

## Calendar No. 88

119TH CONGRESS  
1ST SESSION**S. 258****[Report No. 119–26]**

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

---

## IN THE SENATE OF THE UNITED STATES

JANUARY 27, 2025

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

JUNE 2, 2025

Reported by Mr. CRUZ, with amendments

[Omit the parts struck through and insert the parts printed in *italic*]**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,*

1 **SECTION 1. SHORT TITLE.**

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

5 **SEC. 2. DEFINITIONS.**

6       In this Act:

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

11           (A) severe storms, such as hurricanes and  
12 short-fused, small-scale hazardous weather or  
13 hydrologic events produced by thunderstorms,  
14 including large hail, damaging winds, torna-  
15 does, and flash floods;

16           (B) winter storms, such as freezing or fro-  
17 zen precipitation (including freezing rain, sleet,  
18 and snow), or combined effects of freezing or  
19 frozen precipitation and strong winds; and

20           (C) other weather hazards, such as ex-  
21 treme heat or cold, wildfire, drought, dense fog,  
22 high winds, river flooding, and lakeshore flood-  
23 ing.

24           (2) **HISTORICALLY BLACK COLLEGE OR UNI-**  
25 **VERSITY.**—The term “historically Black college or  
26 university” has the meaning given the term “part B

1 institution” in section 322 of the Higher Education  
 2 Act of 1965 (20 U.S.C. 1061).

3 (3) INDIAN TRIBE.—The term “Indian Tribe”  
 4 has the meaning given the term in section 4 of the  
 5 Indian Self-Determination and Education Assistance  
 6 Act (25 U.S.C. 5304).

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

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

15 (6) UNDER SECRETARY.—The term “Under  
 16 Secretary” means the Under Secretary of Commerce  
 17 for Oceans and Atmosphere.

18 **SEC. 3. HAZARDOUS WEATHER AND WATER EVENT RISK**  
 19 **COMMUNICATION.**

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

1 (b) HAZARD RISK COMMUNICATION IMPROVEMENT  
2 AND SIMPLIFICATION.—

3 (1) IN GENERAL.—The Under Secretary shall  
4 maintain a hazard risk communication office (in this  
5 subsection referred to as the “Office”), for the pur-  
6 poses of simplifying and improving the communica-  
7 tion of hazardous weather and water event risks.

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

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

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

25 (5) SUPPORT PLAN.—

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

4           (B) PERIODIC UPDATE AND ELEMENTS.—  
5           The plan developed under subparagraph (A)  
6           shall be periodically updated and informed by  
7           internal and extramural research and the re-  
8           sults of the evaluation of hazardous weather  
9           and water event communications conducted  
10          under paragraph (4).

11          (6) METHODS.—In carrying out this subsection,  
12          the Office shall develop and implement recommenda-  
13          tions that—

14                (A) are based on the best and most recent  
15                understanding from social, behavioral, risk, and  
16                communication science research;

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

1 (C) account for the needs of various demo-  
 2 graphics, vulnerable populations, and geo-  
 3 graphic regions;

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

6 (E) respond to the needs of Federal, State,  
 7 and local government partners and media part-  
 8 ners; ~~and~~

9 *(F) account for the need for enhanced or*  
 10 *earlier communication of a hazardous weather*  
 11 *event to inform action and encourage response*  
 12 *when the event occurs in a geographic area*  
 13 *where the event is historically abnormal; and*

14 ~~(F)~~(G) account for necessary changes in  
 15 the infrastructure, technology, and protocols for  
 16 creating and disseminating federally operated  
 17 watches and warnings.

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

20 (A) Federal partners, including National  
 21 Laboratories, Cooperative Institutes, and re-  
 22 gional integrated sciences and assessments pro-  
 23 grams;

24 (B) State and local government partners;

25 (C) Indian Tribes;

1 (D) institutions of higher education; and

2 (E) media partners.

3 (8) TIMELINESS AND CONSISTENCY.—The Of-  
4 fice shall develop best practices and guidance for en-  
5 suring timely and consistent communication across  
6 public facing platforms that disseminate hazardous  
7 weather and water event information.

8 (c) HAZARD COMMUNICATION RESEARCH AND EN-  
9 GAGEMENT.—

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

12 (A) to modernize the creation and commu-  
13 nication of risk-based, statistically reliable,  
14 probabilistic hazard information, with the goal  
15 of informing effective actions and encouraging  
16 responses to hazardous weather and water  
17 events; and

18 (B) to improve the fundamental social, be-  
19 havioral, risk, and communication science re-  
20 garding hazardous weather and water event  
21 communication.

