



## **National Oceanic and Atmospheric Administration MARINE AQUACULTURE POLICY<sup>1</sup>**

### **Purpose**

The purpose of this policy is to enable the development of sustainable marine aquaculture within the context of the National Oceanic and Atmospheric Administration's (NOAA) multiple stewardship missions and broader social and economic goals. Meeting this objective will require NOAA to integrate environmental, social, and economic considerations in management decisions concerning aquaculture. This policy reaffirms that aquaculture is an important component of NOAA's efforts to maintain healthy and productive marine and coastal ecosystems, protect special marine areas, rebuild overfished wild stocks, restore populations of endangered species, restore and conserve marine and coastal habitat, balance competing uses of the marine environment, create employment and business opportunities in coastal communities, and enable the production of safe and sustainable seafood.

### **Statement of Policy**

For purposes of this policy, aquaculture is defined as the propagation and rearing of aquatic organisms for any commercial, recreational, or public purpose. This definition covers all production of finfish, shellfish, plants, algae, and other marine organisms<sup>2</sup> for 1) food and other commercial products; 2) wild stock replenishment for commercial and recreational fisheries; 3) rebuilding populations of threatened or endangered species under species recovery and conservation plans; and 4) restoration and conservation of marine and Great Lakes habitat.

It is the policy of NOAA, within the context of its marine stewardship missions and its strategic goals with respect to healthy oceans and resilient coastal communities and economies, to:

1. Encourage and foster sustainable aquaculture development that provides domestic jobs, products, and services and that is in harmony with healthy, productive, and resilient marine ecosystems, compatible with other uses of the marine environment, and consistent

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<sup>1</sup> The term "marine aquaculture" is used because the majority of NOAA's aquaculture authorities and activities relate to marine species. However, this policy applies to all of NOAA's aquaculture authorities and activities, including those related to marine, freshwater, and anadromous species and includes the Great Lakes.

<sup>2</sup> This definition does not include marine mammals or birds.

with the National Policy for the Stewardship of the Ocean, our Coasts, and the Great Lakes (National Ocean Policy).<sup>3</sup>

2. Ensure agency aquaculture decisions protect wild species and healthy, productive, and resilient coastal and ocean ecosystems, including the protecting of sensitive marine areas.
3. Advance scientific knowledge concerning sustainable aquaculture in cooperation with academic and federal partners.
4. Make timely and unbiased aquaculture management decisions based upon the best scientific information available.
5. Support aquaculture innovation and investments that benefit the Nation's coastal ecosystems, communities, seafood consumers, industry, and economy.
6. Advance public understanding of sustainable aquaculture practices; the associated environmental, social, and economic challenges and benefits; and the services NOAA has to offer in support of sustainable aquaculture.
7. Work with our federal partners, through the Joint Subcommittee on Aquaculture<sup>4</sup> and other avenues, to provide the depth of resources and expertise needed to address the challenges facing expansion of aquaculture in the United States.
8. Work internationally to learn from aquaculture best practices around the world and encourage the adoption of science-based sustainable practices and systems.
9. Integrate federal, regional, state, local, and tribal priorities along with commercial priorities into marine aquaculture siting and management and ensure aquaculture development is considered within other existing and potential marine uses to reduce potential conflicts.

### **Basis for the Policy**

NOAA has a long history of conducting regulatory, research, outreach, and international activities on marine aquaculture issues within the context of its missions of service, science, and environmental stewardship. The National Aquaculture Act of 1980, which applies to all federal agencies, states that it is “in the national interest, and it is the national policy, to encourage the development of aquaculture in the United States.” The statutory basis for NOAA’s aquaculture activities includes the Magnuson-Stevens Fishery Conservation and Management Act, the Marine Mammal Protection Act, the Endangered Species Act, the Coastal Zone Management

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<sup>3</sup> EO 13547, which adopts the final recommendations of the Interagency Ocean Policy Task Force (July 19, 2010) is available online at <http://www.whitehouse.gov/oceans>.

<sup>4</sup> The Joint Subcommittee on Aquaculture of the Federal Coordinating Council on Science, Engineering, and Technology was created in the National Aquaculture Act of 1980. The purpose of the coordinating group is to increase the overall effectiveness and productivity of federal aquaculture research, transfer, and assistance programs.

