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# Heat dome hampers cloud seeding for rain

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Texas needs rain, there's no question about it. The reason for the drought has been well documented as a strong high pressure system, or a heat dome, that has been sitting over the Lone Star State for several weeks.

The numbers are staggering. San Antonio has only gotten 1.08 inches since June 1. Dallas has fared a little better, but not by much, receiving 1.25 inches of rain since the start of June. And while Houston did have some heavy rain in June and early July, the largest city in Texas has had zero measurable rainfall since July 7.

According to data from the U.S. Drought Monitor, 71 percent of the state is in at least moderate drought, with 46 percent in severe drought as of Thursday. Every time we see a resurgence of drought in Texas, the same question arises: Can we use cloud seeding to interfere with Mother Nature and bring some rainfall ourselves?

## What is cloud seeding?

Cloud seeding is a technique for increasing the rate of rainfall or snowfall. Before discussing how it works we must first understand how rain develops within clouds.

Rain requires high levels of moisture in the air, yes, but the microscopic water droplets also need to attach to something in order to condense into a raindrop and fall to the ground. Usually, that "something" the water attaches to occurs naturally in the form of dust or salt particles floating through the atmosphere. These are called cloud condensation nuclei.

In cloud seeding, the goal is to increase the levels of cloud condensation nuclei, so that the natural water droplets have more particles to attach onto. Cloud seeding doesn't add any moisture, but it is a way to make the rain-producing process within a cloud more efficient by using as much of the available moisture as possible.

To make this happen, aircraft fly into clouds with pyrotechnic flares attached to the wings. These flares look similar to highway emergency flares. Through combustion, silver iodide is released near the cloud base, and the storm cloud's updraft lifts it to where water droplets are more plentiful. One gram of silver iodide can provide as much as 10 trillion artificial ice crystals, which will melt and fall as rain.

## Cloud seeding in Texas

A state-funded effort in the 1990s was integral in starting several rainfall enhancement projects across Texas. Today, seven cloud seeding projects are underway across the state. The combined cloud seeding effort covers 31 million acres, which is more than a sixth of the state's landmass.

The largest is the South Texas Weather Modification Association, based in Pleasanton. STWMA covers a 10-county area that includes San Antonio. Other cloud seeding projects are in West Texas, Northwest Texas and the Panhandle.

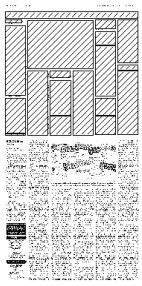
One of the major goals of cloud seeding is to replenish freshwater supplies to reservoirs and aquifers, including the Edwards Aquifer, which is instrumental in providing drinking water to millions of Texans.

"Since 2004, the total recharge enhancement is about 84,000 acre-feet from the weather modification programs just over the recharge zones," said Bria Hieatt, a meteorologist for STWMA. That equates to more than 1.4 billion gallons of water added to the aquifer's recharge zones each year thanks to cloud seeding. An acre-foot is the volume needed to cover an acre with water a foot deep.

Agriculture also reaps the benefits of cloud seeding, such as extra rainfall to crops. According to the Texas Department of Licensing and Regulation, political subdivisions "have embraced the technology of rain enhancement as one element of a long-term, water-management strategy designed to ensure a growing population has enough water to meet its future needs."

## Can cloud seeding help to end the drought?

"Cloud seeding will not 'end' a drought, although it may provide some increases in precipitation



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even during drought periods," according to STWMA. This is because for cloud seeding to be effective, you must already have rain-producing clouds naturally occurring. Agencies cannot simply release silver iodide into the atmosphere on a clear, sunny day and expect rain to develop.

This is why the "heat dome" has been so detrimental to the state as a whole. High atmospheric pressure has been sitting over Texas for the better part of the last two months, keeping skies clear and cloud seeding operations ineffective. Cloud seeding simply cannot create rainfall out of thin air. It only enhances ongoing rainfall rates.

## How effective is cloud seeding?

Whenever the conditions are right and rain is ongoing, cloud seeding actually does work. A 2019 study done by Texas Tech University showed that, on average, seeded thunderstorms lasted 22 minutes longer and produced 24 percent more rainfall than untreated storms. According to the study, a single isolated thunderstorm produced an average of 1,000 acre-feet of additional rainfall when seeded. That's enough water to fill 494 Olympic-size swimming pools.

A 2013 analysis done by the Texas Weather Modification Association states that rainfall increased by 13 percent in their target area, compared to untreated areas. That can mean an additional 1 to 5 inches of rain per year. Cloud seeding is also done over mountainous terrain to increase snowpack. The Desert Research Institute has found that mountain snowpack can increase by 10 percent or more because of cloud seeing programs.

## Is cloud seeding dangerous?

The most common substance used in cloud seeding, silver iodide, has high levels of silver, which can be harmful to health in large quantities. According to the national Centers for Disease Control and Prevention, it can cause breathing problems and skin discoloration. However, the concentrations of silver iodide used in cloud seeding is not nearly high enough to cause negative health issues.

The EPA recommends that the concentration of silver in drinking water should not exceed 0.1 milligrams per liter. According to a report by the Utah Department of Health, multiple studies have found that rainwater and snow from seeded clouds have resulted in silver concentrations less than one thousand times the recommended limit. In other words, the concentrations of silver are considered to be at safe levels.

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**To seed clouds, pyrotechnic flares are used on the wings of aircraft to release silver iodide into clouds, so more of the cloud's moisture can reach the ground.**