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 11216
Silver Spring, MD 20910

Form Approved: OMB No. 0648-0025 Expires 12/31/2007

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
Wind River Range Weather Modification Project (WRRWMP)

2. DATES OF PROJECT
a. DATE FIRST ACTUAL WEATHER MODIFICATION ACTIVITY IS TO BE UNDERTAKEN: 12/01/2018
b. EXPECTED TERMINATION DATE OF WEATHER MODIFICATION ACTIVITIES: 03/31/2019

3. PURPOSE OF PROJECT OR ACTIVITY
Operations. Increase snowpack in the Wind River Range, Wyoming

4. (a) SPONSOR

NAME			
Wyoming Water Development Office, Attn: Ms. Julie Gondzar			
AFFILIATION	PHONE NUMBER		
State of Wyoming	(307) 777-7626		
STREET ADDRESS			
6920 Yellowtail Road			
CITY	STATE	ZIP CODE	
Cheyenne	WY	82002	

4. (b) OPERATOR

NAME			
Bruce A. Boe			
AFFILIATION	PHONE NUMBER		
Weather Modification LLC	(701) 235-5500		
STREET ADDRESS			
3802 20th Street North			
CITY	STATE	ZIP CODE	
Fargo	ND	58102	

5. TARGET AND CONTROL AREAS (See Instructions)

TARGET AREA		CONTROL AREA	
LOCATION	SIZE OF AREA	LOCATION	SIZE OF AREA
west-central Wyoming	~1,247 SQ.MI	none	SQ.MI.

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

Up to 10 (ten) remote-controlled ice nucleus generators sited west, southwest, and southeast of the range will be used to seed clouds upwind of the range, targeting higher elevations to increase snowpack. The locations of the generators are shown on the attached map. In any seeding event, the generators actually used will be determined by the prevailing wind speed and direction. The number used will depend upon the extent of the seedable conditions over the range. The silver iodide-based seeding agent will be released at a rate of about 25 grams per hour from each active generator. Seeding will be guided by an on-site meteorologist, aided by weather observations and four-dimensional (x, y, z, t) prognostic numerical models.

Seeding will occur only when the following conditions are met over the range: (1) the temperature at the 700 mb pressure (approximately 10,000 ft msl) is less than or equal to -6 degrees C, (2) the wind direction is such that the proper transport of the ice nuclei will occur, from the ground-based generators to the target, and (3) liquid water is observed and/or predicted to exist over the range.

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

NAME			
Ms. Erin Fischer			
AFFILIATION	PHONE NUMBER		
Weather Modification LLC	(701) 235-5500		
STREET ADDRESS			
3802 20th Street North			
CITY	STATE	ZIP CODE	
Fargo	ND	58102	

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 [X] NO — Has an Environmental Impact Statement, Federal or State been filed? If yes, please furnish a copy as applicable.
- [X] 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.
- [X] 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	CERTIFICATION: I certify that the above statements are true, complete and correct to the best of my knowledge and belief.		
Bruce A. Boe			
AFFILIATION	SIGNATURE		
Weather Modification, LLC.			
STREET ADDRESS	OFFICIAL TITLE		
3802 20th Street North	Vice President of Meteorology		
CITY / STATE / ZIP CODE	DATE	PHONE NUMBER	
Fargo / ND / 58102	11/05/2018	(701) 235-5500	

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 Williams, 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 <u>mandatory</u>.

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 09/30/2007

WEATHER MODIFICATION
INTERNATIONAL

November 6, 2018

Dr. Kandis Boyd, Deputy Director
NOAA/OAR Office of Weather and Air Quality
1315 East-West Highway #10339
Silver Springs, MD 20910-3282

RE: NOAA FORM 17-4
INITIAL REPORT ON WEATHER MODIFICATION ACTIVIITES
Wyoming Wind River Range, 2017-2018

Dear Dr. Boyd:

Weather Modification International is pleased to submit the enclosed in compliance with the National Oceanic and Atmospheric Administration's weather modification activities initial reporting requirement (P.L. 205, 92nd, Congress).

Below is a summary of additional information required by NOAA Form 17-4.

Item 5: Ground-based operations - Please see enclosed map for locations of the seeding agent release sites.

Item 8: No EIS or EA has been completed. Planned operations include only ground-based seeding. No equipment has been sited on federal lands.

