

**COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY
U.S. HOUSE OF REPRESENTATIVES
SUBCOMMITTEE ON ENVIRONMENT**

HEARING CHARTER

Advancing Earth System Science and Stewardship at NOAA

Thursday, September 23, 2021

10:00 a.m. ET

Online Via Zoom

PURPOSE

The purpose of this hearing is to discuss the Administration’s priorities for the National Oceanic and Atmospheric Administration (NOAA) as they relate to climate science and services; scientific integrity; the scientific workforce; weather, water, and climate research and forecasting; and other issues within the Science Committee’s jurisdiction. This hearing will be an opportunity for Members to discuss their priorities related to the agency’s mission.

WITNESS

- **The Honorable Richard W. Spinrad, Ph.D.**, Under Secretary of Commerce for Oceans and Atmosphere and Administrator, National Oceanic and Atmospheric Administration

OVERARCHING QUESTIONS

- What are the Administration’s priorities for advancing weather, water, and climate research and forecasting at NOAA to improve our understanding of the Earth system and the delivery of timely, accurate forecasts?
- How is NOAA working to enhance climate resilience and adaptation and the equitable delivery of actionable climate information, tools, and services to support decision-making in communities across the nation?
- What is the Administrator doing to ensure scientific integrity is applied and enforced in all of the agency’s science and research activities?
- How is NOAA working to address staffing issues to build a more diverse and equitable workforce?
- What additional resources and policy changes does NOAA need to advance its Earth system science and stewardship mission?

BACKGROUND

The National Oceanic and Atmospheric Administration (NOAA) is a federal science agency that is responsible for weather forecasts and warnings, climate monitoring, fisheries management, coastal restoration, and more. Its stated mission is “to understand and predict changes in climate,

weather, oceans and coasts; to share that knowledge and information with others; and to conserve and manage coastal and marine ecosystems and resources.”¹

NOAA was established in 1970 within the Department of Commerce (DOC).² NOAA’s operations are divided into six Line Offices: National Weather Service (NWS), Office of Oceanic and Atmospheric Research (OAR), National Environmental Satellite, Data, and Information Service (NESDIS), National Ocean Service (NOS), Office of Marine and Aviation Operations (OMAO), and National Marine Fisheries Service (NMFS). The Science Committee has jurisdiction over weather, ocean, and climate research and forecasting, satellites, space weather, and more, spanning work at the NWS, NESDIS, OAR, NOS, and OMAO (described in more detail below). The Committee does not have jurisdiction over marine fisheries (NMFS) or other living marine resources.

Dr. Richard Spinrad, who served previous roles at the agency, including as former Chief Scientist (2014-2016), began his tenure as NOAA Administrator in June of 2021 with three overarching priorities:³

- The development of an environmental products and services portfolio, in coordination with NOAA’s public and private partners, that reflects the urgency of climate change and increases accessibility for underserved communities.
- The advancement of programs and policies that enhance sustainability and environmental stewardship while also fostering economic development.
- The creation of a more equitable and inclusive workforce in the environmental, ecological, and related STEM field through the education and training of emerging professionals.

National Weather Service: The NWS’s mission is to “provide weather, water, and climate data, forecasts and warnings for the protection of life and property and enhancement of the national economy.”⁴ They achieve this by collecting, analyzing, and disseminating weather and climate data to provide the authoritative information needed by Americans. NWS also conducts research to remain on the cutting edge of Earth system sciences.

The National Centers for Environmental Prediction (NCEP) is at the heart of all forecasts and warnings for the nation. It includes the Aviation Weather Center, Climate Prediction Center, National Hurricane Center, Storm Prediction Center, Space Weather Prediction Center, Ocean Prediction Center, Environmental Modeling Center, and NCEP Central Operations. 122 Weather Forecast Offices across the country issue warnings, advisories, and short-term forecasts for their respective local areas. NWS collects environmental observations and other meteorological data from across NOAA Line Offices including data from radars, satellites, aircraft, weather balloons, coastal and offshore buoys, and more to inform the development of weather forecasts. NWS also engages with external scientific partners to collect additional weather observations and data.

NWS is working to advance its Impact-Based Decision Support Services (IDSS) to better enable emergency personnel and public safety officials to make decisions to preserve life and property.

¹ <https://www.noaa.gov/our-mission-and-vision>

² <https://www.noaa.gov/our-history>

³ <https://www.noaa.gov/news-release/richard-w-spinrad-sworn-in-as-noaa-administrator>.

