



Climate Change and Ecosystem Services Challenges and Opportunities

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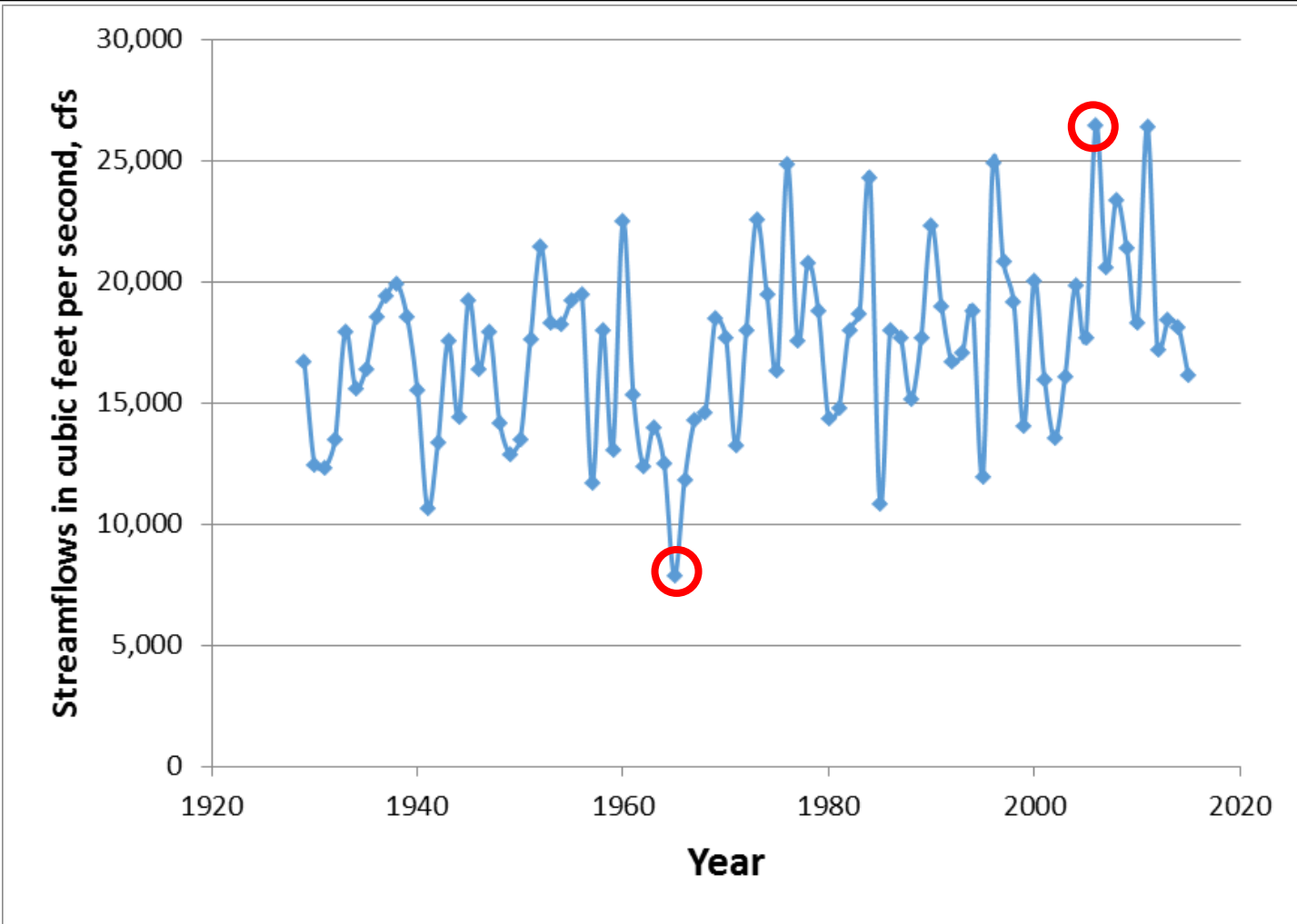
Talking Points

