AGENDA

IDAHO WATER RESOURCE BOARD

Cloud Seeding Committee Meeting No. 1-23
Wednesday, June 28, 2023
3:00 p.m. (MT)

Water Center
Conference Rooms 602 C&D / Online Zoom Meeting
322 E. Front St.
BOISE

Board Members & the Public may participate via Zoom
Click here to join our Zoom Meeting
Dial in Option: 1(253) 215-8782
Meeting ID: 861 0000 2846 Passcode: 654307

1. Introductions and Attendance
2. Cloud Seeding Program*
3. Other Items
4. Adjourn

Committee Members: Chair Marc Gibbs, Jeff Raybould, Al Barker, and Pat McMahon.

* Action Item: A vote regarding this item may be made at this meeting. Identifying an item as an action item on the agenda does not require a vote to be taken on the item.

Americans with Disabilities
The meeting will be held in person and online. If you require special accommodations to attend, participate in, or understand the meeting, please make advance arrangements by contacting Department staff by email jennifer.strange@idwr.idaho.gov or by phone at (208) 287-4800.

Cloud Seeding Program

Status Report

Updated: June 2023

Idaho Water Resource Board

Email: iwrbcloudseeding@idwr.idaho.gov

https://idwr.idaho.gov/iwrb/programs/cloud-seeding-program/

Tel: 208-287-4800

322 E Front St | Boise, ID 83701

Table of Contents

Program Overview

- Cloud Seeding 101
- Cloud Seeding FAQ Sheet

History

Cloud seeding operations have been occurring in various parts of Idaho since the early 1950's; earlier programs were locally sponsored, manually operated ground seeding projects. More consistent operations began in the late 1990's with the development of the High Country Resource Conservation & Development's (HCRCD) east Idaho program, operated by Let it Snow (LIS)- currently the longest operational program in the State. Idaho Power Company (IPC), in response to a shareholder question, also began investigating cloud seeding in the late nineties to support its hydropower generation; and began its first operational project in the Payette River Basin in 2003.

Water Year	Northern Idaho	Southwestern Idaho	Southern Idaho	Southeastern Idaho
1950	*	*	*	*
1951	NAWC	*	*	*
1952	*	*	*	*
1953	NAWC	*	*	*
1954	NAWC	*	NAWC	NAWC
1955	NAWC	NAWC	NAWC	NAWC
1956	NAWC	NAWC	*	NAWC
1957	NAWC	*	*	NAWC
1958	NAWC	*	*	NAWC
1959	NAWC	*	*	NAWC
1960	NAWC	NAWC	*	NAWC
1961	*	NAWC	*	NAWC
1962	*	NAWC	*	NAWC
1963	*	*	*	NAWC
1964	*	*	*	NAWC
1965	*	*	*	NAWC
1966	*	*	*	NAWC
1967	NAWC	*	*	NAWC
1968	NAWC	*	*	NAWC
1969	NAWC	*	*	NAWC
1970	NAWC	*	*	NAWC
1971	NAWC	*	*	*
1972	*	*	*	*
1973	*	*	*	*
1974	NAWC	*	*	*
1975	*	*	*	*
1976	*	*	*	*
1977	*	*	*	*
1978	*	*	*	*
1979	*	*	*	*
1980	*	*	*	NAWC
1981	*	*	*	NAWC
1982	*	*	*	NAWC
1983	*	*	*	*
1984	*	*	*	*
1985	*	*	*	*

