

# NOAA Center for Earth System Sciences and Remote Sensing Technologies

**Shakila Merchant, PhD**

Assistant Director

NOAA CREST Center

The City College of New York, NY

**NOAA-ESRL/PSD- CREST Collaborative Meeting**

**August 13, 2018**

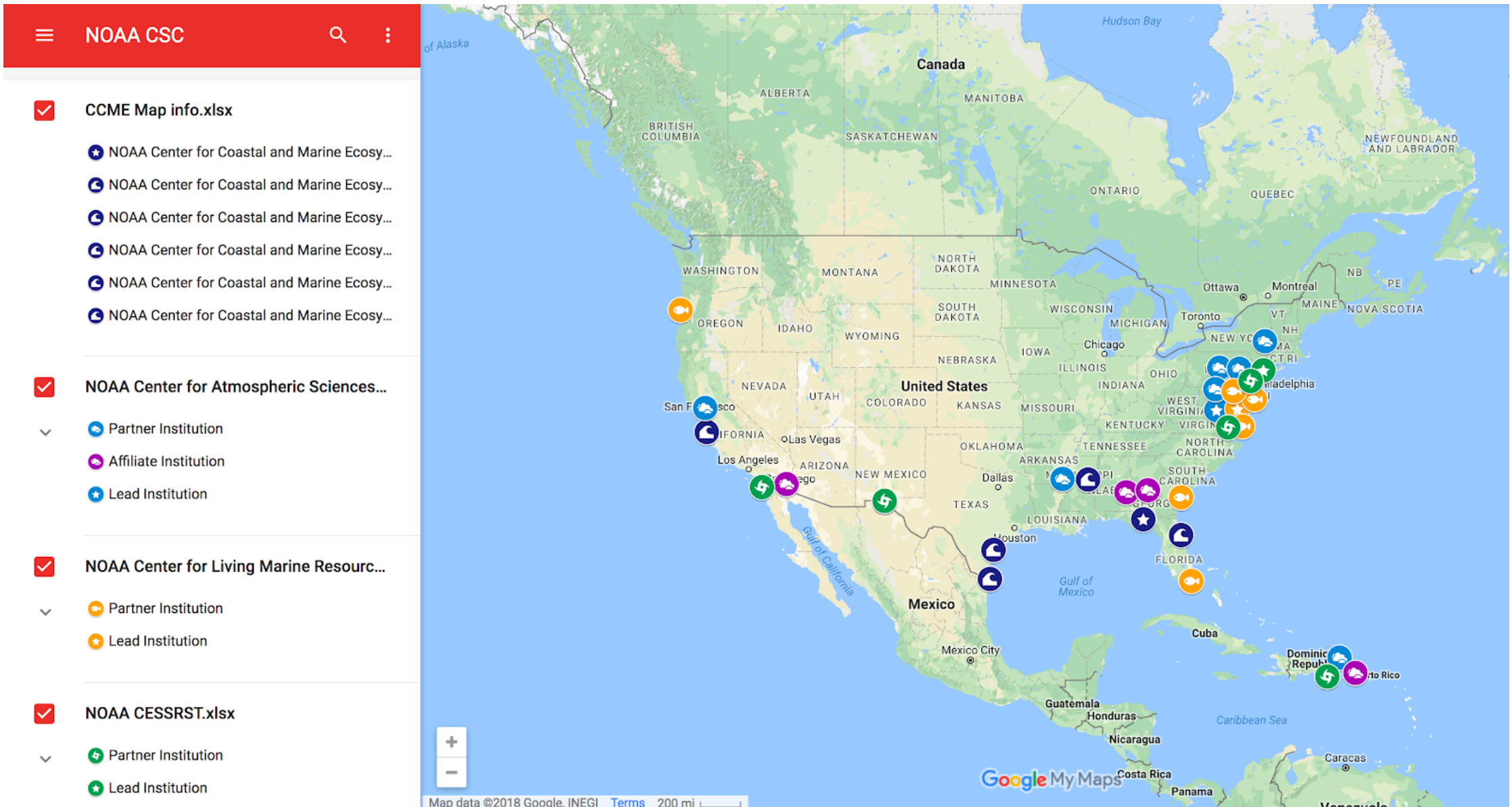


## **National Oceanic and Atmospheric Administration- Center for Earth System Sciences and Remote Sensing Technologies (CREST)**

- **Inter-disciplinary science & engineering in alignment with NOAA Science mission**
- **Education & Diverse Workforce Development in alignment with NOAA Education Mission**

# NOAA-CREST History

- **In existence** since 2001 through major funding by NOAA Educational Partnership Program (EPP)
- **Overarching Goals** – conduct **research** in NOAA related science in collaboration with NOAA and many others....
- **Education** - **recruit, train, educate and graduate** students especially from underrepresented communities in NOAA related sciences, and **public outreach** to help increase environmental literacy and help increase STEM workforce
- **17+ years of capacity building – Science, Training and Infrastructure**



Source: NOAA CCME (Pitter, S., May, 2017)

