
MINNESOTA'S CLIMATE FUTURE:
SAVING
THE PLACES
WE LOVE
Presented by
Saint Paul Sunrise Rotary Club
with Rotary Clubs of Minneapolis
City of Lakes and Roseville

Rotary

Paul Huttner

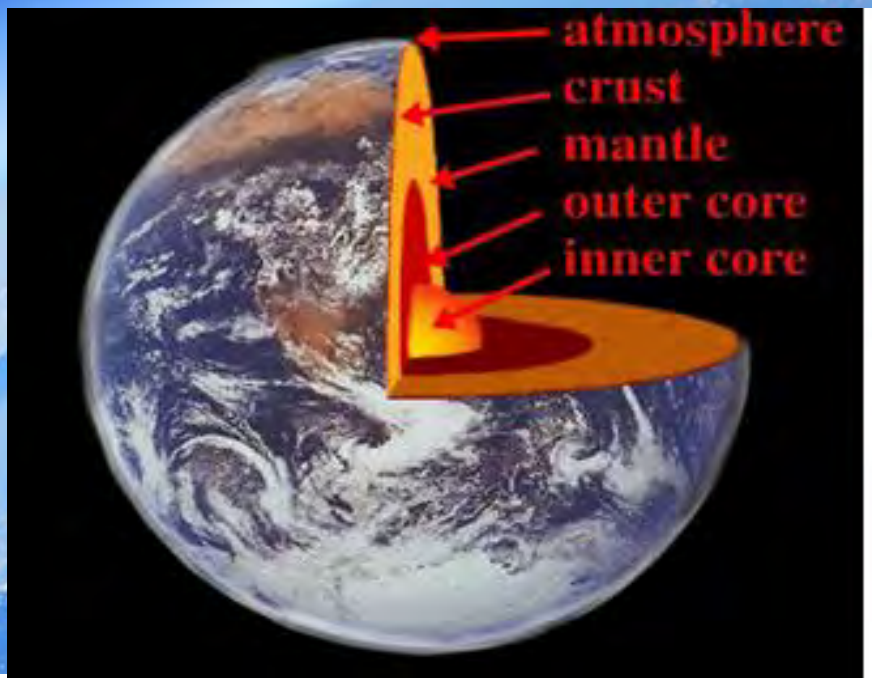
Chief Meteorologist
Minnesota Public Radio


Earth’s atmosphere…
90% in lowest 10 miles
Troposphere

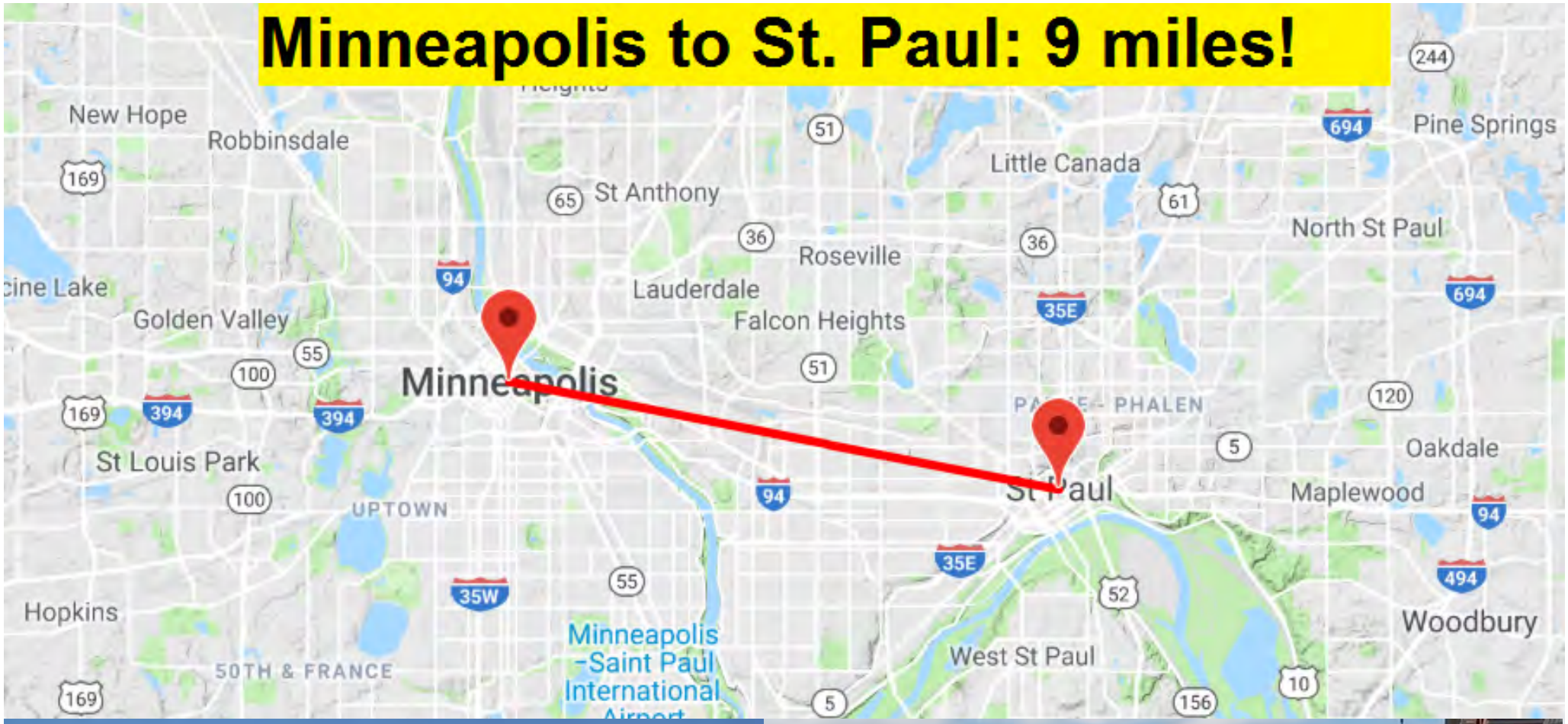
Earth's atmosphere…

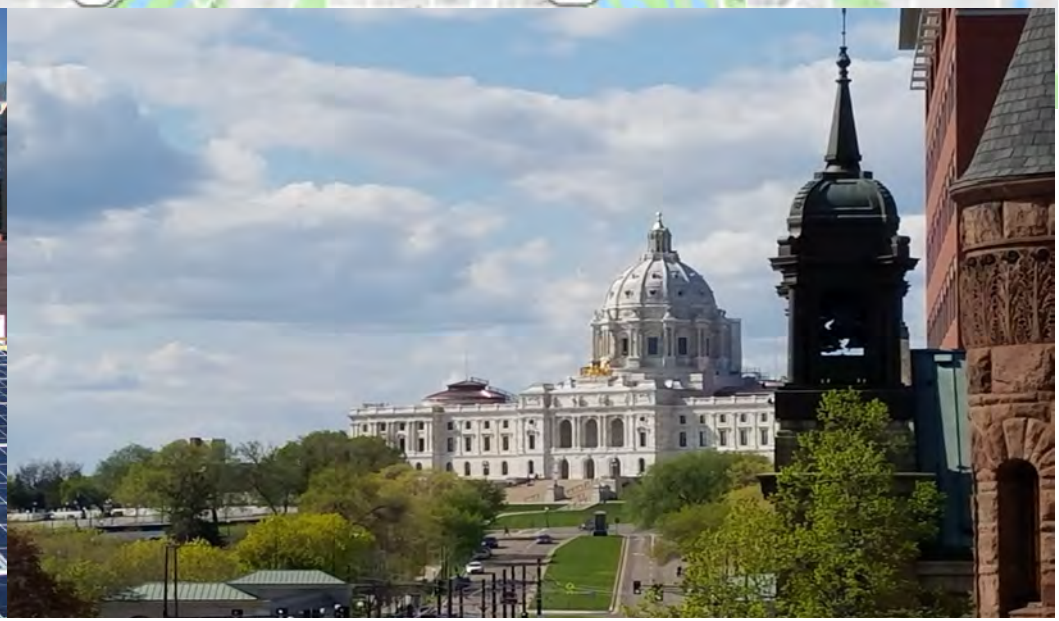
Troposphere:

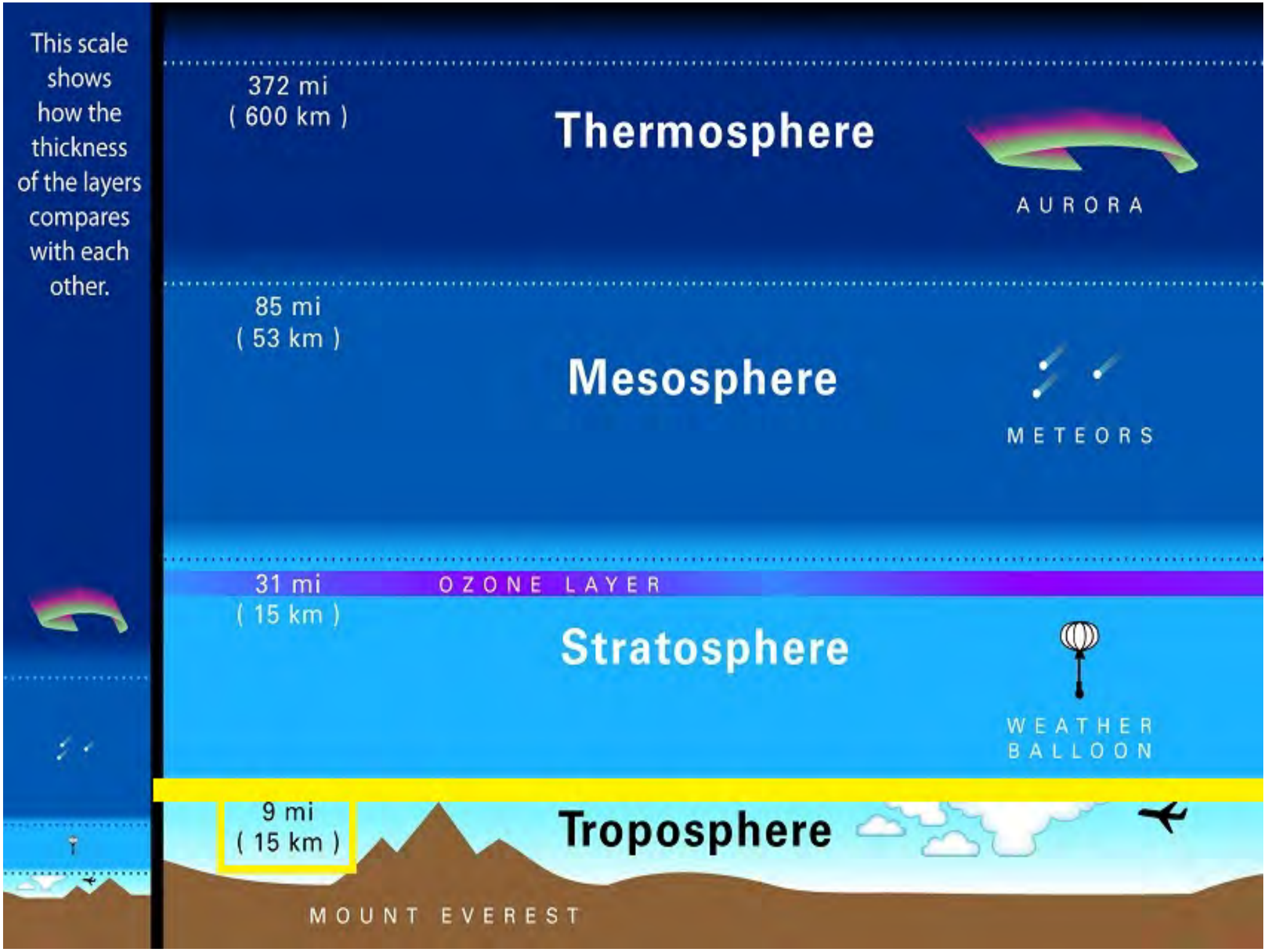
About as thin as the skin of an apple!



Minneapolis to St. Paul: 9 miles!






This scale shows how the thickness of the layers compares with each other.
372 mi
(600 km)
Thermosphere
AURORA
85 mi
(53 km)
Mesosphere
METEORS
31 mi
(15 km)
OZONE LAYER
Stratosphere
WEATHER BALLOON
9 mi
(15 km)
Troposphere
MOUNT EVEREST

Climate Cast

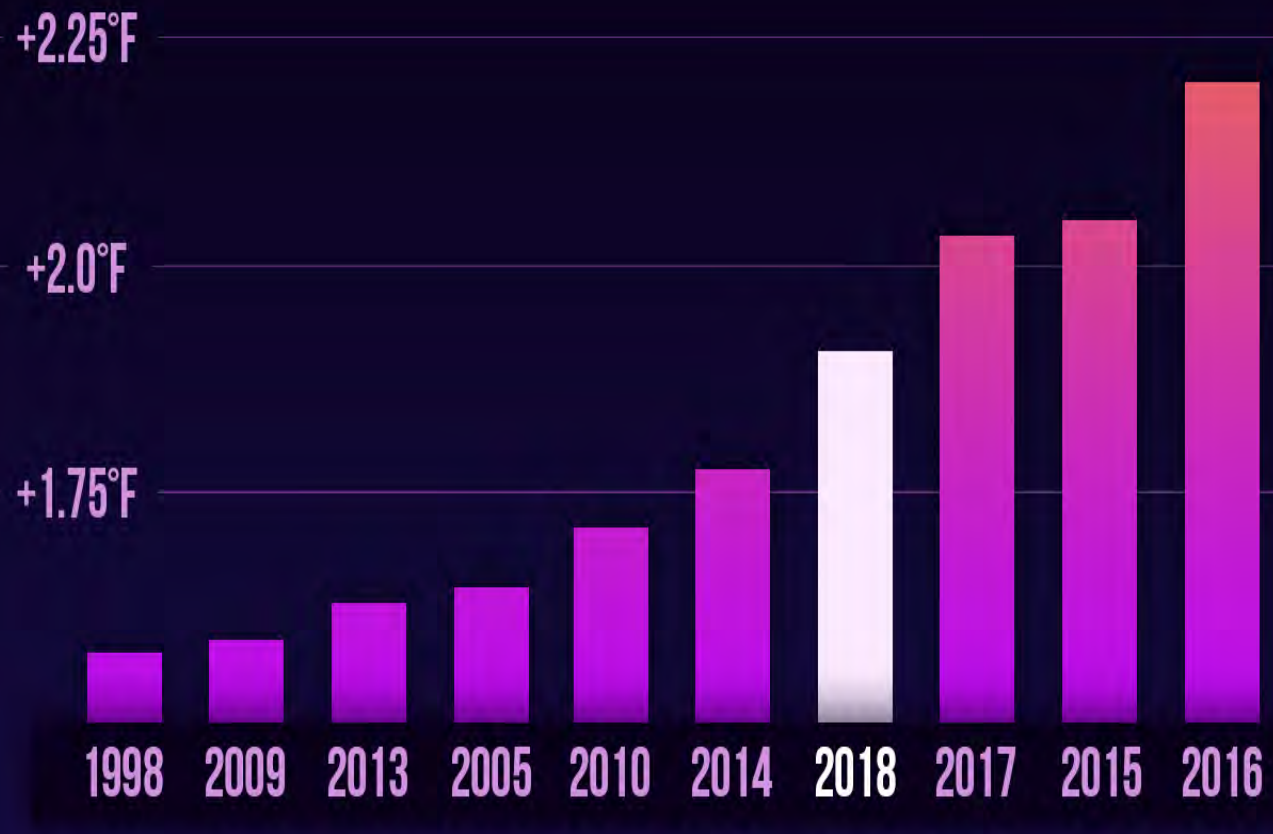
MPRnews

State of Earth's Climate 2019

- 2014-18: 5 warmest years on record globally
- *Unprecedented in modern climate record*
- 2018: 4th warmest year globally
- 1976: Last cooler/average year globally (43?)
- Feb 1985: Last cooler/avg month globally (34?)
- 1958: CO2 at 315 ppm at Mauna Loa
- 2019: CO2 414 ppm at Mauna Loa (+31%)
- Highest CO2 level in 3-million years!

