NOAA Fisheries
Draft Climate Science Strategy

Council Briefing | January 2015

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.

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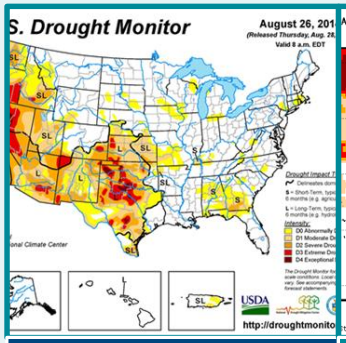
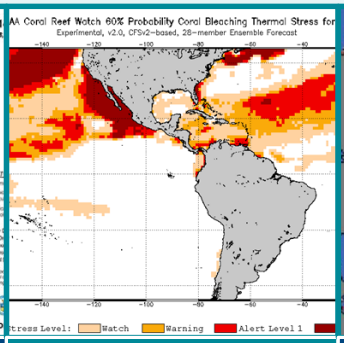
Our Changing Oceans

- Climate change and ocean acidification are profoundly altering ocean ecosystems.
- Negative impacts expected for fisheries globally.
- Positive impacts expected in high latitudes.
- Other stressors exacerbate impacts.
- Significant challenges for resource management in changing conditions.

Growing Challenges for Resource Management



Drought Impacts



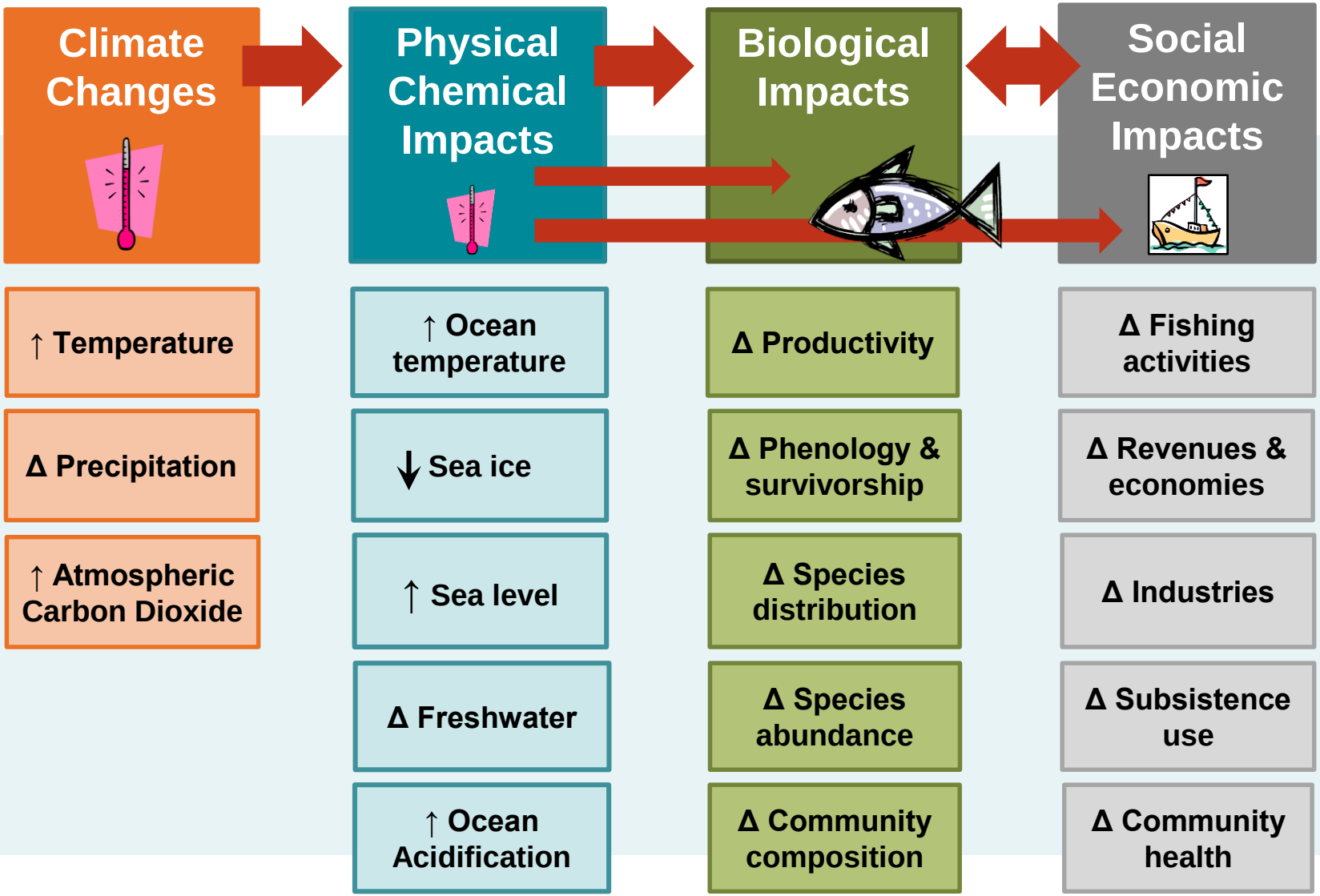
Thermal Stress

Sea Ice Changes

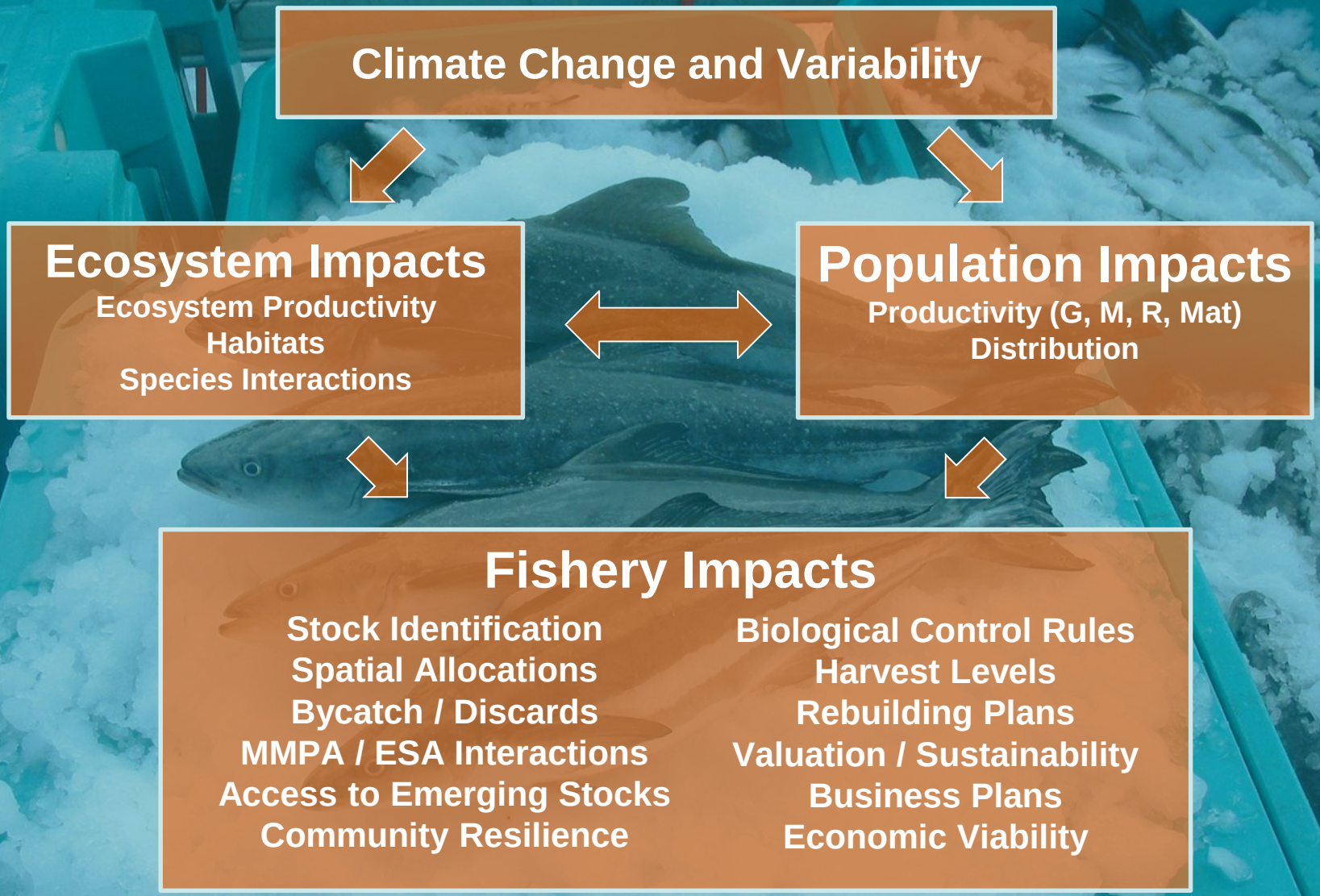
