

What is Adaptive Management?

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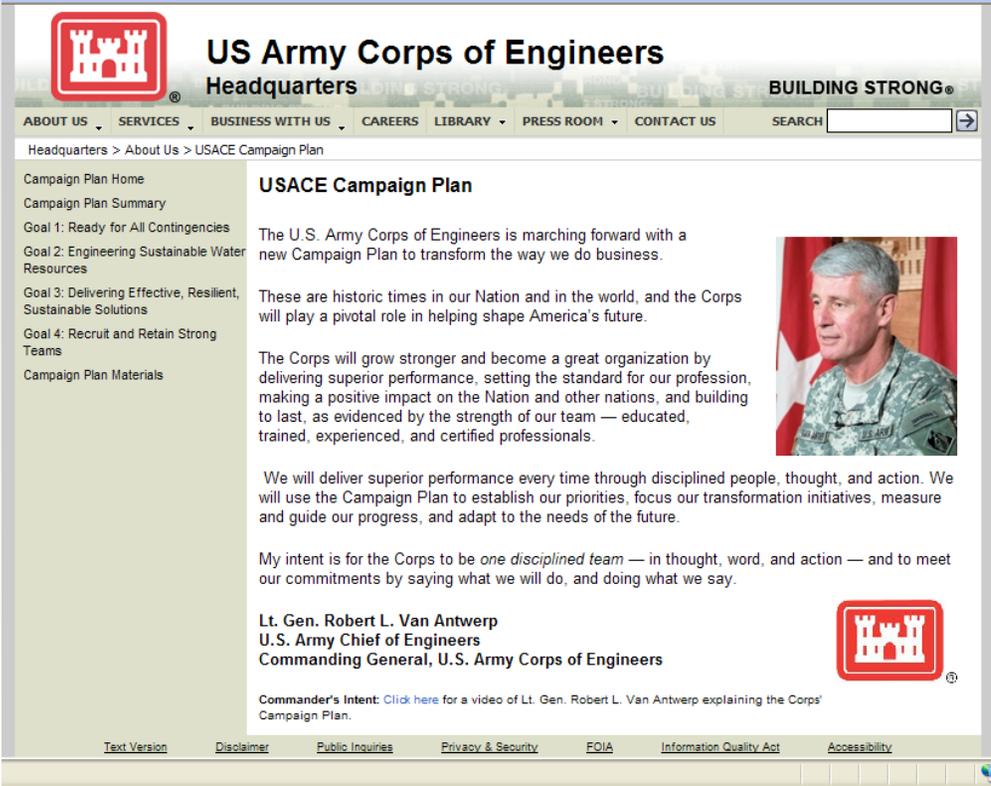
Guidance

Recently, guidance was issued for Section 2039 of WRDA 2007

A future Webinar focusing on the subject is likely

Adaptive Management Team

- Ken Barr, Upper Mississippi River
- Steve Bartell, E2 Consultants
- Tomma Barnes, Louisiana Coast
- Craig Fischenich, ERDC
- Brad Thompson, Missouri River and Small Projects
- Elmar Kurzbach, Everglades
- Andy LoSchiavo, Everglades
- Marci Cook, Columbia River
- David Vigh, Eco PCX
- Richard Thomas, Great Lakes



The screenshot displays the US Army Corps of Engineers Headquarters website. The page features the Corps logo (a red shield with a white castle) and the slogan "BUILDING STRONG®". The navigation menu includes "ABOUT US", "SERVICES", "BUSINESS WITH US", "CAREERS", "LIBRARY", "PRESS ROOM", and "CONTACT US". The main content area is titled "USACE Campaign Plan" and includes a sidebar with links to "Campaign Plan Home", "Campaign Plan Summary", and "Campaign Plan Materials". The main text describes the Corps' new Campaign Plan, stating: "The U.S. Army Corps of Engineers is marching forward with a new Campaign Plan to transform the way we do business." It also includes a quote from Lt. Gen. Robert L. Van Antwerp, U.S. Army Chief of Engineers, Commanding General, U.S. Army Corps of Engineers, who states: "My intent is for the Corps to be *one disciplined team* — in thought, word, and action — and to meet our commitments by saying what we will do, and doing what we say." The page also features a photo of Lt. Gen. Van Antwerp and a link to a video explaining the Campaign Plan. The footer contains links for "Text Version", "Disclaimer", "Public Inquiries", "Privacy & Security", "FOIA", "Information Quality Act", and "Accessibility".

What is Adaptive Management?

Adaptive management is an organized and documented undertaking of goal-directed actions, while evaluating their results to determine future actions.

Simply stated, adaptive management is doing, while learning in the face of uncertain outcomes.

According to the **National Research Council's 2004** Adaptive Management for Water Resources Project Planning, “Adaptive management promotes flexible decision making that can be adjusted in the face of uncertainties as outcomes from management actions and other events become better understood.

Origins of AM

Walters, C. 1986

Adaptive management of renewable resources.
New York: MacMillan Publishing Co.

NRC. 2004

Adaptive Management for Water Resource Planners
The National Academies Press, Washington, D.C.

Holling, C.S., 1978.

Adaptive environmental assessment and management.
New York: John Wiley & Sons

Lee, K. 1993

Compass and gyroscope: Integrating science and politics for the environment.
Washington D.C. Island Press.

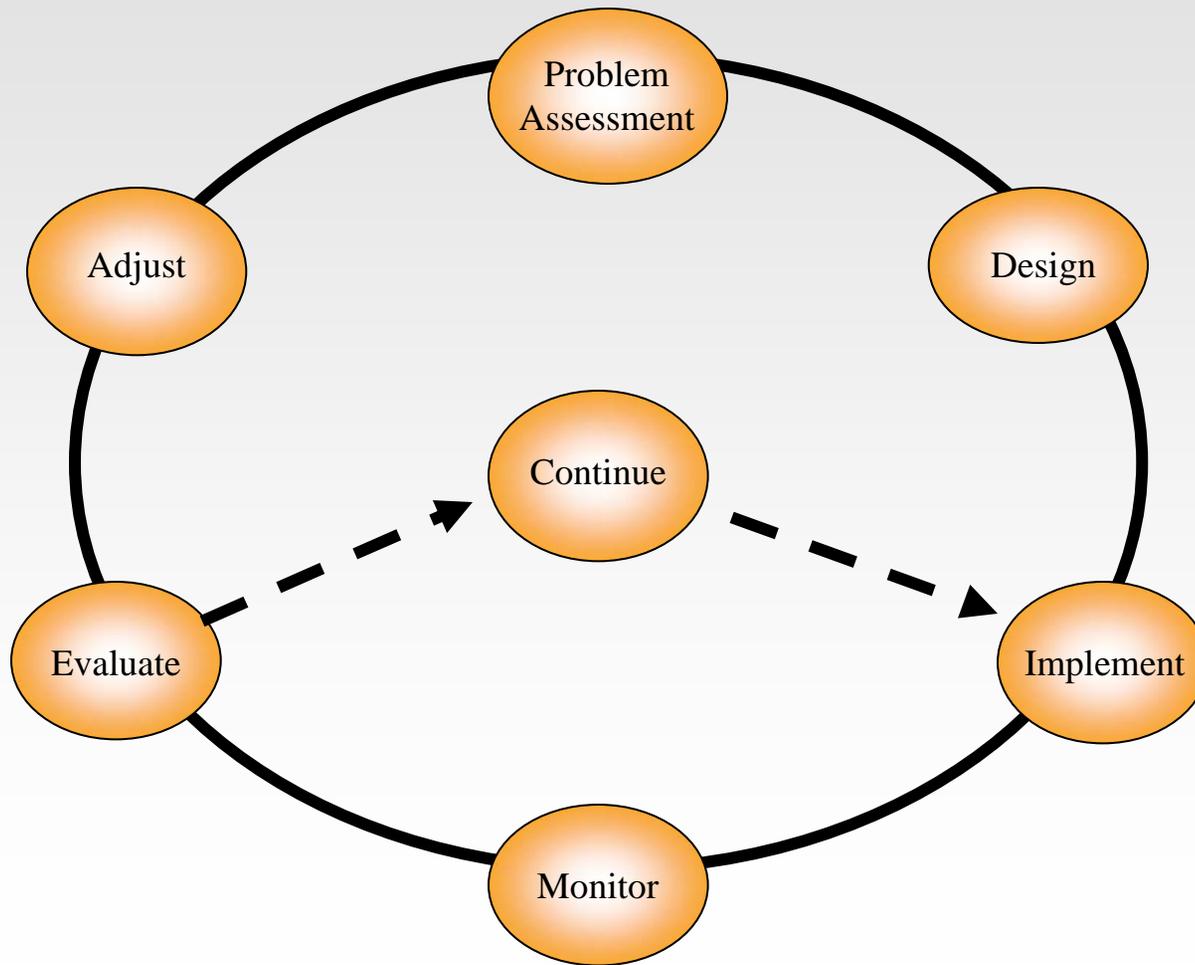
Williams, B.K., R.C. Szaro, and C.D. Shapiro. 2007.

