



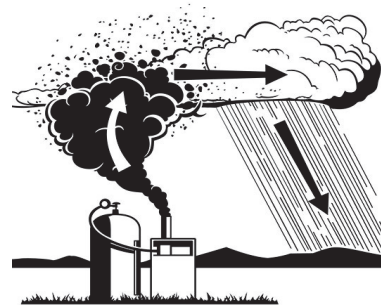
# SANTA ANA RIVER WATERSHED PILOT WEATHER MODIFICATION PROGRAM

## What is the Pilot Weather Modification Program?

In 2020, the Santa Ana River Watershed Project Authority (SAWPA) conducted a study on the economic and technical feasibility of implementing a weather modification, also known as cloud seeding program in the Santa Ana River Watershed to increase water supply in the region. With this study, SAWPA will now conduct a 4-year weather modification program to gather the necessary data for ensure the program is feasible and can be implemented in the watershed.

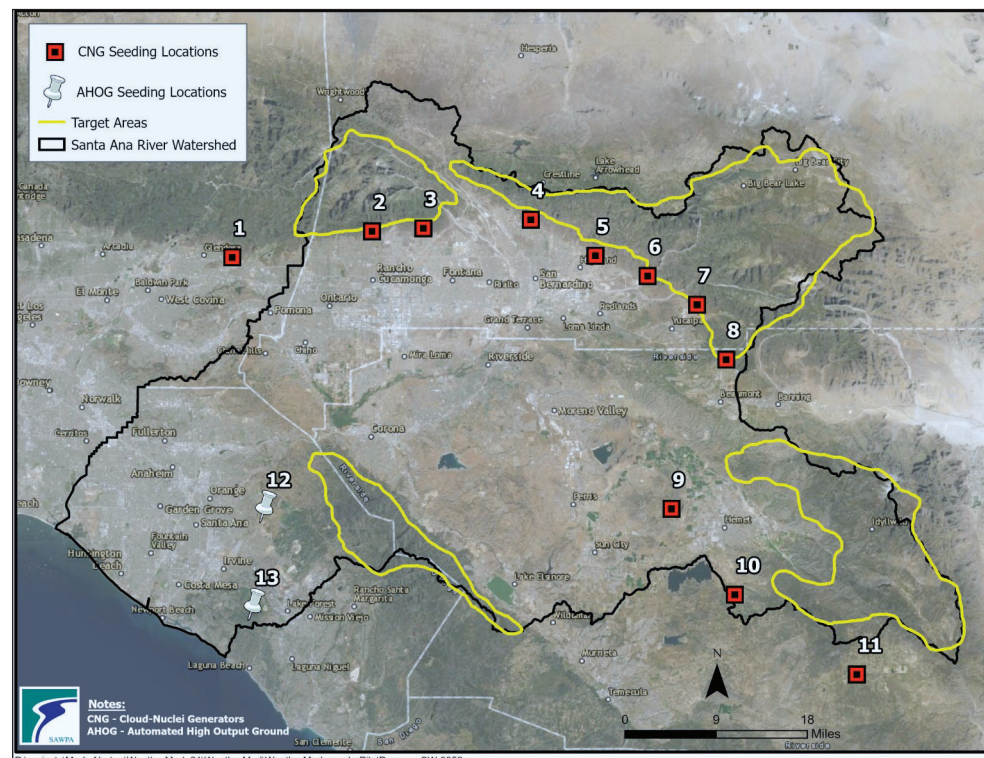
## What is Cloud Seeding?

Cloud seeding is a type of weather modification used to increase the amount of precipitation, including snow or rain, during the storm season. This process works through releasing particles of *silver iodide* into clouds, which increase the chances of droplet condensation.



## Targeted Areas

The program was designed to be implemented in four distinct mountain regions in the watershed. These areas were selected based on their contribution to past seasonal runoff. SAWPA has analyzed multiple storm events in the watershed over the several winter seasons, allowing them to compile a detailed climatology of the Santa Ana River Watershed region. From this, SAWPA has compiled an array of seeding sites for the Watershed's four target areas which then would be seeded by 13 ground seeding locations.



