NEFMC Ecosystem-based Fisheries Management prototype Management Strategy Evaluation (EBFM pMSE)

Management Objectives Workshop
October 28, 2022
New Bedford, MA

New England Fishery Management Council

School for Marine Science & Technology
UMass Dartmouth

Gulf of Maine Research Institute

Management Objectives Workshop Goals

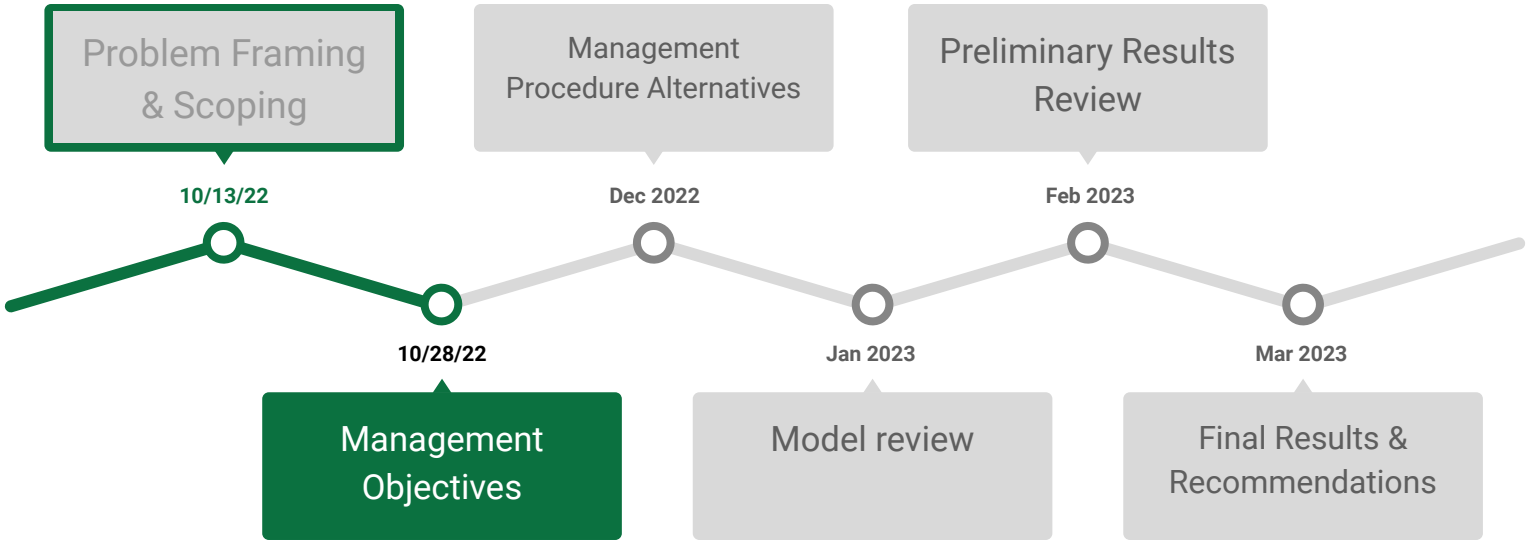
A participatory, facilitated process to:

- Review Scoping Workshop discussions
- Differentiate pMSE from MSE
- Identify the fundamental and means management objectives for the pMSE analyses

Main outcome:

- Co-develop EBFM strategies through Management Strategy Evaluation

Where Are We Going?



Parallel sequence of engagement with the PDT (our ‘technical advisory group’)

Each workshop will contain review of previous decisions & progress

Introductions

- Who you are, how you prefer to be addressed?
- One thing that stuck out to you from the Scoping Workshop?
- Any other pertinent information you would like to share about yourself!

