

Not-So-Early Worries About Climate Change

Climate Change and the National Parks



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Bayfield, Wisconsin



Today's Plan

- Disclaimer And Definitions
- Climate Change Is Real
- Impacts on National Parks
- Apostle Islands Case Study
- So What Do We Do Now?



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The Disclaimer (actually several)

- I'm not a climate change expert
- I won't try to make you one, either
- But I assume you read the papers
- We're not going to debate the causes of global warming



And Though:

- I've tried to document every assertion of fact or scientific projection
- The conclusions are mine, not those of the NPS (although that is changing rapidly, for the better!)

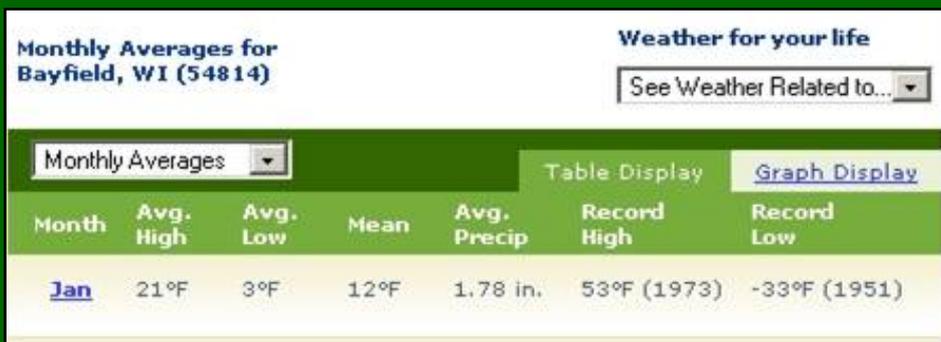


Weather vs. Climate

- It's a question of time scale.
- Weather is what's happening outside at any particular time.



- Climate is the average weather over a long period of time.



Caution: intense interest in climate change can cause hypersensitivity to weather events!



Climate Change or Global Warming?

- The terms are often used interchangeably.
- Global warming is an average increase in the temperature of the atmosphere near the Earth's surface, which can contribute to changes in global climate patterns.
- Climate change refers to any significant change in measures of climate (such as temperature, precipitation, wind, or storm frequency or intensity) lasting for an extended period (decades or longer).
- According to the National Academy of Sciences, **climate change is** preferred because it helps convey that there are other changes in addition to rising temperatures.

From <http://epa.gov/climatechange/basicinfo.html>



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The Warm, Hard Facts

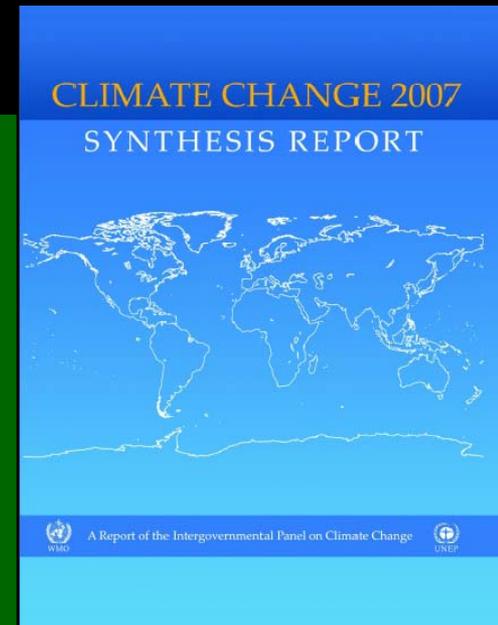
- “Warming of the climate ... is unequivocal.”

* Update: 2007 was second warmest year on record, therefore 12 of the warmest years have been recorded in the last 13 years.

(NASA, 2008) <http://data.giss.nasa.gov/qistemp/2007>

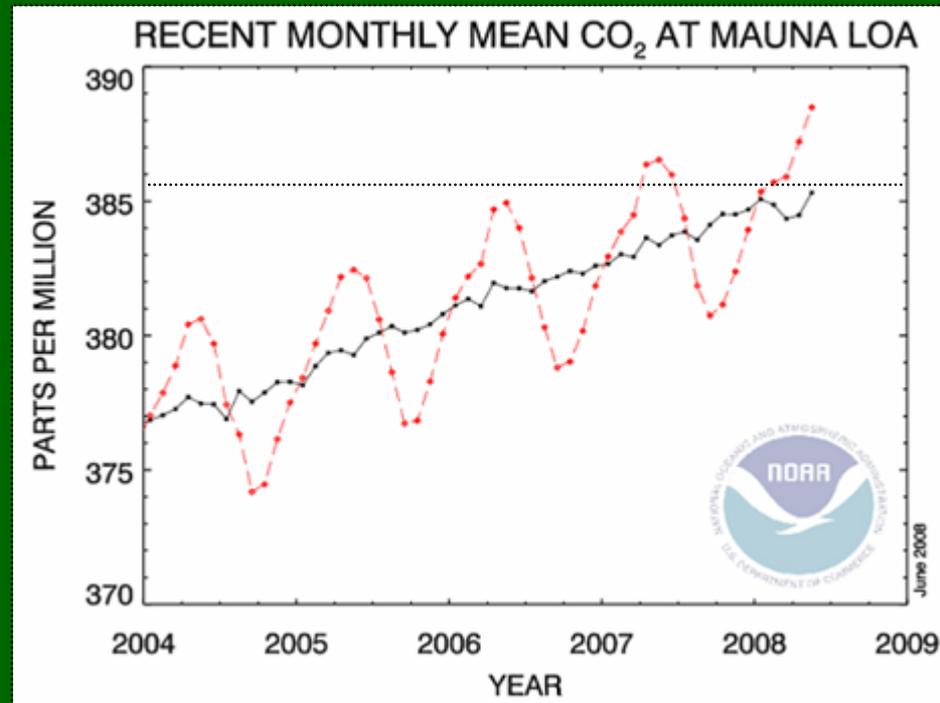
- Arctic temperatures have increased at almost 2x the global average rate in the last 100 years.
- Extreme temperatures are warmer: the coldest 10% of days are warmer and less frequent over most land masses. The hottest 10% of days are warmer and more frequent.
- Both trends are *virtually certain* (>99%) to continue.
- Polar regions have not been this warm for an extended period for 125,000 years... and sea level rose 4-6 m then.

(IPCC, 2007) <http://www.ipcc.ch/ipccreports/ar4-syr.htm>



Carbon Dioxide in the Atmosphere

- 1850: 280 parts per million (ppm)
- June 2008: 386 ppm (up 37%)
- Natural range over last 650,000 years \leq 300 ppm
- The average annual rate of increase (1.9 ppm/year) is increasing and the largest since direct measurements began (1960).



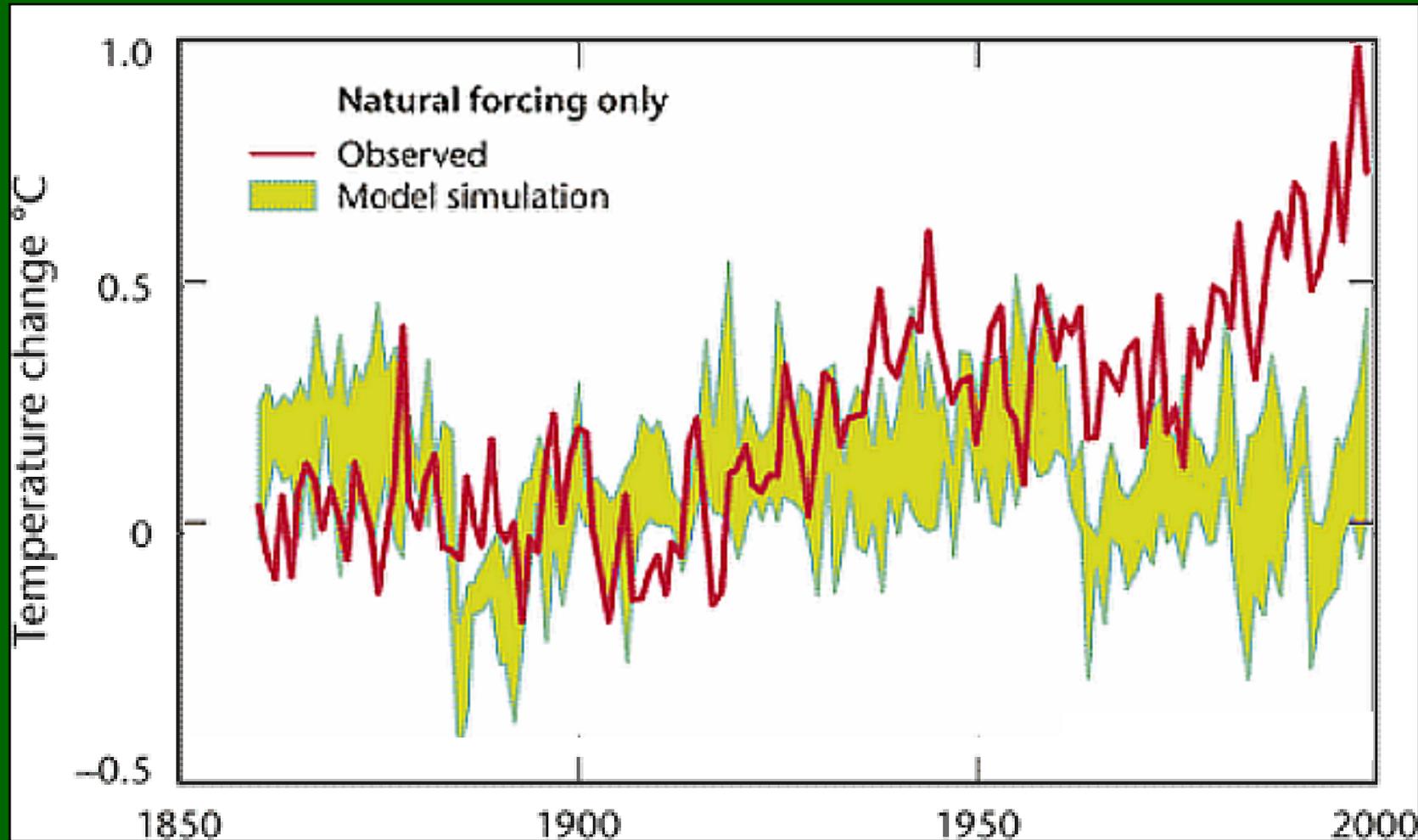
Historical and rate of change data from (IPCC, 2007) <http://www.ipcc.ch/SPM2feb07.pdf>

Current data from NOAA, 2008 <http://www.esrl.noaa.gov/gmd/ccgg/trends>



Climate “Forcing”

Observed Temperature = **Natural** + Human Factors



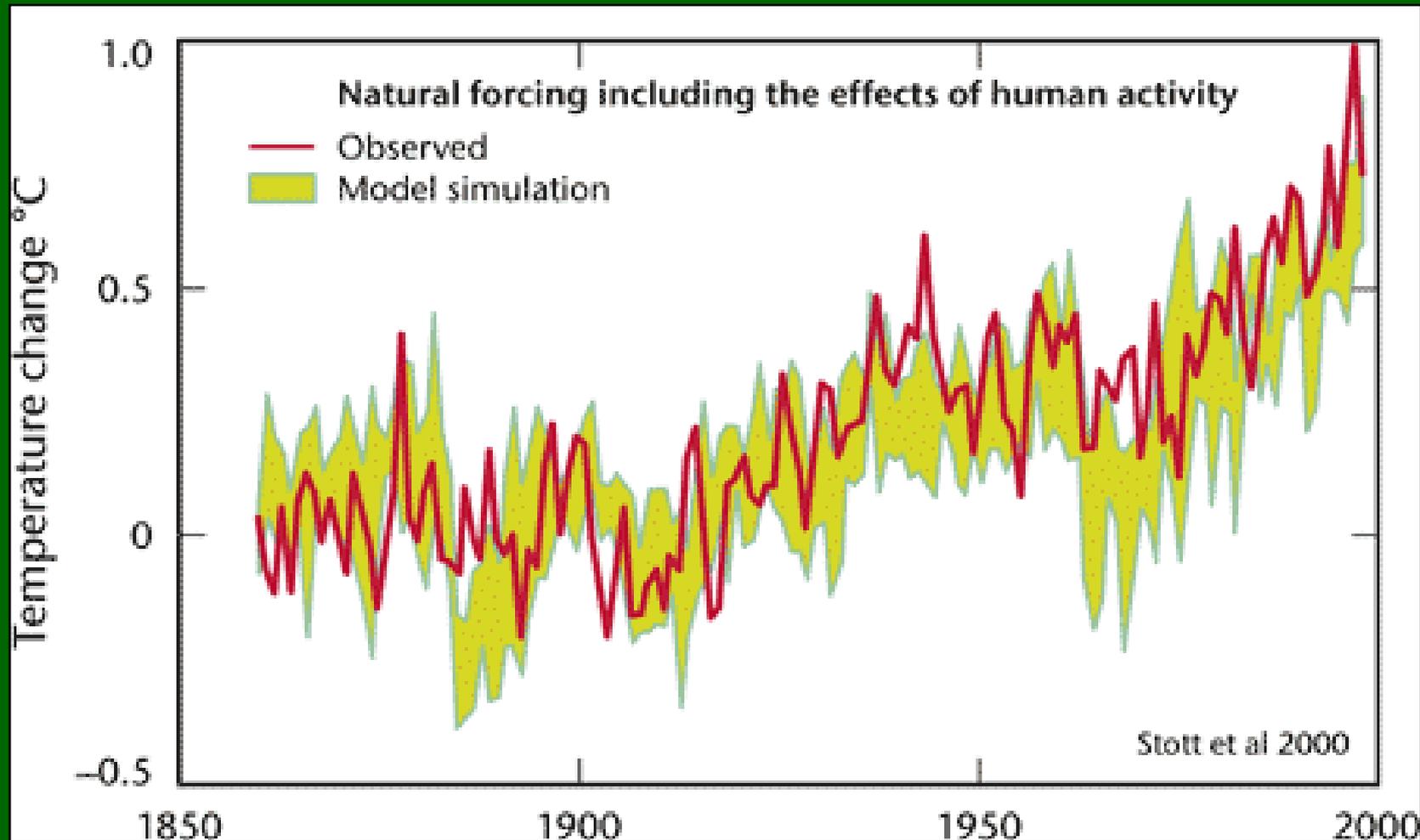
Data from <http://www.sciencemag.org/cgi/content/full/290/5499/2133>

Graphics from <http://www.metoffice.gov.uk/corporate/pressoffice/myths/figures.html#atmos> (Hadley Center)



Climate "Forcing"

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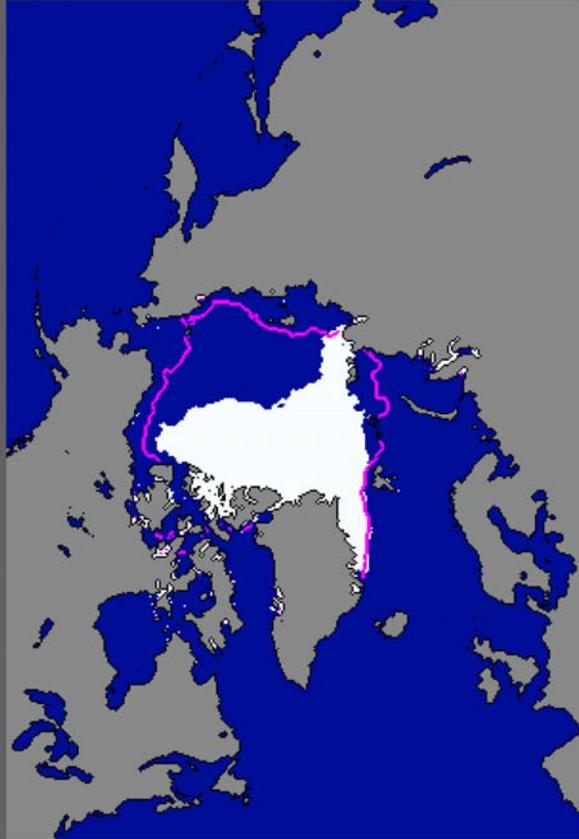
Arctic Sea Ice



