

As we continue the conversation, let's leave the studio for a minute. Imagine you're a rice farmer wondering whether you'll be able to irrigate your crop, or a homeowner whose property value depends on the lake water levels, or a businessman deciding whether to stake your future on a climate-stressed natural resource. Welcome to the Lower Colorado River region of Texas, where uncertainty increases as river levels decline.

The science has clearly established some things, and other things are still pretty much wide-open.

Something has changed about the weather patterns, and the water that we've been able to rely on for that century is not reliable anymore.

I've been coming here since 1971, and I've watched the lake come and go 30 or 40 feet in depth at a time, and we're much lower than that right now and for a much longer sustained period. It's a very different place than it was.

You can see the water line on the pillars behind me. It would not be uncommon for there to be 150 boats tied up to these docks. I'm an optimist that it's gonna come back someday. I kept waiting for that to happen, and then it became inevitable that we couldn't wait any longer.

The effect of carbon dioxide on climate is as well or even better understood as the effect of the sun on climate. So the idea that increasing carbon dioxide levels would cause warming is equivalent, in terms of sound science, as saying that an increase in the intensity of the sunlight would cause the earth to warm. There's no question about that. The next question, though, is how much will it warm? The climate's gonna change between 2 and 6 degrees. At the low end, not so big a problem. At the high end, potentially major problems.

People always said here, "Don't worry; it'll rain," and it historically has. For people's memory, it rained, but then it really cut back, and things changed dramatically in 2008, and that's when things started getting bad. In 2011, they really fell off the table. We're finding there's these natural climate effects that we didn't anticipate could cause these things. How long do we have to make it before maybe the climate change flips back?

In 2010, they estimated about \$2.4 billion of taxable property value here on our lakefront and then another \$1.9 billion of value in neighboring lake area communities, not necessarily waterfront, so about \$4.3 billion in total taxable value. Lake area properties have generally declined in value about 30% over the last several years, so 30% of that 4.3 billion would be about a \$1.3-billion loss of taxable value in the area.

What we're seeing today is, in my opinion, the result of bad management. When people ask me about it, I say that this is bad practices that failed to be covered up by Mother Nature.

There is a problem because, in terms of determining who should get the water, you get different answers from different folks. Naturally, I as a farmer, I take pride in my profession. I like the fact that I'm feeding people with the commodity I produce. I think there should be a certain amount of water reserved and set aside for me and my fellow farmers to produce that food. Corporations like Samsung and others can plunk down billions of dollars on facilities and turn over a whole lot more money in the economy than agriculture can, but at some point we've got to decide, are we going to reserve some water for growing food here in the United States, or are we gonna bring all of our food in from outside our borders?

The thing I worry about about climate change is that when you have such a wide uncertainty level into how much of an impact it's gonna have, we don't know what all the impacts are gonna be. Nature can respond to climate change, but we've put in infrastructure that makes it harder for species to migrate. We've introduced new species different places. We've built our infrastructure based upon the current climate, so whether it gets warmer or colder, it's gonna cost money to adjust to it. My attitude is, if we were to say, "Is it okay to change the climate?" the answer would be, "No. "We don't want to mess with something so complicated and so unpredictable." So the fact that we are changing it worries me.

How often did you hear "unpredictable," "uncertainty" there? When we produced that piece in the early spring, drought was the big issue in Texas. Late May 2015, flooding and damage caused by massive, heavy rains. Let's define what uncertainty means.

Doctor, let me start with you again, Holly. Uncertainty means what, and does the uncertainty-- drought in early spring, flooding by late spring, early summer-- does that cause paralysis in the conversation?

It can. I mean, we all make decisions every day. You evaluate your risk. And you need a level of information we like to call at NOAA environmental intelligence. People need intelligence. They need information to make decisions. Climate isn't gonna happen in 20, 30 years. It's happening now. We're seeing the impacts to communities and economies. We need to start making decisions, but we have to provide people the understanding of the uncertainty in that information. We need to communicate that so they can make the best decision.

Cynthia, in an uncertain environment, when people are making decisions, who's the priority? Is it that guy who had a business on the lake, a marina, a restaurant, important small business in that community, or is it the farmer who says, If the water goes there for the recreational economic impact, what about agriculture?

