Cover Caption: We are NOAA. We are a global leader in environmental science and technology. We are building a Weather-Ready Nation. We are a leading provider of earth observations. We power the blue economy. We are leading stewards of a cleaner, healthier, more sustainable ocean. We are part of the community.

Layout Design: Tiffany Small

National Ocean Service
www.oceanservice.noaa.gov

National Marine Fisheries Service
www.fisheries.noaa.gov

Office of Oceanic and Atmospheric Research
www.research.noaa.gov

National Weather Service
www.weather.gov

National Satellite and Information Service
www.nesdis.noaa.gov

Office of Marine and Aviation Operations
www.omao.noaa.gov

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National Oceanic and Atmospheric Administration
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NOAA BUDGET SUMMARY 2021

Contents

Many of the photos appearing in this publication were taken by NOAA employees, usually during the normal conduct of NOAA activities (unless otherwise noted). Their contribution to this report is gratefully acknowledged.

Rainbow over the Wasatch Mountains near Salt Lake City.

Terminology

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

FY 2019 Spend Plan
Fiscal Year (FY) 2019 Consolidated Appropriations Act, 2019 (P.L. 116-6).

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

Adjustments-to-Base
Includes the estimated FY 2021 civilian pay raise of 1.0 percent and military pay raise of 3.0 percent. Program totals will provide inflationary increases for 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 2021 Base
FY 2020 Enacted plus Adjustments-To-Base.

Program Change
Requested increase or decrease over the FY 2021 base.

FY 2021 Estimate
FY 2021 base plus Program Changes.

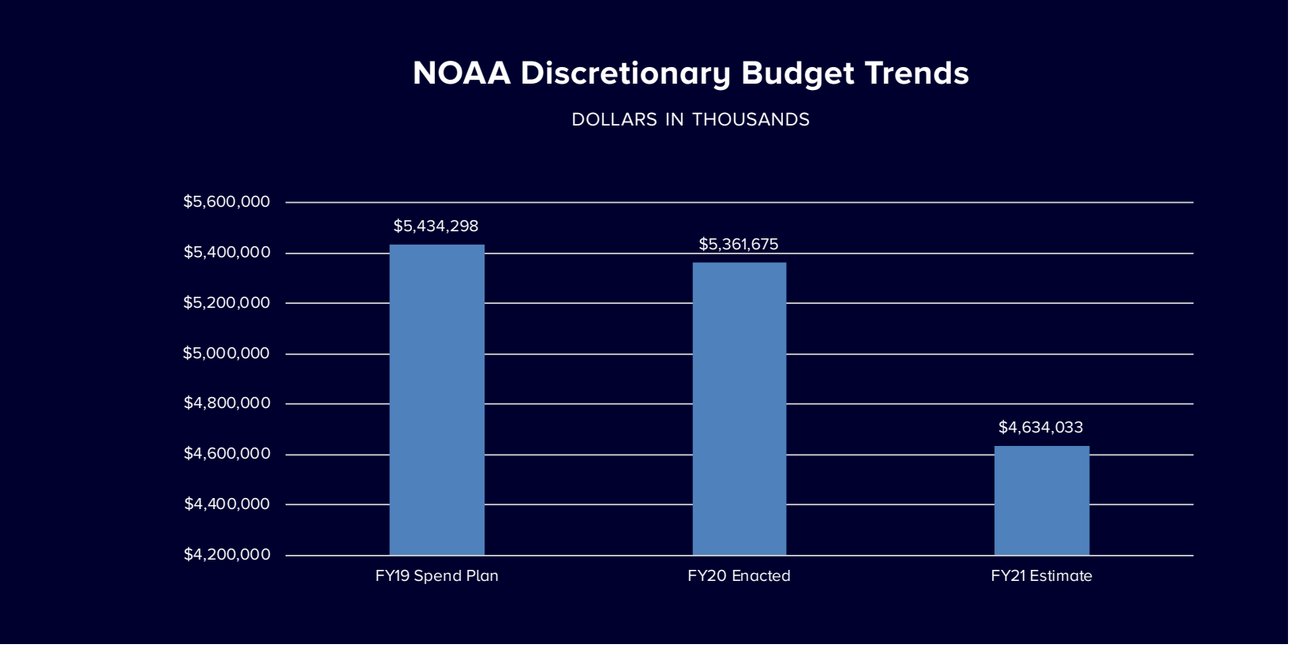
NOAA navigation response team vessel on the Brunswick River, Georgia, en route to the Sidney Lanier Bridge. In anticipation of Hurricane Dorian making landfall, the Office of Coast Survey (OCS) pre-staged personnel and assets in locations outside of the hurricane's impact zone.

CHAPTER 1

Introduction

NOAA's FY 2021 request includes $4,634,033,000 in discretionary appropriations, a $727,642,000 reduction from the FY 2020 Enacted level. This request supports NOAA's mission: 1) to understand and predict changes in climate, weather, oceans, and coasts; 2) to share that knowledge and information with others; and 3) to conserve and manage coastal and marine ecosystems and resources. This budget advances NOAA's goals of reducing the impacts of extreme weather and water events to save lives and protect property by implementing Public Law 115-25, Weather Research and Forecasting Innovation Act of 2017, and Public Law 115-423, *National Integrated Drought Information System Reauthorization Act of 2018*, and maximizing the economic contributions of our ocean and coastal resources, by expanding the American blue economy.

The FY 2021 budget further advances space innovation through new approaches to NOAA satellite missions and provides for mission support activities essential to accomplishing all NOAA missions. FY 2021 will continue to support bold strategies to dramatically expand the agency's application of four emerging science and technology focus areas, 'omics, unmanned systems, artificial intelligence, and high performance cloud computing. This focus will guide transformative advancements in the quality and timeliness of NOAA science, products, and services. More information about NOAA's specific FY 2021 initiatives is provided in the chapters and appendices that follow as well as in NOAA's FY 2021 Congressional Justification.



NOAA appreciates the continued support of Congress, the Administration, and our broad and diverse base of stakeholders. We will continue to monitor major milestones and accomplishments of our programs and activities to evaluate progress and demonstrate success.

Below is a summary of NOAA's emerging science and technology strategies and related accomplishments. Additional accomplishments from 2019 are referenced in the chapters that follow.

NOAA RELEASES NEW STRATEGIES TO APPLY EMERGING SCIENCE AND TECHNOLOGY

In November 2019, NOAA announced new strategies to dramatically expand the agency's application of four emerging science and technology focus areas—NOAA Unmanned Systems, Artificial Intelligence, 'Omics, and the Cloud—to guide transformative advancements in the quality and timeliness of NOAA science, products and services. These draft strategies were highlighted at a White House Summit on Partnerships in Ocean Science and Technology, which convened key players from across the ocean science and technology community including representatives of industry, academia, government, philanthropy, and the private sector. The event promoted cross-sector partnerships in ocean science and technology, showcased American leadership, and engaged the community to explore the unknown ocean, advance marine science, and promote new technologies. In February 2020, NOAA released final strategies for NOAA Unmanned Systems, Artificial Intelligence and 'Omics with the Cloud Strategy being finalized for later release. These strategy documents are here.

THE STRATEGIES DEVELOPED BY NOAA TO IMPROVE THE EFFICIENCY, EFFECTIVENESS AND COORDINATION OF THEIR DEVELOPMENT AND USAGE ACROSS THE AGENCY, INCLUDE:

Unmanned Systems Strategy: In recognition of the opportunities unmanned systems presents for addressing NOAA's mission priorities, the NOAA Unmanned Systems Strategy provides a framework to efficiently provide requirements-driven, safe, cost-effective, and compliant Unmanned Systems services across the agency; prioritize strategic investments in Unmanned Systems applications and technologies that fuel innovation and strengthen operations, and accelerate and enhance capabilities through partnerships.

Artificial Intelligence Strategy: The overarching goal of the NOAA Artificial Intelligence Strategy is to utilize artificial intelligence to advance NOAA's requirements-driven mission priorities. Through this strategy, NOAA seeks to reduce the cost of data processing, and provide higher quality and more timely scientific products and services for societal benefits.

'Omics Strategy: In recognition of the opportunities and challenges presented by the advent of tools associated with 'omics—a suite of advanced methods used to analyze material such as DNA, RNA, or proteins—the NOAA 'Omics Strategy provides a framework to advance the application of 'omics to address mission priorities. The strategy leverages NOAA's current organizational structure to more effectively implement 'omics through improvements in computational and analytical capacities, targeted research, technology transition, workforce proficiency, and partnerships across NOAA's lines, Federal agencies, and extramural research and commercial communities.

Cloud Strategy: NOAA's robust experience with cloud applications is already beginning to demonstrate significant improvements in performance and skill in areas such as satellite data products and services, numerical weather prediction, ocean models, and big data analysis, storage and dissemination. Cloud services will be further leveraged to expand benefits, such as: accelerated timeline to acquire new computing resources; increased security posture; more accessible and monetizable NOAA data to customers, such as academia and industry; reduced transition time from research to operations; scalable infrastructure that supports scientific and high performance computing requirements; and a more agile and innovative culture.

NOAA developed these strategies in accordance with guidance provided by the Administration and Congress, including the Office of Science and Technology Policy FY21 Research and Development Priorities letter, the National Science and Technology Council report "Science and Technology for America's Oceans: a Decadal Vision," the Executive Order on Maintaining American Leadership in Artificial Intelligence, the Weather Research and Forecasting Innovation Act of 2017, the Commercial Engagement Through Ocean Technology (CENOTE) Act, and the Federal Cloud Computing Strategy.

Upon completion of these strategies, NOAA will develop corresponding Strategic Implementation Plans (or "Roadmaps") that define detailed action items, deadlines, and responsibilities. In the meantime, these NOAA S&T focus areas are already improving performance in our economically impactful missions and setting the course to strengthen our renowned environmental science and technology leadership for the coming decades. Through the four strategies, NOAA will be better positioned to achieve our top agency priorities to regain global leadership in numerical weather prediction and sustainably expand the American Blue Economy.

SPECIFIC FY 2019 ACCOMPLISHMENTS RELATED TO SCIENCE AND TECHNOLOGY STRATEGIES INCLUDE:

PRIORITIZING STRATEGIC INVESTMENTS IN UNMANNED SYSTEMS

From observing dangerous wildfires to traversing to the bottom of the ocean, this year NOAA used unmanned systems to make new discoveries, reduce the impacts of extreme weather and water events, and maximize the economic contributions of ocean and coastal resources.

During the 2019 wildfire season, NOAA used Unmanned Aircraft Systems to collect wildfire measurements for forecasts at night, which are important for fire and plume forecasts but too risky for manned research aircrafts to collect. In the past, the inability to collect this night data resulted in critical data gaps that affected the accuracy of fire weather forecasting.

NOAA also conducted operational tests of small drones aboard the NOAA Ship *Thomas Jefferson* in support of survey operations and shoreline mapping conducted along the south coast of Puerto Rico. This method could become a low-cost imaging alternative to traditional shoreline verification and mapping techniques used by NOAA hydrographic survey field units. Potential benefits of using drones for shoreline mapping include: improved data collection efficiency compared to data collection from small skiffs; more accurate feature investigation than traditional techniques; and, most

importantly, removal of personnel from potentially dangerous situations.

On August 3, 2019, a saildrone outfitted with instruments designed by NOAA scientists completed a 196 day voyage circling the entire Southern Ocean. This was the world's first autonomous circumnavigation of Antarctica and a technological feat that was unfathomable just a decade ago. Preliminary results suggest that parts of the ocean could be emitting CO2 and greenhouse gas rather than absorbing them. NOAA continues to push the envelope to develop tools to collect critical data to understand the earth's weather and climate.

APPLICATION OF ARTIFICIAL INTELLIGENCE TO NOAA MISSION AREAS

In 2019, NOAA achieved exponential advances in the development and application of Artificial Intelligence to nearly every NOAA mission area. Machine learning methods were used in fisheries and marine mammal surveys, hazard detection (oil spills, wildfires, volcanic ash plumes), and coral reef assessments. Neural network techniques were applied to weather and ocean prediction, ocean acoustic surveys, satellite data quality control, and data assimilation. Collectively, these accomplishments served as a starting point for following up from the 2019 White House Ocean S&T Partnerships Summit and our 2020 NOAA Artificial Intelligence Strategy and Strategic Implementation Plan.

EXPLORING THE POSSIBILITIES OF eDNA AND OTHER 'OMICS

NMFS scientists are once again using cutting edge 'omics research to provide a much more detailed view of biodiversity, genetic diversity, organismal physiology, and overall health of U.S. fishery ecosystems. By developing research methods and tools to analyze material such as DNA, RNA, and other proteins, NMFS is changing the way research questions are addressed, and increasing the efficiency with which solutions are achieved. Three examples of significant progress using 'omics research include: exploring the use of environmental DNA to assess the reach of salmon populations in the ocean; exploring the use of DNA to detect the presence of killer whales; and examining the potential for eDNA to support population surveys off the West Coast for Pacific hake, an economically important commercial fishery.

For salmon, NOAA research has shown that eDNA results can provide a form of "ground truthing" on the location of salmon, which could be a significant contribution to population assessments. For killer whales, NOAA has found that killer whale DNA lingers in the water after killer whales have been there. In fact, NOAA studies have found that this DNA can also distinguish the type of killer whale, such as the endangered Southern Resident Killer Whale. Finally, for Pacific Hake, ship-borne surveys use a mix of trawling and acoustic echo sounders. In 2019, the survey added sampling from an autonomous saildrone and eDNA analysis to test different methods for estimating the abundance of hake. Improving the accuracy of stock assessments for hake will help fisheries managers determine more refined catch limits.

EXPANDING NOAA'S CLOUD SERVICES

Harnessing the capabilities of the commercial cloud represents a unique opportunity, and NOAA's strategic, unified, and collaborative approach is paying dividends. During 2019, NOAA's cutting-edge innovation and strategic multi-sector partnerships for developing cloud applications improved performance and skill in satellite data products and services, numerical weather prediction, ocean models, and big data analysis, storage, and dissemination.

NOAA's Big Data Project won the Best in Class Public Sector Innovation Award at the Government Innovation Awards for making NOAA's data more open and accessible to the public through public-private partnerships. The Big Data Project team works through non-competitive Cooperative Research and Development Agreements with Amazon, Google, Microsoft, International Business Machines, and the Open Commons Consortium to explore new ways to improve NOAA's publicly available data. Over 70 NOAA datasets were made available on cloud service provider platforms in FY 2019.

Lt. Matt Sharr (left) and Capt. Brian Taggart (NOAA, ret., right) deploy the DJI Phantom 4 drone from one of NOAA Ship *Thomas Jefferson's* survey launches.

Mammatus clouds form as two storm systems come together over the Hayman Burn Scar at sunset in the Colorado Rocky Mountains. The Hayman Fire was Colorado's largest recorded fire burning over 138,000 acres in 2014.

CHAPTER 2

Priority – Reduce the Impacts of Extreme Weather and Water Events

Each year, the United States averages 10,000 thunderstorms, 5,000 floods, 1,300 tornadoes and two Atlantic hurricanes, as well as widespread droughts and wildfires. Weather, water and climate events cause an average of 650 deaths and $15 billion in damage per year and are responsible for 90 percent of all presidentially-declared disasters. About one-third of the U.S. economy—$3 trillion—is sensitive to weather and climate.[1]

NOAA provides weather, water, and climate forecasts and warnings for the United States, its territories, adjacent waters and ocean areas, for the protection of life and property and the enhancement of the national economy. NOAA operates on the front lines of weather and water disaster prediction, response, and recovery by providing local communities and emergency responders the real-time intelligence they need to assess damage and accelerate recovery. In other words, NOAA puts weather and other environmental information into the hands of people and industries to protect lives and property, support the U.S. economy, and manage sustainable coastal ecosystems.

1 https://www.noaa.gov/weather

Central to that effort is the Earth Prediction Innovation Center (EPIC). Authorized in the *National Integrated Drought Information System Reauthorization Act of 2018* (Public Law 115-423), EPIC is a virtual center that will serve as the core research-to-operations-to-research hub for building and maintaining a community modeling framework. EPIC's innovative structure will link world class scientists and software engineers in academia, the private sector and partner agencies with the research, development, and operational activities inside the agency. EPIC will leverage expertise on a national scale to enhance weather forecasting.

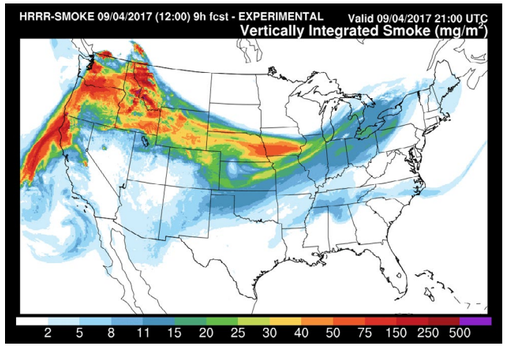
Accelerating the advancements in the U.S. global modeling program is a top priority of the administration and at NOAA. The FY 2021 request will continue NOAA's capacity to provide relevant information that can help create a society that is more adaptive to its environment; experiences fewer disruptions, dislocation, and injuries; and that operates a more efficient economy.

BELOW ARE SOME OF NOAA'S TOP 2019 ACCOMPLISHMENTS THAT SUPPORT THIS PRIORITY:

NOAA RESPONDS TO HURRICANE DORIAN

Hurricane Dorian was the strongest and most destructive storm of the 2019 hurricane season. The northern Bahamas, the Abaco Islands, and Grand Bahama Island were devastated by Dorian's Category 5 winds, estimated to have reached over 180 mph with a storm surge greater than 18 feet. After leaving the Bahamas, Dorian turned northwestward and moved parallel to the Florida east coast, producing over a dozen tornadoes across northeast South Carolina and eastern North Carolina, before making landfall over Cape Hatteras as a Category 1 storm on September 6, 2019.

Thanks to the improved forecasts and Impact-based Decision Support Services from NWS, mandatory evacuations were avoided from South Florida through the Carolinas, minimizing disruption to residents and businesses along the coast. Had this same event occurred 10 years ago, large areas would have likely been evacuated due to forecast



ESRL Global Systems Division's experimental HRRR-Smoke model helps officials advise the public about air quality and visibility issues caused by western U.S. wildfires.

uncertainty. But the track forecasting accuracy from the National Hurricane Center has improved, and NWS has developed relationships with core partners to interpret and explain forecast risk and uncertainty in hurricane events, and inform emergency managers and the public in a more timely and accurate way than ever before.

Over an 11 day period, while Dorian was still a Category 5 hurricane, the Atlantic Oceanographic and Meteorological Laboratory participated in 15 P-3 missions into Dorian, the most missions flown into a single storm since NOAA's hurricane hunting missions began in 1975. The nearly continuous data from these missions will help NOAA scientists better understand and characterize how Dorian's structure and intensity changed so much, determine how well the Hurricane Analysis and Forecast System used to forecast Dorian was able to predict these changes, and allow for continued improvements to be made to future forecasts using this next generation hurricane model.

In anticipation of Dorian's landfall, the Office of Coast Survey teams mobilized to the affected areas and coordinated operations with the U.S. Coast Guard and U.S. Army Corps of Engineers to evaluate and prioritize surveys of ports for navigation hazards. The National Geodetic Survey also collected high-resolution digital imagery to assist Federal, state, and coastal managers in assessing damage. This type of post-disaster aerial imagery provides timely, concise, and cost-effective information on the extent of the damage inflicted by flooding, the damage to major ports and waterways, coastlines, critical infrastructure, and coastal communities for emergency managers. At the request of the Bahamian National Emergency Management Agency, the National Geodetic Survey also captured high resolution imagery along the shoreline, ports, and impacted inland areas of the Bahamian Islands, which helped them determine damage on land and in the water, port approaches, and any obstructions to navigable commerce due to Dorian.

In sum, NOAA Hurricane Hunters and scientists measured Dorian's intensification from a weak tropical storm in the Caribbean, to one of the fiercest Atlantic hurricanes in recorded history. The data they gathered were vital to protecting life and property, supporting NOAA's efforts to warn vulnerable communities of approaching severe weather through accurate forecasts. NOAA anticipates that these high quality forecasts will continue to allow staff and assets to be ready to provide efficient response and recovery efforts, ensuring the safety of citizens, and minimal interruption to the flow of commerce.

NEW HIGH RESOLUTION WEATHER MODEL PREDICTS SMOKE MOVEMENT

There is an increasing demand for high resolution, frequently updated smoke forecasts in the U.S. The experimental High Resolution Rapid Refresh-Smoke (HRRR-Smoke) is the first numerical weather prediction model in the U.S. to predict how the weather can impact smoke movement and how the smoke could reduce visibility for ground transportation and aviation. Developed by the Earth System Research Laboratory, Global Systems Division and partners, the HRRR-Smoke uses data from NOAA and NASA satellites to detect the location and intensity of fires. Forecast offices are already sharing HRRR-Smoke images of how smoke will move downwind from fires to alert communities sensitive to fine airborne particulates, prior to the NWS scheduled transition into operations in 2020. During wildfire operations, NWS Incident Meteorologists used HRRR-Smoke in their briefings to state and local emergency management offices to help with fire management and aviation decisions. HRRR-Smoke will complement NOAA's celebrated Hybrid Single Particle Lagrangian Integrated Trajectory, aka HYSPLIT model, which determines where air pollutants originated, predicts where those pollutants are going, and provides multiple scenarios identifying resulting hazards. Together, HRRR-Smoke and HYSPLIT help ensure NOAA's ability to achieve its mission.

NOAA'S FLAGSHIP WEATHER MODEL ENHANCED WITH NEW CORE ENGINE

In June 2019, the Global Forecast System underwent a significant game-changing upgrade with a new "engine" or dynamical core called the Finite Volume Cubed-Sphere. This new dynamical core, developed by OAR's Geophysical Fluid Dynamics Laboratory, and accompanying enhancements, will drive numerical weather prediction into the future, improving forecasts of the jet stream and associated weather, tropical cyclone intensity and 5-day forecasts, as well as precipitation forecasts across the United States. The Global Forecast System with the Finite Volume Cubed-Sphere upgrade brings together the superior dynamics of global climate modeling with day-to-day reliability and speed of operational numerical weather prediction.

NOAA BEGINS MAKING MODEL CODE PUBLICLY AVAILABLE

In October 2019, the Unified Forecast System (UFS) weather model was transitioned from the internal NWS repository to an open source development environment. All UFS development is now being conducted by scientists from OAR and NWS using this open source environment for weather modeling. The rest of the modeling community will soon be part of this environment once NOAA releases the UFS 1.0 to the public. In the future, more operational modeling suites, such as our future subseasonal to seasonal forecast system and Hurricane Analysis and Forecasting System, will be transitioned to open source development. This is a critical step towards a true community modeling framework that will advance weather modeling skill and international leadership in the area of numerical weather prediction.

NEW FLOOD INUNDATION MAPPING AND NATIONAL WATER MODEL UPGRADE IMPROVE AND SUPPORT FOR MISSOURI, OHIO, AND MISSISSIPPI RIVER FLOODING

NWS improved decision support services by demonstrating a new flood inundation mapping capability serving 25 million people (approximately 8% of the continental U.S. population) residing in flood-vulnerable freshwater basins, and delivering an enhanced excessive rainfall outlook product that extends the lead time of high risk predictions from two days to three days. Emergency managers will use the demonstrated flood inundation mapping capability and the enhanced excessive rainfall outlook to more effectively mitigate flood impacts by prepositioning resources, ensuring critical infrastructure (e.g., hospitals, evacuation routes, etc.) are viable, and ordering evacuations. Supporting this effort was the National Water Model upgrade to Version 2.0, an hourly cycling analysis and forecast system that provides streamflow for over five million miles of streams and rivers, as well as analyses and forecasts of critical water budget variables such as snowpack and soil moisture.

In January 2019, NWS offices began to communicate the potential for widespread flooding in the Missouri, Ohio, and Mississippi River basins. By the release of NOAA's Spring Flood Outlook in March, an estimated 220 million people were at elevated risk for minor flooding in their communities, with over 14 million at an elevated risk for major flooding. While these floods manifested at different times between March and July, the impacts were long lasting, pronounced flooding in the Upper, Middle, and Lower Mississippi Basin, which led to the unprecedented operation of the Bonnet-Carre floodway. Throughout the season, NWS led decision support calls with affected national, regional and local stakeholders such as those from the Mississippi River Cities and Towns Initiative. These calls provided regional and local Impact-based Decision Support Services with geospatial products such as remotely sensed maps of flooded areas derived from NESDIS satellite systems. NOAA's decision support efforts allowed communities to warn residents in advance, preposition supplies, and plan efficient response once the flooding began, thereby reducing the effects of the flooding on the communities.

EXCEPTIONAL END-TO-END FORECAST & WARNING SERVICES ON LATE MAY EF4 TORNADOES

Destructive EF4 tornadoes, the strongest of the year, impacted Dayton, Ohio, and areas near Lawrence, Kansas, in late May 2019. Both events had no reported fatalities due in large part to advanced warnings and Impact-based Decision Support Services. Tornado Warnings were issued with over 30 minutes of initial lead time. Forecasters at NOAA's Storm Prediction Center continually monitored their forecasts during these two active weeks to provide not only the most accurate depiction of the at-risk areas but also the potential for intense tornadoes in these environments. NWS Weather Forecast Offices engaged in preparative discussions with local emergency managers and broadcast meteorologists to inform the public of the likelihood of severe weather several days in advance. The Dayton tornado occurred late at night, while the Lawrence tornado occurred in daylight but was completely obscured by rain. Despite these tornadoes being nearly impossible to see, many in their path were almost instantly made aware of the threat through the NWS's utilization of the Federal Emergency Management Agency's Wireless Emergency Alert notifications directly alerting smartphones, in addition to those with NOAA Weather Radios. These storms illustrate how NWS's advanced warnings, coupled with consistent communication and Impact-based Decision Support Services with local emergency managers, make communities informed and ready to respond to the threat of severe weather.