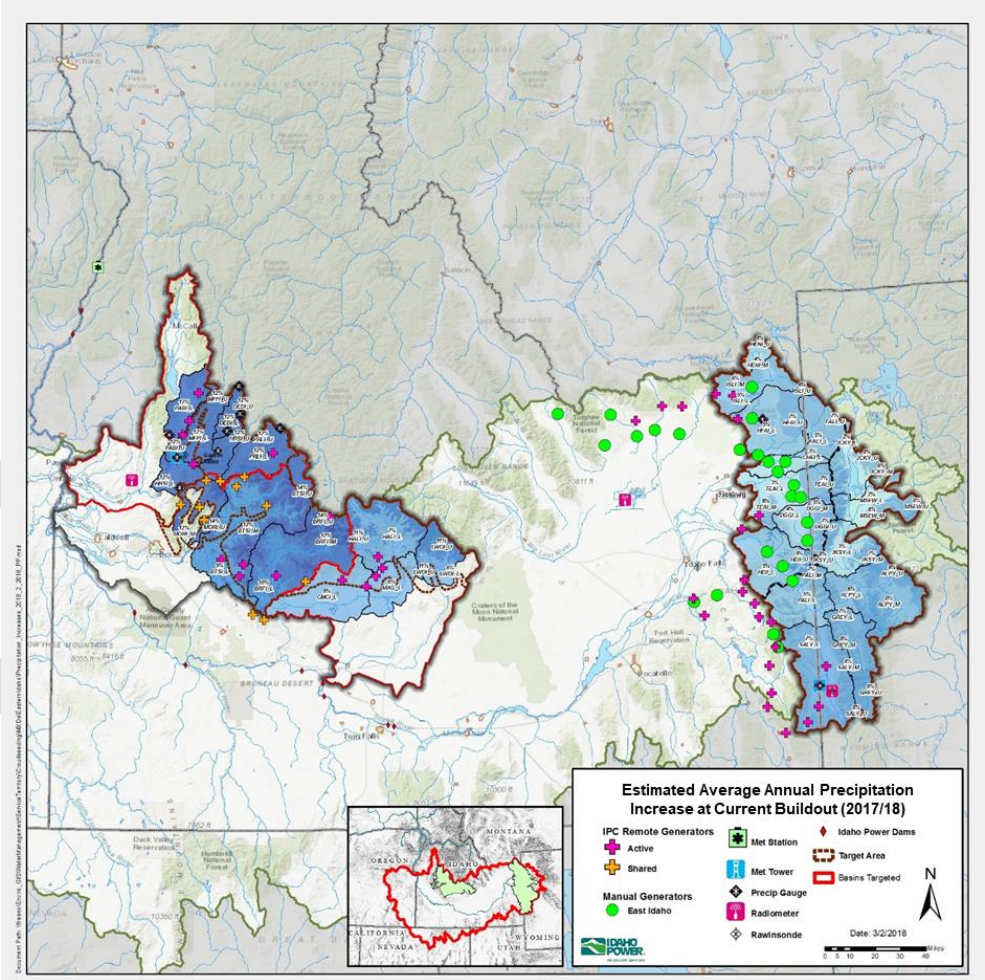
Water Year	Payette	Boise	Wood	Northern Upper Snake	Southern/Eastern Upper Snake
1986	*	*	*	*	*
1987	*	*	*	*	*
1988	*	*	*	*	*
1989	*	*	*	NAWC	NAWC
1990	*	*	*	*	NAWC
1991	*	*	*	*	*
1992	*	*	*	*	NAWC
1993	*	NAWC	*	NAWC	NAWC
1994	*	NAWC	*	*	*
1995	*	NAWC	*	*	NAWC
1996	*	NAWC	*	*	*
1997	AI	*	*	LIS	*
1998	*	*	*	LIS	*
1999	*	*	*	LIS	*
2000	*	*	*	LIS	*
2001	*	*	*	LIS	*
2002	*	NAWC	*	LIS	LIS
2003	IPC	NAWC	*	*	LIS
2004	IPC	NAWC	*	LIS	LIS
2005	IPC	NAWC	*	*	LIS
2006	IPC	*	*	LIS	*
2007	IPC	*	*	LIS	*
2008	IPC	NAWC	*	LIS|IPC	LIS|IPC
2009	IPC	NAWC	*	LIS|IPC	LIS|IPC
2010	IPC	*	*	LIS|IPC	LIS|IPC
2011	IPC	NAWC	*	LIS|IPC	LIS|IPC
2012	IPC	NAWC	*	LIS|IPC	LIS|IPC
2013	IPC	*	IPC	LIS|IPC	LIS|IPC
2014	IPC	NAWC	IPC	LIS|IPC	LIS|IPC
2015	IPC	IPC	IPC	LIS|IPC	LIS|IPC
2016	IPC	IPC	IPC	LIS|IPC	LIS|IPC
2017	IPC	IPC	IPC	LIS|IPC	LIS|IPC
2018	IPC	IPC	IPC	LIS|IPC	LIS|IPC
2019	IPC	IPC	IPC	LIS|IPC	LIS|IPC
2020	IPC	IPC	IPC	LIS|IPC	LIS|IPC
2021	IPC	IPC	IPC	LIS|IPC	LIS|IPC
2022	IPC	IPC	IPC	LIS|IPC	LIS|IPC
2023	IPC	IPC	IPC	LIS|IPC	LIS|IPC

*NAWC- North American Weather Consultants; IPC- Idaho Power Company; IPC: Collaborative; LIS- Let it Snow; AI- Atmospheric Incorporated; * No operations*

Collaborative Cloud Seeding Program

The IWRB began investigating cloud seeding in 2008 as a water management strategy to support the ESPA CAMP. IPC proposed to develop and operate a 5-year pilot project in the Upper Snake River Basin, and if successful, the State and local water users would come to the table to discuss the long-term operation of a program.

