ADVANCING USACE/CONSULTANT DESIGNS FOR THE UPPER MISSISSIPPI RIVER ENVIRONMENTAL MANAGEMENT PROGRAM

NCER 2011 Presentation - Thursday, 4 August - Dan Miller, P.E.

Review of two HREP examples, 10 years after construction
Background
Environmental Management Program (EMP)

- EMP originated as a part of the 2nd lock at Mississippi River L&D 26 in 1986.
- EMP covers the Upper Mississippi River from the mouth of the Ohio River up to Minneapolis/St. Paul; then up the Illinois Waterway to Chicago.
- EMP has completed 53 projects restoring ecosystem to 95,000 acres.
- The EMP program is ongoing with 34 additional projects in the planning, engineering and/or design phases.
Working Together
Consultant – USACE – Local Sponsor

LOCAL SPONSOR

CONSULTANT

OPTIMUM DESIGN

USACE

DESIGN
Working Together
Consultant – USACE – Local Sponsor

LOCAL SPONSOR

USACE

POST CONSTRUCTION
Consultants Need the Time Perspective for Ecosystem Restoration Projects

In contrast to infrastructure projects, Ecosystem Restoration Projects take years to mature:

- How is the project progressing with respect to long term objectives?
- What would you do different?
- What worked better than expected?
- How can we adapt these lessons to the next project?
USACE, USFWS and others have prepared tremendously helpful Lessons Learned documents.

But (paraphrasing Janvrin):

“The desire for a simple approach that can be clearly presented as ecosystem restoration goals and objectives often treat vastly different restoration goals or portions of the ecosystem as if they were the same.”

We need to look back at our own, individual projects.
A Look at Two Designs by Stanley Consultants
Construction Completed About 10 Years Ago

- Calhoun Point HREP – at the confluence of Illinois and Miss.
A Look at Two Designs by Stanley Consultants
Construction Completed About 10 Years Ago

- Pool 8 Islands, Phase II, Stoddard Bay, Wisconsin
Review Process

- Revisit Local and USACE project managers:
  - Calhoun Point:
    - Kim Postlewait, Illinois DNR
    - John Mabery, USFWS, Two Rivers Refuge
    - Brian Markert, USACE, St. Louis District
  - Pool 8 Islands
    - Jeff Janvrin, Wisconsin DNR
    - Jon Hendrickson, USACE, St. Paul District

- Paddle in the water, boots on the ground
Calhoun Point and Swan Lake - Project Objectives

- Creation of aquatic, wetland, and upland habitat for fish, waterfowl, reptiles, and fur-bearing species
- Water level and sediment control to enhance habitat
Water Control Structures - 2000
Water Control Structures - 2011
Use sealed stems and operators to prevent sand and sediment from floods from reaching the operating mechanism.
Cellular Bridge and Water Control
Cellular Bridge and Water Control
Pinch Valves
MWI Couch Pump
Cross Section Thru Pump and Sluice Gate
Point of Calhoun Point – Draw Down
Point of Calhoun Point – In Flood
Rock Spillway

Frequent overtopping led to expansion of overflow section
Intending to abandon road on levee along Mississippi River due to maintenance requirements from frequent overtopping. Currently constructing road across rock spillway. Also – no longer using geotextiles to support road surface. In flooding events the geotextile becomes tangled and creates problems with repairs. Switching to larger ballast and larger surface stone.
We kept the levee footprint narrow, bending the alignment to preserve significant trees (roosts or rare species or old specimens), or other special features. Much more natural appearing than similar levees from earlier projects in this area.
Mississippi River Levee

Not This
Mississippi River Levee

More Like This
Mississippi River Levee
Lower Swan Lake

- Stop Log Structure
- Pump Station
Wooden stop logs jammed going in and coming out.

Aluminum Stop Logs are much better handling and sealing.
Pump Station draws down Swan Lake in early summer to consolidate sediment and grow forage crop for migrating waterfowl.

For the last 4 Years in a row, 2008 thru 2011, water levels have remained too high.
Sediment from flooding and infestation of carp caused clogging of pump suction screens and premature failure of pump bearings.

