

Climate Change in New England

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Mass Audubon



Mass Audubon

Why Does Climate Change Matter?

Climate change amplifies threats and opportunities for communities and our environment.

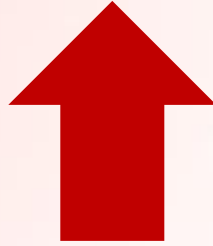


Natural environments and wildlife keep communities livable, sustainable, healthy, and thriving.



Southern New England Climate Vital Signs

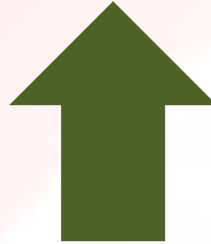
Temperature:



3°F

Since 1895

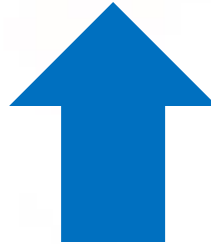
Growing Season:



10 Days

Since 1950

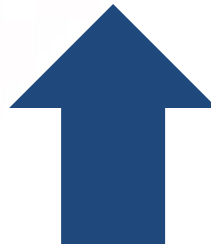
Sea Level Rise:



10 inches

Since 1922

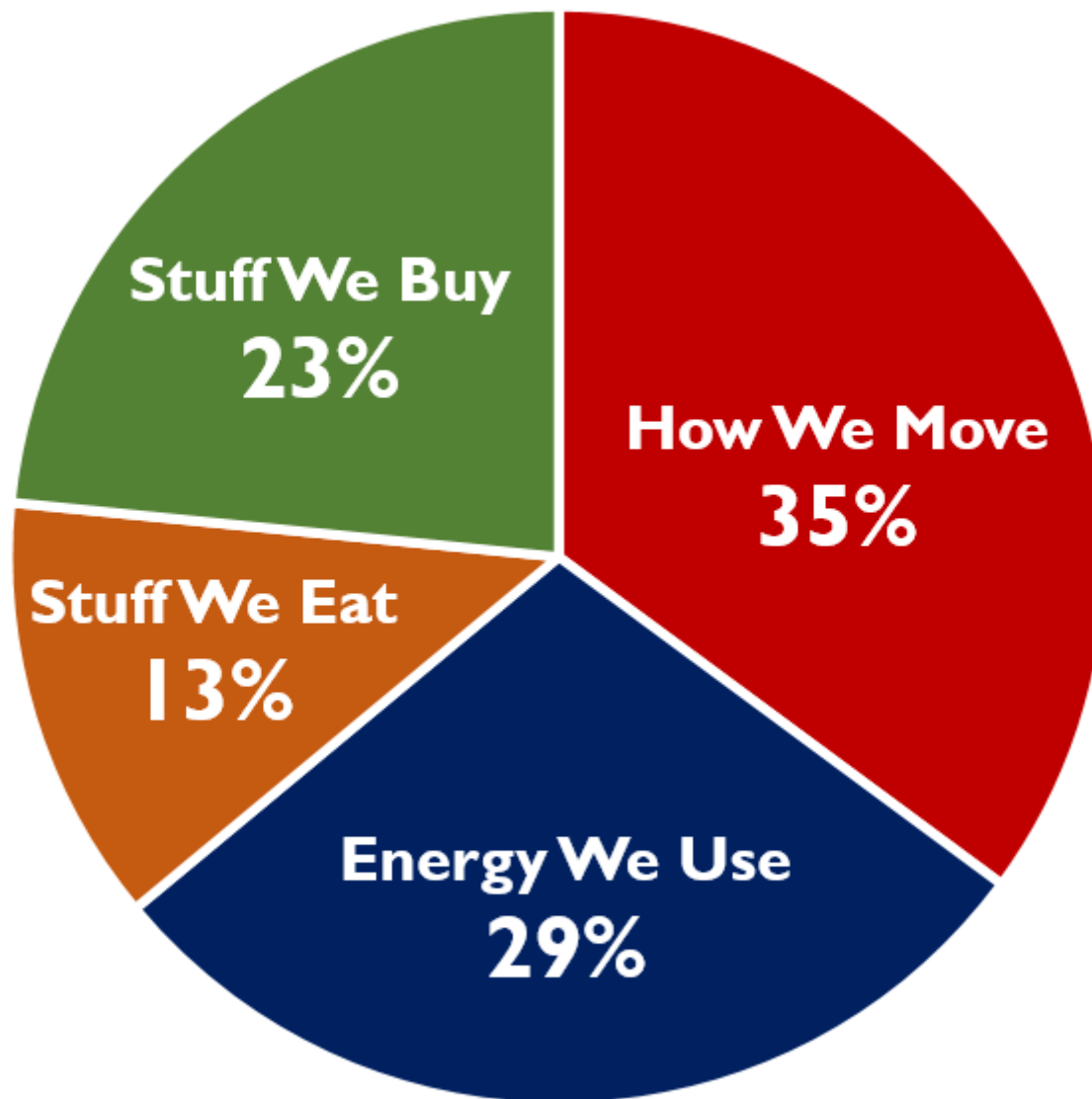
Strong Storms:



71%

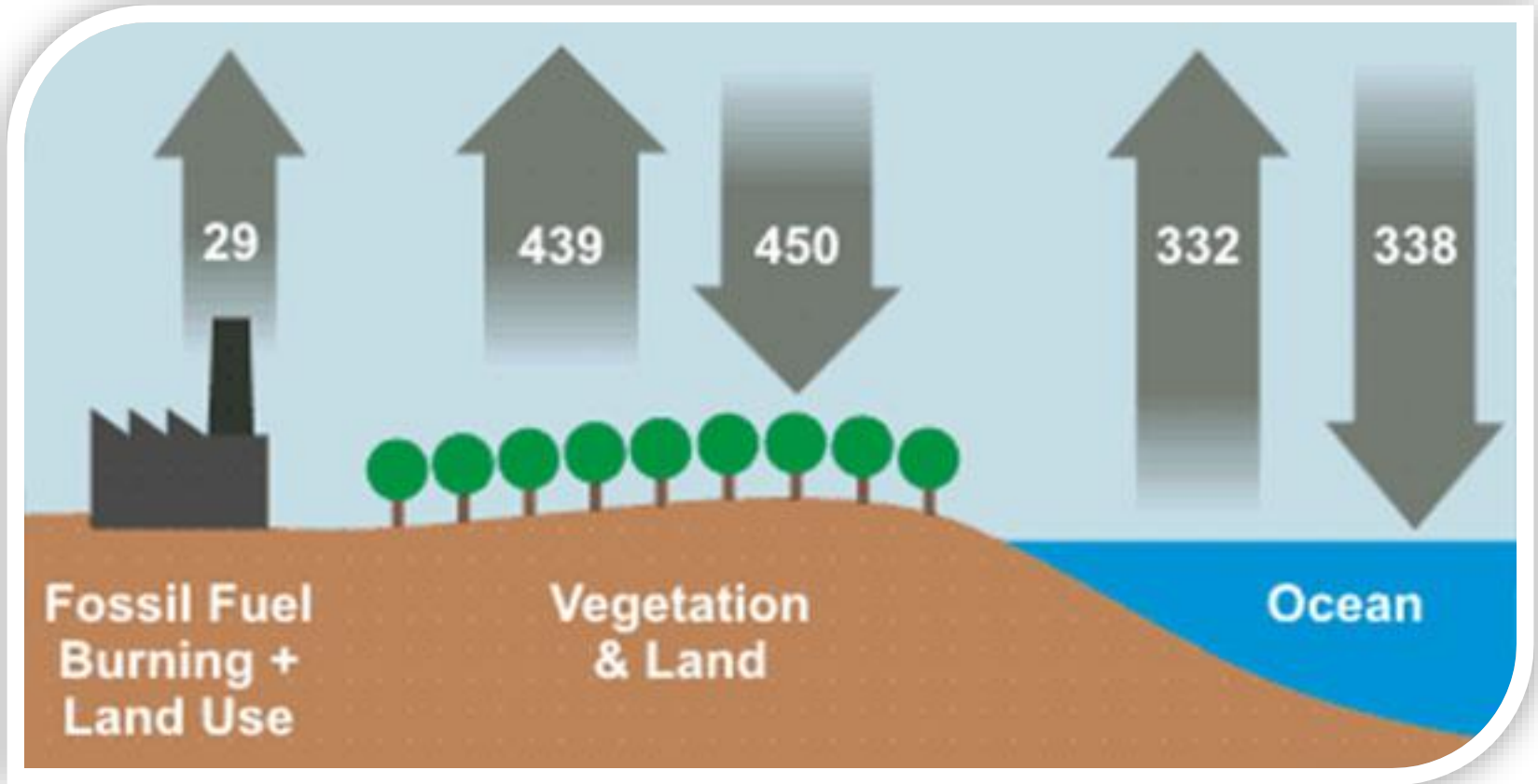
Since 1958

SOURCES OF THE AVERAGE MASSACHUSETTS RESIDENT'S CARBON EMISSIONS



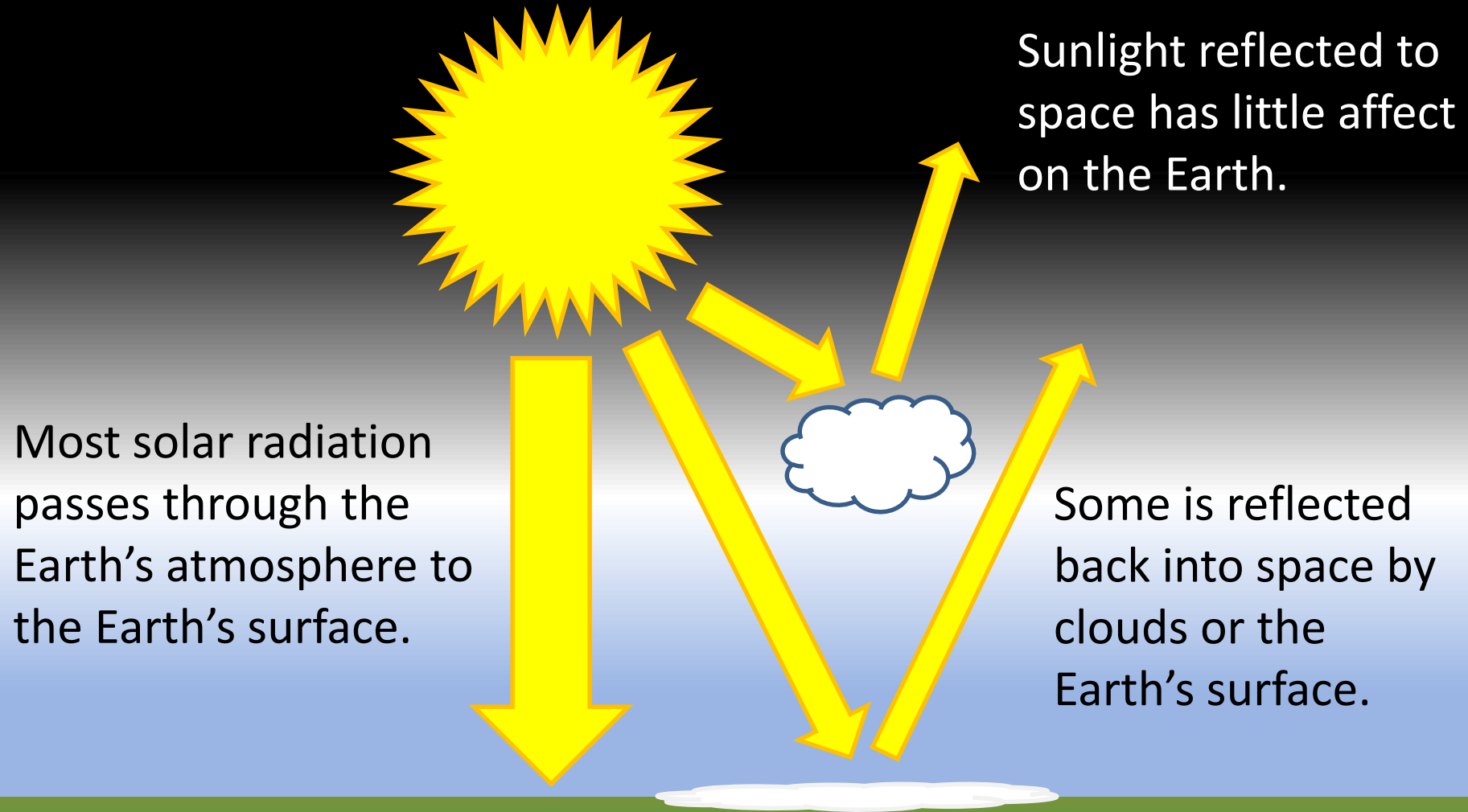
Estimates based on data from the State of Massachusetts and emissions categories from the Union of Concerned Scientists.

