



# So you are thinking about growing shellfish?

*Things to consider....*

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University of Florida / IFAS

Shellfish Aquaculture Extension Program

Cedar Key, Florida



Presented at Aquaculture America 2005, New Orleans, LA



# Why?

## Attributes

- Supports small business entrepreneurship
- Many farms are individual or family operated
- Size of commercial-scale farm relatively small, from 2 to 10 acres
- Relatively inexpensive start-up and operating costs in growout operation
  - Lease lands, do not purchase
  - No feed, aeration or pumping costs
- Provides independent lifestyle on the water
- Over 900 shellfish farms in U.S. with sales value of \$203M (USDA 2005)



# *What shellfish to grow?*

## Species Selection

- Dependant on geographic area
- Supports existing culture operations
- Life history / biology well known
- Hardiness / tolerance to a wide variety of environmental conditions
- Established culture technology
- Reliable seed production / collection methods
- Minimal susceptibility to diseases
- Established markets and existing demand
- Marketable product at early life history stage
- Moderate to high unit sale price

# Oysters



From left to right:

Pacific oyster

*Crassostrea gigas*

Kumamoto oyster

*Crassostrea sikamea*

European flat oyster

*Ostrea edulis*

Olympia oyster

*Ostrea lurida*



Eastern oyster

*Crassostrea virginica*



# Clams



Manila clam  
*Tapes philippinarum*



Pacific littleneck clam  
*Protothaca staminea*

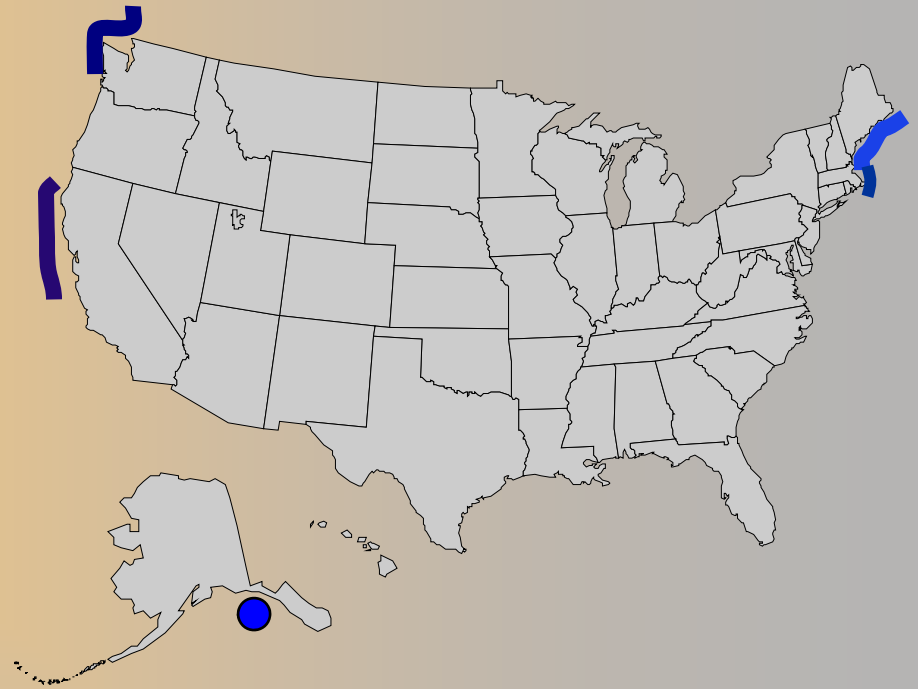


Hard clam, northern quahog  
*Mercenaria mercenaria*

# Mussels



Mussels:  
Mediterranean,  
*Mytilus galloprovincialis*  
California,  
*M. californianus*