- Embrace the uncertainty
- Tell a good story
- Support the decision process

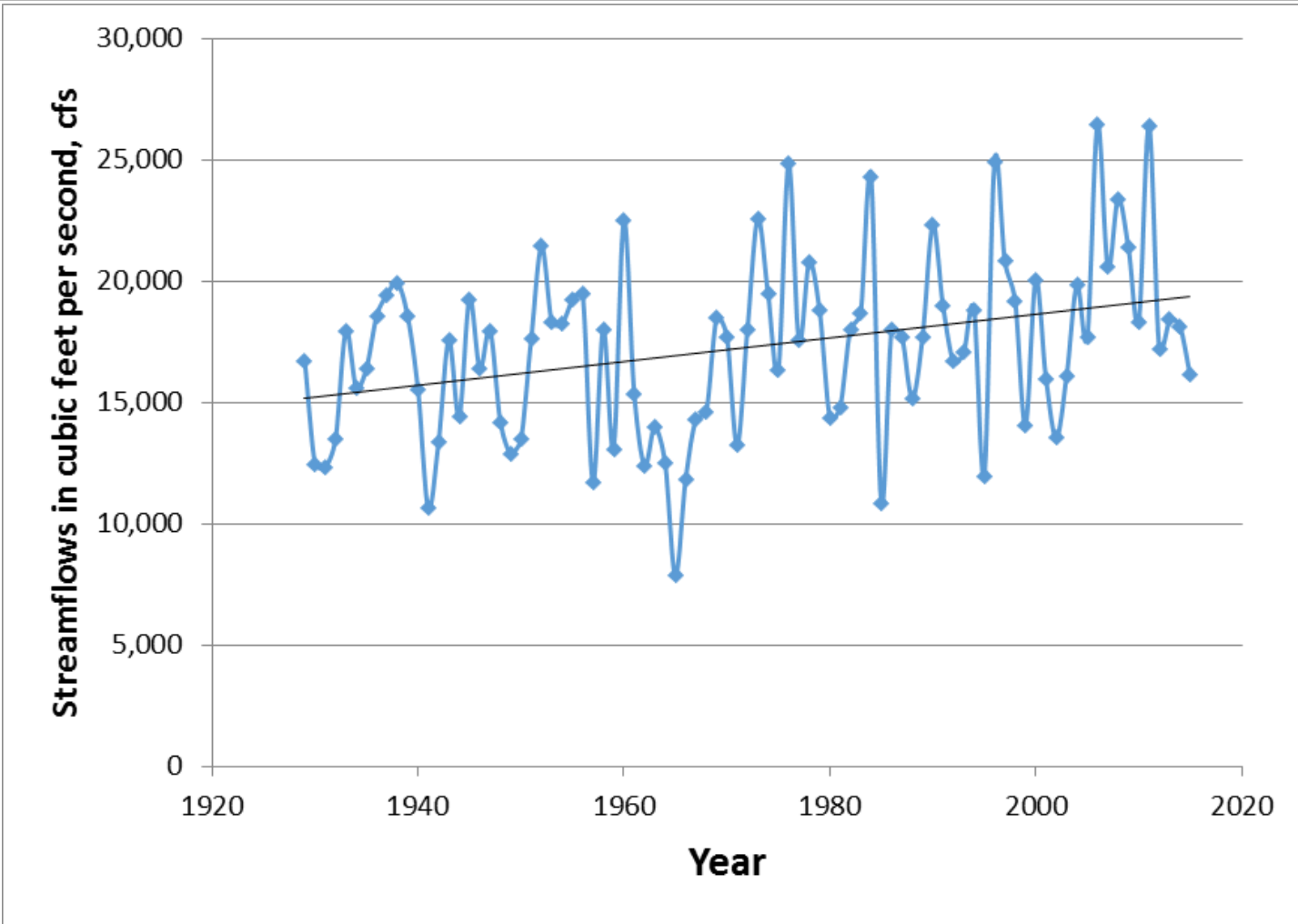
Embrace the Uncertainty

- Climate uncertainty can impede calculations of ecosystems services if you let it, but.....
- We live in a very uncertain world and face a very uncertain future
- One might suggest that climate uncertainty is not our dominant uncertainty
- The natural environment is full of variability

