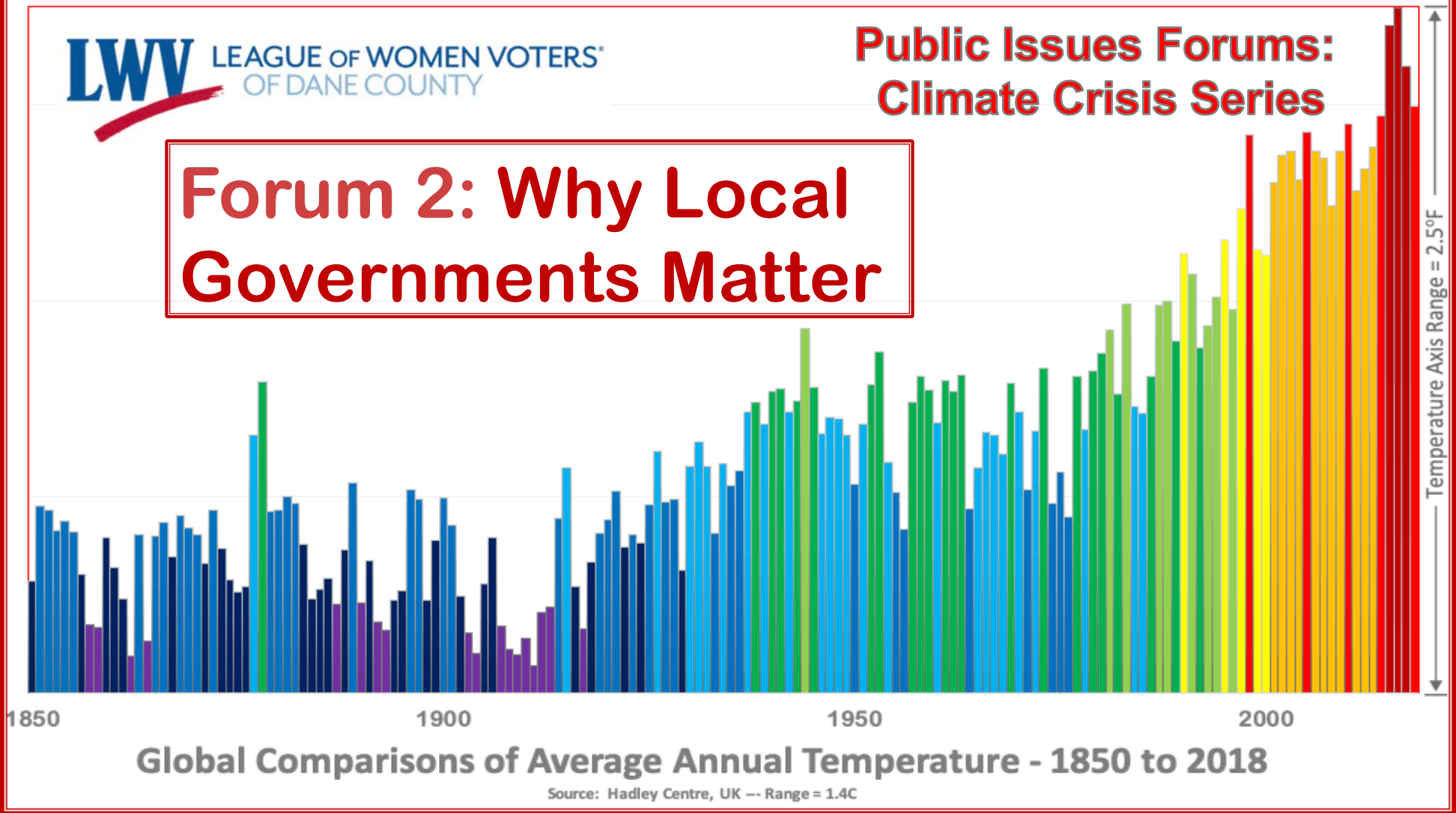


**Forum 2: Why Local  
Governments Matter**



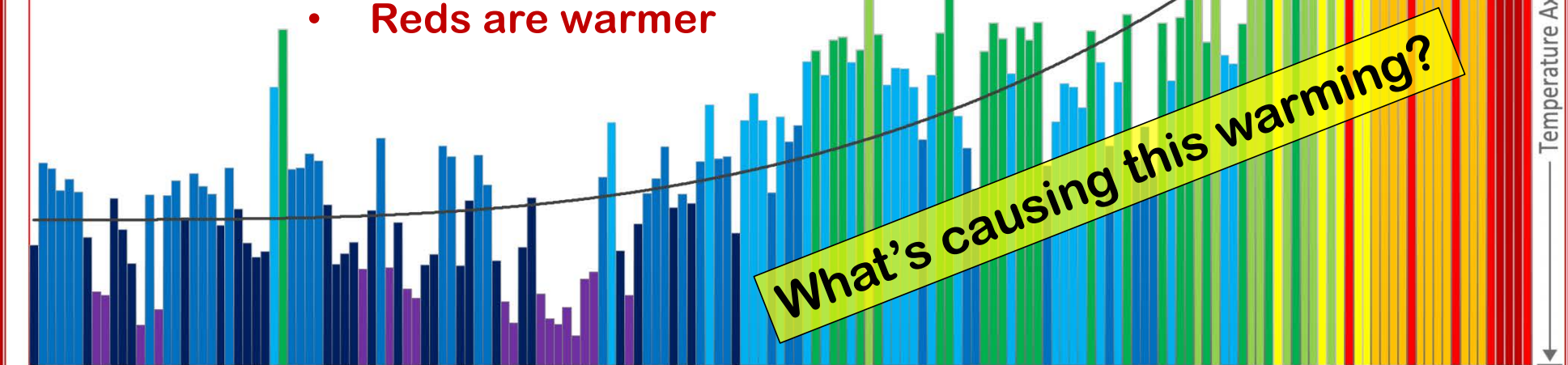
## Climate Crisis Series

Climate Skeptics say that although Climate Change *may* be real, they don't know *why* it's happening. Science says:

Global Temperatures increased from 1850 to 2018

- Vertical scale: 2.5°F (1.4°C) in 0.25°F steps
  - Blues are colder
  - Reds are warmer

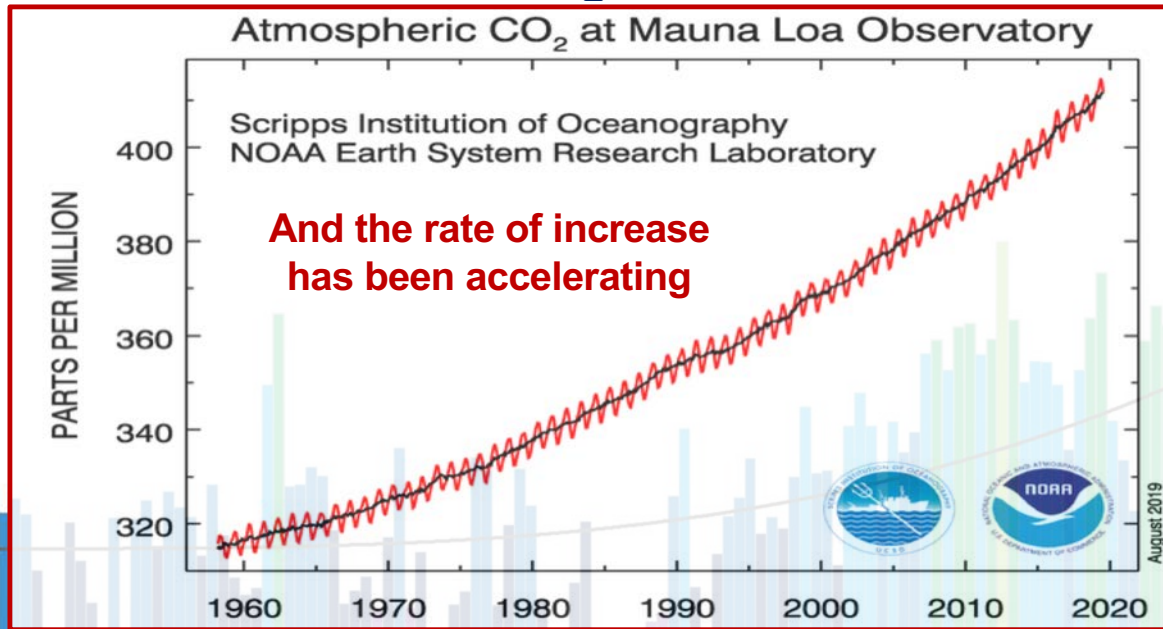
What's causing this warming?



1850 1900 1950 2000  
Global Comparisons of Average Annual Temperature - 1850 to 2018

