

# The effects of climate change on the Ennis, Montana Area

*"Prediction is very difficult, especially about the future."*  
Niels Bohr, Danish physicist (1885-1962)

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## **From the Executive Summary of the United States Global Change Research Program transmitted to the Congress and the President**

**“Observations show that warming of the climate is unequivocal. The global warming observed over the past 50 years is due primarily to human-induced emissions of heat-trapping gases. These emissions come mainly from the burning of fossil fuels (coal, oil, and gas), with important contributions from the clearing of forests, agricultural practices, and other activities.”**

**“Warming over this century is projected to be considerably greater than over the last century. The global average temperature since 1900 has risen by about 1.5°F. By 2100, it is projected to rise another 2 to 11.5°F.”**

# Even Major Oil Companies Have Accepted This

## U.S. energy giants led by Exxon Mobil join global coalition to slow down climate change

“Exxon Mobil said Thursday it was joining a corporate coalition working toward the goals of Paris climate change agreement, the boldest move yet by the oil giant that has faced criticism for past attempts to cast doubts about climate change.

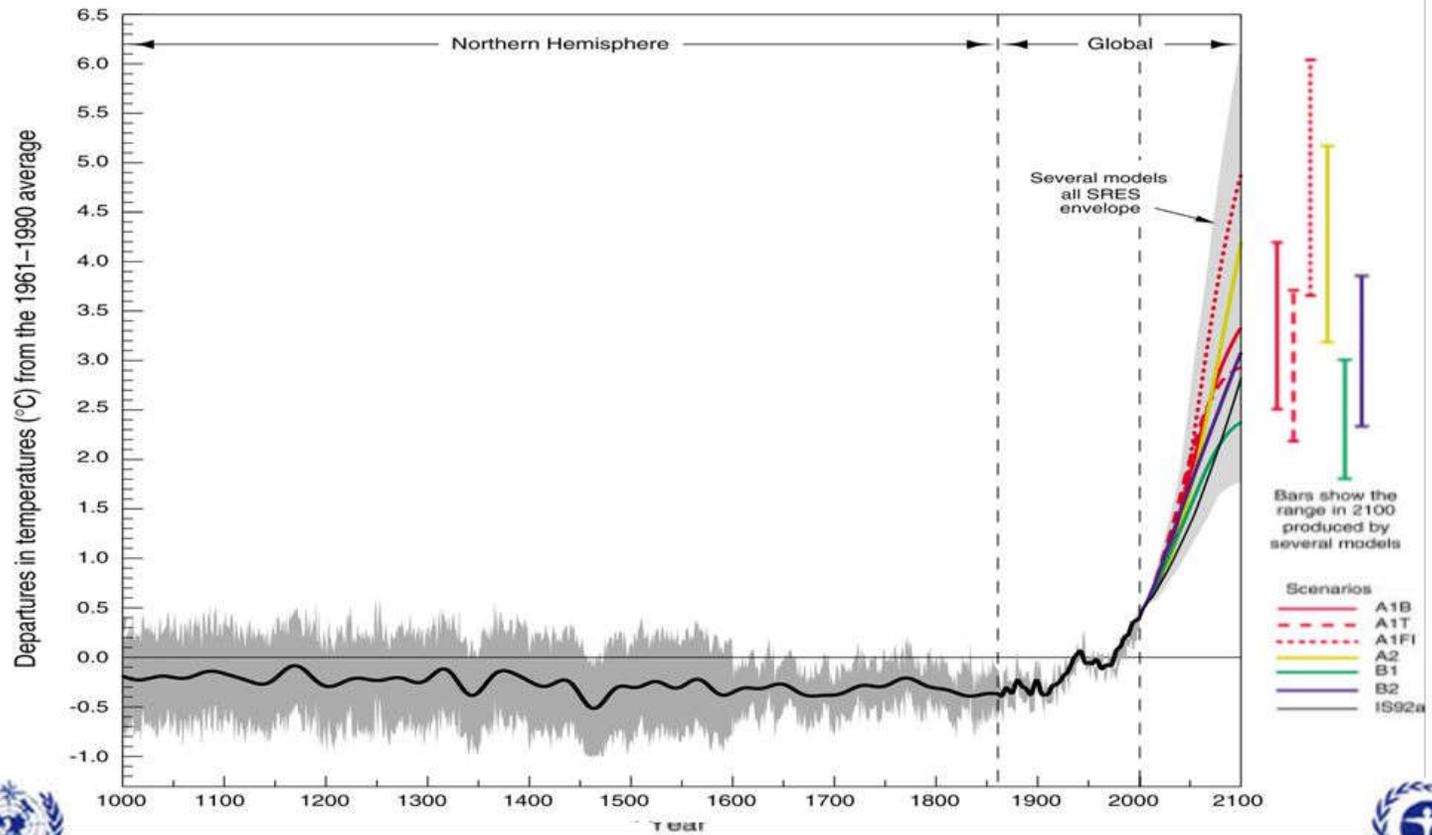
The Irving, Texas-based company is one of the newest members of the Oil and Gas Climate Initiative, described as a “CEO-led initiative which aims to lead the industry response to climate change.”

