Calendar No. 122

111TH CONGRESS
1ST SESSION

S. 601

[Report No. 111–57]

To establish the Weather Mitigation Research Office, and for other purposes.

IN THE SENATE OF THE UNITED STATES

MARCH 16, 2009

Mrs. HUTCHISON introduced the following bill; which was read twice and referred to the Committee on Commerce, Science, and Transportation

JULY 22, 2009

Reported by Mr. ROCKEFELLER, with an amendment

[Strike all after the enacting clause and insert the part printed in italic]

A BILL

To establish the Weather Mitigation Research Office, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,

~~**SECTION 1. SHORT TITLE.**~~

~~This Act may be cited as the "Weather Mitigation Research and Development Policy Authorization Act of 2009".~~

SEC. 2. PURPOSE.

It is the purpose of this Act to develop and implement a comprehensive and coordinated national weather mitigation policy and a national cooperative Federal and State program of weather mitigation research and development.

SEC. 3. FINDINGS.

Congress finds the following:

(1) According to a 2003 report by the National Research Council, ''people in drought- and hail-prone areas willingly spend significant resources on weather mitigation programs, and in 2001 there were at least 66 operational programs being conducted in 10 States across the United States. At the same time, less than a handful of weather mitigation research programs are underway worldwide, and related research in the United States has dropped to less than $500,000 per year from a high of $20,000,000 in the late 1970s.'' The NRC report entitled ''Critical Issues in Weather Modification Research'' also states that ''a coordinated national program of weather modification research is needed''. Such a program is supported by States that need a scientific means of evaluating current programs and increasing their effectiveness through applied research.

(2) Droughts in the United States result in an average economic loss between $6,000,000,000 and $8,000,000,000 annually, while severe hail producing storms result in up to $2,300,000,000 damage to crops and over $2,000,000,000 in property loss annually. Snowpack, rain enhancement, and hail suppression weather mitigation projects help reduce these losses, and additional research in these areas will make existing programs even more effective and permit them to better quantify their impacts. Recent droughts in the Western United States have produced low lake levels at Lake Powell and Lake Mead and have led the Seven Colorado River Basin States to create cooperative agreements. A separate cooperative agreement is in place for wintertime snowfall enhancement programs in the States of Utah, Colorado, and Wyoming to pursue water augmentation to benefit the entire Colorado River System.

(3) Past and recent evaluations of the potential for snowpack augmentation by cloud seeding in the Colorado River Basin indicate a significant yield in runoff can be attained through properly designed projects. A 2006 evaluation by the Bureau of Reclamation of the Department of the Interior indicates

the potential for 800,000 additional acre-feet of water.

(4) The impacts of possible climate change and the human impact on weather are not well understood. Weather mitigation research could provide data on what, if any, impact pollution may have on the precipitation processes in cloud systems. Research into inadvertent and planned weather mitigation may increase our understanding and knowledge of any potential impacts.

(5) The recent Weather Damage Modification Program conducted by the Bureau of Reclamation employed a successful model for combining local, State, and Federal resources in providing a means for scientific evaluation of operational cloud-seeding projects (rainfall and snowfall enhancement and hail suppression) in North Dakota, Oklahoma, Texas, Colorado, Utah, Nevada, and California.

SEC. 4. DEFINITIONS.

In this Act:

(1) Advisory Board.—The term ''Advisory Board'' means the Advisory Board established by section 5(b).

(2) DIRECTOR.—The term ''Director'' means the Director of the Office appointed under section 5(a).

(3) OFFICE.—The term ''Office'' means the Weather Mitigation Research Office established under section 5(a).

(4) RESEARCH AND DEVELOPMENT.—The term ''research and development'' means theoretical analysis, exploration, experimentation, and the extension of investigative findings and theories of a scientific or technical nature into practical application for experimental and demonstration purposes, including the experimental production and testing of models, devices, equipment, materials, and processes.

SEC. 5. WEATHER MITIGATION RESEARCH OFFICE ESTABLISHED.

(a) ESTABLISHMENT.—There is established in the National Science Foundation the Weather Mitigation Research Office to establish and coordinate the national research and development program on weather mitigation described in section 6. The Office shall be headed by a Director, who shall be appointed by the Director of the National Science Foundation.

