Agenda Item E.3.b
Supplemental NMFS PowerPoint (Jason Link)
Electronic Only
March 2015

NOAA FISHERIES

Draft Climate Science Strategy

Pacific Council Briefing
March 2015

Jason Link, PhD

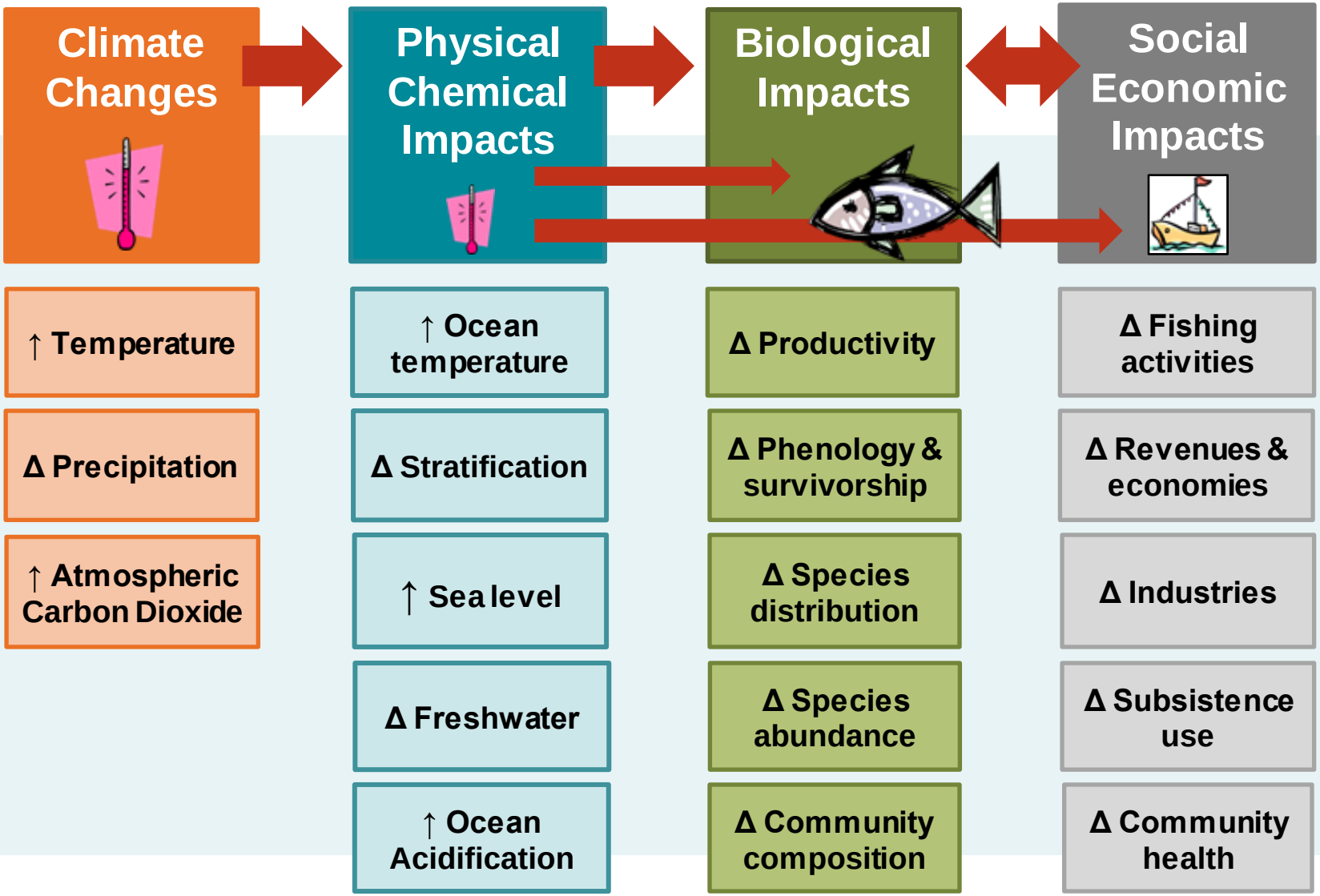
NOAA's Senior Scientist for Ecosystems

WHY	Growing demands and requirements for climate-related information.
GOAL	Increase the production, delivery, and use of climate-related information to support agency and stakeholder decisions.
ASK	Provide input on the draft Strategy and future Regional Action Plans.

