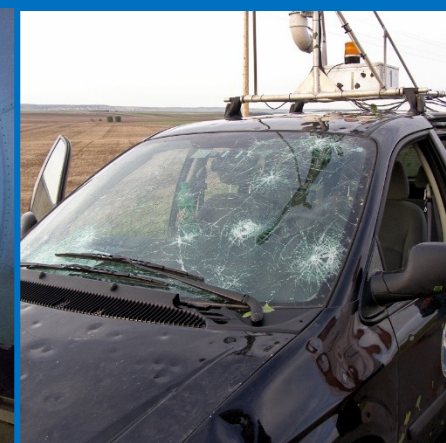
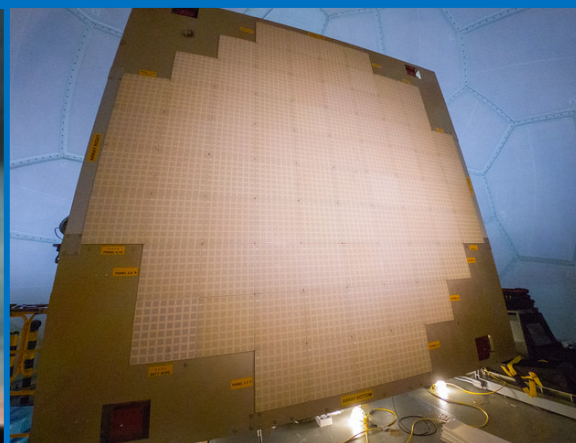


DOC / NOAA / OAR National Severe Storms Laboratory

2021 NSSL Science Review

NSSL Overview

Jack Kain Director, NSSL





Mission Statement

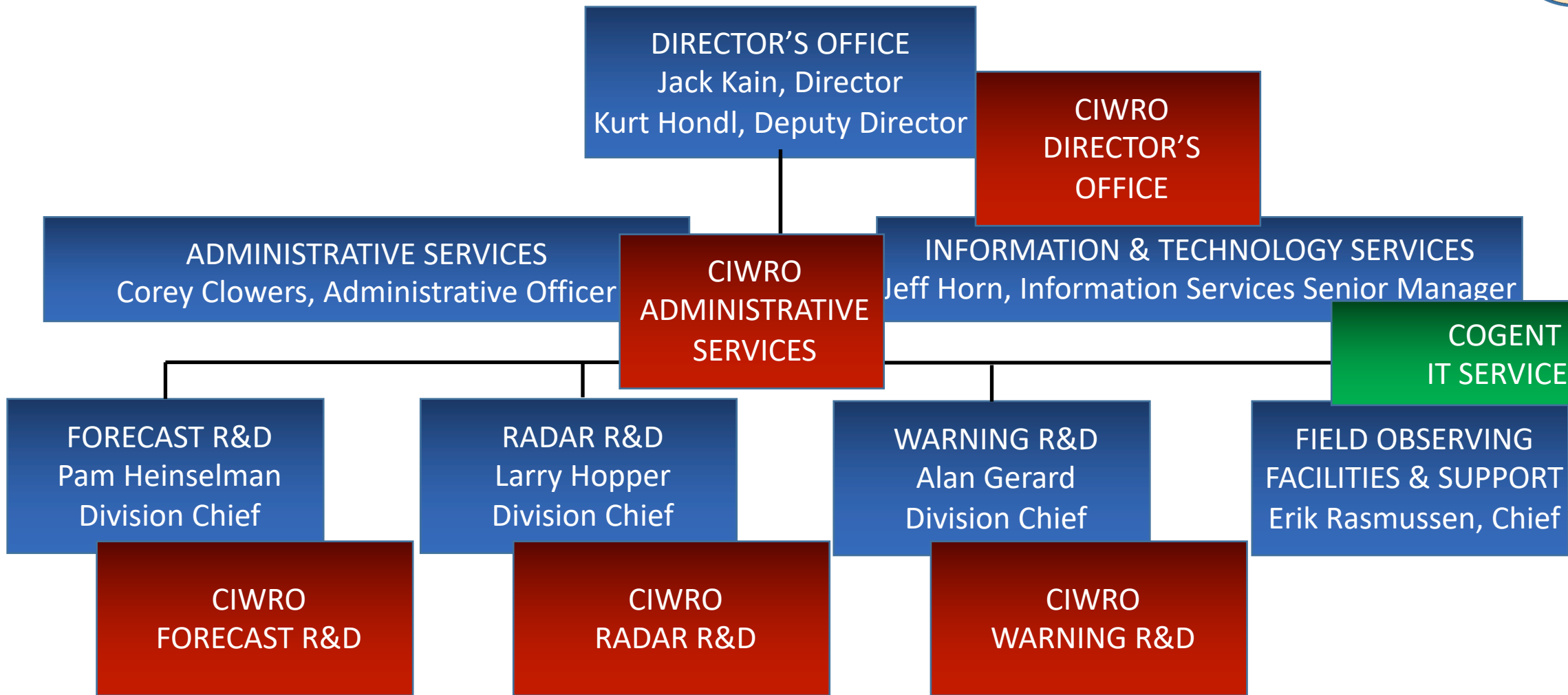
- We are the world's preeminent laboratory for observing, understanding, and modeling severe thunderstorms. We serve as a national resource for severe-weather research and we work collaboratively with the National Weather Service to ensure that their forecasters have the knowledge, capabilities, and technologies to remain world leaders in effectively communicating accurate, timely, and actionable forecasts and warnings of extreme weather to the public and commerce.

NSSL: With you since 1964!





