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Pacific Hake/Whiting MSE update

JMC meeting, 28 July 2022

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MSE is a decision support tool that asks:

- Is the decision-making process meeting its objectives?
- What do you want from the fishery and its management and what are the tradeoffs among objectives?
- How well will the decision-making process work in the (uncertain) future?



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Good
decisions



Predicting
the future



Knowing
your values



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Goals for the hake/whiting MSE

- Evaluate the performance of the current and alternative hake/whiting management procedures under current and future environmental conditions
- Better understand the effects of hake/whiting distribution and movement on both countries' ability to catch fish
- Better understand how fishing in each country affects the availability of fish to the other country in future years



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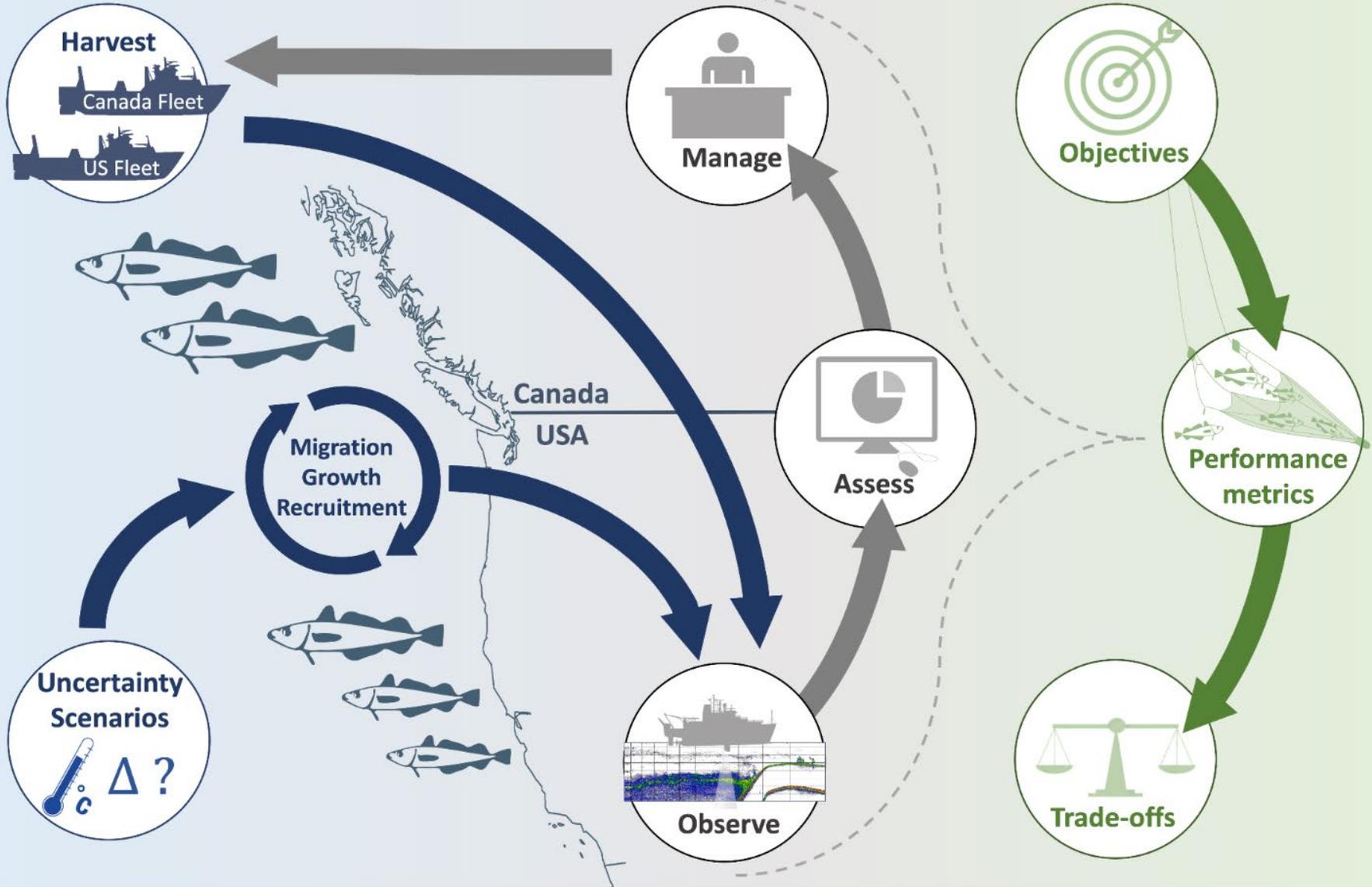


