
555 Vandiver Drive
Columbis, Missouri 62501

Dear Mr. Larson,

We appreciate the detailed comments on the Forestry, Fish and Wildlife Management Plan for the Mississippi River Pools 11-14, 16-18, 21 and 22, in your letter to our office dated 1 February 1982.

Regarding your comment about thinning and improvement cuts, an error was made in the Environment Assessment. The stocking rates were meant to read 70 sq. ft. of basal area for Oak and Hickory and 90-100 sq. ft. of basal area for Silver Maple and Cottonwood.

Thank you for bringing this error to our attention. Any further questions can be directed to our District Staff Forester, Ralph Montrone, at [redacted]

Sincerely,

BERNARD P. SLOFER
Colonel
Commander and District Engineer

CF: OD (Dist File)
OD-R
ED-PB
DD
DE

NATIONAL WILDLIFE FEDERATION

1412 Sixteenth Street, N.W., Washington, D.C. 20036 202—797-6800

February 2, 1982

Bernard P. Slofer, Colonel
District Engineer
U.S. Army Engineering District,
Rock Island
Attn: ED-PB-FP
Clock Tower Building
Rock Island, IL 61201

Dear Sir:

The National Wildlife Federation appreciates the opportunity to comment on the draft Finding of No Significant Impact for Mississippi River Forestry, Fish, and Wildlife Plan, Pools 11-22. NWF is a nonprofit citizens' conservation organization dedicated to the wise management of our nation's natural resources, with over 4.5 million members and supporters nationwide.

The plan appears to be beneficial for rejuvenating and managing the area. However, the Environmental Assessment has grey areas which need clarification, as well as a need for much more emphasis on prevention of harvest-related problems.

The Purpose, Section I, is not clear as to whether environmental assessments for fish and wildlife impacts are being conducted on lands impacted by the forestry plan, but licensed to other public agencies. Is the Fish and Wildlife Service responsible for assessing the impact of timber-harvesting operations on the 7,000 acres of surface waters within its wildlife sanctuaries (p. 7, Section IV.A.4.)?

Any action involving endangered species must be coordinated with the Office of Endangered Species under the Endangered Species Act. Also, surveys to determine the presence and distribution status of endangered species should be completed before a plan is implemented (as mentioned on page 16, paragraph 6, but this should be strongly emphasized). Emphasis is needed to ensure that temporary roads and bridges are properly built and maintained to minimize impact.

The objectives set forth in Section I are generally met in the plan. However, the objectives of habitat management for migratory birds and the provision of colonial nesting sites are

not addressed. On page 18, paragraph 1, it is not clear what constitutes an "adequate buffer zone" around a heron rookery. From the text, it appears that no work has yet been done on bats, and that mussel surveys are incomplete.

Confining harvests to winter months to protect wetlands may only delay erosion until spring floods. Potential danger to wetlands is rightly acknowledged. Are there possibly other deterrents to damage than buffer zones? We see a need for erosion and siltation effects to be emphasized especially in relation to endangered mussels and spawning fish.

Some comments on the Project Description section: on page 2, paragraph 1, does $52,000 for monitoring and stand mapping include monitoring of wildlife resources? If not, where will this money come from? Sanitation cuts that remove actual or potential den sites (page 4. B.) should be balanced by deadening of trees (page 4. C. Timber Stand Improvement) to avoid loss of wildlife habitat. The page 4, Section D, clearcutting recomendations are good. Perhaps if slash were piled and left in certain instances, air quality deterioration from burning would not occur to a large extent. Plantings balance harvest operations almost perfectly (page 4-5, D & E, 1,137 acres harvested and 1,025 acres planted). This should provide for habitat replacement and sustained timber yields over time.

Discussions of silvicultural practices by pool require Table 1 before the meanings are clear. Presentation of material in the text does not include acreage involved in harvest. The reader must refer back to Table 1 to find harvest acreage. Harvest acreages are not divided, so total acreage of clearcuts vs. selective cuts cannot be ascertained. Table 1 should be referenced in each pool discussion for clarity.

In the pool descriptions, the goals include enhancement or maintenance of natural aesthetic and recreational values. How does the Corps propose to carry out this goal?

It is unclear if the Corps of Engineers or local private contractors will be doing the cutting and clearing of timber, and thus, who will reap financial benefits from this forest management program. If it is local contractors that will be doing the cutting, how will they be monitored to ensure proper silvicultural techniques are being followed and endangered species habitat protected? Will the private contractors bear the costs of fish and wildlife mitigation, habitat enhancement, and replanting programs?

It is possible that bringing logging into the area will also bring in increased navigation channel traffic. Are there

impacts associated with increased traffic on the channel? The anticipated construction of barge docks and fleeting areas (p. 16, para. 3) is not adequately addressed as to possible environmental impacts. The draft is unclear regarding what methods will be used to transport timber if barges are not used.

We would again like to say that this plan appears to have many benefits for the resources of the area. It must be strongly emphasized in the Environmental Assessment that erosion and major water disturbances be mitigated or restored, as appropriate, and that these actions be continued all throughout and after the timber-harvesting operations.

Finally, no mention is made of total project costs, nor the allocation of these costs by project purpose. Those elements of the plan with quantifiable benefits for navigation, such as erosion reduction, should be allocated accordingly, and the corresponding costs recovered from waterway users in accordance with the President's cost recovery program.

Sincerely,

E. R. Osann

Edward R. Osann
Director, Water
Resources Program

Amy Rosenstein

Amy Rosenstein
Water Resources Program

Timothy E. O'Brien

Timothy O'Brien
Fish & Wildlife Program

DEPARTMENT OF THE ARMY
ROCK ISLAND DISTRICT, CORPS OF ENGINEERS
CLOCK TOWER BUILDING
ROCK ISLAND, ILLINOIS 61201

REPLY TO
ATTENTION OF:

NCROD-R

Edward R. Osann, Director
Water Resources Program
National Wildlife Federation
1412 Sixteenth Street, N. W.
Washington, D.C. 20036

Dear Mr. Osann,

The comments on the environmental assessment for the Mississippi River Forestry, Fish and Wildlife Plan, Pools 11-14, 16-18, 21, and 22 are very much appreciated. Being a branch of the Federal Government, the US Army Corps of Engineers actively solicits comments from concerned groups and individuals on matters of the public's interest and concern.

Many of your comments and queries in which concern is expressed are more fully covered in our actual Management Plan (Appendix). In order to disspell any misgiving that the National Wildlife Federation may have about the plan, a few of the comments will be addressed here.

This Forestry, Fish and Wildlife Management Plan (Appendice) has been four years in development and is now in final draft form. Throughout the four years the plan was in the developmental stages, coordination has occurred with the Fish and Wildlife Service, Iowa Conservation Commission, Illinois Department of Conservation, and the Missouri Department of Conservation.

Federal lands administered soley by the Fish and Wildlife Service are not covered by this plan. A cooperative agreement exists between the Corps and Fish and Wildlife Service that allows the Fish and Wildlife Service to actively manage for wildlife purposes on specified Corps' project lands. The Corps,however, has retained rights to manage timber resources on these lands, and for these areas our plan covers this aspect of natural resource management.

The assessment itself covers the impacts to fish and wildlife resources on lands where silvicultural practices would be implemented. Any impacts to the shoreline or surface waters would be covered and mitigated through the section 404 water quality process by the Corps of Engineers before the practice is implemented. Potential impacts will be determined during the coordination process with the appropriate state agency and the Fish and Wildlife Service.

As regards your comment about endangered species, it is required in the management plan that coordination with the Fish and Wildlife Service office of Endangered Species be completed prior to implementing any silvicultural practice except stand mapping. Stand mapping is the process of examining each management unit on the ground, delineating stand boundaries and determining pertinent data about it. Such data would include dominant tree species, tree size, stand age, ground cover and tree growth rate.

During coordination meetings with the state agencies and the Fish and Wildlife Service the width of an adequate buffer zone around heron rookery sites was discussed and a determination made that a buffer zone of 1500 feet was reasonable. For your interest, a District Forester with the Iowa Conservation Commission indicated that silvicultural prescriptions had been implimented around colonial rookeries on privately owned lands in Pool 19 with buffer zones as low as 400'. It was indicated that the rookeries were stable or had increased in the number of nests. Additionally, it is felt that through active forest management it is possible to maintain a sustained and regulated level of optimum wildlife habitat, in this case, future rookery sites.

Buffer zones are the best deterent to soil erosion after harvest and where endangered mussels and fish spawning areas are located, annual and continuing coordination will allow us to changed the size and location of harvest to minimize impact to these sensitive areas. Additionally, on the forest floodplain the woody and/or herbaceous vegetation will revegetate the site quickly during spring further reducing potentials for soil erosion.

We appreciate your specific comments about the project description section. The $52,000 consists basically of funds for stand mapping. The monitoring of wildlife resources is the basic responsibility of the appropriate state and the Fish and Wildlife Service, however, we expect to be involved in the monitoring of sensitive areas on Corps' fee titled lands, a small percentage of the money will be spent on monitoring wildlife resources. Sanitation cuts will be balanced by timber stand improvement practices to avoid the loss of wildlife habitat as it becomes apparent during the coordination process. Where air quality deterioration may occur, slash may be piled and left. This option will be discussed during coordination with the appropriate state agencies and the Fish and Wildlife Service, however, we must not allow this option to hinder regeneration or pose a danger of leaving slash to be swept into navigational channel during flooding periods.

We propose to enhance or maintain natural aesthetic and recreational values by the establishment of special management or no management zones along all bodies of water. Additionally, we feel that the rejuvenation of the wildlife resource will allow the public to observe wildlife more frequently. Finally, we believe a bottomland forest resource of an optimum mix of tree species and size class will be more pleasing to the public using the woodlands.

As silvicultural prescriptions are implemented, the Corps may, on a limited basis, cut and clear timber. However, we expect 90% of the silvicultural practices to be implemented by private contractors. The Corps of Engineers will prepare contracts on all timber to be cut and removed, and all timber stand improvement work to be done. Bids will be solicited and the highest bid accepted. All contracts must have a minimum bid below which bids are not accepted. During actual implimentation of silvi-

cultural practices Corps Real Estate personnel, foresters, and Ranger personnel will monitor the contractor during the cutting period by visits to the work site. Replanting programs, habitat enhancement and wildlife mitigation will be done through the Corps of Engineers as coordinated during annual meetings with the states and Fish and Wildlife Service. At the present time logging receipts are put into a general all-purpose fund, however, a mechanism will be installed in the near future that allows logging receipts to be put back into the resource, thereby perpetuating the program. As silvicultural practices are implemented in any management unit, we expect that movement or harvested logs and/or chips by barge to involve only a negligible increase in navigation channel traffic. In most management units logs will be skidded to selected landing areas and then transported via truck to the mill.

In the few areas where barging the wood is the only feasible means to transport the timber, all specialized docks or other structures will be required to be removed upon contract completion.

We hope this will clarify the grey areas in the Enviornmental Assessment. Any further questions may be directed to our district staff forester, Ralph Montrone, at [redacted]

Sincerely,

BERNARD P. SLOFER
Colonel
Commander and District Engineer

CF: OD (Dist File)
OD-R
OD-R-MR
ED-PB

Copies Furnished:
Amy Rosenstein
Water Resource Program
National Wildlife Federation
1412 Sixteenth Street, N.W.
Washington, D. C. 20036

Timothy O'Brien
Fish and Wildlife Program
National Wildlife Federation
1412 Sixteenth Street, N.W.
Washington, D. C. 20036

# United States Department of the Interior

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

IN REPLY REFER TO:
REC

FEB 2 1982

Colonel Bernard P. Slofer
District Engineer
United States Army Corps of Engineers
Attn: ED-PB-FP
Clock Tower Building
Rock Island, Illinois 61201

Dear Colonel Slofer:

This will respond to your letter of December 31, 1981, requesting our review and comment of your "Finding of No Significant Impact" and Environmental Assessment for the Forestry, Fish and Wildlife Plan, Mississippi River, Pools 11-12.

Specific Comments

Page 1, paragraph 3, line 4: "Service or appropriate states", should be changed to "and".

Page 2, paragraph B. Need: The last sentence of the paragraph infers that intensive forest management can reverse the effects of man's influence on the woodlands of the river system. This is not entirely true; ie., most trees can sustain only moderate amounts of standing water and not for extended time periods. Flood flows can be affected to a limited extent by lock and dam operations although this does not duplicate the natural process. The higher water table has changed the vegetative succession and it appears unlikely that the predominance of silver maple and cottonwood can be affected by forest management practices.

Page 2, Section II, first paragraph: Intensive forest management is mentioned several times in the lead section. Unless there are guarantees that the practices believed necessary for regeneration will be funded, harvesting activities cannot be considered intensive management activities.

Page 2, Section II, paragraph A: The proper terminology should be 90-100 square feet of basal area per acre and 70 square feet of basal area per acre.

Page 10, paragraph B, line 5: The proper name for refuge lands should read, "Upper Mississippi River Wild Life and Fish Refuge".

Page 15, paragraph C: The control of vehicle access and trespassers should be addressed both in the appendix and environmental assessment. Opening access areas could have significant effects on wildlife populations due to disturbance.

Page 16, paragraph 5: The wording of this section could lead one to believe that total funding for the proposal is currently available. Is this true?

Page 17, paragraph 10a: There is a problem with this section in that there is little or no discussion of limiting factors currently in effect. Such things as small mammals on seasonally flooded islands are not discussed and islands are a significant part of the land area covered by the appendix and assessment.

Page 18, paragraph 1, line 7: "Adequate buffer zones" should be clarified to include a circumference of at least 1,500 feet around the rookery from the outer most nest trees where no clearcutting will occur.

Page 18, paragraph 10b: The last sentence refers to a 100-year rotation and the appendix addresses 70-year rotations. This conflict should be corrected (FWS prefers a 100-year rotation period).

Page 20, paragraph II, B: We cannot accept the definition of "high grading" that is presented. We suggest that high grading is the removal of only the best size and quality timber.

Page 20, paragraph VI, C: We strongly disagree with the last sentence. It has been our understanding that only the Corps could operate this type of program under the General Plan and Cooperative Agreement. The Fish and Wildlife Service may not have the monetary resources but we do have a high management interest in this type of activity. The sentence should at least read "and/or management interest". It also appears that the Corps may not have the monetary resources to implement this appendix.

In conclusion, our comments of October 15, 1981 on the draft appendix recommended that the forest management responsibility be turned over to the Service and states. Your further consideration of this recommendation, along with the aforementioned comments should be incorporated into the final environmental assessment.

We appreciated the opportunity to review this document and concur with your "Finding of No Significant Impact."

Sincerely yours,

James W. Pulliam, Jr.
Acting Regional Director

DEPARTMENT OF THE ARMY
ROCK ISLAND DISTRICT, CORPS OF ENGINEERS
CLOCK TOWER BUILDING
ROCK ISLAND, ILLINOIS 61201

REPLY TO
ATTENTION OF:

15 MAR 1982

NCROD-R-MR

James W. Pulliam, Jr.
Acting Regional Director
Unites States Department of the Interior
Fish and Wildlife Service
Federal Building, Fort Snelling
Twin Cities, Minnesota 55111

Dear Mr. Pulliam:

We appreciate your comments on the Environmental Assessment for the Forestry, Fish and Wildlife Management Plan for the Mississippi River Pools 11-14, 16-18, 21 and 22, in your letter to our office dated 4 February 1982.

Revision of the final environmental assessment is not being undertaken, as reevaluation of the assessment has been determined to be unwarranted. Your review comments will, however, become a part of our EA and FONSI District File.

Control of vehicle access and vehicular trespass are not considered a significant environmental impact; however, this matter will be addressed at our scheduled annual coordination meetings with the States and US Fish and Wildlife Service.

The flexibility of the plan allows for justified site specific changes in forest management prescriptions based upon input received during the annual coordination and stand mapping processes. Through the cooperation of all the agencies involved it may be possible to attain a sustained yield of superlative wildlife habitat that will benefit all involved resource agencies as well as the general public.

The plan proposes appropriate funding to accomplish intensive management objectives with any Federal action dependent upon Congressional appropriation. It is also hoped that the program will become partially self-sustaining after initial implementation.

15 MAR 1982

NCROD-R-MR BOLLMAN/jj/332-6696
James W. Pulliam, Jr.

It should be reemphasized that we will continue to work closely with all involved State resource management agencies and the US Fish and Wildlife Service during the implementation of this plan in order to assure its success.

Sincerely,

Signed By:
JOSEPH F. MANZI, JR.
LTC, Corps of Engineers
Deputy District Engineer

BERNARD P. SLOFER
Colonel, Corps of Engineers
District Engineer

CF:
OD (File Copy)
OD-R ✓
ED-PB
OD-R-MR

FINDING OF NO SIGNIFICANT IMPACT
FOR
MISSISSIPPI RIVER
FORESTRY, FISH AND WILDLIFE PLAN
POOLS 11-22

Having reviewed the information provided by this environmental assessment, and data obtained from cooperating Federal, State, and local agencies having jurisdiction by law or special expertise, and from the interested public, I find that implementation of the initial 5-year program for the Forestry, Fish and Wildlife Plan, Mississippi River, Pools 11-22, will not have a significant adverse effect on the quality of the environment. Therefore, it is my determination that preparation of an Environmental Impact Statement is not required. This determination may be reevaluated if warranted by later developments.

Three alternatives were considered in addition to the preferred action: "no action," "private-commercial action," and "other public agencies action."

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

1. Negative environmental impacts which could occur are minor, isolated, dispersed, and temporary in effect.

2. Vegetative management techniques are sound silvicultural practices intended to improve timber quality and enhance wildlife and recreation benefits.

3. No significant social,economic, environmental, or cultural impacts are anticipated as a result of the proposed actions. Continued coordination of annual implementation plans will be made to assure appropriate protection, conservation, or mitigation of rare and endangered species and cultural concerns.

4. Findings concerning placement of fill material into the water body, as a result of timber harvesting operations, will be specified through the application of Section 404(b)(1) Guidelines, for the annual implementation plans.

4 MAR 82
DATE

BERNARD P. SLOFER
Colonel, Corps of Engineers
District Engineer

# MISSISSIPPI RIVER PROJECT MASTER PLAN
# WITH
# INTEGRATED ENVIRONMENTAL ASSESSMENT

# UPPER MISSISSIPPI RIVER WATERSHED
# POOLS 11-22
# 9-FOOT CHANNEL NAVIGATION PROJECT
# PLEASANT VALLEY, IOWA

## APPENDIX J

## LAND USE CLASSIFICATION AND MANAGEMENT PLATES

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Guttenberg

Lock & Dam 10

615

USACE
Rock Island District

USACE
St. Paul District

614

Goetz Island

613

11-W-1

11-H-3

612

11-V-1

Island 189

611

IOWA
Clayton County

Cassville Slough

WISCONSIN
Grant County

610

Millville

Nelson Dewey
State Park

609

Turkey River

608

11-L-1

11-E-1

Turkey River Bottoms

607

Cassville

11-W-1

606

- Boat Access
- USACE District Boundary
- County Line
- River Mile
- Corps Aquired Tracts
- Corps Easement on Private Land

**Master Plan Land Classification***

- Environmentally Sensitive Areas
- High Density Recreation
- Low Density Recreation
- Project Operations
- Vegetative Management
- Wildlife Management

- IL DNR Public Lands
- USFWS Public Lands
- IA DNR Owned Public Lands
- MDC Owned Public Lands
- Other Public Lands

***See disclaimer & information at the beginning of map set.**

**Mississippi River Project**
**Master Plan**
**Pool 11**
**River Mile 615 - 606**
**Plate 1 of 36**

0.5 0.25 0 0.5 Miles

Guttenberg

Lock & Dam 10

615

USACE
Rock Island District

USACE
St. Paul District

614

Goetz Island

613

11-W-1

11-H-3

612

11-V-1

IOWA

Clayton County

Island 189

611

WISCONSIN

Grant County

Cassville Slough

610

Millville

609

Turkey River

608

11-L-1

11-E-1

607

Cassville

Turkey River Bottoms

11-W-1

606

- Boat Access
- USACE District Boundary
- County Line
- River Mile

**Managing Agency on Corps Lands***

- Lease Area
- IA DNR Management
- IL DNR Management
- MDC Management
- USFWS Management
- Corps Management

- IL DNR Owned Public Lands
- USFWS Owned Public Lands
- IA DNR Owned Public Lands
- MDC Owned Public Lands

***See disclaimer & information at the beginning of map set.**

**Mississippi River Project**
**Master Plan**
**Pool 11**
**River Mile 615 - 606**
**Plate 1 of 36**

0.5 0.25 0 0.5 Miles

Turkey River Bottoms
606
Cassville
605
Jack Oak Island
604
North Buena Vista
11-E-2
Bertom/McCartney Lake
603
11-W-1
602
11-L-2
601
11-W-1
600
599
598
597
Balltown
Clayton County
Dubuque County
IOWA
WISCONSIN
Grant County

- Boat Access
- County Line
- River Mile
- Corps Aquired Tracts
- Corps Easement on Private Land

**Master Plan Land Classification***

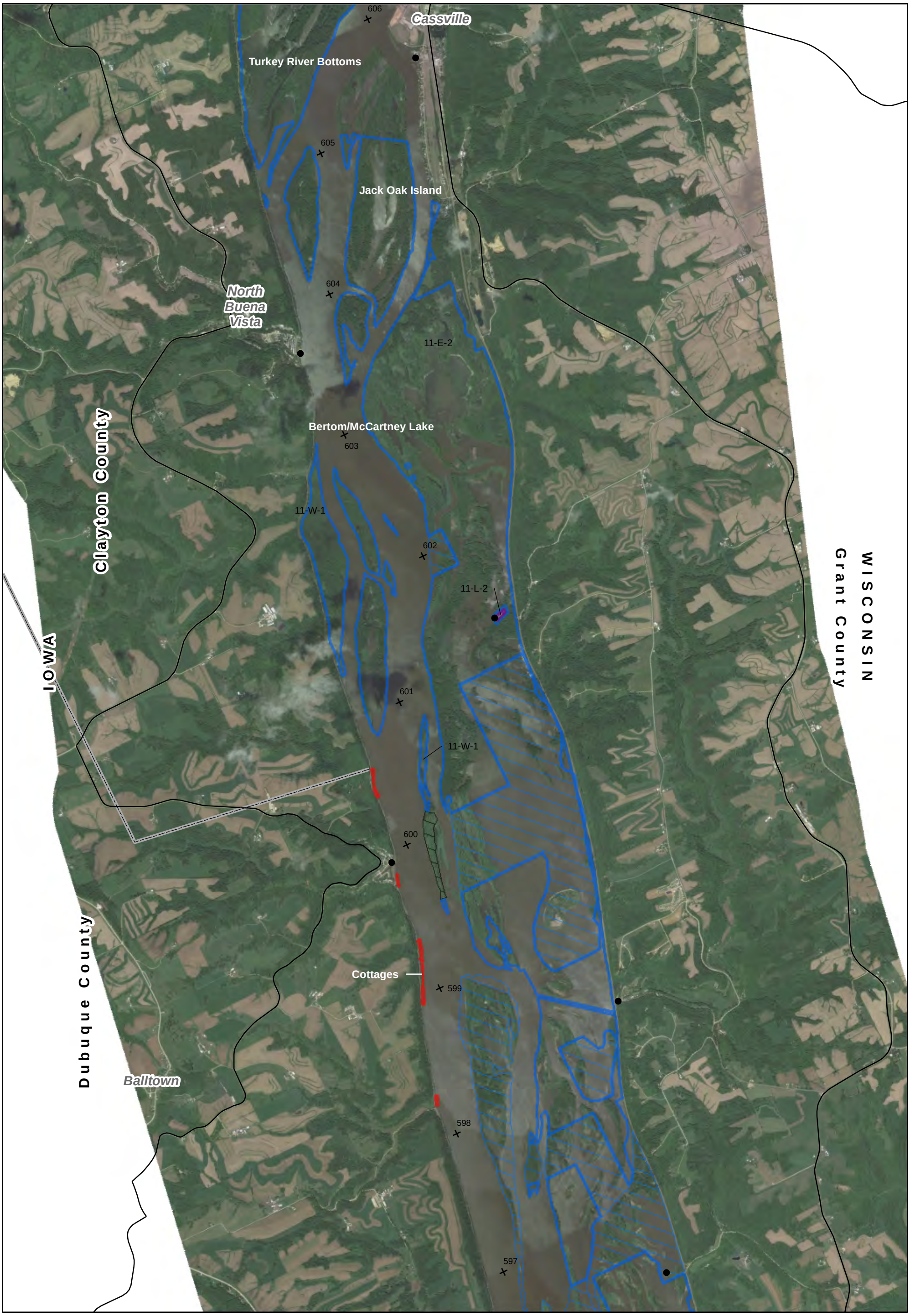
- Environmentally Sensitive Areas
- High Density Recreation
- Low Density Recreation
- Project Operations
- Vegetative Management
- Wildlife Management

- IL DNR Public Lands
- USFWS Public Lands
- Other Public Lands
- IA DNR Owned Public Lands
- MDC Owned Public Lands

*See disclaimer & information at the beginning of map set.

**Mississippi River Project**
**Master Plan**
**Pool 11**
**River Mile 606 - 597**
**Plate 2 of 36**

0.5 0.25 0 0.5 Miles




- Boat Access
- County Line
- River Mile

**Managing Agency on Corps Lands***

- Lease Area
- IA DNR Management
- IL DNR Management
- MDC Management
- USFWS Management
- Corps Management

- IL DNR Owned Public Lands
- USFWS Owned Public Lands
- IA DNR Owned Public Lands
- MDC Owned Public Lands

***See disclaimer & information at the beginning of map set.**

**Mississippi River Project**
**Master Plan**
**Pool 11**
**River Mile 606 - 597**
**Plate 2 of 36**

0.5 0.25 0 0.5 Miles

Balltown

11-E-2

11-W-1

598

597

596

595

11-V-1

11-W-1

11-O-1

594

11-E-3

593

11-L-3

11-L-5

592

591

11-E-4

Grant River Recreation Area

11-H-2

590

11-L-5

Mud Lake

IOWA

Dubuque County

WISCONSIN

Grant County

Potosi

Tennyson

- Boat Access
- County Line
- River Mile
- Corps Aquired Tracts
- Corps Easement on Private Land

**Master Plan Land Classification***

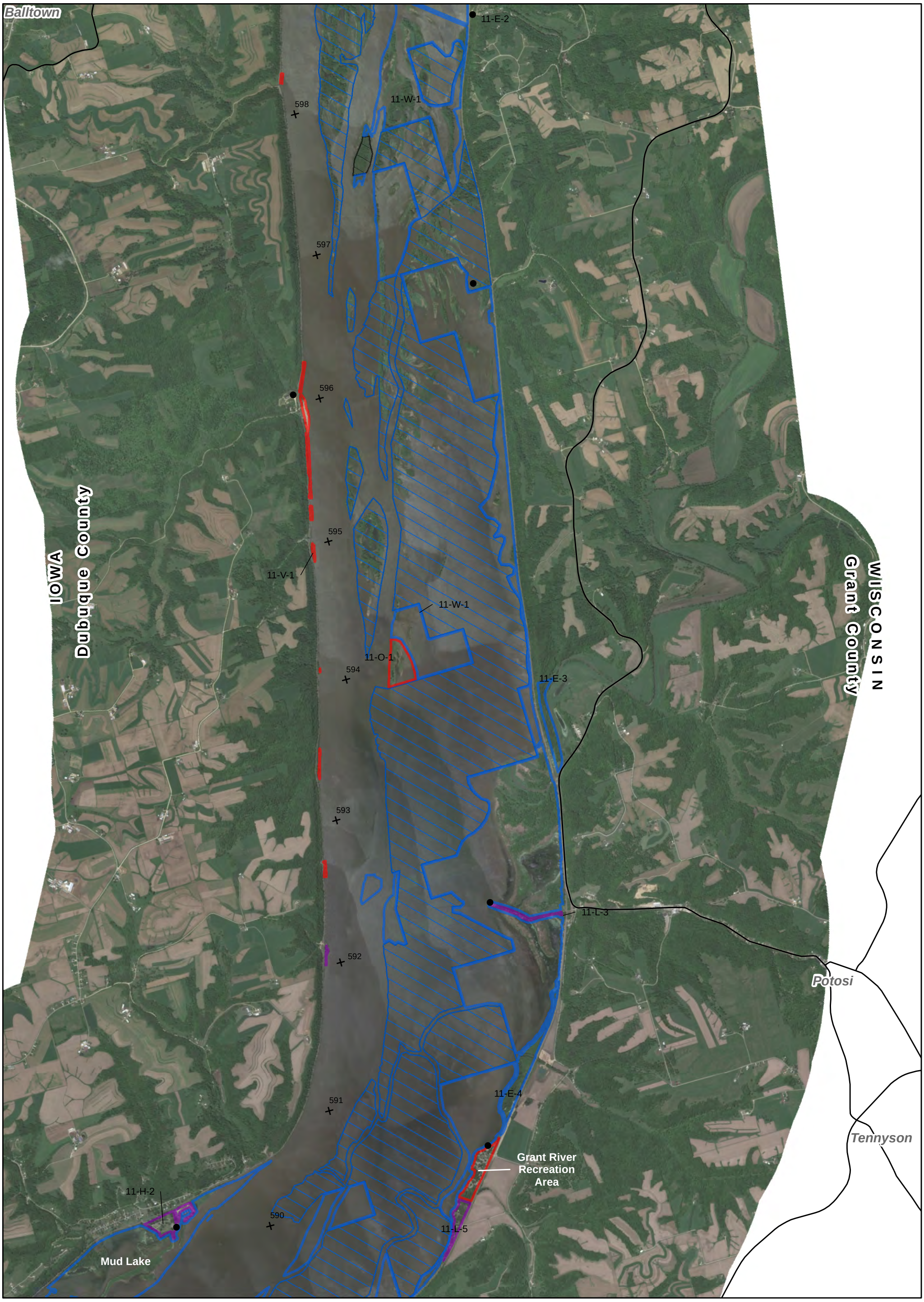
- Environmentally Sensitive Areas
- High Density Recreation
- Low Density Recreation
- Project Operations
- Vegetative Management
- Wildlife Management

- IL DNR Public Lands
- USFWS Public Lands
- Other Public Lands
- IA DNR Owned Public Lands
- MDC Owned Public Lands

***See disclaimer & information at the beginning of map set.**

**Mississippi River Project**
**Master Plan**
**Pool 11**
**River Mile 599 - 589**
**Plate 3 of 36**

0.5 0.25 0 0.5 Miles




- Boat Access
- County Line
- River Mile

**Managing Agency on Corps Lands***

- Lease Area
- IA DNR Management
- IL DNR Management
- MDC Management
- USFWS Management
- Corps Management

- IL DNR Owned Public Lands
- USFWS Owned Public Lands
- IA DNR Owned Public Lands
- MDC Owned Public Lands

***See disclaimer & information at the beginning of map set.**

**Mississippi River Project**
**Master Plan**
**Pool 11**
**River Mile 599 - 589**
**Plate 3 of 36**

0.55 0.275 0 0.55 Miles

IOWA
Dubuque County

WISCONSIN
Grant County

592
591
590
589
588
587
586
585
584
583

Grant River Recreation Area
11-L-5
11-H-2
Mud Lake
Platte River
11-W-1
Little Maquoketa River
Little Makoqueta River Delta
11-L-5
11-L-4
11-V-1
11-W-1
11-L-5
11-O-2
11-H-3
Stumpf Island
Lock & Dam 11 Area
Eagle Point Park (IA DNR)
Dubuque
Sageville

- Boat Access
- County Line
- River Mile
- Corps Aquired Tracts
- Corps Easement on Private Land

**Master Plan Land Classification***

- Environmentally Sensitive Areas
- High Density Recreation
- Low Density Recreation
- Project Operations
- Vegetative Management
- Wildlife Management

- IL DNR Public Lands
- USFWS Public Lands
- Other Public Lands
- IA DNR Owned Public Lands
- MDC Owned Public Lands

***See disclaimer & information at the beginning of map set.**

N W E S

**Mississippi River Project**
**Master Plan**
**Pool 11**
**River Mile 592 - 582**
**Plate 4 of 36**

0.5 0.25 0 0.5 Miles

592
591
590
589
588
587
586
585
584
583
Grant River Recreation Area
11-L-5
11-H-2
Mud Lake
Platte River
IOWA
Dubuque County
11-W-1
Little Makoqueta River Delta
Little Maquoketa River
11-L-5
11-L-4
11-V-1
WISCONSIN
Grant County
11-W-1
11-L-5
Sageville
Lock & Dam 11 Area
Dubuque
11-H-3
11-O-2
Stumpf Island

- Boat Access
- County Line
- River Mile

**Managing Agency on Corps Lands***

- Lease Area
- IA DNR Management
- IL DNR Management
- MDC Management
- USFWS Management
- Corps Management

- IL DNR Owned Public Lands
- USFWS Owned Public Lands
- IA DNR Owned Public Lands
- MDC Owned Public Lands

*See disclaimer & information at the beginning of map set.

N W E S

**Mississippi River Project**
**Master Plan**
**Pool 11**
**River Mile 592 - 582**
**Plate 4 of 36**

0.55 0.275 0 0.55 Miles

IOWA

Dubuque County

WISCONSIN

Grant County

ILLINOIS

Jo Daviess County

Dubuque

East Dubuque

Menominee

Stumpf Island

Frentress Lake

582

581

580

578

577

576

575

574

573

12-H-2

12-H-9

12-H-3

12-O-1

12-O-2

12-W-1

12-H-4

12-L-3

12-E-1

12-E-4

12-E-2

12-O-3

12-L-2

12-H-5

12-W-1

12-E-3

12-E-3

12-V-1

- Boat Access
- County Line
- River Mile
- Corps Aquired Tracts
- Corps Easement on Private Land

**Master Plan Land Classification***

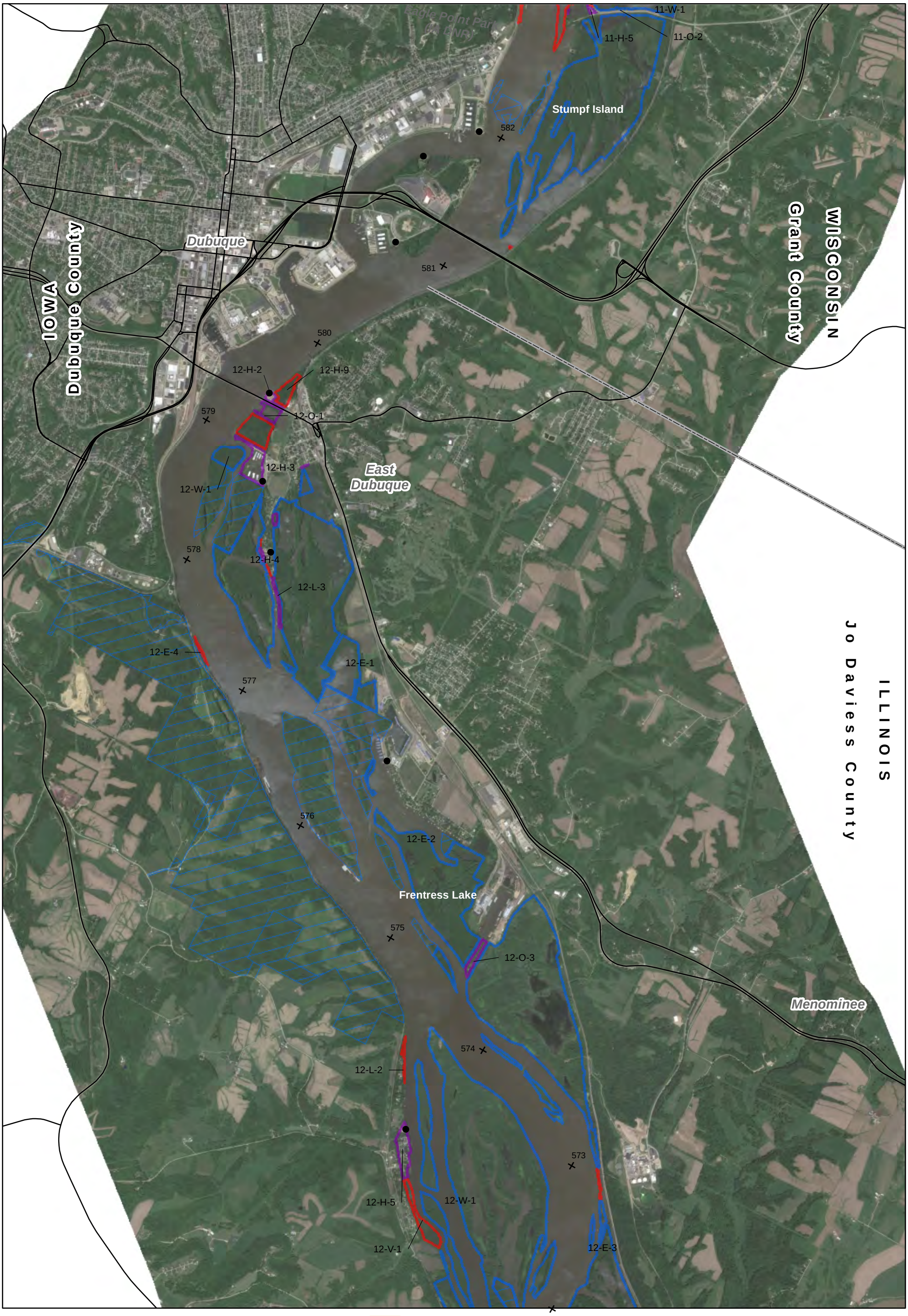
- Environmentally Sensitive Areas
- High Density Recreation
- Low Density Recreation
- Project Operations
- Vegetative Management
- Wildlife Management

- IL DNR Public Lands
- USFWS Public Lands
- IA DNR Owned Public Lands
- MDC Owned Public Lands
- Other Public Lands

***See disclaimer & information at the beginning of map set.**

**Mississippi River Project**
**Master Plan**
**Pool 12**
**River Mile 583 - 572**
**Plate 5 of 36**

0.5 0.25 0 0.5 Miles




*See disclaimer & information at the beginning of map set.

