Island Design

*Presentation
for the*

UMRS EMP
Regional Workshop

by

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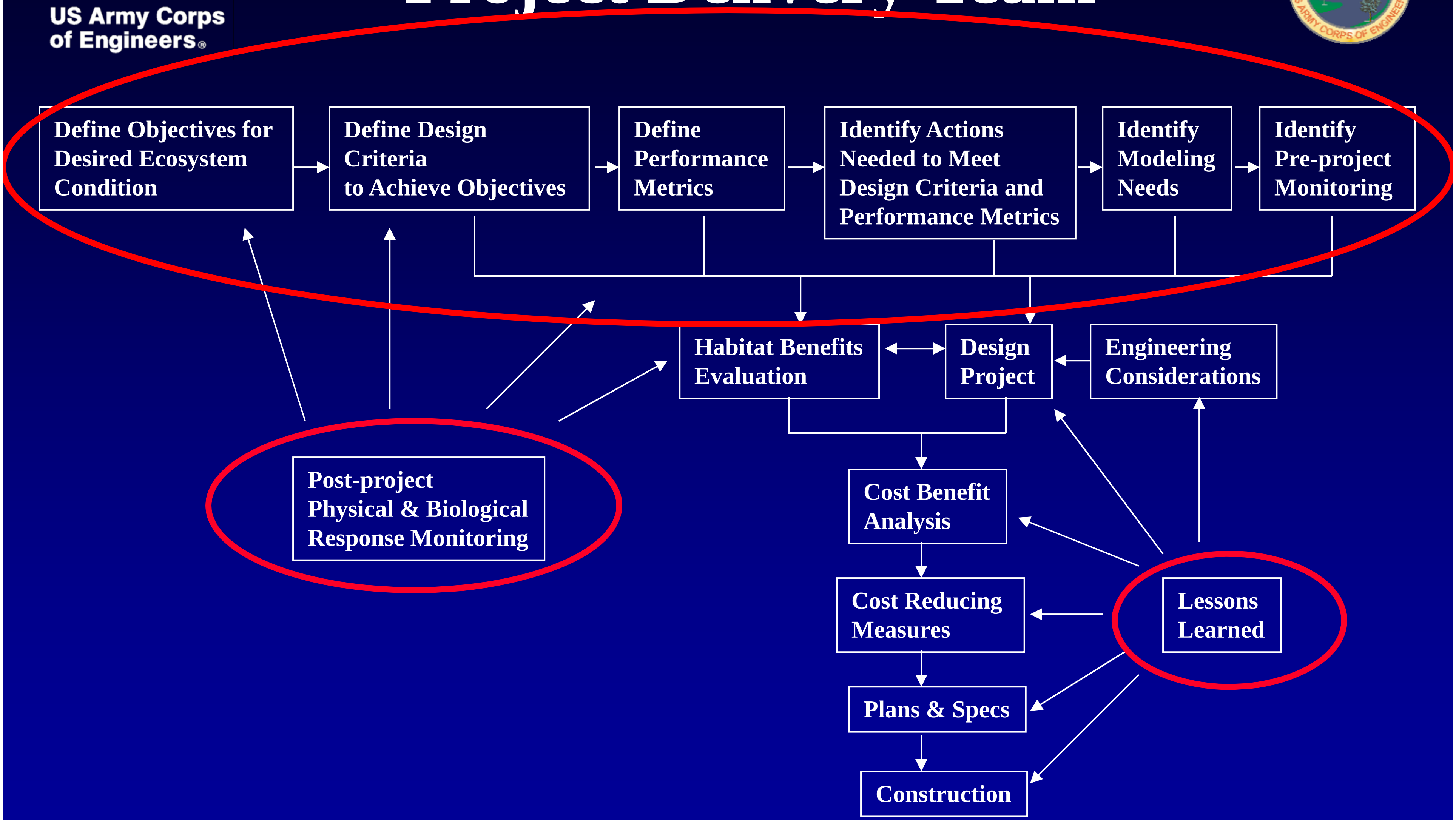
Project Delivery Team



Chapter Development

Discussed at the 20-21 February 2002 EMP Workshop in St. Louis, MO

- "The large river habitat project engineering handbook: Where is it?"

