

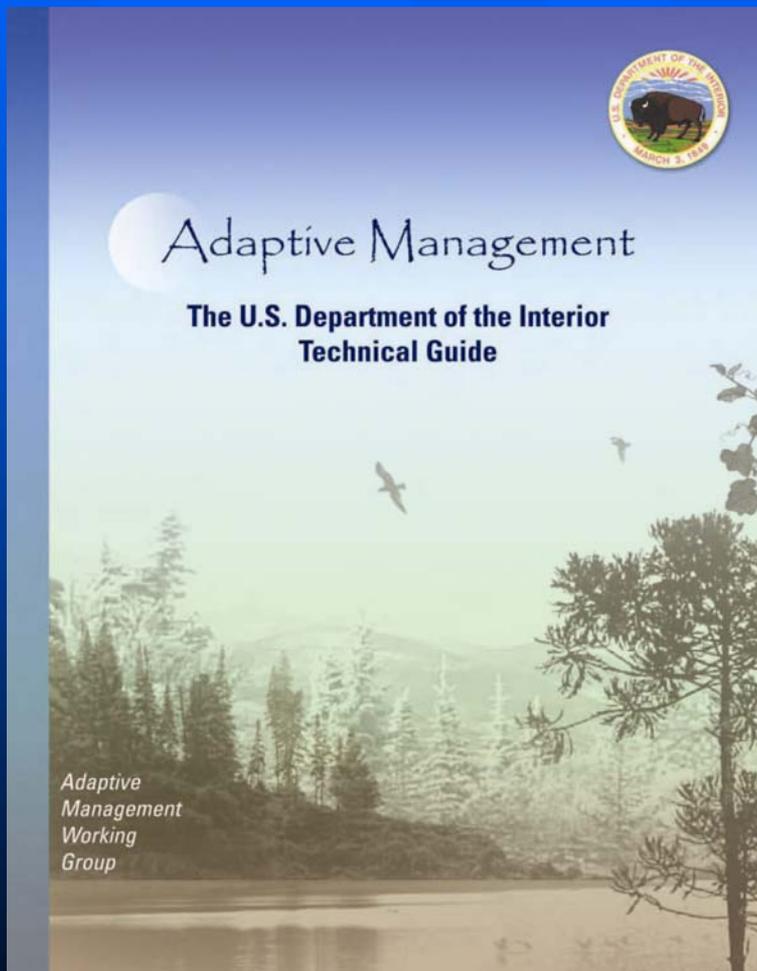
Adaptive Management: Science, Management, or What?

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Adaptive Resource Management

- Used in resource management since at least the 1950s
- Given formal expression by Hollings (1978) Walters (1986), and Lee (1993)
- Described in some detail in the DOI Adaptive Management Technical Guide (2007)

DOI Adaptive Management Technical Guide



Four key questions:

- What is adaptive management?
- When should it be used?
- How is it implemented?
- How can success be recognized and measured?

What is Adaptive Management?

Learning through management, and adapting based on what is learned

- To learn is to improve understanding through time
- To adapt is to adjust management through time
- Two outcomes:
 - Improved understanding
 - Improved management