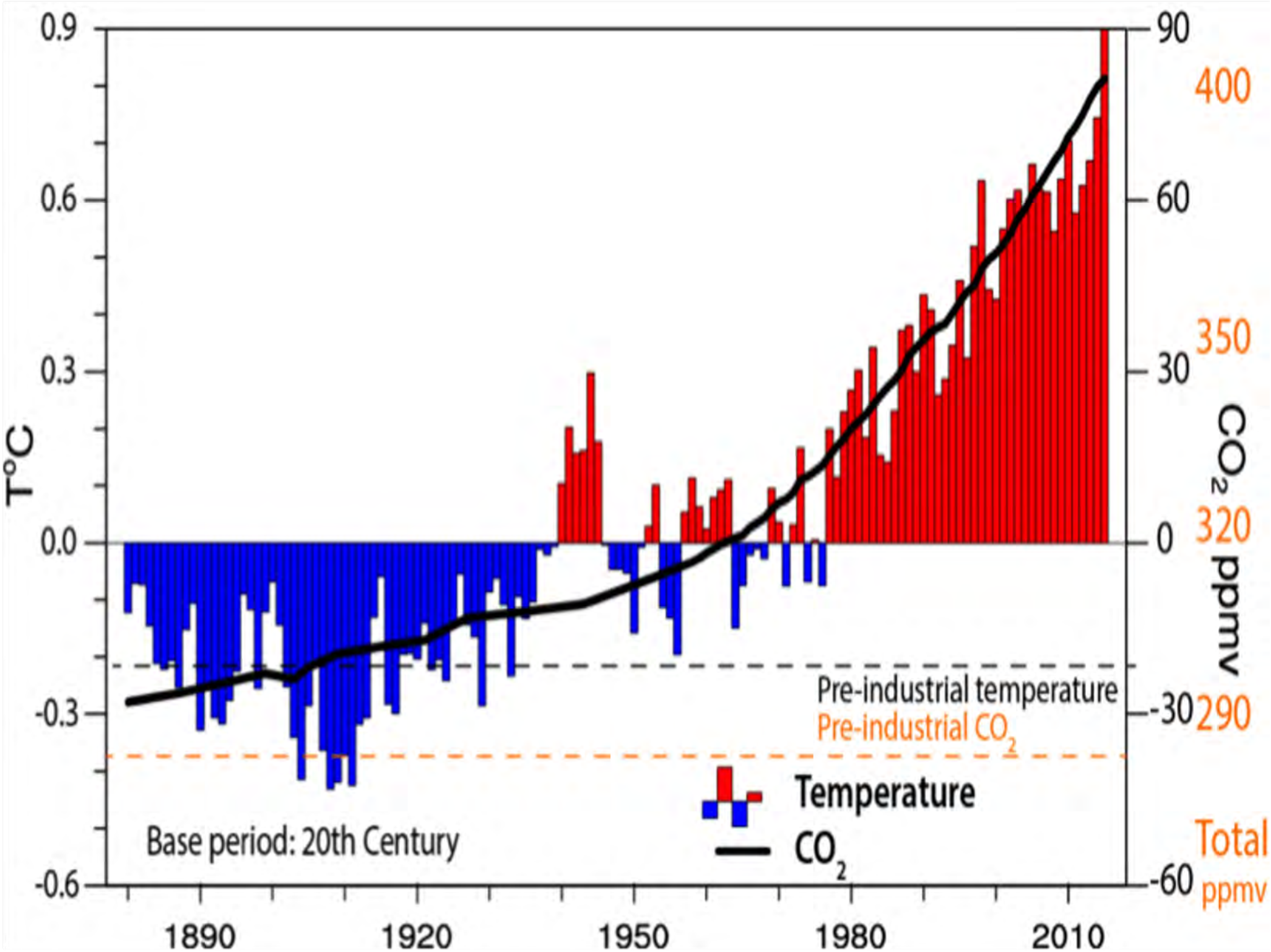
HOTTEST YEARS ON RECORD GLOBALLY

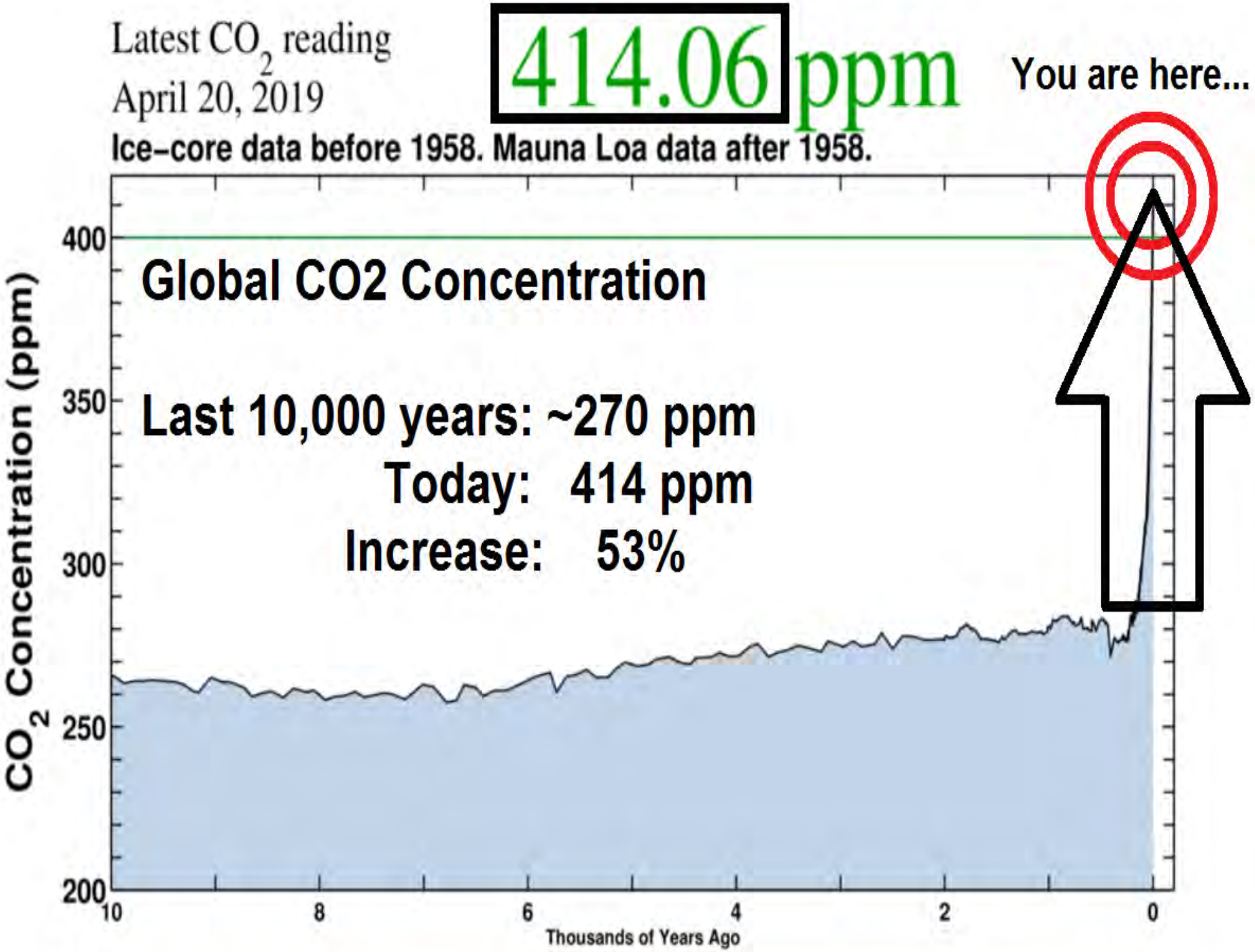
LAST 5 = HOTTEST 5



Source: NASA GISS & NOAA NCEI global temperature anomalies (°F) averaged and adjusted to early industrial baseline (1881-1910). Data as of 2/6/2019

CLIMATE CENTRAL


0.9
0.6
0.3
0.0
-0.3
-0.6
T°C
90
60
30
0
-30
-60
400
350
320
290
Total ppmv
CO2 ppmv
Pre-industrial temperature
Pre-industrial CO2
Temperature
CO2
Base period: 20th Century
1890
1920
1950
1980
2010


Latest CO_2 reading
April 20, 2019
414.06 ppm
You are here...
Ice-core data before 1958. Mauna Loa data after 1958.
Global CO2 Concentration
Last 10,000 years: ~270 ppm
Today: 414 ppm
Increase: 53%
CO_2 Concentration (ppm)
400
350
300
250
200
10
8
6
4
2
0
Thousands of Years Ago


Odds 13 of 15 hottest years occurring in past 15 years without climate change:
1 in 27,000,000
(yup, that's 27 MILLION)
CLIMATE CENTRAL

