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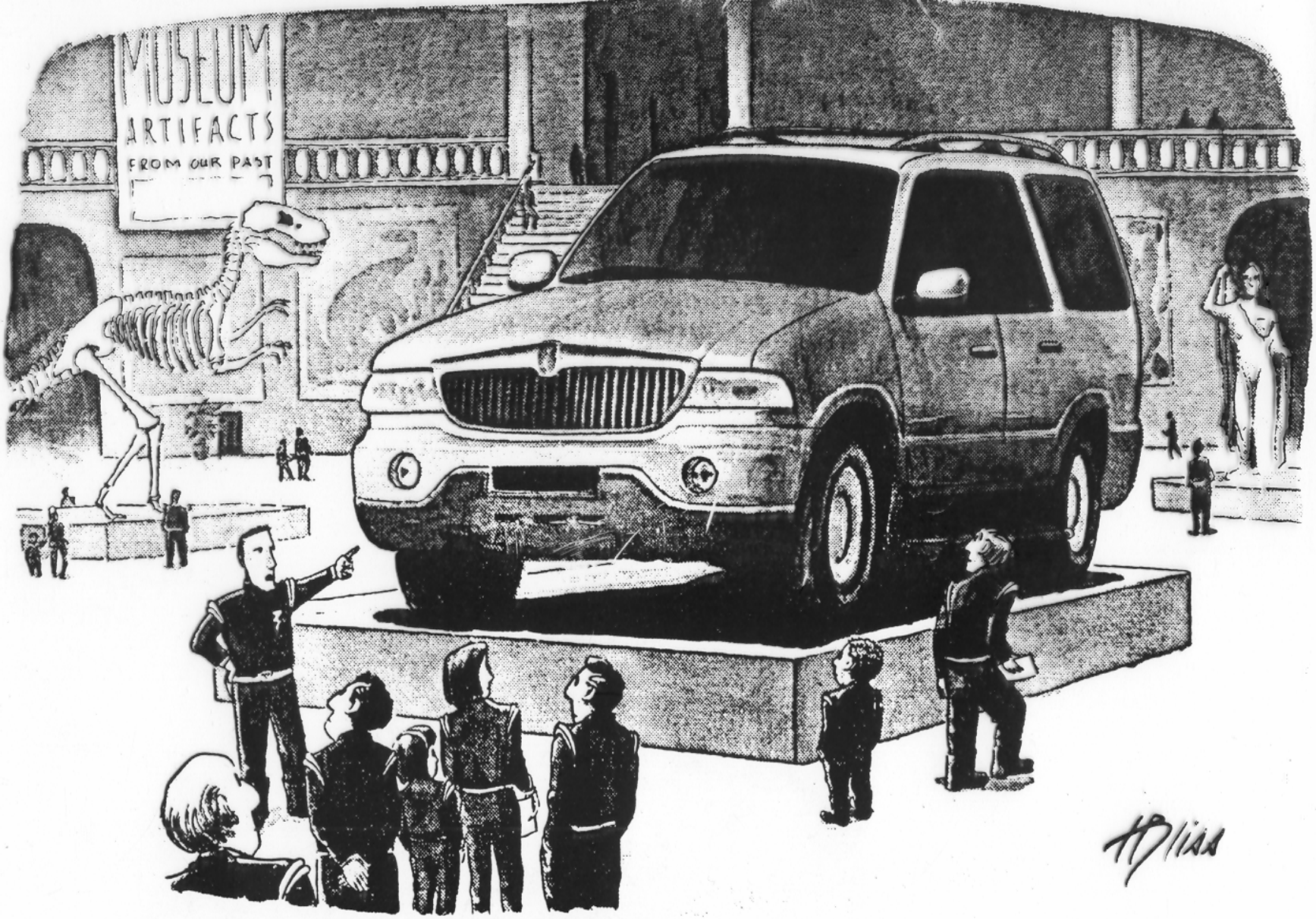
Department of Biological Sciences
and
Center for Environmental Science and Policy
Stanford University

Can We Define—Let Alone Solve--"Dangerous" Climate Change?

Preparing For Climate Disruption
Seattle, WA
27 October 2005

[for more details, see: http://stephenschneider.stanford.edu/]
{also: climatechange.net}



"We're not certain why they disappeared, but archeologists speculate that it may have had something to do with their size."

Large Vehicles Are the Solution, Not the Problem

By Sam Kazman

If you listen to journalists, you'd think sport-utility vehicles were more dangerous than Saddam Hussein. SUVs supposedly deplete the Earth's resources, poison its atmosphere and encourage rude driving. Worst of all, because of their size they allegedly pose a grave collision threat to just about anyone who ventures outdoors. According to a recent New York Times report, the worst safety hazard is yet to come—once these "expensive toys" depreciate and are sold by the "responsible family people" who now drive them, they'll be bought by teenagers who'll handle them even more recklessly.

These threats have been wildly overstated. And the solution proposed by many SUV critics, raising the federal fuel economy standards, would mean expanding a regulatory program that has already caused thousands of traffic deaths.

The federal Corporate Average Fuel Economy standards, enacted in the wake of the mid-1970s oil shocks, require each auto maker's annual output of new cars to meet a set fuel economy level. The current passenger-car CAFE standard is 27.5 miles per gallon; for light trucks, the standard is a more lenient 20.7 mpg.

The easiest way for car makers to meet ever-rising CAFE standards has been through continued car downsizing. As the National Highway Traffic Safety Administration itself noted, "weight reduction is probably the most powerful technique for improving fuel economy. . . . Each 10 percent reduction in weight improves the fuel economy of a new vehicle design by approximately 8 percent." The result was a CAFE-driven downsizing of approximately 500 pounds per car.

Smaller cars, however, are less crashworthy than similarly equipped large cars in practically every type of accident. According to a 1989 Harvard-Brookings study, CAFE-induced downsizing has increased car occupant fatalities by between 14% and 27%; that translates to between 2,000 and 4,000 extra deaths a year.

You'd think that NHTSA, an agency whose middle name is safety, would have brought this issue to the forefront of public attention. But instead NHTSA has repeatedly claimed that CAFE has no safety effect. In a 1992 court case brought by the Competitive Enterprise Institute and Consumer Alert, a panel of federal appeals judges blasted NHTSA's position as "fudged analysis," "statistical legerdemain" and "bureaucratic mumbo-jumbo."

You're safer in a sport utility vehicle.

If CAFE had been a privately produced product, it would long ago have been recalled as defective and its producer, NHTSA, jailed for the coverup. But because CAFE is a product of Washington rather than Detroit, it remains in place; worse yet, it threatens to expand in the face of the SUV "threat."

The overblown nature of that threat is demonstrated by a study issued last month by the Insurance Institute for Highway Safety. Journalists widely reported the study as re-emphasizing the need for action against SUVs, but its findings indicate otherwise. What the institute found was that collisions between cars and SUVs account for only 4% of car occupant fatalities.

Cars are most vulnerable in side impact collisions. According to the institute, in fatal collisions involving cars that are hit on the side by SUVs, the relative risk that the death will be in the car rather than the SUV is an apparently lopsided 27-to-1. But when this relative risk is broken down by car weight categories, it turns out that car-SUV mismatches are frequently outweighed by other common collision disparities. For example, the occupants of a light car struck in the side by a heavy car face a greater relative risk of death than when a heavy car is side-impacted by an SUV. That is, there is a greater mismatch between light cars and heavy cars than there is between heavy cars and SUVs.

What this means is that upsizing the car fleet may well be the most important step we could take toward improving safety. But upsizing, of course, is what CAFE currently restricts.

The same conclusion emerges from a 1997 NHTSA study, which was similarly characterized as indicting SUVs but which turns out, on closer analysis, to indict CAFE. A NHTSA press release touted the study's finding that a 100-pound decrease in SUV weight would prevent 40 fatalities per year, most of them in cars colliding with SUVs. But according to the study itself, this conclusion was not statistically significant; there might even be a net loss of life from such downsizing, and on balance the overall effect would be "negligible." More important, those minimal effects paled in comparison to the effects of a 100-pound *increase* in passenger car weight—a saving of over 300 lives a year. And the effect of this passenger car upsizing was found to be statistically significant, unlike the SUV downsizing.

Upsizing, however, would entail relaxing CAFE rather than tightening it—a move that would be totally alien to this administration and to its environmentalist supporters. The Sierra Club, for example, claims that higher CAFE standards would be "the biggest single step to curbing global warming." In their 1992 campaign book, Bill Clinton and Al Gore recommended raising CAFE to 40 mpg by 2000—a level whose potential safety consequences add more than a little irony to the book's title, "Putting People First."

SUV critics argue, to use Consumer Reports' words, that "most people who buy an SUV don't need one." But what one person doesn't need is largely a matter of another person's opinion. In the early 1800s the Duke of Wellington complained that the new railroads would "only encourage the common people to move about needlessly." Today the elitist view is that the masses still move about needlessly, only now they're doing it with four-wheel drive.

SUV owners have perfectly good reasons for their vehicle choices. Even Consumer Reports praises their "roomy interiors, commanding view of the road, and go-anywhere ability." The fact that NHTSA has trained its sights on SUVs hasn't kept its administrator, Ricardo Martinez, out of one. He puts his family in a Ford Explorer, though he declares that he bought it for safety, to distinguish himself from "some teenager" trying "to be cool." Too bad his regulatory approach doesn't do much for other people's safety.

In fact, much of the SUVs' recent popularity stems from CAFE itself. CAFE's restrictions took their greatest toll on large cars and station wagons. As economist Paul Godek pointed out in a study published last fall, light trucks were the only real alternative for consumers concerned about safety and seating capacity. In effect, he concludes, most of the weight forced off the passenger car fleet by CAFE has reappeared in the light truck fleet.

So the real problem is CAFE, not SUVs. The next time you hear the term SUV, remember: The "S" might as well stand for scapegoat.

Mr. Kazman is general counsel of the Competitive Enterprise Institute in Washington.

