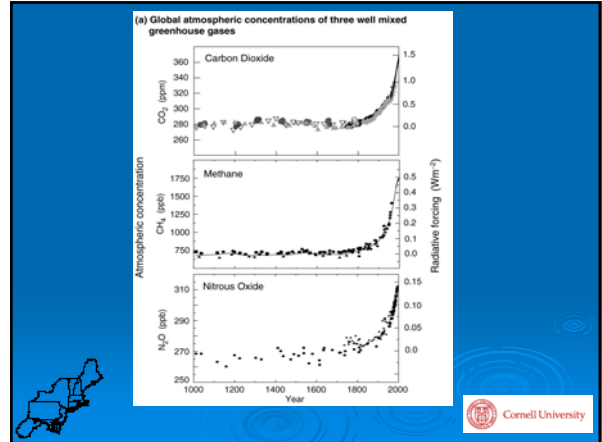


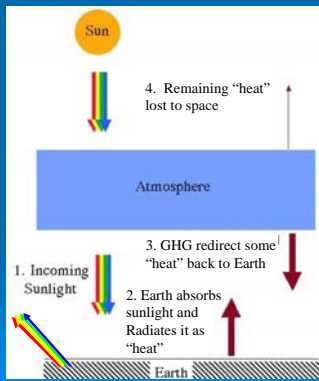
Climate Change and Water in the Northeast

Art DeGaetano
Dept. of Earth & Atmos. Sciences
Cornell University

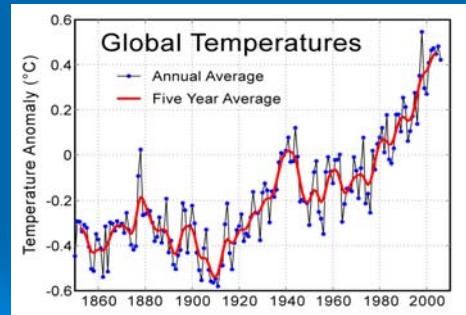
Director, Northeast Regional
Climate Center