Act, the National Marine Sanctuaries Act, and the Fish and Wildlife Coordination Act. Under these laws, in addition to the National Environmental Policy Act, NOAA is responsible for considering and preventing and/or mitigating the potential adverse environmental impacts of planned and existing marine aquaculture facilities through the development of fishery management plans, sanctuary management plans, permit actions, proper siting, and consultations with other regulatory agencies at the federal, state, and local levels. Other statutes, including the National Sea Grant College Program Act, the Saltonstall-Kennedy Act, the Anadromous Fish Conservation Act, the Interjurisdictional Fisheries Act, the Merchant Marine Act, and the Agricultural Marketing Act, authorize NOAA to enable and provide assistance for both public and private sector aquaculture. In addition, the Oceans and Human Health Act calls for research related to aquaculture.

NOAA may engage in regulatory actions in the Exclusive Economic Zone under the authority of the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) through Fishery Management Plans for species in need of conservation and management. NOAA may also engage in regulatory action under National Marine Sanctuaries Act (NMSA) authority with respect to aquaculture activities within or potentially affecting Sanctuaries. NOAA has a direct regulatory role for aquaculture within the sanctuaries, in both state and federal waters, except in state waters when limited by formal written agreement with the Governor of that state. NOAA also engages in consultations with other federal permitting agencies under the authority of the Endangered Species Act, Marine Mammal Protection Act, the Essential Fish Habitat provisions of the Magnuson-Stevens Fishery Conservation and Management Act, the National Environmental Policy Act, and other statutes. Through the Coastal Zone Management Act, NOAA also reviews and approves state coastal management programs, which identify permissible uses in the coastal zone, and oversees federal consistency with these programs.<sup>5</sup>

In developing this policy, NOAA evaluated the application of past NOAA and Department of Commerce aquaculture policies and planning documents and considered the specific challenges and opportunities of today and tomorrow, drawing on the agency's institutional knowledge of the state of science on aquaculture and its potential impacts. In addition, NOAA considered public input provided via an initial public comment period and a series of seven public listening sessions during April and May 2010, and a 60-day public comment period on a public draft of this policy released in February 2011.<sup>6</sup> The policy also aligns with several objectives in NOAA's Next Generation Strategic Plan and is a primary component of NOAA's strategic objective for safe and sustainable seafood.<sup>7</sup>

This policy was also informed by the National Ocean Policy and the framework for effective coastal and marine spatial planning (CMSP).<sup>8</sup> Many of the themes found in the National Ocean Policy – such as protecting, maintaining, and restoring healthy and diverse ecosystems;

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<sup>5</sup> Some federal permit actions are subject to state review under the consistency certification provisions of the Coastal Zone Management Act.

<sup>6</sup> Summaries of the listening sessions and all comments submitted as public input to the development of the NOAA aquaculture policy are posted online at <http://aquaculture.noaa.gov>

<sup>7</sup> Available at [http://www.ppi.noaa.gov/strategic\\_planning.html](http://www.ppi.noaa.gov/strategic_planning.html)

<sup>8</sup> Final Recommendations of the Interagency Ocean Policy Task Force. Available online at <http://www.whitehouse.gov/administration/eop/ceq/oceans>

supporting sustainable uses of the ocean; and increasing scientific understanding and applying that knowledge to make better decisions – are echoed in this document. This policy also mirrors the National Goals for CMSP, setting the stage for aquaculture to be properly considered within the CMSP process. NOAA, as the primary bureau within the Department of Commerce with programmatic aquaculture responsibilities, developed this policy as a complement to the broader Department of Commerce aquaculture policy.

## Background

Approximately 84 percent of the seafood consumed in the United States is imported,<sup>9</sup> about half of which is sourced from aquaculture. In 2009, aquaculture crossed the threshold of providing more than half of all seafood consumed worldwide.<sup>10</sup> However, domestic aquaculture provides only about 5 percent of the seafood consumed in the United States.<sup>11</sup> Growing U.S. and worldwide demand for seafood is likely to continue as a result of increases in population and consumer awareness of seafood's health benefits. The most recent federal *Dietary Guidelines for Americans* (2010) recommend Americans more than double their current seafood consumption.<sup>12</sup> Because wild stocks are not projected to meet increased demand even with rebuilding efforts, future increases in supply are likely to come either from foreign aquaculture or increased domestic aquaculture production, or some combination of both.

