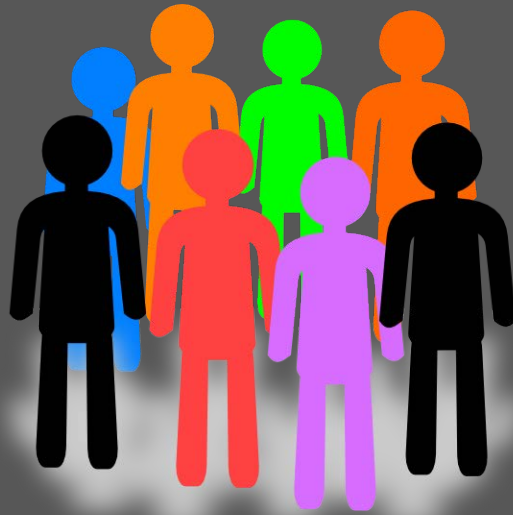


Introduction to Management Strategy Evaluation



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What is MSE?

The Boring

- MSE is a collaborative process to build a simulation tool for evaluating management actions (Deroba)
- Lots of other definitions available with similar themes (Punt et al., 2014; Irwin and Conroy 2013; Allan Hicks IPHC)

What is MSE?

The Road Map



Stakeholders and Managers ID what they want, and how



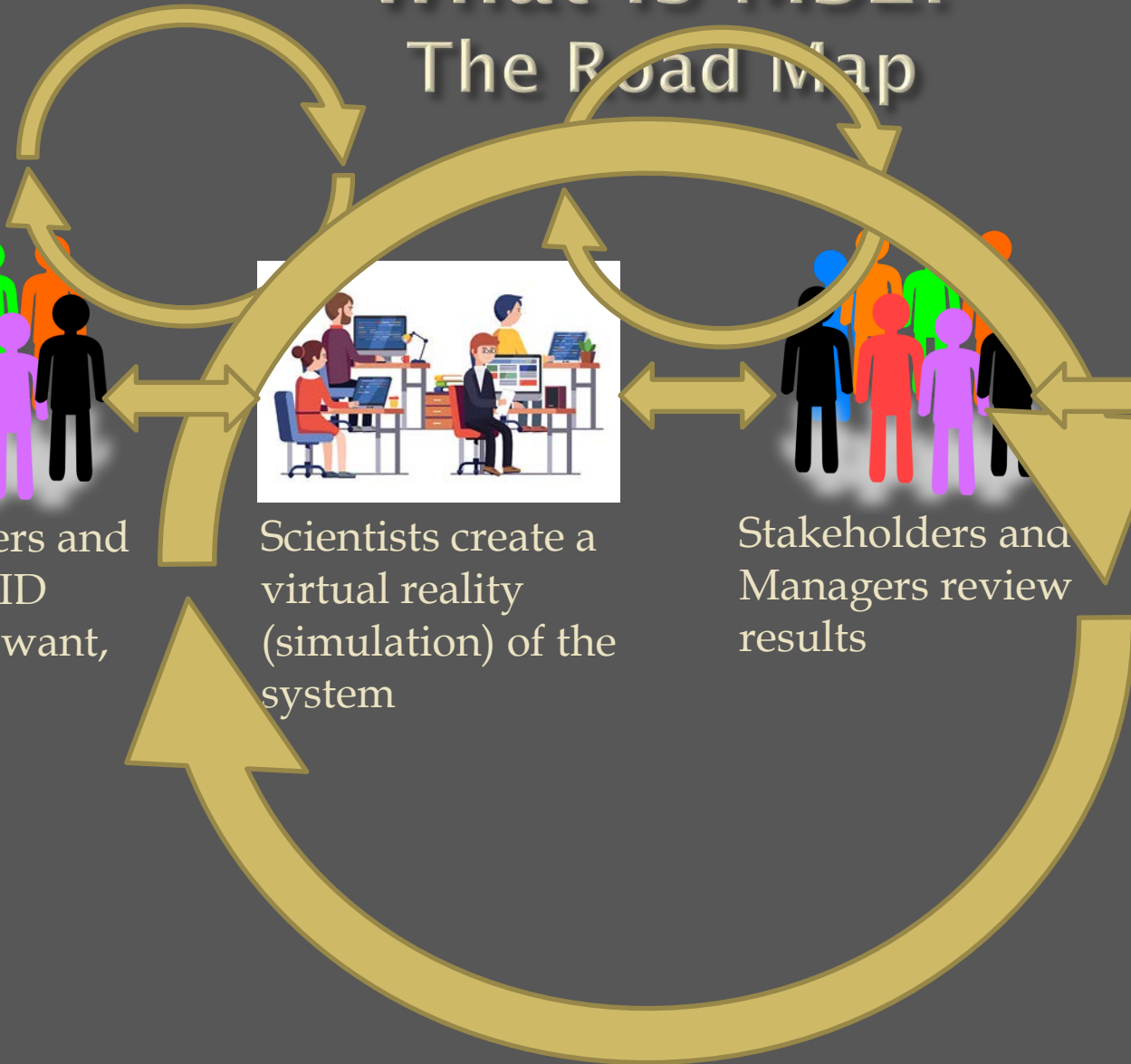
Scientists create a virtual reality (simulation) of the system