Island Design Handbook was completed in April 2005

This Handbook was modified to become the Island Design Chapter in the Current Handbook

Chapter Use

Design Criteria are listed for 6 design categories:

- Layout
- Elevation
- Width
- Side Slope
- Topsoil and Vegetation
- Shoreline Stabilization

Each design category is organized into 4 design disciplines

- Geomorphology
- Engineering
- Constructability
- Habitat

Design criteria are referenced to

- Physical Attributes
- Habitat Parameters
- Engineering Considerations
- Lessons Learned

that were used to develop the design criteria

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Chapter Outline

Resource Problem

E, D, & C Data for Existing Projects

Lessons Learned

Design Criteria

Resource Problem (Lower Reach of Pool)

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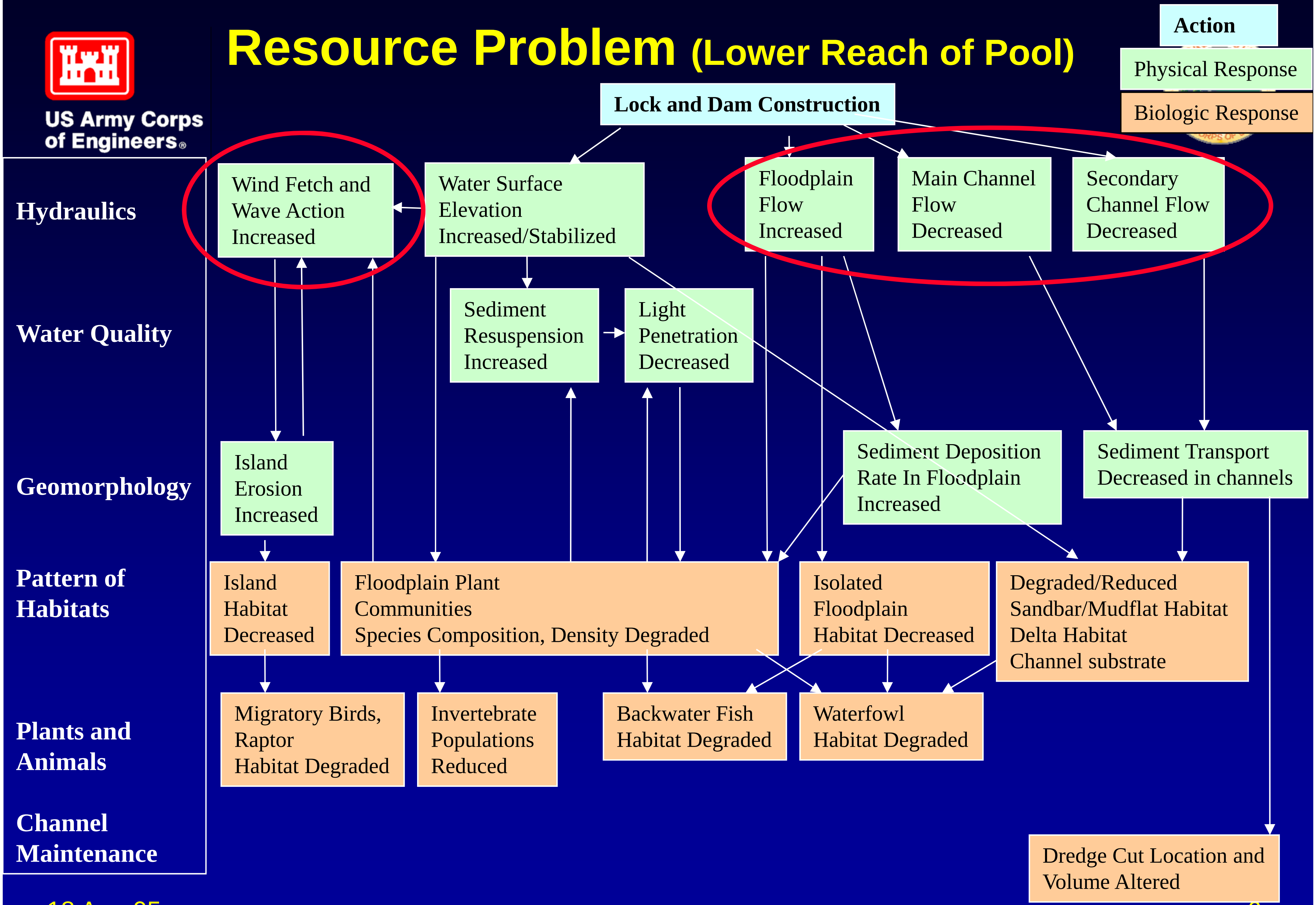

