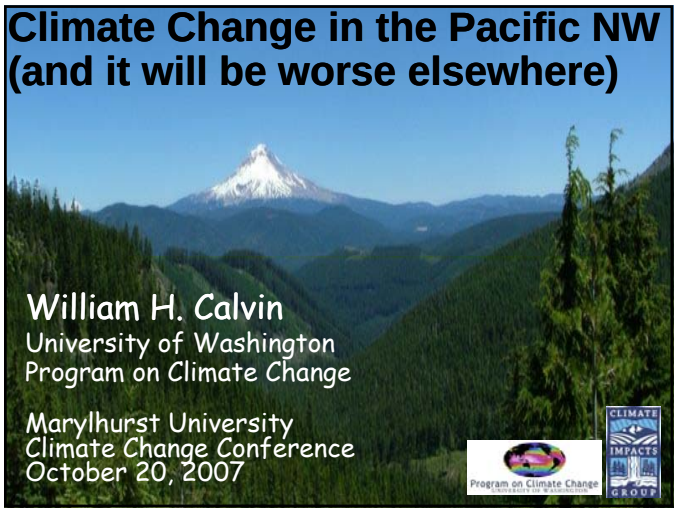
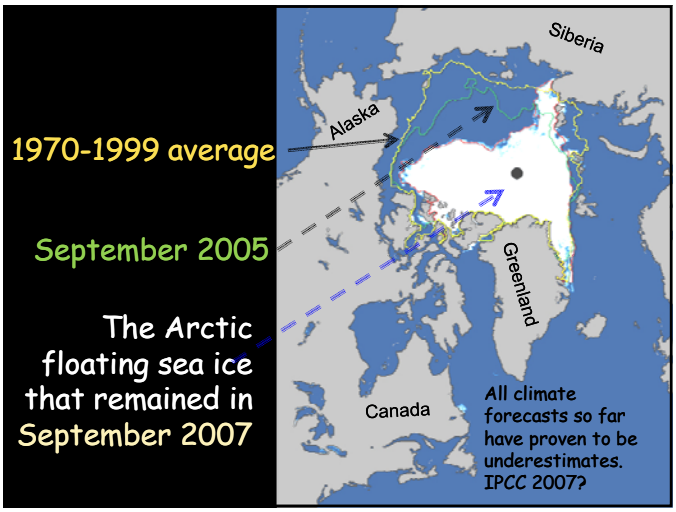
Climate Change in the Pacific NW (and it will be worse elsewhere)



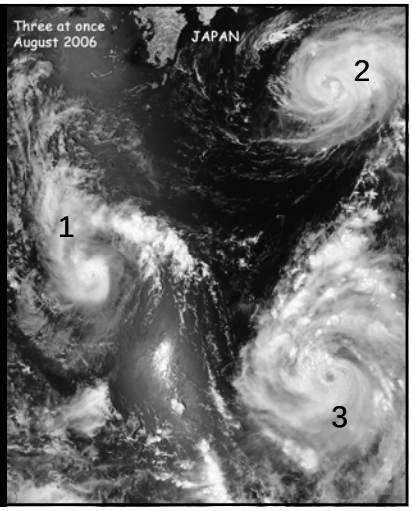
William H. Calvin
University of Washington
Program on Climate Change

Marylhurst University
Climate Change Conference
October 20, 2007



There is already MORE EXTREME WEATHER:

