THE NATIONAL OCEAN BIODIVERSITY STRATEGY

A Report by the

INTERAGENCY WORKING GROUP ON BIODIVERSITY *of the*

SUBCOMMITTEE ON OCEAN SCIENCE AND TECHNOLOGY

COMMITTEE ON ENVIRONMENT

of the

NATIONAL SCIENCE & TECHNOLOGY COUNCIL

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The purpose of the Subcommittee on Ocean Science and Technology (SOST) is to advise and assist on national issues of ocean science and technology. The SOST contributes to the goals for federal ocean science and technology, including developing coordinated interagency strategies and fostering national ocean science and technology priorities. The SOST reports to both the NSTC Committee on Environment and the Ocean Policy Committee.

About the Interagency Working Group on Biodiversity

The SOST Interagency Working Group (IWG) on Biodiversity was established to enhance coordination of ocean biodiversity research and monitoring to inform federal agency mandated activities (e.g., management, protection, regulation) and to understand, assess, and manage climate and environmental impacts on ocean life and habitats. This includes identifying opportunities and leveraging funding for joint collaborative research between federal and non-federal entities. Themes of particular and long-term interest to the IWG include advancing standards and best practices for interoperable, widely accessible biodiversity data; integrating satellite data products with *in situ* observations of ocean biodiversity to understand the distribution and abundance of organisms and the integrity of ecosystems; and expanding collection of ocean biodiversity information across all realms, including the coasts, deep sea, and the Great Lakes.

About this Document

Federal agencies mandated to support ocean biodiversity research, monitoring, and management face logistical challenges in effectively monitoring biodiversity across the vast U.S. ocean. The National Ocean Biodiversity Strategy (strategy) presents a roadmap to strengthen this capacity and expand coordination between the public and private sectors to enhance, rebuild, and sustain the many benefits

that ocean life provides to society. The strategy calls for coordination among federal, Tribal, state, territorial local, and non-governmental partners to strengthen the national enterprise for characterizing and tracking ocean biodiversity in support of existing mandates to conserve, restore, and sustainably manage living ocean resources. Implementing the strategy will advance capacity to forecast changes in ocean life and ecosystem services by ensuring that data are comparable, shared, and available for use across sectors (federal, Tribal, state, territorial, and local governments, non-governmental organizations, private, academic) and regions (subnational, national, international).

This strategy covers biodiversity of U.S. ocean waters, where "ocean" includes the nation's ocean, coasts, estuaries, and the Great Lakes. "Biodiversity" includes the variety of life at all levels—genes, species, habitats, ecosystems—from microbes to whales, including functional diversity of the traits and interactions among organisms that influence ecosystem dynamics, stability, and productivity. Biodiversity here also aims to capture the holistic sense of living nature, including people, common in many Indigenous (and some other) cultures and values. This strategy focuses on ocean ecosystems because they pose unique operational challenges associated with documenting and monitoring biodiversity, but the fundamental motivation to understand the complex living heritage and resources, and many of the needs and solutions identified here, apply to life across habitats and domains and are applicable on land and internationally as well.

The strategy was informed by public comments provided in response to a Request for Information, which received a total of 32 public comments from federal agencies, marine industries, academia, nongovernmental organizations, and private individuals. All comments received helped shape the strategy goals, objectives, and actions.

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Abbreviations and Acronyms

ATN	Animal Telemetry Network
BOEM	Bureau of Ocean Energy Management
CARE	Collective Benefit, Authority to Control, Responsibility, and Ethics
DOC	Department of Commerce
eDNA	Environmental Deoxyribonucleic Acid
EEZ	Exclusive Economic Zone
EPA	Environmental Protection Agency
FAIR	Findable, Accessible, Interoperable, and Reusable
GOOS	Global Ocean Observing System
HABs	Harmful Algal Blooms
IWG	Interagency Working Group
MPAs	Marine Protected Areas
NASA	National Aeronautics and Space Administration
NOAA	National Oceanic and Atmospheric Administration
NSF	National Science Foundation
NSTC	National Science and Technology Council
ONR	Office of Naval Research
OSTP	Office of Science and Technology Policy
SOST	Subcommittee on Ocean Science and Technology
UCAR	University Corporation for Atmospheric Research
USGS	United States Geological Survey

Executive Summary

President Biden has been clear that the ocean is central to life on Earth. As he has proclaimed, "the ocean powers millions of jobs; feeds and sustains us; and is a rejuvenating source of inspiration, exploration, and recreation." The Biden-Harris Administration has worked hard to fulfill the President's goal to protect and conserve at least 30% of U.S. waters by 2030.

The ocean faces increased threats from warming, overfishing, increased acidity, and loss of biodiversity. It is now more important than ever to sustain the many benefits that the ocean, coasts, and Great Lakes provide, including food, a favorable climate, recreation, physical and mental health, and for many, a sense of cultural identity. Ocean life represents an irreplaceable heritage, the foundation of a habitable planet, and a vast trove of resources. Keeping our ocean healthy requires reliable information on the changing status of these living organisms, the drivers of biodiversity change, and options for effectively addressing those drivers. Over 2 million species are estimated to live in the ocean, yet only about 240,000 species have been described by scientists.[1] Most of the ocean's benefits result from those diverse species interacting with one another and the environment they create.

To protect and conserve the ocean, we as a nation need to make better use of existing knowledge and prioritize acquiring new biodiversity knowledge to enable better policy and management decisions. The ability to monitor ocean species and habitats has expanded dramatically over the past decade, with innovations in technology, genomics, taxonomy, big data management and sharing, artificial intelligence, and machine learning. Yet large fractions of the U.S. ocean remain almost unknown. The National Ocean Biodiversity Strategy (strategy) reflects the urgent need to leverage these advances. The goals of this strategy must be guided by the nation's diverse voices and ways of knowing, in order to maximize effective and equitable stewardship of the ocean's diverse life and its benefits to people.

The strategy is intended as a guiding document for government to advance three overarching goals:

- **Goal 1: Drive delivery of ocean biodiversity knowledge at the national scale.** Objectives include developing an Implementation Plan for achieving the strategy's three goals; establishing a coordination mechanism to manage the implementation; and documenting gaps in biodiversity knowledge and the benefits of ocean biodiversity to people and economies.
- **Goal 2: Strengthen tools and institutions to deliver ocean biodiversity knowledge.** Objectives include establishing a robust information pipeline to support indicators and dynamic maps of ocean biodiversity, from the coasts to the deep sea. This pipeline should include expanded observing systems and comprehensive data management; science and technology solutions to accelerate the availability of biodiversity information; and plans to leverage previous investments to rebuild and expand the nation's human capital and infrastructure to sustain foundational taxonomy and biodiversity science.
- **Goal 3: Protect, conserve, restore, and sustainably use ocean biodiversity.** Objectives include expanding the collection, delivery, and use of biodiversity knowledge to inform actions that advance ocean protection, conservation, restoration, and sustainable development. Government should lead in establishing and incentivizing diverse partnerships across scales and sectors to implement those actions and should educate and involve the public to discover and value the nation's diverse ocean life.

