INTRODUCTION TO CLIMATE CHANGE

Presentation to the SCCWRP Commission

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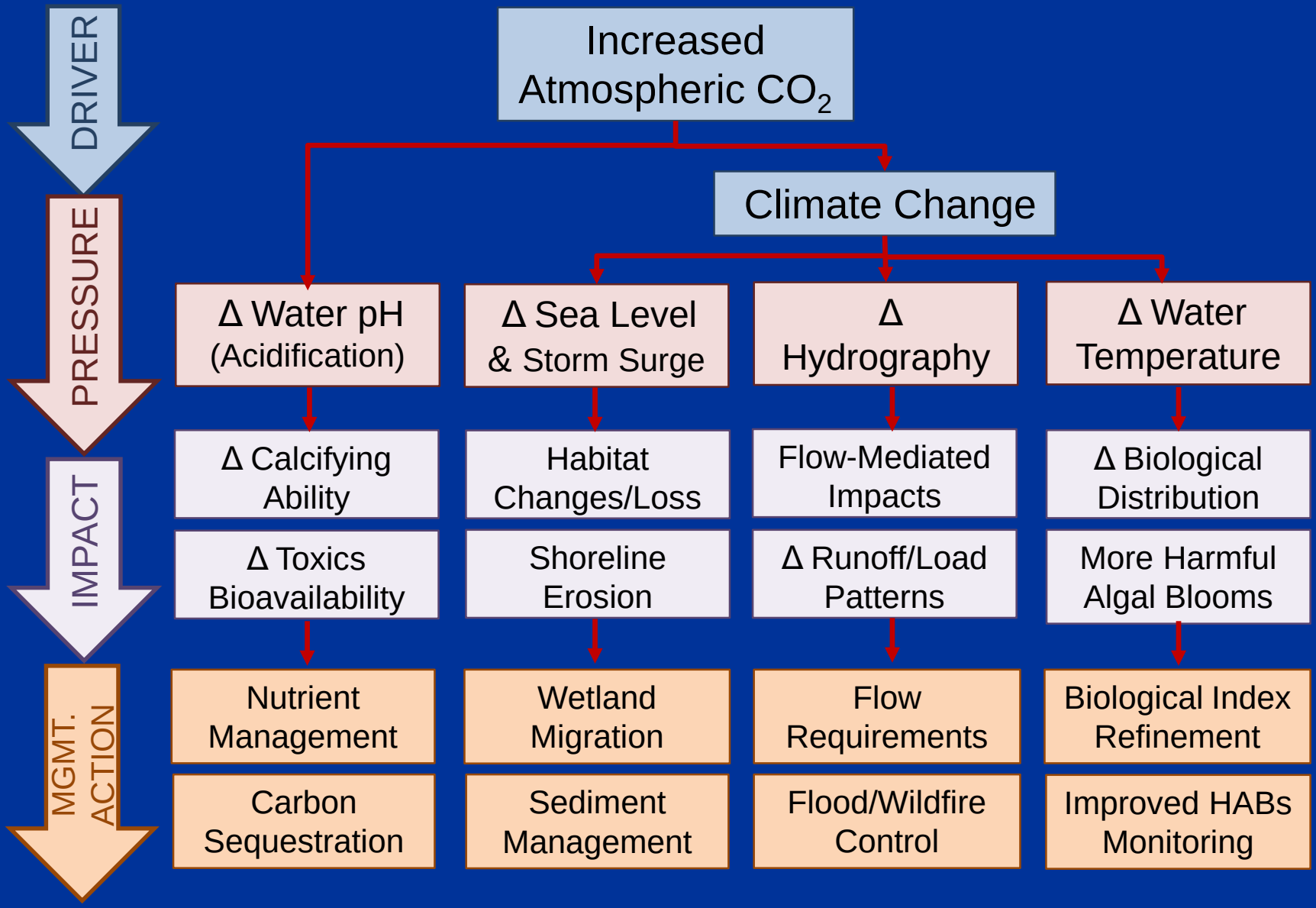
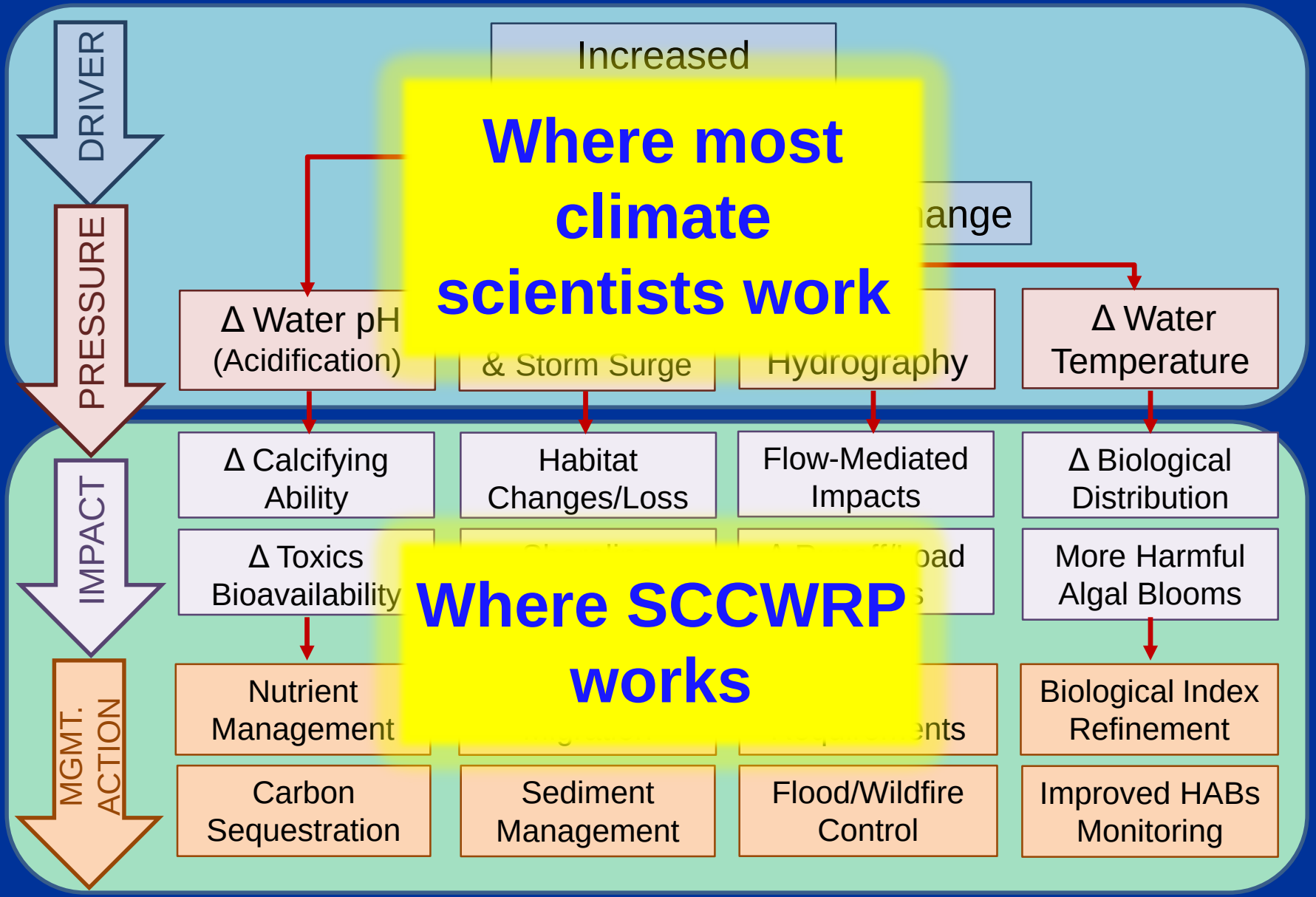
December 1, 2017

