San Juan Mountains Program (SJM Program) 2024-2025 Winter Cloud Seeding Program

Includes seeding for the following regions: West Dolores and Telluride (WDT) Western San Juan's (WSJ) Eastern San Juan's (ESJ)

- WDT Sponsors: Dolores Water Conservancy District, Montezuma Valley Irrigation Company, Southwestern Water Conservation District and Telluride Skiing Co, and Colorado Water Conservation Board.
- WSJ Sponsors: Purgatory Ski Area, Animas La Plata Water Conservancy District, Dolores Water Conservancy District, Southwestern Water Conservation District, and New Mexico Interstate Stream Commission.
- ESJ Sponsors: Pine River Irrigation District, Florida Water Conservancy District, Florida Consolidated Ditch Company, San Juan Water Conservancy District, Southwestern Water Conservation District, and New Mexico Interstate Stream Commission.

State of Colorado Weather Modification Permit # (2020-04)

# **Operational Plan**

The SJM Program is permitted to run from November 1, 2024, to April 15, 2025, and will be operated by Western Weather Consultants LLC (WWC). Seeding can begin December 1, 2024, for non-ski area participants. Seeding for Telluride and Purgatory Ski Resorts may start as early as November 1, 2024. An extension of the program may be implemented if funding is available and appropriate seeding opportunities exist. At all times, WWC shall conduct the SJM Program in compliance with all applicable State and Federal laws and regulations governing weather modification activities and other applicable laws. Up to 40 Cloud seeding Nuclei Generators (CNG) can be used for the SJM Program.

## Target Area

The primary target area for the SJM Program is defined as follows: The San Juan Mountains above 8,500 feet mean sea level, mainly targeting the upper regions of the West Dolores, San Miguel, Dolores, La Plata, Animas, Florida, Pine, San Juan and Blanco River Basins as well as Telluride and Purgatory Ski Resorts. The SJM Program is designed, operated, and intended to affect only the Target Area. Blue pins with stars denote Manual Generator locations. Solid blue pins denote Remote Generator sites.



The SJM Program is divided into three regions: WDT (Yellow), the WSJ (Blue), and the ESJ (Green) shaded areas.

### **Operational Procedure**

The operational procedures used to enhance snowpack in the selected target areas is to produce plumes of silver iodide crystals (artificial cloud nuclei) at rates between 5 and 28 grams per hour from multiple ground-based CNGs to be diffused by favorable wind flows into selected storms or cloud types suitable for precipitation increases meeting the seeding criteria over the Target Area. An analysis of low-level wind fields, cloud characteristics, stability parameters, terrain features, and synoptic meteorological features will determine the network of generators that will best seed the cloud system over the Target Area for each favorable weather system and will provide a method for adjusting the network as new weather information becomes available. Seeding events will be limited to portions of selected favorable weather systems with expected or forecasted precipitation rates and associated augmentation potentials capable of producing additional precipitation of at least one-tenth an inch of water or more per 24 hours of seeded duration. Any selected favorable weather events with the augmentation rate stated above that are expected to last less than 6 hours require prior approval by the Manager of the SWCD and or Andrew Rickert with the CWCB. Seeding for the ski areas is exempt from the 6-hour minimum storm duration if the storm is forecast to produce the required precipitation amount of water over 24 hours.

When the "best" initial network of generators selected to seed an established weather system has been determined, the operators are notified and provided a specific time to start the generator and a particular burn rate. On the same call, they will be given a specific turn-off time, and this could be subject to change if the meteorologist at WWC notices significant changes in the weather system during the seeding event. Incoming weather data into the forecast office allows continuous monitoring of any changes in conditions and any adjustments or terminations in the seeding operation. Following each seeding operation, each generator operator will submit a written report on the actual operational times, verify the seeding rates, and record any weather observations or operational discrepancies during the required operating period. No aircraft will be used for seeding for this Program. The seeding criteria WWC uses for seeding operations are as follows:

- Cloud bases are at least 500 feet below the mean mountain barrier crest of the Target Area. They are forecast to move lower in elevation from the onset of seeding and continue throughout the seeding period. The weather system has clouds predicted to have vertical heights and moisture content capable of producing natural precipitation.
- Temperatures at 500 feet below the mean mountain crest within the Target Area are 5 degrees C. (23 degrees F.) or colder, and are forecast to become colder if it is at -5 degrees C.
- Wind directions and speeds from the surface to the cloud base are observed and forecast to favor the movement into the intended Target Area of the silver iodide nuclei released from the ground-based generator sites.
- There are no stable regions or atmospheric inversions between the surface and cloud base preventing the vertical dispersion of the silver iodide particles from the surface to at least -5 degrees C. (23 degrees F.) level or colder within the cloud system.
- The temperature at approximately 10,000 feet (700 MB level) is warmer than -16 degrees C. (3 degrees F.)

