

Current Issues in Forest [Natural] Resources

Steve Wilent
Mt. Hood Community College
Winter 2024

Issues? **What Issues?**

Current Issues in Forest Resources

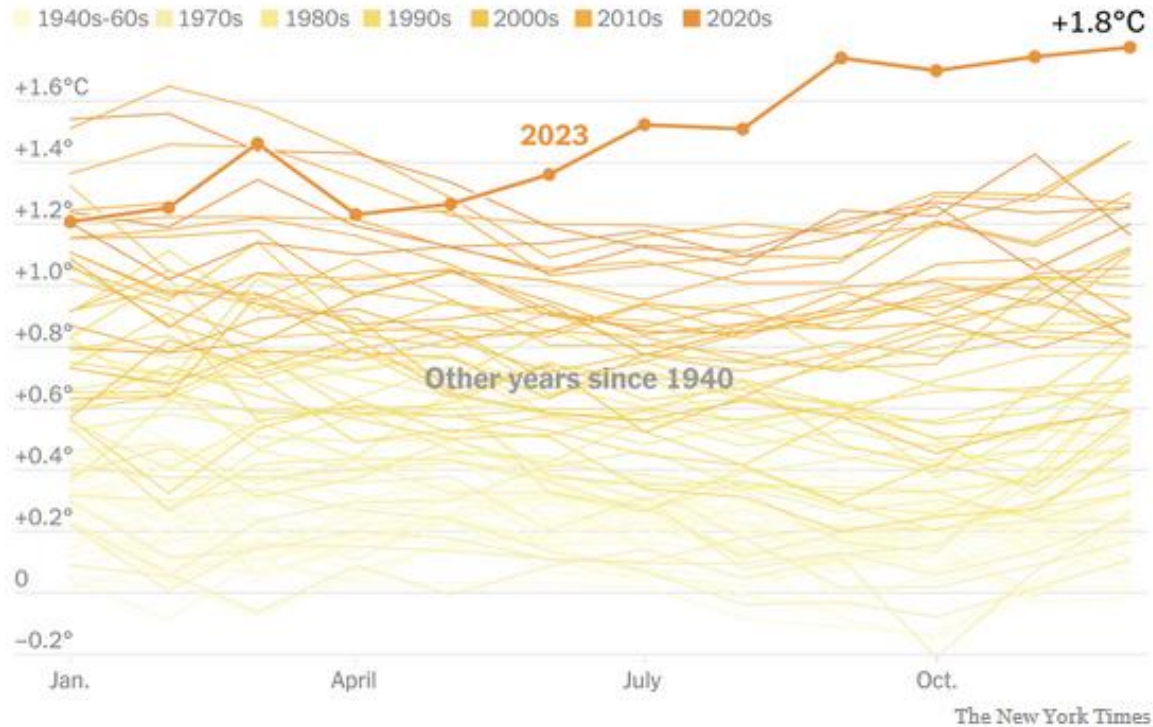
- Understand Key Issues
- Question Everything
- Consider Sources
- How to Take a Position
— and defend it.

The New York Times

January 9, 2024

BREAKING NEWS

Global monthly temperature for each year compared with pre-industrial levels



It's Official: 2023 Was Earth's Hottest Year

Month after month, global temperatures didn't just break records, they smashed them. This year could be even warmer.

[New York Times, January 9, 2024](#)

CLIMATE

Climate change is hastening the demise of Pacific Northwest forests

“In recent years, at least 15 native Pacific Northwest tree species have experienced growth declines and die-offs, 10 of which have been linked to drought and warming temperatures, according to recent studies and reports.”

— Associated Press, Nov. 16, 2023

'Firmageddon' strikes Ashland watershed



John Maurer shows stands of dead Douglas firs (brown trees on hillside) above Ashland. Damian Mann photo

[Ashland \(Oregon\) News, July 6, 2023](#)

“Combination of warmer weather, lack of water and insect infestations killing thousands of trees.”

“Climate change predictions indicate the hotter, drier conditions could continue, compromising forests into the future.”

Vast stands of Douglas fir above Ashland are dying at an alarming rate.

After a prolonged dry spell, large reddish swaths on lush hillsides appeared this spring, painting a startling picture of the accelerating death of Oregon's official state tree, a sight easily viewed from the streets of Ashland.

In some areas, 50 percent or more of the trees on a hillside are dead or dying and now pose a significant fire risk.

“I have lost 90% of my Douglas fir,” said John Maurer, who owns 20 acres just a short distance uphill from Southern Oregon University, near upper Roca Creek. “I’ve never seen that rate of demise.”

Key quote:

“Rather than dwell on a gloomier future, Powell said that historically the hills above Ashland were home to more oak, madrone and Ponderosa pine trees, with only a few Douglas firs in draws and near water sources.”

[Joe Powell is an Ashland forester.]

In other words, there's more to the story than climate change. How?

[Ashland \(Oregon\) News, July 6, 2023](#)

What Do You Know About Climate Change?

**Steve Wilent
Current Issues in Forest Resources
Mt. Hood Community College
Winter 2017**

**What's your 30-second
“elevator speech” about
the effects of
Climate Change
on Pacific Northwest
forests, fish, and wildlife?**

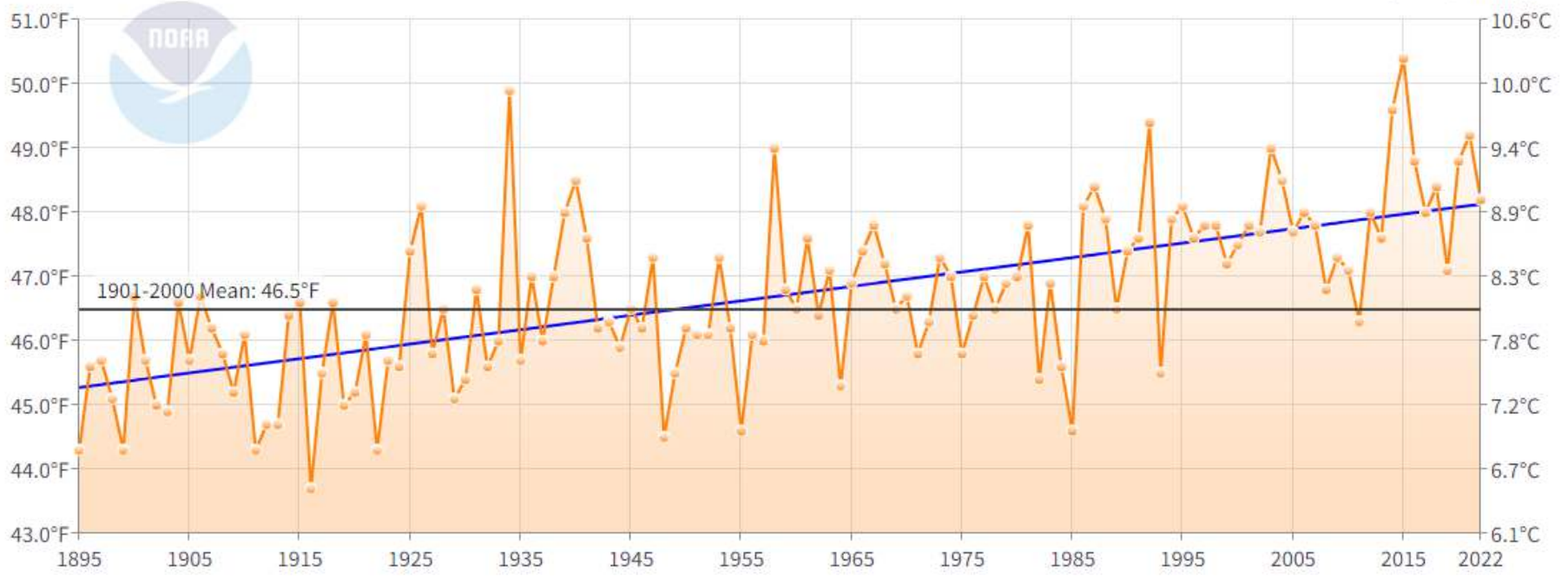
Climate Data:
Temperatures and
Sea-Level
Rising Steadily

Oregon Trend, 1895 – 2023

[NOAA/Climate.gov](https://www.noaa.gov/climate)

Oregon Average Temperature

January-December



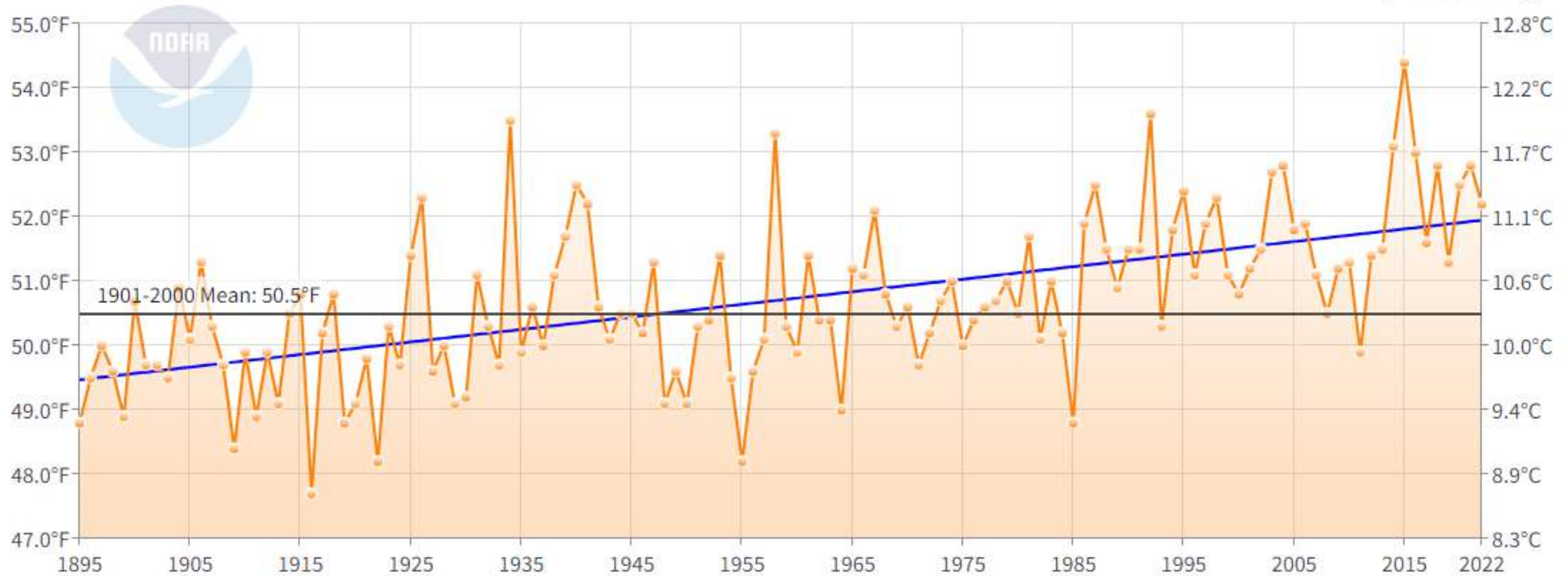
NOAA Climate at Glance Datasets

Multnomah County Trend, 1895 – 2023

[NOAA/Climate.gov](https://www.noaa.gov)

Multnomah County, Oregon Average Temperature

January-December

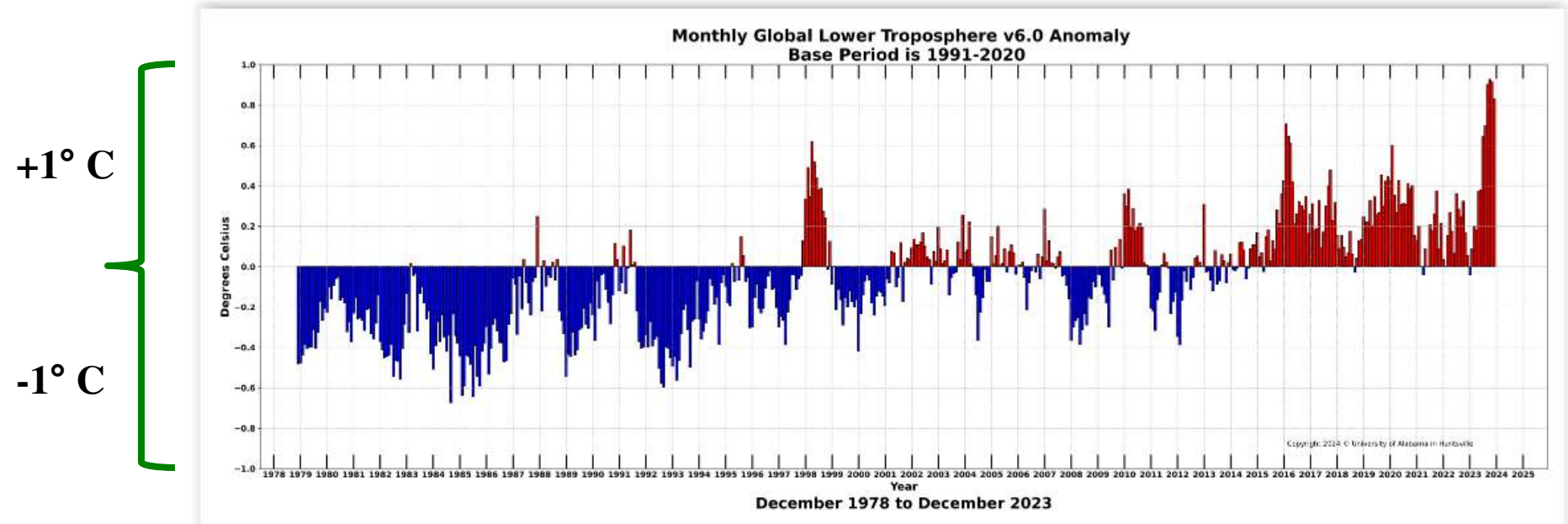


[NOAA Climate at Glance Datasets](#)

Satellite Measurements:

Global climate trend since Nov. 16, 1978:

+0.14 C (about .23 F) per decade



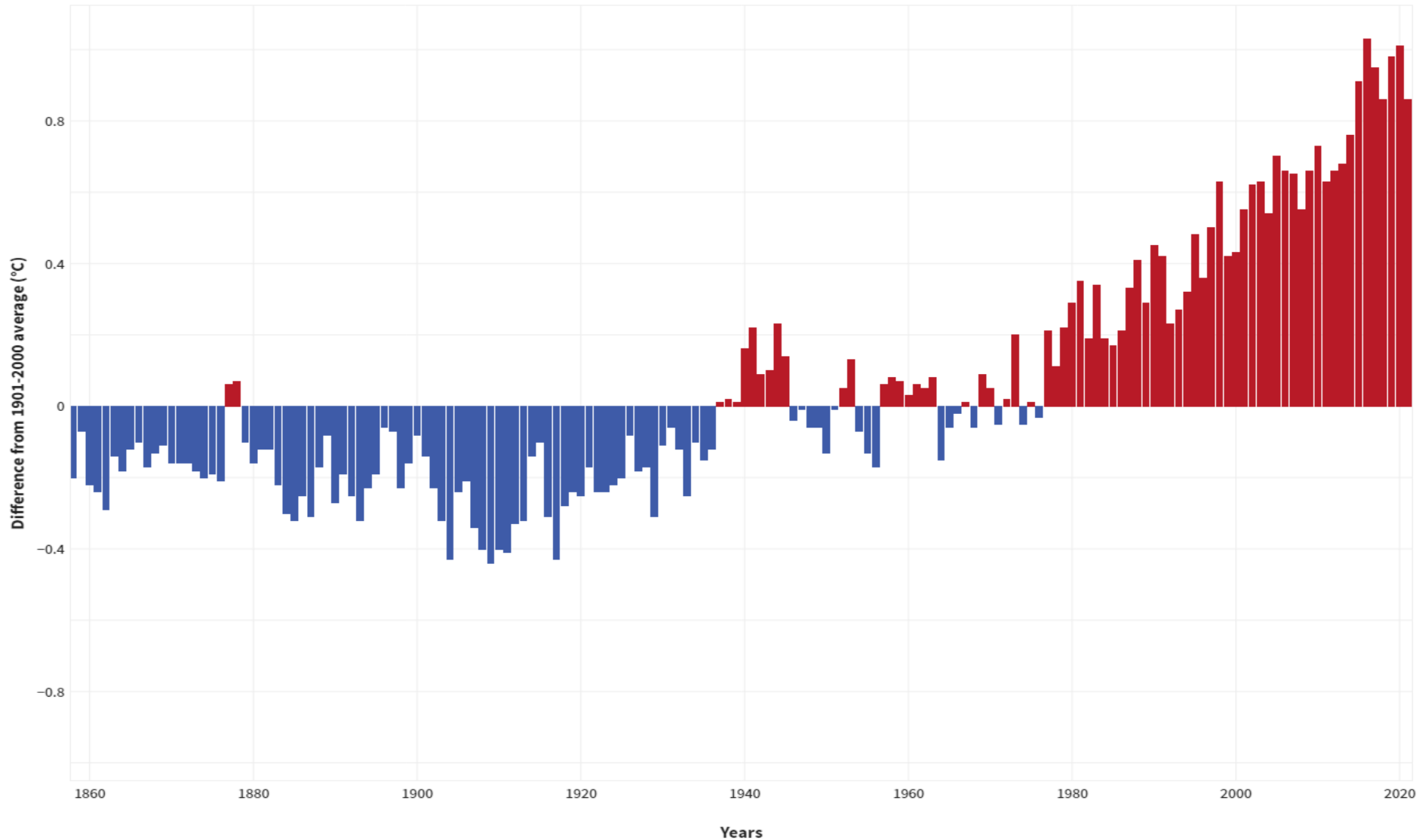
Note that this is a graph of temperature anomalies: variance from the average temperature for a 30-year period (1991-2020).

SOURCE: [University of Alabama, Huntsville](#)

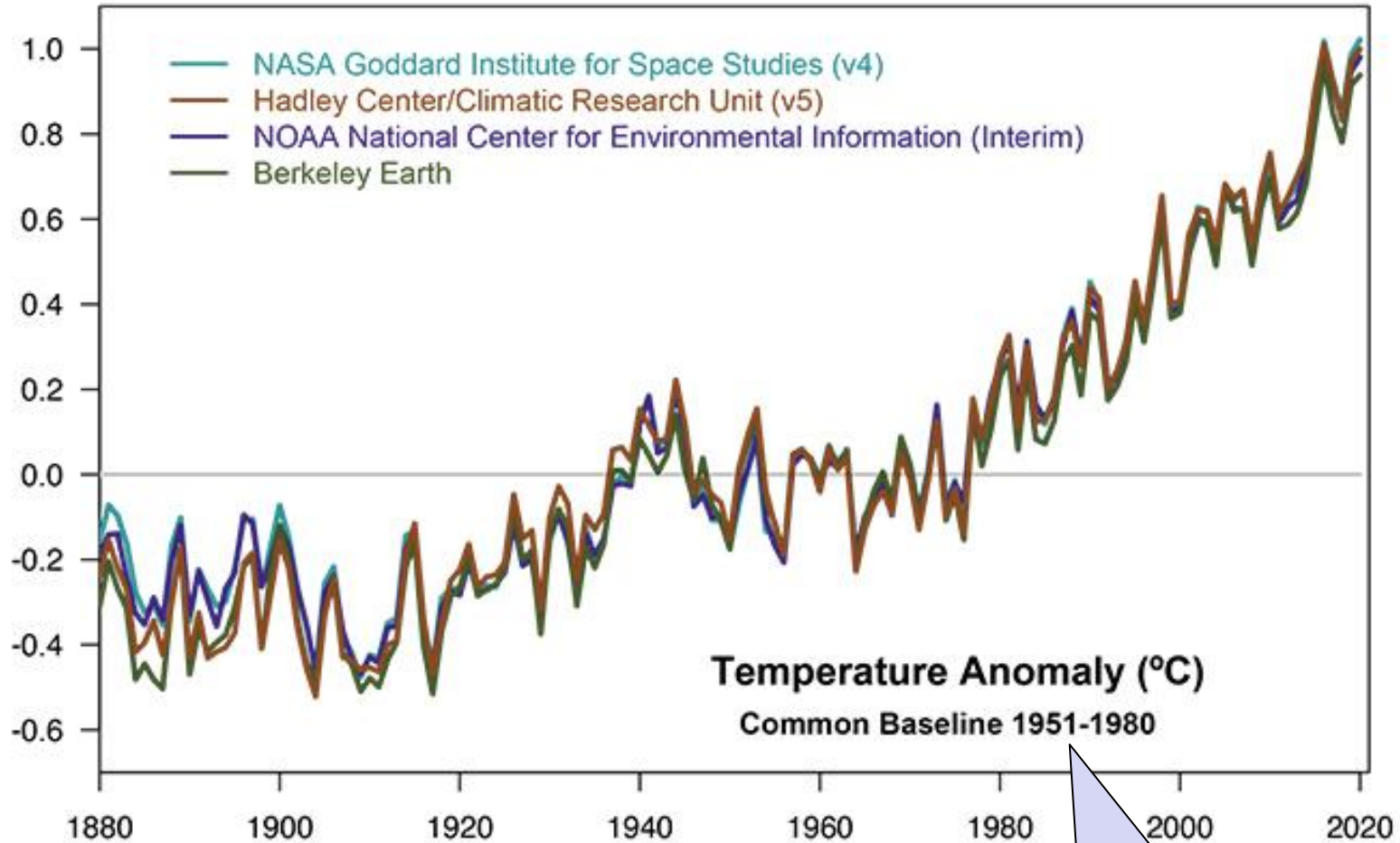
Global Temperature Trend, 1860 – 2022

[NOAA/Climate.gov](https://www.noaa.gov/climate)

GLOBAL AVERAGE SURFACE TEMPERATURE



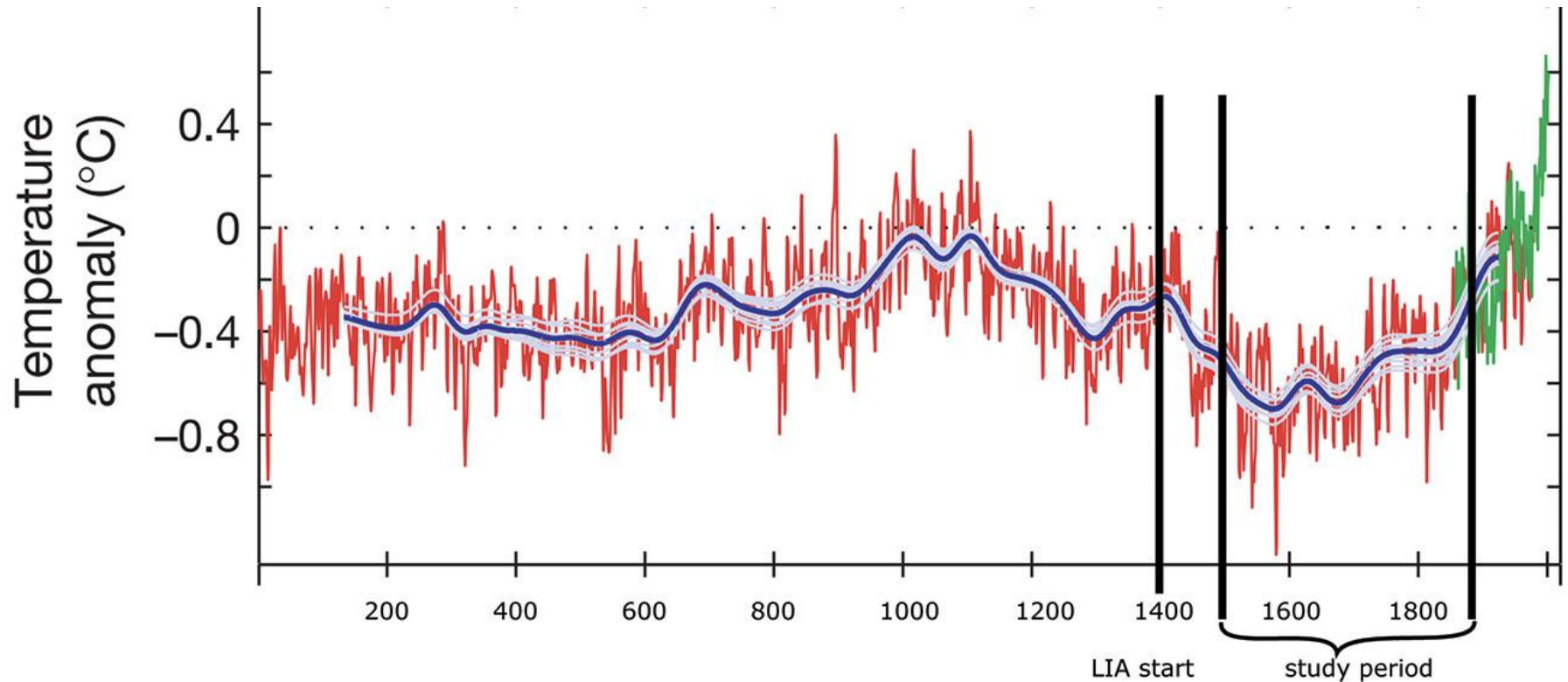
Global Temperature Trend, 1880 - 2022



Why this baseline?

