

Elements in Adaptive Management

- Management objectives
- Management options
- Predictive models
- Monitoring protocols
- Stakeholder involvement

Management Objectives

- Guides to decision making
- Evaluation of performance
- Reduction of uncertainty

Management Options

- A defining property of the decision making process
- Decisions always depend on the options that are available
- Lack of agreement up front about what those options are, can be a major source of controversy among stakeholders

Predictive Models

- Decision making always involves a prediction of consequences
- It's better to make those predictions explicit
- Models predict how resources will change
- Models also used to express uncertainty

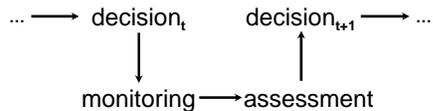
Monitoring

- Provides the data needed to evaluate progress in meeting project objectives
- Measures resource status, so as to identify management actions
- Used to Increase understanding of resource dynamics
- Used for developing and refining resource models

Stakeholder Involvement

- Scoping and bounding the resource problem
- Identifying objectives and management options
- Capturing uncertainties (perhaps through the expression of disagreement)
- Designing and conducting monitoring programs

Sequential Operation of AM



- Decisions guided by objectives at each time
- Monitoring tracks responses to management
- New monitoring information is combined with existing information and models to improve understanding
- Decisions are adjusted in the next time period based on improved understanding

Decision Making

- Assumed to occur through time, typically at regular intervals
- Many approaches to decision making
 - formal optimization to heuristic approaches
 - guided by resource status and understanding
- Flexibility needs to be maintained over the course of a project

Monitoring

- Produces the data about resource status and behavior
 - basis of evaluation, learning, and decision making
- More effective and efficient if protocols are designed around monitoring goals for AM:
 - evaluation
 - learning
 - decision making

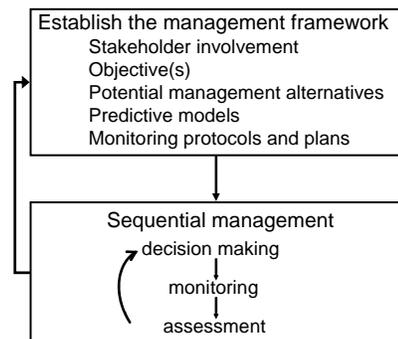
Assessment

- Comparison of desired and actual outcomes as part of performance evaluation
- Comparison and prioritizing of potential management actions
- Comparison of predicted and actual outcomes in the process of learning
- Parameter estimation and model development

Other Learning Opportunities

- Learning about stakeholder values and desires
- Learning about management objectives and options
- Learning about new ecological structures and functions

Double-Loop Learning



Set-up Phase

- Stakeholder Involvement
- Objectives
- Management Actions
- Models
- Monitoring Plans

- How do these steps fit into a NEPA process?

Public Scoping

- Identify and engage your stakeholders
- Notify and inform the public
- Scope the issues:
 - Purpose
 - Need
 - Preliminary Management Alternatives or Actions
 - Adaptive Management Objectives

NEPA Document An EIS Example

- **Chapter 1:** Purpose and Needs developed
- **Chapter 1 or 2:** Adaptive Management Objectives developed and described
- **Chapter 2:** Management Actions identified that can achieve the objectives meeting the purpose and need. Articulate your AM framework

NEPA Document An EIS Example

- **Chapter 2 and 4:** Models developed and articulated to show how actions will meet the objective and what the impacts of the actions will be
- Monitoring plan developed to explain how the effectiveness of the action will be measured over time to determine if objectives are being met

Key to Adaptive Management in a NEPA Process

- Describe management alternatives including:
 - Initial Actions
 - Subsequent Actions
 - Monitoring Actions

Key to Adaptive Management in a NEPA Process

- Describe the potential environmental impacts of the alternatives:
 - Initial Actions
 - Subsequent Actions
 - Monitoring Actions

Key to Adaptive Management in a NEPA Process

- Develop and Describe an AM Framework that articulates under what conditions subsequent actions would be taken

Public Review and Comment

- Public release of your draft plan/EIS or preliminary EA
- Public comment received and addressed
- Document finalized and re-published

NEPA and the Iterative Phase

Decision Making

- Finalize and Describe Decision in a Decision Document:
 - Record of Decision (ROD)
 - Finding of No Significant Impact (FONSI)
- Implement Decision

Follow-up Monitoring

- Implement the monitoring plan that was described in your plan/EIS or EA.
- Could include collecting additional baseline data prior to taking actions

Assessment

- Dust off that EIS or EA
- Evaluate monitoring data to assess whether the management action is achieving the objective. Is it effective?
- Evaluate whether environmental impacts predicted are occurring. Is there a need for additional NEPA?

Assessment

- Determined need for subsequent action
- Check-in on your other compliance needs

Iteration Back to Decision Making

- Will you continue to implement the initial action?
- Will you adopt a subsequent action of the previously selected alternative?
 - What formal decision is required?
 - Memo to File or similar document
 - The formal decision was made prior to implementation of the initial action.
 - Document compliance with other statutory requirements.