Complete in accordance with instructions on reverse and forward copy:

TO: National Oceanic and Atmospheric Administration
Office of Oceanic and Atmospheric Research
1315 East-West Highway SSMC-3 Room 11554
Silver Spring, MD 20910

Form Approved: OMB No. 0648-0025 Expires 01/31/2018

NOAA FORM 17-4 (4-81) U.S. DEPARTMENT OF COMMERCE
NAT'L OCEANIC AND ATMOSPHERIC ADM.

INITIAL REPORT ON WEATHER MODIFICATION ACTIVITIES (P.L. 205, 92ND. CONGRESS)

1. PROJECT OR ACTIVITY DESIGNATION, IF ANY
Central Colorado Mountain River Basin Program

2. DATES OF PROJECT

a. DATE FIRST ACTUAL WEATHER MODIFICATION ACTIVITY IS TO BE UNDERTAKEN: 11/01/ 2021

b. EXPECTED TERMINATION DATE OF WEATHER MODIFICATION ACTIVITIES: 4/15//2022

3. PURPOSE OF PROJECT OR ACTIVITY
Winter snow pack and precipitation augmentation

4. (a) SPONSOR

NAME: see attached pages (CCMRB)

AFFILIATION:

PHONE NUMBER:

STREET ADDRESS:

CITY:

STATE:

ZIP CODE:

4. (b) OPERATOR

NAME: L. M. Hjermstad

AFFILIATION: Western Weather Consultants

PHONE NUMBER: 833-216-1820

STREET ADDRESS: PO Box 58

CITY: Durango

STATE: CO

ZIP CODE: 81302

5. TARGET AND CONTROL AREAS (See Instructions)

TARGET AREA		CONTROL AREA	
LOCATION	SIZE OF AREA	LOCATION	SIZE OF AREA
Eastern Central Colorado Divide Mountains of CO	1,668 SQ.MI	Northern CO Continental Divide and Sangre de Cristo	1,000 SQ.MI.

6. DESCRIPTION OF WEATHER MODIFICATION APPARATUS, MODIFICATION AGENTS AND THEIR DISPERSAL RATES, THE TECHNIQUES EMPLOYED, ETC. *(See Instructions)*

Apparatus: There are 24 total ground based cloud nuclei generators used for seeding the CCMRB program area in the Central Colorado Mountains.

Modification Material: Acetone solution of 4% silver iodide and 1.25% sodium iodide. Rate of dispensing material will range from 3 gm/hr. to 25 gm/hr. depending on cloud base moisture and temperature, cloud base height and cloud type.

Precipitation Measurements: Standard NWS precipitation observations along with NRCS SNOTEL observations in both seeded and control areas.

7. LOG BOOKS: *Enter name, affiliation, address, and telephone number of responsible individual from whom log books or other records may be obtained.*

NAME: Mike Hjermstad

AFFILIATION: Western Weather Consultants

PHONE NUMBER: 833-216-1820

STREET ADDRESS: PO Box 58

CITY: Durango

STATE: CO

ZIP CODE: 81302

THIS REPORT IS REQUIRED BY PUBLIC LAW 92-205; 85 STAT 735; 15 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.

8. SAFETY AND ENVIRONMENT

☐ YES ☒ NO Has an Environmental Impact Statement, Federal or State been filed? If yes, please furnish a copy as applicable.

☒ YES ☐ NO Have provisions been made to acquire the latest forecasts, advisories, warnings, etc. of the National Weather Service, Forest Service, or others when issued prior to and during operations? If yes, please specify on a separate sheet.

☒ YES ☐ NO Have any safety procedures *(operational constraints, provisions for suspension of operations, monitoring methods, etc.)* and any environmental guidelines *(related to the possible effects of the operations)* been included in the operational plans? If yes, please furnish copies or a description of the specific procedures and guidelines.

9. OPTIONAL REMARKS *(See Instructions. Use Separate Sheet.)*

NAME: Mike Hjermstad

CERTIFICATION: I certify that the above statements are true, complete and correct to the best of my knowledge and belief.

AFFILIATION: Western Weather Consultants

SIGNATURE:

STREET ADDRESS: PO Box 58

OFFICIAL TITLE: Asst. Manager

CITY: Durango

STATE: CO

ZIP CODE: 81302

DATE: 10/31/2021

PHONE NUMBER: 8332161820

Reset

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 supplemental report in a 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, and 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.

Item 1. Enter designation, if any, used by operator for the project or activity.

Item 2. Enter: (a) Date first actual weather modification activity is to be undertaken;
(b) Date on which final weather modification activity is expected to occur.