[1] Rogers, A.D. et al. 2023. Accelerating ocean species discovery and laying the foundations for the future of marine biodiversity research and monitoring. Frontiers in Marine Science. DOI: 10:1224471

Achieving these goals will require commitments across society: new federal and private investments, coordination across sectors to address climate and equity challenges, and engagement of Indigenous Knowledge holders and frontline communities as full partners throughout planning and implementation. The Subcommittee on Ocean Science and Technology (SOST) IWG-Biodiversity will begin developing an Implementation Plan to describe and direct specific actions to implement the strategy.

Successful implementation of the strategy will harmonize and expand collection and delivery of timely knowledge on ocean life to all of society. The strategy will also enable evidence-based management and protection of the ocean. Advancing the strategy will build human and institutional capital and partnerships that support both existing mandates and new needs to rebuild and sustain biodiversity, achieve healthy ocean ecosystems, and manage living resources. Implementing the strategy will deliver knowledge for monitoring, modeling, forecasting, and assessments that support food security, public health, and cultural values, and that more effectively protect, conserve, and restore nature.

Introduction

Box 1 | What is biodiversity?

Biodiversity is defined scientifically as the variety of life in all its aspects—species, genetic diversity within species, and the interactions among species of all kinds, from microbes to whales—that create habitats and ecosystems.* It also includes **functional diversity**—the different ways that organisms interact with the environment to determine how an ecosystem operates. An informal term for the diverse, interacting species that create ecosystems in a given landscape or seascape is simply 'Nature'.

Holistic approaches include humans as part of 'Nature' as well as relationships, obligations, and reciprocity between humans and non-human life. Such holistic worldviews are foundational to many Indigenous Knowledge systems.

In this strategy, **ocean biodiversity** includes these various definitions and worldviews to understand the diversity and value of life across the nation's ocean, coasts, and the Great Lakes, as it contributes to people's lives.

*Convention on Biological Diversity. https://www.cbd.int/convention/articles/default.shtml?a=cbd-02

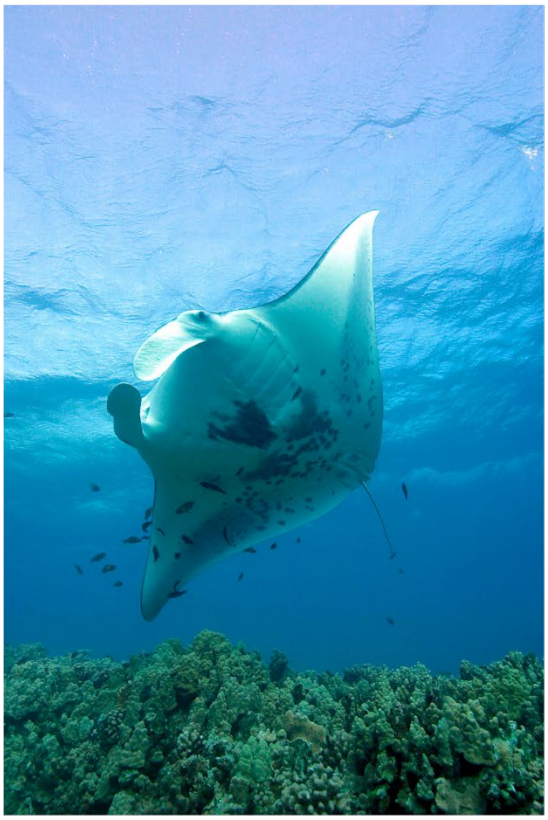

Photo credit: NOAA National Ocean Service

Ocean biodiversity is important to all Americans

People are an integral part of nature, and nature supports people. Even in the continental heartland, human lives, livelihoods, and health rely on ocean biodiversity (**Box 1**). Life in America's ocean, coasts, and Great Lakes provides ecosystem services such as food, clean air and water, climate regulation, recreational and cultural benefits, contributions to physical and mental health, and for many, a sense of cultural identity. Biodiverse and healthy ecosystems, such as coastal wetlands and coral reefs, can buffer human communities from floods, storms, and other natural hazards. More than half of the world's gross domestic product ($44 trillion) is considered highly or moderately dependent on nature.[2] Nature restoration provides more jobs in the United States than many extractive industries, including coal mining, logging, and steel industries, and is estimated to be worth $25 billion per year globally (**Box 2**).[3] The U.S. ocean economy supports 2.4 million jobs across multiple sectors including fishing, tourism,

[2] World Economic Forum. 2020. The Global Risks Report 2020. World Economic Forum. https://www.weforum.org/publications/the-global-risks-report-2020/

[3] BenDor, T., Lester, T.W., Livengood, A., Davis, A. and Yonavjak, L., 2015. Estimating the size and impact of the ecological restoration economy. PloS one. https://doi.org/10.1371/journal.pone.0128339

shipping, and energy generation, which contributed $397 billion to the U.S. gross domestic product in 2019.[4] Much of that economic engine is driven by the diversity of living organisms and their interactions. The value of nature far exceeds those natural products and services that have been valued in formal economic terms; this is because current economic valuations do not yet include many natural assets,[5] ecosystem services, nor the cultural importance of biodiversity.[6] People recognize the interconnectedness of biodiversity and the economy;[7,8] 90% of Americans believe that Earth's biodiversity is important to human well-being,[9] and Americans show strong support for biodiversity conservation.[10] The recently adopted Kunming-Montreal Global Biodiversity Framework recognizes that respecting both monetary and non-monetary values of biodiversity are integral to sustaining global nature.[11]

Yet biodiversity is in crisis. Around 1 million species worldwide currently face extinction, many within decades, unless aggressive action is taken to reduce the drivers of biodiversity loss.[12,13] Many other species are declining far below historical abundances, degrading their ability to maintain essential ecosystem processes and services. In 2020, environmental concerns dominated the top long-term risks identified by the World Economic Forum for the first time. In 2024, the top three decadal risks were extreme weather events, critical change to earth systems, and biodiversity loss and ecosystem collapse. These risks outranked involuntary migration, cyber insecurity, and societal polarization.[14,15] The Intergovernmental Panel on Climate Change also highlighted many current and anticipated impacts to

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[4] National Oceanic and Atmospheric Administration. 2023. New blue economy. https://www.noaa. gov/blue-economy

