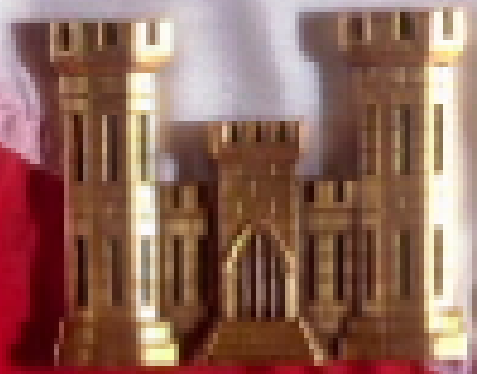
Ecosystem Restoration For Fish and Wildlife Habitat on the UMRS

Presentation for the

2005 Infrastructure Conference



By

JON HENDRICKSON

Hydraulic Engineer
Regional Technical Specialist
Water Quality and Environmental Restoration

02 –04 Aug 2005

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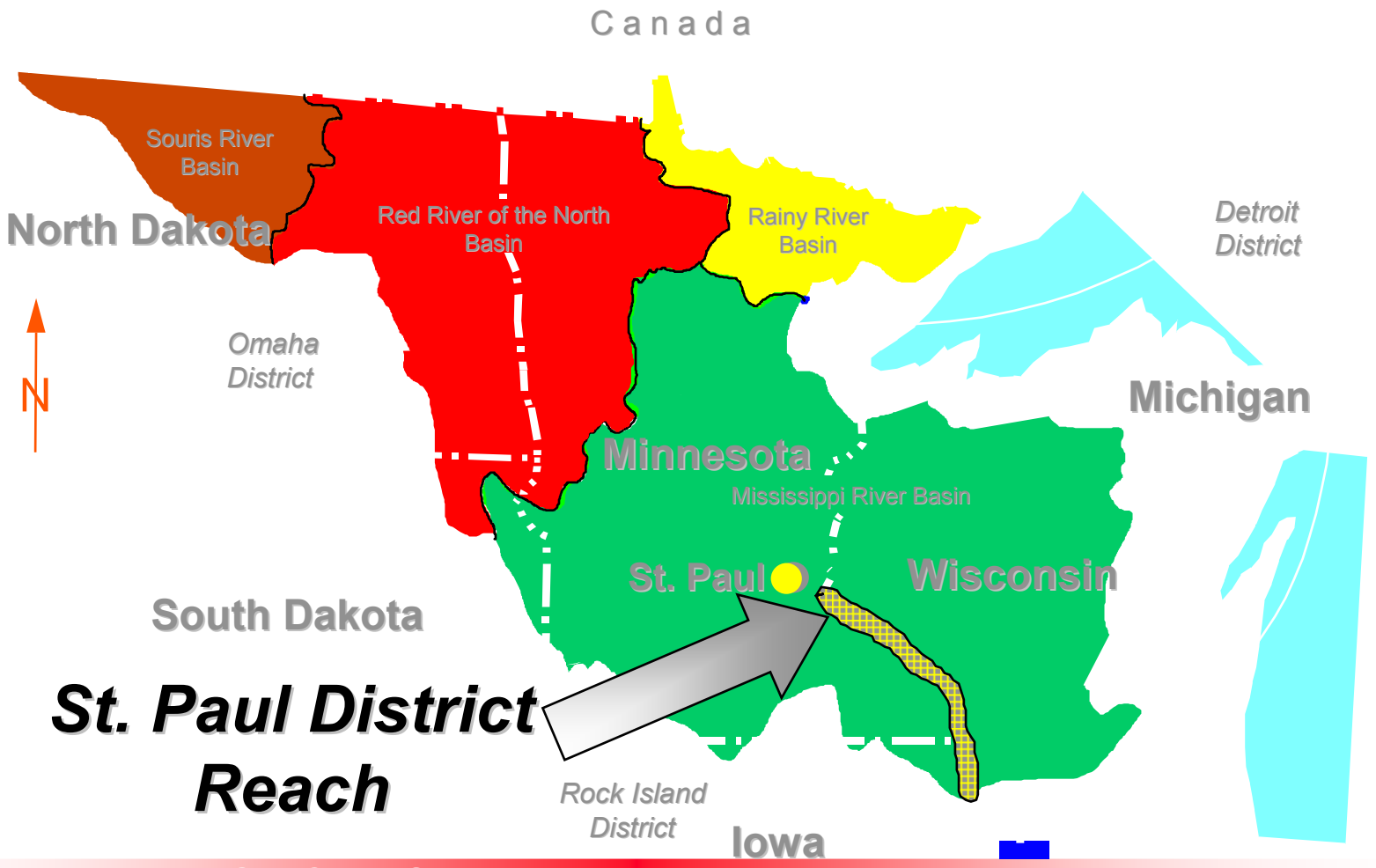
UPPER MISSISSIPPI RIVER ENVIRONMENTAL MANAGEMENT PROGRAM



