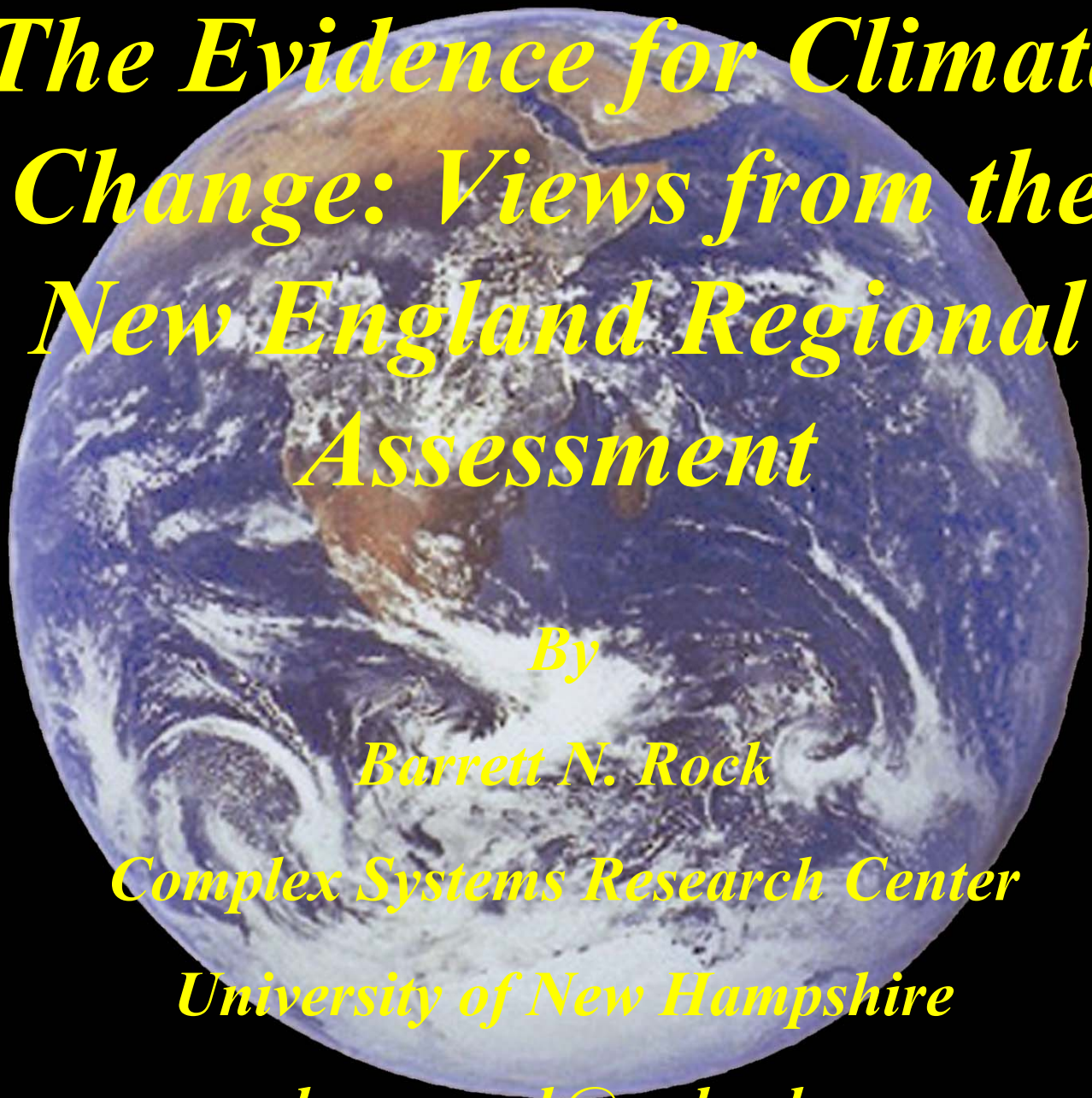
The Evidence for Climate Change: Views from the New England Regional Assessment



By

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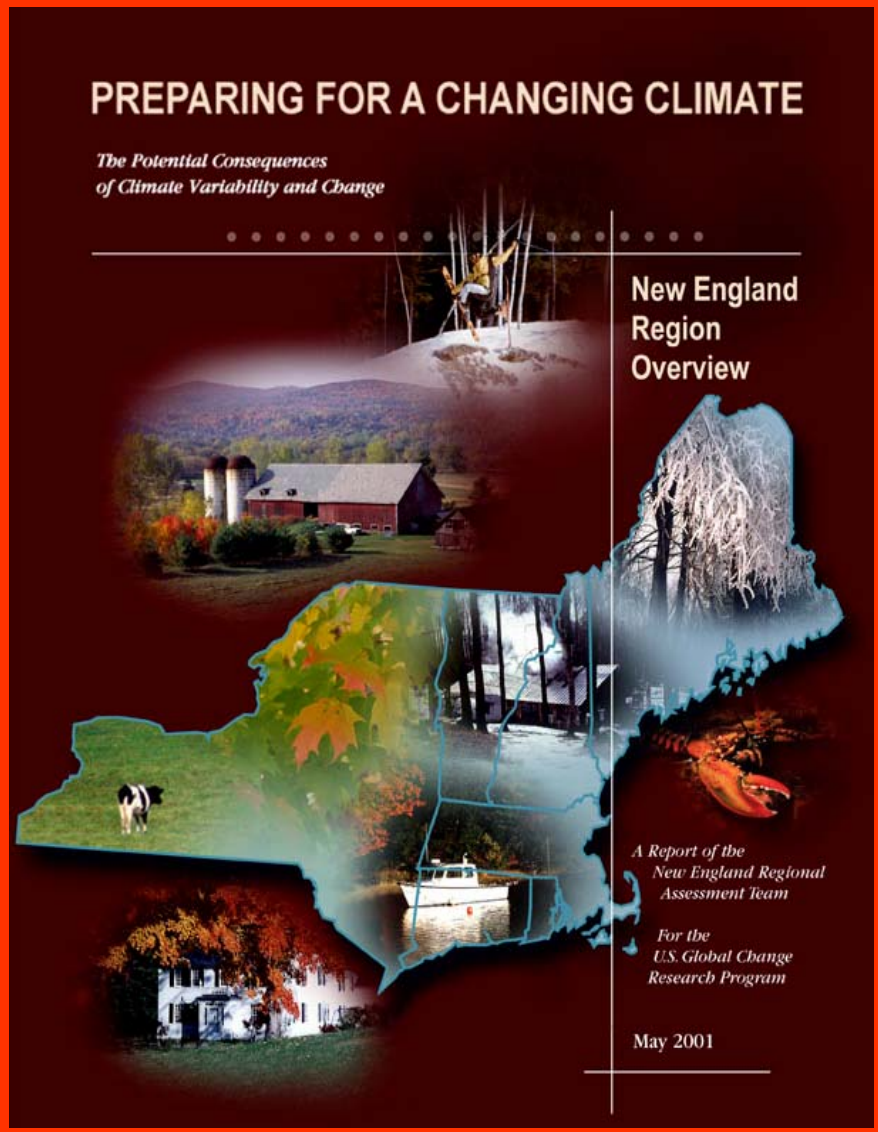
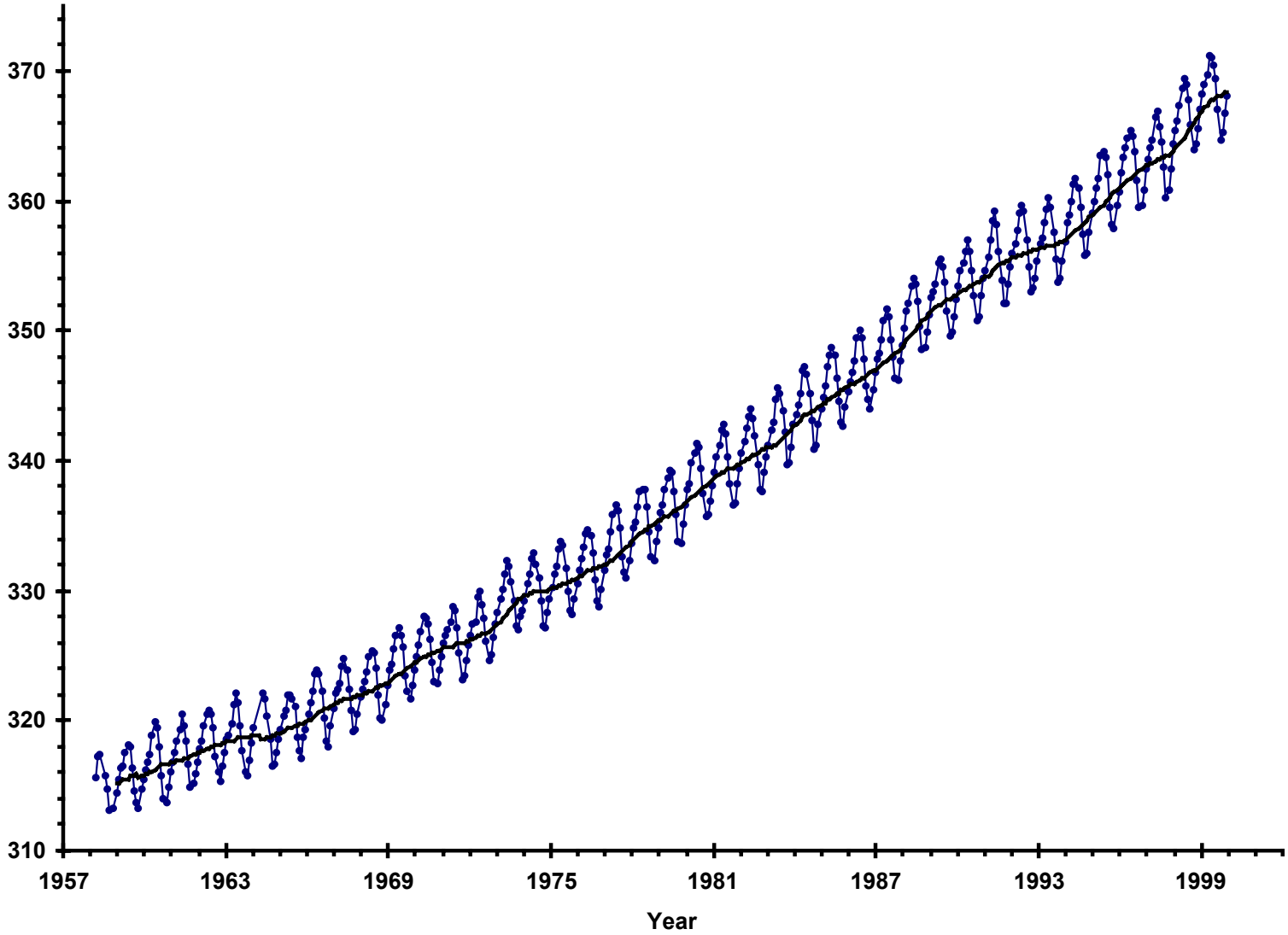
The New England Regional Assessment



