A Framework for Adaptively Managing Restoration Projects

Resilience of Integrated Coastal Systems

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Numerous Other Contributors

NCER
Aug, 2011

US Army Corps of Engineers
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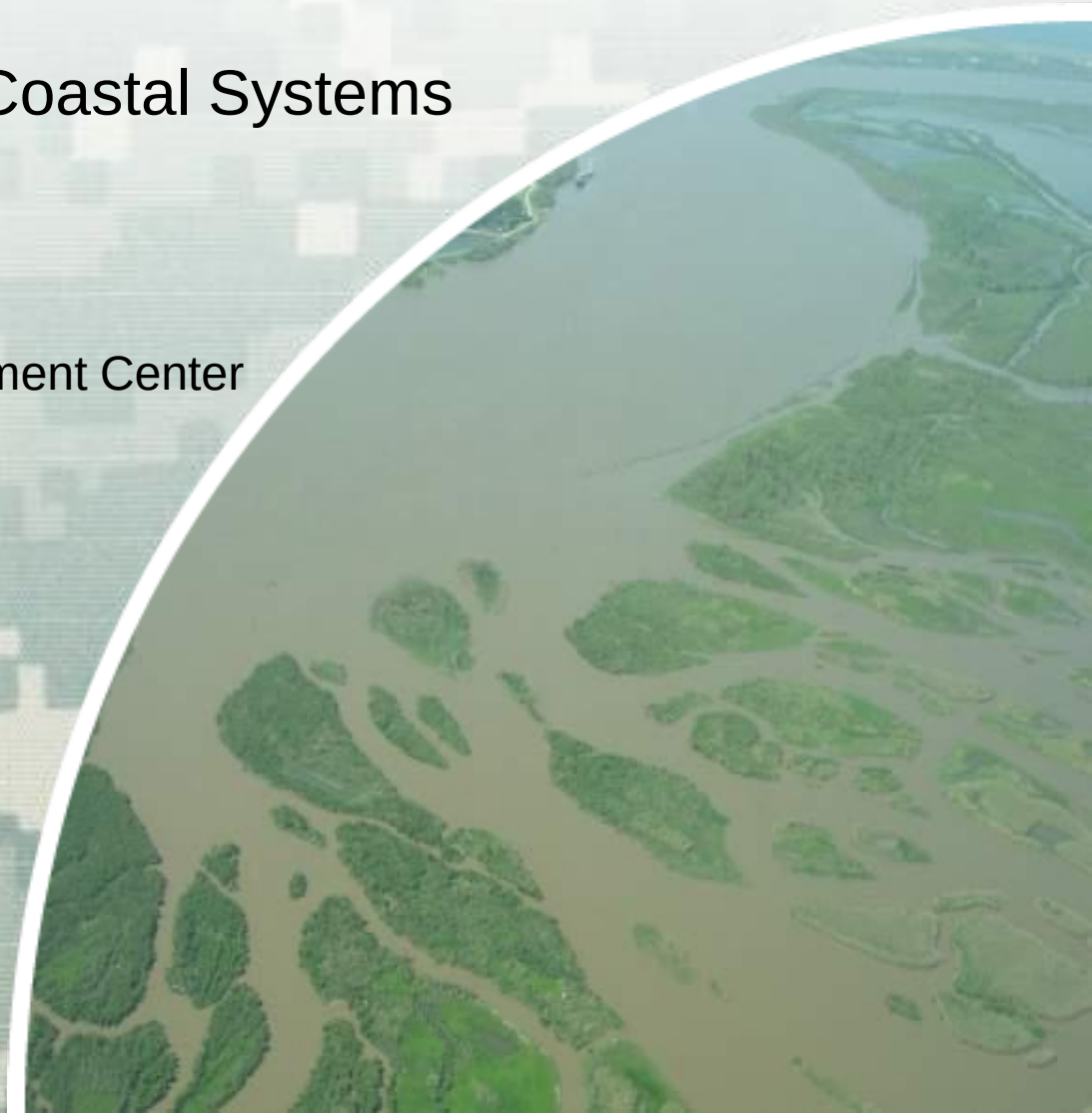

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Providing Solutions to Tomorrow's Environmental Problems

