The Northeast Regional Habitat Assessment:

A collaborative, multi-disciplinary project to develop decision support products for marine fish habitat management

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Presentation to the ASMFC Habitat Committee
November 2022

Acknowledgments

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NOAA NCCOS - Andrew Leight
The Nature Conservancy - Bryan DeAngelis, Rich Bell, Marta Ribera
The PEW Charitable Trusts - Zack Greenberg
Rhode Island DEM - Eric Schneider
US Fish and Wildlife Service -Julie Devers
US Geologic Service - Stephen Faulkner
Virginia Institute of Marine Sciences - Robert Latour
NRHA/FSCVA/HCVA Crosswalk: UMass/SMAST Gavin Fay and Madeleine Guyant, and Project CoPIs, Mike Johnson, Tauna Rankin, Wendy Morrison (NOAA Fisheries)
Other Collaborators: David (Moe) Nelson (NOAA NOS), Aaron Kornbluth (PEW), Lisa Havel and Pat Campfield (ASMFC/ACFHP), Karl Vilacoba, Emily Shumchenia, and Nick Napoli (MARCO/NROC), Sarah Gaichas and Kim Hyde (NOAA Fisheries NEFSC), and Emily Farr

Special thanks to the Councils and NOAA Fisheries Office of Habitat Conservation and Office of Science and Technology for the substantial support provided to NRHA. In addition, this work would not be possible without the support of our many partner organizations represented on our Steering Committee, action team members, and other collaborators.

NRHA Goal: To describe and characterize estuarine, coastal, and offshore fish habitat distribution, abundance, and quality in the Northeast.

Four actions were identified as necessary to meet this goal:

1) Inshore fish habitat assessment
    a) Fish distribution and abundance
    b) Habitat distribution, status, and trends
2) Habitat vulnerability including response to changes in climate,
3) Spatial descriptions of species habitat use in the offshore area, and,
4) Habitat data visualization and decision support tools.

Geographic Scope: Northeast U.S.

South to North

North Carolina/South Carolina boundary to the western end of the Scotian Shelf and includes the Mid-Atlantic Bight, Southern New England, Georges Bank, and the Gulf of Maine.

Inshore to Offshore

Mean high water including estuaries to the shelf-slope break

Focus Species (65+, important to managers)

- **Mid-Atlantic Council:** Atlantic and chub mackerel, butterfish, longfin and shortfin squid, surfclam, ocean quahog, summer flounder, scup, black sea bass, bluefish, golden and blueline tilefish, spiny dogfish
- **New England Council:** Cod, cusk, haddock, pollock, Acadian redfish, plaice, halibut, winter flounder, witch flounder, yellowtail flounder, wolffish, windowpane, ocean pout, offshore, red, and white hake, monkfish, Atlantic herring, salmon, skates (seven species), red crab, sea scallop
- **Additional Atlantic States Marine Fisheries Commission (ASMFC):** Eel, lobster, croaker, menhaden, striped bass, Atlantic sturgeon, black drum, cobia, horseshoe crab, Jonah crab, northern shrimp, red drum, shad and river herring, Spanish mackerel, spot, spotted seatrout, tautog, weakfish, coastal sharks
- **Highly migratory with Habitat Areas of Particular Concern (HAPC) designations:** Sandbar shark, dusky shark

Assessment Products at a Glance

Data inventory

- Catch data from state and federal fisheries-independent surveys; including comparison table
- Environmental datasets (used as model covariates)
- One page metadata document for each survey or data set

Habitat use

- Species profiles: Summarize life history and habitat use for each focus species
- Stage-based, single species and joint (“community”) species distribution models (SDMs)
- Inshore Habitat Report

Climate vulnerability - Species-Habitat Crosswalk

- Species-habitat matrix and climate vulnerability narratives

Habitat data visualization and decision support tools

- NRHA Data Explorer: R-Shiny application used to show trends in species distribution and abundance at state and regional scales, and to share other products and documentation
- Working with partners at Mid-Atlantic Ocean Data Portal, Northeast Ocean Data Portal, and possibly NOAA DisMAP to share selected products

Scientific publications/reports

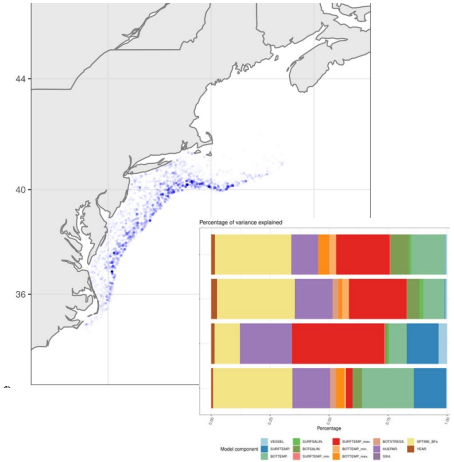
- Community-level Basis Function Modeling methods paper and R package; others in development

Data inventory

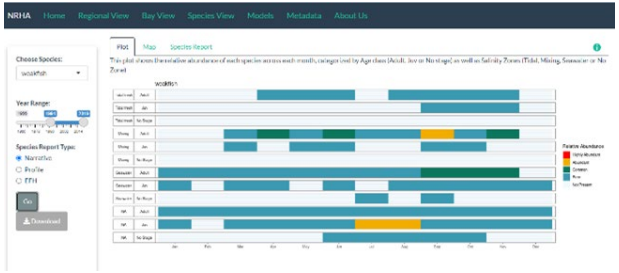
	A	B	C	D	E	
	Name	Region	Inshore/Offshore	Source	Type	Data
	Simple Ocean Data Assimilation (SODA3.3.1)	Entire Atlantic Co	Offshore	NOAA, University o	Point	bottom
	Northwest Atlantic Regional Climatology		Offshore	NOAA		surface
	NOAA OI SST V2 High Resolution Dataset	Global	Offshore	NOAA	gridded	Surfac
	HYCOM + NCODA Global 1/12° Reanalysis	Global	Offshore	COAPS	gridded	3D Hig
	Ocean Acidification tool for the Chesapeake Bay	Chesapeake Bay	Inshore/Offshore	VIMS/NOAA	gridded	surface
	NARR Model based (assimilated, reanalysis)		Offshore	NOAA		High-re
	eMOLT		Offshore	NOAA		Bottom
	Estuarine salinity zones in US	US	Inshore	NOAA	shapefile	Salinity
	NASA Ocean Color	Global		NASA		ocean
	2_nes_zoo - Kevin F.					
	NOAA NMFS Water Column Properties Data	NC to Maine	Offshore	NOAA	spredshe	surface
	USGS Water Data for the Nation	US		USGS		realtim
	Chesapeake Bay Program Water Quality	Chesapeake Bay	Inshore	Chesapeake Bay P	points	physica
	Seafloor Salinity (pss)	Global	Inshore/Offshore	Marine Conservatic	shapefile	bottom
	Salinity Zones for the Gulf of Maine	Gulf of Maine	Inshore	Fish and Wildlife Se	gridded	Salinity

Sediment and Habitat | Bathymetry | Water Chemistry (temp, salinity, chlor, pH) | Coasta

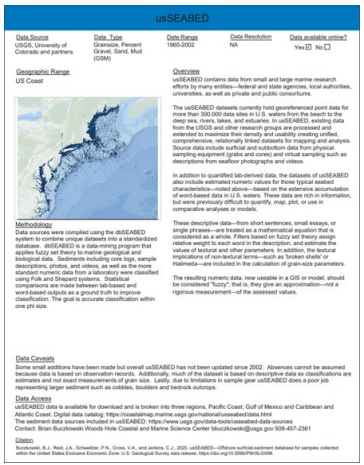
Model-based Approaches



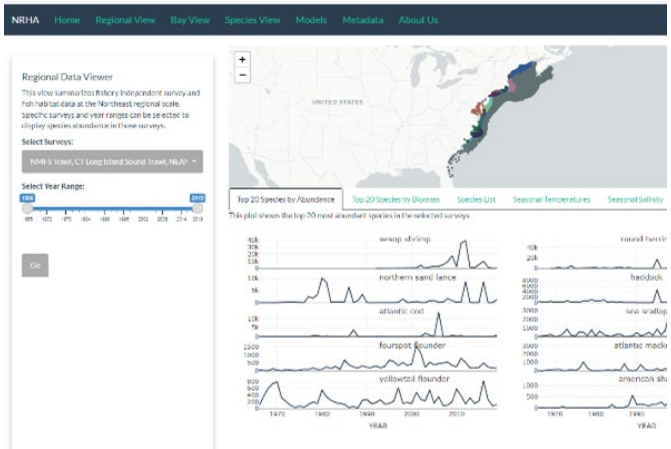
Inshore Fish Data



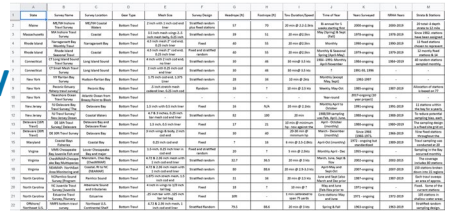
Metadata (1-pagers)



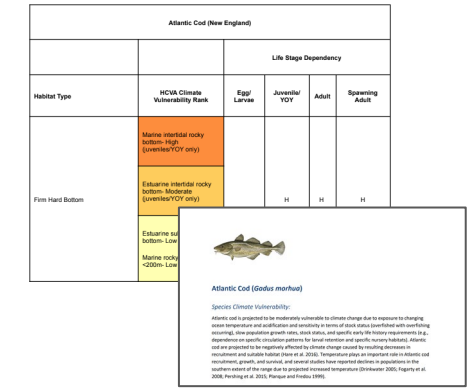
Data Explorer



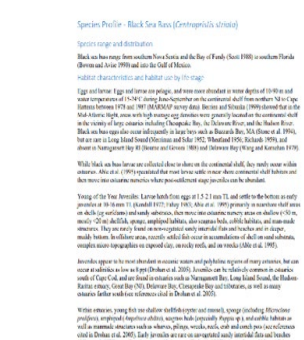
Trawl Survey Comparison



NRHA/CVA/HCVA Crosswalk



Lots of Reports…



Climate Vulnerability Assessment Crosswalk

- Synthesis of information from NOAA's FSCVA, HCVA, ACFHP species-habitat matrix, and EFH designations
- Matrix that indicates species' dependency on (or association with) habitat types, by life stage
- Narratives that describe species and habitat climate vulnerabilities and habitat dependencies, in text and tables
- Will highlight critical/most concerning intersections of species and habitat climate vulnerability
- Products shared via NRHA Data Explorer

Atlantic Cod (New England)					
		Life Stage Dependency			
Habitat Type	HCVA Climate Vulnerability Rank	Egg/ Larvae	Juvenile/ YOY	Adult	Spawning Adult
Firm Hard Bottom	Marine intertidal rocky bottom- High (juveniles/YOY only) Estuarine intertidal rocky bottom- Moderate (juveniles/YOY only) Estuarine subtidal rocky bottom- Low Marine rocky bottom <200m- Low		H	H	H

Atlantic Cod (*Gadus morhua*)

Species Climate Vulnerability:

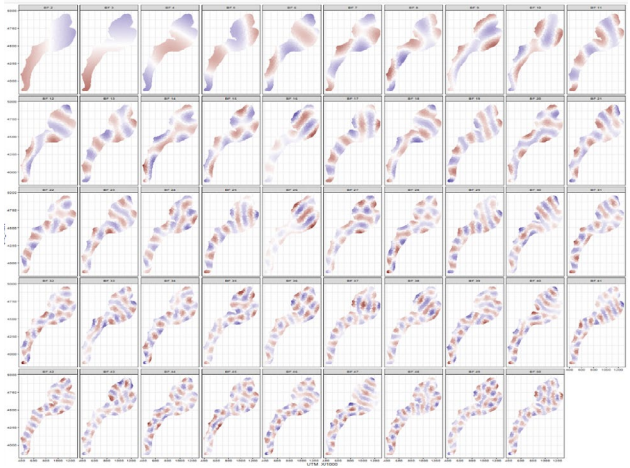
Atlantic cod is projected to be moderately vulnerable to climate change due to exposure to changing ocean temperature and acidification and sensitivity in terms of stock status (overfished with overfishing occurring), slow population growth rates, stock status, and specific early life history requirements (e.g., dependence on specific circulation patterns for larval retention and specific nursery habitats). Atlantic cod are projected to be negatively affected by climate change caused by resulting decreases in recruitment and suitable habitat (Hare et al. 2016). Temperature plays an important role in Atlantic cod recruitment, growth, and survival, and several studies have reported declines in populations in the southern extent of the range due to projected increased temperature (Drinkwater 2005; Fogarty et al. 2008; Pershing et al. 2015; Planque and Fredou 1999).