Menominee

572

571

Little Menominee River

IOWA

Dubuque County

12-W-1

570

569

12-E-3

Sinsinawa River

ILLINOIS

Jo Daviess County

12-W-1

568

IOWA

Jackson County

Tete Des Mortes Creek

567

Galena

12-L-4

12-H-6

566

12-V-1

565

564

Sunfish Lake

563

- Boat Access
- County Line
- River Mile
- Corps Aquired Tracts
- Corps Easement on Private Land

**Master Plan Land Classification***

- Environmentally Sensitive Areas
- High Density Recreation
- Low Density Recreation
- Project Operations
- Vegetative Management
- Wildlife Management

- IL DNR Public Lands
- USFWS Public Lands
- Other Public Lands
- IA DNR Owned Public Lands
- MDC Owned Public Lands

***See disclaimer & information at the beginning of map set.**

**Mississippi River Project**
**Master Plan**
**Pool 12**
**River Mile 572 - 563**
**Plate 6 of 36**

0.5 0.25 0 0.5 Miles

Menominee

572

571

Little Menominee River

IOWA

Dubuque County

570

12-W-1

Sinsinawa River

569

12-W-1

12-E-3

12-L-1

ILLINOIS

Jo Daviess County

568

IOWA

Jackson County

Tete Des Mortes Creek

567

Galena

12-L-4

12-L-1

12-H-6

12-V-1

566

12-L-1

565

564

Sunfish Lake

563

- Boat Access
- County Line
- River Mile

**Managing Agency on Corps Lands***

- Lease Area
- IA DNR Management
- IL DNR Management
- MDC Management
- USFWS Management
- Corps Management
- IL DNR Owned Public Lands
- USFWS Owned Public Lands
- IA DNR Owned Public Lands
- MDC Owned Public Lands

***See disclaimer & information at the beginning of map set.**

**Mississippi River Project**
**Master Plan**
**Pool 12**
**River Mile 572 - 563**
**Plate 6 of 36**

0.55 0.275 0 0.55 Miles

IOWA
Jackson County

ILLINOIS
Jo Daviess County

566
565
564
563
562
561
560
559
558
557
556

12-L-1
12-L-2
12-W-1
12-H-8
12-H-1
12-V-1
12-O-4
12-O-5
13-L-3

Sunfish Lake
Smallpox Creek
Blanding
Landing
Recreation Area
Bellevue

- Boat Access
- County Line
- River Mile
- Corps Aquired Tracts
- Corps Easement on Private Land

**Master Plan Land Classification***

- Environmentally Sensitive Areas
- High Density Recreation
- Low Density Recreation
- Project Operations
- Vegetative Management
- Wildlife Management

- IL DNR Public Lands
- USFWS Public Lands
- Other Public Lands
- IA DNR Owned Public Lands
- MDC Owned Public Lands

*See disclaimer & information at the beginning of map set.

N W E S

**Mississippi River Project**
**Master Plan**
**Pool 12**
**River Mile 566 - 556**
**Plate 7 of 36**

0.5 0.25 0 0.5 Miles

566
12-L-1
565
Sunfish Lake
564
12-L-1
12-L-1
Smallpox Creek
563
IOWA
Jackson County
ILLINOIS
Jo Daviess County
12-W-1
12-L-1
562
12-L-1
561
560
12-H-8
12-W-1
559
12-V-1
12-L-1
558
Blanding Landing
Recreation Area
12-L-2
12-H-1
12-O-4
Bellevue
557
Lock & Dam 12 Area
12-O-5
13-L-3
556

- Boat Access
- County Line
- River Mile

**Managing Agency on Corps Lands***

- Lease Area
- IA DNR Management
- IL DNR Management
- MDC Management
- USFWS Management
- Corps Management

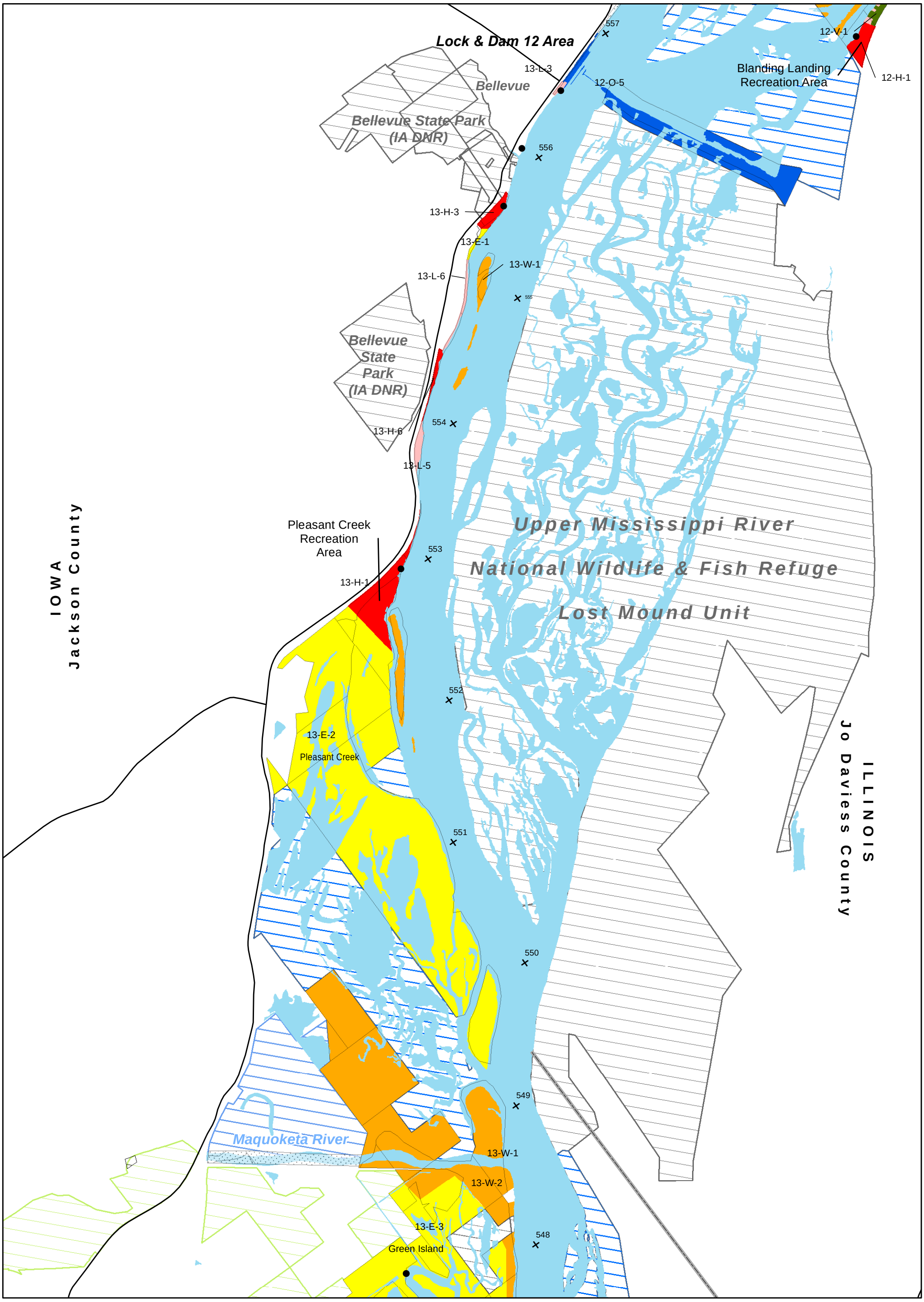
- IL DNR Owned Public Lands
- USFWS Owned Public Lands
- IA DNR Owned Public Lands
- MDC Owned Public Lands

***See disclaimer & information at the beginning of map set.**

N W E S

**Mississippi River Project**
**Master Plan**
**Pool 12**
**River Mile 566 - 556**
**Plate 7 of 36**

0.55 0.275 0 0.55 Miles




- Boat Access
- County Line
- River Mile
- Corps Aquired Tracts
- Corps Easement on Private Land

**Master Plan Land Classification***

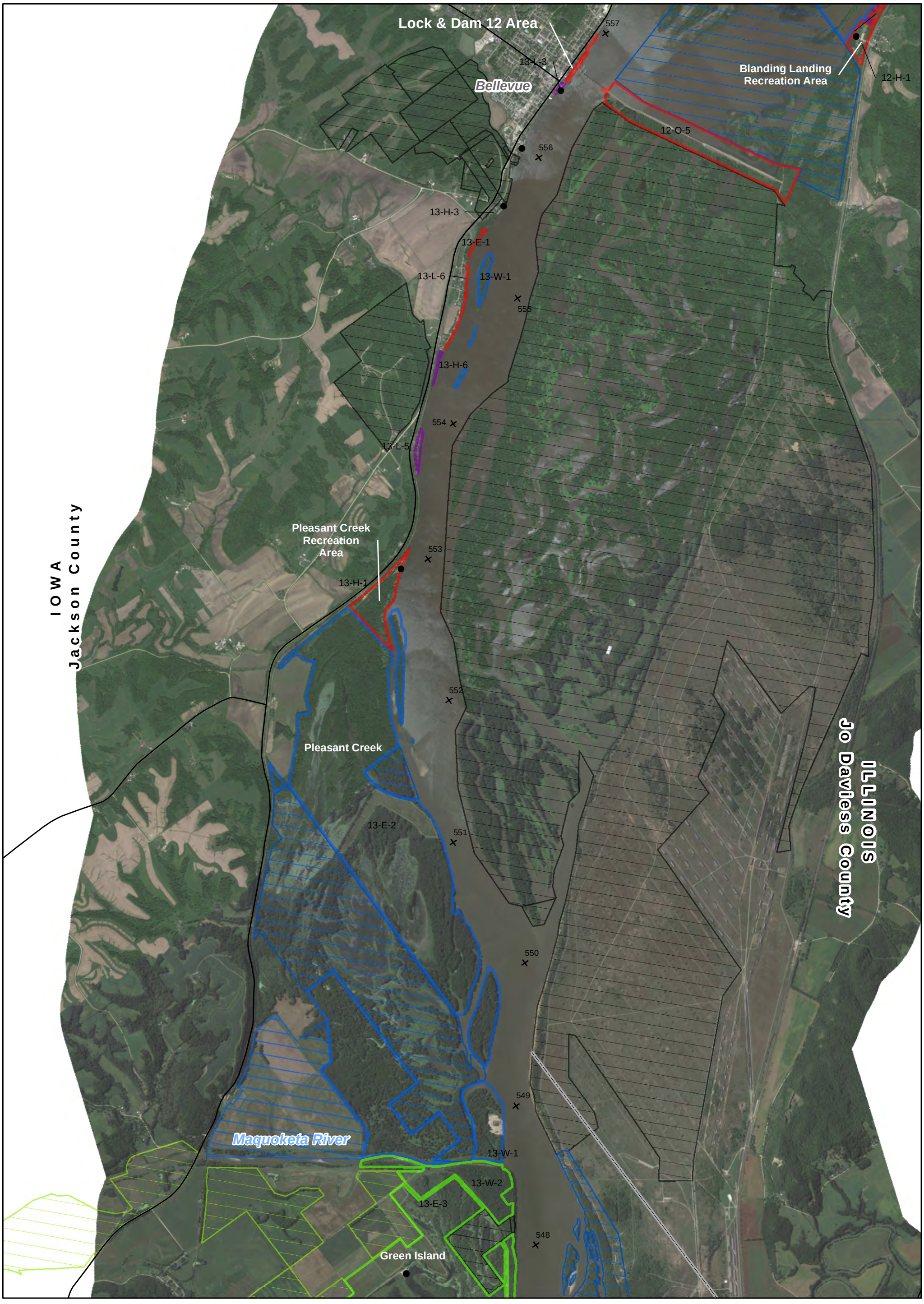
- Environmentally Sensitive Areas
- High Density Recreation
- Low Density Recreation
- Project Operations
- Vegetative Management
- Wildlife Management

- IL DNR Public Lands
- USFWS Public Lands
- Other Public Lands
- IA DNR Owned Public Lands
- MDC Owned Public Lands

***See disclaimer & information at the beginning of map set.**

**Mississippi River Project**
**Master Plan**
**Pool 13**
**River Mile 557 - 548**
**Plate 8 of 36**

0.5 0.25 0 0.5 Miles




- Boat Access
- County Line
- River Mile

**Managing Agency on Corps Lands***

- Lease Area
- IA DNR Management
- IL DNR Management
- MDC Management
- USFWS Management
- Corps Management

- IL DNR Owned Public Lands
- USFWS Owned Public Lands
- IA DNR Owned Public Lands
- MDC Owned Public Lands

***See disclaimer & information at the beginning of map set.**

**Mississippi River Project**
**Master Plan**
**Pool 13**
**River Mile 557 - 548**
**Plate 8 of 36**

0.55 0.275 0 0.55 Miles

ILLINOIS
Jo Daviess County
IOWA
Jackson County
ILLINOIS
Carroll County
548
547
546
545
544
543
542
541
540
539
13-E-3
Green Island
13-W-2
Apple River Island
13-W-1
Brown's Lake
13-E-4
13-W-2
13-L-7
13-L-7
Running Slough
13-W-1

- Boat Access
- County Line
- River Mile
- Corps Aquired Tracts
- Corps Easement on Private Land

**Master Plan Land Classification***

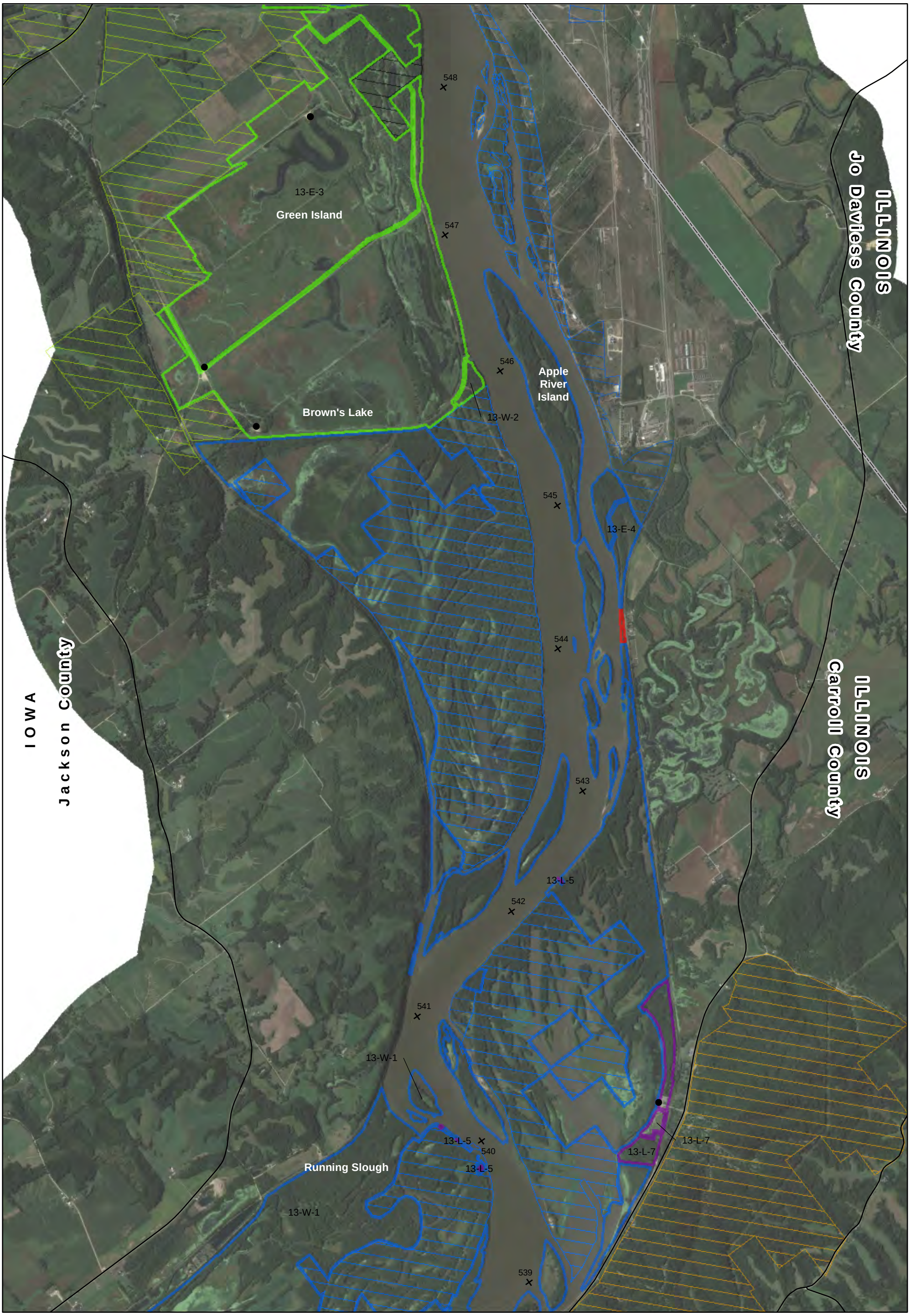
- Environmentally Sensitive Areas
- High Density Recreation
- Low Density Recreation
- Project Operations
- Vegetative Management
- Wildlife Management

- IL DNR Public Lands
- USFWS Public Lands
- Other Public Lands
- IA DNR Owned Public Lands
- MDC Owned Public Lands

***See disclaimer & information at the beginning of map set.**

**Mississippi River Project**
**Master Plan**
**Pool 13**
**River Mile 548 - 539**
**Plate 9 of 36**

0.5 0.25 0 0.5 Miles




- Boat Access
- County Line
- River Mile

**Managing Agency on Corps Lands***

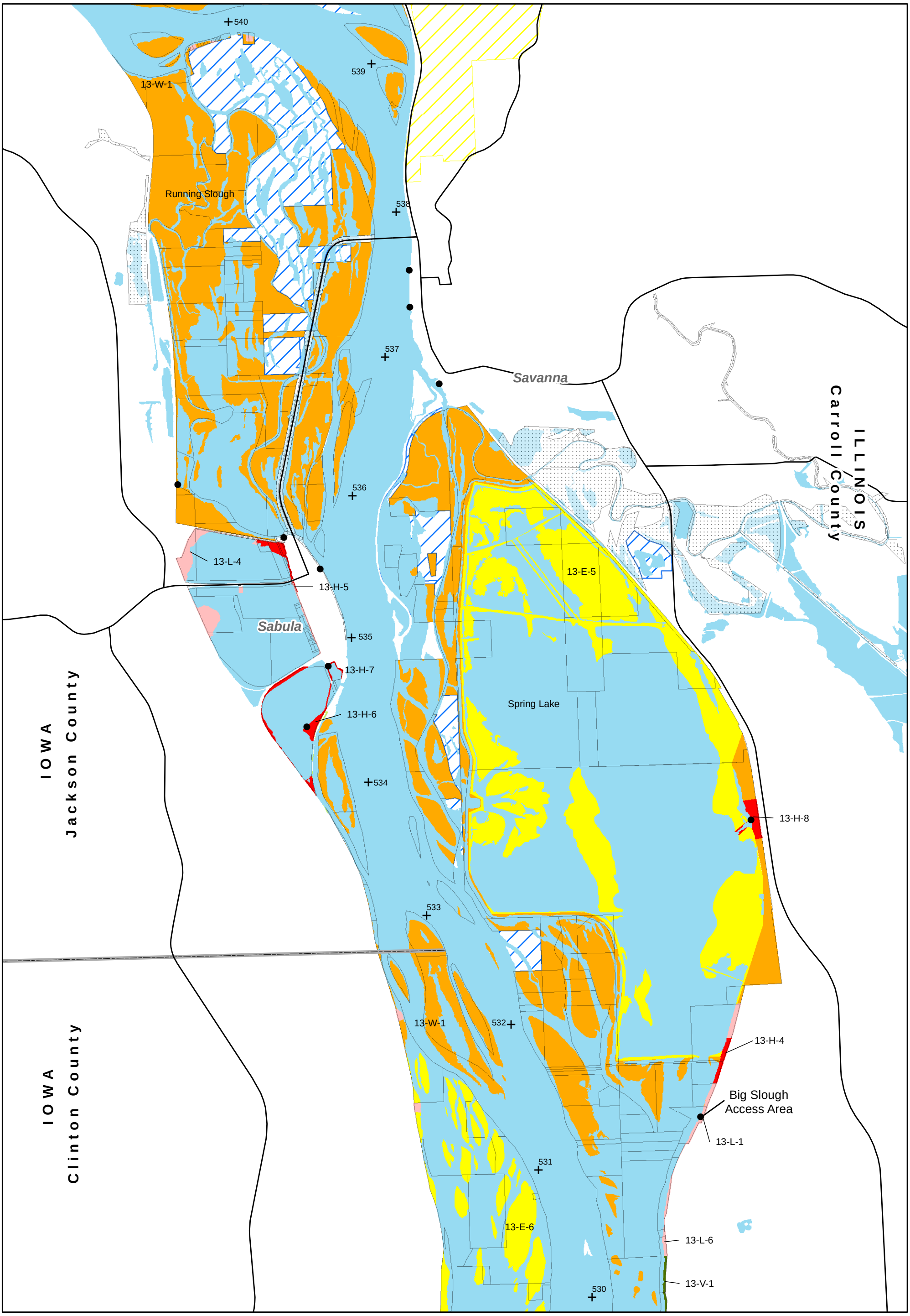
- Lease Area
- IA DNR Management
- IL DNR Management
- MDC Management
- USFWS Management
- Corps Management

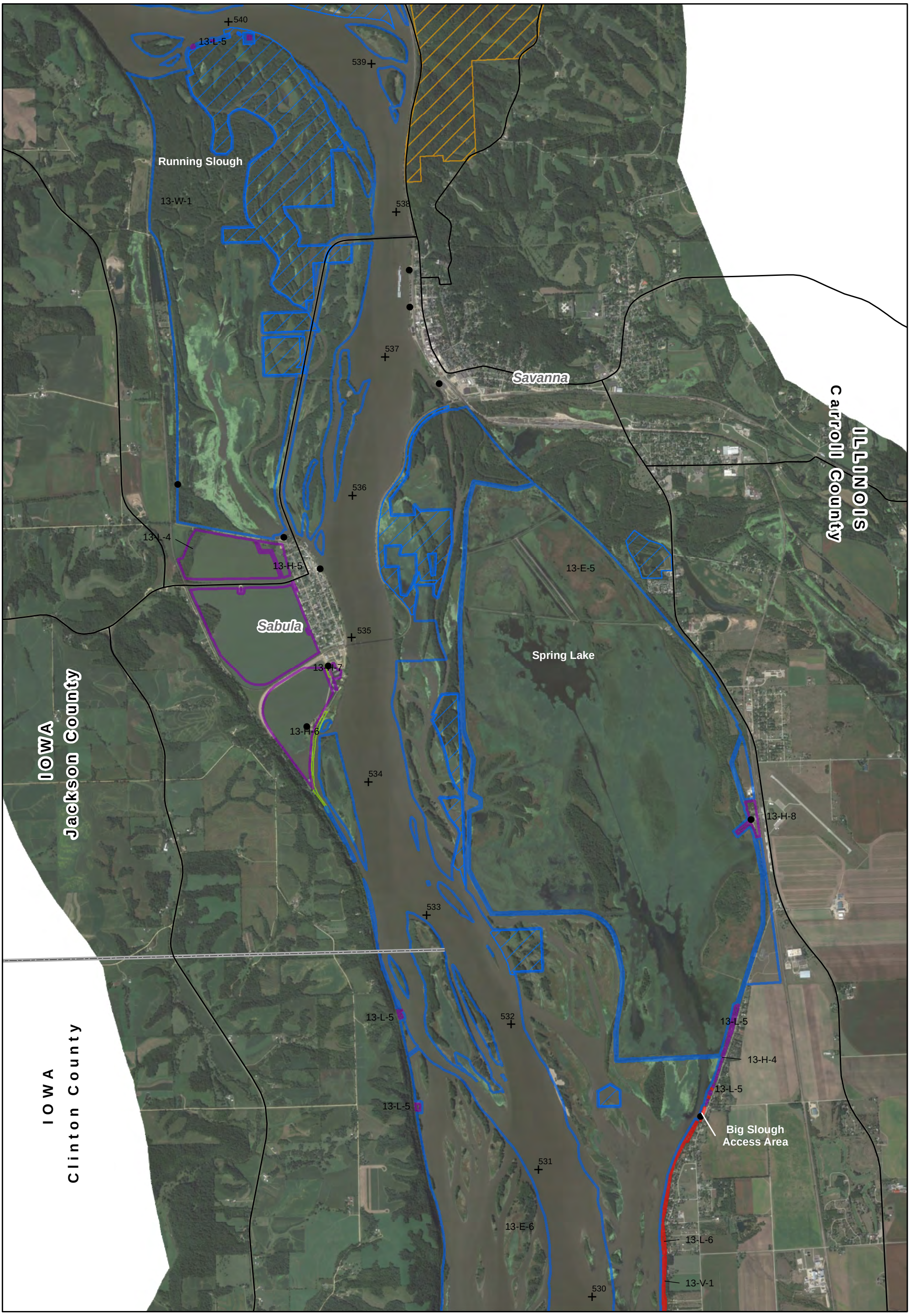
- IL DNR Owned Public Lands
- USFWS Owned Public Lands
- IA DNR Owned Public Lands
- MDC Owned Public Lands

***See disclaimer & information at the beginning of map set.**

**Mississippi River Project**
**Master Plan**
**Pool 13**
**River Mile 548 - 539**
**Plate 9 of 36**

0.5 0.25 0 0.5 Miles


540
539
538
537
536
535
534
533
532
531
530
13-W-1
Running Slough
Savanna
ILLINOIS
Carroll County
13-L-4
13-H-5
Sabula
13-H-7
13-H-6
13-E-5
Spring Lake
13-H-8
IOWA
Jackson County
IOWA
Clinton County
13-W-1
13-H-4
Big Slough
Access Area
13-L-1
13-E-6
13-L-6
13-V-1
Boat Access
County Line
River Mile
Corps Aquired Tracts
Corps Easement on Private Land
Master Plan Land Classification*
Environmentally Sensitive Areas
High Density Recreation
Low Density Recreation
Project Operations
Vegetative Management
Wildlife Management
IL DNR Public Lands
USFWS Public Lands
IA DNR Owned Public Lands
MDC Owned Public Lands
*See disclaimer & information at the beginning of map set.
N
W
E
S
Mississippi River Project
Master Plan
Pool 13
River Mile 541 - 530
Plate 10 of 36
0.5 0.25 0 0.5 Miles




- Boat Access
- County Line
- River Mile

**Managing Agency on Corps Lands***

- Lease Area
- IA DNR Management
- IL DNR Management
- MDC Management
- USFWS Management
- Corps Management

- IL DNR Owned Public Lands
- USFWS Owned Public Lands
- IA DNR Owned Public Lands
- MDC Owned Public Lands

*See disclaimer & information at the beginning of map set.

N W E S

**Mississippi River Project**
**Master Plan**
**Pool 13**
**River Mile 541 - 530**
**Plate 10 of 36**

0.5 0.25 0 0.5 Miles

IOWA
Clinton County
ILLINOIS
Carroll County
ILLINOIS
Whiteside County
Thomson
Clinton
Fulton
530
529
528
527
526
525
524
523
522
521
13-V-1
13-L-6
13-E-6
13-W-1
13-L-5
13-E-7
13-E-7
13-H-2
Thomson Causeway Recreation Area
13-V-1
13-L-5
13-L-2
Bulger's Hollow Recreation Area
13-E-9
13-E-9
13-W-1
13-O-1
14-W-1
14-L-7

- Boat Access
- County Line
- River Mile
- Corps Aquired Tracts
- Corps Easement on Private Land

**Master Plan Land Classification***

- Environmentally Sensitive Areas
- High Density Recreation
- Low Density Recreation
- Project Operations
- Vegetative Management
- Wildlife Management

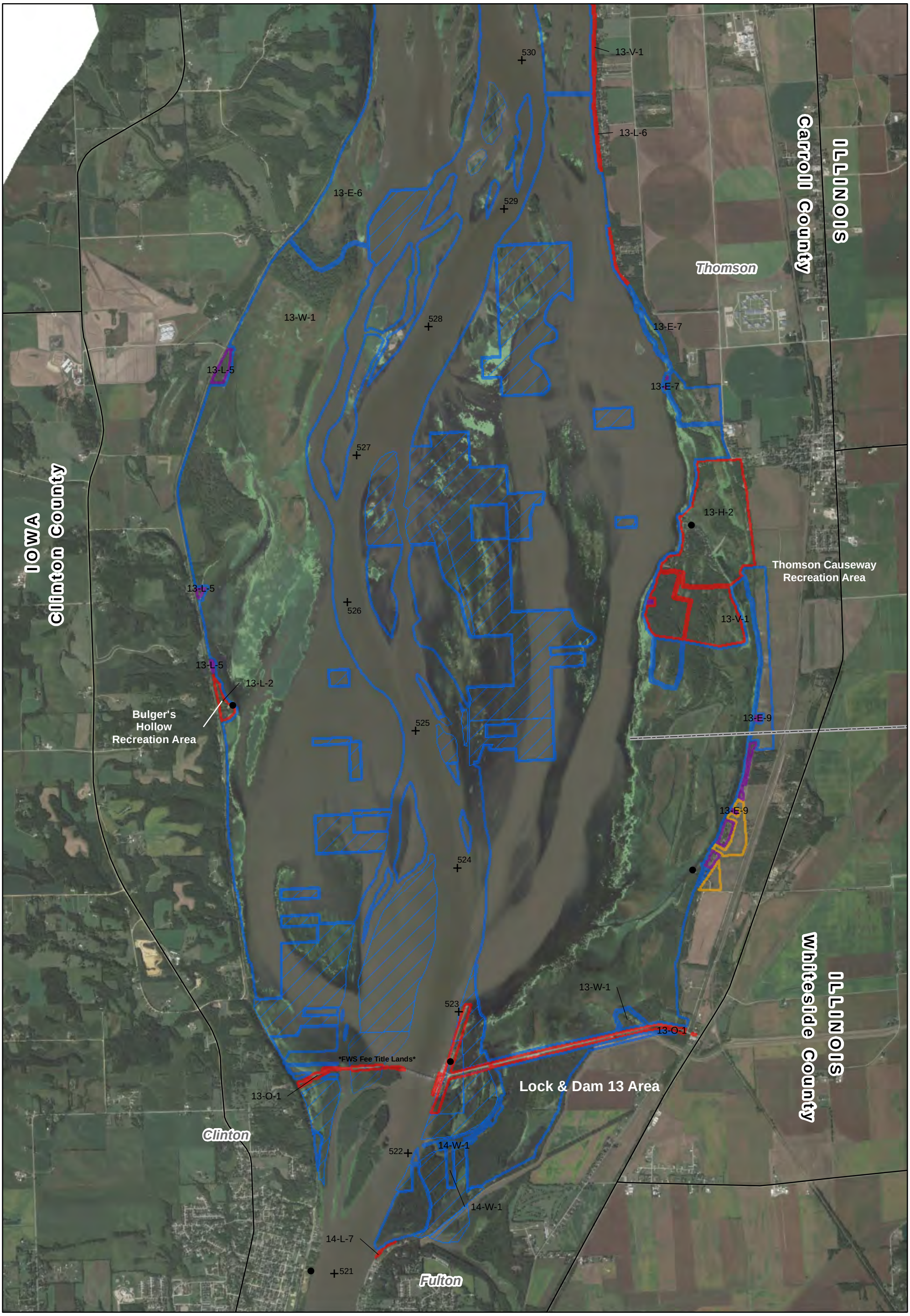
- IL DNR Public Lands
- USFWS Public Lands
- Other Public Lands
- IA DNR Owned Public Lands
- MDC Owned Public Lands

*See disclaimer & information at the beginning of map set.