Points of Emphasis

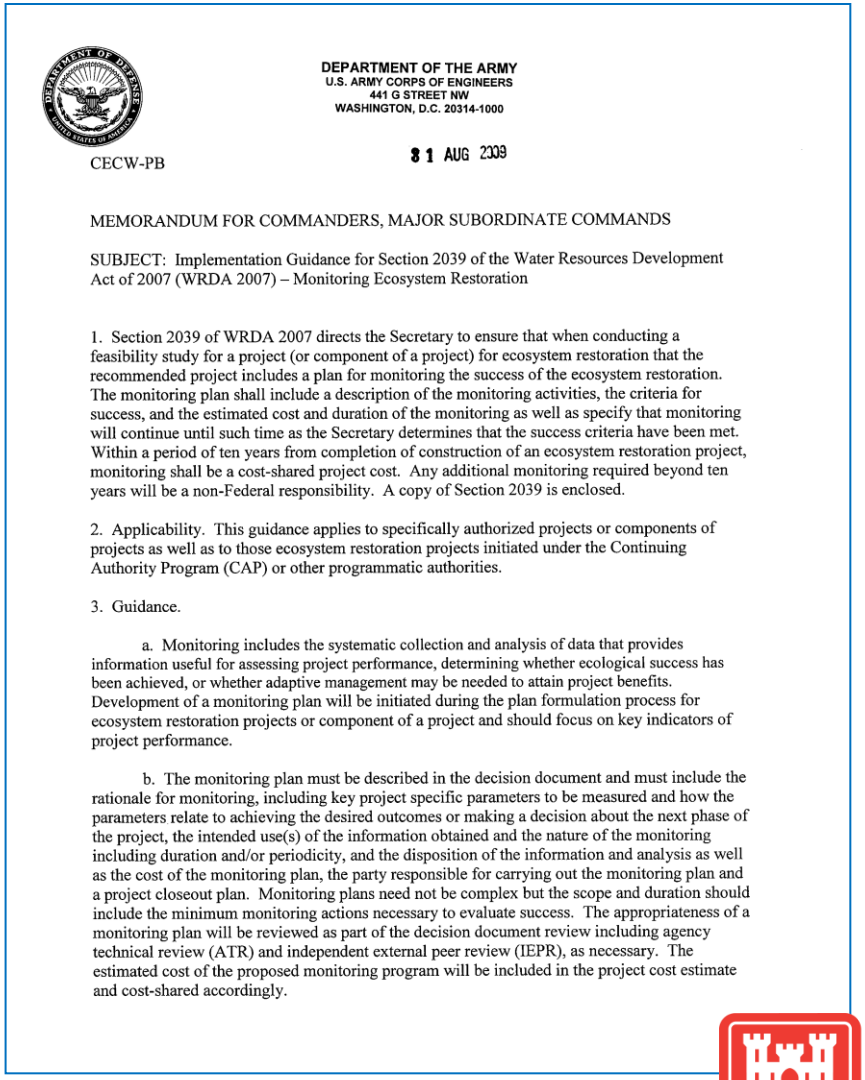
- **Adaptive Management Framework**
  - Applicability
  - Planning Phase
  - Implementation Phase
- **Project vs Programmatic Perspective**
  - Different Objectives and Scale
  - Funding and Governance Challenges
- **Return on Investment**

Background

Implementation Guidance for 2039 of WRDA '07

- M&AM plans prepared for every ER feasibility study
- Must be appropriately scoped to project scale and address:

  Rationale for monitoring & AM
  Metrics for success
  Performance standards
  Nature of planned adaptive management measures
  Cost
  Duration
  Disposition of information
  Responsible Parties



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CECW-PB

31 AUG 2009

MEMORANDUM FOR COMMANDERS, MAJOR SUBORDINATE COMMANDS

SUBJECT: Implementation Guidance for Section 2039 of the Water Resources Development Act of 2007 (WRDA 2007) – Monitoring Ecosystem Restoration

1. Section 2039 of WRDA 2007 directs the Secretary to ensure that when conducting a feasibility study for a project (or component of a project) for ecosystem restoration that the recommended project includes a plan for monitoring the success of the ecosystem restoration. The monitoring plan shall include a description of the monitoring activities, the criteria for success, and the estimated cost and duration of the monitoring as well as specify that monitoring will continue until such time as the Secretary determines that the success criteria have been met. Within a period of ten years from completion of construction of an ecosystem restoration project, monitoring shall be a cost-shared project cost. Any additional monitoring required beyond ten years will be a non-Federal responsibility. A copy of Section 2039 is enclosed.

2. Applicability. This guidance applies to specifically authorized projects or components of projects as well as to those ecosystem restoration projects initiated under the Continuing Authority Program (CAP) or other programmatic authorities.

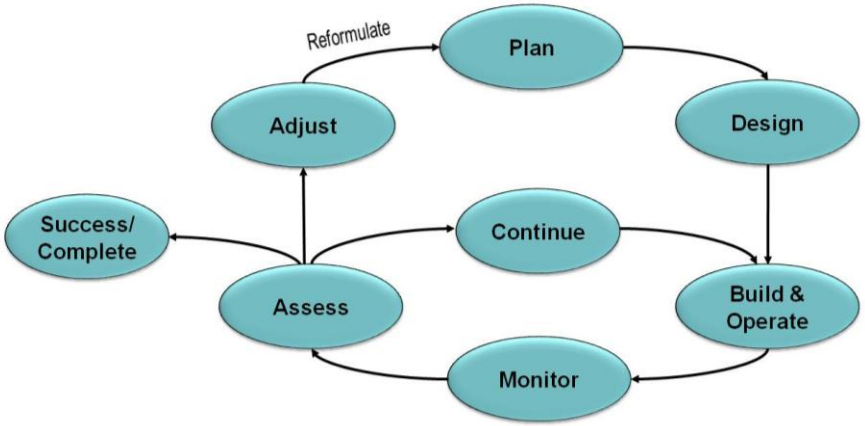
3. Guidance.

a. Monitoring includes the systematic collection and analysis of data that provides information useful for assessing project performance, determining whether ecological success has been achieved, or whether adaptive management may be needed to attain project benefits. Development of a monitoring plan will be initiated during the plan formulation process for ecosystem restoration projects or component of a project and should focus on key indicators of project performance.

