

NOAA R&D

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**HOW MANY FISH
ARE IN THE SEA?**



A dramatic sunset or sunrise over the ocean. The sky is filled with dark, heavy clouds, and a bright light source (the sun) is breaking through near the horizon, creating a strong glow and illuminating the clouds from below. A single bird is seen in flight, silhouetted against the bright light. The ocean surface is dark and textured with small waves.

**HOW MANY FISH
ARE IN THE SEA?**

**WHAT WILL THE WEATHER
BE TOMORROW?**

A dramatic sunset or sunrise over the ocean. The sky is filled with dark, heavy clouds, and a bright light source, likely the sun, is breaking through near the horizon, creating a strong glow and illuminating the clouds from below. The water in the foreground is dark and textured with small waves. A seagull is captured in flight, its wings spread, flying from the upper left towards the center of the frame.

**HOW MANY FISH
ARE IN THE SEA?**

**WHAT WILL THE WEATHER
BE TOMORROW?**

IN 10 YEARS FROM NOW? 100?

A dramatic sunset or sunrise over the ocean. The sky is filled with dark, heavy clouds, and a bright light source, likely the sun, is breaking through near the horizon, creating a strong glow and illuminating the clouds from below. A seagull is captured in flight, its wings spread, against the bright sky. The ocean surface is dark and textured, reflecting the light from the sky.

**HOW MANY FISH
ARE IN THE SEA?**

**WHAT WILL THE WEATHER
BE TOMORROW?**

IN 10 YEARS FROM NOW? 100?

**ARE WE MANAGING
OUR COASTS WISELY?**

NOAA'S STRATEGIC GOALS

Healthy Ecosystems, communities, and economies that are resilient in the face of change.



OCEANS

Marine Fisheries, habitats and biodiversity sustained within Healthy and productive ecosystems



WEATHER

Society is prepared for and responds to weather-related events



COASTS

Coastal and Great Lakes communities that are environmentally and economically sustainable



CLIMATE

An informed society anticipating and responding to climate and its impacts

Who conducts Research within NOAA?



