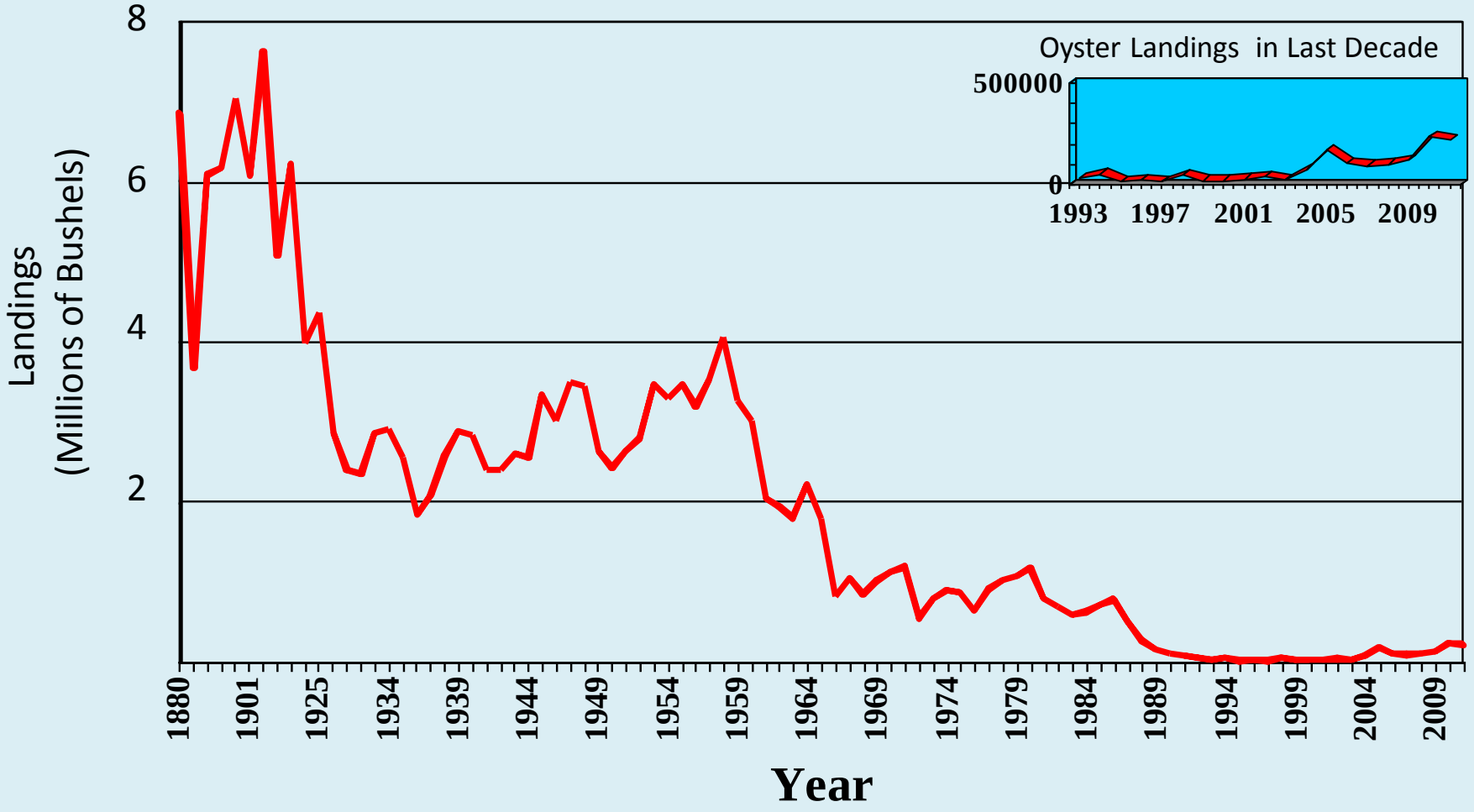
VIRGINIA'S OYSTER MANAGEMENT and INDUSTRY TODAY

Oyster Landings (1880 - 2011)



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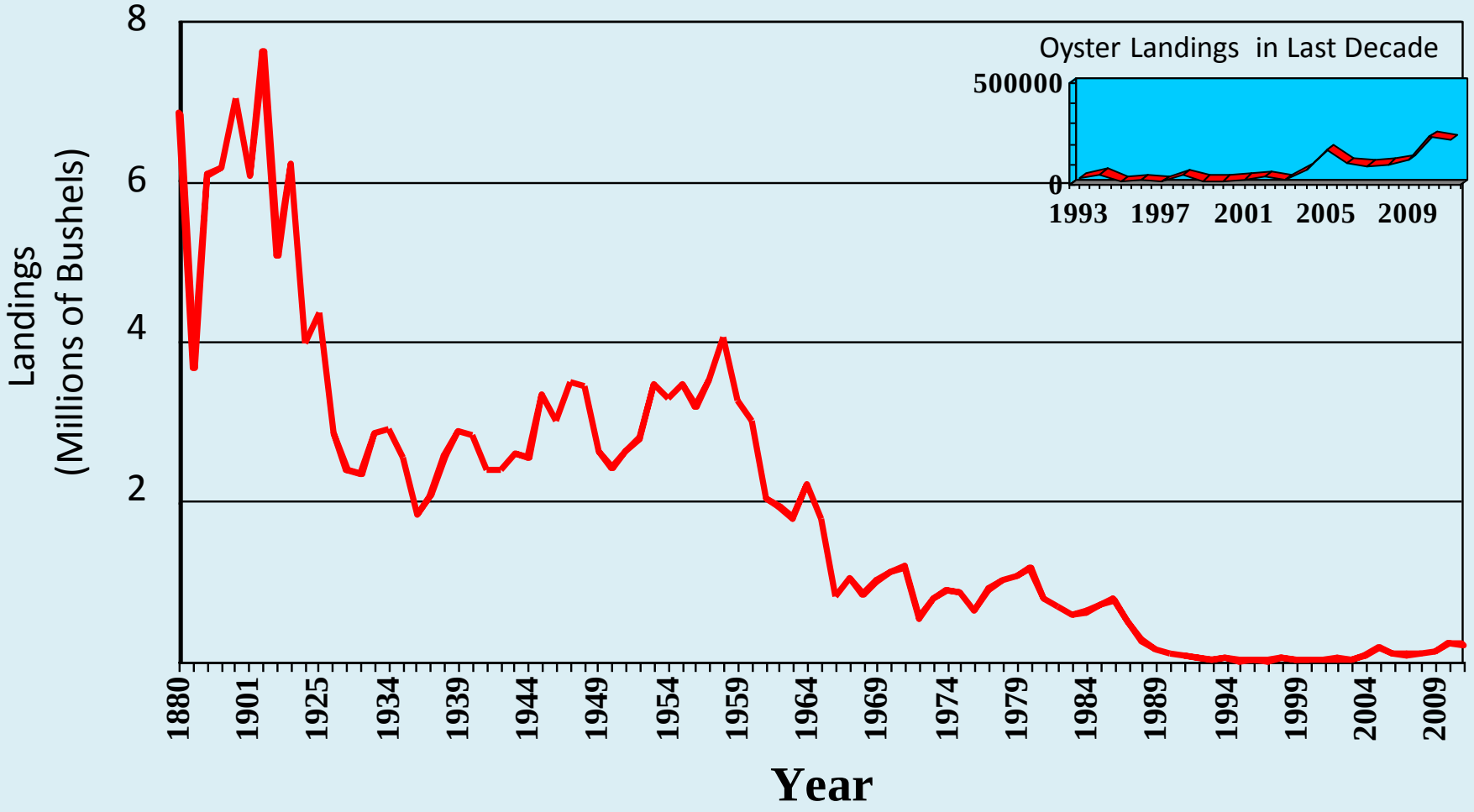
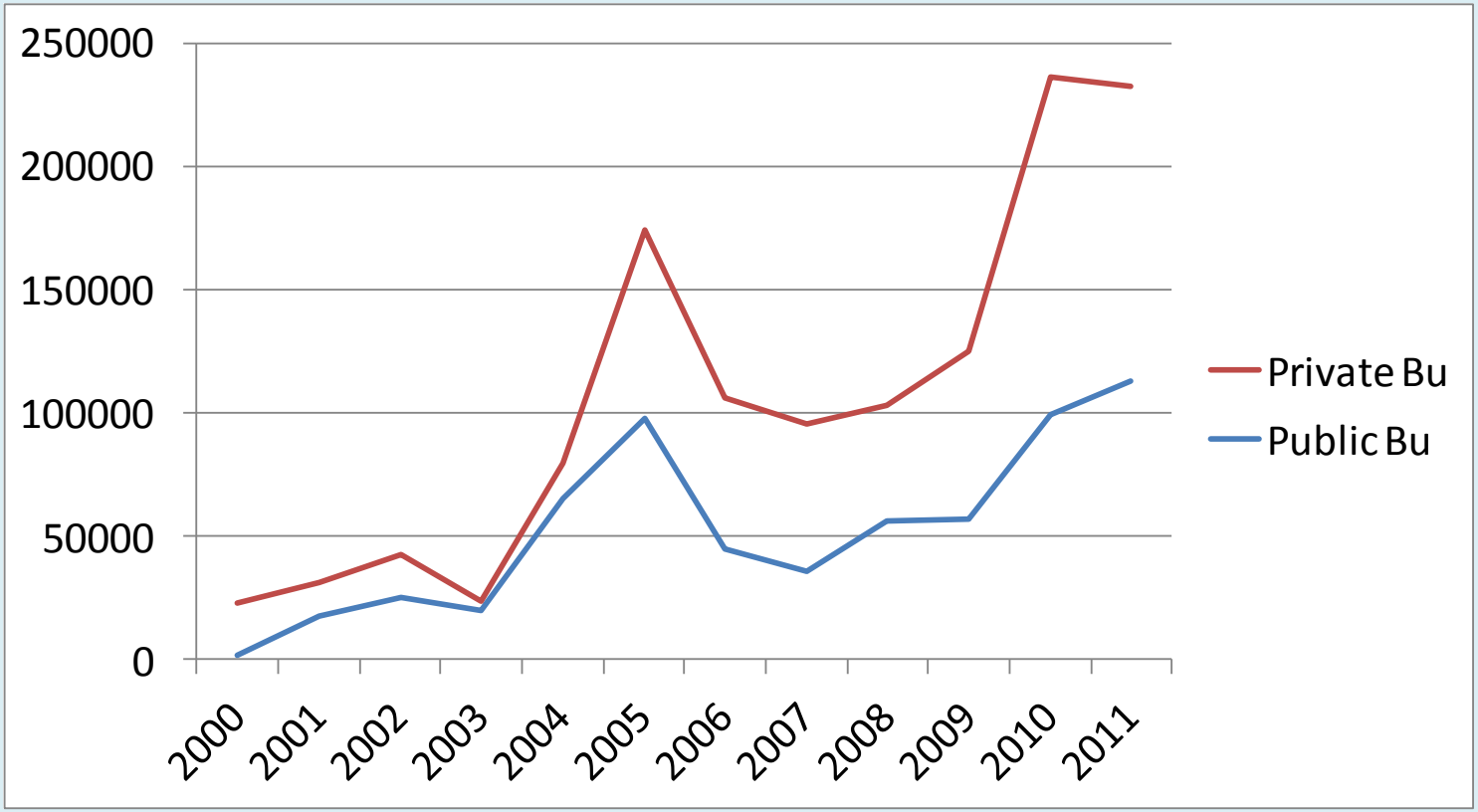


