



COLORADO

**Department of
Regulatory Agencies**

Colorado Office of Policy, Research &
Regulatory Reform

**2017 Sunset Review:
Weather Modification Act of 1972**

October 13, 2017



COLORADO

**Department of
Regulatory Agencies**

Executive Director's Office

October 13, 2017

Members of the Colorado General Assembly
c/o the Office of Legislative Legal Services
State Capitol Building
Denver, Colorado 80203

Dear Members of the General Assembly:

The Colorado General Assembly established the sunset review process in 1976 as a way to analyze and evaluate regulatory programs and determine the least restrictive regulation consistent with the public interest. Since that time, Colorado's sunset process has gained national recognition and is routinely highlighted as a best practice as governments seek to streamline regulation and increase efficiencies.

Section 24-34-104(5)(a), Colorado Revised Statutes (C.R.S.), directs the Department of Regulatory Agencies to:

- Conduct an analysis of the performance of each division, board or agency or each function scheduled for termination; and
- Submit a report and supporting materials to the office of legislative legal services no later than October 15 of the year preceding the date established for termination.

The Colorado Office of Policy, Research and Regulatory Reform (COPRRR), located within my office, is responsible for fulfilling these statutory mandates. Accordingly, COPRRR has completed the evaluation of the Colorado Water Conservation Board's (CWCB) weather modification program. I am pleased to submit this written report, which will be the basis for COPRRR's oral testimony before the 2018 legislative committee of reference.

The report discusses the question of whether there is a need for the regulation provided under Article 20 of Title 36, C.R.S. The report also discusses the effectiveness of the CWCB and staff in carrying out the intent of the statutes and makes recommendations for statutory changes in the event this regulatory program is continued by the General Assembly.

Sincerely,

Marguerite Salazar
Executive Director





COLORADO

Department of Regulatory Agencies

Colorado Office of Policy, Research &
Regulatory Reform

2017 Sunset Review Weather Modification Act of 1972

SUMMARY

What is regulated?

Weather modification, or cloud seeding, endeavors to draw more precipitation from clouds than would occur naturally. Weather modification technology has been in general use since the 1940s and in Colorado since the 1950s.

Why is it regulated?

Beginning in 1951, when the General Assembly enacted the Weather Control Act, the precursor to the Weather Modification Act of 1972 (Act), Colorado claimed the right to all moisture suspended in the atmosphere that fell into Colorado. The Weather Control Act declared a right to increase precipitation by artificial means, so long as doing so did not cause material damage to others.

Who is regulated?

From fiscal year 11-12 through fiscal year 15-16, the Colorado Water Conservation Board (CWCB) issued seven weather modification permits for wintertime cloud seeding.

How is it regulated?

Typically, a water conservancy district or coalition of interests hires an operator who will acquire a permit and perform the weather modification operations.

After a permit application has been submitted, the applicant must participate in public hearings to determine public opinion and establish the terms of a permit. After the hearings are held, the CWCB-staff issues a decision.

The permits sanction cloud seeding five months of the year, typically November 1 through March 31, and are issued for five consecutive years. If a permit has been issued twice consecutively, it may be issued for 10 years.

All of the programs currently operating in Colorado are ground-based and are meant to enhance the snowpack.

What does it cost?

The CWCB expended \$15,308 and allotted 0.15 full-time equivalent employees on administration of the Act during fiscal year 15-16.

KEY RECOMMENDATIONS

Continue the Act for 15 years, until 2033.

The regulatory program established under the Act protects the public health, safety, and welfare in four main ways:

- It controls where weather modification operations are located,
- It provides for public hearings to be held in the area where an operation will take place prior to the decision to permit,
- It controls who receives a permit, and
- It has the ability to cease operations based on a high snow pack or avalanche danger.

The Act protects public interests by controlling where, who, and, most importantly, when, weather modification operations take place.

Repeal the provision which prohibits weather modification unless there is a quid pro quo.

The Act prohibits weather modification operations in Colorado that benefit another state if the other state prohibits weather modification that would benefit Colorado. Colorado only prohibits weather modifications “if” another state prohibits them. In essence this section embodies and legalizes coercion by threatening to withhold water. It represents highly restrictive regulation without definitive public interest.

METHODOLOGY

As part of this review, Colorado Office of Policy, Research and Regulatory Reform staff attended CWCB meetings; interviewed CWCB staff, officials with Colorado water conservancy districts, permittees, operators, and other stakeholders; reviewed Colorado law and program records.