Available On-Line at: http://www.necci.sr.unh.edu/

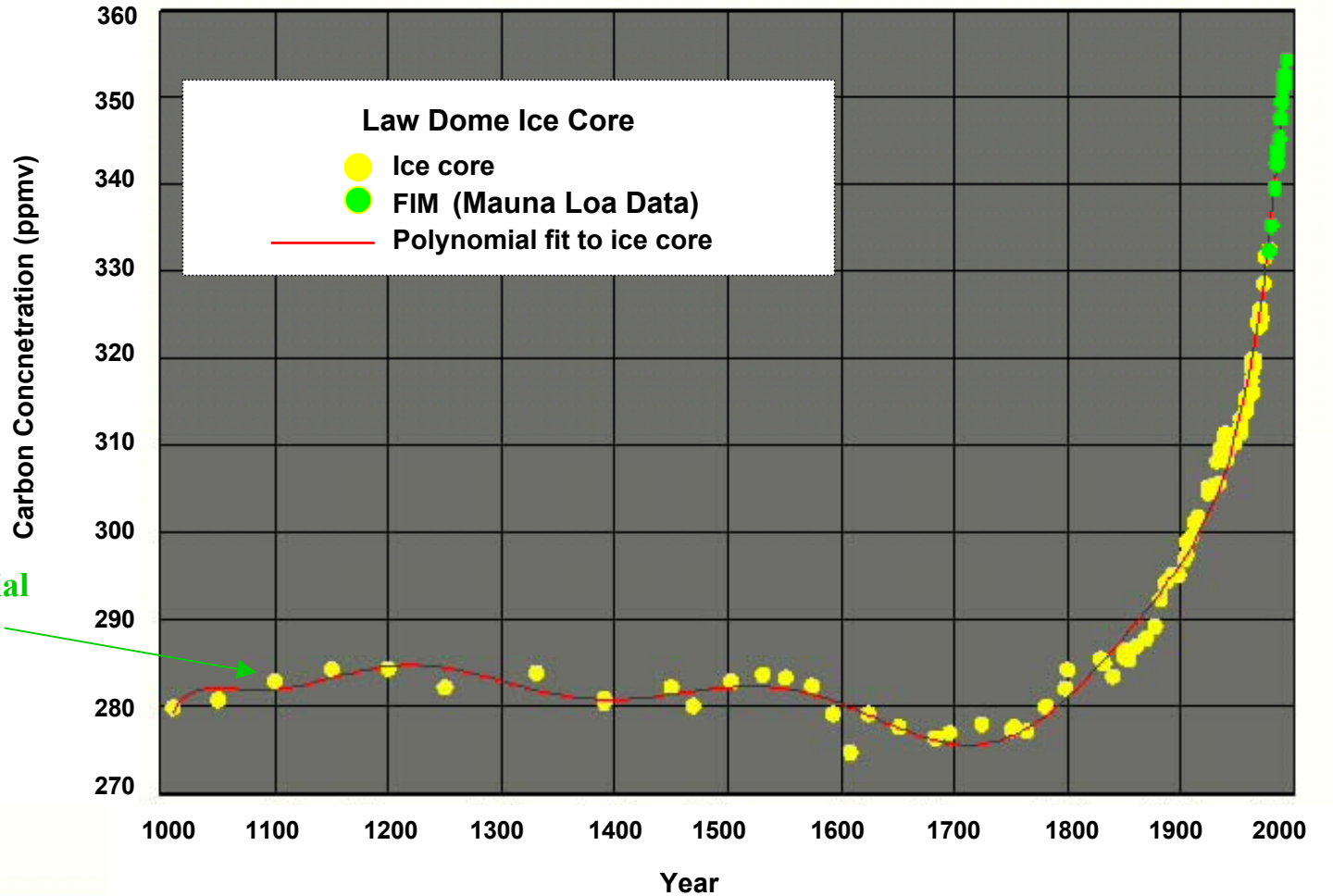
Mauna Loa Monthly Carbon Dioxide Record:

Keeling Record 1958 - 1999



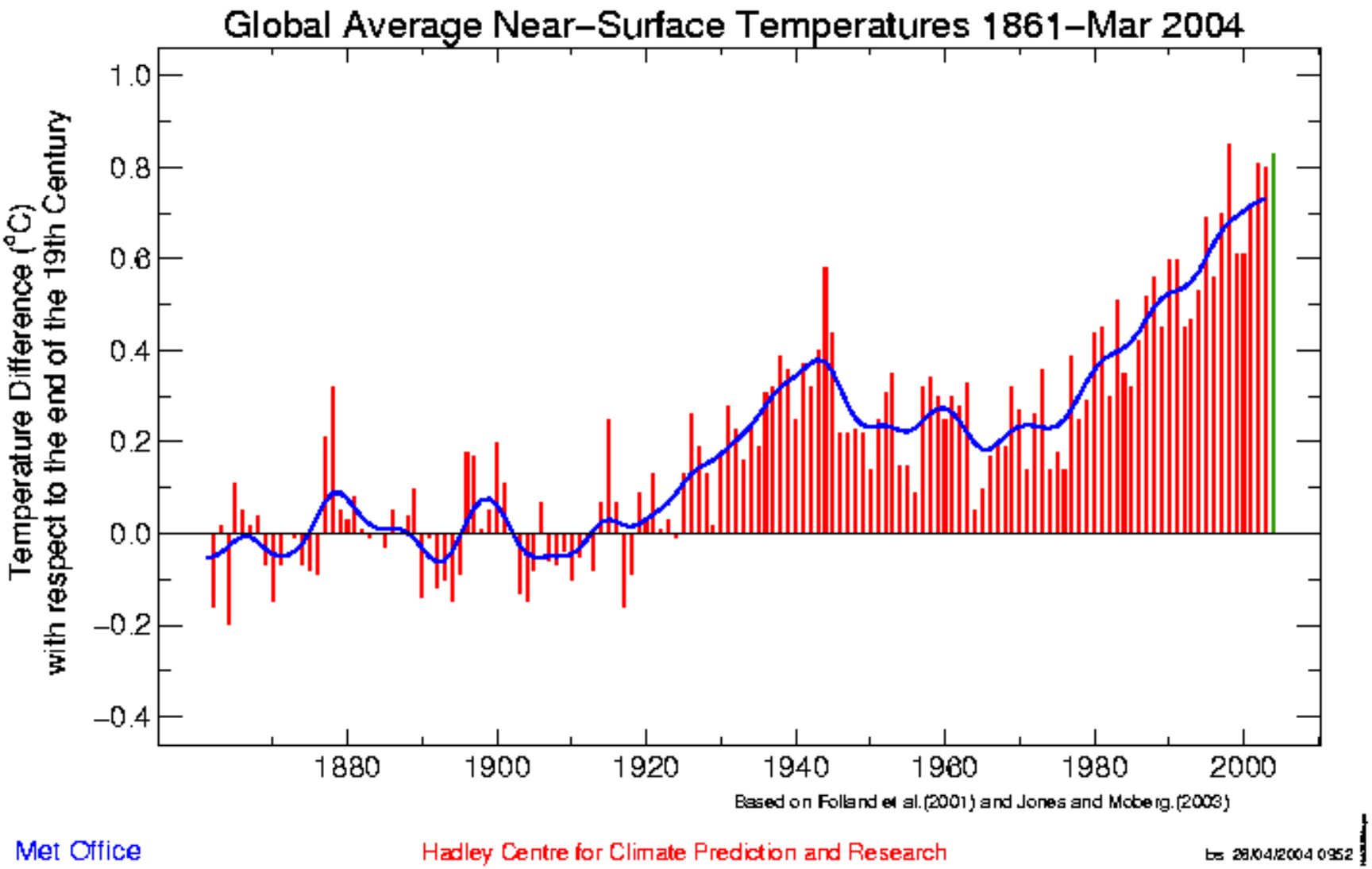
Source: C.D. Keeling and T.P. Whorf

Historical Atmospheric Carbon Concentration for the Last 1000 Years Extracted from the Law Dome Ice Core



Pre-Industrial Level

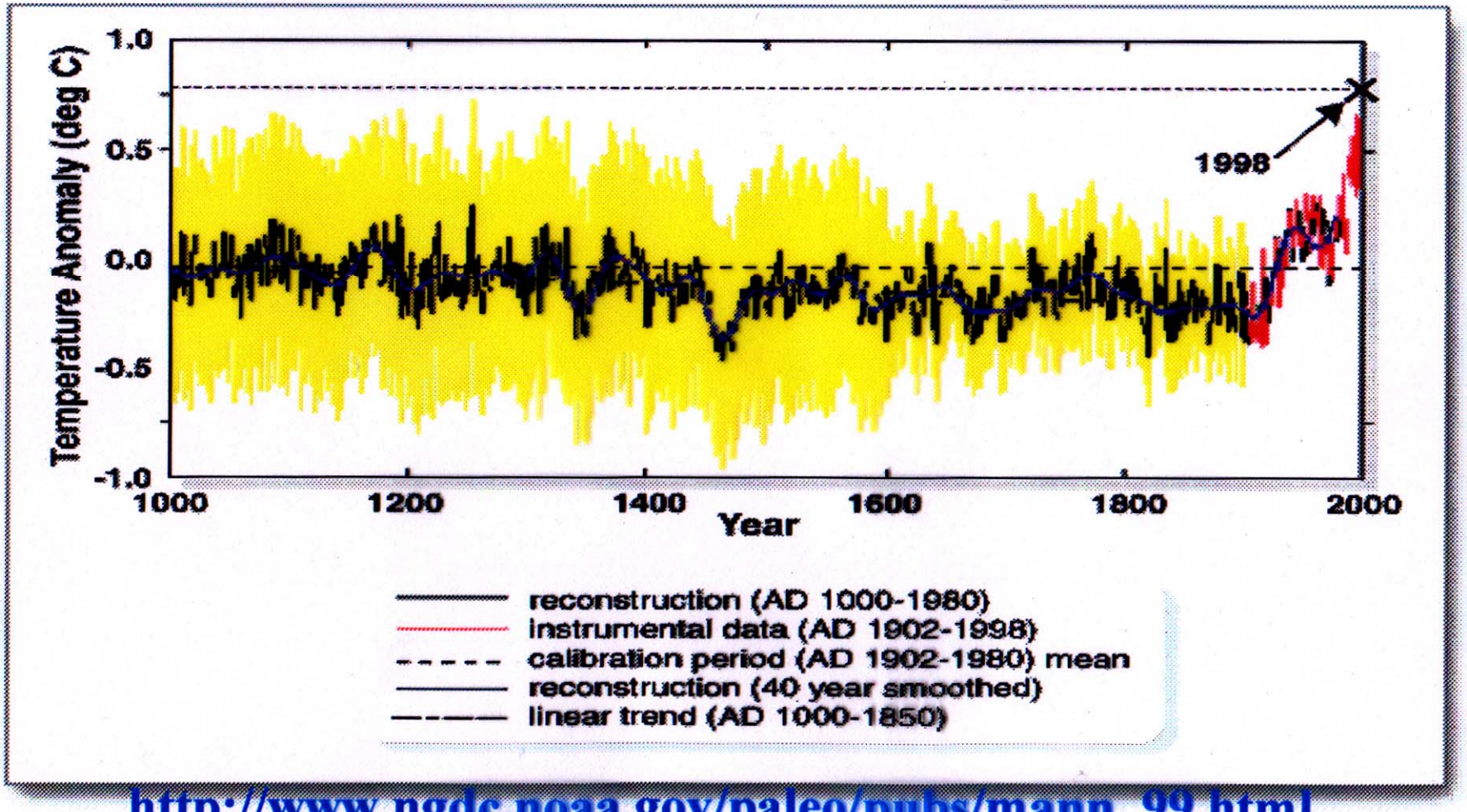
Source: Etheridge, *et.al.*, Petit, *et.al.*



