SPECIAL NOTICE REGARDING
CORONAVIRUS DISEASE 2019 (COVID-19)
AND PARTICIPATION IN PUBLIC MEETINGS

On March 4, 2020, Governor Newsom declared a State of Emergency resulting from the threat of COVID-19. On September 16, 2021, Governor Newsom signed Assembly Bill No. 361 into law. Assembly Bill No. 361 amends Government Code section 54953(e) by adding provisions for remote teleconferencing participation in meetings by members of a legislative body, without the requirements of Government Code section 54953(b)(3), subject to the existence of certain conditions. The San Bernardino Valley Municipal Water District adopted a resolution determining, by majority vote, that, as a result of the declared State of Emergency, a meeting in person would present imminent risks to the health or safety of attendees. Accordingly, it has been determined that all Board and Workshop meetings of the San Bernardino Valley Municipal Water District will be held pursuant to the Brown Act and will be conducted via teleconference. There will be no public access to the meeting venue.

BOARD OF DIRECTORS WORKSHOP - RESOURCES
THURSDAY, APRIL 7, 2022 – 2:00 P.M.

PUBLIC PARTICIPATION

Public participation is welcome and encouraged. You may participate in the April 7, 2022, meeting of the San Bernardino Valley Municipal Water District online and by telephone as follows:

Dial-in Info: (877) 853 5247 US Toll-free
Meeting ID: 979 215 700
PASSCODE: 3802020
https://sbvmwd.zoom.us/j/979215700

If you are unable to participate online or by telephone, you may also submit your comments and questions in writing for the District's consideration by sending them to comments@sbvmwd.com with the subject line "Public Comment Item #" (insert the agenda item number relevant to your comment) or "Public Comment Non-Agenda Item". Submit your written comments by 6:00 p.m. on Wednesday, April 6, 2022. All public comments will be provided to the Chair and may be read into the record or compiled as part of the record.

IMPORTANT PRIVACY NOTE: Participation in the meeting via the Zoom app is strongly encouraged. Online participants MUST log in with a Zoom account. The Zoom app is a free download.
Please keep in mind: (1) This is a public meeting; as such, the virtual meeting information is published on the World Wide Web and available to everyone. (2) Should you participate remotely via telephone, your telephone number will be your "identifier" during the meeting and available to all meeting participants; there is no way to protect your privacy if you elect to call in to the meeting.

SAN BERNARDINO VALLEY MUNICIPAL WATER DISTRICT
380 E. Vanderbilt Way, San Bernardino, CA 92408

BOARD OF DIRECTORS WORKSHOP - RESOURCES

AGENDA

2:00 PM Thursday, April 7, 2022

CALL TO ORDER
Chairperson: Director Hayes
Vice-Chair: Director Harrison

1) INTRODUCTIONS

2) PUBLIC COMMENT
Any person may address the Board on matters within its jurisdiction.

3) SUMMARY OF PREVIOUS MEETING

3.1 Board of Directors' Workshop - Resources - March 3, 2022 (Page 2)
Summary Notes BOD Workshop - Resources 030322

4) DISCUSSION ITEMS

4.1 Staff Update on Cloud Seeding (Page 9)
Staff Memo - Staff Update on Cloud Seeding
Cloud Seeding Update Presentation

5) FUTURE BUSINESS

6) ADJOURNMENT

PLEASE NOTE:
Materials related to an item on this Agenda submitted to the Board after distribution of the agenda packet are available for public inspection in the District's office located at 380 E. Vanderbilt Way, San Bernardino, during normal business hours. Also, such documents are available on the District's website at www.sbvmwd.com subject to staff's ability to post the documents before the meeting. The District recognizes its obligation to provide equal access to those individuals with disabilities. Please contact Melissa Zoba at (909) 387-9228 two working days prior to the meeting with any special requests for reasonable accommodation.

SAN BERNARDINO Valley MUNICIPAL WATER DISTRICT

DATE: April 7, 2022

TO: Board of Directors Workshop - Resources

FROM: Staff

SUBJECT: Summary of March 3, 2022 Board of Directors Workshop – Resources

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The Resources Workshop convened on March 3, 2022. Vice President Hayes chaired the meeting via video conference.

Directors Present: President Kielhold, Vice President Hayes, Director Botello, Director Harrison and Director Longville.

Staff Present:

Heather Dyer, MS, MBA – Chief Executive Officer/General Manager
Joanna Gibson, MS – Executive Director Upper SAR Habitat Conservation Program
Wen Huang, PE, MS – Deputy General Manager / Chief Engineer
Jose Macedo, ML, CPT-P (USA Retired) – Chief of Staff/ Clerk of the Board
Cindy Saks, CPA – Deputy General Manager / Chief Financial Officer
Bob Tincher, PE, MS – Deputy General Manager / Chief Water Resources Officer
Melissa Zoba, MBA, MPA – Chief Information Officer

Anthony Flordelis – Business Systems Analyst
Matthew E. Howard, MS – Water Resources Senior Planner
Chris Jones, MESM – Preserve System Program Manager
Adekunle Ojo, MPA – Manager of Water Resources
Kai Palenscar, Ph.D. – Environmental Compliance Program Manager
Karen Resendez, MA – Human Resources / Risk Manager
Shavonne Turner, MPA – Water Conservation Program Manager

Members of the Public Present:

James Morales, East Valley Water District
Joyce McIntire, Yucaipa Valley Water District
Melody McDonald, San Bernardino Valley Water Conservation District
David Raley, San Bernardino Valley Water Conservation District
Jennifer Alford, CSUSB Water Resources Institute
Allison Wolff, Vibrant Planet
Joe Flannery, Vibrant Planet
Scott Conway, Vibrant Planet

Joseph Rechsteiner, U.S. Forest Service
Michael Brumbaugh, U.S. Forest Service
Susie Kirschner, Inland Empire Resource Conservation District (IERCD)
Lorien Sanders, IERCD
Nancy Sappington, IERCD
Tricia Reed, IERCD
Mary Ann Dickinson, Headwaters Resiliency
Chris Chandler
T. Tennant
Genevieve Cross, Southern California Edison
Stacy Gorin, Southern California Mountains Foundation
Joel B.

1. Introductions

The following attendees introduced themselves:

- David Raley, San Bernardino Valley Water Conservation District
- Mary Ann Dickinson, Headwaters Resiliency Partnership
- Jennifer Alford, CSUSB Professor / Director of the Water Resources Institute, and Headwaters Resiliency Partnership
- Nancy Sappington, Susie Kirschner, Lorien Sanders and Tricia Reed from IERCD
- Melody McDonald, San Bernardino Valley Water Conservation District

2. Public Comment

Chair Hayes invited public comment. There was none.

3. Summary of Previous Meeting

The meeting notes from the February 3, 2022, Board of Directors Workshop - Resources were accepted with no comments.

4.1 Presentation by Vibrant Planet on Land Tender Wildfire Prevention Planning Software

Preserve System Program Manager Chris Jones introduced Allison Wolff, Scott Conway, and Joe Flannery from Vibrant Planet. He explained Vibrant Planet has developed an innovative tool, Land Tender, which is Intended to help identify and prioritize forest management projects across large areas to help reduce the risk of catastrophic wildfires and protect local resources such as water supply and habitat. The Headwaters Resiliency

Partnership is excited about the tool and feels it could be an integral component of the Partnership's long-term plan, he said.

Ms. Wolff explained Vibrant Planet is a team of technology professionals and land managers who worked together on the Land Tender platform in order to fill a gap and build an adaptive management system to prevent catastrophic wildfires. It gives the ability to look at current fuels and other risk conditions, develop scenarios in real time, shorten the length of planning time, and understand trade-offs of different land management decisions to create forest resilience into the future, she said. The system answers questions about community safety, restoration of natural water flows, biodiversity, and the carbon sink.

As data is built, the system is being made available to the scientific community to improve data and science, Wolff continued. A public benefit corporation was formed to build the data needed to operate the platform down to the tree level, she explained, and to create applications that use the platform to solve specific questions around forest health and resilience.

Ms. Wolff presented background on the team members and further explained the Land Tender tool. Chief Executive Officer / General Manager Heather Dyer advised the District is interested in Land Tender because 67 percent of local water supply comes from the San Bernardino National Forest. The U.S. Forest Service does not have the capacity, tools, or funding to manage the forest to avoid catastrophic wildfire, which has the potential to take out water supply, she explained. Part of headwaters resilience is investing in fuels management projects and other management activities that prevent or reduce the risk of catastrophic wildfire, therefore protecting water resources, she stated.

Mr. Conway added that Land Tender puts all information on the table for consideration so all are operating with the same understanding. He described the software licensing setup and provided a demonstration.

Ms. Dyer described the benefits of the information and noted that the tool gives everyone the ability to identify what is important to each stakeholder, what is possible, how much it might cost, provides a cost-benefit ratio, and is a way to have more information for making strategic decisions about how to manage the forest headwaters. She suggested considering incorporating the tool into the headwaters resilience strategic planning process.

Mr. Conway added that the ability to quantify the benefits up front opens opportunities for implementation funding. The base information is provided, he continued, but the objective is to customize the work for the data sets available for the area.

Mr. Jones pointed out that significant data gaps exist and there will be a process to develop the databases. Mr. Conway acknowledged the gaps, saying they are small enough to be able to navigate. Mr. Jones pointed out the District's investment in imagery and LIDAR which is one of the most important base layers that feed into the system and will drive analysis.