Rising Seas

Ocean Acidification

Possible Impacts of a Changing Climate

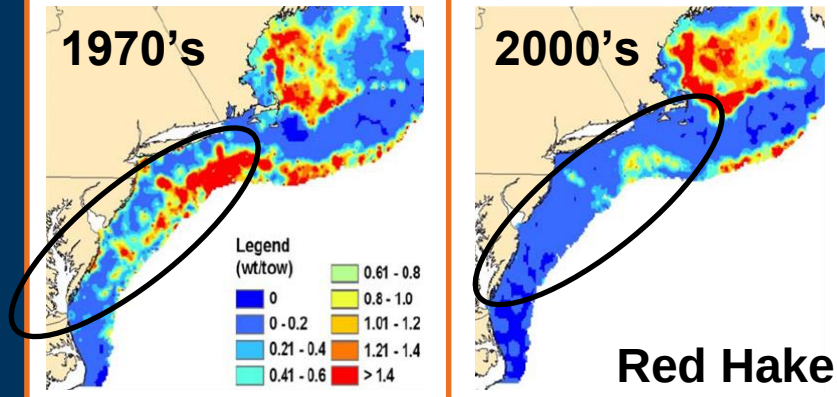


Implications for Fisheries Management

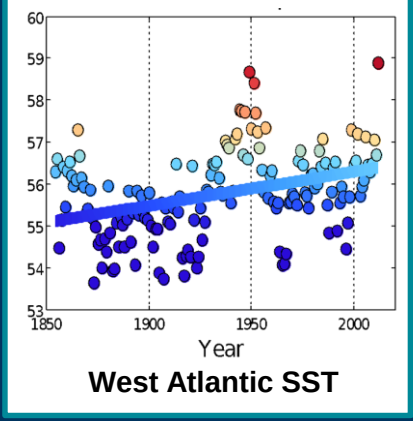


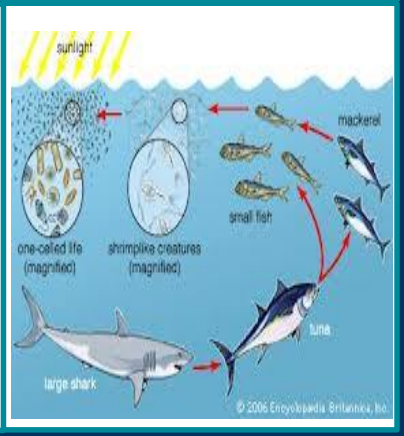
Key Information Requirements

WHAT IS CHANGING?

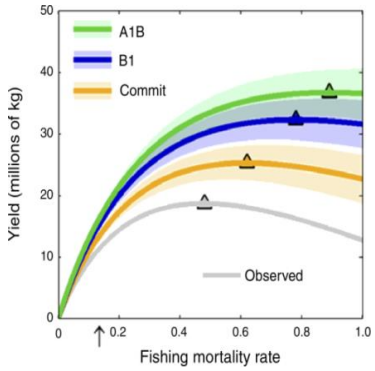


WHY IS IT CHANGING?



