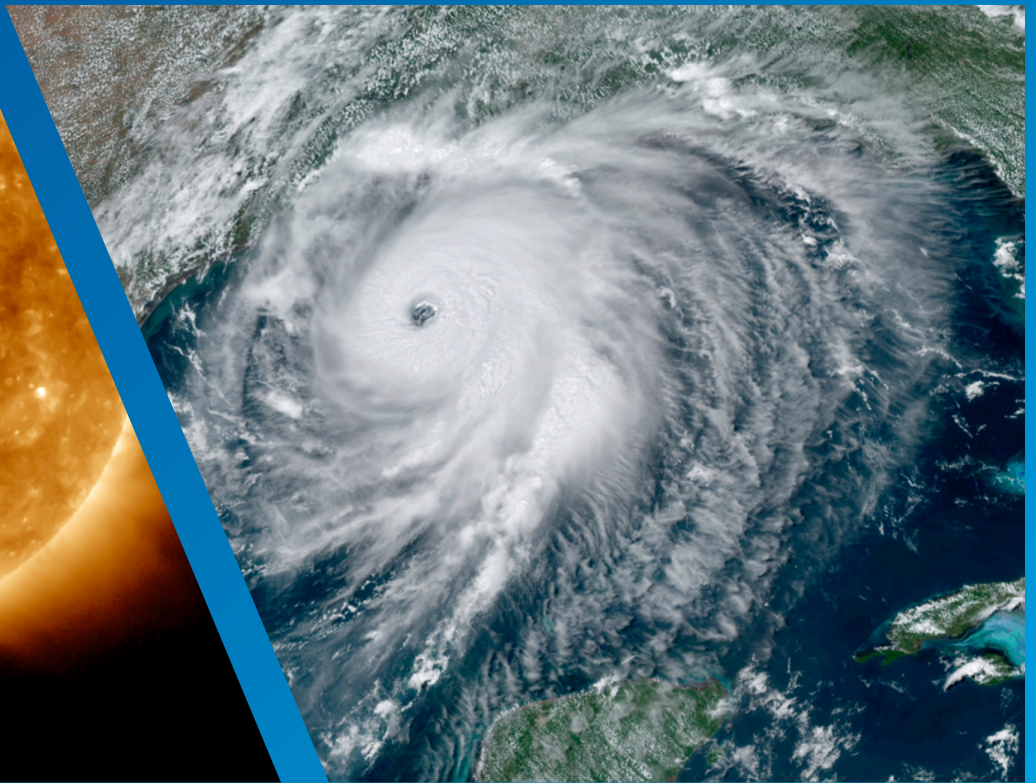
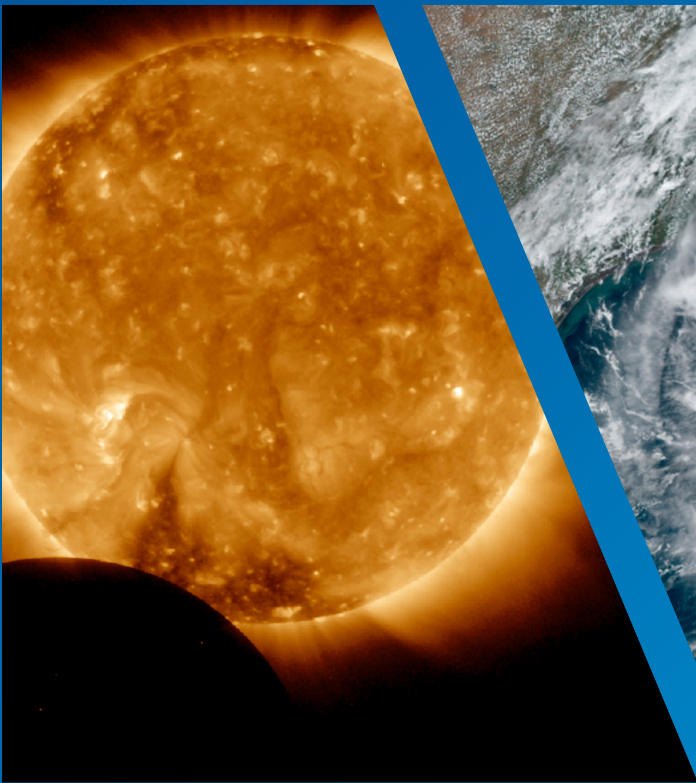




# NOAA BLUE BOOK FY2022





# In Memory of Christopher Cartwright

1969-2021

This Blue Book is dedicated to NOAA Budget Director Chris Cartwright, who passed away on May 1, 2021, at age 52. It represents the passion for public service and NOAA's mission felt by Chris and the entire NOAA community.

Chris spent most of his 30-year career with the National Oceanic and Atmospheric Administration (NOAA), including four years as Director of the NOAA Budget Office. He was a dedicated civil servant with a brilliant mind, a vast well of patience, and boundless compassion.

While at the helm of the NOAA Budget Office, he created an environment of trust, effectiveness and collegiality. He was ever unflappable in the midst of budget chaos, and he always applied a calm, solutions-oriented, and thoughtful approach to achieving NOAA's mission. Through it all, Chris was unfailingly kind and humble, and his professionalism and gentle leadership inspired his team—and all those around him—to be better people, leaders, and public servants. He would always listen to others and validate their ideas, even when he was the most knowledgeable person in the room. His dedication, kindness, and servant leadership will be his enduring legacy.

Chris attended Syracuse University for both his undergraduate and graduate degrees. At the 2020 convocation for Syracuse University Maxwell School, he was selected to lead the recitation of the Athenian Oath:

***We will ever strive for the ideals and sacred things of the city, both alone and with many. We will unceasingly seek to quicken the sense of public duty. We will revere and obey the city's laws. We will transmit this city not only not less, but greater, better, and more beautiful than it was transmitted to us.***

Like the words of the Athenian Oath, Chris's compassionate leadership and dedication to public service will always be a part of NOAA's path forward.





NOAA beluga whale researchers in Cook Inlet, Alaska.





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Ensign Iris Ekmanis navigates a survey launch from NOAA Ship *Fairweather* towards survey grounds near John Hopkins Glacier.



# Terminology

The reader should be aware of the specific meaning of several terms as they are used throughout this budget summary:

## **FY 2020 Enacted**

Fiscal Year (FY) 2020 Consolidated Appropriations Act, 2020 (P.L. 116-93)

## **FY 2021 Enacted**

Fiscal Year (FY) 2021 Consolidated Appropriations Act, 2021 (P.L. 116-260)

## **Adjustments-to-Base**

Includes the estimated FY 2022 civilian pay raise of 2.7 percent and military pay raise of 2.7 percent. Program totals will provide inflationary increases for labor and non-labor activities, including service contracts, utilities, field office lease payments, and rent charges from GSA. In addition, ATBs include unique/technical adjustments to the base program, for example transfers of base resources between budget lines.

## **FY 2022 Base**

FY 2021 Enacted plus Adjustments To Base

## **Program Change**

Requested increase or decrease over the FY 2022 Base

## **FY 2022 Request**

FY 2022 Base plus Program Changes





Eye of Hurricane Sally which made landfall in Alabama on September 16th, 2020.

# Introduction

For Fiscal Year (FY) 2022, the National Oceanic and Atmospheric Administration (NOAA) proposes a budget of \$6,983,329,000 in discretionary appropriations, an increase of \$1,543,531,000 from FY 2021 Enacted. This budget supports NOAA's goal of scaling up efforts to research and mitigate impacts of the climate crisis through investments in research, observations and forecasting, restoration and resilience, support ecologically sound offshore wind development, and equity at NOAA and through programs that touch everyday lives. It also includes additional investments in fleet support and satellites to ensure the continuity of vital observations, and space weather observations and prediction services to protect critical infrastructure that provides the backbone of this country's economic vitality and national security. Some highlights of NOAA's priority initiatives are provided below.

## Climate

***“We have a narrow moment to pursue action at home and abroad in order to avoid the most catastrophic impacts of that crisis and to seize that opportunity that tackling climate change presents.”***

*Executive Order on Tackling the Climate Crisis, January 27, 2021*

**Description of Need:** The atmosphere, oceans,

and land ecosystems all show indicators of a warming and changing climate. To persist and thrive in this changing world, the Nation must make well-informed choices and embrace solutions that pave the way for a viable economy and the sustainable infrastructure to support it.

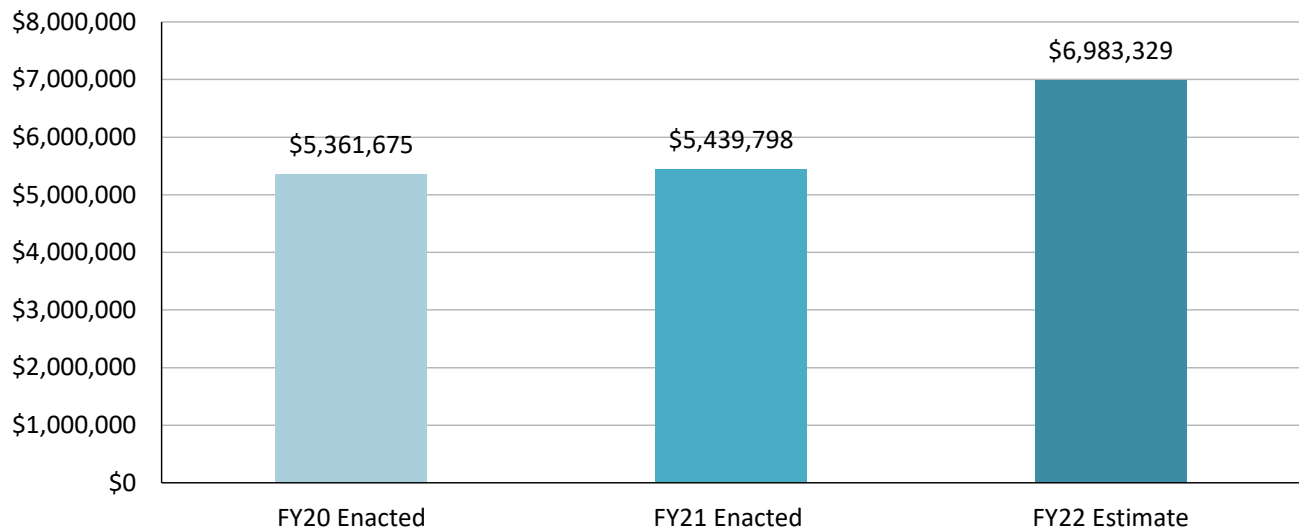
Communities around the country are struggling with the effects of extreme events like hurricanes, floods, droughts, wildfires, and fisheries collapse. In 2020, there were 22 weather-water-climate disaster events in the United States that each had losses exceeding \$1 billion.<sup>1</sup> The 2020 wildfires in California—the worst in the state's history—are a paramount example of the environmental and socio-economic devastation that environmental events can wreak on communities, businesses, and the environment. NOAA's FY 2022 budget requests an additional \$855.1 million over enacted levels to implement Executive Order (EO) 14008 on *Tackling the Climate Crisis at Home and Abroad* to expand investments in climate research, support regional and local decision making with climate data, tools, and services, and help the most vulnerable communities improve resilience to climate change.

For over 50 years, NOAA has provided science, service and stewardship that makes it suited to provide actionable climate science and information needed to help solve the climate crisis. NOAA leverages diverse authorities for climate, weather, fisheries, coasts, and the ocean; huge stores of environmental data and observations; world-renowned expertise; and networks of public, private, and academic partnerships to deliver the most up-to-date knowledge and actionable products to meet the needs of decision makers. This information is critical to resilience-building, national security, and economic vitality; the protection of life and property; the sustainable use of our resources; and the preservation and resilience of our natural

<sup>1</sup> NOAA National Centers for Environmental Information, U.S. 2020 Billion-Dollar Weather and Climate Disasters, (2020), <https://www.ncdc.noaa.gov/billions/>



## NOAA Discretionary Budget Trends (\$ in thousands)



environment. From sun to sea, NOAA takes a comprehensive earth system approach.

**NOAA FY 2022 Investments:** Through the following targeted investments to support an integrated approach to the climate crisis, NOAA will be on track to develop and deliver new and improved climate tools and products that provide critical climate information and services to decision makers, communities, businesses, and the public, including:

**Research:** NOAA will strengthen core research capabilities Foundational research will improve products and services will help communities prepare for and adapt to impacts of extreme weather and climate disasters that have become more frequent and costly in recent decades.

**Observations and Forecasting:** NOAA will expand its delivery of the best available climate observations and information (physical, biological, social, economic) to understand, prepare for, and adapt to future conditions especially in frontline and underserved communities that are particularly vulnerable to the impacts of climate change.

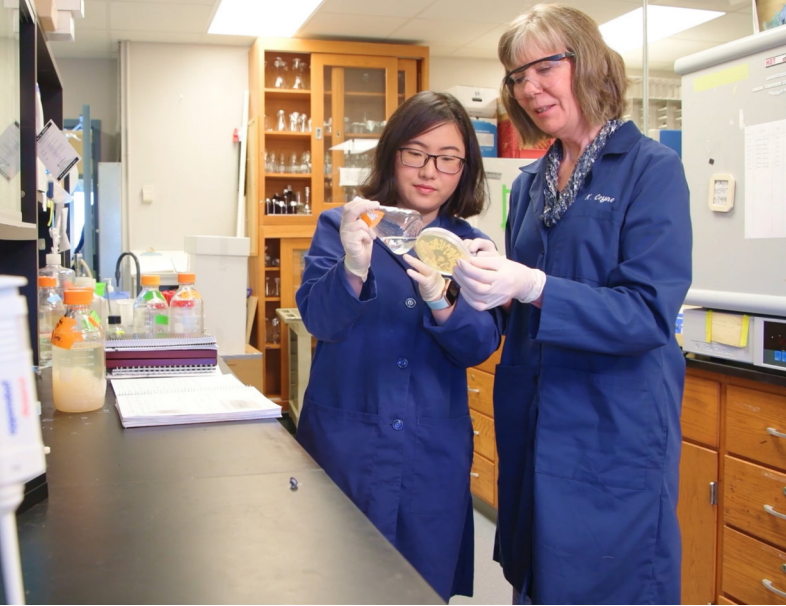
**Restoration and Resilience:** NOAA will invest in ecological restoration and community

resilience, and address an increasing demand for NOAA’s science and services needed to enhance natural and economic resilience of our ocean and coasts through our expertise, robust on-the-ground partnerships, and place-based conservation activities. NOAA will support the Administration’s goal to conserve at least 30 percent of the Nation’s lands and waters by 2030, collaborate with the new Civilian Climate Corps, and coordinate with partners on other related whole-of-government initiatives.

**Offshore Wind:** NOAA will further the Administration’s goal to deploy 30 gigawatts of offshore wind in the U.S. by 2030, while protecting biodiversity and promoting ocean co-use.

**Equity:** NOAA will enhance its integration of equity across the organization, from management, to policies, to service-delivery. NOAA will cultivate a more diverse, climate-ready workforce of the future that builds upon NOAA’s long history of investments in graduate and postgraduate training, fellowships, and extension programs.

Collectively, these investments will support our efforts to build resilient communities, economies, businesses, and ecosystems.



With funding from NCCOS, University of Delaware Professor Kathryn Coyne (right) and doctoral student Yanfei Wang conduct an experiment using the *Shewanella* bacteria-derived compound that can selectively kill marine dinoflagellates that produce harmful algal blooms. University of Delaware, September 2019. Credit: University of Delaware

## Research

NOAA science plays a critical role in informing the Nation and the world about current and projected changes in the climate system. Standing on the firm foundation of world-class earth system and climate science, NOAA provides data, tools, and services that reach every American every day.

To strengthen core research capabilities to respond to increasing demand for the data, tools, and services that this research provides, NOAA is requesting an increase of \$149.3 million. We will improve our understanding of climate change on time scales beginning at two weeks through the next several decades. We will build on this understanding to improve precipitation, fire weather, and sea level rise forecasts, and identify impacts of climate change on fisheries, protected species, and living marine resources to improve management. Of these funds, NOAA will commit \$40 million to the Advanced Research Projects Agency for Climate (ARPA-C) to inform how NOAA's restoration and conservation efforts help sequester carbon while also protecting marine ecosystem diversity.

NOAA will research the ways in which our ocean influences, and is influenced by, climate change. For example, the total amount of excess heat absorbed by the ocean, or how the ocean's role as a sink for anthropogenic carbon will change over time are still not fully quantified. It is imperative that NOAA dedicates research

towards understanding and projecting coastal inundation from rising seas, high lake levels, heavier precipitation, and more frequent extreme weather events associated with our warming climate.

NOAA will invest additional resources to improve predictions and projections in a research environment. In particular, NOAA will improve precipitation predictions across weather and climate timescales for transition to operations through the Precipitation Prediction Grand Challenge Initiative. This is a cross-NOAA effort to advance subseasonal-to-seasonal and seasonal-to-decadal forecasts, will be conducted in collaboration with our academic research partners, and will include more skillful precipitation forecasts using NOAA's Unified Forecast System. In addition, NOAA will develop a global high resolution model to improve the understanding and prediction of extreme events.

As we increase our understanding of the changing climate in the short and long term, we will simultaneously research and develop new and improved tools for decision makers to address extreme impacts such as sea level rise, fire weather, and impacts on living marine resources. NOAA will enhance our Effects of Sea Level Rise (ESLR) extramural grant program in partnership with the Department of Transportation which provides communities science capacity to evaluate vulnerability to SLR, flooding, and inundation threats and assess the effectiveness of mitigation solutions. NOAA proposes an

increase to develop a collaborative and integrated fire weather research program to enable new research into the coupled modeling for both the short-term fire-atmosphere and sub-seasonal to climate scale modeling systems.

Our research will address the needs of sustaining a healthy “blue economy,” which includes tourism, recreation, commercial fishing, and more. Last year the Bureau of Economic Analysis, in partnership with NOAA, released initial findings showing that the U.S. marine economy contributed about \$373 billion to the Nation’s gross domestic product in 2018 and grew faster than the nation’s economy as a whole.<sup>2</sup> The NOAA Climate and Fisheries Initiative will significantly increase fisheries surveys, sampling, and analysis capabilities to deliver information on the distribution and abundance of commercial and recreationally valuable species to decision makers to determine best management strategies. In addition, NOAA will build a national ocean/ecosystem modeling and prediction system spanning U.S. coastal waters, the Arctic, and

the Great Lakes. This research will develop tools for decision makers to prepare for changing conditions in the ocean and Great Lakes, reduce climate impacts, and increase the resilience of all living marine and Great Lakes resources and the communities that depend on them.

Through the ARPA-C initiative, NOAA will pioneer research on blue carbon, carbon stored in ocean and coastal ecosystems, and factors that influence sequestration. This will lead to a better understanding of the effectiveness of certain climate mitigation strategies, such as different renewable energy choices and the role of coastal and ocean ecosystems, including in National Marine Sanctuaries and National Estuarine Research Reserves in carbon sequestration.

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<sup>2</sup> Bureau of Economic Analysis and NOAA, Ocean Economy. (2020), <https://www.bea.gov/data/special-topics/ocean-economy>



## Climate, Research

Budget Program	PPA	Program Change Title	Program Change	Page
NOS	Competitive Research	Nature-based Solutions to Enhance the Resilience of Coastal Ecosystems	20,000	38
NMFS	Marine Mammals, Sea Turtles, and Other Species	Climate Vulnerable Species Under ESA and MMPA	10,000	46
NMFS	Fisheries and Ecosystem Science Programs and Services	Climate-Ready Fisheries: Climate-Informed Fisheries Assessments and Management Strategies for Changing Oceans	10,000	47
NMFS	Fisheries Data Collections, Surveys and Assessments	Climate-Ready Fisheries: Advancing Fisheries Survey Capacity for Commercially and Recreationally Valuable Species	10,000	48
OAR	Climate Laboratories and Cooperative Institutes	Global-Nested High Resolution Model Increase	10,000	59
OAR	Climate Competitive Research	Marine Ecosystem Responses to Climate Change Increase	10,000	59
OAR	Climate Competitive Research	Providing Climate Change Projections out to 2050 to Inform Risk Management Increase	9,000	59
OAR	Climate Competitive Research	Precipitation Prediction Grand Challenge Increase	7,000	60
OAR	Climate Competitive Research	Advanced Research Projects Agency for Climate Increase	40,000	60
OAR	U.S. Weather Research Program	Fire Weather Increase	7,000	61
OAR	Research Supercomputing/ CCRI	R&D HPC Required to Meet Major NOAA Science Outcomes Increase	10,000	63
NESDIS	National Centers for Environmental Information	Improving Local, State, and Regional Climate Services	6,300	79
<b>Total, Climate/Research</b>			<b>149,300</b>	



Satellite image showing Tropical Storm Eta bearing down on Florida.

## Observations and Forecasting

Measuring and predicting climate change impacts are core to NOAA's mission. NOAA proposes a \$368.2 million budget increase to enhance and improve climate observations and forecasting to assist the Nation to become safer and more resilient under a changing climate.

NOAA provides timely, actionable access to global, national, regional, and local environmental data from satellites, radar, surface systems, atmospheric greenhouse gas sampling stations, ocean buoys, uncrewed systems, aircraft, and ships. In FY 2022, NOAA will continue to invest in these platforms to meet the increasing demand for observations. We will continue tracking marine ecosystem conditions to provide critical information for marine industries like fisheries, shipping, and offshore wind. We will also continue to track local environmental conditions that inform farming, forestry, building and construction, resource planning, disaster preparedness, and more. NOAA's local weather stations, climate monitoring stations, and research facilities across the country will continue to maintain long-standing climate records, such as temperature and rainfall observations, taken by experts and community scientists. These records are made publicly available and used to prepare, plan, and execute critical decisions at the local level. NOAA uses these data to establish a baseline normal state against which to compare new environmental states over time.

NOAA's ocean observing system is the basis for forecasting natural climate variability, as well as the impacts of long-term climate change on our ocean resources and on ocean patterns that, in turn, drive our weather. The FY 2022 request will allow NOAA to begin addressing gaps that can be filled to improve forecasts. NOAA provides more than 50% of global in-situ ocean observing through our Argo and Tropical Pacific Observing System, to help us monitor the changing ocean environment. Enhancement and reconfiguration of the existing Tropical Atmosphere Ocean (TAO) moored array, implementation of the Tropical Pacific Observing System (TPOS) backbone observations, and calibrations of the radiation sensors across the observing network are essential to improving NOAA's climate forecast capabilities. These observations, supported by uncrewed platforms like ocean gliders, are also essential to describing the present state of the ocean, detecting long-term changes, and providing necessary operational weather, marine, and climate services worldwide.

The FY 2022 request will allow NOAA to support and maintain long-term atmospheric observations, which serve as a baseline and record of trends for carbon dioxide, methane, other important greenhouse gases, and other atmospheric aerosols and particles that affect climate, weather, and human health. NOAA will invest in our fleet of aircraft to continue to serve as the global leader in monitoring long-term atmospheric and climate change trends. We will complete the acquisition of the G-550, which



improves hurricane forecasting approximately 15–25%. We will also conduct critical maintenance on our two P-3 Hurricane Hunter aircraft, which have unique airborne data collection tools.

One of the greatest forecasting challenges facing NOAA is the need to improve precipitation forecasts across timescales from weather to climate. Related, there is a critical need for improved projections of how the climate will change on more granular, regional scales and over the next several decades. Investments to fully develop a Seasonal Forecast System will improve climate projections on these scales to better inform regional and local adaptation and resiliency planning for infrastructure, natural resource management, food production, finance, national security, and other sectors. Wildfires are influenced by the weather and climate, and the weather and climate are influenced by wildfires. Of particular interest to NOAA in FY 2022 are the opportunities to improve fire weather forecasting. NOAA will work to improve short-term forecasts to better predict fire behavior and the longer-term modeling of interactions between climate variability, climate change, and the likelihood of hazardous wildfire conditions. Tools will be developed in concert with the U.S. Forest Service and relevant Tribal organizations.

Looking beyond the interior to the coast, investments in improved precipitation forecasts, a modernization of water level and land height observations, and a completion of the operational coastal oceanographic modeling system will together provide real time inundation alerts, high tide flooding outlooks, and long-term sea level trends. NOAA will convey this information using a Next-Generation Coastal Inundation Dashboard to allow coastal decision makers to evaluate flood risk at a local level and varying timescales.

NOAA's weather and climate predictions and information must be reliably delivered to users to impact decision making. The FY 2022 request includes a critical investment in the NWS Integrated Dissemination Program

plan to address reliability and capacity issues necessary to ensure the provision of weather and climate predictions, forecasts, and warnings to the public, emergency management partners, and the U.S. weather enterprise. NOAA will invest in dissemination of rapidly increasing open data with the establishment of a NOAA Cloud Program to streamline and accelerate the transition of all NOAA mission areas to the cloud. This, in conjunction with the evolution of NOAA's Open Data Dissemination, will provide worldwide cloud access to NOAA climate and earth system dynamics data crucial to improve climate modeling. NOAA will work with data users to ensure they have access to the data necessary to better understand and decrease climate risks. NOAA must also invest in the transition of legacy telecommunications infrastructure to the government-wide Enterprise Infrastructure Solutions contract, which will adopt modern technologies and a service based approach. This modernization effort will support all of the observing and forecasting efforts described above.

## Climate, Observations and Forecasting

Budget Program	PPA	Program Change Title	Program Change	Page
NOS	Navigations, Observation, and Positioning	Modernizing NOAA's Foundational Geospatial Positioning Framework and Water Level Observations for Climate Decision Support	10,000	36
NOS	Navigations, Observation, and Positioning	Building Climate Outlook Capabilities into a Next-Generation Coastal Inundation Dashboard	5,000	36
NOS	Navigations, Observation, and Positioning	Complete National Coastal Modeling Coverage	5,000	37
NOS	Navigations, Observation, and Positioning	Advancing Coastal and Ocean Modelling and Prediction	10,000	37
NOS	Navigations, Observation, and Positioning	Enterprise Infrastructure Solutions (EIS)	1,000	37
NOS	Navigations, Observation, and Positioning	Data Management and Cyberinfrastructure (DMAC)	2,000	37
NOS	IOOS Regional Observations	Coastal Moorings with Ecological Monitoring	4,000	38
NOS	Coastal Science, Assessment, Response and Restoration	Enterprise Infrastructure Solutions (EIS)	900	38
NOS	Coastal Zone Management and Services	Enterprise Infrastructure Solutions (EIS)	300	39
NOS	Sanctuaries and Marine Protected Areas	Enterprise Infrastructure Solutions (EIS)	800	41
NMFS	Fisheries and Ecosystem Science Programs and Services	Enterprise Infrastructure Solutions (EIS)	200	48
OAR	Climate Laboratories and Cooperative Institutes	Sustained Atmospheric Observations Increase	20,000	59
OAR	Tornado/Severe Storm Research	Phased Array Radar Increase	2,500	61
OAR	Sustained Ocean Observations and Monitoring	Advancing Global Ocean Observing System Increase	23,000	62
OAR	Uncrewed Systems	Uncrewed Systems Increase	4,000	63
NWS	Observations	Enhance the Meteorological Assimilation Data Ingest System (MADIS) to Include Important Climate Datasets	1,200	67
NWS	Observations	Improve Climate and Weather Predictions by Maintaining a Recapitalized Tropical Atmosphere Ocean (TAO) Array	2,441	58
NWS	Observations	Enterprise Infrastructure Solutions (EIS)	750	68



## Climate, Observations and Forecasting Continued

Budget Program	PPA	Program Change Title	Program Change	Page
NWS	Central Processing	Operationalize Flood Inundation Mapping	500	68
NWS	Central Processing	Seamless Weather to Climate Fire Weather Predictions to Improve Resilience and Disaster Mitigation	750	68
NWS	Analyze, Forecast, and Support	Operationalize Flood Inundation Mapping	750	68
NWS	Analyze, Forecast, and Support	Seamless Weather to Climate Fire Weather Predictions to Improve Resilience and Disaster Mitigation	500	68
NWS	Dissemination	Operationalize Flood Inundation Mapping	3,750	70
NWS	Dissemination	Optimize and Upgrade the Integrated Dissemination Program	17,000	70
NWS	Dissemination	Seamless Weather to Climate Fire Weather Predictions to Improve Resilience and Disaster Mitigation	750	70
NWS	Dissemination	Enterprise Infrastructure Solutions (EIS)	11,400	70
NWS	Science and Technology Integration	Seasonal Forecast System (SFS v1)	15,000	71
NWS	Science and Technology Integration	Seamless Weather to Climate Fire Weather Predictions to Improve Resilience and Disaster Mitigation	2,000	71
NWS	Observations	Improve Climate and Weather Predictions by Recapitalizing the Tropical Atmosphere Ocean (TAO) Array	8,059	72
NWS	Observations	Enterprise Infrastructure Solutions (EIS)	470	72
NESDIS	Office of Satellite and Product Operations	Enterprise Infrastructure Solutions (EIS)	1,500	78
NESDIS	Product Development, Readiness & Application	Ocean Remote Sensing	6,505	78
NESDIS	Product Development, Readiness & Application	Advancing Fire Weather Priorities	4,000	78
NESDIS	Product Development, Readiness & Application	Expanding Arctic and Antarctic Datasets and Products	2,000	79
NESDIS	National Centers for Environmental Information	Climate Data Records	6,000	79
NESDIS	National Centers for Environmental Information	Enhance Enterprise Data Stewardship and Archiving	5,300	79
NESDIS	National Centers for Environmental Information	Sustainment of Cloud Framework for Environmental Data	4,900	79
MS	Mission Services and Management	Increase Facility Program Capacity	5,000	90

## Climate, Observations and Forecasting Continued

Budget Program	PPA	Program Change Title	Program Change	Page
MS	Mission Services and Management	Implement a Budget Position Management System	1,400	90
MS	Mission Services and Management	NOAA Open Data Dissemination	3,300	90
MS	Mission Services and Management	NOAA Cloud Program	2,500	90
MS	Mission Services and Management	Enterprise Infrastructure Solutions (EIS)	1,770	90
MS	Mission Services and Management	Spectrum	500	90
MS	IT Security	Improve NOAA's Cybersecurity	19,500	92
OMAO	Marine Operations and Maintenance	Days at Sea Increase	19,669	97
OMAO	Marine Operations and Maintenance	Enterprise Infrastructure Solutions (EIS)	200	98
OMAO	Aviation Operations and Aircraft Services	Increased Aircraft Operations	3,561	98
OMAO	Autonomous Uncrewed Technology Operations	Autonomous Uncrewed Technology Operations	1,500	98
OMAO	NOAA Commissioned Officer Corps	NOAA Corps Officers	2,570	99
OMAO	Platform Capital Improvements & Tech Infusion	P-3 Service Depot Level Maintenance	5,000	100
OMAO	Platform Capital Improvements & Tech Infusion	Uncrewed Technology Acquisitions	2,500	100
OMAO	Aircraft Recapitalization and Construction	Second Aircraft to Meet National Weather Research and Forecasting Needs	100,000	100
OMAO	Aircraft Recapitalization and Construction	Complete G-IV Replacement	15,000	101
<b>Total, Climate/Observations and Forecasting</b>			<b>368,195</b>	





A pipeline rupture allowed an estimated 21,000 gallons of crude oil to reach the Pacific Ocean at Refugio State Beach in California. NOAA's Office of Response and Restoration provided information on the fate and effects of the crude oil and potential environmental impacts both in the water and on the shore.

## Restoration and Resilience

Forty percent of the U.S. population live and work in coastal counties,<sup>3</sup> making a disproportionate segment of our society and economy at increasing risk from such hazards as hurricanes and coastal inundation. Therefore, NOAA is requesting \$259.3 million in FY 2022 for investments in ecological restoration and community resilience that are integral to NOAA's climate strategy, and there is an increasing need for NOAA to create and foster natural and economic resilience along our coasts through our direct financial support, expertise, robust, on-the-ground partnerships, and place-based conservation activities. These activities would support the Administration's efforts to conserve at least 30 percent of the Nation's lands and waters by 2030.

The FY 2022 request utilizes grants to help states, Tribes, and other landowners plan and implement habitat conservation and restoration projects, including for candidate, proposed, and ESA-listed species, increasing habitat acres restored by over 60 percent. Healthy coastal habitats, such as marshes and coral reefs, protect ecosystems, shorelines, and communities from waves, storms, and floods, and help to prevent loss of life, property damage, and erosion. They also are a key source of livelihoods, through tourism and fishing. In addition, restoration

activities and the construction of natural infrastructure employs construction workers, engineers, ecologists, project managers, and heavy equipment operators, and generates a wide array of economic co-benefits. A 2020 reexamination confirmed an initial assessment that a \$10 million investment in ecological restoration of Michigan's Muskegon Lake in 2011, would power up the local economy by approximately \$60 million through increased home prices and recreational visits.<sup>4</sup>

In addition to restoration, NOAA will work with partners to foster resilience of coastal habitats and the communities that depend on them. NOAA requests funds to expand the National Coastal Resilience Fund to help coastal communities and ecosystems prepare for and recover from extreme weather events, climate hazards, and changing ocean conditions. NOAA also will enhance the Coastal Zone Management Program for states to support community adaptation, including focusing on underserved communities disproportionately vulnerable to hazards. With funding requested in FY 2022, NOAA will remove marine debris, increasing such removal by 60 percent, and foster public awareness of the effects of marine debris. NOAA will continue to partner with the National Fish and Wildlife Foundation through the Fishing for Energy program to provide funding support to commercial fishermen to aid removal, disposal,

<sup>3</sup> NOAA Office of Coastal Management and U.S. Census Bureau, American Community Survey Five-Year Estimates. (2017), <https://coast.noaa.gov/digitalcoast/data/acs.html>

<sup>4</sup> Grand Valley State University, Muskegon Lake Area of Concern Habitat Restoration Project: Socio-Economic Assessment Revisited, (2020), <https://www.glc.org/wp-content/uploads/Habitat-socioeconomic-Study-July-2020.pdf>

and prevention of derelict fishing gear and plastic found at sea and aid in economic recovery for this sector.

NOAA will support endangered and threatened marine species through the U.S. Marine Biodiversity Observation Network, to support ecosystem-based management of commercially harvested species through advanced biological observing, modeling, and other innovative tools to inform adaptation strategies. NOAA will combat stony coral tissue loss disease, an especially lethal disease first reported in 2014 that spreads rapidly causing high coral mortality. NOAA will build capacity for disease detection, prevention, and response efforts, and engage partners, coral reef managers, and regional fisheries managers.

NOAA’s active engagement and partnerships with regional users and climate service delivery providers facilitate the uptake and application of NOAA’s authoritative information. NOAA’s Sea Grant Program will increase coastal community understanding of climate risk factors, develop key decision tools, and address critical knowledge gaps for coastal communities. NOAA’s RISA program will work with communities to co-produce and operationalize lasting and equitable climate resilience plans in 50 cities around the Nation, prioritizing underserved communities particularly vulnerable to a changing climate. NOAA will improve response readiness in preparation for more emergency events through an investment in our Office of Response and

Restoration. This will strengthen the national capacity to respond to emergency events by addressing internal and external preparedness gaps, investing in more efficient response equipment, and initiating a nationwide refresh of the Environmental Sensitivity Index to ensure an accurate understanding of the baseline for timely decisions during a disaster.

