Building a Weather-Ready Nation: A Conversation with Dr. Louis W. Uccellini, Director, National Weather Service

By Michael J. Keegan




Americans are increasingly dependent on timely, reliable, and accurate information on weather, water, and climate for the protection of life and property, as well as the enhancement of the nation's economy. In fact, a nationwide survey indicates that weather forecasts generate $35 billion in economic benefits to U.S. households, about six times the cost spent on weather forecasting and research. Extreme weather becomes more common and damaging due to a confluence of physical and socioeconomic factors.

Dr. Louis W. Uccellini, director of the National Weather Service (NWS), joined me on *The Business of Government Hour* to discuss the mission of the National Weather Service, his strategic priorities, and his vision for building a weather-ready nation. The following is an edited excerpt of our discussion, complemented with updated and additional research.

On the History and Mission of the National Weather Service

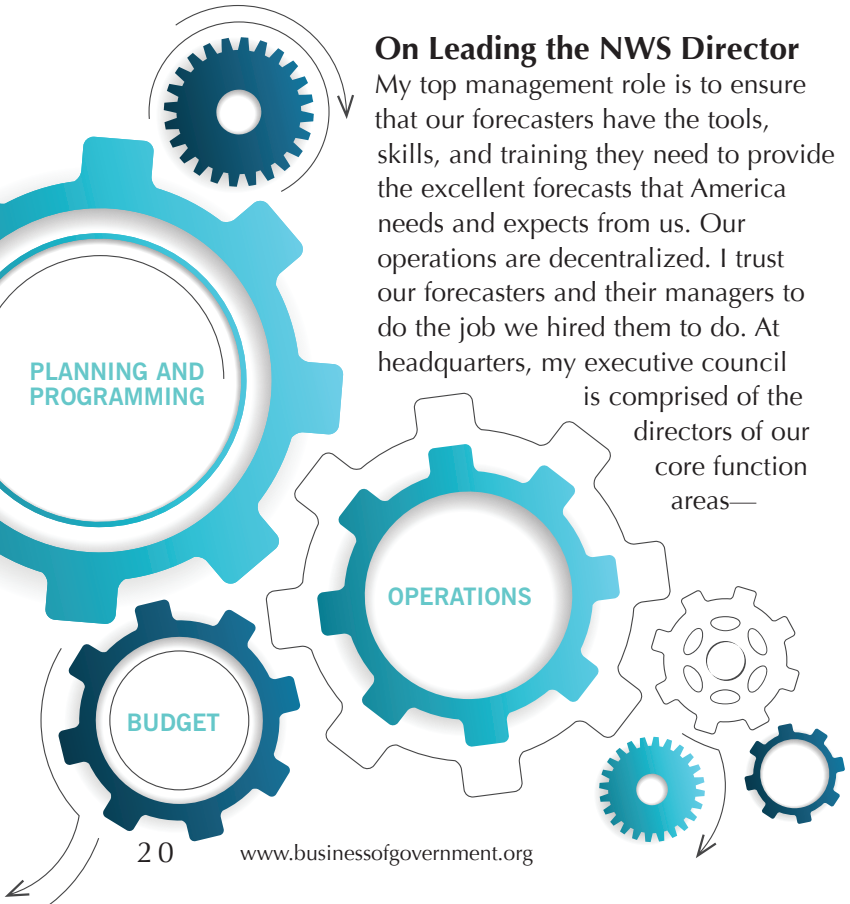
The National Weather Service history is rooted in decisions that were made after the Civil War with the expansion of a population westward into areas known to be, let's put it this way, more challenging weather-wise. The stories were already out about blizzards and tornados that people didn't really experience on the east coast in the early history of the U.S. The NWS core mission has remained constant since we were established: to protect lives and property and enhance the national economy. It was established in 1870 by President Ulysses Grant as part of the Army Signal Service. It was moved to the U.S. Department of Agriculture in 1891 and named the U.S. Weather Bureau. Initially, its mission was directed at public safety, military and commerce, but aviation safety grew in prominence over the next several decades. In 1940, President Roosevelt moved the Weather Bureau to the U.S. Department of Commerce. In 1970, President Nixon established the National Oceanic and Atmospheric Administration and renamed the Weather Bureau to the National Weather Service. As we approach NOAA's 50th anniversary and the National Weather Service's 150th in 2020, we recognize that our past provides the context for who we are today and the inspiration for our future.