(b) ADVISORY BOARD.—

~~(1) IN GENERAL.—The Office shall have an Advisory Board, the function of which shall be to advise the Office and to make recommendations to the Office concerning legislation, policies, administration, research, and other matters, consisting of 11 members, appointed by the Director of the National Science Foundation, as follows:~~

~~(A) At least 2 members shall be representatives of States that are currently supporting operational weather mitigation programs.~~

~~(B) At least 2 members shall be a representative of the National Center for Atmospheric Research of the National Science Foundation.~~

~~(C) At least 1 member shall be a representative of National Aeronautics and Space Administration.~~

~~(D) At least 1 member shall be a representative of the American Meteorological Society.~~

~~(E) At least 1 member shall be a representative of the American Society of Civil Engineers.~~

(F) At least 1 member shall be a representative of the National Academy of Sciences.

(G) At least 1 member shall be a representative of the National Oceanic and Atmospheric Administration of the Department of Commerce.

(H) At least 1 member shall be a representative of the Department of Agriculture.

(I) At least 1 member shall be a representative of institutions of higher education or research institutes with experience in the field.

(2) TENURE.—A member of the Advisory Board shall serve at the pleasure of the Director of the National Science Foundation.

(3) VACANCIES.—Any vacancy on the Advisory Board shall be filled in the same manner as the original appointment.

(c) CHAIR AND VICE CHAIR.—The Advisory Board shall select a Chair and Vice Chair from among its members.

(d) INITIAL MEETING.—Not later than 30 days after the date on which all members of the Advisory Board have been appointed, the Advisory Board shall hold its first meeting.

(c) MEETINGS.—The Advisory Board shall meet at the call of the Chair.

(f) QUORUM.—A majority of the members of the Advisory Board shall constitute a quorum, but a lesser number of members may hold hearings.

(g) DUTIES OF THE OFFICE.—

(1) STUDIES, INVESTIGATIONS, AND HEARINGS.—The Office may conduct studies, obtain information, and hold hearings necessary to carry out the purposes of this Act.

(2) COOPERATION WITH OTHER AGENCIES.—The Office may cooperate with public or private agencies to promote the purposes of this Act.

(3) COOPERATIVE AGREEMENTS.—The Office may enter into cooperative agreements with the head of any department or agency of the United States, an appropriate official of any State or political subdivision of a State, or an appropriate official of any private or public agency or organization to conduct research and development pertaining to weather mitigation.

(4) CONDUCTING AND CONTRACTING FOR RESEARCH AND DEVELOPMENT.—The Director may conduct or contract for research and development activities in accordance with section 6.

SEC. 6. NATIONAL RESEARCH AND DEVELOPMENT PROGRAM ON WEATHER MITIGATION.

(a) IMPLEMENTATION PLAN.—Not later than 180 days after the date of enactment of this Act, the Director, in consultation with the Advisory Board, shall develop and submit to Congress a plan for the establishment and coordination of the national research and development program required by section 5(a). The plan shall—

(1) for the 10-year period beginning in the year it is submitted, establish the goals and priorities for Federal research that most effectively advance scientific understanding of weather mitigation;

(2) describe specific activities required to achieve such goals and priorities, including funding of competitive research grants, training and support for scientists, and participation in international research efforts;

(3) identify and address, as appropriate, relevant programs and activities of the Federal agencies and departments that would contribute to the program;

(4) consider and use, as appropriate, reports and studies conducted by Federal agencies and departments, weather modification organizations, and other expert scientific bodies, including the National

Research Council report entitled ''Critical Issues in Weather Modification Research'';

(5) make recommendations for the coordination of program activities with weather mitigation activities of other national and international organizations; and

(6) estimate Federal funding for research activities to be conducted under the program.

(b) PROGRAM ACTIVITIES.—The national research and development program required by section 5(a) may include the following activities related to weather mitigation:

(1) Interdisciplinary research and development and coordination of research and development and activities to improve understanding of processes relating to planned and inadvertent weather mitigation, including the following:

(A) Research related to cloud and precipitation physics.