[5] See "National Strategy to Develop Statistics for Environmental-Economic Decisions; A U.S. System of Natural Capital Accounting and Associated Environmental-Economic Statistics". Office of Science and Technology Policy. Office of Management and Budget, Department of Commerce. January 2023. https://www.whitehouse.gov/wp-content/uploads/2023/01/Natural-Capital-Accounting-Strategy-final.pdf

[6] See "Guidance for Assessing Changes in Environmental and Ecosystem Services in Benefit-Cost Analysis". Office of Information and Regulatory Affairs, Office of Management and Budget. February 2024. https://www.whitehouse.gov/wp-content/uploads/2024/02/ESGuidance.pdf

[7] Dasgupta, P. 2021. The Economics of Biodiversity: The Dasgupta Review. London HM Treasury. https://assets.publishing.service.gov.uk/media/602e92b2e90e07660f807b47/The_Economics_of_Biodiversity_The_Dasgupta_Review_Full_Report.pdf

[8] Almeida, E., et al. 2022. Central banking and supervision in the biosphere: An agenda for action on biodiversity loss, financial risk and system stability. NGFS-INSPIRE. https://www.ngfs.net/sites/default/files/medias/documents/central_banking_and_supervision_in_the_biosphere.pdf

[9] The Harris Poll. 2014. Nine in ten Americans believe biodiversity is important to human beings. The Harris Poll. https://www.prnewswire.com/news-releases/nine-in-ten-americans-believe-biodiversity-is-important-to-human-beings-300010122.html

[10] Bruskotter, J.T., et al. 2018. Support for the U.S. Endangered Species Act over time and space: Controversial species do not weaken public support for protective legislation. Conservation Letters. https://doi.org/10.1111/conl.12595

[11] COP15: Final text of Kunming-Montreal Global Biodiversity Framework. 2022. Convention on Biological Diversity. https://www.cbd.int/article/cop15-final-text-kunming-montreal-gbf-221222

[12] IPBES. 2019. Global assessment report on biodiversity and ecosystem services of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services. IPBES secretariat. https://doi.org/10.5281/zenodo.3831673

[13] Penn, J.L. and Deutsch, C. 2022. Avoiding ocean mass extinction from climate warming. Science. DOI: 10.1126/science.abe9039

[14] World Economic Forum. 2021. Global Risks Report 2021. World Economic Forum. https://www.weforum.org/publications/the-global-risks-report-2021/

[15] World Economic Forum. 2024. Global Risks Report 2024. World Economic Forum. https://www.weforum.org/publications/global-risks-report-2024/

the well-being of human communities resulting from climate-mediated biodiversity loss.[16] The biodiversity crisis is closely intertwined with climate change, the increasing use and development of land and ocean spaces, and inequity among people. It is increasingly clear that these challenges must be approached together to reach lasting, just solutions that support human health, food security, economic vitality, and national security.

Box 2 | Restoration investments benefit ocean life and economies

Challenge: Healthy habitats support more diverse and abundant ocean life but are declining in many regions.

Solution: The United States is making large investments through the Bipartisan Infrastructure Law and the Inflation Reduction Act to provide resources for Tribes, states, territories, local communities, and non-governmental organizations to restore coastal habitats. This includes removing barriers to fish migration and restoring coastal salt marshes, mangrove forests, kelp beds, and coral reefs. Habitat restoration is creating jobs and economic benefits around the United States and territories by bringing back fisheries that depend on wetlands as nurseries, rebuilding oyster reefs, restoring habitats for threatened salmon, and creating coral nurseries for climate-resilient corals.

Photo credit: NOAA National Ocean Service

What is known about U.S. ocean biodiversity

The United States has a long history of documenting and understanding ocean life. But the work is challenging. The U.S. exclusive economic zone (EEZ) is among the world's largest. It covers an area larger than the 50 states, from shallow coasts to the largely unexplored deep trenches, and the water column above. The information on U.S. ocean life that currently exists is collected by many parties using a wide variety of methods. This information includes genetic and taxonomic data, as well as functional understandings of species interactions and ecosystem services. Data are heterogeneous, often not comparable, scattered among different repositories, generally not coordinated, and often not shared publicly.[17] This lack of interoperability impedes the nation's ability to effectively integrate knowledge and use it to sustain healthy living ocean ecosystems. As a result, much information on changing ocean life and ecosystem services is unavailable or difficult to use. These impediments are more apparent as emerging ocean uses proliferate. These uses include offshore renewable energy development, marine carbon dioxide removal, seabed mineral exploration and extraction, and offshore aquaculture. These

[16] Bindoff, N. L., et al. 2022. Changing Ocean, Marine Ecosystems, and Dependent Communities. Cambridge University Press. https://doi.org/10.1017/9781009157964.007

[17] Fautin, D., et al. 2010. An overview of marine biodiversity in United States waters. PloS one. https://doi.org/10.1371/journal.pone.0011914

and other activities are proceeding with inadequate knowledge of the species and habitats that may be affected and in some cases without well-established regulatory frameworks to determine and avoid impacts on biodiversity.

Across the global ocean, scientists have described more than 200,000 species and many more remain unknown to science, particularly among small organisms and in the deep sea. They cannot all be monitored. One practical approach is to prioritize species and habitats that are feasible to measure and are important to human health and wellbeing, food production, economy, and jobs. This approach was formalized in the Global Ocean Observing System's (GOOS) development of biology and ecosystem essential ocean variables,[18] which have been adopted by the U.S. Marine Biodiversity Observation Network. A group of scientists and practitioners used a similar approach in an initial assessment of U.S. ocean biodiversity that prioritizes habitat-forming species, species of conservation concern, harmful organisms, and supporting organisms such as forage fish and keystone predators.[19]

The decade-long Census of Marine Life, which concluded in 2010, found that the best-known ocean organisms are commercially important fishes, whereas much less is known about smaller, deeper living and offshore species.[20] A recent synthesis tallied over 29,000 species across U.S. marine waters (exclusive of the 3,500 species in the Great Lakes),[21] undoubtedly a substantial underestimate,[22] and similarly identified large biases and gaps in biodiversity knowledge. The synthesis found notably poor coverage of small invertebrates, protists, and microbes, including pathogens and species that cause toxic harmful algal blooms. Many of these poorly known organisms are likely to be significant players in disease dynamics, coral symbioses, fishery food webs, and ecosystem processes, such as transport of atmospheric carbon to the deep ocean.[23,24]

