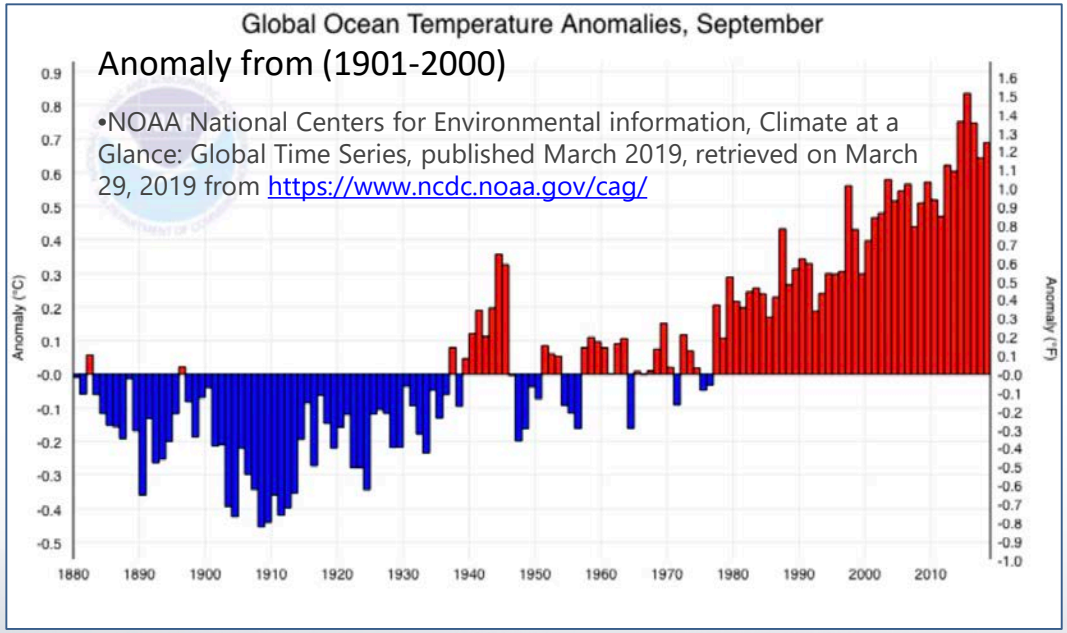
Bering Sea FEP Climate Change Task Force Meeting 2
Feb 26 -28, 2020
Overview



Diana Stram

Kirstin Holsman

FEP meeting Mar 3, 2020

Attendees Feb 26-28 Sea/ANC and on-line

CCTF Members:

Diana Stram
Kirstin Holsman
Brenden Raymond-Yakoubian
Mike LeVine
Jeremy Sterling
Scott Goodman
Steve Martell

Absent: Joe Krieger, Lauren Divine

Other attendees:

LK/TK/Subsistence co-chairs
- Sarah Wise
- Kate Haapala

FEP co-chairs
- Kerim Aydin
- Diana Evans

SocioEcon and Ecosystem AFSC group
- Steve Kasperski
- Ben Fissel
- Alan Haynie
- Stephanie Zador
- Elizabeth Siddon

Crab Plan Team
- Martin Dorn

Public:
- Ernie Weiss
- Steve Marx
- Stephanie Madsen

Overarching workplan

1. **Synthesize** diverse sources of current knowledge regarding climate change effects on the Bering Sea ecosystem , including longer-term projections and forecasting;

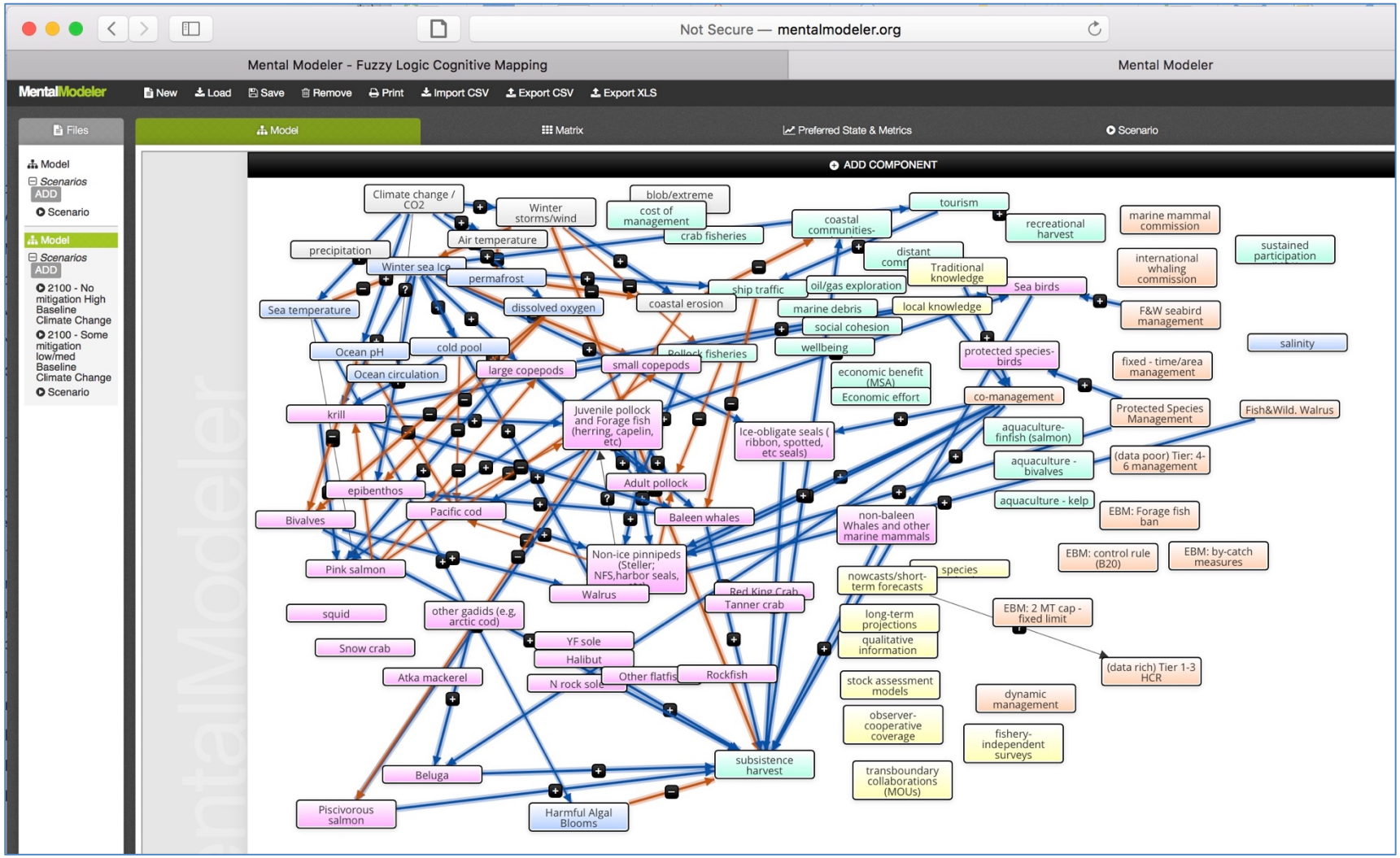
2. **Identify and analyze** the risks and probabilities of success for potential climate-resilient management measures and policies under future scenarios of change; and

3. **Provide recommendations** for short-, medium-, and long-term actions that could be considered and initiated by the Council.