Characterizing Habitat: A comprehensive modeling strategy

- **Stage-based approach**
  - Partitioning spp. into distinct classes based on ontogeny (i.e., juveniles & adults)
  - Better resolution of stage-specific requirements or habitat shifts?
- **Joint-species distribution model**
  - Using a novel spatiotemporal approach (CBFM) w/ comparison to GAMs
  - Improved predictions & possible ecological insights?
- **Dynamic & ecologically relevant covariates**
  - Temporally varying predictors that reflect dynamic nature of the system
  - Predictors with direct consequences for ecological function of animals

CBFM: Community-level Basis Function model

- **Related to GAMS**
  - Basis functions (BF) model covariance in space & time



Spatio-Temporal Joint Species Distribution Modeling:
A Community-Level Basis Function Approach

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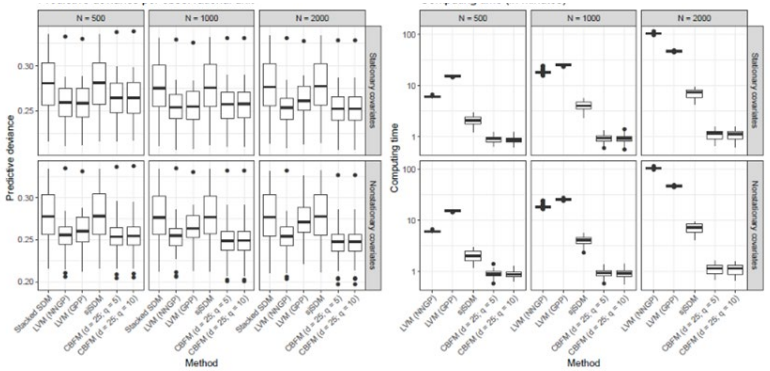


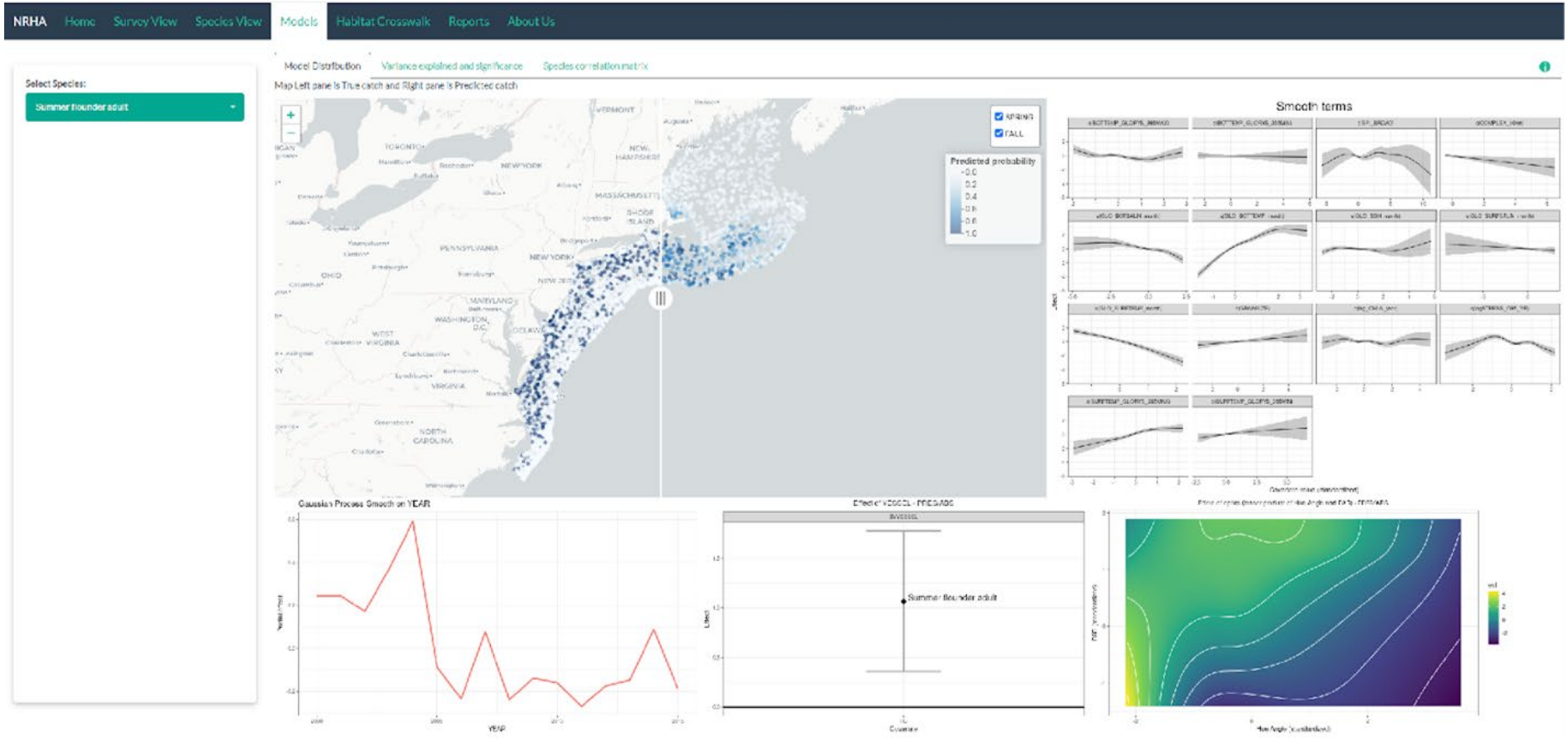
- **Methods Manuscript** w/ Simulation Studies
- **R package** (Github repository, June public release)

GitHub

NRHA CBFM Application

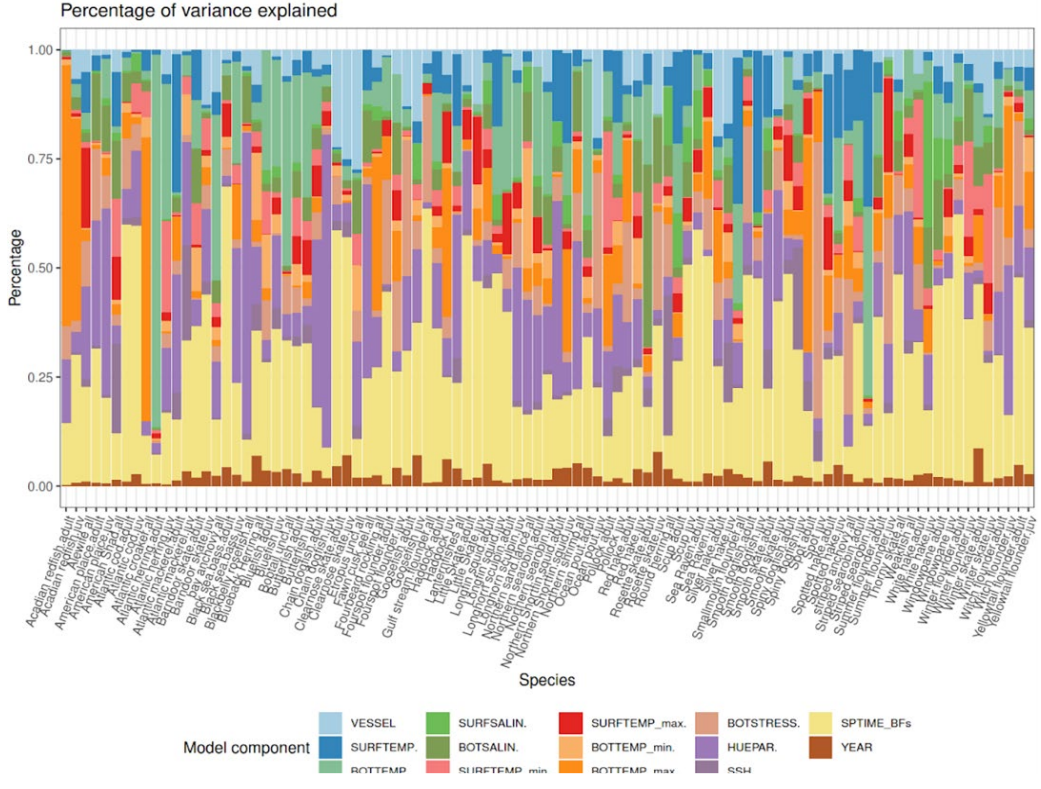
- **97 spp-stages** from NMFS bottom-trawl surveys
  - Demersal, pelagic, benthic spp. (managed, common & prey)
  - Training 2000-2015 (n > 10000 obs), testing 2016-2019 (n > 2700 obs)
- Combined **Spring & Fall** surveys
- Predictors:
  - Surface & bottom **temperature** (monthly & annual min/max), **salinity** (surface & bottom), **sea surface height**, depth (or correlates of depth including **optical environment & hydrodynamic stress**), benthic habitat characteristics (topographic position, complexity & sediment type)
- **Hurdle & ZINB models** (presence/absence & count conditional on presence, or covariate-dependent zero inflation)
- Spatiotemporal Basis Functions (intra-year) & GP smooth on year

Example Predictions: Summer flounder adult (beta)



