

Global Aquaculture Program

Restorative Aquaculture *for nature and people*

Robert Jones | Global Lead, Aquaculture

The Nature
Conservancy 



Who We Are

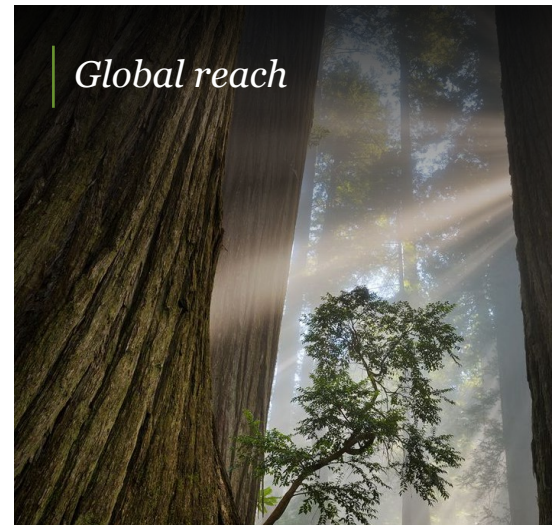
The Nature Conservancy is a global environmental nonprofit working to create a world where people and nature can thrive.



Network

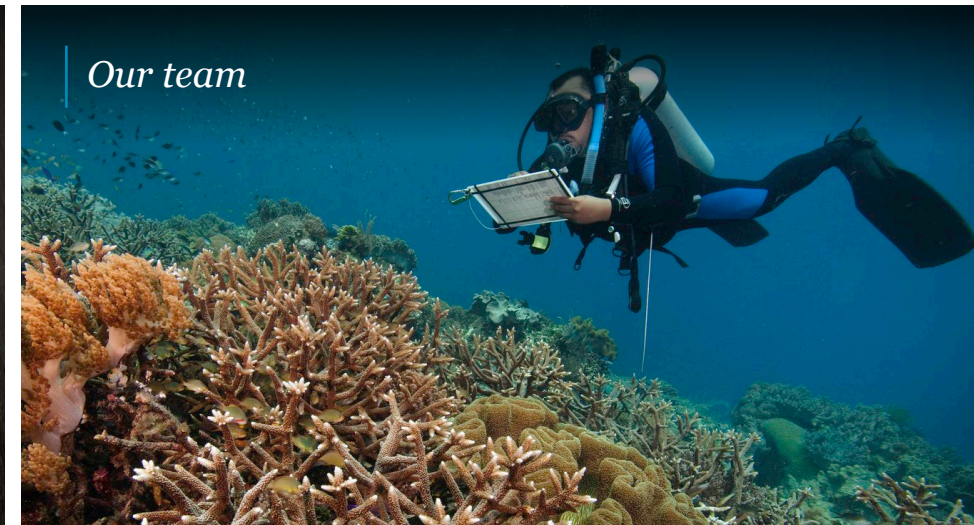
1,000,000
DONORS

1,300
VOLUNTEER LEADERS



Global reach

74
COUNTRIES



Our team

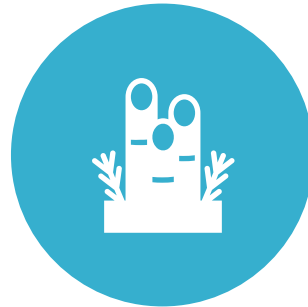
4,000
CONSERVATIONISTS

400+
SCIENTISTS

Major Aquaculture Initiatives Underway at TNC



SOAR:
SUPPORTING OYSTER AQUACULTURE
AND RESTORATION PROGRAM



RESTORATIVE SEAWEED INITIATIVE

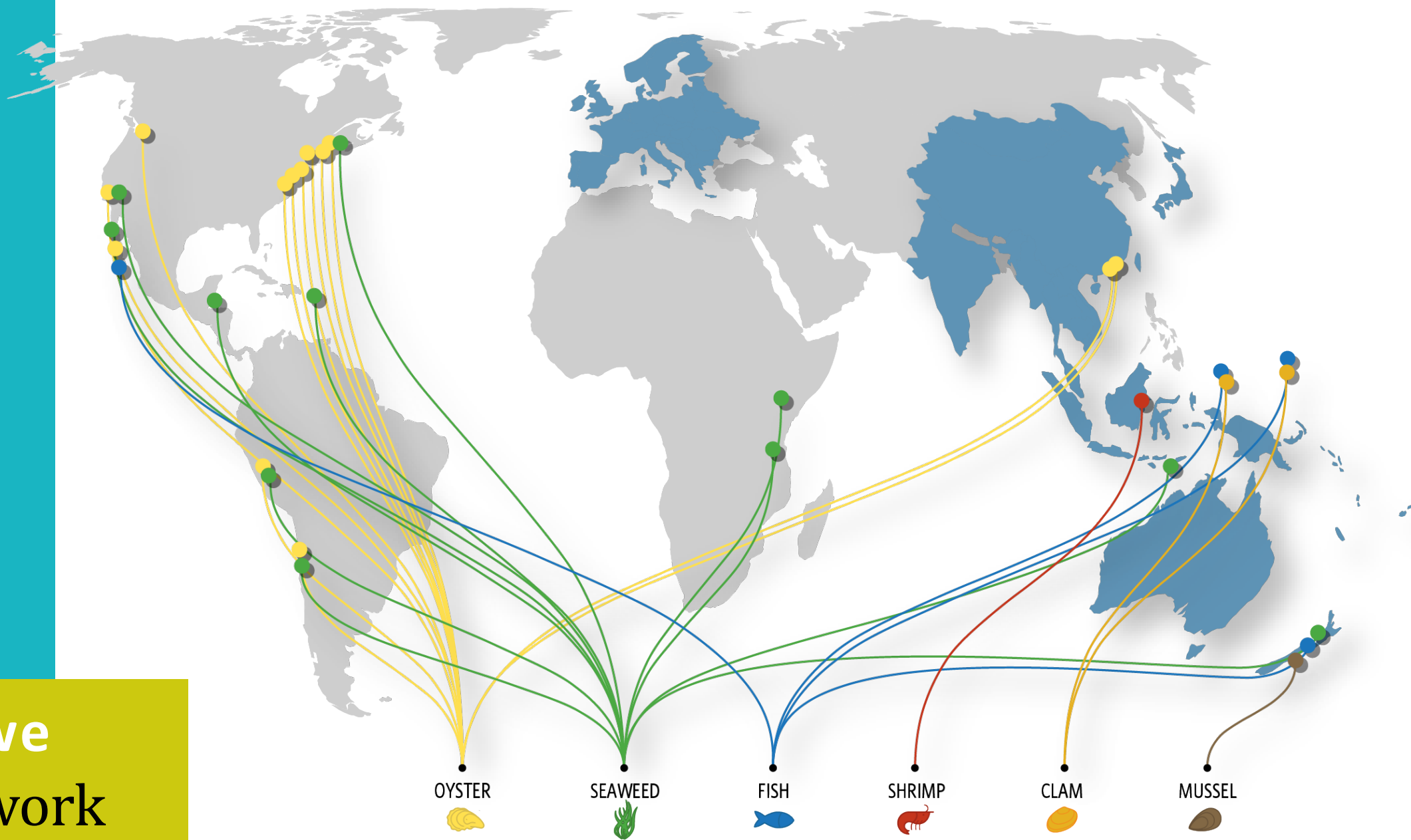


CATALYTIC FINANCE



GLOBAL SCIENCE AND TOOLS

Where we
work



Global Aquaculture Team

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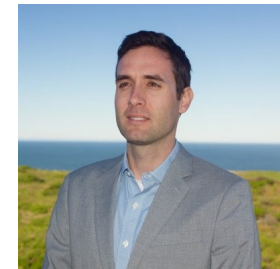
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Global Principles of Restorative Aquaculture

November 2021



- Process and co-authors
- Objectives
- Revised definition
- Environmental Benefits
- Principles
- Roadmaps
- Case Studies

Report available now:
www.nature.org/aquaculture



WORKING GROUPS

Two parallel working groups were held between January to June 2021 to refine the definition, principles, and roadmaps:

- China Society of Fisheries & Global Working Group
- Global working groups with co-authors from 12 organizations, including government, financial institution, university, environmental non-profits