Public vs. Private Oyster Harvest



Virginia Economic Value

Current Oyster Use

500,000 bushels handled - $46M

235,000 (2010)Virginia Harvest-$22M

265,000 bushels imported- $24M which is available for the Virginia oyster industry to produce.

Imported Oysters

Economic loss to Virginia industry

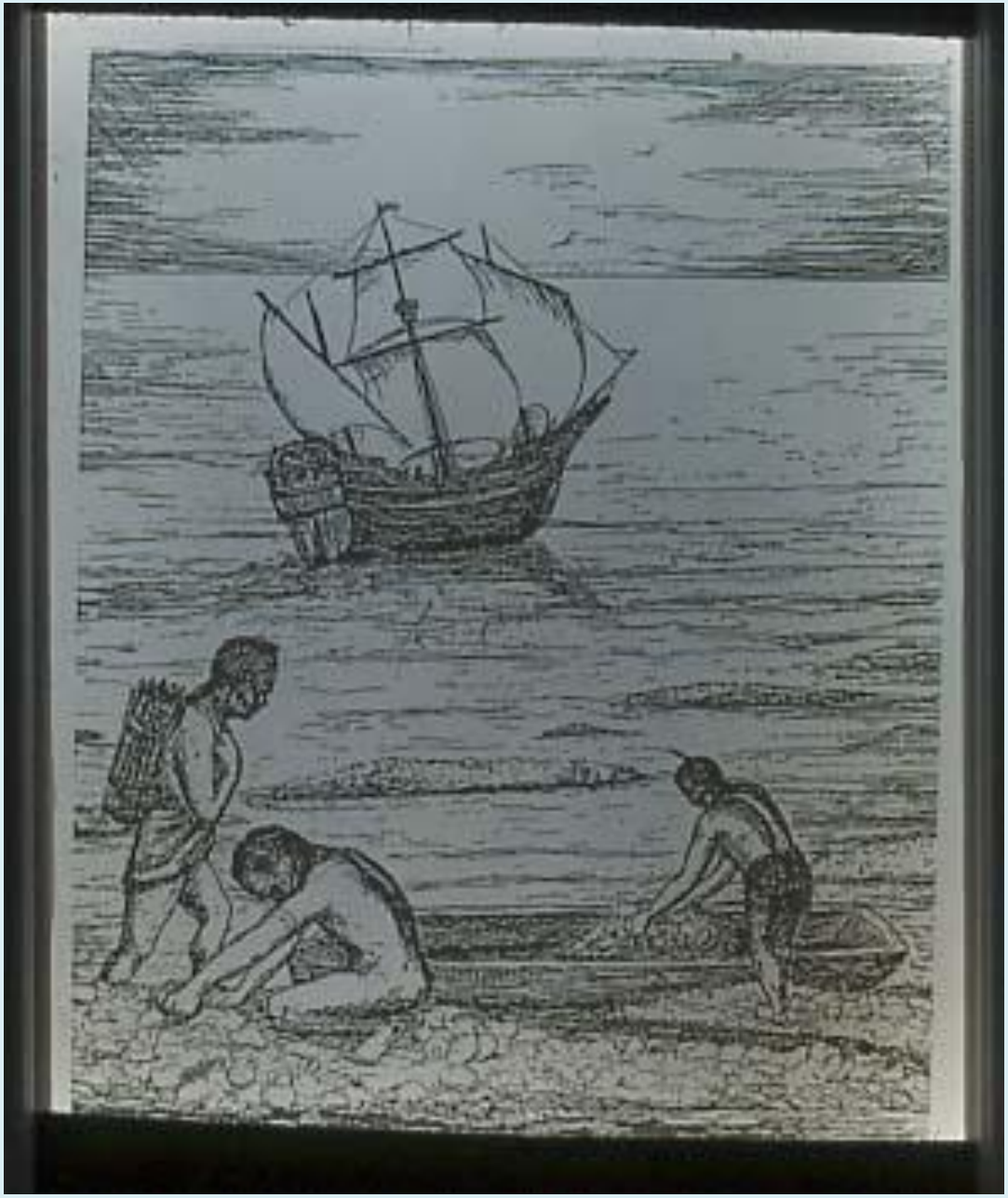
Imports are not dependable:

Interruptions do to hurricanes, flooding, pollution, health issues, and product quality.