Blue mussel  
*Mytilus edulis*  
*M. trossulus*

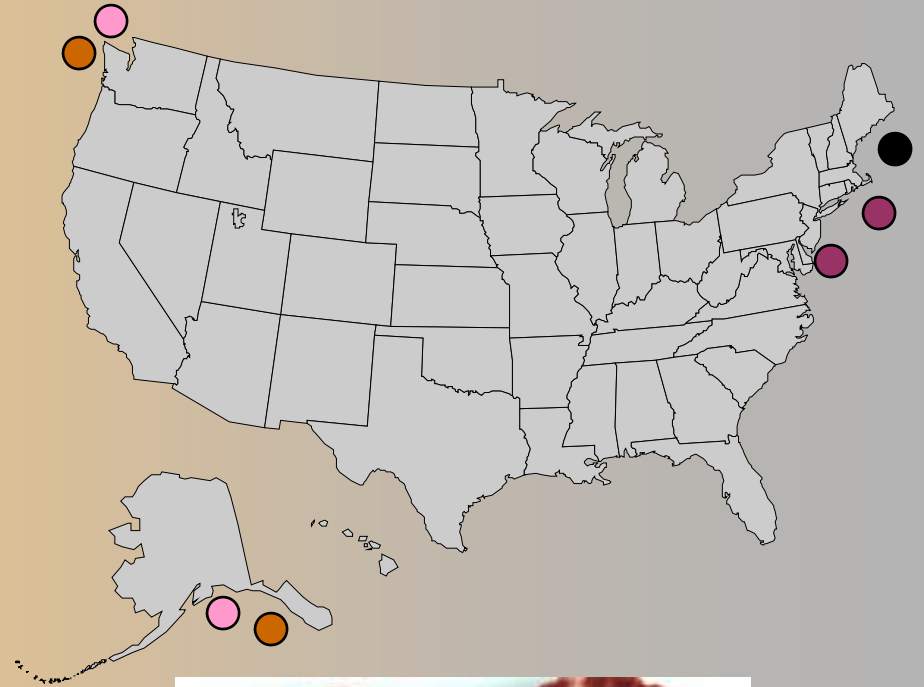
# Other species



Geoduck clams  
*Panopea abrupta*



Soft-shelled clam  
*Mya arenaria*



Scallops:  
Bay, *Argopectin irradians*  
Pink and Spiny, *Chlamys* spp.  
Rock, *Crassadoma gigantea*



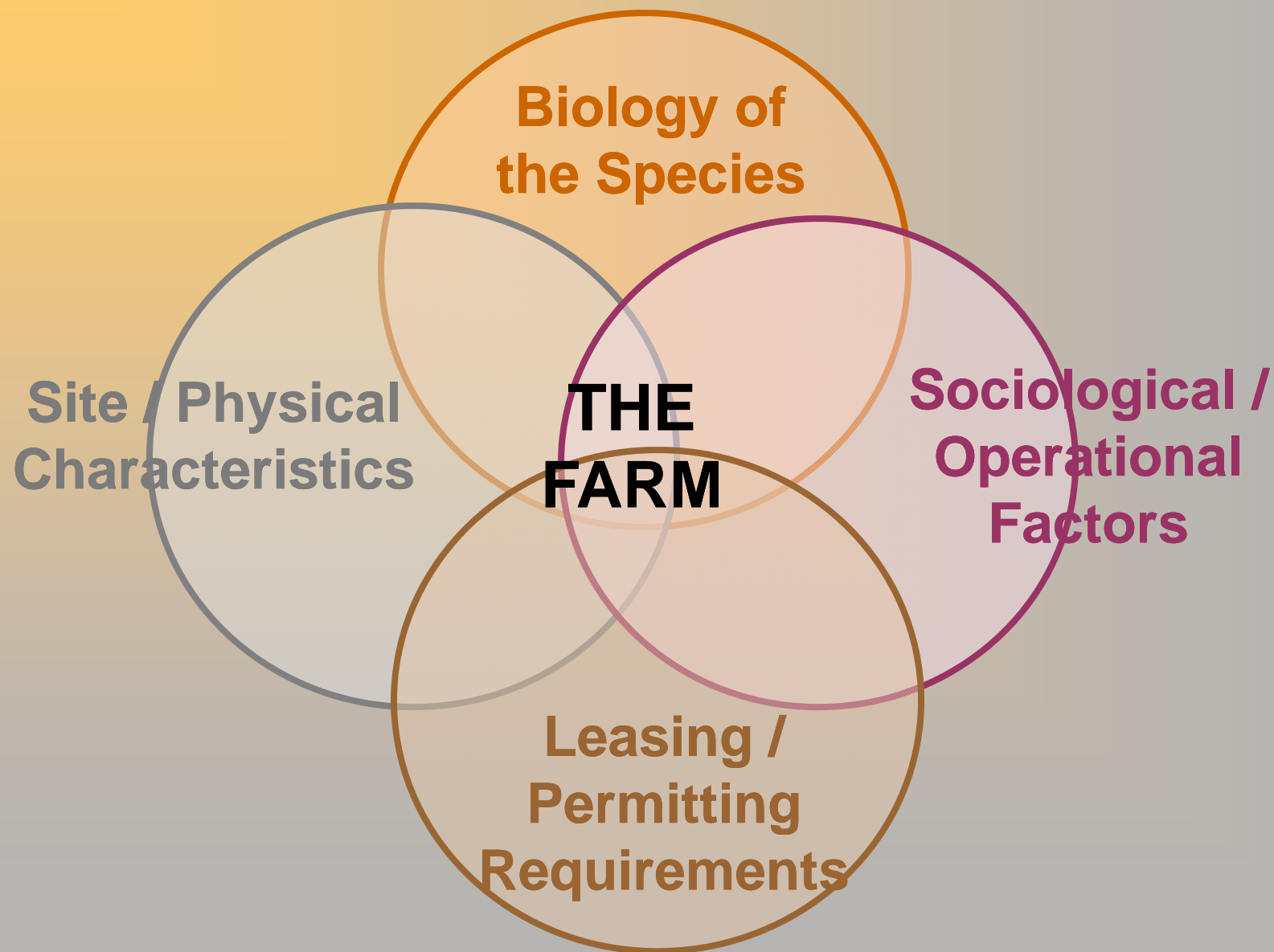
# *Where to locate your farm?*

- 🐚 Open-water farming
  - Estuaries, bays, sounds, offshore
- 🐚 Conducted on
  - State-owned (sovereign) leases
  - Grants / deeds
  - Privately-owned submerged lands