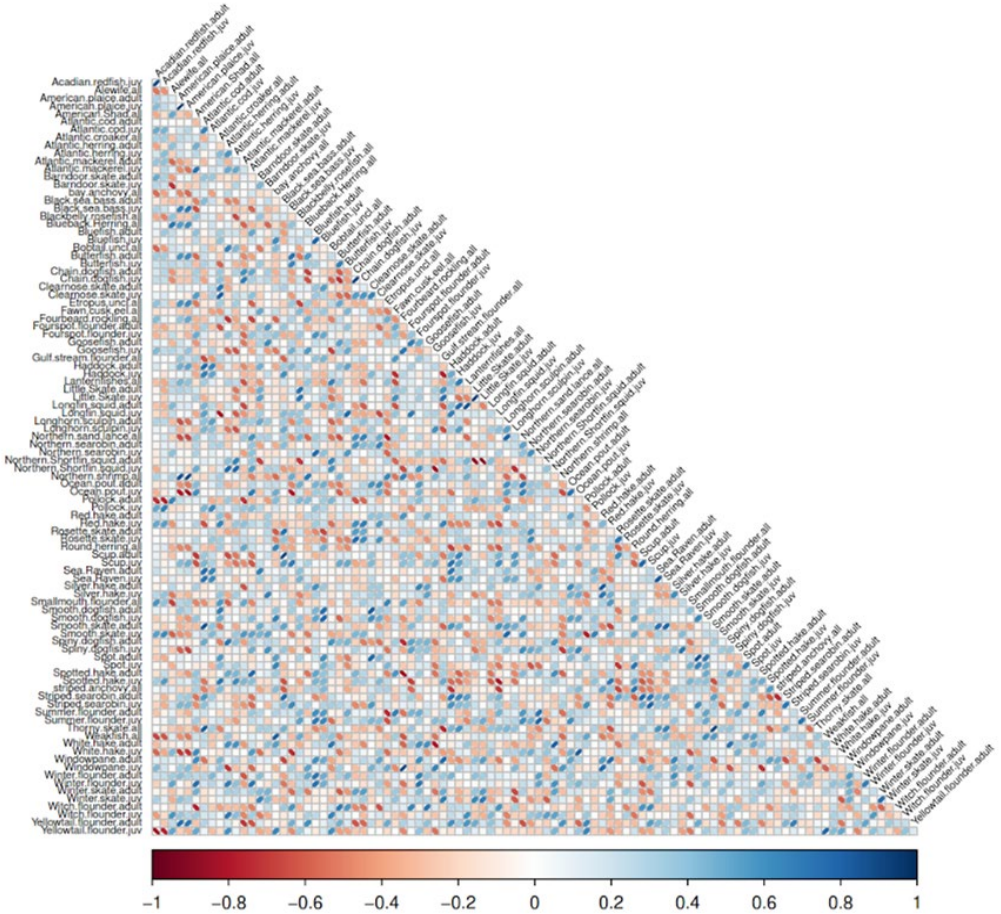
Predictor Importance

- **% variance** explained by each predictor (and spatiotemporal BFs & year effect)
- **What factors are most influential** in driving habitat use of a spp?



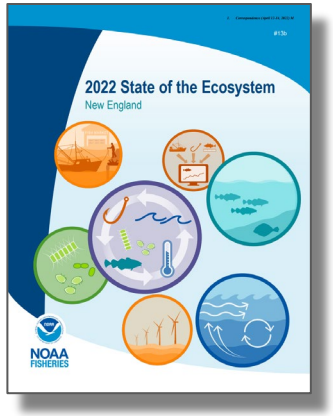
Residual (& Partial) Correlations

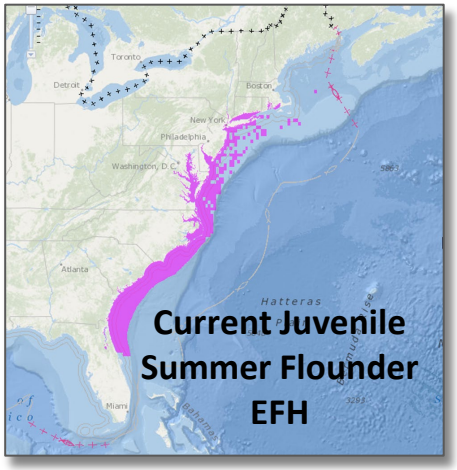
- Correlation b/w spp. that is ***not*** explained by measured predictors
- May be evidence of:
  - **Biotic interactions?**
  - Responses to **"missing" covariates**?
  - **Dispersal** effects
- Partial correlations control for "indirect" interactions (e.g., shared avoidance of a predator)

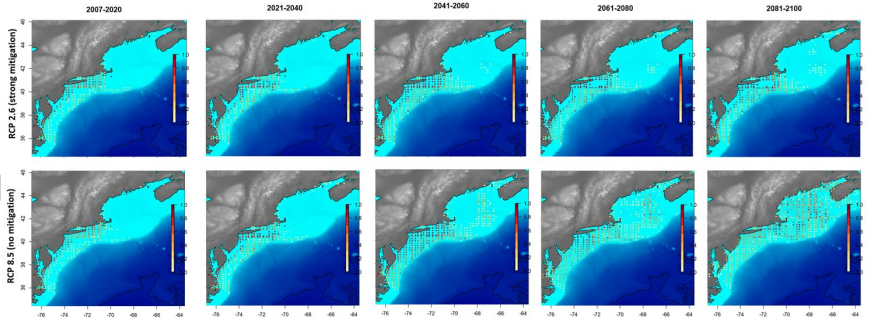


Applications for NRHA Products

- **Essential Fish Habitat:** NRHA provides more specificity on which environmental factors influence species distribution.
  - EFH text descriptions and maps
  - Habitat area of particular concern (HAPC) designations
  - Potential for shifts due to climate change and adaptive approach with automated updates
- **State of the Ecosystem Reports:** NRHA provides habitat and climate change information on managed species
- **Single Species Assessments:** Addresses Ecosystem TORs (e.g. butterfish 2022)
  - NRHA provides historic distributions and projected distributions due to climate change
  - Links between environmental drivers and stock health and recruitment

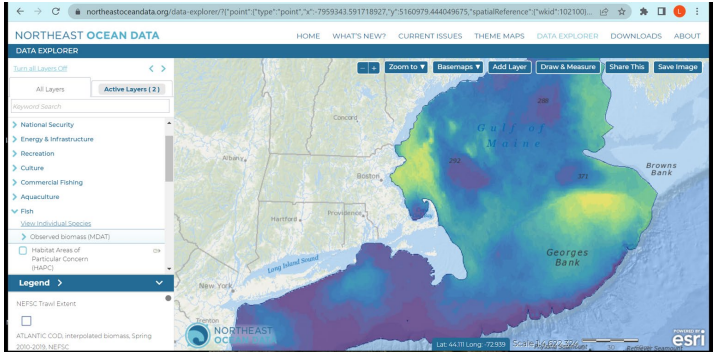


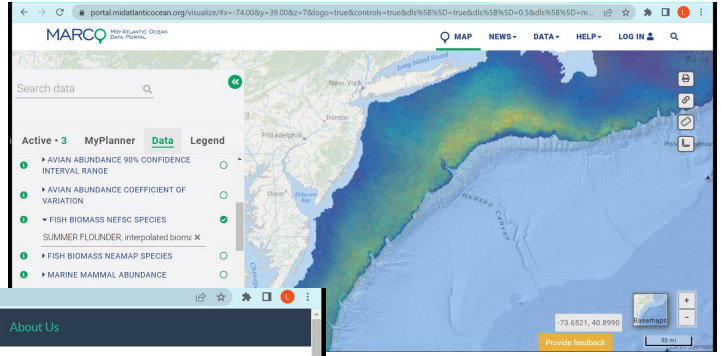


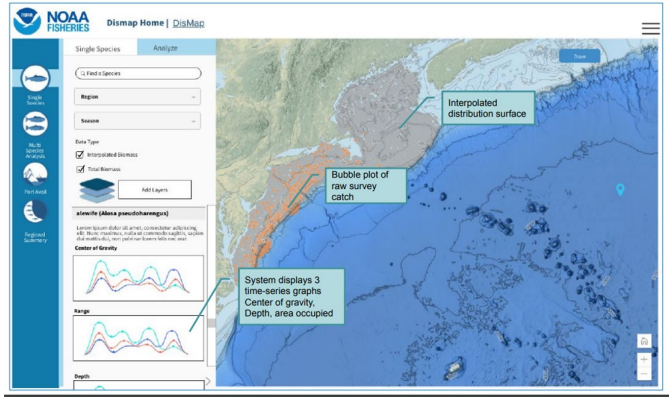


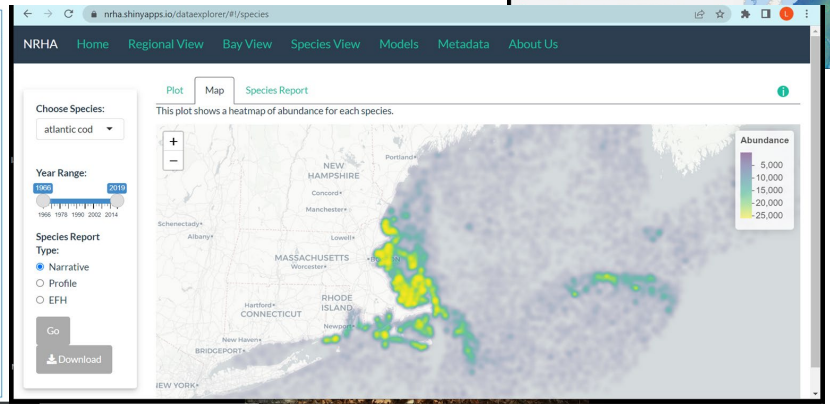
Publicly Available Data Portals

- Intent is to make NRHA products as widely available as possible
- NRHA Data Explorer (R-Shiny) – main host, but share specific/curated products with…
  - Northeast Ocean Data Portal
  - Mid-Atlantic Ocean Data Portal (MARCO)
  - NMFS Distribution Mapping and Analysis Portal (DisMAP)