Global CO₂ Cycle

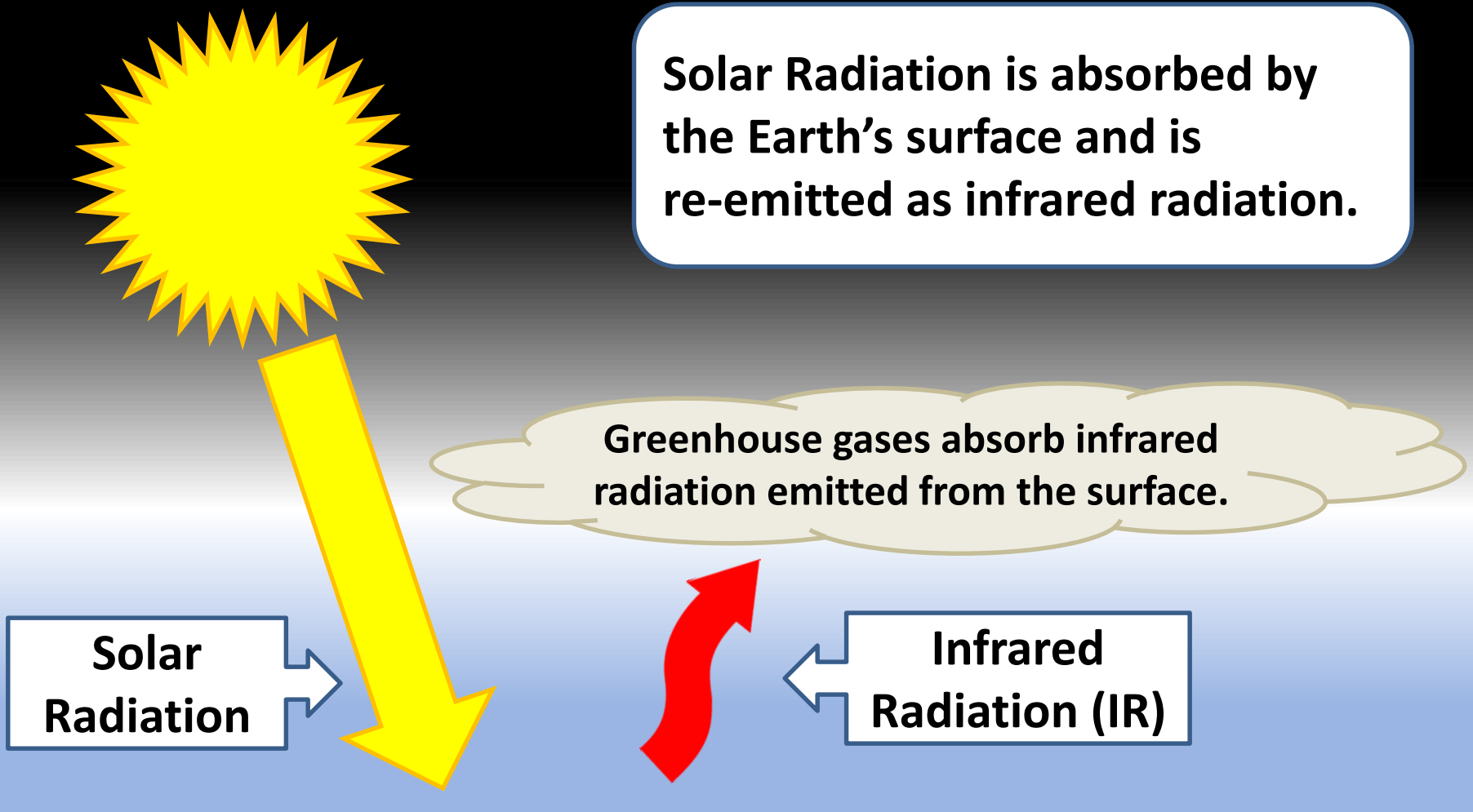


The natural cycle adds and removes CO₂ to keep a balance. Humans add extra CO₂ without removing any.