Progress

- Conceptual model draft
- Indicator draft
- Revised process
- Updated template
- Discussed Adaptation definition
- Discussed Resilience definition
- Revised Executive Summary of Workplan
- *Draft list of short-medium-long-term projects and scenarios to explore (tabled for future meeting)*

Conceptual model



Indicators

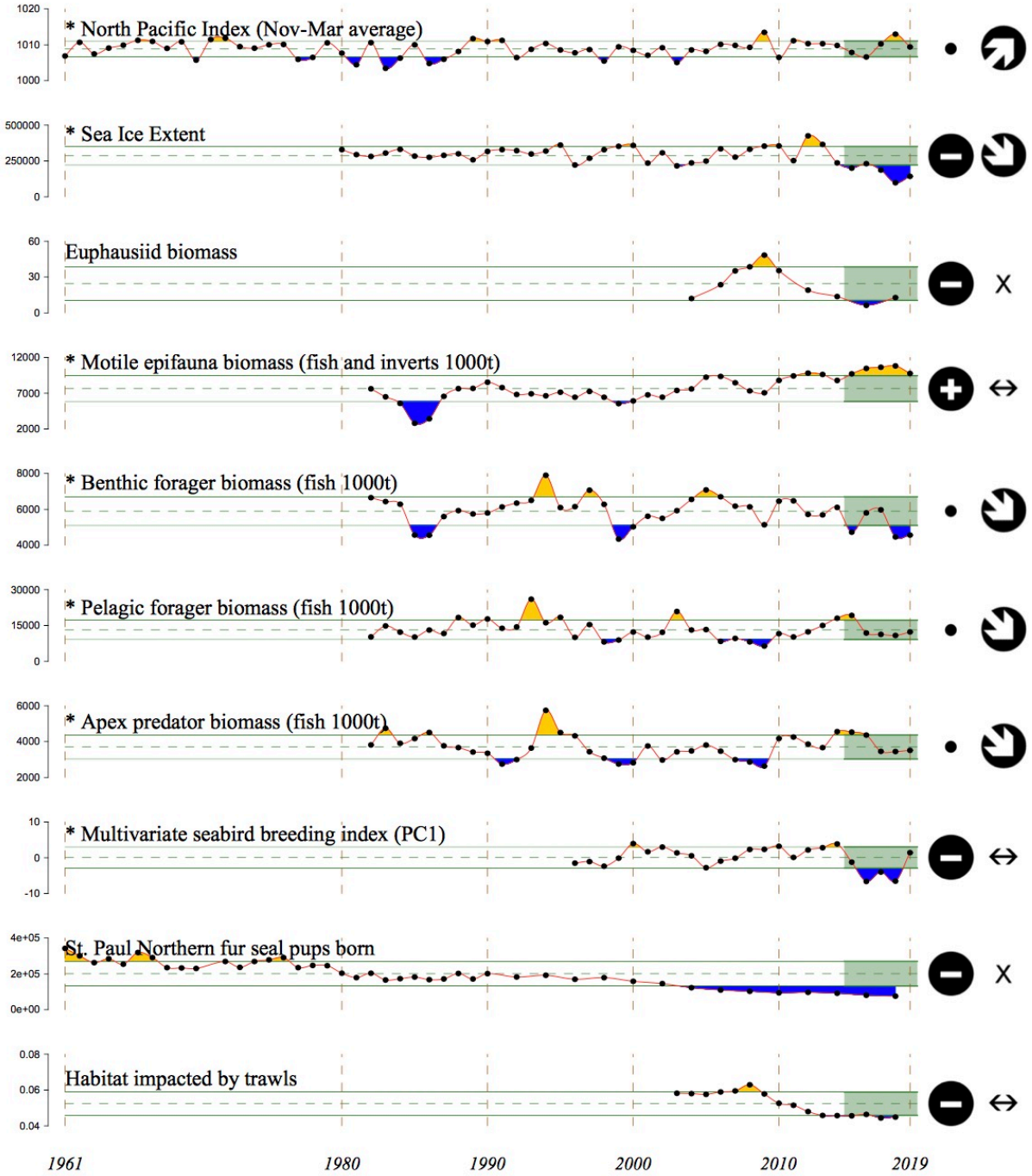
FEP Goals Climate Change Module

File Edit View Insert Format Data Tools Add-ons Zotero Help Last edit was made 4 days ago by Brenden Raymond-Yakoubian