Director Harrison asked if ESRI was involved in the development. Mr. Conway said the system was compatible with ESRI products but is not tied to it.

In response to a question from President Kielhold about making the system available to land managers, Ms. Dyer explained that the value brought to the process by Valley District is the ability to do complicated planning processes and use such tools to develop planning documents, and in being part of the conversation on where the actual implementation is prioritized then carried out by the Forest Service, CalFIRE or other agency.

President Kielhold cautioned that Forest Service action is dependent on many variables. Ms. Wolff pointed out that the State of California and the Forest Service have a shared stewardship agreement, and all the work being done on Land Tender involves the Forest Service.

Mr. Joe Rechsteiner with the U.S. Forest Service pointed out this is another tool in the toolbox and it helps with analysis and identification of conditions, where to focus resources; and planning. He acknowledged President Kielhold's concern and explained that the Forest Service will have to sign a decision document and go through analysis, but a tool that provides information on existing conditions will be helpful. He posited that it does sound like there is value in engaging with this product.

It is common in northern California for water agencies to do these things, like the North Yuba project; they are ahead on impacts of fire on watershed and water supply, Ms. Dyer stated. This is the first introduction of this conversation and what might be possible, she noted.

Director Longville added that the Forest Service will be the largest partner, and since this is the most populated national forest in the nation there will be opportunity to work with other forest landowners. The tool will allow all jurisdictions to see proposed project benefits for their communities.

Mr. Rechsteiner responded to President Kielhold's concern and noted that Congress and the Forest Service are aware of capacity issues and built an administrative framework to allow others to plan and operate on National Forest System lands. He also gave an example

of the Placer County Water Agency which provides project implementation. Land Tender is a great tool to be able to take advantage of some of the District's authorities. President Kielhold pointed out there are other obstacles that are more difficult to overcome than technology.

Director Harrison acknowledged the involvement and knowledge of Director Longville on this, said he is interested in the tool, and it is something in which the District needs to be involved.

Director Botello echoed President Kielhold's concerns and asked about cost and consistency with the District's mission. Ms. Dyer advised that cost is unknown, but the Inland Empire Resource Conservation District has funding available to partner with Valley District. Also, it is a good project to include in the Proposition 1 grant call under decision support tools, she added. It supports the mission in that protecting the water supply that comes from the headwaters is one of the ways to deliver a reliable and sustainable water supply, she said, and this is a proactive way to do that. She pointed to the large attendance at the Headwaters Partnership meetings and said this will be an ongoing effort to gather everyone who has a vested interest in healthy, resilient headwaters in the National Forest and other privately held lands to begin moving forward in the same direction.

Mr. Jones said that staff is actively pursuing a range of partnerships and there are many routes to implementation. The Forest Service is interested in changing the way it has partnered in the past and accepting help from others to do the work, as well as help with the planning, as they realize it is a monumental task.

Ms. Wolff discussed the collaboration, universality and accessibility of Land Tender and the need to push the power to the local level.

Director Longville addressed Director Botello's concern and assured that the group would come back with more information once it is known what can be done, the benefits, and the return on investment; then the question of funding would be addressed.

Director Harrison pointed to the successful One Water One Watershed project and said this would be an ideal situation for applying for Proposition 1 funding for this process.

Vice President Hayes asked about the time frame for deeper discussion and movement. Ms. Dyer responded that it would be several months at least, as further work with the partnership is needed to understand the Proposition 1 grant application.

Mr. Jones thanked Vibrant Planet for the presentation. Ms. Wolff invited questions and shared contact information.

5.1 Consider Agreement to Convey Metropolitan Water District of Southern California Water to Rubidoux Community Services District

Deputy General Manager / Chief Water Resources Officer Bob Tincher introduced the agreement that would convey up to 2,000 acre-feet of Metropolitan Water District (MWD) water to the Rubidoux Community Services District (RCSD). The action was initiated by RCSD, which would like to purchase imported water from MWD but does not have a connection to MWD. When exploring alternatives including building a pipeline connection, RCSD identified that this exchange with West Valley Water District (WVWD) would result in savings of $6.5 million rather than construction of pipeline facilities.

Mr. Tincher pointed out that the MWD water would be delivered directly to WVWD via the San Gabriel pipeline, in which Valley District owns half the capacity. WVWD would treat the water and serve it to their customers, and in turn, WVWD would deliver a like amount to RCSD through a proposed interconnection.

There is no cost to Valley District, Mr. Tincher stated. All costs would be paid by RCSD. Mr. Tincher pointed to a similar agreement approved by the Board which provides MWD water to WVWD.

Director Longville asked if there may be reluctance by MWD to sell any of its imported water, given the challenges with their own needs. Mr. Tincher advised that MWD is part of the process and there is no indication of a problem; they are willing to provide the water to RCSD.

In response to Vice President Hayes, Mr. Tincher noted that WVWD is also a signatory to the agreement and is supportive of the arrangement.

Action Item(s): The Board voted to move this item forward for consideration to a regular Board Of Directors meeting by the following roll-call vote:

There was no motion or second.	APPROVED: 5-0
AYES:	Botello, Harrison, Hayes, Kielhold, Longville
NOES:	None
ABSTAIN:	None
ABSENT:	None

6. Future Business

Action Item(s): The Board voted to add a staff presentation / update on cloud seeding to a future agenda by the following roll-call vote:

	APPROVED: 5-0
AYES:	Botello, Harrison, Hayes, Kielhold, Longville
NOES:	None
ABSTAIN:	None
ABSENT:	None

7. Adjournment

Chair Hayes adjourned the meeting at 3:14 p.m.

Staff Recommendation

Receive and file.

SAN BERNARDINO Valley MUNICIPAL WATER DISTRICT

DATE: April 7, 2022

TO: Board of Directors Workshop - Resources

FROM: Bob Tincher, Chief Water Resources Officer/Deputy General Manager
Adekunle Ojo, Water Resources Manager

SUBJECT: Staff Update on Cloud Seeding

Staff Recommendation

Receive and File

Summary

The Santa Ana Watershed Project Authority (SAWPA) is proposing a multi-year pilot scale cloud seeding project within the Santa Ana River Watershed. At the Board's request, staff provided a technical review of cloud seeding at the June 3, 2021 Resources Workshop. The Board recently asked staff for a follow-up presentation that includes any new information received since staff's previous report.

Background

Cloud seeding is the process of adding a material such as silver iodide or potassium iodide into an existing cloud to cause water vapor to condense and fall as rain or snow. In November 2020, SAWPA completed a Weather Modification and Feasibility Study which concludes that cloud seeding is feasible in the Santa Ana River Watershed. The SAWPA Commission has authorized the development of a multi-year pilot scale field study intended to demonstrate the effectiveness of cloud seeding in the Watershed. SAWPA staff is working to select a site(s) for the ground seeding equipment, develop California Environmental Quality Act documentation, prepare a Proposition 1, Round 2 grant application to cover 50% of the cost and identify funding partners to pay the 50% local match.

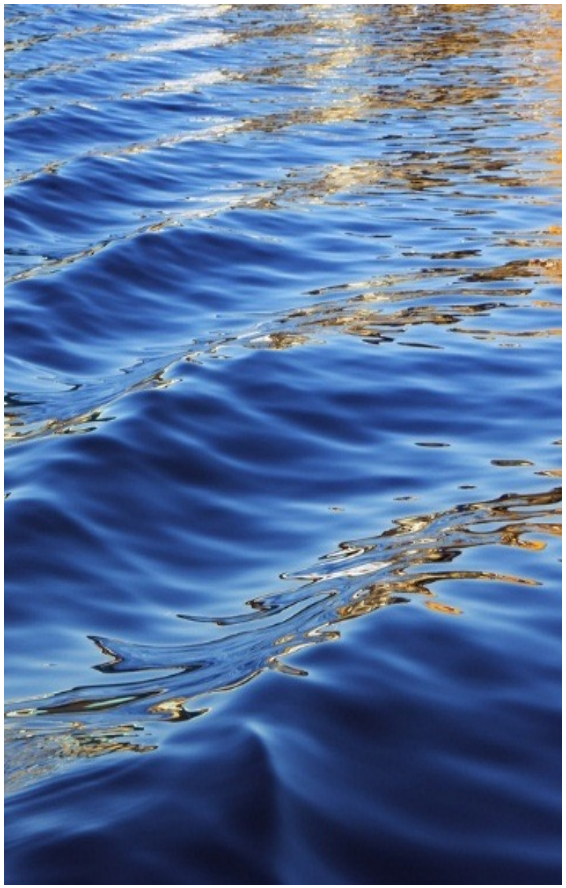
At this workshop, staff will present an overview of cloud-seeding, including any new information

that has been received since staff's previous report to the Board in June 2021, that will include an overview of other cloud seeding projects, an overview of Valley District's prior cloud seeding program and questions and uncertainties on how to measure the actual benefit.