The current status and trends in U.S. ocean species are best documented for those of commercial and conservation interest, and for habitat-forming species that support other organisms. Of the 506 fishery stocks or stock complexes managed by the National Oceanic and Atmospheric Administration (NOAA) Fisheries in 2020, only about 5% were considered overfished. However, many stocks have insufficient data to evaluate status, so this may be an underestimate.[25] Marine habitats created by plants and animals, including those built by corals, oysters, kelps, mangroves, seagrasses, and even microbes in the deep sea, are critical because they create structured habitats for many other species and provide

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[18] Miloslavich, P., et al. 2018. Essential ocean variables for global sustained observations of biodiversity and ecosystem changes. Glob Chang Biol. doi: 10.1111/gcb.14108

[19] Gignoux-Wolfsohn, S. A., et al. 2024. New framework reveals gaps in US ocean biodiversity protection. One Earth. https://doi.org/10.1016/j.oneear.2023.12.014

[20] Fautin, D., et al. 2010. An overview of marine biodiversity in United States waters. PloS one. https://doi.org/10.1371/journal.pone.0011914

[21] Michigan Sea Grant. Great Lakes fast facts. https://www.michiganseagrant.org/topics/great-lakes-fast-facts/#:~:text=More%20than%203%2C500%20species%20of,the%20world's%2015%20largest%20lakes

[22] Gignoux-Wolfsohn, S. A., et al. 2024. New framework reveals gaps in US ocean biodiversity protection. One Earth. https://doi.org/10.1016/j.oneear.2023.12.014

[23] Lima-Mendez, G., et al. 2015. Ocean plankton. Determinants of community structure in the global plankton interactome. Science. doi: 10.1126/science.1262073

[24] Guidi, L., et al. 2016. Plankton networks driving carbon export in the oligotrophic ocean. Nature. https://doi.org/10.1038/nature16942

[25] Overfishing is defined as a stock having a population size that is too low and that jeopardizes the stock's ability to sustain its maximum sustainable yield of harvested fish over the long term under prevailing conditions. See: National Oceanic and Atmospheric Administration. 2023. Status of Stocks 2023. National Oceanic and Atmospheric Administration. https://www.fisheries.noaa.gov/s3/2024-04/2023SOS-final.pdf

shoreline protection for human communities. Unfortunately, these habitats are rapidly declining in many regions, including the United States, as a result of ocean warming, ocean acidification, coastal development, pollution, and disease. Estimates suggest that 85% of oyster reefs[26] and 29% of global seagrass extent[27] have been lost since the late 19th century, and kelp forests have declined in more than a quarter of ecoregions globally.[28,29] U.S. coral reefs were recently judged to be in fair condition, on average, but in moderate decline,[30,31] though this assessment preceded the heatwave that decimated coral reefs in Florida in 2023. The kelp forests that dominate rocky shores in cooler waters are also declining, in part because of ocean warming, which has exacerbated epidemic disease in predatory sea stars along the West Coast, allowing sea urchin populations to explode and severely overgraze kelp.[32] Since 2014, extensive kelp decline in northern California has threatened endangered salmon, abalone, and commercial and recreational fisheries. Ecologically and culturally important species are also at risk, posing concerns for cultural identity and livelihoods of Indigenous and local communities. For example, salmon, which are central for food security and culture for Indigenous peoples on the West Coast, are in decline because of habitat degradation, hydropower operations, hatchery impacts, and overharvesting, all of which are accentuated by climate change.[33]

The United States is addressing these threats to ocean life primarily through area-based protections and single-species approaches, including fishery management, protected species conservation, and habitat protection, conservation, and restoration. Marine protected areas (MPAs) can be an effective area-based tool for conservation, including for species that use a specific localized habitat during their life history, such as spawning aggregations or nurseries.[34] MPAs that restrict all or almost all extractive activities (i.e., marine reserves or "no-take" areas, and highly protected areas) are well documented as effective means of sustaining wild species and ecosystems.[35] In addition, highly protected MPAs could serve as reference sites to measure the efficacy of management interventions to enhance biodiversity. Currently, 25% of U.S. waters are designated as fully or highly protected MPAs,[36] but only 3% of waters are in no-take MPAs. Surprisingly, although a primary purpose of MPAs is to protect biodiversity, the

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[26] Beck, M.W., et al. 2011. Oyster reefs at risk and recommendations for conservation, restoration, and management. Bioscience 61:107-116. https://academic.oup.com/bioscience/article/61/2/107/242615

[27] Waycott, M., et al. 2009. Accelerating loss of seagrasses across the globe threatens coastal ecosystems. Proceedings of the National Academy of Sciences, 106: 12377-12381. https://www.pnas.org/doi/abs/10.1073/pnas.0905620106

[28] Krumhansl, K.A., et al. 2016. Global patterns of kelp forest change over the past half-century. Proceedings of the National Academy of Sciences, 113:13785-13790. https://www.pnas.org/doi/abs/10.1073/pnas.1606102113

[29] Filbee-Dexter, K., et al. 2020. Marine heatwaves and the collapse of marginal North Atlantic kelp forests. Scientific Reports *10:*13388. https://www.nature.com/articles/s41598-020-70273-x

[30] Donovan, C., et al. 2020. Coral reef condition: A status report for U.S. coral reefs. National Oceanic and Atmospheric Administration. https://doi.org/10.25923/wbbj-t585

[31] National Oceanic and Atmospheric Administration. 2018. Coral Bleaching During and Since the 2014-2017 Global Bleaching Event. National Oceanic and Atmospheric Administration. https://coralreefwatch.noaa.gov/satellite/analyses_guidance/global_coral_bleaching_2014-17_status.php

[32] National Oceanic and Atmospheric Administration. 2023. Kelp Forest. National Oceanic and Atmospheric Administration. https://sanctuaries.noaa.gov/visit/ecosystems/kelpdesc.html

[33] See "Year One Report America the Beautiful". December 2021. https://www.whitehouse.gov/wp-content/uploads/2021/12/AtB-Year-One-Report_.pdf

[34] National Marine Protected Areas Center. 2023. Marine Protected Areas. National Marine Protected Areas Center. https://marineprotectedareas.noaa.gov/

[35] Grorud-Colvert, K., et al., 2021. The MPA Guide: A framework to achieve global goals for the ocean. Science, 373(6560), p.eabf0861. https://www-science-org.smithsonian.idm.oclc.org/doi/epdf/10.1126/science.abf0861

[36] Marine Conservation Institute. 2024. Marine Protection by Country. https://mpatlas.org/countries/list/

status of biodiversity within most MPAs is poorly known. A recent assessment concluded that U.S. MPAs cover only a fraction of the biodiversity found in U.S. waters, and that their success in fulfilling globally recognized criteria for an effective network of MPAs varied significantly among ecoregions.[37] This highlights the need for more work to conserve a geographically representative, ecologically connected, and climate-resilient set of marine areas off all U.S. coasts, and to ensure that the benefits of healthy and conserved marine ecosystems are equitably shared. A wide range of marine conservation strategies are needed, including the effective management of MPAs in collaboration with stakeholders, the protection of key habitats for marine life, the restoration of coastal ecosystems, and the designation of additional marine sanctuaries, refuges, and monuments. Better knowledge of the nation's biodiversity will provide an improved evidence base to guide these actions.

