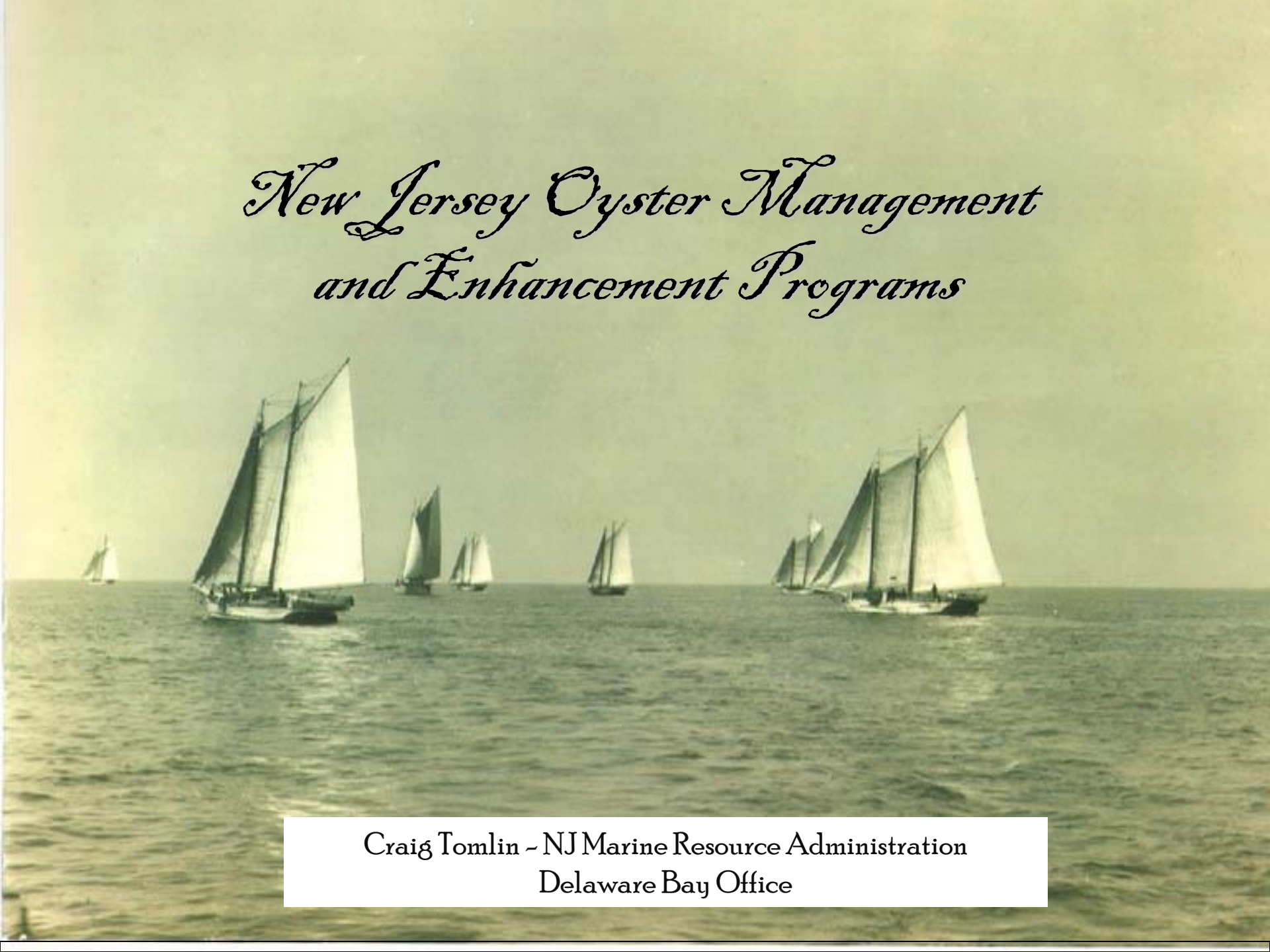
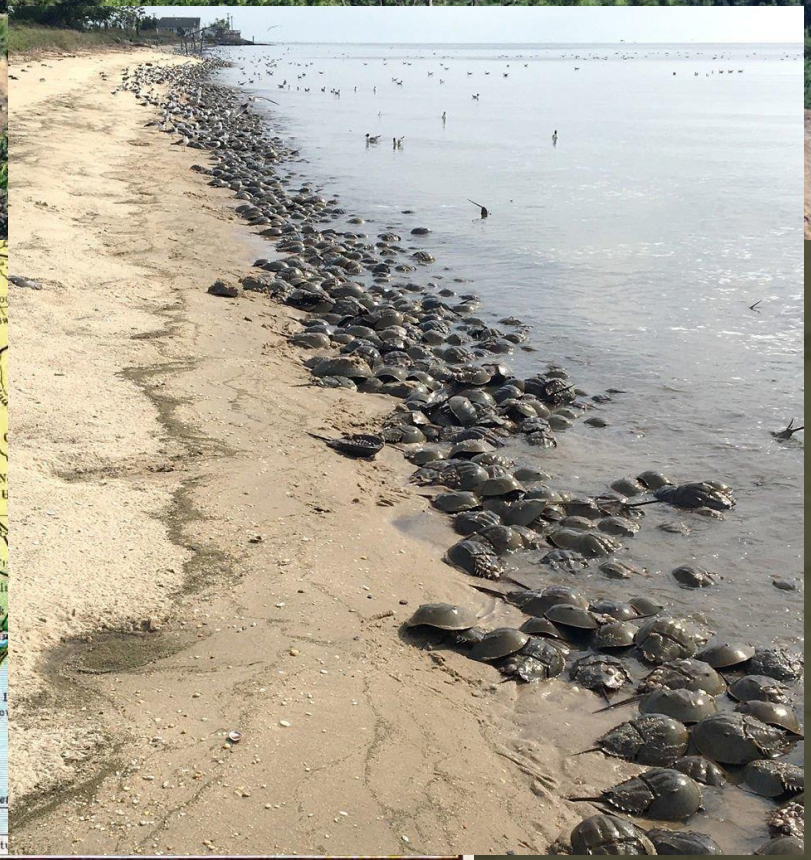
New Jersey Oyster Management and Enhancement Programs



