



# Global Warming: The Forecast for Wildlife





# GLOBAL WARMING: The Forecast for Wildlife



**Global Warming Science**  
**Impacts on NH's Fish & Wildlife**  
**Solutions: What can we do?**



# The Greenhouse Effect



Some energy is reflected back out to space

Earth's surface is heated by the sun and radiates the heat back out towards space

**CO<sub>2</sub>**  
**Water Vapor**  
**Nitrous Oxide**  
**Methane**

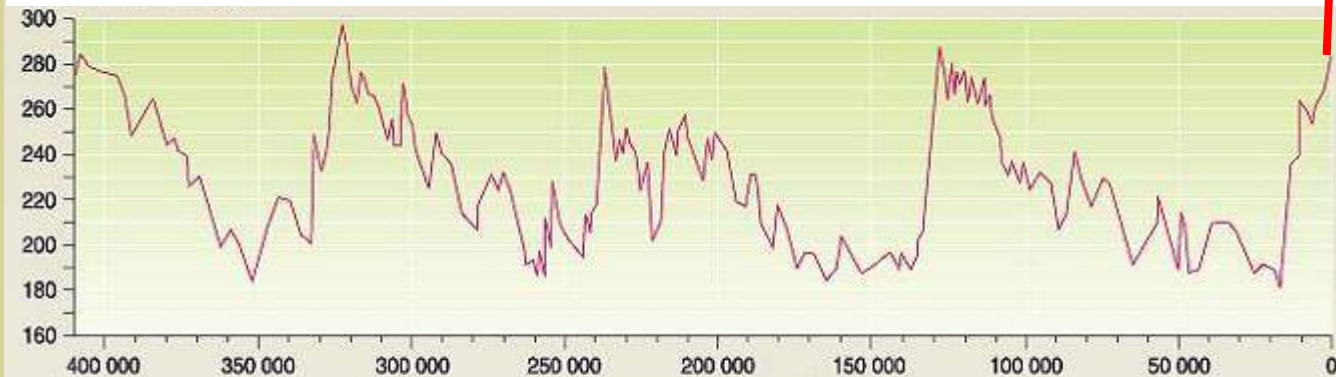
Solar energy from the sun passes through the atmosphere

Greenhouse gases in the atmosphere trap some of the heat



380ppm

## Atmospheric CO<sub>2</sub> (ppm)

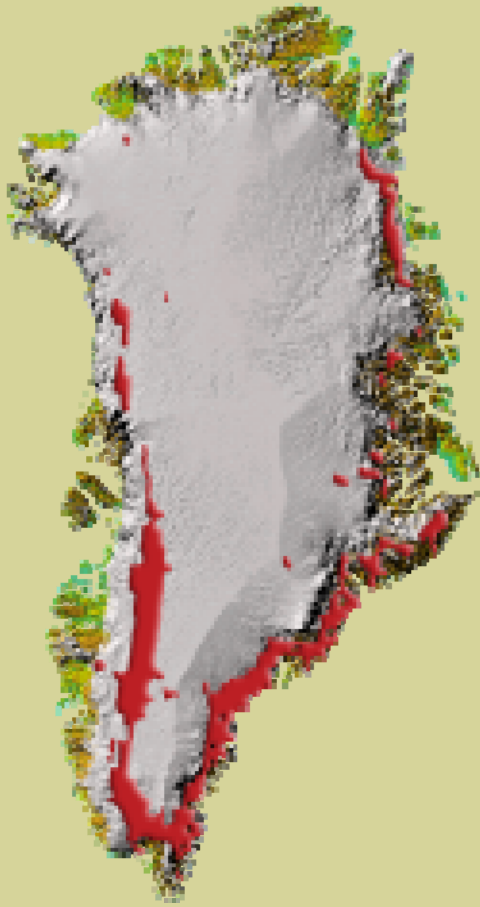


# It's Getting Hotter!

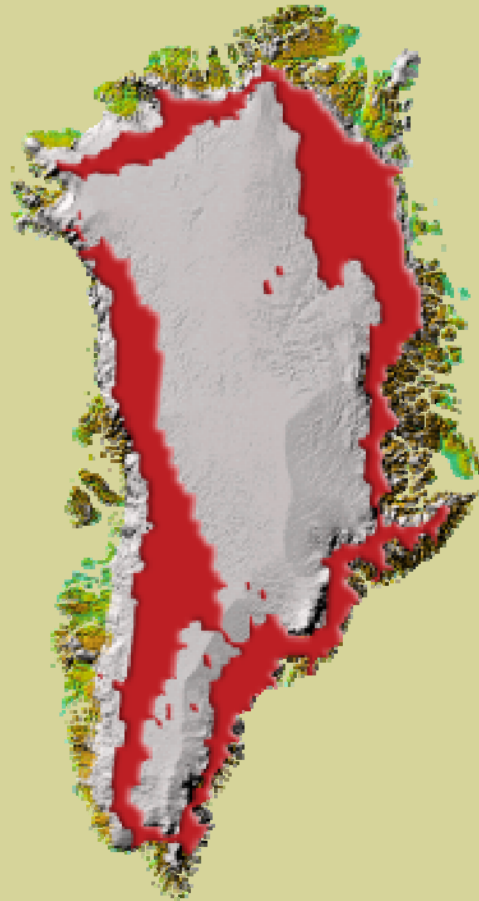
- every year since 1992 has been warmer than 1992;
- the ten hottest years on record occurred in the last 15;
- every year since 1976 has been warmer than 1976;
- the 20 hottest years on record occurred in the last 25;
- every year since 1956 has been warmer than 1956;  
and
- every year since 1917 has been warmer than 1917.