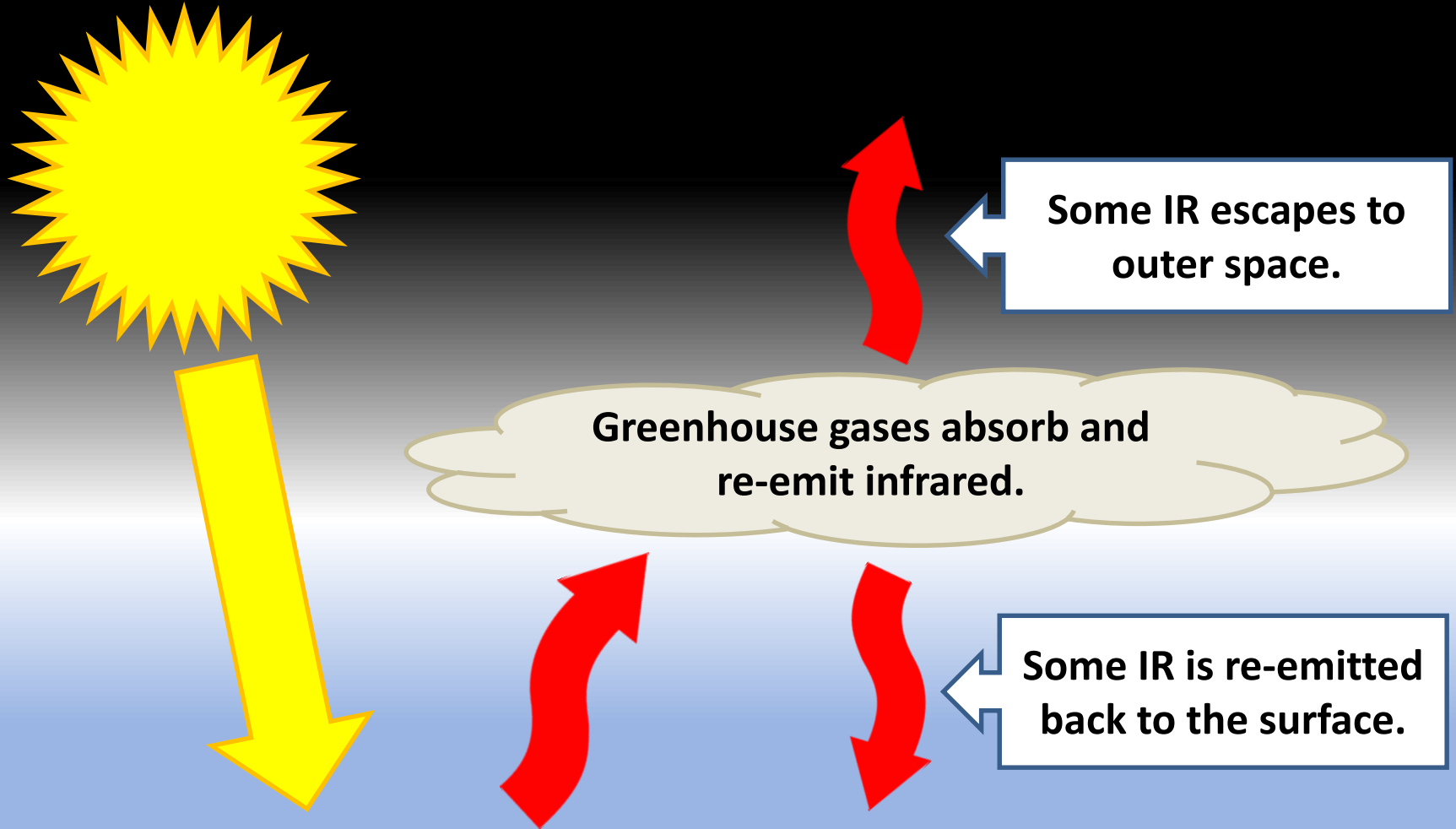
The Greenhouse Effect: Step I



The Greenhouse Effect: Step 2

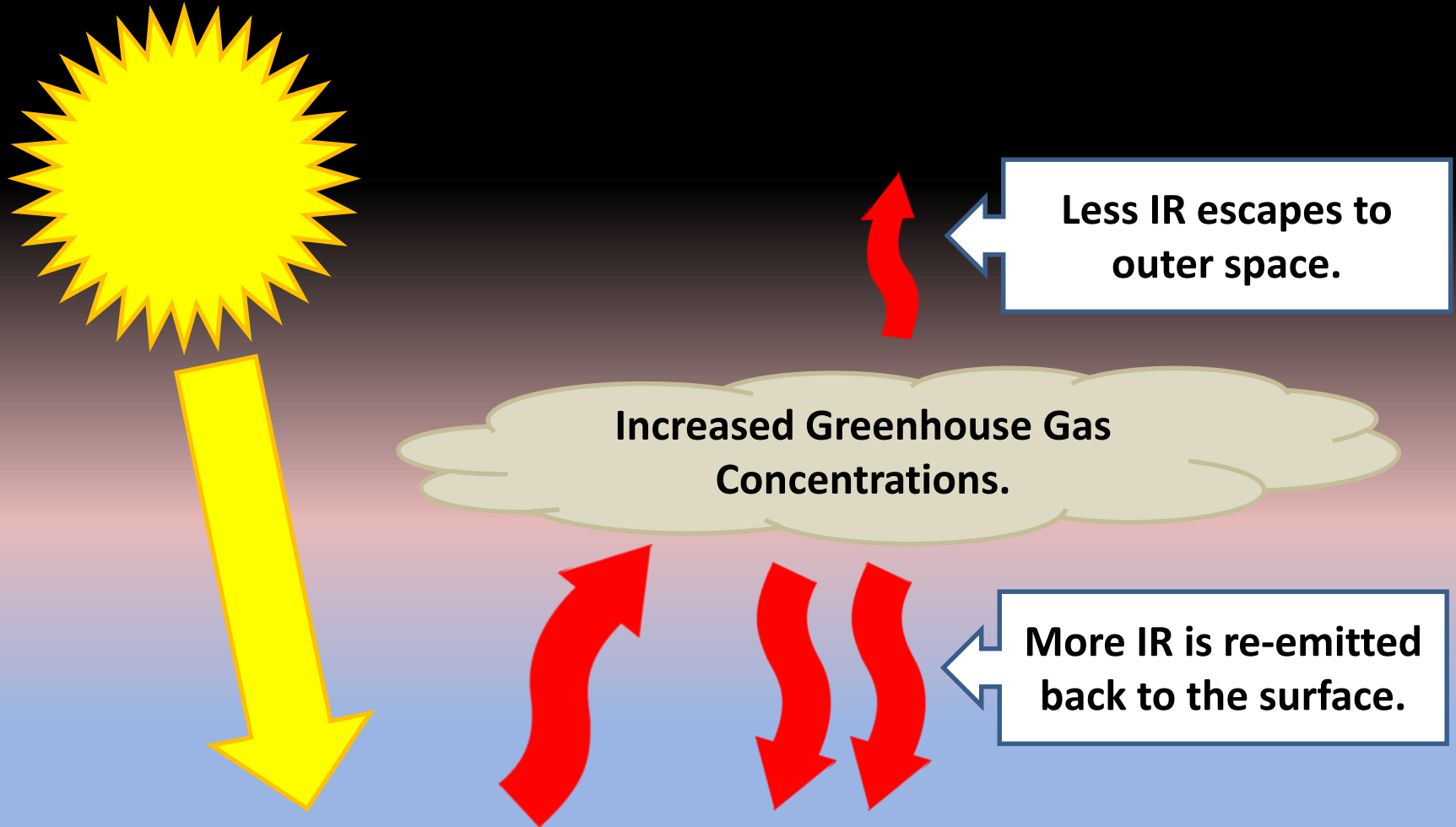


The Greenhouse Effect: Step 3



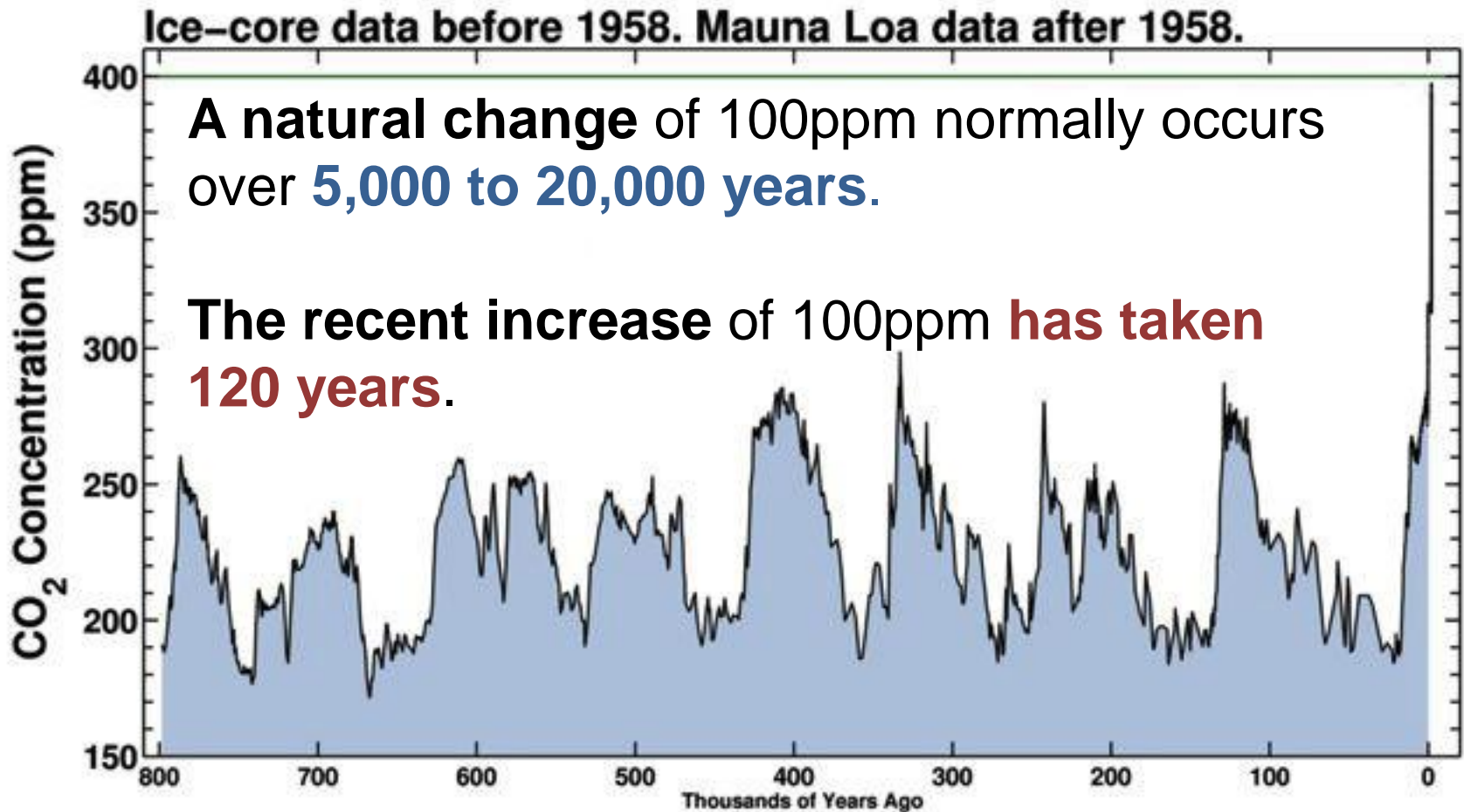
Earth's temperature is hospitable for human life because of the natural greenhouse effect.

The Greenhouse Effect: Step 4

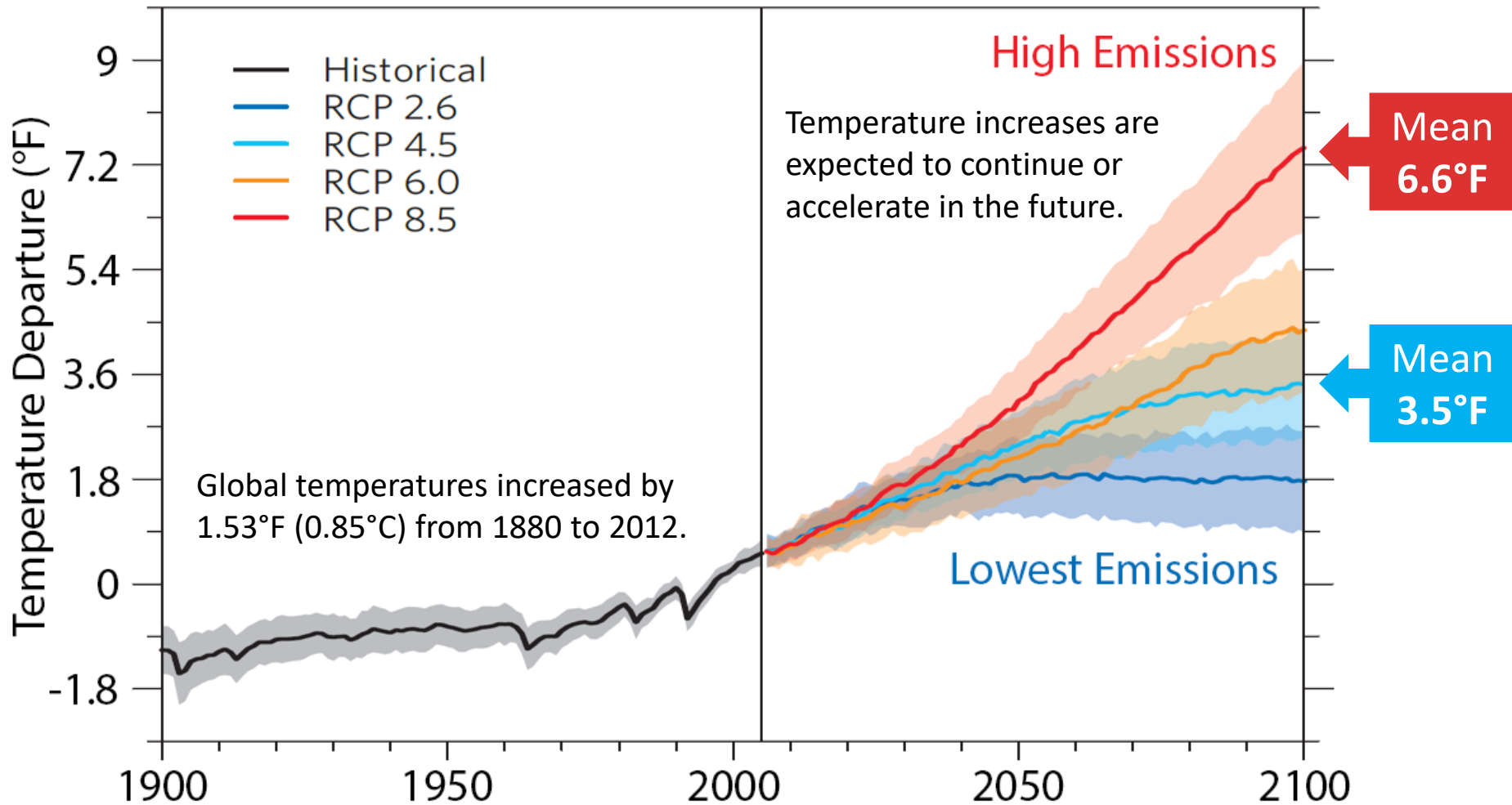


Increased emissions of greenhouse gases have changed the Earth's energy balance.

Historic CO₂ Concentration

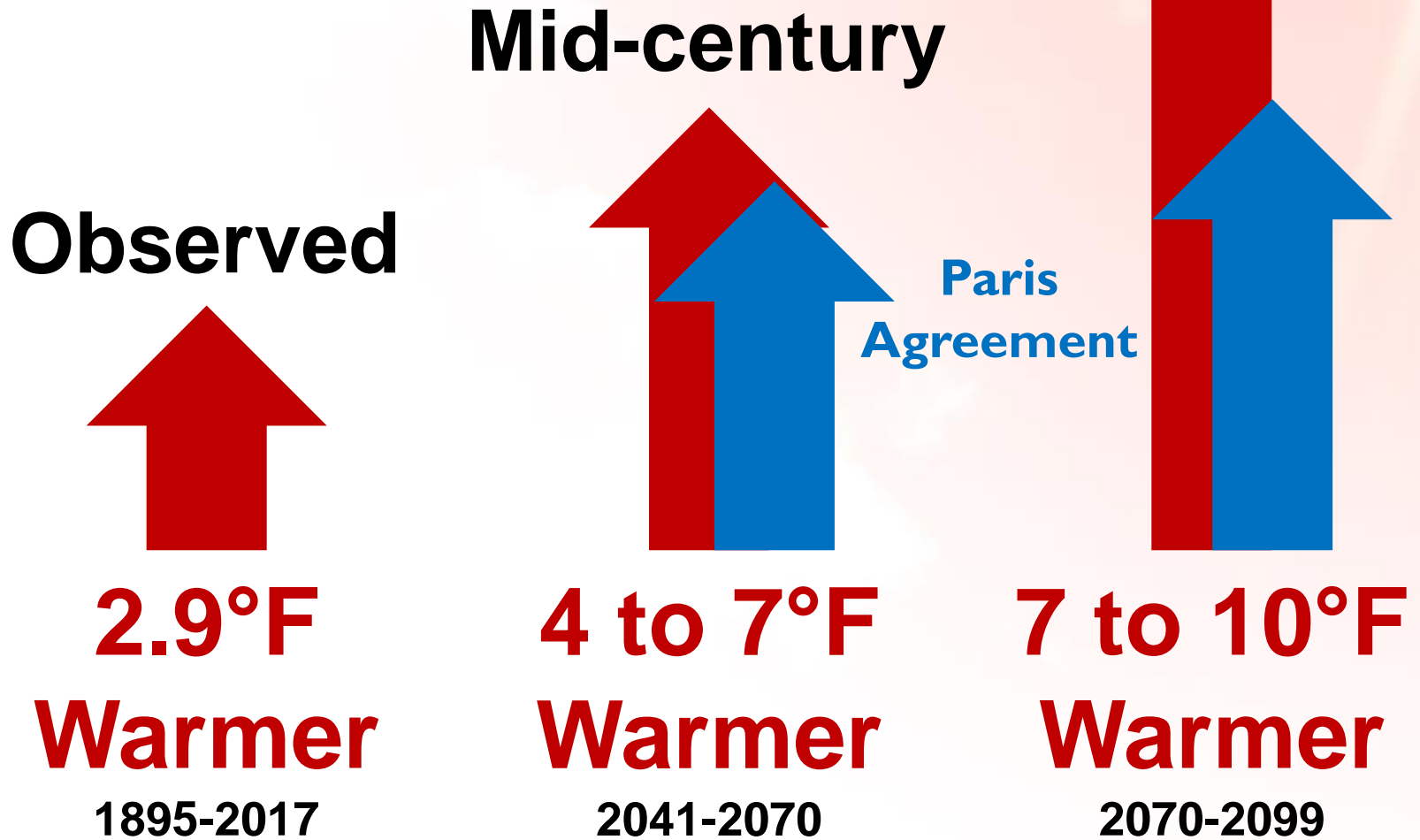


Global Temperature



In the Northeastern US, temperatures could increase by about 10°F by 2100.