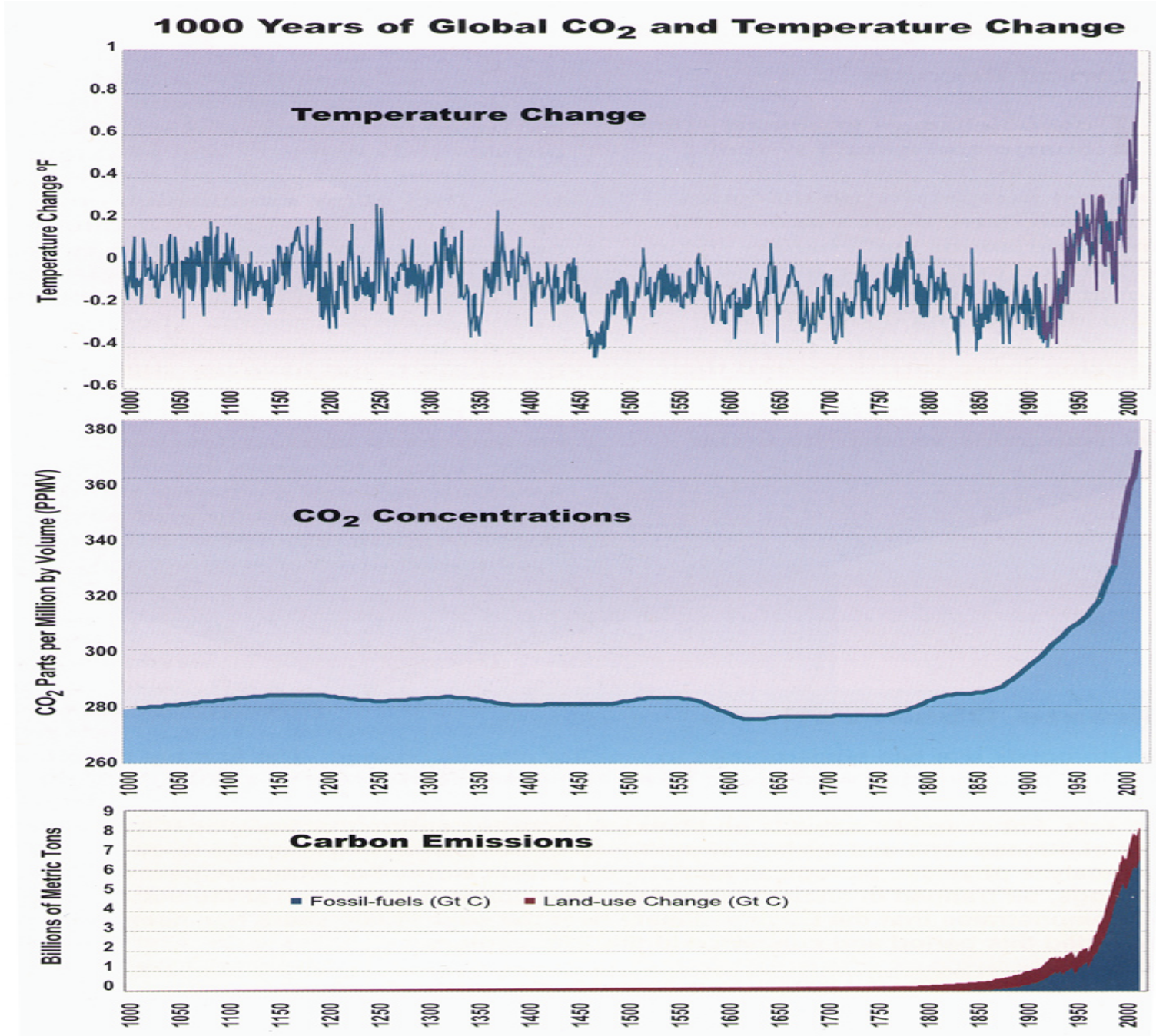
Baseline represents average temperatures for 1861-1899; 2004 only includes Jan. 1- Mar. 31.

Global Temperature Changes in the last 1000 years

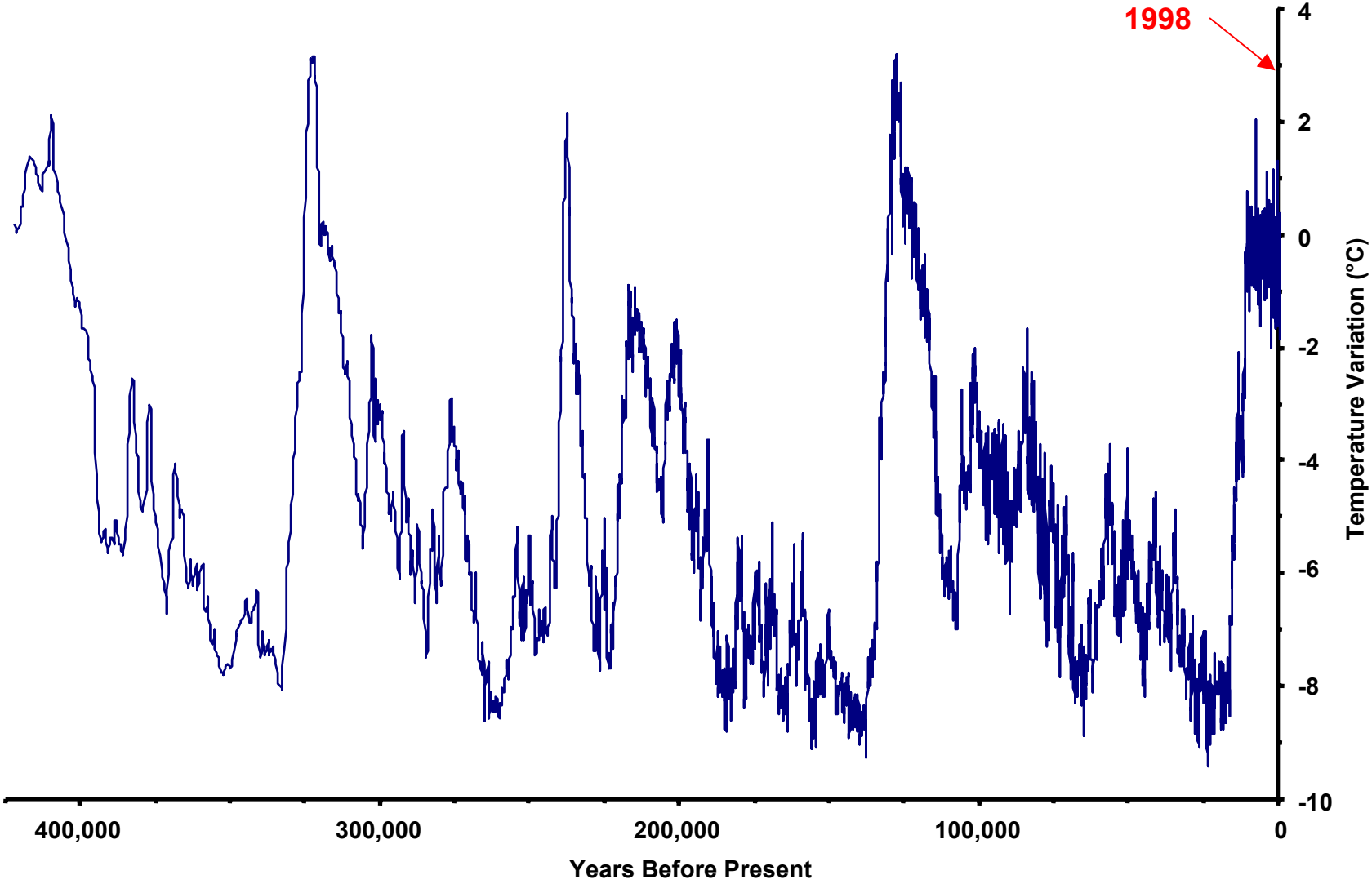
"The warming of the Earth in this century is without precedent in at least 1,200 years"



http://www.ngdc.noaa.gov/paleo/pubs/mann_99.html

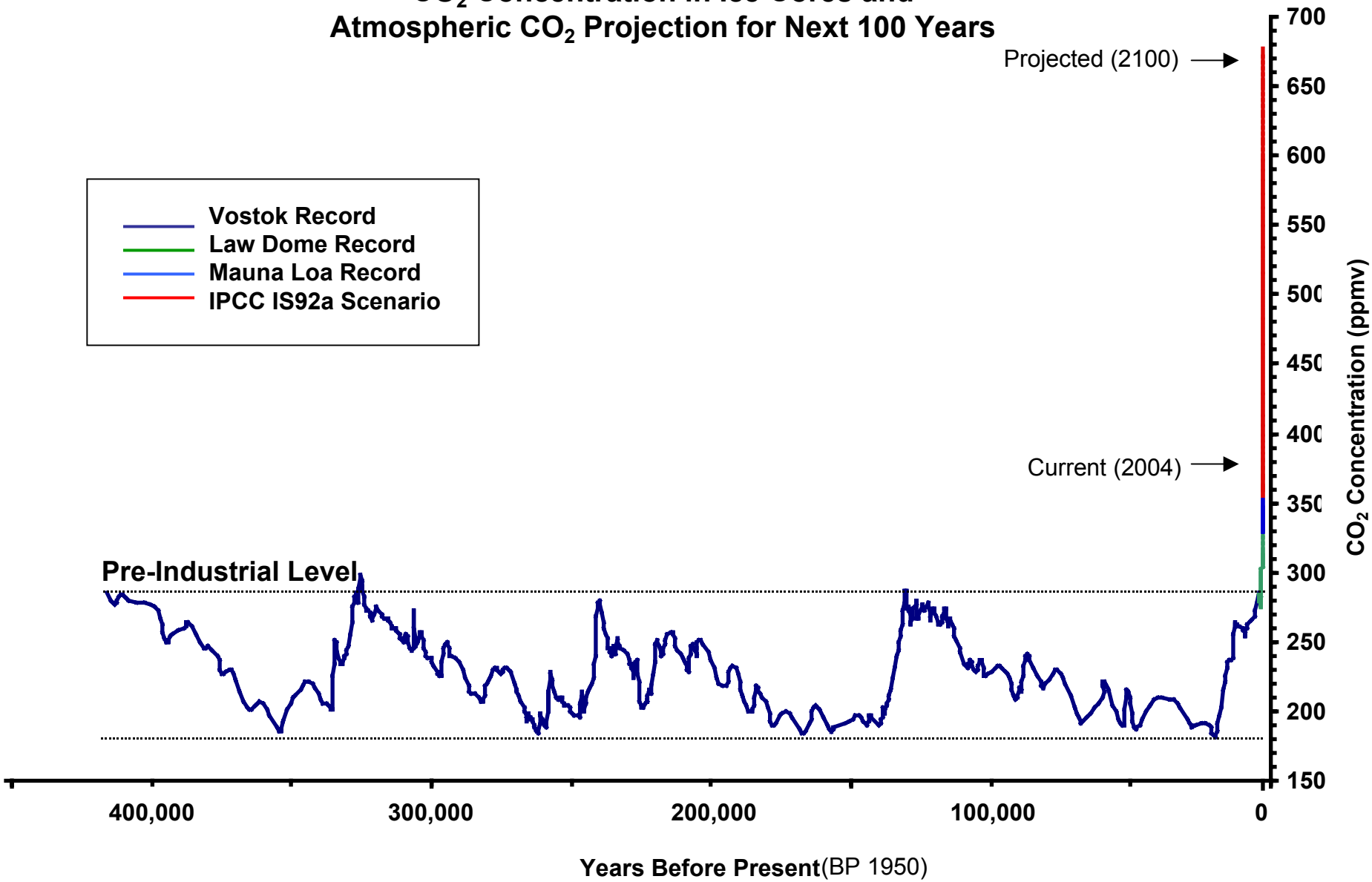

1000 Years of Global CO_2 and Temperature Change
Temperature Change
Temperature Change °F
1
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
1000 1050 1100 1150 1200 1250 1300 1350 1400 1450 1500 1550 1600 1650 1700 1750 1800 1850 1900 1950 2000
CO_2 Concentrations
CO_2 Parts per Million by Volume (PPMV)
380
360
340
320
300
280
260
1000 1050 1100 1150 1200 1250 1300 1350 1400 1450 1500 1550 1600 1650 1700 1750 1800 1850 1900 1950 2000
Carbon Emissions
Billions of Metric Tons
Fossil-fuels (Gt C)
Land-use Change (Gt C)
9
8
7
6
5
4
3
2
1
0
1000 1050 1100 1150 1200 1250 1300 1350 1400 1450 1500 1550 1600 1650 1700 1750 1800 1850 1900 1950 2000