MAJOR CONTACTS MADE DURING THIS REVIEW

City of Grand Junction
Colorado Water Conservation Board
Dolores Water Conservancy District
Desert Research Institute
North American Weather Consultants
Office of the Colorado Attorney General
Water Enhancement Authority for the Grand Mesa
Western Weather Consultants

What is a Sunset Review?

A sunset review is a periodic assessment of state boards, programs, and functions to determine whether they should be continued by the legislature. Sunset reviews focus on creating the least restrictive form of regulation consistent with protecting the public. In formulating recommendations, sunset reviews consider the public's right to consistent, high quality professional or occupational services and the ability of businesses to exist and thrive in a competitive market, free from unnecessary regulation.

Sunset Reviews are prepared by:
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Background

Introduction

Enacted in 1976, Colorado's sunset law was the first of its kind in the United States. A sunset provision repeals all or part of a law after a specific date, unless the legislature affirmatively acts to extend it. During the sunset review process, the Colorado Office of Policy, Research and Regulatory Reform (COPRRR) within the Department of Regulatory Agencies (DORA) conducts a thorough evaluation of such programs based upon specific statutory criteria¹ and solicits diverse input from a broad spectrum of stakeholders including consumers, government agencies, public advocacy groups, and professional associations.

Sunset reviews are based on the following statutory criteria:

- Whether regulation by the agency is necessary to protect the public health, safety and welfare; whether the conditions which led to the initial regulation have changed; and whether other conditions have arisen which would warrant more, less or the same degree of regulation;
- If regulation is necessary, whether the existing statutes and regulations establish the least restrictive form of regulation consistent with the public interest, considering other available regulatory mechanisms and whether agency rules enhance the public interest and are within the scope of legislative intent;
- Whether the agency operates in the public interest and whether its operation is impeded or enhanced by existing statutes, rules, procedures and practices and any other circumstances, including budgetary, resource and personnel matters;
- Whether an analysis of agency operations indicates that the agency performs its statutory duties efficiently and effectively;
- Whether the composition of the agency's board or commission adequately represents the public interest and whether the agency encourages public participation in its decisions rather than participation only by the people it regulates;
- The economic impact of regulation and, if national economic information is not available, whether the agency stimulates or restricts competition;
- Whether complaint, investigation and disciplinary procedures adequately protect the public and whether final dispositions of complaints are in the public interest or self-serving to the profession;
- Whether the scope of practice of the regulated occupation contributes to the optimum utilization of personnel and whether entry requirements encourage affirmative action;

¹ Criteria may be found at § 24-34-104, C.R.S.

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- Whether the agency through its licensing or certification process imposes any disqualifications on applicants based on past criminal history and, if so, whether the disqualifications serve public safety or commercial or consumer protection interests. To assist in considering this factor, the analysis prepared pursuant to subparagraph (i) of paragraph (a) of subsection (8) of this section shall include data on the number of licenses or certifications that were denied, revoked, or suspended based on a disqualification and the basis for the disqualification; and
 - Whether administrative and statutory changes are necessary to improve agency operations to enhance the public interest.

Consistent, flexible, and fair regulatory oversight assures consumers, professionals and businesses an equitable playing field. All Coloradans share a long-term, common interest in a fair marketplace where consumers are protected. Regulation, if done appropriately, should protect consumers. If consumers are not better protected and competition is hindered, then regulation may not be the answer.

As regulatory programs relate to individual professionals, such programs typically entail the establishment of minimum standards for initial entry and continued participation in a given profession or occupation. This serves to protect the public from incompetent practitioners. Similarly, such programs provide a vehicle for limiting or removing from practice those practitioners deemed to have harmed the public.

From a practitioner perspective, regulation can lead to increased prestige and higher income. Accordingly, regulatory programs are often championed by those who will be the subject of regulation.

On the other hand, by erecting barriers to entry into a given profession or occupation, even when justified, regulation can serve to restrict the supply of practitioners. This not only limits consumer choice, but can also lead to an increase in the cost of services.

There are also several levels of regulation.

Licensure

Licensure is the most restrictive form of regulation, yet it provides the greatest level of public protection. Licensing programs typically involve the completion of a prescribed educational program (usually college level or higher) and the passage of an examination that is designed to measure a minimal level of competency. These types of programs usually entail title protection - only those individuals who are properly licensed may use a particular title(s) - and practice exclusivity - only those individuals who are properly licensed may engage in the particular practice. While these requirements can be viewed as barriers to entry, they also afford the highest level of consumer protection in that they ensure that only those who are deemed competent may practice and the public is alerted to those who may practice by the title(s) used.