NOAA’s FY 2022 request supports locally driven management decisions regarding NOAA trust resources through increased engagement with partners, underrepresented communities, Tribes, and local indigenous groups to strengthen conservation outcomes. For example, in National Marine Sanctuaries NOAA will double climate vulnerability assessments, promote climate resilience, and enhance work with states and local communities to achieve on-the-ground conservation goals. NOAA will also provide enhanced technical support and increased capacity within the National Estuarine Research Reserve System to further the benefits of blue carbon, to monitor marsh resilience to sea level rise, and to identify conservation corridors and habitat gaps for conservation and restoration planning. NOAA will convene technical experts, decision makers, and stakeholders to ensure that coastal adaptation investments are science-based, community-driven, and offer equitable solutions, making communities and the environment more resilient to climate impacts.

## Climate, Restoration and Resilience

Budget Program	PPA	Program Change Title	Program Change	Page
NOS	Navigations, Observation, and Positioning	Fostering Ecological Resilience Through Conservation Action	2,000	37
NOS	IOOS Regional Observations	Monitoring Ecological Change Through Observing Systems	15,000	37
NOS	Coastal Science, Assessment, Response and Restoration	Prepare Coastal Communities for Disasters	12,000	38



## Climate, Restoration and Resilience Continued

Budget Program	PPA	Program Change Title	Program Change	Page
NOS	Coastal Science, Assessment, Response and Restoration	Enhancing Community Based Marine Debris Prevention, Removal, and Research	9,000	38
NOS	Coastal Science, Assessment, Response and Restoration	Fostering Ecological Resilience Through Conservation Action	2,000	38
NOS	Coastal Zone Management Grants	Regional Coastal Resilience Communities of Practice	7,500	39
NOS	Coastal Zone Management Grants	Increasing Community Resilience through Coastal Management Grants	30,000	39
NOS	National Oceans and Coastal Security Fund	Increasing Coastal Resilience through Nature-based Approaches	34,000	40
NOS	Coral Reef Program	Reducing Climate Threats to Coral Reefs	10,000	40
NOS	National Estuarine Research Reserve System	Place-based Resilience Training, Education, and Research	14,000	40
NOS	Sanctuaries and Marine Protected Areas	Assessing Place-based Climate Vulnerability for Conservation Action	23,500	40
NOS	Sanctuaries and Marine Protected Areas	Fostering Ecological Resilience Through Conservation Action	2,000	40
NMFS	Species Recovery Grants	Species Recovery Grants Program	10,000	46
NMFS	Habitat Conservation and Restoration	Large Scale Habitat Restoration to Build Climate Resilience	40,000	50
OAR	Regional Climate Data and Information	Enhancing Regional and Community Resilience by Scaling Up RISA Program and "Climate-Smart" Communities Initiative	10,000	59
OAR	National Sea Grant College Program	Sea Grant Builds Resilient Coasts: Expanding Local and Regional Coastal Resilience Capacity and Community Assistance	35,000	61
MS	Mission Services and Management	Acquisition and Grants Office	2,530	90
MS	Mission Services and Management	NOAA Finance Transaction Processing	800	90
<b>Total, Climate/Restoration and Resilience</b>			<b>259,330</b>	



Block Island Wind Farm, 3 miles off the coast of Rhode Island.

## Offshore Wind

Offshore wind development is rapidly expanding in the United States, particularly in the Northeast and Mid-Atlantic, and is being considered along the Gulf and West Coasts as well. This represents a relatively new use of our marine waters and will require substantial scientific and regulatory review to balance energy production with protecting marine resources and fisheries production. NOAA will need to work closely with the Bureau of Ocean Energy Management (BOEM) to minimize the effects of offshore energy projects on protected resources, fisheries, and important habitats in the region; reduce delays and minimize adverse economic impacts to the fishing industry and related coastal communities; and mitigate impacts to fisheries surveys in the Northeast and Mid-Atlantic. NOAA is requesting a total of

\$20.4 million in four complementary areas to appropriately engage in the Federal interagency planning, siting, and permitting of offshore energy projects to minimize impacts on our trust resources and constituencies: 1) Offshore energy assessment and scientific advice to support the regulatory process; 2) Dedicated resources for offshore energy assessment related to protected resources; 3) Increased support for environmental assessments and consultations with BOEM; and 4) Development of new fisheries survey design and methods to address anticipated changes in habitats around offshore wind developments. Working in partnership with BOEM and other relevant agencies, these funds will support NOAA's role in achieving the Administration's goal to deploy 30 GW of offshore wind in the U.S. by 2030, while protecting biodiversity and promoting ocean co-use.

## Climate, Offshore Wind

Budget Program	PPA	Program Change Title	Program Change	Page
NMFS	Marine Mammals, Sea Turtles, and Other Species	Wind Energy: Protected Species Environmental Reviews and Science	3,197	46
NMFS	Fisheries and Ecosystem Science Programs and Services	Wind Energy: Fisheries Science & Technical Reviews	3,648	47
NMFS	Fisheries Data Collections, Surveys and Assessments	Wind Energy: Scientific Survey Mitigation	8,380	48
NMFS	Fisheries Management Programs and Services	Wind Energy: Fisheries Management	5,155	49
<b>Total, Climate/Offshore Wind</b>			<b>20,380</b>	



Families fish together on the lower Yukon River, Alaska. Credit: Corey Arnold, courtesy of Alaska Seafood Marketing Institute

## Equity

The Biden Administration policies, including those described in EO 13985 on *Advancing Racial Equity and Support for Underserved Communities Through the Federal Government*, make it clear that agencies will integrate equity into the DNA of their organizations—from management, to policies, to service-delivery. Underserved communities are especially vulnerable to weather, water and climate events, with large disasters causing poverty rates to increase. In FY 2022, NOAA requests \$57.9 million to develop a framework and lay the foundation for successfully integrating equity across the organization, from management, to policies, to service-delivery. This will position us to help vulnerable communities better prepare for and respond to extreme weather and climate disasters. For example, in many localities whose budgets have already been constrained by the pandemic, major storms cause local revenues to fall by 6% to 7%, with that figure two times greater for municipalities with a significant racial minority population.<sup>5</sup>

This effort includes investing in NOAA's internal capacity to better respond to the needs of vulnerable populations, assessing key services to identify and address barriers to access to all Americans, funding targeted investments

<sup>5</sup> Rhiannon Jerch & Matthew E. Kahn & Gary C. Lin, *Local Public Finance Dynamics and Hurricane Shocks*, (NBER Working Papers 28050, 2020, National Bureau of Economic Research, Inc. 2020)

in historically underserved communities, and enhancing NOAA's capabilities, such as the Drought Portal and the Sea Level Rise Viewer. Given the U.S. could see a one percent reduction in its gross domestic product due to coastal flooding alone by 2100<sup>6</sup> without taking significant actions, this modest investment in NOAA would allow the agency to better provide actionable information and tools to enable informed, risk-based decisions that drive tangible improvements in the lives of all Americans. As Secretary Raimondo said in her first video message to Commerce employees, "we have the tools within the Commerce Department to uplift communities that have been left behind."

NOAA's concrete goals will be responsive to EO 13985 Section 7 and provide an action plan to make service delivery more equitable. This includes delivering Spanish-language translation of weather information from NWS offices and enhancing Tribal consultation on substantive policy matters with at least 30% of federally recognized Tribes in FY 2022. NOAA will also establish a NOAA Climate Cooperative Science Center as part of the José E. Serrano Educational Partnership Program with Minority Serving Institutions (EPP/MSI) to train post-secondary

<sup>6</sup> Schinko, T. , Drouet, L., Vrontisi, Z., Hof, A.F., Hinkel, J., Mochizuki, J. , Bosetti, V., Fragkiadakis, K., et al. Economy-wide effects of coastal flooding due to sea level rise: A multi-model simultaneous treatment of mitigation, adaptation, and residual impacts. (*Environmental Research Communications* 2 (1) e015002. 10.1088/2515-7620/ab6368, 2020)



students in climate science. NOAA will modify many award winning Digital Coast tools and products to make them more accessible and conduct more robust engagement with underserved and vulnerable coastal communities. The National Sea Grant College Program will also increase, in FY 2022, the number of Sea Grant tools, products, and information services that are used to advance environmental literacy and workforce development services for underserved communities.

more tailored recruitment in the NOAA Corps recruitment, the IT Fellowship Program, a new internship program focused on atmospheric sciences. NOAA will accelerate implementation of the Diversity and Inclusion Strategic Plan and training and outreach for staff, supervisors, and leaders. These investments in supporting equity in our current and prospective workforce will allow NOAA to leverage diversity to provide better services to all Americans.

NOAA also seeks to strengthen equity efforts internally to accelerate efforts to attract, retain, and develop talent, including from diverse backgrounds. NOAA will enhance recruitment programs and communication tools to support STEM recruitment efforts from Historically Black Colleges and Universities and other MSIs. NOAA will also leverage these institutions through

## Climate, Equity

Budget Program	PPA	Program Change Title	Program Change	Page
NOS	Coastal Zone Management and Services	Advancing Racial Equity through NOS Products and Services for Coastal Resilience	9,000	39
NMFS	Fisheries and Ecosystem Science Programs and Services	Advancing and Improving Territorial Fisheries Science and Management	3,000	48
NMFS	Fisheries and Ecosystem Science Programs and Services	Community Social Vulnerability Indicators (CSV) Toolbox	1,000	48
NMFS	Fisheries Management Programs and Services	Education and Outreach for Diverse Participation in Regulatory and Science Processes	2,000	49
NMFS	Fisheries Management Programs and Services	Workforce Training to Support the Seafood Industry	1,000	49
OAR	Regional Climate Data and Information	Tribal Drought Resilience Initiative	3,000	59
OAR	National Sea Grant College Program	Sea Grant's Service Equity: Assessing and Integrating Diversity, Equity, and Inclusion Actions to Support Underserved Communities	5,000	62

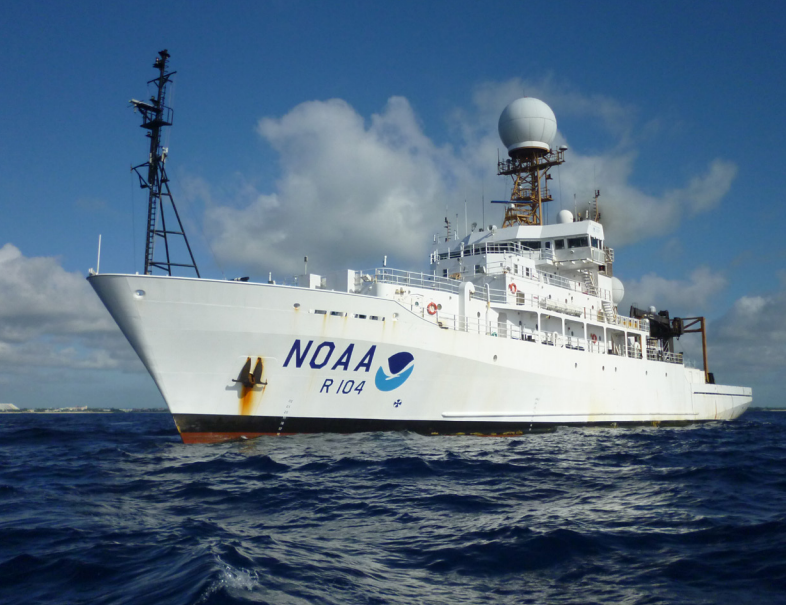
## Climate, Equity Continued

Budget Program	PPA	Program Change Title	Program Change	Page
NWS	Central Processing	Co-Development of Sub-Seasonal to Seasonal (S2S) Decision Support Services to Mitigate the Impacts of Extreme Events and Enable a Resilient Society	900	68
NWS	Central Processing	Expand and Enhance NWS Services to Vulnerable/Underserved Communities for Extreme Events: Improve Service Delivery	2,000	68
NWS	Analyze, Forecast, and Support	Co-Development of Sub-Seasonal to Seasonal (S2S) Decision Support Services to Mitigate the Impacts of Extreme Events and Enable a Resilient Society	500	69
NWS	Analyze, Forecast, and Support	Expand and Enhance NWS Services to Vulnerable/Underserved Communities for Extreme Events: Improve Service Delivery	1,000	69
NWS	Analyze, Forecast, and Support	Expand and Enhance NWS Services to Vulnerable/Underserved Communities for Extreme Events: Assess and Understand User Needs	1,500	69
NWS	Analyze, Forecast, and Support	Increase NOAA Capability to Support Minority Internship Opportunities	1,000	69
NWS	Dissemination	Co-Development of Sub-Seasonal to Seasonal (S2S) Decision Support Services to Mitigate the Impacts of Extreme Events and Enable a Resilient Society	400	70
NWS	Dissemination	Expand and Enhance NWS Services to Vulnerable/Underserved Communities for Extreme Events: Dissemination Enhancements	3,500	70
NWS	Science and Technology Integration	Co-Development of Sub-seasonal to Seasonal (S2S) Decision Support Services to Mitigate the Impacts of Extreme Events and Enable a Resilient Society	3,500	71
MS	Executive Services	NOAA Tribal Liaison	500	89
MS	Executive Services	Strategic Communication and Outreach to Underserved Communities	2,000	89
MS	Mission Services and Management	Equity Assessment and Implementation Support In Compliance with EO 13985	900	90

## Climate, Equity Continued

Budget Program	PPA	Program Change Title	Program Change	Page
MS	Mission Services and Management	Strengthen Diversity in NOAA IT	400	90
MS	Mission Services and Management	NOAA Recruiting Program	1,500	91
MS	Mission Services and Management	NOAA Facilitation Network	600	91
MS	Mission Services and Management	Accelerate NOAA's Diversity and Inclusion Plan	2,900	91
MS	Mission Services and Management	Workplace Violence Prevention and Response Program – Racial Equity/Wellness	900	91
MS	Office of Education	Educational Partnership Program Climate Cooperative Science Center	3,000	93
MS	Office of Education	Engaging New and Diverse Audiences with NOAA Science	2,900	93
MS	Office of Education	Environmental Literacy Grants for Community Resilience Education	2,000	93
OMAO	Marine Operations and Maintenance	Office of Health Services Increase	1,200	98
OMAO	NOAA Commissioned Officer Corps	NOAA Corps Recruitment	800	99
<b>Total, Climate/Equity</b>			<b>57,900</b>	





Oceanographic research vessel NOAA Ship *Ronald H. Brown* off the Bahamas.

## Fleet Support

The FY 2022 request includes significant investments for NOAA's observational infrastructure, such as the NOAA fleet, a key component of the NOAA mission. NOAA drives the Nation's economy, protects and creates better opportunities for the American public, and responds to climate-induced impacts with products and services firmly rooted in data. Much of this data depends on NOAA's fleet of 15 ships. The \$5.4 trillion and 31 million jobs that pass through our Nation's ports,<sup>7</sup> the \$244.1 billion in sales and 1.74 million jobs connected to the Nation's fisheries,<sup>8</sup> and resiliency and prosperity of coastal communities all directly rely on data from NOAA ships. NOAA's detailed recapitalization plan and transformational maintenance strategy is a targeted approach to provide the Nation the most effective at-sea data. NOAA has made significant advancements in reliability and capabilities and, in turn, increased the days at sea available to support national requirements for data collection.

In FY 2022, NOAA requests \$101 million to support mid-life maintenance on the NOAA

<sup>7</sup> Martin Associates for the American Association of Port Authorities, 2018 National Economic Impact of the U.S. Coastal Port System, Spring Conference 2019, <http://www.aapa-ports.org>.

<sup>8</sup> NOAA, Fisheries Economics of the United States, Economic Impact Trends, 2017, (2017) <https://www.fisheries.noaa.gov/national/sustainable-fisheries/fisheries-economics-united-states>

Ship *Ronald H. Brown* and to construct the Southeast Marine Operations Hub to replace Pier Romeo in Charleston, South Carolina, which is the homeport for the *Brown* and NOAA Ship *Nancy Foster*. The *Brown*, NOAA's largest oceanographic research vessel, collects oceanographic and atmospheric data worldwide in direct support of NOAA's climate missions, including data from buoys that drive accurate weather forecasts and climate models and ocean acidification data that informs global carbon models. Upon completion of maintenance, the *Brown's* expected life span will increase to provide 15 more years of reliable and highly capable support for at-sea data collection.

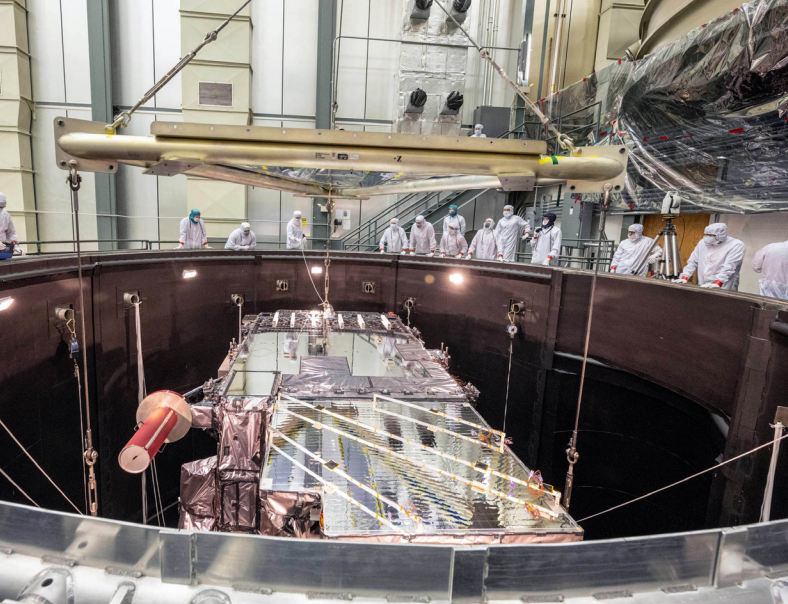


Survey launch approaching NOAA Ship *Rainier*.

## Fleet

Budget Program	PPA	Program Change Title	Program Change	Page
MS	NOAA Construction	Charleston, SC Pier and Facility Recapitalization	38,000	93
OMAO	Platform Capital Improvements & Tech Infusion	NOAA Ship Ronald H. Brown Mid-life Repair	63,000	99
<b>Total, Fleet</b>			<b>101,000</b>	





The GOES-T satellite, scheduled to launch in December 2021, being lowered into the thermal vacuum chamber at Lockheed Martin in Littleton, CO. During this testing, the spacecraft will experience a vast range of temperatures, as high as 188 degrees Fahrenheit and as low as minus 67 degrees Fahrenheit. This testing simulates the extreme temperatures of launch and the space environment. Credit: Lockheed Martin

## Satellites

The FY 2022 request also includes significant investments for NOAA's observational infrastructure, such as NOAA satellites, a key component of the NOAA mission. NOAA is committed to a flat \$2.0 billion budget for the National Environmental Satellite, Data, and Information Service (NESDIS) starting in FY 2022 with no outyear increases other than government-wide inflation assumptions. The FY 2022 budget request underscores NOAA's commitment to making crucial, time-sensitive investments to ensure that the Nation's next-generation satellite systems not only improve capabilities, but that they also expand delivery of essential climate, weather, atmospheric, and oceanographic information to meet the needs of the American public. In support of EO 14008, the FY 2022 budget will help NOAA better observe environmental phenomena connected to climate change-related impacts and patterns, and deliver products, information, and climate services to inform decision makers.

The value of NOAA's data is dependent on users' ability to access and apply it. The FY 2022 budget supports much-needed improvements to NOAA's data infrastructure that will ensure that the data collected are preserved for the future and can be easily accessed in a cloud-based environment. This includes funding to transition NOAA to cloud computing for data ingest, processing, dissemination, and archiving, which will expand the size and diversity of NOAA user communities and data applications.

For decades, the U.S. government was alone in developing Earth observing satellites on behalf of the Nation. Now the government is joined by U.S. companies in the midst of another space race -- a race to deploy constellations of satellites for communications and connectivity. The growth of the U.S. space industry has created new opportunities for Federal agencies like NOAA. Plus, there are more sophisticated commercial technologies and capabilities available than ever before to advance NOAA's national mission. NOAA will initiate development of the next generation of cutting-edge earth observing instruments to continue leading the world in this critical science and technology field, setting the global standards for such observations.

NOAA's current constellation has proven its worth and will continue to do so for close to another decade. While robust, NOAA must invest in the development of the next generation of environmental satellites with the needs of all of our communities in mind. Today's funding for future geostationary, low earth orbit, and space weather observations will ensure critical data continuity from legacy systems, while providing significant improvements in data and products that the U.S. requires to meet complex societal and environmental needs. Our program investments also allow us to immediately exploit the National Aeronautics and Space Administration's (NASA) research satellite observations for NOAA requirements and to integrate critical research observations into NOAA's operational mission.



With advances in technology, NOAA can build a more capable and efficient observing system, one that supports our vision to create an integrated, digital understanding of our Earth environment, that can evolve quickly to help our communities adapt and thrive, and maintain a stable and predictable budget path that avoids outyear cost growth which creates risk to both NESDIS as well as other NOAA priorities. This observing system, composed of satellites deployed by NOAA and our partners in Earth observations, including NASA, the Department of Defense (DOD), European Organisation for the Exploitation of Meteorological Satellites (EUMETSAT), and others, will provide advanced, real-time data critical to saving lives and protecting property. It will improve Earth and space weather forecasting and expand capabilities for ocean, air quality, and climate observations. It will also enable NOAA to continue long-term monitoring and continuous

services with no gaps in coverage of key climate parameters essential to understanding our changing environment.

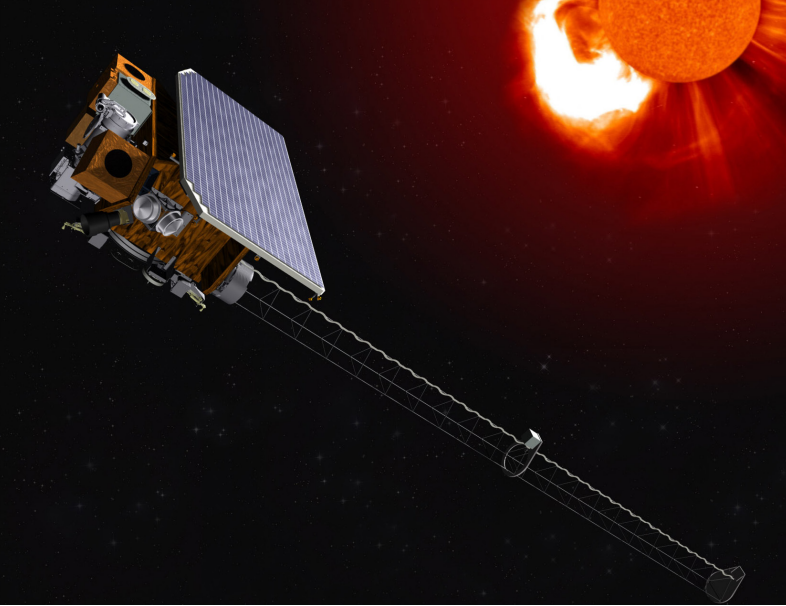
In the current world of increasing environmental changes and disasters, NOAA must invest in the next generation of satellites, products, and services to meet the demands for more accurate and expanded environmental information and services for the American public. Continuity of NOAA's current satellites and information services, exploitation of partner research observations, and implementation of NOAA's plans for enhanced observing capabilities of future satellites and for fostering vital partnerships, will directly support the entire weather enterprise and EO 14008.

NOAA's satellite observing system, viewing the Earth as well as the sun.



## Satellites

Budget Program	PPA	Program Change Title	Program Change	Page
NESDIS	Office of Satellite and Product Operations	Satellite and Product Operations Deferred and Extended Maintenance	7,500	77
NESDIS	Product Development, Readiness & Application	Advance Core Activities	8,000	78
NESDIS	Product Development, Readiness & Application	U.S. Group on Earth Observations (USGEO)	500	79
NESDIS	Geostationary Earth Orbit (GEO)	GOES-R Series Sustainment	1,000	80
NESDIS	Geostationary Earth Orbit (GEO)	Geostationary Extended Observations (GeoXO)	455,000	80
NESDIS	Low Earth Orbit (LEO)	Polar Operational Environmental Satellites (POES) Extension	-252,835	81
NESDIS	Low Earth Orbit (LEO)	LEO Weather Satellites	78,330	81
NESDIS	Low Earth Orbit (LEO)	Cooperative Data and Rescue Services (CDARS)	-13,100	81
NESDIS	Low Earth Orbit (LEO)	COSMIC-2/GNSS RO	2,208	82
NESDIS	Low Earth Orbit (LEO)	Polar Operational Environmental Satellites (POES) Extension	20,000	82
NESDIS	Space Weather Observations	Space Weather Follow On	38,785	83
NESDIS	Space Weather Observations	Space Weather Next	55,000	83
NESDIS	Common Ground Services (CGS)	Data-Source Agnostic Common Services (DACS)	25,007	83
NESDIS	Systems/Services Architecture & Engineering (SAE)	Commercial Weather Data Pilot (CWDP)	5,000	84
NESDIS	Systems/Services Architecture & Engineering (SAE)	Commercial Data Purchase (CDP)	13,000	85
NESDIS	Systems/Services Architecture & Engineering (SAE)	Joint Venture Partnerships	25,000	85
<b>Total, Satellites</b>			<b>468,395</b>	



Artist rendering of NOAA's Space Weather Follow-On-Lagrange 1 (SWFO-L1) measuring a coronal mass ejection event. SWFO-L1, scheduled to launch in February 2025, will continuously monitor signs of solar storms, which may pose harm to Earth's telecommunication networks. Credit: Ball Aerospace

## Space Weather

This request also supports additional capacity for the forecasting of space weather events, which can have far-reaching impacts on our Nation's economy, communications, and national security. An extreme space weather event can severely impact an entire hemisphere and the globe. Impacts might include disruptions to satellite communications, impacts to the terrestrial electric grid, and communication outages to cross polar airline flights, yet current observations and prediction services do not meet the needs of agencies and operators of critical infrastructure to mitigate against these events. The Space Weather Operations, Research, and Mitigation (SWORM) Interagency Working Group, which includes 34 Federal departments and agencies, identified research-to-operations and operations-to-research (R2O2R) as a critical gap in our Nation's ability to improve existing space weather forecast and warning services. To close the gap, the Promoting Research and Observations of Space Weather to Improve the Forecasting of Tomorrow Act (PROSWIFT) (Public Law 116-181) authorizes federal agencies to develop formal mechanisms to transition space weather research models and capabilities to NOAA.

In FY 2022, NOAA requests \$5 million to build towards a space weather prediction capability that will ensure national and global communities are ready for and responsive to space-weather events. For NOAA's Space Weather Prediction Center (SWPC) to improve these model forecasts,

observations, and related watches and warnings, NOAA has identified four goals: implement a formal inter-agency R2O2R Framework; develop and sustain a Space Weather Prediction Testbed; transition new capabilities onto NOAA's operational national infrastructure; and establish two PROSWIFT directed community collaboration efforts, the Space Weather Advisory Group and National Academies Roundtable on Space Weather.

To address the R2O2R gap, NOAA will partner with NASA, National Science Foundation (NSF), DOD, Department of Interior (DOI), and other Federal agencies to implement a formal framework to accelerate space weather research, observations, and model advances into NOAA operations. As a vital component of this framework, NOAA will develop and sustain the Space Weather Prediction Testbed (Testbed) that will leverage the expertise of academia, agencies, and commercial enterprise partners by fostering collaboration to validate, demonstrate, and transition emerging science and technologies into operations. In the Testbed, stakeholders participate in collaborative exercises and experiments using new capabilities under quasi-operational conditions. Following successful validation, the Testbed will demonstrate readiness and then enable the implementation of matured capabilities into NOAA operations.

NOAA will also support two community efforts: the National Academies Roundtable and the Space Weather Advisory Group (SWAG).



The Roundtable will discuss approaches and constructs on implementing the R2O2R framework and seek to identify ways to integrate relevant research from across the entire U.S. science and technology enterprise. SWAG will advise SWORM on methods to advance the space weather enterprise of the Nation by improving the coordination and facilitation of R2O2R.

## Space Weather

Budget Program	PPA	Program Change Title	Program Change	Page
NWS	Central Processing	Space Weather Research to Operations	1,000	68
NWS	Science and Technology Integration	Space Weather Research to Operations	4,000	71
<b>Total, Space Weather</b>			<b>5,000</b>	

Space weather seen at the South Pole in the form of aurora australis.





A cargo ship passes under the Sunshine Skyway Bridge in Tampa, Florida. A new air gap sensor added to Tampa Bay PORTS® will help ships pass safely below the bridge.



# National Ocean Service

NOAA's National Ocean Service (NOS) enables safe, sustainable, and efficient use of marine and coastal resources. It does so by gathering oceanographic observations and providing data to users; conducting and applying research for sustainable management, protection, and restoration of ocean and coastal resources; and using place-based approaches to achieve sound resource management. NOS's science-based products and services support coastal economic activity, reduce risk to life and property, improve effective protection and use of coastal resources, and facilitate adaptation to change.

## FY 2020 ACCOMPLISHMENTS

In FY 2020, NOS improved the quality of the data, tools, and services it provides, which support coastal economies and their contribution to the national economy. Through its dedicated efforts, NOS heavily invested in conservation and resilience efforts, improved research and monitoring of harmful algal blooms (HABs), launched groundbreaking coral restoration efforts, and improved precision navigation and maritime safety across the U.S.

NOS strengthened its investment in the National

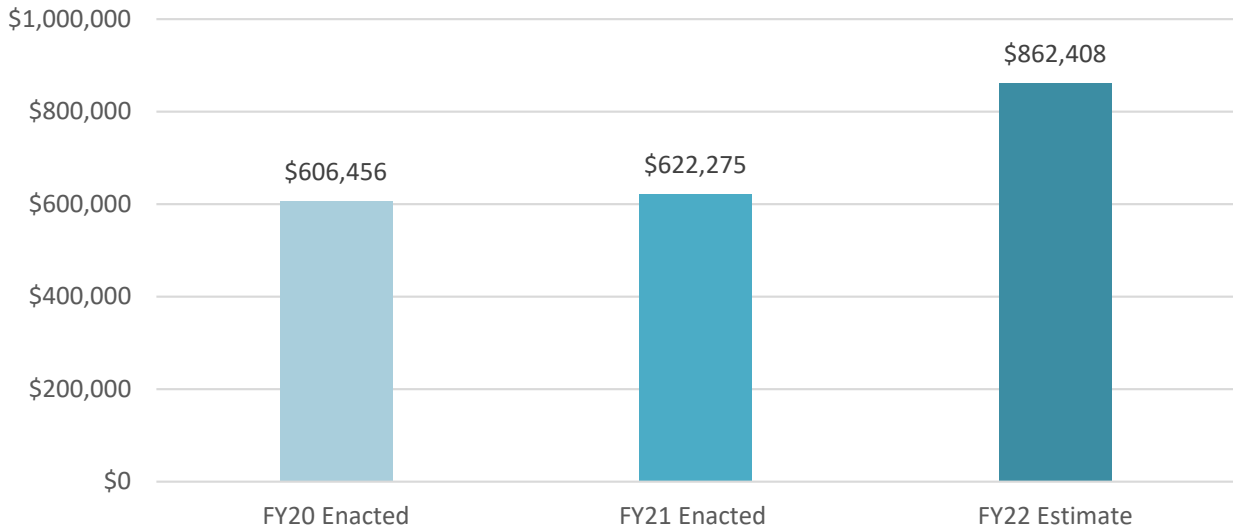
Coastal Resilience Fund, in partnership with the National Fish and Wildlife Foundation and other governmental and private partners, to fund and evaluate nature-based approaches to coastal community and ecosystem resilience through 46 new coastal resilience grants, totaling more than \$37 million. With an additional \$55 million in match from grantees, the combined conservation investment was \$92 million. NOS also funded over \$2.2 million in coastal resilience research through its Effects of Sea Level Rise (ESLR) Program, to investigate the ability of natural coastal and partially engineered or restored habitats to reduce the impacts of sea level rise and flooding, and improve the resilience of their communities. These combined efforts have directly addressed the increasing need to create and foster natural and economic resilience along the U.S. coasts, through direct financial support, expertise, and robust on-the-ground partnerships and place-based conservation activities.

HAB research and monitoring enhance the detection of HAB toxins; test the use of HAB control methods in marine and freshwater; model toxin movement through marine food webs; improve HAB forecasts; and investigate the social and economic impacts of HABs. One of the funded projects allowed the experimental Florida red tide respiratory forecast, which informs visitors of the daily severity of airborne red tide toxins at area beaches, to expand and include Sanibel Island, providing a new tool that residents and visitors can use to assess the best time to visit local beaches during red tides without endangering their own health.

NOAA and its partners announced the Mission: Iconic Reefs initiative to restore seven iconic reefs in the Florida Keys National Marine Sanctuary. Since its release in December 2019, NOAA has led briefings for stakeholders, partners, and constituents; co-hosted a congressional briefing with Florida's U.S. Senator Marco Rubio; and gained national media attention for this groundbreaking effort. In September 2020, NOAA further announced more than \$1.0 million



## NOS Discretionary Budget Trends (\$ in thousands)



for research and development, site preparation, and capacity building to support the long-term work of Mission: Iconic Reefs. These efforts provide critical support to improve reef ecosystem function and resiliency, and significantly increase public and private sector investments in stabilizing this critical system.

In FY 2020, NOS partnered with the U.S. Navy to add two new Physical Oceanographic Real Time Systems (PORTS®) near Kings Bay, GA and Portsmouth, NH. The current meters installed near Kings Bay now provide real-time data to allow U.S. Navy pilots to safely navigate vessels and Ohio-class submarines to and from the Kings Bay Submarine base, thus contributing to national security. The tide station installed as part of the Portsmouth PORTS® monitors daily tidal fluctuations, particularly during inundation/high water events, thus helping protect shipyard personnel, critical facilities, and U.S. Navy submarines. As of the end of FY 2020, NOAA had 35 operational PORTS® serving 79 U.S. seaports.

### **FY 2022 REQUEST** **\$884,628,000**

NOAA requests a total of \$884,628,000 in discretionary and mandatory funds for NOS mission functions. This total includes Operations, Research, and Facilities (ORF); Procurement, Acquisition, and Construction (PAC); and other mandatory accounts, and is a net increase of \$229,529,000 in FY 2022 program changes. This program change total includes a net increase of \$5,925,000 to restore funds that were approved to support the Weather and Climate Operational Supercomputing System (WCOS) and G550 reprogrammings not described below, but represented in the NOAA Control Table in Appendix 2.

To strengthen core research capabilities to respond to increasing demand for the data, tools, and services that this research provides, NOS will increase its investments in competitive research and extramural grants to provide critical information and predictive capabilities required to inform community adaptation and planning to coastal inundation and sea level rise. These

efforts will help NOAA meet the Administration's climate research goals, including Executive Order (EO) 14008 on *Tackling the Climate Crisis at Home and Abroad*, and are critical to ensuring NOAA produces data, tools, and services that are publically accessible to facilitate climate change decision-making nationwide.