- 2008 | ESPA CAMP → implementation of 5-year pilot project in the Upper Snake Basin– IPC
- 2013-2014 | Water users in the Wood and Boise River Basins partnered with IPC to begin new projects.
- 2015| IWRB began participation in program funding with capital for new infrastructure.
- 2016 | IWRB began contributing towards program operations and modeling (1/3 total program cost)
- 2017 | SNOWIE study field campaign in the Payette River Basin
- 2019 |Program reached existing build-out (3 aircraft, 57 remote generators, network of weather instrumentation)

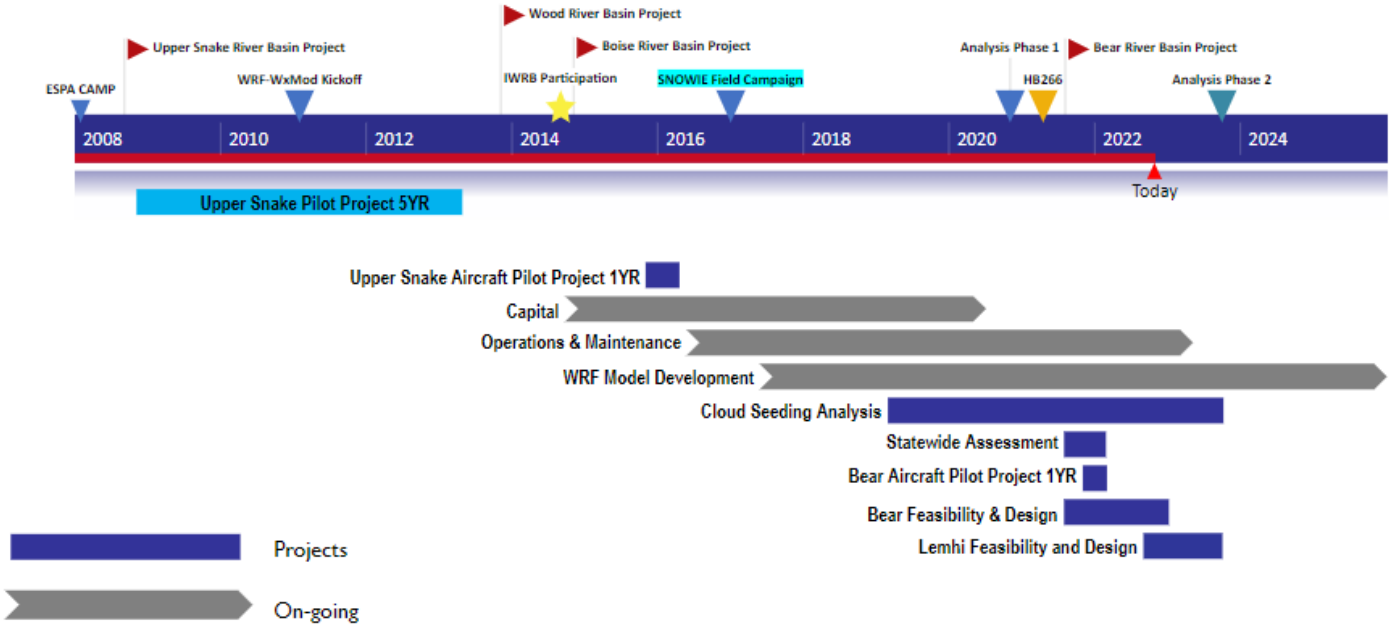


Collaborative Cloud Seeding Program Infrastructure

**HCRCD independently operates 25 manual ground generators ● in the Upper Snake; IPC provides forecasting support*

IWRB Cloud Seeding Program

In 2017, IPC approached the IWRB about partnering for the development of modeling and computing technologies to support cloud seeding operations, planning and design of projects, and ultimately the estimation of benefits. IPC initiated model development with the National Center for Atmospheric Research (NCAR) in 2011 and made initial investments of approximately $2.1 Million before approaching the IWRB.