Provisions have been made to acquire the latest weather information, including advisories, watches, and warnings from the National Weather Service. In addition, project upper air soundings made from Pinedale, Wyoming, will be transmitted in real-time to the NWS offices in Cheyenne and Riverton, WY.

Operational suspension criteria have been revised, and are also enclosed. These criteria have been developed and refined in concert with the Wyoming Water Development Office and the project interagency Technical Advisory Team. .

Tel: 1-701-235-5500 • Fax: 1-701-235-9717 • 3802 20th St N • Fargo, ND 58102 • USA
www.weathermodification.com

Item 9: No additional comments.

If you have any questions, please contact me by telephone at: (701) 235-5500 or by e-mail at bboe@weathermodification.com.

Sincerely,

Bruce A. Boe
Vice President of Meteorology

enc: Target Area Map
Suspension criteria
NOAA Form 17-4

cc: Mr. Lee Arrington, Wyoming State Engineer's Office
Ms. Julie Gondzar, Wyoming Water Development Office

Wind River Range 2018-2019 Cloud Seeding Operations Plan

Prepared by Weather Modification LLC. for the Wyoming Water Development Office
06 November 2018

1. Project Description

Up to 10 (ten) remote-controlled ice nucleus generators sited west, southwest, and southeast of the range will be used to seed clouds upwind of the range, targeting higher elevations to increase snowpack. The locations of the generators are shown on the map in Section 5. In any seeding event, the generators actually used will be determined by the prevailing wind speed and direction. The number used will depend upon the extent of the seedable conditions over the range. The silver iodide-based seeding agent will be released at a rate of about 25 grams per hour from each active generator. Seeding will be guided by an on-site meteorologist, aided by weather observations and prognostic numerical models. Seeding will occur only when the following conditions are met over the range: (1) the temperature at the 700 mb pressure (approximately 10,000 ft msl) is less than or equal to -6 degrees C, (2) the wind direction is such that the proper transport of the ice nuclei will occur, from the ground-based generators to the target, and (3) liquid water is observed and/or predicted to exist over the range.

2. General provisions

WMI will be responsible for the implantation of all design criteria, suspension criteria and evaluation and monitoring as obligated within the final Weather Modification Wind River Mountains 2018-2019 Consultant Contract for Services #07SC0296537.

3. Operator's Contact Information

Table 1 – Weather Modification, Inc., Wind River Range – Key Personnel

Name	***Title***	***Project Role***	***Telephone***	***E-mail***
Bruce Boe	VP, Meteorology	Manager	(701) 673-3354	bboe@weathermod.com
Erin Fischer	Director, Client Services	Recordkeeping	(701) 373-8829	efischer@weathermod.com
Adam Brainard	Field Meteorologist	Field Meteorologist	(815) 488-3881	abrainard@weathermod.com
Michael Paul	Lead Field Technician	Generator Ops/Mx	(970) 769-3225	mpaul@weathermod.com

4. 2018-2019 Operations

The timetables for operations and related activities will be as follows:

- Seeding operations will be conducted as conditions allow beginning on December 1, 2018, through March 31, 2019.
- The ground-based ice nuclei generators (generators) will be maintained as needed throughout the seeding season. Generator sites will also be visited as needed to replenish seeding solution. Dates for generator maintenance and resupply are dependent upon the frequency of site malfunctions and consumption of seeding agent (frequency and duration of seeding events), and thus are unpredictable.
- Annual maintenance of generator sites will be conducted prior to the seeding season, if execution of the seasonal contract allows.
- As directed by Executive Order 2010-4, pertaining to Greater Sage Grouse Core Area Protection, issued by the Governor's Office on August 18, 2010, any and all field activities within or near any Sage Grouse Core Areas will be restricted during the times and dates indicated in the Executive

Order. In previous seasons no conflicts have arisen, but field personnel will comply fully with the intent and letter of this order.

The names, identifiers, locations, and ownership of the ten generator sites employed during the 2018-2019 season are given in Table 2.