Measuring and predicting climate change impacts are core to NOAA's mission. The FY 2022 request prioritizes core climate-related functions within NOS such as monitoring ecological change, providing accurate national water level models, building climate outlook capabilities to better evaluate flood risks, providing complete continental U.S. coverage for a robust climate forecast capability, and better preparing coastal communities for disasters. The increases will allow NOS to expand, renew, and improve its contributions to comprehensive environmental observing and forecasting systems to better support climate change-related decision-making, and ultimately meet the Administration's climate science goals, including those in EO 14008, through improved observations and forecasting for the American public.

Investments in ecological restoration and community resilience are integral to NOAA's climate strategy, and there is an increasing need for NOAA to create and foster natural and economic resilience along our coasts through our direct financial support, expertise, robust, on-the-ground partnerships, and place-based conservation activities. In FY 2022, NOS will directly respond to the increasing need for NOAA to create and foster natural and economic resilience along our coasts through support, expertise, and robust, on-the-ground partnerships and place-based conservation activities. NOS will expand restoration and resilience efforts in ecosystems and communities, assess place-based climate vulnerability, support engagement with local partners to strengthen conservation in existing National Marine Sanctuaries and Marine National Monuments (where we are co-managers), and assess new sites for

sanctuary designation. As outlined in EO 14008, these ecological restoration and community resilience efforts are integral to NOAA and the Administration's climate strategy.

NOAA proposes to develop a framework and lay the foundation for successfully integrating equity across the organization, from management, to policies, to service-delivery. In FY 2022, NOS will advance racial equity through products and services for coastal resilience. NOS will make specific and systemic changes to engagement, service delivery, and training to equip coastal communities, especially those with underserved populations, with improved capacity to address coastal hazards. In doing so, NOS further aligns NOAA with the Administration priority of advancing environmental justice and equity, and supports EO 13985 on *Advancing Racial Equity and Support for Underserved Communities Through the Federal Government* by developing a framework and laying the foundations for successfully integrating equity across the organization to reach a broader range of Americans in underserved or disadvantaged communities.

To strengthen core research capabilities to respond to increasing demand for the data, tools, and services that this research provides, NOS will increase its investments in competitive research and extramural grants to provide critical information and predictive capabilities required to inform community planning and adaptation to coastal inundation and sea level rise. These efforts will help NOAA meet the Administration's climate research goals, including EO 14008, and are critical to ensuring NOAA produces data, tools, and services that are publically accessible to facilitate climate change decision-making nationwide.

Program changes are highlighted below. A summary of funding by Program, Project, and Activity is located in Appendix 2. Detailed descriptions of the program changes below are located in the NOAA FY 2022 Congressional Justification.

## FY 2022 ORF BUDGET SUMMARY

NOAA requests a total of \$853,908,000 to support the ORF activities of the NOS, reflecting a net increase of \$229,529,000 in FY 2022 program changes.

### NAVIGATION, OBSERVATIONS AND POSITIONING \$288,096,000

NOAA requests a net increase of \$51,491,000 in program changes for a total of \$288,096,000 in the Navigation, Observations, and Positioning activity. Funds in this activity will support physical oceanographic observations and applications for the safe and efficient use of coastal waterways. Program changes include:

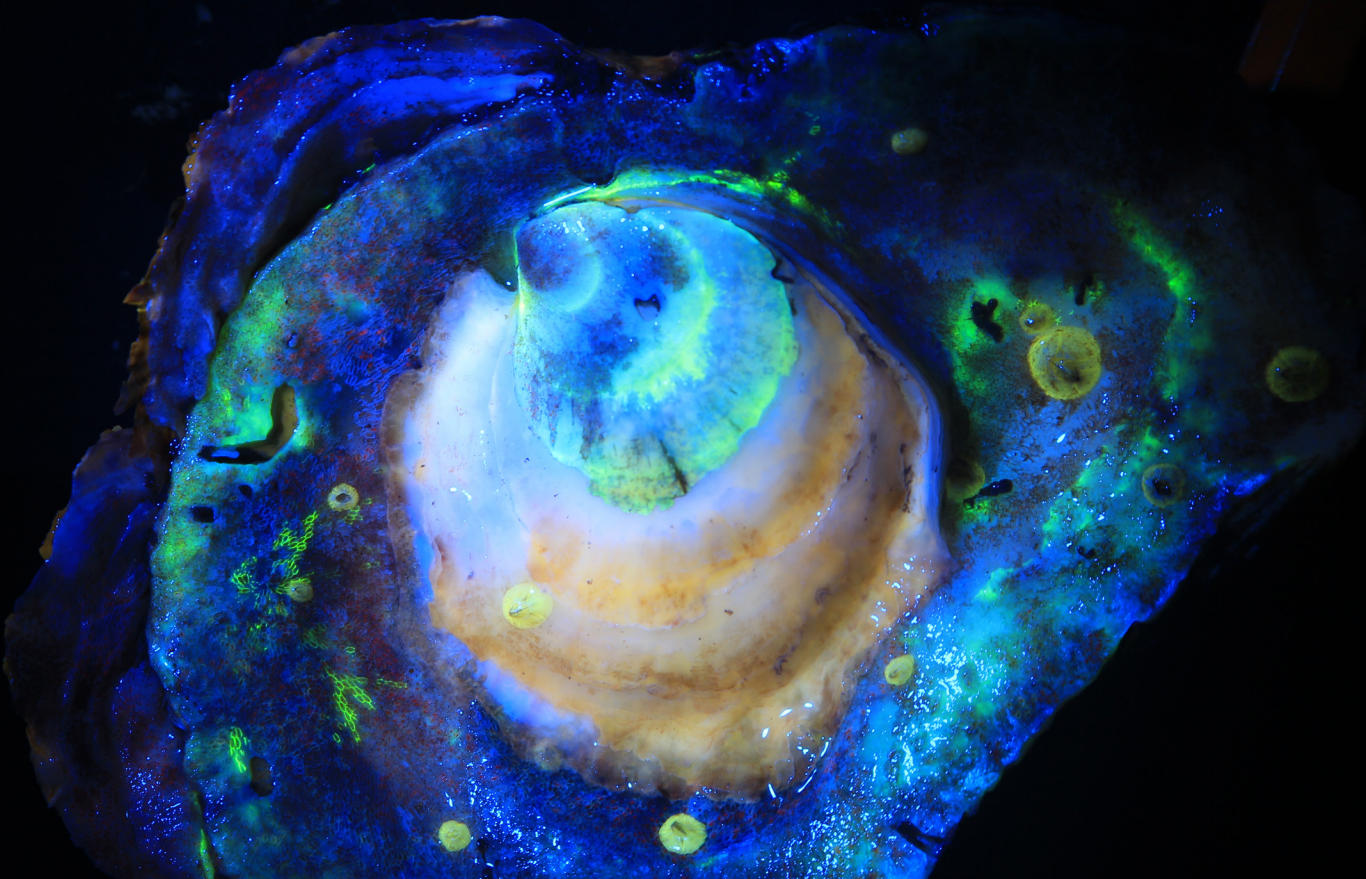
#### Navigation, Observation, and Positioning: Modernizing NOAA's Foundational Geospatial Positioning Framework and Water Level Observations for Climate Decision Support:

NOAA requests \$10,000,000 to advance the modernization of the National Spatial Reference System, and expand, modernize, and recapitalize the National Water Level Observation Network. The resulting accurate national water level models, real-time inundation alerts, high tide flooding outlooks, and long-term sea level trends will provide authoritative information for climate decision support.

#### Navigation, Observation, and Positioning: Building Climate Outlook Capabilities into a Next-Generation Coastal Inundation

**Dashboard:** NOAA requests \$5,000,000 to create a national operational climate inundation outlook, the Next-Generation Coastal Inundation Dashboard, by integrating and operationalizing high tide flood, sea level trend, and vertical land motion information into one capability. This will enable coastal decision-makers to evaluate their flood risk at a local level and evaluate at varying time scales.

This oyster is one of many oyster larvae researchers of the Cooperative Oxford Laboratory in Oxford, Maryland released directly onto an open water oyster reef. This can be confirmed by the calcein fluorescent dye "tag," shown here glowing under special light.





**Navigation, Observation, and Positioning: Complete National Coastal Modeling Coverage:** NOAA requests \$5,000,000 to complete its operational coastal oceanographic modeling system, providing complete continental U.S. coverage for a robust climate forecast capability.

**Navigation, Observation, and Positioning: Fostering Ecological Resilience Through Conservation Action:** This request for a \$2,000,000 increase is one of three complementary requests that are required to convert the increasing number of observations into implementable conservation actions, and ensure that coastal communities receive the full suite of scientific support from NOAA programs and interagency partners to inform local management decisions. These funds would support the establishment of a Marine Life Program.

**Navigation, Observation, and Positioning: Enterprise Infrastructure Solutions (EIS):** NOAA requests an increase of \$1,000,000 to enable NOAA to conduct technology modernization and support an accelerated transition of telecommunications services to the General Services Administration's (GSA) EIS contract vehicle.

**Navigation, Observation, and Positioning: Data Management and Cyberinfrastructure (DMAC):** NOAA requests an increase of \$2,000,000 to enhance data management, data processing, and product development integral to creating environmental data time series that can be used to analyze climate change. The enhanced system architecture is needed to match the increased data collection and modeling efforts across NOAA to enhance regional operational forecast systems and data products for living marine resource management needs.

**Navigation, Observation, and Positioning: Decrease Congressionally Directed Regional Geospatial Modeling Grants:** NOAA proposes a decrease of \$5,396,000 in funding for the



These two cameras in Buxton, North Carolina, and Miami, Florida, were part of the Web Camera Application Testbed (WebCAT), a pilot project for the Webcams for Coastal Observations and Operational Support (WebCOOS) observing network. These cameras have the potential to show material evidence of harmful algal blooms on shore. The transition from WebCAT to WebCOOS is supported by a FY 2020 Ocean Technology Transition grant. Credit: Surfline, Inc.

Regional Geospatial Modeling Grants program. NOAA will continue to support a range of other regional geospatial requirements through NOS's Coastal Zone Management and Services and Navigation, Observations and Positioning program activities. However, several states will likely lose grant funding that supports their Continuously Operating Reference Stations (CORS).

**IOOS Regional Observations: Monitoring Ecological Change Through Observing Systems:** NOAA request an increase of \$15,000,000 for the IOOS Regional Associations to provide critical support for the U.S. Marine Biodiversity Observation Network, a collaboration between NOAA, the National Aeronautics and Space Administration, the Bureau of Ocean Energy Management, and the Animal Telemetry Network, which is focused on understanding the life histories of endangered, threatened, and commercially harvested marine resources in a changing ocean.

**IOOS Regional Observations: Advancing Coastal and Ocean Modeling and Prediction:** NOAA requests an increase of \$10,000,000 in grant funding to enhance integrated coastal

modeling applications to benefit marine navigation and protect human health.

**IOOS Regional Observations: Coastal Moorings with Ecological Monitoring:** NOAA requests an increase of \$4,000,000 in grant funding to improve NOAA's infrastructure to monitor, predict, and understand environmental conditions driving ecosystem variability and change through the IOOS-regional coastal mooring network.

### **COASTAL SCIENCE AND ASSESSMENT \$154,327,000**

NOAA requests an increase of \$45,160,000 in program changes for a total of \$154,327,000 in the Coastal Science and Assessment activity. Funds in this activity will support applied research and scientific information for disaster response and management, protection, and restoration of ocean and coastal resources. Program change increases include:

**Coastal Science, Assessment, Response and Restoration: Prepare Coastal Communities for Disasters:** NOAA requests an increase of \$12,000,000 to build continuity and response capacity, and initiate a nationwide refresh of its Environmental Sensitivity Index maps and data in order to improve its disaster readiness and response posture for climate-related and other coastal disasters as they become more frequent and intense.

**Coastal Science, Assessment, Response and Restoration: Enhancing Community Based Marine Debris Prevention, Removal, and Research:** NOAA requests an increase of \$9,000,000 to increase its nationwide competitive funding opportunities for marine debris prevention, removal, and research.

**Coastal Science, Assessment, Response and Restoration: Fostering Ecological Resilience through Conservation Action:** This request for a \$2,000,000 increase is one of three complementary requests that are required to

convert the increasing number of observations into implementable conservation actions and ensure that coastal communities receive the full suite of scientific support from NOAA programs and interagency partners to inform local management decisions. These funds will allow the National Centers for Coastal Ocean Science to characterize and monitor marine ecosystems and living marine resources, as well as prioritize and synthesize long-term data collections and target modeling to inform adaptation strategies.

**Coastal Science, Assessment, Response and Restoration: Enterprise Infrastructure Solutions (EIS):** NOAA requests an increase of \$900,000 to enable NOAA to conduct technology modernization and support an accelerated transition of telecommunications services to the GSA EIS contract vehicle.

**Competitive Research: Nature-based Solutions to Enhance the Resilience of Coastal Ecosystems:** NOAA requests an increase of \$20,000,000 to expand its Competitive Research Program and extramural grant program Effects of Sea Level Rise to provide the critical information and predictive capabilities required to inform community planning and adaptation to coastal inundation under sea level rise. This effort will also seek to expand its ongoing partnerships and initiate new projects explicitly focused on conducting work with underserved communities.

### **OCEAN AND COASTAL MANAGEMENT AND SERVICES \$411,485,000**

NOAA requests an increase of \$132,878,000 in program changes for a total of \$411,485,000 in the Ocean and Coastal Management and Services activity. Funds in this activity will support place-based, community, and regional approaches to achieve sound management and sustainable use of coastal and marine resources. This total includes an investment to accelerate the economic benefits of new National Marine Sanctuaries. Program change increases include:





Masked Boobies perch atop green sea turtles at the Papahānaumokuākea Marine National Monument.

**Coastal Zone Management and Services:  
Advancing Racial Equity through NOS  
Products and Services for Coastal Resilience:**

NOAA requests an increase of \$9,000,000 to make specific and systemic changes to engagement, service delivery, and training to equip coastal communities, especially those with underserved populations, with improved capacity to address coastal hazards. NOAA will build upon its existing suite of coastal resilience products and services, including through the expansion of equity assessments and analysis of that data, to ensure more equitable access and greater usability for a broader portion of the coastal population.

**Coastal Zone Management and Services:  
Regional Coastal Resilience Communities  
of Practice:** NOAA requests an increase of \$7,500,000 to reinforce and empower existing

resilience Communities of Practice with sustained funding, and establish new regionally based ones where needed, to translate climate data and information into tools, services, and training that can be used for decision-making.

**Coastal Zone Management and Services:  
Enterprise Infrastructure Solutions (EIS):**

NOAA requests an increase of \$300,000 to conduct technology modernization and support an accelerated transition of telecommunications services to the GSA EIS contract vehicle.

**Coastal Zone Management Grants: Increasing  
Community Resilience Through Coastal  
Management Grants:** NOAA requests an increase of \$30,000,000 for its Coastal Zone Management Grants to enable approved coastal programs to better prepare for and become





The Coral Restoration Foundation, CRF™ elkhorn coral outplants at Carysfort Reef showing growth from 2017 (left) to 2019 (right). The CRF™ is a key partner to restore seven iconic reefs in Florida Keys National Marine Sanctuary. Credit: Alexander Neufeld/CRF™

more resilient to storms, flooding and inundation, erosion, sea-level rise and lake-level changes, tsunamis, and other natural hazards that affect the U.S. coastlines.

**National Oceans and Coastal Security Fund: Increasing Coastal Resilience through Nature-Based Approaches:** NOAA requests an increase of \$34,000,000 for the National Coastal Resilience Fund, in partnership with the National Fish and Wildlife Foundation, to restore, increase, and strengthen natural infrastructure to protect coastal communities while also enhancing habitats for fish and wildlife. This request will also increase support for communities most vulnerable to climate impacts, including those who have historically been underserved and often lack access to resources.

**Coral Reef Program: Reducing Climate Threats to Coral Reefs:** NOAA requests an increase of \$10,000,000 to expand research and data collection on Stony Coral Tissue Loss Disease. The Coral Reef Conservation Program would prioritize grants for projects that focus on addressing the disease, reducing the threat of climate change, and restoring coral reefs, particularly in priority coral reef regions and watersheds.

**National Estuarine Research Reserve System: Place-based Resilience Training, Education, and Research:** NOAA requests an increase of \$14,000,000 to improve management of the 29 National Estuarine Research Reserves, including through enhanced monitoring of climate change impacts on these sensitive estuarine ecosystems and increased opportunities to educate and train local students and community members.

**Sanctuaries and Marine Protected Areas: Assessing Place-based Climate Vulnerability for Conservation Action:** NOAA requests an increase of \$23,500,000 to support NOAA's multifaceted approach to address place-based climate vulnerability by bolstering its sanctuary system through research, monitoring, restoration, permitting, community engagement, and interagency partnerships, all of which will better inform local management decisions.

**Sanctuaries and Marine Protected Areas: Fostering Ecological Resilience through Conservation Action:** This request for a \$2,000,000 increase is one of three complementary requests to convert NOAA's increasing observations into implementable conservation actions and incorporate them into sanctuary management plans; ensure that coastal

communities receive the full suite of scientific information from NOAA programs; and inform local management decisions.

**Sanctuaries and Marine Protected Areas: Enterprise Infrastructure Solutions (EIS):**

NOAA requests an increase of \$800,000 to conduct technology modernization and support an accelerated transition of telecommunications services to the GSA EIS contract vehicle.

## FY 2022 PAC BUDGET SUMMARY

NOAA requests a total of \$8,500,000 to support the PAC activities of the NOS, which is equal to its FY 2021 Enacted funding level.

## MANDATORY FUNDS

### DAMAGE ASSESSMENT AND RESTORATION REVOLVING FUND

The Damage Assessment and Restoration Revolving Fund was established in 1990 under Section 1012(a) of the Oil Pollution Act to facilitate (1) natural resources damage assessments and (2) restoration, replacement, or acquisition of injured or lost natural resources, including resources of National Marine Sanctuaries and National Estuarine Research Reserves, tidal wetlands, and other habitats for which NOAA is a trustee. The fund receives proceeds from claims against responsible parties as determined through court settlements or agreements.

### SANCTUARIES ENFORCEMENT ASSET FORFEITURE FUND

The Sanctuaries Enforcement Asset Forfeiture Fund receives proceeds from civil penalties and forfeiture claims against responsible parties, as determined through court settlements or agreements, for violations of NOAA sanctuary regulations. Penalties received are spent on resource protection within a sanctuary in which the violation occurred.

### GULF COAST ECOSYSTEM RESTORATION SCIENCE, OBSERVATION, MONITORING, AND TECHNOLOGY FUND

The Gulf Coast Ecosystem Restoration Science, Observation, Monitoring, and Technology Fund provides funding for the NOAA RESTORE Science Program. The purpose of this program is to initiate and sustain an integrative, holistic understanding of the Gulf of Mexico ecosystem and support restoration efforts and the long-term sustainability of the ecosystem.





A biologist from the Southwest Fisheries Science Center watches through a special bubble window of the survey plane for marine life below.



# National Marine Fisheries Service

NOAA's National Marine Fisheries Service (NMFS) is responsible for the stewardship of the Nation's ocean resources and their habitat. We provide vital services for the Nation, which ensure: productive and sustainable fisheries, safe sources of seafood, the recovery and conservation of protected resources, and healthy coastal habitats—all backed by sound science and an ecosystem-based approach to management. NMFS manages 460 marine and anadromous fish stocks within the U.S. Exclusive Economic Zone (EEZ), as well as invertebrates, sea turtles, marine mammals, and other marine and coastal species and their habitats. The work of NOAA and our partners promotes trade, jobs, and industry growth in commercial and recreational fisheries, aquaculture, tourism, and resource use, while protecting various marine species from extinction. U.S. commercial and recreational saltwater fishing provides significant contributions to our economy, which include 1.7 million jobs, \$212 billion in sales impacts, \$64 billion in income impacts, and almost \$100 billion

in value-added impacts to the U.S. economy.<sup>1</sup>

## FY 2020 ACCOMPLISHMENTS

NMFS continues to lead in the precedent-setting review and analysis of offshore wind energy development. Working under strict One Federal Decision timelines, the NMFS Greater Atlantic Regional Fisheries Office (GARFO) Wind Team has substantially improved the quality of environmental analyses required under the National Environmental Policy Act, and set a high standard for future projects. The GARFO Wind Team created ways to streamline data requests from stakeholders, such as developing quantitative tools to assess the potential impact of wind projects on benthic habitat, fisheries, and protected species. This streamlining will help GARFO to address the quickly growing number of proposed wind energy development projects.

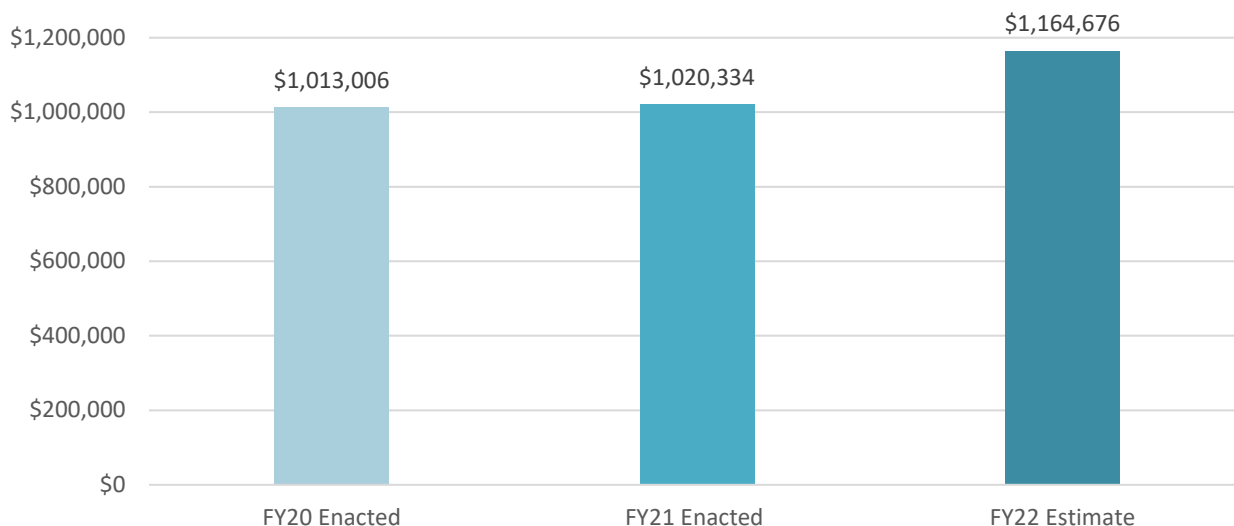
Since the pandemic resulted in reduced research vessel surveys that support stock assessments over the past year, the Alaska Fisheries Science Center leveraged technology to fill data gaps. Building on several years of research and development, Center scientists and partners used uncrewed sailing drones to gather critical data in an area normally surveyed by crewed research vessels to inform the commercially important pollock stock assessment and 2021 catch limits. Similarly, optical systems developed by Pacific Island scientists enabled data collection for the Main Hawaiian Islands bottomfish. NOAA used artificial intelligence and machine learning approaches to analyze the data and incorporate results into stock assessments.

NMFS has continued to take significant steps toward the recovery of the endangered species

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<sup>1</sup> National Marine Fisheries Service. 2018. Fisheries Economics of the United States, 2016. U.S. Dept. of Commerce, NOAA Tech. Memo. NMFS-F/SPO-187. <https://www.fisheries.noaa.gov/resource/document/fisheries-economics-united-states-report-2016>.

## NMFS Discretionary Budget Trends (\$ in thousands)



designated as Species in the Spotlight. This initiative has helped to raise species' profiles, maintain interest, and draw new partners and projects to the effort. Examples of recent success with our partners include major strides in white abalone outplanting, improved access for Atlantic salmon to historic habitat in approximately 250 miles of streams and rivers, and signs of early success for winter-run Chinook salmon in California. North Atlantic right whales were recently designated as a Species in the Spotlight, complementing an extensive coordination effort with stakeholders to develop a rulemaking package to advance recovery and conservation of this critically endangered species.

Marine aquaculture supports our Nation's seafood production and economy. In FY 20, NOAA fostered aquaculture production at the local level by beginning the process to create Aquaculture Opportunity Areas (AOAs). AOAs enable a more focused evaluation of potential aquaculture development in specific regions that are well suited to aquaculture production.

In 2020, NMFS implemented a program expected to increase recreational fishing opportunities, management flexibility, and economic benefits

for private anglers targeting red snapper in the Gulf of Mexico states of Louisiana, Mississippi, Alabama, Florida, and Texas. This program transfers some management authority for recreational fishing of red snapper in Gulf federal waters to these states. Red Snapper management is further enhanced by the results of the Great Red Snapper Count (GRSC), a groundbreaking study to independently estimate the population size of the Gulf red snapper stock. NMFS will work with GRSC investigators to provide scientific advice for adjusting the annual catch limit in light of these results.

### FY 2022 REQUEST \$1,197,458,000

NOAA requests a total of \$1,197,458,000 in discretionary and mandatory funds to continue and enhance the operation of NMFS. This total includes Operations, Research, and Facilities (ORF) and other accounts, and is a net increase of \$114,009,000 in FY 2022 program changes. This program change total includes a net increase of \$9,877,000 to restore funds that were approved to support the Weather and Climate Operational Supercomputing System (WCOSS)

and G550 reprogrammings not described below, but represented in the NOAA Control Table in Appendix 2.

NOAA proposes to develop a framework and lay the foundation for successfully integrating equity across the organization, from management, to policies, to service-delivery. In FY 2022, NMFS proposes new programs that provide education, outreach, and workforce training focused on environmental justice and equity to support more robust and diverse fishing and seafood sectors. NOAA also seeks to enhance fisheries science and management in U.S. Pacific and Caribbean territories, and expand decision-support tools to address environmental justice, climate vulnerability, and racial equity in underserved coastal communities. NOAA is aligned with the Administration priority of advancing environmental justice and equity, and will further support EO 13985 on *Advancing Racial Equity and Support for Underserved Communities Through the Federal Government* through these investments.

To strengthen core research capabilities to respond to increasing demand for the data, tools, and services that this research provides, NMFS will focus on initiatives that boost climate-ready fisheries research and monitor climate vulnerable species under the Endangered Species Act (ESA) and the Marine Mammal Protection Act (MMPA). NMFS will integrate climate science into assessment and management efforts in order to better understand and respond to the impacts of climate change on fisheries, ecosystems, and communities. This request will support the Administration's climate science goals, including those in EO 14008 on *Tackling the Climate Crisis at Home and Abroad*, by providing decision-makers with the information and tools they need to prepare for and respond to climate change nationwide.

Investments in ecological restoration and community resilience are integral to NOAA's climate strategy, and there is an increasing need for NOAA to create and foster natural and economic resilience along our coasts through

our support, expertise, robust, on-the-ground partnerships, and place-based conservation activities. In FY 2022, NMFS will expand investment in large-scale habitat restoration projects to help build climate resilience for coastal ecosystems and communities around the country. Ecological restoration and community resilience, as outlined in EO 14008, are integral to NOAA and the Administration's climate strategy.

Offshore wind development is rapidly expanding and represents a new use of our marine waters requiring substantial scientific and regulatory review. To support NOAA's role in achieving the Administration's goal to deploy 30 GW of offshore wind in the U.S. EEZ by 2030, while protecting biodiversity and promoting ocean co-use, the requested funds would expand capacity for assessing and minimizing the impacts of offshore wind activities on marine species and habitats, reduce delays and minimize adverse economic impacts to the fishing industry and coastal communities, and mitigate impacts to fisheries surveys. These activities are essential to facilitating offshore wind energy development as a climate change mitigation strategy while protecting communities, setting quotas for commercial and recreational fishermen, and monitoring and assessing the recovery and conservation programs for protected species and essential fish habitat.

Program changes are highlighted below. A summary of funding by Program, Project, and Activity is located in Appendix 2. Detailed descriptions of the program changes below are located in the NOAA FY 2022 Congressional Justification.

## FY 2022 ORF BUDGET SUMMARY

NOAA requests a total of \$1,099,327,000 to support the ORF activities of NMFS, reflecting a net increase of \$114,009,000 in FY 2022 program changes.





A female North Atlantic right whale “side feeds” with her calf by her side. These critically endangered whales are one of NOAA’s Species in the Spotlight.

## **PROTECTED RESOURCES SCIENCE AND MANAGEMENT \$237,127,000**

NOAA requests an increase of \$25,355,000 in program changes for a total of \$237,127,000 in the Protected Resources Science and Management activity. These funds will support activities to assess, understand, and protect the health of protected species, the ecosystems that sustain them, and the communities that value and depend on them. Program change increases include:

**Marine Mammals, Sea Turtles, and Other Species: Climate Vulnerable Species under ESA and MMPA:** NOAA requests an increase of \$10,000,000 to support the integration of climate science into protected species management and assessments to address the impacts of climate change on marine mammals and threatened or endangered species. As climate change alters marine and coastal ecosystems, we expect many species to become vulnerable, likely resulting in an increase in the number of petitions to list species under the ESA. To prepare and respond to these changes, NOAA will carry out research to increase our understanding of climate impacts on protected species and implement actions to

help protected species become more adaptable and resilient to climate change.

### **Marine Mammals, Sea Turtles, and Other Species: Wind Energy: Protected Species Environmental Reviews and Science:**

NOAA requests an increase of \$3,197,000 to assess the effects of planned offshore energy activities on Endangered Species Act (ESA) listed species and critical habitat, coordinate Marine Mammal Protection Act (MMPA) incidental take authorizations, and conduct review of environmental impact statements (EIS) analyzing the impacts to living marine resources and affected communities under the National Environmental Policy Act (NEPA). Offshore wind development is rapidly expanding and represents a new use of our marine waters requiring substantial scientific and regulatory review. NOAA is requesting a total of \$20,380,000 in four complementary areas to support wind energy development and mitigate potential impacts of offshore energy projects.

**Species Recovery Grants: Species Recovery Grants Program:** NOAA requests an increase of



\$10,000,000 to increase tribal and state capacity for species recovery. States and tribes have management authorities and responsibilities for protected species within their jurisdictions and, as such, they are uniquely qualified to partner with NMFS in the implementation of recovery actions for listed species.

### **FISHERIES SCIENCE AND MANAGEMENT \$684,765,000**

NOAA requests an increase of \$47,360,000 in program changes for a total of \$684,765,000 in the Fisheries Science and Management activity. These funds will support scientific and management activities to ensure the sustainability of the Nation's marine fishery resources. Program changes include:

**Fisheries and Ecosystem Science Programs and Services: Climate-Ready Fisheries: Climate-Informed Fisheries Assessments and Management Strategies for Changing Oceans:** NOAA requests an increase of \$10,000,000 as part of the NOAA cross line office Climate

Fisheries Initiative (CFI) to support the expanded production, delivery, and use of climate science in fisheries assessments and management to address the impacts of climate change on marine resources, fisheries, and the many businesses and communities that depend on them. With these funds, NOAA will establish a nationwide ocean modeling and decision support system that provides decision-makers with climate-informed advice on changing ocean conditions, impacts on marine resources, and best management strategies to reduce impacts and increase economic resilience.

**Fisheries and Ecosystem Science Programs and Services: Wind Energy: Fisheries Science & Technical Reviews:** NOAA requests an increase of \$3,648,000 to assess the effects of planned offshore energy activities on fish, fisheries, and ecosystems. Funds will advance scientific understanding of the interaction of offshore wind on NOAA trust resources to help inform the regulatory review process. Offshore wind development is rapidly expanding and



Northeast Fisheries Science Center's Cooperative Research staff measures an Atlantic cod during a spring Gulf of Maine longline survey.

represents a new use of our marine waters requiring substantial scientific and regulatory review. NOAA is requesting a total of \$20,380,000 in four complementary areas to support wind energy development and mitigate potential impacts of offshore energy projects.

**Fisheries and Ecosystem Science Programs and Services: Advancing and Improving Territorial Fisheries Science and Management:** NOAA requests an increase of \$3,000,000 to increase science and management efforts for economically and culturally significant fisheries located within U.S. Pacific and Caribbean territories. Several fisheries are at risk of overfishing and immediately require bolstering of current science and management efforts. Local territorial fisheries agencies will benefit greatly from additional resources and support to address gaps in effective reporting, data collection, and complementary management measures.

**Fisheries and Ecosystem Science Programs and Services: Community Social Vulnerability Indicators (CSVI) Toolbox:** NOAA requests an increase of \$1,000,000 to expand the CSVI Toolbox – an interactive, online GIS-based decision-making tool – to include new metrics that consider environmental justice, climate change concerns, and racial equity in underserved coastal communities. The toolbox will provide robust social, economic, and climate change indicators that uniquely characterize and evaluate a community’s vulnerability and resilience to disturbances (e.g., extreme weather, oil spills, sea level rise), and additional funding will enhance understanding of community-level physical threats from climate change and its impacts.

**Fisheries and Ecosystem Science Programs and Services: Enterprise Infrastructure Solutions:** NOAA requests an increase of \$200,000 to conduct technology modernization and support an accelerated transition of telecommunications services to the General Services Administration’s (GSA) Enterprise Infrastructure Solutions (EIS) contract vehicle.

**Fisheries Data Collections, Surveys and Assessments: Climate-Ready Fisheries: Advancing Fisheries Survey Capacity for Commercially and Recreationally Valuable Species:** NOAA requests an increase of \$10,000,000 for surveys, sampling, and analysis capabilities to better track species that are shifting their distributions due to climate change, while working to restore survey days at sea (DAS) for fish and protected species to levels that were performed in the recent past. Surveys are core to our fisheries and protected species management mission. The data gathered through surveys informs stock assessments, management actions, and predictions of future trends. Funds will primarily be used to acquire survey capacity to increase the geographic extent of surveys and collect more climate and environmental data by purchasing supplemental DAS on NOAA ships and chartered vessels, and by investing in advanced sampling technologies (e.g., Saildrone, DriX) to augment survey capacity using innovative approaches.

**Fisheries Data Collections, Surveys and Assessments: Wind Energy: Scientific Survey Mitigation:** NOAA requests an increase of \$8,380,000 to begin a program to mitigate the adverse effects of planned offshore energy activities on NMFS scientific surveys. This initial investment will enable NMFS to begin identifying and developing new survey approaches and data streams for scientific surveys that will be disrupted by offshore wind energy development. Offshore wind development is rapidly expanding and represents a new use of our marine waters requiring substantial scientific and regulatory review. NOAA is requesting a total of \$20,380,000 in four complementary areas to support wind energy development and mitigate potential impacts of offshore energy projects.

**Observers and Training: Northeast Multispecies Fishery:** NOAA requests a decrease of \$3,448,000 for the Northeast At-Sea Monitoring Program (ASM). Using prior year appropriations, NOAA will cover all industry costs





Researchers number the shells of juvenile white abalone – one of NOAA’s Species in the Spotlight – in preparation for outplanting (transplanting from the nursery back to their natural habitat).

for at-sea monitoring and data processing in fishing year 2021 (May 1, 2021, through April 30, 2022). NOAA will fully fund ASM costs for fishing year 2022, consistent with recent Congressional direction.