Rising Temperatures in Massachusetts



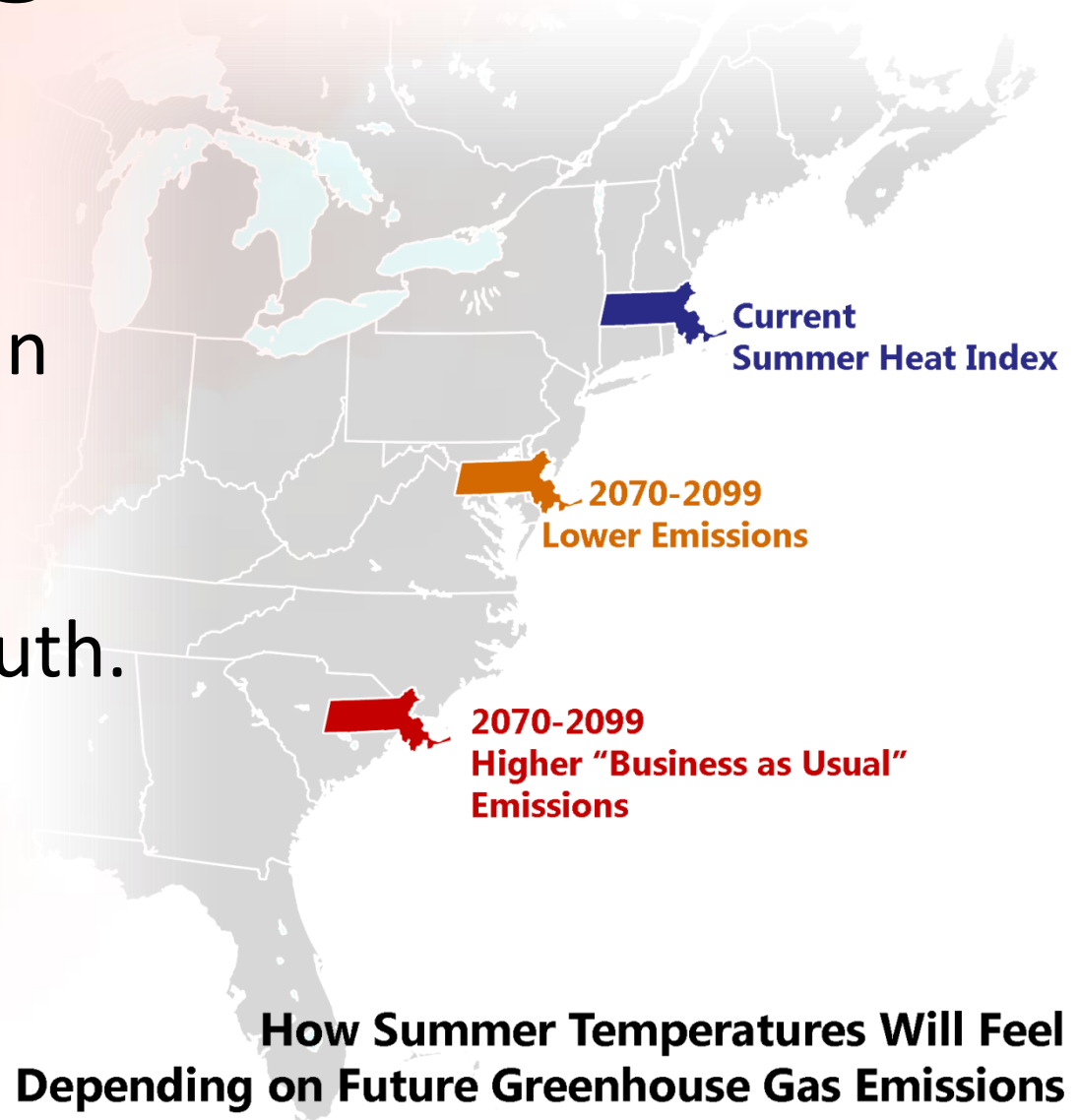
What's in a degree?



During the last ice age, temperatures were 9°F cooler than today.

Migrating Massachusetts

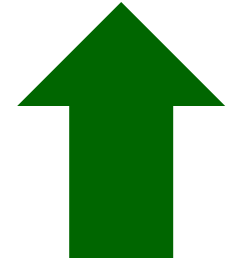
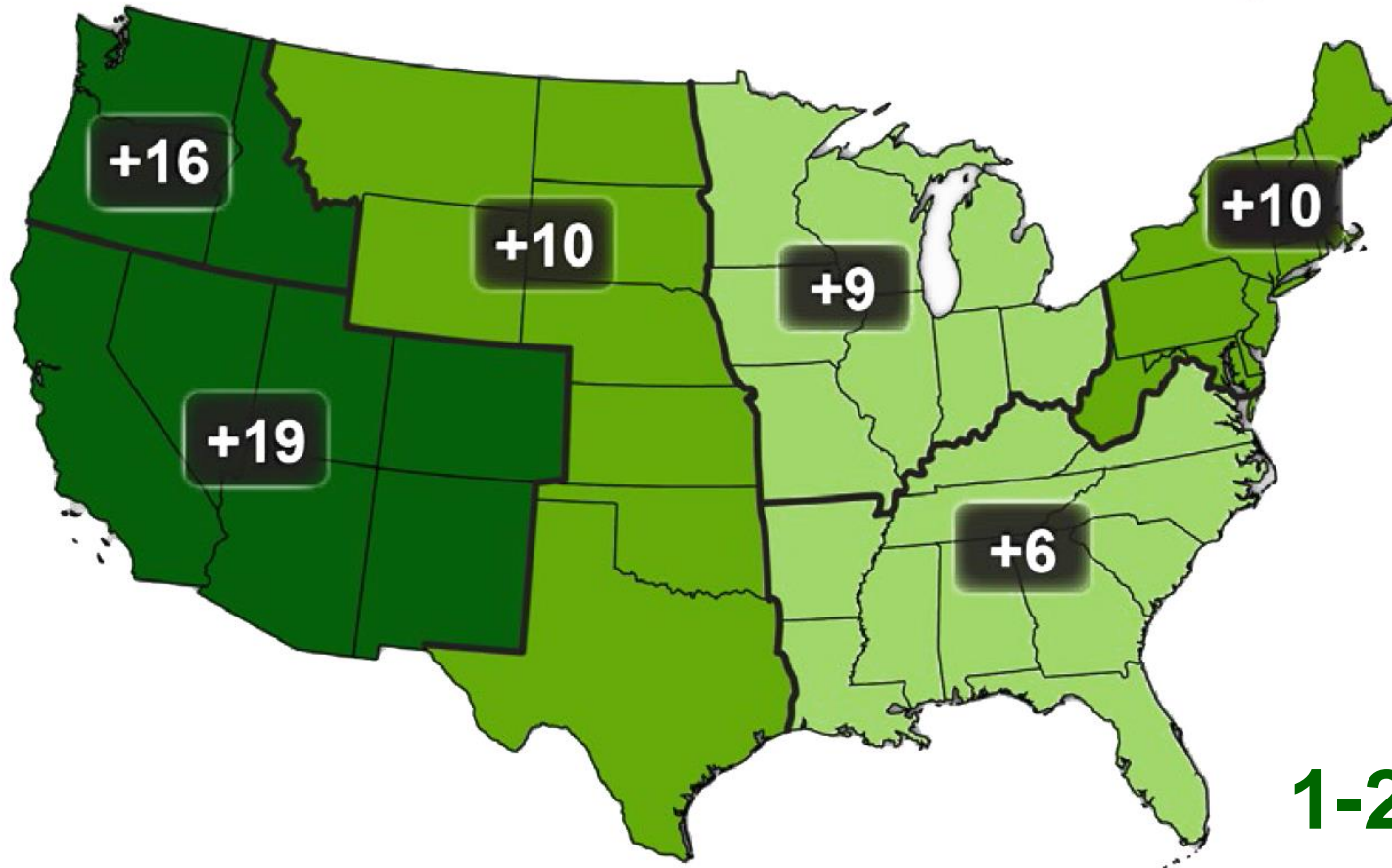
By the end of the century, summers in Massachusetts will “feel” more like summers in the South.



How Summer Temperatures Will Feel Depending on Future Greenhouse Gas Emissions

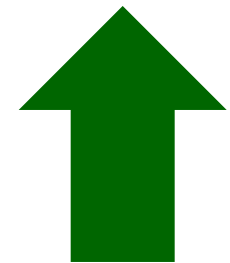
Longer Growing Season

Observed Increase in Frost-Free Season Length



10 Days

Observed
After 1960



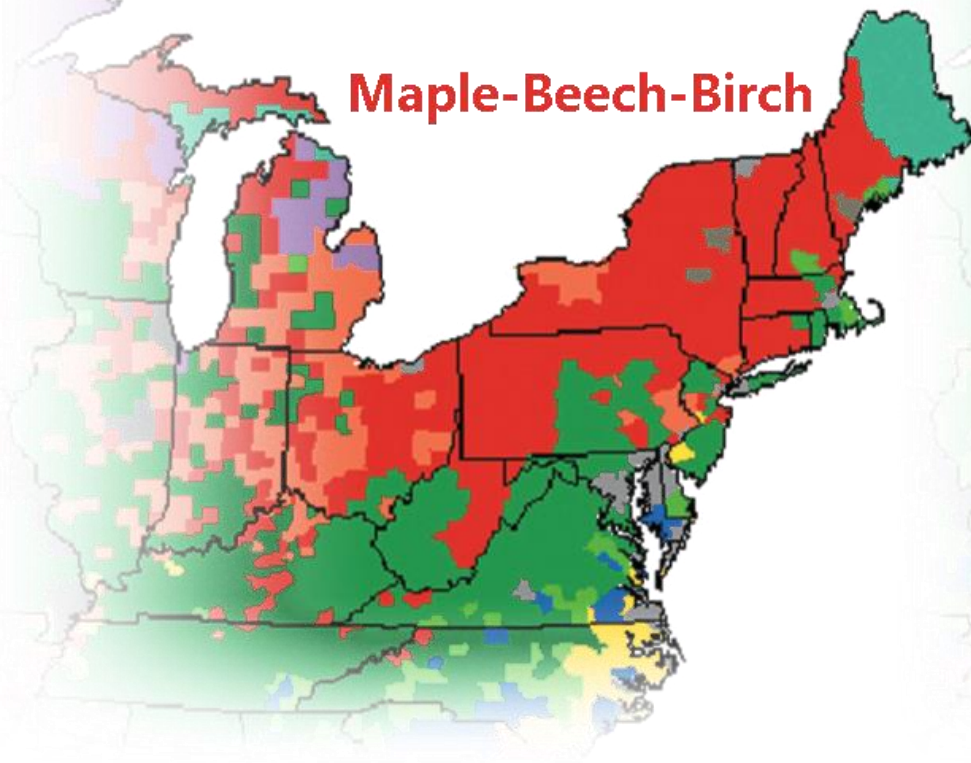
1-2 Months

Projected
2071-2099

Future Forests

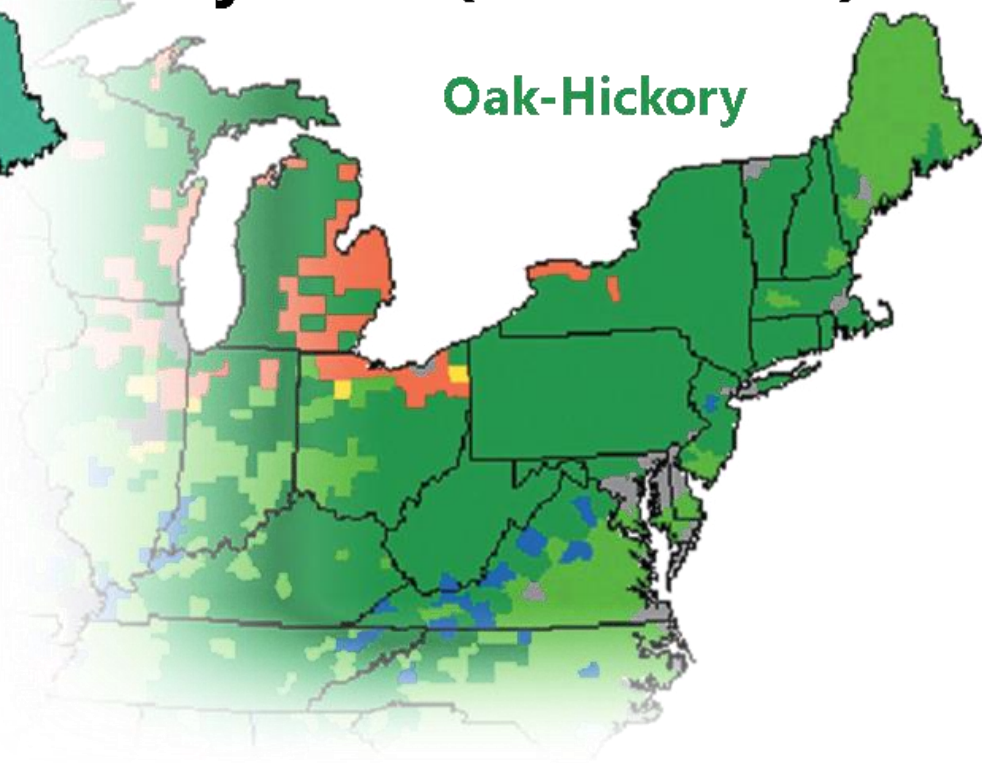
Current (1960-1990)

Maple-Beech-Birch

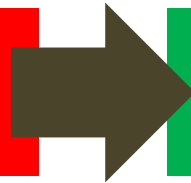


Projected (2070-2100)

