AGENDA

IDAHO WATER RESOURCE BOARD

Cloud Seeding Committee Meeting No. 1-24
Monday, September 9, 2024
3:00 p.m. (MT) / 2:00 p.m. (PT)

Water Center
Conference Rooms 602 C&D
322 E. Front St.
BOISE

Livestream available at https://www.youtube.com/@iwrb

1. Introductions and Attendance
2. Cloud Seeding Program Development
3. Proposed Cloud Seeding Program Funding Request*
4. Other Items
5. 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.

Idaho Collaborative Cloud Seeding Program

Program Development & Expenditures

Idaho Water Resource Board | Cloud Seeding Committee

Kala Golden, IWRB Cloud Seeding Program Manager

September 9, 2024

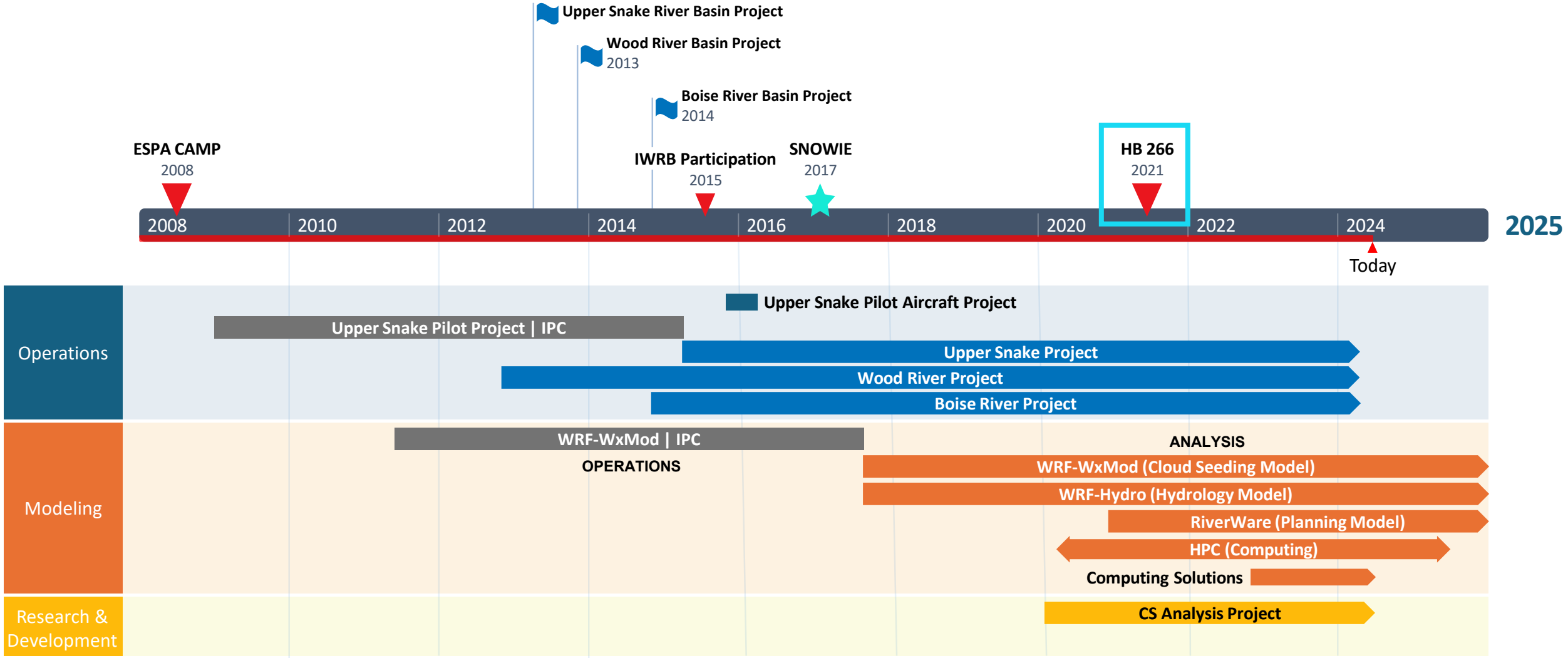
Photo Courtesy of Idaho Power Company

Overview

- Cloud Seeding Program Development
- Cloud Seeding Program Expenditures
- Priorities & Next Steps

Photo Courtesy of Joel Zimmer, WMI

Cloud Seeding Program Development



Legislation | Idaho House Bill 266 (*HB266, 2021*)

Directed the IWRB to:

- Continue analysis of existing cloud seeding projects
- Complete an assessment of opportunities for cloud seeding in other basins
- Authorize cloud seeding programs in Idaho

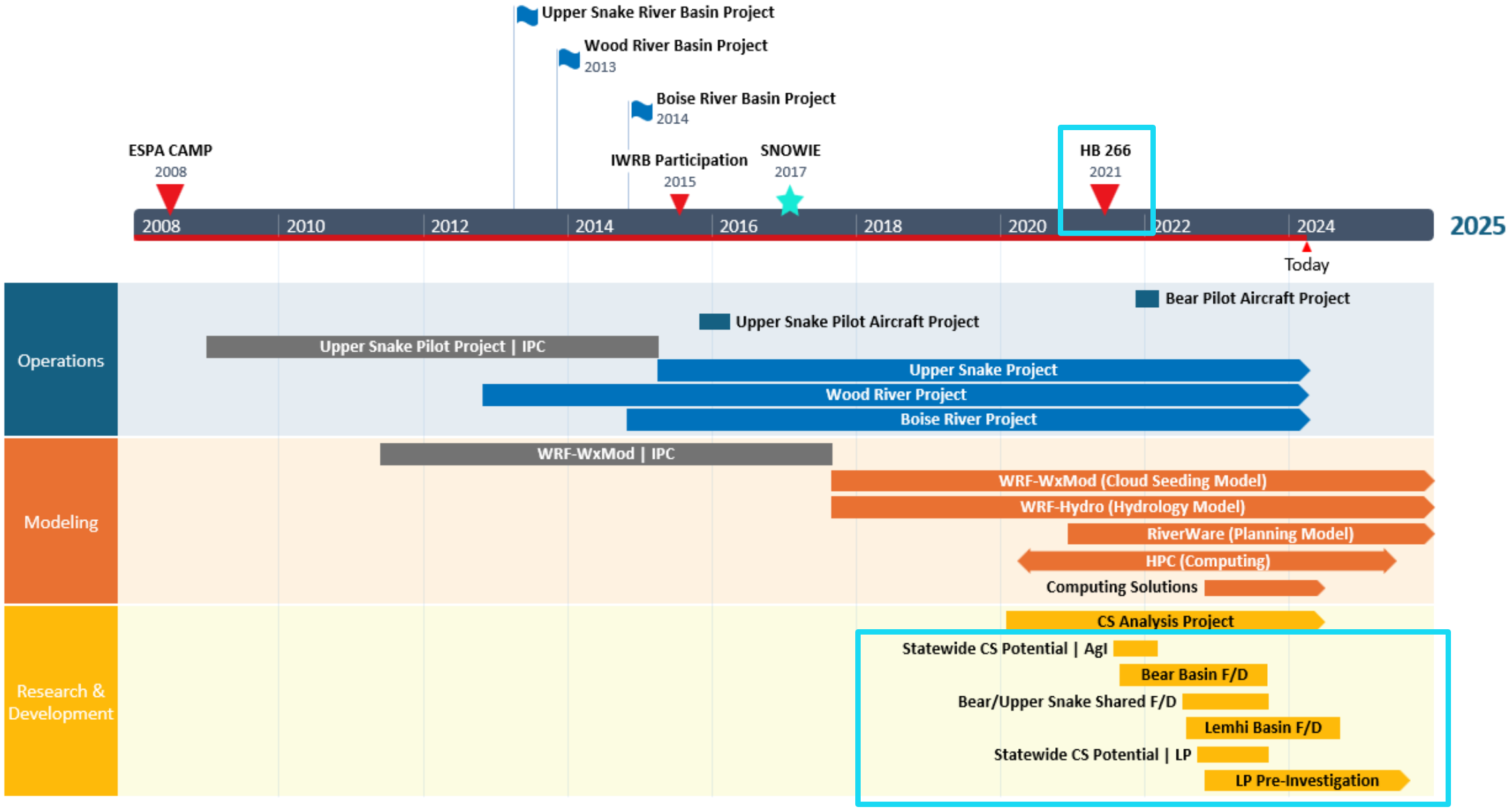
Provides the IWRB authority to:

- Sponsor or develop local or statewide cloud seeding programs
  - *State funds may only be used in basins where the IWRB finds that existing water supplies are insufficient to support existing water rights, water quality, recreation, or fish and wildlife*

Establishes that:

- Water supply that results from cloud seeding shall be distributed in accordance with the prior appropriation doctrine.