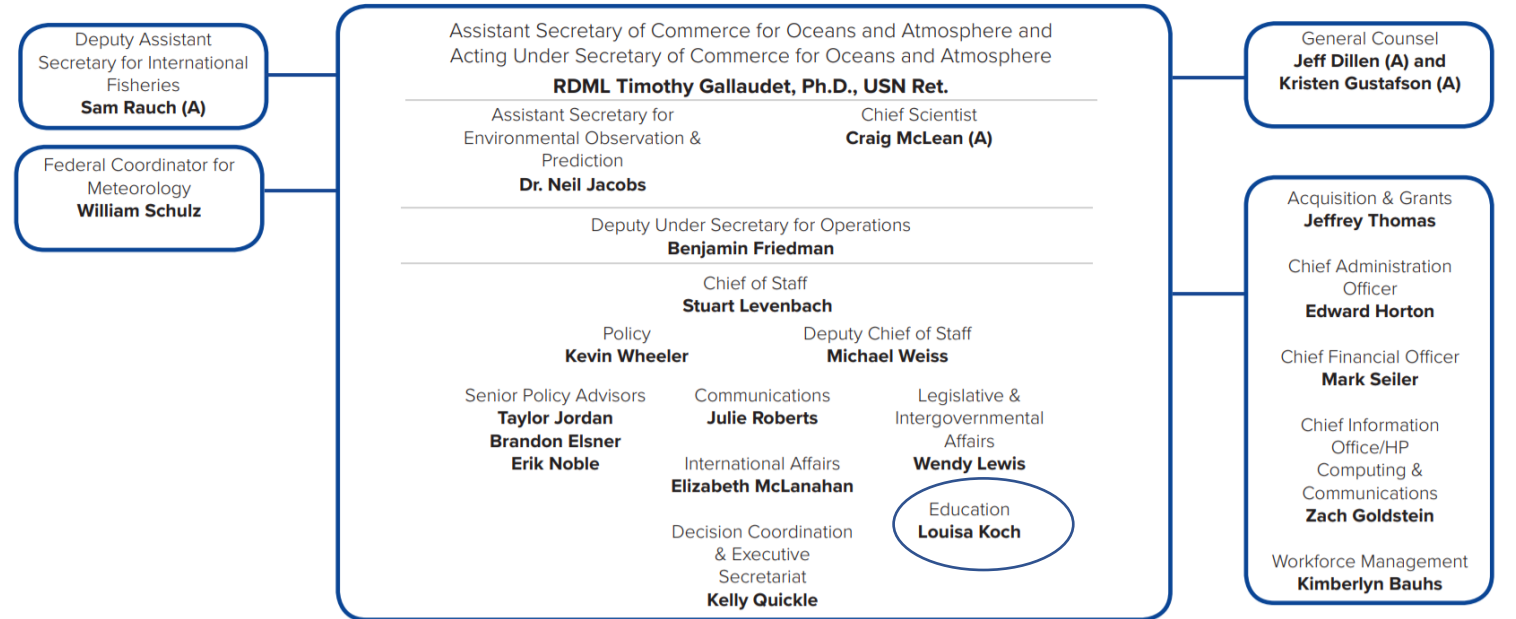
<https://drive.google.com/open?id=1wnnGuwrhrkqkkyRAXed8Z33o-Xk&usp=sharing>



# NOAA HEADQUARTERS ORGANIZATION

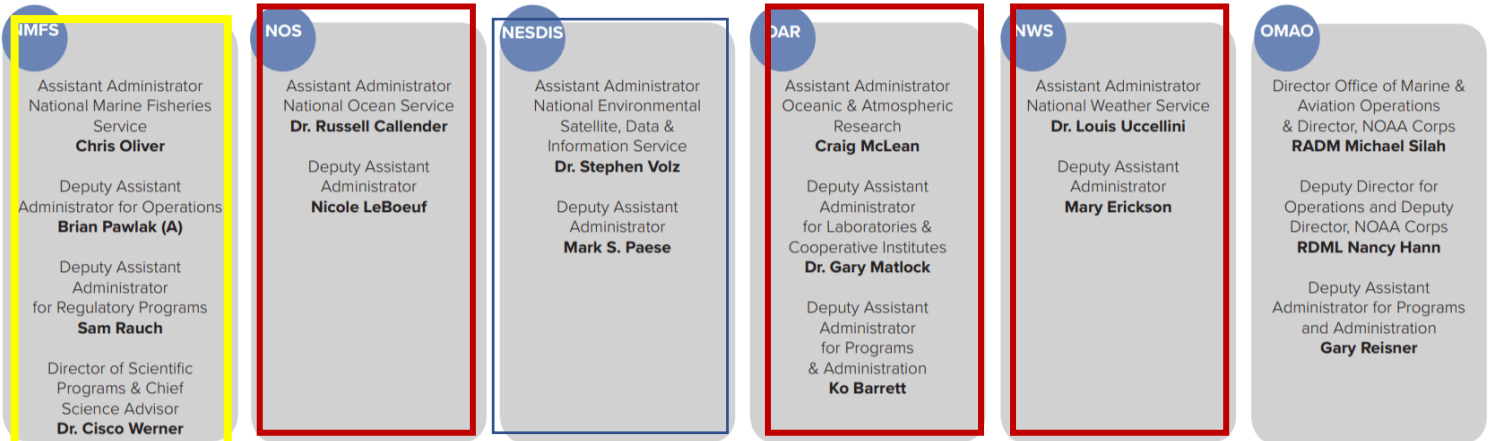


## CORPORATE FUNCTIONS



NOAA's role in science education is clearly defined in the America COMPETES Act. NOAA Education Strategic Plan focuses on the **Diverse Workforce Development**

## LINE OFFICES



# NOAA CREST AT-A-GLANCE (2011-2018)

CREST Lead Institution - The City College of NY

Partner Institutions:  
Hampton University, VA  
University of Maryland, Baltimore County, MD  
University of Puerto Rico, Mayaguez, PR  
California State University of Los Angeles, CA



## By The Numbers

**550** students impacted/trained  
(**307** - Funded || **243** Leveraged)  
**307** of 550 enrolled during 2011-2018  
(184=Funded || **123** Leveraged)  
**282** of 307 graduated during 2011-2018  
(**164** =Funded || **118**=Leveraged)

### Science Mission:

Conduct & train  
students in NOAA  
mission  
STEM Fields

## By Diversity

**Education Mission:** **419** of 550 URM students impacted (76%)  
To create diverse and skilled workforce for NOAA and other sectors  
**221** of 307 enrolled URM students (72%)  
**131** (funded) and **90** (Leveraged)  
**197** of 307 URM graduates (64%)

## By Gender

**119** of 307 Funded (39%) **188** of 307 Funded (61%)  
**75** of 243 leveraged (31%) **166** of 243 leveraged (68%)

### Research Themes

Climate  
Weather & Atmosphere  
Water Resources & Land  
Surface Processes  
Ocean & Coastal Waters

### NOAA Collaborators

NESDIS (primary)  
Other: NWS, OAR, NOS

### Private Sector Partners

IMSG, Inc.  
ERT Inc.  
Northrop Grumman  
Raytheon  
SSAI Inc.

