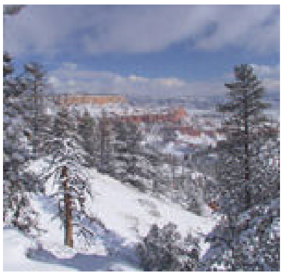
Observed Climate Change and the Negligible Global Effect of Greenhouse-gas Emission Limits in the State of Utah



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Observed climate change in Utah

Annual temperature: The historical time series of statewide annual temperatures in Utah begins in 1895. Over the entire record, there has been an upward trend, which has resulted in temperatures in the early 21st century being about 2ºF warmer than temperatures 100 years ago. Despite this long-term rise however, the record is largely dominated annual and decadal-scale variability. The run of recent warm years comes on the heels of a period of relatively steady temperatures that extended from the early 1950s through the early 1980s. Previous to then, temperatures warmed rapidly from the 1910s through the 1940s. The highest annual average statewide temperature was observed in 1934.

Utah annual temperatures, 1895-2007

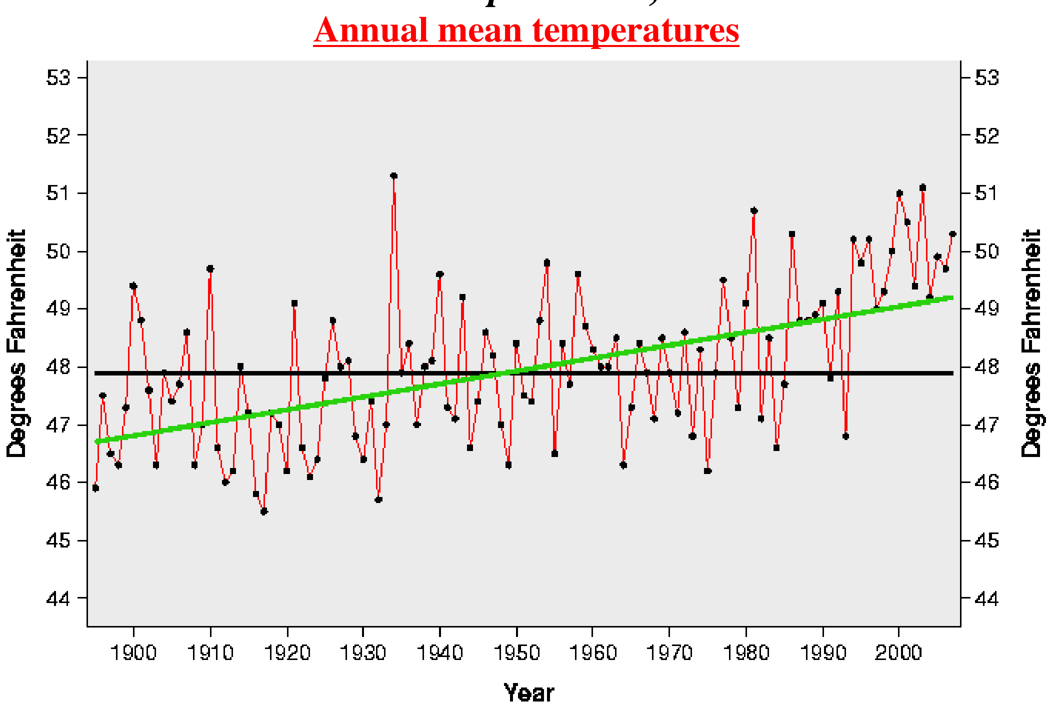


Figure 1. *Annual statewide average temperature history for Utah, 1895-2007 (available from the National Climatic Data Center, http://www.ncdc.noaa.gov/oa/climate/research/cag3/ut.html).*

Seasonal temperatures: When Utah annual temperatures are broken down into individual seasons, it can be seen that the warming has been spread pretty evenly across all of the seasons. Still, throughout all seasons, a large degree of interannual and interdecadal variability is still quite evident.

