Personnel Updates
Claire Satterwhite left the Department in April of 2021 to take a job with the US Fish and Wildlife Service.

Adam Foster, Hydrologist with the WWD Program, took over WXM administrative duties in May of 2021.

Casey Stevens, Hydrologist with the WWD Program, started in February of 2022 and will be assisting in administering the WXM program.

Outreach
Staff attended the 2022 Weather Modification Association Annual Meeting in Corpus Christi.

WXM staff plan on meeting with staff of the various association around the State in the coming month and attend the next Texas Weather Modification Association Meeting.
TEXAS RAIN ENHANCEMENT PROJECTS
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# CURRENT TEXAS WEATHER MODIFICATION PERMITS

## July 2022

<table>
<thead>
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<th>Type</th>
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* Tentatively approved by TDLR Staff. Requires Board Approval.

- **R-E** Rain enhancement only using cloud-seeding techniques and materials
- **H-S** Hail suppression and rain enhancement using cloud-seeding techniques and materials
- **H-S** Hail suppression only using hail-cannons

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# CURRENT TEXAS WEATHER MODIFICATION LICENSES

All licenses valid until August 31, 2022

- Belding Farms Inc. (Fort Stockton)
- Panhandle Groundwater Conservation District (White Deer)
- Seeding Operations & Atmospheric Research (Plains)
- South Texas Weather Modification Association (Pleasanton)
- Trans-Pecos Weather Modification Association (Pecos)
- West Texas Weather Modification Association (San Angelo)
2022 Annual Meeting of the Weather Modification Association
Corpus Christi, TX

Wednesday, April 27, 2022
9:00 AM

Introductory Remarks
DEREK BLESTRUD and ANDREW DETWILER

Session 1: Technological Advances in Weather Modification

9:10 AM
Seeding Temperature Considerations for Ice Crystal Engineering Glaciogenic Ejectable Flares in the Convective Environment.

BRUCE A. BOE,
Weather Modification International, Fargo, ND USA

9:30 AM
Next Generation ‘Early Duplex Vertical Seeding (EDVS)’ Hail Mitigation: Systems Approach towards Swarm-Drone Controlled Technology

P. KUMAR,
MIT World Peace University, Pune, India

9:50 AM
Development of a New Cloud Seeding Vector – Maximizing Cloud Seeding Opportunities Thanks to Smart Balloons

FABRICE CAQUIN
Selerys, Rousset, FRANCE

10:10 AM BREAK
10:20 AM

Benefits of Detecting Atmospheric Electricity for Advance Warning of HAIL RISK
JEAN YVES LOUJOU
Selerys, Rousset, FRANCE

10:40 AM

Implementing rain enhancement operational maneuvers using uncrewed systems with autonomous-adaptive technologies
T.P. DEFELICE
University of Colorado, Boulder, CO USA

11:00 AM

2021 field operations for UAEREP - Targeted Observations and Seeding Using Autonomous Unmanned Aircraft Systems
DAN BREED,
University of Colorado, Boulder, CO USA

11:20 AM

End of Wednesday Morning Session

Session 2: Cloud Seeding in Summer Convective Environments

13:30 PM

Cloud Seeding and Crops Yields: Evaluation of the North Dakota Cloud Modification Project
MARK SKIDMORE
Department of Agricultural, Food and Resource Economics, Michigan State University,
East Lansing, Michigan USA

13:50 PM

A Method for Verification of the North Dakota Cloud Modification Project Hail Suppression Seeding
KYLE PEDERSON
University of North Dakota, Grand Forks, ND USA
14:10 PM

Texas Cloud Seeding Operations in the Time of Covid-19

JONATHAN JENNINGS
Texas Weather Modification Association, San Angelo, TX USA

14:30 PM  BREAK

14:40 PM

An Overview of Three Seeding Events in the Texas Panhandle During the Summer of 2021

COREY CLAY
Panhandle Groundwater Conservation District, White Deer, TX USA

15:00 PM

A New Operational Cloud Seeding Program for the Kingdom of Saudi Arabia

BRUCE A. BOE
Weather Modification International, Fargo, ND USA

Session 3: Cloud Seeding Operations and Management

15:20 PM

Weather Modification Association Certification: Your Questions Answered

MARK D. SCHNEIDER
WMA Certification Board Chair

15:40 PM

The ASCE/EWRI Atmospheric Management Standards (AWM) Committee Update

TOM DEFELICE
University of Colorado, Boulder, CO USA

16:00 PM

End of Wednesday Afternoon Session
Thursday, April 28

**Session 4: Winter Cloud Seeding Operations**

9:00 AM

*Numerical Evaluation of Winter-time Cloud Seeding over the Snowy Mountains of Australia using WRF-WxMod®*