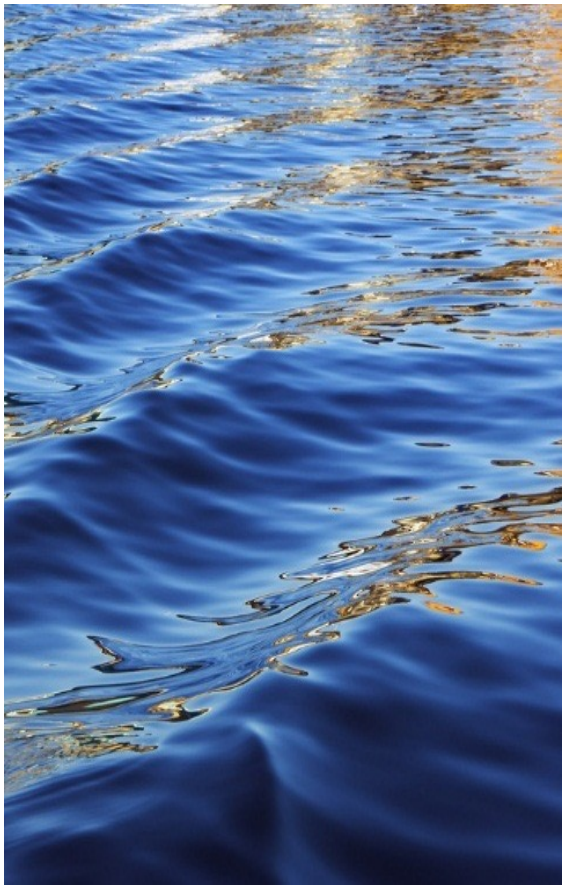
Fiscal Impact

None, this is an informational report

Staff Update on Cloud Seeding



Summary of Previous Report from Staff



Total **Projected** Increases

Ground Only Seeding

Target Area	Seasonal Precip. Increase (inches)	Percent Increase	Avg. Natural Streamflow (AF)	Streamflow Increase (AF)	Percent Increase
NW	0.41	3.5%	25,000	2,043	8.2%
NE	0.49	4.1%	65,000	4,330	6.7%
SW	0.59	3.7%	5,000	447	9.0%
SE	0.49	4.5%	10,000	1,373	13.7%
	TOTAL w/ Ground Only		**105,000**	**8,193**	**7.8%**

With Aerial Support in the NE Target

Target Area	Seasonal Precip. Increase (inches)	Percent Increase	Avg. Natural Streamflow (AF)	Streamflow Increase (AF)	Percent Increase
NW	0.41	3.5%	25,000	2,043	8.2%
NE	0.89	7.3%	65,000	7,772	12.0%
SW	0.59	3.7%	5,000	447	9.0%
SE	0.49	4.5%	10,000	1,373	13.7%
		TOTAL	**105,000**	**11,635**	**11.1%**

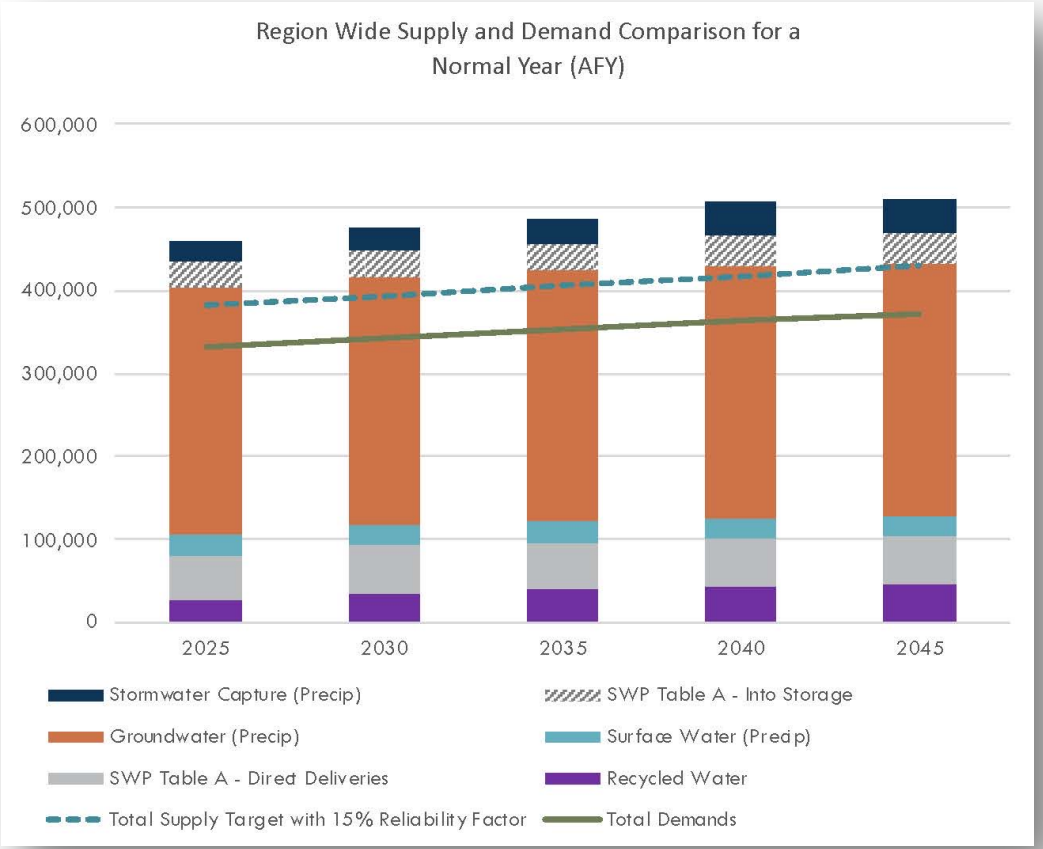
$44/AF ($22/AF with grant funds, 7,800 AF)

Photo Courtesy of Dr. Vincent Schaefer

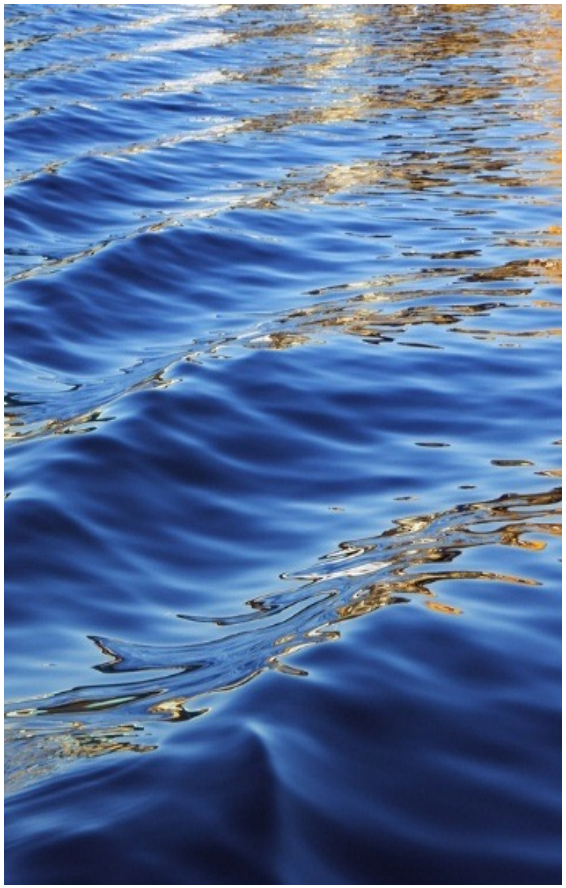
Cloud seeding works but there is no way to directly measure how much water you will actually receive for your money

Photo Courtesy of Dr. Vincent Schaefer

≠



New Information Since Staff's Last Report



Other Projects (provided by SAWPA)

Estimates

Case Study	Name	Location	Year	Increase in Precip	Increase in Runoff	Validation Approach
1	Colorado River Basin Augmentation (Central Colorado Mountains River Basins Program)	Central Colorado	WY 2020-2021	9.3%	107,000 AF	Target and Control and Randomized Seeding
2	Santa Barbara County Water Agency	Huasno-Alamo	1981-2014	9%	--	Target and Control
		Santa Ynez	1981-2014	19%-21%	--	
3	Seeded & Natural Orographic Wintertime clouds: the Idaho Experiment (SNOWIE)	Payette	2003-2020	11.2%	271,000 AF	Target and Control with Doppler Radar
		Boise	2003-2020	12.1%	217,000 AF	
		Wood	2003-2020	10.2%	68,000 AF	
4	Wyoming Weather Modification Pilot Program	Wyoming	2005-2014	5%-15%	0.4%-3.7% increase	Randomized cross over with target and control
5	Australia Snowy Precipitation Enhancement Research Project (SPERP)	Entire area	2004-2015	7%	--	Randomized
		Target area	2004-2015	14%	--	
6	Utah Division of Water Resources	Statewide	24-43 years	7%	--	Target and Control
		Statewide	2019-2020	8%	--	

9

SNOW PACK AUGMENTATION IN THE
SAN BERNARDINO MOUNTAINS

WATER YEARS

1976-77

AND

1977-78

by
Norm Caouette

SAN BERNARDINO VALLEY MUNICIPAL WATER DISTRICT

G Louis Fletcher
District Engineer

Grist

Can cloud seeding help quench the thirst of the US West?

In the mids ...mbracing cloud seeding to increase sn...

