

Cloud Seeding Feasibility Study

Water Policy Interim Committee

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Photo by George Bakos - Unsplash



CLOUD SEEDING IN NORTH AMERICA



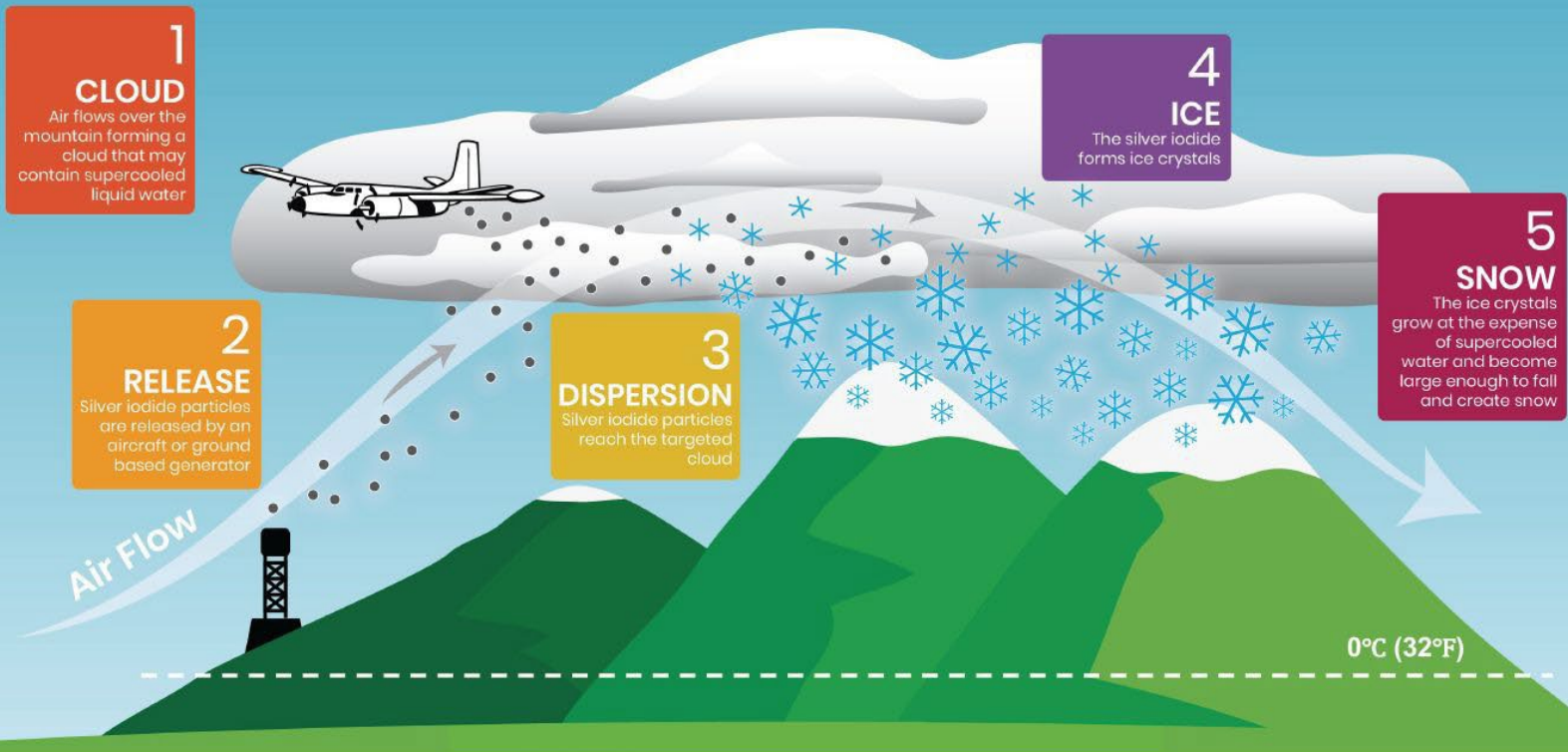
- Target area—Cold-season cloud-seeding
- Target area—Warm-season cloud-seeding



What is cloud seeding?

- Clouds are made up of tiny water droplets or ice crystals that form when water vapor in the atmosphere cools and condenses around a tiny particle of dust or salt floating in the atmosphere.
- Without these particles, raindrops or snowflakes cannot form and precipitation will not occur.
- Cloud seeding is a technique that improves a cloud's ability to produce rain or snow by adding tiny ice nuclei into certain types of subfreezing clouds. These nuclei provide a base for snowflakes to form.

