



STRATEGIC PLAN FOR AQUACULTURE ECONOMIC DEVELOPMENT

A Report by the
SUBCOMMITTEE ON AQUACULTURE
COMMITTEE ON THE ENVIRONMENT

of the
NATIONAL SCIENCE AND TECHNOLOGY COUNCIL

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About the National Science and Technology Council

The National Science and Technology Council (NSTC) is the principal means by which the executive branch coordinates science and technology policy across the diverse entities that make up the federal research and development enterprise. A primary objective of the NSTC is to ensure science and technology policy decisions and programs are consistent with the President's stated goals. The NSTC prepares research and development strategies that are coordinated across federal agencies aimed at accomplishing multiple national goals. The work of the NSTC is organized under committees that oversee subcommittees and working groups focused on different aspects of science and technology. More information is available at <http://www.whitehouse.gov/ostp/nstc>.

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About the NSTC Subcommittee on Aquaculture

The National Aquaculture Act of 1980 stated that “Congress declares that aquaculture has the potential for reducing the United States trade deficit in fisheries products, for augmenting existing commercial and recreational fisheries, and for producing other renewable resources, thereby assisting the United States in meeting its future food needs and contributing to the solution of world resource problems. It is, therefore, in the national interest, and it is the national policy, to encourage the development of aquaculture in the United States.” To this end, the NSTC Subcommittee on Aquaculture (SCA), and its predecessors, were established as the federal interagency coordinating group to increase the effectiveness and productivity of federal aquaculture research, regulation, technology transfer, and assistance programs. The SCA is a statutory subcommittee composed of federal agency representatives that operates under the Committee on Environment of the NSTC under the OSTP in the Executive Office of the President [National Aquaculture Act of 1980 (Public Law 96-362, 94 Stat. 1198, 16 U.S.C. 2801, et seq.) and National Aquaculture Improvement Act of 1985 (Public Law 99-198, 99 Stat. 1641)].

About this Document

The National Aquaculture Development Plan (NADP) is a product of the NSTC Subcommittee on Aquaculture. The first NADP was published in 1983.¹ While the National Aquaculture Act called for periodic updates of the NADP, a comprehensive update has not been completed until now. The NADP builds upon the progress achieved by the U.S. aquaculture community (farmers, research and extension organizations, conservation organizations, recreational and commercial fishermen, state and federal agencies, Tribal and Indigenous groups, and other stakeholders) over the last four decades to propel the United States to a position of global leadership in efficient, responsible, and sustainable aquaculture production and use.

¹ Joint Subcommittee on Aquaculture, Federal Coordinating Council for Science, Engineering, and Technology. White House. *National Aquaculture Development Plan (1983)*. <https://archive.org/details/nationalaquacult01fede>

STRATEGIC PLAN FOR AQUACULTURE ECONOMIC DEVELOPMENT

This *Strategic Plan for Aquaculture Economic Development* was developed by the Economic Development Task Force. The SCA charged the Economic Development Task Force to develop a national economic development plan outlining actions that federal agencies are taking or plan to take within their existing statutory authorities and budgetary resources to support a robust, resilient, globally competitive, and environmentally sustainable domestic aquaculture sector.

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Abbreviations and Acronyms

AMS	Department of Agriculture, Agricultural Marketing Service
APHIS	Department of Agriculture, Animal and Plant Health Inspection Service
ARS	Department of Agriculture, Agricultural Research Service
CAHPS	Comprehensive Aquaculture Health Program Standards
EDA	Department of Commerce, Economic Development Administration
EPA	Environmental Protection Agency
ERS	Department of Agriculture, Economic Research Service
FAS	Department of Agriculture, Foreign Agricultural Service
FDA	Food and Drug Administration
FNS	Department of Agriculture, Food and Nutrition Service
FSA	Department of Agriculture, Farm Service Agency
ITEK	Indigenous Traditional Ecological Knowledge
IUU	Illegal, Unreported, and Unregulated Fishing
MDBA	Department of Commerce, Minority Business Development Agency
NAHP&S	National Aquaculture Health Plan and Standards
NASS	Department of Agriculture, National Agricultural Statistics Service
NIFA	Department of Agriculture, National Institute of Food and Agriculture
NOAA	National Oceanic and Atmospheric Administration
NRCS	Department of Agriculture, Natural Resource Conservation Service
NSF	National Science Foundation
NSTC	National Science and Technology Council
OSTP	Office of Science and Technology Policy
R&D	Research and Development
RAS	Recirculating Aquaculture System
RD	Department of Agriculture, Rural Development
RMA	Department of Agriculture, Risk Management Agency
SBA	Small Business Administration
SBIR	Small Business Innovation Research program
SCA	NSTC Subcommittee on Aquaculture
USDA	U.S. Department of Agriculture
USFWS	U.S. Fish and Wildlife Service

Executive Summary

Aquaculture production in the United States advances national priorities by producing high-quality and nutritious food, recreational opportunities, good jobs, and development in rural, urban, and coastal areas, where it produces \$2.27 billion in annual direct-to-consumer sales.² This Strategic Plan for Aquaculture Economic Development outlines federal actions to advance a robust, resilient, globally competitive, and environmentally sustainable domestic aquaculture sector.

Effective implementation of this plan will require public-private collaboration with a diverse set of stakeholders. The Economic Development Task Force of the Subcommittee on Aquaculture (SCA) prepared this plan using input from stakeholders and the general public and in collaboration with experts from numerous federal agencies.³

This plan supports both the viability and expansion of existing aquaculture operations, and it encourages new entrants by addressing needs across the seafood supply chain and diverse production systems. The proposed actions serve as points of intersection between climate-smart food production, public-private partnerships, blue economy, community resilience and health, workforce development, working waterfronts, urban and rural development, and seafood supply chains.

Recognizing that the aquaculture industry encompasses a variety of practices, species, and operational structures, this plan offers a number of approaches that acknowledge and support this diversity. This plan outlines four strategic goals to guide interagency collaborative efforts to meet the nation's aquaculture priorities:

Goal 1. Support Aquaculture Engagement, Communications, and Literacy

Goal 2. Support Infrastructure and Workforce Development

Goal 3. Encourage Industry Investment

Goal 4. Expand Market Opportunities for U.S. Aquaculture Products

The plan outlines objectives under each goal, and a range of actions that federal agencies will implement over the next five years. Because numerous federal and non-federal programs have mission areas that intersect with the goals and objectives of this plan, the goals and objectives are intentionally broad to provide flexibility and the opportunities for collaboration with a wide range of partners on which successful implementation will depend.

In addition, the goals, objectives, and actions are informed by and will address the following cross-cutting themes, as appropriate, to:

Theme 1. Enable Aquaculture and Communities to be Climate-Ready

Theme 2. Advance Equitable Economic Development of the Aquaculture Industry

Theme 3. Contribute to Healthy Aquatic Ecosystems

The objectives and actions in this plan are informed by and address these themes individually and collectively, through the recognition that the interrelated economic, social, cultural, and environmental benefits of aquaculture can continue to be improved.

This Strategic Plan for Aquaculture Economic Development complements two related National Science and Technology Council (NSTC) strategic plans on aquaculture. The National Strategic Plan for Aquaculture

² USDA National Agriculture Statistics Service. 2022 Census of Agriculture.

https://www.nass.usda.gov/Publications/AgCensus/2022/Full_Report/Volume_1,_Chapter_1_US/st99_1_002_002.pdf

³ Department of Commerce [the National Oceanic and Atmospheric Administration (NOAA), Economic Development Administration (EDA), and Minority Business Development Agency (MBDA)]; Small Business Administration (SBA); U.S. Environmental Protection Agency (EPA); several agencies of the U.S. Department of Agriculture [National Institute of Food and Agriculture (NIFA), Agricultural Marketing Service (AMS), Rural Development (RD), and Economic Research Service (ERS)]; the Department of the Interior's U.S. Fish and Wildlife Service (USFWS); U.S. Food and Drug Administration (FDA); and the Department of State.

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Research⁴ communicates federal priorities for research and technology development to support a science-based industry. The Strategic Plan to Enhance Regulatory Efficiency in Aquaculture⁵ outlines how federal agencies plan to improve efficiency, predictability, timelines, and reduce costs associated with the regulatory process for commercial aquaculture ventures. Together, the overview and three plans comprise the National Aquaculture Development Plan and present a framework and actions to support expansion of the domestic commercial and conservation aquaculture sectors.

⁴ NSTC Subcommittee on Aquaculture. *National Strategic Plan for Aquaculture Research*.
https://www.ars.usda.gov/sca/Documents/2022%20NSTC%20Subcommittee%20on%20Aquaculture%20Research%20Plan_Final%20508%20compliant.pdf

⁵ NSTC Subcommittee on Aquaculture. *Strategic Plan to Enhance Regulatory Efficiency in Aquaculture*.
https://www.ars.usda.gov/sca/Documents/2022%20NSTC%20Subcommittee%20on%20Aquaculture%20Regulatory%20Efficiency%20Plan_Final%20508%20compliant.pdf

Introduction

Aquaculture is a form of agriculture. It is the cultivation of aquatic species for food (i.e., crops), restoration, aquarium trade, bait, energy, and other purposes. Within the United States, it provides opportunities to produce high-quality and nutritious food, non-food commercial products, healthy recreation, environmental improvements, good jobs, and economic development in rural, urban, and coastal areas.

Aquaculture, like all food production, can also pose risks that need to be addressed, as it has the potential to create environmental damage or disrupt rather than complement existing economic activities.^{6,7,8,9} However, increased knowledge, refined husbandry practices, and technological advancements over the past decades now allow for safe and sustainable seafood farming while maintaining healthy ecosystems.^{10,11,12} The three strategic plans that comprise the National Aquaculture Development Plan (NADP) outline specific actions that federal agencies undertake to address these risks and challenges.

Aquaculture can complement our nation's wild harvest fisheries as one of the most environmentally efficient ways to produce food. It optimizes the use of feed and space, has a low carbon footprint, and often supports ecosystem health.^{13,14,15} In addition, expanded domestic aquaculture will be an essential element of food systems designed to reduce and mitigate the effects of climate change.^{16,17} With a growing population, aquaculture will help supplement the domestic seafood supply. Moreover, there has been significant progress in understanding how aquaculture can enhance commercial and recreational fisheries (e.g., Pacific salmon), restore ecologically important habitats (e.g., oyster and coral reefs), and mitigate climate change and other ecosystem stressors such as excess nutrients (e.g., oyster reef and marsh grass restoration). Climate change is driving the need for aquaculture-based actions by federal, state, and Tribal agencies and their partners as part of their biodiversity conservation strategies.

Seafood is an excellent source of nutrients essential for human health and well-being. The term "seafood" includes all wild and farmed aquatic organisms raised for food production, whether harvested in marine or freshwater environments. Federal nutrition guidelines recommend that Americans increase their seafood consumption to about 8 oz per week;¹⁸ in 2021 Americans consumed an average of 6.3 oz of

⁶ Stentiford GD, et al. 2020. Sustainable aquaculture through the One Health lens. *Nature Food* 1, 468-474.

<https://www.nature.com/articles/s43016-020-0127-5>

⁷ Clavelle T, et al. 2019. Interactions and management for the future of marine aquaculture and capture fisheries. *Fish and Fisheries*, 20(2): 368-388. <https://onlinelibrary.wiley.com/doi/abs/10.1111/faf.12351>

⁸ Price, CS, Morris JA. 2013. Marine cage culture and the environment: twenty-first century science informing a sustainable industry. NOAA-NCOSS Technical Memorandum NOS-NCCOS-211. U.S. Department of Commerce.

[https://www.noaa.gov/stories2013/pdfs/2013_PriceandMorris_MarineCageCultureandTheEnvironment\(5\).pdf](https://www.noaa.gov/stories2013/pdfs/2013_PriceandMorris_MarineCageCultureandTheEnvironment(5).pdf)

⁹ Shumway, S. ed. 2011. *Shellfish Aquaculture and the Environment*. John Wiley and Sons.

<https://onlinelibrary.wiley.com/doi/book/10.1002/9780470960967>

¹⁰ Stentiford, G.D., Bateman, I.J., Hinchliffe, S.J. et al. (2020). *Sustainable aquaculture through the One Health lens*. *Nat Food* 1, 468-474. <https://doi.org/10.1038/s43016-020-0127-5>

¹¹ Clavelle, Tyler, Sarah E. Lester, Rebecca Gentry, Halley E. Froehlich (2019). *Interactions and management for the future of marine aquaculture and capture fisheries*. *Fish Fish*. 2019; 20: 368- 388. <https://onlinelibrary.wiley.com/doi/abs/10.1111/faf.12351>

¹² Price, Carol Seals, James A. Morris Jr., National Centers for Coastal Ocean Science (U.S.) (2013). *Marine cage culture & the environment: Twenty-first Century science informing a sustainable industry*. NOAA technical memorandum NOS NCCOS; 164. <https://repository.library.noaa.gov/view/noaa/2712>

¹³ Rust, MB. et al. 2014. Environmental performance of marine net-pen aquaculture in the United States. *Fisheries* 39(11): 508-524.

