Offshore Aquaculture Policy: Allocating Ocean Space as a Resource

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Outline

- US marine aquaculture: markets and projections
- New England aquaculture: spatial conflicts
- What's the relevant resource?
- Ocean space characterization
- National Ocean Aquaculture Act
- Allocation issues and methods
- Organizational theories
- Access system features

Existing and potential aquaculture in the United States

Finfish			Mollusks		Finfish Ranching	Marine Shrimp	Polyculture
offshore	*nearshore*	*land-based*	*offshore*	*nearshore*	*offshore/ nearshore*	*land-based*	*nearshore*
Cobia	Atlantic Salmon	Catfish	Sea Scallops	Oysters**	Pacific Salmon	Penaid Shrimp	Salmon/ Mussels
Moi	Steelhead Trout	Trout	Blue Mussels	Northern Quahog		Crawfish	Finfish/ Red Seaweeds
Cod	Cobia	Hybrid Striped Bass	Red Abalone	Geoducks		Black Tiger Shrimp	
Atlantic salmon	Cod	Tilapia		Manila Clams			
Haddock		Ornamentals		Blue Mussels			
Fluke		Baitfish		Cultured Pearls			
Atlantic Halibut		Fluke		Softshell Clams			
Winter Flounder		Walleye		Bay Scallops			
Pacific Halibut							
Reef Fish*							
Bluefin Tuna							

*proposed reef fish culture includes the red drum, red snapper, mutton snapper, greater amberjack, and red hind grouper.
**Cultured oyster species include the Eastern, Pacific, European flat, Kumamoto, and Olympia oysters.

Possible US Aquaculture Production Targets

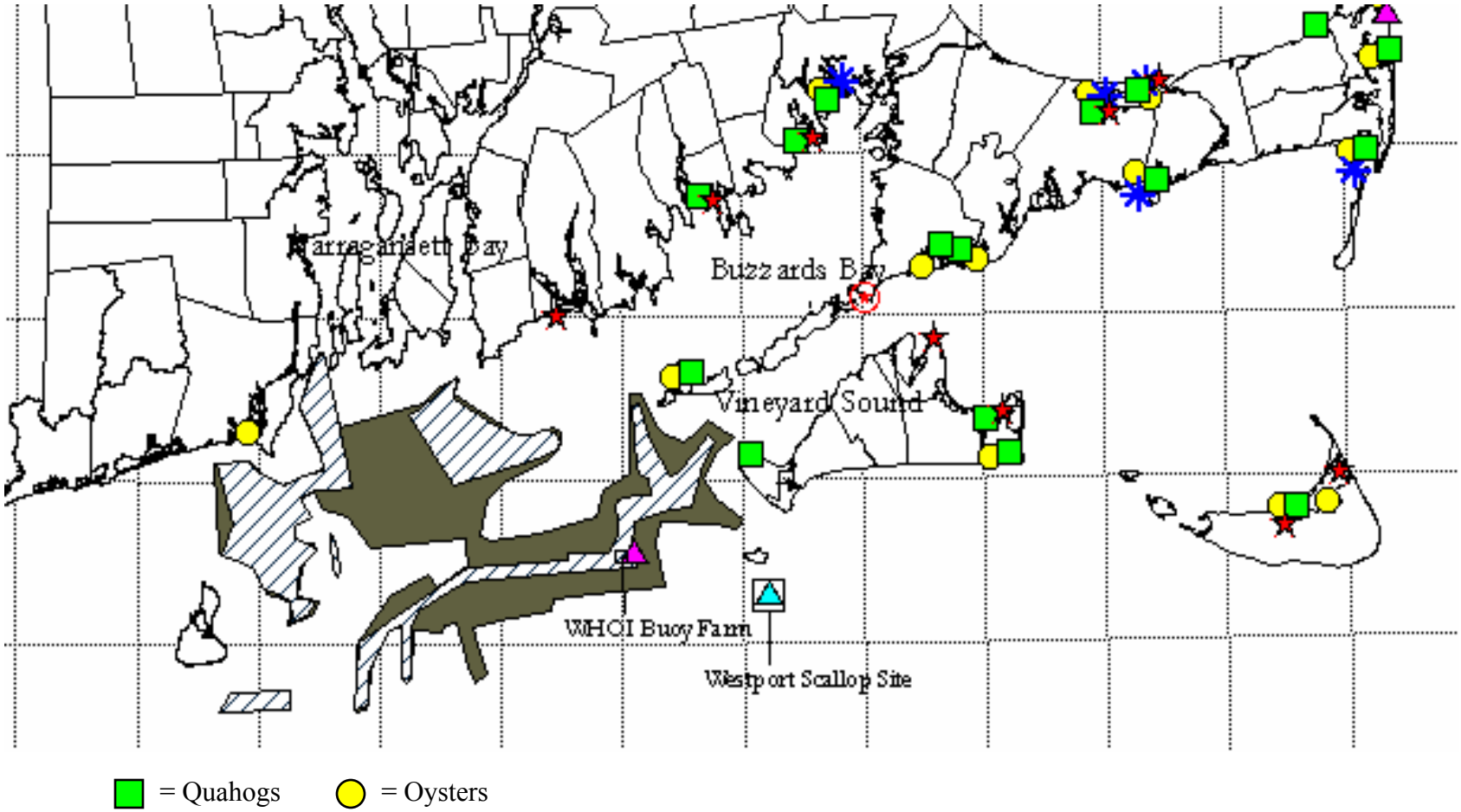
[metric tons (Nash 2004)]