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Quantifying snowfall from orographic cloud seeding

Katja Friedrich[a,1], Kyoko Ikeda[b], Sarah A. Tessendorf[b], Jeffrey R. French[c], Robert M. Rauber[d], Bart Geerts[c], Lulin Xue[b], Roy M. Rasmussen[b], Derek R. Blestrud[e], Melvin L. Kunkel[e], Nicholas Dawson[e], and Shaun Parkinson[e]

[a]Department of Atmospheric and Oceanic Sciences, University of Colorado Boulder, Boulder, CO 80309; [b]Research Applications Laboratory, National Center for Atmospheric Research, Boulder, CO 80307; [c]Department of Atmospheric Science, University of Wyoming, Laramie, WY 82071; [d]Department of Atmospheric Sciences, University of Illinois at Urbana–Champaign, Urbana, IL 61820; and [e]Cloud Seeding Group, Idaho Power Company, Boise, ID 83702

Edited by John H. Seinfeld, California Institute of Technology, Pasadena, CA, and approved January 30, 2020 (received for review October 2, 2019)

Climate change and population growth have increased demand for water in arid regions. For over half a century, cloud seeding has been evaluated as a technology to increase water supply; statistical approaches have compared seeded to nonseeded events through precipitation gauge analyses. Here, a physically based approach to quantify snowfall from cloud seeding in mountain cloud systems is presented. Areas of precipitation unambiguously attributed to cloud seeding are isolated from natural precipitation (<1 mm h^{-1}). Spatial and temporal evolution of precipitation generated by cloud seeding is then quantified using radar observations and snow gauge measurements. This study uses the approach of combining radar technology and precipitation gauge measurements to quantify the spatial and temporal evolution of snowfall generated from glaciogenic cloud seeding of winter mountain cloud systems and its spatial and temporal evolution. The results represent a critical step toward quantifying cloud seeding impact. For the cases presented, precipitation gauges measured increases between 0.05 and 0.3 mm as precipitation generated by cloud seeding passed over the instruments. The total amount of water generated by cloud seeding ranged from 1.2×10^5 m^3 (100 ac ft) for 20 min of cloud seeding, 2.4×10^5 m^3 (196 ac ft) for 86 min of seeding to 3.4×10^5 m^3 (275 ac ft) for 24 min of cloud seeding.

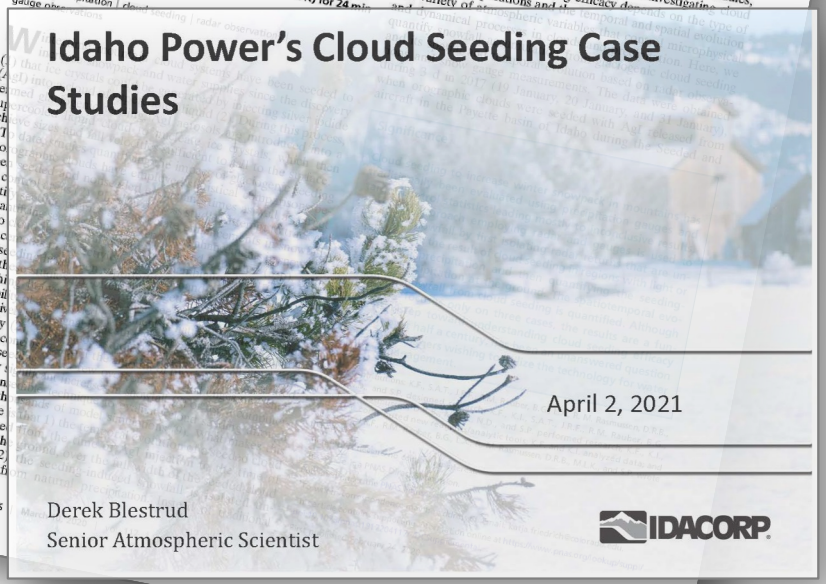
clouds | precipitation | ...

statistical comparisons, we introduce here a physically based approach by which we isolate areas of precipitation that were unambiguously generated by cloud seeding and quantify the amount of precipitation in these areas using precipitation gauge measurements and ground-based radar analyses. This approach is applied to radar echoes that were attributed to seeding at a time of no or light (<1 mm h^{-1}) natural precipitation for three cloud seeding events. This study combines radar and gauge analyses in order to quantify the spatial and temporal evolution of snowfall from cloud seeding.

For the three cases presented, unambiguous evidence was provided in two studies (10, 11) that glaciogenic seeding from an aircraft led to the production of precipitation that eventually fell to the surface. However, the amount of precipitation produced for the three cases was not quantified in these previous studies, which would be a fundamental step toward investigating seeding efficacy. Cloud seeding efficacy ... cloud seeding operations and ... of a variety of ...

www.pnas.org/cgi/doi/10.1073/pnas.1917204117

Idaho Power's Cloud Seeding Case Studies

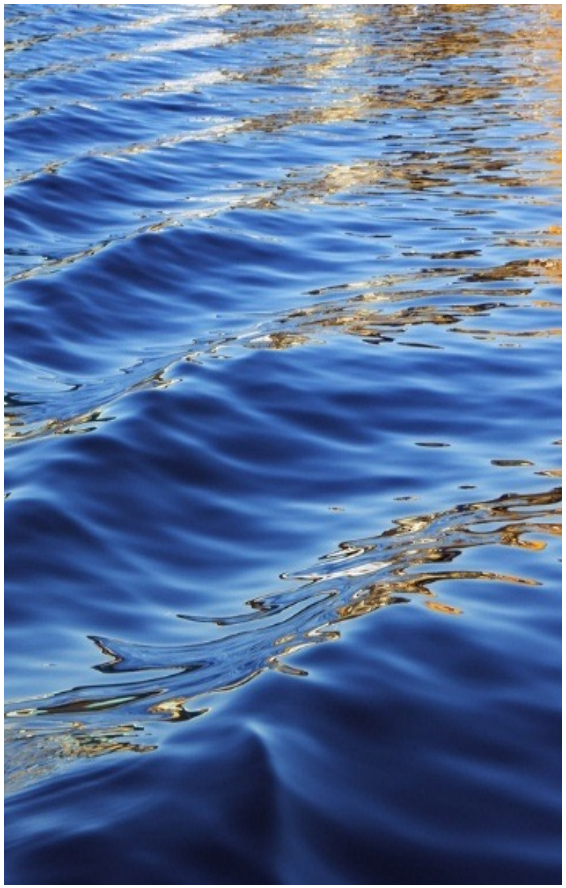


April 2, 2021

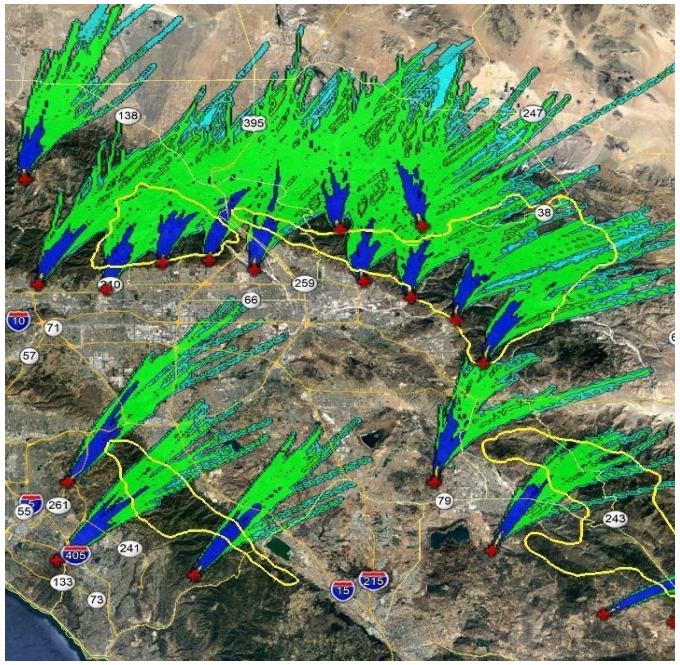
Derek Blestrud
Senior Atmospheric Scientist

IDACORP

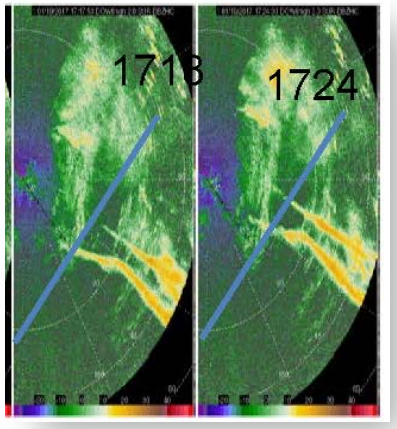
Challenges and Opportunities that May be Addressed in a Pilot Scale Project



