



# Solar Radiation Management, Research Governance, and Weather Modification Law

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# Domestic laws and governance of solar radiation management research

- Baseline: a network of federal and state environmental, health & safety, and liability laws already provide an ad hoc governance network for research on reflective radiation strategies
- From a descriptive perspective, do these laws and regulations – all designed to apply to different circumstances and risks from reflective radiation research – operate in coherent and desirable ways when applied to that research
  - Transparency
  - Effectiveness
  - Consistent outcomes
  - Resiliency against manipulation

# Research Governance

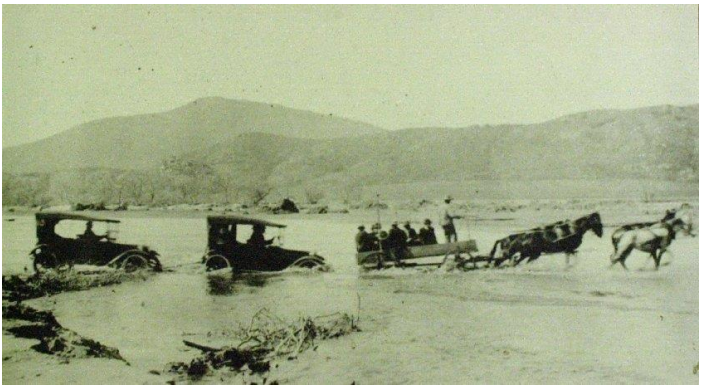
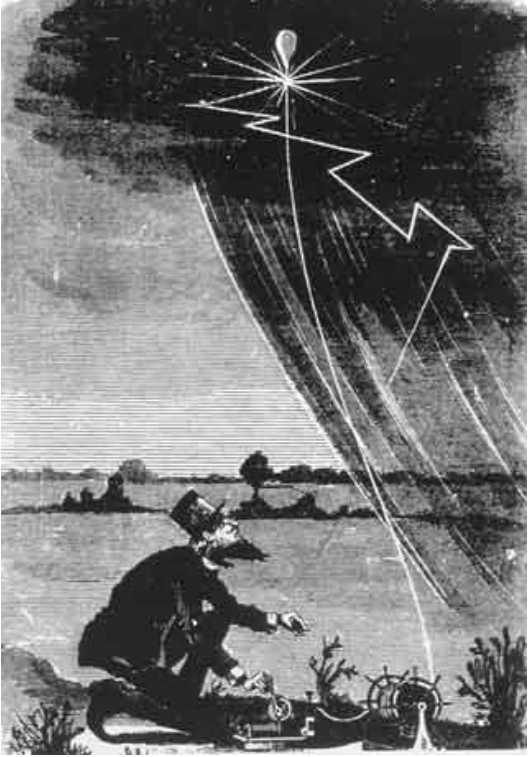
- Drawing the line between research vs application
- Federal and state laws (especially environmental laws) provide some space and flexibility for research projects
  - Substantive legal requirements still apply in background; the research exemptions apply within them
  - Examples:
    - Experimental Use Permits under FIFRA
    - Alternative Compliance Methodologies under CAA
    - Testing consent orders under TSCA
    - Research, Development and Testing Permits for Hazardous Wastes (40 C.F.R. 270.65)
- No existing research exemption in federal environmental laws squarely applies to solar reflective radiation research



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# THE RAINMAKER



# Domestic laws and SRM governance

## NWMA Notification and Liability Mandates

- National Weather Modification Policy Act of 1976
  - Broad definitions, particularly of “weather modification”
  - Mandatory 10-day prior notice, with 45-day follow-up
  - Record-keeping requirements and disclosure
  - Specific notice required for abnormal risks
  - \$10,000 potential fine per violation
- NWMA does not distinguish between research and commercial use of weather modification
- Enforcement concerns
- State laws differ on weather modification permitting

# The National Weather Modification Act and Solar Radiation Management Research

- NWMA section 330(3) defines “weather modification” to include

*Any activity performed with the intention of producing artificial changes to the composition, behavior, or dynamics of the atmosphere.*

- NOAA’s implementing rules (15 C.F.R. 908.3) require reporting of

*[m]odifying the solar radiation exchange of the earth or clouds, through the release of gases, dusts, liquids, or aerosols into the atmosphere*