Roles & Responsibilities

- Project Lead- Dr. Gavin Fay
  - Modeling frameworks, architecture for implementation of the EBFM management procedures
  - Ask about: Project scope, modeling, technical components
- Project Lead- Dr. Lisa Kerr
  - Integration of the multispecies operating model into the existing Groundfish-MSE framework
  - Ask about: Project scope, modeling, technical components
- Quantitative Research Assistant- Jerelle Jesse
  - Modeling, analytical components
- Facilitator- Madeleine Guyant
  - Workshop discussions, engagement with pMSE participants, workshop reports
  - Ask about: Discussions, engagement sequence and scheduling
- Rapporteur-
  - Workshop documentation

Key Acronyms

EBFM= Ecosystem Based Fishery Management

MSE= Management Strategy Evaluation

pMSE= Prototype Management Strategy Evaluation

eFEP= Example Fishery Ecosystem Plan (for Georges Bank)

What is Management Strategy Evaluation? (MSE)

A process for:

- Comparing the performance of management strategies under multiple (& often conflicting) management objectives
- Examining impacts, trade offs, & robustness of management strategies.

MSEs include analytical simulation frameworks but can be more than this, and develop and evaluate tools and outcomes through iterative stakeholder engagement and knowledge coproduction.

Management Strategy Evaluation

MSE is a **participatory** decision-making process that involves **scenario testing** as a means of identifying a fisheries management strategy that achieves desired outcomes for the fishery.

Potential Benefits of Management Strategy Evaluation

- Testing management before implementing changes “on the water”.
- Addressing management performance in the face of uncertainty.
- Increased stakeholder involvement and improved transparency in process.
- Transition away from ad hoc decision making.
- Increase likelihood of achieving fishery management objectives.

What is a ‘prototype MSE’? What is it for?

- Crystallizing the goals of the process will help us
  - Know what constitutes ‘done’
    - i.e. difference between this & other processes
  - Bound scope
  - Common understanding of tool capabilities
  - Define who the participants should be

- Structured Decision Making community term: “Rapid Prototyping”
  - (e.g. Runge & Bean 2020)
  - Value of defining decision statement, the problem / policy alternatives with a small group of stakeholders
  - Demystify process
  - Identify ‘bad’ decision space
  - Opportunity to ‘fail fast‘