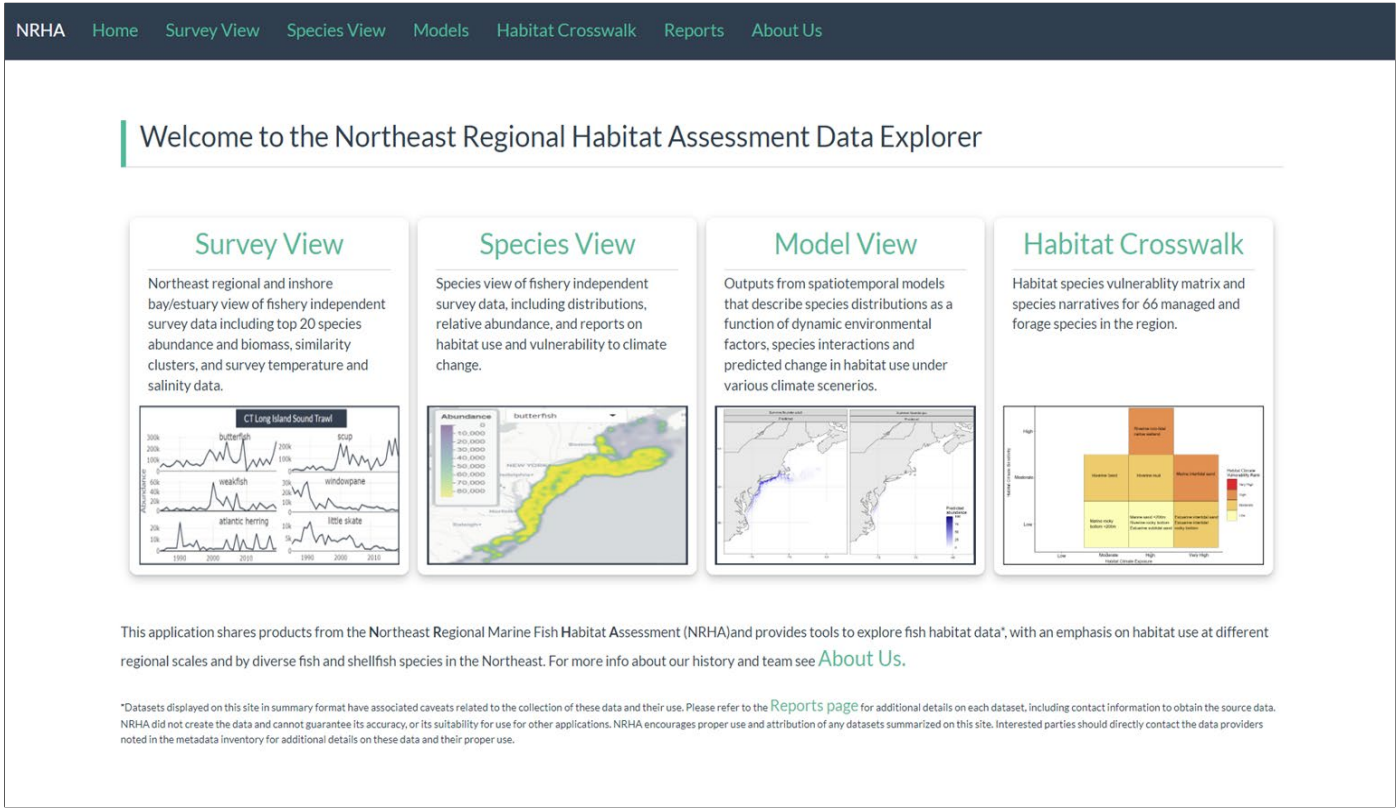






NRHA Data Explorer Demonstration

Available here: https://nrha.shinyapps.io/dataexplorer

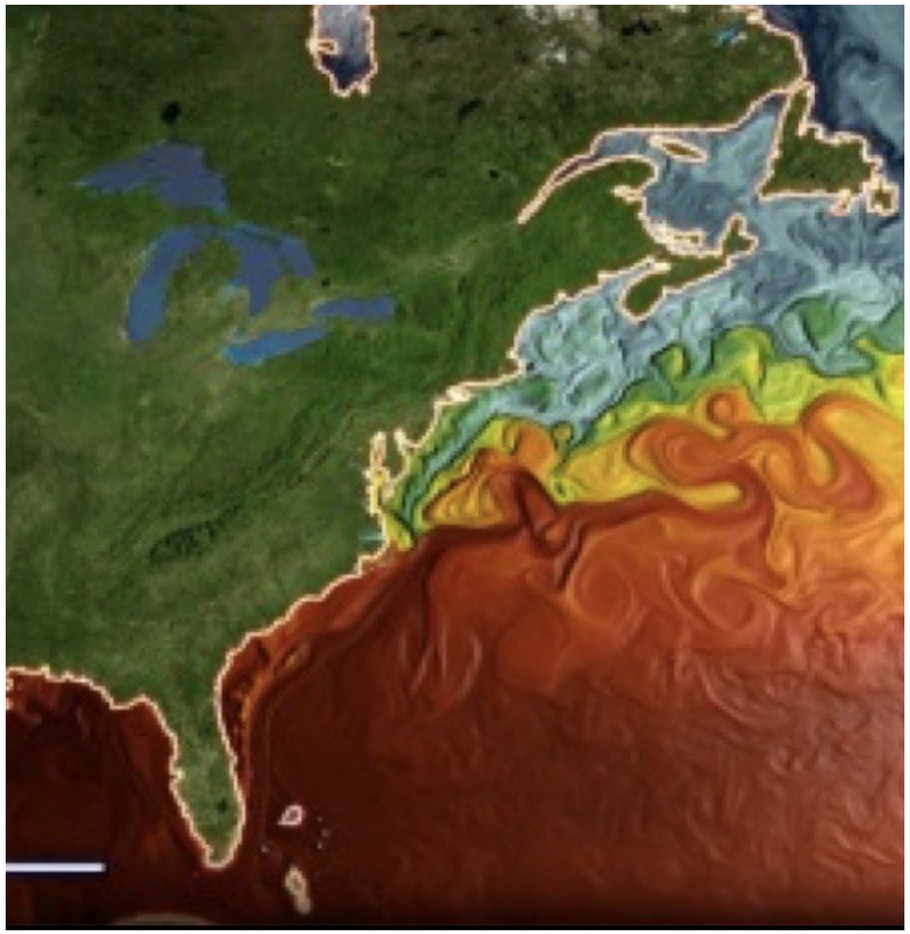


EAST COAST CLIMATE CHANGE SCENARIO PLANNING UPDATE

Update to Council Coordination Committee
October 18, 2022

Today's Objectives

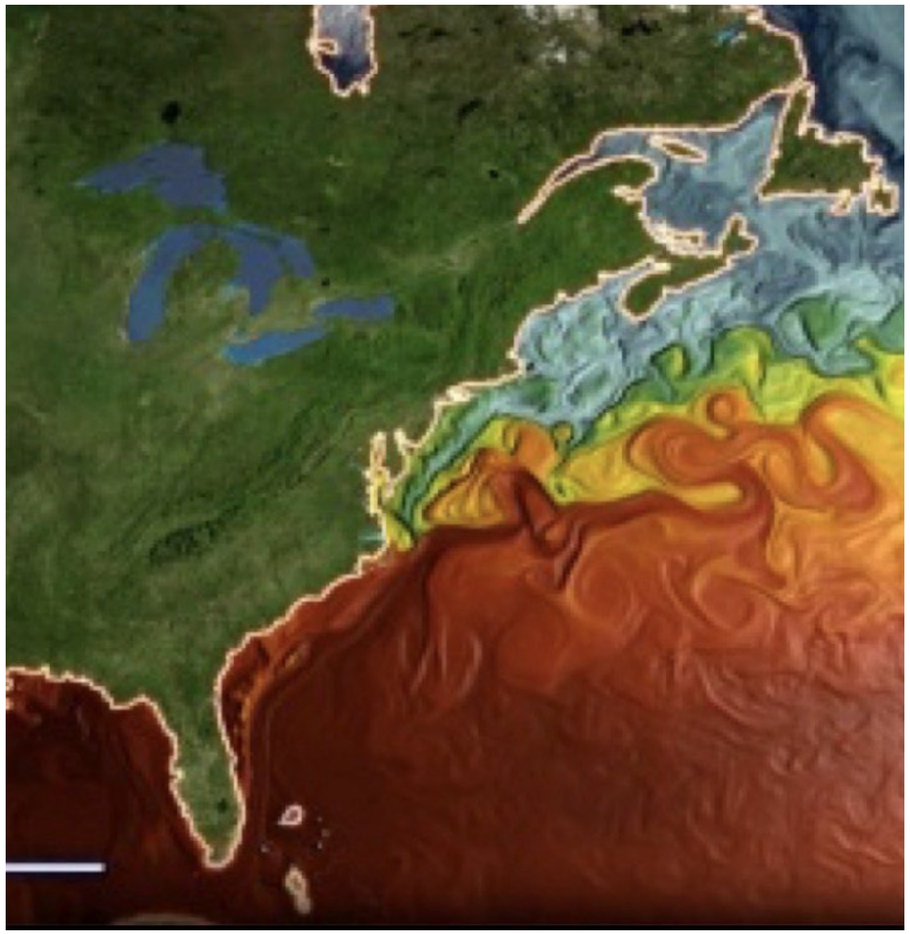
1. Update on scenario development since last CCC meeting
   - "Scenario deepening" process; overview of the 4 scenarios
2. Recent manager brainstorming sessions
3. Next Steps



Initiative Objectives

1. Explore how **East Coast fishery governance and management issues** will be affected by climate driven change in fisheries, particularly changing stock availability and distributions.

2. **Advance a set of tools and processes** that provide flexible and robust fishery management strategies, which continue to promote fishery conservation and resilient fishing communities, and address uncertainty in an era of climate change.



Phases: Scenario Creation, Applications, Monitoring

Steps in this Multi-Year Initiative

Orientation: establish draft objectives, expected outcomes and project focus

Scoping: reach out to stakeholders to gather input on forces of change that could affect fisheries over the next 20 years