Source: Hadley Centre, UK --- Range = 1.4C

## Increases in CO<sub>2</sub> have been documented since 1958



1850 1900 1950 2000

## Global Comparisons of Average Annual Temperature - 1850 to 2018

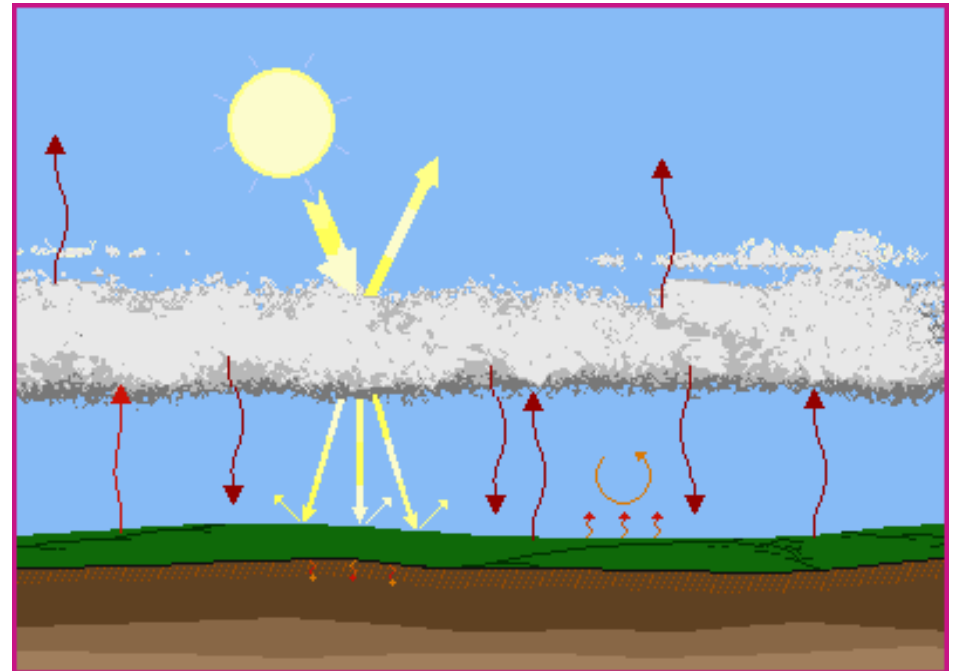
Source: Hadley Centre, UK --- Range = 1.4C

Temperature Axis Range = 2.5°F

## What Processes in the Atmosphere Cause “CO<sub>2</sub> Warming”?

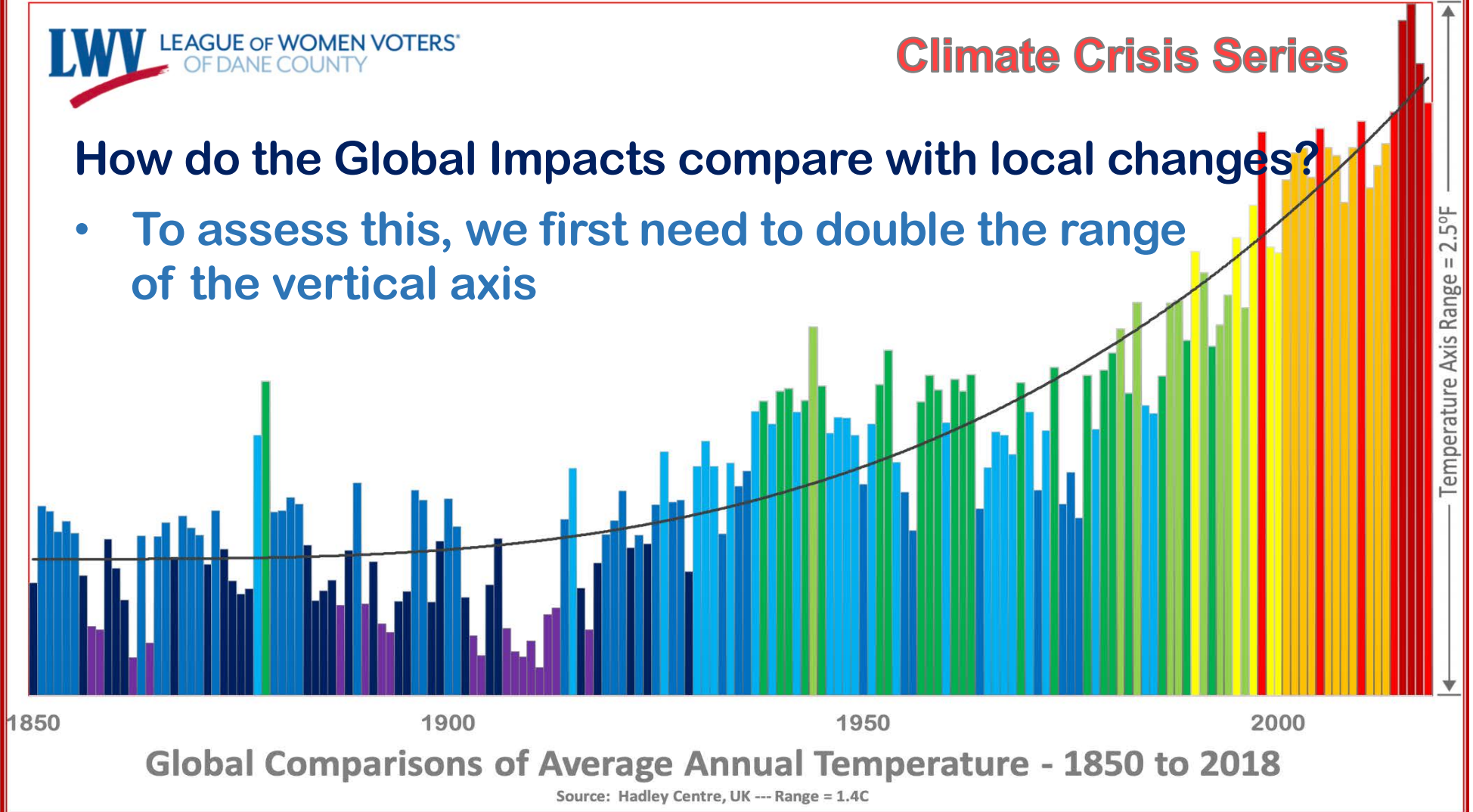
Increasing CO<sub>2</sub> disrupts the normal role of the atmosphere as a ‘radiator’ that balances incoming solar radiation and outgoing terrestrial radiation by:

- Reducing the loss of heat through the atmosphere to space and
- Increasing rewarming of the earth’s surface by the atmosphere.