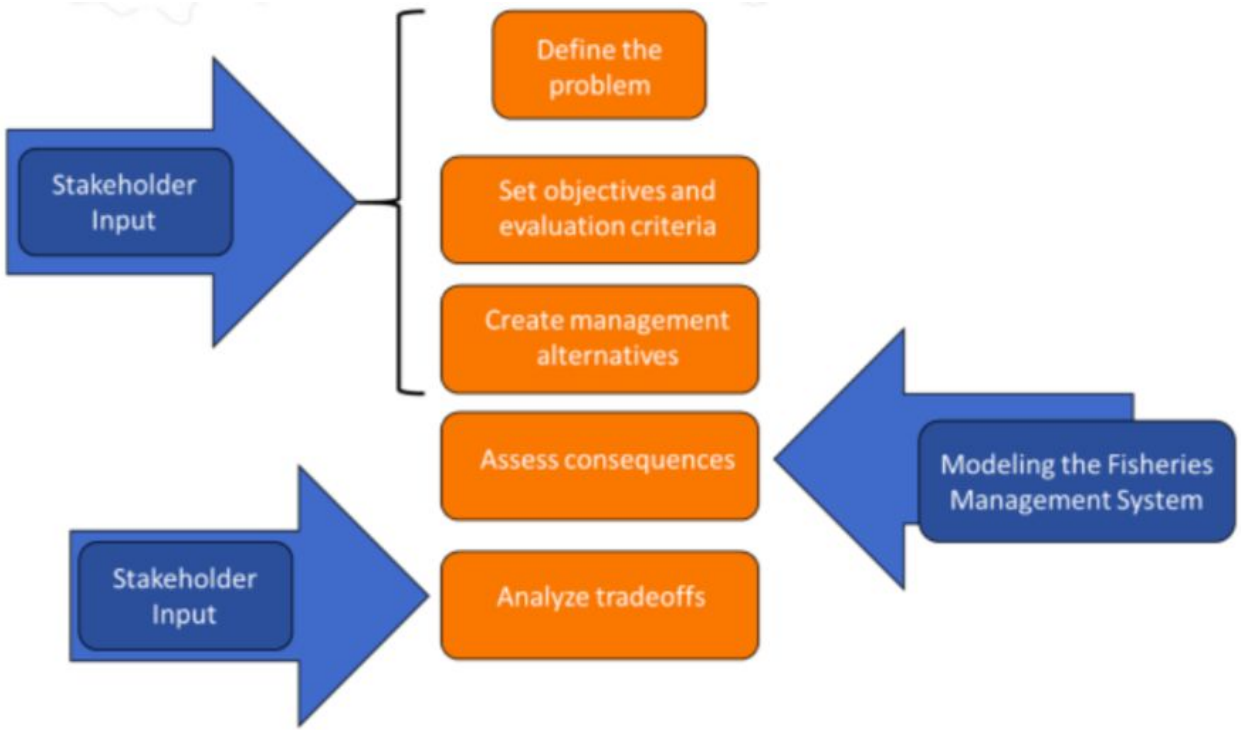
pMSE Overall Goals

- To showcase a simplified MSE framework and demonstrate how MSE will be used to evaluate EBFM management strategies for a Georges Bank Ecosystem Production Unit.
  - Act as an educational dry run from both a development and an operational perspective.
  - Provide an opportunity for the Council to gain experience with the MSE process.
  - Identify and work through the types of decisions to be made during an MSE.
- To identify data sources and develop the models and analyses that will support a full EBFM MSE with broad stakeholder participation in the next phase of the Council's EBFM development strategy.
- The prototype MSE results are not intended to be actionable in a fishery ecosystem plan, but results should be able to be used as the basis for a full MSE, which would be the next step.

Stakeholder Involvement

- MSE offers an opportunity to express input and help define what management ought to achieve, BEFORE analysis and decisions are made.
- You will be explicitly asked what you value.
- Your input on simulation features and management actions can inform design elements of the model.
- You will be asked for management approaches that would achieve “success”.
- Answers are not binding; they are a starting point to identify management actions that may achieve your wish list.

Stakeholder Involvement



Scoping Workshop Summary

- Project Team Introduction & stakeholder roles and responsibilities
- Goals for pMSE and project overview
- Problem framing scoping exercise
- Group scoping review
- Models overview

Scoping Workshop Summary

- **Are the goals identified for the pMSE accurate and complete?**
  - Goals were set by council in June
- Additional objectives of interest:
  - Unstated goal to assess if council is open to exploring a full MSE. Important to be explicit if that is a goal. Third bullet addresses this but not explicitly.
  - Develop communication materials and interactive tool that can transfer to a full MSE.
  - Outcome of pMSE will inform if approach is consistent with NS1 of Magnuson.
  - Everyone has a better understanding of what an EBFM world would look like.
  - What stakeholders need to be and how to organize them.

Scoping Workshop Summary

- **What key questions does the pMSE need to answer?**
  - How do we resolve tensions of multiple viewpoints while ensuring all stakeholders are being listened to?
  - Can we show the models/data are trustworthy?
  - How is Georges Bank area defined and how can different definitions be used together?
  - How can we handle stocks that move in and out of Georges Bank?
  - How can we include drivers of dynamics that are outside the region?
  - Should we have a different currency for quantifying management?
  - Do we need seasons?
  - What do the pMSE results show, manage expectations compared to full MSE?

Scoping Workshop Summary

- **Is there a key area of concern not covered by the proposed approach?**
  - Full retention.
  - Data gaps/untrustworthy data.
  - Predator/prey relations.
  - Communication with fishers and the public to extent it will help inform full MSE.
- **What elements of the eFEP can the pMSE help clarify?**
  - Would climate changes be handled differently under the eFEP structure compared to the single species structure?

Scoping Workshop Summary

- **What species should be included?**
  - Sand lance.
  - Grey seal.
  - Scallop dredge (bycatch).
  - Generic apex predator.
  - MAFMC managed species, co-managed species.
  - Just as many as needed to demonstrate pMSE.
- **What diagnostics would be useful to compare approaches?**
  - Discussion of trade-offs.
  - Model levels of data quality.
  - Reaction to changes in species distribution.

