FLORIDA HOUSE OF REPRESENTATIVES
BILL ANALYSIS

This bill analysis was prepared by nonpartisan committee staff and does not constitute an official statement of legislative intent.

BILL #: CS/CS/HB 477	**COMPANION BILL:** CS/CS/SB 56 (Garcia)
TITLE: Geoengineering and Weather Modification Activities	**LINKED BILLS:** None
SPONSOR(S): Steele, Mayfield	**RELATED BILLS:** None

Committee References

Natural Resources & Disasters	➤	State Affairs
17 Y, 0 N, As CS		15 Y, 9 N, As CS

SUMMARY

Effect of the Bill:

The bill prohibits geoengineering and weather modification activities. Specifically, the bill prohibits the injection, release, or dispersion, by any means, of a chemical, a chemical compound, a substance, or an apparatus into the atmosphere within the borders of the state for the express purpose of affecting the temperature, weather, climate, or intensity of sunlight. Any person who violates this prohibition commits a third degree-felony, punishable by up to five years in prison and a fine up to $200,000.

The bill requires the Department of Environmental Protection (DEP) to establish an e-mail address and an online form for anyone to report observed violations of this prohibition. DEP must investigate any report that warrants further review and refer reports to other specified agencies if appropriate.

The bill requires an operator of a publicly owned airport to report to the Department of Transportation (DOT) monthly on the presence of any aircraft on public property that may be used for geoengineering or weather modification activities.

The bill repeals all other weather modification statutes, including DEP's weather modification license program.

Fiscal or Economic Impact:

The bill has an indeterminate negative fiscal impact on DEP related to creating an online form to report suspected geoengineering and weather modification activities and investigating such reports. DOT and publicly owned airports may also incur costs related to the reporting requirements for such airports.

JUMP TO SUMMARY ANALYSIS RELEVANT INFORMATION BILL HISTORY

ANALYSIS

EFFECT OF THE BILL:

Geoengineering and Weather Modification

The bill prohibits geoengineering and weather modification activities. Specifically, the bill prohibits the injection, release, or dispersion, by any means, of a chemical, a chemical compound, a substance, or an apparatus into the atmosphere within the borders of the state for the express purpose of affecting the temperature, weather, climate, or intensity of sunlight. (Section 2)

The bill specifies that any person who violates this prohibition commits a third degree-felony, punishable by up to five years in prison and a fine up to $200,000. If a public or private corporation violates the prohibition, the officers, directors, or employees of the corporation commit a third-degree felony, punishable by up to five years in prison and a fine up to $200,000. If the violator is an aircraft operator or controller, the penalty is a third-degree felony punishable by up to five years in prison and a fine up to $5,000. The bill specifies that each violation is a separate offense. (Section 2)

The bill requires all moneys collected pursuant to these violations to be deposited in the Air Pollution Control Trust Fund and used only for purposes of air pollution control. (Section 2)

The bill authorizes any person who observes a geoengineering or weather modification activity conducted in violation of the above prohibition to report the violation to the Department of Environmental Protection (DEP) online or by telephone, mail, or e-mail. The bill requires DEP to establish an e-mail address and an online form for individuals to report observed violations and requires DEP to make the e-mail address and online form publicly accessible on its website. In addition, the bill requires DEP to establish a method for intake and screening of the reports and to investigate any report that warrants further review to determine whether violations have occurred. DEP must refer reports of observed violations to the Department of Health or the Division of Emergency Management, if appropriate. The bill requires DEP to adopt any rules that are necessary to implement these reporting requirements. (Section 2)

Public Airport Reporting

The bill defines "public infrastructure" as any publicly owned airport used for public purposes.[1] (Section 3)

Beginning on October 1, 2025, the bill requires all operators of public infrastructure to report monthly to the Department of Transportation (DOT), using a method determined by DOT, the following:

- The physical presence of any aircraft[2] on public property, including any public infrastructure, equipped with any part, component, device, or the like that may be used to support the intentional emission, injection, release, or dispersion of air contaminants into the atmosphere within the borders of the state when such emissions occur for the express purpose of affecting temperature, weather, climate, or the intensity of sunlight.
- The landing, takeoff, stopover, or refueling of an aircraft equipped with such components on the physical location of the public infrastructure. (Section 3)

The bill prohibits DOT from expending any state funds to support a project or program located on or in support of public infrastructure that is not in compliance with this reporting requirement until such time as the entity becomes compliant. (Section 3)