CONCEPTUAL MODEL



CONCEPTUAL MODEL



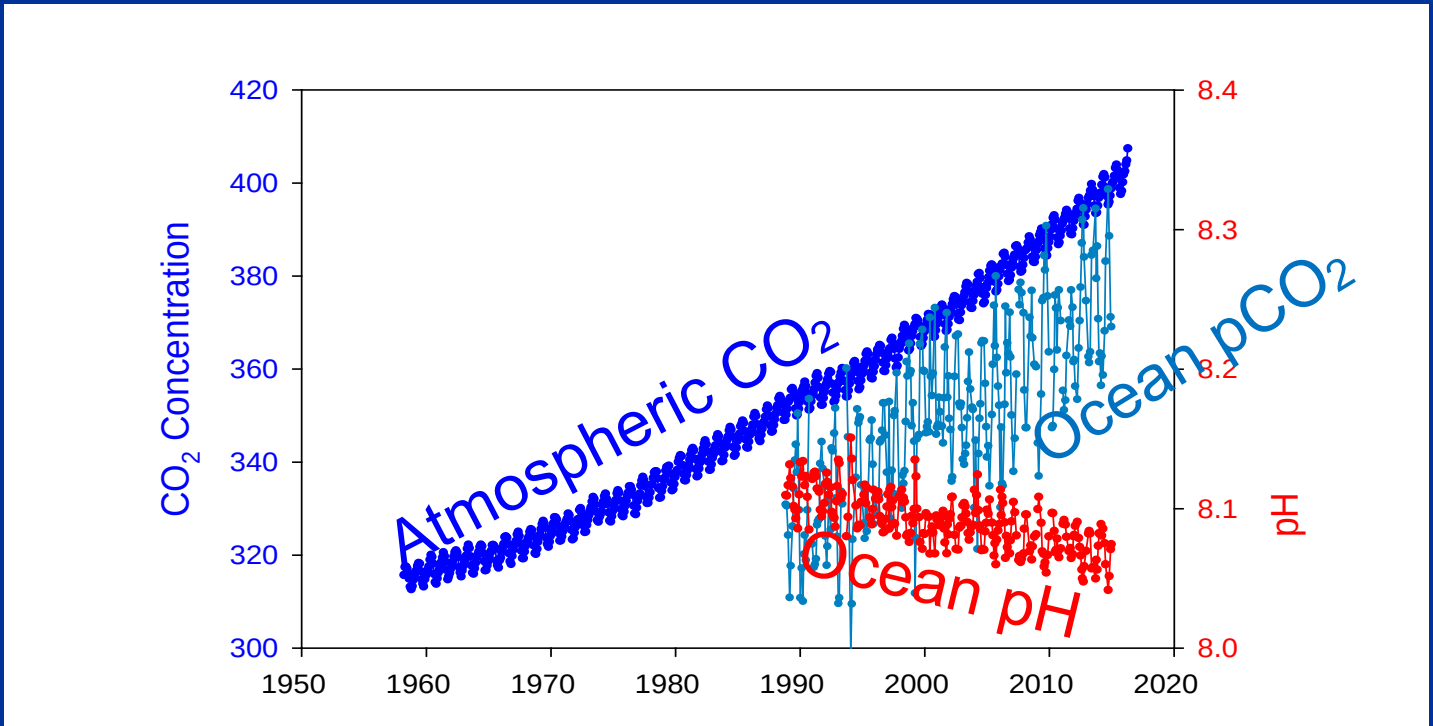
GOALS OF THIS PRESENTATION

- **Overview of the four pressures of climate change**
  - Δ Water pH
  - Δ Sea level
  - Δ Hydrography
  - Δ Water temperature

- **Provide context for your other talks today**
  - Acidification modeling
  - Environmental flows
  - Sea level rise

CHANGING OCEAN pH

- **Ocean pH has fallen by 0.1 pH units since the Industrial Revolution**
  - Equivalent to a 26% increase in ocean acidity
  - Acidity is projected to increase 100%-150% by 2100