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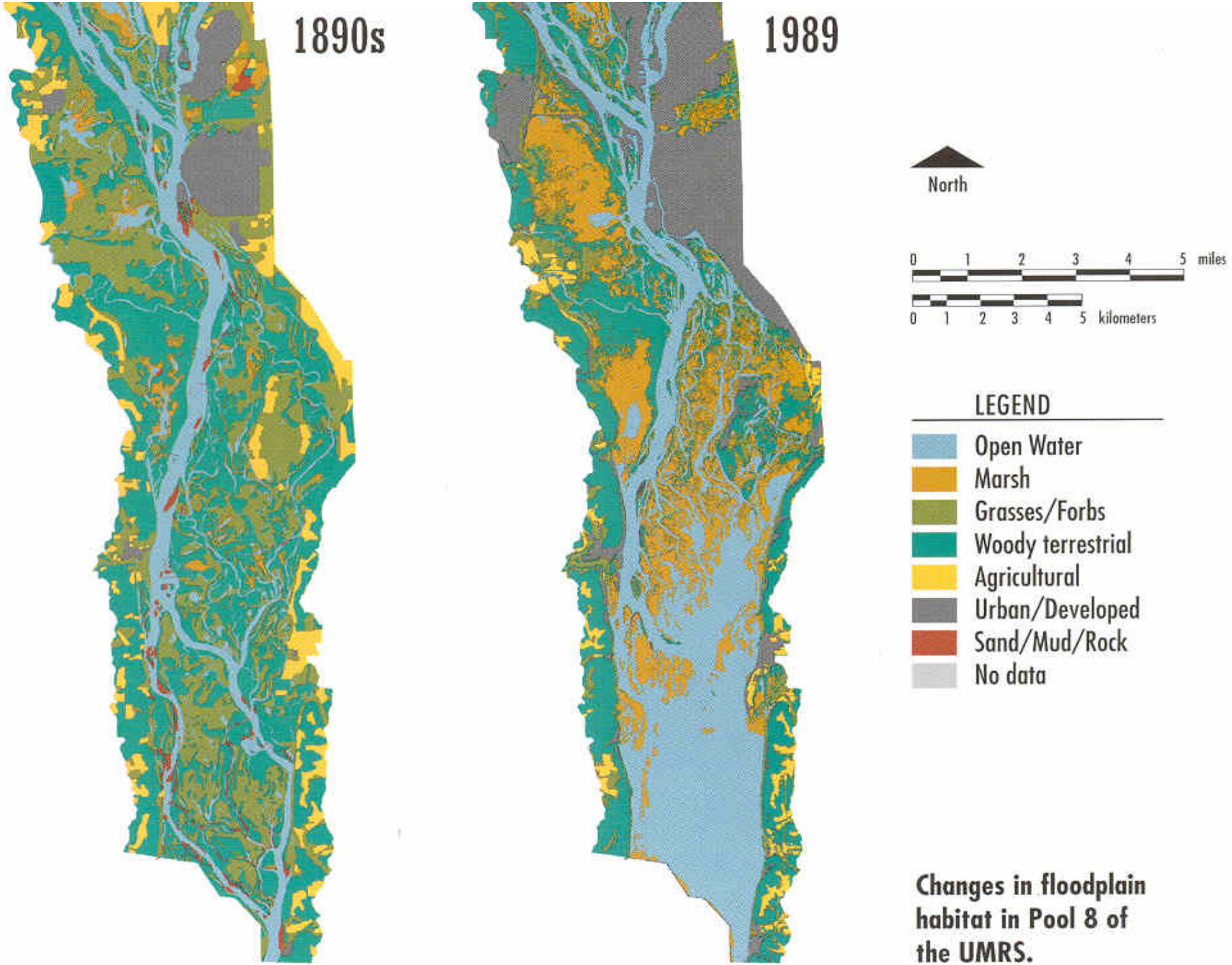
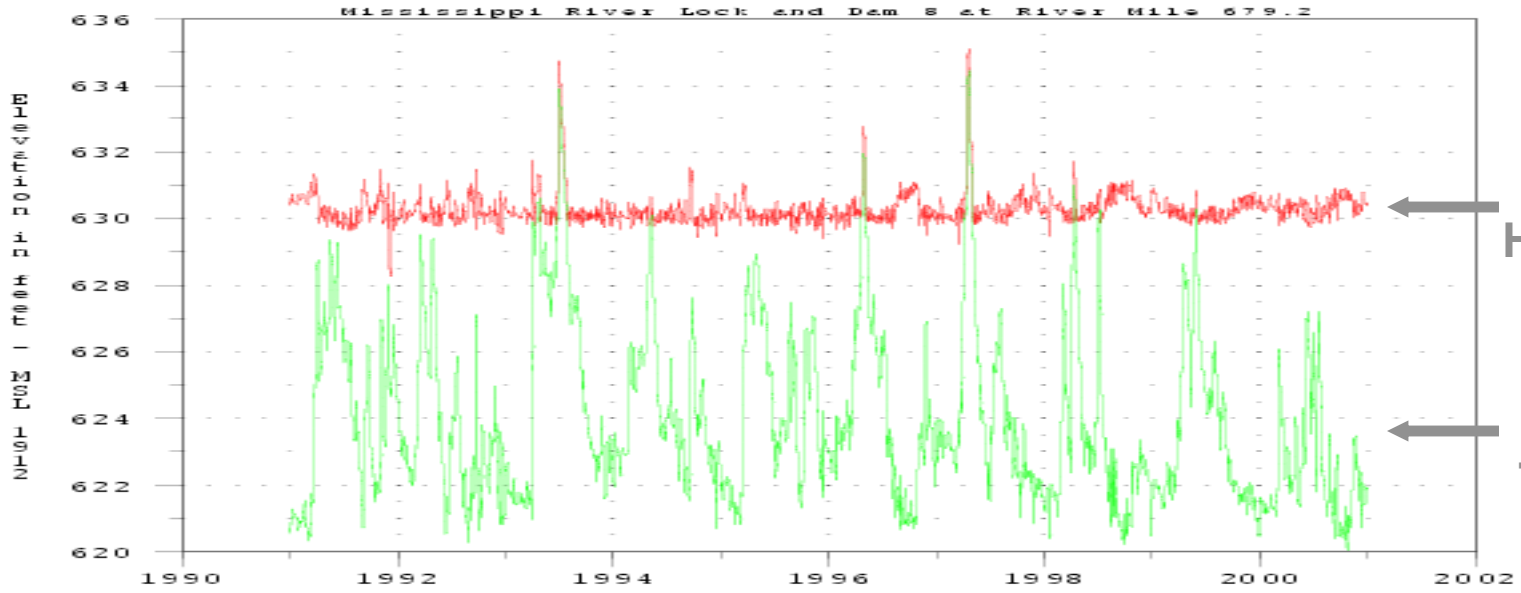
V018JS01

- ✓ **Multi-Agency Effort**
  - ✓ USACE, USFWS, State DNRs, USGS, NGOs
- ✓ **Multi-Discipline**
  - ✓ Engineers, Biologists, Planners
- ✓ **Multi-Use**
  - ✓ Navigation, Recreation, Water Supply, Fish and Wildlife Habitat



Changes in floodplain habitat in Pool 8 of the UMRS.