### How do the Global Impacts compare with local changes?

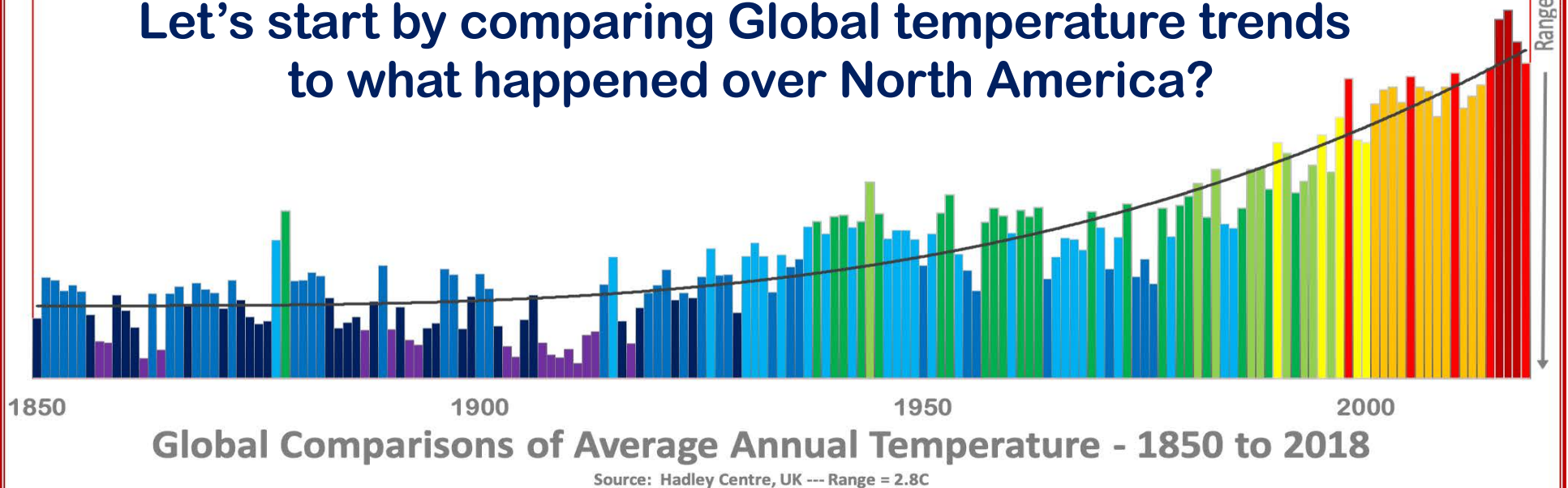
- To assess this, we first need to double the range of the vertical axis



### How do the Global Impacts compare with local changes?

- To assess this, we first need to double the range of the vertical axis

Let's start by comparing Global temperature trends to what happened over North America?