Climate change resulting from excessive greenhouse gas emissions is a threat to biodiversity and ecosystems of all kinds. In the open ocean, impacts include warming, reduced oxygen content of water, and ocean acidification. These perturbations can influence primary production, food web interactions, and ultimately the transport of carbon and nutrients from the surface to the deep ocean across vast areas, leading to declines in deep-sea biodiversity, habitat compression, changing food webs, and declines in keystone species and critical habitats. Deep-sea environments (200 meters or more below the surface) in the U.S. EEZ provide a suite of essential ecosystem services, including critical cycling and sequestration of carbon. Because many species in these remote areas are undescribed, they represent important unknowns that influence the ability to predict responses to a changing climate and other human disturbances. This knowledge gap impedes effective management and conservation and highlights the need for this strategy to inform better understanding of ocean biodiversity baselines.

Why a National Ocean Biodiversity Strategy is needed

All of these challenges and more require timely and accurate information on ocean biodiversity for effective decision-making by local, territorial, state, Tribal, national, and multinational entities. Needs include effectively implementing existing federal mandates for area-based management and species and habitat conservation, including the Magnuson-Stevens Act, Endangered Species Act, Marine Mammal Protection Act, National Marine Sanctuaries Act, Coastal Zone Management Act, Coordination of Ocean Observations and Research Act, and the National Environmental Policy Act. Ocean biodiversity information is critical for informing baselines and benchmarks; climate adaptation and ecological forecasting; meeting high-level commitments to conserve 30% of land and waters by 2030,[38] and ensuring social and economic security.

The National Ocean Biodiversity Strategy will establish the organizational and technical foundation to collect, manage, and apply ocean biodiversity information in evidence-based protection, conservation, restoration, and sustainable use. Most fundamentally, the ability to observe and track biodiversity in the ocean has not kept pace with the ability to monitor ocean environmental conditions. A critical need is to track and predict how ocean life is shifting and changing in response to climate change and anthropogenic stressors. This requires long-term, sustained biodiversity research and observing that spans decades—similar to meteorological time series. A key component of the strategy is coordinating disparate activities across the U.S. EEZ via work to continue and establish new time series of ocean

[37] Some key criteria of an effective protection network include: Viability and adequacy of the size and coverage of MPAs, inclusion of biologically important areas, and representativity of ecosystems. For details, see: Gignoux-Wolfsohn, S. A., et al. 2024. New framework reveals gaps in US ocean biodiversity protection. One Earth. https://doi.org/10.1016/j.oneear.2023.12.014

[38] See Executive Order 14008: Tackling the Climate Crisis at Home and Abroad. Federal Register. January 2021.

species and habitats, elevate and include local and Indigenous Knowledge, leverage and improve natural capital statistics,[39] and deliver biodiversity information in timely and accessible formats to support management and policy decisions.

Sustained delivery of trusted information is the foundation for effective stewardship. This includes evaluating status and trends in ocean life, identifying strategic opportunities for its management and protection, and responding to rapidly growing markets and regulatory environments related to biodiversity, ocean carbon, and other marine resources (e.g., seabed minerals). But while new and better knowledge is necessary, it is not sufficient for effective stewardship. This requires implementing the strategy by integrating ocean biodiversity science and knowledge into actions of both government and the broader society. This includes supporting effective valuation of ocean biodiversity that recognizes both economic and cultural value. Economic valuation, such as underway with the National Strategy to Develop Statistics for Environmental-Economic Decisions,[40] combined with emerging markets for biodiversity, would support measures to require market players to consider the economic costs of degrading biodiversity in decision making, and help put more accurate prices on activities that harm biodiversity, making the many hidden costs of nature degradation explicit in policy and markets. By engaging Tribes and local communities, the strategy also better accounts for the cultural value of biodiversity to the nation's many communities.

A successful strategy will align and expand the nation's extensive ocean activities and improve their coordination to produce several key outcomes: (1) timely delivery of trusted and needed information on ocean life targeted to users across society; (2) more effective management and protection of ocean life and services because of evidence-based decision-making; and (3) a vigorous, sustained infrastructure and workforce to obtain, interpret, and deliver biodiversity information across the nation over the long term. Together these outcomes will ensure more cost-effective, strategic, and equitable management of marine resources and cultural heritage, promote thriving ecosystems that enrich human communities, and foster a shared understanding of ocean biodiversity and its value to all Americans, supporting long-term security and prosperity.

Goals and objectives of the National Ocean Biodiversity Strategy

To be effective, ocean biodiversity information needs to be consistent with and leverage other national priorities. These include the National Nature Assessment,[41] the Ocean Climate Action Plan,[42] the National Strategy for a Sustainable Ocean Economy,[43] the Ocean Justice Strategy,[44] the National

[39] Office of Management and Budget. 2022. Leveraging Federal Statistics to Strengthen Evidence-Based Decision-Making. https://www.whitehouse.gov/wp-content/uploads/2022/03/ap_15_statistics_fy2023.pdf

[40] National Strategy to Develop Statistics for Environmental-Economic Decisions; A U.S. System of Natural Capital Accounting and Associated Environmental-Economic Statistics". Office of Science and Technology Policy. Office of Management and Budget. January 2023. https://www.whitehouse.gov/wp-content/uploads/2023/01/Natural-Capital-Accounting-Strategy-final.pdf

[41] See "National Nature Assessment". U.S. Global Change Research Program. https://www.globalchange.gov/our-work/national-nature-assessment

[42] The Ocean Policy Committee. 2023. Ocean Climate Action Plan. https://www.whitehouse.gov/wp-content/uploads/2023/03/Ocean-Climate-Action-Plan_Final.pdf

[43] The Ocean Policy Committee. National Strategy for a Sustainable Ocean Economy. https://www.federalregister.gov/documents/2023/06/29/2023-13839/request-for-information-national-strategy-for-a-sustainable-ocean-economy

[44] The Ocean Policy Committee. 2023. Ocean Justice Strategy. https://www.whitehouse.gov/wp-content/uploads/2023/12/Ocean-Justice-Strategy.pdf?cb=1701982354

Strategy to Develop Statistics for Environmental-Economic Decisions,[40] ecosystem-based management,[45] ecosystem-service valuation,[46] benefit-cost analysis,[47] and other initiatives. Coordinating ocean biodiversity information will also strengthen U.S. science diplomacy and elevate U.S. leadership of global initiatives. For example, the High-Level Panel for a Sustainable Ocean Economy engages active world leaders, including the United States, and has highlighted the pressing need for a globally coordinated effort to document ocean biodiversity and extinction risk, and to support its long-term monitoring. U.S. leadership also supports global networks and emerging communities of practice developing standards-based approaches to ocean biodiversity via the Group on Earth Observations Marine Biodiversity Observation Network and 'Omic BON, GOOS Biology and Ecosystems Panel, U.S. Integrated Ocean Observing System, Smithsonian MarineGEO program, Ocean Biodiversity Information System, Global Biodiversity Information Facility, and programs focused on marine life within the United Nations Decade of Ocean Science for Sustainable Development.