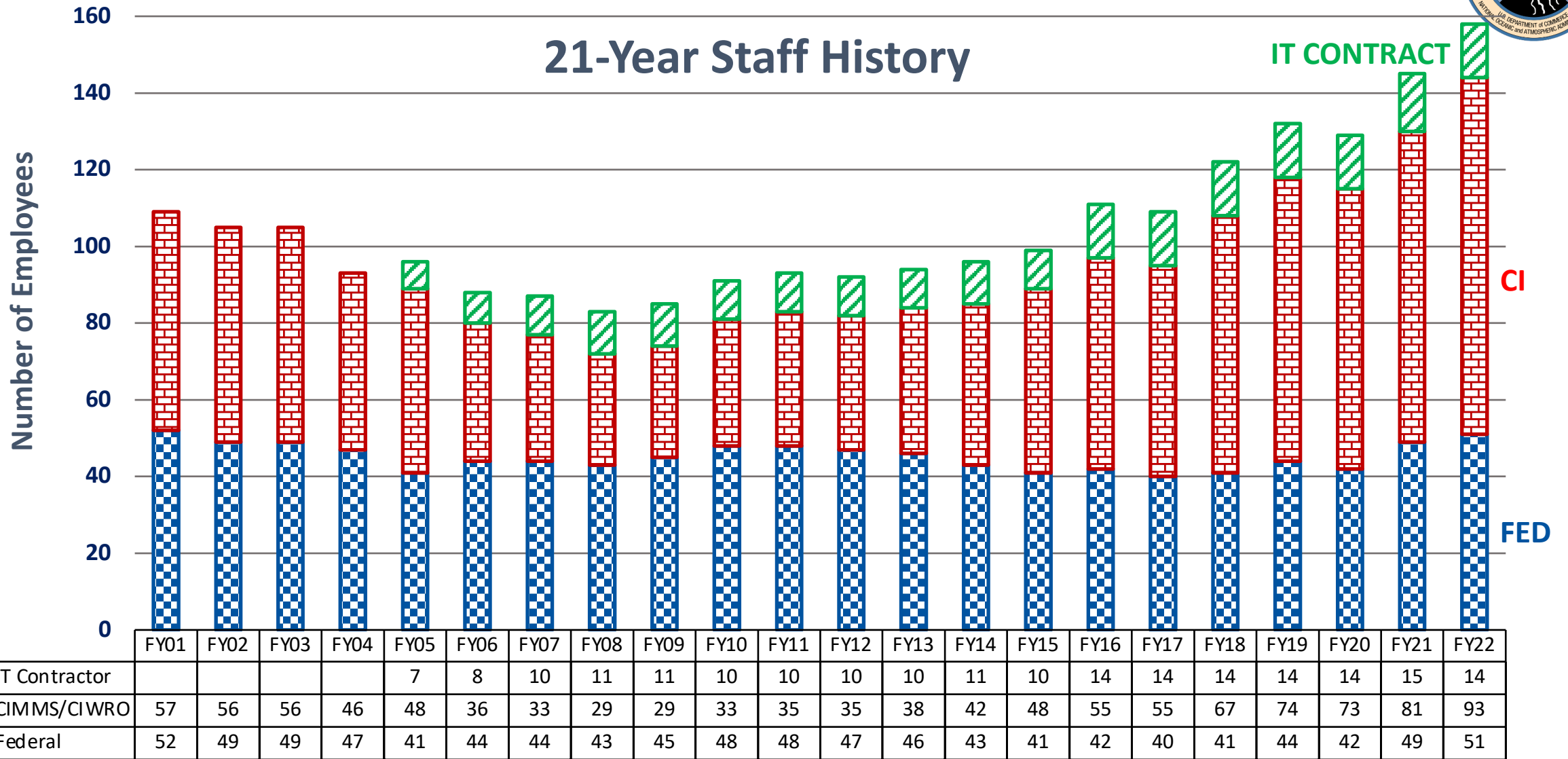
Organizational Chart



NSSL Workforce



21-Year Staff History



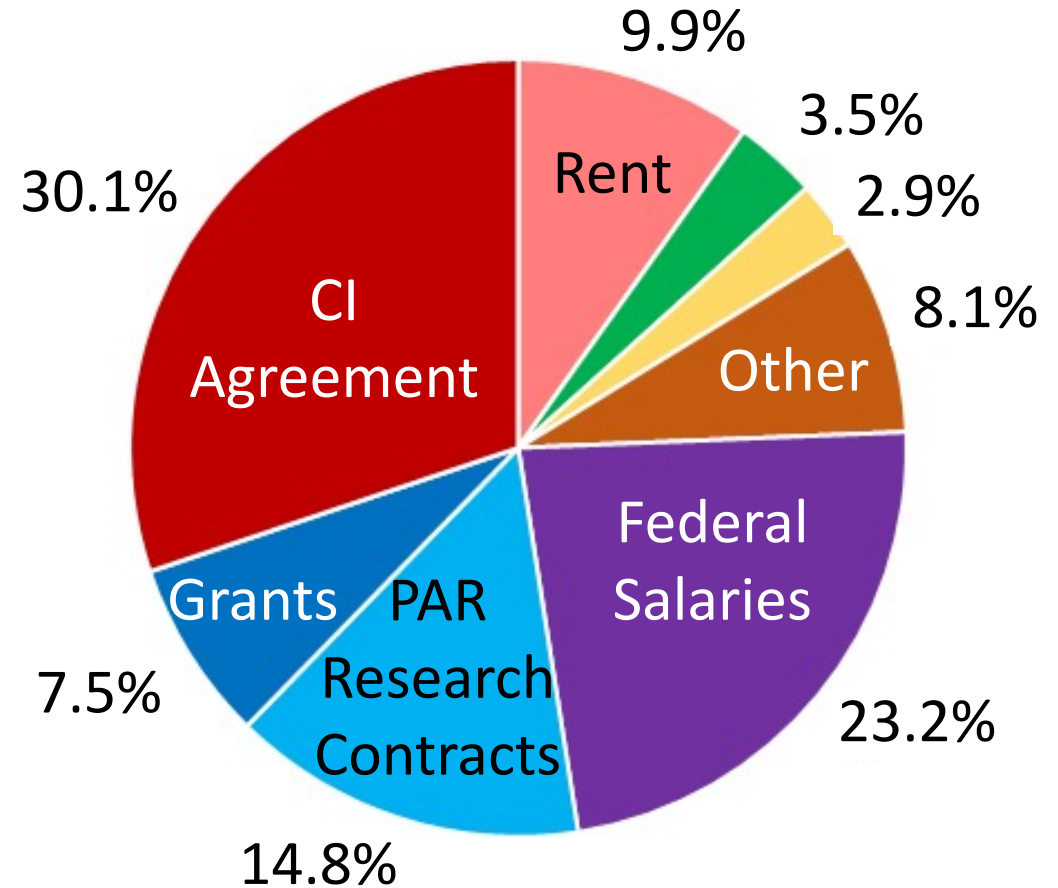


FY21 NSSL Expenses by Category

TOTAL: \$34.5M

FY21 Expenses (%)

- \$3.4M ■ Rent
- \$1.2M ■ IT Contract
- \$1.0M ■ Equipment & Supplies
- \$2.8M ■ Other
- \$8.0M ■ Federal Salaries
- \$5.1M ■ PAR Research Contracts
- \$2.6M ■ Grants
- \$10.4M ■ CI Agreement





Quality:

- ✓ Publications
- ✓ Awards
- ✓ Research Grants
- ✓ Invited Presentations



What about tangible measures of NSSL's influence on science and engineering around the world?





Quality: NSSL innovations that have been adopted around the world



ESSL History

European Severe Storms Laboratory

1-4 Feb 2000	Vision of ESSL first presented by Nikolai Dotzek at the Conference on European Tornadoes and Severe Storms in Toulouse
2002	Vision of ESSL formulated in a pilot study by Nikolai Dotzek, while visiting the NSSL in Norman, Oklahoma
11 Nov 2004	Version 1.00 of the European Severe Weather Database (ESWD) data format decided at the 3 rd European Conference on Severe Storms by the ESWD data



NOAA Hazardous Weather Testbed (HWT)



AVIATION WEATHER TESTBED
NOAA NATIONAL WEATHER SERVICE AWC

HMT

Welcome to the NOAA Hydrometeorology Testbed



ESSL Testbed



Australian Government
Bureau of Meteorology

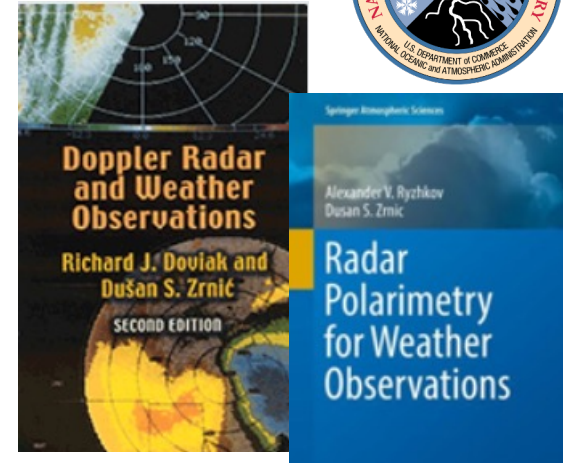
Hazardous Weather Testbed – Nov 2018
Outcomes in brief



Quality: Respected World Leadership in Weather Radar



- NSSL provided the science and engineering foundation for Doppler weather radars (WSR-88D), the dual-polarization upgrade of these radars, and emerging dual-polarized phased-array weather radars;
- Radar technologies developed at NSSL can be tracked directly to many countries around the world, e.g.,

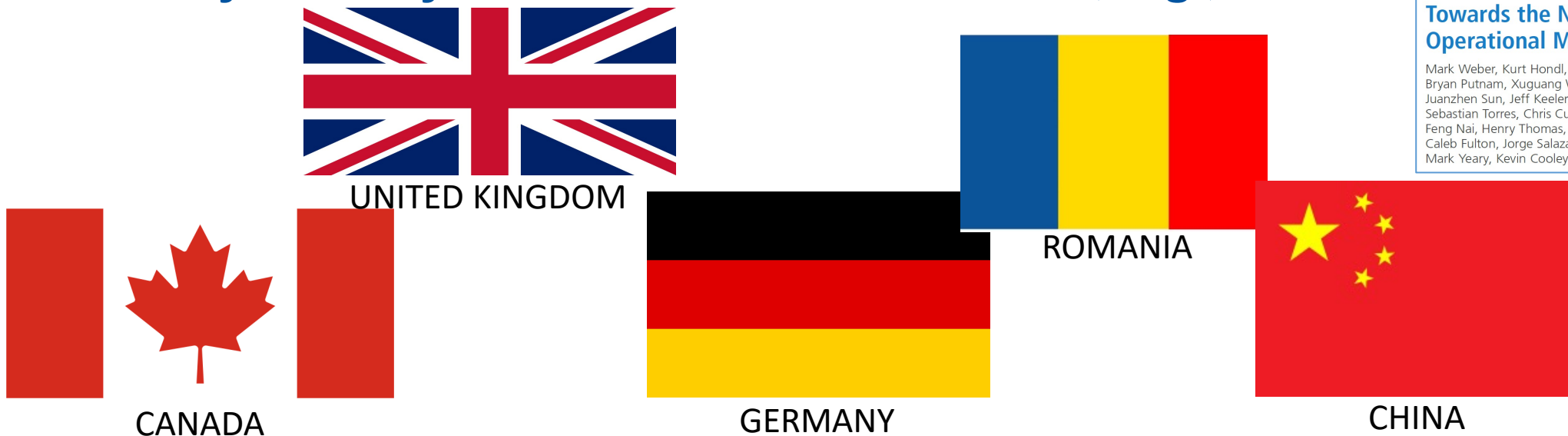


BAMS (2021)

Article

Towards the Next Generation Operational Meteorological Radar

Mark Weber, Kurt Hondl, Nusrat Yussouf, Youngsun Jung, Derek Stratman, Bryan Putnam, Xuguang Wang, Terry Schuur, Charles Kuster, Yixin Wen, Juanzhen Sun, Jeff Keeler, Zhuming Ying, John Cho, James Kurdzo, Sebastian Torres, Chris Curtis, David Schwartzman, Jami Boettcher, Feng Nai, Henry Thomas, Dusan Zrnić, Igor Ivić, Djordje Mirković, Caleb Fulton, Jorge Salazar, Guifu Zhang, Robert Palmer, Mark Yearly, Kevin Cooley, Michael Istok, and Mark Vincent



CANADA

UNITED KINGDOM

GERMANY

ROMANIA

CHINA



Our work is very relevant to NOAA and of great value to society, especially through our close relationship with the National Weather Service



NWS Strategic Goals (2019-2022)

Reduce the impacts of weather, water, and climate events by transforming the way people receive, understand, and act on information.	Harness cutting-edge science, technology, and engineering to provide the best observations, forecasts, and warnings.	Evolve the NWS to excel in the face of change through investment in our people, partnerships, and organizational performance.
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• The Norman Weather Community is anchored by 4 NOAA National Centers:

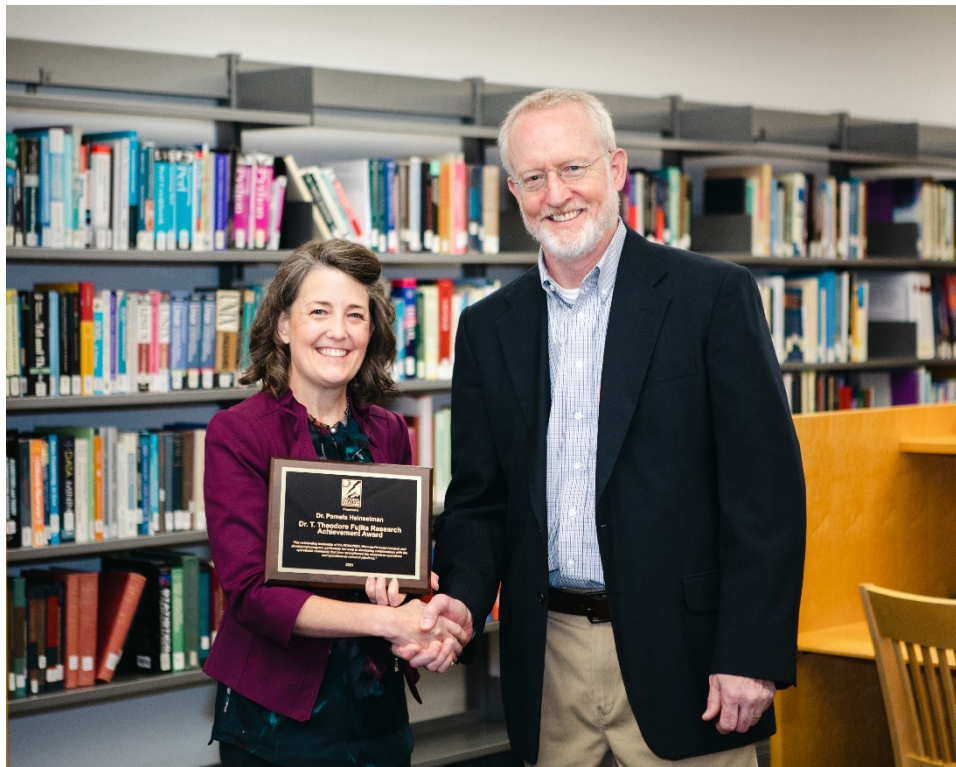
- The designated National Centers for:
 - ❖ Severe Weather Research (**NSSL**)
 - ❖ NWS Severe Weather Prediction (**SPC**)
 - ❖ NWS Warning-Decision Training (**WDTD**)
 - ❖ NWS Radar Operations (**ROC**)



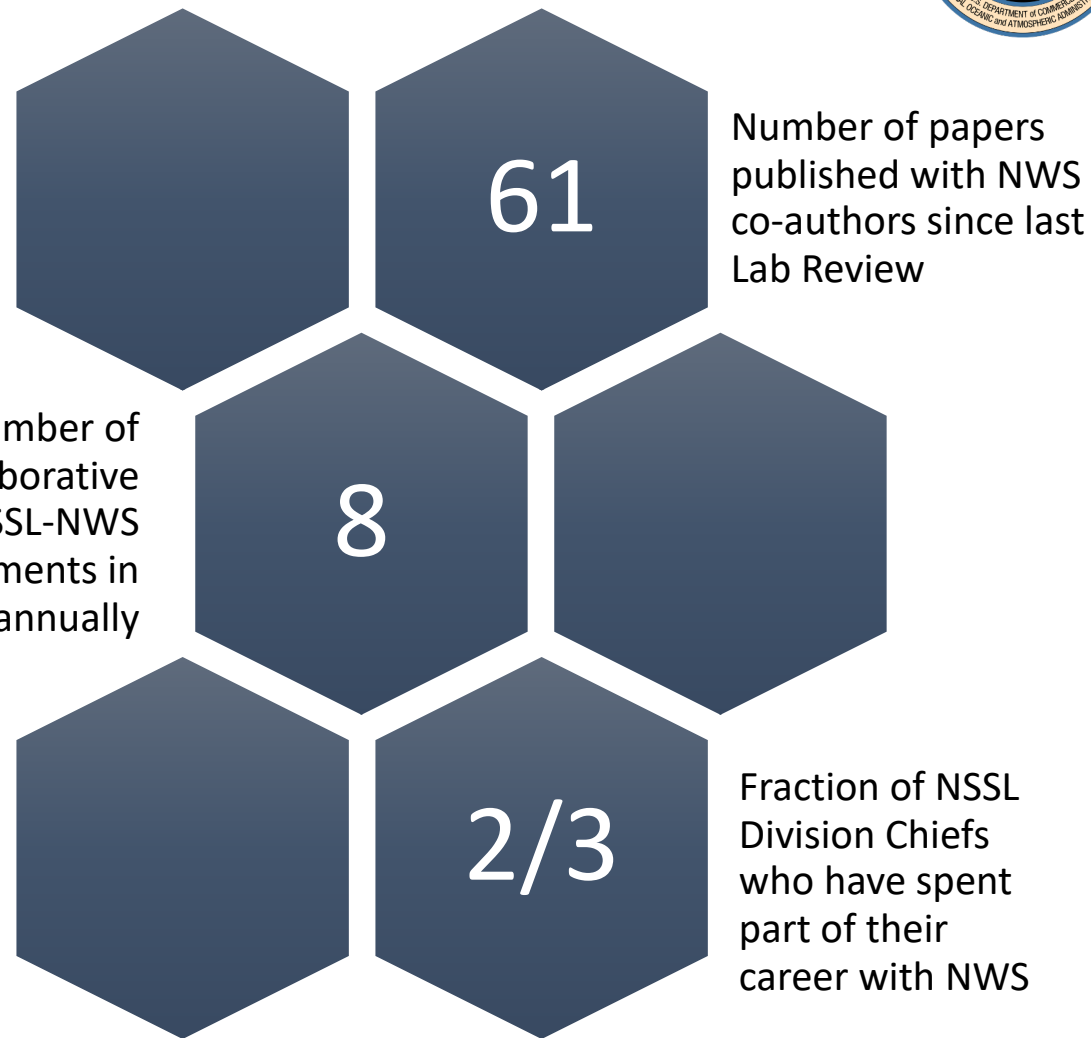
• And an elite NWS local Forecast Office (OUN)



Relevance to the National Weather Service



FRDD Chief Pam Heinselman has never been employed by the NWS but in 2021 she was awarded the prestigious National Weather Association's Dr. T. Theodore Fujita Research Achievement Award, which is presented to an NWA member whose research has made a significant contribution to operational meteorology.





Performance: VORTEX-Southeast

- In January 2015, Congress unexpectedly appropriated \$5M money and directed NSSL to solve the Tornado problem in the Southeast
- From FY15 Omnibus Spending Bill:
 - “...establish why tornadic activity in the Southeast results in more deaths per capita than any other region of the country.”*
 - “...to better understand how environmental factors that are characteristic of the southeastern United States affect the formation, intensity, and storm path of tornadoes for this region”*
- **Rapid, effective, inclusive NSSL response**
 - Grants Program (over 50% of funds for competitive grants)
 - Community Engagement
 - Field Programs



VORTEX
SOUTHEAST

Performance: VORTEX-Southeast



Physical Science Research

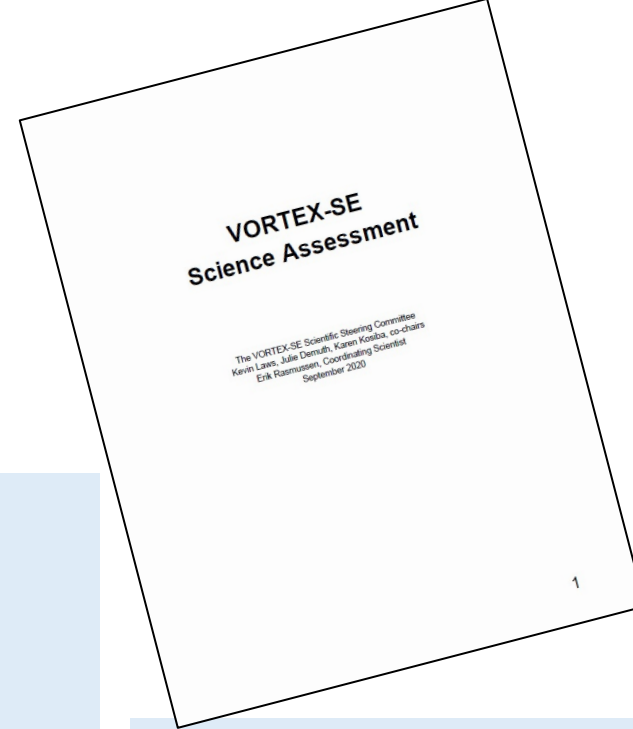
- Terrain and Roughness Influences
- Internal Storm Processes
- Storm Environment Influences
- Climatology
- Tornado Damage Assessment
- Landfalling Hurricane Tornadoes
- Prediction Models

Social, Behavioral, and Economic Sciences (SBES)

- Forecaster Decision-Making
- Risk Communication to Public
- Risk Assessment, Decision-Making, and Actions Taken by Public
- Assessing Tornado Impacts and Vulnerabilities

Field Campaigns

- Broad Meteorological Community Collaboration
- Procurement and Testing of New Instruments and Observation Strategies
- Impacts of New Observations on Analysis and Prediction
- Leverage other Funding Sources (e.g., NSF, NOAA)



VORTEX
SOUTHEAST

Workplace Culture...Very high “percent positive” responses to 2021 *Federal Employee Viewpoint Survey*