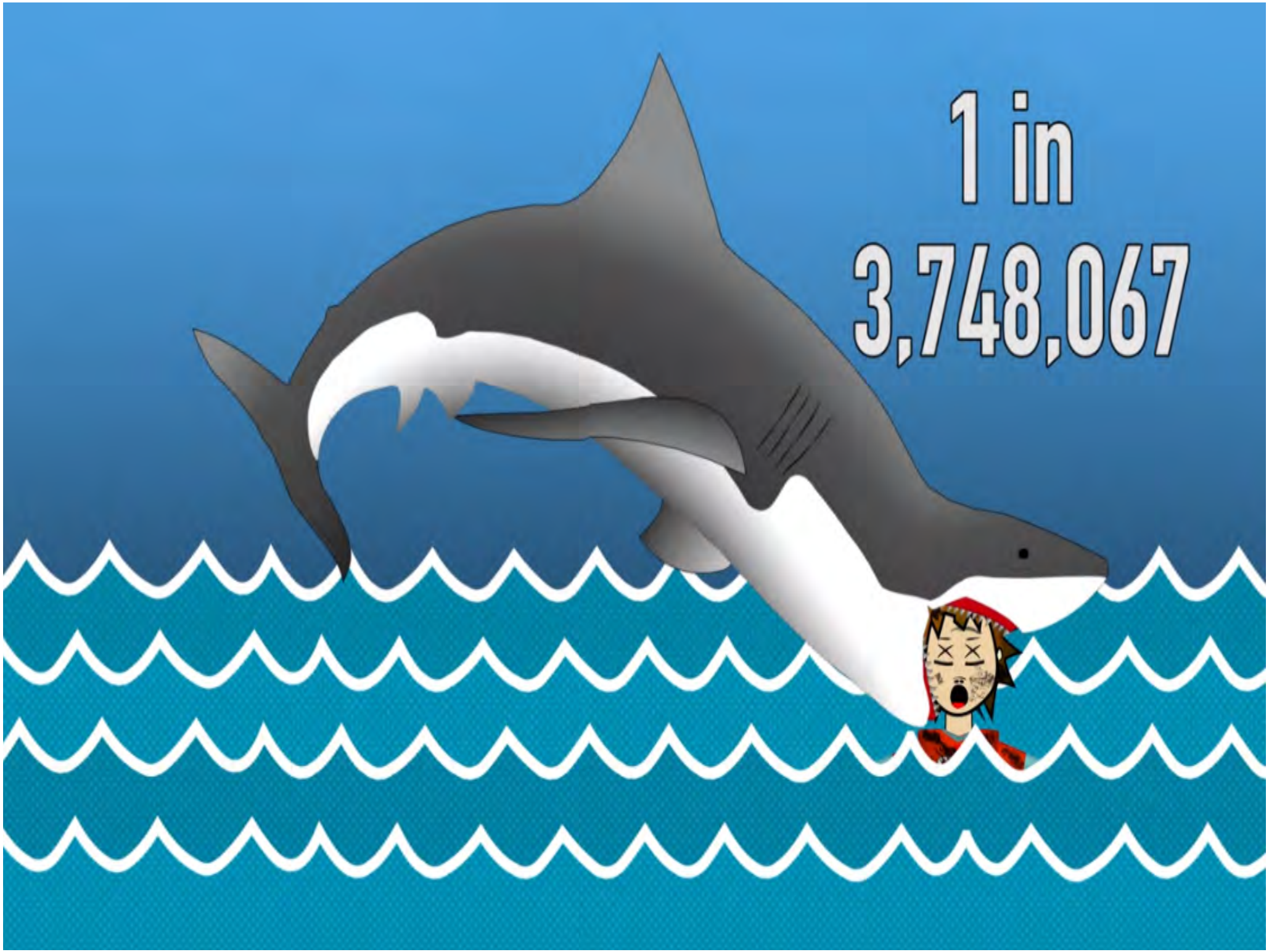
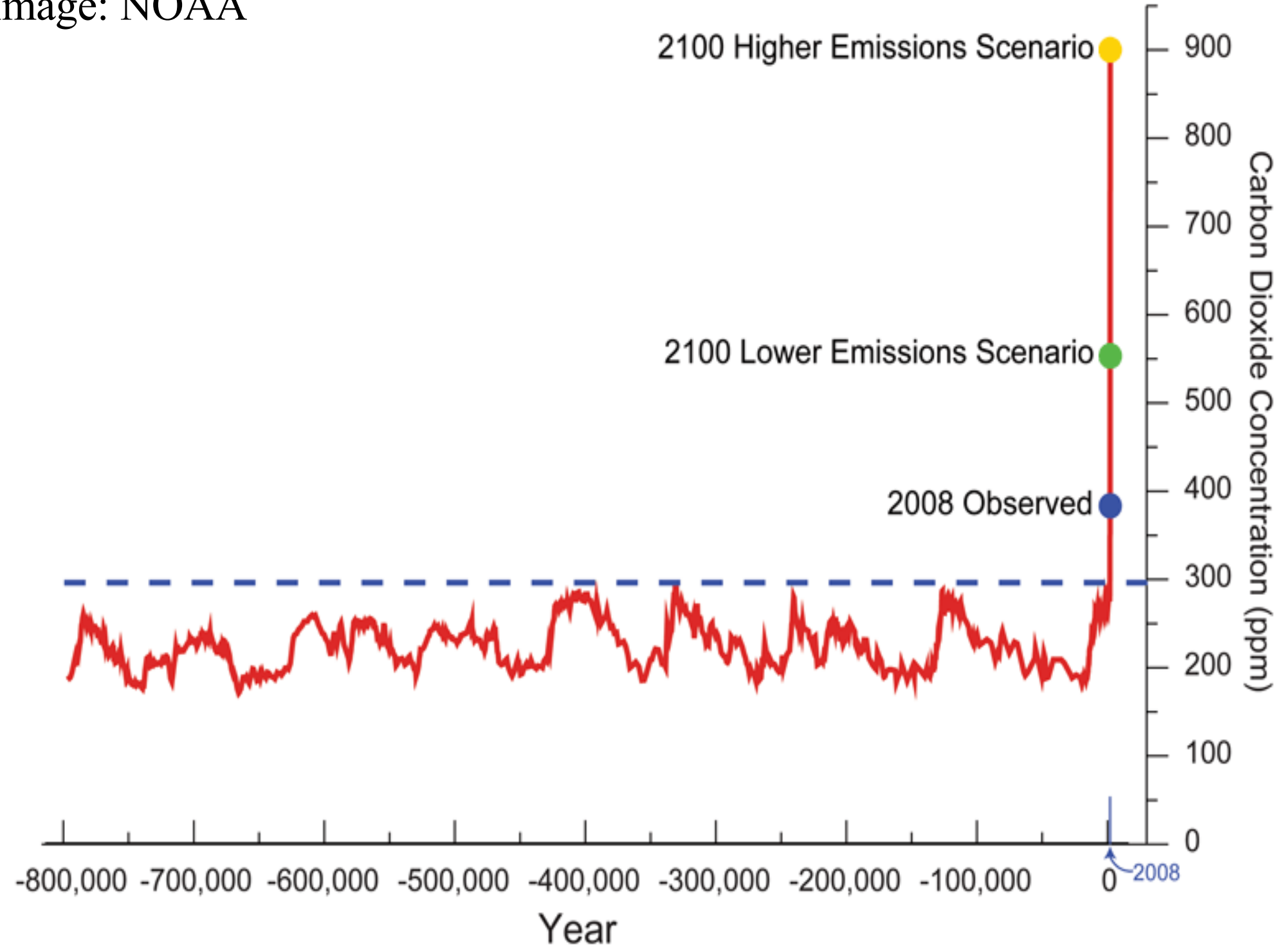
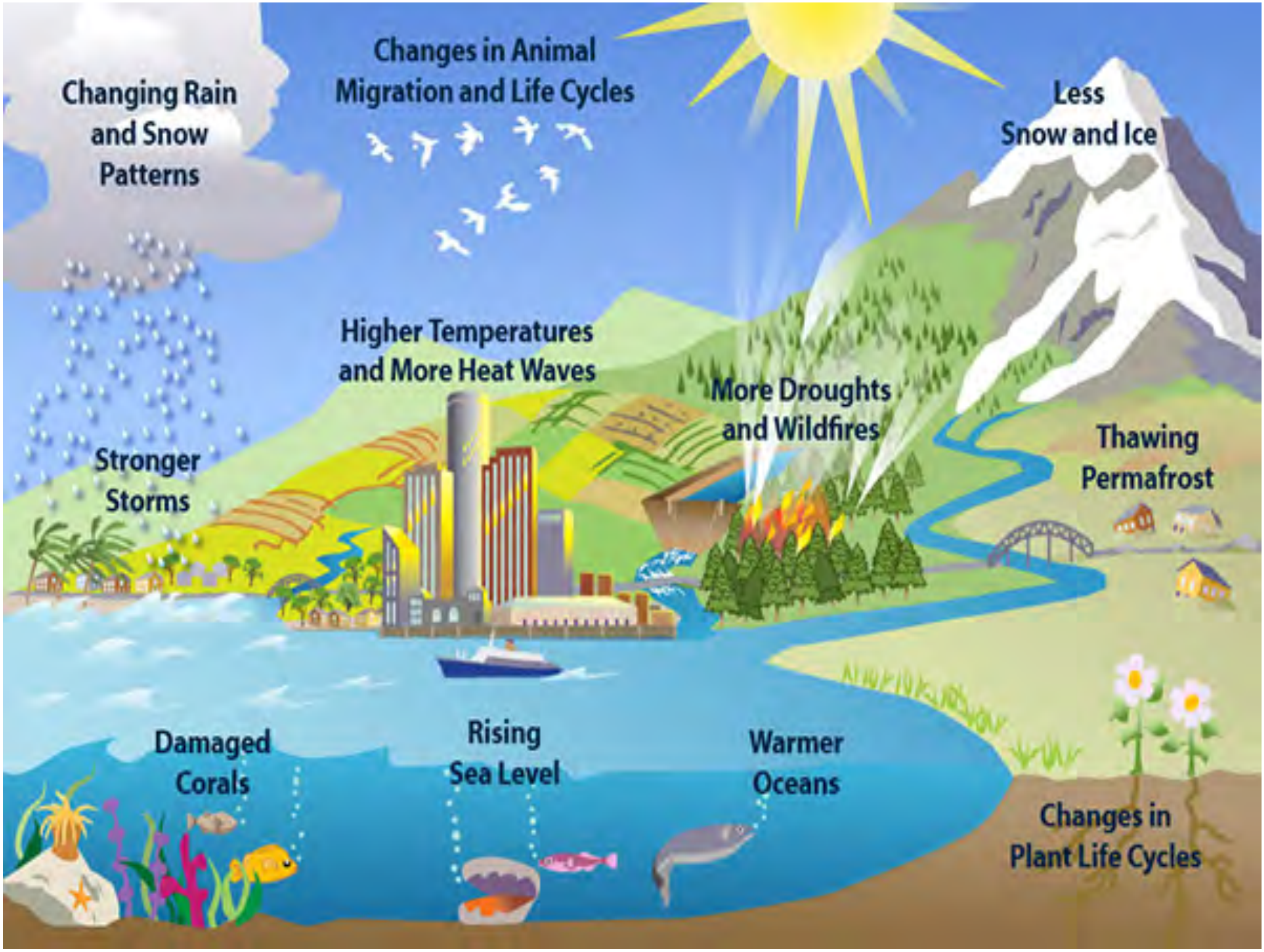
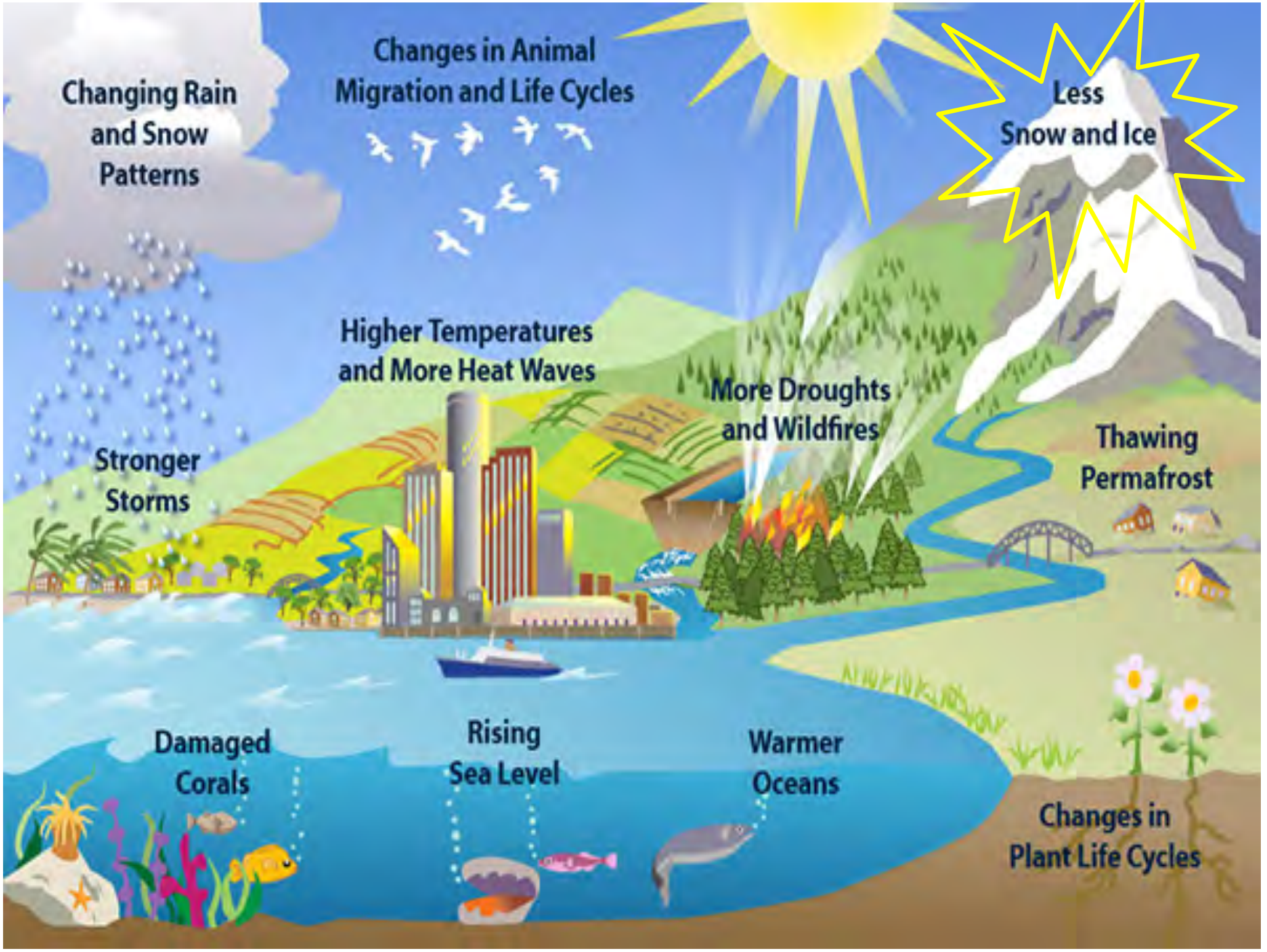

1 in
3,748,067

Image: NOAA


2100 Higher Emissions Scenario
2100 Lower Emissions Scenario
2008 Observed
900
800
700
600
500
400
300
200
100
0
Carbon Dioxide Concentration (ppm)
-800,000
-700,000
-600,000
-500,000
-400,000
-300,000
-200,000
-100,000
0
2008
Year


Changing Rain and Snow Patterns
Changes in Animal Migration and Life Cycles
Less Snow and Ice
Higher Temperatures and More Heat Waves
More Droughts and Wildfires
Thawing Permafrost
Stronger Storms
Damaged Corals
Rising Sea Level
Warmer Oceans
Changes in Plant Life Cycles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Changes in Plant Life Cycles

Sperry Glacier

Glacier National Park, MT

1913 *W. C. Alden photo, courtesy GNP Archives*

Sperry Glacier

Glacier National Park, MT

1913 *W. C. Alden photo, courtesy GNP Archives*

2008 *Lisa McKeon photo, USGS*

In 1913, Sperry Glacier's mass spanned across the entire basin and the glacier's terminus was recorded at over 150 ft. tall. Contemporary images show how the glacier has receded and separated into fragments.

Grinnell Glacier
Glacier National Park, MT

1938

Grinnell Glacier
T. J. Hileman
Glacier National Park Archives

Grinnell Glacier
Glacier National Park, MT

1938

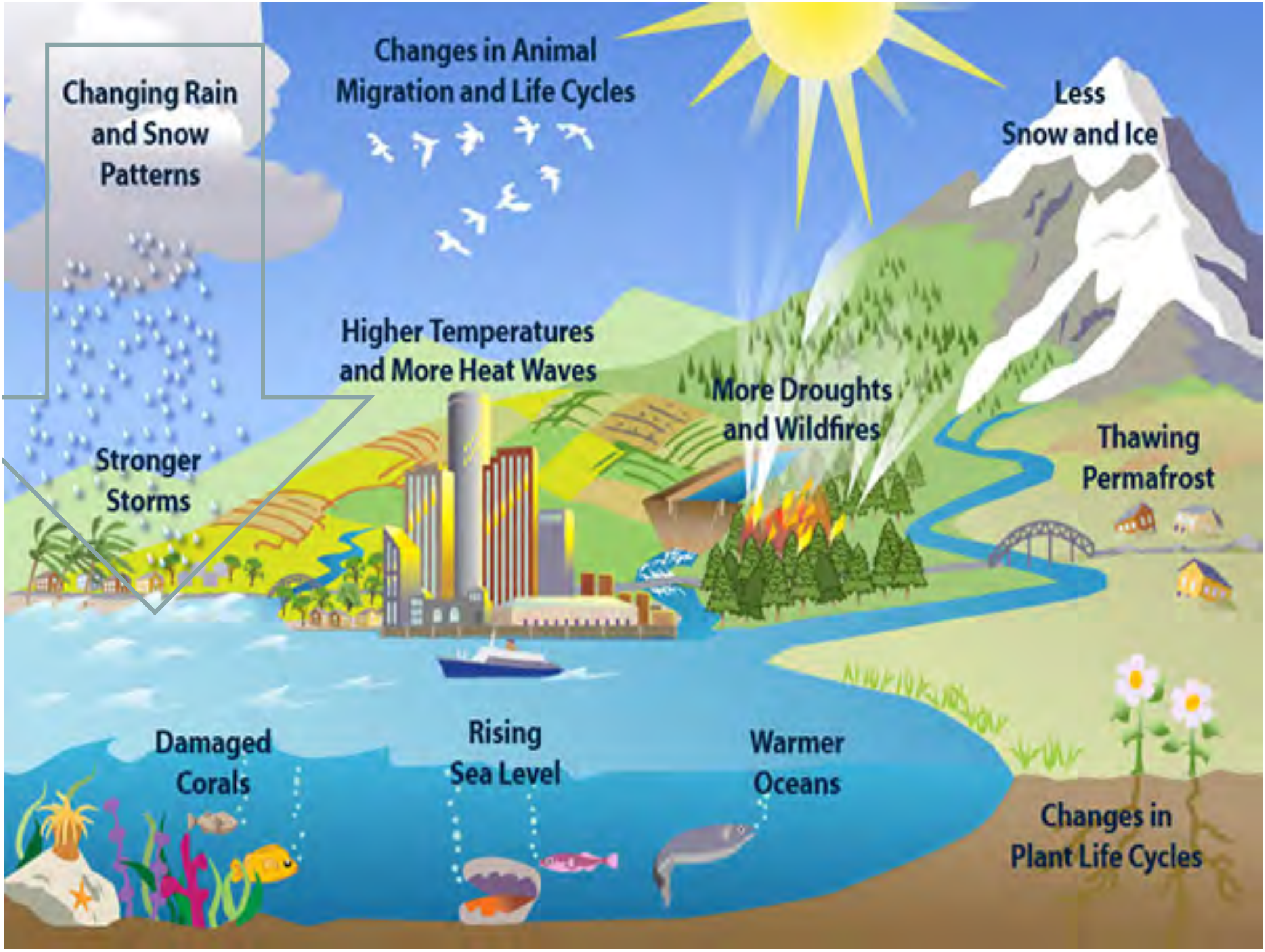
Grinnell Glacier
T. J. Hileman
Glacier National Park Archives