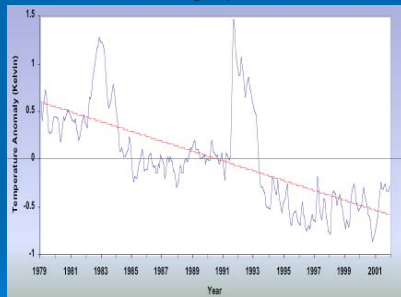
Alone GHG act as a Blanket



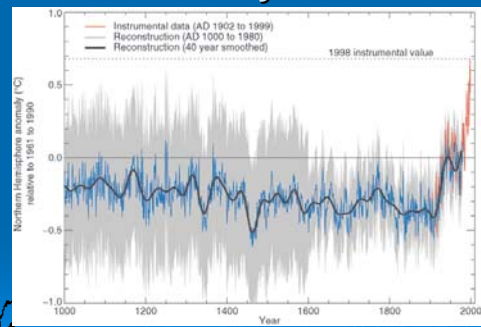
On the Ground

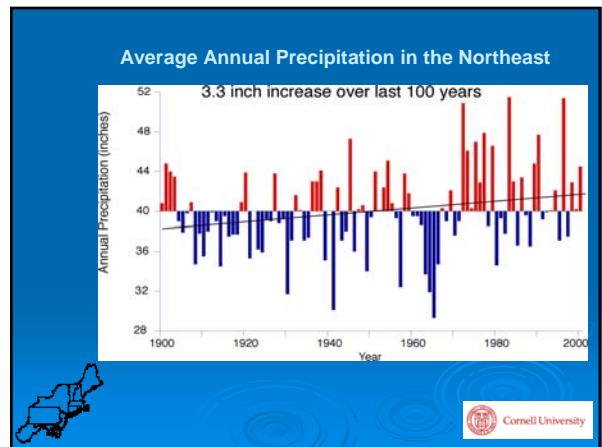
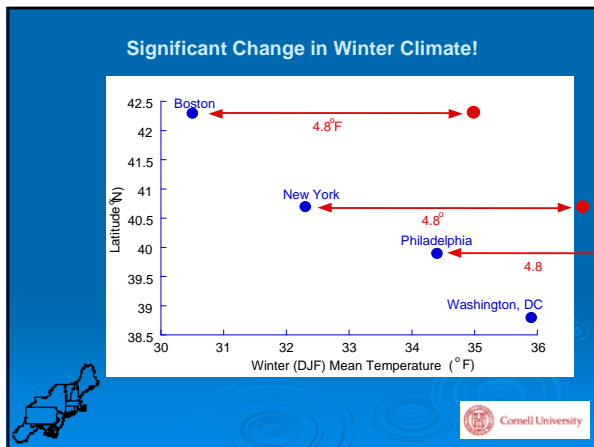
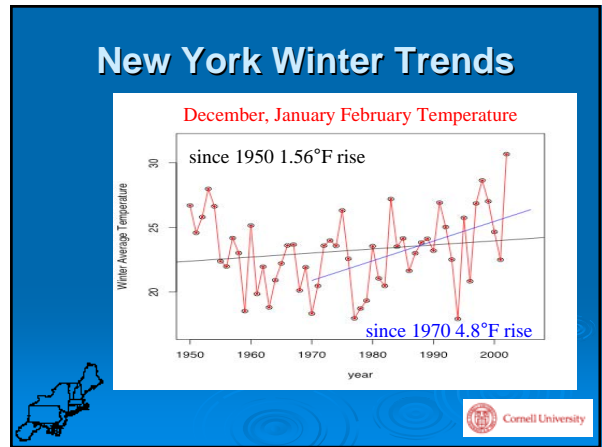
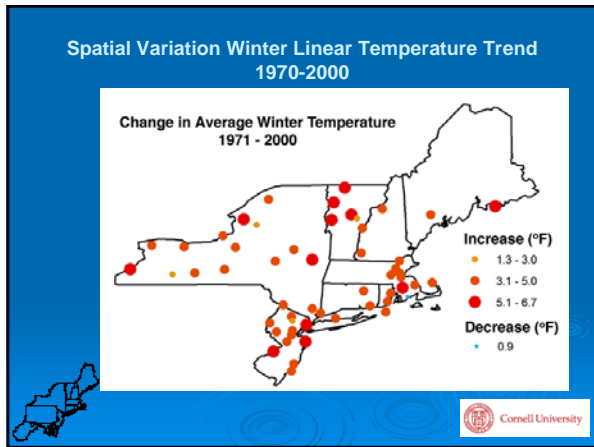
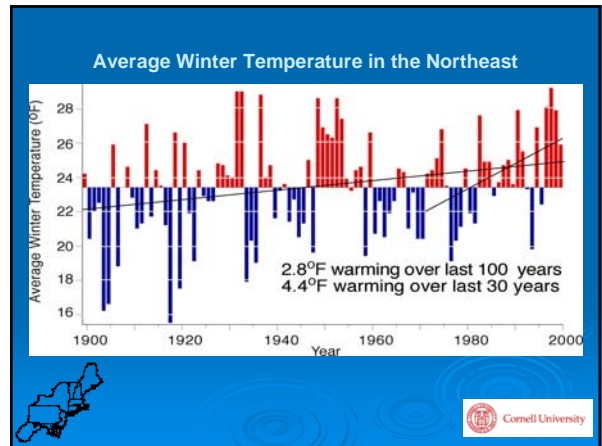
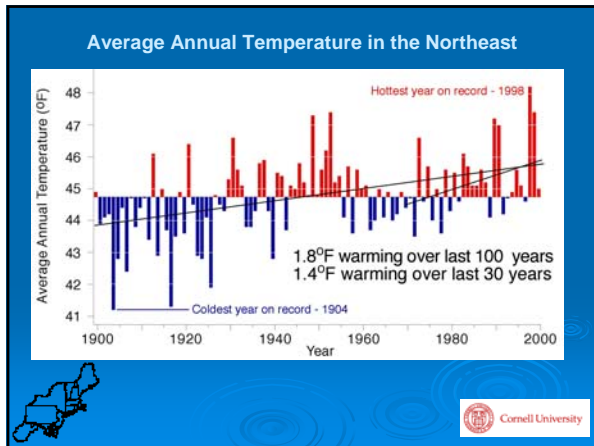