### Leveraged Funds

\$11.23M Research &  
Education grants

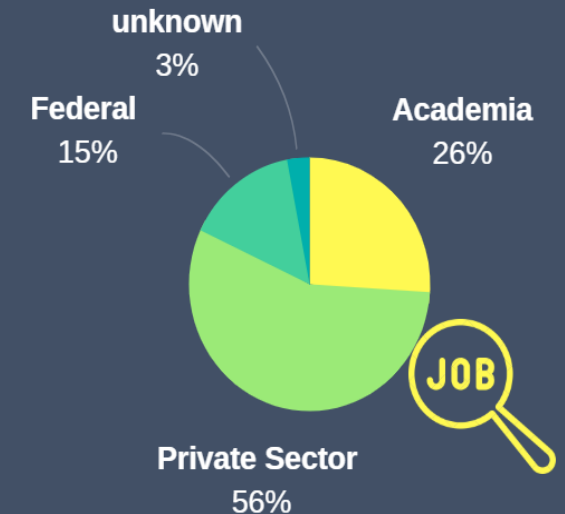
### A Multidisciplinary Program

Engineering (64%)  
Physical Sciences (12%)  
Geo-sciences (5%)  
Life Sciences (3.5%)  
Math and Applied Math (2.5%)  
Other (12%)



282 Degrees Awarded (2011-2018)

**151 out of 268** peer reviewed journals  
published by CREST students



NOAA CREST 2011-2016 was funded by NOAA Educational Partnership Program Grant # NA11SEC4810004 and supported by NOAA NESDIS



# CREST 2016-2021 Research Themes

## Coastal Resilience



Photo Credit: Mike Shanahan, TNC

## Atmospheric Hazards



Hurricane Harvey at Peak Intensity  
Photo Credit: NOAA

## Water Prediction & Ecosystem Services



Photo Credit: NOAA

# Coastal Resilience

**CREST Ocean Observatories in Critical Coastal Regions**

**Quantifying Coastal Erosion in the Arctic, and Assessing Impacts on Vulnerable Coastal Ecosystems and Communities**

**Development of Coastal Water Quality Indicators**

**Development of In-situ and Satellite-based Environmental Datasets for Assessing Resilience to Disturbance in Tropical Coral Reefs**

**Improved monitoring of Harmful Algal Blooms (HABs) and their Impacts in Coastal Eutrophic Systems**



**National Ocean Services**

**NESDIS**

**NEDIS/Coral Reef Watch Team**



# Atmospheric Hazards

**Severe Storm Prediction**

**Heat Stress and Urban Modeling**

**Satellite Validation and Analysis**

**The CREST Earth System Observing  
Network (CESON) and Applications**



**NESDIS**

**OAR/ESRL/CSD/GSD**

**NWS**

# Water Prediction and Ecosystem Services

**Drought Risk Assessment Using Demand Data and Remote Sensing Products**

**Flood Risk Assessment Using In-situ Data and Remote Sensing Data Products**

**Assessment and Improvement of National Water Model Development and Validation of the Snow Data Product**

**Monitoring Land-Atmosphere-Ocean Fluxes**

**Development of Sensors for Unmanned Aircraft Systems (UAS) platforms for Environmental Intelligence and Satellite Product Validation**



**NESDIS**

OAR/ESRL/**PSD**/GMD/GSD

**NWS**

# Social Science Integration – Center Wide

Identify Center's need and improve its understanding of how end-users and other stakeholders besides NOAA use the data and information that the Center produces.

Conduct Stakeholder's workshops – NY and PR region (as an e.g.)

Create a participatory listing and ranking of the (1) Ecosystem Services Changes, (2) Identify the key drivers of changes, and (3) how it aligns with NOAA's Mission of Science Service and Stewardship