⁴ <https://www.weather.gov/about/>

NWS continues to build trusted relationships with partners at the local, state, and national levels and provides them with actionable, timely, and reliable information. NWS provides on-site support at emergency operations centers or at incidents. For example, NWS deploys Incident Meteorologists (IMETs) to help crews on the ground fighting wildfires, providing crucial weather information that will help determine the best strategy to contain the fire and to protect lives and property.⁵

Congress authorized NOAA’s Earth Prediction Innovation Center (EPIC) to improve U.S. numerical weather prediction and forecasting through building a community-based model that involves NOAA internal and external partners.⁶ The Science Committee conducted extensive bipartisan oversight^{7,8} of the EPIC program. In April 2021, NOAA announced that Raytheon Intelligence and Space was chosen to design and develop the Center.⁹

In addition to forecasting meteorological events, NWS also provides tsunami warnings. From two tsunami warning centers, NOAA staff monitor for earthquakes that may cause tsunamis, forecast potentially resulting tsunamis and their impacts, and issue tsunami warnings. As part of the National Tsunami Hazard Mitigation Program, NWS also works to educate the public on tsunami response and helps with community response planning and hazard mitigation.¹⁰

Office of Oceanic and Atmospheric Research: OAR’s stated mission is to “conduct research to understand and predict the Earth system; develop technology to improve NOAA science, service, and stewardship; and transition the results so they are useful to society.”¹¹ OAR, also called “NOAA Research,” is the primary research and development organization within NOAA.

OAR provides the research foundation for understanding the complex systems that support our planet. OAR enables better forecasts, earlier warnings for natural disasters, and a greater understanding of the Earth, to better manage the environment, nationally, and globally.¹² OAR administers collaborative long-term partnerships between NOAA and participating universities and other non-profit institutions, including 16 Cooperative Research Institutes, 33 Sea Grant Programs, and the NOAA Climate Program Office, which manages the Regional Integrated Sciences and Assessments (RISA) program. The primary program components of the OAR network are the National Sea Grant Program, Office of Ocean Exploration and Research, Climate Program Office, Weather Program Office, Uncrewed Systems Research, Ocean Acidification Program, Global Ocean Monitoring and Observing Program, and Research Laboratories.¹³

⁵ https://www.weather.gov/gjt/PeakToValleyWin15V2_IMET

⁶ Section 4, National Integrated Drought Information System Reauthorization Act of 2018, P.L. 115-423

⁷ <https://science.house.gov/letter-to-acting-administrator-jacobs-regarding-upcoming-release-of-the-request-for-proposals-for-epic>

⁸ <https://science.house.gov/hearings/a-task-of-epic-proportions-reclaiming-us-leadership-in-weather-modeling-and-prediction>

⁹ <https://noaa.gov/media-release/raytheon-intelligence-and-space-to-lead-new-center-dedicated-to-advancing-us-weather>

¹⁰ <https://nws.weather.gov/nthmp/>

¹¹ <https://research.noaa.gov/About-Us>

¹² <https://research.noaa.gov/>

¹³ <https://research.noaa.gov/Labs-Programs/oar-programs>

National Environmental Satellite, Data, and Information Service: NESDIS’s mission is to “provide[s] secure and timely access to global environmental data and information from satellites and other sources to promote and protect the nation’s security, environment, economy, and quality of life.”¹⁴

NESDIS operates a constellation of weather and environmental satellites broken into three portfolios to provide on-orbit environmental observations: low Earth orbit (LEO) satellites, geostationary orbit (GEO) satellites, and space weather observations (SWO). The current polar-orbiting Joint Polar Satellite System (JPSS) mission includes three operational LEO satellites that provide observations and data that inform both short- and long-term forecasts.¹⁵ The current Geostationary Operational Environmental Satellites (GOES-R) series includes two operational GEO satellites, along with one spare, that provide advanced imagery and atmospheric measurements of the Western Hemisphere, real-time mapping of lightning activity, and improved monitoring of solar activity and space weather.¹⁶ The SWO portfolio includes observations from the GOES-R series, and from the Deep Space Climate Observatory (DSCOVR) satellite which monitors solar wind and space weather events from Lagrange Point 1, between the Sun and the Earth. The data from SWO are used by the Space Weather Prediction Center to issue warnings up to an hour before a space weather event (which can disrupt a wide variety of space-based and ground-based technologies) reaches the Earth.