Aloft

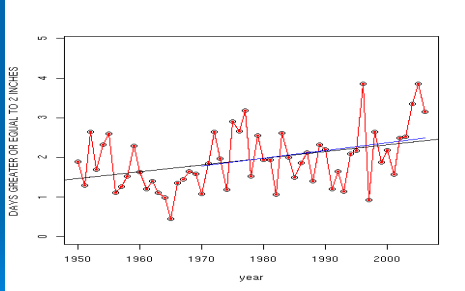


The "Hockey Stick"

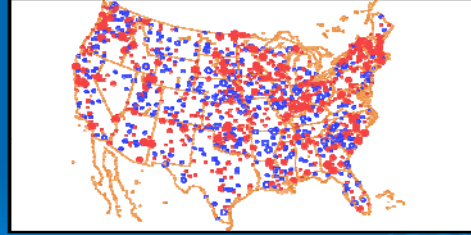




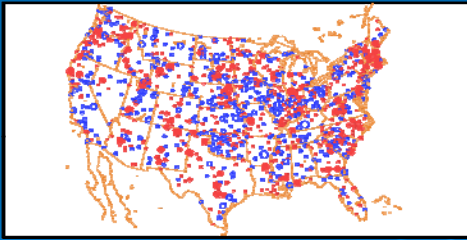
New York Extreme Precipitation Events (>2 inches in 48 hrs)



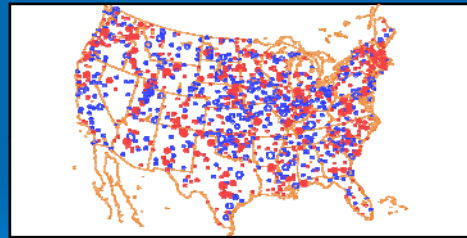
Trend in 2 year Return Period



25 year Return Period



50 year Return Period

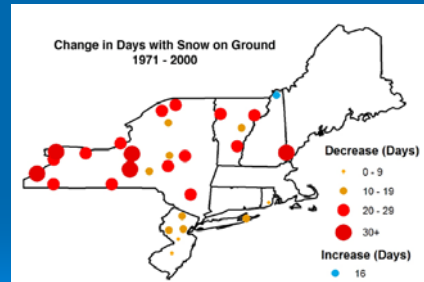


50 year Return Period

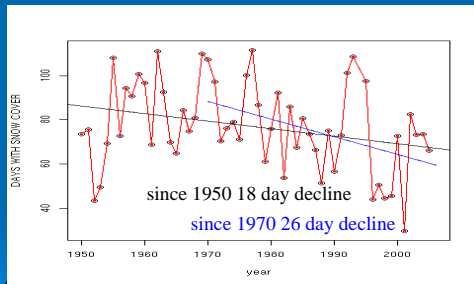
Area	1940 - 1960	1960 - 2007
Albany		
2-yr	2.33	2.40
50-yr	4.48	4.75
100-yr	5.08	5.72
York Haven		
2-yr	2.20	2.89
50-yr	3.93	6.49
100-yr	4.45	8.10



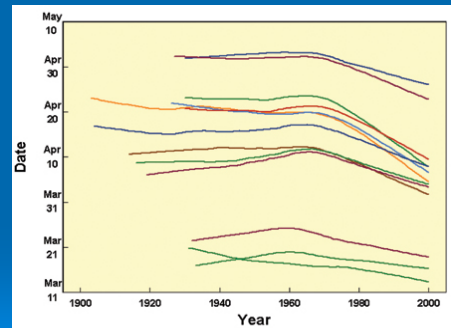
Spatial Variation of Days with Snow on Ground 1970-2000