National Snow and Ice Data Center

Data Centers & Programs Science Publications News & Events

Current Ice Extent
09/16/2007

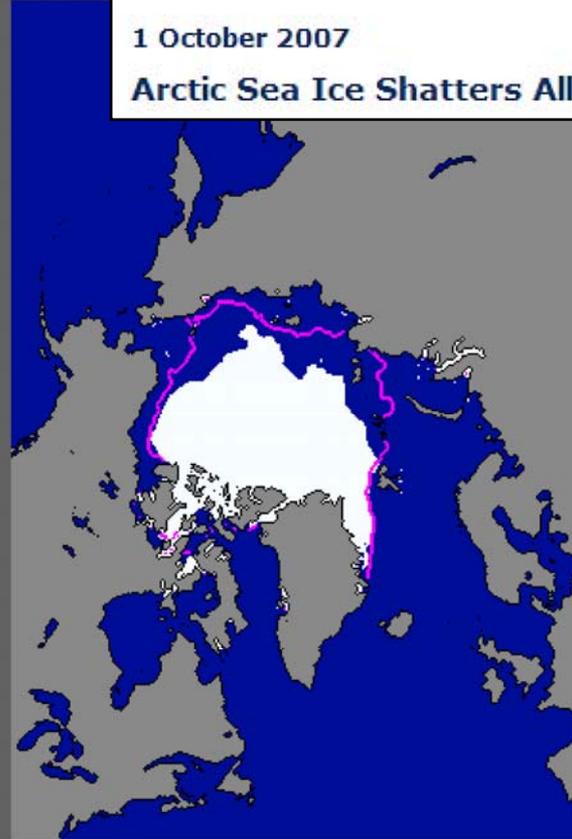


National Snow and Ice Data Center, Boulder, CO

Total extent = 4.1 million sq km

median ice edge

Current Ice
09/21/2005



National Snow and Ice Data Center

Total extent = 5.3 million sq km

median ice edge

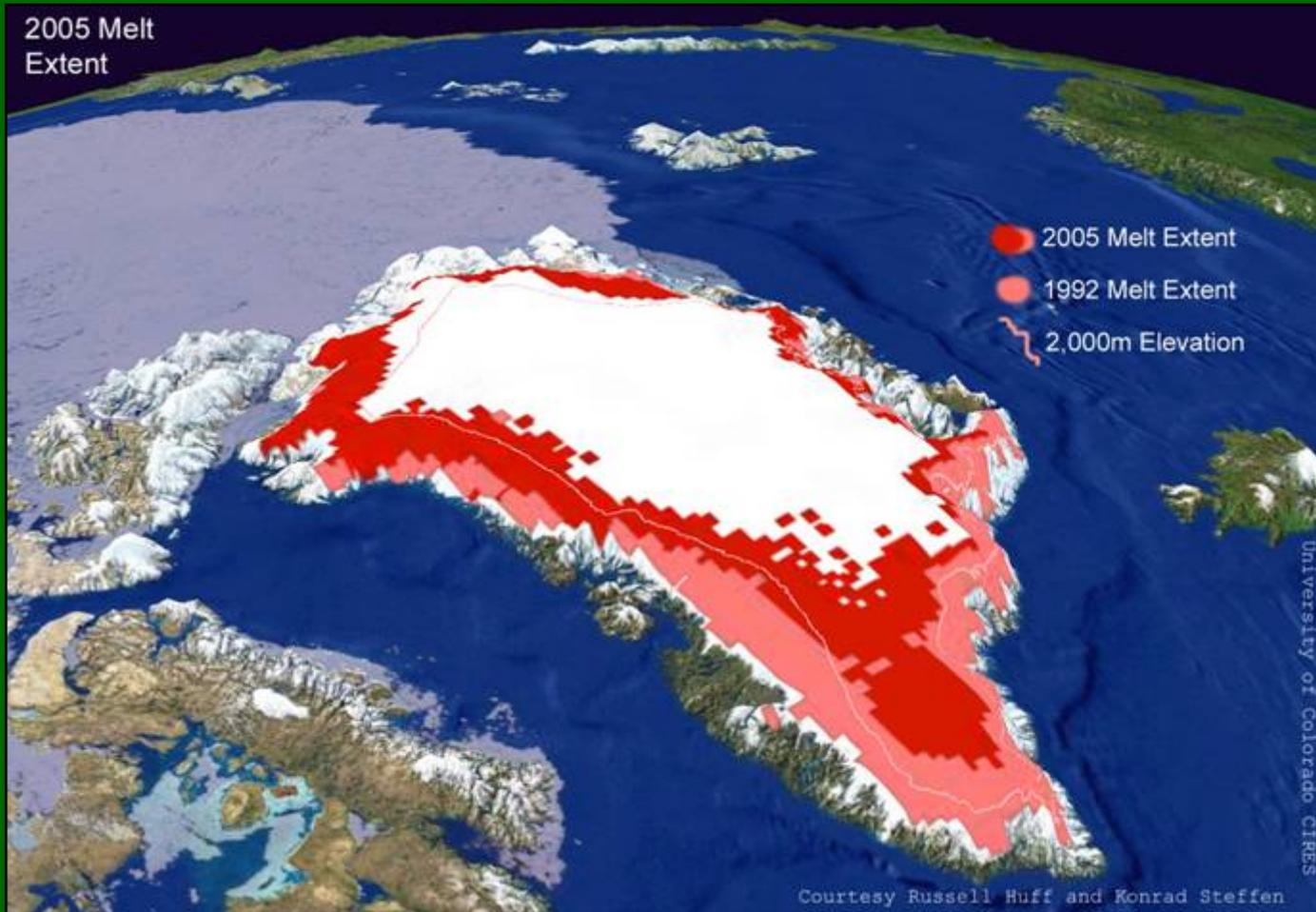
1 October 2007

Arctic Sea Ice Shatters All Previous Record Lows

http://www.nsidc.org/news/press/2007_seaiceminimum/20071001_pressrelease.html



Greenland Snowmelt



Snowmelt in Greenland in 2005 was the most extensive in the 27 years of monitoring.

(Steffen and Huff, 2005)

2007
Greenland melt breaks 2005 record by 10%

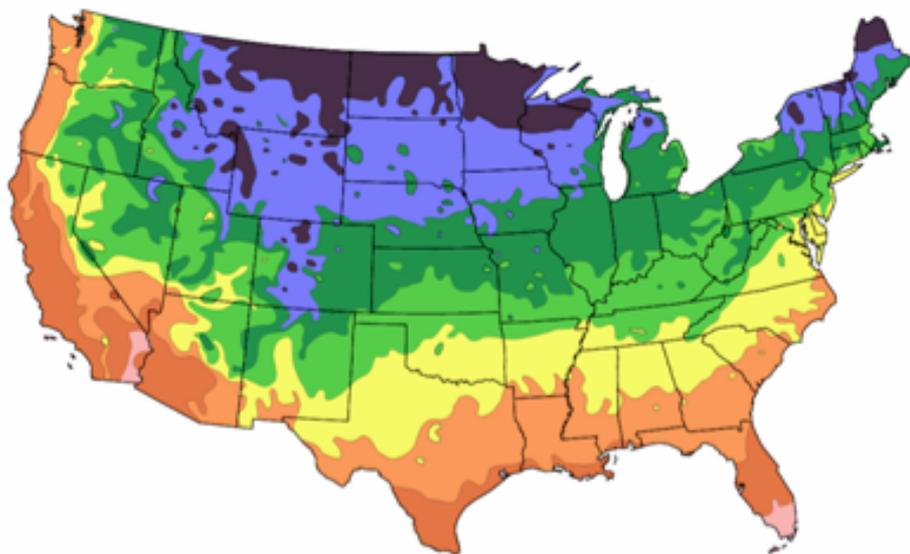
(NASA, 2007)

Graphic: <http://cires.colorado.edu/science/groups/steffen/greenland/melt2005/melt2005and1992.5inch.jpg>



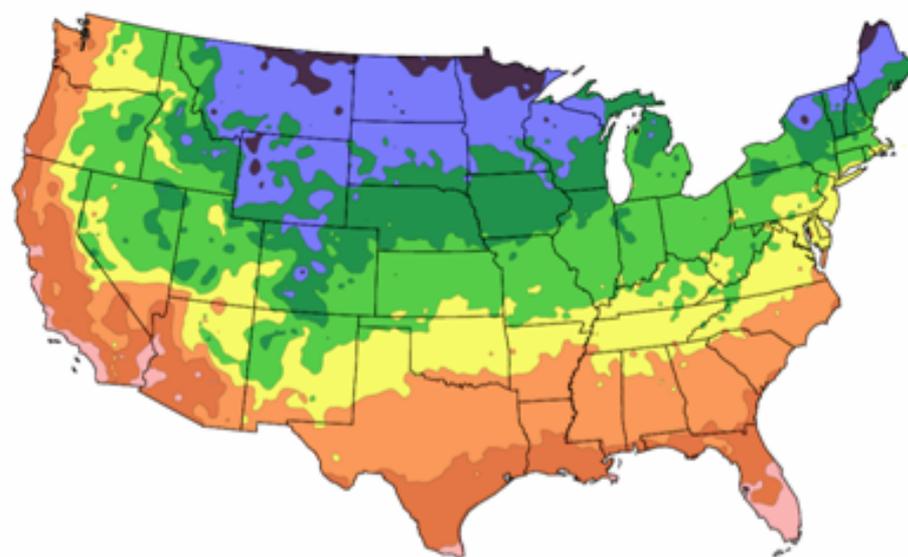
U.S. Plant Hardiness Zones Have Moved North

1990 Map



After USDA Plant Hardiness Zone Map, USDA Miscellaneous Publication No. 1475, Issued January 1990.

2006 Map



National Arbor Day Foundation Plant Hardiness Zone Map published in 2006.

Zone

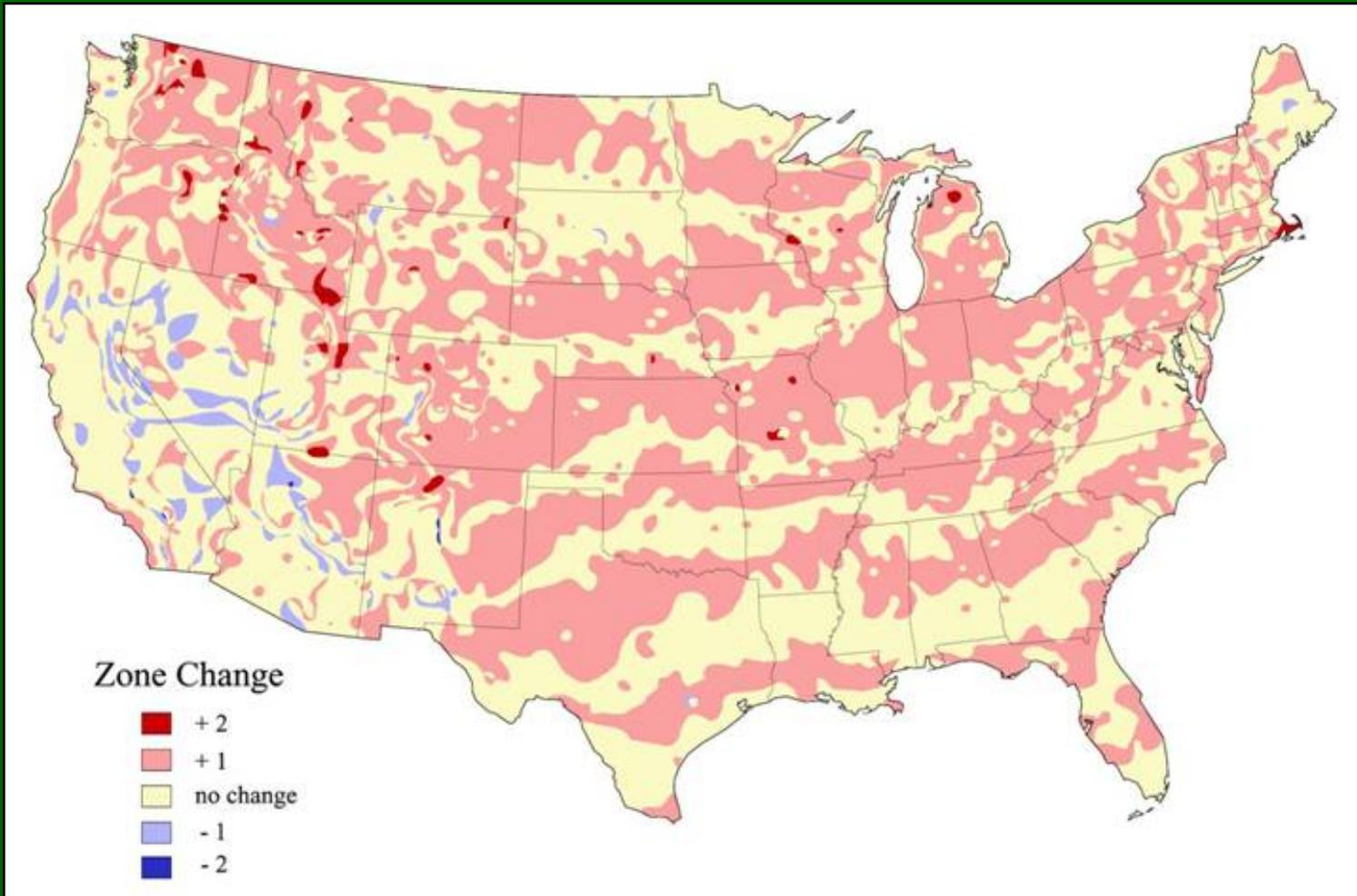


Hardiness zones are based on average annual low temperatures

From <http://www.arborday.org/media/zones.cfm>



Zone Changes Since 1990

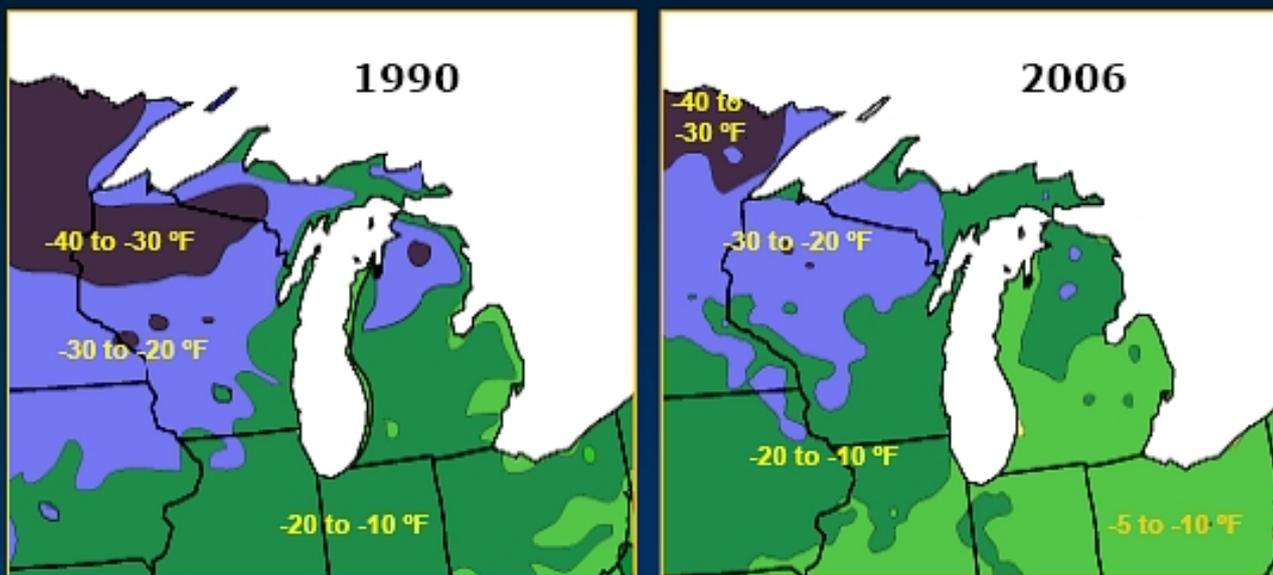


From <http://www.arborday.org/media/zones.cfm>



U.S. Plant Hardiness Zones Have Moved North

Changes in Plant Hardiness Zones Great Lakes: 1990 - 2006



Average Minimum
Temperatures



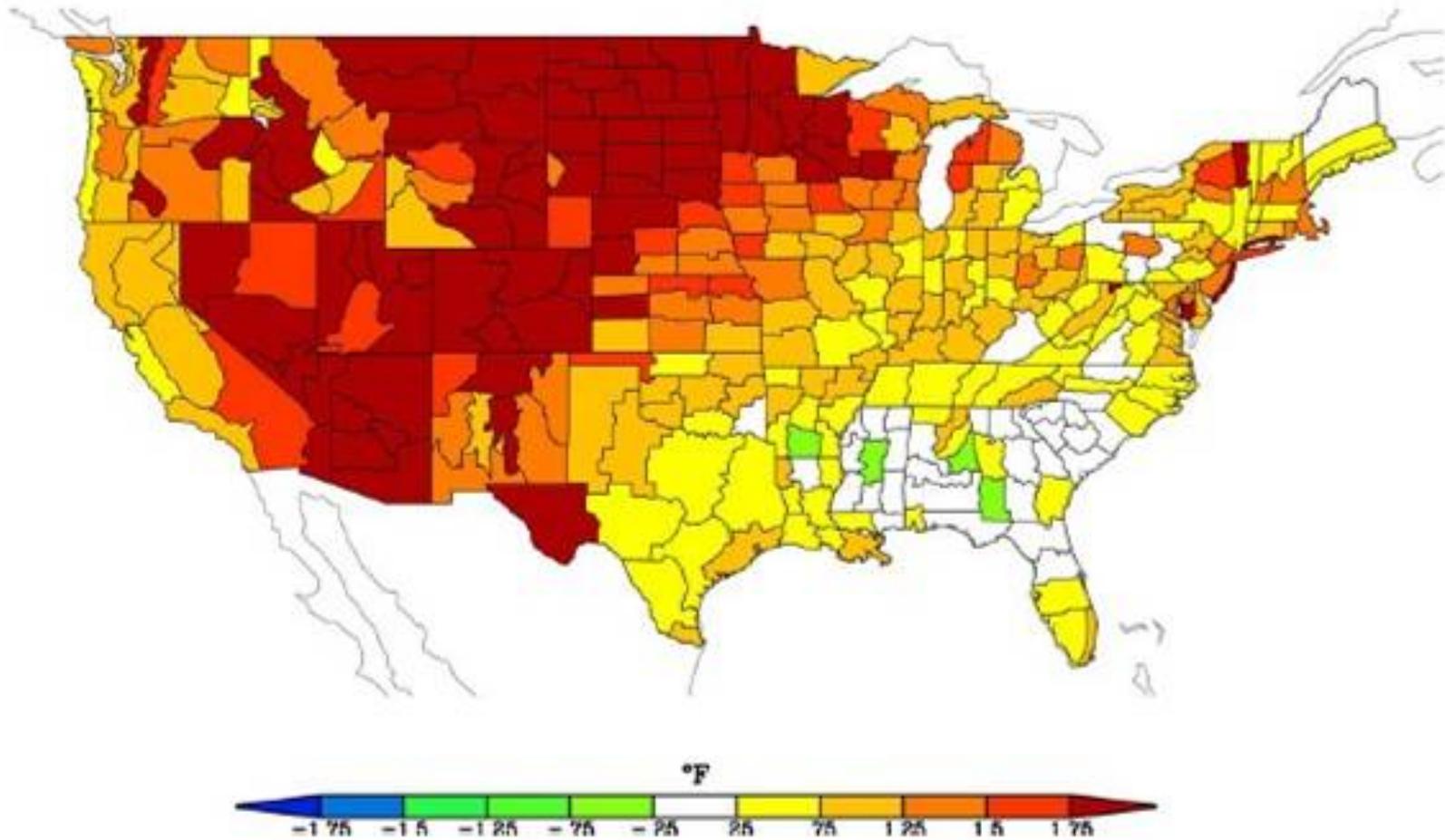
© 2006 by The National Arbor Day Foundation®

From <http://www.arborday.org/media/zones.cfm>



Recent Temperature Anomalies in the U.S.