Upon receipt of the reports, the bill requires DOT to submit aggregated reports to DEP and the applicable state law enforcement agency in support of the enforcement of the geoengineering and weather modification ban. The bill also requires DOT to incorporate reporting guidelines in all grant agreements for public use airports that receive state funds. The bill authorizes DOT to adopt rules necessary to implement the bill's provisions. (Section 3)

Other Provisions

The bill repeals all other existing weather modification statutes, including DEP's weather modification license program. (Section 1)

The bill removes DEP's authority to conduct programs of study, research, and experimentation and evaluation in the field of weather modification. (Section 5)

The bill makes conforming changes. (Sections 4, 6, 7, and 8)

Effective Date

The effective date of the bill is July 1, 2025. (Section 9)

RULEMAKING:

The bill requires DEP to adopt any rules that are necessary to implement the reporting requirements related to violations of the geoengineering and weather modification ban.

[1] *See* s. 332.004(14), F.S.

[2] The bill defines "aircraft" as a powered or unpowered machine or device capable of atmospheric flight, except a parachute or other such device used primarily as safety equipment.

The bill authorizes DOT to adopt rules necessary to implement the reporting requirements for publicly owned airports.

Lawmaking is a legislative power; however, the Legislature may delegate a portion of such power to executive branch agencies to create rules that have the force of law. To exercise this delegated power, an agency must have a grant of rulemaking authority and a law to implement.

FISCAL OR ECONOMIC IMPACT:

STATE GOVERNMENT:

The bill has a negative, indeterminate fiscal impact on DEP related to creating an online form for reporting suspected geoengineering and weather modification activities and investigating such reports. DEP may also see an increase in revenues into the Air Pollution Control Trust Fund due to the fines established for conducting geoengineering or weather modification activities.

DOT may incur costs related to submitting aggregated reports to DEP and law enforcement.

LOCAL GOVERNMENT:

Operators of publicly owned airports may incur costs related to submitting monthly reports to DOT on aircraft that may be used for geoengineering or weather modification activities.

RELEVANT INFORMATION

SUBJECT OVERVIEW:

Geoengineering and Weather Modification

Weather modification and geoengineering are a range of techniques aimed at manipulating Earth's climate systems to modify precipitation or mitigate the impacts of global temperatures. Weather modification, such as cloud seeding, involves altering local or regional atmospheric conditions to increase precipitation or reduce hailstorms. Geoengineering, such as solar radiation modification, focuses on larger-scale actions to reduce the amount of sunlight reaching Earth.

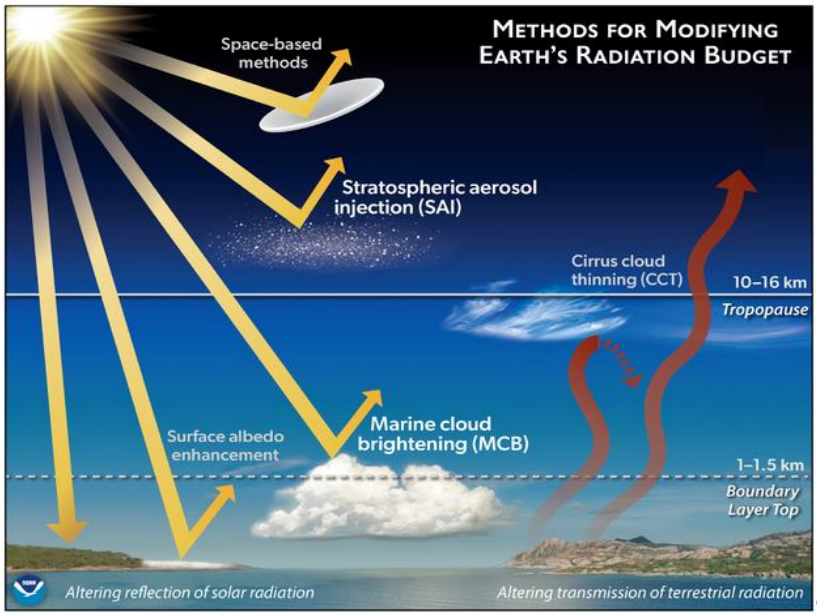
Solar Radiation Modification

Solar radiation modification (SRM) refers to deliberate, large-scale actions intended to decrease global average surface temperatures by increasing the reflection of sunlight away from the Earth.[3] Extensive research efforts are underway to gain a comprehensive understanding of SRM technologies. This research focuses on developing and studying a range of potential future scenarios that combine SRM methods with emissions reductions and carbon dioxide removal technologies, to varying degrees and over varying timescales.[4] There are several different kinds of SRM technologies being researched:

- Stratospheric aerosol injection (SAI): a strategy that involves injecting small reflective aerosols such as sulfate into the stratosphere to increase the reflection of incoming sunlight.
- Marine cloud brightening (MCB): a strategy for adding aerosol to the lower atmosphere over ocean regions to increase the reflectivity of low-lying marine clouds.
- Cirrus cloud thinning: a strategy for modifying the properties of high-altitude ice clouds to increase the transmission of outgoing terrestrial radiation to space.
- Surface albedo enhancement: increasing the reflectivity of surfaces through, for example, white roofs or land-cover changes.

[3] National Oceanic and Atmospheric Administration (NOAA), *Solar Radiation Modification: NOAA State of the Science Factsheet* (hereinafter Solar Modification Factsheet), https://www.climate.gov/news-features/understanding-climate/solar-radiation-modification-noaa-state-science-factsheet (last visited Mar. 19, 2025).
[4] *Id.*

- Space-based methods: proposed methods have primarily consisted of large "mirrors" in space to reflect sunlight.[5]



[6]

SAI and MCB have been the subject of the most research due to their projected feasibility and estimated cost.[7] Most of the current understanding of these technologies come from theoretical and modeling studies, not field experimentation. However, the risks and benefits of SAI and MCB are still poorly understood, including their technical feasibility, efficacy, and potential regional and global effects on the climate, agriculture, and ecosystems.[8]

Cloud Seeding

Cloud seeding is the most common method of weather modification and focuses on producing short-term changes in precipitation, primarily to enhance rain or snowfall or to suppress hail.[9] The most frequently used cloud seeding approaches rely on the introduction of tiny particles, usually silver iodide, into certain cloud types to trigger the formation of ice crystals or rain droplets from water already within the cloud.[10] Clouds amenable to these methods include "cold season clouds" associated with mountainous terrain and "warm season clouds" associated with convective systems, including thunderstorms.[11] While cold season cloud seeding is reasonably well understood, substantial uncertainties remain regarding warm season cloud seeding.[12]

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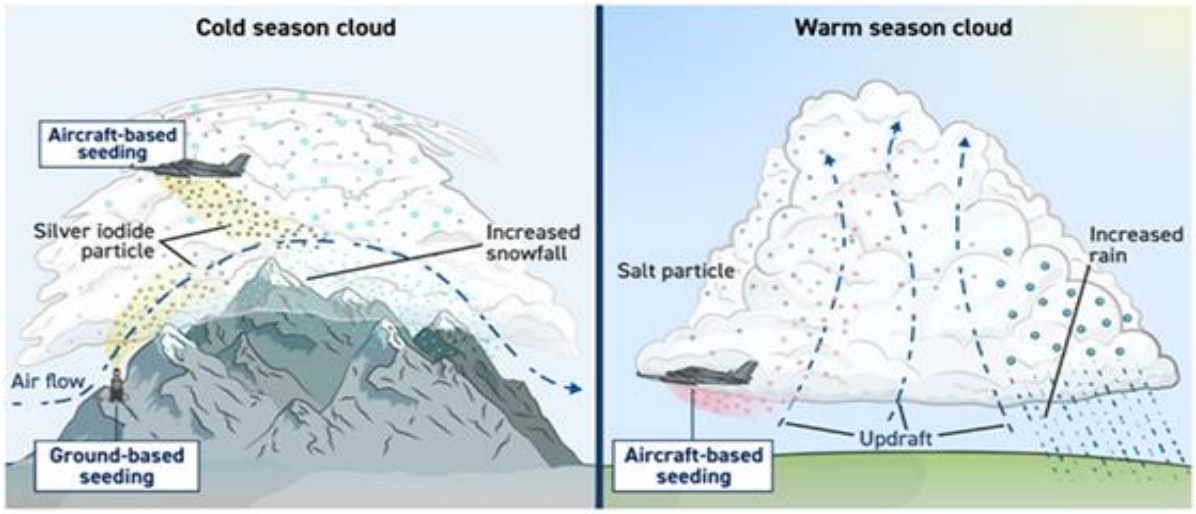
[5] *Id.*; *see also* United States Congressional Research Service, *Solar Geoengineering and Climate Change*, 5-10 (2023), *available at* https://crsreports.congress.gov/product/pdf/R/R47551 (last visited Mar. 19, 2025).
[6] NOAA, Solar Modification Factsheet (last visited Mar. 19, 2025).
[7] *Id.*
[8] *See* U.S. Congressional Service, *Solar Geoengineering and Climate Change* at 10, *available at* https://crsreports.congress.gov/product/pdf/R/R47551; Samantha M. Tracy et al., *Stratospheric aerosol injection may impact global systems and human health outcomes*, Elementa: Science of the Anthropocene, vol. 1, 13-14 (2022), *available at* https://online.ucpress.edu/elementa/article/10/1/00047/195026/Stratospheric-aerosol-injection-may-impact-global. *See generally* Jessica S. Wan et al., *Diminished efficacy of regional marine cloud brightening in a warmer world*, Nature Climate Change, vol. 14 (2024), *available at* https://www.nature.com/articles/s41558-024-02046-7; Robert Monroe, Scripps Institution of Oceanography at the University of California San Diego, *Artificial Climate Controls Might Become Ineffective—Because of Climate Change* (2024), https://scripps.ucsd.edu/news/artificial-climate-controls-might-become-ineffective-because-climate-change; Katharine Ricke et al., *Hydrological Consequences of Solar Geoengineering*, Annual Review of Earth and Planetary Sciences, vol. 51 (2023), *available at* https://www.annualreviews.org/content/journals/10.1146/annurev-earth-031920-083456.
[9] U.S. Government Accountability Office (GAO), *Technology Assessment: Cloud Seeding Technology* (hereinafter Technology Assessment), 3, 5 (2024), *available at* https://www.gao.gov/assets/gao-25-107328.pdf (last visited Apr. 1, 2025).
[10] *Id.*
[11] *Id.* at 3.
[12] *Id*. at 5.