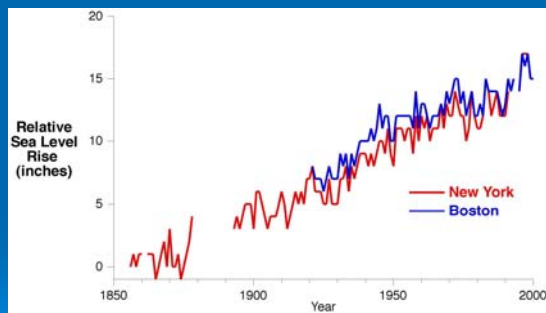
Central Lakes Snow Cover



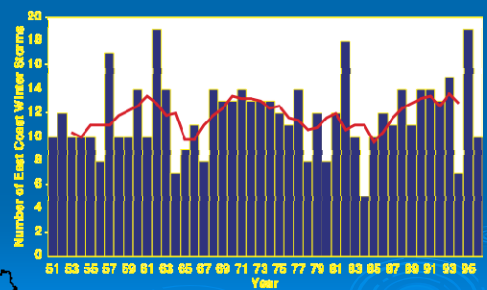
Dates of Center-of-Volume River Flow



Sea Level Rise



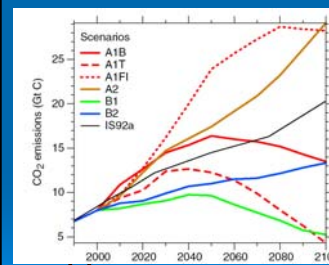
Storms



Looking to the Future

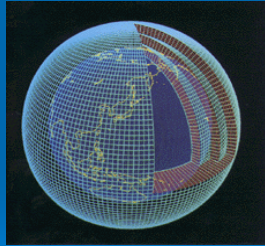
- What will happen to concentrations of climate altering gases such as carbon dioxide?
- What will happen to regional temperature and precipitation?

STEP ONE: Future Emissions from Human Activities



- A1fi (higher)**
continued dependence on fossil fuels with material-intensive economy, ~970ppm by 2100
- B1 (lower)**
shift to alternative energy sources with service & information-focused economy
~550ppm at 2100

STEP TWO: Global Climate Modeling



"Backcast" to compare historical simulations with observed climate.

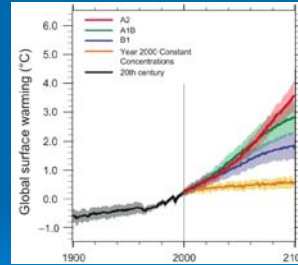
"Forecast" to develop future projections of changes in temperature, precipitation, extreme events, etc.



3 different climate models



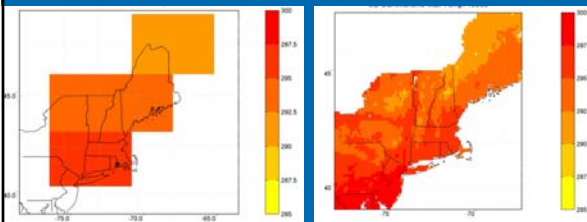
STEP 3: Global Temperature Change



Likely range:
1.1°C to 6.4°C
2°F to 11.5°F



STEP 4: High-resolution regional climate projections

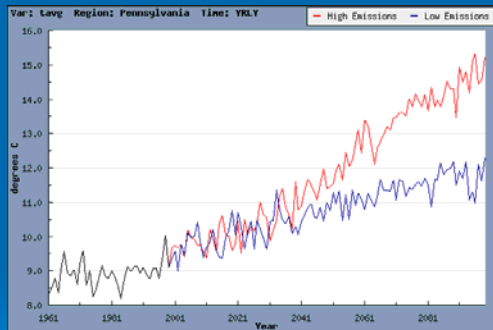
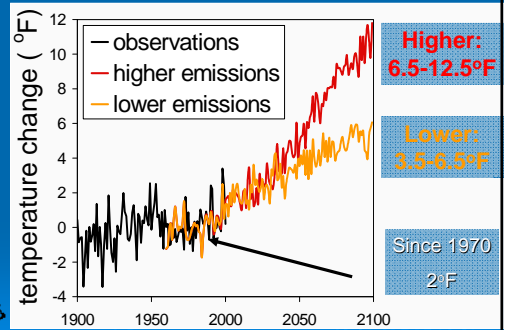


