NOAA

BUDGET SUMMARY

One of Maine's working waterfront wharves in Portland, Maine.

Table of 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.

Sunrise and clouds around the low-level circulation of Tropical Storm Nicole, seen from a NOAA WP-3D Orion Hurricane Hunter.

Letter from the Administrator

Dear NOAA Partners,

As we move closer to the midpoint of this decade and a quarter of the way through this century, our nation continues to lead the world in science, drive innovation, and create opportunities for prosperity. But unlike in previous chapters of our history, we must now contend with the impactful threats brought on by climate change.

In 2022, the United States experienced 18 weather and climate disasters that exceeded $1 billion in loss and damage. In the 1980s, there were an average of 82 days in between these types of events; now, there are just 18. This is one more reminder that a better understanding of climate change and extreme weather through research, observations, and enhanced forecasting will allow us to save lives and safeguard our economy.

This is why I'm pleased to share NOAA's Fiscal Year 2024 budget request of $6.8 billion, as it will allow our agency to improve these critical services and capabilities.

The FY24 request will support NOAA's work to build a climate-ready nation where communities, individuals, and industries have the authoritative and actionable information they need to address climate impacts. This includes—and emphasizes—vulnerable and under-resourced communities and helps ensure that NOAA's climate products and services are accessible and useful to all Americans.

Likewise, we're seeing an emergence of entrepreneurship in ocean and climate data and technology that NOAA is committed to supporting through our world-class research and information. As Secretary Gina Raimondo noted, this budget makes targeted, strategic investments that will position America's workers and businesses to succeed. As such, NOAA stands ready to engage across sectors and with

Richard Spinrad, Ph.D., Under Secretary of Commerce for Oceans and Atmosphere and NOAA Administrator

business leaders to support economic development and job growth through environmental intelligence.

Building on the historic investments of the Inflation Reduction Act and the Bipartisan Infrastructure Law, the FY24 request will scale all aspects of NOAA's science and equitable service delivery, while also supporting key focus areas like offshore wind permitting and conserving and restoring biodiversity and important habitats.

As we look to a new fiscal year, I am dedicated to enhancing our agency's ability to provide the environmental science, information and services needed to protect lives, lifestyles, and livelihoods for all Americans.

Sincerely,
Dr. Rick Spinrad

Coral reefs are some of the most diverse ecosystems in the world. Thousands of species rely on reefs for survival. Millions of people all over the world also depend on coral reefs for food, protection and jobs.

Terminology

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

FY 2022 Enacted
Fiscal Year (FY) 2022 Consolidated Appropriations Act, 2022 (P.L. 117–103)

FY 2023 Enacted
Fiscal Year (FY) 2023 Consolidated Appropriations Act, 2023 (P.L. 117–328)

Adjustments-to-Base
Includes the estimated FY 2024 civilian pay raise of 5.2 percent and military pay raise of 5.2 percent. Program totals will provide inflationary increases for labor and non-labor activities, including service contracts, utilities, field office lease payments, and rent charges from GSA. In addition, ATBs include unique/technical adjustments to the base program, for example transfers of base resources between budget lines.

FY 2024 Base
FY 2023 Enacted plus Adjustments-To-Base.

Program Change
Requested increase or decrease over the FY 2024 base.

FY 2024 Request
FY 2024 base plus Program Changes.

Maine's Wells National Estuarine Research Reserve contains upland fields and forests, freshwater and estuarine wetlands, and a beach-and-dune system. Credit: Julio Aguilar

Chapter 1

Introduction

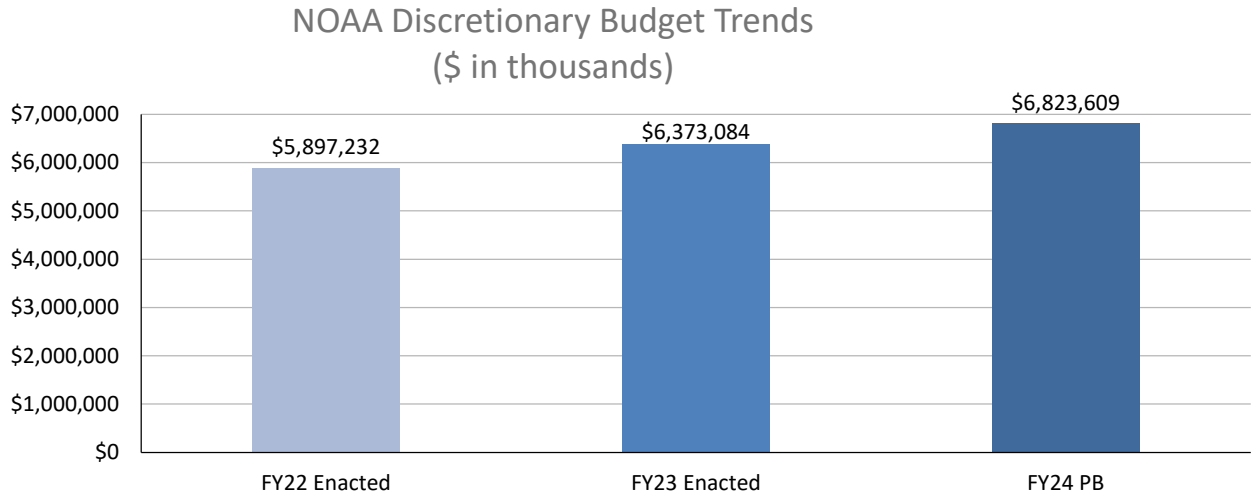
For Fiscal Year (FY) 2024, the National Oceanic and Atmospheric Administration (NOAA) proposes a budget of $6.8 billion in discretionary appropriations, an increase of $450.5 million from the FY 2023 Enacted. The FY 2024 budget builds on investments in the Inflation Reduction Act (P.L. 117–169) and Bipartisan Infrastructure Law (BIL) (P.L. 117–58) for Climate-Ready Coasts, climate data and services, and fisheries and protected resources. Through BIL, NOAA is increasing preparedness activities for Climate-Ready Coasts through landscape-scale habitat restoration in coastal ecosystems nationwide focused on underserved communities and those most impacted by the effects of climate change. BIL funded climate data and services will support a whole-of-government effort to address the climate crisis by providing critical information to decision makers through enhanced wildfire, water, and ocean observing and forecasting capabilities. Funding focused on fisheries and protected resources will maximize benefits to ecosystems and communities, including tribal and underserved communities.

The FY 2024 request builds on BIL and IRA investments and supports the following NOAA goals:

Expanding NOAA's Climate Products and Services—As part of a whole government approach, NOAA will provide actionable environmental information that is the basis of smart policy and decision-making, especially around initial risk and focus areas including wildfires, floods, drought, extreme heat, coasts, marine resources, and mitigation.

Providing Science and Data to Inform Economic Development—NOAA will continue to foster environmental stewardship and optimize advances in science and technology to create value-added, data-driven sustainable and equitable economic development, with a particular focus on the New Blue Economy.

Equity and Workforce—NOAA will integrate equity across the organization by improving capabilities and knowledge sharing and honing product development and service delivery in tribal and underserved communities.



One of NOAA's Hurricane Hunters, a Lockheed WP-3D Orion N42RF, also known as "Kermit," lands at Reagan National Airport for the 2022 Hurricane Awareness Tour in May.

Satellites—NOAA will continue investments in future geostationary, low Earth orbit, and space weather observations to ensure continuity of critical data from legacy systems, while providing significant improvements in data and products.

Facilities—NOAA will continue investments aligned with the NOAA Facilities Strategic Plan and Facilities Investment Plan.

Expanding NOAA's Climate Products and Services

NOAA provides actionable environmental information that is the basis for smart policy and decision-making in a changing world. NOAA is collaborating with other Federal agencies as part of the whole-of government effort to address the climate crisis, strengthen resilience and promote economic growth. Together with its partners, NOAA will build a climate-ready nation whose prosperity, health, security and continued growth benefit from and depend upon a shared understanding of—and collective action to reduce—the impacts of climate change. NOAA will deploy the full breadth of its integrated services and capabilities to build a climate-ready nation. This end-to-end value chain for authoritative climate and weather data and services starts with investing in observational infrastructure and culminates in delivering comprehensive services to meet a diverse set of missions. NOAA's partners—including businesses, federal agencies, emergency managers and underserved and vulnerable communities—can gain insights and take decisive action based on NOAA's data, tools and services. The U.S. has sustained 341 weather and climate disasters since 1980 where overall damages/costs reached or exceeded $1 billion (including CPI adjustment to 2022). In 2022 alone, there were 18 of these weather/climate disasters to affect the United States. These drought, flooding, fire and storm events combined to mark a record eighth-consecutive year where the U.S. experienced 10 or more separate billion-dollar disasters. Overall, these events resulted in the deaths of 474 people and exceeded $165 billion, which is the third-highest cost on record. The U.S. disaster costs for 2022 Hurricane Ian is the third most costly U.S. hurricane on record at $112.9 billion, behind only Hurricane Katrina and Hurricane Harvey. The 2022 Western/Central drought and heat wave was one of the more costly droughts on record, with a diverse array of direct impacts across different regions and industries. The drought's $22.2 billion cost was the second most expensive event for 2022.[1]

The FY 2024 budget builds on investments in the BIL and IRA to pave the way for NOAA's build out of the climate-ready nation initiative. In FY 2024, NOAA requests an additional $78.2 million to implement Executive Order (EO) 14008 on *Tackling the Climate Crisis at Home and Abroad.* Funding will support an earth system approach to enhance NOAA's authoritative climate modeling, prediction and projection, research and development, observational infrastructure, and service delivery and decision support tools.

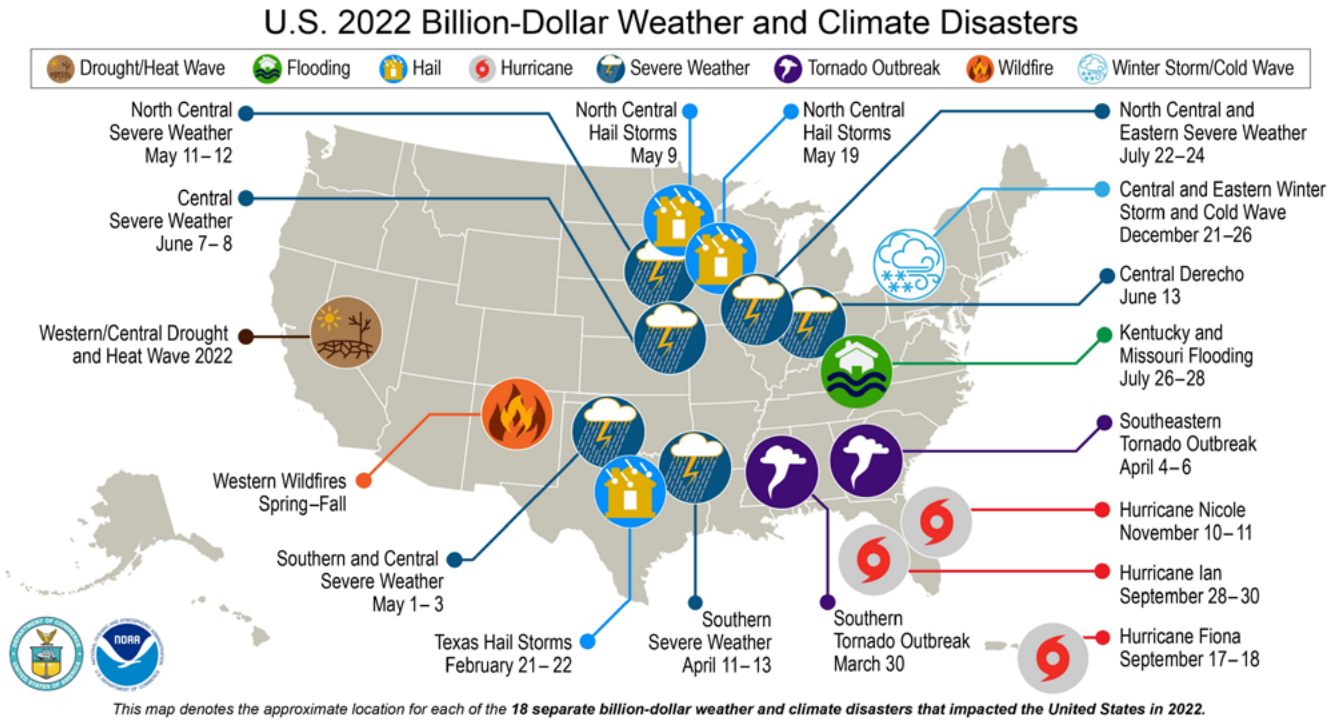
NOAA will invest additional resources to improve predictions and projections in a research environment. In particular, NOAA will improve

1 NOAA National Centers for Environmental Information (NCEI), U.S. Billion-Dollar Weather and Climate Disasters, https://www.ncei.noaa.gov/access/billions/, (accessed March 1, 2023)

precipitation predictions across weather and climate timescales for transition to operations through the Precipitation Prediction Grand Challenge Initiative. This cross-NOAA effort to advance subseasonal-to-seasonal and seasonal-to-decadal forecasts will be conducted in collaboration with our academic research partners, and will lead to improved precipitation forecasts using NOAA's Unified Forecast System. In addition, NOAA will develop a state-of-the-art global reanalysis capability that combines historical observations with modern Earth system models to generate a spatially and temporally complete history of the Earth system. This capability will improve the prediction of high impact weather events, coastal inundation risk, and infrastructure failure. It will also improve understanding of trends in extreme events, climate impacts on marine ecosystems and fisheries, and environmental change in under-observed polar regions.

As we increase our understanding of the changing climate in the short and long term, we will simultaneously research and develop new and improved tools for decision makers to address climate impacts. For example, NOAA will bolster support in the Arctic by providing fundamental science, critical national and international services, and responsible management of marine resources in Alaska, the Arctic, and the Central Arctic Ocean. In recent decades, the warming in the Arctic has been much faster than in the rest of the world, with numerous studies reporting that the Arctic is warming more than twice as fast as the globe on average. The warming Arctic reveals shifting seasons, widespread disturbances, and the value of diverse observations.[2] Arctic communities are grappling with a large number of issues including climate change-related impacts on subsistence livelihoods and food security, infrastructure, and transportation due to retreating sea ice, shorter winters, and a fragile ecosystem. Funding will support scientific monitoring and prediction

2 NOAA Arctic, Arctic Report Card: Update for 2022. https://www.arctic.noaa.gov/Report-Card/Report-Card-2022 (accessed March 1, 2023)



*This map denotes the approximate location for each of the **18 separate billion-dollar weather and climate disasters that impacted the United States in 2022.***

NOAA's National Centers for Environmental Information (NCEI) is the Nation's scorekeeper for archiving severe weather and climate events. In 2022, there were 18 weather/climate disaster events with losses exceeding $1 billion each throughout the United States. These disaster events totaled over $165 billion in damage.

Afternoon thunderstorms move over the Huachuca Mountains and into Sierra Vista, AZ, just before sunset on July 9, 2022. The quick moving storm brought rain and lightning as the 2022 monsoon season ramped up.

of Arctic systems, development of innovative observational technologies, and enhanced modeling capabilities for sea ice and ecosystems, and ensuring that satellite-derived data is provided to users as actionable information in support of high priority applications in polar regions and coastal zones. NOAA will also address the ongoing needs identified by the NOAA-Alaska Tribal Health Consortium to further develop their Tribal climate program, and increase support in service to Alaska Natives.

Our research will also address the needs of commercial fishing and marine resource managers and support tourism and recreation. The NOAA climate-ready fisheries Initiative will expand use of climate science in fisheries assessments and management to address the impacts of climate change on marine resources, fisheries, and the many businesses and communities that depend on them. Warming oceans, rising seas, decreasing sea ice, increasing ocean acidification, and extreme events (e.g., marine heat waves) are affecting the distribution and abundance of marine species. NOAA will establish a nationally and geographically connected operational network that provides decision-makers with climate-informed advice on best management strategies to reduce impacts and increase economic resilience.

NOAA provides timely and actionable environmental observations on a global, national, regional, and local level from satellites, radar, surface systems, atmospheric greenhouse gas sampling stations, ocean buoys, uncrewed systems, aircraft, and ships. In FY 2024, NOAA will continue to invest in these platforms to meet the increasing demand for observations required for NOAA climate products and services. In FY 2024, NOAA's fleet will grow with the addition of a third King Air, and the new NOAA Ships *Oceanographer* and *Discoverer*. In addition to these platforms, NOAA will invest in the Days at Sea and Flight Hours to support critical mission requirements and the NOAA Corps officers needed to safely and effectively operate the new ships and aircraft. In addition, uncrewed platforms have great potential to increase data collection efficiency and fill gaps not met by traditional platforms. Therefore, NOAA will advance research and evaluation for operational readiness of a full spectrum of NOAA's aircraft and maritime Uncrewed Systems (UxS) mission concepts. NOAA will use these resources for research and development related to UxS concepts and technologies to support missions across NOAA.

In FY 2024, NOAA will enhance atmospheric observing systems to support the U.S. government in implementing its commitments towards mitigation of climate change. NOAA will coordinate with other Federal partners and the extramural research community to evaluate greenhouse gas (GHG) emissions and changes at various scales and a more robust understanding of allowable cumulative GHG emissions to limit global warming while taking into account likely changes in natural GHG sinks, sources in the ocean, land, and atmosphere.

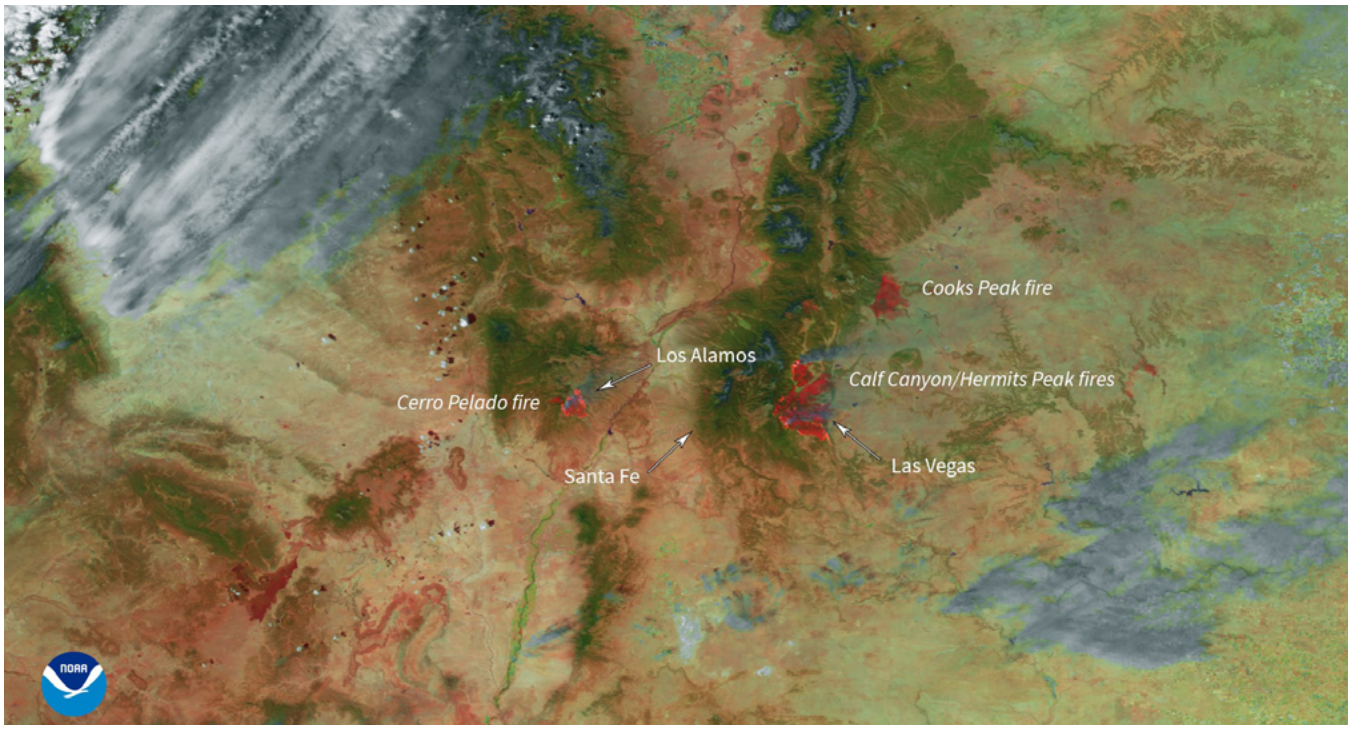
NOAA's weather and climate predictions and information must be reliably delivered to users to

impact decision making. Forty percent of the U.S. population lives and works in coastal counties,[3] making a disproportionate segment of our society and economy at increasing risk from such hazards as hurricanes and coastal inundation. Therefore, in FY 2024, NOAA will invest in service delivery and decision support for community resilience and preparedness as integral to NOAA's climate strategy. To ensure that watches and warnings reach every community in the path of weather, the FY 2024 request will maintain recent investments to optimize the National Weather Service (NWS) Integrated Dissemination Program (IDP). Additional resources will support IDP enhancements and upgrades, as well as hardware refresh, to maintain the health of the applications and system to ensure the provision of weather and climate predictions, forecasts, and warnings to the public, emergency management partners, and the U.S. weather enterprise. NOAA will also invest in a multi-faceted approach that will strengthen response capabilities and advance emergency services on our coasts including giving first responders immediate access imagery to assess and prioritize response efforts, improving positioning and processing, and delivering high resolution GIS ready imagery in real-time (instead of four to six hours after landing).

NOAA's active engagement and partnerships with regional users and climate service delivery providers facilitate the uptake and application of NOAA's authoritative information. In FY 2024, NOAA will continue to expand the proven capabilities of the Climate Adaptation Partnerships (CAP) program to advance adaptation measures and resilience planning at regional and local scales, while prioritizing environmental justice. NOAA will add one regional team for a total of 13, a significant step towards achieving nationwide coverage, while supporting more in-depth research into key climate risks and adaptation approaches. Complementing this work, NOAA's Regional Climate Services will build capacity and increase user engagement

3 NOAA Office of Coastal Management and U.S. Census Bureau, American Community Survey Five-Year Estimates, https://coast.noaa.gov/digitalcoast/data/acs.html (accessed March 1, 2023)

In 2022, NOAA celebrated the 50th anniversary of the Marine Mammal Protection Act. This landmark legislation protects all marine mammals in U.S. waters, including these two young Hawaiian monk seals resting on a beach in the Papahānaumokuākea Marine National Monument.



Color-enhanced NOAA-20 satellite image of wildfires in New Mexico on May 3, 2022. The red spots indicate active fires burning across the state.

at the state level to address unique needs for climate data and information. This will support the development and delivery of place-based products and services to make informed decisions. Overall, these partnerships increase the value of climate information to users and support more efficient, cost-effective delivery of products and services relevant to region-specific economic activity, hazards, and vulnerability.

NOAA will also invest in increasing conservation and protection across the National Marine Sanctuary System, which is an integral part of NOAA's implementation of the *America the Beautiful* initiative (EO 14008) that includes the goal to conserve at least 30 percent of U.S. lands and waters by 2030. NOAA's FY 2024 request supports increased capacity for research, monitoring, restoration, permitting, community engagement, and interagency partnerships to strengthen conservation outcomes in an expanded Sanctuary System. NOAA will work to enhance its sanctuary management capacity as new sanctuaries are designated, identify gaps in marine protection, train the next generation of Marine Protected Area professionals, and expand technology use in sanctuaries to support management priorities. NOAA will increase engagement with partners, communities of color, underrepresented groups, and indigenous and native peoples in conservation, planning, and outreach. NOAA will also invest in large-scale restoration and conservation of key habitats that support wildlife populations, improve water quality, and preserve cultural and heritage assets.

Expanding NOAA's Climate Products and Services

Budget Program	PPA	Program Change Title	Program Change	Page Number
NOS	Navigation, Observations and Positioning	Meeting NOAA's Mission in the Arctic	4,147	27
NOS	Navigation, Observations and Positioning	Advancing NOAA's ability to Prepare and Respond to Extreme Weather and Coastal Hazard Events	1,400	27
NOS	Coastal Science, Assessment, Response and Restoration	Enhancing Marine Debris Science and Innovation	1,094	28
NOS	Coastal Zone Management and Services	Meeting NOAA's Mission in the Arctic	353	29
NOS	Sanctuaries and Marine Protected Areas	Increasing Conservation and Protection Across the National Marine Sanctuary System	17,758	29
NMFS	Fisheries and Ecosystem Science Programs and Services	Climate-Ready Fisheries: Climate-Informed Fisheries Assessments and Management Strategies for Changing Oceans	10,000	35
OAR	Climate Laboratories & Cooperative Institutes	Sustained Atmospheric Observations Increase	1,120	45
OAR	Regional Climate Data & Information	Enhancing Regional and Community Resilience by Scaling Up Climate Adaptation Partnerships (CAP) Program	3,506	45
OAR	Climate Competitive Research	Precipitation Prediction Grand Challenge Increase	2,145	45
OAR	Weather Laboratories & Cooperative Institutes	Global Reanalysis Capability	2,789	45
OAR	Uncrewed Systems	Uncrewed Systems Increase	3,034	47
NWS	Dissemination	Integrated Dissemination Program Implementation	2,447	53
NESDIS	Product Development, Readiness & Application	Earth Observations for At-Risk Regions: Science Support for Polar and Coastal Zone Applications	598	58
NESDIS	National Centers for Environmental Information	Improving Local, State, and Regional Climate Services	1,600	59
MS	Mission Services and Management		3,368	68
OMAO	Marine Operations and Maintenance	Enhanced Fleet Operations	16,231	74
OMAO	Aviation Operations and Aircraft Services	Flight Hours in Support of Cross-NOAA Climate Objectives	2,412	74
OMAO	NOAA Commissioned Officer Corps	Officers to Support Marine and Aviation Operations	4,220	75
Total, Expanding NOAA's Climate Products and Services			**78,222**	

Sustainably grown, organic Alaskan kelp is harvested at the Seagrove Kelp Co. farm in Doyle Bay.

