

# Northern Nevada Water Planning Commission

## STAFF REPORT

**DATE:** September 27, 2018

**TO:** Chairman and Members, Northern Nevada Water Planning Commission (“NNWPC”)

**FROM:** Chris Wessel, Water Management Planner, Western Regional Water Commission (“WRWC”), and Frank McDonough, Desert Research Institute (“DRI”), Associate Research Scientist

**SUBJECT:** Report by DRI on last winter’s cloud seeding operations for the Truckee River and Lake Tahoe Basin, and alternatives for funding and operations for the upcoming winter; discussion and possible recommendation to the WRWC for approval of a scope of work, and funding in an amount not to exceed \$50,000 from the Regional Water Management Fund (“RWMF”), to partially support operations for the upcoming winter; and, possible direction to staff.

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### **SUMMARY**

Since 2009, DRI has conducted its cloud seeding program for the Truckee River and Lake Tahoe Basins (the “Program”) using funds provided by either the Truckee Meadows Water Authority (“TMWA”) or the Truckee River Fund (“TRF”), and the WRWC. At his time, TMWA and the TRF do not anticipate providing funding for cloud seeding operations in the 2018-2019 water year. DRI secured partial funding for the 2018-2019 Program from the State of Nevada during the previous legislative session. State funding will cover the cost of forecasting as well as the operation and maintenance of five of seven existing cloud seeding generators for the upcoming winter.

In anticipation of the funding shortage, DRI is proposing a scope of work in an amount not to exceed \$50,000 from the RWMF, to support operation and maintenance of the remaining two generators associated with the Program for water year 2018-2019. The WRWC budget for FY 2018-2019 includes \$50,000 for the proposed cloud seeding operations.

Mr. Frank McDonough of DRI will provide a presentation about last winter’s cloud seeding operations for water year 2017-2018, and the proposed scope of work for the upcoming winter, water year 2018-2019.

### **BACKGROUND**

Wintertime cloud seeding is focused on enhancing snowfall in mountainous regions to increase the snowpack, resulting in more spring runoff and water supplies in the surrounding areas. The DRI Program has been in operation for more than 25 years. DRI estimates that cloud-seeding has boosted water in the snowpack for the Truckee River watershed by an average of 14,000 acre-feet a year over the last 30 years.

DRI funding cuts in 2008 threatened to eliminate its cloud seeding operations such that outside financing was necessary to continue the Program. In response, DRI applied to the TRF in 2009 to support the operation of five cloud-seeding generators in the Sierra Nevada. DRI received approval for partial funding from the TRF and the WRWC for the 2009-2010 water year. DRI has applied for and received

funding from the TRF, and more recently TMWA, and the WRWC to cover Program operations in each successive water year.

The Program requires permits from both the United States Forest Service and the State of California. The State permit has been 'grandfathered' in through the California Department of Water Resources since the inception of DRI's cloud seeding operations. The permits remain active as long as the project continues, without interruption, for each consecutive water year. If operations were suspended for any water year, permits would likely be revoked and new permits would be required. In addition to the cost of the permits, DRI anticipates that California Environmental Quality Act and National Environmental Policy Act studies would be required, at a cost well in excess of \$50,000.

**FISCAL IMPACT**

If approved, the fiscal impact to the RWMF will not exceed \$50,000. Budget authority exists in the Fiscal Year 2018-2019 budget, located in Fund Group 766, Fund 7066, Account Number 710100, Professional Services, Cost Object WP310103.

**RECOMMENDATION**

Staff recommends that the NNWPC make a recommendation to the WRWC for approval of the proposed scope of work, and funding in an amount not to exceed \$50,000, from the RWMF, to partially support the Program for the 2018-2019 water year; and, provide further direction to staff as appropriate.

Attachment: Proposal and Scope of Work: Cloud Seeding Project for the Tahoe and Truckee Basins for Water Year 2018-2019.

CW:jp



September 24, 2018

**Western Regional Water Commission**  
**1001 E. 9<sup>th</sup> St**  
**Reno, NV 89502**

To: The Western Regional Water Commission (WRWC):

Attached is our proposal and budget for the Water Year 2019 Tahoe-Truckee cloud seeding project. This coming winter (WY2019) the project is primarily sponsored by the State of Nevada, the WRWC portion of the project presented in this proposal represents the supply and maintenance of two of the seven Tahoe-Truckee remote-controlled generators.

If the proposal and budget are found to be satisfactory we request a purchase order be drafted in the amount of the proposed budget in order for DRI to be able to initiate and complete the work in a timely manner. A project start date of October 21, 2018 and project stop date of June 30, 2019 is requested.