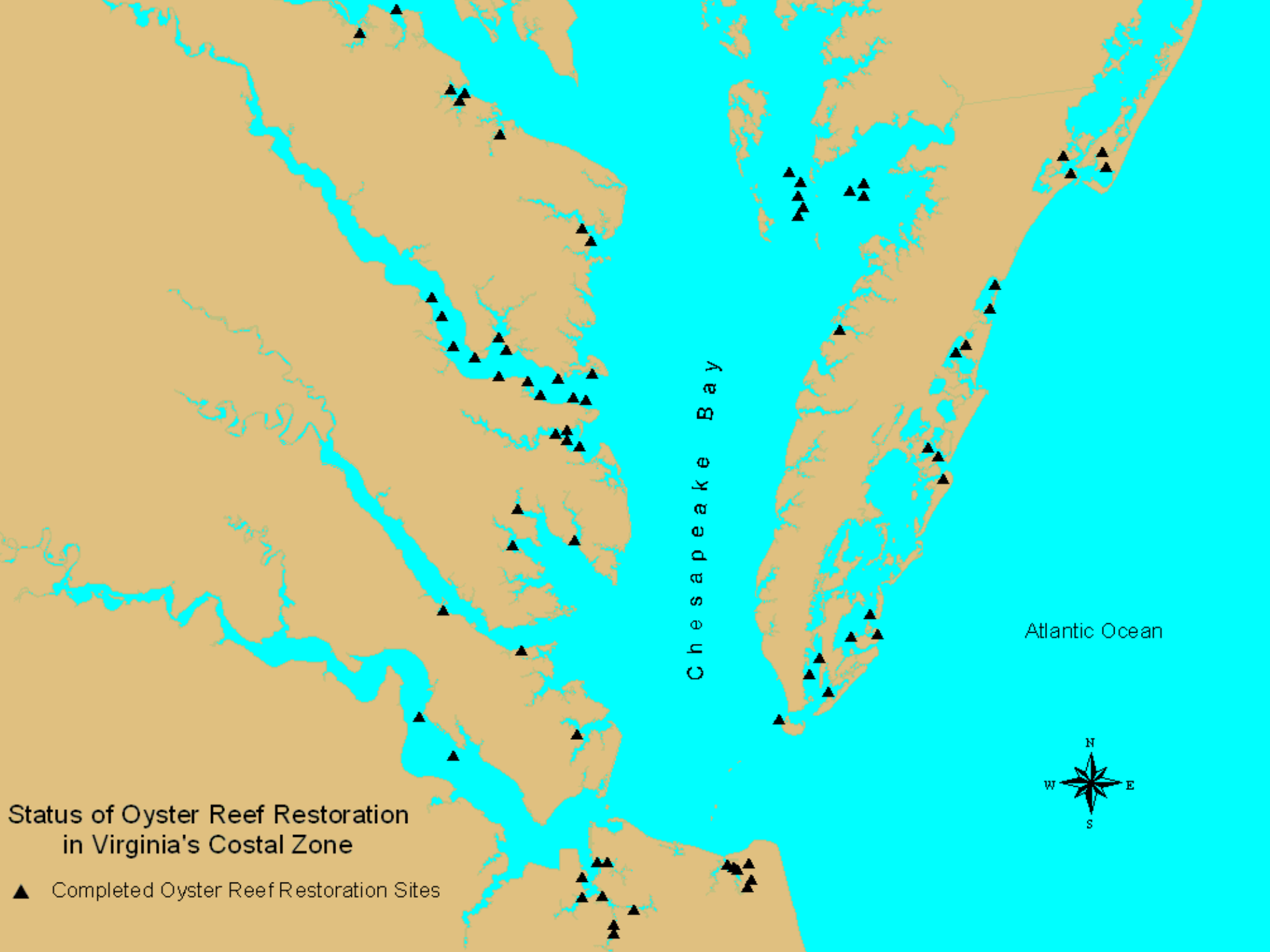
High costs for trucking

Less Virginia jobs

Loss of water quality benefits from fewer oysters in the Bay removing nitrogen




SUBMERGED
DANGER
REEF


Chesapeake Bay
Atlantic Ocean
N
W
E
S
Status of Oyster Reef Restoration
in Virginia's Costal Zone
Completed Oyster Reef Restoration Sites