Providing Science and Data to Inform Economic Development

NOAA will continue to foster environmental stewardship and optimize advances in science and technology to create value-added, data-driven sustainable economic development, with a particular focus on the New Blue Economy: supporting development framed around an information and knowledge-based approach to support fisheries, transportation, shipping, renewable energy, recreation, and livelihoods. In 2022, the Bureau of Economic Analysis, in partnership with NOAA, released the official Marine Economy statistics that the U.S. marine economy contributed about $361.4 billion to the Nation's gross domestic products[4] and supported 2.2 million jobs in 2020[5]. In FY 2024, NOAA requests an additional $81.4 million in support of the expansion of offshore wind energy, the National Seafood Strategy, ocean and coastal mapping and charting, and development of key information systems in our tsunami, weather, and space observations infrastructure. These investments will also support a climate-ready nation by making our infrastructure more resilient, and advancing U.S. leadership in research and development of critical technologies, climate science, and innovation.

4 Bureau of Economic Analysis and NOAA, Ocean Economy, https://www.bea.gov/news/2022/marine-economy-satellite-account-2014-2020 (accessed March 1, 2023)

5 Bureau of Economic Analysis and NOAA, Ocean Economy, https://www.noaa.gov/news-release/marine-economy-continues-to-power-american-prosperity-despite-2020-downturn (accessed March 1, 2023)

Offshore wind development is rapidly expanding in the U.S., particularly in the Northeast and Mid-Atlantic, and is being considered along the Gulf and West Coasts as well. In support of the Administration's goal to deploy 30 gigawatts of offshore energy by 2030, NOAA will facilitate smart economic and ecological offshore wind development. NOAA will need to work closely with the Bureau of Ocean Energy Management (BOEM) to minimize the effects of offshore energy projects on protected marine resources, fisheries, and important habitats; reduce delays and minimize adverse economic impacts to the fishing industry and related coastal communities; and mitigate impacts to fisheries surveys in the Northeast and Mid-Atlantic. NOAA continues to support the all-of-government effort to deploy offshore wind, while protecting biodiversity and promoting co-use through: 1) offshore energy assessment and scientific advice to support the regulatory process; 2) funding for the regulatory review process associated with offshore energy assessment and protected resources; 3) increased support for environmental assessments and consultations with BOEM; and 4) development of new fisheries survey design and methods to address anticipated changes in habitats around offshore wind developments; and 5) expanded data collection including seafloor mapping and biological assessments; in situ observations; predictive models for marine species distribution; and studies of human perceptions and attitudes towards offshore wind within and near potential wind energy areas.

NOAA's National Seafood Strategy outlines actions to rebuild and enhance the competitiveness of the seafood and fishing industries and associated communities. NOAA will support the National Seafood Strategy by combating illegal, unreported, and unregulated (IUU) fishing through a multi-pronged effort that augments capacity to existing programs. NOAA will use advanced technology, improve global fisheries management through

international negotiations and capacity building, monitor U.S. imports to promote legal and sustainable seafood, and increase enforcement capacity and marine forensics.

In FY 2024, NOAA will fill data gaps in the foundational data for ocean and coastal mapping and charting of the U.S. EEZ and build out geospatial and water level infrastructure. Using a 'Map Once, Use Many Times' approach. NOAA will address the data gaps in coastal areas with an early focus on Alaska benefiting local communities and Tribal populations. Also, on the coast, Tsunamis are unpredictable and have an extremely high impact with potentially disastrous consequences to life and property along the already vulnerable U.S. coastlines. In FY 2024, NOAA will provide a common framework that supports the National Tsunami Warning Center, located in Palmer, Alaska, and Pacific Tsunami Warning Center, located in Honolulu, Hawai'i. Funding will ensure seamless continuity of operations by eliminating discontinuities within existing systems, and providing the same guidance to all users, independent of location.

NOAA will advance critical research and support industry engagement to evaluate a dual polarization Phased Array Radar (PAR) technology to meet NOAA's weather radar requirements. PAR is a promising technology that could advance NOAA's current radars from 1988-based technology to be viable well into the 21st century. This integrated effort will prepare for a formal Radar Acquisition Management Program and decision point in 2028 to evaluate the capabilities of PAR as a replacement for the current NEXRAD radar network by 2040. Additional funding will support improvement in the safety of commercial space activities as Earth's orbits become increasingly congested with space traffic and debris. This request will allow the Office of Space Commerce to continue progress toward meeting its target of achieving Full Operating Capability in FY 2025 for space situational awareness services. Commercial operators can use space situational awareness products and services to enhance the safety and security of their on-orbit operations.

This blue crab is a resident of the Mission-Aransas National Estuarine Research Reserve in Texas. Researchers are focused on determining the causes and effects of natural and anthropogenic-induced changes in estuarine ecosystems, including changes in crab populations.

Providing Science and Data to Inform Economic Development

Budget Program	PPA	Program Change Title	Program Change	Page Number
NOS	Navigation, Observations and Positioning	Foundational Data for Improved Ocean and Coastal Mapping and Charting	3,125	27
NOS	Coastal Science, Assessment, Response and Restoration	Foundational Information for Expansion of Offshore Wind Energy	6,219	28
NMFS	Marine Mammals, Sea Turtles, and Other Species	Wind Energy: Protected Species Environmental Reviews and Science	6,759	35
NMFS	Marine Mammals, Sea Turtles, and Other Species	Endangered Species Act (ESA) Consultations and Marine Mammal Protection Act (MMPA) Permitting	3,000	35
NMFS	Pacific Salmon	Pacific Salmon	1,405	35
NMFS	Fisheries and Ecosystem Science Programs and Services	Wind Energy: Fisheries Science and Technical Reviews	7,634	36
NMFS	Fisheries Data Collections, Surveys, and Assessments	Wind Energy: Scientific Survey Mitigation	14,601	37
NMFS	Fisheries Management Programs and Services	Wind Energy: Fisheries Management	3,435	37
NMFS	Fisheries Management Programs and Services	Targeting and Combating Illegal, Unreported, and Unregulated (IUU) Fishing	2,000	37
NMFS	Enforcement	Illegal, Unreported, and Unregulated (IUU) Fishing Enforcement	964	38
OAR	National Oceanographic Partnership Program	National Oceanographic Partnership Program Increase	559	46
OAR	Research Acquisitions and Management	Phased Array Radar Research and Development Follow-On Plan	10,000	47
NWS	Central Processing	Tsunami Unification - Addressing Information Security Risks	1,750	52
NWS	Analyze, Forecast and Support	Tsunami Unification - Common Analytic System	2,250	53
MS	Office of Space Commerce	Space Commerce	17,700	69
Total, Providing Science and Data to Inform Economic Development			**81,401**	

NOAA Pride Employee Resources Group members host a NOAA exhibit booth for outreach and recruitment at the 12th Annual Out in Science Technology Engineering and Math (oSTEM) Conference 2022, a conference for LGBTQ+ people in STEM Professions.

Equity and Workforce

As NOAA tackles the climate crisis by building a climate-ready nation, it will strive to ensure the needs of the Nation's underserved and vulnerable communities are met. To meet this challenge, NOAA is making equity central to every facet of its mission delivery services and is working internally to create a model agency that draws from the full diversity of the nation, where everyone is treated with dignity and respect. We can overcome our challenges when we draw on the talents and experiences of all parts of our society, and our greatest accomplishments are achieved when diverse perspectives are incorporated. The Administration's policies, including those described in EO 13985 on *Advancing Racial Equity and Support for Underserved Communities Through the Federal Government*, direct agencies to integrate equity into the DNA of their organizations—from management, to policies, to service delivery. In FY 2024, NOAA requests an additional $9.1 million to improve capabilities and knowledge sharing in the coastal community and investing in science and management efforts in underserved U.S. Pacific and Caribbean territories, and support a robust and diverse fisheries management process and seafood sector through training and workforce development.

NOAA will expand the Community Social Vulnerability Indicators (CSVI) Toolbox, an interactive, online GIS-based decision-making tool that is comprised of a suite of 14 statistically robust social, economic, and climate change metrics that uniquely characterize a coastal community's vulnerability and resilience to disturbances (e.g., harvest declines associated with management actions or stock collapse, extreme weather, oil spills, sea level rise, etc.). The publicly accessible indicator map and graphing tool enables users to analyze both environmental justice questions and the climate vulnerability of over 4,600 coastal communities in 23 states. The expanded toolbox will be able to identify communities with less capacity to adapt to disturbances and support implementation of policies to address environmental justice, climate change, and racial equity.

Within the U.S. Pacific and Caribbean territories, several fisheries are at-risk of overfishing, impacting the livelihoods of these underserved communities, and immediately require bolstering of current science and management efforts. NMFS will provide additional resources and support to address gaps in effective reporting, data collection, and complementary management measures for economically and culturally significant fisheries located within these areas.

NOAA will support a robust and diverse domestic seafood sector through a series of workforce development and training programs, targeting outreach to underserved and underrepresented communities. Funds will support five to 10 one-year pilot programs for workforce development and training efforts for the seafood, fishing, and aquaculture industries to be better prepared to adapt to disruptions in the market. Partnerships will cater to diverse and historically underserved communities, including but not limited to: minority serving institutions (MSIs), Historically Black Colleges and Universities (HBCUs), tribal colleges, and community colleges. Training will also be provided to increase engagement of diverse communities with the regulations and science that underpin

management. Very few new constituents participate in the fishery management process and many lack an understanding of the process. The training will benefit both the agency and stakeholders by improving cooperation and trust among the industry, public, scientists, and regulators.

Students investigate a spider conch in Fouha Bay, Guam as part of a monitoring event with the Guam Community Coral Reef Monitoring Program.

Equity and Workforce

Budget Program	PPA	Program Change Title	Program Change	Page Number
NMFS	Fisheries and Ecosystem Science Programs and Services	Advancing and Improving Territorial Fisheries Science and Management	3,692	36
NMFS	Fisheries and Ecosystem Science Programs and Services	Community Social Vulnerability Indicators (CSVI) Toolbox	1,200	36
NMFS	Fisheries Management Programs and Services	Education and Outreach for Diverse Participation in Regulatory and Science Processes	2,801	37
NMFS	Fisheries Management Programs and Services	Workforce Training to Support Seafood Industry	1,413	38
Total, Equity and Workforce			**9,106**	

NOAA's JPSS-2 satellite cleared a critical thermal vacuum testing milestone on June 15, 2022. As the third satellite in the Joint Polar Satellite System, JPSS-2 will orbit from the North to South Poles and observe extreme weather such as hurricanes, floods, wildfires, and drought. Credit: Northrop Grumman

Satellites

NOAA satellites are critical for NOAA's mission, as well as the security, safety, and prosperity of the Nation. Data from these satellites provide essential support to all segments of the U.S. economy. In FY 2024, NOAA requests an additional $359.2 million for significant investments in NOAA's observational infrastructure, underscoring NOAA's commitment to making crucial, time-sensitive, and cost-effective investments to ensure that the Nation's next-generation satellite systems expand service delivery of essential earth system observations to meet the evolving needs of the American public. The FY 2024 budget will help NOAA better observe environmental phenomena connected to climate change-related impacts and patterns, and deliver products, information, and climate services to inform decision makers.

The value of NOAA's world-class data is enhanced by NOAA applications and access by users. The FY 2024 budget supports much-needed improvements to NOAA's data infrastructure that will ensure that the data collected are preserved for the future and can be easily accessed in a cloud-based environment. This includes funding to transition NOAA to cloud computing for data ingest, processing, dissemination, and archiving, which will expand the size and diversity of NOAA user communities and data applications.

For decades, the U.S. government was alone in developing Earth-observing satellites on behalf of the Nation. Now, the government is joined by domestic companies in the deployment of satellite constellations for Earth observations, communications and connectivity. The growth of the U.S. space industry has created new opportunities for Federal agencies like NOAA to leverage new technologies, foster partnerships, and diversify key data applications. There are more sophisticated commercial technologies and capabilities available than ever before to advance NOAA's mission. NOAA will continue leading the world in cutting-edge Earth-observing instruments, setting the global standards for such technology and observations.

NOAA's current constellation has proven its worth and will continue to do so for another decade. However, NOAA must concurrently invest in the next generation of environmental satellites with the needs of all of our communities in mind. FY 2024 funding for future geostationary, low earth orbit, and space weather observations will ensure critical data continuity from legacy systems, while providing significant improvements in data and products to meet the complex societal and environmental needs of the Nation. Our program investments also allow us to immediately exploit the National Aeronautics and Space Administration's (NASA) research satellite observations for NOAA requirements and for integration into NOAA's operational mission.

With advances in technology and with commercial sector expertise, NOAA will build a more holistic and efficient observing system—one that supports our vision to create an integrated, digital understanding of our Earth environment, evolves quickly to help our communities adapt and thrive, and maintains a stable and predictable budget path that avoids outyear cost growth (which creates

risk to both NESDIS and other NOAA priorities). NOAA has presented a constrained budget of $25.0 billion in total PAC and ORF for satellite costs over the next decade (FY 2024- FY 2033) allowing NOAA to pursue the most critical observations while making tradeoffs within and between observation portfolios. NOAA's observing system, a composite of satellites deployed alongside our partners in Earth observations—including NASA, the Department of Defense (DOD), Japanese Meteorological Agency, European Organisation for the Exploitation of Meteorological Satellites (EUMETSAT), and others—will provide advanced, real-time data critical to saving lives and protecting property. This joint observing system will improve Earth and space weather forecasting and expand capabilities for extreme weather, ocean, air quality, and climate observations. It will also enable NOAA to continue long-term monitoring and continuous services with no gaps in coverage of key climate parameters essential to understanding our changing environment.

As our weather and climate become increasingly complex, NOAA's satellite observations, data, and scientific experts are needed now more than ever. NOAA must invest in the next generation of satellites, products, and services to meet the demands for more accurate and expanded environmental information and services for the American public. Continuity of NOAA's current satellites and information services, exploitation of partner research observations, support for cutting-edge products and services, and implementation of NOAA's plans for enhanced observing capabilities and vital partnerships, will directly enhance the entire weather and climate enterprise.

Satellites

Budget Program	PPA	Program Change Title	Program Change	Page Number
NESDIS	Office of Satellite and Product Operations	Satellite and Product Operations Deferred and Extended Maintenance	1,500	58
NESDIS	U.S. Group on Earth Observations (USGEO)	U.S. Group on Earth Observations (USGEO)	250	58
NESDIS	Geostationary Earth Orbit (GEO)	Geostationary Extended Observations	132,429	59
NESDIS	Geostationary Systems - R	GOES-R Series	(25,000)	60
NESDIS	Polar Weather Satellites	Polar Weather Satellites	158,910	60
NESDIS	Low Earth Orbit (LEO)	Near Earth Orbit Network	45,260	61
NESDIS	Low Earth Orbit (LEO)	Polar Operational Environmental Satellites (POES) Extension	(10,000)	61
NESDIS	Space Weather Next	Space Weather Next	73,394	62
NESDIS	Space Weather Follow On	Space Weather Follow On	(39,000)	62
NESDIS	Common Ground Services (CGS)	Data-source Agnostic Common Services (DACS)	15,478	63
NESDIS	Systems/Services Architecture and Engineering (SAE)	Commercial Data Purchase	6,000	63
Total, Satellites			**359,221**	

Twin supercomputers Dogwood (pictured here) and Cactus are the newest additions to NOAA's weather and climate operational supercomputing system. Each operates at a speed of 12.1 petaflops, three times faster than NOAA's former system. Credit: General Dynamics Information Technology

Facilities

NOAA's facilities portfolio constitutes a significant capital investment with over 620 facilities across 160 real estate markets and 6,965,592 total Usable Square Feet, including over 400 owned properties with an estimated replacement exceeding $3 billion in value. NOAA has fiduciary responsibilities to ensure the portfolio is capable of supporting its mission in a cost-effective manner and secure safety and long-term sustainability for employees and the Nation. In FY 2024, NOAA requests an additional $55.7 million to keep pace with maintenance and repair of its aging infrastructure and significantly improve facilities across the Nation. Each facility requires financial investments for maintenance, repairs, modernization, and even replacement to effectively sustain and evolve our science capabilities to support the current and future missions. NOAA proposes to significantly invest in facilities with an influx of funding to accompany the strategic priorities identified in the Facilities Strategic Plan and the highest ranked priorities in the Facilities Investment Plan.

Summary

NOAA is working hand-in-hand with numerous partners locally and sharing best practices globally. No matter the need, people know they can turn to NOAA for reliable, easy-to-use climate and extreme weather information to help make informed decisions that help save lives and livelihoods. With increased funding NOAA will build a climate-ready nation by providing actionable environmental information that is the basis of smart policy and decision-making, continue to foster environmental stewardship and optimize advances in science and technology to create value-added, data-driven sustainable economic development, with a particular focus on the New Blue Economy, and NOAA will integrate equity across the organization by improving capabilities and knowledge sharing, creating and expanding opportunities, and honing product development and service delivery in underserved communities. NOAA will continue investments in future geostationary, low Earth orbit, and space weather observations to ensure continuity of critical data from legacy systems while providing significant improvements in data and products and continue investments aligned with the NOAA Facilities Strategic Plan.

Facilities

Budget Program	PPA	Program Change Title	Program Change	Page Number
MS	NOAA Construction	Capital Investment Planning and Design	55,700	70
Total, Facilities			**55,700**	

Puerto Rico's Jobos Bay National Estuarine Research Reserve conducts studies that focus on water quality, coastal and estuarine ecosystem protection, and coastal hazards resilience.

Chapter 2

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.

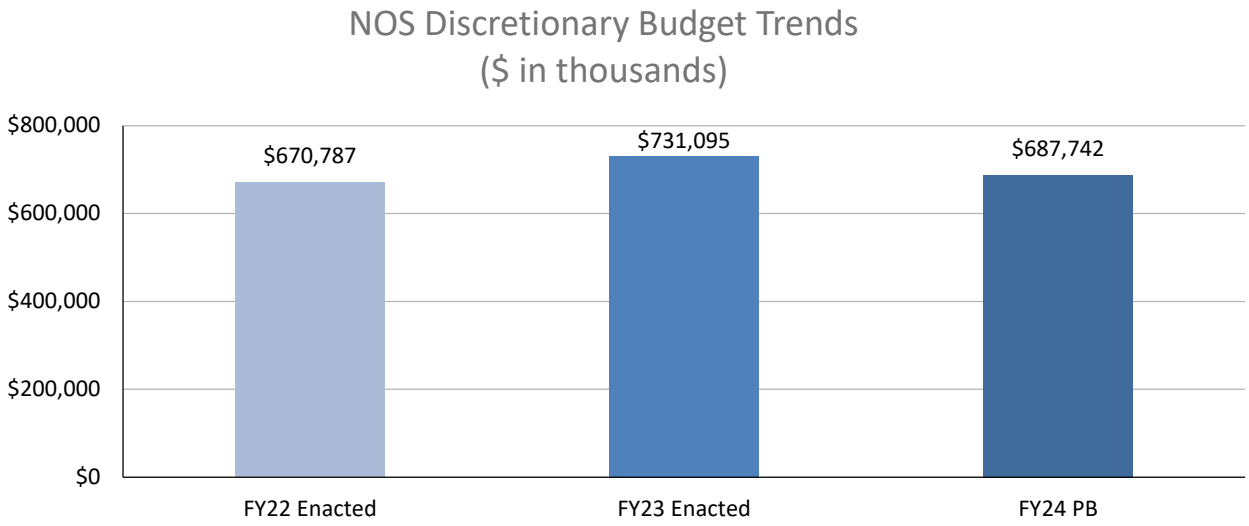
FY 2022 ACCOMPLISHMENTS

In FY 2022, NOS took big steps to advance the *America the Beautiful* initiative Executive Order (EO) 14008, which includes the goal to conserve at least 30 percent of U.S. lands and waters by 2030. On January 14, 2022, NOAA and the State of Connecticut designated the Connecticut National Estuarine Research Reserve (NERR). Located in the southeastern part of the state, it is the 30th site in the NERR System adding over 52,000 acres, and the first in Connecticut. By facilitating new partnerships and collaborative research, the NERR will improve coastal management, local sustainability, and ecosystem resilience.

NOS further worked towards expanding its National Marine Sanctuary System by continuing ongoing and starting new designation processes. In FY 2022, NOS began the designation processes for the proposed Chumash Heritage National Marine Sanctuary along the central coast of California and the proposed Hudson Canyon National Marine Sanctuary off the coast of New York and New Jersey, and continued the designation process for the proposed Lake Ontario National Marine Sanctuary (NY). NOS also launched its new SanctSound repository, raising awareness of the importance of underwater sound to ecosystem health in the National Marine Sanctuary System.

NOS also worked hard to improve coastal resilience and prepare communities, stakeholders, and decision-makers for large scale emergencies in FY 2022. NOS supported the development, implementation, and release of the 2022 Interagency Sea Level Rise Technical Report, which provides the most up-to-date sea level rise projections through 2150 for all U.S. states and territories. A Companion Application Guide to the Sea Level Rise Report was designed with partners to assist coastal decision-makers and professionals with applying and integrating the information into local sea level rise planning and adaptation decisions. The report and companion application are now informing coastal communities so that they can plan more effectively for realities on the ground. NOS also made significant improvements to the Coastal Inundation Dashboard and Sea Level Trends map, updated the Digital Coast Sea Level Rise Viewer, and expanded the Coastal Flood Exposure Mapper, which now includes the Great Lakes. Together, these updated products and services are critical to advancing the Nation's sea level rise science and lay the foundation to improve the accuracy of many critical NOAA products.

During Hurricane Ian, the NOS Disaster Response Center provided real-time data to support forecasts and warnings, in addition to keeping the public informed throughout the storm. NOS collected more than 13,000 post-storm images after flying



16,000 square kilometers, and identified more than 7,200 potential sources of pollution in the first two weeks after landfall. Throughout this time, NOS Navigation Response Teams also conducted surveys to identify hazards, update navigational charts, and help re-open ports for safe transit after storms. NOS continues to work with the Federal Emergency Management Agency and other partners to effectively coordinate and share disaster information and data that informs efforts.

Finally, through its Damage Assessment, Remediation, and Restoration Program, NOS recovered $114 million from polluters in FY 2022 to restore damaged natural resources and compensate for lost use across five states. Three oil spills and three hazardous waste (Superfund) settlements were finalized, including $16.5 million for the Gulf of Mexico, to address the effects of the Taylor Energy oil spill, which was the longest duration offshore oil spill in United States history.

FY 2024 REQUEST $713,709,000

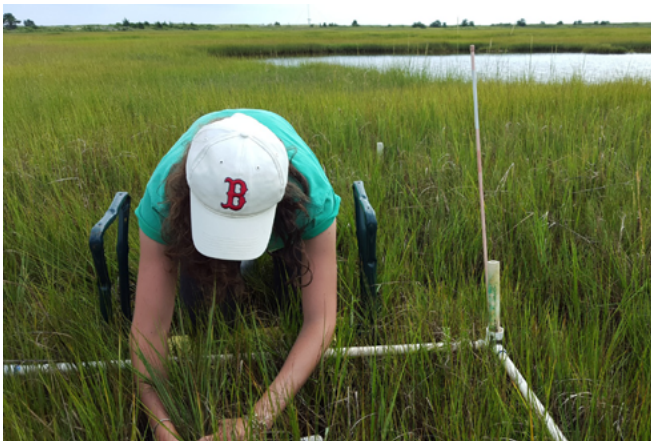
NOAA requests a total of $713,709,000 in discretionary and mandatory funds for NOS mission functions. This total includes Operations, Research, and Facilities (ORF); Procurement, Acquisition, and Construction (PAC); and other mandatory accounts. It is a net decrease of $56,700,000 in FY 2024 program changes.

NOAA will provide actionable environmental information that is the basis of smart policy and decision-making to build a climate-ready nation. In FY 2024, NOS will expand its presence in the Arctic to provide fundamental science, critical national, and international services, and responsible management of marine resources in Alaska, the Arctic Ocean, and Central Arctic Ocean. NOAA will support scientific monitoring and prediction of Arctic systems, the development of innovative observational technologies, and enhanced modeling capabilities for sea ice and ecosystems. NOAA will also address the ongoing needs identified by the NOAA-Alaska Native Tribal Health Consortium partnership to further develop their Tribal climate program, and increase support in service to Alaska Natives. In doing so, NOAA will be able to better understand and address underserved community needs for climate research, data and services in ways that are holistic, community-cen-

tered and result in improved community resilience to climate change impacts across the Arctic.

NOAA will also increase community resilience and preparedness and invest in strengthening its conservation and protection of U.S. waters. Nationwide, NOAA will take a multi-faceted approach to strengthen response capabilities and advance emergency services in coastal communities, such as real-time storm surge alerts to improve the quality and timeliness of evacuation efforts, and giving first responders immediate access imagery to assess and prioritize response efforts, improving positioning and processing, and delivering high resolution GIS ready imagery in real-time. NOAA will invest in increasing conservation and protection across the National Marine Sanctuary System to continue implementation efforts of the *America the Beautiful* initiative. NOAA's FY 2024 request supports increased capacity for research, monitoring, restoration, permitting, community engagement, and interagency partnerships to strengthen conservation outcomes in an expanded Sanctuary System. NOAA will work to identify gaps in marine protection, train the next generation of Marine Protected Area professionals, and expand technology use in sanctuaries to support management priorities. NOAA will increase engagement with partners, communities of color, underrepresented groups, and indigenous and native peoples in conservation, planning, and outreach. NOAA will also invest in large-scale restoration and conservation of key habitats that support wildlife populations, improve water quality, and preserve cultural and heritage assets.

NOAA will continue to foster environmental stewardship and optimize advances in science and technology to create value-added, data-driven sustainable and equitable economic development, with a particular focus on the New Blue Economy. In FY 2024, NOS will accelerate offshore wind energy development by advancing dynamic operational models that incorporate new spatial data and changing ocean and socioeconomic conditions to inform planning and siting of offshore wind energy and increase transparency. These combined efforts will significantly contribute to the Administration's effort to deploy 30 gigawatts of offshore wind energy by 2030. NOS will also fill data gaps in the foundational data for ocean and coastal mapping and charting of the U.S. Exclusive Economic Zone (EEZ) and build out geospatial and water level infrastructure. Using a 'Map Once, Use Many Times' approach. NOAA will address the data gaps in coastal areas with an early focus on Alaska benefiting local communities and Tribal populations.