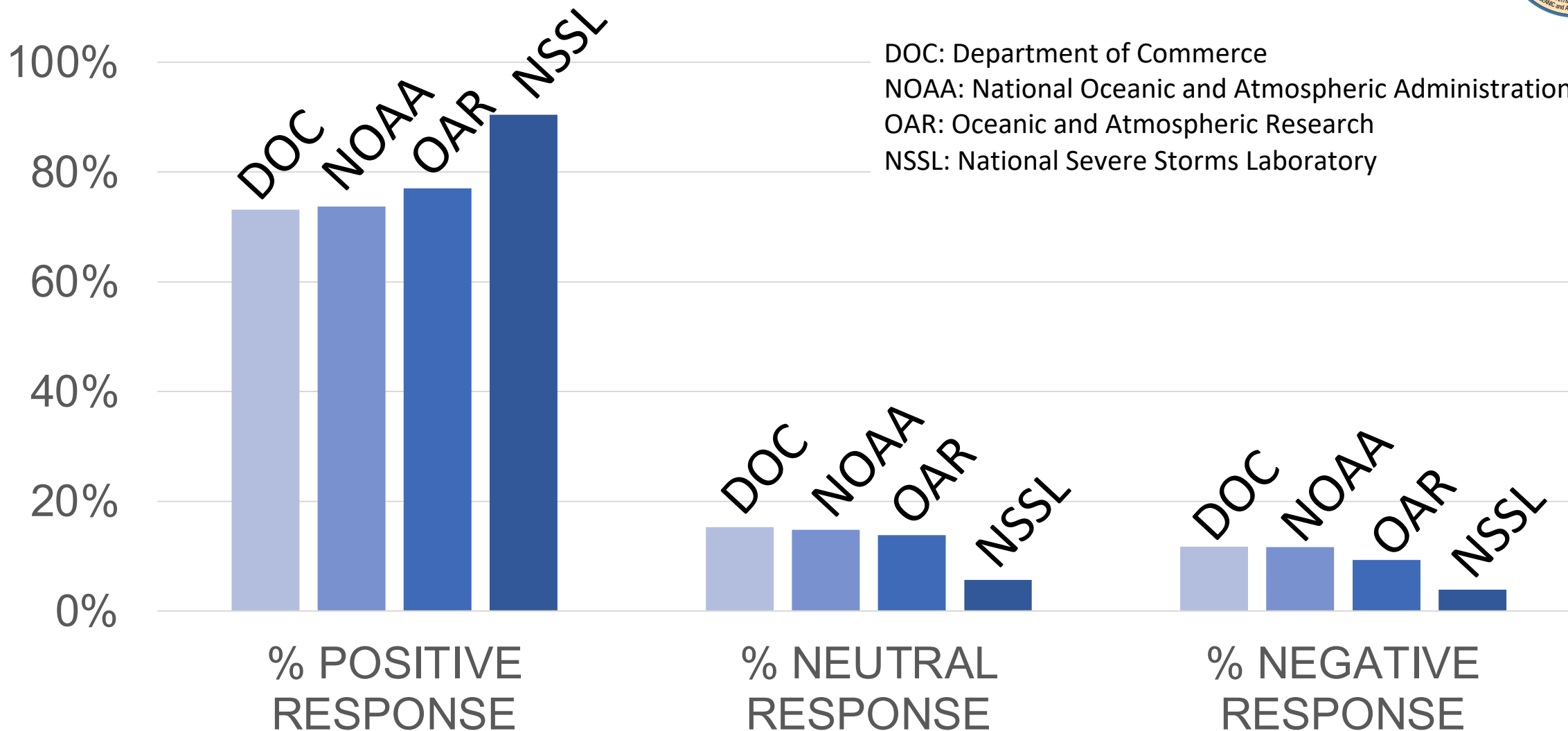
- I recommend my organization as **a good place to work (96%)**
- **Employees are recognized** for providing high quality products and services **(96%)**
- My agency is successful at **accomplishing its mission (100%)**
- **Supervisor Performance:**
 - My supervisor **supports** my need to **balance work and other life issues (100%)**
 - Supervisors in my work unit **support employee development (100%)**
 - My **supervisor listens** to what I have to say **(100%)**
 - My supervisor **treats me with respect (100%)**
 - **I have trust and confidence** in my supervisor **(100%)**
 - Overall, **how good a job** do you feel is being done **by your immediate supervisor? (100%)**

Workplace Culture...

2021 Federal Employee Viewpoint Survey: Aggregate Results



DOC: Department of Commerce
NOAA: National Oceanic and Atmospheric Administration
OAR: Oceanic and Atmospheric Research
NSSL: National Severe Storms Laboratory





Workplace Culture...

From the 2015 NSSL Science Review:

“There is a NSSL-wide lack of diversity among the federal workforce...”

“Women and minorities are markedly absent from lab leadership or management positions...”

