National Weather Service - Academia Partners Roundtable Summary Report

In May 2021, the National Weather Service (NWS) Office of Organizational Excellence (OOE) held a virtual, first-of-its-kind NWS partner engagement event with the Academic sector of the weather, water and climate enterprise. There were a combined total of 270 participants between both days and nearly 50 different universities represented.

This event, entitled the NWS-Academia Partners Roundtable, was split up into two parts and provided two key interactions with the academic community:

1. **Research for a Weather-Ready Nation (May 24, 2021):** Research needed to ensure continued advancement of science and skill for the Nation's Weather, Water and Climate Enterprise and for attaining the Weather-Ready Nation Goals.
2. **Education for a Weather-Ready Nation. (May 25, 2021):** Educational programs and academic curricula that will drive the talent pool for future careers and workforce development for the NWS and the larger weather, water, climate enterprise.

The final agenda can be found here.

The roundtable served as an opportunity to directly connect the Academic weather, water and climate sector with Weather-Ready Nation goals and objectives. These two days of interactions produced rich conversations and key insights around topics such as earth system science, interdisciplinary skill sets, and social equity of services for a Weather-Ready Nation and fostering opportunities for experiential learning for students.

Overall Reflections

This two-day NWS-Partners Academia Roundtable illustrated the overwhelming interest and need for NOAA and the NWS to foster and help direct research priorities, as well as influence and support the future of education with the Academic community which plays such a critical role.

Two major thematic outcomes came from the two-day conversation:

1. There is a critical relationship between the need to equitably serve all communities for a Weather-Ready Nation and the future workforce that will be better able to address those needs. Academia and NOAA must work together in the early engagement of future students who may have interest in this work, as well as in the development of curriculum, identification of research priorities, and in hiring a workforce that represents the communities we serve.
2. There is a clear need for broad interdisciplinary skills, which includes blending the fundamentals of physical sciences to incorporate the entire earth system with social sciences as it relates to decision support, risk communication, calls to action and product design, and data sciences and engineering. These combined skills will be invaluable to the next generation of the NOAA and overall weather enterprise workforce for a Weather-Ready Nation.

Below are the overviews and key takeaways from each session in the 2-day roundtable:

Day 1: Research for a Weather-Ready Nation (please see the full recording here)

Welcoming Remarks - Dr. Louis Uccellini, Director, NWS and Craig McLean, Director, OAR

Overview: Dr. Uccellini kicked off the meeting by setting context and expectations for the two days. He reminded attendees of the "breadth and depth" of the NWS mission and related Weather-Ready Nation vision. Craig McLean emphasized the importance of partnerships and the academic community to improve operations in the NWS.

Key takeaways:

- The forecast of tomorrow is brought to us by the students of today. We will not meet the challenges related to addressing the needs of a society that is facing a more vulnerable future in the face of extreme weather, water and climate events without an academic community aligned with these needs. Most of our researchers (and research) come from (and is done through) universities.
- There is a continued importance of social science. While we haven't given up the physical science aspect of what we do, social science is vital in being able to communicate not just mathematical computation of risk, but getting to the point where society knows how to prepare, respond, and react to weather and climate related threats.
- There is a growing emphasis on the Earth System science approach. Linking the atmosphere, the ocean and hydrosphere, the terrestrial realm, and the cryosphere is critical.

Panel Discussion 1: NOAA Research for Weather-Ready Nation

Moderator: Mary Erickson, *NWS*
Panelists: Dr. Dorothy Koch, *OAR Weather Program Office*; Jason Burks, *Cooperative Institute for Research in the Atmosphere*; Dr. Dan Lindsey, *NESDIS GOES-R*; Dr. DaNa Carlis, *OAR Global Systems Laboratory*

Overview: NOAA research leaders discussed their views and priorities to advance the mission of a Weather-Ready Nation.

Key takeaways:

- 75% of NOAA's Weather Program Office budget goes to the external community.
- There is a gap in innovation - more high-risk development of the next generation forecast system is needed.
- NOAA's Earth Prediction Innovation Center (EPIC) will accelerate community-developed scientific and technological enhancements into operational applications for numerical weather prediction (NWP).
- Cooperative institutes help bridge the gap between research and operations.
- The nature of NOAA's future research needs will be interdisciplinary.

Panel Discussion 2: Academia Research for a Weather-Ready Nation

Moderator: Dr. Russ Schneider, *NWS Storm Prediction Center*
Panelists: Dr. Amy McGovern, *University of Oklahoma*; Dr. Xubin Zeng, *University of Arizona*; Dr. Vernon Morris, *Arizona State University*; Dr. Kim Klockow, *Cooperative Institute for Mesoscale Meteorological Studies*

Overview: Leaders in academia shared their views and research priorities to further advance a Weather-Ready Nation with NOAA.

Panel Discussion 2: Academia Research for a Weather-Ready Nation (Continued)

Key takeaways:

- Machine learning and AI are not ends unto themselves, but tools and capabilities.
- Panelists emphasized the intersection of environmental justice and issues like air quality, weather, and water.
- It's not just about social science, but about humanities.
- Systemic poverty and racism in the nation results in differences in services, and ultimately differences in the resilience of our communities.

Day 1 Open Community Discussion With Full Set of Panelists

Overview: Day 1 panelists returned to answer questions and respond to comments submitted by various roundtable participants.

Key takeaways:

- Industry connections are active across the entire value chain.
- There is a need to look at the whole chain of education to reduce loss of potential talent along the way - community colleges are becoming more important and relevant.
- OAR/Sea Grant connections provide opportunities to leverage and use community connections.
- Community partnerships provide opportunities to connect with community activists.
- COVID has provided an opportunity to learn about and possibly broaden opportunities for place-based and remote programs.
- NWS Strategic Plan connection: the first goal of the plan is to transform the way people receive, understand and act on information.