The Waquoit Bay National Estuarine Research Reserve is a living laboratory and regional resource on one of the Northeast's most studied estuaries.

Program change increases are highlighted below. A list of program change decreases by Line Office is located in Appendix 1 and summary of funding by Subactivity is located in Appendix 3. Detailed descriptions of the program changes below are located in the NOAA FY 2024 Congressional Justification.

FY 2024 ORF BUDGET SUMMARY

NOAA requests a total of $679,242,000 to support the ORF activities of the NOS, reflecting a net decrease of $51,200,000 in FY 2024 program changes.

NAVIGATION, OBSERVATIONS AND POSITIONING $268,862,000

NOAA requests a net increase of $2,672,000 in program changes for a total of $268,862,000 in the Navigation, Observations, and Positioning activity. Funds in this activity provide the foundational navigational, geodetic, and oceanographic data to the public and private sectors to inform decisions that protect life, property and the environment, and ensures the flow of commerce to support growth of America's Blue Economy. The resulting data and services support applications across many NOAA mission areas, including safe and efficient navigation and transportation, coastal resilience, climate readiness, infrastructure, emergency planning and response, place-based conservation and restoration, recreation and tourism, and living marine resource management, among others. Program changes include:

Navigation, Observation, and Positioning: Meeting NOAA's Mission in the Arctic: NOAA requests an increase of $4,147,000 to bolster NOAA's Arctic mission to provide fundamental science, critical national and international services, and responsible management of marine resources in Alaska, the Arctic Ocean, and the Central Arctic Ocean. Funding will support scientific monitoring and prediction of Arctic systems, development of innovative observational technologies, and enhanced modeling capabilities for sea ice and ecosystems.

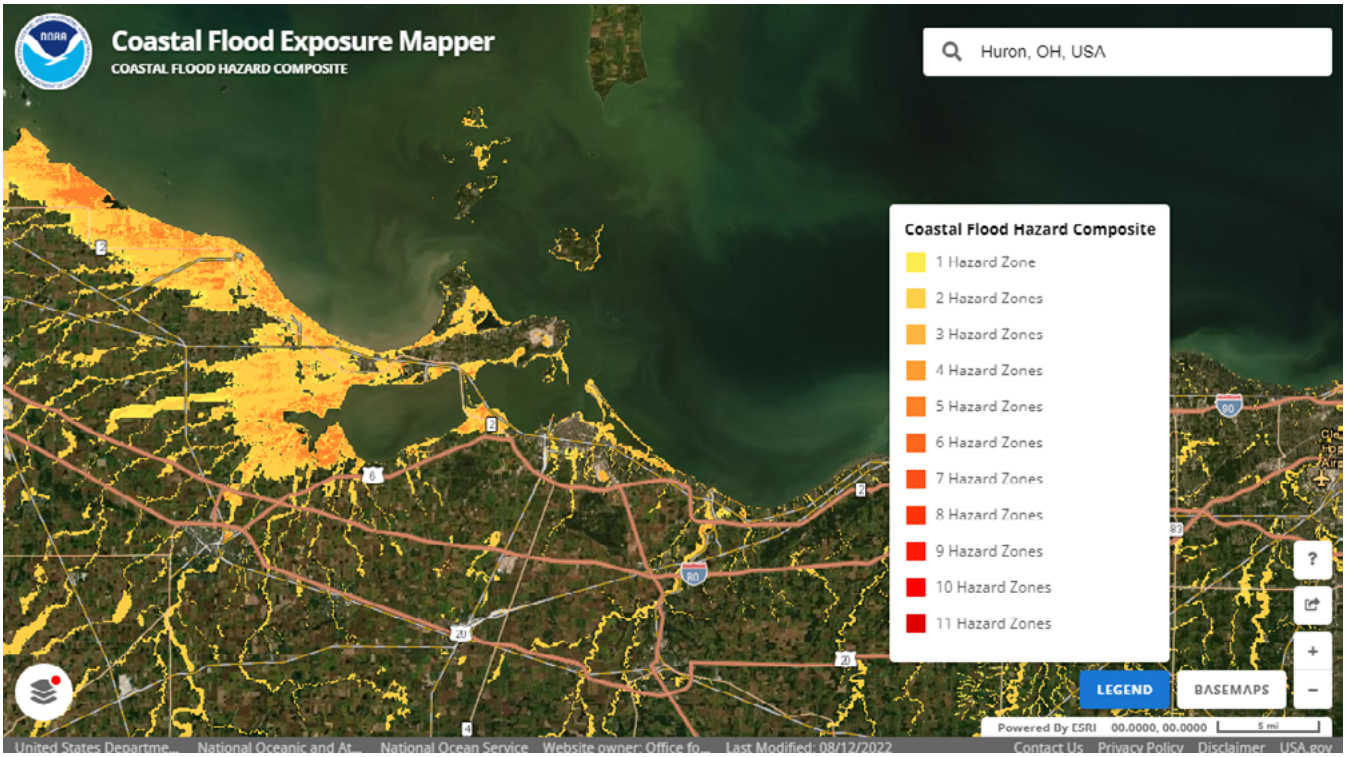
An NWLON station was installed in American Samoa at the Port of Pago Pago. The station provided NOAA's Tsunami Warning Center with critical tsunami data from the Tonga volcanic eruption in January to help warn local communities and Pacific Island governments.

Navigation, Observation, and Positioning: Foundational Data for Improved Ocean and Coastal Mapping and Charting: NOAA requests an increase of $3,125,000 to fill data gaps in the foundational data for ocean and coastal mapping and charting of the U.S. EEZ. Funds will allow NOAA to conduct airborne lidar and imagery surveys in priority areas, develop high resolution bathymetric data sets and improved electronic navigational charts, and maintain foundational geodetic and water level infrastructure. This will significantly improve the quality and utility of NOAA ocean and coastal mapping efforts, and build out foundational geospatial and water level infrastructure, benefiting local communities and Tribal populations.

Navigation, Observation, and Positioning: Advancing NOAA's Ability to Prepare and Respond to Extreme Weather and Coastal Hazard Events: NOAA requests an increase of $1,400,000 to better prepare communities for extreme weather events and increasingly frequent coastal hazards. NOAA will take a multi-faceted approach to strengthen its response capabilities, bolstering the operational readiness of the National Water Level Observation Network, and enabling real time transmission of Emergency Response Imagery. These efforts will significantly improve response readiness of our coastal communities.

COASTAL SCIENCE AND ASSESSMENT $125,861,000

NOAA requests a net increase of $3,790,000 in program changes for a total of $125,861,000 in the Coastal Science and Assessment activity. Funds will be directed towards applied research, delivery of



With data reported in the Sea Level Rise Technical Report,released in February 2022, NOS made updates and improvements to several of its popular Digital Coast tools, including the Sea Level Rise Viewer and Coastal Flood Exposure Mapper, both of which serve as authoritative sources of climate data and services.

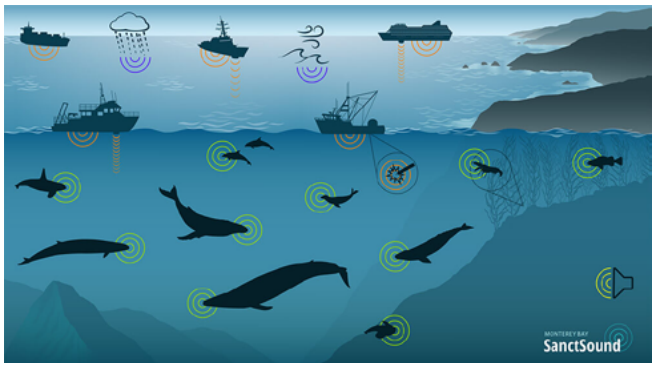
scientific information for disasters and pollution emergency response and the management, protection, and restoration of ocean and coastal resources and communities. Activities will support America's blue economy by developing tools for siting offshore wind energy. Activities will also support the advancement of a climate-ready nation by increasing the critical science to better quantify marine debris impacts to ecosystem services and coastal resilience. Program change increases include:

Coastal Science, Assessment, Response and Restoration: Foundational Information for the Expansion of Offshore Wind Energy: NOAA requests an increase of $6,219,000 to develop the social and ecological science to plan and site offshore wind energy development in support of the Administration's goal to deploy 30 gigawatts of offshore wind energy by 2030. This investment will facilitate and accelerate offshore wind development by advancing and sustaining dynamic operational models that incorporate new spatial data and changing ocean and socioeconomic conditions. NOAA is requesting a total of $8,719,000 in NOS and $51,679,000 in four complementary areas within NMFS for a total of $60,398,000 to support offshore wind energy development and mitigate potential impacts of offshore wind energy projects.

Coastal Science, Assessment, Response and Restoration: Enhancing Marine Debris Science and Innovation: NOAA requests an increase of $1,094,000 to fund critical science needs and innovative marine debris projects. This increase will allow NOAA to comply with the direction of the Save Our Seas 2.0 Act of 2020 to enhance the domestic marine debris response nationwide.

OCEAN AND COASTAL MANAGEMENT AND SERVICES $284,519,000

NOAA requests a net decrease of $19,989,000 in program changes for a total of $284,519,000 in the Ocean and Coastal Management and Services activity. Funds in this activity will support place-based,



The new SanctSounds web portal allows the public to learn about the importance of sound in the marine environment. Physical sounds, such as wind and waves, are in purple, animal sounds are green, and human-made noise is orange. This data helps resource managers better understand physical, animal, and anthropogenic interactions. Credit: Aline Design for NOAA

community, and regional approaches to effectively manage coastal and marine resources. They will also support the empowerment of coastal states and communities with actionable information and resources needed to understand risk and increase resilience of coastal ecosystems and communities, with an emphasis on collaborations and partnerships across multiple levels of public and private organizations. Program change increases include:

Coastal Zone Management and Services: Meeting NOAA's Mission in the Arctic: NOAA requests an increase of $353,000 to bolster NOAA's expanding Arctic mission to provide fundamental science, critical national and international services, and responsible management of marine resources in Alaska, the Arctic Ocean, and the Central Arctic Ocean. These funds will address NOAA's ongoing needs identified by the NOAA-Alaska Native Tribal Health Consortium partnership to further develop their Tribal climate program.

Sanctuaries and Marine Protected Areas: Increasing Conservation and Protection Across the National Marine Sanctuary System: NOAA requests an increase of $17,758,000 to strengthen conservation in U.S. waters by increasing capacity for protection, conservation, and stewardship in an expanded National Marine Sanctuary System. These funds will enhance NOAA's sanctuary management capacity as new sanctuaries are designated, and support the conservation and restoration of key habitats that support wildlife populations, key ecosystem parameters and key cultural or heritage assets.

FY 2024 PAC BUDGET SUMMARY

NOAA requests a total of $8,500,000 to support the PAC activities of the NOS, reflecting a decrease of $5,500,000 in FY 2024 program changes. These funds will support construction and acquisition in the National Estuarine Research Reserve System and the National Marine Sanctuary System. This includes construction and land acquisition projects for the National Estuarine Research Reserves, and capital costs to maintain the Sanctuary System's facilities and small boat fleet.

MANDATORY FUNDS

DAMAGE ASSESSMENT AND RESTORATION REVOLVING FUND

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

SANCTUARIES ENFORCEMENT ASSET FORFEITURE FUND

The Sanctuaries Enforcement Asset Forfeiture Fund receives proceeds from civil penalties and forfeiture claims against responsible parties, as determined through court settlements or agreements, for violations of NOAA sanctuary regulations. Penalties

received are spent on resource protection within a sanctuary in which the violation occurred.

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

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

To celebrate 50 years of ocean and coastal conservation, the U.S. Postal Service and NOAA's Office of National Marine Sanctuaries teamed up to showcase the nation's underwater treasures with 16 new Forever® stamps. The stamps feature scenes that showcase the diverse and abundant wildlife and ecosystems that can be found throughout the National Marine Sanctuary System.

The Kuleana Coral Reefs dive team collects growth rate data on outplant coral colonies in Hawaiian waters as one of three projects NMFS is funding to restore habitat through coastal National Fish Habitat Partnerships. To address loss of coral habitat in West O'ahu, Kuleana Coral Reefs will restore coral reefs with local anglers and other community members. Credit: Kuleana Coral Reefs/ Blake Nowack

Chapter 3

National Marine Fisheries Service

NOAA's National Marine Fisheries Service (NMFS) is responsible for the stewardship of the Nation's marine fisheries, protected resources, and their habitats. NMFS provides vital services for the Nation, which ensure: productive and sustainable fisheries, safe sources of seafood, the recovery and conservation of protected resources, and healthy coastal habitats—all backed by sound science and an ecosystem-based approach to management. NMFS manages 460 marine and anadromous fish stocks within the U.S. Exclusive Economic Zone (EEZ), as well as invertebrates, sea turtles, marine mammals, and other marine and coastal species and their habitats. The work of NMFS and our partners promotes trade, jobs, indigenous food security, and industry growth in commercial and recreational fisheries, aquaculture, tourism, and resource use, while protecting various marine species from extinction. U.S. commercial and recreational saltwater fishing provides significant contributions to our economy, which include 1.7 million jobs, $253 billion in sales impacts, $73 billion in income impacts, and $117 billion in value-added impacts to the U.S. economy.[1] The U.S. aquaculture industry produced $1.5 billion worth of seafood in 2020, which equals about 24 percent of total U.S. seafood production by value.[2]

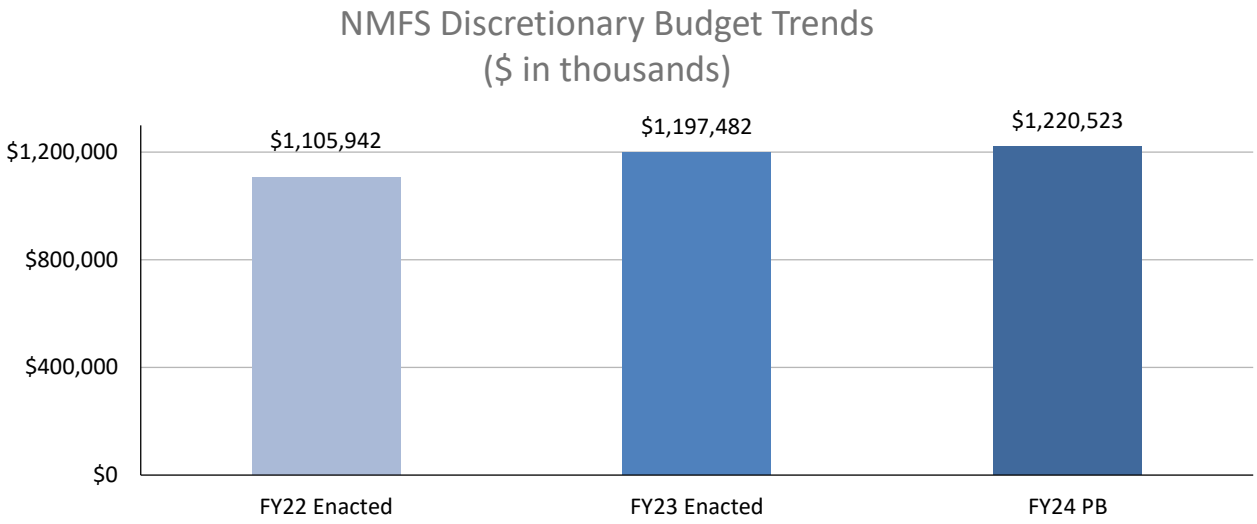
FY 2022 ACCOMPLISHMENTS

NMFS continues its commitment to support the Administration's goal of deploying offshore wind (OSW) while protecting biodiversity and promoting ocean co-use. In FY 2022, NMFS expanded its capacity to address the increasing number of OSW projects, and advanced OSW planning and development in a manner that avoids and minimizes risks to protected resources, habitats, tribal treaty and trust responsibilities, and managed fisheries. This included providing extensive expertise for 10 OSW projects as a cooperating agency with NOS and Bureau of Ocean Energy Management for National Environmental Policy Act environmental impact statements, and through the Endangered Species Act (ESA) and Essential Fish Habitat consultation processes. Under the Marine Mammal Protection Act (MMPA), NMFS issued 12 proposed and 13 final authorizations for OSW site assessment work and seven Notices of Receipt of Adequate and Complete Application for construction rules, and worked with developers on three additional MMPA authorization applications. NMFS also promoted efficiencies and shared understanding of regulatory processes, including hosting training for developers and action agencies and publishing technical guidance and checklists.

NMFS is taking a proactive approach toward climate adaptation by working across NOAA, with partner agencies, organizations, and universities. In FY 2022, NOAA scientists created a number of cutting-edge tools to help managers, municipalities, and seafood businesses make informed decisions as they adapt to climate

1 National Marine Fisheries Service, Fisheries Economics of the United States, 2020. U.S. Dept. of Commerce, NOAA Tech. Memo. NMFS-F/SPO-236, 231 p., February 2023. https://www.fisheries.noaa.gov/national/sustainable-fisheries/fisheries-economics-united-states (accessed March 2, 2023).

2 National Marine Fisheries Service, Fisheries of the United States, 2020. U.S. Department of Commerce, NOAA Current Fishery Statistics No. 2020, May 2022. https://www.fisheries.noaa.gov/national/sustainable-fisheries/fisheries-united-states (accessed March 2, 2023).



change. Studies help clarify how warming ocean temperatures, altered circulation patterns, and increasing acidity are shifting and stressing marine species, including many important seafood species. For instance, NOAA scientists linked fluctuations in oceanography to fluctuations in numbers of young fish entering the yellowtail flounder stock. Incorporating this information into the stock assessment reduces uncertainty around estimates of young fish and spawners; which are important indicators for fishery managers developing measures to promote recovery. A partnership with Rutgers University led to development and release of a data visualization tool—the Distribution Mapping and Analysis Portal—using 40 years of catch data combined with habitat suitability studies to understand how species are adapting to their changing world. Such tools, forecasts and models play a critical role in decision-making for a climate-ready future.

Vessel strikes and fishing gear entanglements are the two primary causes of injury and death for North Atlantic right whales—one of the world's most endangered large whale species. In FY 2022, NMFS announced two important steps in a series of actions to protect and conserve these whales. First, NMFS proposed new changes to Federal vessel speed regulations to further reduce risk of deaths and serious injuries from vessel collisions. Second, it released the draft *Ropeless Roadmap: A Strategy to Develop On-Demand Fishing,* which leverages lessons from fisheries around the world using on-demand ("ropeless") fishing gear and outlines ways to increase this technology's use in commercial fisheries off the U.S. East Coast. Both efforts are part of the *North Atlantic Right Whale Road to Recovery,* which encapsulates NMFS' ongoing and future work with partners and stakeholders to adequately monitor, conserve and rebuild the North Atlantic right whale population.

FY 2024 REQUEST $1,286,653,000

NOAA requests a total of $1,286,653,000 in discretionary and mandatory funds to continue and enhance the operation of NMFS. This total includes Operations, Research, and Facilities (ORF) and other accounts, and is a net decrease of $6,851,000 in FY 2024 program changes.

NOAA will provide actionable environmental information that is the basis of smart policy and decision-making to build a climate-ready nation. In FY 2024, NMFS will expand production, delivery, and use of climate science in fisheries assessments and management to address the impacts of climate change on marine resources, fisheries, and the many businesses and communities that depend on them.

NOAA will continue to foster environmental stewardship and optimize advances in science and technology to create value-added, data-driven sustainable economic development, with a particular focus on the New Blue Economy. In FY 2024, NMFS will support new business development framed around an information and knowledge-based approach to support fisheries, transportation, shipping, renewable energy, recreation, and other ocean-based uses. NMFS will expand the capacity for assessing and minimizing the impacts of offshore wind activities on marine species and habitats, reduce delays and minimize adverse economic impacts to the fishing industry, tribal treaty and trust responsibilities, and coastal communities, and mitigate impacts to fisheries surveys. These activities support the Administration's goal to deploy 30 gigawatts of offshore energy by 2030. NMFS will facilitate smart economic and ecological offshore wind development through expanded data collection for NOAA trust resources, while protecting communities, setting quotas for commercial and recreational fishermen, and monitoring and assessing the recovery and conservation programs for protected species and essential fish habitat. To keep pace with increasing infrastructure development across the country, NMFS will increase its capacity and efficiency for completing ESA consultations and MMPA permitting requests. Additionally, in support of the National Seafood Strategy, NMFS will combat illegal, unreported, and unregulated (IUU) fishing through expanded capabilities of existing programs to detect and deter IUU fishing and increased enforcement capacity.

NOAA will integrate equity across the organization by improving capabilities and knowledge sharing, creating and expanding opportunities, and honing product development and service delivery in underserved communities. In FY 2024, NMFS will support science and management efforts in underserved communities, especially in the Pacific and Caribbean territories, and expand decision-support tools to address environmental justice, climate vulnerability, and racial equity in underserved coastal communities. NMFS will also implement a series of workforce development and training pilot projects and grants, focused on environmental justice and equity through partnerships with entities serving diverse and historically underserved communities. Additional training programs will provide fishing and seafood constituents the information and tools needed to confidently and productively engage in fishery (commercial, recreational, aquaculture) management decision processes.

Program change increases are highlighted below. A list of program change decreases by Line Office is located in Appendix 1 and summary of funding by Subactivity is located in Appendix 3. Detailed descriptions of the program changes below are located in the NOAA FY 2024 Congressional Justification.

FY 2024 ORF BUDGET SUMMARY

NOAA requests a total of $1,154,874,000 to support the ORF activities of NMFS, reflecting a net decrease of $6,851,000 in FY 2024 program changes.

PROTECTED RESOURCES SCIENCE AND MANAGEMENT $256,806,000

NOAA requests a net decrease of $11,905,000 in program changes for a total of $256,806,000 in the Protected Resources Science and Management activity. These funds will support activities to assess,

understand, and protect the health of protected species, the ecosystems that sustain them, and the communities that value and depend on them. Program changes include:

Marine Mammals, Sea Turtles, and Other Species: Wind Energy: Protected Species Environmental Reviews and Science: NOAA requests an increase of $6,759,000 to assess the effects of planned offshore wind energy activities on ESA listed species and critical habitat, coordinate MMPA incidental take authorizations, and conduct review of environmental impact statements analyzing the impacts to living marine resources and affected communities under the National Environmental Policy Act (NEPA). Offshore wind development is rapidly expanding and represents a new use of our marine waters requiring substantial scientific and regulatory review. NOAA is requesting a total of $51,679,000 in four complementary areas within NMFS and $8,719,000 within NOS for a total of $60,398,000 to support offshore wind energy development and mitigate potential impacts of offshore wind energy projects.

Responders use specialized knives to practice removing entanglements from a nearly life-size whale tail fabricated for large whale entanglement response training. These knives increase the safety for the responders and the animals alike, and responders frequently practice using their specialized tools.

Marine Mammals, Sea Turtles, and Other Species: Endangered Species Act (ESA) Consultations and Marine Mammal Protection Act (MMPA) Permitting: NOAA requests an increase of $3,000,000 to continue to support increased staff capacity for ESA consultations and MMPA authorizations to improve NMFS consultation timelines and to keep up with incoming consultation and authorization requests.

Pacific Salmon: Pacific Salmon: NOAA requests an increase of $1,405,000 to continue to conduct interagency Section 7 consultations, habitat conservation planning, and listing and recovery actions to protect and recover threatened and endangered Pacific salmon and steelhead at the current level.

FISHERIES SCIENCE AND MANAGEMENT $754,765,000

NOAA requests a net increase of $43,526,000 in program changes for a total of $754,765,000 in the Fisheries Science and Management activity. These funds will support scientific and management activities to ensure the sustainability of the Nation's marine fishery resources. Program changes include:

Fisheries and Ecosystem Science Programs and Services: Climate-Ready Fisheries: Climate-Informed Fisheries Assessments and Management Strategies for Changing Oceans: NOAA requests an increase of $10,000,000 as part of the NOAA cross line office Climate Ecosystem Fisheries Initiative to support the expanded production, delivery, and use of climate science in fisheries assessments and management to address the impacts of climate change on marine resources, fisheries, and the many businesses and communities that depend on them. With these funds, NOAA will establish a nationwide ocean modeling and decision support system that

During the 2022 Southeast Bottom Longline Survey, James Rhue (OMAO, left) and Christian Jones (NMFS, right) bring up a scalloped hammerhead in the cradle to measure, tag, and collect biological samples from the shark before returning it to the ocean.

provides decision-makers with climate-informed advice on changing ocean conditions, impacts on marine resources, and best management strategies to reduce impacts and increase economic resilience. These funds ensure that increased understanding of changing ecosystems is incorporated in management decisions.

Fisheries and Ecosystem Science Programs and Services: Wind Energy: Fisheries Science & Technical Reviews: NOAA requests an increase of $7,634,000 to assess the effects of planned offshore wind energy activities on fish, fisheries, and ecosystems. Funds will support the regulatory review process for offshore energy assessment and advance scientific understanding of the interaction of offshore wind on NOAA trust resources to help inform the regulatory review process. Offshore wind development is rapidly expanding and represents a new use of our marine waters requiring substantial scientific and regulatory review. NOAA is requesting a total of $51,679,000 in four complementary areas within NMFS and $8,719,000 within NOS for a total of $60,398,000 to support offshore wind energy development and mitigate potential impacts of offshore wind energy projects.

Fisheries and Ecosystem Science Programs and Services: Advancing and Improving Territorial Fisheries Science and Management: NOAA requests an increase of $3,692,000 to increase science and management efforts for economically and culturally significant fisheries located within U.S. Pacific and Caribbean territories. Several fisheries are at risk of overfishing and immediately require bolstering of current science and management efforts. Local territorial fisheries agencies will benefit greatly from additional resources and support to address gaps in effective reporting, data collection, and complementary management measures.