Our Changing Oceans

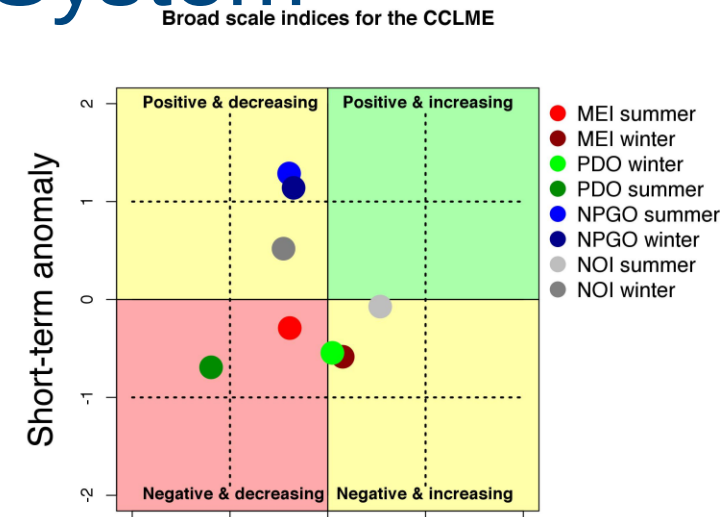
- Climate change and ocean acidification are profoundly altering ocean ecosystems.
- Negative impacts expected for fisheries globally.
- Some positive impacts expected for some fisheries.
- Other stressors exacerbate impacts.
- Significant challenges for fisheries management in changing conditions.

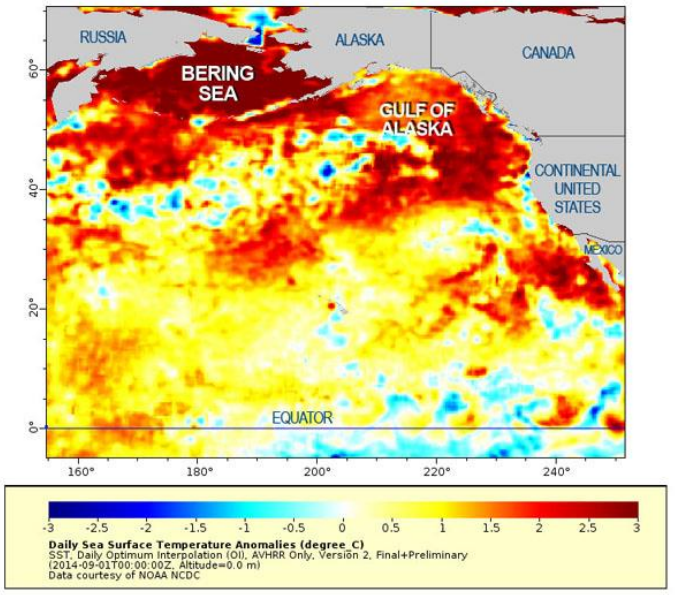
Possible Impacts of a Changing Climate



Long-term Changes in Part of the Land-Atmosphere-Ocean System

- Temperature variable, projected to increase
- Increased hypoxia
- Increased ocean acidification
- Wind patterns changing
- Increased intensity of upwelling events
- Larger amplitude of interannual to decadal variability (El Niño, PDO, NPGO, etc.)
- Alterred Streamflow timing
- And more ….





Observed or Projected Changes in Oceanography

Sea Surface Temperature: 1950-2007 + .09 ºC
2006-2055 + 0.8-1.0 °C
2050-2100 + 2.25-2.5 °C