Certification

Certification programs offer a level of consumer protection similar to licensing programs, but the barriers to entry are generally lower. The required educational program may be more vocational in nature, but the required examination should still measure a minimal level of competency. Additionally, certification programs typically involve a non-governmental entity that establishes the training requirements and owns and administers the examination. State certification is made conditional upon the individual practitioner obtaining and maintaining the relevant private credential. These types of programs also usually entail title protection and practice exclusivity.

While the aforementioned requirements can still be viewed as barriers to entry, they afford a level of consumer protection that is lower than a licensing program. They ensure that only those who are deemed competent may practice and the public is alerted to those who may practice by the title(s) used.

Registration

Registration programs can serve to protect the public with minimal barriers to entry. A typical registration program involves an individual satisfying certain prescribed requirements - typically non-practice related items, such as insurance or the use of a disclosure form - and the state, in turn, placing that individual on the pertinent registry. These types of programs can entail title protection and practice exclusivity. Since the barriers to entry in registration programs are relatively low, registration programs are generally best suited to those professions and occupations where the risk of public harm is relatively low, but nevertheless present. In short, registration programs serve to notify the state of which individuals are engaging in the relevant practice and to notify the public of those who may practice by the title(s) used.

Title Protection

Finally, title protection programs represent one of the lowest levels of regulation. Only those who satisfy certain prescribed requirements may use the relevant prescribed title(s). Practitioners need not register or otherwise notify the state that they are engaging in the relevant practice, and practice exclusivity does not attach. In other words, anyone may engage in the particular practice, but only those who satisfy the prescribed requirements may use the enumerated title(s). This serves to indirectly ensure a minimal level of competency - depending upon the prescribed preconditions for use of the protected title(s) - and the public is alerted to the qualifications of those who may use the particular title(s).

Licensing, certification and registration programs also typically involve some kind of mechanism for removing individuals from practice when such individuals engage in enumerated proscribed activities. This is generally not the case with title protection programs.

Regulation of Businesses

Regulatory programs involving businesses are typically in place to enhance public safety, as with a salon or pharmacy. These programs also help to ensure financial solvency and reliability of continued service for consumers, such as with a public utility, a bank or an insurance company.

Activities can involve auditing of certain capital, bookkeeping and other recordkeeping requirements, such as filing quarterly financial statements with the regulator. Other programs may require onsite examinations of financial records, safety features or service records.

Although these programs are intended to enhance public protection and reliability of service for consumers, costs of compliance are a factor. These administrative costs, if too burdensome, may be passed on to consumers.

Sunset Process

Regulatory programs scheduled for sunset review receive a comprehensive analysis. The review includes a thorough dialogue with agency officials, representatives of the regulated profession and other stakeholders. Anyone can submit input on any upcoming sunrise or sunset review on COPRRR's website at: www.dora.colorado.gov/opr.

The functions of the Colorado Water Conservation Board (CWCB) as enumerated in Article 20 of Title 36, Colorado Revised Statutes (C.R.S.), shall terminate on September 1, 2018, unless continued by the General Assembly. During the year prior to this date, it is the duty of COPRRR to conduct an analysis and evaluation of the program pursuant to section 24-34-104, C.R.S.

The purpose of this review is to determine whether the currently prescribed program to regulate weather modification operations should be continued and to evaluate the performance of the CWCB and staff. During this review, the CWCB must demonstrate that the program serves the public interest. COPRRR's findings and recommendations are submitted via this report to the Office of Legislative Legal Services.

Methodology

As part of this review, Colorado Office of Policy, Research and Regulatory Reform staff attended CWCB meetings; interviewed CWCB staff, officials with Colorado water conservancy districts, permittees, operators, and other stakeholders; reviewed Colorado law and program records.

Profile of Weather Modification in Colorado

Humidity in Colorado is generally quite low because of the state's distance from major sources of moisture such as the Pacific Ocean and the Gulf of Mexico. Therefore, precipitation is generally light in the state's lower elevations. Prevailing air currents reach Colorado from westerly directions. Storms originating in the Pacific Ocean lose much of their moisture falling as rain or snow on the mountaintops and westward-facing slopes. Eastern slope areas receive relatively small amounts of precipitation from these storms, particularly in mid-winter.²

Colorado is a headwaters state with eight major watersheds and several major river systems including the Colorado, Platte, and Arkansas rivers originating in the state. Mountain snow plays a critical role in the hydrological cycle for most western states, stockpiling water during the winter and releasing it to the streams as runoff in the spring and early summer. This helps meet the demand for water. In the West, as much as 70 percent of the region's precipitation falls during winter. States are critically dependent on winter precipitation. The region's rivers tap winter snows in the Rocky Mountains for approximately 70 percent of their annual water flow.