National Marine Fisheries Service



National Ocean Service



National Environmental Satellite, Data & Information Service

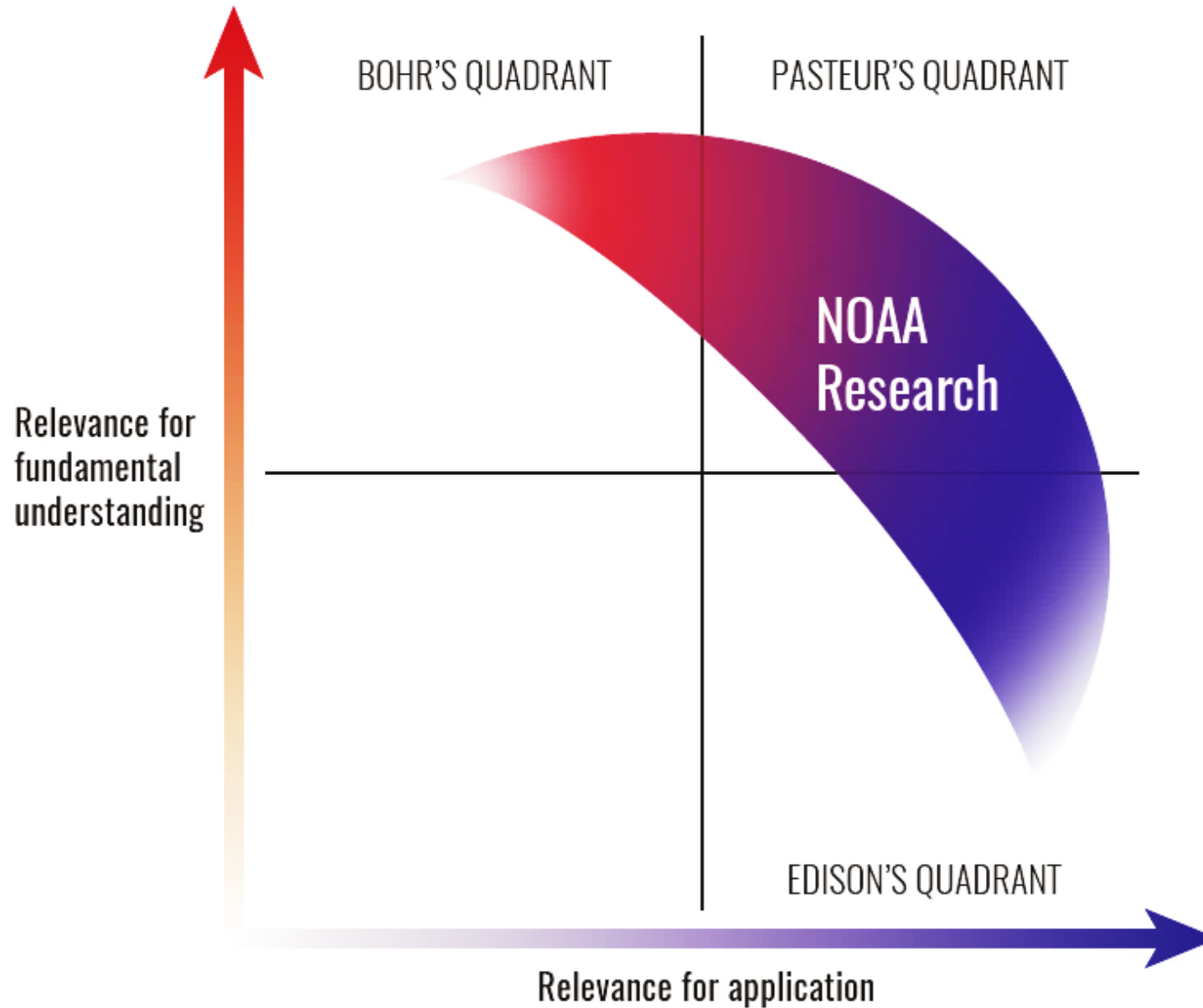


National Weather Service



Oceanic & Atmospheric Research

What Kind of Research?



Research Priorities



OAR Legislative Mandates

General

NOAA innovative and transformational research: Ocean and Atmospheric Research and Development, 33 U.S.C. §§ 893-893c; The America COMPETES Reauthorization Act of 2010, 42 U.S.C. § 1861 note

Cooperative Institutes: Agreements to Aid and Promote Scientific and Educational Activities, 15 U.S.C. § 1540

Weather Research

Weather research:

- **Weather Research and Forecasting Innovation Act of 2017**, 15 U.S.C. § 8501
- **Weather Service Modernization Act**, Title VII, 15 U.S.C. § 313 note, §§ 701-709
- **National Oceanic and Atmospheric Administration Authorization Act of 1992**, Title I, § 108, 15 U.S.C. § 313 note

Water prediction research activities: Inland Flood Forecasting and Warning System Act of 2002, Pub. L. 107-253, 15 U.S.C. § 313c

Tsunami research: Tsunami Warning, Education, and Research Act of 2017, Title V, 33 U.S.C. § 3201 note

Air chemistry and air quality research: Clean Air Act, 42 U.S.C. §§ 7401-7431

High Performance Computing

High-Performance computing for applied research in weather prediction, ocean sciences, and computational fluid dynamics: High-Performance Computing Act of 1991, 15 U.S.C. §§ 5501-5528

Ocean and Coastal Research

National Sea Grant College Program: National Sea Grant College Program Act, 33 U.S.C. §§ 1121-1131 & National Sea Grant College Program Act Amendments of 2008, 33 U.S.C. § 1121 note.

Aquaculture competition: National Aquaculture Act of 1980, 16 U.S.C. §§ 2801-2810

Ocean Exploration and Research Program: Ocean Exploration, 33 U.S.C. §§ 3401

- **Titanic site activities:** R.M.S Titanic Maritime Memorial Act of 1986, 16 U.S.C. §§ 450rr-450rr-6
- **Exploration and mapping of sanctuaries:** National Marine Sanctuaries Act, 16 U.S.C. § 1431-1445c-1
- **Exploration and mapping of areas of commercial recovery:** Deep Seabed Hard Mineral Resources Act, 30 U.S.C. §§ 1401-1473
- **Mapping activities:** Ocean and Coastal Mapping Integration Act, 3501-3507

Ocean Acidification Program: Federal Ocean Acidification Research and Monitoring Act of 2009, 33 U.S.C. §§ 3701-3708

Ocean observations: Integrated Coastal and Ocean Observation System Act of 2009, 33 U.S.C. §§ 3601-3611

Great Lakes Environmental Research Laboratory: Federal Water Pollution Control Act, 33 U.S.C. §§ 1251-1387

Harmful Algal Bloom and Hypoxia Research: Harmful Algal Bloom and Hypoxia Research and Control Amendments Act of 2014, 16 U.S.C. § 1451 note)

Coral research activities: Magnuson-Stevens Fishery Conservation and Management Act, as amended, 16 U.S.C. §§ 1801-1891d & Reef Conservation Act of 2000, 16 U.S.C. §§ 6401-6409

Climate Research

Climate research:

- **General: National Climate Program Act**, 15 U.S.C. §§ 2901-2908
- **Climate Program Office and general: Global Change Research Act** of 1990, 15 U.S.C. §§ 2921-2961

International climate research:

International Cooperation in Global Change Research Act of 1990, 15 U.S.C. §§ 2951-2953

Drought research and information: National Integrated Drought Information System Act of 2006, 15 U.S.C. § 313d

Arctic research: Arctic Research and Policy Act of 1984, as amended, 15 U.S.C. §§ 4101-4111



