

Monitoring and Adaptive Management in the Missouri River Recovery Program

Lessons Learned and Transition to a More Integrated Program

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Background

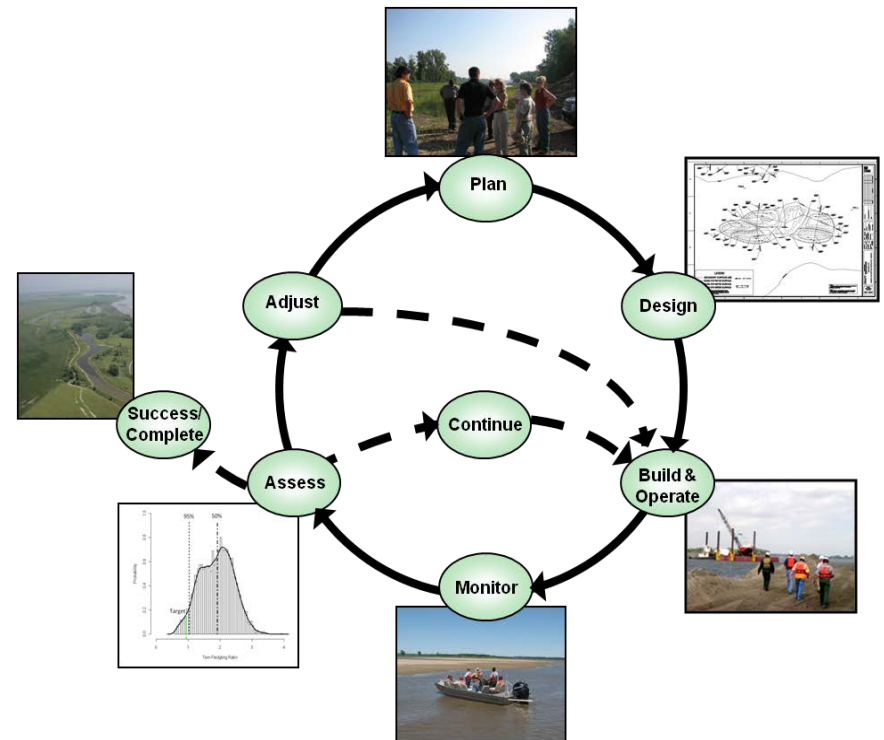
- The MRRP was established in 2006 combining activities related to:
 - Biological Opinion actions (USFWS 2000, 2003) for least terns, piping plovers, pallid sturgeon
 - Bank Stabilization and Navigation Project Mitigation Program (habitat creation and land acquisition)
- The 2003 Amended BiOp describes the need for AM, as does the Missouri River Master Manual
 - “adopt AM as one tool to preclude jeopardy to least terns, piping plovers and pallid sturgeon”
 - “the general management actions identified ...likely will be conducted, modified, and continually improved upon through AM”

Background (contd.)

- Initial efforts focused on habitat creation to meet BiOp targets and monitoring
 - Create 20/30 acres per mile of Shallow Water Habitat (SWH) in lower Missouri River
 - Create Emergent Sandbar Habitat (ESH) to meet amount and distribution seen in 1998
- Efforts initiated to develop an AM process and strategies in the midst of ongoing implementation (no pre-developed AM “plan”)
 - AM Process Framework
 - ESH AM Strategy
 - SWH AM Strategy