Source: [Epa.gov](http://Epa.gov) – Tampa's Well-Being Project, 2016

**NOS**

**NESDIS**

**OAR** (ESRL – **PSD**, GMD, GSD and CSC)

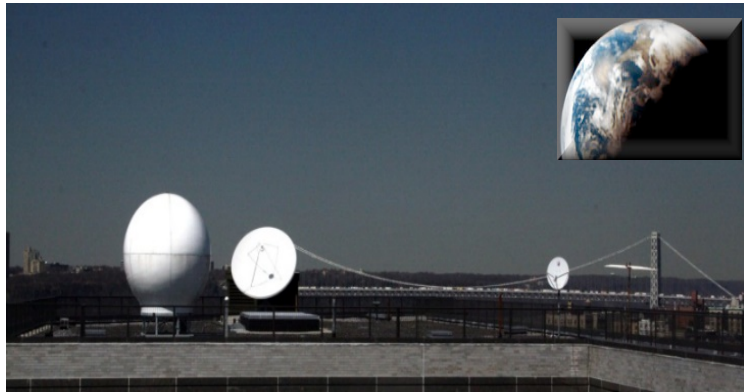
**NWS**

**NMFS**

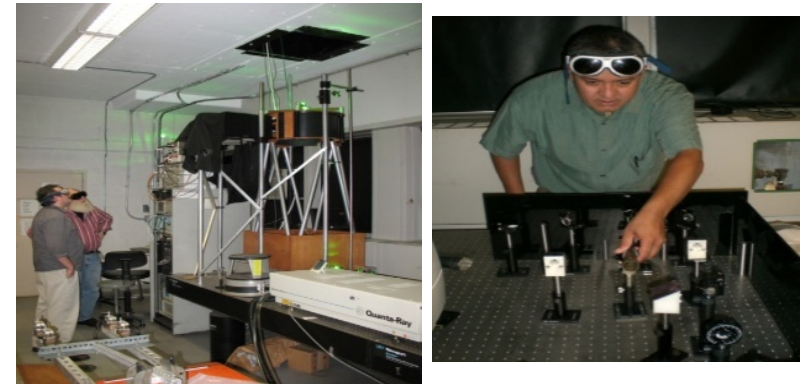


# NOAA CREST Facilities and Opportunities

Satellite Earth Observation System



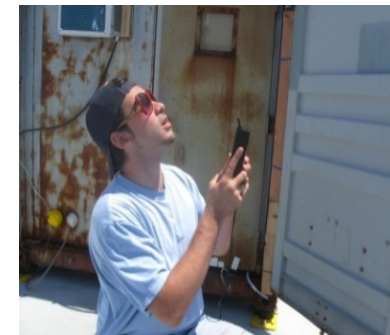
CREST LIDAR NETWORK



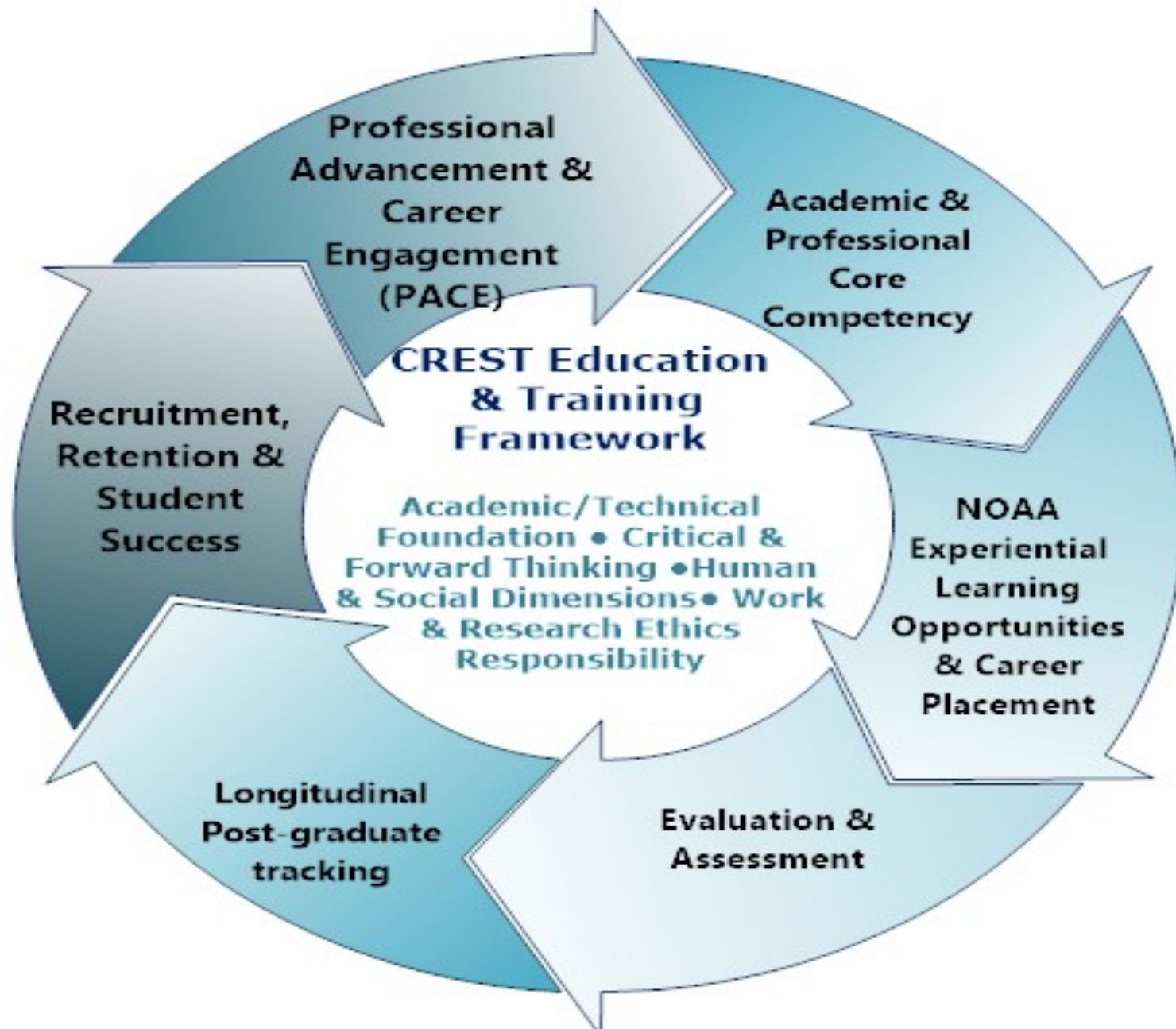
Field Campaigns - Water Sampling



AEROSE Expedition,  
on NOAA Ship – Ronald H. Brown







*Center-Wide Education and Training*

# The five Elements of Students Career Success Pathways

Individualized Student Development Plan (iSDP)

Professional Networking and Career Planning (Seminars, Workshops, brown bags; retreats)

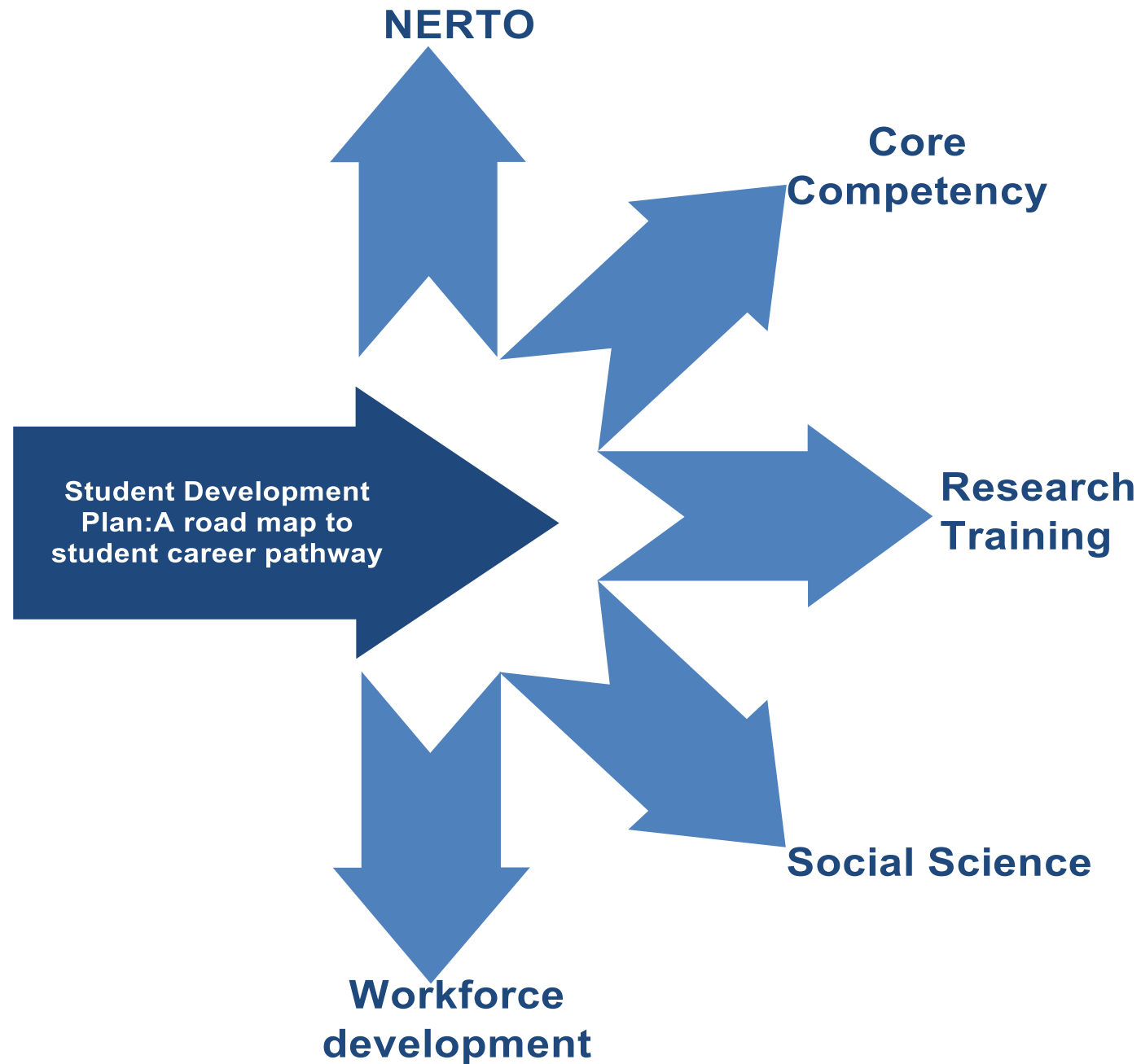
Peer-based mentoring; Community Engagement and Public Outreach; Social Science Integration