E, D, & C Data

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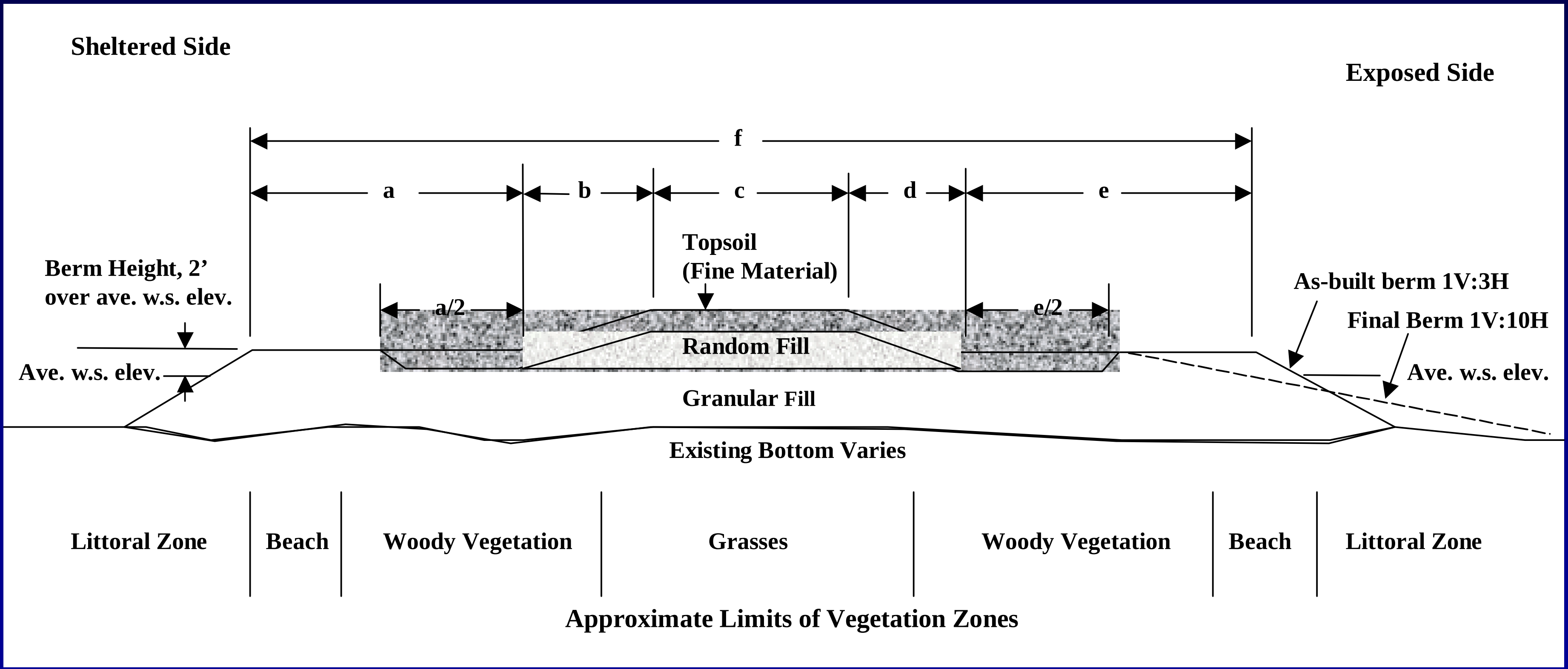


E, D, & C Data

Table 3. Island Cross Section Dimensions. The dimension a through f correspond to those shown in figure 2

Project	a	b	c	d	e	f	Height above Normal Pool and Flood TOR	Side Slopes	Island Length and Reach Description (feet)	Year
Weaver Bottoms	0	32	100	32	0	164	8, 80-yr	1:4 1:4	8700	1986
Lake Onalaska	0	18	50	9	20	100	6, 20-yr	1:3 1:3	3900, 3 islands at 1300 feet each	1989
Pool 8, Phase I, Stage 1 Horseshoe Island	0	20	50	30	30	130	4, 10-yr	1:5 1:10	2100, from head down each leg	1989
	0	20	75	30	30	155	4, 10-yr	1:5 1:10	800, middle west leg	1989
	0	20	30	40	0	90	4, 10-yr	1:5 1:10	600, lower west leg	1989
Pool 8, Phase I, Stage 2 Boomerang Island	30	12	50	12	30	134	3.8, 10-yr	1:5 1:5	7000	1992
	20	12	50	12	20	114	3.8, 10-yr	1:5 1:5	700, several reaches	1992
	30	10	50	40	0	130	3.8, 10-yr	1:4 1:10	500, large fines section	1992
	0	25	30	25	0	80	5, 17-yr	1:5 1:5	500, lower Horseshoe Island.	1992

