

**Northern Minnesota Issues Forum  
Oct 12<sup>th</sup> 2019**

**Climate Change in Northern MN**

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<https://elyminnesota.com/elyclimate/>

Ely Climate Change Group  
Ely Chapter of Citizens' Climate Lobby

**Credits:**

UN IPCC, 4<sup>th</sup> National Climate Assessment,  
World Met Office, MPCA, DNR, IEA, UCS,  
Nat Ice & Snow Center, NOAA, NASA,  
U Minnesota, Inside Climate News,  
Fresh Energy, Climate Central,  
Climate Gen, Wash Post, NY Times,  
friends and colleagues – thank you

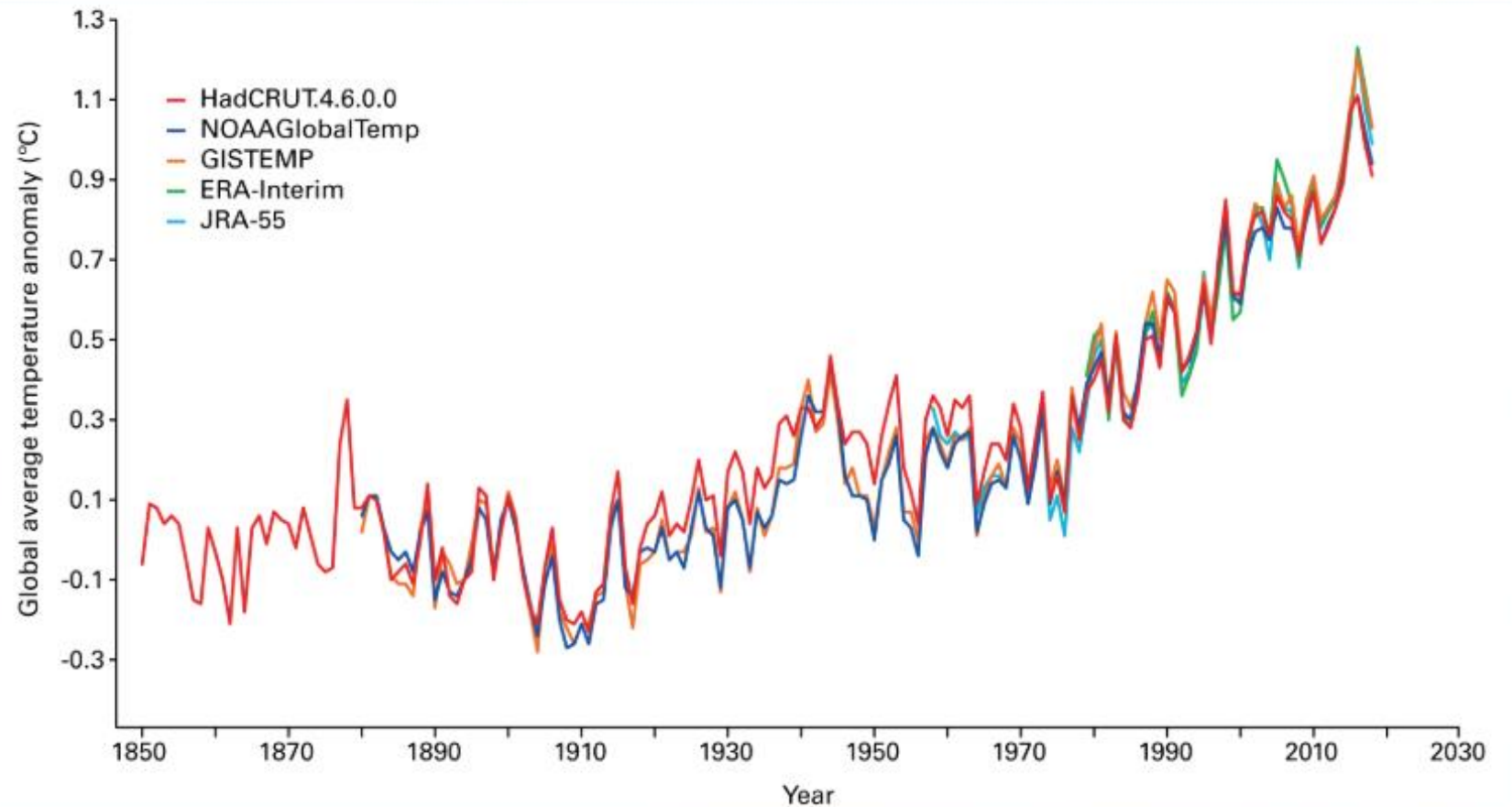


This shows the global atmospheric temp increase compared to a 1850 – 1900 baseline.