Cloud Seeding Program Development



Cloud Seeding Program | Long Term

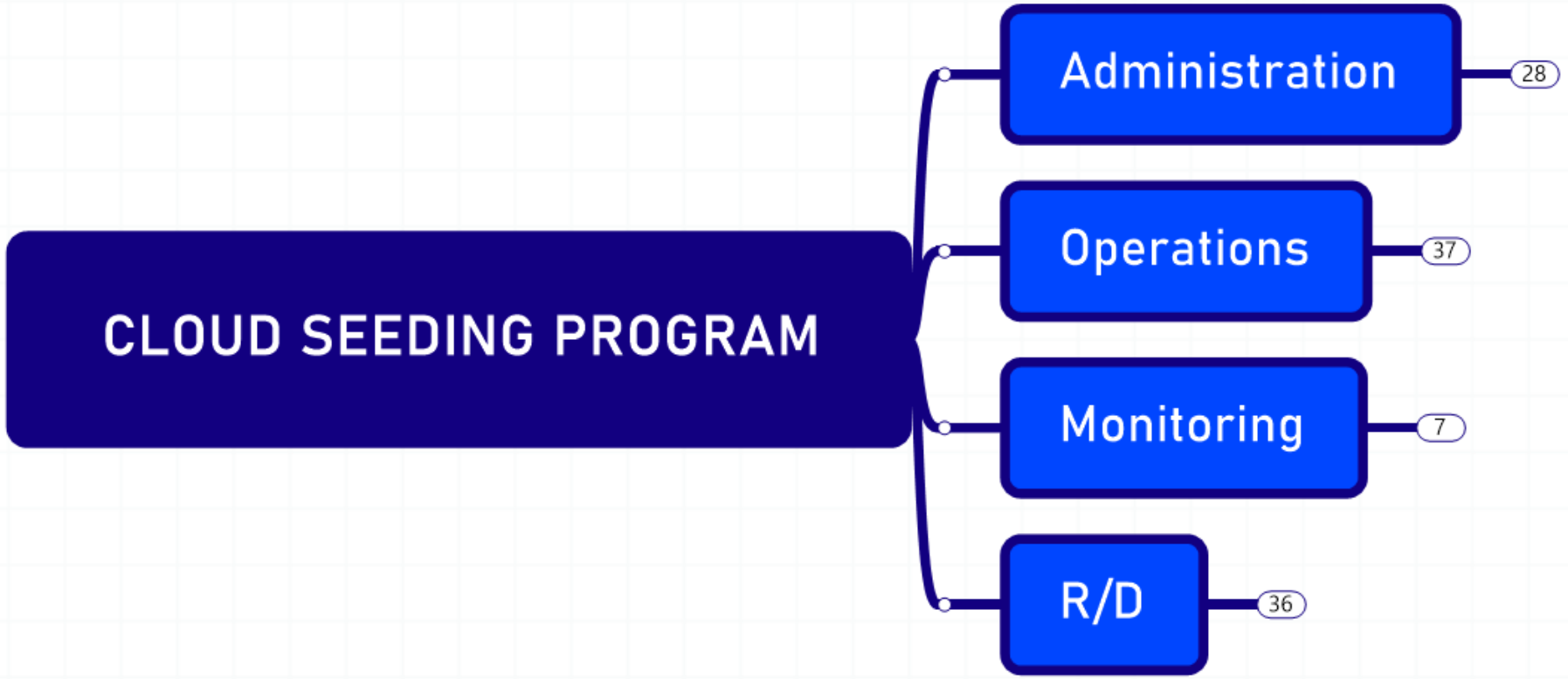
- **Develop Program Structure–** *What is the IWRB's (State) roll? The roll of stakeholders?*
  - *Administrative Oversite*
  - *Program Funding*

- **Secure long term collaborative agreements–** *How will the Program be managed and funded in long term?*

- **Assess opportunities for expansion/enhancement–** *Can we grow the Program and/or be more efficient?*
  - *Full build out of existing projects?*
  - *Support for new basins?*

- **Ongoing monitoring and analysis–** *How will we ensure continued effectiveness and cost efficiency?*