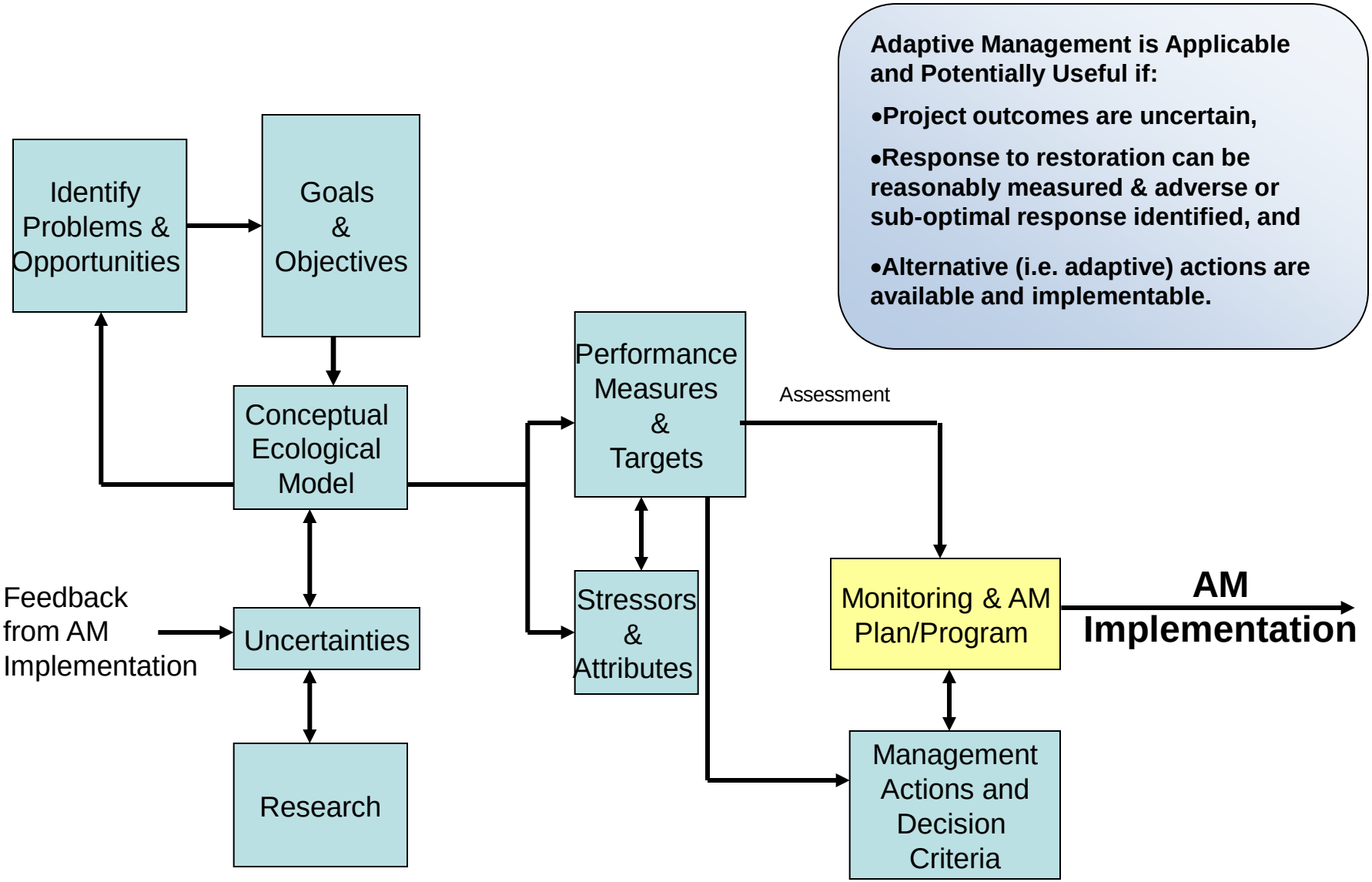
b. The monitoring plan must be described in the decision document and must include the rationale for monitoring, including key project specific parameters to be measured and how the parameters relate to achieving the desired outcomes or making a decision about the next phase of the project, the intended use(s) of the information obtained and the nature of the monitoring including duration and/or periodicity, and the disposition of the information and analysis as well as the cost of the monitoring plan, the party responsible for carrying out the monitoring plan and a project closeout plan. Monitoring plans need not be complex but the scope and duration should include the minimum monitoring actions necessary to evaluate success. The appropriateness of a monitoring plan will be reviewed as part of the decision document review including agency technical review (ATR) and independent external peer review (IEPR), as necessary. The estimated cost of the proposed monitoring program will be included in the project cost estimate and cost-shared accordingly.

AM Framework

- AM is NOT a trial and error process.
- AM is NOT a post-construction consideration.
- AM requires consideration of possible outcomes.
- Detail is project dependent, but should be sufficient to permit a reasonable cost estimate.
- Advocating a two phase process:
  - Set-up phase
  - Implementation phase

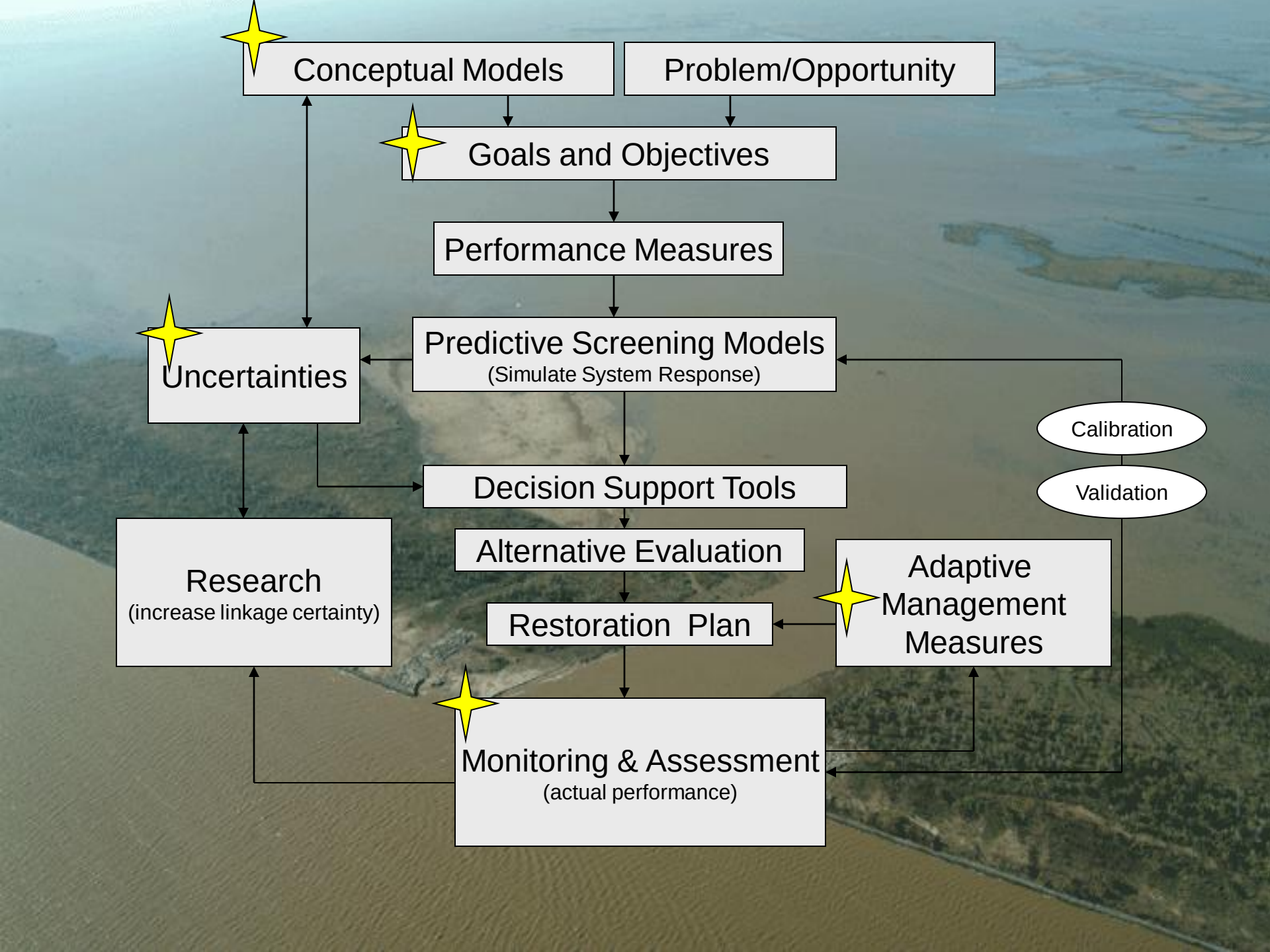


AM Set-up Phase



Example Questions

- What are the project goals and objectives?
- What are the expected project benefits and/or project outcomes? What would you regard as success?
- What are the key metrics, indicators and measures?
- How would you assess progress toward goals?
- What are the key constraints?
- What are the sources of significant uncertainty? How would you address these (monitoring, research, AM)?
- Can you anticipate any unintended consequences? Are there alternative project trajectories or project outcomes?
- Do all parties agree on the most effective design and operation to achieve project goals and objectives?
- What would you do if (fill in blank)?


Conceptual Models
Problem/Opportunity
Goals and Objectives
Performance Measures
Predictive Screening Models
(Simulate System Response)
Uncertainties
Calibration
Validation
Decision Support Tools
Research
(increase linkage certainty)
Alternative Evaluation
Adaptive Management Measures
Restoration Plan
Monitoring & Assessment
(actual performance)

Blind River/Maurepas Swamp Conceptual Ecological Model

INPUT DATA

Climate
- Storm severity/frequency
- Tides and wind
- Potential for climate change

Ecological Characteristics
- Vegetation composition and diversity
- Faunal composition and diversity
- Aquatic species composition and diversity

Hydrology & Hydraulics
- Blind River & Maurepas Swamp
- Upstream System
- Downstream System
- Within the system (network)

Pollutants
- Nutrients
- Salinity

Alternatives (Macro-level)
- Diversion Culverts/ Siphons
- Diversion & Flow Control Pumps
- Hydrologic Target Area(s)
- Distribution through network

ECOLOGICAL EVALUATION

PHYSICAL SYSTEM

Suite of Simulation models:
- Hydrology/Hydraulics
- Water quality
- Operations
- Ecosystem

DRIVERS

Natural Factors
- Subsidence
- Sea Level Rise
- Storms & Hurricanes
- Tides & Wind

Anthropogenic Factors
- Altered Hydrology
- Mississippi River Levees
- Drainage & Gas Line Canals

STRESSORS

Hydrologic Connectivity
- Too much water
- No dry periods
- Lack of distribution & Drainage

Reduced Sediment Input

Lack of Freshwater Input

Lack of Nutrients

ECOLOGICAL EFFECTS

Habitat Change (Vegetation, Fish & Wildlife)
- Switching • Stress • Lower Productivity
- Degradation

Water Quality
- ↑Salinity • ↓DO

Habitat Loss

OUTPUT: ECOLOGICAL ATTRIBUTES/PERFORMANCE MEASURES

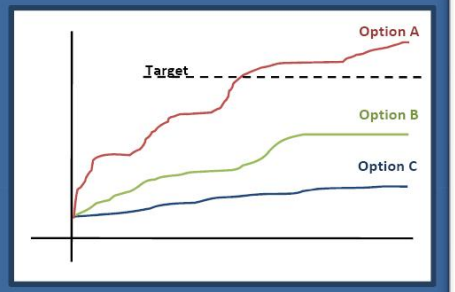
Hydroperiod
- Stage • Duration

Vegetation
- CRMS • WVA
- Cypress Regeneration

Elevation
- SET (accretion)
- Aerial Photography

Water Quality
- WQ Parameters
- Mass Balance of Nutrients and Sediment

Fish & Wildlife
- WVA
- Fish Sampling



CDM

Is Adaptive Management Needed?

QUESTIONS

Is there sufficient flexibility within the project design and operations that permits adjustment of management alternatives?

If No, adaptive management is not possible If Yes, continue with questions

Is the managed system well understood and are management outcomes readily predictable?

Do participants agree on the most effective design and operations to achieve goals and objectives?

Are the ecosystem restoration goals and objectives understood and agreed upon?

Are the goals and objectives for other USACE mission area applications understood and agreed upon?

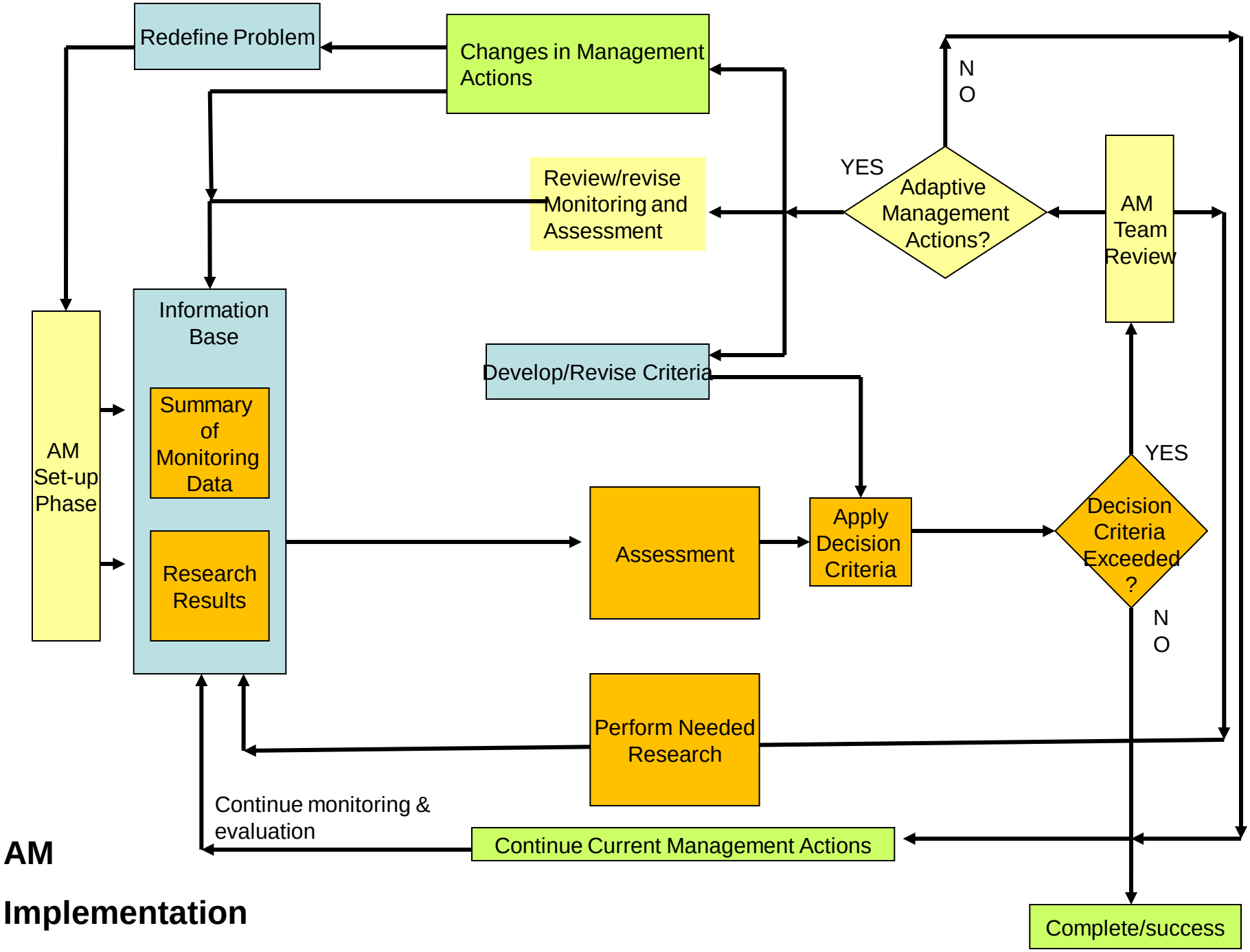
ANSWERS

Yes to all

Adaptive Management is not needed

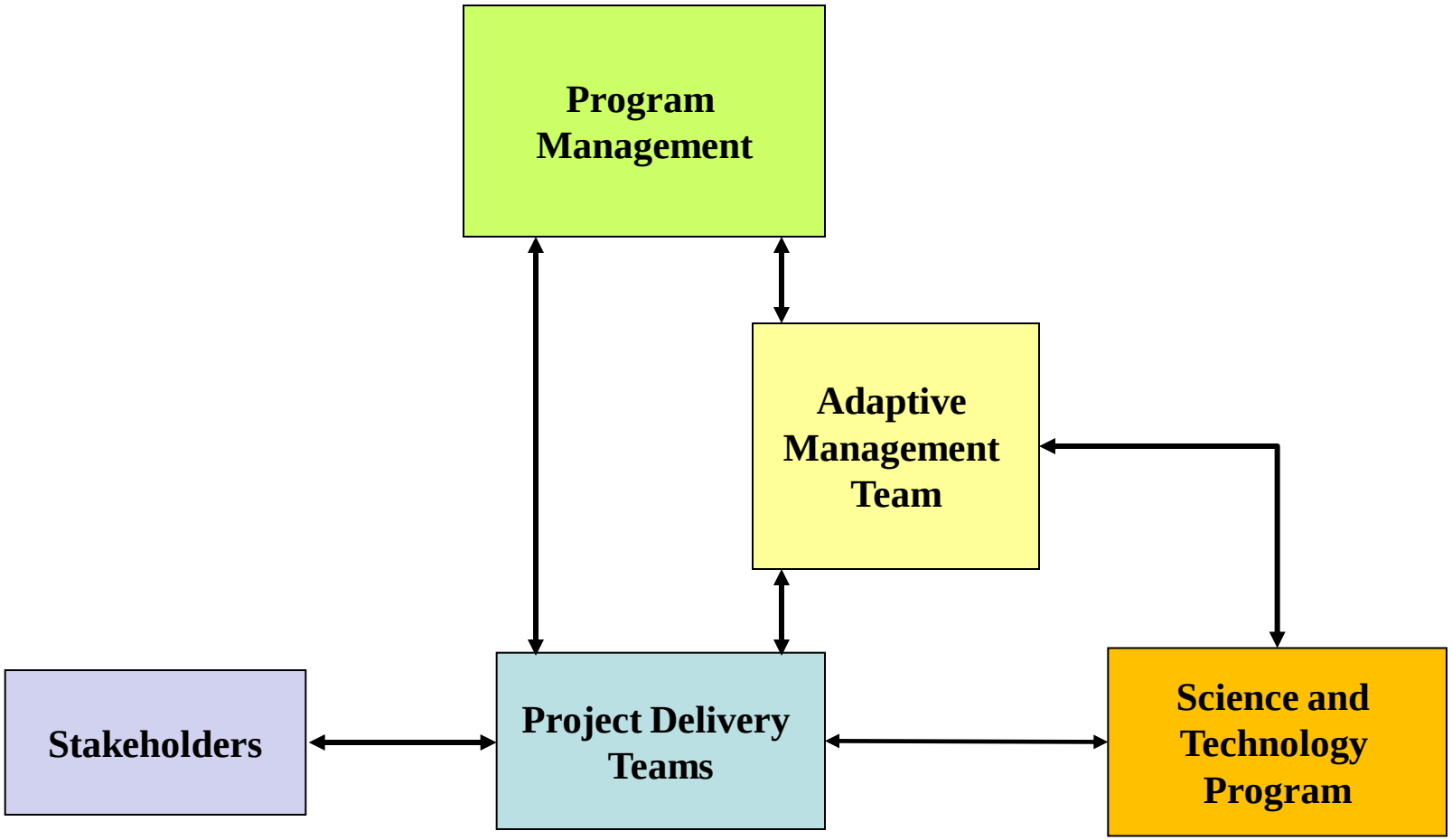
No to any

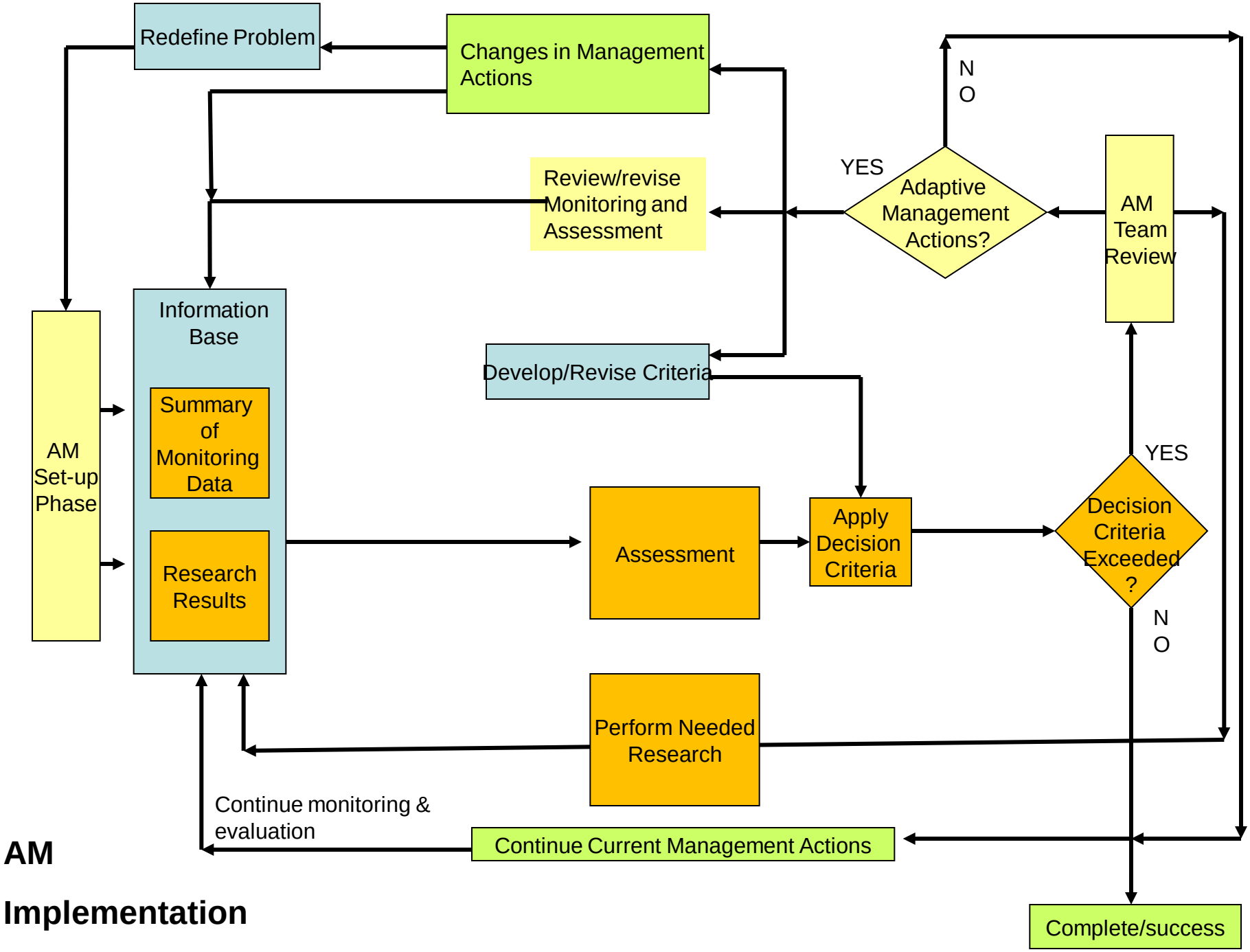
Adaptive Management can probably improve success



AM Implementation

Communication & Governance





AM Implementation

Plan Content

Louisiana Coastal Area Program:
Medium Diversion at White Ditch
Monitoring and Adaptive Management Plan

March 8, 2010
DRAFT

OFFICE OF
Coastal Protection
and Restoration

US Army Corps
of Engineers
New Orleans District

LCA Medium Diversion at White Ditch

Feasibility Level Adaptive Management Plan

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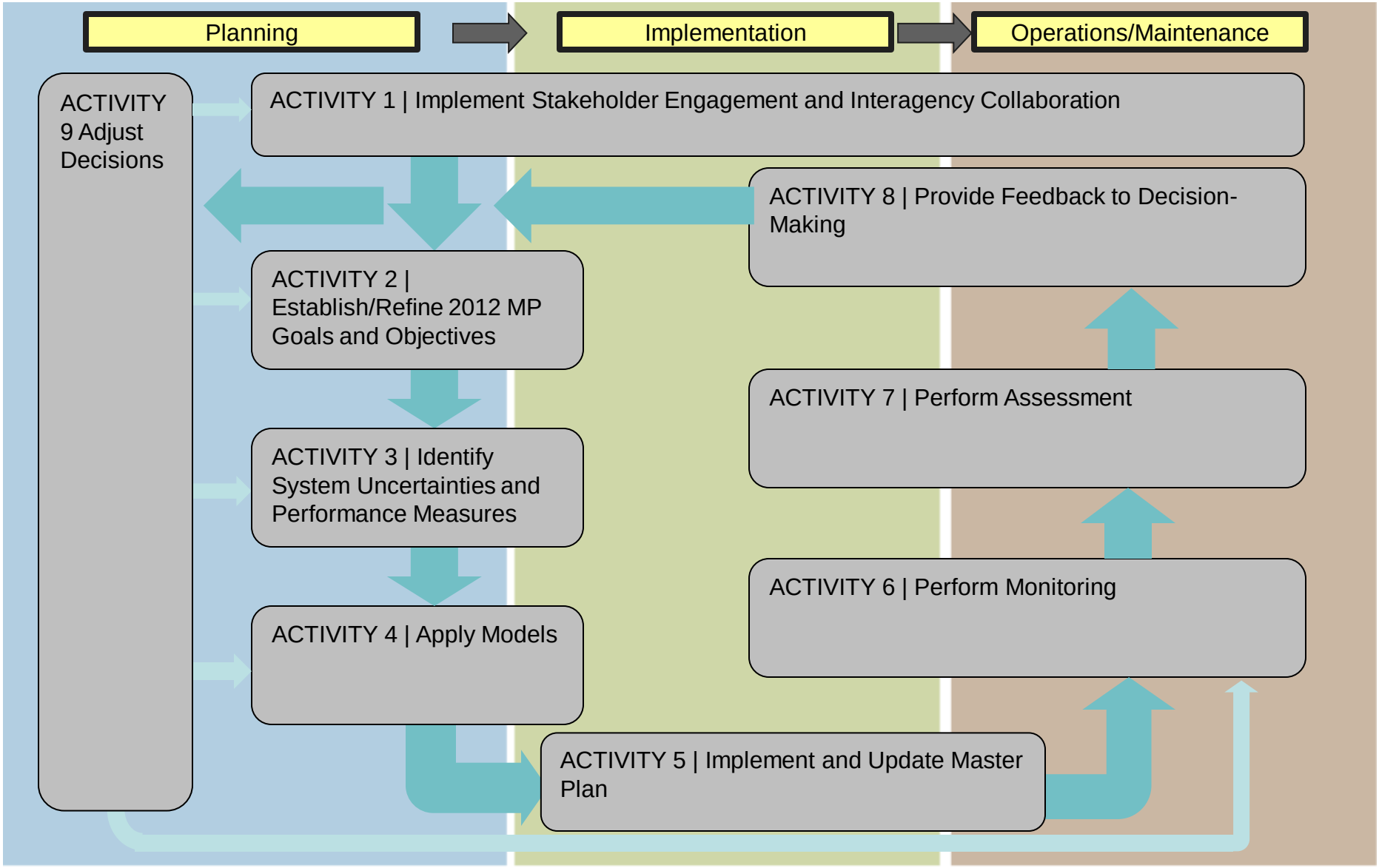
Providing Solutions to Tomorrow's Environmental Problems

A Few Lessons

- Development of an AM plan is as much about the *process* as it is the *product*.
- Not all projects lend themselves to AM.
- AM planning is a deliberative, detailed process involving the entire team and requiring careful consideration of uncertainties and outcomes.
- Governance is crucial and may be difficult to assure for some projects.
- Cost estimates are complicated by uncertainties.
- Refinement during PED is likely, and flexibility in implementation is probably needed.