HURRICANE FORECASTING ADVANCES WITH REAL-TIME HURRICANE ANALYSIS AND FORECAST SYSTEM

The newly developed Hurricane Analysis and Forecasting System (HAFS), NOAA's next-generation hurricane model, ran in real-time development mode during the 2019 hurricane season. The real time experiments, conducted by the Hurricane Forecast Improvement Program, demonstrated initial successes of the new model in the Atlantic basin. A joint development by NWS and OAR, the HAFS uses the new weather model engine, the Finite Volume Cubed-Sphere dynamical core, and runs at multiple resolutions, with fine-scale resolution for the hurricane eye, and coarser scales in the rest of the basin. Part of the NOAA-supported Unified Forecast System, HAFS will continue to evolve into an advanced analysis and forecast system for cutting-edge research on hurricane modeling, and will incorporate advances including placing fine-scale resolution to follow multiple storms, improved treatments of clouds, precipitation, and interactions between ocean and atmosphere. These advances will improve forecasting of track, intensification, anticipation of storm formation, extreme precipitation, and impacts on coastal systems.

FY 2021 INITIATIVES

The FY 2021 Budget requests an increase of $7,000,000 for EPIC, allowing EPIC to expand the community support it provides for UFS applications, accelerating research to operations to research, and leveraging innovation from the Weather Enterprise using a cloud-based development environment. The draft EPIC strategic plan was released on January 10, 2020.

In FY 2021, NOAA proposes initiatives that will protect lives and property through new research and creative partnerships for data sharing. NOAA requests an increase of $3,200,000 to establish a Tornado Warning Improvement and Extension Program (TWIEP) to improve the accuracy and timeliness of tornado forecasts, predictions, and warnings. With this increase, TWIEP will carry out research and leverage existing resources to advance NOAA's tornado observing systems, thunderstorm-scale computer models, and risk communication approaches.

An investment of $4,000,000 to increase observational data sharing with the World Meteorological Organization will improve the frequency and reliability of observational data used to generate weather and water forecasts, watches, and warnings; improve interoperability with international partners; and enable the results of successful research and development to be fully transitioned and implemented into NWS operations.

Aurora australis and Milky Way seen over NOAA Atmospheric Research Observatory.

CHAPTER 3

Priority—Expand the American Blue Economy

The global blue economy is poised for growth and is projected to double in value to $3 trillion by 2030. The coasts are economic engines that support jobs in defense, fishing, transportation, and tourism industries; contribute substantially to the U.S. gross domestic product; and serve as hubs of commerce, with seaports connecting the country with global trading partners. Acceleration of human activity in and around the coast is fostering new ways of thinking about the blue economy concept, the role of sustainability in driving markets, resilience of coastal infrastructure and economies, and the science and technology that will innovate new sectors.

NOAA's mission to share knowledge and information on the Nation's climate, weather, oceans, and coasts and to conserve and manage coastal and marine ecosystems and resources uniquely positions the agency to support the Nation's competitiveness in ocean-related segments of the U.S. economy. NOAA's leadership in five key areas—seafood production, marine transportation, tourism and recreation, ocean exploration, and coastal resilience—will ensure Americans benefit from these growth opportunities.

NOAA is leading the Administration's efforts to increase the economic impact of the Nation's ocean and coastal resources, working collaboratively with Federal, state, and industry partners, and at the forefront of international discussions on the blue economy. NOAA's blue economy activities will advance the Administration's top priorities by reducing regulatory burdens and increasing

View from the M/V Ocean Wind as the ship transits down the Mississippi River. The global blue economy is projected to double in size by 2030, and NOAA is developing a new model to understand and measure U.S. contributions. The Experimental Ocean Economy Satellite Account, will provide first-of-its-kind data for use by government agencies and industries to better evaluate and grow ocean, coast, and Great Lakes-dependent businesses.

Boy holding reef fish. Florida's Gulf Reef Fish Survey produces private boat catch estimates for reef fish species.

economic opportunities and production, in support of Presidential Executive Orders including EO 13840: Ocean Policy To Advance the Economic, Security, and Environmental Interests of the United States and EO 13859: Executive Order on Maintaining American Leadership in Artificial Intelligence and the Presidential Memorandum on Ocean Mapping of the United States Exclusive Economic Zone and the Shoreline and Nearshore of Alaska.

BELOW ARE SOME OF NOAA'S TOP 2019 ACCOMPLISHMENTS THAT SUPPORT THIS PRIORITY:

NOAA DESIGNATES NEW NATIONAL MARINE SANCTUARY

The Mallows Bay-Potomac River National Marine Sanctuary was officially designated on Saturday, November 9, 2019. It is the first National Marine Sanctuary designated in the United States in 20 years and is the 14th in the sanctuary system. The nomination was designed, initiated, and driven by the local community with support from NOAA and other Federal agencies. Located a short drive from Washington, D.C., the 18 square mile sanctuary includes over 100 shipwrecks of national historical significance, known as the Ghost Fleet, most of which were built for the World War I effort in Europe, but were never sent overseas. The local economy is already benefiting from the designation through an increase in tourism and fishing and the area will continue to see ancillary benefits to local businesses like restaurants and hotels as awareness grows among tourists to the Washington, D.C., area.

NOAA AND THE GULF OF MEXICO FISHERY MANAGEMENT COUNCIL APPROVE INNOVATIVE RED SNAPPER REGIONAL MANAGEMENT PLAN

NMFS and the Gulf of Mexico Fishery Management Council are working together to increase fishing opportunities and boost economic benefits for red snapper, the Gulf's most iconic fishery. This collaborative effort resulted in the approval of an action, a regulatory flexibility, delegating private angler red snapper fishery management to the five Gulf States, to take effect in 2020. State managers now have the authority to set the annual season, bag limit, and size limit for state and Federal waters. Overfishing of Gulf red snapper ended in 2009 and the population grew rapidly. The total red snapper quota rose from a low of 5 million pounds in 2007 to a high of 14.3 million pounds in 2015, the highest quota ever allowed.

NEW FISHING OPPORTUNITIES EMERGE FROM RESURGENCE OF WEST COAST GROUNDFISH

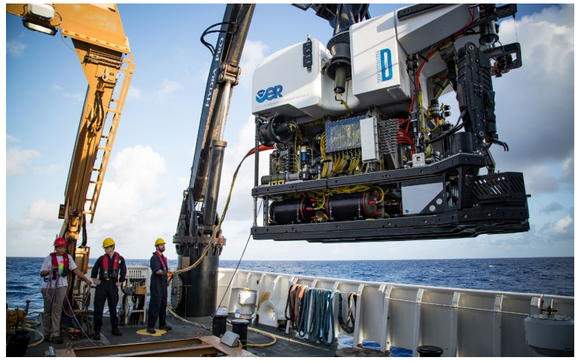
NOAA issued new biennial harvest regulations that allow increased fishing opportunity. Most groundfish stock catch limits increased, historically productive fishing grounds reopened, and quota management procedures were simplified. Streamlined regulations allow vessel operators increased flexibility in how they can use and configure gear to increase access to target stocks and efficiency of fishing practices, while still limiting bycatch to meet conservation objectives.

NOAA PARTNERS WITH THE U.S. ENVIRONMENTAL PROTECTION AGENCY TO COMPLETE ENVIRONMENTAL REVIEW FOR FIRST AQUACULTURE PROJECT IN FEDERAL WATERS

NMFS collaborated with the Environmental Protection Agency and U.S. Army Corps of Engineers to complete the environmental review process for the first pilot aquaculture project in Federal waters of the Gulf of Mexico. The Velella Epsilon project proposes to culture almaco jack in a single cage about 45 miles southwest of Sarasota, Florida, paving the way for future commercial-scale operations to help meet U.S. seafood demand. The project aims to validate the feasibility of a temporary, small-scale, demonstration net pen within which to stock, culture, and harvest a Federally managed species. While at the same time addressing public concerns of open ocean aquaculture in the Gulf of Mexico. This effort to streamline the Federal permitting process enhances job creation and increases aquaculture production to ensure the health of the coastal ecosystem.

NOAA INVESTS IN MAPPING AND MODELING OF ALASKA

NOAA's Office of the Coast Survey released 13 new large-scale electronic navigational charts of Etolin Strait, Alaska, in the improved NOAA Electronic Navigational Chart or ENC® Layout. These charts provide a nearly twenty-fold increase in scale over the previous coverage. New Etolin Strait hydrographic surveys and the resulting ENCs served as a pilot project for the overall re-scheming of the entire NOAA ENC suite with a regular, gridded layout for ENC charts, as outlined in NOAA's National Charting Plan. In addition, the Center for Operational Oceanographic Products and Services developed a new oceanographic model of Cook Inlet, Alaska in partnership with Office of Coast Survey. The model helps mariners to navigate their local waters safely and more efficiently. Specifically, the models will provide operational nowcast and forecast guidance out to 48 hours for Cook Inlet on parameters including water levels, water temperature, salinity, and currents. Center for Operational Oceanographic Products and Services has implemented forecast systems like these in critical ports, harbors, estuaries, Great Lakes, and coastal waters across the United States, forming a national backbone of real-time data, tidal predictions, data management, and operational modeling.



Remotely operated vehicle Deep Discoverer being deployed from the aft deck of NOAA Ship *Okeanos Explorer.*

This work provided NOAA a head start on following up from the 2019 White House Ocean Science and Technology Partnerships Summit and implementing the December 2019 Presidential Memorandum on Ocean Mapping the United States Exclusive Economic Zone.

NOAA EXPLORATION OF THE UNITED STATES EXCLUSIVE ECONOMIC ZONE (U.S. EEZ)

The ocean is increasingly important to the Nation's economy, but significant gaps exist in our basic understanding of the resources it holds, especially in the deep ocean. To address these gaps, the Office of Ocean Exploration and Research (OER) works with partners to conduct exploratory voyages around the globe to collect deep-ocean data that will enhance NOAA's management within the U.S. EEZ. Combined, these efforts provided NOAA a head start on supporting the 2019 White House Ocean Science & Technology Partnerships Summit and implementing the December 2019 Presidential Memorandum focused on mapping, exploring, and characterizing the U.S. EEZ.

OER and partners conducted "Windows to the Deep 2019," as part of a major multi-year, multi-national collaborative field program on NOAA Ship Okeanos Explorer to study poorly understood deepwater areas of the southeastern United States. This expedition resulted in the discovery of expansive and previously unknown coral habitats on the Blake Plateau. Scientists also discovered methane seeps in unexpected spots on the seafloor, which has significant implications for ocean chemistry and alternative energy resources. During this same expedition, the team mapped over 28,000 square kilometers of previously unmapped seafloor. Also in the region, OER partnered with the geotechnical company Fugro to conduct opportunistic surveys along the Blake Plateau, resulting in the addition of another 28,000 square kilometers of publicly available multibeam data within the U.S. EEZ.

In the Pacific, the Exploration Vessel Nautilus, operated by the Ocean Exploration Trust and supported by OER, documented and surveyed unexplored regions along the West Coast of the United States and in the Central Pacific, including American Samoa and U.S. Territorial Islands. The team on the Nautilus discovered a new hydrothermal field at the northern Gorda Ridge. OER also provided support for scientists on the Schmidt Ocean Institute's Research Vessel Falkor to study seafloor communities of several seamounts in the North Pacific to determine whether the water masses bathing the seamounts influence marine life between the Aleutians and Hawaii. This research has implications for fisheries management along the Emperor Seamount chain.

Arctic expeditions resulted in the first ever observations of hydrothermal vents in the Arctic using Woods Hole Oceanographic Institution's innovative hybrid remotely operated vehicle Nereid Under Ice. Surveys of Arctic animal communities along the Gulf of Alaska Seamounts region provided insights into this underexplored region of economic importance that is also poised to undergo unprecedented change.

Scientists also captured the first-ever recording of a giant squid in U.S. waters, discovered multiple 19th Century shipwrecks in the Gulf of Mexico, and observed several potentially new marine species. NOAA tested emerging technologies to unlock the potential of our ocean, including autonomous underwater vehicles to increase the pace and efficiency of ocean mapping, tools for more effective collection of biological samples, and imaging systems to allow scientists to study the deep ocean in more efficient and less invasive ways.

THE GREAT LAKES ENVIRONMENTAL RESEARCH LAB DELIVERS OPERATIONAL CIRCULATION MODEL FOR LAKES MICHIGAN AND HURON TO NOS

The Great Lakes Environmental Research Lab delivered an upgraded model for forecasting circulation in Lakes Michigan and Huron to NOS in 2019. This model of the Great Lakes supports commercial shipping, lake management, search and rescue operations, spill response, and safe recreational activities. The new Lake Michigan-Huron Operational Forecast System replaces the previous separate systems with a single model now part of the broader Great Lakes Operational Forecasting System. The system is comprised of a set of hydrodynamic computer models used to predict the circulation and other physical process (e.g., water temperature, water levels) of the lakes and connecting channels in real-time nowcast and forecast model. The new model fills critical coverage gaps such as the Straits of Mackinac. This region is critical to commercial navigation, U.S. Coast Guard ice breaking operations, and oil spill response due to the location of two 60-year-old pipelines that transport oil across the Straits.

NOAA INFORMS COMMUNITIES ON ECONOMIC IMPACT OF MARINE DEBRIS TO IMPROVE DECISION MAKING

To better understand the relationship between coastal tourism economies and marine debris, the Marine Debris Program (MDP) funded a study to analyze how the amount of marine debris on beaches affects the behaviors of beachgoers, and the economies of coastal communities that depend on tourism. Results showed that if the amount of marine debris normally on beaches were doubled, coastal economies could experience a substantial negative impact from a decrease in beach visits and loss of economic activity in those communities. For example, the largest potential economic loss was found in Orange County, California, where experts estimated that doubling the typical amount of debris could cause a $414 million decrease in local tourism-related spending and a loss of more than 4,200 jobs. Conversely, along Ohio's Lake Erie shoreline, reducing marine debris to near zero could add an estimated $216 million in local, tourism-related spending, and more than 3,700 jobs. The results inform Federal, state, and local agencies as they prioritize marine debris prevention and removal efforts to maximize the benefits provided by clean and healthy beaches and coastal resources.

Also in FY 2019, MDP announced $17.2 million in grants to coastal states and territories impacted by Hurricanes Harvey, Irma, and Maria. These grant awards will aid coastal recovery efforts by supporting marine debris assessment, removal, and disposal. MDP and partners made significant progress in storm debris removal in Georgia and South Carolina for example. Removal efforts targeted vessels, construction materials, and floating docks that were submerged or lodged in coastal marshlands and tidal waters. Georgia removed over 8 million pounds of debris, including four vessels, and South Carolina removed over 100,000 pounds, including 13 vessels. Debris removal allows marshlands to regrow vegetation critical to habitat and for coastal protection.

FY 2021 INITIATIVES

The FY 2021 Budget harnesses NOAA's services, resources, and data to help accelerate growth of U.S. businesses, support ocean industries, and facilitate the development of new technologies that will allow the U.S. to take advantage of the growing blue economy sector.

This budget includes an increase of $8.5 million to support the Presidential Memorandum on Ocean Mapping of the U.S. EEZ and the Shoreline and Nearshore of Alaska. With these funds NOAA will coordinate the development of the interagency mapping strategy to map, explore, and characterize the U.S. EEZ, Arctic and sub-Arctic shoreline, and nearshore of Alaska.

NOAA requests an increase of $2.5 million for regional ocean data portals to implement Executive Order 13840, Ocean Policy to Advance the Economic, Security, and Environmental Interest of the United States, through improved access to credible marine data and information. Ocean data platforms will provide ocean-related Federal data and information to the public to inform regional, coastal, and ocean management decision-making across the United States.

Building upon the FY 2020 investment to establish a centralized Unmanned Systems (UxS) Operations Program, NOAA requests $2.0 million to fund centralized acquisition of UxS systems and platforms. These funds will ensure consistency in the way that NOAA's fleet of ships and aircraft, and UxS are standardized, centrally maintained, and mission ready. Rapidly evolving UxS technology is invaluable in supporting NOAA mission requirements such as: hydrographic and habitat mapping, fishery stock assessment, and oceanographic and atmospheric observations that support weather forecasting and extreme weather events.

The budget includes an increase of $0.3 million to bolster NOAA staffing necessary to execute the Fisheries Disaster Assistance program. NOAA will use these funds to process fisheries disaster grants in a timely manner, and provide additional program oversight and review. This request will improve NOAA's response to fishery disaster declarations and ensure funds are used in the most effective manner.

NOAA requests an increase of $0.5 million to expand NOAA's support for the interagency National Oceanographic Partnership Program. In partnership with the National Oceanographic Partnership Program, NOAA is offering extramural grants in emerging areas, including ocean exploration, aquaculture, and marine debris.

SpaceX Falcon Heavy rocket carrying 24 satellites, including NOAA and partners' Constellation Observing System for Meteorology, Ionosphere, and Climate-2 (COSMIC-2) mission, launched from NASA's Kennedy Space Center on June 25, 2019 as part of the Department of Defense's Space Test Program-2 mission. Credit: NASA/Joel Kowsky

CHAPTER 4

Priority—Space Innovation

Satellite observations have been central to meeting NOAA's mission since the launch of the first operational satellite in 1970. Today NOAA relies on satellites to monitor and forecast changes in terrestrial and space weather, the state of the oceans and coastlines, and the regional and global climate. Completed in 2017, the NOAA Satellite Observing System Architecture (NSOSA) study includes innovative approaches to better meet NOAA's mission requirements, with greater flexibility and responsiveness to evolving technologies, and fosters new business relationships with the private sector. Codified in the *National Integrated Drought Information System Reauthorization Act of 2018* (Public Law 115–423), NOAA's space innovation initiative, based on NSOSA, will inform decisions on the next generation satellite architecture required to meet NOAA's weather forecasting mission.

This initiative is the critical next step to ensure continuity of space based observations. The current development and deployment timeline for high-performance operational space assets is 10–15 years. NOAA must begin on-orbit replenishment of the current constellation in the 2027–2032 timeframe to minimize the risk of observations capability shortfalls, so development of the follow-on systems must begin now.

For the U.S. to remain a world leader, NOAA must be innovative, leverage new technology, and develop broader partnerships, while demonstrating organizational agility to adjust to changing needs, risks, and opportunities. To address this,

NOAA's initial steps are focused on implementing NSOSA through greater use of new technologies, smaller satellites, and partnerships to meet its mission requirements.

BELOW ARE SOME OF NOAA'S TOP 2019 ACCOMPLISHMENTS THAT SUPPORT THIS PRIORITY:

GEOSTATIONARY ORBITING ENVIRONMENTAL SATELLITE (GOES)-17 BECOMES OPERATIONAL

On February 12, 2019, GOES-17, formerly GOES-S, became operational and is now known as NOAA's GOES West satellite. The second of NOAA's advanced geostationary weather satellites, GOES West provides high-resolution real-time visible and infrared imagery of the west coast of the continental U.S., Alaska, Hawaii, and much of the Pacific Ocean, and operates in conjunction with its sister satellite, GOES East (aka GOES-16), which has the same instruments and capabilities. Until recently, high-quality data coverage of the Pacific Ocean was sparse, but now GOES West provides forecasters with access to more detailed views of high-impact weather systems along with environmental hazards such as wildfire smoke and volcanic ash. GOES West has been especially valuable to Alaska, where NOAA's older geostationary satellites provided far less coverage.

COSMIC-2 LAUNCH

On June 25, 2019, NOAA supported the successful launch of the Constellation Observing System for Meteorology, Ionosphere, and Climate (COSMIC-2). The mission consists of six satellites designed to improve weather forecasts and space weather monitoring via state-of-the-art instruments that provide improved precision, performance, and five times the number of measurement capabilities, with near real-time numerical weather prediction. By measuring minute bending in the GPS signal, the information collected by COSMIC-2 satellites will provide meteorologists with details about Earth's atmosphere—such as temperature, pressure, density, and water vapor—that will help meteorologists better observe, study, and forecast severe storms. COSMIC-2 will also monitor solar activity that can disrupt the power delivered to your home and provide global temperature documentation to help scientists understand long-term climate changes on Earth. COSMIC-2 is a joint collaboration with Taiwan, the National Science Foundation, National Aeronautics and Space Administration, U.S. Air Force, and the University Corporation for Atmospheric Research.

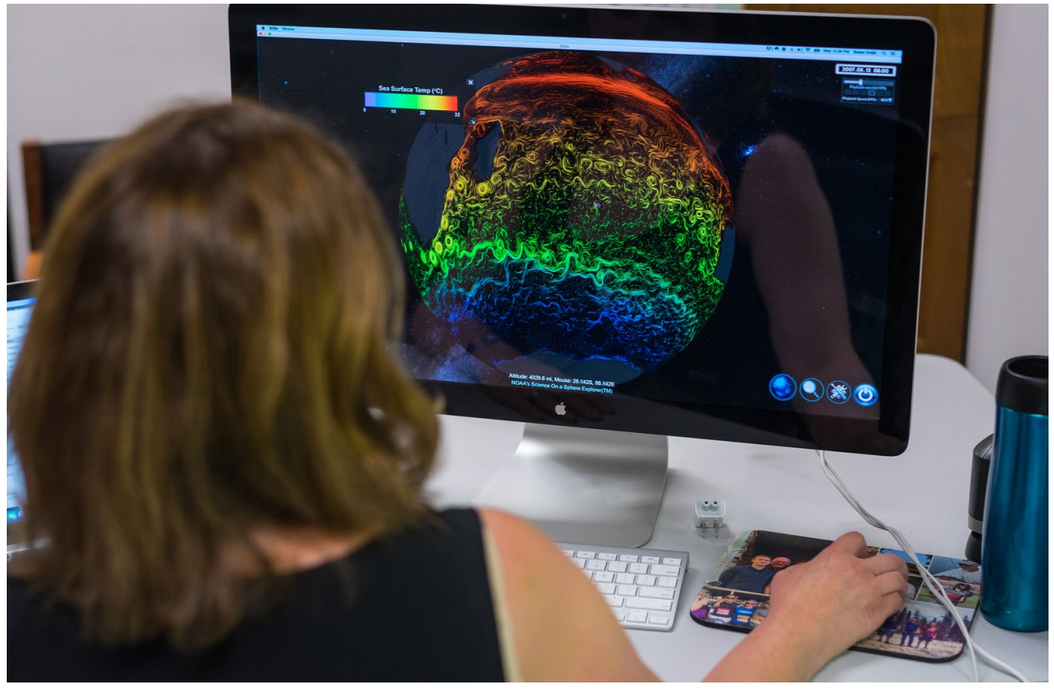
SUPPORT TO THE U.S. INDO-PACIFIC STRATEGY

In 2019, following discussions with the U.S. Air Force, NOAA transferred a decommissioned GOES spacecraft (GOES-13) and two ground antennae to the U.S. Air Force to meet Department of Defense requirements and cover a weather satellite imagery data gap in space-based environmental monitoring coverage over the Indian Ocean region. With the established performance of NOAA's new geostationary satellites, GOES-16 (as GOES-East) and GOES-17 (as GOES-West), and a healthy GOES-14 in reserve, NOAA can provide GOES-13 to the Air Force for their weather forecasting needs. In this partnership, NOAA, the U.S. Air Force, and NASA worked together to refurbish antennae and set up ground capabilities to enable data processing for the new location of the spacecraft. NOAA fully transferred the equipment to the U.S. Air Force and began drifting the spacecraft westward in July of 2019. NOAA will commence final checkouts once the satellite reaches its final orbital slot location. NOAA will operate and support the satellite on a reimbursable basis on behalf of the U.S. Air Force for the life of the mission.

FY 2021 INITIATIVES

In FY 2021, NOAA will expand innovations in space and weather enterprises through research to operations, creative partnerships, and cloud architecture.

Per the *Consolidated Appropriations Act, 2020*, NOAA will begin implementing NSOSA through initial investments to the Joint Venture Partnership, which will enable NOAA to leverage our partners' investments and advance their readiness to meet NOAA's observational needs, and through Geostationary and Extended Orbits, which will provide the development of the next generation of satellites in geostationary and other Earth and Solar orbits to provide continuity of data from the GOES-R Series.



A new downloadable program allows you to view this SOS ExplorerTM animation showing changing sea surface temperatures run on a laptop and displayed on a monitor.

An increase of $5,015,000 for Data-source Agnostic Common Services allows NOAA to begin to utilize essential data and observations from an increasingly capable and diverse array of partner and commercial systems to meet mission requirements in a cost-effective manner. New and legacy NOAA products and services will be transferred within a cloud architecture to increase end-to-end efficiencies through a more flexible and scalable infrastructure. This budget includes an increase of $10,000,000 for Commercial Data Purchase of Global Navigation Satellite System Radio Occultation data for operational use. Global Navigation Satellite System Radio Occultation has the potential to be a cost-effective means to provide atmospheric profiles necessary for accurate weather forecasts. In addition, an increase of $5,000,000 for the Commercial Weather Data Pilot will continue the execution of pilots for the next available commercial data type. These pilots are critical to NOAA's future satellite architecture as they assess operational viability of possible future commercial capabilities.

NOAA requests an increase of $44,115,000 for the Space Weather Follow On program. The NOAA Space Weather Follow On program will ensure continuity of space weather data beyond NOAA's Deep Space Climate Observatory and NASA-European Space Agency research Solar and Heliophysics Observatory, which are well past their design life.

The historic shipwrecks of Mallows Bay-Potomac River National Marine Sanctuary — the first national marine sanctuary to be designated since the year 2000 — provide habitat for birds and other wildlife.