Adaptive Management: US Department of the Interior Technical Guide.
Adaptive Management Working Group
US Department of the Interior,
Washington, DC

Nyberg, B. 1999.

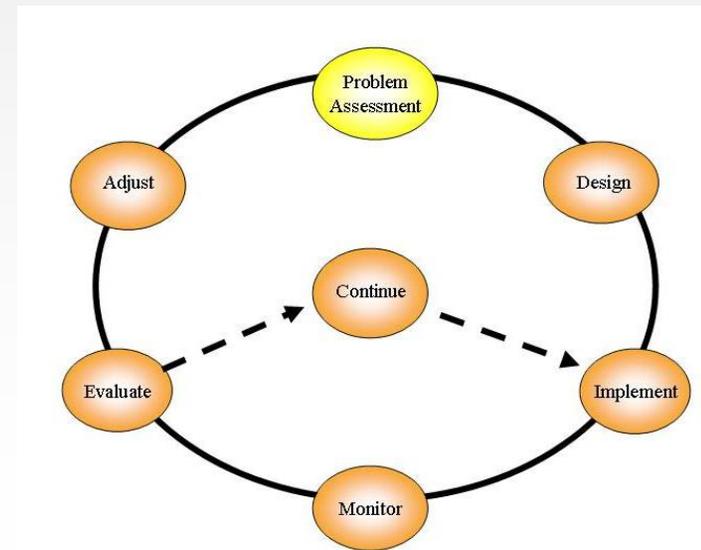
An introductory guide to adaptive management for project leaders and participants.
Victoria, British Columbia: BC Forest Service.

Fundamentals of Adaptive Management



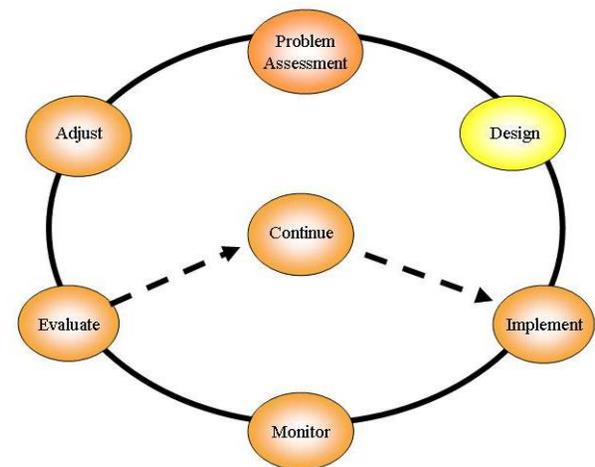
Problem Assessment

- Define the scope of management problem
- Synthesize existing knowledge about system
- Explore the potential outcomes of alternative management actions.
- Forecasts outcomes to assess actions
- Identify gaps in understanding of the system

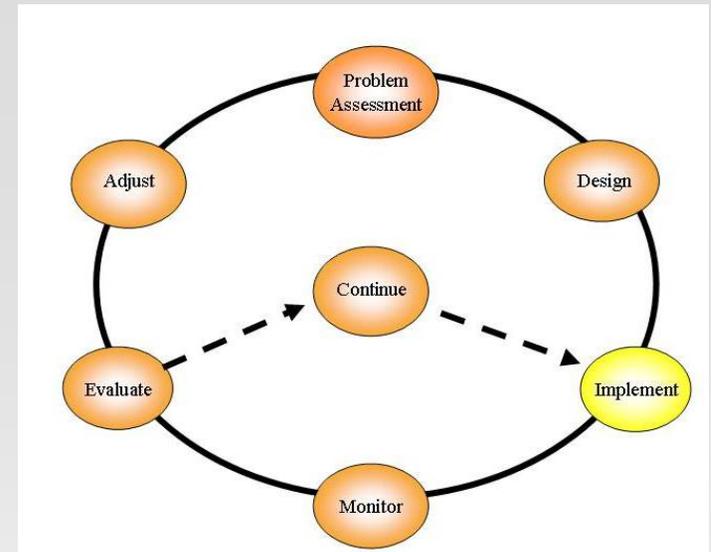


Design

- Adaptive management plan and monitoring program
- Provide reliable feedback about the effectiveness of the chosen actions.
- Design to yield information that will fill the key gaps in understanding identified in Step 1
- Evaluate one or more proposed plans or designs based basis on
 - costs,
 - risks,
 - informativeness
 - ability to meet objectives.