March 12, 1998

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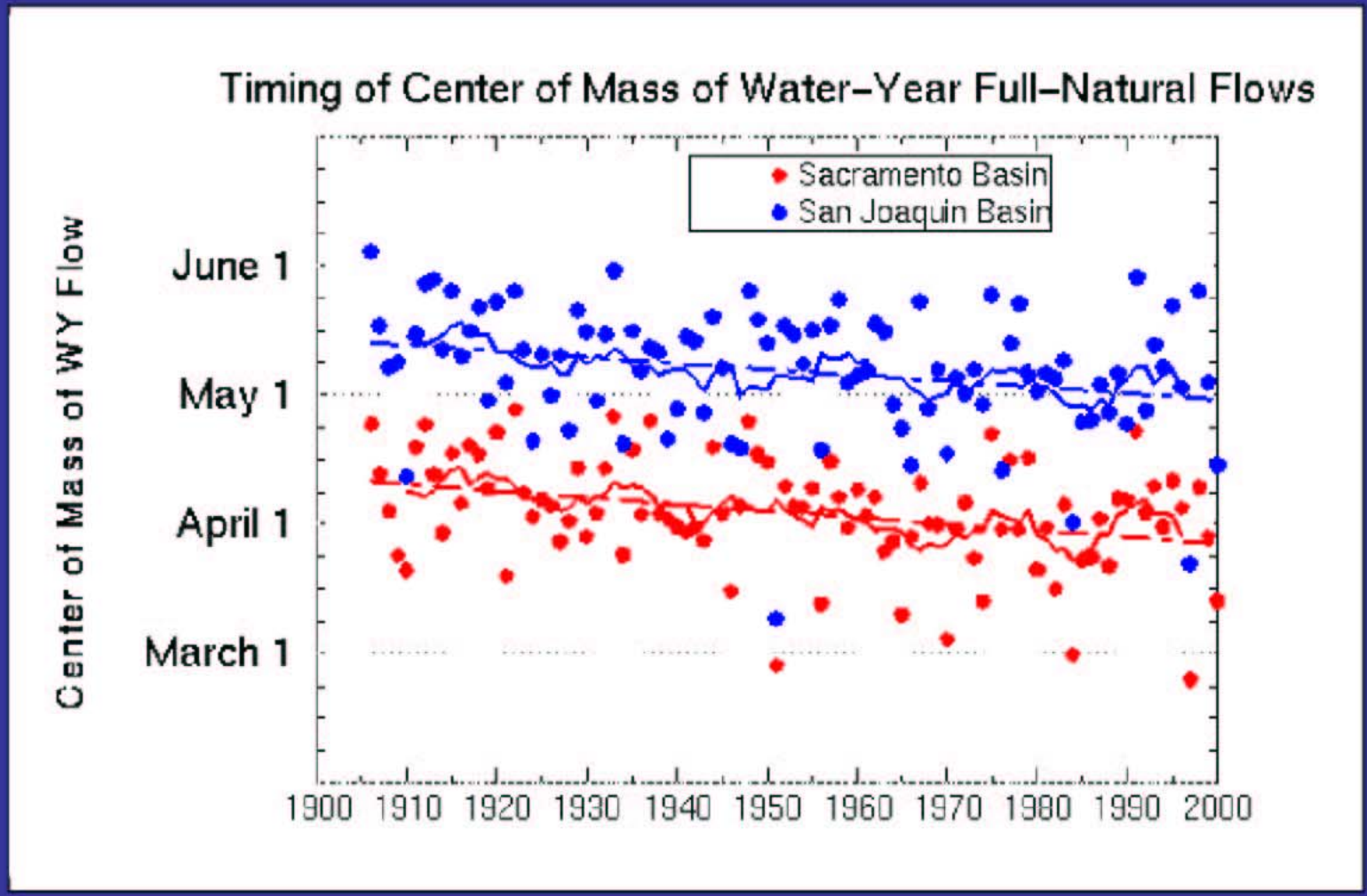
“The Words of the prophets are written on the…?”


MELTING
DOES WELL AT THE POLES.
THE NEW H2.
HUMMER
LIKE NOTHING ELSE.
VIACOM


Anderson
SUPERSTORE
ANDERSON


FOR
CALIFORNIA'S
FUTURE

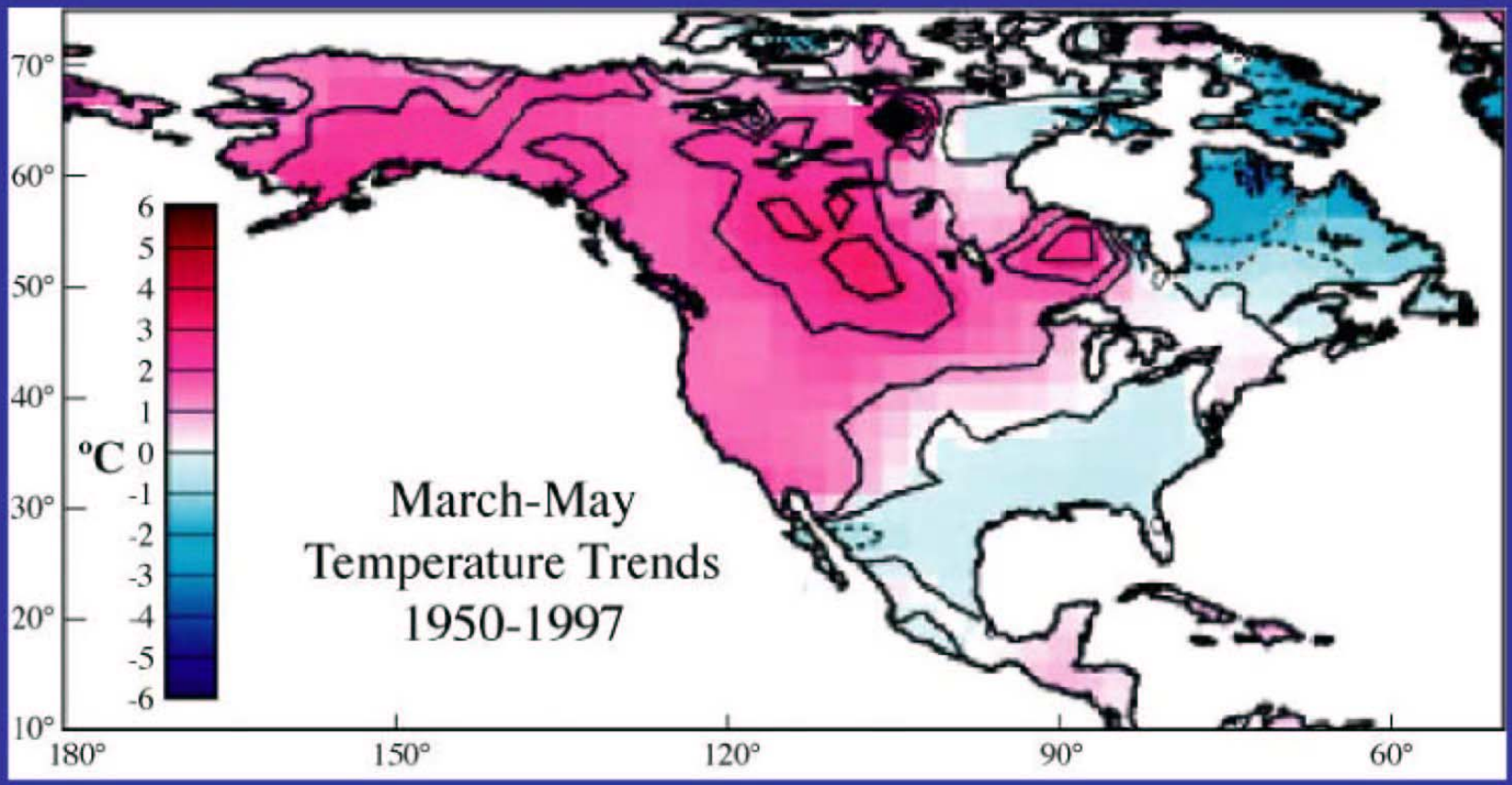
In California, this trend is widespread in the Sierra Nevada, and has yielded flows that are about 2 weeks earlier now.



USGS

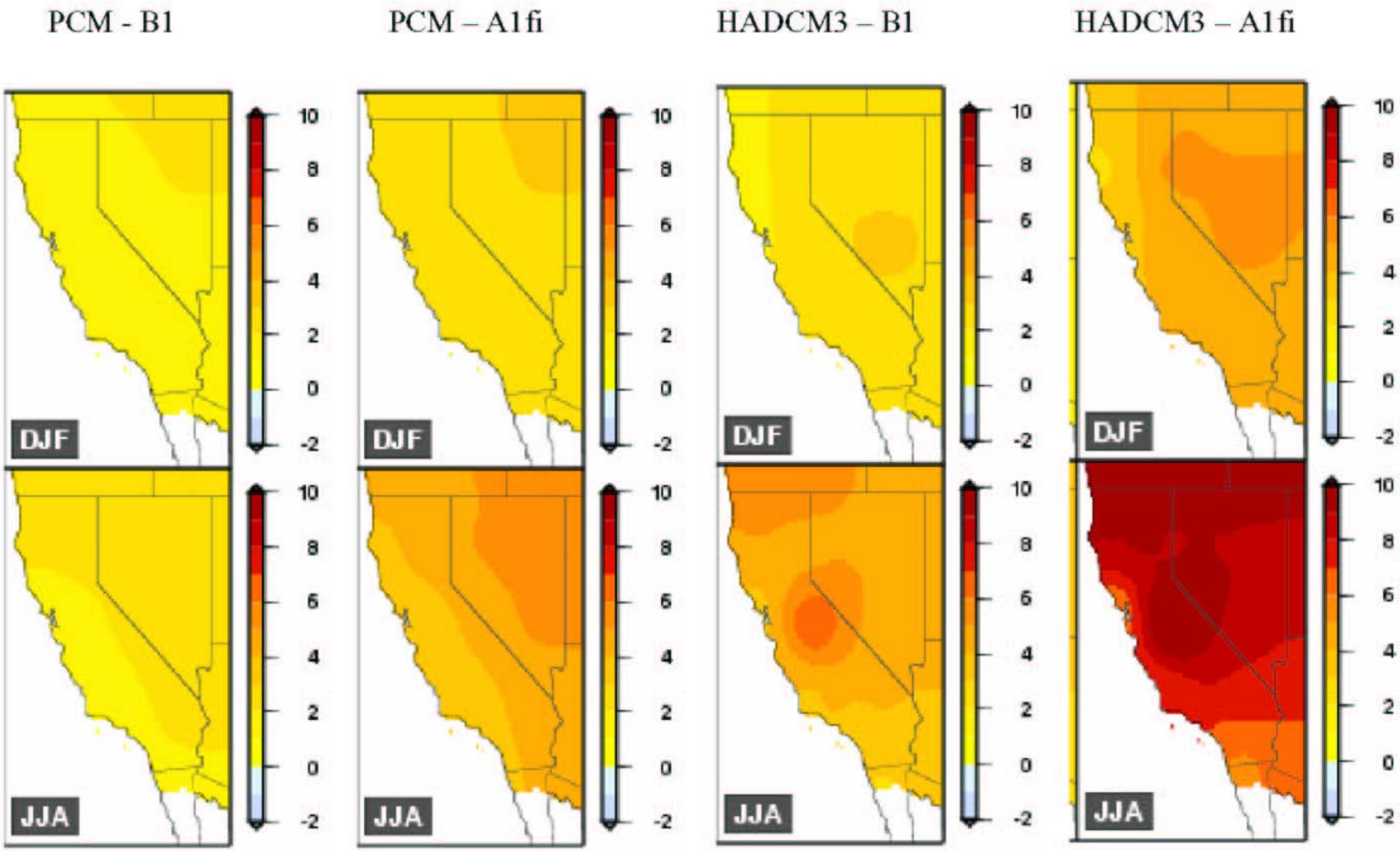
Roos, 1989, 1991; Dettinger and Cayan, 1995

Not surprisingly, these timing and snowpack changes are attributable to long-term winter-spring warming trends across the West.



