

119TH CONGRESS
1ST SESSION

S. _____

To improve forecasting and understanding of tornadoes and other hazardous weather, and for other purposes.

IN THE SENATE OF THE UNITED STATES

Mr. WICKER (for himself, Mrs. HYDE-SMITH, Mr. GRASSLEY, Mr. MORAN, Mr. SHEEHY, Mr. YOUNG, and Mr. CRUZ) introduced the following bill; which was read twice and referred to the Committee on

A BILL

To improve forecasting and understanding of tornadoes and other hazardous weather, and for other purposes.

1 *Be it enacted by the Senate and House of Representa-*
2 *tives of the United States of America in Congress assembled,*

3 **SECTION 1. SHORT TITLE.**

4 This Act may be cited as the “Tornado Observations
5 Research and Notification Assessment for Development of
6 Operations Act” or the “TORNADO Act”.

7 **SEC. 2. DEFINITIONS.**

8 In this Act:

1 (1) HAZARDOUS WEATHER AND WATER
2 EVENTS.—The term “hazardous weather and water
3 events” means weather and water events that have
4 a high risk of loss of life or property, including—

5 (A) severe storms, such as hurricanes and
6 short-fused, small-scale hazardous weather or
7 hydrologic events produced by thunderstorms,
8 including large hail, damaging winds, torna-
9 does, and flash floods;

10 (B) winter storms, such as freezing or fro-
11 zen precipitation (including freezing rain, sleet,
12 and snow), or combined effects of freezing or
13 frozen precipitation and strong winds; and

14 (C) other weather hazards, such as ex-
15 treme heat or cold, wildfire, drought, dense fog,
16 high winds, river flooding, and lakeshore flood-
17 ing.

18 (2) HISTORICALLY BLACK COLLEGE OR UNI-
19 VERSITY.—The term “historically Black college or
20 university” has the meaning given the term “part B
21 institution” in section 322 of the Higher Education
22 Act of 1965 (20 U.S.C. 1061).

23 (3) INDIAN TRIBE.—The term “Indian Tribe”
24 has the meaning given the term in section 4 of the

1 Indian Self-Determination and Education Assistance
2 Act (25 U.S.C. 5304).

3 (4) INSTITUTION OF HIGHER EDUCATION.—The
4 term “institution of higher education” has the
5 meaning given the term in section 101(a) of the
6 Higher Education Act of 1965 (20 U.S.C. 1001(a)).

7 (5) NATIONAL LABORATORY.—The term “Na-
8 tional Laboratory” has the meaning given the term
9 in section 2 of the Energy Policy Act of 2005 (42
10 U.S.C. 15801).

11 (6) UNDER SECRETARY.—The term “Under
12 Secretary” means the Under Secretary of Commerce
13 for Oceans and Atmosphere.

14 **SEC. 3. HAZARDOUS WEATHER AND WATER EVENT RISK**
15 **COMMUNICATION.**

16 (a) IN GENERAL.—The Under Secretary shall main-
17 tain and improve the system of the National Oceanic and
18 Atmospheric Administration by which the risks of haz-
19 ardous weather and water events are communicated to the
20 general public, with the goal of informing action and en-
21 couraging response to prevent loss of life and property.

22 (b) HAZARD RISK COMMUNICATION IMPROVEMENT
23 AND SIMPLIFICATION.—

24 (1) IN GENERAL.—The Under Secretary shall
25 maintain a hazard risk communication office (in this

1 subsection referred to as the “Office”), for the pur-
2 poses of simplifying and improving the communica-
3 tion of hazardous weather and water event risks.

4 (2) TERMINOLOGY.—The Office shall identify,
5 eliminate, or modify unnecessary, redundant, or con-
6 fusing terms for hazardous weather and water event
7 communications and add new terminology, as appro-
8 priate.

9 (3) COMMUNICATIONS IMPROVEMENT.—The Of-
10 fice shall improve the form, content, and methods of
11 hazardous weather and water event communications
12 to more clearly inform action and increase the likeli-
13 hood that the public takes such action to prevent the
14 loss of life or property.

15 (4) EVALUATIONS.—The Office shall, in coordi-
16 nation with the performance branch of the National
17 Weather Service, develop metrics for that branch to
18 track and evaluate the degree to which hazardous
19 weather and water event communications inform ac-
20 tion and encourage response.

21 (5) SUPPORT PLAN.—

22 (A) IN GENERAL.—The Office shall de-
23 velop a plan for the purpose of supporting the
24 activities described in paragraph (3).

1 (B) PERIODIC UPDATE AND ELEMENTS.—

2 The plan developed under subparagraph (A)
3 shall be periodically updated and informed by
4 internal and extramural research and the re-
5 sults of the evaluation of hazardous weather
6 and water event communications conducted
7 under paragraph (4).