The existing domestic marine aquaculture community is mainly comprised of shellfish growing, but also includes finfish and algae production in coastal waters and hatchery production of fish and shellfish to replenish stocks of important commercial, recreational, and endangered species and to restore marine habitat (e.g., oyster reefs). Emerging technologies for marine aquaculture include land-based closed-recirculating systems, marine algae production technologies for biofuels and non-food products, systems that integrate different types of aquaculture or combine aquaculture with other uses, and systems in exposed open-ocean waters.

Federal support, engagement, and authorities related to aquaculture development span a number of agencies, in particular the Food and Drug Administration, Environmental Protection Agency, Army Corps of Engineers, Fish and Wildlife Service, and the U.S. Department of Agriculture. These agencies collaborate with each other, industry, states, and academia to address issues related to aquaculture facilities<sup>13</sup> and to promote the development of new technologies that

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<sup>9</sup> Source: U.S. Department of Commerce, *Fisheries of the United States 2009*.

<sup>10</sup> United Nations Food and Agriculture Organization. (2009). FISHSTAT Plus: Universal Software for Fishery Statistical Time Series (Food and Agriculture Organization, Rome). Version 2.32. This figure includes both freshwater and marine production.

<sup>11</sup> This figure includes both freshwater and marine production. Not included in this figure is the amount of salmon produced in Alaska by regional aquaculture associations and others in Alaska's salmon stock enhancement program. In 2009, Alaska's salmon aquaculture stock enhancement programs produced over 45 million salmon, mostly pink and chum salmon.

<sup>12</sup> See [www.mypyramid.gov](http://www.mypyramid.gov)

<sup>13</sup> A recent example is the National Aquatic Animal Health Plan, which was developed in response to the growing need for a coordinated government effort to ensure aquatic animal health. See <http://aquaculture.noaa.gov/news/naahp.html>

improve the sustainability of the industry. This policy sets the stage for NOAA's continued involvement in these coordinated efforts.

## **Benefits and Challenges**

As interest in commercial aquaculture production and wild species restoration in the marine environment has increased, so too has debate about the potential economic, environmental, and social effects of aquaculture – and the need for better public understanding with respect to these issues. Benefits of sustainable aquaculture may include species and habitat restoration and conservation; nutrient removal; provision of safe, local seafood that contributes to food security and human health and nutrition; increased production of low trophic-level seafood; and synergies with fishing (e.g., using fish processing trimmings in aquaculture feeds). Sustainable aquaculture can also contribute economic and social benefits by creating jobs in local communities and helping to maintain the cultural identity of working waterfronts.

Environmental challenges posed by aquaculture, depending upon the type, scope, and location of aquaculture activity, may include nutrient and chemical wastes, water use demands, aquatic animal diseases and invasive species, potential competitive and genetic effects on wild species, effects on endangered or protected species, effects on protected and sensitive marine areas, effects on habitat for other species, and the use of forage fish for aquaculture feeds. Economic and social challenges may include market competition affecting the viability of domestic aquaculture and/or the prices U.S. fishermen receive for their wild seafood products; competition with other uses of the marine environment; degraded habitats and ecosystem services; and impacts to diverse cultural traditions and values.

Growing consumer demand for safe, local, and sustainably produced seafood, increasing energy costs, increasing seafood demand in countries that currently export seafood to the United States, and growing interest in maintaining working waterfronts are emerging drivers that support sustainable domestic aquaculture production. U.S. aquaculture production – both small-scale and large-scale – has evolved and improved over time through regulations at the federal and state levels, scientific advancements, consumer demand, technological innovation, industry best management practices, and protocols for responsible stock replenishment and hatchery practices. This policy will allow NOAA to further advance these developments through the actions described below.

## **NOAA Aquaculture Priorities**

To implement the Statement of Policy, NOAA has identified the following priorities:

### **Science and Research**

- Expand NOAA's research portfolio to (1) provide the necessary ecological, technological, economic, and social data and analysis to effectively and sustainably develop, support, manage, and regulate private and public sector marine aquaculture and species restoration, including technologies deemed necessary under recovery and

conservation plans for depleted, threatened, and endangered species and habitat; (2) monitor, assess, and address the environmental and socioeconomic effects of marine aquaculture, including cumulative impacts; and (3) complement the scientific work of our federal, state, and academic partners.