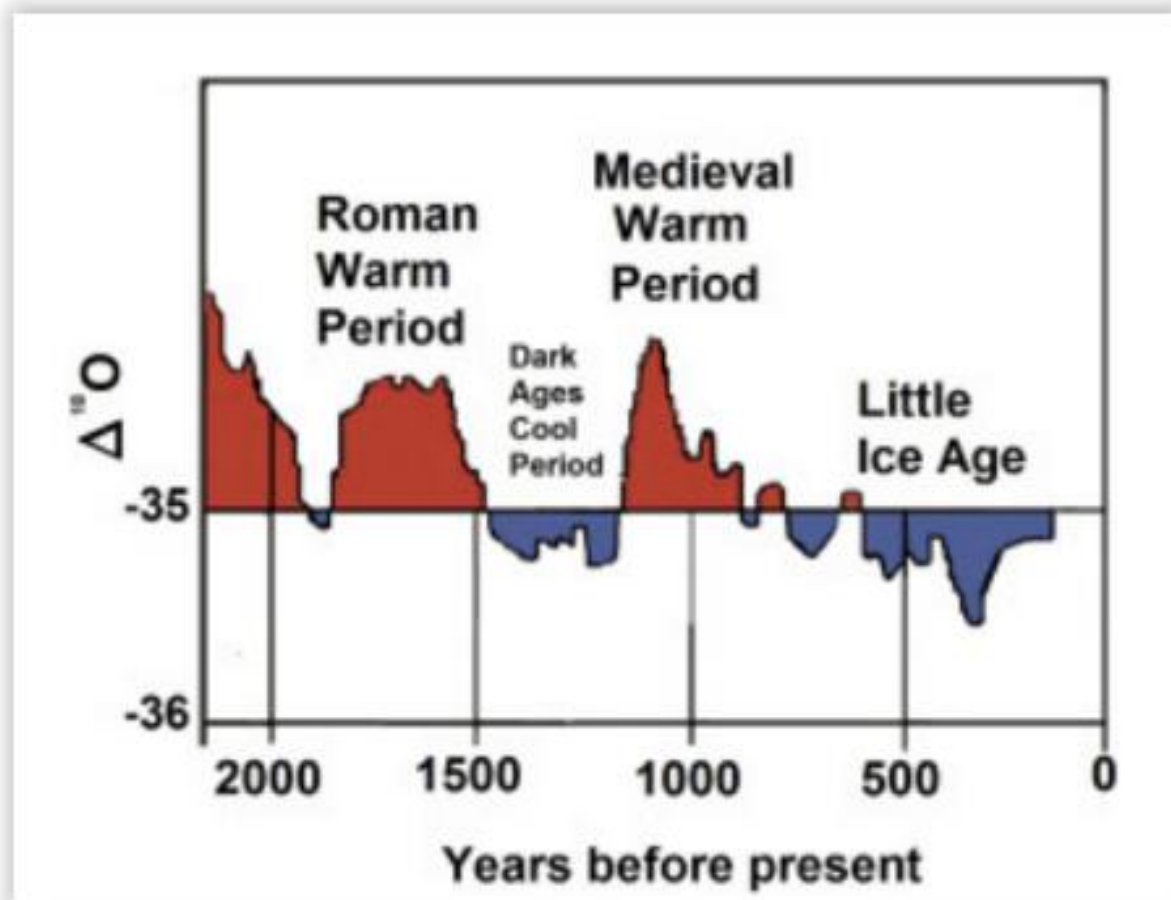
Source: NASA

Recovery from the Little Ice Age



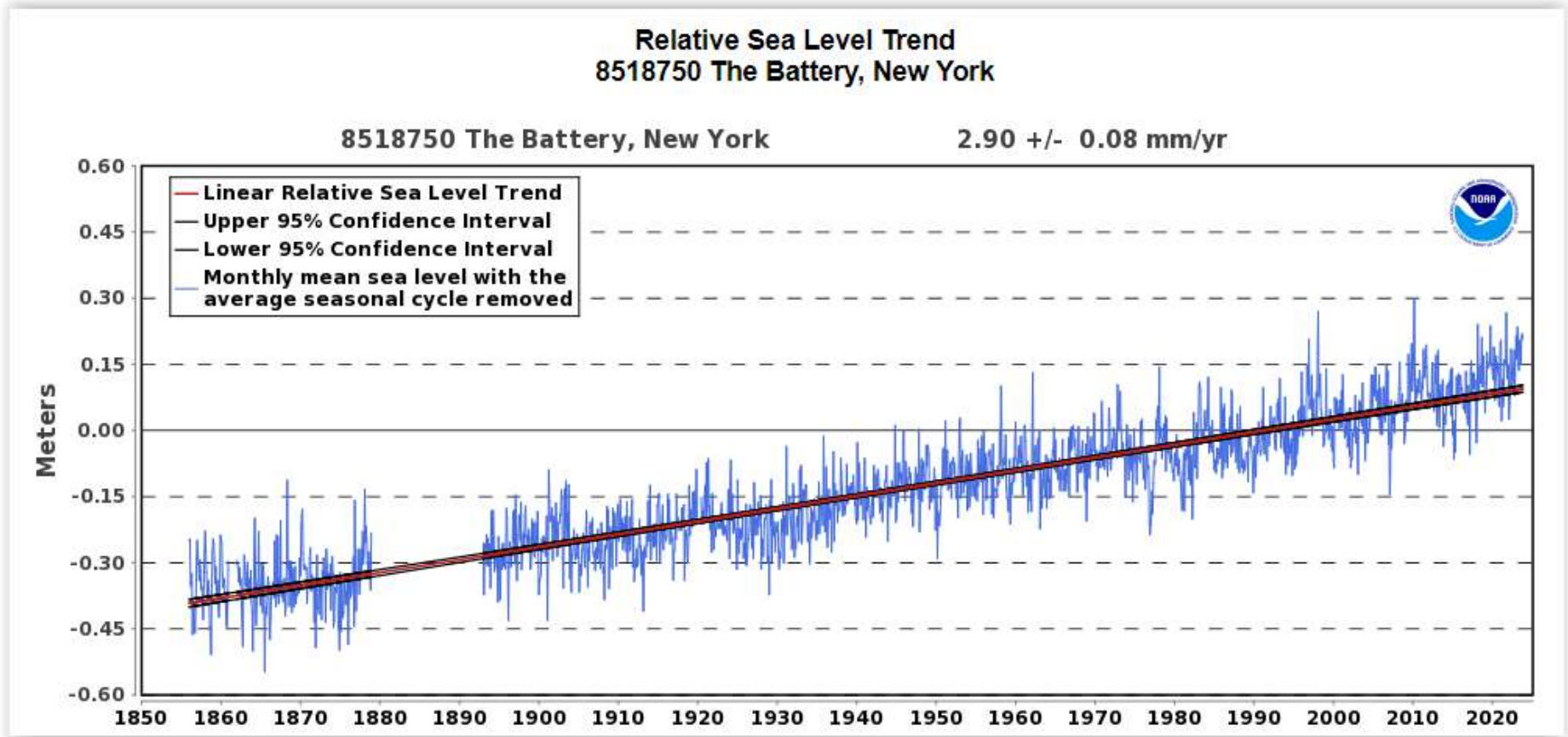
Source: “The Economic Effects of Long-Term Climate Change: Evidence from the Little Ice Age,” *Journal of Political Economy*, University of Chicago Press, Sept. 2022.

Climate cycles



Source: "[Using Patterns of Recurring Climate Cycles to Predict Future Climate Changes](#),"
D.J. Easterbrook, Evidence-Based Climate Science (Second Edition), 2016.

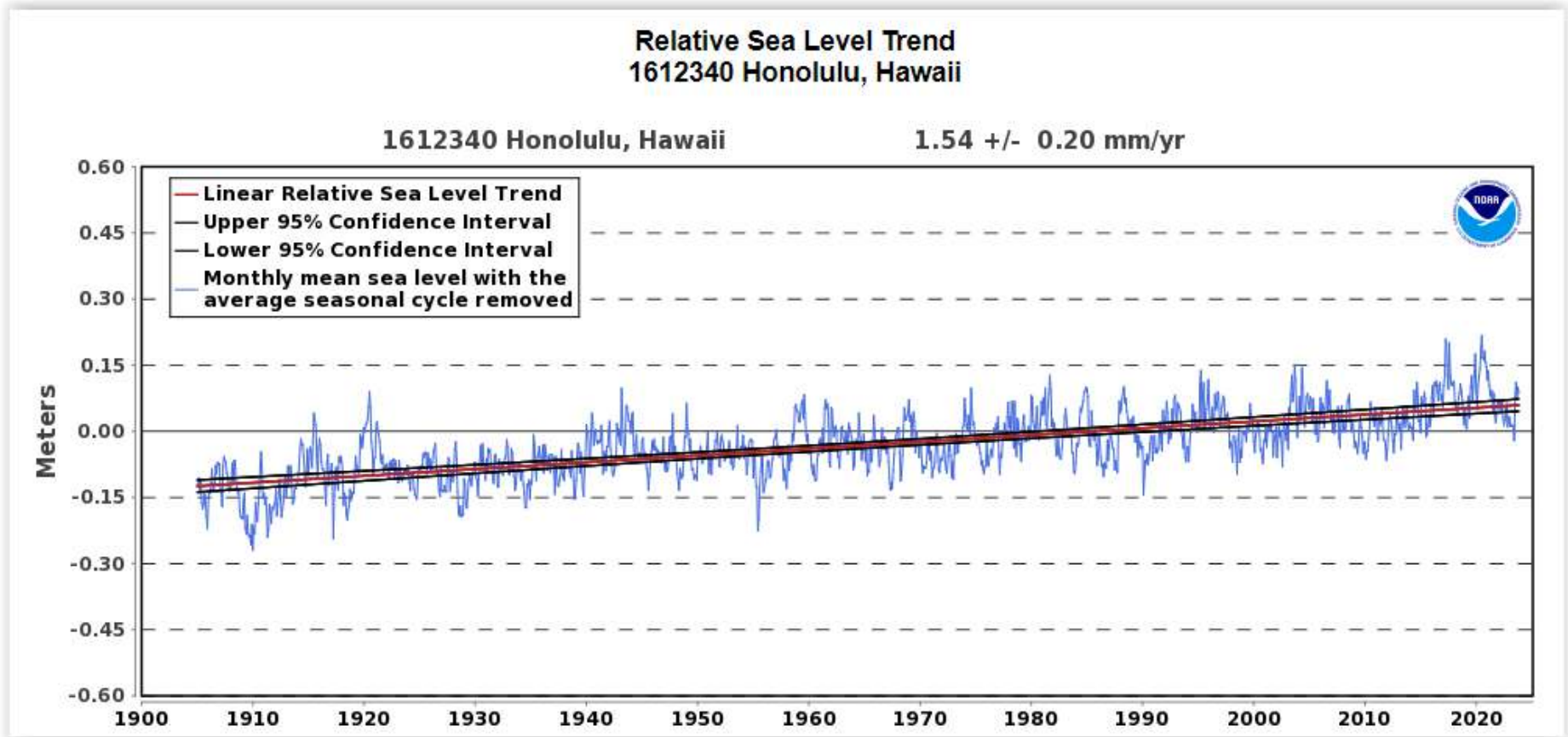
Sea Level Data: Steadily Rising in Most, but Not All, Locations Since ~1850