Table 2 – Active Wind River Range Ground-based Ice Nucleus Generators

Generator Site		*Location*			*Site Ownership*		
Site Name	***Site ID***	***Latitude (N)***	***Longitude (W)***	***Elevation (ft)***	***Private***	***State***	***Federal***
Big Sandy Opening	WR01	42.6082	-109.3094	7,923		X	
Block and Tackle	WR02	42.5611	-109.1547	8,512		X	
White Acorn Ranch	WR03	42.5303	-109.0839	8,333		X	
Sweetwater	WR04	42.4624	-1090125	7,818	X		
Anderson Ridge	WR05	42.4461	-108.9044	7,978		X	
Enterprise	WR07	42.7355	-108.7703	6,708	X		
Boulder Lake	WR09	42.8309	-109.6438	7,803		X	
East Fork	WR10	42.7523	-109.6697	7,040	X		
Pocket Creek	WR12	42.6983	-109.4525	7,822	X		
Green River	WR13	43.0440	-110.0399	7,967		X	

5. Location of Facilities

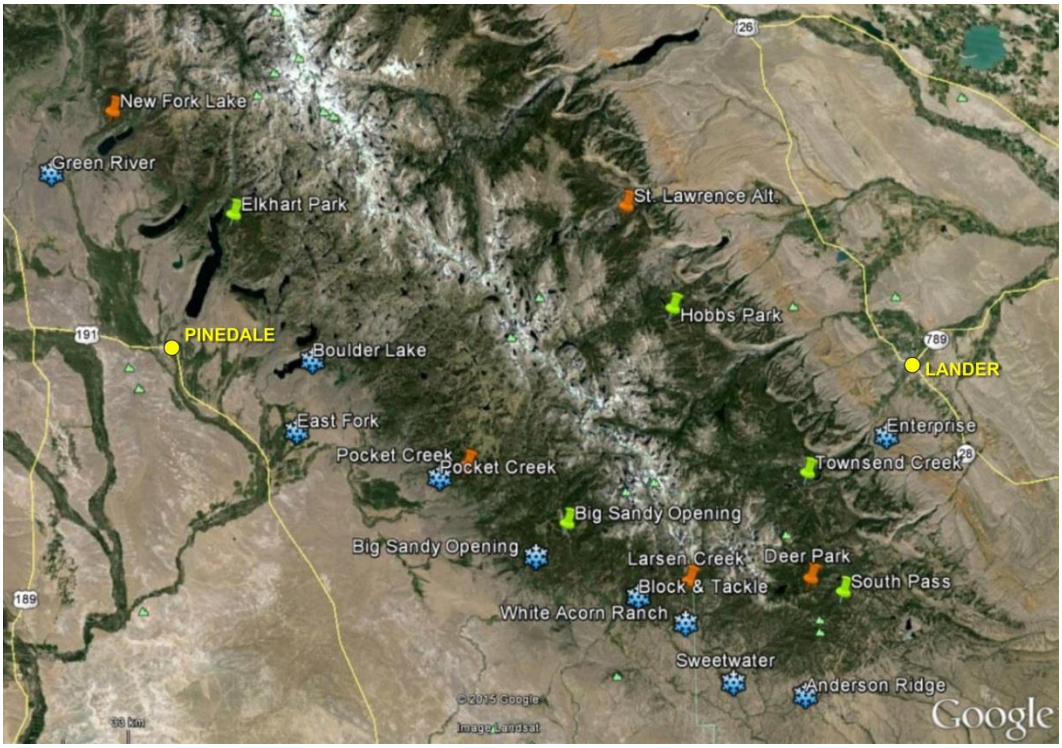


Figure 1. Locations of the generators are shown by the snow crystals. SNOTEL locations are denoted by the pushpins; green indicates those used in calculating the SWE suspension criterion. Those indicated by red pushpins are not used because of proximity to other sites with longer periods of record, or short histories (new sites).

6. Suspension Criteria

Snowfall histories are used to determine the Historic Range of Natural Variability (HRNV) for a given SNOTEL facility. These historic snow-water equivalents are then combined and a 'median' is established

for a period of time, usually 10-20 years of recorded history. This 'median' is then used to set the HRNV by the day or month of any recorded year.

Thresholds at which cloud seeding will be suspended for this operation are identified below. These criteria will be implemented to govern all decisions on the operation of the generators. The criteria for this Wyoming operation were determined using an HRNV at the upper range of 140%, using historic data gathered from up to 30 years of records.