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Operating Model

Management Procedure

Evaluation



Recap what we have learned



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Evaluate the performance of the current and alternative hake/whiting management procedures under current and future environmental conditions

- Decision rules evaluated to date met coastwide objective to have low risk of fishery closure, but not the objective of having spawning biomass above 40 percent of unfished 75 percent of the time
- Future movement scenarios in Jacobsen et al. 2022 suggest risk of fishery closure could be sensitive to future shifts in stock distribution



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Better understand the effects of hake/whiting distribution and movement on both countries' ability to catch fish

- Jacobsen et al. 2022 did not suggest that hake movement or distribution limited either countries' ability to catch fish
- That result depends on our current understanding and assumptions regarding movement, recruitment, and the harvest control rules



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Better understand how fishing in each country affects the availability of fish to the other country in future years

- Selectivity scenarios explored did not indicate effects of catching more younger fish in the US limiting Canadian future catch
- Again, depends on our current understanding and assumptions regarding movement, recruitment, and the harvest control rules



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Hake MSE Progress Since March



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MSE Tech Team 2022 priorities

- Develop standalone technical documentation in a format that will be more transparent and easier to keep current
- Advance research on testing climate robustness
 - Explore the robustness of management procedures (MPs) to current and future environmentally-driven variability in recruitment
 - Hire and onboard new postdoc, begin to develop growth (weight-at-age) variability in OM
- Continue developing and testing dynamic B_0 reference point, variability in initial conditions, and control rule capabilities
- Continue discussions with JMC as requested



