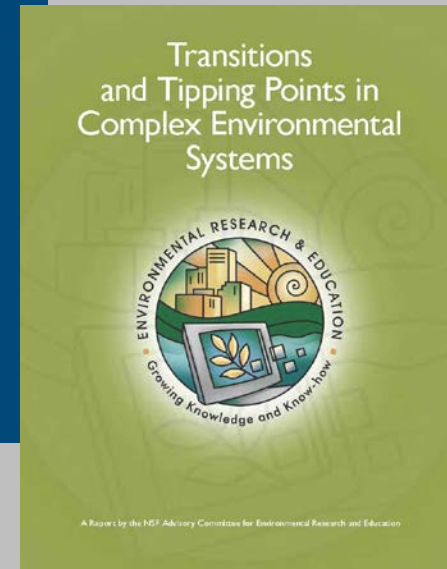
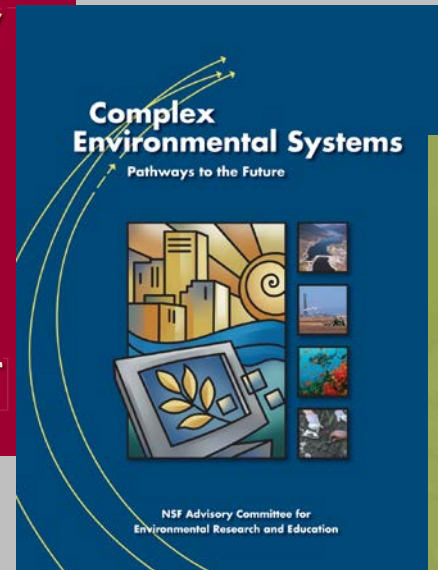
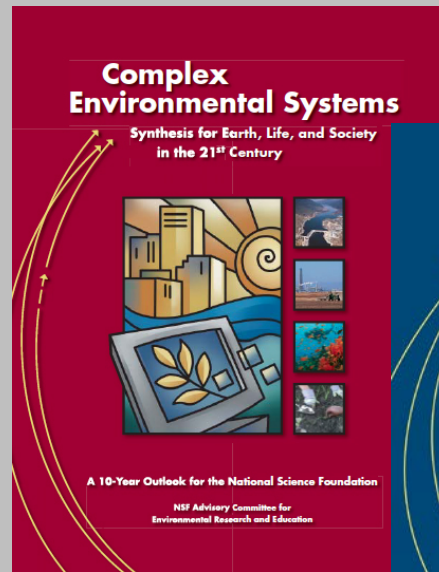
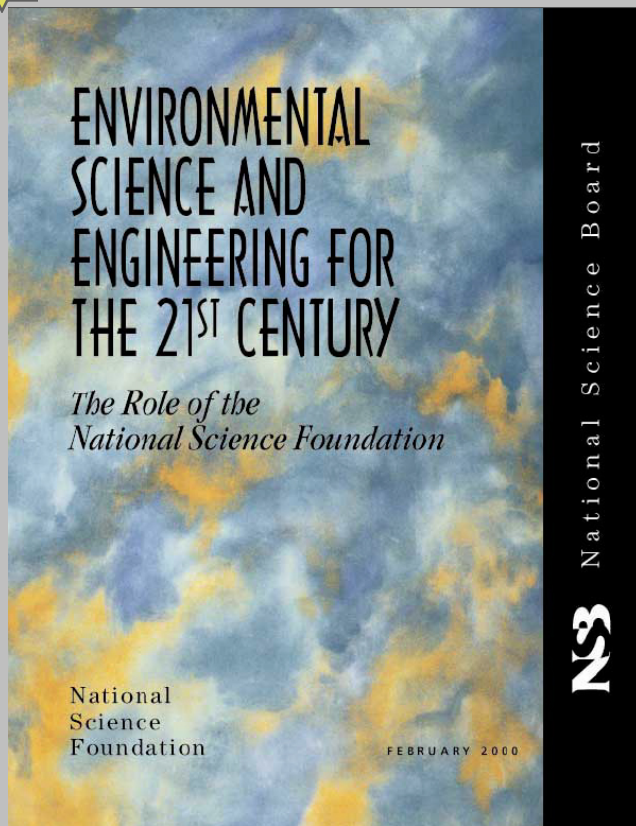




NSF Environmental Science: The role of Biology



Context...

