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EA 30

NOAA Climate Data: Hagerstown, MD

Hagerstown, MD, the location of the National Oceanic and Atmospheric Administration temperature station used in this analysis, is located in the Western Mountain region of Maryland, which is made up of Garrett, Allegany, and Washington counties. Western Maryland is the strip of land between Pennsylvania, West Virginia, and the Potomac River. Its position along the Appalachian Plateau, Ridge, and Valley is why it is known for its beauty and outdoor recreation. In all, it contains four of seven state forests, five wildlife management areas, 13 state parks, three rivers, and the state's largest fresh water body, the Deep Creek Lake (Moss et al. 2002).

The politicians who represent Washington County in Congress accept the facts of climate change. The Hagerstown and Washington Count are represented in the House of Representatives by Democrat John Delaney, who in September 2016 co-introduced the bipartisan Delaney-Gibson Climate Solutions Commission Act[1]. Delaney is a strong advocate of environmental issues, saying on his website that "Climate change is the environmental challenge of our time and it is absolutely necessary that we act." Before the congressional district lines were redrawn to include more liberal counties, Washington County's representatives in the House of Representatives for 20 years was Roscoe "Mr. Peak Oil" Bartlett[2]. Bartlett founded the Peak Oil Caucus, which pushed a message of

[1] https://delaney.house.gov/news/press-releases/delaney-gibson-introduce-legislation-to-begin-bipartisan-action-on-climate

[2] ." http://www.resilience.org/stories/2005-11-21/peak-oil-resolution-us-house-representatives

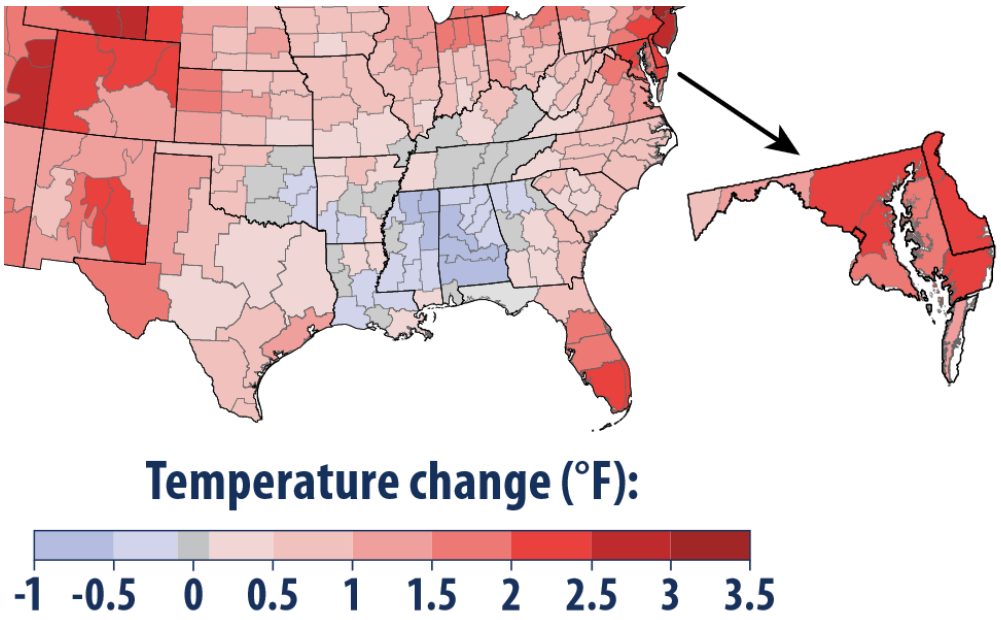
energy independence and curbing the US' environmental impact. But Washington County actually voted overwhelmingly against Delaney in the last election, instead supporting Republican Kathy Szeliga who has a 13 percent rating by the League of Conservation Voters (indicating anti-environmental voting)[3]. Donald Trump also received more than twice as many votes as Hilary in Washington County[4]. Hagerstown is a Red region in a Blue state. This may partly explain why, as can be seen in the table below, a lower percentage of Washington County residents believe global warming is caused by humans than in Maryland or the US as a whole (Yale Project on Climate Change Communication, 2014).

	Believe global warming is caused by humans.	"Global warming will harm me personally."
USA	**63%**	**34%**
Maryland	**68%**	**38%**
Washington County	**60%**	**32%**

Only 32% of Washington County residents think global warming will affect them directly, but here are just several of many ways it will affect them. Since 1900, Maryland's average annual temperature has increased about one degree Celsius (Williamson 2008). As demonstrated by the map below, temperatures have risen all over Maryland but less so in the Western Mountain Region (EPA 2016).