*“Location, location, location...the most critical step!”*



# *Where to site your shellfish farm?*

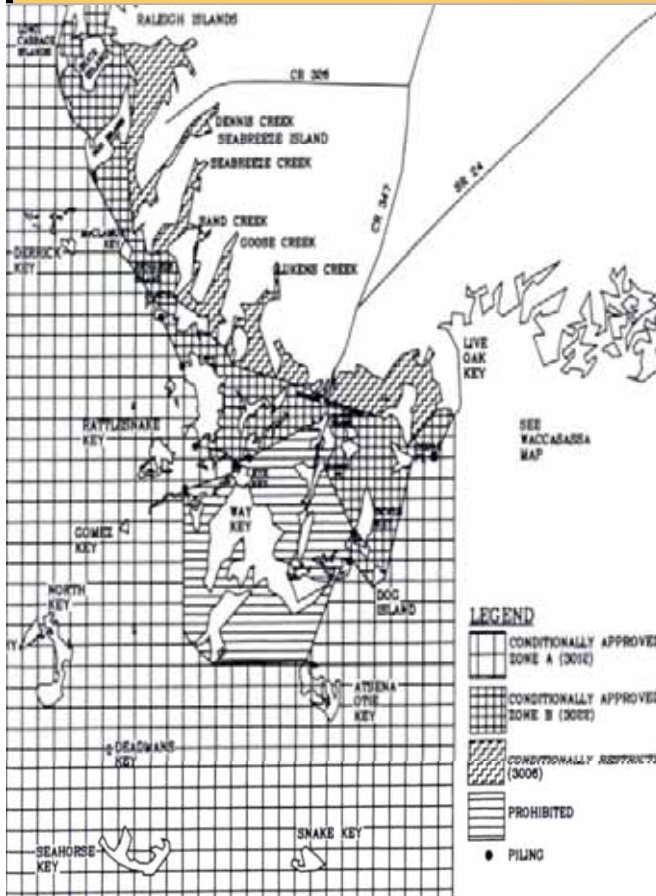


# Biological considerations

- Growth
  - Old shell / Live shell
  - Test plots
- Food (primary productivity)
  - Density - how much?
  - Diversity - what kind?
- Predators
  - Effect on survival
  - Abundance / species
- Fouling
  - Effect on flow, cleaning, equipment, product
- Prevalence of diseases – MSX, Dermo, QPX
- Prevalence of harmful algae blooms - red tide, PSP



# Shellfish water classifications



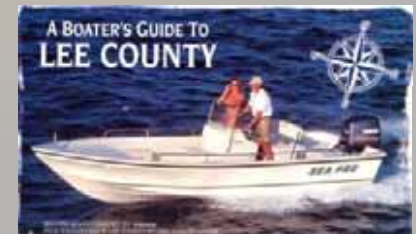
Cedar Key Shellfish Harvesting Area, Classification Map

- Mollusks require sanitary control
  - Filter feeders / Consumed raw
- Federal guidelines provided by ISSC\* National Shellfish Sanitation Program
- Established bacteriological standards
- Shellfish harvesting area (SHA) classifications
  - Approved / Conditionally approved
- SHA maps obtained from state shellfish regulatory authority
- Management plan of SHA
  - Rainfall, river stage, HABs, biotoxins
  - Number of annual closure days

\*Interstate Shellfish Sanitation Conference

# Environmental (physical) factors

- Salinity
- Water depth and contour
- Substrate characteristics
- Sedimentation rate
- Turbidity
- Currents
  - Flow / circulation
- Tidal action
  - Flow / height / exposure
- Wind and wave direction
- Exposure
- Storm damage frequency





# Other considerations

## Sociological Factors

- Riparian and adjacent land owners
- Alternative usages
  - Fisheries
  - Recreational
- Pollution sources
- Future development