2016

Lisa McKeon
USGS


AD 1900


AD 1900
AD 2008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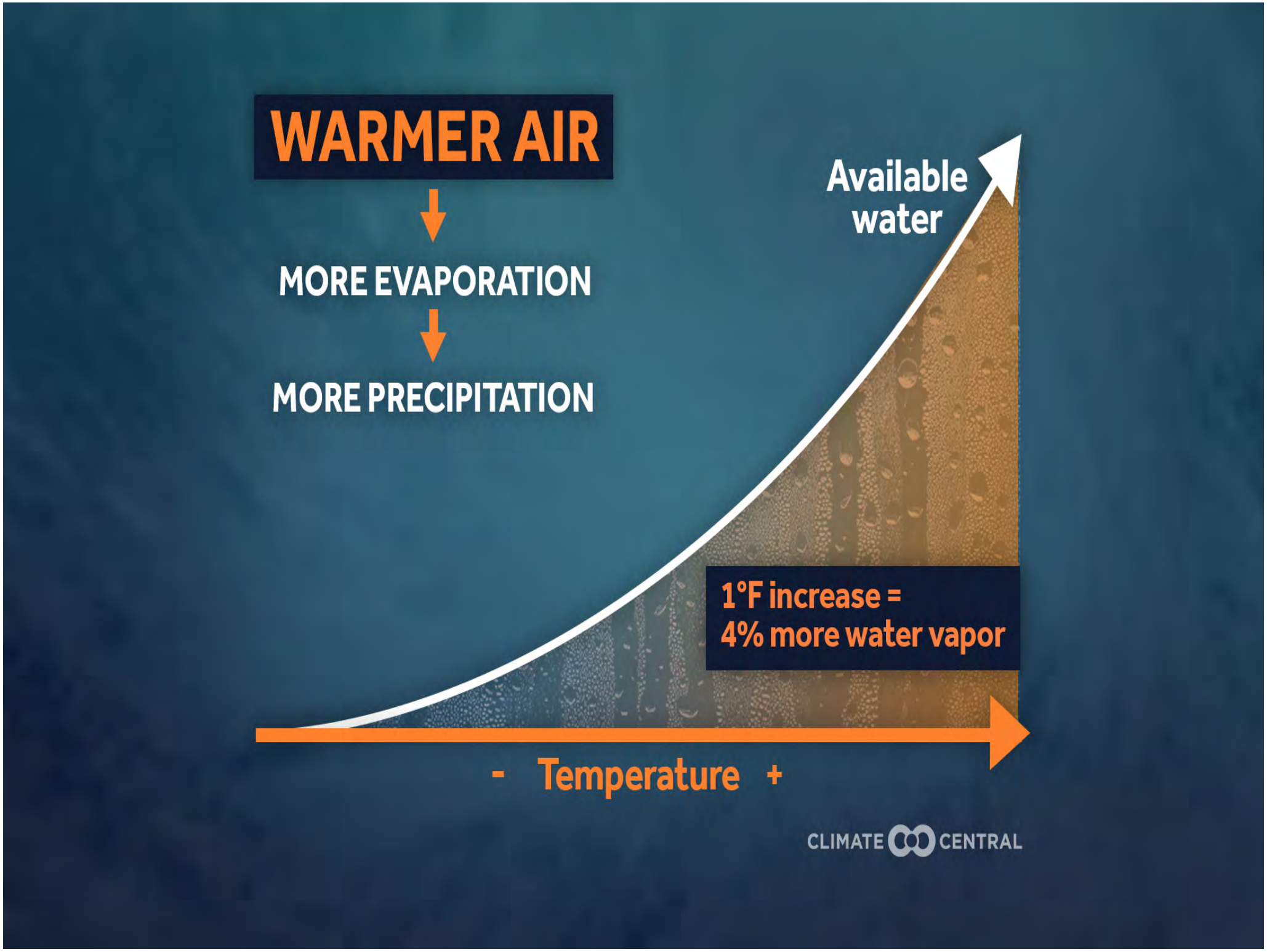
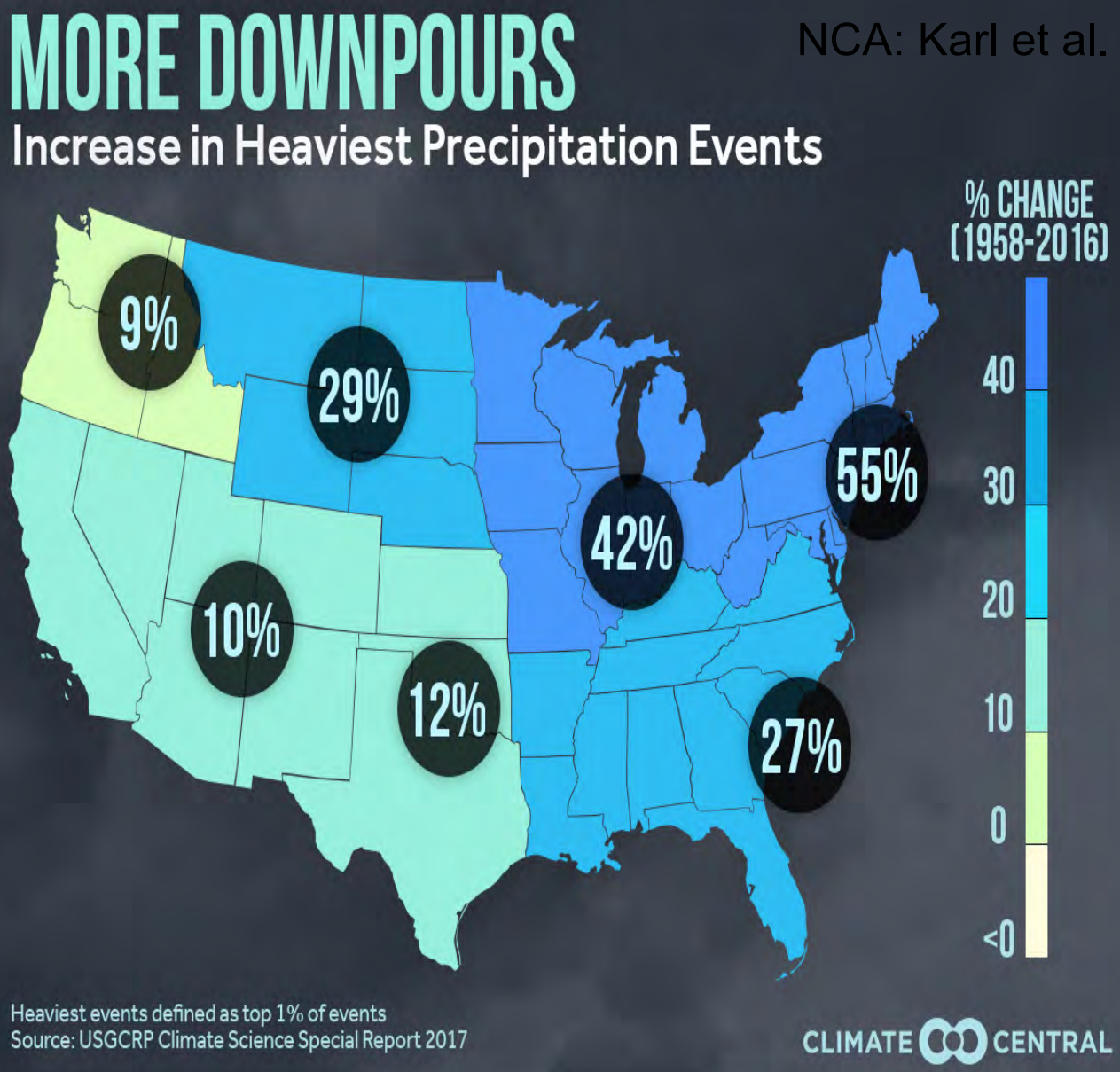
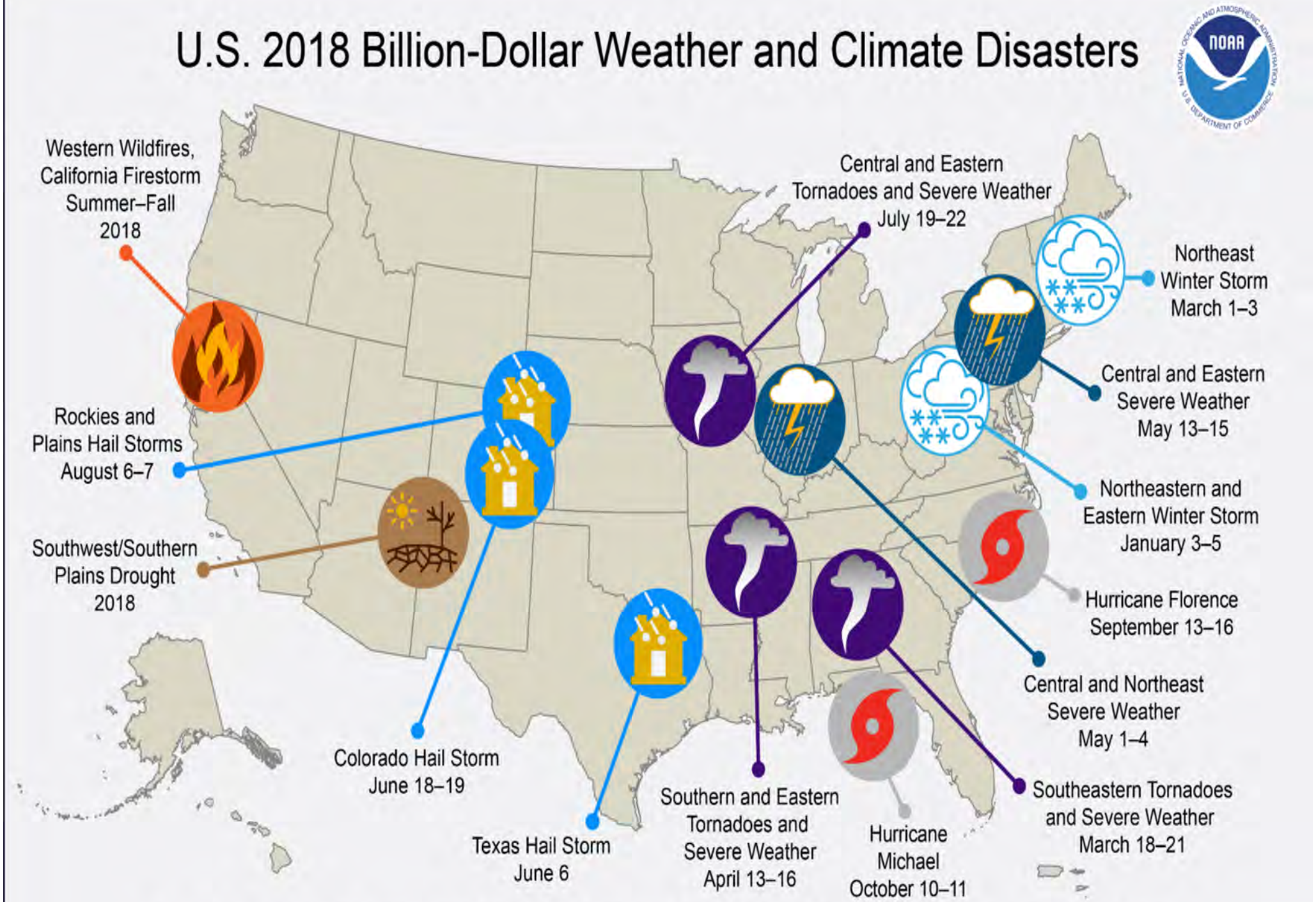

WARMER AIR
MORE EVAPORATION
MORE PRECIPITATION
Available water
1°F increase =
4% more water vapor
- Temperature +
CLIMATE CENTRAL

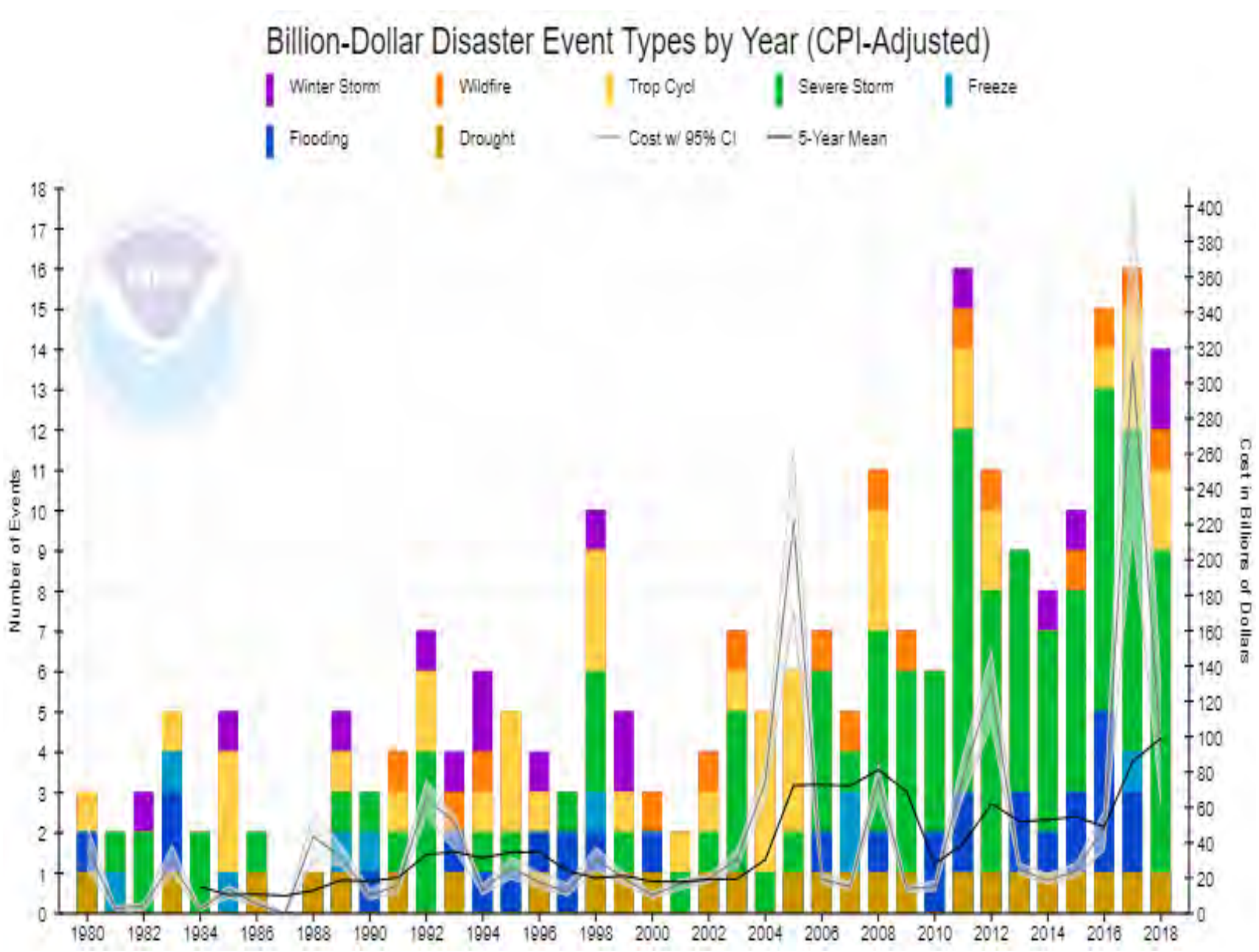
NCA: Karl et al. 2009



U.S. 2018 Billion-Dollar Weather and Climate Disasters



*This map denotes the approximate location for each of the **14 separate billion-dollar weather and climate disasters** that impacted the United States **during 2018**.*


Billion-Dollar Disaster Event Types by Year (CPI-Adjusted)
Winter Storm
Wildfire
Trop Cycl
Severe Storm
Freeze
Flooding
Drought
Cost w/ 95% CI
5-Year Mean
Number of Events
Cost in Billions of Dollars
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
0
20
40
60
80
100
120
140
160
180
200
220
240
260
280
300
320
340
360
380
400
1980
1982
1984
1986
1988
1990
1992
1994
1996
1998
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018

Climate change could make insurance too expensive for most people – report

Munich Re, world's largest reinsurance firm, warns premium rises could become social issue

Climate Cast

Climate Cast mission

- What is the latest evolving climate science?
- How to best *communicate* climate science?
- Make obscure trends *meaningful*
- Relate to peoples weather/climate experience
- Use analogies to make trends clearer
- Focus on science & analysis, not advocacy
- Communicate growing areas of *climate risk*

Established February 2013

MINNESOTA PUBLIC RADIO®

Climate Cast

Our Next Economic "Moon Shot?"