[3] http://www.ontheissues.org/Domestic/Kathy_Szeliga_Environment.htm

[4] http://www.nytimes.com/elections/results/maryland



Western Maryland will feel the effects of climate change most directly through forest loss. Forestry is Maryland's fifth largest industry, providing over 18,000 jobs and two and a half billion dollars in economic activity and it is the number one industry in Western Maryland (Williamson 2008). Even a one percent decrease in harvestable trees from decreased forest density will lose Maryland about $263 in GDP and 1,600 jobs. Amidst rising temperatures, forests are expected to transition from hardwood to softwood trees, for example from birch, beech, and maple dominated trees to oak and hickory trees (CCC 2008). This transition may happen too quickly for farmers to adjust or it may happen slowly. The Western Region is known for its trout but there are only 300,000 in 2016 when at one point there were three million, primarily due to tree felling which has exposed waters to the sun and increased water temperatures (EPA 2016). This particular ecosystem is so unstable at the moment, that there is not much room left for any other ecosystem damage from climate change. Also, the maple syrup industry, which requires

a specific combination of freezing nights and warm days, is leaving Western Maryland, which is significant especially because in 1928 Garrett County was the center of US maple production (EPA 2016).

Western Maryland is not in much danger of rising sea levels, but it will still suffer economically as a result of other parts of Maryland that are. Maryland's eastern shores are at risk of flooding, which was the case of Hurricane Isabel and the $400 million in damages (EPA 2016). 62 percent of tourist activity takes place in the state's coastal counties, which will severely hurt tourism-derived state tax revenues (Williamson 2008). If the 68% of Washington County residents who reported not thinking global warming would affect them personally, maybe these economic impact predictions would change their minds.

But perhaps the climate data from my analysis would not change their minds. My data analysis shows inconclusive temperature results and sometimes decreasing temperature patterns. The biggest weakness of the data is that data is missing between 1901 and 1947. The selection bias of choosing a dataset without almost half of the years missing is indomitable in this case. The data does not point one way or the other enough to overcome not having these years. Figure 3 excludes the missing data, but only spans 46 years, which is not long enough to discern the trends we are looking for in this project. This is clearly a good strategy for presenting misleading data, choosing incomplete data so that no warming is revealed. If I presented this data and said that between 1895 and 1993, temperatures in Hagerstown, MD decreased, it would be misleading not to include information about the missing data. Of course, this is what my Figure 1 says. But the line

of best fit is not close to being statistically significant. On the other hand, statistical significance does not guarantee biological significance. Figure 2 has a p-value below .01, but the September temperatures show a steady decline, when we know from earlier that Maryland is getting warmer.

