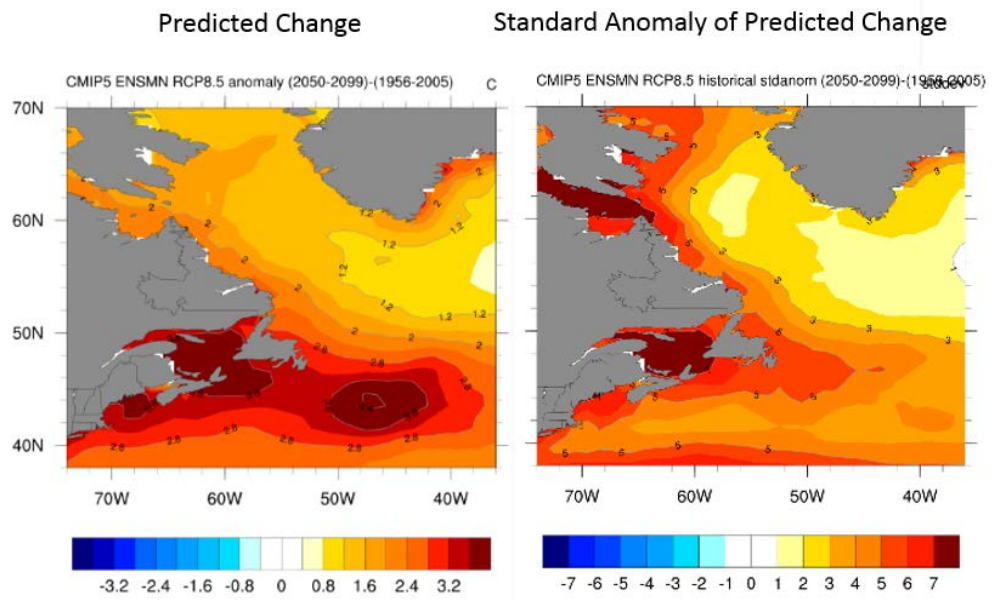
Introduction to Scenario Planning



Source: NOAA Climate Change Web Portal

Diane Borggaard[1] and Dori Dick[2]

[1] Protected Resources Division, Greater Atlantic Regional Fisheries Office, NMFS
[2] Ocean Associates, Inc. in support of Office of Protected Resources, NMFS

With thanks to Wendy Morrison[3] for fisheries examples
[3] Office of Sustainable Fisheries, NMFS

Presentation Overview

- Scenario Planning Overview
- NMFS Scenario Planning Efforts
  - Atlantic Salmon (Pilot)
  - North Atlantic Right Whale
  - Training Opportunities
  - Scenario Planning White Paper
- Other Scenario Planning Examples
  - Pacific Fisheries Management Council
  - Rhode Island

NMFS Scenario Planning Participant Views

"The Atlantic salmon climate scenario project was one of the best prioritization exercises I have ever participated in for salmon. The process that was developed enabled us to focus on all of the threats to salmon, rather than the ones that are easiest to address."

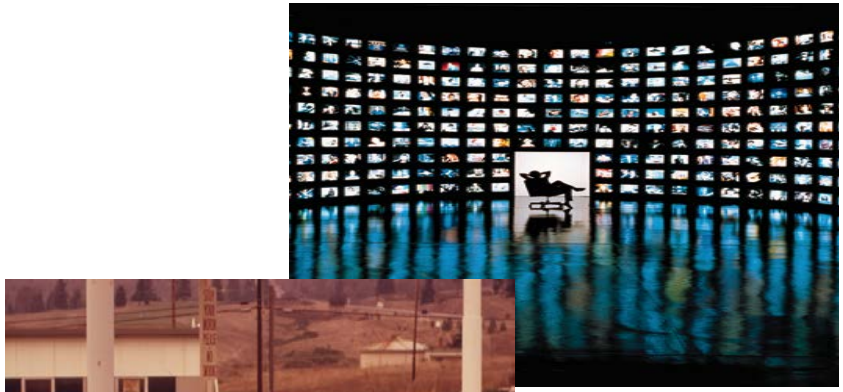
- *Kim Damon-Randall, Deputy RA, GARFO*

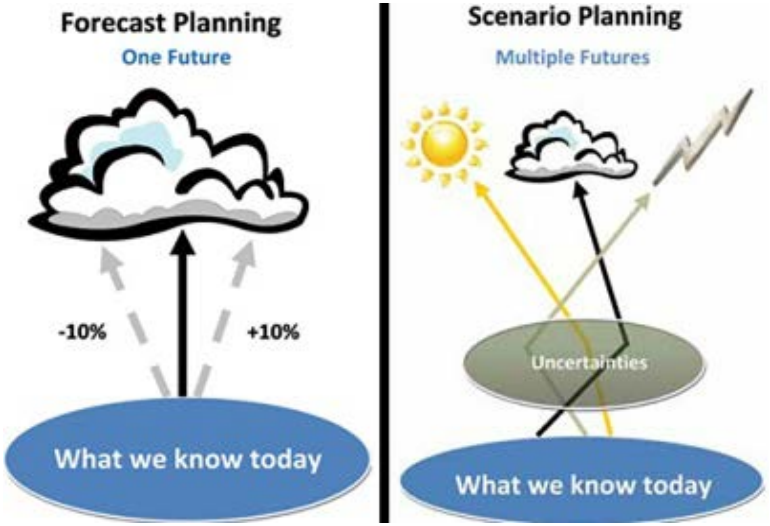
"The structure of the scenario planning brought together folks with diverse expertise and made tackling a "wicked" problem both manageable and intellectually stimulating. The outcome was truly a collective effort that I was pleased to be involved in."