N W E S

**Mississippi River Project**
**Master Plan**
**Pool 13**
**River Mile 530 - 521**
**Plate 11 of 36**

0.5 0.25 0 0.5 Miles




- Boat Access
- County Line
- River Mile

**Managing Agency on Corps Lands***

- Lease Area
- IA DNR Management
- IL DNR Management
- MDC Management
- USFWS Management
- Corps Management

- IL DNR Owned Public Lands
- USFWS Owned Public Lands
- IA DNR Owned Public Lands
- MDC Owned Public Lands

***See disclaimer & information at the beginning of map set.**

N W E S

**Mississippi River Project**
**Master Plan**
**Pool 13**
**River Mile 530 - 521**
**Plate 11 of 36**

0.5 0.25 0 0.5 Miles

13-O-1
13-W-1
522
14-W-1
14-L-7
521
14-V-1
Fulton
520
IOWA
Clinton County
ILLINOIS
Whiteside County
14-H-2
519
Cattail Slough
Recreation Area
518
14-L-1
14-O-1
Clinton
517
14-W-1
516
14-E-1
Beaver Island
515
514
Albany
Camanche
513

- Boat Access
- County Line
- River Mile
- Corps Aquired Tracts
- Corps Easement on Private Land

**Master Plan Land Classification***

- Environmentally Sensitive Areas
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- Low Density Recreation
- Project Operations
- Vegetative Management
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- USFWS Public Lands
- Other Public Lands
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- MDC Owned Public Lands

***See disclaimer & information at the beginning of map set.**

N E S W

**Mississippi River Project**
**Master Plan**
**Pool 14**
**River Mile 522 - 512**
**Plate 12 of 36**

0.5 0.25 0 0.5 Miles

IOWA
Clinton County

ILLINOIS
Whiteside County

13-W-1
13-O-1
522
14-W-1
14-L-7
521
14-V-1
Fulton
520
14-H-2
519
Cattail Slough Recreation Area
518
14-L-1
14-O-1
Clinton
517
14-W-1
516
14-E-1
Beaver Island
515
514
Albany
513
Camanche

- Boat Access
- County Line
- River Mile

**Managing Agency on Corps Lands***

- Lease Area
- IA DNR Management
- IL DNR Management
- MDC Management
- USFWS Management
- Corps Management
- IL DNR Owned Public Lands
- USFWS Owned Public Lands
- IA DNR Owned Public Lands
- MDC Owned Public Lands

***See disclaimer & information at the beginning of map set.**

N W E S

**Mississippi River Project**
**Master Plan**
**Pool 14**
**River Mile 522 - 512**
**Plate 12 of 36**

0.55 0.275 0 0.55 Miles

Clinton
Albany
Camanche
Whiteside County
IOWA
Clinton County
ILLINOIS
Rock Island County
Scott County
Wapsipinicon River
Princeton
Cordova
Swan Island
Adams Island
Wapsi Bottoms
Princeton WMA
Steamboat Island
14-W-1
14-L-2
14-O-2
14-L-5
14-H-3
14-E-2
512
511
510
508
507
506
505
504
503

- Boat Access
- County Line
- River Mile
- Corps Aquired Tracts
- Corps Easement on Private Land

**Master Plan Land Classification***

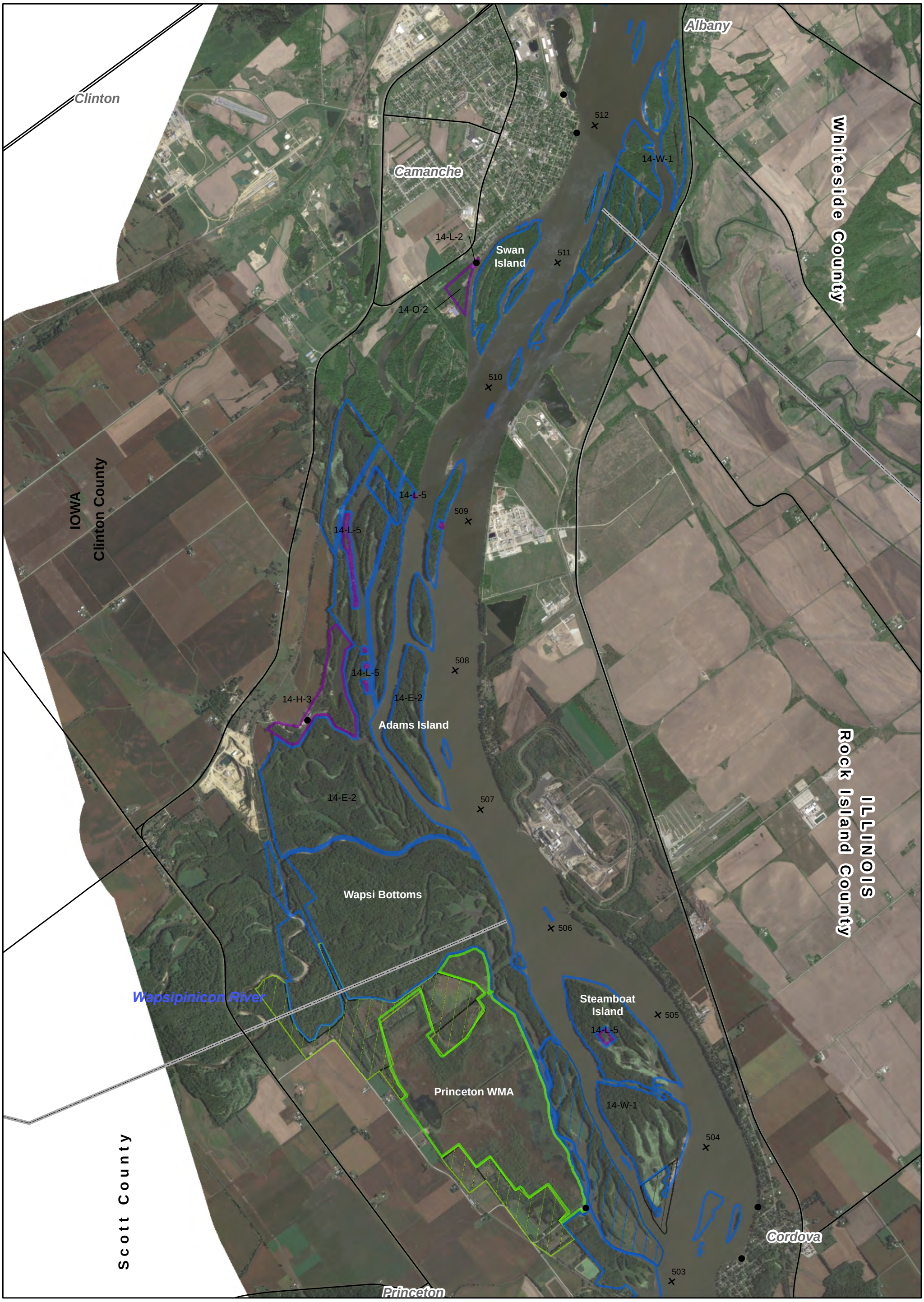
- Environmentally Sensitive Areas
- High Density Recreation
- Low Density Recreation
- Project Operations
- Vegetative Management
- Wildlife Management

- IL DNR Public Lands
- USFWS Public Lands
- Other Public Lands
- IA DNR Owned Public Lands
- MDC Owned Public Lands

***See disclaimer & information at the beginning of map set.**

**Mississippi River Project**
**Master Plan**
**Pool 14**
**River Mile 513 - 503**
**Plate 13 of 36**

0.5 0.25 0 0.5 Miles




- Boat Access
- County Line
- River Mile

**Managing Agency on Corps Lands***

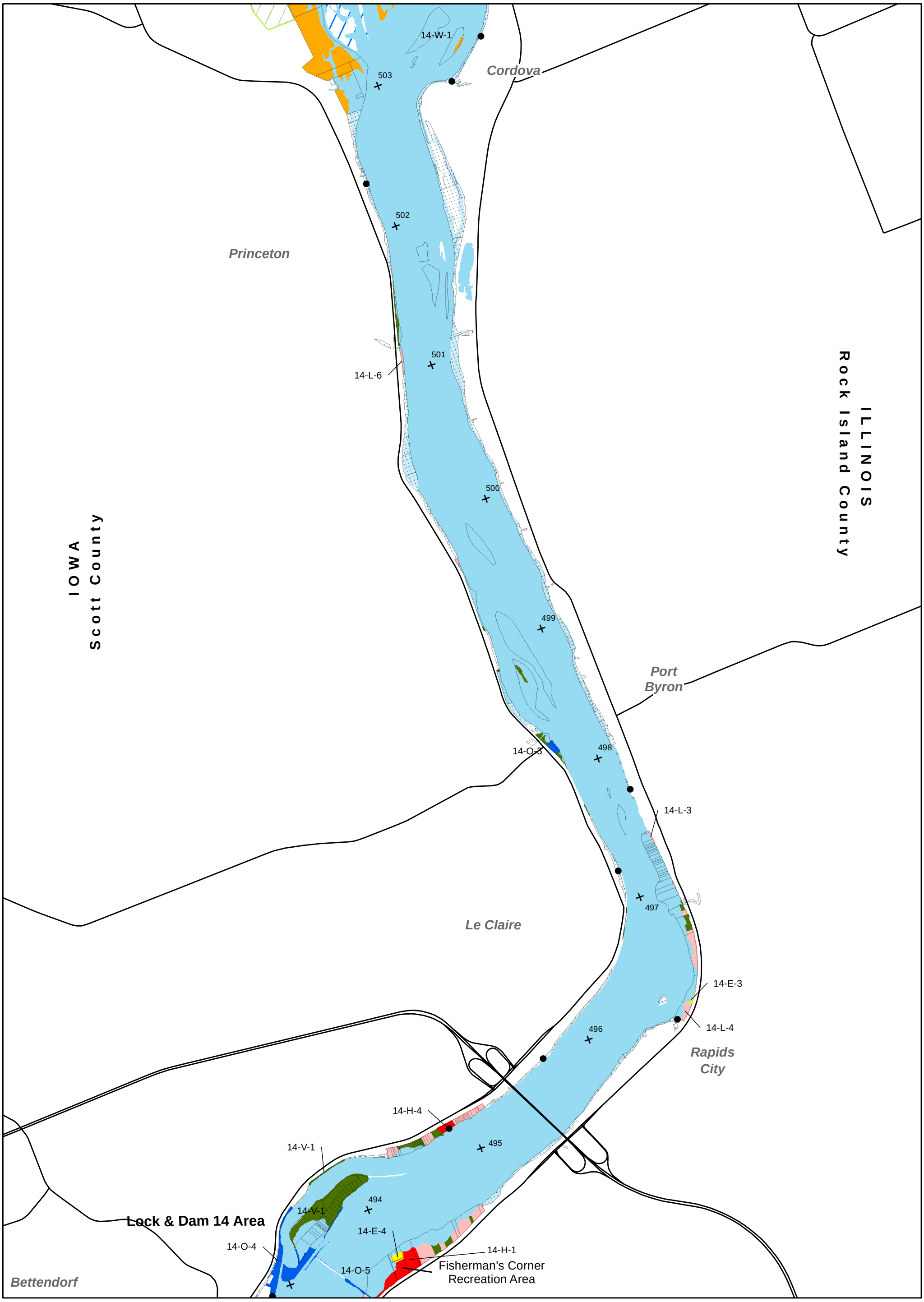
- Lease Area
- IA DNR Management
- IL DNR Management
- MDC Management
- USFWS Management
- Corps Management

- IL DNR Owned Public Lands
- USFWS Owned Public Lands
- IA DNR Owned Public Lands
- MDC Owned Public Lands

***See disclaimer & information at the beginning of map set.**

**Mississippi River Project**
**Master Plan**
**Pool 14**
**River Mile 513 - 503**
**Plate 13 of 36**

0.55 0.275 0 0.55 Miles




- Boat Access
- County Line
- River Mile
- Corps Aquired Tracts
- Corps Easement on Private Land

**Master Plan Land Classification***

- Environmentally Sensitive Areas
- High Density Recreation
- Low Density Recreation
- Project Operations
- Vegetative Management
- Wildlife Management

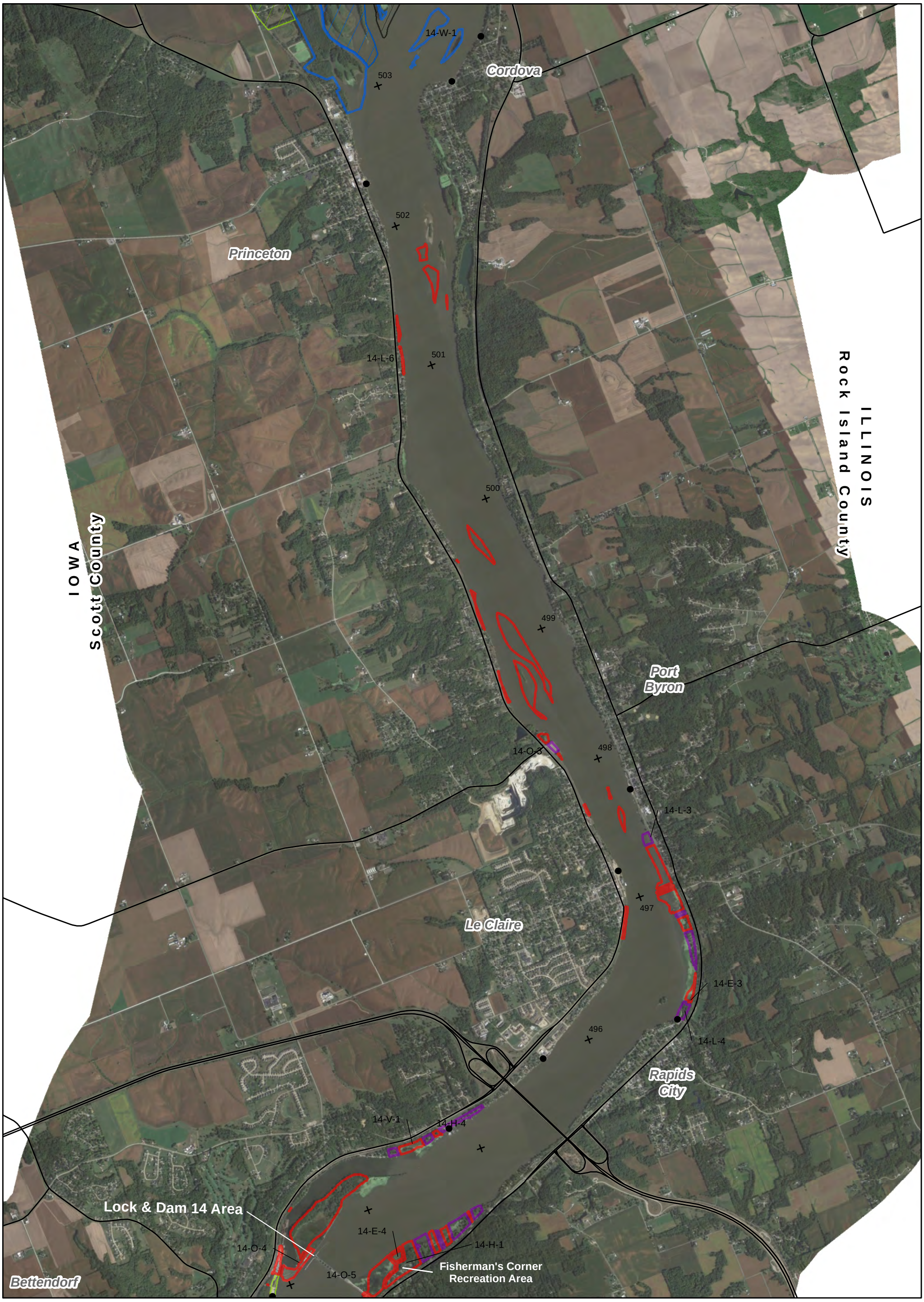
- IL DNR Public Lands
- USFWS Public Lands
- Other Public Lands
- IA DNR Owned Public Lands
- MDC Owned Public Lands

***See disclaimer & information at the beginning of map set.**

N E S W

**Mississippi River Project**
**Master Plan**
**Pool 14**
**River Mile 503 - 493**
**Plate 14 of 36**

0.5 0.25 0 0.5 Miles




- Boat Access
- County Line
- River Mile

**Managing Agency on Corps Lands***

- Lease Area
- IA DNR Management
- IL DNR Management
- MDC Management
- USFWS Management
- Corps Management

- IL DNR Owned Public Lands
- USFWS Owned Public Lands
- IA DNR Owned Public Lands
- MDC Owned Public Lands

***See disclaimer & information at the beginning of map set.**

N E S W

**Mississippi River Project**
**Master Plan**
**Pool 14**
**River Mile 503 - 493**
**Plate 14 of 36**

0.55 0.275 0 0.55 Miles

Carbon Cliff
Silvis
East Moline
Panorama Park
Riverdale
IOWA
Scott County
Bettendorf
ILLINOIS
Rock Island County
Moline
Davenport
Rock Island Arsenal
Rock Island
Lock & Dam 15
15-O-1
492
491
490
489
488
487
486
485
484
483

- Boat Access
- County Line
- River Mile
- Corps Aquired Tracts
- Corps Easement on Private Land

**Master Plan Land Classification***

- Environmentally Sensitive Areas
- High Density Recreation
- Low Density Recreation
- Project Operations
- Vegetative Management
- Wildlife Management

- IL DNR Public Lands
- USFWS Public Lands
- Other Public Lands
- IA DNR Owned Public Lands
- MDC Owned Public Lands

*See disclaimer & information at the beginning of map set.

**Mississippi River Project**
**Master Plan**
**Pool 15**
**River Mile 493 - 483**
**Plate 15 of 36**

0.5 0.25 0 0.5 Miles


- Boat Access
- County Line
- River Mile

**Managing Agency on Corps Lands***

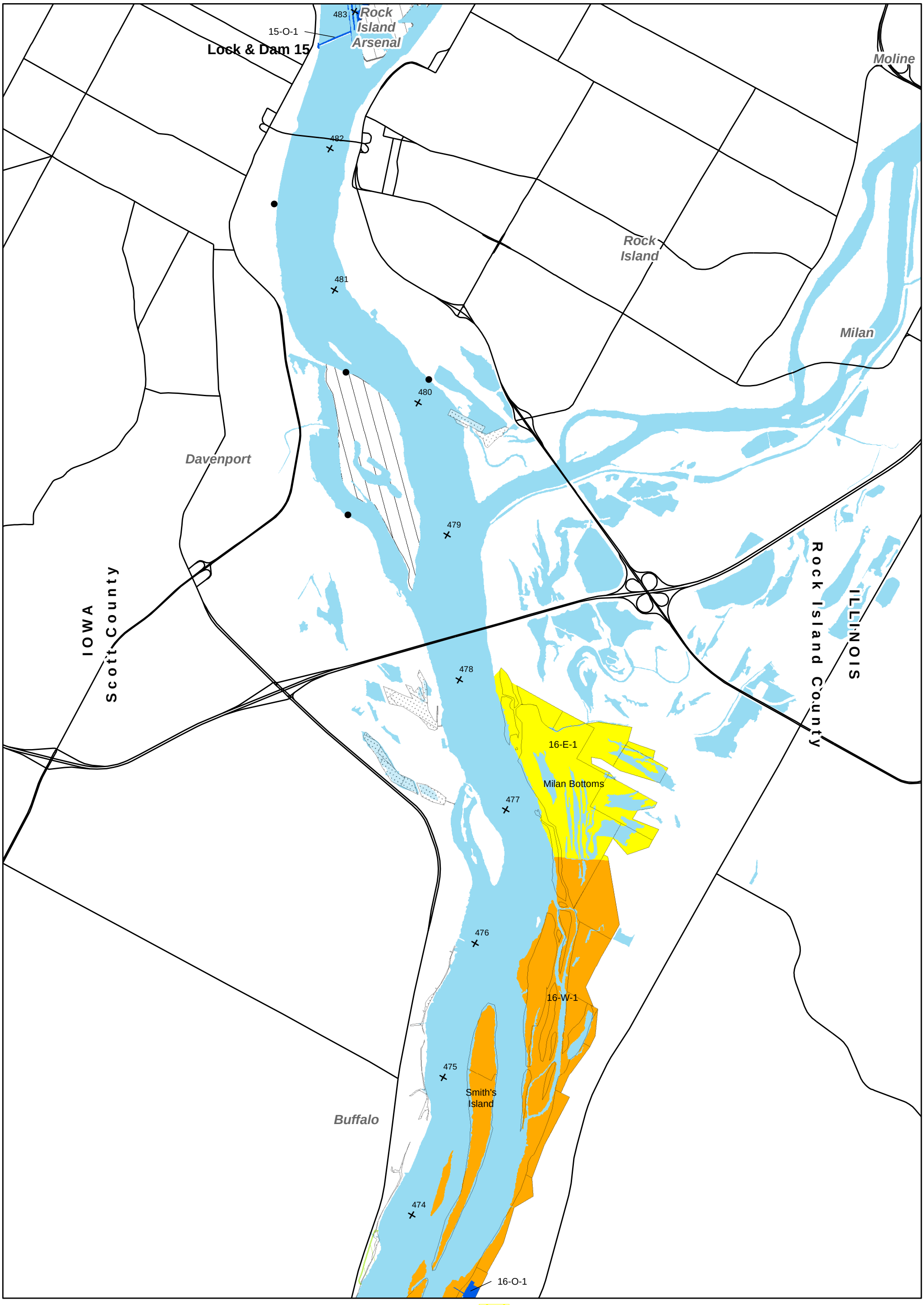
- Lease Area
- IA DNR Management
- IL DNR Management
- MDC Management
- USFWS Management
- Corps Management

- IL DNR Owned Public Lands
- USFWS Owned Public Lands
- IA DNR Owned Public Lands
- MDC Owned Public Lands

***See disclaimer & information at the beginning of map set.**

**Mississippi River Project**
**Master Plan**
**Pool 15**
**River Mile 493 - 483**
**Plate 15 of 36**

0.55 0.275 0 0.55 Miles




- Boat Access
- County Line
- River Mile
- Corps Aquired Tracts
- Corps Easement on Private Land

**Master Plan Land Classification***

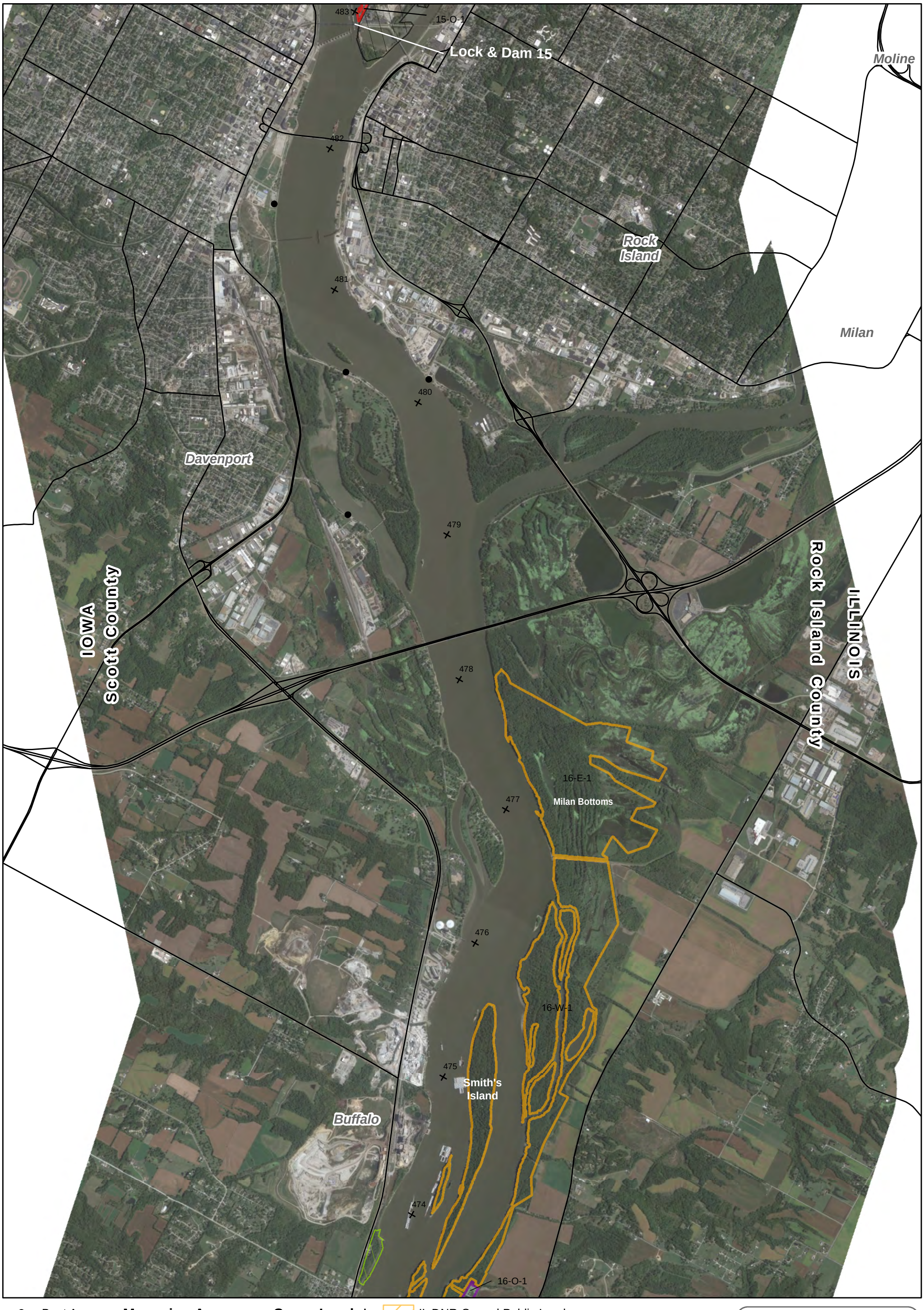
- Environmentally Sensitive Areas
- High Density Recreation
- Low Density Recreation
- Project Operations
- Vegetative Management
- Wildlife Management

- IL DNR Public Lands
- USFWS Public Lands
- Other Public Lands
- IA DNR Owned Public Lands
- MDC Owned Public Lands

***See disclaimer & information at the beginning of map set.**

**Mississippi River Project**
**Master Plan**
**Pool 16**
**River Mile 483 - 474**
**Plate 16 of 36**

0.5 0.25 0 0.5 Miles




- Boat Access
- County Line
- River Mile

**Managing Agency on Corps Lands***

- Lease Area
- IA DNR Management
- IL DNR Management
- MDC Management
- USFWS Management
- Corps Management

- IL DNR Owned Public Lands
- USFWS Owned Public Lands
- IA DNR Owned Public Lands
- MDC Owned Public Lands

***See disclaimer & information at the beginning of map set.**

**Mississippi River Project**
**Master Plan**
**Pool 16**
**River Mile 483 - 474**
**Plate 16 of 36**

0.55 0.275 0 0.55 Miles

474
Smith's Island
16-O-1
Andalusia
473
16-H-3
16-L-5
16-W-1
472
16-H-4
Buffalo
16-L-3
16-L-3
471
16-L-1
16-O-3
470
Andalusia
Slough
Recreation Area
Andalusia Island
16-V-1
16-L-3
469
16-L-3
Clarks Ferry
Recreation Area
16-H-1
16-L-3
16-W-1
16-L-6
16-L-3
16-H-5
16-L-3
467
16-L-6
16-L-4
466
16-L-3
16-L-4
Shady Creek
Recreation
Area
16-V-1
465
16-L-3
IOWA
Scott County
Muscatine County
ILLINOIS
Rock Island County

- Boat Access
- County Line
- River Mile
- Corps Aquired Tracts
- Corps Easement on Private Land

**Master Plan Land Classification***

- Environmentally Sensitive Areas
- High Density Recreation
- Low Density Recreation
- Project Operations
- Vegetative Management
- Wildlife Management

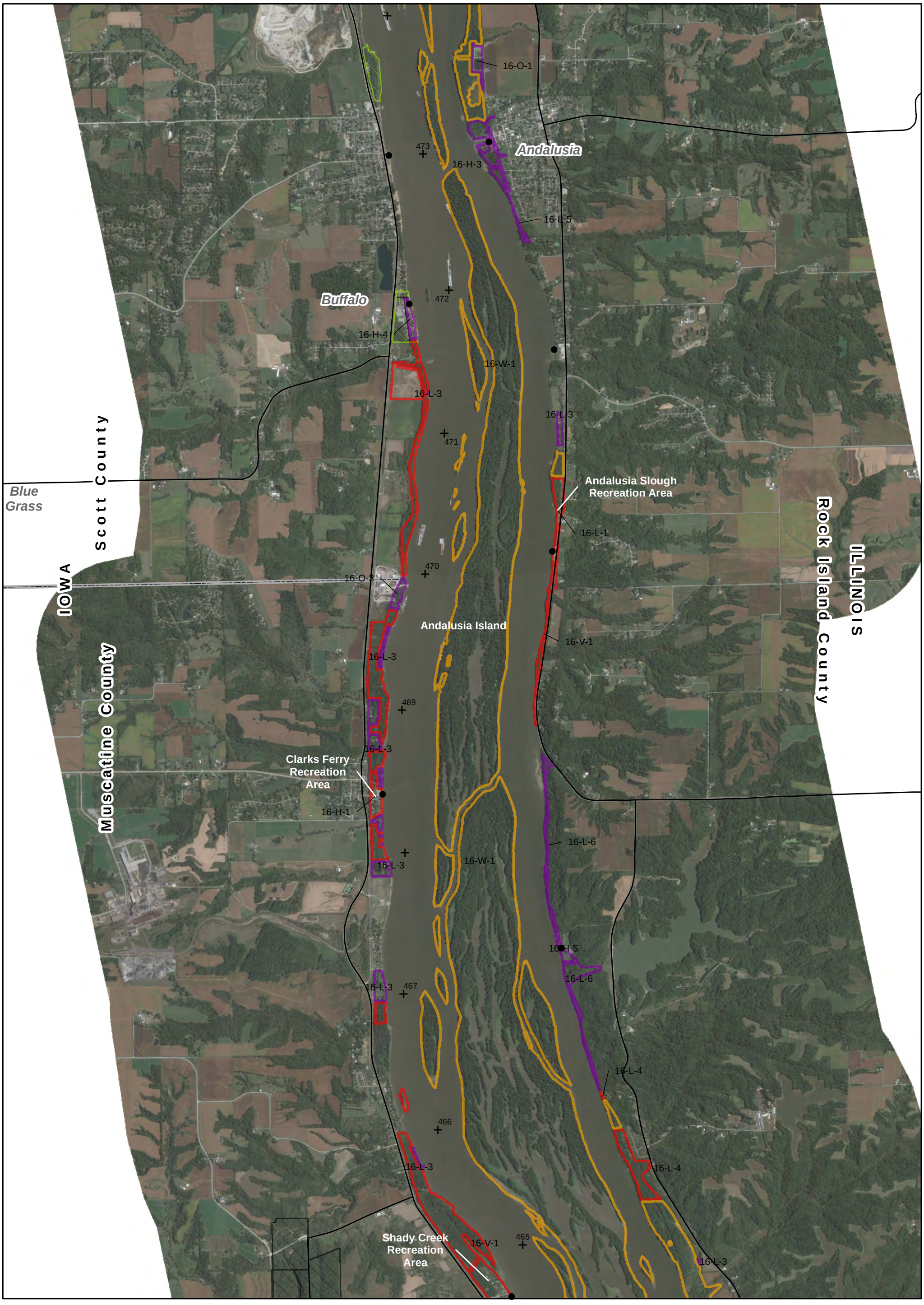
- IL DNR Public Lands
- USFWS Public Lands
- IA DNR Owned Public Lands
- MDC Owned Public Lands
- Other Public Lands

***See disclaimer & information at the beginning of map set.**

N W E S

**Mississippi River Project**
**Master Plan**
**Pool 16**
**River Mile 474 - 465**
**Plate 17 of 36**

0.5 0.25 0 0.5 Miles




- Boat Access
- County Line
- River Mile

**Managing Agency on Corps Lands***

- Lease Area
- IA DNR Management
- IL DNR Management
- MDC Management
- USFWS Management
- Corps Management

- IL DNR Owned Public Lands
- USFWS Owned Public Lands
- IA DNR Owned Public Lands
- MDC Owned Public Lands

***See disclaimer & information at the beginning of map set.**

**Mississippi River Project**
**Master Plan**
**Pool 16**
**River Mile 474 - 465**
**Plate 17 of 36**

0.55 0.275 0 0.55 Miles

Andalusia Island
16-V-1
16-L-4
465
16-W-1
Shady Creek Recreation Area
464
16-W-1
463
16-L-2
16-V-1
462
16-H-6
461
16-W-2
16-O-4
16-L-4
460
459
Geneva Island
458
Lock & Dam 16 Area
457
16-O-5
IOWA
Muscatine County
ILLINOIS
Rock Island County
Muscatine

- Boat Access
- County Line
- River Mile
- Corps Aquired Tracts
- Corps Easement on Private Land

**Master Plan Land Classification***

- Environmentally Sensitive Areas
- High Density Recreation
- Low Density Recreation
- Project Operations
- Vegetative Management
- Wildlife Management

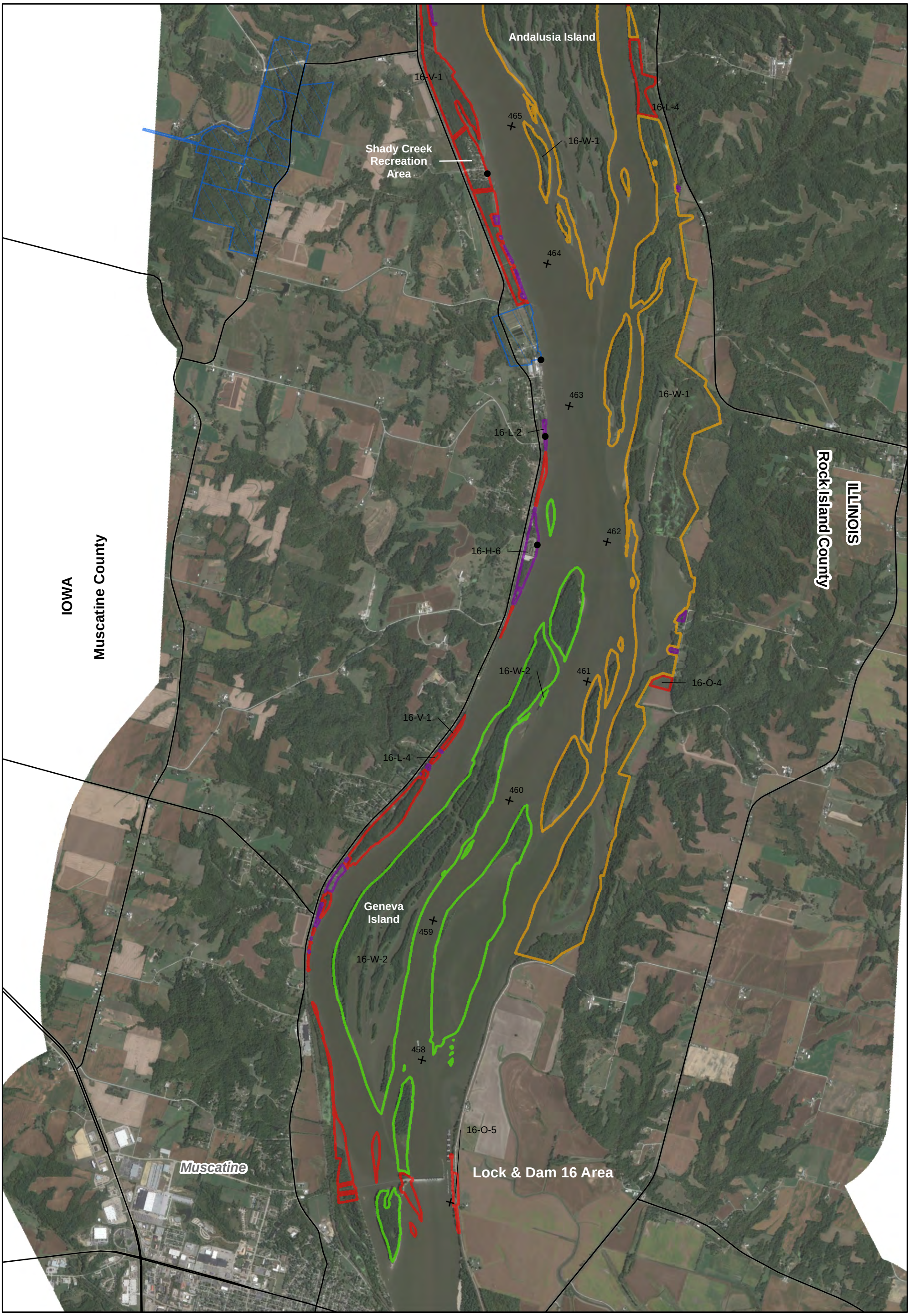
- IL DNR Public Lands
- USFWS Public Lands
- Other Public Lands
- IA DNR Owned Public Lands
- MDC Owned Public Lands