Cloud Seeding Program

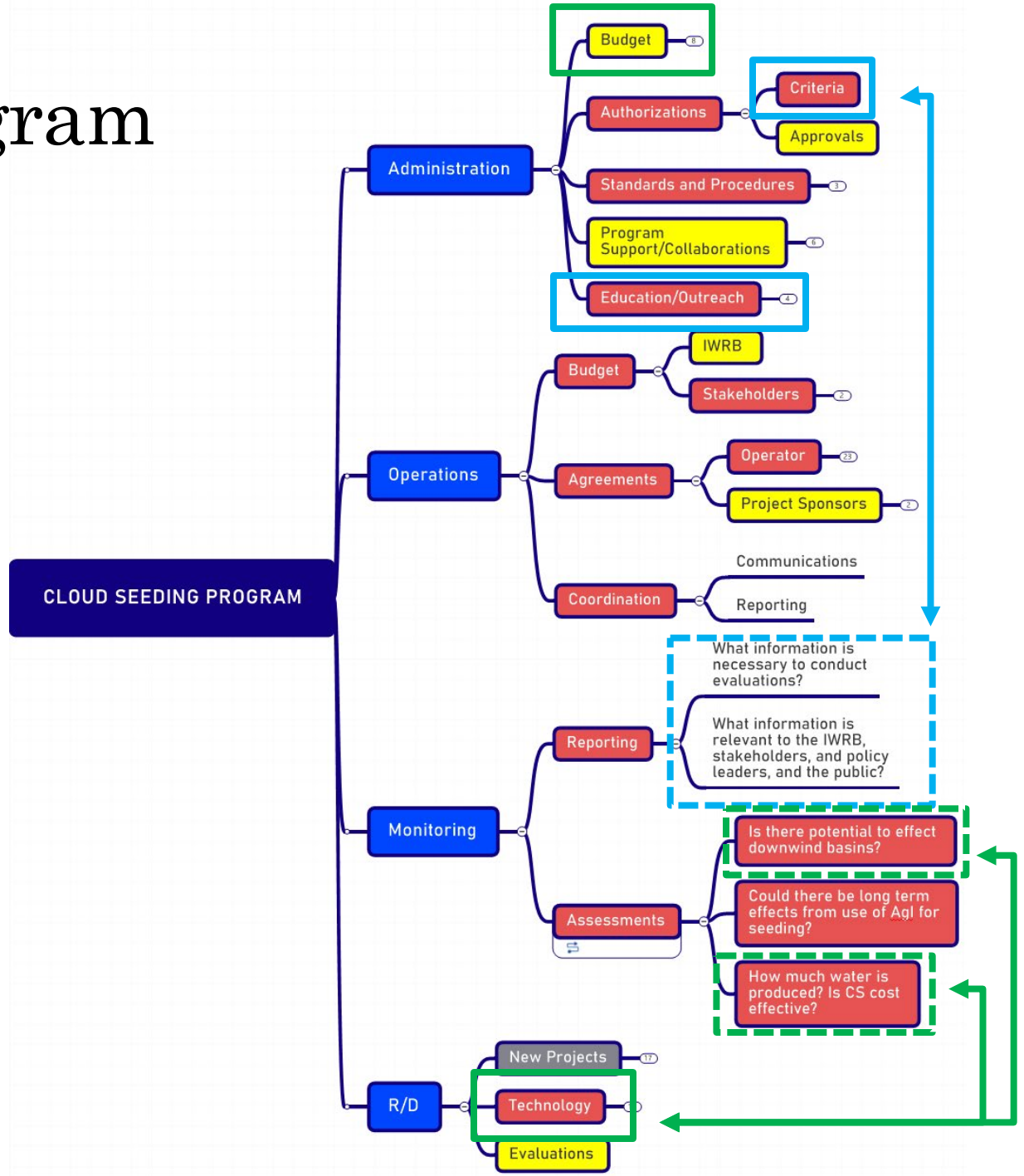


Cloud Seeding Program

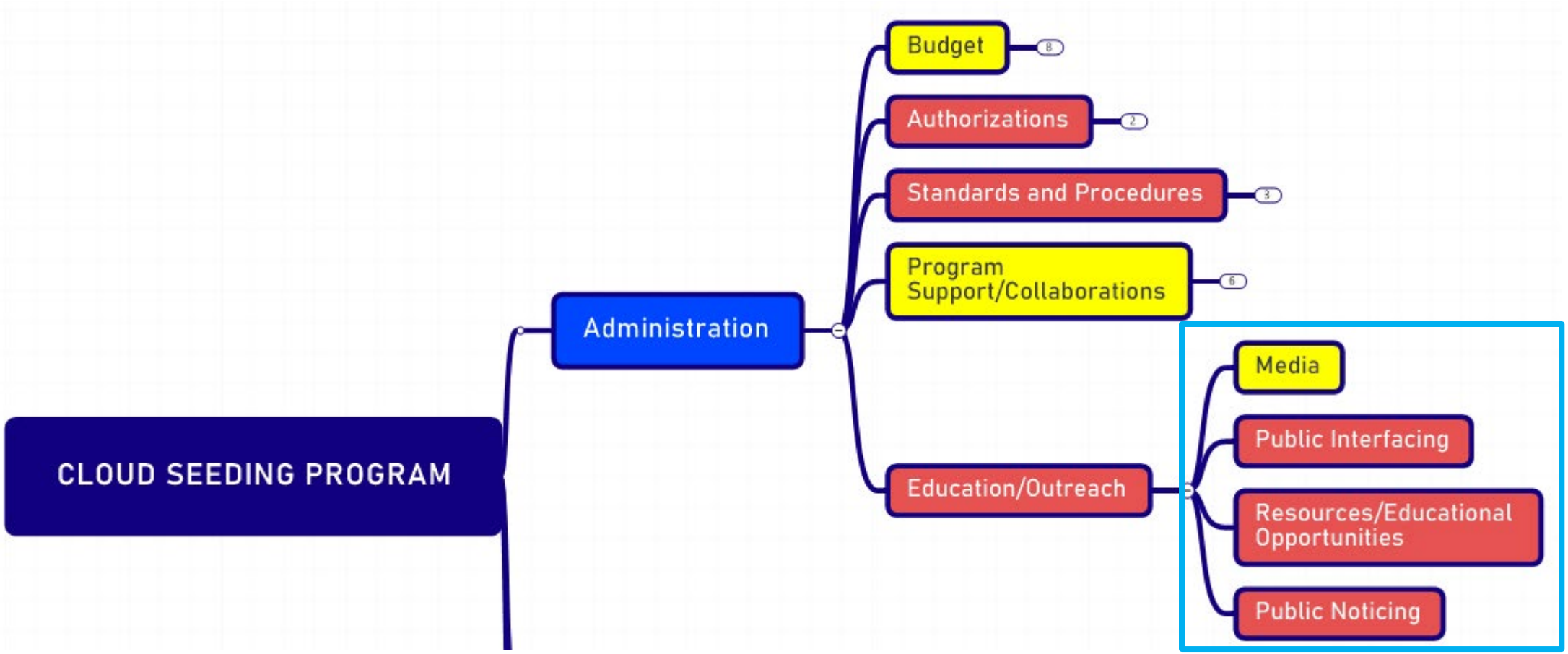
WITHIN NEXT YEAR

NEAR TERM

LONGER TERM



Program Administration

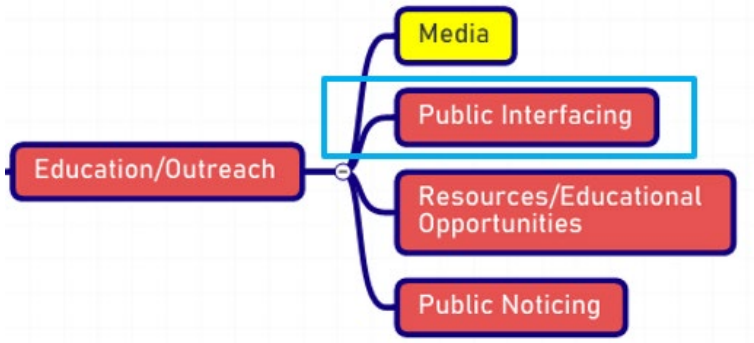


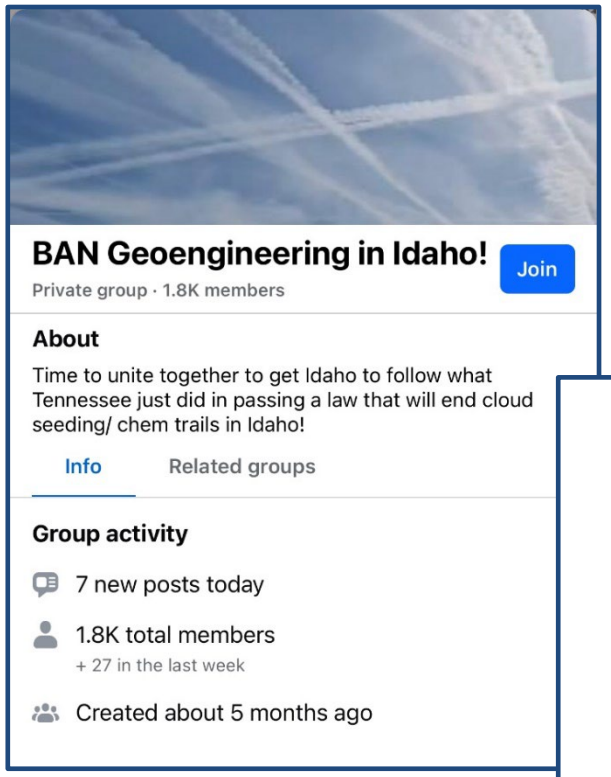
Public Interfacing

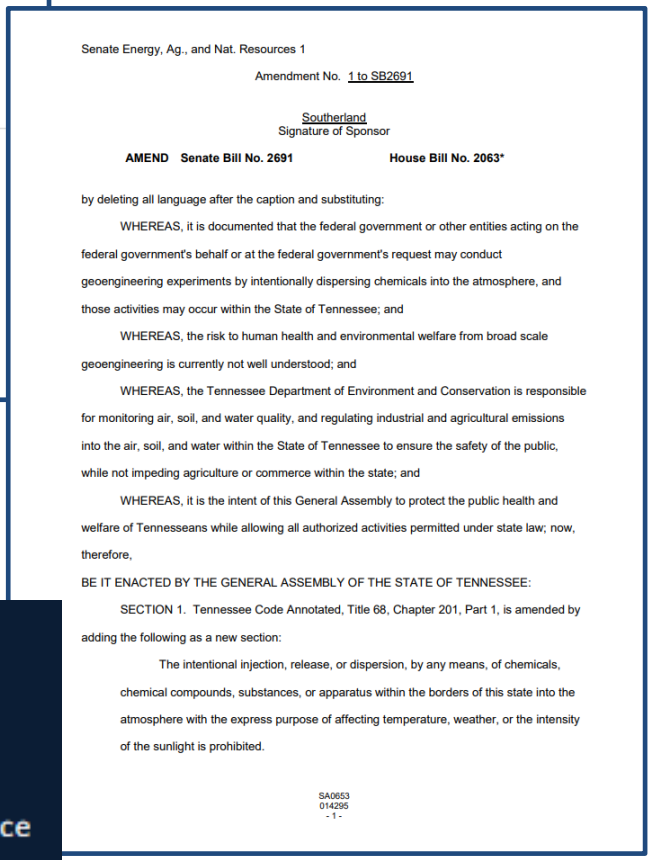
- **Calls/Emails**
  - Condensation trails (misinformation)
  - Health Concerns (effects to air/water quality)
  - Lack of public noticing or involvement

- **Internet/Social Media**
  - Spread of information
  - “Ban Geoengineering Idaho”

- **Policy**
  - Proposed or enacted legislation in other states
  - Federal review of cloud seeding






Senate Energy, Ag., and Nat. Resources 1

Amendment No. 1 to SB2691

Southerland
Signature of Sponsor

AMEND Senate Bill No. 2691 House Bill No. 2063*

by deleting all language after the caption and substituting:

WHEREAS, it is documented that the federal government or other entities acting on the federal government's behalf or at the federal government's request may conduct geoengineering experiments by intentionally dispersing chemicals into the atmosphere, and those activities may occur within the State of Tennessee; and

WHEREAS, the risk to human health and environmental welfare from broad scale geoengineering is currently not well understood; and

WHEREAS, the Tennessee Department of Environment and Conservation is responsible for monitoring air, soil, and water quality, and regulating industrial and agricultural emissions into the air, soil, and water within the State of Tennessee to ensure the safety of the public, while not impeding agriculture or commerce within the state; and

WHEREAS, it is the intent of this General Assembly to protect the public health and welfare of Tennesseans while allowing all authorized activities permitted under state law; now, therefore,

BE IT ENACTED BY THE GENERAL ASSEMBLY OF THE STATE OF TENNESSEE:

SECTION 1. Tennessee Code Annotated, Title 68, Chapter 201, Part 1, is amended by adding the following as a new section:

The intentional injection, release, or dispersion, by any means, of chemicals, chemical compounds, substances, or apparatus within the borders of this state into the atmosphere with the express purpose of affecting temperature, weather, or the intensity of the sunlight is prohibited.

SA0653
014295
- 1 -

GAO Report on Cloud Seeding

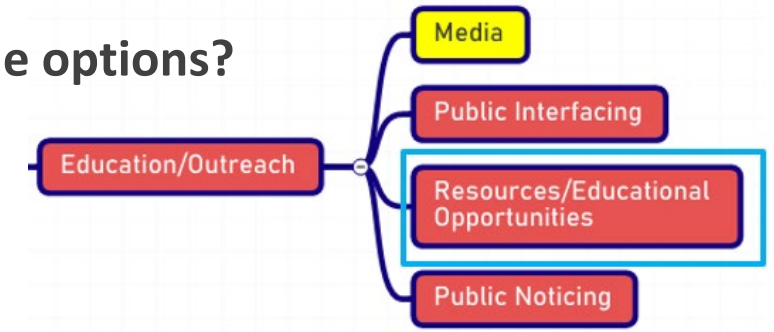
U.S. Government Accountability Office

1. What are the current or emerging technologies for weather modification (including materials or processes used) and what are the most recent developments in those technologies in the United States and in other countries?

2. What are the potential benefits of weather modification for the United States?

3. What challenges (including health or environmental effects) could hinder or result from the development and application of weather modification technologies?

4. To what extent are policy options warranted and what are the options?

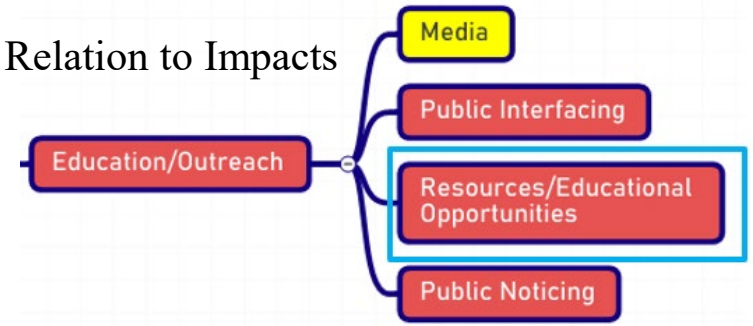


Silver Iodide (AgI) Research

- **Collaboration**
  - North American Weather Modification Council & member states/public agencies

- **Published Literature Review**
  - *The potential environmental impact of silver iodide (AgI) aerosols released by precipitation enhancement and hail suppression programs in the Western United States*
  - Conducted by Heritage Environmental & Wisconsin State Laboratory of Hygiene (WSEL)
  - Total Cost: $49,000 ($4,500 IWRB)

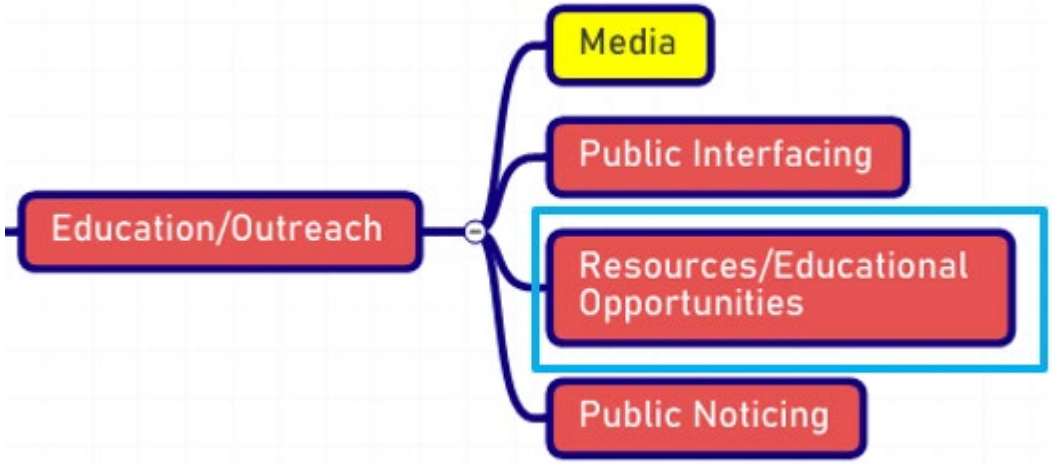
- **Scope of work** ~ 9 months
  1. Calculations of Natural Atmospheric Silver Inputs to Weather Modification Target Regions in the Western United States
  2. Summary of Natural Silver Abundance in Surface Soils and Freshwater bodies
  3. Estimates of Silver Iodide Deposited by Weather Modification Programs.
  4. Review of Silver Toxicity to Terrestrial and Aquatic Organisms
  5. Discussion of Natural and Weather Modification Related Silver Deposition in Relation to Impacts on Terrestrial and Aquatic Organisms