- Evaluate alternative protein and lipid sources to be used in lieu of wild fish and fish oil in aquaculture feeds and develop cost-effective alternative feeds that maintain the human health benefits of seafood and reduce reliance on the use of wild forage fish in the diets of farmed fish.
- Develop and evaluate the cost-effectiveness of methodologies to prevent, minimize, and mitigate potential adverse ecosystem and socioeconomic impacts of aquaculture.
- Monitor and assess the effects of ocean acidification and climate change on marine aquaculture and develop adaptation strategies.

## **Regulation**

- Actively engage federal agencies, Fishery Management Councils, federal advisory councils or committees, coastal states, tribes, other stakeholders, and Congress to clarify NOAA's regulatory authority related to aquaculture in federal waters in the context of other federal, state, and tribal authorities and to establish a coordinated, comprehensive, science-based, transparent, and efficient regulatory program, taking into account relevant international standards, as appropriate, for aquaculture in federal waters consistent with the President's Executive Order on Improving Regulation and Regulatory Review.
- Work with federal, state, local, tribal, and regional agencies and organizations to clarify regulatory requirements and to establish coordinated, comprehensive, science-based, transparent, and efficient processes for permit reviews, permit consultations, and other regulatory and management actions for marine aquaculture in state waters – taking into account existing authorities, international standards, and regional, state, and local goals, policies, and objectives.
- Engage in coastal and marine spatial planning with other agencies and jurisdictions, including the Regional Planning Bodies being created under the National Ocean Council, to ensure siting of marine aquaculture that reduces conflicts among competing uses, minimize adverse impacts on the environment, and identify activities for potential co-location with aquaculture operations.

## **Innovation, Partnerships, and Outreach**

- Collaborate with federal partners, coastal communities, states, tribes, the aquaculture industry, non-governmental organizations, and other stakeholders to transition innovative aquaculture technologies from laboratory studies to commercial and restoration projects and document and assess their environmental, ecosystem, and socioeconomic impacts. Focus on projects that will create jobs in coastal communities, produce healthful local

seafood, revitalize working waterfronts, support traditional fishing communities, avoid impacts to protected areas, and restore depleted species and habitat.

- Work with extension and outreach services to interpret technical and scientific data and provide informational products to transfer that knowledge to other stakeholders and the public.
- Support restoration and commercial shellfish aquaculture initiatives to restore shellfish populations that provide locally produced food and jobs, help improve water quality, and restore and conserve coastal habitat.
- Develop synergies among NOAA's fisheries management, enforcement, financial assistance, aquaculture, seafood inspection, Coastal Zone Management, National Marine Sanctuaries, and National Sea Grant programs to rebuild wild fish stocks and support alternative or supplemental economic options for fishermen.
- Engage within the Joint Subcommittee on Aquaculture and National Ocean Council to promote coordination among federal agencies on marine aquaculture regulatory and science issues and pursue opportunities for collaboration, such as integrating aquaculture with other ocean uses and using aquaculture facilities as a platform for more comprehensive environmental monitoring.

### **International Cooperation**

- Work with other federal agencies to establish a coordinated, consistent, and comprehensive international strategy on sustainable marine aquaculture that supports and is consistent with U.S. policies and priorities regarding food security, international trade, healthy oceans, and economic well-being.
- Work with other nations, as appropriate, to adopt sustainable aquaculture and seafood safety approaches using the best practices.
- Exchange scientific insights with other nations and promote joint participation in cooperative research that is of potential multinational value, including addressing impacts of aquaculture that breach international boundaries.

### **Implementation and Periodic Review**

NOAA will begin to implement this policy immediately upon release. This policy will henceforth guide all NOAA activities with respect to marine aquaculture, until such time as it is amended or rescinded by the NOAA Administrator.

## **Appendices**

NOAA will take a tiered approach with respect to this policy and may publish more detailed policies related to specific authority to regulate aquaculture activities. These tiered documents will be included as appendices to the overarching policy.

### **Appendix 1. NOAA Guidance for Aquaculture in Federal Waters**

Appendix 1 establishes goals for NOAA's regulatory actions with respect to aquaculture production in federal waters of the U.S. Exclusive Economic Zone, and provides a list of principles and approaches that NOAA will take to achieve each goal. In the future, NOAA will be identifying specific actions to be taken to implement each goal.