Group	Sub-group	Current US production	Program increase	Target for 2025
Mollusks	All	~100,000	245,000	345,000
	American oyster	40,000	10,000	50,000
	Pacific oyster	35,000	60,000	95,000
	European oyster	<1000	5000	5000
	Mussels	<2000	80,000	80,000
	Clams	25,000	80,000	105,000
	Scallops	<1000	5,000	5000
	Abalones	<1000	5000	5000
Crustaceans	All	~18,000	47,000	65,000
	Crayfish	14,000	35,000	49,000
	Freshwater prawn	<1000	3000	3000
	Marine shrimp	4000	9000	13,000
Fish	All	~340,000	760,000	1,100,000
	Anadromous fish	25,000	100,000	125,000
	Freshwater fish	~315,000	70,000	385,000
	Saltwater fish	<1000	590,000	590,000
Totals ($\sum$)		~458,000	1,052,000	1,510,000

New England Marine Aquaculture Projects

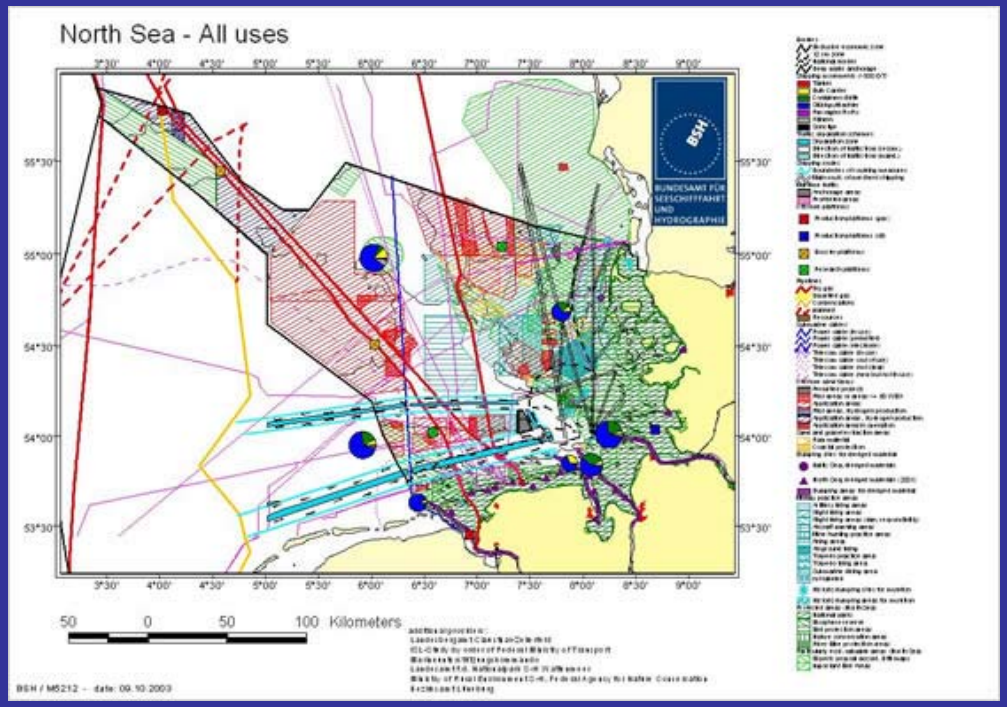
- nearshore shellfish (entire coast)
- salmon netpens (downeast Maine)
- UNH longline, netpen (Isles of Shoals)
- Dutra sea scallops (Provincetown)
- Westport sea scallops project (Nomans)
- WHOI Buoy Farm (RI Sound)
- Mariculture Technologies (Plum Island)
- American-Norwegian salmon proposal (Gloucester)

Rhode Island Sound:
Fluke and Lobster Fisheries vs. Blue Mussel Longlines



What is the relevant ocean resource?