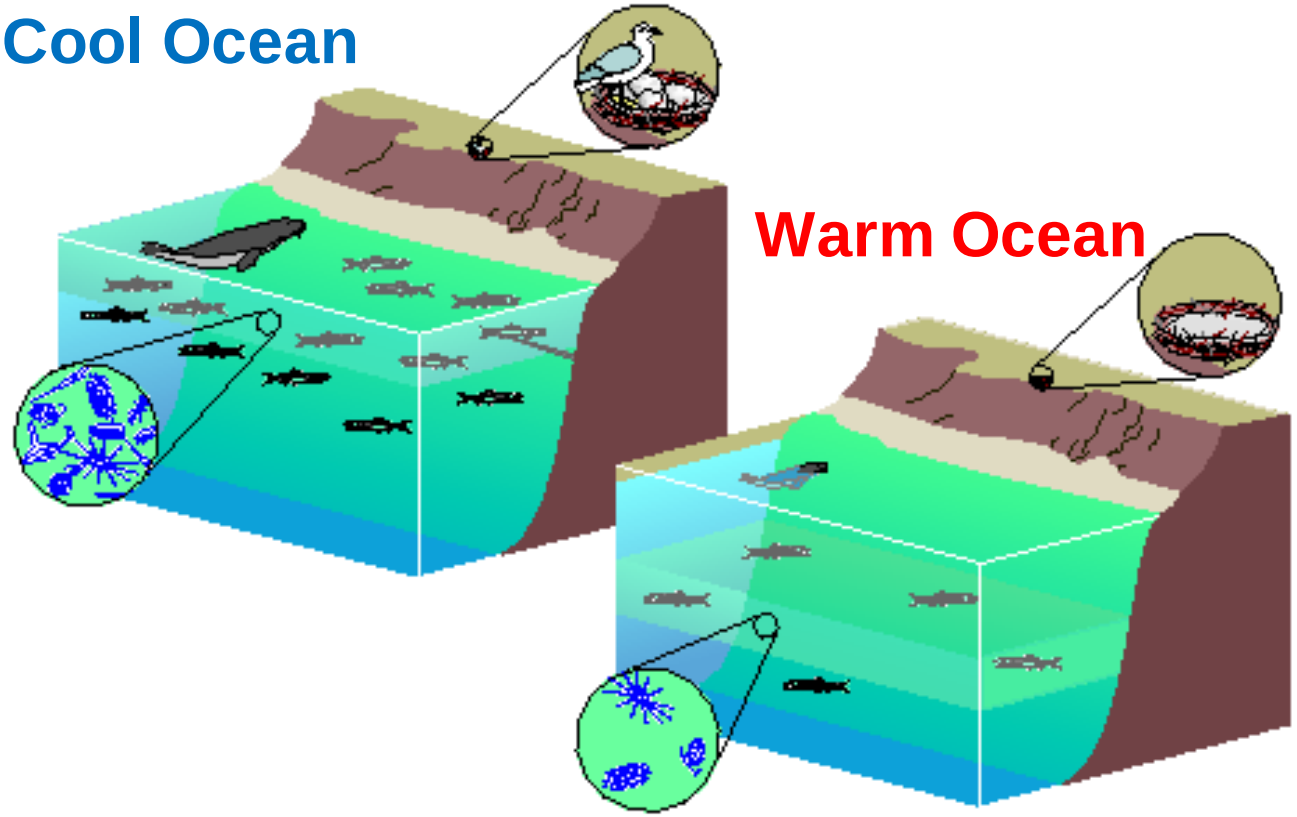
Salinity: 1950-2000 -0.12 psu
2006-2055 - 0.06-0.12 psu
2050-2100 - 0.2-0.3 psu

Sea Level: 1897-2013 - 1.89 ± 0.19 mm/yr (SF Tidal Gauge)
2000-2100 + 42 to 167 cm (1.38 to 5.48 ft)