Fisheries and Ecosystem Science Programs and Services: Community Social Vulnerability Indicators (CSVI) Toolbox: NOAA requests an increase of $1,200,000 to expand the CSVI Toolbox—an interactive, online GIS-based decision-making tool—to include new metrics that consider environmental justice, climate change

Teacher at Sea Maronda Hastie, a high school math teacher from Atlanta, shows off a snowy grouper captured during the bottom longline survey aboard NOAA Ship *Oregon II*.

concerns, and racial equity in underserved coastal communities. The toolbox will provide robust social, economic, and climate change indicators that uniquely characterize and evaluate a community's vulnerability and resilience to disturbances (e.g., harvest declines associated with management actions or stock collapse, extreme weather, oil spills, sea level rise). Additional funding will enhance understanding of community-level physical threats from climate change and its impacts, which supports better informed assessments and better targeted policies and programs for communities dependent on commercial fishing.

Fisheries Data Collections, Surveys and Assessments: Wind Energy: Scientific Survey Mitigation: NOAA requests an increase of $14,601,000 to support a national program to mitigate the adverse effects of planned offshore wind energy activities on NMFS scientific surveys. This investment will enable NMFS to identify and develop new survey approaches and data streams for scientific surveys that will be disrupted by offshore wind energy development. Offshore wind development is rapidly expanding and represents a new use of our marine waters requiring substantial scientific and regulatory review. NOAA is requesting a total of $51,679,000 in four complementary areas within NMFS and $8,719,000 within NOS for a total of $60,398,000 to support wind energy development and mitigate potential impacts of offshore wind energy projects.

Fisheries Management Programs and Services: Wind Energy: Fisheries Management: NOAA requests an increase of $3,435,000 to conduct the environmental reviews necessary to assess the effects of planned offshore wind energy activities on fisheries, living marine resources, and affected communities. Funds will allow NMFS to efficiently and effectively carry out increased fisheries environmental reviews, including Essential Fish Habitat (EFH) consultations and review of environmental impact statements, associated with new offshore wind energy activities. Offshore wind development is rapidly expanding and represents a new use of our marine waters requiring substantial scientific and regulatory review. NOAA is requesting a total of $51,679,000 in four complementary areas within NMFS and $8,719,000 within NOS for a total of $60,398,000 to support offshore wind energy development and mitigate potential impacts of offshore wind energy projects.

Fisheries Management Programs and Services: Education and Outreach for Diverse Participation in Regulatory and Science Process: NOAA requests an increase of $2,801,000 to implement training programs that would provide fishing and seafood constituents the information and tools needed to confidently and productively engage in fishery (commercial, recreational, aquaculture) management decision processes. Very few new constituents participate in the fishery management process, and among those who do participate there is a lack of understanding of the scientific underpinnings and the public processes for regulatory actions. By targeting outreach to underserved and underrepresented communities, NMFS will provide these training opportunities to a more diverse group of new participants. This initiative will benefit both the agency and stakeholders by improving cooperation and trust among industry, the public, scientists, and regulators.

Fisheries Management Programs and Services: Targeting and Combating Illegal, Unreported, and Unregulated (IUU) Fishing: NOAA requests an increase of $2,000,000 to support several initiatives to target and combat IUU fishing through a multi-pronged effort that augments the capacities of existing programs and adds new capabilities. This includes: targeting IUU fishing through advanced technology, improving global fisheries management through international negotiations and capacity building, and implementing U.S. import measures that promote legal and sustainable seafood. This request supports the National Seafood Strategy.

Fisheries Management Programs and Services: Workforce Training to Support the Seafood Industry: NOAA requests an increase of $1,413,000 to implement a series of workforce development and training pilot projects and grants, focused on environmental justice and equity, to support a more robust and diverse domestic seafood sector. The requested funds will support workforce development and training efforts through partnerships with entities serving diverse and historically underserved communities, including but not limited to Historically Black Colleges and Universities and other minority serving institutions.

ENFORCEMENT $84,637,000

NOAA requests a net increase of $14,000 in program changes for a total of $84,637,000 in the Enforcement activity. These funds support the work of NOAA's Office of Law Enforcement in enforcing NOAA's natural resource protection laws and promoting compliance with federal regulations to conserve and protect our Nation's living marine resources and their natural habitat and to combat IUU fishing. Program changes include:

Enforcement: Illegal, Unreported, and Unregulated (IUU) Fishing Enforcement: NOAA requests an increase of $964,000 to improve detection and enforcement of IUU fishing through increased enforcement capacity and marine forensics. This request supports the National Seafood Strategy.

HABITAT CONSERVATION AND RESTORATION $58,666,000

NOAA requests a total of $58,666,000 in the Habitat Conservation and Restoration activity. These funds will support NOAA's programs that protect and restore habitat to sustain fisheries, recover protected species, and maintain resilient coastal ecosystems and communities. There are no program changes in this activity.

Pink salmon are often called "humpback" salmon due to the hump developed by breeding males.

DISCRETIONARY FUNDS

PACIFIC COASTAL SALMON RECOVERY FUND

The Pacific Coastal Salmon Recovery Fund was established by Congress in FY 2000 to protect, restore, and conserve Pacific salmon and steelhead and their habitats through competitive funding to states and Tribes. NOAA requests $65,000,000 for this program in FY 2024.

FISHERIES DISASTER ASSISTANCE FUND

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. Congress passed and the President signed a new law on fisheries disasters in December 2022. As a result, the Magnuson-Stevens Fishery Conservation and Management Act has been revised and provides the authority for fishery disaster assistance. If the Secretary of Commerce determines that a fishery disaster has occurred, Congress may appropriate funds for disaster assistance, which are administered by the Secretary. The FY 2024 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 more quickly process fisheries

disaster determination requests, allocate available appropriations, and award grants. This request will improve responsiveness to administering requests for fishery disaster determinations and assistance. These funds will be used to support implementation of the new law to ensure we meet the new statutory deadlines for each step in the disaster determination and funding processes.

FISHERMEN'S CONTINGENCY FUND

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

FOREIGN FISHING OBSERVER FUND

The Foreign Fishing Observer Fund is financed through fees collected from owners and operators of foreign fishing vessels fishing within the U.S. EEZ. The fund is used by NOAA to pay salaries, administrative costs, data editing and entry costs, and other costs incurred for observers.

FISHERIES FINANCE PROGRAM ACCOUNT

The Fisheries Finance Program is a national loan program that makes long-term, fixed-rate financing available to U.S. citizens who otherwise qualify for financing or refinancing for the reconstruction, reconditioning, or the purchasing of fishing vessels, shoreside processing, aquaculture or mariculture facilities, or individual fishing quota. Additionally, the Fisheries Finance Program can provide loans for fisheries investments of Western Alaska Community Development Quota (CDQ) groups.

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."

Staff deploy an innovative seafloor-mounted upward-looking echosounder (SME) technology to quantify the directional movements of fish over extended periods as part of the Year-Round Monitoring of Pollock Movements in Eastern Bering Sea.

MANDATORY FUNDS

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

NOAA will transfer $355,081,000 from the Promote and Develop account to offset the appropriation requirements of NMFS's ORF account. The transfer to ORF will support data collection, data management, and fisheries stock assessment production within the Fisheries Data Collections, Surveys, and Assessments PPA, the Fisheries Management Programs and Services PPA, the Observers and Training PPA, and the Interjurisdictional Fisheries Grants PPA. With this transfer, $7,530,000 will be available for the Saltonstall-Kennedy program in FY 2024. 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).

FISHERIES FINANCE PROGRAM ACCOUNT

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

FEDERAL SHIP FINANCING FUND

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

ENVIRONMENTAL IMPROVEMENT AND RESTORATION FUND

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

LIMITED ACCESS SYSTEM ADMINISTRATION FUND

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

WESTERN PACIFIC SUSTAINABLE FISHERIES FUND

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

FISHERIES ASSET FORFEITURE FUND

MSA Section 311(e)(1) authorizes the Secretary of Commerce to pay certain enforcement-related expenses from fines, penalties, and forfeiture proceeds received for violations of the MSA, Marine Mammal Protection Act, National Marine Sanctuaries Act, or any other marine resource law enforced by the Secretary. NOAA has established a Civil Monetary Penalty/Asset Forfeiture Fund.

NORTH PACIFIC OBSERVER FUND

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

SEAFOOD INSPECTION PROGRAM

The Seafood Inspection Program (SIP) is a fee-for-service program within NMFS, authorized under the Agricultural Marketing Act of 1946 (7 USC Section 1622(h)). It provides inspection and auditing services to domestic seafood processors and distributors in order to provide health and catch certification for export of fish and fishery products to foreign countries, ensure compliance with food safety regulations, evaluate product quality and grading, and evaluate facility and systems compliance. The Seafood Inspection Program Trust Revolving Fund was established in 2022 to credit receipts and collections for fees assessed to users of the SIP to cover the cost of services provided. SIP costs funded through the trust revolving fund include salary and benefits, travel, operation and maintenance of core business applications, rent, utilities, supplies, transportation, shipping, equipment, contractual services, and administrative overhead.

Colorado Rockies taken from a weather balloon at about 50,000 feet, roughly the same operational envelope as the HORUS uncrewed glider system.

Chapter 4

Office of Oceanic and Atmospheric Research

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

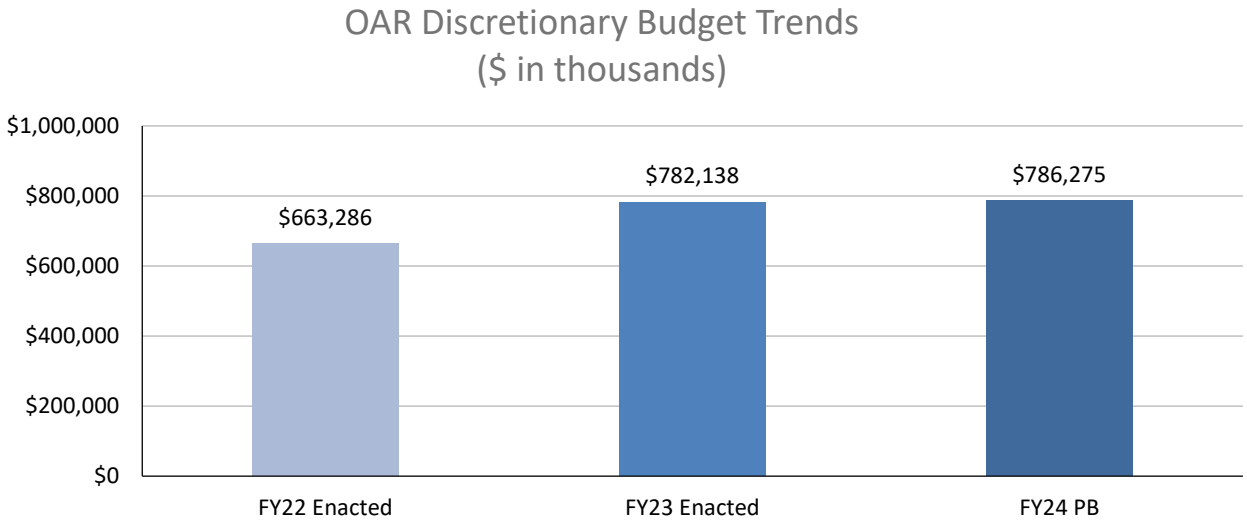
FY 2022 ACCOMPLISHMENTS

Climate change is impacting every region and economic sector of the U.S., and NOAA is providing critical climate science to inform policymakers and the public. Released in December 2021, NOAA's 16th annual Arctic Report Card documented the ways that climate change continues to fundamentally alter this once reliably-frozen region, as increasing heat and the loss of ice drive its transformation into a warmer, less frozen and more uncertain future. This original, peer-reviewed report, compiled by 111 scientists from 12 nations, included environmental observations and analysis documenting rapid and dramatic shifts in weather, climate, terrestrial and oceanic conditions in the circumpolar region. The Arctic continues to warm more than twice as fast as the rest of the globe.

For the first time, the U.S. Environmental Protection Agency is using NOAA's atmospheric measurements to help support a national inventory of emissions from an important family of greenhouse gases. NOAA's observations are helping to track emissions of hydrofluorocarbons, or HFCs, a potent greenhouse gas with a growing climate impact. The American Innovation and Manufacturing Act of 2020 calls for an 85% reduction in HFC production and consumption by 2036, and understanding HFC emissions helps provide guidance to the policymakers developing and assessing emission reduction strategies.

To tackle the challenge of forecasting rapid intensification in hurricanes, NOAA researchers coordinated with multiple partners to launch a host of instruments—underwater gliders, Saildrones, and dropsondes—that sample the ocean and atmosphere in real time. Seven underwater hurricane gliders monitored ocean conditions in the eastern Caribbean during Hurricane Fiona. One NOAA glider a few kilometers from the center of Tropical Storm Fiona collected co-located observations with a Saildrone uncrewed surface vehicle. In addition, NOAA's P-3 Hurricane Hunter aircraft deployed dropsondes in proximity to the Saildrone and gliders for a holistic view of the storm. Using data from these instruments, the National Hurricane Center upgraded Tropical Storm Fiona to a Category 1 hurricane as it traveled south of Puerto Rico. These co-located observations are another example of how NOAA is working with the private sector to improve forecasts of extreme events using better observations.

In December 2021, NOAA and partners launched



approximately 100 new Argo floats across the Atlantic Ocean to bolster the international Argo Program, which maintains a global array of floats that measure ocean pressure, temperature and salinity The use of a sailing vessel created a low-carbon research mission to deploy Argo floats to remote areas of the ocean, filling critical observational gaps. Argo's nearly global coverage is crucial for detecting climate change signals, estimating the ocean's heat content, and observing the global hydrological cycle. Argo data is used every day in weather forecasting and has helped improve maritime navigation and safety charts.

FY 2024 REQUEST $786,275,000

NOAA requests a total of $786,275,000 to support OAR's continued and sustained operations. This total includes Operations, Research, and Facilities (ORF) and Procurement, Acquisition, and Construction (PAC) accounts. It is a net decrease of $5,688,000 in FY 2024 program changes.

NOAA will provide actionable environmental information that is the basis of smart policy and decision-making to build a climate-ready nation. In FY 2024, NOAA will continue to serve as the global leader in monitoring long-term atmospheric and climate change trends. OAR will maintain and enhance its long-term atmospheric observations, which serve as a baseline and record of trends for important greenhouse gases, and support research on future climate scenarios. NOAA will also invest additional resources to improve predictions and projections in a research environment. In particular, OAR will improve precipitation predictions across weather and climate timescales through the Precipitation Prediction Grand Challenge, an effort to advance subseasonal-to-seasonal and seasonal-to-decadal forecasts and will include more skillful precipitation forecasts using NOAA's Unified Forecast System. In addition, NOAA will develop a state-of-the-art global reanalysis capability to improve understanding and prediction of extreme weather events, environmental change, and climate impacts. Delivering the next generation of NOAA's science, products, and services will be supported by crucial investments in research and development of uncrewed systems technologies, which have the potential to enhance timeliness and quality of NOAA missions while reducing costs.

NOAA's weather and climate predictions and information must be reliably delivered to users to impact decision-making. To assist climate risk decision-making across a wide range of stakeholders and economic sectors, OAR will develop accessible and actionable climate projections with society-relevant data delivery services. Investments in OAR's Climate Adaptation Partnerships program will allow OAR to work with more regions and communities across the Nation to co-produce and operationalize lasting and equitable climate resilience plans, prioritizing underserved communities that are particularly vulnerable to a changing climate and its impacts.

NOAA will continue to foster environmental stewardship and optimize advances in science and technology to create value-added, data-driven sustainable and equitable economic development. With key investments in weather observation technology and infrastructure, OAR will advance critical research and support industry engagement to prototype a dual polarization Phased Array Radar (PAR) technology. PAR is a promising technology that could advance NOAA's current radars from 1988-based technology to radars that would be viable until the end of the 21st century. This request is part of an integrated effort to prepare for a formal decision point in 2028 to evaluate the capabilities of PAR as a replacement for the current NEXRAD radar network by 2040.

Program change increases are highlighted below. A list of program change decreases by Line Office is located in Appendix 1 and summary of funding by Subactivity is located in Appendix 3. Detailed descriptions of the program changes below are located in the NOAA FY 2024 Congressional Justification.

FY 2024 ORF BUDGET SUMMARY

NOAA requests a total of $677,775,000 to support the ORF activities of OAR, reflecting a net decrease of $14,188,000 in FY 2024 program changes.

The intensity of the 2019 Williams Flat fire, seen from NASA's DC-8 flying laboratory during the NOAA-NASA FIREX-AQ mission, created a plume that reached the stratosphere, allowing it to spread widely across North America. New research from NOAA and CIRES finds that wildfire smoke is much more widespread and plays a much bigger role in contributing to ozone pollution than previously thought.

CLIMATE RESEARCH $231,343,000

NOAA requests a net increase of $3,771,000 in program changes for a total of $231,343,000 in the Climate Research activity. This total advances the long-term observing, monitoring, research, and modeling capabilities performed in OAR's Climate Research. It provides the science that Americans need to understand how, where, and when Earth's conditions are changing. Program changes include:

Climate Laboratories and Cooperative Institutes: Sustained Atmospheric Observations Increase: NOAA requests an increase of $1,120,000 to support and enhance its atmospheric observing systems. This request would support an evaluation of greenhouse gas (GHG) emissions and changes in emissions at various scales, and provide a more robust understanding of the allowable cumulative GHG emissions to limit global warming at different future levels by taking into account likely changes in natural GHG sinks and sources in the ocean, land, and atmosphere.

Regional Climate Data and Information: Enhancing Regional and Community Resilience by Scaling Up Climate Adaptation Partnerships (CAP) Program: NOAA requests an increase of $3,506,000 to extend the proven capabilities of the CAP program to advance adaptation measures and resilience planning at regional and local scales, while prioritizing environmental justice. Through this initiative, NOAA will continue to expand the CAP program by adding one additional regional team for a total of 13, a significant step towards achieving nationwide coverage, while providing more robust support for those regions already benefiting from a CAP team.

Climate Competitive Research: Precipitation Prediction Grand Challenge Increase: NOAA requests an increase of $2,145,000 to enhance the skill of precipitation predictions across weather and climate timescales in a research environment and for potential transition to operations. NOAA will improve understanding of key physical processes operating in the atmosphere, identify ways to improve model representations of these processes, and reduce the systematic biases in NOAA models, which will lead to the demonstration of improved precipitation forecast skill. This initiative will focus on key research areas, including conducting process studies and global modeling experiments targeting key model deficiencies that limit precipitation prediction skill.

WEATHER & AIR CHEMISTRY RESEARCH $168,630,000

NOAA requests a net decrease of $711,000 for a total of $168,630,000 in the Weather and Air Chemistry Research activity. This total supports NOAA's efforts to advance community-developed enhancements to weather models and to provide the resources needed to advance and accelerate transition of the most promising research activities into operations in the National Weather Service. Program changes include:

Weather Laboratories and Cooperative Institutes: Global Reanalysis Capability: NOAA requests an increase of $2,789,000 to develop

Heavy thunderstorms in Fairfax County, VA, on Aug. 5, 2022, added several inches of additional rainfall in less than three hours to already saturated ground, causing rapid rises in creeks and streams as well as flooding other low-lying areas.

PERiLS (Propagation, Evolution, and Rotation in Linear Storms) Instrumentation will be used to initiate one of the largest and most comprehensive severe storm field campaigns to date across the Southeast United States in the late winter and spring periods of 2022 and 2023.

a state-of-the-art global reanalysis capability that is critical to improving the understanding and prediction of high impact weather events, environmental change, and climate impacts. Reanalysis combines historical observations with modern Earth system models to generate a spatially and temporally complete history of the Earth system. The proposal modernizes and extends the nation's coupled Earth system reanalysis which is an essential digital infrastructure that supports NOAA's operational and research mission as well as the rapidly growing weather and climate enterprise.

OCEAN, COASTAL & GREAT LAKES RESEARCH $255,281,000

NOAA requests an increase of $559,000 in program changes for a total of $255,281,000 in the Ocean, Coastal, and Great Lakes Research activity. This total includes research activities to better understand the ocean and Great Lakes, their natural resources, and the influence they have on the Earth's weather and climate through technological advancements in modeling, computing, observing, and information dissemination. Program changes include:

National Oceanographic Partnership Program (NOPP): NOPP Increase: NOAA requests an increase of $559,000 to expand NOAA's support for the interagency NOPP, 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 $22,521,000

NOAA requests an increase of $3,034,000 in program changes for a total of $22,521,000 in the Innovative Research & Technology activity. This total includes continued support for advanced cloud and traditional high performance computing and

NOAA's new uncrewed glider called, "High-altitude Operational Return Unmanned System (HORUS)" poised to help vastly increase high-altitude research.

technology throughout NOAA, as well as research and evaluation for operational readiness of a full spectrum of uncrewed systems. Program changes include:

Uncrewed Systems: Uncrewed Systems Increase: NOAA proposes an increase of $3,034,000 to advance research and development of a full spectrum of NOAA's aircraft and maritime uncrewed systems mission concepts. These funds will move notional ideas to testable technologies and work closely with OMAO's Uncrewed Systems Operations Center to finalize mature, transition-ready projects into operational use within NOAA. NOAA will use these resources for directed research and proposal solicitations for research and development related to uncrewed systems concepts and technologies to support missions across NOAA.

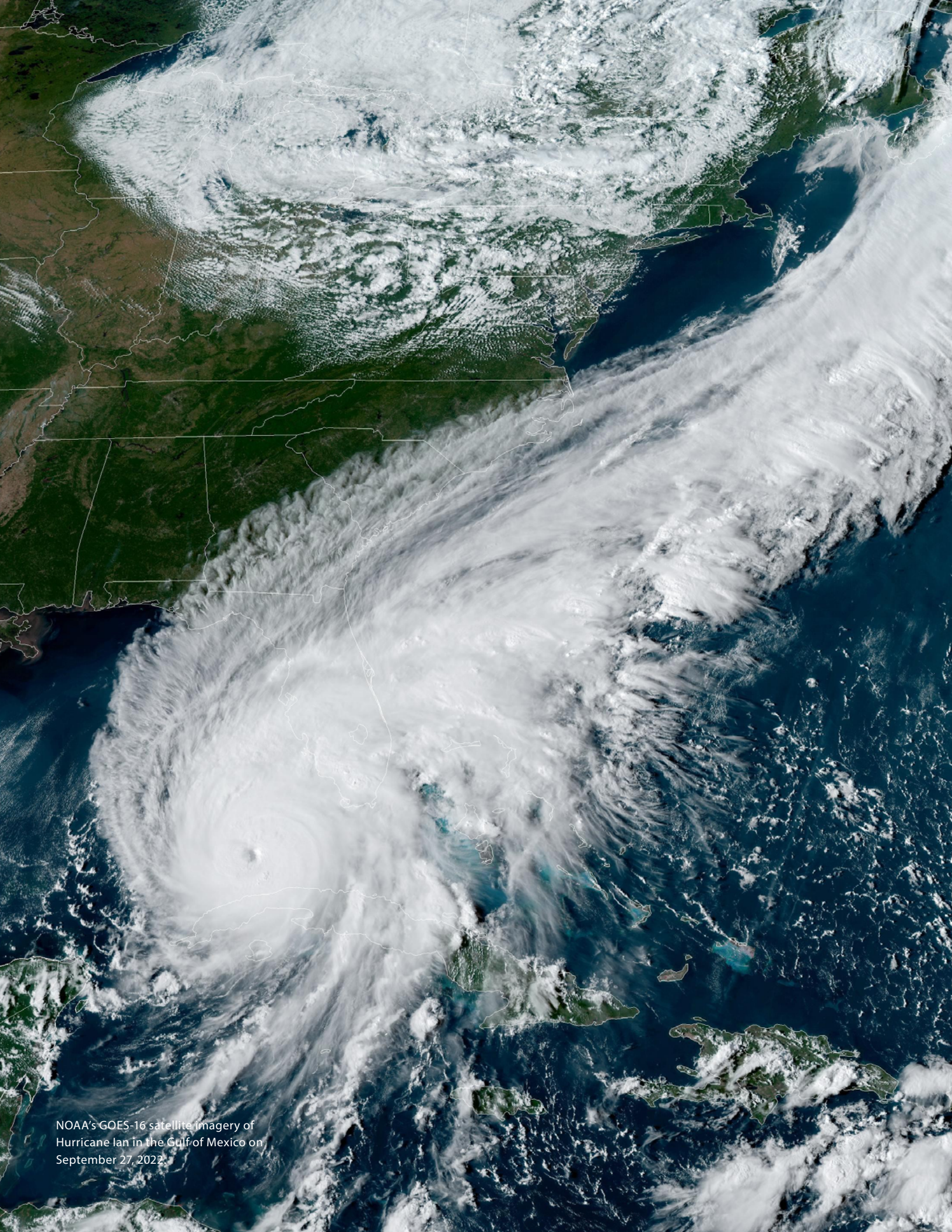
FY 2024 PAC BUDGET SUMMARY

NOAA requests a total of $108,500,000 to support the PAC activities for OAR, reflecting a net increase of $8,500,000 in FY 2024 program changes.

SYSTEMS ACQUISITION $108,500,000

NOAA requests an increase of $8,500,000 in program changes for a total of $108,500,000 in the Systems Acquisition activity. Program changes include:

Research Acquisitions and Management: Phased Array Radar Research and Development Follow-On Plan: NOAA proposes an increase of $10,000,000 to acquire a dual polarization PAR to demonstrate and evaluate advanced techniques needed to perform the rapid updates required with a rotating planar array. This critical step would allow NOAA to evaluate dual polarization PAR technology to meet NOAA's weather radar requirements. This request is part of an integrated effort to evaluate the capabilities of PAR as a replacement for the current NEXRAD radar network.



NOAA's GOES-16 satellite imagery of Hurricane Ian in the Gulf of Mexico on September 27, 2022.

Chapter 5

National Weather Service

NOAA's National Weather Service (NWS) is the official government authority for issuing warnings during life-threatening weather, water, and climate-dependent 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. With 122 Weather Forecast Offices, 13 River Forecast Centers, nine National Centers, and other support offices, the NWS collects and analyzes more than 6.3 billion observations per day and releases about 1.5 million forecasts and 50,000 warnings each year. 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.