Exploration: analyze forces driving change in greater detai

Creation: conduct work-shop sessions to construct and discuss scenarios

Application: use scenarios to identify actions and recommen-dations

Monitoring: identify key indicators to monitor change and outline next steps

Fall 2020 – Summer 2021

Summer – Fall 2021

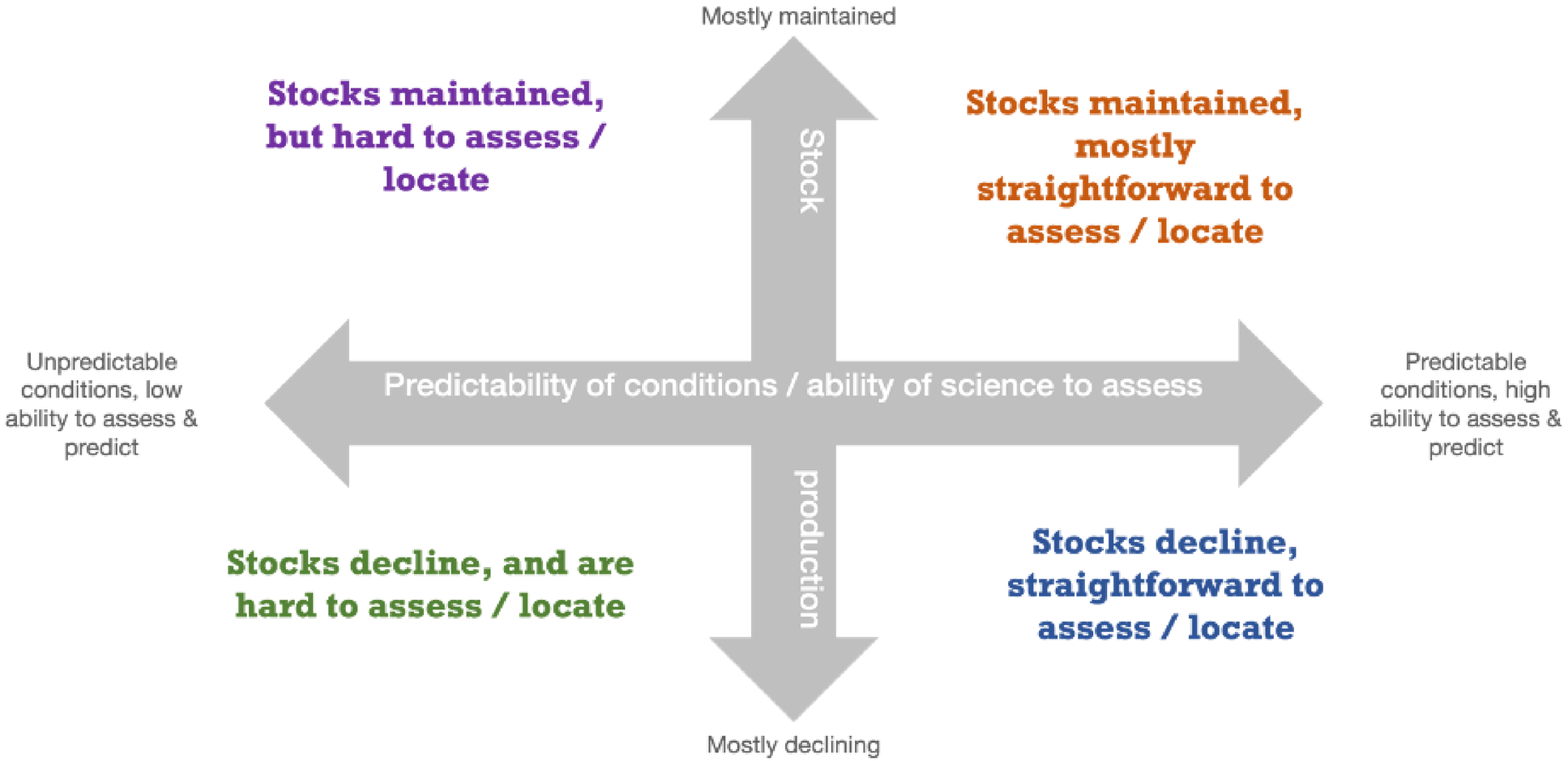
Winter 2022

June 2022

July 2022-Winter 2023

Scenario Framework Construction

Combining the uncertainties results in a matrix that creates four different stories of the future



Divergent scenarios, with several common features

1. Ocean temperature continue to warm, affecting marine species biology and distribution
2. Regions exhibit differences in seasonal temperature changes
3. Primary production changes differently in different regions
4. Sea levels rise
5. Changing ocean uses create more competition for fisheries
6. Coastal population grows

Adaptability matters…

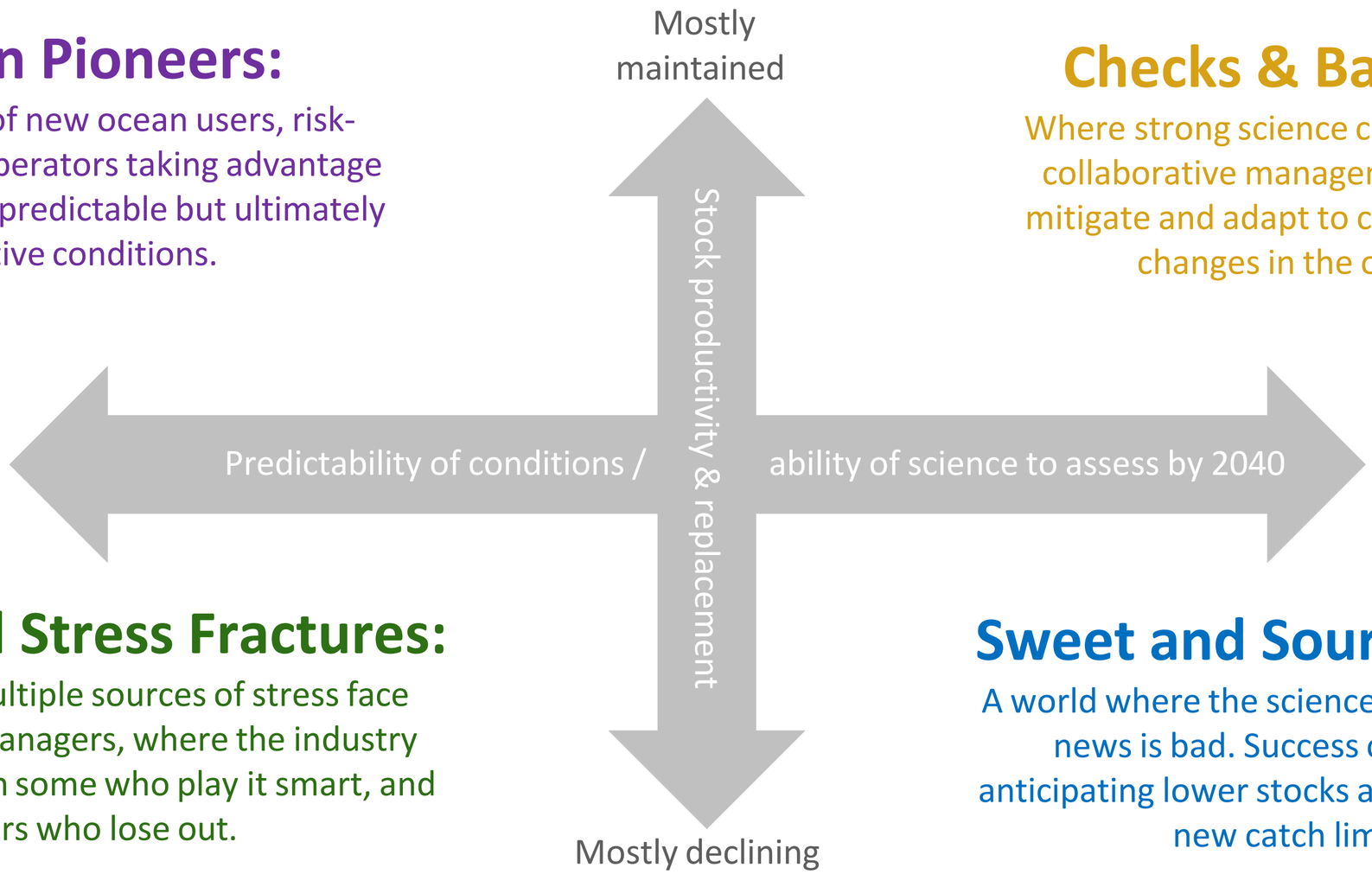
Resulting Scenarios: East Coast Fisheries in 2040

Ocean Pioneers:

A 'wild west' of new ocean users, risk-taking fishery operators taking advantage of confusing, unpredictable but ultimately positive conditions.

Checks & Balance:

Where strong science combines with collaborative management to help mitigate and adapt to climate-driven changes in the ocean.



Compound Stress Fractures:

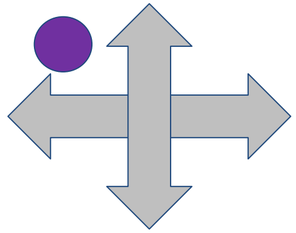
A world with multiple sources of stress face operators and managers, where the industry fractures between some who play it smart, and others who lose out.

Sweet and Sour Seafood:

A world where the science is good, but the news is bad. Success comes from anticipating lower stocks and preparing for new catch limits.

Features of Each Scenario: East Coast Fisheries in 2040

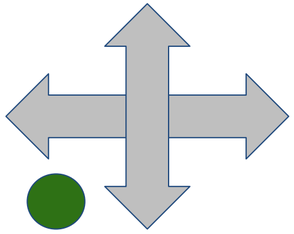
Ocean Pioneers: stocks maintained, but hard to assess / predict



- Weird weather and crazy conditions
- Life on the ocean is remarkably different compared to 20 years ago
- Climate change has prompted more investment in alternative energy and aquaculture
- Seasons and locations of fisheries change unpredictably, and traditional science is unable to make accurate assessments
- Despite this, fishermen report they are encountering plenty of seemingly healthy stocks
- Ocean pioneers thrive in these turbulent conditions. Success doesn’t come easy - it requires taking risks (such as investments in new data-gathering technology), deep pockets and an ability to ride out the storms of uncertainty

Features of Each Scenario: East Coast Fisheries in 2040

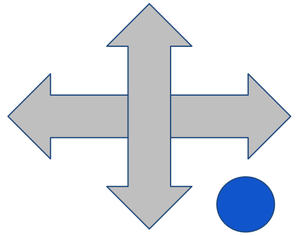
Compound Stress Fractures: stocks declining, and hard to assess / predict



- Several sources of stress have led East Coast fisheries to breaking point by 2040
- Shifts in ocean currents and extreme weather events have tipped ecosystems out of balance
- Major storms lead to more pollution and degraded habitats. Healthy stocks are scarce
- Low abundance leads to reduced harvests and protected species regulations close several fishing grounds
- Science is unable to help, as stock assessments data cannot cope with such a changeable and volatile ecosystem
- Trust between stakeholders is in short supply, illustrated by fractious debates over the siting of offshore wind installations
- Operators are forced to shift to lower trophic level species, and government support is needed to save a few selected fisheries

Features of Each Scenario: East Coast Fisheries in 2040

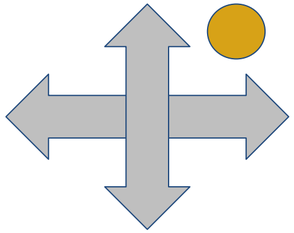
Sweet and Sour Seafood: stocks decline, but straightforward to assess / locate



- The science is good, but the news is bad
- Climate change is affecting ocean and stock conditions in ways long predicted by scientists
- Range shifts; productivity and abundance have declined for most relevant species
- Better forecasting helps fishermen prepare for marine heatwaves and localized die-offs
- Aquaculture provides a much-needed alternative as wild-caught seafood declines, and better science ensures that any pollution dangers are minimized
- There are signs of a few smart management decisions (such as limits on newly arriving species) and adaptation from fishing operators
- However, most management approaches have not adapted to the tougher conditions of today, and those on the horizon

Features of Each Scenario: East Coast Fisheries in 2040

Checks and Balance: stocks maintained, and straightforward to assess / locate



- Good science, smart collaboration, and tolerable conditions allow East Coast fisheries to cope with the challenge of climate change in 2040
- But nothing is easy: stocks shift and expand their ranges, while busier coasts and new offshore activity create accessibility challenges for commercial and recreational fishermen
- Investments in habitat protection and restoration begin to reverse decades of damage and loss
- Science capacity is boosted, delivering improved ocean monitoring, real-time catch reporting and population monitoring
- A prosperous ocean economy leads to competition (e.g., between fisheries and aquaculture) but also collaboration (e.g., as fisheries science is boosted by wind energy installations)
- Gentrification creates concerns over accessibility for the recreational sector

Application Phase: July 2022-Early 2023

Use scenarios as a **platform** to discuss future fishery governance and management issues:

- How well would our current systems work if these new scenario conditions were to occur?
- What would need to change to better prepare for these scenario possibilities?
- What are the tools and processes that need to be advanced now to ensure that fisheries are governed and managed effectively in an era of climate change?