Houston-based Occidental Petroleum and San Ramon, Calif.-based Chevron also announced their memberships on Thursday. Founded in 2014, the coalition now includes 13 of the largest oil and natural gas companies representing 30 percent of the world's oil and natural gas production.”

The Oil and Gas Climate Initiative says on its website that its members are “committed to the direction set out by the Paris Agreement on climate change. We support its agenda for global action and the need for urgency.”

Display of past and possible future global temperature.

# Global Mean Temperature Change

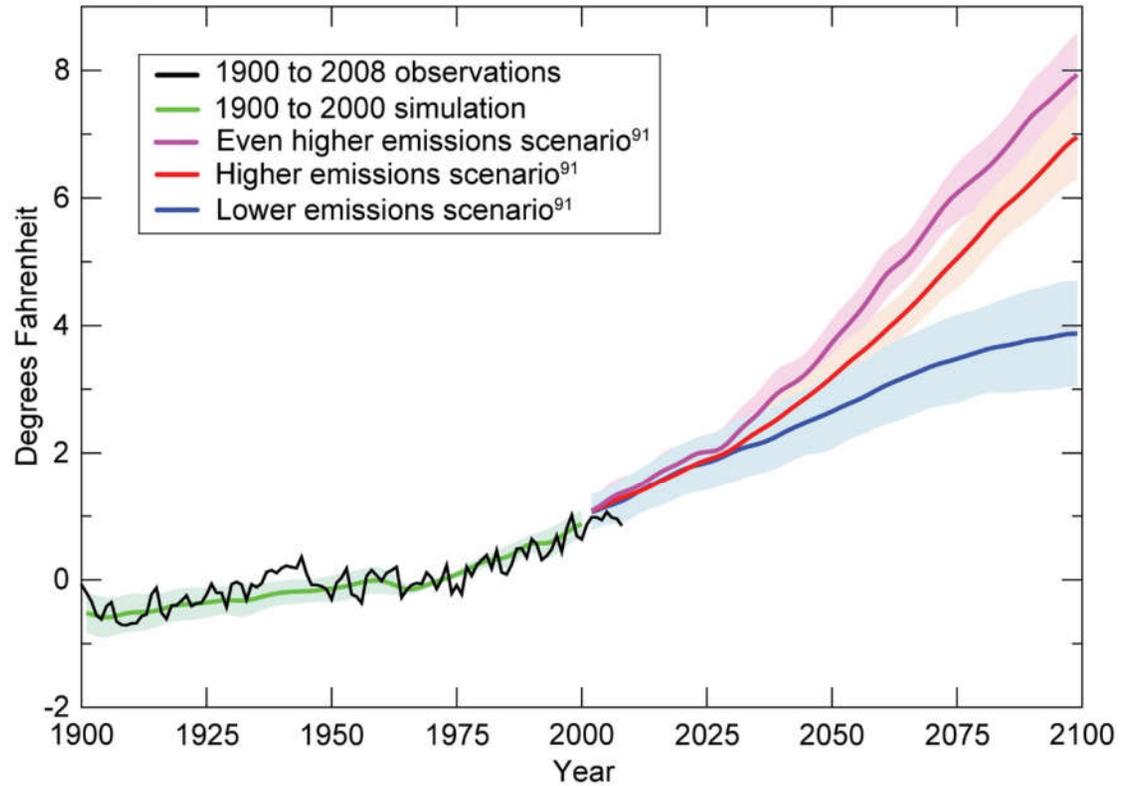


INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE (IPCC)



**Display of recent and possible future global temperatures. A more recent estimate.**

**With the US withdrawal from the Climate Accords the “Lower emissions scenario” is no longer probable. This predicted a 4 degree rise by the end of the century. Current projections are for at least a 7 degree rise.**



Smith *et al.*<sup>72</sup>; CMIP3-A<sup>93</sup>

Observed and projected changes in the global average temperature under three IPCC no-policy emissions scenarios. The shaded areas show the likely ranges while the lines show the central projections from a set of climate models. A wider range of model types shows outcomes from 2 to 11.5°F.<sup>68</sup> Changes are relative to the 1960-1979 average.