- *John Kocik, Protected Species Branch, NEFSC*

Scenario Planning

- Provides framework to support decisions under conditions that are uncertain and uncontrollable
- Explores plausible alternative conditions under different assumptions
  - ➢Not prediction or forecast
  - ➢Does not have to be data intensive
- Flexible and adaptable process
  - ➢E.g., Adapt management now to add necessary flexibility for future





Scenario Insight; Weeks et al. 2011, Park Science

General Framework

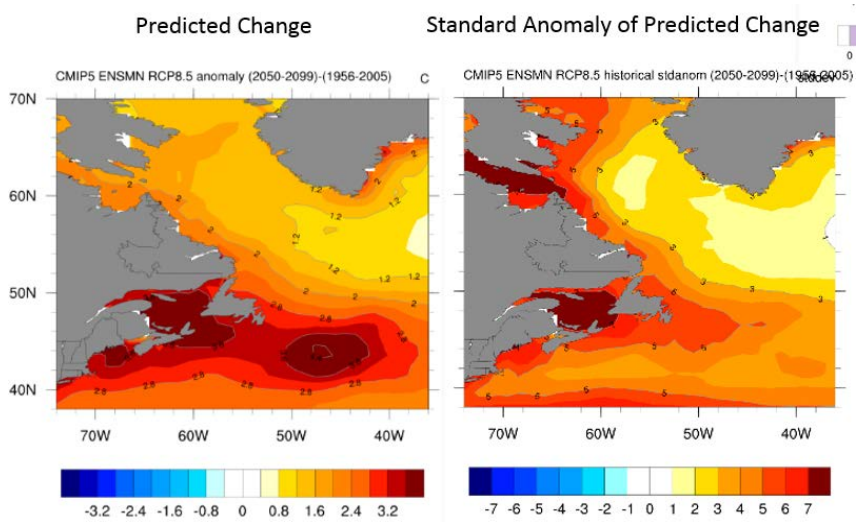
1. Clarify the focus and goals of the investigation (scope & time horizon)

2. Research to identify factors likely to shape the future (climate drivers)

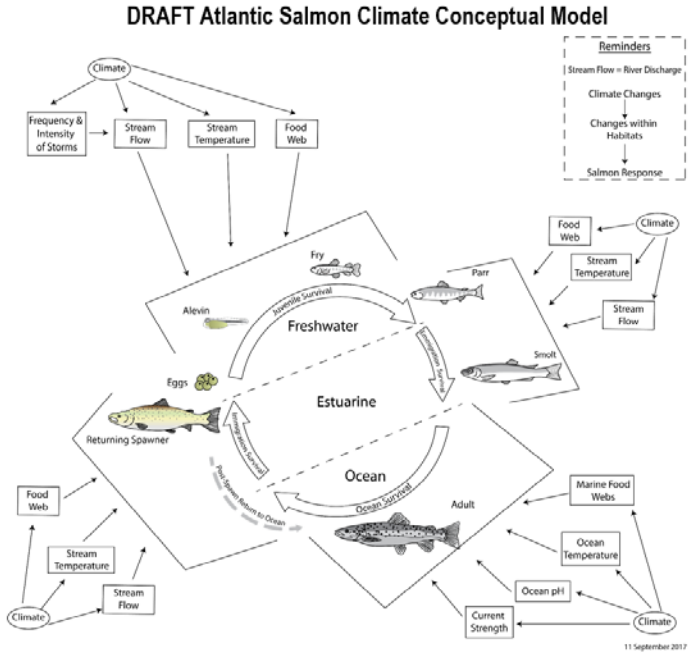
Scenario Insight; NPS 2013, Handbook for practitioners

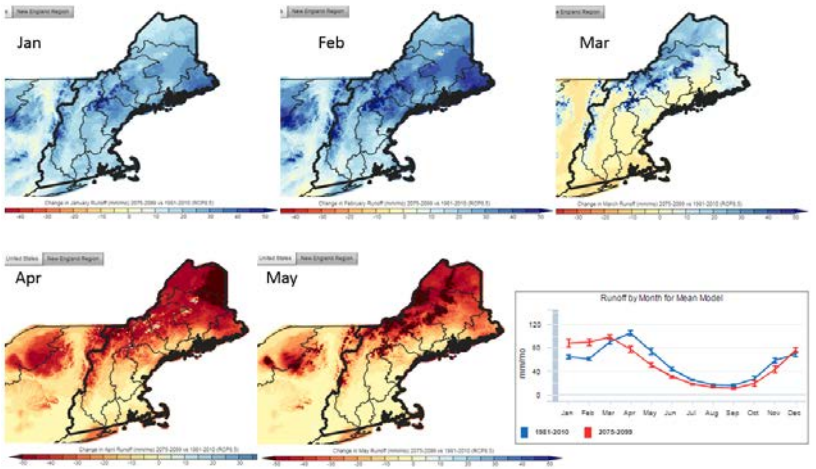
Identifying Drivers

- Climate/Physical Forces
- Biological/Social/Political/Economic/ Technological Forces
- Other Relevant Data Sources



Source: NOAA Climate Change Web Portal





Source: USGS Climate Change Viewer

Source: Borggaard, Dick et al. 2019

General Framework

1. Clarify the focus and goals of the investigation (scope & time horizon)

2. Research to identify factors likely to shape the future (climate drivers)

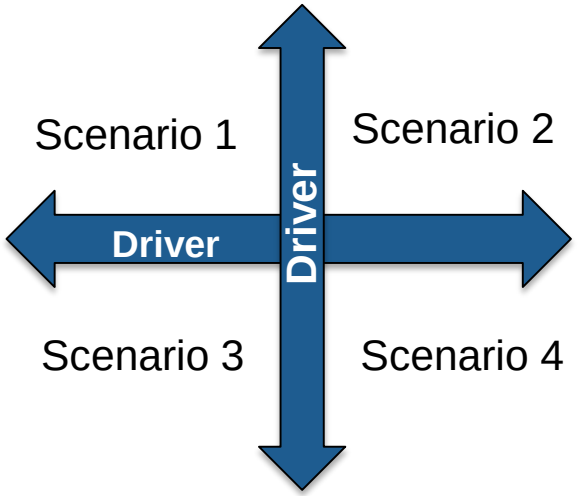
4. Craft a plausible, challenging story for each scenario

3. Combine drivers to create a scenario framework

Scenario Insight; NPS 2013, Handbook for practitioners

Scenario Framework Development

- Identify drivers that are most critical and uncertain
- Driver axes should be independent
- Each scenario should be:
  - ➢ Plausible
  - ➢ Relevant
  - ➢ Challenging
  - ➢ Divergent



General Framework

1. Clarify the focus and goals of the investigation (scope & time horizon)

2. Research to identify factors likely to shape the future (climate drivers)

3. Combine drivers to create a scenario framework

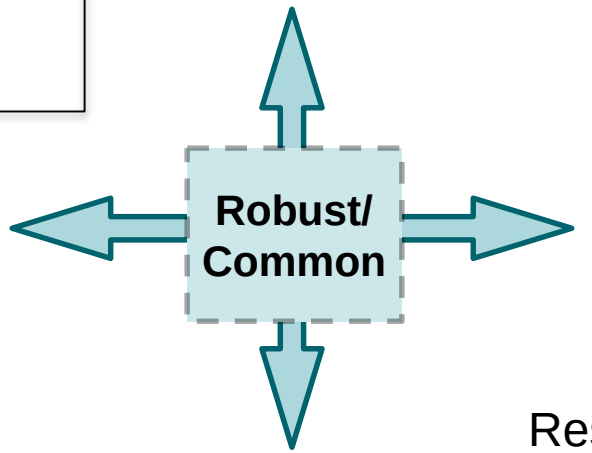
4. Craft a plausible, challenging story for each scenario