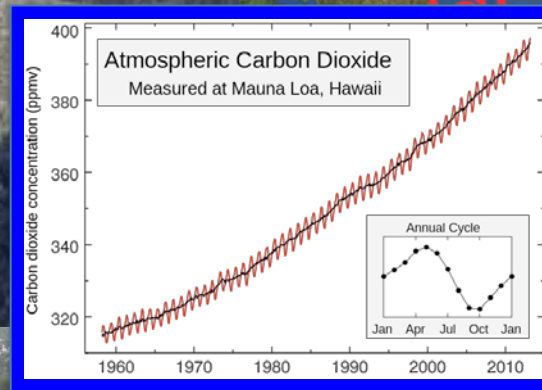
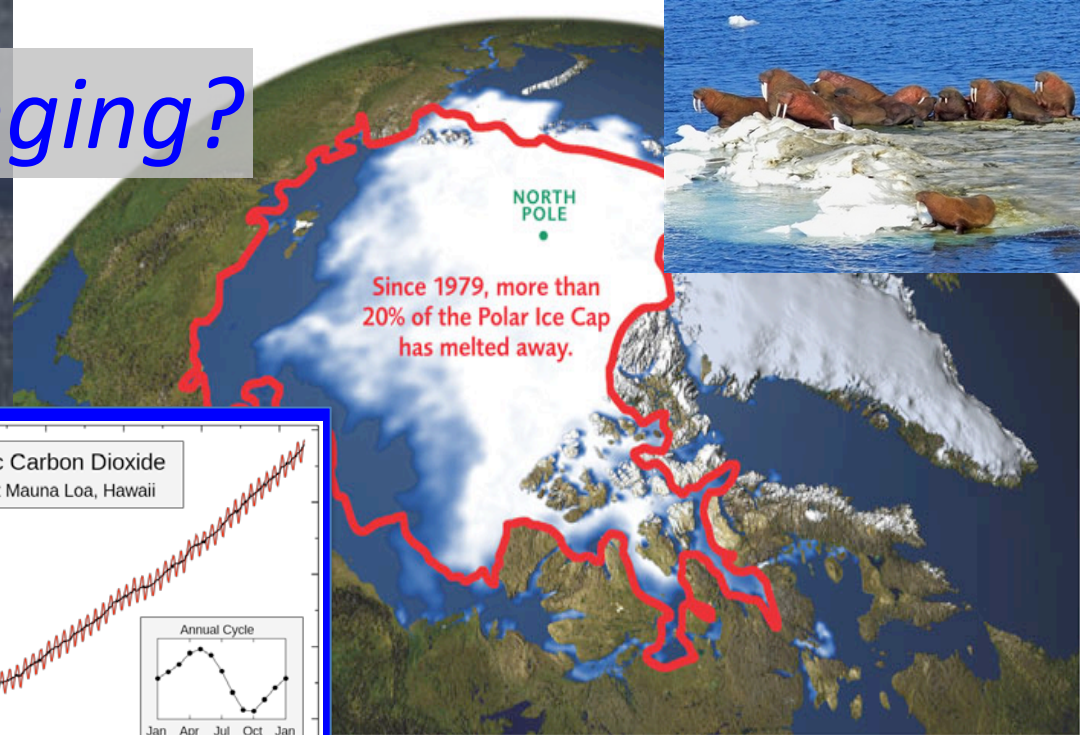
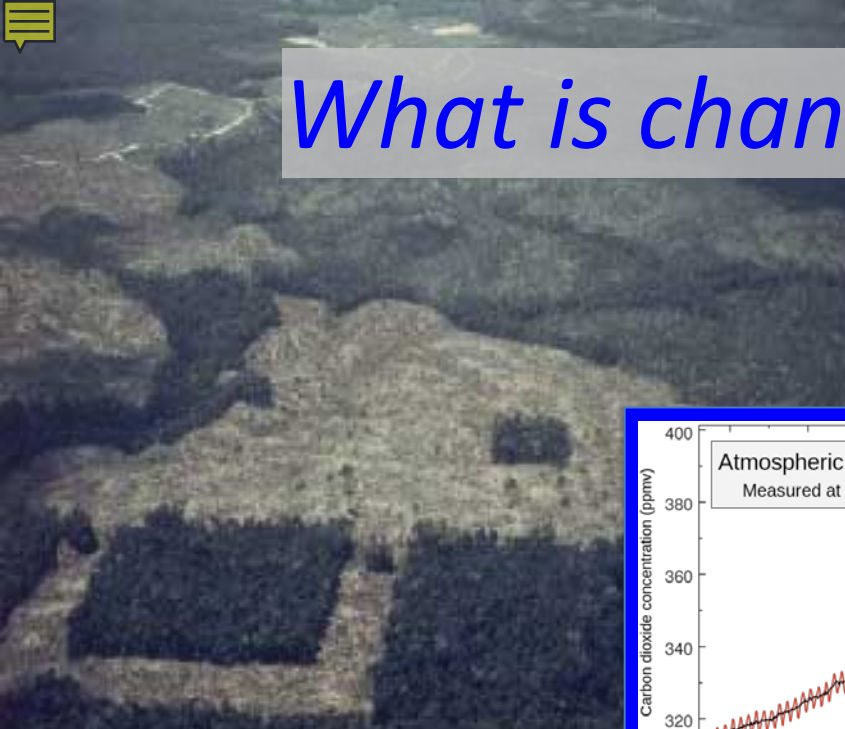


Biocomplexity in the Environment

SEES: Science Engineering and Education for Sustainability

What is on the horizon?