Utah seasonal temperatures, 1895-2007

Seasonal mean temperatures

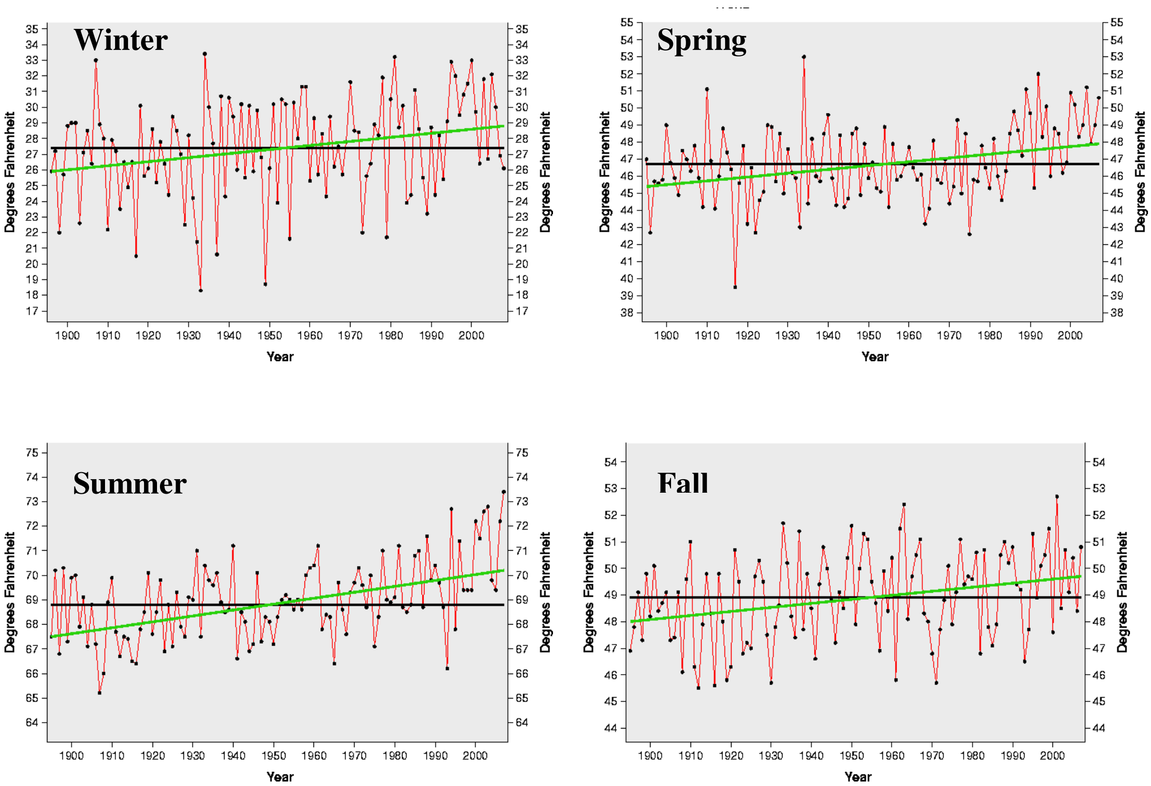


Figure 2. *Seasonal statewide average temperature history of Utah (source: National Climatic Data Center, , http://www.ncdc.noaa.gov/oa/climate/research/cag3/ut.html).*

Precipitation: Averaged across the state of Utah for each of the past 113 years, statewide annual total precipitation exhibits an overall long-term trend towards more precipitation. But this trend is primarily the result of a string of dry years during the early part of the record rather than any events in recent years. Utah's annual precipitation is quite variable from year to year, and has varied from as much as 18.64 inches falling in 1941 to a little as 6.96 inches in 1956.

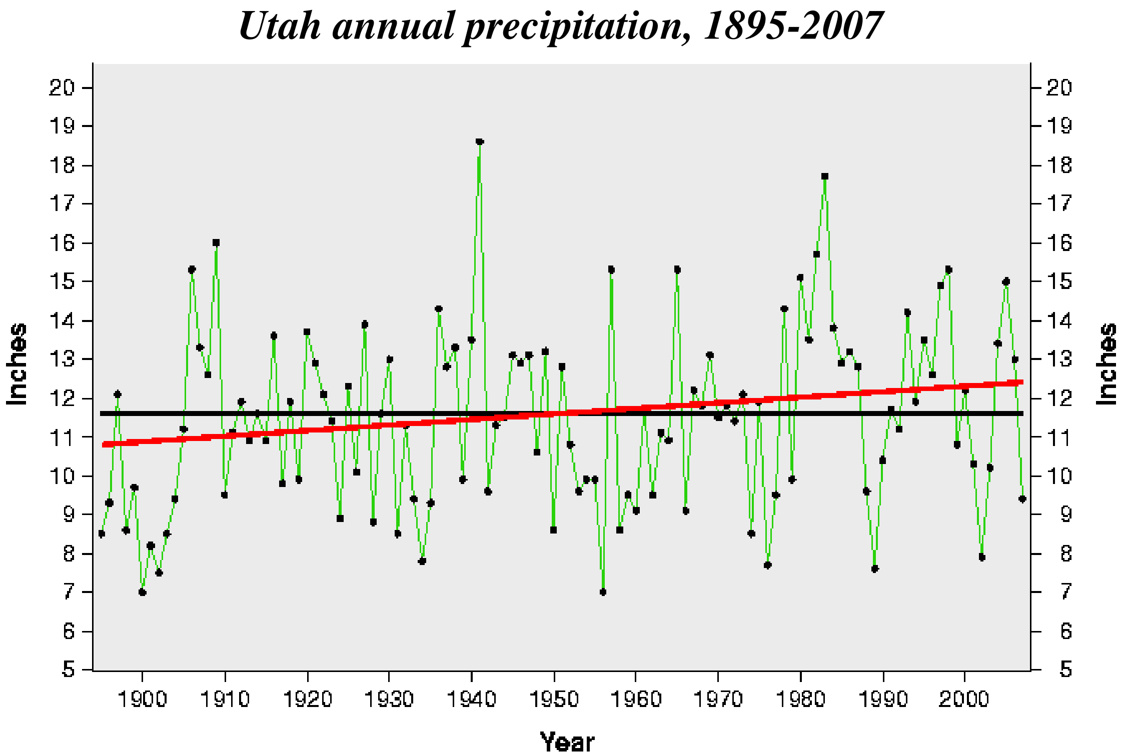


Figure 3. *Statewide average precipitation history of Utah, 1895-2007 (source: National Climatic Data Center, http://www.ncdc.noaa.gov/oa/climate/research/cag3/ut.html).*

Drought: Since 1895, there has been no long-term trend of drought in Utah. Instead, annual and decadal variability prevail.

