A Update on the LTEMP Decision Analysis

Adaptive Management Working Group
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Outline

- Upcoming steps in the LTEMP decision analysis
- Expected value of information, long-term strategies, and experimental design
- Approach to climate change analysis
LTEMP Decision Analysis

Upcoming Steps
Role of SDA in LTEMP

- Structured decision analysis is *one* of the analytical tools being used to evaluate alternatives in the LTEMP EIS
  - Particularly to enhance wide stakeholder input
- The negotiation & selection of a preferred alternative will be based on the full EIS analysis, qualitative and quantitative evaluations, public comment, socioeconomic considerations, and consultation with stakeholders
Upcoming Steps

1. Completion of modeling
2. Joint-lead compilation of quantitative results
3. Stakeholder swing-weighting
4. Multi-criteria decision analysis, including effects of the weights on ranking of alternatives
Upcoming Steps

5. Expected value of information (EVPI) analysis
6. Development of experimental design (adaptive strategies) based on the EVPI analysis
7. Evaluation of adaptive strategies (narrative evaluation)
Stakeholder Swing-weighting

- DOI and the joint-lead agencies are very interested in the structured input of the individual AMWG member agencies
- Steps
  - Webinar to prepare the swing-weighting exercise
  - Workshop to share the modeling results
  - Time to complete swing-weighting
Adaptive Strategies

Expected value of information, long-term strategies, and experimental design
Critical Uncertainty

- Uncertainty that impedes the choice of a long-term management strategy
  - Because different hypotheses lead to different management strategies
  - Information that is “need to know”, not just “nice to know”

- Up front articulation of uncertainty
  - Expression of uncertainty as alternative hypotheses about how the system responds to management
(de-)Constructing Alternatives

**Action elements**
- e.g., daily variation, ramping rates, HFE, etc.

**Single strategies**
- e.g., year-round steady flows, MLFF (describe an annual cycle)

**Long-term strategies**
- Condition-dependent strategies
  - e.g., MLFF with HFES, taking account of equalization

**Adaptive strategies**
- Combination of long-term strategies in expt. design
  - e.g., Basin States alternative
## CDAS Long-term strategies

<table>
<thead>
<tr>
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<th>Temp+</th>
<th>Temp+</th>
<th>Temp-</th>
<th>Temp-</th>
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<tbody>
<tr>
<td></td>
<td>Trout+</td>
<td>Trout-</td>
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<td>Trout-</td>
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<tr>
<td>HFE/RBT+</td>
<td>TMF+</td>
<td>CDAS1</td>
<td>CDAS2</td>
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### Critical Uncertainties:
- **HFE/RTB+**: HFE effect on trout is strong (vs. weak)
- **TMF+**: Trout management flows are effective (vs. not)
- **Temp+**: Temperature effect on HBC productivity is strong (vs. weak)
- **Trout+**: Trout effect on HBC survival and production is strong (vs. weak)
Long-term Strategies

- We are currently analyzing the potential long-term strategies against a set of critical uncertainties.
- We will conduct a value-of-information analysis to identify which uncertainties are most important to resolve.
## Value of Information (EVPI)

<table>
<thead>
<tr>
<th>Alternative</th>
<th>Hypothesis(_1)</th>
<th>Hypothesis(_2)</th>
<th>Average</th>
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<tr>
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<td>0.50</td>
<td>0.50</td>
<td>0.5</td>
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<tr>
<td>Alternative 2</td>
<td><strong>0.70</strong></td>
<td>0.24</td>
<td>0.47</td>
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<td>Alternative 3</td>
<td>0.55</td>
<td><strong>0.63</strong></td>
<td><strong>0.59</strong></td>
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<tr>
<td>Alternative 4</td>
<td>0.43</td>
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<tr>
<td>Best</td>
<td><strong>0.70</strong></td>
<td><strong>0.68</strong></td>
<td><strong>0.69</strong></td>
</tr>
</tbody>
</table>

The expected value of perfect information is 0.10 (a 17% increase): 0.69 – 0.59.
Revision of Adaptive Strategies

- The existing adaptive strategies (RTCD, CDAS, and BR) are composed of various long-term strategies, and focus on different subsets of uncertainty
  - These could be revised based on the value-of-information analysis

- We expect to develop one more adaptive strategy based on the value-of-information analysis
  - Using the best from all long-term strategies
Evaluation

- To evaluate the adaptive strategies, we will look at
  - Their expected performance in the face of uncertainty
  - The potential value-of-information associated with their experimental design
  - The power of their experimental design to resolve uncertainty
  - The costs (both direct costs and opportunity costs) of their experimental design
Climate Change

Approach to Analysis
Two approaches considered

- **Climate adaptation approach**
  - Place climate effects and their uncertainty at the center of the design and analysis of strategies for LTEMP.

- **Robustness to climate change approach**
  - Analyze the robustness of alternatives to uncertainties in the water and sediment inputs.
Robustness Approach

- Use “observed resampled” hydrological (21) and sediment (3) traces to represent possible future trajectories
- Weight these 63 scenarios using two schemes
  - Historical: assume future will be like past
  - Climate change: develop weights based on comparison to the Basin Study
Robustness Approach

- Decision analysis (MCDA, EVPI) will be conducted with both weighting schemes (historical, climate change)
  - Particularly to look at whether the ranking of alternatives changes under different hydrological and sediment conditions