Cayan et al., 2001

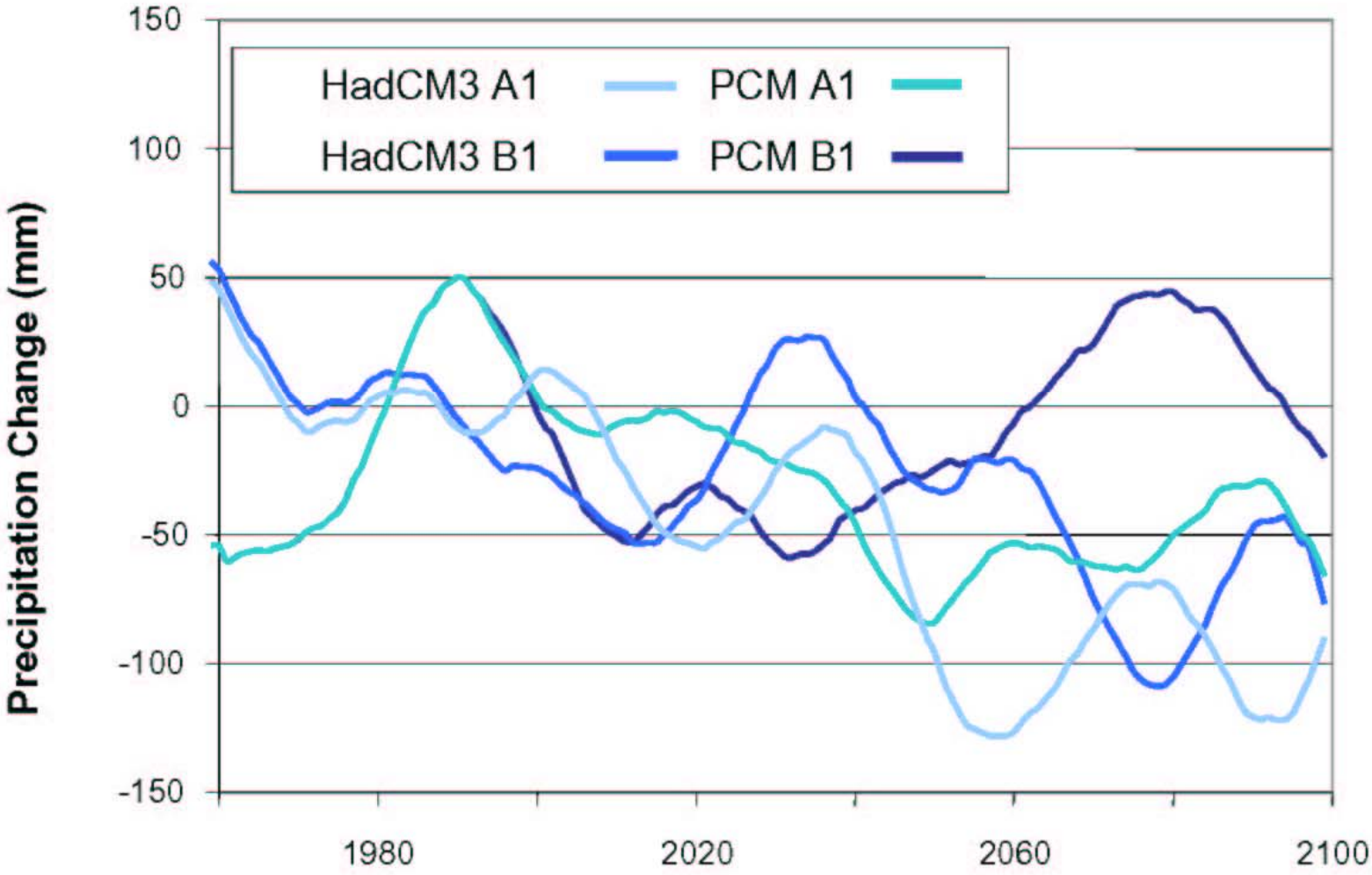
California warming by 2070-2100



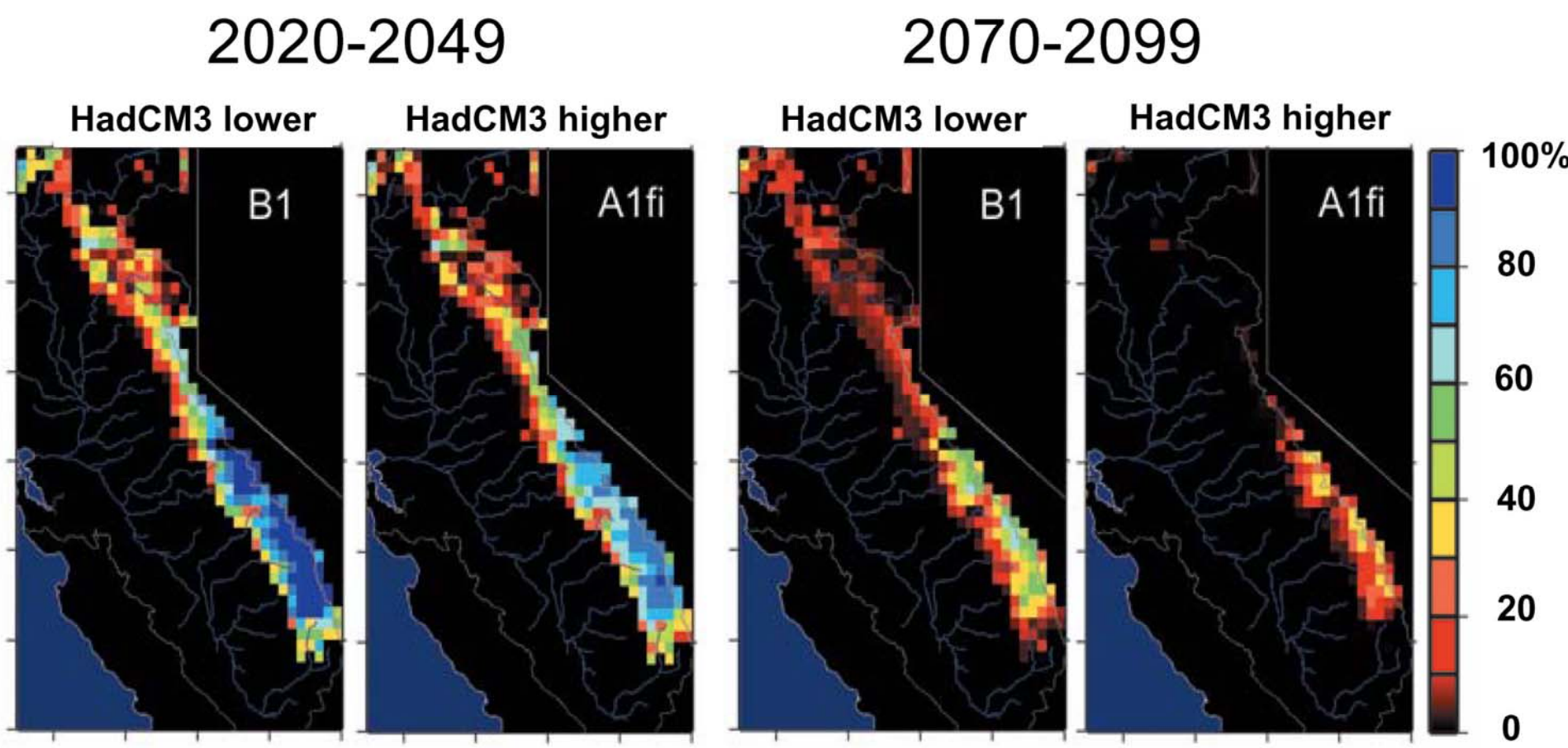
Hayhoe et al. PNAS 2004

Precipitation Projections

Statewide, Winter



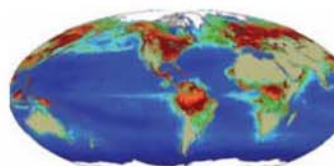
Snowpack (April 1) decreases to 11% of current by end of century under high emissions



% of current snowpack remaining

Some other impacts on water supply
(not yet explored with scenarios)

- higher sea level: effects on sea water intrusion into Delta and coastal aquifers.
- evaporation from surface storage.
- risk of wildfires in watershed areas.
- risk of groundwater overdraft due to more frequent dry spells.
- Colorado River.

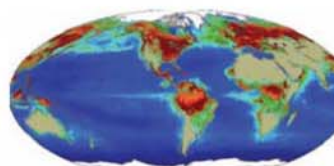


Decreasing wine grape quality

	Current conditions	Lower emissions B1		Higher emissions A1FI	
		PCM	HADCM3	PCM	HADCM3
Wine country	Optimal (mid)	Impaired	Marginal	Impaired	Impaired
Cool coastal	Optimal (low)	Optimal (mid)	Optimal (mid-high)	Optimal (mid-high)	Impaired
Northern Central Valley	Marginal	Impaired	Impaired	Impaired	Impaired

Wine Country (Sonoma, Napa Counties)
Cool Coastal (Mendocino, Monterey Counties)
Northern Central Valley (San Joaquin, Sacramento Counties)

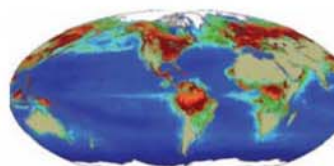
Based on approach of Gladstones, 1992. *Viticulture and Environment.*