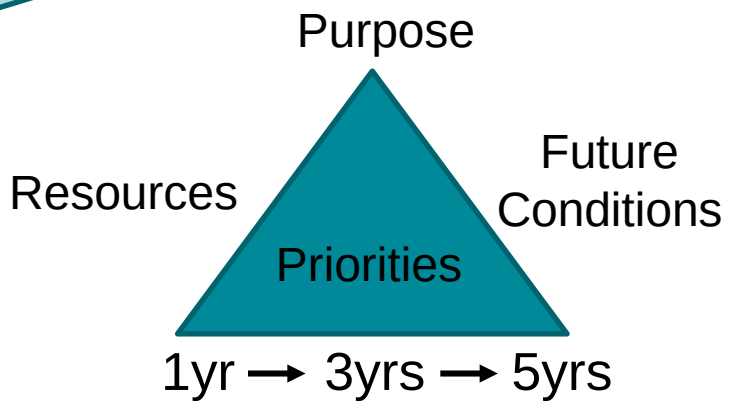
5. Use the scenarios for strategy, innovation, risk, vision-setting

Scenario Insight; NPS 2013, Handbook for practitioners

Generating and Assessing Options

Identify actions to take <u>now</u> to prepare for or avoid the possible future





Source: Scenario Insight, with modifications

Benefits of Scenario Planning

1. *Flexibility to react quickly to a changing world*
2. *More robust decisions and plans*
3. *Innovative ideas*
4. *Early and broad risk identification*
5. *Alignment towards a common vision*

Source: Scenario Insight

Challenges of Scenario Planning

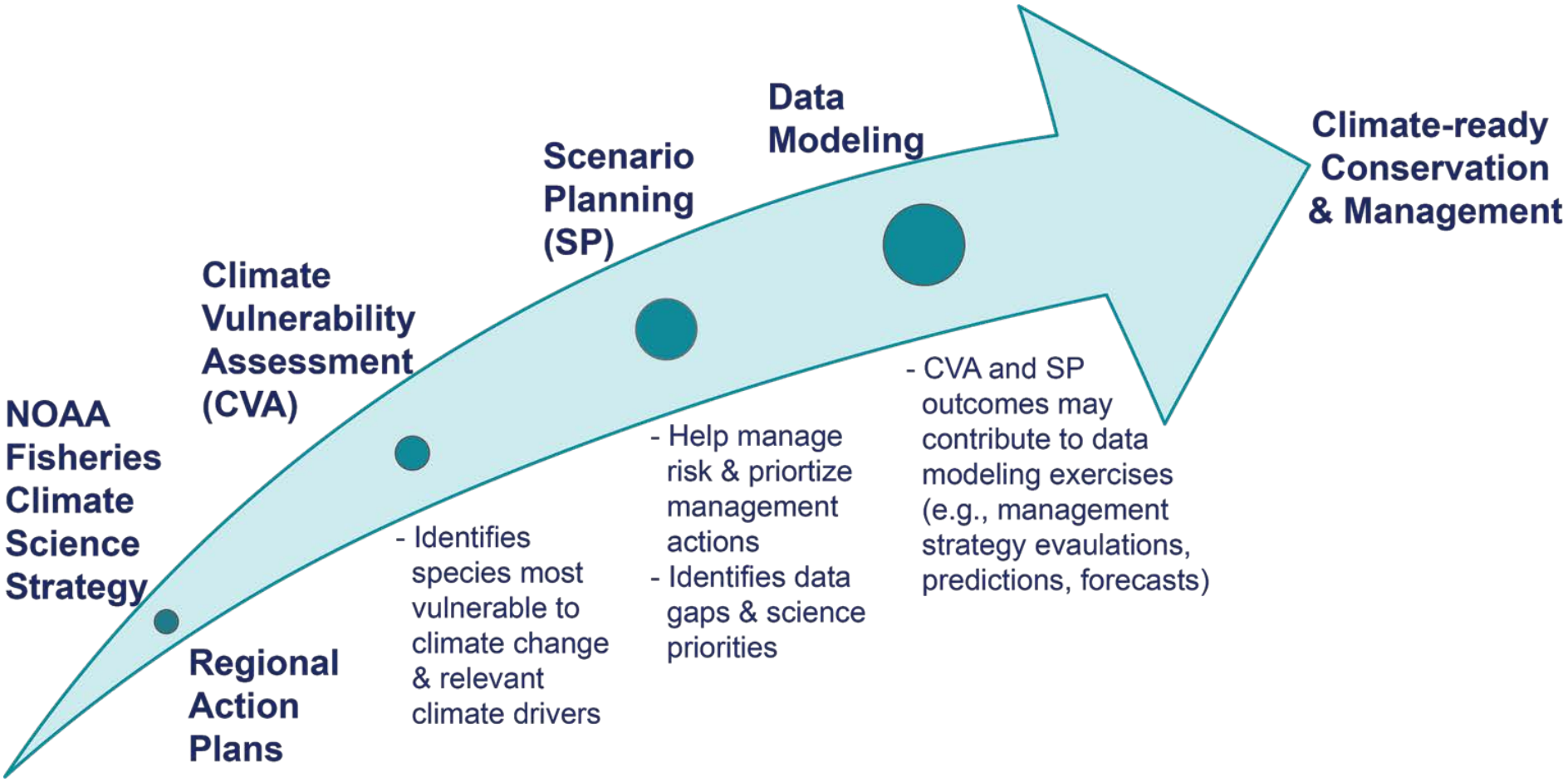
For example:

- *Out-of-the-box thinking if other issues considered higher priority or in an emergency event*
- *Limited number of scenarios*
- *Not predictive*

Scenario Planning Examples

Key Organization(s)	Location
National Park Service	Acadia National Park; Assateague Island National Seashore, etc.
NOAA Greater Farallones National Marine Sanctuary	North-Central California Coast
Tijuana River National Estuarine Research Reserve	Tijuana River Estuary
GeoAdaptive, Florida Fish and Wildlife Conservation Commission	KeysMAP: Florida Keys Marine Adaptation Planning Project
University of Alaska Anchorage	Salmon 2050, Kenai Peninsula, Alaska
Point Blue Conservation Science	San Francisco Bay Estuary
Rhode Island Commercial Fisheries	Rhode Island

NMFS Climate-Ready Example Trajectory



Source: Borggaard, Dick et al. 2019

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https://nature.ca/notebooks/english/atsalmon_p2.htm


Photo: NOAA

Atlantic Salmon Scenario Planning Pilot

Purpose

To explore what NMFS can do to improve U.S. Atlantic salmon population resilience to changing conditions in riverine, estuarine, and marine habitats across its current range.