Two methods of weather modification, winter-time snowpack and summer-time precipitation augmentation, have been used around the world since the 1940s.³ Weather modification research has taken place in Colorado since the 1950s and the first program was at the Vail ski resort in the 1970s. There are more than 40 entities, including towns, counties, water districts and ski areas that participate in what is commonly referred to as cloud seeding.⁴

Winter orographic cloud seeding occurs when a silver iodide (AgI) solution is sprayed across a propane flame from a ground-based generator. When the AgI is released into atmospheric conditions that include super-cooled water droplets, it forms ice crystals that turn into snowflakes which fall in the targeted area.⁵

The CWCB authorizes projects that permit cloud seeding from November through March.⁶ Though aircraft-based seeding is allowed under Colorado law, there are no operations currently active in Colorado.⁷

Ground-based cloud seeding generators can be operated either manually or remotely, within or outside of a target area. Remotely operated generators and radiometers use more up-to-date technology and allow for seeding in relatively inaccessible locations, the ability to monitor conditions and update them continuously, and the ability to turn the system on and off as conditions change.⁸

² Colorado State University, Colorado Climate Center. Learn About the Climate of Colorado. Retrieved September 6, 2017, from http://climate.colostate.edu/climate_long.html

³ Wilson Water Group. *Inventory and Assessment of Colorado Weather Modification Programs* (2015). Colorado Water Conservation Board, p.6.

⁴ *Ibid.* p.9-10.

⁵ *Ibid.* p.6.

⁶ *Ibid.* p.5.

⁷ *Ibid.* p.7.

⁸ *Ibid.* p.7 and p.18.

The CWCB and the Weather Modification Association agree that cloud seeding programs can increase precipitation 5 to 15 percent in the target areas without creating adverse environmental effects or limiting precipitation in other areas.⁹

The programs are funded through multiple mechanisms including: program sponsors, the State of Colorado, and entities from the Lower Basin States of the Colorado River Basin.

While cloud seeding is in fairly widespread use and widely accepted, it has not been statistically proven to work. According to some researchers, studies which determine an increase in precipitation lacked statistical rigor. Performing controlled experiments in cloud seeding studies is a challenge for multiple reasons. The main variable is that there is no way to determine how much rain or snow would have occurred naturally, without seeding. Even the basic mechanics underlying the crystallization of water molecules on seeding agents remains mysterious.¹⁰

There are concerns in some circles about environmental effects because silver is toxic to aquatic life. However, the levels found in surface water post-seeding are far below the toxic threshold. Other concerns surround the notion of changing precipitation patterns. However, because clouds represent a modest amount of moisture in the atmosphere, it is unlikely that cloud seeding would steal moisture from places downwind. The effect of weather modification procedures, given a 15 percent effect, would only remove one to two percent of the water vapor in the affected area.¹¹

⁹ *Ibid.* p. 8.

¹⁰ Chemical and Engineering News, Janet Pelley. *Does cloud seeding really work?* Retrieved July 10, 2017, from <http://cen.acs.org/articles/94/i22/Does-cloud-seeding-really-work.html>

¹¹ *Ibid.*

Legal Framework

History of Regulation

In 1951, the General Assembly enacted the Weather Control Act (WCA). The WCA claimed the right to all moisture suspended in the atmosphere that fell into Colorado and declared a right to increase precipitation by artificial means, so long as doing so did not cause material damage to others. A five-member commission was empowered to require anyone conducting weather control or weather modification operations to obtain a license from the Commissioner of Agriculture.

In 1963, administration of the WCA was transferred from the Commissioner of Agriculture to the Executive Director of the Department of Natural Resources (Executive Director and DNR, respectively).

The General Assembly performed a substantial rewrite of the WCA in 1972. The product is the Weather Modification Act of 1972 (Act), which, among other things:

- Created a 10-member technical advisory committee (repealed in 1992);
- Required each weather modification operation to be individually permitted;
- Required publication of proposed weather modification operations; and
- Required that public hearings be held before permits are issued.

In 1979, the criminal penalty for operating without a permit changed from a misdemeanor to a felony. The General Assembly also required the Executive Director to report to the Federal Aviation Administration anyone operating a weather modification operation from an airplane without a permit.

In 1987, the Executive Director delegated the authority to administer the Act to the Colorado Water Conservation Board (CWCB) where program implementation resides today.

The Act underwent its first sunset review in 1995. Senate Bill 96-90, the sunset review bill, repealed the licensing requirements for individuals, repealed specific reporting requirements, and authorized the Executive Director to establish reporting requirements by rule.