## **Generator Locations**

Site	Site Name	Program	Latitude	Longitude	Elevation
АКМ	Gurley	WDT	38.072809 -108.234151		7761
PLF	Norwood	WDT	38.1601 -108.2797		7057
TEL-REM	Telluride	WDT	38.02906	-108.00265	8825
TCJ	Belmear	WDT-WSJ	37.770747	-108.362923	8487
DOL-REM	Beaver	WDT	37.693012	-108.380856	8295
JVA	Dunton	WDT-WSJ	37.7198	-108.2424	8045
ССВ	Rico	WDT-WSJ	37.672410	-108.035373	8677
ACL	Dolores River	WDT-WSJ	37.6079 -108.0987		8227
RRW	Lewis	WDT-WSJ	37.5211 -108.6294		6950
DCS-BP1	Boggy	WDT-WSJ	37.5032	-108.4670	7577
ABL	Lost Canyon	WDT-WSJ	37.4413	-108.4679	7181
SLH	Mancos	WSJ-WDT	37.3857	-108.3543	7123
SJ-REM	Mancos	WDT-WSJ	37.496008	-108.24179	8915
JMS	Jackson Lake	WSJ-WDT	37.4140	-108.2535	8065
OLW	Mancos Hill	WSJ-WDT	37.3391	-108.2092	8017
GGD	Mayday	WSJ-WDT	37.3277	-108.0690	8599
<b>BUSTO-REM</b>	Busto	WSJ-WDT-ESJ	37.3153	-108.1012	8560
MI	Breen	WSJ-ESJ	37.1963	-108.0723	7393
GRA	Animas Mountain	WSJ-ESJ	37.3326	-107.8680	7073
JLS	Wild Cat	WSJ-ESJ	37.2672	-107.9498	7580
DMZ	Haviland Lake	WSJ-ESJ	37.5407	-107.8227	8250
TrippC-REM	Tripp Creek	WSJ-ESJ	37.4089	-107.8609	7667
LHJ	Grandview	WSJ-ESJ	37.2130	-107.8250	6905
MHJ	Salt Creek	ESJ-WSJ	37.2098	-107.6982	6928
SMA	Dry Creek	ESJ-WSJ	37.2935	-107.6970	7633
HH-REM	Honey Hole	ESJ-WSJ	37.275745	-107.764230	7385
DSG	Bayfield	ESJ	37.2515	-107.5963	7106
HE	Lonetree	ESJ	37.1335	-107.1588	6928
JJT	Oakbrush Ridge	ESJ	37.4505	-107.1857	7926
PAG-REM	Rito Blanco	ESJ	37.2521	-106.8628	8554
JND	Turkey Mountain	ESJ	37.157771	-106.957877	7000
ADT	Coyote Creek	ESJ	37.0128	-106.9058	7247
LOM	Montezuma Creek	ESJ	37.0572	-107.0448	6958

WWC routinely monitors the weather conditions throughout the winter's operating period for systems with cloud seeding potential. Most of the data used comes from the National Weather Service (NWS) websites, the University of Wyoming, Pennsylvania, and Texas A&M Weather websites, the National Center for Atmospheric Research (NCAR) website, and the National Oceanic and Atmospheric Administration

(NOAA), Pivotalweather.com for short and long-range model forecasts. Numerous forecasting websites are available beyond the previously listed that are used, but these tend to be the preferred ones. Other available resources are the Colorado Department of Transportation (CDOT) website to monitor road conditions and concerns, the Colorado Avalanche Information Center (CAIC) for Weather Research Forecasting (WRF) point forecasts, as well as avalanche and potential avalanche conditions in and around the Target Area including the Natural Resources Conservation Service (NRCS) website to monitor snowpack in the Target Area as recorded by the network of SNOTELs in Colorado. Snowpack accumulation is monitored from SNOTEL stations within the Target Area, and the first detailed analysis of snow accumulation is completed using these measurements.