## APPENDIX 1

### NOAA GUIDANCE FOR AQUACULTURE IN FEDERAL WATERS

The purpose of this appendix is to establish a set of goals to guide NOAA's regulatory and programmatic actions with respect to aquaculture production in federal waters of the U.S. Exclusive Economic Zone and to provide a list of implementing actions that NOAA will take to achieve each goal. NOAA will take these actions to the extent of the agency's discretion and funding availability under relevant authorities and in coordination with our federal partners.

These goals and implementing actions are an extension of the NOAA Aquaculture Policy, which applies broadly to all marine aquaculture-related activities at NOAA.

#### **Goal 1. Ecosystem compatibility – Aquaculture development in federal waters is compatible with the functioning of healthy, productive, and resilient marine ecosystems.**

NOAA will achieve this goal by:

- developing, implementing, and enforcing ecosystem-based conservation and management measures for aquaculture that fulfill the agency's marine stewardship responsibilities to protect and restore healthy coastal and ocean ecosystems and to conserve living marine resources, their habitats, and other protected areas
- developing, implementing, and enforcing conservation and management measures for aquaculture designed to maintain the health, genetics, habitats, and populations of wild species; maintain water quality; prevent escapes and accidental discharges into the environment; and avoid harmful interactions with wild fish stock, marine mammals, birds, and protected species
- pursuing efforts to restore wild stocks
- supporting the use of only native or naturalized species in federal waters unless best available science demonstrates use of non-native or other species in federal waters would not cause undue harm to wild species, habitats, or ecosystems in the event of an escape
- employing science-based adaptive management
- taking into account the cumulative impacts of aquaculture throughout all trophic levels of the marine environment and in combination with the impacts of other activities
- encouraging the use of aquaculture feeds that either use fish from sustainably managed fisheries or alternative protein and lipid sources
- considering interactions with marine resources managed by other agencies and jurisdictions
- conducting programmatic or site-specific reviews of impacts related to proposed facilities in federal waters in compliance with National Environmental Policy Act requirements

#### **Goal 2. Compatibility with other uses – Aquaculture facilities in federal waters are sited and operated in a manner that is compatible with other authorized uses of the marine environment.**

NOAA will achieve this goal by:

- coordinating with other agencies to develop tools to properly site aquaculture in federal waters, including tools to reduce conflicts among competing uses and identify activities for potential co-location with aquaculture operations, in the context of regional and national coastal and marine spatial planning (CMSP) activities and ecosystem compatibility goals
- incorporating the preferences of states in decisions about aquaculture development in federal waters
- facilitating discussions among interested aquaculture developers, concerned state agencies, Fishery Management Councils, tribes, other federal agencies, federal advisory committees, and the public as early as possible in project planning and development
- promoting the safety of human life at sea and providing situational awareness for those working on offshore aquaculture operations, including coastal and marine forecasts and marine navigation weather

**Goal 3. Best available science and information – Management decisions for aquaculture in Federal waters are based upon the best available science and information.**

NOAA will achieve this goal by:

- basing management decisions on best available scientific information – including biological, technological, ecological, economic, and social data – in management decisions
- synthesizing and delivering information on the current state of scientific understanding about the observed and potential impacts and benefits of open ocean aquaculture
- identifying gaps and uncertainties associated with the current body of knowledge and taking these uncertainties into account in agency decisions
- conducting and supporting scientific studies to inform agency decision-makers on open ocean aquaculture technologies, practices, benefits, costs, and risks and to develop new and improve existing sustainable practices and products
- monitoring, evaluating, and maintaining databases on the impacts of aquaculture, including cumulative impacts, on biodiversity, predator-prey relationships, and other important characteristics of healthy and productive ecosystems
- working with state and federal agencies, academia, tribes, and other entities to improve scientific understanding of the effects of open ocean aquaculture and to develop cost-effective open ocean aquaculture technologies and practices that prevent, minimize, or mitigate negative environmental or societal effects
- updating and adapting conservation and management measures to reflect the best available scientific information
- incorporating the insights gained by other countries that actively participate in open ocean aquaculture activities