<https://www.tandfonline.com/doi/full/10.1080/03632415.2014.966818>

¹⁴ Froehlich, HE., et al. 2018. Comparative terrestrial feed and land use of an aquaculture-dominant world. *PNAS* 115(20): 5295-5300. <https://www.pnas.org/content/115/20/5295>

¹⁵ Gephart, JA, et al. 2021. Environmental performance of blue foods. *Nature* 597: 360-365

¹⁶ Costello et al. 2020. *The future of food from the sea*. High Level Panel for a Sustainable Ocean Economy. www.oceanpanel.org/future-food-sea

¹⁷ Froehlich, HE, et al. 2021. Securing a sustainable future for US seafood in the wake of a global crisis. *Marine Policy* 124: 104328. <https://www.sciencedirect.com/science/article/pii/S0308597X20309751>

¹⁸ USHHS, Office of Disease Prevention and Health Promotion, USDA Center for Nutrition Policy and Promotion (2020). *Dietary Guidelines for Americans (2020-2025)*. <https://www.dietaryguidelines.gov/>

seafood per week.¹⁹ Aquaculture is an increasingly important way to produce seafood. Globally, it has expanded rapidly over the last several decades and continues to grow faster than other major food production sectors. Aquaculture now accounts for more than half of the world's seafood supply; in contrast, global wild seafood catch has been largely stable for decades. By 2030, seafood production is forecast to increase by 15%, with broad acknowledgement that this growth will come mainly from aquaculture.²⁰

There is substantial untapped potential to expand aquaculture production in the United States. In contrast to the strong growth in aquaculture globally, domestic aquaculture production has remained relatively static since 1995.^{21,22} The United States has outsourced our seafood supply, and the concomitant economic benefits, to other countries; we are the largest single importing country for seafood products.²³ In 2024, the United States ranked number 17²⁴ in global aquaculture production behind many smaller countries, and our seafood trade deficit has risen to \$20.3 billion in 2023.²⁵ Although domestic wild capture fisheries could provide some increased seafood production, most increases in domestic seafood production will likely come from aquaculture.

Aquaculture is one of the most resource-efficient ways to produce food,^{26,27,28} and some forms of aquaculture provide ecosystem services that may enhance the nation's natural capital.²⁹ With limited arable land and fresh water to expand terrestrial farming, human populations will increasingly turn to the ocean and technologies that efficiently use space, water, and nutrients to source food.³⁰ As part of a suite of actions to enhance community resilience—and to enhance resilience of U.S. and global seafood in the face of climate change—the White House Ocean Climate Action Plan (OCAP)³¹ calls for expanding sustainable U.S. aquaculture production.

Beyond human food production, aquaculture provides a wide range of products and services to the American people. Recreational and commercial fisheries benefit from the production of aquatic species for enhancement and live bait. These are substantial economic engines, generating hundreds of millions

¹⁹ NOAA National Marine Fisheries Service. *Landings*. <https://www.fisheries.noaa.gov/foss/f?p=215:200:5203469655174:Mail>

²⁰ UN Food and Agriculture Organization (2022). *The State of World Fisheries and Aquaculture 2022 - Towards Blue Transformation*. Rome, Italy. <https://www.fao.org/documents/card/en/c/cc0461en>

²¹ NOAA National Marine Fisheries Service (2022). *Fisheries of the United States, 2020*.

<https://www.fisheries.noaa.gov/national/sustainable-fisheries/fisheries-united-states>

²² U.S. Department of Commerce, NOAA Current Fishery Statistics No. 2020.; NOAA National Marine Fisheries Service (2017) *Fisheries of the United States, 2016*.

<https://www.fisheries.noaa.gov/resource/document/fisheries-united-states-2016-report>

²³ UN Food and Agriculture Organization. *The State of World Fisheries and Aquaculture 2024 - Blue Transformation in Action*.

<https://openknowledge.fao.org/items/3bfffad3-c474-437b-afd4-bb1182feeea6>;

²⁴ NOAA Office for Coastal Management. *Aquaculture*. <https://coast.noaa.gov/states/fast-facts/aquaculture.html>

²⁵ USDA Economic Research Service. *U.S. Seafood Imports Exceeded Exports by \$20.3 Billion 2023*. <https://www.ers.usda.gov/data-products/chart-gallery/gallery/chart-detail/?chartId=108472>

²⁶ Froehlich, H. E., Runge, C. A., Gentry, R. R., Gaines, S. D., & Halpern, B. S. (2018). *Comparative terrestrial feed and land use of an aquaculture-dominant world*. *Proceedings of the National Academy of Sciences*, 115(20), 5295–5300. www.pnas.org/cgi/doi/10.1073/pnas.1801692115

²⁷ Hilborn, Ray, Jeannette Banobi, Stephen J Hall, Teresa Pucylowski, and Timothy E Walsworth (2018). *The environmental cost of animal source foods*. *Front Ecol Environ* 16(6): 329–335, doi: 10.1002/fee.1822

²⁸ Halpern, B.S., Frazier, M., Verstaen, J. et al. (2022). *The environmental footprint of global food production*. *Nat Sustain* 5, 1027–1039. <https://doi.org/10.1038/s41893-022-00965-x>

²⁹ NOAA National Marine Fisheries Service (2020). *Fact Sheet: Aquaculture Provides Beneficial Ecosystem Services*.

<https://www.fisheries.noaa.gov/resource/outreach-materials/fact-sheet-aquaculture-provides-beneficial-ecosystem-services#:~:text=Aquatic%20crops%20such%20as%20shellfish,and%20crustaceans%2C%20benefiting%20wild%20populations>

³⁰ UN Food and Agriculture Organization (2020). *The State of World Fisheries and Aquaculture*. Rome, Italy.

<https://doi.org/10.4060/ca9229en>

³¹ White House, Ocean Policy Committee (2023). *U.S. Ocean Climate Action Plan*. https://www.whitehouse.gov/wp-content/uploads/2023/03/Ocean-Climate-Action-Plan_Final.pdf

of dollars in value.³² Aquaculture provides highly valuable ornamental species for the aquarium industry³³ and provides raw materials to produce biofuels, cosmetics, pharmaceuticals, and other industrial products. Aquaculture also offers opportunities to help restore and conserve valuable marine habitats, thereby ensuring marine ecosystems' resilience to changing ocean conditions.

The United States has substantial potential to sustainably increase aquaculture production: it possesses large marine, freshwater, and land resources suitable for aquaculture; has strong relevant regulatory and research infrastructure; and has one of the largest seafood markets in the world. As of 2020, aquaculture accounts for just 7% of total domestic seafood production by volume, yet represents 24%³⁴ of the value of all domestic seafood products, highlighting the substantial potential economic value of aquaculture's growth in the United States.

The market and supply chain disruptions caused by the COVID-19 pandemic highlighted the need to expand options for local and regional seafood production and supply chain development to support local labor market opportunities, especially in underserved and rural communities. Increasing domestic aquaculture production and processing will strengthen and diversify our seafood supply chains, thereby increasing community resilience to address future economic and environmental disruptions. The U.S. aquaculture industry is well positioned to expand using a wide variety of responsible farming and production methods to grow finfish, shellfish, algae, and plants on land and in freshwater, estuarine, and marine water bodies. Benefits would include ensuring sustainable and climate-resilient seafood supplies by farming more of our seafood under robust domestic management regimes, creating farming and seafood jobs (especially in rural and underserved communities), and supporting local economies and working waterfronts.

While some of the actions in this plan are specific to food production, the scope of this plan is intentionally broad enough to guide federal actions intended to support all aspects of the commercial and conservation aquaculture industry, including but not limited to food production, ornamentals, baitfish, stock enhancement, pharmaceuticals, and energy. It is intended to address the needs of aquaculture operations of all sizes, from small start-ups to large and established businesses.

This plan does not call for establishing any new federal programs or structures. Instead, it describes ways that existing programs among federal partners can be better coordinated and aligned to address the challenges and opportunities of the aquaculture industry. We recognize the critical role played by state and local governments and stakeholder organizations in supporting aquaculture development. The actions in this plan are intended to support and complement, not duplicate, the work of these partners. Effective implementation of this plan will depend on continued and expanded collaboration with these non-federal partners, as well as among federal agencies themselves. For each objective and its constituent actions, we will need to continuously evaluate the effectiveness of various approaches and adjust as needed to maximize impact.

To the extent possible, the task force intends to provide additional detail for each action, including for the cross-cutting themes, milestones, and timelines during the implementation phase of this plan. In some cases, this may not be possible for many actions for two reasons. First, while some programs and initiatives are specific to aquaculture, many others have a broader scope for which aquaculture entities are not exclusively eligible. For these latter programs, it may not be possible to set aquaculture-specific

³² USDA National Agricultural Statistics Service. 2018. *Census of Aquaculture*.

https://www.nass.usda.gov/Publications/AgCensus/2017/Online_Resources/Aquaculture/index.php

³³ Watson, C. 2021. Florida Tropical Fish Farm Financial and Employment Survey. University of Florida, Tropical Aquaculture Laboratory, Ruskin, FL.

³⁴ NOAA National Marine Fisheries Service (2022). *Fisheries of the United States, 2020*.
<https://www.fisheries.noaa.gov/national/sustainable-fisheries/fisheries-united-states>

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milestones—for example, if aquaculture is competing with other industries for infrastructure funds. In addition, the pace at which the task force will be able to implement the actions described in the plan will depend largely upon the available resources each partner can dedicate.

Goal 1. Increase Aquaculture Engagement, Communications, and Literacy

Expansion of domestic aquaculture requires increasing community understanding and support (i.e., social license) for aquaculture development. To this end, federal agencies (working with our partners) can directly and indirectly (e.g., through partners) help to increase awareness among various stakeholder communities about how modern, responsible aquaculture is beneficial to people, the economy, and the planet.³⁵ Specific needs include increasing awareness of how aquaculture contributes to climate-ready communities and provides economic benefits to local communities, how aquaculture practices have improved over the past decades, how well-managed aquaculture contributes to healthy aquatic ecosystems, and the suite of robust science-based tools available to predict, minimize, and/or avoid potential environmental impacts and user conflicts. Different approaches are required to reach different audiences—the general public, communities with a particular interest in aquaculture, Indigenous and Tribal groups, the media, and Congress.

Of note, commonly cited information from other countries and/or prior (and since improved) practices in the United States may not address the potential positive impacts (e.g., climate-smart food production, jobs, and access to local seafood). This may lead to an exaggerated view of the potential negative impacts of aquaculture and suggest that U.S. managers (state and federal) lack effective policies to support the sustainable development of the sector, resulting in a challenging policy environment.

While broad public awareness of aquaculture provides valuable background and context, much of the work of cultivating social license happens at the farm and community level. Through a range of efforts such as farm tours, taking part in local food festivals and farmers markets, and teaching the public how to prepare seafood, farmers regularly engage their communities and build social license. Federal agencies can assist by helping to strengthen and expand these efforts, and to look for new ways to engage their communities.

As federal agencies take steps to advance sustainable aquaculture, it is important to learn from the deep knowledge and experiences of local communities, notably Tribes. Indigenous Peoples across the United States have been stewards and a part of their environments for thousands of years. Throughout this time, they have amassed an immense amount of knowledge informed by unique ways of knowing and being that can be of great value to achieving the goals in this plan. Indigenous Knowledge (IK) is a body of observations, oral and written knowledge, innovations, practices, and beliefs developed by Tribes and Indigenous Peoples through interaction and experience with the environment.³⁶ This knowledge can be invaluable in federal decision-making and internal management processes related to aquaculture development.³⁷

Objective 1.1: Increase Aquaculture Literacy and Education

Successful and efficient community outreach strategies are built on common understanding of aquaculture. This is essential to increasing aquaculture literacy among various stakeholder communities, including the general public, environmental organizations, community development leaders, policymakers and decision-makers, other ocean users, and Congress. Aquaculture-literate stakeholders

³⁵ NOAA National Marine Fisheries Service, Office of Aquaculture (6 Oct 2022). *NOAA Aquaculture Strategic Plan (2023-2028)*. <https://www.fisheries.noaa.gov/resource/document/noaa-aquaculture-strategic-plan-2023-2028>

³⁶ White House Office of Science and Technology Policy (2022). *Guidance for Federal Departments and Agencies on Indigenous Knowledge*. <https://www.whitehouse.gov/ceq/news-updates/2022/12/01/white-house-releases-first-of-a-kind-indigenous-knowledge-guidance-for-federal-agencies/>

³⁷ NOAA Fisheries. *NOAA Guidance and Best Practices for Engaging and Incorporating Indigenous Knowledge in Decision-Making*. <https://www.noaa.gov/media/file/noaa-indigenous-knowledge-guidance-2023#:~:text=NOAA%20encourages%20the%20inclusion%20of,responsibilities%2C%20respect%20treaty%20rights%2C%20understand>

can examine real-world issues related to aquaculture and think critically about how aquaculture can benefit the economy, environment, and overall culture of their communities. Aquaculture-literate stakeholders are better able to engage in relevant policy discussions, understand how aquaculture operations contribute to their communities (e.g., creating jobs and supporting working waterfronts), and make informed and responsible decisions regarding aquaculture and its products.