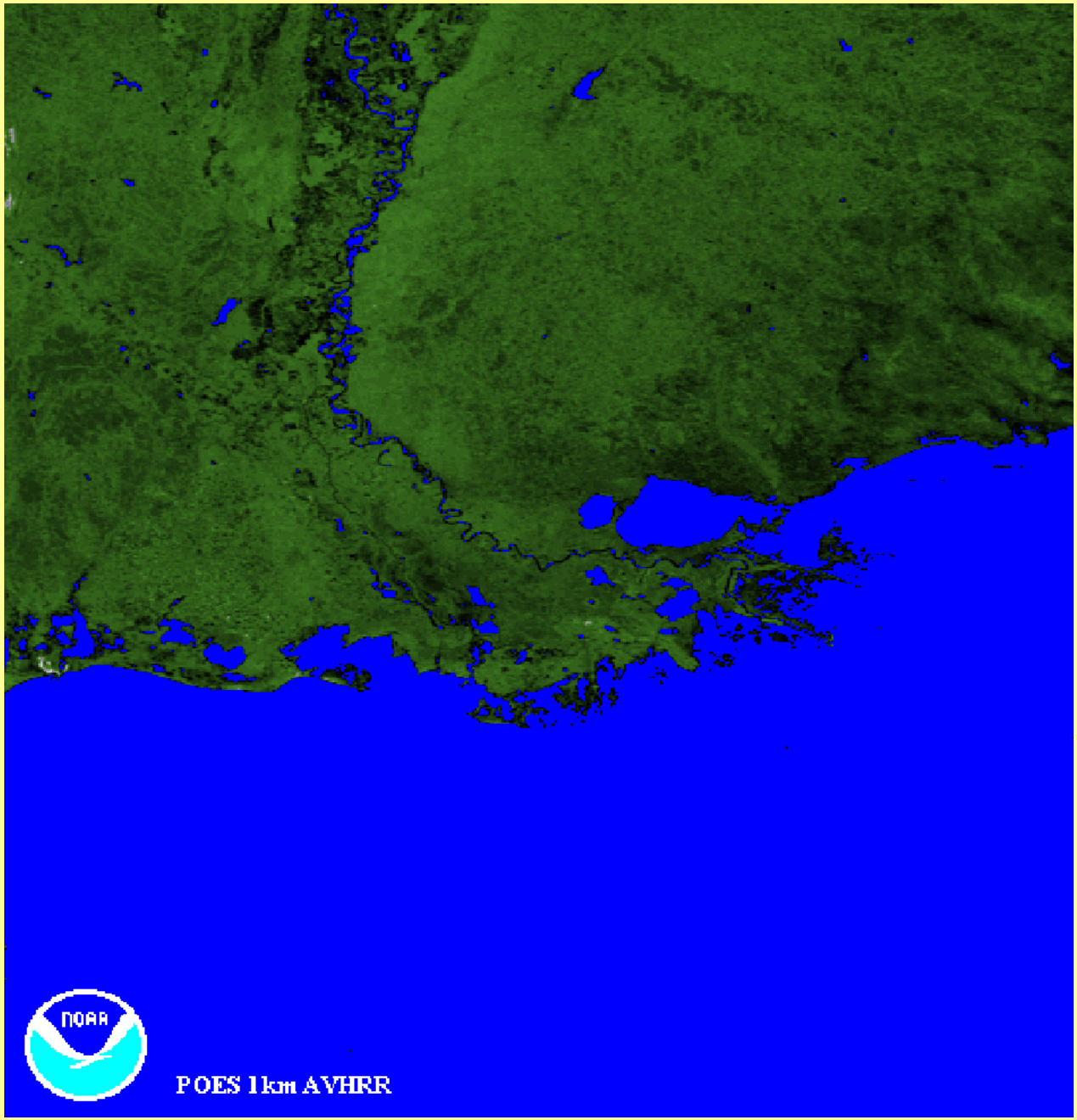


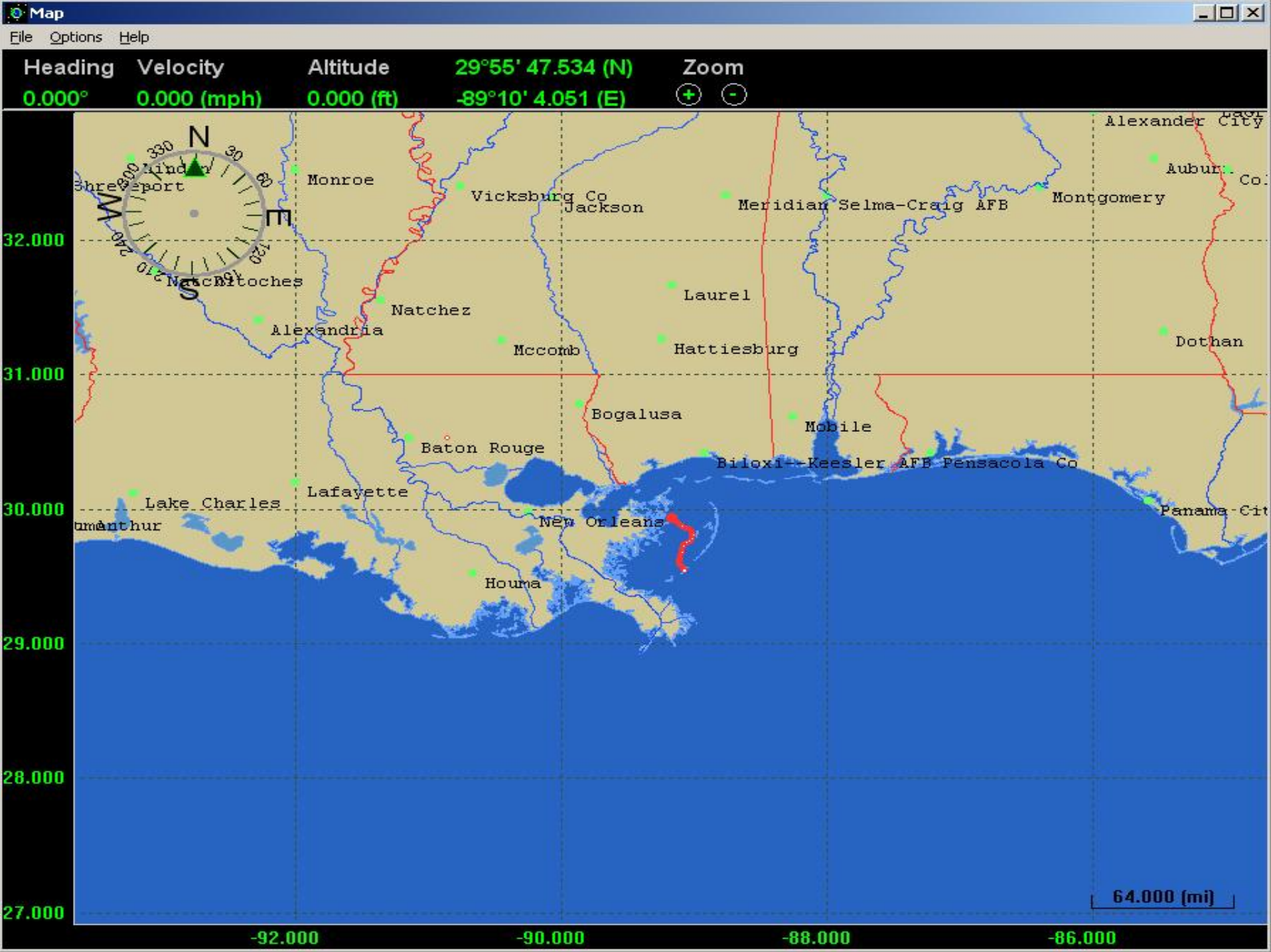
Some other impacts on California agriculture

(not yet explored with scenarios)

- crop water requirements.
- frequency of both floods and droughts.
- reliability of surface water supply.
- water and energy costs.




NOAA
POES 1km AVHRR


Map
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Selma-Craig AFB
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Alexander City
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Alexandria
Laurel
Mccomb
Hattiesburg
Dothan
Bogalusa
Mobile
Baton Rouge
Biloxi--Keesler AFB
Pensacola Co
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Lake Charles
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-88.000
-86.000
64.000 (mi)


Hammond
Covington
Joyce Wildlife Area
Manchac Wildlife Area
Lake Maurepas
Lake Pontchartrain Causeway (TOLL)
Lake Pontchartrain
Slidell
LaPlace
MSY
New Orleans
Metairie
Kenner
Harahan
down town
French Quarter
Chalmette
Convention Center
Gretna
Harvey
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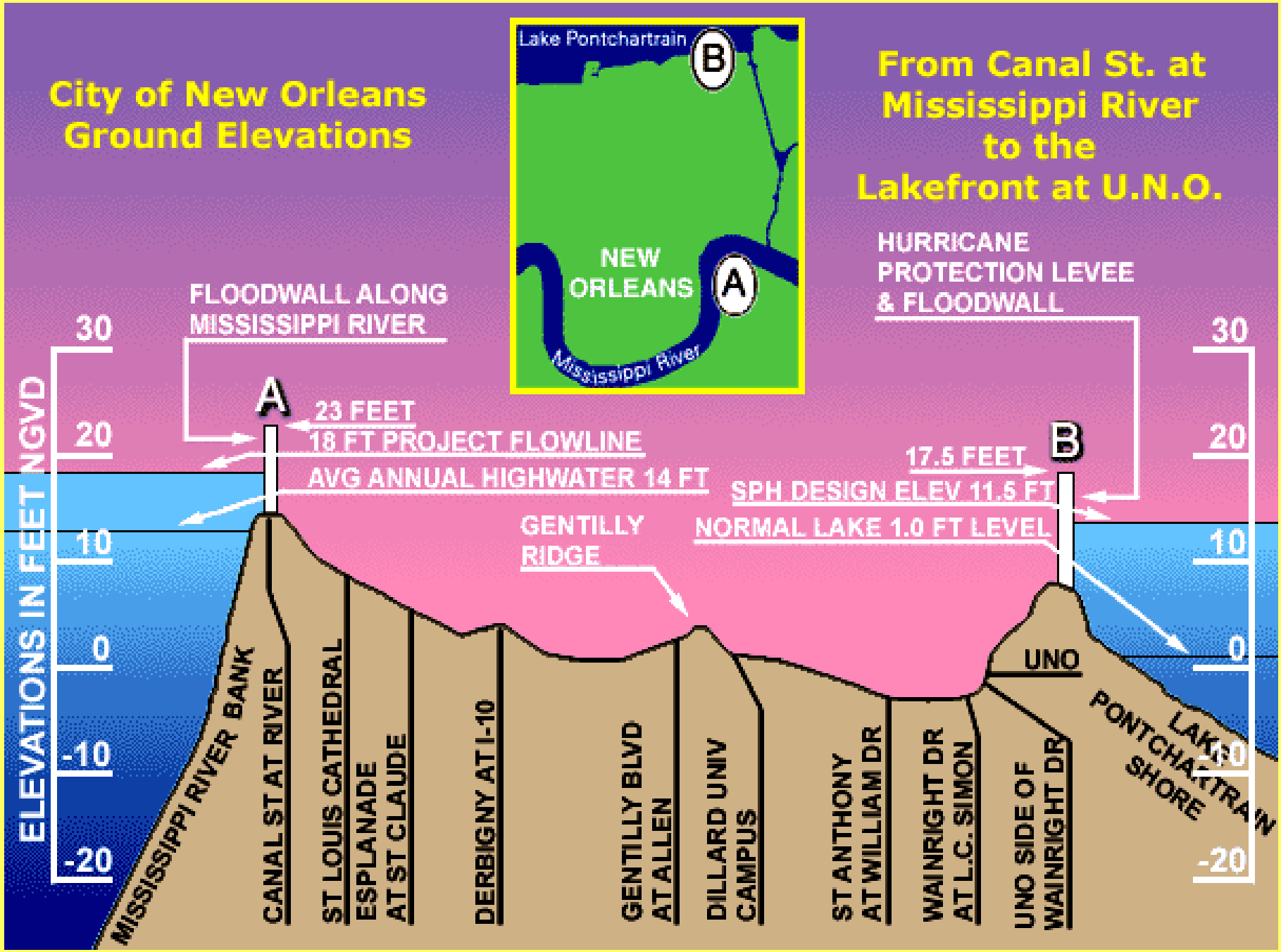
City of New Orleans
Ground Elevations
From Canal St. at
Mississippi River
to the
Lakefront at U.N.O.
Lake Pontchartrain
B
NEW
ORLEANS
A
Mississippi River
HURRICANE
PROTECTION LEVEE
& FLOODWALL
FLOODWALL ALONG
MISSISSIPPI RIVER
ELEVATIONS IN FEET NGVD
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-20
A
23 FEET
18 FT PROJECT FLOWLINE
AVG ANNUAL HIGHWATER 14 FT
B
17.5 FEET
SPH DESIGN ELEV 11.5 FT
NORMAL LAKE 1.0 FT LEVEL
GENTILLY
RIDGE
MISSISSIPPI RIVER BANK
CANAL ST AT RIVER
ST LOUIS CATHEDRAL
ESPLANADE
AT ST CLAUDE
DERBIGNY AT I-10
GENTILLY BLVD
AT ALLEN
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CAMPUS
ST ANTHONY
AT WILLIAM DR
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AT L.C. SIMON
UNO SIDE OF
WAINRIGHT DR
UNO
LAKE PONTCHARTRAIN
SHORE

Adaptive Capacity?

-For New Orleans for greater than category 3 tropical cyclones:
very low adaptive capacity

-Vulnerability is emergent property of coupled socio-natural system, influenced by risk-management decisions as well as environmental hazards

Munich Re:
“We need to stop this dangerous experiment humankind is conducting on the Earth’s atmosphere.”