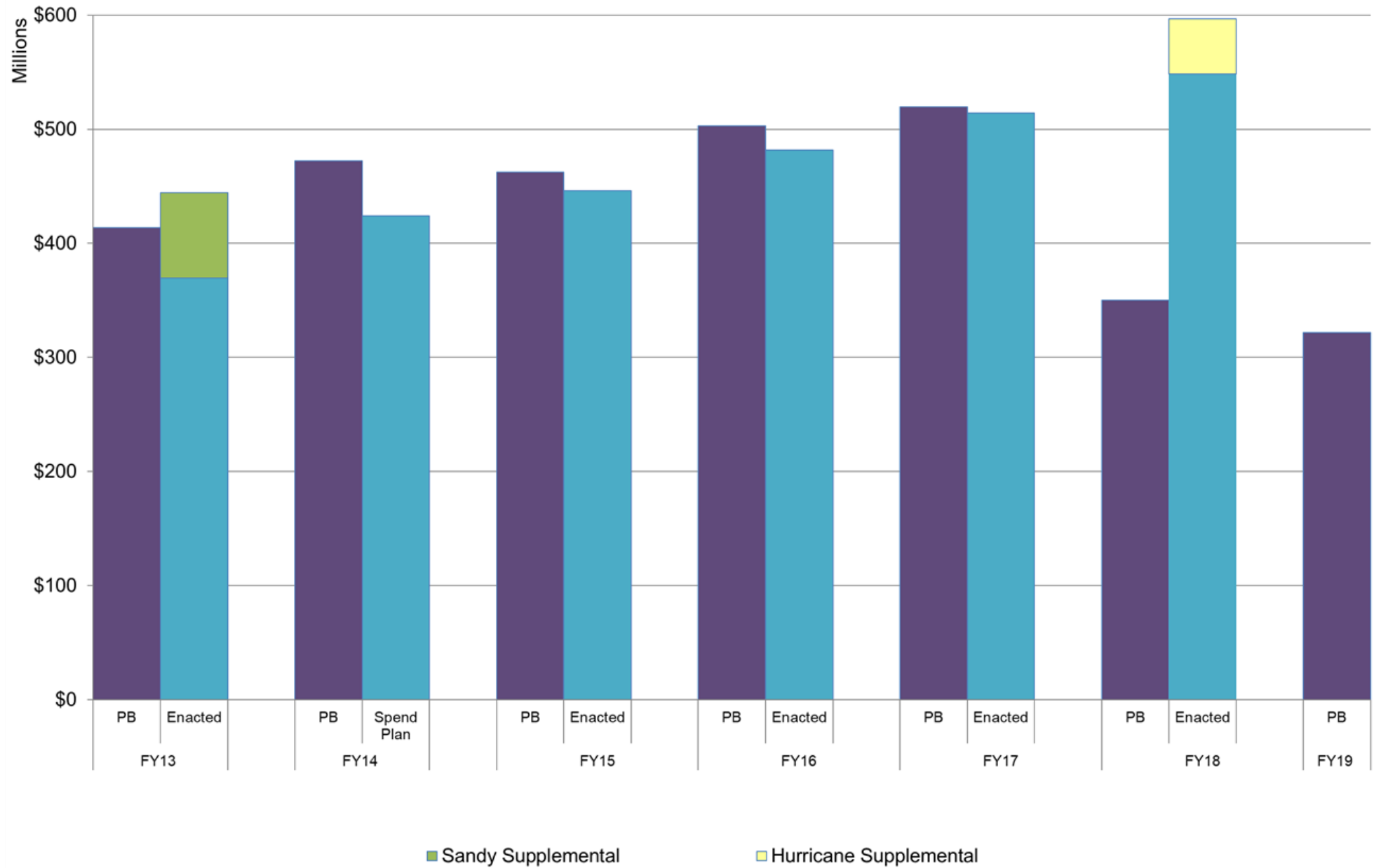
NOAA Legislative Mandates

America Competes Act, 33 U.S.C. §§ 893, 893a, 893b
Atlantic Coastal Fisheries Cooperative Management Act, (1993) 16 U.S.C. " 5101 – 5108; DOO-10-15 Section 3.01(nn)
Atlantic Tunas Convention Act, 16 U.S.C. §§ 971 et seq
Clean Air Act (42 U.S.C. § 7401)
Clean Water Act. 33 U.S.C. ' 1311
Consumer Option for an Alternative System To Allocate Losses Act of 2011 or COASTAL Act of 2011
Coast and Geodetic Survey Act, 33 U.S.C. §§ 883a et seq.
Coastal Wetlands Planning, Protection, and Restoration Act, 16 U.S.C. " 3951-3956; DOO-10-15 Section 3.01(dd)
Coastal Zone Management Act
Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), 42 U.S.C. ' 9601 et seq.
Coral Reef Conservation Act, 16 U.S.C. 6401
Data Quality Act (a.k.a. Information Quality Act)
Endangered Species Act
Establishment of Great Lakes Research Office, 33 U.S.C. § 1268
Estuary Restoration Act of 2000, 33 U.S.C. " 2901-2909
Federal Insecticide, Fungicide, and Rodenticide Act, 7 U.S.C. ' 136 et seq
Federal Ocean Acidification Research and Monitoring Act of 2009, 33 U.S.C. §§ 3701 – 3708
Fish and Wildlife Coordination Act, (1934) 16 U.S.C. '661-666c; Pub. L. No. 85-624
Geophysical Sciences Authorities, 33 U.S.C. §§ 883d, 883e
Global Change Research Act, 15 U.S.C. §§ 2921 et seq
Harmful Algal Bloom and Hypoxia Research and Control Act of 1998, , 33 U.S.C. § 145
High-Performance Computing and Communication Act of 1991
Integrated Coastal and Ocean Observation System (ICOOS) Act of 2009, 33 U.S.C. §3601-3610