Utah drought severity, 1895-2007

Palmer drought severity index

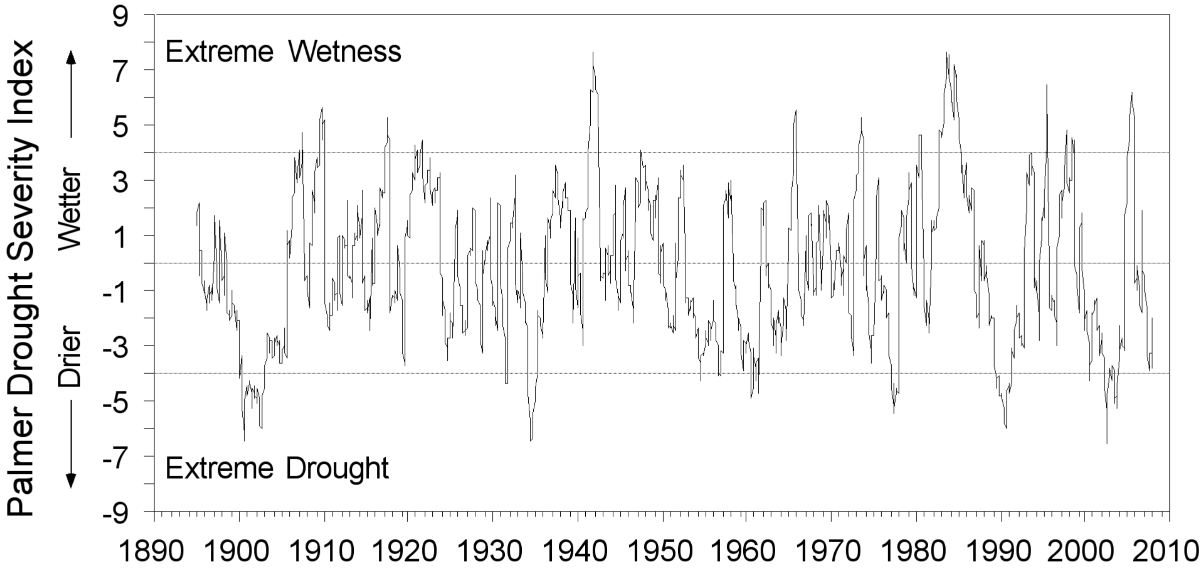


Figure 4. *Monthly statewide average values of the Palmer Drought Severity Index (PDSI) for the state of Utah, 1895-2007 (data from the National Climate Data Center, www.ncdc.noaa.gov)*

Monthly mean Palmer Drought Severity Index values—a standard measure of moisture conditions that reconciles inputs from precipitation and losses from evaporation—show no trend during the past 113 years. The period of record is dominated by short-term variations that clearly illustrate that both dry periods and wet periods occur with regularity in the natural climate of Utah.

Paleodrought: The droughts experienced during the past century in Utah pale in comparison to the megadroughts that have occurred there in the past. The character of past climates can be judged from analysis of climate-sensitive proxies such as tree-rings. Using precipitation information about past precipitation contained in tree rings, Dr. Edward Cook and colleagues have been able to reconstruct a summertime PDSI record for Utah that extends back in time more than 2000 years.

Interestingly, the trend over the past two millennia has been towards generally *wetter* conditions. In fact, one of the wettest periods during the past 2,000 years in Utah, and across the American West at large, was the wet period that occurred during the early 20th century. But rather than anomalously wet periods, the most remarkable characteristic of the reconstructed drought history of Utah is the prolonged dry periods and "megadroughts" that occurred many time in past centuries—droughts that dwarfed any conditions experienced in recent memory. In fact, the past several hundred years have been characterized by relatively moist conditions with low variability. Prior to then, the climate of Utah was characterized by large swings from conditions that approached the 20th century in terms of wetness to dry conditions that were far more intense and a far greater duration than any that have been experienced since the state was settled.

The paleo-climate record give us clear indication that droughts are a natural part of the Utah's climate system and thus should not be used as an example of events that are caused by any type of anthropogenic climate change. Instead, they have been far worse in the past, long before any possible human influences.