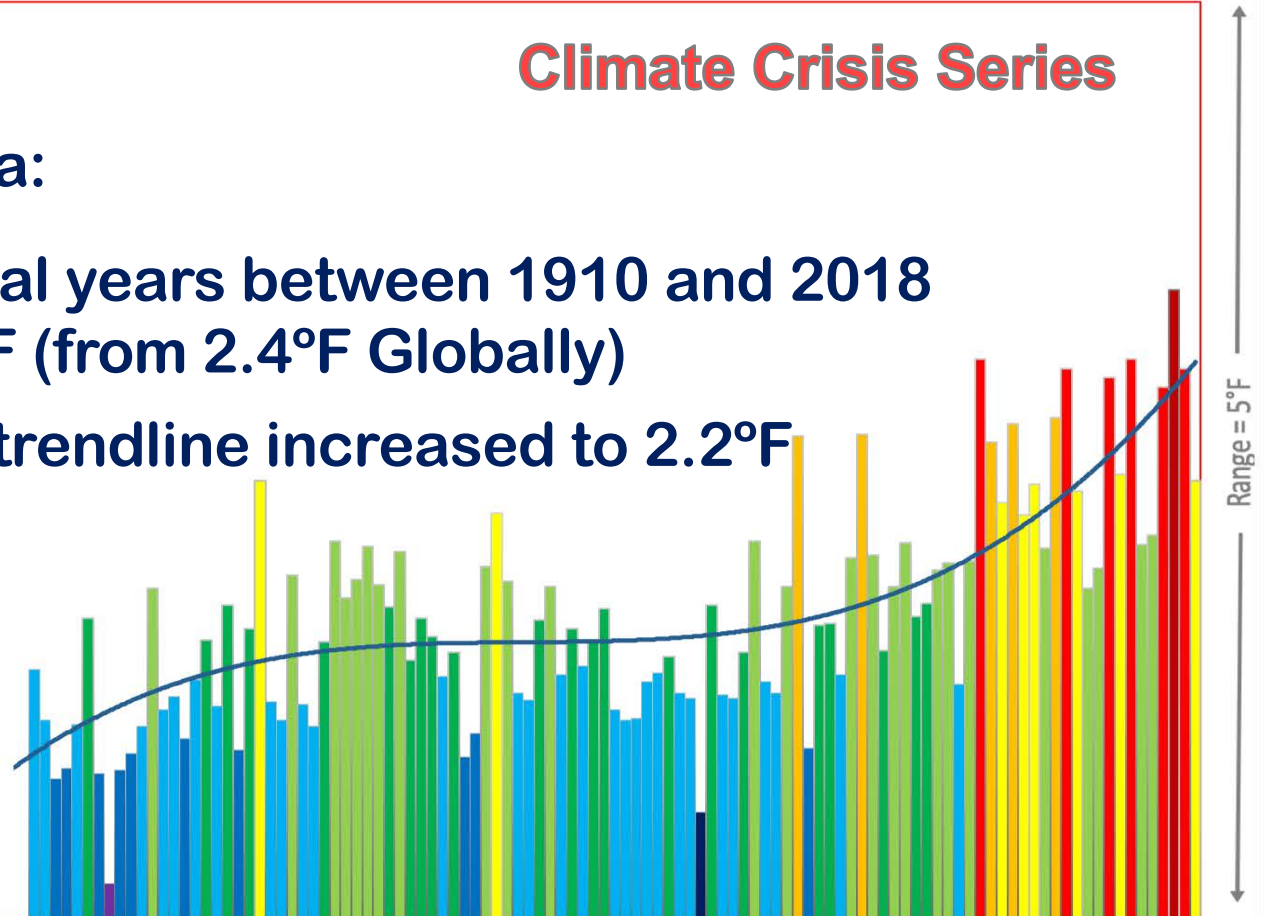


**For North America:**

**Range of individual years between 1910 and 2018 increased to 3.2°F (from 2.4°F Globally)**

**Range of best-fit trendline increased to 2.2°F (from 1.7°F)**

**Let's compare this with changes around Madison**



1850

1900

1950

2000

**North American Average Annual Temperature - 1881 to 2018**

Source: NOAA Global Climate Analysis

## Climate Crisis Series

Near Madison:

Year-to-year Variability  
is much Larger

Range between  
Individual  
years  
triples  
to 4.8°F

Could Madison's records include hidden effects of  
station location changes and/or urban heat islands?  
Let's compare urban Madison with rural Lone Rock?

1850

1900

1950

2000

MSN Area Average Annual Temperature - 1881 to 2018

Source: NOAA Global Climate Analysis

Range = 5°F



## Climate Crisis Series

Comparing Lone Rock with Madison:

Overall, patterns very similar

Slightly cooler

Slightly less warming

How about looking at Lake Mendota records to find other indicators of these changes?