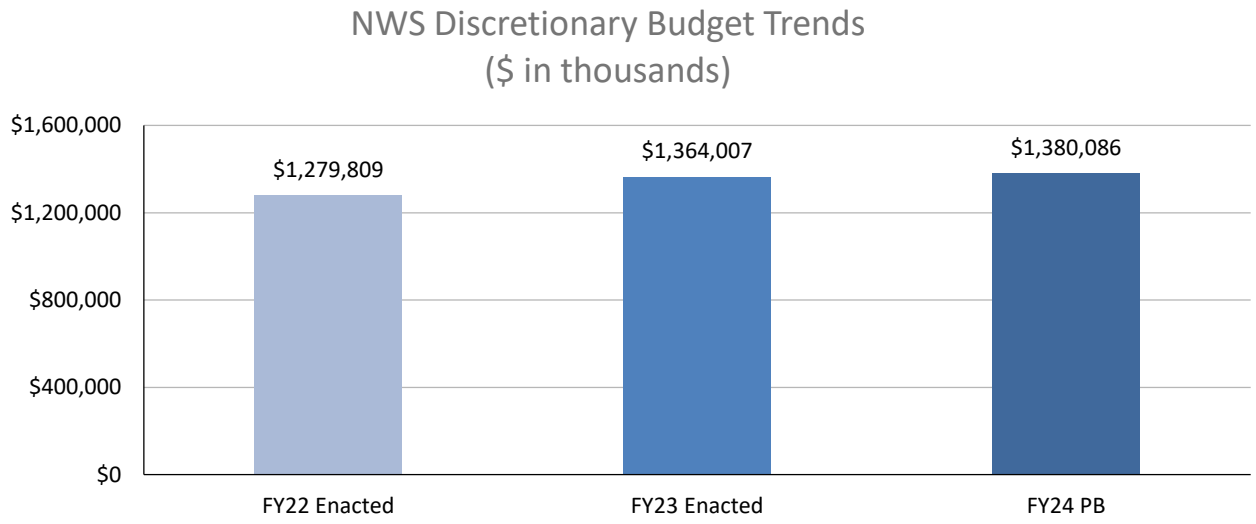
FY 2022 ACCOMPLISHMENTS

During 2022, the NWS issued over 200 Excessive Heat Watches, Warnings, and Advisories with four-five days of lead time ahead of the heat waves that the U.S. experienced. Portions of the Southwest had the hottest April-September in modern record and Texas had the warmest July on record. During 2004–2018, an average of 702 heat-related deaths (415 with heat as the underlying cause and 287 as a contributing cause) occurred in the U.S. annually.[1] In partnership with national, state, and local officials NWS prepares the public for the dangerous heat. The close working relationships between NWS and partners, plus the long lead times for alerts, prompted life-saving actions including opening cooling shelters and closing public schools.

Investments in the Hurricane Forecast Improvement Program since 2007 and the 2021 Global Forecast System upgrade have enabled NWS to improve life-saving forecasts, watches, warnings, and decision support services. For example, during the 2022 Atlantic hurricane season, NWS issued forecasts and warnings for 14 tropical cyclones, enabling timely evacuation and other life-saving decisions, including for Hurricanes Ian, Fiona, and Nicole. NWS had record-low hurricane forecast errors for track out to five days and intensity out to two days. For Ian, the highest impact storm, NWS forecast the threat of a major hurricane for Florida's Gulf Coast five days in advance and warned of life-threatening storm surge two days in advance of the September 28 landfall.

In FY 2022, NWS operationalized a higher capacity Weather and Climate Operational Supercomputing System (WCOSS), running three times faster than previous systems. WCOSS processes billions of observations per day and executes models generating the foundational information supporting operational weather, water, and climate forecasts. In June, NWS' suite of 80 weather and environmental models were transitioned to the new WCOSS with no service interruption. This increase in capacity allows for the deployment of more accurate models

1 Centers for Disease Control and Prevention, Heat Related Deaths - United States, 2004-2018, https://www.cdc.gov/mmwr/volumes/69/wr/mm6924a1.htm (accessed March 1, 2023)



which capture small-scale features, including severe thunderstorms and heavy precipitation; longer lead time for larger scale storms such as winter weather and hurricanes, and better uncertainty assessment. WCOSS supports improvements in earth system predictions to provide the public with more detailed weather forecasts further in advance.

As part of the Integrated Dissemination Program (IDP), in July, after a successful technology demonstration, NWS awarded a contract to migrate NWSChat to Slack, a commercial-off-the-shelf solution, to reliably coordinate vital and timely forecast information. NWSChat is a critical tool for collaboration between meteorologists, core stakeholders, and partners for IDSS when significant weather threatens. The original NWSChat, implemented over a decade ago, was no longer able to fully meet the demand.

NWS initiated use of adaptive machine learning to generate Spanish language translations, creating faster and more accurate translations, previously manually done by Weather Forecast Office (WFO) personnel, leveraging the NOAA Small Business Innovation Research Program funds. WFO San Juan deployed this prototype capability during the latter half of the 2022 hurricane season, bringing critical forecasts and warnings directly to the Spanish-speaking population in Puerto Rico. Future steps include scale-adapted translation to additional WFOs, products, and languages. These efforts support the NWS' commitment to providing services to the growing demographic of over 40 million Spanish speakers and goal to expand translation services for more equitable service delivery.

FY 2024 REQUEST $1,380,086,000

NOAA requests a total of $1,380,086,000 to focus on NWS' core mission, which is to provide weather, water and climate data, forecasts, warnings, and impact-based decision support services for the protection of life and property. This total includes Operations, Research, and Facilities (ORF) and Procurement, Acquisition, and Construction (PAC) accounts and includes a net decrease of $23,771,000 in program changes.

NOAA will provide actionable environmental information that is the basis of smart policy and

decision-making to build a climate-ready nation. In FY 2024, NWS will build off advancements made and continue to optimize and upgrade the IDP in accordance with the plan provided to Congress. The investment in FY 2024 will provide necessary resources for the IDP to recompete the contract needed for 24x7 support and continue to reliably and quickly deliver critical observations, model guidance, forecasts, and watch and warning information to NWS meteorologists, emergency management partners, the Weather Enterprise, and the public.

NOAA will continue to foster environmental stewardship and optimize advances in science and technology to create value-added, data-driven sustainable and equitable economic development. In FY 2024, NWS will address critical improvements needed to its Tsunami Warning Program to ensure mission delivery. Tsunamis are unpredictable and extremely high impact with potentially disastrous consequences to life and property along the already vulnerable U.S. coastlines. NWS will focus on unification of its Tsunami Warning Centers through a Common Analytic System to ensure seamless Continuity of Operations and mitigate risk of operational failure, as well as Information Technology/Information Security investments to meet rigorous FISMA (High) Information Security requirements.

NWS Director Ken Graham and NOAA staff, work with the National Integrated Heat Health Information System and citizen scientists to attach sensors to cars to collect temperature, humidity, time, and location data in Montgomery County, MD.

Program change increases are highlighted below. A list of program change decreases by Line Office is located in Appendix 1 and summary of funding by Subactivity is located in Appendix 3. Detailed descriptions of the program changes below are located in the NOAA FY 2024 Congressional Justification.

FY 2023 ORF BUDGET SUMMARY

NOAA requests a total of $1,275,982,000 to support the ORF activities of the NWS, reflecting a net decrease of $18,526,000 in program changes.

OBSERVATIONS $253,462,000

NOAA requests a decrease of $4,745,000 in program changes for a total of $253,462,000 in the Observations activity. This request is used to operate and maintain all NWS observing systems, evaluate observational requirements, engineer technical solutions, perform system development and testing, and purchase additional observational data from select third-party vendors.

CENTRAL PROCESSING $112,367,000

NOAA requests a net decrease of $733,000 in program changes for a total of $112,367,000 in the Central Processing activity. Program changes include:

Central Processing: Tsunami Unification—Common Analytic System: NOAA requests an increase of $1,750,000 for the unification of the Tsunami Warning Centers (TWCs) operation procedures at the analytic level, thereby ensuring product consistency and 24/7 backup capabilities. This request will complete a technology refresh of the TWCs to replace all end of life equipment to mitigate existing operational security risk and

enable consistent operational processes for backup capabilities between TWCs.

ANALYZE, FORECAST, AND SUPPORT $609,983,000

NOAA requests a net decrease of $3,750,000 in program changes for a total of $609,983,000 in the Analyze, Forecast, and Support activity. Program changes include:

Analyze, Forecast, and Support: Tsunami Unification—Addressing Information Security Risks: NOAA requests an increase of $2,250,000 for the unification of the Tsunami Warning Centers (TWCs) operation procedures at the analytic level, thereby ensuring product consistency and 24/7 backup capabilities. The National Tsunami Warning Center, located in Palmer, Alaska, and Pacific Tsunami Warning Center, located in Honolulu, Hawai'i, currently operate independent tsunami detection, analysis and forecasting systems, and use different analytic techniques and methodologies. This will ensure seamless continuity of operations by eliminating discontinuities within existing systems, and providing the same guidance to all users, independent of location.

An Incident Meteorologist (IMET) trainee provides a weather update to fire crews at Six Rivers Lightning Fire in California in August, 2022. This coordination happens several times a day to enable firefighters to safely combat wildfires.

DISSEMINATION $121,218,000

NOAA requests an increase of $2,447,000 in program changes for a total of $121,218,000 in the Dissemination activity. Program changes include:

Dissemination: Integrated Dissemination Program Implementation: NOAA requests an increase of $2,447,000 to optimize and upgrade both the National Dissemination on-premise IT infrastructure and applications, and to build the public cloud framework, by focusing on activities within Phases 3 and 4 of the IDP plan. This investment will allow IDP the necessary resources to recompete the contract needed for 24x7 support.

SCIENCE AND TECHNOLOGY INTEGRATION $178,952,000

NOAA requests a decrease of $4,480,000 in program changes for a total of $178,952,000 in the Science and Technology Integration activity. This request will allow NWS to continue engaging with partners in research focused outreach efforts, support targeted research and development efforts, improve a suite of forecast guidance models and post-processing, continuously train the workforce on scientific advances, and infuse new science along with social, behavioral, and economic sciences into operations.

FY 2023 PAC BUDGET SUMMARY

NOAA requests a total of $104,104,000 to support the PAC activities of the NWS, reflecting a net decrease of $5,245,000 in program changes.

SYSTEMS ACQUISITION $94,104,000

NOAA requests a decrease of $1,745,000 in program changes for a total of $94,104,000 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.

Ben Kyger, Director of National Centers for Environmental Prediction Central Operations, and others at the NOAA Center for Weather and Climate Prediction during NWSChat 2.0 collaborative discussions in December 2023.

CONSTRUCTION

Facilities Construction and Major Repairs $10,000,000

NOAA requests a decrease of $3,500,000 in program changes for a total of $10,000,000 in the Construction Activity. This total supports repairs and renewal of forecast offices and other government owned weather facilities that contain critical infrastructure; maintain structural integrity through capital improvements.

A flag blows in the wind among damage from Hurricane Ian in Fort Myers Beach, FL on Oct. 2, 2022. Credit: Jocelyn Augustino, Federal Emergency Management Administration

GOES-T, the third satellite in NOAA's GOES-R Series of advanced geostationary weather satellites, successfully launched from Cape Canaveral, FL on March 1, 2022. Credit: United Launch Alliance

Chapter 6

National Environmental Satellite, Data, and Information Service

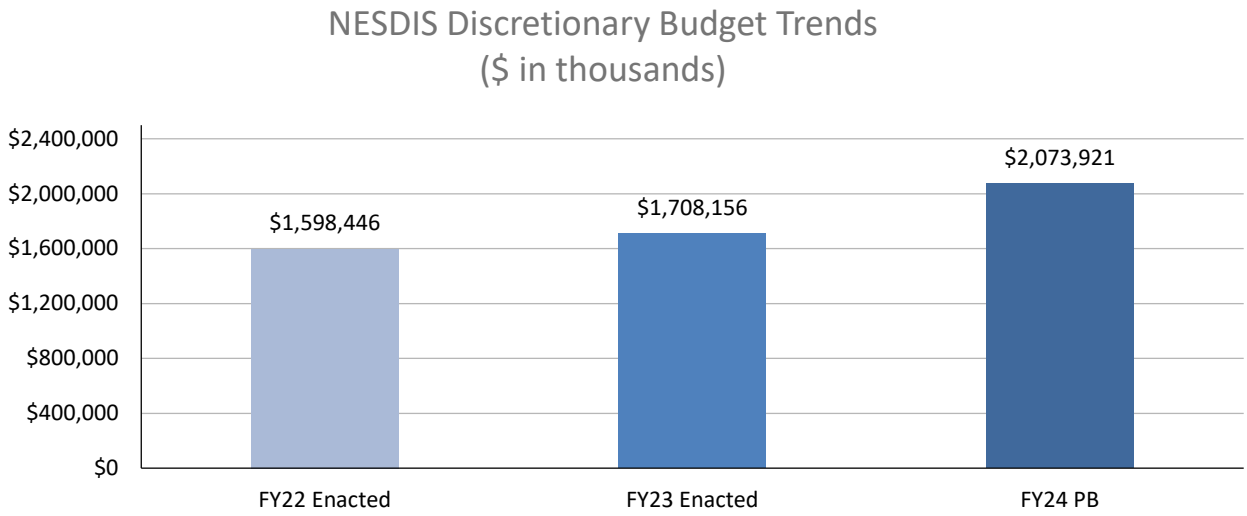
The National Environmental Satellite, Data, and Information Service (NESDIS) has the unique role of providing timely access to global environmental space-based and ground-based data, products, and services, 24/7. These data and end user products promote, protect, and enhance the Nation's economy, security, 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 develops the next generation of satellites to avoid gaps in satellite coverage that could affect NOAA's primary mission essential functions. These next-generation satellite systems will launch in the next decade to further protect people and property in an increasingly complex weather- and climate-sensitive environment.

FY 2022 ACCOMPLISHMENTS

In FY 2022, NOAA achieved important decision milestones to advance its next-generation satellite systems and instruments to better predict the weather on Earth as well as in space. NOAA's Geostationary Extended Observations and Space Weather Next programs completed their Milestone 1 reviews in November 2021, which defined needs, capability gaps, and program objectives. acquisition processes of low Earth orbit. NOAA's QuickSounder project, which will help inform the future acquisition processes of low Earth orbit by demonstrating new business and programmatic models, successfully completed Milestone 1 in August 2022.

NOAA also advanced its mission to provide continuous imagery of the Western Hemisphere when it successfully launched Geostationary Operational Environmental Satellites (GOES)-T satellite on March 1, which was renamed GOES-18 when it reached geostationary orbit on March 14. GOES-18 is the third satellite in the GOES-R Series, the most sophisticated weather observation and environmental monitoring system in the Western Hemisphere. GOES-18 will go directly into operational service as GOES West, providing advanced atmospheric measurements and imagery, mapping real-time lightning activity, and monitoring space weather over the western contiguous United States, Alaska, Hawaii, Mexico, Central America, and the Pacific Ocean.

NOAA's Argos-4 instrument was also prepared to launch as a payload under a joint agreement between NOAA and the French space agency, Centre National d'Etudes Spatiales. As part of the global Argos network, Argos-4 will help track wildlife, gather environmental data, assist with maritime security, and enable industries to comply with environmental regulations.



On August 22, NOAA's Joint Polar Satellite System (JPSS)-2 satellite arrived at its launch facility and successfully underwent final preparations to launch in November 2022. JPSS-2, renamed NOAA-21 after successfully reaching orbit, is the third of five advanced satellites in the JPSS series. It scans the Earth as it orbits from the North to South Poles, providing full global coverage twice a day. NOAA-21 data will improve weather forecasts and are essential for predicting and preparing for extreme weather events and climate change.

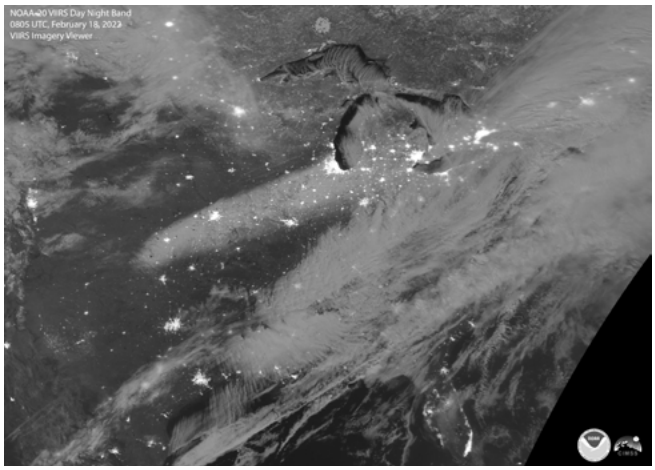
Over a dozen billion-dollar disasters occurred in FY 2022, ranging from hurricanes and severe flooding to wildfires and drought. The Billion-Dollar Disaster and Risk Mapping tools from NOAA's National Centers for Environmental Information now include U.S. Census tract data, allowing users and decision-makers to visualize combined exposure, socioeconomic vulnerability, and markers of resilience to natural hazards at the community level.

NOAA also awarded three Commercial Weather Data Pilot space weather contracts in July. These near-real-time commercial data will characterize conditions that impact satellite operations, navigation, and communications. In addition, NOAA's Commercial Data Program purchased its latest commercial radio occultation data with unlimited distribution rights, marking a significant shift towards open and free global data sharing.

FY 2024 REQUEST $2,073,921,000

NOAA requests a total of $2,073,921,000 to support NESDIS' continued and enhanced operations. This total includes Operations, Research, and Facilities (ORF) and Procurement, Acquisition, and Construction (PAC) accounts, and is a net increase of $357,419,000 in FY 2024 program changes.

NOAA will provide actionable environmental information that is the basis of smart policy and decision-making to build a climate-ready nation. In FY 2024, NESDIS will respond to increased demands for scientific and socioeconomic applications and research, ensuring satellite-derived data are provided to users as relevant, accessible, and actionable information for high-priority applications in polar regions and coastal zones. NESDIS will continue to support NOAA's ability



A nighttime image from the NOAA-20 satellite shows a winter storm impacting the central and eastern U.S. on February 18, 2022.

to better observe environmental phenomena connected to climate change-related impacts and patterns, and deliver products, information, and climate services to inform decision makers. NESDIS will also work with local, state, and regional partners to deliver place-based climate science and information products and services. These resources will help people make informed decisions as well as identify and amplify the climate service needs of traditionally underserved communities and populations.

Crucial, time-sensitive investments in satellites reinforce NOAA's commitment to ensuring the Nation's next-generation satellite systems better deliver essential earth system information to meet the needs of the American public. The FY 2024 request provides continuing support for the development of NOAA's polar-orbiting, geostationary, and space weather programs, and continuing development of the infrastructure and capability to securely import, process, and store external data from commercial providers for operational use. The FY 2024 request will also enable NESDIS to utilize the full functionality of the NESDIS Common Cloud Framework and continue to leverage partner and commercial observations to meet NOAA and NESDIS mission requirements. Specifically, in FY 2024, NESDIS will increase public access to more user friendly and authoritative data sets, enhancing data innovation capability and allowing for improved products and services.

Program change increases are highlighted below. A list of program change decreases by Line Office is located in Appendix 1 and summary of funding by Subactivity is located in Appendix 3. Detailed descriptions of the program changes below are located in the NOAA FY 2024 Congressional Justification.

FY 2024 ORF BUDGET SUMMARY

NOAA requests a total of $394,431,000 to support the ORF activities of NESDIS, reflecting a net decrease of $52,000 in FY 2024 program changes.

ENVIRONMENTAL SATELLITE OBSERVING SYSTEMS $319,431,000

NOAA requests a net increase of $848,000 for a total of $319,431,000 in the Environmental Satellite Observing Systems activity. This total provides continued support for satellite operations and the development of new products to leverage global observing system capabilities. Program changes include:

Office of Satellite and Product Operations: Satellite and Product Operations Deferred and Extended Maintenance: NOAA requests an increase of $1,500,000 to support critical satellite operations and maintenance requirements in Virginia, Alaska, and West Virginia. These funds will ensure NOAA does not redirect mission resources to address repairs, maintenance, and major upgrades.

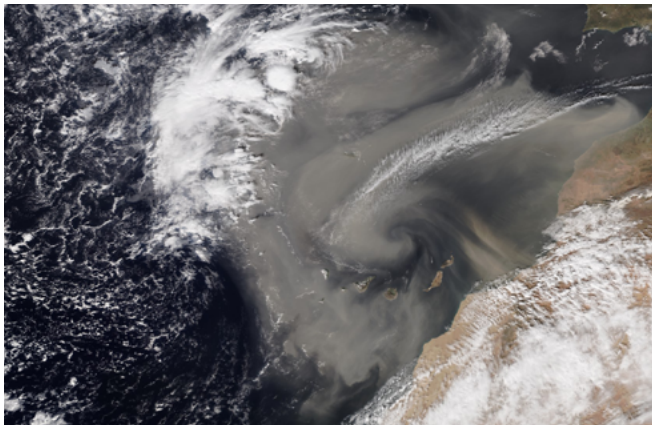
Product Development, Readiness & Application: Earth Observations For Polar and Coastal Zone Applications: NOAA requests an increase of $598,000 to respond to increased demand for scientific and socioeconomic applications and research, ensuring satellite-derived data are provided to users as relevant, accessible, and actionable information in support of high-priority applications in polar regions and coastal zones.

U.S. Group on Earth Observations (USGEO): NOAA requests an increase of $250,000 to the GEO Trust Fund for the operations of the GEO Secretariat and to support and advance the AmeriGEO efforts in the Americas.

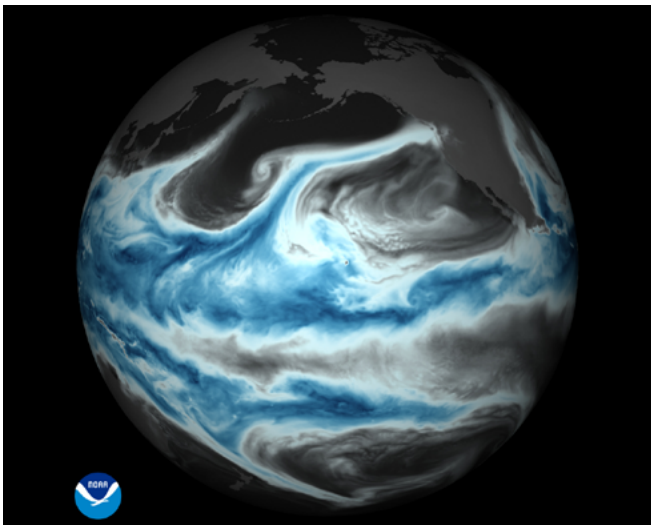
NATIONAL CENTERS FOR ENVIRONMENTAL INFORMATION $75,000,000

NOAA requests an increase of $1,600,000 for a total of $75,000,000 in the NCEI activity. This total provides continued support for aligning science and stewardship requirements and resources to ensure return on investments in NOAA observation systems. Program changes include:

National Centers for Environmental Information: Improving Local, State, and Regional Climate Services: NOAA requests an increase of $1,600,000 to support the need for expanded climate services at local, state, and regional levels, including pointed support for underserved regional populations. These funds will provide resources to increase user engagement, improve climate services, and build capacity at the state level for addressing unique needs for climate data and information.



The NOAA-20 satellite captured an image of dust from the Sahara Desert as it is lofted into the air to blow over the eastern Atlantic Ocean on January 30, 2022.



This image shows the Global Forecast System (GFS) model's predicted moisture plume from the epic atmospheric river brewing over the Pacific Ocean in November, 2022.

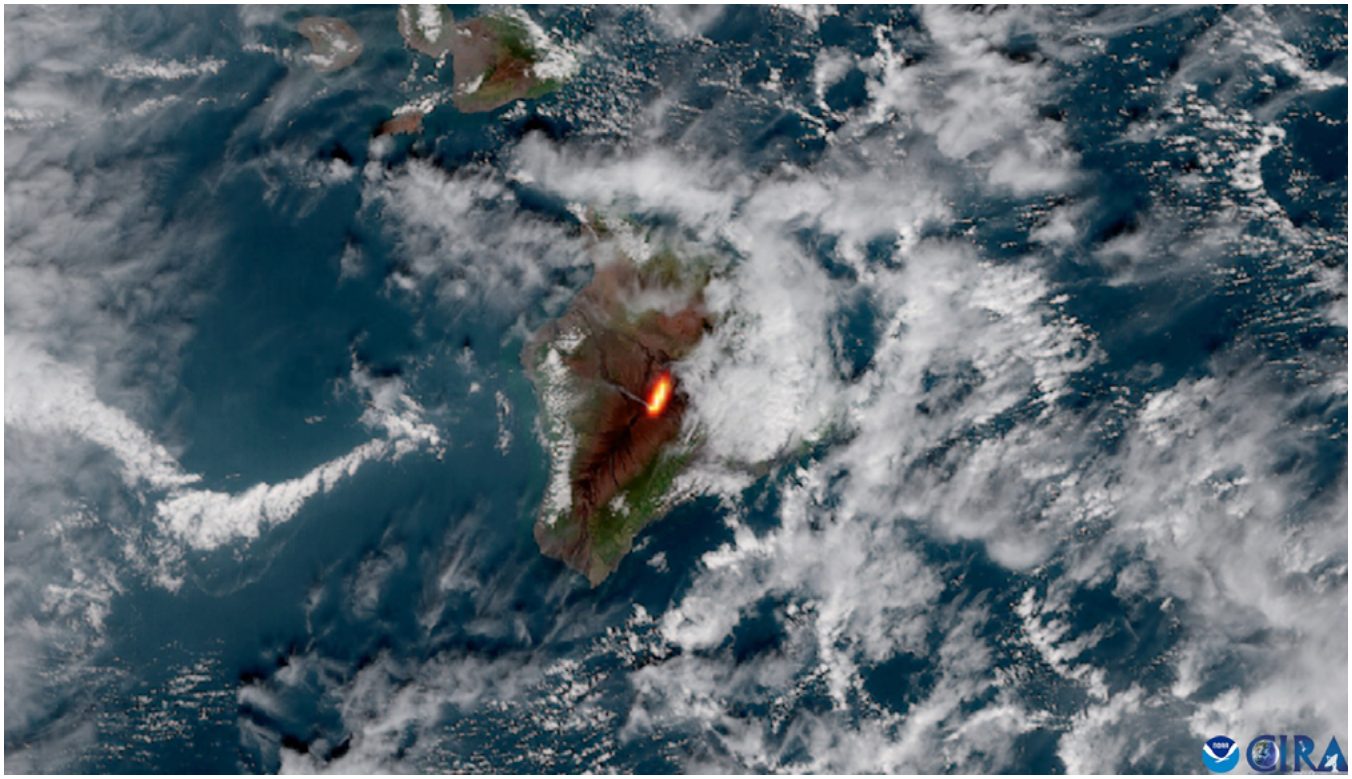
FY 2024 PAC BUDGET SUMMARY

NOAA requests a total of $1,679,490,000 to support the PAC activities for NESDIS, reflecting a net increase of $357,471,000 in FY 2024 program changes.