Utah's reconstructed paleo-drought severity

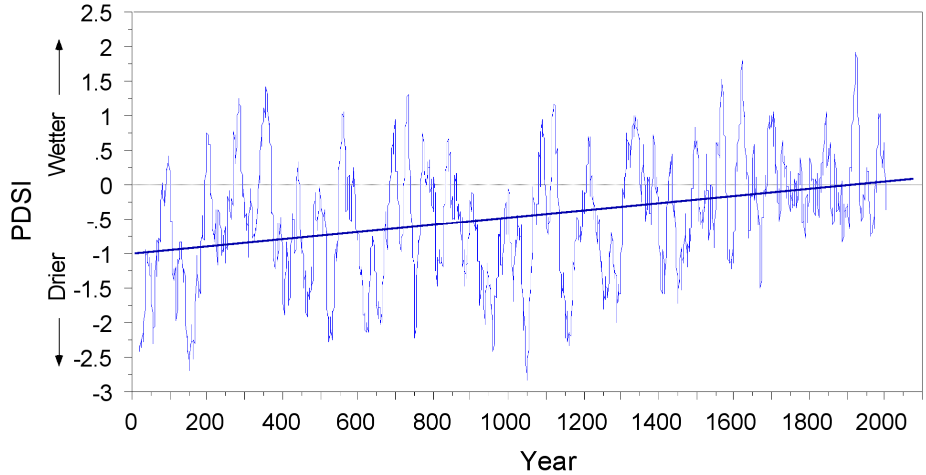


__Figure 5.__ The reconstructed summer (June, July, August) Palmer Drought Severity Index (PDSI) for Utah from 0 A.D. to 2003 A.D. depicted as a 20-yr running mean. (National Climate Data Center, http://www.ncdc.noaa.gov/paleo/pdsi.html)

Wildfires: There is a clear link between dry conditions and the outbreak of wildfires across the western United States, including the state of Utah. Figure 6 shows the co-occurrence of regional wildfire and dry conditions in the U.S. Northern Rockies for the past several hundred years. Notice that most regional wildfire (red triangles) occur when conditions are dry (PDSI is below zero, or summer precipitation is less than normal). Most widespread wildfire outbreaks occur during times of low moisture levels.

Co-occurrence of droughts and wildfires in the Rocky Mountains

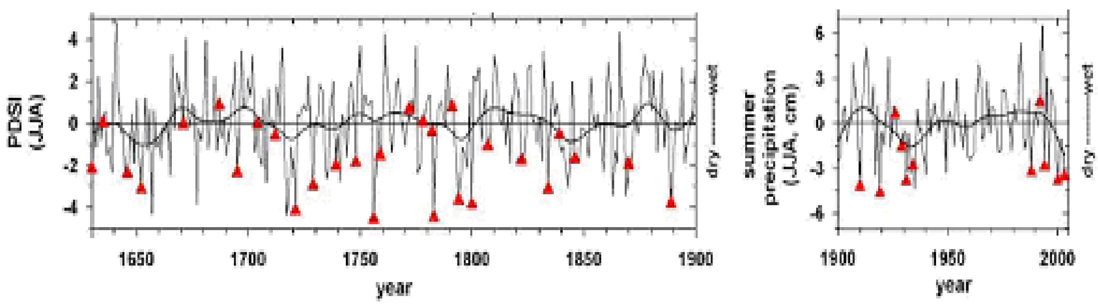


__Figure 6.__ Reconstructed summer Palmer Drought Severity Index during historical years (left) and regional summer precipitation during modern years (right) overlaid with the occurrence of regional wildfires (red triangles) in the Northern Rocky Mountains. (source Heyerdahl et al.)

And, as we have seen from our review of the paleodrought history of Utah (Figure 5), periods of low moisture levels are not uncommon and have been occurring for more than 2000 years.

A recent study created a paleo-reconstruction of wildfires across the western U.S. during the past 550 years using data collected on fire scars on trees (Kitzberger et al., 2007). In addition to finding the expected close occurrence between wildfires and droughts, the authors also found linkages between cycles of wildfire frequency and natural cycles of regional climate variability, both over the Pacific as well as the Atlantic Ocean. These natural cycles can go along way to explaining much of the variability in wildfire outbreaks.

Throughout history, wildfire and drought have been linked together in Utah and the western United States. And wildfires and drought are both influenced by natural oscillations in patterns of sea surface temperature and atmospheric circulation systems in the Atlantic and Pacific oceans. There have been times in the past that have been extensively drier have been associated with a greater frequency of wildfires than anything that we have experienced in the past 100 years, prior to any widespread human impact on the composition of the atmosphere. This demonstrates that without any human alterations, the climate can change and vary in such a manner as to make both drought and wildfire a much more common occurrence in the Utah than it is today.

Vector-borne diseases: Malaria, dengue fever, and West Nile Virus, which have been erroneously predicted to spread owing to "global warming," are not tropical diseases. Climate change will accordingly have a negligible effect on their transmission rates. These diseases are readily controlled by well-known public health policies.

Malaria epidemics occurred as far north as Archangel, Russia, in the 1920s, and in the Netherlands. Malaria was common in most of the United States until the 1950s (Reiter, 1996). In the late 1800s, when the United States was colder than today, malaria was endemic east of the Rocky Mountains—a region stretching from the Gulf Coast all the way up into northern Minnesota.