**Professional  
Advancement &  
Career  
Engagement  
(PACE)**

Research Training and Publications (Ethical Conduct of Research training; Soft Skills Development – Verbal/written Communications)

Summer-Bridge Undergraduate Research Experience (SURE) to prepare potential NOAA undergraduate scholarship applicants

***Professional Advancement and Career Engagement (PACE)***



13 Students completing NERTO



53 Students will receive CWCC training prior to graduation



53 students (cohort I and II) continues to receive research mentoring and training



31 graduates (18 MS and 13 PhD) getting Social Science mentoring



7 Students will graduate by end of summer



3 Students received job offers

# Student Scholarship Internship Opportunity (SSIO) – NOAA Experiential Research and Training Opportunity (NERTO)

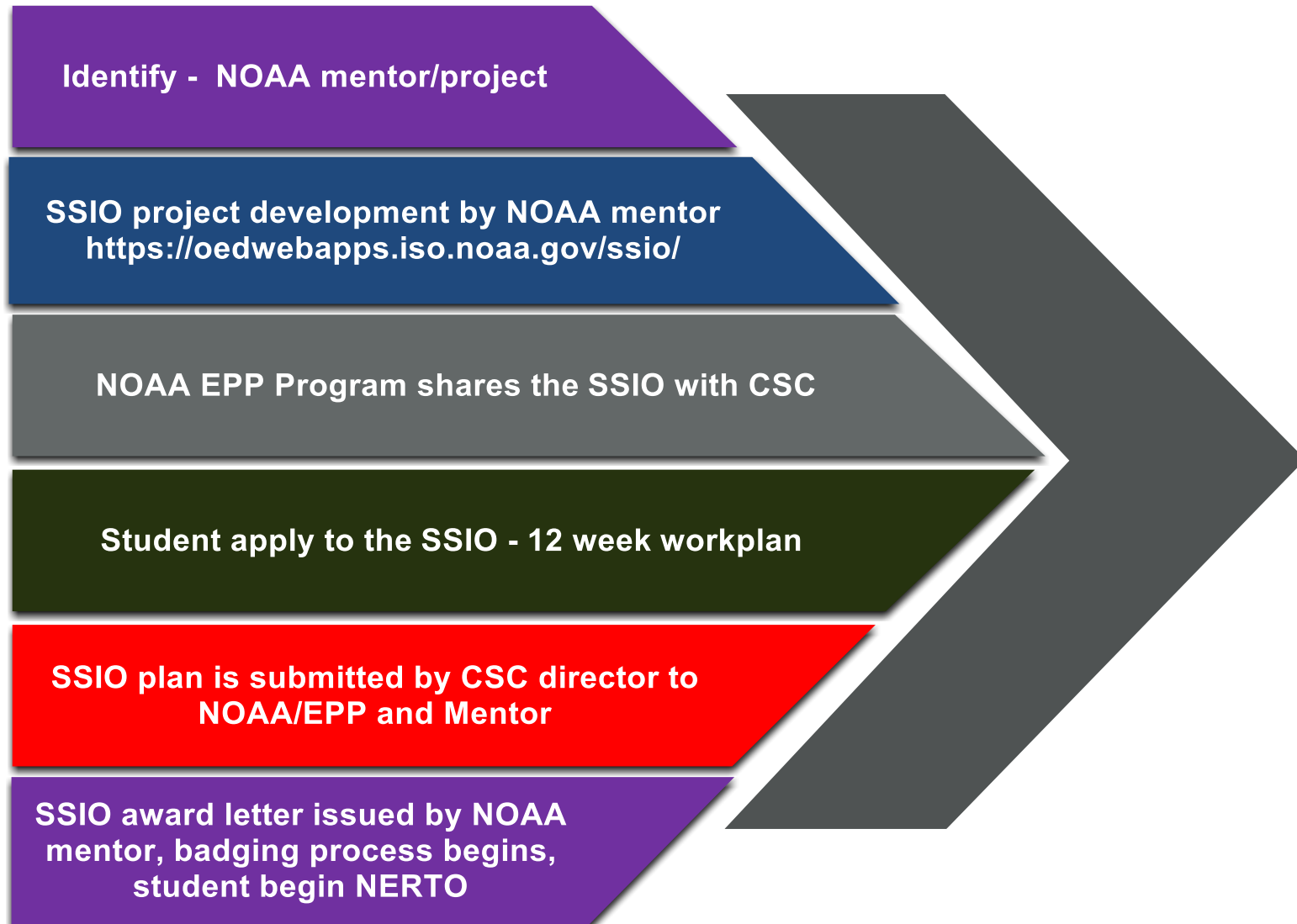


- **NERTO provides value to Students, the Cooperative Science Centers and to NOAA**
- **CSC students participate in 12-week meaningful NOAA mission-aligned STEM, policy, natural resource management, and social science research and training at various NOAA facilities**
- **CSC supported students earn NOAA mission-aligned postsecondary degrees**