Magnuson-Stevens Fishery Conservation & Management Act (MSA), 16 U.S.C. §§ 1801 et seq.
Marine Debris Research, Prevention, and Reduction Act, 33 U.S.C. 1951 note; Pub. L. No. 109-449
Meteorological Services to Support Aviation Authority, 49 U.S.C. § 44720
Migratory Bird Conservation Act, 126 U.S.C. 715 et seq.
National Aquaculture Act, 16 U.S.C. ' 2801-2810; DOO-10-15 Section 3.01(jj)
National Coastal Monitoring Act (Title V of 33 USC 2801-2805)
National Marine Sanctuaries Act. 16 U.S.C. ' 1433
National Sea Grant College Program Act, 33 U.S.C. §§ 1121-1131
Nonindigenous Aquatic Nuisance Prevention and Control Act of 1990 and National Invasive Species Act of 1996, 16 U.S.C. " 4701- 4751; DOO-10-15 Section 3.03f
NOAA Undersea Research Program Act of 2009, 33 U.S.C. §§ 3421-3426
Ocean Exploration Program Act, 33 U.S.C. §§ 3401-3406
Ocean Dumping Act (Titles I and II of the Marine Protection, Research and Sanctuaries Act), 33 U.S.C. " 1401-1445
Oil Pollution Act (OPA), 33 U.S.C. §§ 2701 et seq.; see 33 U.S.C. §§ 2702(b)(2)(A)), 2706(d)(1)
Ocean Satellite Data USC Title 33, Chapter 17, Section 883j
Oceans and Human Health Act: 33 U.S.C. § 3101-3104
Outer Continental Shelf Lands Act, 43 U.S.C. " 1331-1356; DOO-10- 15 Section 3.01gg
Pacific Salmon Treaty Act of 1985, 16 U.S.C. " 3631-3644; Pub. L. No. 99-5; DOO-10-15 Section 3.01xx
Public Health and Welfare – Pollution Prevention and Control, 42 U.S.C. § 7412
Regional Marine Research Programs, 16 U.S.C. § 1447B
Space Weather Authority, 15 U.S.C. § 1532
Study of Migratory Game Fish; Waters Research 16 U.S.C. § 760e
Tsunami Warning and Education Act, 33 U.S.C. §§ 3201 et seq.
Water Pollution Prevention and Control Act
Weather Research and Forecasting Innovation Act of 2017
Water Resources Development Act of 2000 (WRDA 2000) 33 USC 2201
Weather Service Organic Act, 15 U.S.C. § 313