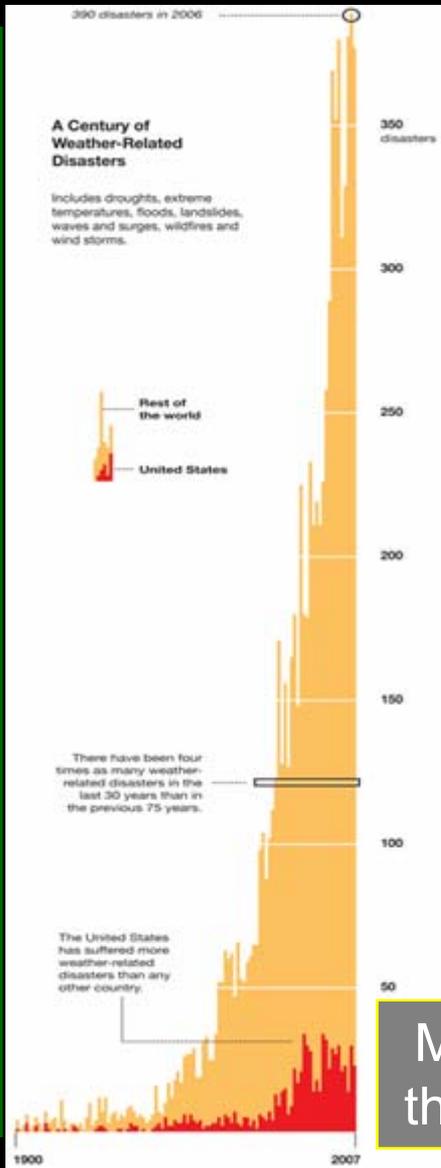
Observed Annual Temperature Anomaly 2000-2006



Source:
NOAA



Weather-Related Disasters Have Increased



More on
this later!

- There have been four times as many weather-related disasters in the last 30 years than in the previous 75 years.
- Definition: A weather-related disaster must meet one of the following criteria:
 - 10 or more people killed
 - 100 or more people affected
 - Declaration of a state of emergency
 - Call for international assistance
- Includes droughts, extreme temperatures, floods, tornadoes, waves and surges, **wildfires**, and wind storms

Source: Center for Research on the Epidemiology of Disasters
Published in the NY Times May 31, 2008

<http://www.nytimes.com/2008/05/31/opinion/31blow.html?ex=1212897600&en=0c5538b49e007385&ei=5070&emc=eta1>



Observed Secondary Effects of Climate Change

- Sea level rise
 - 20th century rate of rise > 19th century rate
 - Accelerating increase since 1993 is *very likely* (90%) due to melting ice sheets.
 - Rise is now ~3.1mm/yr. (IPCC, 2007)
- Ocean temperatures have increased
 - Increases detected to 3000m depths (IPCC, 2007)
- Shift in species ranges
 - 6 km toward poles per decade in the 20th century.
 - "Very high confidence (>95%) in a global climate change fingerprint."
(Parmesan and Yohe, 2003)
- Change in phenology and "temporal mismatches"
 - Spring events came more than 2 days earlier per decade. (Parmesan and Yohe, 2003)
 - 90% decline in pied flycatchers in the Netherlands due to food species peaking prior to spring migration. (Both et al., 2006)



What Scientists Project for the 21st Century

Photo from <http://www.net.org/relatives/4122.pdf>



- Atmospheric CO₂ will continue to rise for several decades *regardless* of what we do with emissions.
- Global surface temperatures will rise *at least* ~ 0.2°C per decade for the next 20 years. (They have risen ~ 0.74 °C over the last century.)
- Continued greenhouse gas emissions at current or increasing rates will accelerate CO₂ rise and cause many changes to the global climate system larger than those observed thus far.

(IPCC, 2007) <http://www.ipcc.ch/SPM2feb07.pdf>



Specific 21st Century Projections

More:

- Extreme heat (both temperature and frequency)
- Extreme precipitation (both amount and frequency)
- Precipitation at high latitudes
- Intensity of typhoons and hurricanes
- Antarctic ice sheet will *increase* in mass.

Less:

- Snow cover
- Greenland ice cover (despite increase in precipitation)
- Precipitation in subtropical regions
- Atlantic Ocean circulation will slow down but it is *very unlikely* there will be an abrupt transition in the 21st century

(IPCC, 2007) <http://www.ipcc.ch/SPM2feb07.pdf>



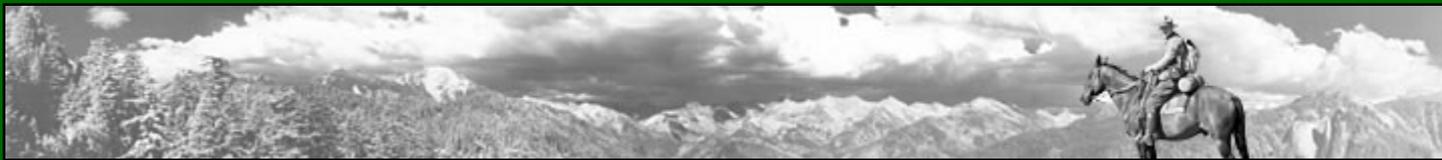
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The National Park Service Mandate

- The National Park Service was established by an Act of Congress in 1916 (16 US Code 1)
- “... to conserve the scenery and the natural and historic objects and the wild life therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations.”
- What are the roles of the national parks and other protected areas in the face of climate change?
- What can and should the NPS do?



The National Parks are Changing - Fast



- **Glacier** National Park is likely to have no glaciers by 2030

From Hall and Fagre 2003 ([http://www.bioone.org/perlserv/?request=get-abstract&doi=10.1641%2F0006-568\(2003\)053%5B0131%3AMCI%5D2.0.CO%3B2&ct=1](http://www.bioone.org/perlserv/?request=get-abstract&doi=10.1641%2F0006-568(2003)053%5B0131%3AMCI%5D2.0.CO%3B2&ct=1))

- Or as soon as 2022?

"[W]e're about eight and a half years ahead of schedule. Our initial projection has proved too conservative. They're going faster than we thought."

– USGS ecologist Dan Fagre 10/1/07

From <http://www.missoulian.com/articles/2007/10/01/outdoors/out61.txt>

- Shrinking glaciers cause:

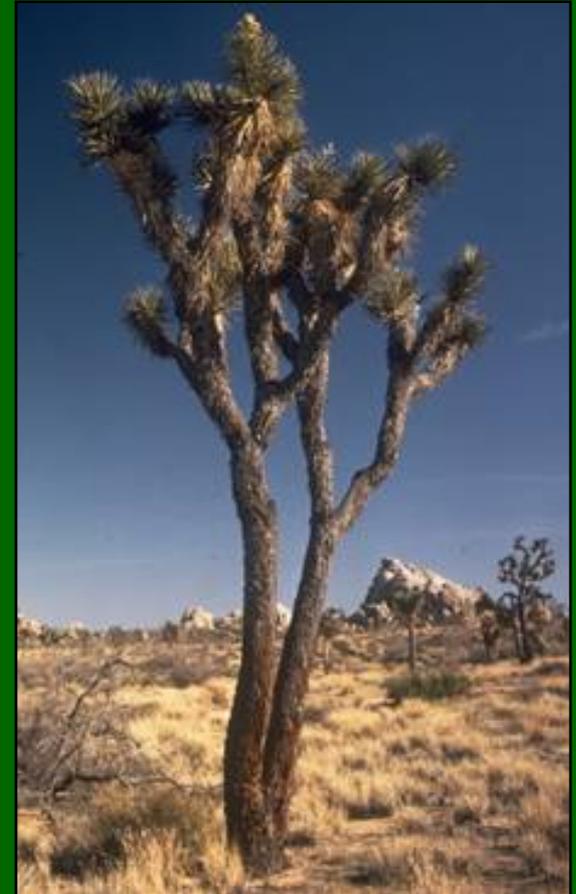
- Less water in streams
- Warming water
- Changes in aquatic biota and fish
- Declines in species that depend on fish
- Major vegetation shifts
- Loss of alpine habitat
- Increase in fires



The National Parks are Changing - Fast

- **Joshua Tree** National Park is likely to lose its Joshua Trees under the predicted 21st century doubling of CO₂ scenario

From http://www.climatescience.gov/workshop2005/posters/P-EC4.2_Cole.pdf



The National Parks are Changing - Fast

- Much of **Everglades** National Park will be flooded under predicted 21st century sea level rise scenarios (which do *not* include possible rapid melting of the Greenland ice cap).



(NPS/Everglades National Park)

Emissions Scenario	Temperature Increase (°C)	Sea Level Rise (m)
Constant Year 2000	0.6	
Minimum Likely	1.8	0.18 – 0.38 (7-15 in)
Maximum Likely	4.0	0.26 – 0.59 (10-23 in)

(IPCC, 2007) <http://www.ipcc.ch/SPM2feb07.pdf>

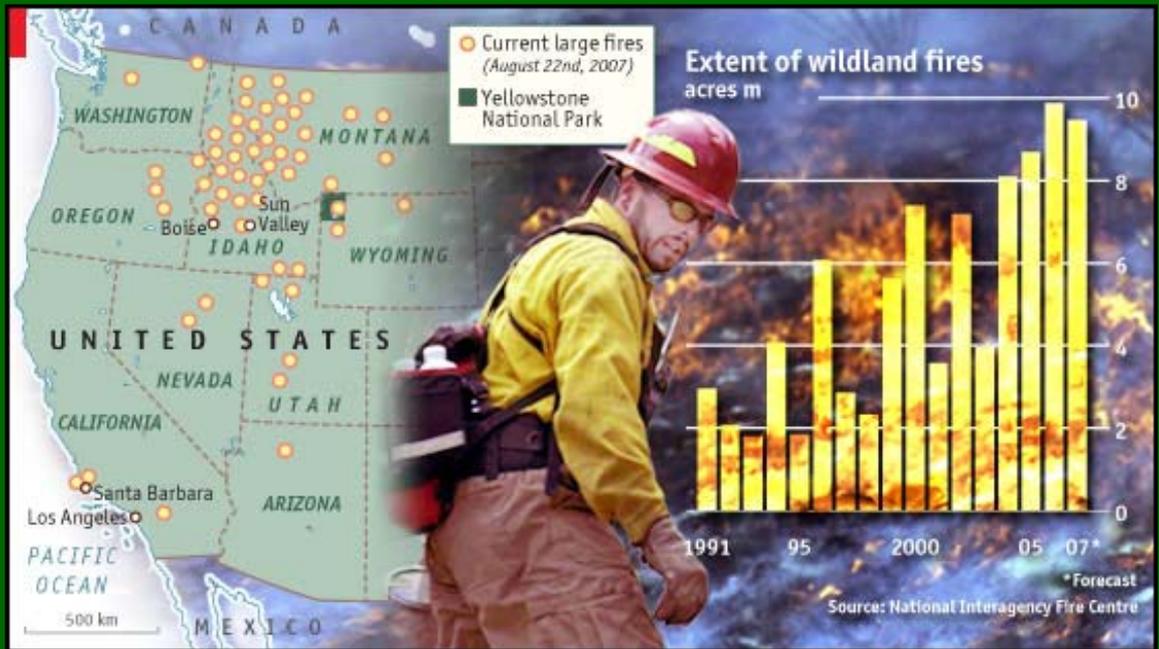


Wildfires are Increasing

Affecting National Parks and Other Public Lands

- Warming and earlier springs are increasing fire activity

(Westerling et al. 2006)



Graphic from http://www.economist.com/daily/chartgallery/displaystory.cfm?story_id=9688989

- “Snow is melting much earlier in the year at very regular intervals now, and we’re getting much longer fire seasons. It dries out much more than before.” – Anthony Westerling, Scripps Institute of Oceanography, quoted by ABC News 6/21/06



It's Not Just the Mountains and Coasts

National Parks in the Middle of the Country are Affected by Climate Change



The Appalachians, e.g.
Great Smoky Mountains
National Park



The Great Plains, e.g.
Badlands National Park



The Deserts, e.g.
Big Bend National Park



The Heartland, e.g.
Buffalo National River

The Great Lakes, e.g.
Isle Royale National Park



The Preservation Predicament

The New York Times

Tuesday, January 29, 2008

The Preservation Predicament

By CORNELIA DEAN



Chip Litherland for The New York Times

Mangrove Trees amid oyster beds exposed at low tide in the Florida Everglades.

Ecologists fear that global warming will make protected landscapes inhospitable to prized species.

- “We have over a 100-year investment nationally in a large suite of protected areas that may no longer protect the target ecosystems for which they were formed,” said Healy Hamilton, director of the California Academy of Sciences. “New species will move in, and the target species will move out.”
- Land conservation done so far has *not* been a wasted effort.
- Many argue that preserved areas will contribute immensely to ecosystem resilience as the climate changes.