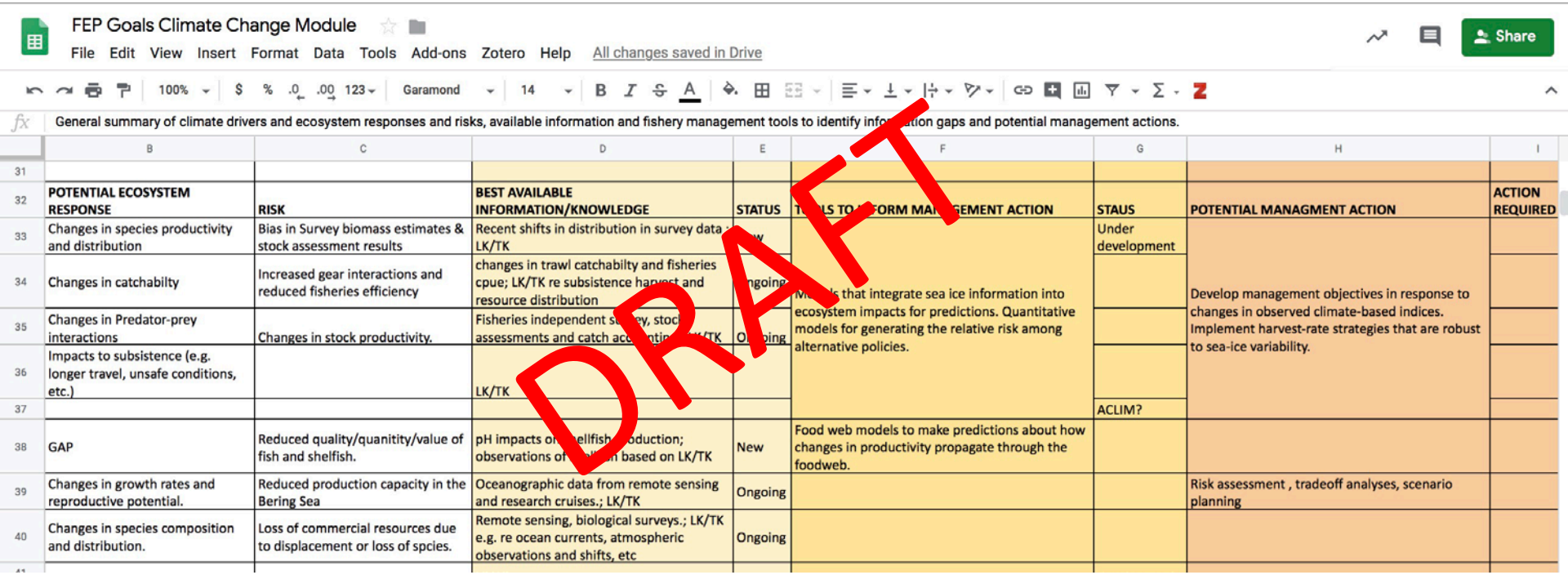
Climate driver/pressure/change

	A	B	C	D	E	F
1	**Climate driver/pressure/change**	**domain**	**Climate indicators**	**sources**	**Notes**	
2	Changes to sea ice	Changes in safety at sea	distance from coast guard centers to fishery centroids	?	Response time for emergencies at sea, cost of saftey operations - f	
3	Increased storm frequency and strength	Changes in safety at sea	Wind strength-days	see Lisa Pf[illegible]er 's work (NWFSC)	Decreased predictability and increased variability in weather patterns, with a variety of effects, including for safety	Centroids of abundance
4	Increased storm frequency and strength	Harbor/infrastructure of small boat harbors	annual cost of armoring and reinforcing/ maintence	Could [illegible]act fisheries management b[illegible]cause t[illegible]re is a lack of infrastructure for small sca[illegible] fishing boats (e.g., pribs)		
5	Changes to sea ice	Changes in subsistence resource access	Sea ice thickness	[illegible] and LK reports, remote sensing, [illegible]ycast models	Reflects sea ice stability, strength, seal breeding potential, access to hunting grounds	Decreases in ice and impacts of that on subsistence resources and hunting
6	Changes to productivity	Changes in marine mammal subsistence resource access	Seal counts [illegible] [illegible]ter rep[illegible]	[illegible]K and LK reports	Seal counts already included in ESR	
7	Economic stability of coastal communities					
8	Multiple climate drivers	Changes to wellbeing	[Lau[illegible] and [illegible]enden - [illegible]lp!]			
9	Multiple climate drivers	Changes to social cohesio[illegible]	? [Lauren[illegible]d Br[illegible]den - help!]			
10	Changes to sea ice					
11	Changes to cold pool	Catchability for yellowfin sole	Ste[illegible]n[illegible]s of the isotherm	Model estimates	Indicates herding of yellowfin sole	
12	Changes to sea ice	Changes in forage rates on bivalves (in open water areas)	Spectacled eider abundance and southern distribution	Fish and wildlife survey	Indicator of bivalve forage predation impacts	
13	Multiple climate drivers	Changes in fish distribution and fishery access	Proportion of catch by reporting area/ EBS grid	VMS - Upward facing acoustics, shared data collaborations, mean distribution of fishing activities; CP (hook and line), residence time by lat	Indicator of fraction of the stock that has left FMP area/ EEZ	
14	Multiple climate drivers	Changes in fish distribution and fishery access	Residence time by lat/lon (northern location	VMS - Upward facing acoustics, shared data collaborations, mean distribution of fishing activities; CP (hook and line), residence time by lat	Indicator of fraction of the stock that has left FMP area/ EEZ	
15			Coastal erosion rates			
16	Changes to sea ice		Changes in cold pool			

DRAFT


* North Pacific Index (Nov-Mar average)
1020
1010
1000
* Sea Ice Extent
500000
250000
0
Euphausiid biomass
60
30
0
X
* Motile epifauna biomass (fish and inverts 1000t)
12000
7000
2000
↔
* Benthic forager biomass (fish 1000t)
8000
6000
4000
* Pelagic forager biomass (fish 1000t)
30000
15000
0
* Apex predator biomass (fish 1000t)
6000
4000
2000
* Multivariate seabird breeding index (PC1)
10
0
-10
↔
St. Paul Northern fur seal pups born
4e+05
2e+05
0e+00
X
Habitat impacted by trawls
0.08
0.06
0.04
↔
1961
1980
1990
2000
2010
2019

Climate impacts & Adaptation options



FEP Goals Climate Change Module

File Edit View Insert Format Data Tools Add-ons Zotero Help All changes saved in Drive