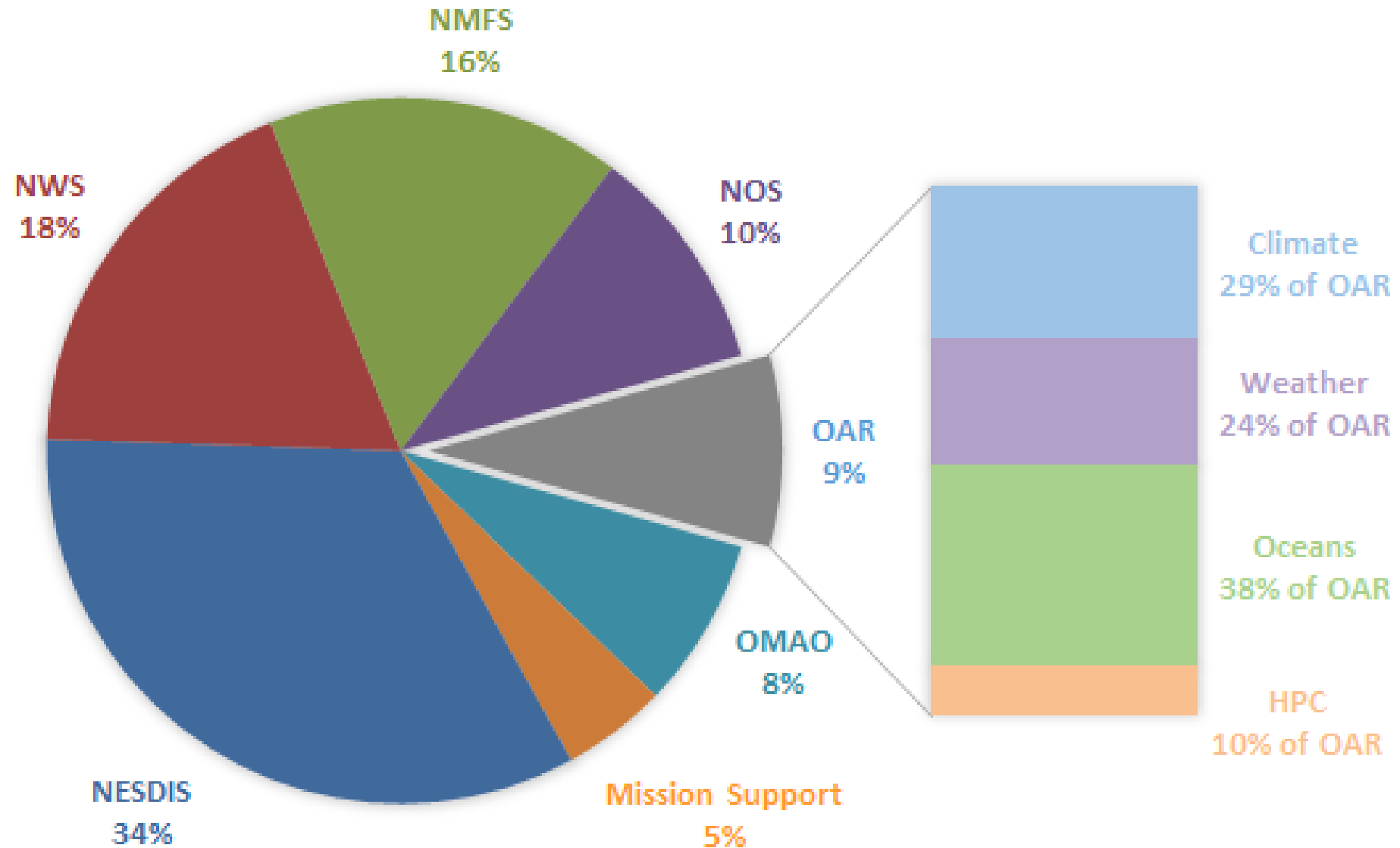
OAR Budget History



■ Sandy Supplemental

■ Hurricane Supplemental

OAR's Portion of NOAA's FY18 Budget



NOAA Priorities

Weather & Water

Blue Economy



Challenges and Opportunities



A photograph of a server room with rows of server racks on both sides of a central aisle. The racks are filled with electronic equipment, many of which have glowing green and blue indicator lights. The floor is a light-colored, reflective material. At the end of the aisle, there is a white door with a green exit sign above it. The overall lighting is dim, with the primary light sources being the server lights and the exit sign.

HPC

High Performance Computing

A satellite image of a hurricane over the ocean. The hurricane has a distinct eye and spiral cloud bands. To the left, a portion of a green landmass is visible. A semi-transparent grey rectangle is centered over the hurricane, containing the text "Weather & Climate" in white.

