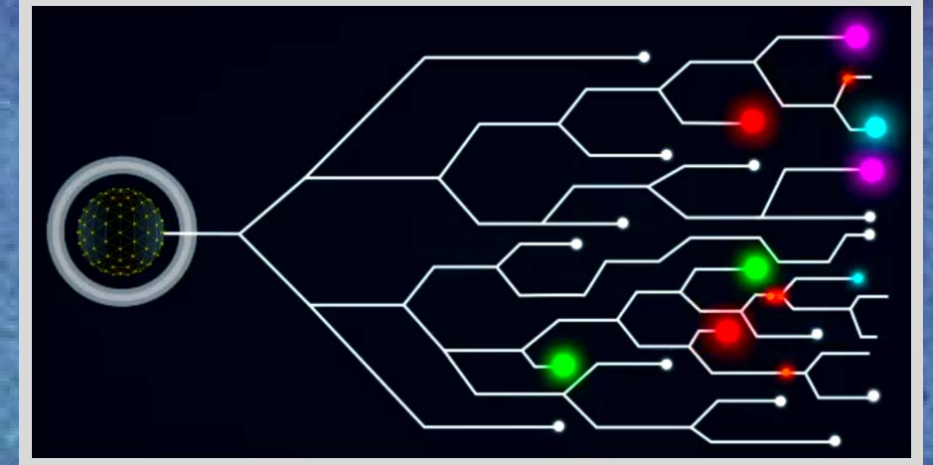


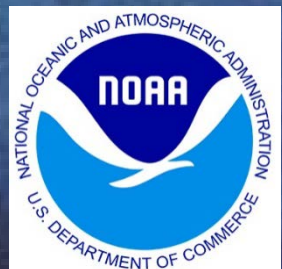
# Decision Making Under Deep Uncertainty (DMDU)



NOAA Science Advisory Board  
July 22-23, 2020  
Ecosystem Sciences Management Working Group

Dr. Michael Castellini, University of Alaska  
Dr. Robert Johnston, Clark University  
Co-chairs

1 Dr. Lisa Wainger, DMDU lead



# Update on activities and path forward

Project approved by SAB, July 2019 Seattle meeting

Format approved by SAB, December 2019 meeting

Update provided to SAB, April 2020 meeting

Meeting with SAB Chair J. Kreider, April 2020

Meeting with SAB working group co-chairs, June 2020

ESMWG meeting, April 2020 (virtual)

Lisa Wainger is leading DMDU project

**ESMWG and experts meeting, July 15-16**

**SAB status report today on July 15-16 findings**

**Target submission (draft report) to SAB, December 2020**



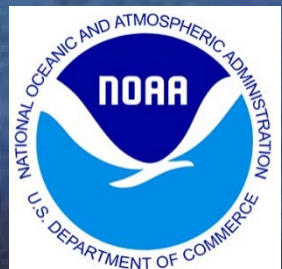
## ■ Key First Concepts from July 15-16 meeting

- It is a powerful set of tools for helping stakeholders consider and use uncertainty analysis, when probabilities are unclear.
- DMDU is not a “magic wand” that provides novel foresight and ensures that all decisions will be robust to future change.
- Rather than providing one best guess “optimal” solution that ignores unlikely events, it aims to characterize the robustness of choices to a range of plausible, but not necessarily likely, outcomes.
- Aims to identify decisions that “succeed” under a wide range of plausible outcomes.



# Key Attributes of DMDU

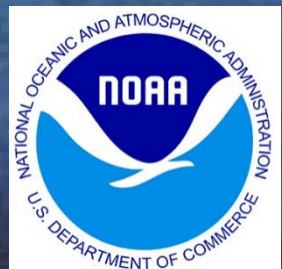
- DMDU is an approach to decision science that incorporates multiple dimensions including:
  - Extensive stakeholder engagement to identify perspectives on uncertainties (“plausible” outcomes), options/strategies and performance metrics.
  - Use of high-powered sensitivity analysis to evaluate futures under a wide range of plausible futures.
  - Emphasis on tradeoffs and the identification of robust, adaptive strategies.