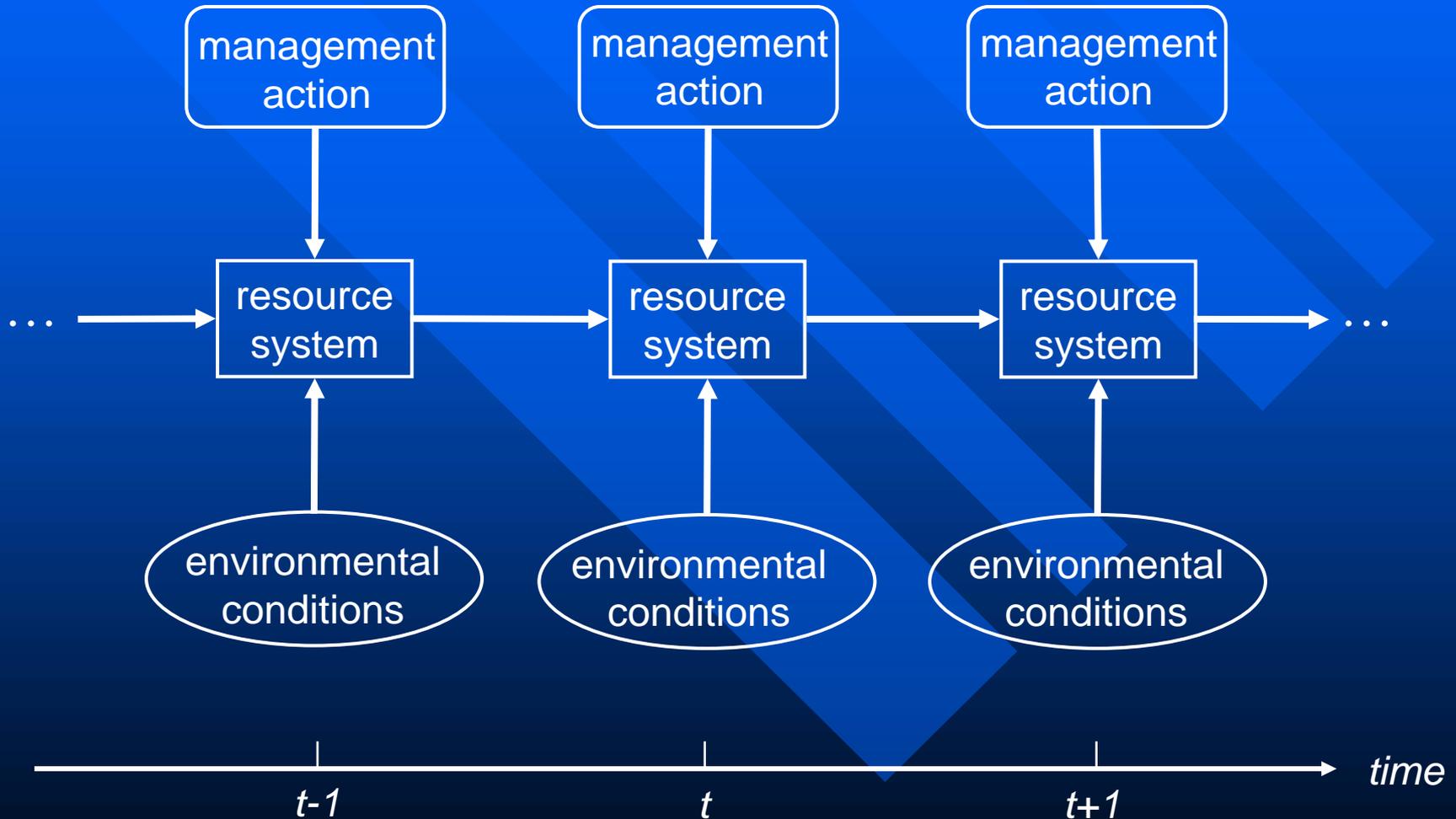
When is Adaptive Management Applicable?

- Management actions are taken through time
- Resource behavior is influenced by management actions
- Resource behavior is influenced by changing environmental conditions
- There is uncertainty (or disagreement) about the expected impacts of management

Examples

- Hydrologic systems
- Agricultural/grazing lands
- Wildlife or fish populations
- Habitats of species of interest
- Biological communities
- Managed wetlands
- Fire management
- etc

General Situation for AM



Environmental Conditions

- Examples include seasonal temperatures, precipitation, etc
- Environmental conditions change through time
 - Temporal variation may or may not be directional
 - Long-term directional change may be indicative of climate change
- Environmental conditions affect resource state

Management Actions

- Taken sequentially over some timeframe
 - Typically at regular intervals
- May focus on resource inputs (fish stocking), outputs (water release), or processes (habitat alterations that affect reproductive success)
- Actions guided at each point by
 - Management objectives
 - Current resource status
 - Current resource understanding

Resource States

- Resource state evolves through time
- Resources are influenced by changing environmental conditions and management actions
- Magnitude and direction of changes are not completely predictable

Uncertainty

- Limited knowledge about resource dynamics and the effects of management
- Expressed in an inability to predict consequences of management actions
- Limits the ability to manage resources effectively and efficiently

Kinds of Structural Uncertainty

- Uncertainty about the resource processes themselves (e.g., mortality, recruitment, movement)
- Uncertainty about the role of process drivers (e.g., environmental conditions, population size or density, habitat structure)
- Uncertainty about process vital rates (e.g., reproduction or survival rate)

How is Adaptive Management Implemented?

