REPORT TO CONGRESS

OFFICE OF OCEANIC AND ATMOSPHERIC RESEARCH AND NATIONAL WEATHER SERVICE EXCHANGE PROGRAM

Developed pursuant to Title I, Section 403 of the Weather Research and Forecasting Innovation Act, 2017 (P.L. 115-25)

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TITLE I, SECTION 403 OF THE WEATHER RESEARCH AND FORECASTING INNOVATION ACT, 2017 (P.L. 115-25) INCLUDED THE FOLLOWING LANGUAGE

a) *The Assistant Administrator for Oceanic and Atmospheric Research and the Director of National Weather Service may establish a program to detail Office of Oceanic and Atmospheric Research personnel to the National Weather Service, and National Weather Service personnel to the Office of Oceanic and Atmospheric Research.*
b) *The goal of this program is to enhance forecasting innovation through regular, direct interaction between the Office of Oceanic and Atmospheric Research's world-class scientists and the National Weather Services's operational staff.*
c) *The program shall allow up to ten (10) Office of Oceanic and Atmospheric Research staff and National Weather Service staff to spend up to 1 year on detail. Candidates shall be jointly selected by the Assistant Administrator for Oceanic and Atmospheric Research and the Director of National Weather Service.*
d) *Not less frequently than once each year, the Under Secretary shall submit to the Committee on Commerce, Science, and Transportation of the Senate and the Committee on Science, Space, and Technology of the House of Representatives a report on participation in such program and shall highlight any innovations that come from this interaction.*

THIS REPORT RESPONDS TO THE CONGRESSIONAL REQUIREMENT.

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I. Introduction

This report is in response to the Title IV, Section 403 Weather Research and Forecasting Innovation Act of 2017 (Public Law 115-25, hereafter referred to as the "Weather Act"), passed into law by Congress on April 18, 2017.

Title IV: Section 403 of the Weather Act includes the following language:

e) The Assistant Administrator for Oceanic and Atmospheric Research and the Director of National Weather Service may establish a program to detail Office of Oceanic and Atmospheric Research personnel to the National Weather Service, and National Weather Service personnel to the Office of Oceanic and Atmospheric Research.

f) The goal of this program is to enhance forecasting innovation through regular, direct interaction between the Office of Oceanic and Atmospheric Research's world-class scientists and the National Weather Services's operational staff.

g) The program shall allow up to ten (10) Office of Oceanic and Atmospheric Research staff and National Weather Service staff to spend up to 1 year on detail. Candidates shall be jointly selected by the Assistant Administrator for Oceanic and Atmospheric Research and the Director of National Weather Service.

h) Not less frequently than once each year, the Under Secretary shall submit to the Committee on Commerce, Science, and Transportation of the Senate and the Committee on Science, Space, and Technology of the House of Representatives a report on participation in such program and shall highlight any innovations that come from this interaction.

II. Background – Collaboration between the Office of Oceanic and Atmospheric Research and the National Weather Service

The recommended exchange program at the National Oceanic and Atmospheric Administration (NOAA) between the Office of Oceanic and Atmospheric Research (OAR) and the National Weather Service (NWS) has developed organically through scientific collaborations driven by research projects, operational needs, and co-location of facilities. To meet the guidance of the Weather Act, OAR and NWS will promote exchanges of up to 1 year between OAR research scientists and NWS forecasters and scientists, through existing NOAA programs, with additional emphasis on opportunities between Line Office staff.

A key mission of NOAA is to understand and predict changes in climate, weather, oceans and coasts. This mission is successfully achieved through support of NOAA Line Offices, such as NWS and OAR, also known as "NOAA Research." The NWS provides weather, water, and climate data, forecasts and warnings for the protection of life and property and enhancement of the national economy. OAR conducts research to understand and predict the Earth system, and works to transition the results so they are useful to society. Working in unison to protect life and property, these Line Offices share resources that aid in NOAA achieving its mission.

The NWS currently employs over 4,000 people serving in a variety of careers, including scientific, technical, and administrative positions in offices across the country. OAR consists of more than 600 federal employees, with many serving as scientific staff conducting research across seven national laboratories and four program offices. Additionally, OAR administers

collaborative long-term partnerships between NOAA and participating universities, as well as other non-profit institutions. These mutually beneficial partnerships include 16 Cooperative Institutes[1], 33 university-based Sea Grant programs[2], Cooperative Science Centers[3], and the Regional Integrated Science and Assessments program[4]. These partnerships add an additional 3,000 university and private sector contractors to the overall workforce within NOAA Research.