Stakeholders and Managers review results



Managers implement an action



What is MSE?

The Road Map



Stakeholders and
Managers ID
what they want,
and how

What is MSE?

Stakeholders and Managers 1.0

- ID what YOU want: objectives and metrics
- Objectives
 - “what you want how to get there”
 - e.g., I want high catch (fundamental objective)
 - e.g., I want to catch MSY (means objective – quantifiable)
- Metrics
 - Quantitative measure of success or failure
 - Used to compare the performance of alternative management actions

(B. Irwin)

What is MSE?

Stakeholders and Managers 1.0

Example Objectives

Example Quantitative Metrics

Minimize risk of low spawning stock

% years with spawning stock below some undesired threshold

Maximize frequency of catching a “keeper”

% trips that harvest a “keeper”

Minimize discards

Number of discards relative to number of landed fish

What is MSE?

Stakeholders and Managers 1.0

- As a participant:
 - This is your opportunity to express what you would like a management action to achieve (i.e., success) – BEFORE any analysis or preliminary decisions have been made
 - Expect meetings with scientists/analysts
 - You may be explicitly asked what your objectives are and what “success” looks like for you
 - Your answers are a starting point to identify management actions
 - e.g., “I want high quality fish list”
 - “I want to harvest 10,000 tons”
 - Expect the need



What is MSE?

Stakeholders and Managers 1.0

- ID possible management actions to evaluate
 - What should management do to achieve your objectives?
 - Can be conceptual (e.g., restrict interannual variability in catch)
 - Input here will form the basis of simulated management actions that are compared for their ability to achieve your objectives

What is MSE?

Stakeholders and Managers 1.0

Example Objectives

Example Management Action

Minimize risk of low spawning stock

Reduce bag limits as stock abundance declines; consider slot limit

Maximize frequency of catching a “keeper”

Consider alternative size limits

Minimize discards

Full retention; hook/gear restrictions;

What is MSE?

Stakeholders and Managers 1.0

- ID uncertainties or desired features for the simulation
 - What don't we know that will prevent us from achieving objectives?
 - e.g., movement of fish, natural mortality, recruitment drivers, discard mortality,....
 - Forms the foundation of the operating model(s), i.e., the simulated system

(Feeney et al., 2019; Goethel et al., 2019)

What is MSE?

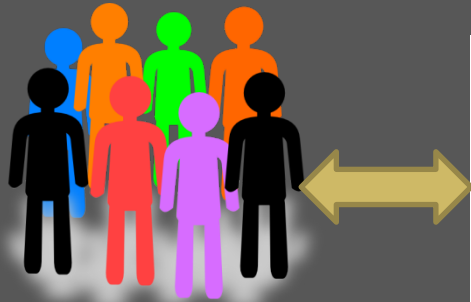
Stakeholders and Managers 1.0

- As a participant:
 - This is your opportunity to suggest possible management actions and help design the evaluation tool – BEFORE the range of possibilities has been narrowed
 - Expect meetings with scientists/analysts
 - The ideas you open possibilities
 - Expect the need for understanding and



What is MSE?