Additionally, NOAA benefits from its international partnerships and utilizes data from partner countries’ satellites to enhance environmental observations. NOAA is currently developing the next generation of satellites, including the Geostationary Extended Observations (GeoXO) mission¹⁷ and the Space Weather Follow-On (SWFO) program.¹⁸ NESDIS’s Office of Satellite Ground Services facilitates its ability to operate NOAA’s satellite constellation efficiently and effectively by sustaining a set of common ground services.¹⁹

NESDIS houses the National Centers for Environmental Information (NCEI), the largest publicly accessible archive of environmental data on Earth that inform decision-makers within government, academia, and the private sector.²⁰ These data are integral to the creation of products and services, such as those described in the Climate Services section of this charter.

National Ocean Service: NOS’s mission is to “provide science-based solutions through collaborative partnerships to address evolving economic, environmental, and social pressures on our ocean and coasts.”²¹ They accomplish this through providing data, tools, and services that support coastal economies, primarily for the purposes of safe and efficient transportation and commerce, preparedness and risk reduction, and stewardship.

¹⁴ <https://www.nesdis.noaa.gov/about/our-mission>

¹⁵ <https://www.nesdis.noaa.gov/current-satellite-missions/currently-flying/joint-polar-satellite-system>

¹⁶ <https://www.nesdis.noaa.gov/current-satellite-missions/currently-flying/geostationary-satellites>

¹⁷ <https://www.nesdis.noaa.gov/next-generation-satellites/geostationary-extended-observations-geoxo>

¹⁸ <https://www.nesdis.noaa.gov/next-generation-satellites/space-weather>

¹⁹ <https://www.nesdis.noaa.gov/about/our-offices/office-of-satellite-ground-services>

²⁰ <https://www.ncei.noaa.gov/about>

²¹ <https://oceanservice.noaa.gov/about/>

Within NOS, the National Centers for Coastal Ocean Science (NCCOS) conduct an array of coastal and Great Lakes research, including on harmful algal blooms (HABs) and hypoxia. NCCOS works to advance the scientific understanding and ability to detect, monitor, assess, and predict HAB and hypoxia events, including issuing short-term and seasonal HAB forecasts.²² NCCOS also conducts social science across its Marine Spatial Ecology, Stressor Impacts and Mitigation, and Coastal Change portfolios.

NOS's Office of Coastal Management works collaboratively with the private sector, nonprofits, scientific community, and government to deliver coastal data and tools to make communities more resilient. NOS's Center for Operational Oceanographic Products and Services (CO-OPS) maintains the nation's network of coastal tide and water level sensors to provide real-time data that supports accurate weather forecasts, coastal storm and flood predictions, and tsunami warnings. NOS is also solely responsible for maintaining the nation's accurate coordinate system to help inform mapping, charting, and transportation activities and infrastructure, through the National Geodetic Survey.

Office of Marine and Aviation Operations: OMAO's stated mission is to "optimize NOAA's observational platforms and unique workforce capabilities to meet NOAA's science, service, and stewardship missions."²³ OMAO manages and operates NOAA's fleet of 15 research and survey ships and nine aircraft that gather oceanic, atmospheric, hydrographic, and fisheries data to support the agency's mission. OMAO also manages the NOAA Diving Program, NOAA Small Boat Program, and NOAA Aviation Safety Program. The staff is composed of civilians and officers of the NOAA Commissioned Officer Corps.

NOAA's fleet is the largest federal research ship fleet in the nation and ranges from large oceanographic research vessels for deep ocean exploration to smaller ships for charting shallow coastal waters. The fleet supports a wide range of research activities across the Line Offices, including nautical charting and ocean and climate studies.

OMAO also operates and maintains a fleet of civilian Hurricane Hunters, which include two P-3 Orion aircraft and one Gulfstream IV (G-IV). The P-3 aircraft fly directly into the storm to collect measurements of storm structure and intensity, as well as ocean temperature and storm surge. Outside of hurricane season, the aircraft support other national and international atmospheric research programs. The G-IV aircraft flies above and around storms to understand the conditions influencing hurricane movement, in addition to supporting missions related to studying winter storms and atmospheric rivers.