Water Levels Stabilized in Lower Reach of Pool



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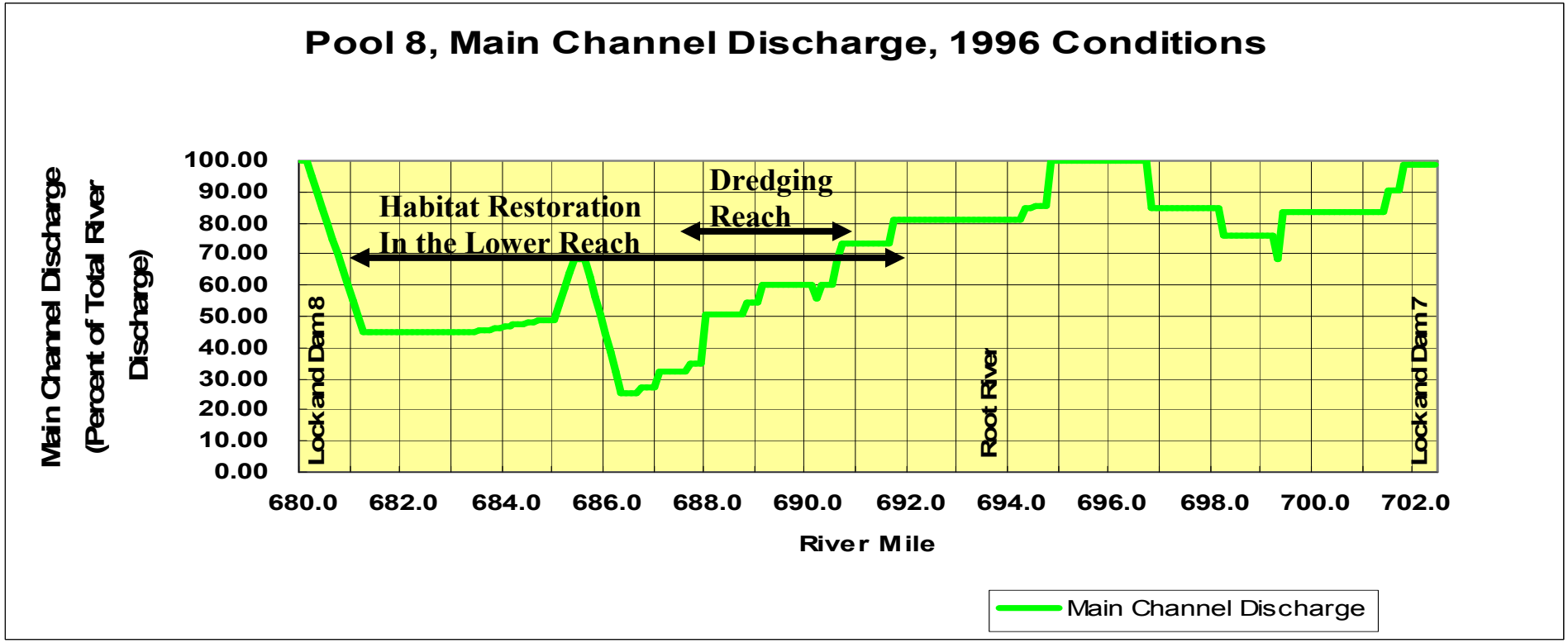
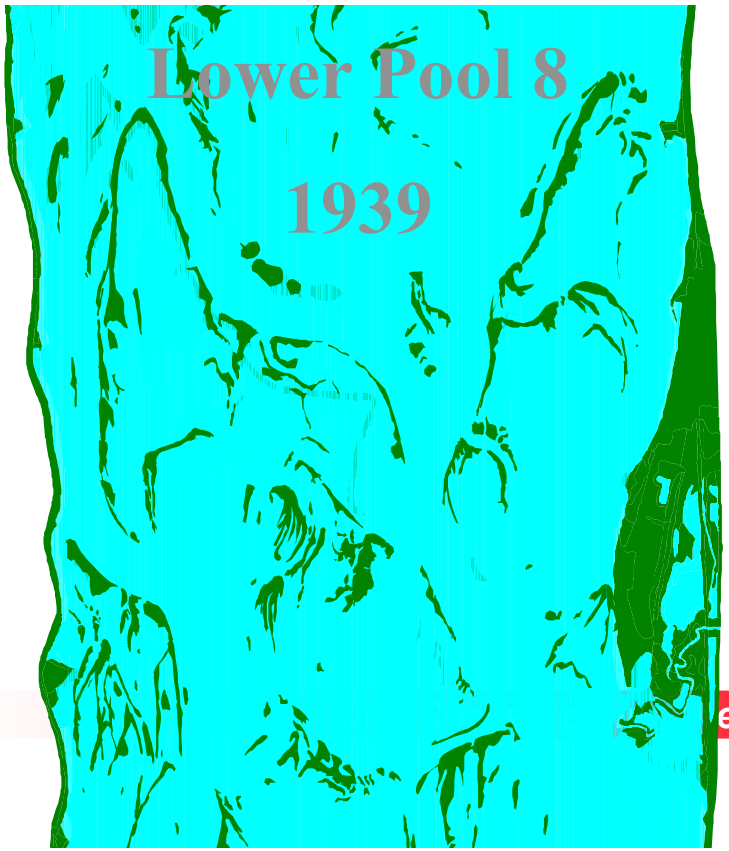
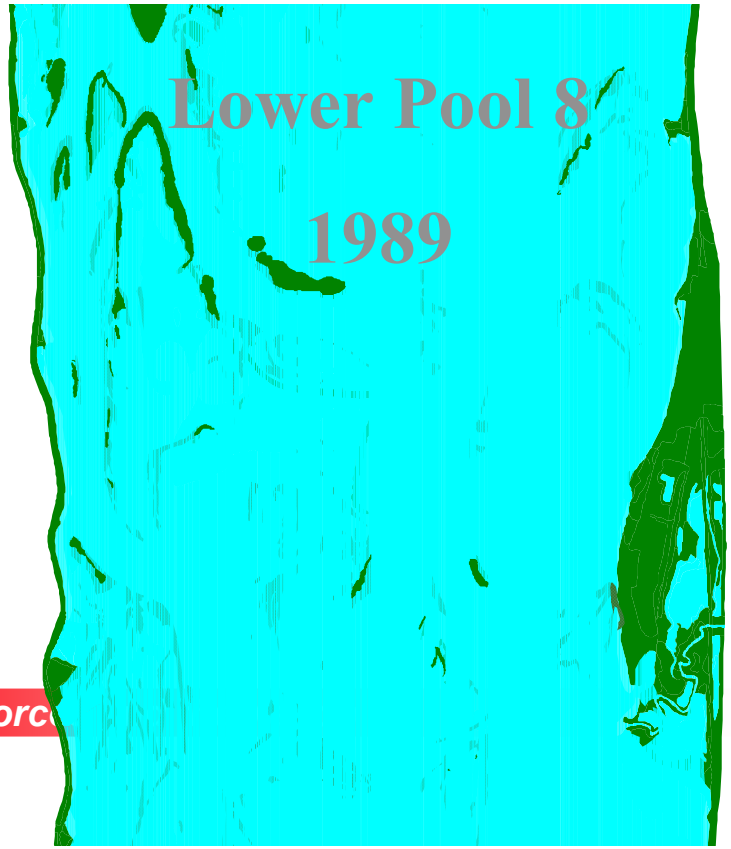
Increased Floodplain Discharge



Island Erosion





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Restoring the River

Navigation and Ecosystem Sustainability Program Initiated in 2005

Environmental Management Program

1986 To The Present

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Project Delivery Teams Need to Operate Smarter

- ✓ Document and Use Lessons Learned
- ✓ Do a better job linking objectives, design criteria, performance metrics, actions, modeling, and monitoring needs.
- ✓ Work with research community to develop
  - ✓ Biological Criteria, Scale of Restoration Guidelines
- ✓ Cross-Discipline Training:
  - ✓ Engineering, Geomorphology, Biology