Variation with Time of the Vostok Isotope Temperature Record



Source: Petit, *et.al.* (*PAGES* / IGBP)

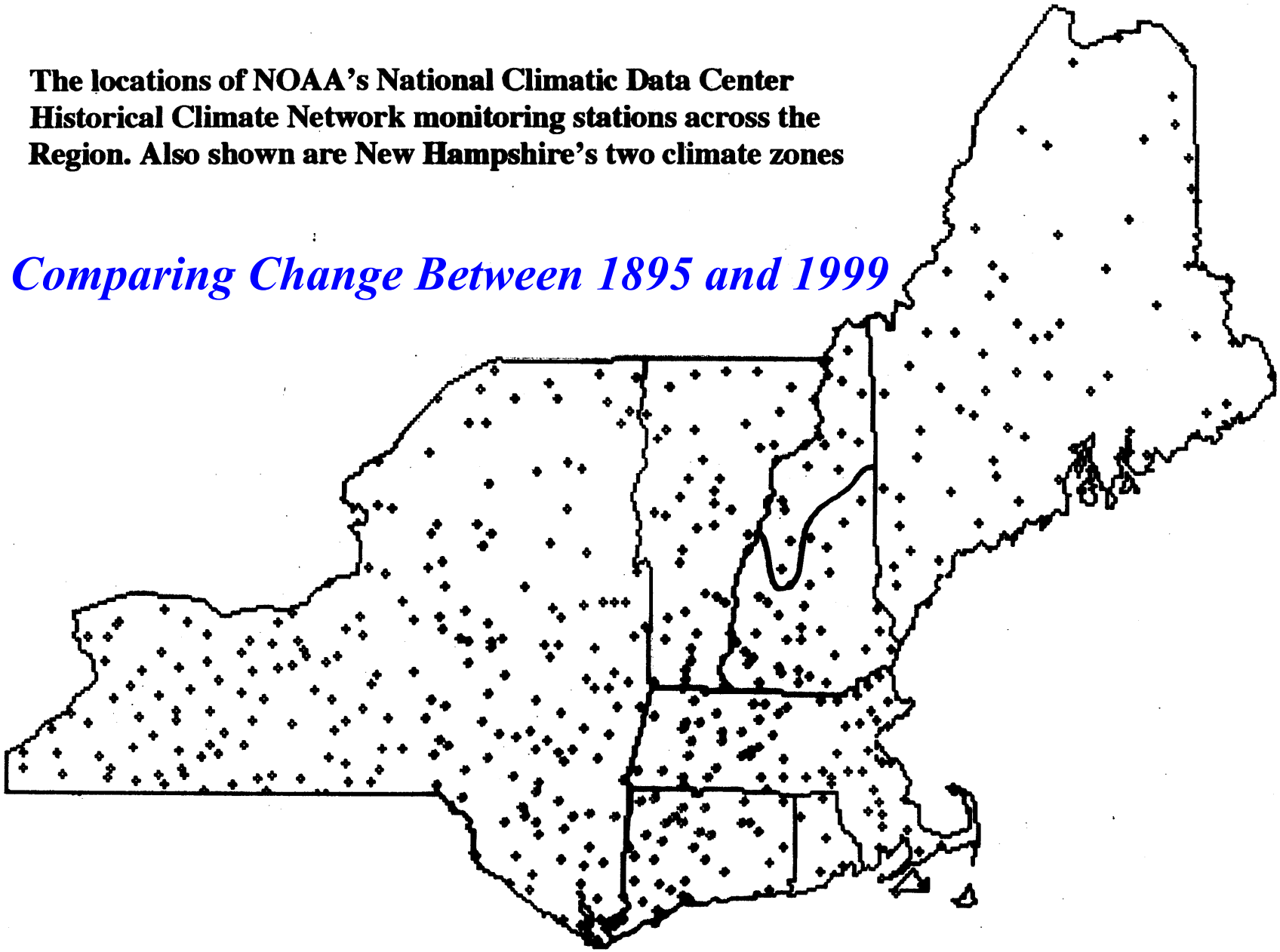
CO_2 Concentration in Ice Cores and Atmospheric CO_2 Projection for Next 100 Years



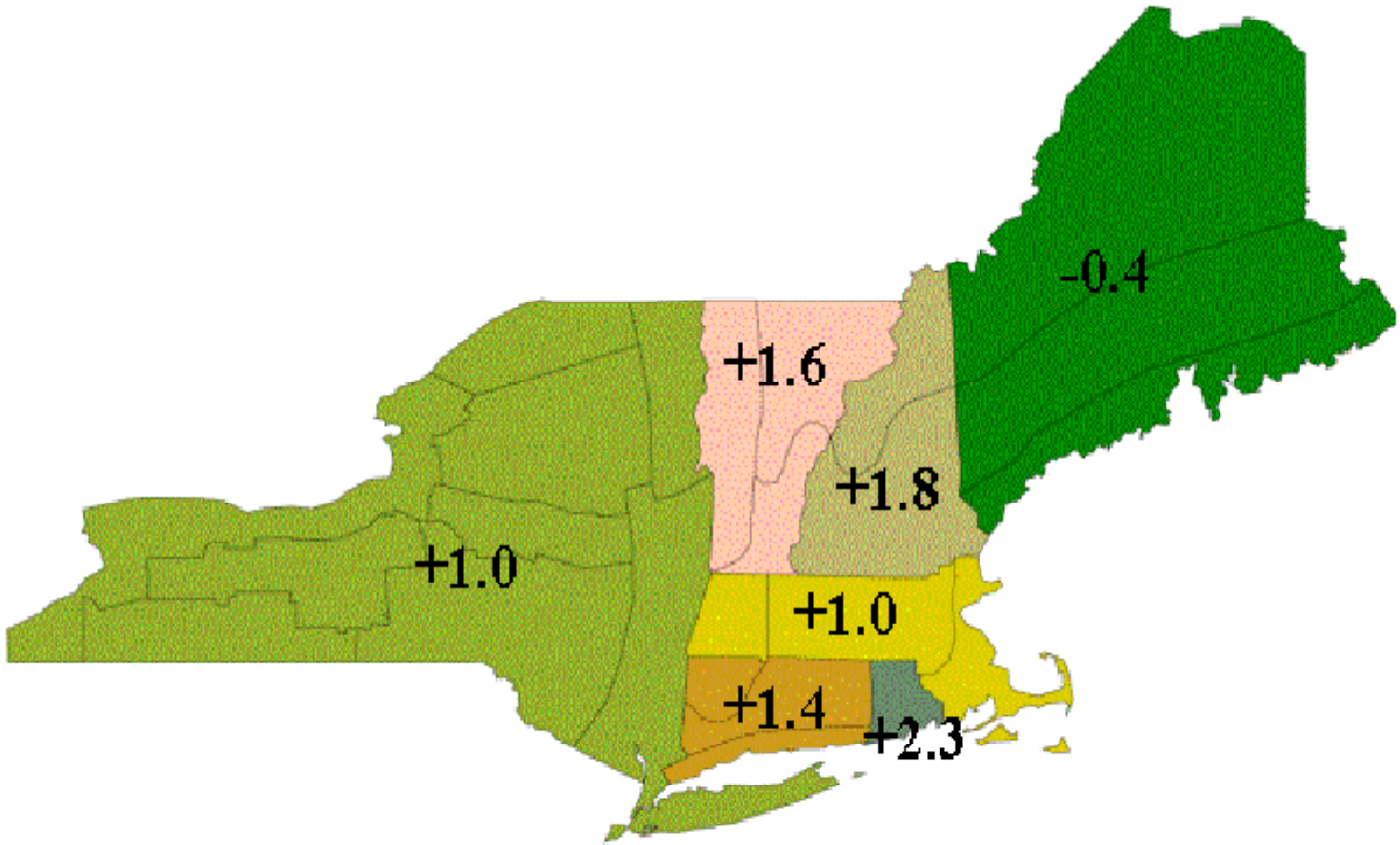
Source: C. D. Keeling and T. P. Whorf; Etheridge *et.al.;* Barnola *et.al.;* *(PAGES* / IGBP); IPCC

The locations of NOAA's National Climatic Data Center Historical Climate Network monitoring stations across the Region. Also shown are New Hampshire's two climate zones