The strategy is inspired by several guiding principles:

- Everyone in America should have equitable access to the benefits provided by the ocean, as articulated in the Ocean Justice Strategy.[48,49]
- Ocean biodiversity monitoring tools and products should be designed for accessibility to diverse audiences at local, state, territorial, regional, Tribal, national, and global scales, and decision making should elevate and include local and Indigenous Knowledge, while mitigating consultation fatigue (**Box 3**).[50]
- Management and policy should be founded on the highest quality evidence and knowledge of ocean life and ecosystems.
- Applying best-available evidence and knowledge requires sustained, coordinated programs for observing changing marine life and environments through time, supported by rigorous taxonomic and genetic characterization of U.S. marine species and dedicated, well-supported data management and delivery systems.
- Ensuring broad public accessibility of ocean biodiversity and environmental information requires an inclusive, coordinated, nationwide effort to link and synthesize the many efforts and products in biodiversity and environmental data collection.
- Inclusive ocean biodiversity education and outreach is needed to expand the knowledge base, bring diverse voices to ocean science and conservation, and broaden participation in ocean stewardship.

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[45] Link, J. S. and Browman, H. I. 2014. Integrating what? Levels of marine ecosystem-based assessment and management. ICES Journal of Marine Science. https://doi.org/10.1093/icesjms/fsu026

[46] OMB Ecosystem Services Guidance: Explanation and Response to Public Input. https://www.whitehouse.gov/wp-content/uploads/2024/02/ESGuidance_explanation.pdf

[47] Memorandum for Heads Of Executive Departments and Establishments. https://www.whitehouse.gov/wp-content/uploads/2023/11/CircularA-94.pdf

[48] The Ocean Policy Committee. 2023. Ocean Justice Strategy. https://www.whitehouse.gov/wp-content/uploads/2023/12/Ocean-Justice-Strategy.pdf?cb=1701982354

[49] See "Justice40 Initiative". July 2021. https://www.whitehouse.gov/environmentaljustice/justice40/

[50] See Presidential Memorandum of November 30, 2022 on "Guidance for Federal Departments and Agencies on Indigenous Knowledge". https://www.whitehouse.gov/wp-content/uploads/2022/12/OSTP-CEQ-IK-Guidance.pdf

Box 3 | Co-management and co-stewardship to conserve special places

Challenge: A big challenge to conservation in the United States is implementing co-stewardship by bringing together governments and organizations working at different scales with different objectives. Conservation efforts must respect and work with state and Indigenous decision-makers and citizens and their constituencies.

Solution: Marine Protected Area programs include partnerships between state and federal agencies such as the Papahānaumokuākea Marine National Monument, managed jointly by the Department of Commerce, Department of the Interior, State of Hawai'i, and the Office of Hawaiian Affairs. In 2021, the co-trustees published Mai Ka Pō Mai, a culmination of over 10 years of discussions with the Native Hawaiian community and the managing agencies to provide Native Hawaiian perspectives and knowledge for Papahānaumokuākea management. Public demand for national marine sanctuaries is growing, and such partnerships provide a model for success. But achieving co-stewardship requires overcoming strong impediments, including lack of clarity on agency authority to implement these arrangements.

Photo credit: NOAA

Goal 1: Drive delivery of ocean biodiversity knowledge at the national scale

Objective 1.1: Establish a coordination mechanism for federal ocean biodiversity efforts

The federal government needs more strategic engagement and collaboration across agencies and sectors to set priorities, identify responsible parties, and set timelines for specific actions to implement this strategy. The formal mechanism for this coordination should include representatives from agencies with ocean-related missions, and consider effective means to engage with non-federal stakeholders, including states, Tribes, local communities, non-governmental organizations, and the private sector. Efforts should ensure that data are interoperable, reproducible, authoritative, formatted appropriately, and available publicly for multiple use, and should enable implementation that builds on and continues to inform national and international efforts.

Objective 1.2: Develop an Implementation Plan for this Strategy

Relevant agencies will work with the SOST IWG-Biodiversity to develop an implementation plan with specific actions, responsible parties, and timelines to implement all three goals of the strategy. Critical early components of implementation will be listening sessions and Tribal consultations to understand the needs and motivations of different end-users and rights-holders, and develop a culture of regular, open communication. Ultimately, the strategy and its implementation will represent a whole-of-society approach and response to critical needs for biodiversity protection. The plan will also leverage insights from development and implementation of other national strategies.

Objective 1.3: Document the benefits of ocean biodiversity to people and economies

Implementation of the strategy will require an early effort across agencies to identify key gaps in ocean biodiversity knowledge that, if addressed, could significantly improve policy, management, and conservation. This should include information on species, geographic areas, functional ecology, ecosystem services, and rates of change, all aligned to relevant agencies, as well as identification of gaps in agency authorities or missions. To build public support for the strategy and its effective implementation, efforts should include coordination with the ongoing National Nature Assessment, as well as efforts to develop national statistics for environmental-economic decisions documenting the benefits of ocean biodiversity to people and economies. The National Strategy to Develop Statistics for Environmental-Economic Decisions, released in 2023,[40] sets a multi-year course to establish natural capital accounts to support the national economic statistics, including marine and ecosystem accounts to increase knowledge of ocean resources, trends, and their linkage with the health of the economy. The marine and ecosystem natural capital accounts will strengthen ocean biodiversity knowledge, and coordination between the development of these statistics and the ocean biodiversity efforts will enhance efficiencies in the implementation of both strategies.