Focal Question (Initial)

How could the effects of climate change impact the watersheds and marine ecosystems over the next 75 years?

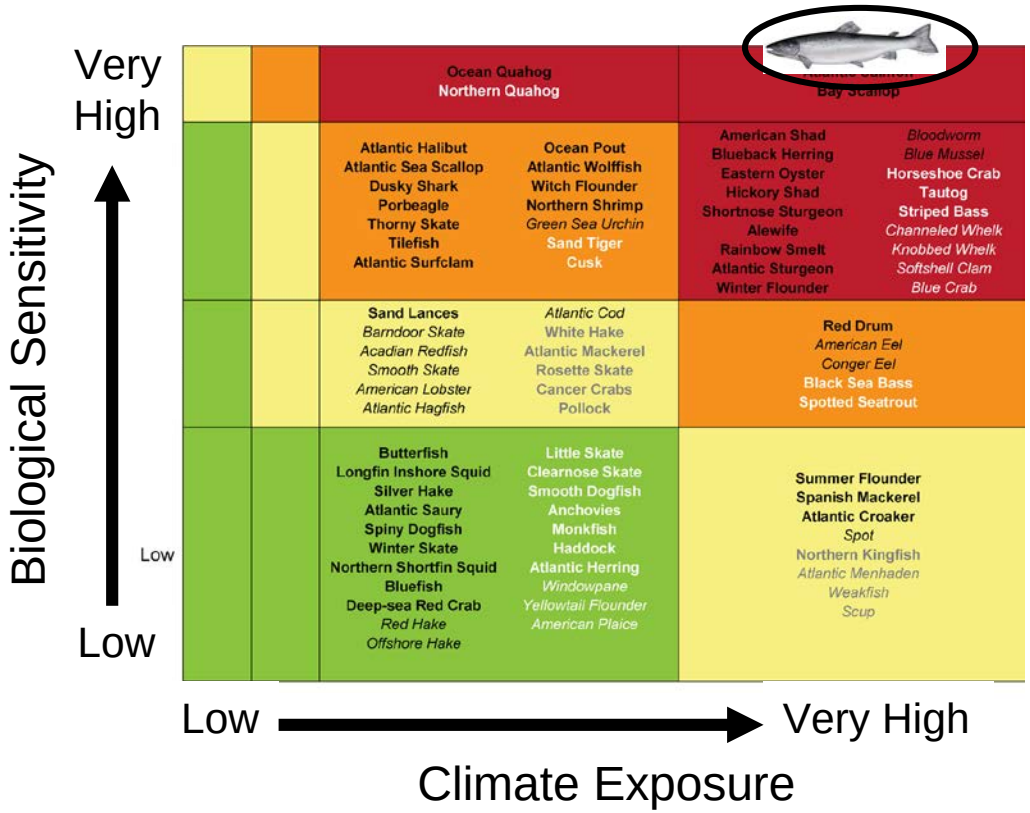
Source: Borggaard, Dick et al. 2019

NMFS Climate Adaptation Planning

Fish & Invertebrate Vulnerability Assessment (2016)

