

## Study predicts dust-bowl Southwest

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Dust-bowl conditions of the 1930s could become the norm in the Southwest by the end of this century, or sooner, because global warming will bring drier weather, a new national study said Thursday.

More air pollution in the cities, fewer saguaros in the desert, more tree die-offs in the mountains and, above all, up to 25 percent less water for people and wildlife in Arizona will be likely results of drier weather, various local experts said in reaction to the report.

By about 2050, this region will see a perpetual drought similar to what struck the Great Plains in the 1930s and the West in the 1950s, said the report from scientists from Columbia University and the National Oceanic and Atmospheric Administration.

"The 1930s drought lasted less than a decade," said Columbia's Richard Seager, the lead researcher. "This is something that could remain for 100 years."

The report was published online Thursday by the journal Science. It was based on computer models prepared by the Intergovernmental Panel on Climate Change, a global group that will be releasing a new, comprehensive report today on effects of climate change. Of 19 models studied, all but one agreed that warming temperatures will make the Southwest drier.

That is "an unprecedented level of agreement" among the various computer models, said Julia Cole, an associate professor of atmospheric sciences and geosciences at the University of Arizona.

"It's very hard to see that the Southwest is going to do anything but dry out, from desert to the sky islands," said Cole.

10% to 20% less rain here

Scientists who prepared the report predicted that most of the Southwest will get 10 percent to 20 percent less rain and snow by the end of the 21st century. The U.S.-Mexican borderlands could lose 25 percent, scientists said. During the Dust Bowl era, rainfall dropped 10 percent.

Even a 10 percent reduction in Arizona will make people much more mindful about how they use water, said Val Little, director of the Southern Arizona Water Conservation Alliance. Perhaps only public pools will be developed. Toilets that use only 1.1 to 1.2 gallons per flush will be required in new developments, compared with 1.6 gallons today. Local governments may do more to encourage water harvesting or use of gray water, she said.

Besides increasing water conservation, a cutback of 20 percent or more would also force authorities to decide how to spread the remaining supplies among residents, farmers and industries, said Tom Carr, the Arizona Department of Water Resources' deputy director.

A 25 percent cutback would make the changes much more dramatic and costly much sooner, Little said. But because society can do a lot more with recycling and desalination of water, Little said she doesn't believe water cutbacks would stop growth. Still, "It's going to get ugly and contentious, and it's going to get less and less comfortable. More conflict will erupt," Little said.

Fewer saguaros

A 20 percent cut would mean a 10-inch average annual rainfall in the Sonoran Desert, compared with 12 today. That would probably mean fewer saguaros and other desert plants, but probably would not kill off any species, said Mark Dimmitt, the Arizona-Sonora Desert Museum's director of natural history.

The average person probably wouldn't notice much difference, said Dimmitt, since Organ Pipe Cactus National Monument, about 120 miles southwest of Tucson, has plenty of saguaros on about 9 inches of rain a year.

But if warming brings more extreme wet and dry years, dry years could "really kill off a lot of things," and warmer temperatures could push the giant cacti higher in elevation, he said. That might not happen, however, if warmer temperatures overall are accompanied by more extreme frosts in some years.

"If someone born today spends time examining the desert over the next 80 years, they probably would see more dying trees and cacti but would not notice a big change in the overall appearance of the landscape," Dimmitt said.

"Bald mountaintops"

The region's "sky islands" - its high mountains - might not be so lucky. Cole said Mount Lemmon is a "great example of a sky island. As you drive up you see different zones," from desert to oaks to conifers - pine, spruce and other evergreens.

"If you dry, the cactus will move up, the oak will move up - and pine and the fir don't have anywhere to go," Cole said. "Are we going to wind up with bald mountaintops or oaks and firs more intermingled?"

Or, she said, as at the end of the last ice age, 15,000 to 20,000 years ago, some species may survive while others don't.

More dust pollution

Air pollution from fine particles that can cause major respiratory problems could also get worse if the weather dries, said Beth Gorman of the Pima County Department of Environmental Quality. With fewer plants to hold down the dust, people riding bikes or walking or driving trucks will disturb the crustlike soil and allow dust to become airborne, Gorman said.

In 1999, periods of drought and high winds led directly to the last recorded violation of federal air-quality standards in Pima County, Gorman said.

More asthma could also result from more blowing dust, depending on what kinds of substances trigger asthma attacks in an individual, Gorman said.

"Poor poorer, rich richer"

The report is the second major study published this year to predict that global warming will trigger more droughts. The first came in February from the National Academy of Sciences.

Regions such as the northwestern and northeastern United States and the tropics that today get plenty of rain would get more under the global-warming scenarios outlined by Thursday's study.

Other arid and semiarid regions of the world, however, will watch their weather dry out like the U.S. Southwest, the study's authors said. Those regions include southwest Australia, the Mediterranean and the northern coast of Africa.

"It's a situation of the poor getting poorer and the rich getting richer when it comes to rainfall," said Yochanan Kushnir, another of the report's authors and, like Seager, a researcher at Columbia's Lamond-Doherty Earth Observatory.

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Richard Seager, researcher

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