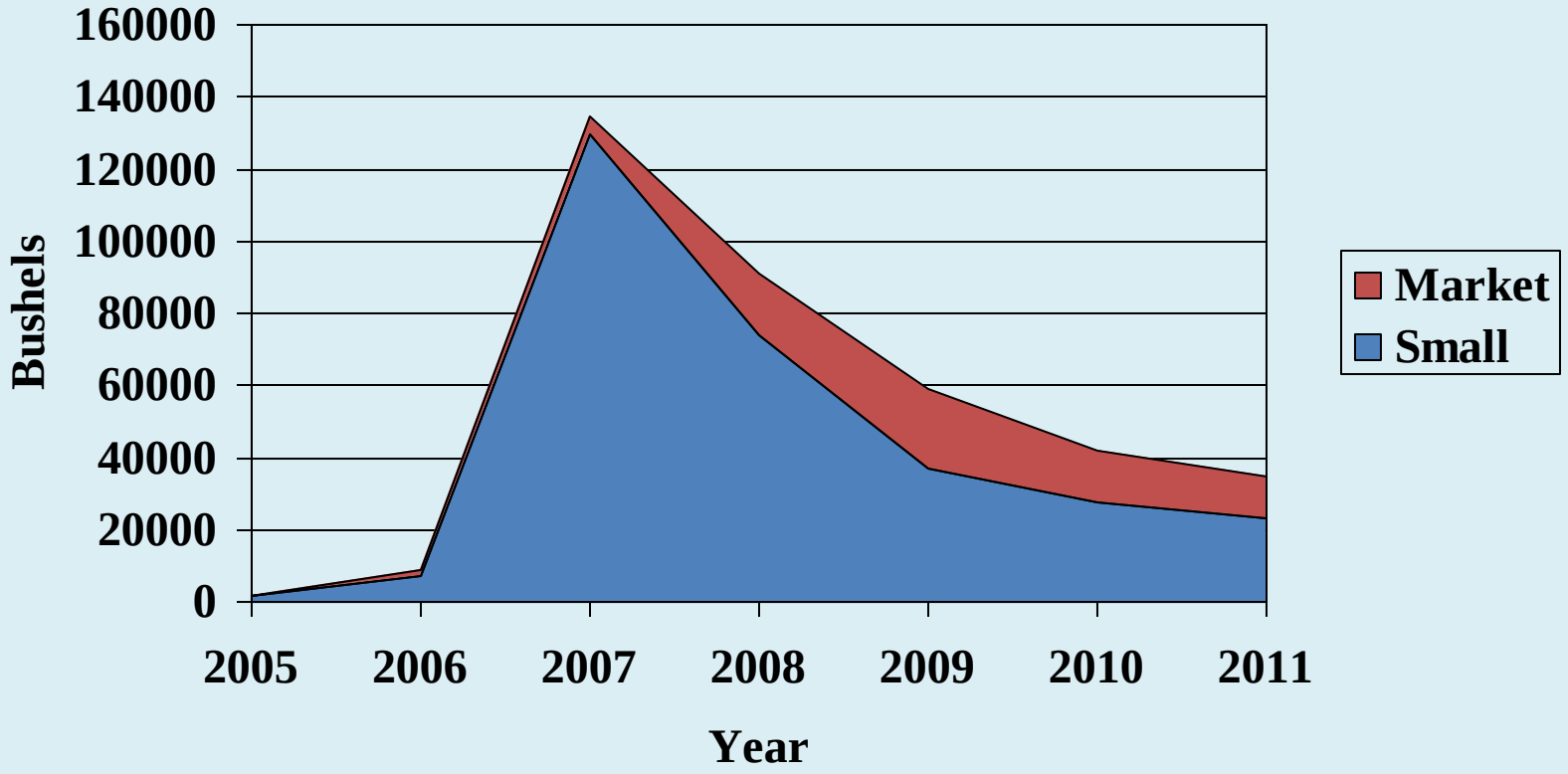
What Controls Natural Oyster Poplations

Recruitment-Spatset

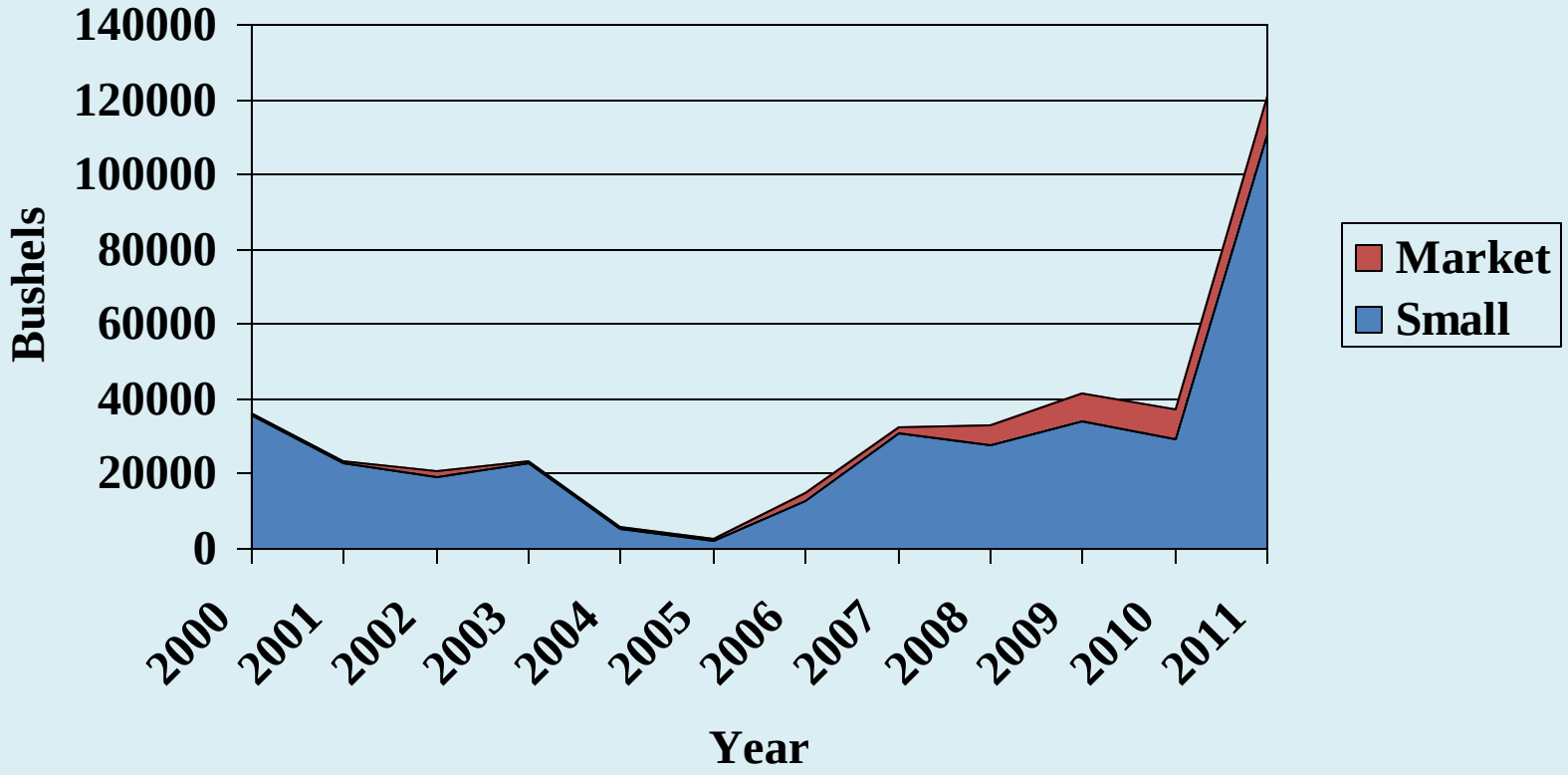
Shell “Budget”