NOAA, USDA, and other federal partners have established communication and outreach strategies targeting researchers, industry stakeholders, environmental organizations, and Tribes and other historically underserved communities.^{38,39,40,41,42} Federal leaders in such communications include Sea Grant Programs, Land Grant Institutions, program offices focused on communications and education, USDA Regional Aquaculture Centers, NOAA Science Centers, and associated partnerships. These efforts can be better coordinated, strengthened, and/or expanded.

To increase aquaculture literacy and engagement, federal agencies will implement the following actions:

Action 1.1.1 Federal agencies will continue to work with stakeholders and partners to routinely identify and update needs and gaps in aquaculture communications and stakeholder engagement. This includes identifying and taking steps to rectify outdated and otherwise inaccurate information about modern domestic aquaculture practices.

Action 1.1.2 NOAA and USDA (NIFA)⁴³ will lead efforts with federal partners to develop and update common messages to help explain the benefits of sustainable aquaculture development to the public, highlight the farmers to humanize seafood farming, address frequent misperceptions, and put aquaculture in broader contexts (e.g., climate-smart food production and nutrition).

Action 1.1.3 NOAA and USDA (NIFA) will engage with state aquaculture agencies to explore ways to support their literacy and engagement work. This may include collaboratively developing tools to educate local municipalities and the public on state aquaculture leasing and licensing programs, aquaculture science and management underpinning permitting decisions, and options for how the public can engage in the process of issuing or renewing leases and licenses.

Action 1.1.4 Federal agencies will explain the linkages between aquaculture and broader federal priorities and initiatives (e.g., USDA Local and Regional Foods, USDA Food System Transformation Framework, USDA Aquaculture is Agriculture, NOAA's New Blue Economy, and the High-Level Panel for a Sustainable Ocean Economy).

Action 1.1.5 Federal agencies will leverage existing resources and ongoing efforts (e.g., common messages and outreach materials) across federal and state agencies, focusing on consolidating and coordinating broad community outreach efforts, to increase awareness of aquaculture (e.g., through federal websites and print and online resources). This will include collaborating with partners such as state universities, non-governmental organizations (NGOs), commercial fishing organizations, Tribal and Indigenous leaders

³⁸ NOAA Sea Grant. *Traditional Local Knowledge: A Vision for the Sea Grant Network* (2018). https://seagrants.noaa.gov/wp-content/uploads/2023/09/TraditionalLocal_110118.pdf

³⁹ NOAA Office of Legislative and Intergovernmental Affairs. *NOAA Tribal Resources*. <https://www.noaa.gov/legislative-and-intergovernmental-affairs/noaa-tribal-resources>

⁴⁰ USDA Natural Resources Conservation Service. *Getting Assistance: Historically Underserved Farmers and Ranchers*. <https://www.nrcs.usda.gov/getting-assistance/underserved-farmers-ranchers>

⁴¹ USDA Economic Research Service. *Socially Disadvantaged, Beginning, Limited Resource, and Female Farmers and Ranchers*. <https://www.ers.usda.gov/topics/farm-economy/socially-disadvantaged-beginning-limited-resource-and-female-farmers-and-ranchers/>

⁴² U.S. Economic Development Administration. *Investment Priorities*. <https://www.eda.gov/funding/investment-priorities>

⁴³ For all action items in this plan, we use the system of identifying the parent organization then, if further detail is warranted, listing the abbreviation for the relevant specific agencies or bureaus in parentheses. For example, actions by USDA's National Institute of Food and Agriculture is listed as USDA (NIFA).

and communities, and aquaculture industry organizations to develop, update, and disseminate these resources and common messages for various audiences.

Action 1.1.6 Federal agencies will work with their federal Public Affairs and Legislative Affairs offices to develop “explainers” for reporters and congressional staff and to develop relationships with publication agencies and reporters so that they can increasingly view federal agencies and our partners as trusted experts on aquaculture matters.

Action 1.1.7 NOAA and USDA (NIFA) will collaborate with partners—including aquariums, chefs, and postsecondary educators—to co-develop signage, messages, and curricula related to aquaculture and seafood to integrate aquaculture into broader agricultural and/or sustainable seafood topics.

Objective 1.2: Expand and Strengthen Aquaculture Social License

In addition to the broad aquaculture literacy objective above, some stakeholders have a particular interest in aquaculture policy or science matters that require more in-depth community engagement and developing and disseminating regionally specific information.⁴⁴ Farmers play an important role in generating social license in the community (e.g., farm tours and farmers markets). Federal agencies work with partners at the state/territory, regional, and local level to expand targeted outreach and engagement with diverse stakeholder communities where current and planned operations are located. These collaborations increase awareness and support for aquaculture and encourage better alignment of messages and strategies. There is a specific need to engage communities in advance of specific regulatory actions, such as public hearings, and as part of local permitting processes.

We recognize the particular interests of fishing communities, Tribal organizations, and Indigenous Peoples in aquaculture development. Federal agencies and our partners can help to support a stronger sense of community and collaboration among these groups. For example, NOAA can conduct and/or support outreach to fishing communities as part of efforts to determine suitable locations for marine aquaculture, and extension agents at USDA and NOAA Sea Grant can highlight job and economic opportunities to fishing and Tribal groups that may benefit from integrating some types of aquaculture into their communities. In addition, federal agencies can better engage with states and fisher to explore how aquaculture may be used as a tool to diversify their incomes and continue working on the water. Federal agencies in turn can learn much from these and other community groups about social, economic, and other factors to consider as we work to support aquaculture development.

To increase community engagement, federal agencies will implement the following actions:

Action 1.2.1 Federal agencies, directly and through collaborations with industry and other partners, will expand cooperative efforts toward enhancing aquaculture community awareness. These efforts may include supporting in-person community functions, such as town hall meetings, scoping meetings, food festivals and other events, and the creation of information kiosks at chambers of commerce, aquariums, and other community centers.

Action 1.2.2 Federal agencies, in advance of specific permitting actions, will support local outreach efforts to increase community awareness about the project, such as relevant regulatory and enforcement provisions. These efforts may include in-person community functions, articles in local news outlets, web stories, and informational sessions in town hall meetings.

Action 1.2.3 Federal partners will engage with Tribal communities on relevant aquaculture priorities, decision-making, and policies. This will include engaging in two-way dialogue with Tribal communities to

⁴⁴Examples include commercial and recreational fishing groups, Tribal governments, ports, seafood producers and processors, environmental NGOs, and communities where new facilities or other initiatives are being proposed.

exchange information about aquaculture development opportunities, challenges, and approaches (e.g., using IK to inform aquaculture siting, practices, and technologies).

Action 1.2.4 Federal partners will engage with fishing communities on relevant aquaculture priorities, decision-making, and policies. This will include engaging in two-way dialogue with fishing communities to exchange information about aquaculture development opportunities, challenges, and approaches.

Action 1.2.5 Federal agencies will create and distribute more in-depth materials about specific topics of interest or concern for a given community (e.g., the intersection of aquaculture with climate change, potential regional economic benefits, and environmental impacts).

Action 1.2.6 Federal agencies will develop and expand efforts to engage with underrepresented groups (e.g., through minority-serving institutions) to increase their participation in the aquaculture sector through various initiatives, such as workforce development and education.

Objective 1.3: Provide Information to Support Permitting, Outreach, Extension, and Economic Development

Federal, state, and local practitioners working on aquaculture permitting, environmental consultations, outreach, and extension often have diverse portfolios and heavy workloads. This can make it challenging to keep up to date with the latest information related to aquaculture science and management relevant to their work. In addition, local and regional economic development entities may lack adequate information on aquaculture to fully appreciate its potential value for broader economic development goals. Federal agencies can assist by summarizing and disseminating information on key topics with policy implications in formats that are easily accessible and useful to these practitioners.

Action 1.3.1 NOAA and USDA (NIFA, ARS) will compile and disseminate (e.g., fact sheets, reports, and in-person meetings) best-available information on key topics relevant to the environmental interactions of aquaculture to support outreach, extension, and permitting and environmental reviews.

Action 1.3.2 EDA, USDA (RD, NIFA), and NOAA will work with regional, state, territorial, and/or Tribal groups to explore ways to better integrate aquaculture challenges and opportunities in economic development plans and initiatives.

Goal 2. Support Infrastructure and Workforce Development

A skilled labor force working on modern equipment in modern facilities is necessary to support climate-ready communities by bolstering the productivity, efficiency, and competitiveness of U.S. seafood and aquaculture industries. In this goal, federal partners are exploring ways to efficiently communicate opportunities that encourage and bolster workforce development, physical infrastructure, and innovative R&D. Federal agencies will emphasize equitable access to programs and services as we implement the actions in this goal; for example, through increasing engagement with Tribes and other underrepresented groups, agencies can better understand and respond to the workforce development and infrastructure needs of these communities. This may include engaging with ongoing efforts to create and establish national clearinghouses for training resources and to help bring aquaculture initiatives into concert with extension efforts in other aspects of U.S. agriculture. For each of the objectives and actions below, federal agencies will work with private industry partners to identify where and how to direct efforts and expand lines of communication between private and public stakeholders to address common challenges.

Objective 2.1: Educate and Train a Skilled and Diverse Aquaculture Workforce

Workforce development refers to training offered to existing and potential workers to provide the skills necessary to improve efficiency and knowledge for the worker, while maintaining competitiveness of businesses in the industry. Workforce development is a long-term approach to ensure opportunities and incentives for professional growth of workers and is essential to the sustainability of businesses. Through workforce development, individuals can obtain subject matter expertise and explore related fields to increase the knowledge and skill base of existing businesses, which creates potentially beneficial nexuses between stakeholders.

The aquaculture sector encompasses a wide range of species, systems, and products. Aquaculture is a tool for local community members to diversify their incomes and continue working on the water, which allows people—especially young people—to stay and work in the region because of the variety of job opportunities in seafood available. This industry offers full-time, year-round employment opportunities that can often supplement other career paths.

To develop the aquaculture sector, a well-trained workforce is necessary to meet industry needs throughout the farming and seafood supply chain. Federal agencies can foster and strengthen partnerships with aquariums, existing aquaculture enterprises, and educational institutions to support specialized training programs (alone or as part of broader educational programs) that provide the education and skills required to pursue careers in aquaculture—e.g., community colleges with technical/vocational programs, minority-serving institutions, and other institutions of higher education with agricultural programs with a focused curriculum on the agricultural industry. The intention is to bolster training programs across the farming and seafood supply chain, in sectors including business planning and entrepreneurship, engineering and marine sciences, trade management, regulatory compliance, and seafood processing and inspection. Efforts should also help to establish and expand apprenticeship and internship opportunities with industry to bolster training opportunities across the farming and seafood supply chain; many of the essential skills and knowledge needed for this sector are transferable to other farming and seafood sectors. Aquaculture workforce development can provide cross-sectional opportunities to help overcome scientific, regulatory, and market challenges.

The goal is to support a diverse labor pool to meet the varying needs of multiple scales of aquaculture operations. As a first step, acknowledging the challenges and constraints on potential entrants into the aquaculture community can help open accessibility to these training opportunities. Federal agencies

acknowledge that workforce needs are region-specific and should support the local communities and economies and plan to work with local partners to support location-specific efforts.

To support workforce development, federal agencies will implement the following actions:

Action 2.1.1 NOAA and USDA (NIFA) will work with industry stakeholders to identify current and future aquaculture workforce needs (including the critical skills for each area of the farming and seafood supply chain) and identify training and education pathways required to fill those needs. Education pathways can include sponsored work-study, apprenticeship, and internship opportunities.

Action 2.1.2 NOAA and USDA (NIFA) will support the development of regional and/or sector-based occupational standards and workforce development programs across the aquaculture supply chain (e.g., production and processing) and the transfer of these standards to workforce development programs (e.g., apprenticeship programs).

Action 2.1.3 NOAA and USDA (NIFA) will promote and support the coordination of local and regional programs that aim to support and connect qualified applicants to employment opportunities throughout the farming and seafood supply chain. These efforts will emphasize engagement with programs and institutions focusing on two broad groups: (1) commercial fishermen, so they can benefit from additional revenue streams while providing their knowledge and expertise (e.g., vessel and gear handling) to aquaculture companies; and (2) underserved communities, veterans and their families, Tribal communities (including a focus on elevating IK), other groups not traditionally represented in the farming or seafood sector, and interested students from landlocked, rural, and urban communities. This includes improvements in the promotion of and accessibility to grant opportunities by offering assistance throughout the application process.