SYSTEMS ACQUISITION $1,677,040,000

NOAA requests a net increase of $357,471,000 for a total of $1,677,040,000 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 include:

Geostationary Earth Orbit (GEO): Geostationary Extended Observations (GeoXO): NOAA requests a planned increase of $132,429,000 to support the development of the GeoXO program. GeoXO will continue and expand weather, ocean, and climate observations provided by the GOES-R Series, improving U.S. forecasting and prediction capabilities to address emerging environmental challenges that threaten the security and well-being of every American.



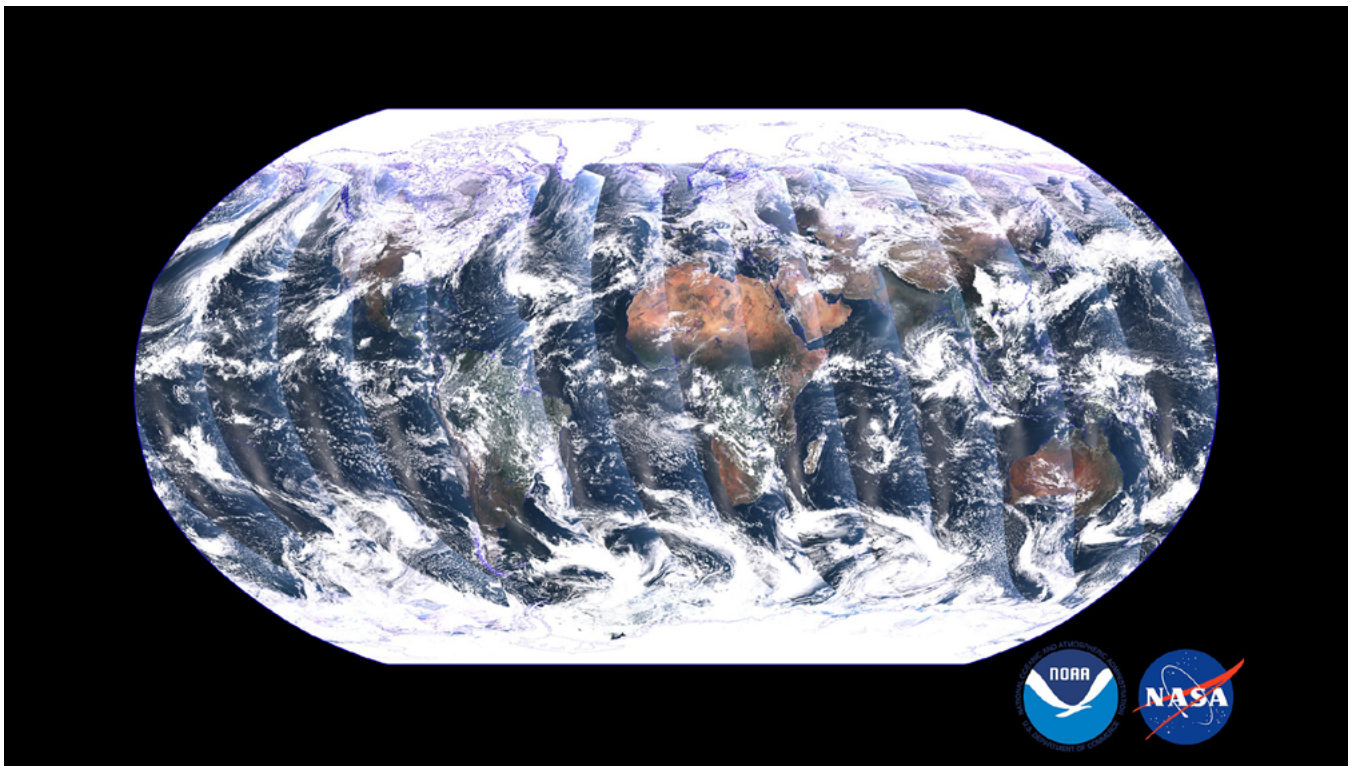
NOAA's GOES-18 satellite observes the eruption of Mauna Loa, the world's largest active volcano, on November 28, 2022. NOAA satellites monitored the eruption, lava flow, ash plume, and sulfur dioxide emissions. These satellites are critical for detecting volcanic activity, alerting those in harm's way, and monitoring the hazards associated with volcanic eruptions.

Total GeoXO Request (BUDGET AUTHORITY IN $K)	
FY 2024 Request	417,429
FY 2025	671,000
FY 2026	691,500
FY 2027	1,320,000
FY 2028	1,320,000
CTC	14,779,460
Total	19,644,389

Total GOES-R Series Request (BUDGET AUTHORITY IN $K)	
FY 2024 Request	276,000
FY 2025	100,000
FY 2026	96,000
FY 2027	96,000
FY 2028	96,000
CTC	480,762
Total	11,022,087

Geostationary Systems-R (GOES-R): GOES-R Series: NOAA requests a planned reduction of $25,000,000 for the GOES-R Series program. The remaining funds will continue integration and testing for the GOES-U satellite, the final satellite in the GOES-R Series program.

Polar Weather Satellites (PWS): NOAA requests an increase of $158,910,000 to complete satellite environmental testing for JPSS-3, continue the development of the JPSS-4 spacecraft and instruments, and sustain the globally distributed ground system supporting low Earth orbit satellites.



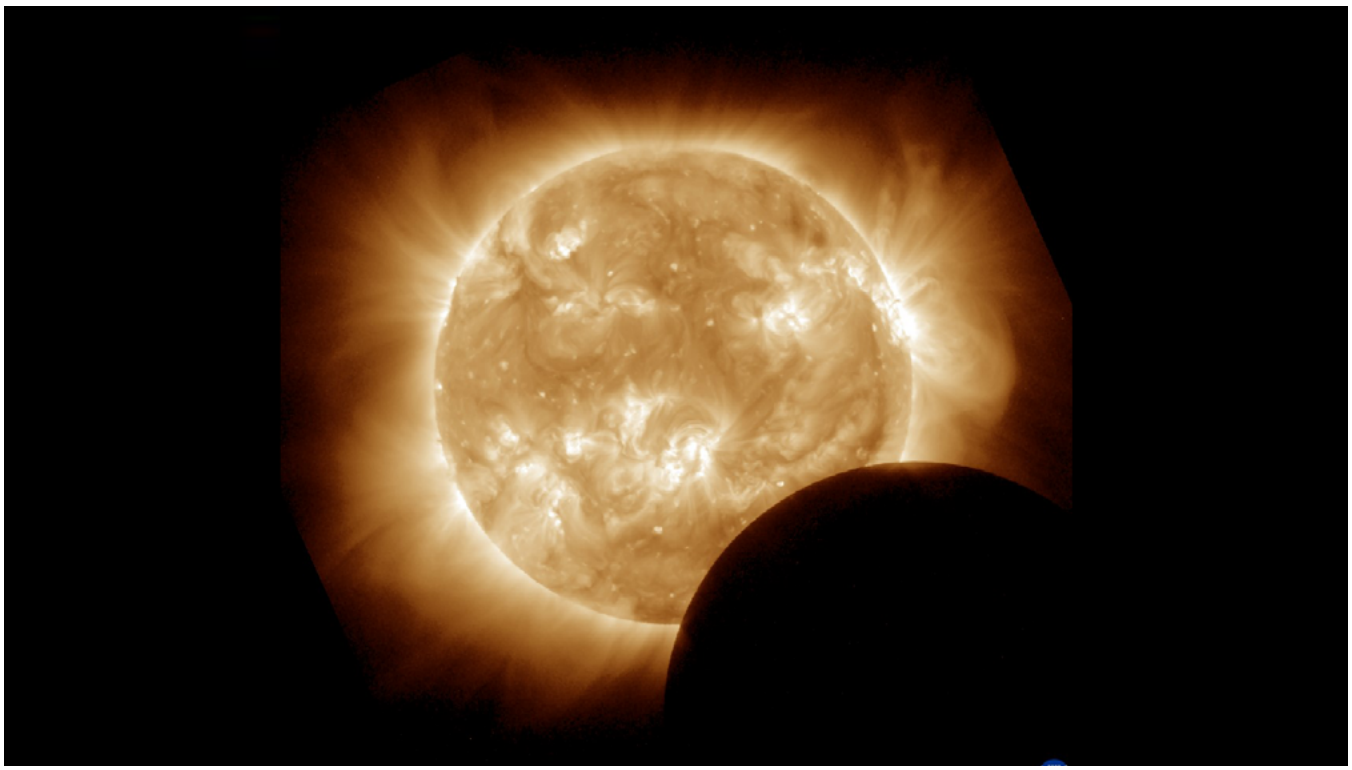
Global mosaic captured by the Visible Infrared Imaging Radiometer Suite (VIIRS) instrument on satellite NOAA-21 over a period of 24 hours between December 5 and 6, 2022. Polar-orbiting satellites, such as NOAA-21, capture swaths of data around the globe and observe the entire planet twice each day.

Total PWS Request (BUDGET AUTHORITY IN $K)	
FY 2024 Request	342,410
FY 2025	342,410
FY 2026	342,410
FY 2027	342,410
FY 2028	342,410
CTC	1,922,931
Total	16,778,585

Low Earth Orbit (LEO): Near Earth Orbit Network (NEON): NOAA requests an increase of $45,260,000 for the Near Earth Orbit Network (NEON, formerly known as LEO Weather Satellites) to continue the development of the QuickSounder demonstration project and formulation activities for the LEO portfolio.

Total NEON Request (BUDGET AUTHORITY IN $K)	
FY 2024 Request	123,590
FY 2025	200,000
FY 2026	200,000
FY 2027	200,000
FY 2028	200,000
CTC	TBD
Total	TBD

Low Earth Orbit (LEO): Polar Operational Environmental Satellites (POES) Extension: NOAA requests a planned decrease of $10,000,000 for the POES Extension to conclude the two-year investment effort that began in FY 2022. While the legacy POES satellites (NOAA-15, NOAA-18, and NOAA-19) are beyond their design life, the spacecraft and many instruments and channels are operational and continue to provide valuable early-morning orbit data to numerical weather prediction models and for situational nowcasting needs.



NOAA's GOES-18 Solar Ultraviolet Imager captures a partial eclipse of the Sun on April 30, 2022.

Total POES Extension Request (BUDGET AUTHORITY IN $K)	
FY 2024 Request	0
FY 2025	0
FY 2026	0
FY 2027	0
FY 2028	0
CTC	0
Total	30,000

Total SW Next Request (BUDGET AUTHORITY IN $K)	
FY 2024 Request	225,000
FY 2025	231,200
FY 2026	231,200
FY 2027	231,200
FY 2028	231,200
CTC	TBD
Total	TBD

Space Weather Next: NOAA requests an increase of $73,394,000 to continue to develop and deploy space weather observational capabilities, such as those from Lagrange points 1 and 5, and perform actions as detailed in the NOAA Space Weather Gap Mitigation plan, including plans for contingency space weather observations by exploiting observations from NOAA partners.

Space Weather Follow On: NOAA requests a planned decrease of $39,000,000 for the SWFO program. Funding will support a SWFO-L1 mission with a Solar Wind Instrument Suite (SWIS) for solar wind observations and a compact coronagraph (CCOR) for CME imagery at Lagrange point 1. The funding also supports the integration of a coronal mass ejection (CME) on the GOES-U spacecraft that is expected to launch in 2024.

NOAA's newest weather & climate satellite, JPSS-2 launched on November 10 from Vandenberg Space Force Base.

Total SWFO Request (BUDGET AUTHORITY IN $K)	
FY 2024 Request	97,200
FY 2025	41,200
FY 2026	22,300
FY 2027	21,800
FY 2028	13,608
CTC	0
Total	692,800

Total DACS Request (BUDGET AUTHORITY IN $K)	
FY 2024 Request	45,500
FY 2025	45,500
FY 2026	45,500
FY 2027	45,500
FY 2028	45,500
CTC	N/A
Total	N/A

Common Ground Services (CGS): Data-source Agnostic Common Services (DACS): NOAA requests an increase of $15,478,000 to realize the full functionality of the NESDIS Common Cloud Framework (NCCF). The NCCF provides a cost-effective solution to continue leveraging partner and commercial observations, deliver enhanced products and services, and improve capabilities for data discoverability and access.

Systems/Services Architecture & Engineering (SAE): Commercial Data Purchase: NOAA requests an increase of $6,000,000 to purchase commercial data for operational use. It will also support continued development and sustainment of the infrastructure and capability to securely import, evaluate, transfer, process, disseminate, and store external data from commercial providers for operational use.

The Mobile Service Tower rolls back from the United Launch Alliance Atlas V rocket carrying the Joint Polar Satellite System (JPSS)-2 civilian polar-orbiting weather satellite for NOAA and NASA's Low-Earth Orbit Flight Test of an Inflatable Decelerator (LOFTID) from Space Launch Complex-3 at Vandenberg Space Force Base, California. Credit: United Launch Alliance

Total CDP Request (BUDGET AUTHORITY IN $K)	
FY 2024 Request	25,000
FY 2025	25,000
FY 2026	25,000
FY 2027	25,000
FY 2028	25,000
CTC	N/A
Total	N/A

NOAA's Barrow Atmospheric Baseline Observatory is one of four monitoring stations maintained by the Global Monitoring Laboratory, which produce long-term, highly accurate data sets of changing atmospheric composition and form one of the foundations of international climate research.

Chapter 7

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.

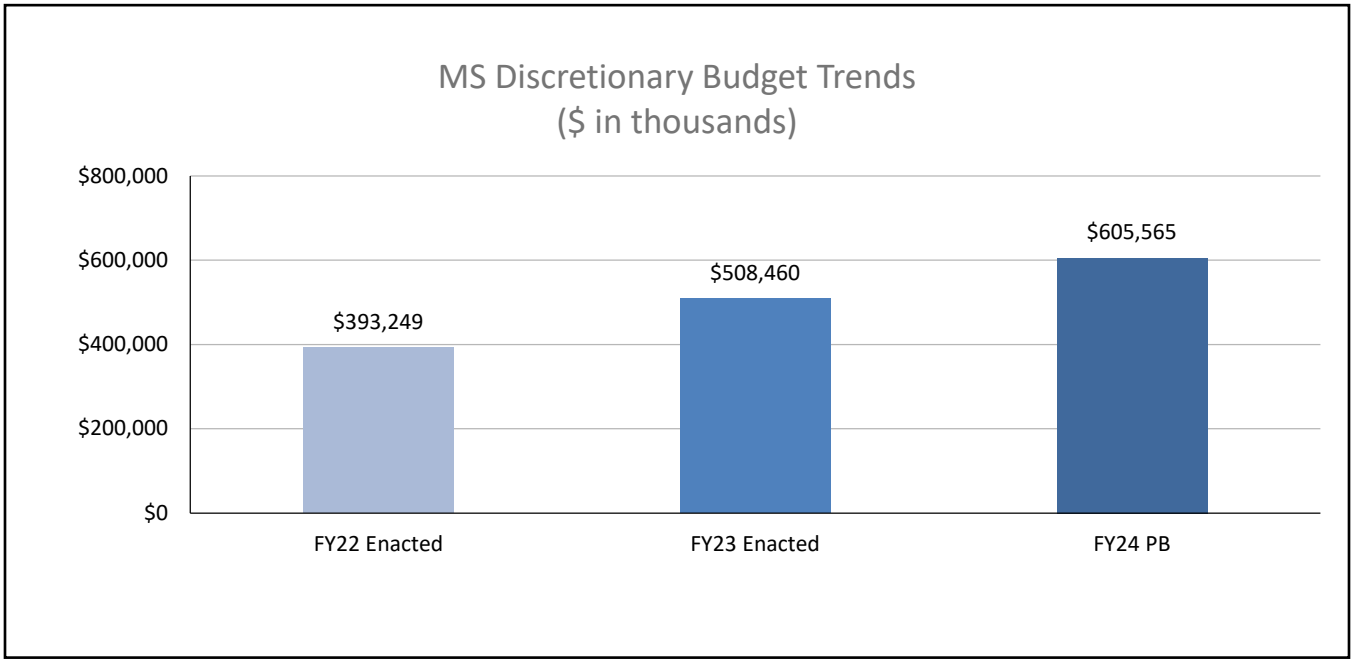
FY 2022 ACCOMPLISHMENTS

In FY 2022, the Staff Offices of Mission Support provided numerous services in support of the NOAA mission including the following highlights. The Acquisition and Grants Office (AGO) obligated over $1.7 billion and managed over 5,000 active contracts valued at over $12 billion. AGO executed over 2,500 financial assistance transactions to award $2.8 billion. NOAA also successfully executed over 11,000 acquisition and over 800 financial assistance closeout actions in FY 2022. NOAA continued its strong support of small businesses in FY 2022, obligating $968 million to small businesses equating to a 53 percent overall small business achievement for the year.

High speed network access is required to ensure scientists and engineers have access to the resources needed to advance research on climate change, propel the New Blue Economy, and achieve NOAA's vital mission. In FY 2022, the Office of the Chief Information Officer (OCIO), N-Wave leveraged many partnerships to offer high quality, highly scalable networking solutions and services to Federal agencies and scientific, research, and education partners across the country. OCIO, partnering with Front Range Gigapop and the Western Regional Network, expanded N-Wave across the state of California. Through extensive design, engineering, partnership coordination, and deployment, N-Wave also established a new high-speed network core in Alaska, initially connecting six NOAA sites, upgrading the Gilmore Creek Satellite Ground Station LAN, and setting the foundation for multi-agency and Department of Defense use to include the Defense Meteorological Satellite Program and the civil augmentation, U.S. Space Force program.

The Workplace Violence Prevention and Response Program (WVPRP) participated in the Fisheries Office of Law Enforcement (OLE), Alaska Division Pulse Operation for Observer Safety in Unalaska. WVPR and OLE conducted training for fishing industry partners such as process plant employees and vessel captains and crew to increase awareness of sexual assault and sexual harassment (SASH) risk reduction and prevention efforts in Dutch Harbor focused on Fisheries Observers. The WVPR Regional Coordinator met with Fisheries Observers aboard vessels in their remote and isolated work locations to gain insight into the unique working conditions of one of NOAA's most vulnerable demographic. These new perspectives gained will allow WVPR to enhance prevention initiatives and increase safety of Fisheries Observers.

In FY 2022, the Office of Space Commerce (OSC) partnered with industry, government, and academia to successfully implement and demonstrate a working prototype of its Traffic Coordination Space System (TraCSS) for providing space situational awareness (SSA) and space traffic management



services to commercial and civil space operators. TraCSS leverages modern technologies operated in a cloud environment to offer flexibility, scalability, mission adaptability, and long-term affordability and creates opportunities for U.S. companies, especially small businesses, to play an innovative role in SSA. In November 2022, with congressional approval, NOAA moved the OSC from NESDIS to Mission Support / Office of the Under Secretary, with direct reporting to the Assistant Secretary for Earth Observation and Prediction. NOAA also restructured the Commercial Remote Sensing Regulatory Affairs (CRSRA) office out of NESDIS, making it a division of OSC.

FY 2024 REQUEST $605,565,000

NOAA requests a total of $605,565,000 to position NOAA's Mission Support programs for more effective execution of NOAA's diverse mission. This total includes Operations, Research, and Facilities (ORF) and Procurement, Acquisition, and Construction (PAC) accounts and includes a net increase of $72,068,000 in FY 2024 program changes.

NOAA will provide actionable environmental information that is the basis of smart policy and decision-making to build a climate-ready nation. In FY 2024, Mission Support will underpin these efforts and support DOC and NOAA's implementation of a new financial, acquisition, and property system while the Commerce Business System (CBS) and associated systems are decommissioned.

NOAA will continue to foster environmental stewardship and optimize advances in science and technology to create value-added, data-driven sustainable and equitable economic development. In FY 2024, Mission Support will continue progress toward meeting its target of achieving Full Operating Capability in FY 2025 for space situational awareness services. Commercial operators can use space situational awareness products and services to enhance the safety and security of their on-orbit operations.

NOAA will continue investments aligned with the NOAA Facilities Strategic Plan. In FY 2024, Mission Support will continue to invest in the maintenance and repair of its aging infrastructure and significantly improve facilities across the

nation. Each facility requires financial investments for maintenance, repairs, modernization, and even replacement to effectively sustain and evolve our science capabilities to support the current and future missions.

Program change increases are highlighted below. A list of program change decreases by Line Office is located in Appendix 1 and summary of funding by Subactivity is located in Appendix 3. Detailed descriptions of the program changes below are located in the NOAA FY 2024 Congressional Justification.

FY 2024 ORF BUDGET SUMMARY

NOAA requests a total of $459,865,000 to support the ORF activities of Mission Support, reflecting a net increase of $16,368,000 in FY 2024 program changes.

EXECUTIVE LEADERSHIP $33,269,000

NOAA requests a total of $33,269,000 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 requested for this activity.

MISSION SERVICES AND MANAGEMENT $185,255,000

NOAA requests an increase of $3,368,000 in program changes for a total of $185,255,000 for the Mission Services and Management activity. These funds will support the planning, administrative, financial, procurement, information technology, human resources, and infrastructure services that are essential to the safe and successful performance of NOAA's mission. Program changes include:

Mission Services and Management: Transitioning to the DOC Business Application System (BAS): NOAA requests an increase of $3,368,000 to support NOAA's financial systems while the Commerce Business System (CBS) and associated systems are decommissioned. With the implementation of BAS in October 2023, NOAA's Financial Systems Division will support NOAA's BAS interests, while also providing support for the FY 2023 reporting and audit requirements based

Volunteers went the extra mile (six actually!) to remove marine debris from remote beaches in Olympic National Park, adjacent to Olympic Coast National Marine Sanctuary. They take a much deserved break to enjoy the beauty of the fall foliage and Ozette River. Credit: Lee First, Twin Harbors Waterkeeper

Student collects water samples for water quality testing near Galveston Bay, Texas. Credit: Desi Farias, Galveston Bay Foundation

on legacy CBS data. NOAA's CBS support contract will continue to be required throughout much of FY 2024 as NOAA's CBS and Data Warehouse environments are decommissioned.

IT SECURITY $16,700,000

NOAA requests a total of $16,700,000 in the IT Security activity. These funds defend NOAA's data, networks, equipment, intellectual property and personnel against a wide variety of adversaries ranging from nation states to lone-wolf attackers. There are no program changes requested for this activity.

PAYMENT TO DOC WORKING CAPITAL FUND $94,457,000

NOAA requests a total of $94,457,000 for the Payment to the DOC Working Capital Fund activity. There are no program changes requested for this activity.

FACILITIES MAINTENANCE $6,500,000

NOAA requests a total of $6,500,000 in the Facilities Maintenance activity. In FY 2024, NOAA will continue to reduce the backlog of deferred maintenance and repair across the NOAA facilities portfolio, provide project and program management, and begin pre-planning for Silver Spring Metro Center lease requirements. There are no program changes requested for this activity.

OFFICE OF SPACE COMMERCE $87,999,000

NOAA requests an increase of $17,700,000 in program changes for a total of $87,999,000 in the Office of Space Commerce activity. These funds will foster the conditions for the economic growth and technological advancement of the U.S. commercial space industry. Program changes include:

Office of Space Commerce: Space Commerce: NOAA requests an increase of $17,700,000 to allow the Office of Space Commerce (OSC) to continue to progress toward meeting its target of achieving Full Operating Capability in FY 2025. Additional funding will support improvement in the safety of commercial space activities as Earth's orbits become increasingly congested with space traffic and debris.

OFFICE OF EDUCATION $35,685,000

NOAA requests a total of $35,685,000 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. There are no program changes requested for this activity.

FY 2024 PAC BUDGET SUMMARY

NOAA requests a total of $145,700,000 to support the PAC activities of Mission Support, reflecting an increase of $55,700,000 in FY 2024 program changes.

NOAA CONSTRUCTION $145,700,000

NOAA requests an increase of $55,700,000 in program changes for a total of $145,700,000 in the NOAA Construction activity. NOAA's facilities portfolio constitutes a significant capital investment with over 620 facilities across 160 markets and 6,965,592 total Usable Square Feet, including over 400 owned properties with an estimated replacement exceeding $3 billion in value. Program changes include:

NOAA Construction: Capital Investment Planning and Design: NOAA requests an increase of $55,700,000 to keep pace with maintenance and repair of its aging infrastructure and significantly improve facilities across the nation. Starting in FY 2024, NOAA proposes to significantly invest in facilities with an influx of funding to accompany the strategic priorities identified in the Facilities Strategic Plan and the highest ranked priorities in the Facilities Investment Plan.

Teacher at Sea alumnus, Jeff Miller, solders an ROV control box circuit board during the Teacher at Sea Alumni Association's Project ROVe: Design and Build workshop in July, 2022.

Galveston Bay Foundation educator instructs campers on how to collect nurdles near Galveston Bay, Texas. Credit: Desi Farias, Galveston Bay Foundation

Canada Department of Fisheries and Oceans observer Leila Bennour looks out the bubble window of a NOAA Twin Otter during a North Atlantic right whale survey.