- With *risk* and *change* comes *opportunity*
- Renewable energy boom in progress
- MN: 25% renewable energy in 2017
- Wind energy projects booming
- Renewable energy job boom
- Wind Energy Technician #1 growth job in U.S.
- Growing public awareness and support for renewables

Established February 2013

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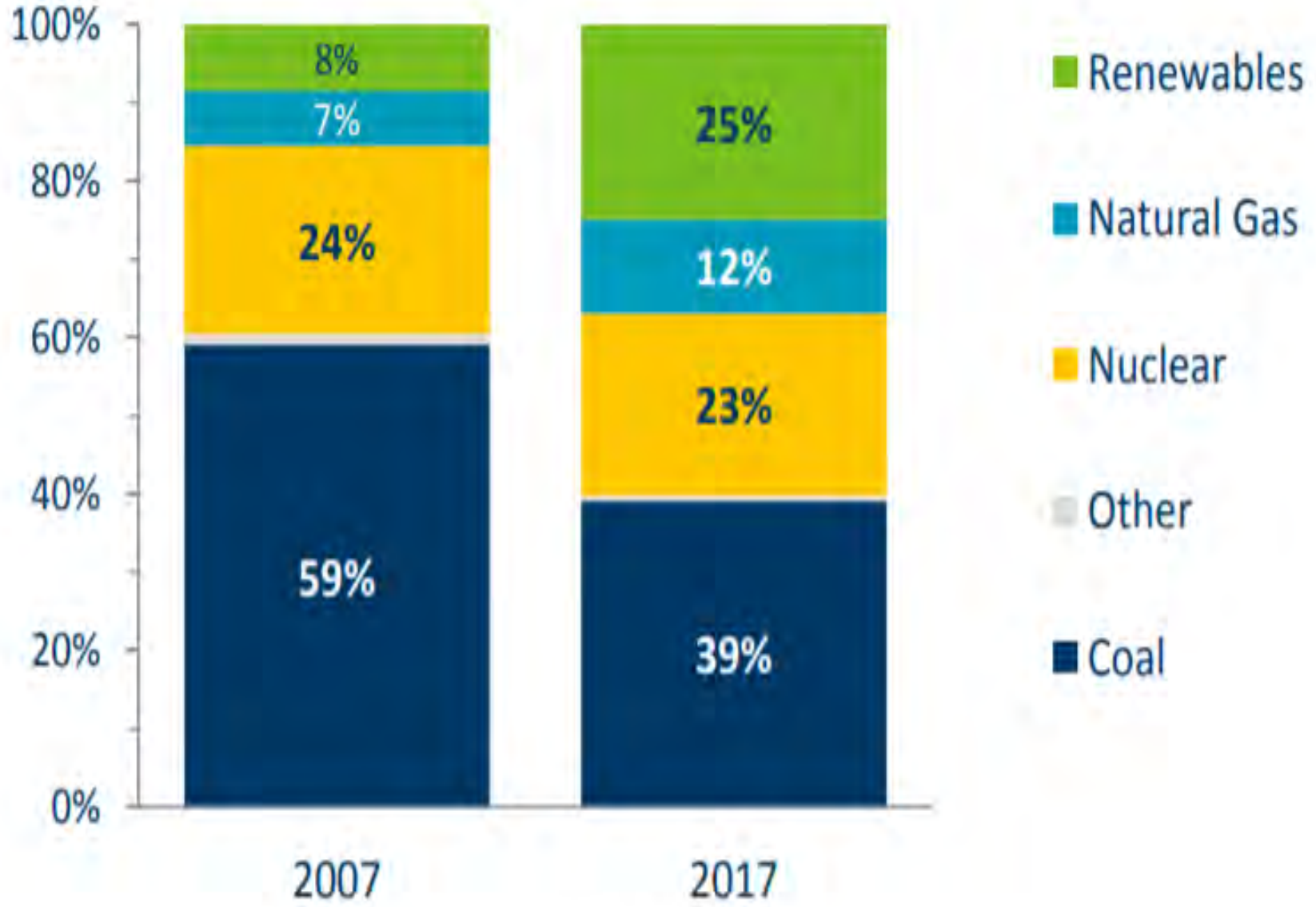
Hilton
FOSHAY

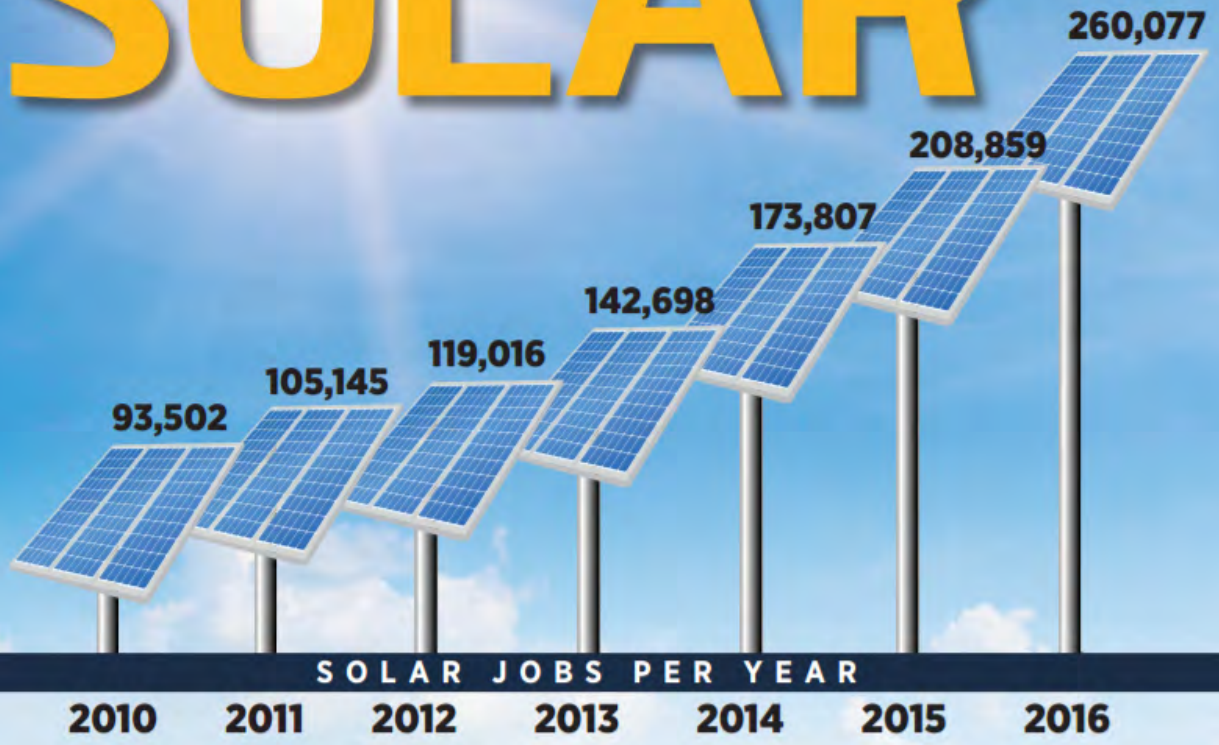
Minnesota's Electricity Generation Mix

(% Megawatthours, source: U.S. EIA)



Powering American Jobs

SOLAR

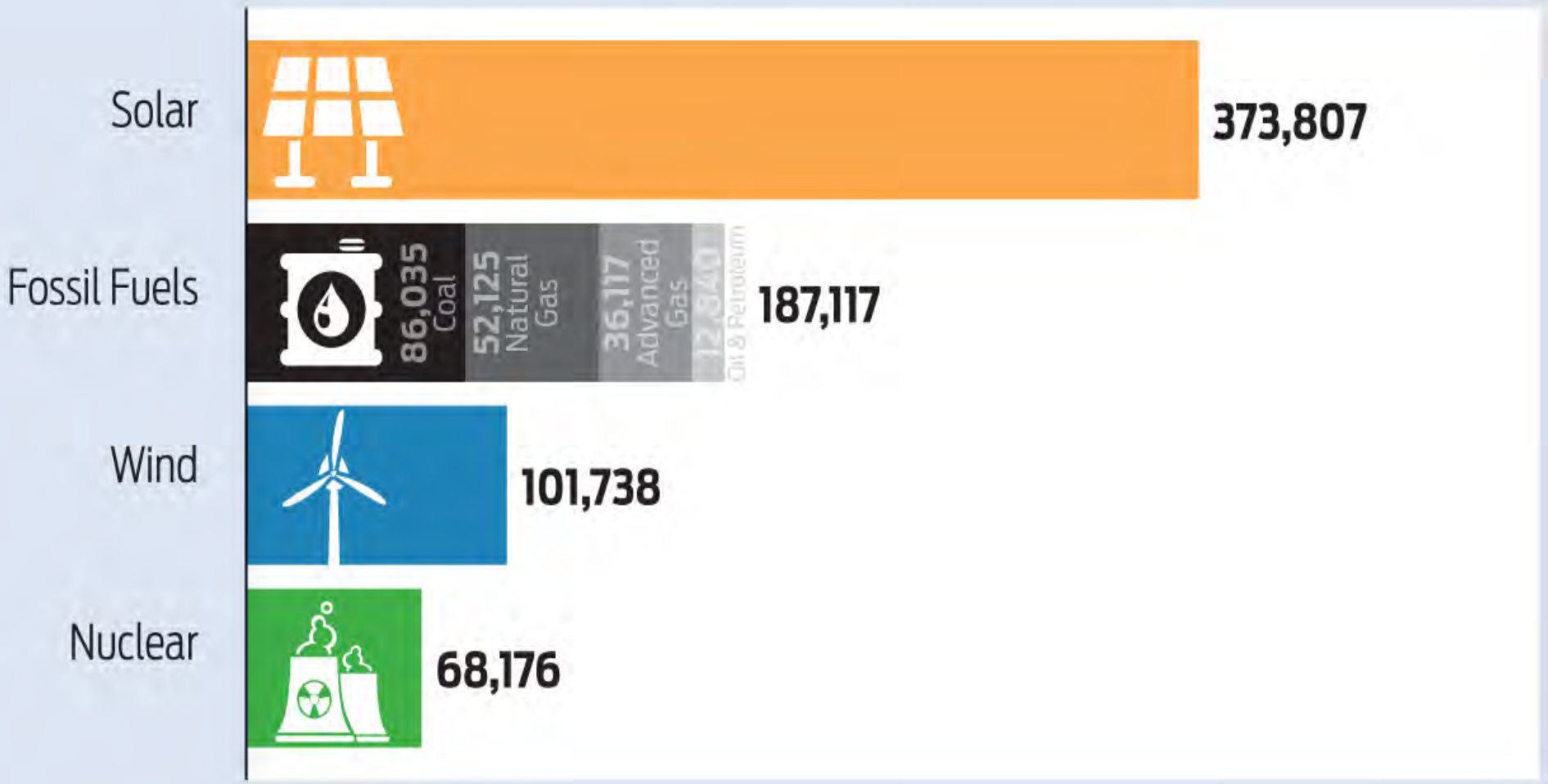


In 2016 . . .

- 260,077 solar workers, a 25% increase over 2015
- Solar jobs have increased at least 20% per year for the past four years
- One in 50 new U.S. jobs were in the solar industry

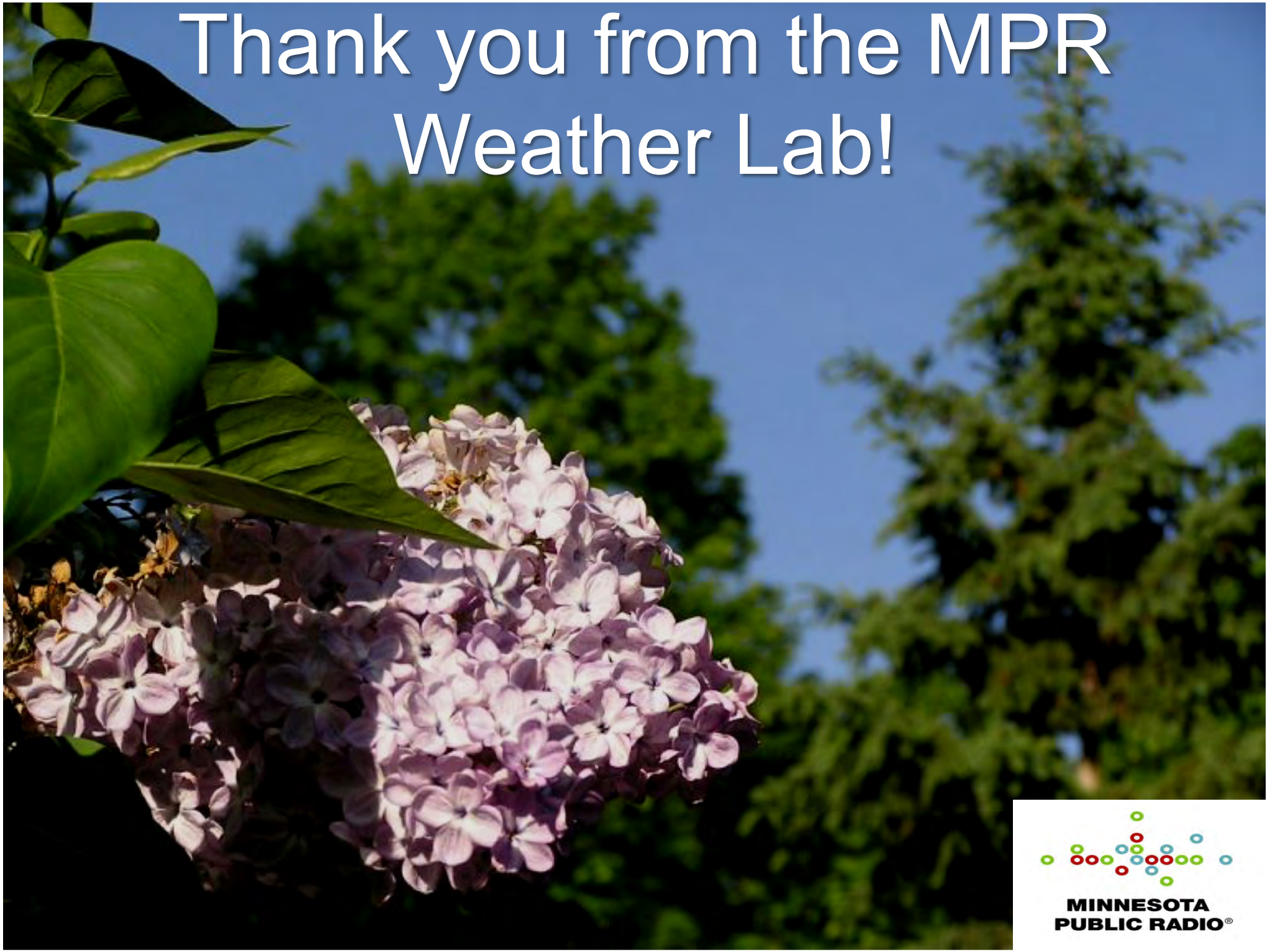
More Workers In Solar Than Fossil Fuel Power Generation

Employment in energy generation by source in the U.S. in 2016



Sources: U.S. Department of Energy, Statista

Thank you from the MPR Weather Lab!



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Alan Anderson

Chair, Northfield Rotary
Climate Action Team

Preserving Rotary's Legacy in a Changing World
The Challenge of Climate Change

By Alan Anderson, Northfield Rotary Climate Action Team

Rotary's Six Focus Areas :

1. Promoting peace
2. Fighting disease
3. Providing clean water
4. Saving mothers and children
5. Supporting education
6. Growing local economies

Which of these efforts by Rotary, are at risk from climate change? **All of them!**

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Minneapolis City of Lakes
Rotary Club

Rotary's good work in the world – the positive results we've achieved and by which we are known – are all at risk of reversal, due to climate change.