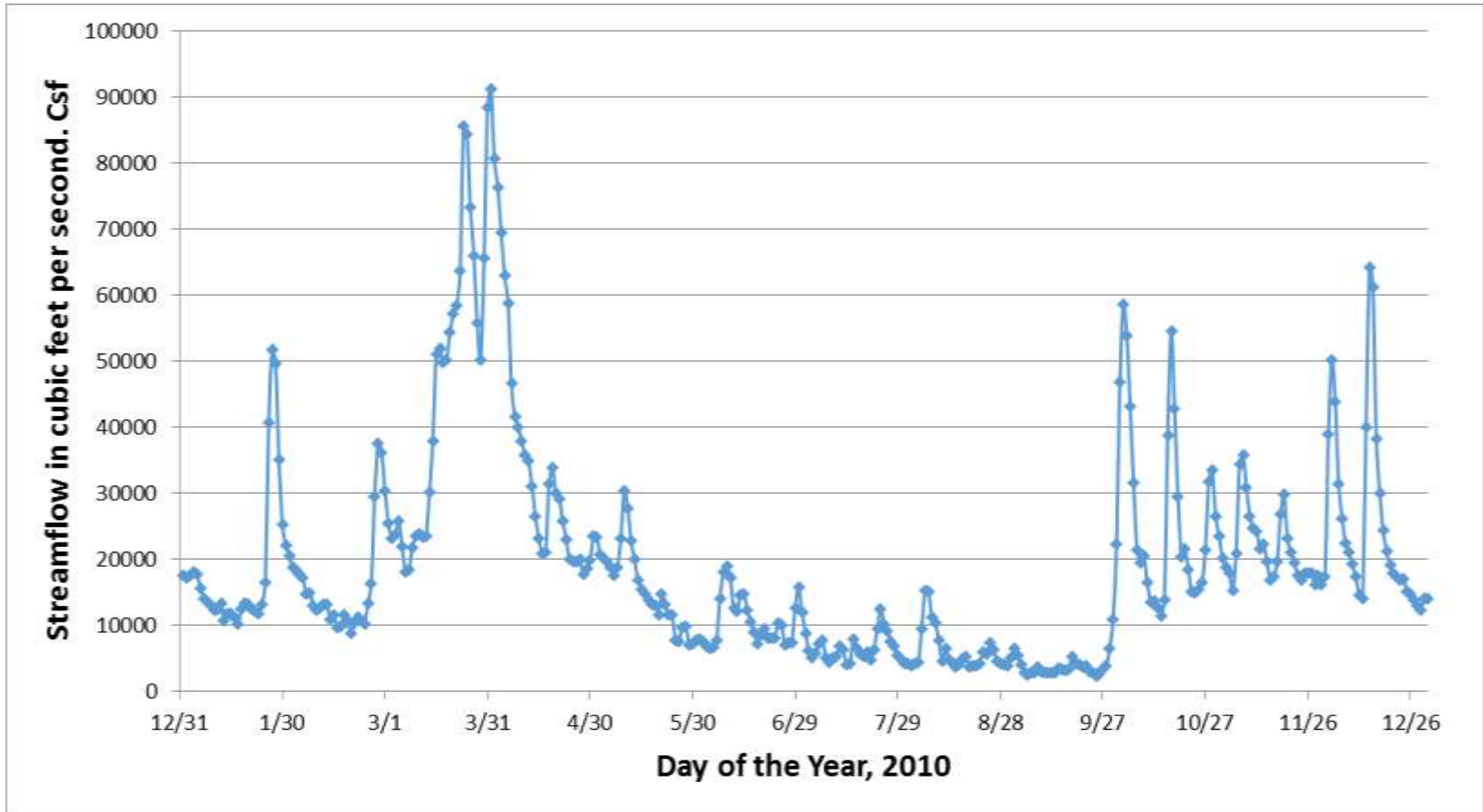
Average Annual Flow in the Connecticut River