In 1878, 100,000 Americans were infected with malaria, and some 25,000 died. Malaria was eradicated from the United States in the 1950s not because of climate change (it was warmer in the 1950s than in the 1880s), but because of technological advances. Air-conditioning, the use of screen doors and windows, and the elimination of urban overpopulation brought about by the development of suburbs and automobile commuting were largely responsible for the decline in malaria (Reiter, 1996).

Malaria occurrence in the United States, 1880s

Figure 7. *In the late 19th century malaria was endemic in shaded region. (Source: Reiter, 2001)*

The effect of technology is also clear from statistics on dengue fever outbreaks, another mosquito-borne disease. In 1995, a dengue pandemic hit the Caribbean and Mexico. More than 2,000 cases were reported in the Mexican border town of Reynosa. But in the town of Hidalgo, Texas, located just across the river, there were only seven reported cases (Reiter, 1996). This is just not an isolated example. Data collected over the past decade have shown a similarly large disparity between incidence of disease in northern

Mexico and in the southwestern United States, though there is very little climate difference.

Another "tropical" disease that is often wrongly linked to climate change is the West Nile Virus. The claim is often made that a warming climate is allowing the mosquitoes that carry West Nile Virus to spread into Utah. This reasoning is incorrect. West Nile Virus, a mosquito-borne infection, was introduced to the United States through the port of New York in summer 1999. Since its introduction, it has spread rapidly, reaching the West Coast by 2002. Incidence has now been documented in every state as well as most provinces of Canada. This is not a sign that the U.S. and Canada are progressively warming. Rather, it is a sign that the existing environment is primed for the virus. In the infected territories, mean temperature has a range more than 40ºF. The virus can thrive from the tropics to the tundra of the Arctic – anywhere with a resident mosquito population. The already-resident mosquito populations of Utah are appropriate hosts for the West Nile virus—as they are in every other state.

Impacts of climate-mitigation measures in Utah

Globally, in 2003, humankind emitted 25,780 million metric tons of carbon dioxide (mmtCO_2: EIA, 2007a), of which emissions from Utah accounted for 62.4 mmtCO_2, or only 0.24% (EIA, 2007b). The proportion of manmade CO_2 emissions from Utah will decrease over the 21st century as the rapid demand for power in developing countries such as China and India outpaces the growth of Utah's CO_2 emissions (EIA, 2007b).

During the past 5 years, global emissions of CO_2 from human activity have increased at an average rate of 3.5%/yr (EIA, 2007a), meaning that the annual *increase* of anthropogenic global CO_2 emissions is more than 10 times greater than Utah's *total* emissions. This means that even a complete cessation of *all* CO_2 emissions in Utah will be undetectable globally, and would be *entirely subsumed by rising global emissions in less than a month's time. A fortiori,* regulations prescribing a *reduction*, rather than a complete cessation, of Utah's CO_2 emissions will have no effect on global climate.

Wigley (1998) examined the climate impact of adherence to the emissions controls agreed under the Kyoto Protocol by participating nations, and found that, if all developed countries meet their commitments in 2010 and maintain them through 2100, with a mid-range sensitivity of surface temperature to changes in CO_2, the amount of warming "saved" by the Kyoto Protocol would be 0.07°C by 2050 and 0.15°C by 2100. The global sea level rise "saved" would be 2.6 cm, or one inch. A complete cessation of CO_2 emissions in Utah is only a tiny fraction of the worldwide reductions assumed in Dr.

Wigley's global analysis, so its impact on future trends in global temperature and sea level will be only a minuscule fraction of the negligible effects calculated by Dr. Wigley.

We now apply Dr. Wigley's results to CO_2 emissions in Utah, assuming that the ratio of U.S. CO_2 emissions to those of the developed countries which have agreed to limits under the Kyoto Protocol remains constant at 39% (25% of global emissions) throughout the 21st century. We also assume that developing countries such as China and India continue to emit at an increasing rate. Consequently, the annual proportion of global CO_2 emissions from human activity that is contributed by human activity in the United States will decline. Finally, we assume that the *proportion* of total U.S. CO_2 emissions in Utah – now 1.1% – remains constant throughout the 21st century. With these assumptions, we generate the following table derived from Wigley's (1998) mid-range emissions scenario (which itself is based upon the IPCC's scenario "IS92a"):

Table 1

Projected annual CO_2 emissions (mmtCO_2)

Year	Global emissions: *Wigley, 1998*	Developed countries: *Wigley, 1998*	U.S. (39% of developed countries)	Utah (1.1% of U.S.)
2000	26,609	14,934	5,795	62
2025	41,276	18,308	7,103	78
2050	50,809	18,308	7,103	78
2100	75,376	21,534	8,355	92

Note: *Developed countries' emissions, according to Wigley's assumptions, do not change between 2025 and 2050: neither does total U.S or Utah emissions.*

In Table 2, we compare the total CO_2 emissions saving that would result if Utah's CO_2 emissions were completely halted by 2025 with the emissions savings assumed by Wigley (1998) if all nations met their Kyoto commitments by 2010, and then held their emissions constant throughout the rest of the century. This scenario is "Kyoto Const."