**Goal 4. Social and economic benefits – Investments in sustainable aquaculture in federal waters provide a net benefit to the Nation’s economy, coastal communities, and seafood consumers while considering regional and state goals and objectives.**

NOAA will achieve this goal by:

- creating opportunities for new aquaculture jobs and economic growth for U.S. communities that complement commercial and recreational fishing, maintain and revitalize working waterfronts, provide upstream and downstream economic opportunities throughout the U.S. economy and provide additional domestic seafood choices for U.S. consumers
- assessing the food safety and human health effects of consumption of aquaculture products (foreign and domestic) in coordination with other federal agencies
- making the agency's fee-for-service seafood inspection services available to aquaculture producers operating in federal waters
- assessing the likely positive and negative social, economic, and cultural impacts of management decisions, individually and cumulatively, over both the short and long term, on permit applicants, individual communities, the group of all affected communities identified, and the U.S. economy, including impacts on employment and the economic viability of working waterfronts
- identifying, developing, and supporting mitigation measures to address social, economic, and cultural impacts

**Goal 5. Industry Accountability – To secure long-term access to operate aquaculture facilities in federal waters, operators are held accountable for protecting the environment, wild species, and human safety and for conducting and reporting ongoing monitoring.**

NOAA will achieve this goal by working with federal agencies and other partners to develop an appropriate framework through which operators of aquaculture facilities will:

- conduct a baseline environmental analysis of the proposed site prior to permit review
- prepare and implement a broodstock management plan, an aquatic animal health plan, and a contingency plan for responding to emergencies
- prepare, obtain federal approval for, and comply with an operating plan that uses recognized best management practices to ensure good husbandry, biosecurity, predator control, and maintenance practices that minimize the number and frequency of escapes, disease outbreaks, noise impacts, and entanglements
- prepare, obtain federal approval for, and comply with a monitoring plan to meet all monitoring and reporting requirements, including reports of escapes, disease outbreaks, drug or chemical applications, nutrient discharges, and other environmental monitoring as required by NOAA or other federal agencies
- incorporate environmentally efficient and responsible management practices that limit inputs and waste discharges into the environment from drugs, chemicals, feeds, etc.
- allow regular inspection of facilities by authorized officers
- provide, upon request, evidence of compliance with applicable laws, including those governing use of drugs and feeds and other operational details that are under the jurisdiction of other agencies
- provide evidence of an assurance bond to address facility removal and site remediation
- safely remove facilities and organisms once operations end and, to the extent necessary and practicable, restore environmental conditions of the site
- ensure the safety of human life at sea

**Goal 6. Approval process – Management decisions for aquaculture operations in federal waters are made in an efficient and transparent manner that produces timely, unbiased, and scientifically based decisions.**

NOAA will achieve this goal by:

- implementing efficient, coordinated, transparent, and timely processes for science-based permit review and issuance and making easily understood information about the permitting process and requirements available on the agency's website
- reducing regulatory uncertainty and minimizing unnecessary regulatory burden on individuals, private or public organizations, or federal, state, tribal, or local governments
- coordinating permit review, approval, and enforcement, both internally and with other federal agencies, to ensure compliance with existing regulatory requirements and to foster an efficient and timely regulatory process
- providing public notice and opportunities for Fishery Management Council, state, tribal, local government and stakeholder input on agency management decisions
- providing leadership in conducting periodic reviews of federal statutory and regulatory requirements to identify gaps or overlaps in federal authority, clarify federal agency roles and responsibilities, and develop streamlined processes for authorizing aquaculture and enforcing regulatory requirements in federal waters, in consultation with Congress, other federal agencies, Fishery Management Councils, and states

**Goal 7. Public information – The public has an accurate understanding of sustainable aquaculture development in federal waters and the associated environmental, social, and economic challenges and benefits; monitoring information is readily available to the public.**

NOAA will achieve this goal by:

- developing, widely disseminating, and effectively communicating regional and national informational materials on the merits, trade-offs, technologies, species, and practices used to conduct aquaculture in federal waters
- making publicly available – in a timely manner and in accordance with applicable standards for transparency and confidentiality – monitoring data, results, and information submitted by aquaculture facilities operating in federal waters, analyses of the data reported by aquaculture operators in federal waters, and the results of research conducted by NOAA and others
- communicating to the public, through extension or other outreach services, new research findings, particularly those from local research and demonstration projects