(B) Cloud dynamics and cloud modeling.

(C) Improving cloud seeding-related technologies.

(D) Severe weather and storm research.

(E) Research related to potential adverse affects of weather mitigation.

(2) Coordination with relevant organizations that engage in weather mitigation research.

(3) Development through partnerships among Federal agencies, State agencies with weather modification experience, and academic institutions of new technologies and approaches for weather mitigation.

(4) Establishing scholarships and educational opportunities that encourage an interdisciplinary approach to weather mitigation.

(5) Promotional activities in accordance with subsection (c).

(6) Administering the grant program described in subsection (d).

(c) PROMOTION OF RESEARCH AND DEVELOPMENT.—In order to assist in expanding the theoretical and practical knowledge of weather mitigation, the Office shall promote and fund research and development, studies, and investigations with respect to—

(1) improved forecast and decision-making technologies for weather mitigation operations, including tailored computer workstations and software and new observation systems with remote sensors; and

(2) assessments and evaluations of the efficacy of weather mitigation.

(d) GRANT PROGRAM FOR RESEARCH AND DEVELOPMENT.—

(1) IN GENERAL.—The Office may establish a grant program for the award of grants to eligible entities for research and development projects that pertain to weather mitigation. To the extent practicable, the grant program shall be modeled after both the Atmospheric Modification Program implemented by the National Oceanic and Atmospheric Administration in 1980, and the Weather Damage Modification Program implemented by the Bureau of Reclamation of the Department of the Interior in 2002.

(2) FEDERAL SHARE.—The Office may not award a grant under this subsection for a project if the Federal share of such project would be greater than 65 percent of the project cost, which may include in-kind services furnished by the participating entity.

(3) ELIGIBLE ENTITIES.—For purposes of this subsection, an eligible entity is a State agency, institution of higher education, or nonprofit organization that has—

(A) an established background and expertise in the field of weather mitigation; and

(B) experience with working with and coordinating with State agencies.

(4) USE OF FUNDS.—A recipient of a grant under this subsection may only use the grant for a research and development project that—

(A) pertains to weather mitigation; and

(B) was in operation on the day before the date the grant was awarded.

SEC. 7. ANNUAL REPORT ON ACTIVITIES.

(a) IN GENERAL.—Not later than January 31, and annually thereafter, the Director shall prepare and submit an annual report to the President, the Senate Committee on Commerce, Science, and Transportation, and the House of Representatives Committee on Science and Technology on the activities conducted pursuant to this Act during the preceding calendar year, including the following:

(1) A summary of the achievements of Federal weather mitigation research, including federally supported external research, during the preceding fiscal year.

(2) An analysis of the progress made toward achieving the goals and objectives of the plan developed under section 6(a), including the identification of trends.

(3) A copy or summary of the plan required by section 6(a) and any changes made to the plan.

(4) A summary of agency budgets for weather mitigation activities for the preceding fiscal year.

(5) Recommendations, if any, regarding additional action or legislation that may be required to assist in achieving the purposes of this Act.

(6) A description of the relationship between research conducted on weather mitigation and research conducted pursuant to the Global Change Research Act of 1990 (15 U.S.C. 2921 et seq.), as well as research on weather forecasting and prediction.

(7) A description of any potential adverse consequences on life, property, or water resource availability from weather mitigation efforts, and any suggested means of mitigating or reducing such consequences if such efforts are undertaken.

(b) FIRST REPORT.—The first report required by subsection (a) shall be submitted on January 31 in the second calendar year following the date of the enactment of this Act.

SEC. 8. COOPERATION WITH WEATHER MITIGATION RESEARCH OFFICE.

The head of any department or agency of the United States and the head of any other public or private agency

or institution that receives research funds from the United States shall, to the extent practicable, cooperate with the Office for purposes of carrying out this Act.

SEC. 9. FUNDING.

(a) AUTHORIZATION OF APPROPRIATIONS.—There are authorized to be appropriated to the Office for the purposes of carrying out this Act $25,000,000 for each of the fiscal years 2010 through 2014. Amounts appropriated pursuant to this subsection shall remain available until expended.