Ocean Acidification: 1900-2000 -0.1 pH
2006-2055 - 0.12 pH
2050-2100 - 0.24 pH

CALIFORNIA CURRENT UPWELLING EFFECTS

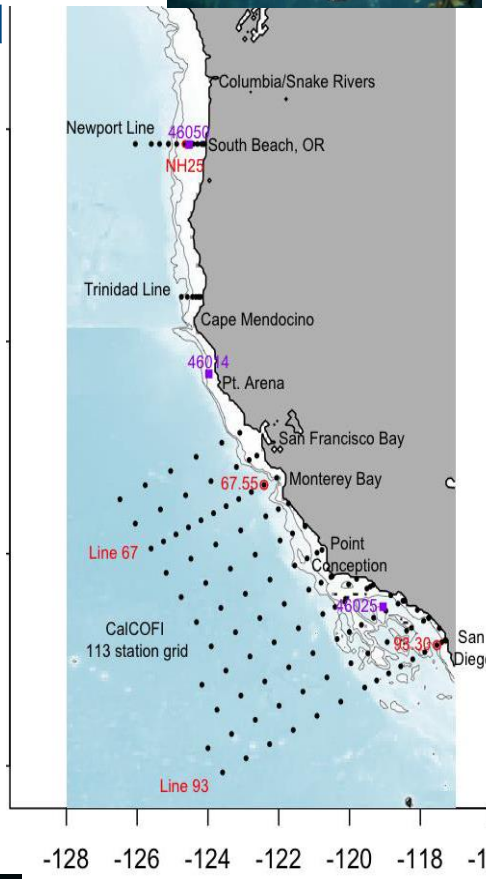
Cool upper ocean: decreased stratification, increased nutrients, high phytoplankton production, and large lipid-rich "subarctic" copepods and krill-like zooplankton support higher trophic levels



Warm upper ocean: increased stratification, low nutrients, decreased primary and secondary production and stressed higher trophic levels

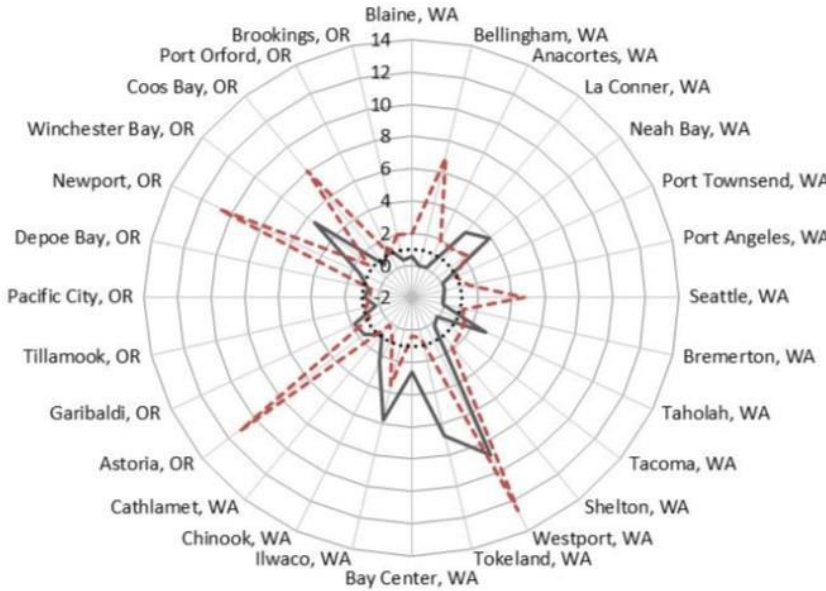
Changes in Marine Resources

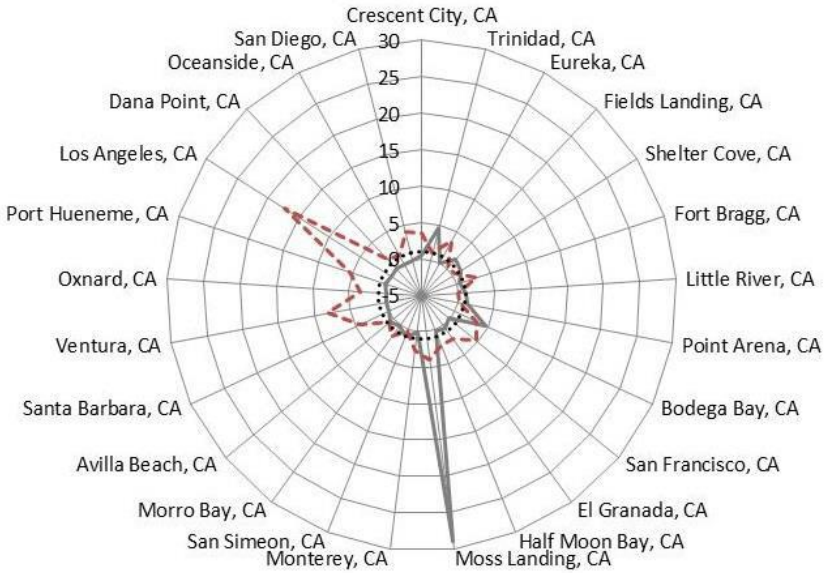
- Observed range shifts in multiple species, some poleward and with depth, some to coast from ETP, reversible?
- OA and hypoxia effects on the base of the food web
- OA effects on bilvalves
- Humboldt squid, other invasives
- Potential for increased sardine/anchovy “flips”
- Warmer ocean/altered river hydrology – poor salmon survival
- Effects on long-lived groundfish difficult to predict, but changes to rockfish productivity probable