- Droughts and wild fires
- Floods and landslides
- High winds
- Heat waves

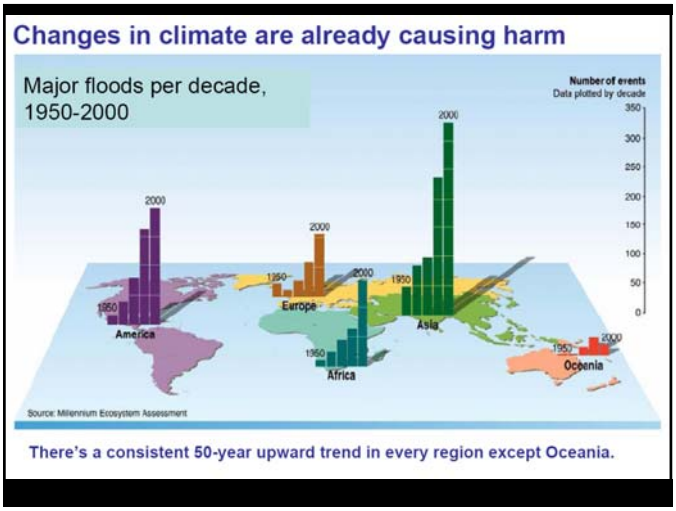


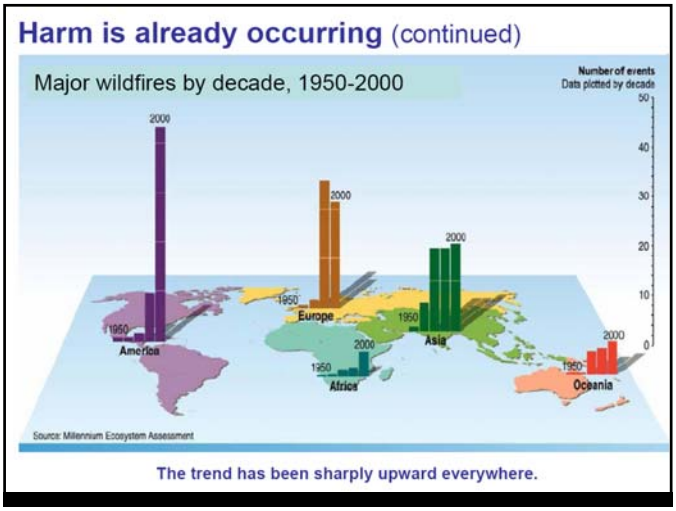
The first hurricane in the South Atlantic Ocean, off Brazil, occurred in 2004 (note clockwise rotation)

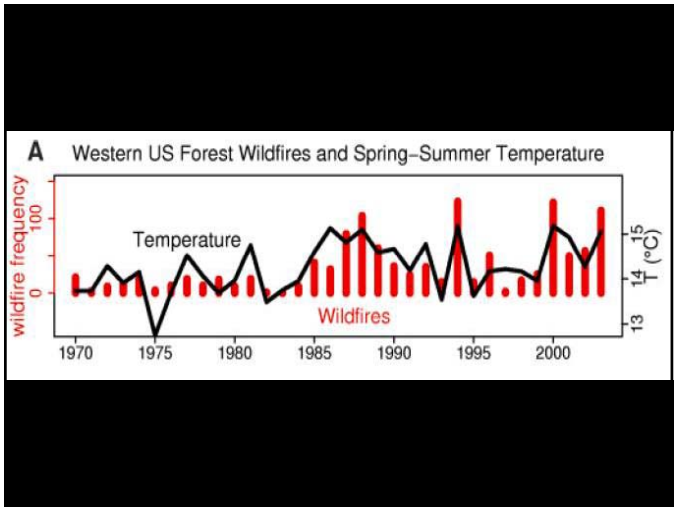
http://upload.wikimedia.org/wikipedia/commons/8/89/Cyclone_Catarina_from_the_ISS_on_March_26_2004.JPG

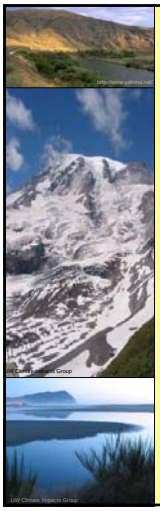
NONLINEAR:

As the wind speed increases 20%, from 50 mph to 60 mph, the damage goes up not 20% but 500%.