CHAPTER 5

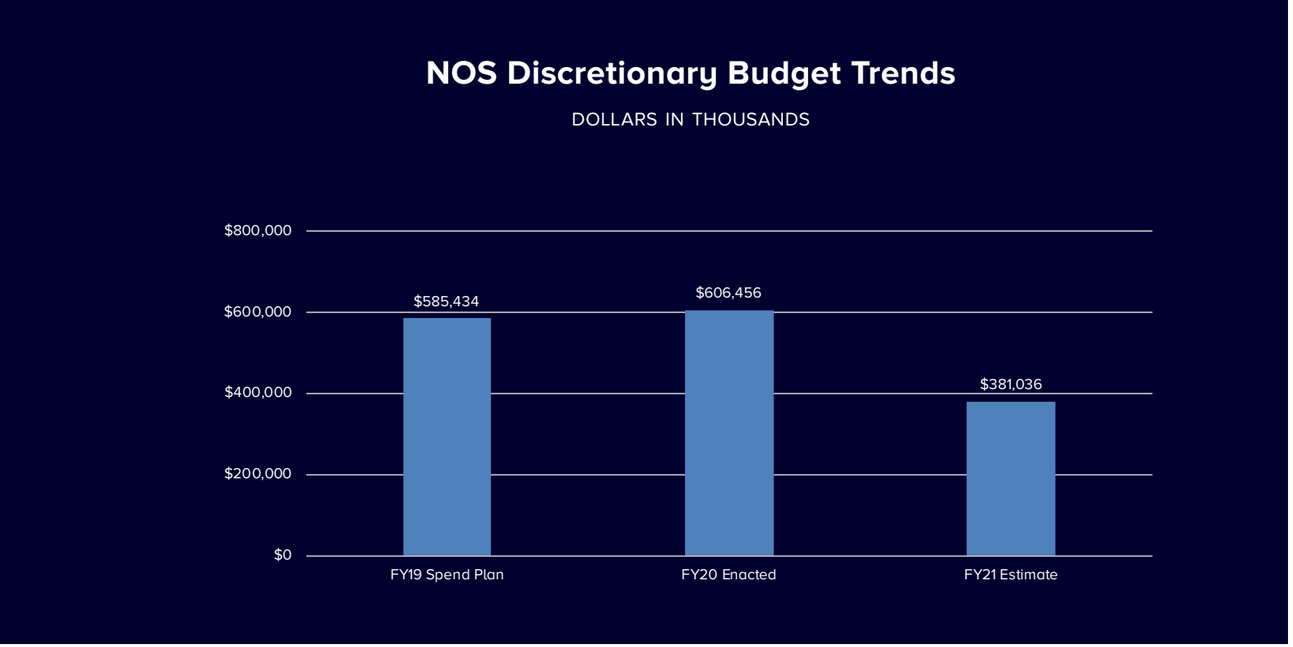
National Ocean Service

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 2019

In FY 2019, NOS provided data, tools, and services that support coastal economies and their contribution to the national economy. NOS worked to close gaps in observations and maintain data, tools and services like navigation charts and the national coordinate system that promote safe and efficient transportation and commerce. Scientists in NOS helped communities better prepare for and respond to a variety of threats, including this year's active hurricane season and harmful algal blooms in the Gulf of Mexico. NOS also provided additional resource protection, characterization, assessment, monitoring, and education activities to better promote and protect special coastal and marine places. NOS highlights include:

On November 9, 2019, NOAA officially designated the Mallows Bay-Potomac River a National Marine Sanctuary. It is the first National Marine Sanctuary designated in the United States in 20 years and



is the 14th in the sanctuary system. The local economy is already benefiting from the designation through an increase in tourism and fishing.

The Center for Operational Oceanographic Products and Services released the Coastal Inundation Dashboard, a new web tool that brings real-time, forecast, and historical water level information together in one place. Using this tool, emergency managers and coastal decision makers can better understand and prepare for the impacts of coastal flooding.

NOAA's Office of the Coast Survey released 13 new large-scale electronic navigational charts of Etolin Strait, Alaska in the improved NOAA Electronic Navigational Chart (ENC®) Layout. These charts provide a nearly twenty-fold increase in scale over the previous ENC coverage. Office of the Coast Survey and Center for Operational Oceanographic Products and Services also collaborated to develop a new oceanographic model of Cook Inlet, Alaska, which will help mariners to navigate their local waters more safely and efficiently. Results will provide operational nowcast and forecast guidance out to 48 hours for Cook Inlet on parameters including water levels, water temperature, salinity, and currents.

In August, 2019, NOS and their Gulf of Mexico Coastal Ocean Observing System (GCOOS) cut the ribbon on two new high-frequency radar

High tide flooding in St. Petersburg, Florida.

installations at the mouth of the Mississippi River. This technology will be operated by a public-private partnership between the geo-intelligence company Fugro and the University of Southern Mississippi. Data from these radars are available through multiple platforms, including U.S. IOOS high-frequency radar map and the GCOOS Data Portal.

FY 2020

In FY 2020, NOS is sustaining core programs and reinforcing support for programs that enhance the resiliency of coastal assets, and to understand and mitigate the changing ecological threats to our oceans and the Great Lakes. NOS highlights include:

NOAA is developing a Precision Navigation Dissemination Site Prototype, a single source location for users to access NOAA's hydrographic, oceanographic and weather datasets. The prototype will be in a commercial cloud environment. It will leverage NOS' 3-D operational oceanographic modeling systems to provide high-resolution bathymetry, surface currents, water level data, and forecast guidance for U.S. coastal waters, seaports, and Great Lakes.

In FY 2020, models and data integration will improve forecasts for hypoxia in the Gulf of Mexico, HABs in the Chesapeake Bay, Florida, and Alaska, and pathogens in the Delaware and Chesapeake Bays. These forecasts will inform actions by resource managers and threatened communities to mitigate the significant threats to human health and economic productivity that these ecological phenomena pose.

NOAA will publish a final rule to streamline and update existing regulations at National Marine Sanctuaries. This final rule would eliminate outmoded and duplicative regulations, while also revising the regulations to be more consistent and efficient across the National Marine Sanctuary System by adopting standard boundary descriptions, consolidating permitting procedures, and revising inconsistent definitions. This effort is part of NOAA's important initiative to carry out the President's directive under Executive Order 13563, "Improving Regulation and Regulatory Review."

FY 2021 REQUEST $404,093,000

NOAA requests a total of $404,093,000 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 includes a net decrease of $235,895,000 in FY 2021 program changes.

The FY 2021 request prioritizes NOS's core functions: mapping and charting; oceanographic observations and earth positioning data; ecological science and monitoring; response and restoration; and protection of key marine

The Integrated Ocean Observing System's Animal Telemetry Network Data Assembly Center is an access point to search, discover, and access animal telemetry data and associated oceanographic datasets from a wide variety of species and platforms.

resources. While this request reduces extramural grants, NOS will continue to provide partners with national-level coordination and technical assistance.

Program change increases are highlighted below. A summary of program change decreases by Line Office is located in Chapter 12 and summary of funding by Program, Project, and Activity is located in Appendix 3. Detailed descriptions of program changes are located in the NOAA FY 2021 Congressional Justification.

FY 2021 ORF BUDGET SUMMARY

NOAA requests a total of $381,036,000 to support the ORF activities of the NOS, reflecting a net decrease of $231,395,000 in FY 2021 program changes.

NAVIGATION, OBSERVATIONS AND POSITIONING $207,676,000

NOAA requests a net decrease of $26,607,000 in program changes for a total of $207,676,000 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 change increases include:

Navigation, Observations and Positioning: Ocean Mapping and Charting in Alaska and the Arctic: While the program has a net decrease, NOAA

Marine debris on Channel Islands, off the coast of California.

requests $8,514,000 specifically to coordinate and help implement an interagency national mapping, exploration, and characterization strategy to map the U.S. EEZ. NOAA is to work with its Federal and non-Federal partners to identify priority mapping areas in the U.S. EEZ, Arctic and sub-Arctic shoreline and nearshore of Alaska, and assist in the mapping efforts, pursuant to Sections 2 and 3 of the 2019 Presidential Memorandum on Ocean Mapping of the United States EEZ.

COASTAL SCIENCE AND ASSESSMENT $46,062,000

NOAA requests a net decrease of $58,350,000 in program changes for a total of $46,062,000 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.

OCEAN AND COASTAL MANAGEMENT AND SERVICES $127,298,000

NOAA requests a net decrease of $144,898,000 in program changes for a total of $127,298,000 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 marine sanctuaries. Program change increases include:

Ocean and Coastal Management and Services: Increase funding for Regional Ocean Data Platforms: NOAA requests an increase of $2,500,000 to provide grants that increase regional capacity to administer ocean data portals. This will help implement Executive Order 13840, Ocean Policy to Advance the Economic, Security, and Environmental Interest of the United States (June 2018) by improving access to credible marine data and information. Ocean data platforms will provide ocean-related Federal data and information to the public to inform regional, coastal, and ocean management decision-making across the United States.

FY 2021 PAC BUDGET SUMMARY

NOAA requests a total of $0 to support the PAC activities of the NOS, reflecting a decrease of $4,500,000 in FY 2021 program changes.

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 Act. 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.

Mallows Bay-Potomac River National Marine Sanctuary.

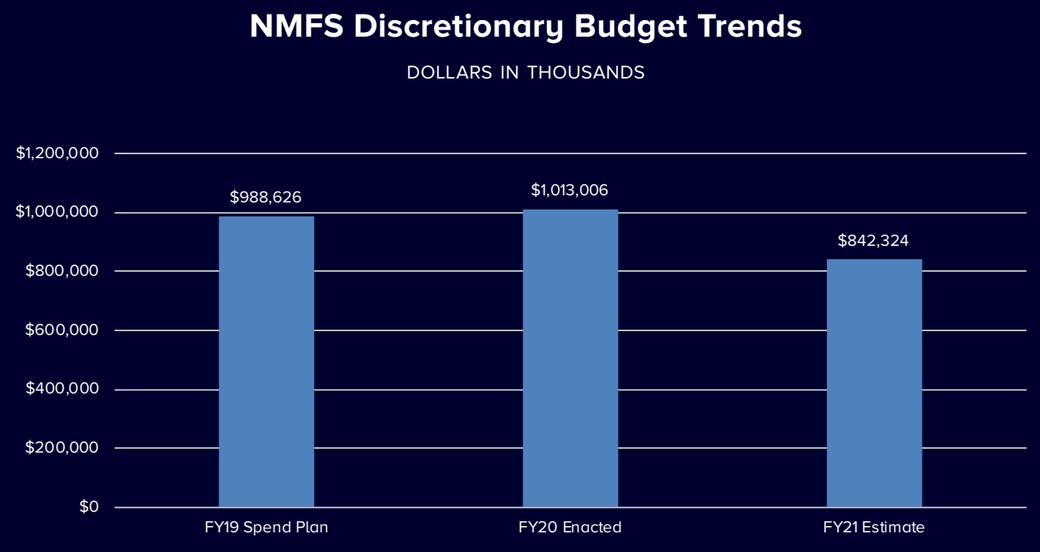
Fresh seaweed headed to processing in New Haven, CT.

CHAPTER 6

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 479 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 partners support our oceans' resources promoting trade, jobs, and industry growth in commercial and recreational fisheries, aquaculture, tourism, and resource use while supporting various marine species facing 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.[1]

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



FY 2019

In addition to the accomplishments found in Chapter 3 regarding innovative regional red snapper management, the first aquaculture project in Federal waters, and eDNA and other 'omics, the achievements below further highlight NMFS efforts in 2019.

As a result of the combined efforts of NOAA, the regional fishery management councils, and other partners, U.S. fish stocks continue their positive trend of rebuilding and reducing overfishing. Yet another fish stock was declared rebuilt, making a total of 45 fish stocks rebuilt since 2000. By ending overfishing and rebuilding stocks, we are strengthening sustainability and the value of U.S. fisheries.

NOAA continues to work on the government-wide effort to reduce unnecessary and ineffective regulatory burdens. For example, this year NMFS implemented 19 deregulatory actions, an increase of 9 actions over the previous fiscal year. NOAA is also continuing efforts to increase efficiency in the Federal permitting process to enhance job creation and increase aquaculture production while ensuring the health of the coastal ecosystem. And in 2019, NMFS, the Bureau of Ocean Energy Management, and the Responsible Offshore Development Alliance signed a 10-year Memorandum of Understanding that brings local and regional fishing interests together with Federal regulators to collaborate on the science and process of offshore wind energy development on the Atlantic Outer Continental Shelf. This collaboration will help achieve NMFS' goal of maximizing fishing opportunities while supporting responsible resource development of offshore wind.

Following a multiagency effort to restore habitat within the San Joaquin River watershed, NOAA's reintroduction of endangered spring Chinook salmon into the San Joaquin River in California resulted in the successful return of fish to spawn for the first time in 65 years. In addition, several West Coast habitat restoration projects supported the recovery of endangered Chinook salmon, steelhead trout, and coho salmon in California and Oregon.

NOAA made significant progress in combating illegal, unreported, and unregulated (IUU) fishing, and seafood fraud, with the implementation of the Seafood Import Monitoring Program (SIMP). In 2019, the inclusion of shrimp, the largest U.S. seafood import, and abalone in SIMP nearly doubled the volume and value of imported fish and fish products subject to program requirements, further leveling the playing field for U.S. fishermen.

FY 2020

In FY 2020, NMFS will continue our priority efforts to rebuild overfished stocks and prevent overfishing; assess, understand, and protect the health of protected species; promote sustainable aquaculture production; and combat IUU fishing and seafood fraud. We will take advantage of new technologies, increase efficiencies, and streamline business practices. Examples of priority actions include:

Ensure successful implementation of the 2019 decision to delegate management of the private angler red snapper fishery to the five Gulf States. Responding to years of management challenges, this new innovative approach, which takes effect in 2020, will increase fishing opportunities and boost economic benefits for the Gulf's most iconic fishery.

Continue the progress made in FY 2019 to streamline and improve consultation efficiency. NMFS will continue to expedite review of hatchery and genetic management plans on the West Coast.

Work to ensure U.S. fisherman are not disadvantaged by IUU, unfair trade practices, or deceptive labeling of seafood products. The agency will continue to invest in the SIMP and enforcement of NOAA's natural resource protection laws.

Work as quickly as possible to plan for and distribute funding appropriated by Congress in 2019 to communities affected by fisheries disasters. The Administration is also working on providing greater clarity and improved consistency with respect to fisheries disaster declaration and funding processes. The changes under consideration will accelerate the Department's responsiveness to fishery disaster requests, help get appropriated funds distributed to affected communities in a timelier manner, and contribute to the long term environmental and economic sustainability of the fishery.

Pacific cod is the second most valuable Alaskan groundfish fishery and a key species in Alaskan ecosystems. Cutting edge technology and fishermen's expertise are helping scientists track Aleutian Islands Pacific cod for the first time

Promote domestic seafood production, create jobs and reduce regulatory burdens, and drive aquaculture research to ensure the continued growth of this industry. The agency will facilitate regulatory efficiency and cross-agency reviews for Federal permitting, and provide science, including coastal planning and siting, disease prevention, and genetics research.

FY 2021 REQUEST $869,750,000

NOAA requests a total of $869,750,000 in discretionary and mandatory funds for NMFS mission functions. This total includes Operations, Research, and Facilities (ORF) and other accounts, and includes a net decrease of $196,342,000 in FY 2021 program changes. The FY 2021 request prioritizes NMFS core functions, such as the government's legal obligations to manage and conserve marine resources, and NMFS will continue to expand upon the important accomplishments and priorities above with available resources.

Program change increases are highlighted below. A summary of program change decreases by Line Office is located in Chapter 12 and summary of funding by Subactivity is located in Appendix 3. Detailed descriptions of program changes are located in the NOAA FY 2021 Congressional Justification.

FY 2021 ORF BUDGET SUMMARY

NOAA requests a total of $841,675,000 to support the ORF activities of NMFS, reflecting a net decrease of $131,642,000 in FY 2021 program changes.

PROTECTED RESOURCES SCIENCE AND MANAGEMENT $192,207,000

NOAA requests a decrease of $15,461,000 in program changes for a total of $192,207,000 in the Protected Resources Science and Management activity. Funding will support actions such as stabilizing the highest priority protected species; minimizing bycatch and entanglement while supporting fisheries; supporting the balance of water management for protected species with other uses; and continuing to increase efficiency in permitting with partner agencies, to support infrastructure, jobs, and the economy while minimizing impacts to protected species.

FISHERIES SCIENCE AND MANAGEMENT $554,490,000

NOAA requests a decrease of $76,260,000 in program changes for a total of $554,490,000 in the Fisheries Science and Management activity. Funding will support actions such as managing stocks for optimum yield while preventing overfishing; assessing prioritized stocks and maintaining information for currently assessed stocks; modernizing fishery information collection, management, and dissemination; enhancing cooperative data collection and sharing; and combating IUU fishing and seafood fraud, and advancing fair trade.

ENFORCEMENT $55,930,000

NOAA requests a net decrease of $20,362,000 in program changes for a total of $55,930,000 in the Enforcement activity. Funding will support traditional enforcement including investigations and patrols focusing on strategic Ports of Entry; technological tools such as Vessel Monitoring Systems; outreach and education designed to increase voluntary compliance with environmental laws and regulations; and international IUU enforcement training and technical assistance.

HABITAT CONSERVATION AND RESTORATION $39,048,000

NOAA requests a decrease of $19,559,000 in program changes for a total of $39,048,000 in the Habitat Conservation and Restoration activity. Funding will support activities such as protecting essential fish habitat under the Magnuson-Stevens Act as well as important habitats under the Fish and Wildlife Coordination Act; providing fish passage at hydroelectric dams; protecting deep-sea coral; and maintaining quick response and restoration of habitats impacted by oil spills or other events. NOAA will continue to provide habitat restoration technical expertise (e.g., engineering and design, implementation, monitoring) and leadership to states, tribes, local communities, and other Federal programs as resources allow.

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 proposes a decrease of $65,000,000 to eliminate funding for this grant program in FY 2021. The agency will continue its Federal commitment to advancing Pacific salmon and steelhead recovery and tribal treaty fishing rights through other NOAA programs as resources allow.

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 determines that a fishery disaster has occurred, Congress may appropriate funds for disaster assistance, which are administered by the Secretary. The FY 2021 Budget includes an investment of $300,000 to bolster NOAA staffing necessary to execute the Fisheries Disaster Assistance Program. NOAA will use these funds to process fisheries disaster requests and grants in a timely manner and provide additional needed program oversight and review.

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.

NOAA Office of Law Enforcement and Department of Homeland Security Customs and Border Protection officers work together to inspect seafood products for possible violations related to illegal, unreported, and unregulated (IUU) fishing and seafood fraud.

FOREIGN FISHING OBSERVER FUND

The Foreign Fishing Observer Fund is financed through fees collected from owners and operators 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, 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 $183,834,000 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. With this transfer, no funds will be available for the Saltonstall-Kennedy program in FY 2021. The Promote and Develop account funds are derived from a transfer of thirty percent of duties on imported fisheries products from the Department of Agriculture (USDA). The Budget also includes a proposal to directly appropriate mandatory funding to DOC, rather than transferring amounts based on customs receipts from USDA. The Administration will formalize these changes through a legislative proposal to be transmitted at a later date. This request is part of a broader reform proposed for USDA's Section 32 program.

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 MSA Section 304(d)(2)(A), NMFS must collect a fee to recover incremental

The United States is recognized as a global leader in sustainable seafood—both wild-caught and farmed. U.S. fishermen and fish farmers operate under some of the most robust and transparent environmental standards in the world.

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

Section 204(e) of the 2006 amendments to the MSA 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

Section 311(e)(1) of the MSA 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, and (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.

Pacific oysters growing in flip bags in Samish Bay, WA, one of the local shellfish growers partnering with the Northwest Fisheries Science Center on the project.

CHAPTER 7

Office of Oceanic and Atmospheric Research

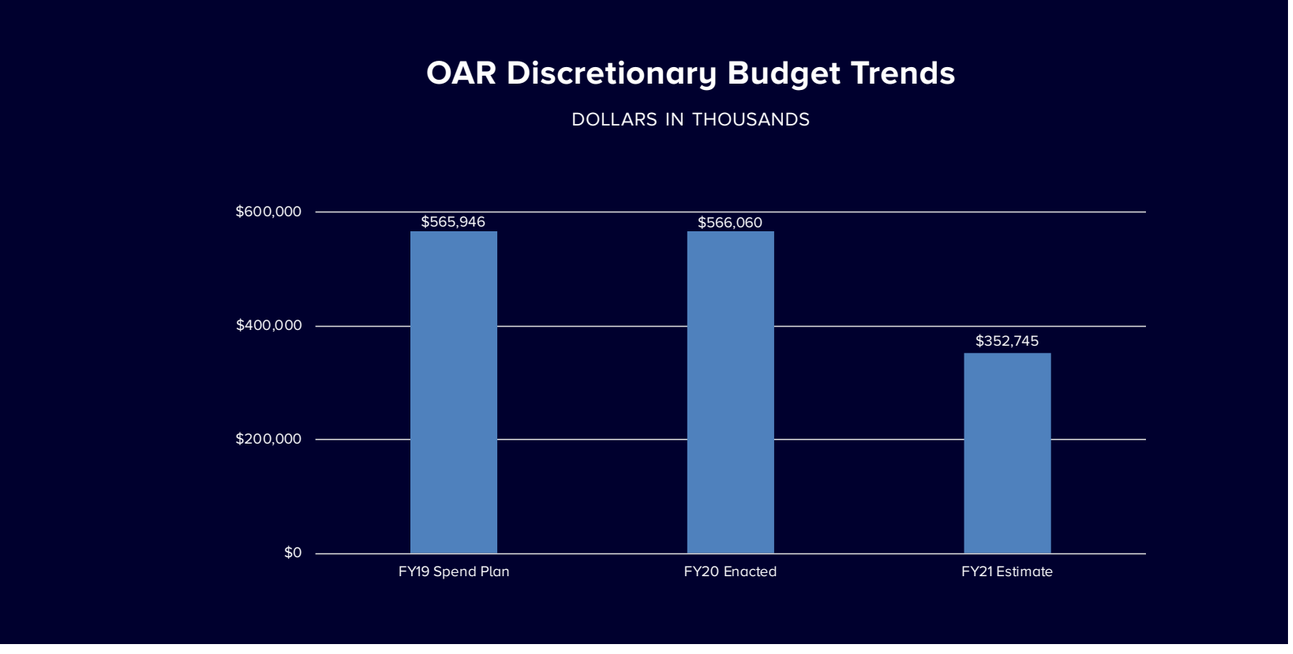
NOAA's Office of Oceanic and Atmospheric Research (OAR) conducts and integrates research across NOAA. OAR's interdisciplinary research promotes better understanding of the Earth, and its scientific results improve NOAA science and services and strengthen decision-making across the country. OAR research 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.

The achievements below highlight NOAA Research in FY 2019 and FY 2020:

FY 2019

The Office of Ocean Exploration and Research (OER) worked with Federal and non-Federal partners to conduct exploratory voyages around the globe to collect deep-ocean data that will enhance NOAA's management of areas within the U.S. Exclusive Economic Zone. In the North Atlantic Ocean, OER's expedition "Windows to the Deep 2019" explored poorly understood deepwater areas of the southeastern United States, resulting in the discovery of expansive and previously unknown coral habitats and methane seeps. In the Pacific, expeditions supported by OER studied seamount communities and discovered a new hydrothermal field. Arctic expeditions resulted in the first ever observations of hydrothermal vents in the Arctic. These and many other advances in deep ocean exploration are detailed in Chapter 3: Expand the American Blue Economy.

Here, Levi Unema, electrical engineer, examines electronics that support Remotely Operated Vehicle (ROV) operations. One missed connection could mean a valuable piece of data lost miles below the surface.



NOAA began work to establish the Earth Prediction Innovation Center (EPIC). Authorized in the *National Integrated Drought Information System Reauthorization Act of 2018*, EPIC is a virtual center that will serve as the core research-to-operations-to-research hub for building and maintaining a community weather modeling framework. In August 2019, NOAA held an EPIC Community Workshop to engage members of the weather enterprise in creating a vision for the future of Earth Systems modeling and high performance computing. Moving forward, EPIC's innovative structure will link world class scientists and software engineers in academia, the private sector and partner agencies with the research, development, and operational activities inside the agency.

The experimental High Resolution Rapid Refresh-Smoke became the first numerical weather prediction model in the U.S. to predict how the weather can impact smoke movement and how the smoke could reduce visibility for ground transportation and aviation. Developed by the Earth System Research Laboratory, Global Systems Division and partners, the High Resolution Rapid Refresh-Smoke uses data from NOAA and NASA satellites to detect the location and intensity of fires.

Two new high-performance computers (HPC) were brought online in 2019: Hera joined NOAA's suite of research and development (R&D) HPC as the agency's newest system, and Mississippi State University began working with NOAA on a newly installed HPC called Orion to support NOAA research and development in environmental, weather and climate modeling, and autonomous vehicle design and operation.

FY 2020

In FY 2020, OAR is expanding resources for climate and ocean research and high performance computing, and investing in new weather and air chemistry research. Examples of actions include:

Conduct world-class climate science that improves our understanding and prediction of droughts, hurricanes, and the next growing season while developing tools to manage resources and improve community resilience and preparedness throughout the Nation. This includes continuing to lead the National Climate Assessment and expanding geographic coverage of the Regional Integrated Sciences and Assessments Program.

Continue to establish EPIC to create a true community global weather research modeling system that is accessible by the public and utilizes innovative strategies to host and manage the modeling system. Efforts in FY 2020 are focused on making the Unified Forecast System (UFS) computer code accessible, portable, and supported on cloud computing platforms. Ultimately, EPIC will leverage expertise on a national scale to enhance weather forecasting.

Advance capabilities in cloud computing for research, expanding NOAA's HPC suite to provide a larger spectrum of capabilities and platforms that support community-based research and development.

Improve tornado forecasts, predictions, and warnings by continuing collaborative tornado research through the VORTEX-Southeast program. Building on this priority work, in FY 2021 NOAA requests an increase to establish the congressionally-mandated Tornado Warning Improvement and Extension Program (TWIEP) to advance NOAA's tornado observing systems, thunderstorm-scale computer models, and risk communication approaches.

Expand efforts to explore the world's oceans, building on recent advances to support the 2019 White House Ocean Science & Technology Partnerships Summit and implement the December 2019 Presidential Memorandum focused on mapping, exploring, and characterizing the U.S. Exclusive Economic Zone.

FY 2021 REQUEST $352,745,000

In FY 2021, NOAA requests a total of $352,745,000 to support OAR's continued and sustained operations. This total includes Operations, Research, and Facilities (ORF) and Procurement, Acquisition, and Construction (PAC) accounts and includes a net decrease of $245,992,000 in FY 2021 program changes.