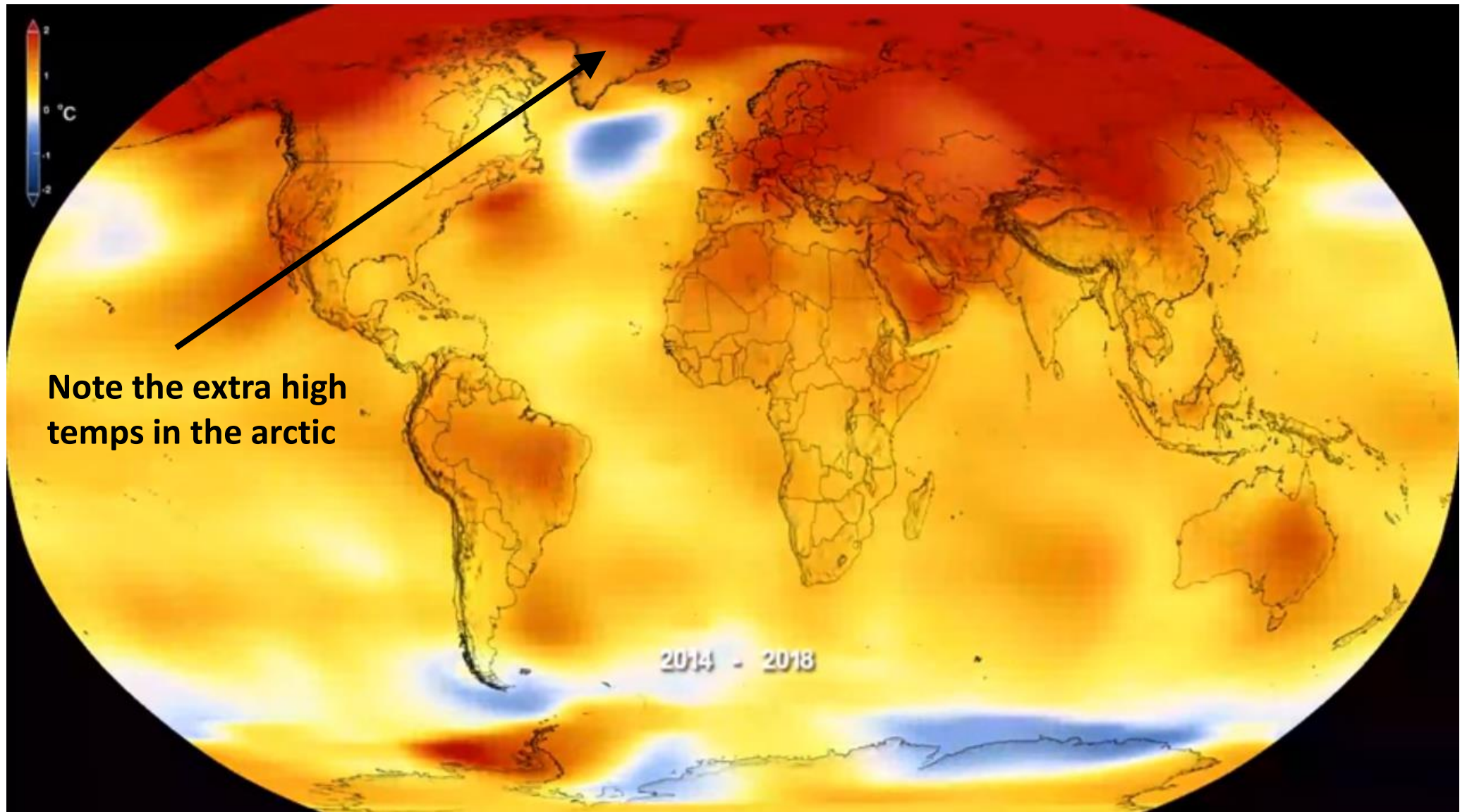
We are now at 1.1C increase

1.5C is imminent and inevitable

2C by 2050, 3C by 2080



Global mean temperature anomalies with respect to the 1850-1900 baseline, for the five global datasets (*Data source: UK Met Office Hadley Centre*)



Temperature changes from 1880 to 2018 <https://svs.gsfc.nasa.gov/4626>

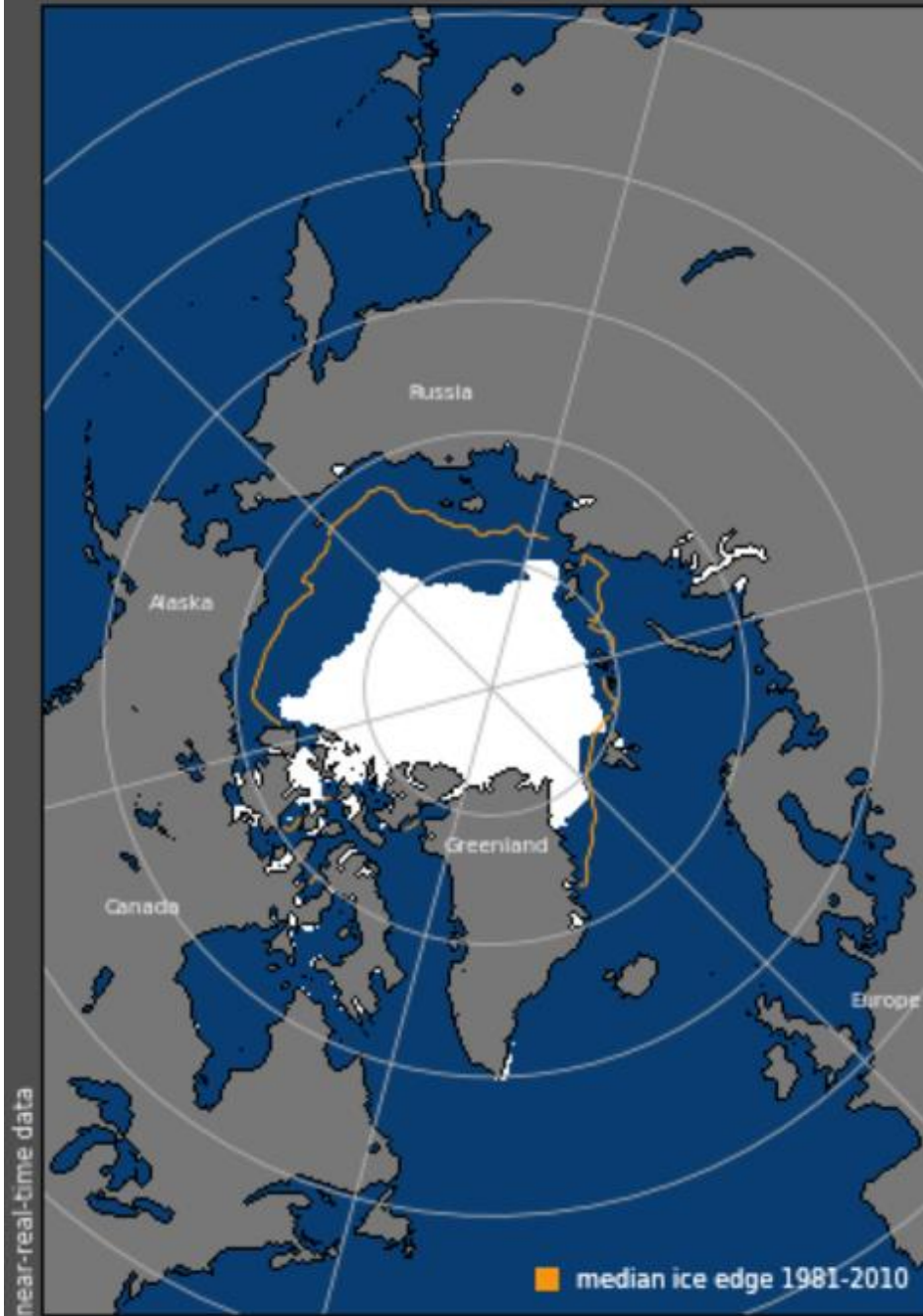




## Muir Glacier Alaska, 1941 (left) and 2014 (right)

[https://climate.nasa.gov/climate\\_resources/4/graphic-dramatic-glacier-melt/](https://climate.nasa.gov/climate_resources/4/graphic-dramatic-glacier-melt/)