The goal of winter orographic cloud seeding is to increase snowpack (and subsequent streamflow)



This material is based upon work supported by the National Center for Atmospheric Research, which is a major facility sponsored by the National Science Foundation under Cooperative Agreement No. 1852977.

Aircraft Seeding



Demonstration of flare ignition, actual dispersion occurs in cloud

- Burn-in-Place (BIP) flares are released in cloud
 - Plane flies through cloud when conditions are sustainable for the aircraft
- Ejectable (EJ) flares are released above cloud
 - Plane flies above cloud when conditions in cloud present hazardous to the aircraft and crew



Wing mounted "Burn-in-Place" (BIP) flares



Belly Mounted Ejectable (EJ) flares

Remote Ground Generators



Base Platform ~9 feet from ground



How much water are we talking about?

Clouds form when invisible water vapor in the air condenses into visible water droplets or ice crystals

Nature will condense roughly 20% of the total available water vapor as moist air rises over a mountain barrier

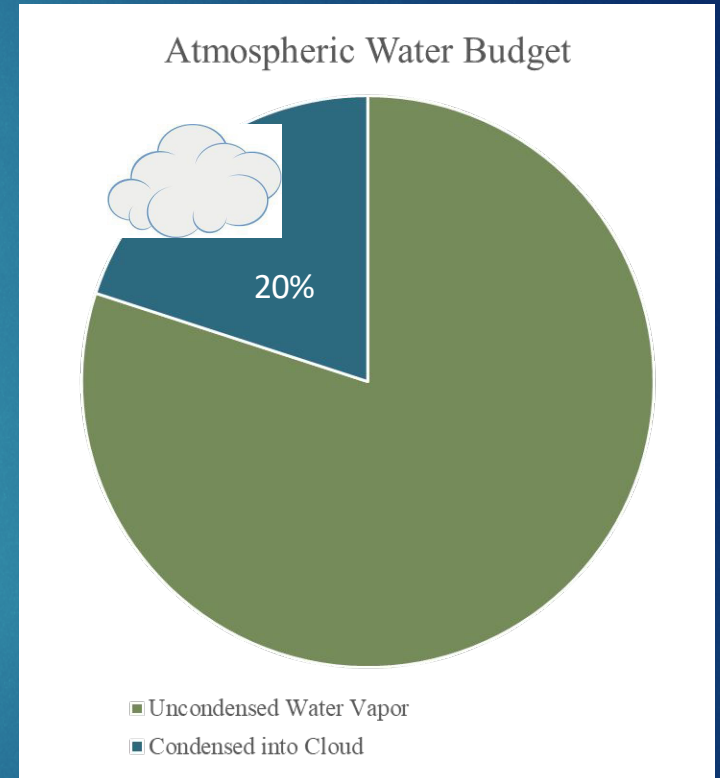


Figure Courtesy of Idaho Power Company

How much water are we talking about?

Winter storms are typically about 30% efficient.

So only about 30% of the condensed water contained in a cloud will fall to the ground as precipitation.

That's equal to roughly 6% of the total water content in the atmospheric water budget

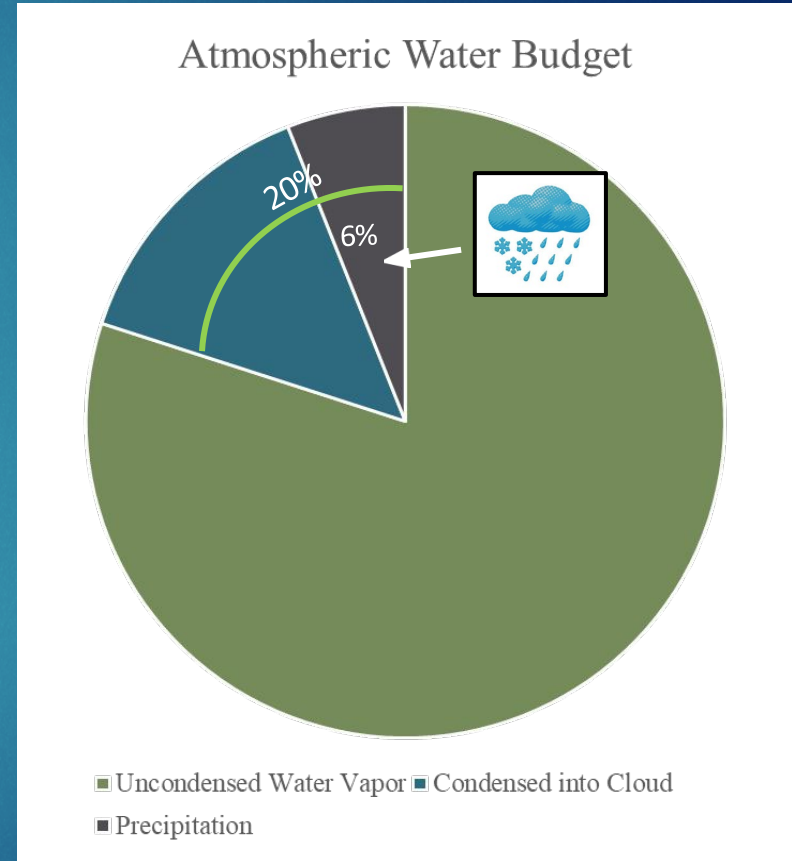


Figure Courtesy of Idaho Power Company

How much water are we talking about?