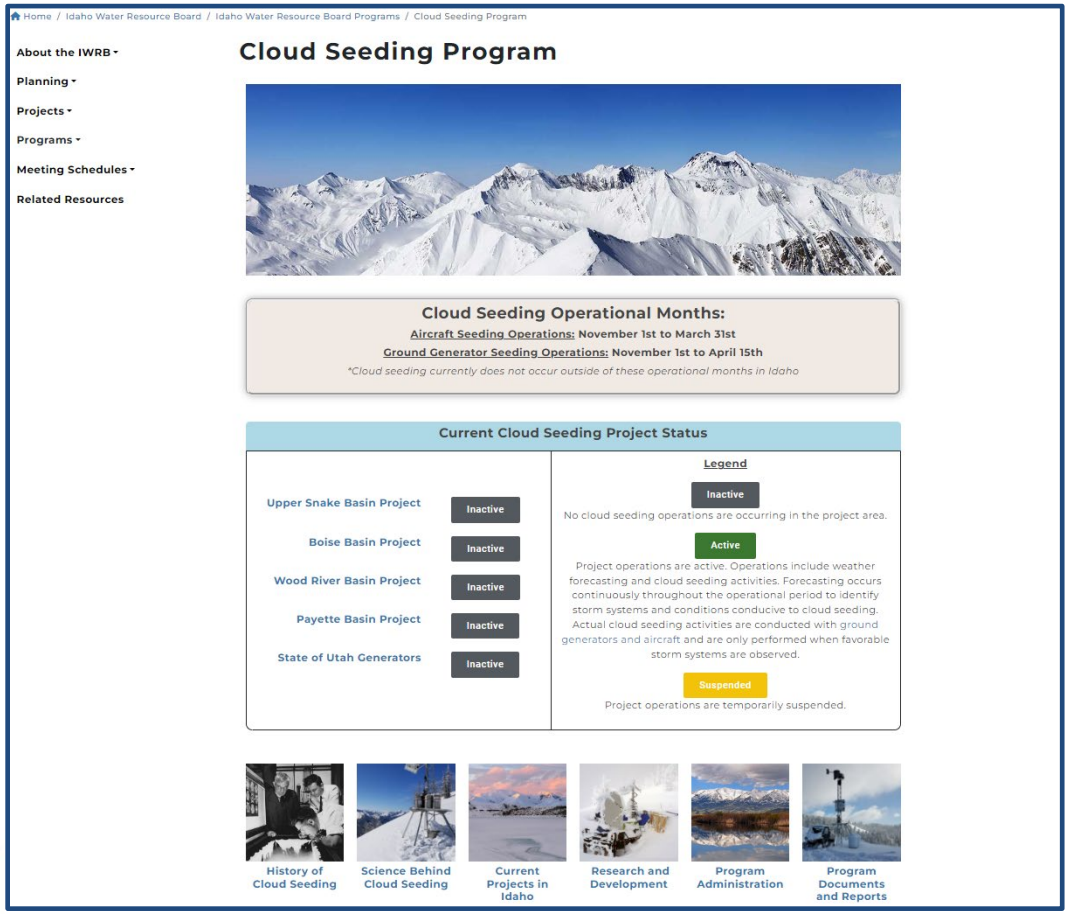


Cloud Seeding in Idaho

- **NEW** – [IWRB Cloud Seeding Webpage]

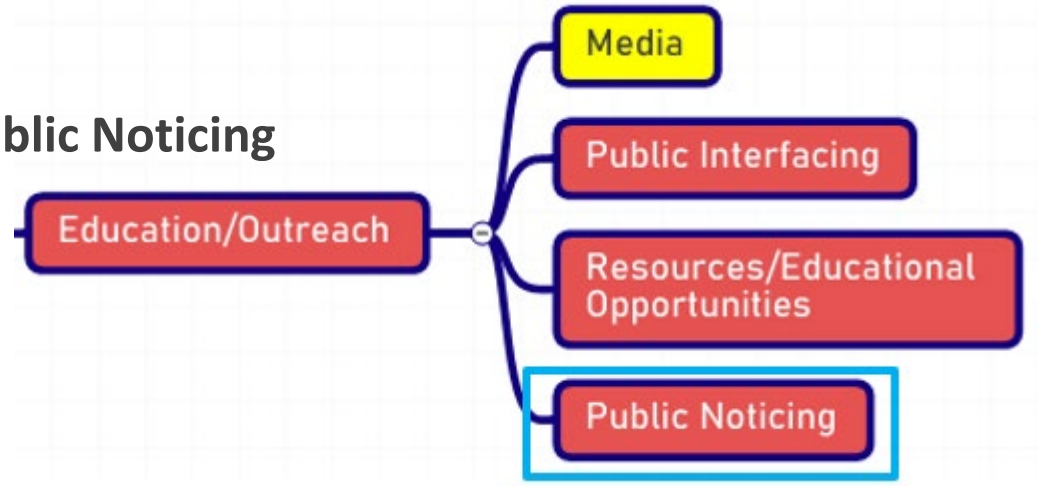
  - Project Status
  - History & Science of Cloud Seeding
  - Research & Development efforts in Idaho
  - Program Administration & Reports
  - Contact information





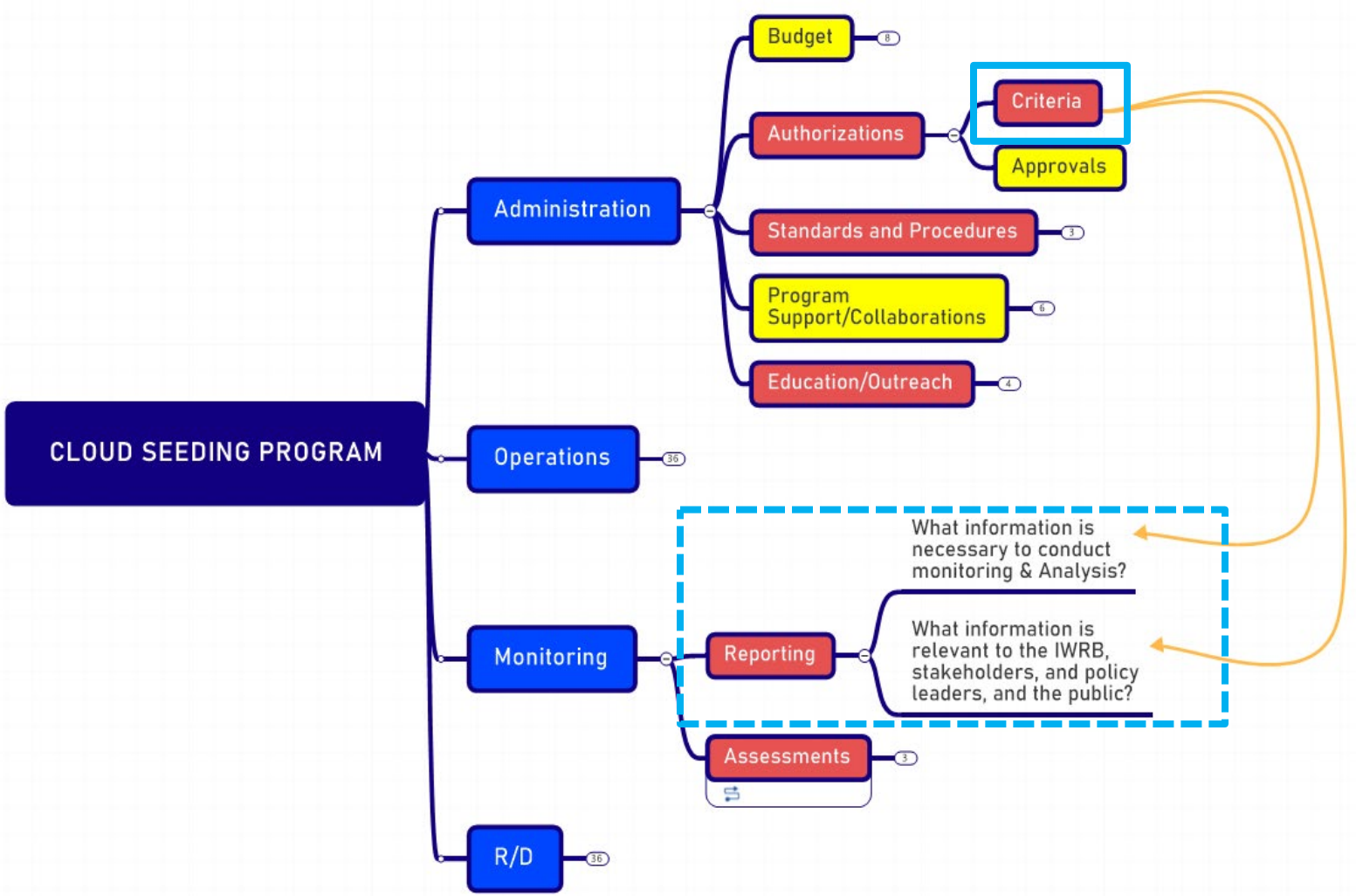
Program Administration | Public Notice

- Objectives:
  - Inform the public on cloud seeding operations in Idaho
    - Annually before operations commence
    - Prior to the Authorization of new or modified cloud seeding projects
  - Provide opportunity for the public to weigh in
- Considerations:
  - Development of Standards & Procedures on Public Noticing
  - Legal Review



Program Administration | Reporting & Authorization Criteria

- The IWRB is the entity charged with oversite and management of cloud seeding projects in Idaho (§42-4301).
- In May 2022, the IWRB passed resolution number 18-2022, approving criteria for the authorization of cloud seeding.
- The resolution recognized that criteria may need to be updated based on new information or industry standards.