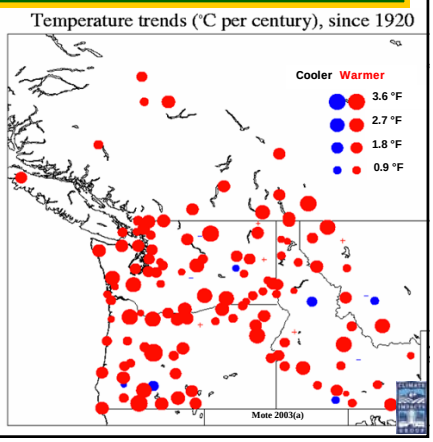
Have we seen changes in PNW 20th century climate?

CLIMATE IMPACTS GROUP

PNW Temperature Trends by Station

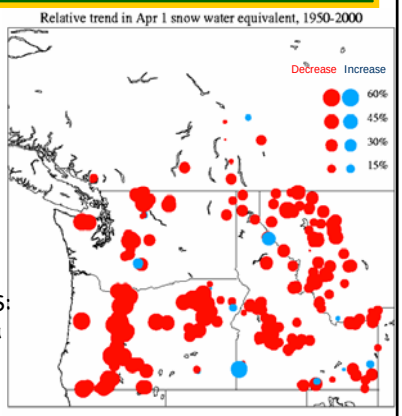
Average annual temperature increased +1.5°F in the PNW during the 20th century

- Almost every station shows warming
- Extreme cold conditions have become rarer
- Low temperatures rose faster than high temperatures



Trends in Snow Water Equivalent

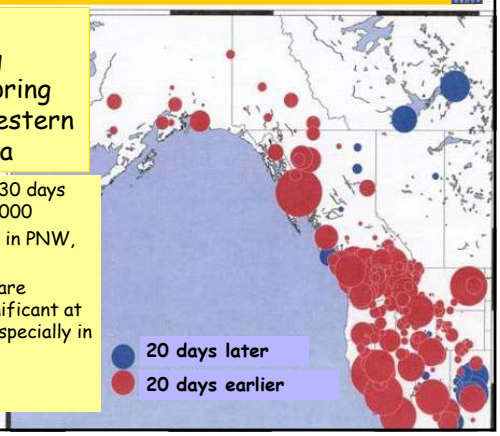
- Most PNW stations show a decline in snow water equivalent
- Numerous sites in Cascades with 30 to 60% declines
- Similar trends seen throughout western US: 73% of stations show a decline in April 1 SWE



Trends in Timing of Spring Runoff

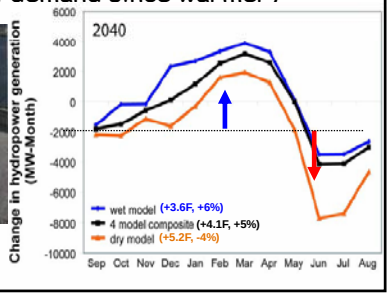
Peak in spring runoff moving earlier into spring throughout western US and Canada

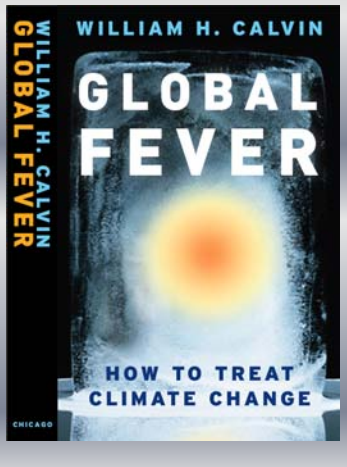
- Advances of 10-30 days between 1948-2000
- Greatest trends in PNW, Canada, and AK
- >30% of trends are statistically significant at the 90% level, especially in the PNW



Impacts on PNW Hydropower

- Increased **winter** generation due to higher stream flows (but lower demand since warmer)
- Reduced **summer** generation due to lower stream flows (but increased demand since warmer)