Share

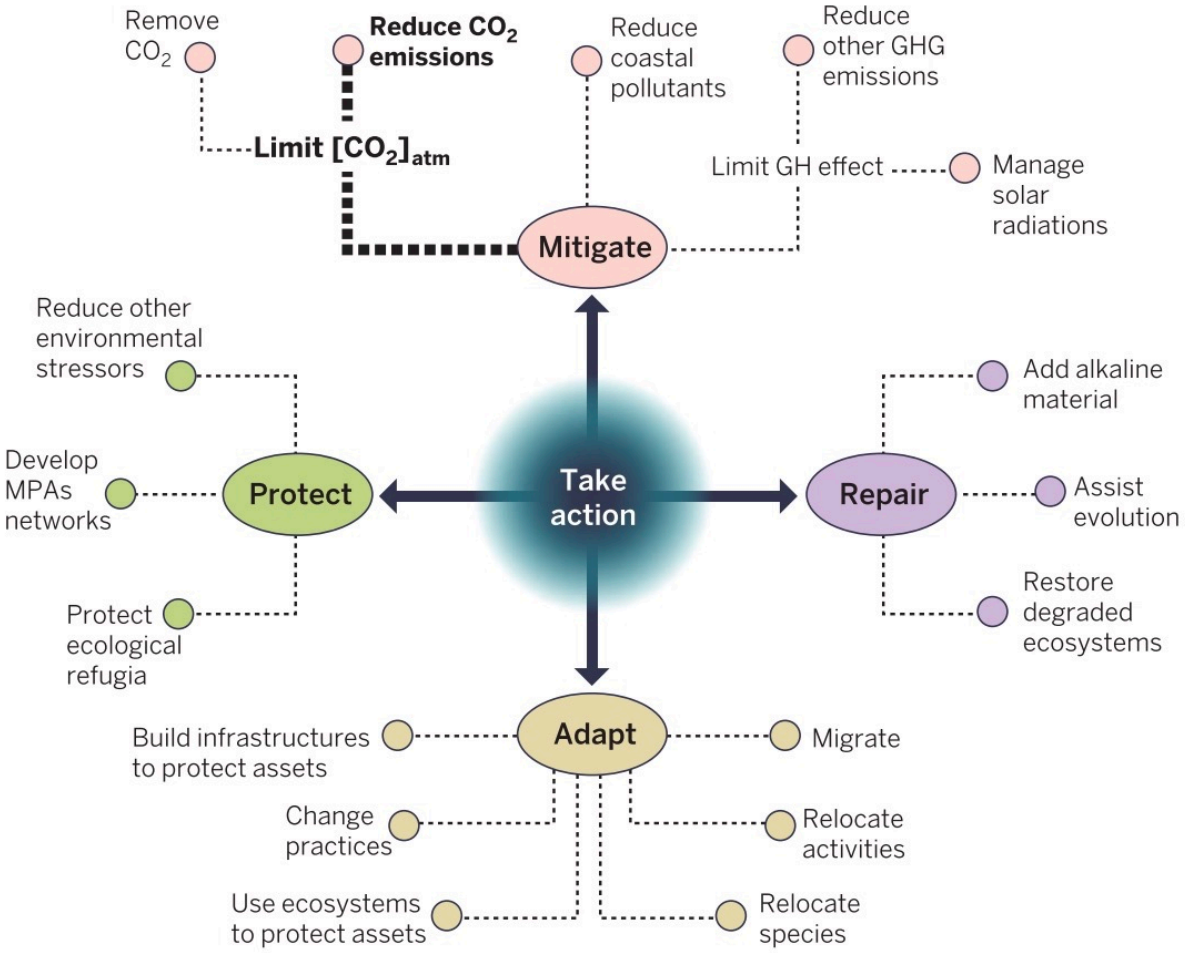
100% $ % .0 .00 123 Garamond 14

General summary of climate drivers and ecosystem responses and risks, available information and fishery management tools to identify information gaps and potential management actions.

	B	C	D	E	F	G	H	I
31								
32	**POTENTIAL ECOSYSTEM RESPONSE**	**RISK**	**BEST AVAILABLE INFORMATION/KNOWLEDGE**	**STATUS**	**TOOLS TO INFORM MANAGEMENT ACTION**	**STAUS**	**POTENTIAL MANAGMENT ACTION**	**ACTION REQUIRED**
33	Changes in species productivity and distribution	Bias in Survey biomass estimates & stock assessment results	Recent shifts in distribution in survey data ; LK/TK	New	Models that integrate sea ice information into ecosystem impacts for predictions. Quantitative models for generating the relative risk among alternative policies.	Under development	Develop management objectives in response to changes in observed climate-based indices. Implement harvest-rate strategies that are robust to sea-ice variability.	
34	Changes in catchabilty	Increased gear interactions and reduced fisheries efficiency	changes in trawl catchabilty and fisheries cpue; LK/TK re subsistence harvest and resource distribution	Ongoing				
35	Changes in Predator-prey interactions	Changes in stock productivity.	Fisheries independent survey, stock assessments and catch accounting; LK/TK	Ongoing				
36	Impacts to subsistence (e.g. longer travel, unsafe conditions, etc.)		LK/TK					
37						ACLIM?		
38	GAP	Reduced quality/quanitity/value of fish and shelfish.	pH impacts on shellfish production; observations of [illegible] based on LK/TK	New	Food web models to make predictions about how changes in productivity propagate through the foodweb.			
39	Changes in growth rates and reproductive potential.	Reduced production capacity in the Bering Sea	Oceanographic data from remote sensing and research cruises.; LK/TK	Ongoing			Risk assessment , tradeoff analyses, scenario planning	
40	Changes in species composition and distribution.	Loss of commercial resources due to displacement or loss of spcies.	Remote sensing, biological surveys.; LK/TK e.g. re ocean currents, atmospheric observations and shifts, etc	Ongoing				

DRAFT

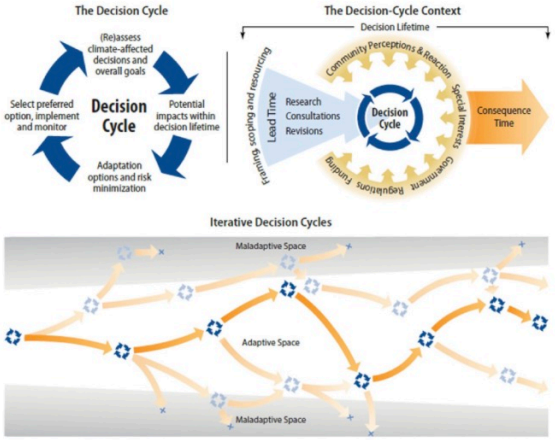
Climate impacts & Adaptation options



Gattuso et al. (2015). Contrasting futures for ocean and society from different anthropogenic CO 2 emissions scenarios. Science, 349(6243), aac4722. https://doi.org/10.1126/science.aac4722

Resilience

Resilience of the Bering Sea coupled social-ecological system



Climate resilience means/looks like:

Human communities:

- (Meta-level note: Importance of collaborative conceptualization and interpretation of adaptation, resilience, etc)
- (Meta-level note: Preference for and necessity of rich qualitative data)
- Sustained communities, "vibrant" communities, ability to remain within the community (e.g., St. paul), community viability.
- Strong social cohesion, integration of community and resource and livelihoods
- Ability to thrive despite variability in resource abundance or availability
- A future for the community (youth and culture thriving); may also include pathways for transmission of knowledge between generations
- Mental and physical health. Lack of stress
- Food security
- [maybe?] Portfolio of economic, food, and nutritional resources
- Durability in social and cultural systems and traditions
- Sense of well-being as locally defined
- Self-determination
- Access to information

Biological resilience:

- Genetic diversity
- physiological scope for enduring variability

DRAFT

Adaptation def.

Adaptation discussion paper IPCC AR6:

"The process of adjustment to actual or expected climate and its effects. In human systems, adaptation seeks to moderate or avoid harm or exploit beneficial opportunities. In some natural systems, human intervention may facilitate adjustment to expected climate and its effects" (IPCC 2014, p. 5)

The IPCC defines adaptation as "the process of adjustment to actual or expected climate change and its effects." (IPCC 2014, p. 5) This IPCC definition is included here as a starting point, and the CCTF intends to work to create our own definition collaboratively with stakeholders to best suit our purposes in the continued development of this workplan and work products from this module.

The AR5 had four adaptation chapters that specifically dealt with the following themes:

- Adaptation Options and Needs (Chapter 14, Noble et al., 2014)
- Adaptation Planning and Implementation (Chapter 15, Mimura et al., 2014)
- Adaptation Opportunities, Constraints and Limits (Chapter 16, Klein et al., 2014), and
- Economics of Adaptation (Chapter 17, Chambwera et al., 2014).

1.3. Key questions for climate adaptation

The key framing questions for adaptation are ~~well-established~~:

- What does it mean to adapt? [what factors--economic, social, cultural?]
- What triggers adaptation -- key indicators, evidence for/against?
- What are we adapting to, and at what timescale?
- Who or what adapts? And how are different considerations for adaptation tailored in each case?
- How do we adapt well including synergies, co-benefit and inclusiveness? And equit (what does it mean to adapt well? For whom or by what metric?)
- What evidence exists that adaptation actions have been successful? (ee.g. case studies, evaluations)
- What are barriers and limits to adaptation? What types of factors facilitate successful adaptation?
- Which factors make adaptation maladaptive?
- ~~What new policy relevant knowledge about adaptation has emerged since the AR5?~~¶

DRAFT

ACTN Meeting template

An example…..