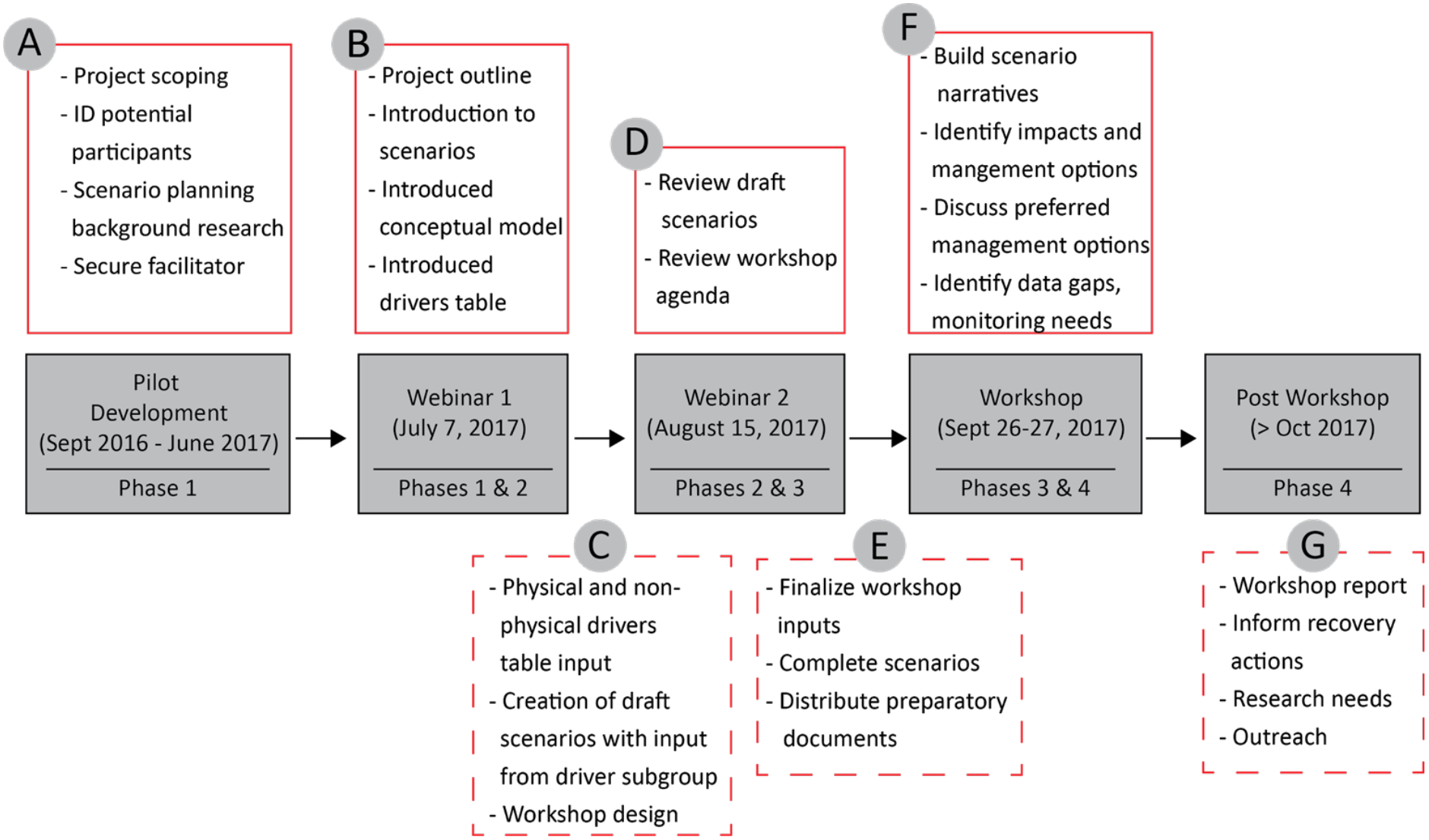
Atlantic salmon

Overall vulnerability = very high



Hare et al. 2016

Example Process Outline (Atlantic Salmon)



Source: Borggaard, Dick et al. 2019

Driver Spreadsheets

- Climate/Physical Forces
- Biological/Social/Political/Economic/Techno Forces
- Other Relevant Data Sources

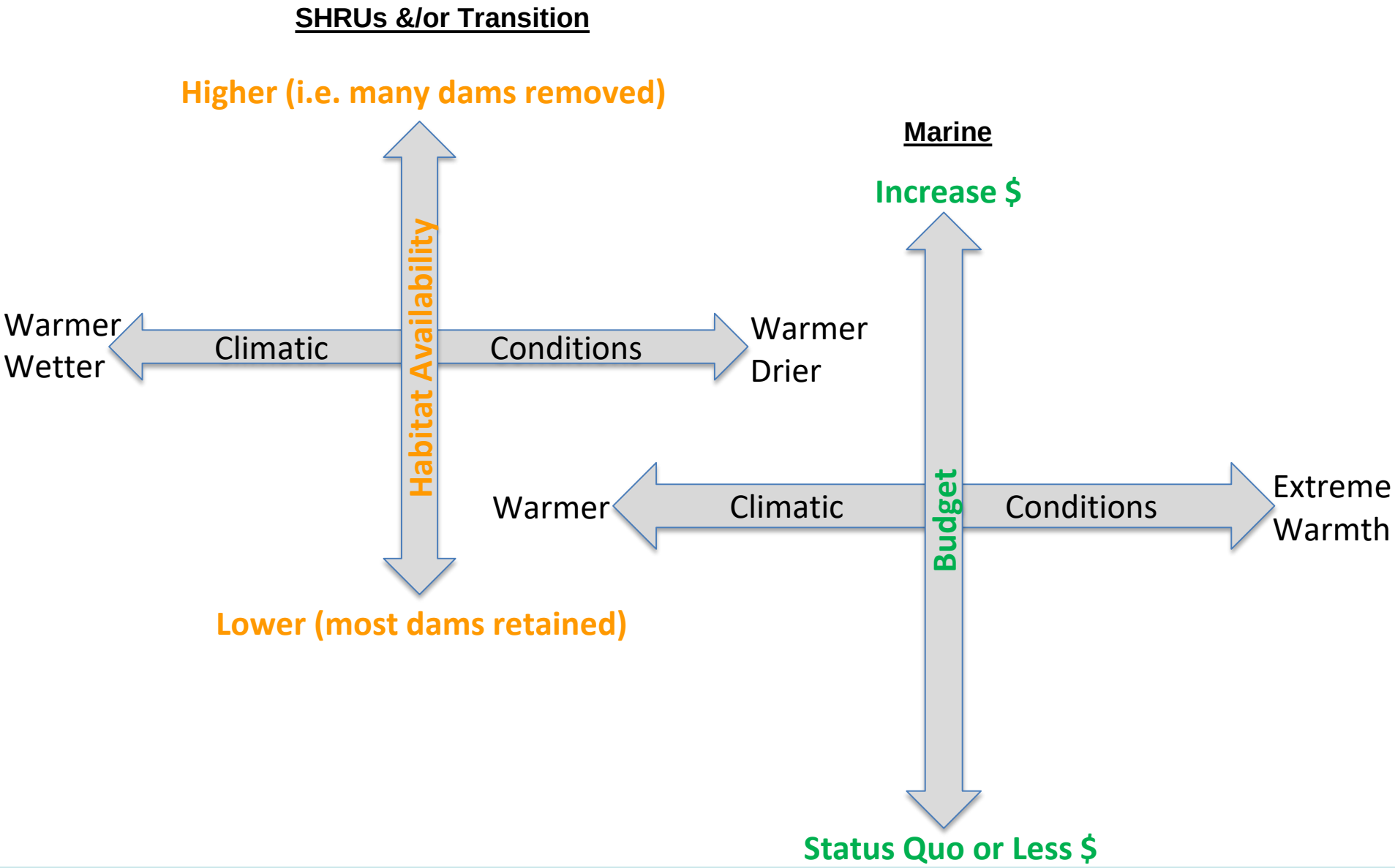
Climate/Physical Variable	Expected General Change	Specified Change Expected and Reference Period	Patterns of change	Confidence	Primary Source and Context
Sea surface temperature	↑	2050-2099: ↑3.2 to 4°C 2060-80: ↑3 to 5°C			https://www.esrl.noaa.gov/psd/ipcc/ocn/ Saba *et al.* 2016. doi.1002/2015JC011346/full
Precipitation	↑				
Ocean bottom temperature	↑				
Sea surface pH (ocean acidification)	↓				
Sea surface salinity	No Δ t				
Air temperature	↑				
Ice affected stream flow	↓				