Oyster Disease

Great Wicomico River Oyster Standing Stocks



Piankatank River Standing Stocks



What Can We Do As Managers

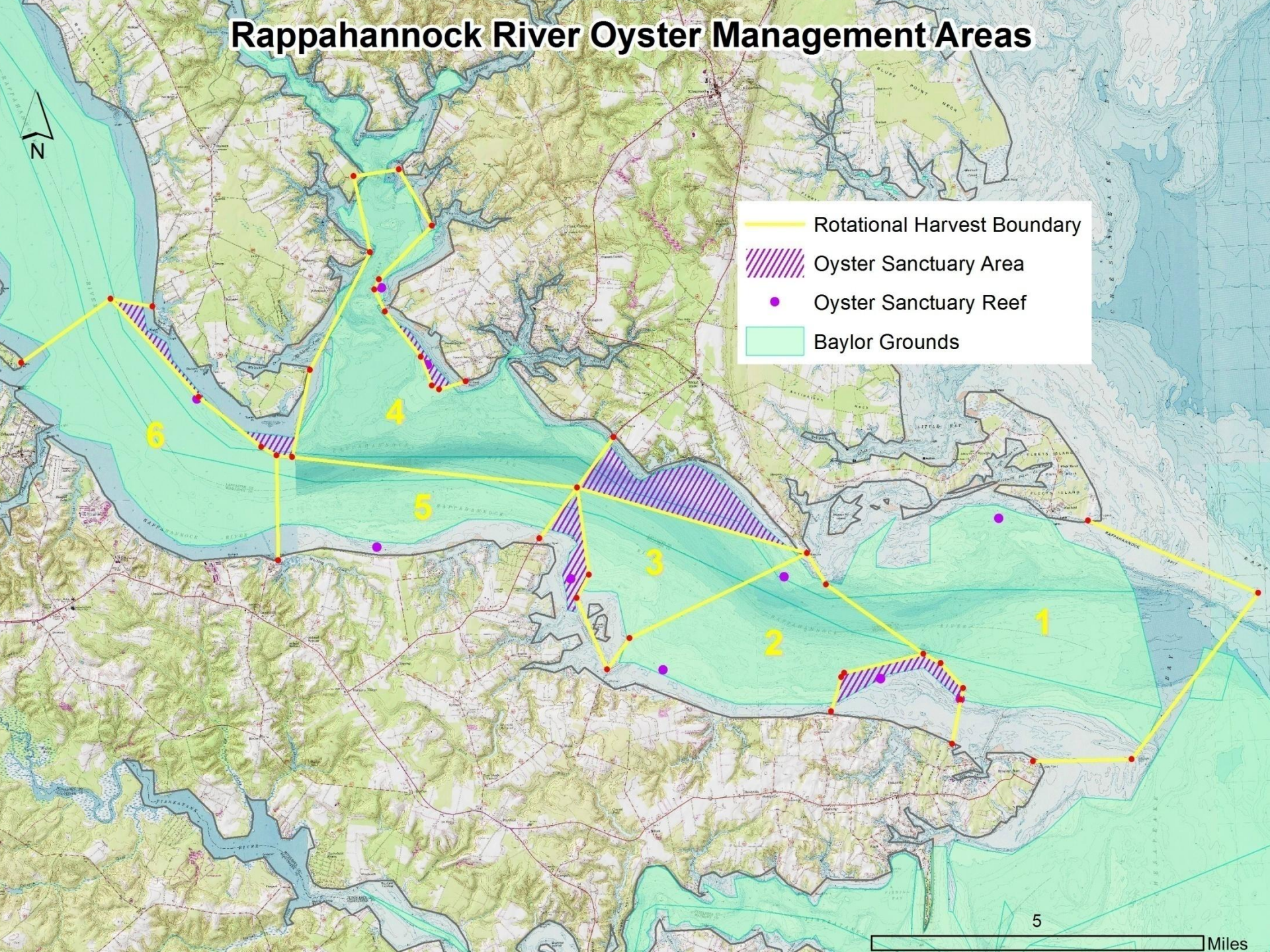
Control Harvest

Replace Shells

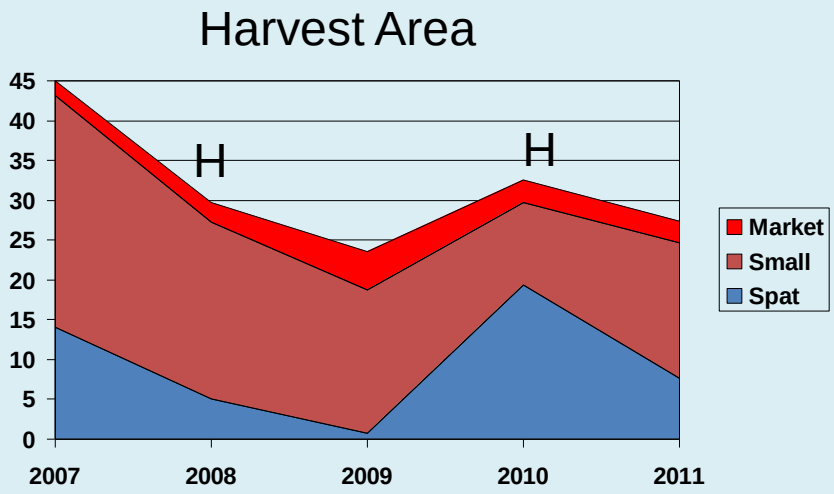
Public Ground Oyster Harvest

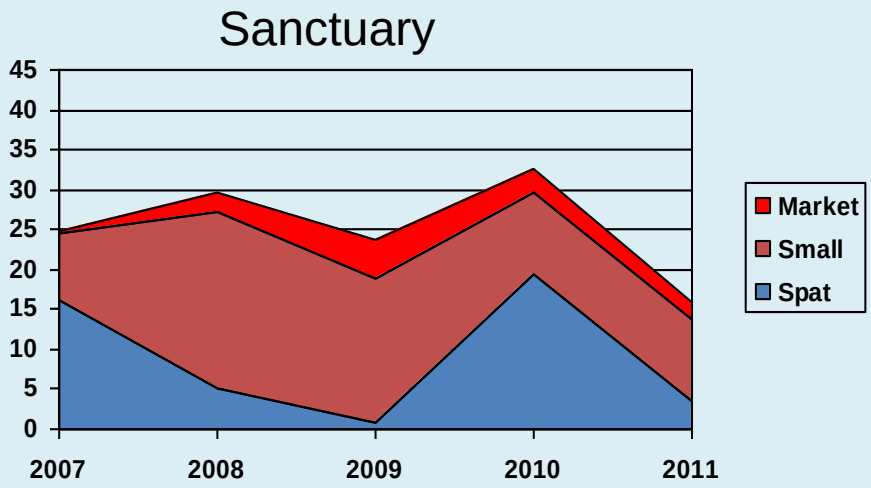
- Controlled By MRC Fisheries Management Through:
  - Seasons
  - Limits
  - Gear Types
  - Public restoration funding

Rappahannock River Oyster Management Areas



Rappahannock River
Area 4
(Oys/m)





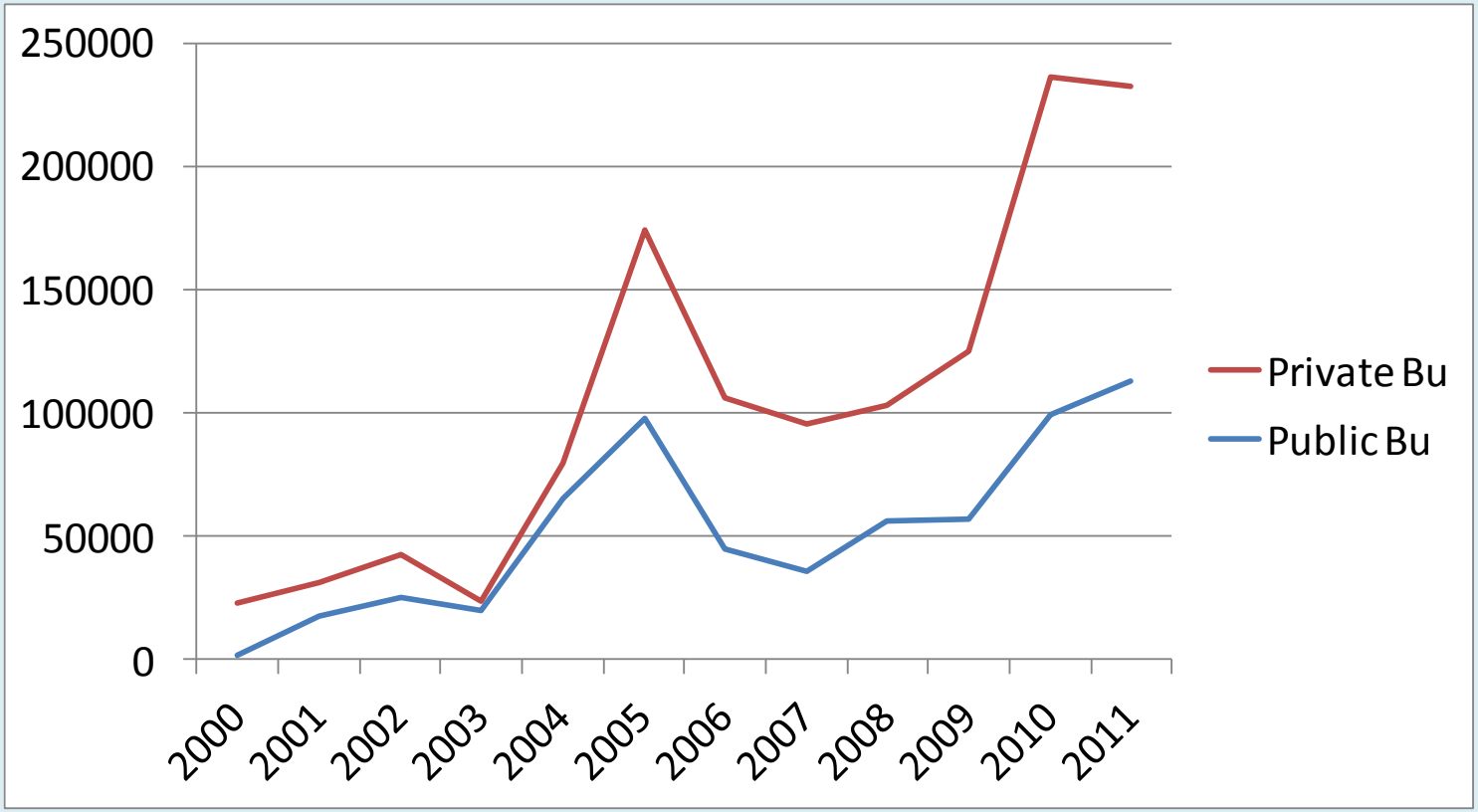
Public Ground Oyster Harvest

- Limited By:
  - Oyster Disease
  - Availability of Large Amounts of Cultch
  - Tragedy of the Commons