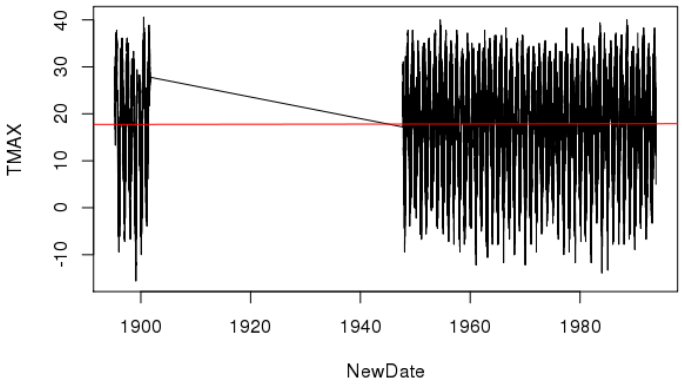


Figure 1: Temperature annual maximums, 1895-1993

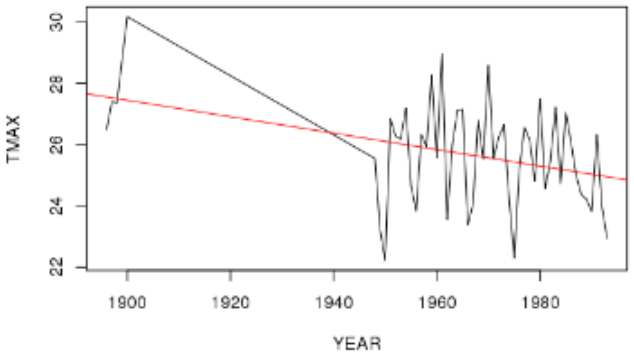


Figure 2: Temperature maximums for September, 1895-1993

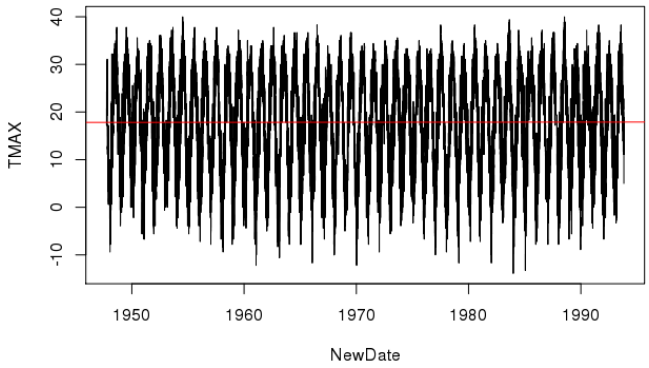
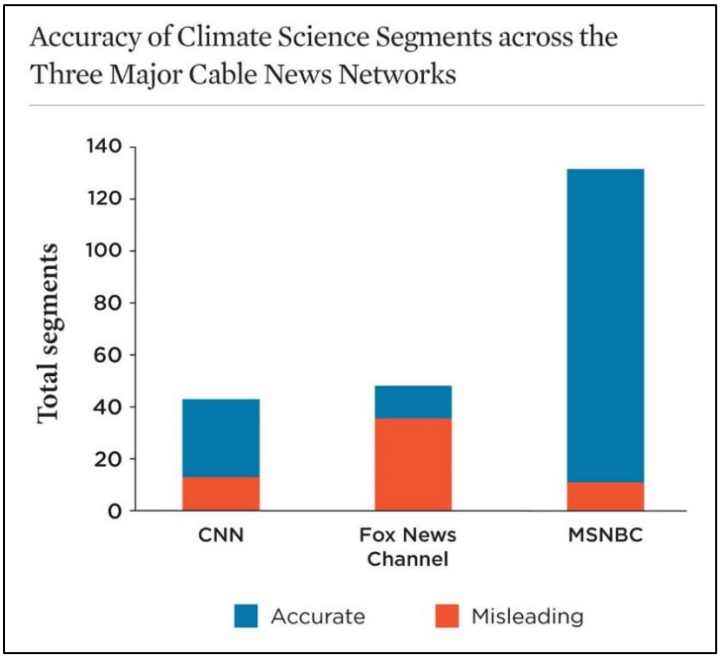


Figure 3: Temperature maximums 1947-1993

Almost all of the results were statistically insignificant. But if I were to publish these results and conclude that global warming is not real, using NOAA data, who knows, it would probably get picked up by climate skeptics.

For numerous examples of misleading climate science presentation, look no further than cable news. The Union of Concerned Scientists tracks the number of climate science segments included on Fox, CNN, and MSNBC, classifying them as misleading or accurate. The results for 2013 are below. About two million viewers per day tuned into these three networks in 2012, with Fox's prime-time audience twice as big as MSNBC's and CNN's (Huertas and Kriegsman 2014).



MSNBC covered climate science the most and most accurately, while Fox News disseminated many inaccurate ideas about the climate. The primary reason why CNN is split virtually one third to two thirds is their recurrent debate segment where two climate change fact-accepters go against one denier. A more helpful and factual debate would be between experts on climate change mitigation and adaptation. But Western Maryland's rural TV watchers likely saw the even more inaccurate Fox News coverage.

The accurate and clear communication of climate information is critical to the public's understanding. Budescu et al. conducted an experiment about laypeople's understanding of reports published by the Intergovernmental Panel on Climate Change (2009). They asked 223 survey participants from the University of Illinois to assign numerical values to the phrases used by the IPCC to describe climate findings' uncertainties. The below table shows how inconsistent the survey participants' answers were with the actual IPCC numbers.

Percentage of Subjects' Range Estimates Consistent, Inconsistent, and Partially Consistent With the Guidelines of the Intergovernmental Panel on Climate Change

	Translation group (n = 67)			Control group (n = 65)		
Probability phrase	Consistent	Partially consistent	Inconsistent	Consistent	Partially consistent	Inconsistent
Very likely (> 90%)	6.0	67.2	26.9	3.1	64.6	32.3
Likely (> 66%)	16.4	70.1	13.4	7.7	73.8	18.5
More likely than not (> 50%)	41.8	49.3	9.0	40.0	56.9	3.1
Unlikely (< 33%)	23.9	59.7	16.4	9.2	72.3	18.5
Very unlikely (< 10%)	7.5	40.3	52.2	4.6	44.6	50.8
Five terms overall	19.1	57.3	23.6	12.9	62.5	24.6
Overall excluding *more likely than not*	13.5	59.3	27.2	6.1	63.9	30.0

Note that the "translation group" was given the IPCC guidelines and could revisit the guidelines at any time. Even the translation group was inconsistent more than it consistent. Budescu's conclusion is that the IPCC would be more successful in registering its findings with the public if it used specific numbers for uncertainties.

It is not right to say, "Wait until those Marylanders start losing their forests, tourism tax money, and shoreline property. They'll see." Donald Trump won the electoral college, and won Hagerstown, by (among other things) inaccurately describing climate issues.

Data, conducted by better trained climate scientists, need to be disseminated throughout places like Hagerstown, MD.

Works Cited

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