We've come to understand that to fully achieve this mission, we need to connect our forecasts and warnings to the decisions our partners are making in the field. It's not about just issuing forecasts and warnings, but making sure that decision makers understand and interpret the information to make good decisions. We call this new focus Impact-based Decision Support Services (IDSS). The IDSS offers more effective communication, more tailored customer service, and is more attentive to the "customer experience" as described in the President's Management Agenda (PMA). We're facing new challenges, increasing vulnerability to

extreme events, and increasing demand from an expanding user base for weather, water, and climate forecasts and information. More sectors of the economy are now recognizing the importance of weather information, relying on our forecasts to meet today's challenges.

On How NWS is Organized

The National Weather Service is fundamentally an operational unit. We have the action verb in our mission statement to provide the data for weather, water, and climate and to provide forecasts—actually predict the future state, which is a very unique aspect of a mission statement for a government agency. Within NOAA the word "predict" maps into their mission statement as well. It's the only agency in the federal government that has that word in its mission. We have a core team of support functions at headquarters, but most of our staffing is in the field. We are decentralized, with offices all over the country: 122 weather forecast offices, 13 River Forecast Centers, six regional headquarters, nine National Centers for Environmental Prediction, 20 Center Weather Service Units, two Tsunami Warning Centers, and a National Water Center. We have 4,189 funded positions onboard. Our agency is small compared to many others, but our footprint is nationwide. Our budget for FY19: $1.163 billion. In the past few years, we conducted an operations and workforce analysis, which concluded that our local presence in communities throughout the country is key to our ability to provide effective IDSS. Our ability to meet our mission is dependent on local relationships.



On Leading the NWS Director

My top management role is to ensure that our forecasters have the tools, skills, and training they need to provide the excellent forecasts that America needs and expects from us. Our operations are decentralized. I trust our forecasters and their managers to do the job we hired them to do. At headquarters, my executive council is comprised of the directors of our core function areas—operations, planning and programming, and budget. Together, we identify agency priorities and needs and develop longer term strategic goals and objectives, including service improvements. There is never a dull moment in my job; no two days are ever the same. I think the worst thing is to come in and say, well, I have a slow day today, because it never works out that way.

From a leadership perspective, I visit the field and have gone to over a hundred of our forecast offices. I emphasize how important the field structure is to accomplishing our mission in a cost-effective manner. From a headquarters perspective, there's always this tension about what we do, because we know our field structure touches every county every day, and is very visible to the country's entire population. We have to ensure that we're all marching towards the same goal. We have a very important strategic goal of building a weather-ready nation. We're continually reminding our workforce that their job doesn't end with producing the most accurate, timely forecasts and warnings. It really involves that connection to good decision making, especially for public safety. Consistency, therefore, is a very important attribute of our products and services. An emergency manager or public safety official, for instance, cannot be getting three or four different forecasts from the same agency and be expected to make decisions five, four, three days before an event. Thus, we have implemented a collaborative effort. That means all of us rolling up our sleeves and making sure we're getting the job done that has to get done with a consistent product in mind.

On Challenges

One of the main challenges I encountered when I became the NWS director in 2013 was that we didn't have a working governance structure, which had caused some fairly complicated budget management issues. My first goal was to fix this problem. We developed a new governance structure that mirrors our forecast process. I hired a new management team and implemented a new budget process that maps to our main portfolio areas. We had to shore up our business processes to understand where every dollar was going and implement fiscal discipline.

For example, we did not have a separate budget category for dissemination. Social media is a major way of communicating the forecast, current conditions, and situational awareness with emergency alerts on cell phones and tablets. How much money were we spending on it? How was it organized? In November 2013, we discovered during the severe weather outbreak how fragile our dissemination capability was at NWS. The entire

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network was under capacity. It was fractured among six different regions. They couldn't even operate training and administrative functions through their office bandwidth to get data in and products out at the same time.

To build a weather-ready nation, we had to deal with the core issues of budget acquisition and program management. When I arrived, we had 25 budget categories that no one knew how they came into existence or how they interacted with each other. We needed to simplify the budget structure that mapped to our functions. Today, NWS has six budget categories. I can tell you the priorities in each one. I can tell you how we plan for the three-year budget cycle. We can show the value proposition and how the money is being spent. We also have six offices. We have the Office of Observations, the Office of Central Processing, the Analyze, Forecast, and Support Office, Office of Dissemination, the Office of Science and Technology Integration (STI) and Office of Facilities. These offices have responsibilities for budget planning and execution mapped to agency goals. We have buy-in, and one of the reasons we have buy-in from all the senior executive service leaders is we hold people accountable. This budget challenge led to a better managed budget, with high execution rates and better investment decisions within the portfolios. Now we are establishing a vision of what the National Weather Service would look like in the future—how it will remain relevant in a rapidly changing and expanding weather enterprise.