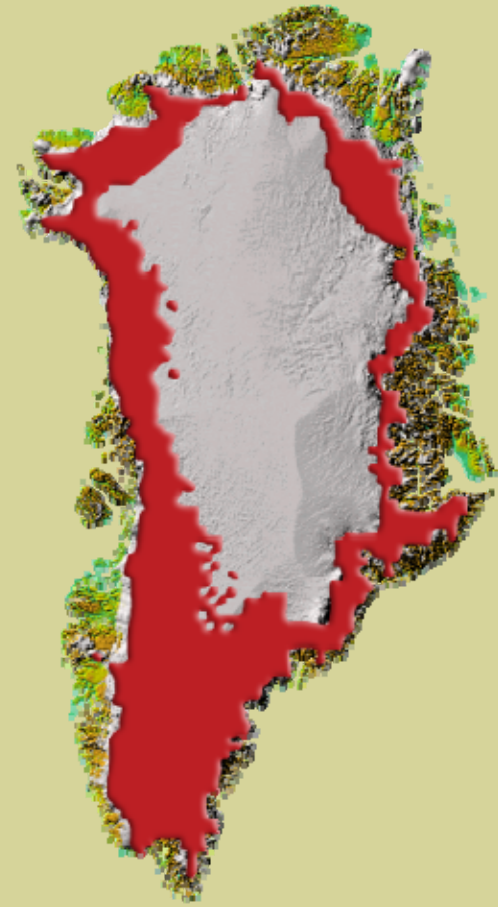
# Greenland Surface Ice Melt (seasonal)



1992





2002





2005



# Intergovernmental Panel on Climate Change (IPCC) 2007 Report

4° F to 11° F  by 2100  
1.3° F  1900-2000



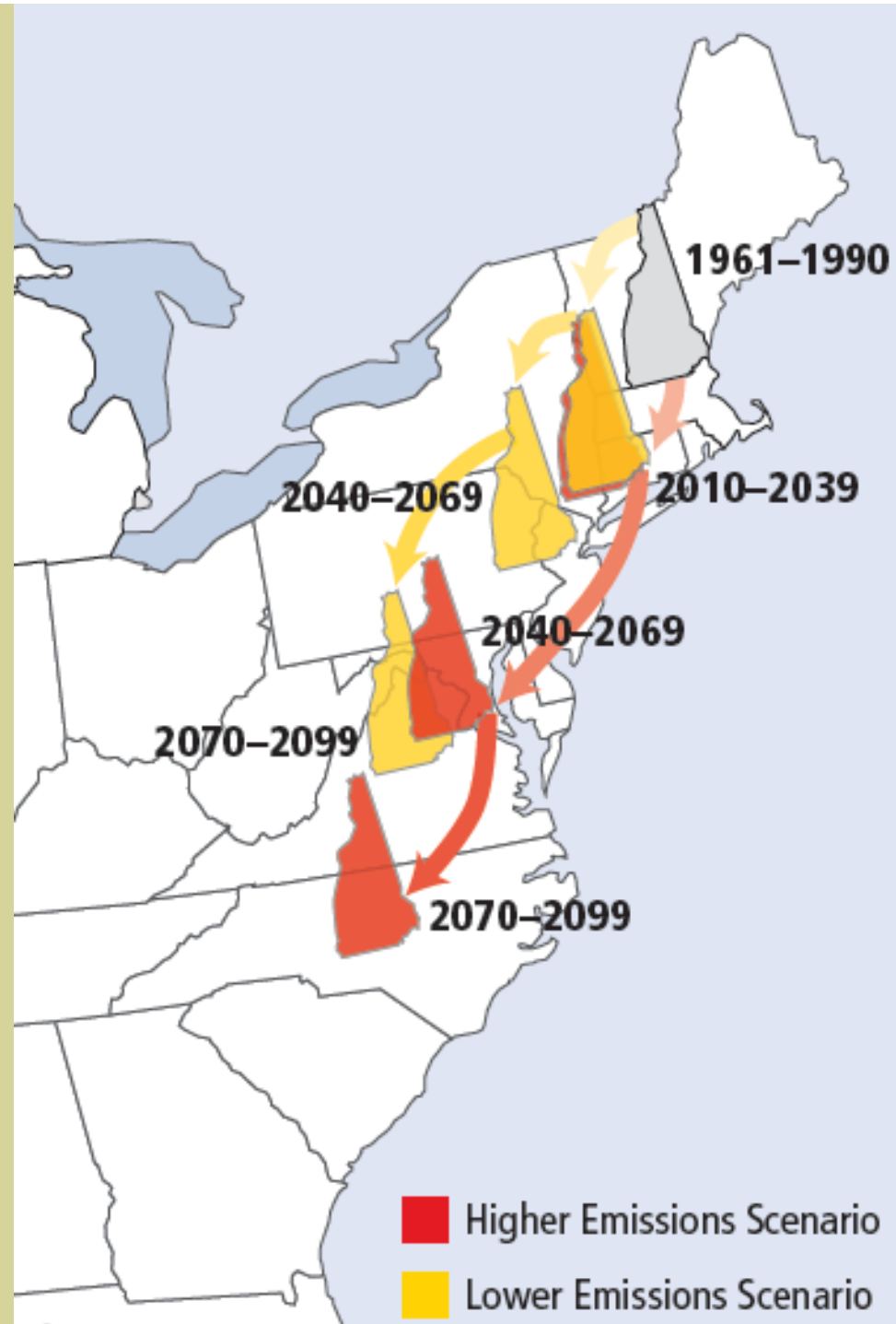
10 to 23 inch  sea level  
by 2100  
7 inch  1900-2000



# NH's Changing Climate – Future Scenarios

## Summer Heat Index

Union of Concerned Scientists, 2006



# Projected Climate Impacts in NH

According to UNH scientists, NH will experience:

- **Altered, less predictable seasons**

- wetter, rainier winters
- hotter, drier summers
- more intense storms/flooding

- **Changing forests**

- Phase out of foliage species: sugar maple, birch, & beech

- **Sea level rise**



# Projected Climate Impacts in NH: *Economic Implications*

**Loss of sugar maples and other foliage trees affect:**

- foliage-related tourism
- maple sugaring



**Decreases in snow cover affect:**

- skiing
- ice fishing
- snowmobiling

**Tourism is a \$4 billion dollar industry in NH...**

*Will the leaf peepers still come?*



# Projected Climate Impacts in NH: *Economic Implications*

## Across the United States...

**34 million** people hunt &/or fish  
**71 million** people engage in wildlife watching

Contributes **\$120 billion** to the US economy

## Here in New Hampshire...

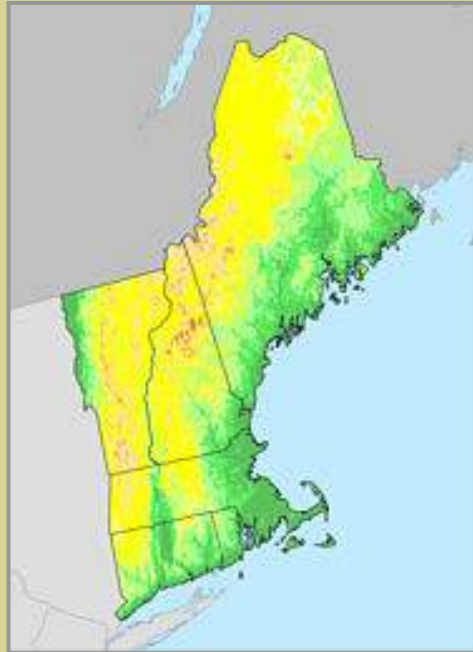
**228,000** people hunt &/or fish  
**480,000** people engage in wildlife watching

Contributes **\$525 million** to NH's economy

*US Fish & Wildlife Service, 2006 Nat'l Survey of Fishing, Hunting  
& Wildlife-Related Recreation*






# NH's Climate is Already Changing



New England has warmed 1.8 °F in the last century. Winter temps have increased the most (4.4 °F over last 30 yrs).

## Warming Trend Consequences

	Indicator	Trends	Years Observed
	Days with Snow on the Ground*	16 fewer days	31
	Snowfall†	Decreased 10–60 inches	30
	River Ice Breakup*	11 days earlier	64
	Lake Winnepesaukee Ice Breakup†	8 days earlier	204
	Lilac Bloom Date*	4 days earlier	36
	Precipitation*	8% increase	100
	Growing Season Length*	8 days longer	101

\*New England †New Hampshire

Source: Indicators of Climate Change in the Northeast, Markham and Wake 2005.  
Photo (middle): Courtesy of the National Weather Service

# GLOBAL WARMING: The Forecast for Wildlife



## **Impacts on Fish and Wildlife**

# Cold Water Fisheries: Trout





# Water Supply is Essential

- Cold
- Clean
- Plentiful





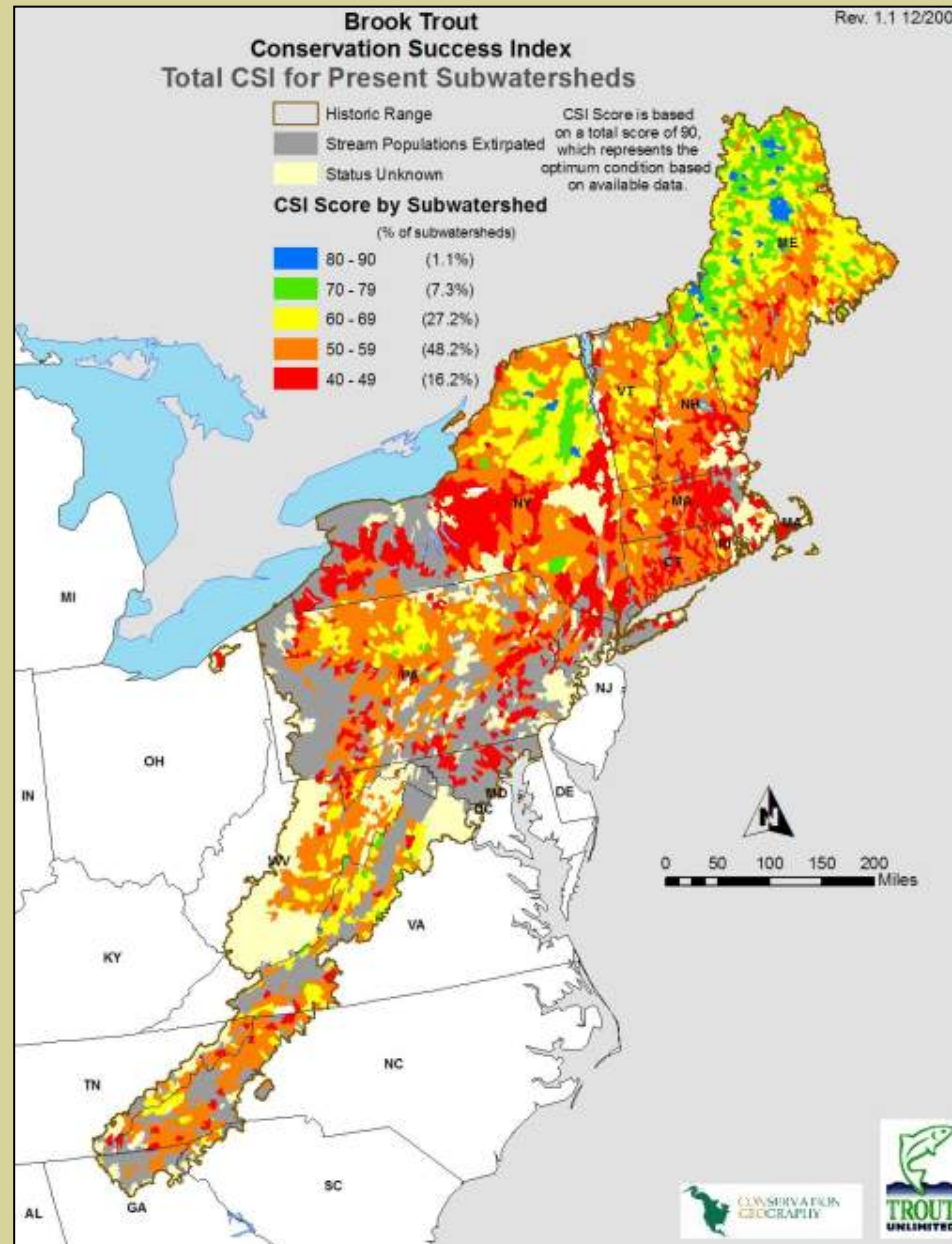
# Temperature Sensitive

70°F ↑ Impaired

75°F ↑ Lethal



# Brook Trout



# Trout Habitat Decline

By 2090 in U.S.