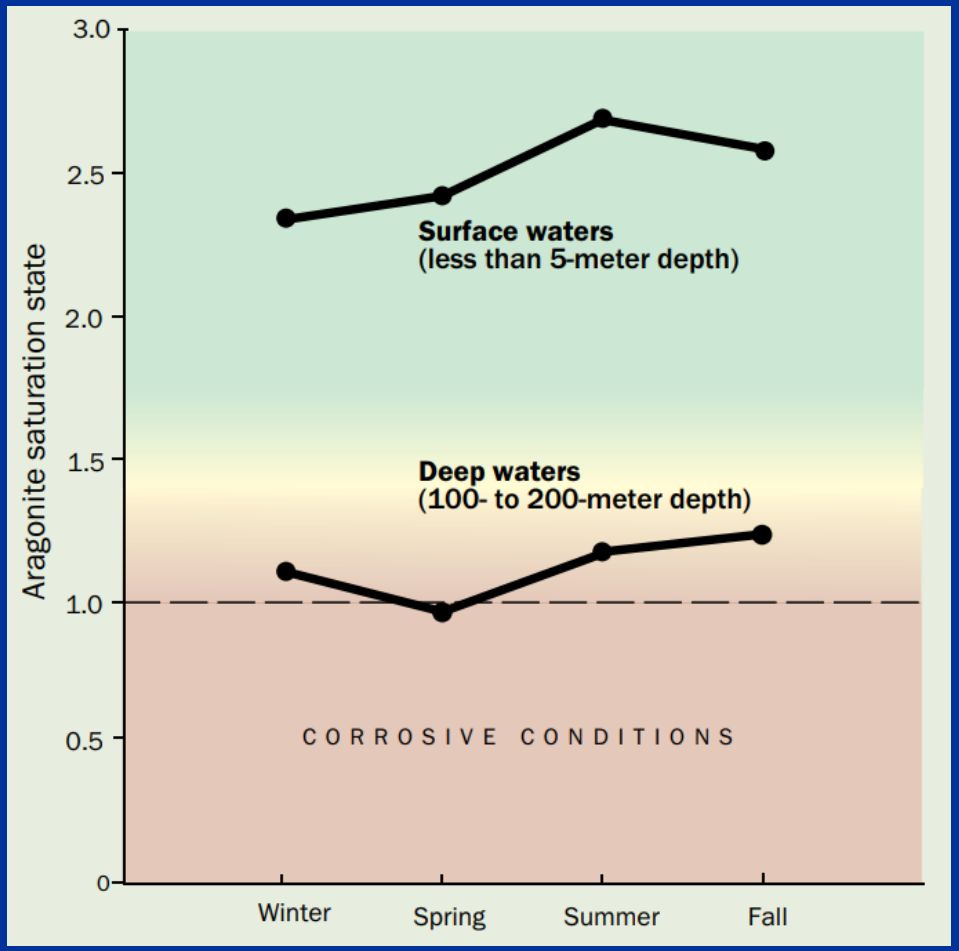


pH data from the Hawaii Ocean Time Series Station (HOTS)