Ground Based



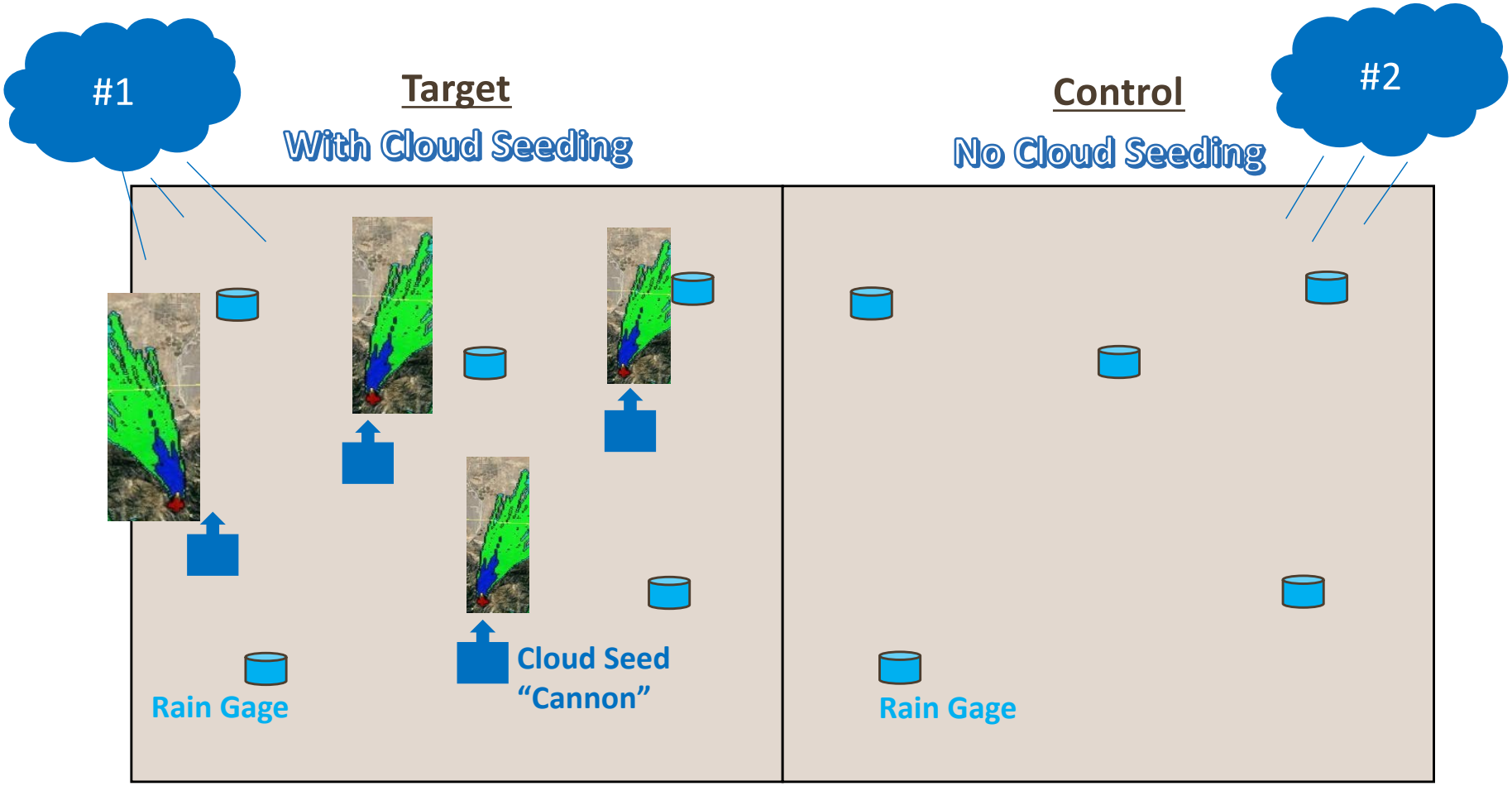
Aerial (Doppler Radar)



Why is it difficult to measure the actual benefit?

- ✓ Areas are not uniform
- ✓ The 3-dimensional dispersion is not uniform and difficult to track in nature in real-time
- ✓ Cloud seeding is not 100% effective across the entire seeded area
- ✓ It is difficult to know whether any measured increase in snow or rain is due to the cloud seeding or to the variability in nature (storm cell)