***See disclaimer & information at the beginning of map set.**

N E S W

**Mississippi River Project**
**Master Plan**
**Pool 16**
**River Mile 466 - 457**
**Plate 18 of 36**

0.5 0.25 0 0.5 Miles




- Boat Access
- County Line
- River Mile

**Managing Agency on Corps Lands***

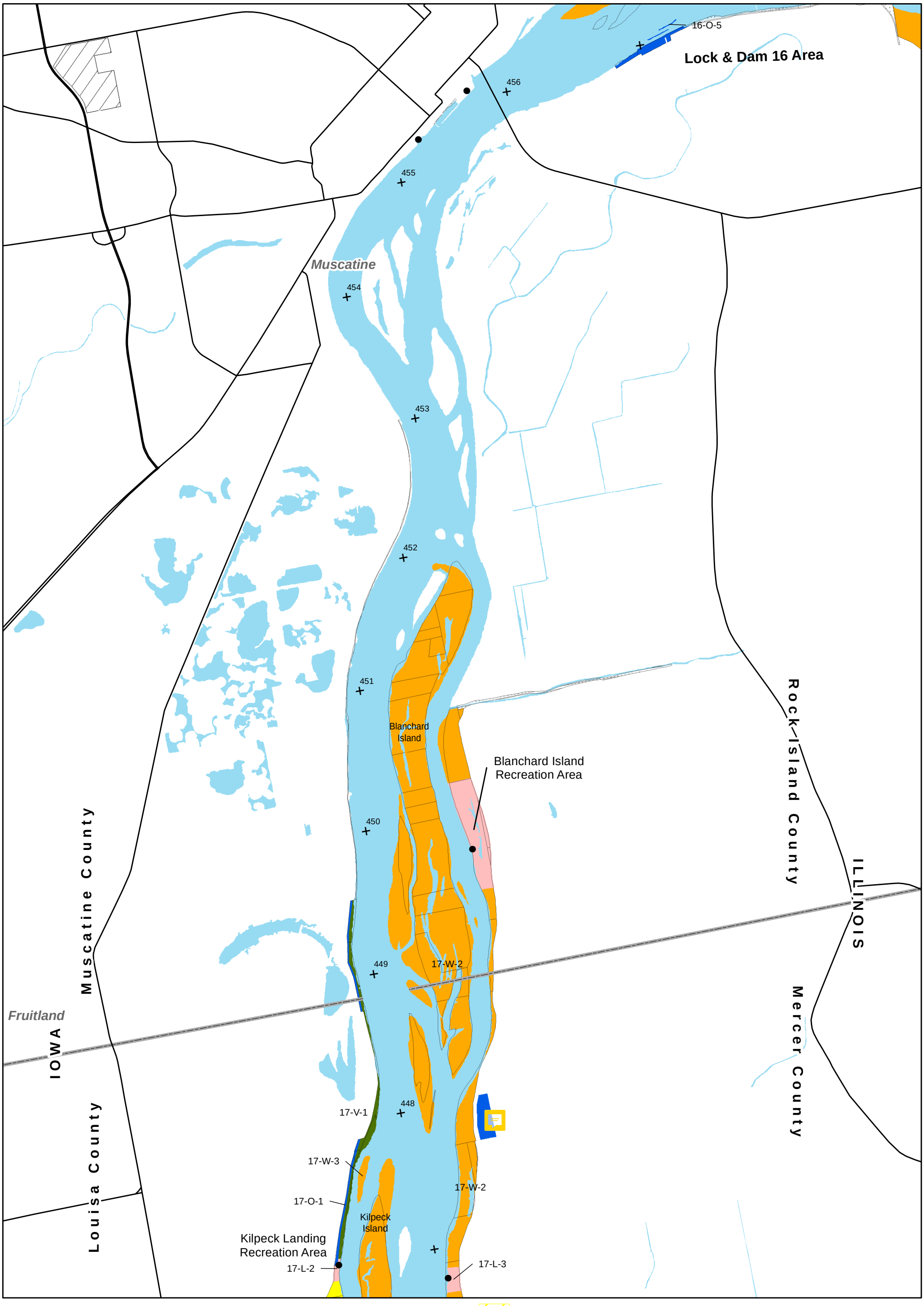
- Lease Area
- IA DNR Management
- IL DNR Management
- MDC Management
- USFWS Management
- Corps Management

- IL DNR Owned Public Lands
- USFWS Owned Public Lands
- IA DNR Owned Public Lands
- MDC Owned Public Lands

***See disclaimer & information at the beginning of map set.**

**Mississippi River Project**
**Master Plan**
**Pool 16**
**River Mile 466 - 457**
**Plate 18 of 36**

0.5 0.25 0 0.5 Miles




- Boat Access
- County Line
- River Mile
- Corps Aquired Tracts
- Corps Easement on Private Land

**Master Plan Land Classification***

- Environmentally Sensitive Areas
- High Density Recreation
- Low Density Recreation
- Project Operations
- Vegetative Management
- Wildlife Management

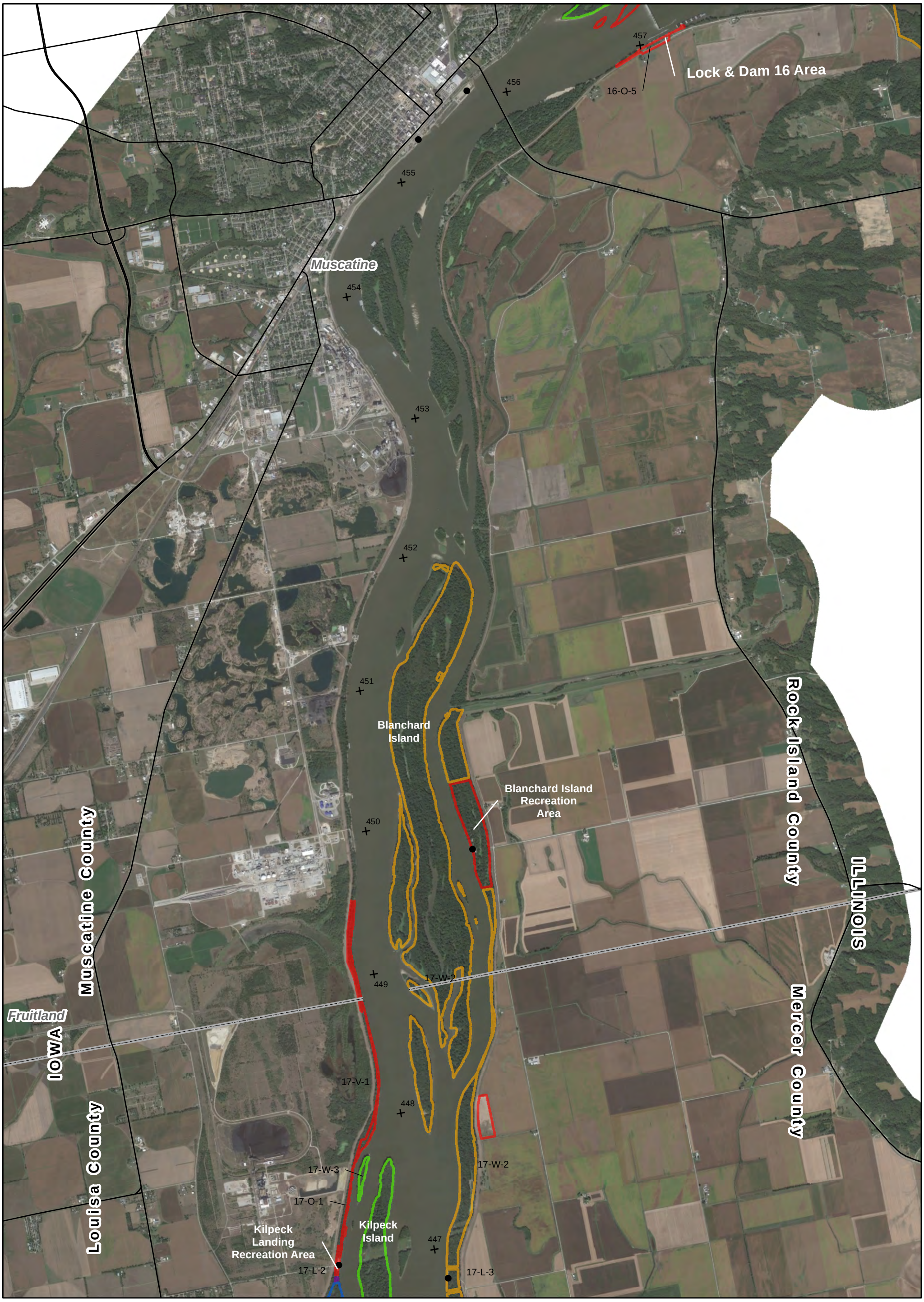
- IL DNR Public Lands
- USFWS Public Lands
- Other Public Lands
- IA DNR Owned Public Lands
- MDC Owned Public Lands

***See disclaimer & information at the beginning of map set.**

N E S W

**Mississippi River Project**
**Master Plan**
**Pool 17**
**River Mile 457 - 447**
**Plate 19 of 36**

0.5 0.25 0 0.5 Miles




- Boat Access
- County Line
- River Mile

**Managing Agency on Corps Lands***

- Lease Area
- IA DNR Management
- IL DNR Management
- MDC Management
- USFWS Management
- Corps Management

- IL DNR Owned Public Lands
- USFWS Owned Public Lands
- IA DNR Owned Public Lands
- MDC Owned Public Lands

***See disclaimer & information at the beginning of map set.**

N W E S

**Mississippi River Project**
**Master Plan**
**Pool 17**
**River Mile 457 - 447**
**Plate 19 of 36**

0.55 0.275 0 0.55 Miles

17-L-2
Kilpeck Landing Recreation Area
Kilpeck Island
17-L-3
446
Bark's Island
17-E-1
Big Timber Division
445
17-O-1
444
17-W-2
17-W-1
443
17-L-4
Bogus Island
Coleman Island
442
17-V-1
441
17-W-2
440
439
17-E-2
Louisa Division
Turkey Island
438
17-O-2
437
18-W-2
17-H-1
Odessa WMA
17-L-5
17-E-3
IOWA
Louisa Couunty
ILLINOIS
Mercer County

- Boat Access
- County Line
- River Mile
- Corps Aquired Tracts
- Corps Easement on Private Land

**Master Plan Land Classification***

- Environmentally Sensitive Areas
- High Density Recreation
- Low Density Recreation
- Project Operations
- Vegetative Management
- Wildlife Management

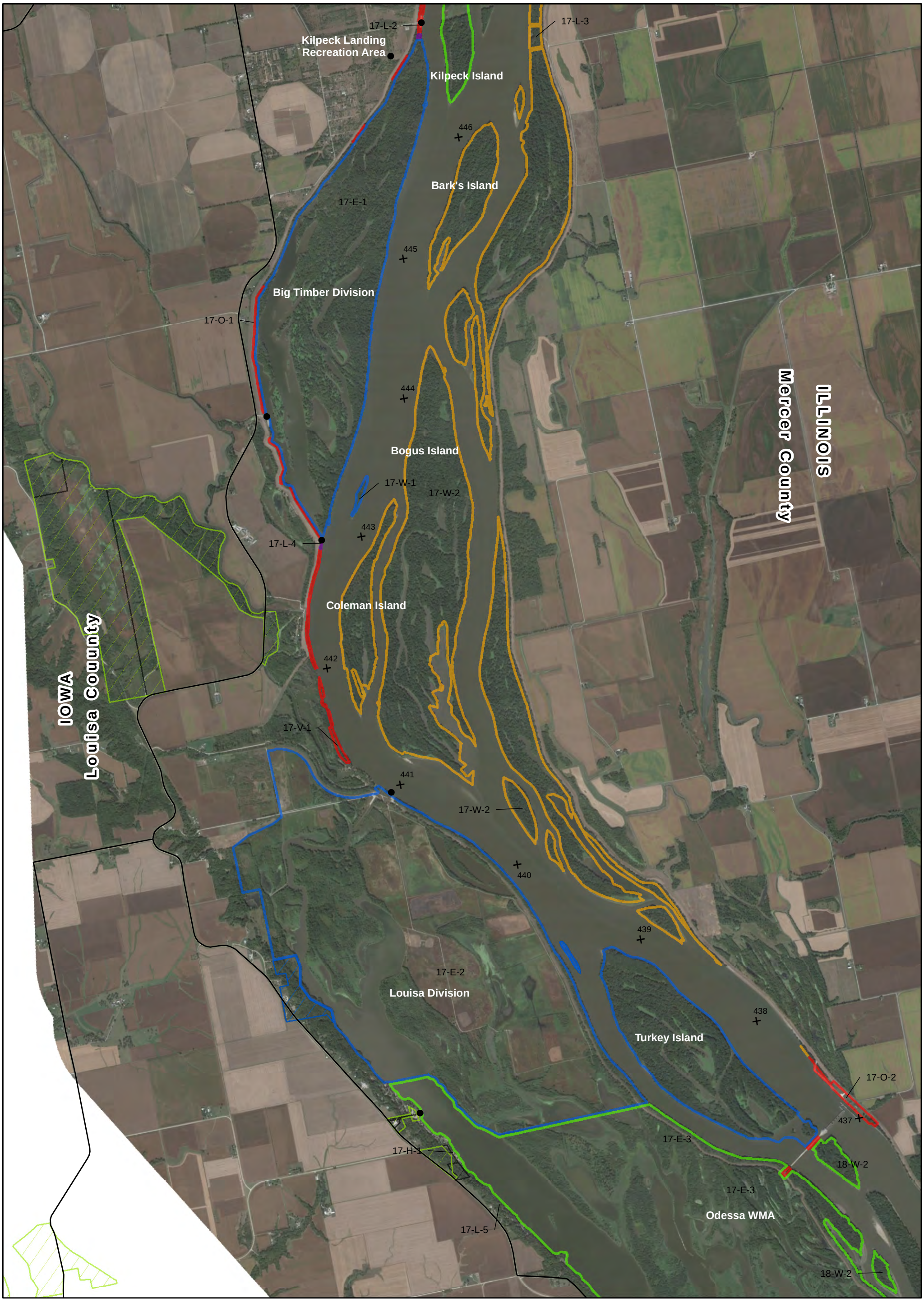
- IL DNR Public Lands
- USFWS Public Lands
- Other Public Lands
- IA DNR Owned Public Lands
- MDC Owned Public Lands

***See disclaimer & information at the beginning of map set.**

N E S W

**Mississippi River Project**
**Master Plan**
**Pool 17**
**River Mile 447 - 437**
**Plate 20 of 36**

0.5 0.25 0 0.5 Miles




- Boat Access
- County Line
- River Mile

**Managing Agency on Corps Lands***

- Lease Area
- IA DNR Management
- IL DNR Management
- MDC Management
- USFWS Management
- Corps Management

- IL DNR Owned Public Lands
- USFWS Owned Public Lands
- IA DNR Owned Public Lands
- MDC Owned Public Lands

***See disclaimer & information at the beginning of map set.**

N E S W

**Mississippi River Project**
**Master Plan**
**Pool 17**
**River Mile 447 - 437**
**Plate 20 of 36**

0.55 0.275 0 0.55 Miles

17-L-4
17-O-1
443
Coleman Island
Bogus Island
442
17-W-2
17-V-1
441
Louisa Division
17-W-2
440
17-E-2
439
17-H-1
Turkey Island
438
17-L-5
Lock & Dam 17 Area
17-O-2
437
436
18-W-2
18-O-1
Odessa WMA
17-E-3
435
Boston Bay
18-E-1
434
New Boston
18-W-1
433
18-V-1
Ferry Landing Recreation Area
18-O-1
IOWA
Louisa County
ILLINOIS
Mercer County

- Boat Access
- County Line
- River Mile
- Corps Aquired Tracts
- Corps Easement on Private Land

**Master Plan Land Classification***

- Environmentally Sensitive Areas
- High Density Recreation
- Low Density Recreation
- Project Operations
- Vegetative Management
- Wildlife Management

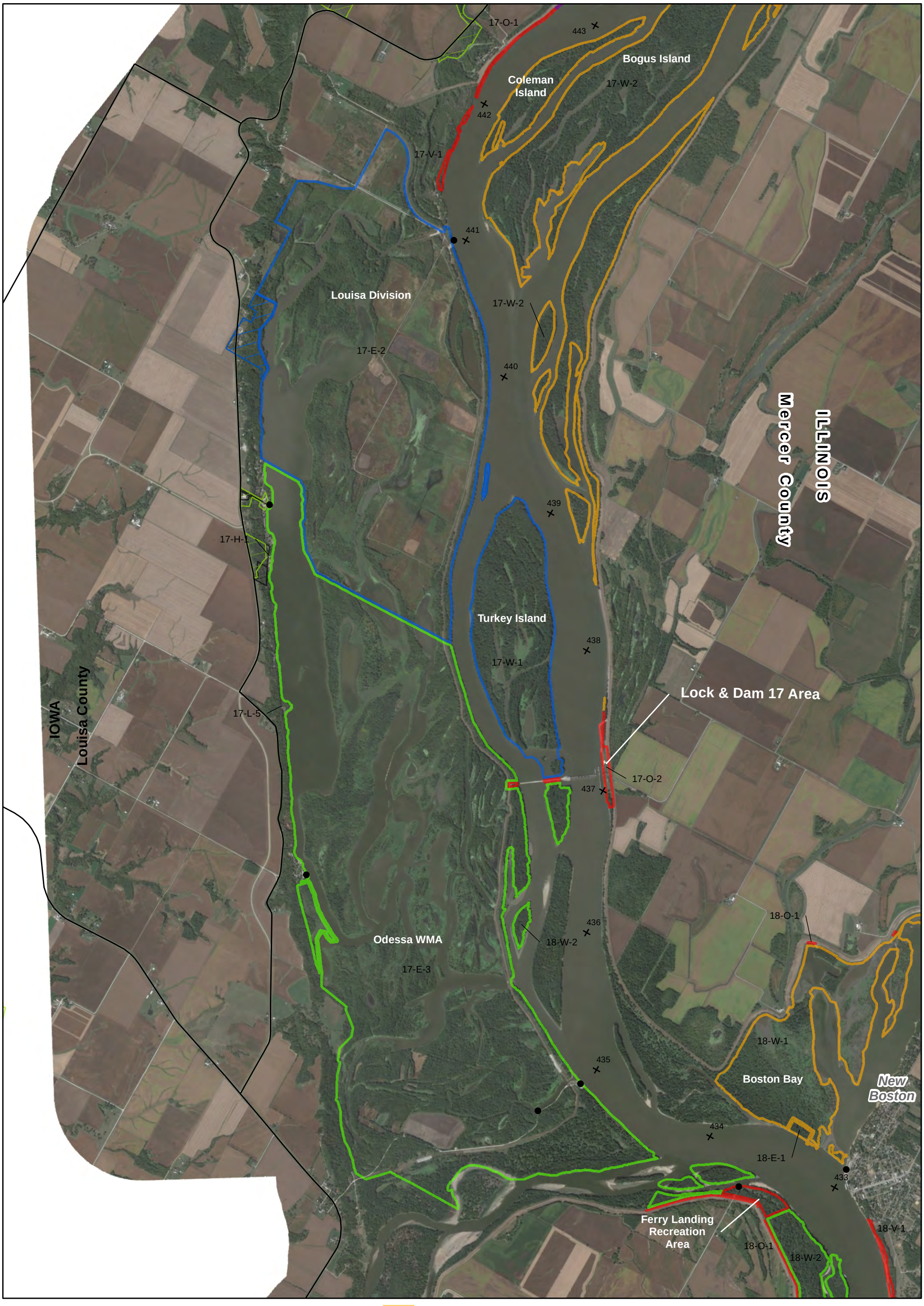
- IL DNR Public Lands
- USFWS Public Lands
- Other Public Lands
- IA DNR Owned Public Lands
- MDC Owned Public Lands

***See disclaimer & information at the beginning of map set.**

N W E S

**Mississippi River Project**
**Master Plan**
**Pool 17**
**River Mile 443 - 432**
**Plate 21 of 36**

0.5 0.25 0 0.5 Miles




- Boat Access
- County Line
- River Mile

**Managing Agency on Corps Lands***

- Lease Area
- IA DNR Management
- IL DNR Management
- MDC Management
- USFWS Management
- Corps Management

- IL DNR Owned Public Lands
- USFWS Owned Public Lands
- IA DNR Owned Public Lands
- MDC Owned Public Lands

***See disclaimer & information at the beginning of map set.**

**Mississippi River Project**
**Master Plan**
**Pool 17**
**River Mile 443 - 432**
**Plate 21 of 36**

0.55 0.275 0 0.55 Miles

17-L-5
17-O-2
437
436
18-O-1
Odessa WMA
17-E-3
435
Boston Bay
434
18-E-1
New Boston
433
Ferry Landing Recreation Area
18-V-1
18-W-2
432
18-W-1
Corsepius Island
IOWA
Louisa County
Mercer County
ILLINOIS
Oakville
18-O-1
430
18-E-2
Keithsburg Division
18-W-2
429
Blackhawk Island
428
Keithsburg

- Boat Access
- County Line
- River Mile
- Corps Aquired Tracts
- Corps Easement on Private Land

**Master Plan Land Classification***

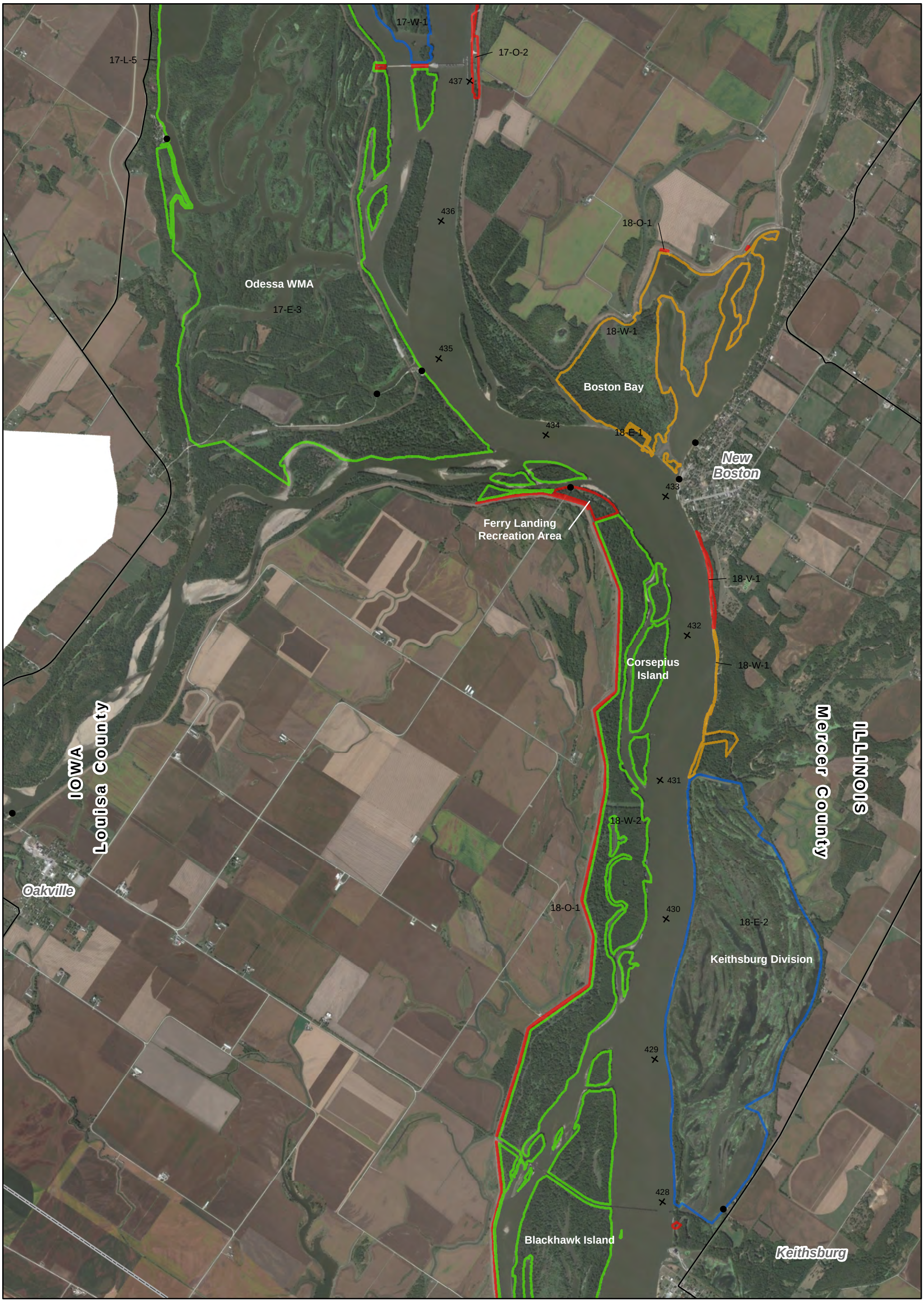
- Environmentally Sensitive Areas
- High Density Recreation
- Low Density Recreation
- Project Operations
- Vegetative Management
- Wildlife Management

- IL DNR Public Lands
- USFWS Public Lands
- Other Public Lands
- IA DNR Owned Public Lands
- MDC Owned Public Lands

***See disclaimer & information at the beginning of map set.**

**Mississippi River Project**
**Master Plan**
**Pool 18**
**River Mile 437 - 428**
**Plate 22 of 36**

0.5 0.25 0 0.5 Miles




- Boat Access
- County Line
- River Mile

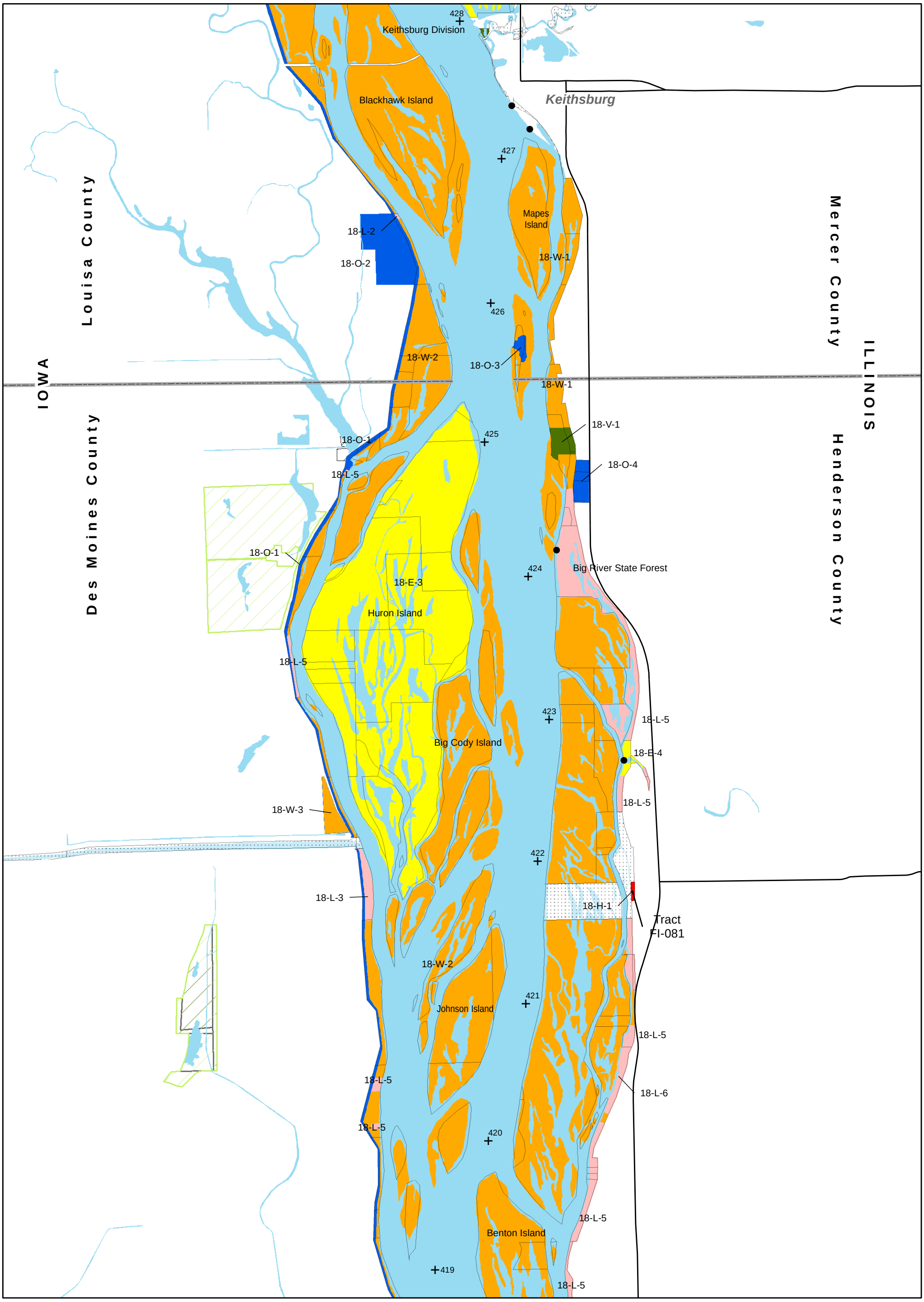
**Managing Agency on Corps Lands***

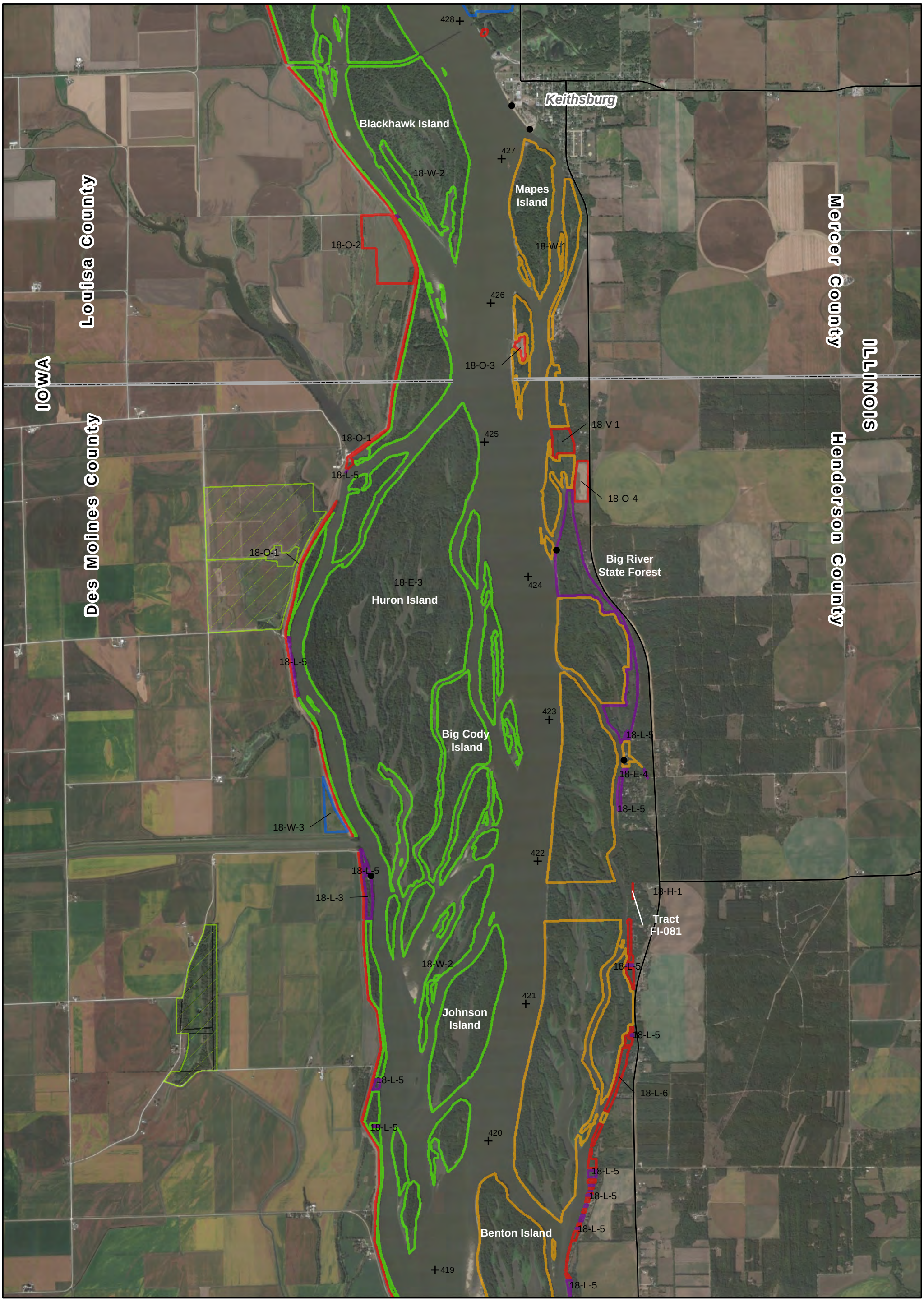
- Lease Area
- IA DNR Management
- IL DNR Management
- MDC Management
- USFWS Management
- Corps Management
- IL DNR Owned Public Lands
- USFWS Owned Public Lands
- IA DNR Owned Public Lands
- MDC Owned Public Lands

***See disclaimer & information at the beginning of map set.**

**Mississippi River Project**
**Master Plan**
**Pool 18**
**River Mile 437 - 428**
**Plate 22 of 36**

0.55 0.275 0 0.55 Miles


428
Keithsburg Division
Blackhawk Island
Keithsburg
427
Mapes Island
18-L-2
18-O-2
18-W-1
426
18-W-2
18-O-3
18-W-1
18-V-1
425
18-O-1
18-L-5
18-O-4
18-O-1
424
Big River State Forest
18-E-3
Huron Island
18-L-5
423
18-L-5
Big Cody Island
18-E-4
18-L-5
18-W-3
422
18-L-3
18-H-1
Tract FI-081
18-W-2
421
Johnson Island
18-L-5
18-L-5
18-L-6
18-L-5
420
18-L-5
Benton Island
419
18-L-5
Louisa County
Des Moines County
IOWA
Mercer County
Henderson County
ILLINOIS
Boat Access
County Line
River Mile
Corps Aquired Tracts
Corps Easement on Private Land
Master Plan Land Classification*
Environmentally Sensitive Areas
High Density Recreation
Low Density Recreation
Project Operations
Vegetative Management
Wildlife Management
IL DNR Public Lands
USFWS Public Lands
Other Public Lands
IA DNR Owned Public Lands
MDC Owned Public Lands
*See disclaimer & information at the beginning of map set.
N
W
E
S
Mississippi River Project
Master Plan
Pool 18
River Mile 428 - 419
Plate 23 of 36
0.5 0.25 0 0.5 Miles




- Boat Access
- County Line
- River Mile

**Managing Agency on Corps Lands***

- Lease Area
- IA DNR Management
- IL DNR Management
- MDC Management
- USFWS Management
- Corps Management

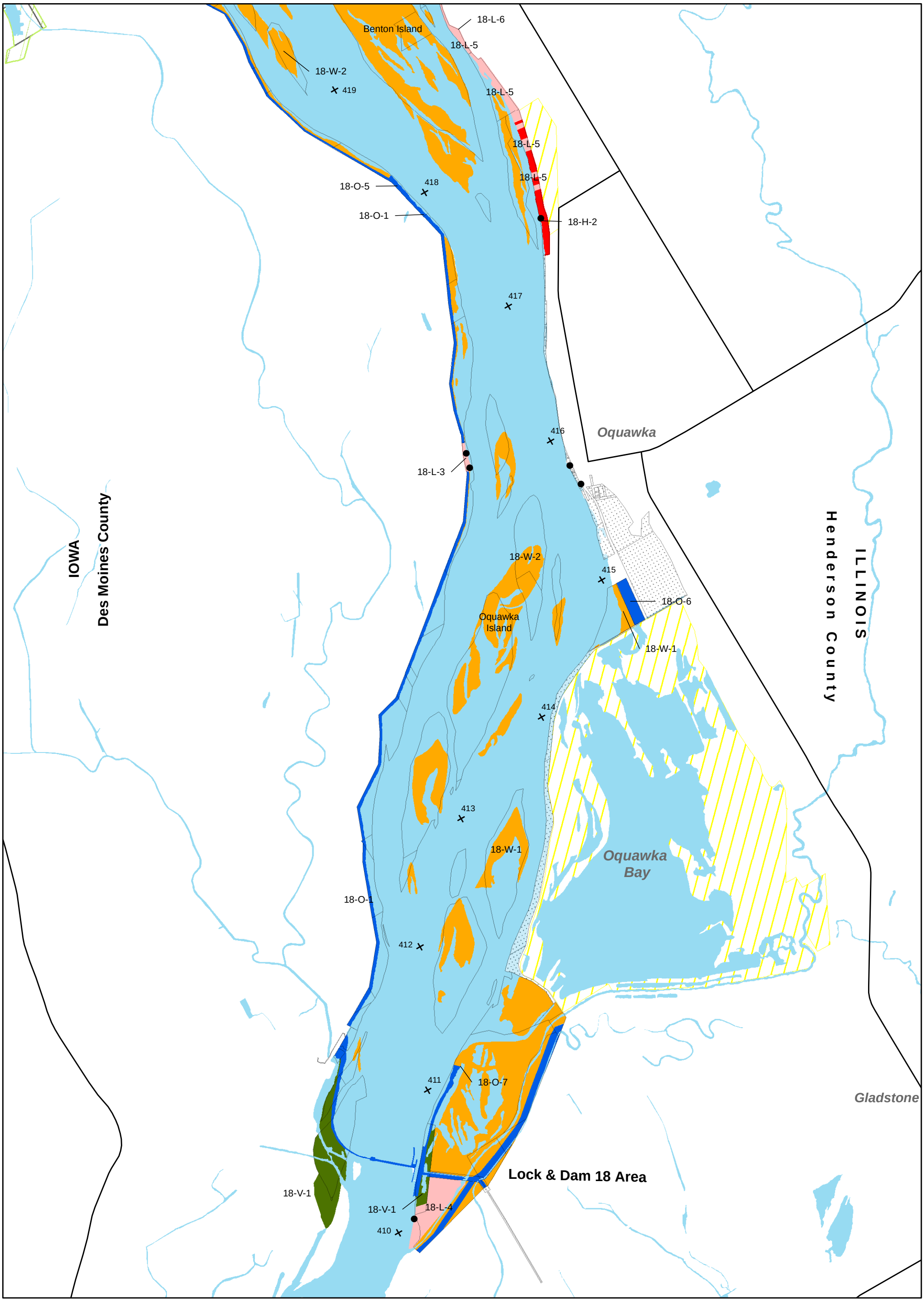
- IL DNR Owned Public Lands
- USFWS Owned Public Lands
- IA DNR Owned Public Lands
- MDC Owned Public Lands