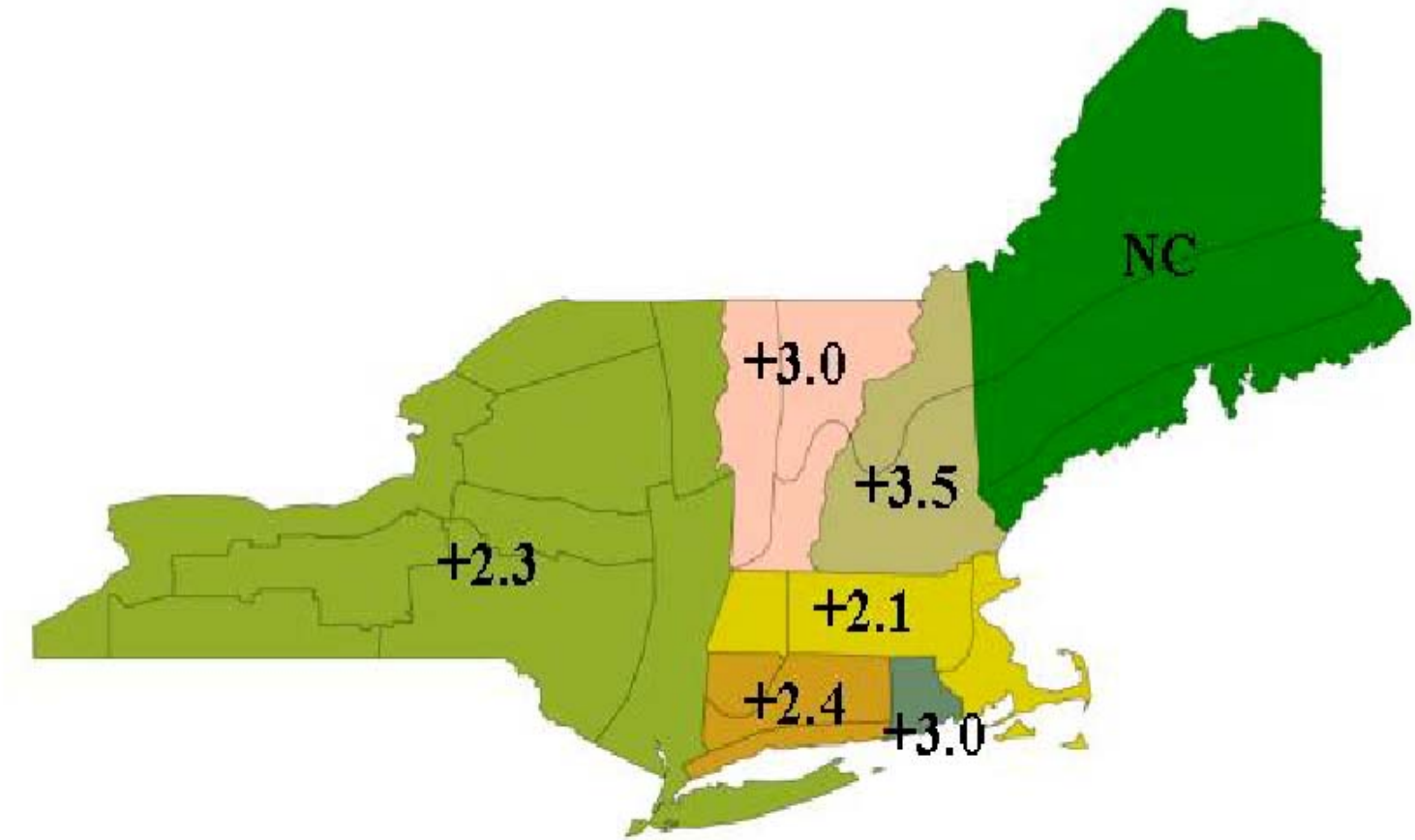
Comparing Change Between 1895 and 1999



Annual Temperature Changes (Regional Weighted)
Average + 0.74 °F

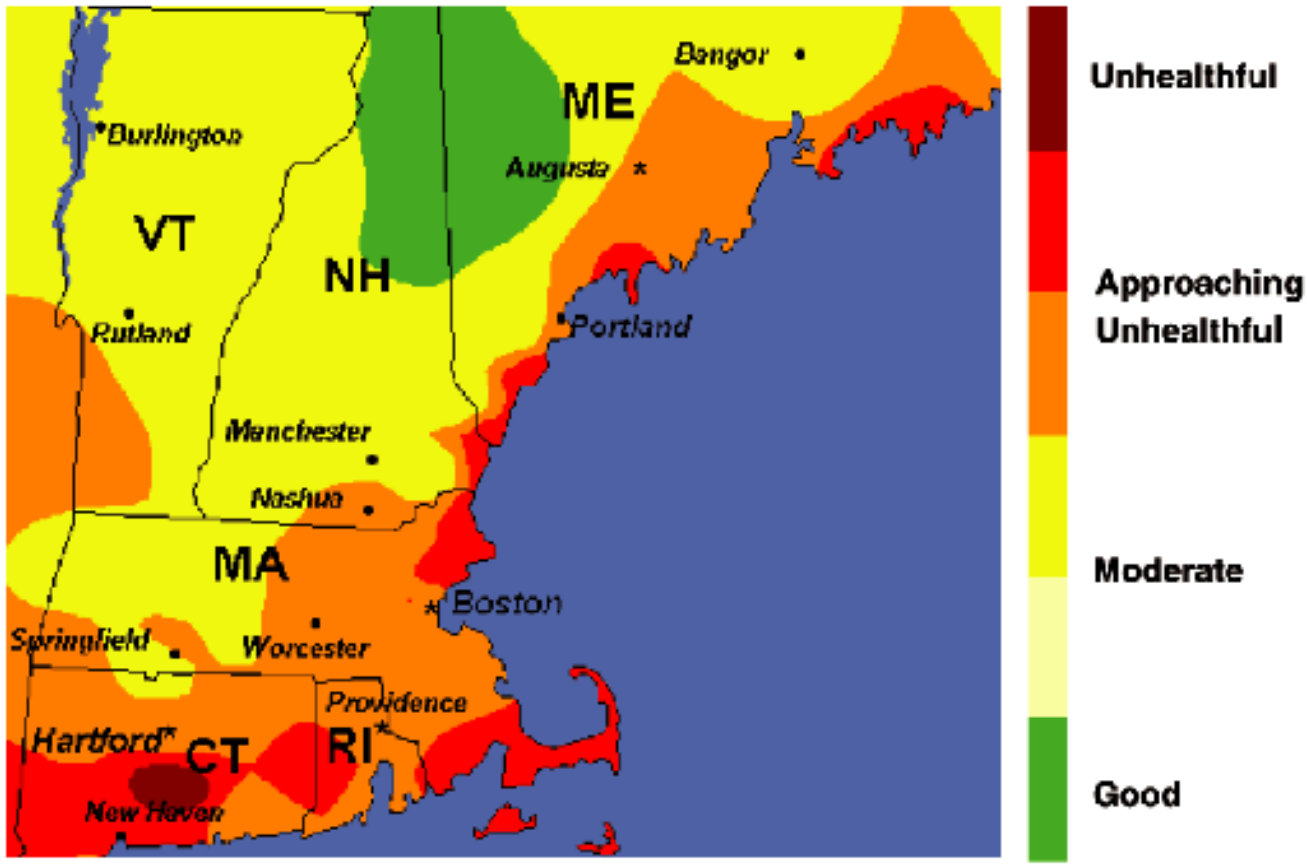


Winter Time Temperature (Regional Weighted)
Average + 1.8°F




Regional Impacts:
Air Quality Poor When Temperatures are High

Bad Ozone Day (8-hour peak values)



July 16, 1999

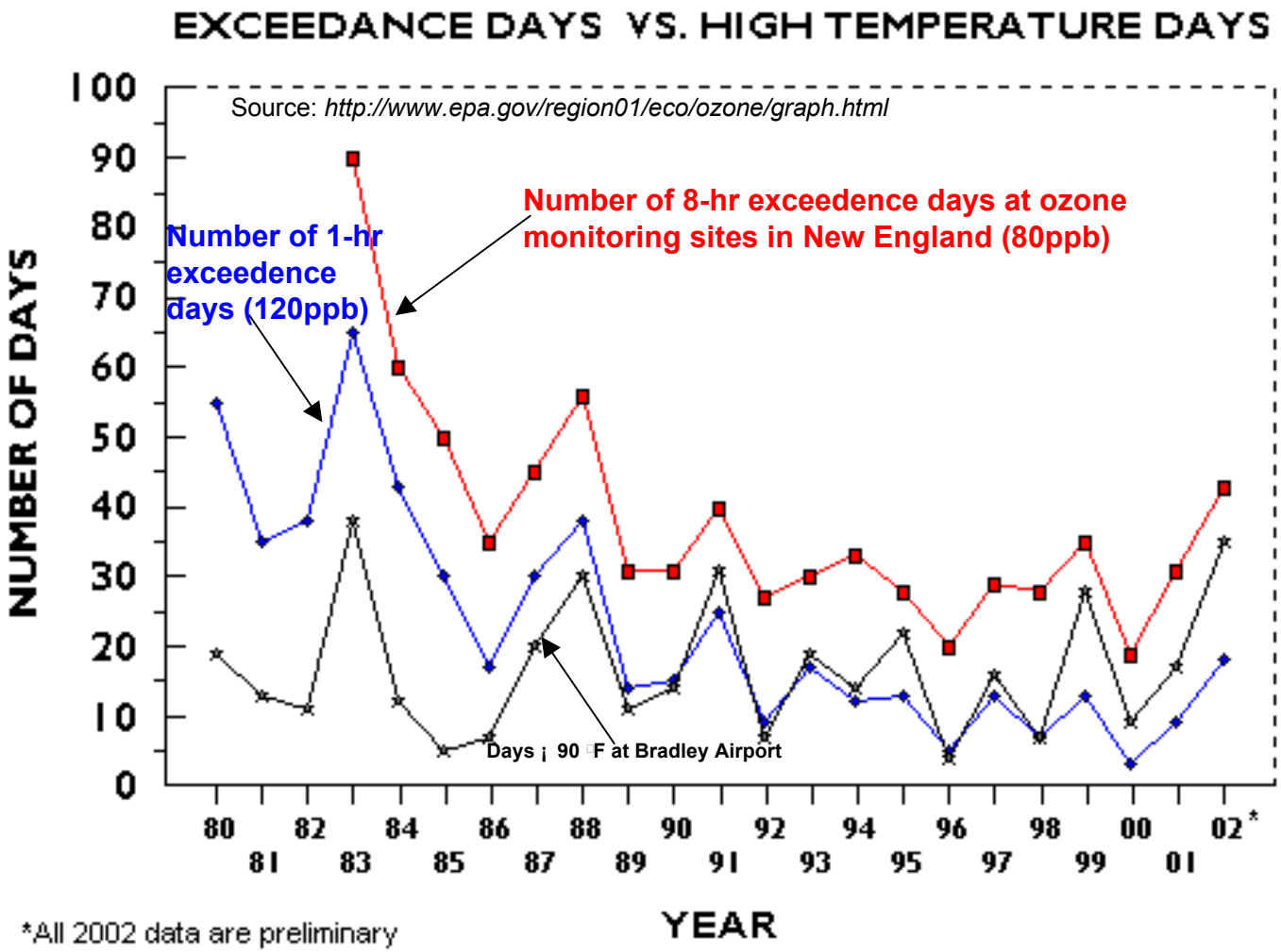
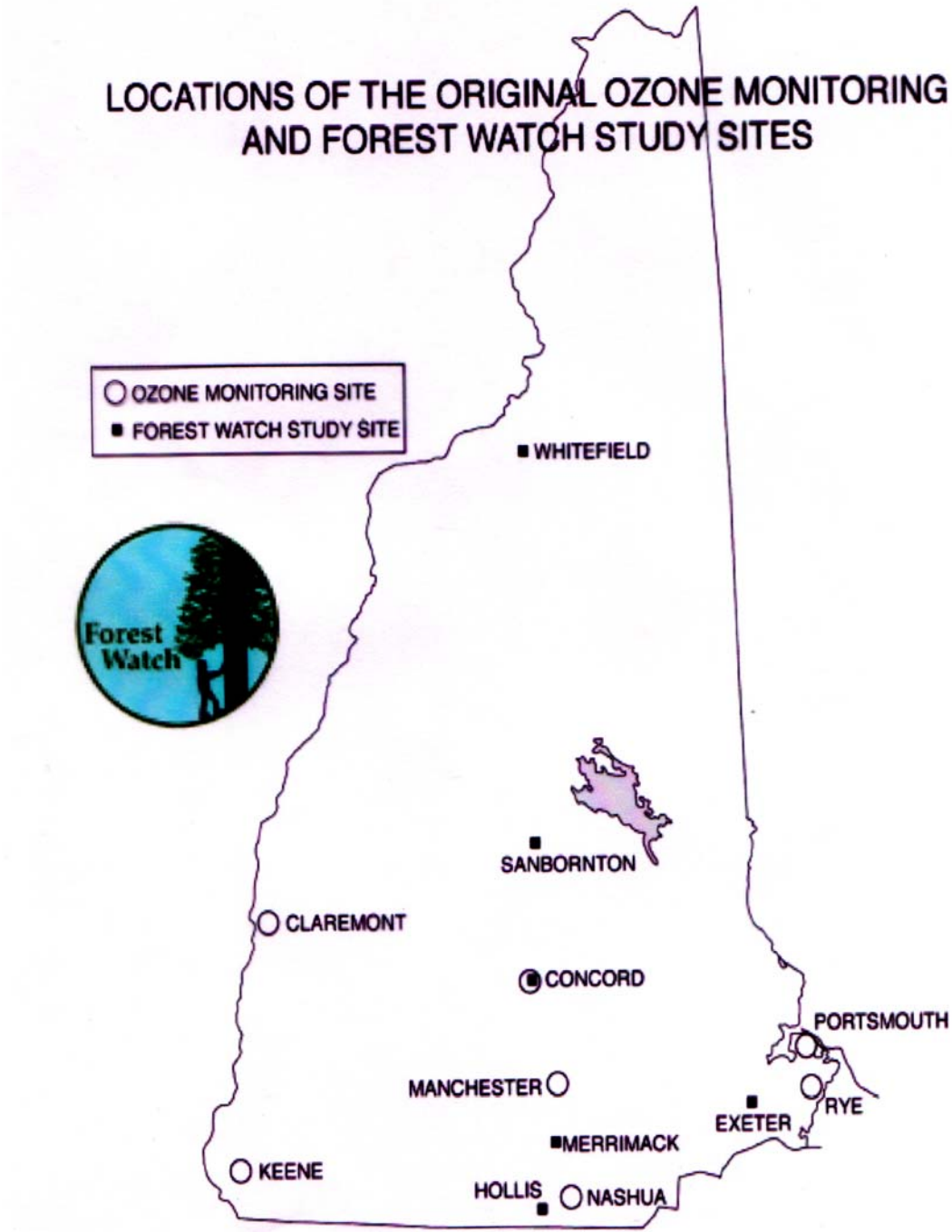