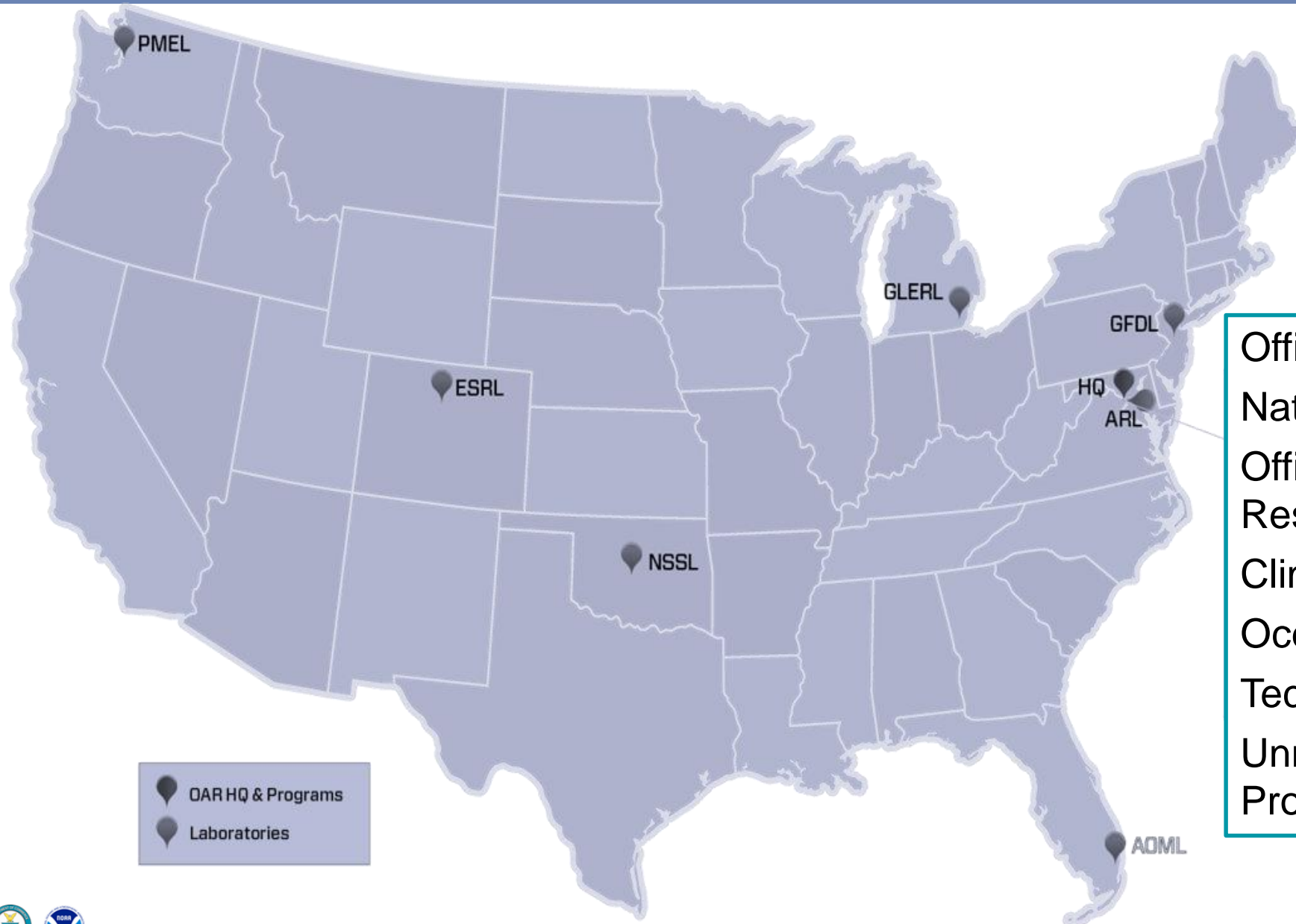
Weather & Climate



The image is a composite. The background is a wide shot of a coastal landscape with a large, layered rock formation in the distance under a clear sky. The foreground shows a calm sea with some seaweed. Overlaid on the right side is a smaller, semi-transparent image of two people in dark blue waders and brown rubber boots. They are standing on a rocky outcrop, leaning over a wooden frame and working with equipment, possibly for scientific research. The text 'Oceans & Coasts' is centered over the image in a white, bold, sans-serif font.