Oak-Hickory



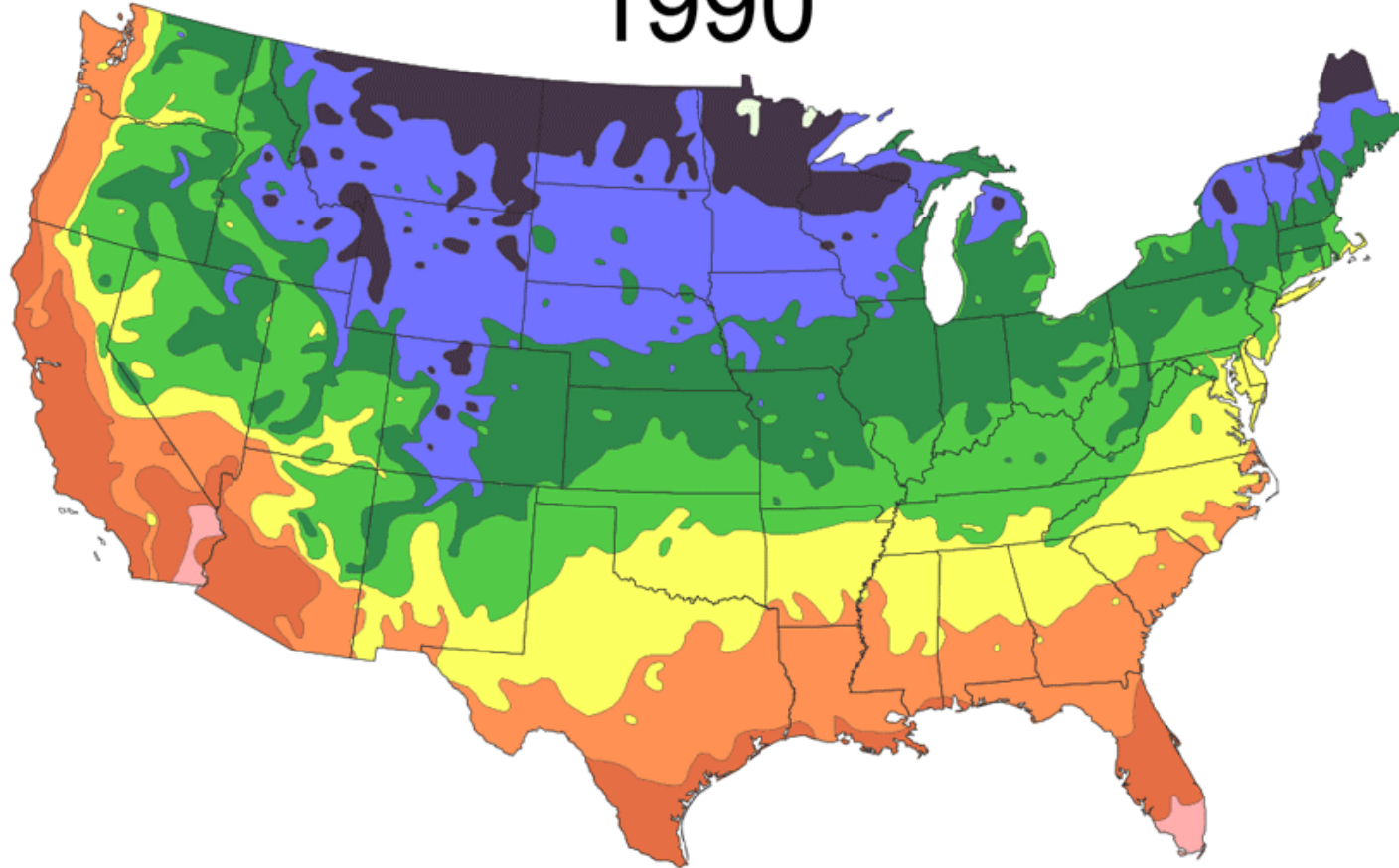
Maple, Beech, Birch



Oak, Hickory

Shifting Plant Hardiness Zones

1990



Zone

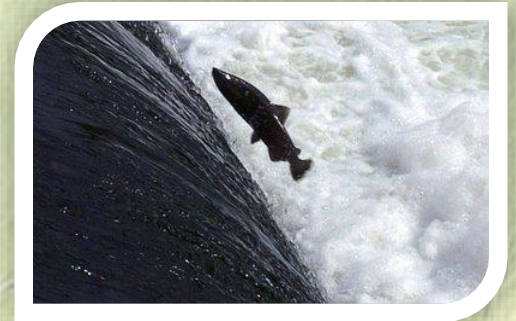


Why do We Care?

The Central Challenge of Climate Change and Ecological Conservation

Climate change will amplify existing stressors on biodiversity, including sensitivity to land and water use.

Without help, many species will be unable to adapt fast enough to keep up with the pace of change.



What about Wildlife?



Moose: Populations are crashing in New England.

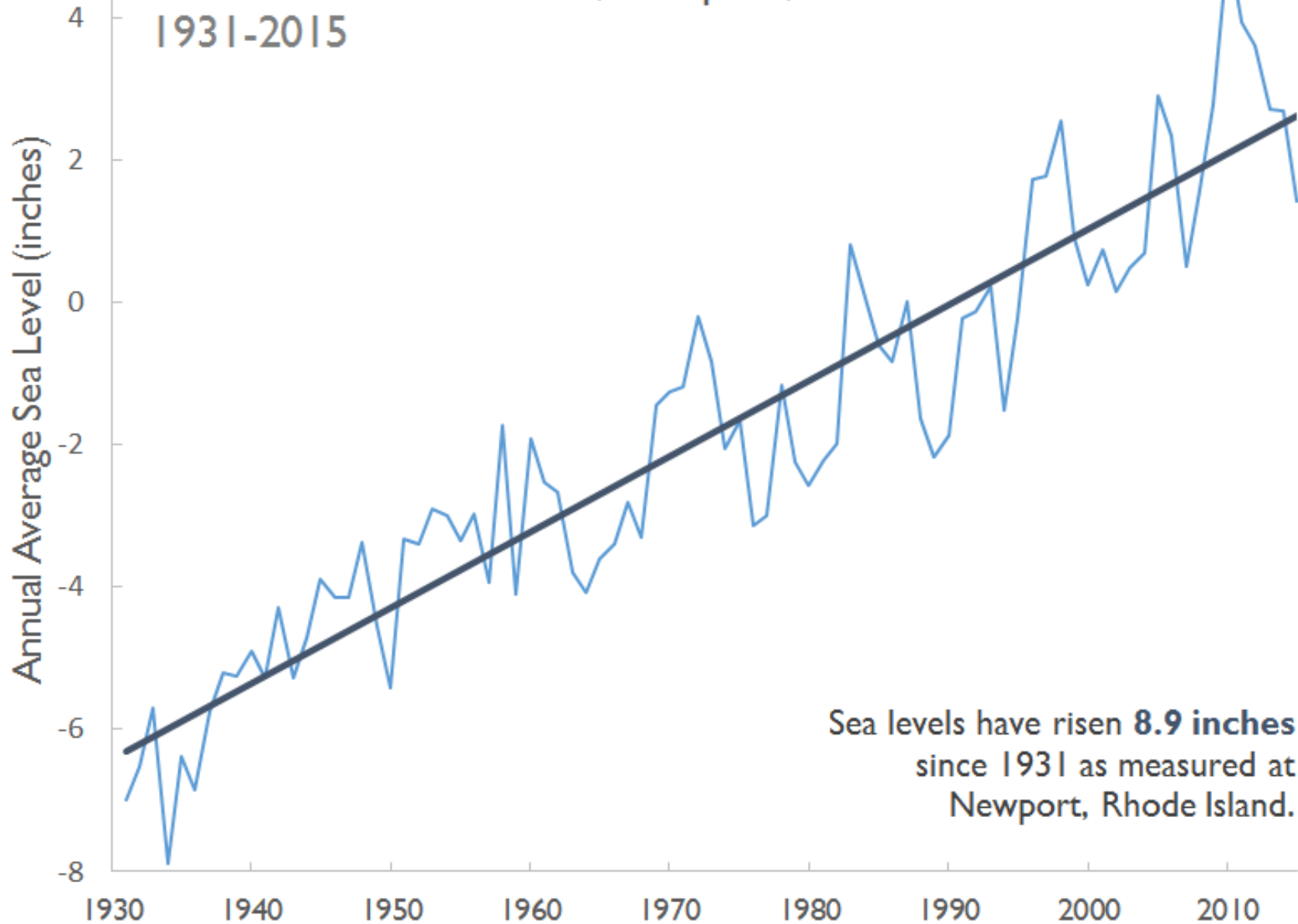


New Hampshire Population
down 40% in last decade

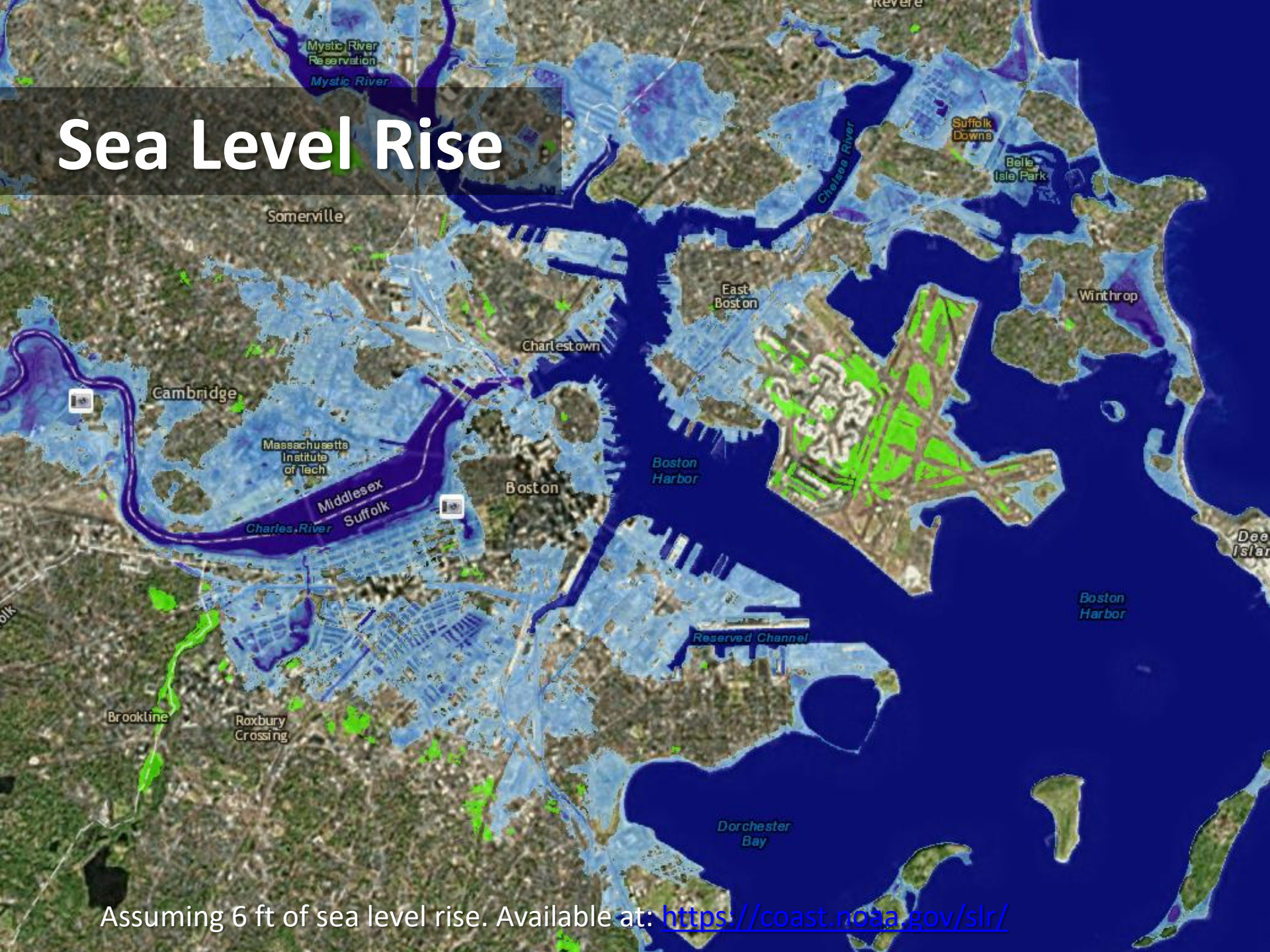


Birds: Long distance migrants and coastal birds may be impacted the most.