Action 2.1.4 NOAA and USDA NIFA will explore workforce recruitment and training opportunities to attract students into the aquaculture industry throughout the country, using the USDA NIFA Veterinary Medicine Loan Repayment Program (VMLRP) as a model.⁴⁵

Action 2.1.5 USDA APHIS will continue to expand training and education platforms on aquatic health intended for USDA-accredited veterinarians, but that are freely available to farmers, regulators, and the public for informational purposes.

Objective 2.2: Develop and Transfer Tools, Technologies, and Techniques

Growth of U.S. aquaculture production relies on the ability to adapt to changing resource management needs, including those driven by climate change. Aquaculturists need access to up-to-date and effective tools and management practices, as well as opportunities for innovation and technological advancement. U.S. aquaculture encompasses a diverse portfolio of production species and systems. This creates myriad challenges and opportunities facing producers across the country, each of which requires a range of tools, technologies, and solutions to minimize risk, maximize productivity, and ensure sustainability and profitability. Additional investments are required across a range of systems, including inland ponds and raceways, offshore and coastal aquaculture, integrated multi-trophic aquaculture, and recirculating aquaculture systems (RAS).

The federal government supports key actions along the entire chain of aquaculture innovation, from research funding and product development to commercialization. For example, USDA NIFA, via its Small

⁴⁵ The VMLRP helps eligible veterinarians working in aquaculture to offset a significant portion of debt incurred in pursuit of their veterinary medical degrees in return for their service in certain high-priority veterinarian shortage situations. USDA National Institute for Food and Agriculture. *Veterinary Medicine Loan Repayment Program*. <https://www.nifa.usda.gov/grants/programs/veterinary-medicine-loan-repayment-program>

Business Innovation Research (SBIR) grant program, and the USDA's Rural Development (USDA RD) have prioritized commercialization of on-farm automation, such as the automatic flipping of oyster culture bags and advancements in aquatic robotics, which provides for a desirable deep cup and easier food service handling. In addition, NOAA Sea Grant and USDA's Agricultural Research Service (USDA ARS) have supported research focused on the development of culture methods for candidate species and culture technologies, such as RAS. These technologies are then transferred to non-federal partners by the USDA NIFA Land Grant Cooperative Extension Service, USDA ARS, and NOAA Sea Grant Extension Network. The extension component is a large part of why the United States leads in science and technology generally, because it serves as a professional connection between research institutes and the end users of scientific information.⁴⁶

To support development and adoption of new technologies, federal agencies will implement the following actions:

Action 2.2.1 NOAA and USDA (NIFA) will explore ways to increase the availability and effectiveness of Sea Grant and Land Grant extension services. This includes working to ensure that extension agents have access to the best-available information related to aquaculture practices, management, and research (e.g., through training materials).

Action 2.2.2 NOAA and USDA (NIFA) will explore the extent of federal aquaculture investments in aquaculture technology development and transfer and identify regulations or policies that may hamper the adoption or implementation of existing and promising new technologies.

Action 2.2.3 NOAA and USDA (NIFA, APHIS) will work with industry to identify high-priority areas to develop and commercialize new and emerging technologies. These discussions could support the broader effort to get industry input on federal grant priorities (e.g., through USDA ARS stakeholder prioritization efforts).

Action 2.2.4 USDA NIFA Land Grant extension, Extension Foundation, and NOAA Sea Grant will collaborate with partners around the topics of technology transfer, user training, and product implementation on aquaculture farms to ensure federally supported innovation research effectively generates short- and long-term benefits for domestic aquaculture producers.

Action 2.2.5 NOAA and USDA (NIFA) will support efforts to expand and broaden access to worker training and resources among stakeholder groups and other partners (e.g., extension agents) to enable more rapid adoption of novel tools and technologies.

Action 2.2.6 Federal partners will encourage and support technology exchanges with other countries for U.S. producers to observe and learn from foreign farming practices and technologies.

Action 2.2.7 NOAA and USDA (NIFA) will work with regulatory agencies toward the goal of developing permitting frameworks that are flexible enough to facilitate the experimentation and adoption of new farming practices and technologies.

Objective 2.3: Increase Investment in Physical Infrastructure

To effectively and sustainably develop the aquaculture sector, bolstering sufficient investment in development and maintenance of physical infrastructure is of paramount importance. Federal agencies plan to strengthen the use of public-private partnerships in the aquaculture sector to foster investment

⁴⁶ NSTC Subcommittee on Aquaculture (2022). *National Strategic Plan for Aquaculture Research*. Goal 2. https://www.ars.usda.gov/sca/Documents/2022%20NSTC%20Subcommittee%20on%20Aquaculture%20Research%20Plan_Final%20508%20compliant.pdf

in physical infrastructure through increased cost-effectiveness, more efficient risk allocation, and the attraction of third-party funding.

The intention of attracting increased investment toward physical infrastructure in the aquaculture sector is to enable and support the development and expansion of upstream facilities (e.g., hatcheries and nurseries) and downstream aquaculture infrastructure that can support both aquaculture and fishing industries (e.g., port facilities and cold storage facilities), as well as improve operational efficiency (e.g., reduce electricity costs). Such infrastructure developments will lead to increased supplies of seed and fingerlings, as well as generally increased processing capacities that promote higher growth in employment and business development. It is imperative to incorporate long-term climate resilience and environmental considerations into infrastructure development projects.

In coastal areas, working waterfronts have long been an important aspect of the U.S. economy and our cultural and social heritage, as they include a range of water-dependent activities and coastal-related businesses that support commercial and recreational industries. These locations provide valuable infrastructure that support aquaculture production and are the nexus for numerous partnerships focused on conserving and protecting these vulnerable communities. However, due to various development pressures, many working waterfronts have been re-developed for residential, commercial, and recreational uses.⁴⁷ Such loss of waterfront access has significant implications not just for aquaculture, but also for commercial and recreational fisheries.

To support investment in physical infrastructure, federal agencies will implement the following actions:

Action 2.3.1 USDA (AMS, RD) and EDA will explore ways to increase private investment and optimize federal assistance for public infrastructure development, including by helping communities to catalyze public-private partnerships that create jobs and foster economic resilience and prosperity. This action will help to increase access to capital to develop and modernize infrastructure projects, including for retail markets and production and manufacturing facilities.

Action 2.3.2 NOAA, USDA (NIFA), and EDA will support and encourage the development, maintenance, modernization, and expansion of upstream aquaculture infrastructure, such as broodstock centers, hatcheries, and nurseries (e.g., to increase supply of shellfish seed and fingerlings), and downstream aquaculture infrastructure (e.g., port facilities, processing capacity, and cold storage).

Action 2.3.3 EDA will initiate and continue efforts to incorporate climate resilience and environmental considerations into economic development planning and projects involving the development and maintenance of physical infrastructure relating to aquaculture. EDA will assist in this capacity by enhancing its emphasis on resilience principles, as well as robust Strengths-Weaknesses-Opportunities-Threats analyses and needs assessments regarding infrastructure modernization, efficiency, and changing workforce needs in Comprehensive Economic Development Strategies.⁴⁸

Action 2.3.4 Federal agencies will work with state agencies to identify and more broadly disseminate existing funding opportunities applicable to aquaculture-related infrastructure projects. Increased awareness of such funding opportunities can decrease barriers to underserved communities seeking infrastructure funding and help to connect funding to communities in need; it can also increase outreach to industry and other stakeholders to more widely spread awareness of infrastructure development opportunities.

⁴⁷ National Working Waterfronts Network, <https://nationalworkingwaterfronts.com/>

⁴⁸ U.S. Economic Development Administration. *Comprehensive Economic Development Strategy (CEDs)*: <https://www.eda.gov/grant-resources/comprehensive-economic-development-strategy>

Action 2.3.5 NOAA and USDA will consult with EDA, Department of Transportation, other federal and state agencies, and non-governmental partners to explore ways to conserve and improve access to working waterfronts.

Objective 2.4: Establish Test Beds, R&D Consortia, and Pilots

To support the existing and growing U.S. aquaculture industry, there is a need to establish and expand test beds⁴⁹ and pilot operations and continue establishment of R&D consortia. Such sites provide the means for research efforts to be conducted under commercial conditions and also facilitate training and workforce development opportunities. In some locations, these sites can possibly revitalize vacant or underused processing facilities. These sites can be essential means of refining methods and technologies in advance of full-scale investments and commercialization. There is a dedicated effort in the United States to expand R&D consortia. NOAA Sea Grant's funding opportunity in 2019 established 11 Aquaculture Collaboratives (commonly referred to as "hubs") focusing on various topics, including land-based salmon production, seaweed aquaculture, Indigenous aquaculture practices, and shellfish breeding.⁵⁰ These hubs have connected research, extension, and industry personnel on a regional and national basis. Similarly, USDA NIFA established the Agricultural Genome to Phenome Initiative, a competitive grant program to develop a community of researchers to expand knowledge of genomes and phenomes for important crops and animals in the agriculture sector; aquaculture species are included in this program.⁵¹ Additional R&D consortia can serve to advance sectors of the emerging U.S. aquaculture industry by facilitating collaborative research involving industry input.

The SCA recognizes the importance of R&D to inform sustainable approaches that maximize aquaculture production while minimizing risks and impacts, and captured this in the NADP through specific actions in the *National Strategic Plan for Aquaculture Research*.

To support test beds, R&D consortia, and pilots, federal agencies will implement the following actions:

Action 2.4.1 NOAA and USDA (NIFA, ARS) will formulate and implement an interagency plan to prioritize and support new and existing R&D consortia, test beds, and pilot facilities through coordinated funding opportunities. Planning should be conducted in collaboration with industry and other partners and should consider using international models of test beds and pilot facilities that have been developed in South Korea,⁵² Norway,⁵³ Scotland,⁵⁴ and Portugal.⁵⁵

⁴⁹ Test beds—also referred to as demonstration centers—and pilot aquaculture facilities are currently limited in the United States.

⁵⁰ NOAA Sea Grant. *Sea Grant 2019 National Aquaculture Initiative Funded Projects and Program*: <https://seagrant.noaa.gov/Portals/0/Documents/Sea%20Grant%202019%20National%20Aquaculture%20Initiative%20Funded%20Projects%20and%20Programs%20Sept2019.pdf>

⁵¹ USDA National Institute of Food and Agriculture. *Agricultural Genome to Phenome Initiative*. <https://www.nifa.usda.gov/grants/competitive-agriculture-and-food-research-initiative-AFRI/agricultural-genome-phenome-initiative-ag2pi>

⁵² The National Institute of Fisheries Science, Pukyong National University in Busan, South Korea is constructing and intends to expand distribution of a recirculating aquaculture system for cold-water fish farming for trout and salmon. National Institute of Fisheries Science (25 Feb 2022). *NIFS Has Provided Eco-Friendly Trout-farming Technology to Private Sector*. https://www.nifs.go.kr/eng/board/actionBoard0044View.do?MENU_ID=M0000329&BBS_ID=20201228045042656DOX&

⁵³ SINTEF ACE is a full-scale laboratory located in Mid-Norway that develops and tests new aquaculture engineering research and technologies to aquaculture operations, mainly for salmon and seaweed sites. SINTEF. *Laboratory - ACE*. <https://www.sintef.no/en/all-laboratories/ace/>

⁵⁴ Researchers from the National Manufacturing Institute at Strathclyde University in Glasgow, Scotland have deployed remotely operated vehicles for underwater 3D scanning to develop virtual reality for diver safety training at north fish farms. Fadley, Keith. *Shetland Fish Farm Chosen as First Test Bed for Virtual Reality*. Scotland Business. <https://www.pressandjournal.co.uk/fp/business/scotland-business/4840882/shetland-fish-farm-chosen-as-test-bed-for-virtual-reality/>

⁵⁵ Portuguese companies RIASEARCH and SPAROS partner to provide industry with small batches of experimental aquafeeds and research to improve marine and shrimp nutrition. RIASEARCH. *About Us*. <https://www.riasearch.pt/about>

Action 2.4.2 NOAA and USDA (NIFA) will encourage and leverage public-private partnerships between universities—which include HBCUs, Tribal colleges and universities, and Hispanic-serving institutions—to promote and provide cost-effective opportunities for state-of-the-art research, research consortiums, and on-the-ground implementation of aquaculture development research. This could include the expansion of aquaculture production research facilities to near-commercial-scale units for both freshwater and marine aquaculture.