## Operational Factors

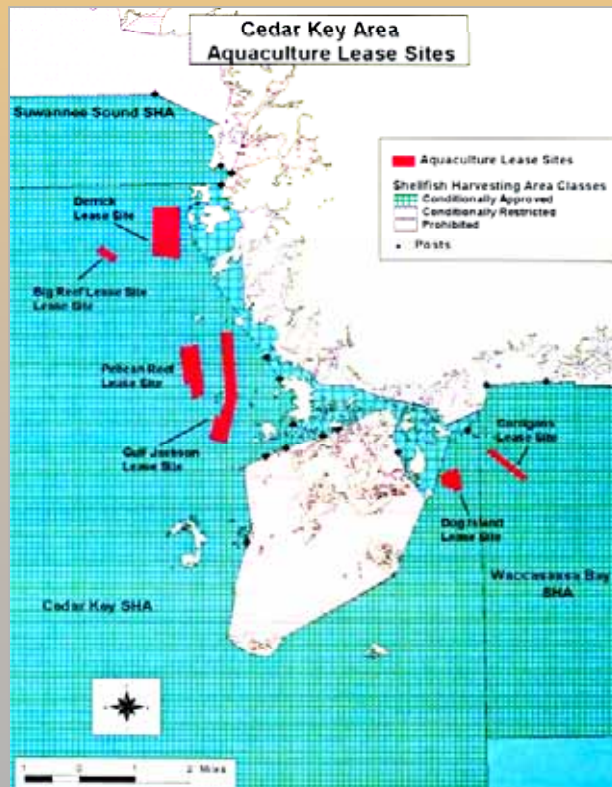
- Upland access
  - Boat launching
  - Nurseries, sieving
  - Wholesalers, harvesting
  - Equipment storage
- Access to markets
- Security / surveillance
- Proximity to other farms
- Production expandability
- Manpower availability





# Leasing requirements

- Contact state agency responsible for administrating leasing program
- Process includes
  - Nominate site / seek preapproved areas
  - Site undergoes inspection
    - Evaluation of natural resources
    - Compatibility with area
    - Must be nonproductive “bare” bottom
  - Submit and review of application and business plan
  - Public notification / Authorization
  - Survey and mark site
  - Application and annual rental fees
  - Cultivation requirements



# Permitting requirements

## -Other state agency permits

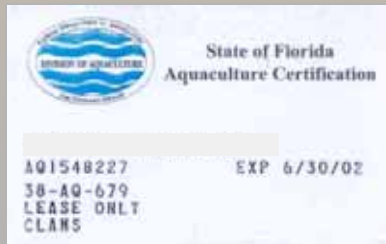
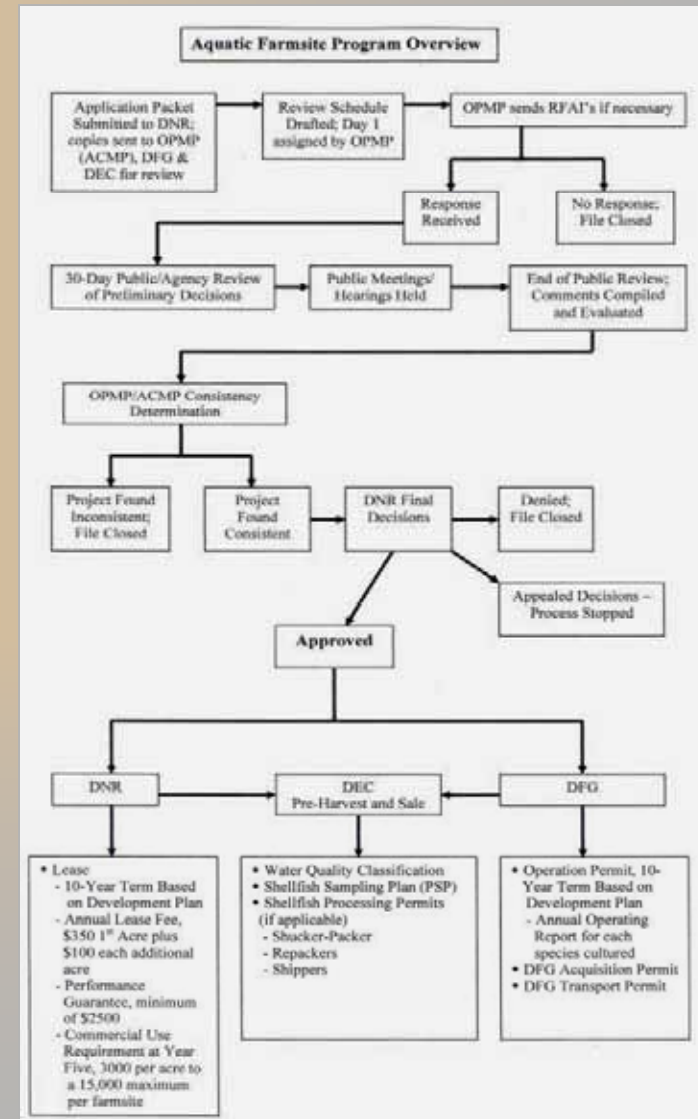
- Leasing
- Upland operations

## -Federal agency permits / notifications

- Army Corps of Engineers
- U.S. Coast Guard

## -Licensing

- Harvesting
- Shellfish wholesaler
- Local occupational





# *How to grow your shellfish?*

- 🐚 Culture methodology
  - Extensive versus intensive
  - Intertidal, subtidal, or water column use
- 🐚 Culture equipment / gear

*“Start off small, allow time to move up the learning curve!”*

# Extensive versus Intensive Culture

- Seed collected from wild
- Usually little equipment involved
- Lower farm costs
- Lower labor input
- Lower production per acre
- High acreage required