Stream water  
2.2 - 4.9°F ↑

Habitat  
25 - 38% ↓



# Other NH Fisheries in Jeopardy

## Atlantic Salmon

“...changing water temperatures as a result of human activities may constitute one of the most serious human-generated threats to the long term survival of this species.”

- from *Atlantic Salmon Journal*,  
Fall 2002

(Dr. Bruce Tufts,  
fish physiologist,  
Queen's  
University)



# Other NH Fisheries in Jeopardy

- **Marine Fisheries**
  - Water temperature increases
  - Sea level rise
  - Species that use coastal estuaries are at risk



# Other NH Fisheries in Jeopardy

- **River Herring**

- Water temperature increases
- Devastating spring floods
- Lack of dissolved oxygen





# River Herring Decline



YEAR	COCHECO RIVER	EXETER RIVER	OYSTER RIVER	LAMPREY RIVER	TAYLOR RIVER	WINNICUT RIVER	ANNUAL TOTAL
1997	31,182	1,302	57,920	22,236	20,420	+	133,060
1998	25,277	392	85,116	15,947	11,979	219	138,930
1999	16,679	2,821	88,063	20,067	25,197	305	153,132
2000	30,938	533	70,873	25,678	44,010	525	172,557
2001	46,590	6,703	66,989	39,330	7,065	1,118	167,795
2002	62,472	3,341	58,179	58,605	5,829	7,041	195,467
2003	71,199	71	51,536	64,486	1,397	5,427	194,116
2004	47,934	83	52,934	66,333	1,055	8,044	176,383
2005	16,446	66	12,882	40,026	223	2,703	72,346
2006	4,318	16	6,035	23,471	147	822	34,809
2007	15,815	40	17,402	55,225	<1,000	7,541	97, 023