From these sites, we review and, at times, archive weather data such as surface and upper air data, synoptic surface maps, significant level maps, model forecast data, rawinsonde data, satellite and radar data, surface observations, webcam images, other forecast aids. This data assists in selecting favorable storms for modification and monitoring suspension criteria.

### Suspension Criteria

The proposed Suspension Criteria will safeguard the program and ensure that risks associated with cloud seeding have been addressed. WWC will retain the right to suspend operations if the weather system becomes unfavorable. Facilities will be maintained to gather and analyze weather data, providing a continuous weather watch. WWC will communicate with the Program Sponsors, the National Weather Service (NWS), the U.S. Forest Service, and the Department of Natural Resources / Colorado Water Conservation Board regarding potential adverse conditions. The forecast and operations center of WWC will monitor the weather patterns over Colorado and the Western United States during the winter operating period on a seven-day-per-week basis. Meteorologists permitted by the State of Colorado to operate weather modification programs will determine if weather events suit precipitation augmentation by cloud seeding.

Before initiating seeding operations, a thorough hazard analysis will be completed for all weather systems deemed suitable. It will be evaluated for the potential to develop into a blizzard, severe storm, or heavy precipitation, possibly associated with a potential for significant avalanche episodes. Also, the effects of the weather event on ranching, agriculture, wildlife, highway travelers, municipal interests, and industry will be considered. This evaluation will concentrate on those areas to be seeded along with considerations of potential adverse effects to adjacent areas that may be influenced by augmented precipitation. No seeding will be initiated during a period determined to have a high potential hazard evaluation. Once a seeding operation has been undertaken, monitoring of existing and forecasted weather conditions will continue throughout the seeding operation. All new meteorological information and generator reports from generator operators, the State Patrol, and field maintenance personnel in the seeded areas will be assessed. The Colorado Avalanche Information Center (CAIC) has modified its website to include a "Cloud Seeder" avalanche hazard level suspension criteria page for all mountain passes in Colorado. Levels of Notice, Caution, and Warning are assigned to the passes, with warnings being used as triggers for the temporary suspension of neighboring generators. Changing weather conditions that would indicate the onset of potentially severe or hazardous weather conditions will result in suspending seeding operations throughout these weather conditions. Snowpack accumulation will be monitored from SNOTEL stations at all SNOTEL sites within the target area, and the first detailed analysis of snow accumulation will be completed using these measurements. Snowpack evaluations indicate minor flooding and stream flow problems can exist when late winter snowpack reaches 155% of normal. More substantial flooding problems can be anticipated when late winter snowpack is more than 175% of normal.

Since the SJM Program is designed for reasonable levels of snowpack enhancement for an outlook of adequately abundant summertime water supply for storage use, we propose to suspend seeding operations in any significant portion of a seeding area when one or more of the following takes place: Snow Water Equivalent Thresholds exceed the following: 175% of average on December 1st, 175% of average on January 1st, 160% of average on February 1st, 150% of average on March 1st and 140% of average on April 1st. The following link can be used to see a map that will show the snowpack percentages of normal:

#### https://www.nrcs.usda.gov/wps/portal/wcc/home/quicklinks/imap

The CWCB Director or his or her designee will determine where and how snowpack water equivalents are to be measured, including at selected "SNOTEL" sites. The CWCB Director or their designee may permit weather modification operations to continue in a portion of the operation target area where snowpack water equivalents are below these suspension criteria percentages if the operation will not impact the area where snowpack water equivalents are above these suspension criteria percentages. These thresholds are designed to keep the seeding effect within the natural variability of the local climate as measured at each SNOTEL station. This comparative normal for these representative snow observation sites will be the long-term Snow Water Equivalent Medians data set from 1991 through 2020 as published by the Natural Resources Conservation Service (NRCS). WWC must suspend all weather modification operations whenever one of the following is issued by the NWS Hazardous Weather Statements that impact any part of the Target Area:

- a. An urban or small stream flood advisory.
- b. A blizzard warning.
- c. A flash flood warning; or
- d. A severe thunderstorm warning.