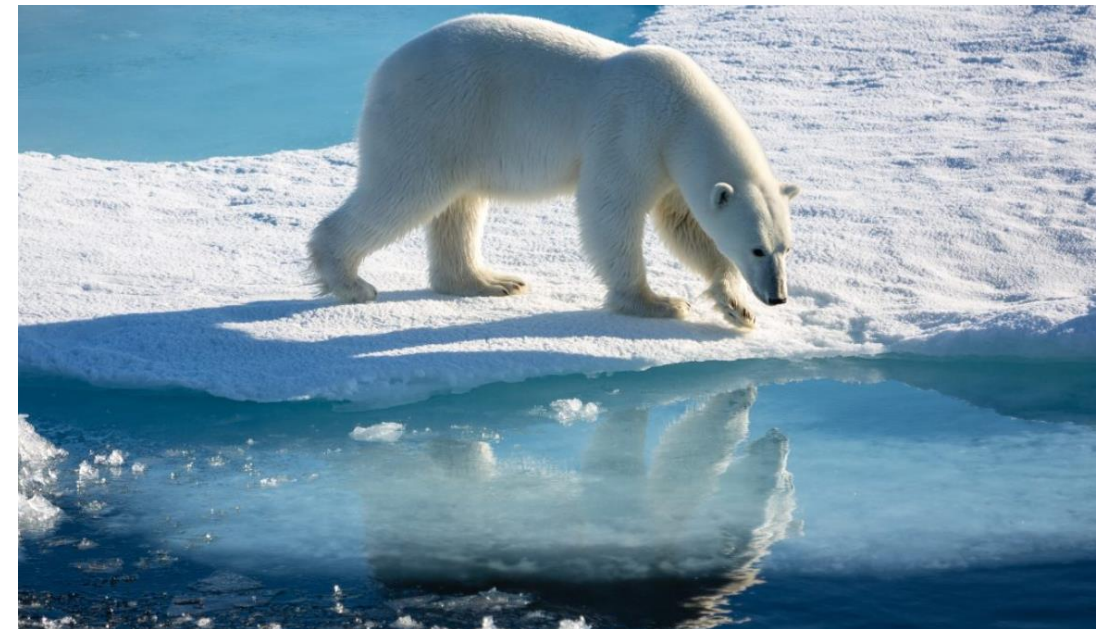
## Sea Ice Extent, 18 Sep 2019



[Arctic sea ice reaches second lowest minimum in satellite record September 23, 2019](http://nsidc.org/arcticseaicenews/2019/09/)

<http://nsidc.org/arcticseaicenews/2019/09/>

The lack of summer sea ice opens the arctic to shipping, resource extraction, but harms ocean ecosystems and wildlife.







As permafrost melts infrastructure and trees which depend on a solid base become unstable. To the left are “drunken trees”  
<https://www.sciencephoto.com/media/673805/view/drunken-forest-in-fairbanks-alaska>

Leaning buildings in Dawson Alaska  
<https://www.northtoalaska.com/ViewPoint.aspx?RouteId={4A0AE0F5-0212-42A2-9489-7C2E3F065936}&PinpointId={4D4D616C-0BE9-4279-8FE6-4DFD28435AB3}>