***See disclaimer & information at the beginning of map set.**

N W E S

**Mississippi River Project**
**Master Plan**
**Pool 18**
**River Mile 428 - 419**
**Plate 23 of 36**

0.5 0.25 0 0.5 Miles




- Boat Access
- County Line
- River Mile
- Corps Aquired Tracts
- Corps Easement on Private Land

**Master Plan Land Classification***

- Environmentally Sensitive Areas
- High Density Recreation
- Low Density Recreation
- Project Operations
- Vegetative Management
- Wildlife Management

- IL DNR Public Lands
- USFWS Public Lands
- Other Public Lands
- IA DNR Owned Public Lands
- MDC Owned Public Lands

***See disclaimer & information at the beginning of map set.**

**Mississippi River Project**
**Master Plan**
**Pool 18**
**River Mile 419 - 410**
**Plate 24 of 36**

0.5 0.25 0 0.5 Miles

18-L-6
18-W-2
18-W-1
18-L-5
Benton Island
419
18-L-5
18-L-5
18-L-5
418
18-O-5
18-H-2
18-O-1
417
416
Oquawka
18-L-3
IOWA
Des Moines County
18-W-2
415
18-O-6
Oquawka Island
18-W-1
414
ILLINOIS
Henderson County
18-O-1
413
412
411
18-O-7
Gladstone
Lock & Dam 18 Area
18-V-1
18-V-1
18-L-4
410

- Boat Access
- County Line
- River Mile

**Managing Agency on Corps Lands***

- Lease Area
- IA DNR Management
- IL DNR Management
- MDC Management
- USFWS Management
- Corps Management

- IL DNR Owned Public Lands
- USFWS Owned Public Lands
- IA DNR Owned Public Lands
- MDC Owned Public Lands

***See disclaimer & information at the beginning of map set.**

N E S W

**Mississippi River Project**
**Master Plan**
**Pool 18**
**River Mile 419 - 410**
**Plate 24 of 36**

0.55 0.275 0 0.55 Miles

IOWA

Des Moines County

Henderson County

ILLINOIS

409

408

407

406

405

404

403

402

401

Gulf Port

Burlington

- Boat Access
- County Line
- River Mile
- Corps Aquired Tracts
- Corps Easement on Private Land

**Master Plan Land Classification***

- Environmentally Sensitive Areas
- High Density Recreation
- Low Density Recreation
- Project Operations
- Vegetative Management
- Wildlife Management

- IL DNR Public Lands
- USFWS Public Lands
- Other Public Lands
- IA DNR Owned Public Lands
- MDC Owned Public Lands

***See disclaimer & information at the beginning of map set.**

N E S W

**Mississippi River Project**
**Master Plan**
**Pool 19**
**River Mile 410 - 400**
**Plate 25 of 36**

0.5 0.25 0 0.5 Miles


- Boat Access
- County Line
- River Mile

**Managing Agency on Corps Lands***

- Lease Area
- IA DNR Management
- IL DNR Management
- MDC Management
- USFWS Management
- Corps Management

- IL DNR Owned Public Lands
- USFWS Owned Public Lands
- IA DNR Owned Public Lands
- MDC Owned Public Lands

***See disclaimer & information at the beginning of map set.**

N E S W

**Mississippi River Project**
**Master Plan**
**Pool 19**
**River Mile 410 - 400**
**Plate 25 of 36**

0.55 0.275 0 0.55 Miles

Burlington

399

398

19-O-1

397

396

19-O-3

395

394

393

392

391

390

Dallas City

Lomax

ILLINOIS

Henderson County

Des Moines County

IOWA

Lee County

- Boat Access
- County Line
- River Mile
- Corps Aquired Tracts
- Corps Easement on Private Land

**Master Plan Land Classification***

- Environmentally Sensitive Areas
- High Density Recreation
- Low Density Recreation
- Project Operations
- Vegetative Management
- Wildlife Management

- IL DNR Public Lands
- USFWS Public Lands
- Other Public Lands
- IA DNR Owned Public Lands
- MDC Owned Public Lands

*See disclaimer & information at the beginning of map set.

**Mississippi River Project**
**Master Plan**
**Pool 19**
**River Mile 400 - 390**
**Plate 26 of 36**

0.5 0.25 0 0.5 Miles


- Boat Access
- County Line
- River Mile

**Managing Agency on Corps Lands***

- Lease Area
- IA DNR Management
- IL DNR Management
- MDC Management
- USFWS Management
- Corps Management

- IL DNR Owned Public Lands
- USFWS Owned Public Lands
- IA DNR Owned Public Lands
- MDC Owned Public Lands

***See disclaimer & information at the beginning of map set.**

**Mississippi River Project**
**Master Plan**
**Pool 19**
**River Mile 400 - 390**
**Plate 26 of 36**

0.5 0.25 0 0.5 Miles

Dallas City

Pontoosuc

IOWA

Lee County

ILLINOIS

Hancock County

389

388

387

386

385

384

383

382

381

Fort Madison

- Boat Access
- County Line
- River Mile
- Corps Aquired Tracts
- Corps Easement on Private Land

**Master Plan Land Classification***

- Environmentally Sensitive Areas
- High Density Recreation
- Low Density Recreation
- Project Operations
- Vegetative Management
- Wildlife Management

- IL DNR Public Lands
- USFWS Public Lands
- Other Public Lands
- IA DNR Owned Public Lands
- MDC Owned Public Lands

*See disclaimer & information at the beginning of map set.

**Mississippi River Project**
**Master Plan**
**Pool 19**
**River Mile 390 - 381**
**Plate 27 of 36**

0.5 0.25 0 0.5 Miles


- Boat Access
- County Line
- River Mile

**Managing Agency on Corps Lands***

- Lease Area
- IA DNR Management
- IL DNR Management
- MDC Management
- USFWS Management
- Corps Management

- IL DNR Owned Public Lands
- USFWS Owned Public Lands
- IA DNR Owned Public Lands
- MDC Owned Public Lands

***See disclaimer & information at the beginning of map set.**

**Mississippi River Project**
**Master Plan**
**Pool 19**
**River Mile 390 - 381**
**Plate 27 of 36**

0.55 0.275 0 0.55 Miles

IOWA

Lee County

Fort Madison

380

379

378

377

376

375

374

373

372

371

370

ILLINOIS

Hancock County

Nauvoo

Montrose

- Boat Access
- County Line
- River Mile
- Corps Aquired Tracts
- Corps Easement on Private Land

**Master Plan Land Classification***

- Environmentally Sensitive Areas
- High Density Recreation
- Low Density Recreation
- Project Operations
- Vegetative Management
- Wildlife Management

- IL DNR Public Lands
- USFWS Public Lands
- Other Public Lands
- IA DNR Owned Public Lands
- MDC Owned Public Lands

*See disclaimer & information at the beginning of map set.

N E S W

**Mississippi River Project**
**Master Plan**
**Pool 19**
**River Mile 381 - 370**
**Plate 28 of 36**

0.5 0.25 0 0.5 Miles

IOWA

Lee County

Fort Madison

380

379

378

377

376

375

374

373

372

371

370

ILLINOIS

Hancock County

Nauvoo

Montrose

- Boat Access
- County Line
- River Mile

**Managing Agency on Corps Lands***

- Lease Area
- IA DNR Management
- IL DNR Management
- MDC Management
- USFWS Management
- Corps Management

- IL DNR Owned Public Lands
- USFWS Owned Public Lands
- IA DNR Owned Public Lands
- MDC Owned Public Lands

***See disclaimer & information at the beginning of map set.**

N E S W

**Mississippi River Project**
**Master Plan**
**Pool 19**
**River Mile 381 - 370**
**Plate 28 of 36**

0.55 0.275 0 0.55 Miles

IOWA

Lee County

ILLINOIS

Hancock County

370

369

368

367

366

365

364

363

362

361

360

Keokuk

Lock & Dam 19 Area

19-O-2

Hamilton

Warsaw

Alexandria

Des Moines River

- Boat Access
- County Line
- River Mile
- Corps Aquired Tracts
- Corps Easement on Private Land

**Master Plan Land Classification***

- Environmentally Sensitive Areas
- High Density Recreation
- Low Density Recreation
- Project Operations
- Vegetative Management
- Wildlife Management

- IL DNR Public Lands
- USFWS Public Lands
- Other Public Lands
- IA DNR Owned Public Lands
- MDC Owned Public Lands

*See disclaimer & information at the beginning of map set.

N W E S

**Mississippi River Project**
**Master Plan**
**Pool 19**
**River Mile 370 - 359**
**Plate 29 of 36**

0.5 0.25 0 0.5 Miles

IOWA

Lee County

ILLINOIS

Hancock County

370

369

368

367

366

365

364

363

362

361

360

Keokuk

Lock & Dam 19 Area

19-O-2

Hamilton

Des Moines River

Warsaw

Alexandria

- Boat Access
- County Line
- River Mile

**Managing Agency on Corps Lands***

- Lease Area
- IA DNR Management
- IL DNR Management
- MDC Management
- USFWS Management
- Corps Management

- IL DNR Owned Public Lands
- USFWS Owned Public Lands
- IA DNR Owned Public Lands
- MDC Owned Public Lands

***See disclaimer & information at the beginning of map set.**

N W E S

**Mississippi River Project**
**Master Plan**
**Pool 19**
**River Mile 370 - 359**
**Plate 29 of 36**

0.55 0.275 0 0.55 Miles

Alexandria
Warsaw
Rose Pond
Conservation Area
(MDC)
Fox Island
NWFR
MISSOURI
Clark County
ILLINOIS
Hancock County
360
359
358
357
356
355
354
353
352
351

- Boat Access
- County Line
- River Mile
- Corps Aquired Tracts
- Corps Easement on Private Land

**Master Plan Land Classification***

- Environmentally Sensitive Areas
- High Density Recreation
- Low Density Recreation
- Project Operations
- Vegetative Management
- Wildlife Management

- IL DNR Public Lands
- USFWS Public Lands
- Other Public Lands
- IA DNR Owned Public Lands
- MDC Owned Public Lands

*See disclaimer & information at the beginning of map set.

N
W
E
S

**Mississippi River Project**
**Master Plan**
**Pool 20**
**River Mile 360 - 351**
**Plate 30 of 36**

0.5 0.25 0 0.5 Miles


- Boat Access
- County Line
- River Mile

**Managing Agency on Corps Lands***

- Lease Area
- IA DNR Management
- IL DNR Management
- MDC Management
- USFWS Management
- Corps Management

- IL DNR Owned Public Lands
- USFWS Owned Public Lands
- IA DNR Owned Public Lands
- MDC Owned Public Lands

***See disclaimer & information at the beginning of map set.**

N W E S

**Mississippi River Project**
**Master Plan**
**Pool 20**
**River Mile 360 - 351**
**Plate 30 of 36**

0.55 0.275 0 0.55 Miles

MISSOURI

Lewis County

Hancock County

ILLINOIS

Adams County

351

350

20-O-4

349

348

20-L-1

Fenway Landing
Recreation Area

347

346

345

344

20-O-3

20-O-5

20-O-2

Lock & Dam 20 Area

343

20-V-1

Canton

342

21-W-1

- Boat Access
- County Line
- River Mile
- Corps Aquired Tracts
- Corps Easement on Private Land

**Master Plan Land Classification***

- Environmentally Sensitive Areas
- High Density Recreation
- Low Density Recreation
- Project Operations
- Vegetative Management
- Wildlife Management

- IL DNR Public Lands
- USFWS Public Lands
- Other Public Lands
- IA DNR Owned Public Lands
- MDC Owned Public Lands

*See disclaimer & information at the beginning of map set.

N
W E
S

**Mississippi River Project**
**Master Plan**
**Pool 20**
**River Mile 351 - 342**
**Plate 31 of 36**

0.5 0.25 0 0.5 Miles

MISSOURI

Lewis County

Hancock County

ILLINOIS

Adams County

351

350

349

348

347

346

345

344

343

342

20-O-4

20-L-1

20-O-5

20-O-3

20-O-2

20-V-1

21-W-1

Fenway Landing
Recreation Area

Lock & Dam 20 Area

Canton

- Boat Access
- County Line
- River Mile

**Managing Agency on Corps Lands***

- Lease Area
- IA DNR Management
- IL DNR Management
- MDC Management
- USFWS Management
- Corps Management

- IL DNR Owned Public Lands
- USFWS Owned Public Lands
- IA DNR Owned Public Lands
- MDC Owned Public Lands

***See disclaimer & information at the beginning of map set.**

N
W E
S

**Mississippi River Project**
**Master Plan**
**Pool 20**
**River Mile 351 - 342**
**Plate 31 of 36**

0.55 0.275 0 0.55 Miles

Canton

342
341
340
339
338
337
336
335
334

21-V-1

Bear Creek
Recreation Area

21-L-1

Pecan Grove

21-W-1

21-W-2

21-W-3

21-W-3

21-E-1

Long Island

Libby
Island

MISSOURI
Lewis County

ILLINOIS
Adams County

La Grange

- Boat Access
- County Line
- River Mile
- Corps Aquired Tracts
- Corps Easement on Private Land

**Master Plan Land Classification***

- Environmentally Sensitive Areas
- High Density Recreation
- Low Density Recreation
- Project Operations
- Vegetative Management
- Wildlife Management

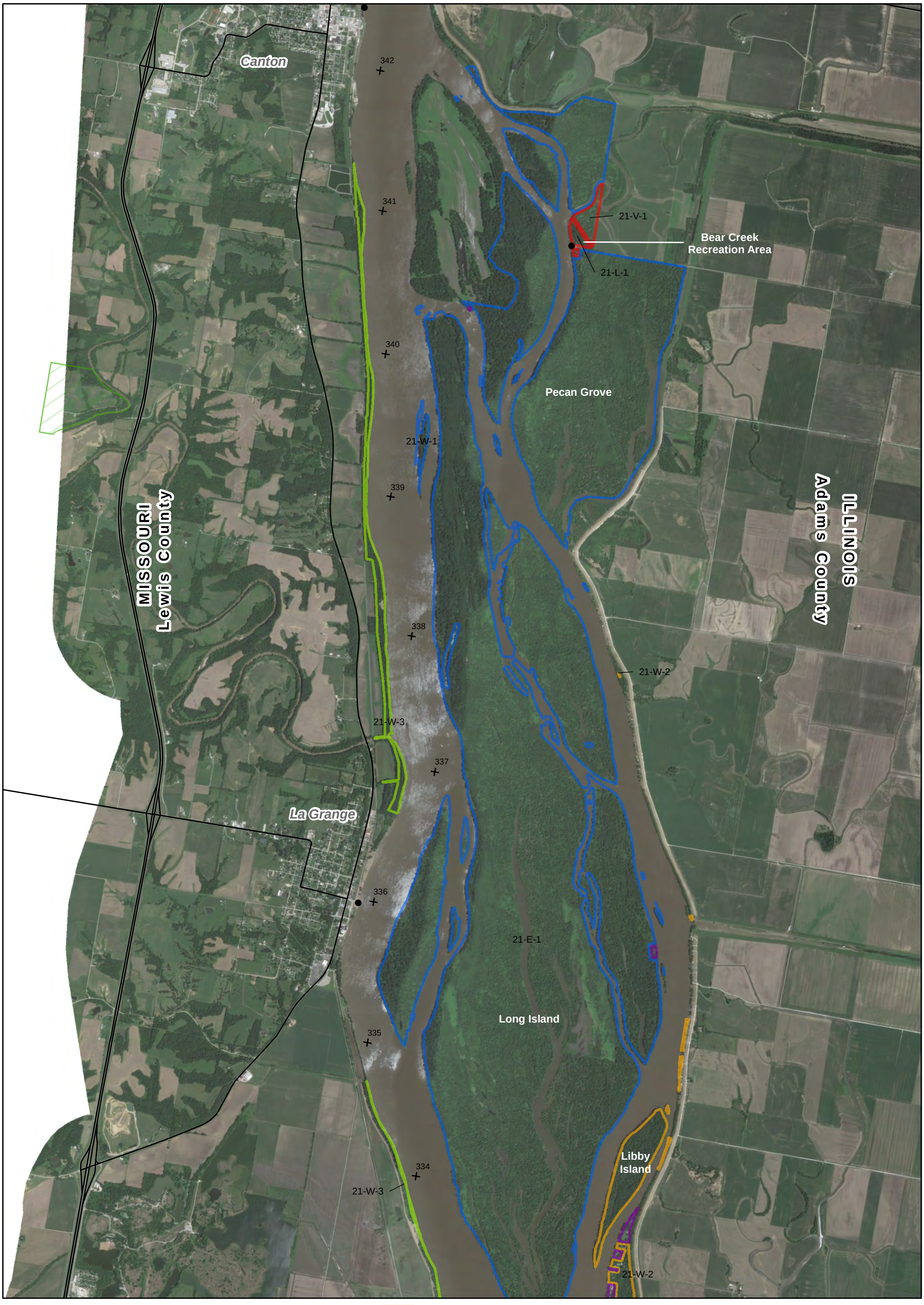
- IL DNR Public Lands
- USFWS Public Lands
- Other Public Lands
- IA DNR Owned Public Lands
- MDC Owned Public Lands

*See disclaimer & information at the beginning of map set.

N
W E
S

**Mississippi River Project**
**Master Plan**
**Pool 21**
**River Mile 342 - 333 Plate 32 of 36**

0.5 0.25 0 0.5 Miles




- Boat Access
- County Line
- River Mile

**Managing Agency on Corps Lands***

- Lease Area
- IA DNR Management
- IL DNR Management
- MDC Management
- USFWS Management
- Corps Management
- IL DNR Owned Public Lands
- USFWS Owned Public Lands
- IA DNR Owned Public Lands
- MDC Owned Public Lands

***See disclaimer & information at the beginning of map set.**

N W E S

**Mississippi River Project**
**Master Plan**
**Pool 21**
**River Mile 342 - 333**
**Plate 32 of 36**

0.55 0.275 0 0.55 Miles

Long Island
21-E-1
Libby Island
334
21-W-2
333
21-W-1
21-V-1
332
21-W-3
21-L-2
Canton Chute Recreation Area
MISSOURI
Lewis County
ILLINOIS
Adams County
21-L-5
21-W-3
330
Quincy Bay
329
Cottonwood Island
21-H-1
21-V-1
328
Quincy
327
Poage Island
326
21-O-1
21-O-2
21-O-2
22-W-2
Lock & Dam 21 Area
21-L-3

- Boat Access
- County Line
- River Mile
- Corps Aquired Tracts
- Corps Easement on Private Land

**Master Plan Land Classification***

- Environmentally Sensitive Areas
- High Density Recreation
- Low Density Recreation
- Project Operations
- Vegetative Management
- Wildlife Management

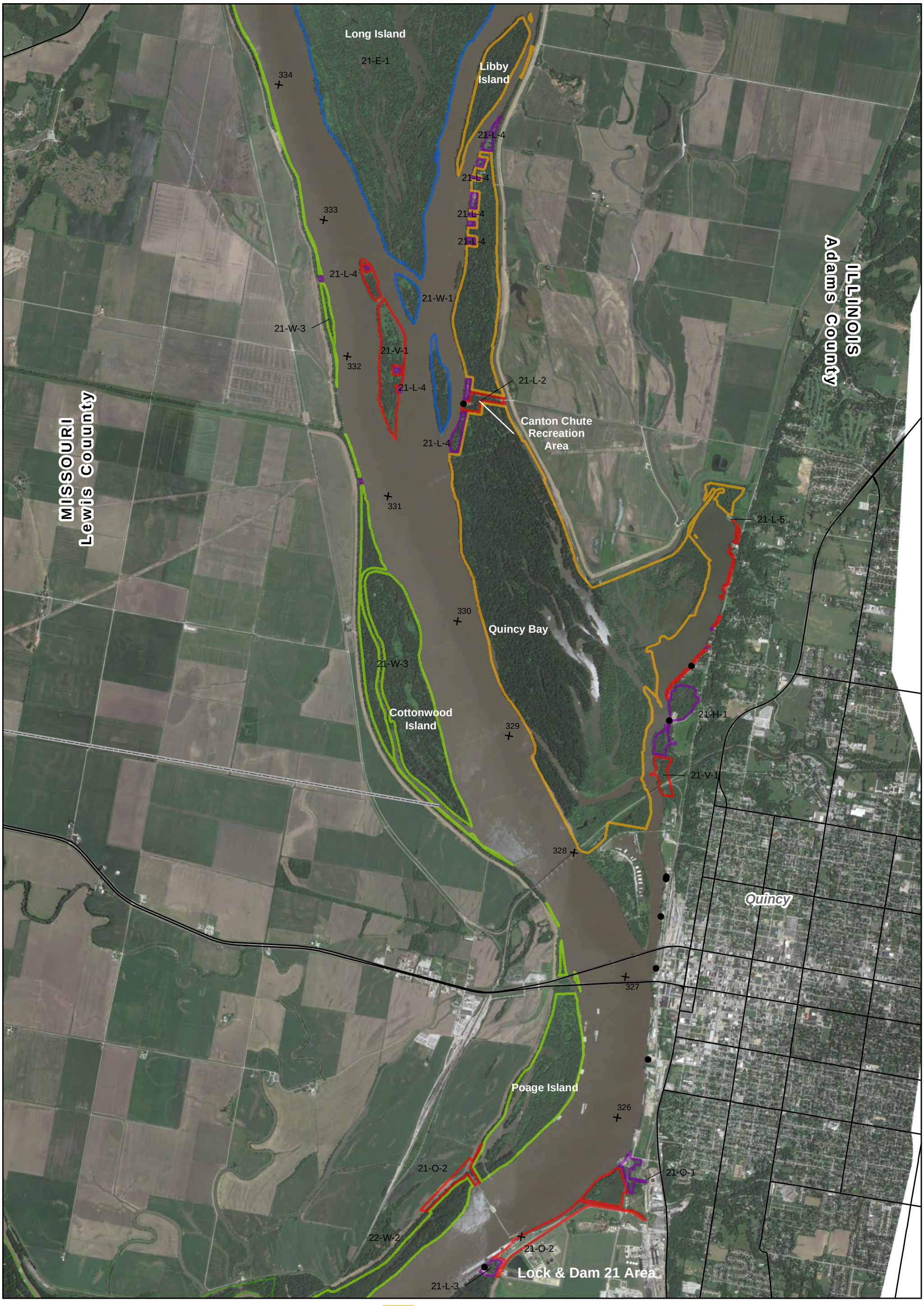
- IL DNR Public Lands
- USFWS Public Lands
- Other Public Lands
- IA DNR Owned Public Lands
- MDC Owned Public Lands

***See disclaimer & information at the beginning of map set.**

N W E S

**Mississippi River Project**
**Master Plan**
**Pool 21**
**River Mile 334 - 324 Plate 33 of 36**

0.5 0.25 0 0.5 Miles




- Boat Access
- County Line
- River Mile

**Managing Agency on Corps Lands***

- Lease Area
- IA DNR Management
- IL DNR Management
- MDC Management
- USFWS Management
- Corps Management

- IL DNR Owned Public Lands
- USFWS Owned Public Lands
- IA DNR Owned Public Lands
- MDC Owned Public Lands

***See disclaimer & information at the beginning of map set.**

N W E S

**Mississippi River Project**
**Master Plan**
**Pool 21**
**River Mile 334 - 324**
**Plate 33 of 36**

0.55 0.275 0 0.55 Miles

21-W-3
327
326
Poage Island
21-O-1
21-O-2
22-W-2
21-O-2
325
324
21-L-3
Quincy
22-L-4
323
22-L-4
22-L-4
Ward Island
322
22-L-4
Fabius Island
22-L-4
22-L-3
North River
22-E-1
321
MISSOURI
Marion County
320
Goose Island
319
22-W-1
22-O-1
318
317
Sny Bottoms
22-W-2
316
ILLINOIS
Adams County

- Boat Access
- County Line
- River Mile
- Corps Aquired Tracts
- Corps Easement on Private Land

**Master Plan Land Classification***

- Environmentally Sensitive Areas
- High Density Recreation
- Low Density Recreation
- Project Operations
- Vegetative Management
- Wildlife Management

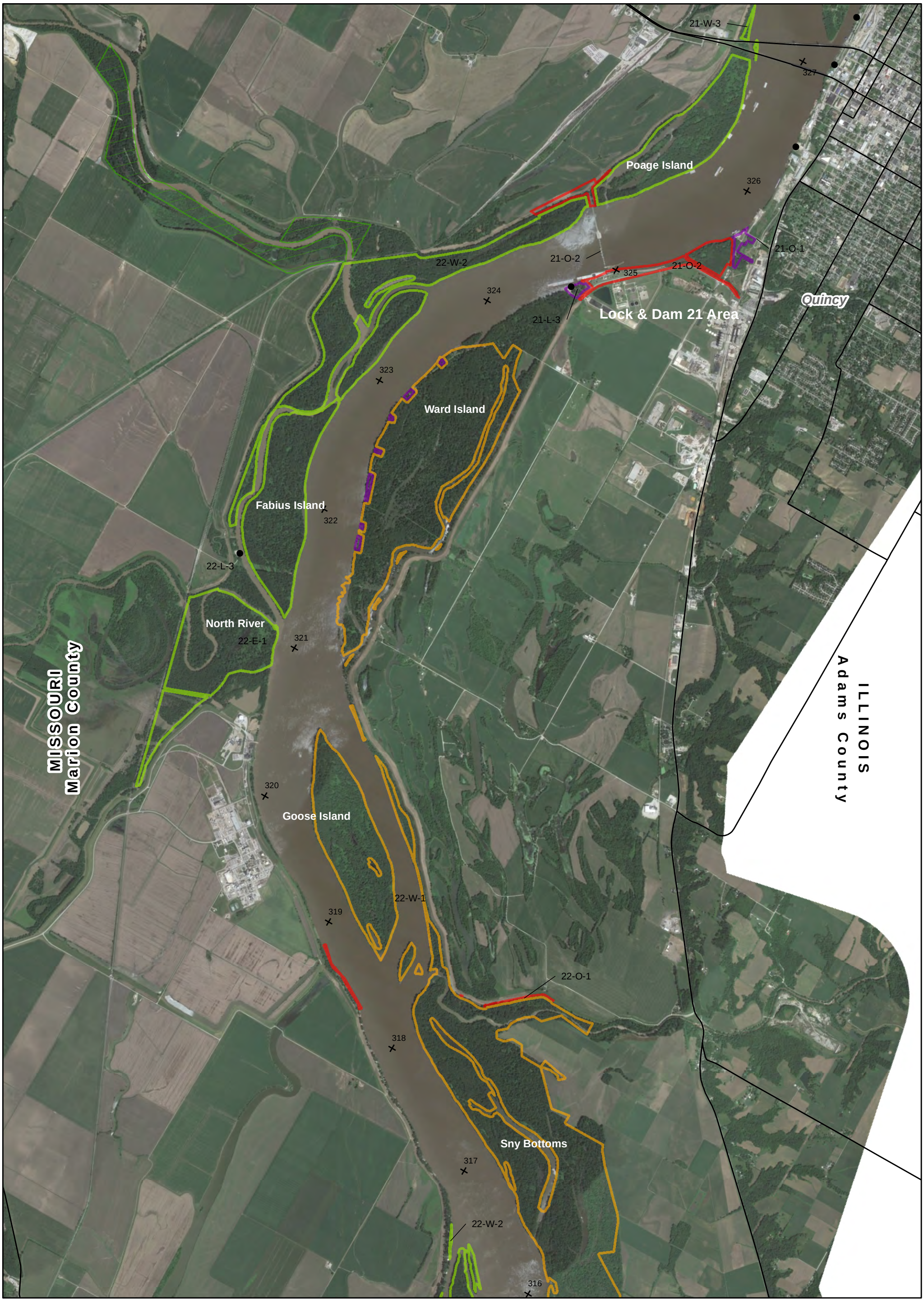
- IL DNR Public Lands
- USFWS Public Lands
- Other Public Lands
- IA DNR Owned Public Lands
- MDC Owned Public Lands

***See disclaimer & information at the beginning of map set.**

N W E S

**Mississippi River Project**
**Master Plan**
**Pool 22**
**River Mile 327 - 316**
**Plate 34 of 36**

0.5 0.25 0 0.5 Miles




- Boat Access
- County Line
- River Mile

**Managing Agency on Corps Lands***

- Lease Area
- IA DNR Management
- IL DNR Management
- MDC Management
- USFWS Management
- Corps Management

- IL DNR Owned Public Lands
- USFWS Owned Public Lands
- IA DNR Owned Public Lands
- MDC Owned Public Lands

***See disclaimer & information at the beginning of map set.**

**Mississippi River Project**
**Master Plan**
**Pool 22**
**River Mile 327 - 316**
**Plate 34 of 36**

0.55 0.275 0 0.55 Miles

MISSOURI
Marion County

ILLINOIS
Adams County

318
317
316
315
314
313
312
311
310
309

22-W-1
22-W-2
Whitney Island
22-W-2
Sny Bottoms
22-L-6
Armstrong Island
22-E-2
Bay Island
22-W-1
Ziegler Island
22-O-2
John Hay Recreation Area

*Ray (J. Thad) Memorial Wildlife Area (MDC)*

*Steyermark (Julian) Woods Conservation Area (MDC)*

*Hannibal*

- Boat Access
- County Line
- River Mile
- Corps Aquired Tracts
- Corps Easement on Private Land

**Master Plan Land Classification***

- Environmentally Sensitive Areas
- High Density Recreation
- Low Density Recreation
- Project Operations
- Vegetative Management
- Wildlife Management

- IL DNR Public Lands
- USFWS Public Lands
- Other Public Lands
- IA DNR Owned Public Lands
- MDC Owned Public Lands

***See disclaimer & information at the beginning of map set.**

N W E S

**Mississippi River Project**
**Master Plan**
**Pool 22**
**River Mile 318 - 308**
**Plate 35 of 36**

0.5 0.25 0 0.5 Miles

MISSOURI
Marion County

ILLINOIS
Adams County

318
317
316
315
314
313
312
311
310
309

22-W-1
22-W-2
22-L-6
22-E-2
22-O-2

Whitney Island
Sny Bottoms
Armstrong Island
Bay Island
Ziegler Island
John Hay Recreation Area
Hannibal

- Boat Access
- County Line
- River Mile

**Managing Agency on Corps Lands***

- Lease Area
- IA DNR Management
- IL DNR Management
- MDC Management
- USFWS Management
- Corps Management

- IL DNR Owned Public Lands
- USFWS Owned Public Lands
- IA DNR Owned Public Lands
- MDC Owned Public Lands

***See disclaimer & information at the beginning of map set.**

N W E S

**Mississippi River Project**
**Master Plan**
**Pool 22**
**River Mile 318 - 308**
**Plate 35 of 36**

0.55 0.275 0 0.55 Miles

Marion County

MISSOURI

Ralls County

ILLINOIS

Pike County

Hannibal

308

307

306

305

304

303

302

301

300

22-W-1

22-V-1

22-L-5

22-E-3

22-O-3

22-L-2

Lock & Dam 22 Area

Park-N-Fish Recreation Area

USACE
Rock Island District

USACE
St. Louis District

- Boat Access
- USACE District Boundary
- County Line
- River Mile
- Corps Aquired Tracts
- Corps Easement on Private Land

**Master Plan Land Classification***

- Environmentally Sensitive Areas
- High Density Recreation
- Low Density Recreation
- Project Operations
- Vegetative Management
- Wildlife Management

- IL DNR Public Lands
- USFWS Public Lands
- Other Public Lands
- IA DNR Owned Public Lands
- MDC Owned Public Lands

***See disclaimer & information at the beginning of map set.**

**Mississippi River Project**
**Master Plan**
**Pool 22**
**River Mile 308 - 300**
**Plate 36 of 36**

0.5 0.25 0 0.5 Miles

Marion County

Hannibal

MISSOURI
Ralls County

ILLINOIS
Pike County

22-W-1

22-W-1

22-V-1

22-V-1

308

307

306

305

304

303

302

301

300

22-L-5

22-E-3

22-L-2

22-O-3

Lock & Dam 22 Area

Park-N-Fish Recreation Area

USACE
Rock Island District

USACE
St. Louis District

- Boat Access
- USACE District Boundary
- County Line
- River Mile

**Managing Agency on Corps Lands***

- Lease Area
- IA DNR Management
- IL DNR Management
- MDC Management
- USFWS Management
- Corps Management

- IL DNR Owned Public Lands
- USFWS Owned Public Lands
- IA DNR Owned Public Lands
- MDC Owned Public Lands

*See disclaimer & information at the beginning of map set.