Goal 3. Encourage Industry Investment and Growth

There is substantial untapped potential for sustainable aquaculture development in the United States. However, investment in this industry involves risks to potential investors for several reasons, including:

- Complicated and uncertain permitting
- The need to adopt new technologies
- Uncertainty about accessibility to risk management programs and services
- Highly competitive markets
- Questions around security of tenure for farms operating in federal waters

Through the actions listed in this goal, federal partners can help de-risk aquaculture operations to incentivize investment in the industry. Some of the actions in this goal will help to reduce existing inequities in the domestic aquaculture industry associated with substantial barriers to entry^{56,57} and the differential capacity of various communities to bear such costs.⁵⁸ Other actions in this goal address various ways federal agencies can better recognize and incorporate aquaculture's contributions to healthy ecosystems and diverse, climate-ready communities in ways that can incentivize investment.

Objective 3.1: Increase Regulatory Efficiency

Effective permitting of aquaculture operations is critical to ensuring sustainable development of the industry. However, industry leaders have repeatedly indicated that a significant barrier to investment in aquaculture is not permitting per se, but permitting processes that are complicated, lengthy, and uncertain. Regulatory inefficiency may disproportionately affect small-scale and start-up operators, underserved communities, and Tribal and Indigenous communities, who may have limited resources to navigate the regulatory process. Efficient and predictable permitting would significantly reduce this risk and related costs. As a result, the SCA established the Regulatory Efficiency Task Force to develop a strategic plan for interagency science and technology coordination to improve regulatory efficiency, research and technology development, and economic growth. The *Strategic Plan to Enhance Regulatory Efficiency in Aquaculture* outlines actions that federal agencies are taking or plan to take to create a more efficient, timely, coordinated, predictable, and science-informed regulatory process while fulfilling conservation, public health, and other legal requirements.

To enhance regulatory efficiency in aquaculture, federal agencies will implement the following action:

Action 3.1.1 Federal agencies in the Regulatory Efficiency Task Force will implement actions identified in the *Strategic Plan to Enhance Regulatory Efficiency in Aquaculture*.

Objective 3.2: Increase Access to Capital

Aquaculture businesses require capital to launch, expand, and maintain operations. Capital is necessary to support expenditures across the supply chain: production, harvest, processing, storage, and transportation. Access to capital is often most constrained within underserved and underrepresented communities, and for small businesses and operations that may have a particularly challenging experience securing the necessary funding to begin growing aquatic products. Federal agencies can work with these communities to explore ways to overcome these challenges.

⁵⁶ Rubino, M. C. (2022). Policy Considerations for Marine Aquaculture in the United States. *Reviews in Fisheries Science & Aquaculture*, 31(1), 86–102. <https://doi.org/10.1080/23308249.2022.2083452>

⁵⁷ van Senten, J., Engle, C. R., Hudson, B., & Conte, F. S. (2020). Regulatory costs on Pacific coast shellfish farms. *Aquaculture Economics & Management*, 24(4), 447–479. <https://doi.org/10.1080/13657305.2020.1781293>

⁵⁸ Cecot C. An Equity Blindspot: The Incidence of Regulatory Costs. *Journal of Benefit-Cost Analysis*. 2023;14(1):35-43. doi:10.1017/bca.2023.3

A range of federal agencies provide capital directly to the aquaculture sector. For example, NOAA offers specific loan programs for the aquaculture and fishing industry⁵⁹ and the USDA offers a wide range of agricultural development programs available to the aquaculture industry.^{60,61,62} Additionally, several other agencies (e.g., Small Business Administration (SBA), Minority Business Development Agency (MBDA), and Economic Development Administration (EDA) offer loan and grant programs that are not specific to economic development of the agriculture or seafood sectors, but consider aquaculture entities eligible. The NOAA Fisheries Office of Aquaculture, in consultation with the SCA, prepared the *Guide to Federal Aquaculture Grant and Financial Assistance Services (2021)*⁶³ in an effort to communicate more effectively these types of opportunities to aquaculture stakeholders. This comprehensive list highlights federal grants and financial assistance programs available to aquaculture operations. Federal partners intend to update this guide annually to provide the most up-to-date information to aquaculture stakeholders.

We recognize that state and local agencies and trade associations conduct valuable work to help increase access to capital. Where appropriate, federal agencies will coordinate and collaborate with these entities in carrying out the actions below. In addition, we recognize that the commercial fishing industry has interest in some of the products and services noted below, especially at USDA. Given the aquaculture focus of this plan, we do not address this interest here in detail. However, we note that various USDA agencies are engaged in discussions to explore what products and services could be available for commercial fishing companies.

To enhance access to capital, federal agencies will implement the following actions:

Action 3.2.1 NOAA will periodically update and publish the *Guide to Federal Aquaculture Grant and Financial Assistance Services* to include all relevant grant and loan programs in collaboration with federal partners, including FDA and USDA (RD, FSA, NRCS, NIFA).

Action 3.2.2 NOAA, SBA, MBDA, and USDA (FSA, NIFA, RD, AMS) will facilitate access to federal grant and loan programs through (1) outreach and engagement with diverse aquaculture stakeholder communities (e.g., Tribal groups, fishing communities, and rural communities) to learn about their needs, inform them of opportunities, and increase awareness of federal programs; and (2) policy recommendations as appropriate to increase eligibility and accessibility of aquaculture operations to federal grants and loans.

Action 3.2.3 SBA, NOAA, and USDA (NIFA, RMA, RD) will support new entrants to the aquaculture sector—including underrepresented communities and veterans—through business and strategic planning and micro-start-up financing, like connecting operations interested in the seafood sector to MBDA’s Business Center network and Capital Readiness Program.

Action 3.2.4 USDA (NIFA, RD) and NOAA will work to improve access and impact of the extension services (e.g., Land Grant universities, cooperative state extension programs, and Sea Grant programs) to help businesses develop and implement business plans, as well as submit credit and grant applications.

Action 3.2.5 USDA (NIFA, RMA, RD, AMS), NOAA, MBDA, SBA, and NSF will support investor “pitch sessions,” business incubators and accelerators, and extension programming focused on increasing

⁵⁹ NOAA National Marine Fisheries Service. *Fisheries Finance Program*. <https://www.fisheries.noaa.gov/national/funding-and-financial-services/fisheries-finance-program>

⁶⁰ USDA Farm Service Agency. *Farm Loan Programs*. <https://www.fsa.usda.gov/programs-and-services/farm-loan-programs/index>

⁶¹ USDA Rural Development. *Business & Industry Loan Guarantee Program*. <https://www.rd.usda.gov/programs-services/business-programs/business-industry-loan-guarantees>

⁶² USDA Rural Development. *Value-Added Producers Grants*. <https://www.rd.usda.gov/programs-services/business-programs/value-added-producer-grants>

⁶³ NOAA National Marine Fisheries Service. *Guide to Federal Aquaculture Grant and Financial Assistance Services (2021)*. <https://www.fisheries.noaa.gov/resource/document/guide-federal-aquaculture-grant-and-financial-assistance-services-2021>

investor awareness and interest in aquaculture, particularly for investment opportunities in diverse and underserved communities.

Action 3.2.6 NSF, USDA (NIFA), and SBA will increase engagement with aquaculture stakeholders to increase awareness of the NSF Innovation Corps⁶⁴ and Small Business Innovation Research and Technology Transfer programs⁶⁵ to accelerate the transition of basic research and technologies to commercialization.

Objective 3.3: Increase Incentives Associated with Enhancing Natural Capital

Nature provides society with ecosystem services that economists consider to be a formal capital.⁶⁶ To capture a more holistic view of the economic opportunity of aquaculture, environmental organizations, investors, state agencies, and financial entities are increasingly interested in exploring concepts of natural capital accounting⁶⁷ and environmental, social, and corporate governance.^{68,69} Scientists and investors realize how heavily the economy relies on natural resources and how economic activities change nature's ability to provide services. Under the Biden-Harris Administration, the federal government is currently developing a U.S. system to account for natural assets in national economic accounts, which will better capture links between nature and the economy.⁷⁰ Aquaculture operations provide ecosystem services that may enhance natural capital.

Some types of commercial aquaculture provide ecosystem services and other benefits beyond the primary goal of food production.⁷¹ Examples include improved water quality in coastal areas (e.g., water filtration,⁷² nutrient absorption,⁷³ enhanced denitrification⁷⁴ by farmed shellfish, and nutrient assimilation by farmed seaweed⁷⁵), habitat provisioning services provided by inland aquaculture ponds (e.g., for migratory birds) and by marine aquaculture gear⁷⁶ (e.g., to juvenile fish⁷⁷), potential enhancement of

⁶⁴ National Science Foundation. *Major Initiatives: NSF's Innovation Corps* <https://new.nsf.gov/funding/initiatives/i-corps>

⁶⁵ U.S. Small Business Administration. *America's Seed Fund*. <https://beta.www.sbir.gov/>

⁶⁶ World Bank Group. *Natural Capital*. <https://www.worldbank.org/en/topic/natural-capital#1>

⁶⁷ World Bank Group (2021). *Accounts to Policy: WAVES Closeout Report—Wealth Accounting and Valuation of Ecosystem Services Global Partnership (2012-2019)*. Washington, D.C.: World Bank Group.

<http://documents.worldbank.org/curated/en/779351636579119839/From-Accounts-to-Policy-WAVES-Closeout-Report-Wealth-Accounting-and-Valuation-of-Ecosystem-Services-Global-Partnership-2012-2019>

⁶⁸ Peritus Capital. <https://www.perituscap.com/>

⁶⁹ O'Shea et al. (2019). *Towards a Blue Revolution: Catalyzing Private Investment in Sustainable Aquaculture Production Systems*. The Nature Conservancy and Encourage Capital.

https://www.nature.org/content/dam/tnc/nature/en/documents/TNC_EncourageCapital_TowardsABlueRevolution_FINAL.pdf

⁷⁰ White House (2023). *National Strategy to Develop Statistics for Environmental-Economic Decisions: A U.S. System of Natural Capital Accounting and Associated Environmental-Economic Statistics*.

<https://www.whitehouse.gov/wp-content/uploads/2023/01/Natural-Capital-Accounting-Strategy-final.pdf>

⁷¹ Alleway, H.K., Gillies, C.L., Bishop, M.J., Gentry, R.R., Theuerkauf, S.J., and Jones, R. (2019). The Ecosystem Services of Marine Aquaculture: Valuing Benefits to People and Nature. *BioScience* 69, 59-68.

⁷² Barr, J.M., Munroe, D., Calvo, L., Kreeger, D., Cheng, K.M., Rose, J.M., Bayer, S. (in press - *Estuaries and Coasts*). Seasonal feeding behavior of aquacultured Eastern Oyster (*Crassostrea virginica*) in the Mid-Atlantic.

⁷³ Lindahl, O., Hart, R., Hernroth, B., Kollberg, S., Loo, L.-O., Olrog, L., Rehnstam-Holm, A.-S., Svensson, J., Svensson, S., and Syversen, U. (2005). Improving marine water quality by mussel farming - a profitable solution for Swedish society. *Ambio* 34, 129-136; Rose, J.M., Bricker, S.B., Tedesco, M.A., and Wikfors, G.H. (2014). A Role for Shellfish Aquaculture in Coastal Nitrogen Management. *Environmental Science & Technology* 48, 2519-2525; Petersen, J.K., Hasler, B., Timmermann, K., Nielsen, P., Tørring, D.B., Larsen, M.M., and Holmer, M. (2014). Mussels as a tool for mitigation of nutrients in the marine environment. *Marine Pollution Bulletin* 82, 137-143.

⁷⁴ Ray, N.E., and Fulweiler, R.W. (2021). Meta-analysis of oyster impacts on coastal biogeochemistry. *Nature Sustainability* 4, 261-269.

⁷⁵ Kim, J.K., Kraemer, G.P., and Yarish, C. (2014). Field scale evaluation of seaweed aquaculture as a nutrient bioextraction strategy in Long Island Sound and the Bronx River Estuary. *Aquaculture* 433, 148-156.

⁷⁶ Tallman, J.C., and Forrester, G.E. (2007). Oyster Grow-Out Cages Function as Artificial Reefs for Temperate Fishes. *Transactions of the American Fisheries Society* 136, 790-799.

⁷⁷ Mercado-Allen, R., Auster, P.J., Clark, P., Dixon, M.S., Estela, E., Liu, Y., Milke, L., Phillips, G., Redman, D., Smith, B.C., Verkade, A., and Rose, J.M. (2023). Oyster aquaculture cages provide fish habitat similar to natural structure with minimal differences based on farm location. *Frontiers in Marine Science* 10.

recruitment to wild populations from increased larval production,⁷⁸ and the potential stabilization and armoring of shorelines against wave energy (e.g., shellfish beds⁷⁹ and oyster reefs⁸⁰). In some cases, these benefits may be quantified and used to inform incentives and subsidies to help offset aquaculture production costs. Aquaculture can provide additional ecosystem services when used as a tool for restoring or enhancing a range of habitats and species, including for sport fishing, recovery of threatened and endangered species,⁸¹ and reef restoration.⁸² Federal agencies can expand research to better understand and quantify these services in the context of natural capital, and work with state and other partners on methods to incorporate them into tax and other incentives for the aquaculture industry. This could allow aquaculture producers to take this information “to the bank” to provide additional investment opportunities.