- 2017 | IWRB Partnered with IPC for development of Weather Research and Forecasting Cloud Seeding model (WRF-WxMod); $2.94 million total cost, split 50/50
- 2019 | IWRB directed staff to conduct an analysis of cloud seeding operations (CS Analysis)
- 2020 | Phase 1 Results of CS Analysis; IWRB directed staff to conduct a more detailed investigation, utilizing sophisticated modeling tools.
- 2021 | Legislature passed House Bill 266 (HB266) on cloud seeding.
  Directed the IWRB to:
  - Continue cloud seeding analysis.
  - Complete an assessment of cloud seeding opportunities statewide.
  - Authorize cloud seeding programs in State

  Provides Authority to:
  - Sponsor or develop local or statewide cloud seeding programs.
- 2021 | IWRB directed staff to conduct: a more detailed cloud seeding analysis (Phase 2); a statewide cloud seeding assessment; and a feasibility and design study of the Bear River Basin
- 2021 | Bear River Basin Pilot Aircraft project
- 2022 | Statewide assessment results (AgI) presented to IWRB CS Committee.
- 2022 | IWRB directed staff to conduct feasibility and design study of the Lemhi River Basin

Statutory Authorities

- §22-3201: Requires any person, persons, association, or firm to register with the Department of Agriculture (DOA)
- §22-3202: Requires that a log of all weather modification activities be filed with DOA
- §22-4301: Allows for the formation of weather modification districts
- §22-4302: Allows for weather modification districts to create and administer funds
- §42-605 (13): Provides that water users within a district may authorize, by resolution, for the water master to develop, coordinate or provide, for weather modification projects
- §42-1805 (10): Authorizes the Director of IDWR to develop, coordinated and provide for Weather Modification projects
- §42-1805 (11): Authorizes the Director to develop and implement plan for gathering data on weather modification projects the department is involved with
- §42-4301: Creates Chapter 43 on Cloud Seeding. Directs the IWRB to continue analysis of operations, assess statewide opportunities, and authorize cloud seeding programs in Idaho. Provides authority to sponsor or develop local or statewide cloud seeding projects.
- §46-1015: Requires that the Office of Emergency Management be appraised of weather conditions and climatic activities; gives authority to direct "*officer or agency empowered to issue permits for weather modification*" to suspend issuance of permits

Program Objectives

The IWRB and its program partners conduct cloud seeding operations for the purpose of increasing winter snowpack, thereby enhancing unregulated runoff in the seeded basins. Increased runoff provides more water for a variety of uses.

To date, the IWRB has not defined objectives for its cloud seeding program as a whole.

Current Priorities

The following list is a summary of current Action Items related to the IWRB's Cloud Seeding Program. More information on each action item can be found in the following sections. The CS Committee will review the current IWRB priorities and make recommendation(s) to the IWRB.

- Establish multi-year agreements with Collaborative Program partners.
    - Review and approve Memorandum of Agreement with IPC
    - Develop agreements with water users.
- Determine distribution of program funding.
    - IPC
    - Collaborative Program Water Users
    - New Basins
- Authorize use of funding for Capital
    - Bear River Basin? Determine next steps
    - Lemhi River Basin? Determine next steps
    - Weather Instrumentation? (Statewide)
    - Modeling? (Statewide)
- Authorize use of funding for Research and Program Development
    - Liquid Propane Investigation
- Should the IWRB participate in a collaborative funding effort with the NAWMC and other states to compile research that supports policy questions (ie- environmental considerations, downwind effects, etc)
- Develop standards and procedures for IWRB participation in new basins.
    - Interest in partnerships from State of UT and State of MT
    - Request from Valley County, HCRCD, Salmon Falls water users

Status Indicator:

No Action Status Update Action Required (Action Item)

Program Administration

Program Budget FOR MORE INFORMATION, CLICK HERE	Funding for the Cloud Seeding Program is authorized under the IWRB's Secondary Aquifer Planning and Management Fund (Secondary Fund). The Cloud Seeding Committee reviews the program budget and provides a funding recommendation to the IWRB; program funding is then approved as a part of the IWRB's Fiscal Year (FY) budget resolution for the Secondary Fund.
Status	**FY24 Budget**: - Operations & Maintenance: $2,350,000 - Capital: $2,950,000 * - Research & Development: $1,700,000 * **Total Budget: $7,000,000** *Requires IWRB authorization to spend
Recent Milestones & Progress	• *May 2023*—FY2024 budget approved.
Timeline – Next Steps	• *June 28, 2023*— CS Committee to assess program priorities and provide recommendation(s) on authorizing use of funds for Capital and/or Research and Development • Authorize funding expenditures

