WATER RESOURCES **Special Report #2229**
Seasonal Forecasting/Weather Research **February 3, 2017**

On January 9, the House passed the Weather Research and Forecasting Innovation Act (H.R. 353) to improve the National Oceanic and Atmospheric Administration's (NOAA) weather research through a focused program of investment on affordable and attainable advances in observational, computing, and modeling capabilities. It is designed to support substantial improvement in weather forecasting and prediction of high impact events, to expand commercial opportunities for the provision of weather data, and for other purposes.

Introduced, by Rep. Frank Lucas (R-OK), its co-sponsors include Representatives Jim Bridenstine (R-OK), Lamar Smith (R-TX), Dana Rohrabacher (R-CA), Chris Stewart (R-UT), and Suzanne Bonamici (D-OR).

Rep. Lucas stated: "H.R. 353 prioritizes improving weather forecasting for the protection of lives and property...by focusing research and computing resources..., quantitative observing data planning, next generation modeling, and an emphasis on research-to-operations technology transfer. As a Representative from Oklahoma, I understand the need for accurate and timely weather predictions firsthand. Every year, the loss of life from deadly tornadoes in my home state is a stark reminder that we can do better to predict severe weather events and provide longer lead times to protect Americans in harm's way."

Under H.R. 353, NOAA would prioritize weather research through "a focused, affordable, attainable, forward-looking research plan," while also encouraging "innovations and new technology capacities," in order to "restore our country's leadership in weather forecasting." It also directs NOAA to "actively consider new commercial data and private sector solutions to further enhance our weather forecasting capacities." Rep. Lucas noted it has taken 4 years to "craft a meaningful package."

Rep. Bonamici added the bill is the "product of hard work and negotiation," and is the "result of a truly bipartisan and bicameral effort." The bill incorporates elements of several bills passed by the House or Senate in the 114th Congress, including the Weather Research and Forecast Innovation Act (H.R. 1561) and the Seasonal Weather Forecasting Act (S. 1331). She stated, "in the northwest Oregon communities I represent, my constituents rely on timely weather forecasts to decide when to harvest their crops, when to go to sea to fish, how to navigate the roads safely when there is freezing rain and snow, and to prepare for possible flood conditions. The National Weather Service (NWS) provides excellent forecasting products to support our economy, but with the increasing frequency of severe weather events, there can be and should be improvements in our forecasting capabilities and delivery.... Improved forecasts can provide more lead time to allow communities to prepare.... The bill connects the research side of NOAA, the Office of Oceanic and Atmospheric Research, more effectively to the forecasting needs of the NWS. This research-to-operations pipeline is essential for the continued improvement of our weather forecasting enterprise."

Under Title I, NOAA is directed to prioritize its research to improving weather data, modeling, computing, forecasting, and warnings for the protection of life and property and for the enhancement of the national economy. The Assistant Administrator for the Office of Oceanic and Atmospheric Research (OAR) would conduct a program to develop improved understanding of and forecast capabilities for atmospheric events and their impacts, placing priority on developing more accurate, timely, and effective warnings and forecasts of high impact weather events.

Program elements focus on advanced radar, radar networking technologies, and other ground-based technologies, including: (A) those emphasizing rapid, fine-scale sensing of the boundary layer and lower troposphere, and the use of innovative, dual-polarization, phased-array technologies; (B) aerial weather observing systems; (C) high performance computing and information technology and wireless communication networks; (D) advanced numerical weather prediction systems and forecasting tools and techniques that improve the forecasting of timing, track, intensity, and severity of high impact weather, including through – (i) the development of more effective mesoscale models; (ii) more effective use of existing, and the development of new, regional and national cloud-resolving models; (iii) enhanced global weather models; and (iv) integrated assessment models; (E) quantitative assessment tools for measuring the impact and value of data and observing systems; (F) atmospheric chemistry and interactions essential to accurately characterizing atmospheric composition and predicting meteorological processes, including cloud microphysical,

precipitation, and atmospheric electrification processes, to more effectively understand their role in severe weather; and (G) additional sources of weather data and information, including commercial observing systems.

It directs NOAA to issue a research and development and research to operations plan to restore and maintain United States leadership in numerical weather prediction and forecasting that describes forecasting skill and technology goals, objectives, and progress performance metrics. NOAA would collaborate with stakeholders, including the weather industry defined as individuals and organizations from public, private, and academic sector partners. NOAA would also develop and maintain a prioritized list of observation data requirements necessary to ensure weather forecasting capabilities to protect life and property to the maximum extent practicable; and identify current and potential future data gaps in observing capabilities.