8 (6) METHODS.—In carrying out this subsection,
9 the Office shall develop and implement recommenda-
10 tions that—

11 (A) are based on the best and most recent
12 understanding from social, behavioral, risk, and
13 communication science research;

14 (B) are validated by social, behavioral,
15 risk, and communication science, taking into ac-
16 count the importance of methods that support
17 reproduction and replication of scientific stud-
18 ies, use of rigorous statistical analyses, and, as
19 applicable, data analysis supported by artificial
20 intelligence and machine learning technologies;

21 (C) account for the needs of various demo-
22 graphics, vulnerable populations, and geo-
23 graphic regions;

24 (D) account for the differences between
25 various types of weather and water hazards;

1 (E) respond to the needs of Federal, State,
2 and local government partners and media part-
3 ners; and

4 (F) account for necessary changes in the
5 infrastructure, technology, and protocols for
6 creating and disseminating federally operated
7 watches and warnings.

8 (7) COORDINATION.—In implementing this sub-
9 section, the Office shall coordinate with—

10 (A) Federal partners, including National
11 Laboratories, Cooperative Institutes, and re-
12 gional integrated sciences and assessments pro-
13 grams;

14 (B) State and local government partners;

15 (C) Indian Tribes;

16 (D) institutions of higher education; and

17 (E) media partners.

18 (8) TIMELINESS AND CONSISTENCY.—The Of-
19 fice shall develop best practices and guidance for en-
20 suring timely and consistent communication across
21 public facing platforms that disseminate hazardous
22 weather and water event information.

23 (c) HAZARD COMMUNICATION RESEARCH AND EN-
24 GAGEMENT.—

1 (1) IN GENERAL.—The Under Secretary shall
2 establish or maintain a research program—

3 (A) to modernize the creation and commu-
4 nication of risk-based, statistically reliable,
5 probabilistic hazard information, with the goal
6 of informing effective actions and encouraging
7 responses to hazardous weather and water
8 events; and

9 (B) to improve the fundamental social, be-
10 havioral, risk, and communication science re-
11 garding hazardous weather and water event
12 communication.

13 (2) COORDINATION.—In carrying out the re-
14 search program required by paragraph (1), the
15 Under Secretary shall coordinate and communicate
16 with States, Indian Tribes, localities, and emergency
17 managers on research priorities and results.

18 (3) PILOT PROGRAM FOR TORNADO HAZARD
19 COMMUNICATION REQUIRED.—

20 (A) IN GENERAL.—To further research
21 into hazard communication, the Under Sec-
22 retary, in collaboration with one or more eligible
23 institutions, shall establish a pilot program for
24 tornado hazard communication to test the effec-

1 tiveness of implementing the research conducted
2 under this subsection with respect to tornadoes.

3 (B) ELIGIBLE INSTITUTION DEFINED.—In
4 this paragraph, the term “eligible institution”
5 means any of the following:

6 (i) A historically Black college or uni-
7 versity located in an area of persistent pov-
8 erty that is subjected to frequent severe
9 weather, such as tornadoes, hurricanes,
10 and floods.

11 (ii) An institution of higher education
12 in close proximity to a Weather Forecast
13 Office of the National Weather Service.

14 (d) DATA MANAGEMENT.—The Under Secretary
15 shall establish, maintain, and improve a central repository
16 system for the National Oceanic and Atmospheric Admin-
17 istration for social, behavioral, risk, and economic data re-
18 lated to the communication of hazardous weather and
19 water events, including data developed or received pursu-
20 ant to paragraphs (3), (4), and (5) of subsection (b).

21 (e) DIGITAL WATERMARKING.—The Under Secretary
22 shall develop methods to reduce the likelihood of unauthor-
23 ized tampering with online hazardous weather and water
24 event risk communication, such as developing digital wa-
25 termarks.

1 **SEC. 4. WARN-ON-FORECAST STRATEGIC PLAN.**

2 (a) IN GENERAL.—Not later than one year after the
3 date of the enactment of this Act, the Under Secretary
4 shall prepare and submit to Congress a strategic plan for
5 developing and prioritizing the implementation of high-
6 resolution probabilistic forecast guidance for hazardous
7 weather and water events using a next-generation weather
8 forecast and warning framework.

9 (b) PLAN ELEMENTS.—The strategic plan required
10 by subsection (a) shall include the following:

11 (1) A discussion of—

12 (A) the priorities and needs of vulnerable
13 populations and National Weather Service part-
14 ners; and

15 (B) high-performance computing, visualiza-
16 tion, and dissemination needs.