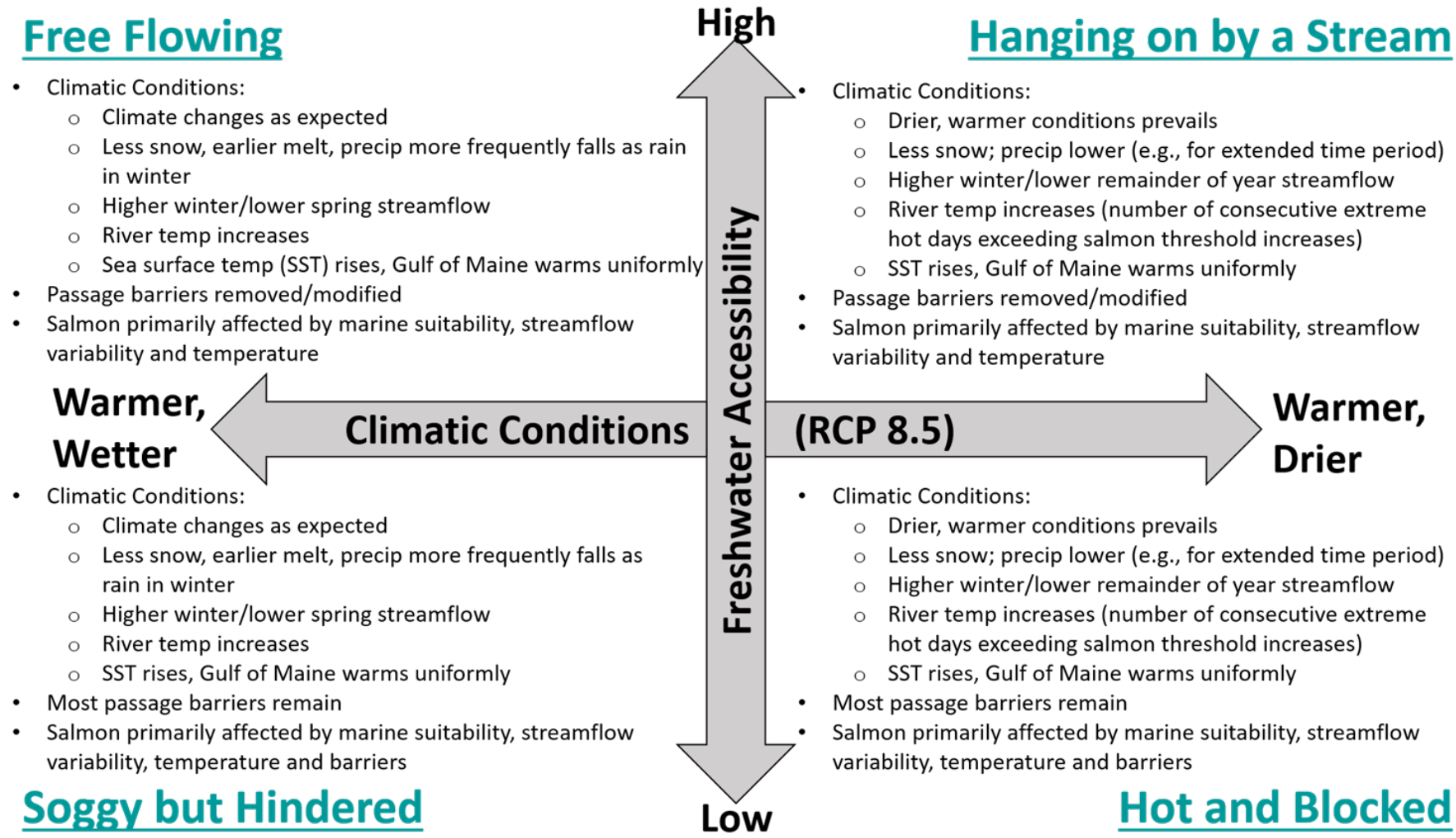
Biological, social, political, economic, technological	Projected change (if applicable)	Source and context	Comments
Freshwater habitat availability	Very uncertain	http://ice.ecosheds.org/; http://db.ecosheds.org/viewerhttp://db.ecosheds.org/viewer; Dan Kircheis' powerpoint; Atlantic salmon designated critical habitat. http://www.nmfs.noaa.gov/pr/pdfs/criticalhabitat/atlant	This variable incorporates many ro dam removal; incidental take; and e current habitat availability and hist
Marine habitat availability			
Societal awaren concern for issu			
Species climate vulnerability			
Rate and magnit greenhouse emis			
Leadership (loc national, interna			

Data Type/Description	Source
Northeast Ocean Data	http://www.northeastoceandata.org/
State of Rivers and Dams in Maine	https://wiki.colby.edu/display/stateofmaine2009/State+of+Rivers+and+Dams+i
Maine GIS Data	http://www.maine.gov/megis/catalog/
NE Coastal Acidification	http://necan.org/
National Climate Change Viewer (USGS)	https://www2.usgs.gov/climate_landuse/clu_rd/nccv.asp

Source: Borggaard, Dick et al. 2019

Scenario Matrix Evolution (early examples)





Source: Borggaard, Dick et al. 2019

Free Flowing

High

Hanging on by a Stream

Warmer, Wetter

Climatic

Freshwater Accessibility

Conditions (RCP 8.5)

Warmer, Drier

Soggy but Hindered

Hot and Blocked

Low

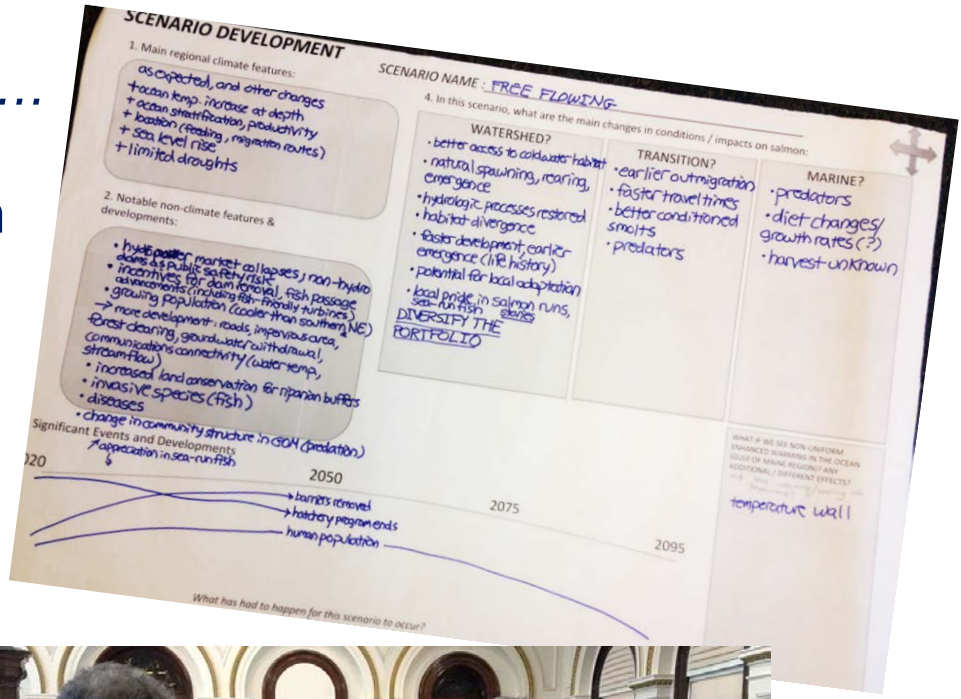
NOAA FISHERIES

Source: Borggaard, Dick et al. 2019

Scenario Development

Breakout Groups: *Given the scenarios…*

- What do the plausible futures mean for salmon?