With an iterative process of

- Decision making, followed by
- Monitoring, followed by
- Analysis and assessment, followed by
- Learning

Reducing Uncertainty with AM



- Decisions are guided by management objectives at each time
- Monitoring is used to track system responses to management
- New information from monitoring is combined with previously collected information to produce improved understanding
- Decisions are adjusted in the next time period based on that improved understanding

Improved Understanding Involves:

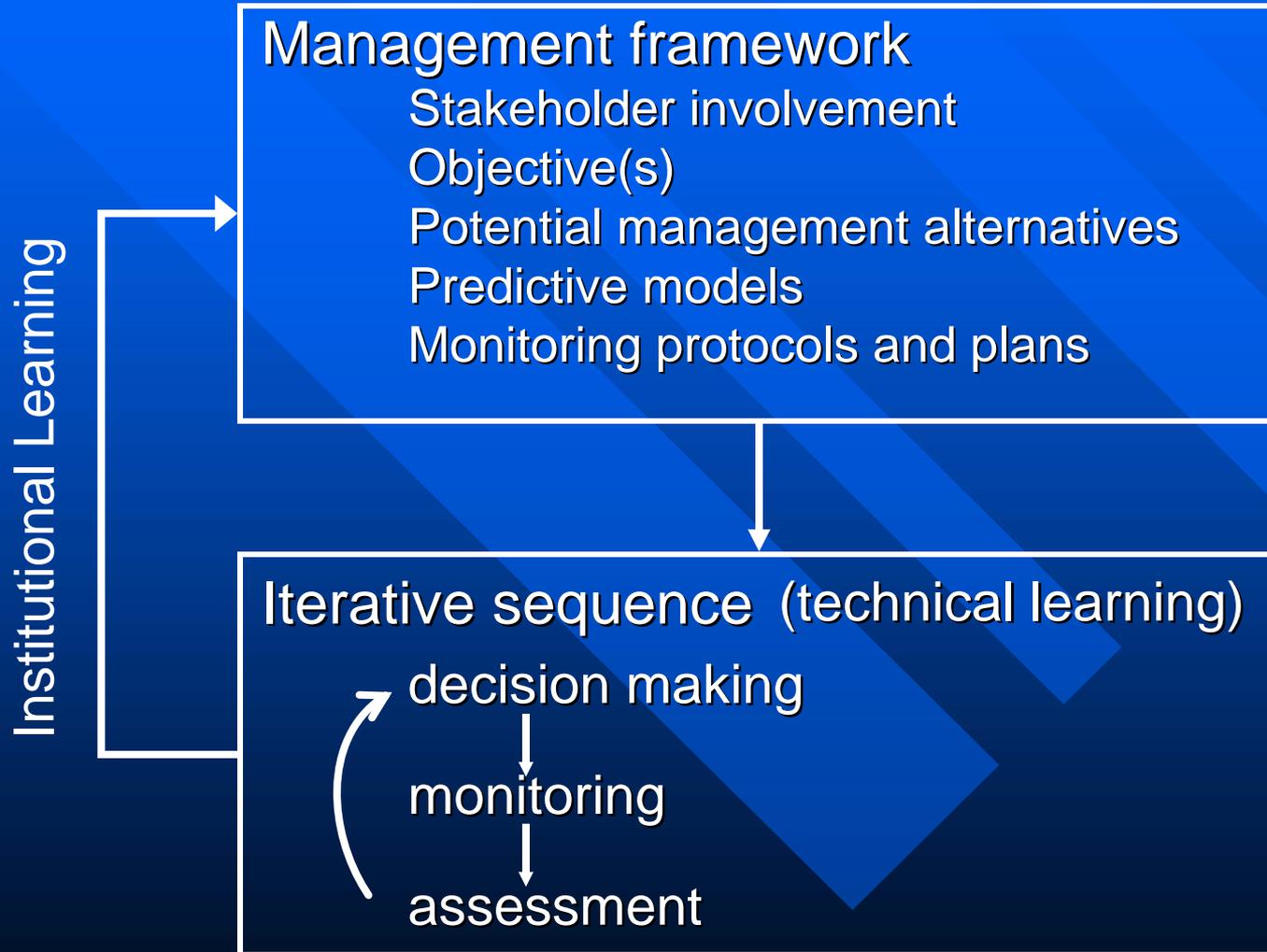
- Use of informative management actions
- Recording the actions taken through time
- Tracking environmental conditions through time
- Tracking resource responses through time
- Using the information that is recorded to learn about processes, vital rates, and resource responses to management

Key Elements in Learning-based Management

- Stakeholder involvement
- Management objectives
- Management alternatives
- Predictions of the effects of potential management actions
- Monitoring protocols and plans

These elements are folded into the iterative learning process of decision making, monitoring, and assessment

Adaptive Resource Management



Institutional Learning

- Potential to learn about the adaptive process itself and its elements as they evolve through time
- Allows objectives, management alternatives, stakeholder values etc to be adapted as needed
- Institutional learning and adaptation typically occur less frequently than technical learning and adaptation

Benefits of AM

- Improved management based on better understanding
- Long-term gain from improved management that compensates for up-front planning costs
- Increased chances for consensus about scope, objectives and acceptable management actions
- Management flexibility in dealing with surprise
- Reduced potential for conflict among stakeholders and litigation