- **The good news is, there are solutions and . . .**

- **Rotarians don't ignore problems – they roll up their sleeves and work to solve them!**
- **Rotary has global reach, credibility, social capital and real impact**
- **Good stewardship challenges us to protect the positive results we've achieved so far, by taking action on climate change**

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Rotary Club

Working to stop the humanitarian crisis caused by climate change, will help the most people and will resonate with the next generation of Rotarians.

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So what could Rotarians do, specifically, to decrease the potential impacts of climate change?

The solutions are many – but for Rotarians here are some suggestions, to begin:

1. Start a Rotary Climate Action Team in your Club (Northfield can help with ideas and tools)
2. Join Rotary's new Environmental Sustainability Action Grp.
3. Develop informational programs on climate change, for clubs across the global, similar to the push on polio.
4. As individuals, take actions like ones on today's handout
5. Learn about and support a revenue-neutral carbon fee and dividend, as recommended by conservative economists, as the fastest way to reduce CO_2 emissions

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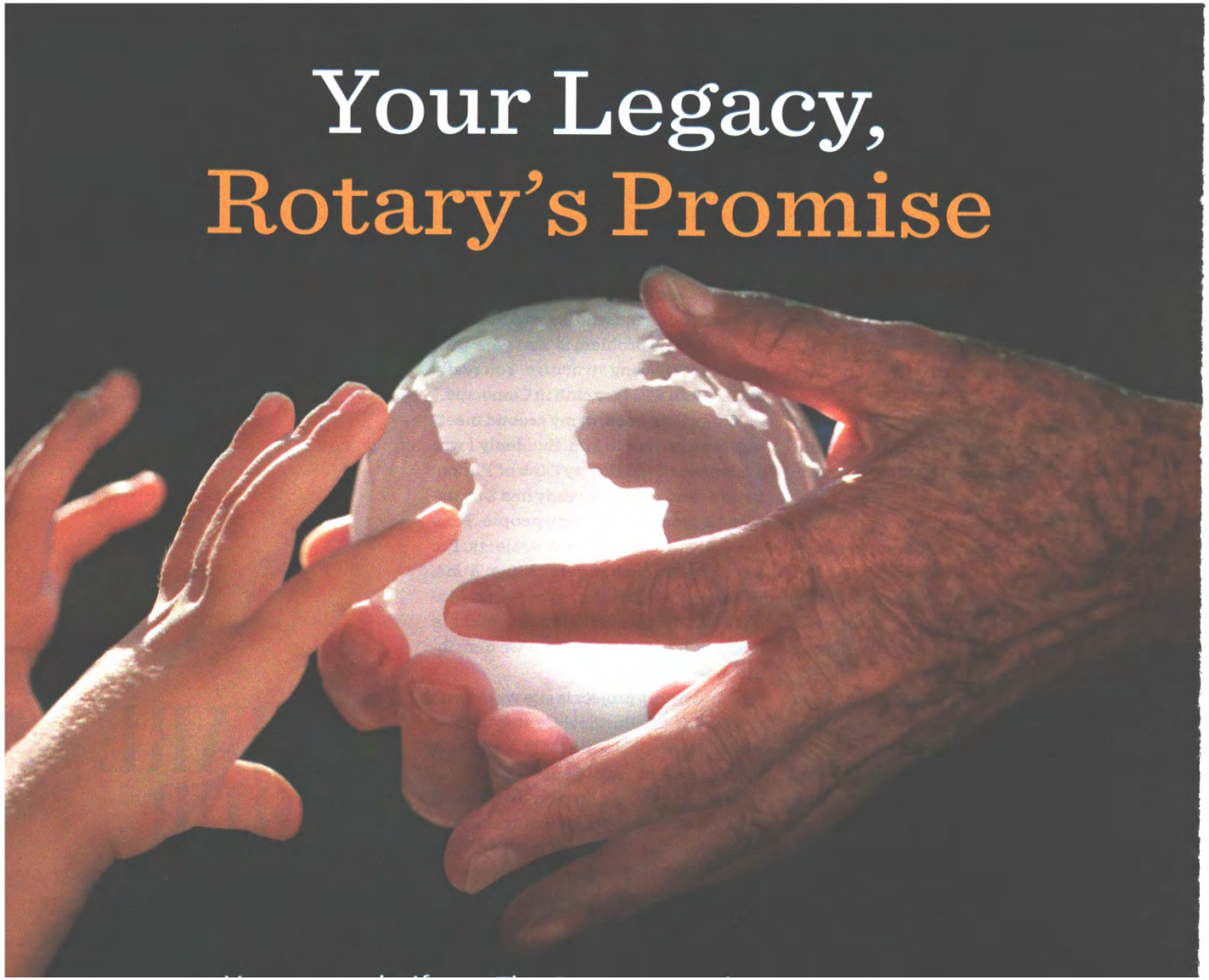
Rotary Club

What kind of world will we pass to future generations?

Scientists tell us we are going to LOSE our legacy, if we do not act!

We have the technology and capability now.

We just need to say **"I'm IN!"** and get to work.



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Russ Stark

Chief Resilience Officer
Mayor’s Office, City of St. Paul

Draft
Saint Paul Climate Action and Resilience Plan

Transition to a Climate-Friendly, More Resilient City

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Minneapolis City of Lakes Rotary Club

Overview

- **Why** Create a Plan?
- **Causes** of Change
- **Local Impacts**
- **Vulnerabilities**
- **Reducing Emissions**
  - Energy Use
  - Transportation
- What **YOU** can do

Source: https://www.spps.org/commed

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Vulnerabilities

PEOPLE

- Low income/wealth
- People of Color/Native People
- Health challenges
- Low access to transportation
- Barriers in communication
- The very old/the very young
- Social Isolation

PLACES

- Less tree canopy (hotter)
- More air pollution (freeway corridors)
- More flooding
- Low access to transportation
- Infrastructure

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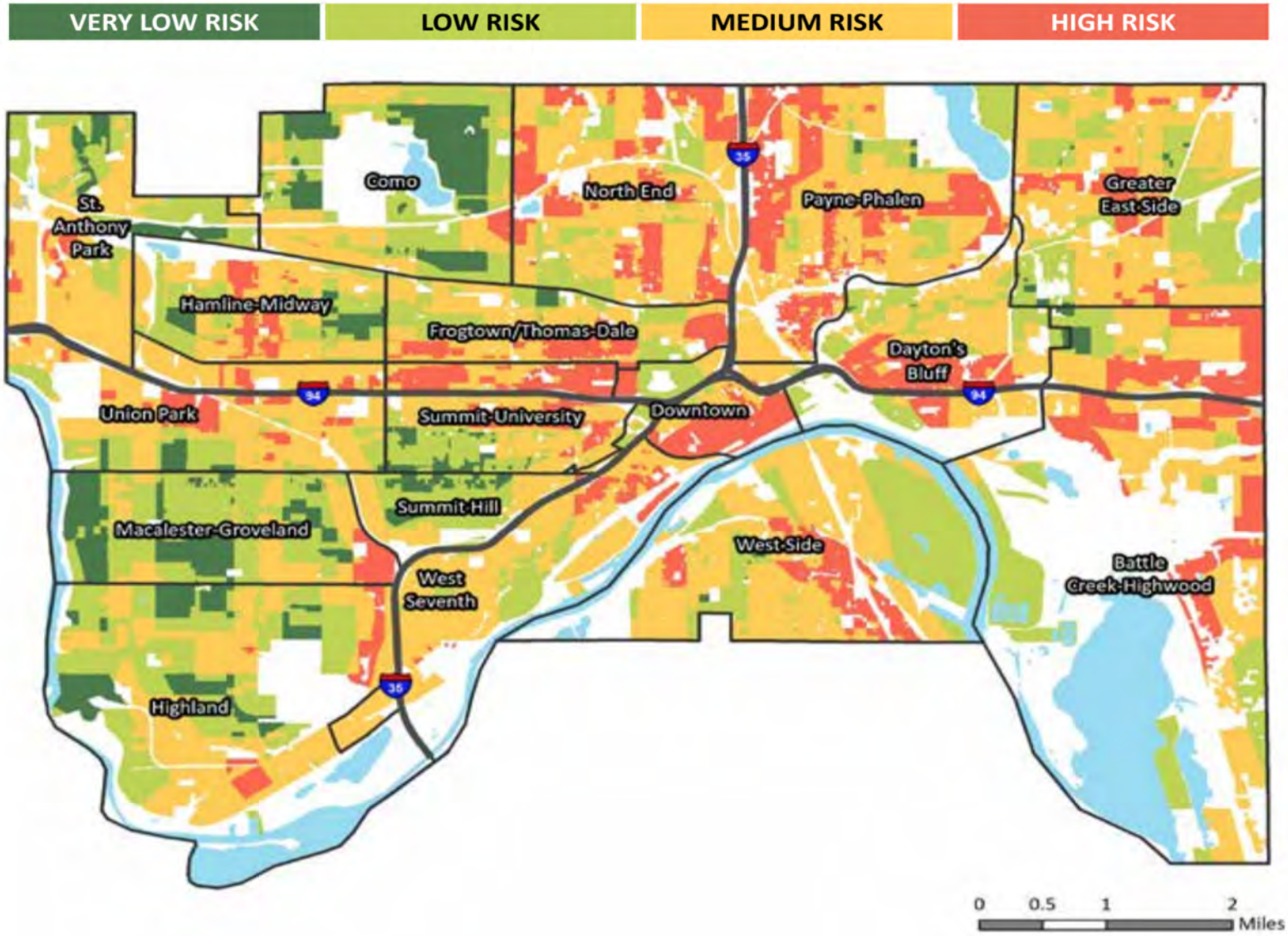

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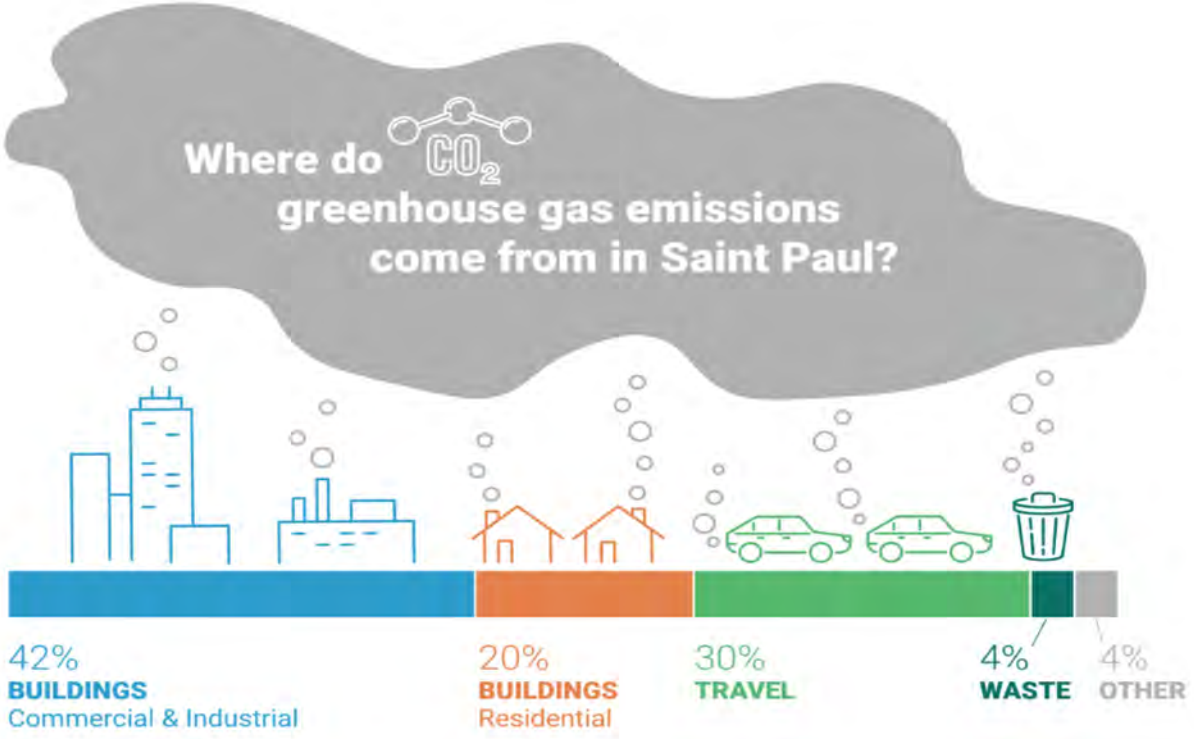
Zero Net emissions by 2050 and 50% reduction by 2030



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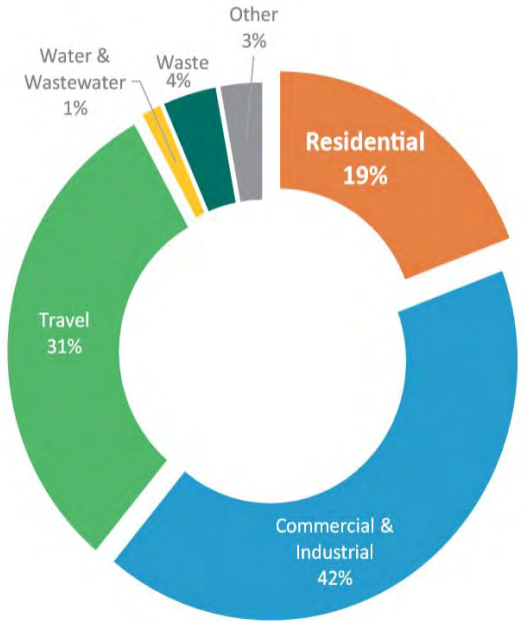
Energy Used in Buildings and Travel

Commercial/Industrial	**42%**
Residential	**20%**
Travel	**<u>31%</u>**
Total	**93%**



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Energy Priorities

- Energy Efficiency, Conservation and Recovery
- Reducing Energy Burden
- Renewable Energy and Energy Storage
- Electrification

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Transportation Goals

Goals	2019-2025 Targets	2025-2030 Targets	2030-2040 Targets
Reduce Single Occupant Car Trips	10%⬇	20%⬇	40%⬇
Increase Transit Ridership	6%⬆	25%⬆	40%⬆
Increase Biking and Walking	**24** miles of new bikeway	**85** miles of new bikeway	**195** miles of new bikeway
Electric Vehicles	10% of all on-road vehicles	33%	80%