Average Annual Flow in the Connecticut River



Daily Average Flow in the Connecticut River



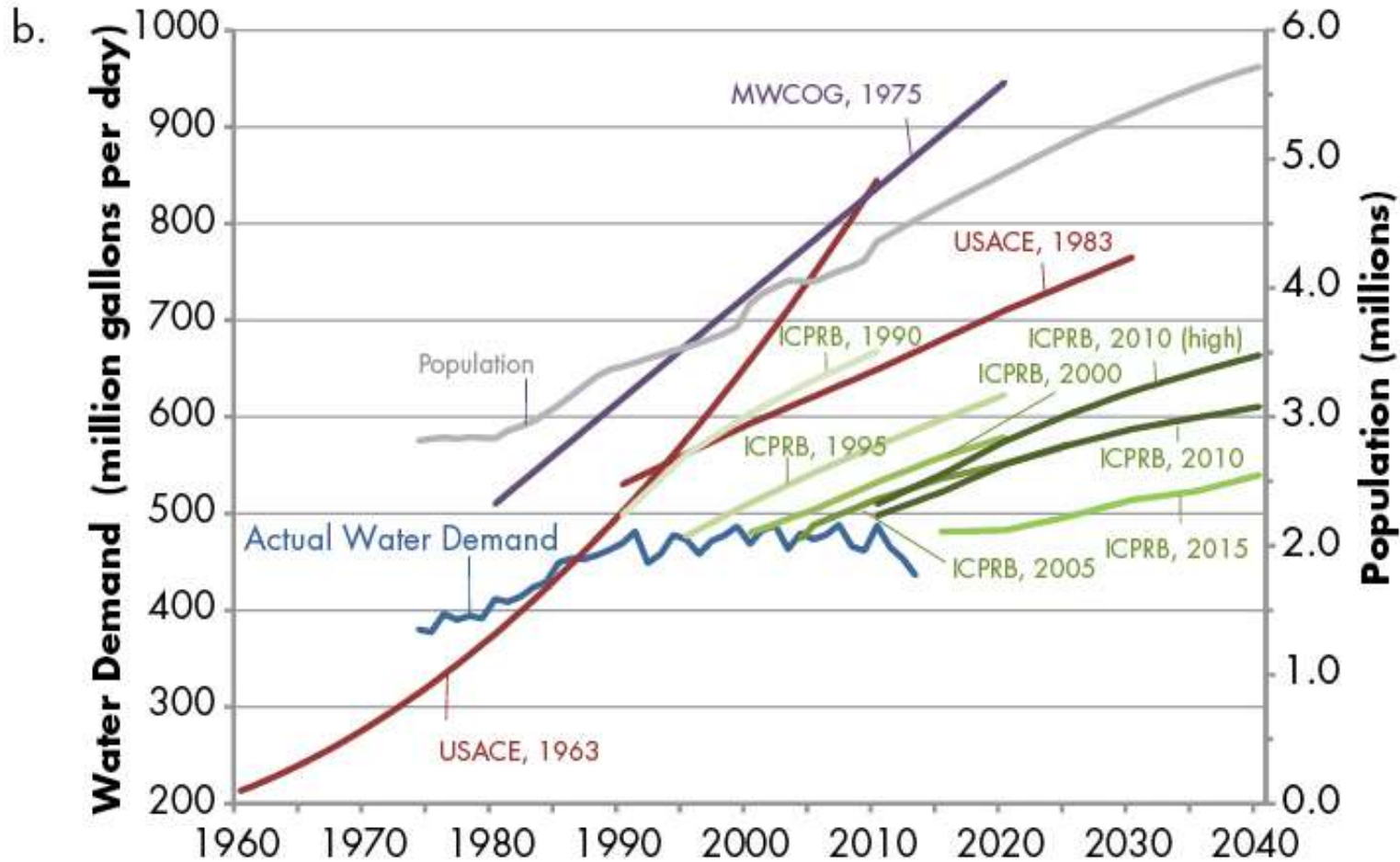




Climate Uncertainty

- Climate uncertainty can impede calculations if you let it, but.....
- We live in a very uncertain world and face a very uncertain future