Current Phase: Applications

Managers' Meetings

September 19
September 20
October 3

Generate ideas

Council & Commission Meetings

ASMFC: November 7-10
NEFMC: December 5-9
SAFMC: December 5-9
MAMFC: December 12-15

Review & generate ideas

Summit Meeting

February 2023
In person, ~50 participants

Review & prioritize recommendations

Current Applications Discussion Categories

1. Management and Industry Adaptability
2. Data & Science
3. Alternative Ocean Uses
4. Cross Jurisdictional Governance & Management

Challenges, Opportunities and Suggested Actions

For Each Scenario…

Adaptability	What does successful adaptability / nimbleness look like for managers? For industry? What are the main barriers to effective adaptability? If you knew that this scenario was going to play out, what actions would you take now so that operators, communities and managers could better adapt to cope with these conditions?
Data & Science	What are the biggest data & science challenges/opportunities facing fishery managers? If you knew this scenario was going to play out, what actions should fisher managers take to ensure that data & science contributed to fisheries' success?
New Ocean Uses	What are the most significant challenges/opportunities for fishery managers posed by new ocean uses? If you knew this scenario was going to play out, what would you do now to ensure that alternative ocean uses resulted in a positive or minimal impact on fisheries?
Cross-jurisdictional Governance & Management	What major stresses would be placed on existing cross-jurisdictional governance arrangements? Would current approaches for updating management authority work well? What new ways should be considered? What management challenges are present for species that move across jurisdictional boundaries? What actions / changes are needed to better manage species that move across boundaries?

Current Phase: Applications

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Project Outputs

- ❑ **A set of scenarios** a few stories that describe – in qualitative terms – different ways in which a changing climate might affect the future of East Coast fisheries
- ❑ **A better understanding** of the challenges and opportunities facing fishery management in the future
- ❑ **A set of near-term and long-term management priorities** that help achieve fishery management objectives under a range of different future conditions
- ❑ **Policy recommendations** for broader governance changes that improve our ability to adapt to future scenarios
- ❑ **A list of** data gaps, research needs, and monitoring needs for changing conditions
- ❑ **A framework** for ongoing conversation and idea generation for all stakeholders to use

For Additional Information

- https://www.mafmc.org/climate-change-scenario-planning
- Core Team:

Organization	Representative
MAFMC	Kiley Dancy
ASMFC	Toni Kerns
NMFS GARFO	Moira Kelly/Travis Ford
NEFMC	Michelle Bachman
NMFS NEFSC	Sean Lucey
SAFMC	Roger Pugliese
NMFS SERO	Karla Gore
NMFS HQ	Wendy Morrison
Process Facilitator	Jonathan Star, Scenario Insight

Aquaculture Work at NEFMC and MAFMC

Michelle Bachman, NEFMC
Jessica Coakley, MAFMC

ASMFC Habitat Committee
November 7, 2022
Long Branch, NJ

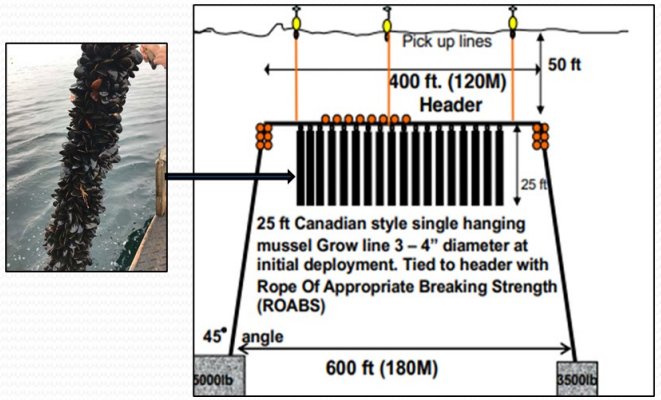
New England
Fishery Management Council

Council policies on habitat & non-fishing activities

- Both Councils have multiple policies that outline conservation concerns and best practices related to non-fishing activities and fish habitat, fish, and fisheries
- The Councils rely on these policies when developing comments on individual projects or on regional planning issues
- Specifically, the policies allow Council staff to craft comments without needing Committee/Council approval
- Policy development process useful for educating Council members, staff, and others on issues related to non-fishing activities
- There is close coordination between the two Councils on policy development and project-specific comments
- We periodically update these policies as needed

Aquaculture backgrounders

- Activity overview
  - Species cultured, by state
  - Areas where aquaculture occurs
  - Permitting and authorization process (federal and state)
- Potential impacts on species and habitats
  - Positive impacts
  - Adverse effects (fish, shellfish, interactions between managed species and aquaculture)
- Potential interactions with other marine and coastal activities
- References and best management practices
- NEFMC backgrounder, MAFMC backgrounder



Policy overview

- Introductory section explains Council role in EFH and HAPC designation and consultation
- Councils seek development compatible with the protection of managed species and their habitats, and with commercial and recreational fishing activities
- Recognizes that aquaculture contributes to food production and is a valued use of the coastal zone and EEZ
- Emphasizes early and often approach to consultation/engagement
- Emphasizes the importance of considering cumulative effects
- Identifies audiences for the policy
- Links to NEFMC policy and MAFMC policy

Principles in the aquaculture policies

1. Site and design projects in the context of ecosystem functions and services
   - Consider distribution of specific sensitive habitats, etc.
2. Adopt operational practices to reduce environmental effects
   - Secure gear, use native/naturalized species when possible, etc.
3. Consider cumulative effects
4. Contribute positively to local coastal economies
5. Develop in the context of other sectors, policies, and goals
   - Consider distribution of fishing grounds and potential for adverse interactions, start with pilot scale projects, use high quality data to understand other uses
6. Clear and ongoing communication is important

Ongoing engagement

- Council staff communicate regularly with aquaculture coordinators at GARFO
- GARFO and Council staff give updates at Committee and Council meetings
  - Specific projects, regional planning, e.g., Aquaculture Opportunity Areas
- Participate in interagency meetings when possible
- Prepare Council comments
  - https://s3.us-east-1.amazonaws.com/nefmc.org/210907_NEFMC-and-MAFMC-to-NSTC-Subctte-on-Aquacult-re-draft-strat-plans.pdf
  - https://s3.us-east-1.amazonaws.com/nefmc.org/210702-NEFMC-MAFMC-to-USACE-re-Blue-Water-Fisheries-project.pdf
  - https://s3.us-east-1.amazonaws.com/nefmc.org/201222-NEFMC-to-GARFO-EPA-USACE-BWF-re-Blue-Water-Fisheries-project.pdf
  - https://s3.us-east-1.amazonaws.com/nefmc.org/201218-NEFMC-to-NOAA-re-AOA-RFI.pdf
- The two councils work individually and jointly as needed

NEFMC Atlantic Salmon Aquaculture Framework

- Salmon FMP prohibits directed fishing and possession in federal waters and allows for authorization of salmon aquaculture via a framework action
- Recent offshore aquaculture proposal (Blue Water Fisheries project) spurred the Council to consider developing an action to facilitate salmon aquaculture
- An action to authorize possession of cultured Atlantic salmon would provide a clear path forward for salmon aquaculture projects in federal waters
- On September 28, the Council initiated an action to consider authorizing possession of cultured Atlantic salmon in the EEZ
- Council is working on this action now, with a goal of final action in April 2023

NEFMC Framework, continued

- Complex issue that requires awareness of the aquaculture permitting process that involves multiple federal agencies
- Desire to keep the scope of the action narrow, while considering related activities and consultations as appropriate
- Need to be somewhat future-proofed; best practices for project design and monitoring will evolve
- Council does not have a standing Atlantic Salmon Committee or Plan Development Team
- Involving a diverse group in framework development – Council staff; GARFO aquaculture, habitat, protected species, NEPA; NEFSC social and habitat scientists; state agency staff; staff at EPA and USACE

Aquaculture
-New Resources and Updates






ASMFC Habitat Committee
Nov. 7, 2022
Kevin Madley

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NOAA Aquaculture Program

NOAA Fisheries

fisheries.noaa.gov

» policy/regulatory
» aquaculture outreach
» science for sound aquaculture development

Sea Grant

seagrant.noaa.gov

» external grants
» extension and education for coastal and Great Lakes aquaculture

National Centers for Coastal Ocean Science

coastalscience.noaa.gov

» spatial planning and siting
» ecosystem services
» environmental monitoring and modeling

NOAA Fisheries- Regional Aquaculture Coordinators

Regional Aquaculture Coordinators

Got questions about aquaculture in your area? Contact one of our regional aquaculture coordinators.

NEW ENGLAND/MID-ATLANTIC

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PACIFIC ISLANDS

Tori Spence
Regional Aquaculture Coordinator
Pacific Islands Regional Office
Office: (808) 725-5186
Email: tori.spence@noaa.gov

- Works within NOAA and with partner federal, state, and local agencies, industry, and members of the scientific, academic, and NGO communities on a variety of marine aquaculture issues
- POC for aquaculture issues within regional offices
- Coordinates with NMFS Science Centers on aquaculture science planning and communications
- Leads or participates in NOAA and interagency aquaculture working groups within regions

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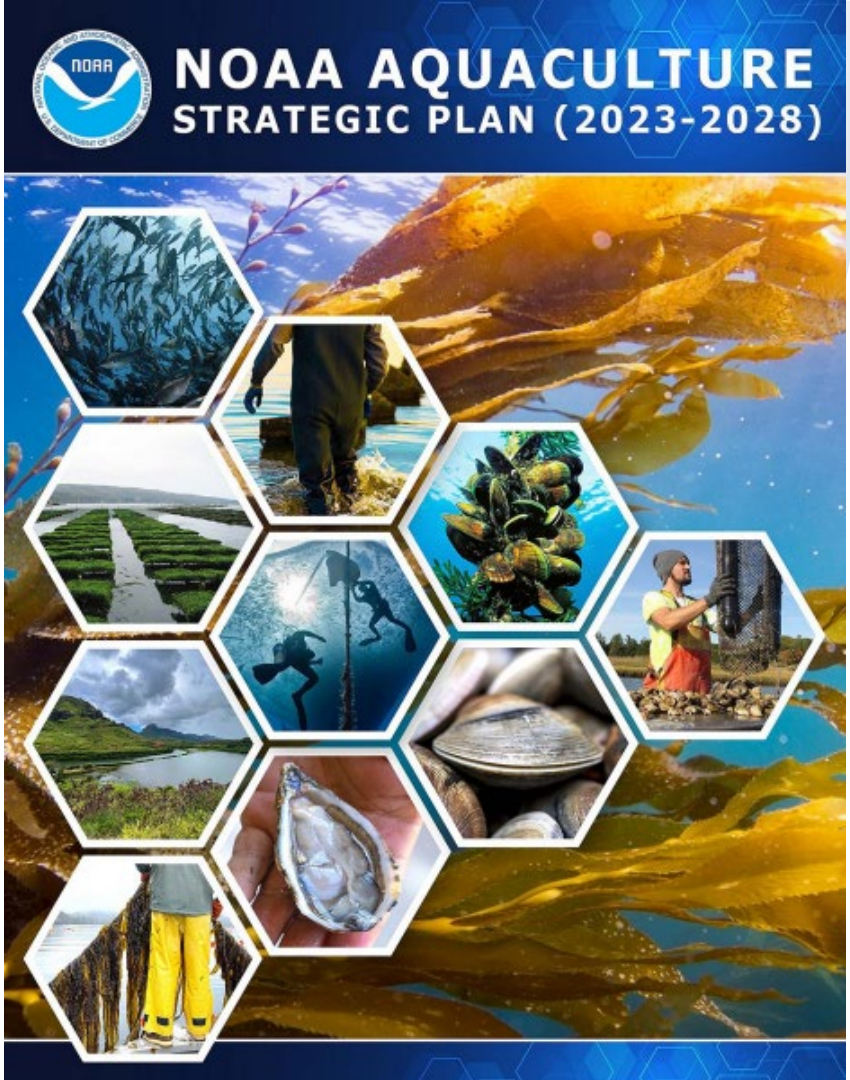
First-ever 5-Year Strategic Plan for Aquaculture to guide the agency's work from 2023-2028.