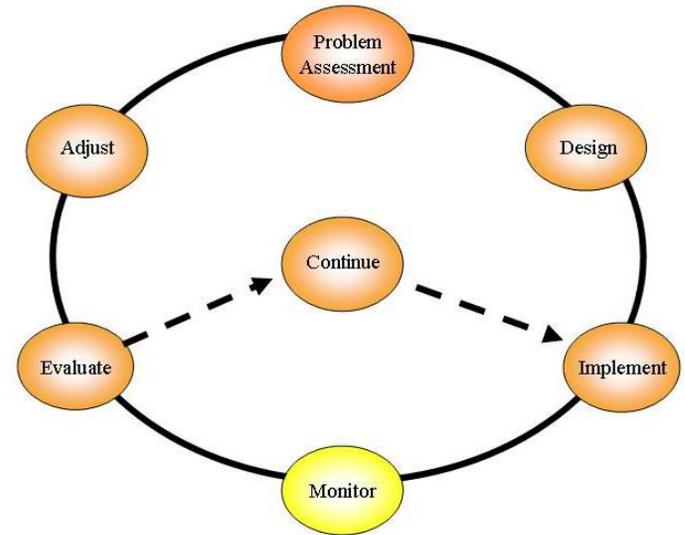
Implement



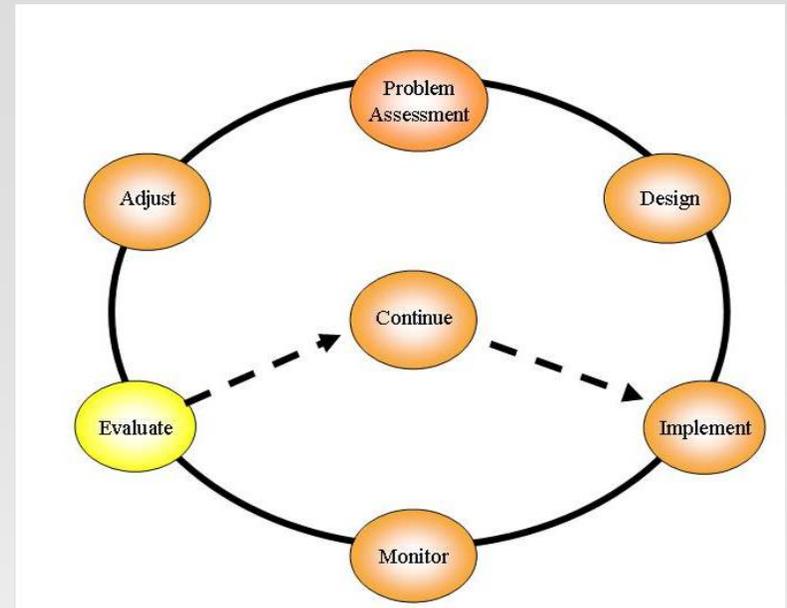
- the plan is put into practice.

Monitor

- Indicators monitored
 - To evaluate progress toward achieving objectives
 - To determine resource status, in order to identify appropriate management actions
 - To increase understanding of resource dynamics via comparison of predictions against monitoring results
 - To enhance and develop models of resource dynamics as needed and appropriate

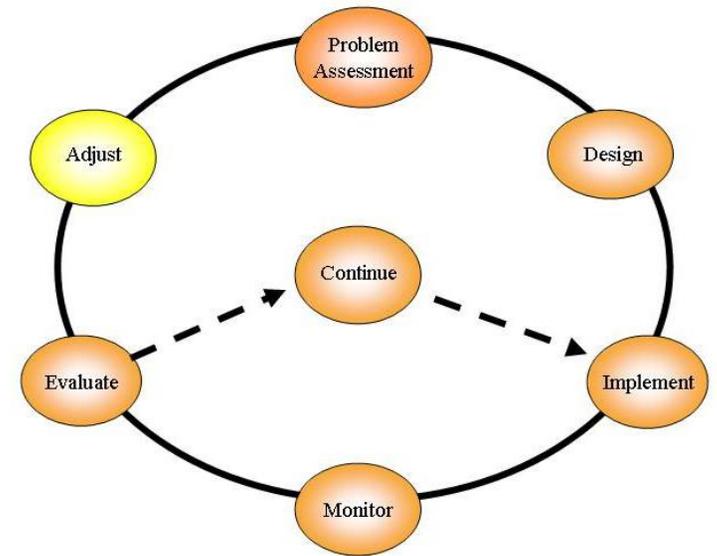


Evaluate



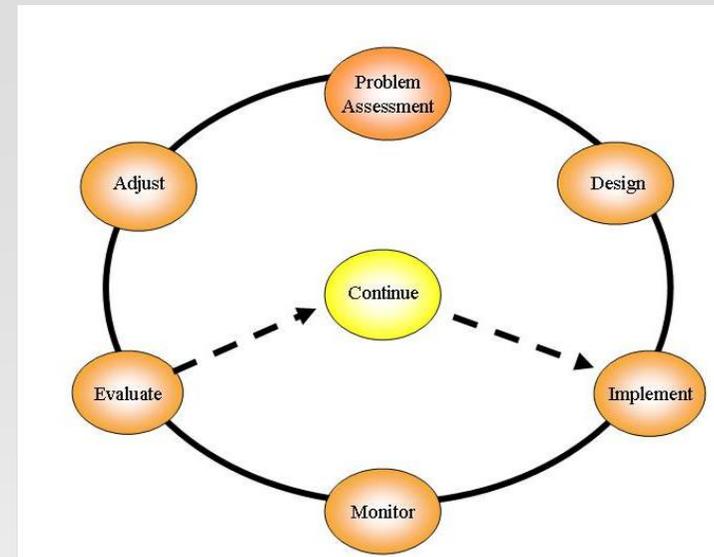
- Comparing the actual outcomes to forecasts
- Examine the reasons underlying any differences

Adjust



- Adjust practices, objectives, and the models to reflect new understanding
- May result in reassessment of the problem, new questions, and new options

Continue



- Continue to implement if no adjustment as needed

Adaptive Management

- Monitoring outcomes:
 - advances scientific understanding
 - helps adjust policies or operations
- Recognizes the importance of natural variability in contributing to ecological resilience
- Does not represent an end in itself - rather a means to more effective decisions and enhanced benefits
- Measure is in how well it helps meet:
 - Environmental, Social, & Economic goals
- Reduces tensions among stakeholders

Evolutionary AM “*trial and error*” or “*learning by doing*”
approach

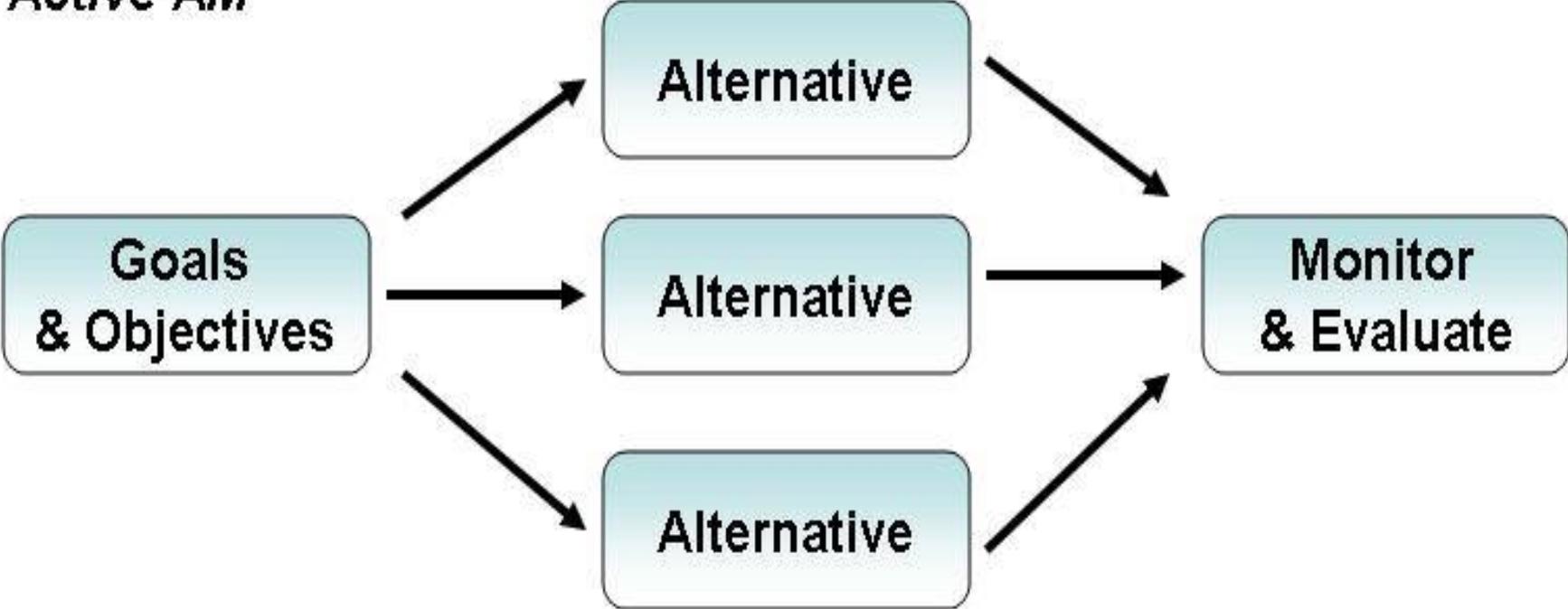
Passive AM reduces uncertainty by using historical data to develop “best guess” hypotheses describing ecological cause-and-effect relationships, and tests them using a single design or operational plan for achieving a desired hydrological or ecological response.