Partnership Agreements FOR MORE INFORMATION, CLICK HERE	Since 2014, the IWRB has participated in a collaborative cloud seeding program (Collaborative Program) with Idaho Power Company (IPC), and water users in the Boise River, Wood River, and Upper Snake River Basins. IPC conducts program operations, and the IWRB and local water users provide funding support.
Status	• The IWRB and IPC have committed to the development of long-term agreements for program operations, prior to the commencement of the 2023-2024 cloud seeding season.
Recent Milestones & Progress	• *May 2023*— Draft Memorandum of Agreement (MOA) with IPC, for review by parties.
Timeline – Next Steps	• Determine distribution of program funding. • Establish multi-year agreement with IPC. • *Fall 2023*—Present Information to water users • Establish multi-year agreements with water users. * Develop process for coordination of program funding

IWRB Authorizations FOR MORE INFORMATION, CLICK HERE	§42-4301 designates the IWRB as the agency responsible for authorizing cloud seeding projects in Idaho. In May 2022, the IWRB adopted criteria for the authorization of cloud seeding programs in Idaho. The criteria are intended to ensure adherence to any state or federal laws that may be applicable to cloud seeding operations and to thoroughly document all cloud seeding activities occurring within the state. Information required for requesting authorization from the IWRB is outlined in the approved criteria.
Status	• No updates or action required at this time.
Recent Milestones & Progress	• *Sept 2022*— IWRB provided authorization for 3 existing cloud seeding projects. - IPC, Payette River Basin Project | Remote Ground, Aircraft - HCRCD, Upper Snake River Basin Project | Manual Ground - State of UT, Lower Bear River Basin Project | Manual Ground
New Requests	There are currently no new requests for authorization.

North American Weather Modification Council FOR MORE INFORMATION, CLICK HERE	The North American Weather Modification Council (NAWMC) is an embodiment of state and local public resource managers that participate in cloud seeding activities in North America. The IWRB is currently a Full Member of the council, represented by its staff. The NAWMC serves as a forum for the exchange of information on weather modification related topics, for purposes of promoting the best available related science, and the safe and effective use of weather modification technologies.
Status	*Background: Interest in cloud seeding as a water or weather management tool has seen rapid growth in (worldwide), in turn widening the spread of concern over the safety and potential environmental impacts that could result from cloud seeding. The State may wish to be responsive to public concerns with peer reviewed documentation, developed collaboratively, that addresses this topic comprehensively.*
Recent Milestones & Progress	• *Apr* 2023— Development of Ad Hoc Committee on Research & Development
Timeline – Next Steps	• Determine if IWRB should contribute collaborative funding, in partnership with the NAWMC and other states and participating entities, towards a project to develop peer reviewed documentation on the environmental considerations related to cloud seeding? • *Winter 2023*— Seminar: Cloud Seeding 101 for Resource Managers • Development of collaborative project(s) to address policy questions on: o Environmental impacts o Downwind effects • Coordination of project funding

Program Operations

Collaborative Cloud Seeding Program

Partnership between the IWRB, IPC, and local water users for the operation of cloud seeding projects in the Upper Snake, Boise, and Wood River basins. IPC operates the program, the IWRB and local water users contribute towards program funding. The objective of the program is to augment snowpack, thereby enhancing runoff, in the seeded basins.

- Collaborative Cloud Seeding Program Overview

(D) Dedicated: Infrastructure dedicated to the project (S): Infrastructure shared with another project

Upper Snake River Basin Project	**Estimated Annual Budget:** $1,545,000 **Project Infrastructure:** - Ground: 25 (D) Remote Ground Generators - Aircraft: 1 aircraft (D) **Estimated Annual Runoff Generated**: 632,000 AF
Status	• 2022-2023 seasonal operations ended 3/31 for aircraft, 4/15 for ground • Upper Snake River Basin (SE only), *operations suspended* 3/17/2022
Timeline – Next Steps	• 2023-2024 Season begins November 1, 2023

Boise River Basin Project	**Estimated Annual Budget:** $910,000 **Project Infrastructure:** - Ground: 17 Remote Ground Generators (5 D, 12 S) - Aircraft: 2 aircraft (S) **Estimated Annual Runoff Generated:** 273,000 AF
Status	• 2022-2023 seasonal operations ended 3/31 for aircraft, 4/15 for ground
Timeline – Next Steps	• 2023-2024 Season begins November 1, 2023

Wood River Basin Project	**Estimated Annual Budget:** $670,000 **Project Infrastructure:** - Ground: 10 Remote Ground Generators (7 D, 3 S) - Aircraft: 1 aircraft (S) **Estimated Annual Runoff Generated:** 273,000 AF
Status	• 2022-2023 seasonal operations ended 3/31 for aircraft, 4/15 for ground • Wood River Basin, *operations suspended 3/17/2023.*
Timeline – Next Steps	• 2023-2024 Season begins November 1, 2023

Statewide Projects

The IWRB does not currently have any active operations outside the Collaborative Program. Feasibility and Design studies for the Bear River Basin and Lemhi River Basins are complete or underway.