NOAA CROSS-CUTTING ISSUES

Scientific Integrity: Scientific integrity (SI) is at the core of NOAA's work and is critical for ensuring public trust in the agency's lifesaving weather forecasts and other public data, information, products, and services that Americans rely on. The policy and procedures guiding the SI of the agency's work and the conduct of its scientists are laid out in a NOAA Administrative

²² <https://coastalscience.noaa.gov/research/stressor-impacts-mitigation/>

²³ <https://www.omaο.noaa.gov/learn/about-omaο/mission-statutory-authority>

Order (NAO).²⁴ The SI NAO was revised in 2011 in response to a memo from the Office of Science and Technology Policy on SI and was most recently revised and approved on January 19, 2021. On January 27, 2021, President Biden issued a Memorandum on Restoring Trust in Government Through Scientific Integrity and Evidence-Based Policymaking.²⁵ According to NOAA, its updated SI policy is “substantially compliant” with the Presidential Memorandum, and they will update this policy as appropriate.²⁶ NOAA has a Scientific Integrity Officer, whose role is to implement the procedures in the SI Policy.

A June 2020 report by the National Academy of Public Administration (NAPA) made a series of recommendations to NOAA to improve its SI policy, upon finding that the policy was violated in the events surrounding the release of an unsigned statement by NOAA during Hurricane Dorian in 2019 (the “Sharpiegate” incident).²⁷ The Science Committee conducted a series of oversight activities investigating the incident.²⁸ The NAPA report made recommendations that would strengthen NOAA’s SI policy of consulting its scientists in developing communications materials involving their expertise. It also called for the DOC Office of Inspector General or other agencies to investigate alleged violations of SI policies when they involve senior NOAA and DOC political leadership.

Workforce – Diversity, Equity, and Inclusion: The Science Committee released a Majority staff report in March 2021 entitled *Scientific Brain Drain: Quantifying the Decline of the Federal Scientific Workforce*.²⁹ The report highlighted that from fiscal year (FY) 2009-2020, NOAA’s overall workforce declined by 8.6 percent, and its STEM workforce declined by 1.6 percent. The report also highlighted NOAA’s challenge with a gender employment gap, noting that at the end of FY 2020, NOAA employed roughly 8.5 male engineers for every 1 female engineer. Additionally, while there was a 13.6 percent increase in STEM employment among minority groups, the Black/African American STEM workforce only increased by 0.4 percent from FY 2016 to FY 2020. NOAA has developed Diversity and Inclusion Strategic Plans, most recently for 2020-2024, to increase the diversity of its workforce and embrace an inclusive work environment concept as part of its organizational culture.³⁰

Climate Services and NOAA Climate Council: Decisionmakers and communities across the U.S. increasingly rely on access to authoritative climate risk information and climate services to inform critical decisions about adaptation and mitigation. NOAA works across the agency to translate its premier climate science and data into accessible information, tools, products, and services to aid

²⁴ NAO 202-735D-2: *Scientific Integrity* (2021) <https://www.noaa.gov/organization/administration/nao-202-735d-2-scientific-integrity>

²⁵ <https://www.whitehouse.gov/briefing-room/presidential-actions/2021/01/27/memorandum-on-restoring-trust-in-government-through-scientific-integrity-and-evidence-based-policymaking/>

²⁶ <https://sciencecouncil.noaa.gov/Scientific-Integrity-Commons/SIC-Integrity-Policy>

²⁷ <https://www.washingtonpost.com/weather/2020/06/15/noaa-investigation-sharpiegate/>

²⁸ For example: <https://science.house.gov/letter-to-president-trump-on-white-house-video-of-altered-hurricane-forecast-map>

²⁹ <https://science.house.gov/imo/media/doc/2021-3%20EMBARGOED%20Scientific%20Brain%20Drain%20Majority%20STAFF%20REPORT%20w%20cover%20page.pdf>

³⁰ <https://www.noaa.gov/organization/inclusion-and-civil-rights/diversity-and-inclusion>

decisionmakers. For example, NOAA's six Regional Climate Centers³¹ support the development and delivery of a wide range of place-based climate science and information products and services to help people make informed decisions. NOAA's RISA program supports ten research teams across the country who work hand-in-hand with stakeholders and decisionmakers to build capacity to prepare for and adapt to climate variability and change.