Project vs. Programmatic View



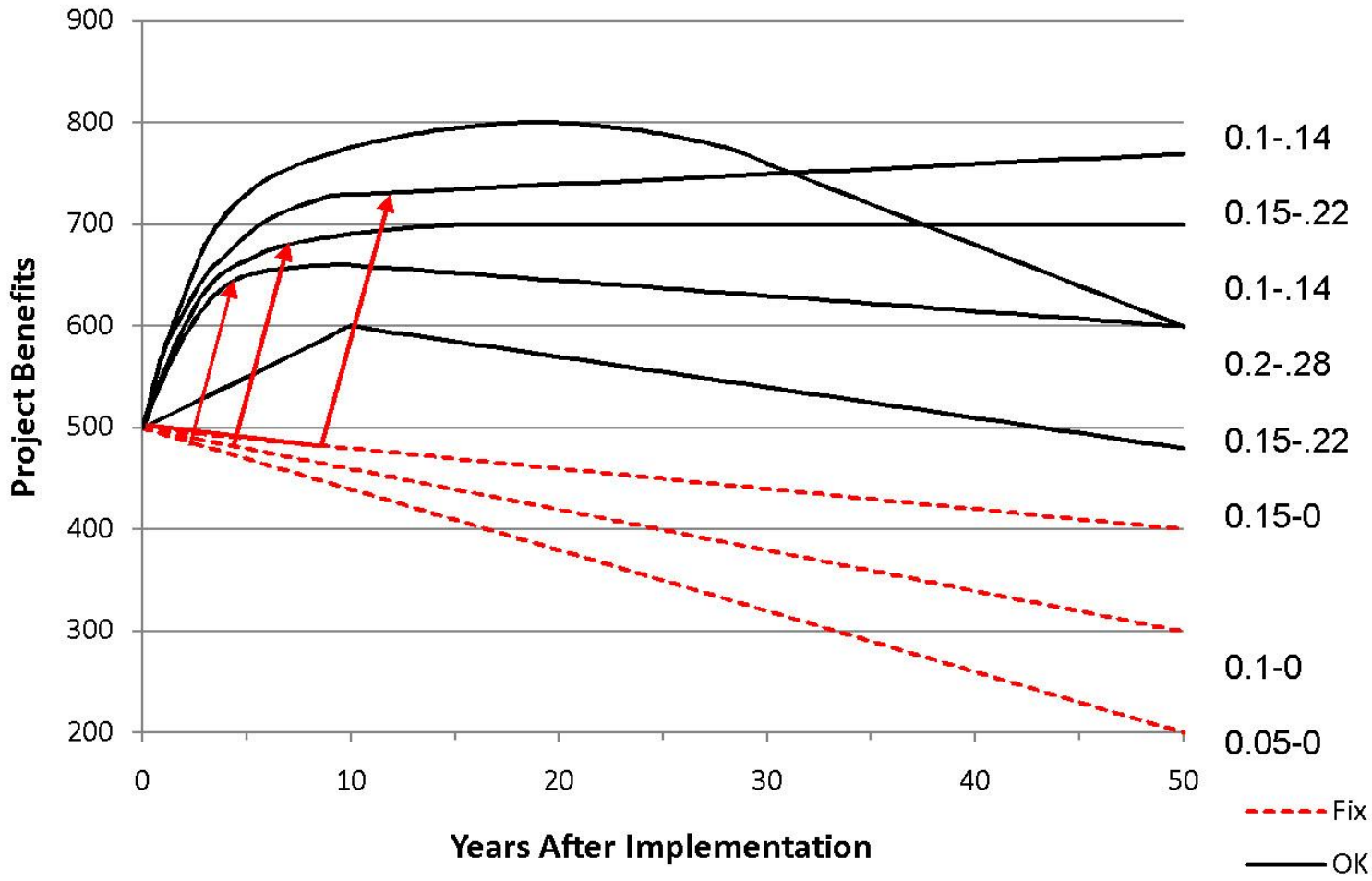
Programmatic vs. Project Scale

	Programmatic	Project
Objectives	• Reduce economic loss from storm-based flooding • Sustain Louisiana's unique culture & heritage	• Reduce salinity by X-ppt • Create X-acres salt marsh
Uncertainties	• Funding source & availability • Community/population changes	• River sediment load • Subsidence • Sea level rise
Performance Measures	• X-level of risk reduction • X-area able to support a variety of commercial and recreational activities	• Marsh accretion rate • Vegetation community
Management Adjustments	• Adjust project priorities or implementation schedule • Change discharges at multiple diversions	• Fill a channel to alter local drainage pattern • Adjust timing, duration or magnitude of a diversion

Benefits of Adaptive Mgt.

- Flexible alternatives increase the likelihood of achieving success across a broad range of future conditions.
- Enhances project planning detail with consequent improvements in selected plan.
- Fosters a more complete and common vision of project purpose and expected outcomes.
- Potential cost savings due to reduced project delays.
- Promotes long-term cost savings by incorporating flexibility and robustness into planning and implementation.
- Increased restoration knowledge and management flexibility to make better decisions for future projects and future project phases.
- Long-term collaboration with stakeholders to increase support for future restoration efforts.

Return On Investment



US Army Corps of Engineers

Ecosystem Restoration Gateway

ECO-PCX

Ecosystem Restoration Gateway

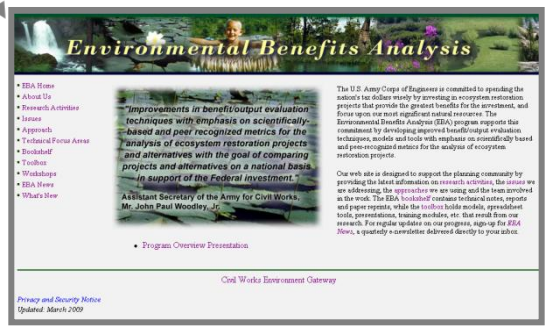
R&D SONS

Restoration Fact Sheets

Community of Practice

People
Learning
Best Practices

EBA – Research



http://cw-environment.usace.army.mil/