- One might suggest that climate uncertainty is not our dominant uncertainty
- The natural environment is full of variability
- Suppose a perfect forecast of the future was required for other types of planning

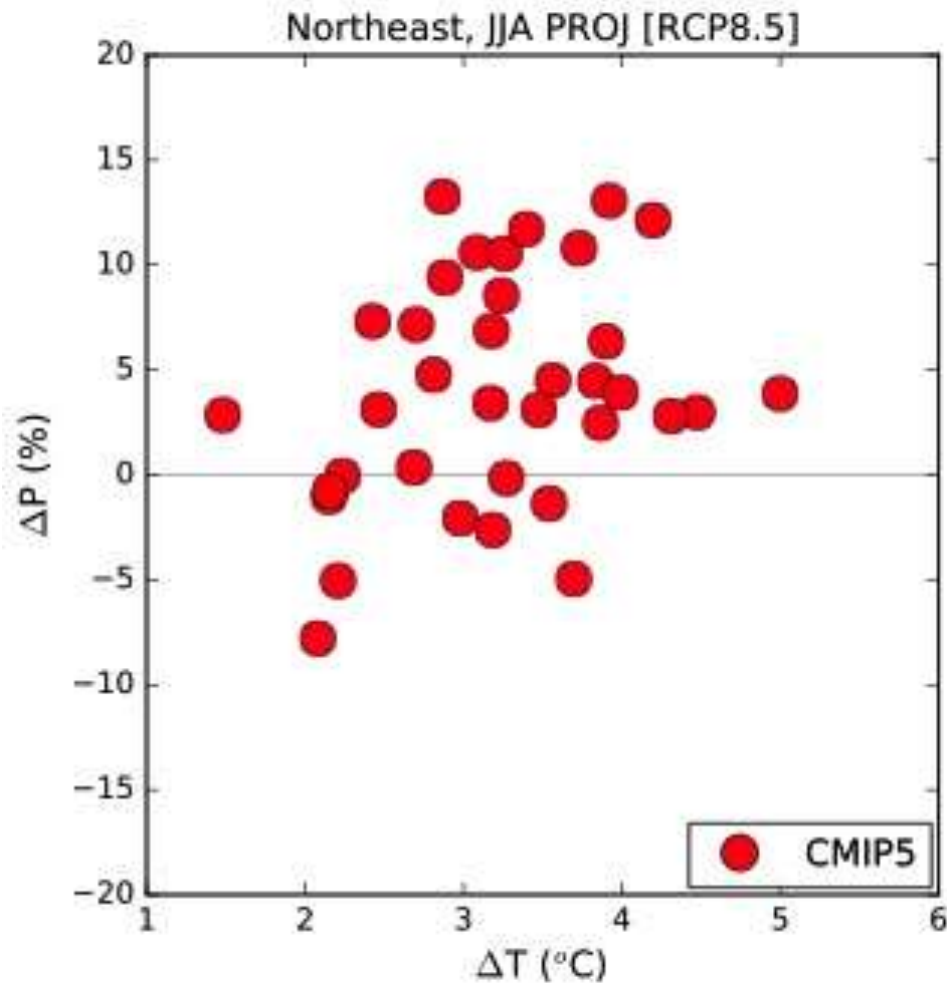
Water Demand in Metropolitan Washington, D.C.