# NERTO: Standard Operating Process

# NERTO: 2018 updates



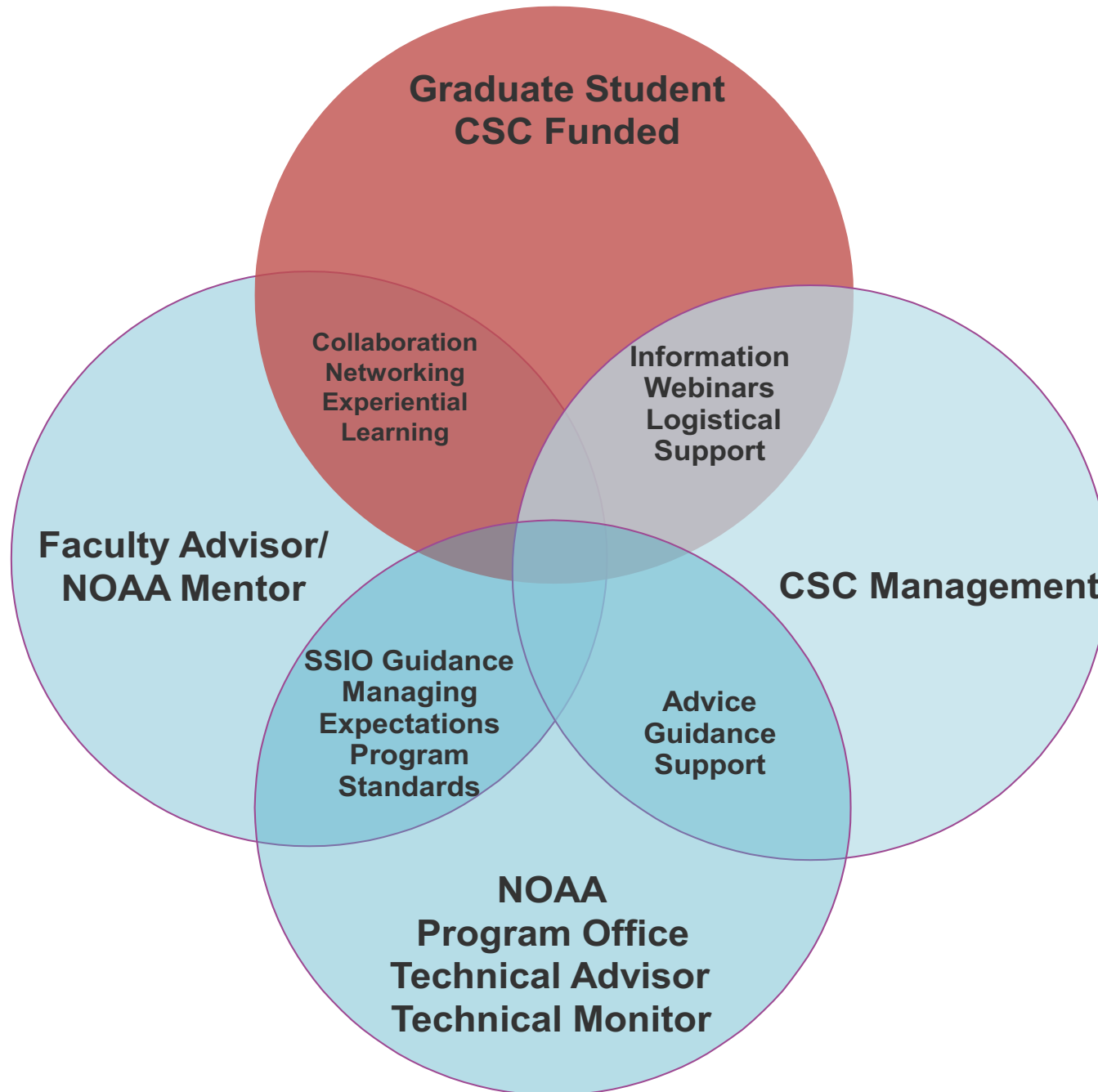
**NERTO**  
provides value to Students, the Cooperative Science Centers and to NOAA

