



COLORADO

Colorado Water Conservation Board

Department of Natural Resources

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TO: Colorado Water Conservation Board Members

FROM: Joe Busto, Weather Modification Program Coordinator,
Watershed Protection and Flood Mitigation Section

DATE: November 15-16, 2017 Board Meeting

AGENDA ITEM: 7a. 2018 Projects Bill
Non-Reimbursable Project Investments
(6) Weather Modification Permitting Program - Continuation

Introduction

The CWCB has had grants for winter cloud seeding since 2004. Colorado River downstream water users have been matching CWCB funding since 2007. Weather modification is one of the three legs of the stool for the Colorado River drought contingency plan. There are over 40 program sponsors of the seven permitted programs in Colorado.

The CWCB WM budget has been \$175,000 for the last eight years. Staff is requesting funding for grants to operations, new equipment, extensions of time of operations, and to help with evaluations and studies. The 2012 Colorado Weather Modification Rules and Regulations suggest periodic independent evaluations and require target control evaluations. An important part of this work is state funding to help Idaho Power Company and the Desert Research Institute remote operated high output ice nucleus generators.

There are new seeders at Winter Park, the Grand Mesa, near Mesa Verde, west of Crested Butte, and above McPhee Reservoir. However, there are still 100 low elevation manually operated seeders that should be replaced and retired. A 2015 particle dispersion modeling study for the Blue River Basin showed that only 20% of the time do valley bottom seeders reach the super cooled liquid water region of clouds. We have purchased a radiometer to collect cloud data that is being shared and moved around among seven programs to collect liquid water data which is the fuel for effective seeding.

This CWCB funding has been matched for about \$2.5M in CWCB funds to \$2.5M in Lower Basin funds since 2007. There is a new nine year agreement with the Colorado River Basin States that will be signed in 2017 that will budget up to \$500K per Upper Basin state per year to be matched with the Upper Basin State funds. The Lower Basin policy is to match the Upper Basin State Funds. The Wyoming Water Development Office is interested in partnering on a cloud seeding program with water users in the North Platte Basin and the CWCB. There has also been new interest in seeding in the Rio Grande Basin as well.

Staff Recommendation

Staff recommends the Board request the General Assembly appropriate \$175,000 from the Construction Fund to the Department of Natural Resources for use by the CWCB for the Weather Modification Program.





The CWCB has had grants since 2004 for water district sponsored cloud seeding programs developed after the early 2000s drought. In 2007 State-to-state agreements were signed to provide grants in Colorado. CWCB distributes grants from the CWCB, New Mexico Interstate Stream Commission, Southern Nevada Water Authority, Central Arizona WCD, and California Six Agency Committee. CWCB funding helps staff leverage pledged match funding from Lower Basin States water users. The CWCB goals are industry standard equipment in operation for efficient and effective programs.

P R O J E C T D E T A I L S	
<i>Project Cost:</i>	\$1.3M (matching from Lower Basin States and local sponsors)
<i>NRI Funding Request:</i>	\$175,000
<i>Funding Source:</i>	Construction Fund
<i>Project Type:</i>	Snowpack augmentation
<i>Type of Grantee:</i>	Local water districts
L O C A T I O N	
<i>Benefits:</i>	Statewide
<i>Water Source:</i>	Various
<i>Drainage Basin:</i>	All Basins

There is interest in both the North Platte and Rio Grande in developing cloud seeding programs. The State of Wyoming has stated interest in partnering with the CWCB and the Jackson Water Conservancy District. Some of the requested funding increase will help facilitate this new state-to-state collaboration in the North Platte Basin. A 2015 National Center for Atmospheric Research Climatology of seeding potential study showed high seeding potential in the North Platte. A 1990 U.S. Bureau of Reclamation Study concluded the same for the North Platte. The local goals would be to augment snowpack in the southeastern part of the basin. The program can be designed to benefit the North Platte and South Platte.

Since 2007 the Lower Basin Water Users in the Colorado River (Southern Nevada Water Authority, California Six Agency Committee, and Central Arizona WCD) have donated \$2.5M to match the CWCB's \$2.5M to bolster locally sponsored cloud seeding in Colorado. Each year about \$1M is spent with \$175,000 or 18% from the CWCB and \$175,000 or 17% from the Lower Basin and New Mexico. The other 65% of the funding comes from ski areas, water districts, towns and counties. Based on success from 2007-2017 the Lower Basin has developed a new nine year agreement that will \$500K per state per year for Upper Basin States as match for upper basin expenditures on cloud seeding programs.



Effective cloud seeding is getting cloud seeders high onto ridges in areas of good airflow to have the silver iodide particles regularly transported into cloud. We have had success at helping upgrade programs with new high elevation seeders at: Winter Park, Grand Mesa, Crested Butte, above McPhee Reservoir, near Mancos, and Telluride. These seeders are now owned by water districts. It has been clearly demonstrated that low elevation manually operated seeders are not particularly effective at getting seeding material in cloud. High elevation seeding equipment is needed. Colorado has high elevation terrain for effective seeding.

The CWCB has ten years of facilitating successful multi-state collaborations to work on a watershed basis to benefit local water supplies and downstream river compact obligations. In 2015, a ten year \$15M winter research experiment in Wyoming concluded that 5-15% increases in snowpack can be expected but only from about 30% of the storms appropriate for seeding. Therefore, a 1-5% increase in snowpack was demonstrated and can be expected in well designed and executed programs. The ranges in the Wyoming experiment were the Sierra Madre and Medicine Bow Ranges just across the border. They also need northwest flow for good winter storms. This is also the case in the North Platte Basin.