1850

1900

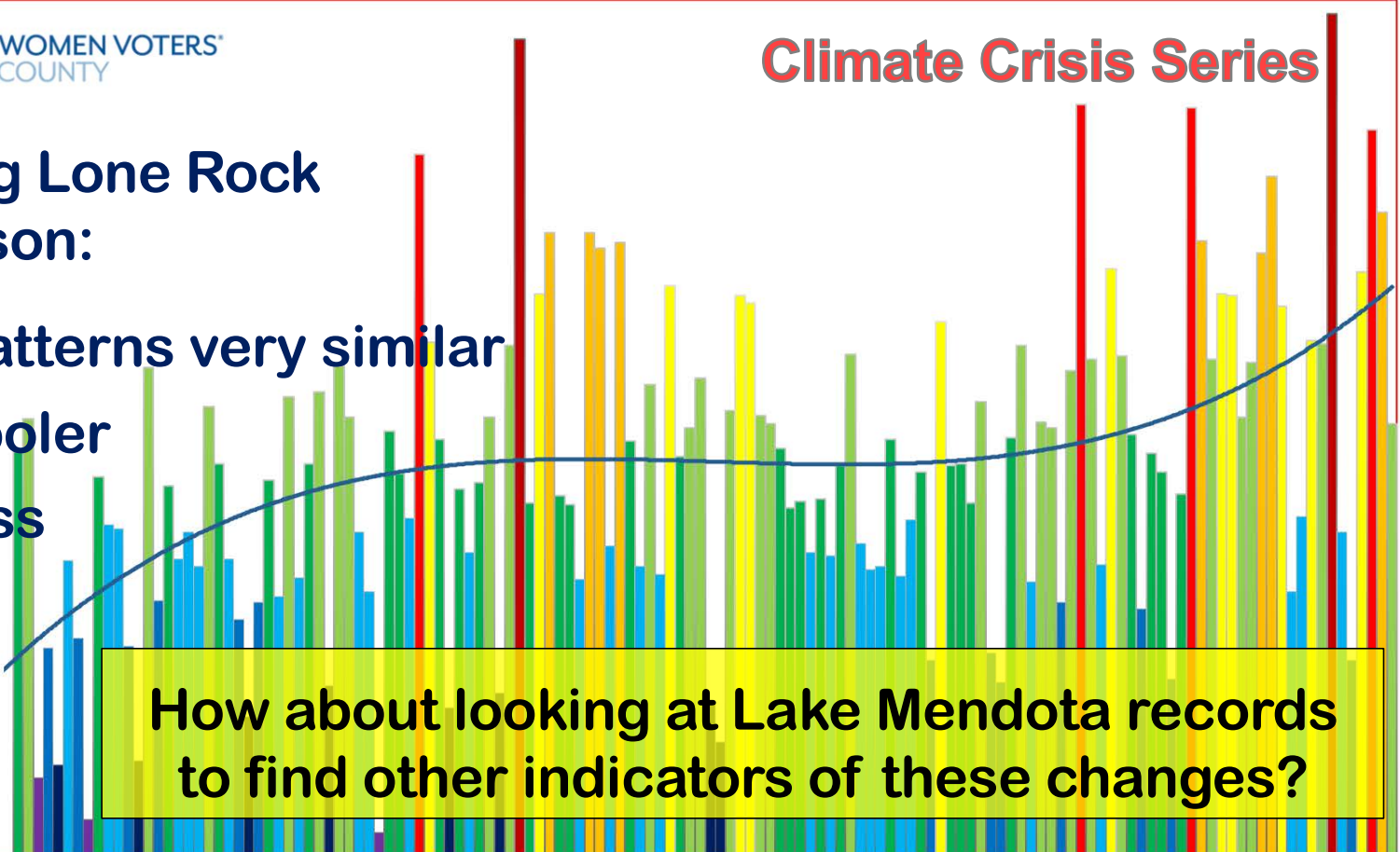
1950

2000

LNR Area Average Annual Temperature - 1881 to 2018

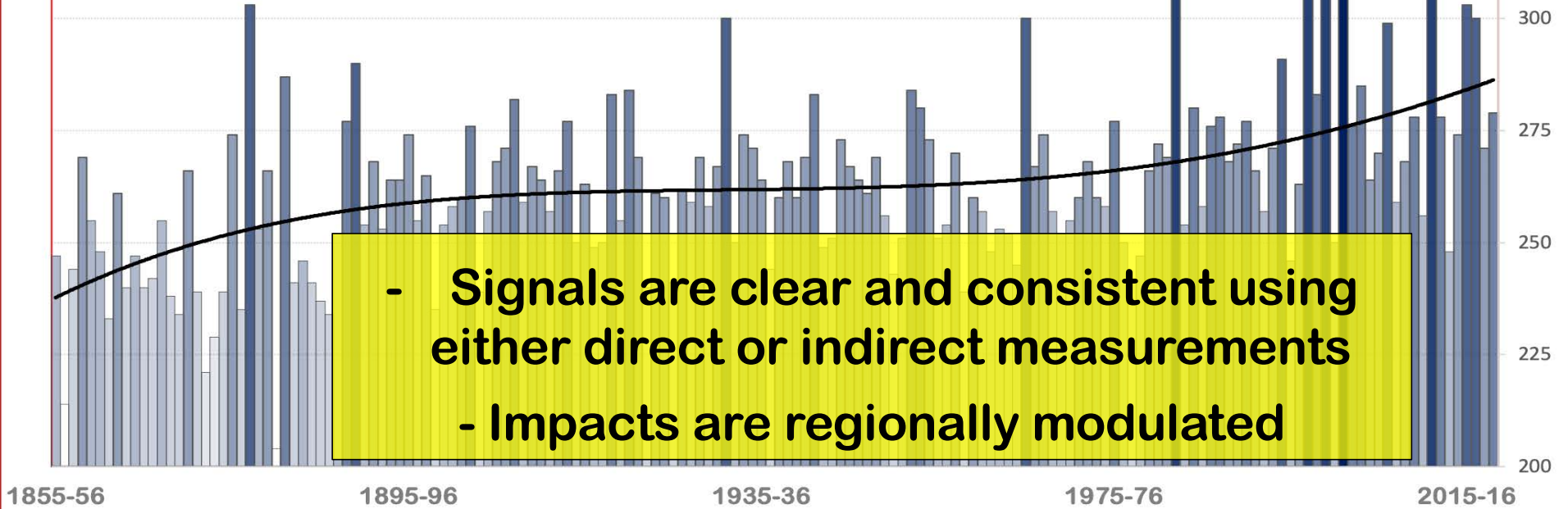
Source: NOAA Global Climate Analysis

Range = 5°F



200 215 215 230 230 245 245 260 260 275 275 290 290 305 305 320 320 335 335 350

**Number of Ice-Free Days on Lake Mendota has increased from about 240 days (1850s) to over 280**



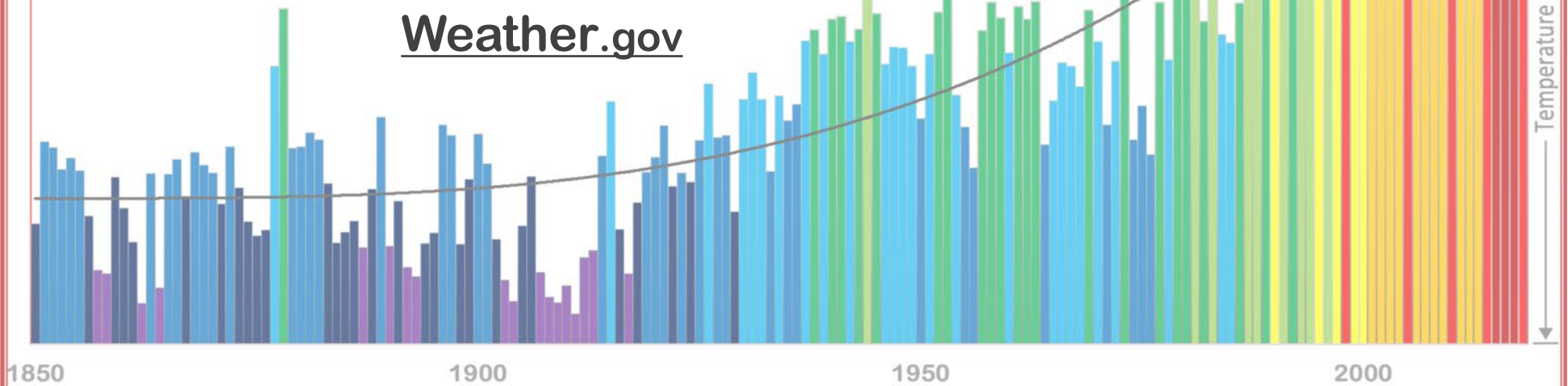
**3 Year Running Avg Days Lake Mendota is Open - 1855 to Present**

Source: University of Wisconsin - Madison

## What climate information is available from the Federal Government?

By law, the National Weather Service (NWS) provides Weather, Water and Climate Services *to the public* for *protection, safety and general information*

Weather.gov



Global Comparisons of Average Annual Temperature - 1850 to 2018