Active AM reduces uncertainty by designing management experiments (field tests) to test multiple hypotheses about how to achieve a desired hydrological or ecological response.

Passive AM



Active AM



Key features of both passive and active adaptive management are

- Iterative decision-making (evaluating results and adjusting actions on the basis of what has been learned)
- Feedback between monitoring and decisions (learning)
- Embraces risk and uncertainty as a way of building understanding

What are the benefits to AM?

- Improved probability of project/program success
- Precautionary approach to act in the face of uncertainty
- Forum for dialogue between scientists and managers
- Encourages robust alternatives with performance-based versatility
- Provides a forum for stakeholder engagement and promotes interagency collaboration and conflict resolution

What are the benefits to AM?

- Employs formal science-based approach to address structural, operational, and scientific questions
- Allows for restoration progress by addressing uncertainty through learning
- Promotes restoration success by anticipating uncertainties during project/program planning and allowing for adjustment during implementation
- Incorporates flexibility and robustness into project/program design, implementation, and operations

These benefits are the reasons why AM is a desired approach for programs/projects faced with a multitude of uncertainties that affect the chances of meeting their goals and objectives.

AM may not need to be applied to all facets of programs/projects, but in cases where uncertainties are prohibiting progress, AM may be the best way to move forward with implementation.

Misperceptions about Monitoring and Adaptive Management

- Reflects lack of good planning
- Corps is not a scientific research agency
- Additional costs to already overcommitted budget
- Corps authorities do not easily allow years of post construction cost shared monitoring & AM
- Not well defined - not closely tied to goals & objectives, performance metrics, decision points, and cost estimates
- AM is a box off to the side and doesn't really affect "us"
- AM is a science thing only
- We are already doing AM – it is just spread out in bits and pieces of current project planning, implementation, and monitoring – no need for a separate identifiable and accountable AM program with associated costs

Not all decisions can or should be adaptive

- No opportunity to apply learning
- Little uncertainty about what action to choose
- Disagreement about objectives

When Should Adaptive Management be Used?

- Management choices are available
- There is an opportunity to apply learning
- Management objectives can be identified
- Uncertainty can be expressed as testable models
- A monitoring system can be established to reduce uncertainty

When to Apply AM

Questions

1. Is the ecosystem to be restored well understood and readily predictable?
2. Do all parties agree on the most effective design and operation to achieve project goals and objectives?
3. Are the targets or endpoints for restoration well understood and agreed upon by all parties?

If the answer is

YES
to all

There is no need to
invest in AM

NO to
any

AM application will
improve probability
of project success

Return on the investment

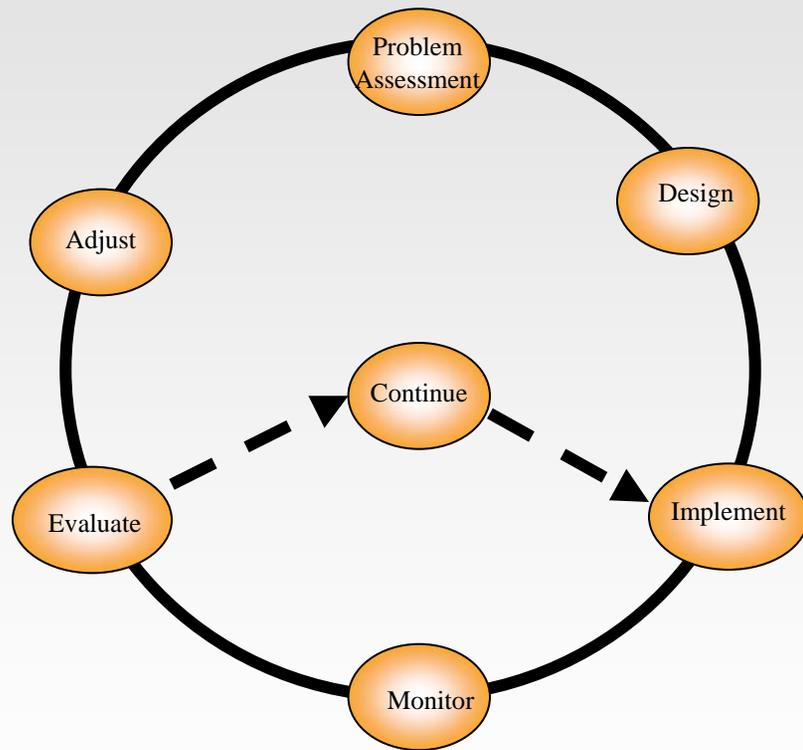
- Long-term cost savings by reduced likelihood of adding new projects or removing old because risk of not meeting goals has decreased
- Potential cost savings by reduced legal issues and policy delays
- Increase likelihood of achieving restoration goals and objectives
- Increased restoration knowledge and management flexibility to make better decisions for future projects and future project phases
- Long-term collaboration with stakeholders to increase support for USACE and other agency restoration efforts

Reasons for Failure

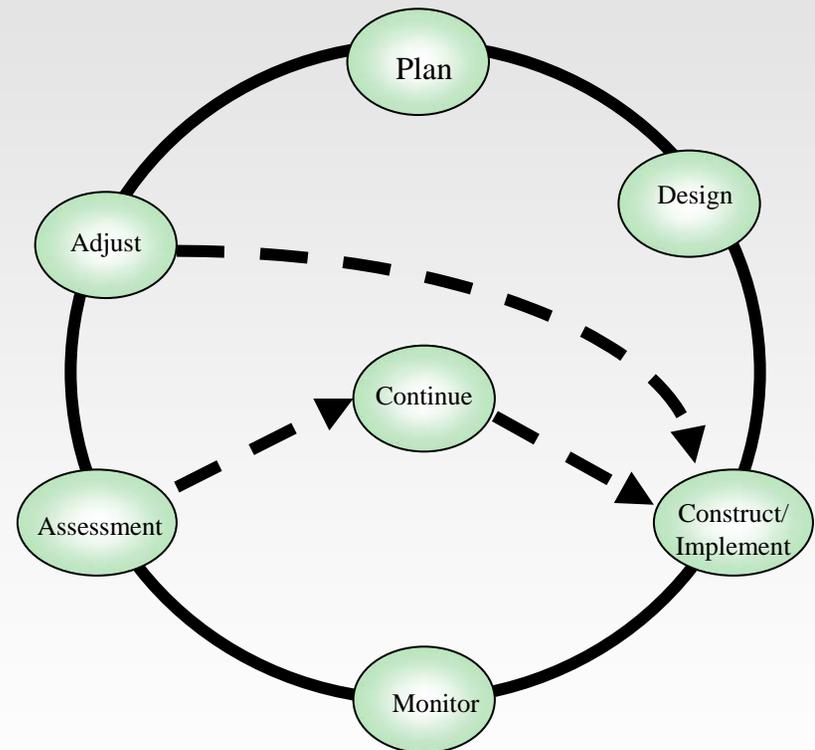
- The monitoring is never completed
- The monitoring data are not analyzed
- The analyzed results are not conclusive
- The analyzed results are interesting but never reach decision makers
- The decision makers do not use the results because of internal or external factors