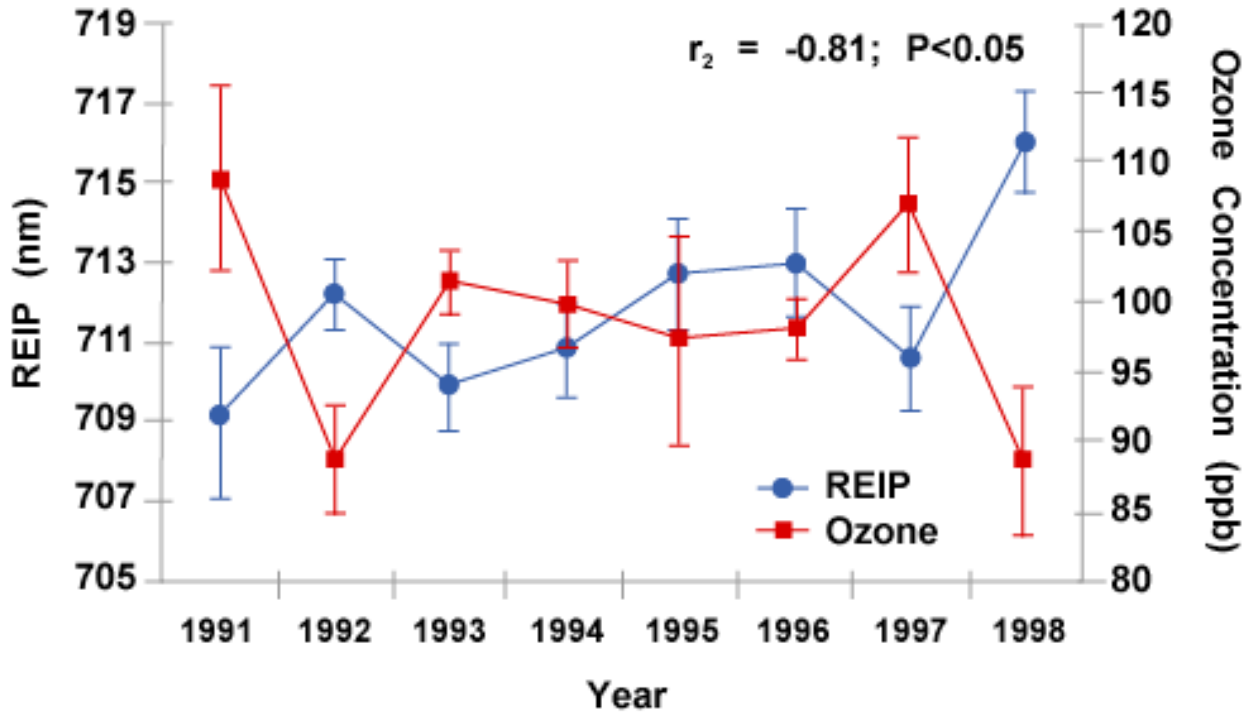
Figure 10: Number of ozone 1-hr and 8-hr exceedances, compared to the number of days with temperatures greater than 90ºF, as measured at Bradley Airport outside Hartford, CT. Data for 2001 show that there were more hot days than in 2000, leading to increases in ozone exceedences at both the 1-hr and 8-hr levels. The overall trend is a decrease in ozone exceedences from 1980 to 2001. 2002 levels were the highest in the past decade. The decrease in ozone levels since the 1980s is in part due to increased EPA emission control standards.

$$NO_x + VOCs \xrightarrow[\text{High T}]{} O_3$$

Forest Watch is a K-12th Grade Environmental Outreach Program Currently Found in Over 180 Schools Across New England. It Was Begun in 1991, with 8 Schools Participating. At Present, six of The Original Schools Continue in the Program (shown here).



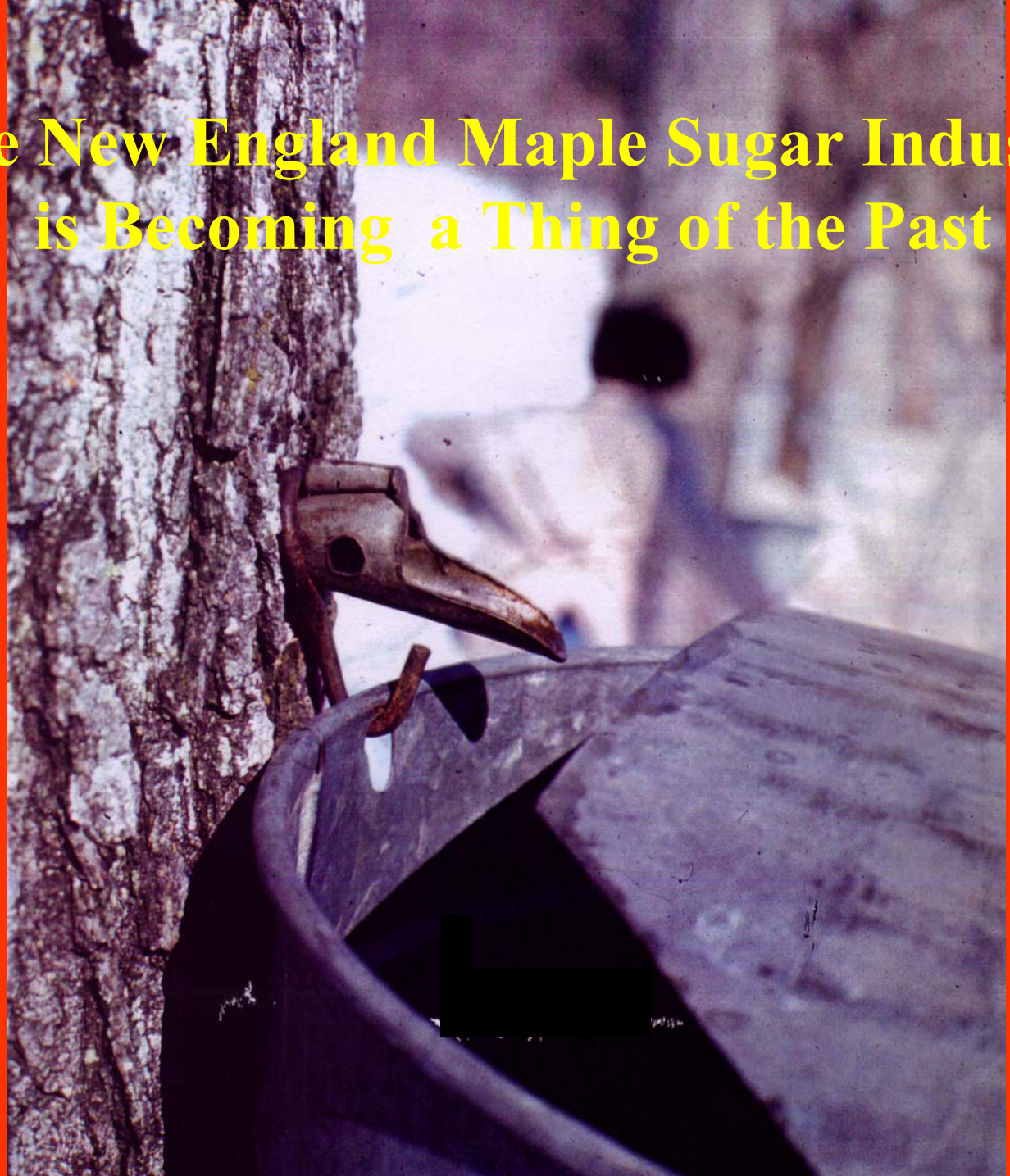
Mean Red Edge Inflection Point (REIP – a Measure of Chlorophyll) and Maximum Monthly (June – August) Ozone Concentration 1991 - 1998



Regional Impacts:

Loss of Our Maple Syrup Industry

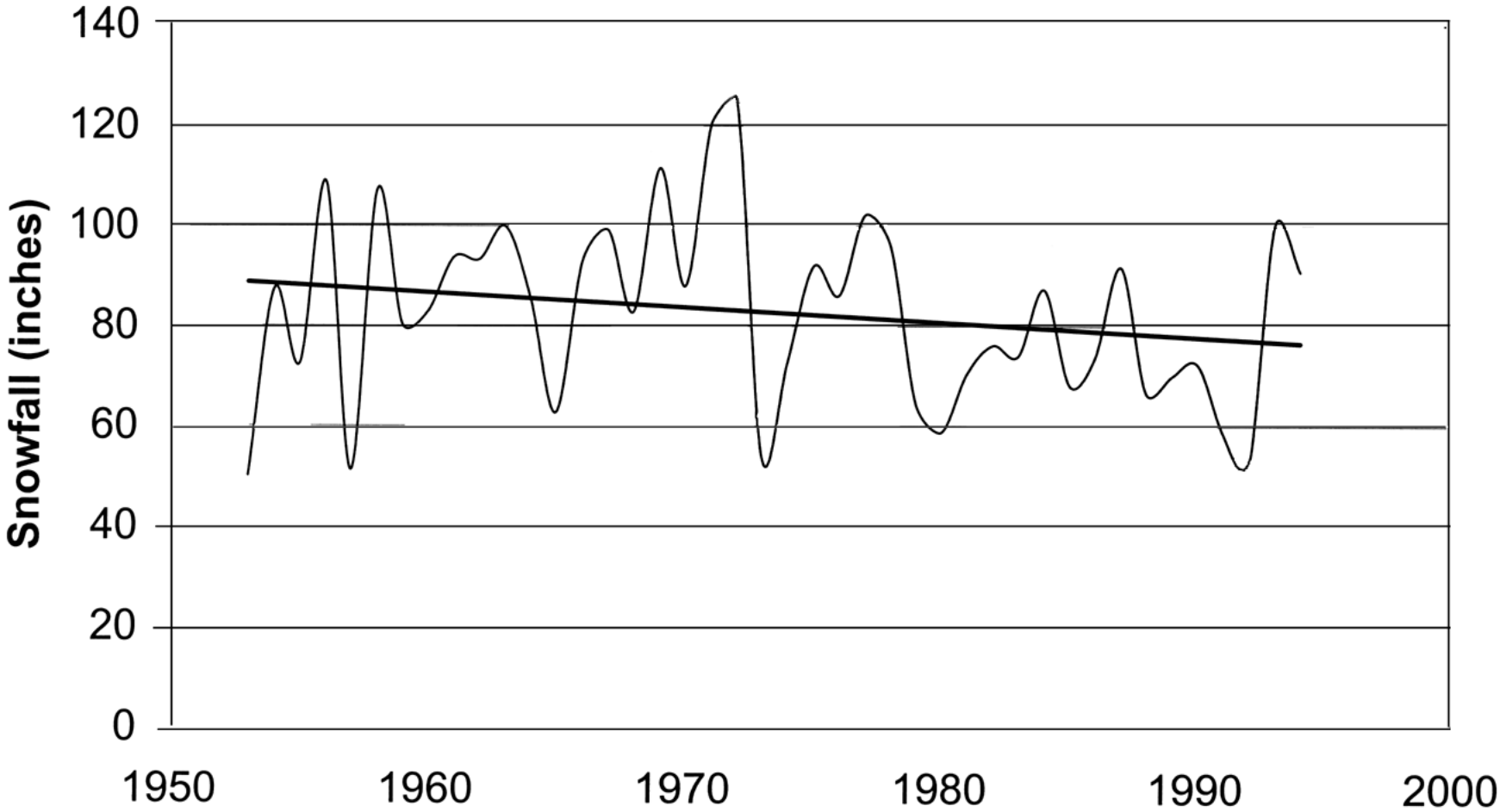
The New England Maple Sugar Industry is Becoming a Thing of the Past



