We are committed to change

- "...even if the concentrations of greenhouse gases in the atmosphere had been stabilized in the year 2000, we are already committed to further global warming of about another half degree [0.5°C] and an additional 320% sea level rise caused by thermal expansion by the end of the 21st century."

Contending with global climate change

- **Mitigation:** Reduction in Greenhouse gases in an effort to stave off or slow worst impacts of global climate change (i.e. reducing the impacts of climate change on our grandchildren’s world)
- **Adaptation:** Preparing today’s society for ongoing and projected impacts of climate change

What information can science provide?

- Where are impacts most likely to occur (and where are they least likely to occur): effects are highly heterogeneous
- Ecological forecasting: Can we predict winners and losers in ecosystems (and proactively use that information to plan for the future by providing that information to decision makers)?

“Take-home point number 1”

- Climate change is a worldwide phenomenon, but has high spatial and temporal variability in its magnitude

Warming is Not a Uniform Process

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*Hoegh-Guldberg and Bruno 2010*
“Take home Point number 2”

- Organisms vary in their physiological responses to temperature, CO₂, acidification and water availability
- There will be “winners” and “losers”
- We can measure many of these relationships using performance curves

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**Thermal Performance Curve**

- Fitness
- Death
- Survival
- Reproduction
- Survival
- Death

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“Warmer and wetter” is good for some plants and animals but very bad for others

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“Take home point Number 3”

- Organisms all have unique ways of “experiencing the world”
- Climate is changing, but it is weather that impacts organisms
- How do we measure “the environment”?

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weather, but weather throws the Punches”

- Graphics and catch phrases courtesy Deke Arndt, NOAA
“Weather forecasts for non-human organisms”

Weather data

Ecological Forecasting

Verify using ground-based msntrs.

Generate thermal maps of risk.

Test using hindcasts.

Heat budget model

When we try to pick out anything by itself, we find it hitched to everything else in the universe

John Muir, My First Summer in the Sierra

NCA Goal and Vision

- The overarching goal is to enhance the ability of the United States to anticipate, mitigate and adapt to changes in the global environment.

- The vision is to advance an inclusive, broad-based, and sustained process for assessing and communicating scientific knowledge of the impacts, risks and vulnerabilities associated with a changing global climate in support of decision-making across the United States.

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