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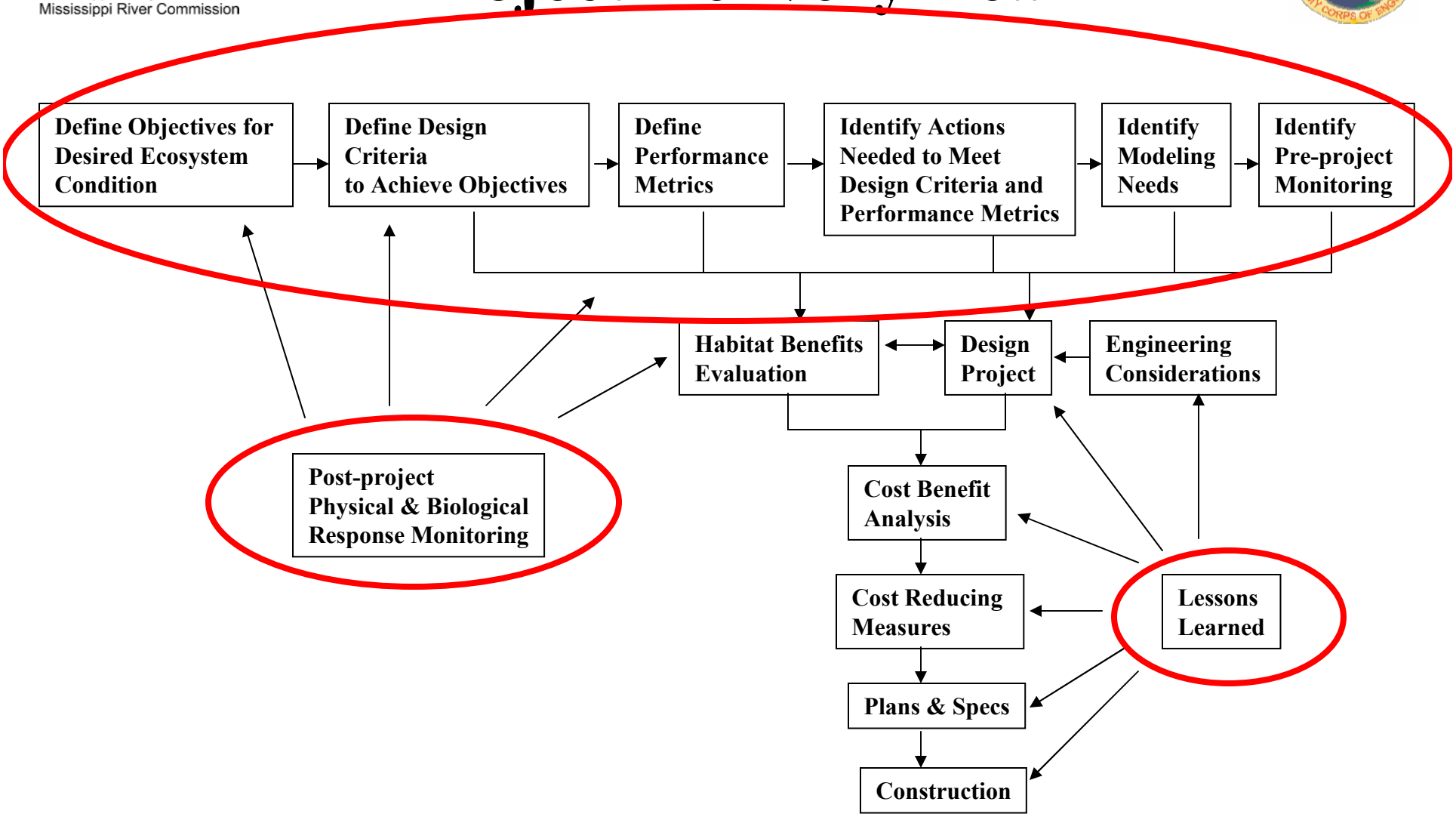
Project Delivery Team



Define Objectives

- ✓ **SMART (Specific, Measurable, Attainable, Relevant, Time Bound) Objectives**
  - ✓ **Example: Increase the area of aquatic vegetation in Weaver Bottoms by the year 2015 as follows:**
    - ✓ **Submersed Aquatic Plants – 300 acres**
    - ✓ **Emerged Aquatic Plants – 600 acres**
    - ✓ **Floating Leaf Aquatic Plants – 300 acres**
- ✓ **Defined by:**
  - ✓ **FWWG (Interagency Team of Biologists, Planners, Engineers)**
  - ✓ **Product Delivery Teams**

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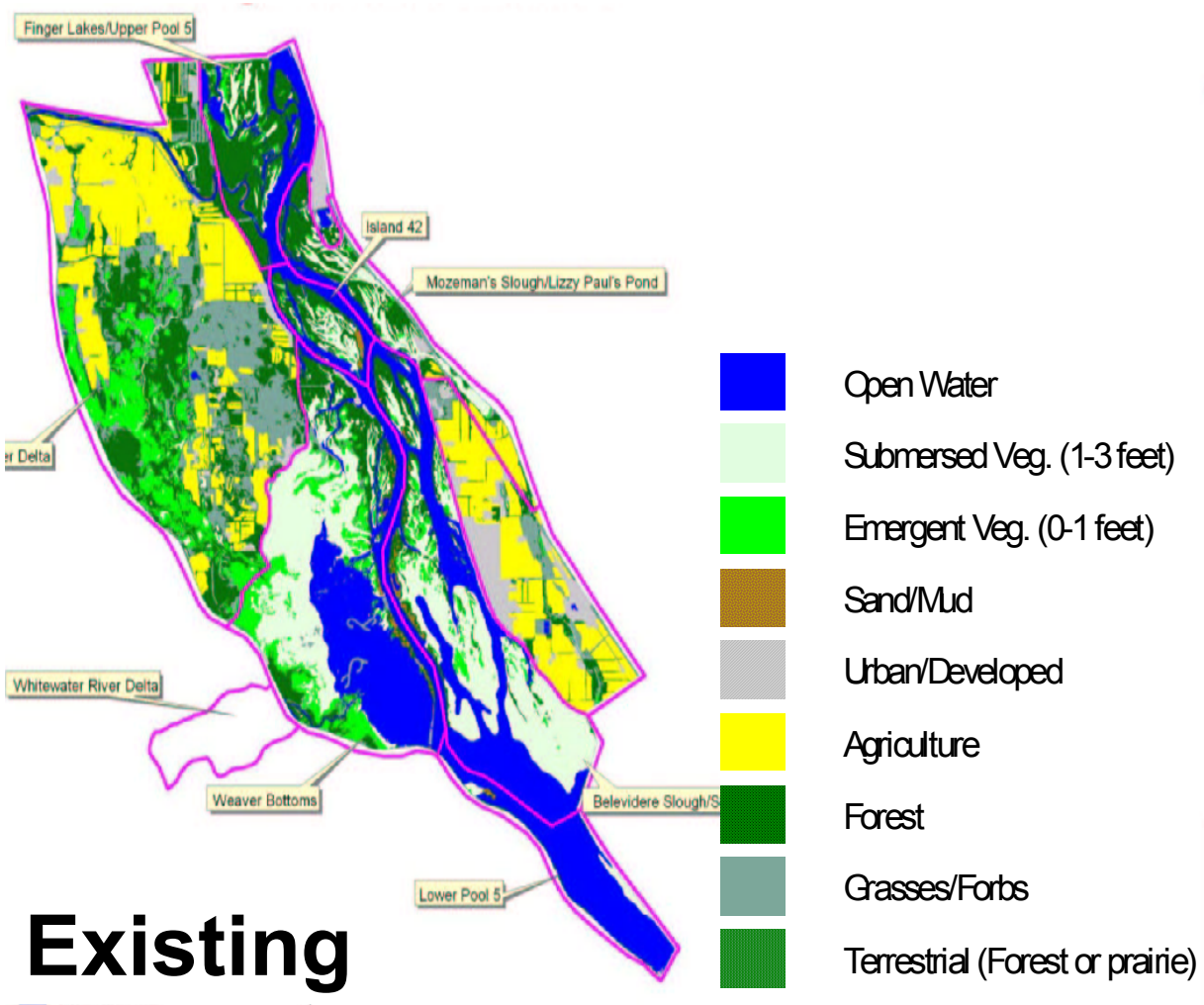
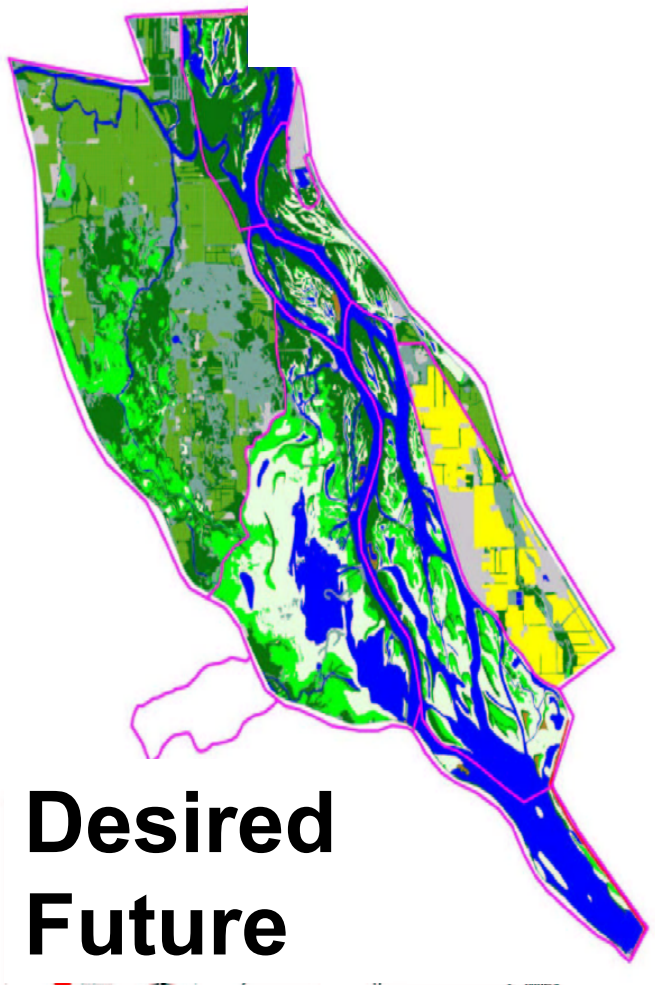
Environmental Pool Plans