ACIDIFICATION IN THE BIGHT

Bight ’13 found that deep coastal waters are already corrosive

– Corrosive conditions = Seawater with aragonite saturation state <1.0



Corrosive conditions creep into shallower waters during upwelling events

CONCEPTUAL MODEL

DRIVER

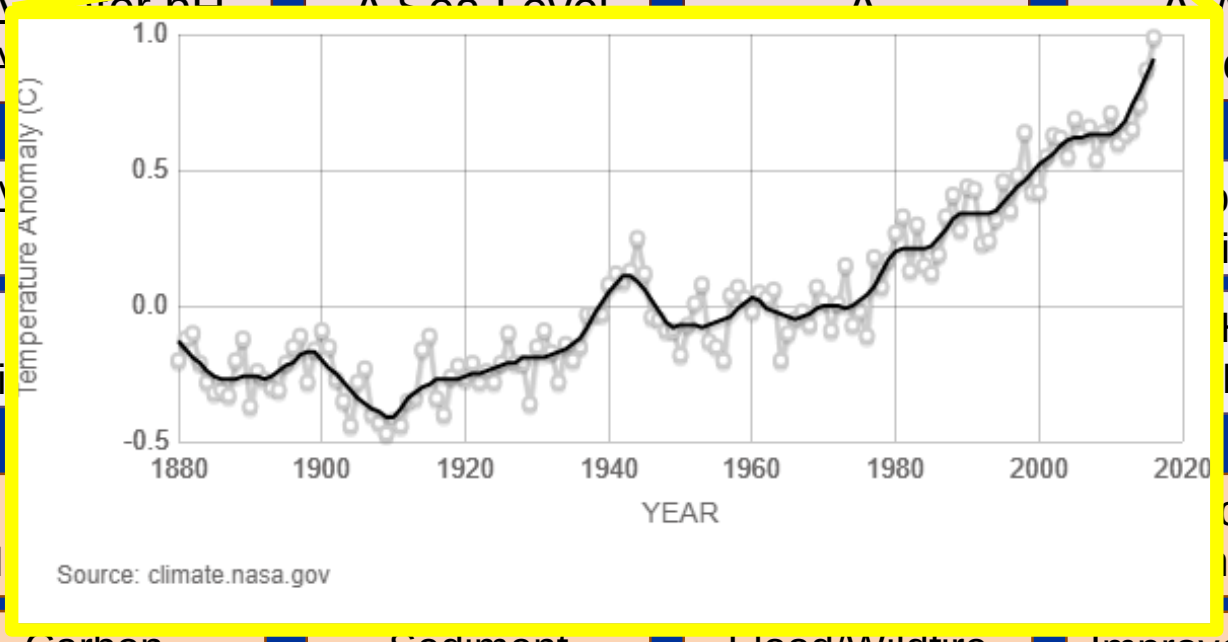
PRESSURE

IMPACT

MGMT. ACTION

Increased Atmospheric CO_2

Climate Change