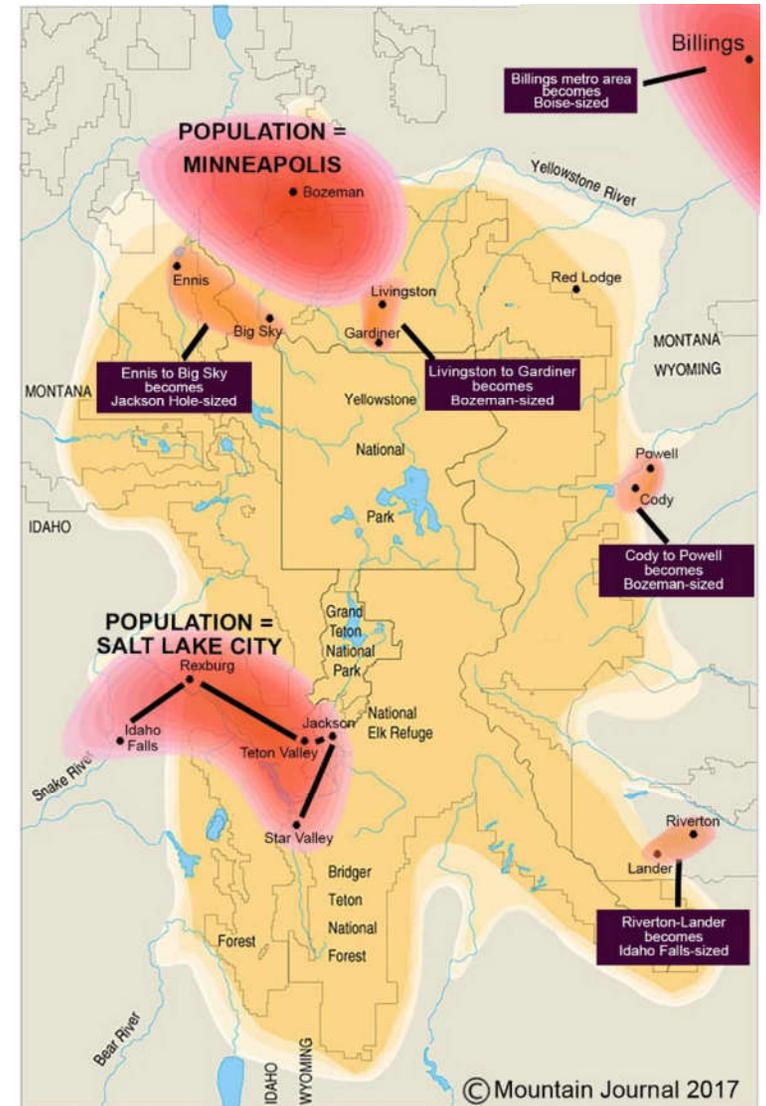
## **What about the Ennis area?**

**This is from an article in the Mountain Journal, September 10, 2017:  
Just based on current population growth patterns the Ennis-Big Sky area is projected to grow to about the size of the current Jackson, WY area by 2065**

**“Bozeman/Gallatin, by 2041, will equal the size of Salt Lake City proper (minus its suburbs). Even more sobering, in less than half a century, 2065, based on the same rate of annual growth, there will be a population of 420,000 here, equal to present-day Minneapolis proper. And Carpenter says that could actually be a conservative estimate, with this scenario arriving faster than people think. “**

## What about the Ennis area?

**Just based on current population growth patterns the Ennis-Big Sky area is projected to grow to about the size of the current Jackson, WY area by 2065. Bozeman is projected to become the size of Minneapolis.**