Arctic Answers
Science briefs from the Study of Environmental Arctic Change
https://www.searcharcticscience.org/arctic-answers

How is diminishing Arctic sea ice influencing coastal communities?

THE ISSUE. Loss of sea ice, thawing permafrost, reduced snow cover, and rising sea level are reducing hunting and fishing opportunities and degrading infrastructure for rural Arctic communities. Most Alaska Native communities are affected by erosion and flooding, with 31 communities imminently threatened and 12 planning to relocate. Local responses to these stresses are hampered by the nation's highest prices for food and fuel and widespread poverty across rural Alaska.

WHY IT MATTERS. Climate change amplifies challenges confronting Arctic communities, where 60-80% of households depend on wild game and fish for food, harvesting several hundred pounds per person annually. Already faced with economic, social, and cultural changes, traditional ways of life in rural Alaska are further threatened by climate change impacts on diminishing food security, deteriorating water and sewage systems, increasing risk of accidents, and greater expenditures to construct and maintain infrastructure. Government agencies and other institutions need to promote policies that reduce stresses on Arctic communities and foster responses consistent with local economies and cultures.

STATE OF KNOWLEDGE. Arctic communities and scientists have worked together to document local observations of climate change; the associated impacts on hunting, fishing, safety, and food security; and the potential impacts of projected changes into the future. More recently, researchers have been assessing the efficacy of local responses. For example, subsistence whalers on St. Lawrence Island in the Bering Sea have initiated a fall harvest to help make up for spring whaling seasons made shorter by changing ice conditions. At Kivalina—a village that is also facing relocation due to erosion—changing spring ice conditions have prevented the harvest of bowhead whales for over 20 years. In other cases, changes can amplify one another. Limited time off from jobs means that whalers from Nuiqsut now have much shorter time available for whaling in fall. In Alaska's Arctic region, 78% of Native Iñupiat households combine jobs and subsistence to meet their economic, cultural, and nutritional needs. The benefits of employment are lessened, however, by the reduction in time devoted to harvesting wild foods. Less time to hunt means less chance to wait out fall storms or to adapt to other changes in weather or animal migration patterns. Those migration patterns may be further altered as diminishing sea ice opens opportunities for industrial activities (for example, shipping and offshore petroleum development). The cumulative effects of stresses and changes are broadly recognized but difficult to measure.

Map of the 11 Alaska traditional whaling communities, with the 2015 and 1981-2010 median September ice extents shown.

June 2017

WHERE THE SCIENCE IS HEADED. More work is needed to understand how local responses can be effective (such as the St. Lawrence Island fall whaling season) as well as how they fall short of what is needed (such as Kivalina's inability to hunt in spring). In addition, future research must address ways that policies exacerbate or mitigate such impacts, for example by imposing additional constraints on what communities can do, or by supporting flexibility and local initiative to solve problems. Actions made without adequate knowledge of local conditions, no matter how well intentioned, may undermine local well-being by promoting ineffective responses or fostering dependence on outside intervention rather than on local talent, capacity, and creativity. Ultimately, communities need support to identify local solutions.


Iñupiat hunters establish a whaling camp on coastal sea ice near Utqiaġvik (formerly Barrow), Alaska, where thinning ice and warming temperatures in Spring are reducing hunting opportunities and increasing risks to personal safety. (Courtesy: M. Druckenmiller)

FURTHER READING

Chapin, F.S., III, S.F. Trainor, P. Cochran, H. Huntington, C. Markon, M. McCammon, A.D. McGuire, and M. Serreze, 2014. Ch. 22: Alaska. Climate Change Impacts in the United States: The Third National Climate Assessment, J. M. Melillo, Terese (T.C.) Richmond, and G. W. Yohe, Eds., U.S. Global Change Research Program, 514-536. doi:10.7930/J00Z7150. [Available online at: http://nca2014.globalchange.gov/report/regions/alaska]

Goldsmith, S., 2008. Understanding Alaska's Remote Rural Economy, UA Research Summary No. 10, Institute of Social and Economic Research, University of Alaska Anchorage. [Available online at: http://www.iser.uaa.alaska.edu/Publications/researchsumm/UA_ RS10.pdf]

SEARCH: *Advancing knowledge for action in a rapidly changing Arctic*
https://www.searcharcticscience.org/arctic-answers

Contact for further information:
Henry Huntington,
Huntington Consulting
hph@alaska.net
Matthew Druckenmiller,
National Snow and Ice Data Center
druckenmiller@nsidc.org

SEARCH is supported by the National Science Foundation. SEARCH Science Brief AA-002.

Updating workplan

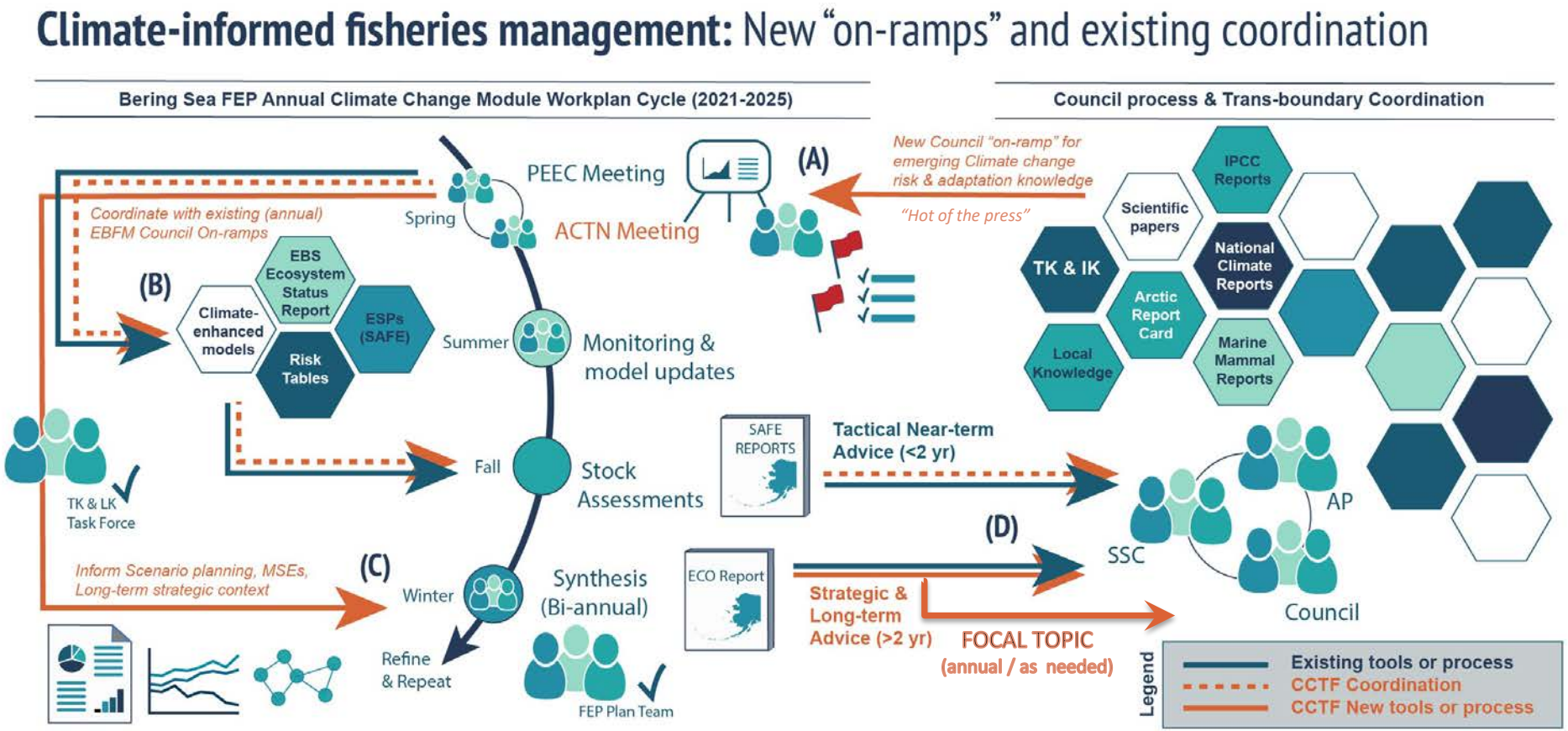
Bering Sea Fishery Ecosystem Plan:
Action Module to evaluate short- to long-term effects of climate change on fish, fisheries, and the Bering Sea Ecosystem, and develop management considerations