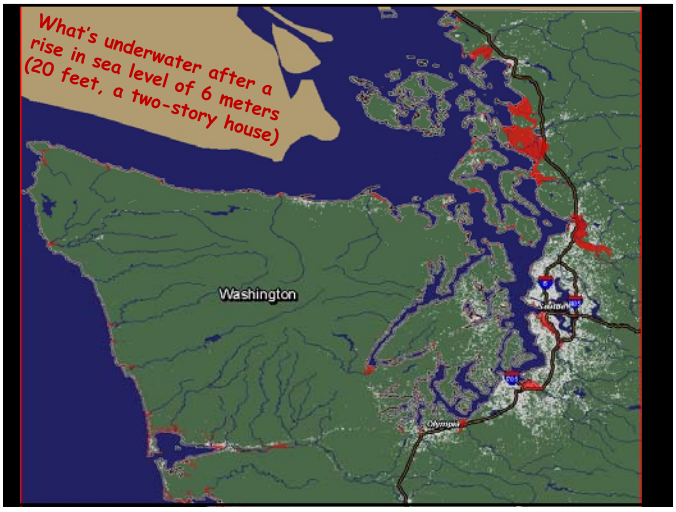


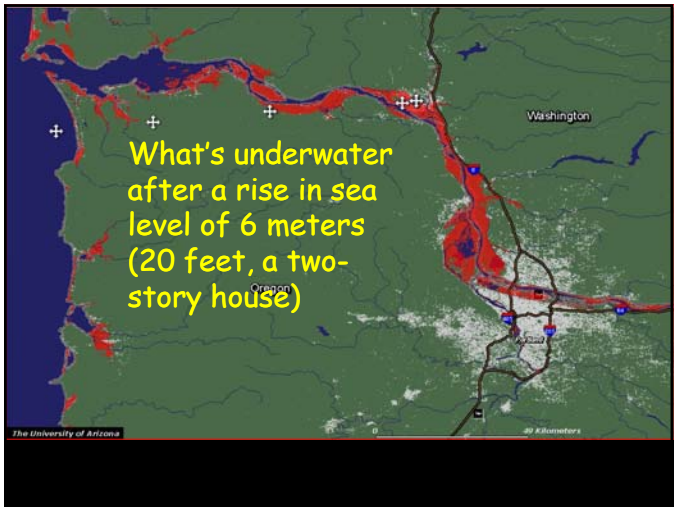


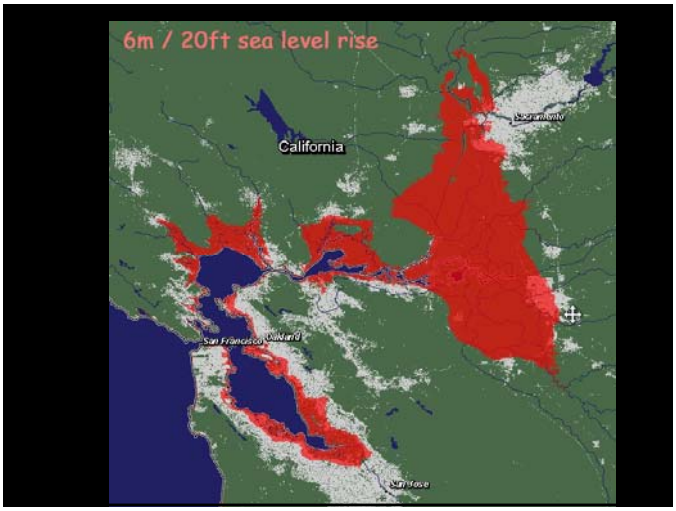
Out in Spring 2008

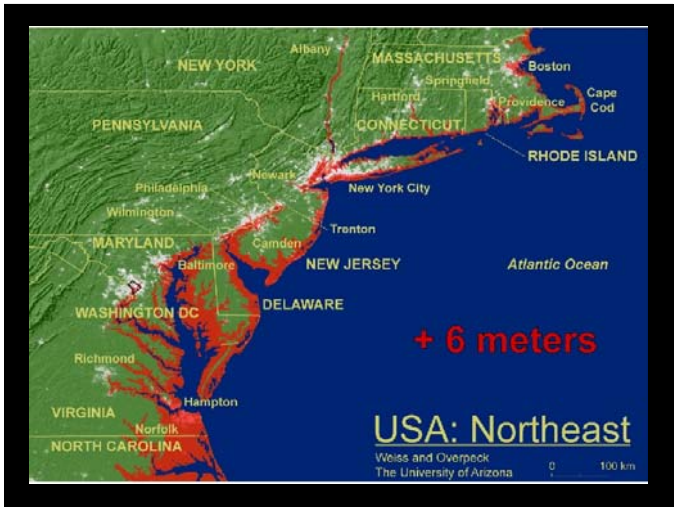
Can read PDF chapter files at