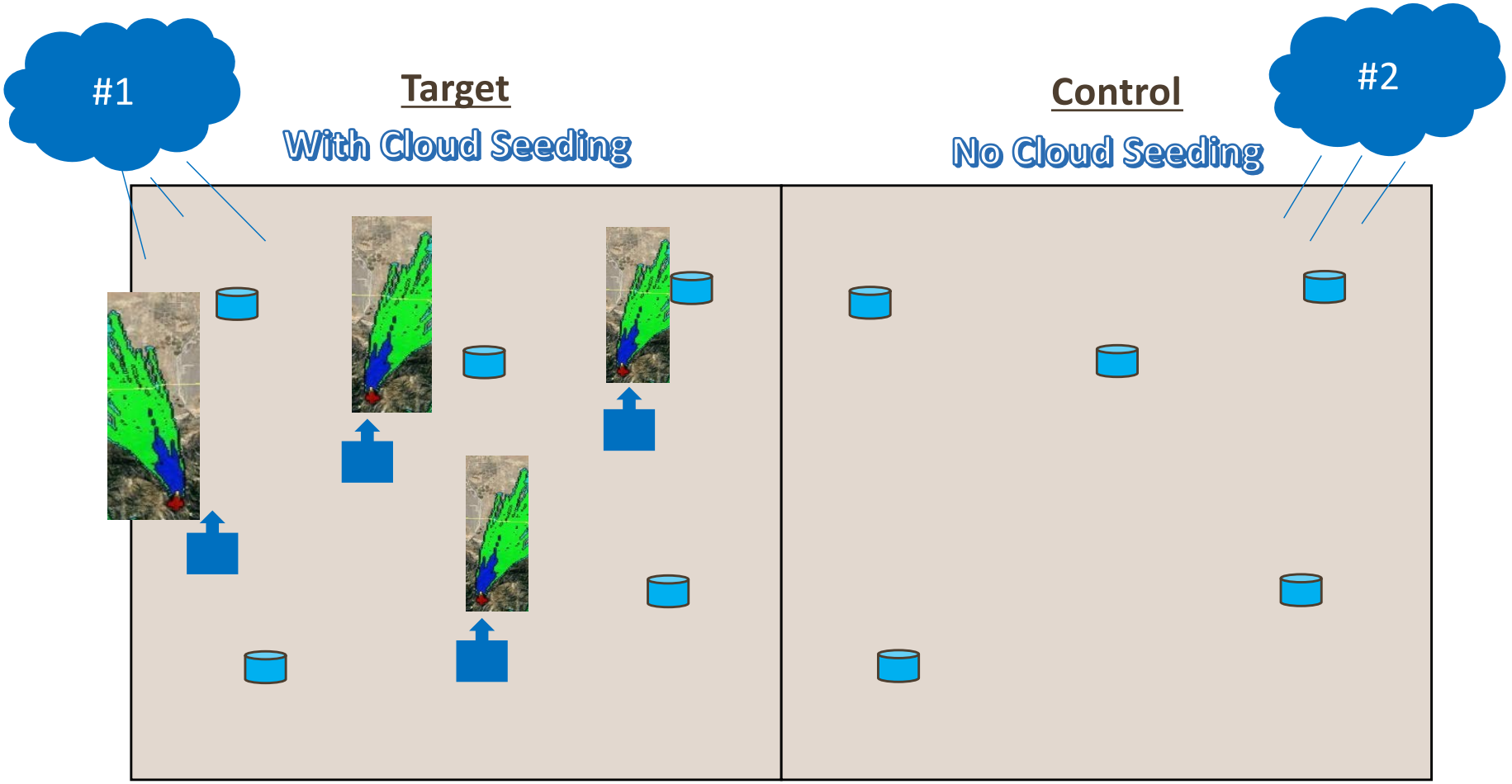
Target-Control Method



Assumptions: #1 = #2

Dispersion area of silver iodide

Target-Control Method

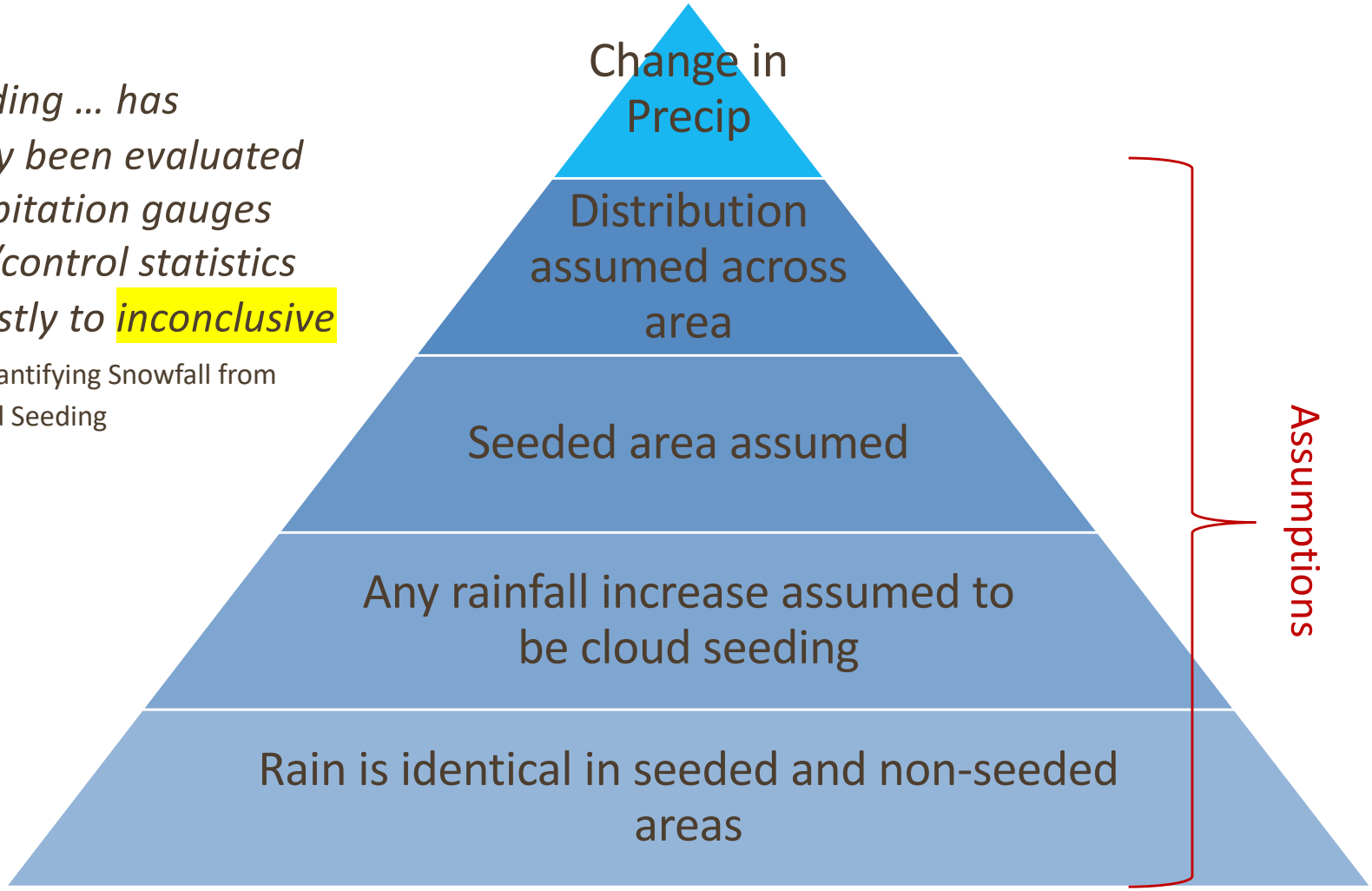


Compare and Difference all due to cloud seeding?

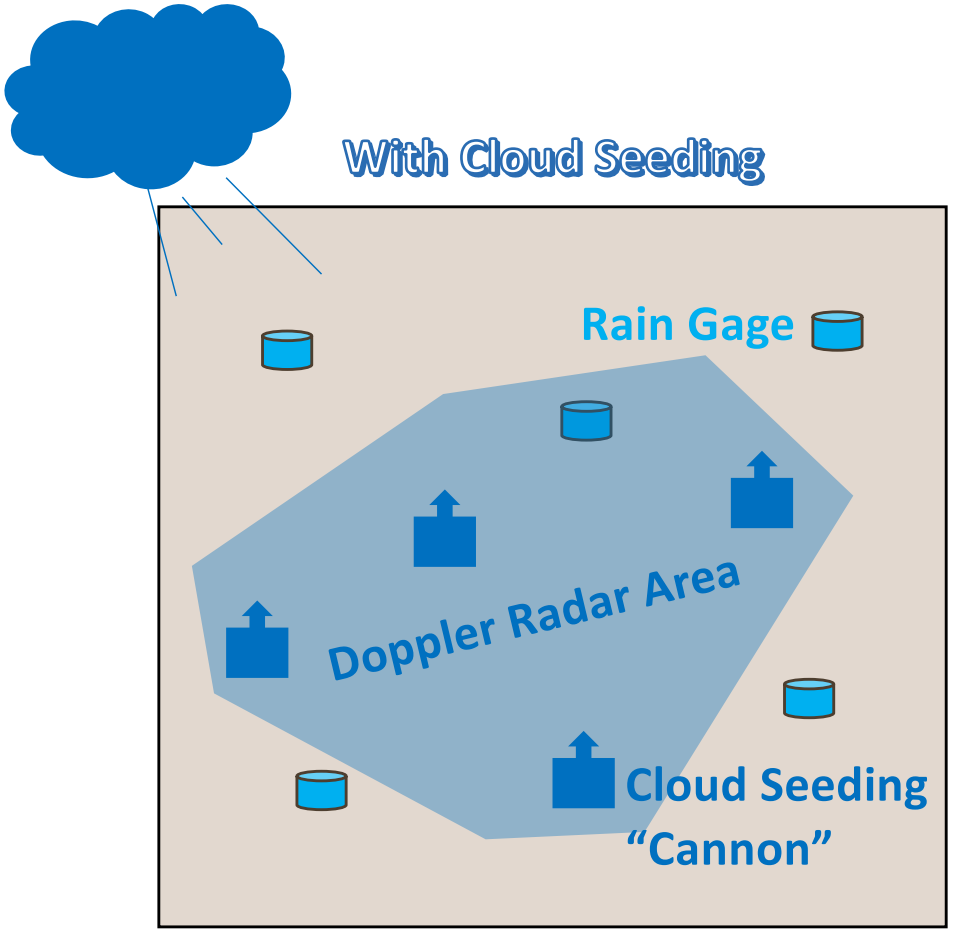
Target-Control Method

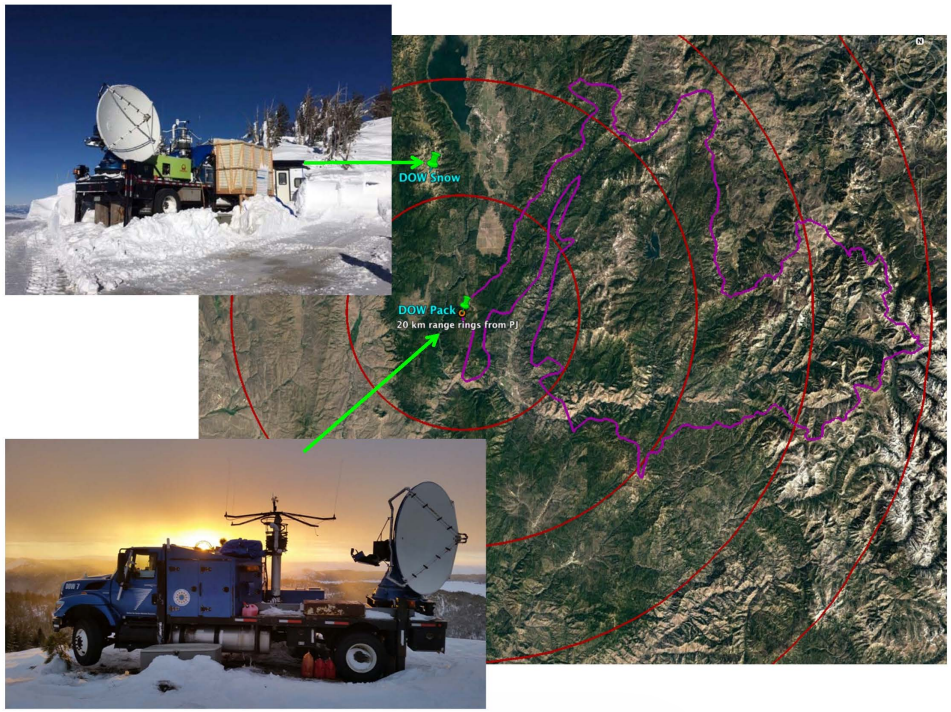
Change in Precipitation Built on Assumptions

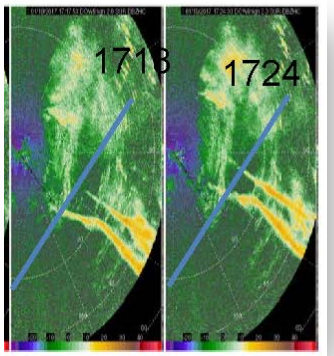
"Cloud seeding … has traditionally been evaluated using precipitation gauges and target/control statistics leading mostly to inconclusive results." Quantifying Snowfall from Orogrpahic Cloud Seeding



Target-Control with Doppler Radar (SNOWIE)