Respectively yours,

*Frank McDonough*

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Attachments: Proposal and Budget  
Cc: Maria Garretson (DRI)

**Proposal and Scope of Work**

**Cloud Seeding Project for the Tahoe and Truckee Basins for WY2019**

**Submitted to the**

**Western Regional Water Commission**

**By**

**Desert Research Institute  
Division of Atmospheric Sciences  
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**September 2018**

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## **Introduction**

Cloud seeding is a long-term water management tool designed to increase snowpack, streamflow, and subsequent water supplies. Since the State of Nevada halted funding the statewide cloud seeding program in 2009, the Tahoe-Truckee portion of the former State project has been funded locally by the Truckee Meadows Water Authority (TMWA) and the Western Regional Water Commission (WRWC). Through their support of the program, these entities have built the project infrastructure to include; 7 high-altitude remote controlled cloud seeding generators (5 sites, with 2 of them having dual generators; Fig. 1), 2 weather stations, a mountain top web camera, 8 precipitation gauges, and cellular and satellite communications systems to operate the equipment, obtain realtime weather and generator performance data.

The Tahoe-Truckee program has added over 14,000 acre-feet of snow water equivalent (SWE), on average, to the watershed for more than 30 years. The project has been operated along and west of the Sierra Crest, delivering snowfall to the east slopes of the Sierra and the Carson Range.

The Nevada State Legislature has refunded the State Cloud Seeding Program for the winter of 2018-2019 (WY2019). Several watersheds around the State are included in the program including the Tahoe-Truckee watershed. For the Tahoe-Truckee portion of the cloud seeding project the State Program will cover all of the project management costs, the weather forecasting services, the reporting, as well as the consumables, supplies, upgrades to the communications equipment, monthly service costs, and maintenance of five of the seven network generators.

This proposal requests that the WRWC ‘adopt’ the remaining two generators that are not covered by the State Program funds (Fig. 1). The costs associated with this include; the consumables, generator supplies, communications equipment upgrade, monthly service costs, and generator maintenance. The operation of these two generators would potentially add 6,000 to 7000 acre-ft of water to the expected 8,000 - 11,000 acre-ft of water expected from the generators funded by the State Program.

## **Project description**

The project design and method of operation will be the same as those used for the previous Tahoe-Truckee projects. With the full program in place, seeding will be conducted from a line of five ground-based CSG locations (7 total CSGs) positioned on, or a few miles upwind of, the main Sierra Nevada crest to the west of Lake Tahoe (Fig. 1). The generators have been positioned to take advantage of the generally southwest wind directions in winter storms in the Tahoe area, and are remotely activated by DRI staff when the proper weather and cloud conditions for seeding have been verified.

Ground-based cloud seeding is based on the following sequence of events. The seeding

material is silver iodide (AgI). The seeding “generators” burn a solution containing AgI dissolved in acetone. The burning process produces a “smoke” of microscopic AgI particles (about 0.0001 mm is size) that are transported downwind and dispersed into clouds over the mountains. Vertical dispersion up to at least 3000 feet above the surface is produced by the turbulence created by wind moving over the uneven terrain. In the presence of cloud droplets existing at temperatures below -5° C the silver iodide particles act as ice-forming nuclei and enhance the ice particle concentration in the natural clouds. Once initiated by silver iodide the ice particles grow in size and mass as they move downwind and begin falling to the surface when they have sufficient mass to overcome the upward motion in the clouds. In the time frame of 20 to 30 minutes snowfall within a seeding plume can reach the surface in and around the Tahoe Basin. This “chain-of-events” in the cloud seeding process has been verified by numerous detailed experiments conducted in the Sierra Nevada and other mountainous regions of the western U.S. (Huggins, 2009).

### **Project Phases**

**Phase 1** of the project will include preparation of the two WRWC sponsored seeding generators at the locations shown in Figure 1 (red arrows). This will require 4 days of work (2 days per generator). Phase 1 typically includes refilling the seeding solution tanks, refilling propane and nitrogen tanks, testing all generator components and upgrading and testing communications links.

**Phase 2** of the project will involve the actual cloud seeding operations. In this portion of the project the WRWC generators will be tested weekly, the weather and operations data downloaded, reviewed for performance metrics, and archived. The generators will be visited by truck and snowmobile during the winter season when repairs are required, typically 2-3 times per winter.

**Phase 3** of the project will begin in May 2019 and includes the final end of season visit to the generators to get them put away for summer.

### **Principals involved**

The full Tahoe-Truckee project will be managed by DRI Meteorologist Frank McDonough. Three experienced technicians will provide field operations and maintenance support for five State of Nevada sponsored and the two potentially WRWC sponsored generators.

### **Schedule**

**Start Phase 1:** 21 October 2018. Generator preparations begin.

**End Phase 1:** By 1 November 2018 the two WRWC sponsored seeding generators are

installed, filled, tested and made ready for use. All web-based computer products are prepared for use in Phase 2.

**Start Phase 2:** 1 November 2018. Cloud seeding occurs as storm conditions dictate. Cloud seeding equipment is monitored and maintained as needed. A log of seeding operations is maintained and the weather data from the generators that are needed to assess operations are archived.