## Benefits

The following are some of the major economic and environmental benefits of implementing ground based cloud seeding in the Watershed:

- Increase of 8% in precipitation, increasing runoff/streamflow in the Santa Ana River, mitigating the negative effects of climate change, and enhancing riparian habitat
- Increase in water supply for the region, enhancing groundwater recharge and reducing reliability on imported water
- Increase in snowpack for snow season recreational activities

## How does cloud seeding work?

1. Storms come into the Watershed region, bringing in clouds and moist air (humidity)
2. Silver iodide particles are released into the atmosphere using ground based seeding systems
3. Freezing in the clouds is activated by silver iodide particles
4. Snowflakes fall to the ground, increasing the amount of snowpack in mountainous regions



## Cloud Seeding is Safe

From 50 years of research, there have been no human effects caused by the cloud seeding agent, silver iodide. The concentration of silver in rainwater or snow from a seeded cloud is much less than the U.S. EPA's standard for silver in drinking water. The potential environmental impacts of silver iodide have been studied extensively and represents a negligible risk to the environment. Cloud seeding



## Cloud Seeding Method

**Ground-based seeding** consists of two methods, called *Cloud Nuclei Generators (CNGs)* and *Automated High Output Ground Seeding (AHOGS)*.

CNGs are manually operated and burn a solution of silver iodide and acetone, creating a continuous plume of seeding material that covers broad area over mountainous terrain. AHOGS systems are remotely operated units, burning in-place flares that rapidly release a high concentration of silver iodide and are ideal for seeding convective bands with high concentrations of supercooled liquid water and strong vertical updrafts. These systems are more expensive than traditional ground generators and are therefore used sparingly where the benefit outweighs the added investment.



CNG



AHOGS

## Program Schedule

**Jan 2022**

Notice of Intent submitted for pilot project & Public review period

**Feb 2022**

CEQA Public Meeting

**Mar-Apr 2022**

Public Review period closes

**Jun 2022**

SAWPA Board of Commissioners to review documents

**Mid-July 2022**

SAWPA Board of Commissioners to approve CEQA for project

**October 2022**

Pilot Cloud Seeding Program begins



## Ensuring Wildlife and Community Safety from Wildfires

The cloud seeding process uses “burn-in-place” flares, meaning the flare never leaves its point of origin. Any embers from the aerial flares will extinguish before they hit the ground because of the elevation. The CNG and AHOGS systems use specialized spark arrestors to catch embers and prevent them from hitting the ground around the installations. In addition, weed reduction is performed to prevent weeds from encroaching on the seeding stations. The AHOGS towers are also equipped with cameras that are used during the seeding process. These systems have been in use for almost 30 years without any issues in California.



## Suspension Criteria for Flood Prevention & Water Quality Protection

When large fires occur, an experienced weather modification contractor will work closely with flood districts to determine the best approach for the season or seasons following the fire. Fires can result in some adjustments to suspension criteria in affected areas of the program. The Santa Ana River Watershed’s four target areas are fairly well-isolated from each other and are all targeted during different wind regimes.

Probability would indicate that the cloud seeding program would only miss one event every two years due to program design to avoid flooding concerns in the downwind area of Riverside County (Southwest target area), which would have only a marginal impact on the overall program effectiveness. In

## Increasing Streamflow in the Santa Ana River

Increases in precipitation in the Santa Ana River Watershed yield a roughly 1.15 multiplicative factor on stream flow. For example, a 10% increase in precipitation will yield a 15% increase in streamflow. Waterways are generally more efficient when more runoff is present, as a smaller percentage of the augmented runoff is lost to soil absorption. As a result, a positive impact down the entire stream & river network in the Santa Ana River Watershed can be predicted.



## Calculating Precipitation Increases with Past Climate Data

The average rainfall is determined by averaging values at the available precipitation stations. The average projected rainfall was not based on the most recent five seasons. Instead, the study sought to ensure that the program would be cost effective even if there were dry years mixed in with average years. Therefore, five noncontinuous seasons from the past 10 historic years were evaluated. These five selected seasons were selected to represent a modified average that would more accurately represent the benefits of seeding during naturally occurring “dry,” “normal” and “wetter” years.

The expected increase in urban, populated areas is projected to be dramatically lower, as they are not a primary target for any of the generators. The largest increases would be for areas downwind from the AHOGS in the Southwest area.