NOAA, January 5, 2024

https://tidesandcurrents.noaa.gov/sltrends/sltrends_station.shtml?stnid=8518750

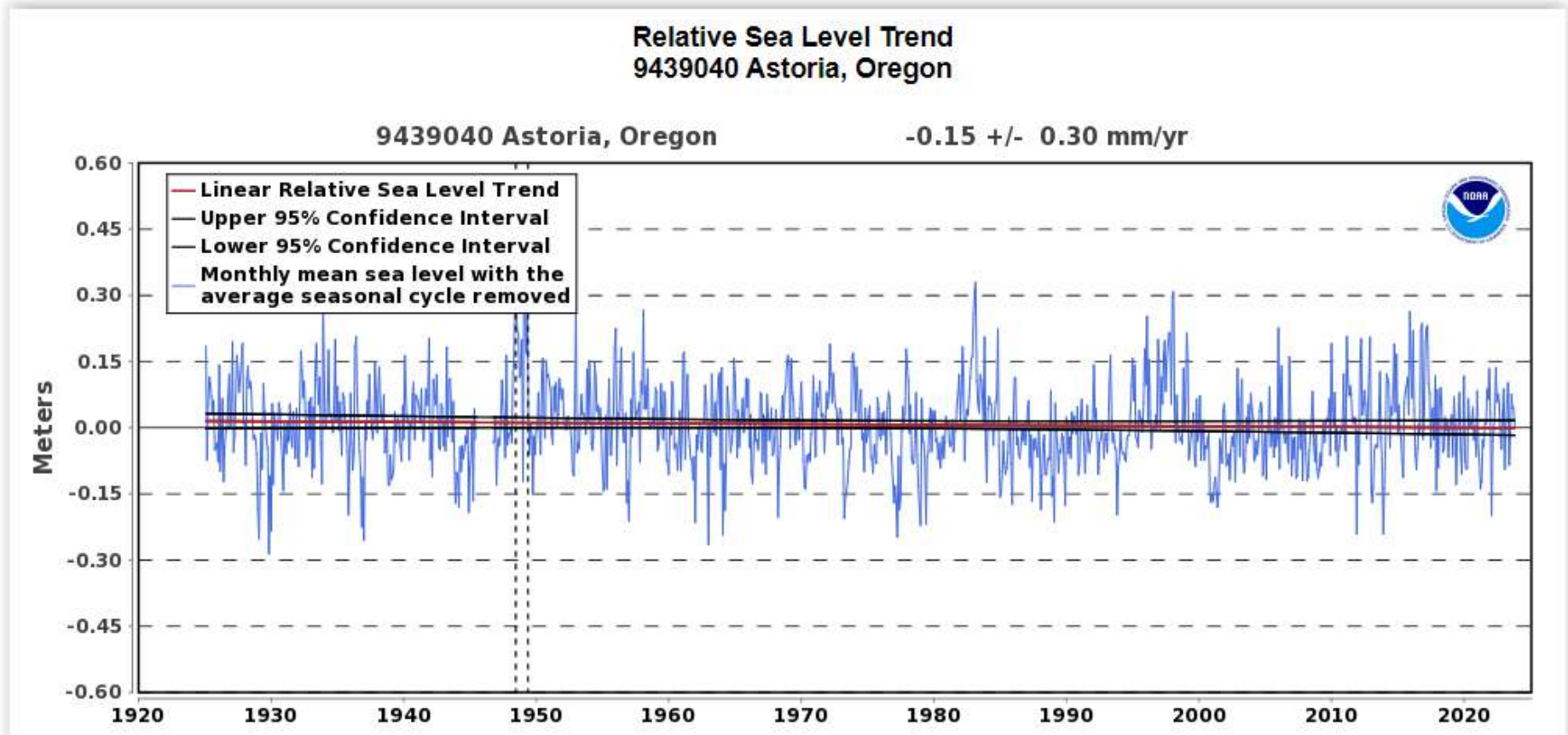
Sea Level Data: Honolulu



NOAA, January 5, 2024

https://tidesandcurrents.noaa.gov/sltrends/sltrends_station.shtml?id=1612340

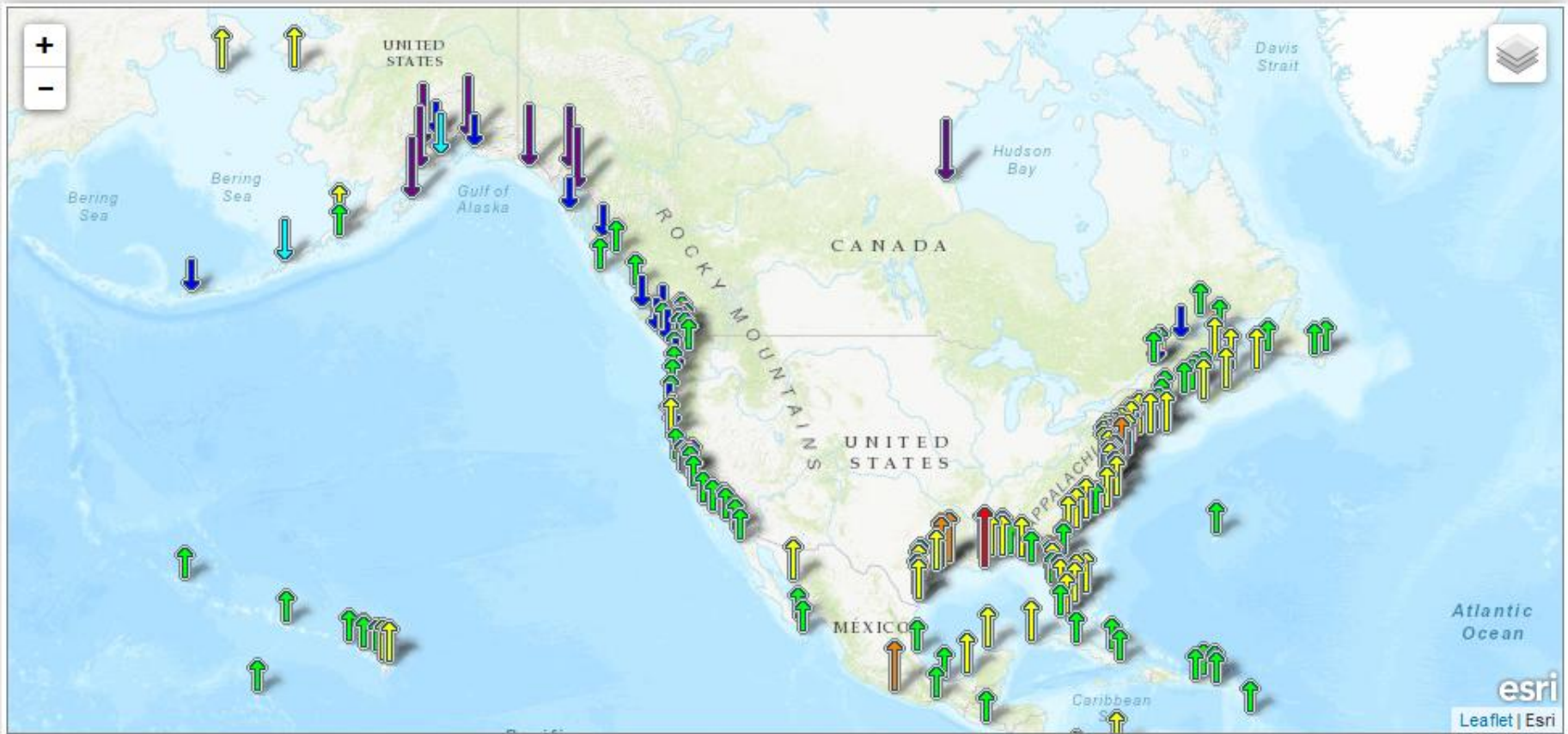
Sea Level Data: Astoria, Oregon



NOAA, January 5, 2024

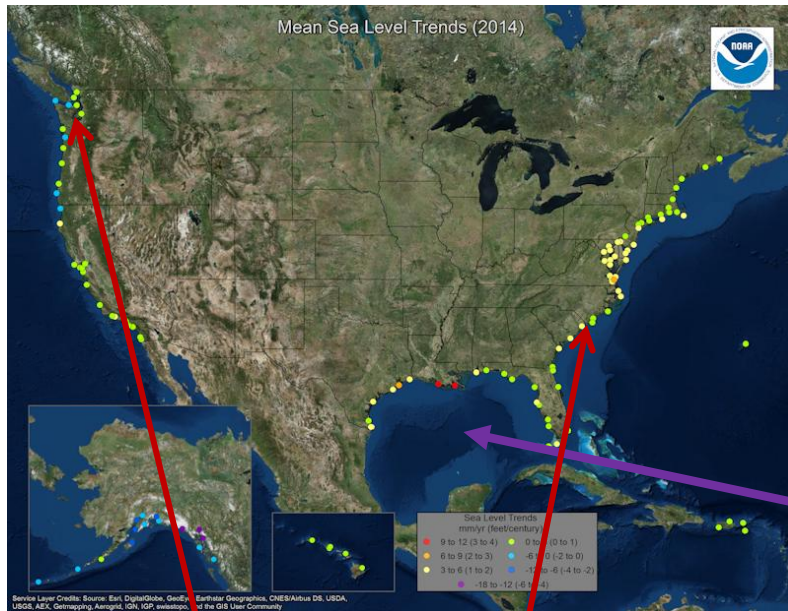
https://tidesandcurrents.noaa.gov/sltrends/sltrends_station.shtml?id=9439040

U.S. Sea Level Trends (NOAA)



<https://tidesandcurrents.noaa.gov/sltrends/sltrends.html>

Sea Level Change: Multiple Causes



- **Post-glacial subsidence:**
Land sinking in the absence of the weight of glacial ice
- **Aquifer compaction**
(water wells)

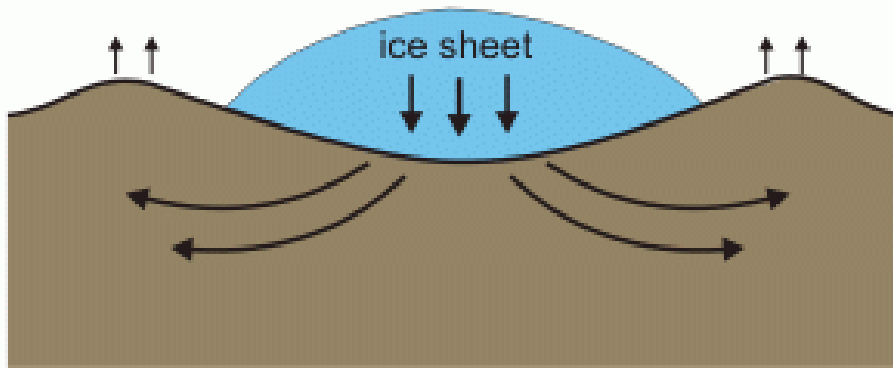
Mississippi River Delta

Subsidence: Land formed by river sediments naturally subsides and sinks over time. Historically, sediment deposition and accretion by plant growth outpaced the natural subsidence, resulting in coastal land gain. Without land-building deposits from the river, subsidence dominates and massive areas of land sink and disappear below sea-level.

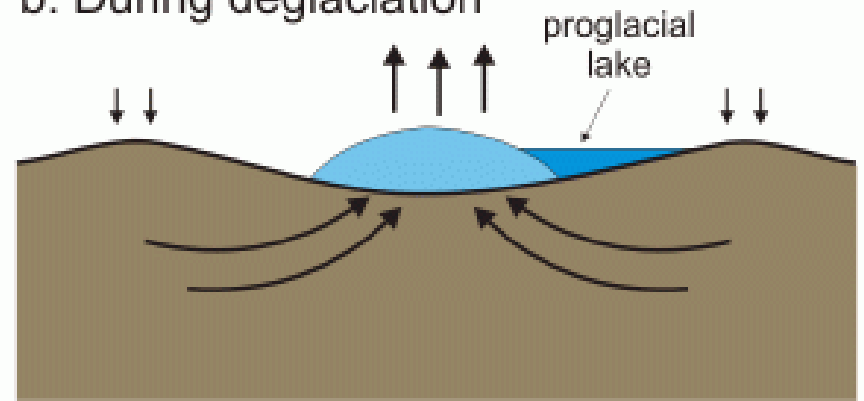
—www.mississippiriverdelta.org

Postglacial Rebound

a. Peak glaciation

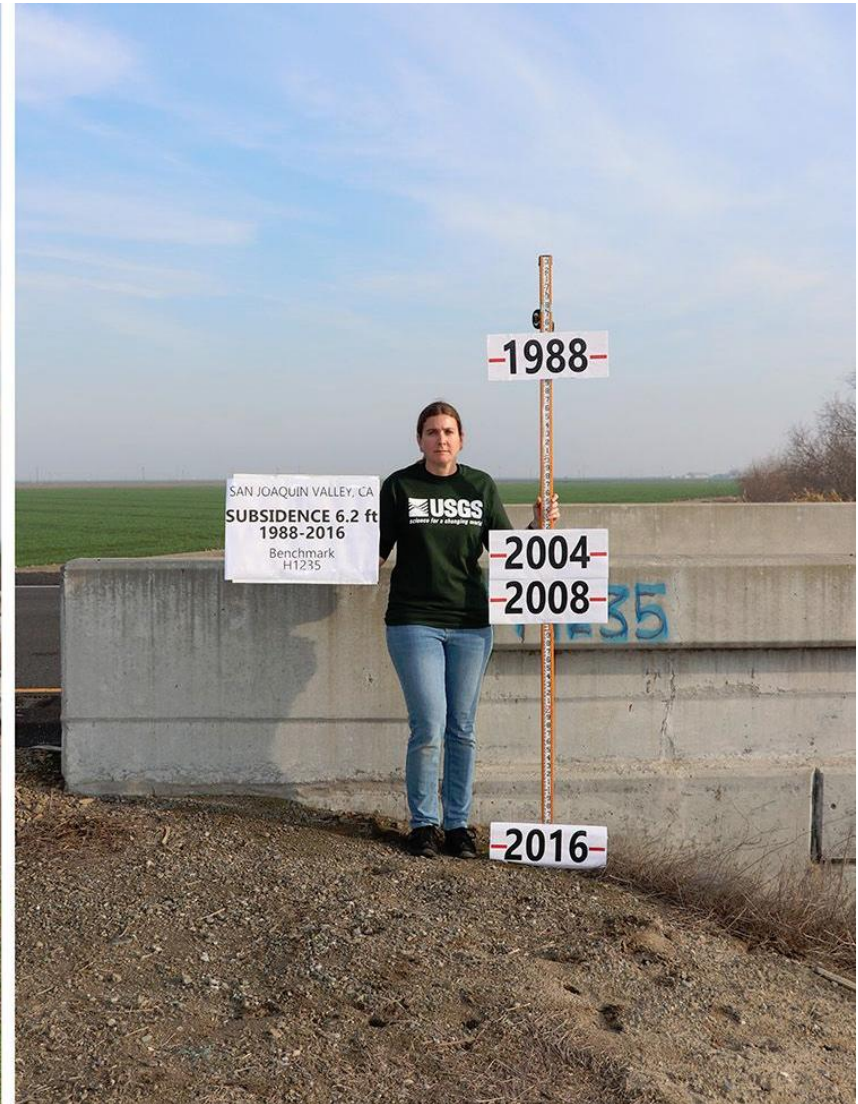


b. During deglaciation



Due to this ongoing ‘relaxation’ of the Earth, when we try to measure how quickly sea-level is changing, the answer we get depends not only on how much meltwater is being added to the ocean, but also whether the land we are standing on to measure sea-level change is rising or falling. — AntarcticGlaciers.org

Compacted Aquifers



San Joaquin Valley, California. Source: [USGS](https://www.usgs.gov/).

Compacted Aquifers

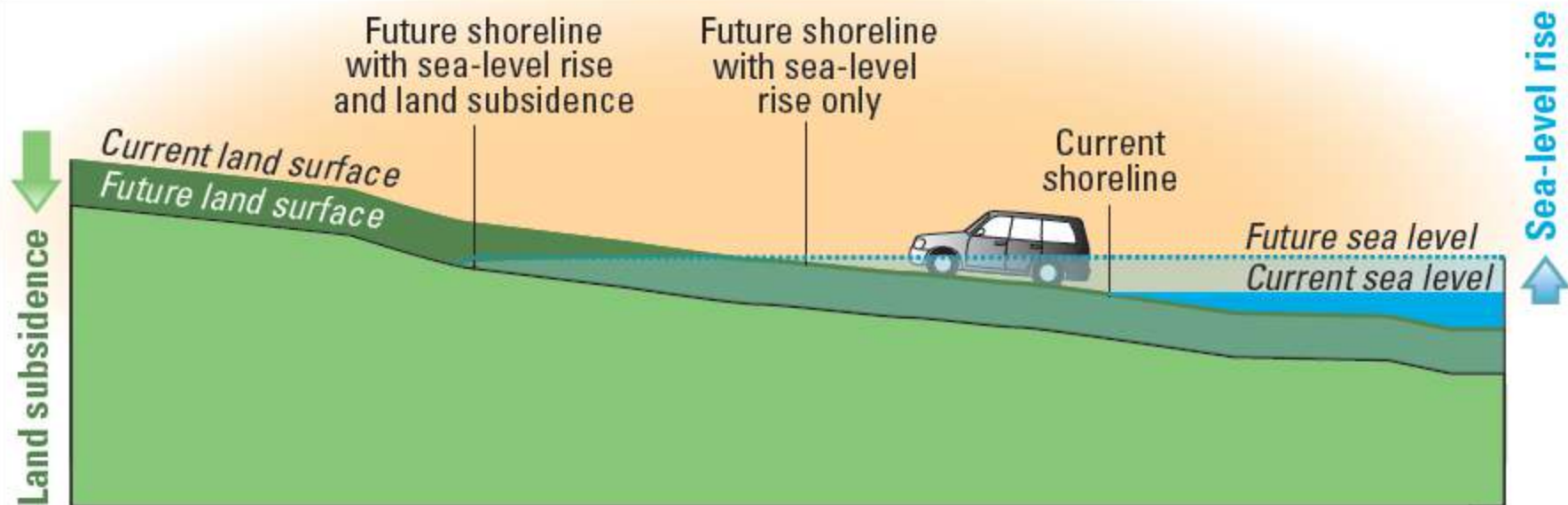


Figure 3. Shoreline retreat caused by a combination of sea-level rise and land subsidence.

“The aquifer system in the [Southern Chesapeake Bay] region has been compacted by extensive groundwater pumping in the region at rates of 1.5- to 3.7-mm/yr; this compaction accounts for more than half of observed land subsidence in the region.”