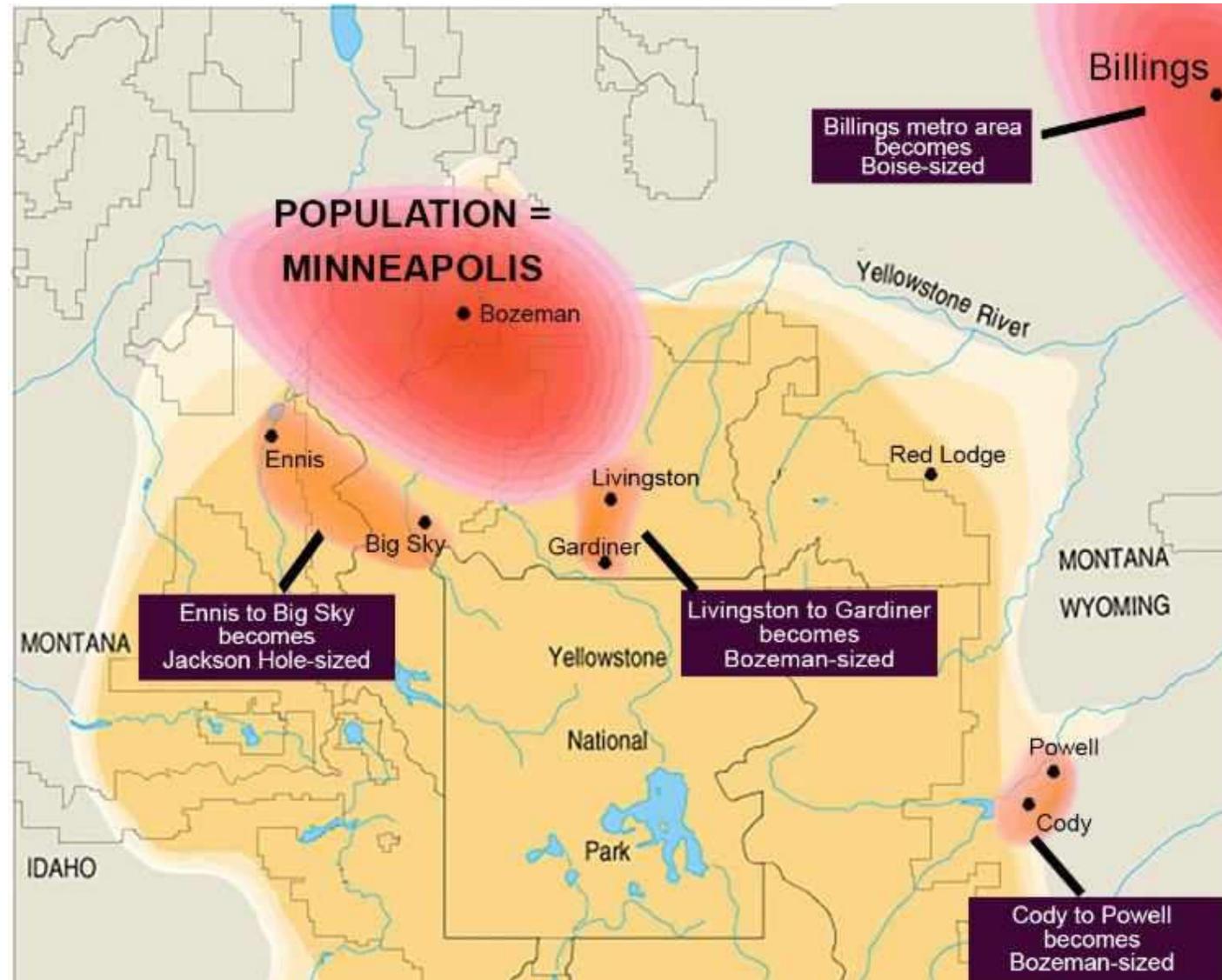


Predicted population growth in Greater Yellowstone Ecosystem by 2065

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## Climate Migration

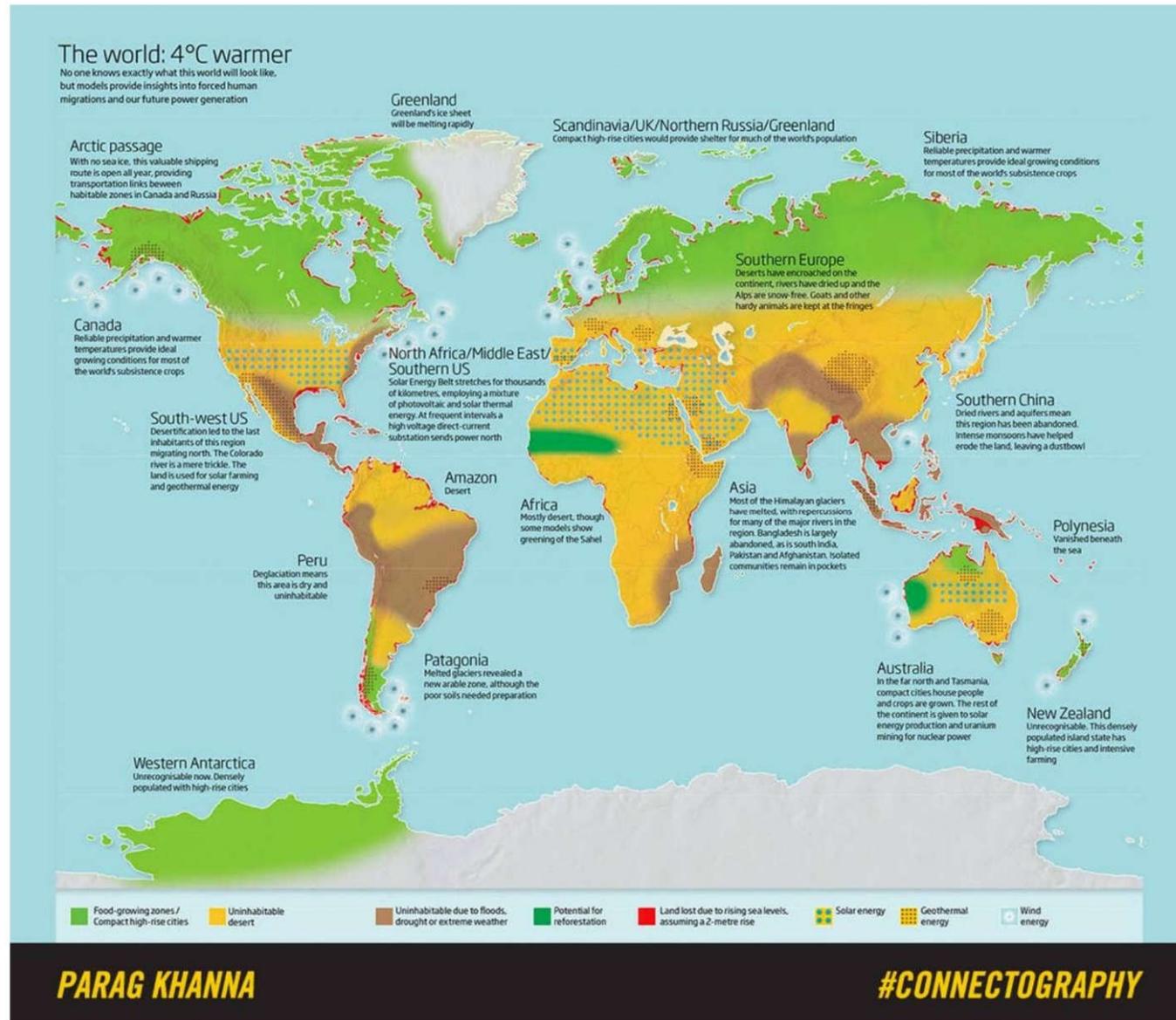
**From the same article: “And then you look at Houston and Hurricane Harvey and Florida and Hurricane Irma, and Phoenix broiling in 120-degree heat, the water shortages coming to cities in the desert Southwest, and the fires in southern California,” Carpenter says from the slope of the Bridgers. “The current explosive growth in Greater Yellowstone is happening because the region is attracting a lot of people coming here with a lot of money wanting to live quieter lives closer to nature. They are the first big wave.”**