Implications for Fishing Communities?

- Climate change will lead to changes in Living Marine Resources
- This will result in change to fleets and coastal communities relying on these resources

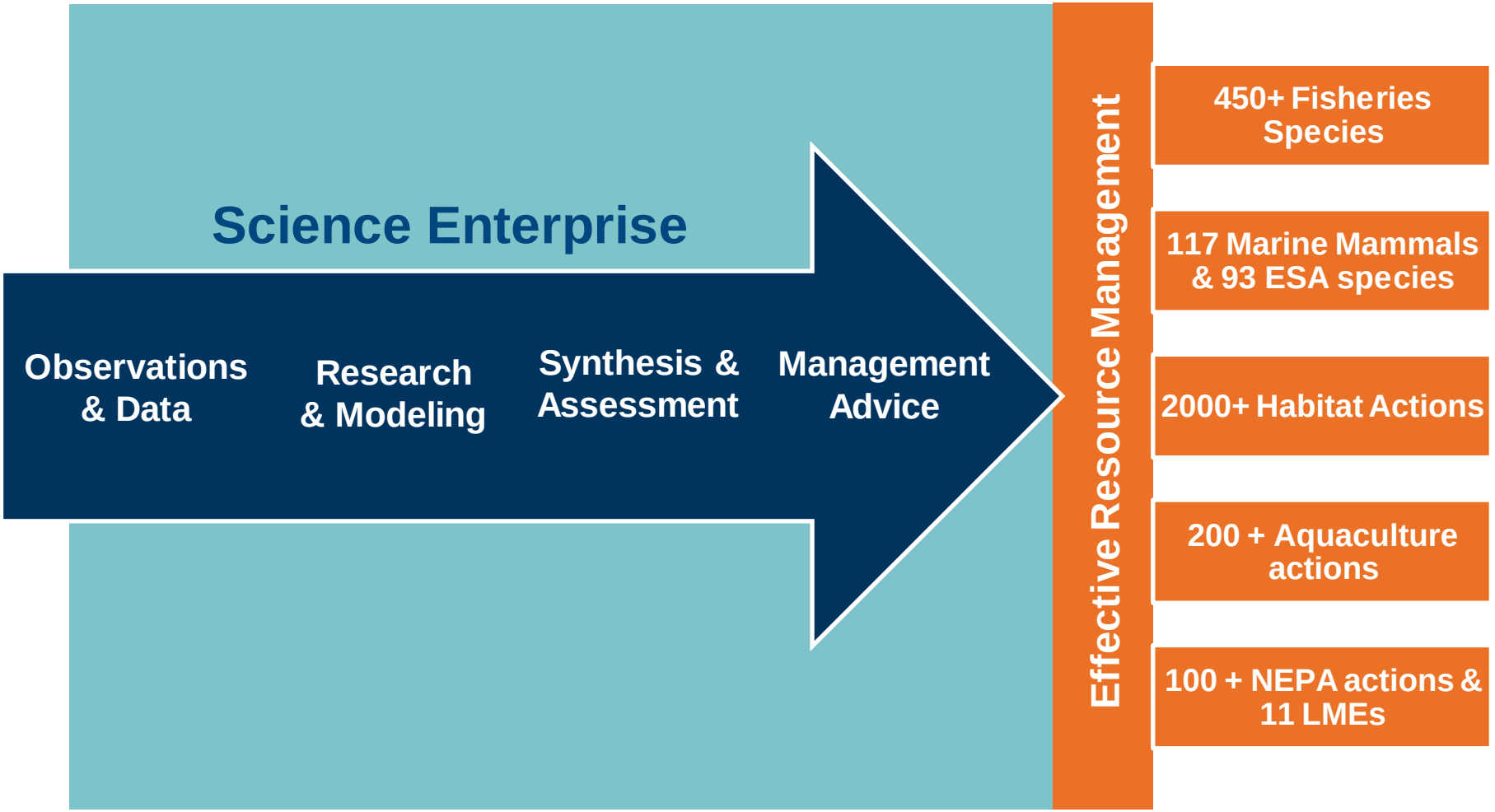




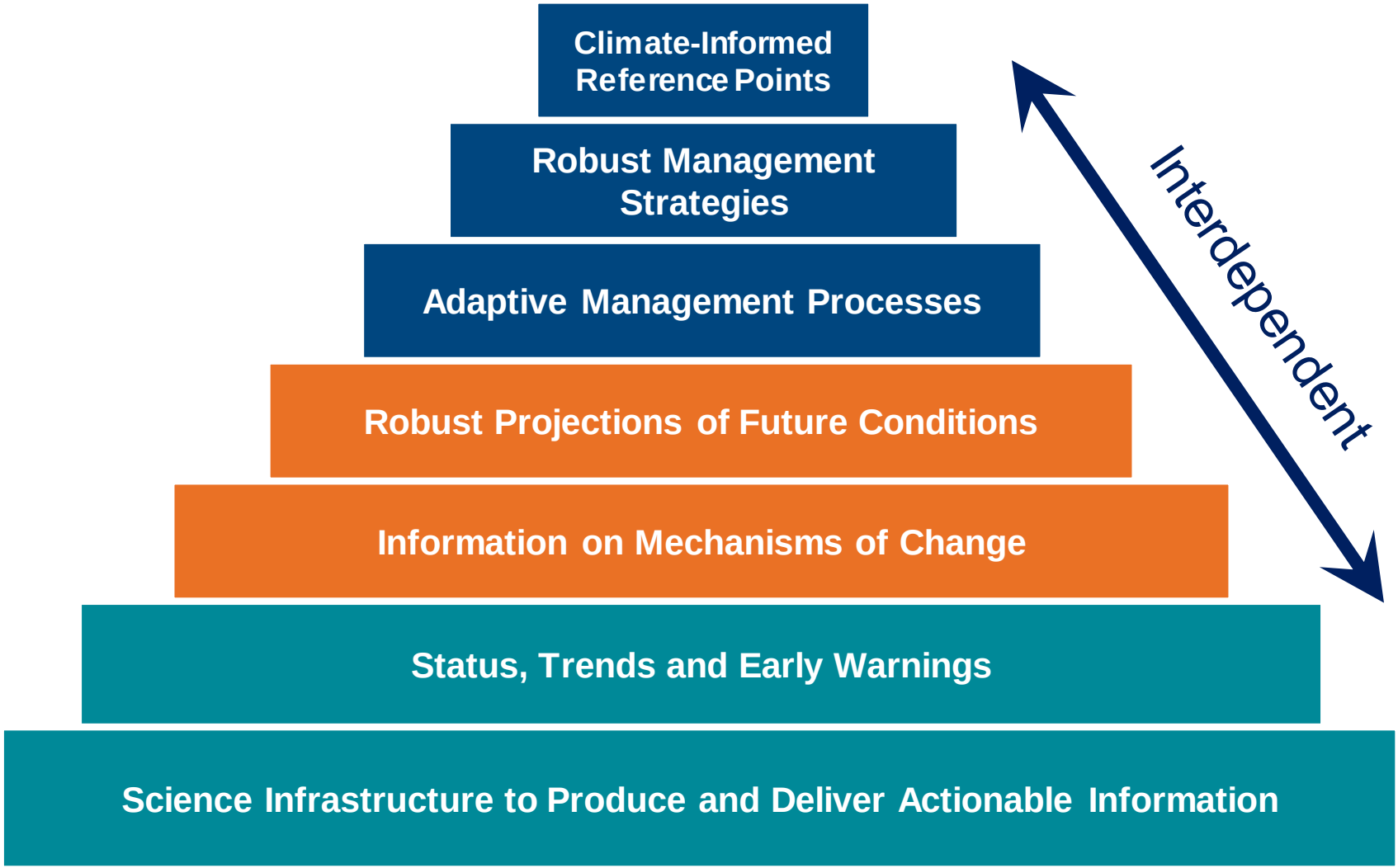
Draft Climate Science Strategy

GOAL	Increase the production, delivery and use of climate-related information to support NOAA Fisheries and stakeholder decisions.
CONTENT	Identifies 7 key objectives to meet NOAA Fisheries information requirements for resource management in a changing climate.
INTENDED USE	Help guide development of NOAA Fisheries science enterprise at national to regional levels (e.g., regional action plans).

Strategy designed to meet climate-related information requirements across mission areas



Draft Climate Science Objectives



Recommendations—Immediate Actions