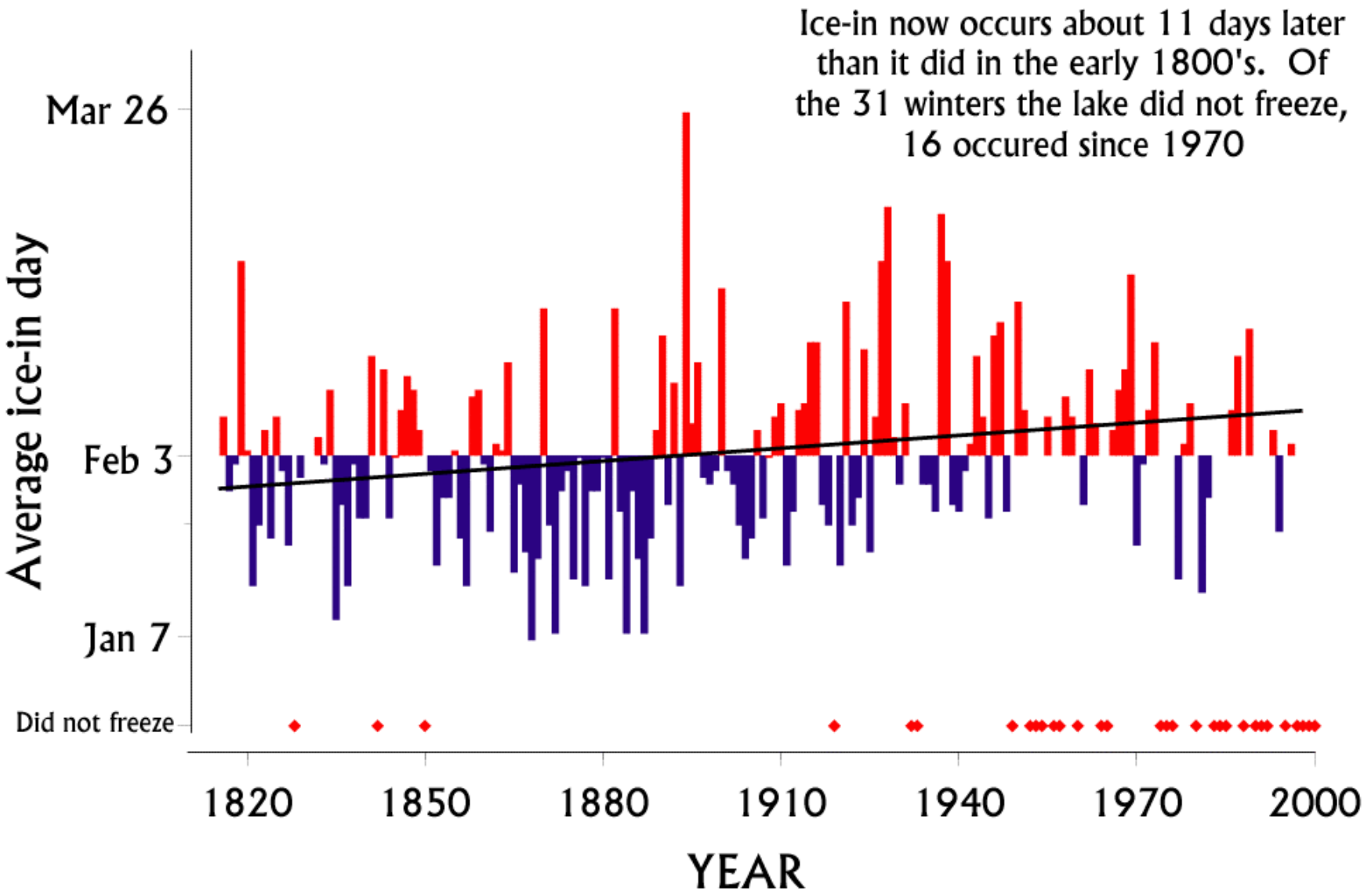
Regional Impacts: Shorter, Milder Winters

Average Snowfall – ME, NH, VT

13” (14.6%) Decrease



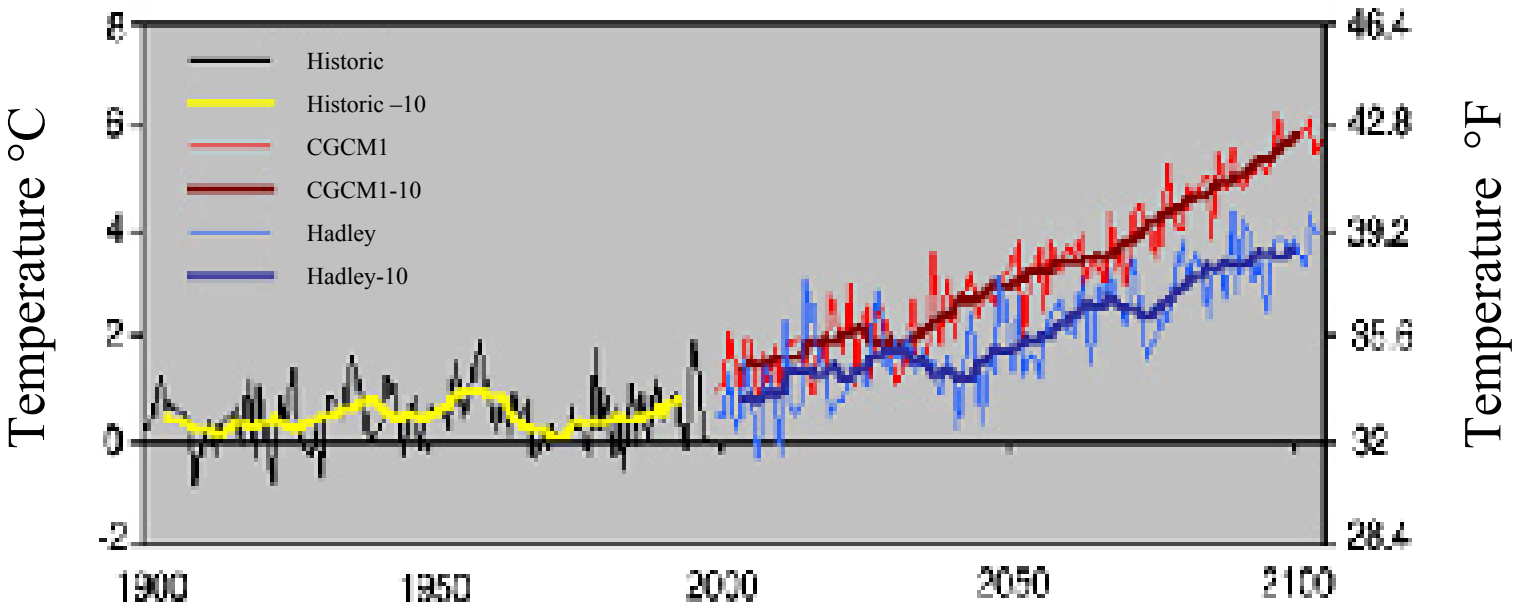
Ice-in day of Champlain Lake, VT



First day of full ice cover on Lake Champlain, VT. Stars at x-axis indicate years that the lake never full froze.


What Will The
Future Hold?

New England Regional Mean Historic and Model Scenario Annual Minimum Temperature Change



How the Projected 6-10°F (3-5°C) Temperature Changes Would Compare With Those of the Past Millennium

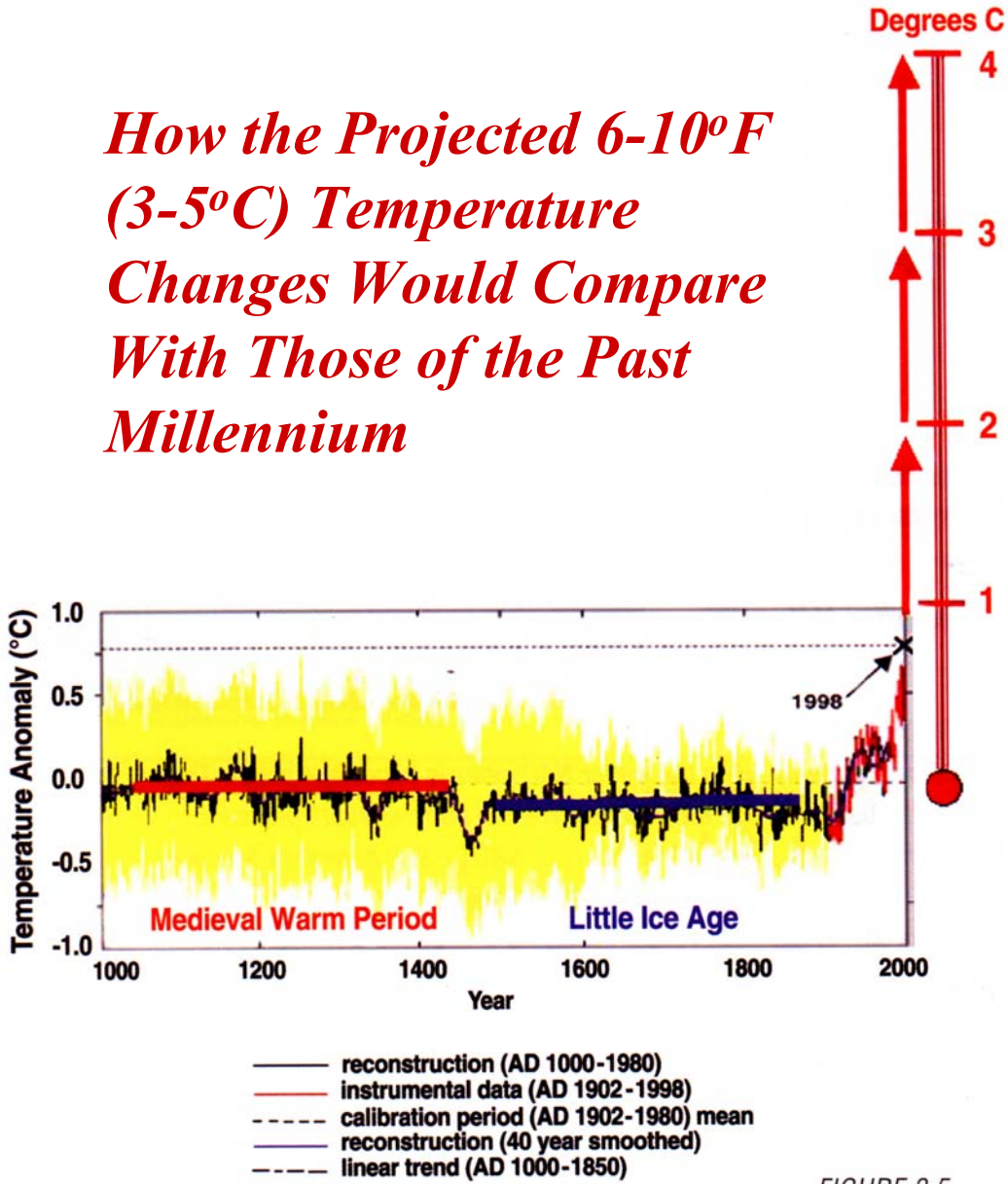


FIGURE 3.5

Northern hemisphere temperature changes in the last 1000 years. The yellow marks the range of variability in the data for temperature derived from proxy sources.