Tell a Good Story

- Use our climate forecasts to create a vision of what our future holds
- Do not suggest climate forecasts allow us to calculate ecosystem services with precision

Diversity in Model Projections



Projected change for 2040-2069 relative to 1980-1998, for the Northeast of the US for the month June , July and August

Coupled Model Intercomparison Project Phase 5

What do these models forecast?

- Why do we want to frame this as a simple story?
 - These models are changing, becoming more complex, and providing a wider range of forecasts over time (uncertainty is not necessarily decreasing)
 - They should be view as broad brushstrokes in most cases
 - They do not replicate the extremes of our climate uniformly

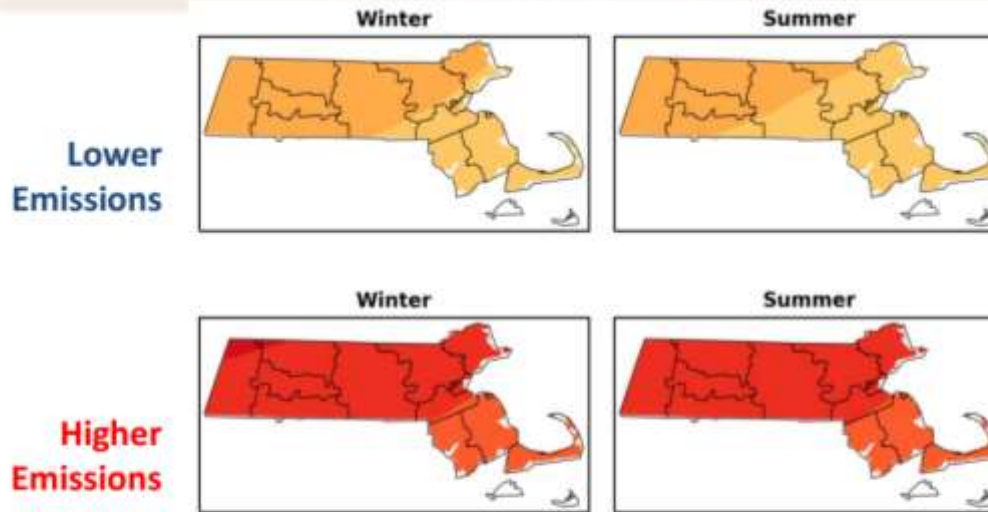
So instead, make the message simple

Warming in Massachusetts

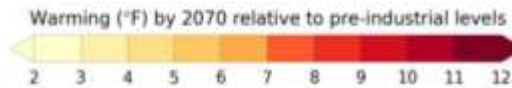


PROJECTIONS

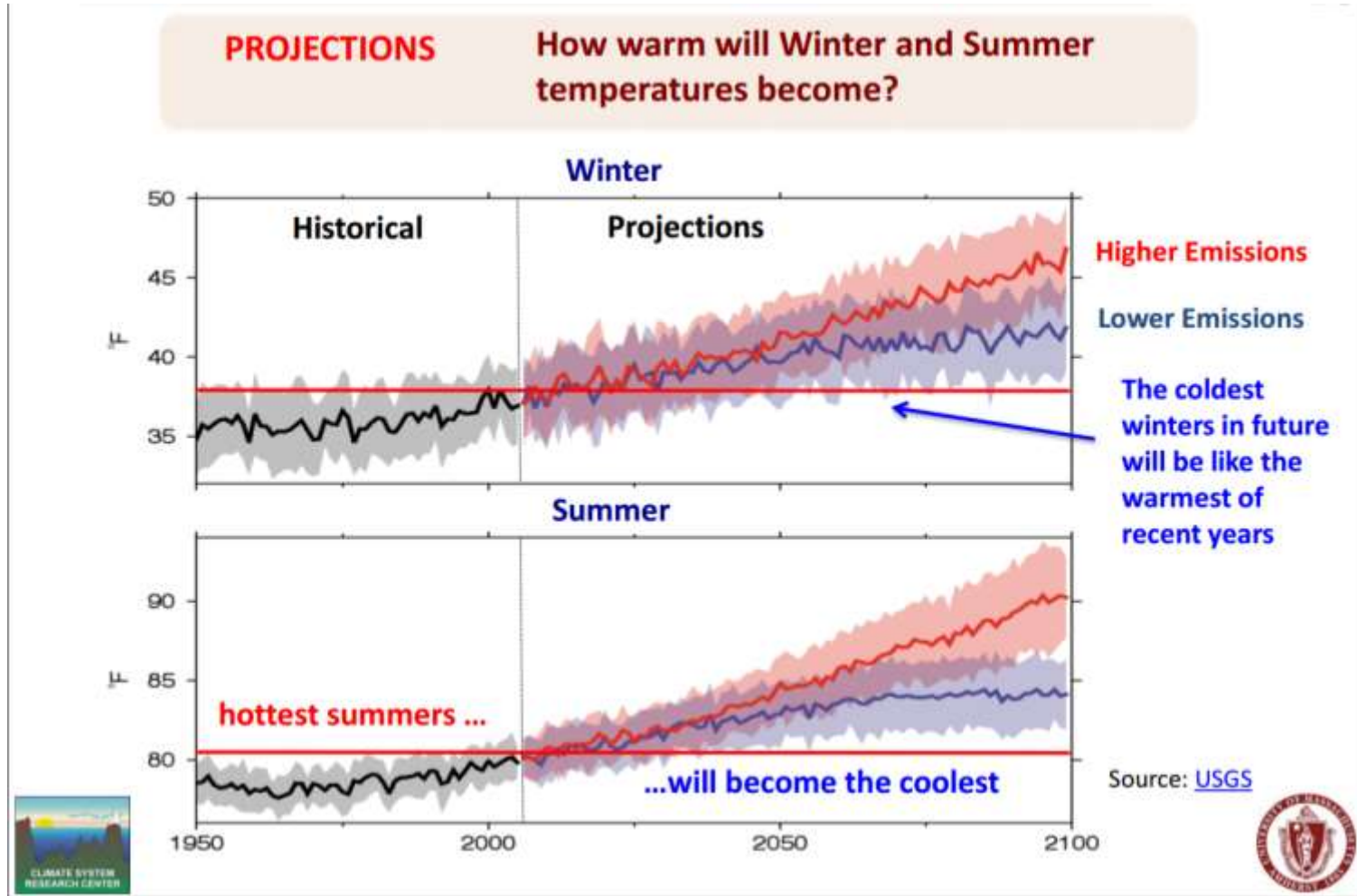
In the next 50-60 years, when global warming crosses the 2°C threshold, MA average summer and winter temperatures are projected to increase by over 6°F (3.3°C) relative to pre-industrial levels.