Consistent with a natural capital framework, a variety of federal financial assistance programs and technical assistance are available to aquaculture operations to improve our nation’s natural environment. These include incentives related to agricultural engineering for aquaculture infrastructure, water quality in areas of clean water inputs and nutrient management outputs, energy conservation engineering, water management engineering for water conveyance systems, and wildlife enhancement.⁸³ For example, the USDA Natural Resources Conservation Service (NRCS) provides technical expertise and conservation planning for farmers (including oyster farmers), ranchers, and forest landowners wanting to make conservation improvements to their land.⁸⁴ In addition, USDA RD has programs to support energy efficiency improvements and install renewable energy systems.⁸⁵ USDA RD also has programs to support energy-efficient renewable energy systems on farms.

Beyond the ancillary benefits to natural capital from seafood farming, aquaculture is a tool that can be used to specifically enhance natural capital as a primary objective. Algae culture (seaweeds and macroalgae) is emerging as an area of increased research investment, given the potential source of valuable products and services beyond those for food, including biofuels, pharmaceuticals, and the potential to reduce greenhouse gas emissions through carbon sequestration. The Department of Energy’s Macroalgae Research Inspiring Novel Energy Resources Program seeks to develop technologies capable of providing economically viable, renewable biomass for energy applications without the need for land, freshwater, and synthetic fertilizers to ultimately expand macroalgae use beyond human consumption.⁸⁶

⁷⁸ Varney, R.L., Watts, J.C., and Wilbur, A.E. (2018). Genetic impacts of a commercial aquaculture lease on adjacent oyster populations. *Aquaculture* 491, 310-320.

⁷⁹ Meyer, D.L., Townsend, E.C., and Thayer, G.W. (1997). Stabilization and Erosion Control Value of Oyster Cultch for Intertidal Marsh. *Restoration Ecology* 5, 93-99.

⁸⁰ La Peyre, M.K., Humphries, A.T., Casas, S.M., and La Peyre, J.F. (2014). Temporal variation in development of ecosystem services from oyster reef restoration. *Ecological Engineering* 63, 34-44.

⁸¹ Rogers-Bennett, L., Aquilino, K.M., Catton, C.A., Kawana, S.K., Walker, B.J., Ashlock, L.W., Marshman, B.C., Moore, J.D., Taniguchi, I.K., Gilardi, K.V., and Cherr, G., N. (2016). Implementing a Restoration Program for the Endangered White Abalone (*Haliotis sorenseni*) in California. *Journal of Shellfish Research* 35, 611-618.

⁸² Brumbaugh, R.D., Sorabella, L.A., Johnson, C., and Goldsborough, W.J. (2000). Small Scale Aquaculture as a Tool for Oyster Restoration in Chesapeake Bay. *Marine Technology Society Journal* 34, 79-86.

⁸³ U.S. Department of Agriculture (2021). *Aquaculture is Agriculture Colloquium*.

<https://www.usda.gov/sites/default/files/documents/aquaculture-agriculture-colloquim.pdf>

⁸⁴ U.S. Department of Agriculture, Natural Resources Conservation Service. *Getting Assistance*. <https://www.nrcs.usda.gov/>

⁸⁵ U.S. Department of Agriculture, Rural Development. *Rural Development Energy Programs*. <https://www.rd.usda.gov/programs-services/energy-programs>

⁸⁶ Department of Energy, Advanced Research Project Agency - Energy (19 Sept 2017). *Macroalgae Research Inspiring Novel Energy Resources (MARINER) Program*. <https://arpa-e.energy.gov/technologies/programs/mariner>

Additional ecosystem services are provided through aquaculture, restoring or enhancing a range of habitats and species, including for sportfishing,⁸⁷ endangered species recovery,^{88,89} and enhancing coastal habitats, such as oyster reefs.⁹⁰

To increase incentives to aquaculture producers, federal agencies will implement the following actions:

Action 3.3.1 NOAA and USDA (NIFA, ARS, RD, ERS) will support research to better understand and quantify how aquaculture operations may contribute to enhancing the nation's natural capital through, for example, enhancing coastal water quality and providing habitat to wild populations.

Action 3.3.2 EPA will work with federal partners to explore how federal tax credit programs could be optimized to provide working capital to aquaculture to encourage investment in diverse and underserved communities. Examples include the New Market Tax Credit Program administered by the Community Development Financial Institutions Fund;⁹¹ Opportunity Zones established under the Tax Cuts and Jobs Act of 2017;⁹² and EPA tax credit programs for coastal brownfield sites.⁹³

Action 3.3.3 NOAA, USDA (NRCS⁹⁴), and USFWS will continue to collaborate with other federal and state agencies, the aquaculture industry, e-NGOs, the recreational fishing industry, and regional fishery management councils and commissions to explore using and/or expanding aquaculture techniques for aquatic habitat and species restoration, conservation, and enhancement goals.

Action 3.3.4 NOAA will continue exploring research and management tools to better understand and incorporate the habitat value of aquaculture operations for consideration in management goals and decisions.

Action 3.3.5 OSTP, USDA, and NOAA will facilitate engagement and provide subject matter expertise between the aquaculture sector, federal partners (e.g., agencies involved in implementing the National Strategy to Develop Statistics for Environmental-Economic Decisions⁹⁵ and the Ocean Policy Committee), and private investment groups to make connections with and leverage opportunities related to natural capital accounting, climate adaptation and mitigation solutions, and environmental, social, and corporate governance.

⁸⁷ U.S. Fish and Wildlife Service Sportfish Restoration Program provides funds to fish and wildlife agencies of the states, the District of Columbia, and U.S. territories for fishery projects, boating access, and aquatic education. U.S. Fish and Wildlife Service. *Sport Fish Restoration*. <https://www.fws.gov/program/sport-fish-restoration#:~:text=The%20Sport%20Fish%20Restoration%20program%20provides%20funds%20to%20fish%20and,the%20Dingell%20DJohnson%20Act>

⁸⁸ The U.S. Fish and Wildlife Service National Fish Hatchery System includes 71 national fish hatcheries across the country that raise fish (and other aquatic species like frogs and mussels) to support conservation. U.S. Fish and Wildlife Service (2022). *Meet Your National Hatchery Service*. <https://www.fws.gov/story/meet-your-national-fish-hatchery-system>

⁸⁹ NOAA supports stock enhancement to rebuild populations of various ESA-listed species, including white abalone and several populations of Pacific salmon. Species Directory: NOAA National Marine Fisheries Service (31 May 2023). *White Abalone - Conservation & Management*. <https://www.fisheries.noaa.gov/species/white-abalone#conservation-management>; NOAA National Marine Fisheries Service, Northwest Fisheries Science Center (1 June 2023). *Fisheries Enhancement and Conservation in the Pacific Northwest*. <https://www.fisheries.noaa.gov/west-coast/science-data/fisheries-enhancement-and-conservation-pacific-northwest>

⁹⁰ NOAA National Marine Fisheries Service, Office of Habitat Conservation (4 February 2022). *Habitat Conservation, Oyster Reef Habitat*. <https://www.fisheries.noaa.gov/national/habitat-conservation/oyster-reef-habitat>

⁹¹ U.S. Department of Treasury, Community Development Financial Institutions Fund (2022). *New Markets Tax Credit Program*. <https://www.cdfifund.gov/programs-training/programs/new-markets-tax-credit>

⁹² Tax Cuts and Jobs Act of 2017, Pub. L. 115-97. <https://www.congress.gov/bill/115th-congress/house-bill/1/text>

⁹³ U.S. Environmental Protection Agency (Aug 2014). *A Guide to Federal Tax Incentives for Brownfields Redevelopment*. https://www.epa.gov/sites/default/files/2014-08/documents/tax_guide.pdf

⁹⁴ USDA Natural Resource Conservation Service. *NRCS Financial Assistance Program Data*. <https://www.farmers.gov/data/financial-assistance/overview>

⁹⁵ White House (2023). *National Strategy to Develop Statistics for Environmental-Economic Decisions: A U.S. System of Natural Capital Accounting and Associated Environmental-Economic Statistics*. <https://www.whitehouse.gov/wp-content/uploads/2023/01/Natural-Capital-Accounting-Strategy-final.pdf>

Objective 3.4: Increase Access to Federal Risk Management Services

Several USDA agencies administer programs to protect farmers and ranchers against declines in crop yield and/or revenue due to weather, disease, and other factors.⁹⁶ For example, USDA's Risk Management Agency (USDA RMA) makes federal crop insurance available and accessible to agricultural producers in order to strengthen the economic stability of farmers and rural communities. USDA RMA manages the Federal Crop Insurance Corporation to provide crop insurance products to farmers and ranchers through a public-private partnership with Approved Insurance Providers, who in turn sell and service federal crop insurance policies. USDA RMA currently has several insurance policies that are specifically designed to help aquaculture.⁹⁷ Additionally, USDA's Farm Service Agency (FSA) recently included all farmed aquatic animals except turtles and alligators within the Emergency Assistance for Livestock, Honeybees, and Farm-raised Fish Program.⁹⁸

To increase access to federal risk management services, federal agencies will implement the following actions:

Action 3.4.1 USDA (RD, FSA) will explore methods to expand accessibility for aquaculture operations to receive federal disaster relief grants, including through increasing communication and engagement with the aquaculture industry and exploring ways to streamline the process.

Action 3.4.2 USDA (RMA, FSA, ERS) will work with state and regional partners to increase outreach to the aquaculture sector to better assess risks and risk management strategies, explore ways to increase the accessibility and coverage of risk management tools to the aquaculture industry, and explore ways to streamline the process.

Objective 3.5: Improve Economic and Social Impact Data and Analyses – Increasing Accessibility and Quality of Aquaculture Market and Economic Data

The U.S. aquaculture industry lacks adequate market and cost data that are easily available to other types of agriculture.⁹⁹ The availability of reliable and timely economic data on freshwater and marine aquaculture species' prices, revenue, production costs, and trade are vital in supporting the economic development of the U.S. aquaculture industry. These data inform policymakers, investors, and regulators of the expected returns on investments in aquaculture infrastructure and the costs of inputs, while also facilitating modeling of market development and the impact of market disruptions. As such, the availability of these data is necessary to secure capital to finance aquaculture development, which is particularly important for new entrants to the aquaculture sector. Additionally, import and export data communicate market information to inform producer decision-making. At the same time, making such data widely available could pose competitive challenges to existing operations. Federal agencies will need to work closely with industry partners to better understand how to balance these different interests.

Several federal and state data products currently report economic data on the U.S. aquaculture industry. The USDA's National Agricultural Statistics Service (USDA NASS) regularly conducts the *Census of Aquaculture* that provides state- and national-level data on production volumes and methods, water

⁹⁶ USDA Rural Development (Jan 2022). Disaster Resiliency and Recovery Resources Guide. https://www.rd.usda.gov/sites/default/files/rd_disastertoolkit-final508.pdf

⁹⁷ USDA Risk Management Agency (Sept 2022). *National Factsheet on Aquaculture (Oysters, Clams, WFRP)*. <https://www.rma.usda.gov/Fact-Sheets/National-Fact-Sheets/Aquaculture-Oysters-Clams-WFRP>

⁹⁸ USDA Farm Service Agency (13 May 2021). *USDA Expands Aquaculture Disaster Assistance to Include Fish Raised for Food*. <https://www.fsa.usda.gov/news-room/news-releases/2021/usda-expands-aquaculture-disaster-assistance-to-include-fish-raised-for-food>

⁹⁹ *Aquaculture is Agriculture Colloquium*, 2021. <https://www.usda.gov/topics/farming/aquaculture/aquaculture-agriculture>

sources, and sales.¹⁰⁰ Additionally, USDA NASS releases biannual state-level data on catfish production and annual state-level data on trout production.¹⁰¹ Prior to 2015, USDA NASS released monthly national data on catfish processing that included information on prices received, as well as imports and exports.¹⁰² The U.S. Department of Commerce's Census Bureau continues to release monthly import and export data through their *Foreign Trade Statistics* data product.¹⁰³ NOAA produces *Fisheries of the United States* reports that document the economic performance of the nation's commercial and recreational fisheries,¹⁰⁴ but this does not include the economic data for aquaculture. In addition to these resources, a number of state natural resource agencies track aquaculture production for several groups of species, such as marine shellfish. Currently, information regarding economic data is also disseminated to the industry via established Land Grant and Sea Grant extension programming.