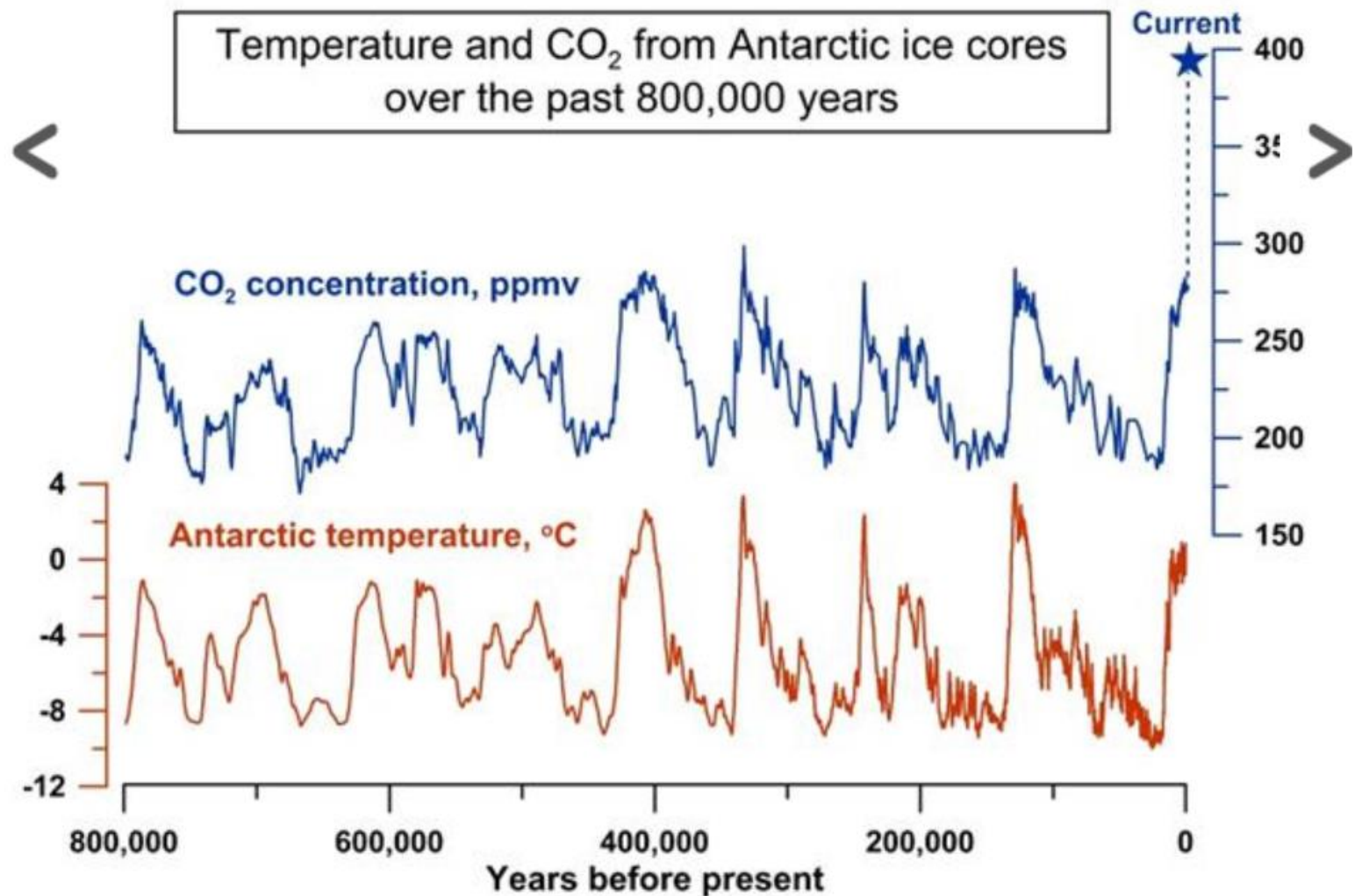


Organic material is melting permafrost decays to methane if it is wet, or to CO<sub>2</sub> in a dry environment. Both are greenhouse gases, methane is more potent than CO<sub>2</sub> and burns when released from under lake ice.

<https://gfycat.com/sphericalmediocrebasilisk>

Here are graphs of CO<sub>2</sub> (blue) and temperature (brown) for the last 800,000 years. During ice ages CO<sub>2</sub> is low and the temp is cold. Between ice ages the temp rises and CO<sub>2</sub> is also higher.

Our current CO<sub>2</sub> level is over 400 ppm shown by the star on the extreme upper right. On geological timescales the rise has been very fast. Most of the temperature rise that we can expect has not yet happened.



<https://niwa.co.nz/atmosphere/research-projects/greenhouse-gases-and-climate-sensitivity-insights-from-ice-cores>





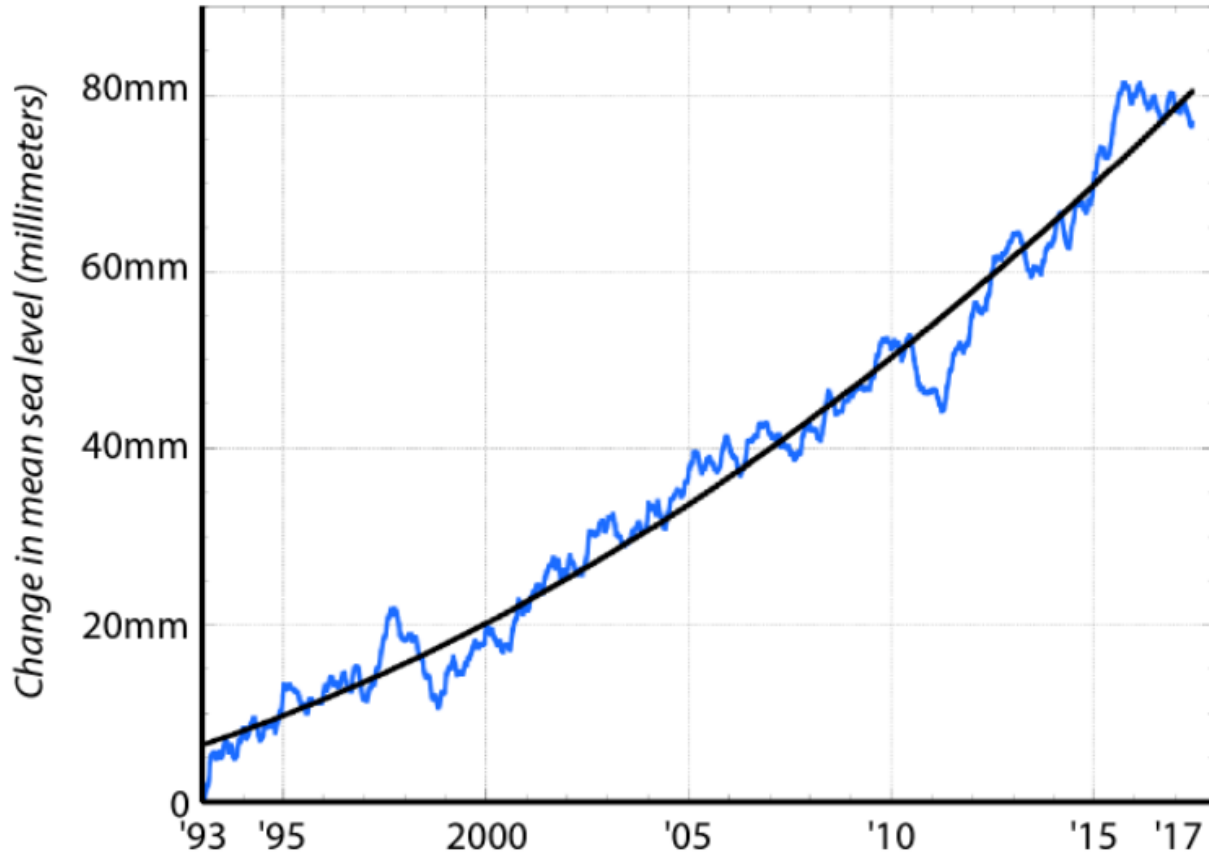
Floods (Hurricane Harvey Texas)

Droughts (former Lake Poopo, Bolivia)



## AVERAGE GLOBAL SEA LEVEL RISE

In millimeters as measured by satellite, 1993-2017



SOURCE: Steve Nerem/University of Colorado, Boulder

InsideClimate News

Sea level rise now 3mm/year, rate doubles every 7 years  
By 2100 we can expect 3 to 8 feet of rise

The red area shows land that would be affected in Florida by a 1m (40") sea level rise. 1.5 million people live in this area. Many of the world's largest cities are close to sea level.