[13]

According to the U.S. Government Accountability Office, cloud seeding activities in the U.S. are primarily funded at the state level or below.[14] As of July 2024, cloud seeding programs were active in at least nine states: California, Colorado, Idaho, Nevada, New Mexico, North Dakota, Texas, Utah, and Wyoming.[15] Several other states have laws that address weather modification in some way. In 2024, Tennessee became the first state to ban cloud seeding and other weather modification operations in the state.[16] Similar bills have been introduced in at least eight other state legislatures between January 2023 and December 2024, including Illinois, Kentucky, Minnesota, New Hampshire, Pennsylvania, Rhode Island, South Dakota, and Texas.[17]

Weather Modification License

Since 1957, Florida law has required a license for weather modification activities.[18] Applications must be submitted to the Department of Environmental Protection (DEP) and include:

- The name and post office address of the applicant or the person on whose behalf the weather modification operation is to be conducted if other than the applicant.
- The education, experience, and qualifications of the applicant.
- The applicant's education, experience, and qualifications.
- The nature, object, and general description of the proposed weather modification operation.
- The method, equipment, and materials the applicant proposes to use.[19]

Each application must be accompanied by a $1,000 filing fee.[20] Applicants must also provide proof of financial responsibility, namely, a certificate of insurance or a bond to prove their ability to pay damages for accidents arising out of their weather modification operations in the amount of: $10,000 for bodily injury to or death of one person resulting from any one incident, and subject to said limit for one person; $100,000 for bodily injury to or death of two or more persons resulting from any one incident; and $100,000 for injury to or destruction of property of others resulting from any one incident.[21]

[13] *Id.* at 4. (a graphic depicting cold and warm season cloud seeding) (last visited Apr. 1, 2025).
[14] *Id.* at 6 (last visited Apr. 1, 2025).
[15] *Id.*
[16] Tenn. Code. Ann. § 68-201-122 (2024).
[17] GAO, *Technology Assessment* at 9 (last visited Apr. 1, 2025).
[18] Chapter 57-128, Laws of Fla.; s. 403.301, F.S.
[19] Section 403.311(1), F.S. DEP may also require the applicant to submit other pertinent information. *Id.*
[20] Section 403.311(2), F.S.
[21] Sections 403.321(1) and 403.321(2), F.S.