(b) ALLOCATION.—Of the amounts appropriated to the National Science Foundation under subsection (a) for each fiscal year—

(1) 66 percent shall be available to, and retained by, the National Science Foundation for use in carrying out its resposibilities under this Act;

(2) 34 percent shall be transferred by the National Science Foundation to—

(A) the National Oceanic and Atmospheric Administration; and

(B) the National Aeronautics and Space Administration.

(c) COMPETITIVE GRANTS.—The Director of the National Science Foundation and the Administrators of the National Oceanic and Atmospheric Administration and

~~the Aeronautics and Space Administration shall each allocate at least 50 percent of the amounts retained by or transferred to their respective entities under subsection (b) for each fiscal year to competitive grants.~~

~~(d) GIFTS.—The Office may accept, use, and dispose of gifts or donations of services or property.~~

SECTION 1. SHORT TITLE.

This Act may be cited as the "Weather Mitigation Research and Development Policy Authorization Act of 2009".

SEC. 2. PURPOSE.

It is the purpose of this Act to develop a national cooperative Federal and State program of weather mitigation research and development.

SEC. 3. FINDINGS.

Congress finds the following:

(1) According to a 2003 report by the National Research Council, "people in drought- and hail-prone areas willingly spend significant resources on weather mitigation programs, and in 2001 there were at least 66 operational programs being conducted in 10 States across the United States. At the same time, less than a handful of weather mitigation research programs are underway worldwide, and related research in the United States has dropped to less than $500,000 per year from a high of $20,000,000 in the late 1970s."

The NRC report entitled "Critical Issues in Weather Modification Research" also states that "a coordinated national program of weather modification research is needed". Such a program is supported by States that need a scientific means of evaluating current programs and increasing their effectiveness through applied research.

(2) Droughts in the United States result in an average economic loss between $6,000,000,000 and $8,000,000,000 annually, while severe hail producing storms result in up to $2,300,000,000 damage to crops and over $2,000,000,000 in property loss annually. Snowpack, rain enhancement, and hail suppression weather mitigation projects could help reduce these losses, and additional research in these areas could make existing programs even more effective and permit them to better quantify the impacts of those projects. Recent droughts in the Western United States have produced low lake levels at Lake Powell and Lake Mead and have led the Seven Colorado River Basin States to create cooperative agreements. A separate cooperative agreement is in place for wintertime snowfall enhancement programs in the States of Utah, Colorado, and Wyoming to pursue water

augmentation to benefit the entire Colorado River System.

(3) Past and recent evaluations of the potential for snowpack augmentation by cloud seeding in the Colorado River Basin indicate the potential for a significant yield in runoff through properly designed projects. A 2006 evaluation by the Bureau of Reclamation of the Department of the Interior indicates the potential for 800,000 additional acre-feet of water.

(4) Weather mitigation research could provide insights on the interaction of pollution with the precipitation processes in cloud systems. Research into inadvertent and planned weather mitigation may increase our understanding and knowledge of any potential impacts.

(5) The recent Weather Damage Modification Program conducted by the Bureau of Reclamation employed a successful model for combining local, State, and Federal resources in providing a means for scientific evaluation of operational cloud-seeding projects (rainfall and snowfall enhancement and hail suppression) in North Dakota, Oklahoma, Texas, Colorado, Utah, Nevada, and California.

SEC. 4. DEFINITIONS.

In this Act:

(1) DIRECTOR.—The term "Director" means the Director of the Program appointed under section 5(a).

(2) PROGRAM.—The term "Program" means the Weather Mitigation Research Program established under section 5(a).

(3) RESEARCH AND DEVELOPMENT.—The term "research and development" means theoretical analysis, exploration, experimentation, and the extension of investigative findings and theories of a scientific or technical nature into practical application for experimental and demonstration purposes, including the development of experimental models, instrumentation, materials, and processes.

(4) WEATHER MITIGATION.—The term "weather mitigation" means the purposeful or inadvertent changing or controlling, or attempting to change or control, by artificial methods the natural development of atmospheric cloud forms or precipitation forms in the troposphere.

(5) WORKING GROUP.—The term "Working Group" means the Working Group established by section 5(c).