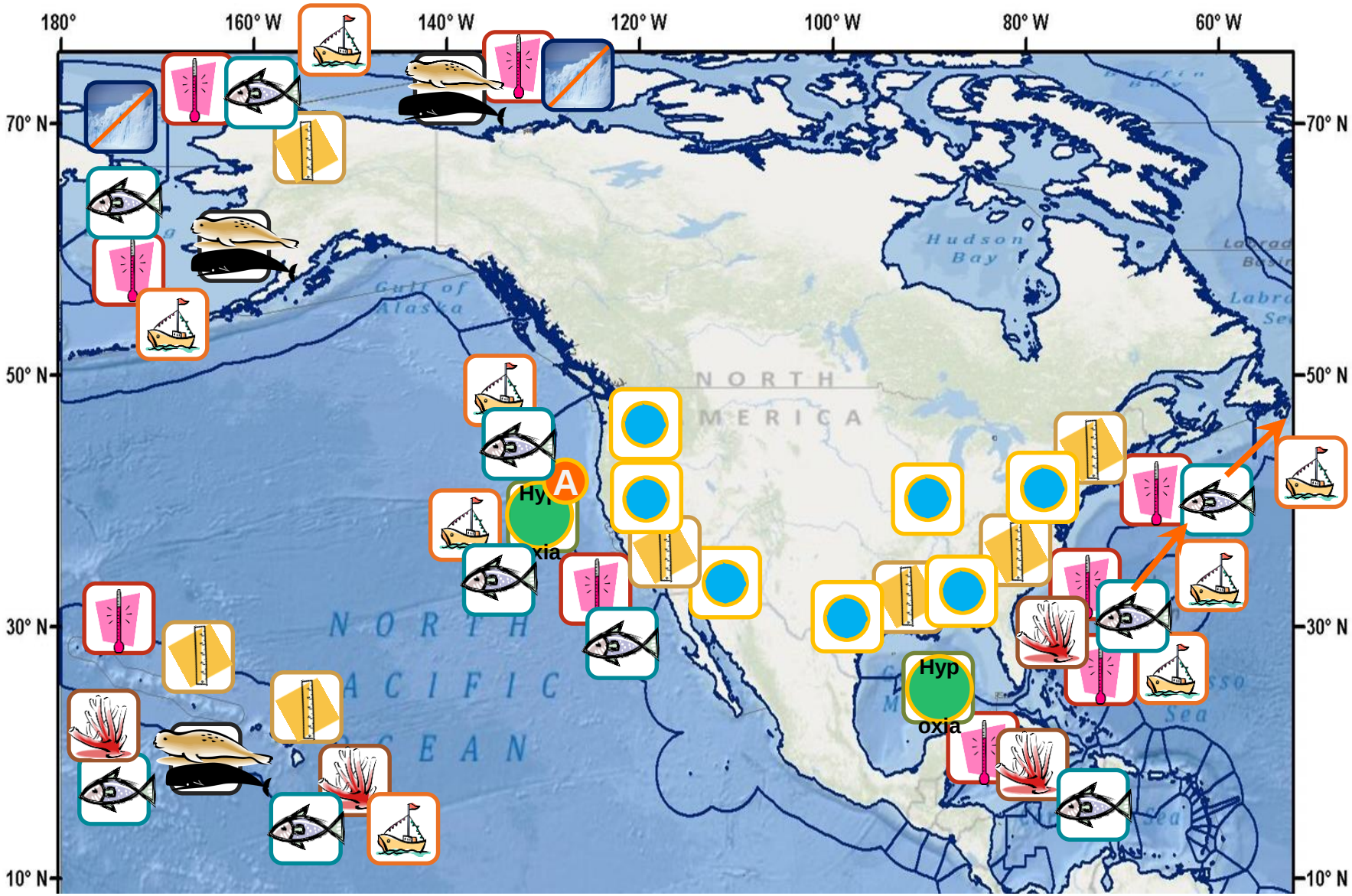


HOW WILL IT CHANGE?



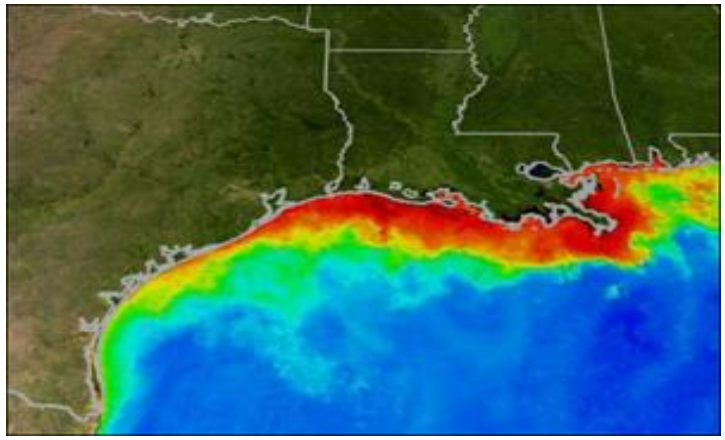
HOW TO RESPOND?