Temp from global climate model

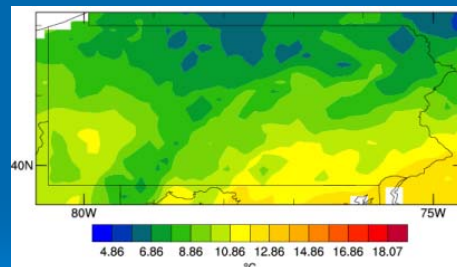
Temperature from downscaling

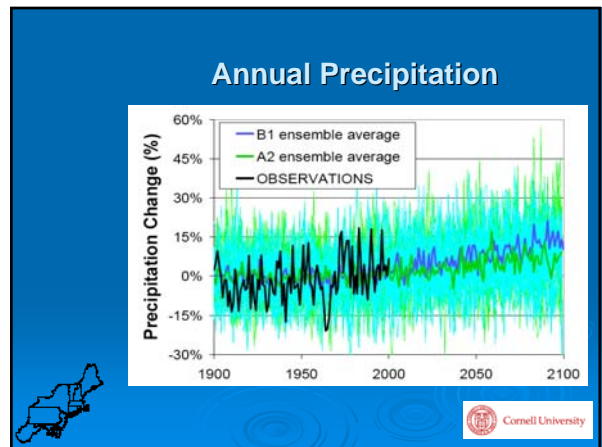
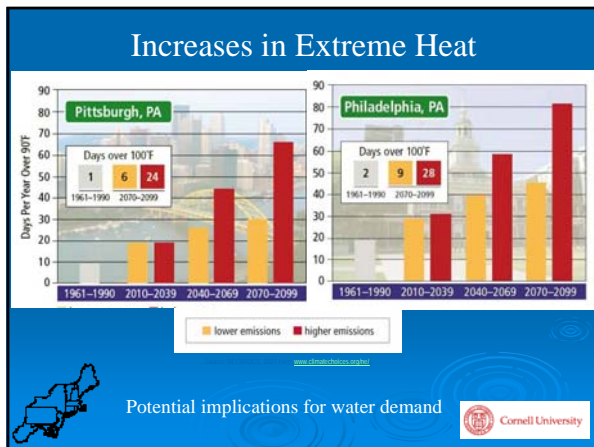
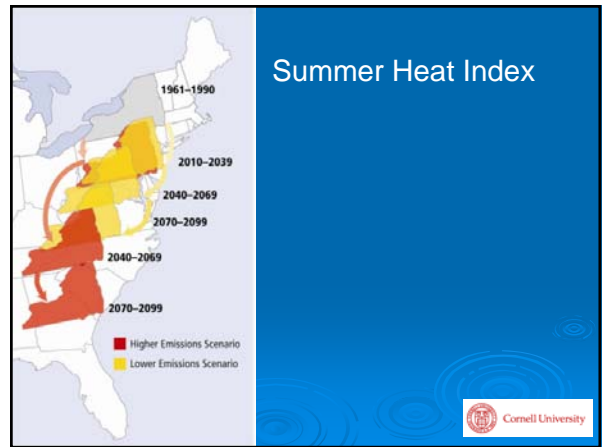
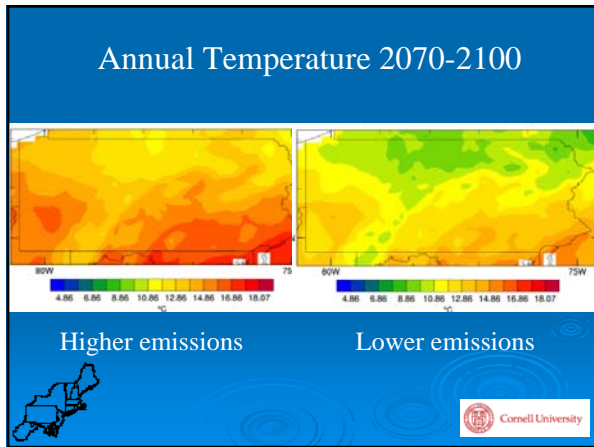
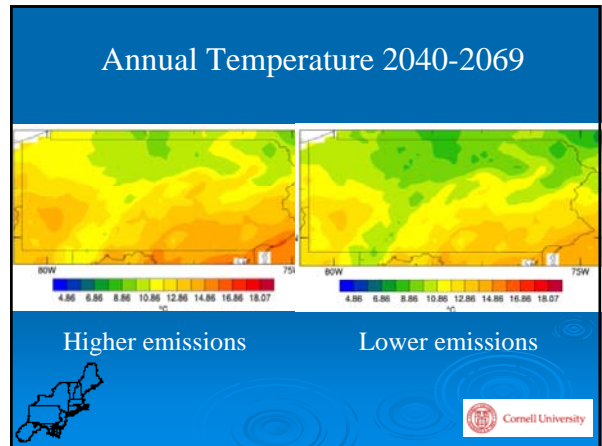
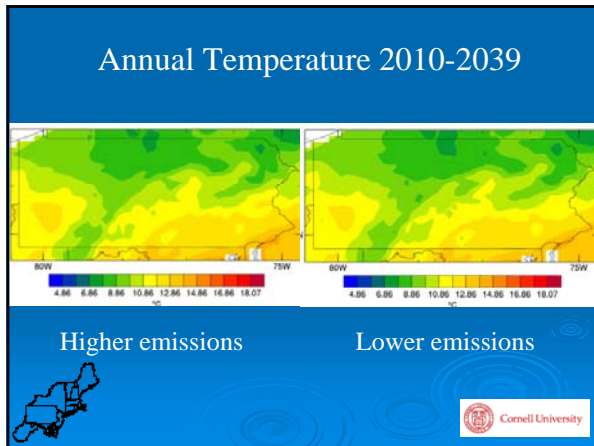