**Mississippi River Project**
**Master Plan**
**Pool 22**
**River Mile 308 - 300**
**Plate 36 of 36**

0.5 0.25 0 0.5 Miles

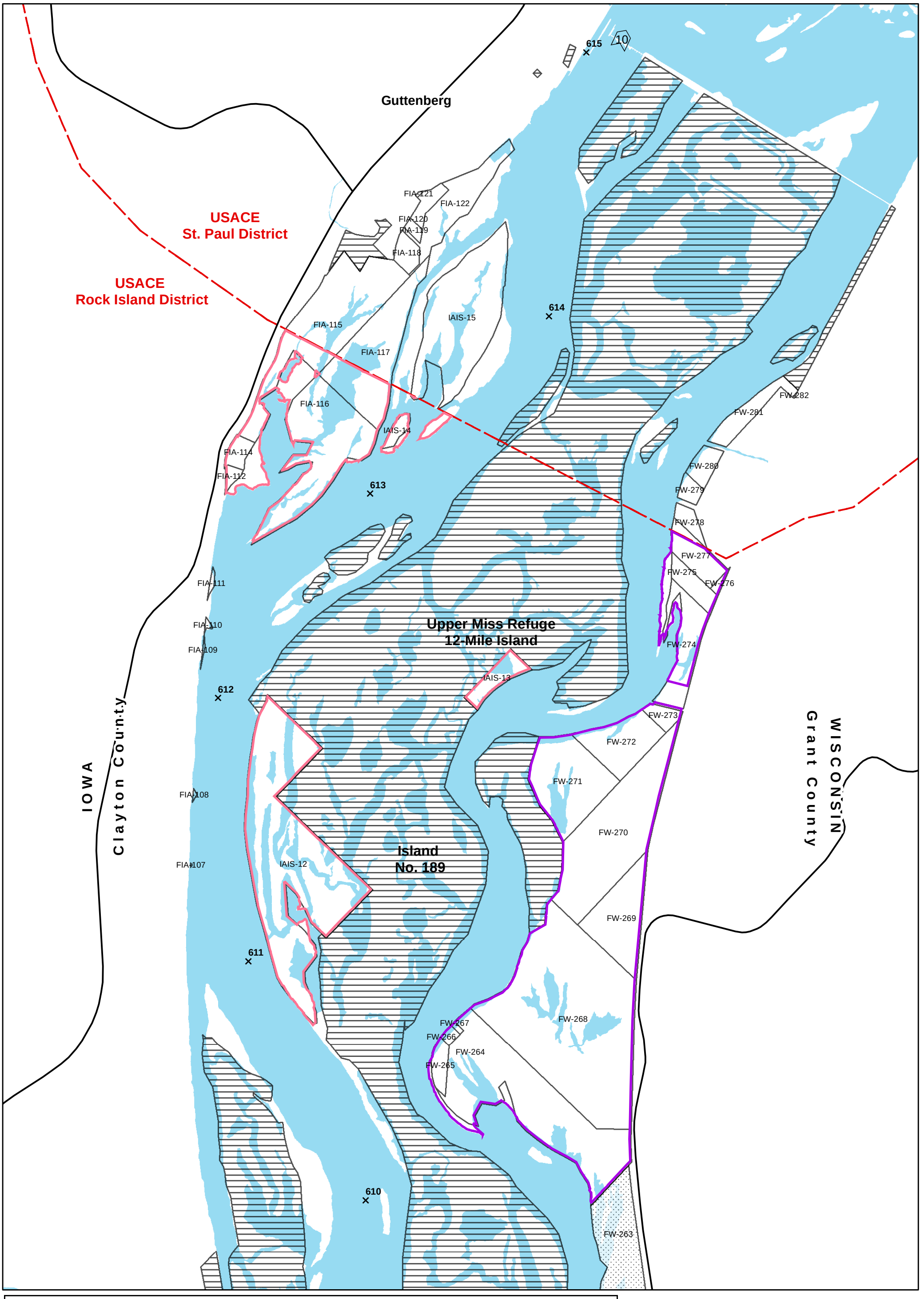
# MISSISSIPPI RIVER PROJECT MASTER PLAN
# WITH
# INTEGRATED ENVIRONMENTAL ASSESSMENT

# UPPER MISSISSIPPI RIVER WATERSHED
# POOLS 11-22
# 9-FOOT CHANNEL NAVIGATION PROJECT
# PLEASANT VALLEY, IOWA

## APPENDIX K

## GENERAL PLANS PLATES

## POOLS 11-13
## POOLS 14-22




Major Roads
USACE District Boundary
County Line
River Mile
Lock and Dam Location

Corps Aquired Tracts
Flowage Easements
Other State/Federal Land

**Lands Available by State**
**Iowa**
USFWS Management
**Wisconsin**
USFWS Management

0.45 0.225 0 0.45 Miles

General Plan
Lands
11-1

IAIS-11
Turkey River
609
FW-263
Island No. 192
FIA-105
FIA-102
FIA-104
FIA-099
FIA-103
FIA-101
FIA-098
FIA-100
608
FIA-095
FW-262
FIA-097
FIA-096
FW-261
FW-259
FW-258
FW-256
FW-253
607
FIA-093
FIA-094
FW-252
FIA-092
Upper Miss Refuge
Turkey River
Bottoms
Cassville
FIA-091
FW-251
FW-250
FW-247
FW-246
FW-245
FW-244
FW-243
FW-241
FW-240
FW-239
FIA-088
FIA-088B
FW-238
606
400E-1
FW-237
FIA-090
FIA-088A
FW-236
FIA-089
FIA-086
FIA-084
FIA-087
FIA-085
605
FIA-083
WIS-22
FIA-081
FIA-082
IAIS-10
FW-235
FW-234
WIS-21
IAIS-09
WIS-20
IOWA
Clayton County
WISCONSIN
Grant County

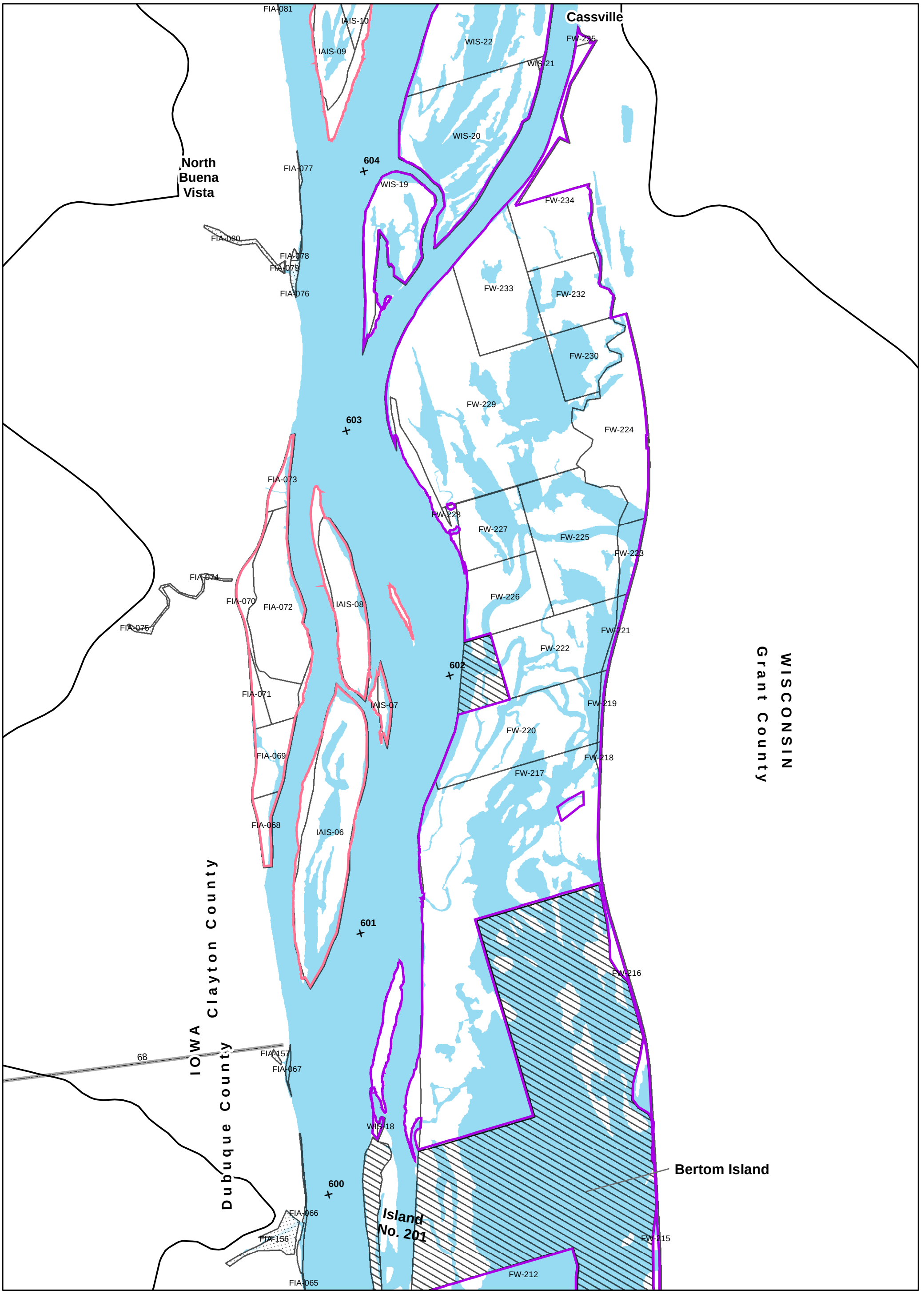
Major Roads
County Line
River Mile
Lock and Dam Location
Corps Aquired Tracts
Flowage Easements
Other State/Federal Land

**Lands Available by State**
**Iowa**
USFWS Management
**Wisconsin**
USFWS Management

0.45 0.225 0 0.45 Miles

N W E S

General Plan Lands 11-2


Cassville
North Buena Vista
FIA-081
IAIS-10
IAIS-09
WIS-22
FW-235
WIS-21
WIS-20
604
FIA-077
WIS-19
FW-234
FIA-080
FIA-078
FIA-079
FIA-076
FW-233
FW-232
FW-230
FW-229
603
FW-224
FIA-073
FW-228
FW-227
FW-225
FW-223
FIA-074
FIA-070
FIA-072
IAIS-08
FW-226
FIA-075
FW-221
FW-222
602
FIA-071
IAIS-07
FW-219
FW-220
FIA-069
FW-218
FW-217
FIA-068
IAIS-06
601
FW-216
IOWA
Clayton County
Dubuque County
68
FIA-157
FIA-067
WIS-18
600
Bertom Island
FIA-066
Island No. 201
FIA-156
FW-215
FIA-065
FW-212
WISCONSIN
Grant County
Major Roads
County Line
River Mile
Lock and Dam Location
Corps Aquired Tracts
Flowage Easements
Other State/Federal Land
Lands Available by State
Iowa
USFWS Management
Wisconsin
USFWS Management
0.45
0.225
0
0.45 Miles
W
N
S
E
General Plan
Lands
11-3

IOWA

Dubuque County

WISCONSIN

Grant County

FIA-065
WIS-17
FW-215
FW-214
FW-212
FIA-064
FW-213
FIA-063
599
FW-210
FW-208
FW-209
FW-399
FW-397
FW-398
FW-211
FW-383
FW-207
FIA-062
FIA-155
FW-206
FW-205
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FW-203
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FW-201
FW-202
FW-200
FW-198
FIA-154
FW-197
FW-199
FIA-061
FW-196
596
FIA-152
FIA-153
FIA-060
FW-195
FIA-059
FIA-058
FW-371
FW-372
FW-396
FIA-057
FW-194
FW-370
FIA-056
595
FW-072

0.45 0.225 0 0.45 Miles

Major Roads
County Line
River Mile
Lock and Dam Location

Corps Aquired Tracts
Flowage Easements
Other State/Federal Land

**Lands Available by State**
**Wisconsin**
USFWS Management

W N S E

General Plan
Lands
11-4

IOWA

Dubuque County

WISCONSIN

Grant County

Rosebrook Island

Potosi

FIA-056
FIA-055
FIA-054
FIA-053
FIA-052
FIA-051
FIA-050
FIA-150
FIA-149
FIA-049
FIA-048
FIA-047
FIA-046
FIA-045
IAIS-05

FW-072
FW-073
FW-071
FW-070
FW-069
FW-068
FW-067
FW-066
FW-065
FW-064
FW-063
FW-062
FW-368
FW-360
FW-357
FW-355
FW-354
FW-356
FW-359
FW-358
FW-353
FW-352
FW-192
FW-139
FW-193
FW-134
FW-124
FW-168
FW-142
FW-098
FW-095
FW-075
FW-112
FW-061
FW-060
FW-059
FW-058
FW-057
FW-056
FW-055
FW-054
FW-053

WIS-16
WIS-15
WIS-14
WIS-13
WIS-12
WIS-09
WIS-10

594
593
592
591
590

0.45 0.225 0 0.45 Miles

Major Roads
County Line
River Mile
Lock and Dam Location

Corps Aquired Tracts
Flowage Easements
Other State/Federal Land

**Lands Available by State**

**Iowa**
USFWS Management

**Wisconsin**
USFWS Management

General Plan
Lands
11-5

IOWA
Dubuque County

WISCONSIN
Grant County

591
590
589
588
587

Mud Lake

FIA-050
FIA-049
FIA-151
FIA-149
FIA-150
FIA-048
FIA-047
FIA-046
IAIS-05
FIA-045
FIA-044
FIA-043A
FIA-043
FIA-042
FIA-041
FIA-040
FIA-038
FIA-039
FIA-037
FIA-036
FIA-124
FIA-123
FIA-125
FIA-126
FIA-127
FIA-022
FIA-031
FIA-035
FIA-032
FIA-033

FW-054
FW-053
FW-052
FW-051
FW-050
FW-351
FW-049
FW-350
FW-048
FW-291
FW-293
FW-290
FW-292
FW-289
FW-047
FW-046
FW-045
FW-044
FW-043

WIS-10
WIS-11
WIS-09
WIS-08
WIS-05
WIS-03

Major Roads
County Line
River Mile
Lock and Dam Location

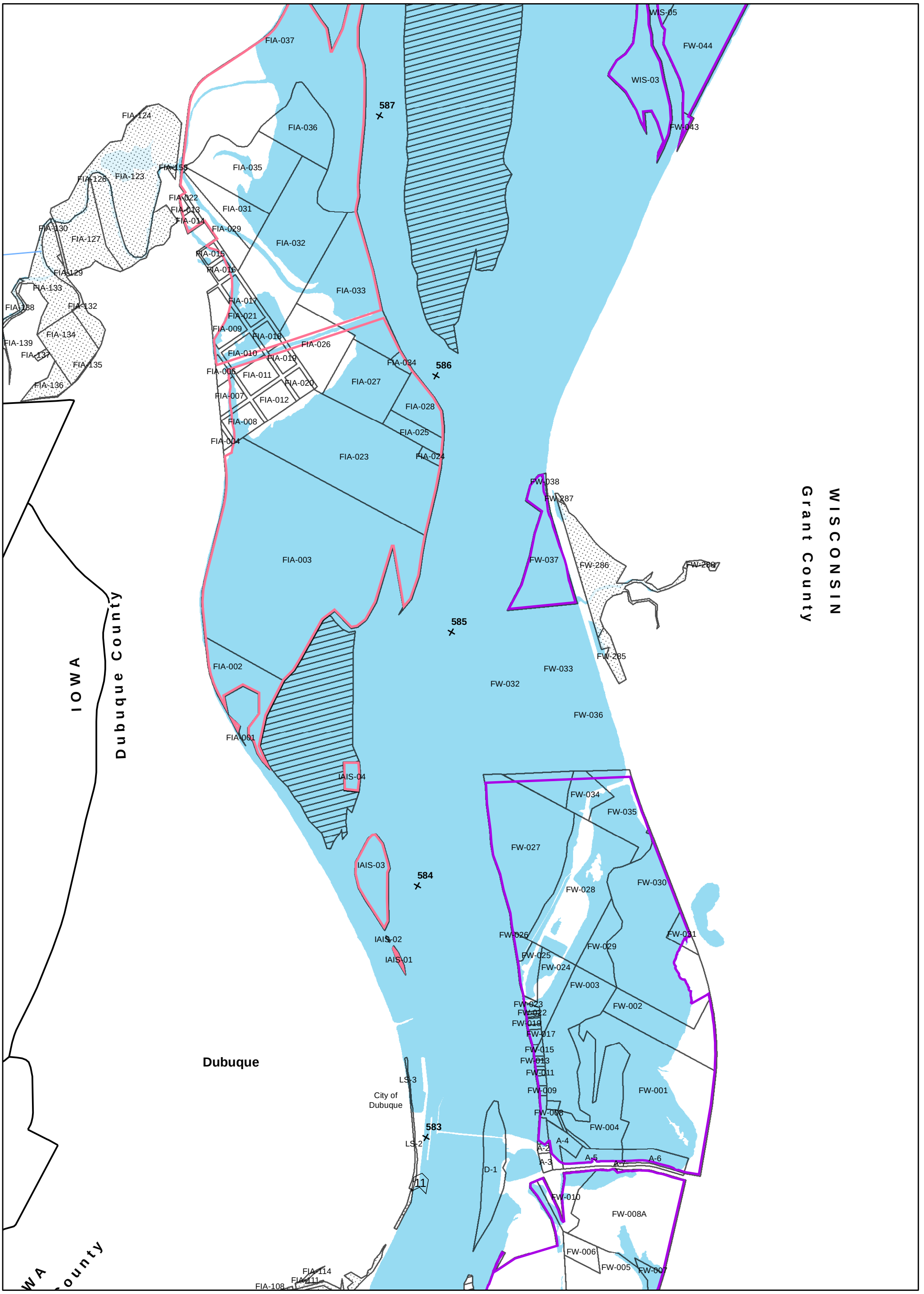
Corps Aquired Tracts
Flowage Easements
Other State/Federal Land

**Lands Available by State**
**Iowa**
USFWS Management
**Wisconsin**
USFWS Management

0.45 0.225 0 0.45 Miles

N W E S

General Plan
Lands
11-6




Major Roads
County Line
River Mile
Lock and Dam Location

Corps Aquired Tracts
Flowage Easements
Other State/Federal Land

**Lands Available by State**

**Iowa**
USFWS Management

**Wisconsin**
USFWS Management

0.45 0.225 0 0.45 Miles

N W E S

General Plan Lands
11-7

Dubuque

A-2
A-4
LS-3
583
LS-2
D-1
FW-010
FW-008A
FW-007
FW-006
FW-005
11
City of Dubuque
FIA-134
FIA-133
FW-004
FIA-116
FIA-132
FIA-112
FIA-108
FIA-107
FIA-131
582
FIA-125
FIA-129
FW-003
FIA-106
FIA-127
FIA-105
FIA-104
FIA-126
FIA-128
FIA-124
FIA-123
FW-002
FIA-102
FIA-122
FW-001
FIA-101
FIA-121
FIA-100
FIA-099
FIA-098
FIA-096
FIA-120
581
FIA-095
66
FIA-094
FIA-093
FIA-092
FIA-090
FIA-074
FIA-078
FIA-073
FIA-117
FIA-070
FIA-068
FIA-066A
FIA-066
FIA-065
FIA-060
FIA-059
580
FI-084
FI-083
East Dubuque
FI-082
FI-081
FI-113
FI-080
579
IIS-41
FI-079
FIA-058
FI-078
FI-077
FI-076
FI-075
578

IOWA
Dubuque County

WISCONSIN
Grant County

Major Roads
County Line
River Mile
Lock and Dam Location

Corps Aquired Tracts
Flowage Easements
Other State/Federal Land

**Lands Available by State**
**Illinois**
USFWS Management
**Wisconsin**
USFWS Management

0.45 0.225 0 0.45 Miles

N W E S

General Plan
Lands
12-1

Dubuque

East Dubuque

Catfish Creek State Preserve

Mines of Spain State Park

Menominee River

ILLINOIS

Jo Daviess County

IOWA

Dubuque County

Menominee

578
577
576
575
574

FI-078
FI-113
FI-077
FI-079
FI-076
FIA-033B
FIA-033A
FI-075
FI-073
FI-074
FI-072
FIA-031A
FI-068
FI-071
FI-070
FI-069
FI-067
FI-066
FI-065
IIS-40
FI-064
FI-063
FI-062
FI-061
FIA-028
IIS-39
IAIS-04B
FIA-026M
IAIS-06
IIS-38
FIA-026K
FIA-026G
IAIS-04A
IAIS-04C
IIS-37
FIA-026D
FIA-026C
FIA-026B
IAIS-05

Major Roads
County Line
River Mile
Lock and Dam Location

Corps Aquired Tracts
Flowage Easements
Other State/Federal Land

**Lands Available by State**

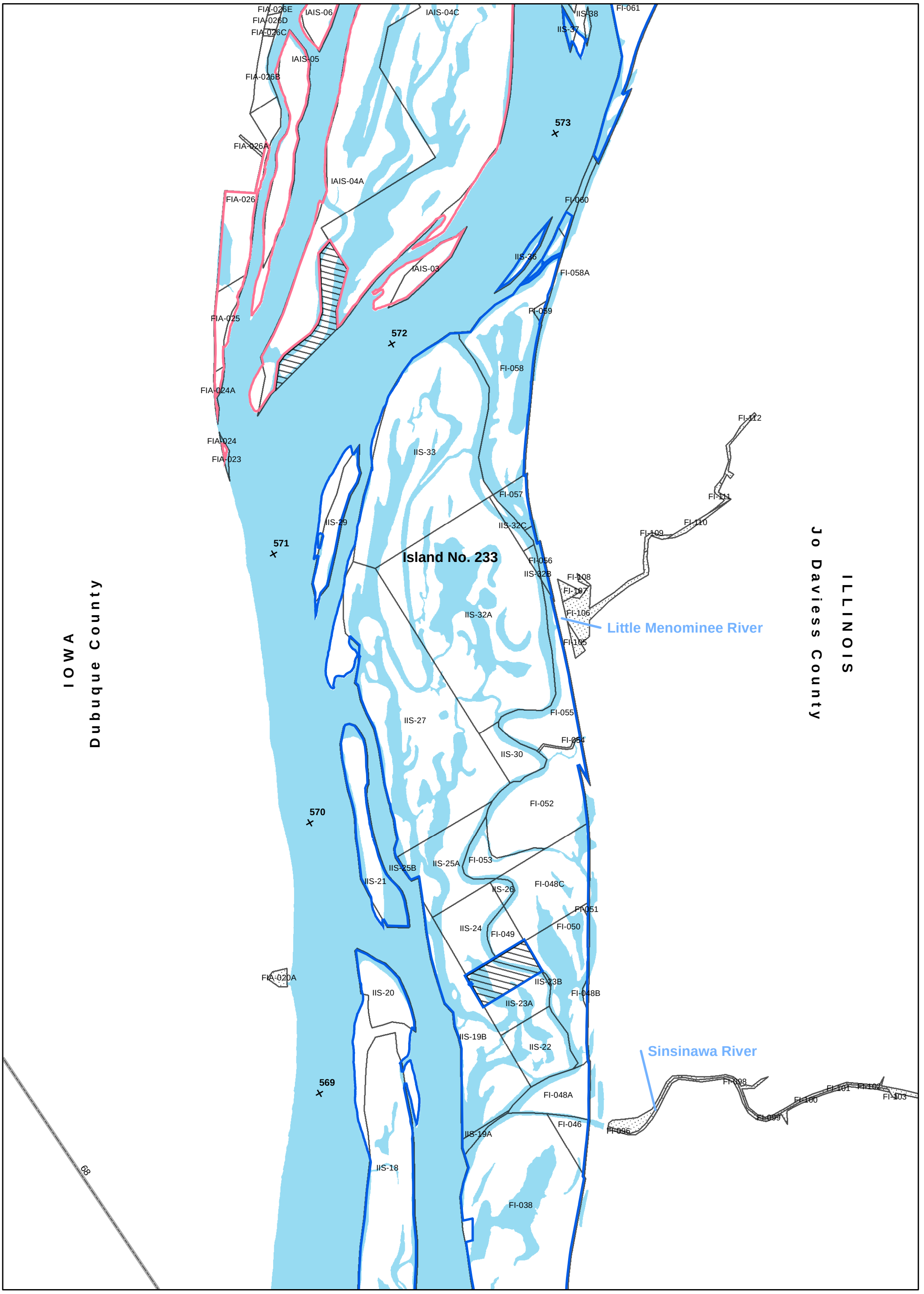
**Illinois**
USFWS Management

**Iowa**
USFWS Management

0.45 0.225 0 0.45 Miles

N W E S

General Plan Lands 12-2


FIA-026E
FIA-026D
FIA-026C
IAIS-06
IAIS-04C
IIS-38
FI-061
IIS-37
IAIS-05
FIA-026B
573
FIA-026A
IAIS-04A
FIA-026
FI-060
IIS-36
IAIS-03
FI-058A
FIA-025
FI-059
572
FI-058
FIA-024A
FIA-024
FIA-023
IIS-33
FI-112
FI-057
FI-111
IIS-29
IIS-32C
FI-110
FI-109
571
Island No. 233
FI-056
IIS-32B
FI-108
FI-107
IIS-32A
FI-106
Little Menominee River
FI-105
IOWA
Dubuque County
ILLINOIS
Jo Daviess County
IIS-27
FI-055
FI-054
IIS-30
FI-052
570
IIS-25B
IIS-25A
FI-053
IIS-21
IIS-26
FI-048C
FI-051
IIS-24
FI-049
FI-050
FIA-020A
IIS-23B
FI-048B
IIS-20
IIS-23A
IIS-19B
IIS-22
Sinsinawa River
569
FI-098
FI-101
FI-102
FI-103
FI-100
FI-099
FI-048A
FI-046
IIS-19A
FI-096
IIS-18
68
FI-038
Major Roads
County Line
River Mile
Lock and Dam Location
Corps Aquired Tracts
Flowage Easements
Other State/Federal Land
Lands Available by State
Illinois
USFWS Management
Iowa
USFWS Management
0.45
0.225
0
0.45 Miles
W
N
S
E
General Plan
Lands
12-3

ILLINOIS
Jo Daviess County

IOWA
Jackson County

68

568
567
566
565
564

IIS-18
IIS-05
IIS-11
IIS-12
IIS-10
IIS-09
IIS-08
IIS-07
IIS-06
IIS-01B
IIS-01A
IIS-02
IIS-01

FI-045
FI-044
FI-038
FI-042C
FI-042B
FI-043
FI-042A
FI-041
FI-040
FI-008
FI-039
FI-007
FI-094
FI-094A
FI-095
FI-093
FI-092A
FI-092
FI-004
FI-002

FIA-012G
FIA-012H
FIA-012F
FIA-012E
FIA-012C
FIA-012D
FIA-012B
FIA-013A
FIA-013
FIA-012A
FIA-012
FIA-011
FIA-010E
FIA-010B
FIA-010D
FIA-010C
FIA-010

Tete Des Mortes Creek

Galena River

0.45 0.225 0 0.45 Miles

- Major Roads
- County Line
- \+ River Mile
- Lock and Dam Location
- Corps Aquired Tracts
- Flowage Easements
- Other State/Federal Land

**Lands Available by State**

**Illinois**
- USFWS Management

**Iowa**
- USFWS Management

General Plan
Lands
12-4

IOWA

Jackson County

ILLINOIS

Jo Daviess County

Smallpox Creek

FI-002
FIA-010E
IIS-01B
IIS-01A
FIA-010B
IIS-02
564
FI-001A
FI-001
FIA-010
FIA-010C
FIA-010D
FI-035
FI-091
FI-090
FI-034
FI-089
IIS-01
FI-033
FI-032
FI-088
563
FI-031
FI-030
FI-029
FI-028B
FI-028A
FIA-009A
FI-025
FI-028
FI-027
FI-026
FI-024
FIA-008C
FIA-008B
562
FI-023
FI-022
FI-019
FI-020
FI-021
FIA-008
IAIS-02
FI-018
FI-017
FI-014
FIA-007
561
FI-016
IAIS-01
FIA-006
FI-015
FIA-005
IIS-17
560
FI-013
FIA-003
FIA-003B
FIA-003A
IIS-15
FI-087
FIA-002
FIA-003C
FI-012
FI-086
FI-009B
IIS-14
FI-010
FIA-001
IIS-13

Major Roads
County Line
River Mile
Lock and Dam Location

Corps Aquired Tracts
Flowage Easements
Other State/Federal Land

**Lands Available by State**

**Illinois**
USFWS Management

**Iowa**
USFWS Management

0.45 0.225 0 0.45 Miles

N W E S

General Plan
Lands
12-5

IOWA
Jackson County

ILLINOIS
Jo Daviess County

IAIS-02
FIA-007
FIA-006
IAIS-01
FIA-005
FIA-003B
FIA-003
FIA-003A
FIA-003C
FIA-002
IIS-17
IIS-15
FIA-001
IIS-14
FIA-056
IIS-13
FIA-054
FIA-055
FIA-053
FIA-052
FIA-051
FIA-050
FIA-049
FIA-048
FIA-045
FIA-044
FIA-043
FIA-040
FIA-039
LS-36
LS-26
LS-22
LS-18
LS-11
LS-07
LS-02
LS-01
FI-018
FI-017
FI-014
FI-016
FI-015
FI-013
FI-009B
FI-012
FI-087
FI-086
FI-010
FI-009A
FI-085
FI-009
D-1
D-2
561
560
559
558
557
556
12
Bellevue

0.45 0.225 0 0.45 Miles

Major Roads
County Line
River Mile
Lock and Dam Location
Corps Aquired Tracts
Flowage Easements
Other State/Federal Land

**Lands Available by State**
**Illinois**
USFWS Management
**Iowa**
USFWS Management

N W E S

General Plan Lands 12-6

Bellevue

556

555

554

553

552

FIA-290

FIA-288

FIA-289

IAIS-51B

IAIS-51A

Bellevue State Park

FIA-287

FIA-286

FIA-285

FIA-284

IAIS-51

FIA-283

IAIS-50

FIA-282

IAIS-49

IAIS-48

FIA-280

FIA-277

FIA-281

IOWA

Jackson County

ILLINOIS

Jo Daviess County

Former Savanna Army Depot

0.45 0.225 0 0.45 Miles

N W E S

General Plan Lands 13-1

Major Roads

County Line

River Mile

Lock and Dam Location

Corps Aquired Tracts

Flowage Easements

Other State/Federal Land

**Lands Available by State**

**Iowa**

USFWS Management

IOWA

Jackson County

ILLINOIS

Jo Daviess County

FIA-262
IAIS-49
FIA-280
IAIS-48
FIA-281
FIA-277
551
550
FIA-278
IAIS-47
FIA-279
FIA-269
Maquoketa River
FIA-267
549
FIA-309
100
FIA-275
FIA-274
FIA-276
FIA-272
FIA-271
FIA-286
FIA-270
500
FIA-308
FIA-352
FIA-318
548
FIA-307
FIA-351
FIA-305
FIA-350
FIA-306
FIA-311
FIA-310
FIA-348
FIA-349
FIA-347
FIA-316
FIA-312
FIA-344
FIA-353
FIA-315
FIA-303A
FIA-304
FIA-314
FIA-345
FIA-313
547
FIA-317
FIA-346
FIA-303B
FIA-294

Major Roads
County Line
River Mile
Lock and Dam Location

Corps Aquired Tracts
Flowage Easements
Other State/Federal Land

**Lands Available by State**

**Iowa**

USFWS Management
Iowa DNR Management

0.45 0.225 0 0.45 Miles

N W E S

General Plan
Lands
13-2

FIA-316
FIA-311
FIA-310
FIA-348
FIA-308
FIA-347
FIA-315
FIA-312
FIA-306
FIA-353
FIA-314
FIA-305
FIA-345
FIA-313
FIA-317
FIA-346
FIA-344
FIA-303B
FIA-303A
FIA-304
547
FIA-302
ILLINOIS
Jo Daviess County
Green Island Wildlife Management Area
FIA-294
FIA-355
FIA-354
546
FIA-142
FIA-292
FIA-293
FIA-141
FIA-140
Apple River Island
FIA-143
FIA-144
FIA-139
Upper Miss Refuge Apple River Island
FIA-145
FIA-146
Upper Miss Refuge Brown's Lake
FIA-138
545
FIA-137
FI-229
FI-253
IIS-31
FI-251
IOWA
Jackson County
544
IIS-32
FI-250
FIA-136
FI-248
FI-249
IIS-30
FI-246
FI-245
FI-244
IIS-29
FI-241
543
FI-240
FIA-135
IAIS-35
FI-239
IAIS-33
FI-238
FI-237
FI-213
IAIS-34
IAIS-31

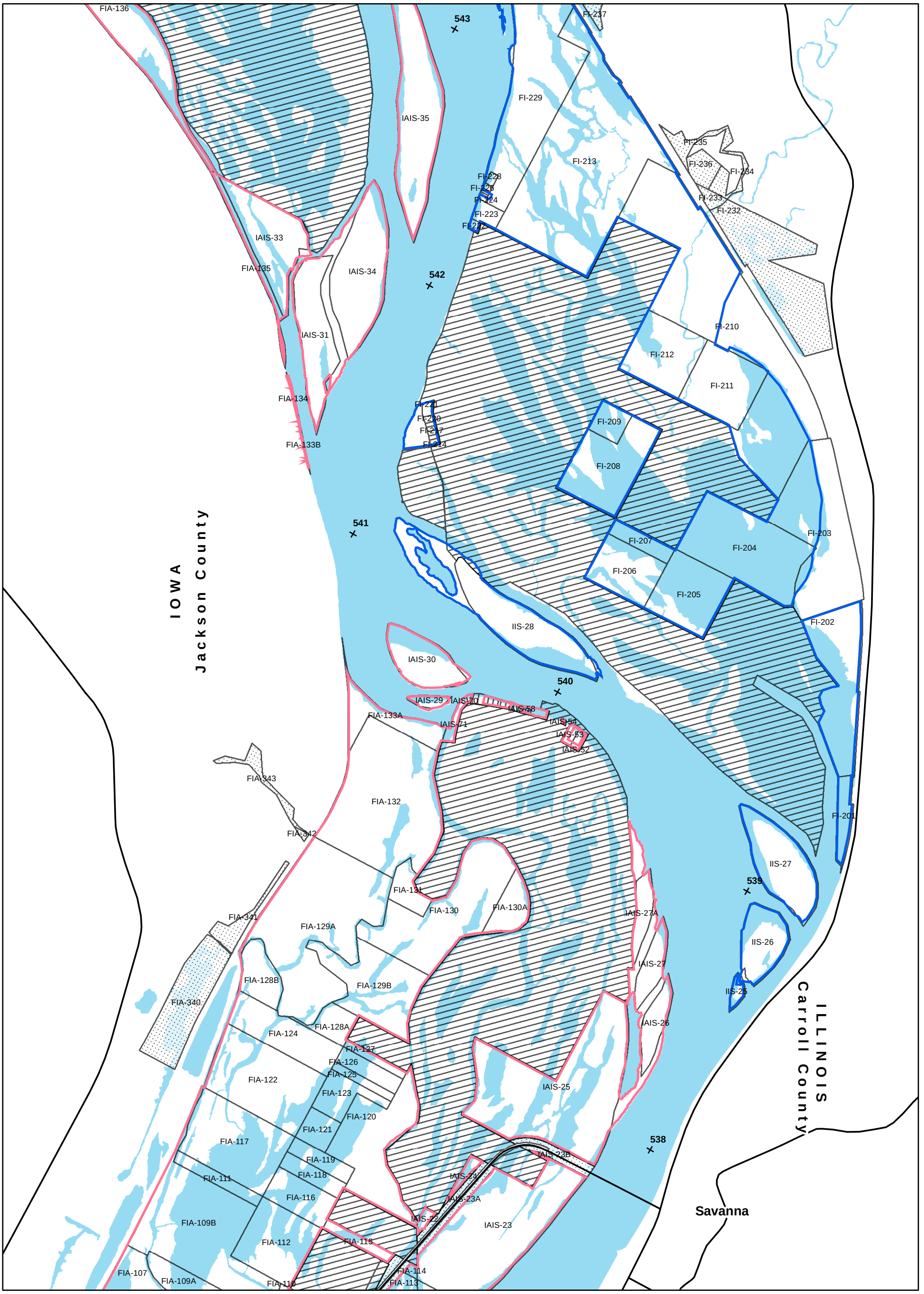
Major Roads
County Line
River Mile
Lock and Dam Location
Corps Aquired Tracts
Flowage Easements
Other State/Federal Land

**Lands Available by State**
**Illinois**
USFWS Management
**Iowa**
USFWS Management
Iowa DNR Management

0.45 0.225 0 0.45 Miles

N W E S

General Plan Lands 13-3


FIA-136
543
FI-237
FI-229
IAIS-35
FI-235
FI-213
FI-236
FI-234
FI-228
FI-226
FI-224
FI-233
FI-223
FI-232
FI-222
IAIS-33
FIA-135
IAIS-34
542
FI-210
IAIS-31
FI-212
FI-211
FIA-134
FI-221
FI-220
FI-209
FI-217
FI-214
FIA-133B
FI-208
541
FI-203
FI-207
FI-204
FI-206
FI-205
IOWA
Jackson County
IIS-28
FI-202
IAIS-30
540
IAIS-29
IAIS-70
IAIS-58
FIA-133A
IAIS-71
IAIS-54
IAIS-53
IAIS-52
FIA-343
FIA-132
FI-201
FIA-342
IIS-27
539
FIA-131
FIA-130
FIA-130A
IAIS-27A
FIA-341
FIA-129A
IIS-26
IAIS-27
FIA-128B
FIA-129B
IIS-25
FIA-340
IAIS-26
FIA-128A
FIA-124
FIA-127
FIA-126
FIA-125
FIA-122
IAIS-25
FIA-123
FIA-120
FIA-121
538
FIA-117
IAIS-23B
FIA-119
IAIS-24
FIA-118
FIA-111
IAIS-23A
FIA-116
Savanna
FIA-109B
IAIS-22
IAIS-23
FIA-112
FIA-115
FIA-107
FIA-114
FIA-109A
FIA-110
FIA-113
ILLINOIS
Carroll County
Major Roads
County Line
River Mile
Lock and Dam Location
Corps Aquired Tracts
Flowage Easements
Other State/Federal Land
Lands Available by State
Illinois
USFWS Management
Iowa
USFWS Management
0.45
0.225
0
0.45 Miles
N
W
E
S
General Plan
Lands
13-4

