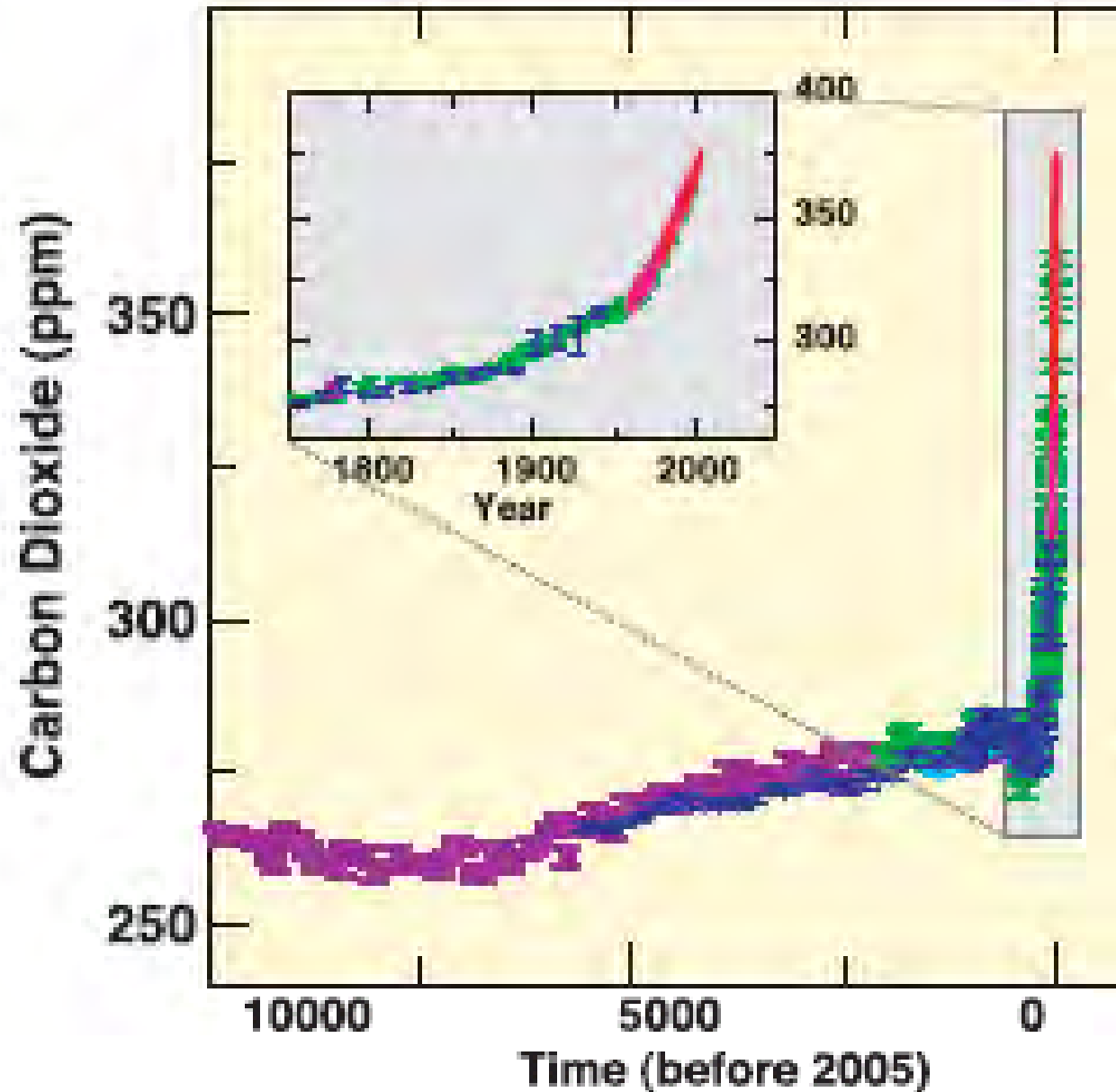


Why Preservation needs Conservation² to succeed!