Projecting Future Climate Change for the Northeast: Rising Annual Temperatures



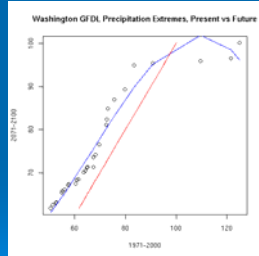
Annual Temperature 1961-1990



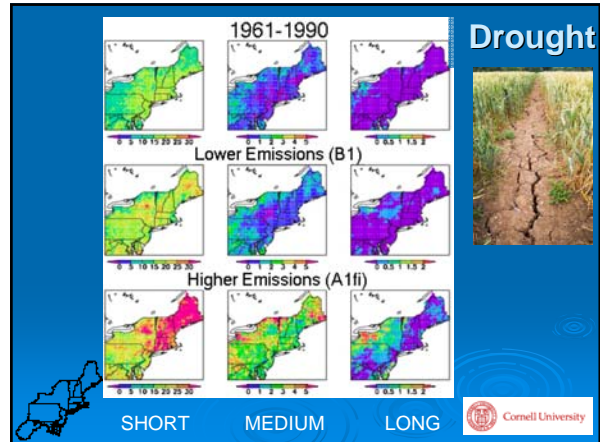


Extreme Precipitation

- Heavy rainfall events are becoming more frequent across the Northeast
- Under both emissions scenarios
 - rainfall expected to become more intense
 - periods of heavy rainfall are expected to become more frequent.

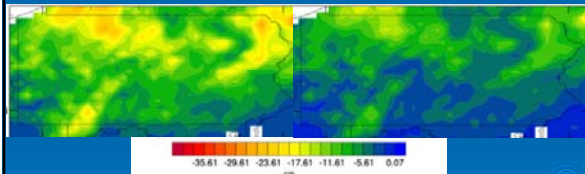


Drought



Decreases in Snow Depth

Change by 2070-2099 relative to 1961-1990

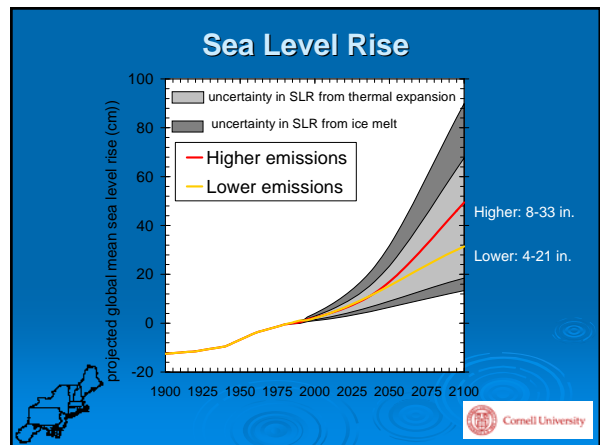


Higher emissions

Lower emissions



Sea Level Rise



Summary of Impacts

- Heavy precipitation events very likely
 - Flood risk
 - Adverse quality of surface/groundwater
 - Contamination of water supplies
- Water supply in snow cover will decline
- Coastal communities stressed by interactions of climate, development and pollution
- Increases in evap, water demand, algal blooms, salt water intrusion



Questions?