<https://uanews.arizona.edu/story/rising-seas-will-affect-major-u-s-coastal-cities-by-2100>









**Tree species changes:**

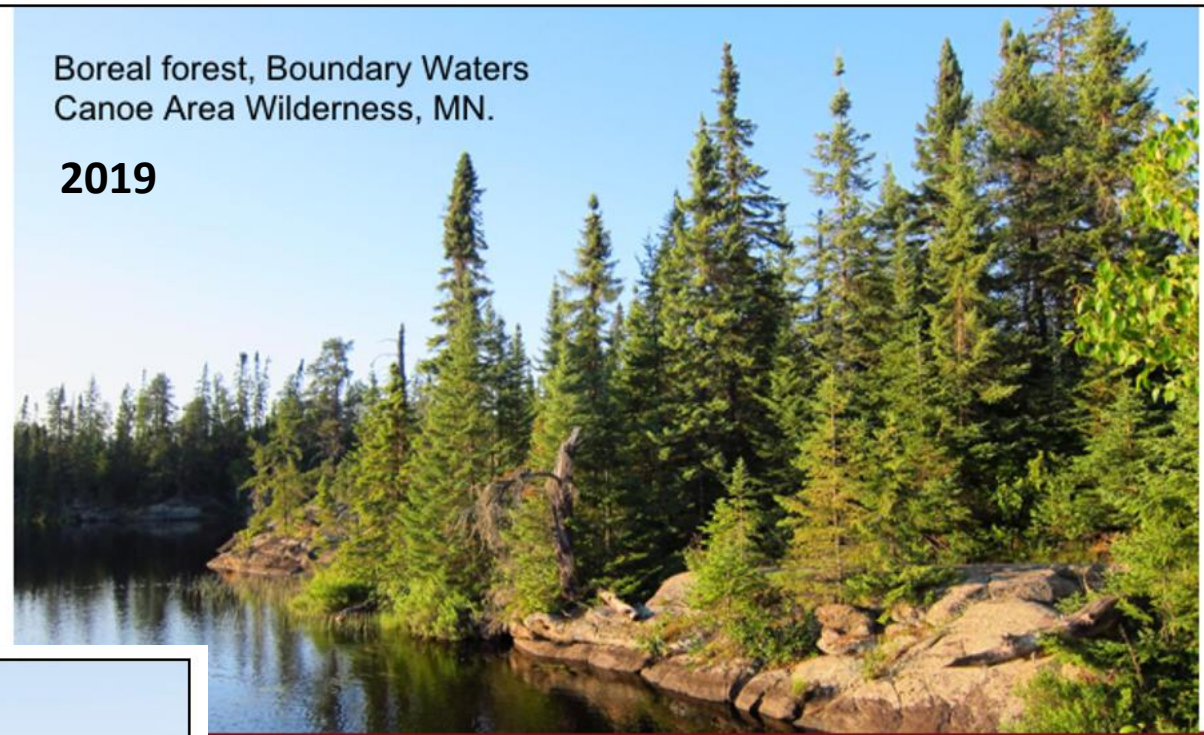
**Boreal species - spruce, balsam, red pine, aspen, birch**

**replaced by temperate species - elm, oak, basswood, hickory**

**What will the future landscape look like?**

Boreal forest, Boundary Waters Canoe Area Wilderness, MN.