Existing



Desired Future

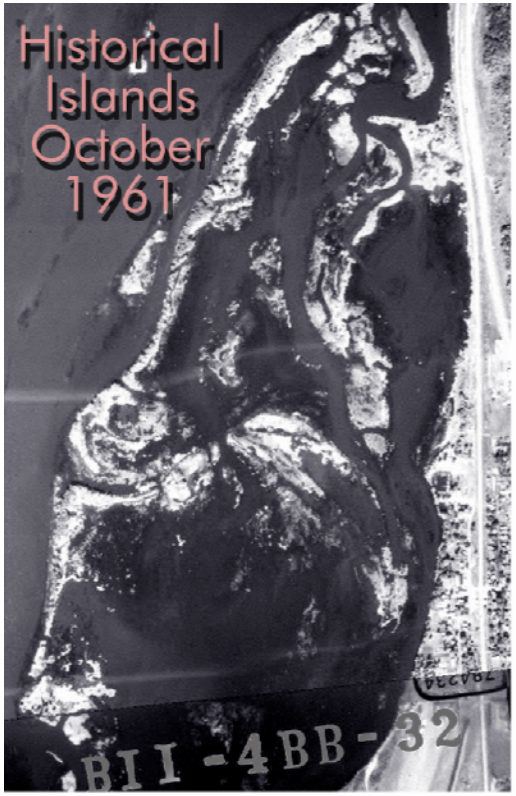
Define Design Criteria

Example: Given the light extinction and substrate typical of backwater areas, aquatic plants grow in the following conditions

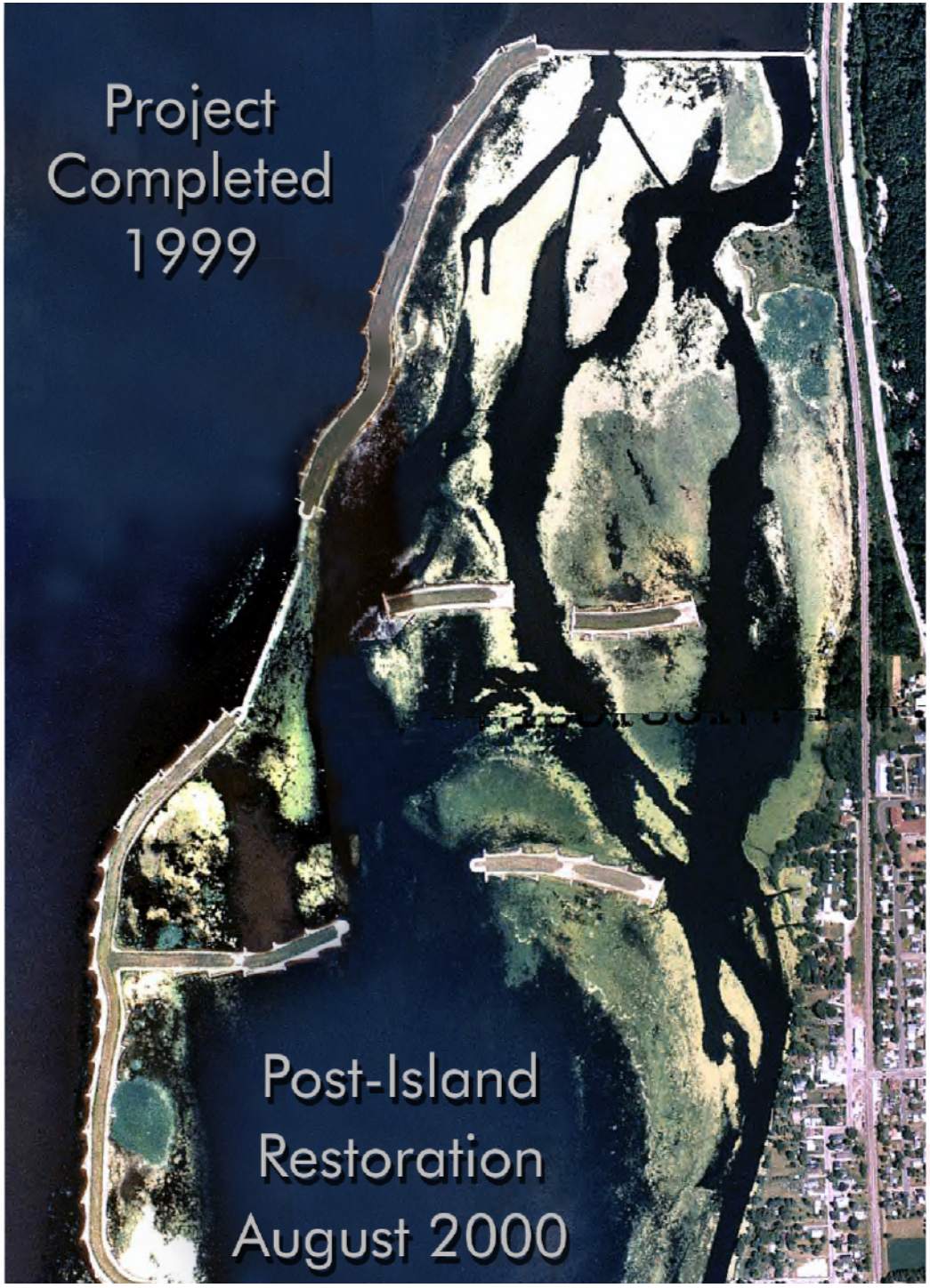
	Depth (feet)	Average Velocity (fps)	Wind Fetch (miles)	Performance Metric
Emergent Aquatics	0 - 2	< .1	< .75	Area Diversity Community Structure
Submersed Aquatics	1.3 – 5.2	< .5	< .75	
Floating Aquatics	.6 – 2.6	< .2	< .75	