Item 3. Enter the purpose of the project or activity: e.g., rainfall increase, hail suppression, cold fog dispersal, etc.

Item 4. Enter: (a) Name, phone number, affiliation, and address of the primary person for whom the project is to be performed (sponsor).

(b) Name, phone number , affiliation, and address of the person primarily responsible for carrying out the project (operator).

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 raingages, radars, or other precipitation measuring devices. Also show location of airport for airborne operations.

Item 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 gages 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 base seeding at 10,000 feet msl).

Item 7. List name, phone number , affiliation, and address of the responsible individual from whom log books or other records may be obtained.

Item 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 of 1995 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. (This includes reports required of weather modification activities.)

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 Catalog 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 seeding agent used.

3. Public reporting burden for this collection of information is estimated to average 40 hours for reporting and 200 hours for record keeping, based on one-half hour per response on Form 17-4 and one-half hour per response on Form 17-4A, and five hours per record keeper. It is estimated that the time per response is approximately the same across all respondents. Send comments regarding this burden estimate or any other aspect of this data collection, including suggestions for reducing this burden to: Ms. Karen King, DOC/NOAA/OAR, 1315 East West Highway, Silver Spring, MD 20910.

4. Reporting of this information under Public Law 92-205, enacted December 18, 1971 (amended by Public Law 94-490, Section 6(b), October 15, 1976) is mandatory.

5. Confidentiality is not a requirement for this reporting; no sensitive information is required.

6. Notwithstanding any other provision of the law, no person is required to respond to, nor shall any person be subject to a penalty for failure to comply with, a collection of information subject to the requirements of the Paperwork Reduction Act, unless that collection of information displays a currently valid OMB Control Number.

September 1, 2000
Expires 09/30/2004

Central Colorado Mountains River Basin Weather Modification Program (CCMRB Program): 2021-2022 Winter Cloud Seeding

State of Colorado Weather Modification Permit # 2017-02

CCMRB Program Sponsors: Front Range Water Council, Colorado River Water Conservation District, Winter Park and Colorado Water Conservation Board.

Points of Contact:

- Colorado River Water Conservation District: Mike Eytel or Dave Kanzer, 201 Centennial St # 200, Glenwood Springs, CO 81601