Table 2

Projected annual CO_2 emissions savings (mmtCO_2)

Year	Utah	Kyoto Const.
2000	0	0
2025	78	4,697
2050	78	4,697
2100	92	7,924

Table 3 shows the proportion of the total emissions reductions in Wigley's (1998) case that would be contributed by a complete halt of all Utah's CO_2 emissions (calculated as column 2 in Table 2 divided by column 3 in Table 2).

Table 3

Utah' percentage of emissions savings

Year	Utah
2000	0.0%
2025	1.7%
2050	1.7%
2100	1.2%

Using the percentages in Table 3, and assuming that temperature change scales in proportion to CO_2 emissions, we calculate the global temperature savings that will result from the complete cessation of anthropogenic CO_2 emissions in Utah:

Table 4

Projected global temperature savings (^oC)

Year	Kyoto Const	Utah
2000	0	0
2025	0.03	0.0005
2050	0.07	0.001
2100	0.15	0.002

Accordingly, a cessation of all of Utah's CO_2 emissions would result in a climatically-irrelevant global temperature reduction by the year 2100 of about two *thousandths* of a degree Celsius. Results for sea-level rise are also negligible:

Table 5

Projected global sea-level rise savings (cm)

Year	Kyoto Const	Utah
2000	0	0
2025	0.2	0.003
2050	0.9	0.02
2100	2.6	0.03

A complete cessation of all anthropogenic emissions from Utah will result in a global sea-level rise savings by the year 2100 of an estimated 0.03 cm, or one *hundredths* of an inch. Again, this value is climatically irrelevant.

Even if the entire Western world were to close down its economies completely and revert to the Stone Age, without even the ability to light fires, the *growth* in emissions from China and India would replace our *entire* emissions in little more than a decade. In this context, any cuts in emissions from Utah would be extravagantly pointless.

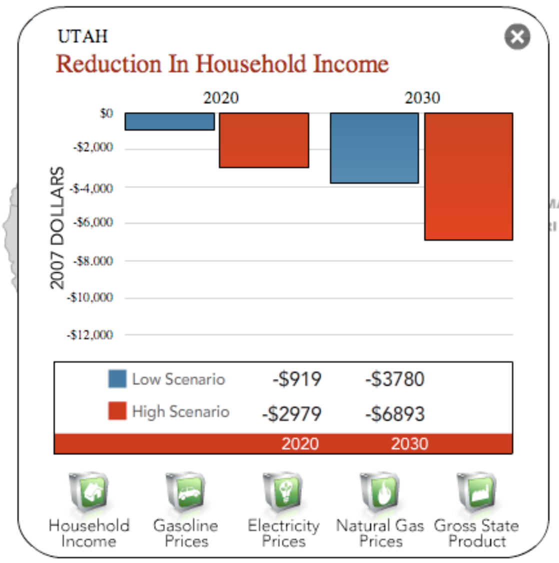
Costs of Federal Legislation

And what would be the potential costs to Utah of legislative actions designed to cap greenhouse gas emissions? An analysis was recently completed by the Science Applications International Corporation (SAIC), under contract from the American Council for Capital Formation and the National Association of Manufacturers (ACCF and NAM), using the National Energy Modeling System (NEMS); the same model employed by the US Energy Information Agency to examine the economic impacts.

For a complete description of their findings please visit:
http://instituteforenergyresearch.org/economic-impact/index.php

To summarize, SAIC found that by the year 2020, average annual household income in Utah would decline by $919 to $2979 and by the year 2030 the decline would increase to between $3780 and $6893. The state would stand to lose between 10,000 and 15,000 jobs by 2020 and between 28,000 and 37,000 jobs by 2030. At the same time gas prices could increase by over $5 a gallon by the year 2030 and the states' Gross Domestic Product could decline by then by as much as $4.7 billion/yr.

And all this economic hardship would come with absolutely no detectable impact on the course of future climate. This is the epitome of a scenario of all pain and no gain.



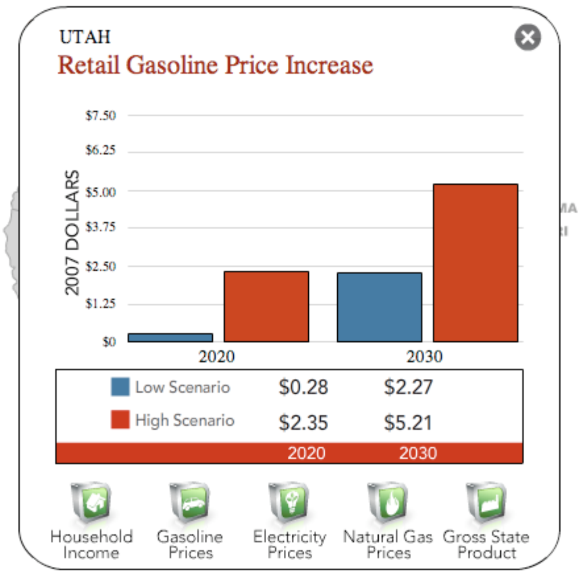


Figure 8. *The economic impacts in Utah of federal legislation to limit greenhouse gas emissions green. (Source: Science Applications International Corporation, 2008, http://instituteforenergyresearch.org/economic-impact/index.php)*