Cloud seeding will be suspended if any of the criteria listed below are met:

1. Seeding shall be suspended in any target area if and when range-wide snow water equivalents (SWE) indicated by designated NRCS SNOTEL sites (see green pushpins, Figure 1) exceed a percentage of the long-term median defined by a linear upper limit of 85% of the thirty-year (1981-2010) median April 1 SWE for the site on November 15 (normal program start), and increasing to 140% of the median April 1 SWE as of April 1. After April 1, the upper limit will remain fixed at 140% of the April 1 median value, until season end[1].
2. Insufficient reservoir storage for flood control, based upon hydrologic estimates of total snowpack using all available data. .
3. Potential for significant rain events above 8,500 feet MSL. The area of risk would not be targeted until the risk had passed.
4. Severe winter weather events, as forecast by the National Weather Service office having responsibility for the target. The area forecast to be affected would not be targeted until the risk had passed.
5. Extreme avalanche risk in a specific target area. The area of risk would not be targeted until the risk had passed.
6. If a significant wildfire occurs within the watersheds of the target area, the Forest Service shall be consulted prior to the next cloud seeding season to determine if there is need for suspension(s) that account(s) for the newly burned areas.
7. Care will be taken to avoid targeting major highways to avoid impact on transportation corridors.
8. Seeding will be suspended at any time, upon direction from the Wyoming Water Development Office (WWDO).

[1]During the Wyoming Weather Modification Pilot Project, a research program, the upper limit was conservatively set at 120% of the 1971-2000 mean SWE. However, when the 1981-2010 thirty-year period of record became available, the Natural Resources Conservation Service (NRCS), which operates the SNOTELs, decided to publish (on the NRCS SNOTEL web sites) the long-term median, rather than the mean, as they determined the medians were more indicative of typical values. Thus the operational criteria now use medians rather than means, and also the 1981-2010 period of record. The upper limit was raised from 120% to 140% because this corresponds approximately to one standard deviation above the long-term medians, meaning that snowpack at this level would still be well within the limits of natural variability. We note that the *lowest* SWE suspension threshold currently employed in the western United States is 140%, including programs in Idaho, Utah, Nevada, and California.

In the event that any of these criteria are met and seeding is to be suspended the notification of field personnel will be achieved as follows:

A. If the WWDO determines that seeding should be suspended (most likely from criteria #2, #6, or #8), the WWDO program manager (Ms. Julie Gondzar) or WWDO Deputy Director, Mr. Barry Lawrence, will contact the WMI program manager (Mr. Bruce Boe) and advise him of the decision to suspend seeding. If Mr. Boe cannot be readily contacted, the lead project meteorologist, Mr. Adam Brainard will be contacted. Mr. Boe will then immediately contact the lead project meteorologist, who in turn will immediately notify the lead project technician (Mr. Michael Paul). If Mr. Brainard is the first to be reached by the WWDO, he will contact the lead project technician, as he would had the suspension directive be relayed by Mr. Boe. If any generators are seeding at the time notification to suspend is received from WWDO, they will be immediately shut down. All WMI personnel will note in their project notes the time and date at which notification was received, and the person from whom it was received. Seeding will resume only upon notification from the WWDO program manager is received by the WMI project manager that resumption of normal seeding operations is desired. As with seeding suspension, all WMI project personnel will note the date and time of notification of any resumption, and also the person from whom notification was received.