ID Actions Needed to Meet Design Criteria and Metrics

- ✓ Water Level Management
- ✓ Islands
- ✓ Dredging
- ✓ Secondary Channel Restoration
- ✓ Shoreline Stabilization
- ✓ Training Structure Modifications
- ✓ Dredge Material Placement
- ✓ Forest Management
- ✓ Tributary Delta Restoration
- ✓ Fish Passage Structures


Historical
Islands
October
1961
BII-4BB-32


Pre-Island
Restoration
August 1994


Project
Completed
1999
Post-Island
Restoration
August 2000

ISLANDS

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Water Level Drawdowns

Water Level Drawdowns

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Secondary Channel Modification

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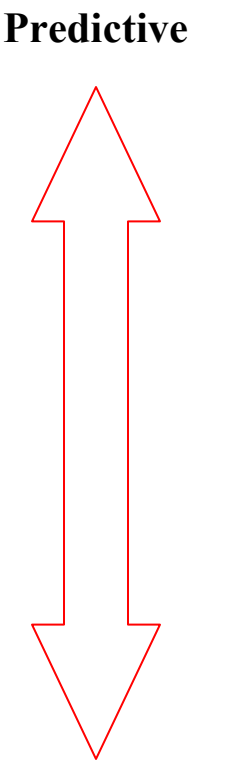
Backwater Dredging

Identify Modeling Needs

- ✓ Hydrodynamic Models
  - ✓ Steady/Unsteady Flow
- ✓ Sediment Transport Models
  - ✓ Multiple Grain Size
  - ✓ Sediment Budgets
- ✓ Water Quality
- ✓ Geomorphology
  - ✓ River Meandering, Island Formation
- ✓ Ecological Response Models
  - ✓ Aquatic and Terrestrial vegetation response
  - ✓ Biota



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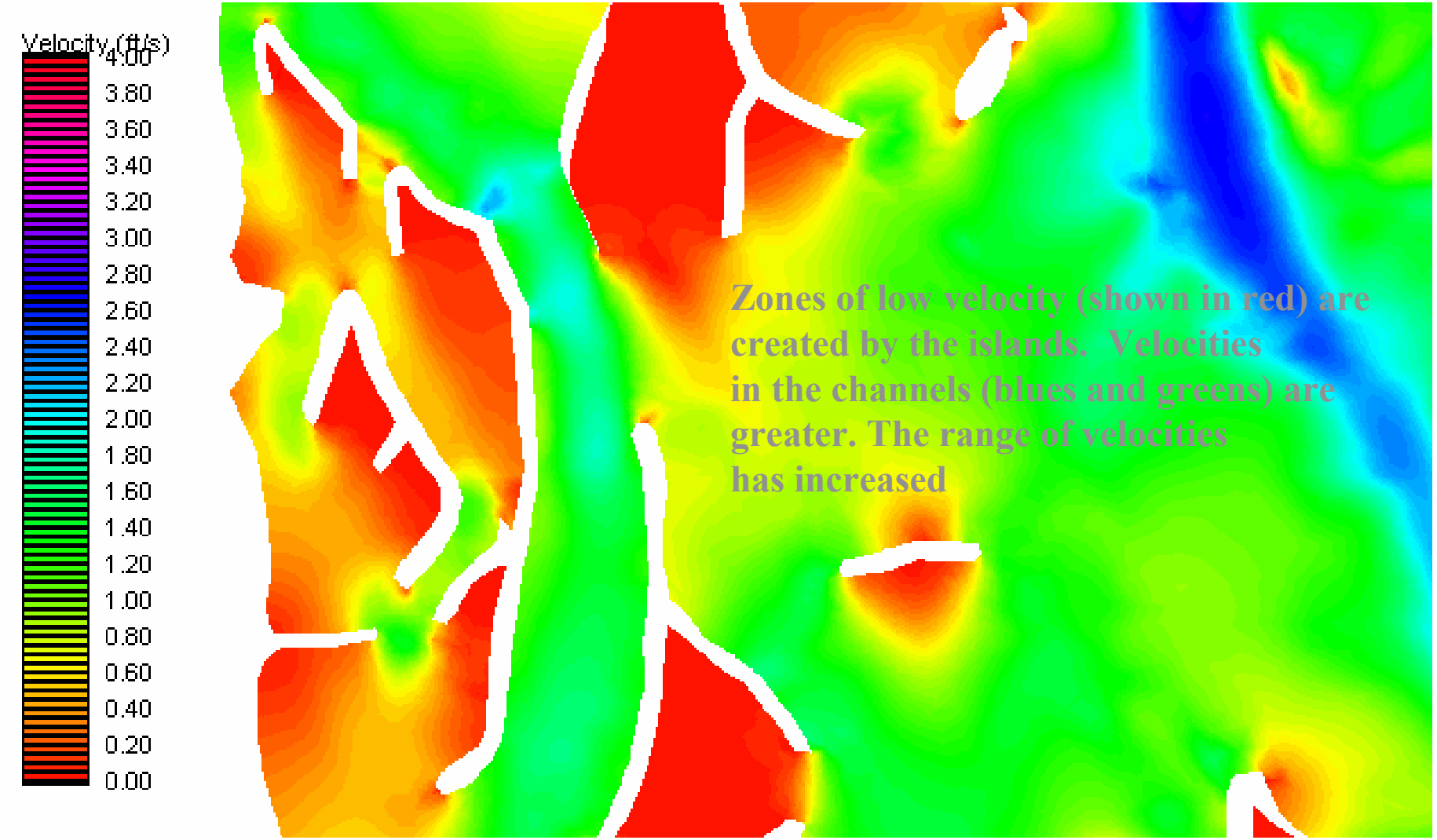
Hydrodynamic Diversity