Through numerous collaborations between OAR and NWS scientists, NOAA has been highly successful in advancing its mission and providing innovative products and services to the Nation. For example, through the Hurricane Forecast Improvement Program, OAR and NWS have worked in tandem to advance model intensity and track forecasts ultimately resulting in decreased uncertainty in forecasts coming from the National Hurricane Center. In addition, the NWS began issuing storm surge watches and warnings to highlight areas along the Gulf and Atlantic coasts of the continental United States that have a significant risk of life-threatening inundation from an ongoing or potential tropical cyclone. Other accomplishments include improvements to the Hurricane Weather Research and Forecasting model and the transition of the Finite Volume Cubed (FV-3) dynamical core to be the new engine of the NWS operational forecast model. These are key examples of ongoing collaborative efforts between OAR and NWS.

III. Professional Development Opportunities within NOAA

NOAA is committed to the development of its workforce to its fullest potential. To accomplish this goal, the agency offers federal employees formal opportunities for developmental assignments in other NOAA organizations through two programs: the NOAA Rotational Assignment Program and the Leadership Competencies Development Program.

A. The NOAA Rotational Assignment Program (NRAP) promotes both employee development and a corporate educational culture. NRAP offers NOAA employees career growth via short-term assignments, typically 3-6 months in duration, away from an employee's primary hire position. An assignment may be extended, with the total assignment length not to exceed 12 months. NRAP encourages both cross-line and cross-functional experiences that broaden an understanding of NOAA's mission, goals, and organizational structures from the regional and headquarters' perspectives. Involvement in the program also results in increased transferable skills and reduction in employee turnover, as participants feel more invested in the agency.

B. The Leadership Competencies Development Program (LCDP) is a competitive 18-month management development program. It provides a series of training and learning experiences for a cadre of NOAA employees who demonstrate the potential for assuming greater leadership responsibilities within the agency. LCDP promotes cross-line, multidisciplinary experiences that broaden participants' understanding of NOAA's

[1] http://ci.noaa.gov/
[2] http://www.seagrant.noaa.gov/
[3] http://www.noaa.gov/office-education/epp-msi/csc
[4] http://cpo.noaa.gov/Meet-the-Divisions/Climate-and-Societal-Interactions/RISA

strategic vision, mission, and goals, as well as its business processes. LCDP is a key component of NOAA's Strategic Human Capital Management Plan, and the agency's premier succession planning initiative.

IV. OAR/NWS Co-locations

Informal opportunities for scientific collaboration also exist within NOAA, which are often developed through geographical connections – in other words, by way of proximity or location. For example, NOAA operates 12 testbeds and proving grounds[5] across the country, conducting transition testing of advanced science and technology for NOAA operations and applications. Each year, these testbeds conduct approximately 100 major transition tests led by NOAA scientists collaborating across the research to operations spectrum. Eight of NOAA's testbeds focus on the testing of improved forecast capabilities, with collaborative testing conducted by NWS operational staff and scientists, and OAR research scientists. These include the following:

- Arctic Testbed
- Aviation Weather Testbed
- Climate Testbed
- Developmental Testbed Center
- Hazardous Weather Testbed (HWT)
- Hydrometeorological Testbed
- Joint Hurricane Testbed
- Operations Proving Ground

In addition to testbeds, many of NOAA's Cooperative Institutes are co-located with NOAA research laboratories, promoting strong collaboration between scientists within labs and partner universities. OAR also relies on work performed at numerous public, private, and academic institutions. Through its laboratories, programs, and external partners, OAR balances the activities that benefit from the long-term, dedicated capabilities of federal facilities with those that require the diverse expertise of its university partners.

The co-location of NOAA facilities is strategically designed to enable interaction and cooperation for solving a variety of operationally-relevant research problems. Table 1 lists co-located facilities, mutually beneficial to NWS and OAR.