Steven P. Hamburg
Environmental Defense Fund

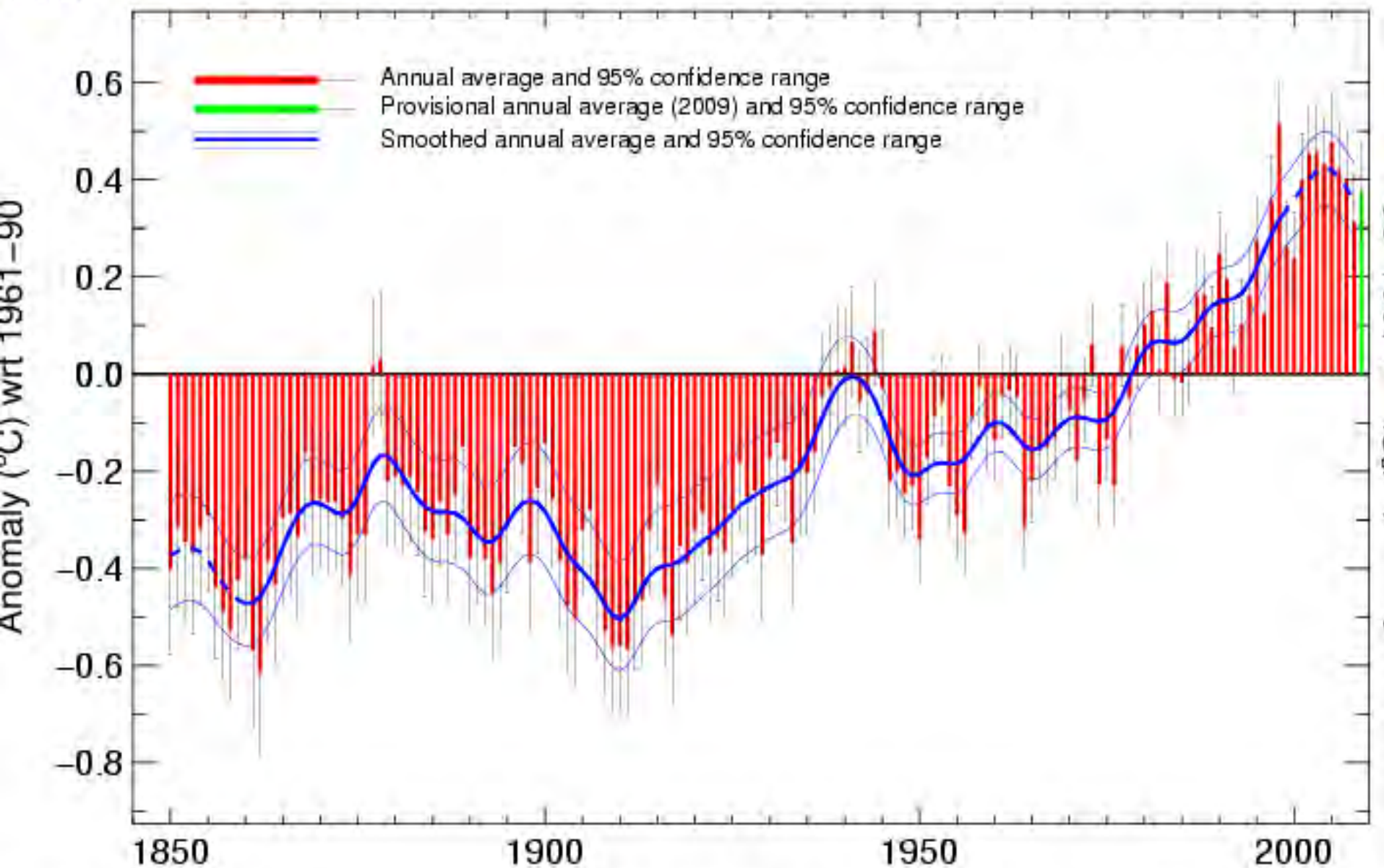
March 16, 2011

Observed Rise in Atmospheric CO₂

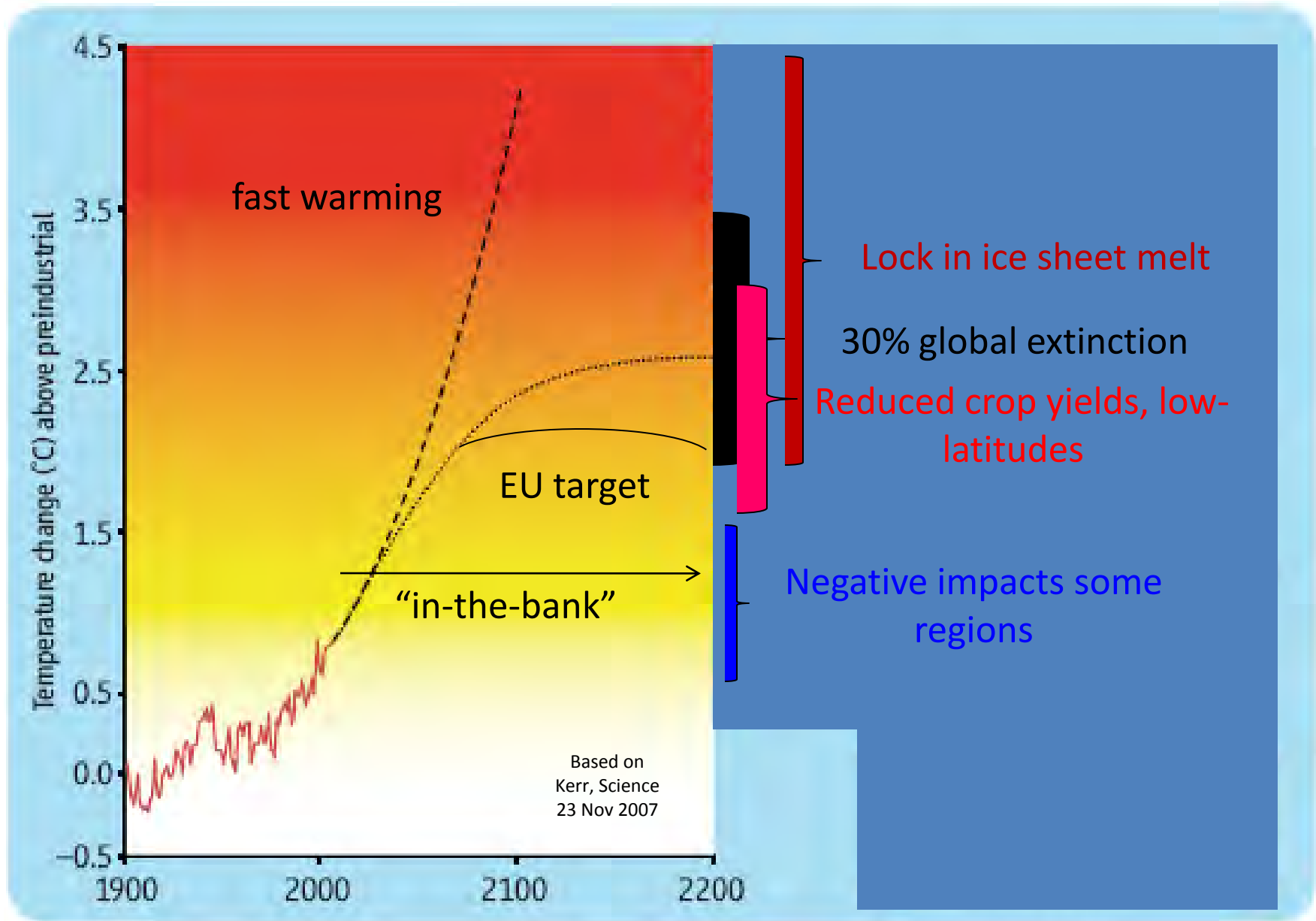


Global average temperature 1850–2008

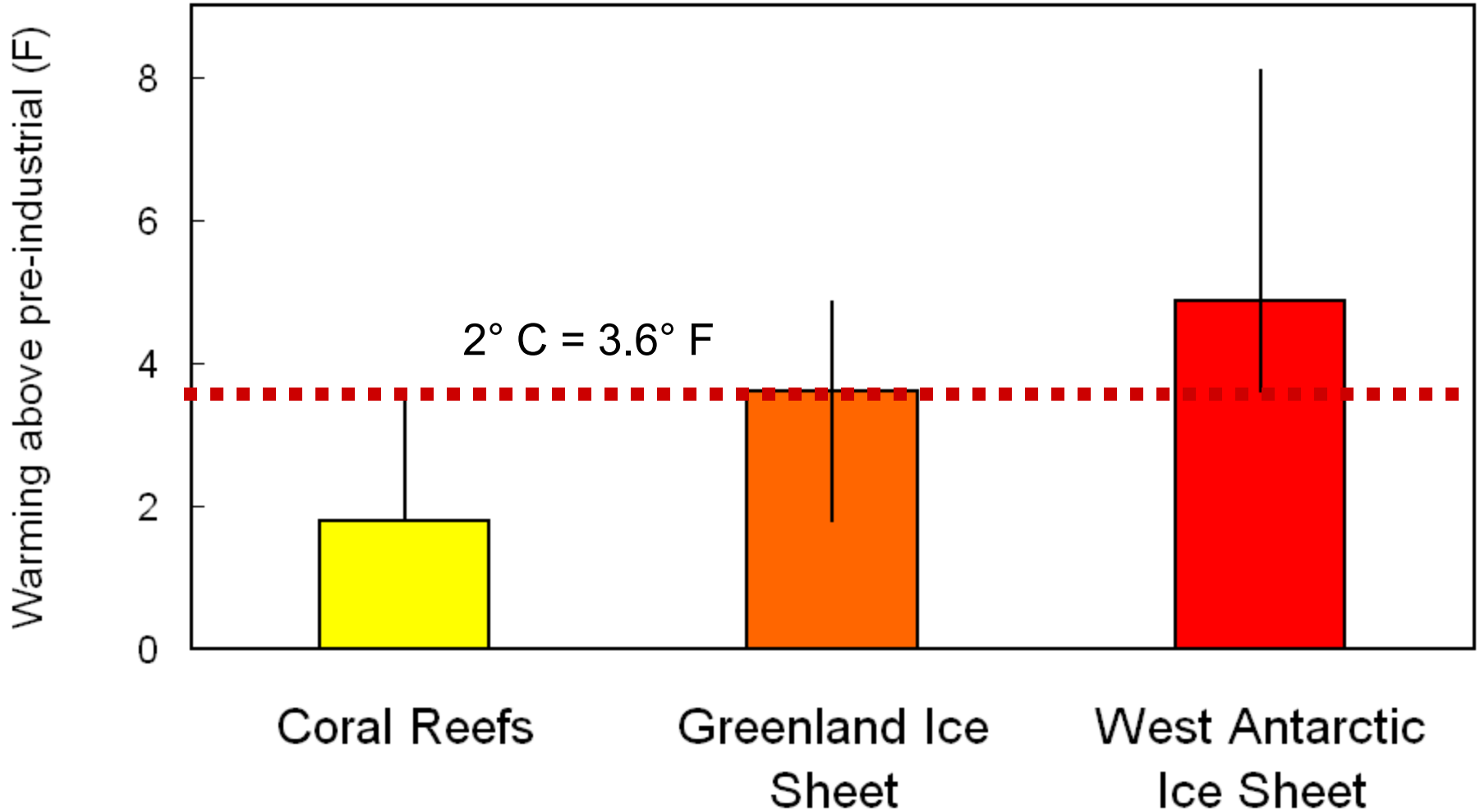
Based on Brohan et al. 2006



Key risks that increase with warming

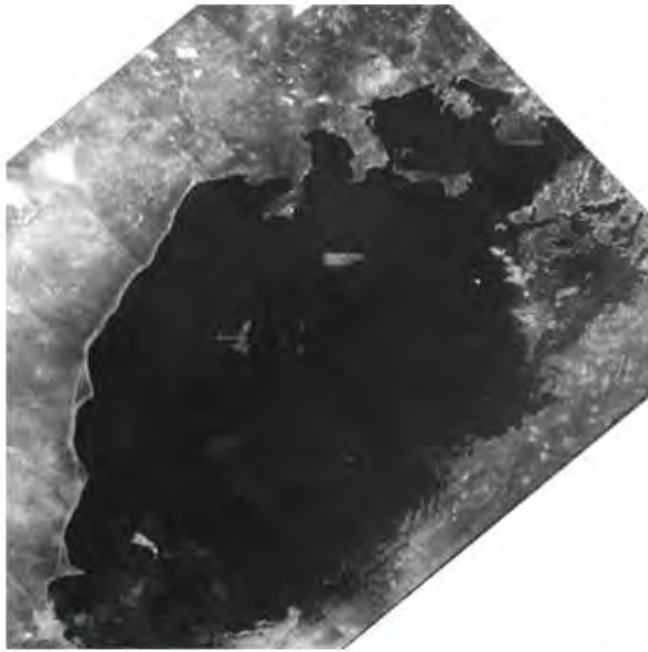


Is 2 degrees too high?

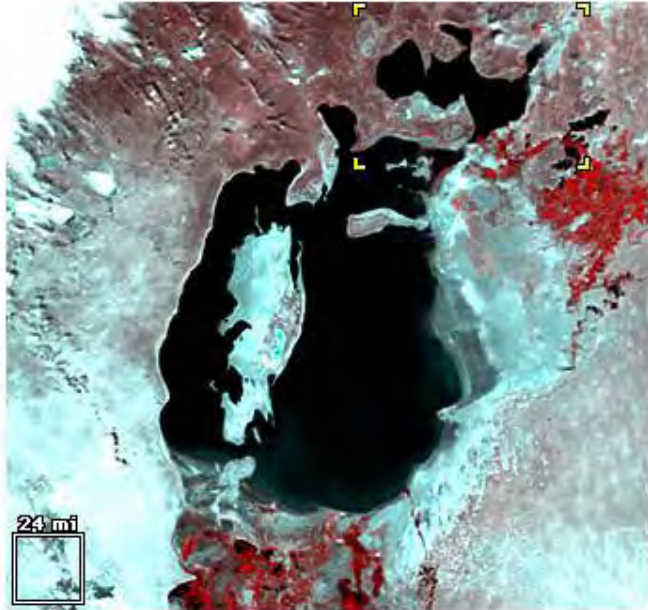


What Is Endangered

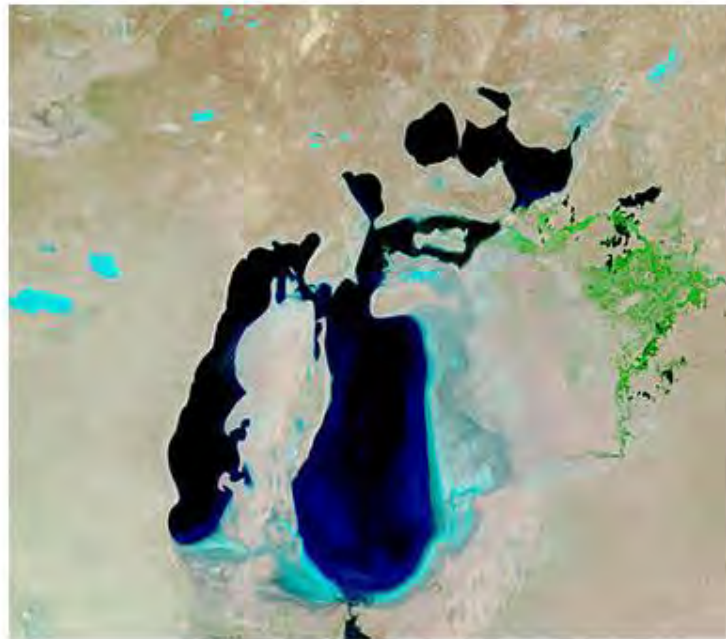
1963



1987



1997



2002

Resource Allocation: Downstream Effects Aral Sea

- Drop in water due to upstream irrigation
- Impacts: aquatic ecosystem loss, human health, modification of climate

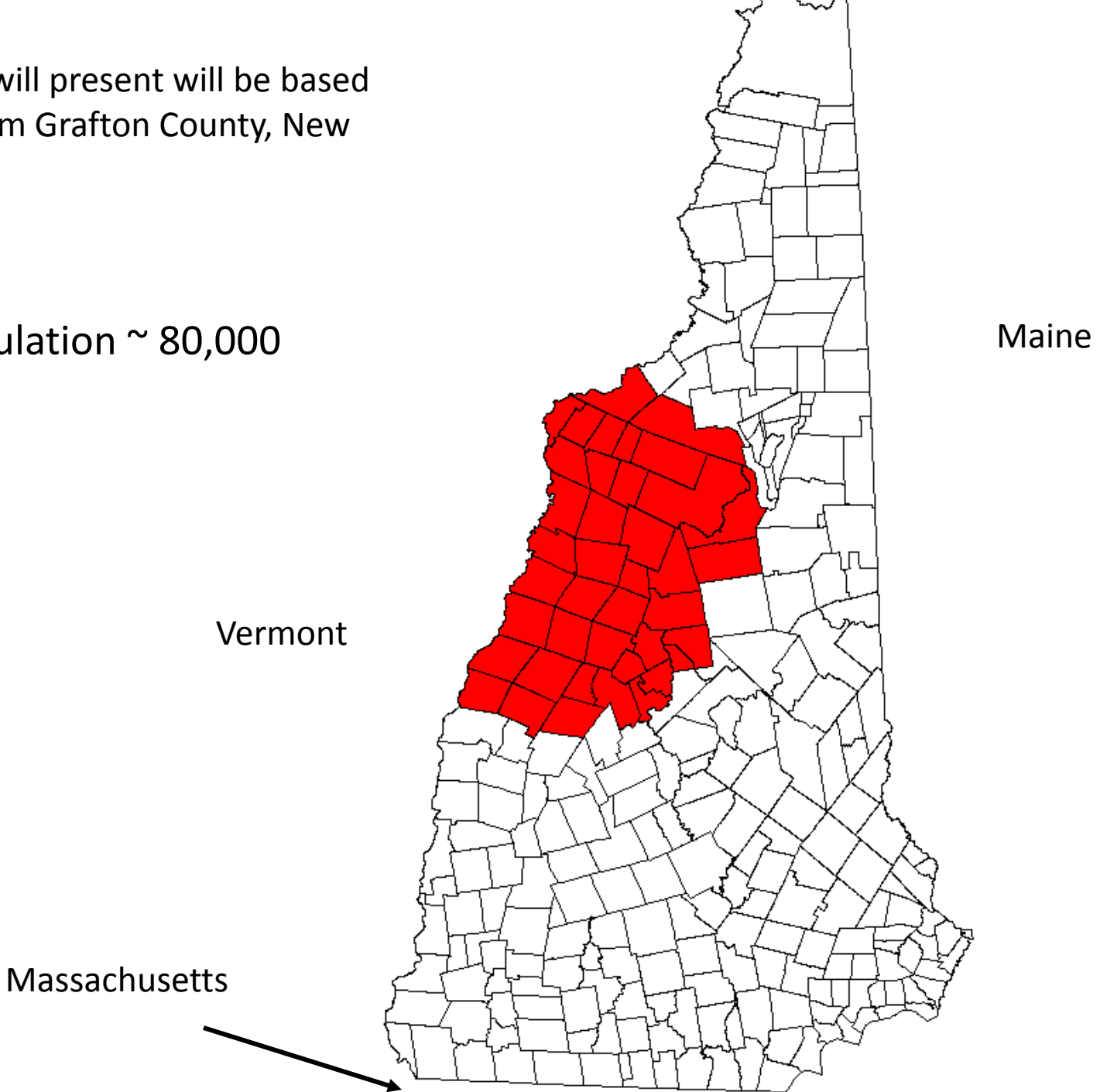
Common Goals for Conservation²

- Long-term perspective > 100y
- Maintain a stable environment
- Reduce exposure to pollution