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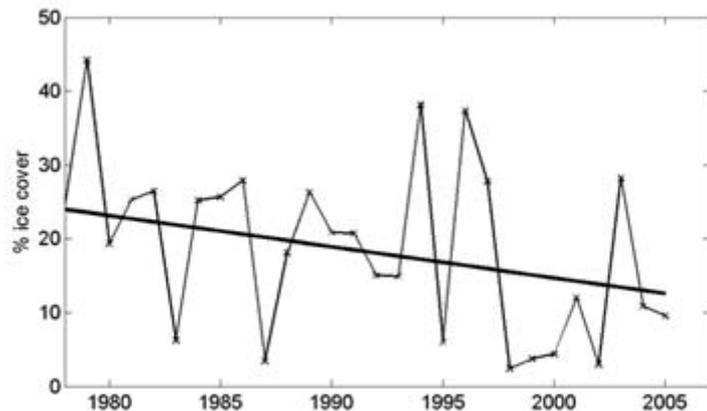
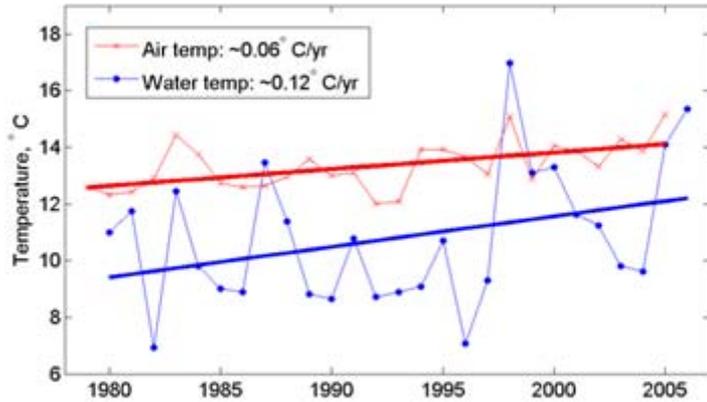


Case in Point

Lake Superior and Apostle Islands National Lakeshore



Lake Superior is Warming Rapidly



- Water temperatures are rising at twice the rate of air temperatures since 1980
- This correlates with decreasing ice cover over the same period
- Research is by Jay Austin and Steve Colman of the Univ. of Minnesota Large Lakes Observatory (Duluth)
- A similar pattern has been noted in Lake Baikal (Russia)

From <http://www.d.umn.edu/~jaustin/ICE.html>

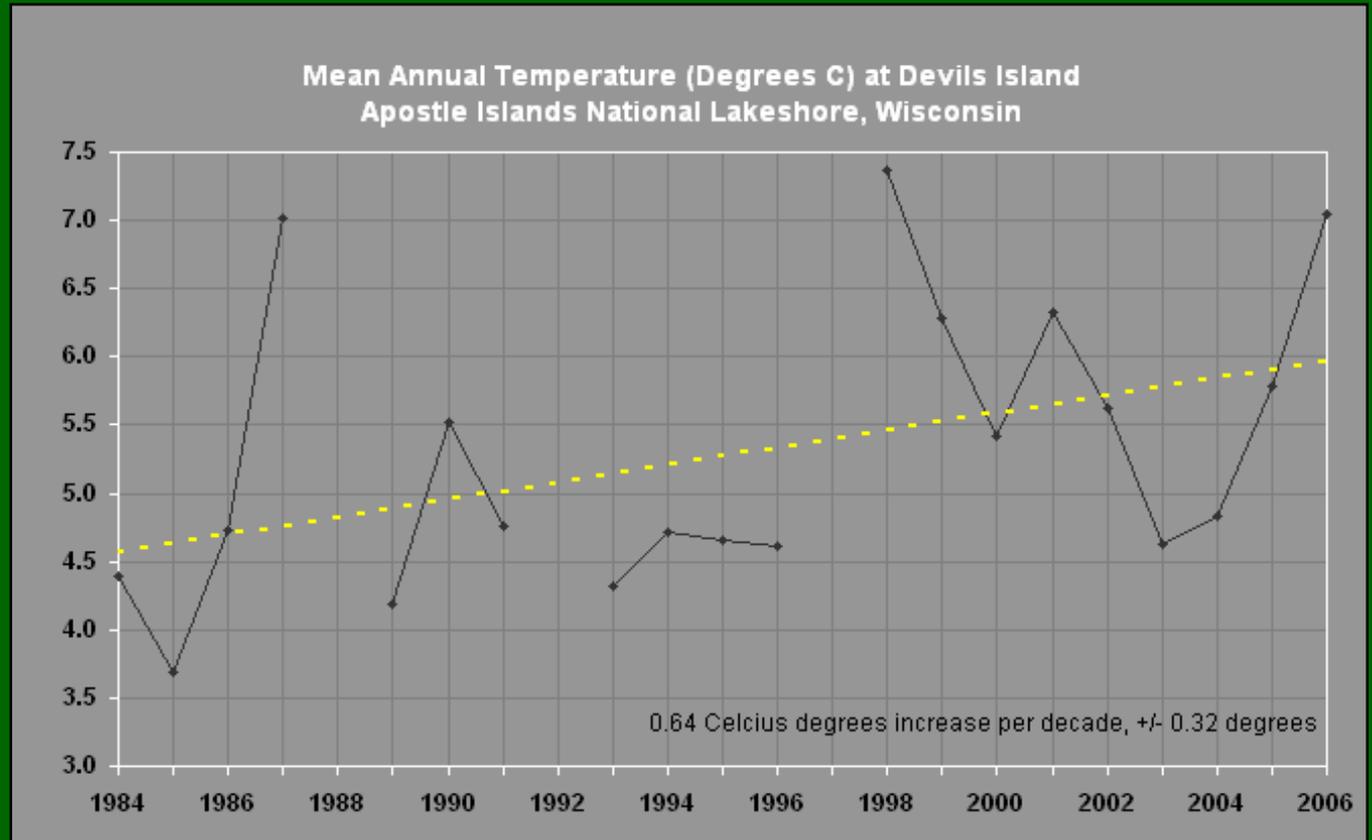
(Austin and Colman, 2007)

From <http://www.planetark.org/dailynewsstory.cfm?newsid=48179>



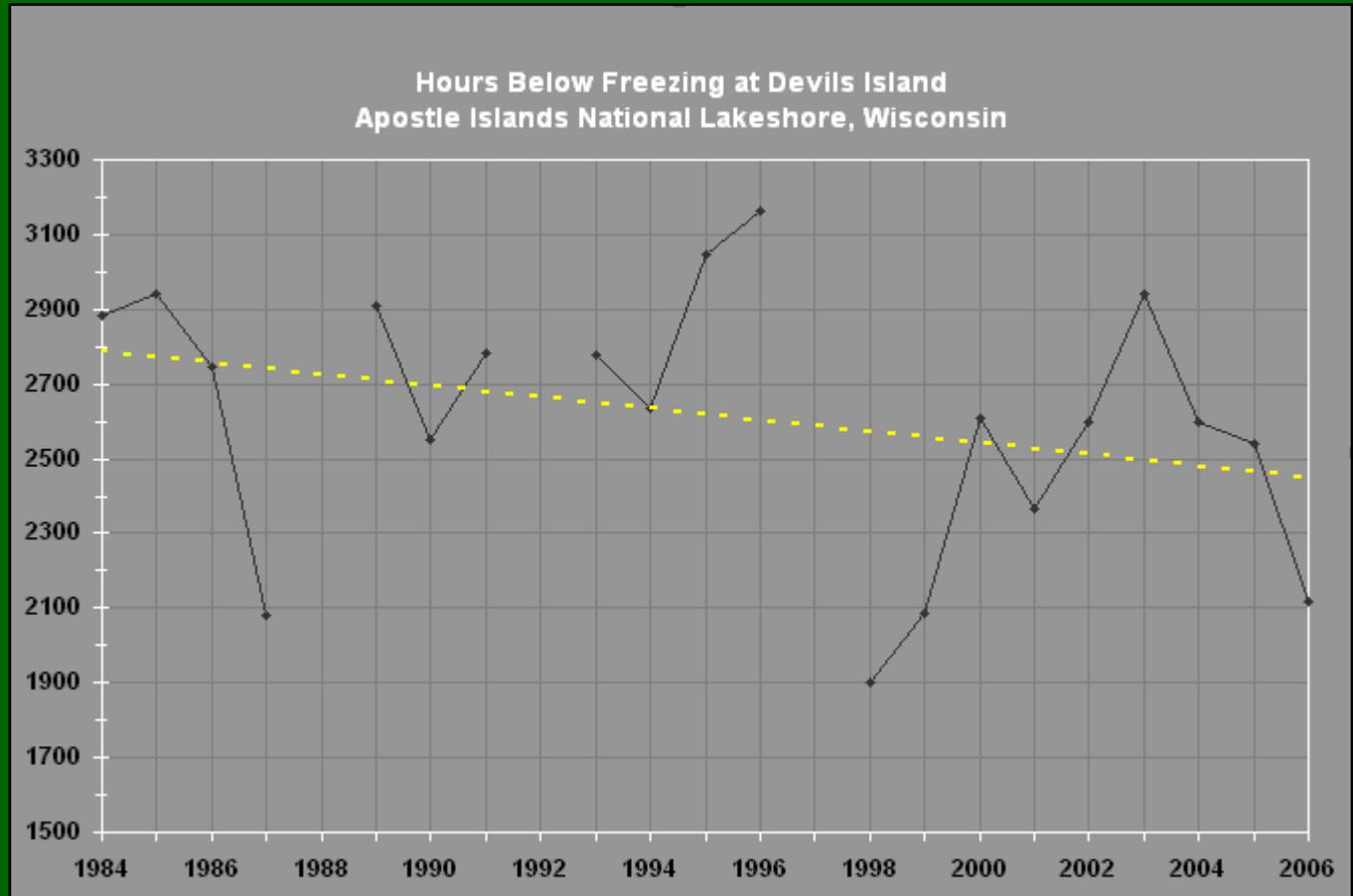
Temperatures at Devils Island

Apostle Islands National Lakeshore, Wisconsin



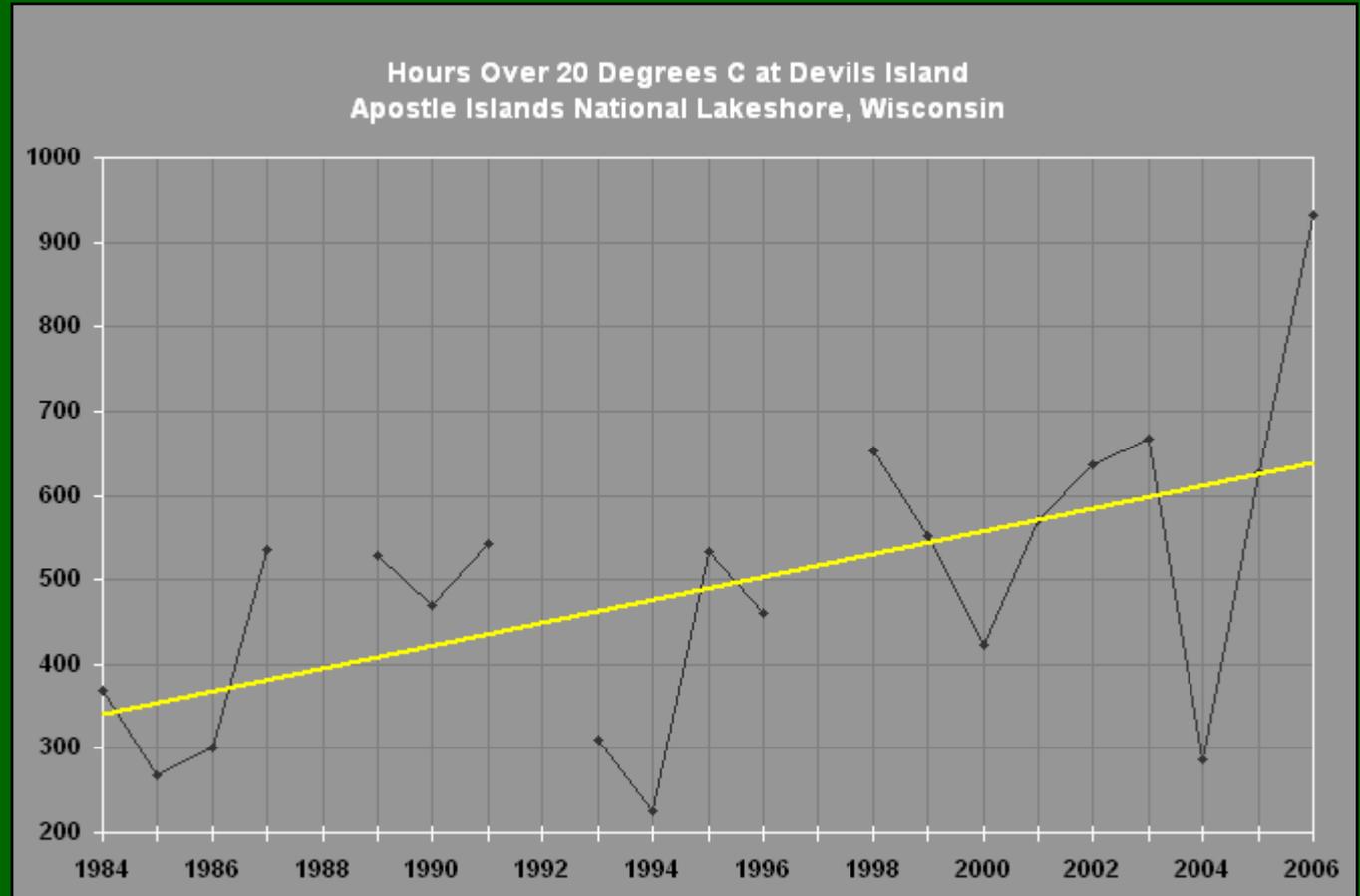
Temperatures at Devils Island

Apostle Islands National Lakeshore, Wisconsin



Temperatures at Devils Island

Apostle Islands National Lakeshore, Wisconsin



NATIONAL PARK SERVICE • APOSTLE ISLANDS NATIONAL LAKESHORE



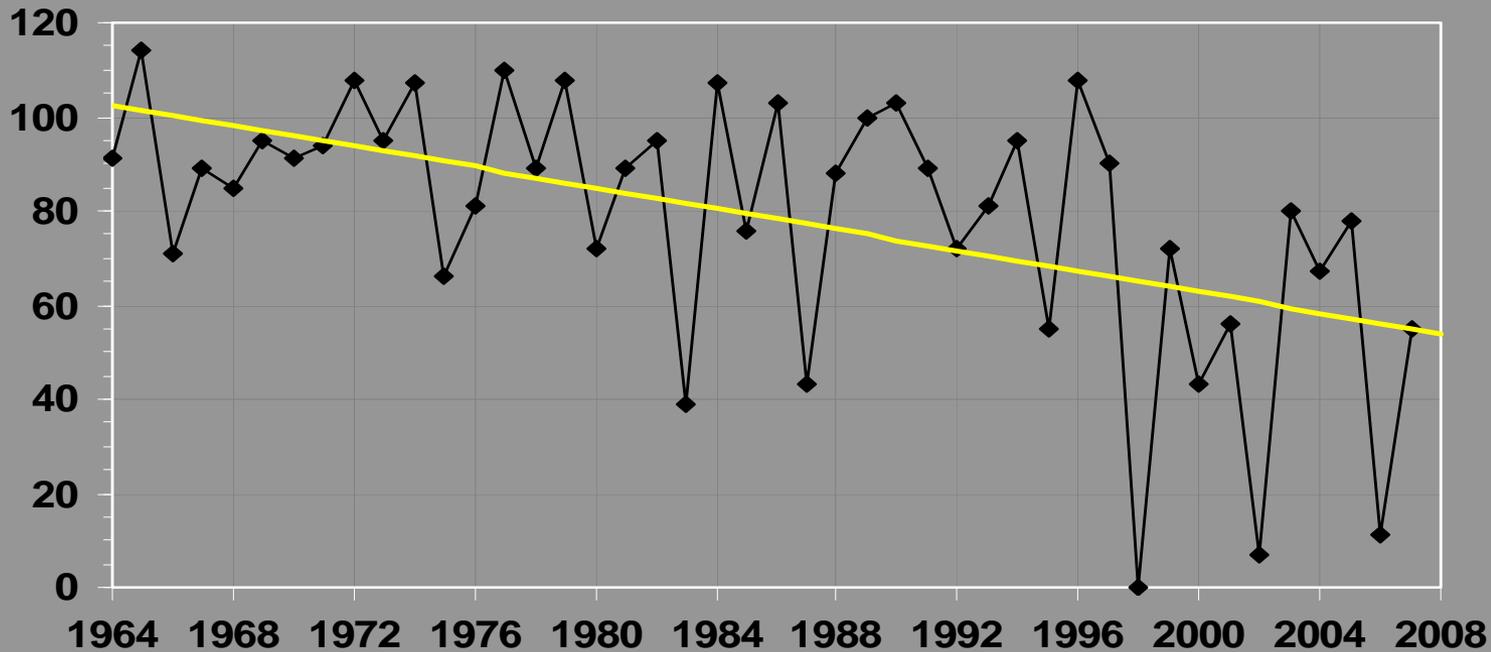
From NOAA data records at http://www.ndbc.noaa.gov/station_history.php?station=disw3

The Madeline Island Ice Road

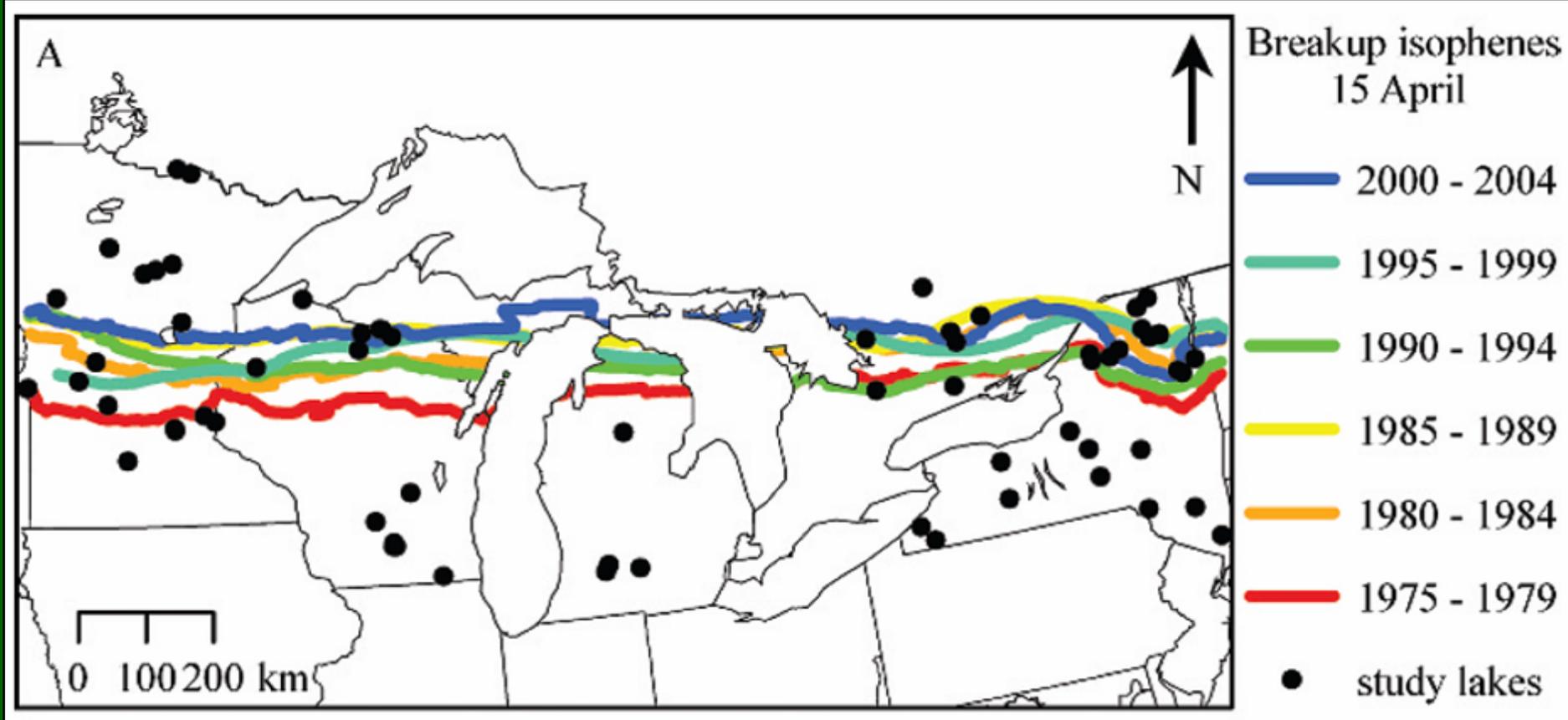
Adjacent to Apostle Islands National Lakeshore



La Pointe Winter History
Total Ice Transportation Days
Chart by Burke Henry - Data from Evan Erickson



The April 15 Ice Out Line is Moving Northward



Jenson, Benson, Magnuson et al., 2007



Spring Is Coming Earlier in Wisconsin

- Nina Leopold Bradley replicated her father Aldo's phenology studies at "The Shack" near Baraboo.
- Data show the arrival of spring has advanced 1.2 days per decade over the last 60 years, correlating with a gradual increase in regional temperature.