[5] http://www.testbeds.noaa.gov/

Table 1: Listing of NWS and OAR Co-located Facilities

	NWS	OAR	Location
1	Storm Prediction Center (SPC) and Norman Weather Forecast Office (WFO)	National Severe Storms Laboratory (NSSL)	Norman, OK
2	National Centers for Environmental Prediction	Air Resources Laboratory	College Park, MD
3	Space Weather Prediction Center and Boulder WFO	Earth System Research Laboratory	Boulder, CO
4	Pacific Tsunami Warning Center and Seattle WFO	Pacific Marine Environmental Laboratory	Seattle, WA

Interactions among scientists at co-located facilities are difficult to quantify due to the rich variety of these exchanges. In Norman, Oklahoma, the NWS SPC, Norman WFO WSR-88D Radar Operations Center, and NSSL began intermittently collaborating as early as the 1970s, and continue to collaborate regularly and systematically on advances to severe weather research and future radar technology. This ongoing partnership allowed scientists and forecasters to work together, ultimately leading to the creation of the Hazardous Weather Testbed (HWT) in 1995.

Today, the HWT hosts an annual Spring Experiment to evaluate the operational utility of new science and technology, capabilities that will improve NWS forecasts and warnings. NWS forecasters from Norman and other field forecast offices work side-by-side with researchers, developers, and other experts (e.g., communications and social sciences) to perform tests, and 14 OAR scientists participated in extended visits to SPC in FY 2017. Similar interactions also took place at co-located facilities in Boulder, CO, Seattle, WA, and College Park, MD.

V. OAR/NWS Personnel Exchanges and Projects

OAR's research scientists and NWS's operational staff and scientists conduct research and development in a variety of ways to achieve the mission of NOAA. One method that has been used frequently at NOAA is for federal employees to participate in rotational assignments, or exchanges (often referred to as "details" or "detail assignments"). NOAA detail assignments last between 3-months to 1-year. In FY 2017, five scientists from OAR and NWS completed inter-Line Office detail assignments, ranging from staffing the NOAA Research Council to working the forecast desk at one of the NWS WFOs.

Another principal method for the exchange of personnel between OAR and NWS is through close association with in-person and cooperative electronic work sessions, on research topics that provide the latest innovations and products to serve the country and build a Weather-Ready Nation. During FY 2017, 86 collaborative exchanges resulted in more than 8,000 OAR-NWS staff interactions (i.e. in-person meetings, trips, teleconferences and videoconferences). OAR research scientists and NWS forecasters and scientists are currently collaborating on more than 180 research and development projects aimed at transitioning new science advances into NWS operations through the NOAA research to applications/commercialization/operations processes. A sample listing of key projects and innovations that involve coordination between OAR and NWS staff is provided below.

- Advanced Weather Interactive Processing System
- Hurricane Weather Research and Forecasting Model
- Next Generation Global Prediction System
- Finite Volume Cubed (FV-3) Dynamical Core Model
- Improved Quantitative Precipitation Forecasts
- Spring Experiment at the HWT
- North American Multi Model Ensemble
- Subseasonal to Seasonal Forecasting
- NOAA's Air Quality Forecast Capability
- Tropical Atmosphere Ocean Buoy Array
- Tropical Pacific Observing System 2020
- Deep-ocean Assessment and Reporting of Tsunami
- NOAA Profiler Network
- Conventional and Satellite Data Assimilation
- Federal Aviation Administration Aviation Weather Research Program
- Warn on Forecast
- Next Generation Weather Radar

VI. Summary

A number of existing opportunities for personnel exchange between OAR and NWS currently exist within NOAA, including NRAP and LCDP. In addition, scientific collaboration is driven by research projects, operational needs, and co-location of facilities. To ensure that these collaborations continue, OAR and NWS will promote exchanges of up to 1 year between OAR research scientists and NWS forecasters and scientists. These exchanges have increased over the past few years and will continue to be promoted through NRAP and LCDP, with additional emphasis on opportunities between Line Office staff. Support for individuals selected for the exchange program will be provided by their respective Line Office. This will provide an opportunity to assess participants in both NRAP and LCDP, and seek additional applicants from OAR and NWS for extended detail assignments as prescribed by the Weather Act.

List of Acronyms

HWT	Hazardous Weather Testbed
LCDP	Leadership Competencies Development Program
NOAA	National Oceanic and Atmospheric Administration
NRAP	NOAA Rotational Assignment Program
NSSL	National Severe Storms Laboratory
NWS	National Weather Service
OAR	Oceanic and Atmospheric Research
SPC	Storm Prediction Center
WFO	Weather Forecast Office
WSR-88D	Weather Surveillance Radar - 1988 Doppler

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