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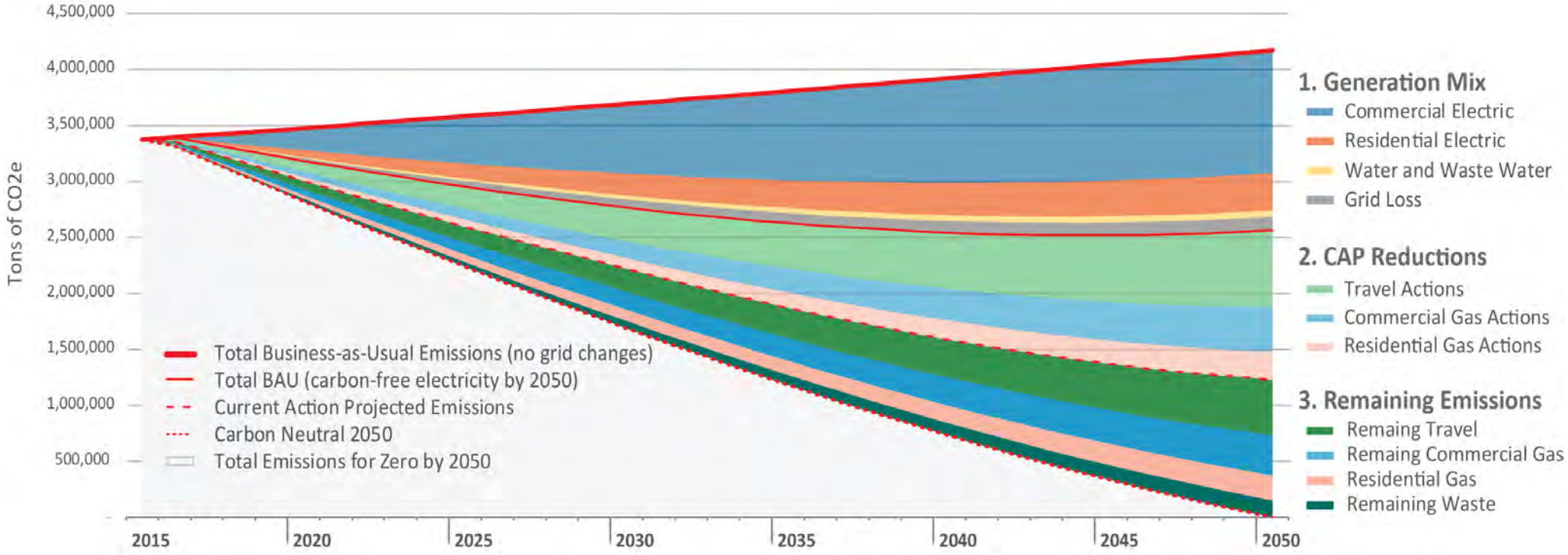
Emissions Scenario



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What YOU can do: Climate Resilience

- Prepare Emergency Disaster Preparedness Kit
- Stay informed on weather warnings and events - don't get caught off guard
- Cool down from extreme heat
- Seek natural cooling techniques
- Make sure you have a reliable form of transportation
- Prepare for power outages
- Create a buddy system to check on neighbors
- Plant rain gardens and increase permeable surfaces on your property
- Make sure your drains are clear in case of downpour
- Support your community food markets

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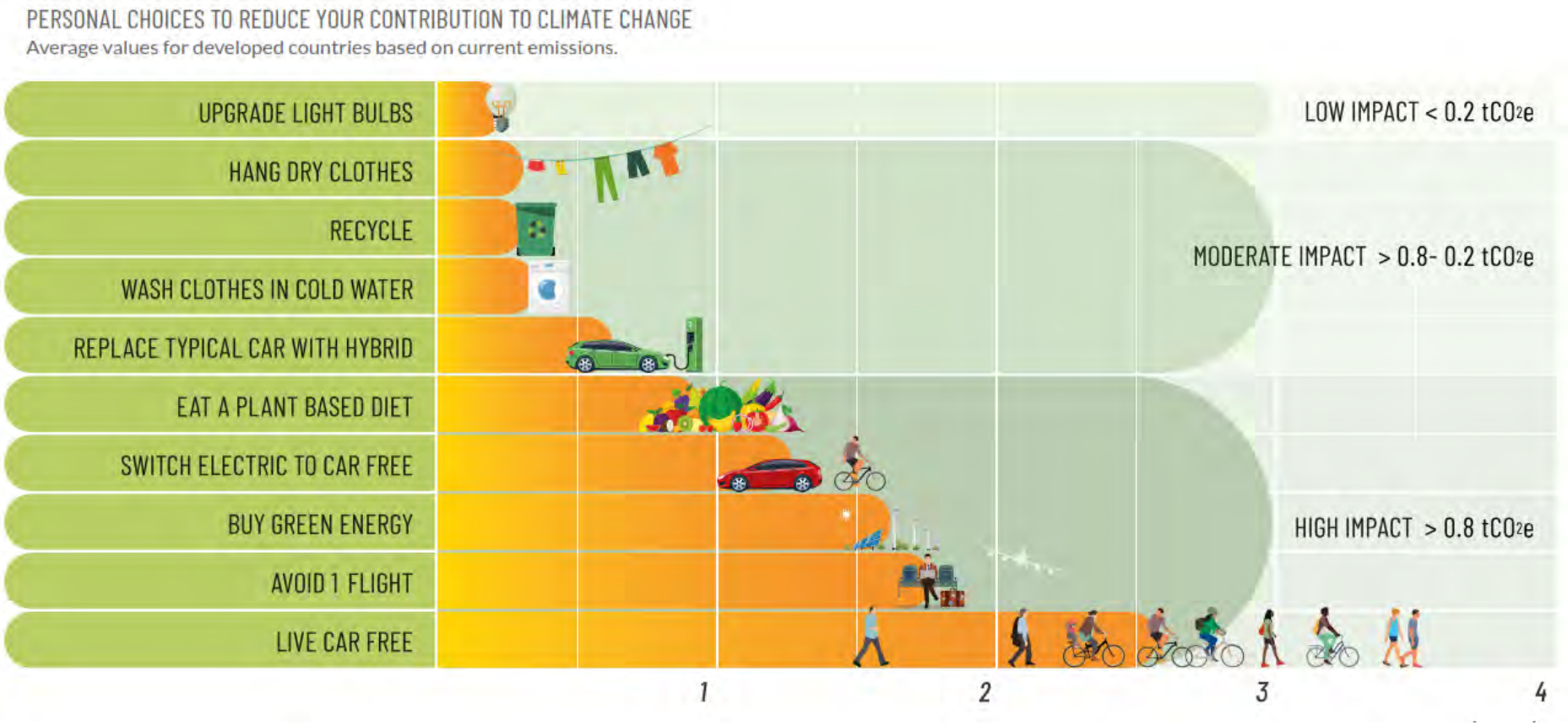
What YOU can do: Climate Mitigation



This graph was developed by GreenFaith and is adapted from Wynes and Nicholas, 2017, Environmental Research Letter

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Questions?

Russ Stark, Chief Resilience Officer

russ.stark@ci.stpaul.mn.us

(651) 266-8511

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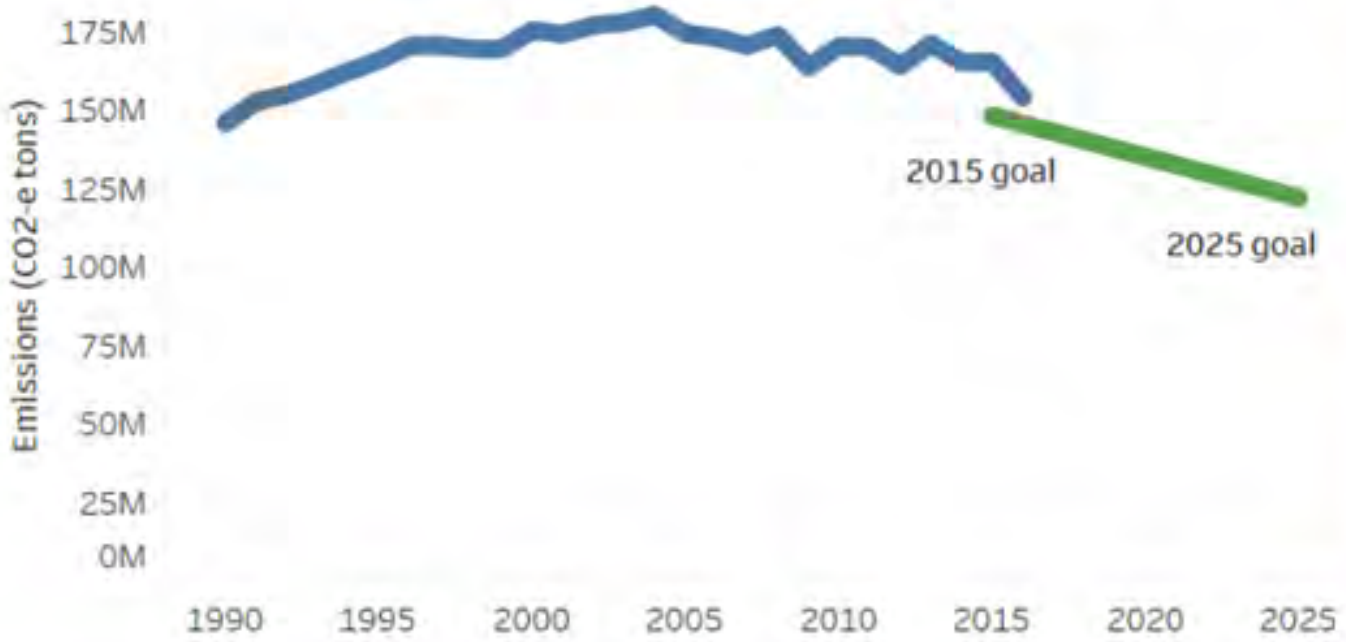
Kathryn Hoffman

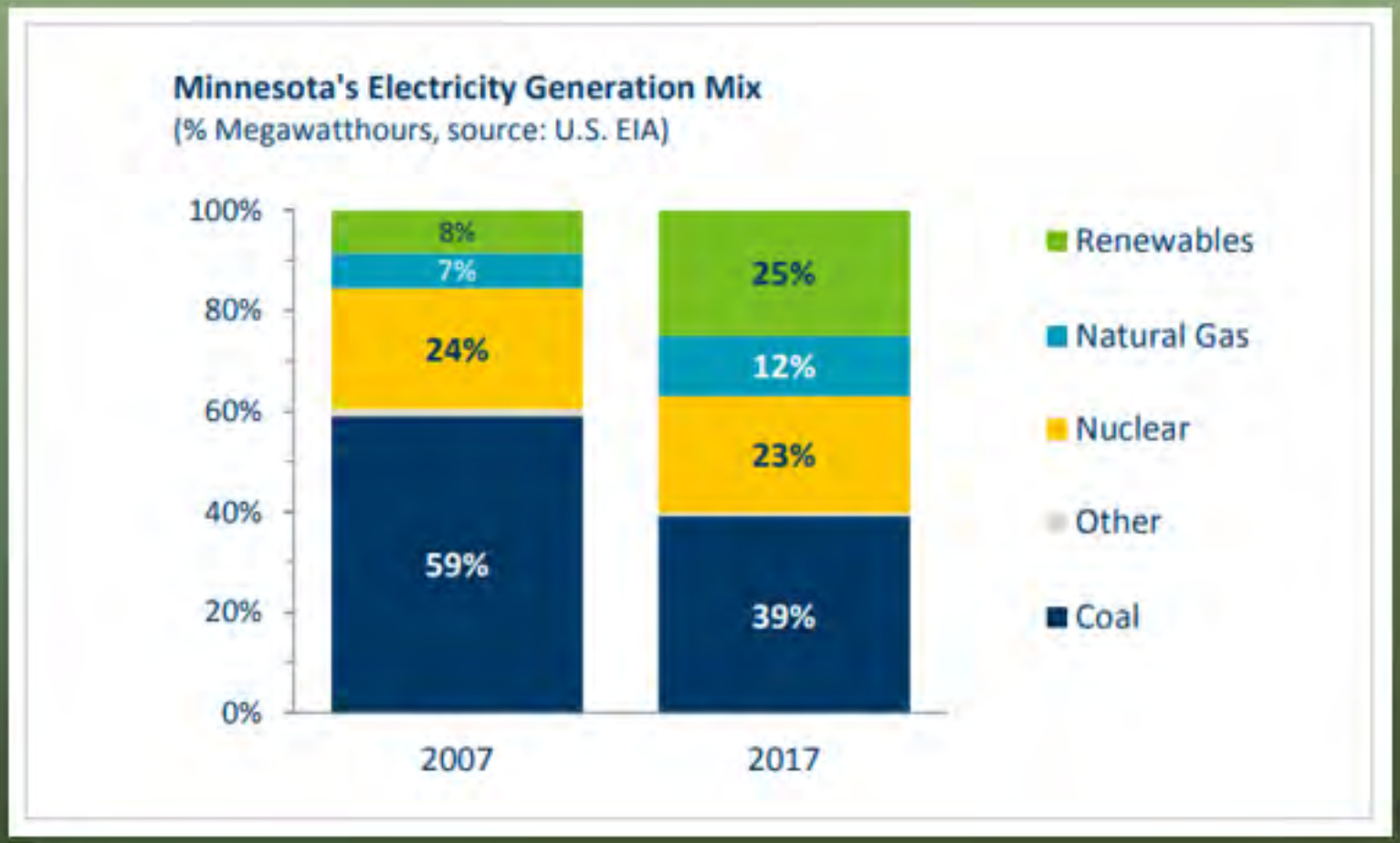
CEO, Minnesota Center for Environmental Advocacy