E, D, & C Data

Table 8. Costs of the pool 8, Phase I and II and Polander Lake Island projects.					
Project	Year Constructed	Feature	Length (feet)	Cost (dollars)	Cost/Foot
Pool 8, Phase I, Stage 2	1992	Earth Islands	9,600	1,456,000	$151
Pool 8, Phase II	1999	Earth Islands	10,600	1,755,000	$165
		Rock Sills	2,500	722,000	$288
		Seed Islands	1,280	169,000	$132
		Total Cost		2,646,000	
Polander Lake, Stage 2	2000	Earth Islands	9,200	1,897,000	$206

Lessons Learned

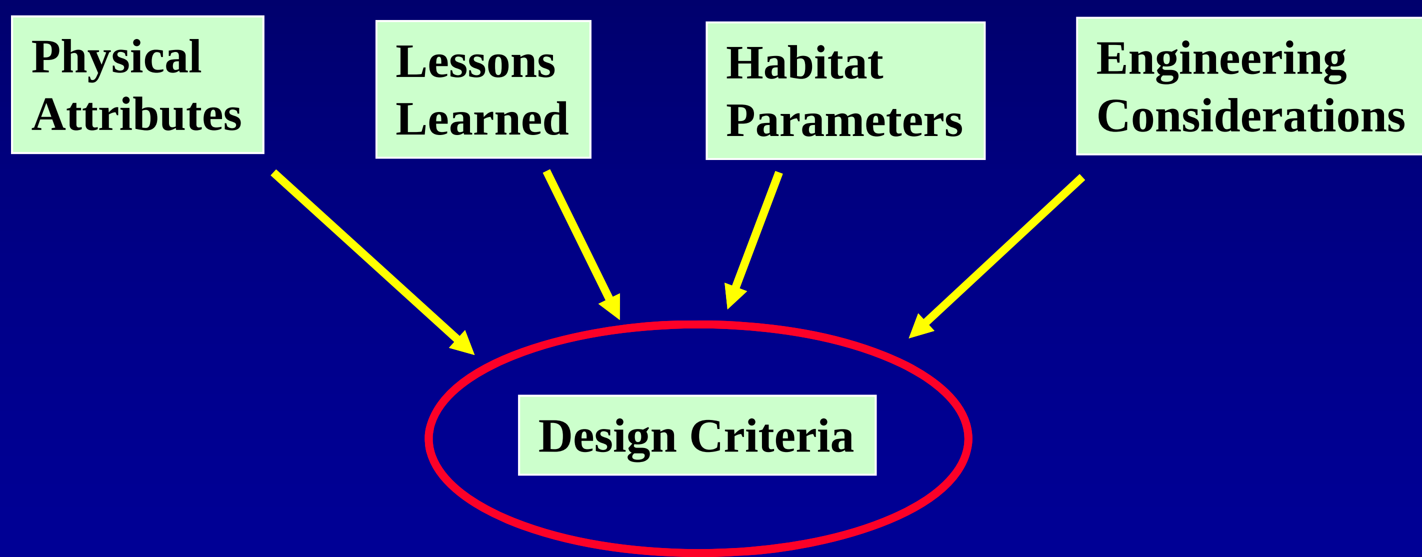
Lessons Learned are described in seven tables, one for each of 6 design categories, and a seventh table for constructability.

- Layout
- Elevation
- Width
- Side Slope
- Topsoil and Vegetation
- Shoreline Stabilization
- Constructability

120 Lessons Learned are listed in these tables

Design Criteria

Design Criteria are described in six tables, one for each of the design categories



Example
For Design Criteria 2.c

Category 2: Island Elevation

Design Criteria 2.c "Rock islands or sills may replace portions of earth islands to provide floodplain flow for more frequent floods. These features should have a lower elevation than earth islands so flow first occurs over the rock, reducing hydraulic forces across the earth islands during later stages of the flood. *Reference: Physical Attribute 5,7; Lessons Learned 2.E.1, 2.H.1; Engineering Considerations 2, 3*

Design Criteria 2.c Referenced to Physical Attributes

Physical Attribute 5: **Balanced fine and coarse sediment budgets.** River reaches export fine and coarse sediment at rates approximately equal to sediment inputs……….

