Multi-Attribute Evaluation of Management Options

GCDAMP

GCDAMP Technical Working Group
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MATA Objectives

- Develop a framework for decision making that addresses:
  - Multiple objectives
  - Trade-offs
  - Uncertainties
- Gain insight into experimental priorities

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Sequenced Decision Making

Develop Evaluation Framework

⇓

Decide: Adopt or experiment? Which experiments?

⇓

Conduct experiments

⇓

Decide to adopt or continue

⇓

Stop .

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What we did

- Created Framework for Decision Making
  - Endpoints and attributes
  - Options
  - Consequence Table
  - Trade-offs

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What we found

- Framework was useful
  - Gained common understanding
  - Focused on attributes: trade-offs and values
  - Linked science to decision making
- There are promising alternatives to MLFF that may be candidate treatments
  - Fluctuating flows
  - Fall steady flows
- Benefits are uncertain

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What we didn't do

Finish!

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MATA Next Steps

- Dec was a *demonstration* and initial *scoping*
  - Refine attributes
  - Refine options
  - Refine consequence estimates
    - Additional analyses
    - Incorporate uncertainty; document hypotheses
    - Formal expert judgment elicitation
- Logical next steps:
  - Refine consequence table
  - Confirm candidate Treatments
  - Develop Experimental Design

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Experimental Design: Feb 2004

- Alternative experimental designs
  - Titration
    - Designed primarily to minimize ecological risk or financial cost
  - Reverse Titration
    - Design to minimize time to chub stabilization
  - Factorial
    - Designed to minimize probability of a wrong signal

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Potential Treatments: Feb-04

- Fluctuating flows
- Fall Steady Flows
- BHBF
- TCD
- Mechanical Removal

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Some Attributes for Evaluating Experimental Design: Feb-04

Fewer than original –on ly those that are sensitive to the design

- Probability of incorrect signal
  - Confounded by lag times?
  - Confounded by non-stationarity?
- Net cost/revenue
- Risk to chub
  - probability of extinction
  - time to stabilization
- Risk to other endpoints?

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Evaluating Experiments

- Identify attributes that will be used to evaluate options
- Identify plausible competing hypotheses about the response of the attributes, assign a probability to each, and estimate the bounds of their response
- Demonstrate that the resolution of the uncertainty matters to the management decision
- Identify flow options worth exploring
- Demonstrate that an experiment has the predictive ability to discriminate among the hypotheses
- Compare alternative experimental designs

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Key Steps in Evaluating Experiments

- Identify endpoints that matter
- Document hypotheses and their probability
  - Small group experts, structured elicitation and discussion, review with TWG
- Estimate range of possible outcomes under each treatment/hypothesis
- Assess reliability of experiment
- Demonstrate that the resolution of uncertainty matters

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Feb 2004

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MATA

- How to use it going forward
  - Structure and aid thinking about decisions
  - Focus/priority for scientific research
  - Support ends (objectives)-oriented dialogue (interest-based)
  - Living doc: Reflect current best available info on management alternatives

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Refinements

- Endpoints / Attributes
  - Refine (primary productivity)
- Consequences
  - New modeling/analysis results
  - Structured expert judgment

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Structured Expert Judgment

- Standards/accepted best practices:
  - Selection: multiple experts
  - Structuring and decomposition
  - De-biasing
  - Encoding and verifying
  - Documenting hypotheses & assumptions
  - Aggregating across experts: dialogue and aggregation
  - Documentation and peer review

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Key Point!

- What we achieved at Dec workshop:
  - Created the evaluation framework: agreed on the endpoints and attributes
  - Identified preliminary alternatives
  - First cut (scoping level) estimate of consequences
- What you need to do next:
  - Revise attributes and alternatives
  - Document the competing hypotheses for each row in the consequence table and the data/rationale in support of each
  - Improve estimates in consequence table as required
  - Identify candidate experimental trials
- Use caution in interpreting the consequence table

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