- It's ocean space.



- Ocean space is a heterogeneous resource that is (potentially) limited in supply.

Competing Demands for Ocean Space

TRANSITORY

- Commercial fisheries
  - Trawls, seines, dredges, longlines, gillnets, handlines
- Recreational Fisheries
- Military
- Shipping
- Yachting
- Whale-watching
- Diving
- Habitat?

NON-TRANSITORY

- Commercial fisheries
  - Pots, weirs, TURFs
- VTSSs and navigation channels
- Deepwater ports
- Wind farms
- Aquaculture sites
- Ocean dumping sites
- Shipwrecks
- Pipeline rights-of-way
- MPAs
- Aesthetic views
- Habitat?

Characteristics of Ocean Space
[relevant for aquaculture]

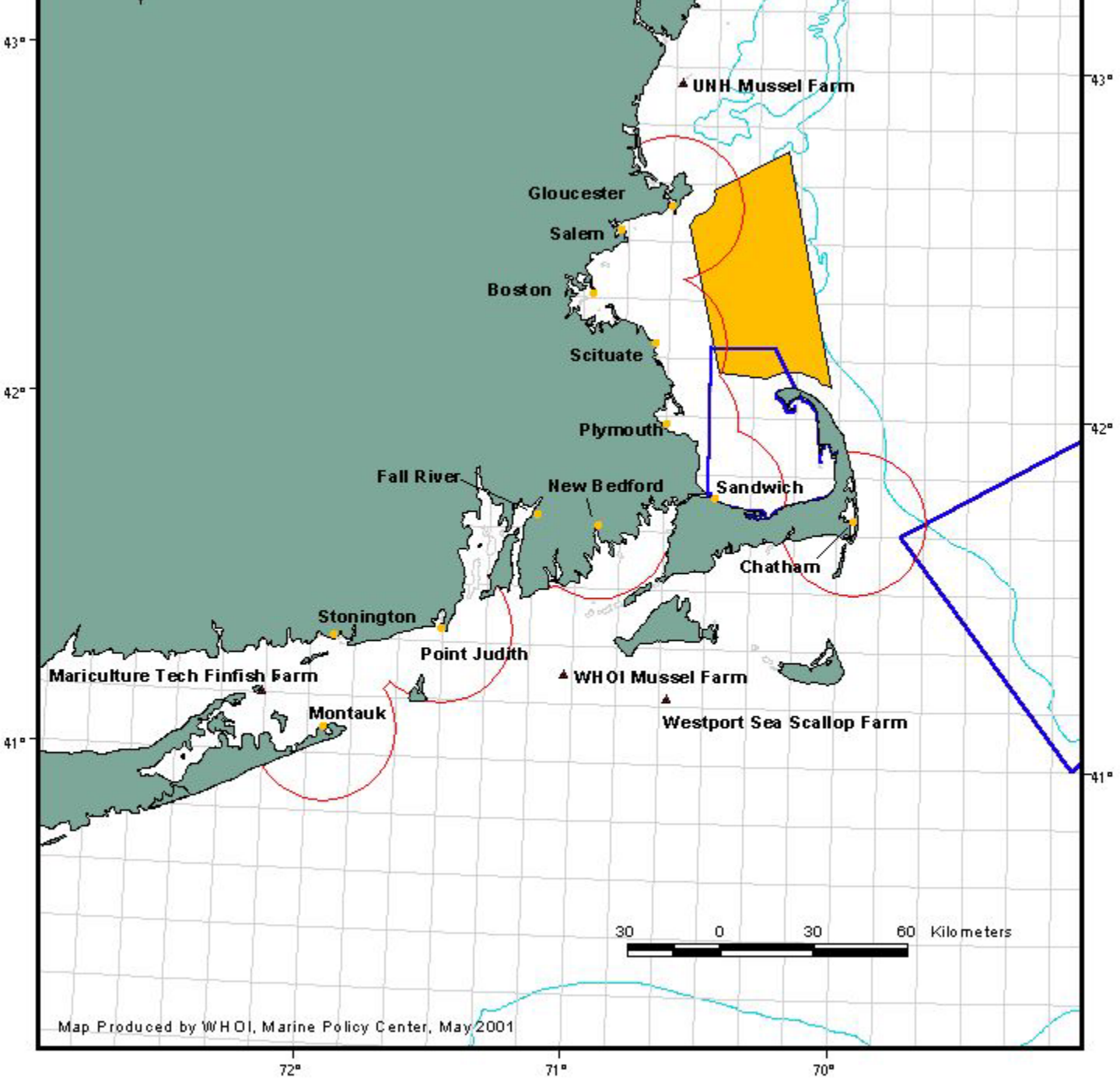
- Geographic location
- Nutrient fluxes
- Plankton densities
- Temperature ranges
- Wind and wave fetch
- Current flows
- Flushing rates
- Predators
- Parasites
- Contaminants
- Others . . .