# Waterfowl



# Waterfowl Production



USFWS



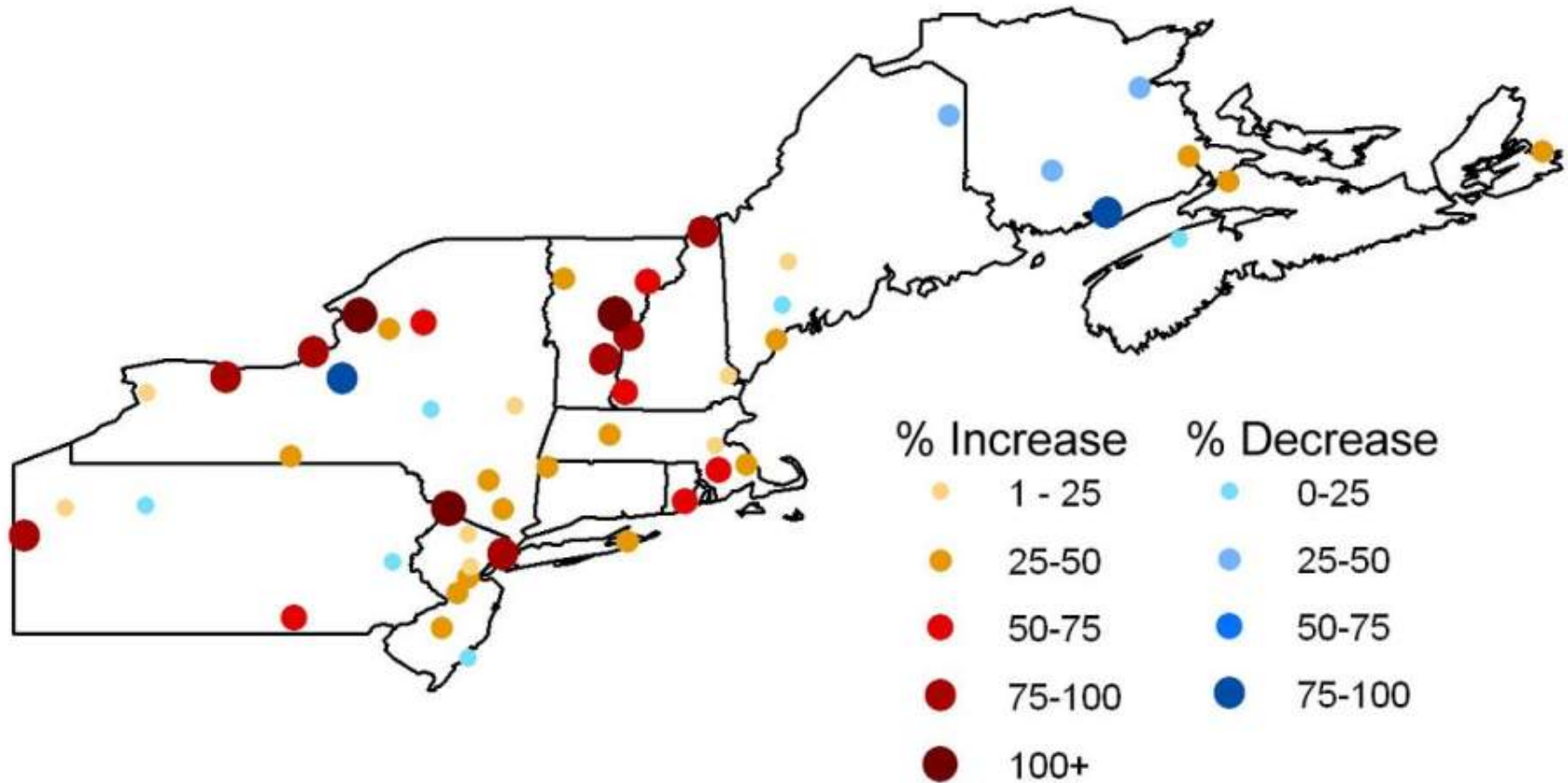


# Newmarket, NH May 2006



# Spatial Variation of Extreme Precipitation Trend

Percent Change in Extreme Precipitation Events  
1949-2002



Source: University of New Hampshire



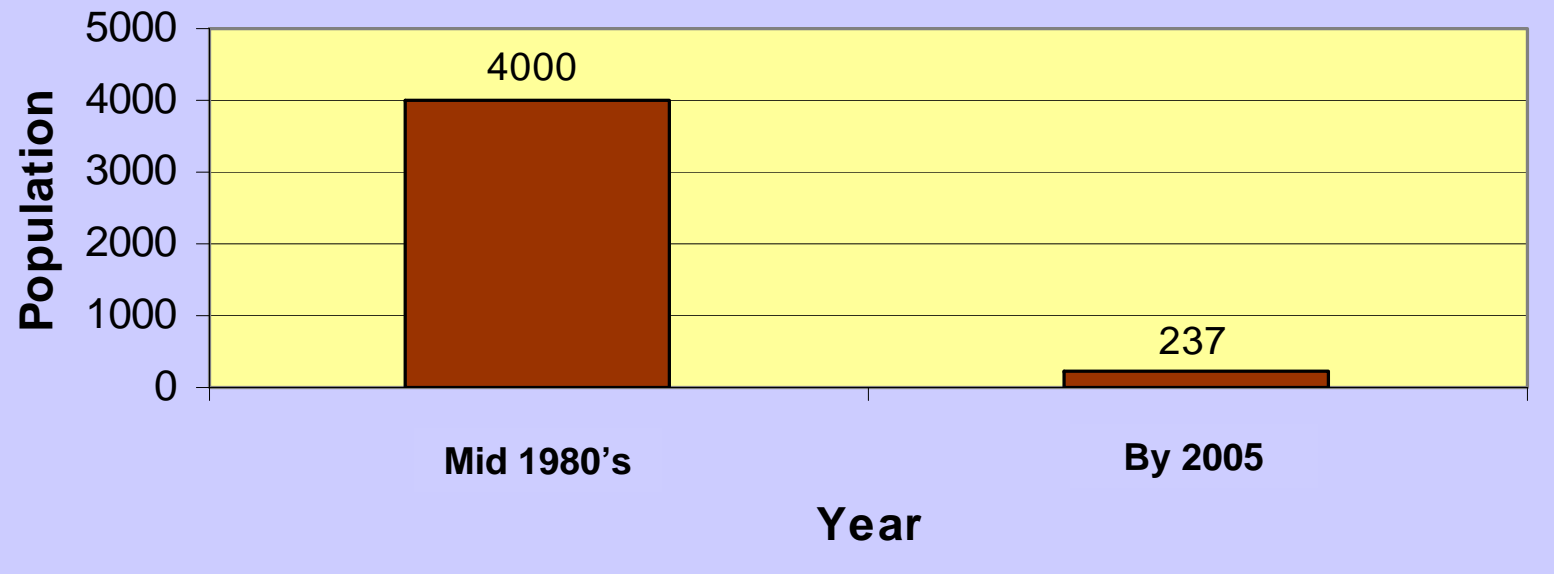


# Moose



# Case Study: Moose


## Moose Population of Northwestern Minnesota



# Minnesota Moose Facts

Average temperatures in past 40 years

Winter  12° F

Summer  4° F

Moose in heat stress

Sept. 57° F

March 23° F



Population  with and without hunting

Pregnancy rate

Northwestern Minnesota 48%

Alaska/Canada 84%



“A variety of factors may be contributing to the decline, but ultimately I think the real driving force is the climate...”



-Dennis Murray,  
*Trent University*  
*researcher*  
Ontario, 2006  
(performed study)

# White *as a* Ghost

*Winter Ticks & Moose*

BY BILL SAMUEL



FEDERATION OF ALBERTA NATURALISTS

VOLUME 1 NATURAL HISTORY SERIES







**“Tick mortality in moose is worse after an early spring followed by a warm, dry fall, so it seems likely that a warming trend will increase tick mortality”**