Observed Sea Level Rise, Newport, Rhode Island 1931-2015

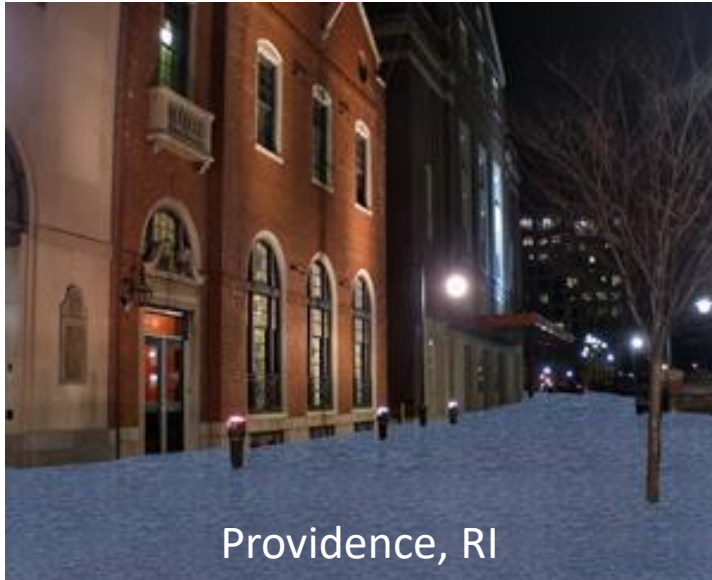


Sea Level Rise



Assuming 6 ft of sea level rise. Available at: <https://coast.noaa.gov/slr/>

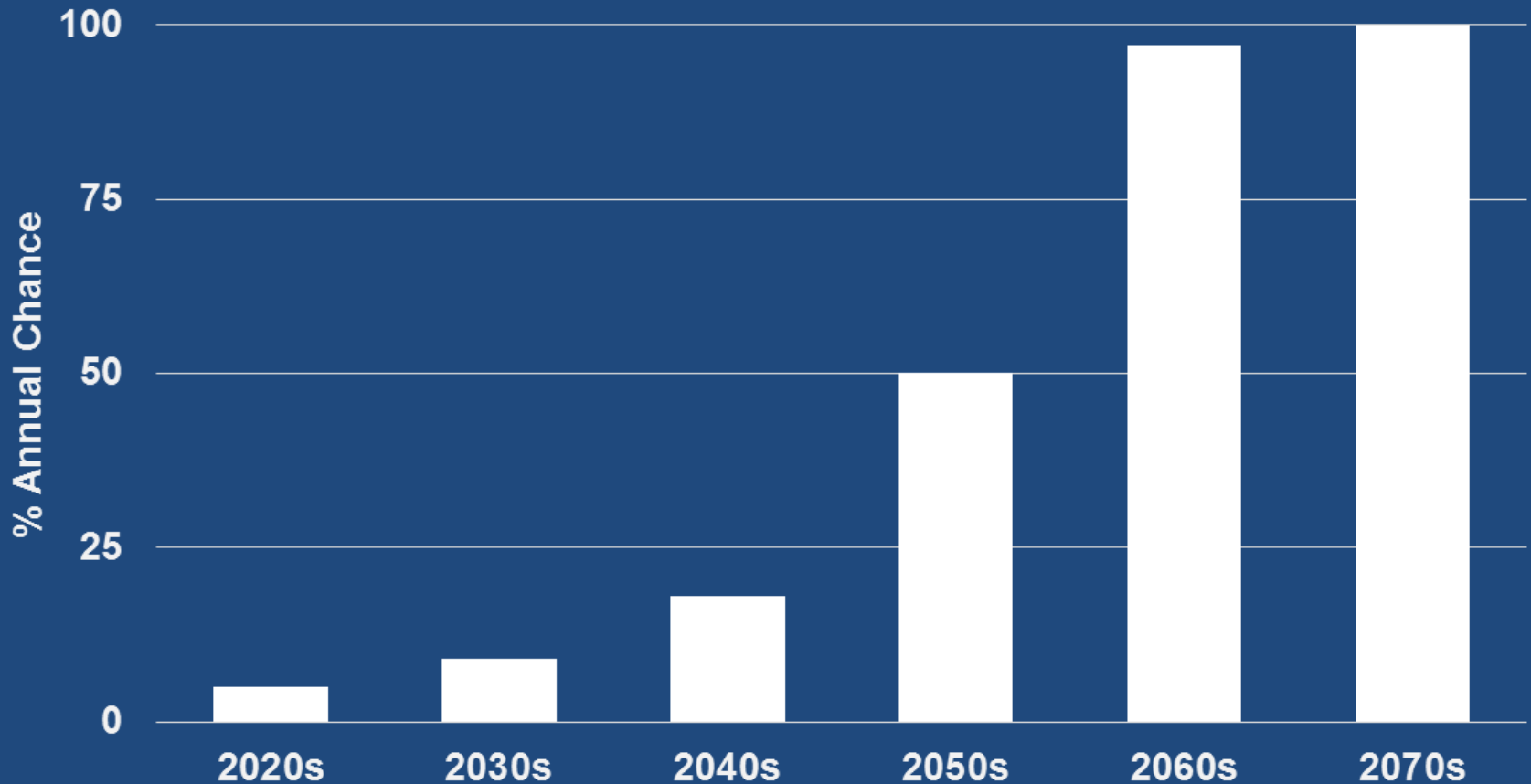
Sea Level Rise Visualizations



Assuming 6 ft of sea level rise. Available at: <https://coast.noaa.gov/slr/>

Coastal Flooding

Projected Single-year Likelihood of Coastal Floods Exceeding 4 Feet Providence, Rhode Island

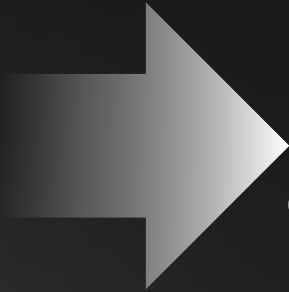


Rising Temperatures Bring More Rain or Snow

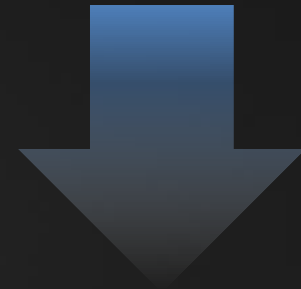


To understand why,
you need only
consider your
morning coffee.

**More
evaporation**



**More
fuel for storms**



**More
precipitation**

**More
Heat**



More Precipitation

Total annual precipitation
has increased by:

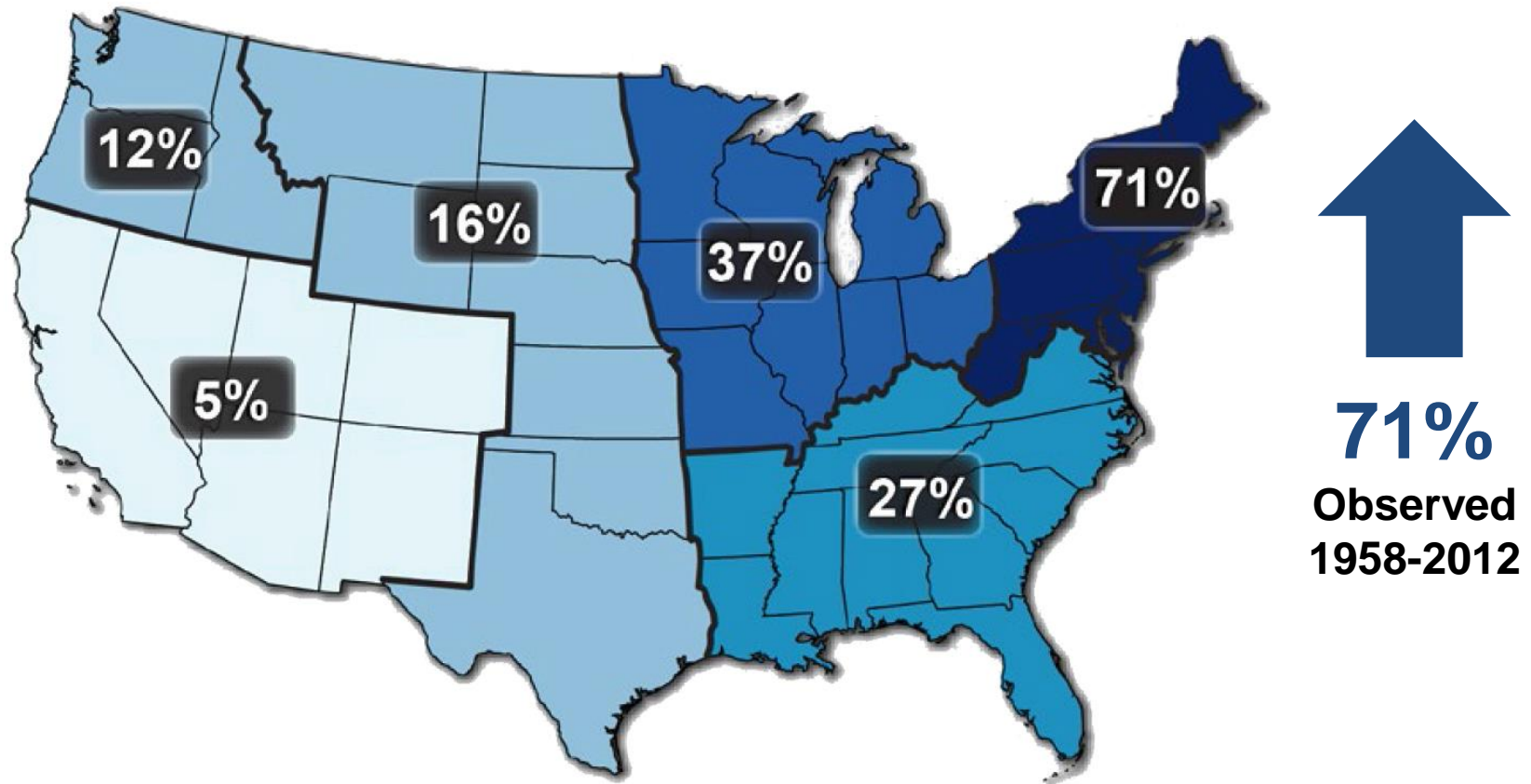
10-16%

1.2 trillion more gallons of
water or equivalent snow falling
on Massachusetts each year.