What is changing?



What is changing?

- Rapid evolution modifying traits and dispersal of organisms
- Novel ecosystems emerging globally from feedbacks among processes operating at multiple scales
- Changing nature of species interactions and ecological functions



A photograph of a river flowing through a dense forest. The river is the central focus, with water flowing over rocks and creating white rapids. The forest is composed of tall evergreen trees, with some bare branches visible in the foreground. The text 'What is changing?' is overlaid in a blue font on a semi-transparent grey background in the upper left. Three other text boxes, 'SUBJECT', 'SCALE', and 'SCOPE', are overlaid in white font on semi-transparent grey backgrounds, positioned along the river's path from the middle to the bottom center.

What is changing?

SUBJECT

SCALE

SCOPE

Environmental Science Event Horizon

Individual Site Based Data

2015 – 2017

Regional-Continental Data

10's of sites

Question-driven monitoring

Somewhat networked

Long-term experiments

10 – 100's sensors

Gigabytes³, eventually

100's – 1000's of sites

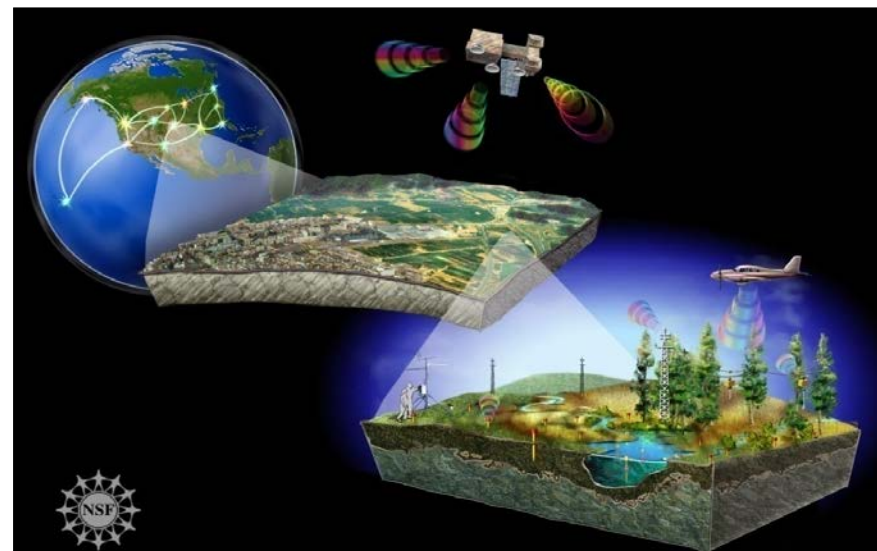
Standardized monitoring

Deliberately networked

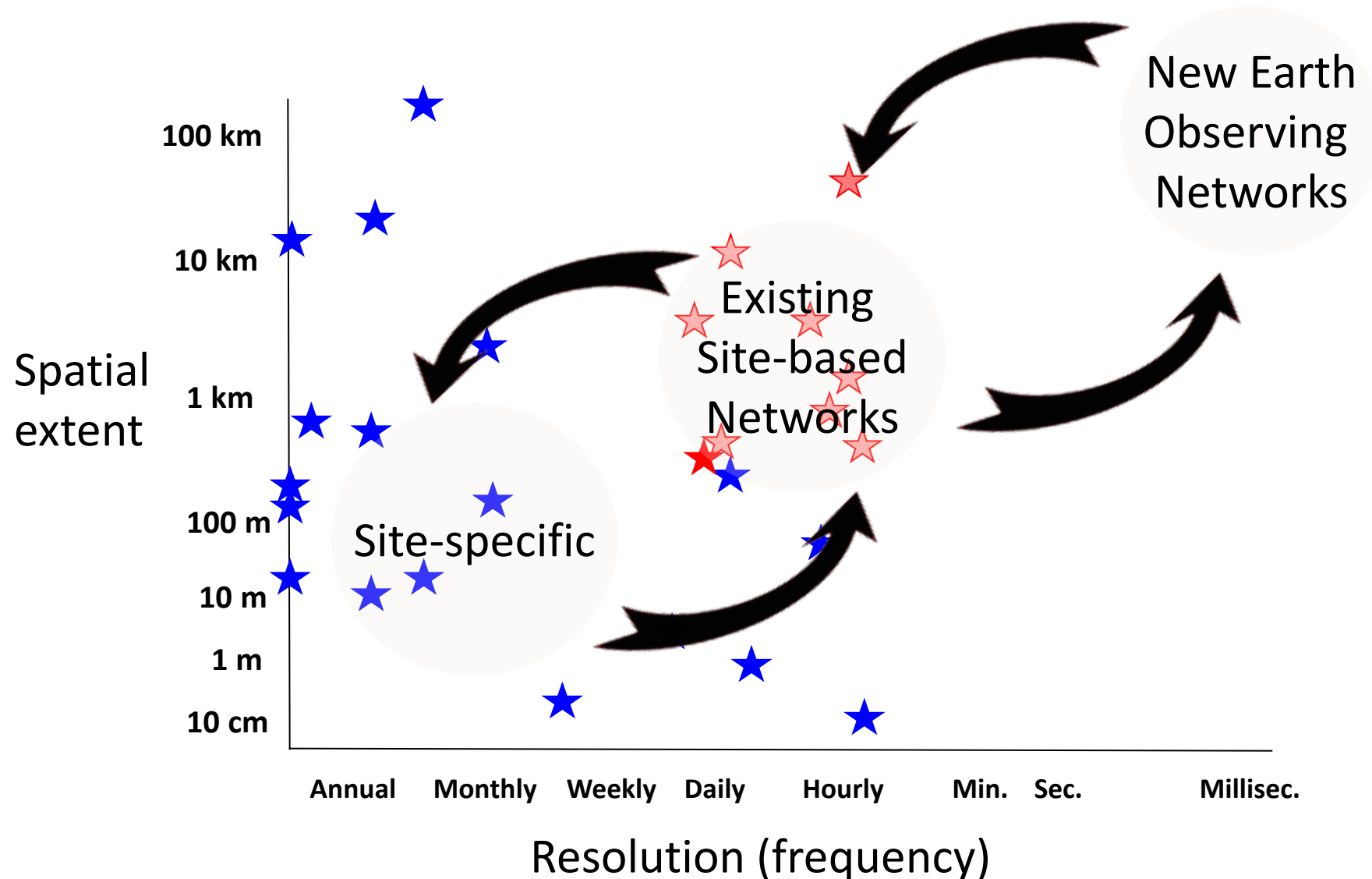
Long-term observations

10,000 – 100,000's sensors

Yottabytes⁸ online, real-time



Environmental Science Event Horizon



“Horizons” initiative?