**That alone, he says, is creating a nightmare of cascading growth-related issues, to which leadership in the Greater Yellowstone Ecosystem is either unable, unwilling or ill-equipped to confront.**

**“But how are the counties and towns going to handle a potential flood of climate refugees on top of the current inundation?” Carpenter asks. He doesn’t even need to speak the answer.**

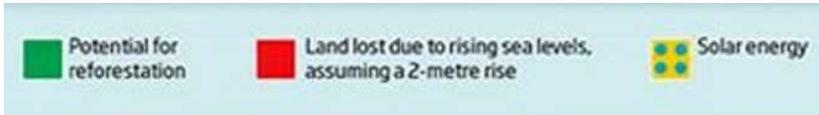
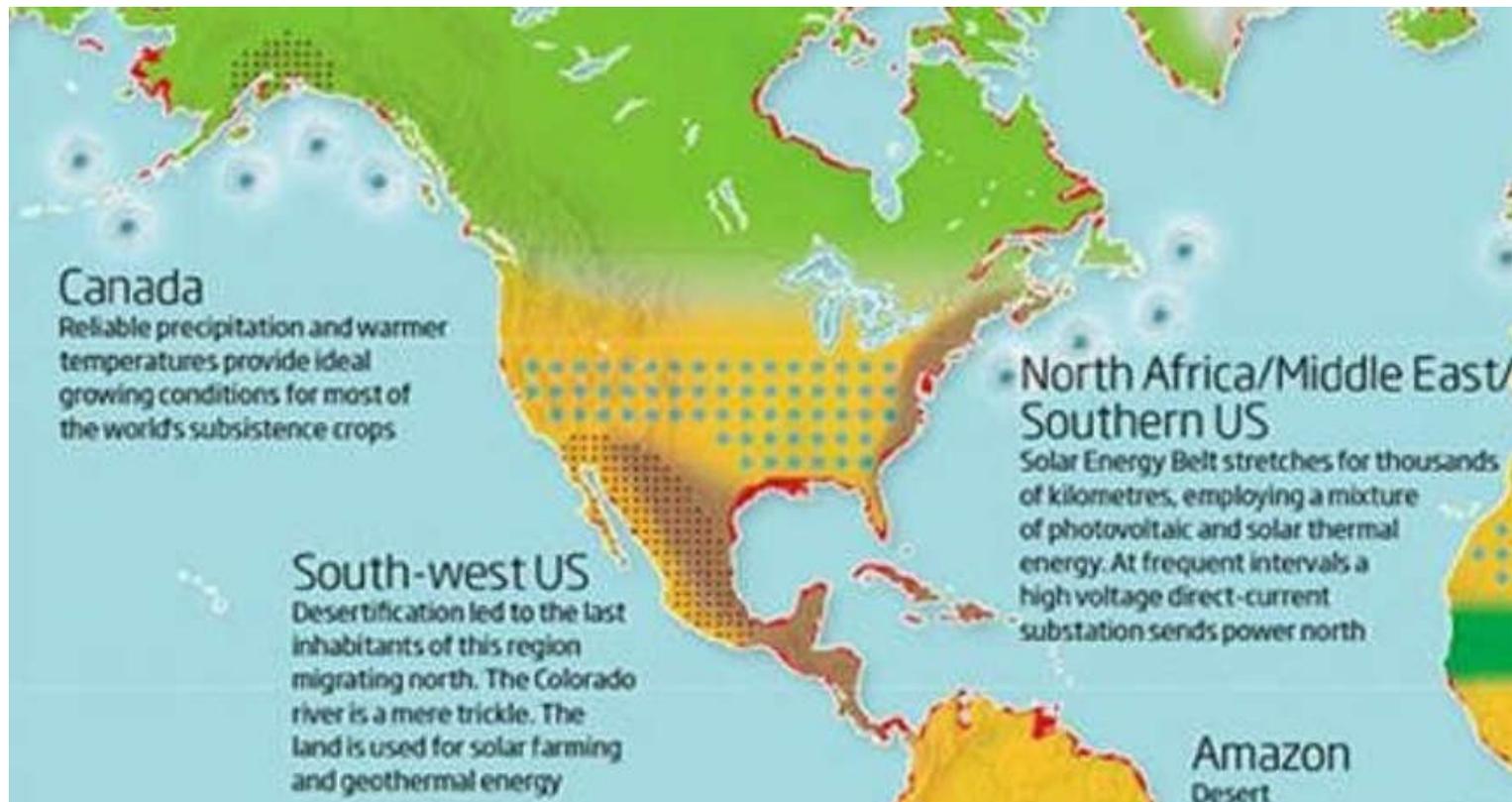
# The world with a 7 degree rise in temperature

4 degrees centigrade is about 7 degrees Fahrenheit.



# North America with a 7 degree rise in temperature

The southern US will become a desert with the forced migration of tens of millions of people to the north. This will be somewhat mitigated by advances in technology.



## Climate Migration and Ennis

**From the previous slide it appears the Ennis area may remain about the same in terms of rain and snow fall, although the snow will melt earlier so that stream flows in summer will be lower. This combined with rising maximum temperatures may doom trout in our rivers. Elk and other animals will also be affected adversely.**

**The major effect will come from increased migration of the population to the north. This will come because of the inundation of these areas by desert conditions. These will include the drying up of the Colorado and Sacramento rivers. With no water the populations will be forced to migrate to the northern US and Canada.**

# Climate Migration and Ennis

**It is impossible to predict the exact expected population of the Madison Valley by the year 2050 and beyond, but it could easily be 100,000 plus.**

**The limiting factor will be our **water resources**. Areas such as the west bench aquifer being studied by the MBMG/GWIP/Montana Tech could be severely affected. Parts of this area could be without water from wells if the population becomes too large and the water table falls or disappears. There may not be enough water entering the system to sustain a large population in the Madison Valley.**

**These factors must be considered by the Town and Zoning Commissions of Ennis, by the County Commissioners, and the State and National Governments.**