Table 6

State CO_2 Mitigation Plans: Futility and Projected Climate "Savings"

State	2004 Emissions (million metric tons CO2)	Percentage of Global Total	Time until Total Emissions Cessation Subsumed by Foreign Growth (days)		Temperature "Savings" (ºC)		Sea Level "Savings" (cm)	
			Global Growth	China Growth	2050	2100	2050	2100
AK	47.0	0.17	18	28	0.0008	0.0013	0.0108	0.0217
AL	140.3	0.52	53	84	0.0025	0.0037	0.0321	0.0647
AR	63.7	0.23	24	38	0.0011	0.0017	0.0146	0.0294
AZ	96.9	0.36	37	58	0.0017	0.0026	0.0222	0.0447
CA	398.9	1.47	152	239	0.0071	0.0106	0.0914	0.1840
CO	93.1	0.34	35	56	0.0017	0.0025	0.0213	0.0430
CT	45.5	0.17	17	27	0.0008	0.0012	0.0104	0.0210
DC	4.0	0.01	2	2	0.0001	0.0001	0.0009	0.0018
DE	16.9	0.06	6	10	0.0003	0.0004	0.0039	0.0078
FL	258.0	0.95	98	155	0.0046	0.0069	0.0591	0.1190
GA	175.7	0.65	67	105	0.0031	0.0047	0.0402	0.0810
HI	22.7	0.08	9	14	0.0004	0.0006	0.0052	0.0105
IA	81.8	0.30	31	49	0.0015	0.0022	0.0187	0.0377
ID	15.6	0.06	6	9	0.0003	0.0004	0.0036	0.0072
IL	244.5	0.90	93	146	0.0044	0.0065	0.0560	0.1128
IN	239.9	0.88	91	144	0.0043	0.0064	0.0549	0.1107
KS	77.8	0.29	30	47	0.0014	0.0021	0.0178	0.0359
KY	151.5	0.56	58	91	0.0027	0.0040	0.0347	0.0699
LA	180.5	0.66	69	108	0.0032	0.0048	0.0413	0.0833
MA	83.6	0.31	32	50	0.0015	0.0022	0.0192	0.0386
MD	80.6	0.30	31	48	0.0014	0.0021	0.0185	0.0372
ME	23.3	0.09	9	14	0.0004	0.0006	0.0053	0.0107
MI	189.9	0.70	72	114	0.0034	0.0051	0.0435	0.0876
MN	102.8	0.38	39	62	0.0018	0.0027	0.0235	0.0474
MO	139.8	0.51	53	84	0.0025	0.0037	0.0320	0.0645
MS	65.1	0.24	25	39	0.0012	0.0017	0.0149	0.0300
MT	35.1	0.13	13	21	0.0006	0.0009	0.0080	0.0162
NC	152.3	0.56	58	91	0.0027	0.0041	0.0349	0.0703
ND	49.9	0.18	19	30	0.0009	0.0013	0.0114	0.0230
NE	43.6	0.16	17	26	0.0008	0.0012	0.0100	0.0201
NH	22.0	0.08	8	13	0.0004	0.0006	0.0050	0.0101
NJ	128.6	0.47	49	77	0.0023	0.0034	0.0295	0.0594
NM	59.0	0.22	22	35	0.0011	0.0016	0.0135	0.0272
NV	47.9	0.18	18	29	0.0009	0.0013	0.0110	0.0221
NY	216.7	0.80	82	130	0.0039	0.0058	0.0496	0.1000
OH	263.6	0.97	100	158	0.0047	0.0070	0.0604	0.1216
OK	100.4	0.37	38	60	0.0018	0.0027	0.0230	0.0463
OR	42.5	0.16	16	25	0.0008	0.0011	0.0097	0.0196
PA	282.5	1.04	107	169	0.0050	0.0075	0.0647	0.1304
RI	11.0	0.04	4	7	0.0002	0.0003	0.0025	0.0051
SC	87.5	0.32	33	52	0.0016	0.0023	0.0200	0.0404
SD	14.0	0.05	5	8	0.0002	0.0004	0.0032	0.0064
TN	123.6	0.45	47	74	0.0022	0.0033	0.0283	0.0570
TX	652.5	2.40	248	391	0.0116	0.0174	0.1495	0.3010
UT	65.7	0.24	25	39	0.0012	0.0017	0.0150	0.0303
VA	129.0	0.47	49	77	0.0023	0.0034	0.0295	0.0595
VT	7.0	0.03	3	4	0.0001	0.0002	0.0016	0.0032
WA	82.9	0.30	32	50	0.0015	0.0022	0.0190	0.0382
WI	108.8	0.40	41	65	0.0019	0.0029	0.0249	0.0502
WV	113.0	0.42	43	68	0.0020	0.0030	0.0259	0.0521
WY	63.9	0.24	24	38	0.0011	0.0017	0.0146	0.0295
U.S. Total	**5,942.2**	**21.86**	**2261**	**3558**				

Utah Scientists Reject UN's Global Warming Claims[1]

At least 404 Utah scientists have petitioned the US government that the UN's human-caused global warming hypothesis is "without scientific validity and that government action on the basis of this hypothesis would unnecessarily and counterproductively damage both human prosperity and the natural environment of the Earth."