-Kristine Rines, Moose Project Leader, NH Fish & Game Department

# Moose: a NH Icon





# Mild winters



**affect the hunting & fishing experience**



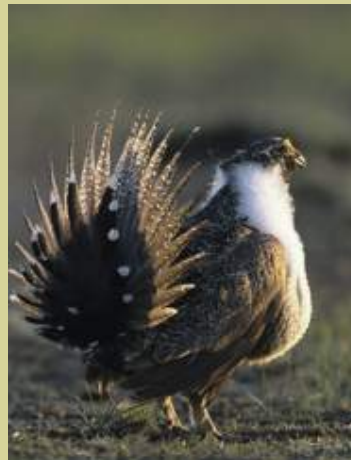
**DANGER**



**THIN ICE  
DEEP WATER  
STAY AWAY**

Caring for your safety Tarmac 

# Not just a NH story...



**Have You  
Observed  
Any  
Changes?**

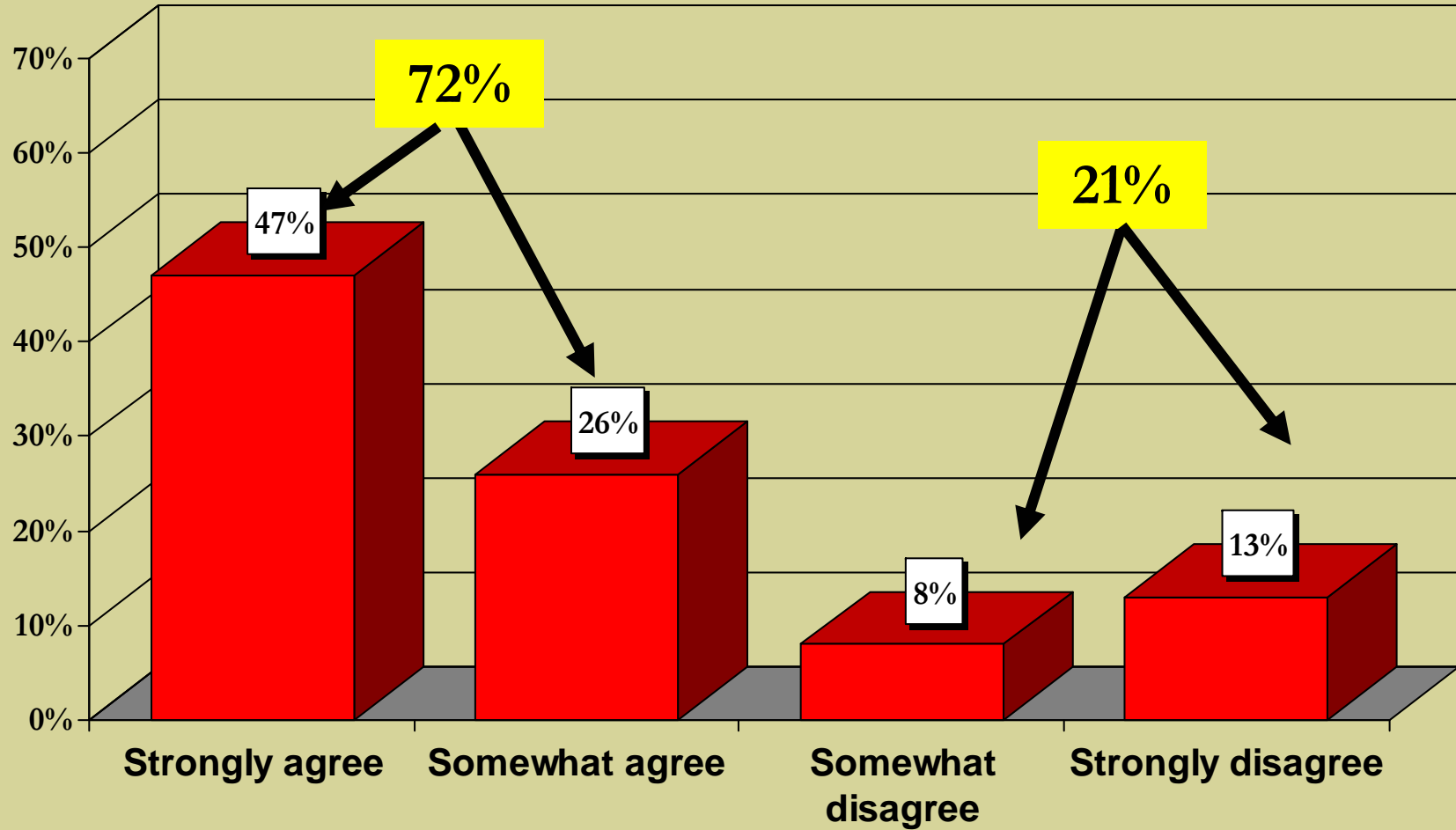






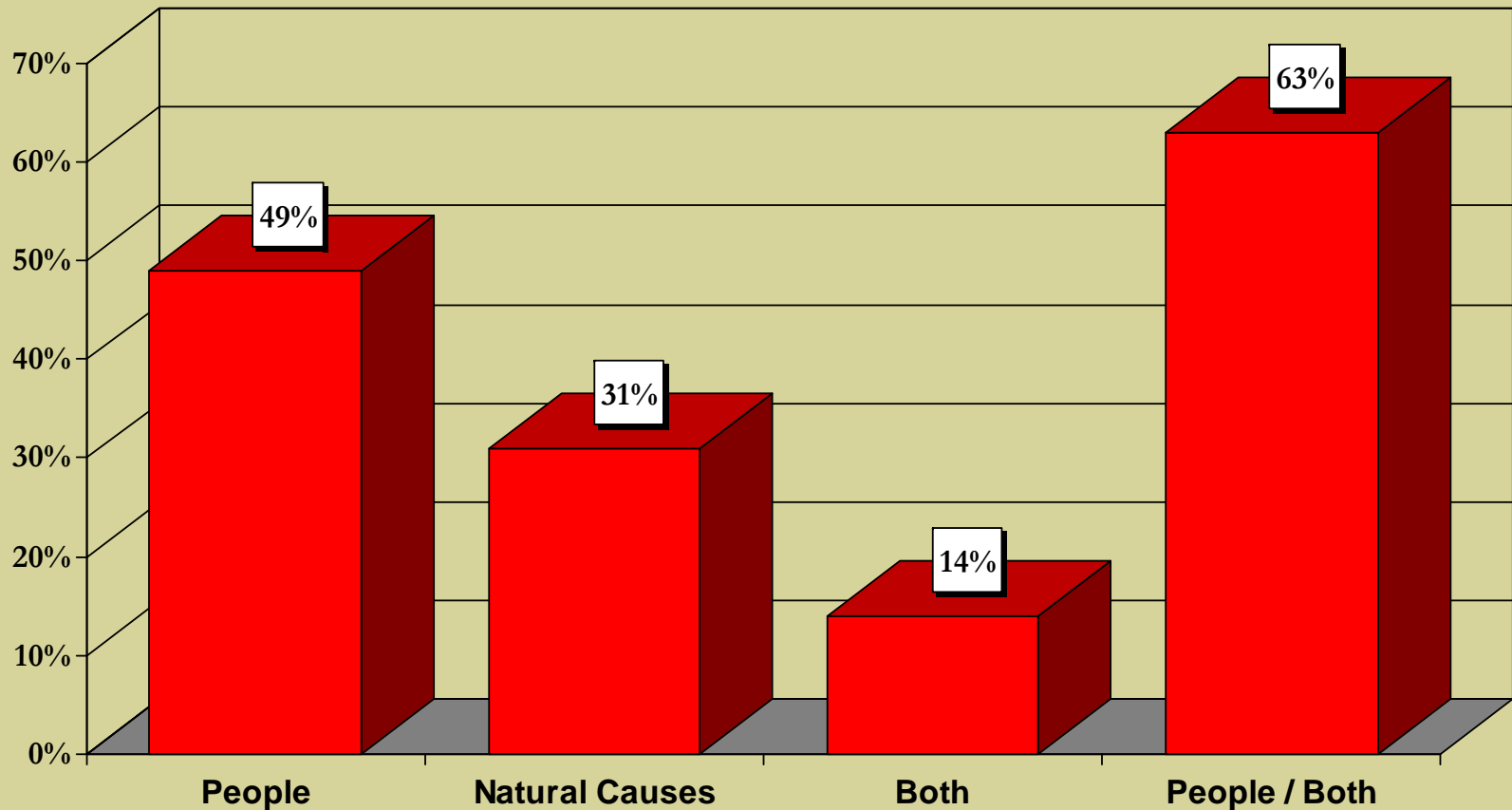
# NH Hunter/Angler Poll: 2007

Do You Agree That Global Warming is Occurring?