Age,
generation,
life stage

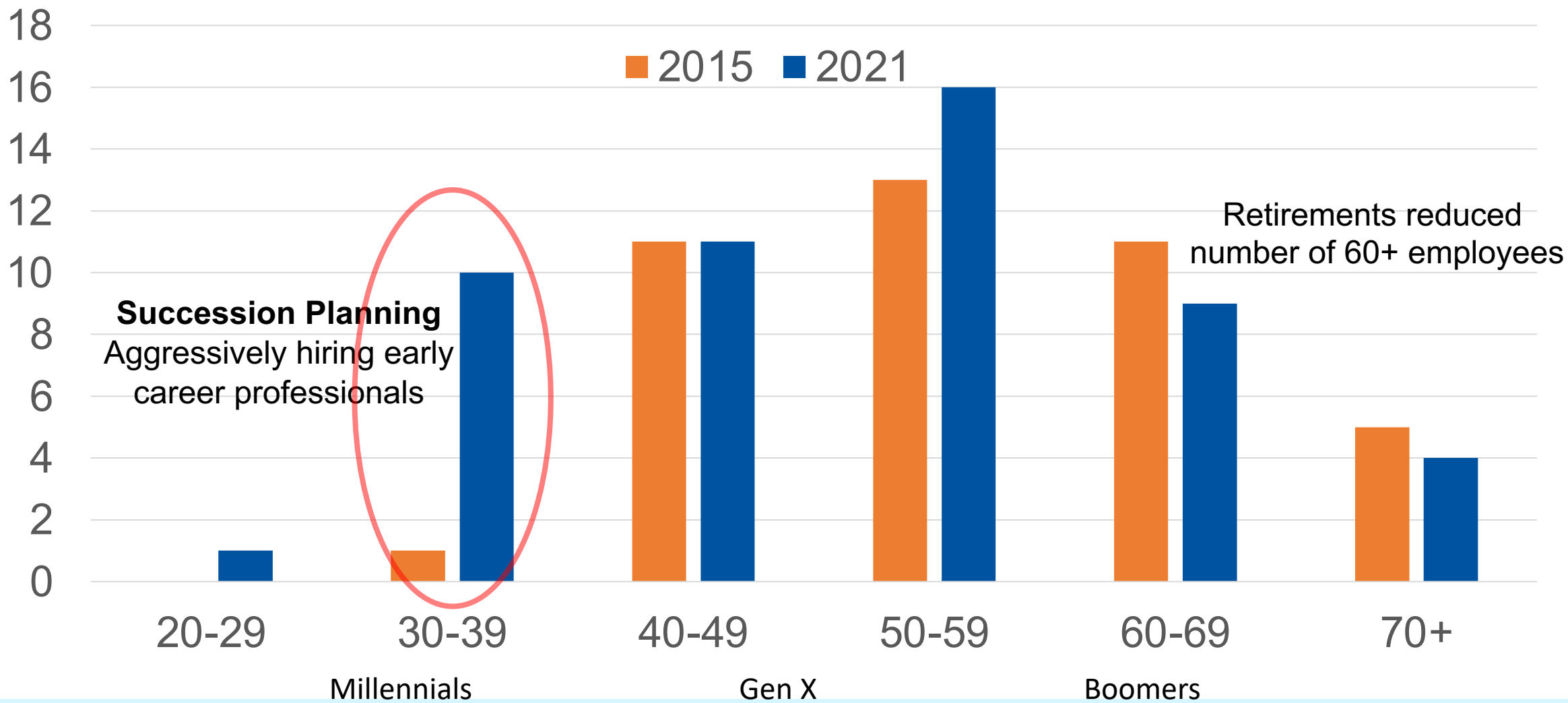
Gender

Race

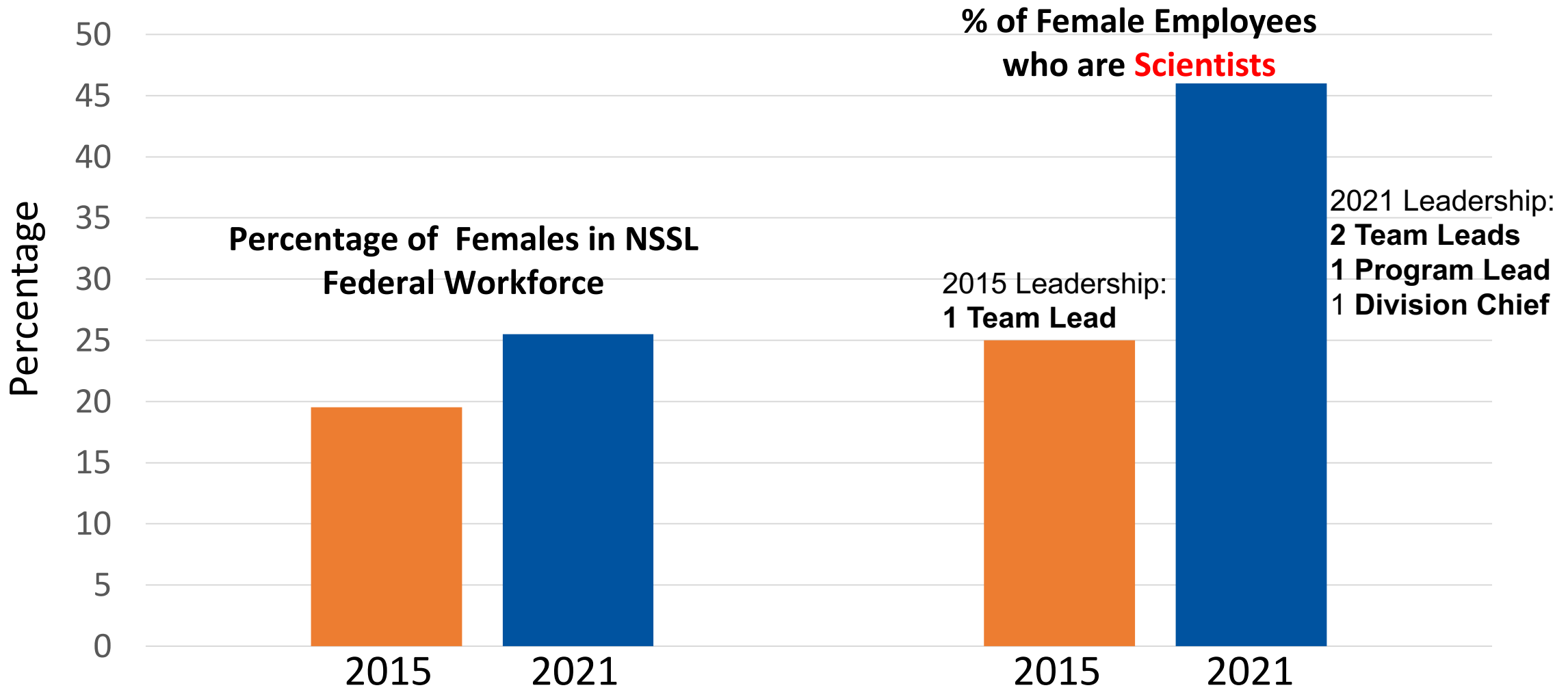
Improve diversity of the workforce, please!



Federal Diversity Progress: Age

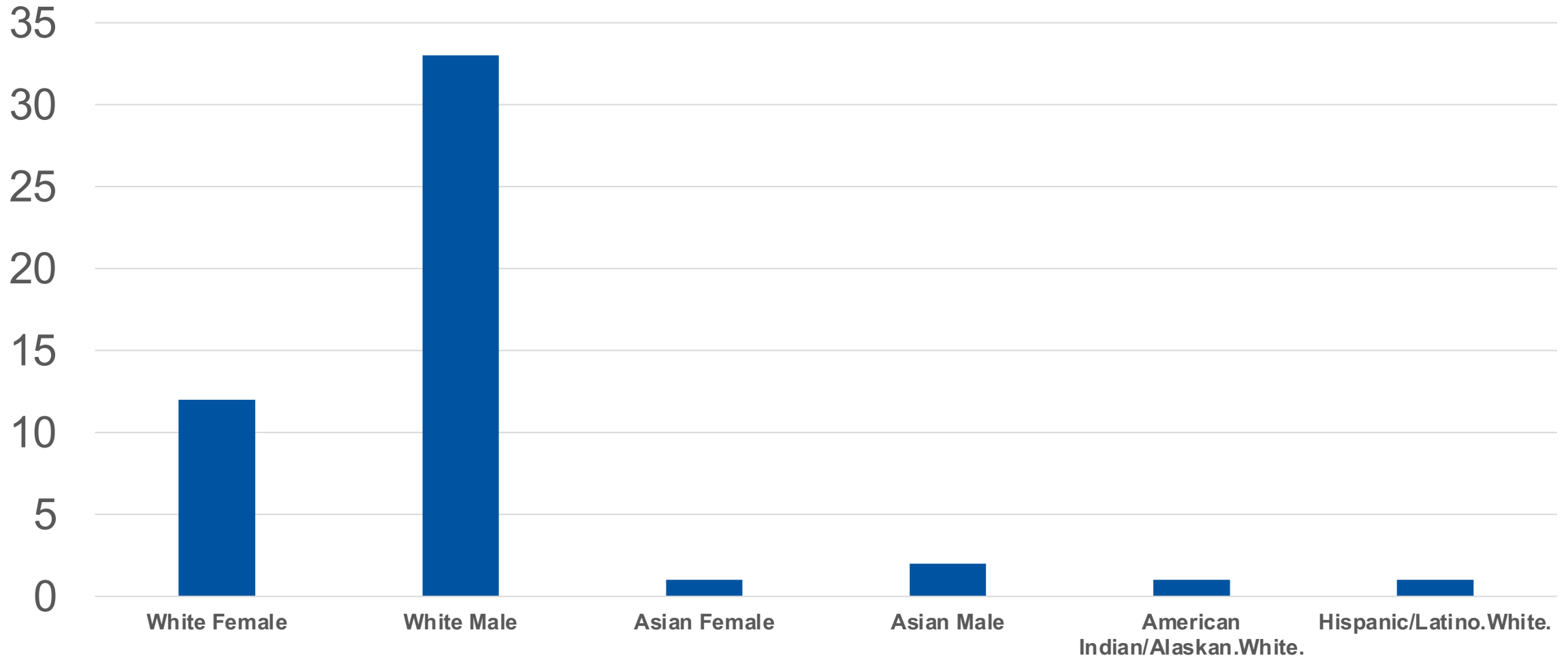


Federal Diversity Progress: Gender





Federal Diversity: Race (2021)





Aggressive Corporate level strategy to enhance DEIA...

- **WORKFORCE DIVERSITY:** Recruit, train, and develop and retain a diverse, highly-capable workforce at all levels of the agency
- José E. Serrano Educational Partnership Program with Minority Serving Institutions (EPP/MSI)
- The primary long term goal of EPP/MSI is to increase the number of students from under-represented communities, who attend NOAA CSC institutions and graduate with degrees in STEM and natural resource management policy - diverse and well-trained candidates for the future NOAA workforce

“you can no longer use the excuse that you don’t know how to get qualified candidates from under-represented groups in your applicant pools”





NSSL Diversity, Inclusion, and Sustainability Team 16 October 2017 to Present

NDIST Lead Deputy Director

One representative from each NSSL's four divisions

Outreach Committee (CIWRO & NSSL)



NSSL Rep: OAR D&I
Advisory Committee

NSSL Rep: OAR's
EEO/Diversity Committee

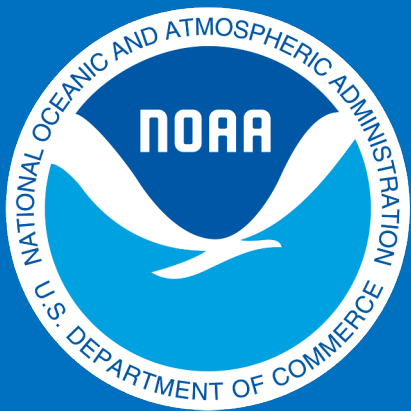
Awards

NOAA Research EEO/Diversity Laboratory of the Year

OAR EEO/Diversity Award for Exemplary Service 😊

Society of American Indian Government Employees (SAIGE) Leadership Award 😊





Corey Clowers
NSSL Admin Officer



Alan Gerard
NSSL WRDD Chief



Pam Heinselman
NSSL FRDD Chief



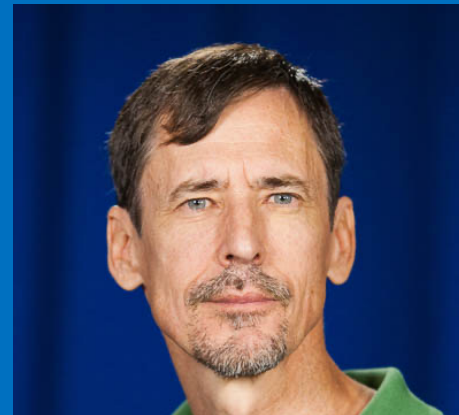
Kurt Hondl
NSSL Deputy Director



Larry Hopper
NSSL RRDD Chief



Jack Kain
NSSL Director



Erik Rasmussen
NSSL FOFS Chief



Greg McFarquhar
CIWRO Director

Questions for the Management Team?





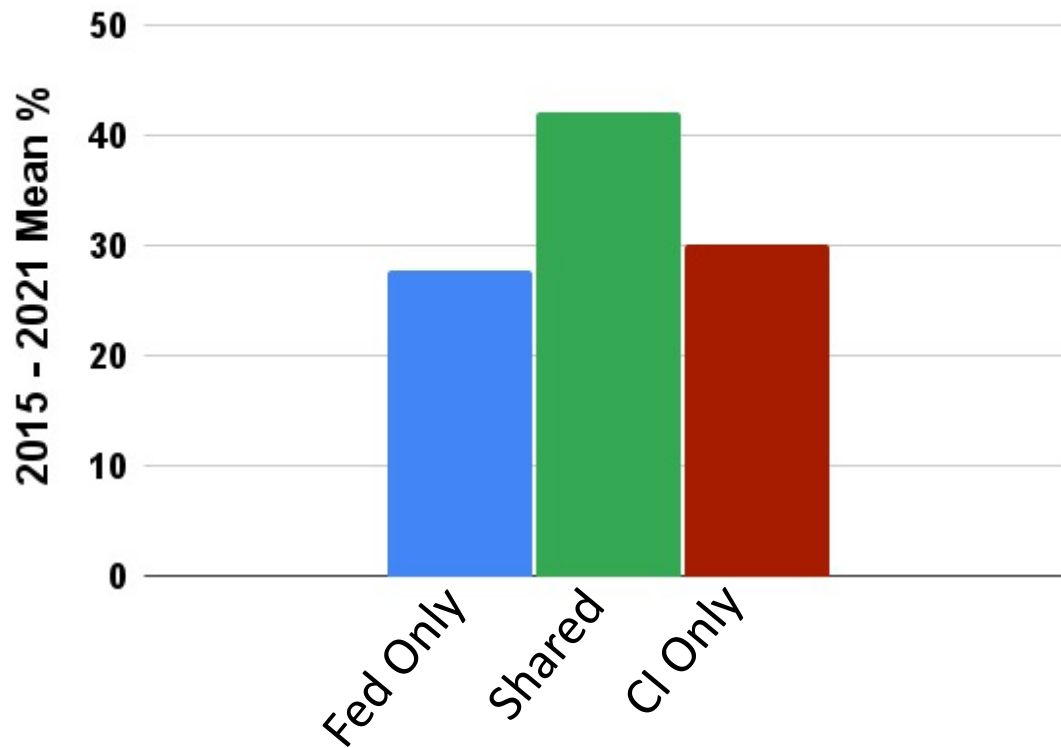
EXTRAS



Quality: Publications per year (2015-2021)