The story I will present will be based on data from Grafton County, New Hampshire

4,000 km²

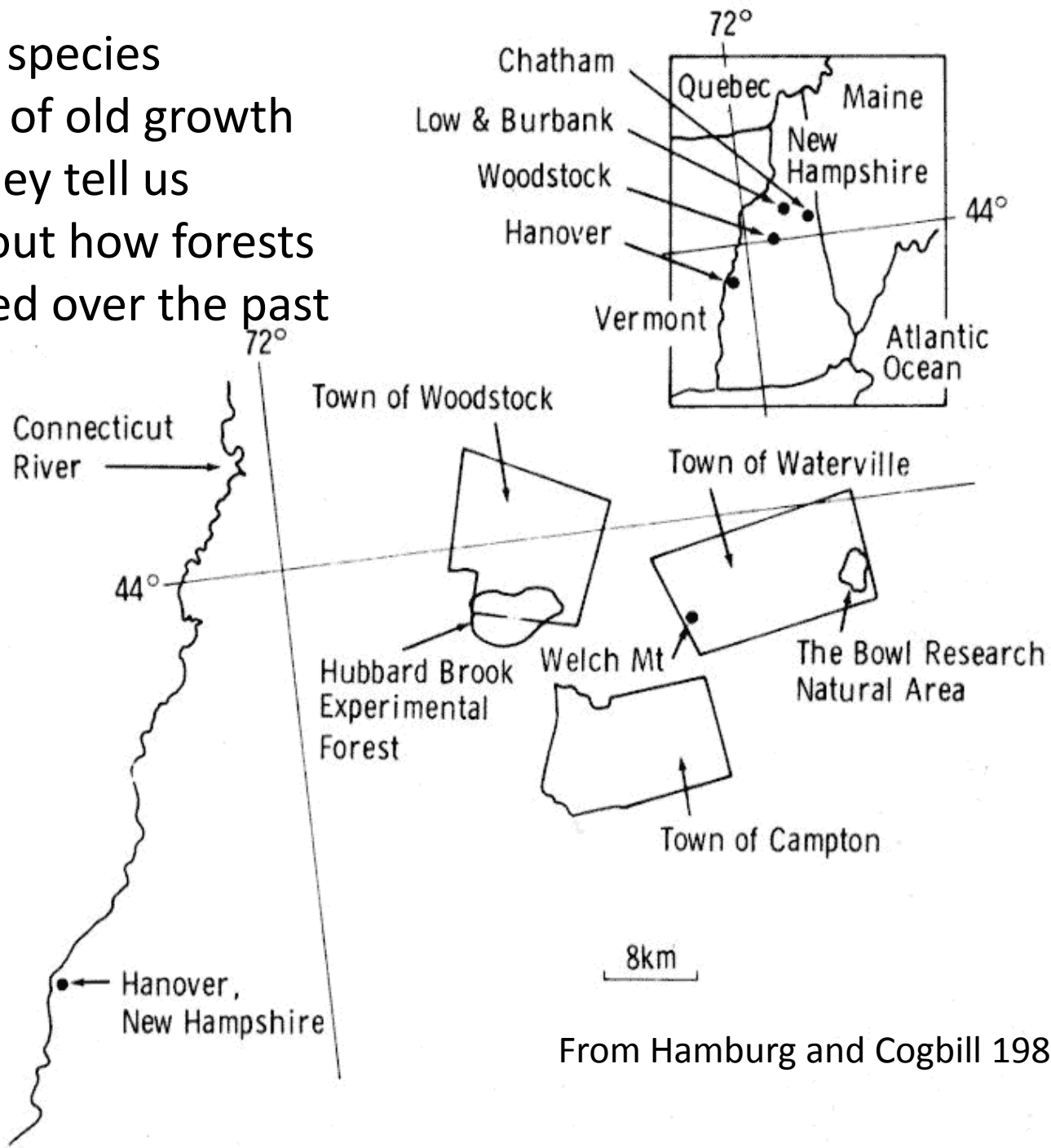
2000 population ~ 80,000





Photograph of spruce old growth forests, Waterville NH, 1903

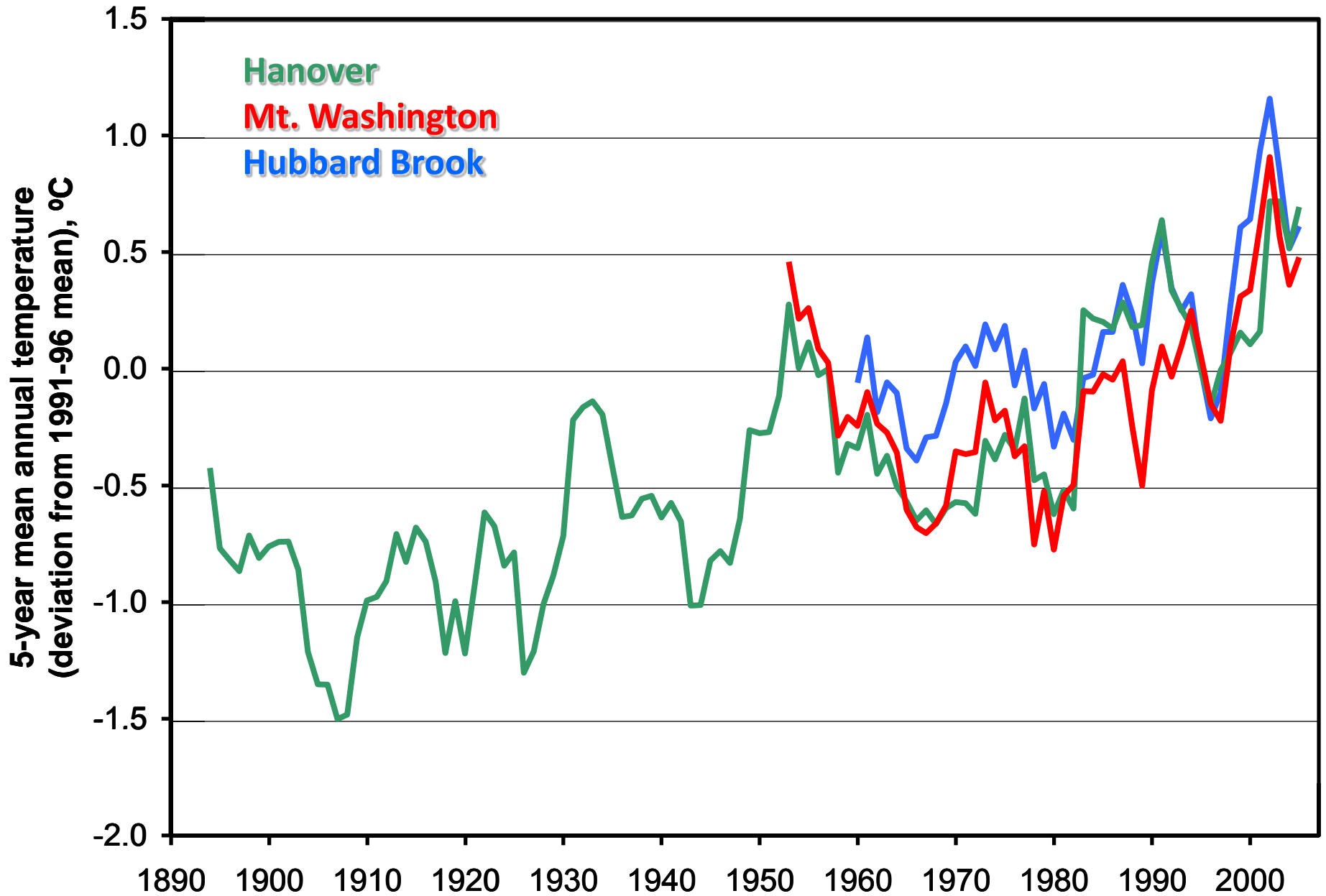
If we look at species composition of old growth forests do they tell us anything about how forests have changed over the past 200 y?



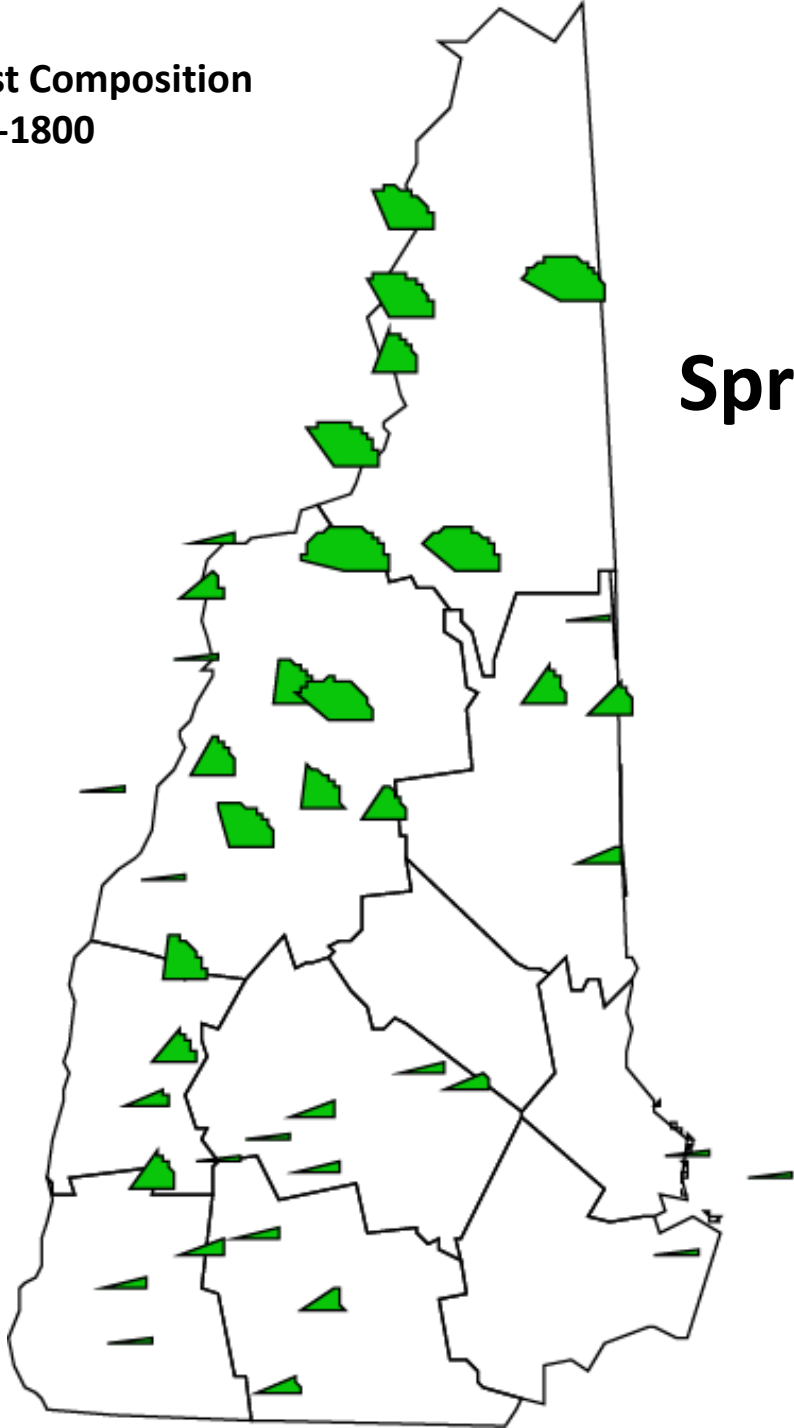
From Hamburg and Cogbill 1988

Location	Waterville	Low and Burbank	Bowl Research Natural Area		Mountain Pond
Date of measurement	1903	1903	1973	1974	1984
Logging	very limited cutting if any	very limited cutting if any	none	none	none
Elevation range (m)	580-700	unknown	580-640	580-700	520-550
Number of trees	5,420	506	384	74	77
Species	Forest composition(%)				
<i>Picea rubens</i>	29	42	6	7	5
<i>Fagus grandifolia</i>	35	24	38	47	49
<i>Betula</i> sp.	24	20	25	31	8
<i>Acer</i> sp.	8	6	30	14	31
<i>Tsuga canadensis</i>	3	5	0	0	0
<i>Abies balsema</i>	<1	0	1	0	0
Other	<1	3	0	1	7