**Fisheries Management Programs and Services: Wind Energy: Fisheries**

**Management:** NOAA requests an increase of \$5,155,000 to conduct the environmental reviews necessary to assess the effects of planned offshore energy activities on fisheries, living marine resources, and affected communities. Funds will allow NMFS to efficiently and effectively carry out increased fisheries environmental reviews, including Essential Fish Habitat (EFH) consultations and review of environmental impact statements (EIS), associated with new offshore energy activities. Offshore wind development is rapidly expanding and represents a new use of our marine waters requiring substantial scientific and regulatory review. NOAA is requesting a total of \$20,380,000 in four complementary areas to support wind energy development and mitigate potential impacts of offshore energy projects.

**Fisheries Management Programs and Services: Education and Outreach for Diverse Participation in Regulatory and Science**

**Process:** NOAA requests an increase of \$2,000,000 to implement training programs that

would provide fishing and seafood constituents the information and tools needed to confidently and productively engage in fishery (commercial, recreational, aquaculture) management decision processes. Very few new constituents participate in the fishery management process, and among those who do participate there is a lack of understanding of the scientific underpinnings and the public processes for regulatory actions. By targeting outreach to underserved and underrepresented communities, NMFS will provide these training opportunities to a more diverse group of new participants. This initiative will benefit both the agency and stakeholders by improving cooperation and trust among industry, the public, scientists, and regulators.

**Fisheries Management Programs and Services: Workforce Training to Support the Seafood Industry:**

NOAA requests an increase of \$1,000,000 to implement a series of workforce development and training pilot projects and grants, focused on environmental justice and equity, to support a more robust and diverse domestic seafood sector. The requested funds will support workforce development and training efforts through partnerships with entities serving diverse and historically underserved communities, including but not limited to Historically Black Colleges and Universities and other minority serving institutions.

**ENFORCEMENT \$77,731,000**

NOAA requests a total of \$77,731,000 in the Enforcement activity. There are no program changes requested for this activity. These funds support the work of NOAA’s Office of Law Enforcement in enforcing NOAA’s natural resource protection laws and promoting compliance with Federal regulations to conserve and protect our Nation’s living marine resources and their natural habitat.

**HABITAT CONSERVATION AND RESTORATION \$99,704,000**

NOAA requests an increase of \$40,572,000 in program changes for a total of \$99,704,000 in the



Louisiana's Queen Bess Island dedication NOAA and partners.

Habitat Conservation and Restoration activity. These funds will support NOAA's programs that protect and restore habitat to sustain fisheries, recover protected species, and maintain resilient coastal ecosystems and communities. Program changes include:

**Habitat Conservation and Restoration: Large Scale Habitat Restoration to Build Climate Resilience:** NOAA requests an increase of \$40,000,000 to develop a competitive process to select and implement large-scale habitat restoration projects that rebuild sustainable fisheries, contribute to the recovery of protected species, and build climate resilience for coastal ecosystems and communities around the country. NMFS will partner with non-Federal entities to restore thousands of acres of coastal wetlands and open riverways to re-establish access to fisheries habitat and restore natural resilience of healthy ecosystems. This level of funding will enable NMFS to accelerate landscape-scale habitat restoration implemented directly with partners in coastal communities.

## DISCRETIONARY FUNDS

### PACIFIC COASTAL SALMON RECOVERY FUND

The Pacific Coastal Salmon Recovery Fund was established by Congress in FY 2000 to

protect, restore, and conserve Pacific salmon and steelhead and their habitats through competitive funding to states and Tribes. NOAA requests \$65,000,000 for this program in FY 2022.

### FISHERIES DISASTER ASSISTANCE

Fisheries Disaster Assistance provides support for addressing the economic and social effects of a commercial fishery failure, for activities to restore the fishery or prevent a similar failure in the future, and for assisting fishing communities. If the Secretary of Commerce determines that a fishery disaster has occurred, Congress may appropriate funds for disaster assistance, which are administered by the Secretary.

### FISHERMEN'S CONTINGENCY FUND

The Fishermen's Contingency Fund allows NOAA to compensate U.S. commercial fishermen for damage or loss of fishing gear, vessels, or revenues caused by oil and gas-related obstructions in any area of the Outer Continental Shelf. The funds are derived from fees collected annually by the Secretary of the Interior.

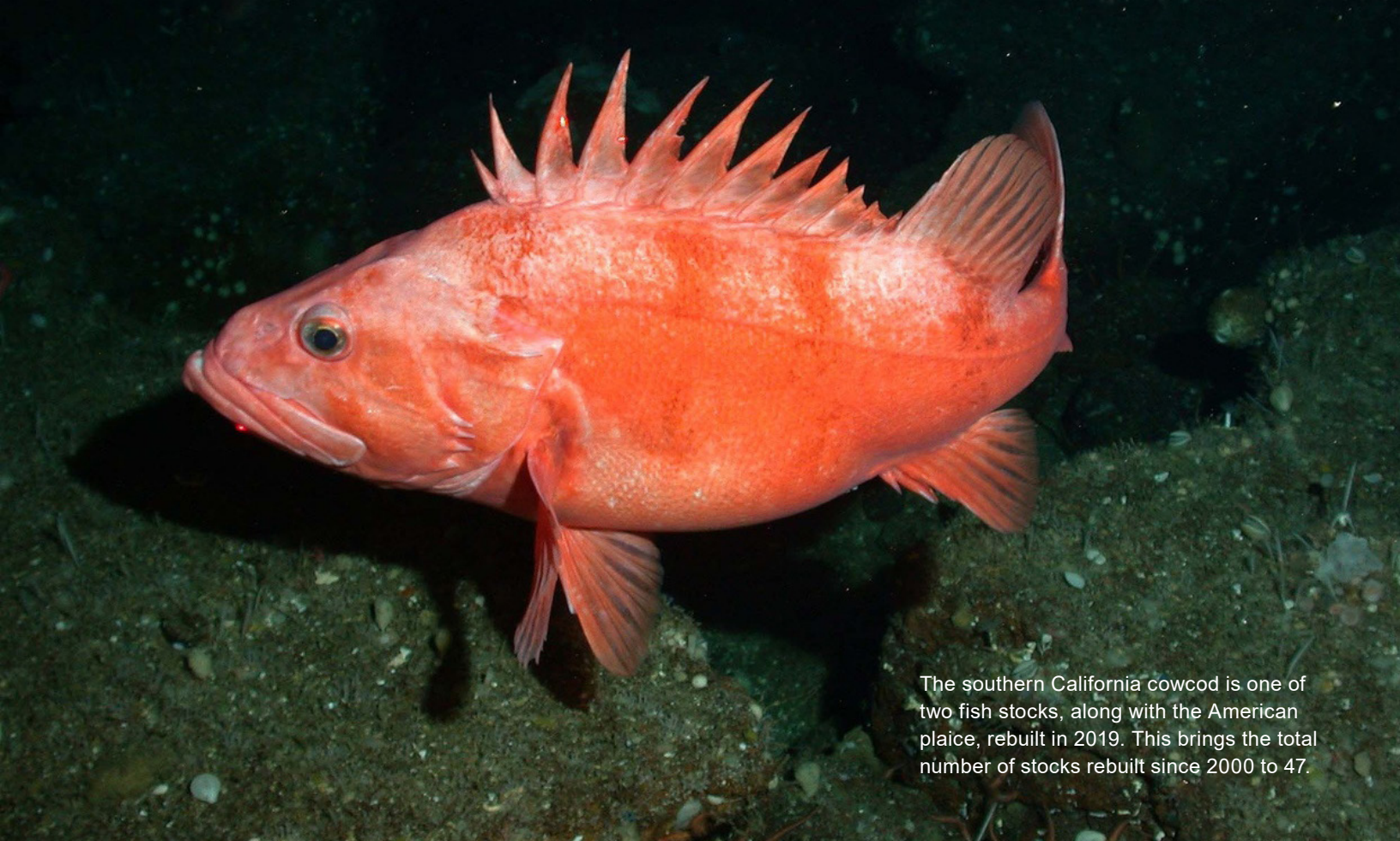
### FOREIGN FISHING OBSERVER FUND

The Foreign Fishing Observer Fund is financed through fees collected from owners and operators



A happy recreational angler shows off a red snapper caught on a trip in the Gulf of Mexico. Credit: Rosemary White





The southern California cowcod is one of two fish stocks, along with the American plaice, rebuilt in 2019. This brings the total number of stocks rebuilt since 2000 to 47.

of foreign fishing vessels fishing within the U.S. EEZ. The fund is used by NOAA to pay salaries, administrative costs, data editing and entry costs, and other costs incurred for observers.

### **FISHERIES FINANCE PROGRAM ACCOUNT**

The Fisheries Finance Program is a national loan program that makes long-term, fixed-rate financing available to U.S. citizens who otherwise qualify for financing or refinancing for the reconstruction, reconditioning, or the purchasing of fishing vessels, shoreside processing, aquaculture or mariculture facilities, or individual fishing quota.

### **MARINE MAMMAL UNUSUAL MORTALITY EVENT FUND**

An unusual mortality event is defined under the Marine Mammal Protection Act as “a stranding that is unexpected; involves a significant die-off of any marine mammal population; and demands immediate response.” This fund supports efforts to examine carcasses and live stranded animals

allowing understanding of threats and stressors and the ability to determine when a situation is “unusual.”

### **MANDATORY FUNDS**

#### **PROMOTE AND DEVELOP AMERICAN FISHERY PRODUCTS & RESEARCH PERTAINING TO AMERICAN FISHERIES FUND**

NOAA will transfer \$246,171,000 from the Promote and Develop account to offset the appropriation requirements of NMFS’ ORF account. The transfer to ORF will support data collection, data management, and fisheries stock assessment production within the Fisheries Data Collections, Surveys, and Assessments PPA, the Fisheries Management Programs and Services PPA, and the Interjurisdictional Fisheries Grants PPA. With this transfer, \$7,988,375 will be available for the Saltonstall-Kennedy program in FY 2022. The Promote and Develop account funds are derived from a transfer of thirty percent





The American plaice is one of two fish stocks, along with the southern California cowcod, rebuilt in 2019. This brings the total number of stocks rebuilt since 2000 to 47. Credit: André-Philippe D. Picard

of duties on imported fisheries products from the Department of Agriculture (USDA).

### **FISHERIES FINANCE PROGRAM ACCOUNT**

The mandatory component of the Fisheries Finance Program Account authority is subject to the Federal Credit Reform Act of 1990 (FCRA) (2 U.S.C. 661). The FCRA requires estimated loan costs to be appropriated in cash when Congress authorizes annual credit ceilings.

### **FEDERAL SHIP FINANCING FUND**

This account manages the loan guarantee portfolio that existed prior to the enactment of the FCRA.

### **ENVIRONMENTAL IMPROVEMENT AND RESTORATION FUND**

The Environmental Improvement and Restoration Fund was created by the Department of the Interior and Related Agencies Appropriations Act of 1998 for the purpose of carrying out marine research activities in the North Pacific.

### **LIMITED ACCESS SYSTEM ADMINISTRATION FUND**

Under the authority of the Magnuson-Stevens Fishery Conservation and Management Act (MSA) Section 304(d)(2)(A), NMFS must collect a fee to recover incremental costs of management, data collection, and enforcement of Limited Access Privilege programs. Fees are deposited into the Limited Access System Administration Fund. Fees shall not exceed three percent of the ex-vessel value of fish harvested under any such program.

### **WESTERN PACIFIC SUSTAINABLE FISHERIES FUND**

MSA Section 204(e) authorizes the establishment of the Western Pacific Sustainable Fisheries Fund to allow foreign fishing within the U.S. EEZ in the Western Pacific through a Pacific Insular Area Fishery Agreement.

### **FISHERIES ASSET FORFEITURE FUND**

MSA Section 311(e)(1) authorizes the Secretary



of Commerce to pay certain enforcement-related expenses from fines, penalties, and forfeiture proceeds received for violations of the MSA, Marine Mammal Protection Act, National Marine Sanctuaries Act, or any other marine resource law enforced by the Secretary. NOAA has established a Civil Monetary Penalty/Asset Forfeiture Fund.

### **NORTH PACIFIC OBSERVER FUND**

The North Pacific Groundfish Observer Program places all vessels and processors in the groundfish and halibut fisheries off Alaska into one of two observer coverage categories: (1) a full coverage category, or (2) a partial coverage category. In the partial coverage category, landings from all vessels will be assessed a 1.25 percent fee on standard ex-vessel prices of the landed weight of groundfish and halibut.

Money generated by this fee will pay for observer coverage in the partial coverage category in the following year.



Shrimp boats moored in Biloxi Harbor, Biloxi, Mississippi. Credit: Terry Kelly Photography





A tower of smoke rising from the Azusa, California, "Ranch2" wildfire during 100-degree heat, on August 15, 2020. Fire-generated "pyrocumulus" clouds carry smoke high into the atmosphere, where it can travel thousands of miles from its source. Credit: Russ Allison Lear/Flickr Creative Commons



# Office of Oceanic and Atmospheric Research

NOAA's Office of Oceanic and Atmospheric Research (OAR) conducts and integrates research across NOAA. OAR's interdisciplinary research promotes better understanding of the Earth, and its scientific results improve NOAA science and services and strengthen decision-making across the country. OAR research improves the accuracy of weather forecasts; enables communities to plan for and respond to short- and long-term weather-related events, such as tornadoes and drought; and enhances the protection and management of the Nation's coastal and ocean resources.

## FY 2020 ACCOMPLISHMENTS

In January 2020, NOAA launched the Atlantic Tradewind Ocean-Atmosphere Mesoscale Interaction Campaign, or ATOMIC, a six-week scientific campaign that used multiple crewed and autonomous vehicles, buoys, radar, and computer modeling to investigate how the ocean, atmosphere, and shallow clouds work together to create the weather and climate we live in. The data from this research campaign will

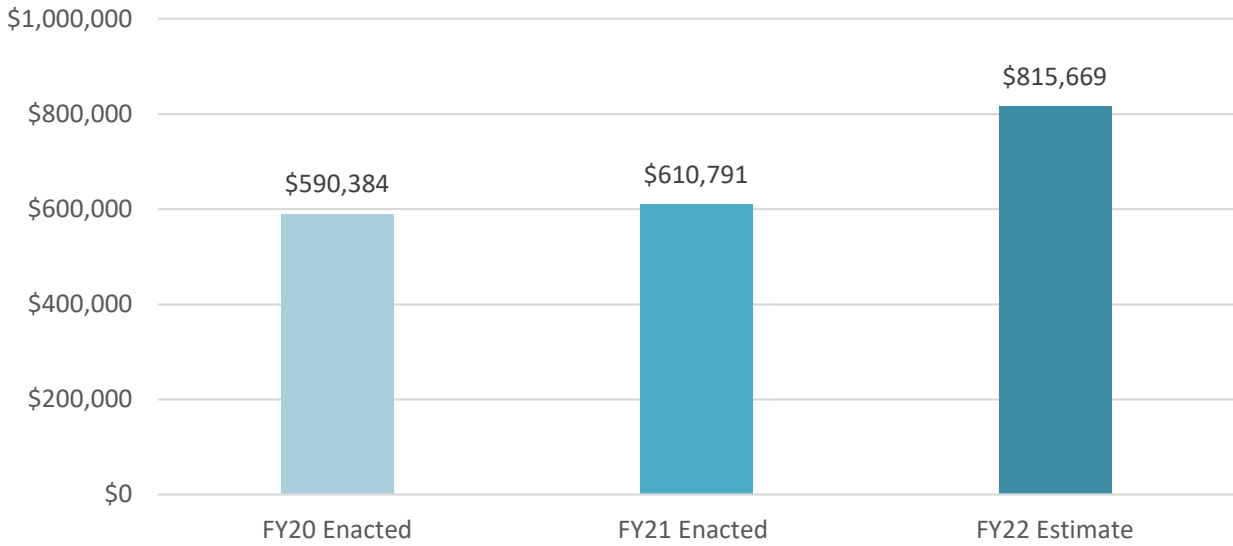
improve the models that forecast our weather and climate conditions. By studying the western tropical Atlantic region in the winter, scientists were able to observe the ocean, air, and clouds in near isolation from the impacts of storms and hurricanes. This will help improve understanding of how the ocean makes shallow clouds, and how these clouds, the basic building blocks for storms, affect larger weather and climate patterns.

In a year with record-setting wildfires in the western U.S., and plumes of Saharan dust swirling across the Atlantic Ocean towards the southern U.S., two NOAA weather models, the High Resolution Rapid Refresh-Smoke model (HRRR-Smoke) and Global Forecast System (GFS)-Aerosols, have been successfully transitioned to NOAA's National Weather Service (NWS) operations and are providing more accurate forecasts of air quality impacts. The HRRR-Smoke is integrated into NOAA's HRRR model, which is the first in the U.S. to forecast smoke's impact on a number of weather variables. HRRR predicts the movement of smoke in three dimensions across the country over 48 hours, simulating how the weather will impact smoke movement and concentrations, and how smoke will affect visibility, temperature and wind.

NOAA's Sea Grant continued investments in the development of sustainable marine and Great Lakes aquaculture to help our Nation maintain a safe and sustainable local seafood supply. Sea Grant-funded researchers in Washington State successfully employed innovations to produce sablefish fingerlings, working with a technician from the Jamestown S'Klallam tribe. The fish are predicted to reach commercial harvest size by 2021.

NOAA's newest high performance computer (HPC), Hera, used for research to advance weather, climate, and ecosystem prediction was upgraded in February 2020 to increase the computing capacity at NOAA's facility in Fairmont, West Virginia from approximately 2 petaflops to 5.3 petaflops. The addition of Hera and recent

## OAR Discretionary Budget Trends (\$ in thousands)



upgrades to other HPCs has enabled NOAA to more than double its research computing capacity over the last year from 8 petaflops to 17 petaflops. NOAA’s Research and Development HPC System provides computational resources to support advances in environmental modeling crucial for understanding critical earth system modeling issues. The most limiting factor in these advances is the availability of reliable supercomputer cycles. NOAA’s environmental modeling enterprise underpins most of NOAA’s products and services to the Nation.

### **FY 2022 REQUEST** **\$815,669,000**

NOAA requests a total of \$815,669,000 to support OAR’s continued and sustained operations. This total includes Operations, Research, and Facilities (ORF) and Procurement, Acquisition, and Construction (PAC) accounts, and is a net increase of \$196,799,000 in FY 2022 program changes. This program change total includes a net increase of \$3,299,000 to restore funds that were approved to support the Weather and Climate Operational Supercomputing System

(WCOSS) and G550 reprogrammings not described below, but represented in the NOAA Control Table in Appendix 2.

To strengthen core research capabilities to respond to increasing demand for the data, tools, and services that this research provides, OAR will research the ways in which our ocean influences, and is influenced by, climate change. OAR will improve precipitation predictions across weather and climate timescales through the Precipitation Prediction Grand Challenge Initiative, a cross-NOAA effort to advance subseasonal-to-seasonal and seasonal-to-decadal forecasts and will include more skillful precipitation forecasts using NOAA’s Unified Forecast System. In addition, NOAA will develop a global high resolution model to improve the understanding and prediction of extreme events. These requests will help NOAA meet the Administration’s climate research goals, including Executive Order (EO) 14008 on *Tackling the Climate Crisis at Home and Abroad*, and is critical to ensuring NOAA produces data, tools, and services that are publicly accessible to facilitate climate change decision-making nationwide.



Measuring and predicting climate change impacts are core to NOAA's mission. Ongoing research is coupled with the development of new and improved tools for decision makers to address extreme impacts such as sea level rise, fire weather, and impacts on living marine resources. OAR will lead the development of a collaborative and integrated fire weather research program to enable new research into the coupled modeling for both the short-term fire-atmosphere and sub-seasonal to climate scale modeling systems. Contributing to the NOAA Climate and Fisheries Initiative, OAR will build a national modeling and prediction system spanning U.S. coastal waters, the Arctic, and the Great Lakes to develop tools for decision makers to prepare for changing conditions. These requests will help NOAA meet the Administration's climate science goals, including those in EO 14008, through improved observations and forecasting for the American public.

Investments in ecological restoration and community resilience are integral to NOAA's climate strategy, and there is an increasing need for NOAA to create and foster natural and economic resilience along our coasts through our support, expertise, robust, on-the-ground partnerships, and place-based conservation activities. Investments in OAR's Regional Integrated Sciences and Assessments (RISA) program and Climate-Smart Communities Initiative will allow OAR to work with more communities across the Nation to co-produce and operationalize lasting and equitable climate resilience plans, prioritizing underserved communities that are particularly vulnerable to a changing climate. Ecological restoration and community resilience are integral to NOAA and the Administration's climate strategy, as outlined in EO 14008.



This image was taken during a remote sensing flight over Lake Erie on July 20, 2020 to assist in improvements to the NOAA harmful algal bloom forecast.



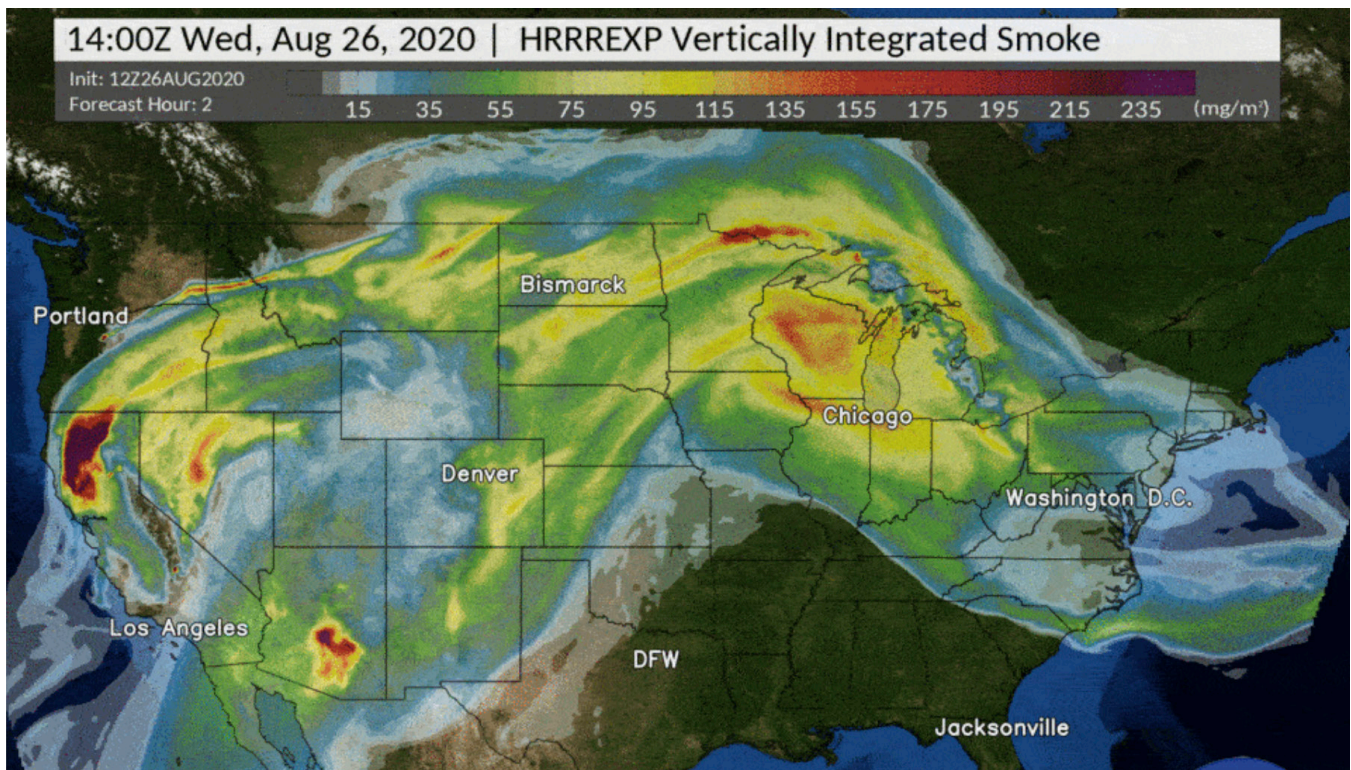
NOAA proposes to develop a framework and lay the foundation for successfully integrating equity across the organization, from management, to policies, to service-delivery. Improving engagement with underserved communities through workforce development and environmental literacy is the focus of OAR's Sea Grant Service Equity Assessment. In addition, investments in the Tribal Drought Resilience Initiative will improve engagement with Tribal nations related to drought forecasting, documentation, and mitigation strategies through the development of a Tribal Drought Portal and Tribal Drought Monitoring Program. NOAA is aligned with the Administration priority of environmental justice and equity and will further support EO 13985 on *Advancing Racial Equity and Support for Underserved Communities Through the Federal Government* by developing a framework and laying the

foundation for successfully integrating equity across the organization to reach a broader range of Americans in underserved or disadvantaged communities.

Program changes are highlighted below. A summary of funding by Program, Project, and Activity is located in Appendix 2. Detailed descriptions of the program changes below are located in the NOAA FY 2022 Congressional Justification.

## FY 2022 ORF BUDGET SUMMARY

NOAA requests a total of \$762,169,000 to support the ORF activities of OAR, reflecting an increase of \$186,799,000 in FY 2022 program changes.



This image shows the High Resolution Rapid Refresh-Smoke (HRRR-Smoke) model forecast showing the distribution of smoke from western wildfires across the continental U.S. for August 26, 2020.



## **CLIMATE RESEARCH \$293,713,000**

NOAA requests an increase of \$110,348,000 in program changes for a total of \$293,713,000 in the Climate Research activity. This total advances the long-term observing, monitoring, research, and modeling capabilities performed in OAR's Climate Research. It provides the science that Americans need to understand how, where, and when Earth's conditions are changing. Program changes include:

### **Climate Laboratories and Cooperative Institutes: Sustained Atmospheric**

**Observations Increase:** NOAA requests an increase of \$20,000,000 to support and enhance its atmospheric observing systems, which will allow NOAA to support a Global Stocktake, a requirement of the Paris Agreement. This requested increase would create an independent, transparent evaluation of greenhouse gas (GHG) emissions and changes in emissions at various scales; provide a robust understanding of the allowable cumulative GHG emissions to limit global warming at different future levels by taking into account likely changes in natural GHG sinks and sources in the ocean, land, and atmosphere; and examine the biogeochemical-climate feedbacks and the resulting climate sensitivity.

### **Climate Laboratories and Cooperative Institutes: Global-Nested High-Resolution**

**Model Increase:** NOAA requests an increase of \$10,000,000 to develop a global high-resolution atmospheric model with a 3km or below resolution to improve NOAA's understanding and prediction of extreme events on all time scales beginning at 2 weeks. The inclusion of an observational program for the boundary layer and clouds will further improve forecasting skill for extreme weather events with earlier warnings and more accurate spatial patterns.

### **Regional Climate Data and Information: Enhancing Regional and Community Resilience by Scaling Up RISA Program and "Climate-Smart" Communities Initiative:**

NOAA requests an increase of \$10,000,000

to extend the proven capabilities of the RISA program and the U.S. Climate Resilience Toolkit (USCRT) to advance adaptation measures and resilience planning at regional and local scales, while prioritizing environmental justice. NOAA proposes a new public-private partnership, the Climate-Smart Communities Initiative, to scale up and accelerate training and the pace of resilience-building in communities across the Nation utilizing the USCRT. This initiative will train communities in 20 cities around the Nation, and address environmental justice issues within these communities when determining how communities are selected.

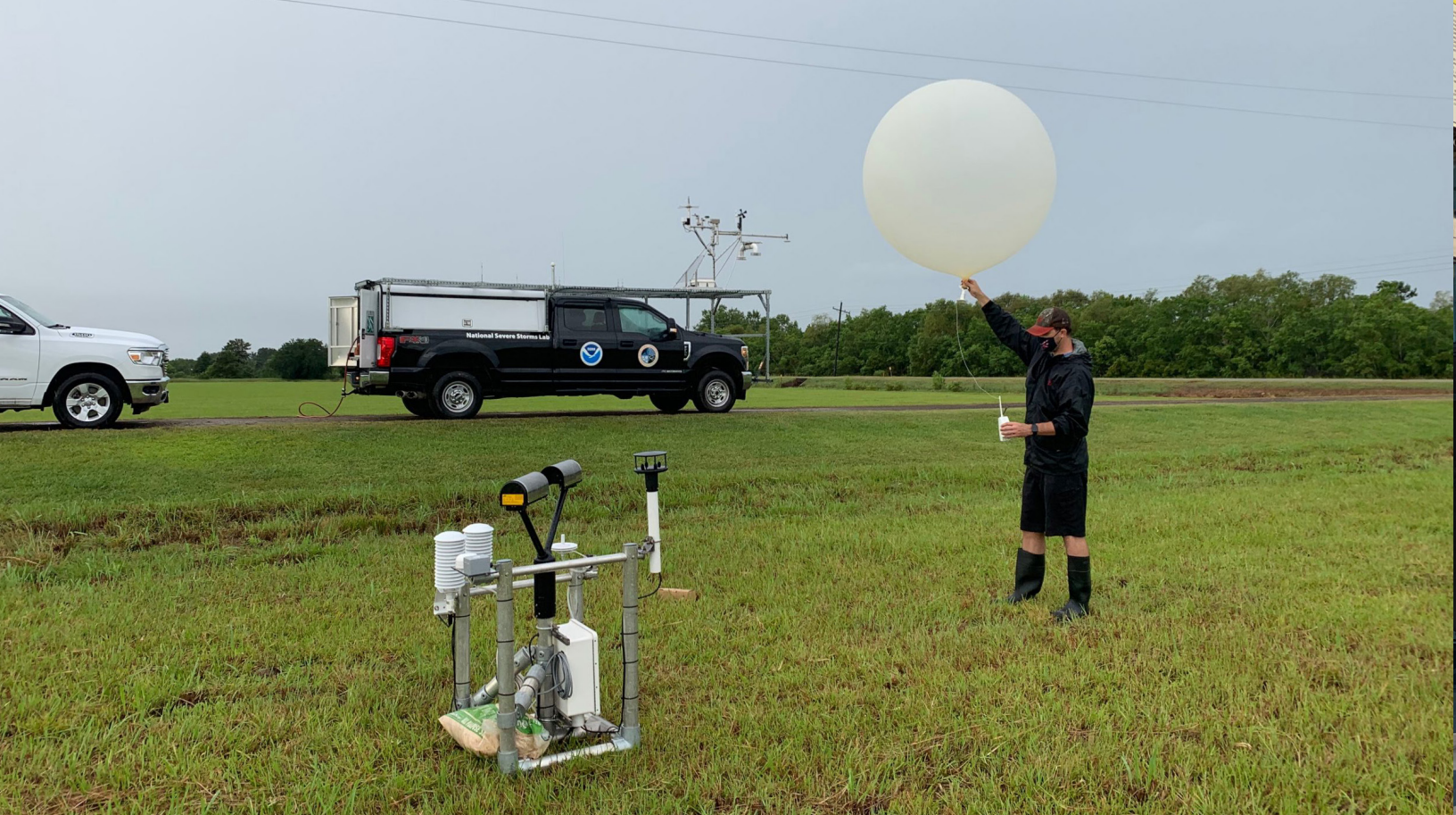
### **Regional Climate Data and Information:**

**Tribal Drought Resilience Initiative Increase:** NOAA requests an increase of \$3,000,000 to broaden Tribal engagement through the National Integrated Drought Information System (NIDIS). To effectively address this, NIDIS, along with Tribal, Federal, and other partners, jointly developed the NIDIS Tribal Drought Engagement Strategy: 2021-2025. Tribal Nations will benefit from increased support to implement the strategy, which articulates specific activities and outcomes to improve: drought observations and monitoring; prediction and forecasting; communication and outreach; planning and preparedness; and interdisciplinary research.

### **Climate Competitive Research: Marine Ecosystem Responses to Climate Change**

**Increase:** NOAA requests an increase of \$10,000,000 to provide decision-makers with the information and tools they need to prepare for changing conditions in the ocean and Great Lakes, reduce climate impacts, and increase the resilience of living marine resources and the communities that depend on them.

**Climate Competitive Research: Providing Climate Change Projections out to 2050 to Inform Risk Management Increase:** NOAA requests an increase of \$9,000,000 to develop standardized and accessible climate projections, provide society-relevant data delivery services,



A team of research scientists from the NOAA National Severe Storms Laboratory and the University of Oklahoma have traveled to the Texas-Louisiana border near the Gulf of Mexico to collect data during the landfall of Hurricane Laura. Here, Research Scientist Sean Waugh releases a weather balloon into the atmosphere.

improve the equity of climate risk information, and assist decision making across a wide range of stakeholders and economic sectors.

**Climate Competitive Research: Precipitation Prediction Grand Challenge Increase:**

NOAA requests an increase of \$7,000,000 to enhance the skill of precipitation predictions across weather and climate timescales in a research environment and for potential transition to operations. NOAA will improve understanding of key physical processes operating in the atmosphere and the ocean, identify ways to improve model representations of these processes, and reduce the systematic biases in NOAA models, which will lead to the demonstration of improved precipitation forecast skill. This initiative will focus on key research areas, including conducting process studies, ocean and atmospheric field campaigns, and global modeling experiments targeting key model deficiencies that limit precipitation prediction skill.

**Climate Competitive Research: Advanced Research Projects Agency for Climate Increase:**

NOAA requests an increase of \$40,000,000 to fund collaborative research in climate adaptation and resilience with the new Advanced Research Projects Agency for Climate (ARPA-C) at the Department of Energy (DOE). This NOAA initiative for ARPA-C blue carbon research will be executed as a reimbursable with DOE. NOAA will invest in research to explore such topics as the extent of blue carbon ecosystems, the factors that influence sequestration, and the management, conservation, and restoration actions that are effective in enhancing sequestration.

**WEATHER & AIR CHEMISTRY RESEARCH \$151,570,000**

NOAA requests an increase of \$10,191,000 in program changes for a total of \$151,570,000 in the Weather and Air Chemistry Research activity. This total supports NOAA's efforts to advance community-developed enhancements to weather





NOAA Great Lakes Environmental Research Laboratory (GLERL) ecologist Paul Glyshaw collects field data aboard a NOAA research vessel in Lake Erie. Collecting and analyzing water samples during the harmful algal bloom (HAB) season plays a key role in NOAA's efforts to forecast and monitor the bloom as it develops and changes over time.

models and to provide the resources needed to advance and accelerate transition of the most promising research activities into the NWS. Program changes include:

**U.S. Weather Research Program: Fire Weather Increase:** NOAA requests an increase of \$7,000,000 to develop a collaborative and integrated fire weather research program to enable new research into the coupled modeling for both the short-term fire-atmosphere and sub-seasonal to climate scale modeling systems. A new NOAA Fire Weather Testbed will be established to bring together OAR, NWS, NESDIS, and emergency managers from across the fire weather community to develop new impact-based decision support tools, products, and models.