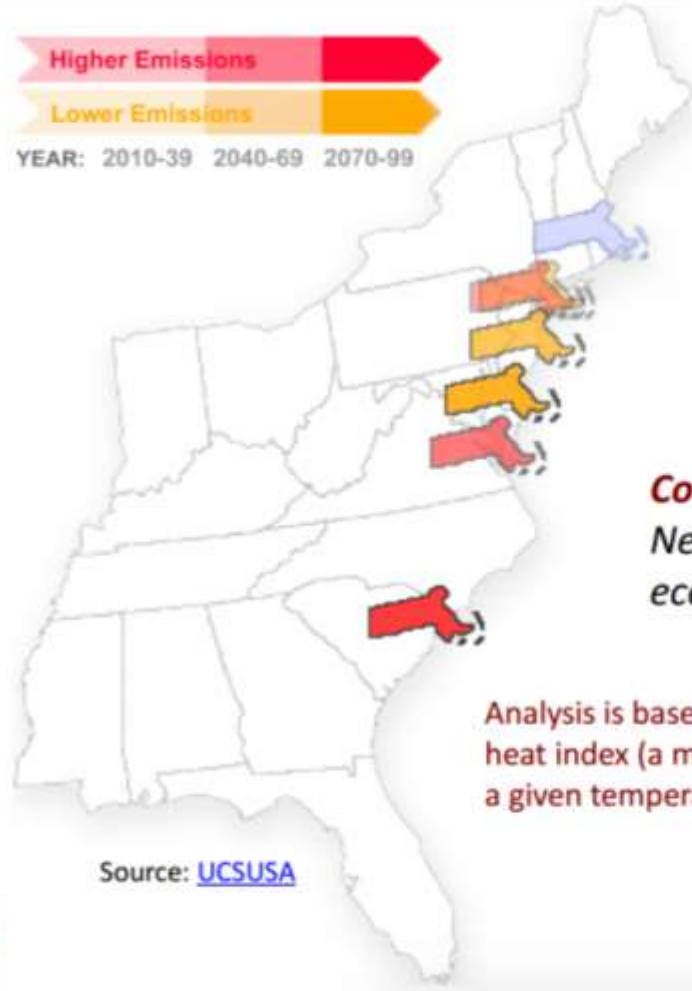
Source: produced by CSRC, UMass Amherst



Warming in Massachusetts



Migrating Massachusetts Climate



PROJECTIONS

Summer in Massachusetts by the end of this century could feel like a present-day typical summer in South Carolina.

Consequences:
Negative impacts on human health, ecosystems, and the economy.

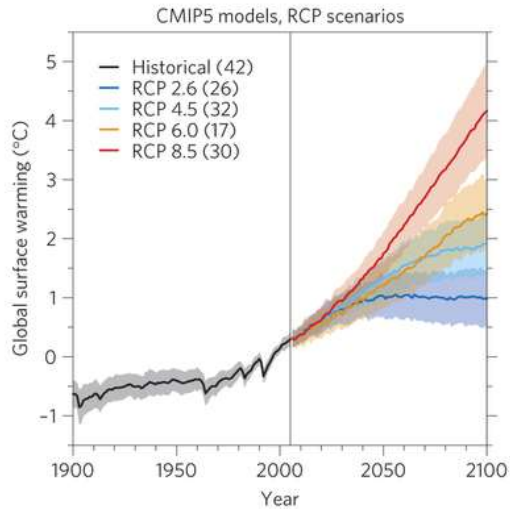
Analysis is based on changes in average summer heat index (a measure of how it actually feels for a given temperature and humidity).



Support the Decision Process

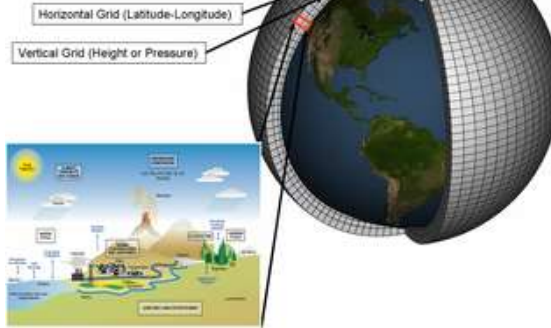
- At what point does the climate science provide useful (actionable) decision information?
- A simple suggestion, what we might call a Shared Vision Exercise
 - Create a simple decision model of your system with your stakeholders
 - Require your stakeholders to make an important management decision with current information
 - Provide simple forecasts of the future
 - Ask if there is a tipping point at which their decision changes. If so,

Emission Scenarios

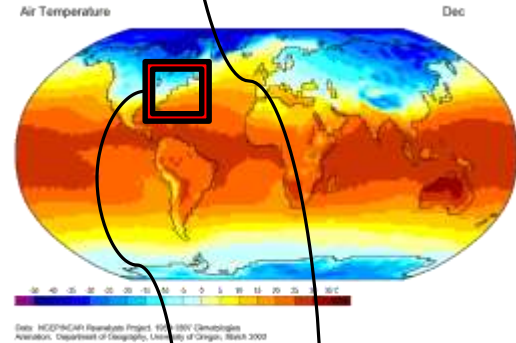
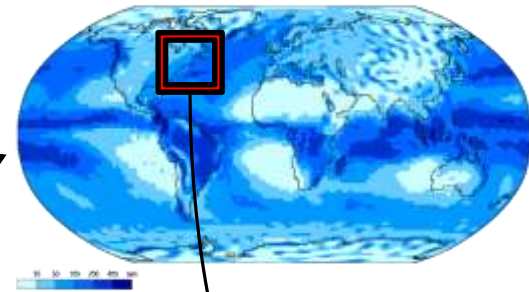