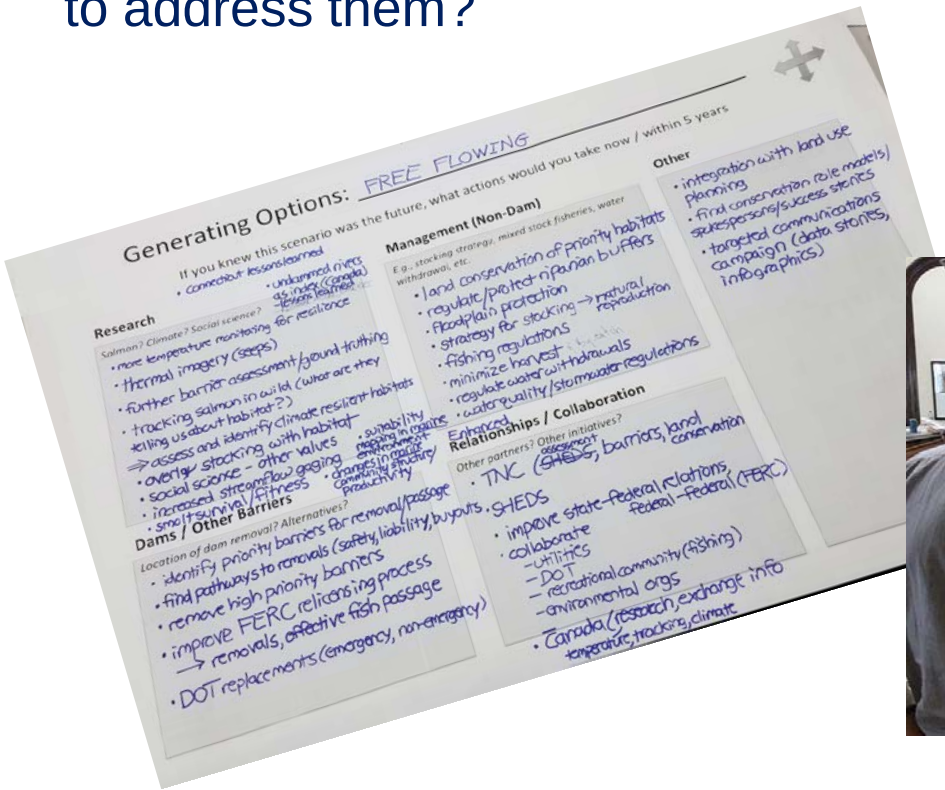


Source: Borggaard, Dick et al. 2019

Generating Options

Breakout Groups: *Given the scenarios…*

- Assuming a scenario is a plausible future, what actions would you take to address them?



Source: Borggaard, Dick et al. 2019

Outcomes

High priority examples:

- Conduct range-wide habitat analysis (e.g., map existing cold water refugia for DPS watersheds)*
- Evaluate migration behavior and survival assessment
- Conduct tagging/tracking studies in marine environment to understand how changing climate might affect survival

* = funded post-pilot workshop

Source: Borggaard, Dick et al. 2019

Recovery Plan

F3.0	**Identify, maintain, protect and restore priority freshwater habitats for Atlantic salmon**								
F3.1	Establish and implement a water temperature monitoring protocol in all SHRUs to support efforts to identify climate vulnerable and climate resilient habitats	A	1	1	Baseline	—	—	—	USFWS, Maine DMR, NMFS, NGO's
F3.2	Inventory and prioritize freshwater habitats that provide the best opportunity for salmon recovery, including climate resilient habitats, in all SHRUs	A	1	1	Baseline	—	—	—	Maine DMR, USFWS
F3.3	Protect and maintain freshwater and riparian habitats according to prioritization in all SHRUs	A	1	2	Calculated	$ 5,000,000.00	$ 25,000,000.00	Estimate's assumes $5 million annual investment of roughly 45,000 acres/year that would provide some conservation benefit to salmon. This figure is estimated based on land acquisition efforts for the purpose of conservation made by the Lands for Maine's future program. This figure does not directly factor in restoration of freshwater	Lands For Maine's Future, Maine DMR, USFWS, NMFS, NGOs,

Source: USFWS and NMFS, 2019

North Atlantic Right Whale

Purpose

To explore future conditions for right whales throughout their range and develop possible options to address those conditions to improve recovery.

Focal Question

What will affect/influence the recovery of right whales throughout their range over the next 60 years?

Source: NMFS, in prep.

Assessing Scenarios and Options

WORKSHEET Scenario Deepening _____
Scenario Name Here

1. Main regional climate features

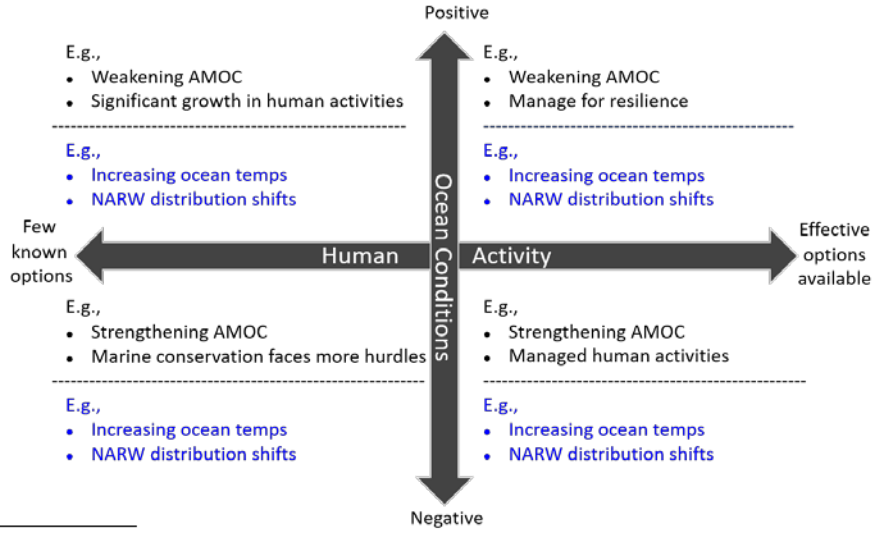
2. Notable non-climate features & developments