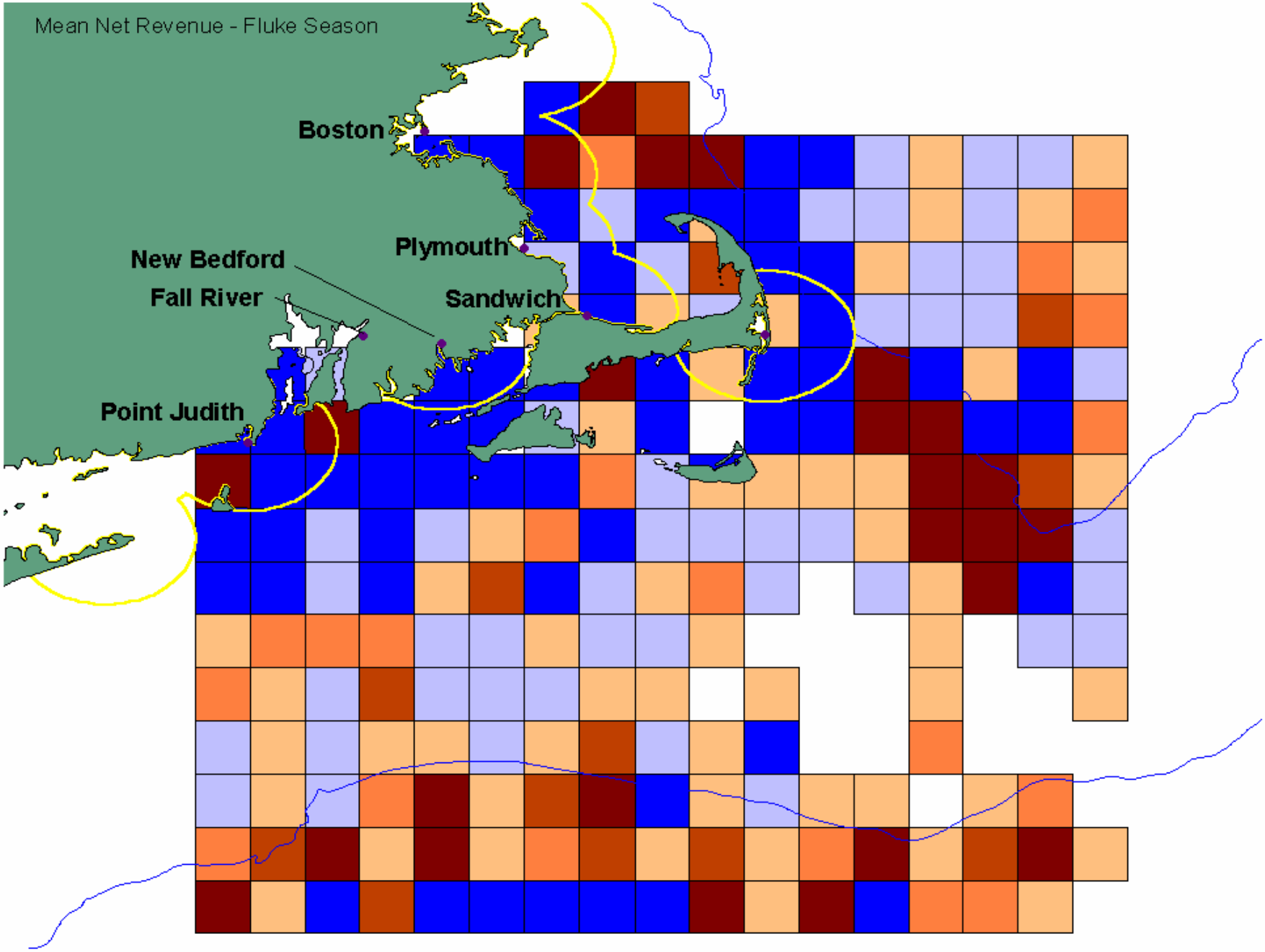
Pacific threadfin (moi) culture (Hawaii)