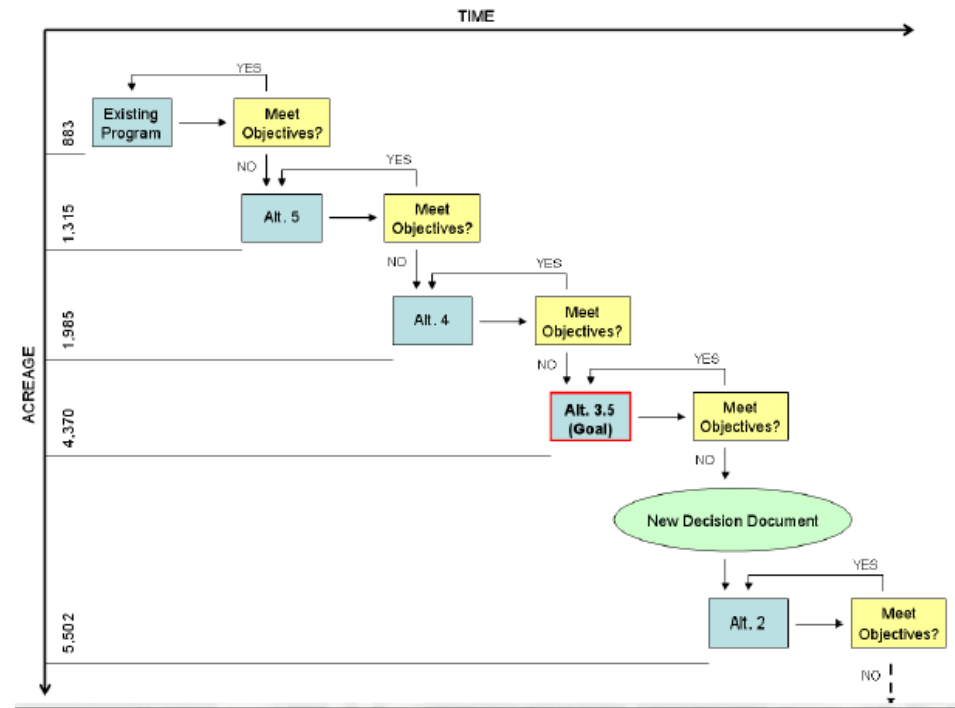
Initial AM Efforts

- AM Process Framework
 - process for developing sub-program AM strategies
 - established regular cycle of implementation, monitoring, assessment, reporting
 - processes for stakeholder involvement



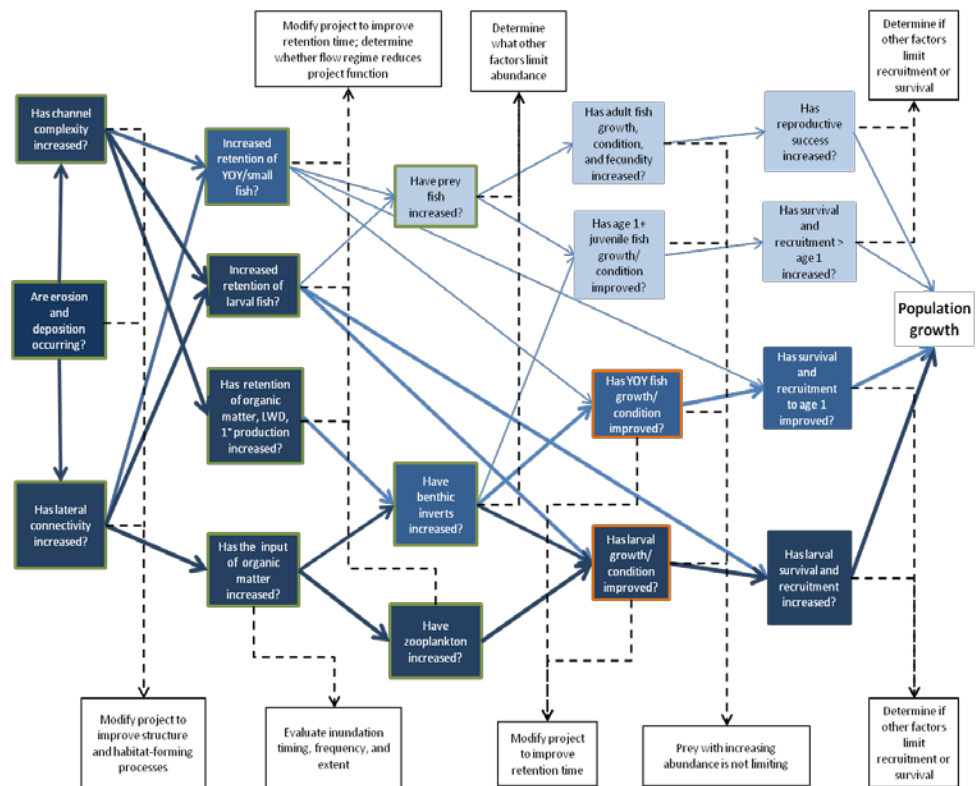
Initial AM Efforts (contd.)