Goal 2: Strengthen tools and institutions to deliver ocean biodiversity knowledge

Objective 2.1: Establish a robust, interoperable pipeline for ocean biodiversity information

A long-term, nationwide initiative to collect, integrate, map, and share standardized, actionable information on the biodiversity of the U.S. ocean, coasts, and Great Lakes is foundational for managing and protecting the nation's living marine resources. This initiative can strengthen and streamline existing efforts and improve the quality, cost-effectiveness, and trust in information used in decision-making. These activities will document provenance and account for data sovereignty by operationalizing findability, accessibility, interoperability, and reusability (FAIR) data principles and aligning with the Collective benefit, Authority to control, Responsibility, and Ethics (CARE) principles for Indigenous data governance, while recognizing best practices for co-design and use.[51, 52] Achieving this goal requires enhancing existing capacity in biodiversity informatics and data management (**Box 4**), and commitment and operational capacity to sustain management and delivery of timely ocean

[51] Wilkinson, M. D., et al. 2016. The FAIR Guiding Principles for scientific data management and stewardship. Scientific Data. https://doi.org/10.1038/sdata.2016.18

[52] Carroll, S. R., et al. 2020. The CARE Principles for Indigenous Data Governance. Data Science Journal. https://doi.org/10.5334/dsj-2020-043

biodiversity information. Priorities include identifying and filling key knowledge gaps through the implementation plan and through ongoing field, laboratory, and data mining efforts, making legacy data accessible, building and sustaining inventories of the nation's rich ocean life, and maintaining nationwide information on biodiversity status, trends, and responses to stressors. Strengthening support for central data repositories and standardized, open source data implementations would promote interoperability and information dissemination.

Objective 2.2: Harness science and technology to accelerate access to biodiversity knowledge

Box 4 | Improving coral reef management with better data

Challenge: Coral reefs are hotspots of biodiversity but have not been properly mapped because data are in a wide range of formats.

Solution: Darwin Core is an open standard for biodiversity data being used in a joint effort by NOAA, the U.S. Geological Survey, Marine Biodiversity Observation Network, U.S. Integrated Ocean Observing System, and global data repositories to integrate and share data on reef life. These products are now improving decision-making by agencies, non-governmental organizations, resource users, and rights-holders in endangered species listing and protected area management.

Photo credit: NOAA National Ocean Service

Coordination of emerging science and policies around use of technology (e.g., the National Aquatic eDNA Strategy,[53] **Box 5**) is a key need to unite scientific inquiry, entrepreneurial enterprise, philanthropic endeavor, and public and private investment to build biodiversity knowledge. Implementation of the strategy should build on existing long-term monitoring and citizen science by leveraging advances in genomics, imaging, acoustics, animal telemetry (**Box 6**),[54] remote sensing, and automated sampling that are revolutionizing the understanding of species across the taxonomic spectrum. For example, these new technologies have substantially improved management outcomes for invasive species, threatened and endangered species, protected species, and fished stocks. These technologies hold special promise for species, habitats, and environments in remote and logistically challenging polar and deep-sea ecosystems. Realizing the full value of such observing technologies

[53] National Aquatic eDNA Strategy. https://oceanexplorer.noaa.gov/technology/omics/media/docs/eDNA_N0001423RFI0014_RFI.pdf

[54] National Oceanic and Atmospheric Administration. 2016. Animal telemetry network implementation plan. https://cdn.ioos.noaa.gov/media/2017/12/ATN-Implementation-Plan-12-22-16.pdf

must go hand in hand with advances in computing and data management technologies to process the data, including artificial intelligence, machine learning, and cloud computing.

Box 5 | Using eDNA to detect and respond to invasive species

Challenge: Increasing globalization has brought many non-native species to U.S. waters. Some of these pose major threats to fisheries, aquatic resources, and biodiversity. Controlling such invasive species requires accurate, fast, and affordable tools for early detection and response.

Photo credit: CSIRO

Solution: Environmental DNA (eDNA) is genetic material left in the water by animals and plants, which can persist for hours to weeks. Water typically contains eDNA from many types of organisms, which can be collected and analyzed to detect a wide range of organisms with great sensitivity and low cost, contributing to public safety and conservation. For example, eDNA has aided early detection and decision-making related to the European green crab, a highly invasive marine species, and to screen for invasive zebra mussels and invasive carp in the Great Lakes region. Coordination on technical and legal standards for using eDNA as evidence in decision-making will help minimize risks and economic impacts of invasive species.

These technological advances are instrumental for coordinated, sustained *in situ* observations of ocean life. The space-based enterprise for observing biodiversity and the environment has a solid foundation, with new platforms and sensors planned or on the horizon, providing a model for such an initiative. Commitment to *in situ*, underwater observation on the same scale is needed to complement these remote sensing platforms and elevate the United States to global ocean leadership and the capacity for near-real time forecasting of ocean ecosystem dynamics comparable to the weather forecasting that Americans use every day. The *in situ* component of the ocean life observation system will require a similar scale of engineering effort as that required to build and launch satellites.

Box 6 | Tracking sharks to ensure public safety around Cape Cod

Challenge: Over the past decade, rebounding populations of formerly hunted seals have attracted white sharks to waters off Cape Cod, Massachusetts, forming one of their only known aggregation sites in the western North Atlantic. White sharks patrol the shoreline in search of prey, bringing them close to popular beaches. Since 2012, white sharks have attacked several people along the coast of Cape Cod, including the first shark-related fatality in Massachusetts since 1936.

Photo credit: Terry Goss

Solution: Modern technologies allow powerful tracking of the behavior and movements of sharks, seals, and other ocean life. The U.S. Animal Telemetry Network has expanded an array of monitoring stations with real-time communications capability off public beaches around Cape Cod. Together with shark tagging by the Massachusetts Division of Marine Fisheries and its collaborators, the stations provide capability for real-time shark detection delivered to managers as soon as it is available. The availability of these real-time data help understand shark and prey behavior to increase beach safety.

Objective 2.3: Rebuild and expand human capital and infrastructure for biodiversity science

Accurate identification and characterization of organisms is the essential foundation for all life sciences. Yet the nation's support for this foundation of taxonomic science has been declining for decades. This capacity must be rebuilt. A major impediment to tracking status and trends of biodiversity and its benefits to humans is the scattered nature and incomplete coordination of the extensive existing taxonomic resources. To remedy this, the speed of taxonomic identification and descriptions must be better aligned with the urgent needs for biodiversity information by organizing and synthesizing taxonomic knowledge, producing accessible biodiversity inventories, and greatly accelerating the capacity to track status and trends in ocean life and ecosystems. Coordination across agencies and institutions is needed to improve the nation's taxonomic infrastructure to ensure it can adequately accommodate and manage the expected strong growth in biological collections,[55] and to ensure they are publicly accessible. This in turn requires a mechanism to harmonize accurate taxonomic classification and best practices with all components of the ocean observing and knowledge pipeline and build workforce capacity that strengthens all components of the pipeline and enhances diversity and inclusion.