Program Standards and Procedures	**The IWRB will need to determine how it will move forward with new cloud seeding projects statewide.**
	- How will the IWRB prioritize new projects?
	- Criteria for IWRB funding
	  - Feasibility and Design Studies
	  - Capital Investments (generators, weather instruments, modeling)
	  - Ongoing funding for O&M and Assessments
	- Long term program funding to support all basins and projects?

Status	• How will the IWRB support new cloud seeding projects?
	• The IWRB has received **4** requests for support for CS in new basins
	  • Valley County Commissioners & VCSWCD (Payette)
	  • HCRCD (Upper Snake)
	  • Salmon Falls
	• The State of Utah (Bear River Basin) and State of Montana (Lemhi River Basin) have each expressed interest in collaborative CS projects for adjoining/interstate basins.

Timeline – Next Steps	• Develop program standards and procedures for supporting other basins. • Determine response to requests for support

Modeling

WRF WxMod FOR MORE INFORMATION, CLICK HERE	The Weather Research and Forecasting Cloud Seeding Model (WRF-WxMod) was initially developed by NCAR with funding support from IPC and the IWRB. This model is used to: - Develop seeding criteria for operations (where are the best opportunities for seeding? Ground? Air?) - Planning and design for enhancing or developing new projects - Conducting assessments: - Provides spatial representation of precipitation over time; can then be used with a hydrologic model (WRF-Hydro) to estimate impacts from water generated IPC began development of this model in 2011 (~$2.1M), and then requested partnership with the IWRB in 2017 (50% cost share of $2.94M development costs). Initial model development costs did not include model validation, though it was contemplated that this effort would be necessary at some point. In 2021 IPC was awarded BOR WaterSmart funding towards costs to validate the model using data from the SNOWIE field campaign; the cost share portion of this grant was estimated to be $2.050M. IPC proposed to split these costs with the IWRB, as the model is necessary not only for operations, but in supporting other IWRB and IPC interests (F/D studies, Statewide Assessment, etc)

Status	• Year 2 of 5 model validation using data SNOWIE
	• Current IWRB projects utilizing this model:
	  - Collaborative Program Operations
	  - CS Analysis
	  - Bear F/D; Bear/Upper Snake Shared Infrastructure
	  - Lemhi F/D
	  - Statewide Assessment

Recent Milestones & Progress	• *Aug 2017*— IWRB Committed $1.47M towards model development costs • *May 2022*—IWRB Committed $1.025M towards model refinement. This effort will use data gathered from the SNOWIE field campaign to validate the model
Timeline – Next Steps	• Model validation project estimated to be complete in December 2025 • *Model enhancements:* - *improvements to spatial distribution of water (radar data)* • *Expand the model to cover other basins where the IWRB may wish to operate** • *Expand the model to represent liquid propane**

WRF-Hydro FOR MORE INFORMATION, CLICK HERE	The Weather Research and Forecasting Hydrologic model (WRF-Hydro), is a physically based hydrologic modeling system that produces forecasts and analyses for all major terrestrial water-cycle components: Precipitation, Streamflow, Soil moisture, Snowpack, Flooding, Groundwater. These forecasts and analyses can be applied to a range of pursuits, such as flash-flood prediction, regional hydroclimate impact assessments, seasonal forecasting of water resources, and land-atmosphere coupling studies that supply forecasters, water managers, and government officials with data driven science to better inform their decisions. The IWRB and IPC invested in this model for purposes of supporting hydroclimate impacts assessments and seasonal forecasting for the Collaborative Cloud Seeding Program. For this model to be efficient in mountainous terrain, it must be calibrated to each region where it used. The IWRB and IPC have shared costs equally for the calibration of basins within the Collaborative Program. If the IWRB chooses to move forward with the development of cloud seeding projects in new basins, WRF-Hydro will need to be calibrated for those regions. This model will also have the capability to be used for other state interests. An example may include forecasting stream flow in regions without gaging.
Status	• As the IWRB develops its cloud seeding program, it will need to consider how it will support modeling needs for new projects. It may be cost effective to instead conduct a statewide calibration of the model, as opposed to basin by basin. • To conduct a statewide calibration of this model, NCAR estimates the effort to cost roughly $700k and will take approximately 2 years to complete.
Recent Milestones & Progress	• Calibration of Upper Snake River Basin • Calibration of Boise/Wood/Payette River Basins
Timeline – Next Steps	• Authorize funding for Statewide Calibration of model. Estimated Cost: $700,000