The Road Map



Stakeholders and
Managers ID

- Objectives
- Related metrics
- Uncertainties
- Management actions or procedures



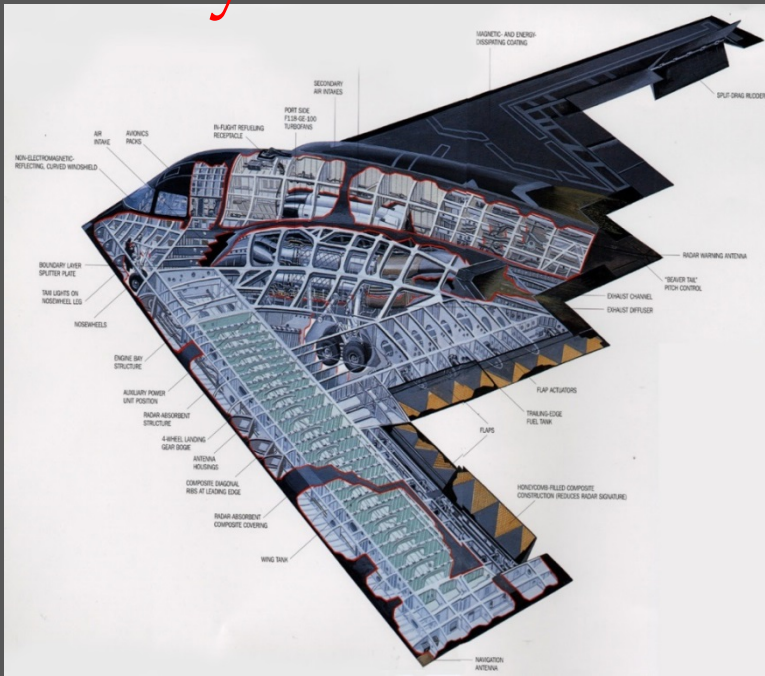
Scientists create a
virtual reality
(simulation) of the
system

What is MSE?

Closed-loop Simulation

- Virtual reality (S. Cadrin)
- Flight simulator (J. Deroba, et al.)
- Play “what if” scenarios with no real world risk (G. Fay)