SUGGESTED CITATION

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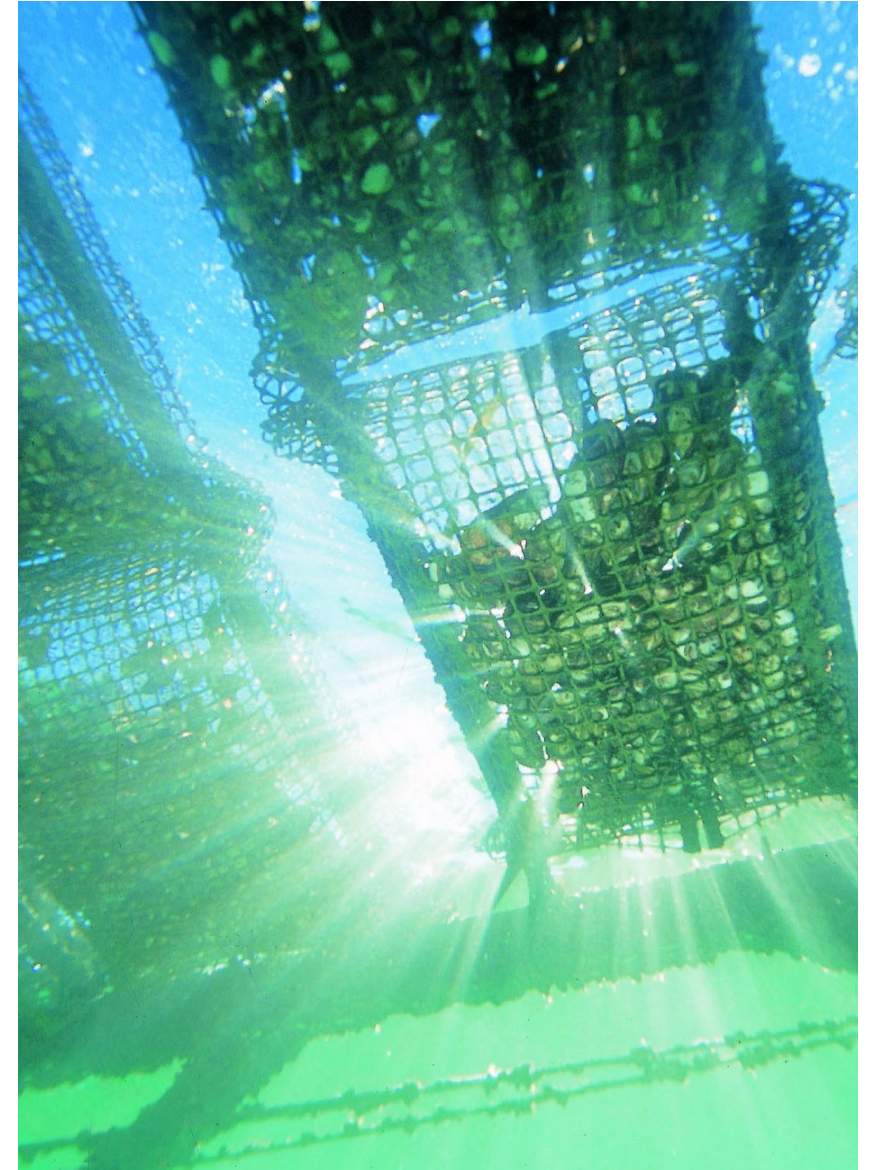
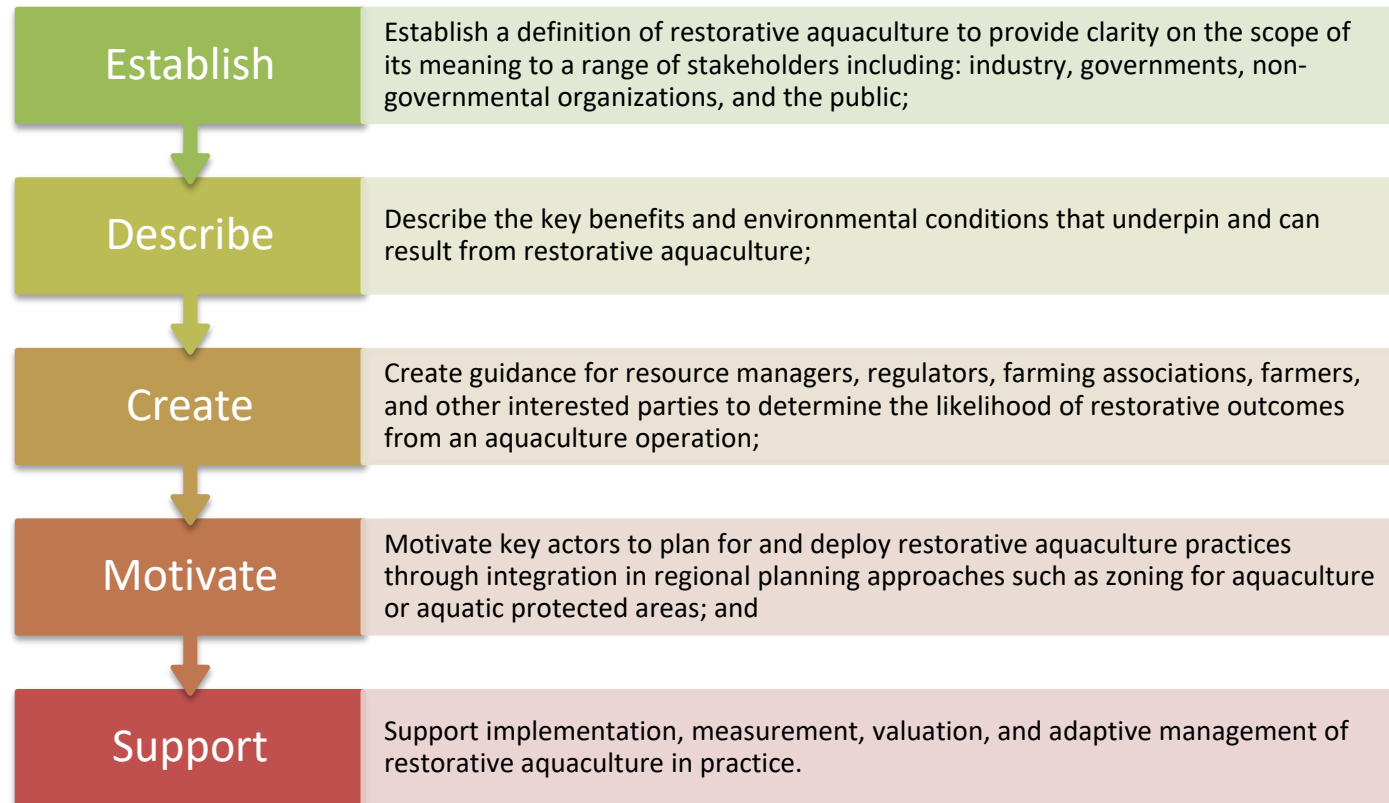
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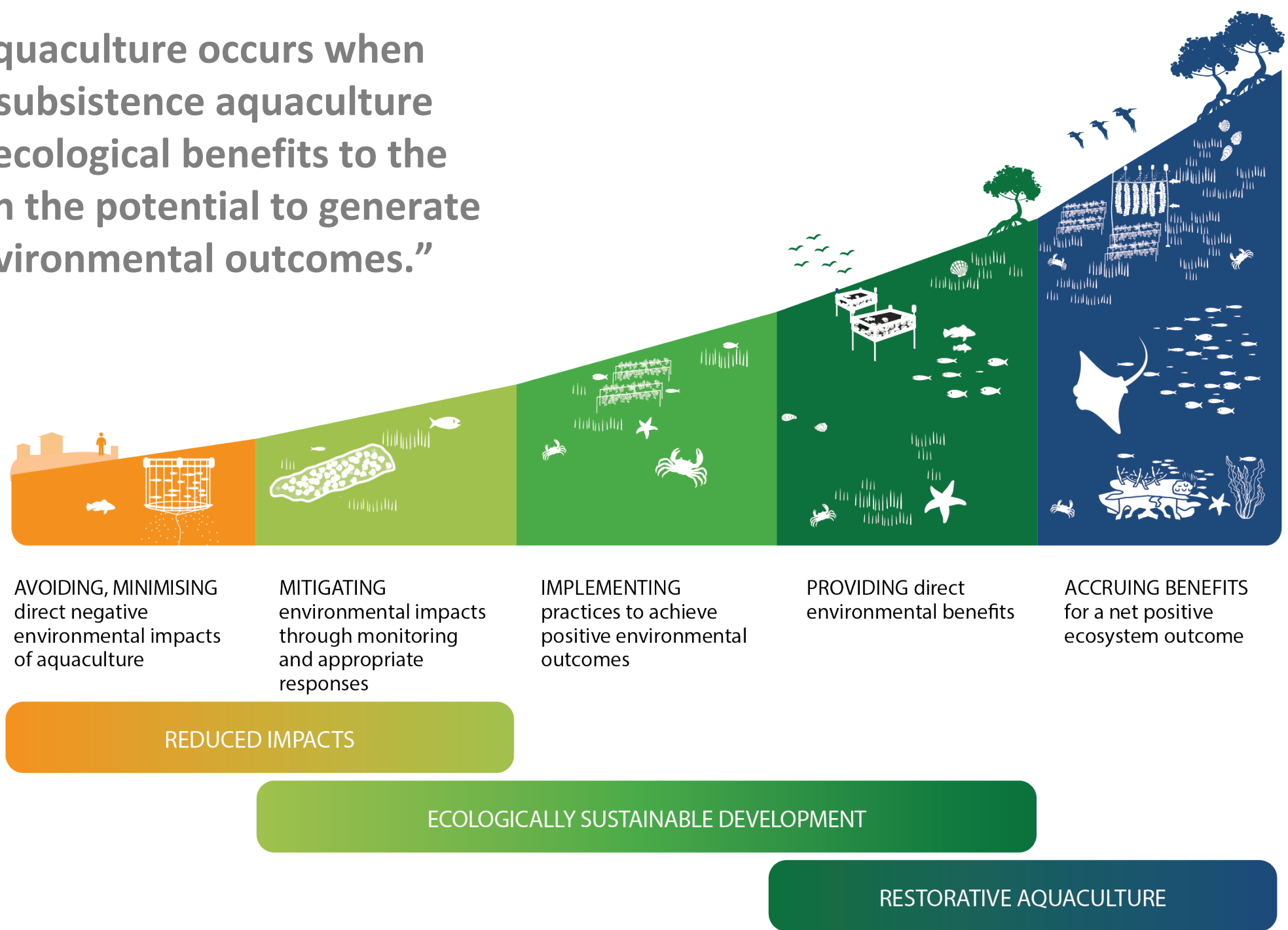