1	progress	Conduct LMR climate vulnerability analyses in each region.
2	progress	Maintain and develop Ecosystem Status Reports to track change and provide early-warnings.
3		Increase capacity to conduct climate-informed Management Strategy Evaluations

Recommendations—Short-term Actions (6-24 months)

1	Complete region-level action plans.
2	Strengthen climate-related science capacity nation-wide.
3	Increase resources for process-oriented research.
4	Establish climate-ready terms of reference for ESA, MSFCMA, MMPA stock assessments and Biological Opinions, etc.

Expected Results:

- ***Better tracking*** of ecosystem changes providing early warnings of climate-related changes.
- ***Increased understanding*** of the mechanisms of change and the vulnerability of fish stocks, communities.
- ***Near and long term forecasts*** of ocean & resource conditions.
- ***Climate sensitive*** stock assessments and biological reference points.
- ***Improved management scenarios.***

Request for Input

1. Climate Science Strategy

- Input requested thru March 31.

2. Regional Action Plans

- Developed in 2015.
- Future call for input on regional needs & priorities.

www.st.nmfs.noaa.gov/ecosystems/climate

WHY

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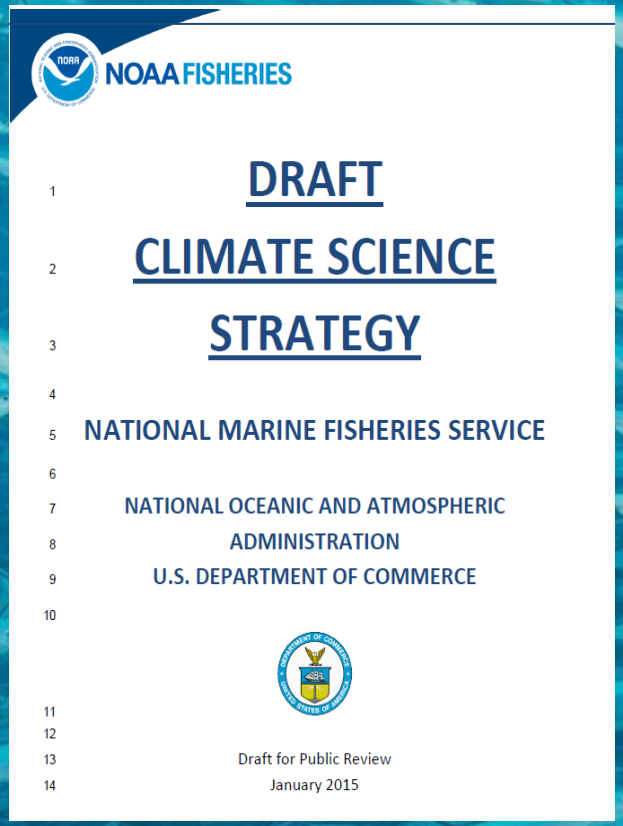

NOAA FISHERIES

DRAFT

CLIMATE SCIENCE

STRATEGY

NATIONAL MARINE FISHERIES SERVICE

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
U.S. DEPARTMENT OF COMMERCE

Draft for Public Review
January 2015

GOAL

Increase the production, delivery, and use of climate-related information to support agency and stakeholder decisions.

REQUEST

Provide input on the draft Strategy and future Regional Action Plans.

Questions?

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