The most recent sunset review, conducted in 2010, noted that the program's rules had not been revised in 24 years. The Colorado Office of Policy, Research, and Regulatory Reform recommended that the General Assembly require a revision, which it did. The rule revision was completed as directed and the current rules became effective June 30, 2012.

Legal Summary

Understanding the economic benefits that may result from weather modification, the General Assembly adopted the Weather Modification Act of 1972 (Act). The Act encourages operations, research, experimentation, and development in the field of weather modification. The Act also minimizes adverse effects, encourages proper safeguards, and produces accurate information concerning weather modification enterprises.¹² A key element of the Act is that in its Declaration of Rights, “Colorado claims the right to all moisture suspended in the atmosphere which falls ... within its borders ... to be the property of the people of [Colorado].”¹³ The declaration also, “claims the right to modify weather as it affects the people” Notwithstanding, if another state prohibits weather modification operations that benefit Colorado, Colorado cannot allow operations that will benefit the other state.¹⁴

As defined in the Act, weather modification is, “any program, operation, or experiment intended to induce changes in the composition, behavior, or dynamics of the atmosphere by artificial means.”¹⁵

The Executive Director is empowered, to administer the Act, which includes the ability to promulgate rules for its implementation.¹⁶ He or she is also directed to aid in research in several ways including developing standards, investigating issues, holding hearings, engaging experts, and contracting research services. The Executive Director is also the state’s representative in interstate matters and intrastate negotiations among local governments.¹⁷

Permits

It is a violation of the Act for a person to engage in weather modification activities without obtaining a permit.¹⁸ Failing to obtain the permit prior to conducting an operation constitutes negligence *per se* under the Act. A cease and desist order may be issued for un-permitted operations. Failing to obey the order is a class 6 felony.¹⁹ The Executive Director may provide permit exemptions for certain research and emergency processes.²⁰

¹² § 36-20-102, C.R.S.

¹³ § 36-20-103, C.R.S.

¹⁴ § 36-20-118, C.R.S.

¹⁵ § 36-20-104(10), C.R.S.

¹⁶ §§ 36-20-105 and 107, C.R.S.

¹⁷ §§ 36-20-108(2) through (9), C.R.S.

¹⁸ § 36-20-109(1), C.R.S.

¹⁹ §36-20-123(2), C.R.S.

²⁰ § 36-20-109(2), C.R.S.

The Executive Director issues permits to weather modification operations²¹ for specific areas and times. Permits for ground-based winter cloud seeding are issued for five years.²² Non-ground-based winter cloud seeding permits may not last longer than one calendar year.²³ Only one active permit may be issued in areas where two or more projects might hamper one another.²⁴ Prior to the issuance of a permit, there must be a public hearing, “within a reasonable proximity of the area expected to be affected by the proposed operation.”²⁵

The Act directs the Executive Director to issue a permit to an applicant that:²⁶

- Pays the applicable fees;
- Provides proof of financial responsibility;
 - A prepaid insurance policy is acceptable but not required. The policy must have a 30-day pre-cancellation notification to the Executive Director.
- Submits a complete operational plan;
- Publishes a notice of intent to modify the weather in affected counties; and
- Provides requested information concerning the qualifications, education, and experience of the operator.

However, the permit cannot be issued unless it is determined from the hearing and the operational plan that the project:²⁷

- Has a reasonable expectation of benefit;
- Is scientifically and technically feasible;
- Does not involve a high degree of risk of substantial harm to land, people, health, safety, property, or the environment;
- Is designed to include adequate safeguards;
- Will not adversely affect another project; and
- Is designed to minimize risk and maximize scientific gains or economic benefits.

An applicant who makes a false statement on an application or who fails to file a required report commits a misdemeanor and, if convicted, may be fined up to \$5,000, jailed up to six months, or both. Each such violation is a separate offense.²⁸

The fee for a permit and its renewal is at least \$100 for a commercial project but must be enough to cover the costs associated with application processing, public hearings, and monitoring of permit operations under the Act.²⁹

Once a permit has been issued, the permittee may only act within the time and area specified in the permit, and must comply with all other permit specifications.³⁰

²¹ § 36-20-105(2), C.R.S.

²² § 36-20-108(1), C.R.S.

²³ § 36-20-114(1), C.R.S.

²⁴ § 36-20-108(1), C.R.S.

²⁵ § 36-20-112(2), C.R.S.

²⁶ § 36-20-112(1), C.R.S.

²⁷ § 36-20-112(3), C.R.S.

²⁸ § 36-20-126(2), C.R.S.

²⁹ § 30-20-113, C.R.S.

³⁰ § 36-20-116, C.R.S.