Event	Average 1936-1947	Average 1976-1998
Robin arrival	March 20	March 12
Hepatica first bloom	April 15	April 8
House wren arrival	May 4	April 23
Columbine first bloom	May 19	May 10
Baptisia first bloom	June 14	May 29



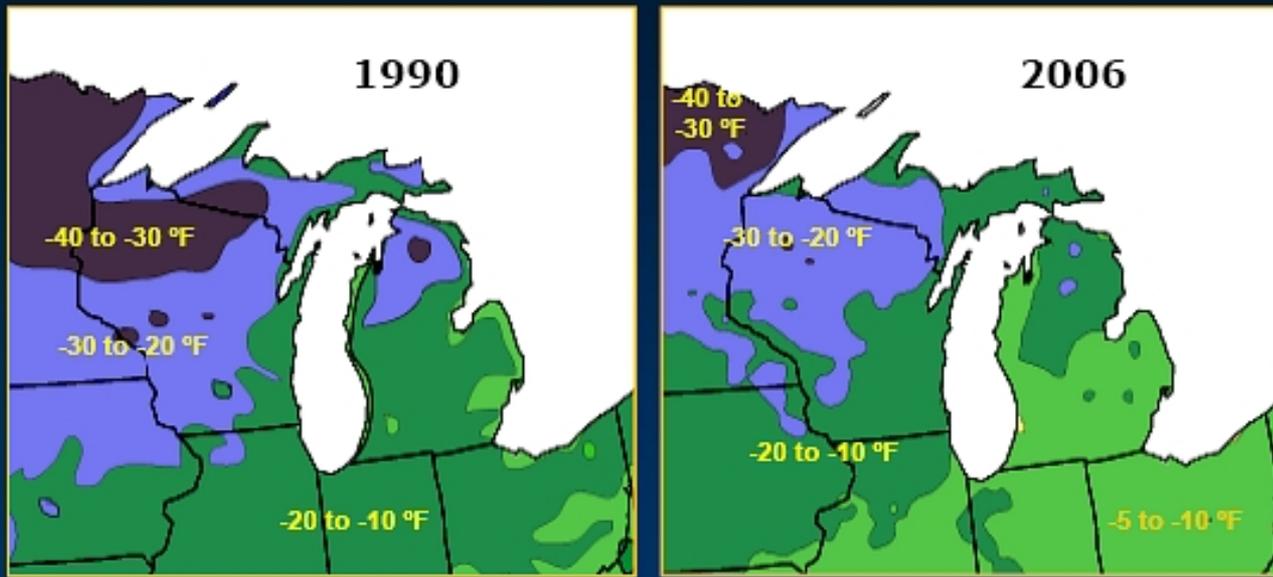
From the Proceedings of the National Academy of Sciences 96:9701-04 (1999) at <http://www.pnas.org/cgi/reprint/96/17/9701>

and the newsletter of the Aldo Leopold Foundation at <http://www.aldoleopold.org/Publications/newsletters/winter2003.pdf>

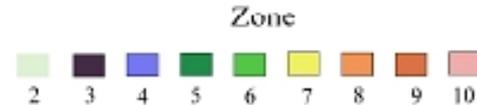


Plant Hardiness Zones Are Moving North

Changes in Plant Hardiness Zones Great Lakes: 1990 - 2006



Average Minimum
Temperatures

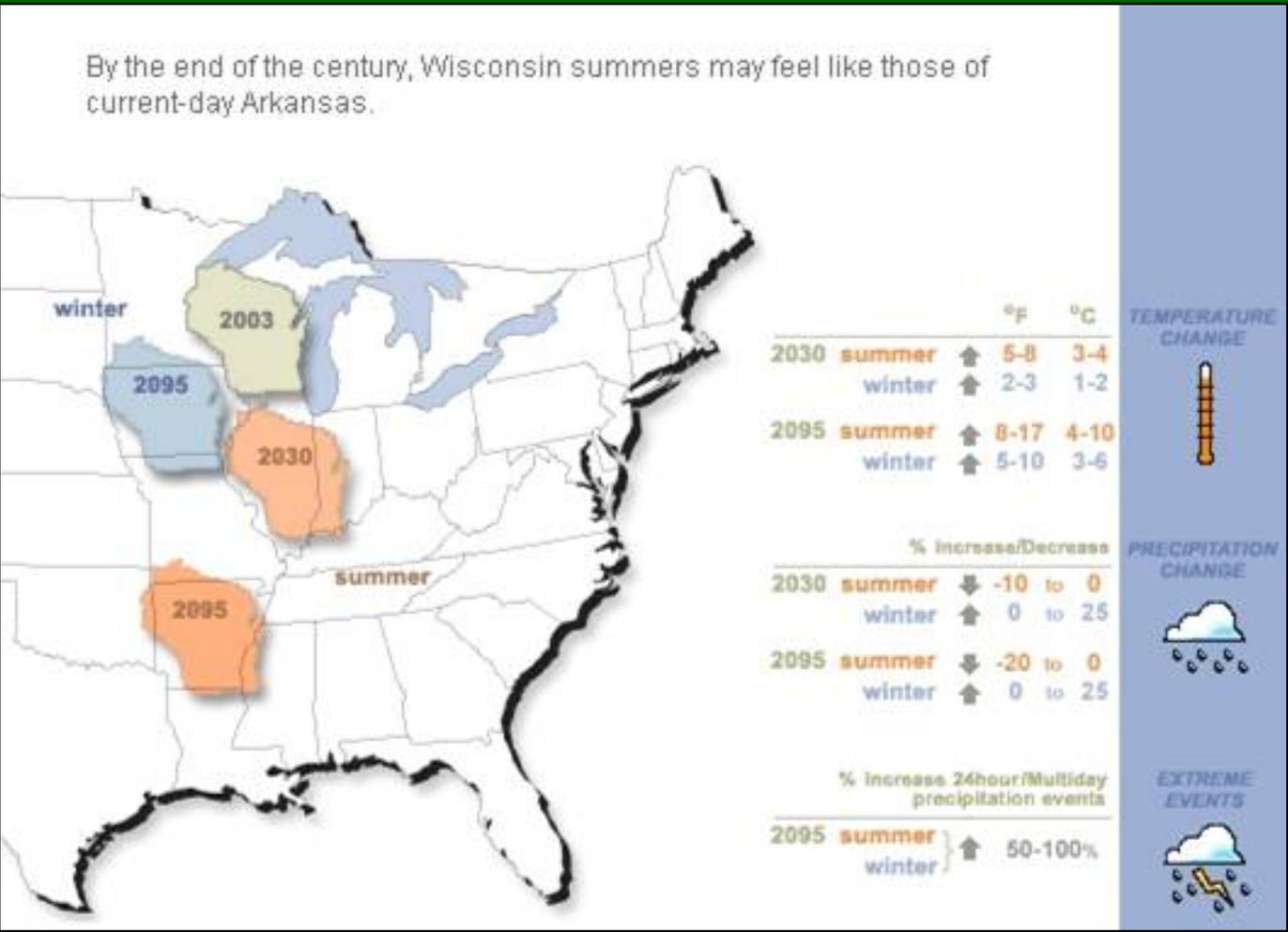


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From <http://www.arborday.org/media/zones.cfm>



Climates Will Migrate South



From <http://www.ucusa.org/greatlakes/glimpactmigrating.html>



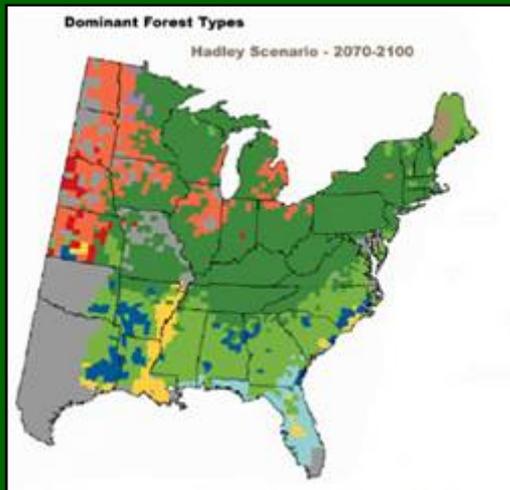
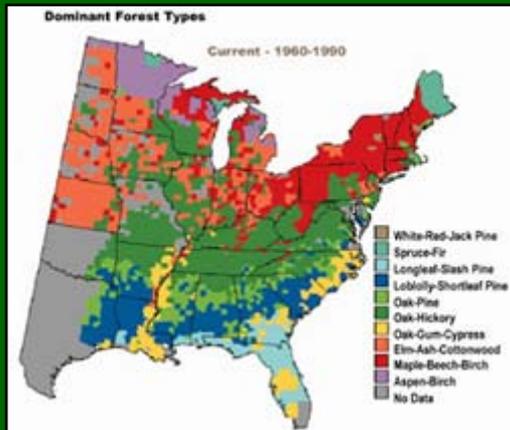
Great Lakes Water Levels – Projections Vary

- Models have inherent scientific uncertainty but are limited by non-scientific uncertainty over future emissions, making it seem like the models are more imprecise than they are.
(Pollack, 2007)
- Ice cover drives lake level models since winter evaporation affects lake levels more than precipitation. (Lofgren et al. 2002)
- 11 of 12 models project significant reductions in levels of the Great Lakes, ranging up to 5 feet. (National Assessment Synthesis Team, 2000)
- Evaporation from Lake Superior will increase by 7-17% by 2030 and 19-39% by 2090. Ice cover will decrease by 2090 to only 2-11% of current February average levels. (Lofgren et al. 2002)
- The 2 most recent major models differ: one has Lake Superior levels decreasing from long term averages by 9” by 2030 and 17” by 2090; the other has levels stable to rising by 4.”

(Lofgren et al. 2002)



Projected Ecological Impacts



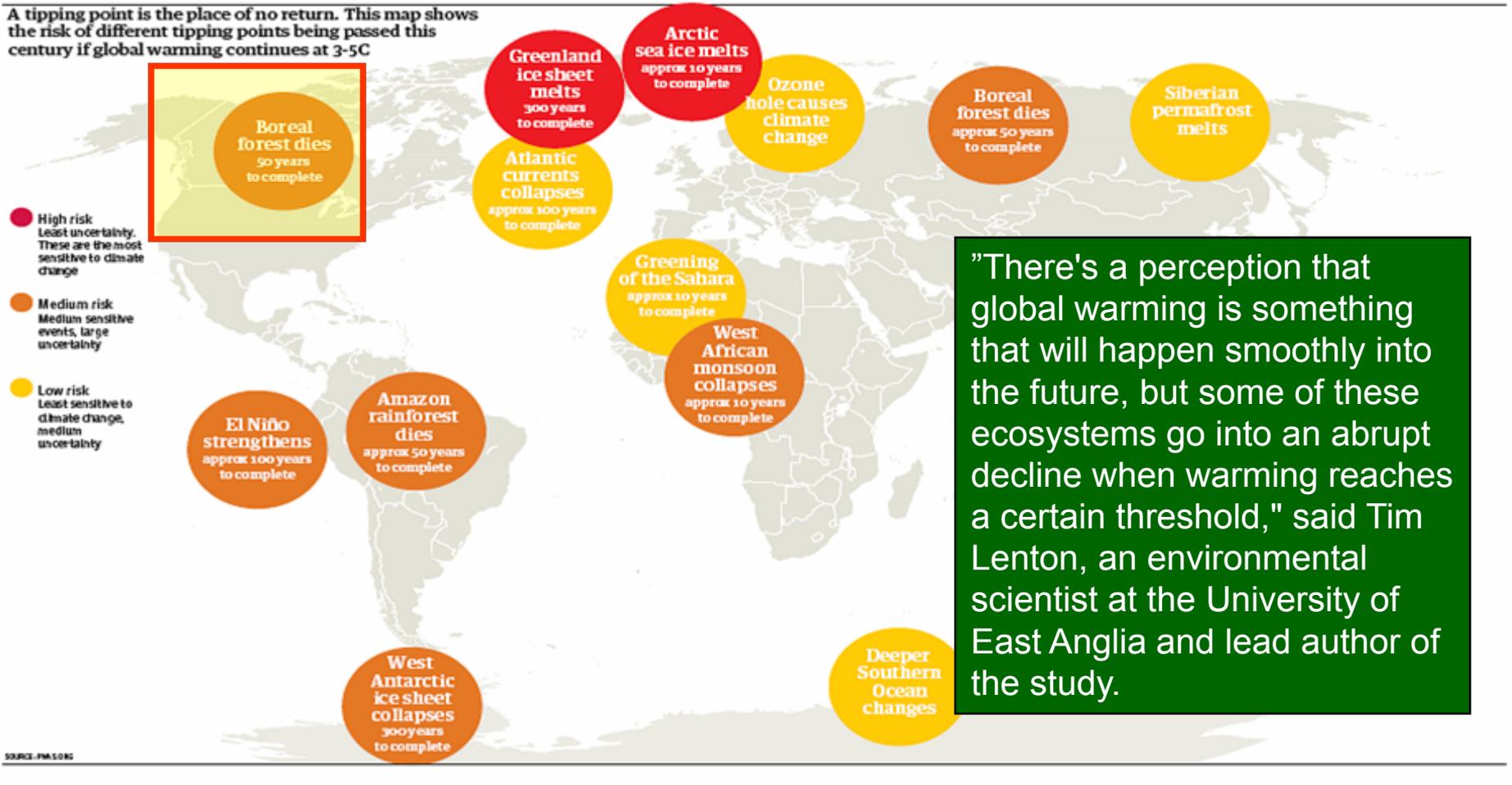
- Spruce, hemlock, and fir forests will shrink. (Union of Concerned Scientists, 2003)
- Birch communities are likely to dramatically decrease in the US, and largely shift into Canada. Oak/hickory and oak/pine habitats will likely increase. (National Assessment Synthesis Team, 2000)
- Increased fire frequency. (He, Mladenoff, and Gustafson, 2002)
- Cold water fish species such as lake trout, brook trout, and whitefish may decline dramatically while cool water species will expand their ranges. (Union of Concerned Scientists, 2003)



The Boreal Forest May Die in the Next 50 Years

Global meltdown

A tipping point is the place of no return. This map shows the risk of different tipping points being passed this century if global warming continues at 3-5C



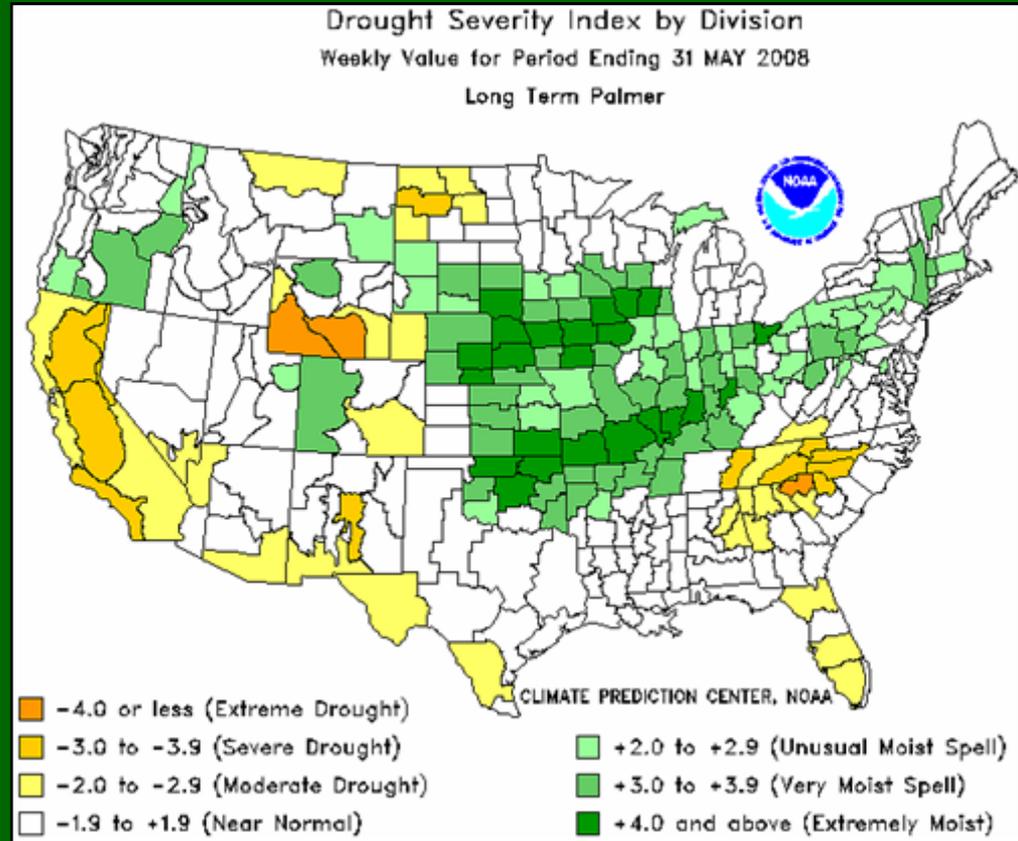
"There's a perception that global warming is something that will happen smoothly into the future, but some of these ecosystems go into an abrupt decline when warming reaches a certain threshold," said Tim Lenton, an environmental scientist at the University of East Anglia and lead author of the study.