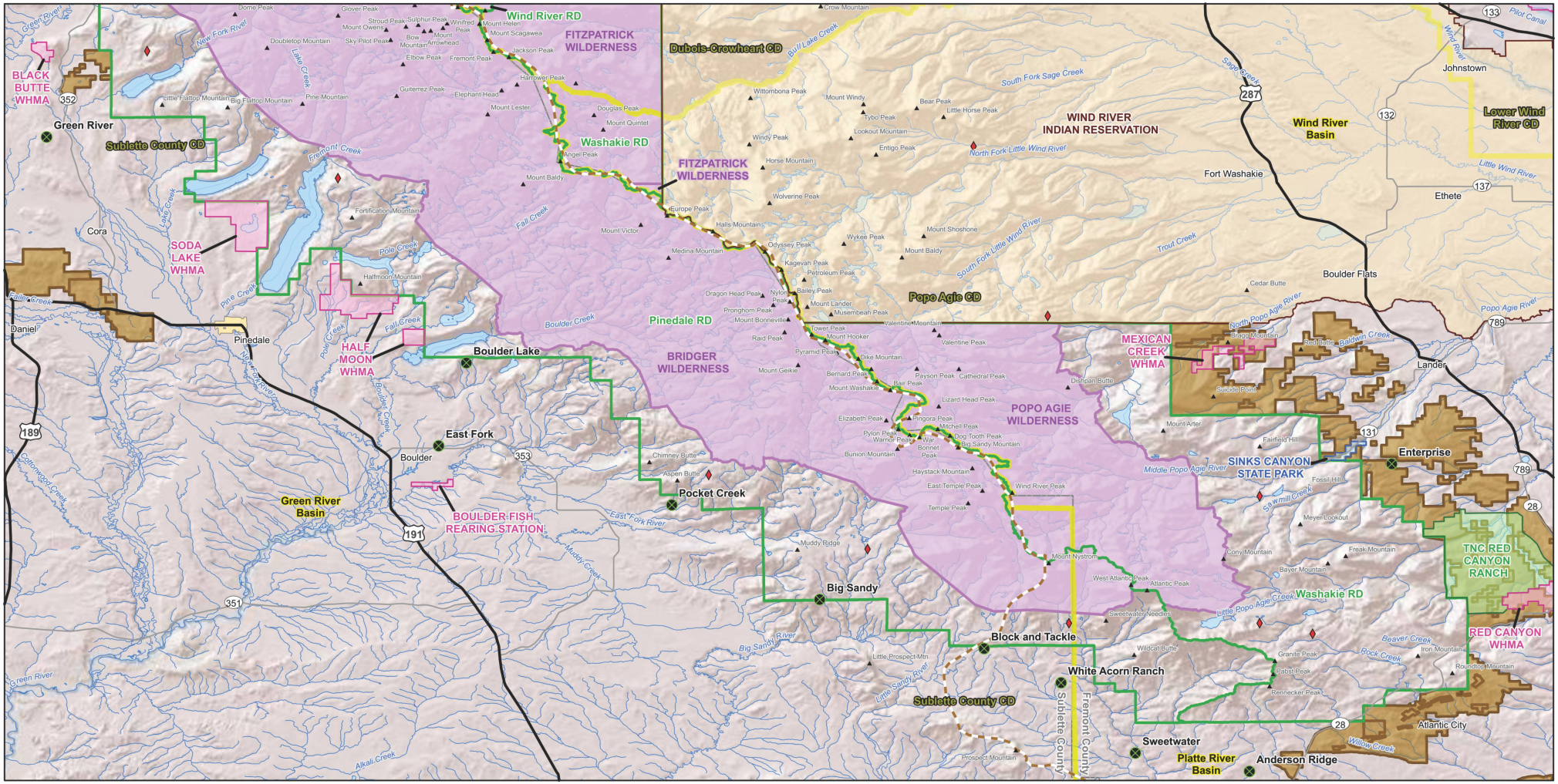
B. If WMI determines that seeding should be suspended (most likely from criteria #1, #3, #4, or #5), the WMI program manager (Mr. Bruce Boe) will contact the WWDO program manager (Ms. Julie Gondzar) and advise her of the reason(s) to suspend seeding. Ms. Gondzar will then assess the situation from the WWDO perspective and either affirm the need to suspend, or provide a directive to continue seeding. In either case, the WWDO decision will be immediately relayed to the WMI lead project meteorologist (Mr. Adam Brainard), who will in turn inform the other WMI field personnel that seeding is either suspended until further notice, or to continue as before. If Ms. Gondzar is unavailable, the WWDO Deputy Director, Mr. Barry Lawrence will instead be informed. If neither Ms. Gondzar nor Mr. Lawrence can be immediately reached, seeding *will be suspended* until such time as one of the other can be informed, and a formal decision made by the WWDO.

In addition, in the event of a localized situation that affects only a portion of the target area, operational seeding activities will be restricted to non-affected portions of the target area. An example of such a situation would be a wildfire burn scar that elevates erosion risks during spring runoff (Criterion 6). Conditions defined in Criterion 5 would also trigger this type of localized suspension. In such case(s), seeding activities that may impact the affected area would *not* be conducted.

06 NOVEMBER 2018



Bruce A. Boe
Vice President, Meteorology



WEATHER MODIFICATION INTERNATIONAL

HERITAGE ENVIRONMENTAL CONSULTANTS, LLC

WYOMING WEATHER MODIFICATION PROJECT

FIGURE 1
WIND RIVER MOUNTAINS WEATHER MODIFICATION PROGRAM

ANALYSIS AREA: SUBLETTE AND FREMONT COUNTIES, WY

2018-11-06 | Author: djb

E:\Wind River Range - WY\Winds-2018\Reporting\