February 2020 DRAFT Action Module Workplan[1]

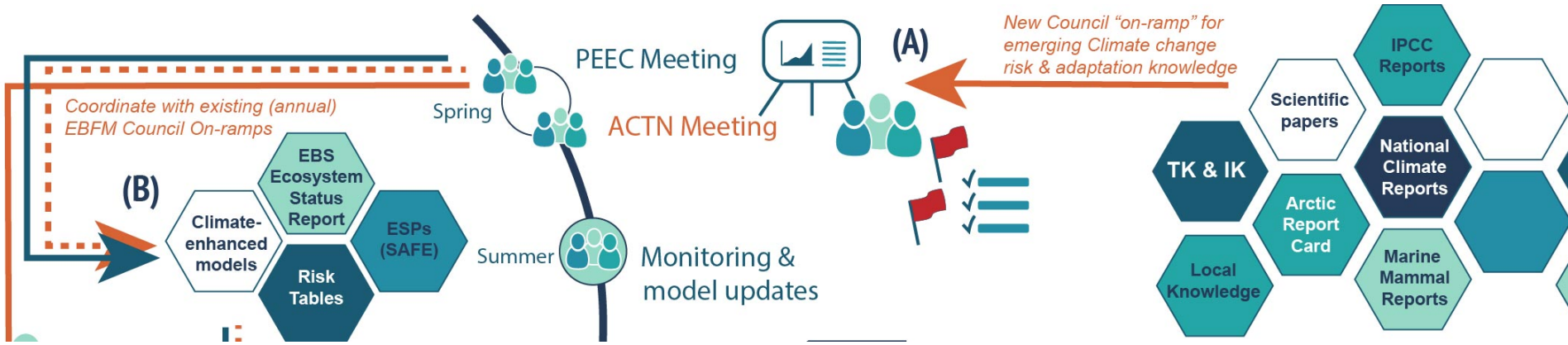
Contents

Will include tracked changes version

CCTF Process



CCTF Process

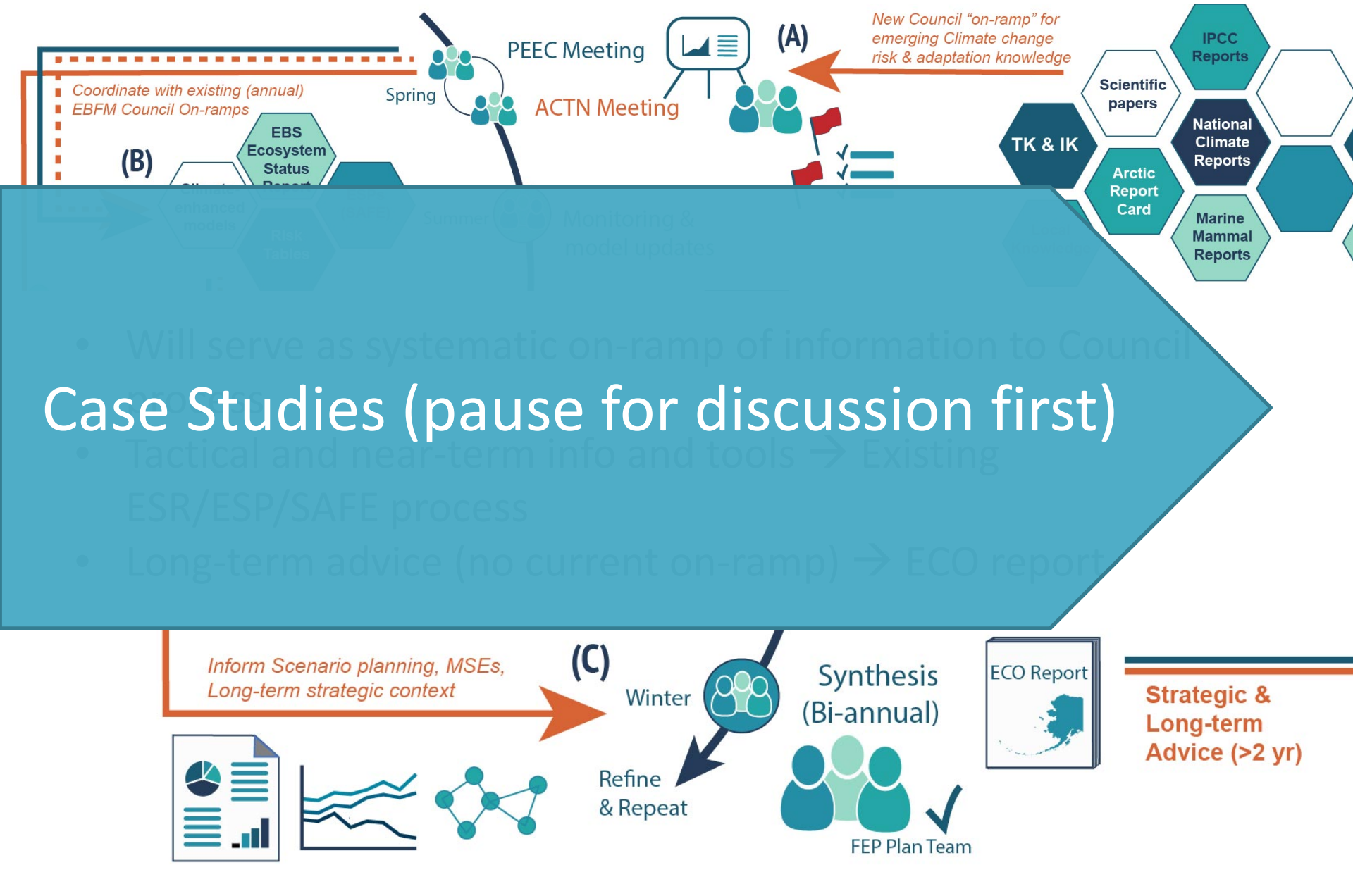


- ACTN meeting will serve as systematic on-ramp of information to Council process
- Tactical and near-term info and tools → Existing ESR/ESP/SAFE process
- Long-term advice (no current on-ramp) → ECO report

Discussion: Planning & logistics

- Work Plan to be reviewed by EC, SSC/AP/Council at April meeting (under FEP report)
  - Track changes version with comments explaining revisions
- Next steps (if plan endorsed):
  - Test case ACTN meeting (May); follow up CCTF June: revise templates based on test meeting in prep for workshop
  - Coordination with LK/TK module
    - Joint meeting/workshop for test case ACTN meeting and ‘test’ process using case studies (Sept)
    - Co-Chairs participating in meetings of both taskforces as needed
- Coordination with other efforts (process as proposed)
  - LK/TK/Subsistence AM TF, and the ongoing work of the Ecosystem Committee
  - Work with ESR/ESP (tactical)
  - Work with FEP Team ECO report (strategic)

CCTF Process