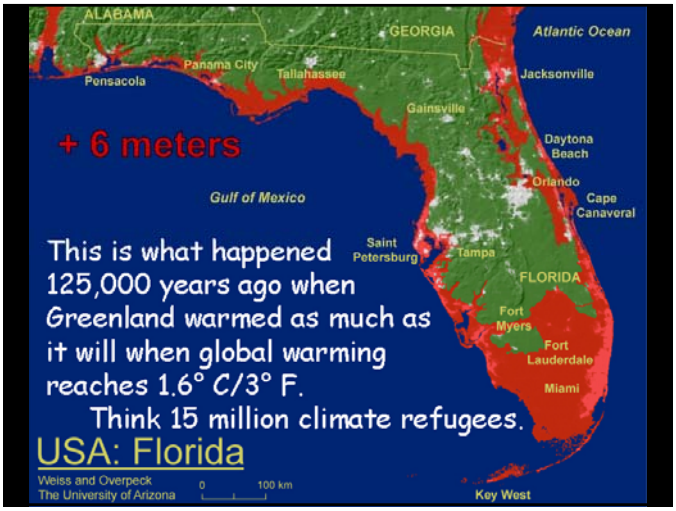
Global-Fever.org



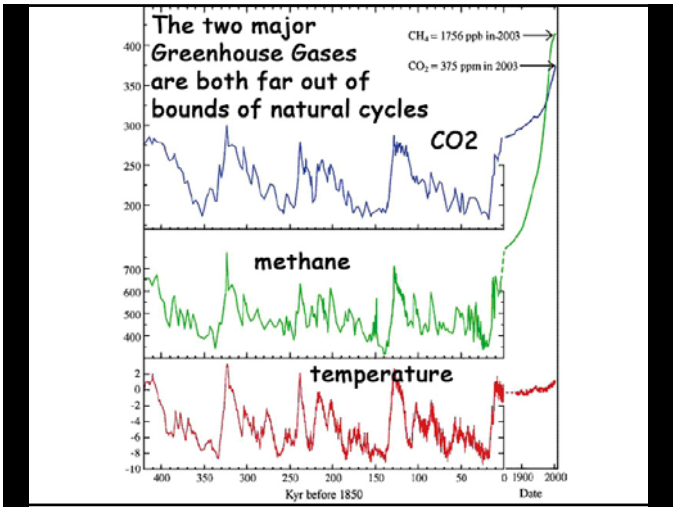

What's underwater after a rise in sea level of 6 meters (20 feet, a two-story house)
Washington
Oregon
The University of Arizona