Physical Attribute 7: **A functional floodplain.** On average, floodplains are inundated once annually by high flows equaling or exceeding bankfull stage.

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Design Criteria 2.c Referenced to Lessons Learned

2.E.1, Pool 9 Islands, 1994 Islands constructed to lower elevations are not exposed to the severe erosive forces associated with floods. These islands, which consisted of rock mounds, have been overtopped several times and show minimal damage.

2.H.1, Pool 8, Phase II, 1999 The low rock sills combined with a stepped down island design resulted in a stable project during the 2001 flood, when the islands were less than 2 years old and didn't have well established vegetation. The rock sills were set at the lowest elevation….

Design Criteria 2.c Referenced to Engineering Considerations

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Engineering Consideration 2: Reducing sediment loads but increasing sediment trap efficiency: Islands reduce the flow of water and sediment to backwater areas or selected parts of backwater areas. This decreases flow velocities, which is usually a necessary step in improving habitat. However, the trap efficiency of the backwater area sheltered by the island is increased so sediment that does enter is more likely to deposit there….

Engineering Consideration 3: Island elevations and bankfull flood elevations in lower pools - River restoration efforts usually attempt to establish riverine flow conditions where flow is conveyed in channels for low and moderate flows and significant floodplain flow occurs only after the bankfull flood level is exceeded. Islands, in their most basic form, are the natural levees that separate channels from floodplains. It follows that island height should correspond to bankfull flood levels …..

POOL 8 ROCK SILL, 1999

Islands and Future Habitat Restoration

- EMP: Five Large Island Projects Being Developed
- HNA: Create or Restore 24,000 Acres of Island Habitat
- EPP: Numerous Islands
- NESP Workshops: 1/3 of Objectives Linked to Islands

Spring Lake: Under Construction 2005

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Swan Lake Islands, Illinois River

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Swan Lake Islands, Illinois River

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Swan Lake Islands, Illinois River

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End Island Talk

Questions

Comments

Lessons Learned

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Start Tributary Restoration Talk

Tributary Restoration = Eliminate Spikes in Sediment

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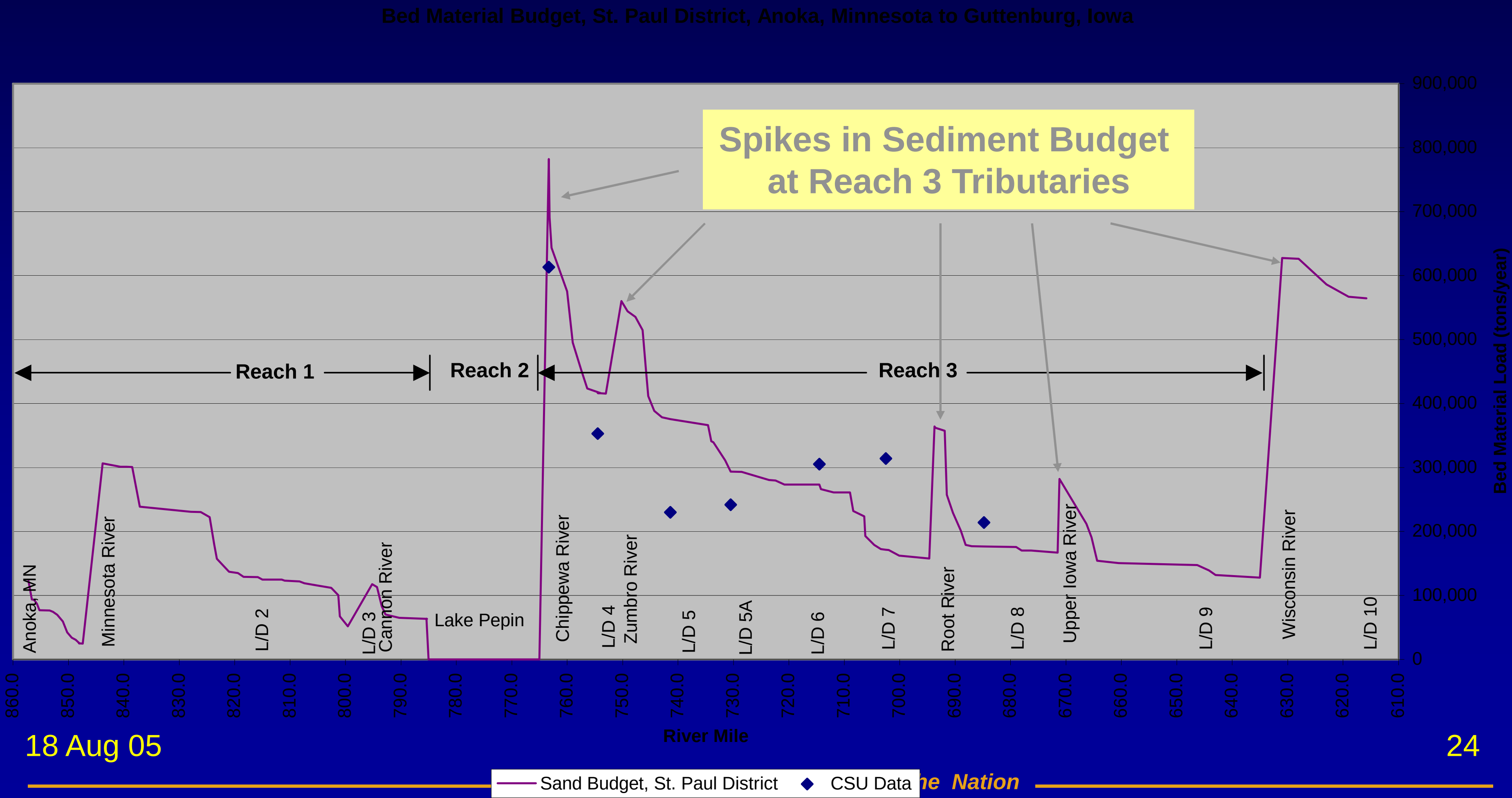