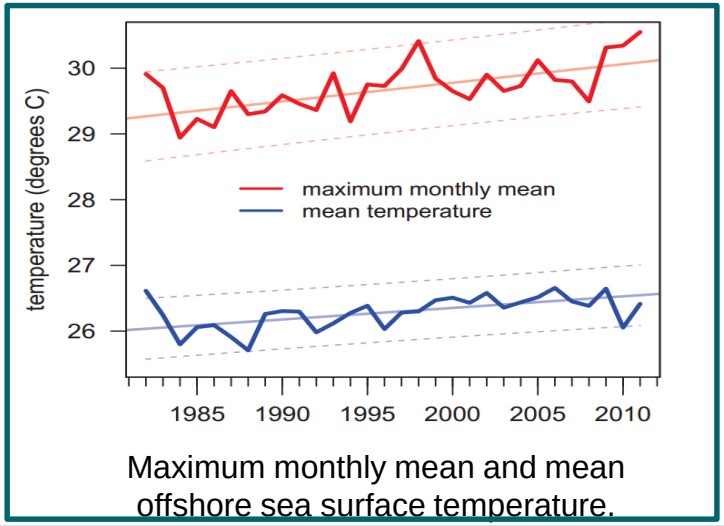
Observed or Projected Climate-related Changes in U.S. Marine Ecosystems



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

- Temperature increasing
- Extreme Weather Events (e.g., hurricanes)
- Ocean currents
- Ocean acidification
- Precipitation
- Salinity
- Nutrients
- Hypoxia
- Sea level rise
- And more ….





Maximum monthly mean and mean offshore sea surface temperature.

Observed or Projected Changes in Oceanography

Ocean temperature:

- 2.0-3.0°C increase projected (down to 200 m)
- Implications for productivity, vital rates, habitats (e.g., bluefin spawning habitat, Muhling et al. 2011)

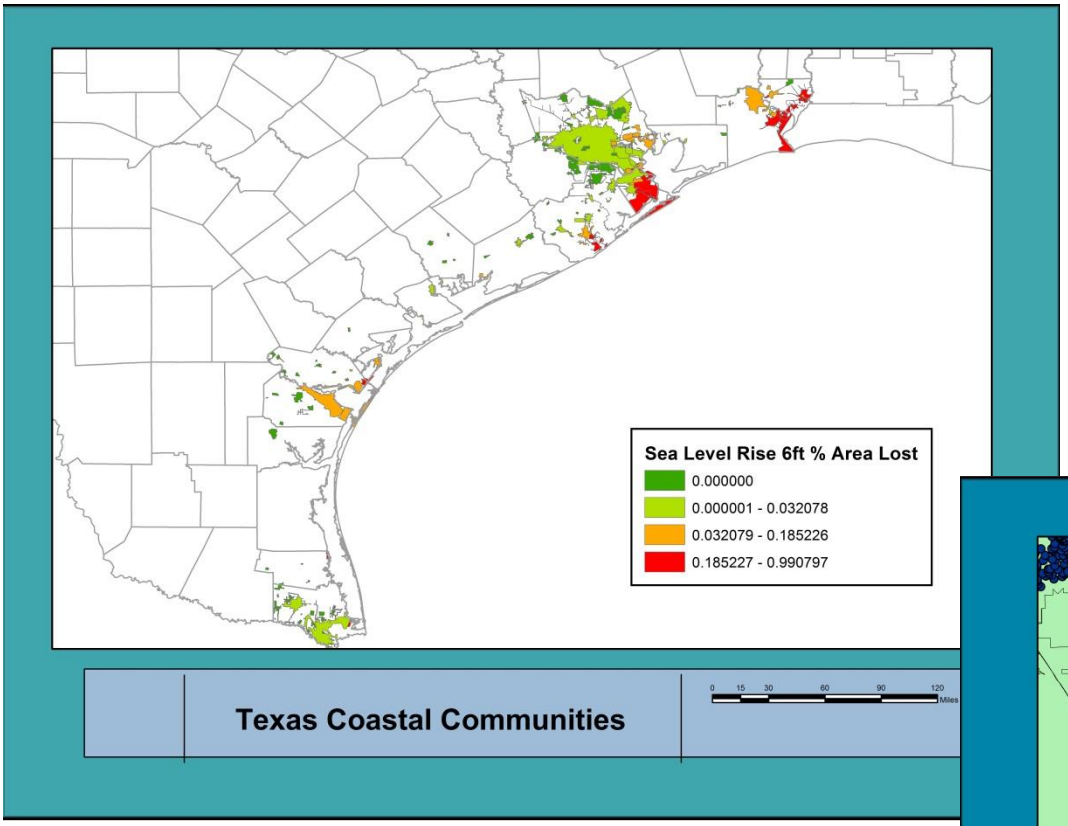
Atlantic Warm Pool (AWP) Index:

- AWP = area of total SST greater than 28.5°C
- Gradual increase over past 25 years
- Reflects increase in SST over Gulf of Mexico
- Higher AWP = Implications for spawning, species distribution and hurricane intensity

Sea Level Rise:

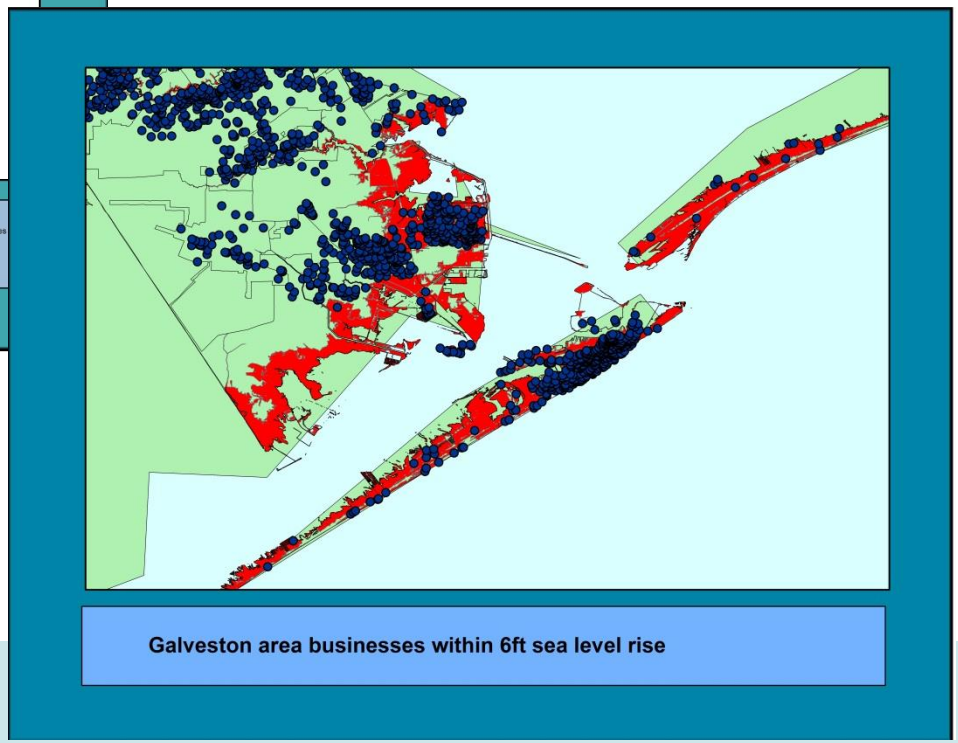
- 8 inch increase in Global sea level since 1880
- 1-4 feet additional rise projected by 2100
- Risks of inundation, seawater intrusion, impacts to habitat etc

Sea level rise effects (ex. Texas)



Which coastal communities and habitats will be most affected by sea level rise?

How will coastal infrastructure and businesses be affected by sea level rise?



Possible Changes in Marine Resources

Species Distribution

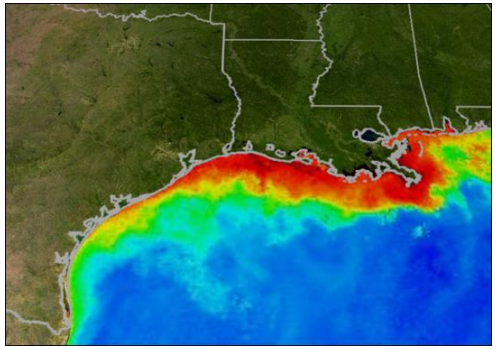
- Shifts North, West and/or deeper?
- Changes in productivity and species interactions?

Species Productivity

- Bluefin tuna productivity is predicted to decrease as sea surface temperatures increase.

Hypoxia

- More heavy rainfall and increased runoff resulting in harmful algal blooms and larger dead zones



Invasive Species

- Lionfish migration into Gulf of Mexico.
- Implications for fisheries as lionfish prey heavily on reef fish larvae.

Ocean Acidification

- Implications for shrimp and oyster fisheries and deepwater coral reefs.

Coral Bleaching

- Increased coral bleaching and mortality

Implications for Gulf Fishing Communities?

- Fisheries are complicated: sectors, gears, permits, etc.
- Interactions with climate change will be complicated

WHAT IS AT RISK?