Δ Water pH (A

Δ Sea Level

Δ

Δ Water erature

Δ

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Bi

Harmful Blooms

M

cal Index ement

Carbon Sequestration

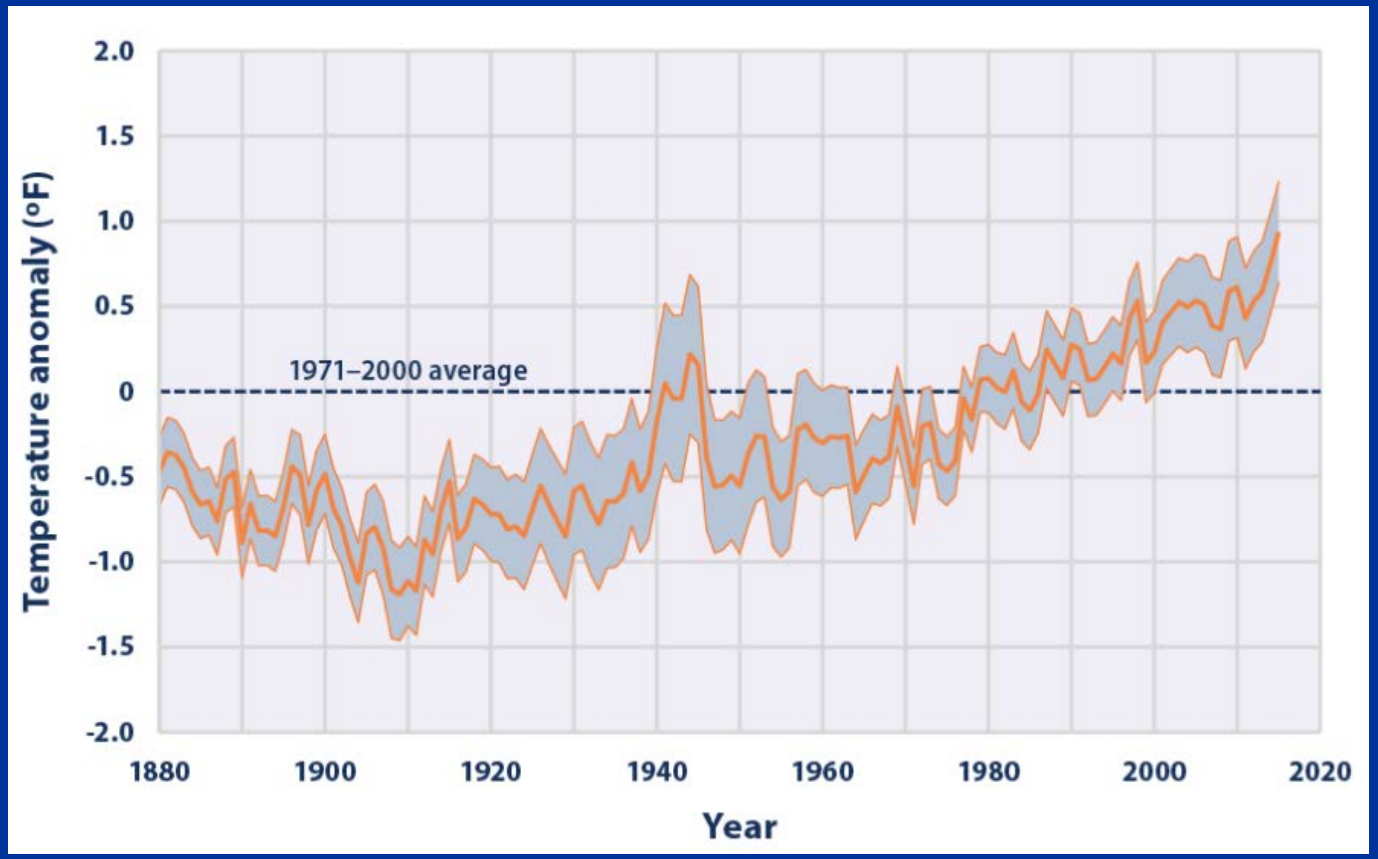
Sediment Management

Flood/Wildfire Control

Improved HABs Monitoring

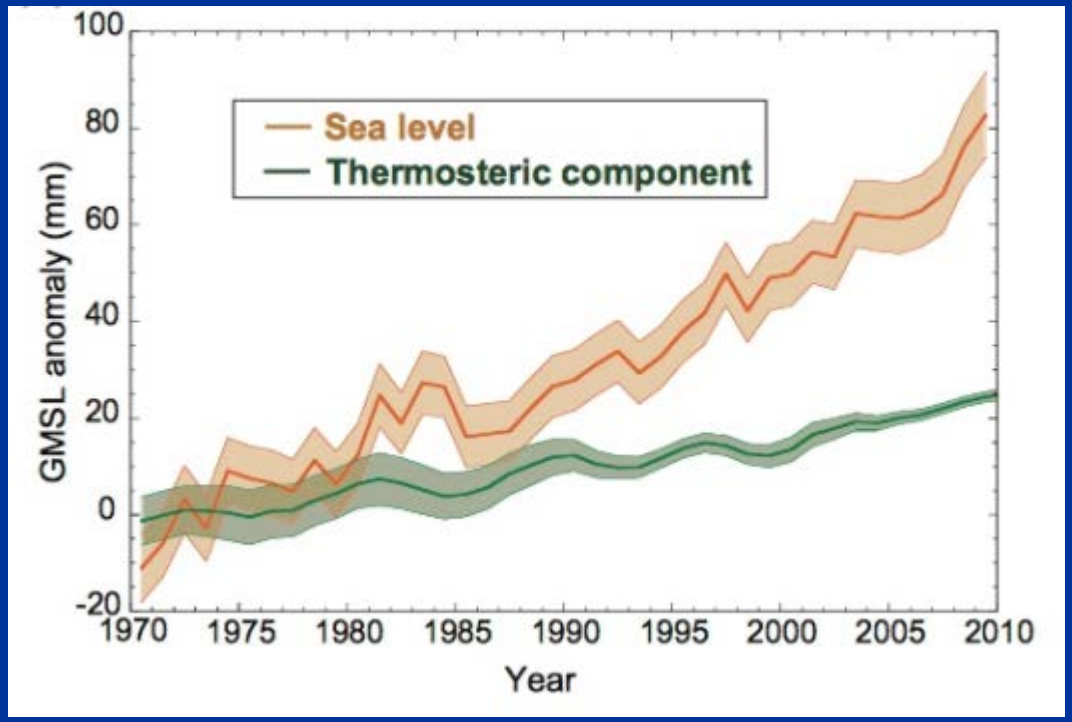
CHANGING WATER TEMPERATURE