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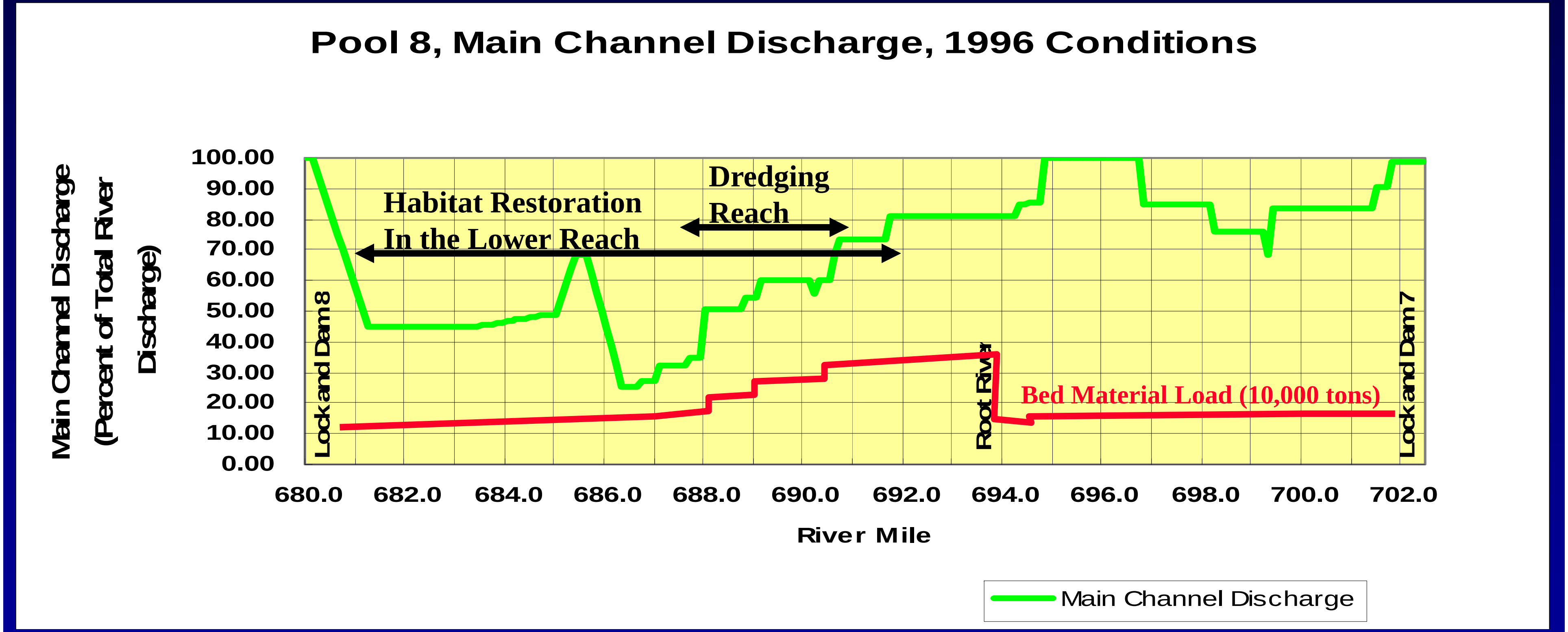
New Projects