Solution involves new intake design with screens and sediment barrier.
Changing Rivers

2000

2011
Changing Rivers

![Stage (Ft)](chart)

*Note: Berm Crown*
Royale Landing Access Road

2000

2011
Trees – RPM Stock
Created Wetlands - 2000
Created Wetlands - 2011
Pool 8 Islands, Phase II, Stoddard Bay, Wisconsin
Pool 8 Island Restoration – Mimic the Natural Condition
### Project Objectives (1)

<table>
<thead>
<tr>
<th>Goal</th>
<th>Objectives</th>
<th>Criteria</th>
</tr>
</thead>
</table>
| Improve habitat conditions for backwater fish species with an emphasis on habitat for Centrarchids. | Create 200 acres of overwintering habitat meeting the following criteria:                                                                      | a) Dissolved oxygen levels > 3 mg/l  
                             b) Current velocity < 0.3 cm/sec over 80% of the area.  
                             c) Water temperature as follows:  
                                - 4°C over 35% of the area,  
                                - 2-4°C over 30% of the area,  
                                - 0-2°C over 35% of the area.  
                             d) Water depths > 4 feet over 40% of the wintering area in year 25                       |
| Enhance and/or create Centrarchid summer habitat meeting the following criteria: | a) Dissolved oxygen levels > 5 mg/l.  
                             b) Aquatic vegetation cover in the range of 25-50%.                                                                                      |
| Enhance and/or create spawning, rearing, and juvenile Centrarchid habitat in three locations, each approximately 5 acres in size, meeting the following criteria: | a) Dissolved oxygen levels > 5 mg/l.  
                             b) Current velocity < 0.5 cm/sec.  
                             c) Aquatic vegetation cover of approximately 80%.  
                             d) Substrates of sand and/or gravel available for spawning.                                                                       |
## Project Objectives (2)

<table>
<thead>
<tr>
<th>Goal</th>
<th>Objectives</th>
<th>Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increase high quality waterfowl habitat to 600 acres and then maintain</td>
<td>Increase and then maintain 600 acres of habitat meeting the following criteria</td>
<td>a) Aquatic plant growth covering approximately 60% of the area with a mix and interspersion similar to conditions that existed in 1975. b) Create 2 to 3 acres of nesting habitat isolated (0.5 mile) from land based predators and with a vegetative cover having an average obscurity rating of 1.5 dm within 2 years. c) Protected sites (i.e., beaches, mudflats, and logs) for birds to get out of the water to loaf and rest totaling approximately 6 acres.</td>
</tr>
</tbody>
</table>
## Project Objectives (3)

<table>
<thead>
<tr>
<th>Goal</th>
<th>Objectives</th>
<th>Criteria</th>
</tr>
</thead>
</table>
| Create habitat for migratory birds other than waterfowl (Neotropical migrants, marsh and water birds, and shorebirds): increase turtle nesting habitat; restore habitat for mammals (primarily beaver, mink, and muskrats), reptiles, and amphibians; and improve conditions for the reestablishment of roosting habitat for species such as bald eagles, peregrine falcons, and other raptors. | When planning and designing habitat features for the Stoddard area, the following habitat types or conditions should be provided | a) For Neotropical migrants (grassland and woodland), provide islands seeded to grass and/or planted to trees.  
b) For marsh and water birds, provide habitat consisting of an interspersion of submergent, rooted floating aquatics, emergent plants, and open water, in proximity to islands.  
c) For shorebirds provide gradual sloping breaches and/or shallow backwater lagoons.  
d) For nesting turtles, provide isolated islands having gently sloping beaches with sparse vegetation and a substrate capable of maintaining soil moisture suitable for turtle egg incubation.  
e) For aquatic and semi-aquatic mammals, reptiles, and amphibians, provide wetland habitat consisting of an interspersion of submergent, rooted floating aquatics, emergents, and open water in proximity to islands.  
f) For raptors, maintain existing mature trees and accelerate succession on new islands to mature trees, floating aquatics, emergents, and open water in proximity to islands. |
Prairie Habitat
Woodlands
Shoreline
Invasives
Centrarchids Habitat

Overwinter:

- $\text{DO} > 3 \text{ ppm}$
- $\text{Temperature} > 0^\circ \text{C.}$
- $\text{Velocity} < 0.3 \text{ cm/s (0.01 fps)}$
- $\text{Depth} \geq 4 \text{ ft.}$
Centrarchids Habitat

Pool 8 Islands Phase II
Pre- and Post-Project Fall Electro-fishing

CPUE (#/hr)

Pre-Project

120 61 130 31 197 496 587 363 435

Bluegill > 2.9
Large Mouth Bass > 4.9

(Project began functioning as over wintering habitat November 1998)
Phase III Under Construction
Pool 8 Restoration
Pool 8 Restoration
Go back and check it out - results do not come immediately.

Many things go better than planned, some do not. Make each new project better than the one before.

Communicate – “In academic science, interdisciplinary work is productive and praised, but is relatively rare. Scientists don't need to cooperate to have their results fit together: they are all describing different parts of the same thing—nature—so in the long run, their results tend to come together into a single picture. Engineering, however, is different. Because it is more creative (it actually creates complex things), it demands more attention to teamwork. If the finished parts are going to work together, they must be developed by groups that share a common picture of what each part must accomplish. Engineers in different disciplines are forced to communicate; the challenge of management and team-building is to make that communication happen.” K. Eric Drexler