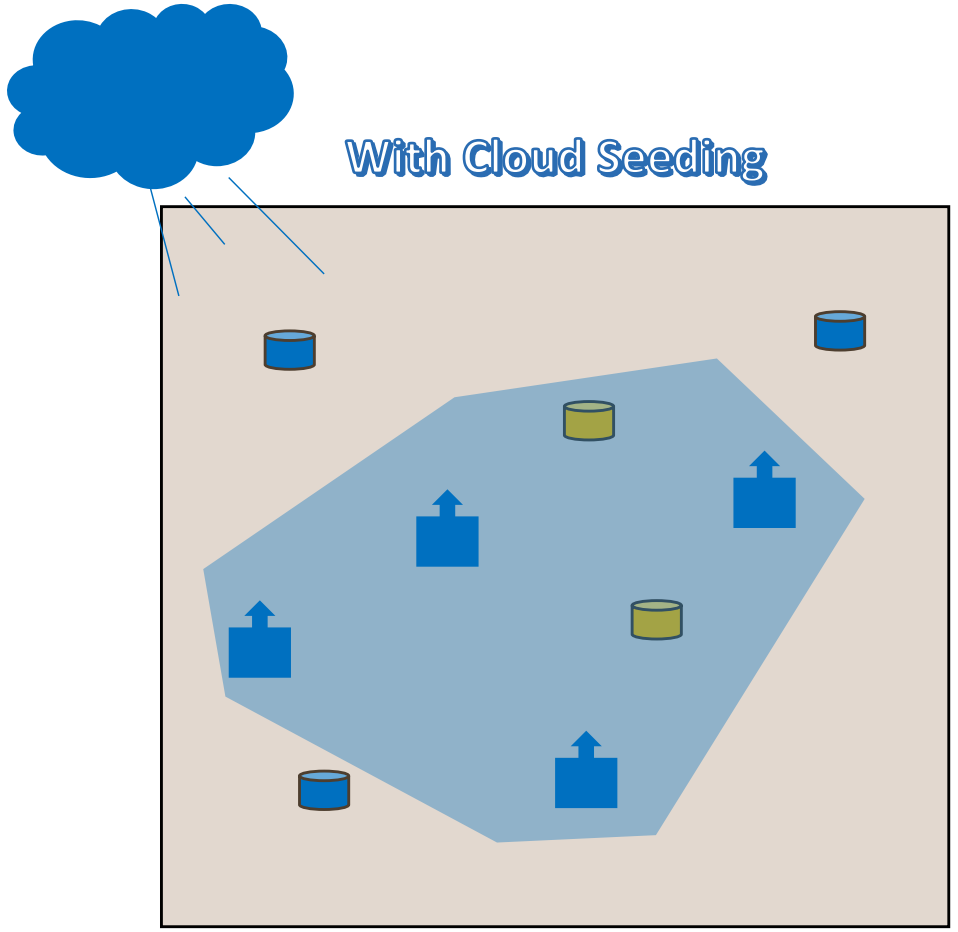


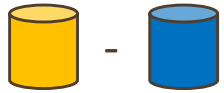
Better defines the "footprint" of the seeded area using Doppler radar

Target-Control with Doppler Radar

"A thorough analysis was conducted to establish a best-match relationship…To address the…related uncertainty, an ensemble of…relationships was also developed…"

Quantifying Snowfall from Orogrpahic Cloud Seeding



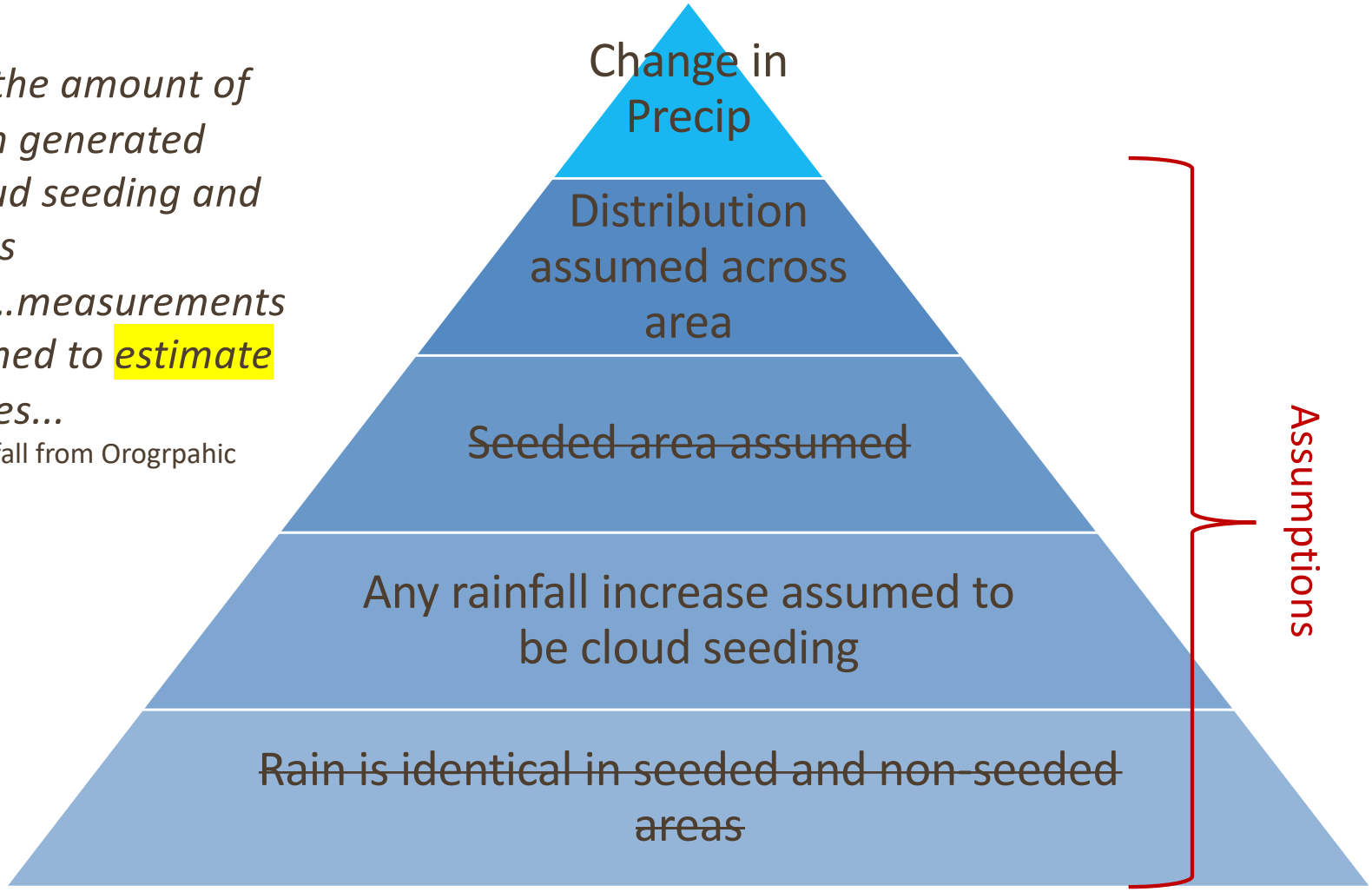
Change in Precipitation 

Target-Control with Doppler Radar

Comparison Built on Assumption

To quantify the amount of precipitation generated through cloud seeding and determine its distribution…measurements …are combined to estimate snowfall rates...

Quantifying Snowfall from Orogrpahic Cloud Seeding



SNOW PACK AUGMENTATION IN THE SAN BERNARDINO MOUNTAINS

WATER YEARS

1976-77

AND

1977-78

by
Norm Caouette

SAN BERNARDINO VALLEY MUNICIPAL WATER DISTRICT

G Louis Fletcher
District Engineer

Valley District's 24-year (1954-78) History with Cloud Seeding

- 1948: a group of cooperators explore the feasibility of cloud seeding in the Santa Ana River watershed
  - Aerial and ground-based
- 1950 - 60: The Santa Ana River Weather Corporation formed. Funding from water agencies including Valley District
- 1954: Valley District formed
- 1960 - 78: Valley District weather modification program
  - 1975: Environmental Impact Report
  - 1976-78: Valley District snowpack augmentation Project

- Louis Fletcher became General Manager and served until 2001. During his tenure, he no longer pursued cloud seeding.