Publication Authorship as a Function of Affiliation



Average

89

% of pubs with no CI authors

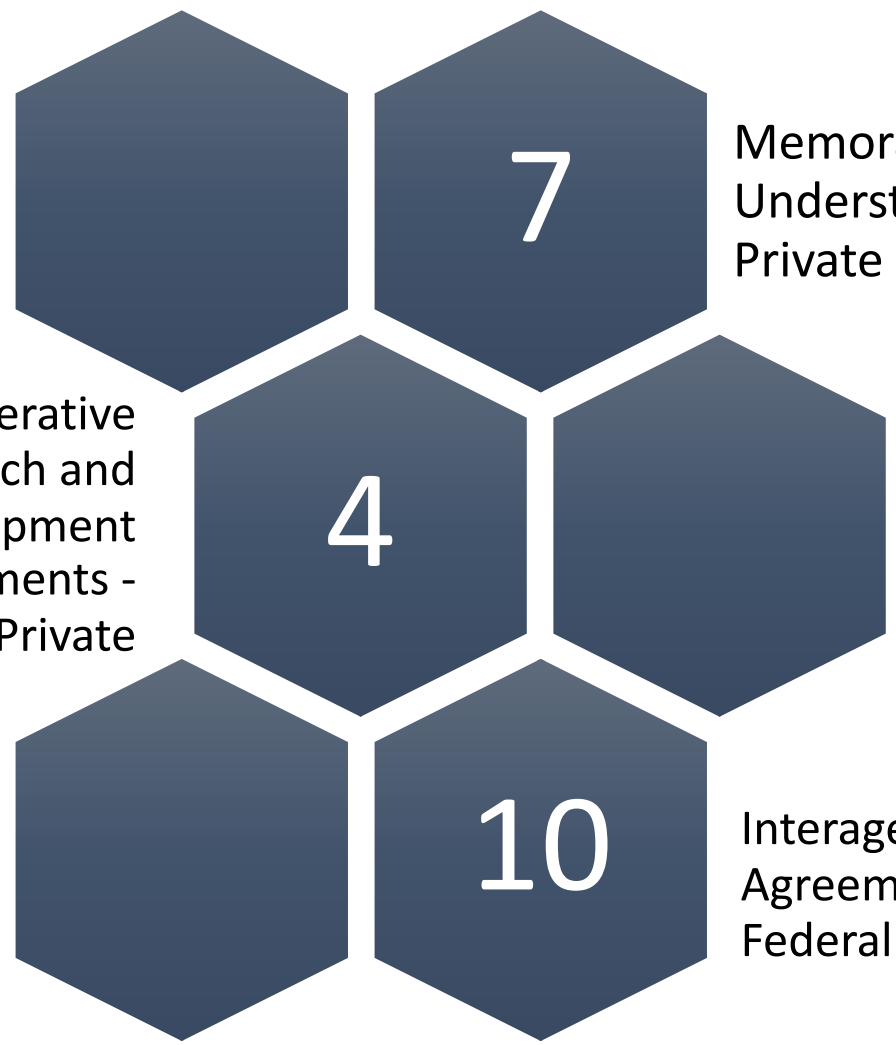
28

% of pubs with no Fed authors

30



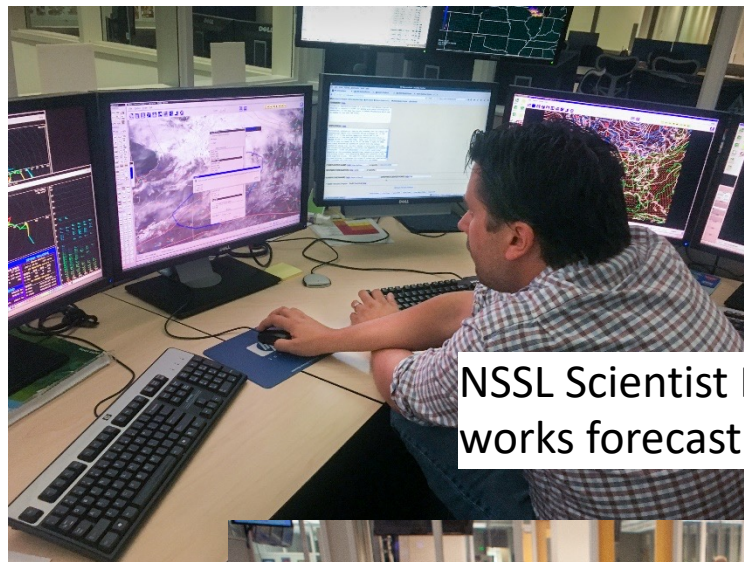
Quality: Collaborations and Agreements



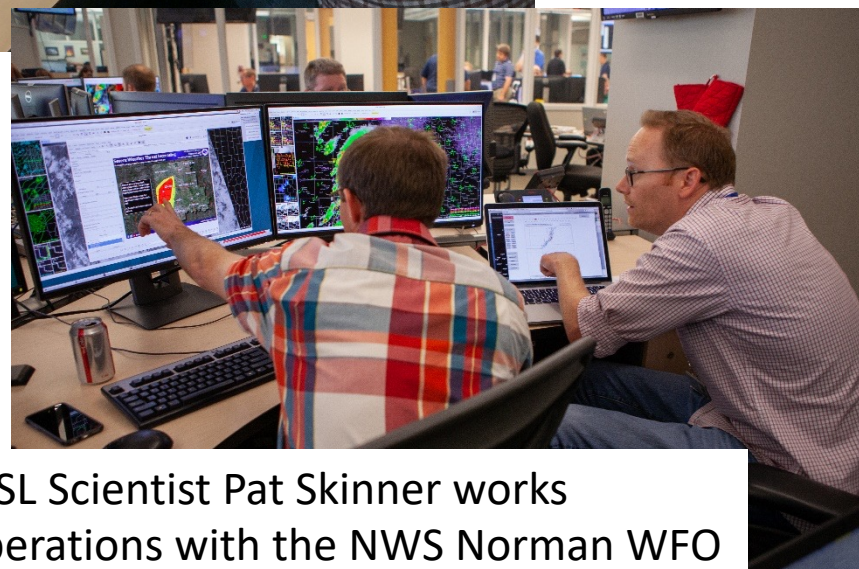
Memoranda of Understanding – Private and State

Cooperative Research and Development Agreements - Private

Interagency Agreements – Federal



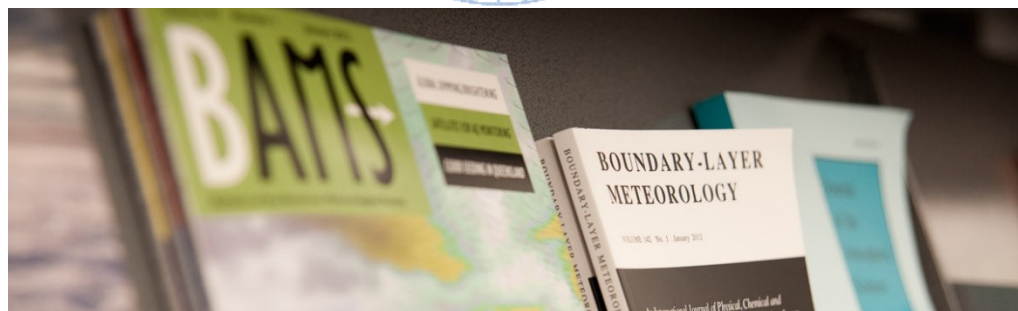
NSSL Scientist Mike Coniglio works forecast shift for the SPC



CIWRO/NSSL Scientist Pat Skinner works warning operations with the NWS Norman WFO