Areas of Concern

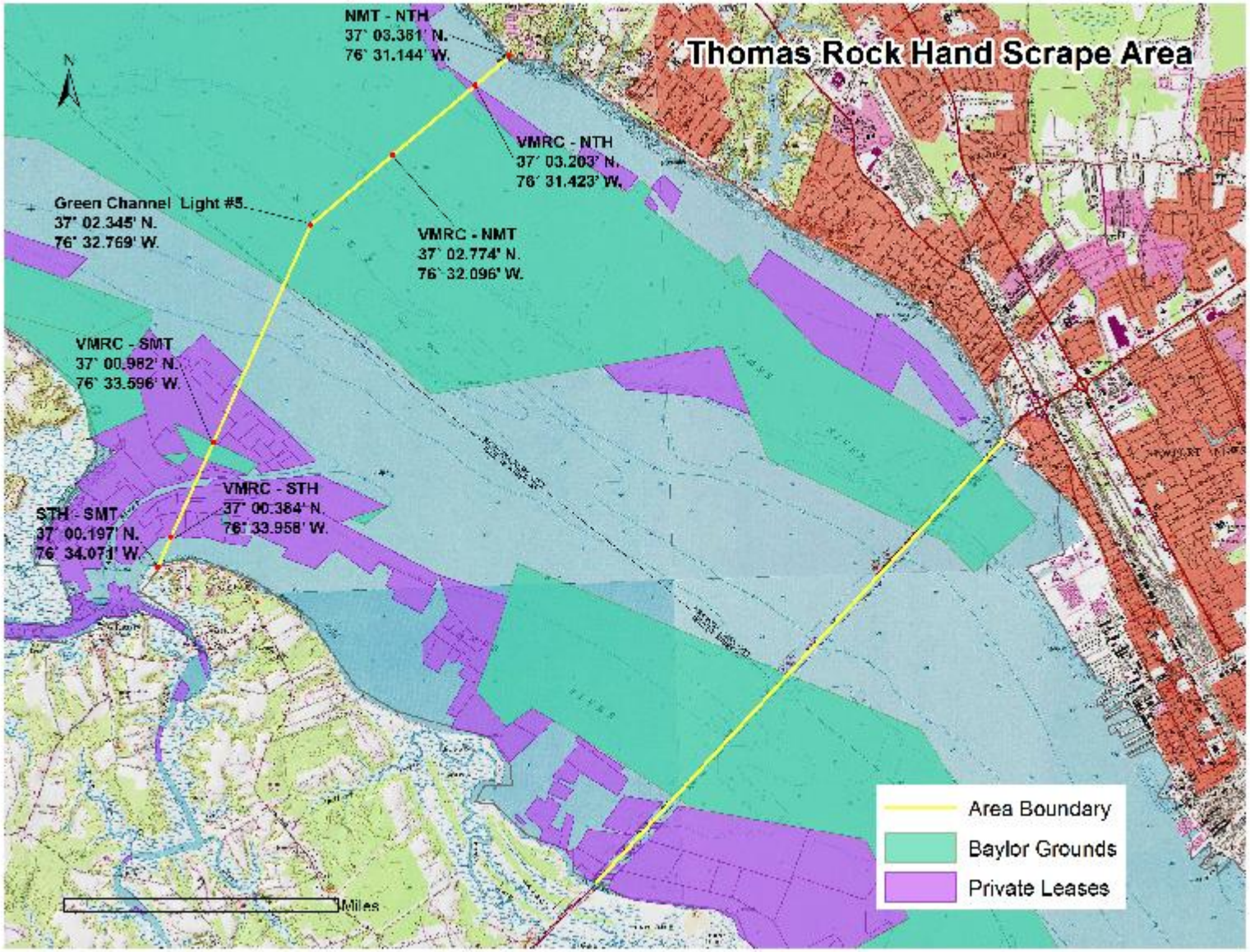
- Consistent funding-Shells must be replenished regularly to maintain productivity-currently $7 return for $1 spent
- Increasing shell prices-competition among restoration “partners” and private industry
- If there are no funds, should public grounds be privatized?

Public vs. Private Oyster Harvest



Private Ground Oyster Harvest

- All Private Industry
- Limited By:
  - Economic Investment
  - Production Capacity
  - Uncertainty of the Bay Environment


Thomas Rock Hand Scrape Area
NMT - NTH
37° 03.361' N.
76° 31.144' W.
VMRC - NTH
37° 03.203' N.
76° 31.423' W.
Green Channel Light #5
37° 02.345' N.
76° 32.769' W.
VMRC - NMT
37° 02.774' N.
76° 32.096' W.
VMRC - SMT
37° 00.982' N.
76° 33.596' W.
VMRC - STH
37° 00.384' N.
76° 33.958' W.
STH - SMT
37° 00.197' N.
76° 34.071' W.
N
Miles
Area Boundary
Baylor Grounds
Private Leases

We have the private oyster ground

One of the oldest but most progressive private oyster ground leasing systems in the world

The Virginia leasing system is very pro-business

More than 100,000 acres are currently under lease

What Does Oyster Aquaculture Mean To Virginia

Create Habitat

Water Filtration

Our Economy

Public Restoration

Public Repletion

Private Planting

We Have A Labor Force

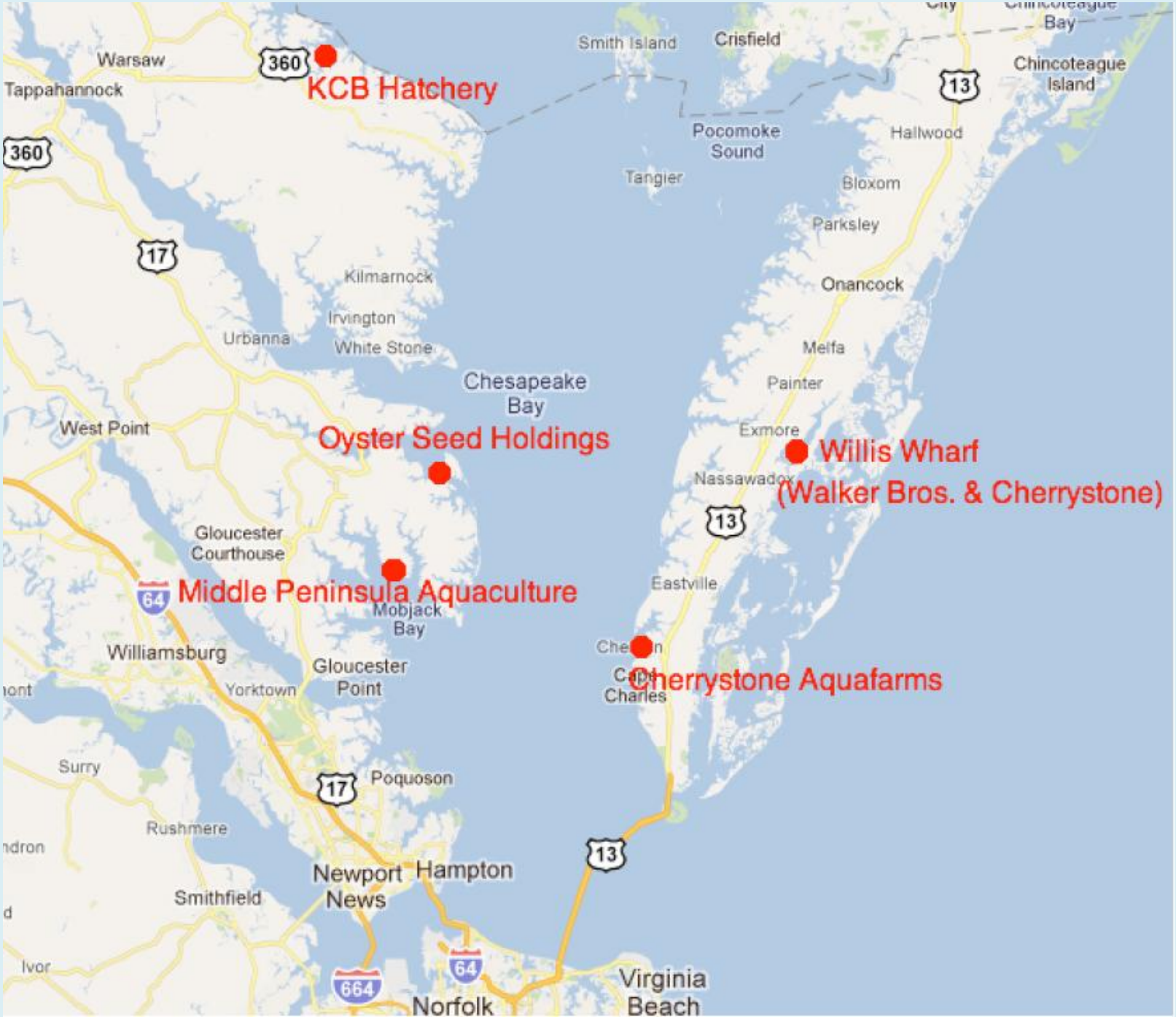
648 licensed oyster fishermen

542 licensed oyster aquaculturists

32 licensed oyster shucking houses

How Does Private Industry Produce Oysters

HATCHERIES


KCB Hatchery
Oyster Seed Holdings
Middle Peninsula Aquaculture
Willis Wharf
(Walker Bros. & Cherrystone)
Cherrystone Aquafarms
Warsaw
Tappahannock
Smith Island
Crisfield
Chincoteague Island
Pocomoke Sound
Hallwood
Tangier
Bloxom
Parksley
Onancock
Kilmarnock
Irvington
Urbanna
White Stone
Melfa
Painter
Chesapeake Bay
West Point
Exmore
Nassawadox
Gloucester Courthouse
Eastville
Mobjack Bay
Williamsburg
Gloucester Point
Yorktown
Charles
Surry
Poquoson
Rushmere
Newport News
Hampton
Smithfield
Virginia Beach
Norfolk
360
17
13
64
664