What does “dangerous” climate change really mean?

Article 2 of the UN Framework Convention on Climate Change (UNFCCC) states that: The ultimate objective of this Convention and any related legal instruments that the Conference of the Parties may adopt is to achieve, in accordance with the relevant provisions of the Convention, stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system". The Framework Convention on Climate Change further suggests that "Such a level should be achieved within a time frame sufficient

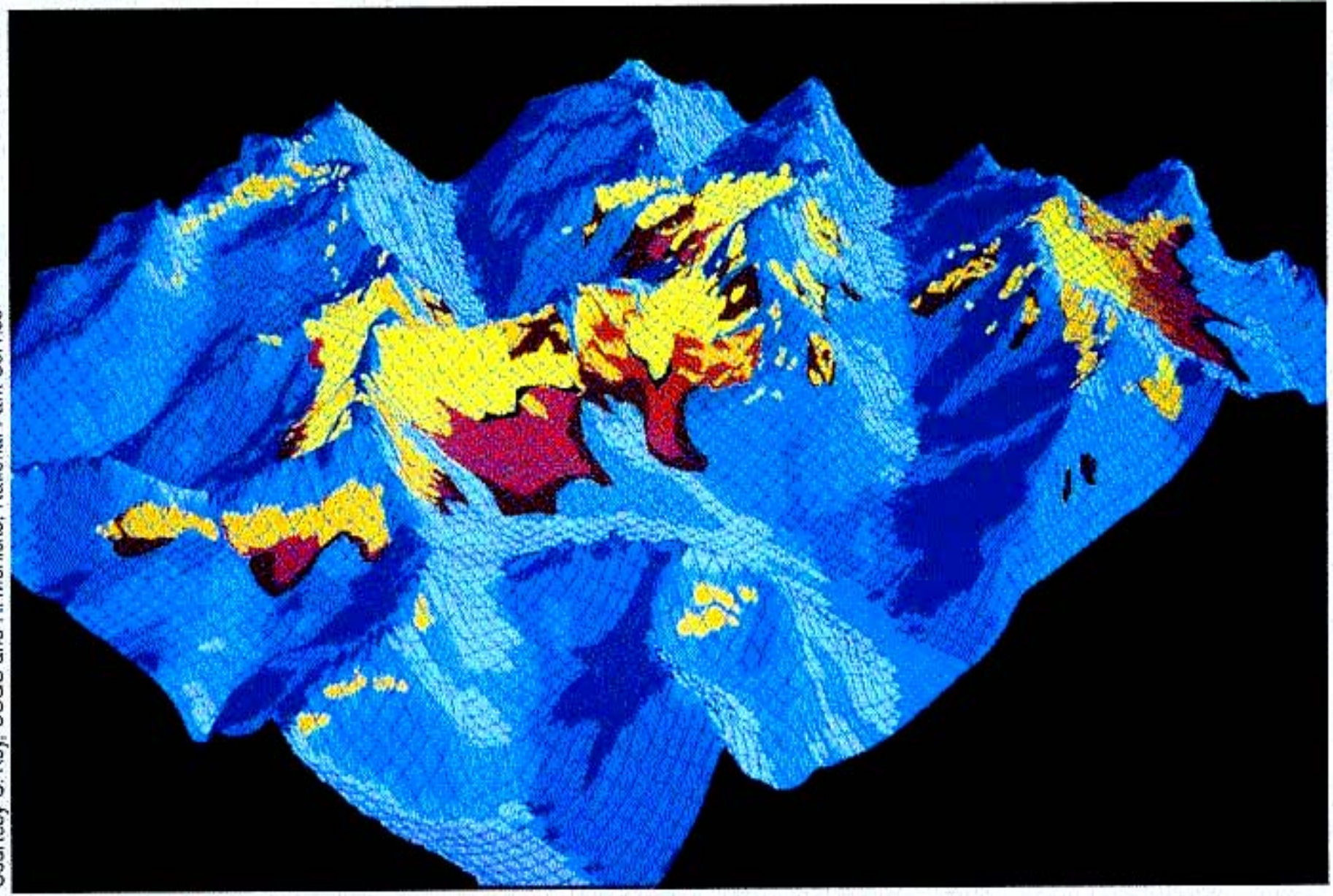
- to allow ecosystems to adapt naturally to climate change,
- to ensure that food production is not threatened and
- to enable economic development to proceed in a sustainable manner."

“Dangerous” Climate Change

- Who decides what is “dangerous” in DAI?

“Dangerous” Climate Change

- Who decides what is “dangerous” in DAI?
- Many ways to define DAI



Courtesy C. Key, USGS and R. Menicke, National Park Service

Fig. 7. A geographic information system representation of glacier shrinkage from 1850 to 1993 in Glacier National Park. The Blackfeet–Jackson glaciers are in the center. The yellow areas reflect the current area of each glacier; other colors represent the extent of the glaciers at various times in the past.

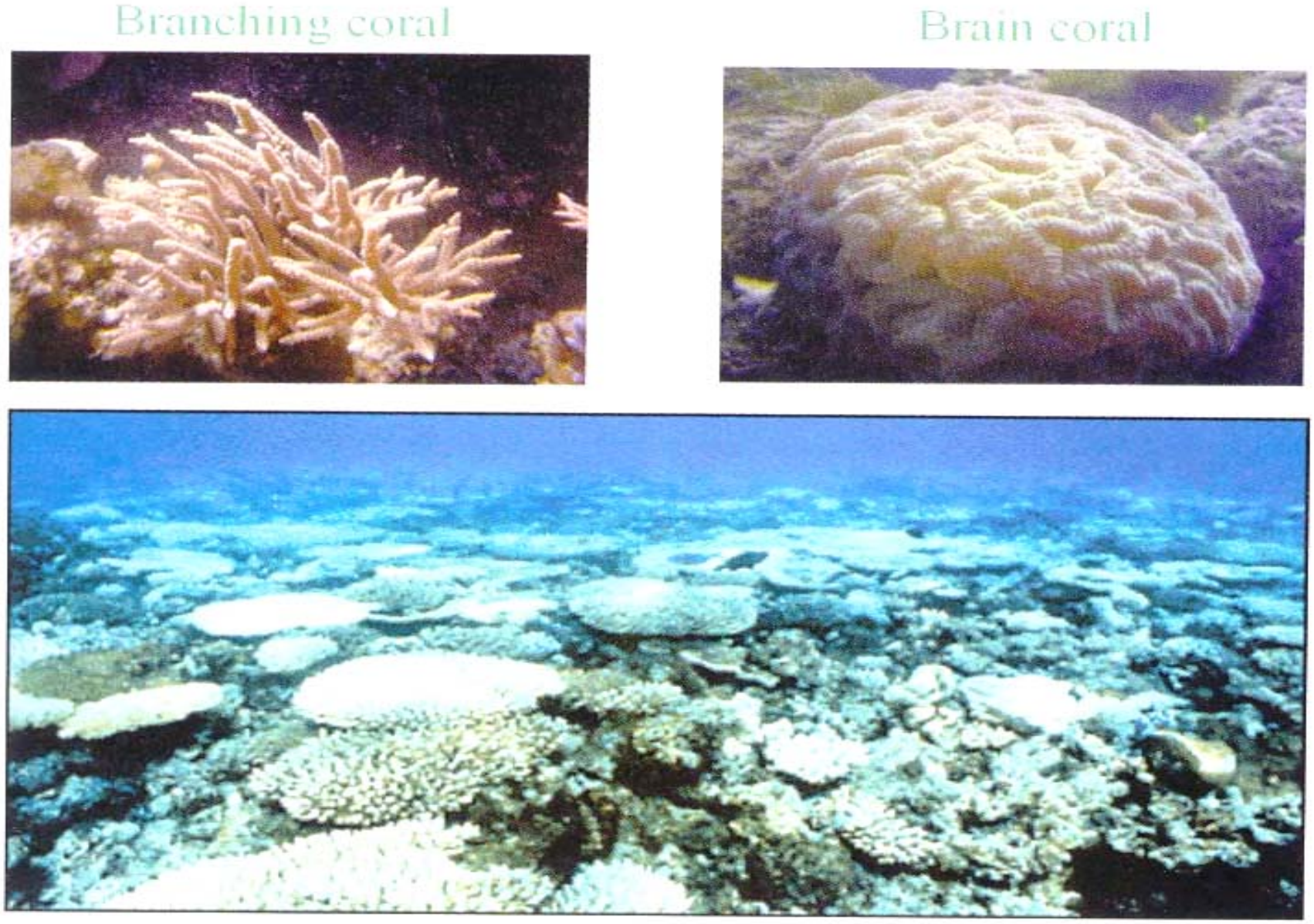


Figure 4-3: The diversity of corals could be affected with the branching corals (e.g., staghorn coral) decreasing or becoming locally extinct as they tend to be more severely affected by increases in sea surface temperatures, and the massive corals (e.g., brain corals) increasing.

Inuit to file anti-U.S. climate petition
Wed Jun 15, 2005 11:09 AM

OSLO (Reuters) - Inuit hunters threatened by a melting of the Arctic ice plan to file a petition accusing Washington of violating their human rights by fueling global warming, an Inuit leader said Wednesday.
Sheila Watt-Cloutier, chair of the Inuit Circumpolar Conference (ICC), also said Washington was hindering work to follow up a 2004 report by 250 scientists that said the thaw could make the Arctic Ocean ice-free in summer by 2100.
Watt-Cloutier, in Oslo to receive an environmental prize, said the inuits' planned petition to the 34-member Organization of American States (OAS) could put pressure on the United States to do more to cut industrial emissions of heat-trapping gases.
"It's still in the works, the drafting is still going on," she said of a long-planned petition to the OAS' human rights arm, the Inter-American

Commission on Human Rights.

“Dangerous” Climate Change

Who decides what is “dangerous” in DAI?