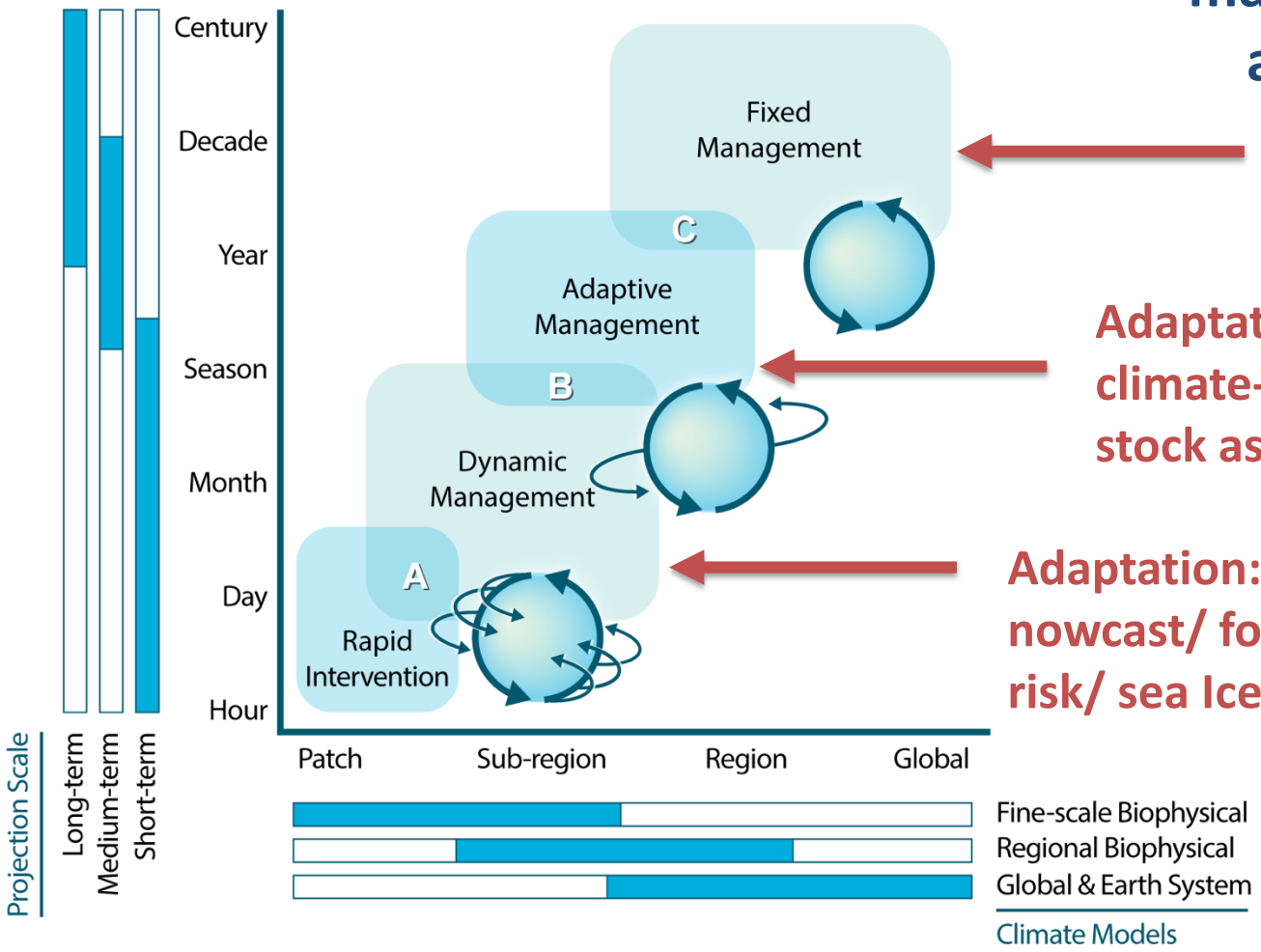


Case Studies

- Goal of case studies: Test the proposed process for a range fishery management issues and scale
  - *Small scale* locally important state/federal management: **NSRKC**
  - *Broad scale* stock moving out of traditional management/survey area: **Bering Sea cod**
  - *Bycatch*: Incidental catch issues driven by environmental conditions: **Bering Sea pollock fishery and squid catch**

Extra slides

Consider nested scales of management & adaptation



Adaptation: increased flexibility

Adaptation: climate-enhanced stock assessments

Adaptation: nowcast/ forecast maps of risk/ sea Ice/spp distributions

Holsman, K. K., Hazen, E. L., Haynie, A., Gourguet, S., Hollowed, A., Bograd, S. J., … Aydin, K. (2019). Towards climate resiliency in fisheries management. ICES Journal of Marine Science. https://doi.org/10.1093/icesjms/fsz031

Test new & existing tools

Adaptation

incremental (normative) adaptation to preserve current livelihoods, health, and well being and meet future demands

transformational adaptation, especially to address/prevent continued marginalization and promote diverse well being, values, and views