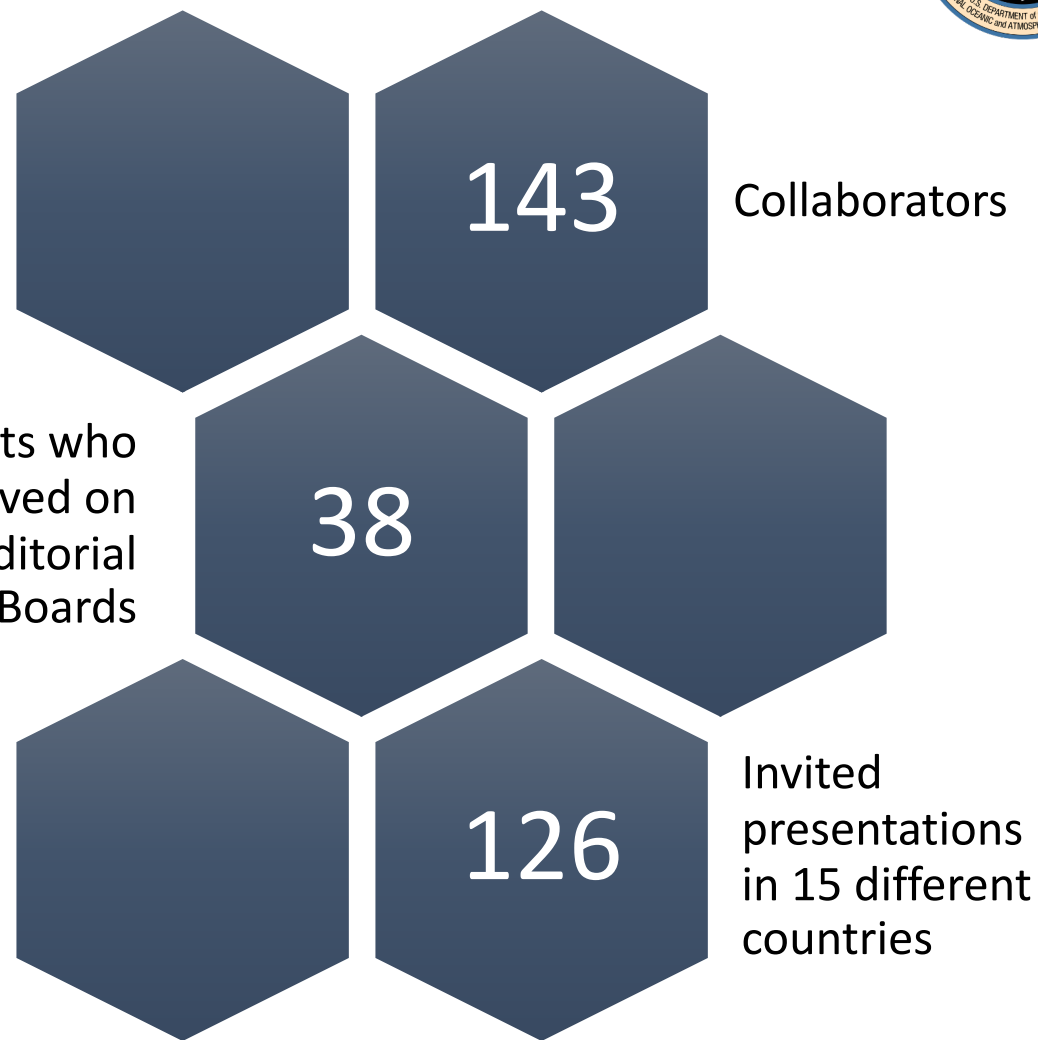


Quality: Engagement and Service (2015-2021)



Harold Brooks chairs a Panel Discussion during the 2015 European Conference on Severe Storms

Photo by Chuck Doswell





Relevance: Alignment with NOAA/OAR Science Goals

NOAA Research and Development Priorities (2020-2026)

Reducing societal impacts from hazardous weather & other environmental phenomena	Sustainable use and stewardship of ocean and coastal resources	A robust and effective research, development, and transition enterprise
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OAR Strategic Goals (2020-2026)

Detect Changes in the Ocean and Atmosphere	Make Forecasts Better	Drive Innovative Science	Explore the Marine Environment
--	-----------------------	--------------------------	--------------------------------

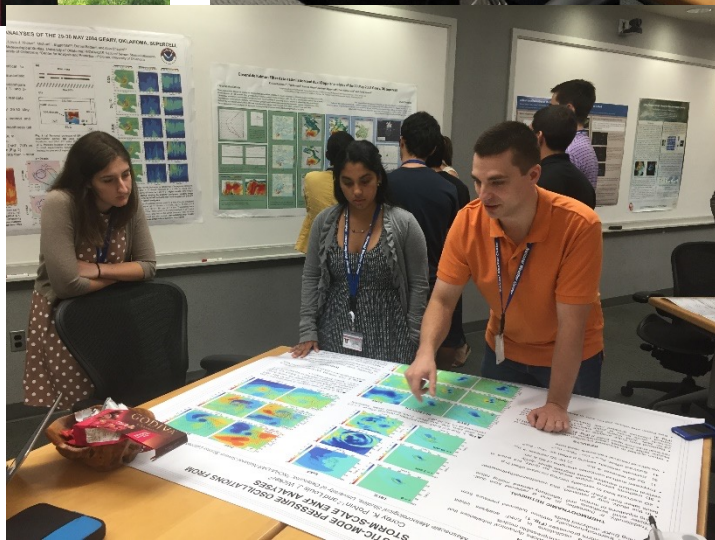
NSSL Strategic Goals (2021-2030)

Better observations and understanding	Better forecast/warning tools and techniques	Better resonance with users and stakeholders	Better foundational underpinnings
---------------------------------------	--	--	-----------------------------------





Relevance to Education: 2015-2021 Numbers



Number of Doctoral Committees Served



Number of Graduate Students Advised



Number of REU & Hollings (undergrad) scholars mentored since last Lab Review





Relevance: Social Media



NWS Shreveport @NWSShreveport · Mar 4

Thanks to a collaborative survey with @NOAANSSL we discovered that the track was longer with the Vivian tornado on February 28th. Unmanned aerial surveys from a drone and a fixed-wing aircraft were helpful to extend the damage path length to 1.5 miles.

NATIONAL WEATHER SERVICE SHREVEPORT, LA

Preliminary Damage Survey Results

Vivian, LA	
Date	February 28, 2021
Time (Local)	6:15 PM – 6:18 PM
EF Rating	EF-1
Est. Peak Winds	90 mph
Path Length	1.50 miles
Max. Width	165 yards
Injuries/Deaths	None

NWS New Orleans @NWSNewOrleans · Nov 30, 2020

In just 2 days, Dec 2, you can chat with @NOAANSSL and ask questions about NSSL's mobile research vehicles

NOAA National Severe Storms Laboratory @... · Nov 30, 2020

Wednesday THIS week, Dec. 2., join us 1-2 pm CST for a #TwitterChat as @NOAA experts take your questions about NSSL's mobile research vehicles.

Follow @NOAANSSL & tag your questions with the hashtag #WeatherQA.



OU Campus Safety @OUemergencyprep · Aug 7, 2020

A quick THANK YOU to the talented professionals @NOAANSSL for making the #MRMS data viewer available! The viewer is a critical tool in making campus #OUsafe from weather threats.

NWS Grand Forks @NWSGrandForks · Oct 28, 2018

Always keeping an eye on the sky? So are we, but we need your help! The #mPING app lets you send your weather reports to the NWS to help us make a better forecast!

NOAA NCEI Climate @NOAANCEIclimate · Oct 28, 2018

Learn more about the #mPING project, managed by @NOAANSSL, which crowdsources weather reports via a free smartphone app: mping.nssl.noaa.gov #CSWGlobal18

National Weather Ctr @NWCNorman · Mar 4

Always so many incredible research projects going on inside the building, here is just one of the many at the NWC... with @NOAANSSL and @OUCIMMS! #WeatherResearch #SpringSafety

University of Oklahoma Research @OUResearch · Mar 3

Researchers from @UofOklahoma and @NOAANSSL are improving current software to enhance guidance for the categorization of flash flood warnings to increase public response and public safety. Learn more at bit.ly/FlashFloods21



Performance: We are effective Stewards of Taxpayer money

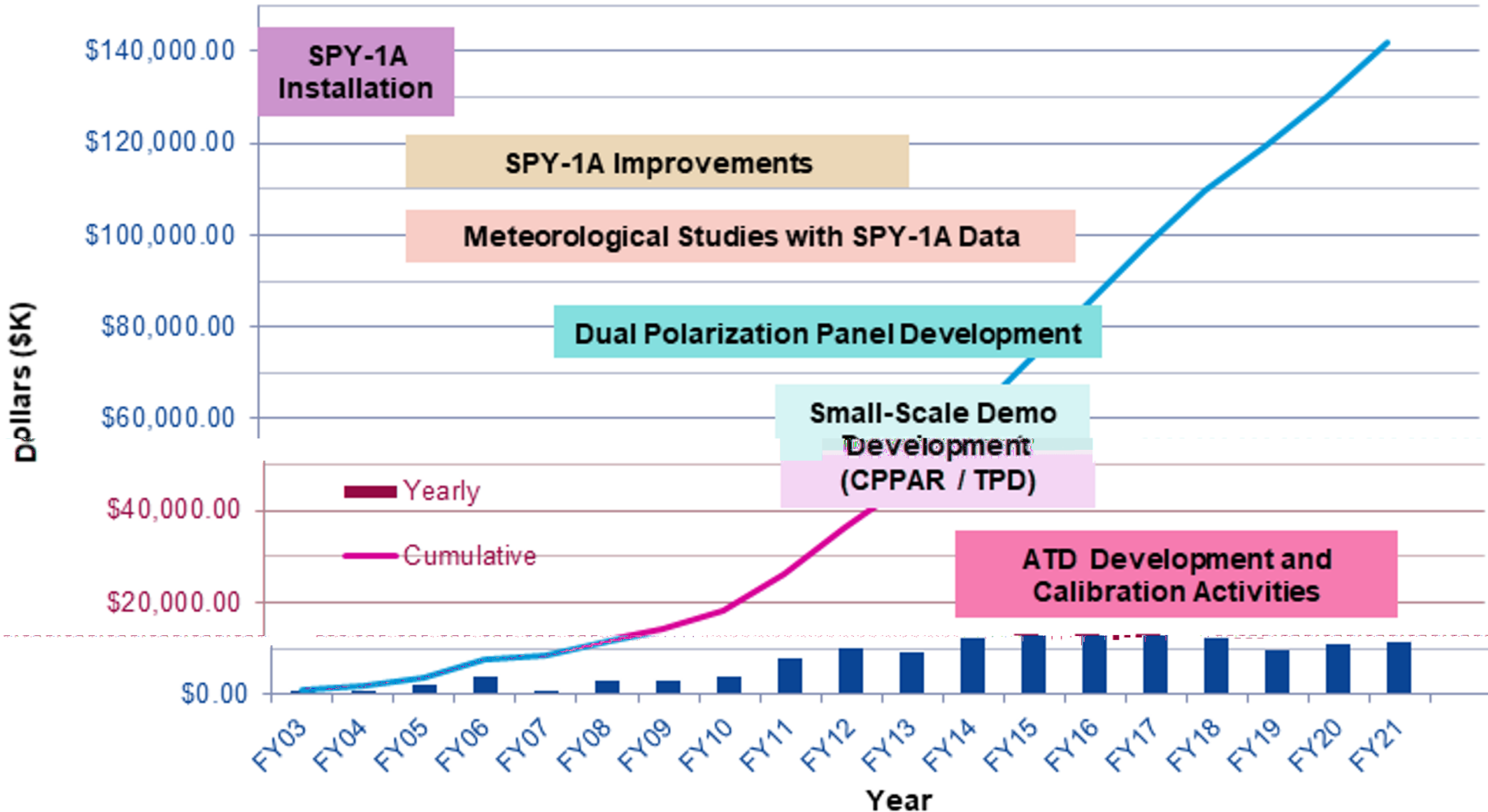
• Examples:

- Weather Radar
- NOAA Hazardous Weather Testbed (HWT)
- VORTEX-SouthEast



PAR R&D Funding History

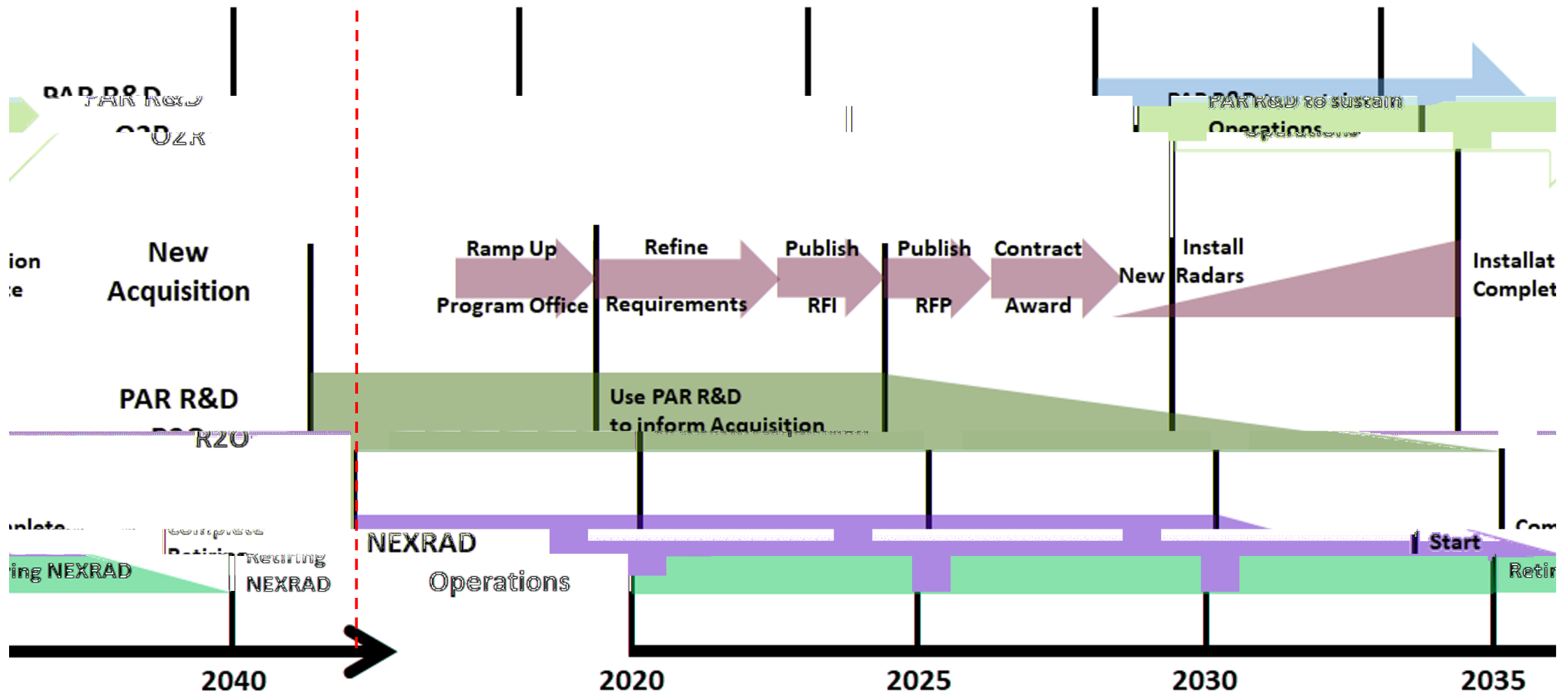
❖ Does not include initial investment of \$24M by non-NOAA entities to establish SPY-1A system in Norman



SCHEDULE – PAR R&D Program (FY20 and beyond)



Adapted From the *Weather Radar Follow-On Plan* Report to Congress delivered 15 June 2020





Performance: NOAA Hazardous Weather Testbed

- Started as the “Spring Program” in 2000, driven by mutual interests of NSSL Researchers and Storm Prediction Center (SPC) Forecasters

SPC Operations



NSSL
Researchers



SPC
Forecasters

Norman Weather
Forecast Office (WFO)
Meteorologist in Charge





Performance: NOAA Hazardous Weather Testbed

- By 2003, we were attracting a broad range of scientists and forecasters



NWS Headquarters

Environment Canada Scientist

Naval Research Laboratory Scientist

Detroit WFO Forecaster

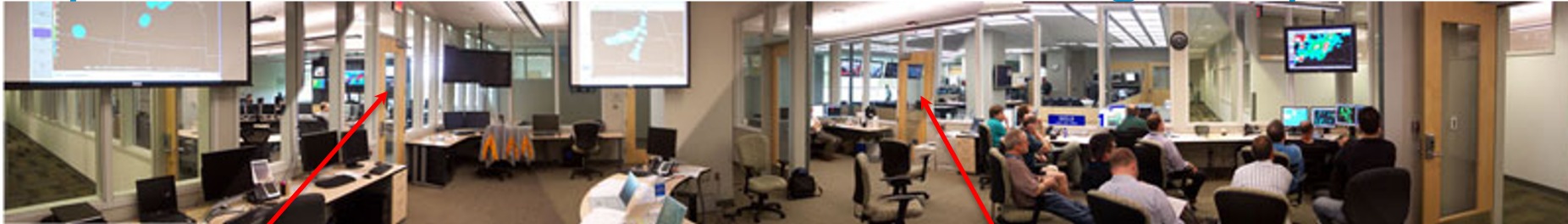
NSSL Scientist

UK Met Office Forecaster/Scientist



Performance: NOAA Hazardous Weather Testbed

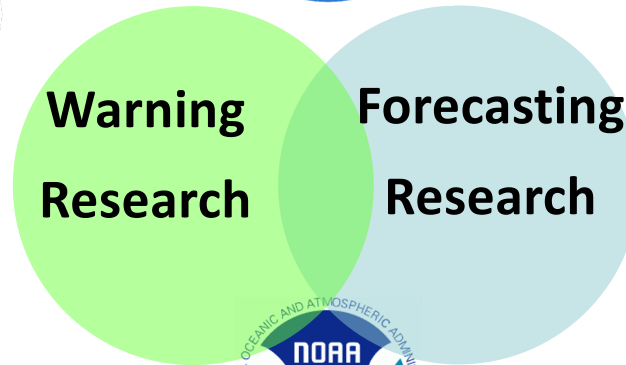
- By 2007, we were in a new building with a dedicated space and both Forecast and Warning components



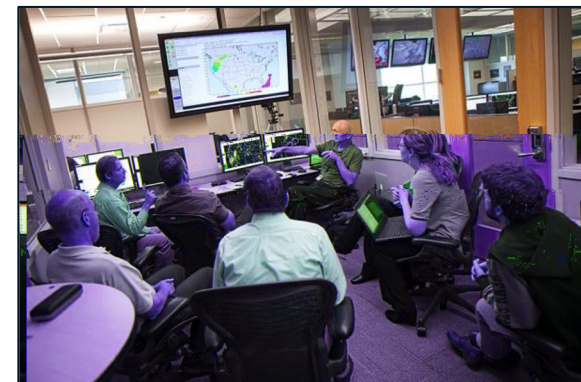
NWS local forecast office
Regional responsibility

NWS Storm Prediction Center
Nationwide responsibility

**Local Forecasts,
Warnings, IDSS**



**National Outlooks,
Watches, IDSS**





Performance: NOAA Hazardous Weather Testbed

- “The HWT is a model for all of NOAA”
 - Louis Uccellini, 2007
- Aviation Weather Testbed (AWT)
- Hydrometeorological Testbed (HMT)



- European Severe Storms Laboratory Testbed (2012)
- Australian Bureau of Meteorology HWT (2018)
- 2019 Experiments/Participants: 7/270 (all in-person)
- 2021 Experiments/Participants: 8/380 (all virtual)
- In the last 5 years we have become the de facto gatekeepers for transfer of Severe-Weather Prediction Tools into NWS Ops