HOW PREPARE?

HOW REDUCE RISK?

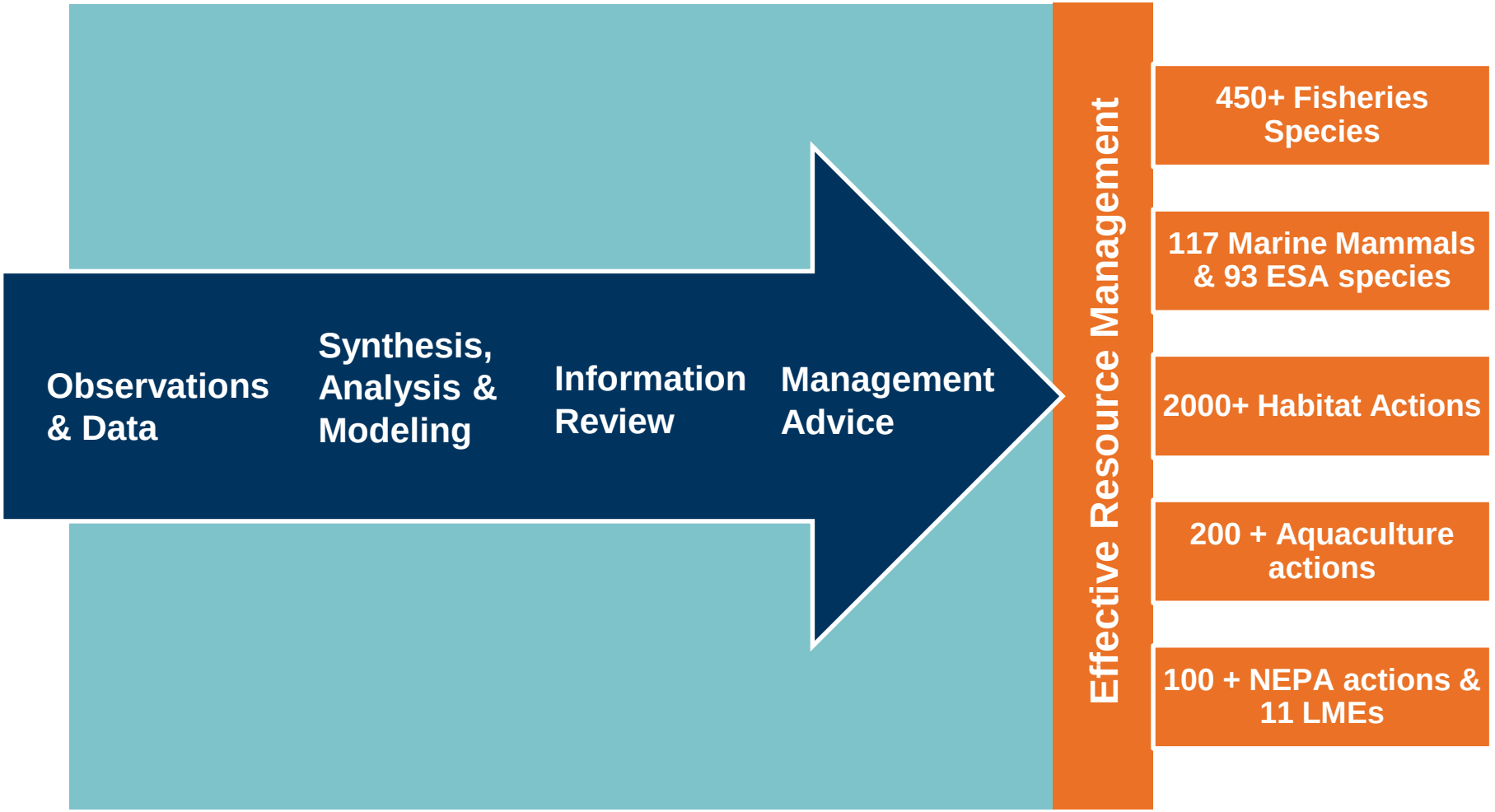
HOW INCREASE RESILIENCE?

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.