— "[Land Subsidence and Relative Sea-Level Rise in the Southern Chesapeake Bay Region](#)," USGS, 2013

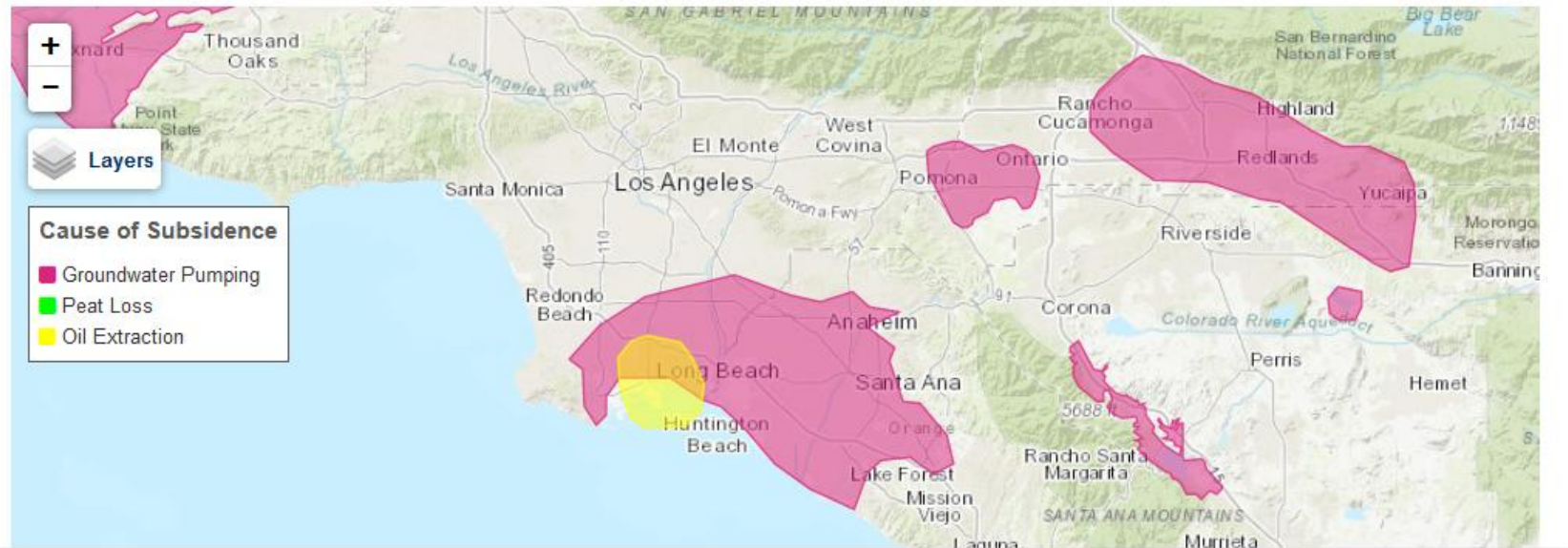
A Factor in Recent LA Flooding?



Land Subsidence in California

Areas of Land Subsidence in California

In California, large areas of land subsidence were first documented by USGS scientists in the first half of the 20th century. Most of this subsidence was a result of excessive groundwater pumping. Completion of California's State and Federal water projects that bring water from California's wet north to its dry south allowed some groundwater aquifers to recover, and subsidence decreased in these areas. However, subsidence continues today, sometimes at nearly historically high rates of **more than 1 foot/year (ft/yr)**. The map below illustrates areas of recorded subsidence—historical and current—across California.



Los Angeles Area, California. Source: [USGS](https://www.usgs.gov/).

“Study: Two-thirds of glaciers on track to disappear by 2100”

Los Angeles Times, Jan. 6, 2023

Half of Earth's glaciers will vanish this century, study finds

The Washington Post, Jan. 6, 2023

Two-thirds of glaciers are on track to disappear by 2100, study says

PBS, Jan. 6, 2023

The missing perspective:

The retreat of glaciers since
1850 has been

“worldwide and rapid.”

— McGill University
(emphasis added)

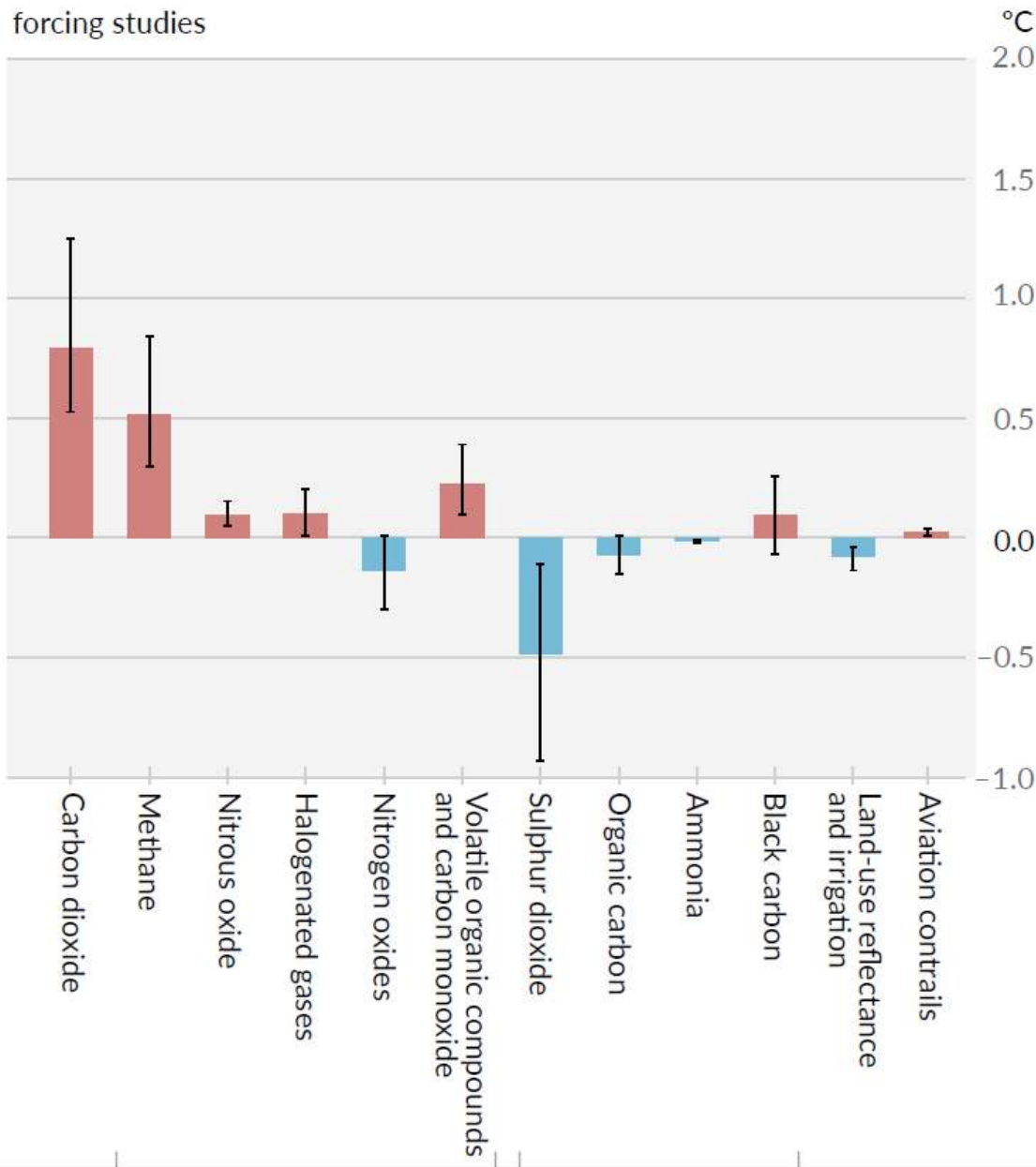
How certain is the
Intergovernmental
Panel on Climate
Change (IPCC) that
climate warming is
occurring?

“It is **unequivocal** that human influence has warmed the atmosphere, ocean and land. Widespread and rapid changes in the atmosphere, ocean, cryosphere and biosphere have occurred.” [emphasis added]

— [IPCC Sixth Assessment Report \(AR6\), 2021](#)

What are the Main
Anthropogenic
Influences on
Climate?

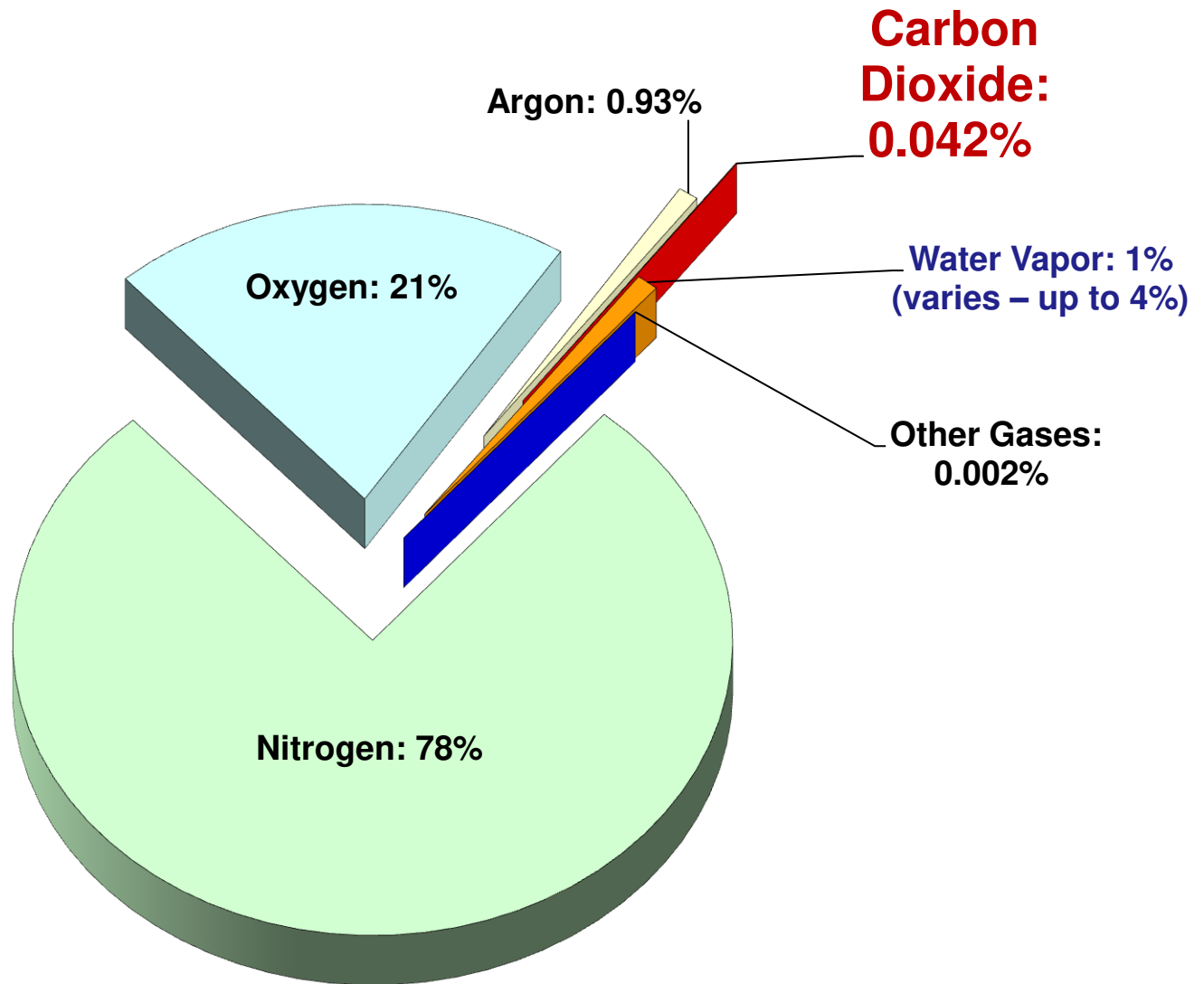
(c) Contributions to 2010–2019 warming relative to 1850–1900, assessed from radiative forcing studies



Observed warming is driven by emissions from human activities, with greenhouse gas warming partly masked by aerosol cooling.

— IPCC, 2021

What gases make up
Earth's atmosphere?



Earth's Air = ~99.9% N, O, Ar

[NOAA: 417.5 parts per million in November 2022](#)

**How much has
atmospheric CO₂
increased?**

Change in Atmospheric CO₂

Preindustrial (~1850): 280 parts per million (ppm)

December 2023: ~422 ppm

$\frac{280}{1,000,000} = .028$ percent of the atmosphere

$\frac{422}{1,000,000} = .042$ percent of the atmosphere

CO₂ has increased by about 138 ppm

CO₂ is now ~149% of the preindustrial level

**Are US CO₂
emissions
increasing or
decreasing?**

U.S. Carbon Emissions Fell in 2023 as Coal Use Tumbled to New Lows

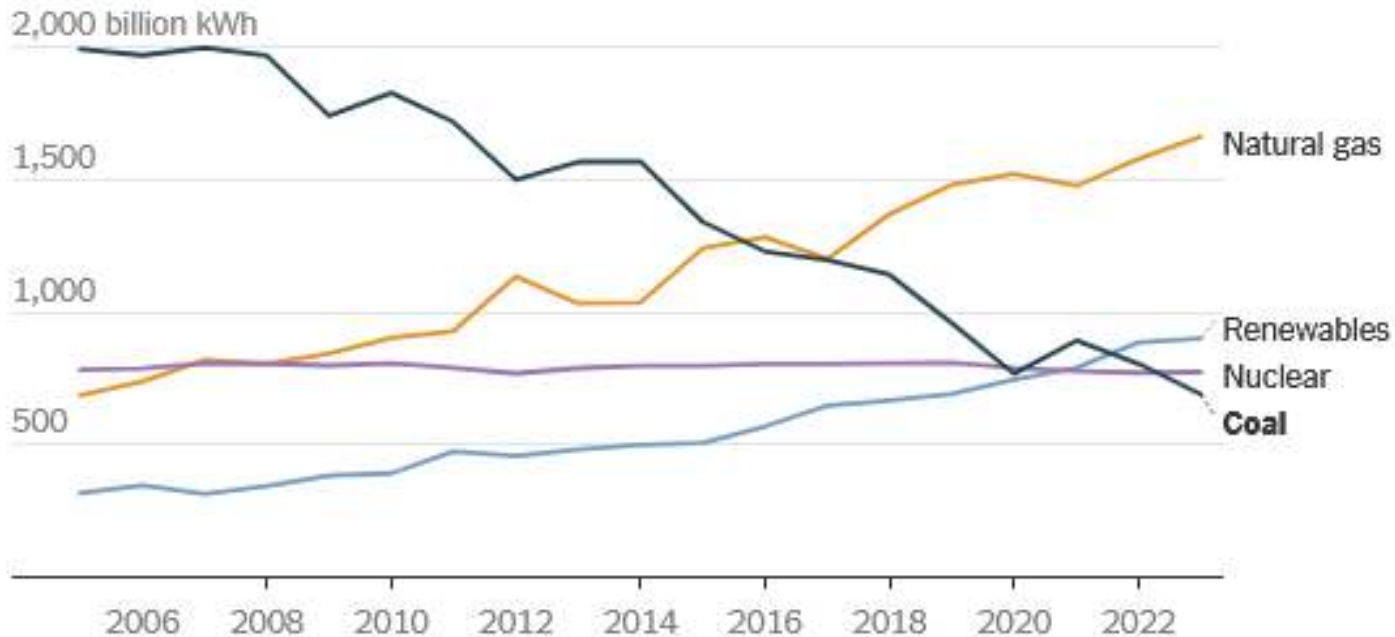
The drop was big, but emissions will need to fall three times as fast for the rest of the decade if the country wants to meet its climate goals.