Flames erupt during a 2016 stand replacement prescribed fire, part of the south Monroe project on the Richfield Ranger District of the Fishlake National Forest, Utah. Credit: Kreig Rasmussen

The FY 2021 request will allow OAR to provide robust science that is instrumental to saving lives and property, managing natural resources, and maintaining a strong economy. With this funding, OAR research will continue to advance NOAA science and services by providing better forecasts and improving understanding of the Earth and its processes.

Program increases are highlighted below. A summary of program decreases by Line Office is located in Chapter 12 and summary of funding by Subactivity is located in Appendix 3. Detailed descriptions of the program changes below are located in the NOAA FY 2021 Congressional Justification.

FY 2021 ORF BUDGET SUMMARY

NOAA requests a total of $326,745,000 to support the ORF activities of OAR, reflecting a net decrease of $229,992,000 in FY 2021 program changes.

CLIMATE RESEARCH $83,903,000

NOAA requests a decrease of $83,196,000 in program changes for a total of $83,903,000 in the Climate Research activity. This total provides 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.

WEATHER & AIR CHEMISTRY RESEARCH $114,792,000

NOAA requests a net decrease of $27,108,000 in program changes for a total of $114,792,000 in the Weather and Air Chemistry Research activity. This total supports NOAA's efforts to advance community-developed enhancements to the last weather models and to provide the resources needed to advance and accelerate transition of the most promising research activities into National Weather Service. Program changes include:

Earth Prediction Innovation Center (EPIC): NOAA requests an increase of $7,000,000 in the U.S. Weather Research Program line to expand the community support it provides for UFS applications, accelerating research-to-operations-to-research, and leveraging innovation from the Weather Enterprise using a cloud-based development environment. FY 2020 appropriations allowed EPIC to contract support to make the UFS computer code accessible, portable, and supported on various cloud computing platforms. It also supported the Joint Center for Satellite Data Assimilation in improving data assimilation techniques. With the requested funding for FY 2021, NOAA will expand the suite of Unified Forecast System (UFS) applications supported in a cloud development environment and user support for those applications, enabling more effective and efficient collaboration and integration of community-based innovations into the UFS.

Tornado Warning Improvement and Extension Program (TWIEP): NOAA requests an increase of $3,200,000 in the U.S. Weather Research Program line to establish a congressionally-mandated program called TWIEP to improve the accuracy and timeliness of tornado forecasts, predictions, and warnings. This increase will advance NOAA's tornado observing systems, thunderstorm-scale computer models, and risk communication approaches. Specifically, the TWIEP will: Improve assimilation of data from observing systems, including conventional and advanced radar technology; Provide high resolution, convection-allowing (thunderstorm-scale) computer prediction models, including the High Resolution Rapid Refresh and Warn-on-Forecast systems; and modernize NOAA's approach to risk communication, informed by social sciences, and delivered to decision makers, the public, and weather enterprise stakeholders before, during, and after tornado events.

Ouray High School senior Lincoln Sackman navigates the inner rings of Saturn with virtual reality goggles linked to NOAA's ScienceOnSphere Explorer™ on a visit to NOAA's labs in Boulder, CO.

The NOAA Hera supercomputer located in Fairmont, WV. Hera has 52,640 Skylake processors with multiple grey cabinets (20 are shown in the image) and is labeled with CRAY CS500. The racks of hardware components are stacked vertically to save space, allow for ease of connecting the many nodes and cores of the supercomputer, and improve efficiency in cooling.

OCEAN, COASTAL & GREAT LAKES RESEARCH $112,754,000

NOAA requests a net decrease of $118,079,000 in program changes for a total of $112,754,000 in the Ocean, Coastal, and Great Lakes Research activity. This total includes research activities to better understand our oceans and Great Lakes 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 Oceanographic Partnership Program: NOAA requests an increase of $534,000 to expand NOAA's support for the interagency National Oceanographic Partnership Program, boosting the stable dedicated funding source that is used to leverage other NOAA programs for this extramural, competitively-awarded partnership-based research program.

INNOVATIVE RESEARCH & TECHNOLOGY $15,296,000

NOAA requests a net decrease of $1,566,000 in program changes for total of $15,296,000 in the Innovative Research & Technology activity. This total provides continued support to accelerate the adoption and transition of advanced cloud and traditional high performance computing and technology throughout NOAA.

FY 2020 PAC BUDGET SUMMARY

NOAA requests a total of $26,000,000 to support the PAC activities for OAR, reflecting a decrease of $16,000,000 in FY 2021 program changes.

SYSTEMS ACQUISITION $26,000,000

NOAA requests a decrease of $16,000,000 in program changes for a total of $26,000,000 in the Systems Acquisition activity. The proposed decrease will terminate the computing partnership with Mississippi State University and decrease research supercomputing. This total provides the computational resources to support advances in environmental modeling crucial for understanding critical Earth system modeling issues.

CHAPTER 8

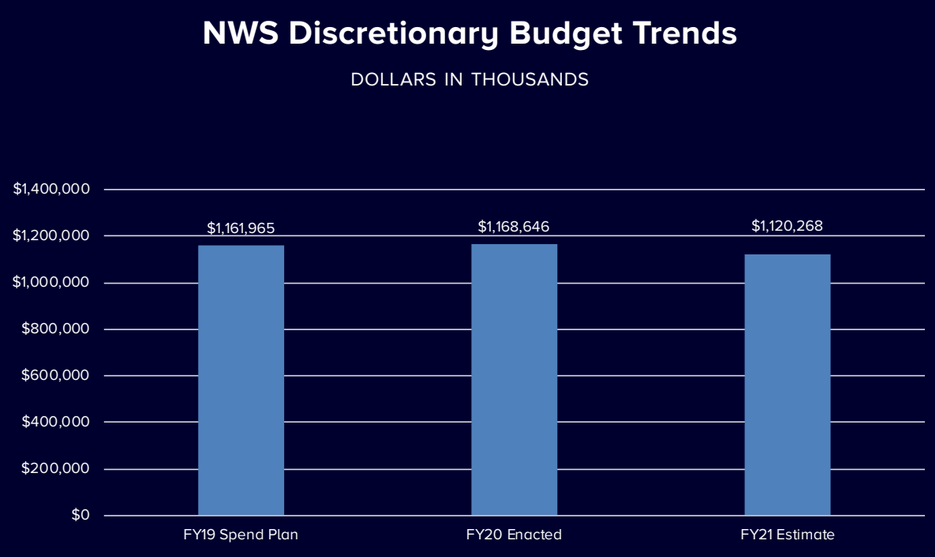
National Weather Service

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 2019

NWS continued its investments to make the United States a Weather-Ready Nation (WRN) to help the public prepare for and respond to extreme weather events. Advancements in quality, consistency, and effectiveness across all portfolios are driven by the goal of building a WRN. NWS continued providing exemplary forecasts for hurricanes, floods, storms, and droughts. Through the 2019 historic hurricane season, NWS provided accurate track, storm surge, and rainfall forecasts, coupled with proactive decision support services, allowing emergency managers, with use of NWS IDSS, and the public to take life-saving measures. Additional 2019 highlights include:

Rainbow Over the Valles Grande. The closest city to this location is Los Alamos, NM.



In June 2019, the Global Forecast System underwent a significant game-changing upgrade with a new "engine" or dynamical core called the Finite Volume Cubed-Sphere. This new dynamical core, developed by OAR's Geophysical Fluid Dynamics Laboratory, and accompanying enhancements, will drive numerical weather prediction into the future, improving forecasts of the jet stream and associated weather, tropical cyclone intensity and 5-day forecasts, as well as precipitation forecasts across the United States. The Global Forecast System with the Finite Volume Cubed-Sphere upgrade brings together the superior dynamics of global climate modeling with day-to-day reliability and speed of operational numerical weather prediction.

NWS installed radiosonde, or weather balloon, autolaunchers at six sites in the Alaska Region: Bethel, Anchorage, King Salmon, McGrath, Nome, and Kotzebue, with two of them installed ahead of schedule by a year. Funded by the Spectrum Relocation Fund, autolaunchers allow automated technology to collect upper air observations for the Nation's radiosonde network, a top five observing system contributing to the accuracy of global weather and regional hurricane models. Autolaunchers are a proven technology used at over 70 locations around the world, and installations in Alaska have increased reliability and lowered costs of radiosonde observations in a region with high labor and infrastructure costs, as well as staffing challenges due to the remote, harsh environment.

In May 2019, for the first time in known history, parts of southeast Alaska were classified under extreme drought by the U.S. Drought Monitor following over a year of below-normal rainfall. In an area that normally experiences between 100 to 150 inches of rainfall, only two-thirds of that amount was recorded, leading to low water reservoirs and impacts to water management for drinking and hydropower. In response to the extreme drought and its known impacts, NWS Juneau jumped into action by providing weekly IDSS in the form of interpretive drought briefings to support the Metlakatla Indian Community in their efforts to manage their scarce water resources.

Staff with the NWS office in Flagstaff, AZ meet with the Navajo Nation Emergency Management to learn about communication gaps and other partner needs. The NWS also works with tribal partners through the Weather-Ready Nation Ambassador initiative.

FY 2020

NWS will continue to implement and execute the Automated Surface Observing System and Next Generation Weather Radar Service Life Extension Programs contracts. The NWS will also continue to improve the National Water Model, which provided particularly accurate flood forecast information for the catastrophic flood levels experienced in North Carolina during Hurricane Florence. NWS forecasts of record precipitation fed extremely accurate river flood level forecasts and duration, which helped emergency managers and responders plan for and respond to the flooding. NWS will continue efforts with the Advanced Weather Interactive Processing Systems to simplify and enhance the software and begin to reduce the systems hardware footprint. Additional 2020 highlights include:

As NOAA realigns the U.S. National Ice Center from NESDIS, NWS will have improved predictions of sea ice and seasonal outlooks in the polar oceans, while more efficiently integrating sea ice information into operational and developmental models.

NWS will continue efforts to expand the Advanced Hydrologic Prediction Services to provide more information on floods and droughts.

NWS will maintain the Tsunami Warning Program as directed, including for the National Tsunami Hazard Mitigation grants; continue improvements on NOAA's Sea, Lake, and Overland Surge from Hurricanes model; and integrate improved technologies into standard modeling operations for storm surge and inland flooding.

NOAA's Integrated Dissemination Program (IDP) will operate and maintain the OneNWS Network, assets deployed under the Ground Readiness Project, and applications migrated to the IDP including the NWS Telecommunications Gateway. NWS will continue to fund upgrades to IDP systems and limited "on-boarding" of legacy dissemination applications onto IDP. NWS will transition water resources prediction capabilities developed by OWP into operations. IDP sustains continuous mission operations in support of the Department of Commerce 2018-2022 Strategic Plan, Strategic Objective 3.3 Reduce Extreme Weather Impacts.

As part of the WSR-88D Service Life Extension Program, the NWS office in Des Moines, IA undergoes a radar pedestal refurbishment.

NOAA awarded a contract for the Weather and Climate Operational Supercomputing System, which provides a significant upgrade to computing capacity, storage space, and interconnect speed. This increase to high-performance computing will triple the capacity and double the storage and interconnect speed when it becomes fully operational in early 2022. Coupled with NOAA's research and development supercomputers, the combined supercomputing capacity will be 40 petaflops.

FY 2021 REQUEST $1,120,268,000

In FY 2021, NOAA requests a total of $1,120,268,000 to focus on NWS's core mission, which is to provide weather, water, and climate forecasts and warnings that protect lives and property. NWS will continue to pursue its WRN goals, including activities to improve forecast accuracy and consistency and enhance forecast collaboration with core partners through IDSS. This total includes Operations, Research, and Facilities (ORF) and Procurement, Acquisition, and Construction (PAC) accounts and includes a net decrease of $74,929,000 in program changes.

Program change increases are highlighted below. A summary of program change decreases by Line Office is located in Chapter 12 and

Senior forecaster, Brian Meade, taking pictures of debris built up along the lakeshore in Grand Haven during a fall storm. He was part of a team that surveyed portions of the Lake Michigan shoreline to gauge the impacts of lakeshore flooding and beach erosion.

summary of funding by Subactivity is located in Appendix 3. Detailed descriptions of the program changes below are located in the NOAA FY 2021 Congressional Justification.

FY 2021 ORF BUDGET SUMMARY

NOAA requests a total of $1,036,876,000 to support the ORF activities of the NWS, reflecting a net decrease of $65,376,000 in program changes.

OBSERVATIONS $230,289,000

NOAA requests a net decrease of $7,355,000 in program changes for a total of $230,289,000 in the Observations activity. Program change increases include:

Data Sharing for World Meteorological Organization Integrated Global Observing System, including Global Basic Observing Network: NOAA requests an increase of $4,000,000 to improve the frequency and reliability of observational data use to generate weather and water forecasts, watches, and warnings; improve interoperability with international partners; and enable the results of successful research and development to be fully transitioned and implemented into NWS operations. The requested funds will go towards providing hardware and software support for systems that collect observational data.

CENTRAL PROCESSING $88,372,000

NOAA requests a net decrease of $14,166,000 in program changes for a total of $88,372,000 in the Central Processing activity.

ANALYZE, FORECAST, AND SUPPORT $500,780,000

NOAA requests a net decrease of $30,755,000 in program changes for a total of $500,780,000 in the Analyze, Forecast, and Support activity.

DISSEMINATION $78,362,000

NOAA requests a net decrease of $750,000 in program changes for a total of $78,362,000 in the Dissemination activity. Program change increases include:

Enhancing the World Meteorological Organization Information System: NOAA requests an increase of $1,000,000 for the World Meteorological Organization (WMO) Information System. This increase will bring the U.S. Global Information System Center up to the WMO's new standards for information sharing. This request will provide for the acquisition of new hardware and software to support the WMO systems, located in College Park, MD, and Boulder, CO. In addition, this request will support NWS' ability to create and maintain the metadata associated with the U.S. Global Information System Center, as well as to provide the additional contractor support to standardize the data.

SCIENCE AND TECHNOLOGY INTEGRATION $139,073,000

NOAA requests a net decrease of $12,350,000 in program changes for a total of $139,073,000 in the Science and Technology Integration activity. Program change increases include:

Establish National Weather Service Pilots: NOAA requests an increase of $2,000,000 to accelerate Evolve Initiative efforts, focusing on NWS model technology that is foundational to the Collaborative Forecast Process, specifically, the National Blend of Models. NWS will continue to focus on improving efficiency and effectiveness of forecasting and IDSS.

FY 2021 PAC BUDGET SUMMARY

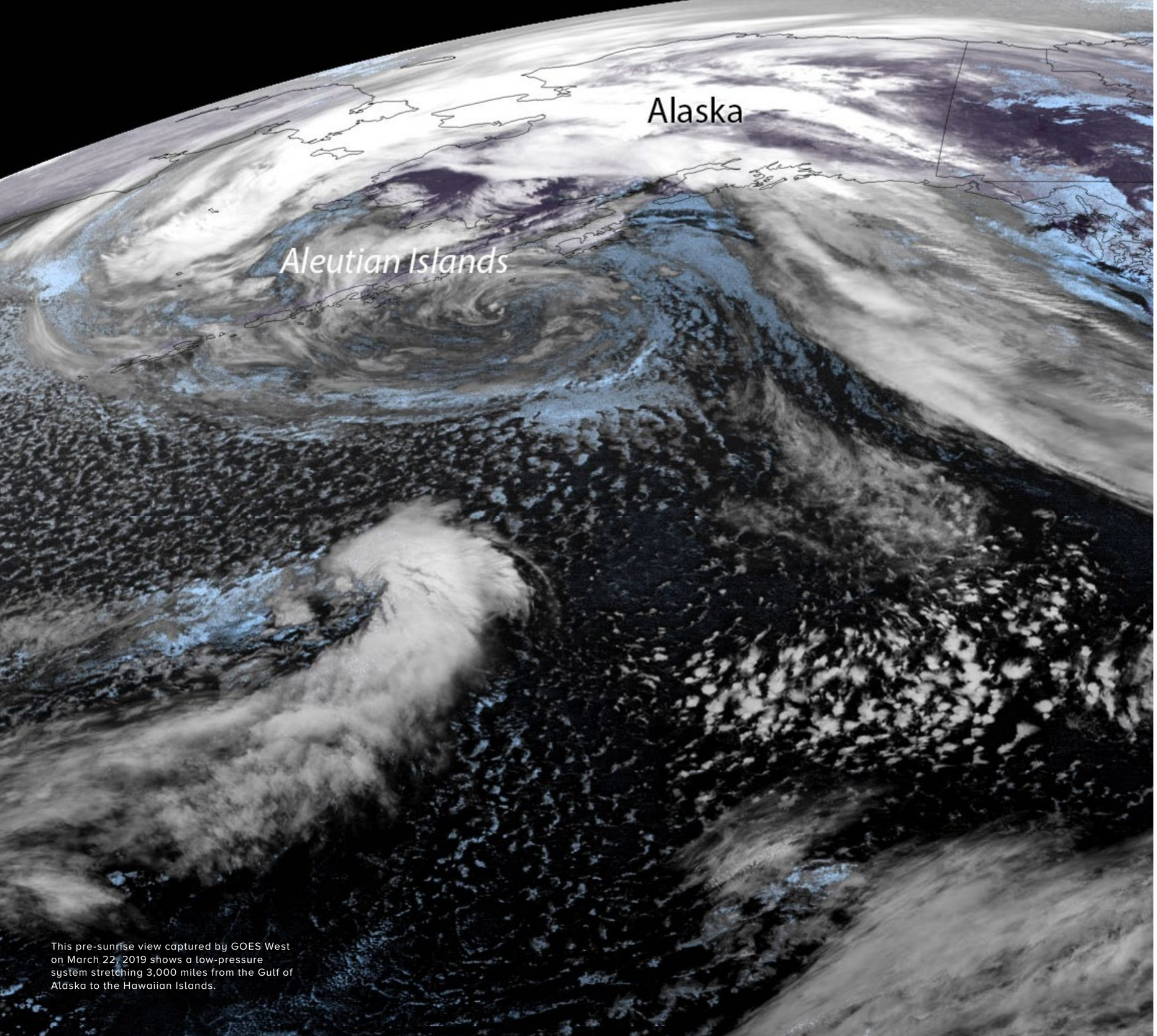
NOAA requests a total of $83,392,000 to support the PAC activities of the NWS, reflecting a net decrease of $9,553,000 in program changes.

SYSTEMS ACQUISITION $83,392,000

NOAA requests a decrease of $9,553,000 in program changes for a total of $83,392,000 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.

Emergency Response Specialist, Leigh Anne Eaton, provides a weather briefing during the small boats safety meeting for the NOAA's Pacific Islands Fisheries Science Center bottomfish survey aboard NOAA Ship *Oscar Elton Sette.*

Warning Coordination Meteorologist in Fairbanks, AK, Ed Plumb, packrafting to a new cooperative observers' remote cabin with rain gage and spotter presentation in tow. These new observers were added to the office's observer network, since there are no weather observations or radar coverage in the area.



This pre-sunrise view captured by GOES West on March 22, 2019 shows a low-pressure system stretching 3,000 miles from the Gulf of Alaska to the Hawaiian Islands.

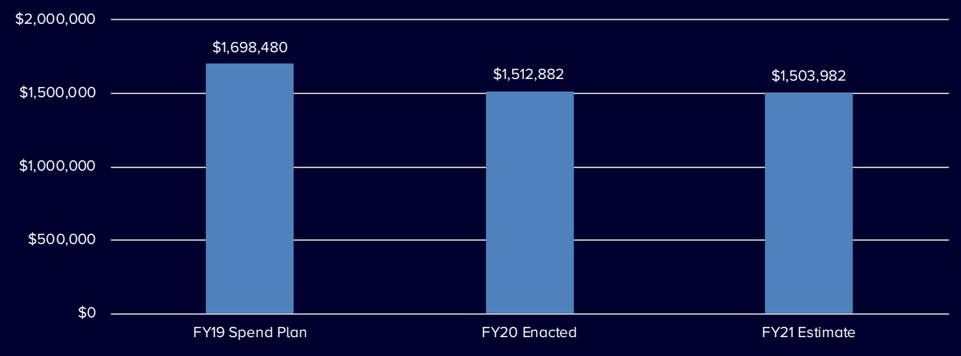
CHAPTER 9

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 2019

In FY 2019, NESDIS continued its investment in technological advances to its satellite programs which provided improved data for weather forecasting and environmental monitoring. GOES-17, the second in the Geostationary Operational Environmental Satellites-R Series (GOES-R Series), became the operational GOES West, complementing GOES East, in the geostationary satellite constellation. The U.S.-Taiwan partnership, the Constellation Observing System for Meteorology, Ionosphere, and Climate-2, or COSMIC-2, mission, was successfully launched in June 2019. COSMIC-2 consists of six satellites designed to improve



weather forecasts and space weather monitoring and is currently going through on-orbit calibration and validation. These satellites, in addition to those already in orbit, are critical to providing continuity of data and imagery during extreme weather events, ranging from wildfires in California and Alaska to hurricanes in the Southeastern United States. Additional select 2019 highlights include:

In February 2019, NOAA-20, previously known as Joint Polar Satellite System-1, or JPSS-1, was designated as NOAA's primary afternoon polar satellite. NOAA-20 features the most advanced technology NOAA has ever flown in a polar orbit to capture more precise observations of the world's atmosphere, land, and waters. Suomi National Polar-orbiting Partnership, which was the prior primary afternoon polar satellite, flies in nearly the same orbit as NOAA-20 but 50 minutes behind, and will continue to provide observations, allowing the U.S. to benefit from two sophisticated spacecraft in our polar-orbit constellation.

NESDIS partnered with European Organisation for the Exploitation of Meteorological Satellites to provide instruments for Metop C, a new polar-orbiting satellite, successfully launched on November 7, 2018. Metop C collects valuable data about Earth's atmosphere, land, and oceans that are critical for NOAA's weather models.

The Commercial Weather Data Pilot Round 2 built on experiences from the Round 1 purchase and evaluation of radio occultation (RO) data by assessing a new data request and acquisition of RO data from the commercial sector. RO data are considered a proven and cost-effective means of increasing the volume of quality global atmospheric soundings. RO data provides temperature, water vapor, and pressure profiles to complement the microwave and infrared soundings provided by NOAA's JPSS and European Organisation for the Exploitation of Meteorological Satellites' Metop satellites, which results in more accurate weather forecasts.

NOAA and Cooperative Institute partners updated and released the World Ocean Database 2018. A standard reference for oceanic studies, the World Ocean Database contains the most comprehensive data available to the oceanographic community, providing access to millions of uniformly formatted records, known as profiles, on ocean temperature, salinity, nutrients, plankton, pH, and oxygen data, and various other ocean characteristics.

The World Magnetic Model (WMM) characterizes the Earth's magnetic field and underlies all modern navigation systems, including more than a billion smartphones for navigation apps. The WMM is a vital part of military and commercial daily operations around the world and was not scheduled to be updated until December 2019. However, scientists determined that due to the more rapid changes in the world's magnetic field, the existing WMM had become inaccurate. In February 2019, an out-of-cycle update was issued to anticipate these new changes. This update improved safety for commercial and defense aviation, and efficiency for a range of commercial applications.

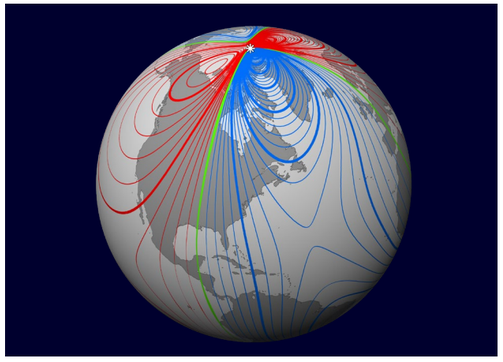
The extent of the U.S. extended continental shelf (ECS) has not been determined, but in 2019, NESDIS was a chief participant in an effort to define this important international boundary. NESDIS helped define the U.S. ECS by collecting and analyzing data on the depth, shape, and geophysical characteristics of the seabed and sub-sea floor. Although there are no official maps yet showing the extent of the U.S. ECS, a prospective map identifies about one million square kilometers or approximately twice the size of California. Roughly half of that area is off Alaska. These boundaries will have significant implications for resource rights.

In August 2019, under the umbrella of the American Meteorological Society, the National Centers for Environmental Information (NCEI) released the high-profile State of the Climate in 2018. Renowned as one of the premier annual reports about the climate, the 29th edition of the report was based on contributions from more than 470 scientists from nearly 60 countries around the world and involved tens of thousands of measurements from multiple independent datasets. It provides a detailed update on global climate indicators, notable weather events, and other data collected by environmental monitoring stations and instruments located on land, water, ice, and in space.

FY 2020

In FY 2020, NESDIS continues its development and acquisition of its geostationary, polar-orbiting, and deep space satellites. NESDIS will continue to provide support to its on-orbit satellites to ensure continued quality assurance of products and services delivered to the National Weather Service and the national weather enterprise. NOAA also took initial steps to begin implementation of the NOAA Satellite Observing System Architecture, which was used to inform future architecture decisions. NESDIS will continue to design a modern architecture by broadly examining instruments, services, platforms, and orbits, driven by user needs, new technology, and exploiting emerging space business models as outlined in the NOAA Satellite Observing System Architecture. NESDIS will continue to archive and provide access to data from NCEI. Additional select 2020 highlights include or will include:

In October 2019, a pair of Broad Agency Announcements were released to engage the community in producing new concepts for instruments, spacecraft, business models, and mission elements. Each Broad Agency Announcement starts a process designed to gather commercial sector information of value to NESDIS. NESDIS intends to inform its development of NOAA's post-2030 architecture using fact-based analysis and recommendations from the community on new ways to both collect observations, in the form of different instruments across a range of performance values or advancements in space craft and platforms, as well as new models for doing business, such as



Map showing the location of the north magnetic pole (white star) and the magnetic declination (contour interval 2 degrees) at the beginning of 2019 according to the out-of-cycle World Magnetic Model update released in February 2019.

hosting arrangements, commercial services purchases, or other collaboration with industry.

Engagement with the commercial sector will continue through the Commercial Data Program, which will continue to assess new types of data and capabilities that are available on the commercial market. If NOAA determines that data or services licensed and evaluated through the Commercial Weather Data Pilot are cost effective, operationally viable, and appropriate for meeting a NOAA observation requirement, NESDIS will pursue purchase of the commercial data or service based on its ability to provide an ongoing operational service as part of the NOAA observation architecture.