Water Filtration

Raw Water in the Bay must be Improved for Hatchery Use

Particles, Plankton, Toxins and other impurities must be removed from the ambient water

Currently this is the Most Problematic Aspect of hatchery production in Virginia

Algae Production

Food for Broodstock , Larvae, and Small Oysters

Several Monocultures of different Algal Species must be Maintained year round

Very Dependent on Water Quality

Huge QuantitiesMust Be Available Every day

Broodstock

Genetically Selected for Fast Growth and Disease Tolerance

Most of the Industry is Using Triploids

Hatcheries must manage Food, Temperature and Water Quality to insure Broodstock Availability for the Entire Hatchery Season

Larvae Holding Tanks

Oyster Larvae are held in Tanks for 12 to 18 days

Larvae are fed algae and the water quality must be ideal for maximum survival

Cage Culture

- Production for Half Shell-Raw sales
- Cultchless-Single Oysters
- Must Be Protected from Predators
- More Labor Intensive
- Requires More Gear and Boat Modifications

Upwellers

Nursery for Small Cultchless Seed

Floating Upweller

Cultchless Oyster Seed

Handling Cages

Sorting Small Oysters

Market Oyster Harvest

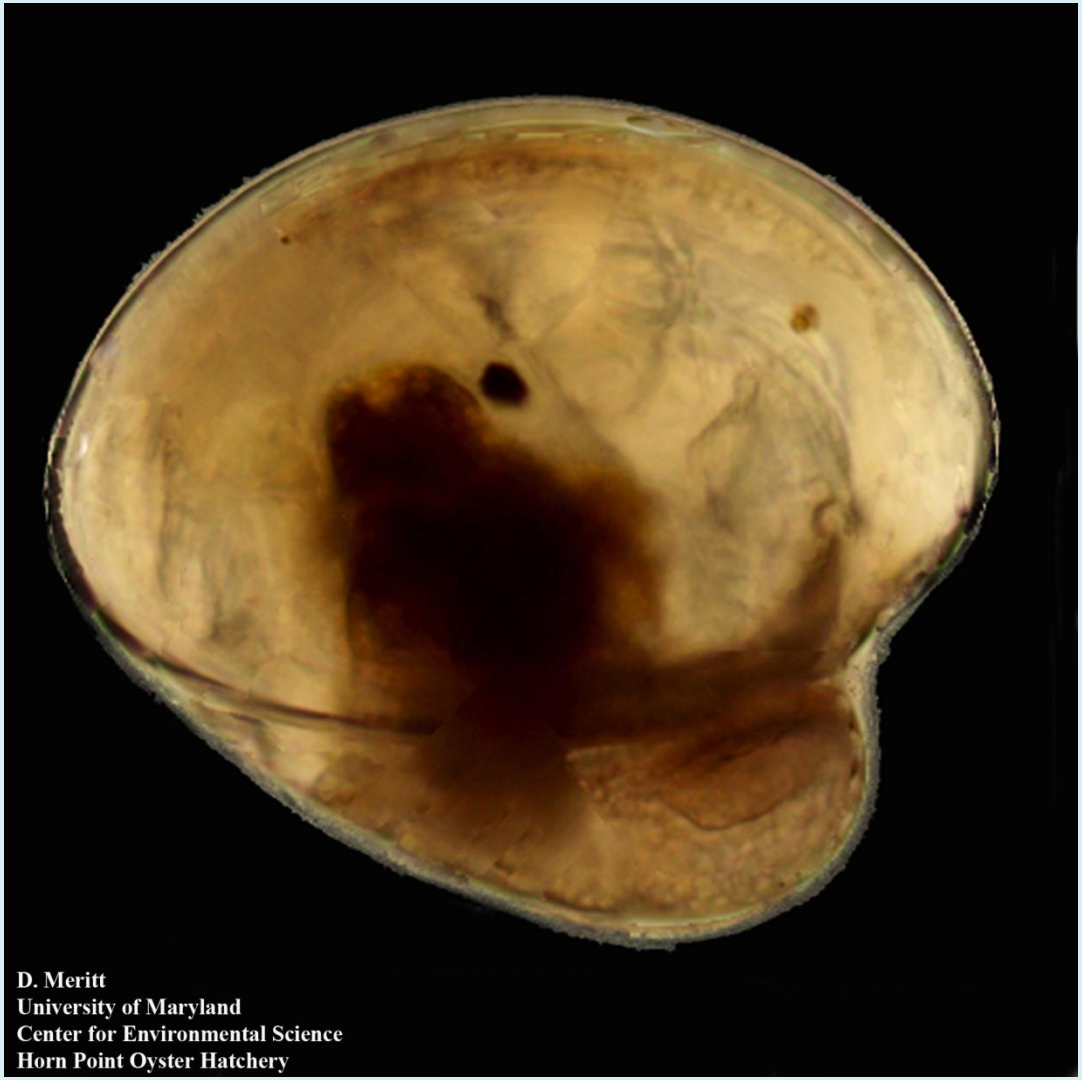
Spat on Shell

- Oysters Produced for Shucking Industry
- Planted Loose on the Bottom
- Lower Labor and Production Costs
- Use Normal Bay Boats and Harvesting Methods
- Subject to Cownosed Ray Predation

Containerized Shell

Eyed Oyster Larva

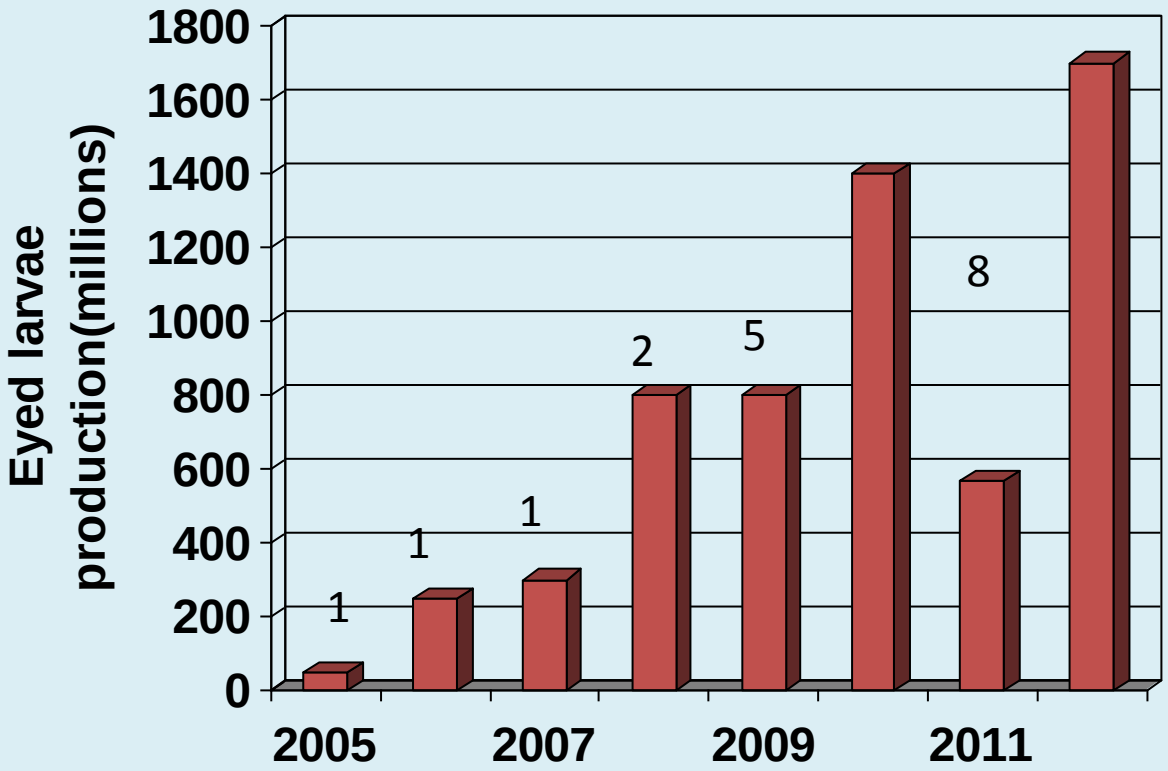
Ready to set after 12-18 days in culture