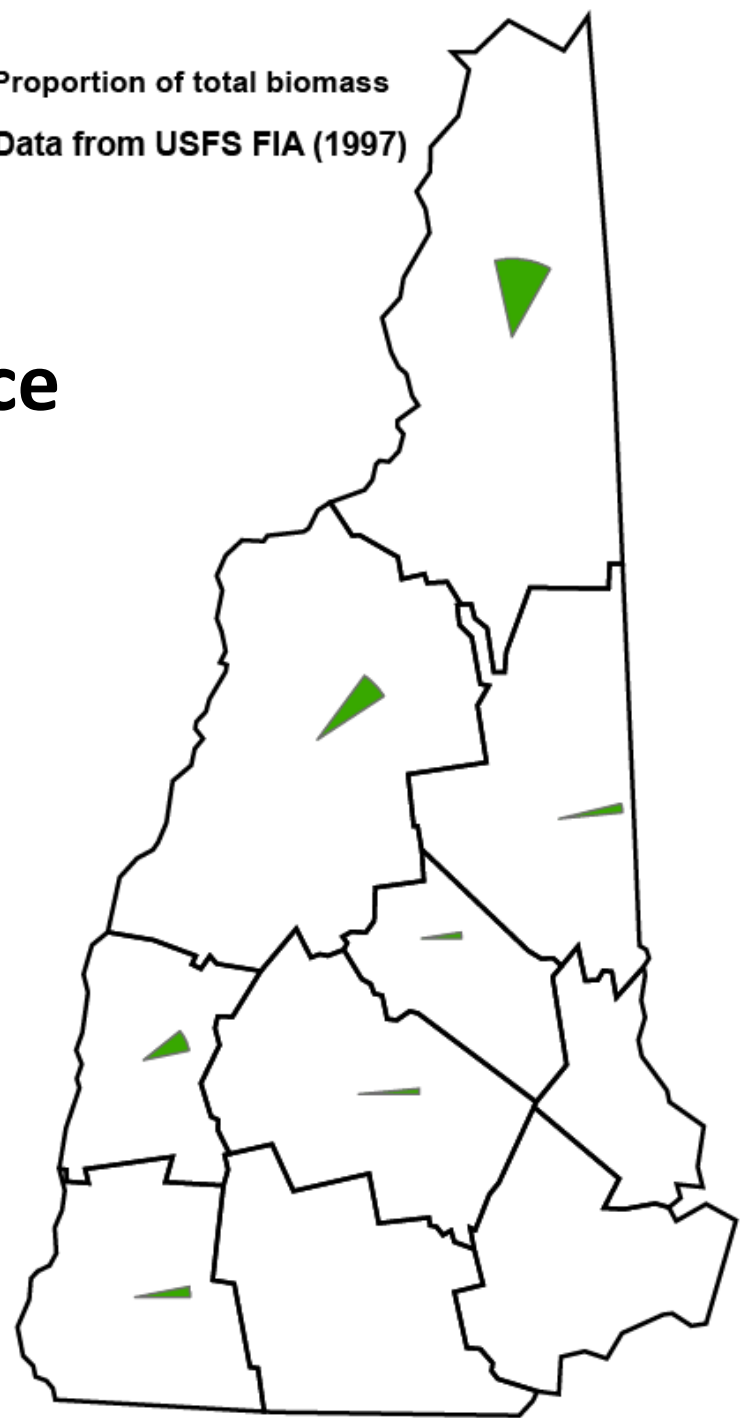
20th Century Temperature Record in NH



**Forest Composition
1700-1800**



**Proportion of total biomass
Data from USFS FIA (1997)**



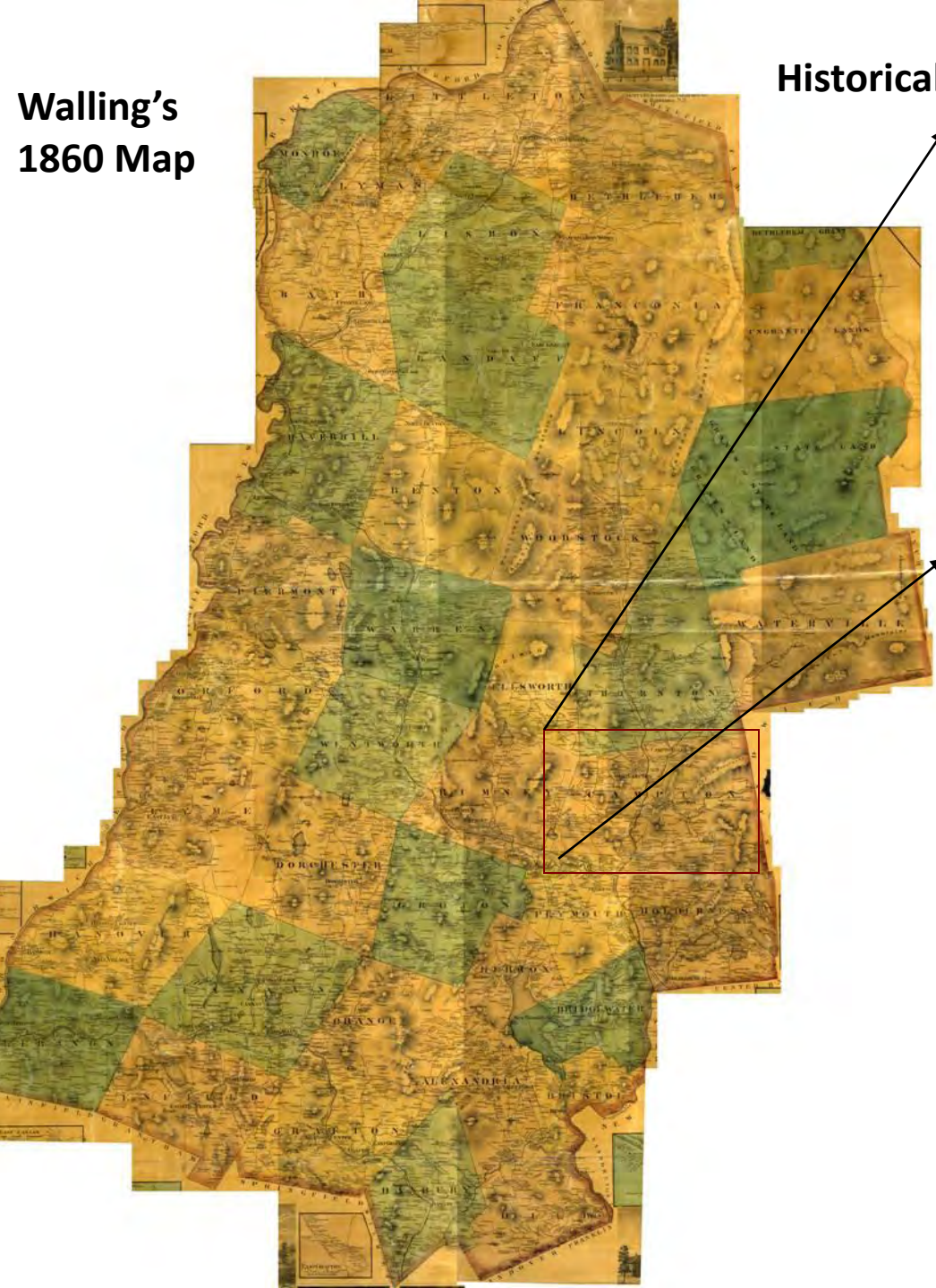
Spruce



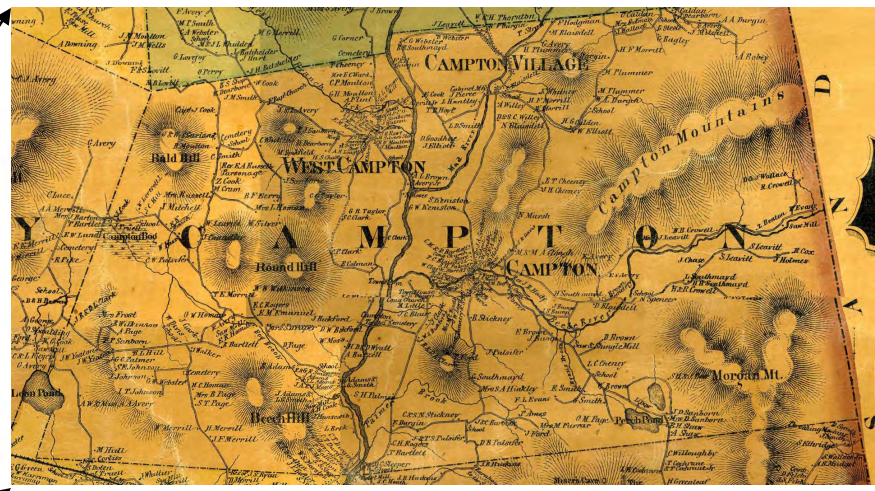
A diversity of land uses have left their mark on the vegetation of the Northeast



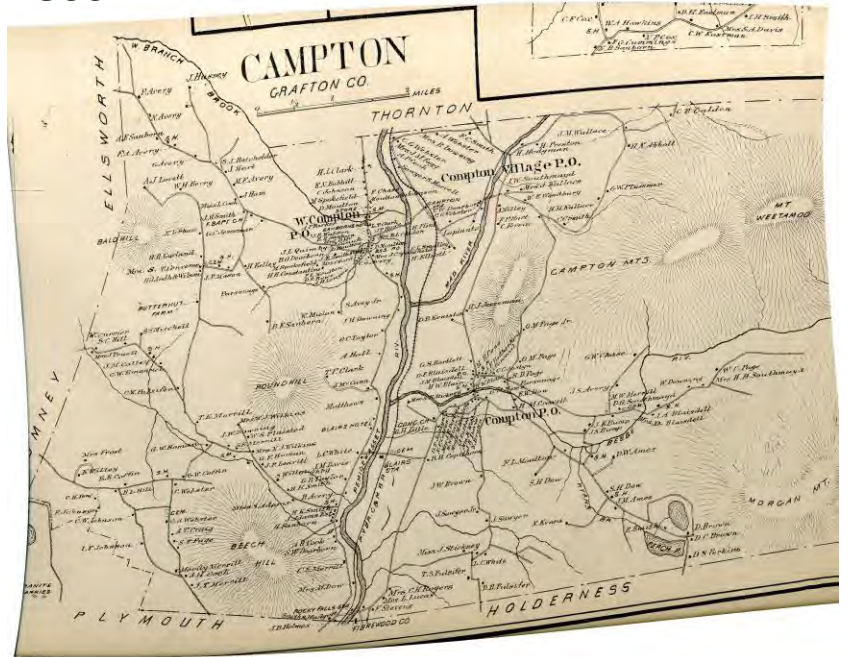
Walling's
1860 Map



Historical Maps - Grafton, NH.

