



# Cloud Seeding Program

## Frequently Asked Questions

For more information, please visit: <https://idwr.idaho.gov/iwrp/programs/cloud-seeding-program/>

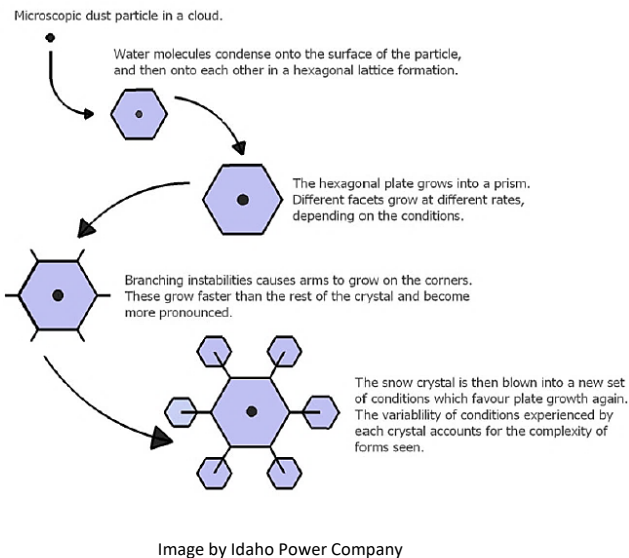
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### What is cloud seeding?

Cloud seeding is a form of weather modification that increases the efficiency of a cloud by enhancing its natural ability to produce precipitation.

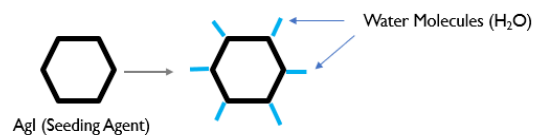
### Why do we seed clouds?

In Idaho, cloud seeding is used during the cold season to augment high elevation snowpack, our primary storage reservoirs. In other areas of the US and around the world, cloud seeding is also used for rain enhancement during warm seasons, hail mitigation to reduce damage to crops and infrastructure, and for fog suppression around airports.



### How does cloud seeding work?

Cloud seeding is a physical process whereby a seeding agent comprised of minute particles is released into an *existing* cloud formation, providing a surface for supercooled liquid water molecules to bond and formulate ice crystals. Water molecules freeze on contact with the particles and begin to grow into a snowflake as it encounters other water molecules, until the snowflake reaches a density heavy enough to fall to the ground as precipitation.



### How do we seed clouds?

Cloud seeding can be done by ground and/or by aircraft. Ground generators are placed on the windward side of a mountain and rely on winds flowing up and over the mountains to carry the seeding material up into a cloud where it will generate ice, that ultimately falls out as snow over the mountain tops (the “target area”). Aircraft can also be used to fly through or above clouds to release the seeding material.

### What seeding agent is used to seed clouds?

Silver Iodide (AgI) is the most common seeding agent used to conduct cloud seeding. AgI has the same physical shape (hexagonal) as naturally occurring ice. This incites the growth of ice crystals and can be used to generate ice at warmer temperatures than naturally occurring ice.

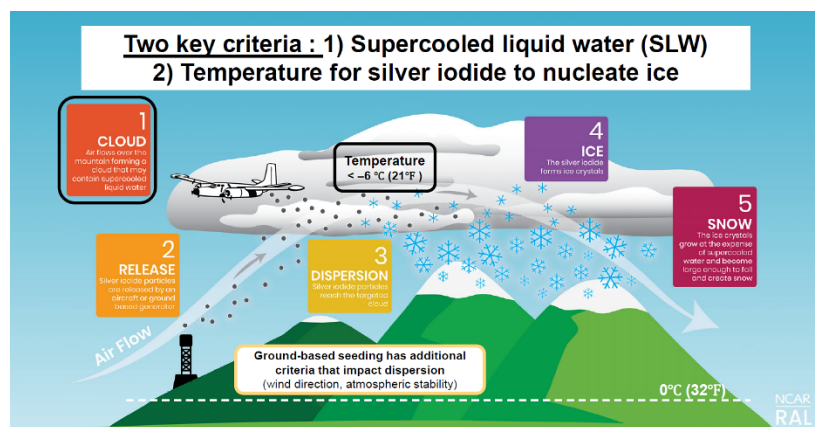


Image by the National Center for Atmospheric Research



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### What is Silver Iodide (AgI), and is it environmentally safe?

AgI is a non-organic chemical compound with a level of solubility close to that of quartz; it is inert in the natural environment. More than 20 comprehensive studies and data reviews on the environmental effects of the use of AgI for cloud seeding all concur that there is no evidence for adverse effects to human health or the environment from the use of silver iodide for cloud seeding. States such as California, Colorado, and Utah have also had continuously operational cloud seeding programs for more than 3 decades without evidence of environmental concern.

### Does cloud seeding take water from downwind basins (AKA “robbing Peter to pay Paul”/downwind effect/extra-area effects)?

Atmospheric rivers, analogous to surface flowing rivers, are very dynamic and experience many “gains” and “losses” as they move across the continent. On average, roughly 20% of the total atmospheric water budget in a given area will condense into clouds; of that amount, only about 30% will fall to the ground as precipitation naturally (roughly 6% of the overall water budget). It is estimated that less than 1% of the total water budget in a given area is impacted by cloud seeding. Additionally, the nucleation process, once initiated in a seeded cloud, can continue for a given distance downwind, aiding downwind precipitation as a result. While further research is required to better address this question, evidence suggests there is either a neutral or positive benefit to downwind users.

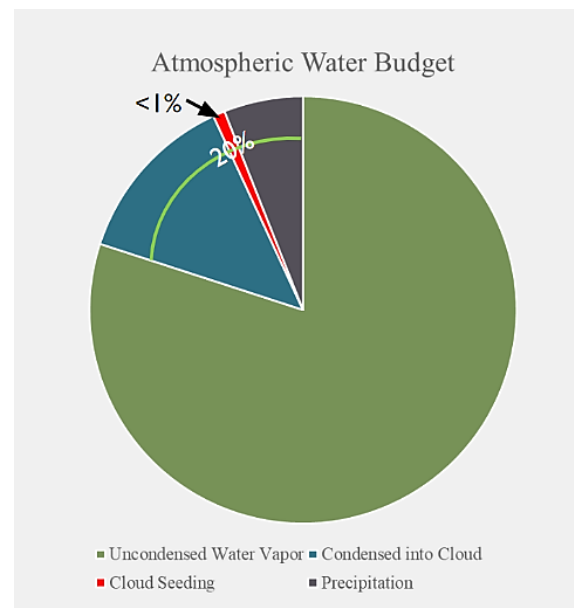


Figure by Idaho Power Company

### How much additional water is generated from cloud seeding?

The amount of precipitation generated is based on a number of factors, including the geography and climatology of the individual basins where operations occur, the conditions of the storms passing through, and the level of operations being conducted. In Idaho, cloud seeding generates about a 10% average annual increase in snowpack across all basins of operation. Statewide this results in approximately 1,240,000 acre-feet of additional water on an average annual basis.

### How much does it cost to operate a cloud seeding program?

The cost for operating a program varies by basin/region and is largely dependent upon the number of seeding opportunities each season and the scale of operations being conducted. In total, Idaho’s basins are supported by 57 remote ground generators, 25 manual ground generators, 3 aircraft, and a network of weather instrumentation. During seasonal operations, programs are supported 24-7 by a team of atmospheric scientists. The average annual cost to operate Idaho’s cloud seeding programs is about \$3.9 million dollars, equal to roughly \$3.22/acre foot of water produced.