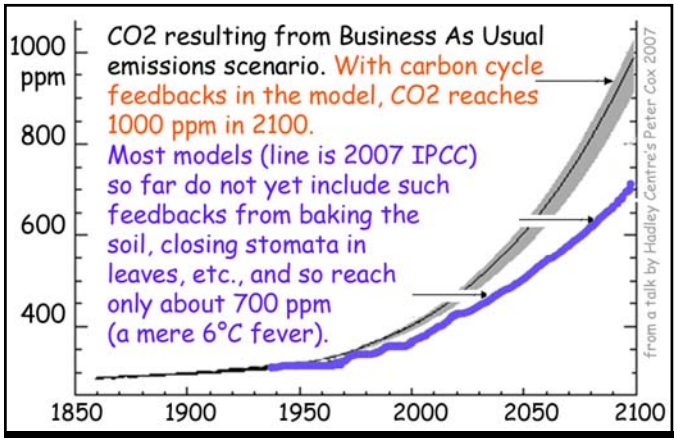

6m / 20ft sea level rise
California


NEW YORK
Albany
MASSACHUSETTS
Boston
Springfield
Hartford
Providence
Cape Cod
PENNSYLVANIA
CONNECTICUT
RHODE ISLAND
Philadelphia
Newark
New York City
Wilmington
Trenton
MARYLAND
Camden
Baltimore
NEW JERSEY
Atlantic Ocean
WASHINGTON DC
DELAWARE
+ 6 meters
Richmond
Hampton
VIRGINIA
Norfolk
NORTH CAROLINA
USA: Northeast
Weiss and Overpeck
The University of Arizona
0
100 km

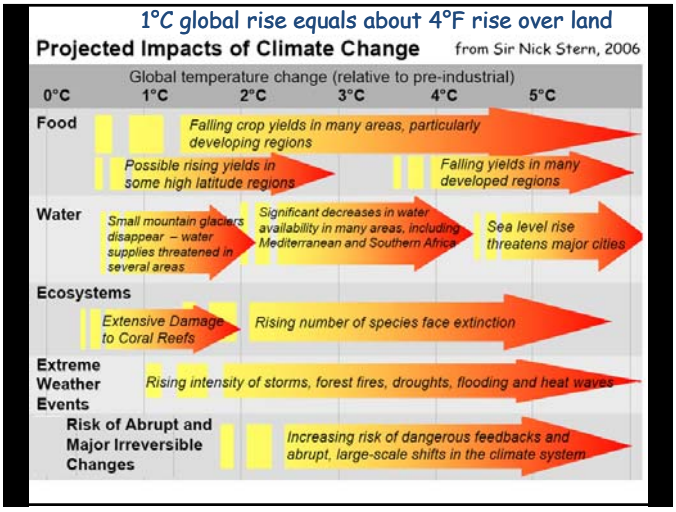

ALABAMA
GEORGIA
Atlantic Ocean
Pensacola
Panama City
Tallahassee
Jacksonville
Gainsville
+ 6 meters
Daytona Beach
Orlando
Gulf of Mexico
Cape Canaveral
This is what happened 125,000 years ago when Greenland warmed as much as it will when global warming reaches 1.6° C/3° F.
Think 15 million climate refugees.
Saint Petersburg
Tampa
FLORIDA
Fort Myers
Fort Lauderdale
Miami
USA: Florida
Weiss and Overpeck
The University of Arizona
0
100 km
Key West

The RED areas show the land covered by a 6m/20ft rise in sea level, what is expected from the 3°C/5°F temperature rise this century.

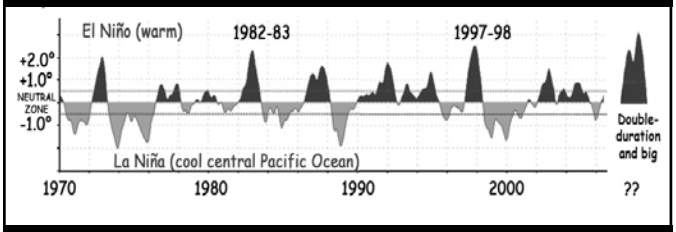




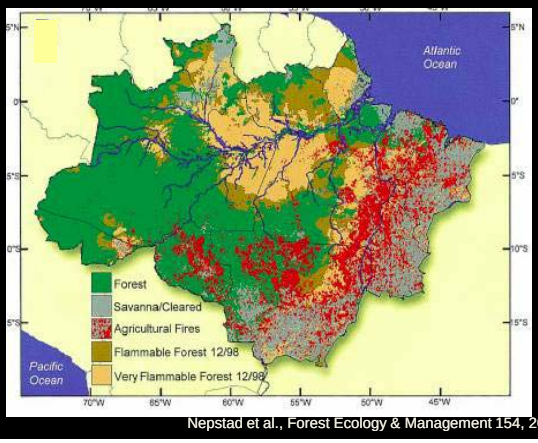
CO2 and Temperature rises are likely to be worse than you've heard so far.