IOWA
Jackson County
ILLINOIS
Carroll County
Savanna
Sabula
Spring Lake
538
537
536
535
534
533
FIA-109B
FIA-116
FIA-120
IAIS-25
IAIS-23B
IAIS-24
IAIS-23A
FIA-107
FIA-112
FIA-115
IAIS-22
IAIS-23
FIA-111A
FIA-114
FIA-109A
FIA-110
FIA-113A
FIA-113
FIA-105
IAIS-20
IAIS-21
FIA-104
IAIS-19
IAIS-16
FIA-108
FIA-106
IAIS-13
FIA-101
IAIS-18
FIA-102
IAIS-17
IAIS-14A
IAIS-14
IAIS-13A
FIA-264
FIA-099
FIA-260
FIA-266
IAIS-10
IAIS-11
IIS-18
FIA-258
FIA-262
FIA-103
IAIS-15
IIS-16A
FIA-263
FIA-226
IAIS-09
FI-200
FIA-230
FIA-259
IAIS-08
FI-013A
FIA-257
FIA-217
IAIS-07
FIA-232
FIA-255
FIA-237
FIA-212
FIA-239A
FIA-206
IIS-16
FIA-256
FIA-240
FIA-198
FIA-193
IIS-15
FI-013
FIA-254A
FIA-242
FIA-244
FI-199
FIA-245
FIA-190
IIS-14
IIS-16B
FIA-248
FIA-254
FI-263
FIA-250D
FIA-252
IIS-13
FI-267
FIA-189
FIA-253
IIS-12
FI-266
FIA-187
FIA-185
FI-265
FI-268
FI-264
FI-269
FIA-184
IIS-11
FI-009
FI-271
FIA-182
FIA-183
FI-012
FI-273
FI-274
FI-175
FI-275
FI-011
FI-010
FI-277
FI-172
FI-008
FI-278
FI-176
FI-279
FI-169
IAIS-06
IIS-09
FI-281
FI-166
FI-173
FI-283
FIA-098
FI-174
IAIS-05
FI-280
FI-285A
FI-007A
FI-284
FI-170
IIS-06
FI-007
IIS-08
FI-285
FIA-097
FI-171
FIA-096
FI-167
IIS-05
FI-168
IAIS-03
IIS-04
96
FI-164
IAIS-45
FI-151
IAIS-44
FI-154
FI-152
FI-156
FI-153
FI-146
FI-155
FI-165
FI-144
FI-147
FI-143
FI-149
FI-139
FI-140
FI-150
FI-148

Major Roads
County Line
River Mile
Lock and Dam Location
Corps Aquired Tracts
Flowage Easements
Other State/Federal Land

**Lands Available by State**
**Illinois**
USFWS Management
**Iowa**
USFWS Management

0.45 0.225 0 0.45 Miles

N W E S

General Plan Lands 13-5

IAIS-05
FI-007
IIS-06
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FIA-097
IIS-04
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FIA-168
FIA-167
FI-112
FIA-165
IIS-22
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FI-113
FIA-162
FIA-161
FIA-156B
FIA-155B
FIA-163
FIA-332
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IAIS-38B
FI-194
FI-103
FI-108A
FIA-328
IAIS-39
FIA-149
FIA-147
FI-107

Clinton County, IOWA

Carroll County, ILLINOIS

Thomson

- Major Roads
- County Line
- + River Mile
- Lock and Dam Location
- Corps Aquired Tracts
- Flowage Easements
- Other State/Federal Land

**Lands Available by State**

**Illinois**
- USFWS Management

**Iowa**
- USFWS Management

0.45 0.225 0 0.45 Miles

N W E S

General Plan Lands 13-6

IOWA

Clinton County

528 527 526 525 524

Clinton

Major Roads
County Line
River Mile
Lock and Dam Location

Corps Aquired Tracts
Flowage Easements
Other State/Federal Land

**Lands Available by State**

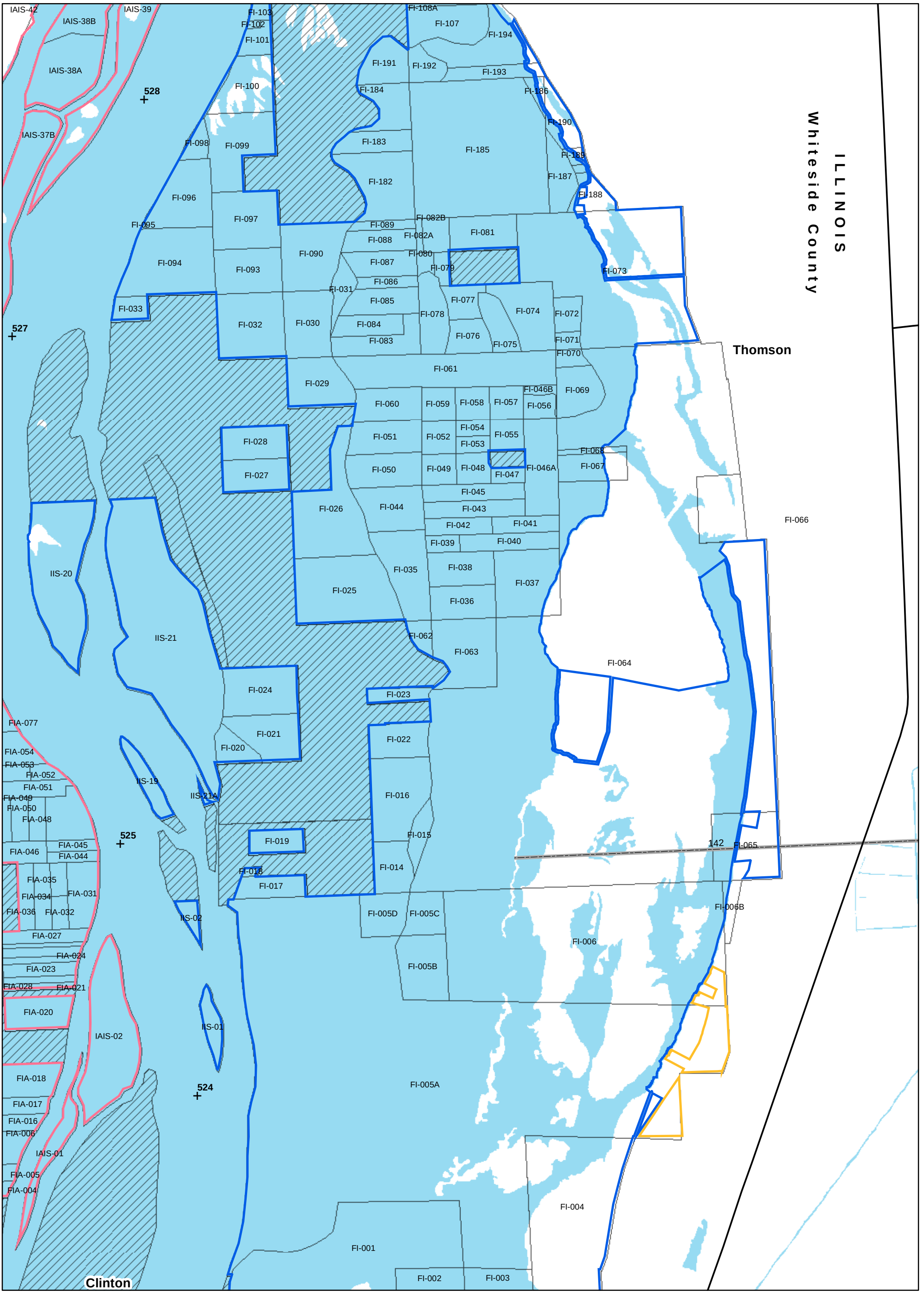
**Illinois**
USFWS Management

**Iowa**
USFWS Management

0.45 0.225 0 0.45 Miles

N W E S

General Plan
Lands
13-7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IAIS-38B
IAIS-38A
IAIS-37B
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527
525
524
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FI-102
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FI-100
FI-098
FI-099
FI-096
FI-095
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FI-064
FI-066
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IIS-21
FI-024
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FI-021
FI-020
FI-016
IIS-19
IIS-21A
FI-019
FI-015
FI-018
FI-014
FI-017
IIS-02
FI-005D
FI-005C
FI-006
FI-005B
FI-005A
FI-004
FI-001
FI-002
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142
FI-065
FI-006B
FIA-077
FIA-054
FIA-053
FIA-052
FIA-051
FIA-049
FIA-050
FIA-048
FIA-046
FIA-045
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FIA-034
FIA-031
FIA-036
FIA-032
FIA-027
FIA-024
FIA-023
FIA-028
FIA-021
FIA-020
IAIS-02
IIS-01
FIA-018
FIA-017
FIA-016
FIA-006
IAIS-01
FIA-005
FIA-004
ILLINOIS
Whiteside County
Thomson
Clinton
Major Roads
County Line
River Mile
Lock and Dam Location
Corps Aquired Tracts
Flowage Easements
Other State/Federal Land
Lands Available by State
Illinois
USFWS Management
Illinois DNR Management
Iowa
USFWS Management
0.45
0.225
0
0.45 Miles
N
W
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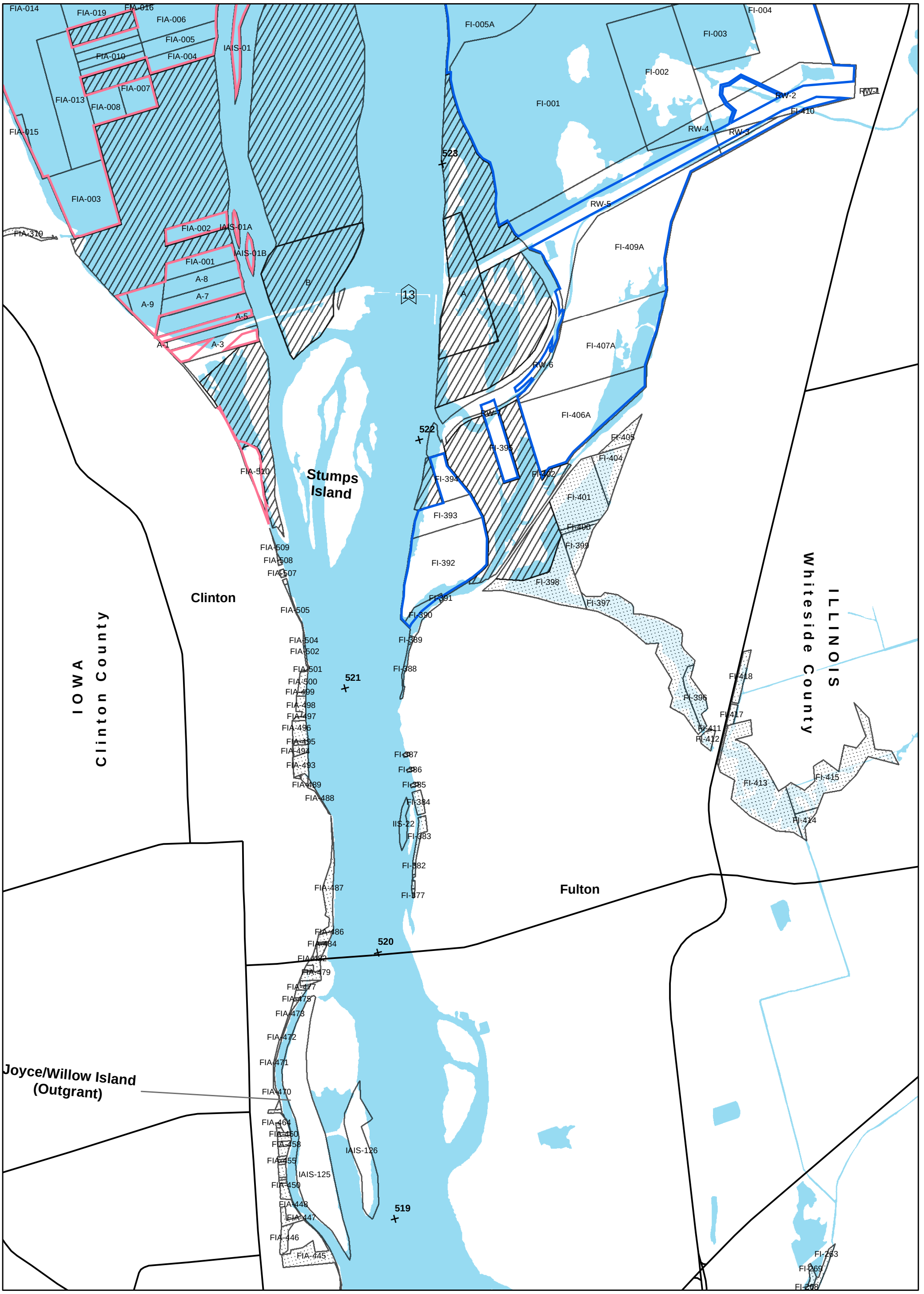
S
General Plan
Lands
13-8




Major Roads
County Line
River Mile
Lock and Dam Location

Corps Aquired Tracts
Flowage Easements
Other State/Federal Land

**Lands Available by State**

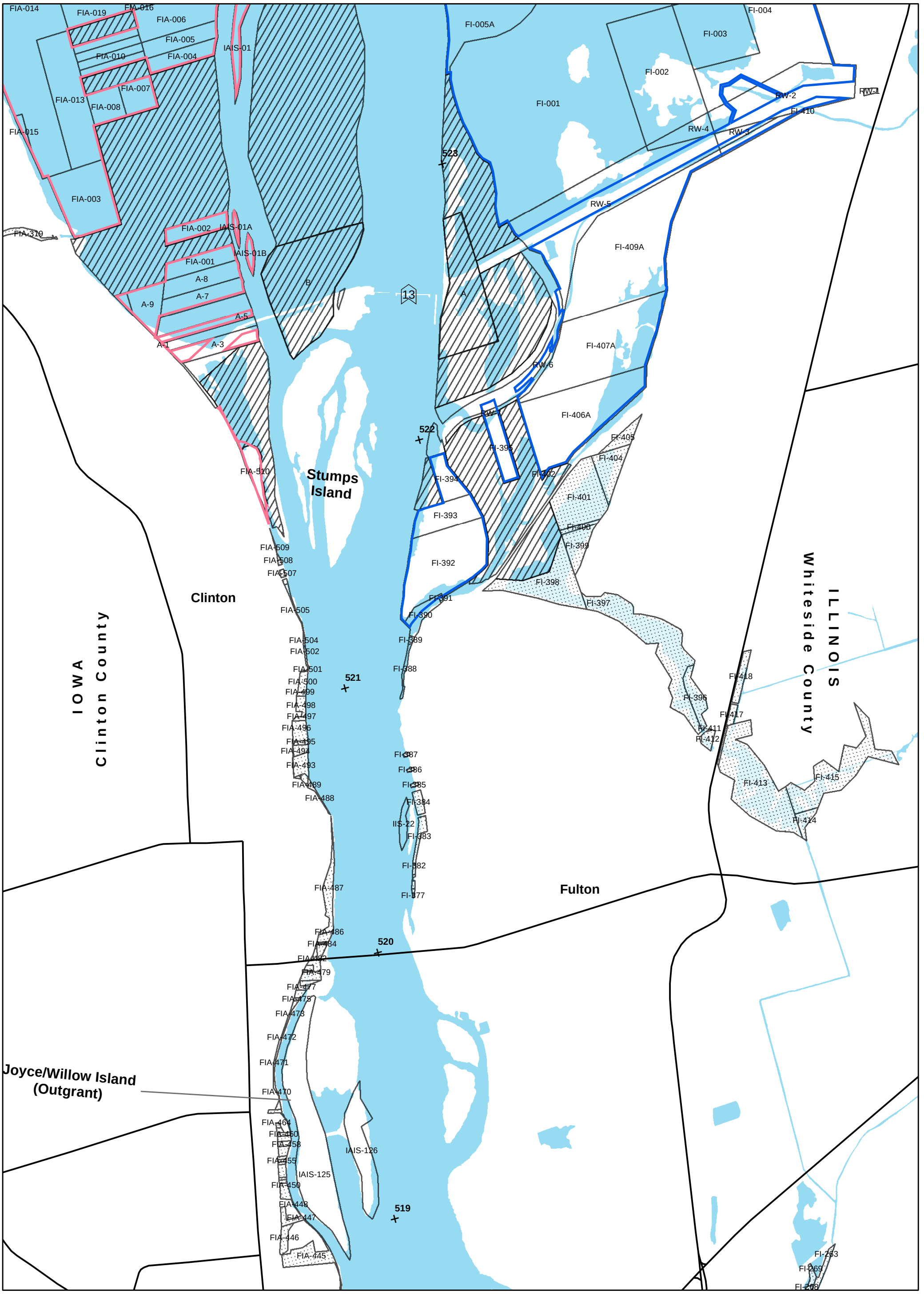
**Illinois**
USFWS Management

**Iowa**
USFWS Management

0.45 0.225 0 0.45 Miles

N E S W

General Plan Lands 14-1




Major Roads
County Line
River Mile
Lock and Dam Location

Corps Aquired Tracts
Flowage Easements
Other State/Federal Land

**Lands Available by State**

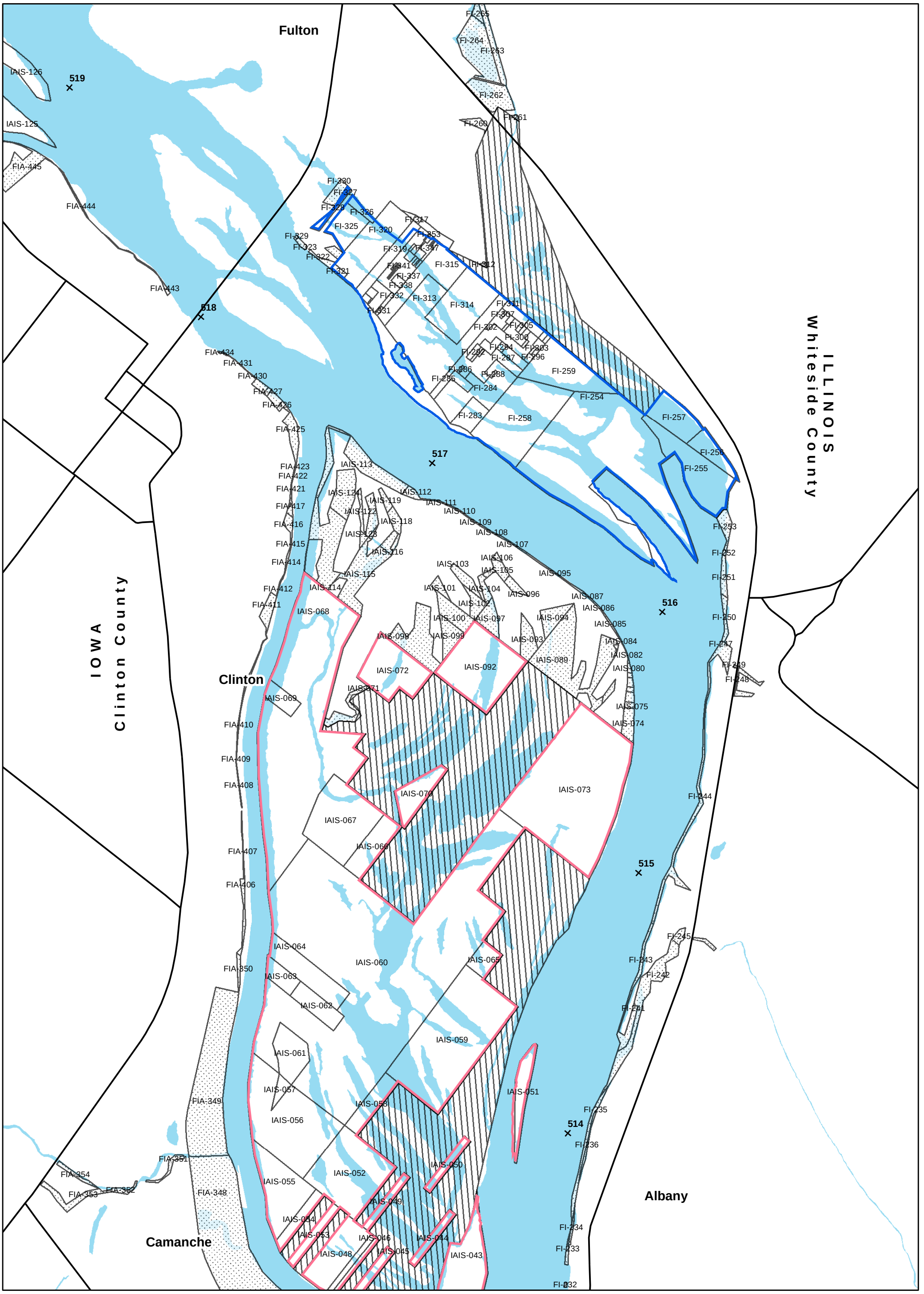
**Illinois**
USFWS Management

**Iowa**
USFWS Management

0.45 0.225 0 0.45 Miles

N E S W

General Plan Lands 14-1


ILLINOIS
Whiteside County
IOWA
Clinton County
Fulton
Clinton
Camanche
Albany
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FI-232
Major Roads
County Line
River Mile
Lock and Dam Location
Corps Aquired Tracts
Flowage Easements
Other State/Federal Land
Lands Available by State
Illinois
USFWS Management
Iowa
USFWS Management
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0.45 Miles
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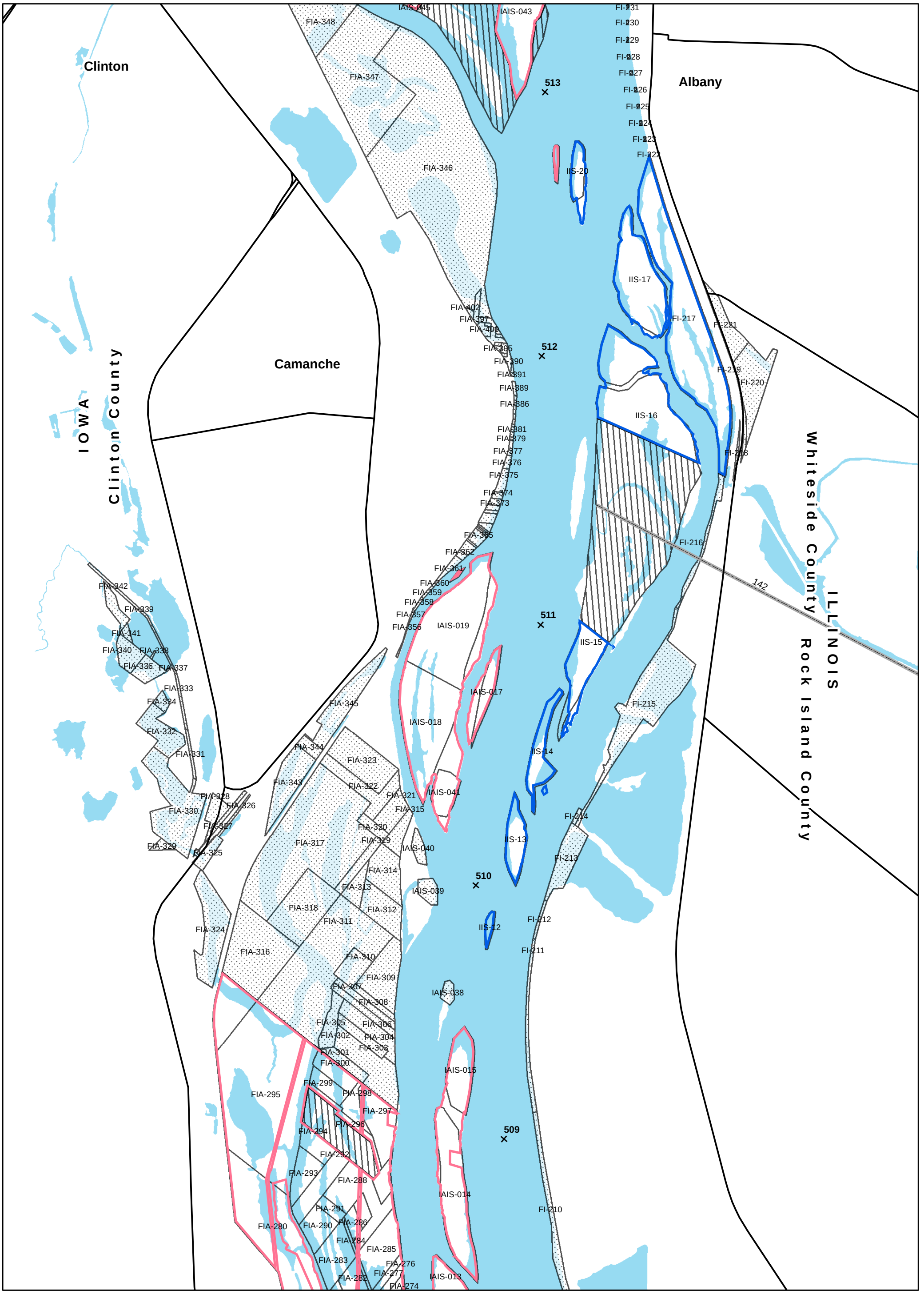
General Plan
Lands
14-2


Clinton
Camanche
Albany
IOWA
Clinton County
ILLINOIS
Rock Island County
Whiteside County
142
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IAIS-045
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IAIS-020
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FIA-274
FIA-402
FIA-397
FIA-400
FIA-396
FIA-390
FIA-391
FIA-389
FIA-386
FIA-381
FIA-379
FIA-377
FIA-376
FIA-375
FIA-374
FIA-373
FIA-365
FIA-362
FIA-361
FIA-360
FIA-359
FIA-358
FIA-357
FIA-356
Major Roads
County Line
River Mile
Lock and Dam Location
Corps Aquired Tracts
Flowage Easements
Other State/Federal Land
Lands Available by State
Illinois
USFWS Management
Iowa
USFWS Management
0.45
0.225
0
0.45 Miles
N
E
S
W
General Plan
Lands
14-3

IOWA

Clinton County

Scott County

ILLINOIS

Rock Island County

Cordova

102

FIA-280 FIA-279 FIA-278 FIA-277 FIA-276 FIA-275 FIA-274 FIA-273 FIA-272 FIA-270 FIA-269 FIA-271 FIA-285 IAIS-014 IAIS-013 FI-210 IAIS-012 508 FIA-248 FIA-249 FI-209 FIA-253 FIA-247 FIA-243 IAIS-011 FI-208 FIA-256 FIA-255 FIA-246 FIA-245 FIA-244 FI-207 FIA-250 FIA-257 FIA-232 FIA-258 507 FIA-259 FIA-251 FIA-231 FIA-262 FIA-237 FIA-260 FIA-236 FIA-261 FIA-235 FIA-252 FIA-229 FIA-263 FIA-265 FIA-242 FIA-241 FIA-234 FIA-266 FIA-267 FIA-227 FIA-233 FI-206 FIA-268 FIA-239 IIS-11 506 FIA-240 FIA-238 IAIS-010 FI-204 FI-205 FI-202 FI-203 FI-200 FI-201 FI-199 FI-198 FI-197 FIA-228 FI-195 FI-193 FIA-226 FI-192 505 IAIS-008 FI-191 FIA-225 FI-184 FI-182 FI-181 FI-180 FI-179 FI-178 FIA-224 IAIS-004 FI-177 IAIS-005 504 FI-176 FIA-223 FIA-222 FI-175

Major Roads
County Line
River Mile
Lock and Dam Location

Corps Aquired Tracts
Flowage Easements
Other State/Federal Land

**Lands Available by State**
**Iowa**
USFWS Management
Iowa DNR Management

0.45 0.225 0 0.45 Miles

N E S W

General Plan
Lands
14-4

IOWA
Scott County

ILLINOIS
Rock Island County

Princeton

Cordova

Port Byron

FIA-223
FIA-222
FIA-221
FIA-220
FIA-219
FIA-217
FIA-218
FIA-216
FIA-215
FIA-214
FIA-213
FIA-209
FIA-205
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IIS-10
IIS-09
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IIS-07
IIS-06
IIS-05
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IAIS-003
IAIS-002
IAIS-001

FI-176
FI-175
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FI-115C
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FI-111
FI-110
FI-108

Major Roads
County Line
River Mile
Lock and Dam Location

Corps Aquired Tracts
Flowage Easements
Other State/Federal Land

**Lands Available by State**

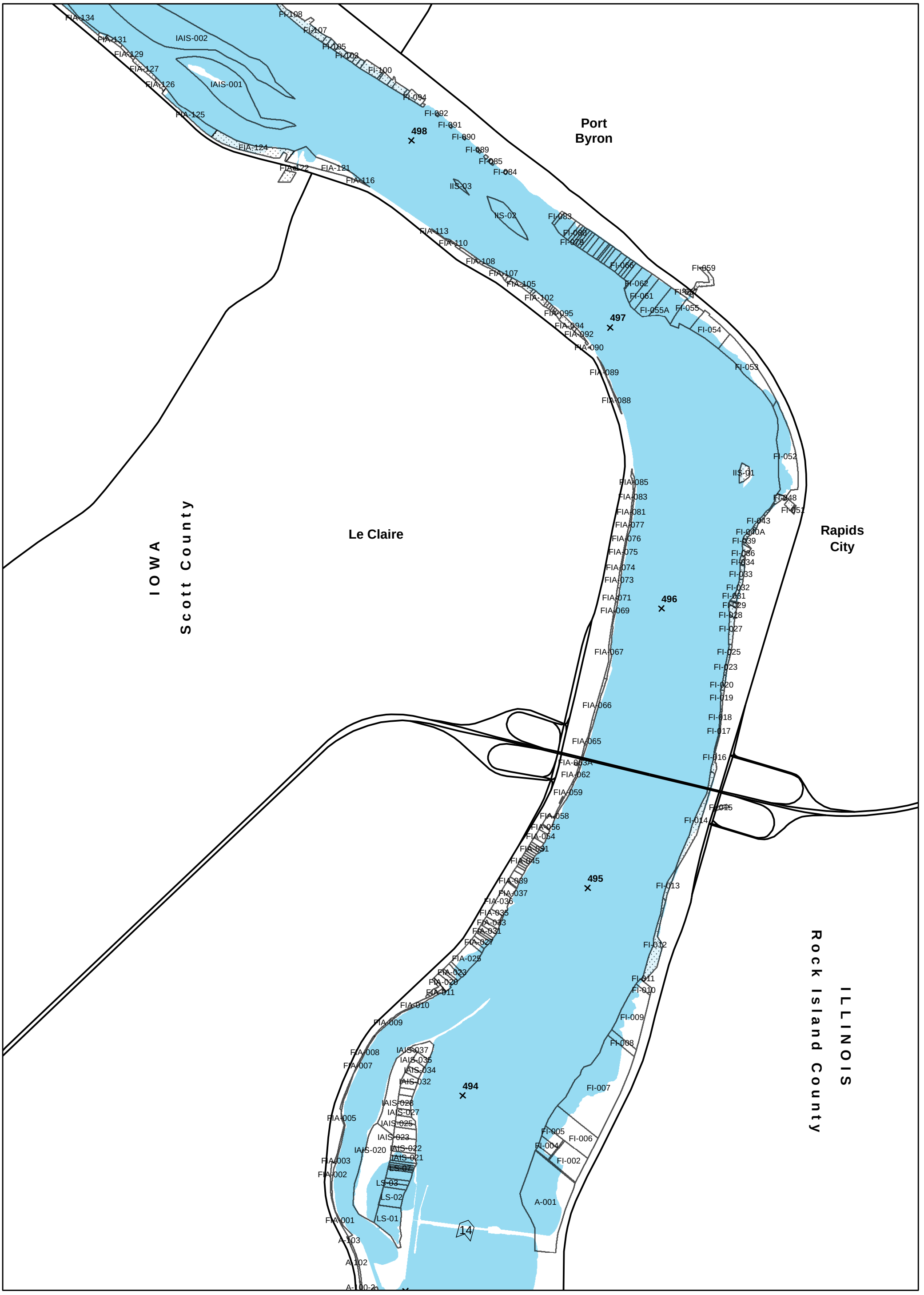
**Illinois**
USFWS Management

**Iowa**
USFWS Management
Iowa DNR Management

0.45 0.225 0 0.45 Miles

N E S W

General Plan
Lands
14-5




Major Roads
County Line
River Mile
Lock and Dam Location
Corps Aquired Tracts
Flowage Easements
Other State/Federal Land

0.45 0.225 0 0.45 Miles

N E S W

General Plan
Lands
14-6

Rock Island

478
FIA-094
FIA-093
FIA-087
FIA-092
FIA-086
FIA-085
FIA-084
FIA-083
IIS-63
FI-87
FI-86
IIS-62
FI-85
FI-84
FI-83
IIS-61
FI-82
Milan Bottoms
FIA-082
FIA-081
FIA-080
FIA-078
FIA-079
FIA-077
FIA-076
FIA-074
FI-79
FI-81
477
IIS-60
FI-80
Davenport
IIS-59
FI-78
IIS-58
IIS-56
IIS-57
476
FI-77
FIA-072
IIS-55
FI-75
FI-76
IIS-54
FI-74
FIA-071
FIA-070
IIS-53
IIS-50
FI-73
FIA-069
IIS-52
475
IIS-49
IIS-51
FI-72
FIA-068
FIA-067
Smith Island
IOWA
Scott County
ILLINOIS
Rock Island County
Buffalo
FIA-066
FIA-065
474
FI-71
Island No. 318
FI-70
FIA-064
IIS-48
Andalusia

Major Roads
County Line
River Mile
Lock and Dam Location
Corps Aquired Tracts
Flowage Easements
Other State/Federal Land

**Lands Available by State**
**Illinois**
Illinois DNR Management

0.45 0.225 0 0.45 Miles

N E S W

General Plan
Lands
16-1

FIA-065
FIA-064
FIA-063
FIA-062
FIA-061
FIA-060
FIA-059
FIA-058
FIA-057
FIA-056
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FIA-049
FIA-048

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FI-42
FI-41

473
472
471
470
469

Andalusia
Buffalo
ILLINOIS
Rock Island County
IOWA
Scott County
Muscatine County
103

Major Roads
County Line
River Mile
Lock and Dam Location
Corps Aquired Tracts
Flowage Easements
Other State/Federal Land

**Lands Available by State**
**Illinois**
Illinois DNR Management

0.45 0.225 0 0.45 Miles

N E S W

General Plan
Lands
16-2

IOWA

Muscatine County

ILLINOIS

Rock Island County

FIA-048
FIA-047
FIA-046
FIA-045
FIA-044
FIA-043
FIA-042
FIA-041
FIA-040
IAIS-49
FIA-039
FIA-038
FIA-037
FIA-107
FIA-036
FIA-035
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FIA-032
FIA-031

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IIS-26
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IIS-07

FI-43
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FI-34
FI-33

0.45 0.225 0 0.45 Miles

Major Roads
County Line
River Mile
Lock and Dam Location

Corps Aquired Tracts
Flowage Easements
Other State/Federal Land

**Lands Available by State**
**Illinois**
Illinois DNR Management

N E S W

General Plan
Lands
16-3

IOWA

Muscatine County

ILLINOIS

Rock Island County

FIA-034
FIA-033
FIA-032
FIA-031
FIA-030
FIA-029
FIA-028
FIA-027
FIA-026
FIA-025
FIA-024
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FIA-021
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FIA-015
FIA-014
FIA-013

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IIS-46

IAIS-48
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IAIS-30
IAIS-29
IAIS-46
IAIS-45