Many ways to define DAI

Ultimately, not a scientific choice

Climate Uncertainty

- Inherent uncertainty in projections of future climate

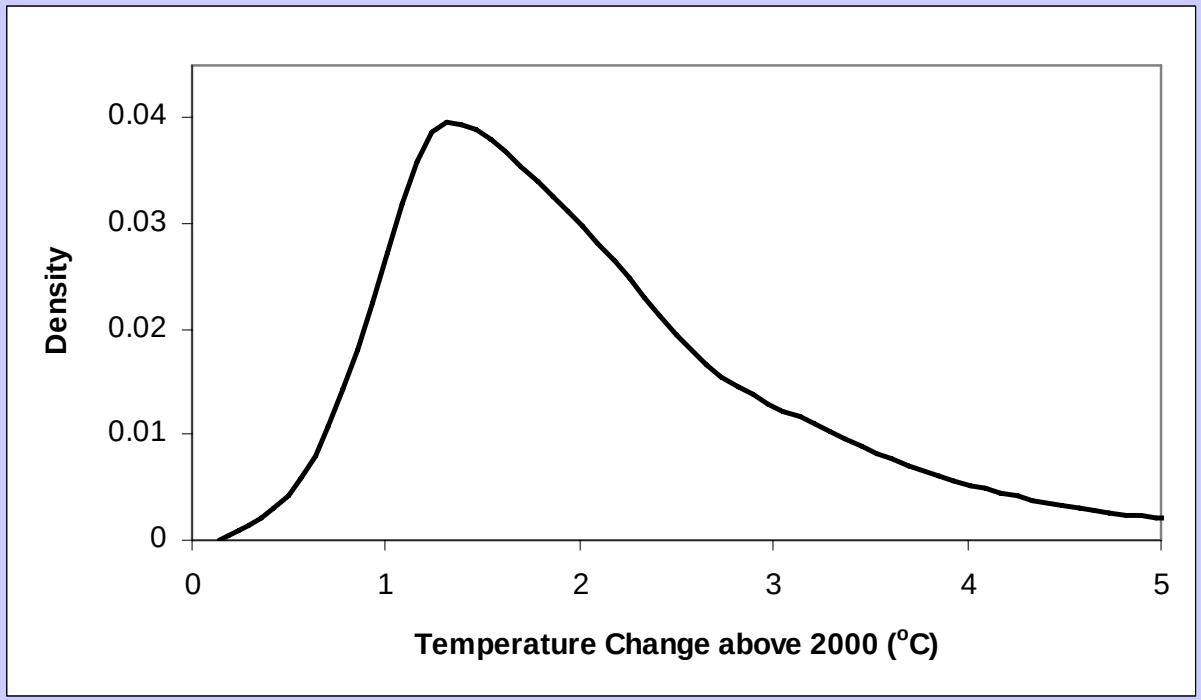
Climate Uncertainty

- Inherent uncertainty in projections of future climate

- Best guess → Range → PDFs

Climate Uncertainty

Climate Uncertainty



Climate Uncertainty

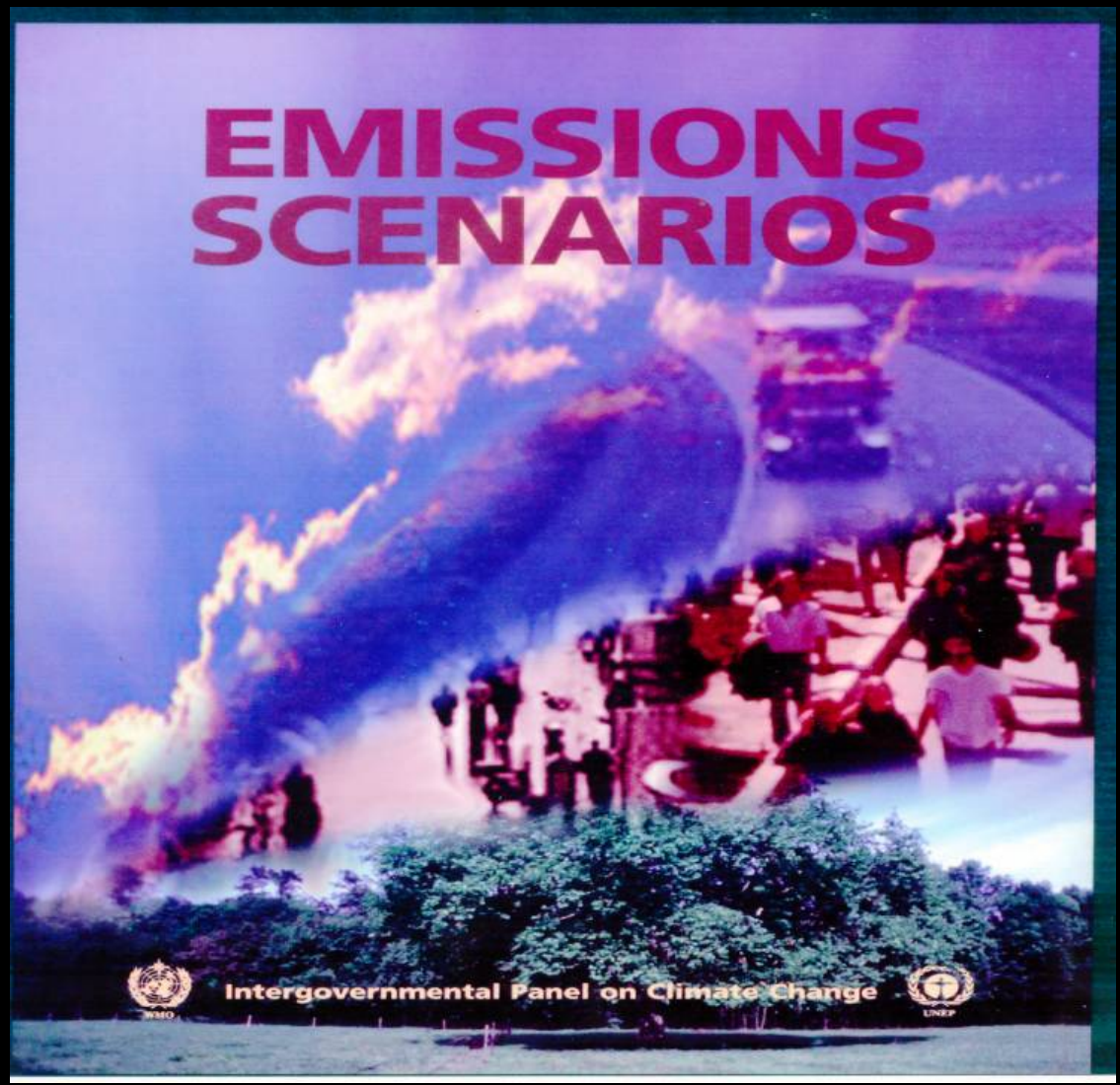
- Inherent uncertainty in projections of future climate
- Best guess → Range → PDFs
- Climate policy → risk management

Climate Policy Analysis

- Assess risk as a function of policy choices

The role of the scientific community

#1: Provide climate change scenarios



The IPCC's Special Report on Emissions Scenarios (SRES) - 2000

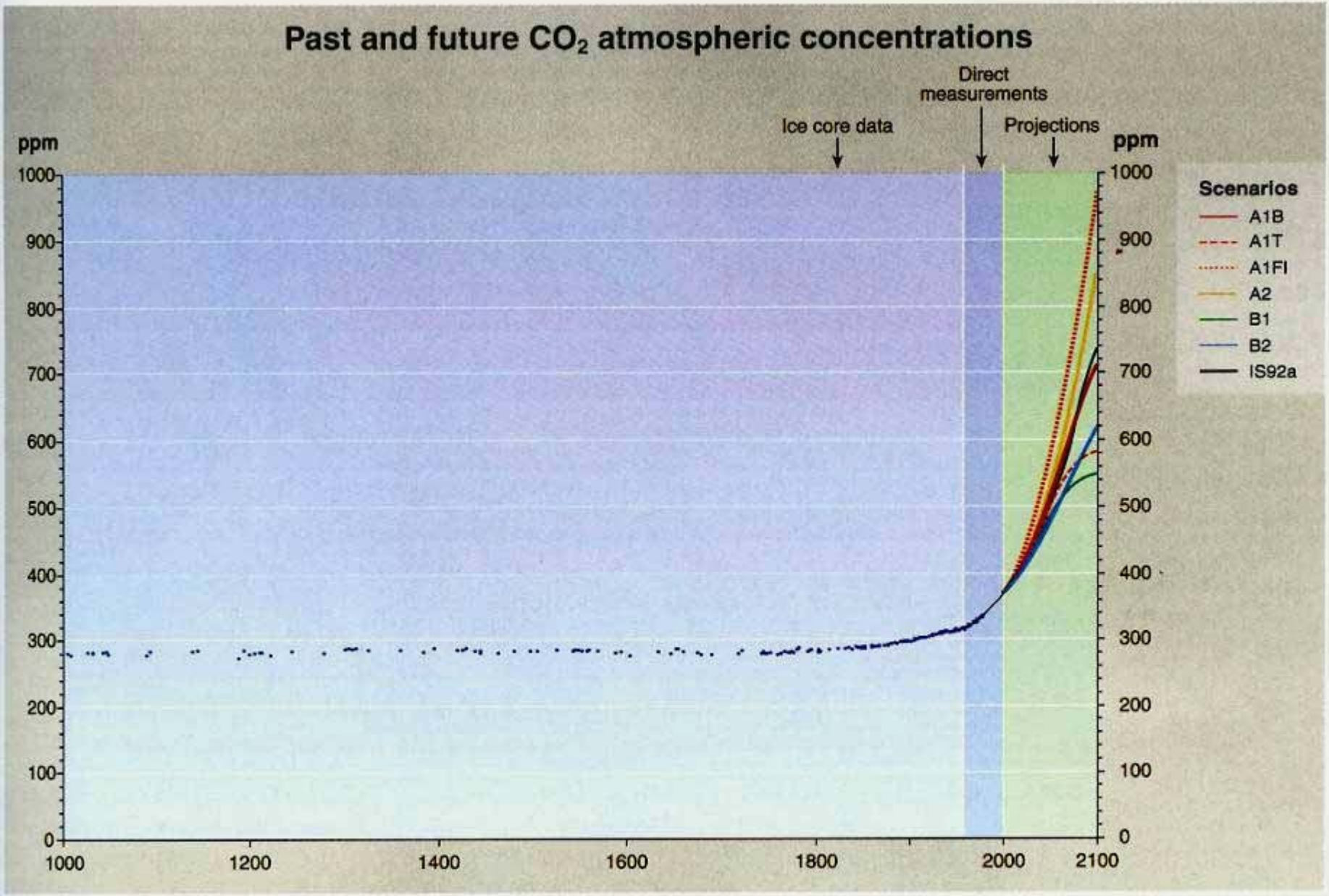


Figure SPM-10a: Atmospheric CO_2 concentration from year 1000 to year 2000 from ice core data and from direct atmospheric measurements over the past few decades. Projections of CO_2 concentrations for the period 2000 to 2100 are based on the six illustrative SRES scenarios and IS92a (for comparison with the SAR).