- ESH AM Strategy
 - major uncertainties
 - metrics to measure success
 - monitoring focus
 - strategy for adjusting management actions



Initial AM Efforts (contd.)

- SWH AM Strategy
 - Formalized specific biological and physical objectives, metrics, targets
 - Developed CEMs to highlight hypotheses
 - ID key monitoring, research
 - Strategy for adjusting SWH actions



Independent Science Advisory Panel Report

- An **adaptive management plan** should be developed that anticipates implementation of **combined flow management actions and mechanical habitat construction** below Gavins Point Dam, and this plan should be used to guide future management actions, monitoring, research, and assessment activities.
- The development of an adaptive management plan should be preceded by and based upon an **effects analysis** that incorporates new knowledge that has accrued since the 2003 Biological Opinion.
- **Conceptual ecological models** should be developed for each of the **three listed species** and these models should articulate the **pathways from management actions to species performance**.
- **Baseflow restoration** should be evaluated as a potential management action



Independent Science Advisory Panel Report

- **Monitoring programs** along the lower Missouri River **should be re-designed** so as to determine if expected outcomes are attributable to specific management actions.
- The agencies should **identify decision criteria** (trigger points) **that will lead to continuing a management action or selecting a different management action.** A formal process should be designed and implemented to regularly compare incoming monitoring results with the decision criteria.
- **Other managed flow programs and adaptive management plans should be evaluated as guiding models** for the lower Missouri River recovery program.

MRR Management Plan Effort

- Effects Analysis
- Human Considerations
- Programmatic Adaptive Management Plan
- NEPA compliance framework for AM implementation

Effects Analysis

- Develop CEMs linking management actions to species response
- Identify hypotheses related to potential effects of management actions
- Develop quantitative models
- Assess hypotheses with models and other lines of evidence
- Informs alternative formulation and AM plan



Human Considerations

- Objectives and metrics being developed by MRRIC meant to help evaluate impacts of alternatives
- Represent a range of key interests of basin stakeholders: agriculture, cultural resources, sand dredging, env. conservation, flood risk mgt., hydropower, irrigation, local govt., navigation, recreation, thermal power, tribal resources, wastewater, water quality, water supply