We recognize there are costs to farmers associated with the time and effort required to fill out economic surveys, and that these may have significant impacts on the farmer's ability to operate their business. This impact may be disproportionately felt by smaller businesses. The federal partners listed below will work with industry partners to seek ways to streamline these actions.

To improve economic and social data and analysis, federal agencies will implement the following actions:

Action 3.5.1 NOAA and USDA (NASS) will work to improve and better harmonize federal and state aquaculture data collection activities on species of major economic importance to the United States, including through data sharing agreements, while respecting established confidentiality and data sharing requirements.

Action 3.5.2 USDA (NASS) will, in collaboration with the aquaculture industry and state and federal partners, explore opportunities to increase participation and better coordinate and streamline survey processes of data collected in the *Census of Aquaculture*.

Action 3.5.3 USDA (NASS) and NOAA will work with the aquaculture industry to explore expanding data reports and products to include other major aquaculture commodities, such as clams and oysters, to better understand whether/how to communicate information on prices received for aquaculture output and the seasonal variation in prices, while respecting confidentiality and data sharing requirements.

Action 3.5.4 NOAA and USDA (NIFA, NASS, ERS, RMA) will continue to collaborate with the U.S. Department of Labor's Bureau of Labor Statistics and industry partners as they work to develop a producer price index for the aquaculture sector.

Action 3.5.5 NOAA will work with academic and other partners to develop and refine projections of future aquaculture prices.

¹⁰⁰ USDA National Agricultural Statistics Service. *Surveys - Census of Aquaculture*.

https://www.nass.usda.gov/Surveys/Guide_to_NASS_Surveys/Census_of_Aquaculture/index.php

¹⁰¹ USDA Economics, Statistics, and Market Information System. *Catfish Production Data*.

<https://usda.library.cornell.edu/concern/publications/bg257f046?locale=en>; USDA Economics, Statistics, and Market Information System. *Trout Production Data*. <https://usda.library.cornell.edu/concern/publications/t722h882h?locale=en>

¹⁰² USDA Economics, Statistics, and Market Information System. National Catfish Production Data Report (2014).

<https://usda.library.cornell.edu/concern/publications/3f462541v?locale=en>

¹⁰³ U.S. Census (2023). *Current US International Trade in Goods and Services (FT900)*. https://www.census.gov/foreign-trade/Press-Release/current_press_release/index.html; NOAA Fisheries, Office of Science and Technology (2023). *Foreign Fishery Trade Data*.

<https://www.fisheries.noaa.gov/national/sustainable-fisheries/foreign-fishery-trade-data>

¹⁰⁴ NOAA National Marine Fisheries Service, Office of Sustainable Fisheries. *Reports - Fisheries of the United States*.

<https://www.fisheries.noaa.gov/national/sustainable-fisheries/fisheries-united-states>; NOAA National Marine Fisheries Service, Office of Sustainable Fisheries. *Reports - Fisheries Economics of the United States*. <https://www.fisheries.noaa.gov/national/sustainable-fisheries/fisheries-economics-united-states>

Action 3.5.6 NOAA and USDA (NIFA) will explore ways to amplify the reach and impact of Land Grant and Sea Grant extension to improve the collection and dissemination of economic and financial management information to the aquaculture industry.

Action 3.5.7 Federal partners will coordinate with aquaculture partners on options to improve quality and accessibility of international trade data, including exploring ways to better distinguish aquaculture from wild-caught products.

Action 3.5.8 USDA and NOAA will explore how to develop economic/market valuation data to benefit the domestic aquaculture industry following disasters (e.g., hurricanes and pandemics), allowing for more accurate and expedited loss assessments.

Action 3.5.9 USDA (ERS) and NOAA will consider conducting an analysis of the domestic seafood supply chain (e.g., wild and farmed, hatcheries, bait, gear, and fuel) to better understand the true economic value of the seafood industry.

Goal 4. Expand Market Opportunities for U.S. Aquaculture

This goal includes steps the federal government can take or support to expand aquaculture product consumption or utilization that could strengthen U.S. influence in the global markets.

Objectives include supporting new product development and further integrating domestic aquaculture products into the domestic and international seafood markets. In addition, this goal addresses ways to support nutrition equity by increasing access to healthy seafood for diverse communities, in part through exploring ways to further support domestic farmed seafood products in federal nutrition assistance and commodity purchasing programs. Beyond human food production, some of the objectives and actions in this goal are relevant for expansion and growth of markets for ornamental aquatic species, cosmetics, pharmaceuticals, biofuels, and other industrial products.

Many of the seafood-focused objectives below are equally relevant to both wild harvest and farmed seafood products. In some instances, there is a distinct benefit to taking a seafood-wide approach. Where appropriate, the actions in this goal reference “seafood,” while retaining the focus on aquaculture given the context of this plan.

Objective 4.1: Evaluate Technical and Economic Potential of New and Emerging Species

Numerous species are in various stages of technical readiness for commercial culture, and additional research will develop techniques to propagate and rear these and additional species in the future. For species with limited or no existing markets, it will be important to evaluate not just the technical readiness of their commercial culture, but also their market potential. Such information will be valuable to help private and public sector researchers and investors make informed decisions about prioritization of species, given limited resources.

As an example, there are a limited number of marine finfish species commercially grown for food in the United States, but there are significant opportunities for expansion. In 2021, a consortium of USDA, NOAA, academic partners, and private industry experts identified 18 marine finfish species as candidates for new or expanded aquaculture industries in the United States.¹⁰⁵ This consortium continues to refine this list. In addition, there may be opportunities to expand commercial farming of various freshwater finfish, bivalve mollusks, and seaweeds for food.¹⁰⁶ Domestic seaweed culture for both human consumption and other uses (e.g., animal feed ingredients) is currently very small but is rapidly expanding, and the sector has the potential to bring numerous new product types to market.

Economic analyses of these species (e.g., profitability potential based on operating costs, market demands, and supplies from foreign and domestic fisheries and aquaculture) would help assess the potential economic viability of each species in the marketplace. Such information would be valuable as investors and farmers consider whether to try to develop new or expanded markets for these species.

To evaluate the potential of new and emerging species, federal agencies will implement the following actions:

Action 4.1.1 NOAA and USDA (APHIS, NIFA) will work with academic and industry partners on techno-economic analyses to explore the market potential for scaling various new and emerging aquaculture species to commercial production levels.

¹⁰⁵ Rexroad Jr, C.E., Rust, M.B., Riche, M., Wills, P., Davis, M. 2021. Opportunities for US Marine Finfish Aquaculture. Journal of the World Aquaculture Society. 1-8. <https://onlinelibrary.wiley.com/doi/10.1111/jwas.12791>

¹⁰⁶ Hudson, B., K. Page, T. Stephens and A. Suhrbier. 2023. Shellfish and Seaweed Species and Gear Thresholds for Alaskan Mariculture. Pacific Shellfish Institute. Olympia, Washington.

Objective 4.2: Support New Product Development

Most aquaculture products grown in the United States are currently marketed as fresh or frozen. There is a trend of increasing demand for ready-to-cook and convenient-to-prepare food items across food types. The COVID-19 pandemic changed where and how people accessed, prepared, and consumed food. There is an increasing need and opportunity to expand the development of new or value-added and shelf-stable products to reach diverse communities and support nutritional equity. We recognize that much of the competitive advantage of the domestic farming business sector is in fresh products. As new products are developed in response to market demands, there may be opportunities to take advantage of this strategic advantage for domestic growers.

Prior to the COVID-19 pandemic, about three-quarters of the seafood consumed in the United States was sold by restaurants.¹⁰⁷ As more consumers began eating at home in 2020, retail sales dramatically increased for fresh, frozen, and shelf-stable seafood.¹⁰⁸ Individuals and families had to find ways to eat without support from restaurants or school lunch programs. People needed nutritious, easy-to-make meal options that offered convenience. Some in the seafood industry expect the convenience of purchasing, preparing, and consuming food will remain a key characteristic of new products post-pandemic.¹⁰⁹ For example, market analysts expect grab-and-go products, such as sushi, to appeal to busy, mobile consumers.^{110,111}

Despite the potential for the development of new aquaculture products, various trade journals estimate the failure rate for new food products ranges from 70 to 95%. To achieve market success, new products should be innovative and meet specific needs or solve end users' specific problems sourcing, preparing, and consuming food.¹¹² In addition, it is important to note that developing and marketing new products is expensive. The cost of trade and marketing promotions to launch new products can run as high as 25% of the list price just to generate consumer awareness. Companies need more information about consumer preferences and other factors that led to the acceptance, or lack thereof, of various products in the market. Companies also need healthy revenue streams to fund new-product introductions and to continually refine existing products to satisfy shifting consumer expectations. Marketing new products requires: (1) identifying customer needs and satisfying them profitably; (2) understanding the target customer so well that the product practically sells itself; and (3) acquiring, keeping, and growing customers by creating, communicating, and delivering superior value to target accounts.¹¹³

To support new product development, federal agencies will implement the following actions:

Action 4.2.1 NOAA and USDA (ERS), in collaboration with industry, academia, and other partners, will support market research to better understand consumer preferences and expectations for economic value and convenience of seafood products.

¹⁰⁷ Cobe, Patricia. 2020. *Seafood Prices Reflect a Complex Supply Chain*. Restaurant Business Online.

<https://www.restaurantbusinessonline.com/operations/seafood-prices-reflect-complex-supply-chain>

¹⁰⁸ Blank, Christine. 2022. *Seafood Industry Powers through the Pandemic with Ingenuity, Flexibility*. SeafoodSource.

<https://www.seafoodsource.com/news/foodservice-retail/seafood-industry-powers-through-the-pandemic-with-ingenuity-flexibility>

¹⁰⁹ Maze, Chris. 2021. *How Important Is Customer Convenience in a Post-Pandemic Society?* SeafoodSource.

<https://www.seafoodsource.com/news/foodservice-retail/how-important-is-customer-convenience-in-a-post-pandemic-society>

¹¹⁰ Kearns, Madelyn. 2021. *Getting a Grip on Seafood's Rising Grab-and-go Segment*. SeafoodSource.

<https://www.seafoodsource.com/news/foodservice-retail/getting-a-grip-on-seafoods-rising-grab-and-go-segment>

¹¹¹ In addition, a North Carolina study revealed that the prime value in having access to fresh seafood was being able to prepare fresh meals for home consumption. Individuals wanted enhancements to facilitate, not eliminate, meal preparation. Nash, Barry, Jane Harrison, and John Whitehead. 2021. *Consumer Demand for North Carolina Seafood*. North Carolina Sea Grant.

<https://ncseagrant.ncsu.edu/wp-content/uploads/2021/03/Consumer-Demand-for-North-Carolina-Seafood.pdf>

¹¹² Christensen, C. et al.,. 2016. *Competing Against Luck*. Harper Collins. Page xii.

¹¹³ Kotler, P. and K.L. Keller. 2016. *A Framework for Marketing Management*. Pearson Publishing. Page 2.

Action 4.2.2 USDA (NIFA, ARS) will support food science R&D and market adoption of new and improved seafood product types. This includes developing shelf-stable products to protect or enhance the flavor, texture, color, appearance, and safety of products, as well as developing and deploying new post-harvest processing methods to increase consumer confidence to expand markets.

Action 4.2.3 NOAA and USDA (AMS, ARS, NIFA) will support and contribute to establishing and enhancing state and private-sector food science and technology extension programs where small businesses and extension agents can access guidance and hands-on assistance with business planning and developing value-added seafood.

Action 4.2.4 FDA, NOAA, and USDA will collaborate in developing or updating, as needed, requirements regarding product country of origin and nutritional labels on retail packages for aquaculture products.

Action 4.2.5 FDA will ensure new products introduced to the market meet processing, quality control, and seafood-safety specifications under FDA law and regulations.¹¹⁴

Action 4.2.6 USDA (RD, NIFA) and FDA will support efforts to develop aquaculture products for uses other than human food (e.g., pet foods, pharmaceutical and medical products, bioplastics, and fertilizers).

Objective 4.3: Expand Domestic Market Opportunities

The United States has a significant opportunity to bolster domestic seafood consumption. The consumer market is dominated by imported products, half of which are farmed products. Less than a quarter of the U.S. population over one year of age consumes the recommended amount of seafood; however, consumers are gaining awareness of the contributions of seafood to a healthy diet. Consumer demand for value-based products, such as organic and sustainable seafood, continues to grow, and there is increasing interest in supporting local products and shortening supply chains, particularly in response to the COVID-19 pandemic.

