Drought-ridden L.A. tries rainmakers to tap storm clouds

By David Biello, Scientific American on 06.01.16
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An aircraft flies over Thailand in a bid to seed clouds, July 9, 2015. REUTERS/Chaiwat Subprasom

Los Angeles has officially stopped trying to make it rain — for now. During three separate storms in the past two months, contract workers for the L.A. County Department of Public Works ignited 25 special flares in the hills above Pasadena, sending columns of glittering smoke into the clouds to give them a literal silver lining that could boost precipitation.

The efforts mark the first time since 2002 that the parched metropolis has seeded clouds in an attempt to enhance rainfall; it is currently enduring a nearly five-year-long drought with this winter's rainfall at just 40 percent of the usual amount. Although scientific scrutiny in California and elsewhere has shown cloud seeding to have limited effectiveness at best, even the faint hope of wresting more water from the vast reservoir in the sky remains impossible to resist.

"We were hoping to get more rain on that promise of an El Niño winter," says Kerjon Lee, a spokesman for the Public Works Department, which has overseen cloud seeding efforts for more than 50 years in a bid to cut down on the expense of water imported from other parts of California and elsewhere. "Storm water is 85 percent less expensive than imported water." The department estimates that cloud seeding can generate 5.7 billion liters of extra

water over an October to April season, based on past results. For the privilege of harvesting extra water that could cost $3.2 million, per Public Works estimates, the region's taxpayers paid $550,000 to North American Weather Consultants, the company that carries out the process.

In the foothills of the San Gabriel Mountains east of the city, North American runs 10 “generators” — six hand-operated burners and four remotely operated flare trees that poke above the scrub like dull gray cacti. Each burner or flare sends up 15 grams of silver iodide, a metallic compound that promotes ice crystallization in a cloud.

Soot, dust and even bacteria have been shown to play a similar role in natural rain and snow, but for artificial purposes silver iodide works best because its molecular structure is similar to that of ice, encouraging such crystals to form. In a rain cloud whose water vapor has become supercooled without freezing — what pilots know as “icing conditions” — particles of silver iodide can induce ice crystals to form around themselves. More ice rimes around these nascent crystals until they grow heavy enough to fall as rain or snow. The extra precipitation is captured by L.A. County reservoirs or by spreading grounds where the water percolates into the ground.

The basic principle has been widely known since the 1950s, when Bernard Vonnegut (brother of famous novelist Kurt) wrote about it for Scientific American. More recent statistical surveys suggest that under very specific conditions cloud seeding with silver iodide can increase precipitation by as much as 15 percent. In determining its effectiveness, however, there is always the question of how much it might have rained or snowed anyway — and the matter of teasing out the relatively small amount of human impact from the massive amount of natural variability. Asked if this year's efforts worked, Don Griffith, who is president of North American Weather Consultants and has been seeding clouds since the 1960s, says: “That's a very difficult question to answer…. We think so, we hope so, but there's no way you can demonstrate that.”

Others are more confident. “It's a proven program as far as we're concerned, and it's something we'll continue to do,” Lee says. "Cloud seeding is just one of the efforts we employ to increase our local water supply."

Given that California needs an extra 42 trillion liters of water to end its drought, any and all efforts may be needed. “We don't go out there and say we're drought relief,” says Neil Brackin, meteorologist, pilot and president of Weather Modification Inc. “Sorry, can't happen. But as part of a comprehensive water management program, cloud seeding can be very effective.”

But the potential for that effectiveness comes with a lot of conditions. Like snowflakes, no two clouds are the same. Part of the trick is finding the right geographical and meteorological situation as well as getting the silver iodide into the right spot in a cloud — while not seeding monster storms or inducing rainfall over places susceptible to dangerous flooding, landslides or other ill effects. In the future drones might help with that.

Seeding thunderstorms, suppressing hail and making more clouds in hopes of rain have never been proved to work, but that has not stopped authorities in places ranging from North Dakota to China from trying all of these weather-controlling efforts — and more. Part of the motivation is political. “In terms of water agencies, a lot of it is just getting out there and doing something,” says William Cotton, an atmospheric scientist and emeritus professor at Colorado State University.

And of course, many parts of California have mountains abutting a coastline, facilitating the specific conditions that are the only proved way to make cloud seeding work. Specifically, storm clouds have to run into mountains that force the humid air upward, creating convection bands of supercooled water vapor that has not yet frozen and is thus a fertile zone for silver iodide particles to boost precipitation.

Few places are blessed with such an optimum setup. Perhaps that's why the United Arab Emirates — which has invested more than $5 million in research to maximize precipitation, including cloud seeding operations — is using computers to model the effectiveness of building a mountain in the desert and harvesting rain from clouds that run into the artificial peak. Apparently, the Burj Khalifa — Dubai’s 830-meter showpiece skyscraper and the tallest structure on Earth — isn't big enough to start the rains. "Nobody can create a cloud," says Roelof Bruintjes, an atmospheric scientist at the U.S.'s National Center for Atmospheric Research and chair of the expert team on weather modification at the World Meteorological Organization. "Cloud seeding is more a long-term water resource management tool."

Quiz

1 Read the following selection from the article.

> *In a rain cloud whose water vapor has become supercooled without freezing — what pilots know as "icing conditions" — particles of silver iodide can induce ice crystals to form around themselves. More ice rimes around these nascent crystals until they grow heavy enough to fall as rain or snow.*

Which of the following options BEST defines the word "nascent" as used in the sentence?

(A) promising

(B) undeveloped

(C) poorly formed

(D) newly emerged

2 Read the following selection from the article.

> *Asked if this year's efforts worked, Don Griffith, who is president of North American Weather Consultants and has been seeding clouds since the 1960s, says: "That's a very difficult question to answer…. We think so, we hope so, but there's no way you can demonstrate that."*

Which of the following options BEST describes Griffith's tone in the quote above?

(A) fleetingly concerned

(B) cautiously optimistic

(C) slightly overwhelmed

(D) thoroughly convinced

3 Read the first paragraph of the article.

> *Los Angeles has officially stopped trying to make it rain — for now. During three separate storms in the past two months, contract workers for the L.A. County Department of Public Works ignited 25 special flares in the hills above Pasadena, sending columns of glittering smoke into the clouds to give them a literal silver lining that could boost precipitation.*

How does this paragraph contribute to the article?

(A) by comparing the various methods used by two different city governments

(B) by describing a past event that greatly affected the people of Los Angeles

(C) by giving an example of an attempted solution to the drought problem discussed in the article

(D) by predicting the actions that drought experts will take to address future problems

4 Why does the author include the final paragraph in the article?

(A) to predict that cloud seeding is the answer to drought prevention in the future

(B) to imply that cloud seeding is not necessarily effective no matter where it is used

(C) to contrast California's use of cloud seeding to a location with even greater water needs

(D) to broaden the question of the usefulness of cloud seeding to other potential applications