Programmatic AM Plan

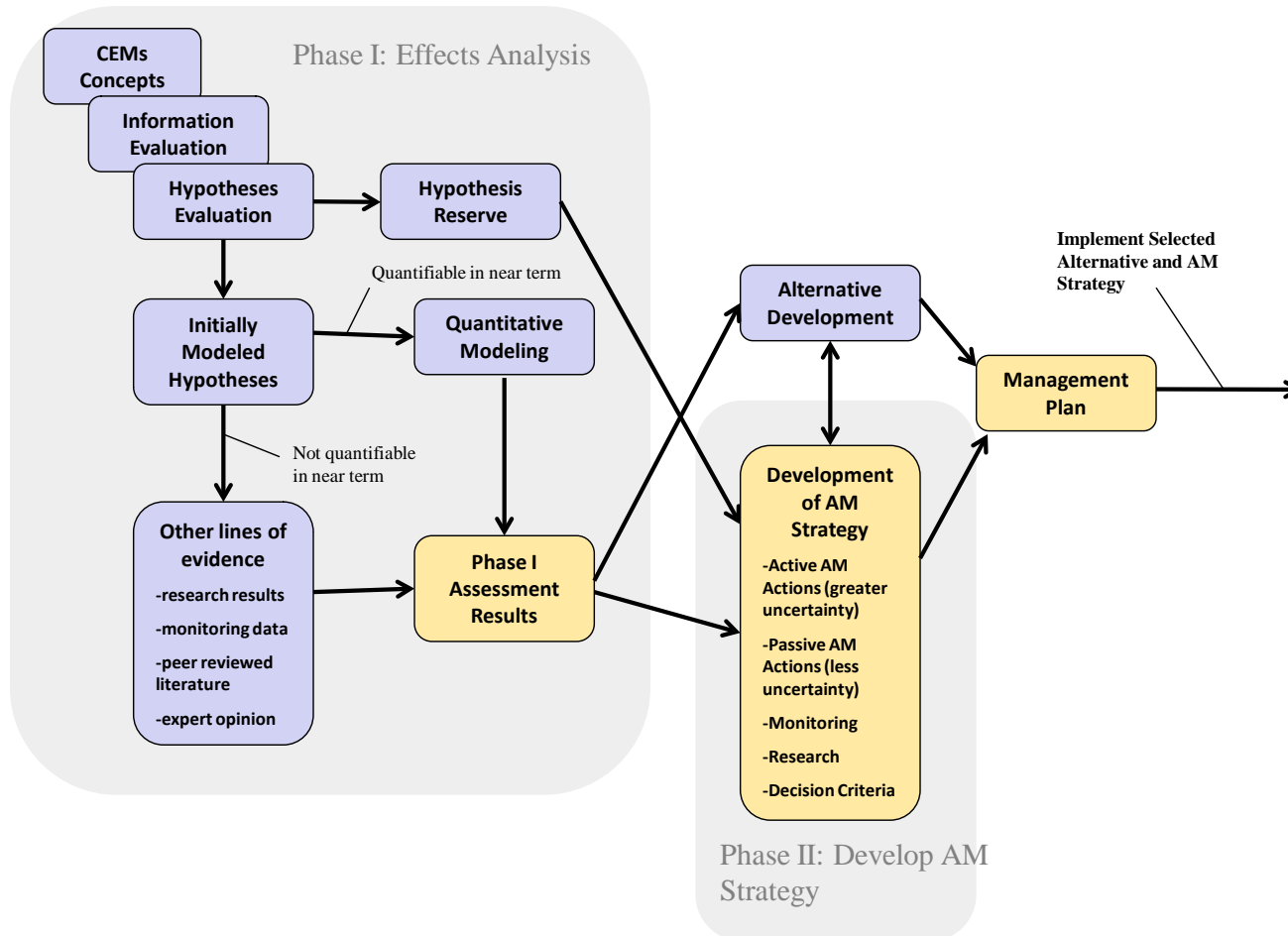
- Program-level AM Plan will supersede sub-program strategies
- AM Plan Components
 - Fundamental and Means Objectives
 - CEMs
 - Hypotheses
 - Quantitative models
 - Mgt. actions
 - Decision criteria
 - Monitoring and focused research
 - Assessment process
 - Data Management Plan and Information Base
 - Reporting
 - Governance and decision-making process

Hypothesis Routing

- **During and after** the Mgt. Plan timeframe CEMs, quantitative models, scientific information, and hypotheses can be used to ID which hypotheses have sufficient information to begin useful modeling, which need additional information compiled from existing sources, and which require new information from research.
- Develop **options for addressing information gaps** associated with hypotheses through learning-focused management actions such as adaptive field experiments, controlled lab experiments, or other focused research.
- These learning-focused options could be assessed in the Mgt. Plan along with actions aimed more specifically at achieving objectives

