Utah Division of
Water Resources

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Cloud Seeding Frequently Asked Questions

What is cloud seeding?

A form of weather modification that improves the efficiency of a cloud's ability to produce rain or snow. It introduces high distributions of ice nuclei into clouds where supercooled liquid water is available, stimulating precipitation.

Why cloud seed in Utah?

Utah's snowpack generates up to 95% of Utah's annual water resources (Utah Division of Water Resources, 2024). Cloud seeding can increase that snowpack. Clouds in Utah are great candidates for cloud seeding due to the nature of orographic lift and ample amounts of supercooled liquid water. Cloud seeding can also act as an offset for dust and pollution aerosols that lessen a cloud's efficiency in producing precipitation.

What materials are used in cloud seeding?

All cloud seeding in Utah is conducted with silver iodide or propane. Silver iodide interacts with supercooled liquid water, allowing freezing to occur at warmer temperatures. This stimulates better droplet growth and pulls more moisture out of the cloud than we otherwise would have observed. Propane, on the other hand, creates intense evaporative cooling that generates many ice crystals within a cloud.

Other areas in the United States also use hygroscopic material, which release high concentrations of calcium chloride which only need a small percentage of relative humidity to condense, but these are primarily used in convective programs.

How is cloud seeding done in Utah?

Primarily using ground-based generators. These generators sit at high elevations and rely on upslope flow over the mountains to transport the cloud seeding material. Also, in the last two years, Utah has begun using aircraft to fly directly into a cloud. This allows for more precise targeting of the material. These aircraft are equipped with burn-in-place flares that burn on the rack of a wing, placing the material inside the cloud.

How effective is cloud seeding?

Evaluating cloud seeding programs is difficult due to the natural variability in how precipitation falls. However, statistical analysis by North American Weather Consultants have shown up to a 10% increase while other studies done by the Desert Research Institute (Manton and Warren, 2011) also show a 10% increase and a Wyoming project (Wyoming Water Development Office, 2015) shows an increase upwards to 15%. Though this may not sound like much, a study by the Division of Water Resources suggests an increase of at least 183,000 acre-feet of increased streamflow (Nay et al, 2018). While cloud seeding is unable to end or prevent droughts, it plays a part in long-term water management strategy.

Is cloud seeding safe?

The amount of silver iodide released for cloud seeding in Utah only represents 0.33% of all silver released by cloud seeding programs per year. Additionally, the silver released here in Utah for cloud seeding is only 0.01% of all silver released into the atmosphere (Eisler 1996). Silver concentrations must be below 50 micrograms per liter to be considered safe (Erdreich 1985). Studies conducted by Stone (1996, 2006), Sanchez (1999) and Tsiouris (2002a, 2002b) have indicated that silver accumulations in stream flows, soil and lakes were either undetectable or could not be differentiated from the natural background levels of silver. Silver iodide is insoluble in water, which is what keeps it from having harmful effects.

Does cloud seeding deplete moisture downwind of a project area?

It is often asked if cloud seeding pulls moisture away from other areas downwind of a project area. However, when liquid water changes to a solid, heat is released within the cloud, allowing it to expand both vertically and horizontally. This results in continued precipitation, even downwind from targeted regions (French et. al 2018). Even with cloud seeding, the amount of precipitation falling is a minimal amount of the overall moisture available.

How is cloud seeding regulated?

Cloud seeding activities in Utah must be licensed and permitted to operate within the state. The Cloud Seeding Act of 1973 gives the Division of Water Resources the ability to approve these licenses and permits assuming the applicant meets the act's requirements. All cloud seeding projects also must report to the National Oceanic and Atmosphere Administration before and after a cloud seeding project is conducted.

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