Unless a permit is for ground-based, winter cloud seeding, a separate annual permit is required for each operation. If an operation is conducted under a contract, a separate permit is required for each contract.³¹ Under certain circumstances, the Executive Director may conditionally approve these permits for more than one year.³²

The Executive Director also is empowered to grant an emergency permit without publication of notice in cases of fire, frost, hail, sleet, smog, fog, drought, or other emergencies. In those cases, publication must occur as soon as possible.³³

If it appears that the operator is no longer qualified or has violated any provision of the Act, the Executive Director may suspend or revoke a permit.³⁴ A permit may not be suspended or revoked without a hearing conducted by an administrative law judge.³⁵ The Executive Director may also refuse to issue another permit to an applicant that did not comply with the Act.³⁶ All actions taken under the Act are subject to judicial review under the State Administrative Procedure Act.³⁷

The Executive Director may revise the terms and conditions of a permit if the operator is given notice and hearing and a revision is needed to protect the environment, health, or property.³⁸ However, if an emergency could endanger life, property, or the environment, the Executive Director may modify the conditions of a permit by order without prior notice or a hearing. The issuance of the order must include notice of a hearing, to be held within 10 days, to determine if permanently modifying the conditions is necessary. Failure to comply with an order is grounds for immediate revocation of the permit.³⁹

³¹ § 36-20-114(1), C.R.S.

³² §§ 36-20-114(1) and -114(2), C.R.S.

³³ § 36-20-114(3), C.R.S.

³⁴ § 36-20-119(1), C.R.S.

³⁵ § 36-20-121, C.R.S.

³⁶ § 36-20-119(2), C.R.S.

³⁷ § 36-20-125, C.R.S.

³⁸ § 36-20-115(1), C.R.S.

³⁹ § 36-20-115(2), C.R.S.

Program Description and Administration

The Weather Modification Act of 1972 (Act) is administered through the Colorado Department of Natural Resources (DNR). The Executive Director of DNR has designated the Colorado Water Conservation Board (CWCB) to implement the provisions of the Act.⁴⁰ The program established to administer the Act, issues permits to qualified weather modification operations throughout the state. Table 1 shows the monetary expenditures and full-time equivalent (FTE) employees associated with implementation.

Table 1
Weather Modification Program Expenditures
Fiscal Years 11-12 through 15-16

| Fiscal Year | Total Program Expenditures | FTE |
|-------------|----------------------------|------|
| 11-12 | \$6,495 | 0.15 |
| 12-13 | \$9,361 | 0.15 |
| 13-14 | \$13,972 | 0.15 |
| 14-15 | \$19,400 | 0.15 |
| 15-16 | \$15,308 | 0.15 |

Both the monetary expenditure and FTE associated with program implementation are minimal. The FTE remained steady throughout the period examined for this sunset review. The cash expenditures varied slightly but did increase overall from the beginning of the analytical period to the end. Staff explained that the increase is due to more staff time in the field which increased costs slightly. The dollars expended do not include those expended on the FTE or Office of the Colorado Attorney General representation, which are paid from the DNR General Fund budget. The dollars enumerated reflect program travel, studies, evaluations, and professional organization membership for program staff.

Permits

Prior to performing weather modification activities, an operation must obtain a permit. An application for a permit is required to be submitted at least 45 days prior to the commencing of an operation.⁴¹

⁴⁰ 2 CCR 401-1, Colorado Weather Modification Rule 2.

⁴¹ 2 CCR 401-1, Colorado Weather Modification Rule 5.A.

The weather modification operator, the actual contractor who conducts the weather modification operation,⁴² must prove that he or she possesses one of the following qualifications:

- A minimum of four years of field experience in the management and control of weather modification operations or research, and a degree in engineering, the physical sciences, or meteorology;
- A certification by the Weather Modification Association as a Certified Operator; or
- Other training and relevant experience that the CWCB accepts as indicative of sufficient competence in the field of weather modification activities.

An operator must be available to the CWCB whenever weather modification activities are occurring.⁴³

The permit application is required to include several justifications and explanations including:⁴⁴

- The objectives of the proposed weather modification operation;
- The specific time period for the operation;
- Technical feasibility and scientific documentation that the proposed form of weather modification is viable and likely to produce the intended effect;
- An explanation of how the operation will be carried out, including, the location of the office, weather data used, aircraft types, seeding devices and material, and seeding rates;
- An explanation of economic benefit to the target area (applicable only to commercial operations);
- An explanation of expected benefit to both persons living in the target area and the people of Colorado;
- An explanation of how other weather modification operations and research projects could be adversely affected by the proposed operation, if applicable; and
- An explanation of significant expected negative ecological impacts.