SISI CHEN  
Research Applications Laboratory  
NCAR, Boulder, CO, USA

9:20 AM

*Cloud seeding impacts of two SNOWIE IOPs from observation-constrained ensemble seeding simulations*

LULIN XUE  
Research Applications Laboratory  
NCAR, Boulder, CO, USA

9:40 AM

*Investigating the Feasibility of Cloud Seeding in the Bear River Basin*

SARAH TESSENDORF  
Research Applications Laboratory  
NCAR, Boulder, CO, USA

10:00 AM  BREAK

10:10 AM

*Recent cloud-seeding research sponsored by the US Bureau of Reclamation*

SARAH TESSENDORF  
Research Applications Laboratory  
NCAR, Boulder, CO, USA
10:30 AM

Simulated hygroscopic seeding effects on a congestus cloud using bin and bulk microphysics and WRF piggybacking framework

LULIN XUE,
Research Applications Laboratory,
National Center for Atmospheric Research, Boulder, CO USA

10:50 AM

Cloud Seeding Research: Progress and Future Plan in Utah

BINOD POKHARAL\textsuperscript{1,2}
\textsuperscript{1}Utah Climate Center, Utah State University, Logan, UT
\textsuperscript{2}Central Department of Hydrology and Meteorology, Tribhuvan University, Kathmandu, Nepal

11:10 AM

The role atmospheric water management technologies might play in Nature-based solutions

TOM DEFELICE
University of Colorado, Boulder, CO USA

11:30 AM

End of Thursday morning session
Cloud-seeding drones: What they can and can't do

BY METEOROLOGIST CHRISTOPHER NUNLEY, PH.D. | NATIONWIDE
PUBLISHED 11:45 AM ET SEP. 14, 2021

Technology to make it rain isn't as farfetched some may think. The United Arab Emirates announced it’s utilizing drones in Dubai to increase precipitation and decrease temperatures by using electrical charges to enhance precipitation.

Basically, using drones to seed clouds.

What You Need To Know
- United Arab Emirates is attempting to alter the weather in Dubai
- Cloud seeding science has existed for decades
- Cloud seeding will not mitigate climate change and end droughts
Cloud seeding 101

Clouds consist of tiny ice crystals and water droplets, no matter what type of cloud it is.

These ice crystals and water droplets form on small pieces of salt and dust known as cloud condensation nuclei (CCN).

CCN is necessary for the development of precipitation (i.e. rain, snow, sleet and hail). This is where cloud seeding comes into play.

Cloud seeding is a small form of weather modification.

This small modification can aid in improving a cloud's ability to precipitate by artificially adding CCN to the atmosphere to help raindrops and snowflakes develop.

The science behind cloud seeing. (Santa Barbara County Public Works Department)
A substance commonly used as CCN is silver iodide. Airplanes in the sky or flare trees on the ground release the silver iodide into the atmosphere to seed clouds.

Ideally, once a cloud becomes seeded and precipitation develops in the cloud, it becomes robust enough to reach the ground.

"The goal is to produce ice in clouds that otherwise have very little or no ice particles," says Associate Professor at the University of Wyoming Dr. Jeff French.
Researchers and scientists have led cloud seeding efforts in North America for decades, including in the U.S.

The western states, where clouds typically need an extra boost, are some areas that most commonly utilize this science to enhance precipitation.

While cloud seeding has yielded promising results, it's not the answer to mitigating climate change or ending droughts. In the case of droughts, that's because they can take a long time to end.
Cloud seeding is not the answer to ending drought

Cloud seeding has led to promising results and effectively enhanced precipitation, but is not the answer to ending drought.
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NATIONWIDE | 3 DAYS AGO
Seeing double: How do two rainbows form?
CALIFORNIA CONSUMER DO NOT SELL MY PERSONAL INFORMATION
Did They Really Make It Rain Over Dubai? Does It Matter?

You’d think the idea that humans can modify the weather would be exciting.

