THE UNIVERSITY OF TEXAS AT AUSTIN
CENTER FOR INTEGRATED EARTH SYSTEM SCIENCE

The Drought of 2012 – Are We Prepared?

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We are gathered today to address the question: "The Drought of 2012 – are we prepared?" This question is prompted by unprecedented circumstances. From June to August 2011, Texas experienced the hottest summer of any state ever recorded in the history of the United States. During 2011, the total volume of water stored in the surface water reservoirs of Texas dropped by the largest amount ever recorded. We enter this Spring with our water supply conditions in a much more vulnerable state than they were at this time last year. Falling groundwater levels have prompted trucking of water supplies to begin for some locations. What is ahead for 2012? Nobody knows for sure, but the application of science, observations from the past, and prudent projections, can clarify the situation.

The drought that we are experiencing does not arise in Texas alone, or just in the United States – it is a result of the myriad interactions among the atmosphere, oceans and land system of the whole earth. It is even influenced by cyclical changes from year to year in solar radiation. To study such questions we need earth system science. In 2011, the University of Texas at Austin formed a new Center for Integrated Earth System Science, or CIESS, directed by Dr Zong-Liang Yang from the Jackson School for Geosciences, and myself from the Cockrell School of Engineering. Today's Texas Water Forum is the first public event that CIESS has sponsored. We have invited representatives of our public water agencies to address you this morning concerning their assessments of the drought, and representatives of the University of Texas community to speak this afternoon about their research and how it can contribute to drought solutions.

In contemplating this situation, I am reminded of a water supply crisis I observed in Corpus Christi during the summer of 1984. Corpus Christi had two water supply reservoirs. Choke Canyon Reservoir was nearly dry and Lake Corpus Christi was one-third full – sufficient water for about one year of supply for Corpus Christi. The 240,000 residents of Corpus Christi learned quite suddenly that at some point during 1985 they could run out of water. You can imagine the concerns this raised. Panic solutions were proposed, such as building a $100 million desalinization plant to purify the waters of Corpus Christi Bay, or using an oil pipeline to bring water from Lake Texana. Citizens lost confidence in their elected leaders. Elected leaders lost confidence in their technical advisors. Young engineers lost confidence in older engineers. I could see an unraveling of the social fabric of the city. Fortunately for Corpus Christi, in October of 1984 there was a deluge – reservoir water levels rose substantially and the crisis was averted. But I have always kept that experience at the back of my mind because if a great multiyear drought, like that of the 1950's, were to hit Texas again, I can readily envisage a similar unraveling of the social fabric on a wider scale in our state.

In 2006, I happened to be in Canberra during the peak of the great Australian drought. From afar, I knew that they had some problems but it was not until I got there that I experienced the tension gripping the country. It was like a very slowly unfolding Hurricane Katrina. For years, rivers flowed at less than half their normal discharge. Irrigated agriculture collapsed in the Murray-Darling basin, the bread basket of Australia. Livelihoods were lost. People committed suicide. When I visited my sister in Melbourne, I saw that her lawn and garden had been abandoned to become weeds and dirt because they were not allowed to use piped city water outdoors.

Fortunately, we are not yet in such a dire state here in Texas, and let's hope that the drought gradually eases or we get a deluge and our water supply problem is solved naturally. But if a crisis does occur, our citizens will expect that our state's water is being competently managed, and that the best science, data and tools that universities and industry have to offer are being applied to address the situation. They will be intolerant of confusion and lack of answers to reasonable questions. In 1996, Texas experienced a similar sharp, severe drought, which prompted our Legislature to pass Senate Bill 1 in 1997 that initiated a process in subsequent years to improve water planning, data and computer models. Texas water planning is today in much stronger shape to face the current situation than we were a decade ago. But we can do better.

The origins of drought are obscure, but I believe that with better understanding and computation of the teleconnections between global causes and local effects, the intensity and duration of droughts can be better anticipated. Two weeks ago, we were visited by a large delegation from the meteorological service of the United Kingdom, led by their Chief Scientist, Dr Julia Slingo. They are seeking to use their Unified Model to compute weather and climate conditions from global to local scale. Over Texas, they plan to use one kilometer grid cells, much more highly resolved computations than the weather and climate models routinely operated in the United States. They are coming to Austin to do this because a new supercomputer called Stampede is presently under construction at the Pickle Research Campus. Stampede will have 500,000 processors and will supersede Ranger, which has 63,000 processors and is itself one of the fastest supercomputers in the world. Our research has shown that we can translate weather and climate model outputs into streamflows, and compute simultaneously the flow of water in all the rivers and streams of Texas. You will hear more about this research this afternoon.

Satellite measurement of the force of gravity over Texas is now sufficiently accurate to be used as an indicator of the change through time of the total mass of water stored in the state. Water web services make it possible to synthesize the information arising from observation networks operated by different water agencies into a network of networks depicting water conditions over a region.

The "flash drought" we are experiencing, though short, is unprecedented in severity. We do not know if this is an indicator of things to come or just a statistical freak occurrence. To secure the future water supply of our citizens in the face of such uncertainty, prudent water planning and management in our state require the best science, data and computation that can be assembled. We are proposing that Texas water agencies, industry and universities begin to work collaboratively to create a large-scale Texas Water Model, connected to weather and climate models, which can continually trace the volume and movement of water throughout our state. I hope that an outcome of this Texas Water Forum will be the formation of a steering committee that can define the information needed to better manage droughts in Texas, and develop a process to assemble the data, computations and communication mechanisms required to meet those needs.