Vision: A new biology of unprecedented environmental change...

*...that focuses on **poorly-understood** biological processes, functions and feedbacks that **drive and respond to** rapid, large scale and novel change*



“Horizons” initiative?

Key challenges:

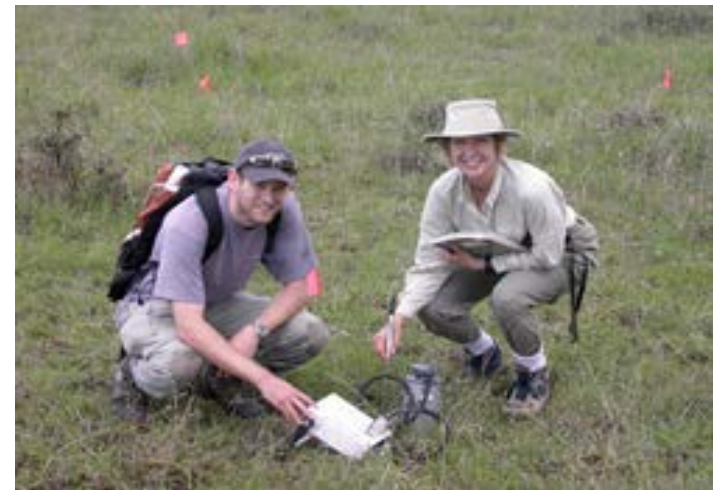
- Coupling **new data streams** with classic process-based approaches
- Linking theoretical frameworks **across scales of inquiry**
- Integrating modes of research (observations, experiments, models) to develop process-based understanding of pattern **across levels of organization**



“Horizons” initiative?

Framing priorities:

- Cooperative engagement among broad domains of study to prioritize investments
- Next-generation training to bridge conceptual and tactical gaps between current biological work and emerging EON investments
- Strategic domestic and international partnerships to leverage efforts



A wide-angle landscape photograph showing a large, deep blue lake in the foreground, dotted with small, rocky islands. In the background, a massive, rugged mountain range rises, its peaks and ridges partially covered in patches of white snow. The sky is a clear, vibrant blue with a few wispy white clouds. In the immediate foreground, the dark green needles of evergreen trees and the grey, craggy texture of rocks are visible, framing the bottom and right sides of the scene.

What are the priorities for BIO in a
“Horizons” initiative?