Operations may resume after these statements expire.

As required by the "Colorado Weather as required by the "Colorado Weather Modification Rule and Regulations" effective July 1, 2012, WWC notifies the local NWS weather forecast office, CAIC, the County emergency managers, and the CSU Colorado Climate Center of the intended weather modification activities and provide WWC's contact information before the 2024-2025 season of weather modification operations.

### **Contact Information**

Manager Larry Hjermstad 970-946-6328 westernweather.larry@gmail.com

Assistant Manager Mike Hjermstad 970-946-6324 westernweather@gmail.com Director of Field Operations Eric Hjermstad 406-581-3360 westernweather.eric@gmail.com

Alisa Hjermstad 970-430-1023 westernweather.alisa@gmail.com

Western Weather Consultants LLC. P.O. Box 58 Durango, CO 81302

NOAA FORM 17-4	U.S. DEPA	RTMENT OF COMMERCE	Form Approved OMB Control No. 0648-0025			
(4-81)	NATIONAL OCEANIC AND ATMOSP	HERIC ADMINISTRATION	Expires 05/51/2021			
INITIAL REPORT ON WEATHER MODIFICATION ACTIVITIES This report is required by Public Law 92-205; 85 Stat. 735; 145 U.S.C. 330b. Knowing and willful violation of any rule adopted under the authority of Section 2 of Public Law 92-205 shall subject the person violating such rule to a fine of not more than \$10,000, upon conviction thereof.			Complete in accordance with instructions on reverse and forward one copy to: National Oceanic and Atmospheric Administration Office of Oceanic and Atmospheric Research 1315 East-West Highway, WWMC-3, Rm 11216 Silver Spring, MD 20910			
1. PROJECT OR ACTIVIT	Y DESIGNATION, IF ANY		2. DATES OF PROJECT			
			a. DATE FIRST ACTUAL WEATHER MODIFICATION ACTIVITY IS TO BE UNDERTAKEN			
			b. EXPECTED TERMINATION DATE OF WEATHER MODIFICATION ACTIVITIES			
4. (a) SPONSOR			4. (b) OPERATOR			
NAME			NAME			
AFFILIATION	AFFILIATION		AFFILIATION			PHONE NUMBER
STREET ADDRESS			STREET ADDRESS			
CITY	STATE	ZIP CODE	CITY		STATE	ZIP CODE
5. TARGET AND CONTROL	AREAS (See Instructions)					
	TARGET AREA				CONTROL AREA	
LOCATION		SIZE OF AREA	LOCATION			SIZE OF AREA
6. DESCRIPTION OF WE Instructions)	ATHER MODIFICATION APPARATI	JS, MODIFICATION AGEN	IS AND THEIR DISPER	SAL RATES, TH	E TECHNIQUES EMP	LOYED, ETC. (See
7. LOG BOOKS Enter no	me, affiliation, address, and telep	hone number of responsib	le individual from who	m log books oi	r other records may b	pe obtained.
AFFILIATION			PHONE NUMBER			
STREET ADDRESS						
CITY			STATE	ZIP CODE		
			507112			
8. SAFETY AND ENVIRO	NMENT NO Has an	Environmental Impact Sta	tement, Federal or Sta	ate, been filed?	P If yes, please furnis	h a copy as applicable.
YES	NO Forest	rovisions been made to ac Service, or others when is:	ade to acquire the latest forecasts, advisories, warnings, etc., of the National Weather Service, when issued prior to and during operations? If yes, please specify on a separate sheet.			
YES NO Have any safety procedures ( <i>operational constraints, provisions for suspension of operations, monitoring methods, etc.</i> ) PHONE PROVIDE AND PR						
9. OPTIONAL REMARKS	(See instructions. Use Separate S	Sheet).				
<b>CERTIFICATION:</b> I certify that all statements in this report on this weather modification project are complete and correct to the best of my knowledge and are made in good faith.			NAME OF REPORTING PERSON			
AFFILIATION			SIGNATURE			
STREET ADDRESS			OFFICIAL TITLE			

#### INSTRUCTIONS FOR INITIAL REPORT ON WEATHER MODIFICATION ACTIVITIES

One completed copy of this form is to be received 10 days\* or more prior to actual modification activities. A NOAA file number will be assigned by the Administrator after receipt of the initial report for each project or activity.