RiverWare FOR MORE INFORMATION, CLICK HERE	
Status	
Recent Milestones & Progress	
Timeline – Next Steps	

RESEARCH & DEVELOPMENT

Ongoing research and development activities that support Cloud Seeding Program initiatives or furthering research related to cloud seeding.

Cloud Seeding Impacts Analysis FOR MORE INFORMATION, CLICK HERE	In 2019, the IWRB directed staff to conduct an investigation of cloud seeding in the basins where cloud seeding operations are conducted. This analysis is being conducted in 2 parts. Phase 1 developed a high level analysis and looked at impacts to various water use categories. It was determined that more sophisticated modeling tools would be needed to improve certainty of these results. This project required the development of 2 separate models. One model to determine how much water was generated (calibrated WRF-Hydro) and another model to route the water through the system (Snake River Planning model/RiverWare). The IWRB contracted with NCAR to develop hydrologic data on the amount of water that is estimated as a result of CS operations. IDWR Hydrology staff are simultaneous working on improvements to the RiverWare planning model, to then ingest the hydrologic data from NCAR and see where the additional water goes. **Objective:** Determine impacts from cloud seeding operations in the collaborative program basins. **Project Budget:** $350,000 **Estimated timeline:** 4 Years **Estimated completion:** Fall 2023
Status	•
Recent Milestones & Progress	•
Timeline – Next Steps	•

Statewide Assessment FOR MORE INFORMATION, CLICK HERE	In July of 2021, in response to legislation under HB266, the IWRB directed staff to conduct a statewide assessment of cloud seeding, to determine where other opportunities for seeding might exist. The assessment is intended to provide a high-level assessment of opportunities; more detailed feasibility and design studies will be required for basins of interest. **Objective:** **Project Budget:** **Estimated timeline:** **Estimated completion:**
Status	• Statewide Assessment of AgI complete • Statewide Assessment of Liquid Propane in progress
Recent Milestones & Progress	• *Feb 2022*— Results of Statewide Assessment for Silver Iodide (AgI)
Timeline – Next Steps	• *Fall 2023*— Results of Statewide Assessment for Liquid Propane • Determine how the IWRB will use these results to prioritize development of cloud seeding projects in other basins.

Bear River Basin Feasibility & Design FOR MORE INFORMATION, CLICK HERE	In July of 2021, the IWRB directed staff to conduct a feasibility and design (F/D) study of the Bear River Basin (BRB), to assess opportunities for cloud seeding. The study looks at both ground and aerial seeding opportunities, targeting regions within the Bear that contribute to the fill of Bear Lake, and stream reaches that supply water to Idaho's users. The study also investigates opportunities for shared infrastructure with the Upper Snake River Basin (USRB). Sharing Infrastructure with the USRB provides an opportunity to support the BRB, while enhancing operations in the USRB; also allowing for the shared cost of operations between both basins.
Status	• Study Complete. Staff working to schedule time with the CS Committee to present results
Recent Milestones & Progress	• *Nov 2021*—F/D of aerial seeding complete • *Dec 2022*— F/D of ground seeding and final report
Timeline – Next Steps	• Present results to IWRB CS Committee/IWRB • Determine next steps for cloud seeding BRB

Lemhi River Basin Feasibility & Design FOR MORE INFORMATION, CLICK HERE	**Objective:** Determine the feasibility of cloud seeding in the Lemhi River Basin to support settlement objectives. **Project Budget:** $375,000 **Estimated timeline:** 1 Year **Estimated completion:** *Spring 2024*
Status	• ***Project Delayed—*** due to access to computing to support F/D modeling. Completion originally estimated to be Sept 2023 - In January 2023 it was determined that the IWRB would need to relieve some computing space on the shared HPC. - Moved modeling to "Falcon" computer; the Falcon is a public research computer operated through a BSU partnership agreement and is available to state and public entities for research purposes. - The models have not been able to work on the Falcon computer. - Staff have identified some alternative options and are working to secure computing space.
Recent Milestones & Progress	
Timeline – Next Steps	• *September 2023— Present information to Lemhi Basin stakeholders* • Does the IWRB wish to investigate opportunities to share infrastructure with State of MT in the Lemhi River Basin? • *Authorize funding for investigation of shared infrastructure opportunities:* ***$90,000***