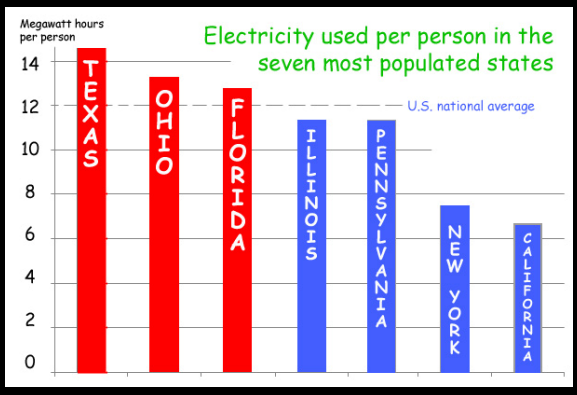
How to rearrange atmospheric circulation in only a few months
All it takes is a big El Niño

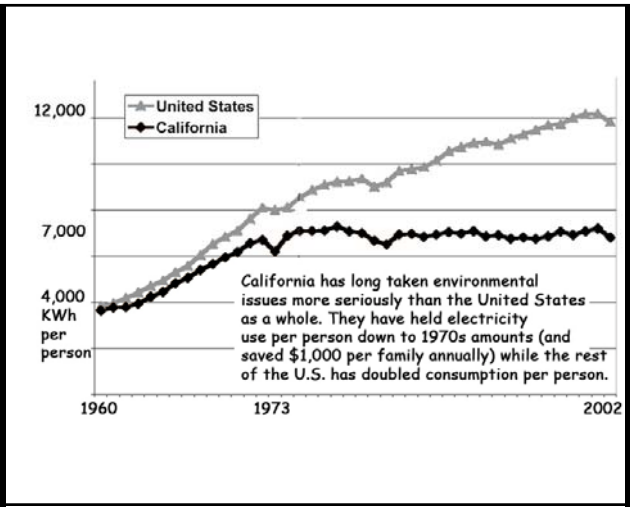


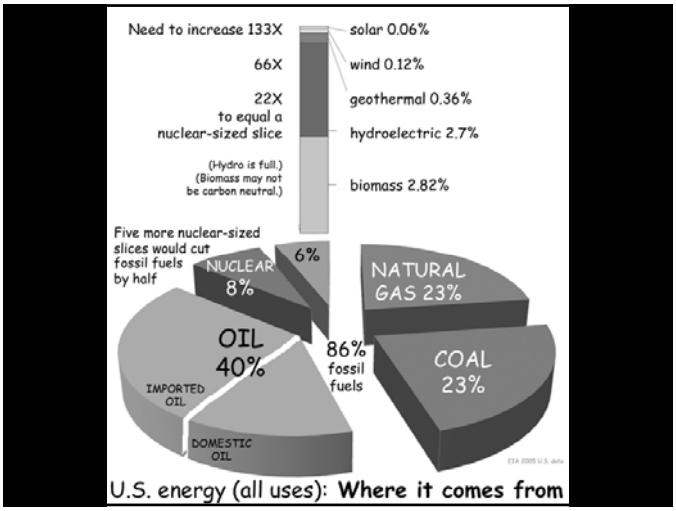
The Amazon is drying & burning under the influence of deforestation & climate-change-induced drought