Build capacity to revaluate & enable transformative actions

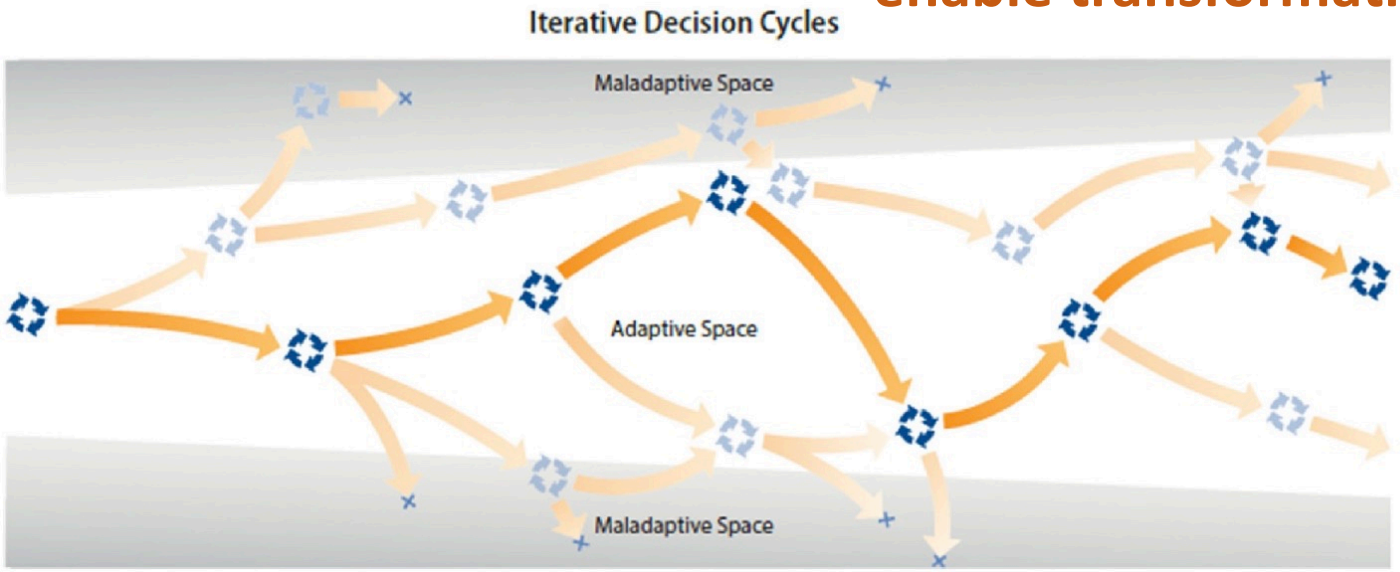
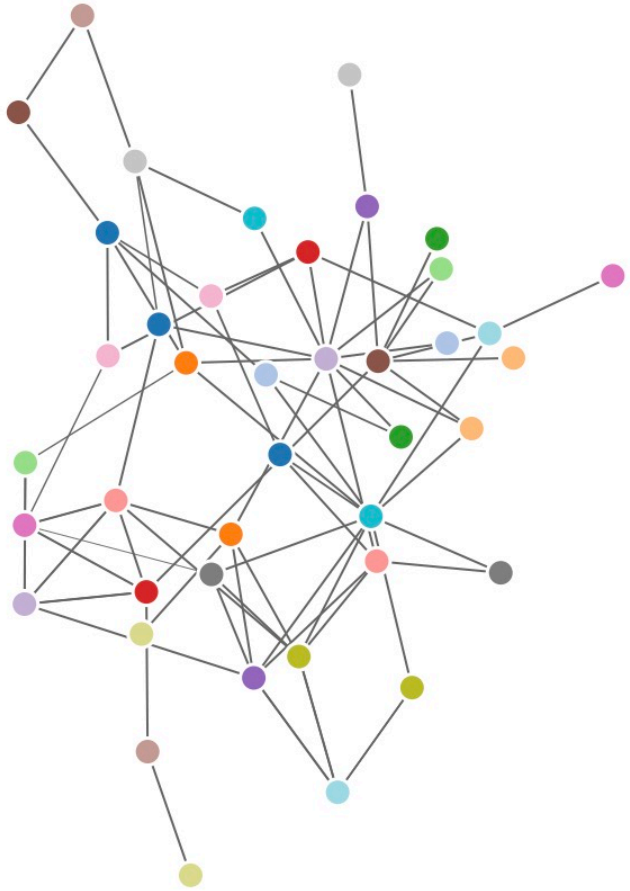
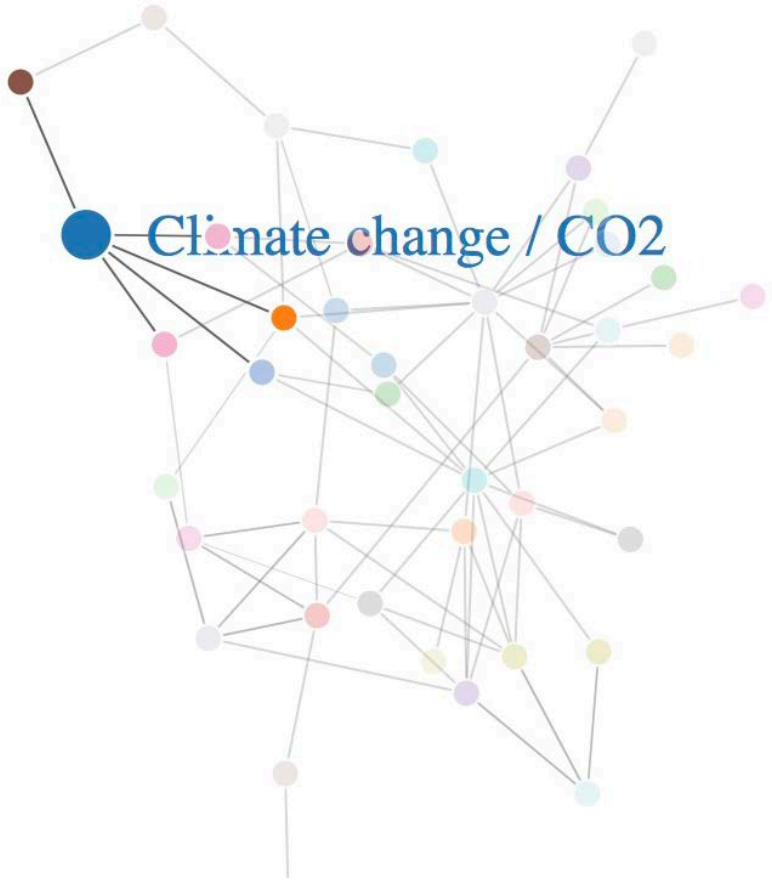


Fig. 1 from Wise et al. 2014. Reconceptualising adaptation to climate change as part of pathways of change and response. Global Environmental Change 28: 325–336

Conceptual model



Conceptual model



Bering Sea Conceptual model