# NH Hunter/Angler Poll: 2007

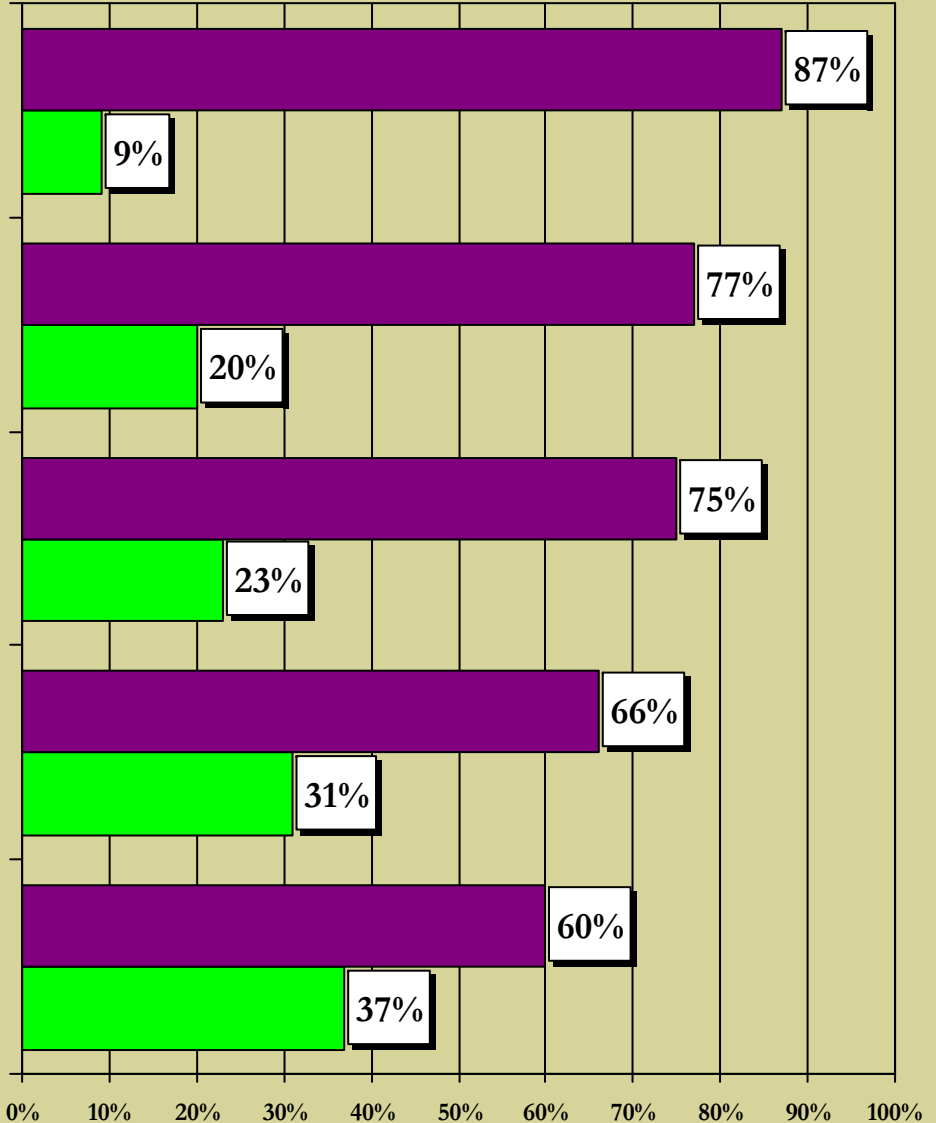
What do you think is causing global warming?





# NH Hunter/Angler Poll: 2007

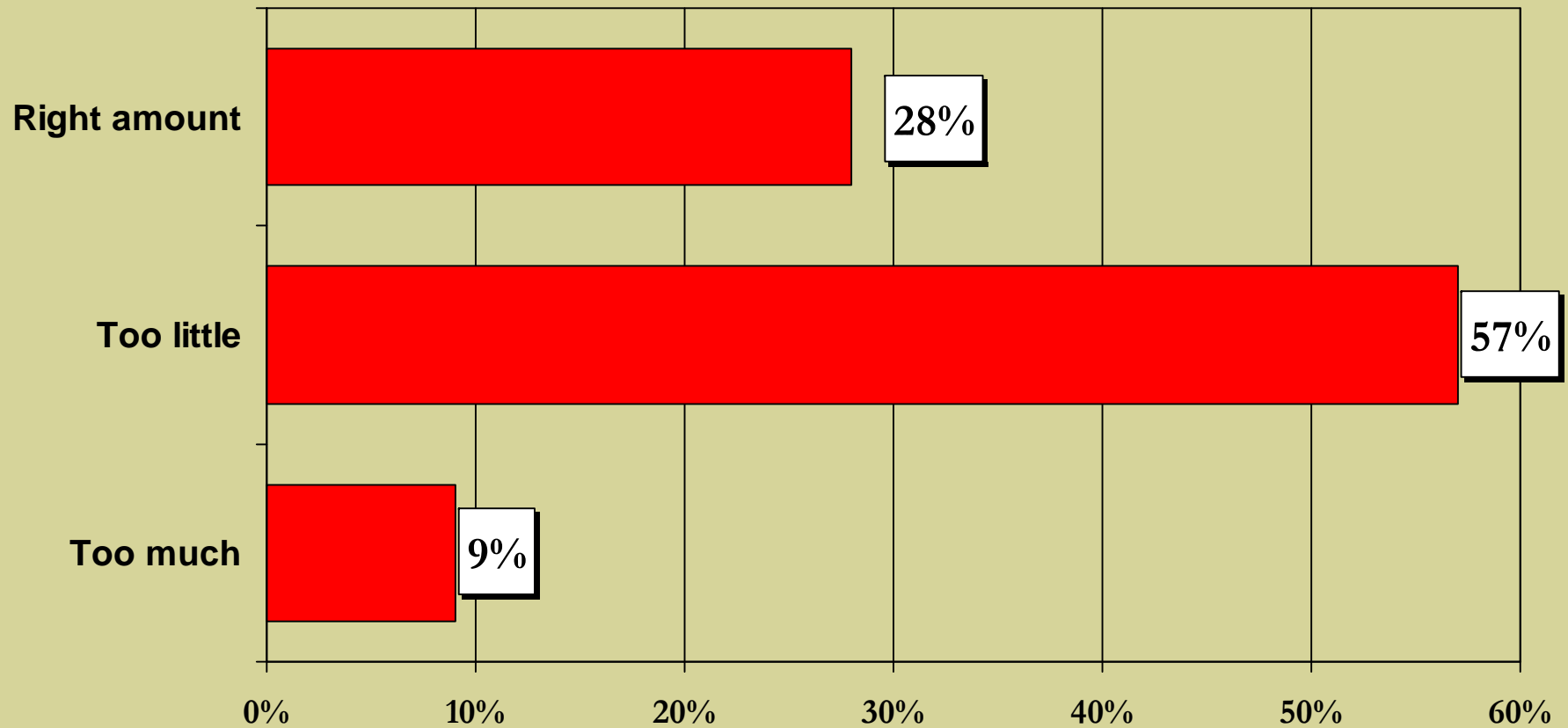
**We can improve the environment and strengthen the economy by investing in renewable energy technologies that create jobs while reducing global warming**