Title I authorizes $111.5M for FY2017-FY2018 for the OAR, plus $85.8M for weather laboratories and cooperative institutes; $25.8M for weather and air chemistry research; and an additional $20M for a joint technology transfer initiative.

Title II addresses improving subseasonal and seasonal forecasts and directs that the Under Secretary of Commerce for Oceans and Atmosphere, acting through the Director of the NWS and the heads of such other programs of the NOAA as the Under Secretary considers appropriate, shall: (1) collect and utilize information in order to make usable, reliable, and timely foundational forecasts of subseasonal (2 weeks to 3 months) and seasonal (3 month to 2 years) temperature and precipitation; (2) leverage existing research and models from the weather industry to improve such forecasts; and (3) determine and provide information on how the forecasted conditions may impact – the number and severity of droughts, fires, tornadoes, hurricanes, floods, heat waves, coastal inundation, winter storms, high impact weather, or other relevant natural disasters; as well as snowpack and sea ice conditions.

Title II provides for Forecast Communication Coordinators. NOAA is directed to foster effective communication, understanding, and use of the forecasts by the intended users of the information. Each state may request up to $100,000 on a 50%-50% matching basis for assistance from NOAA including funds to support an individual to serve as a liaison with NOAA, other federal agencies, the weather industry, counties, tribes and other interests, and to receive and disseminate forecasts and information.

Within 180 months, after enactment, NOAA is required to submit a report to Congress with: (A) an analysis of the how information on subseasonal and seasonal forecasts is used in public planning and preparedness; (B) specific plans and goals for the continued development of the subseasonal and seasonal forecasts and related products; and (C) an identification of research, monitoring, observing, and forecasting requirements to meet the goals. In developing the report, NOAA would consult with relevant Federal, regional, State, tribal, and local government agencies, research institutions, and the private sector.

Title III, NOAA Weather Satellite and Data Innovation, addresses completion and operationalization of the Constellation Observing System for Meteorology, Ionosphere, and Climate-1 and Climate-2 (COSMIC) by: (i) deploying constellations of microsatellites in both the equatorial and polar orbits; (ii) by integrating the resulting data and research into all national operational and research weather forecast models; and (iii) by ensuring that the resulting data are free and open to all communities.

Also, Title III directs NOAA to: (A) integrate additional coastal and ocean observations, and other data and research, from the Integrated Ocean Observing System (IOOS) into regional weather forecasts to improve weather forecasts and forecasting decision support systems; and (B) support the development of real-time data sharing products and forecast products in collaboration with the private sector, academia, and research institutions to ensure timely and accurate use of ocean and coastal data in regional forecasts.

NOAA is directed to identify degradation of existing monitoring and observation capabilities that could lead to a reduction in forecast quality, and develop specifications for new satellite systems or data determined by operational needs. It calls for an independent study by the National Academy of Science or another appropriate organization of future satellite data needs and develop recommendations to make the data portfolio more “robust and cost-effective,” including a review of the costs and benefits of moving toward a constellation of many small satellites, standardizing satellite bus design, relying more on the purchasing of data, or acquiring data from other sources or methods.

Title IV maintains a standing Environmental Information Services Working Group to advise on prioritizing weather research initiatives to produce real improvement in forecasting, as well as evaluate incorporating existing or emerging technologies or techniques in private industry. The working group would identify further opportunities to improve communications between public and private entities, including emergency management personnel, and the public.

It provides for one-year interagency details between the NWS and OAR, as well as visiting academic researchers at the National Centers for Environmental Prediction. Another change is the designation of NWS Warning Coordination Meteorologists, in order to increase impact-based decision support services and products for users, including agricultural communities and forestry, land and water management interests. Another of the coordinators' responsibilities will be to work closely with State, local and tribal emergency management agencies and other disaster management agencies to "ensure a planned, coordinated, and effective preparedness and response effort."

Title IV also addresses improving NOAA communication of hazardous weather and water events including its system for issuing watches and warnings to prevent loss of life and property. The intent is to focus on ways to communicate risks as broadly and rapidly as practicable, as well as encourage actions by the public to mitigate the risk, in consultation with a wide range of interests. Weather impacts in urban areas on infrastructure are also to be reviewed, "taking into account factors including varying building heights, impermeable surfaces, lack of tree canopy, traffic, pollution, and inter-building wind effects."