Q9 Figure 9-1a

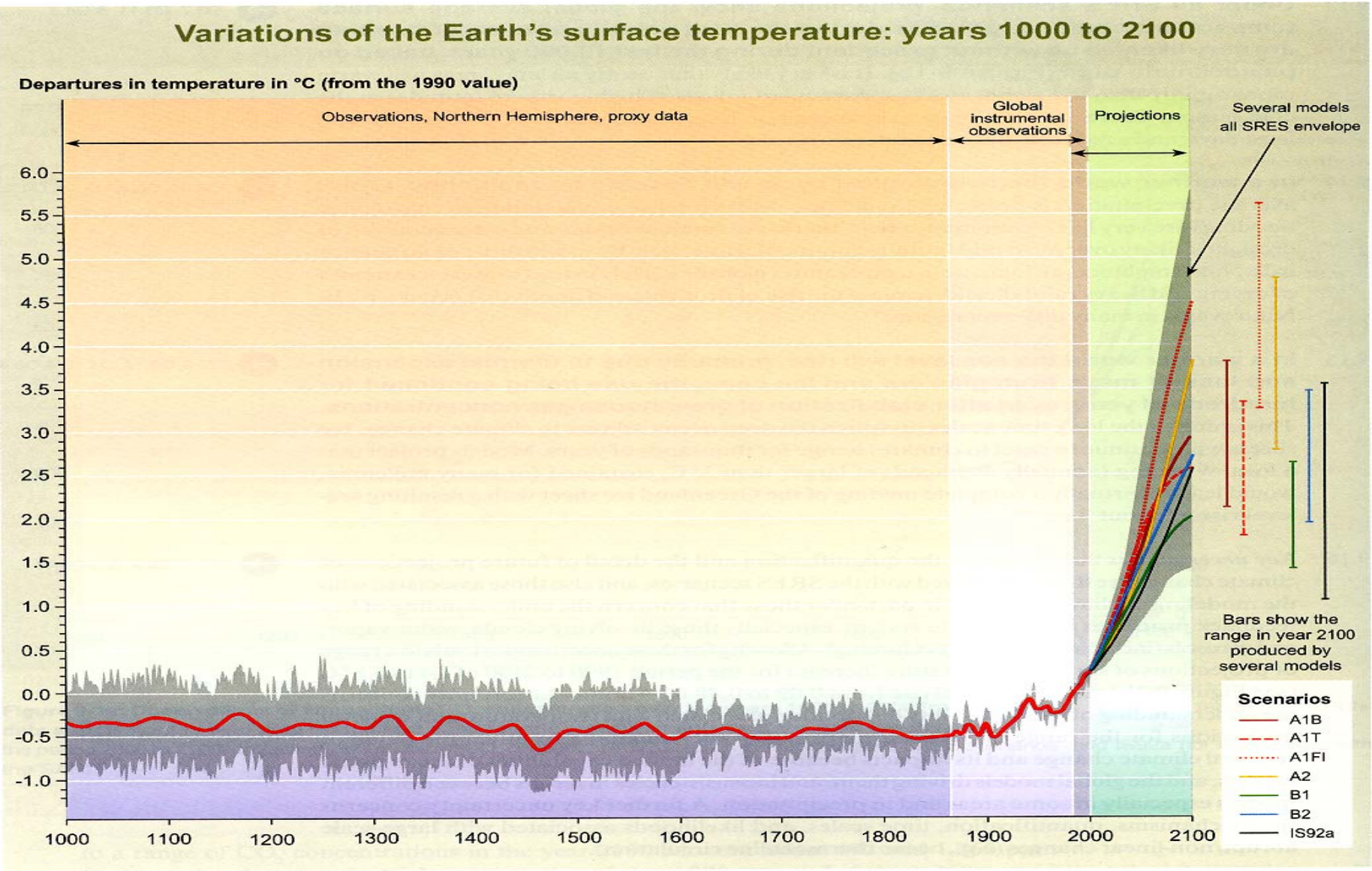


Figure 9-1b: Variations of the Earth's surface temperature: years 1000 to 2100. Over the period 1000 to 1860, observations are shown of variations in average surface temperature of the Northern Hemisphere (corresponding data from the Southern Hemisphere not available) constructed from proxy data (tree rings, corals, ice cores, and historical records). The line shows the 50-year average, and the grey region the 95% confidence limit in the annual data. From the years 1860 to 2000, observations are shown of variations of global and annual averaged surface temperature from the instrumental record. The line shows the decadal average. Over the period 2000 to 2100, projections are shown of globally averaged surface temperature for the six illustrative SRES scenarios and IS92a as estimated by a model with average climate sensitivity. The grey region "several models all SRES envelope" shows the range of results from the full range of 35 SRES scenarios in addition to those from a range of models with different climate sensitivities.

WGI TAR SPM Figures 1b & 5d

Risk = Probability x Consequence
[What metrics of harm?]

-$/ton C avoided

-lives lost/ton C avoided

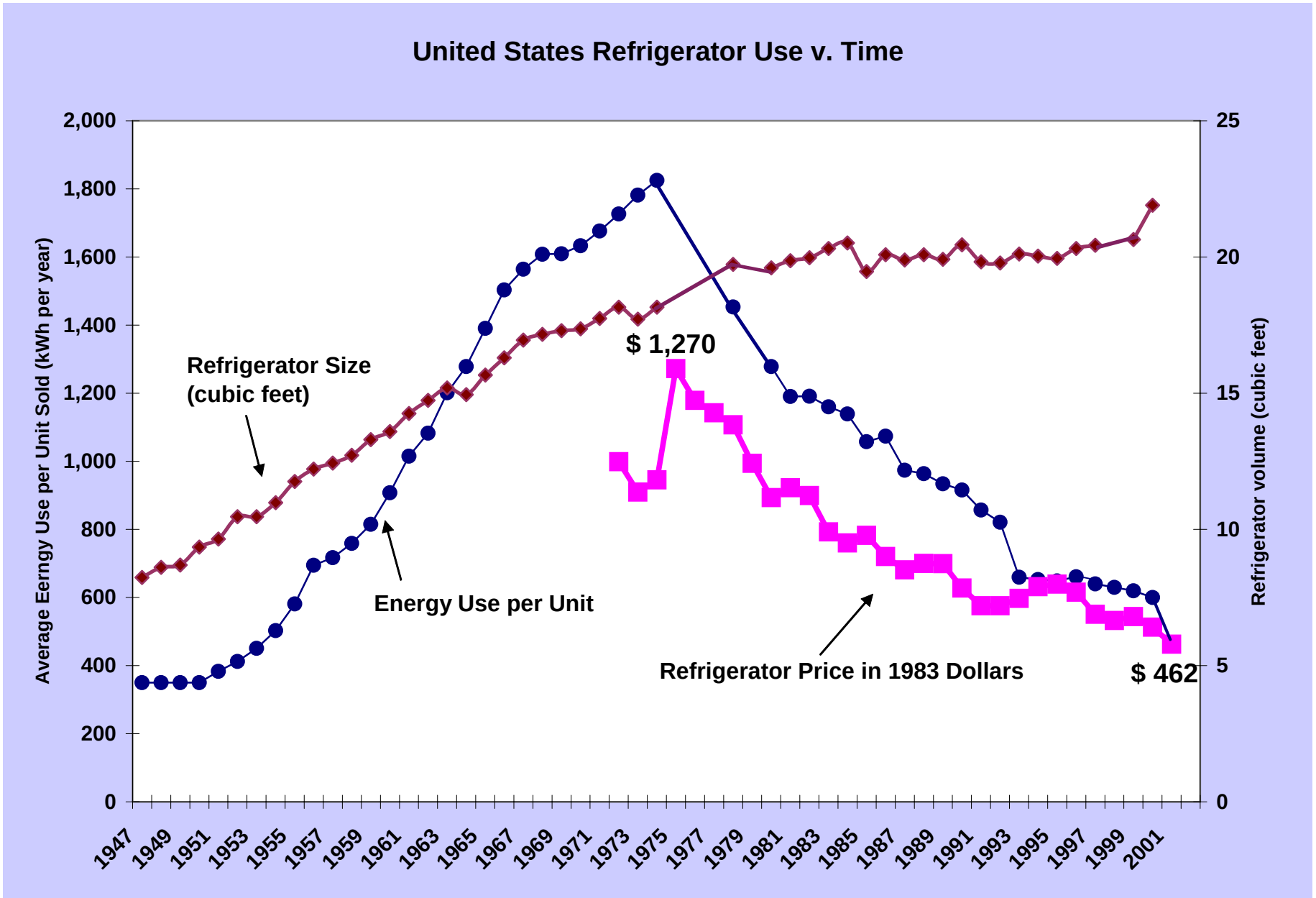
-species lost/ton C avoided

-increased inequity/ton C avoided*

-quality of life degraded/ton

*Perception that prime generators of the risks are not accepting responsibility for their emissions or helping victims to adapt (e.g., OECD countries refusing to join in Kyoto Protocol) itself creates risks.

[Source: “The Five Numeraires”, Schneider, Kuntz-Duriseti and Azar 2000]