AM and Corps Planning Process

AM and Corps Planning Process

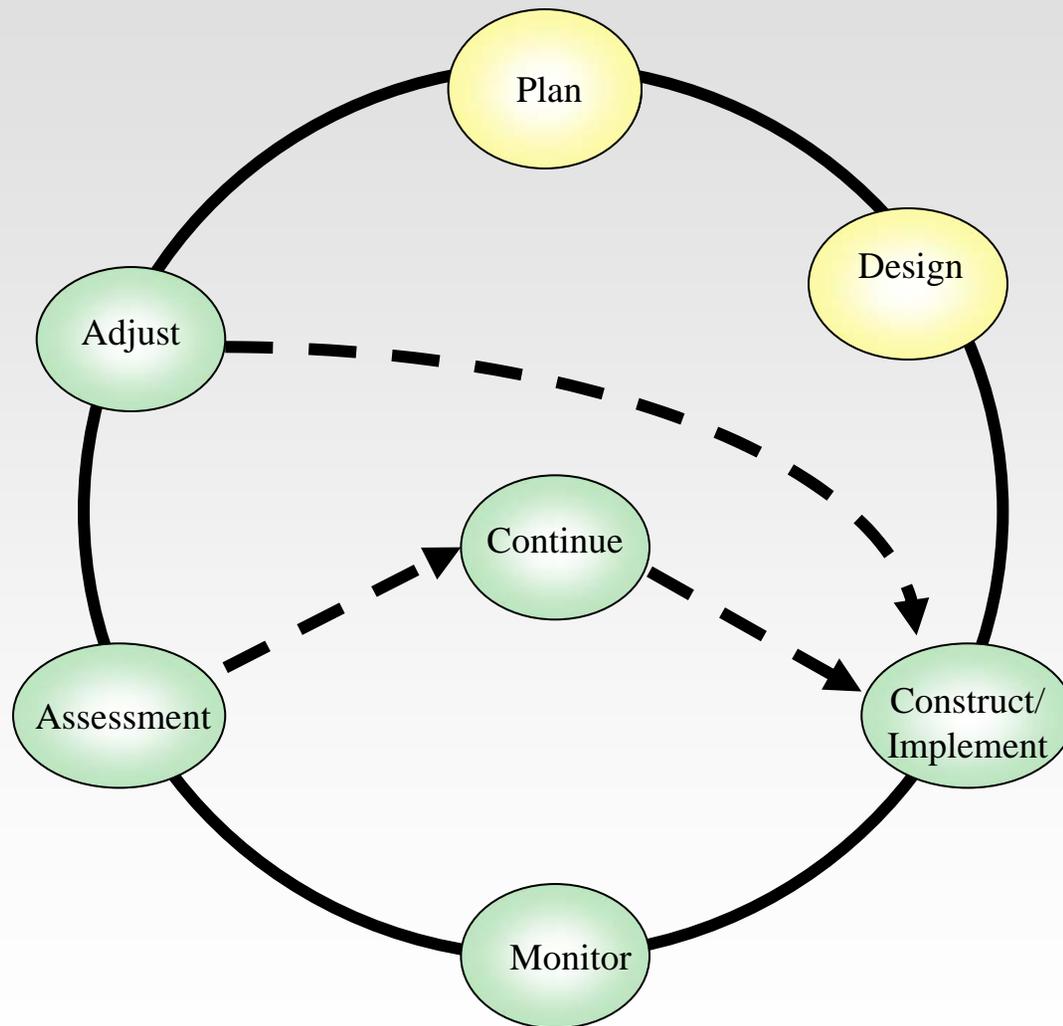


Traditional AM Process



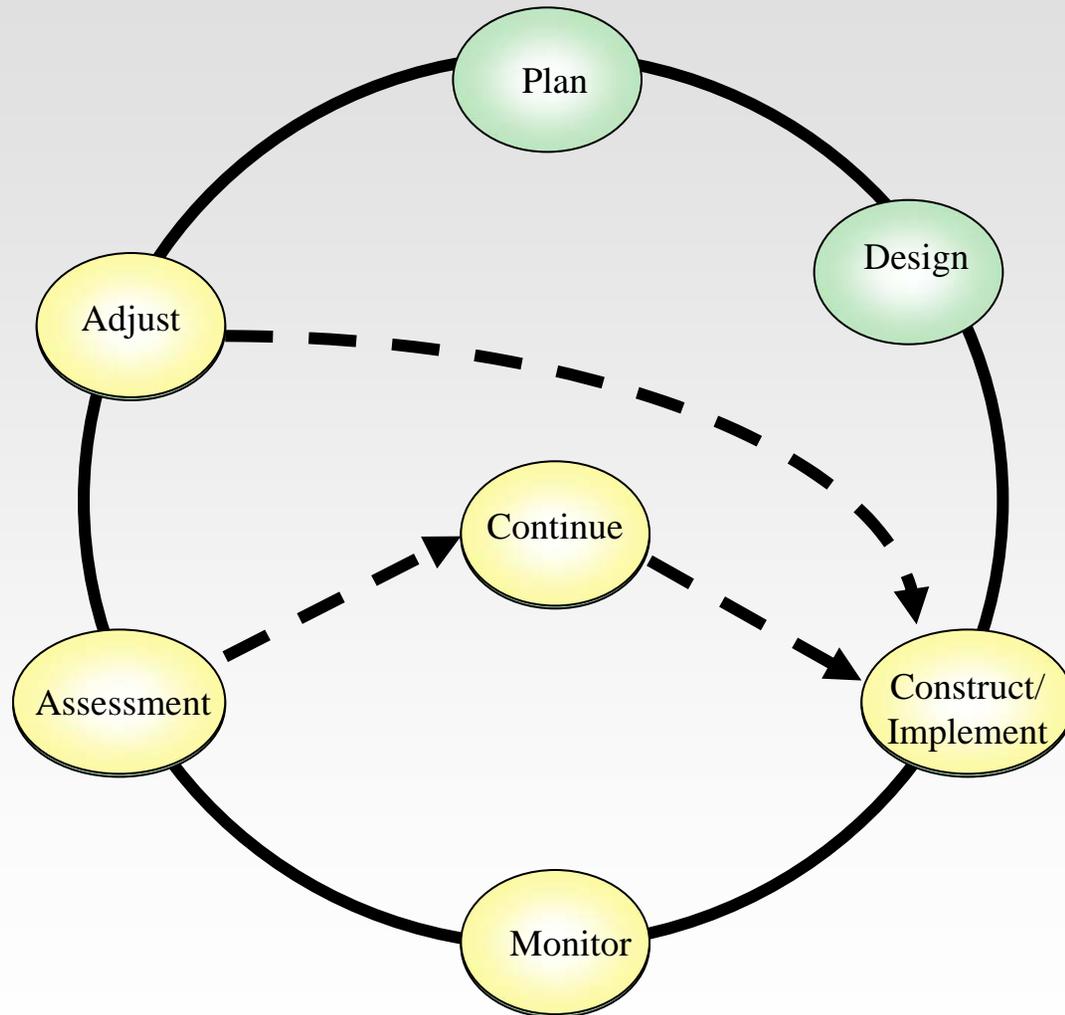
Corps AM Process

Set-up Phase



- stakeholder involvement
- defining management objectives, identifying potential management actions
- identifying or building predictive modeling tools
- specifying performance measures and/or risk endpoints
- creating monitoring plans with values for the monitored measures that would trigger AM
- plan is selected and designed