Goal 1:MANAGE SUSTAINABLY AND EFFICIENTLY

Goal 2:SCIENCE FOR SUSTAINABILITY

Goal 3: EDUCATE AND EXCHANGE INFORMATION

Goal 4: SUPPORT ECONOMIC VIABILITY AND GROWTH



Federal Coordination on Aquaculture

E.O. 13921 Promoting American Seafood Competitiveness and Economic Growth

Covers reducing regulatory barriers for commercial fishing and aquaculture & improving seafood trade

- Removing Barriers to American Fishing
- Combating Illegal, Unreported, Unregulated Fishing
- **Removing Barriers to Aquaculture Permitting**
- **Aquaculture Opportunity Zones**
- **Improving Regulatory Transparency for Aquaculture**
- **Updating National Aquaculture Development Plan**
- Promoting Aquatic Animal Health
- International Trade

Subcommittee on Aquaculture

www.ars.usda.gov/SCA

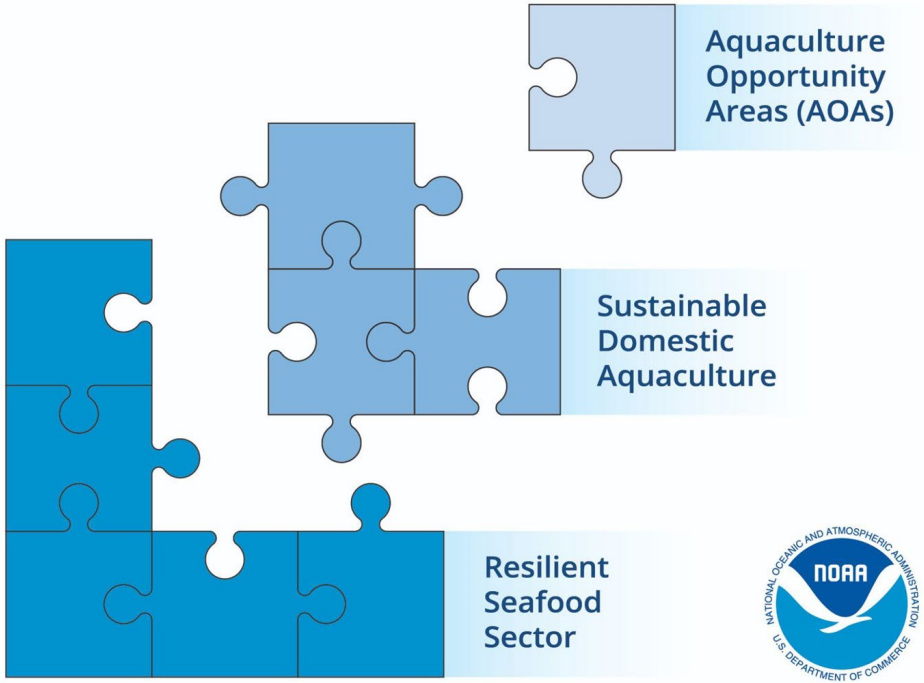
The Subcommittee on Aquaculture (SCA) serves as the Federal interagency coordinating group to increase the overall effectiveness and productivity of Federal aquaculture research, regulation, technology transfer, and assistance programs.

- established pursuant to the National Aquaculture Act of 1980.
- members: USDA, DOC, DOD, EPA, and DHHS.

EO 13921: directs Secretaries of Interior, Agriculture, and Commerce, in consultation with the SCA, to "…assess whether to revise the National Aquaculture Development Plan" and "…shall subsequently assess, not less than once every 3 years, whether to revise the National Aquaculture Development Plan…"

- National Strategic Plan for Aquaculture Research (Feb. 2022)
- Strategic Plan to Enhance Regulatory Efficiency in Aquaculture (Feb. 2022)
- Draft Economic Development Outline

Aquaculture Opportunity Areas and Expanding U.S. Seafood



AOAs are one piece of a larger strategy to expand domestic aquaculture and complement wild-caught seafood.

Taken together, these are critical to the resilience of the U.S. seafood sector.

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What is the goal of this effort?

- Meet the directives of Executive Order 13921
- **To utilize a science-based approach to inform offshore marine aquaculture planning**
- Find areas that could be suitable for multiple future offshore aquaculture projects
- Address interests and concerns regarding offshore aquaculture siting
- Address the increasing demand for seafood
- Promote American seafood competitiveness, food security, economic growth while also sustaining and conserving marine resources

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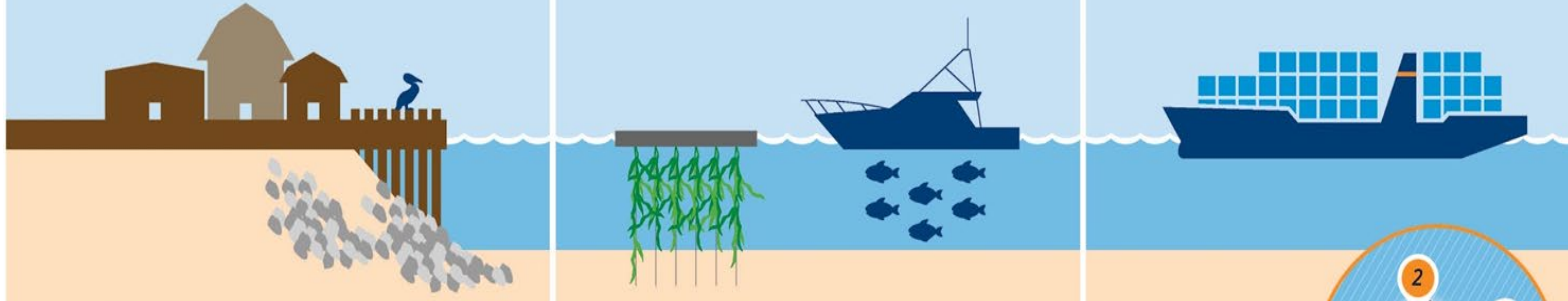
What is an Aquaculture Opportunity Area?

Aquaculture Opportunity Areas show high potential for commercial aquaculture. A science and community-based approach to identifying these areas helps minimize interference with other enterprises, account for current fishing patterns, and protect the ecosystem.

AOAs will expand economic opportunities in coastal and rural areas, and increase our nation's seafood security.

AOAs use the best available science to find appropriate spaces for sustainable aquaculture.

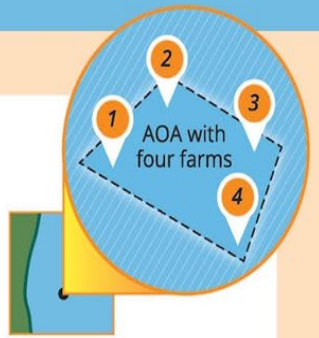
AOAs minimize interactions with other users, such as shipping, fishing, and the military.



Assessment and Use of AOAs

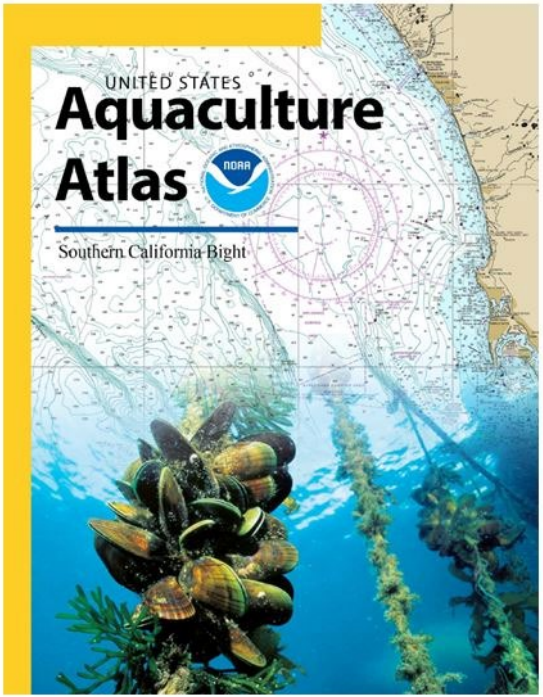
Stakeholder input is essential in the design and location of AOAs and NOAA expects these areas will be shaped through a public process that allows constituents to share their community and stewardship goals, as well as critical insights.

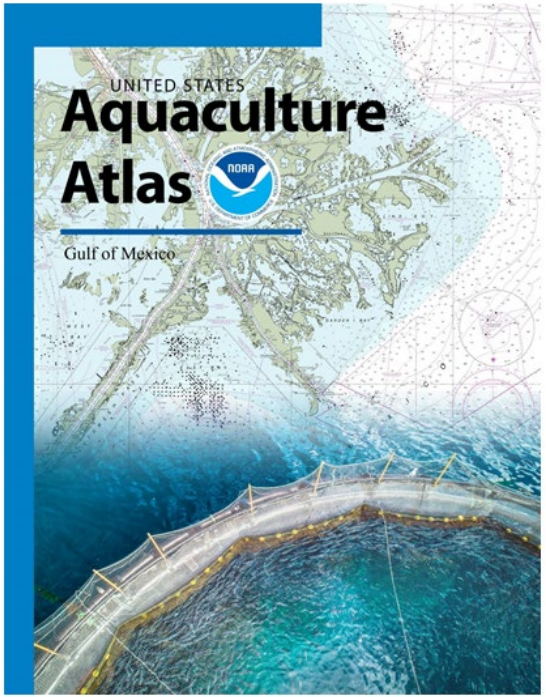
AOA size, exact location, and farm types will be determined through spatial analysis and public input to expand sustainable domestic seafood production while minimizing potential user conflicts. Farms will still need to go through the permitting process and environmental reviews.