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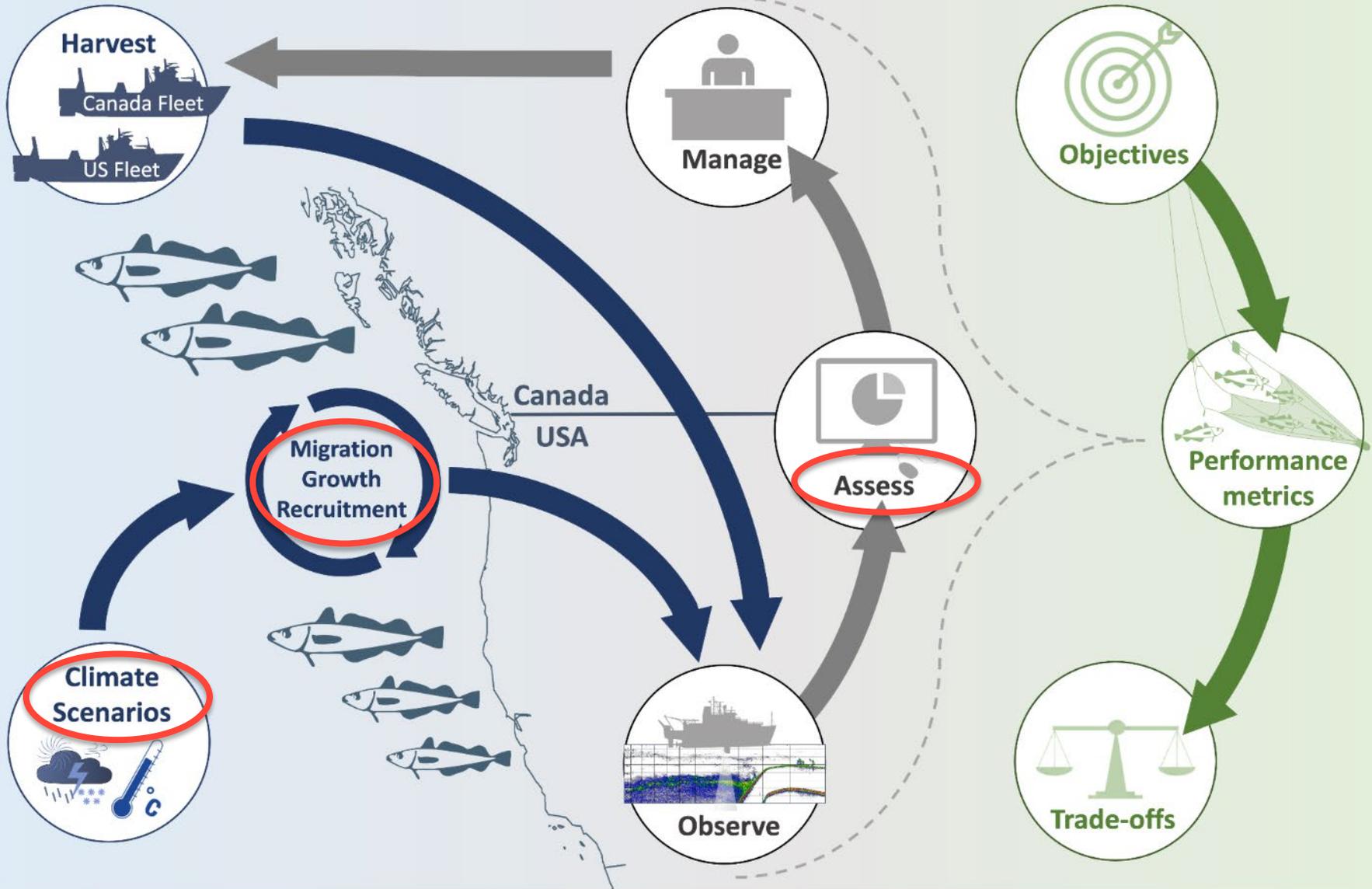
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Testing Climate Robustness

Operating Model

Management Procedure

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Testing robustness to environmentally-driven movement, recruitment, and growth

- Hire a postdoctoral researcher
- Build capability into OM code to add a driver of recruitment and variability in weight-at-age
- Project ocean conditions and/or use conceptual scenarios to represent future conditions
- Test climate robustness by evaluating current and alternative MP performance under climate change scenarios for distribution, recruitment and growth



Recruitment update

- Vestfals et al. manuscript on hake recruitment drivers in review at *Fisheries Oceanography*
- Study underway to test predictive power of early life stages datasets
- Undergraduate intern (R. Ren) working with K. Oken to simulation test performance of recruitment drivers in the stock assessment model
- OM development with respect to recruitment anticipated late summer/fall



Weight-at-age research questions

Numbers-at-age * weight-at-age = Biomass-at-age

- While JTC stock assessment uses empirical weight-at-age, the MSE operating model assumes weight-at-age in the future is constant, at an average of 1976-2018 weight-at-age
- SRG 2021 requested OM to model variable weight-at-age
- We are exploring how to model weight-at-age in the future in the OM. What are the consequences of assuming the future is or is not similar to the past?



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Weight-at-age progress update

- Graduate student intern (A. Odell) exploring spatiotemporal patterns in weight-at-age from the survey
- Investigating evidence for cohort effects and annual variation
- Potential to explore ecosystem drivers of weight-at-age
- Models fit to historical observations will be used to inform choices of model structure to represent variable weight-at-age in the OM





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Cooperative Research Workshop with US hake fishery participants

Pacific Hake, environmental influences, and fishermen's knowledge workshop



Photo credit: Midwater Trawlers Cooperative

Co-hosted by NWFSC researchers, Pacific Whiting Conservation Cooperative, and Midwater Trawlers Cooperative – April 19, 2022
Funded by: NWFSC Cooperative Research Program

Pacific Hake, environmental influences, and fishermen's knowledge workshop cont.