After a permit application is submitted, the applicant must publish the application in local newspapers and participate in public hearings. The purpose of the hearing is to gauge public support and establish the terms of a permit. An applicant must define where and what equipment is going to be used, the project sponsors, the operator's qualifications, and liability insurance information. After the hearings are held, the CWCB-staff issues a decision and, if approved, a permit. No permits were denied during the period analyzed for this sunset review, fiscal years 11-12 through 15-16.

All of the programs currently operating in Colorado are ground-based and are meant to enhance the snowpack.

⁴² § 36-20-104(4.5), C.R.S.

⁴³ 2 CCR 401-1, Colorado Weather Modification Rule 5.B.

⁴⁴ 2 CCR 401-1 Colorado Weather Modification Rule 6.A.

The permits sanction cloud seeding five months of the year, typically November 1 through March 31, and are issued for five consecutive years. If a permit has been issued twice consecutively, it may be issued for 10 years.⁴⁵

During the spring of 2017, there were seven weather modification programs operating. The areas in which those operations were located were:⁴⁶

- Grand Mesa;
- Central Colorado Mountains River Basin;
- Vail/Beaver Creek;
- Upper Gunnison River;
- Western San Juan Mountains;
- Eastern San Juan Mountains; and
- Dolores River Basin and Telluride Ski Area.

Typically, it is a water conservancy district or coalition of interests that hires the operator to acquire the permit and perform the weather modification. The lone exception is the Vail/Beaver Creek Program.

Weather Modification Suspensions

The program has the authority to suspend cloud seeding operations when a high snowpack presents danger from avalanche and/or excessive spring runoff.⁴⁷ No operations were suspended because the snowpack carried a high risk for excessive spring runoff between fiscal years 11-12 and 15-16, which is the period examined for this sunset review. However, during the winter of 2016-17, which falls outside of the analytical time cohort, several operations had to be temporarily suspended for this reason.

Table 2 shows the years and the permits in which suspensions occurred because of high avalanche danger. In these cases, staff is informed by the Colorado Avalanche Information Center in relation to the level of danger that is present near operations.

⁴⁵ Wilson Water Group. *Inventory and Assessment of Colorado Weather Modification Programs* (2015). Colorado Water Conservation Board. pp.5-6.

⁴⁶ *Ibid.* p. 11.

⁴⁷ 2 CCR 401-1, Colorado Weather Modification Rule 17

Table 2
Suspensions for Avalanche Danger
Fiscal Years 11-12 through 15-16

| Permittee | Area | FY 11-12 | FY 12-13 | FY 13-14 | FY 14-15 | FY 15-16 |
|------------------------------------|----------------------------|----------|----------|----------|----------|----------|
| Water Enhancement Authority | Grand Mesa | 1 | 0 | 0 | 0 | 0 |
| North American Weather Consultants | Gunnison | 0 | 0 | 0 | 2 | 1 |
| Western Weather Consultants | Dolores/ Telluride | 0 | 0 | 0 | 0 | 1 |
| Western Weather Consultants | Western San Juan Mountains | 0 | 0 | 0 | 0 | 2 |
| Western Weather Consultants | Eastern San Juan Mountains | 0 | 0 | 0 | 0 | 1 |
| Western Weather Consultants | Central Mountains | 0 | 0 | 0 | 0 | 0 |

Table 2 indicates that suspensions due to avalanche danger also are a rarity. Eight times operations were suspended during the period examined. Of those eight suspensions, three, or 38 percent, occurred in the Gunnison area over a two year period, and five, or 63 percent, occurred in the same year, fiscal year 15-16.

Whether a suspension occurs due to high snowpack or avalanche danger, the suspensions are based on the conditions present at the time. Because weather is ever changing, a suspension may be lifted when the conditions that led to the suspension no longer exist.

Fines

The Act empowers the CWCB to issue fines for violations of the Act.⁴⁸ However, there were no fines issued during the period examined for this sunset review.

Collateral Consequences – Criminal Convictions

Section 24-34-104(6)(b)(IX), C.R.S., requires the Colorado Office of Policy, Research, and Regulatory Reform to determine whether the agency under review, through its licensing processes, imposes any disqualifications on applicants or registrants based on past criminal history, and if so, whether the disqualifications serve public safety or commercial or consumer protection interests.

There are no disqualifications based on criminal history in the Act.

⁴⁸ § 36-20-126(2), C.R.S.

Analysis and Recommendations

Recommendation 1 – Continue the Weather Modification Act of 1972 for 15 years, until 2033.