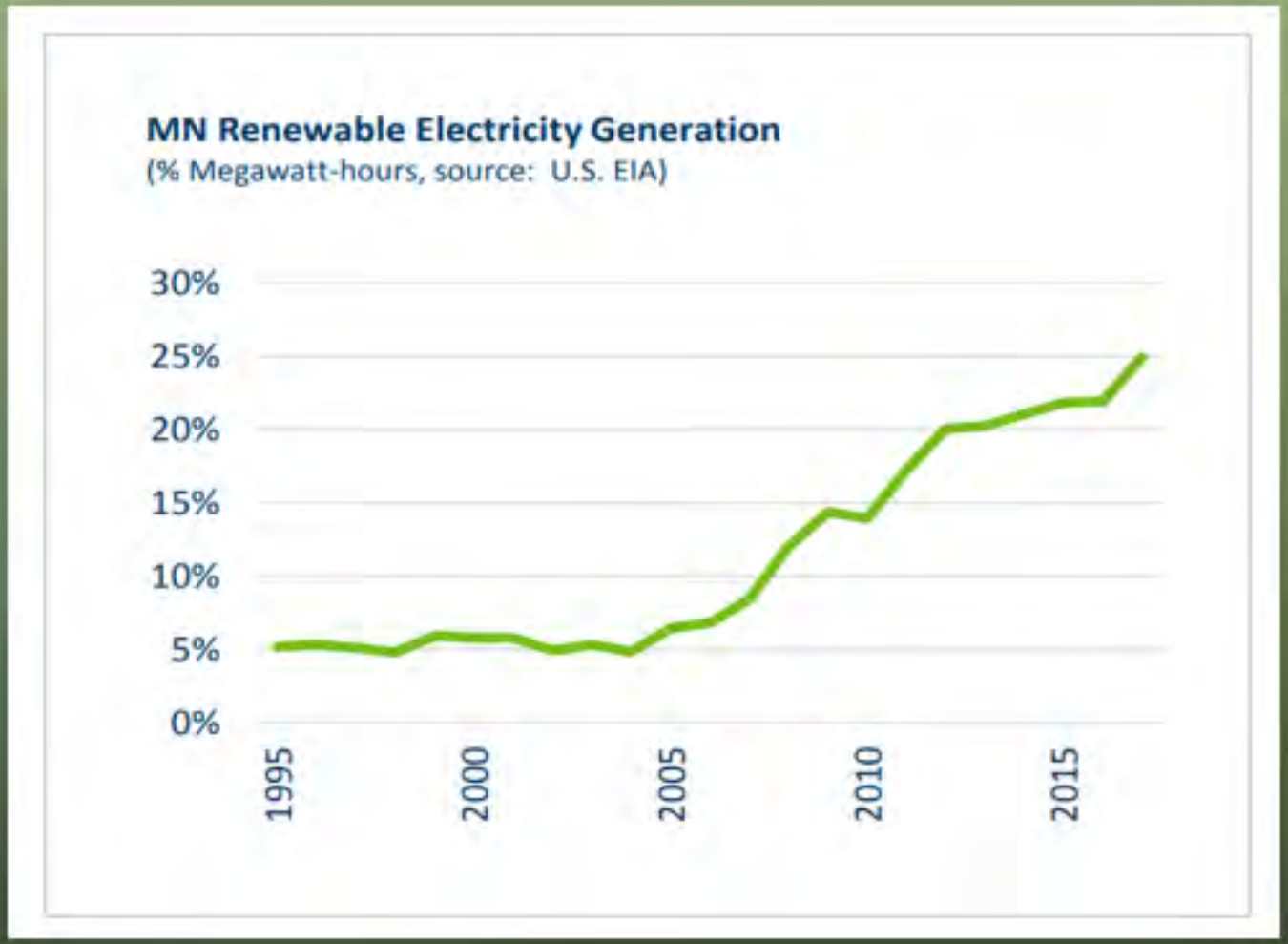
State Level Climate Strategies

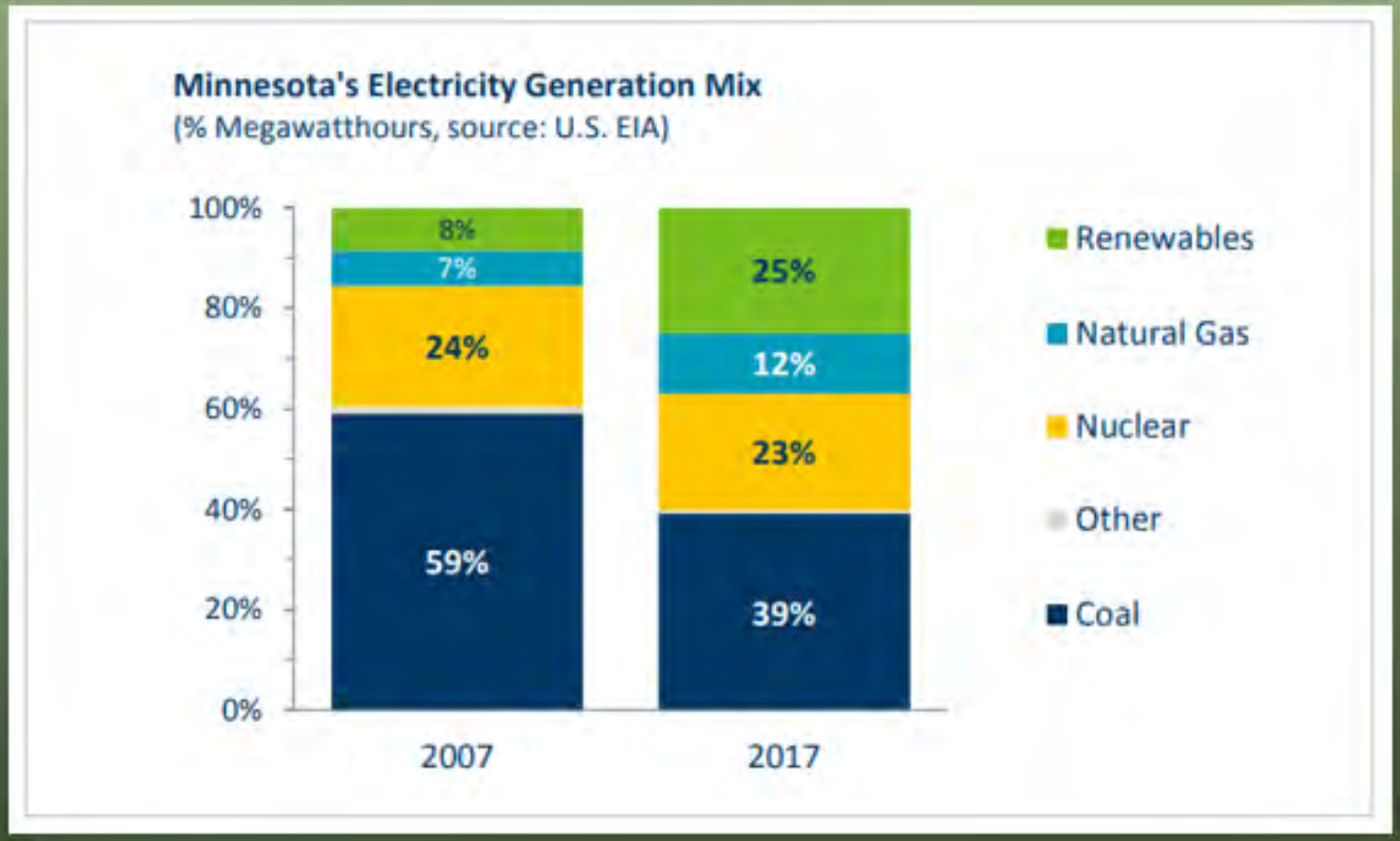
Kathryn Hoffman
CEO
Minnesota Center for
Environmental Advocacy
5/2/2019

Figure 3. Minnesota's GHG emissions, 1990-2016, compared to the 2015 and 2025 goals of the Next Generation Energy Act. Although emissions are decreasing, we did not meet the 2015 emissions reduction goal.




Minnesota's Electricity Generation Mix
(% Megawatthours, source: U.S. EIA)
100%
80%
60%
40%
20%
0%
8%
7%
24%
59%
25%
12%
23%
39%
2007
2017
Renewables
Natural Gas
Nuclear
Other
Coal


MN Renewable Electricity Generation
(% Megawatt-hours, source: U.S. EIA)
30%
25%
20%
15%
10%
5%
0%
1995
2000
2005
2010
2015


Minnesota's Electricity Generation Mix
(% Megawatthours, source: U.S. EIA)
100%
80%
60%
40%
20%
0%
8%
7%
24%
59%
25%
12%
23%
39%
2007
2017
Renewables
Natural Gas
Nuclear
Other
Coal

Nicole Rom

Executive Director
Climate Generation:
A Will Steger Legacy

CLIMATEGENERATION

A WILL STEGER LEGACY

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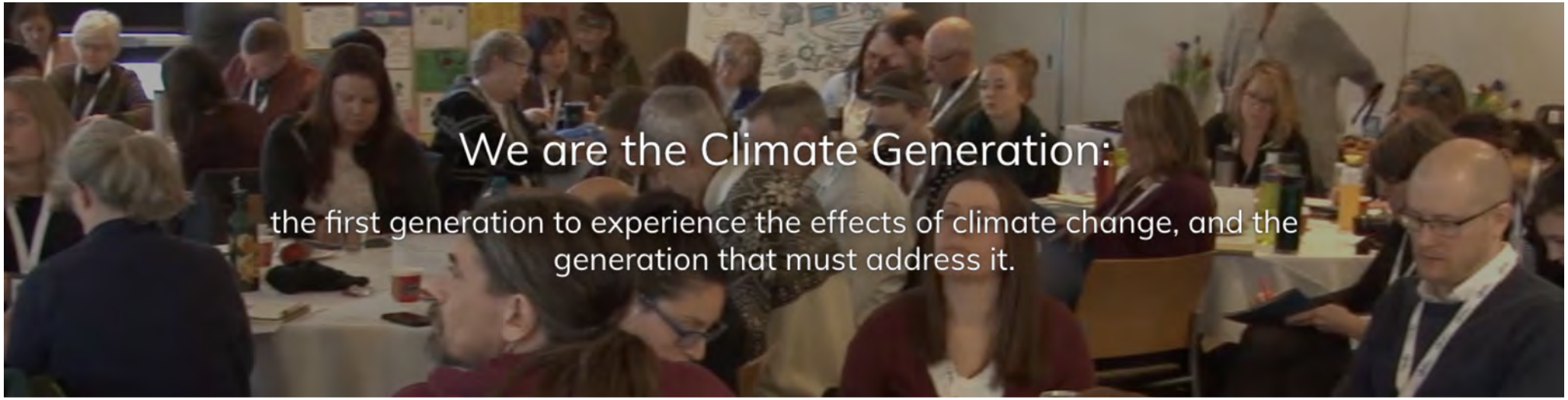

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Our Founder, Will Steger

Our unique story stems from our founder Will Steger, who uses his compelling eyewitness account of the consequences of a warming world from over 50 years of polar exploration and his time as an educator to engage people in the issue and solutions

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Climate Generation: A Will Steger Legacy inspires individuals and their communities to engage in solutions to climate change

CLIMATEGENERATION
A WILL STEGER LEGACY

Youth

Educators

Public

Influentials

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Educators

- Professional Development
  - Worksops
  - Summer Institute
- Curricula Resources
- National teacher network, TeachClimate

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Public

- Nationally recognized model of convening a community in conversations and solutions
- Sharing of personal climate stories
- Engagement events with arts, business, communities, parks
- Normalizing the conversation through Talk Climate Institute

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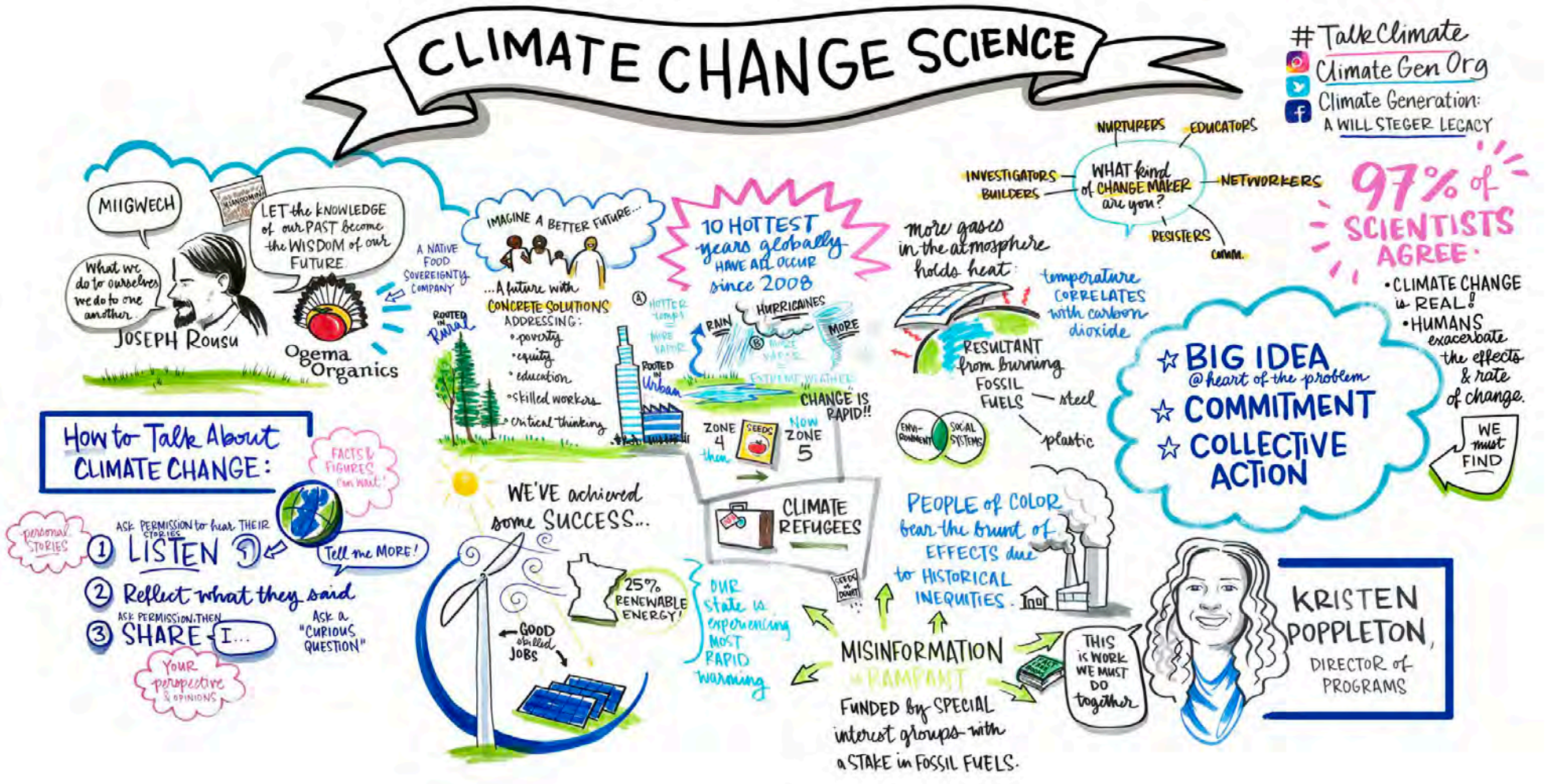
CLIMATE CHANGE SCIENCE
#TalkClimate
Climate Gen Org
Climate Generation:
A WILL STEGER LEGACY
MIIGWECH
LET the KNOWLEDGE of our PAST become the WISDOM of our FUTURE
What we do to ourselves we do to one another
JOSEPH Rousu
Ogema Organics
A NATIVE FOOD SOVEREIGNTY COMPANY
IMAGINE A BETTER FUTURE...
...A future with CONCRETE SOLUTIONS ADDRESSING:
•poverty
•equity
•education
•skilled workers
•critical thinking
ROOTED in Rural
ROOTED in Urban
10 HOTTEST years globally HAVE ALL OCCUR since 2008
HOTTER temps
MORE WATER VAPOR
HURRICANES
RAIN
MORE
EXTREME WEATHER
CHANGE IS RAPID!!
more gases in the atmosphere holds heat
temperature CORRELATES with carbon dioxide
RESULTANT from burning FOSSIL FUELS
steel
plastic
ENVIRONMENT
SOCIAL SYSTEMS
NURTURERS
EDUCATORS
INVESTIGATORS
BUILDERS
WHAT kind of CHANGE MAKER are you?
NETWORKERS
RESISTERS
97% of SCIENTISTS AGREE
•CLIMATE CHANGE is REAL!
•HUMANS exacerbate the effects & rate of change.
WE must FIND
☆ BIG IDEA @ heart of the problem
☆ COMMITMENT
☆ COLLECTIVE ACTION
How to Talk About CLIMATE CHANGE:
FACTS & FIGURES I've Heard
personal STORIES
ASK PERMISSION to hear THEIR STORIES
1 LISTEN
Tell me MORE!
2 Reflect what they said
ASK PERMISSION, THEN
3 SHARE I...
Ask a "CURIOUS QUESTION"
YOUR perspective & OPINIONS
ZONE 4 then
SEEDS
Now ZONE 5
CLIMATE REFUGEES
WE'VE achieved some SUCCESS...
25% RENEWABLE ENERGY!
GOOD skilled JOBS
OUR state is experiencing MOST RAPID warming
SEEDS of DOUBT
PEOPLE of COLOR bear the brunt of EFFECTS due to HISTORICAL INEQUITIES.
MISINFORMATION is RAMPANT
FUNDED by SPECIAL interest groups with a STAKE in FOSSIL FUELS.
FACTS
THIS is WORK WE MUST DO together
KRISTEN POPPLETON,
DIRECTOR of PROGRAMS

Youth

- Network of metro high school leaders, YEA! MN
- Greater MN Youth Convening Minnesota
- Middle school Green careers fair, curricula, training
- MN Can’t Wait

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Influentials

- Climate Communications & Action for Businesses
- Member of statewide policy coalitions and conversations pushing just, equitable clean energy policy
- UN Climate Summit delegations

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Mainstream climate change education

Normalize conversations about climate change impacts and solutions

Elevate the moral imperative and a future built on innovation through youth voices

Embolden leadership of decision makers and businesses to act on climate

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CLIMATEGENERATION

A WILL STEGER LEGACY


MINNESOTA'S CLIMATE FUTURE:
SAVING
THE PLACES
WE LOVE
Presented by
Saint Paul Sunrise Rotary Club
with Rotary Clubs of Minneapolis
City of Lakes and Roseville

Rotary