**NERTO**  
13 graduate students doing NERTO (summer 2018)

**NERTO**  
two graduate student successfully completed

13 NOAA mentors  
9 NOAA locations

# NERTO: A Collaborative and Holistic Approach

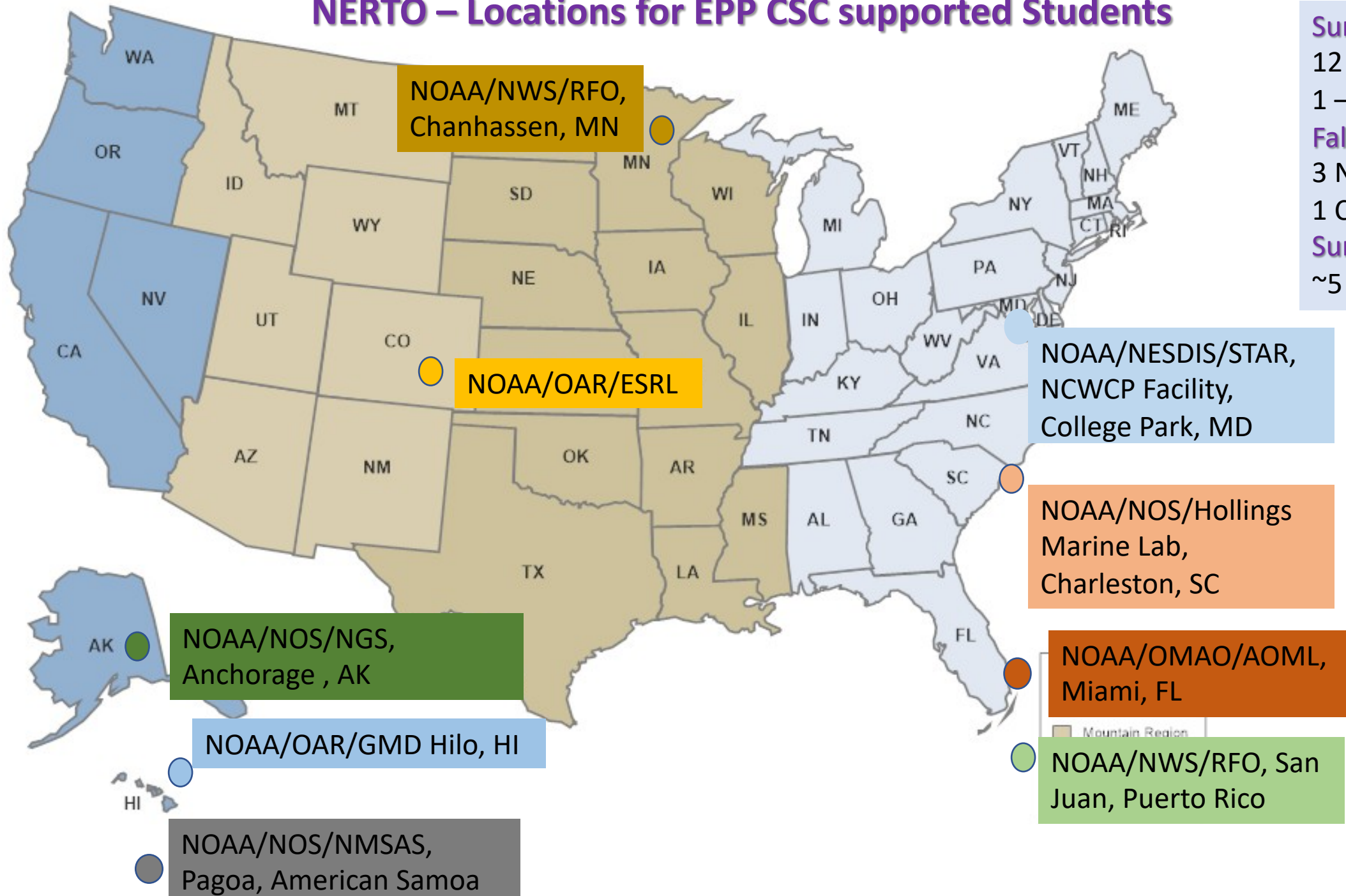


# Center for Earth System Sciences and Remote Sensing Technologies

## Strategic Approach to Successful NERTO Planning and Execution

- **Proactive Approach** planning ahead of time – to manage scope and expectations of NERTO opportunities each year (recruitment plan and developing student project)
- Online Student **E-portfolio System** (center wide)
- Student creates an **Individualized Student Development Plan (ISDP)** within 90 days of their recruitment in the program
- **Regular monitoring/interaction** by the CSC education team and the Center leadership team
- Identifying and defining the **NERTO plan** (communication and coordination between Graduate Students, NOAA mentors, CSC Advisors with guidance and support from NOAA Technical Monitor and NOAA Program Office)

# NERTO – Locations for EPP CSC supported Students



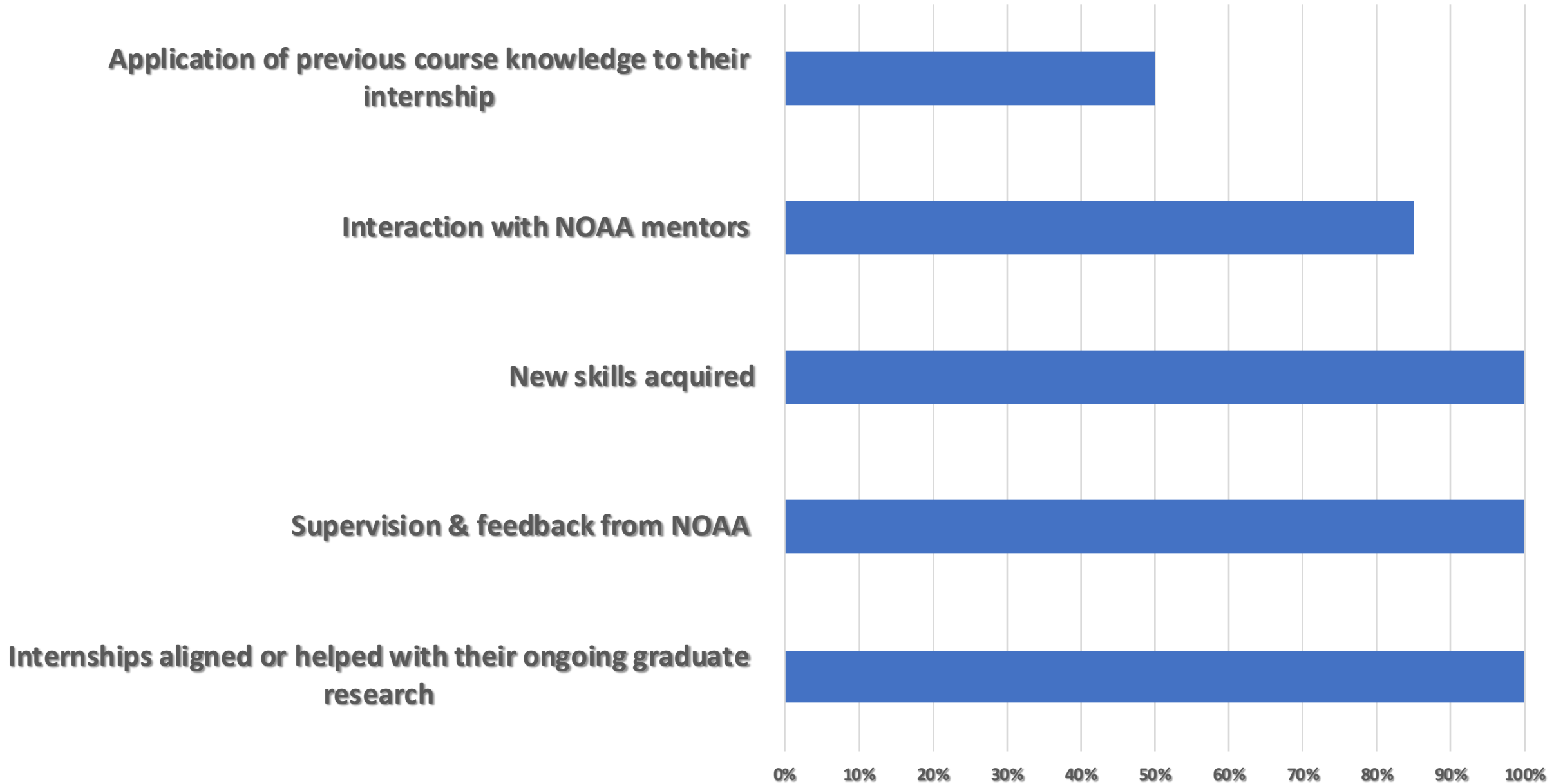
**Summer 2018:**  
12 NERTO cohort I  
1 – cohort II