Iterative Phase

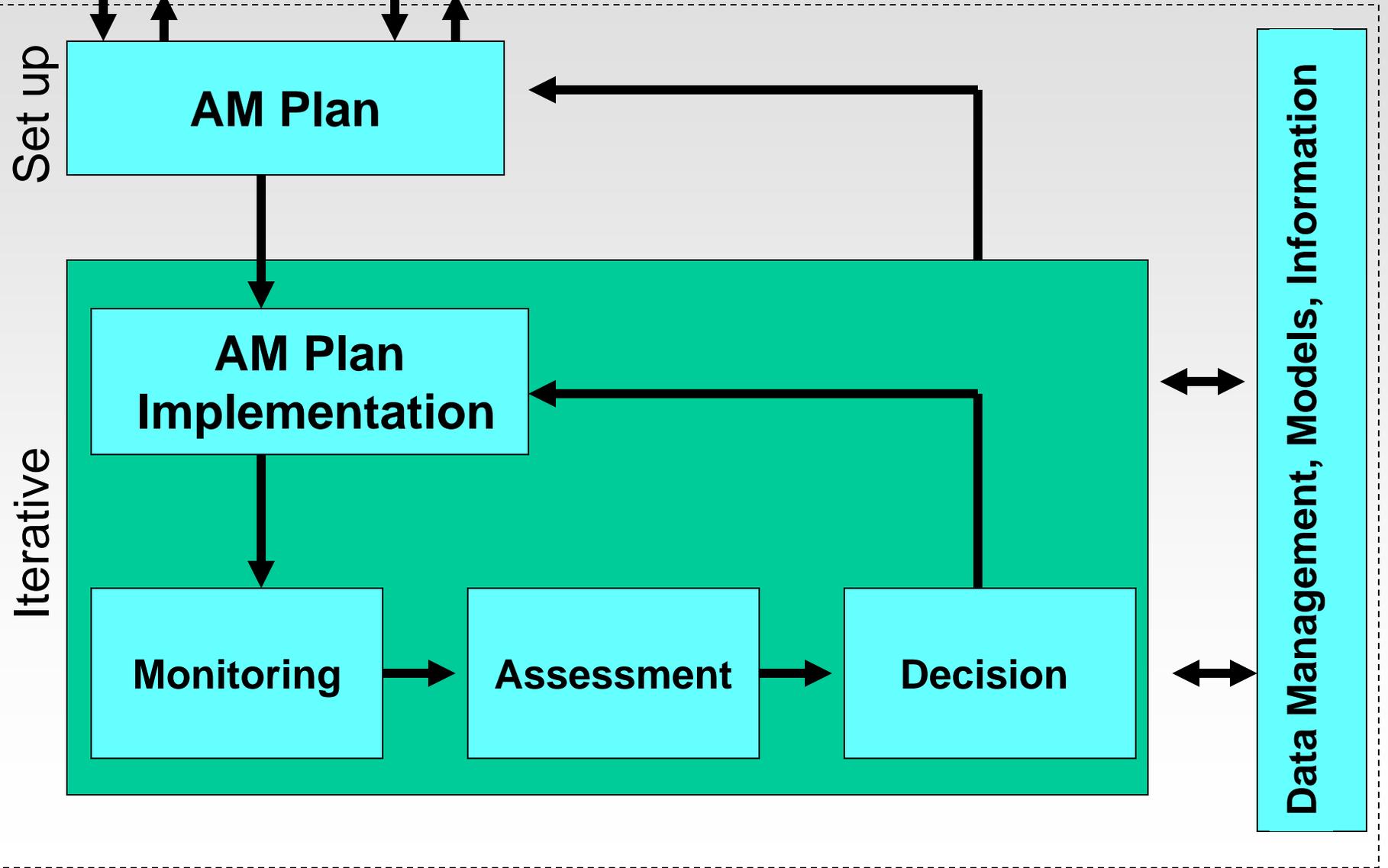


- construction and operation
- where the actual implementation of the AM process begins
- includes monitoring and assessment and adjusting, if deemed necessary
- uses these elements in an ongoing cycle of learning about system structure and function, and manages based on what is learned.
- elements include monitoring, assessment, and decision making (continue with implementation or move to reformulation)

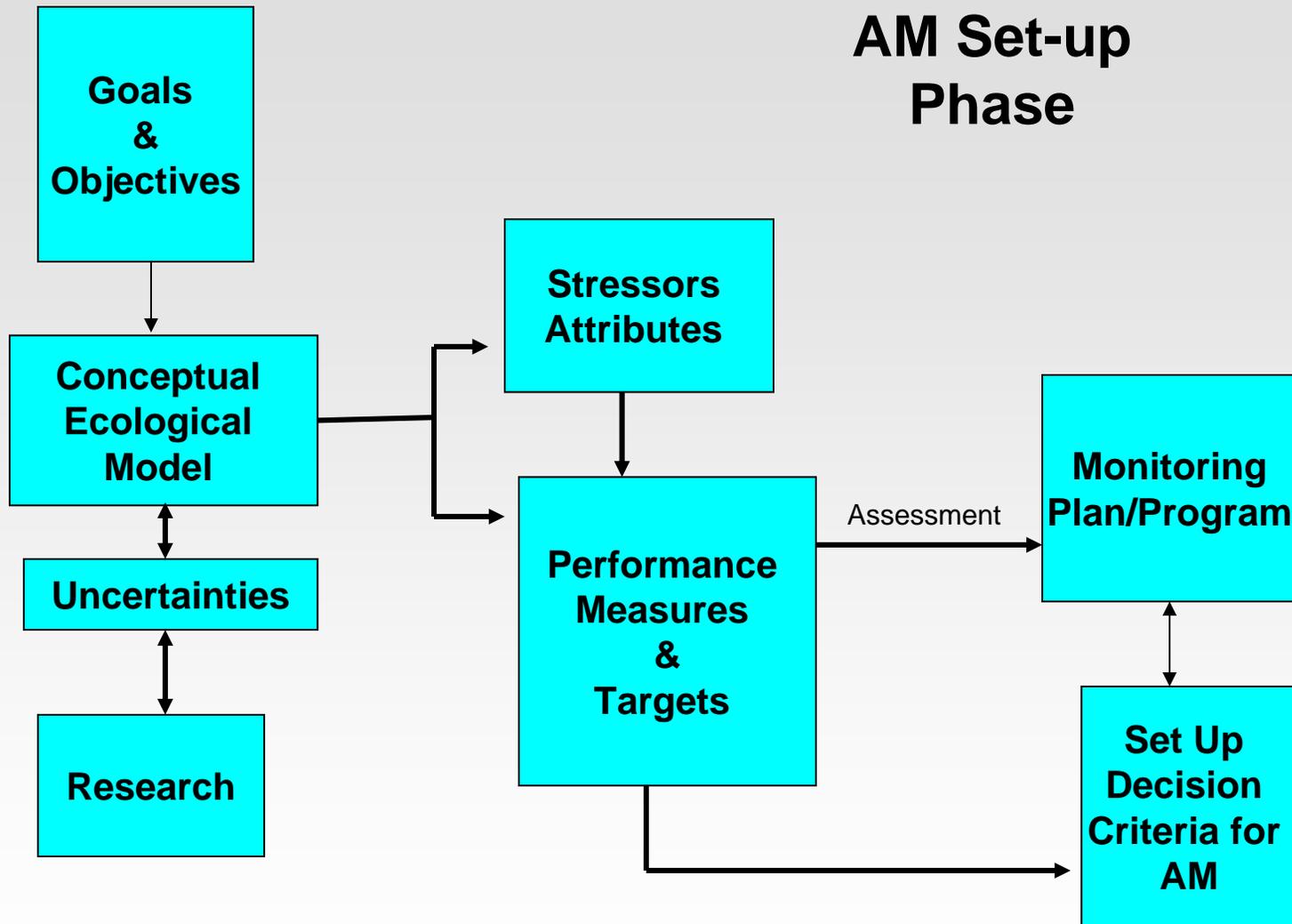
Crosswalk of Traditional Corps Process & AM Process