United States Refrigerator Use v. Time
Average Eerngy Use per Unit Sold (kWh per year)
Refrigerator volume (cubic feet)
2,000
1,800
1,600
1,400
1,200
1,000
800
600
400
200
0
25
20
15
10
5
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1947
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1951
1953
1955
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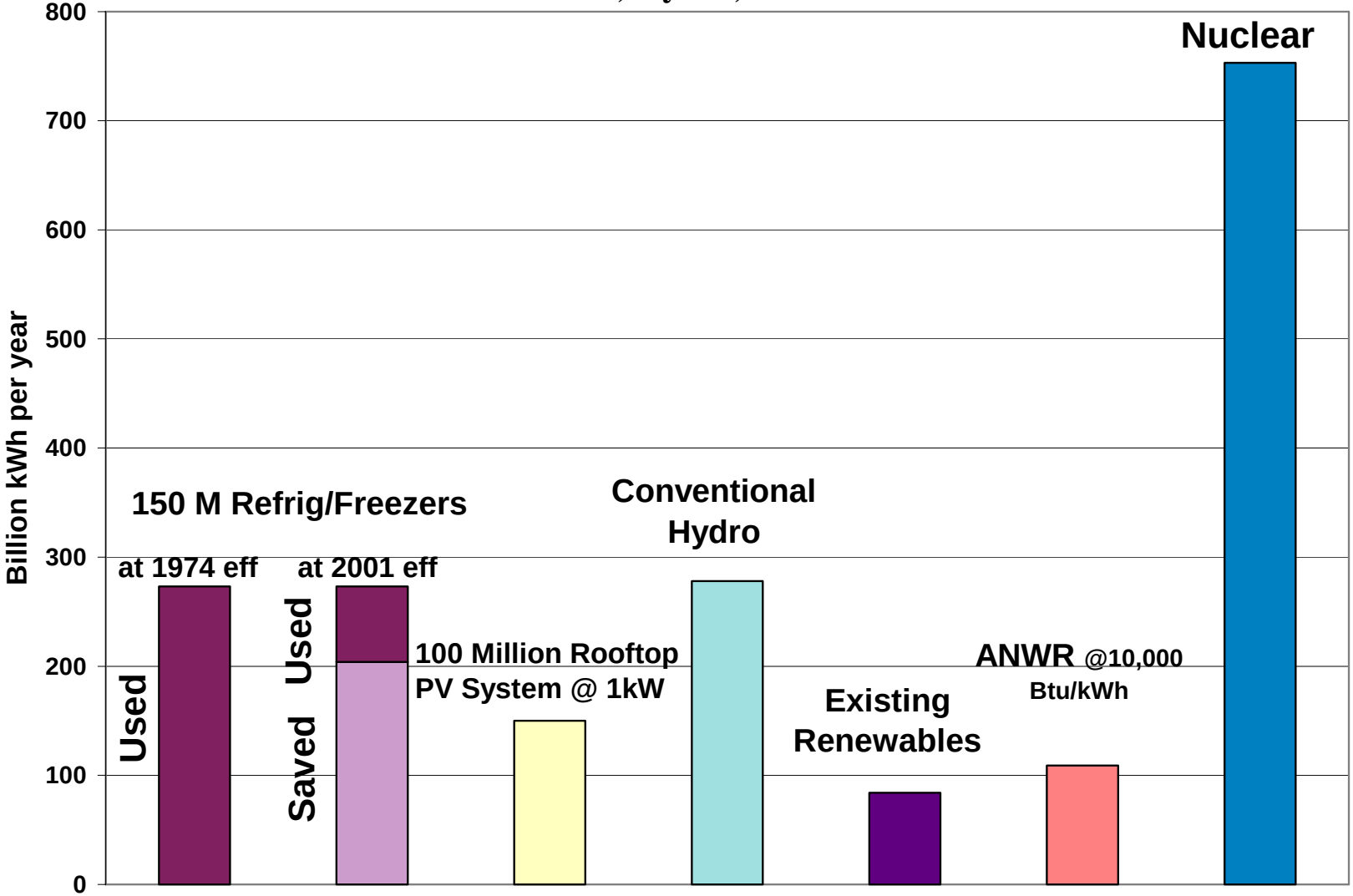
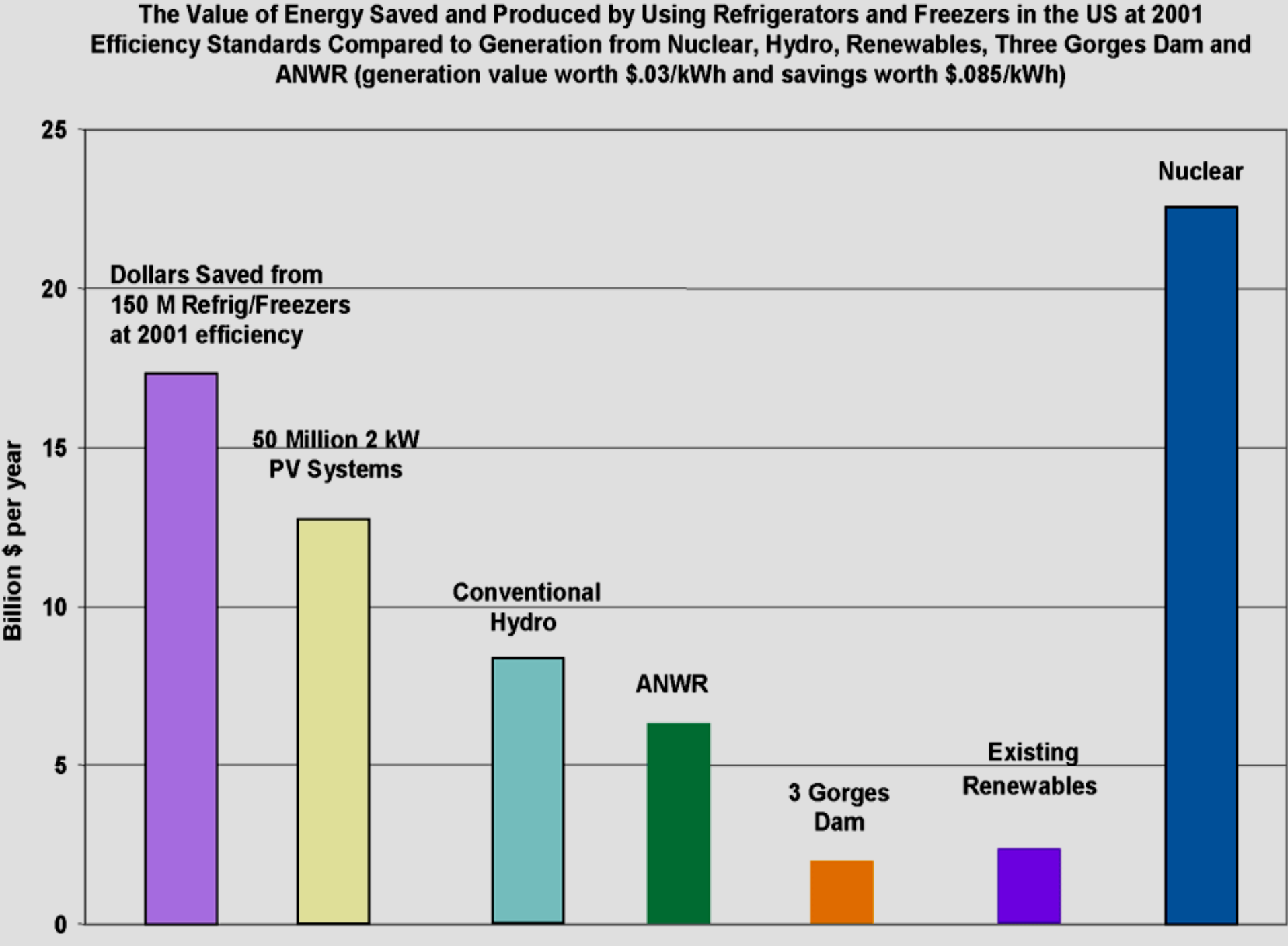
1965
1967
1969
1971
1973
1975
1977
1979
1981
1983
1985
1987
1989
1991
1993
1995
1997
1999
2001
Refrigerator Size
(cubic feet)
Energy Use per Unit
$ 1,270
Refrigerator Price in 1983 Dollars
$ 462

Electricity Use of Refrigerators and Freezers in the US compared to Generation from Nuclear, Hydro, Renewables and ANWR




The Value of Energy Saved and Produced by Using Refrigerators and Freezers in the US at 2001 Efficiency Standards Compared to Generation from Nuclear, Hydro, Renewables, Three Gorges Dam and ANWR (generation value worth $.03/kWh and savings worth $.085/kWh)
Billion $ per year
25
20
15
10
5
0
Dollars Saved from 150 M Refrig/Freezers at 2001 efficiency
50 Million 2 kW PV Systems
Conventional Hydro
ANWR
3 Gorges Dam
Existing Renewables
Nuclear

Stephen H. Schneider[Personal Values]

Recommendations For Action

1-Good Debate on Issues/Actions

2-Do What Already Makes Sense: Co-Benefits

-adapting to climate variability

-energy efficiency

-reducing oil imports

-reducing local air pollution

-reducing congestion

3-Address Health Issues

-ozone

-particulates

-asthma

-wildfire

-heat waves

4-Fairness and Equity

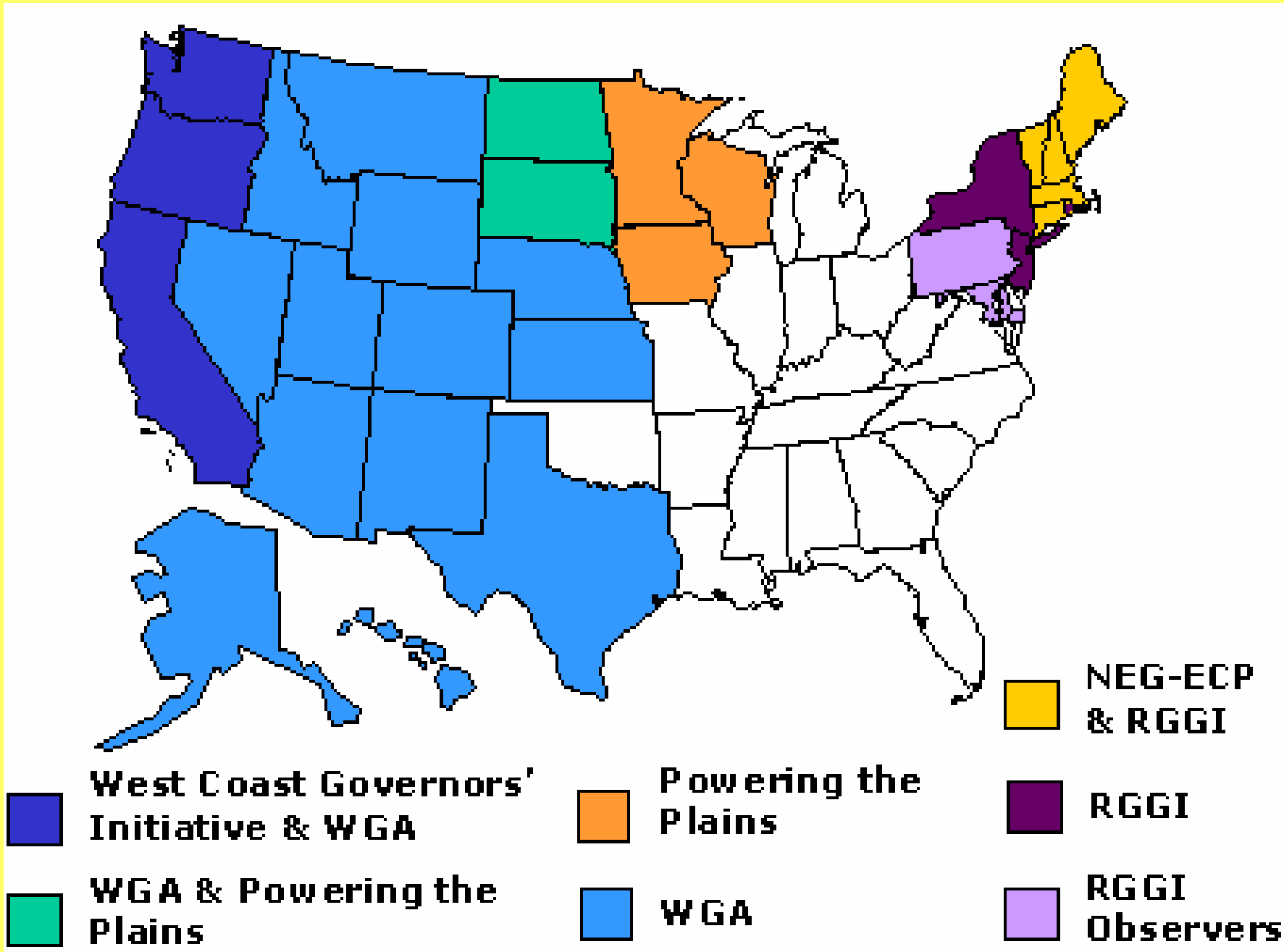
-mitigate impacts on most vulnerable

-reduce burden on lowest income groups

5-Adopt Long-term Perspective

-children and grandchildren…

-plants and animals: sustainability over centuries


NEG-ECP & RGGI
West Coast Governors' Initiative & WGA
Powering the Plains
RGGI
WGA & Powering the Plains
WGA
RGGI Observers

West Coast Governors' Global Warming Initiative

[http://www.ef.org/westcoastclimate/]

The approved recommendations include:

1. Set new targets for improvement in performance in average annual state fleet greenhouse gas emissions.

2. Collaborate on the purchase of hybrid vehicles.

3. Establish a plan for the deployment of electrification technologies at truck stops in each state on the I-5 corridor, on the outskirts of major urban areas, and on other major interstate routes.

4. Set goals and implement strategies and incentives to increase retail energy sales from renewable resources by one percent or more annually in each state through 2015.

5. Adopt energy efficiency standards for eight to 14 products not regulated by the federal government, establishing a cost-effective efficiency threshold for all products sold on the West Coast.

6. Incorporate aggressive energy efficiency measures into updates of state building energy codes, with a goal of achieving at least 15 percent cumulative savings by 2015 in each state.

7. Organize a West Coast Governors' conference in 2005 to inform policymakers and the public of climate change research concerning the West Coast states.

QUESTIONS AND COMMENTS PLEASE

California Climate Projections

Summary: End of Century

- Higher emissions yield higher summer temperatures
  - "Higher scenario" summer: + 5 to 10°C
  - "Lower scenario" summer: + 2 to 5° C
- Heat waves 2-5 times more common, more intense, and longer lasting
- Precipitation variable, with trends towards slight decrease
- Sierra snowpack loss
  - 70-90% in higher scenario
  - 30-70% lower scenario

Probabilistic assessment??