Source: Hadley Centre, UK --- Range = 1.4C

## **What climate information is available from the Federal Government?**

**Tasks focus on Observations, Analyses and Forecasts**

**These include:**

- **General forecasts of weather, rivers/coasts, and climate**
- **Warnings of hazardous weather and flooding potential**
- **Other extreme weather/climate events**
- **Shared global responsibility for international aviation and marine forecasts, as well as space weather products**

## What climate information is available from the Federal Government?

The NWS is also responsible for:

- **Basic observations**
  - *Surface and Balloon-borne*
    - Taken across the US and some surrounding areas
    - “Weather” observations are also “Climate” observations
  - *Radar observations*

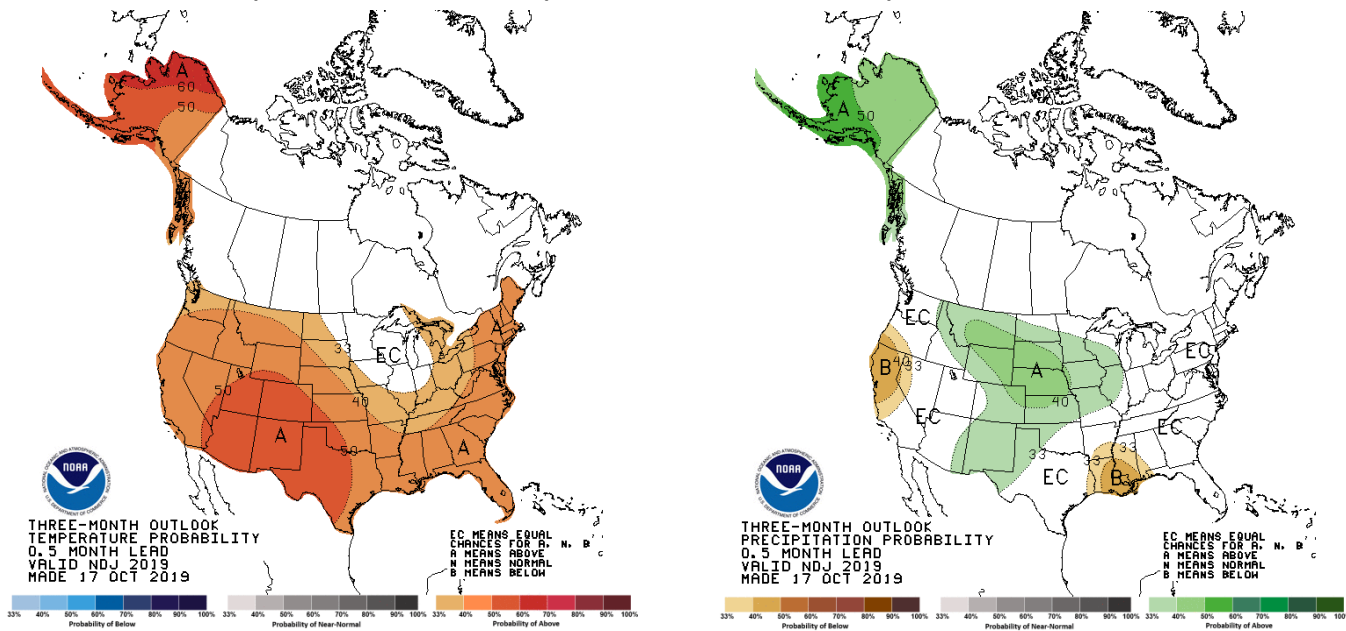
Other parts of NOAA:

- Run US operational weather-related satellite systems
- Conduct research into improving our understanding and forecasts of weather and climate

The NWS [Climate Prediction Center](#) (CPC) monitors and forecasts short-term climate fluctuations and provides information on the effects that changing climate patterns can have on the nation

Some examples include:

Seasonal Temperature and Precipitation Forecasts (Departures from normal)

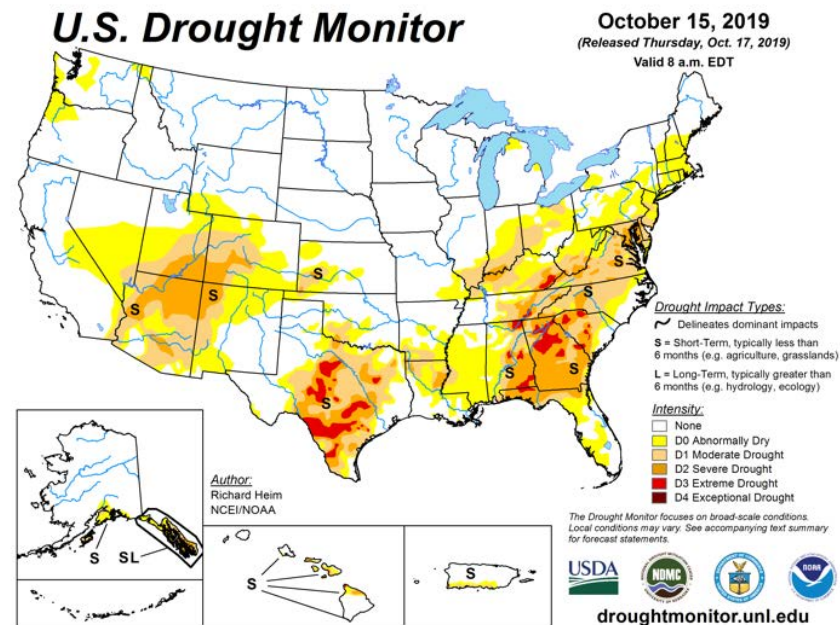


The NWS [Climate Prediction Center](#) (CPC) monitors and forecasts short-term climate fluctuations and provides information on the effects that changing climate patterns can have on the nation

Some examples include:

CPC also provides climate information to other federal agencies in support of their missions.

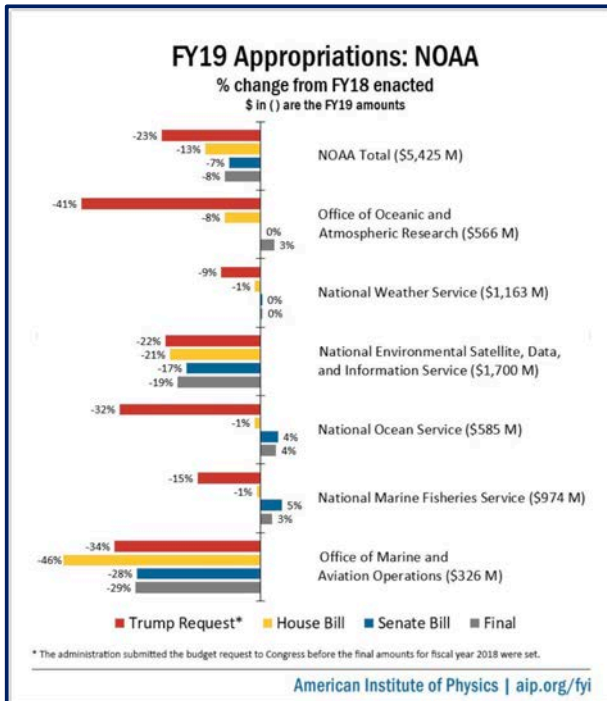
Examples include the U.S. Drought Monitor and Drought Forecasts - distributed jointly with Dept. of Ag.



# What do NOAA's Weather/Water/Climate Services cost you?

NOAA products are openly available, free of charge

We can look at a detailed Eye Chart



Or

We can express it in more practical terms  
*(Annual cost per US resident)*

NWS alone costs each of us less than a Big Mac



NOAA's total Weather/Water/Climate observations and services cost less than one Big Mac, Fries and Shake Combo

*Quite the Value Meal!*