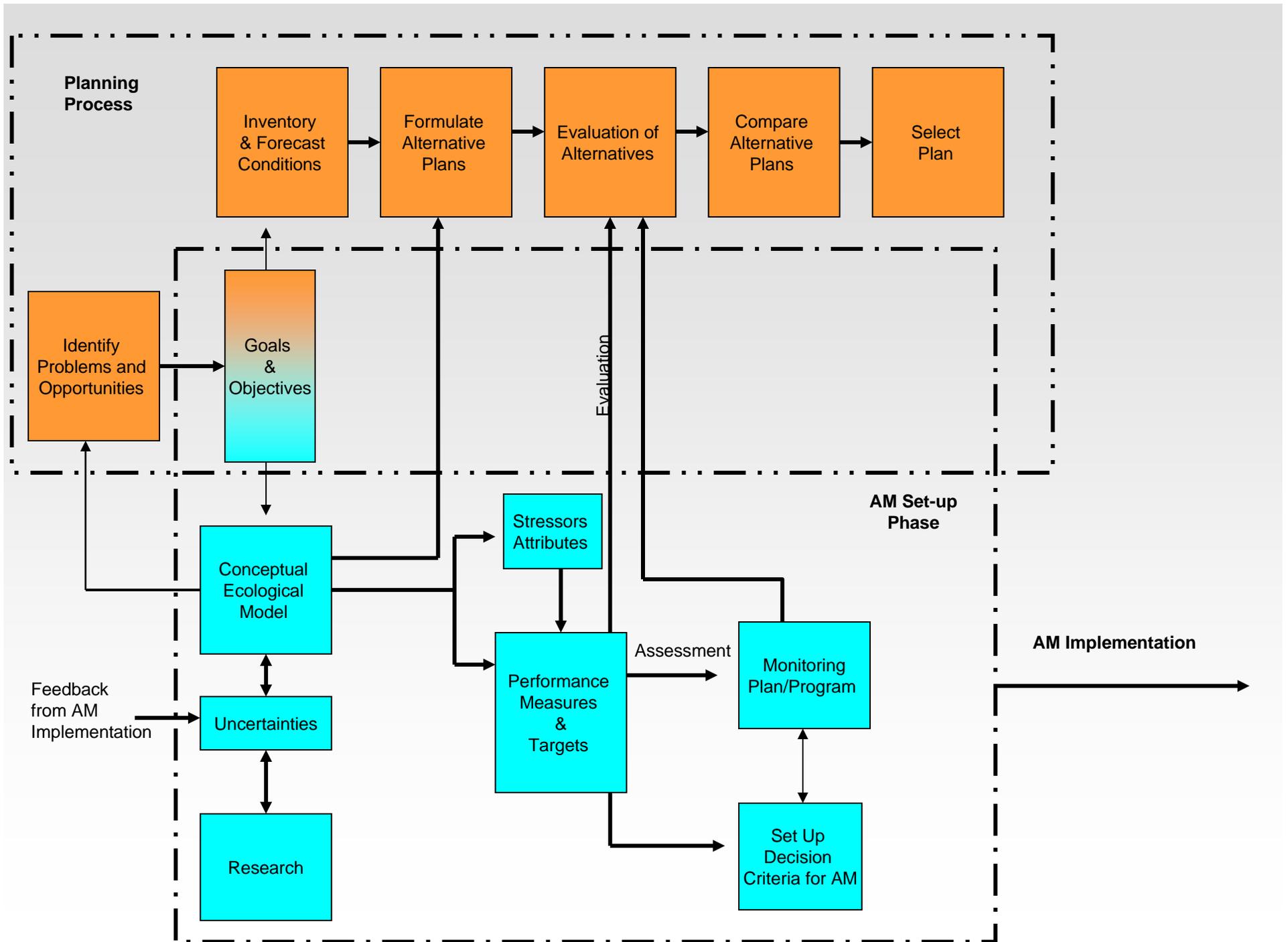
Traditional Corps CW Steps	Adaptive Management Process
Identify Problems and Opportunities	Plan / Assess Problem
Inventory and Forecast	
Formulate Alternative Plans	
Evaluate Alt Plans	
Compare Alt Plans	
Select Recommended Plan	
Design	
Construct/Implement	Implement
Operate and Maintain	Monitor
	Evaluate
	Adjust

Set-up and Implementation



AM Set-up Phase





AM Conceptual Planning (Set-up)

- Stakeholders
- Adaptive Management Team
- Goals and Objectives
- Management and Restoration Actions
 - Conceptual Ecological Models
 - Stressors and Attributes
 - Performance Measures and Targets
 - Uncertainties
- Monitoring Program
- Assessment
- Decision Criteria
- Decision-making Process
- Scale and Complexity
- Plan for Adaptive Management

Stakeholder Involvement/Collaboration

- Identified and involved early in project planning process
- Critical Component of AM
- Actively engages in problem solving
- Committed to AM for duration of project
- Benefits
 - builds better understanding among stakeholders
 - promotes relationships and trust
 - provides opportunity for cooperative learning
 - provides a mechanism to identify and address key issues and concerns
 - creates networks for honest dissemination of new understanding as the project/program unfolds
 - enables development of creative solutions that address the unique mix of stakeholder interests
 - increases the likelihood of program/project success

Adaptive Management Team

- Responsible for implementation of AM plan
- Should be clearly identified
- Consist of planners, scientists, engineers, and decision-makers involved in the planning process
- Team should be formalized
- Possible augmentation during the AM process by individuals with special technical skills or management experience uniquely required by the particular AM program
- Operating Principles

Goals and Objectives

- Must be useful for Decision Making and Evaluation
 - Specific/Clearly Focused
 - Measurable
 - Achievable
 - Results-oriented
 - Time-fixed
- Identified at beginning of the planning process
- Linked to management actions
- Linked problems to opportunities
- Address stakeholder values