**Tornado/Severe Storm Research: Phased Array Radar Increase:** NOAA requests an increase of \$2,500,000 to advance and refine the conceptual design of the rotating planar array

for the phased array radar in support of NWS operational requirements. The increase would be used to refine the conceptual design of the rotating planar array that has emerged as the leading candidate for a phased array radar that meets or exceeds NWS operational requirements.

### **OCEAN, COASTAL & GREAT LAKES RESEARCH \$294,859,000**

NOAA requests a net increase of \$62,260,000 in program changes for a total of \$294,859,000 in the Ocean, Coastal, and Great Lakes Research activity. This total includes research activities to better understand the ocean and Great Lakes, their natural resources, and the influence they have on the Earth's weather and climate through technological advancements in modeling, computing, observing, and information dissemination. Program changes include:

**National Sea Grant College Program: Sea Grant Builds Resilient Coasts: Expanding Local and Regional Coastal Resilience**



**Capacity and Community Assistance:**

NOAA requests an increase of \$35,000,000 to expand Sea Grant’s research and engagement to make coastal communities more resilient to natural hazards and changing conditions. Sea Grant proposes to expand its approach of placing research, extension, and education professionals in the communities they serve, and provide university-based research funding allowing programs to be nimble and responsive to emerging and local needs. Sea Grant will also build on its foundation of investments in coastal resilience through one or more Federal funding opportunities. To strengthen and expand local and regional science and engagement effectiveness and reach across the U.S., Sea Grant will invest in state-based and headquarters-based national coordination capacity.

**National Sea Grant College Program: Sea Grant’s Service Equity: Assessing and Integrating Diversity, Equity, and Inclusion Actions to Support Underserved Communities:** NOAA requests an increase of \$5,000,000 to implement a service equity assessment of Sea Grant research and workforce



Stefan Mraz, an oyster farmer with Virgin Oyster Company, rakes oysters on their leased permit site in Little Bay, Newington, NH. Credit: Tim Briggs, New Hampshire Sea Grant

development programs, and work with partners to advance innovative initiatives to further connect to, learn with, and empower underserved communities. This proposal complements the increase requested for Sea Grant to expand research and engagement to make coastal communities more resilient to natural hazards and changing conditions. This proposal also includes support for the critical need to expand extension agents and other staff and services supporting underserved communities.

**Sustained Ocean Observations and Monitoring: Advancing Global Ocean Observing System Increase:** NOAA requests an increase of \$23,000,000 to address a number of stakeholder-driven requirements including: fill priority gaps for additional global ocean observations, promote innovative tools and approaches for measuring, and disseminate ocean data. These investments will focus on four areas that will advance NOAA’s understanding and prediction capability for: 1) climate and weather prediction, 2) ecosystems, 3) decision support for coastal communities, and 4) extreme weather & climate events.

**Sustained Ocean Observations and Monitoring: Sustained Ocean Observations and Monitoring Decrease:** NOAA requests a decrease of \$2,000,000 in funding for Sustained Ocean Observations and Monitoring. NOAA



A researcher with the NOAA National Severe Storms Laboratory flies a drone near tornado damage in Alabama in April 2021. Scientists hope aerial images of tornado paths of destruction can better characterize high-wind damage to vegetation and in rural areas to improve disaster response and recovery.



will reduce external grant funding used to leverage partnerships to develop a sustained, comprehensive, and responsive global ocean observing system. This decrease will also reduce the number of platforms NOAA will help maintain. The high-quality, long-term observations serve as a foundation for the information our Nation needs to foster a more informed and climate resilient society and to reduce risks for its people, businesses, and assets. This decrease is taken in conjunction with the Advancing Global Ocean Observing System increase request and allows NOAA to continue to address a number of stakeholder-driven requirements including to fill priority gaps for additional global ocean observations, promote innovative tools and approaches for measuring, and disseminate ocean data.

### **INNOVATIVE RESEARCH & TECHNOLOGY \$22,027,000**

NOAA requests a net increase of \$4,000,000 in program changes for a total of \$22,027,000 in the Innovative Research & Technology activity. This total advances continued support to accelerate the adoption and transition of advanced cloud and traditional high performance computing and technology throughout NOAA. Program changes include:

#### **Uncrewed Systems: Uncrewed Systems**

**Increase:** NOAA proposes an increase of \$4,000,000 to advance research and evaluation for operational readiness of a full spectrum of NOAA's aircraft and maritime Uncrewed Systems (UxS) mission concepts. These funds will move notional ideas to testable technologies and finalize mature, transition-ready projects into operational use within NOAA. NOAA will use these resources for directed research and proposal solicitations for R&D related to UxS concepts and technologies to support missions across NOAA's Line Offices.

## **FY 2022 PAC BUDGET SUMMARY**

NOAA requests a total of \$53,500,000 to support the PAC activities for OAR, reflecting an increase of \$10,000,000 in FY 2022 program changes.

### **SYSTEMS ACQUISITION**

#### **\$53,500,000**

NOAA requests an increase of \$10,000,000 in program changes for a total of \$53,500,000 in the Systems Acquisition activity. Program changes include:

#### **Research Supercomputing/CCRI: R&D HPC Required to Meet Major NOAA Outcomes**

**Increase:** NOAA proposes an increase of \$10,000,000 to provide dedicated funding support for Hera, the supercomputer located in Fairmont, West Virginia, that was initially funded through a supplemental appropriation. These resources provide essential infrastructure support and will continue to be a critical element of NOAA's HPC enterprise, especially as we move forward to new, advanced applications and architectures, such as artificial intelligence and machine learning.



Lightning is visible near the NWS Weather Forecast Office in El Paso, Texas. All forecast offices maintained full operations (24 hours a day, 7 days a week) throughout the record-breaking 2020 weather year.





# National Weather Service

NOAA's National Weather Service (NWS) is the official government authority for issuing warnings during life-threatening weather events. Every day, NWS forecasters issue public, aviation, marine, fire weather, climate, space weather, river, and flood forecasts and warnings for the protection of life, property, and the enhancement of the national economy. NWS forecasters work with local partners and communities by providing Impact-based Decision Support Services (IDSS) to understand and manage risk, formulate emergency response plans, and promote community preparedness and public safety. Each year, NWS collects approximately 76 billion observations and issues approximately 1.5 million forecasts and 50,000 warnings. NWS data and products are publicly available through a national information infrastructure used by the public, governmental agencies, the private sector, and the global community.

## FY 2020 ACCOMPLISHMENTS

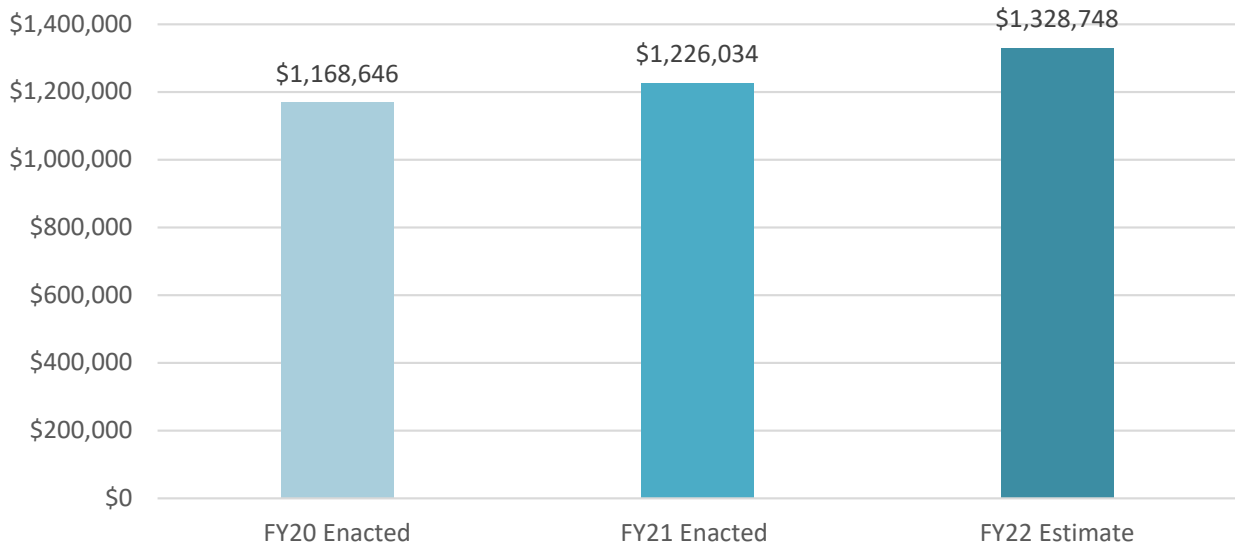
2020 marked NWS' 150th year of serving the Nation with life-saving watches and warnings, and marked a record-breaking weather year where the vision of a weather-ready nation was evident. NWS employees provided exceptional,

accurate and consistent life-saving observations, forecasts, warnings, and almost continuous IDSS provided days to minutes before storms, saving lives and mitigating property loss. During the unprecedented 2020 Atlantic Hurricane Season, multiple episodes of extreme weather and water events, and a record response to the fire season, NWS has continued to provide expert, timely, and actionable weather information to emergency managers, water resource managers, and other government agencies at the state, local, and tribal levels. Twelve Atlantic Tropical Systems made landfall in the U.S. this year, for which accurate forecasts, warnings, and IDSS (up to 10 days in advance for several systems) were provided through a collaborative forecast and related interactions involving the entire NWS.

In recognition of increased vulnerability to extreme weather events and the need to provide IDSS, the NWS launched the Evolve effort in 2017. The Evolve Initiative works toward consistent, collaborative, science-based IDSS for a Weather-Ready Nation. During 2020 NWS put both the National Blend of Models v3.2 and v4.0 into operations, a nationally consistent suite of calibrated forecast guidance based on a blend of both NWS and non-NWS model output with the goal of providing a highly accurate starting point for forecasts. NWS established key attributes for a Collaborative Forecast Process (CFP), with the goal of a Fully Integrated Field Structure and Common Operating Picture that results in "One Event—One Forecast" and enables offices to meet IDSS Demand. Another vital building block for CFP, Regional Operations Centers were established with Initial Operating Capability at the six NWS Regional Headquarters. Finally, the success of the GS 5-12 Meteorologist Career Progression Program and partnership with NOAA's Office of Human Capital Services to streamline hiring processes allowed NWS to end FY 2020 with the highest staffing level since 2016.

Flood Inundation Modeling (FIM) supports emergency operations to pre-position resources,

## NWS Discretionary Budget Trends (\$ in thousands)



ensure the security of critical infrastructure, and recommend evacuations for better protection of life and property. This capability revolutionizes short-range planning and response to high impact flooding events to help mitigate the human toll and infrastructure impacts. Building upon the successful 2019 demonstration of FIM in Texas, NWS expanded the demonstration to include FIM downstream from a majority of NWS official Advanced Hydrologic Prediction Service river forecast locations throughout the contiguous United States.

Operationally implemented on September 29, 2020, the Winter Storm Severity Index (WSSI) is a tool that forecasts the potential impacts of winter storms throughout the continental United States. The tool is designed to help people prepare before the storm and gives expected winter storms an ‘impact ranking’ in 6 categories, ranging from ‘No Impacts’ to ‘Extreme Impacts’. The WSSI impact scale helps people quickly and easily know what to expect from a winter storm.

### **FY 2022 REQUEST** **\$1,328,748,000**

NOAA requests a total of \$1,328,748,000 to focus on NWS’ core mission, which is to provide weather, water, and climate forecasts and warnings that protect lives and property. This total includes Operations, Research, and Facilities (ORF) and Procurement, Acquisition, and Construction (PAC) accounts and includes a net increase of \$59,310,000 in program changes. This program change total includes a net decrease of \$21,624,000 to restore funds that were approved to support the Weather and Climate Operational Supercomputing System (WCOS) and the G550 reprogrammings represented in the NOAA Control Table in Appendix 2.

Measuring and predicting climate change impacts are core to NOAA’s mission. This request recapitalizes the TAO array in the tropical Pacific, and will enable NWS to modernize the moorings and sensors and provide additional capability to



measure key weather and ocean parameters in real-time. Investments to fully develop a Seasonal Forecast System will improve climate projections over the decades and on regional scales to better inform regional and local adaptation and resiliency planning for infrastructure, natural resource management, food production, finance, national security, and other sectors. NOAA will work to improve short-term forecasts to better predict fire behavior and the longer-term modeling of interactions between climate variability, climate change, and the likelihood of hazardous wildfire conditions. NWS will operationalize a Flood Inundation Mapping (FIM) capability nationwide that will better inform life and property decisions and mitigate flooding impacts to the U.S. population and economy.

NWS will continue to pursue its Weather Ready Nation goals. This request will also allow NWS to optimize and upgrade the Integrated Dissemination Program (IDP) program in accordance with the plan provided to Congress. These requests will help NOAA meet the Administration's climate science goals, including Executive Order (EO) 14008 on *Tackling the Climate Crisis at Home and Abroad*, through improved observations and forecasting for the American public.

NOAA proposes to develop a framework and lay the foundation for successfully integrating equity across the organization, from management, to policies, to service-delivery. NWS will expand and enhance services to underserved and vulnerable communities by focusing on improving service delivery, dissemination, and assessing and understanding user needs. Additional investments in subseasonal to seasonal decision support services will allow NWS to work toward better serving underserved communities, including Tribal nations and inner-city areas. NOAA supports the Administration's priority of environmental justice and equity and will implement EO 13985 on *Advancing Racial Equity and Support for Underserved Communities Through the Federal Government*

by developing a framework and laying the foundation for successfully integrating equity across the organization to reach a broader range of Americans in underserved or disadvantaged communities.

This request also supports additional capacity for the forecasting of space weather events, which can have far-reaching impacts on our Nation's economy, communications, and national security. Investments in a Space Weather Prediction Testbed will allow NWS to build toward a space weather prediction capability that will ensure national and global communities are ready for and responsive to space-weather events. This request will increase NOAA's ability to forecast these events by increasing research-to-operations-to-research capabilities.

Program changes are highlighted below. A summary of funding by Program, Project, and Activity is located in Appendix 2. Detailed descriptions of the program changes below are located in the NOAA FY 2022 Congressional Justification.

## FY 2022 ORF BUDGET SUMMARY

NOAA requests a total of \$1,216,585,000 to support the ORF activities of the NWS, reflecting a net increase of \$80,553,000 in program changes.

### **OBSERVATIONS \$244,222,000**

NOAA requests a net increase of \$9,115,000 in program changes for a total of \$244,222,000 in the Observations activity. Program change increases include:

**Observations: Enhance the Meteorological Assimilation Data Ingest System (MADIS) to Include important climate datasets:** NOAA requests an increase of \$1,200,000 to update MADIS which will enable climate observations from over 8,200 Cooperative Observer Program

stations to be readily accessible by climate and weather models and research communities.

**Observations: Improve Climate and Weather Predictions by maintaining a recapitalized Tropical Atmosphere Ocean (TAO) array:**

NOAA requests an increase of \$2,441,000 to overhaul the long-standing TAO array in the Tropical Pacific. The existing legacy TAO array, consisting of 55 moorings in the Tropical Pacific Ocean, measures marine weather and subsurface ocean parameters to a depth of 500 meters.

**Observations: Enterprise Infrastructure Solutions (EIS):** NOAA requests an increase of \$750,000 as part of the NOAA-wide EIS modernization effort that will support a five year transition of its current infrastructure to the new General Services Administration (GSA) EIS contract.

**CENTRAL PROCESSING**  
**\$108,472,000**

NOAA requests a net increase of \$6,403,000 in program changes for a total of \$108,472,000 in the Central Processing activity. Program changes include:

**Central Processing: Operationalize Flood Inundation Mapping:** NOAA requests an increase of \$500,000 to operationalize a Flood Inundation Mapping capability nationwide that will better inform life and property decisions and mitigate flooding impacts to the U.S. population and economy.

**Central Processing: Seamless Weather to Climate Fire Weather Predictions to Improve Resilience and Disaster Mitigation:** NOAA requests an increase of \$750,000 to reduce the devastating impacts of future wildfires by providing NWS Incident Meteorologists (IMETs), state and local fire control, the forest service, and other federal agencies with DSS tools to prevent and fight increased wildfire activity. This project proposes the development and implementation

of a comprehensive, integrated, seamless suite of prediction and DSS tools for fire weather on timescales from hours to sub-seasonal and spatial scales from national to local.

**Central Processing: Co-Development of Sub-Seasonal to Seasonal (S2S) Decision Support Services to Mitigate the Impacts of Extreme Events and Enable a Resilient Society:** NOAA requests a total \$900,000 to develop S2S (week two to three months) DSS for long lead time environmental events that occur on a timeframe from weeks to months. This request in Central Processing will expand existing computational capacity to support this initiative.

**Central Processing: Expand/Enhance NWS Services to Vulnerable/Underserved Communities for Extreme Events- Improve Service Delivery:** NOAA requests an increase of \$2,000,000 to increase availability of NWS products translated to Spanish language for preparedness information and high-impact extreme events.

**Central Processing: Space Weather Research to Operations:** NOAA requests an increase of \$1,000,000 to develop the Space Weather Prediction Testbed and co-locate it with the Space Weather Prediction Center (SWPC) in Boulder, Colorado, as a key component of a formal research-to-operations/operations-to-research (R2O2R) mechanism. This request will provide the essential developmental and testbed IT, and engineers, to better enable transition to operations of space weather research advances.

**ANALYZE, FORECAST, AND SUPPORT**  
**\$565,097,000**

NOAA requests a net increase of \$5,378,000 in program changes for a total of \$565,097,000 in the Analyze, Forecast, and Support activity. Program changes include:

**Analyze, Forecast, and Support: Operationalize Flood Inundation Mapping:** NOAA requests an increase of \$750,000 to





A photo taken near Sugar Grove, Illinois of a shelf cloud that was part of the August 2020 derecho. This billion-dollar disaster highlights the importance of advancing science to further improve forecast capabilities.

operationalize a Flood Inundation Mapping (FIM) capability nationwide that will better inform life and property decisions and mitigate flooding impacts to the U.S. population and economy.

**Analyze, Forecast, and Support: Seamless Weather to Climate Fire Weather Predictions to Improve Resilience and Disaster Mitigation:**

NOAA requests an increase of \$500,000 to reduce the devastating impacts of future wildfires by providing NWS IMETs, state and local fire control, the forest service, and other federal agencies with DSS tools to prevent and fight increased wildfire activity. This project proposes the development and implementation of a comprehensive, integrated, seamless suite of prediction and DSS tools for fire weather on timescales from hours to sub-seasonal and spatial scales from national to local.

**Analyze, Forecast, and Support: Co-Development of Sub-Seasonal to Seasonal (S2S) Decision Support Services to Mitigate the Impacts of Extreme Events and Enable a Resilient Society:**

NOAA requests an increase of \$500,000 to develop S2S (week two to three months) DSS for long lead time environmental events that occur on a timeframe from weeks to months. This request in Analyze, Forecast, and Support will facilitate stakeholder engagement to gather requirements for the development of DSS product/services.

**Analyze, Forecast, and Support: Expand/Enhance NWS Services to Vulnerable/Underserved Communities for Extreme Events- Improve Service Delivery:**

NWS requests an increase of \$1,000,000 to identify and enhance services for historically underinvested and underserved communities that are at greater risk for experiencing negative health impacts related to extreme heat, tornadoes and hurricane landfalls.

**Analyze, Forecast, and Support: Expand/Enhance NWS Services to Vulnerable/Underserved Communities for Extreme Events- Assess and Understand User Needs:**

NOAA requests an increase for \$1,500,000 to hire three Social, Behavioral & Economic scientists that will assess user needs of underserved/under-resourced and hard to reach communities and identify best practices for dissemination of extreme weather event information to those communities.

**Analyze, Forecast, and Support: Increase NOAA Capability to Support Minority Internship Opportunities:**

NOAA requests an increase of \$1,000,000 to expand funding for early career employment opportunities in partnership with Historically Black Colleges and Universities (HBCUs) and Minority Serving Institutions (MSIs). NWS will establish the June Bacon-Bercey Internship Program to create a

job pathway for eligible HBCU/MSI rising seniors and graduate students, and BIPOC students that have participated in NOAA Cooperative Science Centers or other NOAA internship programs.

### **DISSEMINATION \$117,646,000**

NOAA requests a net increase of \$36,818,000 in program changes for a total of \$117,646,000 in the Dissemination activity. Program changes include:

**Dissemination: Operationalize Flood Inundation Mapping:** NOAA requests an increase of \$3,750,000 to operationalize a Flood Inundation Mapping (FIM) capability nationwide that will better inform life and property decisions and mitigate flooding impacts to the U.S. population and economy.

**Dissemination: Optimize and Upgrade the Integrated Dissemination Program:** NOAA requests an increase of \$17,000,000 to optimize and upgrade both the National Dissemination on-premise IT infrastructure and applications, and to build the public cloud framework, by focusing on activities within Phases 3 and 4 of the Integrated Dissemination Program (IDP) plan. These activities will provide the public and core partners with timely critical warnings, watches, and forecasts that protect lives and property.

**Dissemination: Seamless Weather to Climate Fire Weather Predictions to Improve Resilience and Disaster Mitigation:** NOAA requests an increase of \$750,000 to reduce the devastating impacts of future wildfires by providing NWS IMETs, state and local fire control, the forest service, and other federal agencies with DSS tools to prevent and fight increased wildfire activity. This project proposes the development and implementation of a comprehensive, integrated, seamless suite of prediction and DSS tools for fire weather on timescales from hours to sub-seasonal and spatial scales from national to local.

**Dissemination: Co-Development of Sub-Seasonal to Seasonal (S2S) Decision Support Services to Mitigate the Impacts of Extreme Events and Enable a Resilient Society:** NOAA requests an increase of \$400,000 to develop S2S (week two to three months) DSS for long lead time environmental events that occur on a timeframe from weeks to months. This request in Dissemination will provide improved delivery of new products and services as well as better information to vulnerable/underserved communities.

**Dissemination: Enterprise Infrastructure Solutions (EIS):** NOAA requests an increase of \$11,400,000 as part of the NOAA-wide EIS modernization effort that will support a five year transition of its current infrastructure to the new GSA EIS contract.

**Dissemination: Expand/Enhance NWS Services to Vulnerable/Underserved Communities for Extreme Events:** **Dissemination Enhancements:** NOAA requests an increase of \$3,500,000 to improve the dissemination of weather information to vulnerable/underserved communities in both urban and rural geographies. NWS proposes developing a preliminary program in partnership with other federal agencies and industries to



Snow falls outside of the NWS Weather Forecast Office in Las Vegas, Nevada.





The NWS Employee Engagement Session at the January 2020 American Meteorological Society conference.

expand communication of weather forecasts, watches, warnings through mobile technologies, low-bandwidth technologies, and social media.

## SCIENCE AND TECHNOLOGY INTEGRATION \$181,148,000

NOAA requests a net increase of \$22,839,000 in program changes for a total of \$181,148,000 in the Science and Technology Integration activity. Program changes include:

### Science and Technology Integration:

**Seasonal Forecast System (SFS v1):** NOAA requests an increase of \$15,000,000 to establish a Seasonal Forecast System (SFS) forecast capability to improve the skill, lead time, and breadth of weather and environmental prediction.

### Science and Technology Integration:

**Seamless Weather to Climate Fire Weather Predictions to Improve Resilience and Disaster Mitigation:** NOAA requests an increase of \$2,000,000 to reduce the devastating impacts of future wildfires by providing NWS IMETs, state and local fire control, the forest service, and other federal agencies with DSS tools to prevent and fight increased wildfire activity. This project proposes the development and implementation of a comprehensive, integrated, seamless suite of prediction and DSS tools for fire weather on

timescales from hours to sub-seasonal and spatial scales from national to local.

**Science and Technology Integration: Co-Development of Sub-Seasonal to Seasonal (S2S) Decision Support Services to Mitigate the Impacts of Extreme Events and Enable a Resilient Society:** NOAA requests an increase of \$3,500,000 to develop S2S (week two to three months) DSS for long lead time environmental events that occur on a timeframe from weeks to months. This request for the STI portfolio includes Research and Development, Product/Service Development, Operational Transition and user training and outreach.

### Science and Technology Integration: Space Weather Research to Operations:

NOAA requests an increase of \$4,000,000 to develop the Space Weather Prediction Testbed and co-locate it with the Space Weather Prediction Center (SWPC) in Boulder, Colorado, as a key component of a formal research-to-operations/operations-to-research (R2O2R) mechanism. With this request, NOAA will provide essential science and engineering support, facility buildout, operating costs, communication and knowledge gathering, and interagency coordination for increasing research-to-operations capabilities to better incorporate space weather research advances into its operational forecasting systems.

### Science and Technology Integration: Delay the NOAA COASTAL Act Implementation:

NOAA requests a decrease for \$3,686,000 which will delay implementation of the NOAA Consumer Option for an Alternative System To Allocate Losses (COASTAL) Act of 2012 in order to better align NOAA's timeline with FEMA's.

## FY 2022 PAC BUDGET SUMMARY

NOAA requests a total of \$112,163,000 to support the PAC activities of the NWS, reflecting a net decrease of \$21,243,000 in program changes.

## **SYSTEMS ACQUISITION** **\$102,163,000**

NOAA requests a decrease of \$21,243,000 in program changes for a total of \$102,163,000 in the Systems Acquisition activity. This total provides continued support for the Nation's weather radar and surface weather observing network, ensures the uninterrupted flow of information from the collection of observations, to central guidance production, to local applications of all essential weather and climate data products, and continuity of public watches and warnings, and development of a reliable and scalable NWS dissemination infrastructure to sustain 24x7 mission operations.

### **Observations: Improve Climate and Weather Predictions by Recapitalizing the Tropical**

**Atmosphere Ocean (TAO) Array:** NOAA requests an increase of \$8,059,000 to overhaul the long-standing TAO array in the tropical Pacific. This request will enable NWS to deploy and maintain the modernized moorings and sensors, and provide additional capability to measure key weather and ocean parameters in real-time at the optimal vertical resolution based on the best science available.

**Observations: Enterprise Infrastructure Solutions (EIS):** NOAA requests an increase of \$470,000 as part of the NOAA-wide EIS modernization effort that will support a five year transition of its current infrastructure to the new GSA EIS contract.



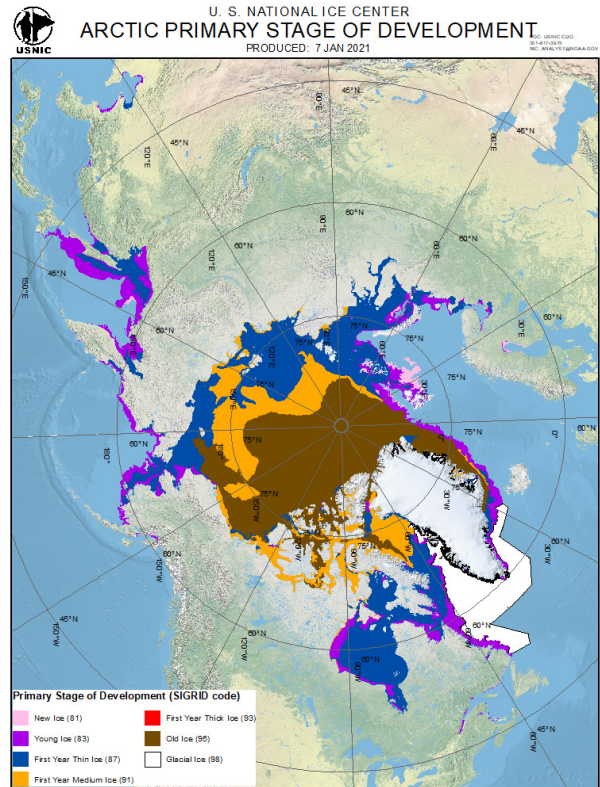
Patrick Gilchrist, Warning Coordination Meteorologist, at NWS Glasgow, Montana operates a Remote Automated Weather Station in the aftermath of the Lion's Head Fire.



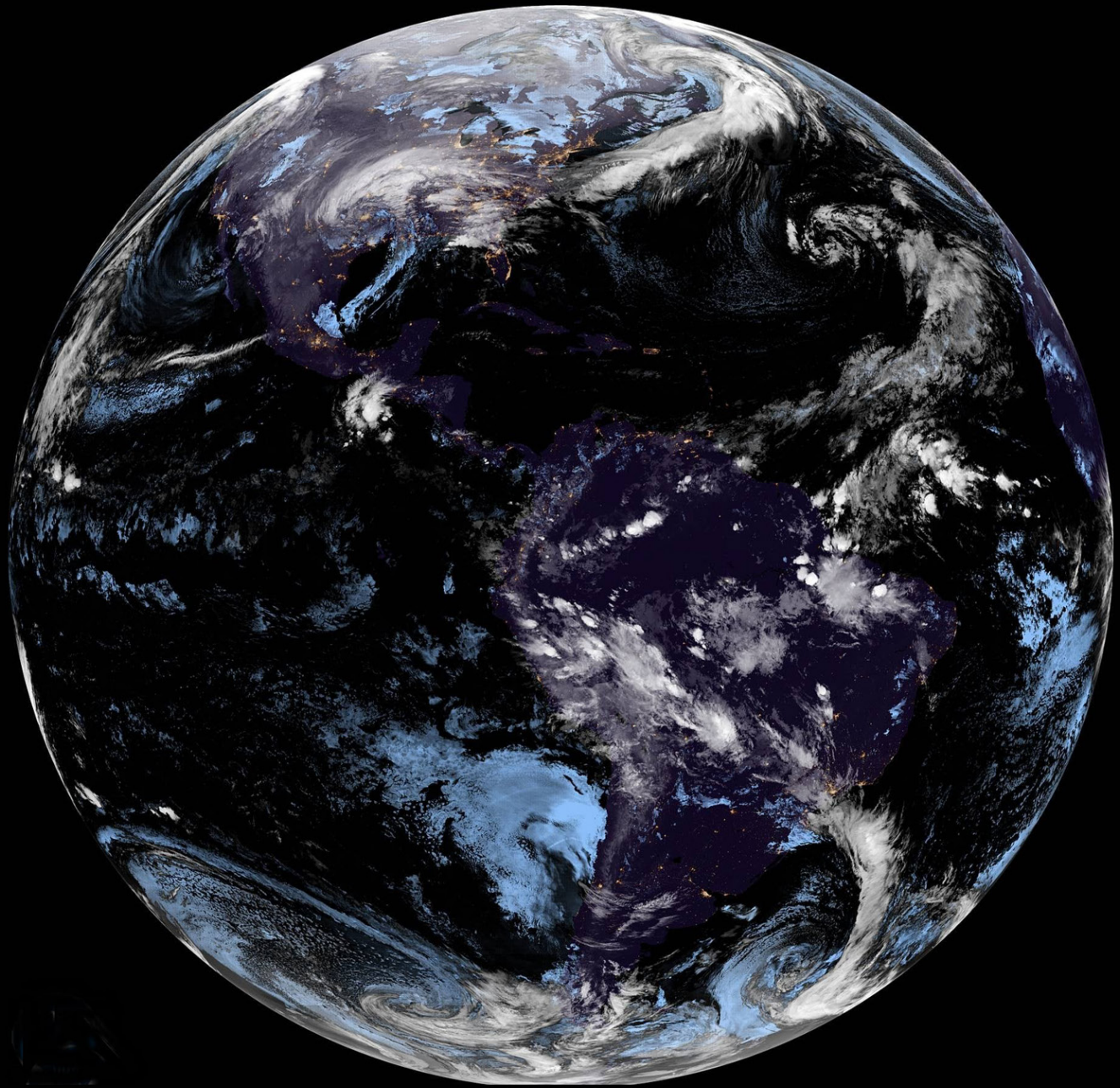
## CONSTRUCTION

### Facilities Construction and Major Repairs \$10,000,000

NOAA requests a total of \$10,000,000 in the Construction Activity. This total supports repairs and renewal of forecast offices and other government owned weather facilities that contain critical infrastructure; maintain structural integrity through capital improvements. There are no program changes requested for this activity.



This graphical representation of the estimated stage of ice development thickness is produced by the U.S. National Ice Center (USNIC) based on weekly ice analysis. The NOAA component of the USNIC transitioned from NESDIS to the NWS in FY 2020, and is now a part of the Ocean Prediction Center. Source: USNIC



This image was captured by NOAA's GOES-East satellite shortly after midnight ET on January 1, 2021. GOES provide advanced imagery and atmospheric measurements of Earth's Western Hemisphere, real-time mapping of lightning activity, and improved monitoring of solar activity and space weather.



# National Environmental Satellite, Data, and Information Service

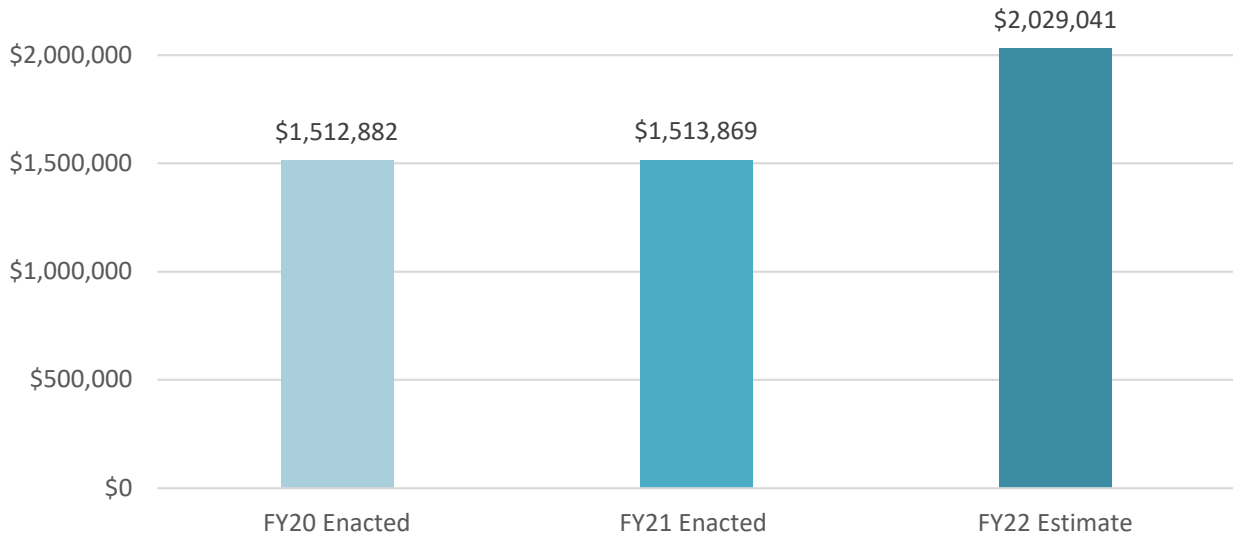
The National Environmental Satellite, Data, and Information Service (NESDIS) provides timely access to global environmental space based and ground-based data that promote, protect, and enhance the Nation's economy, national security, environment, and quality of life. Along with launching and operating NOAA's satellites, NESDIS manages the product development and distribution of NOAA and partner satellite data, archives this and other environmental data, and provides numerous environmental and resource reports for commercial, state, regional, national, and global users. NOAA satellites support the national weather and space weather forecasting enterprise by providing timely, high quality data for model outputs and publicly disseminated weather forecasts and warnings. NESDIS also works to develop the next generation of satellites to avoid gaps in satellite coverage that could affect NOAA's primary mission essential functions.