Program Administration | Reporting & Authorization Criteria

As the State agency charged with oversite and management of cloud seeding in Idaho, the IWRB will have a need to:

- Demonstrate that cloud seeding operations do not adversely impact the health and safety of the public, the environment, and/or infrastructure.
- Demonstrate safe, responsible, and scientifically based practices are being used and applied for cloud seeding operations in Idaho.
- Understand the cost efficiency and ability for a project to support the State's water management goals, for cloud seeding projects where public funds are expended.

The development of reporting and authorization criteria should be guided by the need to evaluate these objectives.

Program Administration | Reporting & Authorization Criteria

Proposed Updates to the Criteria for Cloud Seeding Program Authorization:

- ***NEW*** Section II: Operator Requirements
- ***Objective****: Refine standards for responsible management and safe practices of cold season cloud seeding*

  - Operator Certification (WMA CS Operator); or a minimum of 5 years of operational experience both conducting and managing the type of cloud seeding operations proposed (cold or warm season); and
  - Establish defined safe handling practices for hazardous materials; storage, use, disposal
  - Consider requirement of a modified CS Aircraft certification
  - Establish a minimum number of flight hours conducting aerial cloud seeding operations for proposed cloud seeding by aircraft (TBD)
  - For cold season cloud seeding, a requirement of 2 pilots per cloud seeding aircraft; 1 dedicated to flight, second staff member to operate cloud seeding and document for records
  - Defined minimum suspension criteria guided by the American Society of Civil Engineers (ASCE) recommendations on cloud seeding (most current version)

Program Administration | Reporting & Authorization Criteria

Proposed Updates to the Criteria for Cloud Seeding Program Authorization:

- ***UPDATE*** Section I. *Request for Authorization*

  - UPDATE current part B. "IWRB sponsored programs must **meet all Operator Requirements referenced in section II** and comply with the Terms of Authorization referenced in **Section III**.
  - ADD 4. Certifications held and training completed relevant to cloud seeding operations.

Program Administration | Reporting & Authorization Criteria

Proposed Updates to the Criteria for Cloud Seeding Program Authorization:

- ***UPDATE*** section **Terms of Authorization- Reporting**
- ***Objective****: update reporting standards to ensure the collection of adequate data to support ongoing monitoring and analysis*

  – Records: "Maintain accurate records of all seeding operations, including but not limited to specific periods of operation, location(s) of operation, number of seeding hours by device, **rates of material dispersion and the total amount of material dispensed for each operational period**; dates and description of any periods of suspension.

  – Reporting: IWRB will develop its own standard form for reporting. All operators will use the standardized reporting form.

Program Administration | Reporting & Authorization Criteria

Proposed Updates to the Criteria for Cloud Seeding Program Authorization:

- ***NEW*** Monthly reporting requirements.
- ***Objective****: ensure the collection of adequate data to support ongoing monitoring and analysis and address policy questions*

- No more than 45 days after seasonal operations commence, and each calendar month thereafter until operations are concluded for season, operators shall be required to submit a monthly report (form to be developed by staff) of its cloud seeding operations that includes the following information:
  - Period(s) of seeding operation, including start and stop times UTC
  - Location(s) of seeding operation, including generator ID and/or flight plan #
  - Total number of seeding hours by device; for each period of operation and cumulative for month and season to date.
  - Total number of pyrotechnics consumed per operational period
  - Cumulative number of pyrotechnics consumed month to date and season to date.
  - Manufacturer name and contact information for all pyrotechnic consumables used to conduct operations
  - Rates of primary seeding agent material dispersion and total material (g) released for each period of seeding
  - Dates and detailed description of any periods of suspension
  - Copies of all required state and/or federal reporting documents

Program Administration | Reporting & Authorization Criteria

Proposed Updates to the Criteria for Cloud Seeding Program Authorization:

- ***UPDATED*** Annual reporting requirements.
- ***Objectives****: create a standardized process and documentation to ensure adherence to reporting requirements; ensure the collection of adequate data to support ongoing monitoring and analysis and address policy questions*

  - Submit **both** IWRB Annual reporting form (form to be developed by staff*)* and copies of NOAA Form 17-4 & 17-4A, to the IWRB by August 30 of each calendar year. Annual reports shall include (same as monthly).

Program Administration | Reporting & Authorization Criteria

Proposed Updates to the Criteria for Cloud Seeding Program Authorization:

- ***NEW*** Communications Standards.
- ***Objective****: increase the availability of information on cloud seeding*

  - Operator will notify IWRB of any suspensions that occur within 24 hours, including the reason for suspension and anticipated duration of suspension.
  - Operator will notify IWRB immediately of any potentially hazardous conditions or events that may be a direct or indirect result of cloud seeding operations.
  - All reports, information, and materials specifically concerning cloud seeding operations authorized in the State of Idaho shall be made available to the IWRB at its request and shall be made available to the public.

Program Administration | Reporting & Authorization Criteria

Next Steps

1. Review proposed criteria with cloud seeding operators

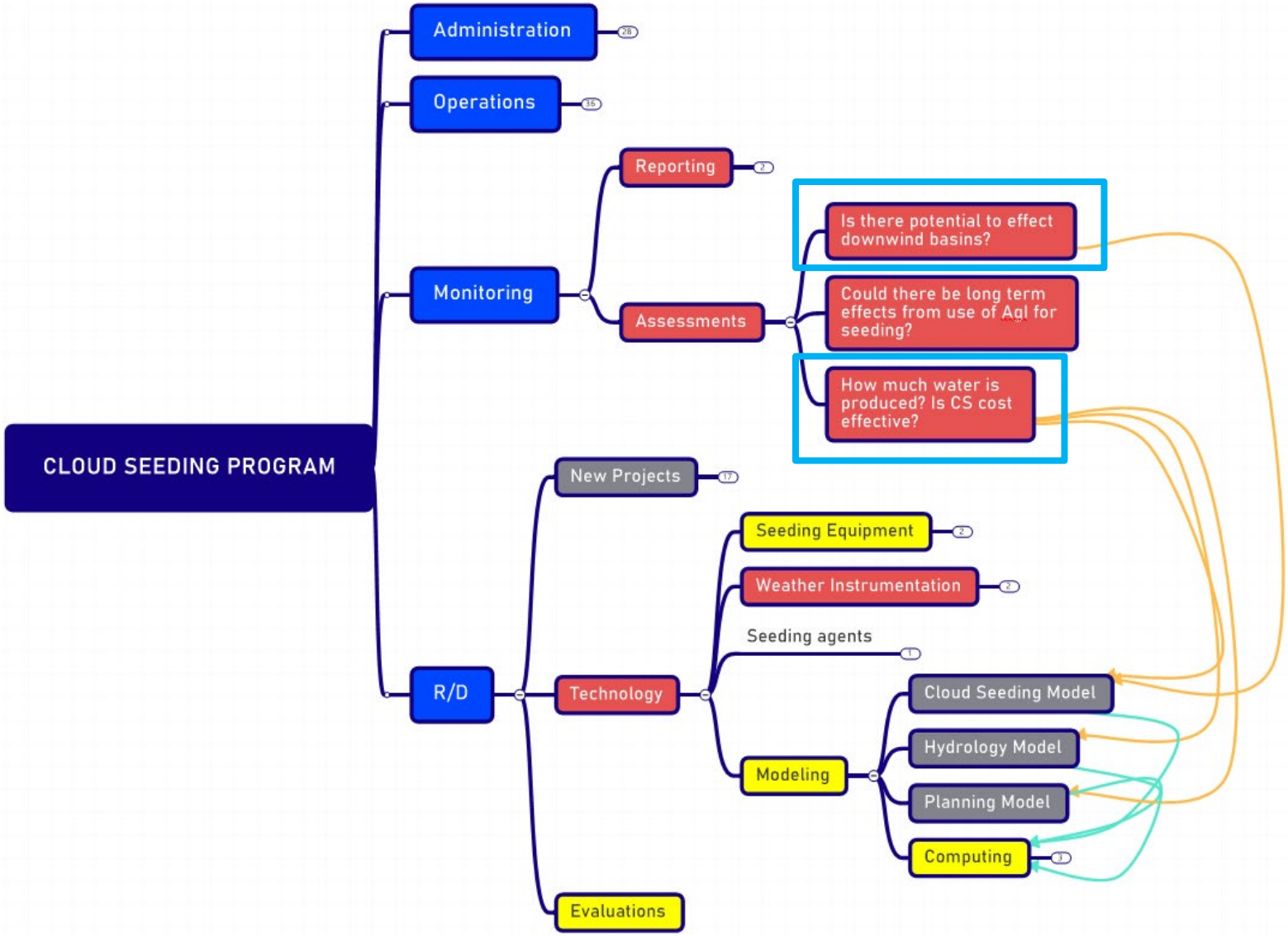
   – Are these changes feasible?
   – What limitations or challenges exist?