Upland Sediment Control/ Tributary Modifications

Start River Training Structure or Secondary Channels Talk

Increased Floodplain Discharge



Secondary Channel Mods

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Rock Partial Closure at Lansing Big Lake

Earth Closure

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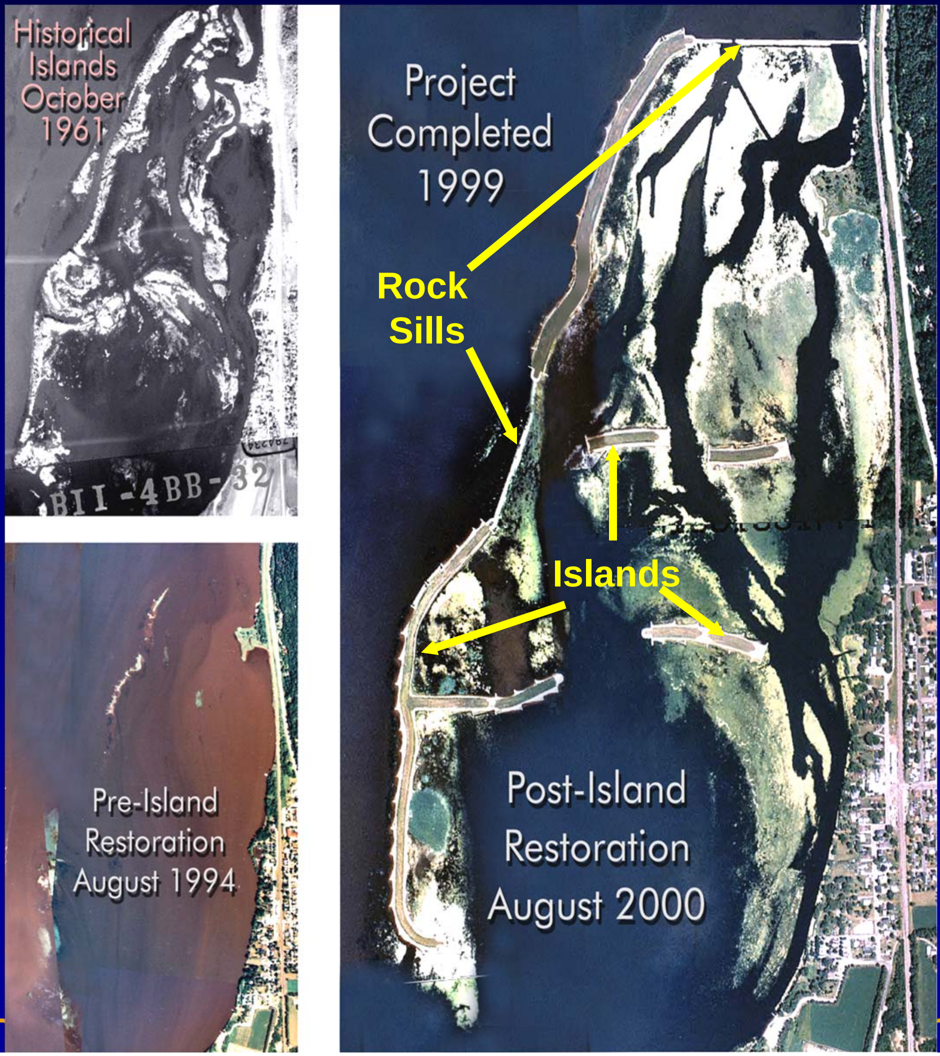
Start More Island Images

Island Erosion

Stoddard Bay Islands = Dredging 300,000 Yd^3

The form, function, and habitat value of Stoddard Bay was degraded due to island erosion and wave action