The recently established NOAA Climate Council aims to implement a holistic government response to the changing climate by the fast integration of research and government action in tackling the fundamental causes of increasing emissions, while also assisting vulnerable populations adapt to the inevitable effects.³² A main priority of the Climate Council is to strengthen NOAA's climate goods and services and ensure they reach all communities equitably.³³

High Performance Computing (HPC): NOAA requires robust HPC capabilities to support both its research and operational activities, and to stay at the forefront of Earth Systems science. HPC enables NOAA scientists to run advanced Earth system models to improve the accuracy of forecasts and predictions. NOAA's Research and Development HPC System (RDHPCS) supports advances in research and modeling to better understand Earth systems. NOAA's Weather and Climate Operational Supercomputing System (WCOSS) provides HPC capabilities to run real-time numerical models for weather and climate forecasting. NOAA requires additional HPC resources to support advances in modeling and forecasting, as well as data management and storage capacity. Insufficient computing capacity is the most limiting factor for NOAA's ability to advance understanding of Earth systems and to provide products and services to the nation.³⁴

The Fifth National Climate Assessment: The National Climate Assessment (NCA), developed by the U.S. Global Change Research Program (USGCRP), are the Nation's comprehensive, authoritative quadrennial reports on the effects of climate change on the U.S. and projections of future conditions, designed to inform climate decisions. The Fifth National Climate Assessment (NCA5) is currently in development and anticipated to be completed in 2023.³⁵ NOAA plays a key role as the administrative agency for NCA5 and through providing data, tools, and information to help people understand and prepare for climate variability and change.

NOAA's FY 2022 Budget: The President's Budget Request for FY 2022 represents a historic proposed increase in NOAA's budget to \$6.98 billion, which is 29 percent above the FY 2021 enacted level of \$5.44 billion.³⁶ On July 19, the House Appropriations Committee reported out the Commerce, Justice, Science and Related Agencies Appropriations bill with a top line number for NOAA of \$6.46 billion, but the bill has yet to pass the House.³⁷

³¹ Through the National Centers for Environmental Information at the National Environmental Satellite, Data, and Information Service.

³² <https://oceanfdn.org/what-noaas-new-climate-council-means-for-our-ocean/>

³³ <https://www.noaa.gov/new-noaa-climate-council-to-enhance-delivery-of-climate-science-and-services>

³⁴ [NOAABlueBook2022_final.pdf](#)

³⁵ <https://www.globalchange.gov/nca5>

³⁶ NOAA's FY22 Blue Book and Congressional Justification can be found at

<https://www.noaa.gov/organization/budget-finance-performance/budget-and-reports>

³⁷ <https://www.congress.gov/117/crpt/hrpt97/CRPT-117hrpt97.pdf>

APPENDIX – Relevant HSST Hearings

Relevant Hearings³⁸ – 117th Congress

- July 21, 2021 – Silent Killer: The Rising Problem of Extreme Heat in the U.S.
- July 20, 2021 – Spectrum Needs for Observations in Earth and Space Sciences
- June 29, 2021 – The State of Federal Wildland Fire Science: Examining Opportunities for Further Research & Coordination
- June 7, 2021 – Defining a National ‘Oceanshot’: Accelerating Ocean and Great Lakes Science and Technology
- April 21, 2021 – Working Towards Climate Equity: The Case for a Federal Climate Service
- March 17, 2021 – Brain Drain: Rebuilding the Federal Scientific Workforce
- March 12, 2012- The Science Behind Impacts of the Climate Crisis

Relevant Hearings – 116th Congress

- September 30, 2020 – Coping with Compound Crises: Extreme Weather, Social Injustice, and a Global Pandemic
- July 14, 2020 – Sweltering in Place: COVID-19, Extreme Heat, and Environmental Justice
- February 27, 2020 – An Examination of Federal Flood Maps in a Changing Climate
- January 15, 2020 – An Update on the Climate Crisis: From Science to Solutions
- November 20, 2019 – A Task of EPIC Proportions: Reclaiming U.S. Leadership in Weather Modeling and Prediction
- October 23, 2019 – Space Weather: Advancing Research, Monitoring, and Forecasting Capabilities
- September 26, 2019 – Understanding, Forecasting, and Communicating Extreme Weather in a Changing Climate
- July 22, 2019 – Field Hearing: Weathering the Storm: Improving Hurricane Resiliency Through Research
- July 11, 2019 – Earth's Thermometers: Glacial and Ice Sheet Melt in a Changing Climate
- June 5, 2019 – Ocean Exploration: Diving to New Depths and Discoveries
- June 4, 2019 – Nature in Crisis: Biodiversity Loss and its Causes
- May 16, 2019 – The Future of Forecasting: Building a Stronger U.S. Weather Enterprise
- April 30, 2019 – A Review of the NOAA Fiscal Year 2020 Budget Request
- February 27, 2019 – Sea Change: Impacts of Climate Change on Our Oceans and Coasts
- February 13, 2019 – The State of Climate Science and Why It Matters

³⁸ <https://science.house.gov/hearings>