SEC. 5. WEATHER MITIGATION RESEARCH PROGRAM ESTABLISHED.

(a) ESTABLISHMENT.—There is established in the National Science Foundation's Geosciences Directorate the Weather Mitigation Research Program to establish and coordinate the national research and development program on weather mitigation described in section 6. The Program shall be headed by a Director, who shall be appointed by the Director of the Geosciences Directorate. The Director of the National Science Foundation shall coordinate the Program's work with the Office of Science and Technology Policy.

(b) DUTIES OF THE PROGRAM DIRECTOR.—

(1) STUDIES, INVESTIGATIONS, AND WORKSHOPS.—The Director may fund studies, obtain information, and hold workshops necessary to carry out the purposes of this Act.

(2) COOPERATION WITH OTHER AGENCIES.—The Director may cooperate with public or private agencies to promote the purposes of this Act.

(3) COOPERATIVE AGREEMENTS.—The Director may enter into cooperative agreements with the head of any department or agency of the United States, an appropriate official of any State or political subdivision of a State, or an appropriate official of any private or public agency or organization to conduct re-

search and development pertaining to weather mitigation.

(c) WORKING GROUP.—

(1) IN GENERAL.—The Program shall have a Working Group, the function of which shall be to advise the Program and to make recommendations to the Program concerning administration, research, and other matters, consisting of the Program Director and 11 members, appointed by the Director of the National Science Foundation, as follows:

(A) At least 2 members shall be representatives of States that are currently supporting weather mitigation programs.

(B) At least 1 member shall be a representative of institutions of higher education or research institutes with experience in the field.

(C) Other members shall have expertise in one or more of the following areas:

(i) Cloud dynamics.

(ii) Precipitation physics.

(iii) Nucleation theory.

(iv) Hydrology.

(v) Water management engineering.

(vi) Numerical modeling of cloud systems.

(vii) Hail and fog.

(viii) Social sciences.

(ix) Lightning.

(x) Any other area of expertise deemed necessary by the Director.

(2) TENURE.—A member of the Working Group shall serve at the pleasure of the Director of the National Science Foundation.

(3) VACANCIES.—Any vacancy on the Working Group shall be filled in the same manner as the original appointment.

(d) CHAIR AND VICE CHAIR.—The Working Group shall select a Chair and Vice Chair from among its members.

(e) INITIAL MEETING.—Not later than 30 days after the date on which all members of the Working Group have been appointed, the Working Group shall hold its first meeting.

(f) MEETINGS.—The Working Group shall meet at the call of the Chair.

(g) QUORUM.—A majority of the members of the Working Group shall constitute a quorum, but a lesser number of members may hold hearings.

SEC. 6. NATIONAL RESEARCH AND DEVELOPMENT PROGRAM ON WEATHER MITIGATION.

(a) IMPLEMENTATION PLAN.—Not later than 1 year after the date of enactment of this Act, the Director, in consultation with the Working Group, shall develop and submit to Congress a plan for the establishment and coordination of the national research and development program required by section 5(a). The plan shall—

(1) for the 10-year period beginning in the year it is submitted, establish the goals and priorities for Federal research that most effectively advance scientific understanding of weather mitigation;

(2) describe specific activities required to achieve such goals and priorities, including funding of competitive research grants, training and support for scientists, and participation in international research efforts; and

(3) estimate Federal funding for research activities to be conducted under the program.

(b) PROGRAM ACTIVITIES.—The national research and development program required by section 5(a) may include the following activities related to weather mitigation:

(1) Interdisciplinary research and development and coordination of research and development and activities to improve understanding of processes relating

to planned and inadvertent weather mitigation, including the following:

(A) Research related to cloud and precipitation physics.

(B) Cloud dynamics and cloud modeling.

(C) Research on advance technologies related to cloud seeding.

(D) Severe weather and storm research.

(E) Research related to potential adverse affects of weather mitigation.

(2) Coordination with relevant organizations that engage in weather mitigation research.

(3) Development through partnerships among Federal agencies, State agencies with weather modification experience, and academic institutions of new technologies and approaches for weather mitigation.

(4) Establishing scholarships and educational opportunities that encourage an interdisciplinary approach to weather mitigation.