Ocean Space as a Resource

Like agricultural lands, ocean space:

- Is of varying quality
- Exhibits a gradient of resource rents
  - Von Thunen geographic rents
  - Rents may arise from a variety of alternative uses
- Uses can lead to external effects (pollution)
- Can become degraded as a consequence of overuse


43°
42°
41°
72°
71°
70°
UNH Mussel Farm
Gloucester
Salem
Boston
Scituate
Plymouth
Fall River
New Bedford
Sandwich
Chatham
Stonington
Point Judith
Mariculture Tech Finfish Farm
WHOI Mussel Farm
Westport Sea Scallop Farm
Montauk
30 0 30 60 Kilometers
Map Produced by WHOI, Marine Policy Center, May 2001


Mean Net Revenue - Fluke Season
Boston
Plymouth
New Bedford
Fall River
Sandwich
Point Judith

Ocean Space as a Resource

Unlike agricultural lands, ocean space:

- Is not allocated through private markets
- Historical (especially transitory) uses may have a priority
  - Public trust in state tidelands
  - Implied legal interests based on tradition
  - Pre-existing policies
- Allocation decisions are spread across multiple agencies
- Monitoring/enforcement can be more costly

Surf Battles

- NOAA General Counsel memorandum (1993) asserts jurisdiction over offshore aquaculture as a form of "fishing" under Magnuson-Stevens
- 2005 bill (S. 1195) specifically excludes offshore aquaculture from the definition of "fishing" under Magnuson-Stevens
- S. 1195 authorizes Secretary of Commerce to issue offshore aquaculture permits
- S. 1195 authorizes Secretary of the Interior to concur with offshore aquaculture permits on or near OCS leases
- Sens. Stevens and Inouye seek to require state "opt-outs" in coastal state's "seaward portion" of the EEZ

Marine Aquaculture Act of **1995**

S. 1192, 104th Cong., 1st sess.

Sec. 2(b)(3): It is the policy of the United States . . . to ensure that the placement and operation of any new marine aquaculture facility within a State coastal zone, the territorial sea, or the United States exclusive economic zone, is economically and environmentally sound and does not pose unreasonable constraints on the other public trust uses of marine waters, such as navigation, fishing, recreation, and national defense.

National Offshore Aquaculture Act of **2005**

S. 1195, 109th Cong., 1st sess.

Sec. 1(A): It is the policy of the United States to—support an offshore aquaculture industry that will produce food and other valuable products, protect wild stocks and the quality of marine ecosystems, and be compatible with other uses of the EEZ.

Meaning of “Compatible”

- “Capable of orderly, efficient integration and operation with other elements in a system"

Sec. 4(d)(1): The Secretary shall consult as appropriate with other Federal agencies to ensure that offshore aquaculture for which a permit has been issued . . . is compatible with the use of the EEZ for navigation, fishing, resource protection, recreation, national defense (including military readiness), mineral exploration and development, and other activities.