By Paul McAdory
Aug. 11, 2021

Driving coastward through Mississippi last month, I hit rain. First it spat at the windshield, a few drops sprinkling down from the sky onto a 2009 Accord. Then the bucket tipped, the road disappearing into smudges of light and water cascading on glass in the milliseconds between frantic wiper swipes. I eased into a doughnut shop’s flooded parking lot and settled in to watch.

I was reminded of that downpour by an arresting series of short videos posted to Instagram last month by the United Arab Emirates’ National Center of Meteorology. In one, we see cars speeding through heavy rain while palm fronds shiver and the sun peers meekly through clouds, casting the scene in sepia tones. In another, we see the effects of a deluge: flooded streets, stationary vehicles, brown water streaming over sand. A third shows S.U.V.s traversing what appears to be a bumper-deep lake.

It bears repeating that we are looking at the U.A.E. — specifically, at its cutting-edge highways, which are engineered to withstand extreme temperatures, allowing drivers to safely cross the desert on their way to ultramodern cities like Dubai and Abu Dhabi. We might expect to observe heat radiating off asphalt; we might expect sand, swept up by traffic, glinting in the overwhelming brightness. Instead, rain dumps down and bounces from the blacktop. The videographer’s slow pans from side to side seem to channel our incredulity. This is scarcely believable in a country where annual precipitation usually hovers around four inches. It’s as if every detail is being recorded, more than once, so the proof becomes incontrovertible. And whatever surprise you experience at seeing it may redouble when you read, via reports in The Washington Post, The Independent and elsewhere, that this surreal footage was a result of a technology called cloudseeding, which the U.A.E. has been refining for more than a decade.

Those reports may be slightly exaggerated. Cloudseeding traditionally refers to a set of weather-modification techniques in which a substance — salt, or silver iodide, or dry ice — is fired into a cloud to enhance precipitation, not single-handedly create it. For years, this has been done by planes; more recently, unmanned drones have been tried, releasing electrical charges that can have a similar effect. In theory, the seeding creates an attractive substrate for water molecules to coalesce around, forming droplets or crystals dense enough to fall to the ground without evaporating.

Whatever power these videos want to convey will always be dwarfed by a greater one.

The U.A.E. is exploring this technology because its climate is dry and hot, and getting hotter as the planet warms. So far this year, temperatures have topped 125 degrees Fahrenheit in parts of the country. Complicating matters further is the Emirates’ exploding population: From 2005 to 2010, it nearly doubled, to about 8.5 million, and it now hovers around 10 million. More people need more water, and only 4 percent of the U.A.E.’s supply comes from renewable sources. To make up the difference, and to conserve what water it does have, the country has turned to desalination, which is expensive, and to cloudseeding, which is relatively cheap — and, assuming it can work at scale, may have the added benefit of temporarily making both the air and the nation’s social-media content cooler.

It’s unclear whether the 14 cloudseeding flights the U.A.E. conducted in the week before those heavy rains even targeted the clouds responsible. But it certainly behooves the state to sow optimism, and the National Center of Meteorology often publishes simulations and announcements tagged #cloud_seeding, followed by videos of inundated roadways. The same confusion surrounds the technology in general. Despite large weather-modification programs, like the one in China, many scientists remain unconvinced that the process reliably increases rainfall. (There is some evidence that it can modestly increase snowfall in certain circumstances, but for complex reasons, experimental evidence on warm-weather clouds hasn’t been conclusive.) If it does reliably work, no one’s sure how much precipitation it can produce or whether there’s a risk of it working too well and causing dangerous flooding.
Experts also disagree over whether generating rain this way might result in less precipitation for downwind areas, which means accusations of rain theft abound. It’s a difficult thing to wrap your mind around: If you’re suffering drought while the people upwind are cheering their ability to wring water from passing clouds, you may not be inclined to wait around for expert consensus.

Attempts to summon rain are hardly a new activity for human beings. For millennia, we’ve had prayers and rituals and outlandish inventions geared to the purpose — as well as many that aimed to do the opposite, warding off storms and floods. At first glance, what these videos from the Emirates want to document is the closing of a loop: human ingenuity transforming the fantasy of weather manipulation into effective practices of control. The U.A.E. demanded rain, and there was rain, and it was good public relations. The Emirati government, after all, presides over a scorching nation whose economy depends on the export of crude oil. It has a strong interest in presenting itself as potent enough to manage the fallout of climate change by, say, making water fall from the sky.