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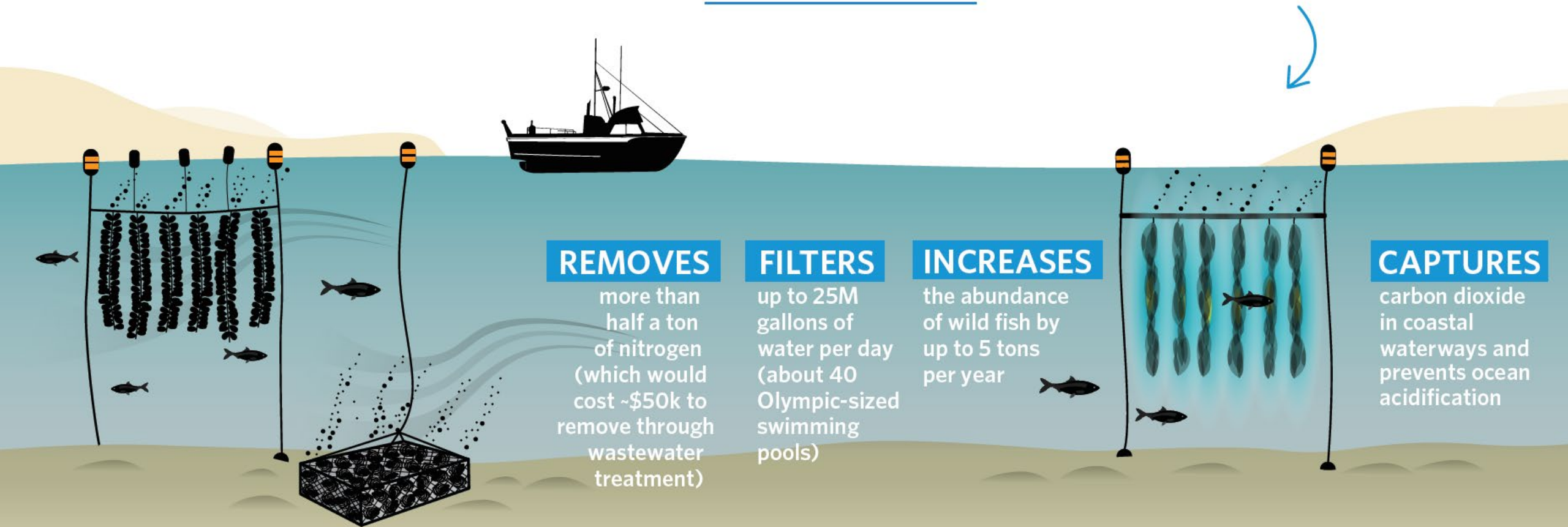
“Restorative aquaculture occurs when commercial or subsistence aquaculture provides direct ecological benefits to the environment, with the potential to generate net positive environmental outcomes.”