Nepstad et al., Forest Ecology & Management 154, 2001



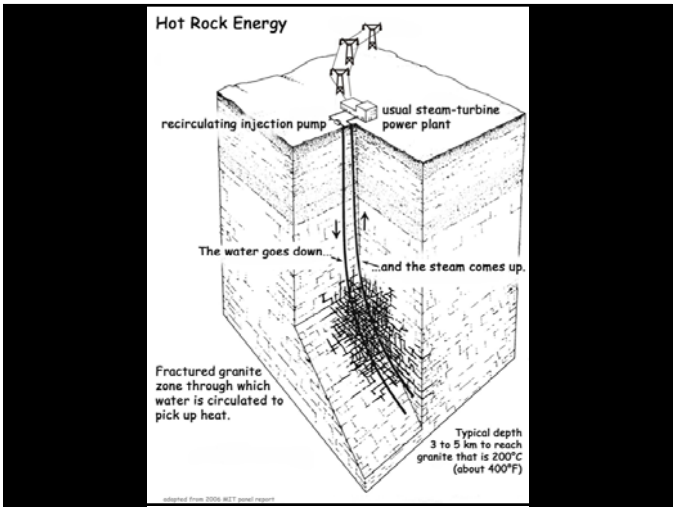


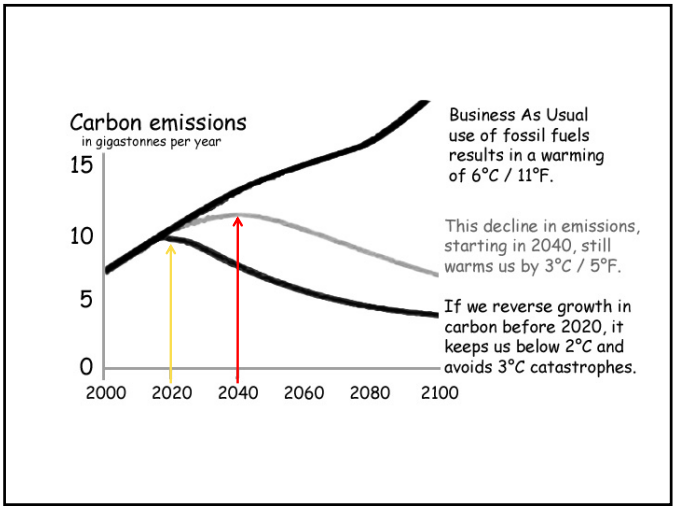


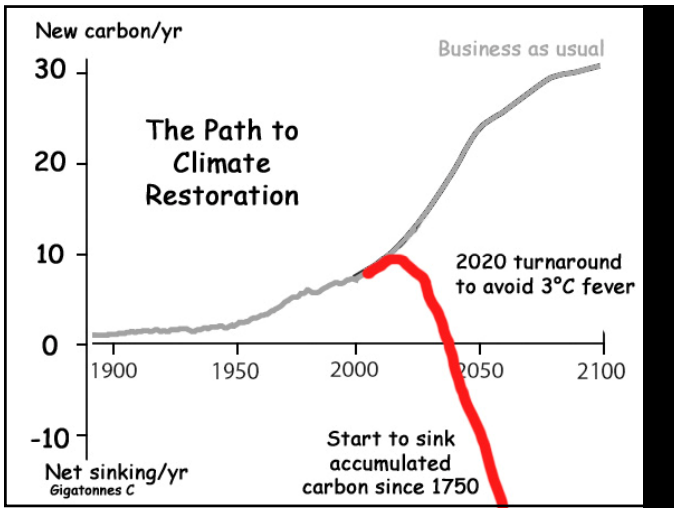
Three technologies, in combination, could solve the 2020 part of the problem.

1. Plug-in hybrid vehicles so daily commute was entirely from the electrical grid. Retire most supertankers.
2. Start building enough nuclear or geothermal power plants to retire most coal trains.
3. Subsidize DC power transmission lines to countries apt to modernize using their own coal or oil.

DO THIS WORLDWIDE, and emissions growth will stop by 2020 and limit Earth's fever to 2°C. (= 4°C in the interior = 8°F)







The public interest requires doing today those things that men of intelligence and goodwill would wish, five or ten years hence, had been done.

– Edmund Burke

The End

My books and talks may be found at:

WilliamCalvin.com

Edvard Munch, *The Scream*