Prior to beginning operations, the licensee must file with DEP a notice of intention to operate that includes the licensee's information and the area and approximate time of operations.[22] The notice must be published in a newspaper within the county or counties of operation, and proof of publication must be filed with DEP.[23]

Licensees are required to maintain a record of all operations conducted pursuant to the license, including the method employed, the type and composition of materials used, the times and places of operation, and the name and post office address of each person participating or assisting in the operation other than the licensee.[24] Such records must be made available to the public.[25]

Any person in violation of these requirements is guilty of a second-degree misdemeanor and subject to penalties including imprisonment of up to 60 days and a $500 fine.[26] Each license entitles the licensee to conduct the operation described in the application for the calendar year for which the license is issued unless the license is revoked or suspended.[27] The conducting of any weather modification operation or the use of any equipment or materials other than those described in the application is cause for revocation or suspension of the license. The license may be renewed annually by payment of a $50 filing fee.[28] A weather modification license may be revoked or suspended if DEP finds that the licensee has failed or refused to comply with any requirements related to weather modification licensing.[29]

DEP may grant an emergency license and waive notice requirements if a weather modification operation appears to DEP to be necessary or desirable in aid of the extinguishment of fire, the dispersal of fog, or another emergency.[30]

According to DEP, there are currently no active weather modification licenses, and there have been no applications for licenses in recent years.[31]

In addition to regulating weather modification licenses, state law also authorizes DEP to study, research, and experiment in the field of weather modification.[32] However, there is no indication that DEP has been involved in such weather modification programs.

Federal Weather Modification Regulations

The Weather Modification Reporting Act of 1972 requires anyone who conducts weather modification activities within the United States to report such activities to the National Oceanic and Atmospheric Administration (NOAA) Administrator at least 10 days prior to undertaking the activities.[33] The report must include, among other things, the project's purpose and location, as well as the modification agents used (e.g., carbon dioxide, sodium chloride, silver iodide).[34] Another report, which summarizes the project duration and total modification agents dispensed, is required within 45 days after completion of the project.[35] For ongoing projects, interim reports are required on January 1 of each year and must include the number of days weather modification activities took place, total hours

[22] Section 403.351, F.S.
[23] Sections 403.361 and 403.371, F.S. The notice must be published at least once a week for two consecutive weeks in a newspaper having general circulation and published within any county or counties where the operation is to be conducted and in which the affected area is located. *See* s. 403.361, F.S.
[24] Section 403.381(1), F.S.
[25] Section 403.381(2), F.S.
[26] Sections 403.411, 775.082(4)(b), and 775.083(1)(e), F.S.
[27] Section 403.331(2), F.S.
[28] Section 403.331(3), F.S.
[29] Section 403.401, F.S.
[30] Section 403.391, F.S.
[31] Email from DEP to staff of the Natural Resources & Disasters Subcommittee (Feb. 24, 2025) (on file with the Natural Resources & Disasters Subcommittee).
[32] Section 373.026(6), F.S.
[33] 15 U.S.C. § 330a; 15 CFR 908.4(a).
[34] 15 CFR 908.4(a).
[35] 15 CFR 908.6.

of operation, and the amount of agent used.[36] Failure to adhere to these reporting requirements can result in fines of up to $10,000.[37]

Activities subject to these reporting requirements include:

- Seeding 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.
- Using fires or heat sources to influence convective circulation or to evaporate fog.
- Modifying the solar radiation exchange of the earth or clouds through the release of gases, dusts, liquids, or aerosols into the atmosphere.
- Modifying the characteristics of land or water surfaces by dusting or treating with powders, liquid sprays, dyes, or other materials.
- Releasing electrically charged or radioactive particles, or ions, into the atmosphere.
- Applying shock waves, sonic energy sources, or other explosive or acoustic sources to the atmosphere;
- Using aircraft propeller downwash, jet wash, or other sources of artificial wind generation.
- Using lasers or other sources of electromagnetic radiation.[38]

These reporting requirements do not apply to activities of a purely local nature that can reasonably be expected not to modify the weather outside of the area of operation.[39] This exception is restricted to the use of lightning deflection or static discharge devices in aircraft, boats, or buildings, and to the use of small heat sources, fans, fogging devices, aircraft downwash, or sprays to prevent the occurrence of frost in tracts or fields planted with crops susceptible to frost or freeze damage. Also exempt are religious activities or other ceremonies, rites, and rituals intended to modify the weather.[40]

According to NOAA's website, NOAA is not currently researching or conducting weather modification experiments and has no plans to do so in the future. However, NOAA studies the stratosphere and marine boundary layer with instruments on balloons and aircraft to help fill important gaps in our knowledge and inform decisions about the potential risks and benefits of solar geoengineering.[41]