Oyster cultch lease, Apalachicola, FL

- Hatchery-produced seed
- Equipment required for predator protection
- Higher capital costs
- Higher operating costs
- Higher labor input
- Higher production per acre
- Less acreage required



Oyster racks, Moonstone Oyster Farm, RI



# Intertidal culture



# Water column culture

# Subtidal culture





# Oyster culture



*Cultch and seed plant, LA*



**Floating chub,  
NC**



**Flexible belt, FL**



# Oyster culture



*Bag and  
stacked rack,  
FL*



*Bag and rack, MA*



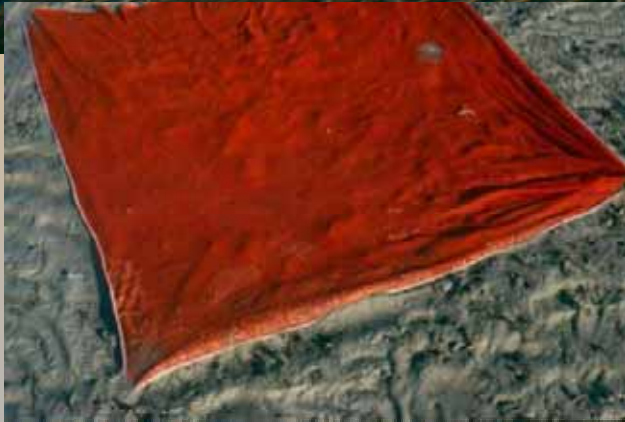
# Oyster culture

*Tray and lantern nets,  
NJ, RI, MA and BC*





# Clam culture



Soft bottom bag, FL



Pen system, SC



Bottom tray, FL

# Clam culture

*Bottom exclusion nets,  
VA and MA*





# Mussel culture



*Filling socks,  
ME*

*Hanging ropes, ME*



*Long lines, BC*



# *Where to get your seed?*

- 🐚 Natural recruitment
- 🐚 Collection from wild sources
  - Cultch, spat collectors, relay
- 🐚 Hatchery production
- 🐚 Land-based nursery options

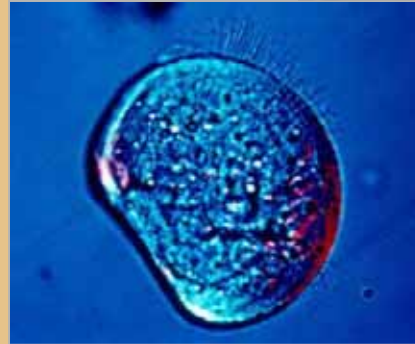
*“Start off small...you can learn as much by killing 10,000 seed as with a million seed!”*



# Hatchery production



Spawning



Algal production

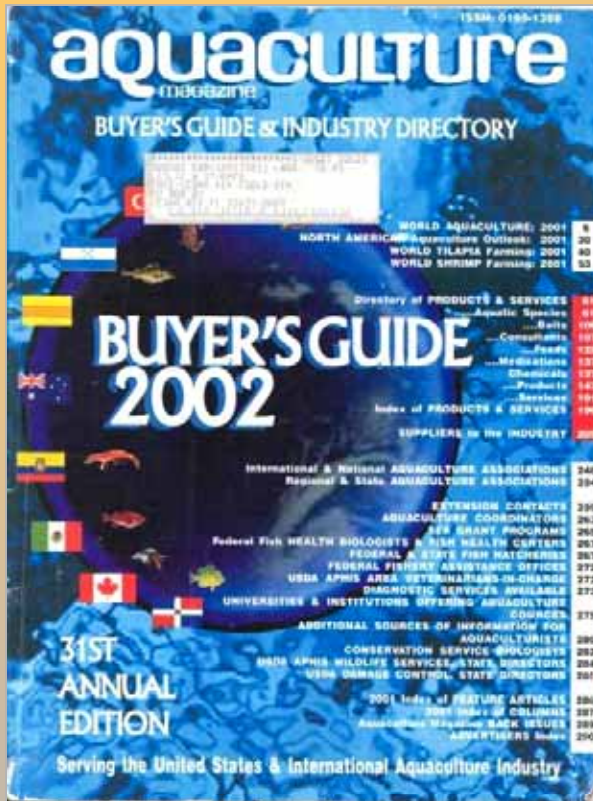


Larval rearing



Post-set nursing

# Where to buy seed?



National suppliers guide

RUTGERS COOPERATIVE EXTENSION  
New Jersey Agricultural Experiment Station

## East Coast Shellfish Hatchery and Nursery List 2004

Gulf Shells  
Marine Extension Team

This list will be updated in the future. If there are any suppliers who have not been included, they should contact the author for inclusion in the next publication. If someone is using this list and cannot locate a business because the contact information has changed or is incorrect, please send a note, print, or e-mail contact information to the author. If a new hatchery comes on line, please e-mail them to contact me. This is done as a service to the industry, please help to keep the information current.