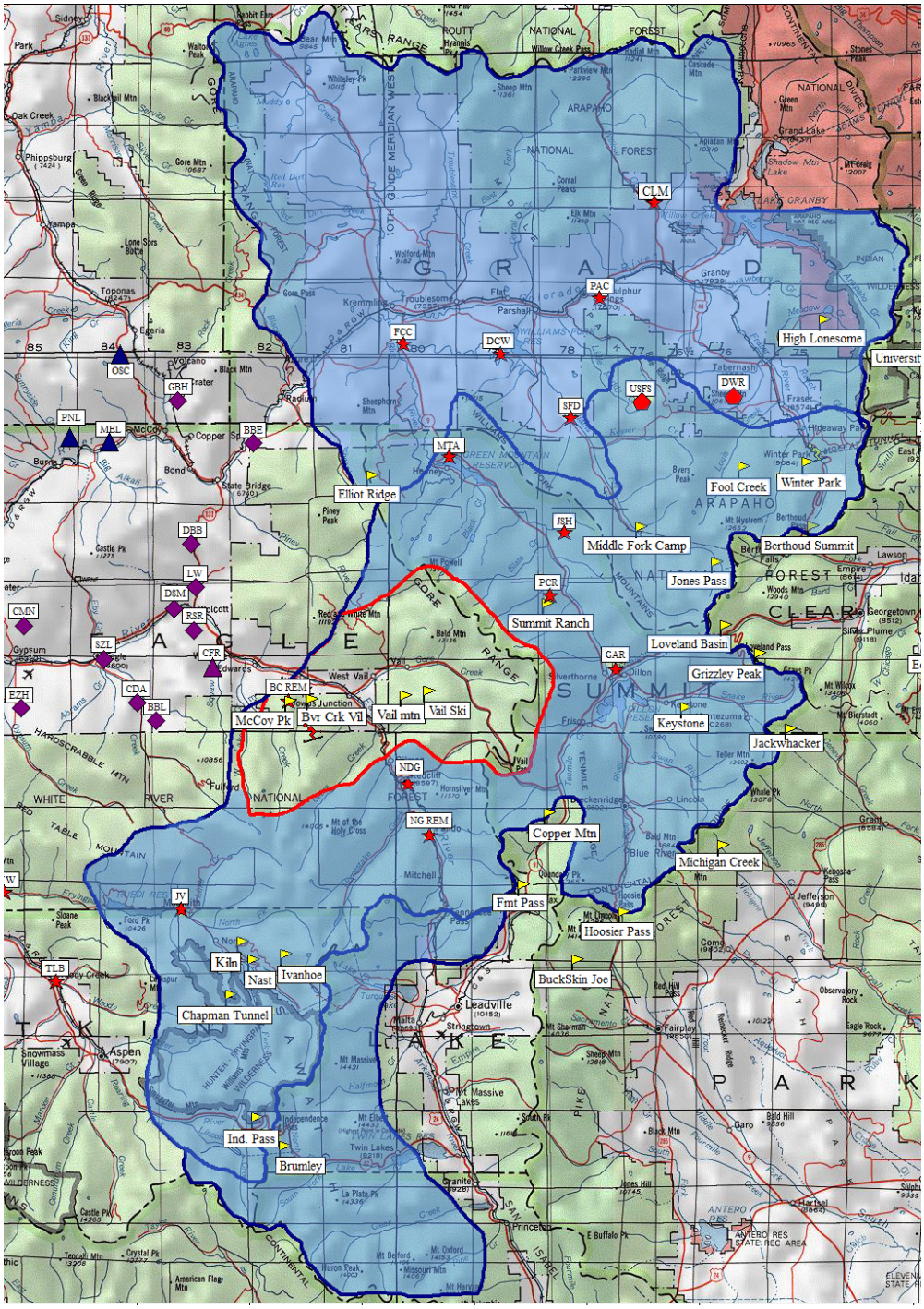
Operational Plan

The 2021-2022 CCMRB Program will be operated by Western Weather Consultants, LLC. (WWC) with the intention of increasing the mountains snowpack for recreational, agricultural, industrial, and domestic uses. The cloud seeding operations will use both manually and remotely operated ground-based Cloud Nuclei Generators (CNG). The manually operated CNG use a 4% silver iodide, 1.25% sodium iodide solution in Acetone, burned in a propane flame at a rate of 5 to 25 grams per hour. The remotely operated CNG use a 2% silver iodide, .75% sodium iodide solution in Acetone, burned in a propane flame at a rate of 15 to 25 grams per hour. The permitted operational timeframe for the CCMRB Program will be November 1, 2021, to April 15, 2022.

Target Area

The Blue Shaded area, illustrated in the attached map, indicates the Target Area for the CCMRB Program (which also encompasses the Vail/ Beaver Creek Ski Resorts cloud seeding program target area, outlined in red). The Vail/ Beaver Creek Program runs independent of the CCMRB Program. Some generator sites in the area can be used to benefit both programs and will be considered as shared sites. Any seeding hours utilizing the Vail/ Beaver Creek generators, for seeding the CCMRB Program Target Area, will be allocated to the CCMRB Program by WWC and vice versa. The CCMRB Program is designed, operated, and intended to affect only the Target Area.

Target Area Map



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 25 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 which 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. With a "best" initial network to seed an established weather system, and when there is observed precipitation in the Target Area through SNOTEL or precipitation data that is publicly available (documentation of this will be provided in the WWC annual reports), the generator operators are notified to turn on their generator at a specific time and operate them at a specific burn rate. On the same call, they will be given a specific turn-off time, 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 a continuous monitoring of any changes in conditions and any adjustments or termination in the seeding operation. Following each seeding operation, each generator operator who was instructed to operate the nuclei generator will submit a written report on the actual observation times; verify the seeding rates and note 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 and are forecast to move lower in elevation from the onset of seeding and continue throughout the seeding period. The weather system has clouds that are forecast to have vertical heights and moisture content capable of producing natural precipitation.
- Temperatures at the height of 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 at -5 degrees C.