Scoping Workshop Summary

- **What constraints to fisheries management are critical to include?**
  - Get model truth as close to water truth as possible.
  - Compliance with NS1 of Magnuson.
- **What fishing fleets should be included and how should their dynamics be represented?**
  - Scallop.
  - Recreational.

Discussion Expectations

- Be recognized before speaking.
- Constructively engage with the topic under discussion.
- To mirror a full MSE process, discussions will emphasize designated stakeholders.
- Participants outside of stakeholder groups will have opportunities to provide input during breakout and plenary discussions if time permits.

pMSE/MSE Sorting Exercise

Which elements are critical to MSEs?

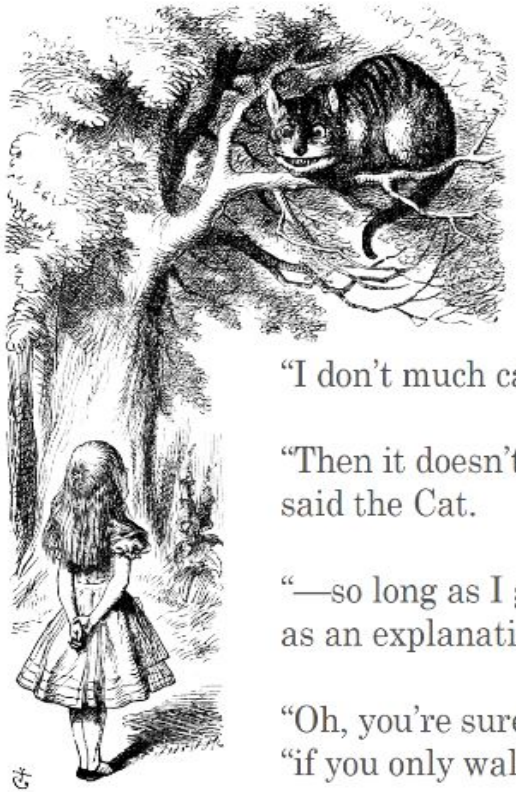
Which elements critical to MSEs are necessary for this pMSE?

Sort prompts individually, then discuss with a neighbor (~5 minutes).

pMSE/MSE Sorting Exercise

Plenary review.

Goal Setting and Objectives



"Would you tell me, please, which way I ought to walk from here?"

"That depends a good deal on where you want to get to," said the Cat.

"I don't much care where—" said Alice.

"Then it doesn't matter which way you walk," said the Cat.

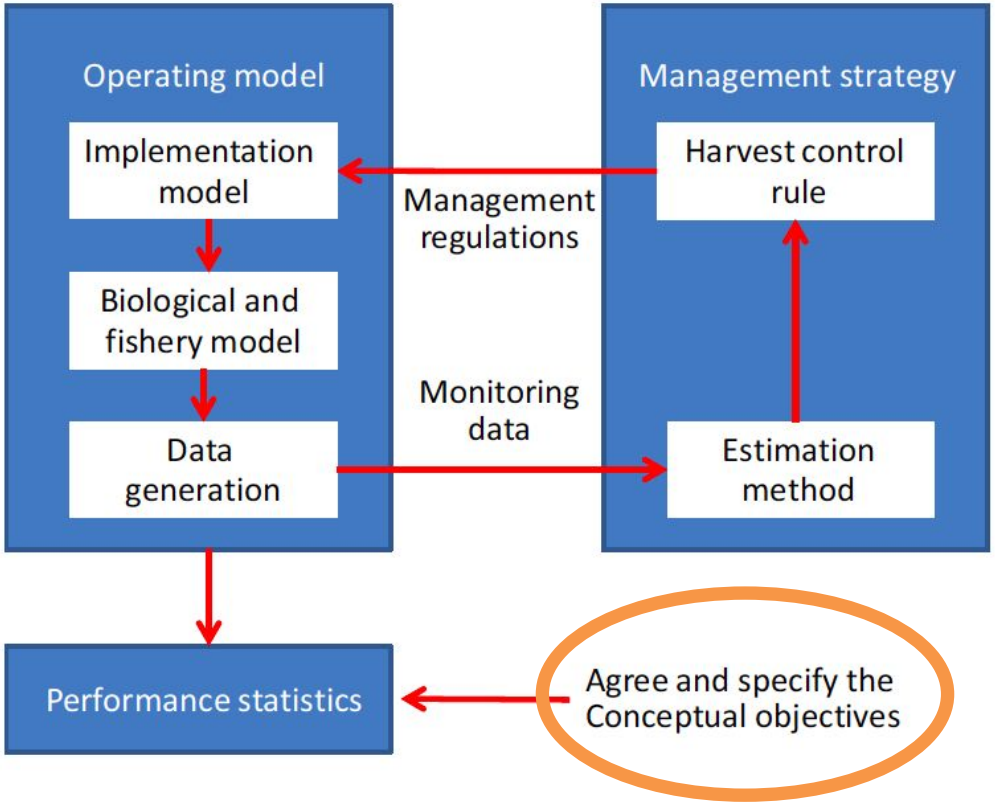
"—so long as I get *somewhere*," Alice added as an explanation.