America's greenhouse gas emissions fell 1.9 percent in 2023, in large part because the burning of coal to produce electricity plummeted to its lowest level in half a century, according to estimates published on Wednesday by the Rhodium Group, a nonpartisan research firm.

The drop means that **United States emissions have now fallen roughly 17.2 percent since 2005.** [emphasis added]

— *NY Times*, January 10, 2024

U.S. electricity generation by source



Note: Renewables include wind, solar, hydropower, geothermal and biomass. • Source: Rhodium Group • By The New York Times

The drop means that United States emissions have now fallen roughly 17.2 percent since 2005.

— *NY Times*, January 10, 2024

US CO₂ emissions: Declining since 2005

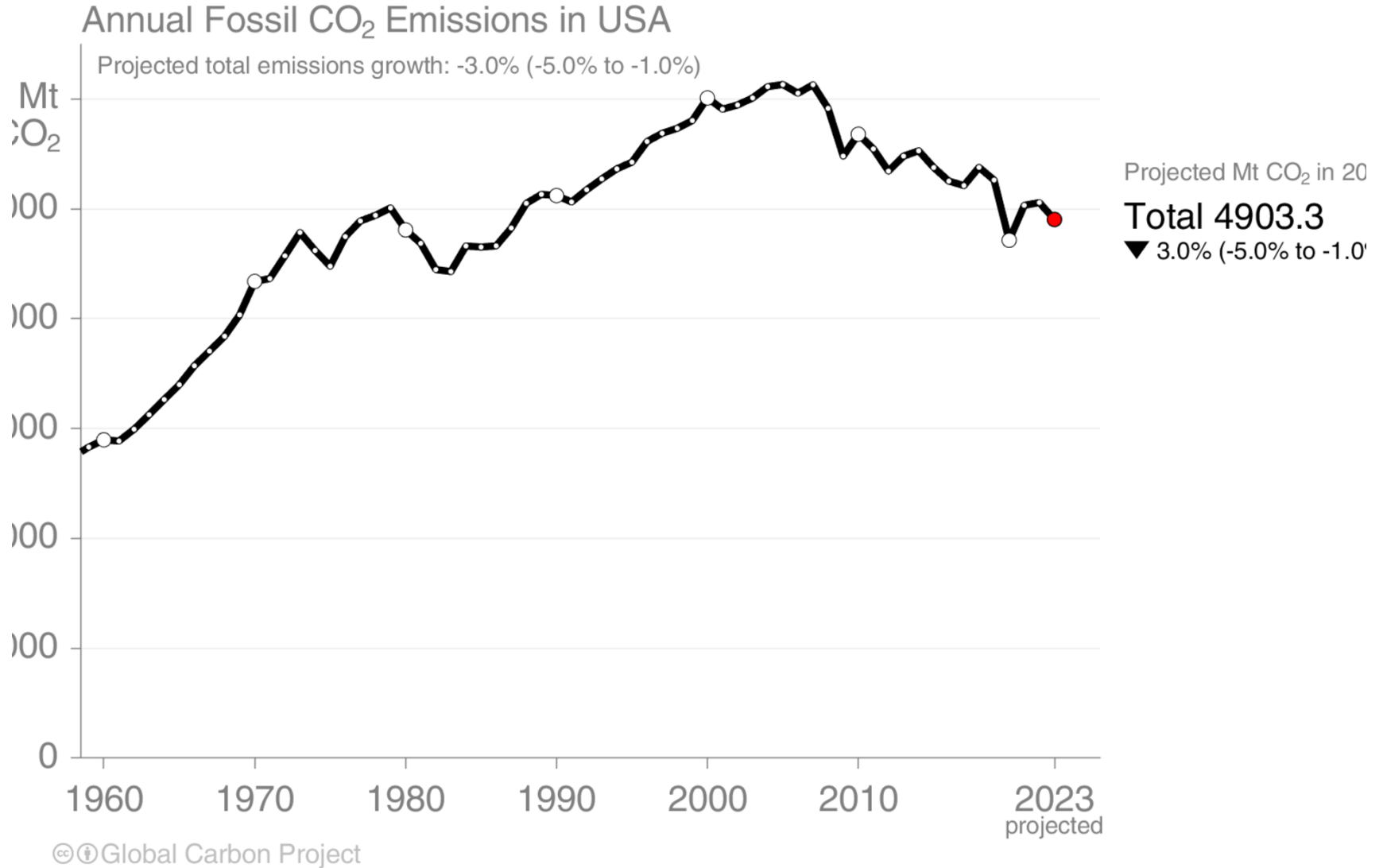
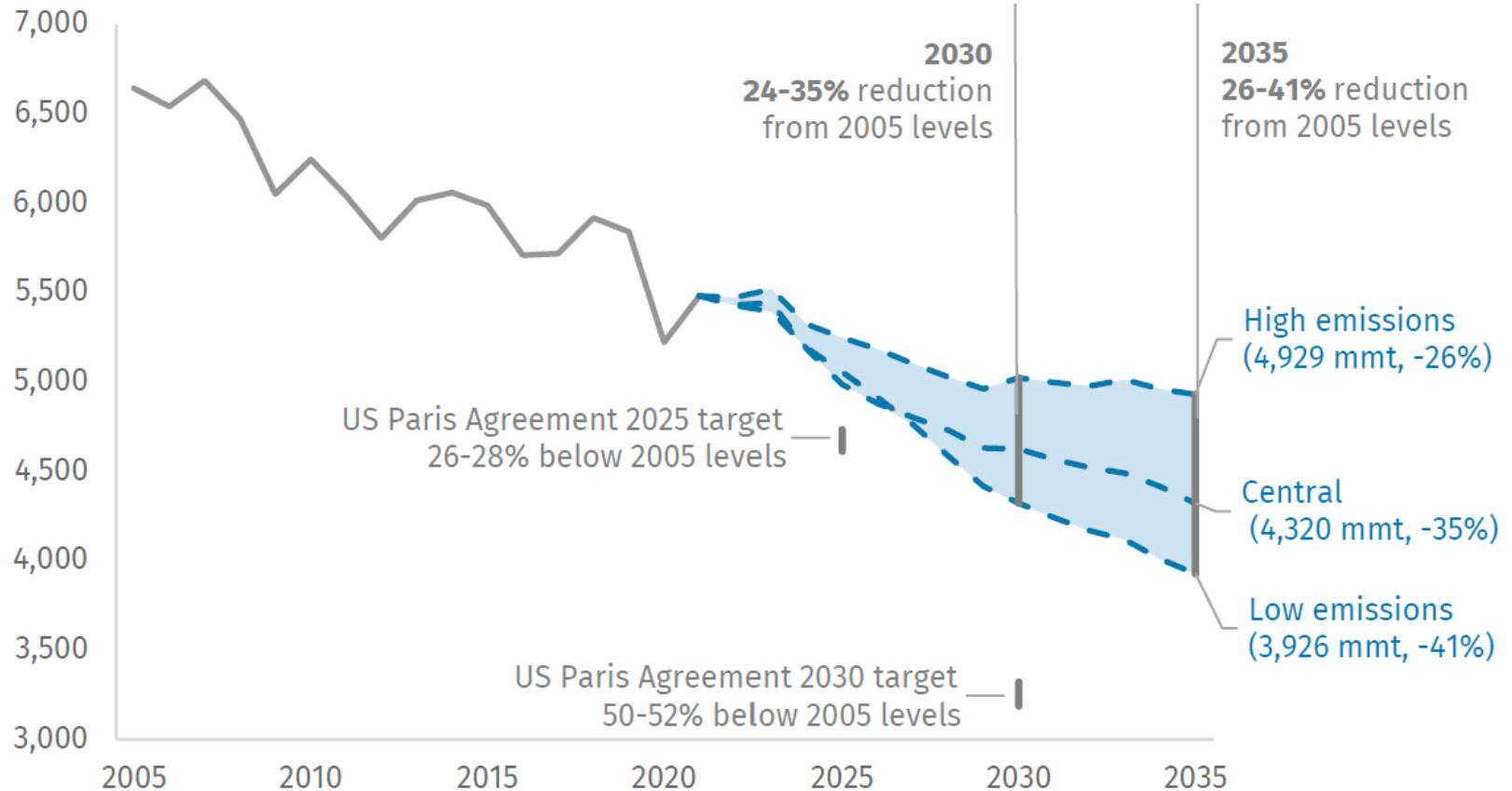


FIGURE 1

US greenhouse gas emissions under current policy

Net million metric tons (mmt) of CO₂e



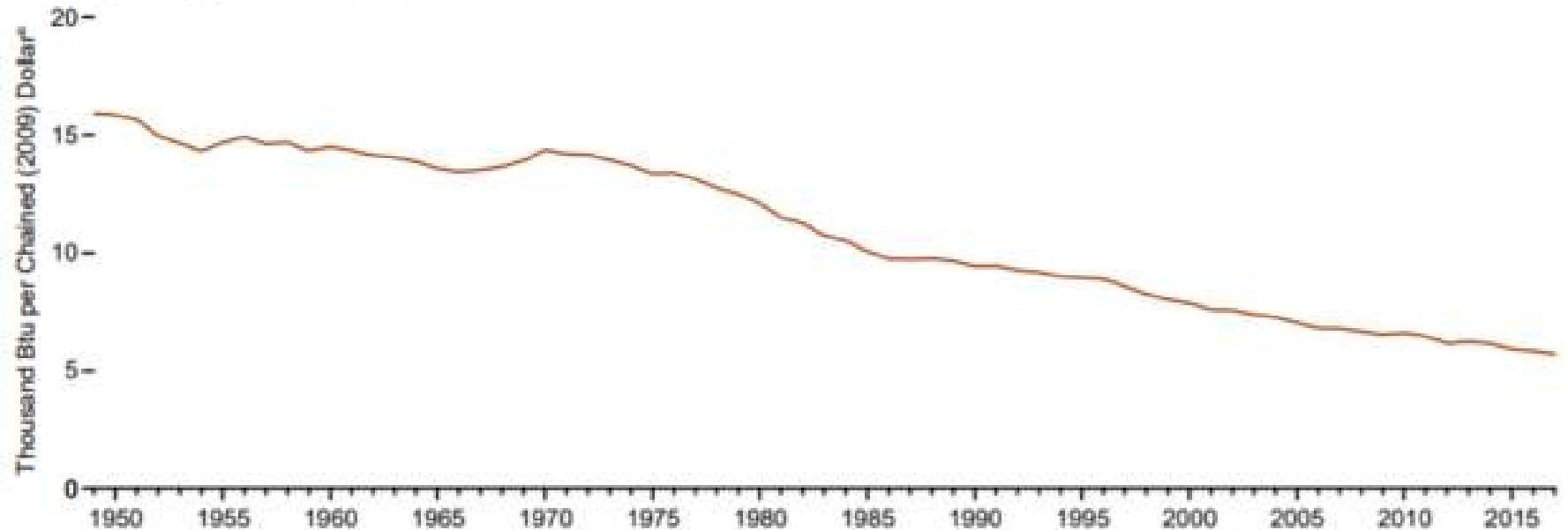
Source: Rhodium Group

“[W]e find that under current policy and with no additional action, the US is on track to reduce emissions by 24-35% below 2005 levels in 2030, and 26-41% below 2005 levels in 2035.

[Source: Rhodium Group, July 2022](#)

**Are US *per capita*
emissions of CO₂
increasing or
decreasing?**

Primary Energy Consumption per Real Dollar^a of Gross Domestic Product, 1949–2017



Data: US Energy Administration

The amount of CO₂ emitted per person has declined in recent years to 15.8 metric tons per person in 2017, the **lowest measured levels in 67 years.**

How Does
CO₂
Affect Climate?

It's the Water (Vapor)

“Most of the warming caused by carbon dioxide does not come directly from carbon dioxide, but from effects known as feedbacks. Water vapor is a particularly important feedback. As the climate warms, the atmosphere becomes more humid. Since water is a greenhouse gas, it serves as a powerful positive feedback to the climate system, amplifying the initial warming. ...water [vapor] greatly amplifies warming caused by increased levels of carbon dioxide.”

NASA Jet Propulsion Laboratory

[Emphasis added]

What are the sources
of anthropogenic
atmospheric CO₂ and
other GHGs?