Cloud seeding enhances the storm's efficiency by an average of 10% to 15%.

That amount is equal to <1% of the total amount available in the atmospheric water budget.

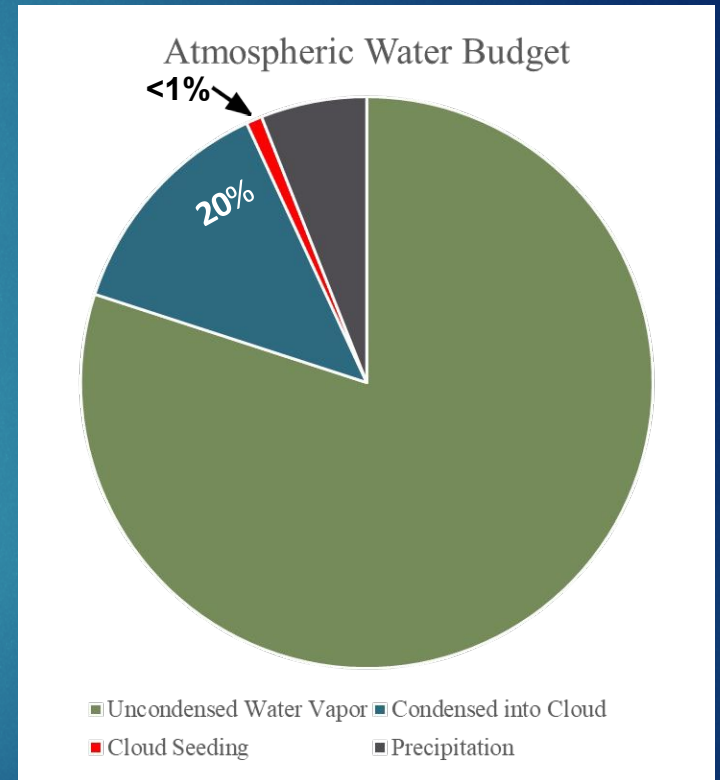


Figure Courtesy of Idaho Power Company

IDAHO COLLABORATIVE CLOUD SEEDING PROGRAM

West Central Mountains Project

Estimated Average Additional Runoff
(Unregulated) & Current Project Costs
(Annually)

