

BRIEF ANALYSIS

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Global Warming Politics: Are Tennessee and Texas Getting Hotter?

When James Hansen, director of NASA's Goddard Institute, testified before the Senate in 1988 that he was "99 percent" certain that human-caused greenhouse gases were changing the climate, Sen. (now Vice President) Al Gore took Hansen's argument seriously. In his book *Earth in the Balance*, Gore argued that human-caused global warming is the greatest threat facing civilization. In addition, the September 7th *Washington Times* reported that at Gore's 51st birthday party in 1999, he said his home state of Tennessee had warmed substantially since he was born. To prevent global warming, Gore advocates that the U.S. ratify a treaty that would reduce energy use and economic growth.

Are Hot Days an Indicator of Global Warming? Some advocates of the global warming theory — and the popular press — point to warmer-than-average local and global temperatures as evidence of "a discernible human impact" on climate. In 1984 a paper in the *Journal of Climate and Applied Meteorology* suggested that an increase in greenhouse gases could produce a change in temperature distribution, thereby causing a substantial increase in the number of days with extreme high temperatures. Four years later, Hansen collaborated with others on an article in the *Journal of Geophysical Research* that concluded even small increases in temperature could yield large increases in the number of days with extreme high afternoon temperatures.

If human-caused emissions of greenhouse gases are causing temperatures to rise, this is likely to be a matter of concern to residents of Tennessee and Texas, two Southern states that also are the homes of the current leaders in the races for the Democratic and Republican nominations for president. With Gore's ardent belief

in global warming, it is certain to be an issue in the presidential campaign if he receives the Democratic nomination. Is the vice president correct? Is Tennessee warmer now than when he was a child? What about Texas, whose Gov. George W. Bush is the front-runner for the Republican nomination? And might a look at climate change — or lack of it — in those two states give us some clue to what's happening globally?

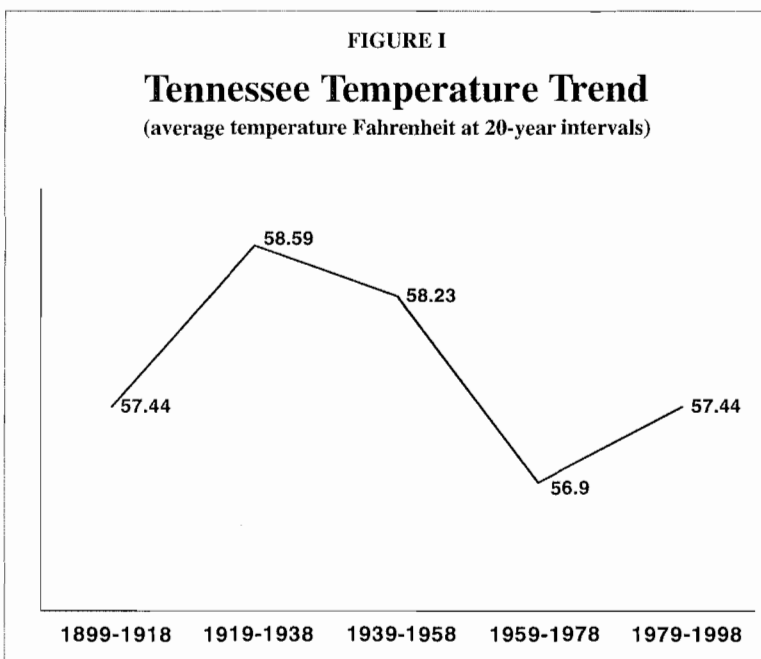
Texas — with a total area of 267,277 square miles — and Tennessee — with a total area of 42,146 square miles — together take up only 0.0016 percent of the Earth's total area. It would take 636 Texas/Tennessee-sized areas to cover the globe. Nonetheless, it is possible that the high-quality, long-term climate records gathered in these states might shed light on how regional climate is responding to the ongoing buildup of greenhouse gases.