On Building a Weather-Ready Nation

The strategic vision for the NWS is to build a Weather-Ready Nation—which means that every person in America is ready, responsive, and resilient to extreme weather, water, and climate events. The initiative has three main goals going forward:

1. Reduce the impact of weather, water, and climate events by transforming the way people receive, understand, and act on information. Through scientific studies and anecdotal evidence, we are realizing that we need to better connect our forecasts and warnings to decisions at all levels in order to accomplish our mission of saving lives and property.
2. We need to harness cutting-edge science, technology, and engineering to provide the best observations, forecasts, and warnings. We've made great strides in improving the accuracy and precision of our forecasts and warnings, but there is still room for improvement.
3. Finally, we need to evolve the NWS through investment in our people, partnerships, and organizational performance. In other words, in order to accomplish the first two priorities, we need to focus on organizational and culture change.

Advances in science technology are transforming the nature of work across our economy. It's happening in meteorology as well. High resolution observations, new computer models, statistical techniques like machine learning, are helping to generate accurate and highly-resolved forecasts a week or more in advance. We need to ensure these new advances are built into the forecast process. Another trend is the growing weather, water, and climate enterprise. A few decades ago, the private sector primarily tailored NWS forecasts and warnings for public consumption. Now, the private sector is involved in observations, modeling, forecasting, and decision support. We need to expand our partnerships with the enterprise to ensure we are all providing the very best products and services to the nation. For instance, that may include buying more observations from industry rather than building those systems in house.

On Connecting Forecasts to Decision Making

For a long time, NWS forecasters were told that their job ended with issuing the forecast or warning. Over time, meteorologists have come to realize that connecting those forecasts to decisions is critical to fully achieve our mission of protecting lives and property. Now, we are working towards evolving the organization to make this a key component of what we do.

IDSS can take many forms. It could be a virtual briefing to an emergency manager or public safety official. It could be a heads-up phone call. Or, it could take the form of a meteorologist embedding in an activated emergency operations center during an extreme event. In 2017, Congress explicitly authorized this activity for the NWS with the Weather Research and Forecasting Innovation Act. This law directs us to provide IDSS to public safety officials

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across federal, state, local, and tribal levels of government. While we don't provide IDSS to the public, we are working with the enterprise to simplify and better communicate our forecasts and warnings so they are more understandable and actionable.

The only way to understand what our partners do, we need to be at their table-top exercises. We have to practice with them. We can't show up just before a weather event and say, okay, I'm here, what do you need? We need to be involved. They need to understand we can't give them a perfect forecast. The longer out in time, the less accurate the forecast. We build a trusted relationship by engaging in these exercises and that relationship flows both ways. There is a personal and professional stake involved here. For example, the storm in Taylorville, Illinois, on December 1, 2018, we forecasted a tornadic outbreak that likely could affect the town's Christmas parade at 5 p.m. that Saturday evening. With that trusted relationship, we provided the town officials with the best information so they could make the most informed decision. The parade was cancelled. When the tornado did touch down, it was between an F2 or F3 and ripped through the block where the parade was supposed to be. We've received testimonials from the local officials that undoubtedly this process saved lives—that's the IDSS connecting us to the decision making.

On Partnerships and Collaboration

It's a priority to make partnerships and business relationships a win-win for NOAA and the National Weather Service. We regularly host meetings and workshops with our partners to openly collaborate and explore opportunities to meet the vision of the Weather-Ready Nation initiative. We've been partnering with America's Weather and Climate Industry for decades to help expand the reach of NWS observations, forecasts, and warnings to communities and the public to save lives and property. We know we can't do it alone. There are areas where we know we need to leverage new and innovative partnerships—including use and visualization of data; sharing, distributing, and communicating data, information, forecasts and warnings; improving the suite of observations used in our models; improving the situational awareness of our forecasters, including crowdsourcing; and improving our understanding of how to use new predictive analytics to improve our forecasts, as well as artificial intelligence to assist forecasters in providing decision support. We seek partnerships throughout the modeling community to build and improve our modeling suite and improve research to operations.

To learn more about the National Weather Service, go to weather.gov.

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