<http://www.guardian.co.uk/environment/2008/feb/05/climatechange>



The Recent Drought in the Upper Midwest

- Warmer, drier summers
- Warmer winters
- Shorter cold season
- More winter precipitation as rain
- Warmer water
- Less ice
- Later freeze-up, earlier ice-out
- More evaporation from lakes
- Lower lake levels



Climate Change Projections for the Great Lakes

- Warmer, drier summers
- Warmer winters
- Shorter cold season
- More winter precipitation as rain
- Warmer water
- Less ice
- Later freeze-up, earlier ice-out
- More evaporation from lakes
- Lower lake levels
- Irregular, higher intensity storms
- More flooding, esp. in spring



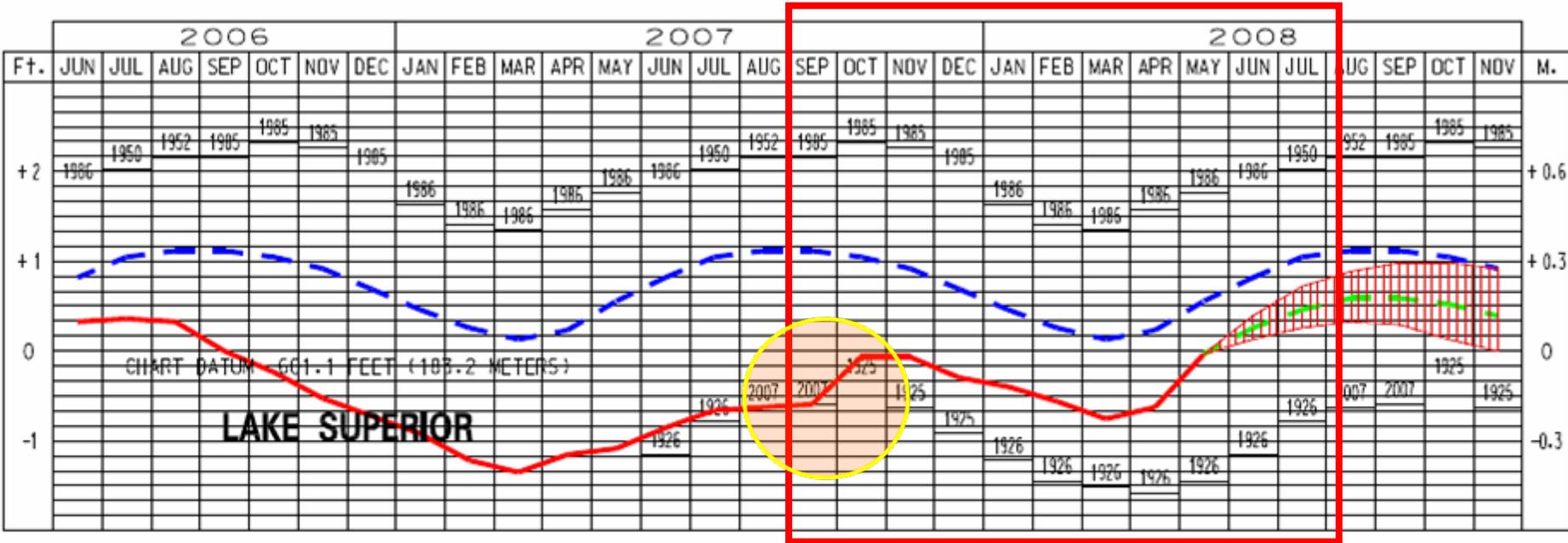
Climate Change Projections for the Great Lakes

- Warmer, drier summers (IPCC, 2001)
- Warmer winters (IPCC, 2001)
- Shorter cold season (International Joint Commission, 2003)
- More winter precipitation as rain (Wuebbles and Hayhoe, 2004)
- Warmer water (Lehman, 2002)
- Less ice (International Joint Commission, 2003)
- Later freeze-up, earlier ice-out (International Joint Commission, 2003)
- More evaporation from lakes (Nat'l Assessment Synthesis Team, 2000)
- Lower lake levels (Nat'l Assessment Synthesis Team, 2000)
- Irregular, higher intensity storms (International Joint Commission, 2003)
- More flooding, esp. in spring (Kling et. al, 2003)



Lake Superior Water Level - Observed

LAKE SUPERIOR WATER LEVELS - JUNE 2008

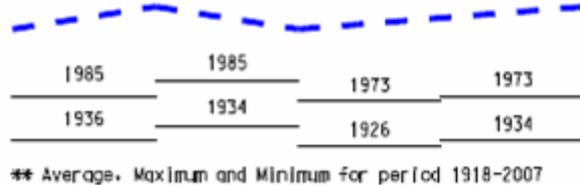


washingtonpost.com

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Lake Superior Sets Record for Low Water

By JOHN FLESHER
The Associated Press
Monday, October 1, 2007; 6:24 AM



** Average, Maximum and Minimum for period 1918-2007

recasts/monthlybulletinofgreatlakeswaterlevels



The *Current* Lake Superior Water Level

June 3, 2008

“We are venturing into the unknown with climate.”

-Thomas R. Karl (National Climatic Data Center)
and

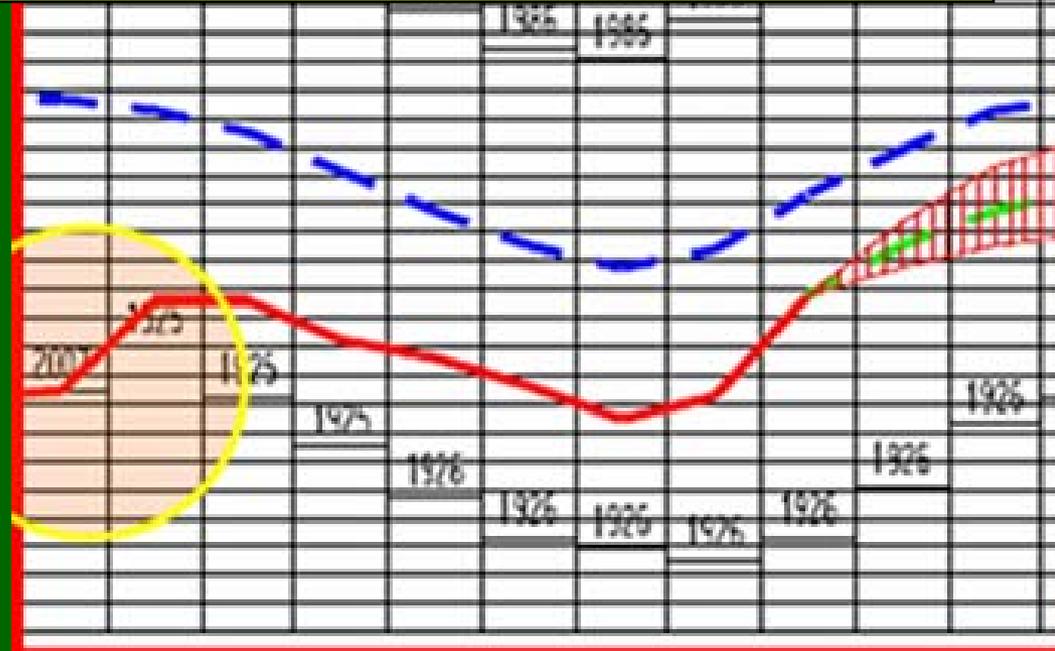
Kevin E. Trenberth (National Center for Atmospheric Research)
Science

5 December 2003

Vol. 302. no. 5651, pp. 1719 – 1723

<http://www.sciencemag.org/cgi/content/abstract/302/5651/1719>

- The normal annual fluctuation in Lake Superior is less than 13”
(Crowley, 2006)
- September 2007: the lake was 22” below normal
- It remains 10” below normal
- Normally*, the lake drops in fall but it rose last fall before dropping
- Do we even know what *normal* is any more?



Lower Water Levels in Lake Superior

We've Seen it Lately – This Is Not Just Some “Possible” Future



- Recreational infrastructure: fixed docks will be too high, ramps will need to be extended, more navigational hazards will be exposed.
- Commercial shipping: locks and berths will be too shallow. Ships will have to carry less to float higher.
- Ephemeral wetlands (e.g. the Kakagon Sloughs south of the Apostle Islands), hugely important biological areas, may dry up, affecting wild rice beds, fisheries, and possibly tribal communities.

Lower Water Levels in Lake Superior

We've Seen it Lately – This Is Not Just Some “Possible” Future

Bad River wild rice harvest cancelled

By Chad Dally

Thursday, August 09th, 2007 10:35:05 AM



Leah Gibala/Submitted Photo

Bad River tribal members Donald Corbine and his son, Justin, harvest wild rice in the Kakagon Slough in August, 2006.

The fears of many Bad River tribal members have been realized: For the first time in history, there will be no harvest of wild rice this year within tribal boundaries.

The Bad River Tribal Council announced on Wednesday that, due to extremely low water levels, a one-year hiatus is in place for rice beds in the 12,000-acre Kakagon, Bad River and Bad River Slough complexes, as well as Honest John Lake and the Sand Cut Sloughs off of Oak Point.

"This is something we have to do as a people," said Matt O'Claire, a game warden with Bad River's Natural Resources Department (NRD). "...It's something that we share with everybody, but we also talk about looking ahead seven generations and the need to protect it for our children and grandchildren."

- Ephemeral wetlands (e.g. the Kakagon Sloughs south of the Apostle Islands), hugely important biological areas, may dry up, affecting wild rice beds, fisheries, and possibly tribal communities.

Warmer and Longer Summers



- More boats ill suited for the cold, treacherous waters of Lake Superior, e.g. jet skis, pontoon boats.
- “Shoulder” seasons will begin earlier, end later, and see more activity.
- Warm waters will change the cold water fishery.
- Increased turbidity and algae in the Lake.
- Shipwrecks and other submerged cultural resources will deteriorate faster.



More Intensive Storms

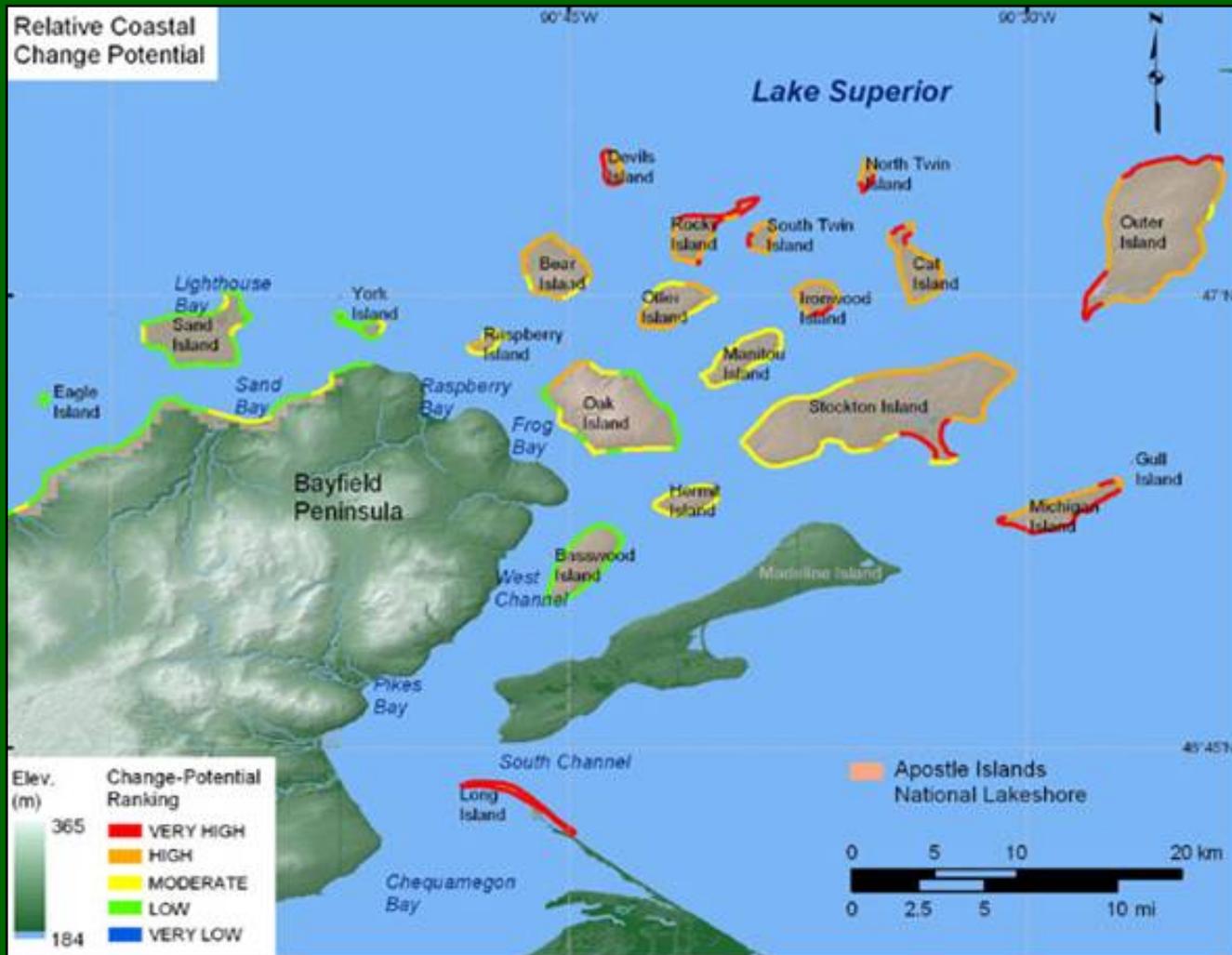
Coupled with warmer temperatures, there will likely be more boaters unprepared for storms on the lake, leading to more groundings, capsizings, and more need for rescues.



More Dangerous Boating/More Need for Rescues



Vulnerability of Coastal Areas on the Great Lakes



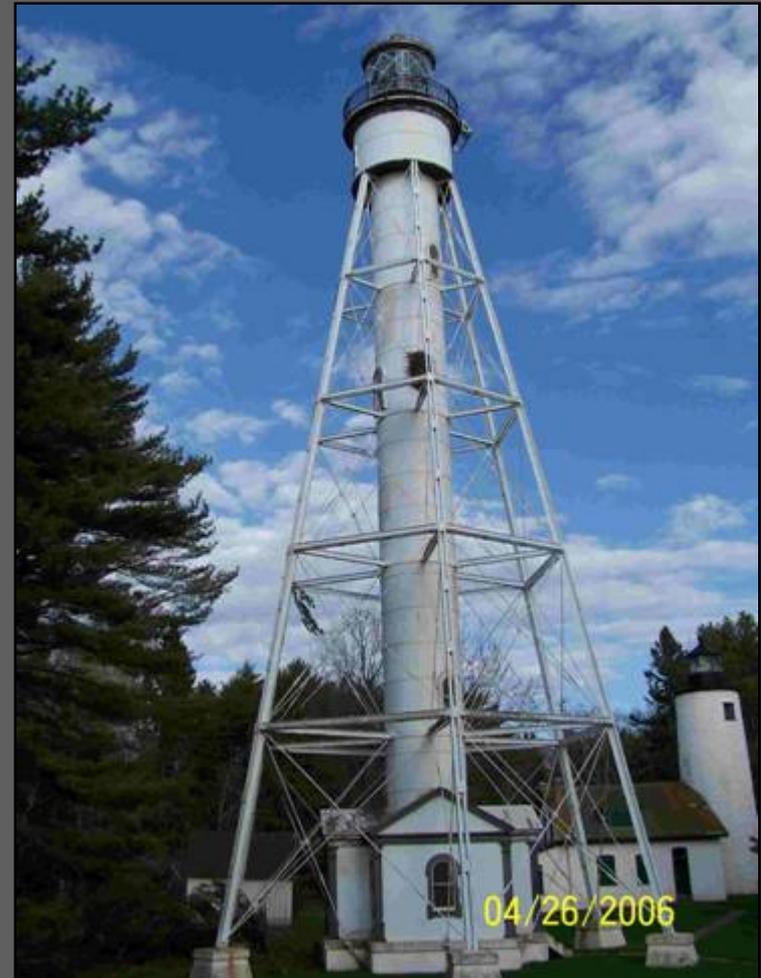
- Relative Coastal Change Potential Assessment of Apostle Islands National Lakeshore (APIS) to Lake-Level Changes
- Elizabeth A. Pendleton, E. Robert Thieler, S. Jeffress Williams
- USGS Open-File Report 2005-1249

From <http://woodshole.er.usgs.gov/project-pages/nps-cvi/parks/APIS.htm>



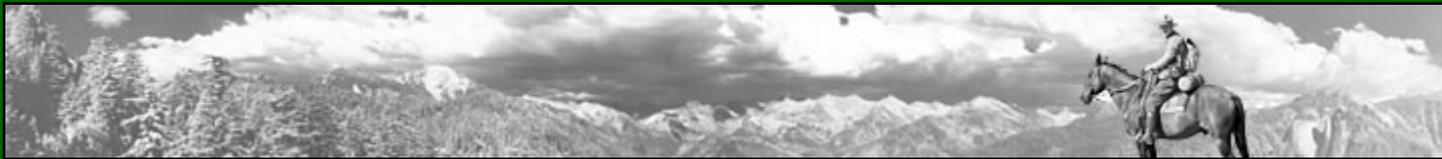
Today's Plan

- Disclaimer And Definitions
- Climate Change Is Real
- Impacts on National Parks
- Apostle Islands Case Study
- **So What Do We Do Now?**



The National Park Service Mandate

- The National Park Service was established by an Act of Congress in 1916 (16 US Code 1)
- “... to conserve the scenery and the natural and historic objects and the wild life therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations.”
- What are the roles of the national parks and other protected areas in the face of climate change?
- What can and should the NPS do?



Increase Commitment to Sustainability and then Lead By Example



Apostle Islands National Lakeshore
National Park Service
U.S. Department of the Interior

Superintendent's Order # 31

Safety and Sustainability

Effective Date of this Order: February 12, 2007



Apostle Islands National Lakeshore
Sustainability Best Management Practices
July, 2007

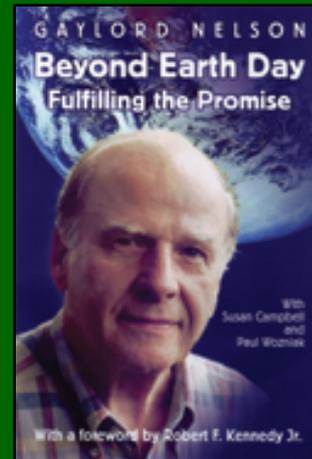


Increase Commitment to Sustainability

and then Lead By Example



“Without vigorous and persistent leadership ...the goal of sustainability can not be achieved... A way to make environmental problems appear to be less daunting is to relate them to our communities and convey their relevance to our daily lives – as they unquestionably are relevant.”



-- Gaylord Nelson
Beyond Earth Day
2002



Educate Ourselves and Others



Climate Change

Dying birch trees, minimal snowpack, and ice-free lakes are just some...
Impacts of Midwest Warming

The Science is In
Recent reports by the U.S. Global Change Research Program, the National Academy of Sciences, and the United Nations Intergovernmental Panel on Climate Change, give a clear indication of a warming world and related changes in our global climate system. The climate is changing, and there is little scientific doubt that most of the temperature increases since the mid 20th century are due to greenhouse gases produced by human activities. Taking action now will diminish the risks associated with climate change, and reduce the likelihood of catastrophic and far more expensive consequences.

A Changing Climate
Change has a way to go. A powerful force of nature, natural events help us understand how much change influences our lives by illustrating how interconnected we are with our environment.

Temperatures and Precipitation
The Northern Midwest, including the upper Great Lakes region, has warmed by almost 4°F (2°C) in the last century.
Data for Lake Michigan, Huron and Superior show that summer water temperatures are increasing. Lake Superior's summer surface water temperatures have increased by 4.4°F (2.4°C) since 1976.
The timing of Lake Superior's summer ice-out is now two weeks earlier than expected in 1976.

Consequences
Warmer winters in the northern Midwest are causing a loss of snow cover, which is important for the protection of winter wheat crops. In the Great Lakes region, the loss of snow cover is causing a loss of winter habitat for many birds and mammals. In the Great Lakes region, the loss of snow cover is causing a loss of winter habitat for many birds and mammals.

Ice is melting faster and melting earlier on lakes and streams in the Great Lakes region. Two-thirds of the whitefish in 1976 and 2001 in the Milwaukee region are getting shorter in the Great Lakes region. The loss of snow cover is causing a loss of winter habitat for many birds and mammals. In the Great Lakes region, the loss of snow cover is causing a loss of winter habitat for many birds and mammals.

The contribution of reduced winter ice, warmer lake temperatures, and greater precipitation leads scientists to believe that the level of Lake Superior will fall two to five inches to several feet. A warmer lake could mean increased algae growth and significant changes to aquatic ecosystems.



Determine the message and deliver it consistently!



Educate Ourselves and Others

Climate Friendly Park Workshop July 2007



Other Climate Friendly National Parks:

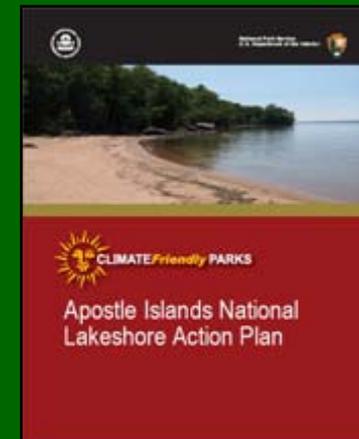
- Everglades
- Gateway
- Glacier
- Glacier Bay
- Great Smoky Mtns
- Hawaii Volcanoes
- Pictured Rocks
- Point Reyes
- Rocky Mountain
- Yosemite
- Zion



Apostle Islands develops action plan for climate change

By CHAD DALLY
The Daily Press

Wednesday, July 18th, 2007 09:16:48 AM



For more information, see <http://www.nps.gov/climatefriendlyparks>





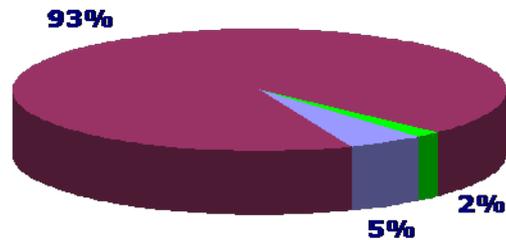
Total GHG Emissions = 672 MTCE*

*Metric Tons of Carbon Equivalent

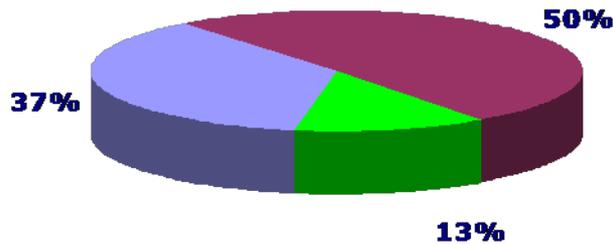
	Energy	Transportation	Waste	Total
Park Operations	32	44	11	87
Visitors	1	499	0	501
Apostle Islands Cruise Service	0	85	0	85
Total	33	628	11	672

■ Energy ■ Transportation ■ Waste

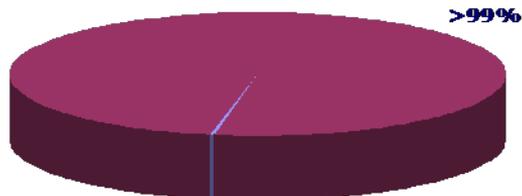
Park Total GHG Emissions = 672 MTCE



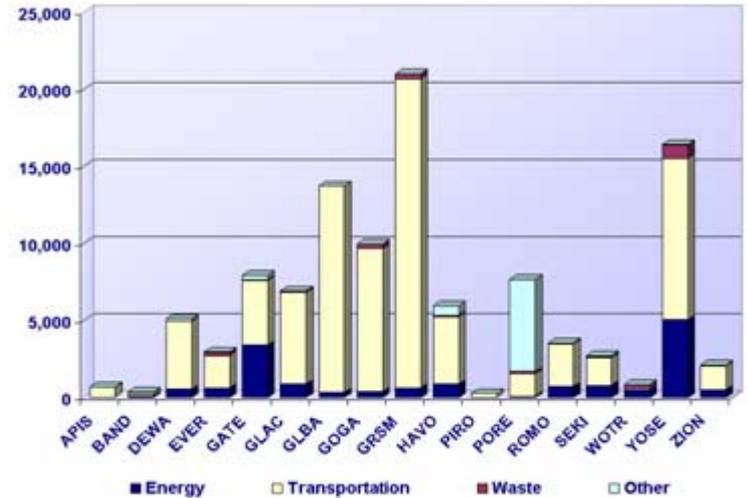
Park Operations GHG Emissions = 87 MTCE



Visitor GHG Emissions = 501 MTCE



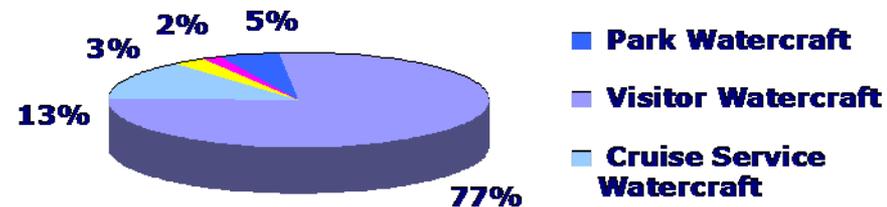
CFP Park Emission Inventory Results Spring 2008



	CO ₂	CH ₄	N ₂ O	HFCs	Total
Energy	32	1	0	NA	33
Transportation	622	1	5	NA	628
Waste	0	11	0	NA	11
Total	654	13	5	0	672

NA - Not Applicable

Transportation GHG Emissions = 628 MTCE



Plan for Change / Adapt Facilities as appropriate

APOSTLE ISLANDS NATIONAL LAKESHORE
WISCONSIN

NATIONAL PARK SERVICE
U.S. NATIONAL PARK SERVICE



Options For Future Management

Dear Friend of Apostle Islands National Lakeshore:

A little more than a year ago, we held several meetings around Wisconsin and Minnesota to discuss the revision of the General Management Plan for Apostle Islands National Lakeshore. As you may recall, National Park Service (NPS) general management plans are very broad planning documents that create a vision for the park for the next 15 to 20 years. This new management plan will address wilderness issues for the first time because of the designation of the Gaylord Nelson Wilderness in late 2004.

We have learned a lot about the issues that are important to you, and we have given the issues a lot of thought ourselves. As we prepare to begin drafting this important plan for the park, we invite you to review the issues and some different options for addressing them. Once we have a complete list of issues, each with a broad range of options, we will define planning alternatives and prepare a Draft General Management Plan / Wilderness Management Plan / Environmental Impact Statement for your review.

This newsletter highlights several issues that we believe are appropriate for the general management plan to address, and outlines several different approaches to each of the issues. We want to hear from you! Is the list of issues complete? Is there a reasonable, legal option for approaching a particular issue that we have missed? Do you prefer any particular approach to an issue? Any thoughts that you can share with us along these lines would be extremely valuable to us.

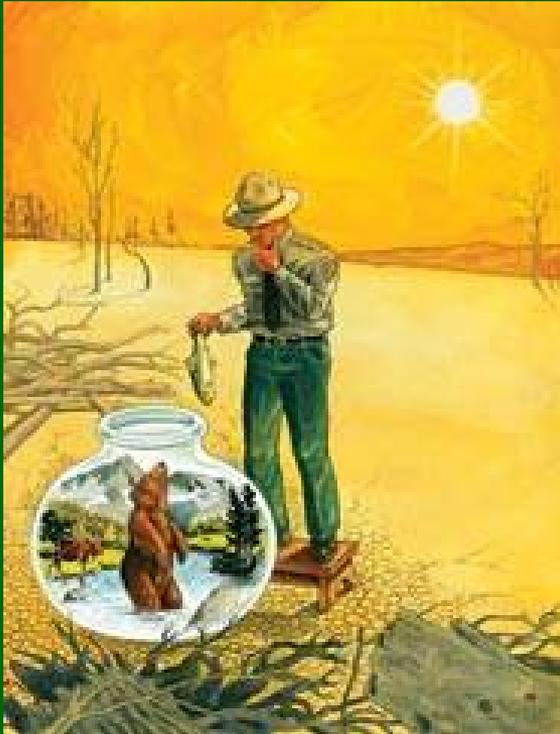
We'll be hosting several meetings around the region this summer to listen to your views and gather input for the plan. (Please see page 22 for the schedule.) Help us decide what the Apostle Islands National Lakeshore will look like 20 years from now. We hope you'll stay engaged in this important planning process by reviewing this newsletter, attending a meeting, and sending us your comments.

Sincerely,

Bob Krumenaker
Superintendent



Protect Species / Adapt to Ecological Changes



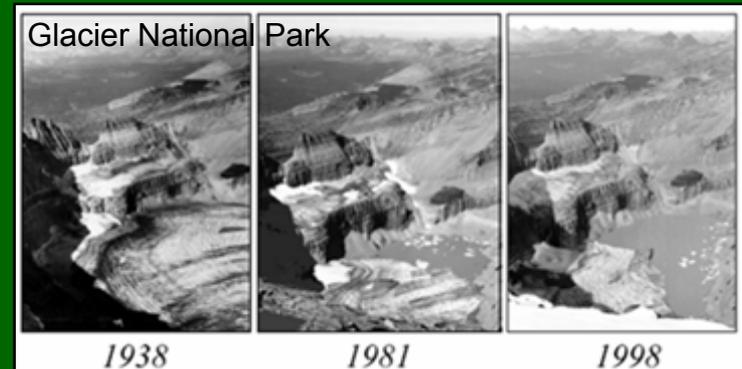
Graphic By John Kastner
From High Country News 2/4/2008

- This is the most difficult of the strategies.
- Do we know how? Can it be done?
- Should we even try?
- Should we create refugia in new habitats?
- If so, what's the impact on the “receiving” area”?
- A protected species in one area may look like an invasive species in another...
- Does “native” still have a meaning for protected area policy?
- We need to *manage for maximum resiliency...*



Most Importantly: Change the Paradigm

- Climate change is not simply about the changes to park environments and regional ecosystems...
- We need to consider changes to, and rethinking of:
 - Experiences
 - Expectations
 - Safety
 - Facilities and access
 - Demands on management agencies
 - What it means to “conserve unimpaired”
- Climate change is not just a *resource* management issue; it’s a *protected area* management issue -- and one for our gateway communities and visitors.



Climate Change and the National Parks

“For the past 25 years, I have been doing field work at high elevations in the ... premier national parks, including Glacier, Yellowstone, Mt. Rainier, Yosemite, and Sequoia. In all of these parks, we are seeing the fingerprint of global climate change. Glaciers are disappearing and plants, animals and insect pests are moving upslope at unprecedented rates.

“Our national parks can no longer be protected from human influence by building a fence or hiring park rangers. Recall that national parks are an American invention. In fact, the writer Wallace Stegner often remarked that the idea of national parks was the best idea that we ever had. *It's my fervent hope that we find the will to address global climate change in order to ensure that the parks and wild places ... continue to delight and inspire future generations.* “



Lisa Graumlich
Director, School of Natural Resources
University of Arizona

From <http://www.earthsky.org/article/50989/20-scientists-speak>



What Should the NPS Midwest Region Do?

Strategy and Tactics From the 2007 MWR Superintendents' Conference to "Mainstream" Climate Change

IDEA	ACTION	STATUS
Assure scientific credibility	•Peer-reviewed "Talking Points"	•Complete for Great Lakes
Develop interpretive materials	•Acquire national brochure •Develop 3 MWR site bulletins	•Done •Done
Increase park sustainability	• Encourage Climate-Friendly Park Workshops and Action Plans • Develop regional emphasis or incentives	•APIS, PIRO •Needs work!
Accountability	•Superintendent critical element	•In FY08 Supt. EPAPs
Incorporate into planning at all levels, disciplines	•Identify resources at risk •Guidelines for <i>appropriate</i> adaptation	•Needs work!
Develop carbon offset program	• Keep it in the MWR? NPS?	•Needs work!