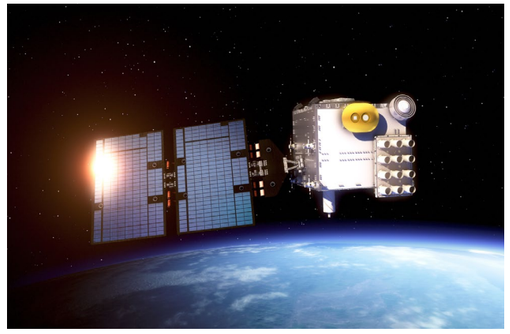
Development of the Space Weather Follow On (SWFO) program, including the mission to Lagrange 1 (L1) and geostationary orbit, will continue. SWFO will continue developing compact coronagraphs and the Solar Wind Instrument Suite. The FY 2020 funding allows NOAA to develop SWFO to meet the integration timeline for a rideshare with NASA's research mission to the same deep space location.

NESDIS will continue to support the launch of the Argos Advanced Data Collection System instrument as a hosted payload with U.S. Air Force support on a reimbursable basis to low Earth orbit on a commercial spacecraft by late 2021.

NESDIS will complete the installation and obtain full operational capability of the Southwest USA Medium Earth Orbiting Local User Terminal (MEOLUT) ground station in New Mexico. The Southwest USA MEOLUT will increase the overall distress signal detection coverage area for the Medium Earth Orbiting Search and Rescue program by closing the coverage gap in the South Pacific, accelerating the implementation of the Medium Earth Orbiting Search and Rescue, and providing operational redundancy to NOAA's current MEOLUTs in Hawaii and Florida.

FY 2021 REQUEST $1,503,982,000

NOAA requests a total of $1,503,982,000 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 decreases totaling $108,044,000 and increases totaling $98,074,000, for an overall net decrease of $9,970,000 in FY 2021.



Artist's rendering of one of the six remote-sensing microsatellites comprising NOAA and partners' Constellation Observing System for Meteorology, Ionosphere, and Climate-2 (COSMIC-2) mission. Credit: Surrey Satellite Technology, Ltd.

The FY 2021 request includes 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 change increases are highlighted below. A summary of program change decreases by Line Office is located in Chapter 12 and summary of funding by Subactivity is located in Appendix 3. Detailed descriptions of the program changes below are located in the NOAA FY 2021 Congressional Justification.

FY 2021 ORF BUDGET SUMMARY

NOAA requests a total of $269,992,000 to support the ORF activities of NESDIS, reflecting a decrease of $16,642,000 in FY 2021 program changes.

ENVIRONMENTAL SATELLITE OBSERVING SYSTEMS $217,485,000

NOAA requests a net decrease of $6,053,000 for a total of $217,485,000 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.

NATIONAL CENTERS FOR ENVIRONMENTAL INFORMATION (NCEI) $52,507,000

NOAA requests a net decrease of $10,589,000 for a total of $52,507,000 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.

FY 2021 PAC BUDGET SUMMARY

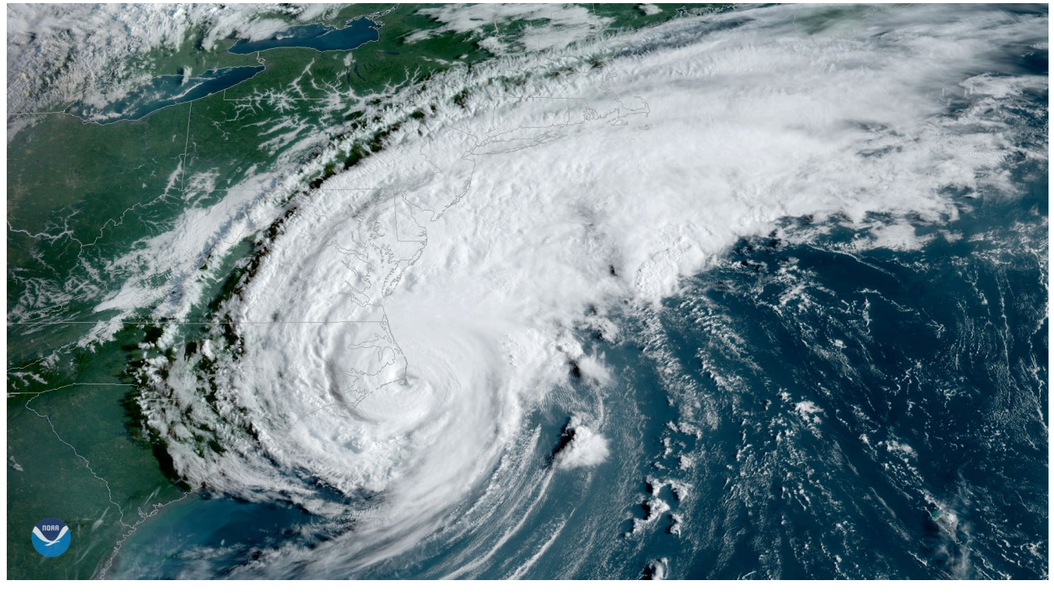
NOAA requests a total of $1,233,990,000 to support the PAC activities of NESDIS, reflecting a net increase of $6,672,000 in FY 2021 program changes.

SYSTEMS ACQUISITION $1,235,292,000

NOAA requests a net increase of $6,672,000 for a total of $1,235,292,000 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. Program changes also include:

Geostationary Systems-R: NOAA requests an increase of $30,444,000 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 and the Committee on Foreign Investment in the United States to discontinue use of Chinese data systems by FY 2022.

(BUDGET AUTHORITY IN $K)	Total GOES-R Request
FY 2021 Request	$334,500
FY 2022	$292,500
FY 2023	$250,000
FY 2024	$250,000
FY 2025	$86,027
CTC	TBD
Total	TBD



View of Hurricane Dorian as seen by GOES East moments before making landfall over Cape Hatteras, NC on September 6, 2019.

This true-color composite image of smoke from Arctic wildfires spreading across Alaska and Canada was captured by GOES East and GOES West on July 23, 2019. Data on the location of fires, overlaid onto the image as yellow-red dots, were gathered using the VIIRS sensor onboard NOAA-20.

Cooperative Data and Rescue Services (CDARS): NOAA requests an increase of $3,500,000 to continue the U.S. Air Force Hosted Payload Solutions firm fixed price contract for a scheduled launch in August 2021 of the Argos-4 Advanced Data Collection System instrument provided by the French space agency, Centre National d'Etudes Spatiales.

(BUDGET AUTHORITY IN $K)	Total CDARS Request
FY 2021 Request	$14,400
FY 2022	$1,300
FY 2023	$1,300
FY 2024	$1,300
FY2025	$1,300
CTC	TBD
Total	TBD

Space Weather Follow On (SWFO): NOAA requests an increase of $44,115,000 for the SWFO program. SWFO is designed to meet NOAA's need for operational coronal mass ejection imagery and solar wind measurements. Funding will support a mission to L1 with a compact coronagraph and a Space Weather Instrument Suite. The NOAA SWFO-L1 mission will ensure continuity of space weather data beyond NASA's Advanced Composition Explorer and NASA-European Space Agency research Solar and Heliophysics Observatory, which are operating well past their design life; and NOAA's Deep Space Climate Observatory which is nearing the end of its design life.

(BUDGET AUTHORITY IN $K)	Total SWFO Request
FY 2021 Request	$108,100
FY 2022	$146,900
FY 2023	$136,200
FY 2024	$97,200
FY 2025	$41,200
CTC	$57,500
Total	$692,800

Satellite Ground Services (SGS): Data-source Agnostic Common Services (DACS): NOAA requests an increase of $5,015,000 to utilize essential data and observations from partner and commercial systems to meet mission requirements in a cost-effective manner. NESDIS will transition new and legacy products and services to a cloud architecture to increase efficiencies and to enable advanced processing capabilities.

(BUDGET AUTHORITY IN $K)	DACS	Total SGS Request
FY 2021 Request	$5,015	$39,287
FY 2022	TBD	TBD
FY 2023	TBD	TBD
FY 2024	TBD	TBD
FY 2025	TBD	TBD

Systems/Services Architecture & Engineering (SAE): Commercial Data Purchase: NOAA requests an increase of $10,000,000 to continue activities with the commercial sector and purchase commercial Global Navigation Satellite System RO data for operational use. This request 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.

(BUDGET AUTHORITY IN $K)	Commercial Data Purchase (SAE)	Total SAE Request
FY 2021 Request	$15,000	$44,322
FY 2022	$25,000	$54,322
FY 2023	$30,000	$59,322
FY 2024	$35,000	$64,322
FY 2025	$40,000	$69,322

Systems/Services Architecture & Engineering (SAE): Commercial Weather Data Pilot: NOAA requests an increase of $5,000,000 to continue executing pilots for the next available commercial data type. With the additional pilot project work, NOAA will continue to assess new capabilities that are available on the commercial market, and test commercially available capabilities based on market research, in accordance with the NOAA Commercial Space Policy.

(BUDGET AUTHORITY IN $K)	Commercial Weather Data Pilot (SAE)	Total SAE Request
FY 2021 Request	$8,000	$39,322
FY 2022	$10,000	$41,322
FY 2023	$15,000	$46,322
FY 2024	$20,000	$51,322
FY 2025	$25,000	$56,322

CHAPTER 10

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 2019

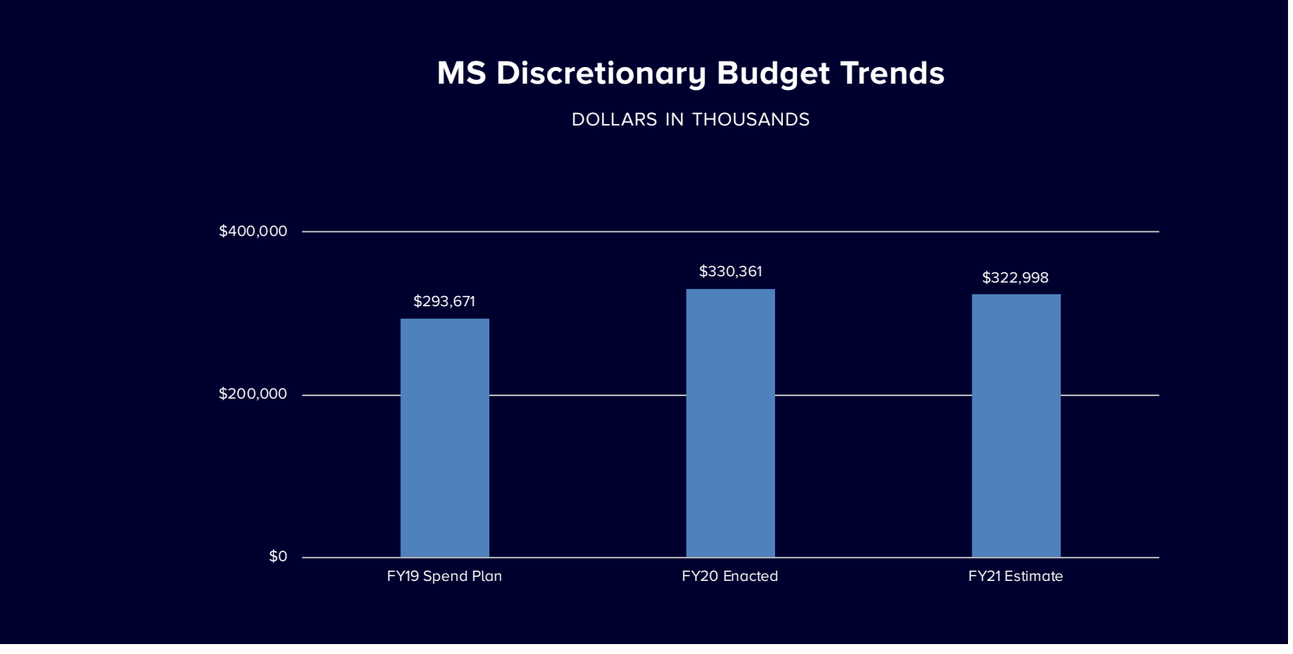
The Office of Inclusion and Civil Rights successfully conducted its 3rd Annual Diversity and Inclusion Summit with more than 310 in person and 404 online participants. This summit promotes the value of diversity and inclusion and sponsored some of the most prominent speakers in the field. It was highly successful. Participation from FY 2018 increased by approximately 200 employees and 93 percent of the attendees surveyed rated it positively.

NOAA initiated a pilot regional analysis of the Northwest and Alaska as the first of several regional studies that will inform the Strategic Facilities Master Plan.

NOAA's Big Data Project, led by the Office of the Chief Information Officer (OCIO), won the Best in Class Public Sector Innovation Award at the Government Innovation Awards for making NOAA's data more open and accessible to the public through public-private partnerships.

FY 2019 was a record year for the Acquisition and Grants Office for both acquisitions and financial assistance awards. $1.86 billion was obligated

At "Take Your Child To Work Day" the NOAA family was invited to bring their kids to work at the Silver Spring, Maryland, campus on April 25, 2019.



via 8,589 contract award and modification transactions and $1.26 billion was obligated via 4,300 financial assistance transactions.

The Office of Human Capital Services (OHCS) strengthened human capital recruitment and maturity through a new NOAA Honors Program and developing other "recent grads" projects and activities to support entry hiring and enhanced employee development programs such as a new NOAA-wide Mentoring Program.

NOAA's Hollings Scholarship Program and Educational Partnership Program with Minority Serving Institutions supported 558 students by providing internships, scholarships, and other experiential training in NOAA mission-related disciplines.

FY 2020

NOAA will continue its efforts to improve facilities management through improved facilities planning and continued implementation of the facilities asset management tool. In FY 2020, NOAA is completing regional studies for the Northeast and Southeast, the second and third of such studies that will inform the Strategic Facilities Master Plan.

NOAA will complete a technology refresh and go live with its new Commerce Business System architecture in FY 2020.

The OCIO will establish the Internal Risk Mitigation Program to be operational by the end of FY 2020 and will support enterprise initiatives bringing NOAA missions to the cloud.

In FY 2019, OHCS created a Consulting Model and Customer Engagement Tool Kit to guide HR personnel with customer interactions and developed a guide to Human Centered Design processes focused on customer- centric approaches to solutions. In FY 2020, OHCS implemented and further developed each element of the model and increased the amount and sophistication of each element of support.

FY 2021 REQUEST $322,998,000

NOAA requests a total of $322,998,000 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 decrease of $35,329,000 in FY 2021 program changes.

With this request, Mission Support will continue to provide services that are essential to the safe and successful execution of NOAA's mission, while strengthening NOAA's commitment to sexual assault and sexual harassment prevention and response; supporting the implementation of new administrative systems; implementing NOAA's 2030 Footprint initiative; and supporting core education coordination and outreach activities.

Program change increases are highlighted below. A summary of program change decreases by Line Office is located in Chapter 12 and summary of funding by Program, Project, and Activity is located in Appendix 3. Detailed descriptions of the program changes below are located in the NOAA FY 2021 Congressional Justification.

FY 2021 ORF BUDGET SUMMARY

NOAA requests a total of $281,713,000 to support the ORF activities of Mission Support, reflecting a net decrease of $20,626,000 in FY 2021 program changes.

EXECUTIVE LEADERSHIP $28,024,000

NOAA requests a total of $28,024,000 in the Executive Leadership activity. These funds will support NOAA's centralized executive management as well as policy formulation and direction. There are no program changes in this activity.

MISSION SERVICES AND MANAGEMENT $161,163,000

NOAA requests an increase of $1,200,000 in program changes for a total of $161,163,000 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 change increases include:

Mission Services and Management: Workplace Violence Prevention and Response Program: NOAA requests and increase of $1,700,000 to both expand and provide full dedicated funding for the Workplace Violence Prevention and Response Program. This program will increase prevention and response services across all of NOAA's regions. Increased services include development of resiliency training for all NOAA employees, expansion and maintenance of the Rape, Abuse & Incest National Network contract to include

Teacher at Sea Alumnus Chris Tait (NOAA Ship *Reuben Lasker*, 2017) prepares for his poster presentation at the Tri-State Teacher at Sea Alumni Workshop at the Jacques Cousteau Coastal Center in Tuckerton, New Jersey.

dedicated hotline/helpline for sexual assault and sexual harassment response services, development and maintenance of a workplace violence database, execution of workplace violence summits, development and maintenance of a workplace violence prevention website, toolkits for employees and management, and outreach materials. NOAA is committed to ensuring a safe workplace for all NOAA employees, contractors, and affiliates.

Mission Services and Management: Business Application Solutions (BAS) and Administrative System Program Management Office: NOAA requests an increase of $500,000 to support the successful implementation of the Department of Commerce-wide BAS system. While the Department budget does include centralized funding for BAS, NOAA must conduct planning, integration, and implementation activities within the bureau to ensure readiness for BAS and associated NOAA-specific changes. Funding from this request will be used to establish a structure within NOAA for administrative systems governance and to support DOC's BAS initiative in the form of an Administrative Systems Program Management Office. This governance structure will not only support the administrative systems within the scope of BAS, but all NOAA administrative systems both during the BAS implementation and thereafter.

IT SECURITY $15,378,000

NOAA requests a total of $15,378,000 in the IT Security activity. These funds will support bureau-level oversight of cybersecurity programs across all six NOAA Line Offices. The IT Security Program recently released its FY 2018-2022 Cybersecurity Roadmap, which sets forth an ambitious plan for NOAA as a whole to move from a compliance-based program to one that is risk-based, while also implementing a full suite of effective enterprise IT services. The Roadmap will be a primary driver for FY 2021 IT Security Program activities, and includes acquiring and implementing a Common Operating Picture capability to share information across the enterprise on current and future threats. Additionally, the NOAA OCIO will continue focusing its resources on protecting U.S. intellectual property, defending against insider threats, and bolstering Data Loss Prevention capabilities. There are no program changes in this activity.

PAYMENT TO DOC WORKING CAPITAL FUND $66,389,000

NOAA requests 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 $1,108,000

NOAA requests a decrease of $29,184,000 in program changes for a total of $1,108,000 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 on STEM for NOAA and the Department of Commerce.

Two Ocean Guardian Ambassadors from Adams Elementary School, a NOAA Ocean Guardian School, search for the small Pacific mole crab at Hendry's Beach. Adams Ocean Guardians had first-hand experiences with the ocean before learning about threats to the ocean and how they can help.

Students from Edmunds Central School in Roscoe, South Dakota sort through the catch from a trawl in the Gulf of Mexico aboard the R/V Caretta.

FACILITIES MAINTENANCE $9,651,000

NOAA requests an increase of $7,607,000 in program changes for a total of $9,651,000 in the Facilities Maintenance activity. In FY 2021, NOAA plans to consolidate facilities maintenance and construction funding within Mission Support, in both ORF and PAC, for a more centralized approach to the funding and management of these activities. Routine operations and maintenance of facilities typically funded by field offices, such as janitorial services and minor repairs, will continue to be funded through the Line Offices. This consolidation leverages NOAA's recent efforts for more consistent, corporate approaches to facilities management and planning and reflects NOAA's commitment to advancing the Department's strategic objective to achieve cost savings through consolidated functions. Program Change increases include:

Mission Services and Management: Facilities Maintenance: NOAA requests an increase of $7,607,000 for deferred maintenance and repair projects at NOAA-owned properties. The cost of maintaining NOAA's existing facility footprint is escalating at a rate that NOAA cannot afford. If deferred maintenance and repair projects are not funded, then NOAA must redirect mission resources to address critical maintenance and repairs when facility failures begin to affect mission accomplishment. If not funded, the maintenance and repair backlog will continue to increase and divert crucial funds away from primary mission essential functions.

FY 2021 PAC BUDGET SUMMARY

NOAA requests a total of $41,285,000 to support the PAC activities of Mission Support, reflecting a net decrease of $14,703,000 in FY 2021 program changes.

NOAA CONSTRUCTION $41,285,000

NOAA requests a net decrease of $14,703,000 in program changes for a total of $41,285,000 in the NOAA Construction activity. As noted above, in FY 2021, NOAA plans to consolidate facilities maintenance and construction funding within Mission Support, in both ORF and PAC, for a more centralized approach to the funding and management of these activities. Program change increases include:

NOAA Construction: Evaluate and Address Northwest Facilities Issues: NOAA requests an increase of $20,500,000 to begin implementation of the Regional Master Plan s in the Northwest region as part of its Strategic Facilities Master Plan for 2030. NOAA will examine options to consolidate facilities across GSA Region 10 (Alaska, Washington, Oregon and Idaho) with the strategic intent to strengthen footprint alignment to mission requirements while reducing facilities-related costs for owned and leased properties. Key mission investments include evaluating options for relocating functions at the Montlake Lab, which will soon be affected by a massive highway reconstruction project in Seattle, and for consolidating small Washington offices. These additional funds will continue important work started in 2020, with the ultimate goal of strategically and cost-effectively reducing the NOAA footprint, freeing resources to improve critical mission-driven programs.

Lt. Cmdr. John Rossi at the controls of a NOAA WP-3D Orion Hurricane Hunter aircraft.

CHAPTER 11

Office of Marine and Aviation Operations

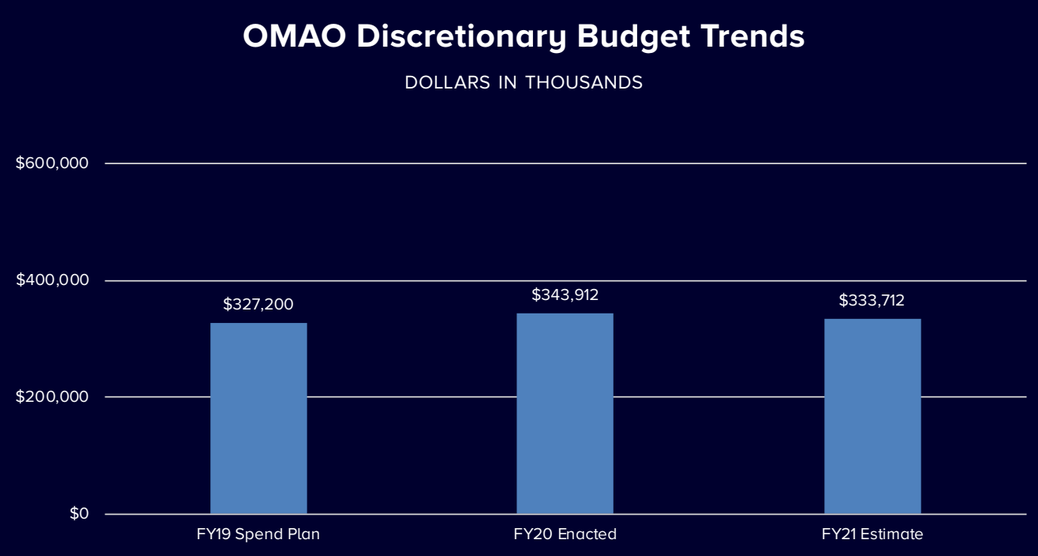
NOAA's Office of Marine and Aviation Operations (OMAO) manages an array of specialized ships and aircraft that gather oceanographic, atmospheric, hydrographic, and fisheries data in support of NOAA's public safety, environmental stewardship, and scientific missions. OMAO also provides centralized coordination, 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 324 NOAA Corps officers, including three flag officers.

FY 2019

In FY 2019, OMAO personnel, ships, and aircraft played a critical role in gathering environmental data vital to the Nation's economic security, the safety of its citizens, and the understanding, protection, and management of its natural resources. OMAO highlights include:

In October 2019, NOAA published its first Aircraft Plan, which outlines the requirements for people and aircraft to support NOAA's prioritized airborne requirements over the next 10-years, setting the course for NOAA's future in aircraft observations.

During the 2019 wildfire season, NOAA used Unmanned Aircraft Systems to collect wildfire measurements for forecasts at night, which are important for fire and plume forecasts but too risky for manned research aircrafts to collect. In the past, the inability to collect this night data resulted



in critical data gaps that affected the accuracy of fire weather forecasting.

On September 26, 2019, NOAA's WP-3Ds provided vital search and rescue assistance for the distressed tug supply vessel Bourbon Rhode, at the request of the U.S. Coast Guard. The WP-3Ds were nearby conducting flights into Hurricane Lorenzo and diverted to search for crewmembers aboard the offshore tug that sank off Martinique Island. Six of the fourteen crewmembers were recovered. The U.S. Coast Guard Deputy Commandant for Operations commended NOAA's "willingness to adhere to the highest calling of those who go out or over the seas. And at the end of the day, three families will be whole as their loved ones return safe. It is always a pleasure to stand beside our shipmates from NOAA."

On October 22, 2018 NOAA's largest oceanographic research vessel, NOAA Ship Ronald H. Brown, steamed into its Charleston, South Carolina, home port after a 243-day voyage around the world to conduct scientific research and service buoys that inform global weather, climate and ocean forecasting. The ship sailed nearly 44,289 miles, made port calls in South Africa, the Seychelles, India, Australia and Hawaii, and opened its decks to international partner scientists and school children.

FY 2020

In FY 2020, will continue to deliver high quality platforms, people and services to support and advance NOAA's observational requirements and the collection of accurate and reliable data. OMAO highlights include:

NOAA will operate 15 research and survey ships and nine aircraft that play a critical role in the in-situ collection of oceanographic, atmospheric, hydrographic, and fisheries data in support of NOAA's missions. OMAO's personnel, ships, and aircraft play a critical role in gathering environmental data vital to the Nation's economic security; public safety; and the understanding, protection, and management of the Nation's natural resources.

NOAA will begin the down selection for detail design and construction for the first NOAA Auxiliary General Purpose Oceanographic Research Variant vessel, which primarily supports oceanographic monitoring, research and modeling. NOAA will also advance the acquisition of NOAA's first Class B vessel, which will conduct charting and surveying as its primary mission.

OMAO continues efforts to acquire a new King Air and a new High Altitude Jet. These aircraft will increase NOAA's ability to meet prioritized mission requirements, consolidate the number of aircraft types in NOAA's fleet, and leverage the latest technology, enhancing NOAA's support for marine transportation as well as hurricane surveillance and research. In FY 2020, NOAA will execute contracts for the aircraft modifications and instrumentation of the G-550, and is on track to receive the fully modified King Air by the end of 2020.