Please, this information by no means suggests a recommendation about the quality of the product or services that these seed suppliers provide, and similarly, by no means, be construed as an endorsement for any of these companies by either the author or Rutgers University.

The list has been reviewed numerous times by people in primary areas listed. If there is an omission, it has not been intentional.

**CONNECTICUT**

**Bay Shellfish Co. - H, N**  
P.O. Box 289  
Terra Ceia, FL 34250  
Contact: Curt Herndl  
(941) 721-3887 or 722-1346 (Fax)  
boystfish@earthlink.net

**Brewer's Clams - H, N**  
4225 Indian River Drive  
Cocoa, FL 32927  
Contact: Gray Brewer  
(321) 632-4920

**Bull Bay Clam Farm - N**  
7228 Surrybrook Blvd.  
Egglewood, FL 34224  
Contact: Dan Leonard  
(941) 473-3292 or 270-2032 (cell)  
clams@sunline.net

**The Clam Bed - H, N**  
P.O. Box 700758  
Webbport, FL 32970  
Contact: Bill Thompson  
(352) 589-6138

**Cedar Creek Shellfish Farms - H, N**  
859A Pompano Avenue  
New Smyrna Beach, FL 32169  
Contact: Mike Sullivan  
(386) 426-0113 or 847-3202 (cell)  
Shellfish@ucsb.net

**Atlantic Clam Farm - H, N**  
465 Millard Point Road  
Merritt Island, FL 32952  
Contact: Barry Moore  
(321) 453-2685  
clamsa@aol.com

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Shellfish@ucsb.net

**Clams R' Us - N**  
705 27th Avenue SW #5  
Vero Beach, FL 32960  
Contact: Joe Weissman  
(772) 465-2400, ext. 414  
baptiste@bbai.edu

**Cole's Clam Nursery - N**  
P.O. Box 82  
Pacida, FL 33946  
Contact: Dot Cole  
(941) 697-3181

**First Choice Clam Seed - N**  
419 N. Washington Avenue  
Titusville, FL 32796  
Contact: Greg Neilson  
(321) 267-1667  
(321) 383-1324 (after 7PM)

**David Grudin - N**  
Nettles Island Marina  
Jensen Beach, FL 34996  
Contact: David Grudin  
(352) 250-0667  
dgrud@yahoo.com

**Harbor Branch Clams - H, N**  
5600 U.S. 1 North  
Fort Pierce, FL 34946  
Contact: Joe Weissman  
(772) 538-1051  
Weissm\_j@bellsouth.net  
or Richard Baptiste  
(772) 465-2400, ext. 414  
baptiste@bbai.edu

**Hydrosphere Research - H**  
1184 Research Circle  
Alichaun, FL 32615  
Contact: Craig Watts  
(386) 462-7889  
craig@hydrosphere.net

**Kibbe & Company - N**  
P.O. Box 629  
St. James City, FL 33956  
Contact: John Pfeiffer  
(954) 436-8828 or  
(239) 707-5322 (cell)

More on back →

**RUTGERS**

Regional suppliers list



These hatchery and nursery operations are supplying hard clam (*Mercenaria mercenaria*) seed to Florida growers this year. Contact suppliers directly for information on sizes, price, color variation and availability.

### H-Hatchery N-Nursery

- Atlantic Clam Farm - H, N**  
465 Millard Point Road  
Merritt Island, FL 32952  
Contact: Barry Moore  
(321) 453-2685  
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(239) 707-5322 (cell)

Provided by  
University of Florida  
Shellfish Aquaculture Extension  
P.O. Box 89  
Cedar Key, FL 32625  
Phone: (352) 543-5057  
E-Mail: LNST@mail.ifas.ufl.edu

UNIVERSITY OF  
**FLORIDA**  
IFAS EXTENSION

State suppliers list



# What is a land-based nursery?

- Intermediate step
- Seed obtained from a hatchery is nursed to a final plant or field plantable size
- Simple in design and operation
- Consist of wellers and raceways
- Requires minimum maintenance
- Lowers initial seed costs
- Increases seed availability





# Land-based nursery options



Upwellers



Raceways



FLUPSY





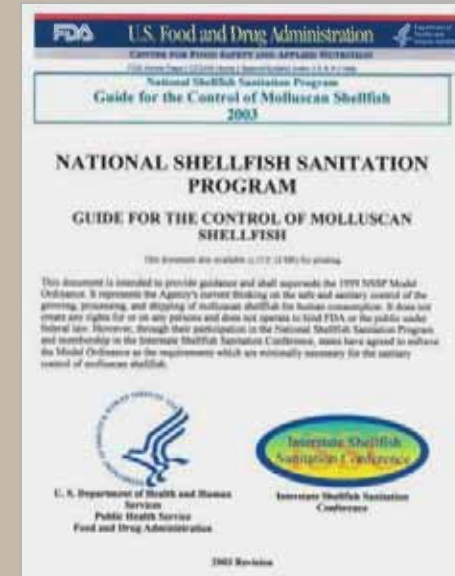
# *How to sell your product?*

- 🐚 Sell to a shellfish wholesaler
- 🐚 Become a shellfish wholesaler
  - How to become a wholesaler?
- 🐚 Processing / Product forms
- 🐚 Market channels / Distribution