17 (2) A timeline and guidance for implementation
18 of—

19 (A) high-resolution numerical weather pre-
20 diction models;

21 (B) methods for meeting the high-perform-
22 ance computing, visualization, and dissemina-
23 tion needs discussed under paragraph (1)(B);

24 (C) real-time high-resolution probabilistic
25 forecasts;

1 (D) improved observations, including
2 through radars, satellites, and uncrewed aerial
3 systems;

4 (E) a flexible framework to communicate
5 clear and simple hazardous weather and water
6 event information to the public; and

7 (F) social, behavioral, risk, and commu-
8 nication research to improve the forecaster
9 operational environment and societal informa-
10 tion reception and response.

11 **SEC. 5. TORNADO RATING SYSTEM.**

12 (a) IN GENERAL.—The Under Secretary shall, in col-
13 laboration with such stakeholders as the Under Secretary
14 considers appropriate—

15 (1) evaluate the system used as of the date of
16 the enactment of this Act to rate the severity of tor-
17 nadoes; and

18 (2) determine whether updates to that system
19 are required to ensure that the ratings accurately re-
20 flect the severity of tornadoes.

21 (b) UPDATE REQUIRED.—If the Under Secretary de-
22 termines under subsection (a) that updates to the tornado
23 rating system are necessary, the Under Secretary shall up-
24 date the system.

1 **SEC. 6. POST-STORM SURVEYS AND ASSESSMENTS.**

2 (a) IN GENERAL.—The Under Secretary shall per-
3 form one or more post-storm surveys and assessments fol-
4 lowing each hazardous weather or water event determined
5 by the Under Secretary to be of sufficient societal impor-
6 tance to warrant a post-event survey and assessment.

7 (b) COORDINATION.—The Under Secretary shall co-
8 ordinate with Federal, State, and local governments, In-
9 dian Tribes, private entities, and relevant institutions of
10 higher education when conducting post-storm surveys and
11 assessments under subsection (a) in order to optimize data
12 collection, sharing, and integration.

13 (c) DATA AVAILABILITY.—The Under Secretary shall
14 make the data obtained from each post-storm survey and
15 assessment conducted under subsection (a) available to the
16 public as soon as practicable after conducting the survey
17 and assessment.

18 (d) IMPROVEMENT.—The Under Secretary shall—

19 (1) investigate the role of uncrewed aerial sys-
20 tems in data collection during post-storm surveys
21 and assessments conducted under subsection (a);

22 (2) identify gaps in and update tactics and pro-
23 cedures to enhance the efficiency and reliability of
24 data obtained from post-storm surveys and assess-
25 ments; and

1 (3) increase the number of post-storm commu-
2 nity impact studies, including by—

3 (A) surveying individual responses;

4 (B) conducting review of the accuracy of
5 prior risk evaluations;

6 (C) evaluating the efficacy of prior mitiga-
7 tion activity; and

8 (D) gathering survivability statistics.

9 (e) SUPPORT FOR EMPLOYEES.—The Under Sec-
10 retary shall provide training, resources, and access to pro-
11 fessional counseling to support the emotional and mental
12 health and well-being of employees conducting post-storm
13 surveys and assessments under subsection (a).

14 **SEC. 7. VORTEX-USA PROGRAM.**

15 (a) IN GENERAL.—Section 103 of the Weather Re-
16 search and Forecasting Innovation Act of 2017 (15 U.S.C.
17 8513) is amended—

18 (1) in the section heading, by striking “**TOR-**
19 **NADO WARNING IMPROVEMENT AND EXTEN-**
20 **SION**” and inserting “**VORTEX-USA**”;

21 (2) in subsection (a), by striking “establish a
22 tornado warning improvement and extension pro-
23 gram” and inserting “maintain a program for rap-
24 idly improving tornado forecast and warnings”;

1 (3) by redesignating subsections (d) and (e) as
2 subsections (f) and (g), respectively;

3 (4) by inserting after subsection (c) the fol-
4 lowing:

5 “(d) WARNINGS.—The program required by sub-
6 section (a) shall—

7 “(1) continue the research necessary to develop
8 and deploy probabilistic weather forecast guidance
9 technology for tornadoes; and

10 “(2) incorporate, as appropriate, hazard com-
11 munication research.

12 “(e) RESEARCH.—

13 “(1) IN GENERAL.—The Under Secretary shall,
14 through the program required by subsection (a),
15 award grants for research that focuses on improv-
16 ing—

17 “(A) the social, behavioral, risk, commu-
18 nication, and economic sciences related to
19 vulnerabilities, risk communication, and delivery
20 of information critical for saving lives and prop-
21 erty related to tornadoes; and

22 “(B) the physical sciences, engineering,
23 and technology related to tornado formation,
24 the interactions of tornadoes with the built and

1 natural environment, and the interaction of tor-
2 nadoes and hurricanes.

3 “(2) PRIORITY INSTITUTIONS.—

4 “(A) IN GENERAL.—In awarding grants
5 under paragraph (1), the Under Secretary may
6 prioritize awarding grants to minority-serving
7 institutions.