ENVIRONMENTAL BENEFITS of Restorative Aquaculture Farms

A SINGLE HECTARE OF RESTORATIVE FARMS...



Global Principles of Restorative Aquaculture

Principle 1: Farms are sited where environmental benefits can be generated

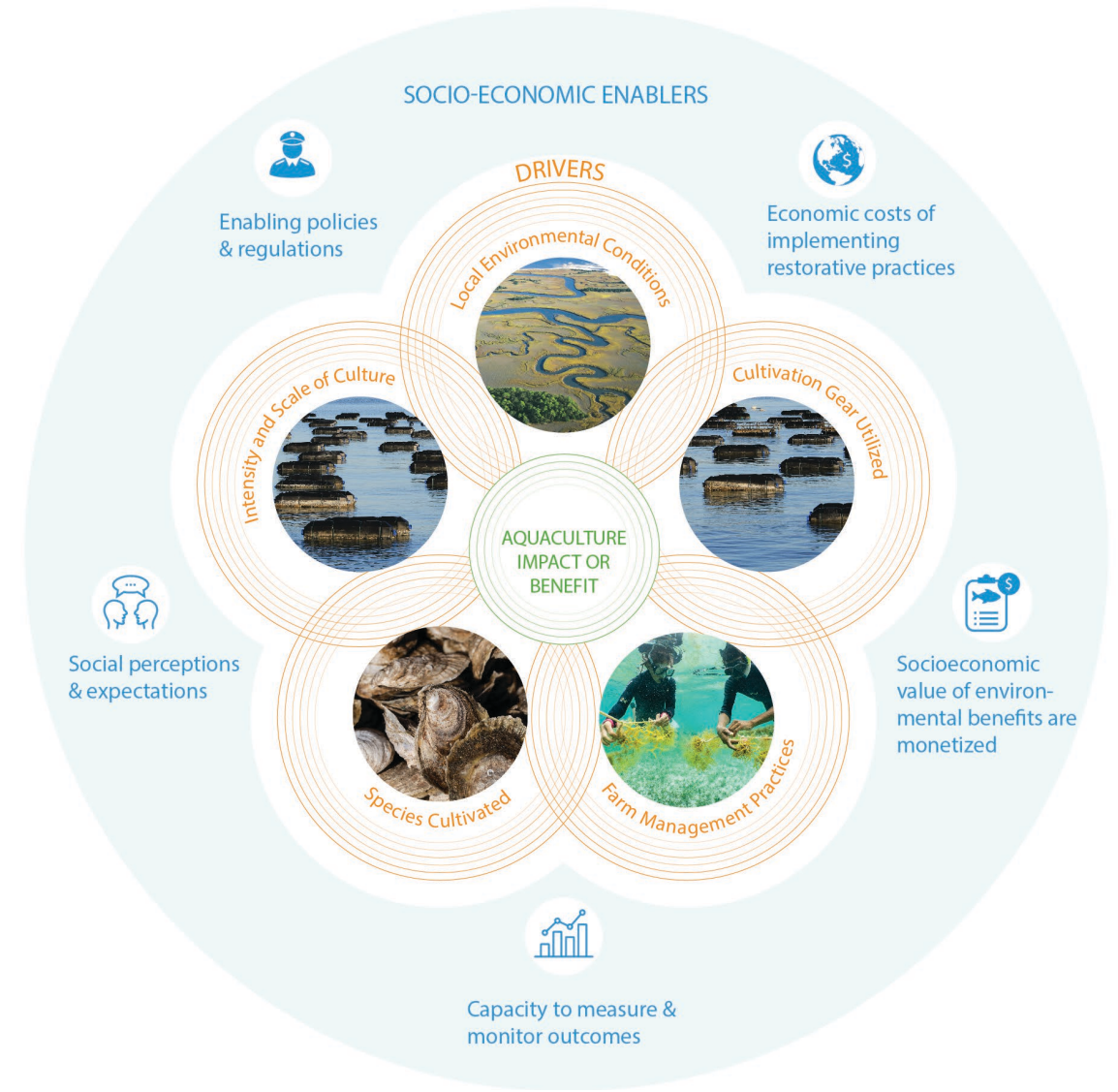
Principle 2: Culture species that can provide the intended environmental benefits intended