**2019**



**Future**

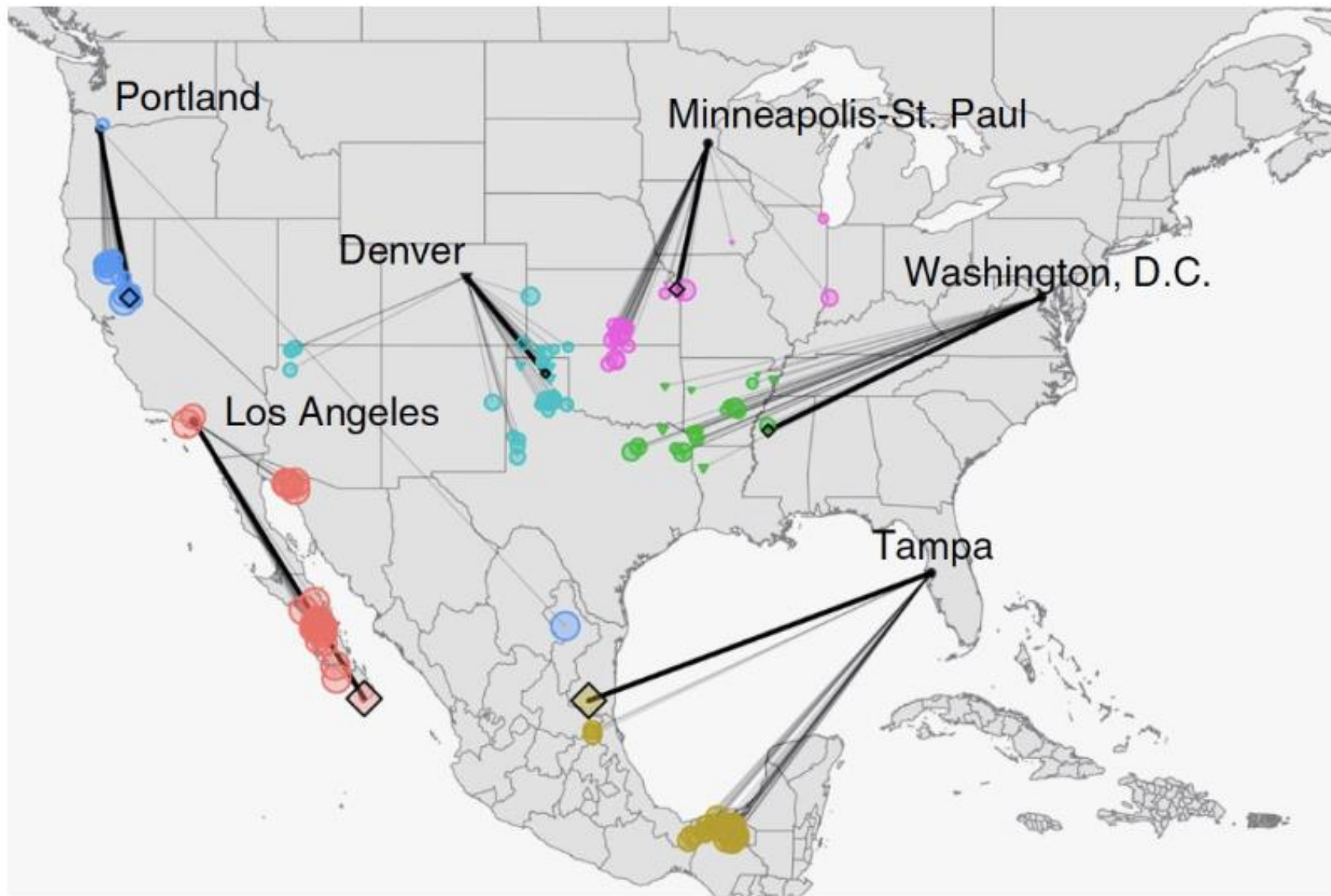


Analog for future of boreal forest in the BWCAW—lake and rocky shore scenery, Gneiss Outcrops Natural Area

Thanks to Lee Frelich, U Minnesota

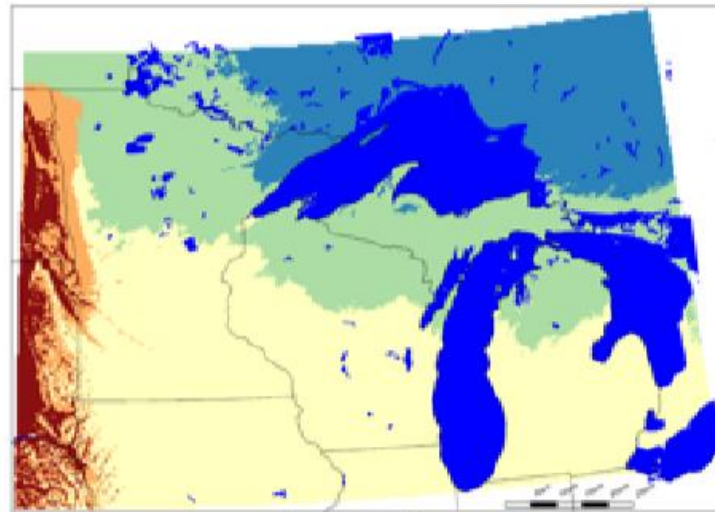






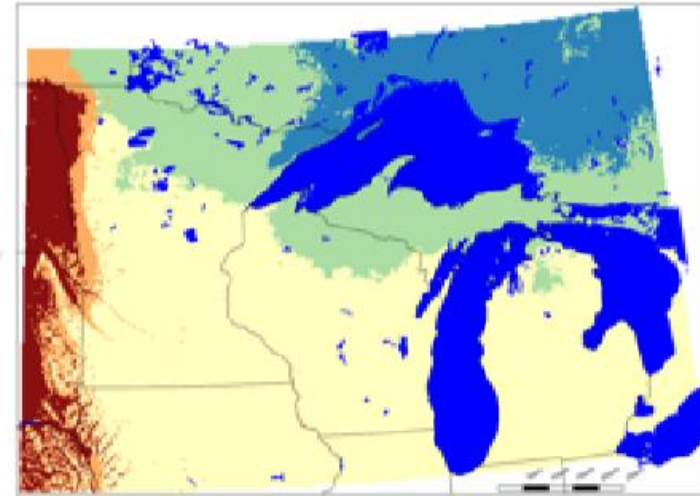
MATT FITZPATRICK/UNIVERSITY OF MARYLAND CENTER FOR ENVIRONMENTAL SCIENCE

Future biome distribution in MN depends on choices made now for high or low CO2 emission scenarios



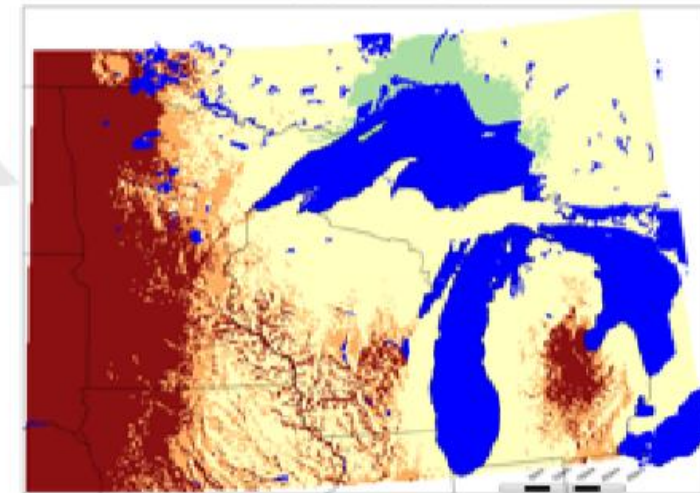
Current

Low



Future-2070

High





## Changes in Minnesota

2019 has been the wettest year on record. Farmers have had problems planting and harvesting. Much rain has come in heavy storms bringing run off and flooding.

Nutrient runoff makes algae in lakes

Mosquitoes and ticks bringing new diseases

Heat stress to people and animals

2/3 USA bird species face extinction

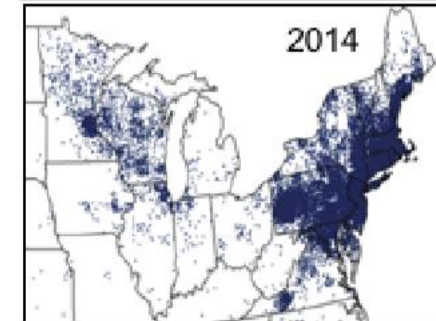
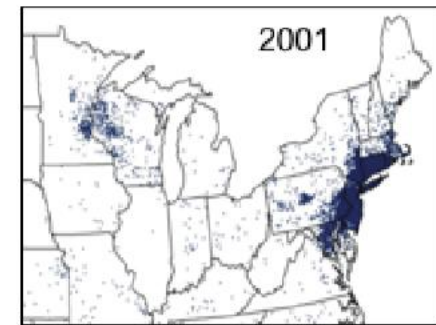
No loons by 2080 (StarTribune, 10/13/2019)

Longer pollen season, allergies and asthma

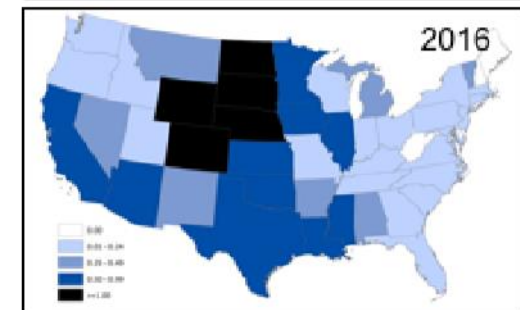
Disproportionate risks to low income communities, people of color and indigenous communities.