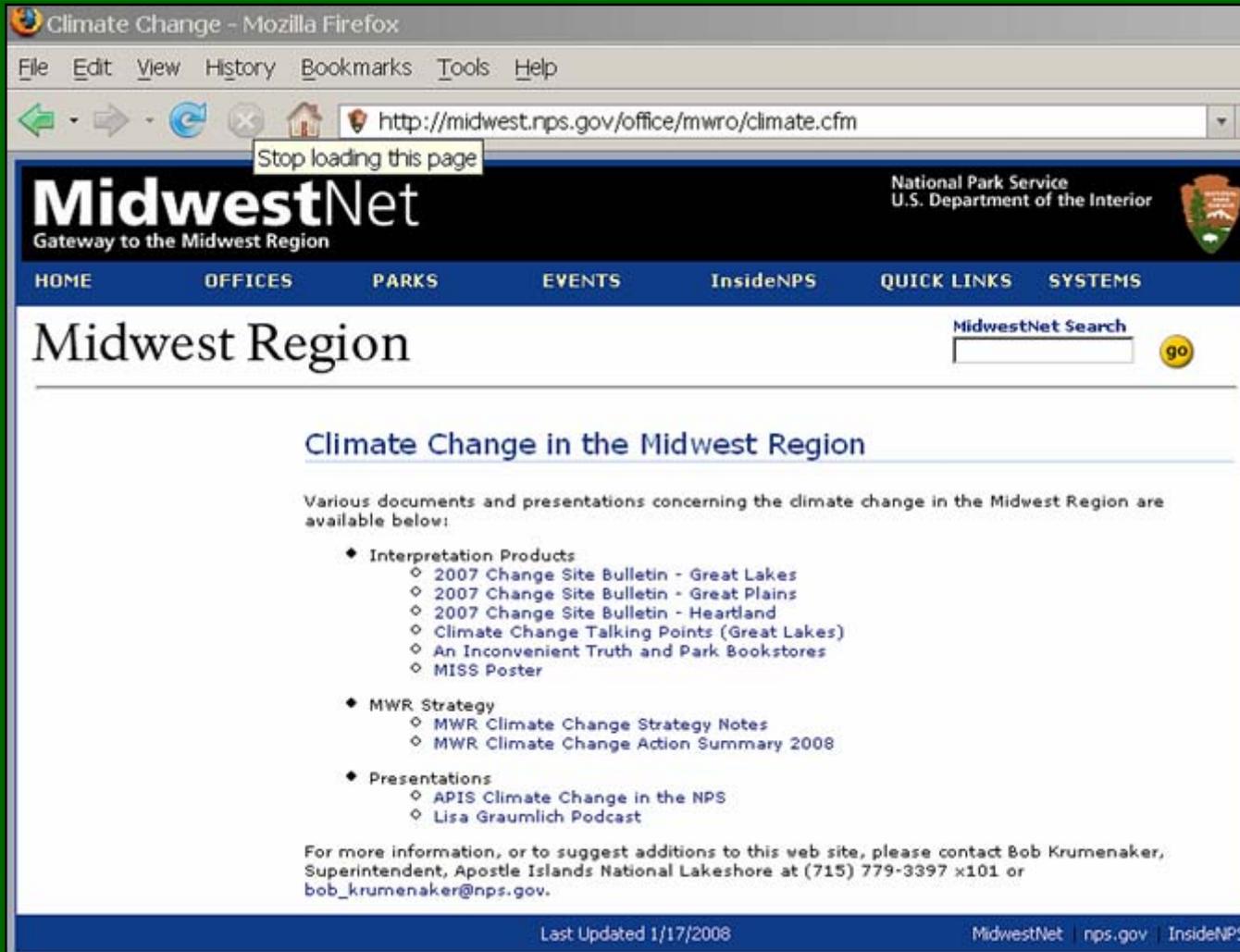
Where to Find NPS Climate Change Resources

The screenshot shows the MidwestNet website interface. At the top, the browser address bar displays 'http://midwest.nps.gov/'. The website header includes the 'MidwestNet Gateway to the Midwest Region' logo and the National Park Service logo. A navigation menu contains links for HOME, OFFICES, PARKS, EVENTS, InsideNPS, QUICK LINKS, and SYSTEMS. Below the navigation is a search bar labeled 'MidwestNet Search' with a 'go' button. The main content area features a large photograph of a tree-lined path with autumn foliage. To the left of the photo is a sidebar with a 'Regional Director' section for Ernest Quintana, a 'Make MidwestNet Your Home Page' section, and a 'Directory Lookup' section for MWRO. To the right of the photo is a 'Did You Know...' section and a 'MWRO WeatherLine' advertisement. Below the photo is a caption: 'Indiana Dunes NL - Shoreside Lane along Lake Michigan Charles F. Webster, NPS Show Entire Gallery'. Underneath the photo is a 'Headlines' section with a bullet point: '2008 Junior Ranger Contest Announced'. At the bottom right of the page, there is a circular graphic with the text 'Climate Change in the Midwest Region' and a yellow arrow pointing to it from the right.

Click on the earth!



Where to Find NPS Climate Change Resources



The screenshot shows a Mozilla Firefox browser window displaying the MidwestNet website. The address bar shows the URL <http://midwest.nps.gov/office/mwro/climate.cfm>. The page header includes the "MidwestNet Gateway to the Midwest Region" logo and the National Park Service U.S. Department of the Interior logo. A navigation menu contains links for HOME, OFFICES, PARKS, EVENTS, InsideNPS, QUICK LINKS, and SYSTEMS. A search box labeled "MidwestNet Search" is present. The main content area is titled "Climate Change in the Midwest Region" and lists various documents and presentations. At the bottom, contact information for Bob Krumenaker is provided, along with a "Last Updated 1/17/2008" notice and navigation links for "MidwestNet", "nps.gov", and "InsideNPS".

Climate Change - Mozilla Firefox

File Edit View History Bookmarks Tools Help

http://midwest.nps.gov/office/mwro/climate.cfm

Stop loading this page

MidwestNet
Gateway to the Midwest Region

National Park Service
U.S. Department of the Interior

HOME OFFICES PARKS EVENTS InsideNPS QUICK LINKS SYSTEMS

MidwestNet Search go

Climate Change in the Midwest Region

Various documents and presentations concerning the climate change in the Midwest Region are available below:

- ◆ Interpretation Products
 - ◇ 2007 Change Site Bulletin - Great Lakes
 - ◇ 2007 Change Site Bulletin - Great Plains
 - ◇ 2007 Change Site Bulletin - Heartland
 - ◇ Climate Change Talking Points (Great Lakes)
 - ◇ An Inconvenient Truth and Park Bookstores
 - ◇ MISS Poster
- ◆ MWR Strategy
 - ◇ MWR Climate Change Strategy Notes
 - ◇ MWR Climate Change Action Summary 2008
- ◆ Presentations
 - ◇ APIS Climate Change in the NPS
 - ◇ Lisa Graumlich Podcast

For more information, or to suggest additions to this web site, please contact Bob Krumenaker, Superintendent, Apostle Islands National Lakeshore at (715) 779-3397 x101 or bob_krumenaker@nps.gov.

Last Updated 1/17/2008 MidwestNet nps.gov InsideNPS



Where to Find NPS Climate Change Resources

Climate Friendly Parks - Mozilla Firefox

File Edit View History Bookmarks Tools Help

http://www.nps.gov/climatefriendlyparks/ Google

National Park Service
U.S. Department of the Interior



CLIMATE Friendly PARKS

HOME
EXPLORE CLIMATE FRIENDLY PARKS
BECOME A MEMBER
RESOURCE CENTER
CONTACT US
FAQS

Do Your Part for Climate Friendly Parks

CLIP Tool: Inventory Module

CLIP Tool: Action Planning Module

Listserv

To sign up for the Climate Friendly Parks listserv: click the link above and type "subscribe" into the subject line.

FIND A PARK



CFP MEMBER PARKS

-  **Apostle Islands National Lakeshore**
-  **Delaware Water Gap National Recreation Area**
-  **Everglades National Park**
-  **Gateway National Recreation Area**
-  **Glacier National Park**
-  **Glacier Bay National Park**
-  **Hawaii Volcanoes National Park**



Where to Find AINL Climate Change Resources

Follow this link on our home page

www.nps.gov/apis:



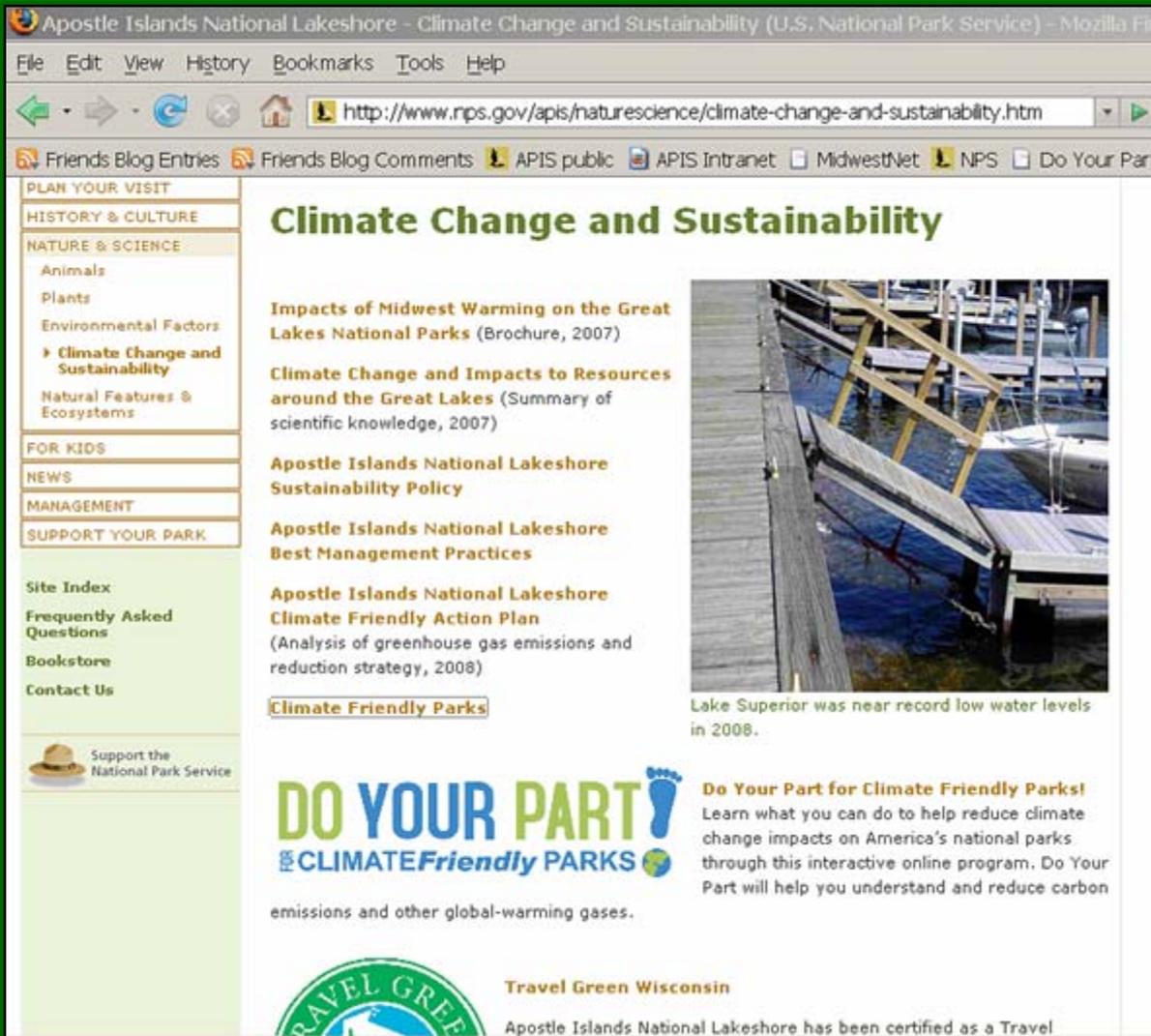
Climate Change and Sustainability

Learn about how climate change will affect Lake Superior and the Apostle Islands, and some of the the park's efforts to address the issue.

[more...](#)



Where to Find AINL Climate Change Resources



The screenshot shows a web browser window with the URL <http://www.nps.gov/apis/naturescience/climate-change-and-sustainability.htm>. The page title is "Climate Change and Sustainability". The left sidebar contains a navigation menu with categories: PLAN YOUR VISIT, HISTORY & CULTURE, NATURE & SCIENCE (with sub-items: Animals, Plants, Environmental Factors, Climate Change and Sustainability, Natural Features & Ecosystems), FOR KIDS, NEWS, MANAGEMENT, and SUPPORT YOUR PARK. Below the menu are links for Site Index, Frequently Asked Questions, Bookstore, and Contact Us. The main content area features the following resources:

- Impacts of Midwest Warming on the Great Lakes National Parks** (Brochure, 2007)
- Climate Change and Impacts to Resources around the Great Lakes** (Summary of scientific knowledge, 2007)
- Apostle Islands National Lakeshore Sustainability Policy**
- Apostle Islands National Lakeshore Best Management Practices**
- Apostle Islands National Lakeshore Climate Friendly Action Plan** (Analysis of greenhouse gas emissions and reduction strategy, 2008)

A photograph shows a wooden dock structure partially submerged in water, with a boat nearby. The caption reads: "Lake Superior was near record low water levels in 2008."

There is a link for **Climate Friendly Parks**. Below this is a "DO YOUR PART" logo for CLIMATE Friendly PARKS, with a footprint icon. The text says: "Do Your Part for Climate Friendly Parks! Learn what you can do to help reduce climate change impacts on America's national parks through this interactive online program. Do Your Part will help you understand and reduce carbon emissions and other global-warming gases."

At the bottom, there is a "TRAVEL GREEN Wisconsin" logo and text: "Apostle Islands National Lakeshore has been certified as a Travel Green Wisconsin."

Missing:
Research
needs and
opportunities



Do Your Part! For Climate Friendly Parks

NPS Staff Site Only. NPS Visitor Site Coming Soon.



HOME | LOG IN | MY ACCOUNT | CONTACT US

Reduce Your Carbon Footprint



OUR 2008 GOAL

CURRENT NATIONAL PLEDGE: 1,017,567 lbs. (0.83 %)

122,000,000 lbs.

Join the 317 national park visitors who have pledged to do their part to protect our national parks.

START DOING YOUR PART!
CLICK TO SEE **How It Works**

If 5 percent of National Park visitors reduced the number of miles they drove by 10 miles per week, they would save 7 billion lbs. of CO₂ per year.



Pick a Park to Start



Reduce your carbon footprint in **THREE** easy steps:

- 1. Pick a Park**
- 2. Sign Up**
- 3. Calculate and Pledge**

*All emissions are reported in pounds of CO₂ equivalent.

HOW IT WORKS | SCIENCE & IMPACTS | CLIMATE Friendly PARKS | RESOURCES | SUBSCRIBE TO E-TIPS | SEND FEEDBACK

Do Your Part! for Climate Friendly Parks is a joint effort of:



National Parks Conservation Association*
Protecting Our National Parks for Future Generations*



SUPPORT PARKS & BECOME A SPONSOR of DO YOUR PART!



Do Your Part! For Apostle Islands

The screenshot shows a web browser window with the URL <http://www.doyourpartparks.org/apis.php>. The page features a navigation bar with links for HOME, LOG IN, MY ACCOUNT, and CONTACT US. A red banner at the top right states "NPS Staff Site Only. NPS Visitor Site Coming Soon." The main heading is "Reduce Your Carbon Footprint". A progress bar at the top shows a row of blue footprints, with a small orange triangle indicating the current progress. Below the progress bar, it says "CURRENT VISITOR PLEDGE: 11,723 lbs. (1.17 %)" and "OUR 2008 GOAL 1,000,000 lbs." To the left, a text box encourages visitors to support Apostle Islands National Lakeshore by reducing 1 million lbs. of CO2 nationally. Below this is a "SIGN UP To Support" button with a "CLICK HERE TO" link. A photo of a young boy holding a laundry basket is shown next to a text box stating that if 5 percent of national park visitors washed their clothes in cold water instead of hot, they would save 1.5 billion lbs. of CO2 per year. To the right, a section titled "Apostle Islands National Lakeshore" features a photo of a rocky coastline. Below the photo, it says "All emissions are reported in pounds of CO2 equivalent." To the right of the photo is a "Reduce your carbon footprint in THREE easy steps:" list: 1. Pick a Park, 2. Sign Up, and 3. Calculate and Pledge. At the bottom, a navigation bar includes links for HOW IT WORKS, SCIENCE & IMPACTS, CLIMATE Friendly PARKS, RESOURCES, SUBSCRIBE TO E-TIPS, and SEND FEEDBACK. The footer contains logos for the National Parks Conservation Association, the National Park Service, and a "SUPPORT PARKS & BECOME A SPONSOR of DO YOUR PART!" button.



We've Got Some Work To Do...



QUESTIONS? FOR MORE INFORMATION
BOB KRUMENAKER • SUPERINTENDENT
415 WASHINGTON AVENUE • BAYFIELD WI 54814
(715) 779-3397 x101
bob_krumenaker@nps.gov



Lake Superior and the Apostle Islands From ... Home