Principle 3: Prioritize farming equipment that enhances the delivery of environmental benefits

Principle 4: Adopt farming management practices that can enhance local ecological environmental benefits

Principle 5: Strive to farm at an intensity and scale of culture that can enhance ecosystem outcomes

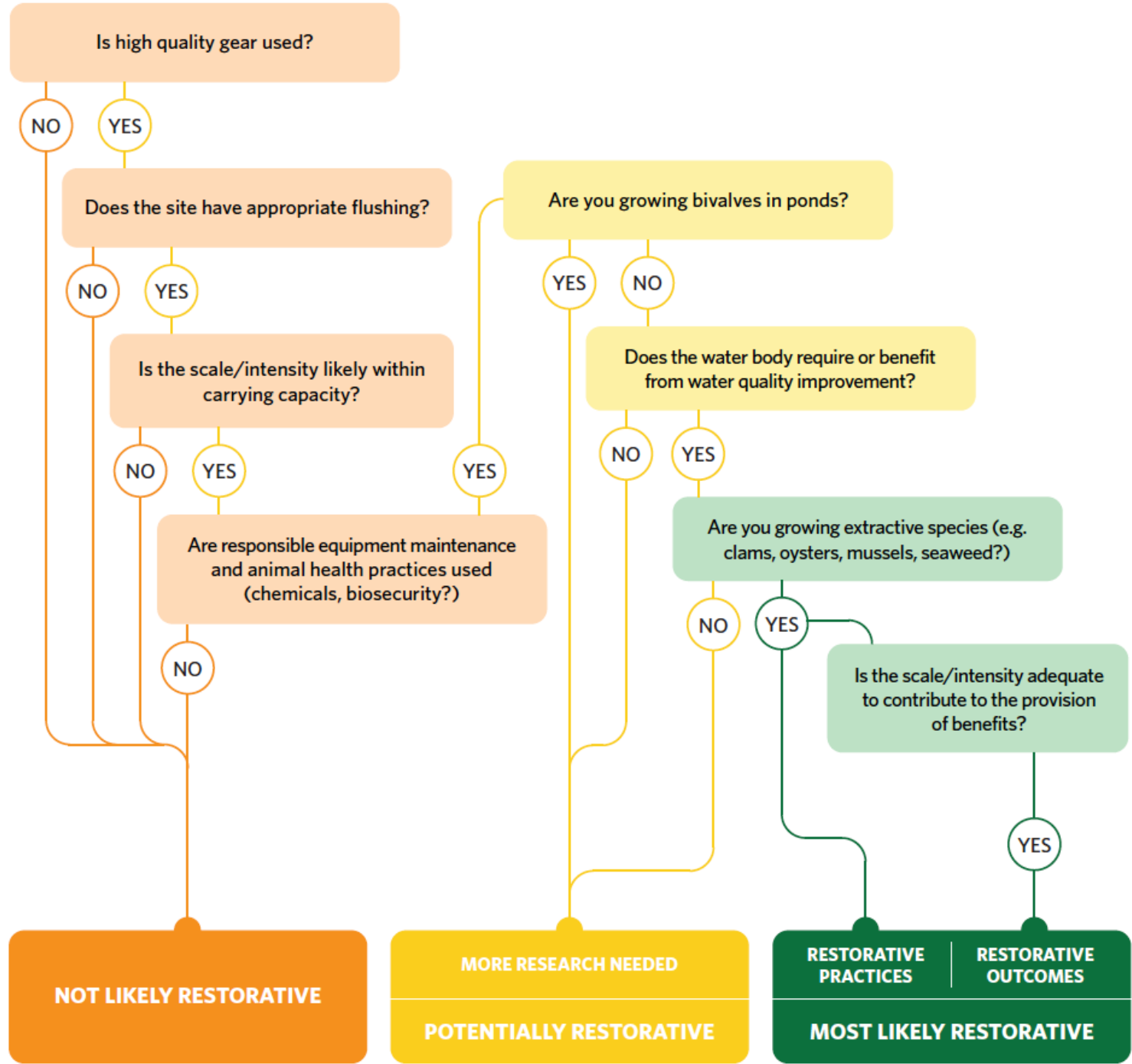
Principle 6: Recognize the social and economic value of the environmental benefits provided





Roadmap for Water Quality Benefits

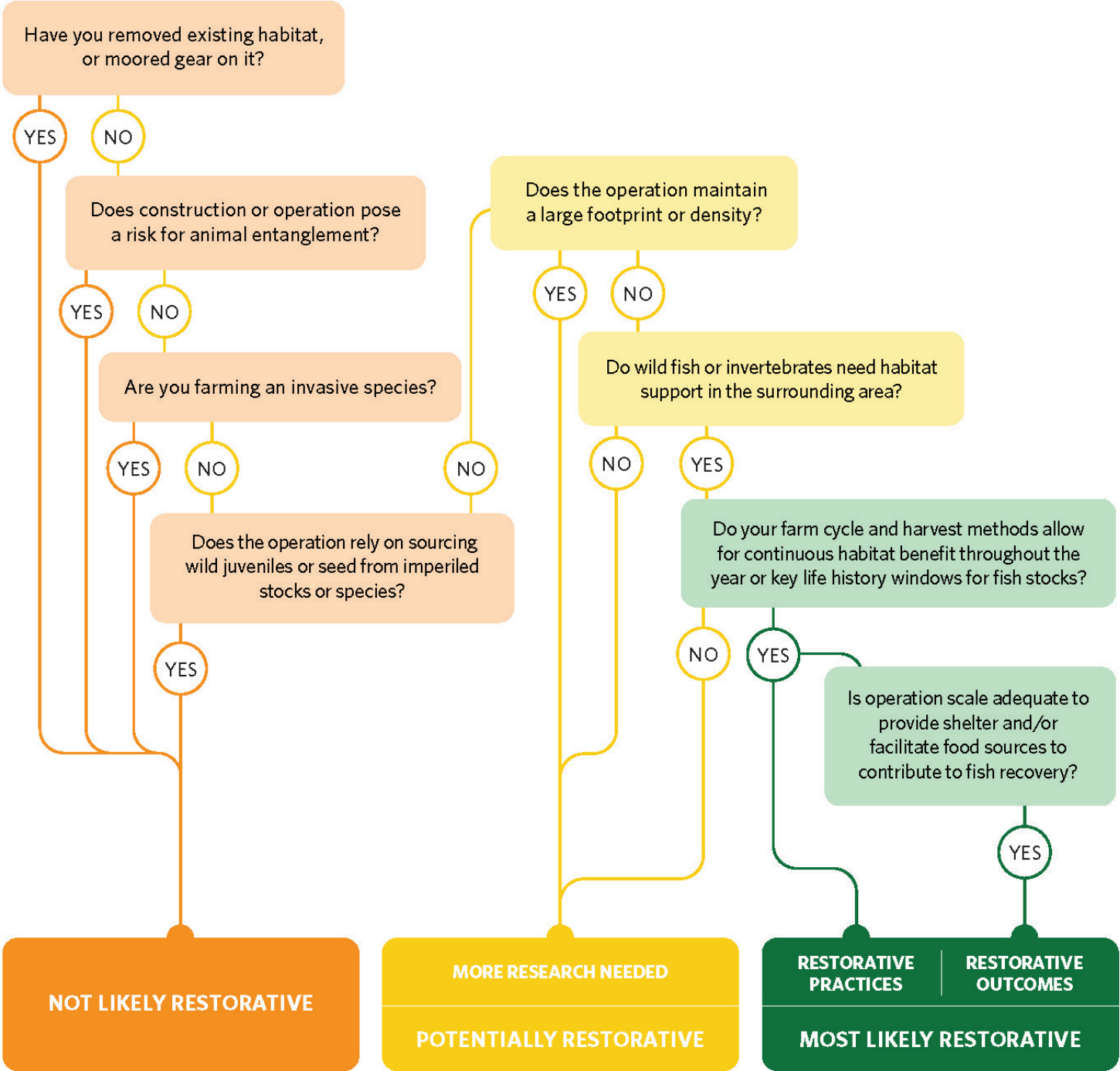
Does this aquaculture operation improve water quality?





Roadmap for Habitat Benefits

Does this aquaculture operation improve habitat and fish stocks?





Filter-feeding Fish Aquaculture
China



Oyster Aquaculture
Chesapeake Bay, USA



Seaweed Aquaculture
Belize

Case Studies



The value of water quality improvements in mariculture



	Nitrogen removal by area			Nitrogen removal by harvest volume		
Taxon	kg ha ⁻¹ yr ⁻¹	USD ha ⁻¹ yr ⁻¹	n	kg t _{FW} ⁻¹	USD t _{FW} ⁻¹	n
Clam	107 (-3-477)	3452 (-99-15410)	7	11 (4-29)	128 (368-937)	6
Mussel	581 (275-1172)	18,756 (8900-37865)	12	13 (8-21)	245 (416-690)	11
Oyster	314 (150-612)	10,147 (4854-19781)	22	25 (16-39)	505 (801-1255)	23
Scallop	52 ^a	1670	0	4.2 ^a	136	0
Seaweed	275 (96-678)	8889 (3084-21886)	8	3.8 (2.6-5.4)	84 (124-175)	34

Barrett, *et al.* (2022) [Sustainable growth of non-fed aquaculture can generate valuable ecosystem benefits](#). *Ecosystem Services*. 53: 101396



Habitat Value of Shellfish and Seaweed Aquaculture

Barrett, *et al.* (2022) [Sustainable growth of non-fed aquaculture can generate valuable ecosystem benefits](#). *Ecosystem Services*. 53: 101396

Table 4
 Descriptive statistics for effects of aquaculture habitat on local production of targeted fish species. Values are for assemblages, i.e. the net effect across all targeted species effectively sampled by a study (minimum 2 species per study for inclusion). Values are presented as means and bootstrapped 95% confidence intervals (both weighted by the number of species effectively sampled). Additional population density can take negative values if aquaculture is associated with lower population density. Values are aggregated regardless of reference habitat (structured or unstructured). Clam and scallop aquaculture are data-deficient for habitat value.

Farmed taxa	n	Relative abundance (lnRR) ^a	Additional production (total kg ha ⁻¹ yr ⁻¹) ^b	Additional production (landable individuals ha ⁻¹ yr ⁻¹) ^b	Additional production (landable kg ha ⁻¹ yr ⁻¹) ^b	Recreational value (USD ha ⁻¹ yr ⁻¹) ^{bc}	Commercial value ex-vessel (USD ha ⁻¹ yr ⁻¹) ^{bc}
Oysters	12	0.86 (0.36–1.37)	1147 (172–2346)	456 (34–1066)	1110 (158–2237)	2848 (476–6603)	2504 (180–5290)
Mussels	5	0.53 (-0.08–1.12)	363 (59–764)	244 (34–478)	348 (57–741)	1919 (336–4125)	997 (139–2042)
Seaweeds	7	0.69 (0.25–1.22)	529 (-144–2452)	680 (60–2129)	494 (-158–2339)	1087 (143–3454)	972 (-538–4994)



LAUNCHING AND EXECUTING THE SOAR PROGRAM

A WIN-WIN FOR PEOPLE AND
NATURE DURING THE COVID-19
PANDEMIC



Impact on Oyster Aquaculture in US



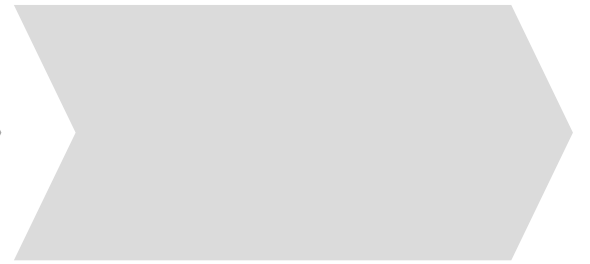
Large Scale
Restaurant
Closures



Decreased
Demand



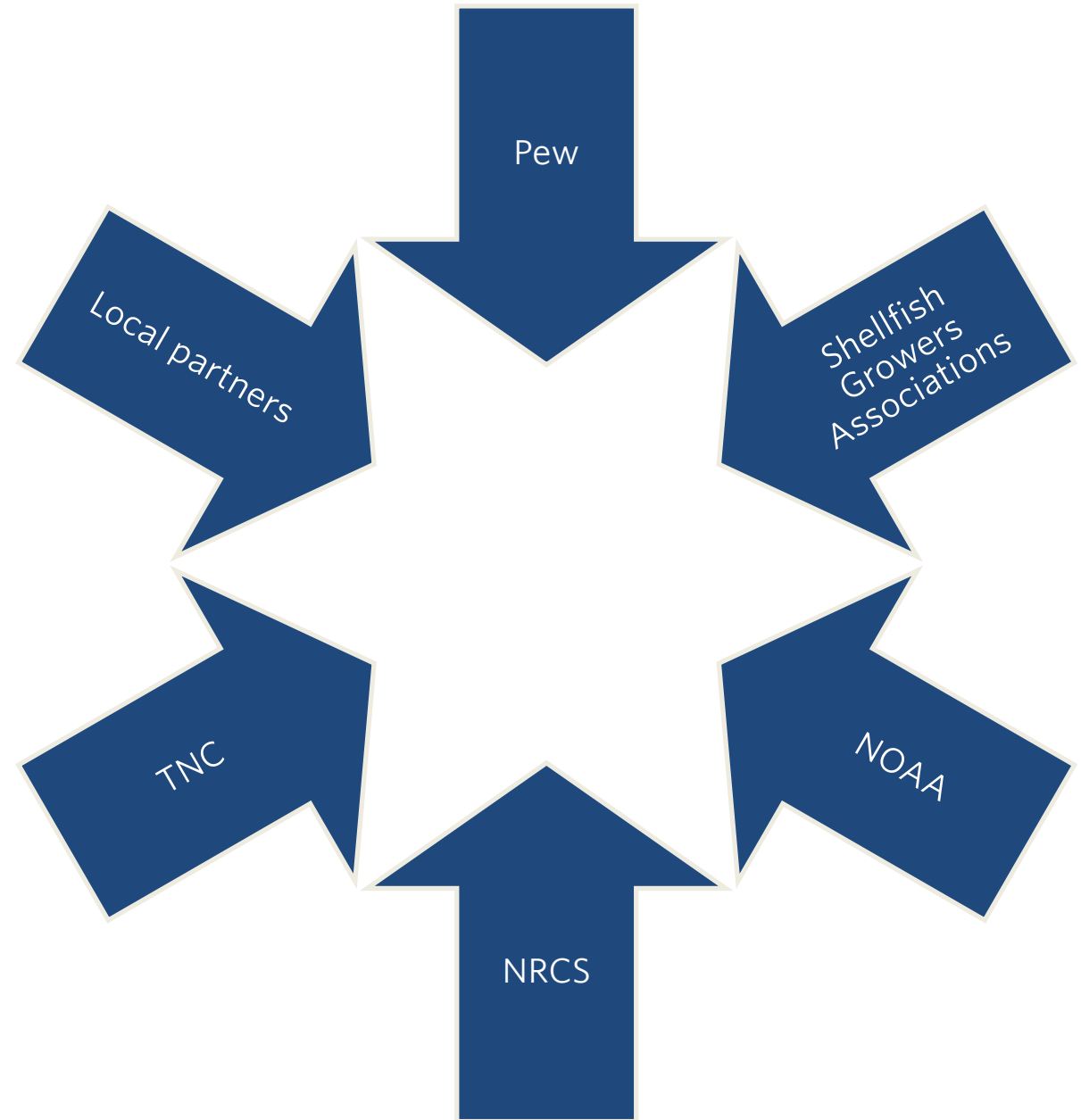
Increased
Surplus



Oversized
Oysters on
Farms



SOAR Collaboration





Oyster Purchase Program

Conservation Impact



3.5+ million
oysters
purchased

125 growers
participated

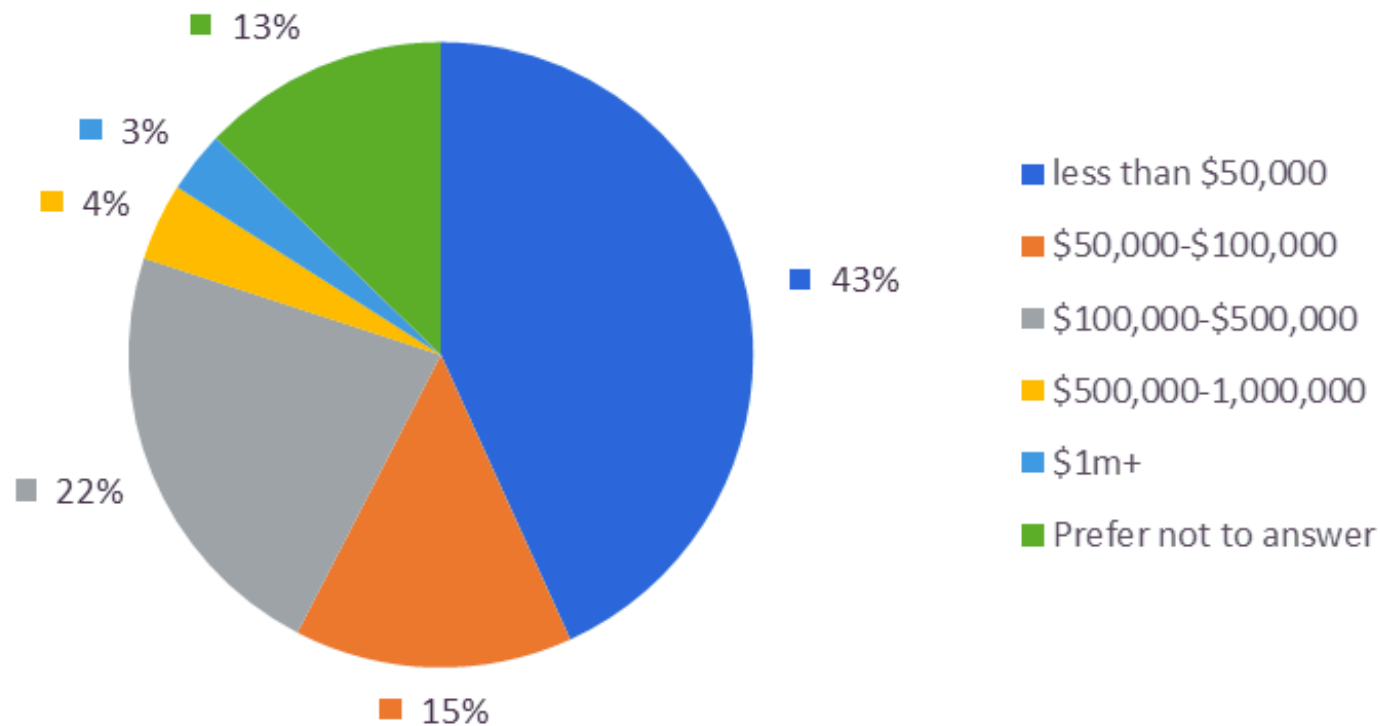
450+ jobs
sustained

~40 acres of
oyster reef
supported

25 restoration
sites

Economic Impact

Approximate gross revenue from oysters (sales) in 2019



\$13,000 average purchase price

1/4 of annual revenue supported for nearly half of farmers

2/3 reported "very beneficial" to sustaining their businesses



SOAR Shellfish Growers Resiliency Fund





The Steering Committee

Aaron Kornbluth, Officer, Conserving Marine Life in the U.S., The Pew Charitable Trusts

Bill Walton, Extension Specialist & Associate Professor, Auburn University Shellfish Laboratory

Bob Rheault, Executive Director, East Coast Shellfish Growers Association

Boze Hancock, Senior Marine Habitat Restoration Scientist, The Nature Conservancy

Christina Popolizio, SOAR Program Coordinator, The Nature Conservancy (*Coordinator*)

Chuck Weirich, Aquaculture Manager, National Sea Grant Office, NOAA

Danielle Blacklock, Director, Office of Aquaculture, NOAA

Gary Fleener, Ecologist, Hog Island Oyster Company

Jan Surface, National Water Quality Specialist/Aquatic Ecologist, USDA NRCS

Laura Brown, Owner and Operative, Fox Point Oysters

Margaret Pilaro, Executive Director, Pacific Coast Shellfish Growers Association

Mark Rath, Aquaculture Manager, National Sea Grant Office, NOAA

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Sandy Zeiner, Shellfish Policy Analyst, Northwest Indian Fisheries Commission



The Priorities

Small Award

- Farmer engagement in shellfish restoration, marine conservation, or broader environmental outcomes
- Efficient farming operations
- Product marketing to increase demand
- New products and species
- Diversity, equity, and inclusion in the shellfish aquaculture industry

Large Award

- Advancing payments for ecosystem services
- Long-term markets for restoration
- Product marketing to increase demand
- New products and species
- Supporting infrastructure and services
- Regulation of shellfish aquaculture



SMALL AWARD
28 projects

LARGE AWARD
8 projects