(5) Dissemination activities in accordance with subsection (c).

(6) Administering the grant program described in subsection (d).

(c) PROMOTION OF RESEARCH AND DEVELOPMENT.—In order to assist in expanding the theoretical and practical

knowledge of weather mitigation, the Program shall promote and fund research and development, studies, and investigations with respect to—

(1) improved forecast and decisionmaking technologies for weather mitigation operations, including innovations in human-centered observations systems and remote sensor systems; and

(2) adaptation and scaling experiments in the efficacy of weather mitigation.

(d) GRANT PROGRAM FOR RESEARCH AND DEVELOPMENT.—

(1) IN GENERAL.—The Director of the National Science Foundation may establish a grant program for the award of grants to eligible entities for research and development projects that pertain to weather mitigation. For purposes of this subsection, an eligible entity is a State agency, institution of higher education, or nonprofit organization that has—

(A) an established background and expertise in the field of weather mitigation; and

(B) experience with working with and coordinating with State agencies.

(2) USE OF FUNDS.—A recipient of a grant under this subsection may only use the grant for a re-

search and development project that pertains to weather mitigation.

SEC. 7. BIENNIAL REPORT ON ACTIVITIES.

(a) IN GENERAL.—Not later than January 31, and every 2 years thereafter, the Director shall prepare and submit a report to the President, the Senate Committee on Commerce, Science, and Transportation, and the House of Representatives Committee on Science and Technology on the activities conducted pursuant to this Act during the preceding 2 calendar years, including the following:

(1) A summary of the achievements of Federal weather mitigation research, including federally supported external research, during the preceding 2 fiscal years.

(2) An analysis of the progress made toward achieving the goals and objectives of the plan developed under section 6(a), including the identification of trends.

(3) A copy or summary of the plan required by section 6(a) and any changes made to the plan.

(4) Recommendations, if any, regarding additional action that may be required to assist in achieving the purposes of this Act.

(5) A description of any potential adverse consequences on life, property, or water resource avail-

ability from weather mitigation efforts, and any suggested means of mitigating or reducing such consequences if such efforts are undertaken.

(b) FIRST REPORT.—The first report required by subsection (a) shall be submitted on January 31 in the second calendar year following the date of the enactment of this Act.

SEC. 8. COOPERATION WITH WEATHER MITIGATION RESEARCH PROGRAM.

The head of any department or agency of the United States and the head of any other public or private agency or institution that receives research funds from the United States shall, to the extent practicable, cooperate with the Director for purposes of carrying out this Act.

SEC. 9. COORDINATION.

(a) IMPLEMENTATON PLAN.—In support of the implementation plan required by section 6(a), the Office of Science and Technology Policy shall—

(1) identify and address, as appropriate, relevant programs and activities of the Federal agencies and departments that would contribute to the program;

(2) consider and use, as appropriate, reports and studies conducted by Federal agencies and departments, weather modification organizations, and other

expert scientific bodies, including the National Research Council report entitled "Critical Issues in Weather Modification Research"; and

(3) make recommendations for the coordination of program activities with weather mitigation activities of other national and international organizations, in consideration of relevant international agreements.

(b) ANNUAL REPORT.—In support of the annual report required by section 7(a), the Office of Science and Technology Policy shall provide—

(1) a summary of agency budgets for weather mitigation research for the preceding fiscal year; and

(2) a description of the relationship between research conducted on weather mitigation and research conducted pursuant to the Global Change Research Act of 1990 (15 U.S.C. 2921 et seq.), as well as research on weather forecasting and prediction.

SEC. 10. FUNDING.

(a) AUTHORIZATION OF APPROPRIATIONS.—There are authorized to be appropriated to the Director of the National Science Foundation for the purposes of carrying out this Act $25,000,000 for each of the fiscal years 2010 through 2014. Amounts appropriated pursuant to this subsection shall remain available until expended.

(b) GIFTS.—The Program may accept, use, and dispose of gifts or donations of services or property.

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[Report No. 111–57]

A BILL

To establish the Weather Mitigation Research Office, and for other purposes

JULY 22, 2009

Reported with an amendment