## NWMA definitions and MCB research

- NOAA's rules to implement the NWMA (15 C.F.R. 908.3(a)(1)) also may separately affect marine cloud brightening and cirrus cloud modification research

- Must report the

[s]eeding or dispersing of any substance into clouds or fog, to alter drop size distribution, produce ice crystals or coagulation of droplets, alter the development of hail or lightning, or influence in any way the natural development cycle of clouds or their environment;

# NWMA Data Clearinghouse

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## NOAA Central Library

National Oceanic and Atmospheric Administration



(<https://library.noaa.gov/>)

### Collections

▶ [Government Documents \(https://noaa.libguides.com/c.php?g=815416\)](https://noaa.libguides.com/c.php?g=815416)

▶ [Digital Collections \(/Collections/Digital-Docs\)](/Collections/Digital-Docs)

▶ [Rare Books & Archival Materials \(/Collections/Rare-Books\)](/Collections/Rare-Books)

▶ [NOAA Photo Library \(/Collections/Photo-Lab\)](/Collections/Photo-Lab)

### Weather Modification Project Reports

#### Publication History & Scope

In the late 1940's and 1950's many deemed "the deliberate or the inadvertent alteration of atmospheric conditions by human activity", also known as weather modification, as a promising science of the future. Currently, the most common form of weather modification is cloud seeding, which increases rain or snow, usually for the purpose of increasing the



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Complete in accordance with instructions on reverse and forward copy:			Form Approved: OMB No. 0648-0025 Expires 12/31/2007		
TO: National Oceanic and Atmospheric Administration Office of Oceanic and Atmospheric Research 1315 East-West Highway SSMC-3 Room 11216 Silver Spring, MD 20910			NOAA FORM 17-4 U.S. DEPARTMENT OF COMMERCE (4-81) NAT'L OCEANIC AND ATMOSPHERIC ADM. INITIAL REPORT ON WEATHER MODIFICATION ACTIVITIES (P.L. 205, 92 <sup>ND</sup> . CONGRESS)		
1. PROJECT OR ACTIVITY DESIGNATION, IF ANY San Gabriel Mountains			2. DATES OF PROJECT		
3. PURPOSE OF PROJECT OR ACTIVITY Increase precipitation.			a. DATE FIRST ACTUAL WEATHER MODIFICATION ACTIVITY IS TO BE UNDERTAKEN 12/15/2015		
			b. EXPECTED TERMINATION DATE OF WEATHER MODIFICATION ACTIVITIES 04/15/2016		
4. (a) SPONSOR			4. (b) OPERATOR		
NAME Keith Hala			NAME Don A. Griffith		
AFFILIATION Los Angeles County Department of Public Work		PHONE NUMBER (626) 458-6186	AFFILIATION North American Weather Consultants (NAWC)		PHONE NUMBER (801) 942-9005
STREET ADDRESS 900 Fremont St.			STREET ADDRESS 8180 S. Highland Dr., Ste. B-2		
CITY Alhambra	STATE CA	ZIP CODE 91803	CITY Sandy	STATE UT	ZIP CODE 84093
5. TARGET AND CONTROL AREAS (See Instructions)					
TARGET AREA			CONTROL AREA		
LOCATION San Gabriel Mountains north of Los Angeles		SIZE OF AREA ~800 SQ.MI	LOCATION Big Bear, Lk. Arrowhead, east of target area.		SIZE OF AREA N.A. SQ.MI.
6. DESCRIPTION OF WEATHER MODIFICATION APPARATUS, MODIFICATION AGENTS AND THEIR DISPERSAL RATES, THE TECHNIQUES EMPLOYED, ETC. (See Instructions)					
Six manually operated silver iodide ground generators will be used; each emitting 8 grams of AgI/hr. Four remotely operated ground-based silver iodide flare trees. Each flare emits 15 grams of seeding material. Generators and flare trees activated when storm conditions meet					

# U.S. Laws and SRM research governance

## Liability Principles

- Tort liability
  - Tort liability risks for reflective radiation field research – causation, preemption/displacement, state law options
  - Prior example: nanoscale material research liability
  - Complications: liability shields under state weather modification laws, state tort reform statutes, sovereign immunity, SLAPPs
- Insurance and risk management – exclusions from coverage; environmental impairment liability coverage