Goals:

- All participants increase their knowledge about Pacific Hake and their interactions with the environment and other species
- Fishery participants share knowledge about Pacific Hake from their fishing experience

Topics:

- Drivers of hake recruitment
- Drivers of hake weight-at-age
- Drivers of the distribution of hake and incidentally caught species

Outcomes:

- 22 attendees, 15 fishery participants
- Workshop summary report (anticipated Aug 2022)
- Research products informed by fishermen's knowledge



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Dynamic B_0 and variability in initial conditions

Expectations

- Dynamic B_0
 1. Introduce concepts to JMC (this meeting)
 2. Test and evaluate approach in MSE
 3. Research in response to SRG request
 4. Additional research

- Variability in initial conditions
 1. Currently deemed lower priority relative to other tasks
 2. May initiate if timing allows



Looking ahead



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2023-2024 Priorities

- Funded research on climate robust management for Pacific Hake/Whiting
- Continue interactions with JMC/AP on spatial objectives and performance metrics
- Test performance of alternative values for F_{SPR}
- Transitioning MSE to be more self-sustaining (2024-2025)



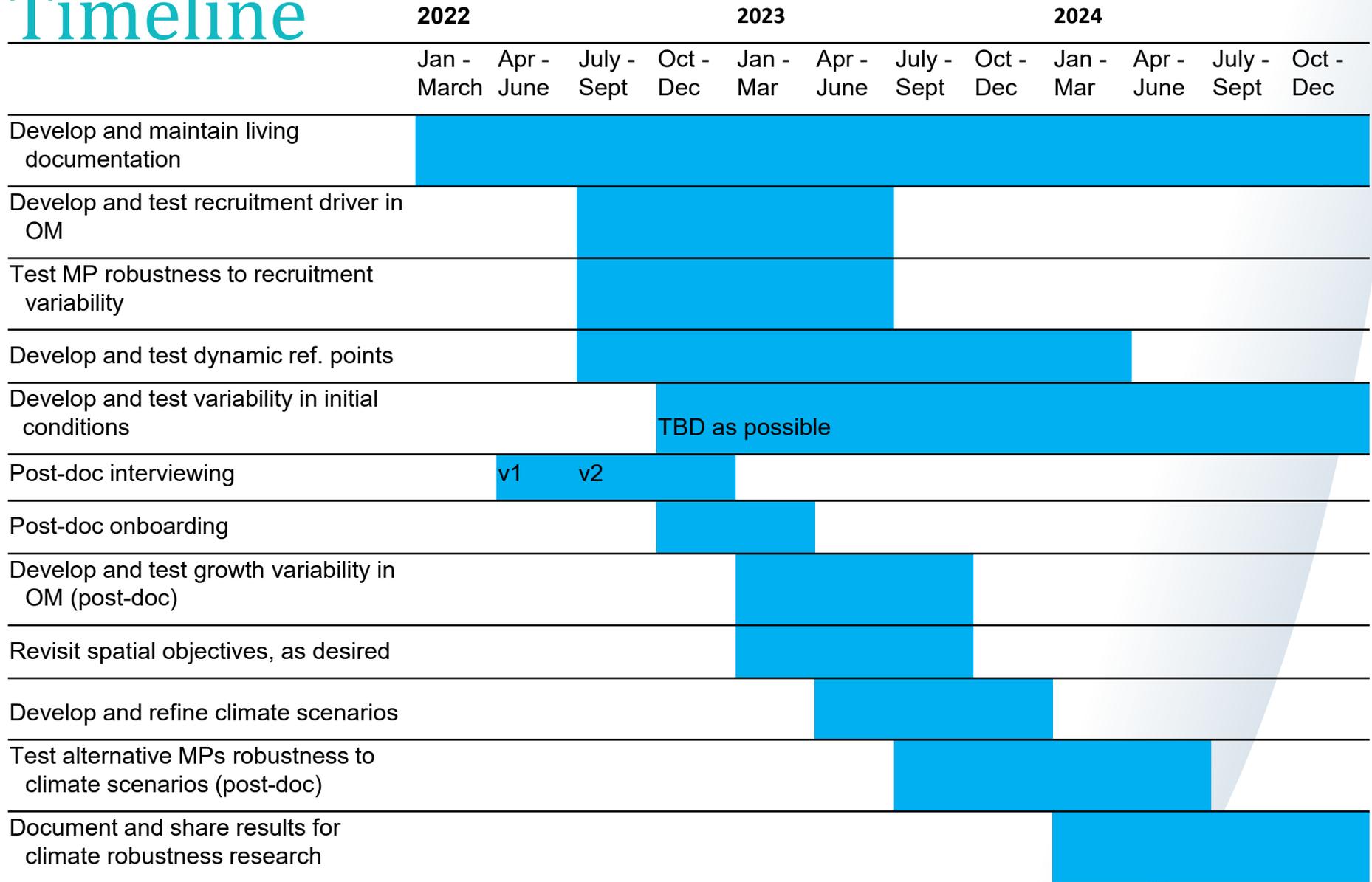
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Timeline