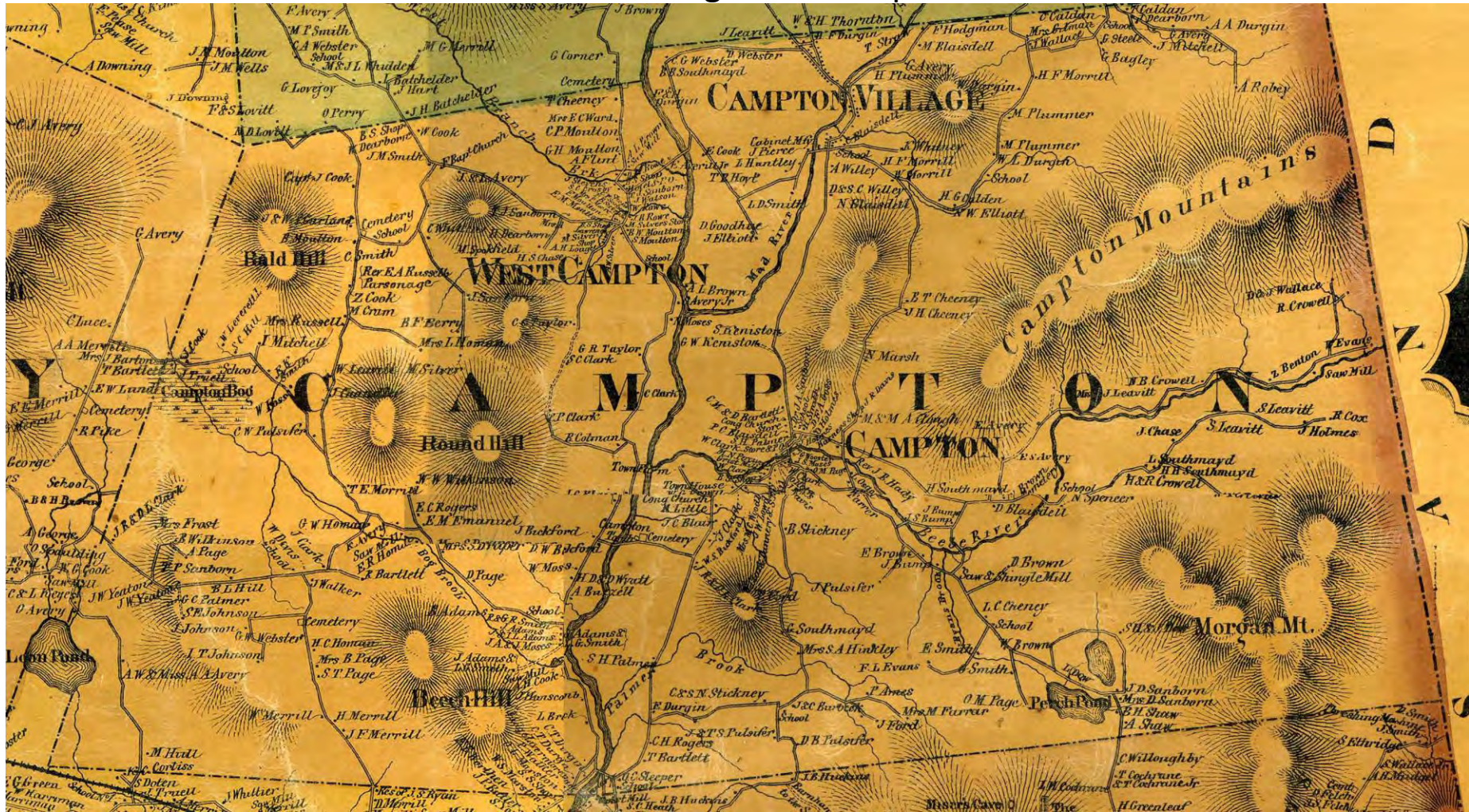


1860



1892

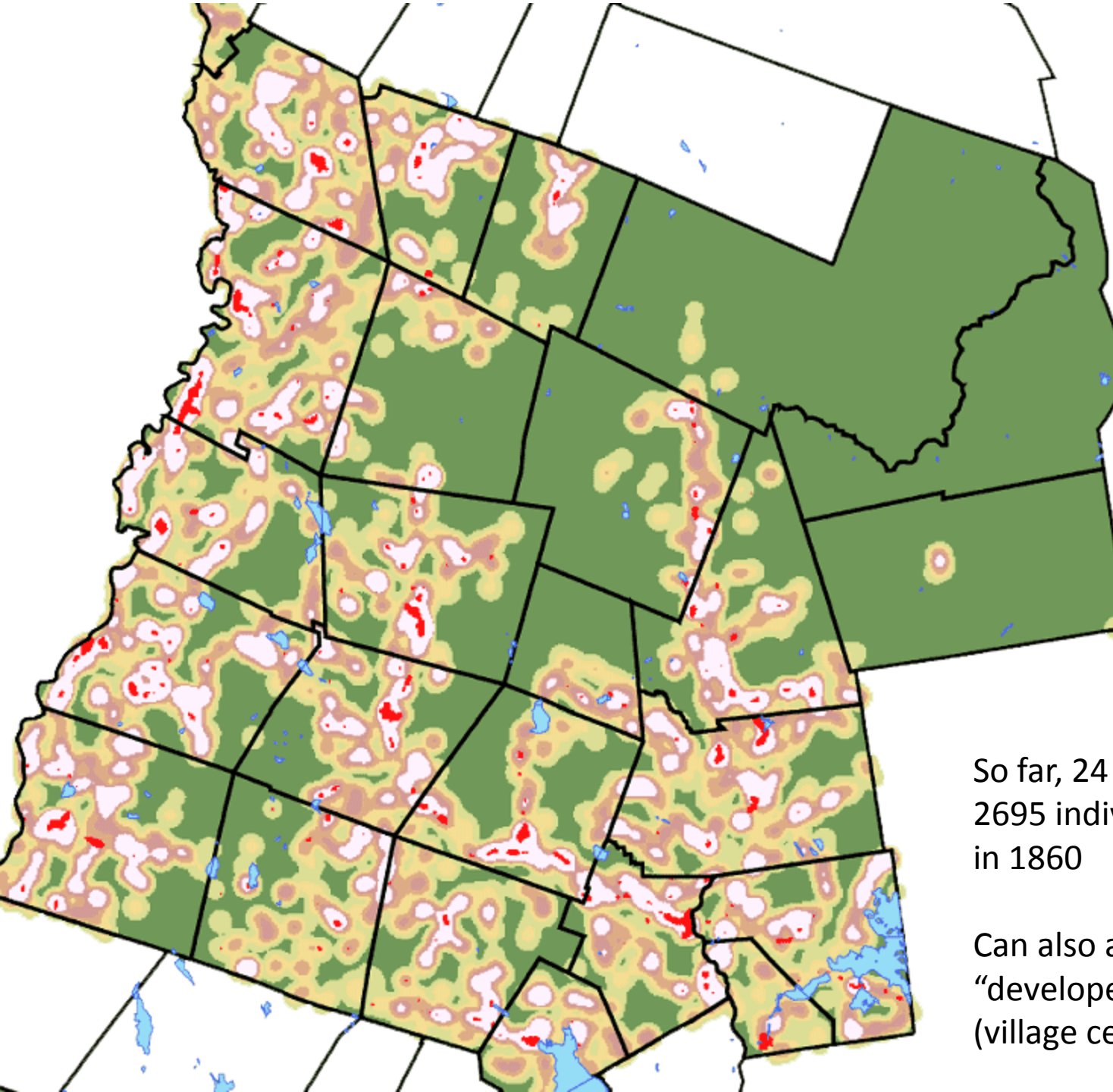
Walling's 1860 Map



SCHEDULE 4.—Productions of Agriculture in *Howland*
 enumerated by me, on the

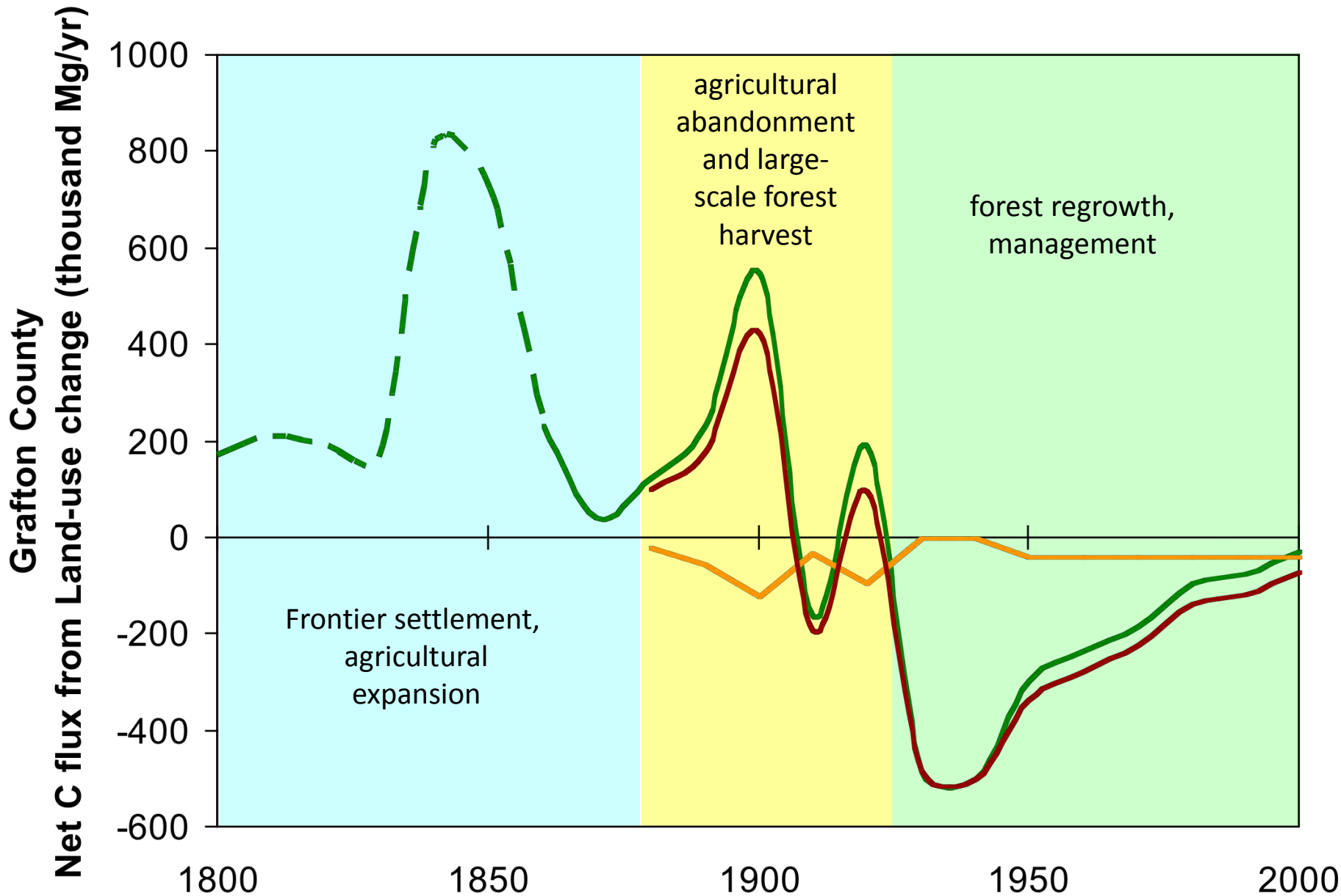
Name of Owner, Agent, or Manager of the Farm.	Acres of Land.		Cash value of Farm.	Value of farming Imple- ments and Machinery.	Live			
	Improved.	Unimproved.			Horses.	Asses and Mules.	Milk Cows.	Working Oxen.
1	2	3	4	5	6	7	8	9
<i>Horace Eaton</i>	70	25	1800	50			2	2
<i>E. Warner</i>	60	40	2000	40	1		2	
<i>Phineas Merrill</i>	60	40	2000	50	1		4	2
<i>Abel Parks</i>	75	40	2000	75	1		3	2
<i>Walter Tenny</i>	100	40	2500	100	1		4	4
<i>E. G. DeLano</i>	80	30	1500	75	2		4	
<i>William Mc Intire</i>	80	20	1500	100	3		3	2
<i>George Cotting</i>	20		1000	40	2		2	
<i>J. S. Dudley</i>	20		300	20	1		2	
<i>Amos Dudley</i>	60	15	1700	25	2		1	2
<i>G. H. Green</i>	40	20	900	40	1		1	
<i>William Tenny</i>	45	6	5000	80	2		3	
<i>Jonathan Burice</i>	100		6000	150	10		6	
<i>Chas. Bentone</i>	130	50	5000	500	3		2	6

- Agricultural Census from 1850-1880.
- Land value data from county records
- General census data aggregated by town.
- Would like to look at demographics and changes in property values in a spatial context.