Day 2: Education for a Weather-Ready Nation (please see the full recording here and NOAA Education Handout here)

Welcoming Remarks - Mary Erickson, Deputy Director, NWS and Dr. Richard Clark, Millersville and AMS President-elect

Overview: Mary Erickson provided an overview of the hiring process and career progression in NOAA and NWS, emphasizing the importance of learning interdisciplinary skills and social equity in impact-based decision support services. Dr. Richard Clark similarly provided those perspectives from both his academic and American Meteorological Society leadership positions. He recognized the importance of the new NWS paradigm that the job doesn't end with the forecast, but how the information needs to be connected to decision making as he read from the NWS Weather Ready Nation BAMS paper to make this point and its related challenges to university curriculums.

Key takeaways:

- NWS is hiring and has been hiring throughout the pandemic! Positions are listed on USAJOBS and there are a variety of internship programs available as well. NWS is working to build a diverse workforce that represents communities that are being served.
- Interdisciplinary skills are pertinent to the needs of the NWS workforce. The most important skills include: physical, social, and behavioral science; software engineering, AI, and computer programming; resilience, disaster preparedness, and emergency management; and an understanding of the Earth Systems approach.
- Continual learning is key. Collaborative science does not end after graduation.

Panel Discussion 3: NOAA Skills for a Weather-Ready Nation

Moderator: Dr. John Ten Hoeve, NWS OOE
Panelists: Steven Zubrick, NWS Science Operations Officer; John (JJ) Brost, NWS Operations Proving Ground; Dr. Jennifer Meehan, NWS Space Weather Program Manager; Sudhir Shrestha, NWS National Water Center

Overview: NWS leaders provided insights into their unique career paths and discussed which skills NWS needs for the future of Weather-Ready Nation.

Key takeaways:

- To work in an NWS Field Office, a diverse and interdisciplinary skill set is necessary. Knowledge of meteorology, statistical analysis, and how to work with real-time data is important.
- The Operations Proving Ground (OPG) supports the final stages of research to operations, taking new science, tools, processes and applying them in a simulated environment. Useful skills to work in the OPG include leveraging probabilistic information, data science, mesoscale analysis, and creativity.
- There are many avenues for students to get involved in space weather. Recommended skill sets include communication, writing, technical writing.
- The most important skills in providing water services are interdisciplinary. Communication, social science knowledge, data science and machine learning are key.

Panel Discussion 4: Academia Training for a Weather-Ready Nation

Moderator: Louisa Koch, NOAA Education
Panelists: Dr. Sepi Yalda, Millersville University; Dr. Elizabeth Barnes, Colorado State University; Dr. Scott Glenn, Rutgers University; Dr. Belay Demoz, University of Maryland, Baltimore County

Overview: Academia leaders shared their views on education and curriculum priorities to advance Weather-Ready Nation with NOAA.

Key takeaways:

- There is a diverse group of people who want to be involved in this field - not just traditional undergraduate students.
- Proper data science training is critical.
- The atmosphere and the ocean are linked; it is important to understand not only what society wants out of these fields, but also what incoming students want out of these fields.
- Foundational learning is crucial for students to be able to compete.

Day 2 Open Community Discussion With Full Set of Panelists

Overview: Day 2 panelists returned to answer questions and respond to comments submitted by various roundtable participants.

Key takeaways:

- For academic programs to become more interdisciplinary, consider integrating data science and statistics into other science courses, like biology and meteorology, or even engineering courses. Statistics and calculus are still important for forecasting, along with core courses like physics, to have a broader application within NOAA.
- The pandemic has encouraged the use of a variety of training platforms to reach a greater number of students. Many online courses are now available, whereas formal classroom training used to be the only option.
- As COVID has reduced opportunities for in-person student-faculty interaction, NOAA should consider expanding efforts to mentor students and collaborate for research and overall learning.

Next Steps

Following this two-day conversation, the NWS envisions more routine interactions similar to this to continue the dialogue, idea-sharing, and partnership building between NOAA and Academia. This type of interaction is fully aligned with the NWS Partnership Strategy.

Some recommended next steps include:

- NOAA and Academia should leverage future gatherings of representatives from atmospheric science colleges and universities to further collaborate on interdisciplinary programs, course needs, and experiential opportunities for both undergraduate and graduate students.
- Aligned with the NOAA Education Strategic Plan, NOAA should continue to consider virtual experiential opportunities for students in addition to in-person opportunities. NOAA will build and support a diverse and skilled future STEM workforce is critical to NOAA's mission.
- NOAA should consider whether the Federal Government 1340 Meteorologist Job Series could be refreshed in coordination with OFCM, AMS and others.
- NOAA should continue to interact with Academia experts to learn more about how to serve communities effectively and equitably for a Weather-Ready Nation.
- As NOAA leads on efforts to research, adapt to, and mitigate the impacts of climate change, it will rely on collaborations with the academic community by strengthening core research capabilities for improved climate forecast products and services.
- NOAA will cultivate a more diverse, climate-ready workforce of the future that builds upon NOAA's long history of investments in graduate and postgraduate training, fellowships, and extension programs, an enterprise which already has an alumni base numbering in the thousands.
- Leveraging the NOAA Science Advisory Board, NOAA should continue to strengthen its connection and partnerships with the academic and research community.
- NOAA should follow-up on the NWS-Academia Partners Roundtable key takeaways with the heads and chairs meeting organized by UCAR.

Attendees

While not all attendees are reflected here, we want to illustrate the academic institutions who were represented in the two day roundtable: