Fact Sheet 2022

NOAA FISHERIES

Office of Aquaculture

Aquaculture and Environmental Interactions

A school of juvenile fish swimming in a large tank. Credit: NOAA Fisheries.

ECOSYSTEM SERVICES

Shellfish and seaweed aquaculture can increase food production, create economic opportunities in coastal areas, and can improve the water quality surrounding farm sites among other ecosystem services. Sustainable finfish aquaculture practices can prevent waste from accumulating around farm sites and can reduce potential water quality impacts.

Learn more:
fisheries.noaa.gov/aquaculture

Aquaculture Helps Clean Water

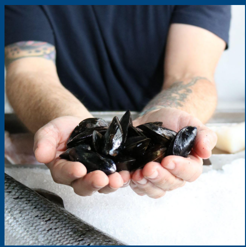
One of the major concerns that people have about aquaculture is its potential effect on water quality. The type of aquaculture practiced largely determines potential impacts to the ecosystem. Shellfish and seaweed farms are often referred to as 'low-to-no input' farms, meaning that no feed, fresh water, or fertilizer are typically required to grow these crops. These farms can actually improve water quality, as the shellfish and seaweed remove excess nutrients, buffer ocean acidification, and create habitat for sea life.

WATER QUALITY IMPACTS OF FINFISH AQUACULTURE

In the United States, responsible fish farming can be one of the most environmentally friendly ways to produce animal protein. Fish require far less feed than most land-dwelling farm animals, and regulations help ensure that best practices are applied to ensure sustainability.

Advancements in feed formulas and feeding efficiency have further improved the sustainability of aquaculture. Additionally, advancements in aquaculture technology, such as the use of automated feeding systems that integrate cameras and machine learning allow for precise and efficient feeding that minimizes waste.

The primary potential water quality effects from fish farms include dissolved nitrogen and phosphorus, water clarity, and dissolved oxygen impacts. However, when farms are sited in flowing water with adequate currents, it is rare to find a decline in water quality. Another benefit of properly sited farms is that with appropriate stocking densities of fish, phytoplankton (algae) are less likely to form harmful blooms that block sunlight and deplete oxygen from marine plants and animals.



WHY FARM SEAFOOD?

Today, the United States ***imports between 70-85% of the seafood we eat*** *by value–more than any other country. Global and domestic demand for seafood continues to grow. Even as we maintain and rebuild our wild harvest fisheries, we cannot meet increasing domestic demand for seafood through wild-caught fisheries alone.*

Marine aquaculture provides a domestic source of economically and environmentally sustainable seafood that complements and supports our wild fisheries production.

Learn more:
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BENTHIC IMPACTS

Benthic impacts can occur in areas where organic nutrients from uneaten feed and fish waste accumulate on the seafloor, and do not decompose quickly enough to keep up with the supply. Healthy seafloor sediments and associated benthic organisms maintain water quality and dissolved oxygen levels, and are essential for both sustaining ecosystem health and farm productivity.

Properly sited farms in areas with adequate currents and with appropriate stocking densities and feeding regimens can typically avoid this over-accumulation of waste materials. In impacted areas, farmers use techniques such as fallowing (relocating or not restocking fish pens) to help the sediment recover, which generally takes a few months.

MANAGEMENT TOOLS

Fish farms in the U.S. must monitor discharges to both the benthic environment and the water column, according to the Clean Water Act, and follow effluent limitations set by the Environmental Protection Agency (EPA). Environmental impact models now allow regulators to assess the suitability of sites, to understand the risks and benefits of potential fish farms, and to estimate the limits of fish biomass for sites.

Good site selection is key in minimizing the impacts of fish farm nutrient runoff to the water column and benthic environment. Fallowing and Integrated Multitrophic Aquaculture (IMTA) are two other tools that can be used to further reduce environmental impacts. Under ideal conditions, farms should not require fallowing.

IMTA is the practice of culturing species from multiple trophic levels that allow for assimilating of fish wastes, thus reducing environmental discharge. The most commonly selected species for IMTA with marine fish are seaweeds, oysters, and mussels.

NOAA RESEARCH

The Coastal Aquaculture Siting and Sustainability (CASS) program, part of the National Ocean Service's National Centers for Coastal Ocean Science, assesses aquaculture environmental interactions to support sustainable coastal aquaculture development CASS uses spatial planning and siting tools to help coastal managers make informed and confident decisions regarding aquaculture in the coastal zone.

Scientists at the Northeast Fisheries Science Center's Milford Lab are investigating the biological, chemical, and physical effects of existing aquaculture activities, such as hydraulic dredging or "fixed gear," on habitat and ecology. They are also exploring the ability of shellfish to extract nutrients from the environment, thus improving water quality.

As they continue to refine the science of improving nutrient removal and water quality through shellfish aquaculture, researchers will share information for the benefit of aquaculture farms, coastal ecosystems, and resource managers across the U.S.