- **Ocean surface temperature has risen an average of 0.13 °F per decade since 1880**
  - About 15 times faster than at any other time in past 10,000 years



CHANGING WATER TEMPERATURE

- **Thermal expansion is the dominant driver of sea level rise**
  - Seawater expands as it warms
  - Ice melt will play a bigger role going forward



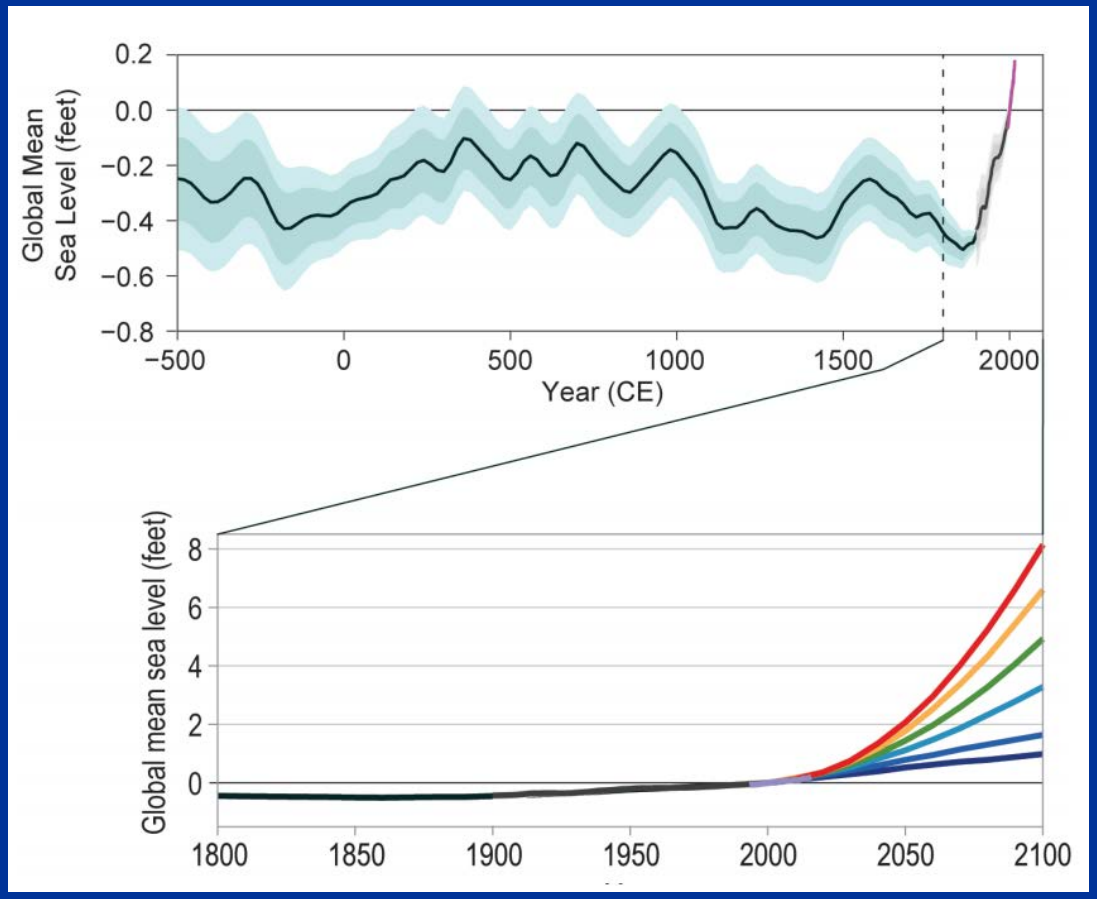
Ice melt is increasingly driving sea level rise