22 (2) COORDINATION.—In carrying out the re-  
23 search program required by paragraph (1), the  
24 Under Secretary shall coordinate and communicate

with States, Indian Tribes, localities, and emergency managers on research priorities and results.

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

(A) IN GENERAL.—To further research into hazard communication, the Under Secretary, in collaboration with one or more eligible institutions, shall establish a pilot program for tornado hazard communication to test the effectiveness of implementing the research conducted under this subsection with respect to tornadoes.

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

(i) A historically Black college or university located in an area of persistent poverty that is subjected to frequent severe weather, such as tornadoes, hurricanes, and floods.

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

(d) DATA MANAGEMENT.—The Under Secretary shall establish, maintain, and improve a central repository system for the National Oceanic and Atmospheric Admin-



1 istration for social, behavioral, risk, and economic data re-  
 2 lated to the communication of hazardous weather and  
 3 water events, including data developed or received pursu-  
 4 ant to paragraphs (3), (4), and (5) of subsection (b).

5 (e) DIGITAL WATERMARKING.—The Under Secretary  
 6 shall develop methods to reduce the likelihood of unauthor-  
 7 ized tampering with online hazardous weather and water  
 8 event risk communication, such as developing digital wa-  
 9 termarks.

#### 10 **SEC. 4. WARN-ON-FORECAST STRATEGIC PLAN.**

11 (a) IN GENERAL.—Not later than one year after the  
 12 date of the enactment of this Act, the Under Secretary  
 13 shall prepare and submit to Congress a strategic plan for  
 14 developing and prioritizing the implementation of high-  
 15 resolution probabilistic forecast guidance for hazardous  
 16 weather and water events using a next-generation weather  
 17 forecast and warning framework.

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

20 (1) A discussion of—

21 (A) the priorities and needs of vulnerable  
 22 populations and National Weather Service part-  
 23 ners; and

24 (B) high-performance computing, visualiza-  
 25 tion, and dissemination needs.

1           (2) A timeline and guidance for implementation  
 2       of—

3                   (A) high-resolution numerical weather pre-  
 4       diction models;

5                   (B) methods for meeting the high-perform-  
 6       ance computing, visualization, and dissemina-  
 7       tion needs discussed under paragraph (1)(B);

8                   (C) real-time high-resolution probabilistic  
 9       forecasts;

10                  (D) improved observations, including  
 11       through radars, satellites, and uncrewed aerial  
 12       systems;

13                  (E) a flexible framework to communicate  
 14       clear and simple hazardous weather and water  
 15       event information to the public; ~~and~~

16                   (F) *improved coordination among offices of*  
 17       *the National Weather Service, such as the Na-*  
 18       *tional Hurricane Center, the River Forecast Cen-*  
 19       *ters, and forecast offices of the National Weather*  
 20       *Service, to reduce the occurrence of disparate*  
 21       *weather predictions and to better communicate*  
 22       *the relationship between overlapping weather*  
 23       *forecasts for different periods of time; and*

24                  ~~(F)~~(G) social, behavioral, risk, and commu-  
 25       nication research to improve the forecaster

1 operational environment and societal informa-  
2 tion reception and response.

3 **SEC. 5. TORNADO RATING SYSTEM.**

4 (a) IN GENERAL.—The Under Secretary shall, in col-  
5 laboration with such stakeholders as the Under Secretary  
6 considers appropriate—

7 (1) evaluate the system used as of the date of  
8 the enactment of this Act to rate the severity of tor-  
9 nadoes; and

10 (2) determine whether updates to that system  
11 are required to ensure that the ratings accurately re-  
12 flect the severity of tornadoes.

13 (b) UPDATE REQUIRED.—If the Under Secretary de-  
14 termines under subsection (a) that updates to the tornado  
15 rating system are necessary, the Under Secretary shall up-  
16 date the system.

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

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

23 (b) COORDINATION.—The Under Secretary shall co-  
24 ordinate with Federal, State, and local governments, In-  
25 dian Tribes, private entities, and relevant institutions of

1 higher education when conducting post-storm surveys and  
2 assessments under subsection (a) in order to optimize data  
3 collection, sharing, and integration.

4 (c) DATA AVAILABILITY.—The Under Secretary shall  
5 make the data obtained from each post-storm survey and  
6 assessment conducted under subsection (a) available to the  
7 public as soon as practicable after conducting the survey  
8 and assessment.

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

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

13 (2) identify gaps in and update tactics and pro-  
14 cedures to enhance the efficiency and reliability of  
15 data obtained from post-storm surveys and assess-  
16 ments; and

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

19 (A) surveying individual responses;

20 (B) conducting review of the accuracy of  
21 prior risk evaluations;

22 (C) evaluating the efficacy of prior mitiga-  
23 tion activity; and

24 (D) gathering survivability statistics.