~9,700 filled Prudential Towers



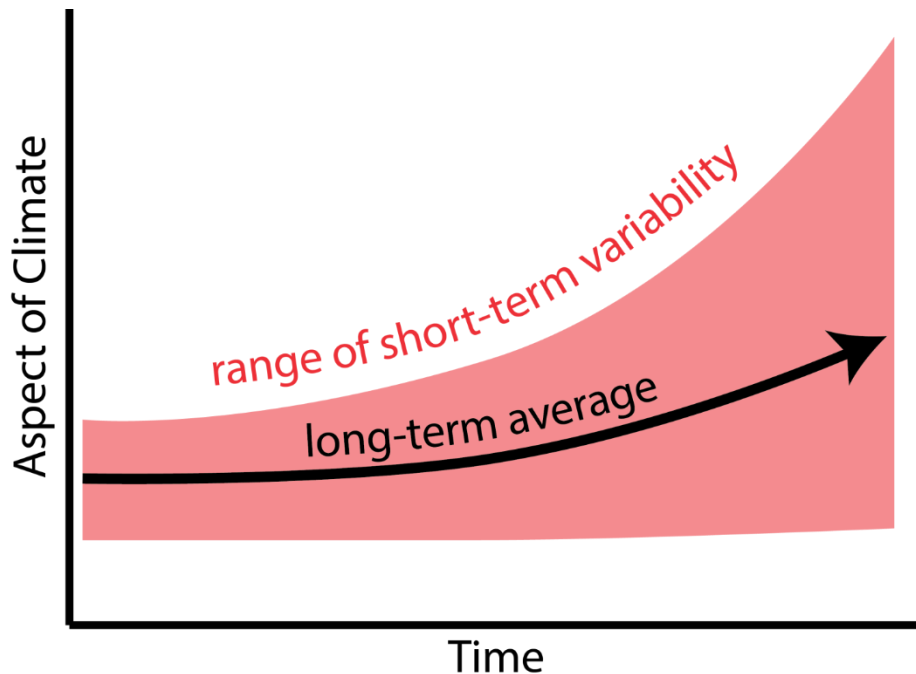
More Extreme Precipitation



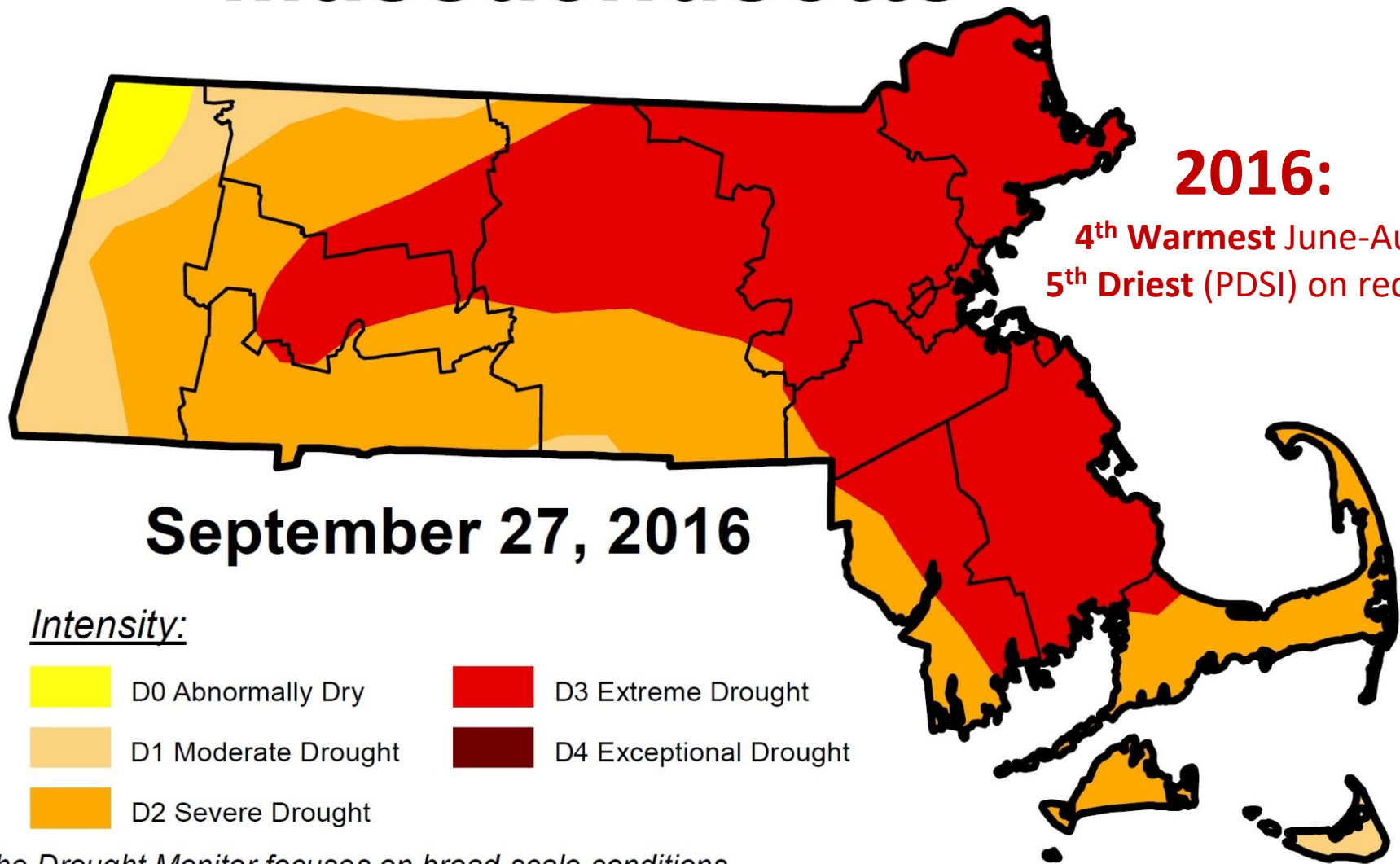
The amount falling in the heaviest 1% of precipitation events increased by **71% in the Northeast** from 1958 to 2012.

Long-term change doesn't rule out shorter-term variability.

Example: Even as average temperatures warm, we will still experience winter storms.



U.S. Drought Monitor Massachusetts



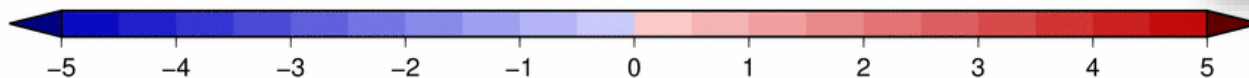
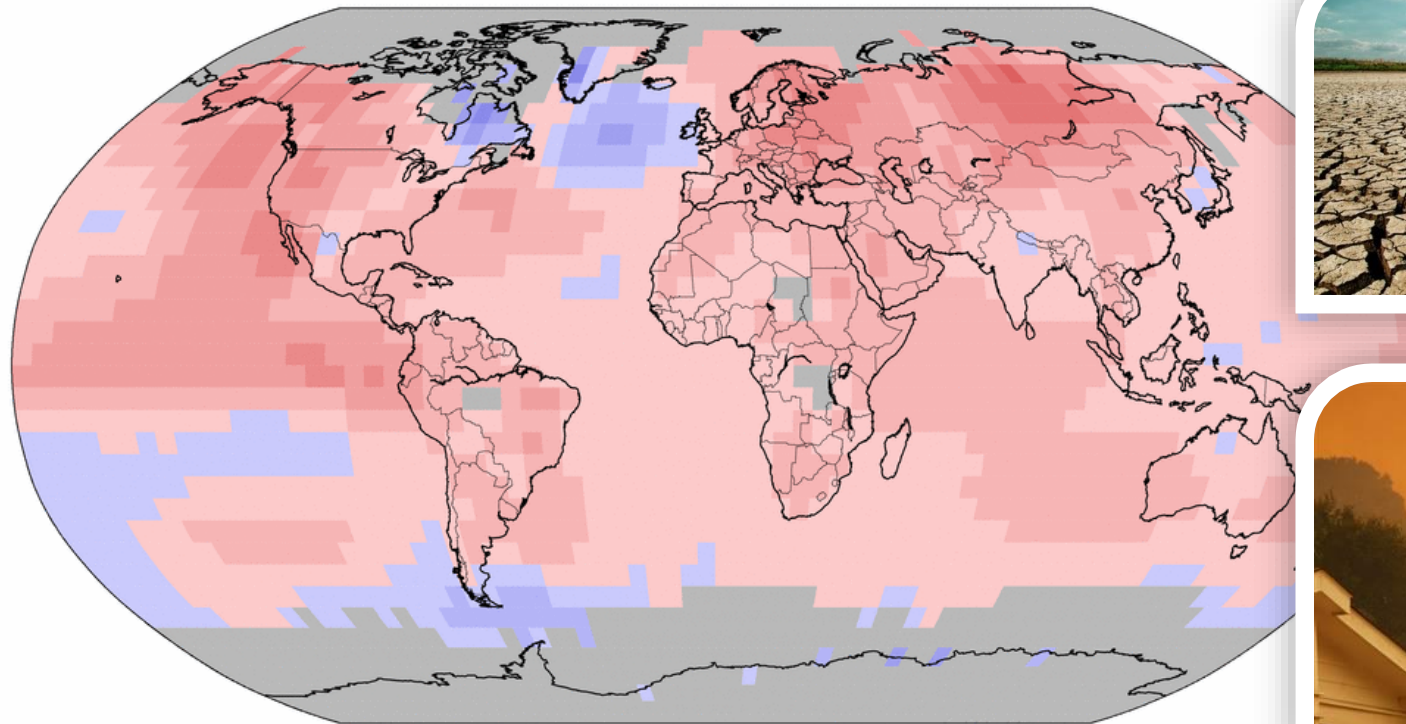
*The Drought Monitor focuses on broad-scale conditions.
Local conditions may vary. See accompanying text summary
for forecast statements.*

<http://droughtmonitor.unl.edu/>

Globally, 2015 was the warmest year on record since 1880.

Land & Ocean Temperature Departure from Average Jan–Dec 2015
(with respect to a 1981–2010 base period)

Data Source: GHCN–M version 3.3.0 & ERSST version 4.0.0

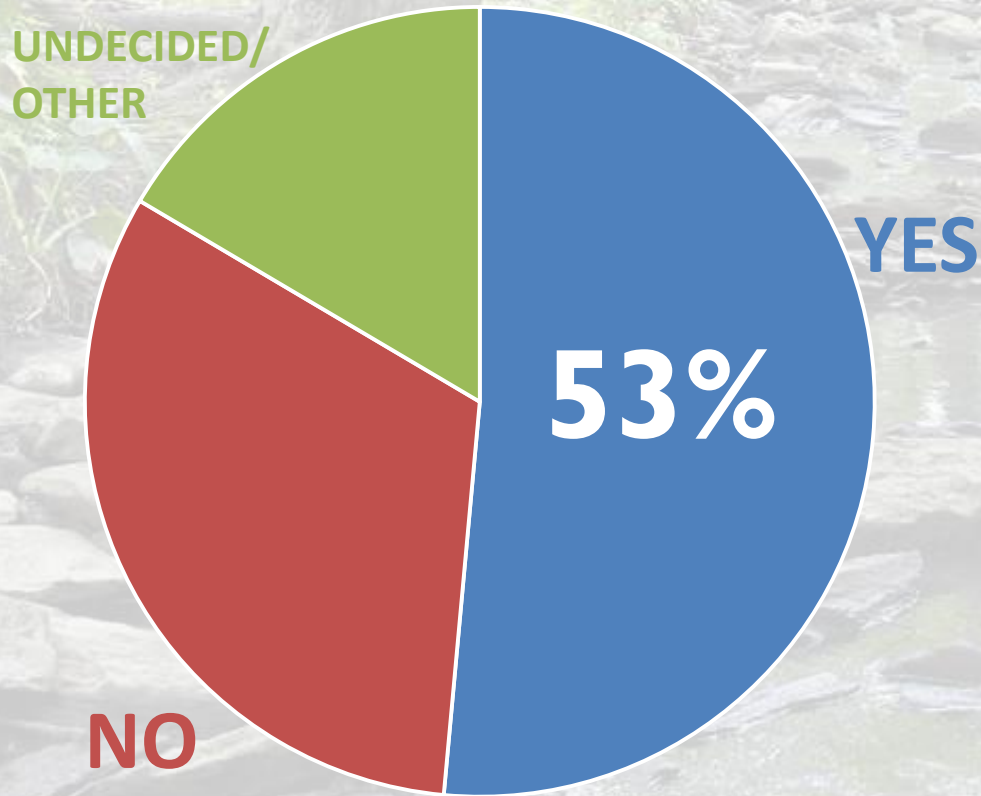


Meanwhile, in Boston...

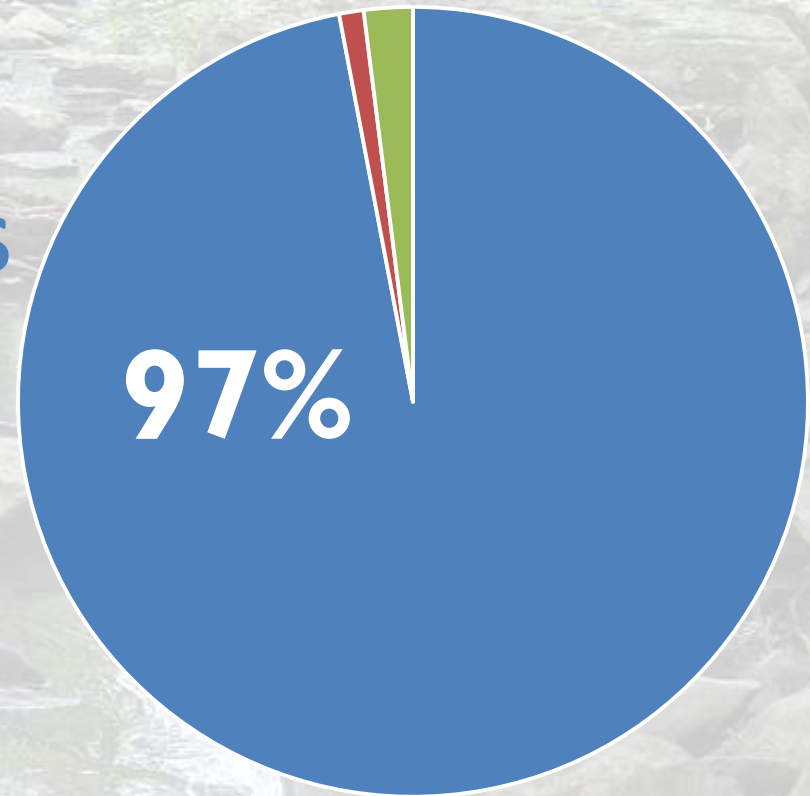


Talk About It: Percent of Americans that say climate change is real and caused by humans...