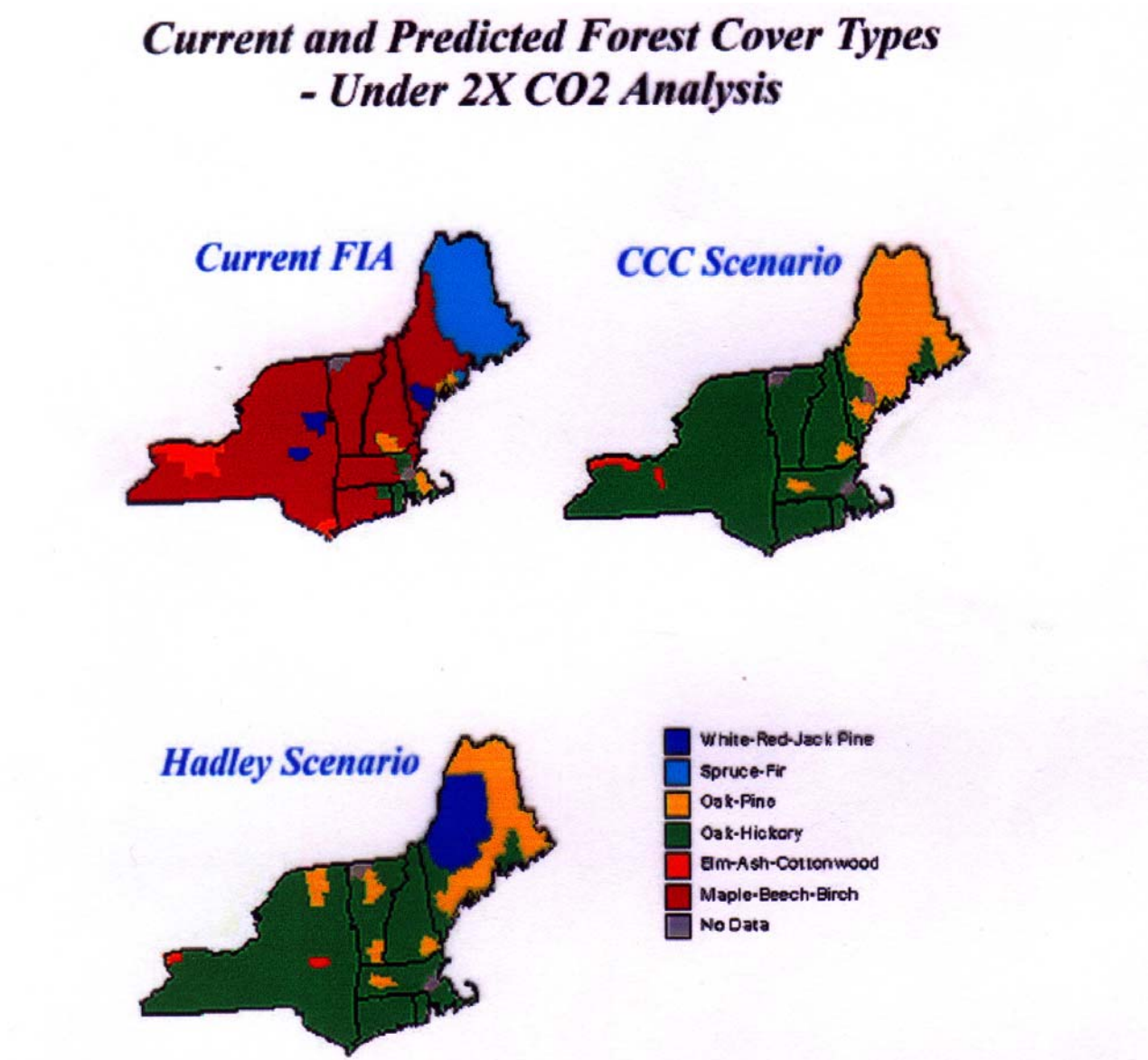


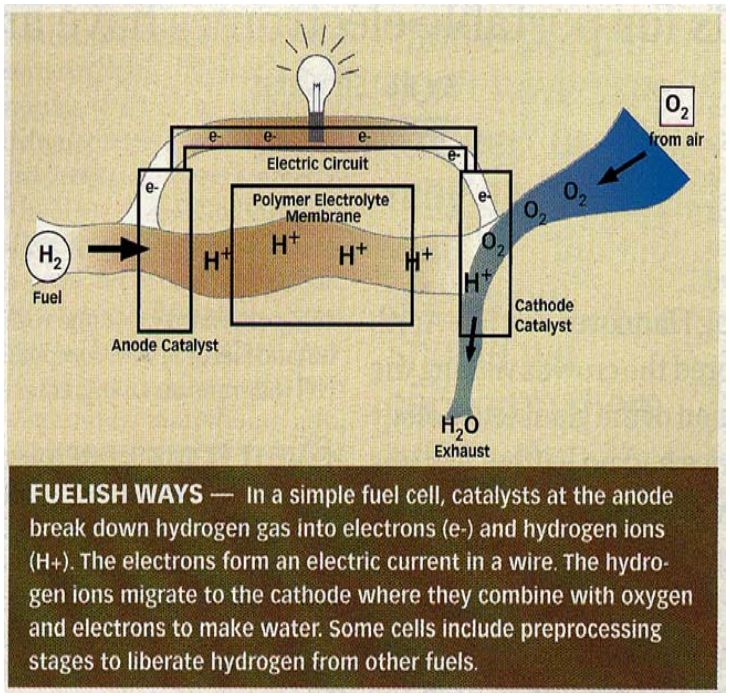
Figure 2. IV Model Forest Type Predictions. Adapted from Prasad and Iverson (2000).


What Can We Do to Reduce the Risk in the Future?

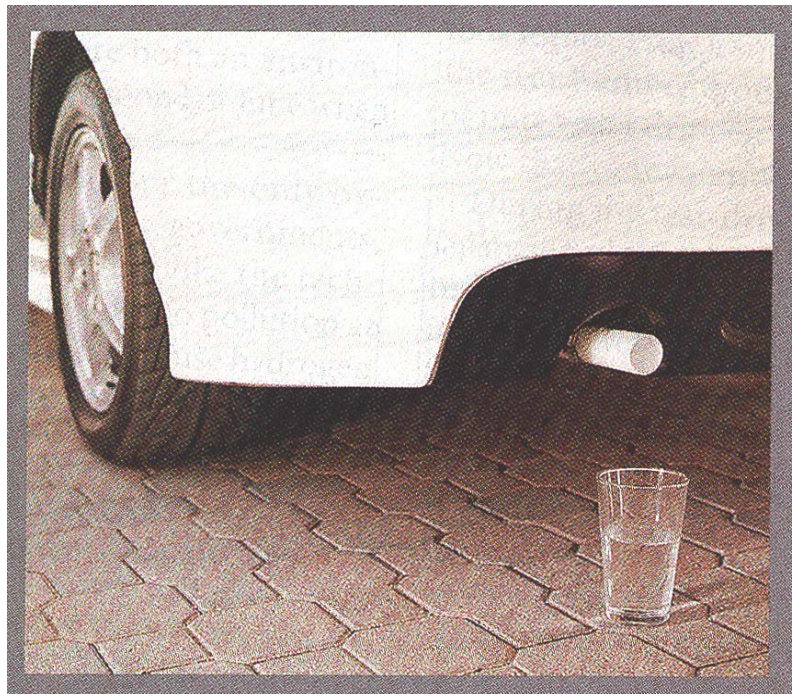
Develop Alternative Energy Sources

Consider the Hybrid Option

Develop Fuel Cell Technology?

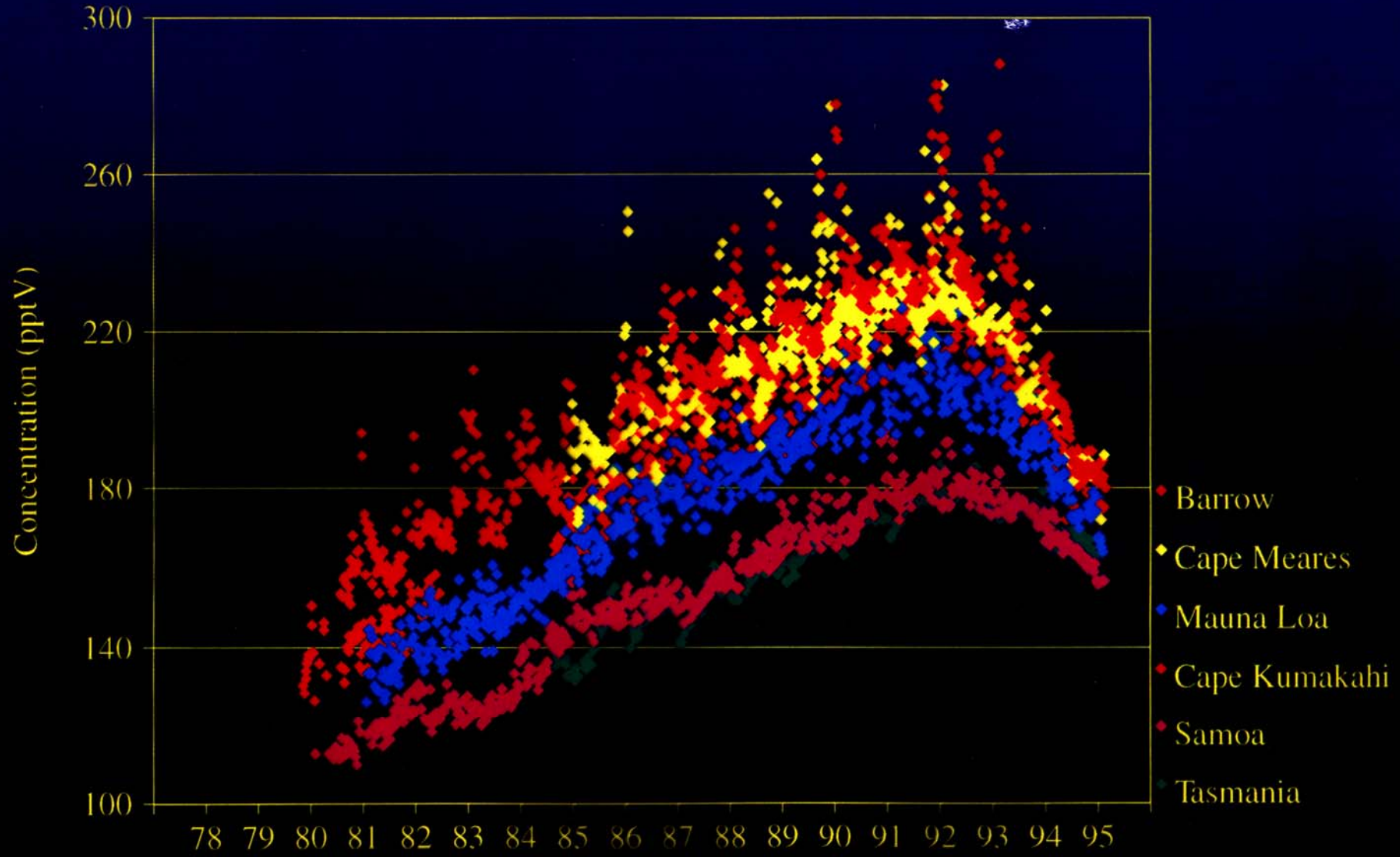


FUELISH WAYS — In a simple fuel cell, catalysts at the anode break down hydrogen gas into electrons (e-) and hydrogen ions (H+). The electrons form an electric current in a wire. The hydrogen ions migrate to the cathode where they combine with oxygen and electrons to make water. Some cells include preprocessing stages to liberate hydrogen from other fuels.



GLOBAL CH_3CCl_3 TRENDS

WEEKLY FLASK SAMPLES



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M A K Khalil

Source: W. Eugene Smith *The Family of Man Exhibition*

What Will the Future Be? Our Decisions Today Will Shape Tomorrow