## FY 2020 ACCOMPLISHMENTS

In FY 2020, NOAA's Commercial Remote Sensing Regulatory Affairs transformed the regulatory process to help U.S. industry remain world leaders in obtaining information about objects or areas on Earth from a distance, known as space-based remote sensing, by publishing new, streamlined regulations on licensing of private remote sensing space systems. This new approach to commercial remote sensing regulation improves U.S. competitiveness by increasing regulatory transparency, reduces licensing process timelines by 50 percent, and lessens the administrative burden to licensees by at least 33 percent. This paradigm shift ensures NOAA upholds its regulatory obligations, listens to the industry's interests, and continues to support the vast amount of data about Earth systems provided to the Nation via remote sensing.

NESDIS' Commercial Weather Data Pilot (CWDP) enables the commercial sector to demonstrate new satellite capabilities to acquire and improve utilization of data in NOAA's models, products, and archives. As a result of these efforts, in 2020, NOAA published its first Request for Proposals to purchase commercially-provided satellite data for operational use and released a Request for Information for another potential round of pilots. NOAA maintained and established new agreements with international partners to secure access to Earth observations with the Japan Aerospace Exploration Agency, Vietnam National Space Center, and many others to strengthen scientific cooperation in the fields of climate, weather, oceans, and coasts. By engaging with the commercial sector and strengthening international partnerships, NESDIS is able to explore innovative opportunities for data exploitation and new concepts for instruments, spacecraft, business models, and mission elements for NOAA's future space-based observation architecture.

## NESDIS Discretionary Budget Trends (\$ in thousands)



NESDIS continues to develop plans for the next generation satellite architecture to meet NOAA’s Earth observing system requirements. In 2020, NESDIS initiated Joint Venture, which allows NOAA to leverage our partner’s investments and advance readiness to meet NOAA’s future observational needs. Through these partnerships, NOAA awarded 32 contracts for design analyses to develop mission, spacecraft, and instrument concepts for future satellite observation capabilities. In addition, understanding customers’ needs is vital to inform the development of NOAA’s next generation satellite architecture. In 2020, NOAA launched a series of communication initiatives, including five thematic workshops and associated surveys covering fire, weather, human health, agriculture, and oceans. These discussions helped NOAA pinpoint user satellite observing needs in the 2030-2050 time frame and allowed us to communicate our strategic objectives, current activities, and future plans for NOAA’s current and future satellite programs to meet the highest priority NOAA observational needs in the most efficient manner.

NESDIS is making strides to employ cloud-enabled capabilities and artificial intelligence

(AI) to increase security, efficiency, agility, and innovation. NESDIS completed the first operational use of the NESDIS Cloud Strategy with the successful implementation of the Operational Secure Ingest Service, which enables internal customers to securely access external data and made significant progress in a multi-year effort to ensure NOAA’s Comprehensive Large Array-Data Stewardship System, the enterprise archive for NESDIS’s large programs, is ready to migrate historical data to the cloud for backup capability. NOAA also signed a three-year Other Transaction Authority agreement with Google to jointly explore the benefits of AI for enhancing NOAA’s use of data. These cloud and AI activities allow NOAA to leverage the enormous volume and diversity of environmental data to enhance weather and climate predictions.

### **FY 2022 REQUEST** **\$2,029,041,000**

NOAA requests a total of \$2,029,041,000 to support the continued and enhanced operations of NESDIS through its Operations, Research, and Facilities (ORF) and satellite development



through its Procurement, Acquisition, and Construction (PAC) accounts. This includes a net increase of \$507,488,000 in FY 2022. This program change total includes a net increase of \$2,588,000 to restore funds that were approved to support the Weather and Climate Operational Supercomputing System (WCOSS) and the G550 reprogrammings represented in the NOAA Control Table in Appendix 2.

To strengthen core research capabilities to respond to increasing demand for the data, tools, and services that this research provides, in FY 2022, NESDIS will support the development and delivery of a wide range of place-based information products and services to help people make informed decisions. These efforts increase the value of weather and climate information to users and support more efficient, cost-effective delivery of products and services relevant to region-specific economic activity, hazards, and vulnerability.

In FY 2022, NESDIS will enhance enterprise data stewardship and archiving, sustain consistent multi-decadal climate data records, and sustain science and data stewardship operations in the cloud to enable accelerated public access. NESDIS will also expand the scope and transition to operations of numerous ocean, arctic, and fire-related products to address critical information gaps for decision makers.

The FY 2022 request also includes significant investments for NOAA's observational infrastructure, such as NOAA satellites. NOAA's satellites collect essential data for weather prediction that also serve as a long-term record for monitoring key climate parameters. With this request, NESDIS is taking essential steps to operate more effectively over the coming years. NESDIS is committed to a flat \$2.0 billion budget starting in FY 2022 with no outyear increases other than government-wide inflation assumptions. NOAA is also proposing to restructure the NESDIS budget to position itself to thrive in a new, diverse observing system

environment while enabling the organization to more efficiently make the tradeoffs to maintain a flat overall budget. This observing system will provide advanced, real-time data critical to saving lives and protecting property, powering sophisticated models that forecast climate change-driven weather patterns and environmental conditions never seen before, to provide our communities and users with information to manage their lives and investments into the future.

The FY 2022 request includes increased and continued support for development of NOAA's polar-orbiting, geostationary, and Space Weather Follow On satellite programs, support for satellite operations, and increased support for commercial data purchase of Global Navigation Satellite System RO data. Program changes are highlighted below. A summary of funding by Program, Project, and Activity is located in Appendix 2. Detailed descriptions of the program changes below are located in the NOAA FY 2022 Congressional Justification.

## FY 2022 ORF BUDGET SUMMARY

NOAA requests a total of \$351,722,000 to support the ORF activities of NESDIS, reflecting an increase of \$55,093,000 in FY 2022 program changes.

### ENVIRONMENTAL SATELLITE OBSERVING SYSTEMS \$263,636,000

NOAA requests a net increase of \$32,133,000 for a total of \$263,636,000 in the Environmental Satellite Observing Systems activity. This total provides continued support for satellite operations and the development of new products to leverage global observing system capabilities. Program changes include:

#### **Office of Satellite and Product Operations: Satellite and Product Operations Deferred**

**and Extended Maintenance:** NOAA requests an increase of \$7,500,000 to support critical satellite operations and maintenance requirements. These funds will ensure NOAA does not redirect mission resources to address repairs, maintenance, and major upgrades.

**Office of Satellite and Product Operations: Enterprise Infrastructure Solutions (EIS):** NOAA requests \$1,500,000 for NOAA to conduct a technology modernization and support an accelerated transition of telecommunications services to the General Services Administration (GSA) EIS contract vehicle.

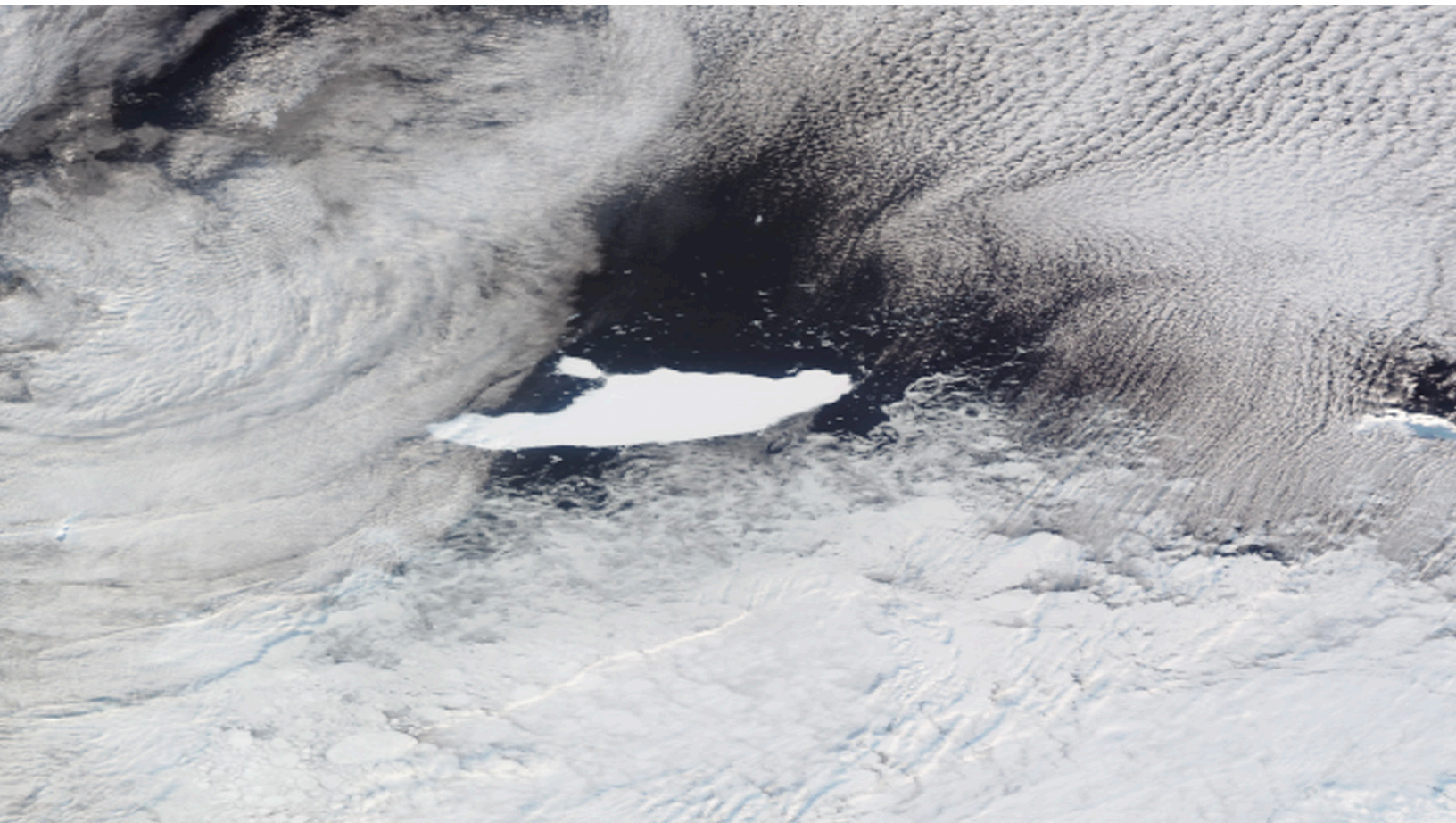
**Product Development, Readiness & Application: Advance Core Activities:** NOAA requests \$8,000,000 to improve the development rate of data products, applications, techniques, and systems to better meet NOAA mission

requirements, defining an appropriate baseline performance, as well as to support the full requirement for the legacy geostationary and polar satellite systems calibration and validation of instruments.

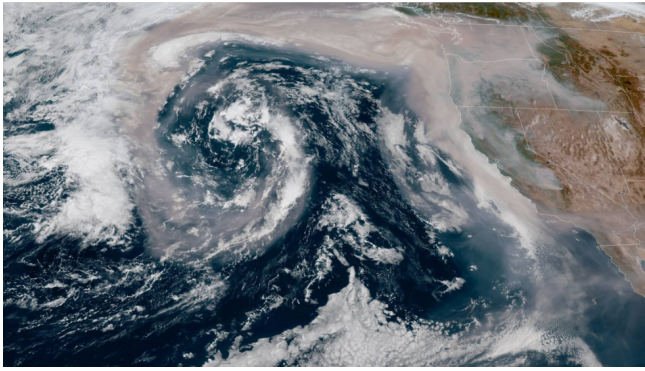
**Product Development, Readiness & Application: Ocean Remote Sensing:** NOAA requests \$6,505,000 to support sustainment and development of ocean-related products and their transition to operations, including products utilized by the global and coastal ocean user community, climate-related products, and products and services that support improved understanding of ocean dynamics and marine ecosystems.

**Product Development, Readiness & Application: Advancing Fire Weather Priorities:** NOAA requests \$4,000,000 for fire product research, development, transition,

As NOAA-20 (JPSS-1) passed over the Antarctic Peninsula on May 5, 2020, it captured the world's largest iceberg, known as Iceberg A-68A. NOAA monitored the massive iceberg that was on a collision course with the island of South Georgia, one of the world's largest marine conservation areas and important fishing grounds.







NOAA's GOES-West captured massive wildfire smoke plumes billowing from the western wildfires in the summer of 2020, blowing over the Pacific Ocean and swirling into a low pressure system. GOES-West provides critical, lifesaving information to direct firefighting efforts, as well as data informing our understanding of the entire lifecycle of a fire disaster—from drought to fire to floods and landslides.

and sustainment. NESDIS is pursuing a series of short-term and long-term fire product development activities, including demonstrating fire detection and characterization products and alerting systems in the NOAA Fire Weather Testbed, that address critical gaps in the fire product lifecycle.

**Product Development, Readiness & Application: Expanding Arctic and Antarctic Datasets and Products:** NOAA requests \$2,000,000 to substantially expand the scope of the current satellite work and its application for the Arctic and Antarctic. This increase will support products, such as snow depth on ice and sea ice detection, used to facilitate commerce, support national defense, and understand climate change.

**Product Development, Readiness & Application: U.S. Group on Earth Observations (GEO):** NOAA requests \$500,000 to the GEO Trust Fund for the operations of the GEO Secretariat and to support the AmeriGEO efforts in the Americas.

**NATIONAL CENTERS FOR ENVIRONMENTAL INFORMATION (NCEI) \$88,086,000**

NOAA requests a net increase of \$22,960,000 for a total of \$88,086,000 in the NCEI activity. This total provides continued support for aligning

science and stewardship requirements and resources to ensure return on investments in NOAA observation systems. Program changes also include:

**National Centers for Environmental Information: Improving Local, State, and Regional Climate Services:** NOAA requests \$6,300,000 to increase support for local, state, and regional climate services and fund climate change attribution services. NCEI's Regional Climate Services, including the Regional Climate Centers, support the development and delivery of a wide range of place-based climate science and information products and services to help people make informed decisions.

**National Centers for Environmental Information: Enhance Enterprise Data Stewardship and Archiving:** NOAA requests \$5,300,000 to enhance enterprise data stewardship and archiving to further the value of NOAA's investment in Earth observations. It will allow NCEI to address the current underfunded demand for data management, archive, and access capabilities and be able to better meet future demand.

**National Centers for Environmental Information: Climate Data Records:** NOAA requests \$6,000,000 for additional funding to revitalize NOAA's ability to develop and operationally sustain seamless and consistent multi-decadal climate data records (CDRs) derived from NOAA and NOAA partner satellite observations. Government, industry, and academia use CDRs to detect, monitor, and assess climate change-related trends and patterns in the Earth system.

**National Centers for Environmental Information: Sustainment of Cloud Framework for Environmental Data:** NOAA requests \$4,900,000 for additional funding to provide sustained science and data stewardship operations in the cloud. To enable accelerated public access, increased data innovation, and

economic exploitation of NCEI products and services, NESDIS proposes to move all of its product areas and supporting applications to the cloud.

## FY 2022 PAC BUDGET SUMMARY

NOAA requests a total of \$1,677,319,000 to support the PAC activities of NESDIS, reflecting a net increase of \$452,395,000 in FY 2022 program changes.

### SYSTEMS ACQUISITION \$1,676,869,000

NOAA requests a net increase of \$452,395,000 for a total of \$1,676,869,000 in the Systems Acquisition activity. This total provides continued support for the development, deployment, and sustainment of flight and ground assets that meet the Nation’s needs for observations and measurements, and to lead and manage the NESDIS system architecture, enterprise engineering, and advanced planning efforts to deliver sustainable, robust, and adaptive systems and services that meet NESDIS customer needs.

NESDIS began evolving its budget structure in FY 2020 and 2021 to lay the groundwork for the architecture recommendations in accordance with the NOAA Satellites Observing System Architecture (NSOSA) study. Budget structure changes proposed in FY 2022 align with the investments requested for all our observing systems. In FY 2020, NESDIS created two Subactivities: Polar Weather Satellites and Systems/Services Architecture and Engineering (SAE). In FY 2021, NESDIS established the Geostationary Earth Orbit (GEO) Subactivity, to manage future geostationary observations, specifically the next generation geostationary satellite series. Program changes include:

**Geostationary Earth Orbit (GEO): GOES-R Series Sustainment:** NOAA requests an increase of \$1,000,000 for near term sustainment

funds in the GOES-R Series program. These funds will continue sustainment of the GOES-R Series Ground System, including replacement of the IBM servers, in compliance with requirements under the Consolidated Appropriations Act of 2014.

#### Total GOES-R Request

##### (BUDGET AUTHORITY IN \$K)

FY 2022 Request	\$335,500
FY 2023	\$276,000
FY 2024	\$272,500
FY 2025	\$124,500
FY 2026	\$98,500
CTC	\$672,128
Total	\$11,022,087

#### Geostationary Earth Orbit (GEO):

##### Geostationary Extended Observations (GeoXO):

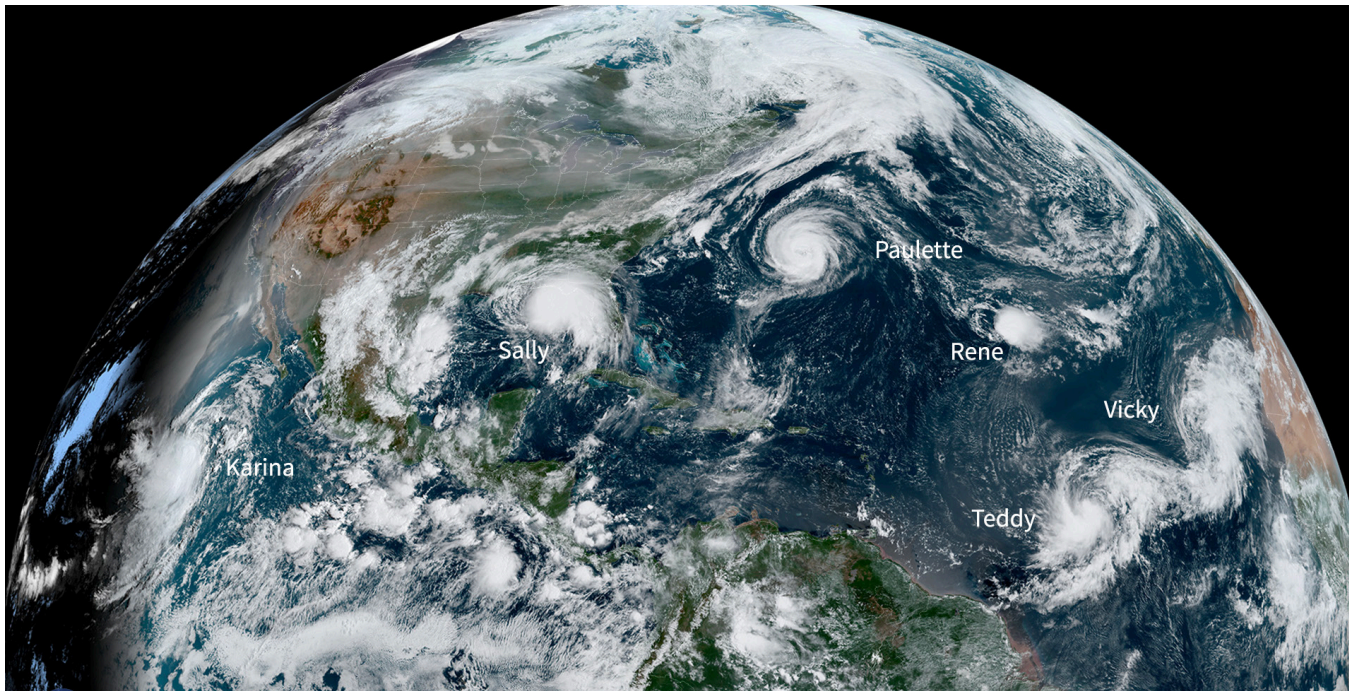
NOAA requests an increase of \$455,000,000 for Phase A formulation studies with industry for all GeoXO instruments (e.g. imager, sounder, lightning mapper, sounder, ocean color, and atmospheric composition instruments), as well as for the spacecraft. These Phase A industry studies will provide the data needed to finalize performance requirements and enable NESDIS to initiate the GeoXO instrument and spacecraft implementation contracts starting in FY 2023.

#### Total GeoXO Request

##### (BUDGET AUTHORITY IN \$K)

FY 2022 Request	\$465,000
FY 2023	\$490,000
FY 2024	\$545,000
FY 2025	\$780,000
FY 2026	\$790,000
CTC	TBD
Total	TBD





On the morning of September 14, 2020, NOAA's GOES-East satellite spied six active tropical systems spanning the Atlantic and Pacific Oceans. The advanced observational capabilities available from the GOES-R Series help NOAA issue the best watches, warnings, forecasts, and analyses of hazardous tropical weather and increases understanding of these hazards.

In FY 2022, NOAA proposes to establish the Low Earth Orbit (LEO) Subactivity, which will set the stage for managing future polar and other low earth and medium earth orbit satellite observations as loosely coupled programs. Program changes include:

**Low Earth Orbit (LEO): Polar Weather Satellites:** NOAA requests a decrease of \$252,835,000 for planned decreases to Polar Weather Satellite (PWS) due to the rescheduled launch commitment dates applying to a five-year cadence. The launch vehicles will be purchased in future years reducing the current need.

Total PWS Request (BUDGET AUTHORITY IN \$K)	
FY 2022 Request	\$405,000
FY 2023	\$405,000
FY 2024	\$405,000
FY 2025	\$405,000
FY 2026	\$425,000
CTC	\$3,287,241
Total	\$18,025,965

**Low Earth Orbit (LEO): LEO Weather Satellites:** NOAA requests an increase of \$78,330,000 to initiate a LEO Weather Satellites program that will ultimately serve as the follow-on to the PWS program.

Total LEO Weather Satellites Request (BUDGET AUTHORITY IN \$K)	
FY 2022 Request	\$78,330
FY 2023	\$78,330
FY 2024	\$90,000
FY 2025	\$90,000
FY 2026	\$92,000
CTC	TBD
Total	TBD

**Low Earth Orbit (LEO): Cooperative Data and Rescue Services (CDARS):** NOAA requests a decrease of \$13,100,000 due to completion of the integration and launch phases of the program. The remaining funding and personnel will continue post launch as support for the U.S. Air Force Hosted Payload Solutions of the Argos-4



Advanced Data Collection System instrument provided by the French space agency Centre National d'Etudes Spatiales.

assurance of the data and maintains ground reception stations used to acquire data.

Total CDARS Request (BUDGET AUTHORITY IN \$K)	
FY 2022 Request	\$1,300
FY 2023	\$1,326
FY 2024	\$1,353
FY 2025	\$1,380
FY 2026	\$1,407
CTC	TBD
Total	TBD

Total COSMIC-2/GNSS RO Request (BUDGET AUTHORITY IN \$K)	
FY 2022 Request	\$8,100
FY 2023	\$8,262
FY 2024	\$8,427
FY 2025	\$8,596
FY 2026	\$8,768
CTC	TBD
Total	TBD

**Low Earth Orbit (LEO): COSMIC-2/Global Navigation Satellite System (GNSS) Radio Occultation (RO):** NOAA requests an increase of \$2,208,000 to maintain the current operational capability of the ground system for the COSMIC-2 program. This increase supports quality

**Low Earth Orbit (LEO): Polar Operational Environmental Satellites (POES) Extension:** NOAA requests \$20,000,000 to extend operations of the Polar Operational Environmental Satellites (POES) system and its associated ground system, which provide critical early-morning orbit observations.



The VIIRS instrument on the NOAA-20 satellite captured a rare wintertime clear day over the Great Lakes on Feb. 3, 2021.



**Total POES Extension Request  
(BUDGET AUTHORITY IN \$K)**

FY 2022 Request	\$20,000
FY 2023	\$10,000
FY 2024	-
FY 2025	-
FY 2026	-
CTC	-
Total	\$30,000

In FY 2022, NOAA also proposes to establish the Space Weather Observations (SWO) Subactivity, which will manage the future space weather observations as loosely coupled programs. Program changes include:

**Space Weather Observations: Space Weather Follow On (SWFO):** NOAA requests an increase of \$38,785,000 for the SWFO program. Funding will support a SWFO-L1 mission with a Space Weather Instrument Suite for solar wind observations and a compact coronagraph for coronal mass ejection imagery at Lagrange point 1 (L1). The NOAA SWFO-L1 mission will ensure continuity of space weather data beyond NOAA’s Deep Space Climate Observatory and NASA-European Space Agency research Solar and Heliospheric Observatory, which are well past their design life.

**Total SWFO Request  
(BUDGET AUTHORITY IN \$K)**

FY 2022 Request	\$146,900
FY 2023	\$136,200
FY 2024	\$97,200
FY 2025	\$41,200
FY 2026	\$22,300
CTC	\$35,185
Total	\$692,800

**Space Weather Observations: Space Weather Next:** NOAA requests \$55,000,000 to initiate the Space Weather Next program that will sustain, improve, extend and mitigate potential gaps in observations to support NOAA space weather forecast operations as authorized by the “Promoting Research and Observations of Space Weather to Improve the Forecasting of Tomorrow Act” and driven by the National Space Weather Strategy and Action Plan.

**Total Space Weather Next Request  
(BUDGET AUTHORITY IN \$K)**

FY 2022 Request	\$55,000
FY 2023	\$145,000
FY 2024	\$150,000
FY 2025	\$152,100
FY 2026	\$200,000
CTC	TBD
Total	TBD

NESDIS will utilize a Common Ground Services approach to operate the evolving observing system, and integrated cloud, artificial intelligence, and machine-learning capabilities to verify, calibrate, and fuse data into better products and services. This includes a flexible, scalable platform that enables secure ingest of partner data in different formats. Program changes include:

**Common Ground Services (CGS): Data-source Agnostic Common Services (DACs):** NOAA requests an increase of \$25,007,000 to expand leveraging non-NOAA and commercial data sources and to provide the IT infrastructure to securely ingest, generate science products, distribute, and archive data. NOAA will complete an end-to-end infrastructure that will allow us to leverage partner and commercial observations to meet NOAA’s and NESDIS’ mission requirements



NOAA's GOES-East GeoColor capture of Hurricane Laura over the Gulf of Mexico, the strongest and most damaging landfalling U.S. hurricane of 2020. The satellite's high-resolution imagery provides optimal viewing of severe weather events, including thunderstorms, tropical storms, and hurricanes.

in a cost-effective manner, and to begin delivering enhanced products and services to meet NOAA's environmental and climate mission.

**Total DACS Request  
(BUDGET AUTHORITY IN \$K)**

FY 2022 Request	\$30,022
FY 2023	\$30,022
FY2024	\$45,500
FY2025	\$45,500
FY 2026	\$45,500
CTC	N/A
Total	N/A

Through Systems/Services Architecture and Engineering (SAE), NESDIS initiated studies to define next generation polar and geostationary satellite capabilities. Program changes include:

**Systems/Services Architecture & Engineering (SAE): Commercial Weather Data Pilot**

**(CWDP):** NOAA requests \$5,000,000 to continue executing pilots on emerging commercial data capabilities. These pilots assess operational viability of possible future commercial capabilities, which is critical to planning for NOAA's future satellite architecture needs.

**Total CWDP Request  
(BUDGET AUTHORITY IN \$K)**

FY 2022 Request	\$8,000
FY 2023	\$8,000
FY 2024	\$8,000
FY 2025	\$8,000
FY 2026	\$8,000
CTC	N/A
Total	N/A



**Systems/Services Architecture & Engineering (SAE): Commercial Data Purchase:** NOAA requests an increase of \$13,000,000 to purchase commercial GNSS RO data for operational use. It will also support continued development and sustainment of the infrastructure and capability to securely import, transfer, process, and store external data from commercial providers for operational use.

Total Commercial Data Purchase Request (BUDGET AUTHORITY IN \$K)	
FY 2022 Request	\$22,000
FY 2023	\$25,000
FY 2024	\$28,000
FY 2025	\$31,000
FY 2026	\$31,000
CTC	N/A
Total	N/A

**Systems/Services Architecture & Engineering (SAE): Joint Venture Partnerships:** NOAA requests \$25,000,000 to expand activities with other agencies and the commercial sector that investigate, mature, and demonstrate new technologies and capabilities that could potentially be incorporated into NOAA satellite architectures and associated enterprise products and services portfolios.

Total Joint Venture Partnerships Request (BUDGET AUTHORITY IN \$K)	
FY 2022 Request	\$30,000
FY 2023	\$20,000
FY 2024	\$20,000
FY 2025	\$20,000
FY 2026	\$20,000
CTC	N/A
Total	N/A

**CONSTRUCTION \$2,450,000**

NOAA requests \$0 in program changes for a total of \$2,450,000 in the Construction activity. This total supports repairs and renews facilities that contain critical infrastructure; maintains structural integrity through capital improvements; and ensures availability of power and cooling necessary for NOAA’s satellite ground system.

Total Satellite CDA Facility (BUDGET AUTHORITY IN \$K)	
FY 2022 Request	\$2,450
FY 2023	\$2,450
FY 2024	\$2,450
FY 2025	\$2,450
FY 2026	\$2,450



A Bay Watershed Education and Training program grantee introduces students to the Choptank River, a major tributary of the Chesapeake Bay.





# Mission Support

NOAA's Mission Support services are the backbone of NOAA's programs and mission. These activities ensure that NOAA staff have the proper work environment, the necessary tools and equipment, and vital personnel and finance services which, in turn, allow them to provide the finest possible service to the American people, the economy, and the environment.

## FY 2020 ACCOMPLISHMENTS

In FY 2020, the Staff Offices of Mission Support provided numerous services in support of the NOAA mission including the following highlights. The Acquisition and Grants Office (AGO) executed 22,910 acquisition transactions, obligating \$1.72 billion and managing over 4,500 active contracts valued at over \$5 billion. AGO executed over 2,300 financial assistance transactions to award \$1.52 billion. NOAA also successfully executed over 9,300 acquisition and nearly 800 financial assistance closeout actions in FY 2020. In addition, NOAA continued its strong support of small businesses in FY 2020, obligating \$823 million to small businesses equating to a 50.6 percent overall small business achievement for the year.

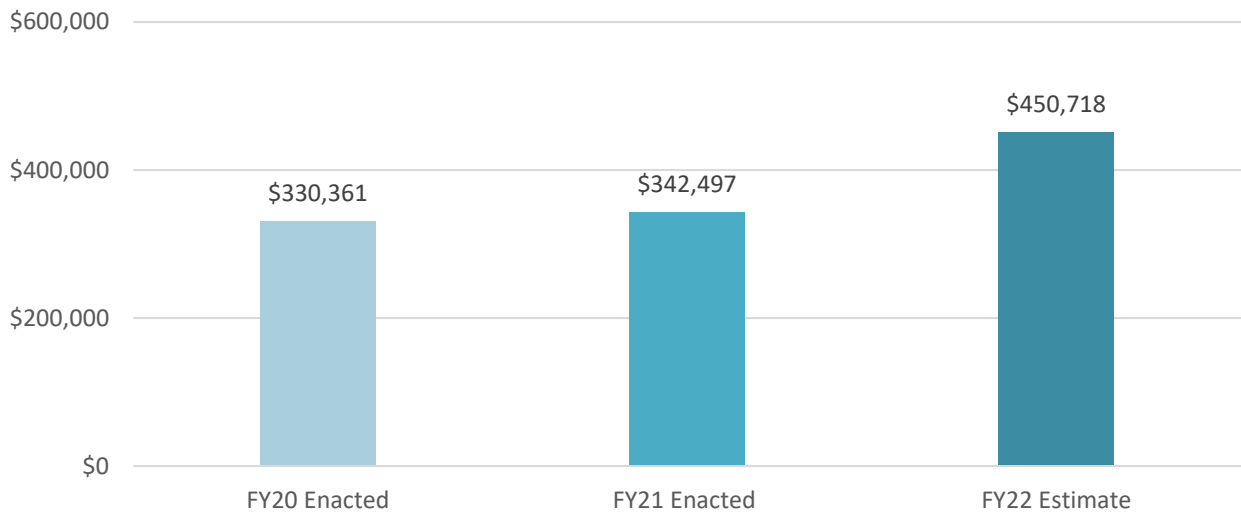
The Office of the Chief Administrative Officer (OCAO) is implementing an asset management

tool to document, analyze, track and report conditions, repair needs, space use, replacement value and sustainment cost for its owned assets. Additionally, NOAA created standardized processes for how and what real property data is collected, and awarded a contract to validate the data on 75 percent (1.8 million gross square feet) of NOAA's inventory of owned properties. Upon full implementation of the asset management program, NOAA will have a repeatable, traceable, and accurate owned facility data set. With this information, NOAA executives will make data-driven decisions to best utilize limited resources to sustain its mission-critical footprint.

The Office of Human Capital Services launched its new and dynamic LANTERN (Leveraging Abilities, Needs, Talents Energies & Resources Network) program which enables all Line and Staff Offices to provide detail opportunities to NOAA personnel that support distinct organizational needs while promoting individual professional growth and experience. The office initiated the first NOAA-wide senior executive continuing education program in concert with a nationally known university that provided a tailored program of instruction.

NOAA's Office of Education enhanced the NOAA Citizen Science Community of Practice with 215 members representing projects that provide more than 1.1 million volunteer hours per year. The office developed an implementation plan with over 100 actions in support of NOAA's Education 2021-2040 Strategic Plan across the agency by working with the NOAA Education Council, as required by America COMPETES Act. The Office of Education also coordinated 25 aquariums and marine science education institutions through the Coastal Ecosystems Learning Centers network and 154 educational institutions through the Science on a Sphere® network.

## MS Discretionary Budget Trends (\$ in thousands)



### FY 2022 REQUEST \$450,718,000

NOAA requests a total of \$450,718,000 to position NOAA’s Mission Support programs for more effective execution of NOAA’s diverse mission. This total includes Operations, Research, and Facilities (ORF) and Procurement, Acquisition, and Construction (PAC) accounts and includes a net increase of \$96,248,000 in FY 2022 program changes. This program change total includes a net increase of \$3,348,000 to restore funds that were approved to support the Weather and Climate Operational Supercomputing System (WCOS) and G550 reprogrammings represented in the NOAA Control Table in Appendix 2.

Measuring and predicting climate change impacts are core to NOAA’s mission. Mission Support will support NOAA Open Data Dissemination to provide worldwide cloud access to NOAA’s climate and earth systems dynamics data. This will allow for enhanced collaboration to improve climate modeling in conjunction with the NOAA Cloud Program to streamline and accelerate the

transition of increased data to the cloud. NOAA also seeks to increase capacity to manage facilities repair and construction needs to ensure NOAA facilities can support climate, weather, ocean, and fisheries research and services, multi-billion-dollar satellite programs and NOAA’s ship and aircraft operations. This will help NOAA meet the Administration’s climate science goals, including Executive Order (EO) 14008 on *Tackling the Climate Crisis at Home and Abroad*, through improved observations and forecasting for the American public.