2. Review proposed criteria with legal

3. Consider resolution to adopt amended criteria

4. Consider resolution to update existing cloud seeding authorizations

Program Expenditures | Assessments



Program Expenditures | Fiscal Year 2024 Secondary Fund Budget

CLOUD SEEDING PROGRAM				
			FY25 Proposed	
Operations & Maintenance	**Upper Snake River Basin**	2024-2025 Project Operations - Aircraft & Remote Ground (=2/3 * $1,675,000)	$1,117,225	
	Wood River Basin	2024-2025 Project Operations - Aircraft & Remote Ground (=2/3 * $765,000)	$510,255	
	Boise River Basin	2024-2025 Project Operations - Aircraft & Remote Ground (=2/3 * $1,010,000)	$673,670	
	Collaborative Program	*Estimated* Water User Contributions	($430,000)	
	HCRCD Program	2024-2025 Upper Snake Project Operations - Manual Ground	$60,000	*
	Technology	Administration | Operational Modeling and Computing	$60,000	
		TOTAL	**$1,991,150**	
Capital	**Weather Instrumentation**	(Existing) Replacement/Enhancement/Upgrade	$200,000	*
		(Statewide) New Devices	$0	
	Technology	(Infrastructure) Computing and Modeling	$1,100,000	*
	Equipment	Remote Ground Generators	$0	
		TOTAL	**$1,300,000**	
Research & Development	**Technology**	(Development) Weather Instrumentation and Modeling	$1,000,000	*
	Investigations	Analysis/Assessments, cost share for research to support policy questions	$600,000	*
	New Basins	Infrastructure, investigations, administration | Bear River Basin	$300,000	*
	Reserve	Additional Program Costs	$250,000	
		TOTAL	**$2,150,000**	
CLOUD SEEDING PROGRAM TOTAL			**$5,441,150**	

Program Expenditures | Fiscal Year 2024 Secondary Fund Budget

Memorandum

To: IWRB Cloud Seeding Committee

From: Kala Golden, Program Manager

Date: September 5, 2024

Re: Cloud Seeding Program Expenditures—Cloud Seeding Model Development

ACTION: Recommendation of a resolution to authorize funding for model development

Background

Staff is requesting authorization for the expenditure of funds approved by the Idaho Water Resource Board (IWRB) in its Fiscal Year (FY) 2025 Secondary Aquifer Management and Planning Fund Budget. The IWRB is the entity charged with oversite and management of cloud seeding projects in Idaho (§42-4301). As a part of this responsibility, the IWRB was directed by legislature to continue analysis of existing cloud seeding operations and investigate the potential for cloud seeding in other basins. Due to the complex terrain found in Idaho's mountainous regions, it is necessary to refine our modeling capabilities in Idaho to more accurately model cloud seeding and conduct assessments. The IWRB Cloud Seeding Committee (Committee) is being asked to consider recommendation of a resolution to authorize funding for model development and analysis to support these ongoing objectives.

The State of Idaho and its partners have invested in projects that resulted in significant data sets useful for cloud seeding model development. Existing data can be utilized to further develop modeling capabilities for their specific use in Idaho. These improvements will advance our understanding of the physical processes that affect simulated precipitation changes from cloud seeding; and utilize advanced model development technology to assess what conditions yield the greatest effects from cloud seeding. This will advance operational efficiency by determining optimal conditions for cloud seeding under various conditions. Understanding these physical processes will additionally support analysis on the effects from cloud seeding.

Requested Expenditures

Model Development:

- Utilize data from Bear River Basin (BRB) Feasibility and Design study to conduct a detailed analysis to understand the physical processes that lead to precipitation changes
- Utilize advanced model development technologies to identify the conditions that yield the greatest simulated seeding effects

- **Cost:** $290,000
- **Timeline:** 12 months

Attachments:

- *Draft Resolution to Authorize Expenditures for Cloud Seeding*

Program Expenditures | Fiscal Year 2024 Secondary Fund Budget

CLOUD SEEDING PROGRAM				
			FY25 Proposed	
Operations & Maintenance	**Upper Snake River Basin**	2024-2025 Project Operations - Aircraft & Remote Ground (=2/3 * $1,675,000)	$1,117,225	
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Capital	**Weather Instrumentation**	(Existing) Replacement/Enhancement/Upgrade	$200,000	*
		(Statewide) New Devices	$0	
	Technology	(Infrastructure) Computing and Modeling	$1,100,000	*
	Equipment	Remote Ground Generators	$0	
		TOTAL	**$1,300,000**	
Research & Development	**Technology**	(Development) Weather Instrumentation and Modeling	$1,000,000	*
	Investigations	Analysis/Assessments, cost share for research to support policy questions	$600,000	*
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		TOTAL	**$2,150,000**	
CLOUD SEEDING PROGRAM TOTAL			**$5,441,150**	

Program Expenditures | Fiscal Year 2024 Secondary Fund Budget

Memorandum

To: IWRB Cloud Seeding Committee

From: Kala Golden, Program Manager

Date: September 5, 2024

Re: Cloud Seeding Program Expenditures—Model Output Data

ACTION: Recommendation of a resolution to authorize funding for model outputs

Background

Staff are requesting authorization for the expenditure of funds approved by the Idaho Water Resource Board (IWRB) in its Fiscal Year (FY) 2025 Secondary Aquifer Management and Planning Fund Budget for purposes of research and development to support technology.

The Idaho Water Resource Board (IWRB) and its program partners have invested in modeling technologies to support cloud seeding operations and analysis in Idaho. To simulate localized weather and ultimately the effects from cloud seeding, models need historical data sets to analyze. If the data ingested into the model is too course- or rather covers too broad of a geographic area, the model will not capture the variability of Idaho's complex mountainous terrain; this can lead to gross overestimation or underestimation of effects from cloud seeding.

Running a high-resolution multi-decadal simulation is a computationally expensive, as significant computing and data storage resources are required. After this simulation dataset is created, however, future monitoring and analysis work can utilize results to fully compare with target-control results that look at increased precipitation form cloud seeding. In addition, results could be used to drive hydrology model simulations and serve as a data source for more in-depth and high-resolution climatology analyses in the State of Idaho. Costs proposed for this project are a conservative 'not to exceed' amount; actual costs will be determined by the final size of the domain used to conduct downscaling, the resolution of scaling, and the amount of data storage necessary to store these data sets.

Requested Expenditures

Downscaling of the CONUS404 Simulation over Idaho:

- **Cost:** $910, 000
- **Timeline:** 24 months
- **Deliverables:** Downscaled model output files for use in evaluating cloud seeding in Idaho

Attachments:

- *Draft Resolution to Authorize Expenditures for Cloud Seeding*

Program Expenditures | Fiscal Year 2024 Secondary Fund Budget

CLOUD SEEDING PROGRAM				
			FY25 Proposed	
Operations & Maintenance	**Upper Snake River Basin**	2024-2025 Project Operations - Aircraft & Remote Ground (=2/3 * $1,675,000)	$1,117,225	
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	Reserve	Additional Program Costs	$250,000	
		TOTAL	**$2,150,000**	
CLOUD SEEDING PROGRAM TOTAL			**$5,441,150**	

Program Expenditures | Fiscal Year 2024 Secondary Fund Budget

Memorandum

To: IWRB Cloud Seeding Committee

From: Kala Golden, Program Manager

Date: September 4, 2024

Re: Cloud Seeding Program Expenditures— Liquid Propane Investigation

ACTION: Recommendation of a resolution to authorize funding for model outputs

Background

Staff are requesting authorization for the expenditure of funds approved by the Idaho Water Resource Board (IWRB) in its Fiscal Year (FY) 2025 Secondary Aquifer Management and Planning Fund Budget for cloud seeding research and development to support investigations.

The Idaho Water Resource Board (IWRB) and its program partners have invested in a preliminary investigation to understand the use of liquid propane (LP) as a potential seeding agent for cloud seeding. LP can generate ice at warmer temperature than traditionally used Silver Iodide (AgI), is generally cheaper to operate, and does not rely on orographic winds to carry seeding material. With trends pointing toward a warmer climatology, LP may provide a viable option to sustain the efficiency of program operations and potentially support cloud seeding in areas not conducive for seeding with AgI. The IWRB authorized funding in its Fiscal Year (FY) 2023 and FY2024 budget for the deployment of instrumentation and collection of weather data; and for the development of model simulations to be used for assessing LP and determining an appropriate test site for a full scale field study of LP.

The State of Utah is also interested in investigating LP and participating in a collaborative research effort to understand the efficacy of cloud seeding with LP. Regardless of where the research is conducted, findings will have broad applicability. As so, UT has authorized approximately $240,000 in its FY2025 budget to support funding for a Principal Investigator (PI) to coordinate and lead the LP research effort; and for funding to support additional equipment and data collection over the winter of 2024-2025 in the Camas Prairie and Kilgore areas of Idaho. The field investigation will require continued support for weather instrumentation and the collection of data. Staff are proposing to collaborate with UT to support winter 2024-2025 data collection for the LP research investigation. Idaho Power Company (IPC) will additionally support this effort with field staff in these existing operational regions, and use of a liquid propane generator.

Requested Expenditures

Liquid Propane Data Collection

- **Cost:** $170,000
- **Timeline:** 12 months
- **Deliverables:** Final Report with analysis of snow depth distribution, estimated degree of wind redistribution, viability of site, and an evaluation of the sampling strategy with respect to the viability of detecting a cloud seeding signal, and suitability of the generator location.