Identify Pre-Project Monitoring Needs

- ✓ With goals and objectives, design criteria, performance measures, and actions identified, can develop a pre-project monitoring plan to address critical unknowns
  - ✓ Ecosystem condition
  - ✓ Topography for plans and specs
  - ✓ Data needed for model calibration

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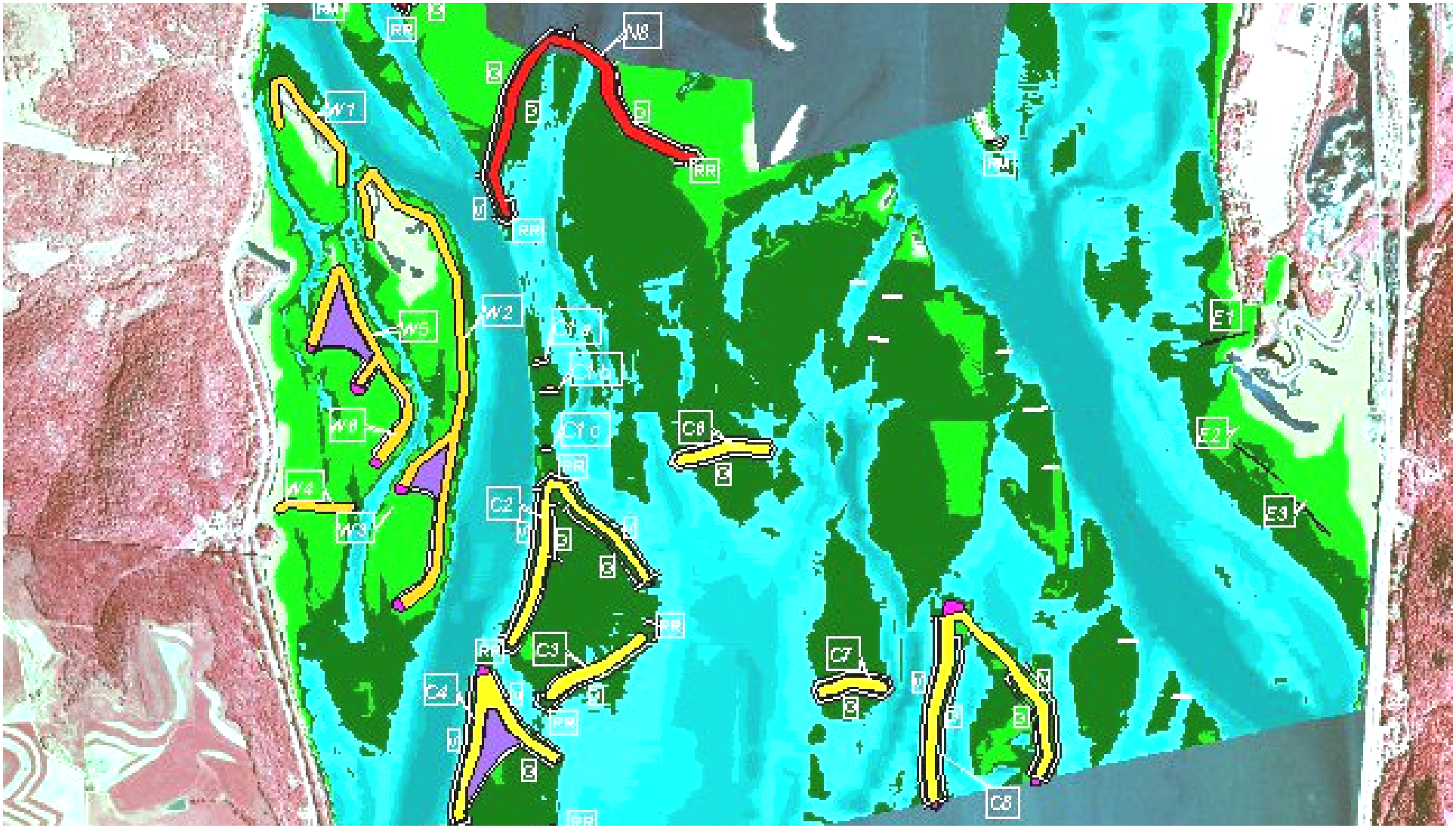
Pool 8, Phase 3 Layout



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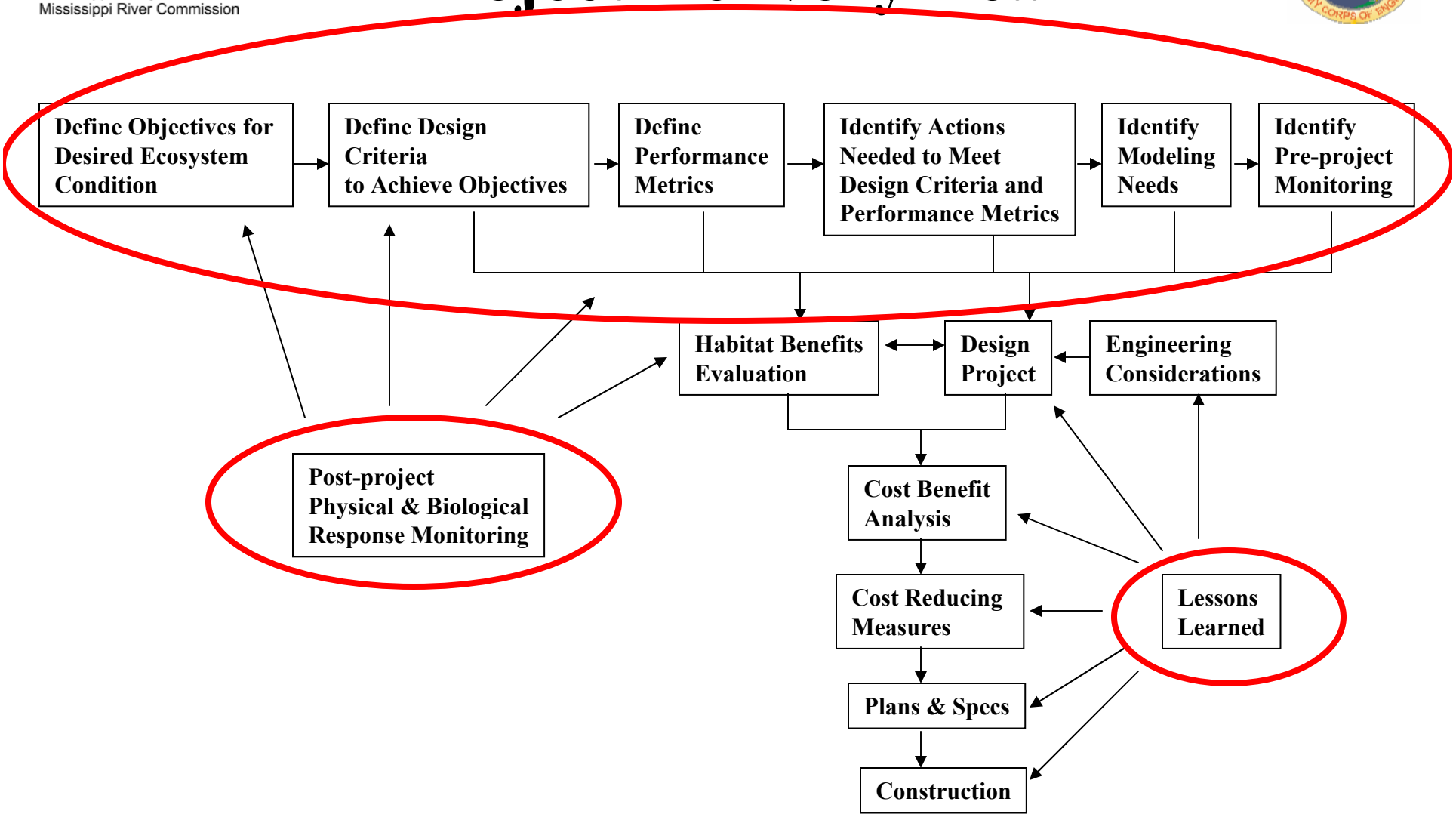
Project Delivery Team