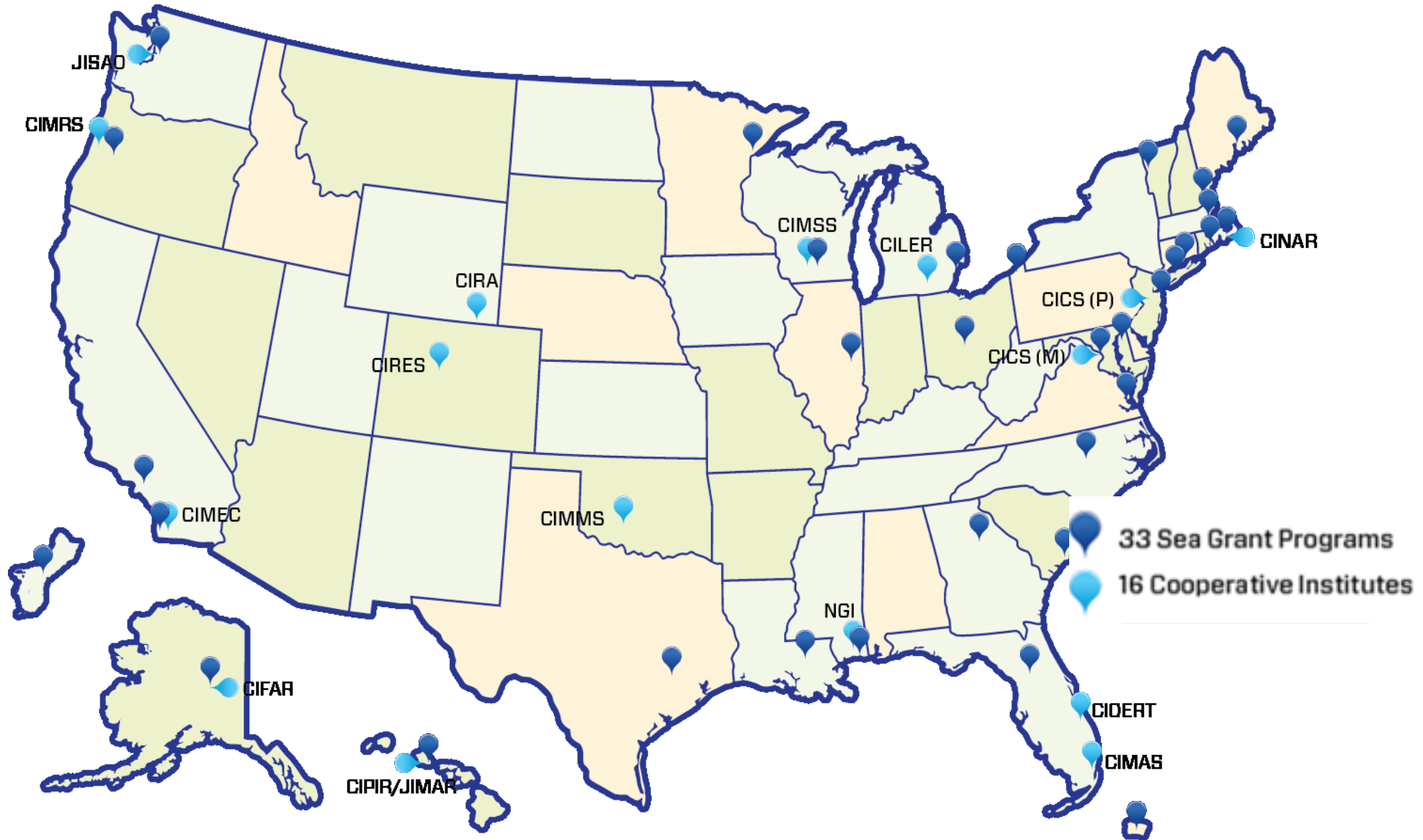
Oceans & Coasts

OAR Labs and Programs



Office of Weather & Air Quality
National Sea Grant Program
Office of Ocean Exploration & Research
Climate Program Office
Ocean Acidification Program
Technology Partnership Office
Unmanned Aircraft Systems Program

Integrating ACADEMIA into OAR is a key strategy



Universities with FY17 funding from OAR

Albany State University	Oak Ridge Associated Universities, Inc.	University of Alabama	University of North Carolina at Asheville
Arizona State University	Ohio State University	University of Alabama, Huntsville	University of North Carolina at Chapel Hill
Brown University	Old Dominion Research Foundation	University of Alaska Fairbanks	University of North Carolina at Wilmington
University of Nebraska	Oregon State University	University of Arizona	University of North Dakota
Carnegie Mellon University	Pennsylvania State University	University of California, Davis	University of Oklahoma
Colorado State University	Portland State University	University of California, Irvine	University of Puerto Rico Mayaguez
Cornell University	Harvard College	University of California, Los Angeles	University of Reading
Drexel University	Purdue University	University of California, Santa Barbara	University of Rhode Island
Duke University	University of Virginia	University of California, Santa Cruz	University of South Carolina
Florida Atlantic University	University of Colorado	University of Central Florida	University of South Florida
Florida International University	University of Michigan	University of Chicago	University of Southern California
Florida State University	University of Minnesota	University of Connecticut	University of Southern Mississippi
George Mason University	Regents of the University of California	University of Delaware	University of Tennessee
Georgia Tech Research Corporation	Research Foundation for the State	University of Florida	University of Texas at Arlington
Gulf of Maine Research Institute	University of New York	University of Georgia	University of Texas at Austin
Idaho State University	Research Foundation for the City	University of Guam	University of Toronto
Johns Hopkins University	University of New York	University of Hawaii Systems	University of Tokyo
Kent State University	Rutgers University	University of Illinois	University of Utah
Leland Stanford Junior University	Saint Louis University	University of Iowa	University of Vermont & State Agricultural College
Louisiana State University	South Carolina Sea Grant Consortium	University of Kansas Center for Research, Inc.	University of Washington
Massachusetts Institute of Technology	Southern Illinois University	University of Maine System	University of Wisconsin System
Michigan State University	Texas A & M University	University of Maryland	University System of New Hampshire
Minnesota State University, Mankato	Texas A&M University, Corpus Christi	University of Maryland Center for Environ. Science	Utah State University
Mississippi State University	Texas Tech University System	University of Maryland, Baltimore County	Villanova University
Nevada System of Higher Education	University of California, San Diego	University of Massachusetts	Virginia Institute of Marine Science
New Jersey Sea Grant Consortium	Princeton University	University of Miami	Western Kentucky University Research Foundation
North Carolina State University	Boston University	University of Mississippi	Woods Hole Oceanographic Institution
Northeastern University	Clark University	University of Montana	
Northern Illinois University	Columbia University		