"Oh, you're sure to do that," said the Cat, "if you only walk long enough."

Management Objectives

- Objectives are what you really care about.
- Well defined objectives are critical in order to:
  - Create alternatives
  - Compare alternatives
  - Choose pertinent information
  - Explain your decision to others
- The foundation of structured decision making.

MSE Components- Objectives



Punt et al. 2016. Fish & Fisheries

Management Objectives

When Are Decisions Easy?

- Objectives are clear
- No disagreement about what is “best”
- No tradeoffs
- Not restricted by constraints
- Simple set of available alternatives
- System dynamics known
- Uncertainty is inconsequential
- Steps are transparent

Related to Objectives

- **Goals** are general statements of what we would like to achieve
  - High levels of catch, Happy stakeholders
- **Concerns** are general statements of what we are worried about
  - Hard to catch fish, Stakeholders feel excluded

Recognizing goals & concerns can be helpful in identifying objectives

Related to Objectives

- **Alternatives** are what we choose among to achieve objectives
  - Adjust areas open to fishing
  - Gear restrictions
  - Catch limits
- **Constraints** place limits on decisions
  - Can't spend more than budget
  - Law says we can't kill right whales
- **Targets** are specific values of indicators
  - Generate 100 new jobs

Objectives

- Drive the decision-making process
- Are more specific than goals
- Should be quantifiable
- Needed for:
  - Comparing alternatives
  - Explaining decisions to others
  - Answering “What are we trying to achieve?”
- It is not possible to determine success or failure without measurable objectives!

Fundamental Objectives

- What decision-makers care most about:
  - Often reflect core values
  - Can't be substituted
  - Can be used to evaluate alternatives
  - "fundamental" depends on decision context
- Ask "Why?"
  - Why is that important?
  - Answers like "Just because", "It's the law", an "Inherent value" all indicate a fundamental objective

(Alice's "where you want to go")

Lyons et al. 2008

Means Objectives

- A pathway (or means) to achieving fundamental objectives

- Ask “How?”
  - How can that be achieved?
  - How can a concern be addressed?
  - Answers may help create alternatives

i.e. “a way to get there”

Lyons et al. 2008

Fundamental and Means Objectives

(*also High-level and Operational*)

Ask 5 times test

Fundamental: What do you really care about?

e.g. maintain biodiversity

Why? Why? Why? Why? Why?

Means: How do you get there?

e.g. reduce toxic inputs to water supply

How? How? How? How? How?

Objectives

- Management **objectives** ≠ management **strategy**.
- Objectives are unlikely to be self-consistent (e.g. maximize yield and minimize risk).
- Ideally, objectives should be selected by the decision makers and stakeholders.
- Many decision makers confuse the **tactics** (what to do next year) with the **objectives** (why are we doing what we are doing next year).

Why classify objectives?