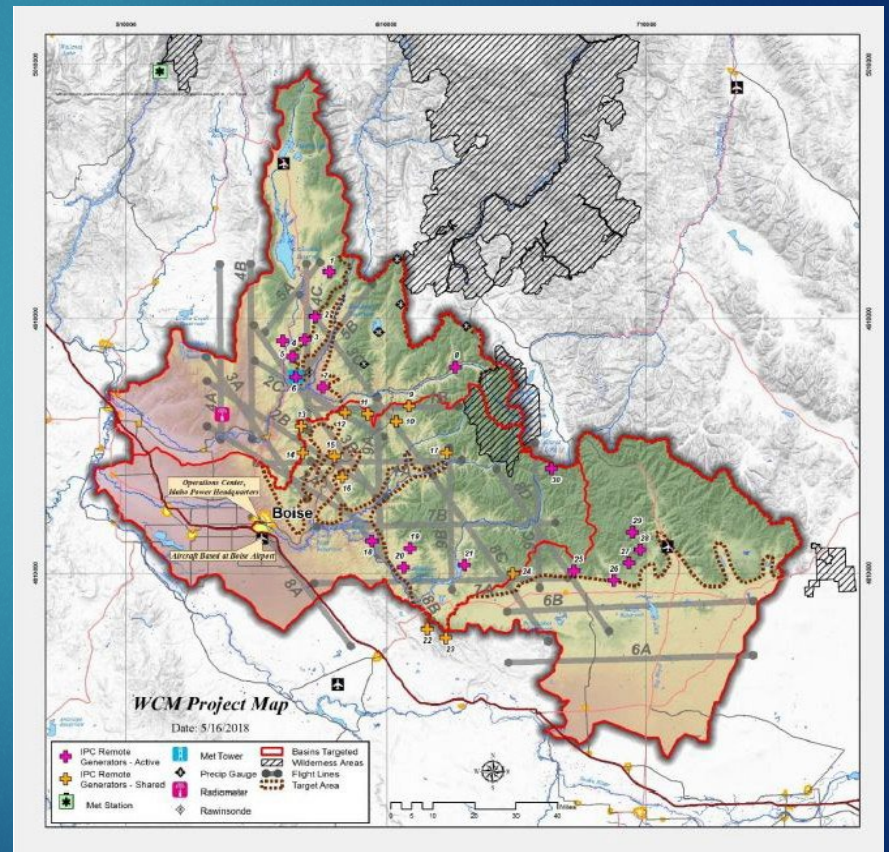
Boise River Basin– 273 KAF | \$910K

Wood River Basin – 112 KAF | \$670K

Payette River Basin* – 223 KAF | \$870K

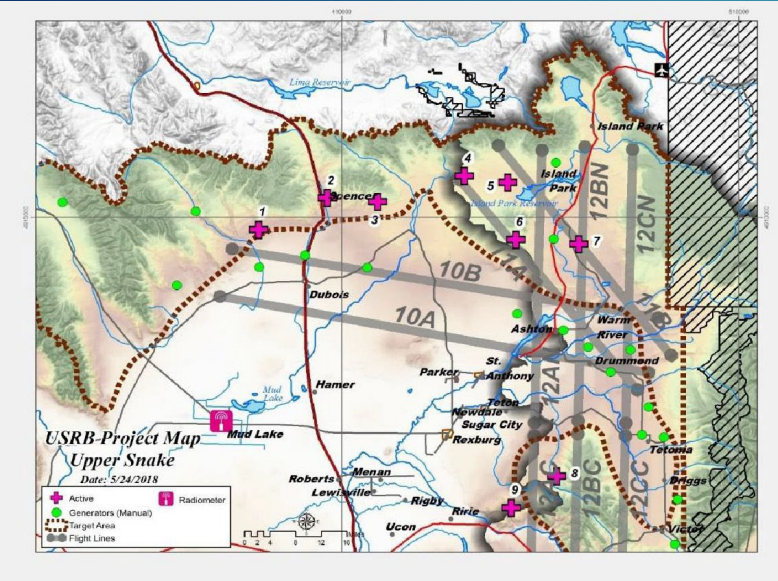
WCM Total: 608 KAF | \$2.45M

**Independent project operated by Idaho Power Co in coordination with the Collaborative. 100% Funded by IPC.*

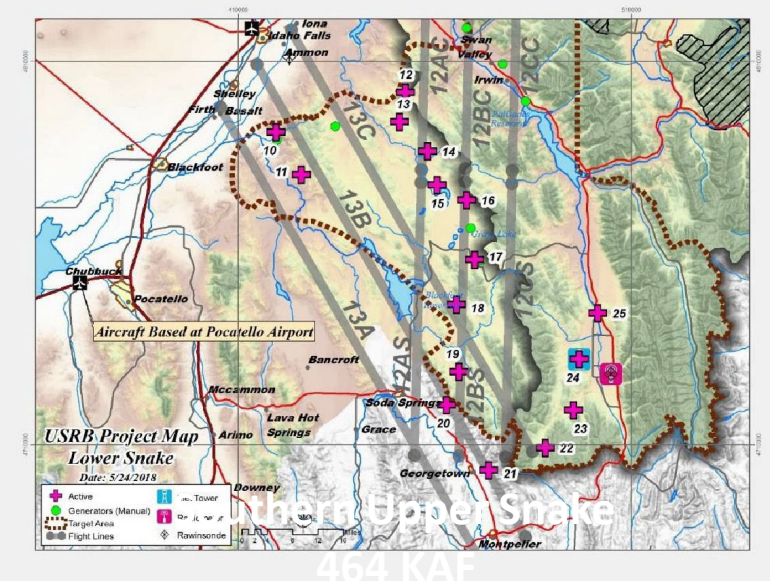


Idaho Collaborative Cloud Seeding Program

Upper Snake River Basin Projects



Northern Upper Snake
168 KAF



Southern Upper Snake
464 KAF

Upper Snake River Basin– 632KAF | \$1.54M

Montana Feasibility Study

- ▶ **Study Goal #1: Assess the potential for cloud seeding to augment snowpack and subsequent streamflow in select target mountain ranges in southwestern Montana.**
- ▶ **Study Goal #2: Complete a preliminary cost/benefit analysis and preliminary program design based upon weather/climate analysis.**
- ▶ **Study Goal #3: Support development of public engagement and education activities and materials related to cloud seeding.**



Questions/Comments?



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