reality

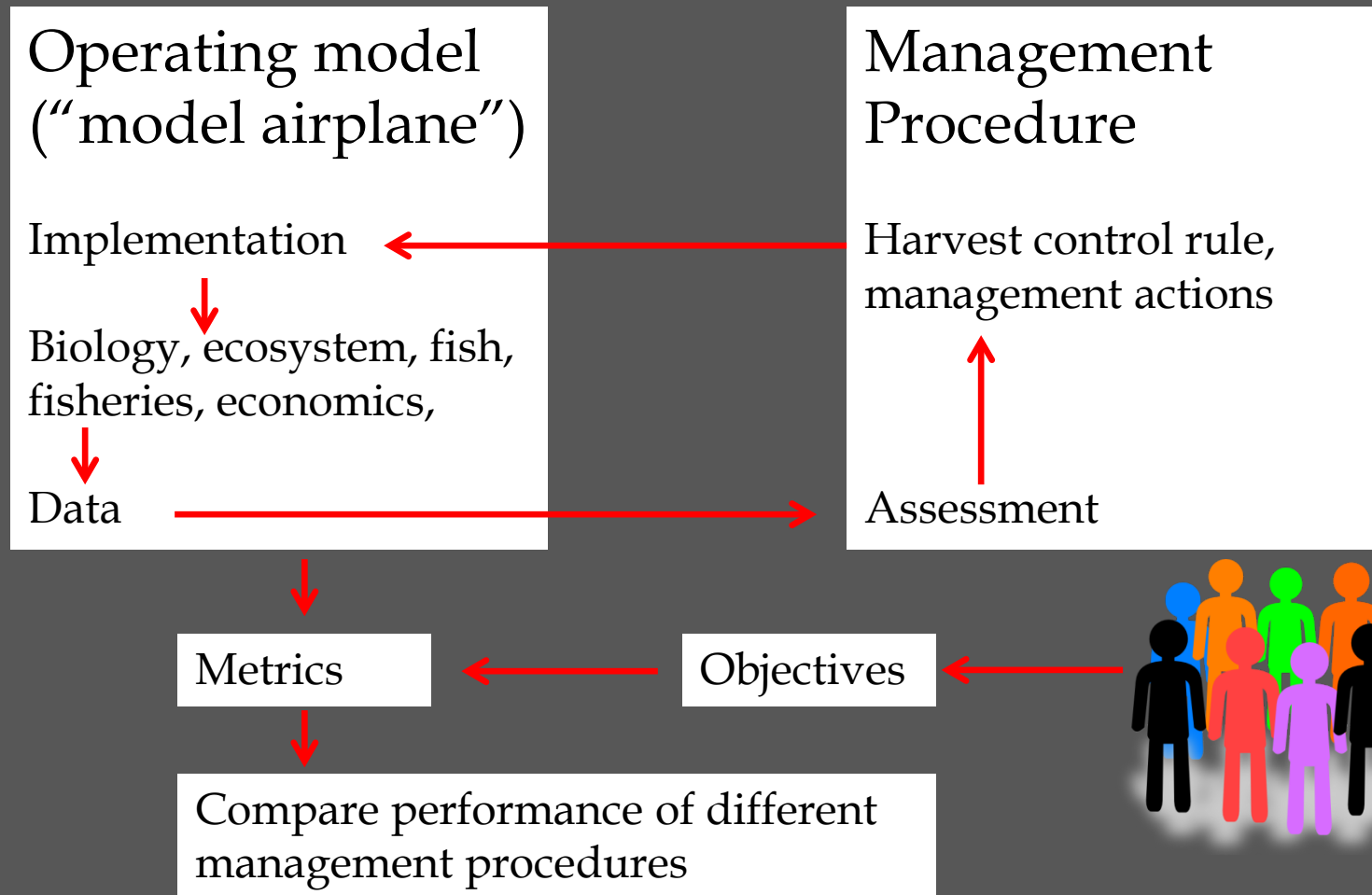


simulations



What is MSE?

Closed-loop Simulation



What is MSE?

Closed-loop Simulation

- As a participant:
 - This is the most technically dense element of the process
 - Hold scientists accountable for making the simulation tool clear and understandable
 - You should see your input on management actions and simulation features (e.g., biology) represented
 - i.e., your model airplane should be identifiable



What is MSE?

The Road Map



Stakeholders and Managers ID

- Objectives
- Related metrics
- Uncertainties
- Management actions or procedures

Scientists simulate

- Data collection
- Assessment
- Harvest rule
- Ecosystem dynamics
- Human/fleet behavior
- Economic model
- Other
- Uncertainties
- Record metrics

Stakeholders and Managers review results

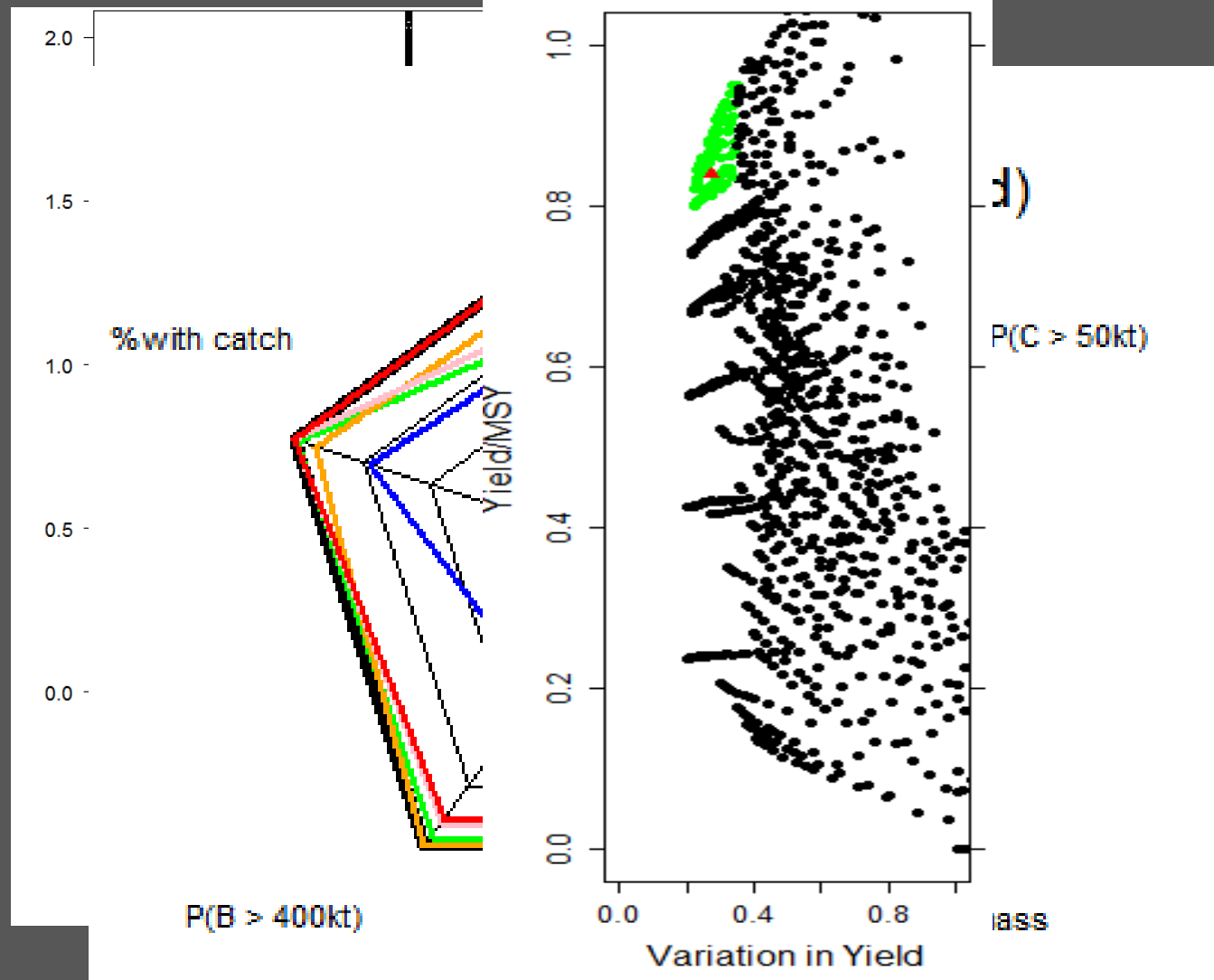
What is MSE?