AOA Atlases - Gulf of Mexico and Southern California

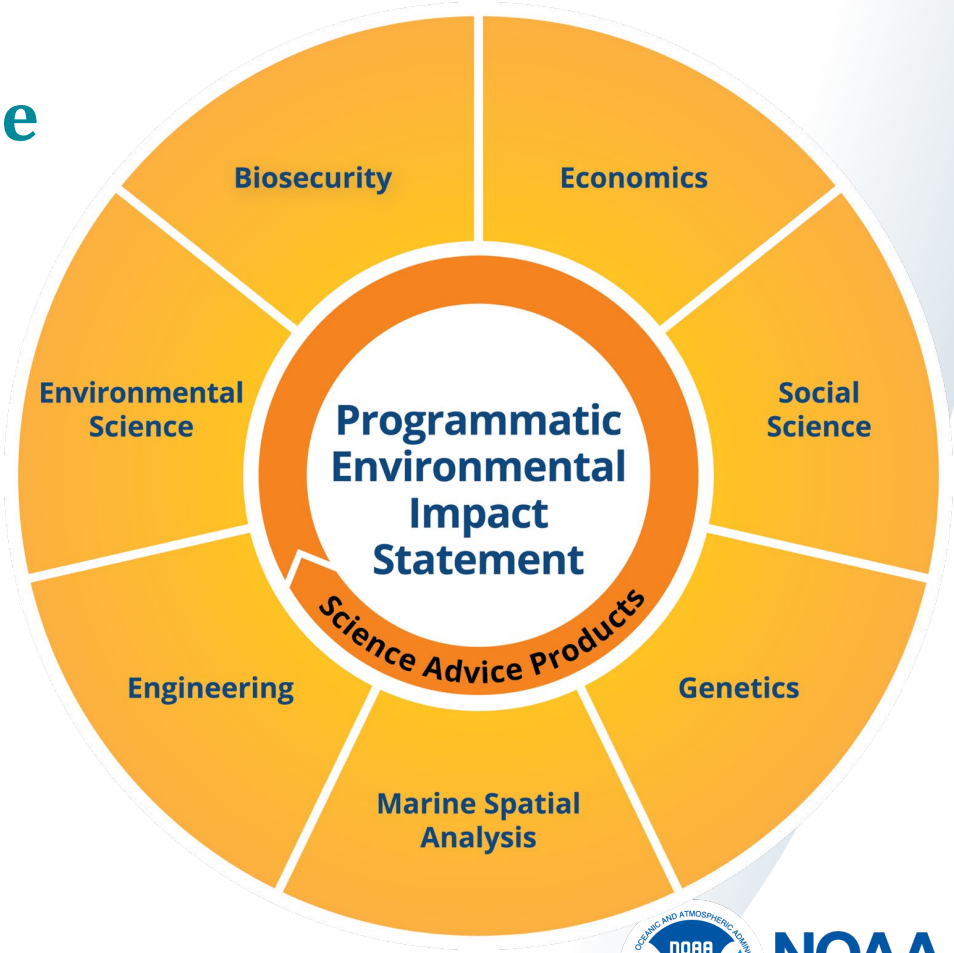
noaa.gov/news-release/noaa-analyses-to-inform-aquaculture-siting-in-gulf-of-mexico-and-southern-california





Multidisciplinary Science

Use the best available science across multiple disciplines, public and stakeholder input, and relevant regulations, laws, policies, to evaluate the beneficial and adverse impacts of siting aquaculture in a given area.



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Overview of AOA PEIS Process and Timeline

- ✓ Publish Notice of Intent and initiate 60 day formal public scoping period
- Consider public comments
- Develop draft PEIS
- Notice of Availability of draft PEIS in Federal Register and formal public comment period
- Consider and respond to public comments (in final PEIS)
- Publish final PEIS
- Publish Record of Decision (30-day waiting period)

GOAL: Two years from publishing of NOI to signing of ROD

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Selecting the next AOA Region(s)

Interest in four areas:

- Western Pacific/Guam
- USVI and Puerto Rico
- Florida
- Alaska for shellfish and seaweed aquaculture (state and federal waters); Governor support and invitation into state waters

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EO 13921, Section 6: Removing Barriers to Aquaculture Permitting

- Complete all environmental reviews and authorization decisions within 2 years once the Federal agencies determine an environmental impact statement (EIS) will be prepared

- Under certain conditions, NOAA is the NEPA lead Federal agency for aquaculture projects located outside of the waters of any State or Territory and within the EEZ
  - When there are two or more reviews/authorizations
  - When an EIS is prepared

Status of Aquaculture Projects in Federal Waters

Northern Atlantic

- Blue Water Fisheries - MA
- Salem State University - MA
- Running Tide – MA
- Manna Fish Farm – NY

Pacific Ocean

- Ocean Rainforest - CA
- Pacific Ocean Aquafarm - CA

Gulf of Mexico

- Ocean Era - FL
- Manna Fish Farm - FL

Status of Aquaculture Projects in Federal Waters

Pacific Ocean
- Ocean Rainforest - CA
- Pacific Ocean Aquafarm - CA

Gulf of Mexico
- Ocean Era - FL
- Manna Fish Farm - FL

American Mussel Farms

Northern Atlantic
- Blue Water Fisheries - MA
- Salem State University - MA
- Running Tide – MA
- Manna Fish Farm – NY

ASMFC award to Gulf Stream Aquaculture LLC for "Preliminary Identification of an Aquaculture Development Area in the Atlantic: Siting-level Benthic Analyses for Offshore Mariculture Activities"

Resources for Marine Aquaculture Permitting in the United States

- Aquaculture Opportunity Areas (in process for the Gulf of Mexico and S. California)
  - Aquaculture Atlases (published Nov 2021)
  - Programmatic Environmental Impact Statements (estimated Summer 2024)
- Guide to Permitting Marine Aquaculture in the United States (published Feb 2022)
- State-by-State Aquaculture Permitting Inventories (Sep 2021)
  - Shellfish
  - Seaweed
  - Finfish

fisheries.noaa.gov/aquaculture

Find the most up-to-date information on our website, including past presentations and links to public comments

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State Marine Aquaculture Coordination Network

- The North Carolina Division of Marine Fisheries and the Florida Department of Agriculture and Consumer Services Division of Aquaculture, in collaboration with the National Sea Grant Law Center, recently formed the State Marine Aquaculture Coordination Network (SMACN).

- SMACN provides a forum to bring together state officials and extension personnel to discuss best practices for marine aquaculture management and an avenue for interstate information exchange.

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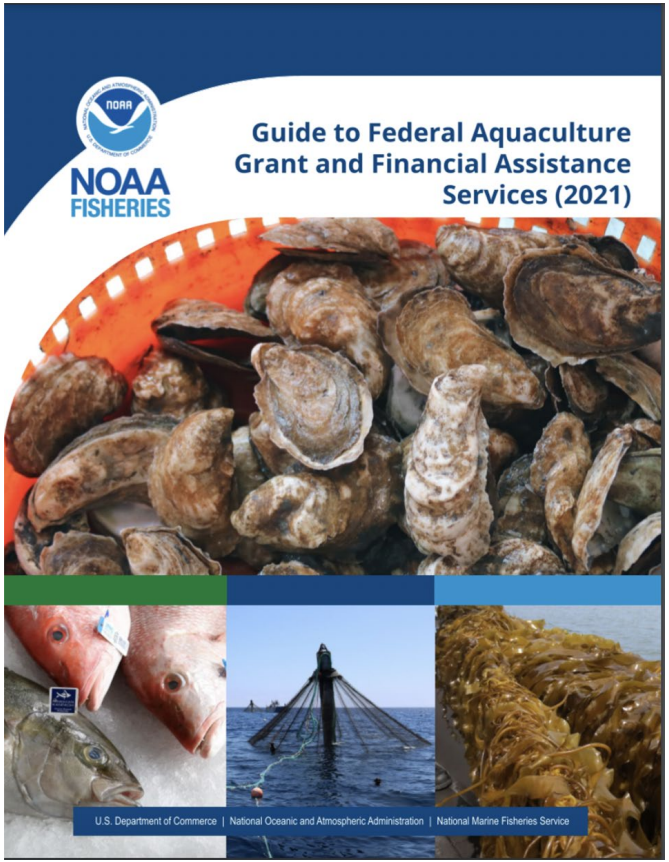
New Grants and Financial Assistance Guide



- Portals and Information Resources
- Business and Farm Grants
- Disaster Assistance Grants
- Research Assistance Grants
- Loans and other Financial Assistance

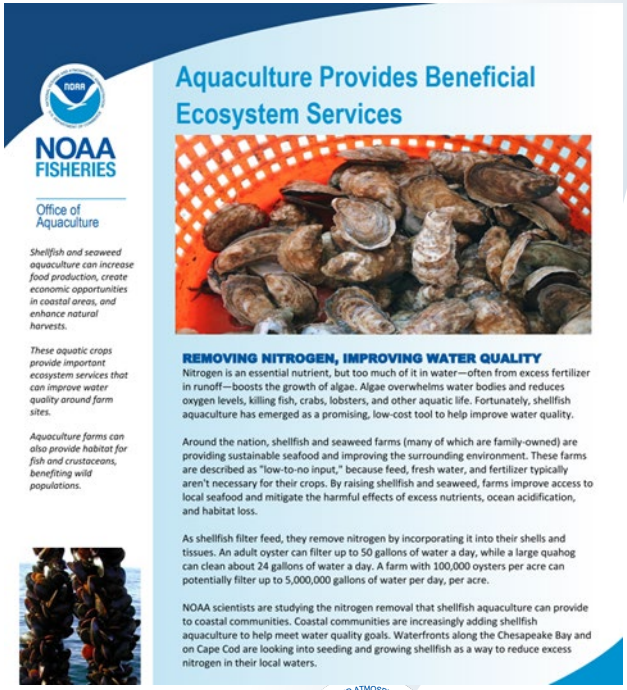
fisheries.noaa.gov/resource/document/guide-federal-aquaculture-grant-and-financial-assistance-services-2021

NOAA Aquaculture Science Resources

fisheries.noaa.gov/aquaculture-library

Fact Sheets:

- Antibiotic Use in Finfish
- Aquaculture and Environmental Interactions
- Aquaculture Provides Beneficial Ecosystem Services
- Climate Resilience and Aquaculture
- Disaster Assistance for Fisheries
- Marine Aquaculture in the U.S.
- Potential Risks of Aquaculture Escapes
- Regulation of Marine Aquaculture
- Sustainable Aquaculture Feeds and Fish Nutrition



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Office of Aquaculture

Shellfish and seaweed aquaculture can increase food production, create economic opportunities in coastal areas, and enhance natural harvests.

These aquatic crops provide important ecosystem services that can improve water quality around farm sites.

Aquaculture farms can also provide habitat for fish and crustaceans, benefiting wild populations.

Aquaculture Provides Beneficial Ecosystem Services

REMOVING NITROGEN, IMPROVING WATER QUALITY

Nitrogen is an essential nutrient, but too much of it in water—often from excess fertilizer in runoff—boosts the growth of algae. Algae overwhelms water bodies and reduces oxygen levels, killing fish, crabs, lobsters, and other aquatic life. Fortunately, shellfish aquaculture has emerged as a promising, low-cost tool to help improve water quality.

Around the nation, shellfish and seaweed farms (many of which are family-owned) are providing sustainable seafood and improving the surrounding environment. These farms are described as "low-to-no input," because feed, fresh water, and fertilizer typically aren't necessary for their crops. By raising shellfish and seaweed, farms improve access to local seafood and mitigate the harmful effects of excess nutrients, ocean acidification, and habitat loss.

As shellfish filter feed, they remove nitrogen by incorporating it into their shells and tissues. An adult oyster can filter up to 50 gallons of water a day, while a large quahog can clean about 24 gallons of water a day. A farm with 100,000 oysters per acre can potentially filter up to 5,000,000 gallons of water per day, per acre.

NOAA scientists are studying the nitrogen removal that shellfish aquaculture can provide to coastal communities. Coastal communities are increasingly adding shellfish aquaculture to help meet water quality goals. Waterfronts along the Chesapeake Bay and on Cape Cod are looking into seeding and growing shellfish as a way to reduce excess nitrogen in their local waters.

NOAA FISHERIES

kevin.madley@noaa.gov

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