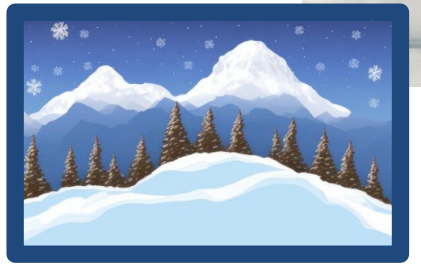
Attachments: *Draft Resolution to Authorize Expenditures for Cloud Seeding*

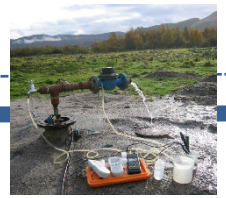
Program Expenditures | Fiscal Year 2024 Secondary Fund Budget

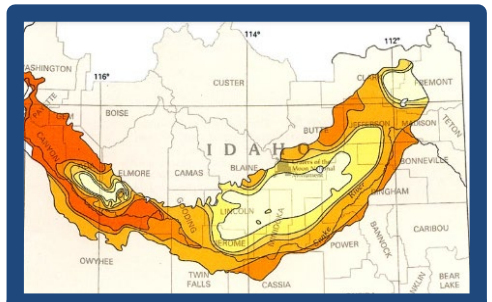
CLOUD SEEDING PROGRAM								
			FY25 Proposed		FY25 Authorized To Date			
Operations & Maintenance	Upper Snake River Basin	2024-2025 Project Operations - Aircraft & Remote Ground (=2/3 * $1,675,000)	$1,117,225		$1,117,225			
	Wood River Basin	2024-2025 Project Operations - Aircraft & Remote Ground (=2/3 * $765,000)	$510,255		$510,255			
	Boise River Basin	2024-2025 Project Operations - Aircraft & Remote Ground (=2/3 * $1,010,000)	$673,670		$673,670			
	Collaborative Program	*Estimated* Water User Contributions	($430,000)					
	HCRCD Program	2024-2025 Upper Snake Project Operations - Manual Ground	$60,000	*				
	Technology	Administration | Operational Modeling and Computing	$60,000		$60,000			
		TOTAL	$1,991,150		$2,361,150			
Capital	Weather Instrumentation	(Existing) Replacement/Enhancement/Upgrade	$200,000	*				
		(Statewide) New Devices	$0		$0			
	Technology	(Infrastructure) Computing and Modeling	$1,100,000	*				
	Equipment	Remote Ground Generators	$0		$0			
		TOTAL	$1,300,000		$0			
Research & Development	Technology	(Development) Weather Instrumentation and Modeling	$1,000,000	*	$0	$910,000	Downscaling; data sets	
	Investigations	Analysis/Assessments, cost share for research to support policy questions	$600,000	*	$0	$460,000	Model physcial processes; LP Winter 24-25	
	New Basins	Infrastructure, investigations, administration | Bear River Basin	$300,000	*				
	Reserve	Additional Program Costs	$250,000		$250,000			
		TOTAL	$2,150,000		$250,000			
CLOUD SEEDING PROGRAM TOTAL			$5,441,150		$2,611,150	$3,981,150		

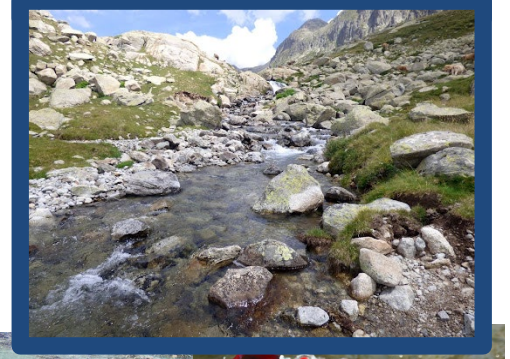
Questions?

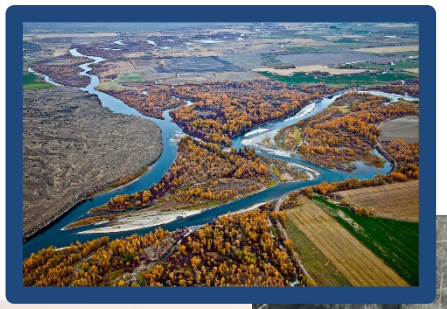
Who benefits from more water in the system?

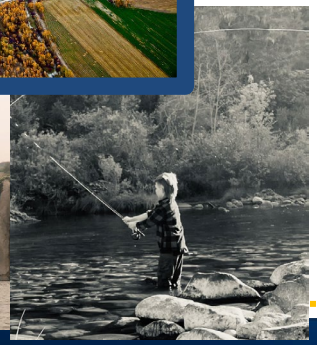


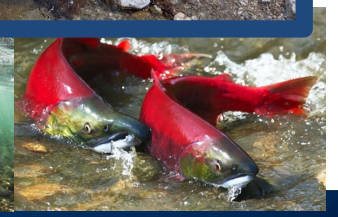


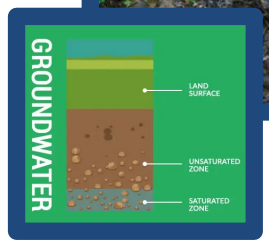


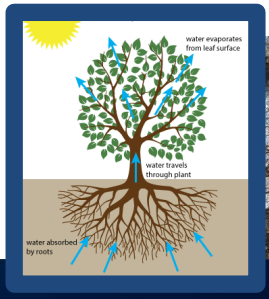


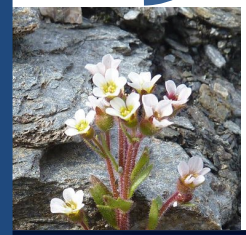












Memorandum

To: IWRB Cloud Seeding Committee

From: Kala Golden, Program Manager

Date: September 5, 2024

Re: Cloud Seeding Program Development—Reporting and Program Authorizations

ACTION: No action proposed at this time

Background

The IWRB is the entity charged with oversite and management of cloud seeding projects in Idaho (§42-4301). In May 2022, the IWRB passed resolution number 18-2022, approving criteria for the authorization of cloud seeding. The resolution recognized that criteria may need to be updated based on new information or industry standards. While cloud seeding operations have been occurring for several decades, only recently have public bodies began to develop or refine administration for the oversite and management of cloud seeding. Growth in interest for cloud seeding as a water management tool has also elevated questions surrounding the efficacy and safety of its use. To be responsive to these questions and ensure the IWRB has the ability to adequately manage and evaluate cloud seeding in Idaho, staff is recommending the IWRB consider:

1. Development of standards and procedures for public noticing of cloud seeding projects.
2. Update reporting requirements and the criteria for cloud seeding authorizations.
3. Update all existing authorizations for cloud seeding.

Public Noticing

There has been expressed concern that information on cloud seeding operations has not been made adequately available or been noticed to the public. A number of other states and public entities that participate in cloud seeding utilize public noticing processes to support expectations on the availability of information concerning cloud seeding. The IWRB may wish consider implementation of standards and procedures on public noticing and the availability of information concerning cloud seeding. These may include annual noticing of planned operations and/or noticing before the implementation of new projects; and may potentially incorporate opportunity for public comment or feedback. The development of a public noticing processes will require further development and legal support.

Development of Reporting & Authorization Criteria

As the State agency charged with oversite and management of cloud seeding in Idaho, the IWRB will have a need to:

1. Demonstrate that cloud seeding operations do not adversely impact the health and safety of the public, the environment, and/or infrastructure.
2. Demonstrate safe, responsible, and scientifically based practices are being used and applied for cloud seeding operations in Idaho.
3. Understand the cost efficiency and ability for a project to support the State's water management goals, for cloud seeding projects where public funds are expended.

The development of reporting and authorization criteria should be guided by the need to evaluate these objectives.

Reporting Criteria

To ensure the collection of adequate data for ongoing monitoring and analysis, to enhance available information, and to improve the IWRB's standards for reporting and access of information on cloud seeding- staff are recommending the IWRB consider amending its current reporting requirements and the criteria for the authorization of Cloud Seeding Programs in Idaho. The following is a summary of proposed changes, including the ***Objective*** for each proposed update:

- ***NEW*** Section II: Operator Requirements (***Objective****: Refine standards for responsible management and safe practices of cold season cloud)*
    - Operator Certification (WMA CS Operator); or a minimum of 5 years of operational experience both conducting and managing cold season cloud seeding operations; and
    - Safe handling practices for hazardous materials; storage, use, disposal
    - Modified CS Aircraft certification
    - Establish a minimum number of flight hours conducting aerial cloud seeding operations for proposed cloud seeding by aircraft (TBD)
    - 2 pilots per cloud seeding aircraft; 1 dedicated to flight, second staff member to operate cloud seeding and document for records
    - Defined suspension criteria guided by the American Society of Civil Engineers (ASCE) recommendations on cloud seeding (most current version)

- ***UPDATE*** Section I. *Request for Authorization*
    - UPDATE current part B. "IWRB sponsored programs must **meet all Operator Requirements referenced in section II** and comply with the Terms of Authorization referenced in **Section III**.
    - ADD 4. Certifications held and training completed relevant to cloud seeding operations.

- ***UPDATE*** section **Terms of Authorization** (***Objective****: update reporting standards to ensure the collection of adequate data to support ongoing monitoring and analysis)*
    - Records: "Maintain accurate records of all seeding operations, including but not limited to specific periods of operation, location(s) of operation, number of seeding hours by device, **rates of material dispersion and the total amount of material dispensed for each operational period**; dates and description of any periods of suspension.
    - Reporting: IWRB will develop its own standard form for reporting. All operators will use the standardized reporting form.

- ***NEW*** Monthly reporting requirements. (***Objective****: ensure the collection of adequate data to support ongoing monitoring and analysis and address policy questions)*

    - No more than 45 days after seasonal operations commence, and each calendar month thereafter until operations are concluded for season, operators shall be required to submit a monthly report (form to be developed by staff) of its cloud seeding operations that includes the following information:

        - Period(s) of seeding operation, including start and stop times UTC
        - Location(s) of seeding operation, including generator ID and/or flight plan #
        - Total number of seeding hours by device; for each period of operation and cumulative for month and season to date.
        - Total number of pyrotechnics consumed per operational period
        - Cumulative number of pyrotechnics consumed month to date and season to date.

- Manufacturer name and contact information for all pyrotechnic consumables used to conduct operations
- Rates of primary seeding agent material dispersion and total material (g) released for each period of seeding
- Dates and detailed description of any periods of suspension
- Copies of all required state and/or federal reporting documents

- ***UPDATED*** Annual reporting requirements. (***Objective****: create a standardized process and documentation to ensure adherence to reporting requirements)*

  Submit **both** IWRB Annual reporting form (form to be developed by staff*)* and copies of NOAA Form 17-4 & 17-4A, to the IWRB by August 30 of each calendar year. Annual reports shall include (same as monthly).