FY 2021 REQUEST $363,787,000

NOAA requests a total of $363,787,000 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 decrease of $18,385,000 in FY 2021 program changes.

The FY 2021 request sustains NOAA's data collection capabilities at sea in the air, while advancing the adoption of new technologies through the acquisition of unmanned systems. With these resources, OMAO will continue to invest in NOAA's ship fleet and support NOAA aircraft operations that provide critical observations to predict hurricanes, droughts, and other severe storms. OMAO will also continue to improve the centralization and standardization of the unmanned systems operations across NOAA.

Furthermore, OMAO seeks to increase clarity and programmatic transparency in FY 2021 by consolidating OMAO funds supporting the NOAA Corps within its own new budget line. This budget realignment will allow OMAO to better align the changes in Titles 10, 37 and 38, which provide the legal basis for the roles, missions and organization of the armed forces, directly to a NOAA Corps activity instead of applying changes to parts of the Marine Operations and Maintenance, Aviation Operations and Aircraft Services, or Unmanned Systems activities. NOAA Line Offices will continue to partially fund NOAA Corps officers serving in their Offices, and their contributions will continue to be reflected in their respective budgets.

NOAA Corps and civilian crew members on the bridge of NOAA Ship *Oscar Dyson*, a Fisheries Survey Vessel homeported in Kodiak, Alaska.

Program change increases are highlighted below. A summary of program change decreases by Line Office is located in Chapter 12 and summary of funding by Program, Project, and Activity is located in Appendix 3. Detailed descriptions of program changes are located in the NOAA FY 2021 Congressional Justification.

FY 2021 ORF BUDGET SUMMARY

NOAA requests a total of $238,421,000 to support the ORF activities of the OMAO, reflecting a decrease of $14,085,000 in FY 2021 program changes.

MARINE OPERATIONS AND MAINTENANCE $163,339,000

NOAA requests a decrease of $2,760,000 in program changes for a total of $163,339,000 in the Marine Operations and Maintenance activity. These funds will support 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.

AVIATION OPERATIONS AND AIRCRAFT SERVICES $28,204,000

NOAA requests a decrease of $2,262,000 in program changes for a total of $28,204,000 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 investigations and air quality studies.

UNMANNED SYSTEM OPERATIONS $5,230,000

NOAA requests a decrease of $7,563,000 in program changes for a total of $5,230,000 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.

NOAA CORPS $41,648,000

NOAA requests a decrease of $1,500,000 in program changes for a total of $41,648,000 in the NOAA Corps activity. This newly established budget line will provide NOAA Corps Officers that operate NOAA ships, fly aircraft, manage research projects, conduct diving operations, and serve in NOAA staff positions to fulfill NOAA's mission requirements.

NOAA Ship *Okeanos Explorer* as seen from a NOAA Twin Otter aircraft.

FY 2021 PAC BUDGET SUMMARY

NOAA requests a total of $93,700,000 to support the PAC activities of the OMAO, reflecting a net decrease of $4,300,000 in FY 2021 program changes.

MARINE AND AVIATION CAPITAL INVESTMENTS $93,700,000

NOAA requests a net decrease of $4,300,000 in program changes for a total of $93,700,000 in the Marine and Aviation Capital Investments activity. These resources will enable OMAO to continue to implement its fleet recapitalization plan, as well as maintain its vessels and provide 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 change increases include:

A NOAA Lockheed WP-3D Orion "hurricane hunter" taking off from Lakeland Linder International Airport.

Marine and Aviation Capital Investments: Unmanned Systems Acquisition: NOAA requests an increase of $2,000,000 to support the acquisition and maintenance of unmanned systems, ensuring consistency in the way that NOAA's fleet of ships and aircraft, and unmanned systems are managed across NOAA. These additional resources will allow NOAA to acquire ship and shore-based deployment infrastructure, and unmanned systems and platforms. This centralized acquisition will allow NOAA to leverage the unmanned technologies needed to efficiently execute NOAA mission requirements, and provide the required IT infrastructure and cyber security resources. It will help avoid duplication of equipment, training and certification, and provide the infrastructure needed for the safe deployment of unmanned systems from NOAA ships and aircraft, coordinated and implemented through the Unmanned Systems Operations 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 2021 payments to the accrual fund are estimated to be $1,591,000. This is a slight increase over the FY 2020 amount ($1,497,000).

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, 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.

Crew members aboard NOAA Ship *Henry B. Bigelow* recovering oceanographic equipment.

CHAPTER 12

Program Change Reductions

NOAA's FY 2021 Budget request reflects the commitment to advance national security and the economy. NOAA contributes to those priorities every day by putting data in the hands of those who need it to protect our communities and grow the economy. This FY 2021 Budget request includes the core infrastructure and capabilities that professionals at NOAA need to provide the critical services that the American people require. Chapter 12 summarizes the reductions made in FY 2021 to allow NOAA to prioritize its core mission, 1) to understand and predict changes in climate, weather, oceans, and coasts; 2) to share that knowledge and information with others; and 3) to conserve and manage coastal and marine ecosystems and resources. This budget advances NOAA's goals of reducing the impacts of extreme weather and water events to save lives and protect property by implementing Public Law 115-25, *Weather Research and Forecasting Innovation Act of 2017,* and Public Law 115-423, *National Integrated Drought Information System (NIDIS) Reauthorization Act of 2018*, and maximizing the economic contributions of our ocean and coastal resources, by expanding the American blue economy.

National Ocean Service

ORF
NAVIGATION, OBSERVATIONS AND POSITIONING

ELIMINATE AND REDUCE CONGRESSIONALLY DIRECTED GRANTS TO JOINT OCEAN AND COASTAL MAPPING CENTER -$2,500
NOAA proposes to discontinue new funding awards for the joint ocean and coastal mapping centers in Mississippi and New Hampshire. NOAA will continue to support these efforts through its Coast Survey Development Laboratory, which explores and develops survey, geospatial data management, and cartographic technologies, and other Navigation, Observation and Positioning programs.

ELIMINATE CONGRESSIONALLY DIRECTED REGIONAL GEOSPATIAL MODELING GRANTS -$8,000
NOAA requests to terminate the Regional Geospatial Modeling Grant 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.

PHYSICAL OCEANOGRAPHIC REAL-TIME SYSTEM DECREASE -$1,000
NOAA requests to decrease funding for its Physical Oceanographic Real-Time System (PORTS®) program, a cost-shared program between NOAA and local maritime community partners. NOAA will work to address local maritime community partner requests for both new PORTS® and enhancements at the lower funding level.

HYDROGRAPHIC SURVEY PRIORITIES/CONTRACTS

HYDROGRAPHIC SURVEY PRIORITIES/CONTRACTS -$5,051
NOAA requests to reduce the acquisition of hydrographic data from contract surveys. NOAA will continue to acquire hydrographic survey data from contract surveyors with the remaining funds in support of safe and efficient transportation and commerce.

IOOS REGIONAL OBSERVATIONS

REDUCE INTEGRATED OCEAN OBSERVING SYSTEM - REGIONAL OBSERVATION GRANTS -$19,556
NOAA requests to reduce grants to the IOOS Regional Observations Program. NOAA will continue to support the 11 IOOS Regional Associations at the reduced funding level.

COASTAL SCIENCE, ASSESSMENT, RESPONSE AND RESTORATION

REDUCE RESPONSE AND RESTORATION ACTIVITIES -$725
NOAA requests to reduce the funding available for response and restoration activities, particularly for the training program. While this will reduce the quantity and quality of staff trained, NOAA will continue to prioritize responses to oil spills, chemical accidents, and other emergencies in coastal areas.

REDUCE MARINE DEBRIS PROGRAM ACTIVITIES -$1,522
NOAA requests to reduce the funding available for removal and research marine debris grants available for local partners. NOAA will work to find efficiencies to continue its important marine debris reduction, prevention, research, monitoring, and removal activities with the remaining funds available.

TERMINATE NATIONAL CENTERS FOR COASTAL OCEAN SERVICE -$37,103
NOAA requests to begin the phased termination of the National Centers for Coastal Ocean Science (NCCOS). NOAA will retain $8.9 million of funding and personnel to sustain key components of the NCCOS science portfolio; specifically, harmful algal bloom, hypoxia, and pathogen research, prevention, and forecasting; habitat and species forecasting; and marine aquaculture siting science and tool development.

COMPETITIVE RESEARCH

ELIMINATE NCCOS COMPETITIVE FUNDING SUPPORT FOR RESEARCH ON ECOLOGICAL THREATS -$19,000
NOAA proposes to eliminate the NCCOS Competitive Research program, which provides grants to academic institutions to conduct ecological research that advances NOAA's missions.

COASTAL ZONE MANAGEMENT AND SERVICES

ELIMINATE FUNDING SUPPORT FOR INTEGRATED WATER PREDICTION -$2,576
NOAA proposes to eliminate funding for the NOS portion of the Integrated Water Prediction (IWP) project. With this reduction, NOS will continue to engage in the NOAA Water Team, but would curtail development of new products and services for end users.

COASTAL ZONE MANAGEMENT GRANTS

ELIMINATE COASTAL ZONE MANAGEMENT GRANTS -$77,000
NOAA requests a decrease to eliminate grants within the Coastal Zone Management (CZM) Program that support actions of states and other grantees authorized under the Coastal Zone Management Act (CZMA). NOAA will continue to support states' participation in the National CZM program by reviewing and supporting implementation of states' management plans, supporting Federal consistency reviews, and providing technical assistance services.

TITLE IX FUND

ELIMINATE FEDERAL FUNDING SUPPORT FOR THE TITLE IX FUND -$33,000
NOAA requests to eliminate Federal funding support for Title IX of the National Oceans and Coastal Security Act, which allows grants to be awarded through a partnership between the National Fish and Wildlife Foundation (NFWF) and NOAA.

CORAL REEF PROGRAM

REDUCE FUNDING FOR CORAL REEF RESTORATION AND THREAT ABATEMENT INITIATIVES -$3,661
NOAA proposes to decrease funding for coral reef restoration and threat abatement initiatives. In FY 2021, NOAA will continue to work with its partners to protect and restore coral reefs, prioritizing traditional methods of coral reef restoration that are the most cost-effective.

NATIONAL ESTUARINE RESEARCH RESERVE SYSTEM

ELIMINATE FEDERAL FUNDING SUPPORT FOR NERRS -$27,500
NOAA proposes to discontinue NOAA grants to state agencies and academic institutions that support operations of the National Estuarine Research Reserve System (NERRS). Under this proposal, NOAA will continue to provide national-level system coordination and in-kind support to state agencies and academic institutions that choose to continue operating the reserves using state funds.

SANCTUARIES AND MARINE PROTECTED AREAS

REDUCE SANCTUARY OPERATIONS -$2,463
NOAA requests a decrease to the Sanctuaries and Marine Protected Areas Program. The program would reduce scalable costs in areas such as contracts and supplies. NOAA will support all its authorizations, maintain its unique capabilities, support continued implementation of management plans across the National Marine Sanctuary System, and continue engaging coastal communities and stakeholders to promote science-based stewardship of designated areas at the lower funding level.

ELIMINATE RESEARCH GRANTS FOR MONUMENTS -$1,000
NOAA requests a decrease to eliminate Federal funding for Marine Sanctuaries research grants for Marine National Monuments. These Congressionally directed grants provide funding for competitive research and management grants for the Papahanaumokuakea Marine National Monument.

PAC
NATIONAL ESTUARINE RESEARCH RESERVE SYSTEM CONSTRUCTION

ELIMINATE FEDERAL FUNDING SUPPORT FOR NERRS CONSTRUCTION -$4,500
NOAA requests to eliminate Federal funding support to states for National Estuarine Research Reserve System land acquisition and construction. NOAA will continue to provide national-level system coordination and in-kind support to state governments that choose to continue operating the reserves using state funds.

National Marine Fisheries Service

ORF
MARINE MAMMALS, SEA TURTLES, AND OTHER SPECIES

ESA AND MMPA PERMITTING CAPACITY -$3,392
This request reduces the additional resources provided in FY 2020 to work with Federal partners to improve coordination and efficiency of consultations within the permitting processes. While it will decrease consultation and permitting capacity that supports requirements of the Endangered Species Act (ESA) and the Marine Mammal Protection Act (MMPA), NMFS will continue to meets its responsibilities within base resources.

PRESCOTT GRANT PROGRAM -$4,000
This request will eliminate funding for the Prescott Grants Program, which provides grants or cooperative agreements to eligible stranding network participants for recovery and treatment (i.e., rehabilitation) of stranded marine mammals, data collection from living or dead stranded marine mammals, and facility upgrades, operations costs, and staffing needs.

RIGHT WHALE RECOVERY -$3,048
This request reduces the additional funds provided in FY 2020 for research, development, and conservation efforts of the North Atlantic Right Whale (NARW). The budget includes $8.6 million in dedicated funds to continue efforts to support right whale recovery.

SPECIES RECOVERY GRANTS

SPECIES RECOVERY GRANTS PROGRAM -$1,010
This request will decrease support for conservation and recovery of marine and anadromous species through the Species Recovery Grant Program. This level of funding will still allow NMFS to continue to adequately support our state and tribal partners in species recovery.

PACIFIC SALMON

HATCHERY GENETIC MANAGEMENT PLANS (HGMPS) -$3,763
This request reduces the Congressionally directed resources provided in FY 2020 to work with partners to help expedite HGMP reviews.
Fisheries and Ecosystem Science Programs and Services

FISHERIES SCIENCE ACTIVITIES -$6,176
This request will reduce programmatic support for science activities in NMFS science centers and headquarters program offices.

NORTHEAST GROUNDFISH RESEARCH -$2,500
This request will eliminate funding provided in FY 2020 appropriations for New England groundfish research. NOAA recently completed studies on the effects of changing climatic conditions and warming waters on the fishery, including stock health and natural mortality through ten research projects.

ANTARCTIC RESEARCH -$2,967
This request will eliminate funding for NOAA's Antarctic Ecosystem Research Program and discontinue research at the Southwest Fisheries Science that related to the U.S. Antarctic Marine Living Resources (AMLR) Convention Act and the Convention for the Conservation of Antarctic Marine Living Resources (CCAMLR).

FISHERIES DATA COLLECTION, SURVEYS & ASSESSMENTS
FISHERIES SURVEYS AND STOCK ASSESSMENTS -$10,442
This request reduces the additional funding provided in FY 2020 for targeted fisheries surveys including: Alaska bottom trawl surveys, cooperative research west coast groundfish surveys, and reef fish surveys and assessments in the Gulf of Mexico and South Atlantic.

COOPERATIVE RESEARCH PROGRAM -$2,916
This request reduces funding for the Cooperative Research program, which will lead to approximately ten fewer projects funded in FY 2021. The program will continue to execute cooperative research with industry, fishermen, and other stakeholders.

OBSERVERS & TRAINING

NORTHEAST AT SEA MONITORS AND NORTH PACIFIC FISHERY OBSERVERS -$11,241
This request will reduce the additional funding provided in FY 2020 appropriations for the Northeast At-Sea Monitoring Program (ASM) and North Pacific Observing Program. The FY 2021 budget includes $6.3 million for the program, and NOAA will continue to cover costs to maintain core capabilities of this program.

FISHERIES MANAGEMENT PROGRAMS & SERVICES

FISHERIES MANAGEMENT PROGRAMS AND SERVICES -$3,029
This request will reduce funding for analysis and decision-making to support fisheries management and regulatory implementation. It will reduce support for management activities to ensure sustainability and apply an ecosystem-based management approach to the stewardship of the Nation's marine fishery resources. NMFS will continue to carry out mandated activities, though actions may be reduced and/or delayed.

ELECTRONIC MONITORING & REPORTING (EM/ER) IMPLEMENTATION -$2,700
This request will reduce the additional funding provided in FY 2020 for data collection and catch and effort validation to support timely implementation of electronic logbooks for the federally permitted charter-for-hire sector in the Gulf of Mexico. The request will also decrease funding in the NMFS Enforcement activity for State and Federal enforcement activities of electronic logbooks in this sector.

NATIONAL CATCH SHARE PROGRAM -$3,975
This request will reduce support for catch share programs. NOAA will continue to support catch share programs and will prioritize the most critical activities.

SEAFOOD IMPORT MONITORING PROGRAM IMPLEMENTATION -$1,200
This request will reduce the additional funding provided in FY 2020 for specific implementation requirements of the Seafood Import Monitoring Program (SIMP).

AQUACULTURE

AQUACULTURE -$2,402
This request reduces funding for NMFS to coordinate and streamline interagency marine aquaculture permitting requirements. NOAA will continue to focus on aquaculture science and streamlined permitting with remaining funds.

SALMON MANAGEMENT ACTIVITIES

COLUMBIA RIVER HATCHERIES AND PACIFIC SALMON TREATY -$21,595
This request will reduce the additional funds provided in FY 2020 for Mitchell Act hatcheries and implementation of new Pacific Salmon Treaty requirements.

REGIONAL COUNCILS AND FISHERIES COMMISSIONS

REGIONAL COUNCILS AND FISHERIES COMMISSIONS -$1,878
This request will reduce funding for the three Interstate Marine Fisheries Management Commissions.

INTERJURISDICTIONAL FISHERIES GRANTS

INTERJURISDICTIONAL FISHERIES GRANTS -$3,365
This request will eliminate interjurisdictional fisheries grants program. These grants are non-competitive, formula-based.

ENFORCEMENT

ENFORCEMENT -$1,862
This request will reduce the additional funding provided in FY 2020 for increased enforcement capacity (-$537) and for State enforcement activities related to the charter-for-hire sector in the Gulf of Mexico (-$600).

COOPERATIVE ENFORCEMENT PROGRAM -$18,500
This request will eliminate funding to support the Cooperative Enforcement Program (CEP). These JEAs provide funds to state and U.S. territorial law enforcement agencies to perform enforcement services in support of Federal regulations.

HABITAT CONSERVATION AND RESTORATION

SUSTAINABLE HABITAT MANAGEMENT -$4,836
This request will reduce additional funding provided in FY 2020 for Sustainable Habitat Management. Of this amount, NOAA will reduce Essential Fish Habitat (EFH) consultations by $3.0 million and other activities, such as ensuring fish passage at hydropower dams licensed by FERC or identifying and conserving deep water corals, by $1.8 million. NMFS will continue to perform EFH consultations with available resources.

FISHERIES HABITAT GRANTS -$14,723
This request will eliminate grants for habitat restoration projects. NOAA will end its financial support for partnerships and grants provided through the Community-based Restoration Program, and will continue to provide technical expertise and leadership to states, tribes, and local communities, as well as other programs and Federal agencies implementing fishery and coastal habitat restoration project, as resources allow.

Oceanic and Atmospheric Research

ORF
CLIMATE LABORATORIES AND COOPERATIVE INSTITUTES

AOML CLIMATE RESEARCH TERMINATION -$5,057
This request will terminate funding for climate-related research and observations at the Atlantic Oceanographic & Meteorological Laboratory (AOML). This decrease will not close AOML however; for example, AOML's other work funded through weather and oceans PPAs includes critical research of hurricanes, ocean observation, and oceans and coastal systems will continue.

LABORATORIES AND COOPERATIVE INSTITUTES DECREASE (CLIMATE) -$6,570
This request will reduce funding for activities in the Climate Laboratories and Cooperative Institutes, including the Experimental, Seasonal to Decadal (S2D) Predictions activities that are intended to minimize gaps in forecasting capabilities and identified as benefiting from short-term funding in FY 2020.

ARCTIC RESEARCH ELIMINATION -$1,940
This request will eliminate Arctic research within the Climate Laboratories & Cooperative Institutes Subactivity. NOAA will terminate improvements to sea ice modeling and predictions and y other Arctic research products, including future scenarios for changes to Arctic Ocean sea-ice extent, ecosystem and fisheries vulnerabilities, and ocean acidification.

REGIONAL CLIMATE DATA & INFORMATION

ARCTIC RESEARCH ELIMINATION -$3,745
This request will eliminate Arctic research within the Regional Climate Data & Information Subactivity. NOAA will terminate improvements to sea ice modeling and predictions and other Arctic research products, including future scenarios for changes to Arctic Ocean sea-ice extent, ecosystem and fisheries vulnerabilities, and ocean acidification.

ELIMINATE CLIMATE COMPETITIVE RESEARCH FUNDING -$22,797
This request will eliminate climate competitive research activities in the Regional Climate Data and Information Subactivity, terminating the Regional Integrated Sciences and Assessments Program (RISA) program, and eliminating NOAA's portion of the funding for the National Climate Assessment (NCA). NOAA will continue to provide support for the NCA through other PPAs.

CLIMATE COMPETITIVE RESEARCH

ELIMINATE CLIMATE COMPETITIVE RESEARCH SUBACTIVITY -$43,087
This request will terminate the Climate Program Office (CPO), with the exception of the National Integrated Drought Information System (NIDIS) program. It will also reduce competitive research grants to cooperative institutes, universities, NOAA research laboratories, and other partners.

WEATHER AND AIR CHEMISTRY RESEARCH LABORATORIES AND COOPERATIVE INSTITUTES

AIR RESOURCES LABORATORY CLOSURE -$4,979
This request will close the Air Resources Laboratory. It will eliminate ARL's research on air chemistry, mercury deposition, and atmospheric dispersion of harmful materials, as well as ARL's observational data collection that is being used to study and project effects of air chemistry on human health and the environment.

VORTEX-SOUTHEAST TERMINATION -$4,966
This request will terminate Vortex-Southeast (VORTEX-SE), a project that seeks to improve tornado forecasts in the southeastern U.S.

LABORATORIES AND COOPERATIVE INSTITUTES DECREASE -$6,860
This request will reduce funding for weather research activities identified as benefiting from short-term funding in FY 2020.

U.S WEATHER RESEARCH PROGRAM (USWRP)

INFRASONIC WEATHER MONITORING RESEARCH TERMINATION -$1,000
With this reduction, NOAA will conclude infrasonic monitoring research. NOAA has completed an evaluation of this technology using congressionally directed funding in FY 2016 through FY 2020.

U.S. WEATHER RESEARCH PROGRAM (USWRP) DECREASE -$6,486
This request will decrease the funding for activities in USWRP identified as benefiting from short-term funding in FY 2020, as NOAA shifts its focus to the Earth Prediction Innovation Center (EPIC) to accelerate research to improve weather models.

TORNADO/SEVERE STORM RESEARCH (PAR)

TORNADO SEVERE STORM RESEARCH/PAR DECREASE -$1,020
This request will decrease the funding used to advance priority activities in Tornado/Severe Storm Research line. NOAA will prioritize the remaining funding to continue evaluation of the Phased Array Radar (PAR) technology as a possible cost-effective replacement for aging weather radars.

JOINT TECHNOLOGY TRANSFER INITIATIVE

JOINT TECHNOLOGY TRANSFER INITIATIVE (JTTI) -$11,997
NOAA will decrease the funding used to accelerate the transition of the most promising research activities within NOAA and the weather enterprise into NWS operations through testing, demonstrating,

and partnerships with external partners.

OCEAN, COASTAL, AND GREAT LAKES LABORATORIES AND COOPERATIVE INSTITUTES

GENOMICS TERMINATION -$1,880
With this reduction, NOAA will eliminate the environmental genomics program at the Atlantic Oceanographic and Meteorological Laboratory (AOML).

LABORATORIES AND COOPERATIVE INSTITUTES DECREASE -$5,335
This request will reduce funding for activities in the Ocean, Coasts, & Great Lakes Laboratories and Cooperative Institutes identified as benefiting from short-term funding in FY 2020,

NATIONAL SEA GRANT COLLEGE PROGRAM

NATIONAL SEA GRANT COLLEGE PROGRAM TERMINATIONS -$87,198
With this reduction, NOAA will terminate the National Sea Grant College Program Base and the Marine Aquaculture Program.

OCEAN EXPLORATION AND RESEARCH

OCEAN EXPLORATION DECREASE -$10,146
This request will decrease extramural ocean exploration and research efforts. However, within its base program, NOAA will reprioritize activities to support the Presidential Memorandum on Ocean Mapping.

INTEGRATED OCEAN ACIDIFICATION

INTEGRATED OCEAN ACIDIFICATION DECREASE -$5,947
This request will reduce funding for the Integrated Ocean Acidification Program. NOAA will continue to support the highest priority research within OA that improves our understanding of ocean and coastal acidification (OA) and its impacts on marine resources, coastal communities, and economies.

SUSTAINED OCEAN OBSERVATIONS AND MONITORING

SUSTAINED OCEAN OBSERVATIONS AND MONITORING DECREASE -$8,107
This request will reduce external grant funding for the global ocean observing system.

HIGH PERFORMANCE COMPUTING AND COMMUNICATIONS (HPCC)

R&D HPC CLOUD COMPUTING SERVICES DECREASE -$1,609
This request will reduce funding toward NOAA's expansion of cloud and community computing capability.

PAC
RESEARCH SUPERCOMPUTING/CCRI

MISSISSIPPI STATE PARTNERSHIP TERMINATION -$15,000
With this reduction, NOAA will terminate the Mississippi State University Partnership established by congressionally directed requirements to develop a dedicated high performance computing facility in collaboration with partners with existing high performance computing expertise and scientific synergies.

RESEARCH SUPERCOMPUTING DECREASE -$1,000
With this reduction, NOAA will decrease funding to the NOAA Research and Development (R&D) High Performance Computing System (HPCS) as NOAA strategically shifts to greater utilization of commercially-provided cloud computing services.

National Weather Service

ORF
OBSERVATIONS

NATIONAL MESONET PROGRAM -$4,200
NOAA proposes this decrease which will reduce funding for the National Mesonet Program. The decrease will sustain a core set of ongoing activities and procurement of non-Federal surface and near-surface mesonet observational data from external partners, which will strengthen this private/public partnership.

REDUCE MARINE OBSERVATIONS -$1,500
NOAA proposes this reduction to the scope and operations of marine observations. NOAA will maintain its full array of 39 Deep-ocean Assessment and Reporting of Tsunamis (DART) moorings to support the tsunami mission, but will remove 17 of the 210 NOAA Water Level Observation Network (NWLON stations and NOAA's contribution to the US Geological Survey Seismic network which also supports the tsunami mission.