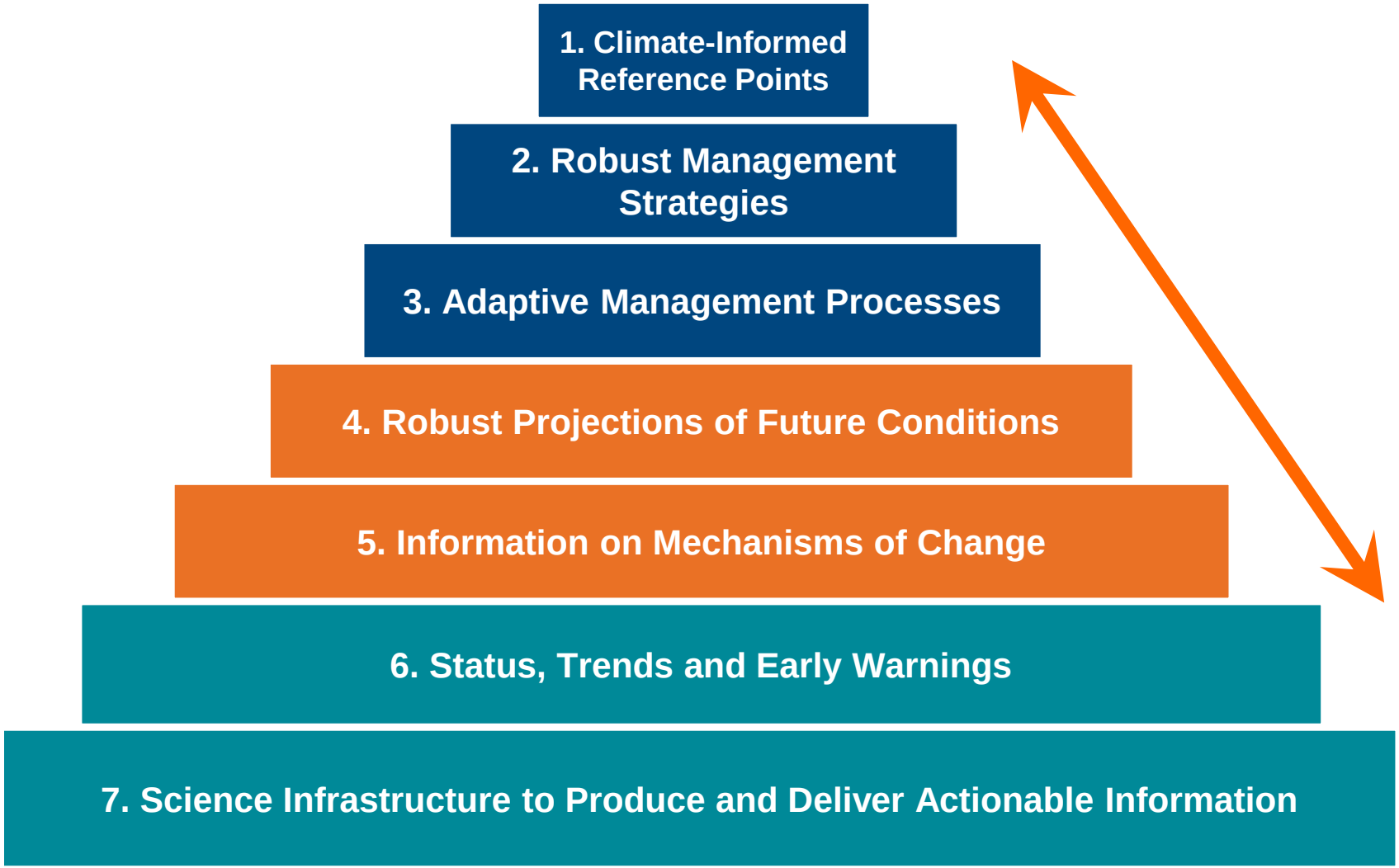
Draft Climate Science Strategy

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).

Process to Improve Climate Information to Fulfill Our Mission



Draft Climate Science Objectives



Draft Climate Science Objectives

Objective 1	**Identify appropriate, climate-informed reference points.**
Objective 2	**Identify robust management strategies.**
Objective 3	**Implement adaptive decision processes that respond to changing climate conditions.**

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Objective 4	**Identify likely future states to plan for.**
Objective 5	**Identify mechanisms of climate effects to improve projections and responses.**

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Objective 4	Identify likely future states to plan for.
Objective 5	Identify mechanisms of climate effects to improve projections and responses.
Objective 6	**Track trends and provide early warnings of change.**
Objective 7	**Strengthen the science infrastructure required to fill these needs.**

Recommendations—Immediate Actions

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

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.

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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

Summary

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Questions?

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