- ***NEW*** Communications Standards: (***Objectiv****e: increase the availability of information on cloud seeding)*

  - Operator will notify IWRB of any suspensions that occur within 24 hours, including the reason for suspension and anticipated duration of suspension.
  - Operator will notify IWRB immediately of any potentially hazardous conditions or events that may be a direct or indirect result of cloud seeding operations.
  - All reports, information, and materials specifically concerning cloud seeding operations authorized in the State of Idaho shall be made available to the IWRB at its request and shall be made available to the public.

Attachments: None

Memorandum

To: IWRB Cloud Seeding Committee

From: Kala Golden, Program Manager

Date: September 5, 2024

Re: Cloud Seeding Program Expenditures—Cloud Seeding Model Development

ACTION: Recommendation of a resolution to authorize funding for model development

Background

Staff is requesting authorization for the expenditure of funds approved by the Idaho Water Resource Board (IWRB) in its Fiscal Year (FY) 2025 Secondary Aquifer Management and Planning Fund Budget. The IWRB is the entity charged with oversite and management of cloud seeding projects in Idaho (§42-4301). As a part of this responsibility, the IWRB was directed by legislature to continue analysis of existing cloud seeding operations and investigate the potential for cloud seeding in other basins. Due to the complex terrain found in Idaho's mountainous regions, it is necessary to refine our modeling capabilities in Idaho to more accurately model cloud seeding and conduct assessments. The IWRB Cloud Seeding Committee (Committee) is being asked to consider recommendation of a resolution to authorize funding for model development and analysis to support these ongoing objectives.

The State of Idaho and its partners have invested in projects that resulted in significant data sets useful for cloud seeding model development. Existing data can be utilized to further develop modeling capabilities for their specific use in Idaho. These improvements will advance our understanding of the physical processes that affect simulated precipitation changes from cloud seeding; and utilize advanced model development technology to assess what conditions yield the greatest effects from cloud seeding. This will advance operational efficiency by determining optimal conditions for cloud seeding under various conditions. Understanding these physical processes will additionally support analysis on the effects from cloud seeding.

Requested Expenditures

Model Development:

- Utilize data from Bear River Basin (BRB) Feasibility and Design study to conduct a detailed analysis to understand the physical processes that lead to precipitation changes
- Utilize advanced model development technologies to identify the conditions that yield the greatest simulated seeding effects

- **Cost:** $290,000
- **Timeline:** 12 months

Attachments:

- *Draft Resolution to Authorize Expenditures for Cloud Seeding*

Memorandum

To: IWRB Cloud Seeding Committee

From: Kala Golden, Program Manager

Date: September 5, 2024

Re: Cloud Seeding Program Expenditures—Model Output Data

ACTION: Recommendation of a resolution to authorize funding for model outputs

Background

Staff are requesting authorization for the expenditure of funds approved by the Idaho Water Resource Board (IWRB) in its Fiscal Year (FY) 2025 Secondary Aquifer Management and Planning Fund Budget for purposes of research and development to support technology.

The Idaho Water Resource Board (IWRB) and its program partners have invested in modeling technologies to support cloud seeding operations and analysis in Idaho. To simulate localized weather and ultimately the effects from cloud seeding, models need historical data sets to analyze. If the data ingested into the model is too course- or rather covers too broad of a geographic area, the model will not capture the variability of Idaho's complex mountainous terrain; this can lead to gross overestimation or underestimation of effects from cloud seeding.

Running a high-resolution multi-decadal simulation is a computationally expensive, as significant computing and data storage resources are required. After this simulation dataset is created, however, future monitoring and analysis work can utilize results to fully compare with target-control results that look at increased precipitation form cloud seeding. In addition, results could be used to drive hydrology model simulations and serve as a data source for more in-depth and high-resolution climatology analyses in the State of Idaho. Costs proposed for this project are a conservative 'not to exceed' amount; actual costs will be determined by the final size of the domain used to conduct downscaling, the resolution of scaling, and the amount of data storage necessary to store these data sets.

Requested Expenditures

Downscaling of the CONUS404 Simulation over Idaho:

- **Cost:** $910, 000
- **Timeline:** 24 months
- **Deliverables:** Downscaled model output files for use in evaluating cloud seeding in Idaho

Attachments:

- *Draft Resolution to Authorize Expenditures for Cloud Seeding*

Memorandum

To: IWRB Cloud Seeding Committee

From: Kala Golden, Program Manager

Date: September 4, 2024

Re: Cloud Seeding Program Expenditures— Liquid Propane Investigation

ACTION: Recommendation of a resolution to authorize funding for model outputs

Background

Staff are requesting authorization for the expenditure of funds approved by the Idaho Water Resource Board (IWRB) in its Fiscal Year (FY) 2025 Secondary Aquifer Management and Planning Fund Budget for cloud seeding research and development to support investigations.

The Idaho Water Resource Board (IWRB) and its program partners have invested in a preliminary investigation to understand the use of liquid propane (LP) as a potential seeding agent for cloud seeding. LP can generate ice at warmer temperature than traditionally used Silver Iodide (AgI), is generally cheaper to operate, and does not rely on orographic winds to carry seeding material. With trends pointing toward a warmer climatology, LP may provide a viable option to sustain the efficiency of program operations and potentially support cloud seeding in areas not conducive for seeding with AgI. The IWRB authorized funding in its Fiscal Year (FY) 2023 and FY2024 budget for the deployment of instrumentation and collection of weather data; and for the development of model simulations to be used for assessing LP and determining an appropriate test site for a full scale field study of LP.

The State of Utah is also interested in investigating LP and participating in a collaborative research effort to understand the efficacy of cloud seeding with LP. Regardless of where the research is conducted, findings will have broad applicability. As so, UT has authorized approximately $240,000 in its FY2025 budget to support funding for a Principal Investigator (PI) to coordinate and lead the LP research effort; and for funding to support additional equipment and data collection over the winter of 2024-2025 in the Camas Prairie and Kilgore areas of Idaho. The field investigation will require continued support for weather instrumentation and the collection of data. Staff are proposing to collaborate with UT to support winter 2024-2025 data collection for the LP research investigation. Idaho Power Company (IPC) will additionally support this effort with field staff in these existing operational regions, and use of a liquid propane generator.

Requested Expenditures

Liquid Propane Data Collection

- **Cost:** $170,000
- **Timeline:** 12 months
- **Deliverables:** Final Report with analysis of snow depth distribution, estimated degree of wind redistribution, viability of site, and an evaluation of the sampling strategy with respect to the viability of detecting a cloud seeding signal, and suitability of the generator location.

Attachments: *Draft Resolution to Authorize Expenditures for Cloud Seeding*

BEFORE THE IDAHO WATER RESOURCE BOARD

IN THE MATTER OF CLOUD SEEDING IN THE STATE OF IDAHO	RESOLUTION TO AUTHORIZE THE EXPENDITURE OF FUNDS FOR MODELING AND ANALYSIS

WHEREAS, House Bill 266 (HB 266), passed and approved by the 2021 legislature, and recognized that cloud seeding has provided a unique and innovative opportunity to support sustainable water supplies for the State of Idaho, and designated the Idaho Water Resource Board (IWRB) as the agency responsible for authorization of cloud seeding programs within the State; and

WHEREAS, HB266 created section §42-4301 on cloud seeding, directing the IWRB to continue its analysis of cloud seeding operations, conduct an assessment of cloud seeding opportunities across the State of Idaho, and identify opportunities for expanding the Cloud Seeding Program (Program) within the State; and

WHEREAS, Cloud Seeding Program develop and analysis require the use of sophisticated modeling technologies, many of which are actively under development for the first time; and

WHEREAS, to advance modeling capabilities for program development and long term monitoring and analysis of cloud seeding in Idaho, improvements to model characteristics and supporting data sets will need to be made; and

WHEREAS, the IWRB has initiated a pre-investigation of the potential for use of liquid propane as a seeding agent. The objective of the pre-investigation is to identify a test site for a full scale investigation of liquid propane as a seeding agent; and

WHEREAS, the State of Utah is interested in the potential use of liquid propane for cloud seeding and has authorized funding for a principle investigator (PI) to lead and coordinate the LP research investigation, and to support instrumentation and the collection of data at current test sites in Idaho; and

WHEREAS, the LP pre-investigation will require additional weather instrumentation and data support for the winter season 2024-2025; and

WHEREAS, on May 24, 2024, the IWRB adopted the Secondary Aquifer Planning, Management, and Implementation Fund (Secondary Aquifer Fund) Fiscal Year 2025 Budget, which included a Research & Development under the Cloud Seeding Program with $1,000,000 for Technology and $600,000 for Investigations.

NOW, THEREFORE BE IT RESOLVED that, the IWRB authorizes expenditures not to exceed $910,000 from the Secondary Aquifer Fund, Cloud Seeding Program, Research & Development - Technology for a project to downscale the resolution of data sets available in Idaho.

BE IT FURTHER RESOLVED that, the IWRB authorizes expenditures not to exceed $290,000 from

the Secondary Aquifer Fund Cloud Seeding Program, Research & Development - Investigations for the assessment of physical processes that lead to precipitation changes under varying conditions; and to assess what characteristics yield the greatest seeding effects to support operational planning and improved efficiency.

BE IT FURTHER RESOLVED that, the IWRB authorizes expenditures not to exceed $170,000 from the Secondary Aquifer Fund Cloud Seeding Program, Research & Development - Investigations for costs related to deployment of instrumentation and the collection of data to support a full scale study of liquid propane as a cloud seeding agent.

BE IT FURTHER RESOLVED that the IWRB authorizes its chairman or designee, Brian Patton, Executive Manager to the IWRB, to execute the necessary agreements or contracts to complete the proposed efforts.

DATED this 13th day of September 2024.

_____
Jeff Raybould, Chairman
Idaho Water Resource Board

ATTEST _____
Dean Stevenson, Secretary