Stakeholders and Managers 2.0

- Time to look at results and compare performance of management options
- MSEs generate incredible amounts of results
 - Likely a range (10s to 1000s) of management procedures
 - Likely several operating models (simulated realities)
 - Communication and visuals will be vital

What is MSE?

Stakeholders and Managers 2.0



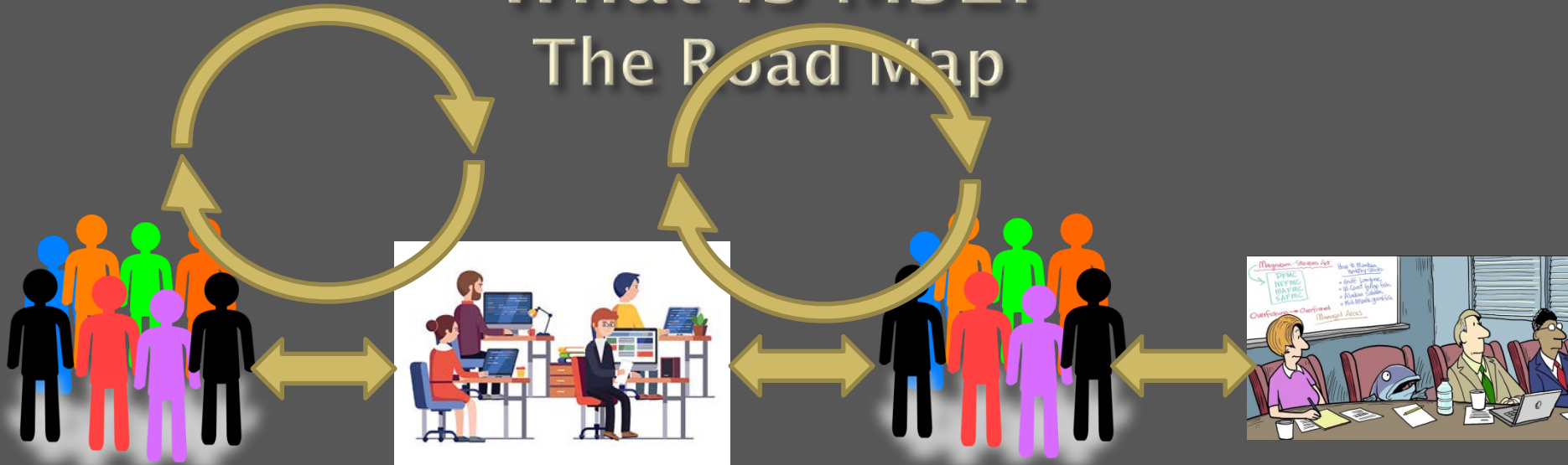
What is MSE?