Thermal expansion will be a smaller contributor going forward

NASA

SEA LEVEL RISE

- **Sea level rise is happening faster now than anytime in the past 2,500 years**

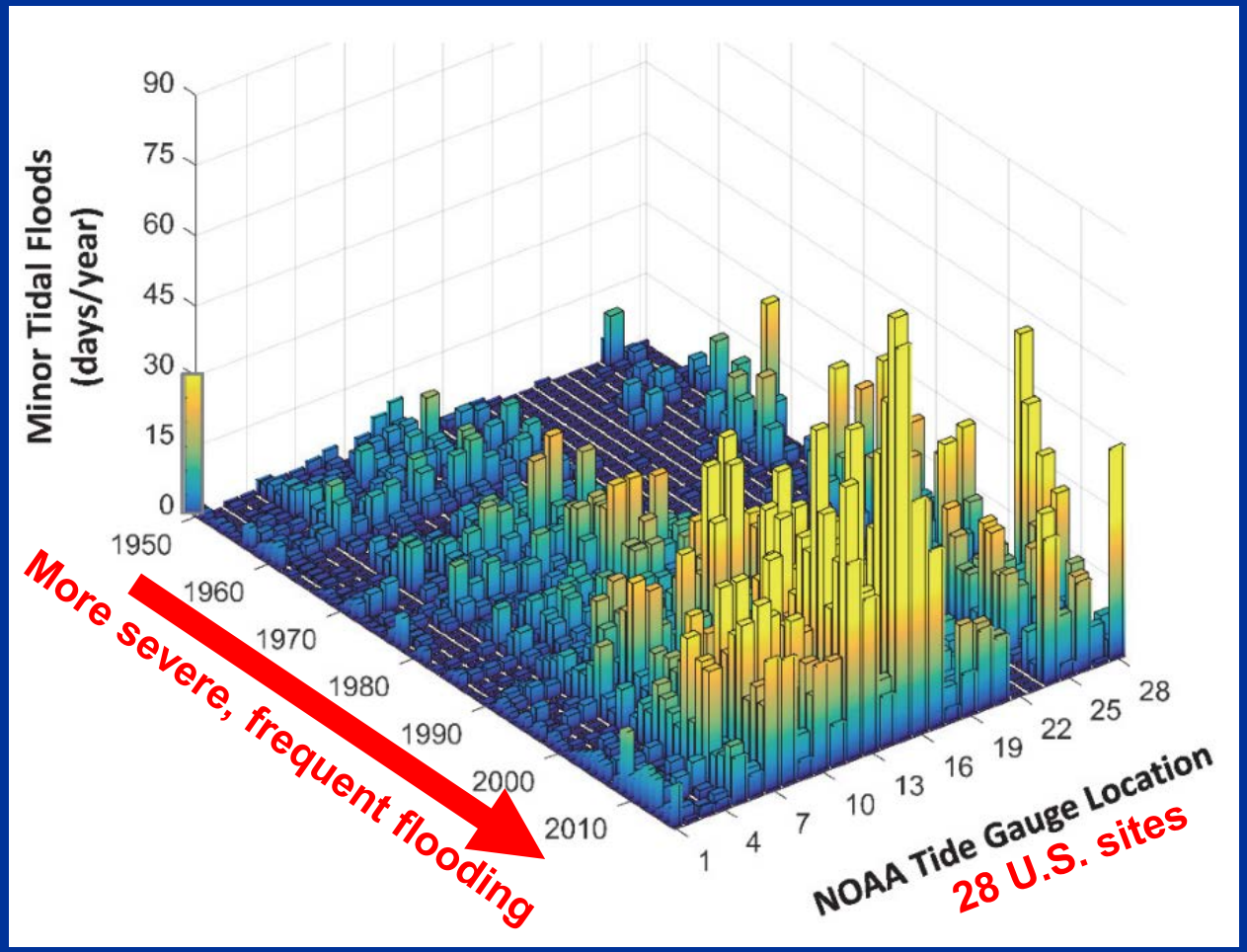


Models predict anywhere from 1 to 8 feet by 2100

U.S. Global Change Research Program

STORM SURGE

- **Storm surge will continue to intensify**
  - As early as 2050, today's 100-year storm event could strike annually

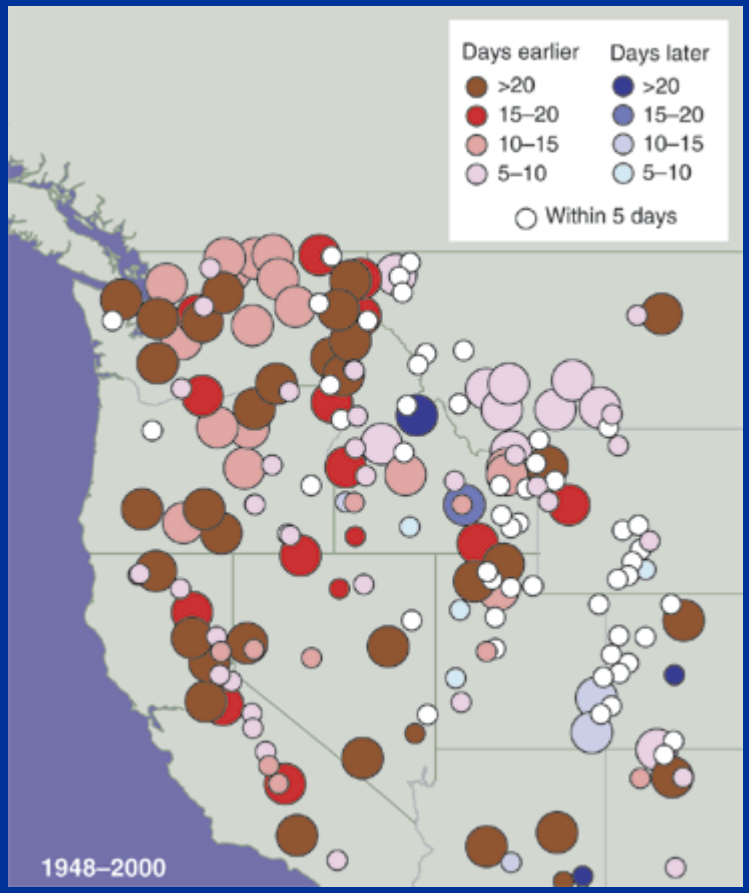


NOAA

CHANGING HYDROGRAPHY

- **Peak snowmelt and rainfall patterns are changing**
  - CA snowpack melting 3+ weeks earlier than in the 1940s
  - Projections are for shorter rainy seasons with bigger storms
- **Has implications for water resources management**
  - Peak flows will change
  - There will be more pressure to maintain environmental flows

Scripps and USGS, Science Magazine



Number of days earlier that peak snowmelt is occurring 1948 vs. 2000

TODAY'S PRESENTATIONS

- **Δ Water pH**
  - SCCWRP research: Acidification modeling and biological thresholds
- **Δ Hydrography**
  - SCCWRP research: Management of environmental flows
- **Δ Sea level**
  - SCCWRP research: Coastal wetland vulnerability + sediment management strategies
  - City of Los Angeles: Climate change resilience assessment