The habitat value was restored in 1999 by constructing islands

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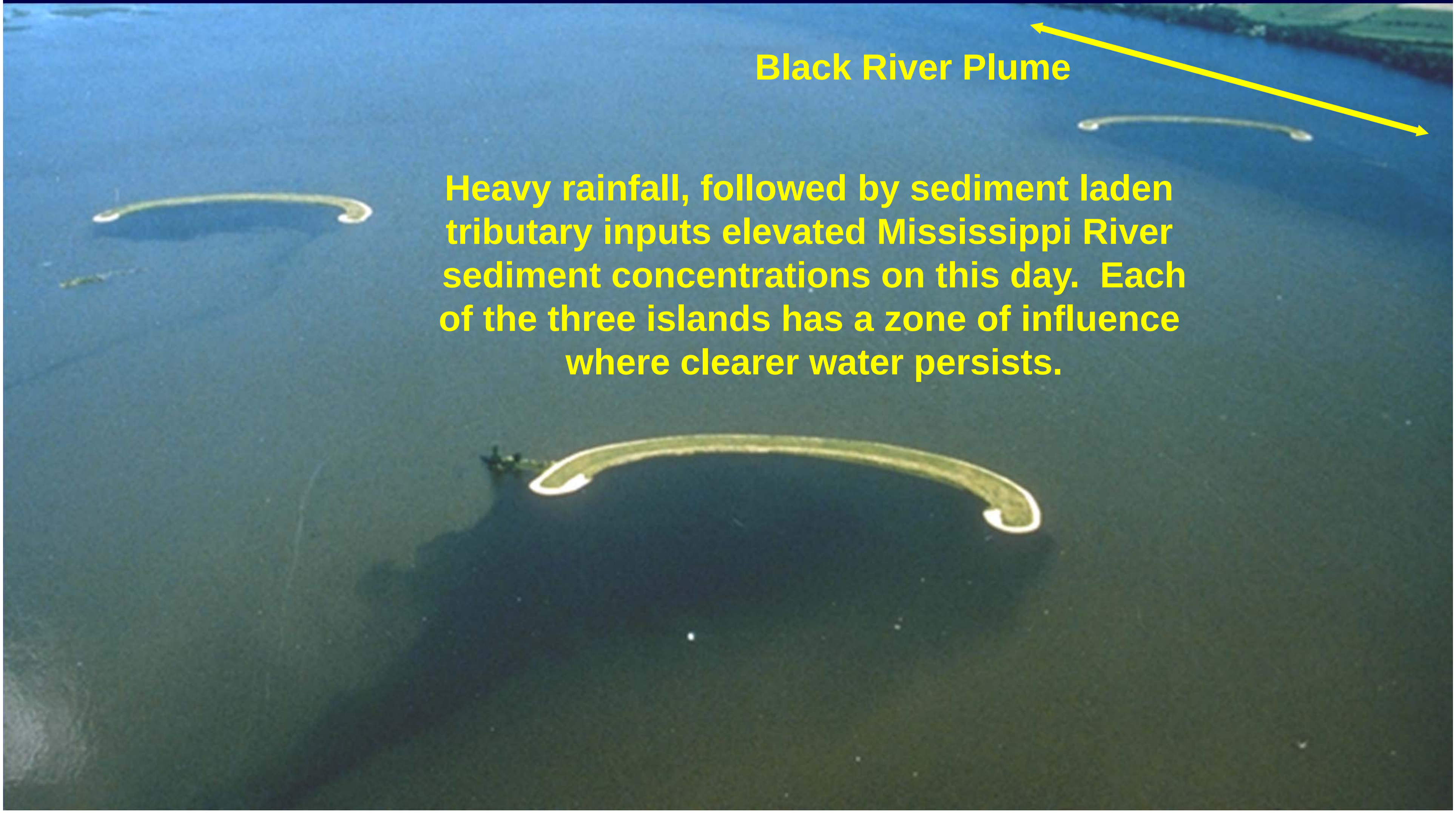
Lake Onalaska: Sheltered zone downstream of islands



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Polander Lake: Constructed 2000

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Polander Lake Interior wetland

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Island Cost = $200/ft

Cost Breakdown

- 30% Granular Fill
- 25% Fines
- 25% Shoreline Stabilization
  - ✓ Riprap: 1/5 of s.l. length
  - ✓ Biotechnical: 2/5 of s.l. length
  - ✓ Vegetative: 2/5 of s.l. length
- 10% Mob-Demob
- 10% Turf, Plantings, Geotextile

ISLAND CROSS SECTION

HABITAT ➡	AQUATIC PLANTS & MUDFLATS	WILLOWS & BEACH	TREES & GRASSES
DIMENSION ➡	MUDFLAT WIDTH IS 20 TO 200 FEET	BERM WIDTH IS 30 TO 60 FEET	TOP WIDTH IS 30 TO 80 FEET