Stakeholders and Managers 2.0

- As a participant:
 - Your input here will inform the management action that gets applied in reality – BEFORE final decisions
 - Recall your definition of success from earlier
 - What tradeoffs or compromises are you willing to make to achieve your ideal success?
 - Success as you defined it may not be achievable, but is there an acceptable management action?
 - If possible, then do some homework and familiarize yourself with results and graphs beforehand
 - Reach out to the scientists directly if necessary

What is MSE?

The Road Map



Stakeholders and Managers ID

- Objectives
- Related metrics
- Uncertainties
- Management actions or procedures

Scientists simulate

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- Record metrics

Stakeholders and Managers Review

- Management action performance...
- ...via tradeoffs in metrics

Managers

- Implement an action

What is MSE?

Managers Select and Implement an Action

- Selection of a management action might entail:
 - Finding an “optimal” action, but rarely possible
 - Eliminating obviously bad options (sometimes easiest)
 - A “satisficing” option with the tradeoffs, logic, and analyses laid bare
- The decision may be no less contentious, but the process helps

What is MSE?

The Road Map



Stakeholders and Managers ID

- Objectives
- Related metrics
- Uncertainties
- Management actions or procedures



Scientists simulate

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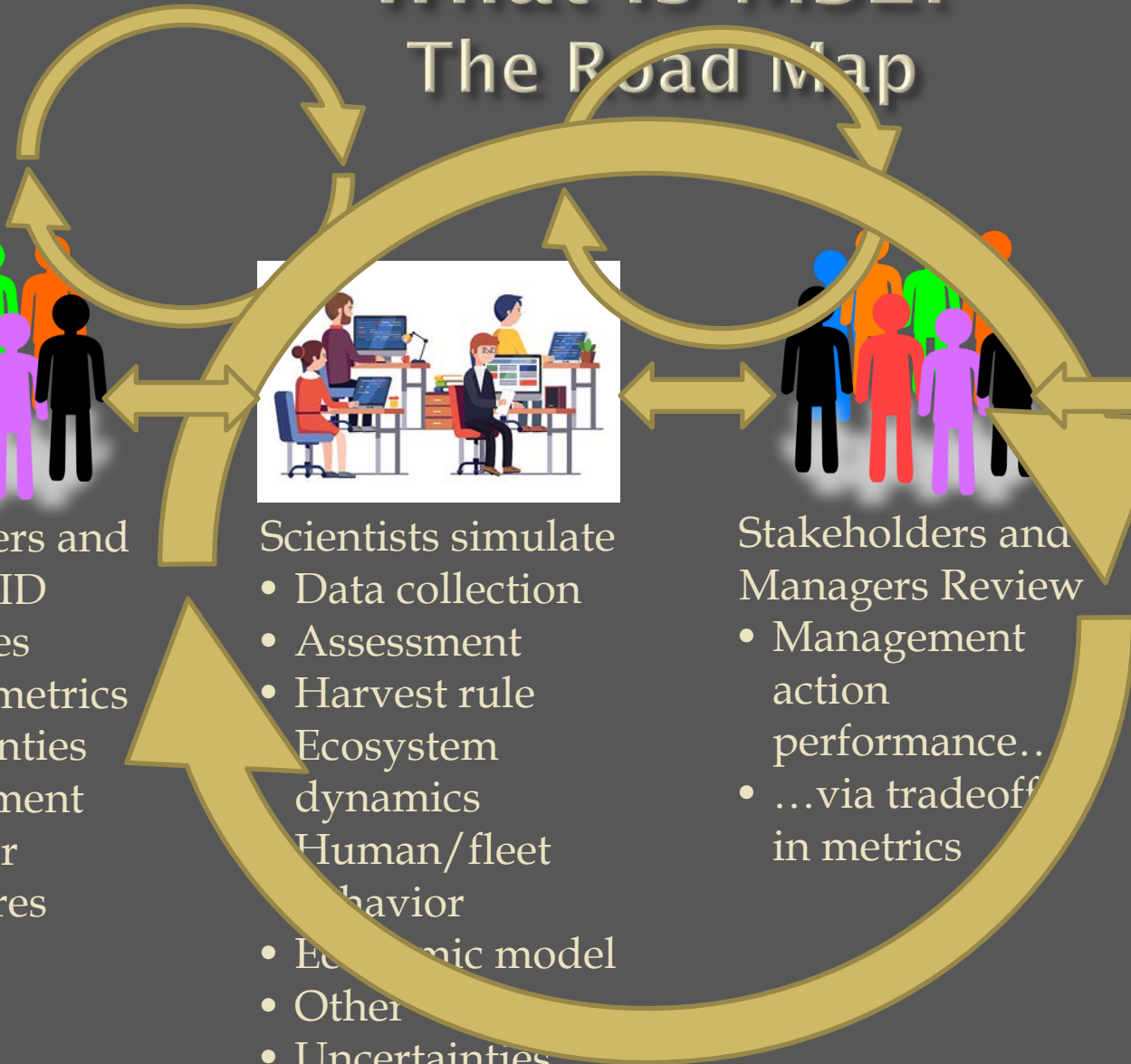
Stakeholders and Managers Review