- Need to know where you want to go…
- Fundamental vs. means
  - Setup consideration of tradeoffs
  - Weighting of utility functions
- Focus on “controllable” objectives
- Identify “stranded” objectives
- Allow for consistent comparison of alternatives
- Difference between *why* and *how* a decision is made

Common Fishery Management Objectives

Benefits

- Resource objectives
  - Abundance
  - Distribution
  - Diversity
- Resource use objectives
  - Catch
  - Money
  - Recreational enjoyment
- Social/cultural objectives
  - Distribution of benefits
  - Cultural legacy

Costs

- Money
- Time
- Human Resources

J. Cummings

Defining Management Objectives

General Objective	Measurable Objective	Measurable Outcome	Time-frame	Tolerance	Performance Metric
1.1. Keep female spawning biomass above a limit to avoid critical stock sizes and conserve spatial population structure	Maintain a female spawning stock biomass above a biomass limit reference point at least 95% of the time	*SB* < Spawning Biomass Limit (SB_{Lim}) SB_{Lim}=20% unfished spawning biomass	Long-term	0.05	$P(SB < SB_{Lim})$
	Maintain a defined minimum proportion of female spawning biomass in each Biological Region	$p_{SB,2} > 5\%$ $p_{SB,3} > 33\%$ $p_{SB,2} > 10\%$ $p_{SB,2} > 2\%$	Long-term	0.05	$P(p_{SB,R} < p_{SB,R,min})$
2.1 Maintain spawning biomass around a level that optimizes fishing activities	Maintain the coastwide female spawning biomass above a biomass target reference point at least 50% of the time	*SB*<Spawning Biomass Target (SB_{Targ}) SB_{Targ}=$SB_{36\%}$ unfished spawning biomass	Long-term	0.50	$P(SB < SB_{Targ})$
2.2. Limit Catch Variability	Limit annual changes in the coastwide TCEY	Annual Change (*AC*) > 15% in any 3 years	Short-term		$P(AC_3 > 15\%)$
		Median coastwide Average Annual Variability (AAV)	Short-term		*Median AAV*
	Limit annual changes in the Regulatory Area TCEY	Annual Change (*AC*) > 15% in any 3 years by Regulatory Area	Short-term		$P(AC_{3,A} > 15\%)$
		Average AAV by Regulatory Area (AAV_A)	Short-term		*Median* AAV_A
2.3. Provide Directed Fishing Yield	Optimize average coastwide TCEY	Median coastwide TCEY	Short-term		*Median* $\overline{TCEY}$
	Optimize TCEY among Regulatory Areas	Median $TCEY_A$	Short-term		*Median* $\overline{TCEY_A}$
	Optimize the percentage of the coastwide TCEY among Regulatory Areas	Median $\%TCEY_A$	Short-term		*Median* $\left(\overline{\frac{TCEY_A}{TCEY}}\right)$
	Maintain a minimum TCEY for each Regulatory Area	Minimum $TCEY_A$	Short-term		*Median Min(TCEY)*
	Maintain a percentage of the coastwide TCEY for each Regulatory Area	Minimum $\%TCEY_A$	Short-term		*Median Min(%TCEY)*

IPHC 2020

Recipe for Good Objectives

- Convert concern to objective –
- Direction + Thing you want
  - Direction
    - maximize (I want more of…)
    - minimize (I want less of…)
  - Thing you want
    - description of what you value
- Create measurable attribute – how to assess success
  - What is the unit of measurement?
- Be as direct and descriptive as possible

J. Cummings

Management Objectives Discussion

Identify the fundamental and means management objectives for the pMSE analyses.

Facilitated small group discussion.

Management Objectives Discussion

- What are the high-level management objectives?
  - e.g. conserve stock
  - Conflicting responses are ok!
- What are the operational objectives?
  - Quantifiable with performance statistics
- What would describe an acceptable scenario?
  - Performance thresholds
- Reflect actual resource dynamics.

Management Objectives Discussion

Plenary review.

Next Steps

December: Performance metrics & management procedure workshop

Meeting summary will be distributed.

Survey from Madeleine about management objectives

Questions?