Management and Restoration Actions

- Must translate management and restoration goals and objectives into specific performance measures and risk endpoints
- Use conceptual ecological models
- Create as set of physical, chemical, biological, and ecological endpoints that will be used to characterize risk endpoints
- Identify uncertainties
 - Research

Set-up Monitoring Program

- Evaluated project performance in relation to management goals and objectives or risk endpoints
- Technologies for acquiring the necessary data and information
- Methods for data analysis and summarization
- Degrees of accuracy and precision
- Units of measure and reporting
- Data management system

Assessment

- Identify process by which the results of monitoring efforts will be compared to the desired project performance measures/acceptable risk endpoints that reflect the goals and objectives of actions
- Address the frequency and timing for comparison of monitoring results
- Nature and format of these comparisons

Decision-making Process

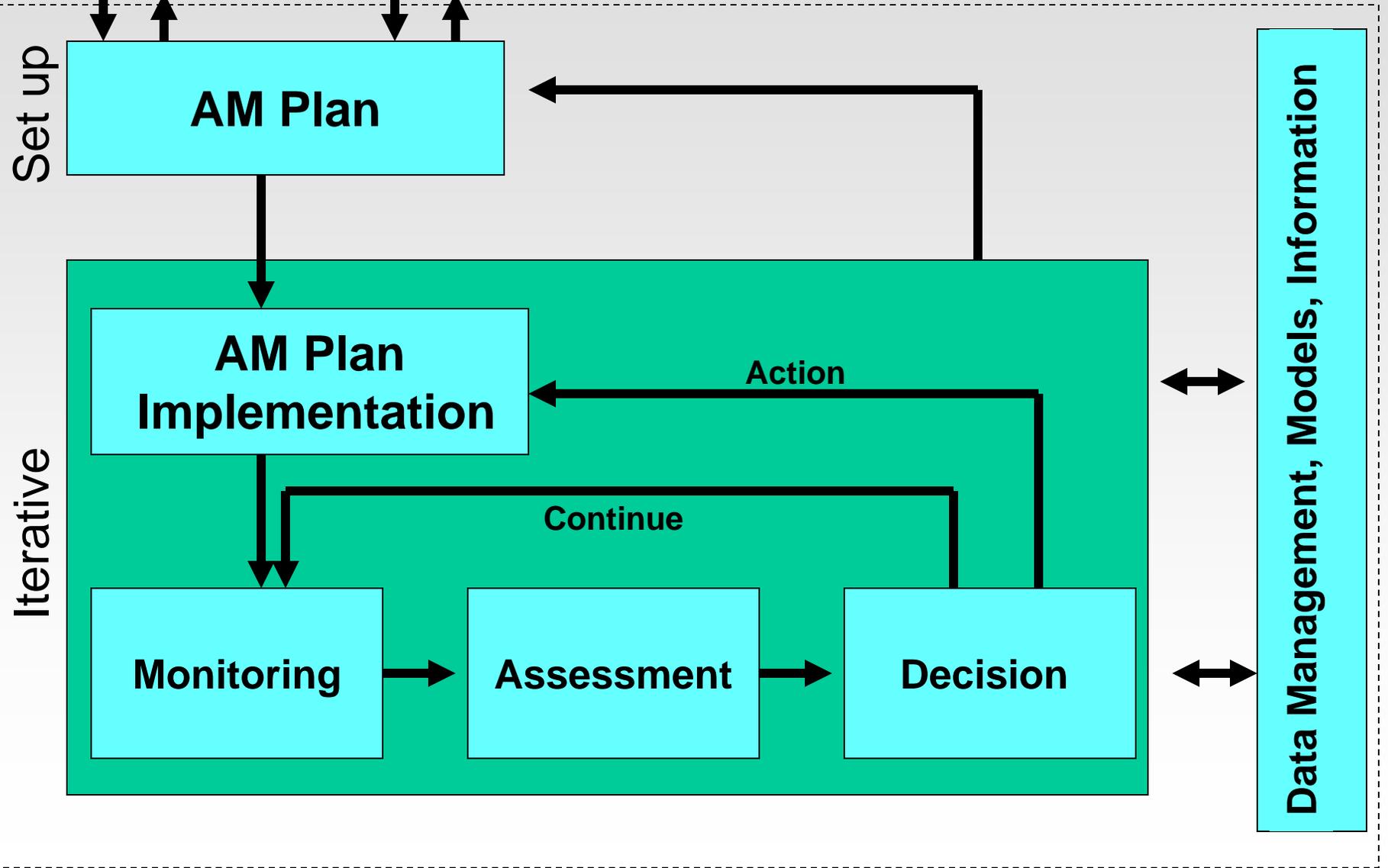
- Define decision criteria
- Define process - how results of the assessment will be used to make decisions concerning project management
- Process for decision making should be documented as part of overall AM plan

Scale and Complexity

- Requires consideration of relevant temporal scales
- Duration may exceed project duration
- Traditional Corps planning guidelines may not meet the need

Plan for Adaptive Management

- Contingency Plan
- Conceptual Model of entire AM process
 - Takes form of a detailed outline or schematic illustration or flow diagram
- Appropriately scoped to the scale of the project
- Part of decision document



Set up

AM Plan

Iterative

AM Plan Implementation

Monitoring

Assessment

Decision

Action

Continue

Data Management, Models, Information

AM Plan Implementation

- Iterative
- May require a charter or other vehicle that documents how AM plan will be put into action
- Must be sufficiently documented in order that it can proceed in a coherent manner
- Monitoring
 - Data management
- Assessment
- Apply Decision Criteria
 - AM Team
- Continue
- AM Action
 - Review/revise Monitoring and Assessment
 - Changes in Management Actions
 - Develop/Revise Criteria

The U.S. Army Corps of Engineers Campaign Plan

- Highlights the need for a comprehensive system approaches to water resource management
- National team formed to develop an AM framework that can be incorporated into Corps' Civil Works projects providing flexible decision making in the face of uncertainty
- AM team consisting of Corps' staff and contractors participating in large scale ecosystem restoration projects throughout the US



Campaign Plan
of the
U.S. Army Corps of
Engineers (USACE)

Great Lakes
Lake Ontario – St. Lawrence River
Adaptive Management Initiative



US Army Corps of Engineers
Great Lakes and Ohio River Division



Missouri River Recovery Program



Adaptive Management Team

Overall charge:

- Develop a framework for AM that can be incorporated into USACE Civil Works projects to allow for flexible decision making in the face of uncertainty
- Results will support business processes aimed at balancing economic, social, and ecological factors for a sustainable future

Louisiana Coastal Area (LCA) Ecosystem Restoration Program



UPPER MISSISSIPPI RIVER Illinois Waterway



NAVIGATION AND ECOSYSTEM SUSTAINABILITY PROGRAM



Great Lakes
Lake Ontario – St. Lawrence River
Adaptive Management Initiative



US Army Corps of Engineers
Great Lakes and Ohio River Division



Adaptive Management Team

- Summarize existing policy and guidance
- Develop a draft USACE Guide to Adaptive Management - in consideration of the NRC review of AM for Water Resources Planning 2004
- Information Sharing

Louisiana Coastal Area (LCA) Ecosystem Restoration Program



UPPER MISSISSIPPI RIVER Illinois Waterway



NAVIGATION AND ECOSYSTEM SUSTAINABILITY PROGRAM

Missouri River Recovery Program