American Adults



Climate Scientists





ARTICLE · Jan 23, 2017

How to Inoculate the Public Against Misinformation About Climate Change

By [Sander van der Linden](#), [Anthony Leiserowitz](#), [Seth Rosenthal](#) and [Edward Maibach](#)

Filed under: [Messaging](#)

Prior studies have found widespread public misunderstanding about the scientific consensus that human-caused global warming is happening. A series of experiments have also found that simply informing people of the fact that 97% of climate scientists are convinced human-caused global warming is happening, significantly increased public understanding of the consensus. In turn, the increase in public understanding of the scientific consensus was associated with smaller, but potentially important increases in respondents' own conviction that global warming is happening, human-caused, and a worrisome threat that requires action.

is happening, human-caused, and a worrisome threat that requires action.

However, the basic fact of the scientific consensus has long been challenged by opponents of climate action, who have attempted to sow doubt among the public.

Change. Global Climate
Change. 2017. DOI:
10.1002/gch2.201600

Addressing Misconceptions



Skeptical Science

Getting skeptical about global warming skepticism



MOST USED Climate Myths

and what the science really says...

- 1 Climate's changed before
 - 2 It's the sun
 - 3 It's not bad
 - 4 There is no consensus
 - 5 It's cooling
 - 6 Models are unreliable
 - 7 Temp record is unreliable
 - 8 Animals and plants can adapt
 - 9 It hasn't warmed since 1998
 - 10 Antarctica is gaining ice
- [View All Arguments...](#)

Many leaders often feel uncomfortable discussing climate change.

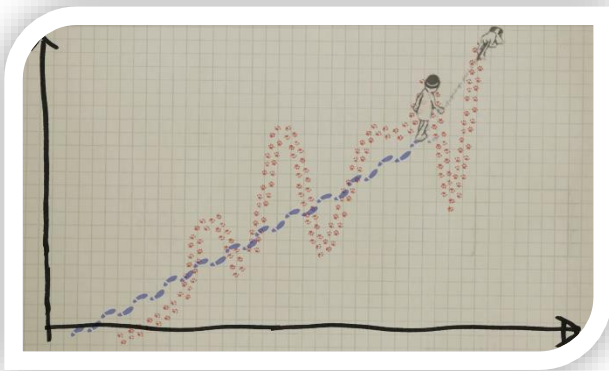
“Inoculate” them to common skepticism, alarmism and inaccuracies. It improves their comfort and depth of knowledge.

Best resource: skepticalscience.com

Engage with Stories and Analogies



Climate change is
“weather on steroids”.



Climate is to weather as a
man is to a dog he’s
walking.

What do we need to do?

- **We need to be ready** for unavoidable changes.
Comprehensive Adaptation Management Plan (CAMP)
- **We need to reduce emissions** to avoid the most dangerous impacts.
Global Warming Solutions Act (GWSA)



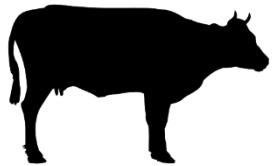
How We Can Help



Make the Switch!



Commit to Car-free Days



Eat Less Beef



Talk About It



Join a

Community Organization

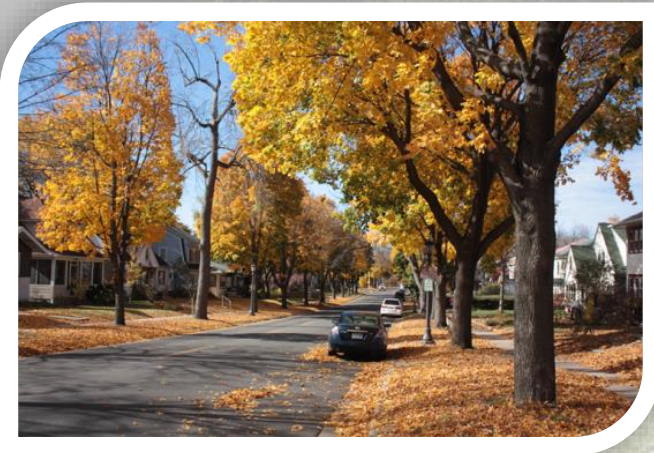
Start near home.



Adopt a drain.

Adopt a tree.

Adopt a neighbor.

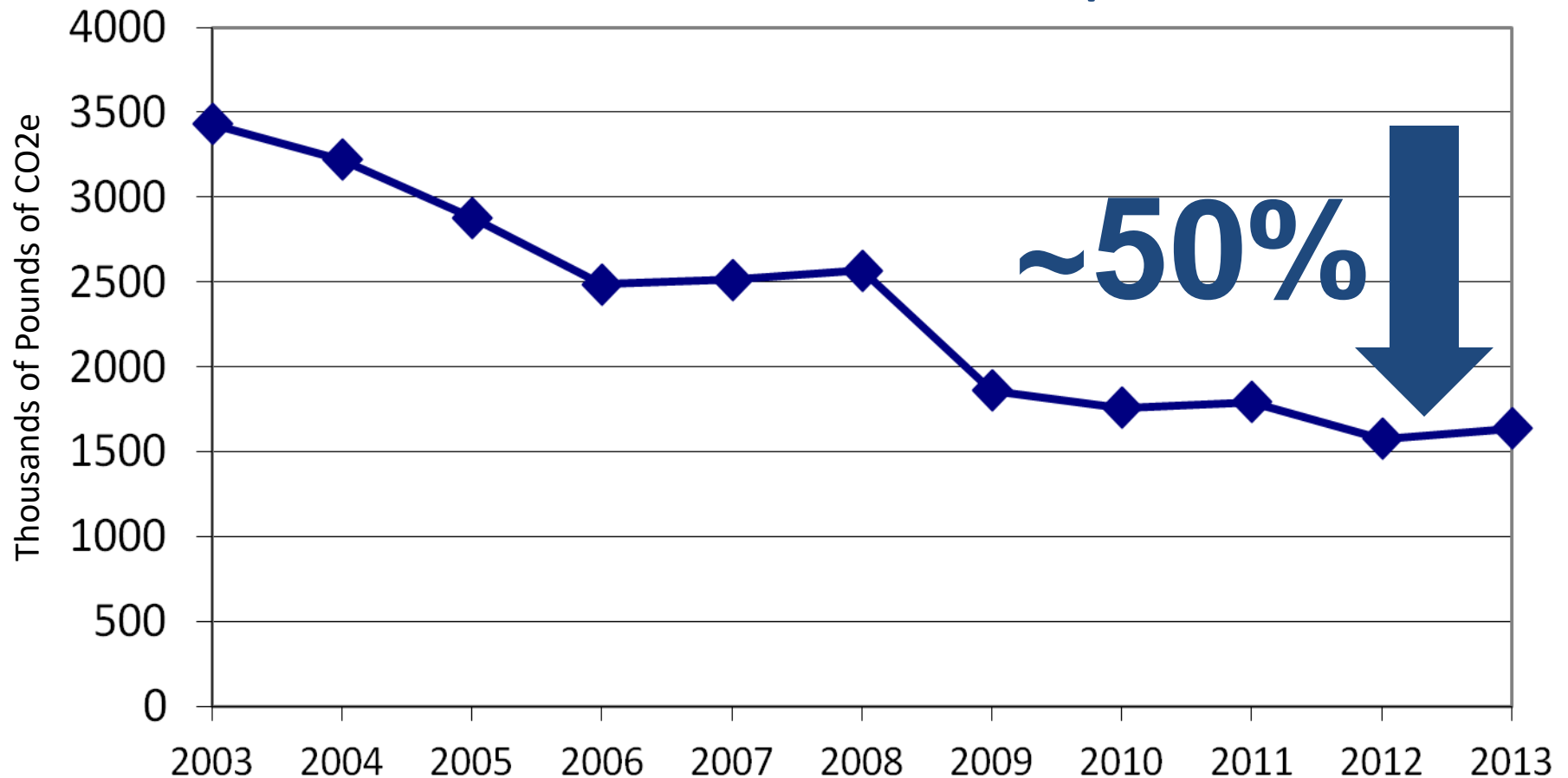


Protect land. The best adaptation practice is preserving natural infrastructure.



Mass Audubon reduced its carbon footprint by about 50% from 2003-2013.

Mass Audubon Carbon Footprint



Leading by Example

During FY 2016 Mass Audubon generated:

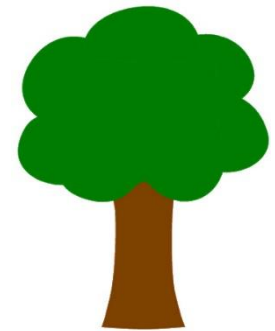
372 MWh of clean energy

That's equivalent to the carbon dioxide emitted from:



Driving a passenger car from Boston to LA 208 times.

Or the carbon sequestered over a year by 248 acres of forest.



Block Island Wind Farm

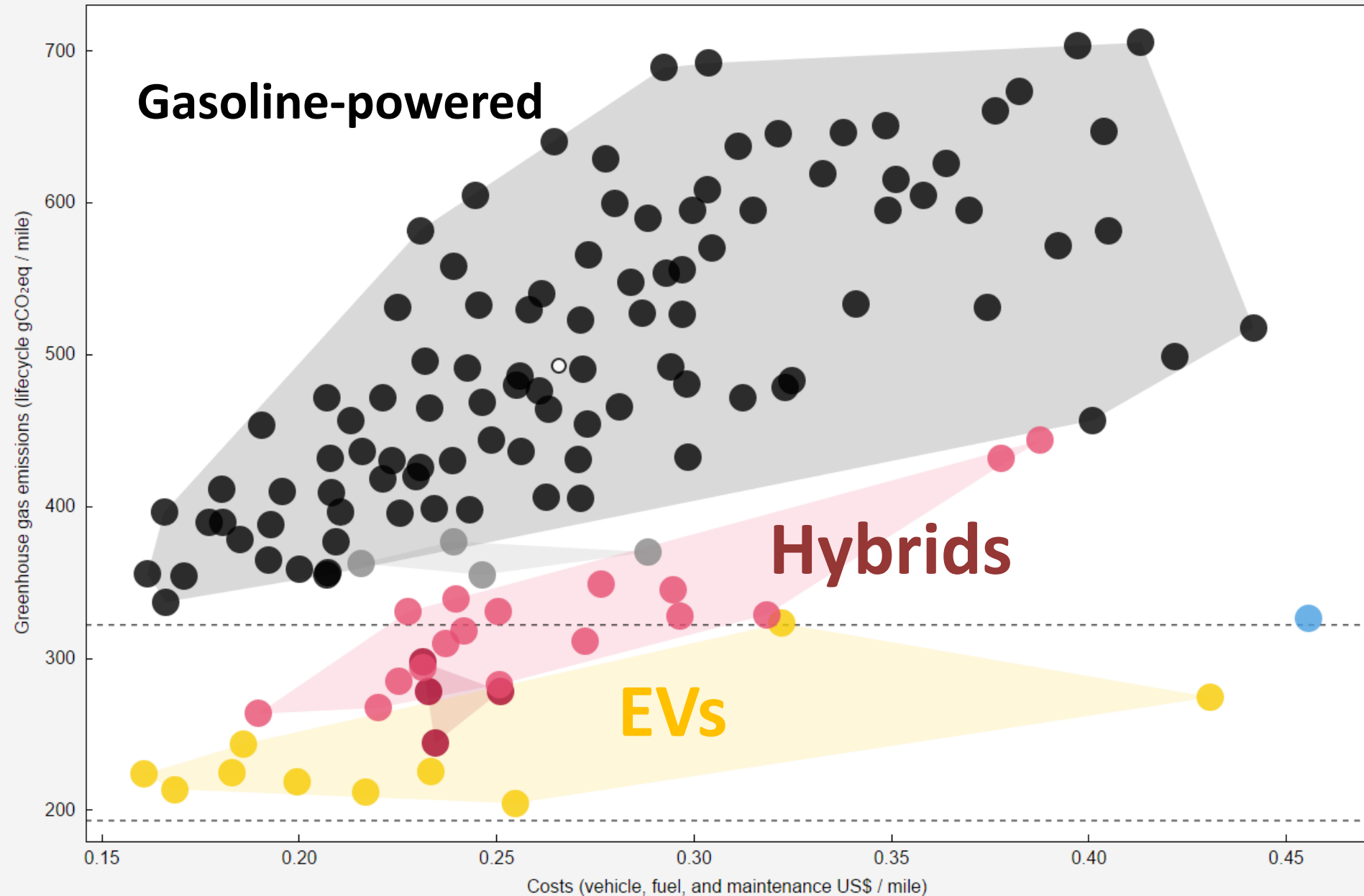
5 Turbines

125,000 MWh

expected annually

**336 × Electricity generated by
Mass Audubon**

MIT: carboncounter.com





What We Eat: The Beef with Beef

Beef production results
in about 5-10 times the
greenhouse gas
emissions from other
meats.

Eshel et al, PNAS, 2014

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Photo by Daniel Brown