A <u>supplemental report</u> in letter form referring to the appropriate NOAA file number must be made to the Administrator if the "Initial Report" is found to contain any material inaccuracies, misstatements, omissions, or if there are changes in plans for the project or activity.

\*For exceptions, see Sections 908.4(b) and (c), Part 908 of Title 15, Code of Federal Regulations.

ltem 1	Enter designation, if any, used by operator for the project or activity.				
ltem 2	<ul><li>Enter: (a) Date first actual weather modification activity is to be undertaken;</li><li>(b) Date on which final weather modification activity is expected to occur.</li></ul>				
Item 3	Enter the purposes of the project or activity: e.g., rainfall increase, hail suppression, cold fog dispersal, etc.				
Item 4	<ul> <li>Enter: (a) Name, phone number, affiliation, and address of the primary person for whom the project is to be performed (sponsor).</li> <li>(b) Name, phone number, affiliation, and address of the person primarily responsible for carrying out the project (operator).</li> </ul>				
Item 5	A map should be attached showing size and location of target area, control area, coded number and location of each item of ground-based weather modification apparatus and coded number and location of key rain gauges, radars, or other precipitation measuring devices. Also show location of airport for airborne operations.				
ltem 6	Describe the weather modification apparatus, modification agents, and the techniques to be used. This would include type of ground or airborne apparatus to be used, type of modification material to be dispensed, rate of dispensing material in grams per hour or other appropriate units, type of precipitation gauges to be used in target and control areas, and any other pertinent information such as type of radars, type of aircraft to be used, techniques to be employed (e.g., cloud-based seeding at 10,000 feet msl).				
ltem 7	List name, phone number, affiliation, and address of the responsible individual from whom log books or other records may be obtained.				
ltem 8	Provide applicable answers to questions as indicated.				
Item 9	This item is to permit the reporting person to include any information not covered by items 1 through 8 but which he feels is significant or of interest. It is also to be used to include any information not covered elsewhere that the Administrator may request.				

### INFORMATION PROVIDED UNDER THE PROVISIONS OF THE PAPERWORK REDUCTION ACT OF 1995

The Paperwork Reduction Act o f1995 requires that individuals or organizations be provided with the following information if they provide information on paper forms which are collected by the Federal Government.

1. Public Law 92-205, enacted December 18, 1971 (amended by Public Law 94-490, Section 6(b), October 15, 1976) requires that all non-federal weather modification activities in the United States and its territories be reported to the Secretary of Commerce. The National Oceanic and Atmospheric Administration has implemented the Act and the current reporting requirements are published in the Code of Federal Regulations (15 CFR 908).

2. The intent of the program is to increase expertise in the field of weather modification, to allow scientists and other concerned persons to have access to information on current and past efforts at weather modification, to help avoid unneeded and wasteful duplications, to aid in preventing territorial overlapping of weather modification operations, to provide data to assess possible harmful or dangerous activities, and to furnish information to check both desirable and undesirable atmospheric changes against records of weather modification efforts. To meet this objective, information is collected on the location and size of the target area, names and addresses of sponsors and operators, beginning and ending dates of the project, specific purpose, description of apparatus and seeding agents to be used, number of days of operations, number of hours of operations of each type of weather modification apparatus, and total amount of seeing agent used.

3. A Federal agency may not conduct or sponsor, and a person is not required to respond to, nor shall a person be subject to a penalty for failure to comply with an information collection subject to the requirements of the Paperwork Reduction Act of 1995 unless the information collection has a currently valid OMB Control Number. The approved OMB Control Number for this information collection is 0648-0025. Without this approval, we could not conduct this information collection. Public reporting for this information collection is estimated to be approximately 30 minutes per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the information collection. All responses to this information collection are mandatory pursuant to Public Law 92-205, enacted December 18, 1971 (amended by Public Law 94-490, Section 6(b), October 15, 1976). Send comments regarding this burden estimate or any other aspect of this information collection, including suggestions for reducing this burden to the OAR Weather Program Office at Weather.Modification@noaa.gov.