Increasing domestic aquaculture production and increasing the amount of seafood consumed in the United States would have significant positive impacts for the seafood sector, human health, and local communities. In *Aquaculture is Agriculture: USDA's Role in Supporting Farmers of Fish, Shellfish, and Aquatic Plants*, the USDA outlines existing resources and recommendations to advance aquaculture in the United States.¹¹⁵ The white paper's section on marketing highlights opportunities to expand domestic markets through federal purchasing programs and marketing standards. Additionally, producers—particularly small and beginning—are gravitating toward local, ethnic, and regional markets.¹¹⁶ Producers can more readily access these markets, scale their businesses over time, and retain a greater portion of the food dollar. In the pandemic, these markets became even more advantageous due to consumer accessibility and are now understood to play an essential role in developing resilient food systems.¹¹⁷

NOAA's Marine Fisheries Advisory Committee (MAFAC) researched how to help improve consumer confidence in and consumption of U.S. seafood in the United States. Given the need to elevate the narrative of the nutritional value of seafood and inherent sustainability of the management practices and harvesting of U.S. wild-caught and aquaculture seafood products, MAFAC recommended that a National

¹¹⁴ *Seafood Guidance Documents & Regulatory Information*. U.S. Food and Drug Administration. <https://www.fda.gov/food/guidance-documents-regulatory-information-topic-food-and-dietary-supplements/seafood-guidance-documents-regulatory-information>

¹¹⁵ *Aquaculture is Agriculture Colloquium*, 2021. <https://www.usda.gov/topics/farming/aquaculture/aquaculture-agriculture>

¹¹⁶ Stoll, Joshua S, Harrison, Hannah L. et al. *Alternative Seafood Networks During COVID-19: Implications for Resilience and Sustainability*. *Front. Sustain. Food Syst.*, 31 March 2021. Sec. Social Movements, Institutions and Governance, Volume 5 – 2021. <https://doi.org/10.3389/fsufs.2021.614368>

¹¹⁷ *Id.*

Seafood Council be established to conduct education, research, promotion, and marketing on behalf of U.S. seafood.¹¹⁸

Some domestic aquaculture products, as with wild-caught seafood, may face challenges competing in the domestic seafood market in light of imported products that may be available at lower prices. U.S. seafood has many attributes that can be valuable to consumers, helping to provide an advantage that may help offset some of these challenges. These attributes include known freshness, production under U.S. laws and policies that result in demonstrably sustainable and safe seafood, and greater confidence in the quality of the product. Communicating the origin of domestic seafood to consumers may help boost consumer confidence. As domestic production increases and can better meet our domestic demand, domestic aquaculture products may be able to better compete with imported seafood on other factors.

To expand domestic opportunities, federal agencies will implement the following actions:

Action 4.3.1 FDA and USDA (FNS, AMS) will work with other federal and state health agencies to amplify federal messaging and outreach on the health benefits of eating seafood.

Action 4.3.2 NOAA Fisheries' Seafood Inspection Program and USDA AMS Process Verified Program will develop market labels for production practices and traceability that can help boost demand for domestically produced aquaculture products.

Action 4.3.3 USDA (AMS) will continue to explore the development of organic standards for aquaculture products.

Action 4.3.4 USDA (AMS, FNS) will continue to expand approved vendors and explore potential new forms of aquaculture products based on demand from USDA nutrition assistance programs.

Action 4.3.5 USDA will continue to educate staff and stakeholders that "aquaculture is agriculture." This will include increasing outreach to aquaculture producers and industry on USDA programs and resources across the supply chain, and encouraging increased program utilization. This effort will promote commercial aquaculture industry and consumer literacy.

Action 4.3.6 USDA (AMS) will seek opportunities for seafood producers to increase participation in the Local and Regional Food System. This will include increasing opportunities for seafood producers and harvesters to sell in local and regional markets, as well as other direct-to-consumer and indirect market channels.

Action 4.3.7 USDA (APHIS), in consultation with relevant federal partners, will advance the comprehensive aquaculture health program standards (CAHPS) and the National Aquaculture Health Plan and Standards (NAHP&S). These efforts promote the health of U.S. farm-raised aquatic animals and, if program participation is recognized by state authorities for aquatic animal health, domestic movement of U.S. farm-raised aquatic animals will be streamlined and less burdensome for producers and exporters.¹¹⁹

Objective 4.4: Promote Global Competitiveness of U.S. Seafood Products

U.S. wild-caught seafood volume alone cannot keep up with domestic demand—as it has been stable for the last two decades—leading to a significant reliance on seafood imports. Cheaper imports and difficulty accessing foreign markets undermine potential growth and competitiveness of the U.S. seafood industry.

¹¹⁸ NOAA Fisheries Marine Fisheries Advisory Committee, *Federal Advisory Committee Recommends Establishing a National Seafood Council*. <https://www.fisheries.noaa.gov/federal-advisory-committee-recommends-establishing-national-seafood-council>

¹¹⁹ Domestic aquaculture operations may opt to implement CAHPS International in facilities outside the United States such that there are equivalent programs in networked facilities (i.e., premises that source animals from each other) and health status may be evaluated using the same standards. This opportunity may alleviate issues with varying state regulations for the importation of aquatic animals.

The United States is the top importing country of seafood by value,¹²⁰ importing between 70 and 85% of consumed seafood by value (with at least 50% of the imported products being farmed seafood).¹²¹ U.S. companies may face challenges in the global market due to inconsistent trade and tariff policies, non-tariff barriers to trade, and differences in international resource management practices. These challenges may be particularly acute for small or medium enterprises due to limited resources to effectively overcome them.

Ensuring that sustainable U.S. fisheries exporters stay competitive will help increase food security and decrease reliance on illegal, unreported, and unregulated (IUU) fishing and forced labor. For decades, IUU fishing has been a global problem affecting ocean ecosystems and sustainable fisheries management, threatening economic security and natural resources, and putting law-abiding fishermen and seafood producers at a disadvantage.¹²² Fisheries and aquaculture products are among the most internationally traded food commodities, with over one-third of fisheries and aquaculture products entering into international trade, generating billions in revenue.¹²³ Our seafood industry has a critical role to play in enhancing public health and nutrition, creating jobs (especially in rural and underserved communities), and serving as a key part of a climate-resilient food strategy. In the larger context of seafood, aquaculture has the potential to significantly increase our domestic seafood production, which could lessen the reliance on foreign fish sources. Aquaculture development is key to expanding U.S. seafood revenue overall, as well as creating opportunities for the United States to compete in foreign markets currently served by the growth in foreign aquaculture products to help even the playing field.¹²⁴

USDA's Foreign Agricultural Service (USDA FAS)¹²⁵ and the U.S. Trade and Development Agency provide market information and conduct export promotion activities designed to help domestic producers identify and take advantage of global market opportunities. Through assessing market conditions, USDA FAS connects U.S. exporters to new markets by endorsing and supporting participation in international trade shows, sponsoring international trade missions,¹²⁶ and hosting virtual trade events. USDA FAS also supports small or medium enterprises and Tribal communities through outreach efforts, strategic planning resources, financial assistance programs,¹²⁷ and export training initiatives to increase awareness of specialty and Indigenous-developed products.¹²⁸

To promote global competitiveness of U.S. seafood, federal agencies will implement the following actions:

¹²⁰ UN Food and Agriculture Organization (2022). *The State of World Fisheries and Aquaculture 2022 - Towards Blue Transformation*. Rome, Italy. <https://www.fao.org/documents/card/en/c/cc0461en>

¹²¹ The top valued imported items included: shrimp, salmon filets and steaks, whole or eviscerated salmon (primarily Atlantic), whole or eviscerated tuna, and canned tuna. Shrimp remains the most overall valuable import accounting for 27% of the value of total edible imports. *Fisheries of the United States*, 2020.

¹²² U.S. Interagency Working Group on IUU Fishing. *National 5-Year Strategy for Combating Illegal, Unreported, and Unregulated Fishing (2022-2026)*. https://media.fisheries.noaa.gov/2022-10/2022_NationalStrategyReport_USIWGonIUUfishing.pdf

¹²³ U.S. Department of State. *Illegal, Unreported, and Unregulated Fishing*. <https://www.state.gov/key-topics-office-of-marine-conservation/illegal-unreported-and-unregulated-fishing/>

¹²⁴ The top U.S. trading partners for imports are Canada, India, Indonesia, Chile, and China. The top markets for U.S. exports are: Canada, China, Japan, South Korea, and the Netherlands. *Fisheries of the United States*, 2020.

¹²⁵ USDA Foreign Agricultural Service. *USDA Foreign Agricultural Service Programs*. <https://www.fas.usda.gov/programs>

¹²⁶ USDA FAS-sponsored international trade missions open doors and deliver results for U.S. exporters, giving them the opportunity to forge relationships with potential customers, gather market intelligence, and, most importantly, generate sales. *Id.*

¹²⁷ Specific to SMEs, USDA FAS offers two financial assistance programs that provide repayment guarantees to reduce the risk for external investors to fund these types of enterprises: (1) the Export Credit Guarantee (GSM-102) and (2) the Facility Guarantee Program. Additionally, SBA offers the State Trade Expansion Program that provides financial awards to state and territorial governments to assist small businesses with export development. *Id.*; U.S. Small Business Administration. *State Trade Expansion Program*. <https://www.sba.gov/funding-programs/grants/state-trade-expansion-program-step>

¹²⁸ The USDA Market Access Program (MAP) funds the U.S. Sustainability Alliance, which provides online guidance and launched a public awareness campaign in 2022. USDA Foreign Agricultural Service. *USDA Foreign Agricultural Service Programs - Market Access Program (MAP)*. <https://www.fas.usda.gov/programs/market-access-program-map>. Also see USDA Foreign Agricultural Service. *USDA Foreign Agricultural Service Programs - Agricultural Trade Promotion Program*. <https://www.fas.usda.gov/programs/agricultural-trade-promotion-program-atp>

Action 4.4.1 NOAA, FDA, and USDA FAS international trade programs will collaborate on a coordinated approach to identify targeted actions to promote seafood industry exports, engage with the aquaculture industry on opening market access, and ensure responsible trade that support broader goals for conservation and sustainable use of marine resources. This will include supporting interagency working groups implementing the National Export Strategy.¹²⁹

Action 4.4.2 USDA (FAS) will work with industry and trade groups to promote both market research and information exchange to identify and pursue foreign market opportunities for seafood products, equipment, and aquaculture inputs (e.g., feeds).

Action 4.4.3 USDA (FAS) and SBA will work with U.S. Trade and Development Agency, the U.S. Department of State, state and territorial agencies, regional partners, and private entities to promote resources and financial assistance programs for U.S. exporters seeking entry into foreign markets, including participation in federally endorsed trade shows and virtual webinars to increase awareness of international opportunities.

Action 4.4.4 NOAA will work with USDA (FAS) and FDA to improve interagency coordination to identify non-tariff trade barriers and unfair trade practices for fish and fish products, including aquaculture products.

Action 4.4.5 The USDA FAS regional offices will work with the U.S. Department of State to encourage harmonization of regional and national trade rules to increase transparency and predictability, which will reduce costs and risk to U.S. exporters.

Action 4.4.6 USDA (APHIS), in consultation with federal partners, will advance the Comprehensive Aquaculture Health Program Standards (CAHPS) and the National Aquaculture Health Plan and Standards (NAHP&S). These efforts promote the health of U.S. farm-raised aquatic animals and ensure that health requirements established by trading partners, foreign and domestic, are met.

Action 4.4.7 The U.S. Codex Office will facilitate, with federal partners, the development of consistent and established international standards, guidelines, and norms for aquaculture production, antimicrobial resistance, aquatic animal hygiene, and water quality.

Objective 4.5: Explore the Expansion of Seafood Purchases for Federal Nutrition Assistance Programs

The USDA Agricultural Marketing Service (AMS) purchases a variety of domestically produced and processed commodity food products through a competitive process among approved vendors, and the USDA Food and Nutrition Service (FNS) distributes the products to recipients of federal nutrition assistance programs. These programs promote the consumption of domestic products and provide nutritious food to people in need. Some examples of federal nutrition assistance programs include:

- National School Lunch Program
- Emergency Food Assistance Program
- Food Distribution Program on Indian Reservations

To explore expanding use of commodity purchase programs, federal agencies will implement the following actions:

¹²⁹ U.S. Department of Commerce. *National Export Strategy (2023)*. <https://www.trade.gov/sites/default/files/2023-06/National-Export-Strategy-2023.pdf>

Action 4.5.1 USDA (FNS, AMS) will continue and expand outreach to aquaculture producers (including those that qualify for Small Business Socioeconomic Programs¹³⁰) to disseminate relevant information about commodity purchase programs and criteria to be considered, and to explore the potential to expand purchases (quantity and variety) of seafood products.

Action 4.5.2 USDA (FNS, AMS) will engage with the Department of Defense and the Federal Emergency Management Agency to explore opportunities to secure more seafood in their commodity purchase programs.

¹³⁰ USDA Agricultural Marketing Service. *Small Business Opportunities*. <https://www.ams.usda.gov/selling-food/small-businesses>