EMP Project Design Handbook

Project Design Criteria Based on:

- ✓ Lessons Learned
- ✓ Habitat Design Criteria
  - ✓ Fish
  - ✓ Migrating Waterfowl (Fall)
  - ✓ Aquatic Vegetation
  - ✓ Terrestrial Vegetation
  - ✓ Loafing Habitat
  - ✓ Nesting
- ✓ Desired Physical Attributes
  - ✓ Water and Sediment
- ✓ Engineering Considerations
  - ✓ Shoreline stabilization, geotechnical, constructability, …

Post-project Physical and Biological Monitoring

- ✓ Monitoring should lead to improved designs (adaptive management) and should quantify the effects at the project scale
- ✓ Our knowledge base should be increased
- ✓ Large scale effects of numerous small projects needs to be determined
- ✓ Limited by Budgets

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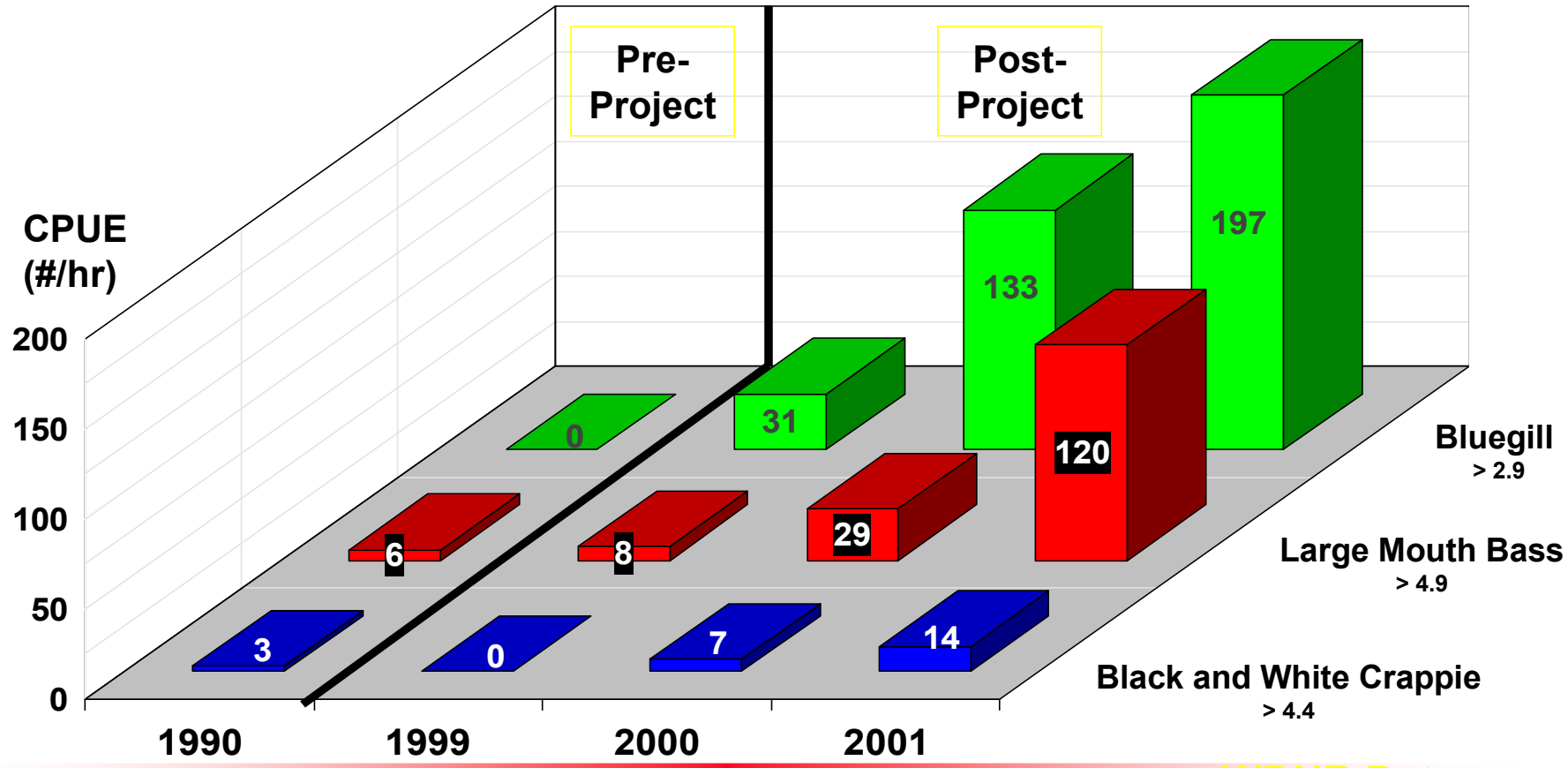
Pool 8 Islands Phase II

Pre- and Post-Project Fall Electro-fishing



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WDNR Data

The number of fish in the phase II island area has increased significantly.

Conclusion

- ✓ **Strengths**
  - ✓ Cooperative Interagency Effort
  - ✓ Adaptive Engineering Based on Lessons Learned and Available Knowledge
  - ✓ Design Tools: Hydrodynamic Models, GIS, CADD
- ✓ **Weaknesses**
  - ✓ Ecosystem Response Monitoring has been Minimal
  - ✓ Ecosystem Response Models Are Poor
    - ✓ Individual Species Based Models
    - ✓ Matrix Scoring
  - ✓ Weak Relationship Between Research Community and PDTs