Like a lot of P.R., the videos show us something with miraculous overtones but wind up provoking anxiety instead. Confronted with evidence that we may have achieved one of humanity’s perennial goals — control, however partial, over the weather, which we used to commend to the whims of gods and nature — you might expect to feel some shred of pride or triumph. But then the context clicks. Humans, you remember, have already managed to alter not just the weather but the climate of the entire planet, a change of such magnitude that the idea of using drones to milk the clouds over a small patch of desert feels paltry and insignificant. As the videos loop, you begin to discern that this fact lurks in the background of each one, haunting the images. Whatever power they want to convey will always be dwarfed by a greater one.

It may well be that human engineering of the environment, or technologies for things like carbon capture, are vital parts of our future on the planet. It is, at the very least, fascinating to consider their possibilities. But what’s most deflating about these videos may be what they tell us about how those possibilities will become realities — not as part of some international consensus to limit our damage to the Earth but, perhaps, because they are unilaterally deployed by wealthy nations or billionaire monarchs. And used, in the end, simply to improve the weather at home — or to project to the world, and to Instagram, that someone holds the power to make any desert bloom.

Watching rain pound down on Emirati highways, alongside news reports suggesting that it was provoked by humankind, captivated me for a moment. The videos offered an attractive portrait of human mastery, a fleeting sense of wonder and hope. Then the moment passed, along with the vague fantasy of our ability to prevent the fatal sweep of sea and heat over so much life. My awe shriveled. I wasn't looking at a storm like the one in Mississippi. I was looking at content.

Source photograph: Shutterstock.

Paul McAdory is a writer and an editor from Mississippi who lives in Brooklyn. He last wrote about his pet snake for the magazine.

A version of this article appears in print on , Page 7 of the Sunday Magazine with the headline: Dark Clouds
Scientists in the US are flying planes into clouds to make it snow more

By Jennifer Gray and Rachel Ramirez, CNN
Updated 5:50 PM EDT, Mon March 14, 2022

Editor’s Note: A version of this article originally appeared in the weekly weather newsletter, which releases every Monday. You can sign up here to receive these every week and during significant storms.

(CNN) — With 61% of the contiguous US in drought, wouldn’t it be nice if we could just “make it rain” or just “make more snow?”

Well, certain parts of the country are doing just that, sort of. It’s called cloud seeding, and it’s nothing new.

It’s been around since the 1940s and countries all over the world have been doing it for...
various reasons (most notably China), but it’s a growing practice in the US, especially in the drought-stricken West.

It’s also surrounded with controversy.

We spoke with Julie Gondzar who is the program manager for Wyoming’s Weather Modification Program, who admits she gets lots of calls about what they are doing.

Gondzar said some people say “you’re playing God,” others say “you are stealing moisture from the storm,” making other areas drier than they normally would be, kind of like robbing Peter to pay Paul.

There are also environmental factors to consider, as well as the cost-effectiveness versus the reward, which in the West these days water is liquid gold.

“Think about it like water storage, but in the winter on mountaintops,” is how Gondzar described what cloud seeding is trying to achieve in her state, “in a nutshell.”

Wyoming started cloud seeding in 2003 as part of a study. Then eight seasons ago, they started doing it in an official capacity after their 10-year study proved it works.

This season, they have gone on 28 flight missions for cloud seeding in Wyoming.

King Air’s twin engine plane that is used for cloud seeding.
She pointed out there are four weeks left in the season, so she is hoping for more opportunities before it winds down.

When you compare Wyoming to other states such as Utah and North Dakota, who have been cloud seeding since the ’70s and ‘80s, the state is fairly new to the game.

Cloud seeding uses an already existing cloud, and injects silver iodide into the cloud, which adds tiny particles called ice nuclei (which water needs to freeze).

Clouds, in basic terms, are a collection of water droplets and/or ice crystals floating in the sky.

The nuclei help the cloud produce precipitation, and artificial ice nuclei help create more precipitation than the cloud would produce otherwise.

It’s done in two ways: One way is from the ground and the other is from the air, using silver iodide as the seeding agent.

“The ground-based generators kind of look like small weather stations, are like 20 feet tall, and they aerosolize into the atmosphere,” Gondzar explained. “But you have to wait for the right atmospheric conditions so that the plume goes over the mountain range.” It makes seeding a little more tricky, because if the wind is blowing in the wrong direction, you’ll completely miss your target.