8 “(B) DEFINITION OF MINORITY-SERVING
9 INSTITUTION.—In this paragraph, the term ‘mi-
10 nority-serving institution’ means—

11 “(i) a part B institution (as defined in
12 section 322 of the Higher Education Act
13 of 1965 (20 U.S.C. 1061));

14 “(ii) a Hispanic-serving institution (as
15 defined in section 502(a) of that Act (20
16 U.S.C. 1101a(a)));

17 “(iii) a Tribal College or University
18 (as defined in section 316(b) of that Act
19 (20 U.S.C. 1059c(b)));

20 “(iv) an Alaska Native-serving institu-
21 tion (as defined in section 317(b) of that
22 Act (20 U.S.C. 1059d(b)));

23 “(v) a Native Hawaiian-serving insti-
24 tution (as defined in section 317(b) of that
25 Act (20 U.S.C. 1059d(b)));

1 “(vi) a Predominantly Black Institu-
2 tion (as defined in section 318(b) of that
3 Act (20 U.S.C. 1059e(b)));

4 “(vii) an Asian American and Native
5 American Pacific Islander-serving institu-
6 tion (as defined in section 320(b) of that
7 Act (20 U.S.C. 1059g(b))); or

8 “(viii) a Native American-serving,
9 nontribal institution (as defined in section
10 319(b) of that Act (20 U.S.C.
11 1059f(b))).”; and

12 (5) by adding at the end the following:

13 “(h) AUTHORIZATION OF APPROPRIATIONS.—There
14 is authorized to be appropriated to the Under Secretary
15 to carry out this section \$11,000,000 for each of fiscal
16 years 2025 through 2032, of which not less than
17 \$2,000,000 each fiscal year shall be used for grants
18 awarded under subsection (e).”.

19 (b) CLERICAL AMENDMENT.—The table of contents
20 in section 1(b) of the Weather Research and Forecasting
21 Innovation Act of 2017 (Public Law 115–25; 131 Stat.
22 91) is amended by striking the item relating to section
23 103 and inserting the following:

“Sec. 103. VORTEX-USA program.”.

1 **SEC. 8. GOVERNMENT ACCOUNTABILITY OFFICE REPORT**
2 **ON HAZARDOUS WEATHER AND WATER**
3 **ALERT DISSEMINATION.**

4 (a) IN GENERAL.—Not later than 540 days after the
5 date of the enactment of this Act, the Comptroller General
6 of the United States shall submit to the Committee on
7 Commerce, Science, and Transportation of the Senate and
8 the Committee on Science, Space, and Technology of the
9 House of Representatives a report that examines the infor-
10 mation technology infrastructure of the National Weather
11 Service of the National Oceanic and Atmospheric Adminis-
12 tration, specifically regarding the system for timely public
13 notification of hazardous weather and water event alerts
14 and updates.

15 (b) ELEMENTS.—The report required by subsection
16 (a) shall include the following:

17 (1) An analysis of the information technology
18 infrastructure of the National Weather Service, in-
19 cluding software and hardware capabilities and limi-
20 tations, including an examination of server and data
21 storage methods, broadband, data management, and
22 data sharing.

23 (2) An identification of secondary and tertiary
24 fail-safes for the timely distribution of hazardous
25 weather and water event alerts to the public.

1 (3) A determination of the extent to which pub-
2 lic notifications are delayed and an identification of
3 corrective measures that do not add additional noti-
4 fication time.

5 (4) An assessment of whether collaboration with
6 other Federal Government offices, States, or private
7 entities could reduce delays in notifications to the
8 public.

9 (5) A description of actions being undertaken to
10 better identify critical steps in the hazards notifica-
11 tion process that may be vulnerable to disruption or
12 failure in the event of communication, technologic,
13 or computational failure.

14 **SEC. 9. ELIMINATION OF CERTAIN REPORT REQUIRE-**
15 **MENTS.**

16 (a) WEATHER RESEARCH AND FORECASTING INNO-
17 VATION ACT OF 2017.—

18 (1) IN GENERAL.—Section 403 of the Weather
19 Research and Forecasting Innovation Act of 2017
20 (15 U.S.C. 8543) is amended by striking subsection
21 (d).

22 (2) TECHNICAL AMENDMENT.—Section 403(a)
23 of such Act (15 U.S.C. 8543(a)) is amended by in-
24 serting “the” after “Director of”.

1 (b) NATIONAL OCEANIC AND ATMOSPHERIC ADMIN-
2 ISTRATION AUTHORIZATION ACT OF 1992.—Section 106
3 of the National Oceanic and Atmospheric Administration
4 Authorization Act of 1992 (Public Law 102–567; 106
5 Stat. 4274) is amended by striking subsection (c) (15
6 U.S.C. 1537).