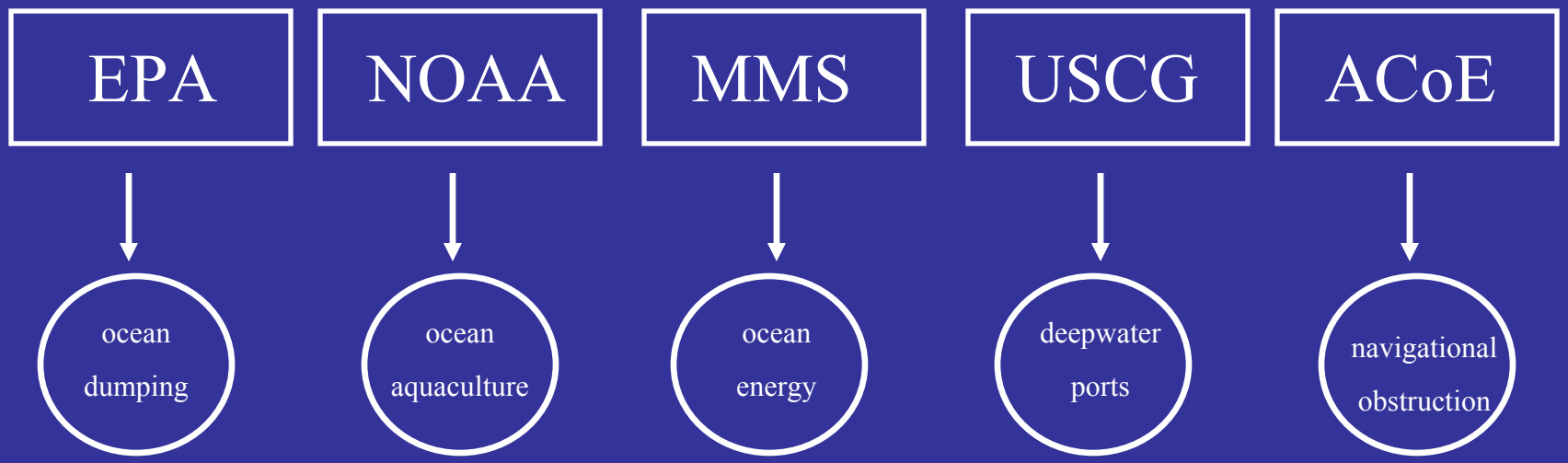
Allocation of Ocean Space as a Resource

How do we think about the issue of "compatibility"?

Economic issues:

- What's the "highest and best" use (or combination of uses)?
- Are uses mutually exclusive?
- How do we value individual mutually exclusive uses?
- What if environmental conditions or preferences change?

“Dis”integrated Ocean Allocation



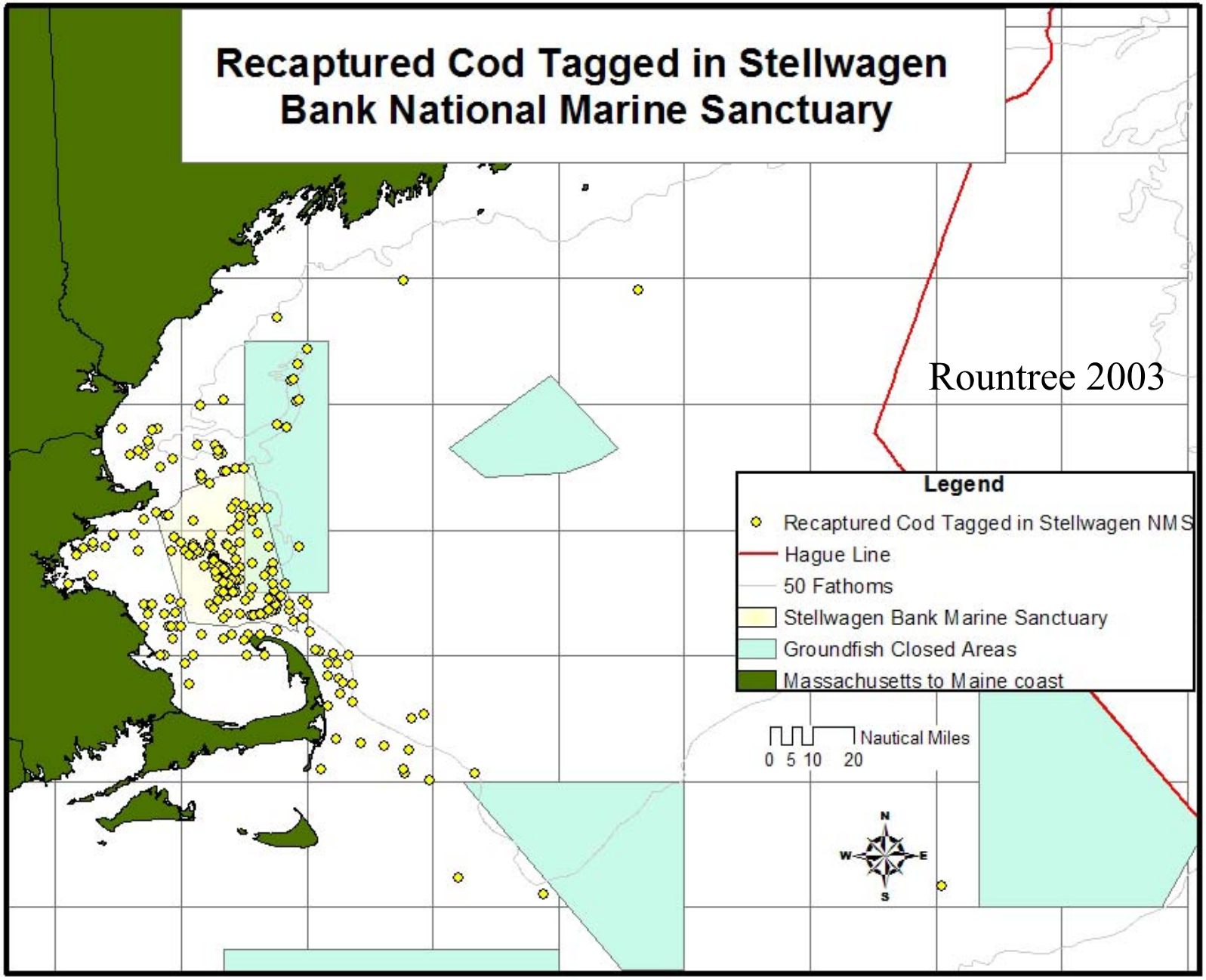
dredge spoils	fish	oil, gas sand windpower	ocean space	navigable waters