Federal Aviation Act and Preemption of State Law

The Federal Aviation Act of 1958 gave the Federal Aviation Administration (FAA) the authority to establish safety standards for interstate and international air transportation.[42] FAA has adopted rules relating to, among other things, airspace use, air traffic control, aircraft maintenance and registration, and navigational facilities.[43] Courts have held that Congress, in enacting the Federal Aviation Act and relevant regulations, intended to preempt state regulation of aviation safety.[44]

Federal law also expressly preempts state law in other areas related to aviation.[45] States may not adopt or attempt to enforce any standard regarding air pollutant emissions from any aircraft or engine thereof unless it is identical

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[36] 15 CFR 908.5.
[37] 15 U.S.C. § 330d; 15 CFR 908.10.
[38] 15 CFR § 908.3(a). While all of these activities are subject to initial reporting, NOAA may waive the subsequent reporting requirements. The decision to waive certain reporting requirements is based on the general acceptability, from a technical or scientific viewpoint, of the apparatus and techniques to be used. 15 CFR § 908.3(d).
[39] 15 CFR § 908.3(c).
[40] *Id.*
[41] NOAA, *Fact check: Debunking Weather Modification Claims* (Oct. 23, 2024), https://www.noaa.gov/news/fact-check-debunking-weather-modification-claims (last visited Apr. 1, 2025).
[42] *See* 1958 Federal Aviation Act, Pub. L. No. 85-726, 72 Stat. 731 (codified as amended at 49 U.S.C. §§ 40101-49105).
[43] 14 CFR 1-199.
[44] *Abdullah v. American Airlines, Inc.*, 181 F.3d 363, 367-368 (3d Cir. 1999). *See generally* FAA and U.S. Dep't of Transportation, *State and Local Regulation of Unmanned Aircraft Systems (UAS) Fact Sheet*, 1 (2023), *available at* https://www.faa.gov/sites/faa.gov/files/uas/public_safety_gov/public_safety_toolkit/FAA%20UAS%20Fact%20Sheet.pdf (explaining that states and local governments may not regulate in the fields of aviation safety or airspace efficiency but generally may regulate outside those fields).
[45] Federal preemption arises under three circumstances: (1) where Congress has expressly preempted state law; (2) where state law attempts to regulate a field that Congress intended the federal government to occupy exclusively; or (3) where state

to federal standards.[46] In addition, states may generally not enact or enforce laws or regulations related to prices, routes, or services of commercial air carriers.[47]

BILL HISTORY

COMMITTEE REFERENCE	ACTION	DATE	STAFF DIRECTOR/ POLICY CHIEF	ANALYSIS PREPARED BY
Natural Resources & Disasters Subcommittee	17 Y, 0 N, As CS	4/1/2025	Moore	Weiss
THE CHANGES ADOPTED BY THE COMMITTEE:	• Removed provisions that repealed DEP's weather modification license program; and • Removed provisions that banned weather modification activities outright and instead increased the fine for conducting such activities without a license or violating related provisions from $500 to $10,000.			
State Affairs Committee	15 Y, 9 N, As CS	4/17/2025	Williamson	Weiss
THE CHANGES ADOPTED BY THE COMMITTEE:	• Prohibited all weather modification and geoengineering activities and established penalties for any person or corporation who conducts these activities. • Required DEP to establish an e-mail address and an online form for anyone to report observed violations of this prohibition. • Required DEP to investigate any report that warrants further review and refer reports to other specified agencies if appropriate. • Required an operator of a publicly owned airport to report to the Department of Transportation monthly on the presence of any aircraft on public property that may be used for geoengineering or weather modification activities. • Repealed all other weather modification statutes, including DEP's weather modification license program.			

THIS BILL ANALYSIS HAS BEEN UPDATED TO INCORPORATE ALL OF THE CHANGES DESCRIBED ABOVE.

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law actually conflicts with federal law, either because it would be impossible to comply with both federal and state regulations, or because the state regulation "stands as an obstacle to the accomplishment and execution of the full purposes and objectives of Congress." *R.J. Reynolds Tobacco Company v. Marotta*, 214 So. 3d 590, 596 (Fla. 2017) (quoting *Vreeland v. Ferrer*, 71 So. 3d 70, 76 (Fla. 2011)).

[46] 42 U.S.C. § 7573.

[47] 42 U.S.C. § 41713(b).