The first sunset criterion asks whether regulation is necessary to protect the public health, safety, or welfare. This sunset review of the Weather Modification Act of 1972 (Act) examined the processes by which a permit is obtained to modify the weather by cloud seeding in Colorado. This review acknowledges that while cloud seeding is in fairly widespread use and widely accepted, it has not been statistically proven to work. The sunset review starts from the public policy position that the General Assembly adopted the Act to protect the public and it does not address the scientific validity of the process.

The regulatory program established under the Act protects the public health, safety, and welfare in four main ways. First, it controls where the weather modification permittees operate. Controlling where the operations are located allows Colorado Water Conservation Board (CWCB) staff to verify that the area's conditions, both atmospheric and ground-based, are generally receptive to the cloud seeding and added precipitation. The Act refers to this as being, "scientifically and technically feasible."⁴⁹ It is also important to know where the operations are operating to prevent them from being too geographically close to one another. If there were no permit process, the operations could locate wherever they choose which could cause adverse effects such as avalanche or flooding.

A second manner in which the public is protected, is the provision of public hearings. To aid in determining whether a permit should be issued, the Act provides for public hearings to be held in the area where the operation will take place prior to the decision to issue an initial permit and prior to permit renewals. After the public has a chance to provide input, staff issues a decision about whether to approve a permit. Though the option for a public hearing is an important informational tool which promotes consumer protection, the hearings are sparsely attended and no permits were denied during the period analyzed for this sunset review. In addition to the public hearings, individuals can be informed by the CWCB when cloud seeding operations are taking place in their area. Interested parties may sign up for updates on the CWCB website.

A third protection provided under the Act is that it controls who receives a permit. A contractor must be qualified and available whenever weather modification activities are taking place. While they are not licensed, contractors must have either a certification by the Weather Modification Association as a Certified Operator, or specified on-the-job, educational, or other acceptable training. These are important prerequisites. Availability is necessary in case CWCB staff must contact the contractor to cease operations at any time. The qualifications are important for multiple reasons. Recall that silver iodide is the substance that is used to seed the clouds. Silver, in high levels, can be toxic in the environment. While the silver has never been detected in toxic

⁴⁹ § 30-20-112(3)(c), C.R.S.

amounts near an area in which the cloud seeding takes place, when risky substances are projected into the atmosphere, a qualified individual should be involved.

The final way in which the Act protects the public, alluded to above, is that it has the ability to cease operations based on a high snow pack or avalanche danger. While these suspensions are not a regular occurrence, some operations were suspended for both reasons during the winter of 2016-17. Increasing the amount of precipitation is the end-goal of modifying the weather but too much precipitation can cause danger for individuals and communities. Avalanches can bury people and property, and extreme spring runoff can bring havoc to communities downstream. In this regard, the ability to suspend operations, when needed, is the strongest public protection offered under the Act.

The Act has put into place the ability for the CWCB to allow for weather modification operations to proceed within the state. It does so while protecting the interests of the public by controlling where, who, and, most importantly, when, weather modification operations take place. For these reasons, and because this sunset review did not expose any issues that demand near-term scrutiny by the General Assembly, the General Assembly should continue the Act for 15 years, until 2033.

Recommendation 2 - Repeal the provision which prohibits weather modification unless there is a *quid pro quo*.

The second statutory criterion that guides the sunset review process directs the Colorado Office of Policy, Research, and Regulatory Reform to consider:

If regulation is necessary, whether the existing statutes and regulations establish the least restrictive form of regulation consistent with the public interest, considering other available regulatory mechanisms, and whether agency rules enhance the public interest and are within the scope of legislative intent;⁵⁰

The Act has a prohibition on allowing operations that benefit another state if there is no *quid pro quo* relationship. The Act reads:

Weather control operations may not be carried on in Colorado for the purpose of affecting weather in any other state if that state prohibits such operations to be carried on in that state for the benefit of Colorado or its inhabitants.⁵¹

When CWCB staff was queried about how this this section protected the public health, safety, and welfare, no explanation was given. However, what is known is that this section has been part of Colorado statute since 1963.

⁵⁰ § 24-34-104(6)(b)(II), C.R.S.

⁵¹ § 36-20-118, C.R.S.

This section is overtly protectionist without explanation in statute, or justification by science or program staff. Furthermore, Colorado only prohibits weather modifications “if” another state prohibits them. In essence this section embodies and legalizes coercion by threatening to withhold water. It represents highly restrictive regulation without definitive public interest. Therefore, the General Assembly should repeal section 36-20-118, Colorado Revised Statutes as overly restrictive regulation.