REDUCE MARINE OBSERVATIONS TROPICAL ATMOSPHERE OCEAN PLATFORM -$1,300
NOAA proposes this reduction to the Tropical Atmosphere Ocean Platform. This decrease will reduce the 55-buoy array by 15 while maintaining 80 percent availability for the remaining network.

REDUCE UPPER AIR OBSERVATIONS -$1,655
NOAA will reduce the geographic scope and purchase of observations performed by aircraft and will eliminate the aircraft observations over other parts of the oceans and in other continents. NOAA will reduce the number of reserve radiosondes, to an amount needed for daily operations only.

REDUCE SHIP OBSERVATIONS DATA BUY -$500
NOAA will reduce the purchase of commercial ship observations data by 23 percent. NOAA will continue to be reliant on an extreme sparse Volunteer Observing Ship network to support its forecast and warning responsibilities in all its areas of maritime responsibility, and it will miss the opportunity of increasing the level of data available in data spare areas.

REDUCE NEXRAD RADOME & TOWER MAINTENANCE SERVICES -$1,000
NOAA proposes this decrease to the NEXRAD and Tower Maintenance Services contract. This reduction would result in the inability to maintain and repair approximately seven radomes and nine towers each year. This decrease would result in the need to defer some routine repair and maintenance to future years. NEXRAD and Tower repair and maintenance are necessitated by damage from lightning strikes, high winds, hail, vandalism, and normal degradation.

REDUCE WEATHER AND OCEAN PLATFORM BUOYS -$1,200
NOAA will eliminate seven buoys that are farthest from U.S. shores in the tropical Atlantic Ocean and are the most costly to operate, while maintaining 80 percent availability for the remaining nine buoys in the tropical Atlantic.

CENTRAL PROCESSING

ESTABLISHMENT OF REGIONAL ENTERPRISE APPLICATION DEVELOPMENT AND INTEGRATION TEAMS -$11,917
NOAA proposes to initiate a phased consolidation of the NWS 122 Information Technology Officers (ITO) located at each WFO. Consolidating IT support functions is a critical part of evolving the NWS, including a right-sized workforce and appropriate organizational structure.

SLOW ADVANCED HYDROLOGIC PREDICTION SYSTEM EXPANSION -$2,000
NOAA will slow the expansion of new technology at AHPS forecast locations, reducing training and implementation support. NOAA will delay/forgo aspects of research and development efforts to address limitations in HEFSv1.

ANALYZE, FORECAST AND SUPPORT

REDUCE NWS WORKFORCE -$15,000
This program change request reduces forecast personnel by implementing recommendations outlined in NWS' Operations and Workforce Analysis (OWA) which will enable NWS to continue to evolve and build a Weather-Ready Nation. The OWA recognizes inherent inefficiencies associated with the rigid field office structure of NWS and provides various recommendations to make the agency more effective and efficient to protect lives and property.

REDUCE TSUNAMI WARNING PROGRAM -$11,000
NOAA will merge the Pacific Tsunami Warning Center in Hawaii and the National Tsunami Warning Center in Alaska. NOAA proposes to continue to fund critical operational tsunami program components to ensure high-quality tsunami watches, warnings, and advisories at one center.

TERMINATE AVIATION SCIENCE RESEARCH TO OPERATIONS -$1,806
In coordination with the proposed program change in the Science and Technology Integration activity, NOAA will terminate aviation science research and development and R2O transition efforts. With this reduction, NOAA will maintain current levels of operational aviation weather forecast products and services, but will terminate efforts to complete, develop and implement aviation tools and capabilities that support the Next Generation Air Transportation System (NextGen).

CONSOLIDATE CLIMATE PREDICTION CENTER/WEATHER PREDICTION CENTER FUNCTIONS -$1,200
NOAA will consolidate functions at the National Centers for Environmental Prediction (NCEP) Climate Prediction Center (CPC) and Weather Prediction Center (WPC). The consolidation will result in creating one national center that will span the continuum of prediction services through existing sub-seasonal and seasonal time domains, eliminate overlap between the transition at the weather and climate scale domains, improve efficiency, promote consistency in presenting data and forecast information, and base products on monthly and seasonal predictions of temperature and precipitation.

REDUCTION TO OFFICE OF WATER PREDICTION CENTER STAFFING SUPPORT -$1,500
NOAA will maintain the current staffing levels within the Water Prediction Operations Division (WPOD) at the Office of Water Prediction (OWP) located at the National Water Center (NWC). This decrease will delay meeting Full Operating Capability (FOC) as previously directed in the Consolidated Appropriations Act, 2020.

DISSEMINATION

REDUCTION IN NOAA WEATHER RADIO TRANSMITTERS -$1,750
NOAA will reduce the number of NOAA Weather Radio (NWR) transmitters by 27 percent, from 1,030 to 754. NOAA will initiate the termination of 276 NWR transmitters at targeted locations based on combined lease, telecom, utilities, and maintenance costs, as well as taking into account high populated areas, including urban areas with greater cell phone coverage and other means of warning communication services.

SCIENCE AND TECHNOLOGY INTEGRATION

REDUCE THE INVESTMENT IN NUMERICAL WEATHER PREDICTION MODELING -$2,101
NOAA will decelerate investments that would transition advanced modeling research into operations for improved warnings and forecasts. NOAA proposes to slow down the development of the Next Generation Global Prediction System (NGGPS) and Hurricane Forecast Improvement Project (HFIP) by reducing grants for collaborative research activities and NOAA's testbeds.

TERMINATE HYDROLOGY AND ADDITIONAL WATER RESOURCES -$6,000
NOAA proposes to terminate the external grants, which supported collaboration with external academic partners to improve fine and large-scale measurements of snow depth and soil moisture data that can be used to expand and improve the National Water Model (NWM).

TERMINATE COASTAL ACT -$5,000
NOAA proposes to terminate the actions associated with the implementation of the Consumer Option for an Alternative System to Allocate Losses (COASTAL) Act of 2012. This termination includes the efforts to develop the capability to produce detailed "post-storm assessments" in the aftermath of a damaging tropical cyclone that strikes the U.S. or its territories. This also terminates efforts to create a Coastal Wind and Water Event Database (CWWED) to provide the public access to "covered data" (the observations collected during the storm to assist with the assessment.

TERMINATE AVIATION SCIENCE RESEARCH TO OPERATIONS -$1,000
NOAA proposes to terminate aviation science research and development and research into operations (R20) transition efforts within the NWS. NWS will maintain the current level of operational aviation weather forecast products and services. The termination will include automated aviation forecast verification tools, digital aviation service tools, collaborative aviation weather statements (CAWS), local aviation model statistical guidance, and integrated support for impacting air-traffic environment (INSITE) tools.

PAC
OBSERVATIONS

SERVICE LIFE EXTENSION PROGRAM FOR NEXRAD -$550
NOAA proposes a planned decrease for the Service Life Extension Program (SLEP) to sustain aging Next Generation Weather Radar (NEXRAD) infrastructure. This reflects the award of major contracts on the pedestal and shelter refurbishments, and generator replacement projects, now in deployment.

CENTRAL PROCESSING

ELIMINATE INTEGRATED WATER PREDICTION HIGH PERFORMANCE COMPUTING -$4,172
NOAA proposes this decrease which will eliminate high performance computing funding for Integrated Water Prediction (IWP) capability.

REDUCE RESEARCH AND DEVELOPMENT HIGH PERFORMANCE COMPUTING -$4,400
NOAA proposes this decrease which will reduce the NWS contribution to NOAA's Research and Development High Performance Computing System (R&D HPCS). NOAA proposes to eliminate the "Jet" supercomputing system and associated contract support in Boulder, CO and reduce NWS's supercomputing use and associated contract support in Fairmont, WV.

National Environmental Satellite, Data and Information Service

ORF
SATELLITE AND PRODUCT OPERATIONS

OSPO DEFERRED AND EXTENDED MAINTENANCE -$5,032
NOAA will decrease satellite operations and maintenance though a decrease to support activities by deferring and extending maintenance schedules. NOAA will prioritize operational and primary satellite support activities.

PRODUCT DEVELOPMENT, READINESS & APPLICATION

DECREASE DATA PRODUCTS DEVELOPED -$1,021
NOAA will reduce the number of PDR&A data products, applications, techniques, and systems developed, and will continue to focus on calibration and validation in order to provide accurate products to customers.

NATIONAL CENTERS FOR ENVIRONMENTAL INFORMATION

REGIONAL CLIMATE SERVICES TERMINATION -$6,000
NOAA will terminate Regional Climate Services, to include termination of the Regional Climate Centers.

NCEI EXTERNAL GRANT REDUCTION -$4,589
NOAA will reduce grants provided to the Cooperative Institues at the University of Colorado in Boulder, University of Maryland at College Park, North Carolina State University, and Mississippi Sea Grant. This decrease will limit NCEI's science innovation efforts, reducing the quantity of products and services, and impacting users particulary in the business sectors.

PAC
POLAR WEATHER SATELLITES

POLAR WEATHER SATELLITES DECREASE -$87,165
The remaining funds will be used to continue the build of the JPSS-2 instruments and spacecraft, continue JPSS-2 satellite level integration and testing, and continue the development of the spacecraft and instruments for JPSS-3 and JPSS-4.

SATELLITE GROUND SERVICES

SATELLITE GROUND SERVICES -$4,237
The requested decrease will support sustainment of existing ground systems, including technology refresh and hardware and software upgrades. Sustainment requirements for legacy ground systems will be prioritized.

Mission Support

ORF
MISSION SERVICES AND MANAGEMENT

NMFS OPERATIONS CONTRACT -$1,000
This request eliminates additional funds provided in FY 2020 appropriations to enter into a contract with an independent organization to evaluate efficiencies that can be made to NMFS budgetary operations.

OFFICE OF EDUCATION

OFFICE OF EDUCATION GRANTS -$21,434
Eliminate funding for the Competitive Education Grants Program ($3,050), and the Educational Partnership Program for Minority Serving Institutions (EPP/MSI) ($17,200) within the Office of Education and reduce funds for the Office of Education ($1,184). Remaining funds for the Office of Education of $1,108 will support a centralized office focused on coordinating and improving the performance of NOAA's numerous activities in STEM education.

NOAA BAY-WATERSHED EDUCATION AND TRAINING (B-WET) REGIONAL PROGRAM -$7,750
Terminate the Bay-Watershed Education and Training (B-WET) Regional Program.

PAC
NOAA CONSTRUCTION

FACILITIES MAINTENANCE AND CONSTRUCTION -$35,203
NOAA proposes a decrease for deferred maintenance and construction. NOAA will prioritize the remaining $20,785 in NOAA Construction (excluding requested funds for implementation of the Northwest/Alaska Regional Footprint Study) for its highest priority facilities maintenance (both regular and deferred) and recapitalization needs.

Office of Marine and Aviation Operations

ORF
MARINE OPERATIONS AND MAINTENANCE

REDUCE DAYS AT SEA (DAS) PERFORMED -$2,760
NOAA requests a decrease in funding for ship operational maintenance and repair. NOAA will ensure the program continues to support OMAO's highest priority maintenance and repair needs. This decrease will result in approximately 75 less days at sea being performed in FY 2021.

AVIATION OPERATIONS AND AIRCRAFT SERVICES

ATMOSPHERIC RIVERS -$1,500
NOAA requests a decrease to reduce additional congressionally-directed funds provided in FY 2020 for the monitoring of atmospheric rivers.

REDUCE AIRCRAFT OPERATIONS -$762
NOAA requests a decrease to aircraft operations. To accommodate increased operational costs, OMAO will reduce aircraft operations by approximately 370 flight hours.

UNMANNED SYSTEM OPERATIONS

UNMANNED SYSTEMS -$7,563
NOAA requests to a decrease to the Unmanned System Operations Program. This reduction will decrease unmanned systems research and the acquisition of data from unmanned maritime systems, while continuing to increase the application and use of unmanned aircraft and marine systems in every area of NOAA.

NOAA CORPS

REDUCE PILOT TRAINING AND RECRUITMENT -$1,500
NOAA requests a decrease to pilot training and recruitment. NOAA proposes to decrease additional funds provided by Congress in FY 2020 to further efforts to recruit and train NOAA Corps pilots.

PAC
PLATFORM CAPITAL IMPROVEMENT AND TECH INFUSION

DECREASE IN PROGRESSIVE LIFECYCLE MAINTENANCE -$6,300
NOAA requests a decrease in funds for capital repairs to NOAA's ship fleet. Funding provided in FY 2018 and FY 2019 are helping to address the deferred maintenance backlog on NOAA vessels. Funds provided in FY 2021 will be used to meet priority at-sea requirements and improve Fleet support to NOAA's mission-critical nautical charting, bathymetric mapping, fisheries research, ecosystem assessments, coastal-ocean circulation, and oceanographic and atmospheric research.

The public celebrates the designation of the Mallows Bay-Potomac River National Marine Sanctuary, the first national marine sanctuary to be designated since the year 2000.

APPENDIX 1

Proposed Changes to General Provisions

NOAA seeks the following changes to the General Provisions in its FY 2021 budget submission. For a more detailed discussion of the justification for these proposed changes, please consult the FY 2021 Congressional Justification.

1. NOAA Cost Recovery Language

SEC. 108. To carry out the responsibilities of the National Oceanic and Atmospheric Administration (NOAA), the Administrator of NOAA is authorized to: (1) enter into grants and cooperative agreements with; (2) use on a non-reimbursable basis land, services, equipment, personnel, and facilities provided by; and (3) receive and expend funds made available on a consensual basis from: a Federal agency, State or subdivision thereof, local government, tribal government, territory, or possession or any subdivisions thereof, foreign government, international or intergovernmental organization, public or private organization, or individual: Provided, That funds received pursuant to this section shall be deposited accordingly under the heading "National Oceanic and Atmospheric Administration—Operations, Research, and Facilities" and "National Oceanic and Atmospheric Administration—Procurement, Acquisition, and Construction" and shall remain available until expended, for such purposes: Provided further, That all funds within this section and their corresponding uses are subject to section 505 of this Act.

Justification

NOAA proposes clarifying edits and expansion of this authority to include additional entities such as foreign government, international or intergovernmental organization, public or private organization, or individual.

APPENDIX 2

Technical Adjustments by PPA

Technical adjustments refer to unique or technical adjustments to the base program, for example transfers of base resources between budget lines.

Account	Line Office	PPA	NOS Marine Sanctuaries Transfer	Regional Councils and Fisheries Commission Consolidation	OAR Consolidate Climate Research	NESDIS Transfers to ORF Operations	NESDIS Phase A Mission Concept	Transfers to DOC	Facilities Maintenance Consolidation (ORF)	Facilities Maintenance Consolidation (PAC)	OMAO NOAA Corps	Total PPA Technical ATB
ORF	NOS	Sanctuaries and Marine Protected Areas	462									462
ORF	NMFS	Marine Mammals, Sea Turtles, and Other Species							(253)			(253)
ORF	NMFS	Fisheries and Ecosystem Science Programs and Services							(1,536)			(1,536)
ORF	NMFS	Fisheries Data Collections, Surveys, and Assessments		(534)								(534)
ORF	NMFS	Fisheries Management Programs and Services		(4,317)								(4,317)
ORF	NMFS	Regional Councils and Fisheries Commissions		4,851								4,851
ORF	NMFS	Habitat Conservation and Restoration							(255)			(255)
ORF	OAR	Climate Research Laboratories and Cooperative Institutes			14,932							14,932
ORF	OAR	Climate Competitive Research			(20,608)							(20,608)
ORF	OAR	U.S. Weather Research Program (USWRP)			5,676							5,676
ORF	NESDIS	Satellite and Product Operations				22,375						22,375
ORF	NESDIS	Commercial Remote Sensing Regulatory Affairs						(1,800)				(1,800)
ORF	NESDIS	Office of Space Commerce						(2,300)				(2,300)
ORF	MS	Mission Services and Management						(799)		(1,000)		(1,799)
ORF	MS	Payment to the DOC Working Capital Fund						(1,421)				(1,421)
ORF	MS	Facilities Maintenance							2,044			2,044
ORF	OMAO	Marine Operations and Maintenance									(34,326)	(34,326)
ORF	OMAO	Aviation Operations and Aircraft Services									(8,423)	(8,423)
ORF	OMAO	Unmanned Systems Operations									(399)	(399)
ORF	OMAO	NOAA Corps									43,148	43,148
PAC	NOS	Marine Sanctuaries Construction Base	(462)							(2,538)		(3,000)
PAC	NWS	Facilities Construction and Major Repairs								(10,000)		(10,000)
PAC	NESDIS	Cooperative Data and Rescue Services				(450)						(450)
PAC	NESDIS	Satellite Ground Services				(17,198)						(17,198)
PAC	NESDIS	Projects, Planning and Analysis				(4,727)						(4,727)
PAC	NESDIS	Geostationary Earth Orbit (GEO)					10,000					10,000
PAC	NESDIS	Systems/Services Architecture & Engineering (SAE)					(10,000)					(10,000)
PAC	NESDIS	Satellite CDA Facility								(2,450)		(2,450)
PAC	MS	NOAA Construction								15,988		15,988
	Total		0	0	0	0	0	(6,320)	0	0	0	(6,320)

* The total PPA Technical ATB column aligns with the amounts for each PPA in the Technical ATBs column of the FY 2021 President's Budget Control Table as reflected in the CJ.

**Note that the FY 2021 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.

National Ocean Service DOLLARS IN THOUSANDS

Navigation, Observations and Positioning					
Navigation, Observations and Positioning	159,456	5,367	164,823	(3,540)	161,283
Hydrographic Survey Priorities/Contracts	32,000	0	32,000	(5,051)	26,949
IOOS Regional Observations	39,000	0	39,000	(19,556)	19,444
Total, Navigation, Observations and Positioning	**230,456**	**5,367**	**235,823**	**(28,147)**	**207,676**
Coastal Science and Assessment					
Coastal Science, Assessment, Response and Restoration	82,000	3,412	85,412	(39,350)	46,062
Competitive Research	19,000	0	19,000	(19,000)	0
Total, Coastal Science and Assessment	**101,000**	**3,412**	**104,412**	**(58,350)**	**46,062**
Ocean and Coastal Management and Services					
Coastal Zone Management and Services	45,000	1,543	46,543	(274)	46,269
Coastal Management Grants	77,000	0	77,000	(77,000)	0
Title IX Fund	33,000	0	33,000	(33,000)	0
Coral Reef Program	29,500	268	29,768	(3,661)	26,107
National Estuarine Research Reserve System	27,500	0	27,500	(27,500)	0
Sanctuaries and Marine Protected Areas	55,500	2,885	58,385	(3,463)	54,922
Total, Ocean and Coastal Management and Services	**267,500**	**4,696**	**272,196**	**(144,898)**	**127,298**
Total, NOS - Discretionary ORF	**598,956**	**13,475**	**612,431**	**(231,395)**	**381,036**
Total, NOS - Discretionary PAC	7,500	(3,000)	4,500	(4,500)	0
Total, NOS - Other Discretionary Accounts	0	0	0	0	0
Discretionary Total - NOS	**606,456**	**10,475**	**616,931**	**(235,895)**	**381,036**
Total, NOS - Mandatory Accounts	210,618	(187,561)	23,057	0	23,057
GRAND TOTAL NOS	**817,074**	**(177,086)**	**639,988**	**(235,895)**	**404,093**

National Marine Fisheries Service DOLLARS IN THOUSANDS

FY 2021 Proposed Operating Plan	FY 2020 Enacted	Total FY 2021 ATBs	FY 2021 Base	FY 2021 Program Changes	FY 2021 Estimate
Protected Resources Science and Management					
Marine Mammals, Sea Turtles, and Other Species	122,164	3,860	126,024	(10,440)	115,584
Species Recovery Grants	7,000	10	7,010	(1,010)	6,000
Atlantic Salmon	6,500	135	6,635	(248)	6,387
Pacific Salmon	65,000	2,999	67,999	(3,763)	64,236
Total, Protected Resources Science and Management	**200,664**	**7,004**	**207,668**	**(15,461)**	**192,207**
Fisheries Science and Management					
Fisheries and Ecosystem Science Programs and Services	146,427	3,591	150,018	(11,643)	138,375
Fisheries Data Collections, Surveys, and Assessments	173,709	3,701	177,410	(13,358)	164,052
Observers and Training	54,968	1,104	56,072	(11,115)	44,957
Fisheries Management Programs and Services	123,836	(232)	123,604	(10,904)	112,700
Aquaculture	15,250	273	15,523	(2,402)	13,121
Salmon Management Activities	58,043	260	58,303	(21,595)	36,708
Regional Councils and Fisheries Commissions	40,247	6,208	46,455	(1,878)	44,577
Interjurisdictional Fisheries Grants	3,365	0	3,365	(3,365)	0
Total, Fisheries Science and Management	**615,845**	**14,905**	**630,750**	**(76,260)**	**554,490**
Enforcement					
Enforcement	74,023	2,269	76,292	(20,362)	55,930
Total, Enforcement	**74,023**	**2,269**	**76,292**	**(20,362)**	**55,930**
Habitat Conservation and Restoration					
Habitat Conservation and Restoration	57,125	1,482	58,607	(19,559)	39,048
Subtotal, Habitat Conservation & Restoration	**57,125**	**1,482**	**58,607**	**(19,559)**	**39,048**
Total, NMFS - Discretionary ORF	**947,657**	**25,660**	**973,317**	**(131,642)**	**841,675**
Total, NMFS - Discretionary PAC	0	0	0	0	0
Total, NMFS - Other Discretionary Accounts	65,349	0	65,349	(64,700)	649
Discretionary Total - NMFS	**1,013,006**	**25,660**	**1,038,666**	**(196,342)**	**842,324**
Total, NMFS - Mandatory Accounts	42,030	(14,604)	27,426	0	27,426
GRAND TOTAL NMFS	**1,055,036**	**11,056**	**1,066,092**	**(196,342)**	**869,750**

Office of Oceanic and Atmospheric Research DOLLARS IN THOUSANDS

FY 2021 Proposed Operating Plan	FY 2020 Enacted	Total FY 2021 ATBs	FY 2021 Base	FY 2021 Program Changes	FY 2021 Estimate
Climate Research					
Laboratories & Cooperative Institutes	66,500	17,368	83,868	(13,567)	70,301
Regional Climate Data & Information	40,000	144	40,144	(26,542)	13,602
Climate Competitive Research	63,000	(19,913)	43,087	(43,087)	0
Total, Climate Research	**169,500**	**(2,401)**	**167,099**	**(83,196)**	**83,903**
Weather & Air Chemistry Research					
Laboratories & Cooperative Institutes					
Laboratories & Cooperative Institutes	82,000	2,469	84,469	(16,805)	67,664
Subtotal, Laboratories & Cooperative Institutes	**82,000**	**2,469**	**84,469**	**(16,805)**	**67,664**
Weather & Air Chemistry Research Programs					
U.S. Weather Research Program (USWRP)	23,000	5,753	28,753	2,714	31,467
Tornado Severe Storm Research / Phased Array Radar	13,634	33	13,667	(1,020)	12,647
Joint Technology Transfer Initiative	15,000	11	15,011	(11,997)	3,014
Subtotal, Weather & Air Chemistry Research Programs	**51,634**	**5,797**	**57,431**	**(10,303)**	**47,128**
Total, Weather & Air Chemistry Research	**133,634**	**8,266**	**141,900**	**(27,108)**	**114,792**
Ocean, Coastal, and Great Lakes Research					
Laboratories & Cooperative Institutes					
Laboratories & Cooperative Institutes	35,500	1,300	36,800	(7,215)	29,585
Subtotal, Laboratories & Cooperative Institutes	**35,500**	**1,300**	**36,800**	**(7,215)**	**29,585**
National Sea Grant College Program					
National Sea Grant College Program Base	74,000	187	74,187	(74,187)	0
Marine Aquaculture Program	13,000	11	13,011	(13,011)	0
Subtotal, National Sea Grant College Program	**87,000**	**198**	**87,198**	**(87,198)**	**0**
Ocean Exploration and Research	42,000	242	42,242	(10,146)	32,096
Integrated Ocean Acidification	14,000	174	14,174	(5,947)	8,227
Sustained Ocean Observations and Monitoring	45,000	408	45,408	(8,107)	37,301
National Oceanographic Partnership Program	5,000	11	5,011	534	5,545
Total, Ocean, Coastal, & Great Lakes Research	**228,500**	**2,333**	**230,833**	**(118,079)**	**112,754**

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Office of Oceanic and Atmospheric Research (cont'd) DOLLARS IN THOUSANDS

FY 2021 Proposed Operating Plan	FY 2020 Enacted	Total FY 2021 ATBs	FY 2021 Base	FY 2021 Program Changes	FY 2021 Estimate
Innovative Research & Technology					
High Performance Computing Initiatives	16,750	155	16,905	(1,609)	15,296
Total, Innovative Research & Technology	**16,750**	**155**	**16,905**	**(1,609)**	**15,296**
Total, OAR - Discretionary ORF	**548,384**	**8,353**	**556,737**	**(229,992)**	**326,745**
Total, OAR - Discretionary PAC	42,000	0	42,000	(16,000)	26,000
Total, OAR - Other Discretionary Accounts	0	0	0	0	0
Discretionary Total - OAR	**566,060**	**8,353**	**598,737**	**(245,992)**	**352,745**

National Weather Service DOLLARS IN THOUSANDS

Observations	229,862	7,782	237,644	(7,355)	230,289
Central Processing	97,980	4,558	102,538	(14,166)	88,372
Analyze, Forecast and Support	513,556	17,979	531,535	(30,755)	500,780
Dissemination	76,843	2,269	79,112	(750)	78,362
Science and Technology Integration	147,460	3,963	151,423	(12,350)	139,073
Total, NWS - Discretionary ORF	**1,065,701**	**36,551**	**1,102,252**	**(65,376)**	**1,036,876**
Total, NWS - Discretionary PAC	102,945	(10,000)	92,945	(9,553)	83,392
Total, NWS - Other Discretionary Accounts	0	0	0	0	0
Discretionary Total - NWS	**1,168,646**	**26,551**	**1,195,197**	**(74,929)**	**1,120,268**