The most popular way is by plane, using flares. “There are flares on the wing of the planes with silver iodide inside of cardboard casings and there are flares on the belly of the plane,” Gondzar pointed out.
Once the pilot flies into the storm, they ignite the cardboard casings full of silver iodide and “seed” the clouds. The result is more moisture in the cloud, resulting in more precipitation.

The silver iodide “is a natural salt compound,” Gondzar emphasized. “The reason it’s used is because the geometric shape down to a molecular level is very similar to that of an ice crystal. And if you don’t have that, you’re not going to create additional ice crystals, which will then accumulate into snowflakes.”

But if you think you can bust the drought by using planes to modify the weather, Gondzar said think again.

**Is it working?**

“Cloud seeding does not fix the drought,” Gondzar said. “You can’t break a drought with cloud seeding. It’s a tool in the toolbox.”

Gondzar admitted while they know the method makes more snow than they would otherwise receive, it’s difficult to know exactly how much more they are getting.

“There’s evidence of it in radar and all kinds of papers written,” Gondzar noted. “The question that they’re trying to answer now is how well does it work? And that’s a difficult question to answer. Because there’s an abstract piece of this. There’s really no way to know how much snow a particular system would have produced.”

She knows cloud seeding doesn’t generate a lot of additional snowfall, but every little bit helps these days.

According to [Wyoming’s Water Systems Data Map](https://www.wyoming.gov/publications/wyoming-water-systems-data-map), some areas in the state are only at 60% of average for snowpack this season, and the window for additional snow is slowly closing as the season winds down.

Since most of the West gets the majority of its water from snowmelt, she hopes what they are doing helps a tiny bit in the long term.
7-day average streamflows

- Much below normal
- Below normal
- At or above normal

Preliminary 7-day average streamflows as of June 20, 2022 compared to historical data for each site on the same day. Sites with no data or fewer than 30 years of comparison data omitted. “Normal” means current readings are in at least the 25th percentile compared to past values. “Much below normal” means the current reading is less than in the 10th percentile.

“It’s a small incremental change over a long period of time. That’s why consistency is
It’s a small incremental change over a long period of time. That’s why consistency is important,” Gondzar urged.

She added at $28-$34 per acre foot, cloud seeding is relatively cheap.

“Those numbers tell us that this is an inexpensive way to help add water to the system. Essentially, we are creating a little bit of additional snowpack, that becomes additional streamflow in the spring and summer.”

But you need a cloud, to cloud seed. You can’t just go out to the Mojave Desert and make it rain.

“This is not something that we can do out of thin air,” Gondzar cautioned. “The criteria is very specific for this to actually work.”

It can only be done within already existing clouds that were going to produce snow anyway and there has to be a certain temperature range.

“The silver iodide in the cloud is initiating that snow,” Gondzar said. “But you can’t just make snow out of nothing. You have to have the supercooled liquid water in the cloud.”

She explained part of what made this year difficult was the much drier weather during the last month. There were fewer opportunities to cloud seed.

“A lot of people think it’s manipulating the weather pattern,” Gondzar remarked. “We are essentially just playing with cloud dynamics and cloud physics, on a super, super-small scale.”

She is a meteorologist as well and points out the moisture from the weather systems come from much bigger areas like the Gulf of Mexico or the Pacific.

“There’s always a huge stream of moisture that our systems are tapping into, and cloud seeding probably brings an additional one to 2% down to the surface.”

**Playing God**

While Gondzar is confident cloud seeding doesn’t steal snow from another area, some scientists disagree.

Daniel Swain is a climate scientist at UCLA and spoke with my colleague and climate writer Rachel Ramirez.

He told her “It is possible that you’re actually stealing water from someone else when you do
this, because it may be, at least on a regional basis, a zero-sum game where if water falls out of the cloud in one spot, it’s even drier by the time it makes it downwind to the next watershed.”

Snow on the ground across the US

Here’s where the National Weather Service detects at least an inch of snow on the ground in the contiguous United States.

Current snow depth, in inches

1 inch  2  5  10  20  40  80

Note: Measurements not available for islands in the Great Lakes. Data as of Tuesday, June 21 at 2:00 a.m. ET.