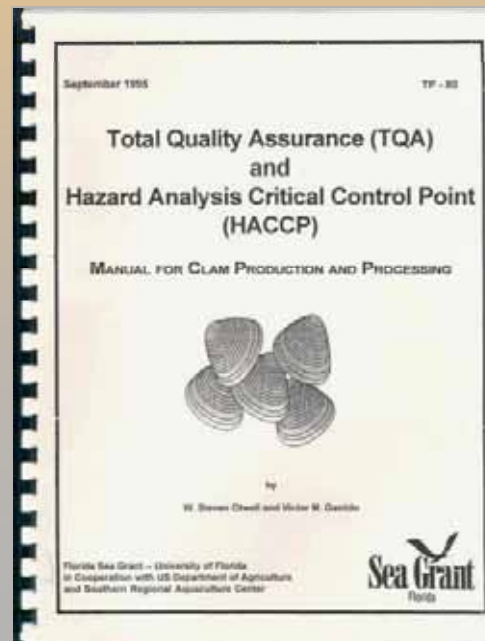
*“You don’t make money growing shellfish, you make money selling ’em...if you get a good enough price.”*

# Shellfish wholesaler requirements

- Harvesting, processing and shipping of molluscs highly regulated
- Accountability from point of harvest to consumer
- Federal oversight – FDA and ISSC National Shellfish Sanitation Program



<http://www.issc.org>



- State permitting / certification
- Plant inspections
- Approved plans
  - Facility
  - HACCP
  - Sanitation



# Shellfish product forms



Shucked meats

Live shellstock





# Shellstock processing



Culling



Washing/tumbling



Grading



Tagging / Packaging



Transporting in refrigerated trucks



# Shellstock market channels





## *What else?*

- ☞ Develop a business plan
- ☞ Obtain adequate financing
  - Capital (it takes money, to make money)
  - Operating (for at least 2-3 years of operation)
- ☞ Gain practical experience
  - Initially grow a small plot of shellfish
  - Work with other shellfish farmers

*“Approached in a well logical, well-informed manner, shellfish farming has the potential for returning a profit on your efforts. Likewise, done without adequate planning it is guaranteed to lose you money!”*