Forecasting Maria

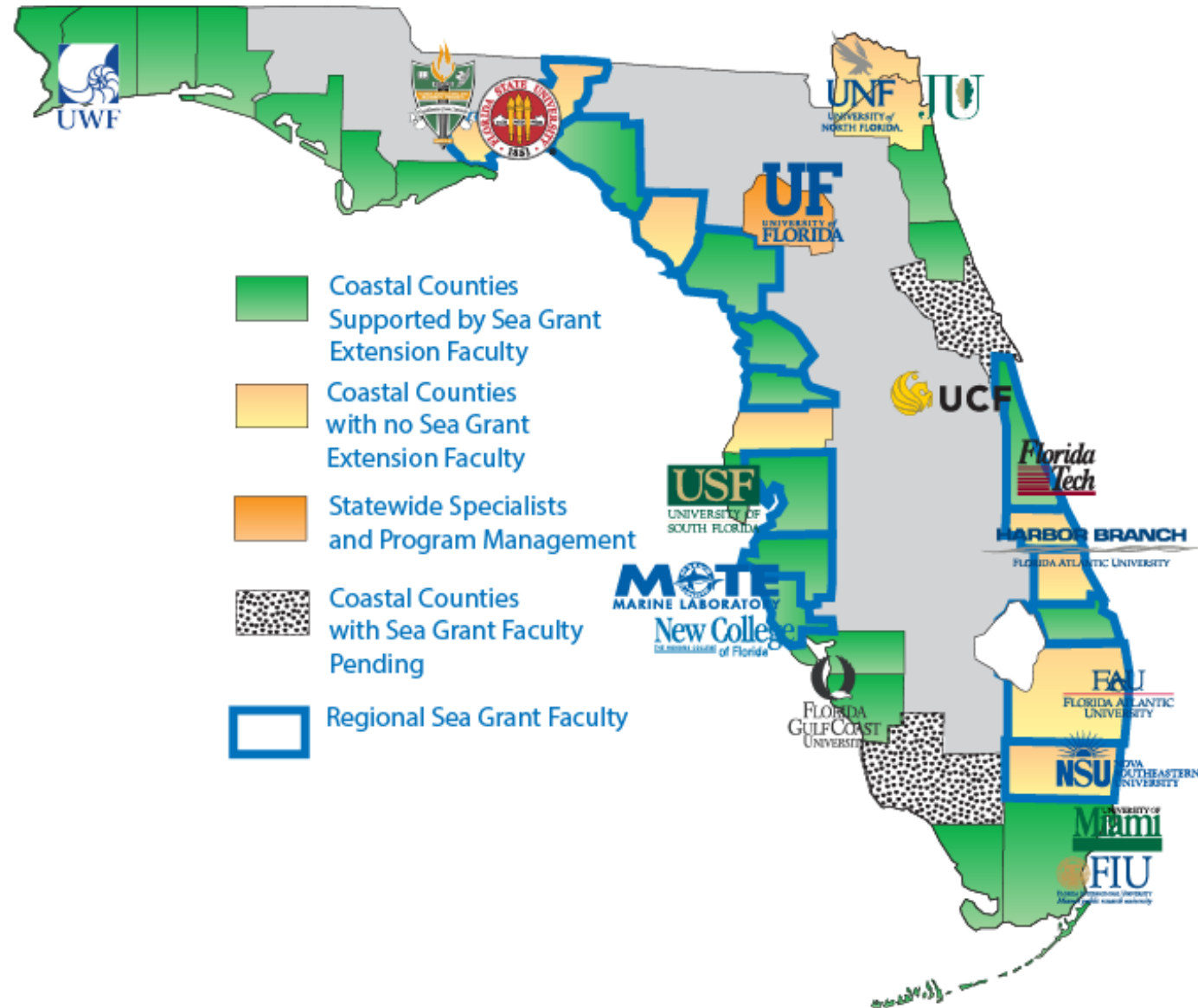
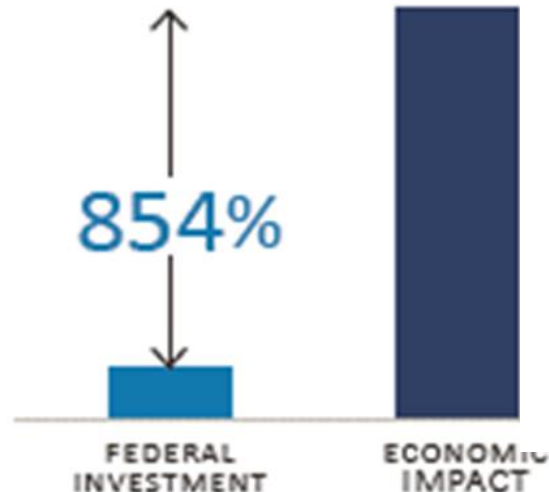
ATLANTIC



Sea Grant



\$575M
in economic impact



Cooperative Institutes



CI for Ocean Exploration,
Research, and Technology



CI for Marine and
Atmospheric Studies

NOAA Education FY2017



Over **4,400 postsecondary students** were trained in NOAA-mission related sciences through NOAA-funded higher education programs.

790 postsecondary degrees in NOAA-related disciplines were awarded to students who were supported by NOAA in higher education programs.



Thank you



research.noaa.gov