NOAA proposes to develop a framework and lay the foundation for successfully integrating equity across the organization, from management, to policies, to service-delivery. In FY 2022, investments in recruitment, the implementation of the Diversity and Inclusion Plan, strategic communications, and our premiere education programs position the agency as a critical leader to make tangible improvements to vulnerable communities. NOAA is aligned with the Administration priority of environmental justice and equity and will further support EO 13985 on *Advancing Racial Equity and Support for*



*Underserved Communities Through the Federal Government* by developing a framework and laying the foundation for successfully integrating equity across the organization to reach a broader range of Americans in underserved and disadvantaged communities.

The FY 2022 request includes significant investments for NOAA's observational infrastructure, such as the NOAA fleet, a key component of the NOAA mission. NOAA will ensure NOAA has fully functional pier space to support a permanent homeport for the NOAA Ship *Ronald H. Brown* and the NOAA Ship *Nancy Foster*.

Investments in ecological restoration and community resilience are integral to NOAA's climate strategy, and there is an increasing need for NOAA to create and foster natural and economic resilience along our coasts through our direct financial support, expertise, robust, on-the-ground partnerships, and place-based conservation activities. In FY 2022, an investment in AGO will support increased management responsibilities through expanded programs that allow NOAA to provide inherently governmental management and oversight functions.

Program changes are highlighted below. A summary of funding by Program, Project, and Activity is located in Appendix 2. Detailed descriptions of the program changes below are located in the NOAA FY 2022 Congressional Justification.

## FY 2022 ORF BUDGET SUMMARY

NOAA requests a total of \$369,718,000 to support the ORF activities of Mission Support, reflecting a net increase of \$58,248,000 in FY 2022 program changes.

### EXECUTIVE LEADERSHIP \$30,980,000

NOAA requests an increase of \$2,603,000 in program changes for a total of \$30,980,000 in the Executive Leadership activity. These funds will support NOAA's centralized executive management as well as policy formulation and direction. Program changes include:

#### **Executive Leadership: NOAA Tribal Liaisons:**

NOAA requests an increase of \$500,000 to create two full-time NOAA Tribal Liaison positions to strengthen NOAA communications and outreach to Tribal governments, Native Alaska Corporations, and Native Hawaiians; one in Juneau, Alaska and one located in the Washington DC metro area. The Tribal Liaisons will support meaningful consultations and coordination with tribal officials in the development and implementation of Federal policies that have tribal implications.

#### **Executive Leadership: Strategic Communication and Outreach to Underserved Communities:**

NOAA requests an increase of \$2,000,000 to put the NOAA Communications capacity on par with that of other Federal science agencies. This directly supports NOAA's mission of sharing scientific knowledge, data and services with the public, including underserved communities. This request enables the Office of Communications to implement a strategy, using traditional and new media platforms, to educate and build awareness among diverse and multi-sector decision-makers, community members, and stakeholders.

### MISSION SERVICES AND MANAGEMENT \$189,386,000

NOAA requests an increase of \$28,245,000 in program changes for a total of \$189,386,000 for the Mission Services and Management activity. These funds will support the planning, administrative, financial, procurement, information technology, human resources, and infrastructure services that are essential to the safe and successful performance of NOAA's mission. Program changes include:

**Mission Services and Management:**

**Acquisition and Grants Office:** NOAA requests an increase of \$2,530,000 for personnel to process and manage new grants, and diligently monitor those grants to ensure good performance and proper financial stewardship.

**Mission Services and Management: Increase**

**Facility Program Capacity:** NOAA requests an increase of \$5,000,000 to build capacity within OCAO to coordinate capital investment, sustainment, and deferred maintenance and repair activities supported by NOAA's Facilities Maintenance (ORF) and Construction (PAC) accounts.

**Mission Services and Management:**

**Implement a Budget Position Management**

**System:** NOAA requests an increase of \$1,400,000 to implement a budget position management system to improve NOAA's ability to report required position data and be directly responsive to Congressional directives in recent years. The establishment of a transparent linkage between positions and budget is a necessary component for oversight and interoperability to continuously improve the provision of human capital services, most importantly the hiring process, across NOAA.

**Mission Services and Management: Equity Assessment and Implementation Support In**

**Compliance with EO 13985:** NOAA requests an increase of \$900,000 to expand the number of Service Equity Assessments of NOAA's programs and services per Section 5 of EO 13895 and learn, through the statistical collection of evidence, which plans are effective in addressing barriers. In this way, it will be possible to quickly incorporate lessons learned and institutionalize an efficient strategy for equitable service delivery at NOAA.

**Mission Services and Management: NOAA**

**Finance Transaction Processing:** NOAA requests an increase of \$800,000 for additional support staff to ensure successful processing

and appropriate oversight of financial transactions associated with the appropriated resources requested in the FY 2022 President's Budget. Additional staff will review internal controls, support external audit requests and analysis, and provide financial policy guidance and reporting.

**Mission Services and Management: NOAA**

**Open Data Dissemination:** NOAA requests an increase of \$3,300,000 to evolve NOAA's proven, cost-effective Big Data Program into an Enterprise-wide Service, NOAA Open Data Dissemination (NODD). NODD will provide worldwide cloud access to all of NOAA's rapidly increasing open data, including climate data and other Earth System dynamics crucial to improve climate modeling.

**Mission Services and Management: NOAA**

**Cloud Program:** NOAA requests an increase of \$2,500,000 to establish a NOAA Enterprise Cloud Program Office to streamline and accelerate the transition of NOAA mission areas to the cloud and access to innovative cloud inherent technologies. The program will deliver comprehensive multi-cloud services, avoiding the need for duplication of effort across NOAA in the following areas: acquisition support, networking, cybersecurity, authentication services, cloud subject matter expertise, and customer advocacy.

**Mission Services and Management:**

**Enterprise Infrastructure Solutions (EIS):**

NOAA requests an increase of \$1,770,000 to conduct a technology modernization and support an accelerated transition of telecommunications services to the General Services Administration (GSA) EIS contract vehicle.

**Mission Services and Management:**

**Spectrum:** NOAA requests an increase of \$500,000 to more effectively manage its access to spectrum and support wireless broadband.

**Mission Services and Management: Diversity**

**in IT:** NOAA requests an increase of \$400,000 to expand an IT Fellowship Program to diversify its





NOAA's Earth Systems Research Laboratory can be found at the David Skaggs Research Center in Boulder, CO.

high-quality, entry-level Information Technology (IT) workforce. Demand for IT professionals is high nation-wide. In order to compete with the private sector and other government agencies, NOAA must expand the opportunities it provides to promising candidates, including IT professionals of color.

**Mission Services and Management: NOAA Recruiting Program:** NOAA requests an increase of \$1,500,000 to develop and execute a NOAA-wide recruiting program. This program will improve entry level hiring outreach and create a student-in-residence program to engage and employ students on a part-time basis year round to assist with recruiting efforts on the campuses of targeted minority serving institutions.

**Mission Services and Management: Facilitation Network:** NOAA requests an increase of \$600,000 to formalize and manage a NOAA Facilitation Network, an internal, cross-line office effort to develop organizational excellence by promoting more inclusive, productive and efficient meetings, planning sessions and training workshops.

**Mission Services and Management: Accelerate NOAA's Diversity and Inclusion Plan:** NOAA requests an increase of \$2,900,000 to fully implement its Diversity and Inclusion (D&I) Plan. This will enable NOAA to comply with the provisions of EO 13985 to assess current programs and policies which perpetuate systemic barriers to opportunities and benefits for people of color and other underserved populations. Training and outreach resources are required for staff, supervisors and leaders. Tools will be developed to track progress and measure D&I outcomes.

**Mission Services and Management: Workplace Violence Prevention and Response Program—Racial Equity and Wellness:** NOAA requests an increase of \$900,000 to establish three full-time positions to support program evaluations such as needs assessments, and gap analyses to ensure culturally competent victim services, social justice, and racial equity. The Workplace Violence Prevention and Response Program will also co-lead the implementation of EO 13985, Section 8 goals of strengthening engagement of underserved communities, by embedding “community liaisons” strategically



in selected NOAA programs to build more meaningful coordination.

### **IT SECURITY \$35,365,000**

NOAA requests an increase of \$19,500,000 in program changes for a total of \$35,365,000 in the IT Security activity. These funds defend NOAA's data, networks, equipment, intellectual property and personnel against a wide variety of adversaries ranging from nation states to lone-wolf attackers. Program changes include:

#### **IT Security: Improve NOAA's Cybersecurity:**

NOAA requests an increase of \$19,500,000 to establish dedicated funding to ensure critical cybersecurity activities are maintained. This will replace direct bill funding for cybersecurity so that Line and Staff Offices can retain funds to address their specific Federal Information Security Management Act system cybersecurity vulnerabilities and needed cybersecurity architectural and technological improvements,

thereby strengthening NOAA's overall cybersecurity compliance and ability to handle evolving threats.

### **PAYMENT TO DOC WORKING CAPITAL FUND \$66,389,000**

NOAA requests a total of \$66,389,000 for the Payment to the DOC Working Capital Fund activity. There are no program changes in this activity.

### **OFFICE OF EDUCATION \$41,120,000**

NOAA requests an increase of \$7,900,000 in program changes for a total of \$41,120,000 in the Office of Education activity. These funds will support a centralized Office of Education focused on coordinating and improving the performance of NOAA's numerous activities in STEM education. This request recognizes this office's critical role as primary point of contact for the National Science and Technology Council's Committee

Sarah Rogowski, Emergency Response Specialist at NWS' Western Regional Operating Center, briefs the Director of the California Office of Emergency Services and high-level state decision makers during the state's busy wildfire season in 2020.





on STEM for NOAA and DOC. Program changes include:

**Office of Education: Educational Partnership Program Climate Cooperative Science Center:** NOAA requests an increase of \$3,000,000 to establish a NOAA Climate Cooperative Science Center as part of the Jose E Serrano Educational Partnership Program with Minority Serving Institutions. Through a national competition, the Center will be established to train post-secondary students in climate science and related multi-disciplinary fields including, atmospheric sciences, oceanography, Earth science, meteorology, hydrology, geography, physics, chemistry and computer sciences.

**Office of Education: Engaging New and Diverse Audiences with NOAA Science:** NOAA requests an increase of \$2,900,000 to provide dedicated funding to build on its most successful public engagement programs, such as Science On a Sphere®, NOAA Heritage initiatives, and the Coastal Ecosystem Learning Centers Network. This initiative will increase NOAA's capacity to bring NOAA's cutting-edge science and compelling history to new audiences, with a focus on enhancing equity by engaging cultural and racial minorities.

**Office of Education: Environmental Literacy Grants for Community Resilience Education:** NOAA requests an increase of \$2,000,000 for environmental literacy grants to develop and implement innovative approaches to building community resilience through formal and informal education and engage the most vulnerable children, youth, and adults in learning about and creating resilience for their communities. This increase will enable the Office of Education to fund more projects that involve the communities that bear a disproportionate share of the burden of climate change, including communities of color, low income communities, and tribal and indigenous communities.

## **FACILITIES MAINTENANCE** **\$5,000,000**

NOAA requests a total of \$5,000,000 in the Facilities Maintenance activity. There are no program changes requested for this activity. In FY 2022, NOAA will continue to reduce the backlog of deferred maintenance and repair across the NOAA facilities portfolio, provide project and program management, begin pre-planning for Silver Spring Metro Center lease requirements and begin a business case analysis for a National Coastal Mapping and Aquaculture Center of Excellence at the University of New Hampshire.

## **FY 2022 PAC BUDGET** **SUMMARY**

NOAA requests a total of \$81,000,000 to support the PAC activities of Mission Support, reflecting a net increase of \$38,000,000 in FY 2022 program changes.

## **NOAA CONSTRUCTION \$81,000,000**

NOAA requests a net increase of \$38,000,000 in program changes for a total of \$81,000,000 in the NOAA Construction activity. NOAA's facilities constitute a significant capital investment with over 690 different facilities across 160 markets and 6,965,592 total Usable Square Feet, including 401 NOAA-owned facilities with an estimated replacement value of \$3 billion. Program changes include:

**NOAA Construction: Charleston, SC Pier and Facility Recapitalization:** NOAA requests an increase of \$38,000,000 for the recapitalization of NOAA pier Romeo located in Charleston, SC. The pier will ensure a permanent homeport for the NOAA Ship *Ronald H. Brown* and the NOAA Ship *Nancy Foster*. The recapitalization project will replace critical pier infrastructure and will ensure NOAA has fully functional pier space to support the current and future fleet.





NOAA Gulfstream IV N49RF Gonzo prepares for an 8.5-hour mission to Tropical Storm Laura.



# Office of Marine and Aviation Operations

NOAA's Office of Marine and Aviation Operations (OMAO) manages an array of specialized ships and aircraft that gather oceanographic, atmospheric, hydrographic, and fisheries data in support of NOAA's public safety, environmental stewardship, and scientific missions. OMAO also provides centralized coordination, support and guidance for unmanned systems across NOAA. OMAO includes civilians, mariners, and officers of the NOAA Commissioned Officer Corps (NOAA Corps), one of the eight uniformed services of the United States. NOAA is currently authorized for 500 NOAA Corps officers, excluding flag officers.

## FY 2020 ACCOMPLISHMENTS

Despite the challenges created by the Coronavirus Pandemic in FY 2020, all fifteen NOAA Ships and nine NOAA Aircraft operated in support of NOAA prioritized requirements. OMAO's integrated, science-based COVID-19 safety protocols were supported by concrete actions, such as the COVID-19 polymerase chain reaction (PCR) testing indefinite delivery,

indefinite quantity contracts (IDIQ), a robust contract that pushes the limits of science and brings the best medicine has to offer to personnel sailing on NOAA ships and flying on NOAA aircraft.

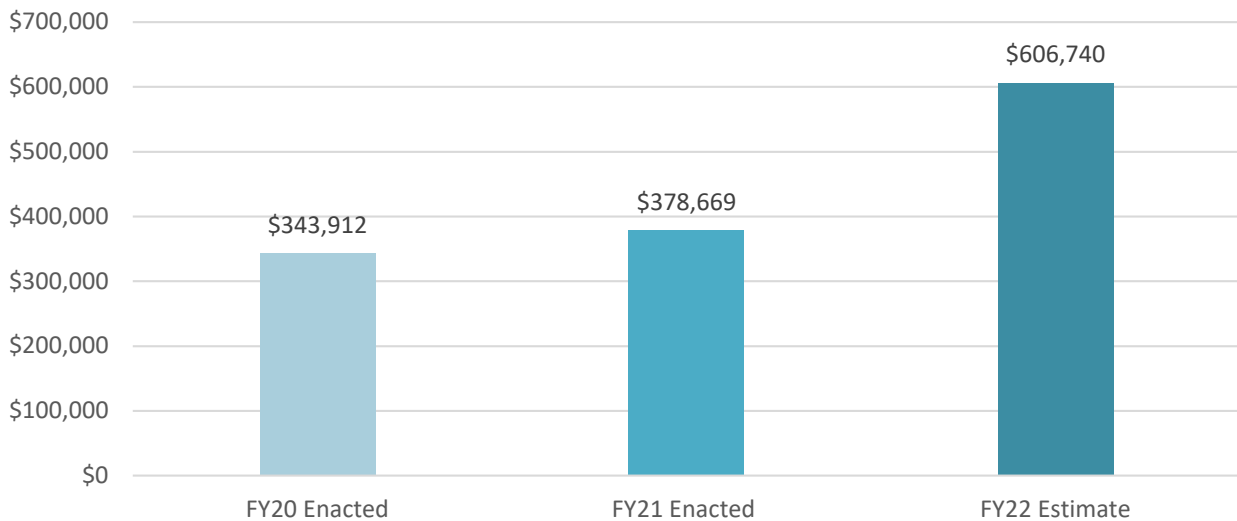
Since commencing emergency response operations in June 2020, ships safely operated from 13 ports, and conducted data collection from the Arctic Circle to the Flower Garden Banks National Marine Sanctuary. NOAA ships safely operated with nearly 40 scientists aboard, while also modifying the crew to pick up scientific duties.

NOAA Ship *Thomas Jefferson*, in response to Hurricane Delta, filled a critical role conducting hydrographic surveys over the offshore portions to the entrance of the Calcasieu Ship Channel which connects to the Port of Lake Charles, the 11th largest port in the U.S. During the ship's investigation, it was discovered that none of the 42 offshore aids to navigation were on station, with some dangerously pushed into the center of the channel by the storm. Without the *Thomas Jefferson's* response work, the entrance channel could have remained unsurveyed, resulting in major economic impact to the region.

NOAA's Aircraft successfully flew over 3,500 flight hours in support of critical missions, including over 270 P-3 and 130 G-IV hours in support of the most active hurricane season on record, with 30 named tropical cyclones. For the first time in more than five years, both P-3s were deployed for hurricane tasking and flew 10 hurricanes from domestic and international locations. Working with its scientific partners, while minimizing risk to all personnel, OMAO successfully processed critical hurricane data from the aircraft, ensuring it was processed near real-time into model forecast guidance.

In FY2020, NOAA's Uncrewed Systems Operations Center was established within OMAO. OMAO will provide services that will include training, cybersecurity, acquisition,

## OMAO Discretionary Budget Trends (\$ in thousands)



and other expert support, ensuring safe, cost effective operations across the Agency. The new program will be housed at two locations; the NOAA Aircraft Operations Center located in Lakeland, Florida, which will continue to support the agency’s uncrewed aircraft activities, and, at a new facility being built by the Mississippi Port Authority in partnership with the University of Southern Mississippi in Gulfport, Mississippi which, will support uncrewed maritime systems.

NOAA is in the process of acquiring two new oceanographic ships as part of the agency’s fleet recapitalization effort. The first ship, to be named the *Oceanographer*, will be homeported in Honolulu, Hawaii. The second ship, to be named the *Discoverer*, will be homeported in Newport, Rhode Island. These ships will greatly enhance the agency’s ocean exploration and science research capabilities.

### **FY 2022 REQUEST** **\$638,530,000**

NOAA requests a total of \$638,530,000 in discretionary and mandatory funds to support

the continued operations of OMAO. This total includes Operations, Research, and Facilities (ORF); Procurement, Acquisition, and Construction (PAC); and other accounts and includes a net increase of \$211,587,000 in FY 2022 program changes. This program change total includes a net decrease of \$3,413,000 to restore funds that were approved to support the G550 reprogramming represented in the NOAA Control Table in Appendix 2.

Measuring and predicting climate change impacts are core to NOAA’s mission. In FY 2022, OMAO will provide capable, mission-ready aircraft and professional crews to better meet demand for data during increasingly active hurricane seasons, maximizing the critical data sets that only NOAA aircrafts can collect. NOAA will also advance the adoption of new data collection technologies through uncrewed systems. Additional funds are requested to complete the acquisition of the new and more reliable and capable G-550 that will join NOAA’s fleet of aircraft for the 2024 Hurricane season; and for the acquisition of a second high-altitude Hurricane Hunter that will meet redundancy requirements outlined in the Weather Research



and Forecasting and Innovation Act. The ability to issue accurate forecasts and warnings that inform decision makers and the public about the impact of storm surge, heavy rain, wind and tornadoes.

NOAA proposes to develop a framework and lay the foundation for successfully integrating equity across the organization, from management, to policies, to service-delivery. In FY 2022, OMAO will support ship personnel and training, expanding NOAA's ability to address behavioral and mental health within the entire workforce.

The FY 2022 request includes significant investments for NOAA's observational infrastructure, such as the NOAA fleet, a key component of the NOAA mission. Resources are requested to extend the service life of the NOAA Ship *Ronald A. Brown*, which collects oceanographic and atmospheric data world-wide in direct support of climate impacts. OMAO's activities are directly aligned with Administration priorities, including Executive Order (EO) 14008 on *Tackling the Climate Crisis at Home and Abroad*, through support for a science-based climate response and Made in America initiatives to benefit the American economy.

Furthermore, NOAA seeks to further increase clarity and programmatic transparency in FY 2022 by consolidating all funds from other Line Offices supporting the NOAA Corps within OMAO in the NOAA Commissioned Officer Corps activity. This transfer will allow for better alignment of funding and greater transparency over the full cost of the NOAA Corps. This transfer also increases efficiency within the program by reducing administrative burdens, and allows NOAA to better manage personnel requirements consistent with the NOAA Corps Amendments Act of 2020.

Program changes are highlighted below. A summary of funding by Program, Project, and Activity is located in Appendix 2. Detailed descriptions of the program changes below are located in the NOAA FY 2022 Congressional Justification.



A small boat is carefully brought alongside NOAA Ship *Oregon II*.

## FY 2022 ORF BUDGET SUMMARY

NOAA requests a total of \$299,623,000 to support the ORF activities of the OMAO, reflecting an increase of \$29,587,000 in FY 2022 program changes.

### MARINE OPERATIONS AND MAINTENANCE \$193,974,000

NOAA requests an increase of \$21,143,000 in program changes for a total of \$193,974,000 in the Marine Operations and Maintenance activity. These funds will advance maintenance and operations for NOAA's diverse fleet of vessels. NOAA ships range from large oceanographic research vessels capable of exploring the world's deepest oceans to smaller ships responsible for charting the shallow bays and inlets of the United States. Program Changes include:

**Marine Operations and Maintenance: Days at Sea Increase:** NOAA requests an increase of \$19,669,000 for additional Days at Sea, improving the utilization of the NOAA fleet in support of NOAA's growth in data collection requirements. NOAA will also improve diversity, inclusion, and quality of life aboard NOAA vessels through investment in personnel and training.

**Marine Operations and Maintenance: Office of Health Services Increase:** NOAA requests an increase of \$1,200,000 for the Office of Health Services (OHS) to expand NOAA's ability to address behavioral and mental health within the workforce. These additional resources will help build and shape a total worker wellness program for the workforce and agency.

**Marine Operations and Maintenance: Enterprise Infrastructure Solutions (EIS):** NOAA requests an increase of \$200,000 to conduct technology modernization and support an accelerated transition of telecommunications services to the General Services Administration (GSA) EIS contract vehicle.

## **AVIATION OPERATIONS AND AIRCRAFT SERVICES** **\$36,700,000**

NOAA requests an increase of \$3,574,000 in program changes for a total of \$36,700,000 in the Aviation Operations and Aircraft Services activity. These resources will help provide capable, mission-ready aircraft and professional crews to safely meet NOAA's scientific mission by assisting with coastal mapping, flood prediction, hurricane prediction modeling, marine mammal population assessments, coastal erosion surveys, oil spill



NOAA's newest aircraft, a King Air 350CER, arrives at the NOAA Aircraft Operations Center on December 18, 2020.

investigations and air quality studies. Program Changes include:

**Aviation Operations and Aircraft Services: Increased Aircraft Operations:** NOAA requests an increase of \$3,561,000 to strengthen NOAA's ability to meet current and growing demands for airborne data resulting from climate-induced changes by increasing staffing and flight hours.

## **AUTONOMOUS UNCREWED TECHNOLOGY OPERATIONS** **\$15,576,000**

NOAA requests an increase of \$1,500,000 in program changes for a total of \$15,576,000 in the Unmanned System Operations activity. These resources will allow OMAO to continue providing centralized coordination, support, and guidance for unmanned marine and aircraft systems across NOAA, evaluate emerging technologies, manage unmanned systems acquisitions, and determine cost-effective opportunities to carry out NOAA mission-critical activities. Program Changes include:

**Autonomous Uncrewed Technology Operations:** NOAA requests an increase of \$1,500,000 for a total of \$15,576,000 for the Uncrewed Systems Operations Center (UxSOC) to train personnel, refine requirements, and maintain new platforms for climate-related projects. This will also fund sea days on NOAA ships to support evaluation and integration work for the new multi-mission uncrewed marine surface system and other UxS.

## **NOAA COMMISSIONED OFFICER CORPS \$53,373,000**

NOAA requests an increase of \$3,370,000 in program changes for a total of \$53,373,000 in the NOAA Commissioned Officer Corps activity. This newly established budget line supports NOAA Corps Officers that operate NOAA ships, fly aircraft, operate uncrewed systems, conduct diving operations, and serve in NOAA staff positions to fulfill NOAA's mission requirements. Program Changes include:





Crew members aboard NOAA Ship *Fairweather's* ambar vessel in Glacier Bay, AK.

**NOAA Commissioned Officer Corps: NOAA Corps Officers:** NOAA requests an increase of \$2,570,000 to strengthen NOAA's ability to meet current and growing demands for airborne and marine data requirements resulting from climate-induced changes by hiring ten additional NOAA Corps Officers -- eight aviators and two Marine Officers. Coupled with enhanced operational support, additional pilots will improve NOAA's ability to collect climate observations, enabling better climate modeling and aiding in the reduction and mitigation of severe weather and climate change events.

**NOAA Commissioned Officer Corps: NOAA Corps Recruitment:** NOAA requests an increase of \$800,000 for NOAA to accelerate and improve NOAA Corps recruitment levels, with a focus on leveraging programs to underserved communities and building partnerships with Minority Serving Institutions (MSIs) and Historically Black Colleges and Universities (HBCUs) to improve diversity. Increasing diversity will improve individual and organizational performance and result in better value to customers and other stakeholders.

## FY 2022 PAC BUDGET SUMMARY

NOAA requests a total of \$305,500,000 to support the PAC activities of the OMAO, reflecting a net increase of \$182,000,000 in FY 2022 program changes.

### MARINE AND AVIATION CAPITAL INVESTMENTS \$305,500,000

NOAA requests a net increase of \$182,000,000 in program changes for a total of \$305,500,000 in the Marine and Aviation Capital Investments activity. These resources will enable OMAO to continue to implement its fleet and aircraft recapitalization plans, maintain its vessels and aircraft, and provide the sustained technology refresh that plays a critical role in the in-situ collection of oceanographic, atmospheric, hydrographic, and fisheries data in support of NOAA's missions. Program changes include:

**Platform Capital Improvements & Tech Infusion: NOAA Ship *Ronald H. Brown* Mid-life Repair:** NOAA requests an increase of





NOAA Ship *Ronald H. Brown* and WP-3D Orion N43RF Miss Piggy are seen collecting data together for a project.

\$63,000,000 to support the single phase mid-life repair of NOAA ship *Ronald H. Brown*, which will extend the service life of the vessel. With these funds, the mid-life maintenance will be conducted in a single phase, which will minimize cost, reduce the time the ship is not available to collect data, and leverage the best practices from similar mid-life maintenance packages on sister ships.

**Platform Capital Improvements & Tech Infusion: P-3 Service Depot Level**

**Maintenance:** NOAA requests an increase of \$5,000,000 to begin Service Depot Level Maintenance for NOAA's two P-3 Hurricane Hunter aircraft. This maintenance is required to maintain the aircraft's airworthiness certification, a legal requirement to fly. The P-3s are extremely important airborne tools for NOAA's climate products and services. They collect data that informs hurricane forecasts, fire predictions, tornado warnings and much more.

**Platform Capital Improvements & Tech Infusion: Uncrewed Technology Acquisitions:**

NOAA requests an increase of \$2,500,000 for the Uncrewed Systems Operations Center to purchase one multi-mission uncrewed marine surface system for climate-related projects. Procuring a multi-mission marine surface system for evaluation and development will allow the Uncrewed Systems Operations Center to train personnel, refine requirements, and develop concepts of operations and procedures for further UMS operations in these fields.

**Aircraft Recapitalization and Construction: Second Aircraft to Meet National Weather Research and Forecasting Needs:**

NOAA requests an increase of \$100,000,000 to bring a second specialized high-altitude Hurricane Hunter on-line to meet national needs as outlined in the Weather Research and Forecasting Innovation Act. NOAA will also allocate \$20,000,000 from OMAO's base funds to support this acquisition in



FY 2022. This request will help NOAA meet the Administration's climate science goals, including EO 14008, through improved observations and forecasting for the American public.

**Aircraft Recapitalization and Construction: Complete G-IV replacement:** NOAA requests an increase of \$15,000,000 to finalize its acquisition of a new high altitude jet. This funding will complete NOAA's effort to replace its current G-IV high altitude jet. Data collected by this aircraft is instrumental to NOAA's ability to issue accurate forecasts and warnings that inform decision makers and the public about the impact of storm surge, heavy rain, wind, and tornadoes. Additional funds will enable NOAA to fully integrate the new and more reliable and capable G-550 into NOAA's fleet for the 2024 Hurricane season.

United States Code. NOAA transfers retirement pay funds to the U.S. Coast Guard, which handles the payment function for retirees and annuitants. Healthcare funds for non-Medicare eligible retirees, dependents, and annuitants are transferred to the U.S. Public Health Service, which administers the health care program.

## DISCRETIONARY FUNDS

### MEDICARE-ELIGIBLE RETIREE HEALTHCARE FUND CONTRIBUTION

The FY 2003 Department of Defense Authorization Act requires all uniformed services, including NOAA, to participate in an accrual fund for Medicare-eligible retirees. Payments into this accrual fund will cover the future healthcare benefits of present, active-duty NOAA officers and their dependents and annuitants. FY 2022 payments to the accrual fund are estimated to be \$1,617,000. This is a slight increase over the FY 2021 amount (\$1,591,000).

## MANDATORY FUNDS

### NOAA CORPS COMMISSIONED OFFICERS RETIREMENT

The retirement system for the uniformed services provides a measure of financial security after release from active duty for service members and their survivors. It is an important factor in the choice of a career in the uniformed services and is mandated by Federal statutes under Title 10,

Appendix 1

# Technical Transfers

## ORF Account

Line Office	PPA	NWS Hydrology and Water Resources Cooperative Institute	OMAO NOAA Corps	NESDIS Restructure	DOC Working Capital Fund	DOC Working Capital Fund Transfer to DOC	Total PPA Technical ATB
NOS	Navigation, Observations and Positioning		(2,044)				(2,044)
NOS	Coastal Science, Assessment, Response & Restoration	(1,000)	(319)				(1,319)
NOS	Competitive Research	1,000					1,000
NOS	Sanctuaries and Marine Protected Areas		(563)				(563)
NMFS	Fisheries Data Collections, Surveys, and Assessments		(1,562)				(1,562)
OAR	Climate Laboratories & Cooperative Institutes		(261)				(261)
OAR	Ocean Laboratories and Cooperative Institutes		(390)				(390)
OAR	Ocean Exploration and Research		(130)				(130)
OAR	Sustained Ocean Observations and Monitoring		(130)				(130)
NWS	Observations		(324)				(324)
NWS	Central Processing		(346)				(346)
NWS	Analyze, Forecast and Support		(54)				(54)
NESDIS	Office of Satellite and Product Operations		(277)				(277)
NESDIS	Product Development, Readiness & Application		(276)				(276)
MS	Mission Services and Management		(661)		3,071		2,410
MS	Payment to the DOC Working Capital Fund				(3,071)	(396)	(3,467)
OMAO	NOAA Commissioned Officer Corps		7,337				7,337



## PAC Account

Line Office	PPA	NWS Hydrology and Water Resources Cooperative Institute	OMAO NOAA Corps	NESDIS Restructure	DOC Working Capital Fund	DOC Working Capital Fund Transfer to DOC	Total PPA Technical ATB
NESDIS	Geostationary Systems–R			(334,500)			(334,500)
NESDIS	Polar Weather Satellites			(657,835)			(657,835)
NESDIS	Cooperative Data and Rescue Services			(14,400)			(14,400)
NESDIS	Space Weather Follow On			(108,115)			(108,115)
NESDIS	COSMIC-2 / GNSSRO			(5,892)			(5,892)
NWS	Common Ground Services			9,339			9,339
NESDIS	Projects, Planning, and Analysis			(15,945)			(15,945)
NESDIS	Geostationary Earth Orbit			334,500			334,500
NESDIS	Low Earth Orbit			678,127			678,127
NOS	Space Weather Observations			114,721			114,721
<b>Total</b>		<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>(396)</b>	<b>(396)</b>

\* The total PPA Technical ATB column aligns with the amounts for each PPA in the Technical ATBs column of the FY 2022 President's Budget Control Table as reflected in the CJ.

\*\*Note that the FY 2022 Total ATBs column in the Blue Book Control Table includes both Calculated (Inflationary) ATBs and Technical ATBs so it includes the amounts in the table above but does not match these amounts for all PPAs.