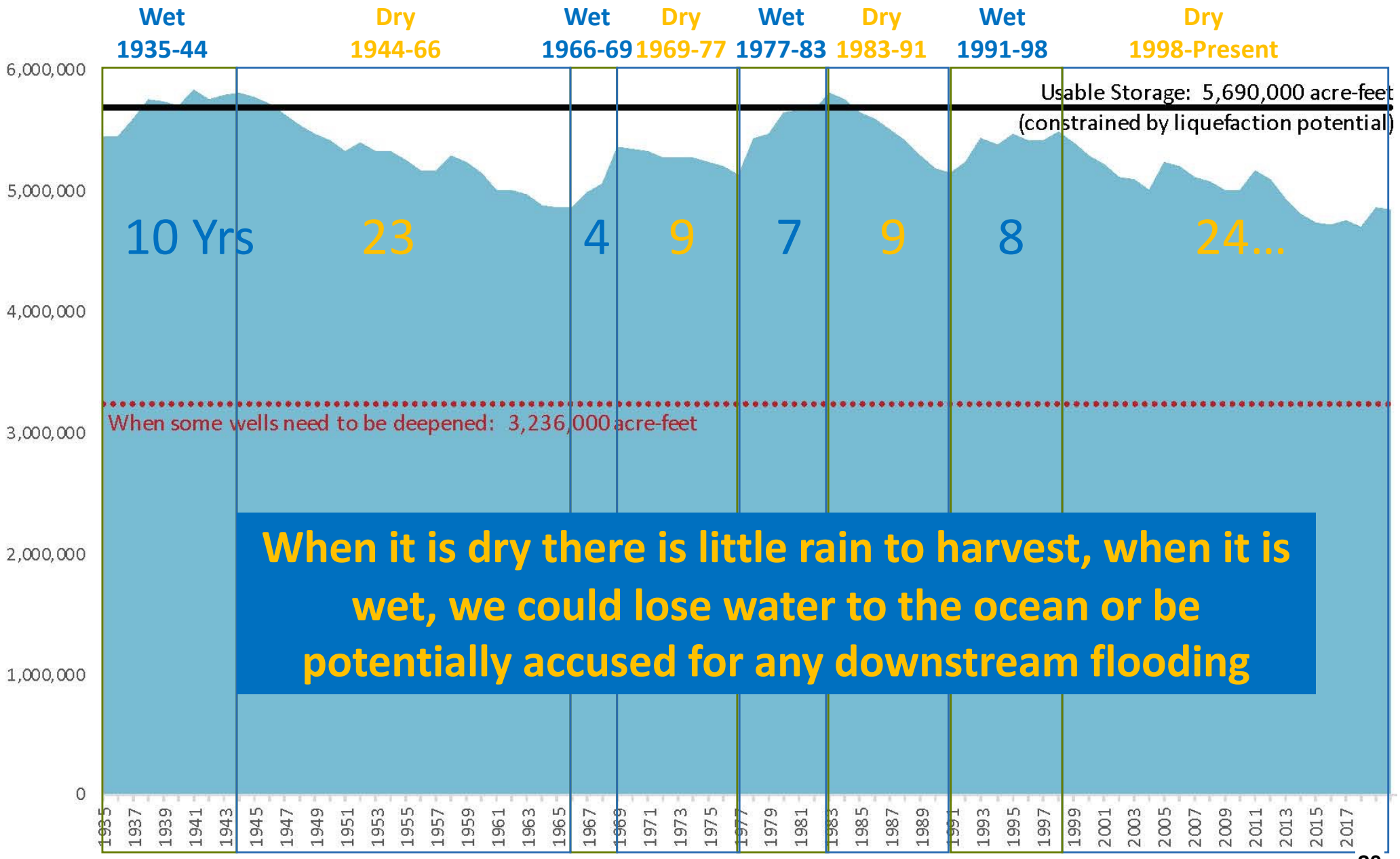
Results from 1976-78 Project

- 1976-77: driest year on record
- 1977-78: 3rd wettest year on record

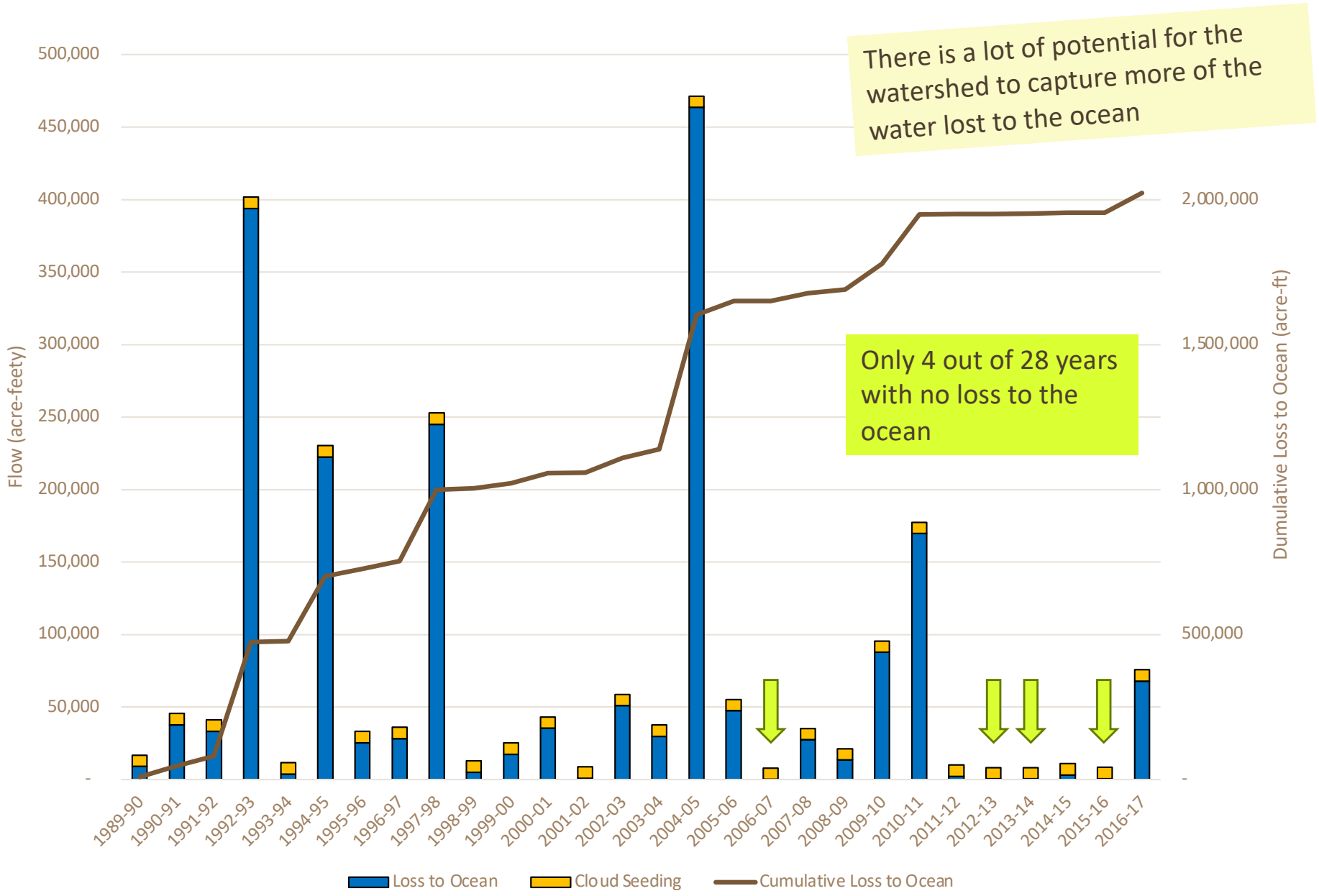
Our typical
"Feast or Famine Hydrology"

- Conclusion:
  - Inconclusive
    - Minimum number of seeding events
    - "Some influence" (not quantified) did occur during one storm

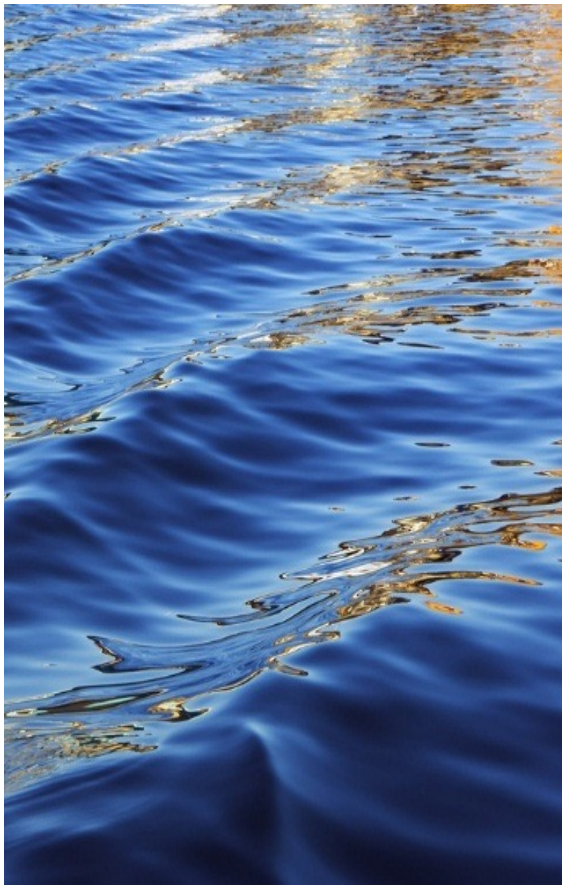
Cloud Seeding will be Challenging with the Watershed's "Feast of Famine" Hydrology



Any Cloud Seeding Benefit Could Flow Into the Ocean



Pilot Scale Project



A Cloud Seeding Pilot Scale Project is Consistent with Our Strategic Plan

RESILIENT.
Resilient to seismic conditions, drought, population growth and climate change.

RESTORATIVE.
Reduce carbon footprint and recover environmental health.

SCIENCE BASED.
Built from reliable regional data shared among all partners.

COST-EFFECTIVE.
Optimize operational efficiency and maximize benefits from ratepayer investments.

INTEGRATED.
Holistically optimize value to the region.

COLLABORATIVE.
Dedicated to work inclusively.

TRUSTWORTHY.
Committed to earn respect.

INNOVATIVE.
Proactive and effective problem- solvers.

DRIVEN.
Passionate and empowered leaders.

OUR *strategies* ARE TO...

1. Achieve climate resilience through prioritized adaptation and mitigation.
2. Proactively manage a diverse, adaptable water supply portfolio to maximize the value of the region's water assets.
3. Drive science-based decision making and proactive risk management.
4. Build trust by being a collaborative and resourceful partner through effective communication and engagement.
5. Attract and support top talent and promote a rewarding culture of growth and opportunity.
6. Commit to effective governance through Board leadership development.

Considerations for a Cloud Seeding Pilot Scale Project

1. To address questions regarding the actual benefit from cloud seeding:

a. Consider independent measurement, analysis and peer review of the results from an entity that has expertise in weather but is not involved in cloud seeding such as the Center for Western Weather and Water Extremes (CW3E), USGS and/or RAND

b. Look for ways to improve the Target-Control method to avoid the possibility that the study results will be inconclusive

c. Provide a list of all assumptions used in the estimation of the benefits

d. Look for a method that can be used to determine the probability that increased precipitation is from cloud seeding and not due to variability in the weather

e. Provide error bands on the results

f. Include SAWPA member agency staff in the process

2. To address questions about cloud seeding benefits possibly flowing into the Ocean:

a. Consider using the watershed's calibrated flow models to track the water from cloud seeding

b. Consider comparing daily flow to the ocean with the estimated cloud seeding benefits to help determine whether the water flowed into the ocean

3. To address questions regarding liability for potential floods:

a. Show how SAWPA will avoid potential liability for any flood events