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OCEANS

AQUACULTURE BY DESIGN: FARMING SEAFOOD THE RIGHT WAY

“With earth’s burgeoning human populations to feed, we must turn to the sea with understanding and new technology. We must farm it as we have the land.”

– Jacques Cousteau

People around the world are eating more and more fish. But as wild fish stocks decline, increasingly the seafood landing on people’s plates is farmed. Today, more than half of the seafood produced is from aquaculture, and the \$144 billion a year industry is booming—farm raised seafood now exceeds global beef production. Yet, aquaculture’s rapid rise has spawned environmental costs, including damaged coastal habitats, polluted waters and disease. As the world’s population rises, so will our reliance on aquaculture. The challenge is harnessing how and where it will expand, and what people can do to help steer it towards more sustainable practices so we can produce more seafood with minimal harm to the ocean.

NOW IS THE OPPORTUNITY

As aquaculture spreads to new places around the world, the time is ripe to transform this industry. The good news is that when aquaculture is properly sited and responsibly managed, it has little impact on the environment and can even benefit our oceans and coasts. Ocean farming uses less freshwater, has better feed efficiency and a lower carbon footprint than land-based animal food production. Sustainable shellfish and seaweed aquaculture can also improve water quality, enhance fish habitats, provide good jobs and supply healthy seafood. It can also help alleviate poverty in developing countries.

OUR AQUACULTURE STRATEGY

The Nature Conservancy’s global oceans program helps countries around the world go beyond canned strategies to build durable solutions. We are teaming up with industry and policy makers to make aquaculture not only sustainable but beneficial to our coasts. Using market-based initiatives coupled with new farming methods and policies, we can make aquaculture an ecologically beneficial part of the global food system. Our strategy focuses on two distinct yet complementary approaches: restorative and smart growth.

OUR STRATEGY

RESTORATIVE AQUACULTURE

Shellfish and seaweed are nature's water purification systems; they clean and filter estuaries and bays and provide vital fish habitat. Yet, these species and the services they provide are fast disappearing. By farming shellfish and seaweed, we can provide food and jobs and restore coastal ecosystems. As a global leader in shellfish restoration, the Conservancy will collaborate with industry, government and academia to boost the ecological benefits of shellfish and seaweed aquaculture through three priority areas:

- **Develop the science of aquaculture** to determine how, when and where ocean farming can significantly accelerate restoration and identify the best practices to accomplish this.
- **Implement in-the-water projects** with farmers to modify growing methods, design new farms and apply effective management practices.
- **Address barriers to growth** by simplifying permitting processes and reducing financial and technical obstacles.

SMART AQUACULTURE GROWTH

Where we put aquaculture farms matters. By properly siting them, we can prevent environmental problems. Using our relationship building and ocean planning expertise, the Conservancy will help shape the future of ocean farming to alleviate past problems and allow for growth by:

- Collaborating with government, universities and businesses to **develop new spatial planning and siting tools** for smart aquaculture growth.
- **Providing training and capacity building** in the countries where aquaculture is likely to grow. Working with governments, we will train people in sustainable practices and ensure that local communities are involved in aquaculture siting decisions.
- **Moving aquaculture offshore** to deep waters to minimize environmental and social impacts and address regulatory and technological barriers to offshore aquaculture.



OUTCOMES

BY 2025

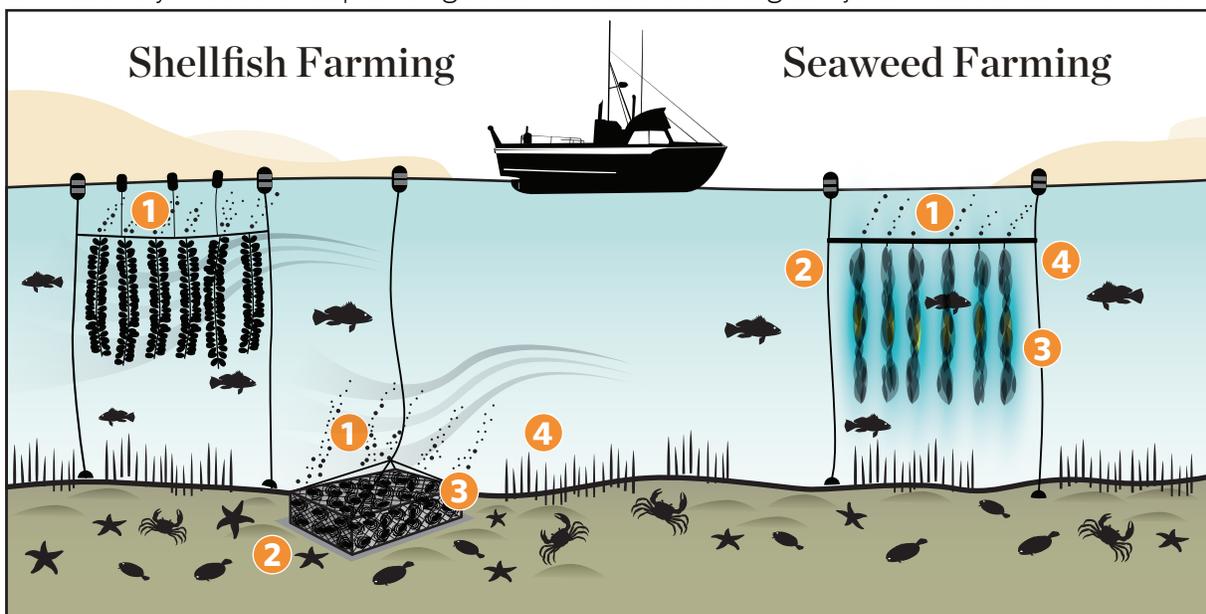
- 15% of new aquaculture growth is sustainable
- Commercial aquaculture is restoring coastal ecosystems in 7 priority estuaries
- Unsustainable aquaculture siting is reduced by 25%

BY 2050

- 50% of new aquaculture growth is sustainable
- Commercial aquaculture is restoring coastal ecosystems in 25 priority estuaries
- Aquaculture is sustainably sited in all countries worldwide

Restorative Aquaculture

We need all hands on deck to recover coastal ecosystems. Coastal ecosystems are threatened by coastal pollution, loss of habitat, overfishing, and face an added threat amplifiers of climate change. When done in the right way and the right places, commercial aquaculture can accelerate ecosystem recovery in addition to providing sustainable seafood and green jobs in coastal communities.



Shellfish Farming

Seaweed Farming

1

Mitigate Pollution
Shellfish and seaweed aquaculture can improve water quality by extracting nitrogen and phosphorous from coastal waterways. As filter feeders, bi-valve shellfish can improve water clarity. These factors can lessen the symptoms of eutrophication, which effects 415 estuaries worldwide.

2

Habitat Provision
85 percent of native oyster populations have been lost worldwide and many seaweed communities are similarly in decline. Shellfish and seaweed aquaculture can provide some of the benefits of these lost habitats.

3

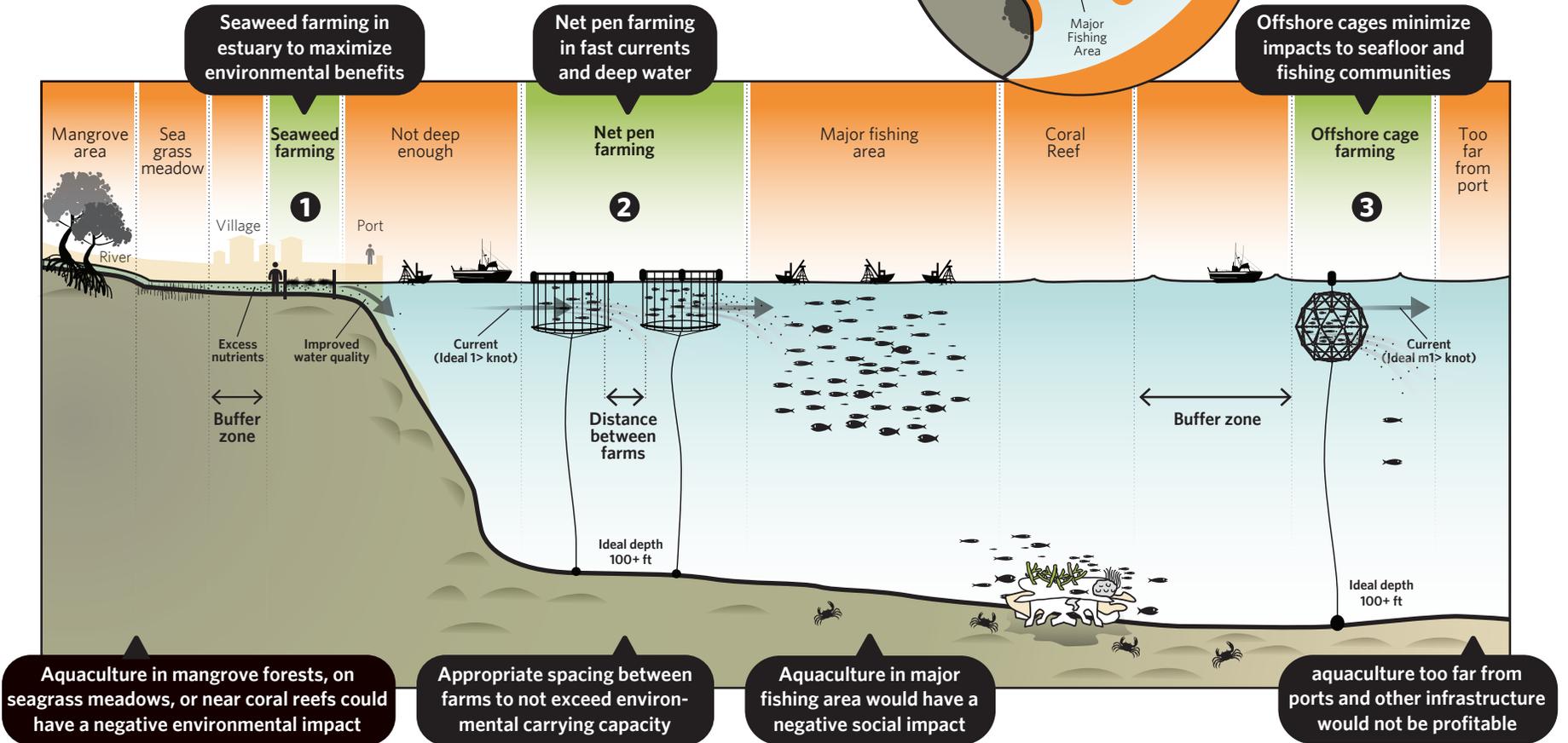
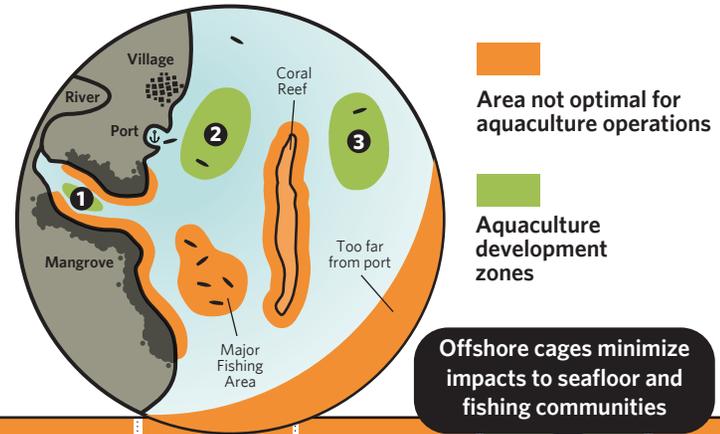
Support Fish Populations
Shellfish and Seaweed aquaculture gear provides refuge for macro-fauna including fish, crustaceans, and other invertebrates.

4

Reduce Local Climate Change Impacts
Seaweed aquaculture can reduce carbon dioxide and oxygenate waterways, and thereby locally mitigate the effects of ocean acidification. Through increased water clarity, shellfish aquaculture may promote the growth of eelgrass beds, a carbon sink.

Smart Aquaculture Growth

Siting of aquaculture operations is the first and most critical consideration to minimize negative impacts of aquaculture operations. It is also a critical factor in determining the profitability of an aquaculture operation. To protect the environment and ensure economic growth, aquaculture operations should be sited in optimal locations based on environmental, economic, and social factors.





Floating oyster cages at Whitestone Oyster Company, Virginia.
© Andy Lacatell

AQUACULTURE BY DESIGN: THE NATURE CONSERVANCY'S GLOBAL AQUACULTURE STRATEGY

Fiscal Year in Review FY 2017

Aquaculture is the fastest growing form of food production globally and is poised to spread to new locations around the world. As one of the most resource efficient ways of producing animal protein, aquaculture has major potential to sustainably increase seafood supplies for a growing population. In parts of the world where aquaculture is poorly managed, however, aquaculture still poses significant environmental challenges. Ensuring aquaculture's new growth is sustainable and ecologically restorative is an important mission for the Nature Conservancy.

I'm pleased to share with you some of the latest updates from the first year of the Nature Conservancy's new Aquaculture by Design Strategy. To develop our newest oceans focused strategy, we discussed with many voices within and outside the Nature Conservancy to arrive at two initial priorities to guide our aquaculture work: **"Restorative Aquaculture"** and **"Smart Aquaculture Growth."**

Our "Restorative Aquaculture" priority focuses on understanding, how, where and when aquaculture can contribute to coastal ecosystem restoration in a variety of environmental contexts. We're developing global assessments and on the ground projects in tandem to answer key science and management questions. Our "Smart Aquaculture Growth" priority focuses on ensuring fish, shellfish, and seaweed aquaculture grows sustainably. We are applying our spatial

planning expertise to aquaculture area management and fostering innovation and technology development in key environmental challenge areas.

Work is now underway for both priorities with many chapters engaged in new on ground projects in the United States, Belize, Indonesia, and Palau. In each project, we are working with industry to address environmental challenges that are also business challenges; applying out of sector skills and technologies to the field of aquaculture to solve pressing issues; and cultivating co-management approaches with farmers to build a bright future for aquaculture.

With a sense of direction, and demonstration projects underway, we are poised make significant conservation gains and provide benefit to coastal communities in the United States and abroad. To learn more, read on for highlights from our project work to date!

Robert Jones
Global Lead, Aquaculture
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Accomplishments for FY 2017

Can Aquaculture Help Improve the Health of Chesapeake Bay?

The Virginia Chapter of the Nature Conservancy has launched a new partnership with four farms on the Chesapeake Bay to assess the effects of aquaculture operations on water clarity with underwater ROVs. Science support will be provided by Virginia Institute of Marine Science, one of the Nation's leading universities focusing on oyster aquaculture. *Project Lead: Andy Lacatell, Virginia Chapter alacatell@tnc.org*



Remotely operated underwater vehicle used by the Virginia Chapter of the Nature Conservancy and the Virginia Institute of Marine Science to assess water quality benefits of shellfish farms.
© Andy Lacatell

and fisheries. NOAA is now prioritizing aquaculture and is keen to work with the Nature Conservancy around the environmental aspects of aquaculture operations. As a first project, we will be partnering with the NOAA National Ocean Service to create a bio-economic

New Strategic Partnership with NOAA

The Nature Conservancy has added aquaculture as a focal area for collaboration with NOAA adding depth to a longstanding relationship on habitat conservation



Offshore aquaculture in the Bahamas.
© NOAA Fisheries

analysis to identify the best places around the world to develop aquaculture for nature and people.

Belize- the Science of Seaweed

The Belize team has added a science component to its seaweed pilot to assess the ecological benefit these farms are providing to juvenile lobster populations, one of Belize's most important fisheries. In FY 2018 we will be working with scientists

from University of New England in attempt to quantify this benefit and determine the ecological relationship between seaweed and lobsters. The Belize team will be teaming up with the Smithsonian Institution to determine the chemical cues that is released by the seaweed that attract settlement of lobster larvae. *Project Lead: Julie Robinson, Mexico and Northern Central America, Julie.robinson@tnc.org*



The Global Aquaculture program consists of 6 on the ground projects in the United States, Belize, Tanzania, Palau, and Indonesia. We have identified 5 additional locations for demonstration projects to further our global strategy.

Accomplishments for FY 2017 (Continued)



Aerial drone imagery of oyster gear and eelgrass at Hog Island Oyster Company in Tomales, California.

© California Chapter of the Nature Conservancy

Flying Drones to Monitor Eelgrass: Oyster farmers remark that their farms are helping to foster eelgrass growth. However, concern over shellfish aquaculture’s potential damage to eelgrass beds is the primary regulatory issue affecting the shellfish industry. The California Chapter of the Nature Conservancy is teaming up with Hog Island Oyster Company and the University of California Santa Cruz to see whether aerial drones can be an inexpensive way to assess aquaculture’s positive and negative impacts on sea grass beds in Tomales Bay, California. The first step of the project is to demonstrate a proof of concept and protocols for using drones for the monitoring work. *Project Lead: Sarah Newkirk, California Chapter Snewkirk@tnc.org*

Public Perceptions of Aquaculture Are Improving, Collaborative TNC Study Says: Through analysis of thousands of newspaper headlines from over 66 nations around the world, public opinion of aquaculture

development is improving. The study is part of the Science For Nature and People Partnership Co-led by the Nature Conservancy and the National Centers for Ecological

Synthesis in Santa Barbara, California. The full paper can be found here: [Froelich et. al 2017](#).

Are Regulations a New Way of Measuring Aquaculture Sustainability?: The Nature Conservancy will be developing an innovative tool to assess the robustness of national aquaculture management regimes. As a test case, we will be comparing U.S. regulations to international standards developed by the United Nations. This approach differs from the predominant method of assessing sustainability by evaluating operations at the individual farm level. If successful, the Conservancy will be able to utilize the tool in countries around the world to assess strengths and weaknesses of management regimes. The project is in cooperation with Dr. Michelle Walsh of the Florida Keys Community College and is funded by NOAA Sea Grant.



Harvesting seaweed on Rote Island, Indonesia
© Robert Jones

Accomplishments for FY 2017 (Continued)

New Partnership with Cargill on Sustainable Seaweed Sourcing: The Nature Conservancy will extend its long history of collaboration on terrestrial issues with the leading agriculture company into the sea with a new collaboration on seaweed aquaculture.

Cargill is a major buyer of seaweed for the industrial food market and is interested in ensuring that their product is sourced sustainably and benefits local communities. Initial pilots will be to develop sourcing standards and training protocol for seaweed aquaculture in Indonesia.

Facebook Live! On the Chesapeake Bay: We filmed one of the Conservancy's first Facebook live videos on location at Big Island Aquaculture Company outside of Gloucester Virginia. The Event was attended by over 10,000 online viewers and featured

TNC staff along with our industry and academic partners. Caroline Spruill from global communications daringly sampled her first oyster in front of a live audience while the Vogt Family, who own and operate the farm, proudly displayed how they cultivate oysters.

New Staff in Feature

Jefferson Tasik: Aquaculture Program Manager, Indonesia Program:

We are very excited to announce Jefferson joined the Nature Conservancy in May to manage the new aquaculture program in Indonesia. He will be working to develop seaweed pilots into a comprehensive program focused on providing livelihoods and reducing negative impacts of seaweed farming. Jefferson has many years of working on the ground in Indonesia with local communities on US AID projects throughout Indonesia. He will be based at the Kupang Field Office. *Contact: Jefferson.Tasik@TNC.Org*



Jefferson Tasik at the Conservancy's demonstration site in Oelolot Village, Rote Island, Indonesia.
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