Instrumentation & Computing Assessment FOR MORE INFORMATION, CLICK HERE	Cloud seeding operations are supported by a broad network of weather instruments that provide weather data that is then used to support modeling for operations, planning, and assessments. As the IWRB develops its program, it will need to have computing and instrumentation resources to support the development of new projects. • Provide support for computing solutions engineering: $25,000 • Assess instrumentation needs and provide recommendation: $25,000 • Update WRF-WxMod, update case calling algorithms, add new model domains for the Bear and Lemhi River Basins: $210,000 **Objective:** Determine what computing and instrumentation resources the IWRB will need to support cloud seeding program development. **Project Budget:** $260,000 **Estimated timeline:** 1 year **Estimated completion:** Spring 2024
Status	• Computing engineering and planning; in progress • Instrumentation evaluation; in progress • Model Updates awaiting IWRB authorization for funding
Recent Milestones & Progress	
Timeline – Next Steps	• Authorize expenditure of $210,000 to update WRF-WxMod and add domains for Lemhi and Bear River basins • *August 2023*—Inventory and recommendation on weather instrumentation needs

Liquid Propane Pre-Investigation FOR MORE INFORMATION, CLICK HERE	Liquid Propane (LP), like Silver Iodide (AgI) has been demonstrated in lab settings to nucleate ice. The difference is that LP has show to generate ice at warmer temperatures and is cheaper to use than AgI. The feasibility and efficiency of using LP to support operational cloud seeding projects has never been investigated. The IWRB may wish to investigate the efficiency of using LP as either an alternative or enhancement to its operational cloud seeding projects. This may provide a cheaper mechanism for seeding and allow the program's operators to take advantage of more seeding opportunities. Coupled with general warming trends in global climatology, LP may be better suited for seeding certain regions into the future. Many other states and entities have interest in studying the efficacy of using LP for seeding. There exist multiple partnership and potential grant opportunities to support a comprehensive investigation. Before a comprehensive investigation can be developed, a test site will need to be identified. Staff are proposing to work with IPC, NCAR and others to continue data collection at 2-3 possible sites and determine a test site for a full investigation proposal. **Objective:** Identify test site(s) for an investigation of liquid propane **Project Budget:** **Estimated timeline:** 1.5 years **Estimated completion:** Summer 2024
Status	• Season 1 data collection 2022-2023; contracting delays resulted in a short window for collecting data. Project team recommended a second year of data collection on the Little Camas Prairie and in East Idaho near Driggs • Awaiting IWRB approval and authorization of funding
Recent Milestones & Progress	
Timeline – Next Steps	• Authorize expenditure of up to $500,000 for the deployment of a weather radar

CAPITAL

Funding needs for on-going program development.

Instrumentation FOR MORE INFORMATION, CLICK HERE	Capital funding needed to purchase instrumentation. Project based (TBD) **Objective:** Acquire instrumentation resources the IWRB will need to support cloud seeding program development. **FY24 Budget:** $1,200,000 ($1M for new devices, $200k for replacements) **Estimated timeline:** On-going
Status	• Awaiting results of Computing and Instrumentation Assessment, *est Aug 2023*
Recent Milestones & Progress	
Timeline – Next Steps	• Authorize expenditure of funding for weather instruments to support program

Devices FOR MORE INFORMATION, CLICK HERE	Capital funding needed to purchase ground generators and supporting equipment. **Objective:** Acquire ground seeding generators or other resources the IWRB will need to support cloud seeding program development. **FY24 Budget:** $750,000 **Estimated timeline:** On-going
Status	• Awaiting IWRB direction on new projects
Recent Milestones & Progress	
Timeline – Next Steps	• Authorize expenditure of funding for devices

Computing & Modeling FOR MORE INFORMATION, CLICK HERE	Capital funding needed to purchase computing and modeling resources. **Objective:** Acquire computing and modeling resources the IWRB will need to support cloud seeding program development. **FY24 Budget:** $1,000,000 **Estimated timeline:** On-going
Status	• Awaiting results of Computing and Instrumentation Assessment, *est Spring 2024*
Recent Milestones & Progress	
Timeline – Next Steps	• Authorize expenditure of funding for computing and modeling support