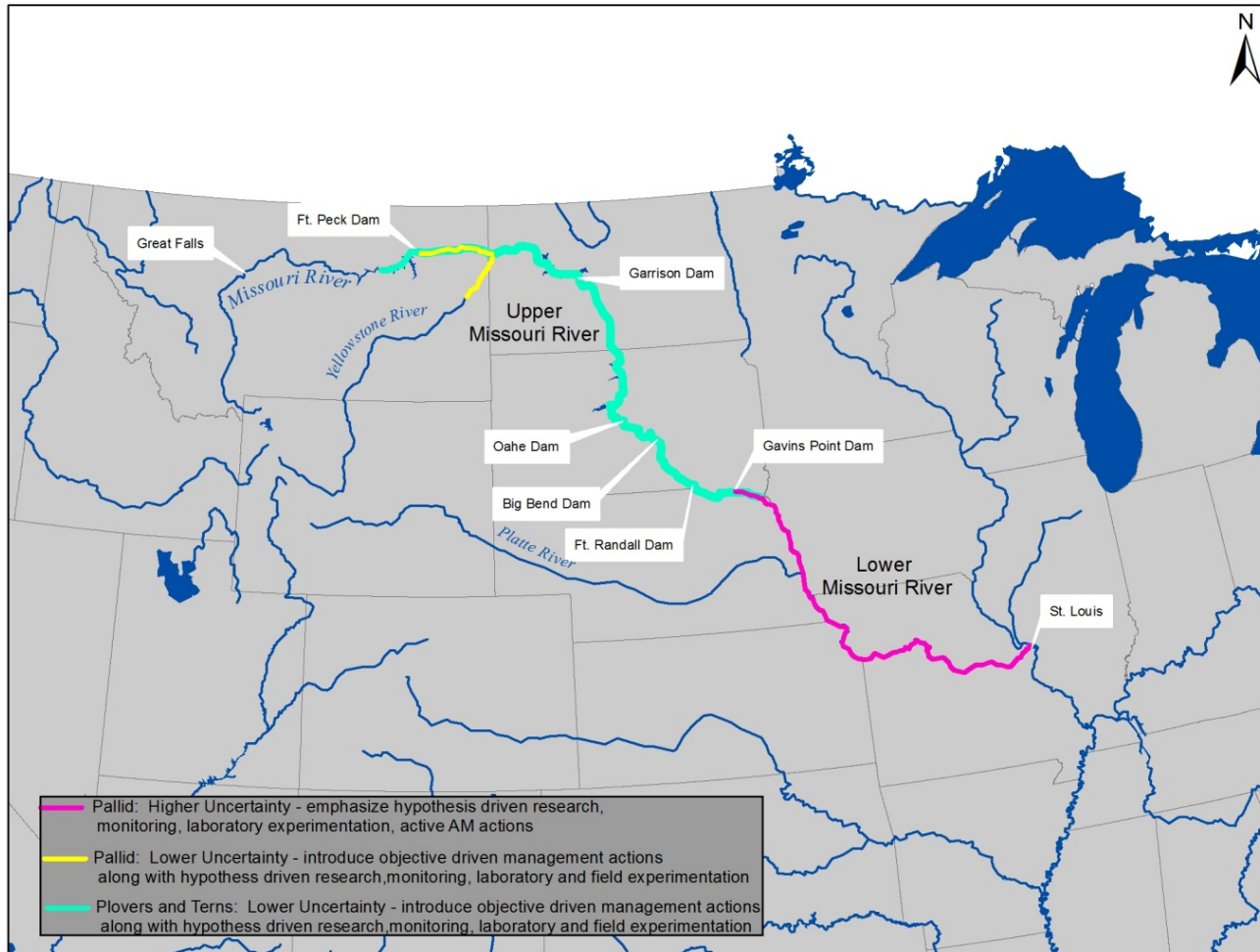
MISSOURI RIVER RECOVERY PROGRAM

Hypothesis Assessment/Routing

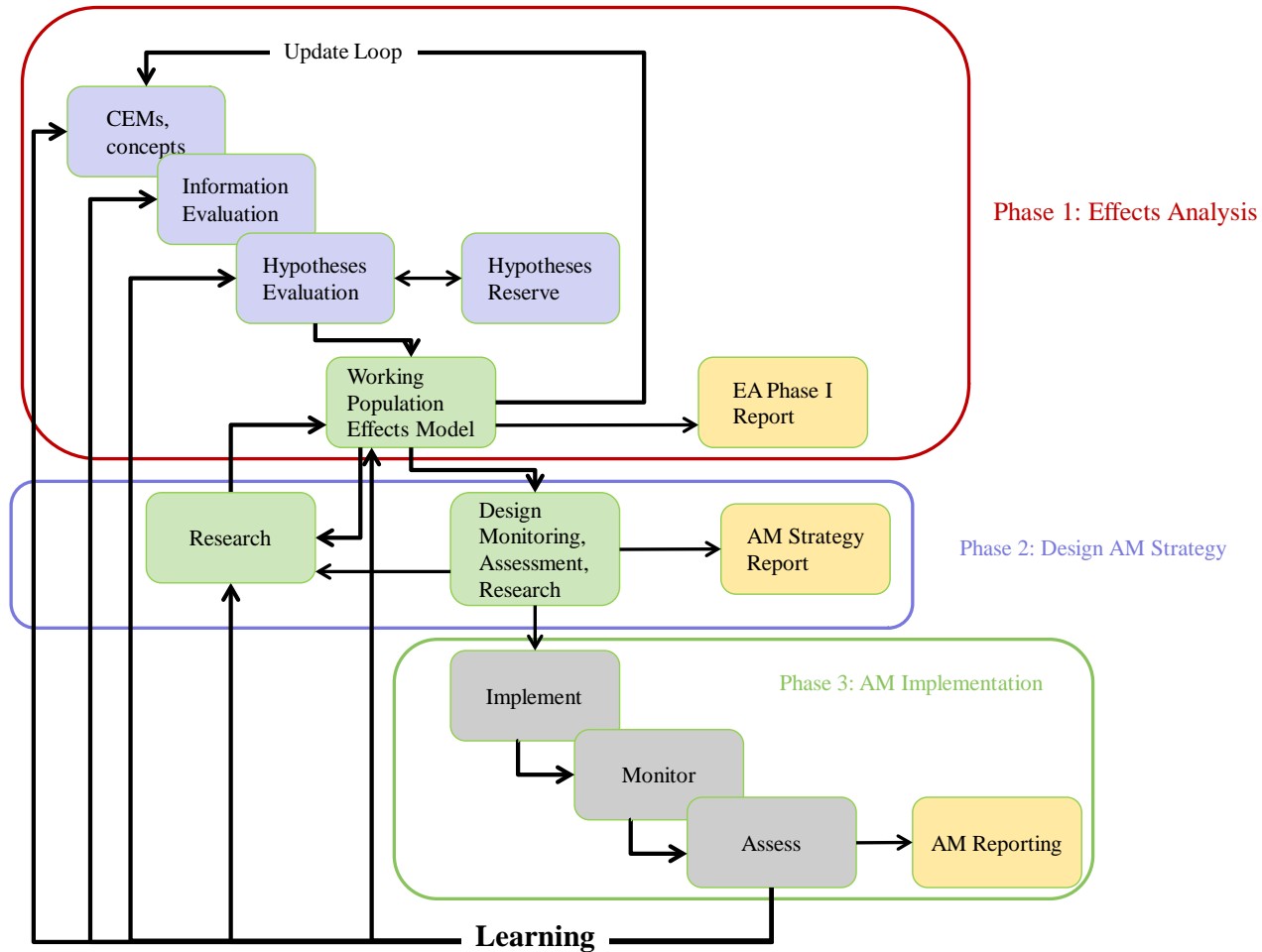


MISSOURI RIVER RECOVERY PROGRAM

General Spatial Distribution of Uncertainty



EA > AM Plan > AM Implementation



Key Improvements in AM

- Completion of a comprehensive effects analysis as a basis for AM
- Close interaction with the ISAP to benefit from independent expertise
- Frequent interactions with MRRIC to ensure transparency
- Addition of effects analysis teams to conduct critical analyses and assessments including model development necessary for AM
- Commitment to continuing iterative process
- Commitment to refine science efforts with a focus on meeting AM needs
- Defining clear, measurable objectives with defined targets and decision points
- Transparent acknowledgement of uncertainty through CEM based hypotheses
- Involvement of a broad group of expertise including from outside the Basin
- Clarification and refinement of the decision-making structure based on lessons learned and future AM needs

A few common challenges from other examined AM efforts...

- Establishing AM framework early in the process
- Clarifying decision process
- Maintaining adequate stakeholder engagement and collaboration
- Establishing clear goals and objectives
- Focusing monitoring & assessments on AM needs
- Embracing uncertainty
- Enabling AM within the agency
- Establishing clear decision trigger points