So far, 24 towns linked
2695 individual farms
in 1860

Can also account for
“developed” land use
(village centers)



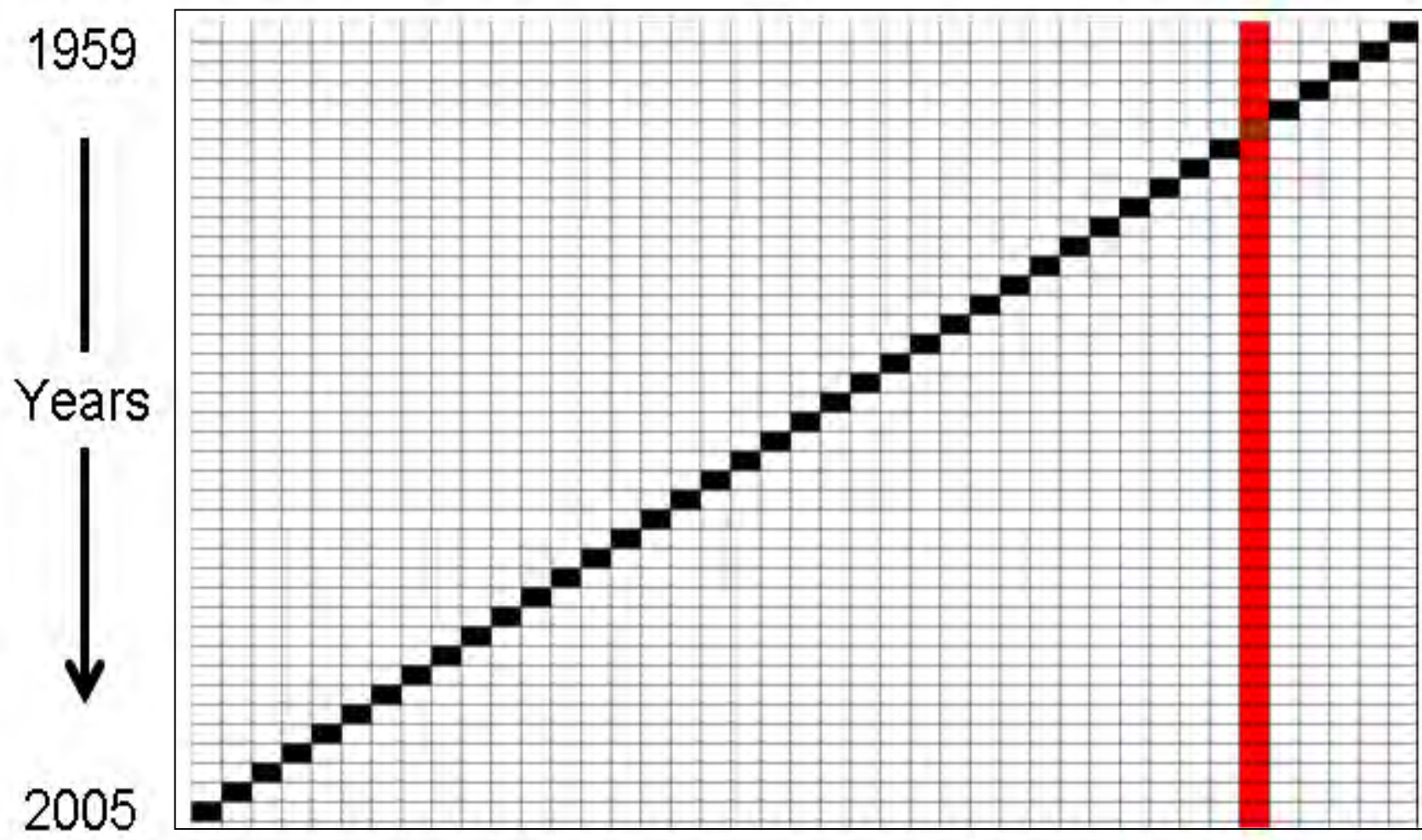


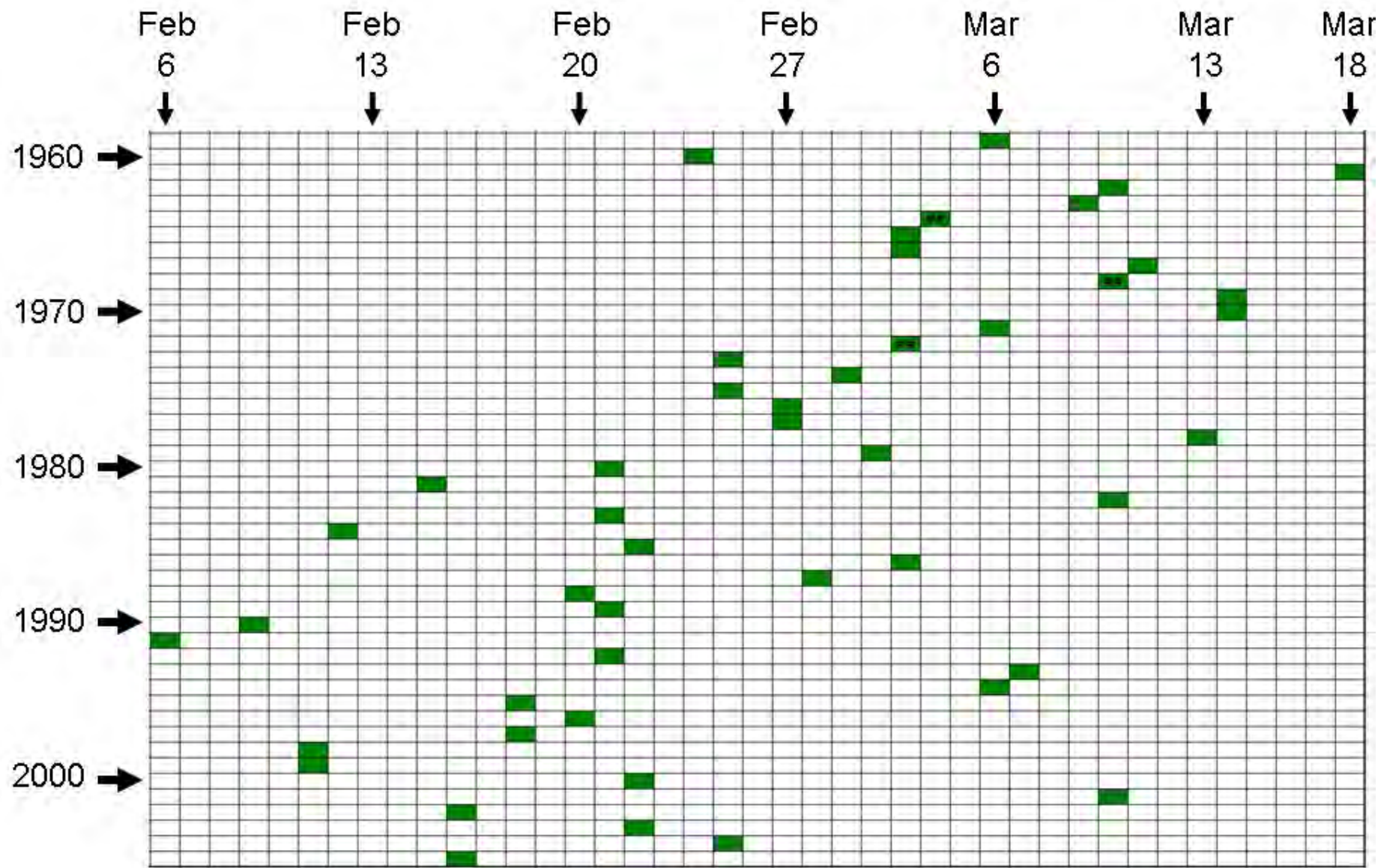


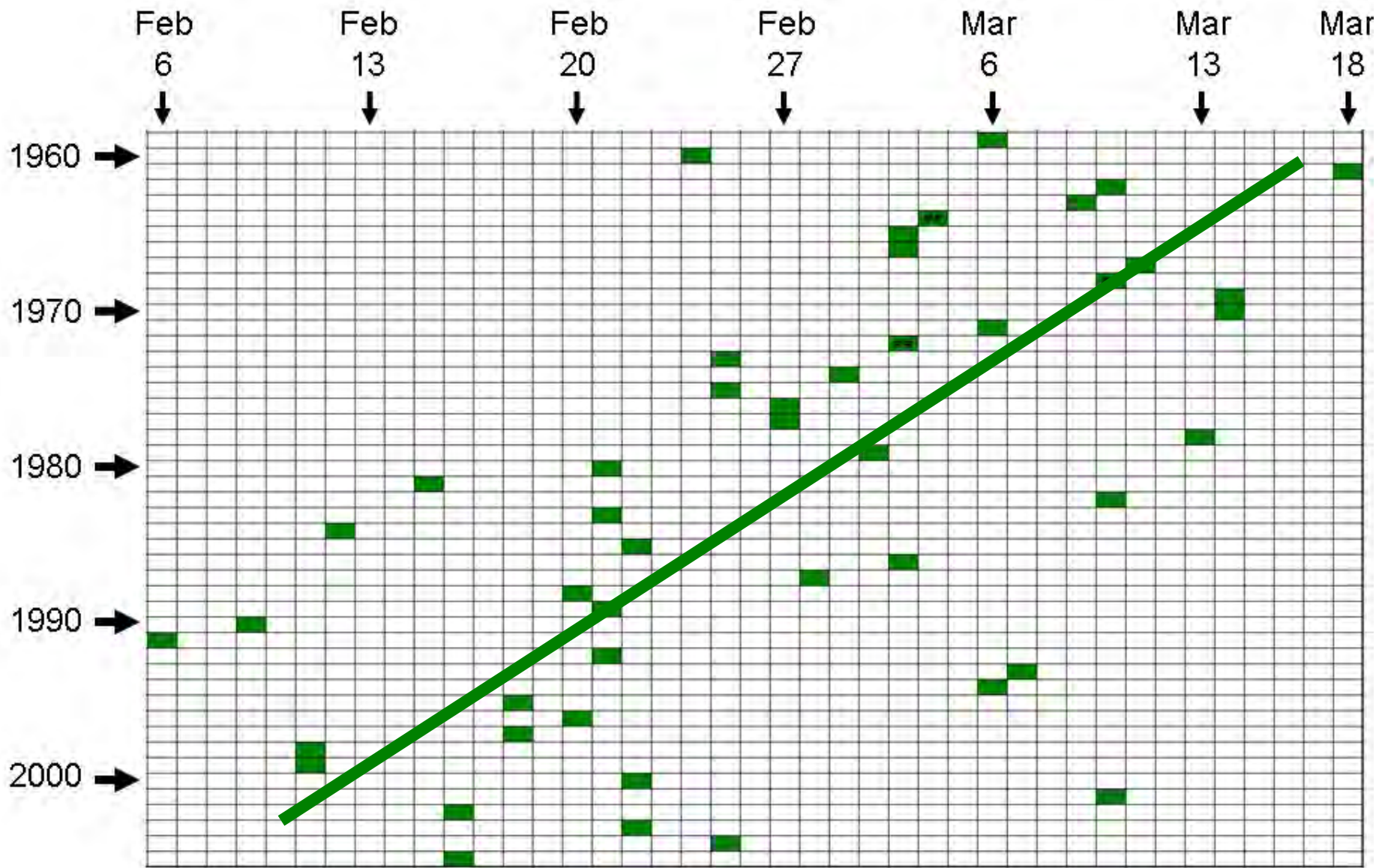
Team 1952 for Clark's Sugar House

Item	Quantity	Unit Price	Total
1. Sugar	1000	1.00	1000.00
2. Flour	500	0.50	250.00
3. Butter	200	0.75	150.00
4. Eggs	1000	0.10	100.00
5. Milk	500	0.20	100.00
6. Apples	1000	0.15	150.00
7. Oranges	500	0.30	150.00
8. Bananas	1000	0.10	100.00
9. Cakes	100	1.00	100.00
10. Cookies	200	0.50	100.00
11. Candy	100	1.00	100.00
12. Ice Cream	50	2.00	100.00
13. Soda	100	1.00	100.00
14. Paper	100	1.00	100.00
15. Labor	100	1.00	100.00
16. Fuel	100	1.00	100.00
17. Repairs	100	1.00	100.00
18. Insurance	100	1.00	100.00
19. Taxes	100	1.00	100.00
20. Miscellaneous	100	1.00	100.00
Total			10000.00