General Circulation Models

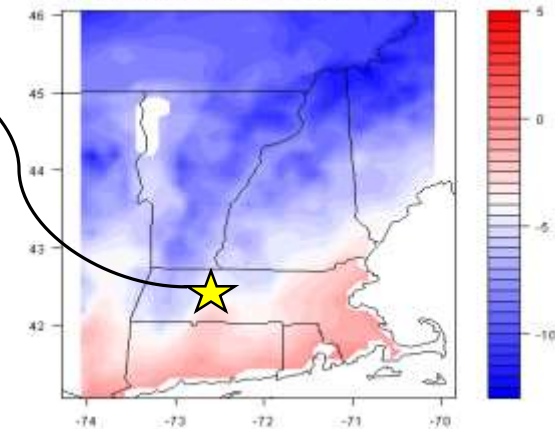
Schematic for Global Atmospheric Model



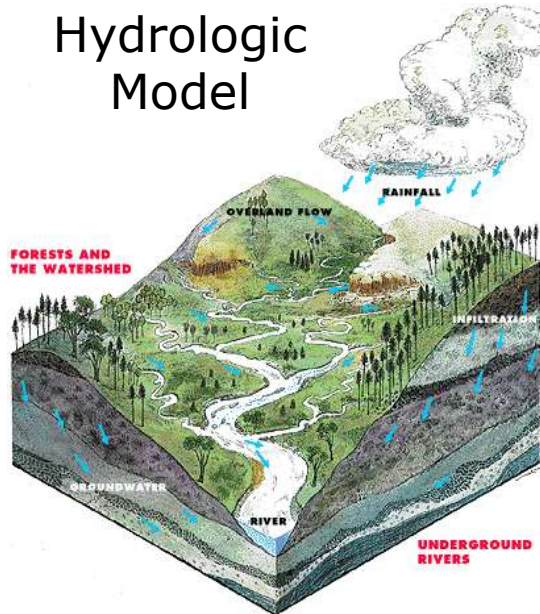
Geography Department, U. Oregon



Bias Correction and Downscaling



Hydrologic Model



Water Resources System Model

EcoSystem Services Under Future Climate Scenarios

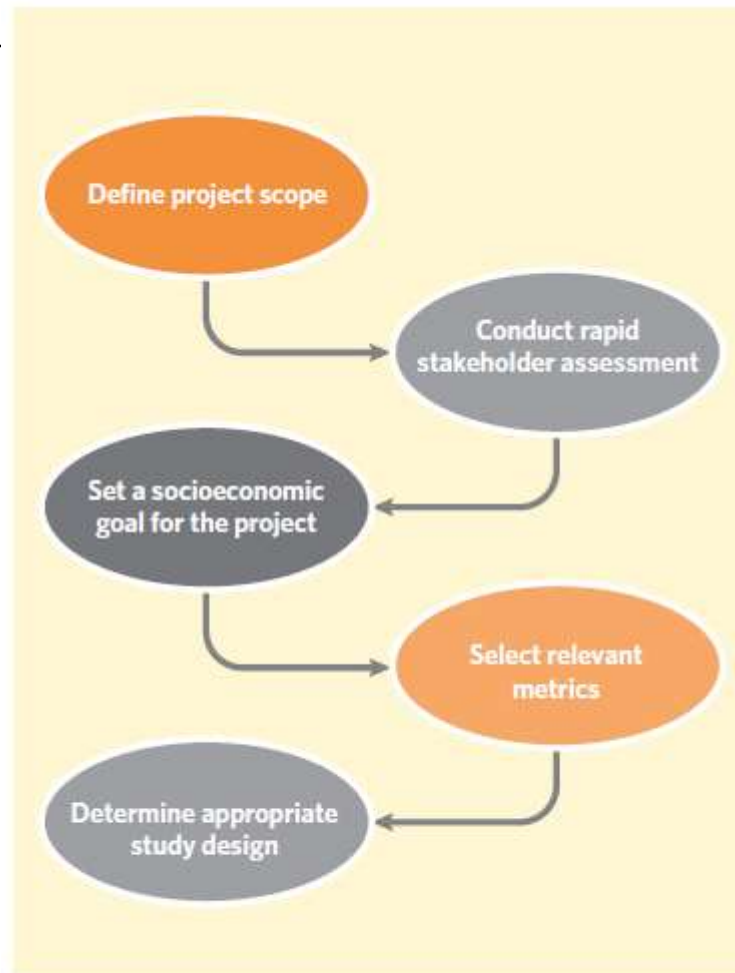


Figure 1. Overview of steps for conducting an ecosystem service valuation study for a coastal restoration project.