- Management action
- performance..
- ...via tradeoff in metrics

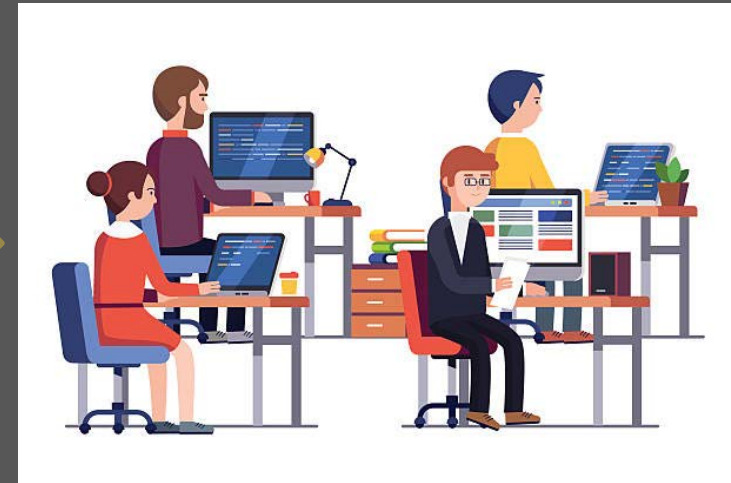
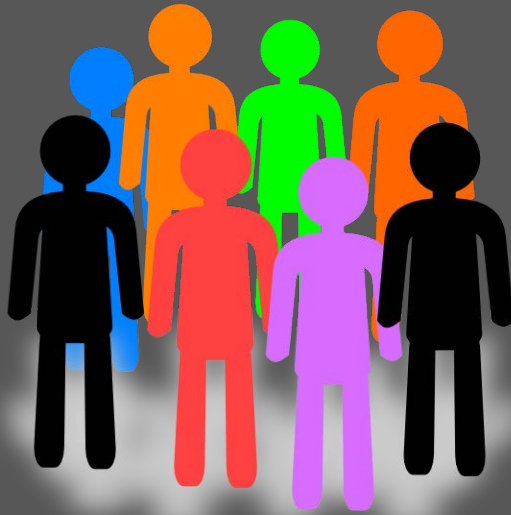


Managers

- Select and implement an action
- Monitor



Thanks!!