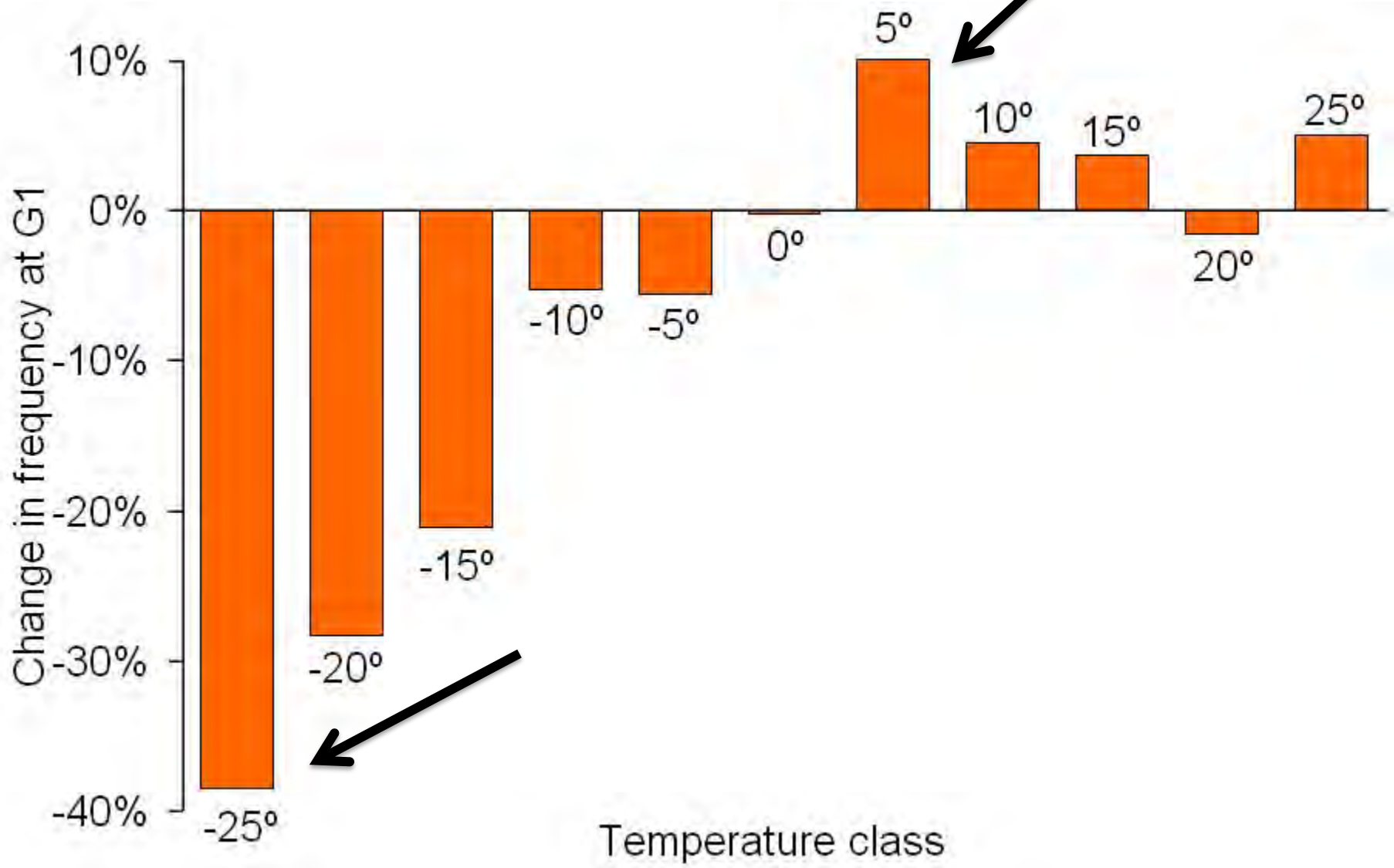
Feb 6 ← Days → Mar 18





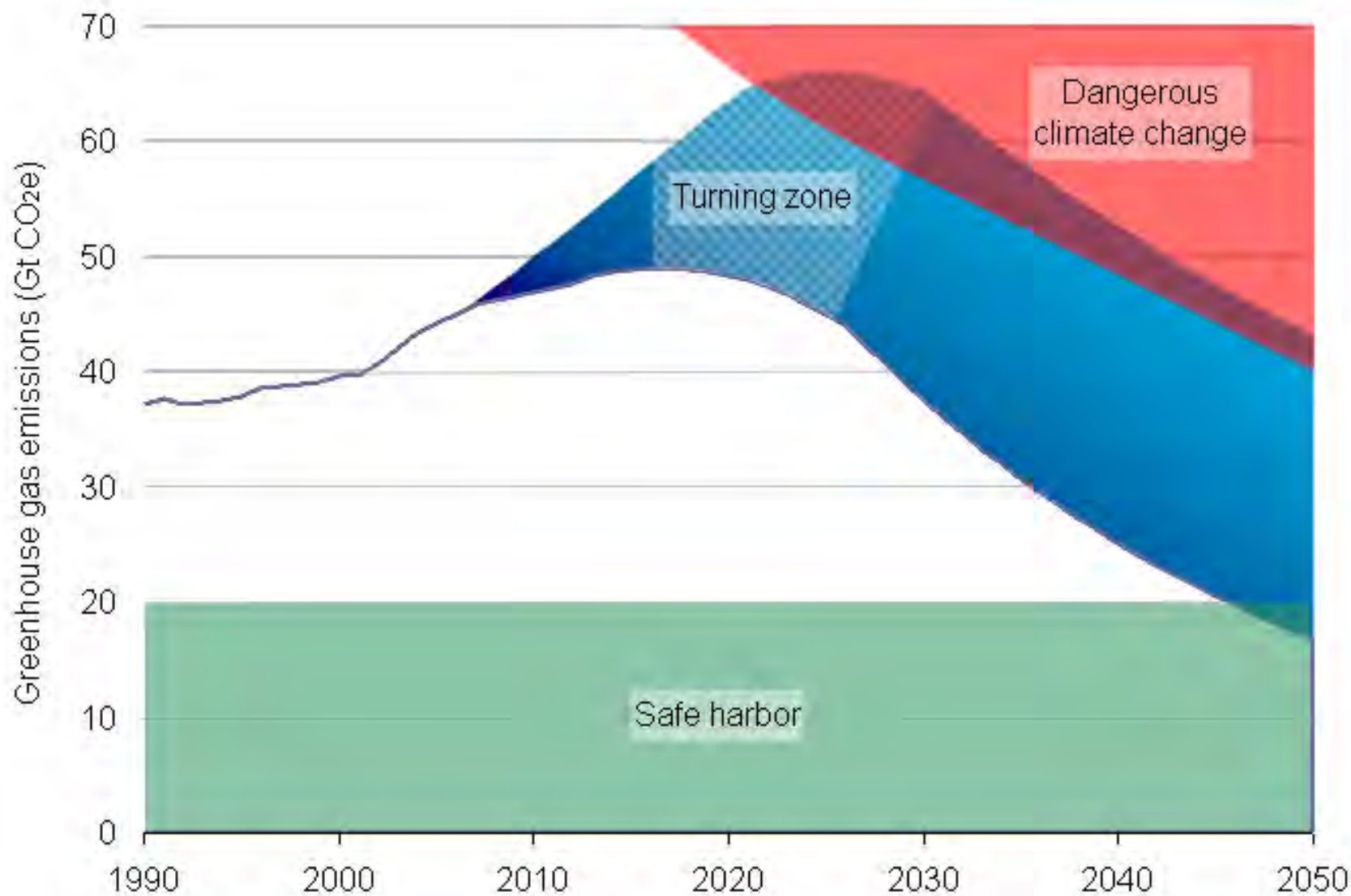


**Winters are less severe
and trees are dying**



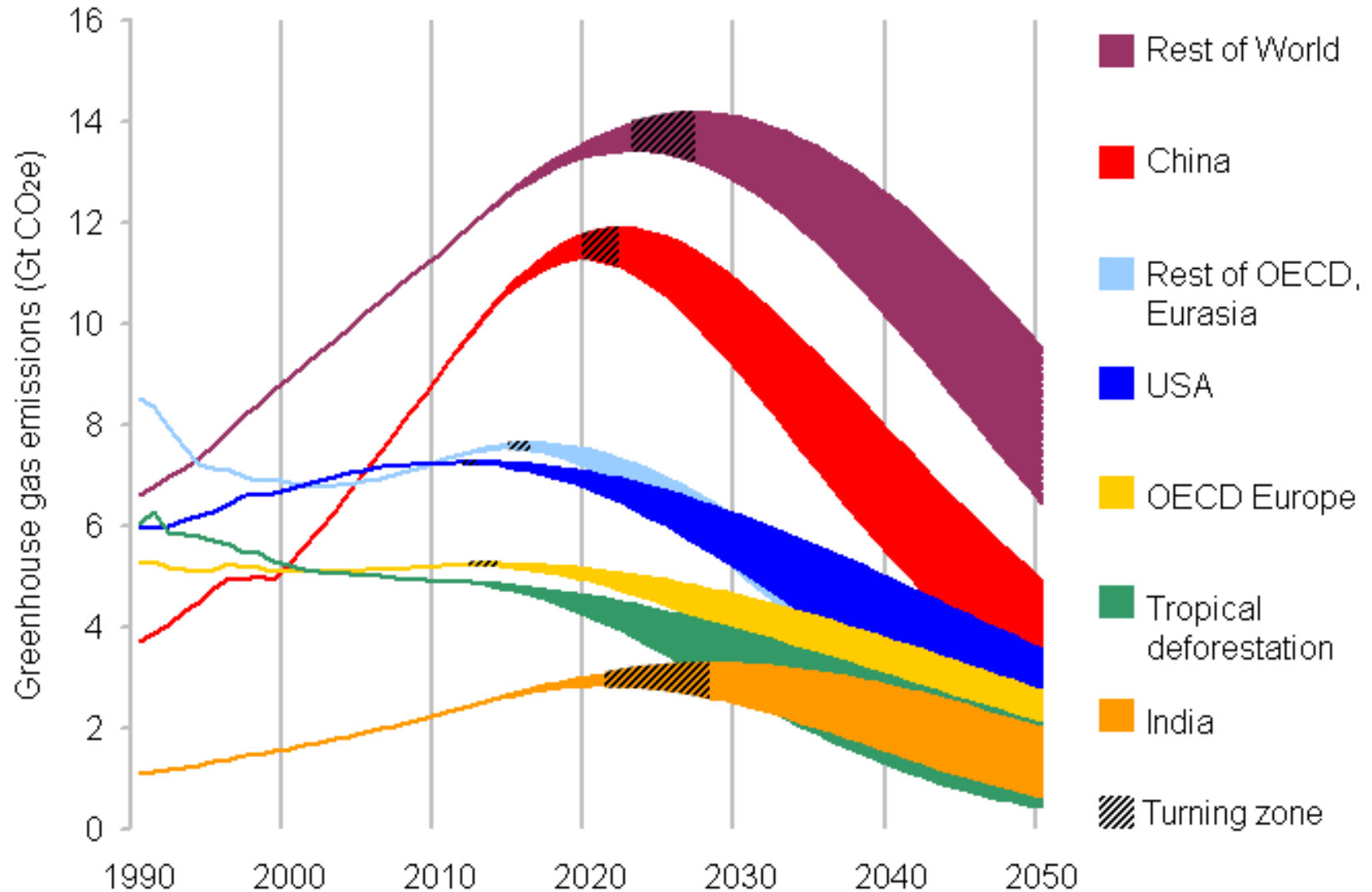
Charting the course to safe harbor

To avoid 2°C of warming, global emissions must peak by around 2020



Regional and national pathways to safe harbor

Steps to safety provide platform for a transition to global climate stability



Common Goals for Conservation²

- Long-term perspective > 100y
- Maintain a stable environment
- Reduce exposure to pollution

Vision for preserving our past while protecting our future

- **Create Ultra low energy consuming environments** – minimal energy/greenhouse gas emissions
- **Low ambient air pollution** – what is good for material preservation is good for people
- **Passive environments** – easiest to maintain are those with fewest moving parts



Mount Washington, NH

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That's Fit to Print"

The New York Times

VOL. CLVI . . . No. 53,812

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TUESDAY, JANUARY 2, 2007

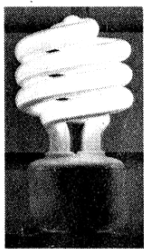
Wal-Mart Puts Some Muscle Behind Power-Sipping Bulbs

By MICHAEL BARBARO

As a way to cut energy use, it could not be simpler. Unscrew a light bulb that uses a lot of electricity and replace it with one that uses much less.

While it sounds like a promising idea, it turns out that the long-lasting, swirl-shaped light bulbs known as compact fluorescent lamps are to the nation's energy problem what vegetables are to its obesity epidemic: a near perfect answer, if only Americans could be persuaded to swallow them.

But now Wal-Mart Stores, the giant discount retailer, is determined to push them into at least 100 million homes. And its ambitions extend even further, spurred by a sweeping commitment from its chief executive, H. Lee Scott Jr., to reduce energy use across the country, a move that could also improve Wal-Mart's appeal to the more affluent consum-



ers the chain must win over to keep growing in the United States.

"The environment," Mr. Scott said, "is begging for the Wal-Mart business model."

It is the environmental movement's dream: America's biggest company, legendary for its salesmanship and influence with suppliers, encouraging 200 million shoppers to save energy.

For all its power in retailing, though, Wal-Mart is meeting plenty of resistance — from light-bulb makers, competitors and consumers. To help turn the tide, it is even reaching out to unlikely partners like Google, Home Depot and Hollywood.

A compact fluorescent has clear advantages over the widely used incandescent light — it uses 75 percent less electricity, lasts 10 times longer, produces 450 pounds fewer greenhouse gases from power plants and saves consumers \$30 over the life of each bulb. But it is eight times as ex-

Wal-Mart Puts Muscle Behind a Power-Sipper

Continued From Page A1

persive as a traditional bulb, gives off a harsher light and has a peculiar appearance.

As a result, the bulbs have languished on store shelves for a quarter century; only 6 percent of households use the bulbs today.

Which is what makes Wal-Mart's goal so wildly ambitious. If it succeeds in selling 100 million compact fluorescent bulbs a year by 2008, total sales in the United States would increase by 50 percent, saving Americans \$3 billion in electricity costs and avoiding the need to build additional power plants for the equivalent of 450,000 new homes.

That would send shockwaves — some intended, others not — across the lighting industry. Because compact fluorescent bulbs last up to eight years, giant manufacturers like General Electric and Osram Sylvania, would sell far fewer lights. Because the bulbs are made in Asia, some American manufacturing jobs could be lost. And because the bulbs contain mercury, there is a risk of pollution when millions of consumers throw them away.

Michael B. Petras, vice president of lighting at G.E., concedes that "the economics are better with incandescent bulbs."

All that has only spurred Wal-Mart to redouble its efforts — and, in typical fashion, it is asking those who may be hurt by the change to help achieve it.

During an extraordinary meeting in Las Vegas in early October, competing bulb makers, academics, environmentalists and government officials met to ponder, at times uncomfortably, how Wal-Mart could sell more of the fluorescent lights.

The proposals discussed at what Wal-Mart dubbed the "light bulb summit" ranged from the practical (advertise the bulbs on the back of a Coke 12-pack) to the quixotic (create a tax on incandescent bulbs to make them more expensive).

Selling 100 million bulbs "is not a slam dunk by any stretch of the imagination," Stephen Goldmacher, an executive at Royal Philips, the Dutch company that is one of the world's largest light-bulb makers, told the group. "If this were easy, it would have happened already."

The attendees did not need to look far for evidence. Wal-Mart had asked the owners of the Mirage Hotel and Casino, where the conference was held, to commit to using the energy-saving bulbs in its guest rooms in time for the meeting. The hotel politely declined.

Pushing a Bright Idea

Wal-Mart is promoting consumer use of compact fluorescent light bulbs over incandescents. Here's how the bulbs compare.

	INCANDESCENT	FLUORESCENT
Energy used (watts)	60	13
Light output (lumens)	850	800
Average cost (dollars)	\$0.25 to 0.60	\$2 to 4
Annual savings (dollars)	\$0	\$8
Annual carbon savings (pounds)	0	roughly 100
Life (hours)	1,000	5,000 to 10,000
Mercury in the bulb (milligrams)	none	4
Mercury emissions (milligrams)	10	2.4
Number of bulbs sold annually*	1.5 to 2 billion	130 to 150 million