Measuring Temperatures. Those high-quality, long-term records are available on the Internet as monthly temperature data for Tennessee and Texas from January 1895 to the present, from the climate division database of the National Climatic Data Center (NCDC). Dr. Tom Karl, head of the NCDC, was instru-

mental in developing this dataset.

Tennessee is divided into four approximately equal climate areas and Texas into 10. Scientists at the NCDC average temperature records from stations in each area to arrive at the monthly mean temperatures. They avoid measurements from major metropolitan areas because of an urban "heat island" effect: concentrations of pavement and buildings are significantly warmer than surrounding areas simply because they retain heat and thus do not provide reliable measurements.

Is Tennessee Really Hotter than It Used To Be? Quite the contrary, whether considering the year as a whole or only the summer, when temperatures are hottest. Each of the four climate areas has cooled overall and in summer during the past century. According to the temperature records:



- From 1895 to 1998 the year-round temperature in Tennessee declined an average of 0.00607°F per year, or 0.63°F over the 104-year period.
- During the same period the summertime temperature (June through August) declined an average of 0.00963°F per year, or a total of slightly more than 1°F.

Since Vice President Gore's birth in 1948, the average temperature in Tennessee has *dropped* by more than half a degree (0.59°F). So a majority of Tennessee's century-long cooling has occurred since the vice president's birth. The highest temperature ever measured in Tennessee came well before he was born, in August 1930, when Perryville recorded 113°F. Figure I, which shows the average temperatures in Tennessee for 20-year periods, illustrates how the average dropped from earlier in the century.

Is Texas Getting Warmer? Texas Gov. George W. Bush has been more cautious in his assessment of the evidence for human-caused global warming. His campaign website indicates that while he thinks the potential threat of global warming should be taken seriously, he believes the threat has been overblown and policies promoted by Gore and the Clinton

administration to fight global warming are not supported by the best climate science.

His non-alarmist views find support in the Texas temperature record. According to the NCDC records, the situation in Texas is similar to that in Tennessee. Of the 10 climate areas in Texas, nine are cooling and only one (the High Plains of northern Texas) shows any warming. Four show a statistically significant cooling trend from 1895 to 1998. Summer temperatures increased slightly from 1895 to the mid-1950s (Seymour, Texas, had the record high: 120°F in 1936), but the 15 years after 1955 show a large decline. Although the trend generally has been upward since 1970, the 10-year

averaged data are still well below the warm conditions of the 1950s. While 1998 was the warmest summer ever in Texas, 1999 saw a return to normal.

Although Texas warmed during the 1979-1998 period, Figure II shows that it is still cooler than early in the 20th century. According to the temperature records:

- From 1895 to 1998 the year-round temperature in Texas declined an average of 0.0053°F per year, or a total of 0.55°F.
- The summertime temperature declined an average of 0.0037°F per year, a total of 0.38°F.

The Influence of Heat Waves. James Hansen's testimony in 1988 was received by many Washingtonians as an explanation of the heat wave that

gripped the city that year. Again in 1995 a heat wave, this one primarily in Chicago and the Midwest, focused attention on the greenhouse gas debate. However, Tom Karl of the NCDC concluded after an extensive analysis of the 1995 heat wave that "because of the impact of changes in instrumentation at primary National Weather Service stations, the potential affects of urbanization, and little trend of summer mean temperatures, it is unlikely that the

macroscale climate of heat waves in the Midwest or in Chicago is changing in any significant manner."

Conclusion. Despite a perception by some that a substantial change in climate is occurring, actual data fail to back up the perception. Temperature records confirm that Tennessee — and the South — has not experienced the warming that Vice President Gore "recognized" and is worried about.

This Brief Analysis was prepared by Dr. Robert C. Balling Jr., director of the Office of Climatology and a professor of geography at Arizona State University. Dr. Balling also serves as a science advisor to the Greening Earth Society.