- Wind directions and speeds from the surface to cloud-base are observed and forecast to favor the movement into the intended Target Area of the silver iodide nuclei being released from the ground-based generator sites.
- There are no stable regions or atmospheric inversions between the surface and cloud-base that would prevent the vertical dispersion of the silver iodide particles from the surface to at least the -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 ID	Site Name	Program	Latitude	Longitude	Elevation
V1	BBE	Mc Phee Gulch	Vail/CCMRB	39.9012	-106.5955	7088
V6	DBB	Wolcott Divide	Vail/CCMRB	39.7840	-106.6885	8194
V24	RSR	Red Sky Ranch	Vail/CCMRB	39.6838	-106.6838	7704
V32	SZL	Adams Rib	Vail/CCMRB	39.6511	-106.8194	6950
V28	EZH	Hardscrabble Gulch	Vail/CCMRB	39.5942	-106.9402	6910
CCMRB-REM3	BC REM	Beaver Creek	CCMRB-REM3	39.602703	-106.543955	9512
V33	BBL	Lady Bell	Vail/CCMRB	39.6008	-106.7681	7144
CCMRB12	RKW	7 Castles	CCMRB12/Vail	39.381902	-106.965541	7002
CCMRB15	JV	Meredith	CCMRB15/Vail	39.3573	-106.6902	8305
CCMRB13	TLB	Woody Creek	CCMRB13	39.2788	-106.8874	7375
CCMRB-REM5	YMCA-REM	YMCA	CCMRB-REM5	39.990558	-105.953297	9175
CCMRB16	NDG	Redcliff	Vail/CCMRB16	39.5077	-106.3664	8687
CCMRB-REM4	NG REM	Nova Guides	CCMRB-REM4	39.4476	-106.3346	9222
CCMRB1	PAC	Cottonwood	CCMRB1	40.0687	-106.0825	7926
CCMRB2	DCW	McQueary Gulch	CCMRB2	40.0044	-106.2287	7833
CCMRB3	SFD	Aspen Canyon	CCMRB3	39.92987	-106.125093	8224
CCMRB4	FCC	Junction Butte	CCMRB4	40.0150	-106.3728	7487
CCMRB5	MTA	Green MTN Res	CCMRB5	39.8728	-106.3084	8058
CCMRB-REM6	OC-REM	Otter Creek	CCMRB-REM6	39.8480	-106.2693	8080
CCMRB6	JSH	Big Gulch	CCMRB6	39.7976	-106.1346	8555
CCMRB-REM1	DWR	Denver Water	CCMRB-REM1	39.95503	-105.88323	8964
CCMRB-REM2	USFS	USFS	CCMRB-REM2	39.94869	106.01888	9590
CCMRB7	PCR	Pebble Creek	CCMRB7	39.724339	-106.155463	9354
CCMRB8	GAR	Silverthorn	CCMRB8	39.63925	-106.058991	9174

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

website, and National Oceanic and Atmospheric Administration (NOAA), Pivotalweather.com for short and long-range model forecasts. There are numerous forecasting websites available beyond the previously listed that are used as well, but these tend to be the preferred forecasting sites. Other available resources are the Colorado Department of Transportation (CDOT) website to monitor road conditions and concerns, Colorado Avalanche Information Center (CAIC) for Weather Research Forecasting (WRF) point forecasts, and to view 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, web cam images, and other forecast aids. This data assists in selecting favorable storms for modification and monitoring suspension criteria.

Suspension Criteria

The proposed Suspension Criteria provides safeguards to the program to ensure that risks associated with cloud seeding have been addressed. WWC will retain the right to suspend operations during any period if the weather system is determined detrimental. Facilities will be maintained to gather and analyze weather data providing a continuing weather watch. WWC will maintain communications 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 on a seven day per week basis the weather patterns over Colorado and the Western United States during the winter operating period. Meteorologists permitted by the State of Colorado to operate weather modification programs will determine if weather events are suitable for precipitation augmentation by cloud seeding.

Prior to initiating any seeding operations, a thorough hazard analysis will be evaluated a potential weather system judged suitable for seeding will be evaluated for its potential to develop into a blizzard, severe storm, or heavy precipitation possibly associated with a potential for major avalanche episode. Also, the effects of the weather event on ranching, agriculture, wildlife, highway travelers, municipal interests and industry will also be considered. This evaluation will be concentrated upon those areas to be seeded along with considerations of potential adverse effects to adjacent areas which 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 initiated, monitoring of existing and forecast weather conditions will continue throughout the duration of the seeding operation. All new meteorological information will be assessed as well as generator reports from generator operators, the State Patrol, and field maintenance personnel in the seeded areas. 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 Warning being used as a trigger for temporary suspension of neighboring generators. Changing weather conditions that would indicate the onset of potentially severe or hazardous weather conditions will result in the suspension of seeding operations throughout the duration of these potentially hazardous weather conditions. Snowpack accumulation will be monitored from SNOTEL stations from all SNOTEL sites within the target area and the first detailed analysis of snow accumulation will be completed using these measurements. Evaluations of snowpack indicate that 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 CCMRB 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 major 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, 165% of average on February 1st, 155% of average on March 1st and 145% of average on April 1st.

The following website can be used to see a map which will show the snowpack percentages of normal:

https://www.wcc.nrcs.usda.gov/ftpref/states/co/snow/state/daily/co_cloud_seed.pdf

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 his or her 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 to within the realm of 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 1981 through 2010 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 impacts 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 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 intended weather modification activities and provide WWC's contact information prior to the 2021-2022 season of weather modification operations.

Contact Information

Manager
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970-946-6328
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