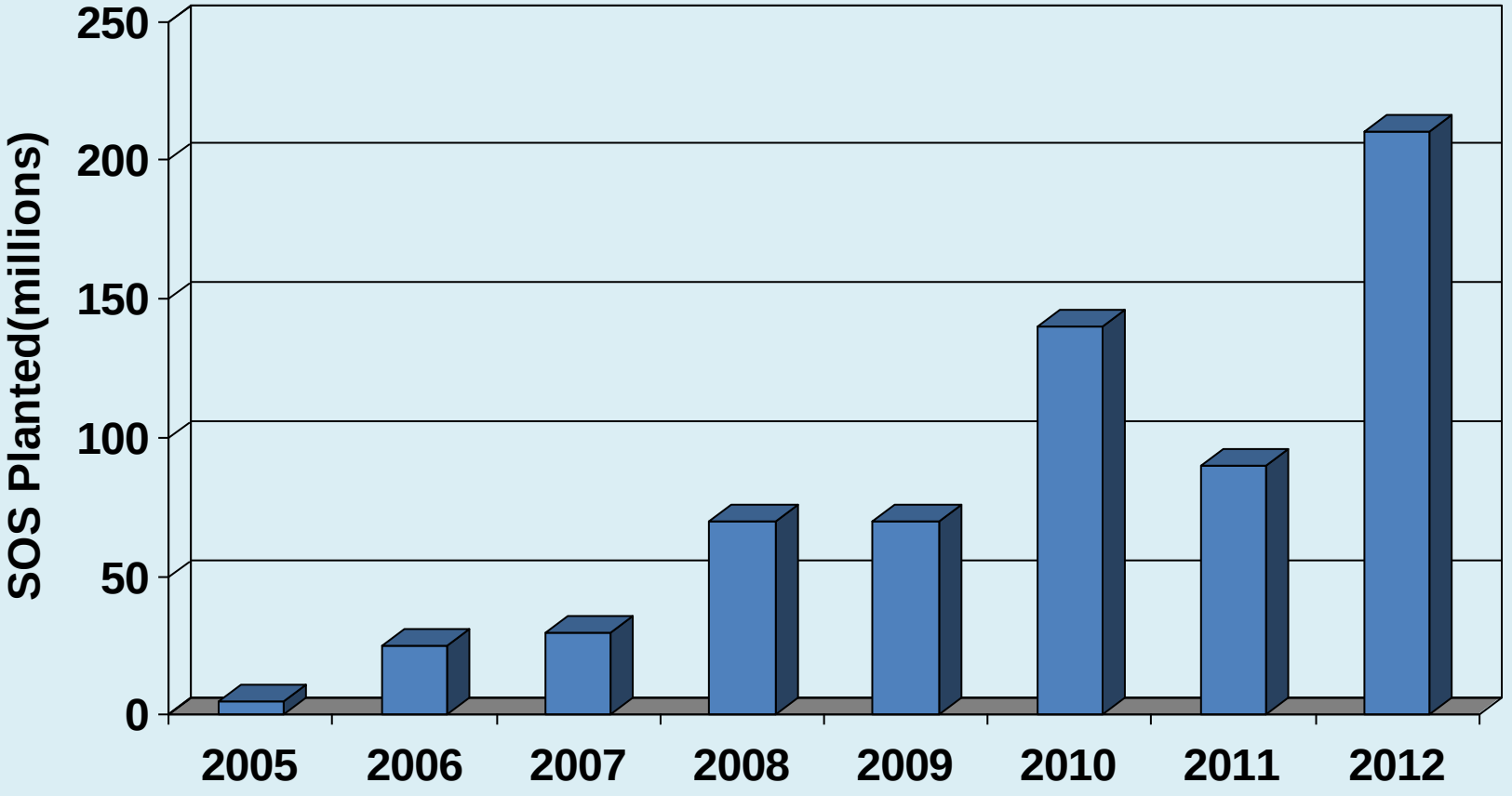

HONEY


INCHES
LABORATORY APPARATUS, FURNITURE
SCIENTIFIC INSTRUMENTS & CHEMICALS
VWR

Eyed Larvae Hatchery Production



Spat-on-Shell Production



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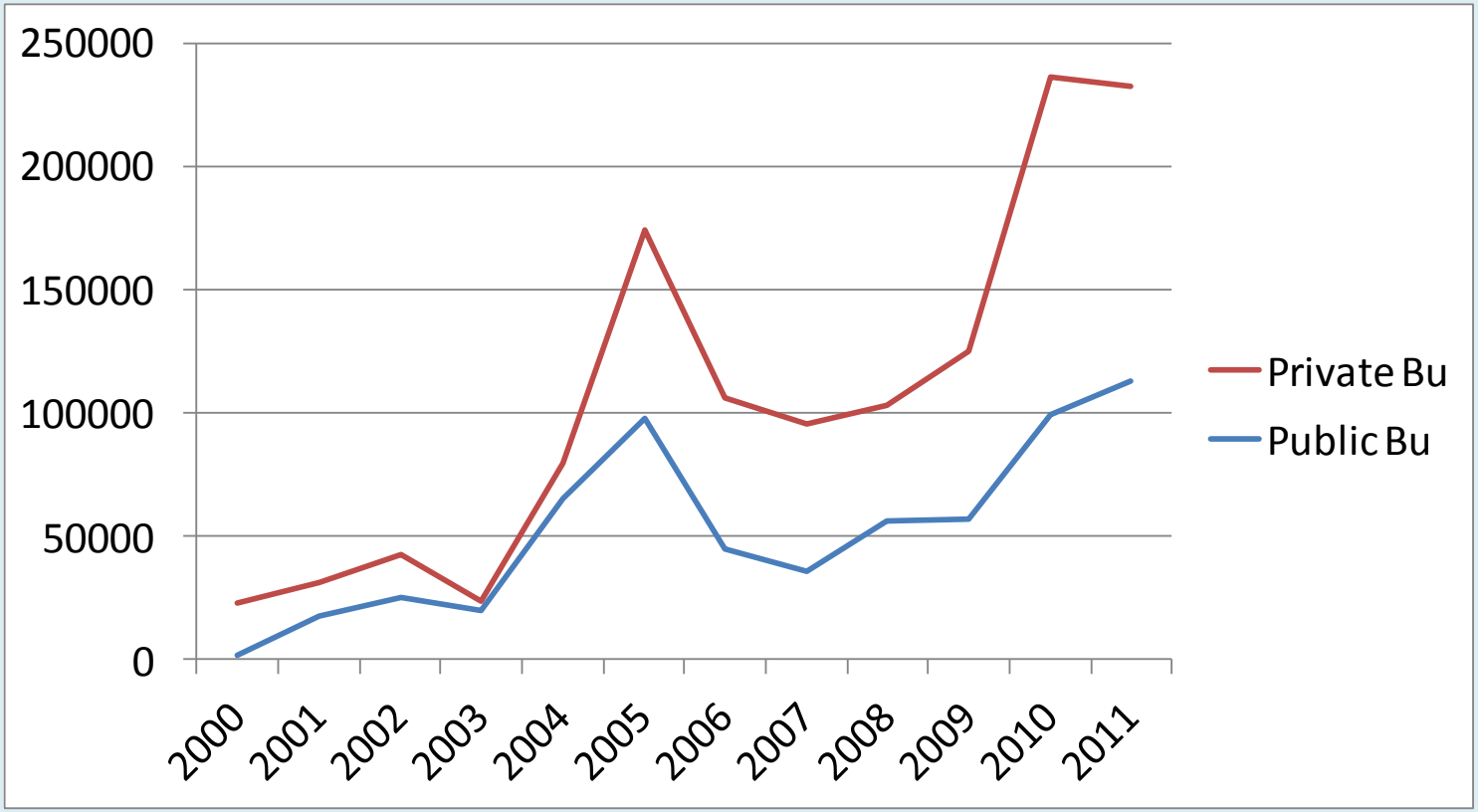

Areas of Concern

Hatchery Productivity and Water Quality

Chesapeake Bay Watershed

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