Appendix 2

# Control Table

## National Ocean Service (\$ in Thousands)

FY 2022 Proposed Operating Plan	FY 2021 Spend Plan	Total FY 2021 ATBs	FY 2022 Base	Total FY 2022 Program Changes	FY 2022 Estimate
Navigation, Observations and Positioning					
Navigation, Observations and Positioning	159,613	4,492	164,105	22,491	186,596
Hydrographic Survey Priorities/Contracts	32,000	0	32,000	0	32,000
IOOS Regional Observations	40,500	0	40,500	29,000	69,500
Total, Navigation, Observations and Positioning	232,113	4,492	236,605	51,491	288,096
Coastal Science and Assessment					
Coastal Science, Assessment, Response and Restoration	85,240	1,927	87,167	25,160	112,327
Competitive Research	21,000	1,000	22,000	20,000	42,000
Total, Coastal Science and Assessment	106,240	2,927	109,167	45,160	154,327
Ocean and Coastal Management and Services					
Coastal Zone Management and Services	45,890	1,289	47,179	17,610	64,789
Coastal Zone Management Grants	78,500	0	78,500	30,000	108,500
National Oceans and Coastal Security Fund	34,000	0	34,000	34,000	68,000
Coral Reef Program	33,000	193	33,193	10,000	43,193
National Estuarine Research Reserve System	28,500	0	28,500	14,000	42,500
Sanctuaries and Marine Protected Areas	55,532	1,703	57,235	27,268	84,503
Total, Ocean and Coastal Management and Services	275,422	3,185	278,607	132,878	411,485
Total, NOS - Discretionary ORF	613,775	10,604	624,379	229,529	853,908
Total, NOS - Discretionary PAC	8,500	0	8,500	0	8,500
Total, NOS - Other Discretionary Accounts	0	0	0	0	0
Discretionary Total - NOS	622,275	10,604	632,879	229,529	862,408
Total, NOS - Mandatory Accounts	77,302	(55,082)	22,220	0	22,220
GRAND TOTAL NOS	699,577	(44,478)	655,099	229,529	884,628



## National Marine Fisheries Service (\$ in Thousands)

FY 2022 Proposed Operating Plan	FY 2021 Spend Plan	Total FY 2021 ATBs	FY 2022 Base	Total FY 2022 Program Changes	FY 2022 Estimate
Protected Resources Science and Management					
Marine Mammals, Sea Turtles, and Other Species	123,889	4,596	128,485	14,472	142,957
Species Recovery Grants	6,933	12	6,945	10,067	17,012
Atlantic Salmon	6,438	233	6,671	62	6,733
Pacific Salmon	66,246	3,425	69,671	754	70,425
Total, Protected Resources Science and Management	203,506	8,266	211,772	25,355	237,127
Fisheries Science and Management					
Fisheries and Ecosystem Science Programs and Services	145,226	5,828	151,054	19,549	170,603
Fisheries Data Collections, Surveys, and Assessments	174,261	3,338	177,599	20,046	197,645
Observers and Training	54,936	1,116	56,052	(2,916)	53,136
Fisheries Management Programs and Services	122,540	4,791	127,331	9,451	136,782
Aquaculture	17,351	378	17,729	149	17,878
Salmon Management Activities	61,387	397	61,784	663	62,447
Regional Councils and Fisheries Commissions	41,114	1,402	42,516	386	42,902
Interjurisdictional Fisheries Grants	3,333	7	3,340	32	3,372
Total, Fisheries Science and Management	620,148	17,257	637,405	47,360	684,765
Enforcement					
Enforcement	74,278	2,731	77,009	722	77,731
Total, Enforcement	74,278	2,731	77,009	722	77,731
Habitat Conservation and Restoration					
Habitat Conservation and Restoration	57,053	2,079	59,132	40,572	99,704
Subtotal, Habitat Conservation & Restoration	57,053	2,079	59,132	40,572	99,704
Total, NMFS - Discretionary ORF	954,985	30,333	985,318	114,009	1,099,327
Total, NMFS - Discretionary PAC	0	0	0	0	0
Total, NMFS - Other Discretionary Accounts	65,349	0	65,349	0	65,349
Discretionary Total - NMFS	1,020,334	30,333	1,050,667	114,009	1,164,676
Total, NMFS - Mandatory Accounts	41,945	(9,163)	32,782	0	32,782
GRAND TOTAL NMFS	1,062,279	21,170	1,083,449	114,009	1,197,458

## Office of Oceanic and Atmospheric Research (\$ in Thousands)

FY 2022 Proposed Operating Plan	FY 2021 Spend Plan	Total FY 2021 ATBs	FY 2022 Base	Total FY 2022 Program Changes	FY 2022 Estimate
<b>Climate Research</b>					
Climate Laboratories & Cooperative Institutes	74,750	1,444	76,194	30,750	106,944
Regional Climate Data & Information	42,107	476	42,583	13,393	55,976
Climate Competitive Research	63,795	793	64,588	66,205	130,793
<b>Total, Climate Research</b>	<b>180,652</b>	<b>2,713</b>	<b>183,365</b>	<b>110,348</b>	<b>293,713</b>
<b>Weather &amp; Air Chemistry Research</b>					
<b>Weather Laboratories &amp; Cooperative Institutes</b>					
Weather Laboratories & Cooperative Institutes	84,980	2,165	87,145	520	87,665
<b>Subtotal, Weather Laboratories and Cooperative Institutes</b>	<b>84,980</b>	<b>2,165</b>	<b>87,145</b>	<b>520</b>	<b>87,665</b>
<b>Weather and Air Chemistry Research Programs</b>					
U.S. Weather Research Program (USWRP)	26,425	263	26,688	7,075	33,763
Tornado Severe Storm Research / Phased Array Radar	14,336	130	14,466	2,546	17,012
Joint Technology Transfer Initiative	12,950	130	13,080	50	13,130
<b>Subtotal, Weather and Air Chemistry Research Programs</b>	<b>53,711</b>	<b>523</b>	<b>54,234</b>	<b>9,671</b>	<b>63,905</b>
<b>Total, Weather and Air Chemistry Research</b>	<b>138,691</b>	<b>2,688</b>	<b>141,379</b>	<b>10,191</b>	<b>151,570</b>
<b>Ocean, Coastal, and Great Lakes Research</b>					
<b>Ocean Laboratories and Cooperative Institutes</b>					
Ocean Laboratories and Cooperative Institutes	36,098	610	36,708	402	37,110
<b>Subtotal, Ocean Laboratories and Cooperative Institutes</b>	<b>36,098</b>	<b>610</b>	<b>36,708</b>	<b>402</b>	<b>37,110</b>
<b>National Sea Grant College Program</b>					
National Sea Grant College Program	74,950	694	75,644	40,050	115,694
Marine Aquaculture Program	13,000	124	13,124	0	13,124
<b>Subtotal, National Sea Grant College Program</b>	<b>87,950</b>	<b>818</b>	<b>88,768</b>	<b>40,050</b>	<b>128,818</b>



## Office of Oceanic and Atmospheric Research Cont'd (\$ in Thousands)

FY 2022 Proposed Operating Plan	FY 2021 Spend Plan	Total FY 2021 ATBs	FY 2022 Base	Total FY 2022 Program Changes	FY 2022 Estimate
Ocean Exploration and Research	42,639	410	43,049	361	43,410
Integrated Ocean Acidification	15,404	198	15,602	96	15,698
Sustained Ocean Observations and Monitoring	45,063	386	45,449	21,345	66,794
National Oceanographic Partnership Program	2,994	29	3,023	6	3,029
Total, Ocean, Coastal, and Great Lakes Research	230,148	2,451	232,599	62,260	294,859
Innovative Research & Technology					
High Performance Computing Initiatives	17,800	227	18,027	0	18,027
Uncrewed Systems	0	0	0	4,000	4,000
Total, Innovative Research & Technology	17,800	227	18,027	4,000	22,027
Total, OAR - Discretionary ORF	567,291	8,079	575,370	186,799	762,169
Total, OAR - Discretionary PAC	43,500	0	43,500	10,000	53,500
Discretionary Total - OAR	610,791	8,079	618,870	196,799	815,669

## National Weather Service (\$ in Thousands)

FY 2022 Proposed Operating Plan	FY 2021 Spend Plan	Total FY 2021 ATBs	FY 2022 Base	Total FY 2022 Program Changes	FY 2022 Estimate
Observations	227,186	7,921	235,107	9,115	244,222
Central Processing	96,727	5,342	102,069	6,403	108,472
Analyze, Forecast and Support	536,872	22,847	559,719	5,378	565,097
Dissemination	78,344	2,484	80,828	36,818	117,646
Science and Technology Integration	153,499	4,810	158,309	22,839	181,148
<b>Total, NWS - Discretionary ORF</b>	<b>1,092,628</b>	<b>43,404</b>	<b>1,136,032</b>	<b>80,553</b>	<b>1,216,585</b>
<b>Total, NWS - Discretionary PAC</b>	<b>133,406</b>	<b>0</b>	<b>133,406</b>	<b>(21,243)</b>	<b>112,163</b>
<b>Discretionary Total - NWS</b>	<b>1,226,034</b>	<b>43,404</b>	<b>1,269,438</b>	<b>59,310</b>	<b>1,328,748</b>



# National Environmental Satellite, Data, and Information Service

(\$ in Thousands)

FY 2022 Proposed Operating Plan	FY 2021 Spend Plan	Total FY 2021 ATBs	FY 2022 Base	Total FY 2022 Program Changes	FY 2022 Estimate
<b>Environmental Satellite Observing Systems</b>					
Satellite and Product Operations	187,118	4,794	191,912	10,981	202,893
Product Development, Readiness & Application	28,287	804	29,091	20,652	49,743
Office of Space Commerce	10,000	0	10,000	0	10,000
U.S. Group on Earth Observations (USGEO)	500	0	500	500	1,000
<b>Total, Environmental Satellite Observing Systems</b>	<b>225,905</b>	<b>5,598</b>	<b>231,503</b>	<b>32,133</b>	<b>263,636</b>
<b>National Centers for Environmental Information</b>					
National Centers for Environmental Information	63,040	2,086	65,126	22,960	88,086
<b>Total, National Centers for Environmental Information</b>	<b>63,040</b>	<b>2,086</b>	<b>65,126</b>	<b>22,960</b>	<b>88,086</b>
<b>Total, NESDIS - Discretionary ORF</b>	<b>288,945</b>	<b>7,684</b>	<b>296,629</b>	<b>55,093</b>	<b>351,722</b>
<b>Total, NESDIS - Discretionary PAC</b>	<b>1,224,924</b>	<b>0</b>	<b>1,224,924</b>	<b>452,395</b>	<b>1,677,319</b>
<b>Discretionary Total - NESDIS</b>	<b>1,513,869</b>	<b>7,684</b>	<b>1,521,553</b>	<b>507,488</b>	<b>2,029,041</b>

## Mission Support (\$ in Thousands)

FY 2022 Proposed Operating Plan	FY 2021 Spend Plan	Total FY 2021 ATBs	FY 2022 Base	Total FY 2022 Program Changes	FY 2022 Estimate
<b>Mission Support Services</b>					
Executive Leadership	26,975	1,402	28,377	2,603	30,980
Mission Services and Management	152,755	8,386	161,141	28,245	189,386
IT Security	15,378	487	15,865	19,500	35,365
Payment to the DOC Working Capital Fund	66,389	1,478	67,867	0	67,867
Facilities Maintenance	5,000	0	5,000	0	5,000
<b>Total, Mission Support Services</b>	<b>266,497</b>	<b>11,753</b>	<b>278,250</b>	<b>50,348</b>	<b>328,598</b>
<b>Office of Education</b>					
Office of Education	33,000	220	33,220	7,900	41,120
<b>Total, Office of Education</b>	<b>33,000</b>	<b>220</b>	<b>33,220</b>	<b>7,900</b>	<b>41,120</b>
<b>Total, MS - Discretionary ORF</b>	<b>299,497</b>	<b>11,973</b>	<b>311,470</b>	<b>58,248</b>	<b>369,718</b>
<b>Total, MS - Discretionary PAC</b>	<b>43,000</b>	<b>0</b>	<b>43,000</b>	<b>38,000</b>	<b>81,000</b>
<b>Discretionary Total - MS</b>	<b>342,497</b>	<b>11,973</b>	<b>354,470</b>	<b>96,248</b>	<b>450,718</b>



## Office of Marine and Aviation Operations (\$ in Thousands)

FY 2022 Proposed Operating Plan	FY 2021 Spend Plan	Total FY 2021 ATBs	FY 2022 Base	Total FY 2022 Program Changes	FY 2022 Estimate
Marine Operations and Maintenance	165,926	6,905	172,831	21,143	193,974
Aviation Operations and Aircraft Services	31,987	1,139	33,126	3,574	36,700
Autonomous Uncrewed Technology Operations	13,665	411	14,076	1,500	15,576
NOAA Commissioned Officer Corps	42,000	8,003	50,003	3,370	53,373
<b>Total, OMAO - Discretionary ORF</b>	<b>253,578</b>	<b>16,458</b>	<b>270,036</b>	<b>29,587</b>	<b>299,623</b>
Total, OMAO - Discretionary PAC	123,500	0	123,500	182,000	305,500
Total, OMAO - Other Discretionary Accounts	1,591	26	1,617	0	1,617
<b>Discretionary Total - OMAO</b>	<b>378,669</b>	<b>16,484</b>	<b>395,153</b>	<b>211,587</b>	<b>606,740</b>
Total, OMAO - Mandatory Accounts	30,770	1,020	31,790	0	31,790
<b>GRAND TOTAL OMAO</b>	<b>409,439</b>	<b>17,504</b>	<b>426,943</b>	<b>211,587</b>	<b>638,530</b>

## ORF Summary (\$ in Thousands)

FY 2022 Proposed Operating Plan	FY 2021 Spend Plan	Total FY 2021 ATBs	FY 2022 Base	Total FY 2022 Program Changes	FY 2022 Estimate
National Ocean Service	613,775	10,604	624,379	229,529	853,908
National Marine Fisheries Service	954,985	30,333	985,318	114,009	1,099,327
Office of Oceanic and Atmospheric Research	567,291	8,079	575,370	186,799	762,169
National Weather Service	1,092,628	43,404	1,136,032	80,553	1,216,585
National Environmental Satellite, Data and Information Service	288,945	7,684	296,629	55,093	351,722
Mission Support	299,497	11,973	311,470	58,248	369,718
Office of Marine and Aviation Operations	253,578	16,458	270,036	29,587	299,623
<b>SUBTOTAL LO DIRECT DISCRETIONARY ORF OBLIGATIONS</b>	<b>4,070,699</b>	<b>128,535</b>	<b>4,199,234</b>	<b>753,818</b>	<b>4,953,052</b>



## ORF Adjustments (\$ in Thousands)

FY 2022 Proposed Operating Plan	FY 2021 Spend Plan	Total FY 2021 ATBs	FY 2022 Base	Total FY 2022 Program Changes	FY 2022 Estimate
SUBTOTAL ORF DIRECT OBLIGATIONS	4,070,699	128,535	4,199,234	753,818	4,953,052
FINANCING					
Deobligations	(17,500)	0	(17,500)	0	(17,500)
Total ORF Financing	(17,500)	0	(17,500)	0	(17,500)
SUBTOTAL ORF BUDGET AUTHORITY	4,053,199	128,535	4,181,734	753,818	4,935,552
TRANSFERS					
Transfer from ORF to PAC	33,272	(33,272)	0	0	0
Transfer from P&D to ORF	(246,171)	0	(246,171)	0	(246,171)
Total ORF Transfers	(212,899)	(33,272)	(246,171)	0	(246,171)
SUBTOTAL ORF APPROPRIATION	3,840,300	95,263	3,935,563	753,818	4,689,381

## Procurement, Acquisition, and Construction (\$ in Thousands)

FY 2022 Proposed Operating Plan	FY 2021 Spend Plan	Total FY 2021 ATBs	FY 2022 Base	Total FY 2022 Program Changes	FY 2022 Estimate
<b>NOS</b>					
Construction					
National Estuarine Research Reserve Construction	4,500	0	4,500	0	4,500
Marine Sanctuaries Construction	4,000	0	4,000	0	4,000
Subtotal, NOS Construction	8,500	0	8,500	0	8,500
Total, NOS - PAC	8,500	0	8,500	0	8,500
Total, NMFS - PAC	0	0	0	0	0
<b>OAR</b>					
Systems Acquisition					
Research Supercomputing/ CCRI	43,500	0	43,500	10,000	53,500
Subtotal, OAR Systems Acquisition	43,500	0	43,500	10,000	53,500
Total, OAR - PAC	43,500	0	43,500	10,000	53,500
<b>NWS</b>					
Systems Acquisition					
Observations	15,700	0	15,700	8,529	24,229
Central Processing	97,772	0	97,772	(29,772)	68,000
Dissemination	9,934	0	9,934	0	9,934
Subtotal, NWS Systems Acquisition	123,406	0	123,406	(21,243)	102,163
Construction					
Facilities Construction and Major Repairs	10,000	0	10,000	0	10,000
Subtotal, NWS Construction	10,000	0	10,000	0	10,000
Total, NWS - PAC	133,406	0	133,406	(21,243)	112,163
<b>NESDIS</b>					
Systems Acquisition					
Geostationary Systems - R	334,500	(334,500)	0	0	0
Polar Weather Satellites	657,835	(657,835)	0	0	0
Cooperative Data and Rescue Services (CDARS)	14,400	(14,400)	0	0	0
Space Weather Follow On	108,115	(108,115)	0	0	0

## Procurement, Acquisition, and Construction Con't (\$ in Thousands)

FY 2022 Proposed Operating Plan	FY 2021 Spend Plan	Total FY 2021 ATBs	FY 2022 Base	Total FY 2022 Program Changes	FY 2022 Estimate
COSMIC 2/GNSS RO	5,892	(5,892)	0	0	0
Common Ground Services (CGS)	39,287	9,339	48,626	25,007	73,633
Projects, Planning and Analysis	15,945	(15,945)	0	0	0
Geostationary Earth Orbit (GEO)	10,000	334,500	344,500	456,000	800,500
Low Earth Orbit (LEO)	0	678,127	678,127	(165,397)	512,730
Space Weather	0	114,721	114,721	93,785	208,506
Systems/Services Architecture and Engineering (SAE)	38,500	0	38,500	43,000	81,500
Subtotal, NESDIS Systems Acquisition	1,224,474	0	1,224,474	452,395	1,676,869
Construction					
Satellite CDA Facility	2,450	0	2,450	0	2,450
Subtotal, NESDIS Construction	2,450	0	2,450	0	2,450
Transfer to OIG	(2,000)	0	(2,000)	0	(2,000)
Total, NESDIS - PAC	1,224,924	0	1,224,924	452,395	1,677,319
Mission Support					
Construction					
NOAA Construction	43,000	0	43,000	38,000	81,000
Subtotal, Mission Support Construction	43,000	0	43,000	38,000	81,000
Total, Mission Support - PAC	43,000	0	43,000	38,000	81,000
OMAO					
Marine and Aviation Capital Investments					
Platform Capital Improvements & Tech Infusion	25,000	0	25,000	70,500	95,500
Vessel Recapitalization and Construction	63,500	0	63,500	11,500	75,000
Aircraft Recapitalization and Construction	35,000	0	35,000	100,000	135,000
Subtotal, Marine and Aviation Capital Investments	123,500	0	123,500	182,000	305,500
Total, OMAO - PAC	123,500	0	123,500	182,000	305,500
GRAND TOTAL PAC DISCRETIONARY OBLIGATIONS	1,576,830	0	1,576,830	661,152	2,237,982



## PAC Adjustments (\$ in Thousands)

FY 2022 Proposed Operating Plan	FY 2021 Spend Plan	Total FY 2021 ATBs	FY 2022 Base	Total FY 2022 Program Changes	FY 2022 Estimate
SUBTOTAL PAC DIRECT OBLIGATIONS	1,576,830	0	1,576,830	661,152	2,237,982
<b>FINANCING</b>					
Deobligations	(13,000)	0	(13,000)	0	(13,000)
Unobligated balance, Rescission	0	(39,250)	(39,250)	0	(39,250)
Total PAC Financing	(13,000)	(39,250)	(52,250)	0	(52,250)
SUBTOTAL PAC BUDGET AUTHORITY	1,563,830	(39,250)	1,524,580	661,152	2,185,732
<b>TRANSFERS</b>					
Transfer from ORF to PAC	(33,272)	33,272	0	0	0
Transfer to OIG	2,000	0	2,000	0	2,000
Unobligated balance, Rescission	0	39,250	39,250	0	39,250
Total PAC Transfers	(31,272)	72,522	41,250	0	41,250
SUBTOTAL PAC APPROPRIATION	1,532,558	33,272	1,565,830	661,152	2,226,982

## Other Accounts Discretionary (\$ in Thousands)

FY 2022 Proposed Operating Plan	FY 2021 Spend Plan	Total FY 2021 ATBs	FY 2022 Base	Total FY 2022 Program Changes	FY 2022 Estimate
<b>NMFS</b>					
Fishermen's Contingency Fund Obligations	349	0	349	0	349
Fishermen's Contingency Fund Budget Authority	349	0	349	0	349
Fishermen's Contingency Fund Appropriations	349	0	349	0	349
<b>Foreign Fishing Observer Fund</b>					
Foreign Fishing Observer Fund Obligations	0		0	0	0
Foreign Fishing Observer Fund Budget Authority	0		0	0	0
Foreign Fishing Observer Fund Appropriation	0		0	0	0
<b>Fisheries Finance Program Account</b>					
Fisheries Finance Program Account Obligations	0		0	0	0
Fisheries Finance Program Account Budget Authority	0		0	0	0
Fisheries Finance Program Account Appropriation	0		0	0	0
<b>Promote and Develop Fisheries</b>					
Promote and Develop Fisheries Obligations	0	0	0	0	0
Promote and Develop Fisheries Budget Authority	(246,171)	0	(246,171)	0	(246,171)
Promote and Develop Fisheries Appropriation	0	0	0	0	0
<b>Pacific Coastal Salmon Recovery Fund</b>					
Pacific Coastal Salmon Recovery Fund Obligations	65,000	0	65,000	0	65,000
Pacific Coastal Salmon Recovery Fund Budget Authority	65,000	0	65,000	0	65,000
Pacific Coastal Salmon Recovery Fund Appropriation	65,000	0	65,000	0	65,000
<b>Marine Mammal Unusual Mortality Event Fund</b>					
Marine Mammal Unusual Mortality Event Fund Obligations	0	0	0	0	0
Marine Mammal Unusual Mortality Event Fund Budget Authority	0	0	0	0	0
Marine Mammal Unusual Mortality Event Fund Appropriation	0	0	0	0	0
<b>Fisheries Disaster Assistance Fund</b>					
Fisheries Disaster Assistance Fund Obligations	0	0	0	0	0

## Other Accounts Discretionary Con't (\$ in Thousands)

FY 2022 Proposed Operating Plan	FY 2021 Spend Plan	Total FY 2021 ATBs	FY 2022 Base	Total FY 2022 Program Changes	FY 2022 Estimate
Fisheries Disaster Assistance Fund Budget Authority	0	0	0	0	0
Fisheries Disaster Assistance Fund Appropriation	0	0	0	0	0
Subtotal, NMFS Other Discretionary Direct Obligations	65,349	0	65,349	0	65,349
Subtotal, NMFS Other Discretionary Budget Authority	(180,822)	0	(180,822)	0	(180,822)
Subtotal, NMFS Other Discretionary Appropriation	65,349	0	65,349	0	65,349
OMAO					
Medicare Eligible Retiree Healthcare Fund Obligations	1,591	26	1,617	0	1,617
Medicare Eligible Retiree Healthcare Fund Budget Authority	1,591	26	1,617	0	1,617
Medicare Eligible Retiree Healthcare Fund Appropriation	1,591	26	1,617	0	1,617
Subtotal, OMAO Other Discretionary Direct Obligations	1,591	26	1,617	0	1,617
Subtotal, OMAO Other Discretionary Budget Authority	1,591	26	1,617	0	1,617
Subtotal, OMAO Other Discretionary Appropriation	1,591	26	1,617	0	1,617
TOTAL, OTHER DISCRETIONARY DIRECT OBLIGATIONS	66,940	26	66,966	0	66,966
TOTAL, OTHER DISCRETIONARY BUDGET AUTHORITY	(179,231)	26	(179,205)	0	(179,205)
TOTAL, OTHER DISCRETIONARY APPROPRIATION	66,940	26	66,966	0	66,966



## Grand Total Summary Discretionary Appropriations (\$ in Thousands)

FY 2022 Proposed Operating Plan	FY 2021 Spend Plan	Total FY 2021 ATBs	FY 2022 Base	Total FY 2022 Program Changes	FY 2022 Estimate
Operations, Research, and Facilities	3,840,300	95,263	3,935,563	753,818	4,689,381
Procurement, Acquisition, and Construction	1,532,558	33,272	1,565,830	661,152	2,226,982
Fisherman's Contingency Fund	349	0	349	0	349
Pacific Coastal Salmon Recovery Fund	65,000	0	65,000	0	65,000
Fisheries Disaster Assistance Fund	0	0	0	0	0
Medicare Eligible Retiree Health Care Fund	1,591	26	1,617	0	1,617
<b>GRAND TOTAL DISCRETIONARY APPROPRIATION</b>	<b>5,439,798</b>	<b>128,561</b>	<b>5,568,359</b>	<b>1,414,970</b>	<b>6,983,329</b>

## Summary of Discretionary Resources (\$ in Thousands)

FY 2022 Proposed Operating Plan	FY 2021 Spend Plan	Total FY 2021 ATBs	FY 2022 Base	Total FY 2022 Program Changes	FY 2022 Estimate
<b>Direct Discretionary Obligations</b>					
ORF Direct Obligations	4,070,699	128,535	4,199,234	753,818	4,953,052
PAC Direct Obligations	1,576,830	0	1,576,830	661,152	2,237,982
OTHER Direct Obligations	66,940	26	66,966	0	66,966
<b>TOTAL Direct Discretionary Obligations</b>	<b>5,714,469</b>	<b>128,561</b>	<b>5,843,030</b>	<b>1,414,970</b>	<b>7,258,000</b>
<b>Discretionary Budget Authority</b>					
ORF Budget Authority	4,053,199	128,535	4,181,734	753,818	4,935,552
PAC Budget Authority	1,563,830	(39,250)	1,524,580	661,152	2,185,732
OTHER Budget Authority	(179,231)	26	(179,205)	0	(179,205)
<b>TOTAL Discretionary Budget Authority</b>	<b>5,437,798</b>	<b>89,311</b>	<b>5,527,109</b>	<b>1,414,970</b>	<b>6,942,079</b>
<b>Discretionary Appropriations</b>					
ORF Appropriation	3,840,300	95,263	3,935,563	753,818	4,689,381
PAC Appropriation	1,532,558	33,272	1,565,830	661,152	2,226,982
OTHER Appropriation	66,940	26	66,966	0	66,966
<b>TOTAL Discretionary Appropriation</b>	<b>5,439,798</b>	<b>128,561</b>	<b>5,568,359</b>	<b>1,414,970</b>	<b>6,983,329</b>

## Other Accounts Mandatory (\$ in Thousands)

FY 2022 Proposed Operating Plan	FY 2021 Spend Plan	Total FY 2021 ATBs	FY 2022 Base	Total FY 2022 Program Changes	FY 2022 Estimate
<b>NOS</b>					
Damage Assessment and Restoration Revolving Fund Obligations	71,155	(55,155)	16,000	0	16,000
Damage Assessment and Restoration Revolving Fund Budget Authority	5,855	145	6,000	0	6,000
Damage Assessment and Restoration Revolving Fund Appropriation	0	0	0	0	0
<b>Sanctuaries Enforcement Asset Forfeiture Fund Obligations</b>					
Sanctuaries Enforcement Asset Forfeiture Fund Obligations	120	0	120	0	120
Sanctuaries Enforcement Asset Forfeiture Fund Budget Authority	114	6	120	0	120
Sanctuaries Enforcement Asset Forfeiture Fund Appropriation	120	0	120	0	120
<b>Gulf Coast Ecosystem Restoration Fund Obligations</b>					
Gulf Coast Ecosystem Restoration Fund Obligations	6,027	73	6,100	0	6,100
Gulf Coast Ecosystem Restoration Fund Budget Authority	0	0	0	0	0
Gulf Coast Ecosystem Restoration Fund Appropriation	0	0	0	0	0
<b>Subtotal, NOS Other Mandatory Direct Obligations</b>					
Subtotal, NOS Other Mandatory Direct Obligations	77,302	(55,082)	22,220	0	22,220
<b>Subtotal, NOS Other Mandatory Budget Authority</b>					
Subtotal, NOS Other Mandatory Budget Authority	5,969	151	6,120	0	6,120
<b>Subtotal, NOS Other Mandatory Appropriation</b>					
Subtotal, NOS Other Mandatory Appropriation	120	0	120	0	120
<b>NMFS</b>					
Promote and Develop Fisheries Obligations	12,000	(4,011)	7,989	0	7,989
Promote and Develop Fisheries Budget Authority	258,171	(4,011)	254,160	0	254,160
Promote and Develop Fisheries Appropriation	0	0	0	0	0
<b>Fisheries Finance Program Account Obligations</b>					
Fisheries Finance Program Account Obligations	3,564	(3,564)	0	0	0
Fisheries Finance Program Account Budget Authority	3,564	(3,564)	0	0	0
Fisheries Finance Program Account Appropriation	3,564	(3,564)	0	0	0



## Other Accounts Mandatory Cont'd (\$ in Thousands)

FY 2022 Proposed Operating Plan	FY 2021 Spend Plan	Total FY 2021 ATBs	FY 2022 Base	Total FY 2022 Program Changes	FY 2022 Estimate
Environmental Improvement & Restoration Fund Obligations	6,289	(3,381)	2,908	0	2,908
Environmental Improvement & Restoration Fund Budget Authority	6,289	(3,381)	2,908	0	2,908
Environmental Improvement & Restoration Fund Appropriation	6,669	(3,585)	3,084	0	3,084
Limited Access System Administration Fund Obligations	13,477	202	13,679	0	13,679
Limited Access System Administration Fund Budget Authority	13,477	202	13,679	0	13,679
Limited Access System Administration Fund Appropriation	13,455	237	13,692	0	13,692
Western Pacific Sustainable Fisheries Fund Obligations	493	102	595	0	595
Western Pacific Sustainable Fisheries Fund Budget Authority	493	102	595	0	595
Western Pacific Sustainable Fisheries Fund Appropriation	500	100	600	0	600
Fisheries Enforcement Asset Forfeiture Fund Obligations	3,594	102	3,696	0	3,696
Fisheries Enforcement Asset Forfeiture Fund Budget Authority	3,594	102	3,696	0	3,696
Fisheries Enforcement Asset Forfeiture Fund Appropriation	3,696	0	3,696	0	3,696
North Pacific Observer Fund Obligations	2,528	1,387	3,915	0	3,915
North Pacific Observer Fund Budget Authority	2,528	1,387	3,915	0	3,915
North Pacific Observer Fund Appropriation	2,500	1,500	4,000	0	4,000
Subtotal, NMFS Other Mandatory Direct Obligations	41,945	(9,163)	32,782	0	32,782
Subtotal, NMFS Other Mandatory Budget Authority	288,116	(9,163)	278,953	0	278,953
Subtotal, NMFS Other Mandatory Appropriation	30,384	(5,312)	25,072	0	25,072

## Other Accounts Mandatory Cont'd (\$ in Thousands)

FY 2022 Proposed Operating Plan	FY 2021 Spend Plan	Total FY 2021 ATBs	FY 2022 Base	Total FY 2022 Program Changes	FY 2022 Estimate
OMAO					
NOAA Corps Commissioned Officers Retirement Obligations	30,770	1,020	31,790	0	31,790
NOAA Corps Commissioned Officers Retirement Budget Authority	30,770	1,020	31,790	0	31,790
NOAA Corps Commissioned Officers Retirement Appropriation	30,770	1,020	31,790	0	31,790
Subtotal, OMAO Other Mandatory Direct Obligations	30,770	1,020	31,790	0	31,790
Subtotal, OMAO Other Mandatory Budget Authority	30,770	1,020	31,790	0	31,790
Subtotal, OMAO Other Mandatory Appropriation	30,770	1,020	31,790	0	31,790
TOTAL, OTHER MANDATORY DIRECT OBLIGATIONS	150,017	(63,225)	86,792	0	86,792
TOTAL, OTHER MANDATORY BUDGET AUTHORITY	324,855	(7,992)	316,863	0	316,863
TOTAL, OTHER MANDATORY APPROPRIATION	61,274	(4,292)	56,982	0	56,982

## NOAA Summary (\$ in Thousands)

FY 2022 Proposed Operating Plan	FY 2021 Spend Plan	Total FY 2021 ATBs	FY 2022 Base	Total FY 2022 Program Changes	FY 2022 Estimate
TOTAL Direct Obligations (Discretionary & Mandatory)	5,864,486	65,336	5,929,822	1,414,970	7,344,792
TOTAL Budget Authority (Discretionary & Mandatory)	5,762,653	81,319	5,843,972	1,414,970	7,258,942
TOTAL Appropriation (Discretionary & Mandatory)	5,501,072	124,269	5,625,341	1,414,970	7,040,311
Reimbursable Financing	361,294	(119,294)	242,000	0	242,000
TOTAL OBLIGATIONS (Direct & Reimbursable)	6,225,780	(53,958)	6,171,822	1,414,970	7,586,792
Offsetting Receipts	(10,352)	(7,300)	(17,652)	0	(17,652)
TOTAL OBLIGATIONS (Direct, Reimbursable & Offsetting Receipts )	6,215,428	(61,258)	6,154,170	1,414,970	7,569,140



## Line Office Summary (\$ in Thousands)

FY 2022 Proposed Operating Plan	FY 2021 Spend Plan	Total FY 2021 ATBs	FY 2022 Base	Total FY 2022 Program Changes	FY 2022 Estimate
National Ocean Service					
ORF	613,775	10,604	624,379	229,529	853,908
PAC	8,500	0	8,500	0	8,500
OTHER	77,302	(55,082)	22,220	0	22,220
TOTAL, NOS	699,577	(44,478)	655,099	229,529	884,628
National Marine Fisheries Service					
ORF	954,985	30,333	985,318	114,009	1,099,327
PAC	0	0	0	0	0
OTHER	107,294	(9,163)	98,131	0	98,131
TOTAL, NMFS	1,062,279	21,170	1,083,449	114,009	1,197,458
Oceanic and Atmospheric Research					
ORF	567,291	8,079	575,370	186,799	762,169
PAC	43,500	0	43,500	10,000	53,500
TOTAL, OAR	610,791	8,079	618,870	196,799	815,669
National Weather Service					
ORF	1,092,628	43,404	1,136,032	80,553	1,216,585
PAC	133,406	0	133,406	(21,243)	112,163
TOTAL, NWS	1,226,034	43,404	1,269,438	59,310	1,328,748
National Environmental Satellite, Data and Information Service					
ORF	288,945	7,684	296,629	55,093	351,722
PAC	1,224,924	0	1,224,924	452,395	1,677,319
TOTAL, NESDIS	1,513,869	7,684	1,521,553	507,488	2,029,041
Mission Support					
ORF	299,497	11,973	311,470	58,248	369,718
PAC	43,000	0	43,000	38,000	81,000
Total, Mission Support	342,497	11,973	354,470	96,248	450,718
Office of Marine and Aviation Operations					
ORF	253,578	16,458	270,036	29,587	299,623
PAC	123,500	0	123,500	182,000	305,500
OTHER	32,361	1,046	33,407	0	33,407
TOTAL, OMAO	409,439	17,504	426,943	211,587	638,530

## Line Office Summary Cont'd (\$ in Thousands)

FY 2022 Proposed Operating Plan	FY 2021 Spend Plan	Total FY 2021 ATBs	FY 2022 Base	Total FY 2022 Program Changes	FY 2022 Estimate
<b>DIRECT DISCRETIONARY OBLIGATIONS</b>					
ORF	4,070,699	128,535	4,199,234	753,818	4,953,052
PAC	1,576,830	0	1,576,830	661,152	2,237,982
OTHER	216,957	(63,199)	153,758	0	153,758
<b>TOTAL, DIRECT DISCRETIONARY OBLIGATIONS</b>	<b>5,864,486</b>	<b>65,336</b>	<b>5,929,822</b>	<b>1,414,970</b>	<b>7,344,792</b>
<b>DISCRETIONARY APPROPRIATIONS</b>					
ORF Adjustments (Deobligations/Rescissions)	(17,500)	0	(17,500)	0	(17,500)
ORF Transfers	(212,899)	(33,272)	(246,171)	0	(246,171)
PAC Adjustments (Deobligations/Rescissions)	(13,000)	(39,250)	(52,250)	0	(52,250)
PAC Transfers	(31,272)	72,522	41,250	0	41,250
OTHER Discretionary Adjustments	0	0	0	0	0
Mandatory Accounts Excluded	(150,017)	63,225	(86,792)	0	(86,792)
<b>TOTAL, DISCRETIONARY APPROPRIATIONS</b>	<b>5,439,798</b>	<b>128,561</b>	<b>5,568,359</b>	<b>1,414,970</b>	<b>6,983,329</b>



Photos top left moving clockwise reflect: 1) Flooding in Sanford, Michigan caused by heavy rainfall and subsequent dam failure, May 2020. Credit: State of Michigan; 2) NWS Incident Meteorologist gathers weather observations to support wildfire suppression at the Pine Gulch Fire north of Grand Junction, CO., August 2020; 3) NOAA's GOES-East GeoColor capture of Hurricane Laura over the Gulf of Mexico, the strongest and most damaging landfalling U.S. hurricane of 2020; 4) A partial eclipse of the sun and moon seen with GOES-East's Solar Ultraviolet Imager.