They are joined by over **31,072** Americans with university degrees in science – including **9,021** PhDs.

Names of the Utah scientists who signed the petition can be viewed here:
http://petitionproject.org/gwdatabase/Signers_BY_State.html

Papers focusing on the Problems with the IPCC

http://scienceandpublicpolicy.org/originals/prejudiced_authors_prejudiced_findings.html

http://scienceandpublicpolicy.org/originals/whytheipccshouldbedisbanded.html

http://scienceandpublicpolicy.org/peerreview.html

http://scienceandpublicpolicy.org/reprint/sellers_ipcc_report.html

http://scienceandpublicpolicy.org/reprint/has_ipcc_inflated_feedback_factor.html

http://scienceandpublicpolicy.org/reprint/ipcc_on_the_run.html

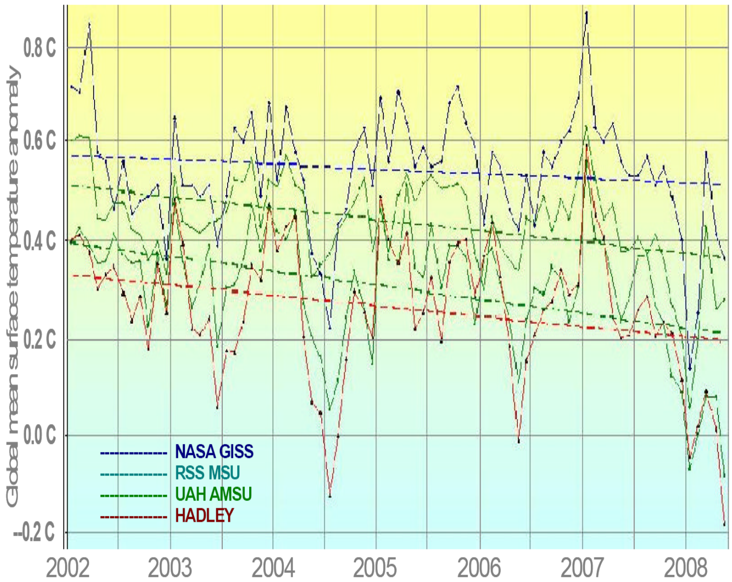
http://scienceandpublicpolicy.org/reprint/open_letter_to_un.html

http://scienceandpublicpolicy.org/reprint/whatiswrongwiththeipcc.html

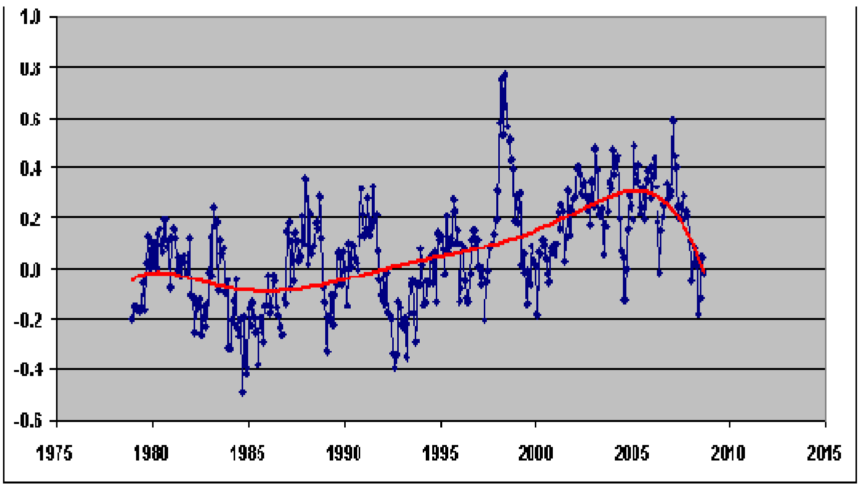
http://scienceandpublicpolicy.org/reprint/akasofu_cool_it.html

[1] Questions about this survey should be addressed to the petition organizers.

Appendix: **Recent *global* temperatures:** As the global temperature graph below shows, all four of the world's major global surface temperature datasets (NASA GISS; RSS; UAH; and Hadley/University of East Anglia) show a decline in temperatures that have now persisted for seven years. The fall in temperatures between January 2007 and January 2008 was the greatest January-January fall since records began in 1880.



All four of the world's major surface-temperature datasets show seven years of global cooling. The straight lines are the regression lines showing the trend over past seven years. It is decisively downward.



Lower-troposphere global surface temperature anomalies, 1979-2008 (UAH satellite data).

The year 2008 will turn out to have been no warmer than 1980 – 28 years ago. This is not a short-run change: the cooling trend set in as far back as late 2001, seven full years ago, and there has been no net warming since 1995 on any measure.

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