Out of crisis sometimes, good dialogue happens, and I've seen this recently. It was painful to go through. I'm not saying we're through it all, but recently the governor said for the first time that there were gonna be mandatory cuts on urban uses. Before this, there's been kind of, say, soft goals, and all the individual water districts were trying. But there wasn't a mandate like, If you don't get there you're gonna be penalized, which is what was just announced. And when the governor announced that, all of a sudden, Well, what about ag? It was kind of an ongoing thing, and there was a lot of angst and anger, like, Well, ag shouldn't be getting off. They're getting off easy. So once the governor and his executives went back and explained it a little bit differently, there was a little bit calmer. But as a result of that, we had more of a public dialogue about the fact that, Yes, you're right. We are using 40% of the water, and we're creating food. And guess what? As a person, you're using anywhere from 2,000 to 2,500 gallons a day based on a 2300-calorie diet and the fact that you need to take a shower and you might want to water your lawn. So as a citizen, you have a responsibility. It's a two-way street. Yes, we're using water, and we're producing food here in the United States under the best conditions you can get anywhere in the world, and we want to continue to have that.

To have a dialogue, though, Dr. Ragster, people have to care about an issue. People hopefully have enough education to talk about the issue in an informed way. Also, to have a real dialogue, you have to set your mistrust and your suspicions aside. Do the ingredients exist for that dialogue?

Well, I think the part that's intriguing to me is the part where you have a country that has decided that uncertainty should not exist. We have to now make decisions knowing that things will continue to change. When I served as president, if we did anything, I had to be able to make a decision about something that could go from first to third world within a short period of time. That gives you a completely different end product, and we're gonna have to do similar things with respect to climate change. It is going to be a challenge.

Jack Moyer, help me understand the extremes we saw in the Texas piece, where for months and months, you're dealing with drought, which I assume strains the water supply system in one unique way, and then you have heavy rains and the floods, and they get overwhelmed in quite the other way. What are the challenges for the infrastructure in that kind of swinging environment?

If I could, I'd like to come back to something Cynthia said about the need for water for agriculture, and in round numbers, the water in this country goes roughly into three equal places. The biggest is the generation of energy. We're highly dependent on electrical energy in this country-- look at these lights and cameras. And then secondly, to agriculture, and as Cynthia made a good case, we need the food. And then the third category is everything else. In all three of those areas, we have challenges, but we also have opportunities to improve our efficiencies. Cynthia also mentioned watering lawns, and lawn watering accounts for about 30% of the water used by residential customers in a lot of cities. That's a huge savings opportunity.

Conservation should not be as controversial. How does that factor into this? You're right. For many years in our industry, conservation was almost a four-letter word. We're in the business of selling water; we don't want to talk conservation; we want to sell water. We need to change that mind-set. We are in the business of providing food and water and energy for a long time to come, and conservation is part of that solution, and we're all in it together.

Let's bring another voice. Carlos Rubinstein is with the Texas Water Board. Let's hear his views on conservation and how it can be done in a cost-efficient way. We know that, to meet our demands going forward over the next 50 years, we're gonna need to find an additional 8.3 million acre feet of water. And conservation plays a huge role in how we get there. In fact, conservation can satisfy about a third of that demand in our future. The best part of it is conservation only represents about 12% of our costs. The reason is, we're dealing with water we already have. We just need to learn how to use that water better.

Milton Bluehouse, take us to Native American lands in your experience. Are there efforts underway to bring conservation? I assume this is part of your culture, but do you get the help you need, especially where your land borders other land?

There's something important that I think we oftentimes forget to talk about, and it's highlighted by an experience I had at the Indian Health Service Hospital with my grandmother. We were watching television, and what we'd seen were news reports about the conflict in some of the African nations. And she made a mention in Navajo that was really quite startling for me. She said, "Why are those people fighting? Look how green it is." And I thought about it, and I remember thinking about how, in this effort to conserve, in this effort to have a conversation on how to address climate change, the bipolar political discussions, the economic conversations that are occurring around climate change we forget what my grandmother was mentioning. How do we live together when these resources are being impacted, and that goes back to this issue in Navajo in which we say [speaking Navajo]. How do we speak with harmony with one another in addressing these concerns? And I think we need to look at mediation or peace making so that our conversations on climate change recognize the humanity of one another, rather than the politics.

Milton mentions uncertainty of jurisdiction. We've had uncertainty of priorities. Dr. Mitchell, what does uncertainty mean from a public health perspective? Your job is to treat the patient, but is it also to educate and to deal with uncertainties?

A number of our physicians are telling us that they're patients have asthma, but they're used to having asthma attacks. They're seasonal, during certain periods of time. The same thing with allergies. But now we see that the allergy season has not only increased in the length, that the pollen has increased in the amounts, but that it's unpredictable. We can't say that this is the time that you're gonna need your asthma medication, this is the time that you're gonna need your allergy medication, this is how much you're gonna need for the next month because things have

changed so much there. But we also need to educate. We need to be able to respond to address some of these issues.