<https://www.epa.gov/climate-indicators/climate-change-indicators-lyme-disease>

<https://www.cdc.gov/westnile/statsmaps/cumMapsData.html>




Lyme disease



West Nile Virus Disease





A group of people, including men in suits and women in blue shirts, standing in front of a wooden podium in a grand hall with flags.

**Spring 2019 St Paul**

**Major Minnesota companies are urging state lawmakers to address climate change as part of final policy and spending negotiations at the Capitol.**

**General Mills, Best Buy, Target, Cargill, Aveda, Uponor, Cliff Bar, Ben and Gerrys**

<https://www.mprnews.org/story/2019/05/08/cargill-target-ask-lawmakers-to-address-climate-change-in-final-capitol-negotiations>

Locally – need to get BOTH houses into DFL hands  
2019 the senate stymied many good measures from the house

A house vote April 2019 declared **“Greenhouse gas emissions resulting from human activities are a key cause of climate change.”**

Voting YES - all 75 Democrats and 4 Republicans

Abstaining - 5 Republicans

Voting NO - 50 Republicans

2019 DFL proposals in the house

- Policy to require a carbon free power grid by 2050
- Expand MN community solar garden program
- Put solar on K-12 school roofs and in state parks
- Buy electric buses for Metro Transit
- Give a rebate to people who buy electric cars and “Clean Cars Minnesota”
- Clean Energy First - Change state regulatory policy so that utility companies adding new power sources had to give renewables a far stronger preference.

**THESE PROPOSALS PASSED IN THE HOUSE AND FAILED IN THE SENATE**



# The Green New Deal

**Rep. Alexandria Ocasio-Cortez, Senator Ed Markey**

**Promotes: Net zero emissions by 2050 or before, renewable energy, transportation, reduce economic inequality, universal health care, education, and preventing monopolies**

**Opposes: carbon and emissions trading, carbon offsets, carbon capture and storage, nuclear power, waste to energy, biomass energy**