Challenges

- Proposal/funding/contracting lags to support a full-time post-doc
- Ambitious priority list identified for advancing the MSE process, model, and software
- Coordinating workload among Technical Team members across agencies (NWFSC and DFO) who are balancing multiple priorities
- Support for coordinating with JMC/AP/MSEWG



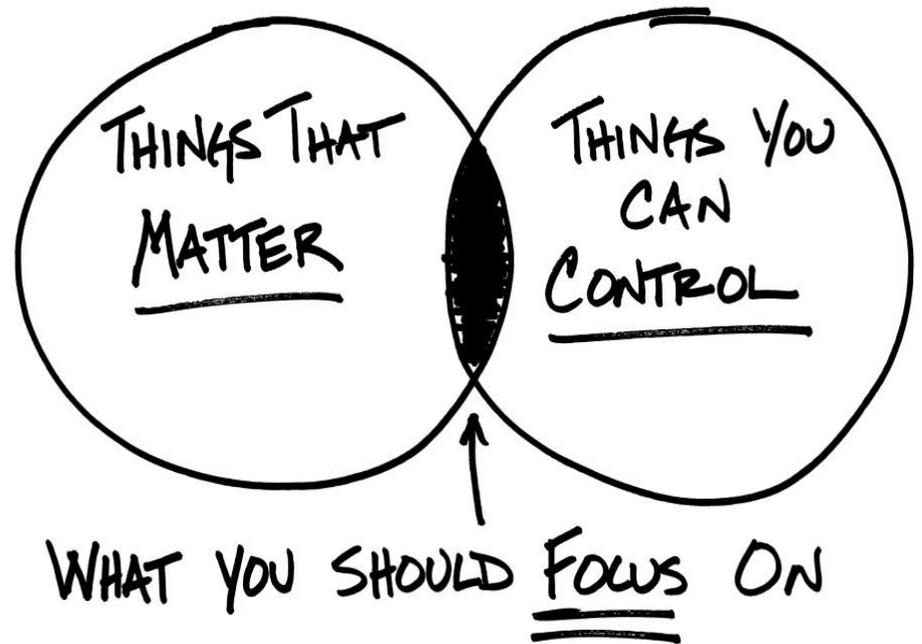
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Constructing a
MSE is a
collaborative,
iterative
process



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Thanks!

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Github: <https://github.com/pacific-hake/pacifichakemse>

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