**Fall 2018:**  
3 NERTO cohort I  
1 Cohort II

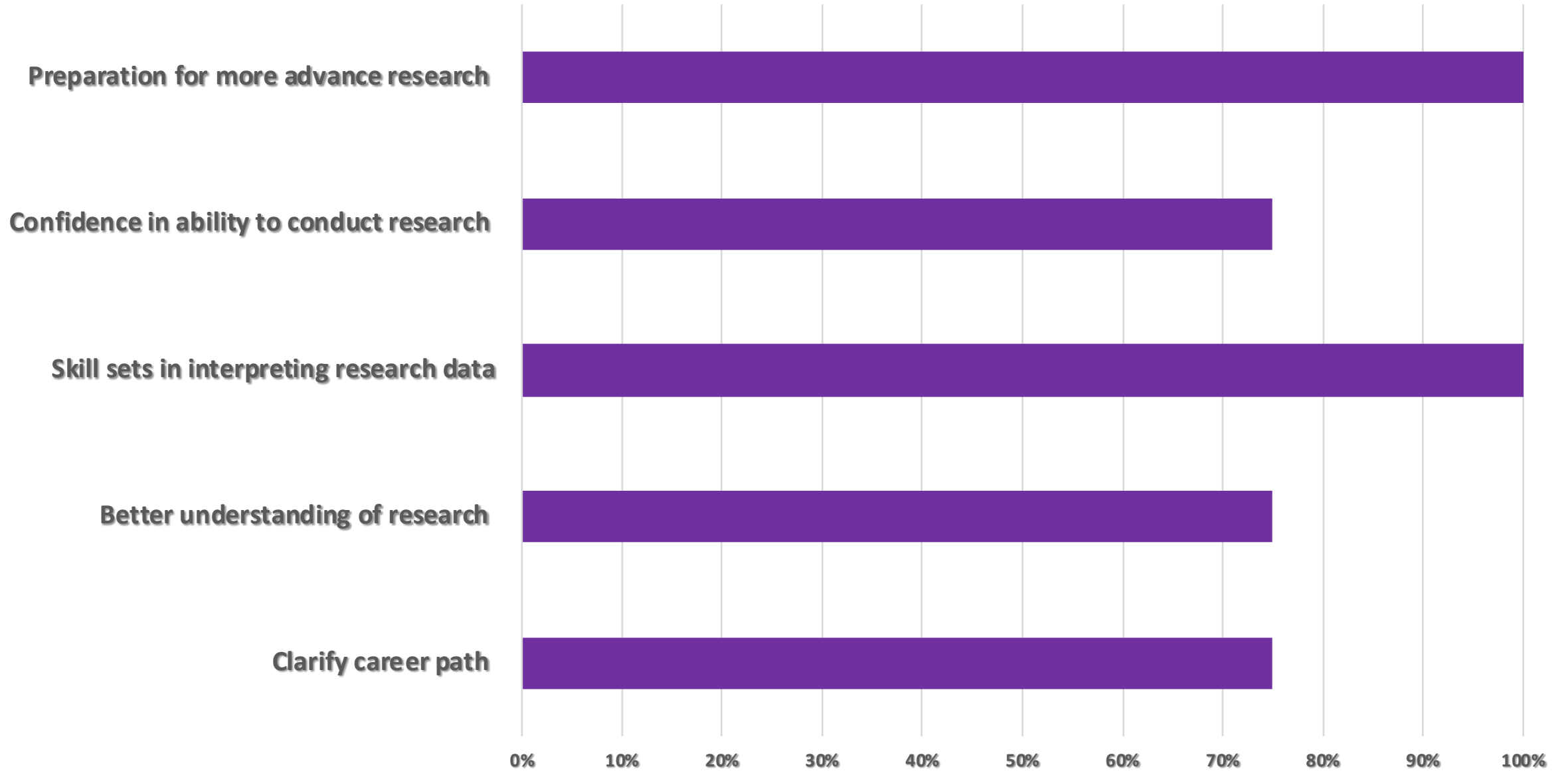
**Summer 2019:**  
~5 (cohort II)



## Students Satisfaction with their internship experience



## Benefits of participating in a NOAA internship



# Benefits and Outcome of the NOAA Internships – NERTO (Qualitative Assessment)

- **NOAA Know-how:** Students have a better understanding of NOAA mission sciences.
- **Shift in the Paradigm:** Focus on NOAA Mission Aligned Sciences
- **User- Inspired Research:** Social Science & Science nexus, Operational Research
- Enhanced NOAA Collaboration and Engagement
- Enhanced Opportunities to join NOAA Enterprise Workforce for CSC graduates through postdoctoral and/or NOAA and other federal contractual jobs.
- Increased Professional Networks across the nation.



# Early NOAA Engagement

- NOAA Emerging Technologies for Observations Workshop, August 22-23, 2017 **(Use of UAS and Drones for Earth System Observations)**
- National Water Center, Tuscaloosa, AL – October 27, 2017
- Collaborative engagement during R2O workshop organized by OAR/OWAQ Office (John Cortinas) – November 2, 2017 **(Collaboration on Integration of Soil Moisture and Snow Water Equivalent Data Product into the National Water Model)**
- National Weather Service/Regional Forecast Office, San Juan, PR, February 27, 2018 **(Collaboration on Surface Wave Heights and Coastal Inundation and Flood Forecasting in PR Island)**
- NOAA/OAR/ESRL/Physical Science Division, March 2018 (met during 9<sup>th</sup> NOAA EPP forum) and follow-up group conference call on April 24, 2018. **(Collaborations on National Water Model, Integrated Soil Moisture Network, Drought Index/outlook, and Food Security and Hydrologic Extremes)**
- NOAA/NMFS/SWFC, Santa Cruz (conference call April 24, 2018) **(Collaboration on impact of climate/water extremes on fish productivity)**

# Outcome (wish list!!)

- Research Collaborations
  - *Science*
  - *Social Science*
- Joint Proposals
- Seminar Series
- Workshops/Seminars/Conference presentations (AMS/AGU)
- NERTO opportunities
- Join Post-doc opportunities