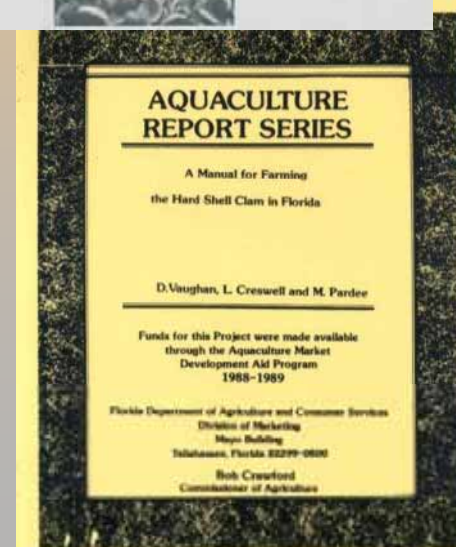
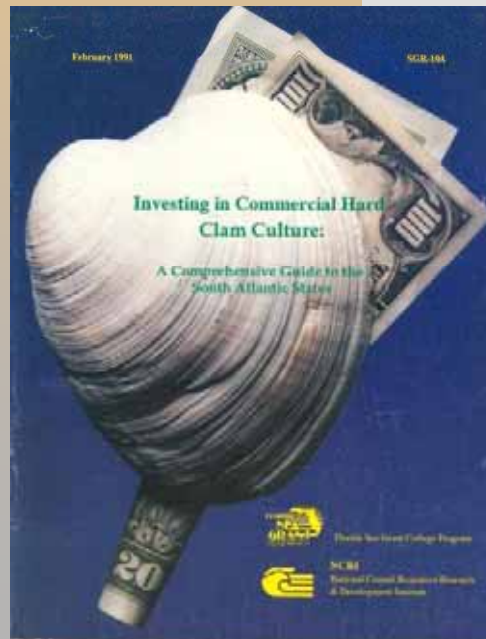
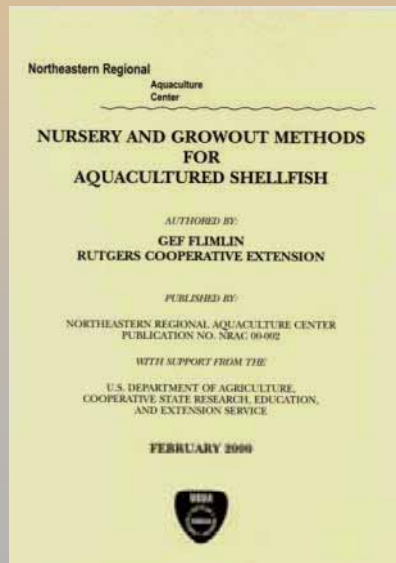
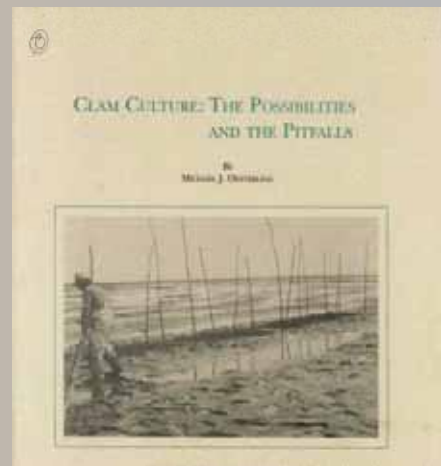
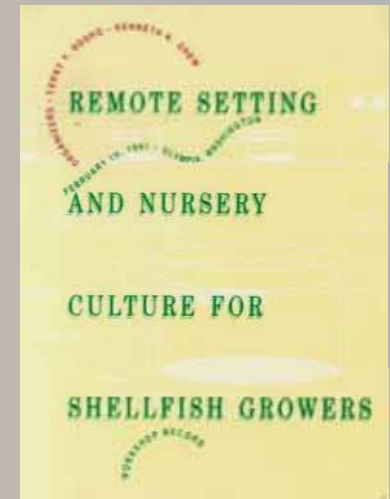
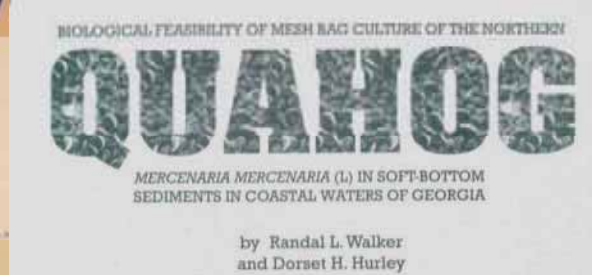
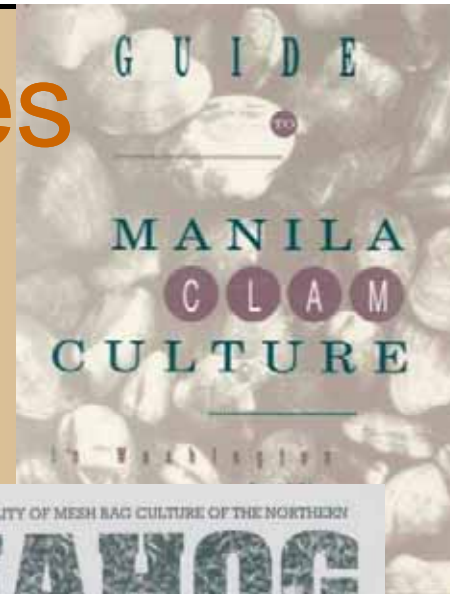
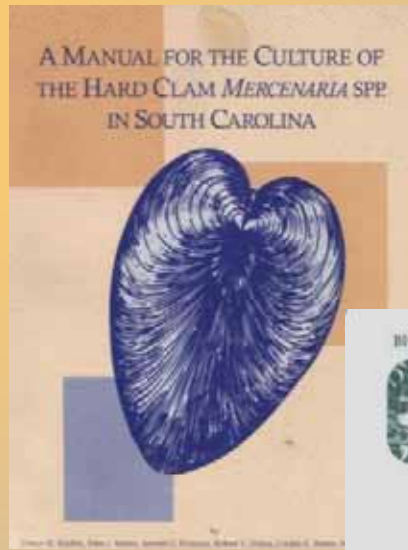
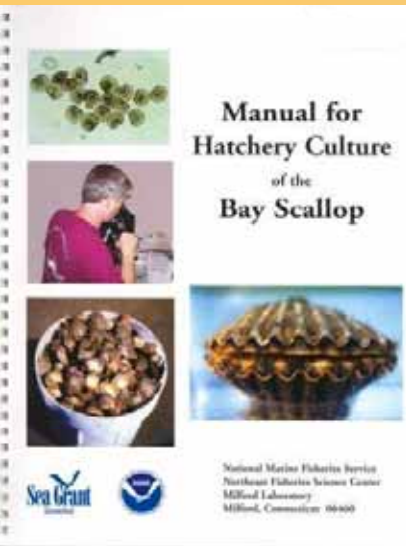
## *How to get information?*

- Aquaculture extension agents or Sea Grant marine agents
- USDA Regional aquaculture centers (NRAC, SRAC, WRAC)
- Internet / Industry, suppliers and association web sites
- Shellfish farmers

*“In spite of available information, it will still be your time, money and dedication that will be required for a successful shellfish farm.”*



# Information sources



# Shellfish farming...

## ...a way of life