## Who is SAWPA?

### SAWPA is a Watershed Agency Focused on Regional Water Issues

The Santa Ana River Watershed Project Authority (SAWPA) was created to help resolve interagency conflicts and address regional water issues in the Santa Ana River watershed. SAWPA tackles issues related to water supply reliability, water quality improvement, recycled water, wastewater treatment, groundwater management, and brine disposal.

## SAWPA's Role

### SAWPA Supports its Member Agencies and Other Organizations with Water Planning

SAWPA is a Joint Powers Authority of five member agencies that supports water resources planning: Eastern Municipal Water District, Inland Empire Utilities Agency, Orange County Water District, San Bernardino Valley Municipal Water District, and Western Municipal Water District. SAWPA seeks to create and facilitate partnerships with and between organizations pursuing shared interests and overall watershed sustainability. Our regional leadership provides a model of collaboration and cooperation utilizing integrated solutions. SAWPA's Mission is to:

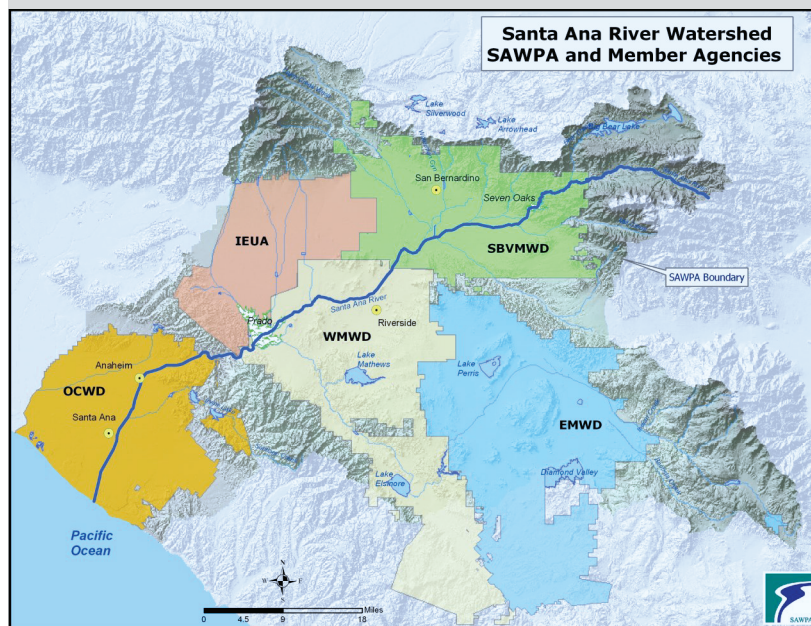
- Facilitate communication
- Identify emerging opportunities
- Develop regional plans
- Secure funding
- Implement programs
- Build projects
- Operate and maintain facilities

### SAWPA Administers Multi-Agency Task Forces

SAWPA serves as an administrator for several Task Forces within the watershed through meeting facilitation, contract service administration, and Task Force Agreement coordination. Through collaborative processes, SAWPA creates value by building relationships among regulators, SAWPA members, and regulated parties that allow for economies of scale, reduced costs, or increased benefits in addressing water related issues; provides regional capacity and neutral venue for supporting multi-agency forum(s) to address the water resources challenges in the Santa Ana River Watershed; and assists in the establishment and on-going facilitation of stakeholder processes to address watershed-specific issues.

## SAWPA Regional Planning Efforts

- Middle Santa Ana River TMDL Task Force
- Emerging Constituents Program Task Force
- Imported Water Recharge Workgroup
- Regional Water Quality Monitoring Task Force
- One Water One Watershed Program
- Santa Ana Sucker Conservation Team
- Lake Elsinore and Canyon Lake TMDL Task Force
- Forest First
- Water Energy Community Action Network
- Arundo Habitat Management



## Learn More and Contact Information

To learn more about the Pilot Weather Modification Program, please visit:



[sawpa.org/latest-info/watershed-cloud-seeding-feasibility-study/](https://sawpa.org/latest-info/watershed-cloud-seeding-feasibility-study/)



Contact Mark Norton at:  
[mnorton@sawpa.org](mailto:mnorton@sawpa.org)