■ Disagree ■ Agree

# NH Hunter/Angler Poll: 2007

Is the U.S. doing enough about global warming?



# GLOBAL WARMING: The Forecast for Wildlife

**So, What Can We Do?**



***Help Wildlife Survive***

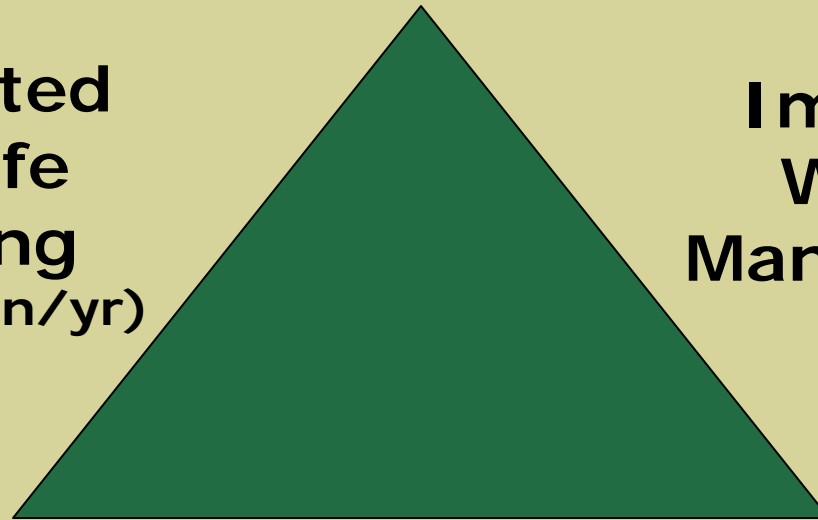
***Reduce Global  
Warming Pollution***

# Protecting Wildlife from Global Warming



**Dedicated  
Wildlife  
Funding**  
(↑\$2 billion/yr)

**Improved  
Wildlife  
Management**



**Reduce Pollution to  
Slow Warming**  
(↓2%/yr)

# We've Helped Wildlife Survive Before



# NH Wildlife Success Stories

- Deer
- Turkey
- Wood Duck
- Beaver
- Otter



# NH Wildlife Action Plan – 2006

*keeping common species common*



- Identifies Global Warming as a threat to NH's wildlife
- Number 1 Recommendation: identify & protect critical habitat to help wildlife stressed by effects of global warming

# Helping Wildlife Survive

- Secure adequate funding to maintain healthy, connected, genetically diverse populations
- Do not rely solely on historical weather/species data for projections
- Reduce non-climate threats
- Prevent and control invasive species
- Protect coastal wetlands and expect sea level rise





# GLOBAL WARMING: The Forecast for Wildlife

**So, What Can We Do?**



***Help Wildlife Survive***

***Reduce Global  
Warming Pollution***

# Carbon-Based Fuels

Natural Gas

Oil

Coal



# No Silver Bullet, but lots of silver pellets

- Increase energy efficiency
- Improve vehicle mileage
- Change building design
- Use renewable energy sources
- Carbon capture and storage



# Renewable Energy

Wind



Biomass



Solar



# NH Global Warming Solutions

- **2007** – NH passed Renewable Energy Act requiring **25%** of state's electricity to come from renewable sources by 2025
- **May 2007** – Schiller Station converted one of the coal boilers to wood
- **2008** – Governor Lynch signed legislation committing NH to the Regional Greenhouse Gas Initiative



# What You Can Do

## Reduce Home Energy Needs

- Insulation
- Efficient Windows & Doors
- Fluorescent Light Bulbs
- Efficient Appliances
- Clothesline!



# What You Can Do

## Recycle, Reduce, Re-Use, & Repair

## Energy-Efficient Cars & Boats

- reduce emissions
- use 20% - 50% less
- Save \$\$!



## Help Protect & Restore Critical Habitat

- Become active in your local Conservation Commission activities

# Meeting the Challenge

**Pass strong national climate & energy policies that provide:**

- At least 2% annual reduction in CO<sub>2</sub> emissions
- Increased wildlife funding





# You Can Help!

## *Demand a Strong National Climate & Energy Policy*

- ✓ Call/write your elected officials
  - US Congress: esp. Senators Gregg & Sununu
  
- ✓ Let Presidential candidates know your concerns about how global warming is affecting hunting & fishing in New Hampshire
  
- ✓ **Ask your hunting & fishing club to sign onto a letter to Congress calling for action on global warming**



# You Can Help!

## *Congressional Sign on Letter*

✓ Join thousands of hunting & fishing groups across the country in speaking up for action on global warming

✓ Encourage other hunting &/or fishing groups in New Hampshire to do the same



[TARGETGLOBALWARMING.ORG](http://TARGETGLOBALWARMING.ORG)

TARGETGLOBALWARMING.ORG



**You can help change the forecast for  
New Hampshire's wildlife!**

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