3. Significant Events and Developments

2020 — 2030 — 2050 — 2075

4. In this scenario, what are the main changes in conditions / impacts on right whales?

REGION 1	REGION 2	REGION 3



WORKSHEET Generating Options _____
Scenario Name Here

What ha
What indicators would you look at to

If you knew this scenario was the future, what actions would you take now / within 5 years to prepare for / achieve / avoid this?

SCIENCE / RESEARCH	MANAGEMENT - VESSELS	RELATIONSHIPS / COLLABORATION
	MANAGEMENT - OTHER (e.g., AQUACULTURE, WIND ENERGY, NOISE)	OTHER


NEFSC NOAA permit 775-1875

Source: NMFS, in prep.

Atlantic Salmon & Right Whale Highlights

- Identified most critical and uncertain drivers
- Created plausible future scenarios of climate impacts to the species/ ecosystem
- Identified and prioritized actions across one or more futures
- Increased collaboration with partners to address an area of common concern
- Identified resource needs for recovery, data gaps, and climate change adaptation strategies
- Provided opportunity for participants to extract themselves from a “triage” approach to recovery, and insert themselves into advanced planning

Source: Borggaard, Dick et al. 2019; NMFS, in prep.

Thanks to:

Salmon Pilot: Federal Experts from NOAA (NMFS and ESRL), USFWS, USGS, USFS including:

Dan Kircheis
Mike Alexander
Matt Bernier
Matt Collins
Julie Crocker
Kim Damon-Randall
Rob Dudley
Jon Hare
Sean Hayes
Mike Johnson
John Kocik
Wendy Morrison
Ben Letcher
Nate Mantua
Keith Nislow
Vince Saba
Rory Saunders
Tim Sheehan
Michelle Staudinger
Jed Wright
Joe Zydlewski
Roger Griffis

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Mike Asaro
Diane Borggaard
Colleen Coogan
David Morin
Peter Burns
Kevin Madley
Julie Crocker
Sean Hayes
Peter Corkeron/Allison Henry
Henry Milliken
Harvey Walsh
Vince Saba
Lance Garrison
John Quinlan
Laura Engleby/Jessica Powell
Barb Zoodsma
Shannon Bettridge
Teri Rowles
Jacqueline Pearson-Meyer
Donna Wieting
Lynne Barre
Dave Wiley/Ben Haskell
Becky Shortland
Mike Alexander
Quay Dortch
Frances M.D. Gulland
Peter Thomas
Michael Runge
Michelle Staudinger

Facilitator and Trainer: Jonathan Star (Scenario Insight)

Support from: Offices of Protected Resources and Science and Technology

NMFS Scenario Planning Trainings

GARFO Training (2018)

- Overview of principles and hands-on exercises

Planning for a Changing Climate (2019-2023)

- Target: protected resource managers and scientists, others engaged in endangered species and marine resource conservation planning
- Climate smart principles, driver identification, vulnerability assessments, scenario planning
- Offered at U.S. FWS National Conservation Training Center and in a region annually


National Conservation Training Center

Training Announcement

Planning for a Changing Climate

ALC5916

Course Description

Objectives

Scenario Planning White Paper

- Office of Sustainable Fisheries is working on a white paper that introduces scenario planning and summarizes 5-6 examples
- Coming ~Spring 2020

Slide: Courtesy of Wendy Morrison, NMFS F/SF

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https://nature.ca/notebooks/english/atsalmon_p2.htm


Photo: NOAA

PFMC Climate & Communities Initiative

- PFMC is initiating a scenario planning exercise on the topic of shifting stock availability.

- Expected outcome = "the definition of tools, products, and processes necessary to react to potential future ecosystem states."

https://www.pcouncil.org/ecosystem-based-management/fishery-ecosystem-plan-initiatives/climate-and-communities-initiative/

Slide: Courtesy of Wendy Morrison, NMFS F/SF
Project Contact: Christopher Kit Dahl, PFMC

PFMC Climate & Communities Initiative- General Timeline

Timeframe	Activity
Early 2018	Science & management background documents & webinars
Late 2018	Council adds scenario planning to initiative
Summer 2019	Interview ~15 expert stakeholders
September 2019	Report to Council on plans
January 2020	Workshop to create scenarios
March 2020	Report to Council on progress
Spring 2020	Refine scenario descriptions
Fall 2020	Investigate management implications; assess whether management changes are needed

https://www.pcouncil.org/ecosystem-based-management/fishery-ecosystem-plan-initiatives/climate-and-communities-initiative/

Slide: Courtesy of Wendy Morrison, NMFS F/SF
Project Contact: Christopher Kit Dahl, PFMC

Resilient Fisheries Rhode Island

- SK funded project
- Aimed to create conversation among commercial fishing community about climate change
- Process included interviews with fishermen, webinars on climate issues and workshop to plan for the future

http://resilientfisheriesri.org/

Slide: Courtesy of Wendy Morrison, NMFS F/SF

Resilient Fisheries Rhode Island

- Based on concerns heard in interviews, facilitators created four future scenarios with environmental and socio-political details.
- During the workshop fishermen were divided into four groups (1 group for each scenario) to:
  - Discuss how fishing would change under their scenario
  - Brainstorm proposed strategies
  - Rate proposed strategies from other groups as to how well it would work in their scenario
  - Identify win-win strategies

http://resilientfisheriesri.org/

Slide: Courtesy of Wendy Morrison, NMFS F/SF

Resilient Fisheries Rhode Island

Results: 7 Goals and 32 tactics under the following strategy areas:

- Public relations (4)
- Civic engagement (4)
- The next generation (6)
- Innovative seafood marketing (4)
- Working waters and coastlines (4)
- Healthy habitats (4)
- Adaptive science & management (6)

http://resilientfisheriesri.org/

Slide: Courtesy of Wendy Morrison, NMFS F/SF

Questions?

Contact Info:

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