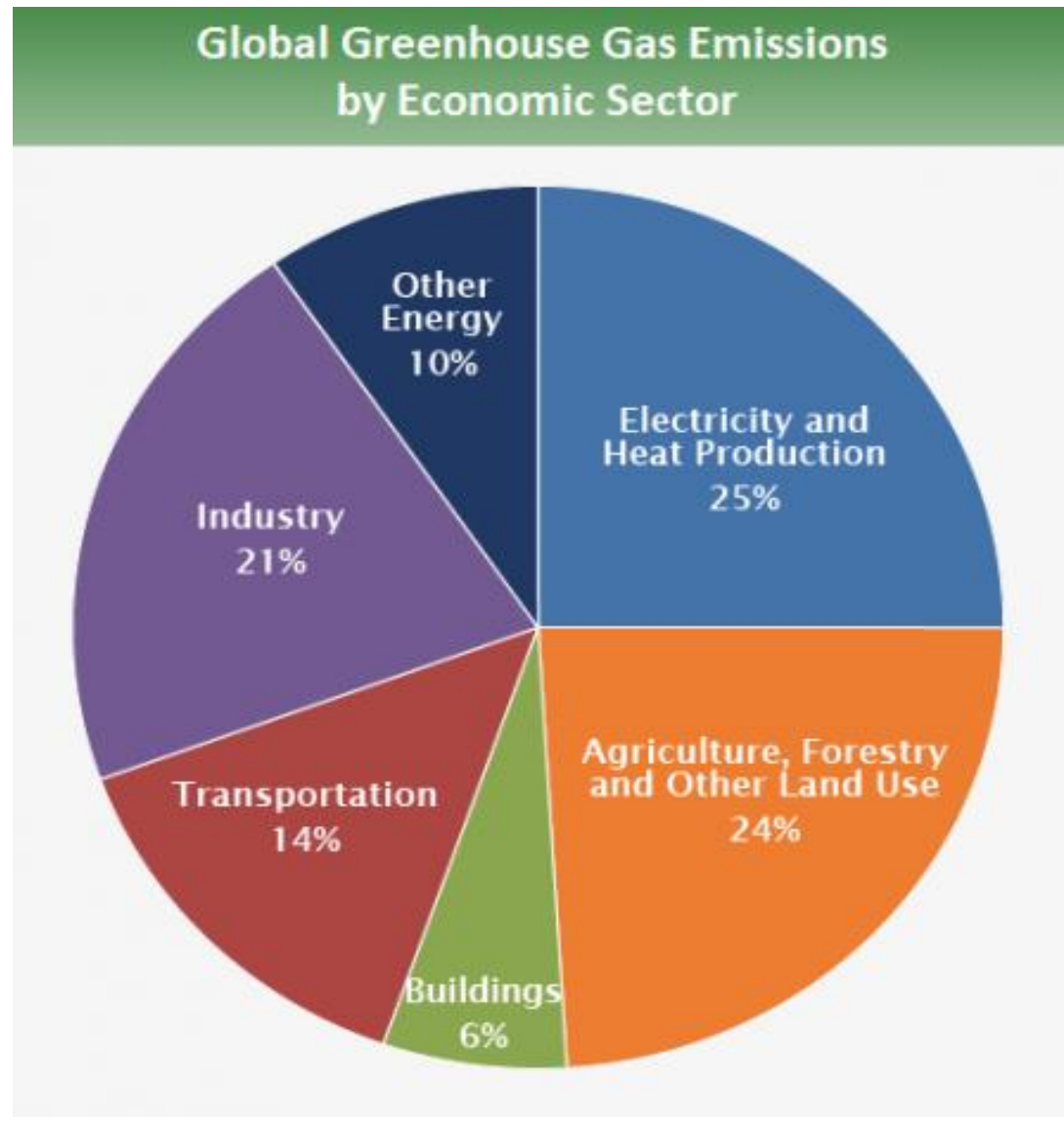


Chart: IPCC, 2014.

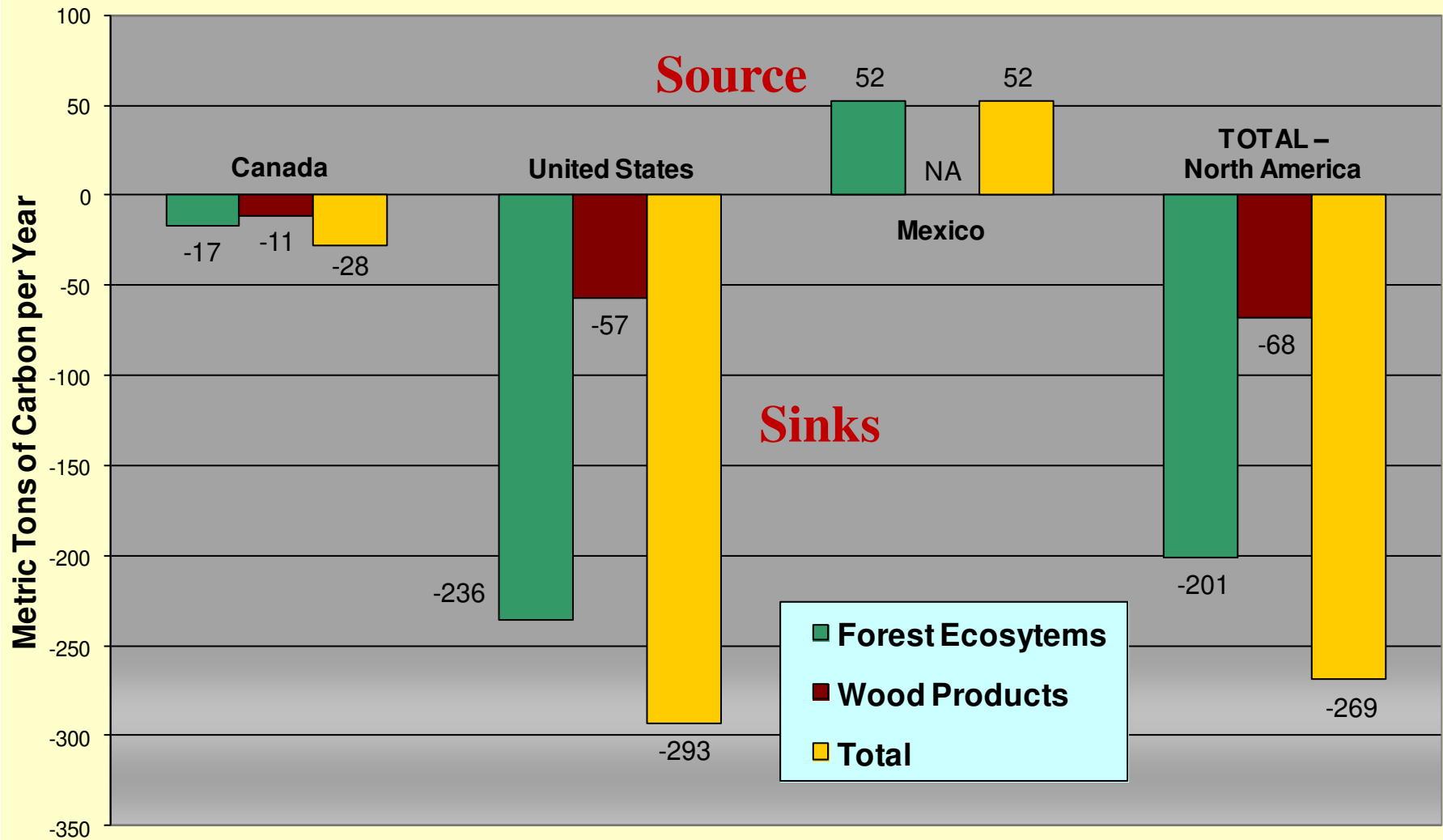
Graph shows GHG sources, but not sinks.

What are the natural
sources and sinks of
CO₂?

Natural sources and sinks of CO₂:

- **Ocean-atmosphere exchange (source and sink)**
- **Animal and plant (forests, etc.) respiration (source and sink)**
- **Volcanic eruptions (source)**

North American Forest Carbon Sinks and Sources



Data: "The First State of the Carbon Cycle Report," U.S. Climate Change Science Program, 2007, www.climatechange.gov

Data: "The First State of the Carbon Cycle Report," U.S. Climate Change Science Program, www.climatechange.gov

Key Climate Change Agreements:

1. UNFCCC
2. Kyoto Protocol
3. Paris Agreement
4. Glasgow Climate Pact
5. COP28

1994: The United Nations Framework Convention on Climate Change (UNFCCC)

1. Recognized that there was a problem: “human activities have been substantially increasing the atmospheric concentrations of greenhouse gases.”
2. Objective: stabilize GHG concentrations “at a level that would prevent dangerous anthropogenic (human induced) interference with the climate system.”
3. “Industrialized countries are expected to do the most to cut emissions.”
4. Financial support for developing nations

Information: unfccc.int

1997: The Kyoto Protocol

Commits industrialized countries to stabilize GHG emissions based on the principles of the Convention through:

1. Binding emissions-reduction commitments by developed countries. More than 100 developing countries, including China and India, were exempted from the treaty.

2. The establishment of flexible market mechanisms (emissions permit trading).

• *192 nations are signatories; the US signed the agreement in 1998, but Congress did not ratify it.*

Information: unfccc.int

Financial support for developing nations:

REDD

Reduce Emissions from Deforestation and forest Degradation

Example:

- In 2015, Norway, Germany, and the UK pledged **\$5 billion** to various nations and funds

Ecosystem Marketplace, tinyurl.com/n9mem47

2015-2016: The Paris Agreement

Paris Conference, December 2015

- Long-term goal: reaffirms the goal of limiting global temperature increase to well below 2 degrees Celsius, while pursuing efforts to limit the increase to 1.5 degrees.
- US “accepted” the agreement in September 2016.
- In June 2020, under President Trump, the US withdrew from the Paris accord

2021: Glasgow Climate Pact

COP26: World agrees to phase out fossil fuel subsidies and reduce coal

(COP = Conference of the Parties to the United Nations Framework Convention on Climate Change)

Nearly 200 countries at the UN climate change summit in Glasgow have also committed to revisit and strengthen their 2030 emissions reductions plans next year, keeping the door open to the crucial 1.5°C temperature goal.

[New Scientist](#), Nov. 13, 2021

2023: COP28 Dubai Highlights (*Forbes*)

Loss and Damage: A landmark agreement to support vulnerable nations facing the worst of climate change's impacts.

Climate Finance Target: A new collective quantified goal (NCQG), which builds on the \$100 billion pledged by developed nations to finance climate mitigation and adaptation initiatives in developing nations.

Global Goal On Adaptation: Continuing a theme from COP27, this COP saw emphasis put on supporting strategies for adapting to the impacts of climate change.

Carbon Markets: Negotiators were trying to further define how credit markets would be supervised and how different types of credits would be accounted for. No agreement was reached....

**What you may not
know about
climate change**



Courtesy: The Columbian

The Columbia River, 1930. *“The river, under what is now the I-5 bridge, was frozen so solid that year that you could drive on it and even land a plane.”*

“Between 1600 and 1814, it was not uncommon for the River Thames to freeze over for up to two months at time.”

www.historic-uk.com/HistoryUK/HistoryofEngland/The-Thames-Frost-Fairs/



Image: Frost Fair on the Thames River, London, 1683, British History Online, www.british-history.ac.uk