Theory of the Firm

- Coase (1937); Williamson (1975)
- Institutional economics (transactions costs)
- Essential idea is a tradeoff in costs:
  - firm (management costs)
  - market (transactions costs)
- Asset specificity leads to formation of a firm
  - custom product or service => opportunism

Theory of Integrated Ocean Management?

- Is there an "optimal" (transaction cost-minimizing) institutional arrangement for allocating ocean space among competing uses?
- Each agency produces (allocates) ocean space for specific resource uses and coordinates (contracts) with other agencies for their customized expertise
- Transactions costs are steep:
  - High costs of negotiating and enforcing agreements with other agencies
  - Stakeholders align with individual agencies (vetoes, litigation, end-runs)
- Argument for centralized management (integration) in the allocation of ocean space
- What are the costs of integrated management?
- Stellwagen Bank NMS example


Recaptured Cod Tagged in Stellwagen Bank National Marine Sanctuary
Rountree 2003
Legend
Recaptured Cod Tagged in Stellwagen NMS
Hague Line
50 Fathoms
Stellwagen Bank Marine Sanctuary
Groundfish Closed Areas
Massachusetts to Maine coast
Nautical Miles
0 5 10 20
N
W
E
S

What Does an Access System Look Like?

- What are the specific features of an economically efficient system of access for ocean space?
- What can we learn from historical practice?
- Are there lessons that can be drawn from existing access systems for:
    - other natural resources
    - foreign access systems

Generic Access System Features

1. Regional planning
2. Policy objective
3. Lead/Coordinating agencies
4. Management processes
5. Resource assessment
6. Area Selection
7. Multiple use resolution
8. Environmental review
9. **Allocation method**
10. Instrument
11. Legal interests
12. Size
13. Tenure
14. Financial terms
15. Performance
16. Monitoring
17. Subsidies
18. R&D incentives
19. Transferability
20. Termination

Methods of Resource Allocation (Shubik 1970)

- force, fraud, or deceit
- custom, including gifts and inheritance
- chance
- **higher authority, fiat, or dictatorship**
- voting procedures
- **bidding**
- bargaining
- economic market with a price system

Allocation Method

- Discretionary (first-come, first served)
  - Bonanza phenomenon
  - Criticism of resource “give-aways”
- Competitive
  - Valuations revealed
  - Costly if demand is thin
- Institutional issues
  - When to shift from discretionary to competitive?
  - Inclusivity of other users?
  - Distributions of transitory uses?
  - Irreversibility of allocations?
  - Others . . .

Summary

- Ocean space is a resource: it has value because it is scarce
- Traditional approach to ocean management is focused on the needs of distinct user groups
- The transactions costs of the traditional approach amplify as the ocean is used more intensively
- Argument in organizational theory for centralizing management around the common theme of allocating ocean space