

Putting Uncertainty in Context

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EcoAdapt



Climatic change is affecting all ecosystems, and will continue to do so for centuries, so...

- We need to *incorporate climatic change into long-term planning*
 - Minimize risk of wasting time, money, and effort
 - Maximize likelihood of success

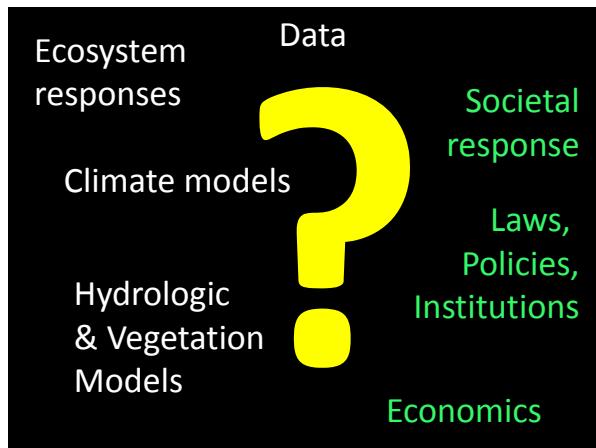
Ecosystem responses

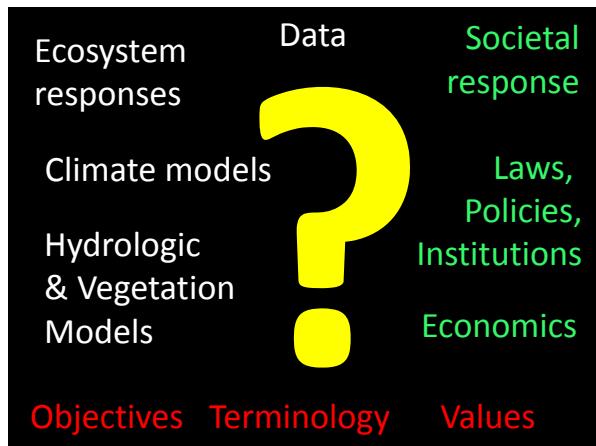
Data

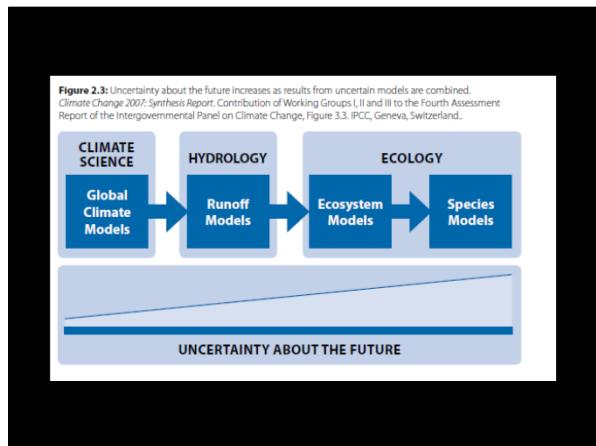
Climate models

Hydrologic & Vegetation Models









Responses to uncertainty

Responses to uncertainty

- Ignore it/wait until it disappears/pretend you can get rid of it

Certain: death and taxes

Uncertain: everything else



Reducible vs. irreducible uncertainty

- Future greenhouse gas emissions
vs
- How global temperatures respond
to increases in GHG concentration
vs
- How global precipitation regimes
respond to increases in GHG
concentration



scherphotography

The allure of downscaling

Beware spurious precision!

May I have the ability to reduce the
uncertainties I can, the willingness to work
with the uncertainties I cannot, and the
scientific knowledge to know the
difference.

*Joe Barsugli, Cheis Anderson, Joel Smith and
Jason Vogel*

Responses to uncertainty

- Ignore it/wait until it disappears/pretend you can get rid of it
- Understand it

Known unknowns vs. Unknown unknowns



- Known unknowns
 - Scientific: Lake level changes, temperature change
 - Sociopolitical: Land use changes, boss's mood
- Unknown unknowns: New technologies, ecosystem tipping points, political revolution

Directionality vs. magnitude

- All climate models say things will get warmer; they disagree on just how much warmer
- Models disagree on whether things get wetter or drier overall



Controllability

- Whether or not to buy a car
- Greenhouse gas emissions
- Massive methane belch from the deep sea



Uncertainty as information

Being uncertain is not the same as knowing nothing

Responses to uncertainty

- Ignore it/wait until it disappears/pretend you can get rid of it
- Understand it
- **Surf the wave!**
 - Adaptive management
 - Scenario planning
 - Risk management



Adaptive Management Plan for South Bay Salt Pond Restoration Project

– Specified key uncertainties and research to address them

– Specified triggers for action

– Specified necessary science and institutional structure for adaptive management to work

Really cool table!

| MANAGEMENT TRIGGER | APPLIED STUDIES |
|---|--|
| <ul style="list-style-type: none"> Outboard modifir decreases greater than the range of interannual variability + observational variability/error. | <ul style="list-style-type: none"> Will sediment movement into wetland tidal areas significantly impact plant life and/or ecological functioning (such as plankton, benthic, fish or bird diversity or abundance) in the South Bay? |
| <ul style="list-style-type: none"> Couarse study sessions to review and interpret findings to assess if observed changes are due to natural variability or widespread changes in the sediment budget (e.g., effects of sea level rise). Study biological effects of loss of marsh, salt marsh shallows, and/or subtidal channel habitats. Adjust restoration phasing and design to reduce net loss of tidal marsh area. Options may include remove bayfront levees to increase wind fetch and maintain tidal modifir; phase breaching to match Antioch Channel opening and/or breach only high-salinity ponds to limit sediment demand. Reconsider movement up marsh. | <ul style="list-style-type: none"> Development of a 2- and 3-D South Bay tidal habitat evolution model. |