- DMDU is best characterized as a collection of related techniques, not a single monolithic approach
- DMDU techniques are not commonly applied by NOAA but are not entirely foreign to the agency
- For example, management Strategy Evaluations (MSEs) conducted by NOAA fisheries share many characteristics of DMDU
- More could be done to apply DMDU techniques within NOAA, to enable more transparent approaches to adjudicating uncertainty
- DMDU techniques can assist decision-making in some circumstances but is not well-suited to others



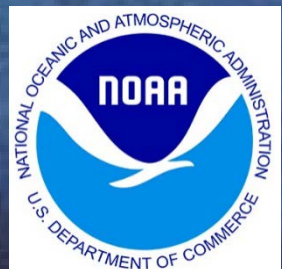
- DMDU may be particularly useful when
  - High-stakes decisions are involved (and resources are available for DMDU analysis)
  - Decisions are complex with multiple tradeoffs
  - There are many possible decision options
  - Probabilities are poorly characterized and stakeholders disagree
- First step is for NOAA to understand what DMDU is and what it can accomplish, compared to current approaches
- To begin to integrate DMDU into other types of decisions, a good first step is to apply the concept of “stress-testing”.

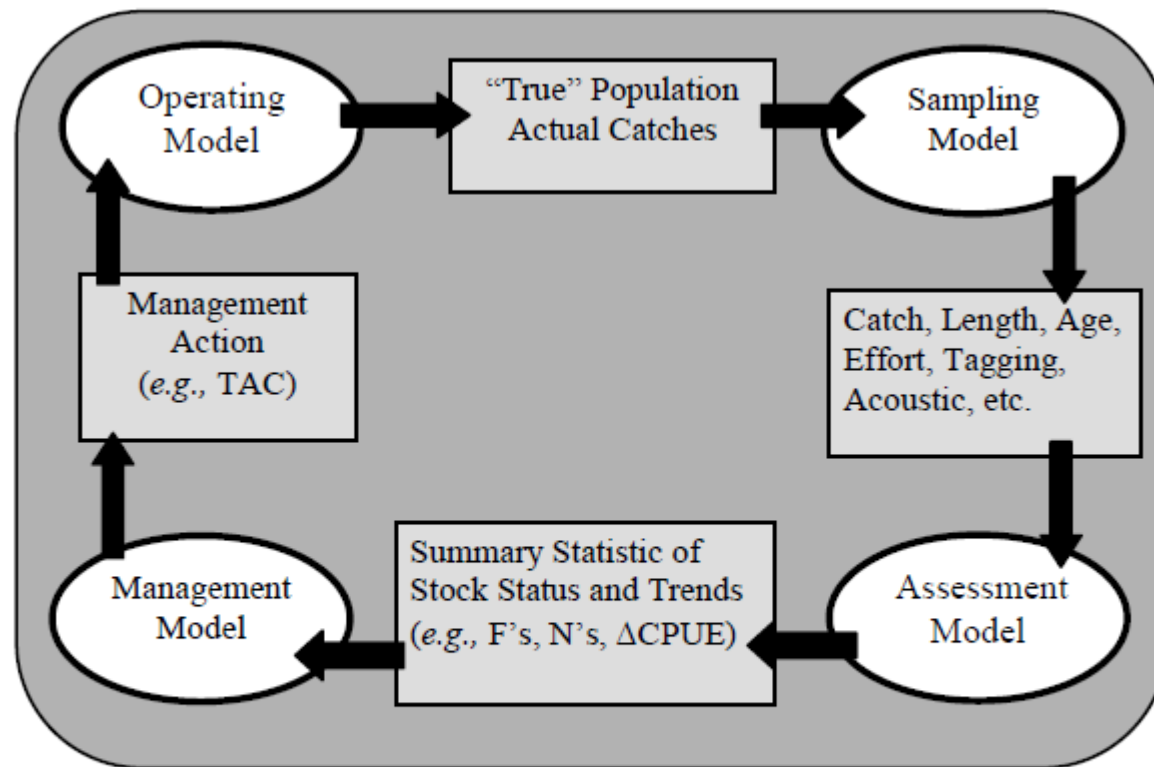


# DMDU - What is it? How might NOAA use it?

## Proposed Report Outline (10 pages + appendices)

- Background on DMDU methods
  - How do methods differ from traditional approaches
  - Examples of use in NOAA or in government decision making
- Potential benefits of application to a set of illustrative NOAA activities
  - Coastal planning
  - Fisheries
- Opportunities for and barriers to adoption
  - Types of decisions likely to benefit from its application
  - Potential challenges or drawbacks of adoption
- Recommendations
  - Approaches for exploring DMDU procedures for NOAA
  - Criteria for identifying programs that may benefit from adoption
  - Suggested next steps





**Figure 1.** Typical Structure of an MSE Simulation Model