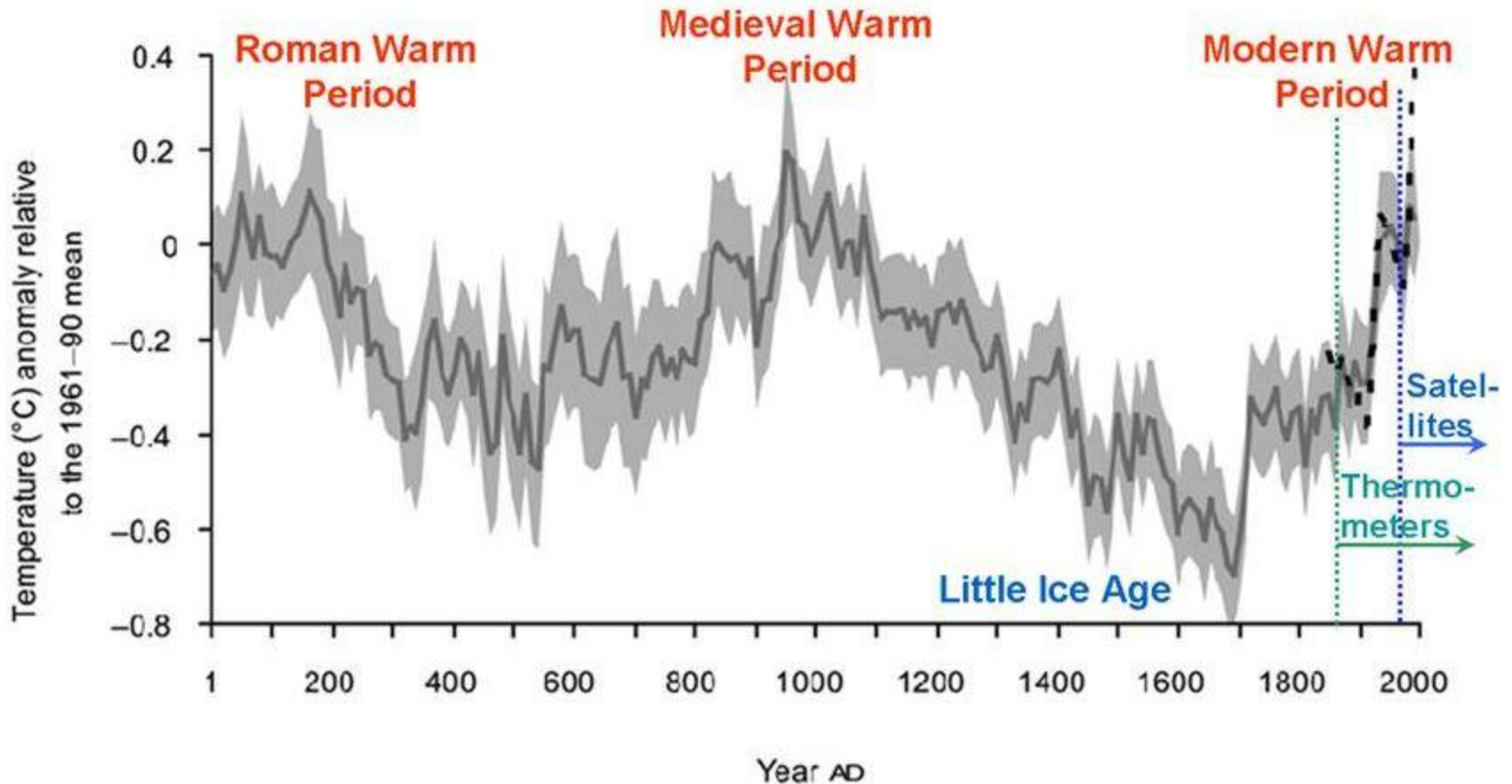
The Last Frost Fair, 1814

www.historic-uk.com/HistoryUK/HistoryofEngland/The-Thames-Frost-Fairs/



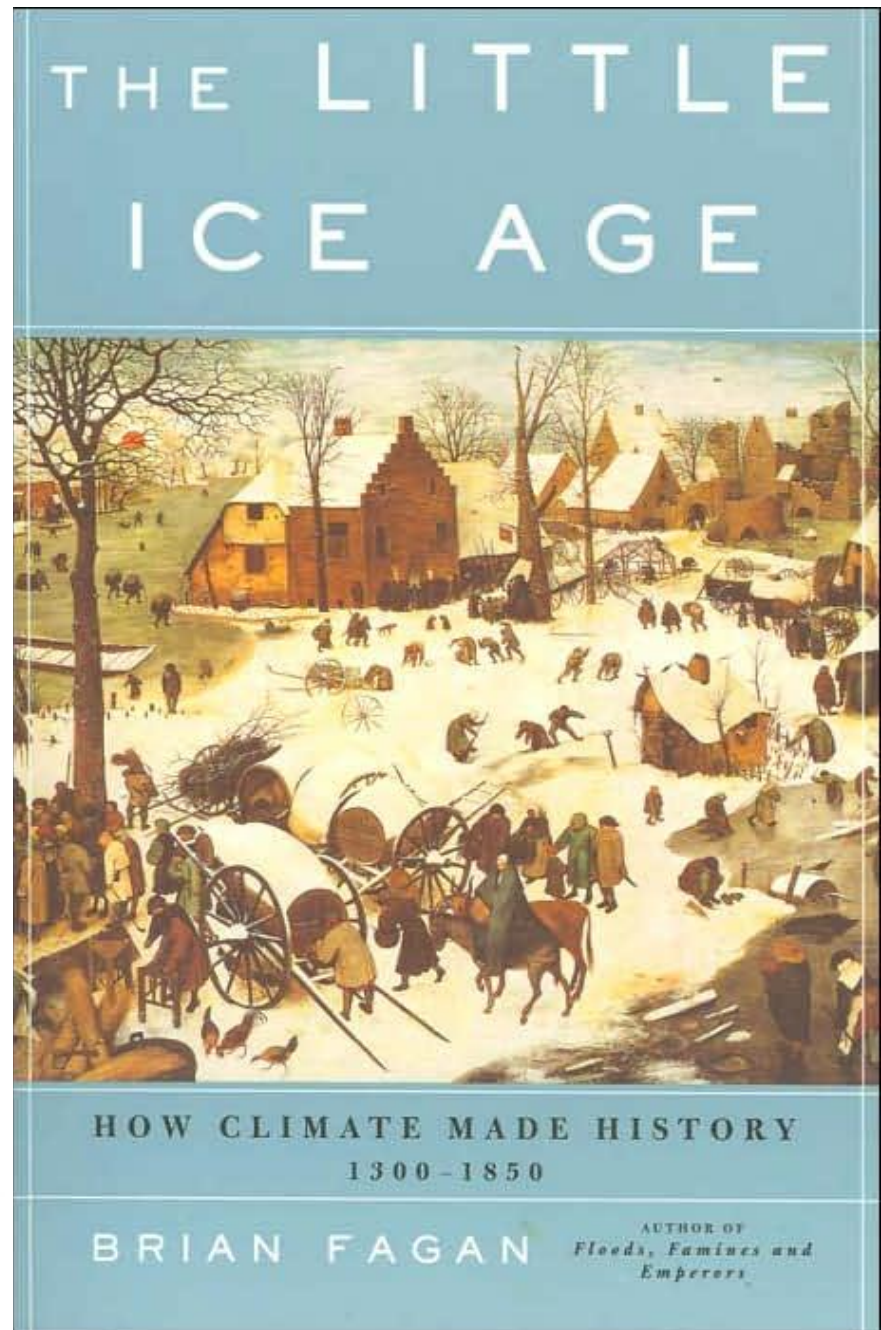
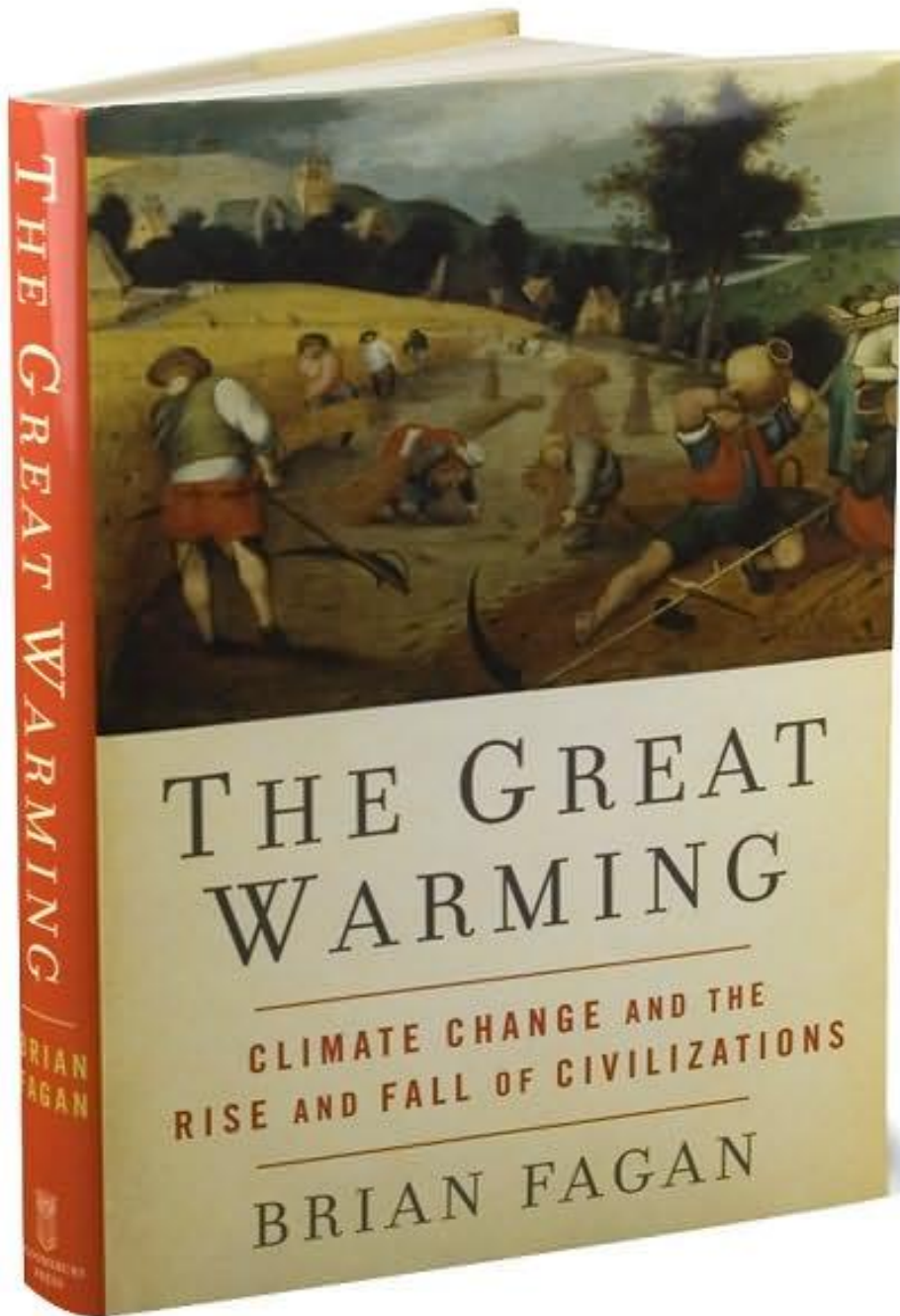
“By the 1800’s the climate had started to warm, the severity of the winters had waned, and the last ever London Frost Fair took place in the January of 1814.”

2,000 Years of Climate Change



*Ljungqvist, F.C. 2010. A new reconstruction of temperature variability in the extra-tropical Northern Hemisphere during the last two millennia. *Geografiska Annaler: Physical Geography*, Vol. 92 A(3), pp. 339-351, September 2010. DOI: 10.1111/j.1468-0459.2010.00399.x

[Another chart.](#)



THE THIRD HORSEMAN

CLIMATE CHANGE and THE GREAT FAMINE
of THE 14TH CENTURY



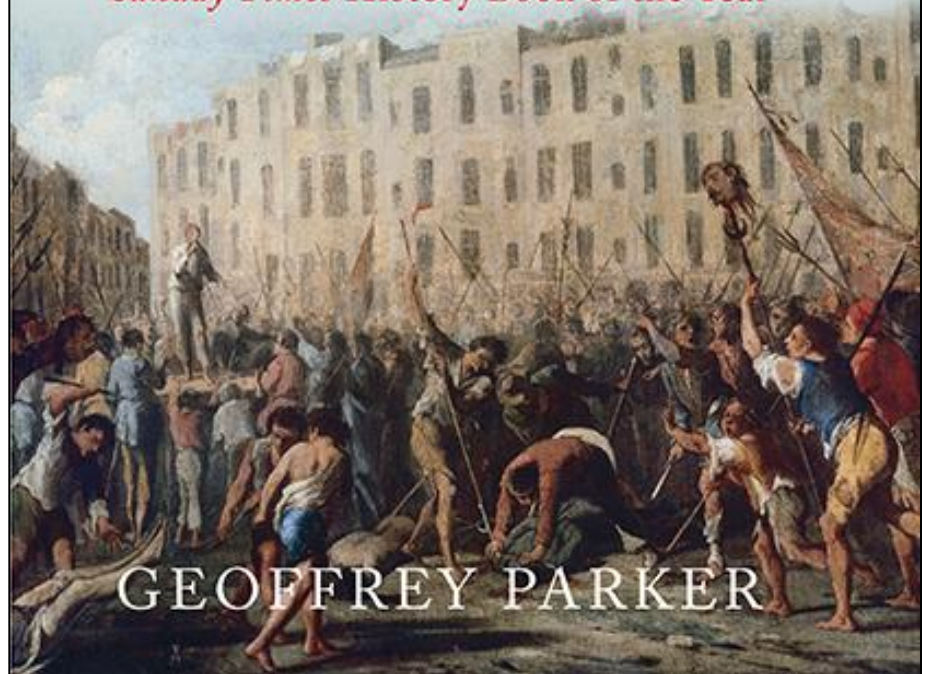
author of JUSTINIAN'S FLEA

WILLIAM ROSEN

GLOBAL CRISIS

WAR, CLIMATE CHANGE
& CATASTROPHE IN THE
SEVENTEENTH CENTURY

'Sunday Times History Book of the Year'



GEOFFREY PARKER

Perspective: Drought and Climate Change

**Latin root meaning of “perspective”:
“look through” or “perceive”**

North American Drought: A Paleo Perspective

The Beginning

The Story

The Data

A Final Word

Site Map

Paleo Home

The Last 2,000 Years

When records of drought for the last two millennia are examined, the major 20th century droughts appear to be relatively mild in comparison with other droughts that occurred within this time frame. Even the 16th century drought appears to be fairly modest, when compared to some early periods of drought. Although there are still a few high



resolution (offering data on annual to seasonal scales), precisely dated (to the calendar year), tree-ring records available paleodrought data that extends back this coarsely resolved. These records reflect overall conditions rather than single droughts in these records with 20th century droughts in these records with 20th century can still be evaluated in this context the 20th century or the 20th century as a with these records. The studies below illustrate past 2,000 years:

And 21st century droughts

- [Moon Lake Record of Great Plains Drought](#)
- [Rainfall Reconstructions for New Mexico](#)
- [A Multimillennial-length Record of Precipitation from Bristlecone Pine](#)
- [Drought and Mayan Civilization Collapse Back to... The Data](#)

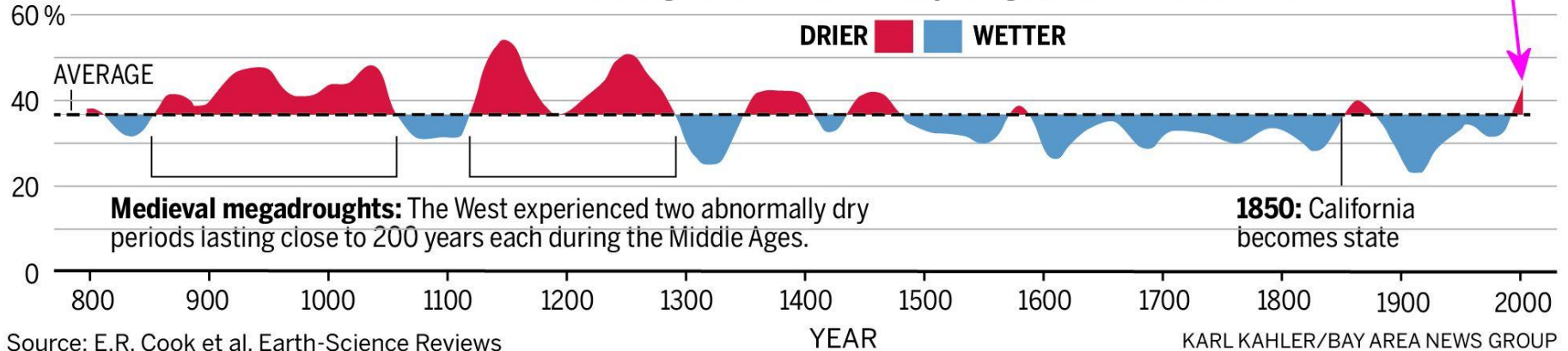
“When records of drought for the last two millennia are examined, the major 20th century droughts appear to be relatively mild in comparison with other droughts that occurred within this time frame.”

National Climatic Data Center (NCDC),

www.ncdc.noaa.gov/paleo/drought/drght_2000years.html.

A 200-year drought?

Evidence from tree rings shows that drought was historically much more widespread in the American West than now, while the 20th century was wetter than normal. Percentage of the West affected by drought from 800 A.D. to 2000:



California drought: Past dry periods have lasted more than 200 years, scientists say

San Jose Mercury-News, January 25, 2014

“The longest droughts of the 20th century, what Californians think of as severe, occurred from 1987 to 1992 and from 1928 to 1934. Both ... are minor compared to the ancient droughts of 850 to 1090 and 1140 to 1320.” [emphasis added]

Next Week:

1. Climate Crazy

2. Says Who?

3. “CO₂ Obsession”

Position Statement