**General support from ALL Democratic Presidential candidates**

**Trump's comment: "It will permanently eliminate all Planes, Cars, Cows, Oil, Gas & the Military"**



# Democratic Presidential Candidates' Plans

**Rejoin Paris Accord**

**Decarbonize by 2050**

**Ban drilling on public lands**

**Ban on fracking**

**Fuel standards, electric cars,  
green public transportation**

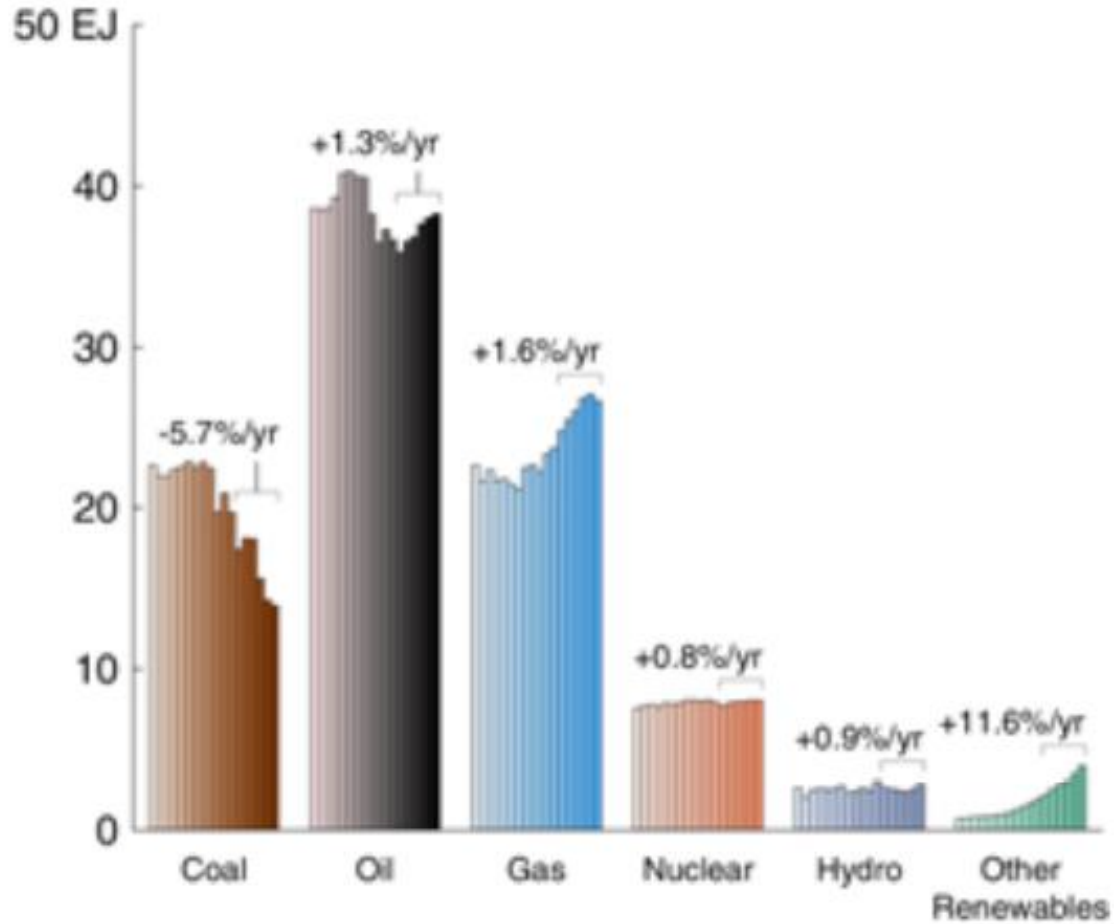
**Efficiency Standards**

**Carbon Fee and Dividend**

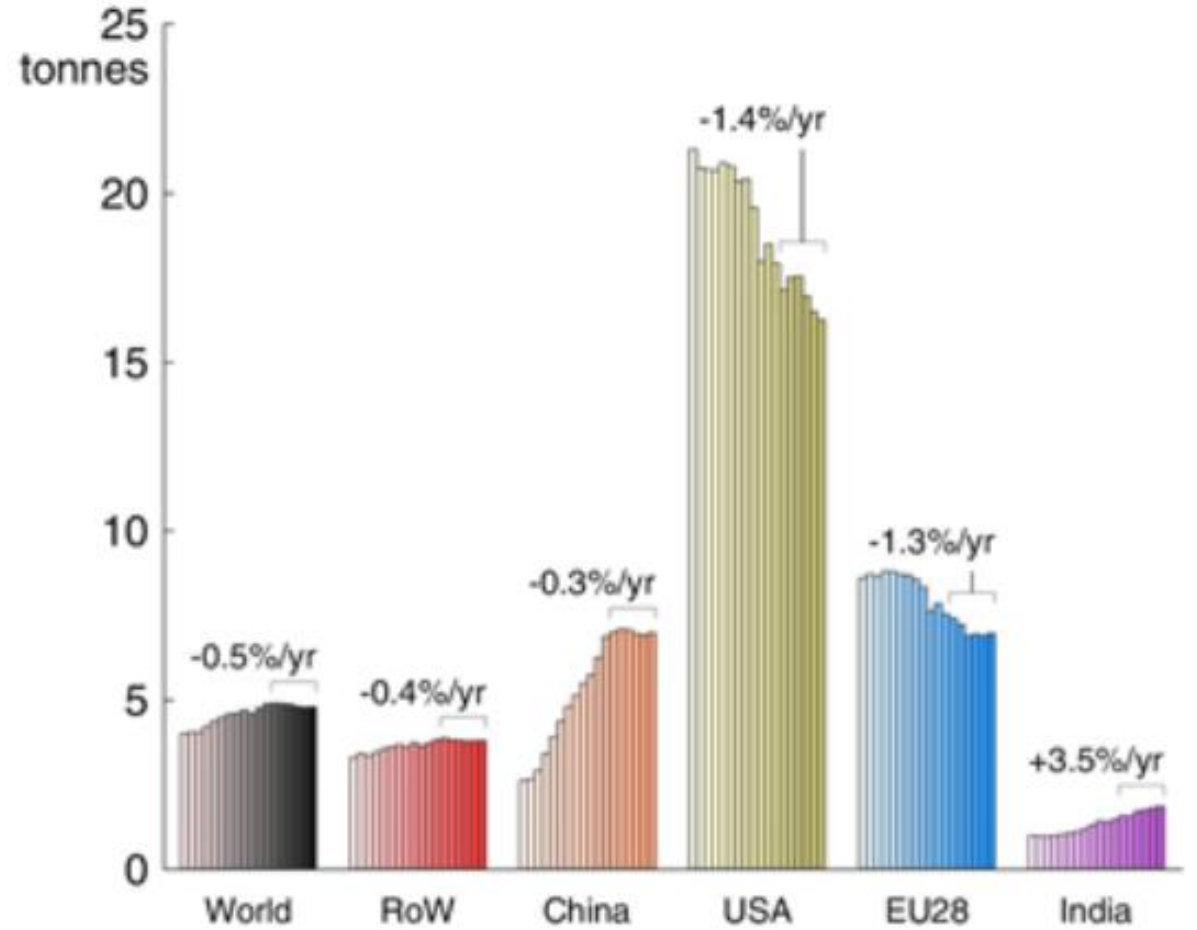




USA energy sources 2000 - 2017



CO2 emissions per person 2000 - 2017



[https://www.globalcarbonproject.org/carbonbudget/18/files/GCP\\_CarbonBudget\\_2018.pdf](https://www.globalcarbonproject.org/carbonbudget/18/files/GCP_CarbonBudget_2018.pdf)

Source: [BP 2018](#); [Jackson et al 2018](#); [Global Carbon Budget 2018](#)

**What can an individual person do right now?**

**Have fewer kids/grand kids**

**Drive a small electric car fewer miles**

**Install solar or support local solar/wind power**

**Don't fly if you can avoid it**

**Efficiency in home – insulation, appliances**

**Buy local, consume less, plant trees**

**Talk to your family, friends, church, neighbors about climate change**

***Lobby your political reps for good regional and national policies***

***Encourage support of developing countries, technology, education for girls***



**Greta Thunberg to UN**    Sept 27<sup>th</sup> 2019

This is all wrong. I shouldn't be standing here. I should be back in school on the other side of the ocean. Yet you all come to me for hope? How dare you!

You have stolen my dreams and my childhood with your empty words. And yet I'm one of the lucky ones. People are suffering. People are dying. Entire ecosystems are collapsing.

We are in the beginning of a mass extinction. And all you can talk about is money and fairytales of eternal economic growth. How dare you!

For more than 30 years the science has been crystal clear. How dare you continue to look away and come here saying that you are doing enough, when the politics and solutions needed are still nowhere in sight.













## **Citizens' Climate Lobby Energy Innovation Act – Congress HR 763 “Carbon Fee and Dividend”**

**US Govt collects a fee on coal and oil as it comes from the ground  
Returns all the money to households as a monthly dividend – revenue neutral**

**Price of gasoline and other carbon based products will rise  
More than 70% of consumers will get more back in the dividend than they spend**

**The fee rises slowly each year and so does the dividend**

**Goods containing less energy intensive carbon will become less expensive,  
economy will shift to “greener” products. Reduces CO2 by 40% in 10 years**

**Extra cash stimulates overall economy and creates jobs**

**Citizens' Climate Lobby**