*Includes all wattages

Sources: Environmental Protection Agency, Environmental Defense, Itron, Philips The New York Times

THE ENERGY CHALLENGE

From Product to Cause

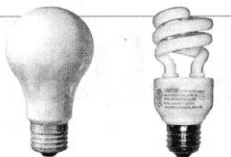
It is not alone. Compact fluorescent bulbs, introduced in the United States with much fanfare in 1979 by Philips just as the nation's second energy crisis of the decade was getting under way, have never captured the public imagination.

The new bulbs — lighted by sparking an efficient chemical reaction, rather than heating a metal filament — were ungainly, took several seconds to light up and often did not fit into traditional light fixtures.

Since then, refinements have made them far more convenient to use, reducing their size and price as well. But Wal-Mart sold only 40 million in 2005, compared with about 350 million incandescent bulbs, according to people briefed on the figures.

And it would have stayed that way unless Wal-Mart decided to go green. More than a year ago, Mr. Scott, the company's chief executive, began reaching out to some of environmental groups, telling them that Wal-Mart, long regarded as an environmental offender, wanted to become a leader on issues like fuel efficiency and greenhouse gas emissions.

Mr. Scott viewed such a move as a way to use Wal-Mart's influence to improve the environment, cut costs and, of course, burnish the company's bruised image. In September 2005, Mr. Scott and Andy Ruben, Wal-



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Sources: Environmental Protection Agency, Environmental Defense, Itron, Philips The New York Times

Mart's vice president for strategy and sustainability, drove 6,000 feet to the Mount Washington Observatory in New Hampshire with Steve Hamburg, an environmental studies professor at Brown University, and Fred Krupp, the president of the advocacy group Environmental Defense.

At the summit, where scientists measure climate change 24 hours a day, the men discussed global warming, acid rain, the hole in the ozone layer and what Wal-Mart could do about them.

"You need to look at what is being sold on the shelf," Mr. Hamburg recalled telling Mr. Scott over a dinner of turkey and mashed potatoes. He began talking excitedly about compact fluorescent bulbs. "Very few products," he said, "are such a clear winner" for consumers and the environment.

Soon after returning from the trip, Wal-Mart publicly embraced the bulbs with the zealotry of a convert. In meetings with suppliers, buyers for the chain laid out their plans: lower prices, expanding the shelf space dedicated to them and heavily promoting the technology.

Light-bulb manufacturers, who sell millions of incandescent lights at Wal-Mart, immediately expressed reservations. In a December 2005 meeting with executives from General Electric, Wal-Mart's largest bulb supplier, "the message from G.E. was, 'Don't go too fast. We have all these plants that produce traditional bulbs,'" said one person in-

Articles in this series are examining the ways in which the world is, and is not, moving toward a more energy-efficient, environmentally benign future. Previous articles are at nytimes.com/energychallenge.
ONLINE: A video discussion with more detail about energy-efficient light bulbs: nytimes.com/business

gest challenges rest. In the fall, the company began reaching out to competing retailers, Internet companies and even filmmakers.

The goal was to turn its sales campaign into a broader cultural movement.

One proposal, headed by Lawrence Bender, who produced Al Gore's 2006 documentary, "An Inconvenient Truth," is to create a Web site that would track sales of compact fluorescent bulbs at major retailers like Walgreen's and Target. The result would be a real-time map, with data collected by a third party, showing how much Americans have saved by using the energy-efficient bulbs.

Mr. Ruben said such a map "helps consumers see this as something bigger than buying a bulb."

At the same time, Google and Yahoo are in talks with Wal-Mart about the negotiations.

The response from the Wal-Mart buyer was blunt, this person said. "We are going there," the buyer said. "You decide if you are coming with us."

In the end, as Wal-Mart suppliers generally do, the bulb makers decided to come with the company.

Philips, despite protests from packaging designers, agreed to change the name of its compact fluorescent bulbs from "Marathon" to "energy saver." To keep up with swelling orders from the chain, Osram Sylvania took to flying entire plane loads of compact fluorescent bulbs from Asia to the United States.

"When Wal-Mart sets its mind to something with a narrow objective like that, they are going to make it happen," said Jim Jubb, vice president for consumer product sales at Sylvania.

At the same time that it pressured suppliers, Wal-Mart began testing ways to better market the bulbs. In the past, Wal-Mart had sold them on the bottom shelf of the lighting aisle, so that shoppers had to bend down. In tests that started in February, it gave the lights prime real estate at eye level. Sales soared.

To show customers how versatile the bulbs could be, Wal-Mart began displaying them inside the lamps and hanging fans for sale in its stores. Sales nudged up further.

To explain the benefits of the energy-efficient bulbs, the retailer placed an education display case at the end of the aisle, where it occupied four feet of valuable selling space — an extravagance at Wal-Mart. Sales climbed even higher.

In August 2006, the chain sold 3.94 million, nearly twice the 1.65 million it sold in August 2005, according to a person briefed on the numbers.

But to reach 100 million, Wal-Mart has to do much more — and that, executives concede, is where the biggest challenges rest. In the fall, the