National Environmental Satellite Data and Information Service
DOLLARS IN THOUSANDS

FY 2021 Proposed Operating Plan	FY 2020 Enacted	Total FY 2021 ATBs	FY 2021 Base	FY 2021 Program Changes	FY 2021 Estimate
Environmental Satellite Observing Systems					
Office of Satellite and Product Operations	166,063	28,068	194,131	(5,032)	189,099
Product Development, Readiness & Application	28,434	473	28,907	(1,021)	27,886
Commercial Remote Sensing Regulatory Affairs	1,800	(1,800)	0	0	0
Office of Space Commerce	2,300	(2,300)	0	0	0
U.S. Group on Earth Observations (USGEO)	500	0	500	0	500
Total, Environmental Satellite Observing Systems	**199,097**	**24,441**	**223,538**	**(6,053)**	**217,485**
National Centers for Environmental Information					
National Centers for Environmental Information	61,642	1,454	63,096	(10,589)	52,507
Total, National Centers for Environmental Information	**61,642**	**1,454**	**63,096**	**(10,589)**	**52,507**
Total, NESDIS - Discretionary ORF	**260,739**	**25,895**	**286,634**	**(16,642)**	**269,992**
Total, NESDIS - Discretionary PAC	1,252,143	(24,825)	1,227,318	6,672	1,233,990
Total, NESDIS - Other Discretionary Accounts	0	0	0	0	0
Discretionary Total - NESDIS	**1,512,882**	**1,070**	**1,513,952**	**(9,970)**	**1,503,982**

Mission Support DOLLARS IN THOUSANDS

Executive Leadership	27,078	1,195	28,273	(249)	28,024
Mission Services and Management	155,934	4,029	159,963	1,200	161,163
IT Security	15,079	299	15,378	0	15,378
Payment to the DOC Working Capital Fund	62,070	4,319	66,389	0	66,389
Office of Education	30,200	92	30,292	(29,184)	1,108
Facilities Maintenance	0	2,044	2,044	7,607	9,651
Total, MS - Discretionary ORF	**290,361**	**11,978**	**302,339**	**(20,626)**	**281,713**
Total, MS - Discretionary PAC	40,000	15,988	55,988	(14,703)	41,285
Total, MS - Other Discretionary Accounts	0	0	0	0	0
Discretionary Total - MS	**330,361**	**27,966**	**358,327**	**(35,329)**	**322,998**

Office of Marine and Aviation Operations DOLLARS IN THOUSANDS

Marine Operations and Maintenance	194,000	(27,901)	166,099	(2,760)	163,339
Aviation Operations and Aircraft Services	37,750	(7,284)	30,466	(2,262)	28,204
Unmanned System Operations	12,665	128	12,793	(7,563)	5,230
NOAA Corps	0	43,148	43,148	(1,500)	41,648
Total, OMAO - Discretionary ORF	**244,415**	**8,091**	**252,506**	**(14,085)**	**238,421**
Total, OMAO - Discretionary PAC	98,000	0	98,000	(4,300)	93,700
Total, OMAO - Other Discretionary Accounts	1,497	94	1,591	0	1,591
Discretionary Total - OMAO	**343,912**	**8,185**	**352,097**	**(18,385)**	**333,712**
Total, OMAO - Mandatory Accounts	30,075	0	30,075	0	30,075
GRAND TOTAL OMAO	**373,987**	**8,185**	**382,172**	**(18,385)**	**363,787**

LO Direct Discretionary ORF Obligations DOLLARS IN THOUSANDS

FY 2021 Proposed Operating Plan	FY 2020 Enacted	Total FY 2021 ATBs	FY 2021 Base	FY 2021 Program Changes	FY 2021 Estimate
National Ocean Service	598,956	13,475	612,431	(231,395)	381,036
National Marine Fisheries Service	947,657	25,660	973,317	(131,642)	841,675
Office of Oceanic and Atmospheric Research	548,384	8,353	556,737	(229,992)	326,745
National Weather Service	1,065,701	36,551	1,102,252	(65,376)	1,036,876
National Environmental Satellite, Data and Information Service	260,739	25,895	286,634	(16,642)	269,992
Mission Support	290,361	11,978	302,339	(20,626)	281,713
Office of Marine and Aviation Operations	244,415	8,091	252,506	(14,085)	238,421
SUBTOTAL LO DIRECT DISCRETIONARY ORF OBLIGATIONS	**3,956,213**	**130,003**	**4,086,216**	**(709,758)**	**3,376,458**

ORF Adjustments DOLLARS IN THOUSANDS

SUBTOTAL ORF DIRECT OBLIGATIONS	**3,956,213**	**130,003**	**4,086,216**	**(709,758)**	**3,376,458**
FINANCING					
Deobligations	(17,500)	(10,000)	(27,500)	0	(27,500)
Total ORF Financing	**(17,500)**	**(10,000)**	**(27,500)**	**0**	**(27,500)**
SUBTOTAL ORF BUDGET AUTHORITY	**3,938,713**	**120,003**	**4,058,716**	**(709,758)**	**3,348,958**
TRANSFERS					
Transfer from P&D to ORF	(174,774)	(9,060)	(183,834)	0	(183,834)
Total ORF Transfers	**(174,774)**	**(9,060)**	**(183,834)**	**0**	**(183,834)**
SUBTOTAL ORF APPROPRIATION	**3,763,939**	**110,943**	**3,874,882**	**(709,758)**	**3,165,124**

Procurement, Acquisition, and Construction DOLLARS IN THOUSANDS

FY 2021 Proposed Operating Plan	FY 2020 Enacted	Total FY 2021 ATBs	FY 2021 Base	FY 2021 Program Changes	FY 2021 Estimate
NOS					
Construction					
National Estuarine Research Reserve Construction (NERRS)	4,500	0	4,500	(4,500)	0
Marine Sanctuaries Construction Base	3,000	(3,000)	0	0	0
Subtotal, NOS Construction	**7,500**	**(3,000)**	**4,500**	**(4,500)**	**0**
Total, NOS - PAC	**7,500**	**(3,000)**	**4,500**	**(4,500)**	**0**
Total, NMFS - PAC	**0**	**0**	**0**	**0**	**0**
OAR					
Systems Acquisition					
Research Supercomputing/ CCRI	42,000	0	42,000	(16,000)	26,000
Subtotal, OAR Systems Acquisition	**42,000**	**0**	**42,000**	**(16,000)**	**26,000**
Total, OAR - PAC	**42,000**	**0**	**42,000**	**(16,000)**	**26,000**
NWS					
Systems Acquisition					
Observations	16,250	0	16,250	(732)	15,518
Central Processing	66,761	0	66,761	(8,821)	57,940
Dissemination	9,934	0	9,934	0	9,934
Subtotal, NWS Systems Acquisition	**92,945**	**0**	**92,945**	**(9,553)**	**83,392**
Construction					
Facilities Construction and Major Repairs	10,000	(10,000)	0	0	0
Subtotal, NWS Construction	**10,000**	**(10,000)**	**0**	**0**	**0**
Total, NWS - PAC	**102,945**	**(10,000)**	**92,945**	**(9,553)**	**83,392**
NESDIS					
Systems Acquisition					
Geostationary Systems - R	304,056	0	304,056	30,444	334,500
Polar Weather Satellites	745,000	0	745,000	(87,165)	657,835

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Procurement, Acquisition, and Construction (cont'd) DOLLARS IN THOUSANDS

FY 2021 Proposed Operating Plan	FY 2020 Enacted	Total FY 2021 ATBs	FY 2021 Base	FY 2021 Program Changes	FY 2021 Estimate
Cooperative Data and Rescue Services (CDARS)	11,350	(450)	10,900	3,500	14,400
Space Weather Follow On	64,000	0	64,000	44,115	108,115
COSMIC 2/GNSS RO	5,892	0	5,892	0	5,892
Satellite Ground Services	55,707	(17,198)	38,509	778	39,287
Projects, Planning and Analysis	31,000	(15,059)	15,941	0	15,941
Geostationary Earth Orbit (GEO)	0	10,000	10,000	0	10,000
Systems Architecture and Engineering (SAE)	33,990	332	34,322	15,000	49,322
Subtotal, NESDIS Systems Acquisition	**1,250,995**	**(22,375)**	**1,228,620**	**6,672**	**1,235,292**
Construction					
Satellite CDA Facility	2,450	(2,450)	0	0	0
Subtotal, NESDIS Construction	**2,450**	**(2,450)**	**0**	**0**	**0**
Transfer to OIG	**(1,302)**	**0**	**(1,302)**	**0**	**(1,302)**
Total, NESDIS - PAC	**1,252,143**	**(24,825)**	**1,227,318**	**6,672**	**1,233,990**
Mission Support					
Construction					
NOAA Construction	40,000	15,988	55,988	(14,703)	41,285
Subtotal, Mission Support Construction	**40,000**	**15,988**	**55,988**	**(14,703)**	**41,285**
Total, Mission Support - PAC	**40,000**	**15,988**	**55,988**	**(14,703)**	**41,285**
OMAO					
Marine and Aviation Capital Investments					
Platform Capital Improvements & Tech Infusion	23,000	0	23,000	(4,300)	18,700
Vessel Recapitalization	75,000	0	75,000	0	75,000
Aircraft Recapitalization	0	0	0	0	0
Subtotal, Marine and Aviation Capital Investments	**98,000**	**0**	**98,000**	**(4,300)**	**93,700**
Total, OMAO - PAC	**98,000**	**0**	**98,000**	**(4,300)**	**93,700**
GRAND TOTAL PAC DISCRETIONARY OBLIGATIONS	**1,542,588**	**(21,837)**	**1,520,751**	**(42,384)**	**1,478,367**

PAC Adjustments DOLLARS IN THOUSANDS

FY 2021 Proposed Operating Plan	FY 2020 Enacted	Total FY 2021 ATBs	FY 2021 Base	FY 2021 Program Changes	FY 2021 Estimate
SUBTOTAL PAC DIRECT OBLIGATIONS	**1,542,588**	**(21,837)**	**1,520,751**	**(42,384)**	**1,478,367**
FINANCING					
Deobligations	(13,000)	0	(13,000)	0	(13,000)
Total PAC Financing	**(13,000)**	**0**	**(13,000)**	**0**	**(13,000)**
SUBTOTAL PAC BUDGET AUTHORITY	**1,529,588**	**(21,837)**	**1,507,751**	**(42,384)**	**1,465,367**
TRANSFERS					
Transfer to OIG	1,302	0	1,302	0	1,302
Total PAC Transfers	**1,302**	**0**	**1,302**	**0**	**1,302**
SUBTOTAL PAC APPROPRIATION	**1,530,890**	**(21,837)**	**1,509,053**	**(42,384)**	**1,466,669**

Other Accounts Discretionary DOLLARS IN THOUSANDS

FY 2021 Proposed Operating Plan	FY 2020 Enacted	Total FY 2021 ATBs	FY 2021 Base	FY 2021 Program Changes	FY 2021 Estimate
NMFS					
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
Foreign Fishing Observer Fund Obligations	0	0	0	0	0
Foreign Fishing Observer Fund Budget Authority	0	0	0	0	0
Foreign Fishing Observer Fund Appropriation	0	0	0	0	0
Fisheries Finance Program Account Obligations	0	0	0	0	0
Fisheries Finance Program Account Budget Authority	0	0	0	0	0
Fisheries Finance Program Account Appropriation	0	0	0	0	0
Promote and Develop Fisheries Obligations	0	0	0	0	0
Promote and Develop Fisheries Budget Authority	(174,774)	(9,060)	(183,834)	0	(183,834)
Promote and Develop Fisheries Appropriation	0	0	0	0	0
Pacific Coastal Salmon Recovery Fund Obligations	65,000	0	65,000	(65,000)	0
Pacific Coastal Salmon Recovery Fund Budget Authority	65,000	0	65,000	(65,000)	0
Pacific Coastal Salmon Recovery Fund Appropriation	65,000	0	65,000	(65,000)	0
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
Fisheries Disaster Assistance Fund Obligations	0	0	0	300	300
Fisheries Disaster Assistance Fund Budget Authority	0	0	0	300	300
Fisheries Disaster Assistance Fund Appropriation	0	0	0	300	300
Subtotal, NMFS Other Discretionary Direct Obligations	**65,349**	**0**	**65,349**	**(64,700)**	**649**
Subtotal, NMFS Other Discretionary Budget Authority	**(109,425)**	**(9,060)**	**(118,485)**	**(64,700)**	**(183,185)**
Subtotal, NMFS Other Discretionary Appropriation	**65,349**	**0**	**65,349**	**(64,700)**	**649**

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Other Accounts Discretionary (cont'd) DOLLARS IN THOUSANDS

FY 2021 Proposed Operating Plan	FY 2020 Enacted	Total FY 2021 ATBs	FY 2021 Base	FY 2021 Program Changes	FY 2021 Estimate
OMAO					
Medicare Eligible Retiree Healthcare Fund Obligations	1,497	94	1,591	0	1,591
Medicare Eligible Retiree Healthcare Fund Budget Authority	1,497	94	1,591	0	1,591
Medicare Eligible Retiree Healthcare Fund Appropriation	1,497	94	1,591	0	1,591
Subtotal, OMAO Other Discretionary Direct Obligations	**1,497**	**94**	**1,591**	**0**	**1,591**
Subtotal, OMAO Other Discretionary Budget Authority	**1,497**	**94**	**1,591**	**0**	**1,591**
Subtotal, OMAO Other Discretionary Appropriation	**1,497**	**94**	**1,591**	**0**	**1,591**
TOTAL, OTHER DISCRETIONARY DIRECT OBLIGATIONS	**66,846**	**94**	**66,940**	**(64,700)**	**2,240**
TOTAL, OTHER DISCRETIONARY BUDGET AUTHORITY	**(107,928)**	**(8,966)**	**(116,894)**	**(64,700)**	**(181,594)**
TOTAL, OTHER DISCRETIONARY APPROPRIATION	**66,846**	**94**	**66,940**	**(64,700)**	**2,240**

Summary of Discretionary Appropriations DOLLARS IN THOUSANDS

FY 2021 Proposed Operating Plan	FY 2020 Enacted	Total FY 2021 ATBs	FY 2021 Base	FY 2021 Program Changes	FY 2021 Estimate
Operations, Research, and Facilities	3,763,939	110,943	3,874,882	(709,758)	3,165,124
Procurement, Acquisition, and Construction	1,530,890	(21,837)	1,509,053	(42,384)	1,466,669
Fisherman's Contingency Fund	349	0	349	0	349
Pacific Coastal Salmon Recovery Fund	65,000	0	65,000	(65,000)	0
Fisheries Disaster Assistance Fund	0	0	0	300	300
Medicare Eligible Retiree Health Care Fund	1,497	94	1,591	0	1,591
GRAND TOTAL DISCRETIONARY APPROPRIATION	**5,361,675**	**89,200**	**5,450,875**	**(816,842)**	**4,634,033**

Summary of Discretionary Resources DOLLARS IN THOUSANDS

FY 2021 Proposed Operating Plan	FY 2020 Enacted	Total FY 2021 ATBs	FY 2021 Base	FY 2021 Program Changes	FY 2021 Estimate
Direct Discretionary Obligations					
ORF Direct Obligations	3,956,213	130,003	4,086,216	(709,758)	3,376,458
PAC Direct Obligations	1,542,588	(21,837)	1,520,751	(42,384)	1,478,367
OTHER Direct Obligations	66,846	94	66,940	(64,700)	2,240
TOTAL Direct Discretionary Obligations	**5,565,647**	**108,260**	**5,673,907**	**(816,842)**	**4,857,065**
Discretionary Budget Authority					
ORF Budget Authority	3,938,713	120,003	4,058,716	(709,758)	3,348,958
PAC Budget Authority	1,529,588	(21,837)	1,507,751	(42,384)	1,465,367
OTHER Budget Authority	(107,928)	(8,966)	(116,894)	(64,700)	(181,594)
TOTAL Discretionary Budget Authority	**5,360,373**	**89,200**	**5,449,573**	**(816,842)**	**4,632,731**
Discretionary Appropriations					
ORF Appropriation	3,763,939	110,943	3,874,882	(709,758)	3,165,124
PAC Appropriation	1,530,890	(21,837)	1,509,053	(42,384)	1,466,669
OTHER Appropriation	66,846	94	66,940	(64,700)	2,240
TOTAL Discretionary Appropriation	**5,361,675**	**89,200**	**5,450,875**	**(816,842)**	**4,634,033**

Other Accounts Mandatory DOLLARS IN THOUSANDS

NOS					
Damage Assessment and Restoration Revolving Fund Obligations	204,853	(188,853)	16,000	0	16,000
Damage Assessment and Restoration Revolving Fund Budget Authority	5,853	147	6,000	0	6,000
Damage Assessment and Restoration Revolving Fund Appropriation	0	0	0	0	0
Sanctuaries Enforcement Asset Forfeiture Fund Obligations	120	0	120	0	120
Sanctuaries Enforcement Asset Forfeiture Fund Budget Authority	120	0	120	0	120
Sanctuaries Enforcement Asset Forfeiture Fund Appropriation	120	0	120	0	120
Gulf Coast Ecosystem Restoration Fund Obligations	5,645	1,292	6,937	0	6,937
Gulf Coast Ecosystem Restoration Fund Budget Authority	0	0	0	0	0
Gulf Coast Ecosystem Restoration Fund Appropriation	0	0	0	0	0
Subtotal, NOS Other Mandatory Direct Obligations	**210,618**	**(187,561)**	**23,057**	**0**	**23,057**
Subtotal, NOS Other Mandatory Budget Authority	**5,973**	**147**	**6,120**	**0**	**6,120**
Subtotal, NOS Other Mandatory Appropriation	**120**	**0**	**120**	**0**	**120**
NMFS					
Promote and Develop Fisheries Obligations	8,009	(8,009)	0	0	0
Promote and Develop Fisheries Budget Authority	182,783	1,051	183,834	0	183,834
Promote and Develop Fisheries Appropriation	0	0	0	0	0
Fisheries Finance Program Account Obligations	4,841	(4,841)	0	0	0
Fisheries Finance Program Account Budget Authority	4,841	(4,841)	0	0	0
Fisheries Finance Program Account Appropriation	4,841	(4,841)	0	0	0
Federal Ship Financing Fund Obligations	0	0	0	0	0
Federal Ship Financing Fund Budget Authority	0	0	0	0	0
Federal Ship Financing Fund Appropriation	0	0	0	0	0
Environmental Improvement & Restoration Fund Obligations	6,883	(2,522)	4,361	0	4,361
Environmental Improvement & Restoration Fund Budget Authority	6,883	(2,522)	4,361	0	4,361
Environmental Improvement & Restoration Fund Appropriation	7,315	(2,681)	4,634	0	4,634

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Other Accounts Mandatory (cont'd) DOLLARS IN THOUSANDS

FY 2021 Proposed Operating Plan	FY 2020 Enacted	Total FY 2021 ATBs	FY 2021 Base	FY 2021 Program Changes	FY 2021 Estimate
Limited Access System Administration Fund Obligations	14,468	125	14,593	0	14,593
Limited Access System Administration Fund Budget Authority	14,468	125	14,593	0	14,593
Limited Access System Administration Fund Appropriation	14,456	146	14,602	0	14,602
Western Pacific Sustainable Fisheries Fund Obligations	384	203	587	0	587
Western Pacific Sustainable Fisheries Fund Budget Authority	384	203	587	0	587
Western Pacific Sustainable Fisheries Fund Appropriation	375	225	600	0	600
Fisheries Enforcement Asset Forfeiture Fund Obligations	3,941	(27)	3,914	0	3,914
Fisheries Enforcement Asset Forfeiture Fund Budget Authority	3,941	(27)	3,914	0	3,914
Fisheries Enforcement Asset Forfeiture Fund Appropriation	3,914	0	3,914	0	3,914
North Pacific Observer Fund Obligations	3,504	467	3,971	0	3,971
North Pacific Observer Fund Budget Authority	3,504	467	3,971	0	3,971
North Pacific Observer Fund Appropriation	3,500	500	4,000	0	4,000
Subtotal, NMFS Other Mandatory Direct Obligations	**42,030**	**(14,604)**	**27,426**	**0**	**27,426**
Subtotal, NMFS Other Mandatory Budget Authority	**216,804**	**(5,544)**	**211,260**	**0**	**211,260**
Subtotal, NMFS Other Mandatory Appropriation	**34,401**	**(6,651)**	**27,750**	**0**	**27,750**
OMAO					
NOAA Corps Commissioned Officers Retirement Obligations	30,075	0	30,075	0	30,075
NOAA Corps Commissioned Officers Retirement Budget Authority	30,075	0	30,075	0	30,075
NOAA Corps Commissioned Officers Retirement Appropriation	30,075	0	30,075	0	30,075
Subtotal, OMAO Other Mandatory Direct Obligations	**30,075**	**0**	**30,075**	**0**	**30,075**
Subtotal, OMAO Other Mandatory Budget Authority	**30,075**	**0**	**30,075**	**0**	**30,075**
Subtotal, OMAO Other Mandatory Appropriation	**30,075**	**0**	**30,075**	**0**	**30,075**
TOTAL, OTHER MANDATORY DIRECT OBLIGATIONS	**282,723**	**(202,165)**	**80,558**	**0**	**80,558**
TOTAL, OTHER MANDATORY BUDGET AUTHORITY	**252,852**	**(5,397)**	**247,455**	**0**	**247,455**
TOTAL, OTHER MANDATORY APPROPRIATION	**64,596**	**(6,651)**	**57,945**	**0**	**57,945**

NOAA Summary DOLLARS IN THOUSANDS

TOTAL Direct Obligations (Discretionary & Mandatory)	5,848,370	(93,905)	5,754,465	(816,842)	4,937,623
TOTAL Budget Authority (Discretionary & Mandatory)	5,613,225	83,803	5,697,028	(816,842)	4,880,186
TOTAL Appropriation (Discretionary & Mandatory)	5,426,271	82,549	5,508,820	(816,842)	4,691,978
Reimbursable Financing	242,000	0	242,000	0	242,000
TOTAL OBLIGATIONS (Direct & Reimbursable)	**6,090,370**	**(93,905)**	**5,996,465**	**(816,842)**	**5,179,623**
Offsetting Receipts	(3,114)	(4,512)	(7,626)	0	(7,626)
TOTAL OBLIGATIONS (Direct, Reimbursable & Offsetting Receipts)	**6,087,256**	**(98,417)**	**5,988,839**	**(816,842)**	**5,171,997**

Line Office Summary DOLLARS IN THOUSANDS

FY 2021 Proposed Operating Plan	FY 2020 Enacted	Total FY 2021 ATBs	FY 2021 Base	FY 2021 Program Changes	FY 2021 Estimate
National Ocean Service					
ORF	598,956	13,475	612,431	(231,395)	381,036
PAC	7,500	(3,000)	4,500	(4,500)	0
OTHER	210,618	(187,561)	23,057	0	23,057
TOTAL, NOS	**817,074**	**(177,086)**	**639,988**	**(235,895)**	**404,093**
National Marine Fisheries Service					
ORF	947,657	25,660	973,317	(131,642)	841,675
PAC	0	0	0	0	0
OTHER	107,379	(14,604)	92,775	(64,700)	28,075
TOTAL, NMFS	**1,055,036**	**11,056**	**1,066,092**	**(196,342)**	**869,750**
Oceanic and Atmospheric Research					
ORF	548,384	8,353	556,737	(229,992)	326,745
PAC	42,000	0	42,000	(16,000)	26,000
TOTAL, OAR	**590,384**	**8,353**	**598,737**	**(245,992)**	**352,745**
National Weather Service					
ORF	1,065,701	36,551	1,102,252	(65,376)	1,036,876
PAC	102,945	(10,000)	92,945	(9,553)	83,392
TOTAL, NWS	**1,168,646**	**26,551**	**1,195,197**	**(74,929)**	**1,120,268**
National Environmental Satellite, Data and Information Service					
ORF	260,739	25,895	286,634	(16,642)	269,992
PAC	1,252,143	(24,825)	1,227,318	6,672	1,233,990
TOTAL, NESDIS	**1,512,882**	**1,070**	**1,513,952**	**(9,970)**	**1,503,982**
Mission Support					
ORF	290,361	11,978	302,339	(20,626)	281,713
PAC	40,000	15,988	55,988	(14,703)	41,285
SUBTOTAL, Mission Support	**330,361**	**27,966**	**358,327**	**(35,329)**	**322,998**
Office of Marine and Aviation Operations					
ORF	244,415	8,091	252,506	(14,085)	238,421
PAC	98,000	0	98,000	(4,300)	93,700

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Line Office Summary (cont'd) DOLLARS IN THOUSANDS

FY 2021 Proposed Operating Plan	FY 2020 Enacted	Total FY 2021 ATBs	FY 2021 Base	FY 2021 Program Changes	FY 2021 Estimate
OTHER	31,572	94	31,666	0	31,666
TOTAL, OMAO	**373,987**	**8,185**	**382,172**	**(18,385)**	**363,787**
DIRECT DISCRETIONARY OBLIGATIONS					
ORF	3,956,213	130,003	4,086,216	(709,758)	3,376,458
PAC	1,542,588	(21,837)	1,520,751	(42,384)	1,478,367
OTHER	349,569	(202,071)	147,498	(64,700)	82,798
TOTAL, DIRECT DISCRETIONARY OBLIGATIONS	**5,848,370**	**(93,905)**	**5,754,465**	**(816,842)**	**4,937,623**
ORF Financing	(17,500)	(10,000)	(27,500)	0	(27,500)
ORF Transfers	(174,774)	(9,060)	(183,834)	0	(183,834)
PAC Financing	(13,000)	0	(13,000)	0	(13,000)
PAC Transfers	1,302	0	1,302	0	1,302
OTHER Discretionary Adjustments	0	0	0	0	0
Mandatory Accounts Excluded	(282,723)	202,165	(80,558)	0	(80,558)
TOTAL, DISCRETIONARY APPROPRIATIONS	**5,361,675**	**89,200**	**5,450,875**	**(816,842)**	**4,634,033**