**End Phase 2:** 30 April 2019 (potentially May 15, 2019) is the approximate end of the operational cloud seeding period.

**Start Phase 3:** 1 May 2018. Visit generators to close them down for summer.

**End Phase 3:** 30 June 2019 end of season summer shutdown for the generators complete, per USFS permits.

**Budget discussion:**

The budget for the WRWC portion of the partnership for WY2019 (maintain and provide consumables for the Echo and the Morattini generators) is \$50,000. The details of the budget are presented in the spreadsheet in Table 1.

<b>Cost Category</b>	<b>Echo site</b>	<b>Morattini Flats site</b>
Cloud Seeding Solution (Agl)	\$10,500	\$10,500
Truck/Snowmobile/Fuel	\$1,050	\$1,050
Generator Parts (repair)	\$1,000	\$1,000
Propane/Nitrogen	\$1,000	\$1,000
Communications /modems	\$2,500	\$1,500
Site Permits	\$500	\$500
Total Labor (field/shop)	\$8,540	\$9,450
=====	=====	=====
<b>Total Costs</b>	<b>\$25,000</b>	<b>\$25,000</b>

# WY 2018 Tahoe-Truckee network

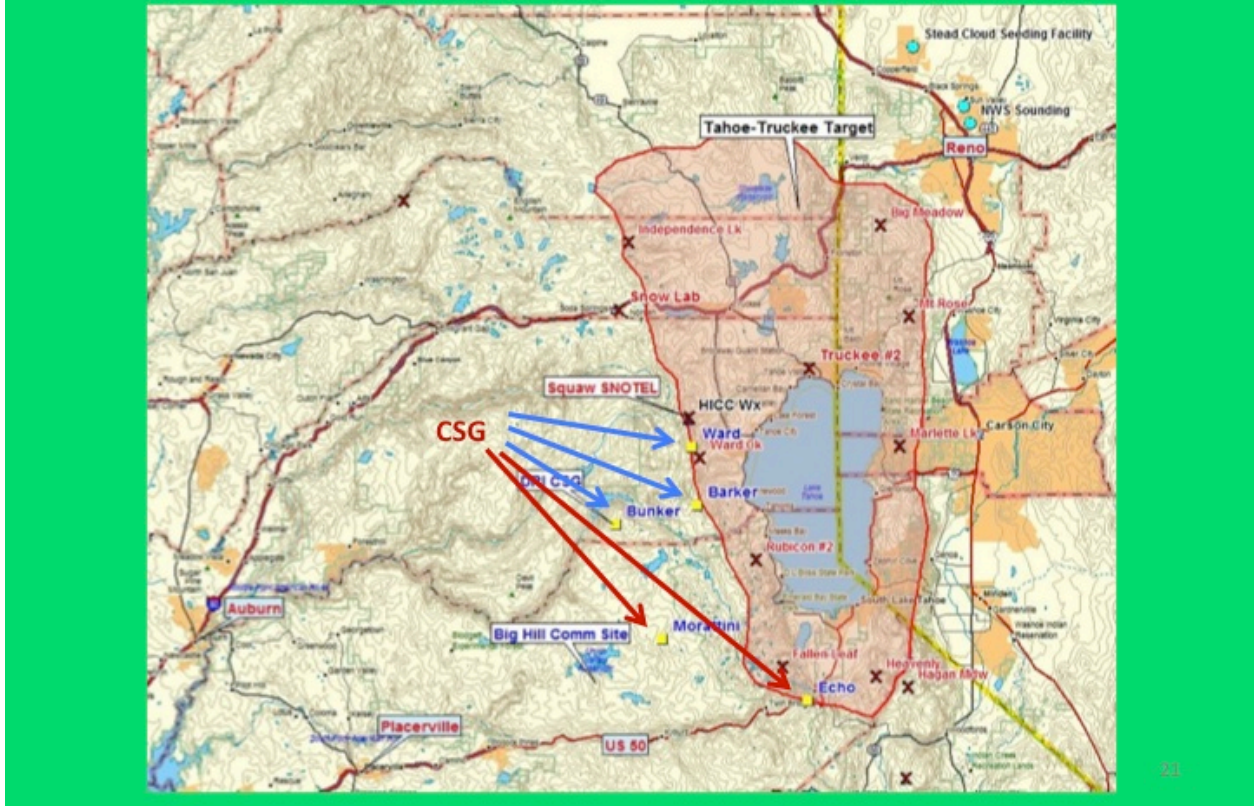


Figure 1. Operations area and generator locations for WY2019 Tahoe-Truckee cloud seeding project. Red shaded area denotes the target region; Yellow pins with blue labels represent DRI cloud seeding generators; Blue arrows point to the generators maintained by the State Program and the red arrows point to the generators proposed to be maintained by the WRWC. The Bunker and Barker sites each have 2 generators.