[55] Schindel, D. E. and the Economic Study Group of the Interagency Working Group on Scientific Collections. 2020. "Economic Analyses of Federal Scientific Collections: Methods for Documenting Costs and Benefits." Report. Washington, DC: Smithsonian Scholarly Press. https://doi.org/10.5479/si.13241612

Goal 3: Protect, conserve, restore, and sustainably use ocean biodiversity

Objective 3.1: Expand and deliver biodiversity knowledge for ocean conservation, restoration, and sustainable development

Ensuring that planning, implementation, and management of public and private ocean activities are sustainable and minimize impacts to ocean life depends on integrating and acting on the best-available biodiversity knowledge. This in turn requires expanding capacity, which will improve long-term outcomes of emerging and expanding offshore development by informing appropriate siting, permitting, timing, technology, and mitigation approaches, and by coordination among authorities and actors.[56] Mechanisms need to be developed to leverage existing federal investments and data management to support models, forecasts, and real-time data products related to ocean biodiversity. These include leveraging the coordination mechanisms (Objective 1.1) with input from listening sessions (Objective 3.2) and iterative dialogue with diverse communities to bridge priorities of federal and other interests and identify pathways for action.

Objective 3.2: Establish and incentivize diverse partnerships across scales and sectors

Long-term, trust-based partnerships built on reciprocity and shared benefits are needed for ocean biodiversity decision-making processes and should be promoted whenever possible. Fostering equitable co-production of knowledge and co-design of solutions focused on users will enhance communication, knowledge sharing, trust building, and collaboration. As an early step in implementation, listening sessions should be held to understand the motivations and needs of ocean resource users and rights-holders across scales, governance organizations, and sectors. These listening sessions will increase understanding among the different actors, build trust, and build foundations for productive partnerships.

Objective 3.3: Inspire, educate, and involve the public to discover and value ocean life

Advancing inclusive education, knowledge generation, and knowledge sharing at all levels provides key leverage for more effective biodiversity conservation.[57, 58] There is a special need for focus on the many audiences, including underserved and inland communities and decision-makers who lack opportunities to explore the benefits of healthy ocean biodiversity and ecosystems. Coordinated and unified messaging on ocean biodiversity would enable regional educational institutions (e.g., museums, aquariums, nonprofits), conservation organizations, and science educators to broaden participation in ocean stewardship and experiential learning opportunities. These messaging efforts must include the perspectives of recreational communities (e.g., fishing, boating) and commercial fishers to grow awareness, promote conservation, and enhance citizen science and new data collection. Efforts to connect people of all ages and backgrounds firsthand to the often hidden and inaccessible

[56] Turnipseed, M., et al. 2009. Oceans. Legal bedrock for rebuilding America's ocean ecosystems. Science. DOI: 10.1126/science.1170889

[57] IPBES. 2019. Global assessment report on biodiversity and ecosystem services of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services. IPBES secretariat. https://doi.org/10.5281/zenodo.3831673

[58] IPBES. 2019. Summary for policymakers of the global assessment report on biodiversity and ecosystem services. IPBES Plenary at its seventh session. https://zenodo.org/records/3553579

life of the ocean through storytelling and other forms of communication will align with and amplify existing local, territorial, state, and Tribal efforts in ocean education.

Implementation

This document provides strategic direction and identifies high-level goals aligned with existing authorities. Implementing the strategy will require developing a detailed plan for accomplishing its objectives and mobilizing new resources to do so. The SOST IWG-Biodiversity, in consultation with relevant stakeholders and interested parties, will develop an Implementation Plan that identifies specific actions to accomplish the goals and objectives presented in this strategy, determines timelines, and establishes metrics to measure progress against the strategy.

This strategy is far-reaching and ambitious. Fully achieving its goals, and the associated benefits, will require a whole-of-society initiative, including substantial and long-term committed attention by the federal government, the private sector, and non-governmental organizations. The effort will be significant, but must be weighed against the rapidly mounting costs of business as usual incurred by looming changes in distributions and conditions of fisheries, marine mammals, and threatened and endangered species, as well as the impacts of pathogens, toxic harmful algal blooms (**Box 7**), and invasive species that are currently difficult or impossible to plan for in the absence of knowledge of the nation's changing ocean species and habitats.

Box 7 | Protecting people and ocean wildlife from toxic algae

Challenge: Phytoplankton suspended in water feed aquatic food webs. But some phytoplankton species can grow into harmful algal blooms that are dangerous to animals and people.

Solution: Satellites, airborne sensors, and in-water monitoring are used to forecast and warn of impending toxic blooms, protecting drinking water and recreation on the Great Lakes, and similar programs monitor the coastal ocean. The next generation of hyperspectral imaging satellites, from NASA and NOAA, will support better ecological forecasts and mitigation by discriminating different types of phytoplankton from space, aided by beach sampling of shellfish in nearshore areas.

Photo credit: NOAA

This strategy does not commit specific resources or funds from any agency, but new resources and strategic allocation of existing resources will be critical to its successful implementation. Thus, the

implementation plan and subsequent steps must consider human and financial resource needs and avenues for mobilizing new funding to meet them. Cooperation in the form of leveraging funding and sharing expertise across research, data, and management entities will be needed, as well as ensuring that rights holders, communities most affected by biodiversity loss, and other interested parties have a voice in implementation. The National Oceanographic Partnership Program will be an important mechanism to identify opportunities to leverage resources across the public and private sectors and to ensure that leveraged funding and partnerships are aligned with national priorities. Likewise, coordination with ongoing national efforts to observe, map, explore, and characterize the U.S. EEZ, including the National Strategy for Mapping, Exploring, and Characterizing the United States Exclusive Economic Zone,[59] will facilitate implementation of the strategy and execution of the goals therein.

Conclusion

The United States has one of the largest ocean territories in the world and supports diverse marine life that yields economic and cultural benefits to people within and outside of U.S. borders. Successful implementation of this strategy requires building understanding across society about the value and importance of the ocean's diverse life, the benefits it provides to human communities, and the urgent need for biodiversity protection in the face of pervasive environmental change. Success of the strategy will require establishing long-term partnerships to increase the availability of ocean biodiversity information for decision-making and action.

This strategy charts a path for federal agencies to work together and partners with Tribes, states, territories, and local communities and across sectors to address these needs. These partnerships will expand and coordinate capacity to achieve existing mandates and to document and track status and trends in ocean biodiversity, leveraging new technology to transform the collective ability to protect these resources for future generations.

[59] National Strategy for Mapping, Exploring and Characterizing the United States Exclusive Economic Zone, https://www.noaa.gov/sites/default/files/2022-07/NOMECStrategy.pdf