Chapter 8

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 uncrewed systems (UxS) 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 up to 500 NOAA Corps officers, excluding flag officers.

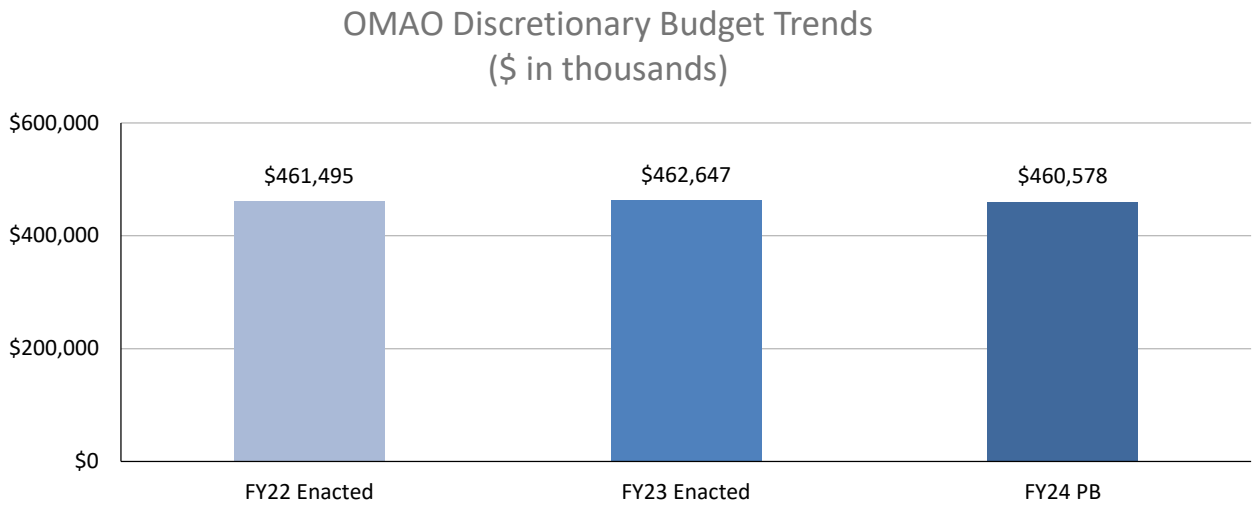
FY 2022 ACCOMPLISHMENTS

This past hurricane season, NOAA Hurricane Hunter aircraft flew over 582 mission hours to collect atmospheric data critical to hurricane forecasting and research, passing through the eye of a hurricane 65 times and deploying over 1,700 scientific instruments. NOAA's Gulfstream IV-SP also flew a research mission from Cabo Verde, Africa, the genesis stage for Atlantic storm activity, in August. This historic mission was the furthest east NOAA's Hurricane Hunters have flown to investigate a developing storm.

NOAA's WP-3D aircraft (P-3) surveilled Hurricane Ian from September 23 to September 30. During this time, the King Air and Twin Otter took their first imagery and followed the storm through Charleston, South Carolina, ending on October 2. Aircraft Operations Center flight crews flew 20 missions, over 120 hours, dropping 427 dropsondes into Hurricane Ian, capturing a data set that began in the Caribbean and ended when Ian made final landfall in South Carolina as a Category One hurricane. Just hours after the storm passed, emergency response aircraft collected 13,172 images of damaged areas, providing community managers and emergency responders critical data to plan recovery efforts. Aircraft mechanics worked tirelessly to ensure all aircraft were operational and safely evacuated prior to any storm impacts. The UxS team successfully deployed the air-launched Altius system into Ian, sampling winds of over 200 mph inside the eyewall near the ocean surface. This is a huge milestone in the research to operations transition planning for this system.

NOAA and Thoma-Sea Marine Constructors, LLC held two keel-laying ceremonies in Houma, Louisiana, in 2022 for NOAA's newest oceanographic research ships, *Oceanographer* and *Discoverer*, the first newly constructed NOAA vessels since the *Ruben Lasker* in 2014, and the first planned vessel construction projects since the 2016 NOAA Fleet Plan was completed.

In October, NOAA Ship *Thomas Jefferson* (TJ) completed a productive field season in the Great Lakes, the first time a NOAA ship has been deployed there since the early 1990s. The TJ surveyed 450 square nautical miles of Lake Erie, an economically important and ecologically sensitive region, and 274 square nautical miles in Lake Ontario. The ship's crew identified 42 confirmed and new shipwrecks, along with 22 additional features. The TJ also deployed a DriX, an Uncrewed



Surface Vessel with seabed mapping capabilities, in both lakes. NOAA has long recognized the need for mapping work in the Great Lakes; currently, 93 percent remains unmapped to modern standards.

FY 2024 REQUEST $495,576,000

NOAA requests a total of $495,576,000 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 $10,969,000 in FY 2024 program changes.

NOAA will provide actionable environmental information that is the basis of smart policy and decision-making to build a climate-ready nation. In FY 2024, OMAO will continue investment in NOAA's data collection capabilities at sea and air, improving the ability of the NOAA fleet to inform climate science, while investing in NOAA's workforce. In FY 2024, NOAA's fleet will grow with the addition of a third King Air, and the new NOAA Ships *Oceanographer* and *Discoverer*. Progress on The NOAA Fleet Plan has put NOAA on a steady path toward a more reliable fleet that supports NOAA's science needs. In addition to these platforms, NOAA will invest in the Days at Sea to support critical mission requirements. NOAA will also continue to grow the NOAA Corps to safely and effectively operate the new ships and aircraft to better meet demand for NOAA data nationwide in response to increasing impacts of climate change.

Program change increases are highlighted below. A list of program change decreases by Line Office is located in Appendix 1 and summary of funding by Subactivity is located in Appendix 3. Detailed descriptions of the program changes below are located in the NOAA FY 2024 Congressional Justification.

FY 2024 ORF BUDGET SUMMARY

NOAA requests a total of $352,461,000 to support the ORF activities of the OMAO, reflecting a net increase of $14,531,000 in FY 2024 program changes.

The NOAA Aircraft Operations Center in Lakeland, Florida, is home to NOAA's fleet of highly specialized environmental data-gathering aircraft.

MARINE OPERATIONS AND MAINTENANCE $224,148,000

NOAA requests a net increase of $16,031,000 in program changes for a total of $224,148,000 in the Marine Operations and Maintenance activity. These funds allow NOAA to provide ships capable of meeting prioritized, geographical and temporal, at-sea NOAA requirements and will advance maintenance and operations for NOAA's diverse fleet of vessels. NOAA ships range from large oceanographic research vessels capable of exploring the world's deepest oceans to smaller ships responsible for charting the shallow bays and inlets of the United States. Program Changes include:

Marine Operations and Maintenance: Enhanced Fleet Operations: NOAA requests an increase of $16,231,000 to deliver the days at sea necessary for at-sea data collection and other critical mission requirements, such as increased staffing, enhanced ship operations and maintenance, mission and safety system improvements. Funds will also allow for preparation activities for NOAA's new ships, which are critical to fulfilling NOAA's diverse and growing mission needs, including fishery surveys, marine ecosystem assessments, and hydrographic surveys.

AVIATION OPERATIONS AND AIRCRAFT SERVICES $43,372,000

NOAA requests a net increase of $1,412,000 in program changes for a total of $43,372,000 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. Program Changes include:

Aviation Operations and Aircraft Services: Flight Hours in Support of Cross NOAA Climate Objectives: NOAA requests an increase of $2,412,000 in support of increased airborne data requirements. This request will strengthen NOAA's ability to meet current and growing demands for airborne data requirements as the Nation works to adapt to and mitigate the impacts of climate change. Increased flight hours will support surveys to better manage water resources in the face of climate-induced flooding and droughts, activities to better understand climate impacts on marine resources, and monitoring of shoreline changes.

AUTONOMOUS UNCREWED TECHNOLOGY OPERATIONS $14,560,000

NOAA requests a decrease of $7,132,000 in program changes for a total of $14,560,000 for the Autonomous Uncrewed Technology Operations activity. This total allows 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 COMMISSIONED OFFICER CORPS $70,381,000

NOAA requests an increase of $4,220,000 in program changes for a total of $70,381,000 in the NOAA Commissioned Officer Corps activity. This budget line supports NOAA Corps Officers that

NOAA's Office of Marine and Aviation Operations and NOAA Corps' commitment to diversity, equity and inclusion has led to an intensified focus on recruiting from HBCUs and other minority serving institutions. Basic Officer Training Class 138 is one of the most diverse of the past decade.

operate NOAA ships, fly aircraft, operate uncrewed systems, conduct diving operations, and serve in NOAA staff positions to fulfill NOAA's mission requirements. Program Changes include:

NOAA Commissioned Officer Corps: Officers to Support Marine and Aviation Operations: NOAA requests an increase of $4,220,000 to provide safer and more reliable ship and aircraft operations in service to NOAA's weather and climate forecasting, environmental stewardship, and other missions by shrinking the gap between the current and required number of NOAA Corps officers to operate NOAA ships, aircraft, and uncrewed systems, in support of NOAA, the Department of Commerce, Congress, and the Nation.

FY 2024 PAC BUDGET SUMMARY

NOAA requests a total of $106,500,000 to support the PAC activities of the OMAO, reflecting a net decrease of $25,500,000 in FY 2024 program changes.

MARINE AND AVIATION CAPITAL INVESTMENTS $106,500,000

NOAA requests a net decrease of $25,500,000 for a total of $106,500,000 in the Marine and Aviation Capital Investments activity. These resources will enable OMAO to continue to maintain its vessels and provide the sustained technology refresh that plays a critical role in the in-situ collection of oceanographic, atmospheric, hydrographic, and fisheries data in support of NOAA's missions. With the FY 2024 funding provided in this request, in addition to the funding provided through the Inflation Reduction Act, NOAA will also continue the acquisition of a second G-550 for its high-altitude jet 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 2024 payments to the accrual fund are estimated to be $1,617,000.

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.

The crew of NOAA Ship *Nancy Foster* performs a dunk test of the remotely operated vehicles aboard the vessel prior to heading to sea for the Valor in the Atlantic project. Credit: Art Howard, Global Foundation for Ocean Exploration

Appendix 1

Decreases

Appropriation	Budget Program	PPA	Program Change Title	Program Change
ORF	NOS	NOAA Community Project Funding/ NOAA Special Projects	Terminate NOAA Community Project Funding/ NOAA Special Projects	(37,673)
ORF	NOS	Navigation, Observations and Positioning	Decrease Geospatial Modeling Grants	(5,000)
ORF	NOS	Navigation, Observations and Positioning	Enterprise Infrastructure Solutions (EIS) Decrease	(1,000)
ORF	NOS	Coastal Science, Assessment, Response and Restoration	Decrease Disaster Preparedness Program Funding	(1,603)
ORF	NOS	Coastal Science, Assessment, Response and Restoration	Terminate NCCOS Support to NOAA's Cooperative Institute for Research to Operations in Hydrology	(1,020)
ORF	NOS	Coastal Science, Assessment, Response and Restoration	Enterprise Infrastructure Solutions (EIS) Decrease	(900)
ORF	NOS	Coastal Zone Management and Services	Enterprise Infrastructure Solutions (EIS) Decrease	(300)
ORF	NOS	Coastal Zone Management Grants	Reduce Coastal Zone Management Grants	(3,000)
ORF	NOS	National Oceans and Coastal Security Fund	Terminate Base Funding for the National Coastal Resilience Fund	(34,000)
ORF	NOS	Sanctuaries and Marine Protected Areas	Enterprise Infrastructure Solutions (EIS) Decrease	(800)
PAC	NOS	National Estuarine Research Reserve Construction	Reduce National Estuarine Research Reserve Construction	(4,000)
PAC	NOS	Marine Sanctuaries Construction	Reduce Marine Sanctuaries Construction	(1,500)
ORF	NMFS	NOAA Community Project Funding/ NOAA Special Projects	Terminate NOAA Community Project Funding/ NOAA Special Projects	(38,486)
ORF	NMFS	Marine Mammals, Sea Turtles, and Other Species	North Atlantic Right Whale Industry Grants	(19,879)
ORF	NMFS	Marine Mammals, Sea Turtles, and Other Species	Marine Mammal Projects Reduction	(3,190)
ORF	NMFS	Fisheries and Ecosystem Science Programs and Services	Enterprise Infrastructure Solutions (EIS) Decrease	(200)
ORF	NMFS	Fisheries Data Collections, Surveys, and Assessments	Fisheries Data Collection Projects Reduction	(1,200)
ORF	NMFS	Fisheries Management Programs and Services	Fisheries Management Projects Reduction	(1,850)
ORF	NMFS	Enforcement	Enforcement Projects Reduction	(950)
ORF	OAR	NOAA Community Project Funding/ NOAA Special Projects	Terminate NOAA Community Project Funding/ NOAA Special Projects	(20,841)
ORF	OAR	Climate Competitive Research	Water in the West	(3,000)
ORF	OAR	Weather Laboratories & Cooperative Institutes	VORTEX-Southeast	(3,500)
PAC	OAR	Research Supercomputing/CCRI	Research and Development (R&D) High Performance Computing (HPC)	(1,500)
ORF	NWS	NOAA Community Project Funding/ NOAA Special Projects	Terminate NOAA Community Project Funding/ NOAA Special Projects	(7,265)

Appropriation	Budget Program	PPA	Program Change Title	Program Change
ORF	NWS	Observations	Reduce National Mesonet Program	(4,745)
ORF	NWS	Central Processing	Eliminate Advanced Hydrologic Prediction Services System Expansion	(2,483)
ORF	NWS	Analyze, Forecast and Support	Terminate Tsunami Grant Program	(6,000)
ORF	NWS	Science and Technology Integration	Reduce the Cooperative Institute for Research to Operations in Hydrology	(4,480)
PAC	NWS	Observations	Observations PAC Reduction	(30)
PAC	NWS	Central Processing	Slow cloud readiness studies	(1,649)
PAC	NWS	Dissemination	Dissemination PAC Reduction	(66)
PAC	NWS	Facilities Construction & Major Repairs	Reduce Radar Relocations	(3,500)
ORF	NESDIS	NOAA Community Project Funding/ NOAA Special Projects	Terminate NOAA Community Project Funding/ NOAA Special Projects	(2,500)
ORF	NESDIS	Office of Satellite and Product Operations	Enterprise Infrastructure Solutions (EIS) Decrease	(1,500)
ORF	MS	NOAA Community Project Funding/ NOAA Special Projects	Terminate NOAA Community Project Funding/ NOAA Special Projects	(4,700)
ORF	OMAO	Marine Operations and Maintenance	Enterprise Infrastructure Solutions Decrease	(200)
ORF	OMAO	Aviation Operations and Aircraft Services	Reduce Atmospheric Rivers Observations	(1,000)
ORF	OMAO	Autonomous Uncrewed Technology Operations	Eliminate Funding for Uncrewed Maritime Systems Services	(7,132)
PAC	OMAO	Platform Capital Improvements & Tech Infusion	Finish P-3 Service Depot Level Maintenance	(2,500)
PAC	OMAO	Platform Capital Improvements & Tech Infusion	Decrease in Progressive Lifecycle Maintenance	(3,000)
PAC	OMAO	Vessel Recapitalization and Contstructon	Decrease in New Vessel Construction	(20,000)
Total, Decreases				**(258,142)**

Appendix 2

Technical Transfers

Account	Line Office	PPA	OMAO Aircraft Recapitalization and Construction Transfer	NESDIS Operational Phase Transfers	Total PPA Technical ATB
ORF	NESDIS	Office of Satellite and Product Operations		5,750	5,750
ORF	NESDIS	Product Development, Readiness & Application		2,350	2,350
PAC	NESDIS	Low Earth Orbit (LEO)		(8,100)	(8,100)
PAC	OMAO	Platform Capital Improvements & Technology Infusion	5,000		5,000
PAC	OMAO	Aircraft Recapitalization and Construction	(5,000)		(5,000)
	Total		**0**	**0**	**0**

* The total PPA Technical ATB column aligns with the amounts for each PPA in the Technical ATBs column of the FY 2024 President's Budget Control Table as reflected in the CJ.

**Note that the FY 2024 Total ATBs column in the Blue Book Control Table includes both Calculated (Inflationary) ATBs and Technical ATBs so it includes the amounts in the table above but does not match these amounts for all PPAs.

Appendix 3

Control Table

National Ocean Service ($ in Thousands)

FY 2024 Proposed Operating Plan	FY 2023 Enacted	Total FY 2024 ATBs	FY 2024 Base	FY 2024 Program Changes	FY 2024 Estimate
Navigation, Observations and Positioning					
Navigation, Observations and Positioning	184,702	6,375	191,077	2,672	193,749
Hydrographic Survey Priorities/Contracts	32,500	113	32,613	0	32,613
IOOS Regional Observations	42,500	0	42,500	0	42,500
Total, Navigation, Observations and Positioning	**259,702**	**6,488**	**266,190**	**2,672**	**268,862**
Coastal Science and Assessment					
Coastal Science, Assessment, Response and Restoration	96,500	3,033	99,533	3,790	103,323
Competitive Research	22,500	38	22,538	0	22,538
Total, Coastal Science and Assessment	**119,000**	**3,071**	**122,071**	**3,790**	**125,861**
Ocean and Coastal Management and Services					
Coastal Zone Management and Services	51,220	1,422	52,642	53	52,695
Coastal Zone Management Grants	81,500	0	81,500	(3,000)	78,500
National Oceans and Coastal Security Fund	34,000	0	34,000	(34,000)	0
Coral Reef Program	33,500	199	33,699	0	33,699
National Estuarine Research Reserve System	32,500	0	32,500	0	32,500
Sanctuaries and Marine Protected Areas	68,000	2,167	70,167	16,958	87,125
Total, Ocean and Coastal Management and Services	**300,720**	**3,788**	**304,508**	**(19,989)**	**284,519**
NOAA Community Project Funding/NOAA Special Projects	37,673	0	37,673	(37,673)	0
Total, NOS - Discretionary ORF	**717,095**	**13,347**	**730,442**	**(51,200)**	**679,242**
Total, NOS - Discretionary PAC	**14,000**	**0**	**14,000**	**(5,500)**	**8,500**
Total, NOS - Other Discretionary Accounts	**0**	**0**	**0**	**0**	**0**
Discretionary Total - NOS	**731,095**	**13,347**	**744,442**	**(56,700)**	**687,742**
Total, NOS - Mandatory Accounts	**96,013**	**(70,046)**	**25,967**	**0**	**25,967**
GRAND TOTAL NOS	**827,108**	**(56,699)**	**770,409**	**(56,700)**	**713,709**

National Marine Fisheries Service ($ in Thousands)

FY 2024 Proposed Operating Plan	FY 2023 Enacted	Total FY 2024 ATBs	FY 2024 Base	FY 2024 Program Changes	FY 2024 Estimate
Protected Resources Science and Management					
Marine Mammals, Sea Turtles, and Other Species	175,255	4,363	179,618	(13,310)	166,308
Species Recovery Grants	7,250	12	7,262	0	7,262
Atlantic Salmon	6,750	198	6,948	0	6,948
Pacific Salmon	72,000	2,883	74,883	1,405	76,288
Total, Protected Resources Science and Management	**261,255**	**7,456**	**268,711**	**(11,905)**	**256,806**
Fisheries Science and Management					
Fisheries and Ecosystem Science Programs and Services	161,500	5,422	166,922	22,326	189,248
Fisheries Data Collections, Surveys, and Assessments	203,851	4,742	208,593	13,401	221,994
Observers and Training	58,383	1,091	59,474	0	59,474
Fisheries Management Programs and Services	137,750	4,324	142,074	7,799	149,873
Aquaculture	19,000	410	19,410	0	19,410
Salmon Management Activities	65,250	380	65,630	0	65,630
Regional Councils and Fisheries Commissions	44,297	1,456	45,753	0	45,753
Interjurisdictional Fisheries Grants	3,377	6	3,383	0	3,383
Total, Fisheries Science and Management	**693,408**	**17,831**	**711,239**	**43,526**	**754,765**
Enforcement					
Enforcement	82,000	2,623	84,623	14	84,637
Total, Enforcement	**82,000**	**2,623**	**84,623**	**14**	**84,637**
Habitat Conservation and Restoration					
Habitat Conservation and Restoration	56,684	1,982	58,666	0	58,666
Subtotal, Habitat Conservation & Restoration	56,684	1,982	58,666	0	58,666
NOAA Community Project Funding/NOAA Special Projects	38,486	0	38,486	(38,486)	0
Total, NMFS - Discretionary ORF	**1,131,833**	**29,892**	**1,161,725**	**(6,851)**	**1,154,874**
Total, NMFS - Discretionary PAC	**0**	**0**	**0**	**0**	**0**
Total, NMFS - Other Discretionary Accounts	**65,649**	**0**	**65,649**	**0**	**65,649**
Discretionary Total - NMFS	**1,197,482**	**29,892**	**1,227,374**	**(6,851)**	**1,220,523**
Total, NMFS - Mandatory Accounts	**63,473**	**2,657**	**66,130**	**0**	**66,130**
GRAND TOTAL NMFS	**1,260,955**	**32,549**	**1,293,504**	**(6,851)**	**1,286,653**

Office of Oceanic and Atmospheric Research ($ in Thousands)

FY 2024 Proposed Operating Plan	FY 2023 Enacted	Total FY 2024 ATBs	FY 2024 Base	FY 2024 Program Changes	FY 2024 Estimate
Climate Research					
Climate Laboratories & Cooperative Institutes	104,102	2,029	106,131	1,120	107,251
Regional Climate Data & Information	47,932	538	48,470	3,506	51,976
Climate Competitive Research	72,116	855	72,971	(855)	72,116
Total, Climate Research	**224,150**	**3,422**	**227,572**	**3,771**	**231,343**
Weather & Air Chemistry Research					
Weather Laboratories & Cooperative Institutes					
Weather Laboratories & Cooperative Institutes	93,156	2,211	95,367	(711)	94,656
Subtotal, Weather Laboratories and Cooperative Institutes	93,156	2,211	95,367	(711)	94,656
Weather and Air Chemistry Research Programs					
U.S. Weather Research Program (USWRP)	39,100	397	39,497	0	39,497
Tornado Severe Storm Research / Phased Array Radar	20,916	193	21,109	0	21,109
Joint Technology Transfer Initiative	13,244	124	13,368	0	13,368
Subtotal, Weather and Air Chemistry Research Programs	73,260	714	73,974	0	73,974
Total, Weather and Air Chemistry Research	**166,416**	**2,925**	**169,341**	**(711)**	**168,630**
Ocean, Coastal, and Great Lakes Research					
Ocean Laboratories and Cooperative Institutes					
Ocean Laboratories and Cooperative Institutes	39,500	976	40,476	0	40,476
Subtotal, Ocean Laboratories and Cooperative Institutes	39,500	976	40,476	0	40,476
National Sea Grant College Program					
National Sea Grant College Program	80,000	720	80,720	0	80,720
Sea Grant Aquaculture Research	14,000	129	14,129	0	14,129
Subtotal, National Sea Grant College Program	94,000	849	94,849	0	94,849
Ocean Exploration and Research	46,000	567	46,567	0	46,567
Integrated Ocean Acidification	17,000	214	17,214	0	17,214
Sustained Ocean Observations and Monitoring	52,500	591	53,091	0	53,091
National Oceanographic Partnership Program	2,500	25	2,525	559	3,084
Total, Ocean, Coastal, and Great Lakes Research	**251,500**	**3,222**	**254,722**	**559**	**255,281**
Innovative Research & Technology					
High Performance Computing Initiatives	18,231	236	18,467	0	18,467
Uncrewed Systems	1,000	20	1,020	3,034	4,054
Total, Innovative Research & Technology	**19,231**	**256**	**19,487**	**3,034**	**22,521**

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

FY 2024 Proposed Operating Plan	FY 2023 Enacted	Total FY 2024 ATBs	FY 2024 Base	FY 2024 Program Changes	FY 2024 Estimate
NOAA Community Project Funding/NOAA Special Projects	20,841	0	20,841	(20,841)	0
Total, OAR - Discretionary ORF	**682,138**	**9,825**	**691,963**	**(14,188)**	**677,775**
Total, OAR - Discretionary PAC	**100,000**	**0**	**100,000**	**8,500**	**108,500**
Discretionary Total - OAR	**782,138**	**9,825**	**791,963**	**(5,688)**	**786,275**

National Weather Service ($ in Thousands)

FY 2024 Proposed Operating Plan	FY 2023 Enacted	Total FY 2024 ATBs	FY 2024 Base	FY 2024 Program Changes	FY 2024 Estimate
Observations	251,462	6,745	258,207	(4,745)	253,462
Central Processing	110,500	2,600	113,100	(733)	112,367
Analyze, Forecast and Support	589,500	24,233	613,733	(3,750)	609,983
Dissemination	116,979	1,792	118,771	2,447	121,218
Science and Technology Integration	178,952	4,480	183,432	(4,480)	178,952
NOAA Community Project Funding/NOAA Special Projects	7,265	0	7,265	(7,265)	0
Total, NWS - Discretionary ORF	**1,254,658**	**39,850**	**1,294,508**	**(18,526)**	**1,275,982**
Total, NWS - Discretionary PAC	**109,349**	**0**	**109,349**	**(5,245)**	**104,104**
Discretionary Total - NWS	**1,364,007**	**39,850**	**1,403,857**	**(23,771)**	**1,380,086**

National Environmental Satellite, Data, and Information Service

($ in Thousands)