**"It's good business," said Bruno Sarda, head of sustainability at NRG Energy. "All these questions ... are actually just good governance and good risk management."**

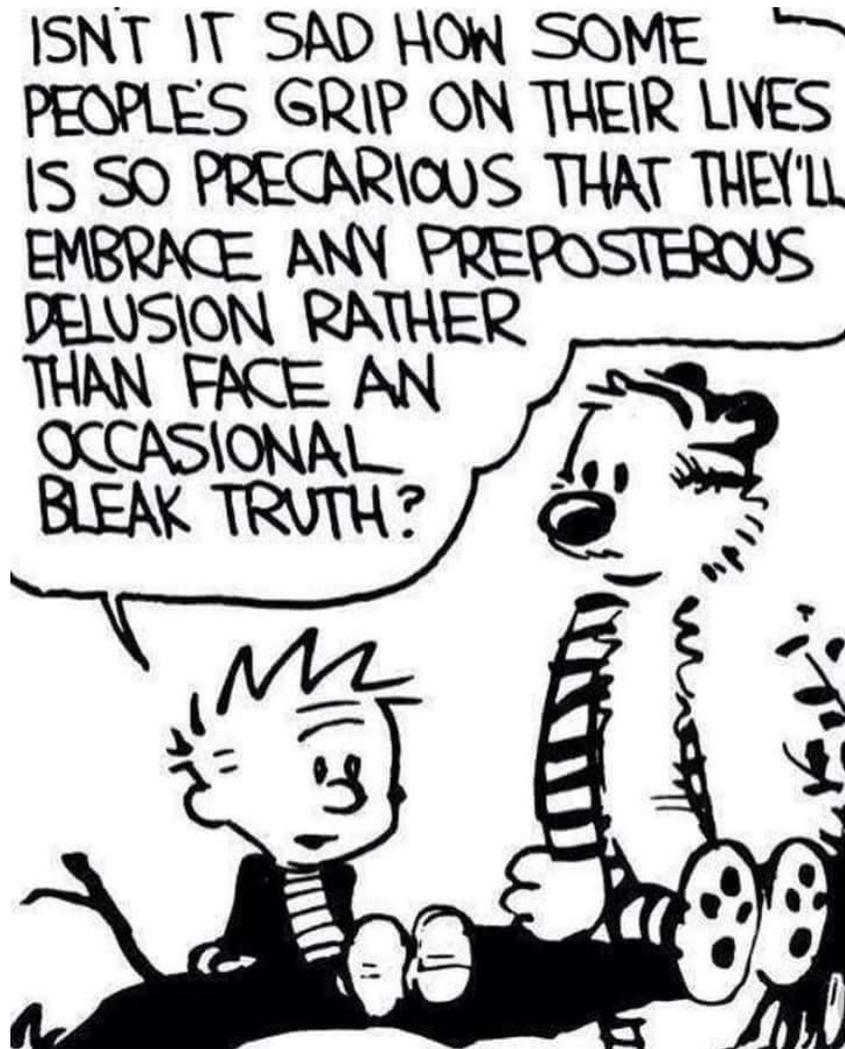
## **Climate Migration and Affordable Housing**

**One aspect of climate migration is the financial side. Wealthier families will have the resources to migrate to areas with better climate. These families will generally be able to purchase homes at higher prices than current residents. This could mean there will be **no** “affordable housing” in these areas.**

**In these areas the effect on the lower income peoples may be to increase the density of residents in sub-standard housing units. Will this result in “slums” in our valley?**

**What needs to be done **now** to mitigate this?**

## Comments



# Sources

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# **Disclaimer!**

**These projections are based on my reading and interpretation of currently available reports and the scientific literature.**

**They do not reflect in any way the policies of local, county, state or federal governments with which I might be associated. They are purely my product and have been supported solely by my finances.**

*Mark E. Odegard; Grizzly Geosciences*