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

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

7 (a) IN GENERAL.—Section 103 of the Weather Re-  
 8 search and Forecasting Innovation Act of 2017 (15 U.S.C.  
 9 8513) is amended—

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

13 (2) in subsection (a), by striking “establish a  
 14 tornado warning improvement and extension pro-  
 15 gram” and inserting “maintain a program for rap-  
 16 idly improving tornado forecast and warnings”;

17 (3) by redesignating subsections (d) and (e) as  
 18 subsections (f) and (g), respectively;

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

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

23 “(1) continue the research necessary to develop  
 24 and deploy probabilistic weather forecast guidance  
 25 technology for tornadoes; and

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

3           “(e) RESEARCH.—

4           “(1) IN GENERAL.—The Under Secretary shall,  
5           through the program required by subsection (a),  
6           award grants for research that focuses on improv-  
7           ing—

8                   “(A) the social, behavioral, risk, commu-  
9                   nication, and economic sciences related to  
10                  vulnerabilities, risk communication, and delivery  
11                  of information critical for saving lives and prop-  
12                  erty related to tornadoes; and

13                  “(B) the physical sciences, engineering,  
14                  and technology related to tornado formation,  
15                  the interactions of tornadoes with the built and  
16                  natural environment, and the interaction of tor-  
17                  nadoes and hurricanes.

18           “(2) PRIORITY INSTITUTIONS.—

19                  “(A) IN GENERAL.—In awarding grants  
20                  under paragraph (1), the Under Secretary may  
21                  prioritize awarding grants to minority-serving  
22                  institutions.

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

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

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

7 “(iii) a Tribal College or University  
8 (as defined in section 316(b) of that Act  
9 (20 U.S.C. 1059c(b)));

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

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

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

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

23 “(viii) a Native American-serving,  
24 nontribal institution (as defined in section

1                   319(b) of that Act (20 U.S.C.  
2                   1059f(b))).”; and

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

4           “(h) AUTHORIZATION OF APPROPRIATIONS.—There  
5 is authorized to be appropriated to the Under Secretary  
6 to carry out this section \$11,000,000 for each of fiscal  
7 years 2025 through 2032, of which not less than  
8 \$2,000,000 each fiscal year shall be used for grants  
9 awarded under subsection (e).”.

10          (b) CLERICAL AMENDMENT.—The table of contents  
11 in section 1(b) of the Weather Research and Forecasting  
12 Innovation Act of 2017 (Public Law 115–25; 131 Stat.  
13 91) is amended by striking the item relating to section  
14 103 and inserting the following:

“Sec. 103. VORTEX-USA program.”.

15 **SEC. 8. GOVERNMENT ACCOUNTABILITY OFFICE REPORT**  
16 **ON HAZARDOUS WEATHER AND WATER**  
17 **ALERT DISSEMINATION.**

18          (a) IN GENERAL.—Not later than 540 days after the  
19 date of the enactment of this Act, the Comptroller General  
20 of the United States shall submit to the Committee on  
21 Commerce, Science, and Transportation of the Senate and  
22 the Committee on Science, Space, and Technology of the  
23 House of Representatives a report that examines the infor-  
24 mation technology infrastructure of the National Weather  
25 Service of the National Oceanic and Atmospheric Adminis-



1 tration, specifically regarding the system for timely public  
2 notification of hazardous weather and water event alerts  
3 and updates.

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

6 (1) An analysis of the information technology  
7 infrastructure of the National Weather Service, in-  
8 cluding software and hardware capabilities and limi-  
9 tations, including an examination of server and data  
10 storage methods, broadband, data management, and  
11 data sharing.

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

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

19 (4) An assessment of whether collaboration with  
20 other Federal Government offices, States, or private  
21 entities could reduce delays in notifications to the  
22 public.

23 (5) A description of actions being undertaken to  
24 better identify critical steps in the hazards notifica-  
25 tion process that may be vulnerable to disruption or

1 failure in the event of communication, technologic,  
 2 or computational failure.

3 **SEC. 9. ELIMINATION OF CERTAIN REPORT REQUIRE-**  
 4 **MENTS.**

5 (a) WEATHER RESEARCH AND FORECASTING INNO-  
 6 VATION ACT OF 2017.—

7 (1) IN GENERAL.—Section 403 of the Weather  
 8 Research and Forecasting Innovation Act of 2017  
 9 (15 U.S.C. 8543) is amended by striking subsection  
 10 (d).

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

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



Calendar No. 88

119<sup>TH</sup> CONGRESS  
1<sup>ST</sup> Session

**S. 258**

[Report No. 119-26]

**A BILL**

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

JUNE 2, 2025

Reported with amendments