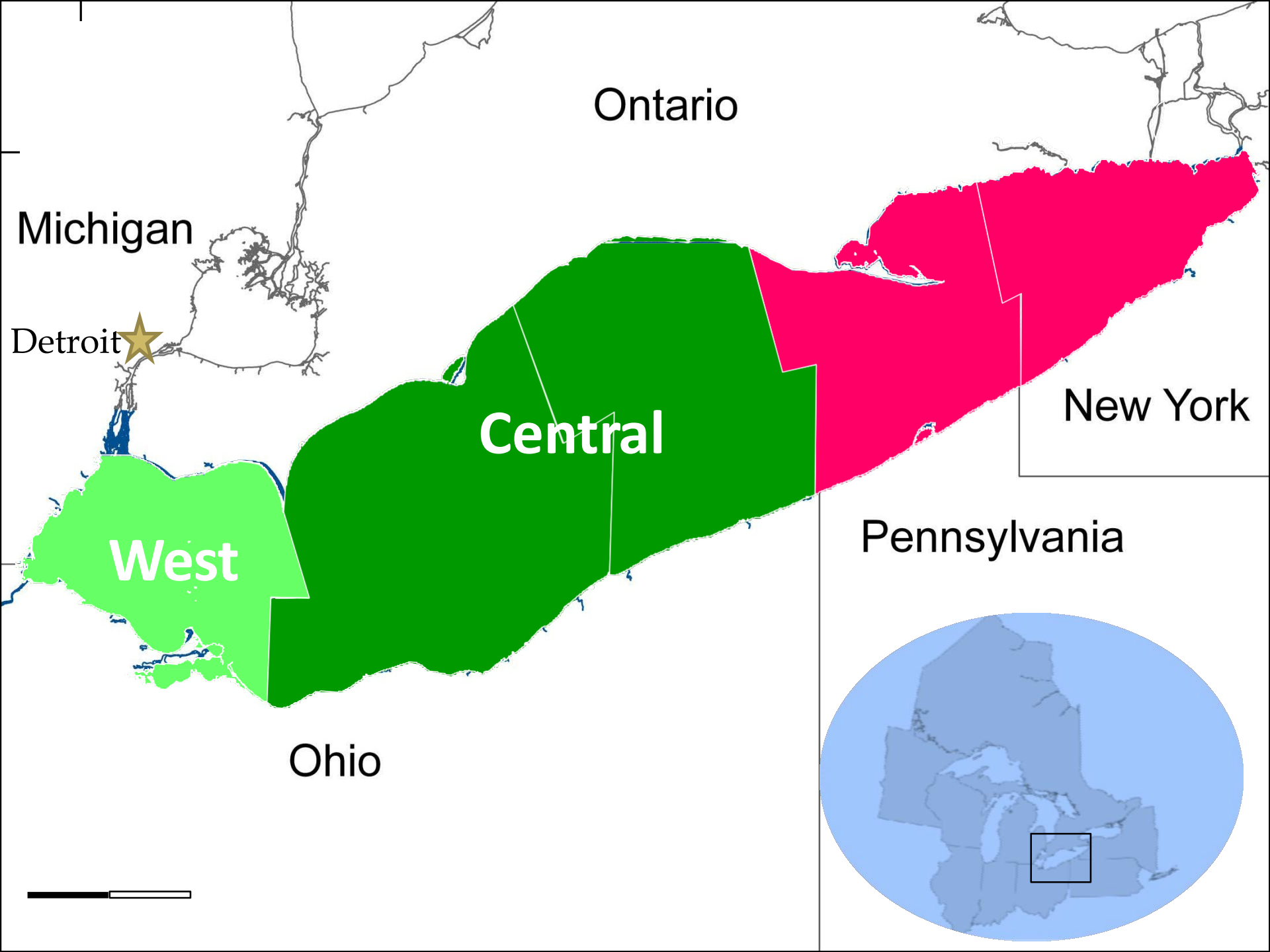
Acknowledgements:

Gavin Fay, Amanda Hart, Allan Hicks,
Brian Irwin, Sarah Gaichas

Welcome to the Lake Erie Walleye (*Sander vitreus*) MSE Workshop



All content related to walleye provided
by Jones, M.L., Catalano, M.J., and
Peterson, L.K. 2018. Michigan State
University



Walleye Fishery

Sport (recreation/charter)

- U.S. dominated

97% of harvest

95% of effort



Commercial (gill nets)

- exclusive to Canadian waters
- managed as an ITQ system



Walleye MSE Workshop

- Lake Erie managers specified objectives:
 - Minimize economic risk to commercial fishery
 - Maintain acceptable catch rates for recreational anglers
 - Minimize risk of low spawning stock
- Other possible management objectives?
- Performance metrics reflective of objectives
 - What would success look like?
- Uncertainties? What don't we know? What might prevent success?



What Happens Next?



Stakeholders and Managers ID what they want, and how



Scientists create a virtual reality (simulation) of the system



Stakeholders and Managers review results



Managers implement an action