FY 2024 Proposed Operating Plan	FY 2023 Enacted	Total FY 2024 ATBs	FY 2024 Base	FY 2024 Program Changes	FY 2024 Estimate
Environmental Satellite Observing Systems					
Office of Satellite and Product Operations	245,915	11,016	256,931	0	256,931
Product Development, Readiness & Application	57,500	3,402	60,902	598	61,500
Office of Space Commerce	0	0	0	0	0
U.S. Group on Earth Observations (USGEO)	750	0	750	250	1,000
Total, Environmental Satellite Observing Systems	**304,165**	**14,418**	**318,583**	**848**	**319,431**
National Centers for Environmental Information					
National Centers for Environmental Information	71,372	2,028	73,400	1,600	75,000
Total, National Centers for Environmental Information	**71,372**	**2,028**	**73,400**	**1,600**	**75,000**
NOAA Community Project Funding/NOAA Special Projects	2,500	0	2,500	(2,500)	0
Total, NESDIS - Discretionary ORF	**378,037**	**16,446**	**394,483**	**(52)**	**394,431**
Total, NESDIS - Discretionary PAC	**1,330,119**	**(8,100)**	**1,322,019**	**357,471**	**1,679,490**
Discretionary Total - NESDIS	**1,708,156**	**8,346**	**1,716,502**	**357,419**	**2,073,921**

Mission Support ($ in Thousands)

FY 2024 Proposed Operating Plan	FY 2023 Enacted	Total FY 2024 ATBs	FY 2024 Base	FY 2024 Program Changes	FY 2024 Estimate
Mission Support Services					
Executive Leadership	31,743	1,526	33,269	0	33,269
Mission Services and Management	182,375	(488)	181,887	3,368	185,255
IT Security	16,393	307	16,700	0	16,700
Payment to the DOC Working Capital Fund	71,299	23,158	94,457	0	94,457
Facilities Maintenance	6,500	0	6,500	0	6,500
Office of Space Commerce	70,000	299	70,299	17,700	87,999
Total, Mission Support Services	**378,310**	**24,802**	**403,112**	**21,068**	**424,180**
Office of Education					
Office of Education	35,450	235	35,685	0	35,685
Total, Office of Education	**35,450**	**235**	**35,685**	**0**	**35,685**
NOAA Community Project Funding/NOAA Special Projects	4,700	0	4,700	(4,700)	0
Total, MS - Discretionary ORF	**418,460**	**25,037**	**443,497**	**16,368**	**459,865**
Total, MS - Discretionary PAC	**90,000**	**0**	**90,000**	**55,700**	**145,700**
Discretionary Total - MS	**508,460**	**25,037**	**533,497**	**72,068**	**605,565**
Total, MS - Mandatory Accounts	**47,000**	**(47,000)**	**0**	**0**	**0**
GRAND TOTAL MS	**555,460**	**(21,963)**	**533,497**	**72,068**	**605,565**

Office of Marine and Aviation Operations ($ in Thousands)

FY 2024 Proposed Operating Plan	FY 2023 Enacted	Total FY 2024 ATBs	FY 2024 Base	FY 2024 Program Changes	FY 2024 Estimate
Marine Operations and Maintenance	204,000	4,117	208,117	16,031	224,148
Aviation Operations and Aircraft Services	40,500	1,460	41,960	1,412	43,372
Autonomous Uncrewed Technology Operations	21,677	15	21,692	(7,132)	14,560
NOAA Commissioned Officer Corps	62,500	3,661	66,161	4,220	70,381
Total, OMAO - Discretionary ORF	**328,677**	**9,253**	**337,930**	**14,531**	**352,461**
Total, OMAO - Discretionary PAC	**132,000**	**0**	**132,000**	**(25,500)**	**106,500**
Total, OMAO - Other Discretionary Accounts	**1,970**	**(353)**	**1,617**	**0**	**1,617**
Discretionary Total - OMAO	**462,647**	**8,900**	**471,547**	**(10,969)**	**460,578**
Total, OMAO - Mandatory Accounts	**34,760**	**238**	**34,998**	**0**	**34,998**
GRAND TOTAL OMAO	**497,407**	**9,138**	**506,545**	**(10,969)**	**495,576**

ORF Summary ($ in Thousands)

FY 2024 Proposed Operating Plan	FY 2023 Enacted	Total FY 2024 ATBs	FY 2024 Base	FY 2024 Program Changes	FY 2024 Estimate
National Ocean Service	717,095	13,347	730,442	(51,200)	679,242
National Marine Fisheries Service	1,131,833	29,892	1,161,725	(6,851)	1,154,874
Office of Oceanic and Atmospheric Research	682,138	9,825	691,963	(14,188)	677,775
National Weather Service	1,254,658	39,850	1,294,508	(18,526)	1,275,982
National Environmental Satellite, Data and Information Service	378,037	16,446	394,483	(52)	394,431
Mission Support	418,460	25,037	443,497	16,368	459,865
Office of Marine and Aviation Operations	328,677	9,253	337,930	14,531	352,461
SUBTOTAL LO DIRECT DISCRETIONARY ORF OBLIGATIONS	**4,910,898**	**143,650**	**5,054,548**	**(59,918)**	**4,994,630**

ORF Adjustments ($ in Thousands)

FY 2024 Proposed Operating Plan	FY 2023 Enacted	Total FY 2024 ATBs	FY 2024 Base	FY 2024 Program Changes	FY 2024 Estimate
SUBTOTAL ORF DIRECT OBLIGATIONS	4,910,898	143,650	5,054,548	(59,918)	4,994,630
FINANCING					
Deobligations	(23,000)	0	(23,000)	0	(23,000)
Total ORF Financing	**(23,000)**	**0**	**(23,000)**	**0**	**(23,000)**
SUBTOTAL ORF BUDGET AUTHORITY	4,887,898	143,650	5,031,548	(59,918)	4,971,630
TRANSFERS					
Transfer from P&D to ORF	(344,901)	(10,180)	(355,081)	0	(355,081)
Total ORF Transfers	**(344,901)**	**(10,180)**	**(355,081)**	**0**	**(355,081)**
SUBTOTAL ORF APPROPRIATION	**4,542,997**	**133,470**	**4,676,467**	**(59,918)**	**4,616,549**

Procurement, Acquisition, and Construction ($ in Thousands)

FY 2024 Proposed Operating Plan	FY 2023 Enacted	Total FY 2024 ATBs	FY 2024 Base	FY 2024 Program Changes	FY 2024 Estimate
NOS					
Acquisition/Construction					
National Estuarine Research Reserve Construction	8,500	0	8,500	(4,000)	4,500
Marine Sanctuaries Construction	5,500	0	5,500	(1,500)	4,000
Subtotal, NOS Construction	14,000	0	14,000	(5,500)	8,500
Total, NOS - PAC	**14,000**	**0**	**14,000**	**(5,500)**	**8,500**
Total, NMFS - PAC	**0**	**0**	**0**	**0**	**0**
OAR					
Systems Acquisition					
Research Supercomputing/ CCRI	70,000	0	70,000	(1,500)	68,500
Research Acquisitions and Management	30,000	0	30,000	10,000	40,000
Subtotal, OAR Systems Acquisition	100,000	0	100,000	8,500	108,500
Total, OAR - PAC	**100,000**	**0**	**100,000**	**8,500**	**108,500**
NWS					
Systems Acquisition					
Observations	16,200	0	16,200	(30)	16,170
Central Processing	69,649	0	69,649	(1,649)	68,000
Dissemination	10,000	0	10,000	(66)	9,934
Subtotal, NWS Systems Acquisition	95,849	0	95,849	(1,745)	94,104
Construction					
Facilities Construction and Major Repairs	13,500	0	13,500	(3,500)	10,000
Subtotal, NWS Construction	13,500	0	13,500	(3,500)	10,000
Total, NWS - PAC	**109,349**	**0**	**109,349**	**(5,245)**	**104,104**
NESDIS					
Systems Acquisition					
Geostationary Systems - R	301,000	0	301,000	(25,000)	276,000
Polar Weather Satellites	183,500	0	183,500	158,910	342,410
Space Weather Follow On	136,200	0	136,200	(39,000)	97,200
Common Ground Services (CGS)	105,433	0	105,433	15,478	120,911
Geostationary Earth Orbit (GEO)	285,000	0	285,000	132,429	417,429
Low Earth Orbit (LEO)	96,430	(8,100)	88,330	35,260	123,590
Space Weather Next	151,606	0	151,606	73,394	225,000
Systems/Services Architecture and Engineering (SAE)	68,500	0	68,500	6,000	74,500
Subtotal, NESDIS Systems Acquisition	1,327,669	(8,100)	1,319,569	357,471	1,677,040

Procurement, Acquisition, and Construction Cont'd ($ in Thousands)

FY 2024 Proposed Operating Plan	FY 2023 Enacted	Total FY 2024 ATBs	FY 2024 Base	FY 2024 Program Changes	FY 2024 Estimate
Construction					
Satellite CDA Facility	2,450	0	2,450	0	2,450
Subtotal, NESDIS Construction	2,450	0	2,450	0	2,450
Transfer to OIG	0	0	0	0	0
Total, NESDIS - PAC	**1,330,119**	**(8,100)**	**1,322,019**	**357,471**	**1,679,490**
Mission Support					
Construction					
NOAA Construction	90,000	0	90,000	55,700	145,700
Subtotal, Mission Support Construction	90,000	0	90,000	55,700	145,700
Total, Mission Support - PAC	**90,000**	**0**	**90,000**	**55,700**	**145,700**
OMAO					
Marine and Aviation Capital Investments					
Platform Capital Improvements & Tech Infusion	28,000	5,000	33,000	(5,500)	27,500
Vessel Recapitalization and Construction	95,000	0	95,000	(20,000)	75,000
Aircraft Recapitalization and Construction	9,000	(5,000)	4,000	0	4,000
Subtotal, Marine and Aviation Capital Investments	132,000	0	132,000	(25,500)	106,500
Total, OMAO - PAC	**132,000**	**0**	**132,000**	**(25,500)**	**106,500**
GRAND TOTAL PAC DISCRETIONARY OBLIGATIONS	**1,775,468**	**(8,100)**	**1,767,368**	**385,426**	**2,152,794**

PAC Adjustments ($ in Thousands)

FY 2024 Proposed Operating Plan	FY 2023 Enacted	Total FY 2024 ATBs	FY 2024 Base	FY 2024 Program Changes	FY 2024 Estimate
SUBTOTAL PAC DIRECT OBLIGATIONS	1,775,468	(8,100)	1,767,368	385,426	2,152,794
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	1,762,468	(8,100)	1,754,368	385,426	2,139,794
TRANSFERS					
Transfer to OIG	0	0	0	0	0
Total PAC Transfers	**0**	**0**	**0**	**0**	**0**
SUBTOTAL PAC APPROPRIATION	**1,762,468**	**(8,100)**	**1,754,368**	**385,426**	**2,139,794**

Other Accounts Discretionary ($ in Thousands)

FY 2024 Proposed Operating Plan	FY 2023 Enacted	Total FY 2024 ATBs	FY 2024 Base	FY 2024 Program Changes	FY 2024 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
Promote and Develop Fisheries Obligations	0	0	0	0	0
Promote and Develop Fisheries Budget Authority	(344,901)	(10,180)	(355,081)	0	(355,081)
Promote and Develop Fisheries Appropriation	0	0	0	0	0
Pacific Coastal Salmon Recovery Fund Obligations	65,000	0	65,000	0	65,000
Pacific Coastal Salmon Recovery Fund Budget Authority	65,000	0	65,000	0	65,000
Pacific Coastal Salmon Recovery Fund Appropriation	65,000	0	65,000	0	65,000
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	300	0	300	0	300
Fisheries Disaster Assistance Fund Budget Authority	300	0	300	0	300
Fisheries Disaster Assistance Fund Appropriation	300	0	300	0	300
Subtotal, NMFS Other Discretionary Direct Obligations	65,649	0	65,649	0	65,649
Subtotal, NMFS Other Discretionary Budget Authority	(279,252)	(10,180)	(289,432)	0	(289,432)
Subtotal, NMFS Other Discretionary Appropriation	65,649	0	65,649	0	65,649
OMAO					
Medicare Eligible Retiree Healthcare Fund Obligations	1,970	(353)	1,617	0	1,617
Medicare Eligible Retiree Healthcare Fund Budget Authority	1,970	(353)	1,617	0	1,617
Medicare Eligible Retiree Healthcare Fund Appropriation	1,970	(353)	1,617	0	1,617
Subtotal, OMAO Other Discretionary Direct Obligations	1,970	(353)	1,617	0	1,617
Subtotal, OMAO Other Discretionary Budget Authority	1,970	(353)	1,617	0	1,617
Subtotal, OMAO Other Discretionary Appropriation	1,970	(353)	1,617	0	1,617
TOTAL, OTHER DISCRETIONARY DIRECT OBLIGATIONS	**67,619**	**(353)**	**67,266**	**0**	**67,266**
TOTAL, OTHER DISCRETIONARY BUDGET AUTHORITY	**(277,282)**	**(10,533)**	**(287,815)**	**0**	**(287,815)**
TOTAL, OTHER DISCRETIONARY APPROPRIATION	**67,619**	**(353)**	**67,266**	**0**	**67,266**

Grand Total Summary Discretionary Appropriations ($ in Thousands)

FY 2024 Proposed Operating Plan	FY 2023 Enacted	Total FY 2024 ATBs	FY 2024 Base	FY 2024 Program Changes	FY 2024 Estimate
Operations, Research, and Facilities	4,542,997	133,470	4,676,467	(59,918)	4,616,549
Procurement, Acquisition, and Construction	1,762,468	(8,100)	1,754,368	385,426	2,139,794
Fisherman's Contingency Fund	349	0	349	0	349
Pacific Coastal Salmon Recovery Fund	65,000	0	65,000	0	65,000
Fisheries Disaster Assistance Fund	300	0	300	0	300
Marine Mammal Unusual Mortality Event Fund	0	0	0	0	0
Medicare Eligible Retiree Health Care Fund	1,970	(353)	1,617	0	1,617
GRAND TOTAL DISCRETIONARY APPROPRIATION	**6,373,084**	**125,017**	**6,498,101**	**325,508**	**6,823,609**

Summary of Discretionary Resources ($ in Thousands)

FY 2024 Proposed Operating Plan	FY 2023 Enacted	Total FY 2024 ATBs	FY 2024 Base	FY 2024 Program Changes	FY 2024 Estimate
Direct Discretionary Obligations					
ORF Direct Obligations	4,910,898	143,650	5,054,548	(59,918)	4,994,630
PAC Direct Obligations	1,775,468	(8,100)	1,767,368	385,426	2,152,794
OTHER Direct Obligations	67,619	(353)	67,266	0	67,266
TOTAL Direct Discretionary Obligations	**6,753,985**	**135,197**	**6,889,182**	**325,508**	**7,214,690**
Discretionary Budget Authority					
ORF Budget Authority	4,887,898	143,650	5,031,548	(59,918)	4,971,630
PAC Budget Authority	1,762,468	(8,100)	1,754,368	385,426	2,139,794
OTHER Budget Authority	(277,282)	(10,533)	(287,815)	0	(287,815)
TOTAL Discretionary Budget Authority	**6,373,084**	**125,017**	**6,498,101**	**325,508**	**6,823,609**
Discretionary Appropriations					
ORF Appropriation	4,542,997	133,470	4,676,467	(59,918)	4,616,549
PAC Appropriation	1,762,468	(8,100)	1,754,368	385,426	2,139,794
OTHER Appropriation	67,619	(353)	67,266	0	67,266
TOTAL Discretionary Appropriation	**6,373,084**	**125,017**	**6,498,101**	**325,508**	**6,823,609**

Other Accounts Mandatory ($ in Thousands)

FY 2024 Proposed Operating Plan	FY 2023 Enacted	Total FY 2024 ATBs	FY 2024 Base	FY 2024 Program Changes	FY 2024 Estimate
NOS					
Damage Assessment and Restoration Revolving Fund Obligations	88,296	(72,296)	16,000	0	16,000
Damage Assessment and Restoration Revolving Fund Budget Authority	5,996	4	6,000	0	6,000
Damage Assessment and Restoration Revolving Fund Appropriation	0	0	0	0	0
Sanctuaries Enforcement Asset Forfeiture Fund Obligations	651	(1)	650	0	650
Sanctuaries Enforcement Asset Forfeiture Fund Budget Authority	591	9	600	0	600
Sanctuaries Enforcement Asset Forfeiture Fund Appropriation	600	0	600	0	600
Gulf Coast Ecosystem Restoration Fund Obligations	7,066	2,251	9,317	0	9,317
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	96,013	(70,046)	25,967	0	25,967
Subtotal, NOS Other Mandatory Budget Authority	6,587	13	6,600	0	6,600
Subtotal, NOS Other Mandatory Appropriation	600	0	600	0	600
NMFS					
Promote and Develop Fisheries Obligations	11,500	(3,970)	7,530	0	7,530
Promote and Develop Fisheries Budget Authority	356,401	6,210	362,611	0	362,611
Promote and Develop Fisheries Appropriation	0	0	0	0	0
Fisheries Finance Program Account Obligations	5,722	(5,722)	0	0	0
Fisheries Finance Program Account Budget Authority	5,722	(5,722)	0	0	0
Fisheries Finance Program Account Appropriation	5,722	(5,722)	0	0	0
Environmental Improvement & Restoration Fund Obligations	6,557	7,544	14,101	0	14,101
Environmental Improvement & Restoration Fund Budget Authority	6,557	7,544	14,101	0	14,101
Environmental Improvement & Restoration Fund Appropriation	6,953	8,000	14,953	0	14,953

Other Accounts Mandatory Cont'd ($ in Thousands)

FY 2024 Proposed Operating Plan	FY 2023 Enacted	Total FY 2024 ATBs	FY 2024 Base	FY 2024 Program Changes	FY 2024 Estimate
Limited Access System Administration Fund Obligations	12,877	558	13,435	0	13,435
Limited Access System Administration Fund Budget Authority	12,877	558	13,435	0	13,435
Limited Access System Administration Fund Appropriation	12,968	495	13,463	0	13,463
Western Pacific Sustainable Fisheries Fund Obligations	734	16	750	0	750
Western Pacific Sustainable Fisheries Fund Budget Authority	734	16	750	0	750
Western Pacific Sustainable Fisheries Fund Appropriation	750	0	750	0	750
Fisheries Enforcement Asset Forfeiture Fund Obligations	2,132	(14)	2,118	0	2,118
Fisheries Enforcement Asset Forfeiture Fund Budget Authority	2,132	(14)	2,118	0	2,118
Fisheries Enforcement Asset Forfeiture Fund Appropriation	2,118	0	2,118	0	2,118
North Pacific Observer Fund Obligations	4,451	145	4,596	0	4,596
North Pacific Observer Fund Budget Authority	4,451	145	4,596	0	4,596
North Pacific Observer Fund Appropriation	4,530	70	4,600	0	4,600
Seafood Inspection Program Trust Fund	19,500	4,100	23,600	0	23,600
Seafood Inspection Program Trust Fund	0	0	0	0	0
Seafood Inspection Program Trust Fund	0	0	0	0	0
Subtotal, NMFS Other Mandatory Direct Obligations	63,473	2,657	66,130	0	66,130
Subtotal, NMFS Other Mandatory Budget Authority	388,874	8,737	397,611	0	397,611
Subtotal, NMFS Other Mandatory Appropriation	33,041	2,843	35,884	0	35,884
MS					
Spectrum Relocation Fund (ORF) Obligations	40,900	(40,900)	0	0	0
Spectrum Relocation Fund (ORF) Budget Authority	40,900	(40,900)	0	0	0
Spectrum Relocation Fund (ORF) Appropriation	40,900	(40,900)	0	0	0
Spectrum Relocation Fund (PAC) Obligations	6,100	(6,100)	0	0	0
Spectrum Relocation Fund (PAC) Budget Authority	6,100	(6,100)	0	0	0
Spectrum Relocation Fund (PAC) Appropriation	6,100	(6,100)	0	0	0
Subtotal, MS Other Mandatory Direct Obligations	47,000	(47,000)	0	0	0
Subtotal, MS Other Mandatory Budget Authority	47,000	(47,000)	0	0	0
Subtotal, MS Other Mandatory Appropriation	47,000	(47,000)	0	0	0

Other Accounts Mandatory Cont'd ($ in Thousands)

FY 2024 Proposed Operating Plan	FY 2023 Enacted	Total FY 2024 ATBs	FY 2024 Base	FY 2024 Program Changes	FY 2024 Estimate
OMAO					
NOAA Corps Commissioned Officers Retirement Obligations	34,760	238	34,998	0	34,998
NOAA Corps Commissioned Officers Retirement Budget Authority	34,760	238	34,998	0	34,998
NOAA Corps Commissioned Officers Retirement Appropriation	34,760	238	34,998	0	34,998
Subtotal, OMAO Other Mandatory Direct Obligations	34,760	238	34,998	0	34,998
Subtotal, OMAO Other Mandatory Budget Authority	34,760	238	34,998	0	34,998
Subtotal, OMAO Other Mandatory Appropriation	34,760	238	34,998	0	34,998
TOTAL, OTHER MANDATORY DIRECT OBLIGATIONS	**241,246**	**(114,151)**	**127,095**	**0**	**127,095**
TOTAL, OTHER MANDATORY BUDGET AUTHORITY	**477,221**	**(38,012)**	**439,209**	**0**	**439,209**
TOTAL, OTHER MANDATORY APPROPRIATION	**115,401**	**(43,919)**	**71,482**	**0**	**71,482**

NOAA Summary ($ in Thousands)

FY 2024 Proposed Operating Plan	FY 2023 Enacted	Total FY 2024 ATBs	FY 2024 Base	FY 2024 Program Changes	FY 2024 Estimate
TOTAL Direct Obligations (Discretionary & Mandatory)	**6,995,231**	**21,046**	**7,016,277**	**325,508**	**7,341,785**
TOTAL Budget Authority (Discretionary & Mandatory)	**6,850,305**	**87,005**	**6,937,310**	**325,508**	**7,262,818**
TOTAL Appropriation (Discretionary & Mandatory)	**6,488,485**	**81,098**	**6,569,583**	**325,508**	**6,895,091**
Reimbursable Financing	402,686	(160,686)	242,000	0	242,000
TOTAL OBLIGATIONS (Direct & Reimbursable)	**7,397,917**	**(139,640)**	**7,258,277**	**325,508**	**7,583,785**
Offsetting Receipts	(19,000)	4,194	(14,806)	0	(14,806)
TOTAL OBLIGATIONS (Direct, Reimbursable & Offsetting Receipts)	**7,378,917**	**(135,446)**	**7,243,471**	**325,508**	**7,568,979**

Line Office Summary ($ in Thousands)

FY 2024 Proposed Operating Plan	FY 2023 Enacted	Total FY 2024 ATBs	FY 2024 Base	FY 2024 Program Changes	FY 2024 Estimate
National Ocean Service					
ORF	717,095	13,347	730,442	(51,200)	679,242
PAC	14,000	0	14,000	(5,500)	8,500
OTHER	96,013	(70,046)	25,967	0	25,967
TOTAL, NOS	**827,108**	**(56,699)**	**770,409**	**(56,700)**	**713,709**
National Marine Fisheries Service					
ORF	1,131,833	29,892	1,161,725	(6,851)	1,154,874
PAC	0	0	0	0	0
OTHER	129,122	2,657	131,779	0	131,779
TOTAL, NMFS	**1,260,955**	**32,549**	**1,293,504**	**(6,851)**	**1,286,653**
Oceanic and Atmospheric Research					
ORF	682,138	9,825	691,963	(14,188)	677,775
PAC	100,000	0	100,000	8,500	108,500
TOTAL, OAR	**782,138**	**9,825**	**791,963**	**(5,688)**	**786,275**
National Weather Service					
ORF	1,254,658	39,850	1,294,508	(18,526)	1,275,982
PAC	109,349	0	109,349	(5,245)	104,104
TOTAL, NWS	**1,364,007**	**39,850**	**1,403,857**	**(23,771)**	**1,380,086**
National Environmental Satellite, Data and Information Service					
ORF	378,037	16,446	394,483	(52)	394,431
PAC	1,330,119	(8,100)	1,322,019	357,471	1,679,490
TOTAL, NESDIS	**1,708,156**	**8,346**	**1,716,502**	**357,419**	**2,073,921**
Mission Support					
ORF	418,460	25,037	443,497	16,368	459,865
PAC	90,000	0	90,000	55,700	145,700
OTHER	47,000	(47,000)	0	0	0
TOTAL, Mission Support	**555,460**	**(21,963)**	**533,497**	**72,068**	**605,565**
Office of Marine and Aviation Operations					
ORF	328,677	9,253	337,930	14,531	352,461
PAC	132,000	0	132,000	(25,500)	106,500
OTHER	36,730	(115)	36,615	0	36,615
TOTAL, OMAO	**497,407**	**9,138**	**506,545**	**(10,969)**	**495,576**

Line Office Summary Cont'd ($ in Thousands)

FY 2024 Proposed Operating Plan	FY 2023 Enacted	Total FY 2024 ATBs	FY 2024 Base	FY 2024 Program Changes	FY 2024 Estimate
DIRECT DISCRETIONARY OBLIGATIONS					
ORF	4,910,898	143,650	5,054,548	(59,918)	4,994,630
PAC	1,775,468	(8,100)	1,767,368	385,426	2,152,794
OTHER	308,865	(114,504)	194,361	0	194,361
TOTAL, DIRECT DISCRETIONARY OBLIGATIONS	**6,995,231**	**21,046**	**7,016,277**	**325,508**	**7,341,785**
ORF Adjustments (Deobligations/Rescissions)	(23,000)	0	(23,000)	0	(23,000)
ORF Transfers	(344,901)	(10,180)	(355,081)	0	(355,081)
PAC Adjustments (Deobligations/Rescissions)	(13,000)	0	(13,000)	0	(13,000)
PAC Transfers	0	0	0	0	0
OTHER Discretionary Adjustments	0	0	0	0	0
Mandatory Accounts Excluded	(241,246)	114,151	(127,095)	0	(127,095)
TOTAL, DISCRETIONARY APPROPRIATIONS	**6,373,084**	**125,017**	**6,498,101**	**325,508**	**6,823,609**

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 Environmental Satellite, Data, and Information Service
www.nesdis.noaa.gov

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

United States Department of Commerce
National Oceanic and Atmospheric Administration
14th and Constitution Avenue, NW
Washington, DC 20230
www.noaa.gov

Cover Caption: NOAA is an agency that enriches life through science. Our reach goes from the surface of the sun to the depths of the ocean floor as we work to keep the public informed of the changing environment around them.

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