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Lisa
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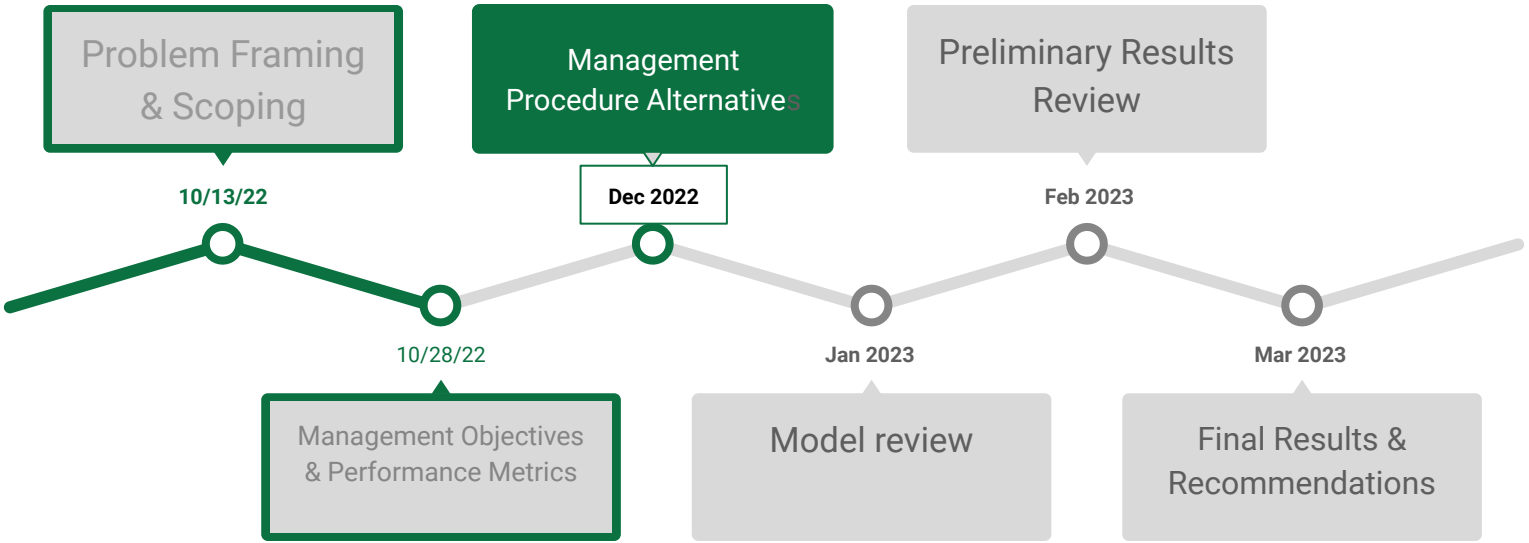

Workshops - what can you expect?

Scoping workshop (now): problem framing, review goals for the pMSE and determine research question scope, including the choices for modeling components to understand software development needs in the project (e.g. alternatives/extensions to the proposed framework), extent of operating model scenarios, species to include, and specific questions the pMSE analyses will be applied to.

Objectives and Performance metrics workshop (10/28): identify the fundamental and means management objectives for the pMSE analyses, and develop a suite of quantitative performance metrics that can be calculated and used to assess how the chosen management procedures are able to meet the management objectives. Identification of visualization tools and summary graphics that can support interpretation of performance metrics.

Management Procedure workshop: develop the set of management procedures (combinations of monitoring, species complex aggregations, assessment methods, and types of control rules) to be tested within the pMSE; outline and work through the needed steps and decision points associated with each management procedure, and identify gaps associated with implementation that can and can not be addressed within the pMSE analyses.

Modeling workshop: overview, review, and discussion on the modeling software and model scenarios, including technical details of operating models, MSE closed-loop simulation structure, and management procedure implementations.

Preliminary results workshop: walk-through of preliminary results for initial pMSE scenarios, with review of graphic and other presentations of results, including comparison among a subset of management procedures. Opportunity for stakeholder group to see a small version of the final results format, and for project team to learn and revise presentation/communication tools as well as identify needed changes for final analyses.

Final results workshop: presentation of pMSE results including comparison of performance among management procedures and tradeoff analysis, supported by interactive Shiny application for results viewer. Identification of key pMSE outcomes, and recommendations for further model development, data synthesis, and exploration of alternative candidate management procedures that could be included in the next stage of the Council's EBFM MSE process (e.g. a broader public stakeholder-based MSE).