Source: National Weather Service
Graphic: John Keefe, CNN
He went on to ask, “To what extent are you just shifting around the spatial distribution of precipitation during a scarcity period rather than actually causing it to rain or snow more overall?”

He believes water equity issues need to be researched more.

Another note of controversy has been the safety of the chemicals used in cloud seeding. Gondzar stressed it is not made of harmful chemicals like some people claim.

She pointed out they did lots of testing for before they started officially cloud seeding and could not find any traces of harmful amounts of silver.

“There’s silver in natural background levels in the water in the soil everywhere, on the surface of the earth,” Gondzar noted. “So you already have a natural background level of silver, it’s been really difficult to find anything beyond background levels.”

She said the amount of silver iodide used is only a few grams at a time. What she’s hoping is a small price to pay for bigger rewards down the road.

There have been climate concerns surrounding cloud seeding. Here’s more from Ramirez, who reached out to a few scientists, to get their take on cloud seeding’s climate angle.

**Climate scientists remain skeptical this is the silver bullet**

Although cloud seeding has been around for decades and is currently being operated in roughly 50 countries, many climate scientists remain skeptical of the technology’s efficacy as well as the time and effort put into trying to manipulate weather.

Swain pointed out it has been historically difficult to design scientific experiments to test the effectiveness of cloud seeding, leaving behind a trail of unclear, intangible evidence on what the benefits are.

“How do you know how much precipitation that might actually end up falling from that cloud occurred due to the seeding? Or how much would have fallen without the seeding?” Swain told CNN. “This isn’t a setting where you can do a truly controlled experiment.”

Cloud seeding experiments typically deal with a narrow set of parameters, according to Swain, taking into account weather conditions including cloud cover, time of the day, and
Swain, taking into account weather conditions including cloud cover, time of the day, and location. Additionally, the rapidly changing climate adds another layer to the list of variables. As the planet warms, weather patterns and clouds will constantly evolve, often in unexpected ways.

That’s what Sarah Tessendorf, a scientist at the National Center for Atmospheric Research, and other researchers from universities and an Idaho power company, set out to examine in 2017. Their results, published in 2020 in the Proceedings of the National Academies of Sciences, managed to quantify how effective cloud seeding is. Yet uncertainties still linger.

During the cold winter months in 2017, the researchers flew aircraft to inject silver iodine, the seeding chemical used, into clouds over the Payette Basin in Idaho, while simultaneously using radars and models to measure its impact on snowfall.

In three cloud-seeding events, the scientists identified “unambiguous seeding patterns,” in cold cloud decks not producing ice at all; but once seeded, ice crystals formed inside mirroring the same pattern the aircraft had flown. They were then able to track the formed ice and snow to the ground and measure how much additional snow fell from the seeded clouds.

Despite the results, Tessendorf said more experiments need to be done to improve the technology for it to become a sweeping solution to the climate crisis. The amount of precipitation produced by cloud seeding — up to 10% — isn’t enough at all to quench the drought-stricken West.
“It could help over the years augment the storage levels in reservoirs, so that when you get into that extract, you might just go into that drought with a little bit more than you would have otherwise,” she said. “That to me is the way that cloud seeding should be viewed. It’s not going to be the silver bullet, but it could be a helpful tool in a water manager’s toolbox.”

When it comes to tackling climate change as a whole, many also question the methods such as the deployment of fossil fuel-powered aircraft to inject silver iodide into clouds, arguing it is counterintuitive to the overall climate goals of slashing fossil fuel emissions. But Tessendorf argued it is a small price to pay in order to improve the technology.

“I will say that the number of aircraft and the duration of these flights to do cloud seeding and the programs that are currently having it done pales in comparison to the number of commercial flights and aircraft we have in the skies all over the world right now,” she contended. “So it’s to me a drop in the bucket of extra fossil fuels being burned.”

“But that does not mean that there isn’t room for improvement there in order to have more of a clean process,” Tessendorf added.

With the climate crisis accelerating, climate scientists like Swain say resources are much better invested in climate solutions already guaranteed to make significant and equitable impacts.

“There needs to be controlled studies that actually shows it was the seeding that increased the precipitation in a meaningful way,” Swain asserted. “The best case scenario is it’s a small incremental adjunct to other water-saving or conservation measures during scarce periods, but even that’s not clear if it would really work in that capacity in any systematic way.”

CNN meteorologist Judson Jones contributed to this article