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FI-19
FI-20

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463
462
461
460

0.45 0.225 0 0.45 Miles

Major Roads
County Line
River Mile
Lock and Dam Location

Corps Aquired Tracts
Flowage Easements
Other State/Federal Land

**Lands Available by State**

**Illinois**
Illinois DNR Management

**Iowa**
Iowa DNR Management

N E S W

General Plan
Lands
16-4

IOWA

Muscatine County

ILLINOIS

Rock Island County

Muscatine

FIA022
FIA-021
FIA-103
FIA-102
FIA-101
FIA-017
FIA-016
FIA-015
FIA-014
FIA-013
FIA-011
FIA-099
FIA-010
FIA-009
FIA-008
FIA-007
FIA-096
FIA-097
FIA-005
FIA-003
FIA-095
FIA-002
FIA-001

IAIS-33
IAIS-32
IAIS-31
IAIS-30
IAIS-34
IAIS-28
IAIS-27
IAIS-26
IAIS-25
IAIS-24
IAIS-23
IAIS-22
IAIS-21
IAIS-20
IAIS-18
IAIS-17
IAIS-16
IAIS-43
IAIS-44
IAIS-42
IAIS-14
IAIS-13
IAIS-41
IAIS-12
IAIS-11
IAIS-40
IAIS-10
IAIS-39
IAIS-38
IAIS-09
IAIS-37
IAIS-08
IAIS-36
IAIS-07
IAIS-35
IAIS-06
IAIS-05
IAIS-04
IAIS-03
IAIS-02
IAIS-01
IAIS-46
IAIS-45
IAIS-53
IAIS-52
IAIS-51
IAIS-50

IIS-01
FI-19
FI-20
FI-18
FI-17
FI-16
FI-15
FI-14
FI-13
FI-12
FI-11
FI-09
FI-10
FI-08
FI-06
FI-05
FI-03
FI-01
FI-02

D-2
D-1
D-3
A-3
A-2
A-1
AR-1
AR-2
L-2
L-1

460
459
458
457
456

16

0.45 0.225 0 0.45 Miles

**Lands Available by State**

**Illinois**
Illinois DNR Management

**Iowa**
Iowa DNR Management

Major Roads
County Line
River Mile
Lock and Dam Location

Corps Aquired Tracts
Flowage Easements
Other State/Federal Land

N E S W

General Plan
Lands
16-5

Muscatine

FIA-096
FIA-095
FIA-094
FIA-093
FIA-092
FIA-091
FIA-090
FIA-089
452
FIA-088
FIA-087
FIA-086
FIA-085
451
FIA-084
FIA-083
FIA-082
450
FIA-081
FIA-080
FIA-079
FIA-078
FIA-077

IIS-34
IIS-33
IIS-32
IIS-31
IIS-30
IIS-29
IIS-28
IIS-27
IIS-26
IIS-24
IIS-23
IIS-25
IIS-22
IIS-21
IIS-20
IIS-19
IIS-17
IIS-18
IIS-16
IIS-15

FI-26
FI-25
FI-28
FI-27
FI-24
FI-29
FI-30
FI-23
FI-22
FI-21
FI-19
FI-20
FI-18
FI-17

105
104

IOWA
Muscatine County
Louisa County
Rock Island County
Mercer County
ILLINOIS

0.45 0.225 0 0.45 Miles

Major Roads
County Line
River Mile
Lock and Dam Location
Corps Aquired Tracts
Flowage Easements
Other State/Federal Land

**Lands Available by State**
**Illinois**
Illinois DNR Management

N
W
E
S

General Plan
Lands
17-1

IOWA

Louisa County

ILLINOIS

Mercer County

448

447

446

445

444

IIS-16

IIS-15

FIA-077

FI-17

FI-16A

FIA-076

FI-16

FI-15

FI-15A

FIA-075

FI-14

IAIS-3

FIA-074

FIA-073

FI-13

FIA-072

FIA-071

IIS-12

FIA-070

FI-12A

FIA-069

FI-10B

FI-12

FIA-068

FI-10A

FI-11

FIA-067

FIA-066

FI-10

FIA-065

FIA-062

FI-09

FIA-064

FIA-063

FIA-061

FIA-057B

FIA-057A

FIA-058

FIA-059

FIA-060

FI-09D

FIA-056

FIA-047

FIA-055

FIA-051

FIA-054

FIA-050

FIA-052

FIA-053

FIA-048

FIA-046

FIA-044

FIA-045

FIA-043

FIA-042

FIA-041

FIA-040

FIA-038

FIA-039

FIA-037

FIA-028

FIA-029

FIA-036

FIA-035

FIA-034

FIA-032

FIA-033

IIS-08

FIA-031

IIS-08A

FIA-030

FIA-027

FIA-026

FIA-025

FIA-024

FIA-023

IIS-07

FIA-022

FIA-021

FIA-020

FIA-019

FIA-018

IAIS-2

IIS-05

IIS-06

FIA-014

IIS-09

Major Roads

County Line

River Mile

Lock and Dam Location

Corps Aquired Tracts

Flowage Easements

Other State/Federal Land

**Lands Available by State**

**Illinois**

Illinois DNR Management

**Iowa**

USFWS Management

Iowa DNR Management

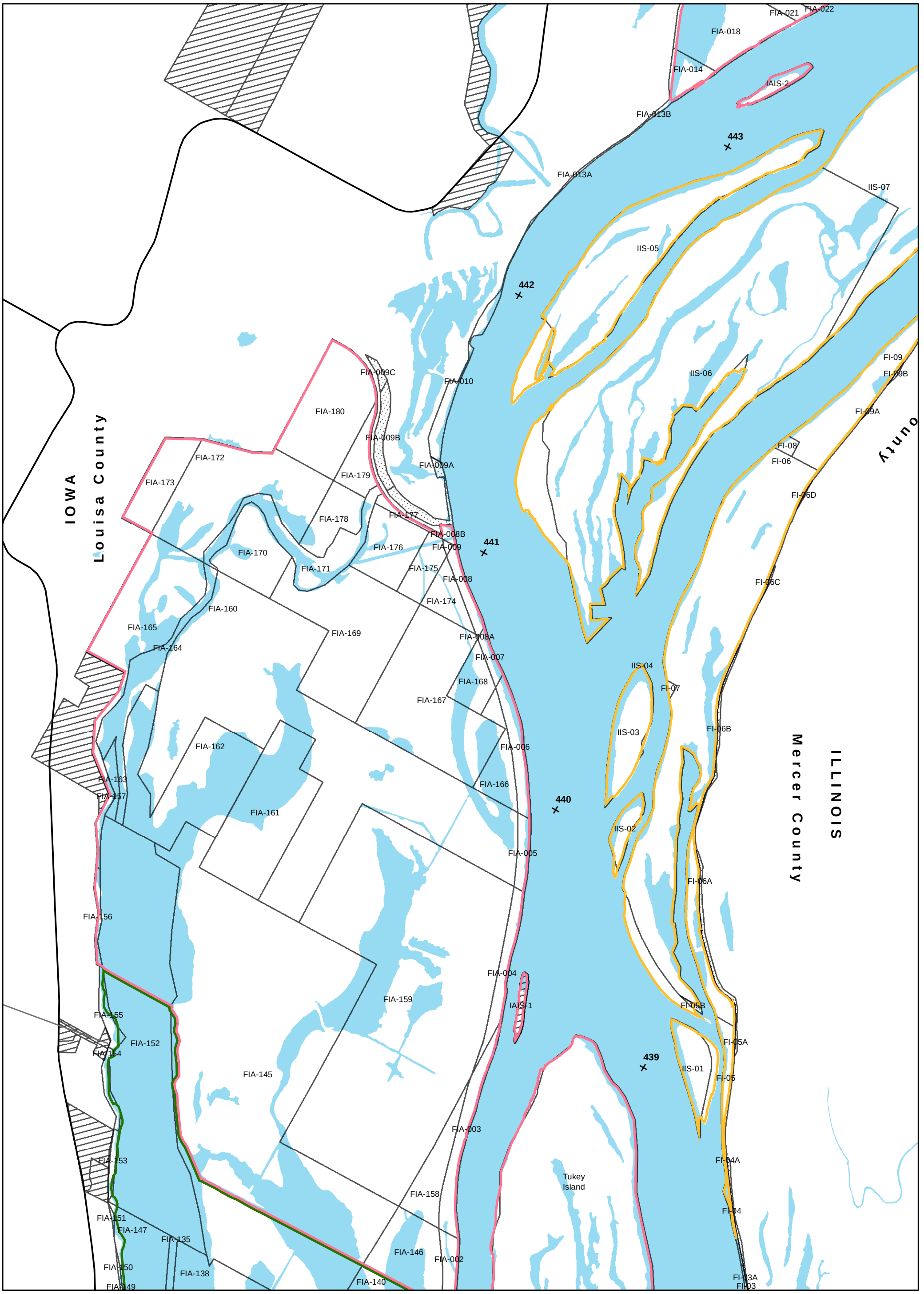
0.45 0.225 0 0.45 Miles

N

W E

S

General Plan
Lands
17-2




Major Roads
County Line
River Mile
Lock and Dam Location

Corps Aquired Tracts
Flowage Easements
Other State/Federal Land

**Lands Available by State**

**Illinois**
Illinois DNR Management

**Iowa**
USFWS Management
Iowa DNR Management

0.45 0.225 0 0.45 Miles

N W E S

General Plan
Lands
17-3

FIA-151
FIA-152
FIA-159
FIA-158
FIA-003
FIA-145
FIA-150
FIA-147
FIA-146
FIA-002
FIA-149
FIA-140
FIA-148
FIA-001C
FIA-144
FIA-143
FIA-137
FIA-001B
FIA-135
FIA-136
FIA-138
FIA-001A
FIA-134
FIA-142
FIA-141
FIA-1
FIA-133
FIA-139
FIA-132
FIA-127
FIA-128
FIA-126
FIA-129
FIA-130
FIA-131
FIA-125
FIA-124
FIA-123
FIA-119
FIA-122
FIA-118
FIA-121
FIA-117
FIA-120
FIA-115
FIA-112
FIA-113
FIA-101
FIA-116
FIA-104
FIA-114
FIA-099
FIA-100
FIA-172A
FIA-174
FIA-171
IAIS-72
IAIS-73
IAIS-74
FIA-61
FIA-59
FIA-62
FIA-60
FIA-58
FI-05
FI-04A
FI-04
FI-03A
FI-03
FI-02
FI-02A
FI-01A
FI-01
LS-2
LS-01
R-01
Tukey Island
438
437
436
435
434
17
ILLINOIS
Mercer County
IOWA
Louisa Couunty

Major Roads
County Line
River Mile
Lock and Dam Location

Corps Aquired Tracts
Flowage Easements
Other State/Federal Land

**Lands Available by State**

**Illinois**
Illinois DNR Management

**Iowa**
USFWS Management
Iowa DNR Management

0.45 0.225 0 0.45 Miles

N W E S

General Plan Lands 17-4

436
435
434
433
432
431
FI-177
FI-176
FI-173B
FI-175
FI-172C
FI-173A
FI-174
FI-172B
FI-172A
FI-171
FI-170
FIA-119
FIA-115
FIA-114
IAIS-72
IAIS-73
IAIS-74
FIA-61
FIA-59
FIA-62
FIA-60
FIA-58
IAIS-71
FIA-57
IAIS-70
FI-107A
FIA-55
FIA-56
IAIS-69
FI-107
IAIS-68
FI-115
FI-116
FI-114
FIA-54
FIA-53
FI-109
FI-112
FI-113
FI-108
FI-106
FI-105
FI-111A
IAIS-67
FIA-52
FI-111B
FI-111
FI-110
IAIS-66
FI-104
FIA-51A
IAIS-65
FIA-51
FI-099
FIA-50
IAIS-61
IAIS-64
New Boston
IOWA
Louisa Couunty
ILLINOIS
Mercer County

Major Roads
County Line
River Mile
Lock and Dam Location
Corps Aquired Tracts
Flowage Easements
Other State/Federal Land

**Lands Available by State**

**Illinois**
Illinois DNR Management
USFWS Management

**Iowa**
Iowa DNR Management

0.45 0.225 0 0.45 Miles

N W E S

General Plan Lands 18-1

New Boston

IOWA
Louisa Couunty

ILLINOIS
Mercer County

Port Louisa Refuge
Keithsburg Division

Keithsburg

FIA-57
FIA-55
FIA-56
FIA-54
FIA-53
FIA-52
FIA-51A
FIA-51
FIA-50
FIA-49
FIA-48
FIA-47
FIA-46
FIA-45
FIA-44

IAIS-70
IAIS-69
IAIS-68
IAIS-67
IAIS-66
IAIS-65
IAIS-64
IAIS-63
IAIS-62
IAIS-61
IAIS-60
IAIS-59
IAIS-58
IAIS-57
IAIS-56
IAIS-55
IAIS-54
IAIS-53
IAIS-52
IAIS-51
IAIS-50

FI-116
FI-115
FI-114
FI-113
FI-112
FI-111B
FI-111A
FI-111
FI-110
FI-109
FI-108
FI-107A
FI-107
FI-106
FI-105
FI-104
FI-103
FI-102
FI-101
FI-100
FI-099
FI-098
FI-168
FI-166
FI-165
FI-163
FI-156
FI-155
FI-153
FI-152
FI-150
FI-149
FI-148
FI-147

432
431
430
429
428

Major Roads
County Line
River Mile
Lock and Dam Location

Corps Aquired Tracts
Flowage Easements
Other State/Federal Land

**Lands Available by State**

**Illinois**
Illinois DNR Management
USFWS Management

**Iowa**
Iowa DNR Management

0.45 0.225 0 0.45 Miles

N W E S

General Plan
Lands
18-2

FIA-48
FIA-47
FIA-46
FIA-45
FIA-44
FIA-43
FIA-42
FIA-41
FIA-35
FIA-34
FIA-33
FIA-32
FIA-31
FIA-30
FIA-29
FIA-28
FIA-27
IAIS-55
IAIS-54
IAIS-53
IAIS-52
IAIS-51
IAIS-50
IAIS-49
IAIS-48
IAIS-47
IAIS-46
IAIS-45
IAIS-44
IAIS-43
IAIS-42
IAIS-41
IAIS-40
IAIS-39
IAIS-38
IAIS-37
IAIS-60
IAIS-59
IAIS-58
IAIS-57
FI-099
FI-100
FI-168
FI-169
FI-165
FI-166
FI-164
FI-163
FI-155
FI-157
FI-098
FI-153
FI-152
FI-150
FI-149
FI-148
FI-147
FI-146
FI-145
FI-134
FI-132
FI-129
FI-125
FI-121
FI-097
FI-096
FI-095
FI-094
FI-093
FI-092
FI-091
FI-090
FI-088
FI-089
IIS-37
IIS-36
IIS-35B
IIS-35A
IIS-34
IIS-30A
IIS-29
302
301
300
428
427
426
425
424
106
107
Keithsburg
ILLINOIS
Mercer County
IOWA
Louisa County
Des Moines County

Major Roads
County Line
River Mile
Lock and Dam Location
Corps Aquired Tracts
Flowage Easements
Other State/Federal Land

**Lands Available by State**

**Illinois**
Illinois DNR Management
USFWS Management

**Iowa**
Iowa DNR Management

0.45 0.225 0 0.45 Miles

N
W E
S

General Plan
Lands
18-3

IOWA

Des Moines County

ILLINOIS

Henderson County

IAIS-31 IAIS-40 IAIS-41 FI-088 FIA-27 IAIS-38 IAIS-39 FI-089 IAIS-33 FIA-26 IAIS-32 IAIS-35 IAIS-34 FI-087 IAIS-31 IAIS-36 FI-086 IIS-28 IAIS-30 IIS-27 IIS-26 423 IAIS-29 FI-085 FIA-25 IIS-25 IAIS-25 FI-084 IAIS-28 IAIS-26 IIS-24 FI-082 FI-083 FIA-24 IIS-23 IAIS-27 IAIS-24 IIS-22 FIA-23 FIA-36 FIA-22 IIS-21 422 IAIS-26A FI-080 IIS-20 FIA-21 FI-081 IIS-19 IAIS-23 IAIS-21 FI-079 IAIS-22 IAIS-20 IIS-18 IAIS-16 FI-078 FIA-20 IAIS-19 FI-077 IAIS-18 421 FI-075 IAIS-15 FI-076 IAIS-17 IIS-10 FI-074 IAIS-14 IIS-17 IIS-12 FIA-19 IIS-16 IIS-15 IIS-14 IIS-13 IAIS-13 420 IIS-11 IAIS-12 FI-073 FIA-18 FI-072 FI-071 IAIS-11 IIS-05 FIA-17 IIS-08 FIA-16 IIS-06 IIS-07 FI-070

Major Roads
County Line
River Mile
Lock and Dam Location

Corps Aquired Tracts
Flowage Easements
Other State/Federal Land

**Lands Available by State**

**Illinois**
Illinois DNR Management

**Iowa**
USFWS Management
Iowa DNR Management

0.45 0.225 0 0.45 Miles

N W E S

General Plan Lands 18-4

IOWA

Des Moines County

ILLINOIS

Henderson County

Oquawka

419

418

417

416

415

FIA-18
IAIS-11
FIA-17
FIA-16
FIA-15
FIA-14
FIA-13
FIA-12
IAIS-10
FIA-11
IAIS-09
IAIS-08
IAIS-07
FIA-10
IAIS-06
FIA-09
IAIS-05
FIA-08
FIA-07
FIA-06
IAIS-05A

IIS-07
IIS-06
FI-070
IIS-05
FI-069
FI-067
FI-068
IIS-04
FI-066A
FI-064
FI-061
FI-058
FI-056
FI-055
FI-054
FI-052
FI-050
FI-049
FI-047
FI-048
FI-046
FI-045
FI-042
FI-041
FI-036
FI-030
FI-027
FI-025
FI-012
FI-022
FI-023
FI-013
FI-014
FI-011
FI-010
FI-009
FI-008
FI-006
FI-005
FI-007
FI-004

Major Roads
County Line
River Mile
Lock and Dam Location

Corps Aquired Tracts
Flowage Easements
Other State/Federal Land

**Lands Available by State**

**Illinois**
Illinois DNR Management

**Iowa**
Iowa DNR Management

0.45 0.225 0 0.45 Miles

N E S W

General Plan Lands 18-5

FI-006
FI-005
IAIS-07
IAIS-06
FIA-10
FIA-09
FI-004
IAIS-05A
IAIS-05
FIA-08
414
FIA-07
FIA-06
FI-003
IAIS-02
IAIS-04
IAIS-03
413
Oquawka Bay
IIS-03
FIA-05
IIS-02
IAIS-01
FIA-04
FI-002
IAIS-56
412
IIS-01
FIA-03
IIS-09
FI-001
RW-6
RW-5
IOWA
Des Moines County
FIA-02
FIA-01
Henderson County
ILLINOIS
A-2
100E
RW-4
A-1
101E
D-4
411
RW-7
D-3
RW-3
RW-2
D-2
18
3
4
LS-1
5
2
RW-1
D-1
1
6
410

Major Roads
County Line
River Mile
Lock and Dam Location

Corps Aquired Tracts
Flowage Easements
Other State/Federal Land

**Lands Available by State**

**Illinois**
Illinois DNR Management

**Iowa**
Iowa DNR Management

0.45 0.225 0 0.45 Miles

N E S W

General Plan Lands 18-6

Canton

MISSOURI

Lewis County

Adams County

ILLINOIS

342
341
340
339
338

FM-31
FM-30
FM-29
FM-28
FM-27
FM-26
FM-25
FM-24
FM-23
FM-22
FM-21
FM-20
300E
FM-19
FM-18
FM-58
FM-61
FM-17

FI-163
FI-162
FI-161
FI-160
FI-158
FI-164
FI-153
FI-151
FI-157
FI-155
FI-152
FI-156
FI-165
FI-164
FI-089
FI-088
FI-087
FI-086
FI-085
FI-082
FI-084
FI-083
FI-081
FI-080
FI-079
FI-077
FI-076
FI-078
FI-074
FI-072
FI-073
FI-071
FI-070
FI-069
FI-068
FI-067
FI-116A
FI-116
FI-115A
FI-115
FI-114

IIS-48
IIS-49
IIS-44B
IIS-46
IIS-47
IIS-45
IIS-44
IIS-44A
IIS-40
IIS-39
IIS-38
IIS-43
IIS-42
IIS-41A
IIS-41
IIS-37
IIS-36
IIS-35
IIS-32
IIS-34
IIS-33
IIS-31
IIS-28
IIS-26
IIS-30
IIS-29
IIS-27
IIS-25
IIS-24
IIS-07
IIS-23

Major Roads
County Line
River Mile
Lock and Dam Location

Corps Aquired Tracts
Flowage Easements
Other State/Federal Land

**Lands Available by State**

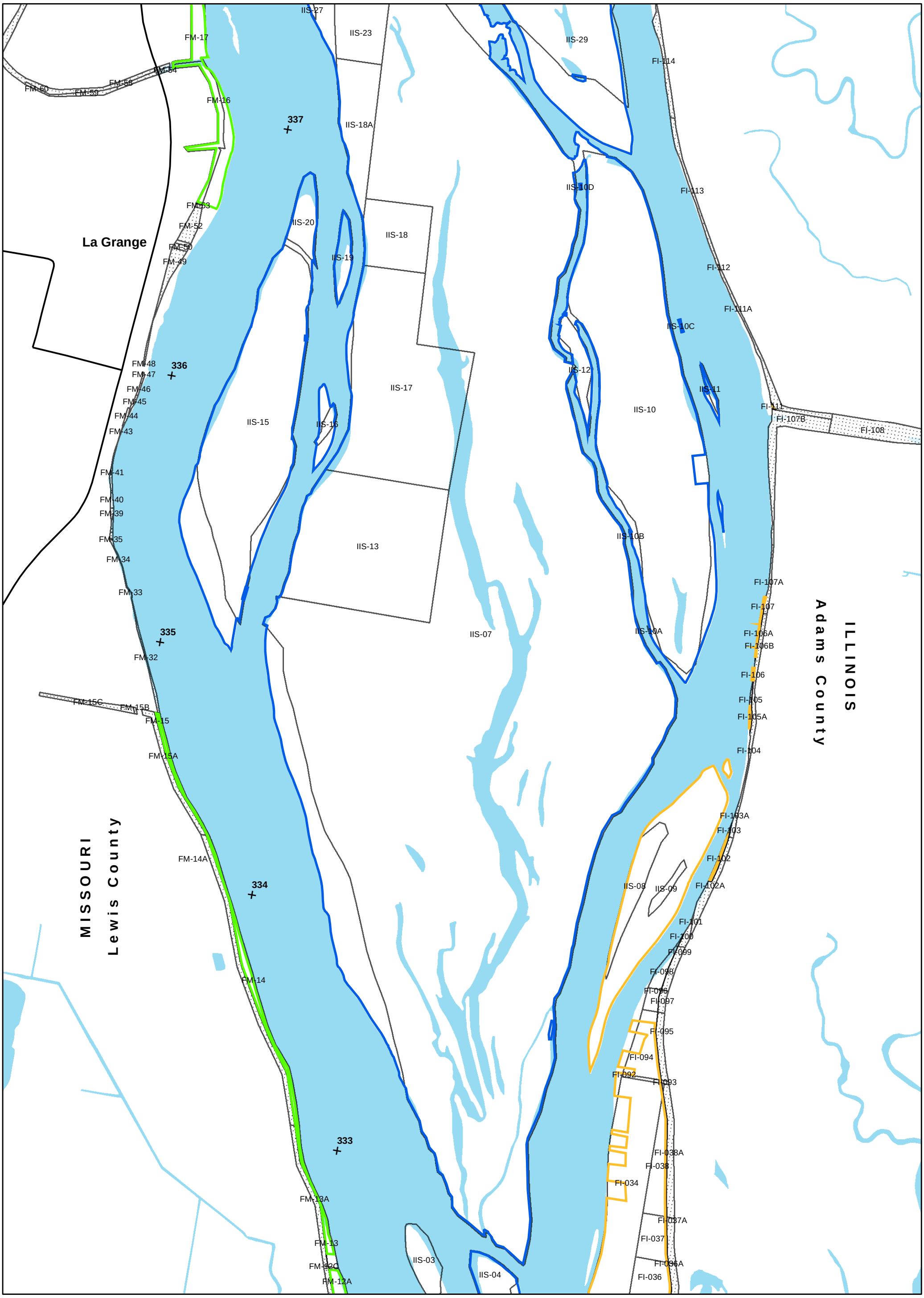
**Illinois**
Illinois DNR Management
USFWS Management

**Missouri**
MDC Management

0.45 0.225 0 0.45 Miles

N W E S

General Plan Lands 21-1




Major Roads
County Line
River Mile
Lock and Dam Location

Corps Aquired Tracts
Flowage Easements
Other State/Federal Land

**Lands Available by State**

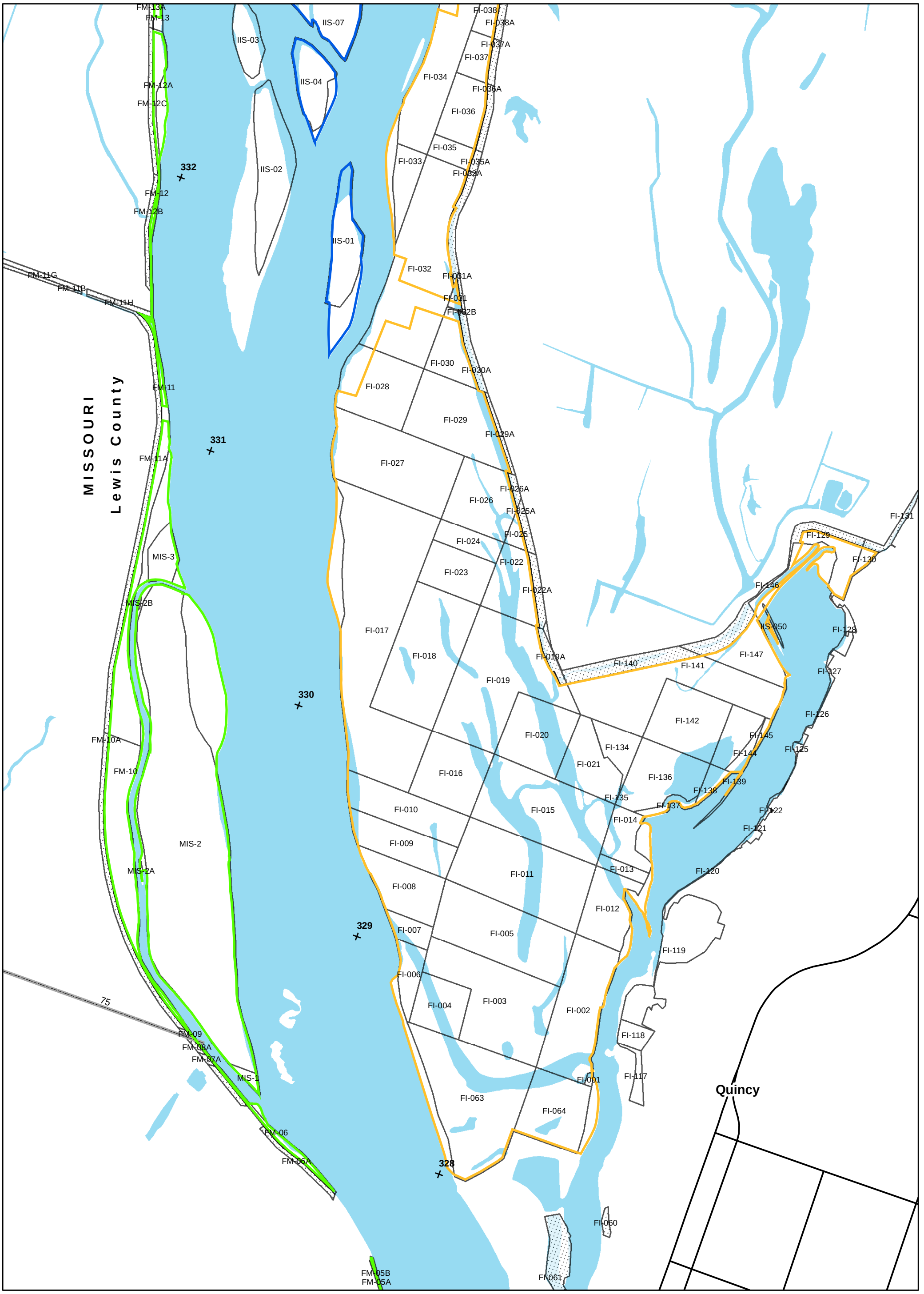
**Illinois**
Illinois DNR Management
USFWS Management

**Missouri**
MDC Management

0.45 0.225 0 0.45 Miles

N W E S

General Plan Lands 21-2




Major Roads
County Line
River Mile
Lock and Dam Location

Corps Aquired Tracts
Flowage Easements
Other State/Federal Land

**Lands Available by State**

**Illinois**
Illinois DNR Management
USFWS Management

**Missouri**
MDC Management

0.45 0.225 0 0.45 Miles

N W E S

General Plan Lands 21-3

FI-008
FI-007
FI-006
FI-003
FI-002
329
FI-004
FI-064
FI-063
FI-060
328
FI-061
MIS-2
MIS-1
FM-07
FM-09A
FM-06B
FM-06
FM-06A
FM-05B
FM-05A
327
FI-059
FI-058
FM-05
MIS-4
FM-03A
FM-03
FI-057
FM-02B
FM-02A
326
FM-02
FI-056
FI-055
FI-054
FI-050
FI-049
FI-046
FI-041
FI-043
FI-040
LS-2
FM-01
FM-01A
FI-039
A-2
A-1
21
325
LS-1
FM-162
FM-161
FM-160
324
FI-71
FI-72
FI-70
FI-69
FM-159
IIS-33
MIS-11
FI-67
FM-157
FM-158
FM-156
FM-155
FI-68

Quincy

ILLINOIS
Adams County

MISSOURI
Marion County

0.45 0.225 0 0.45 Miles

Major Roads
County Line
River Mile
Lock and Dam Location

Corps Aquired Tracts
Flowage Easements
Other State/Federal Land

**Lands Available by State**
**Illinois**
Illinois DNR Management
**Missouri**
MDC Management

N E S W

General Plan
Lands
21-4

MISSOURI
Marion County

ILLINOIS
Adams County

FM-161
FM-160
325
LS-2
LS-1
324
FM-159
FM-158
FM-157
FM-156
FM-155
MIS-11
FI-72
FI-71
323
FI-70
FI-69
MIS-10
MIS-09
IIS-33
FM-151
FI-68
FI-67
FM-154
322
FI-66
FI-65
FI-64
MIS-08
IIS-32
FI-63
IIS-31
FM-153
FI-62
IIS-30
FI-61
FM-152
FI-55
FM-087
FM-086
FM-088
IIS-29
FM-085
FI-60
FM-084
321
FI-59
FI-58
FM-083
FI-57
FM-080
FM-082
FM-081
FM-074
FM-075
FM-076
FI-56
IIS-28
FI-94
320
FM-077
FI-93
FM-079
IIS-27
FM-078
IIS-26
FM-073

Major Roads
County Line
River Mile
Lock and Dam Location
Corps Aquired Tracts
Flowage Easements
Other State/Federal Land

**Lands Available by State**
**Illinois**
Illinois DNR Management
**Missouri**
MDC Management

0.45 0.225 0 0.45 Miles

N W E S

General Plan Lands 22-1

MISSOURI
Marion County

ILLINOIS
Adams County

IIS-28
IIS-27
IIS-26
319
FM-073
FI-93
FM-072
FI-94
IIS-37
FM-071
FI-95
FI-96
FI-97
FI-98
FI-92
318
FM-070
FI-91
FI-90
FI-88
FM-068
FI-89
317
IIS-36
FI-86
FI-87
FM-067
FI-85
FI-82
IIS-35
MIS-06
FI-84
FM-066
316
FI-83
IIS-34
MIS-05
FI-80
FI-81
FM-065
MIS-04
FI-79
FI-78
FM-064
MIS-03
FI-53
FI-52
FM-063
315
IIS-25
MIS-02
IIS-23
IIS-22B
FM-062
FM-061
IIS-19
FI-51A
FM-059
FI-51
IIS-22A
FM-060

- Major Roads
- County Line
- River Mile
- Lock and Dam Location
- Corps Aquired Tracts
- Flowage Easements
- Other State/Federal Land

**Lands Available by State**

**Illinois**
- Illinois DNR Management

**Missouri**
- MDC Management

0.45 0.225 0 0.45 Miles

N W E S

General Plan
Lands
22-2

MISSOURI

Marion County

Adams County

Pike County

ILLINOIS

Hannibal

MIS-02

MIS-01

FM-063 FM-062 FM-059 FM-061 FM-060 FM-057 FM-058 FM-056 FM-053 FM-052 FM-050 FM-055 FM-042 FM-051 FM-049 FM-047 FM-046 FM-045 FM-044 FM-043 FM-041 FM-039 FM-040 FM-039A FM-146 FM-145 FM-144

IIS-19 IIS-22A IIS-18 IIS-17 IIS-20 IIS-16 IIS-15 IIS-13 IIS-12 IIS-11 IIS-10 IIS-09 IIS-08 IIS-07

FI-51 FI-51B FI-50 FI-48A FI-49 FI-48B FI-46 FI-47 FI-45D FI-45B FI-45C FI-45A FI-44 FI-43 FI-42A FI-42 FI-41 FI-40 FI-38 FI-39 FI-37 FI-36 FI-35 FI-34 FI-19B FI-19E FI-33 FI-19C FI-30 FI-29 FI-28 FI-27 FI-26 FI-23 FI-20 FI-19A FI-19D FI-18 FI-17 FI-17A FI-15 FI-13

314 313 312 311 310

115

0.45 0.225 0 0.45 Miles

N W E S

**General Plan Lands 22-3**

- Major Roads
- County Line
- \+ River Mile
- Lock and Dam Location
- Corps Aquired Tracts
- Flowage Easements
- Other State/Federal Land

**Lands Available by State**

**Illinois**

- Illinois DNR Management

**Missouri**

- MDC Management

FI-20
FI-19A
FI-19D
FI-19C
310
FI-18
FI-17
FI-17A
FI-14
FI-15
309
FI-13
Hannibal
IIS_06
FI-12
FI-12A
ILLINOIS
Pike County
308
IIS-05
FI-11
FI-10B
MISSOURI
Marion County
IIS-04
FI-10A
FM-143
FM-142
FM-140
FM-139
307
FI-10C
FI-10
76
FI-09
FM-138
FM-136
FI-09A
FI-08A
306
FI-08
Ilasco
IIS-03

0.45 0.225 0 0.45 Miles

Major Roads
County Line
River Mile
Lock and Dam Location

Corps Aquired Tracts
Flowage Easements
Other State/Federal Land

**Lands Available by State**
**Illinois**
Illinois DNR Management

N W E S

General Plan Lands 22-4

MISSOURI
Ralls County

ILLINOIS
Pike County

MIS-07
FM-136
FM-027
FM-017
FM-038A
FM-033
FM-021
FM-015
FM-013
FM-011
FM-009
FM-006
FM-003
FM-135
FM-134
FM-133
FM-132
FM-131
FM-130
FM-130A
FM-129
FM-128
FM-127
FM-126
FM-125
FM-122
FM-120B
FM-120A
FM-119
FM-118
FM-117
FM-114
FM-111
FM-110
FM-109
FM-108
FM-105
FM-107
FM-106
FM-104
FM-103
FM-102

305
304
303
302
301

IIS-03
IIS-02
IIS-01

FI-08
FI-08A
FI-07B
FI-07A
FI-07
FI-06A
FI-06
FI-05
FI-04A
FI-04
FI-03A
FI-03
FI-02
FI-02A
FI-01

A-2
A-1
D-1
D-2

LS-3A
LS-2A
LS-1A

22

Saverton

0.45 0.225 0 0.45 Miles

Major Roads
County Line
River Mile
Lock and Dam Location

Corps Aquired Tracts
Flowage Easements
Other State/Federal Land

**Lands Available by State**
**Illinois**
Illinois DNR Management

N W E S

General Plan
Lands
22-5