Craig Tomlin ~ NJ Marine Resource Administration
Delaware Bay Office


alamy

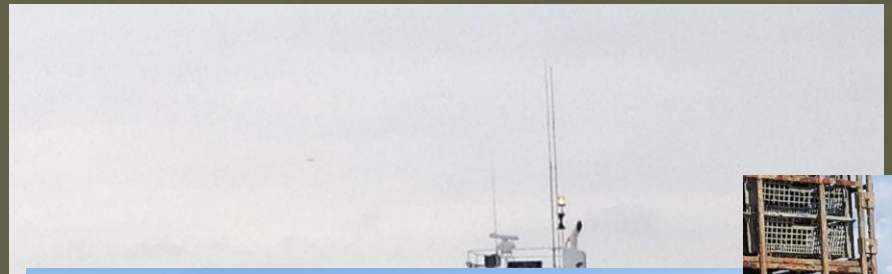


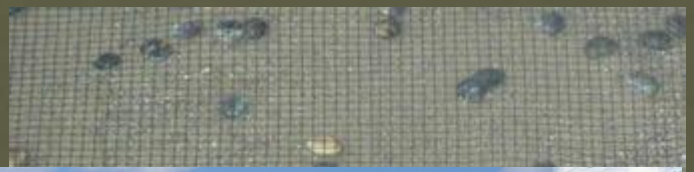
West Chester
Camden
Lumberton
Vincentown
Medford
Marlton
Chatsw
Wiuslow Jc.
Hammonton
Elwood
Weymouth
Buguntine Jc.
Mays
Landing
Smith's Landi
English Creek
Somers Point
Peterslu
Avalon
Wildwood
Hollybeach
Longitu

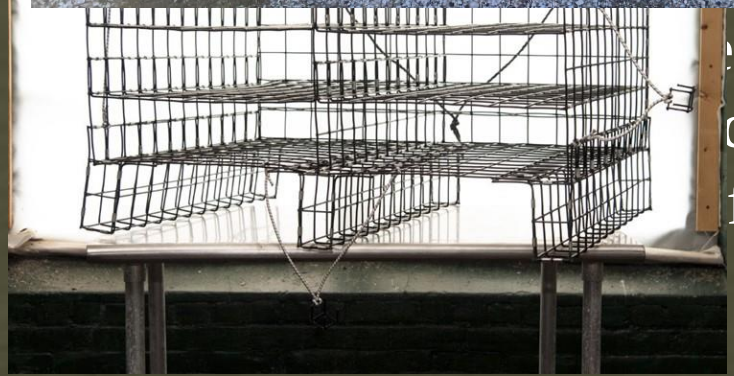
NJ Management Complexity

- Governmental
  - NJ Department Of Environmental Protection
    - NJ Natural And Historic Resources
      - NJ Fish and Wildlife
        - NJ Marine Resources Administration
          - NJ Bureau of Shellfisheries

- Non Governmental
  - NJ Fish and Wildlife Council
    - NJ Marine Fisheries Council
      - NJ Shellfisheries Councils
        - Councils are comprised of active shellfishers







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d Structural Aqua

f ADZs

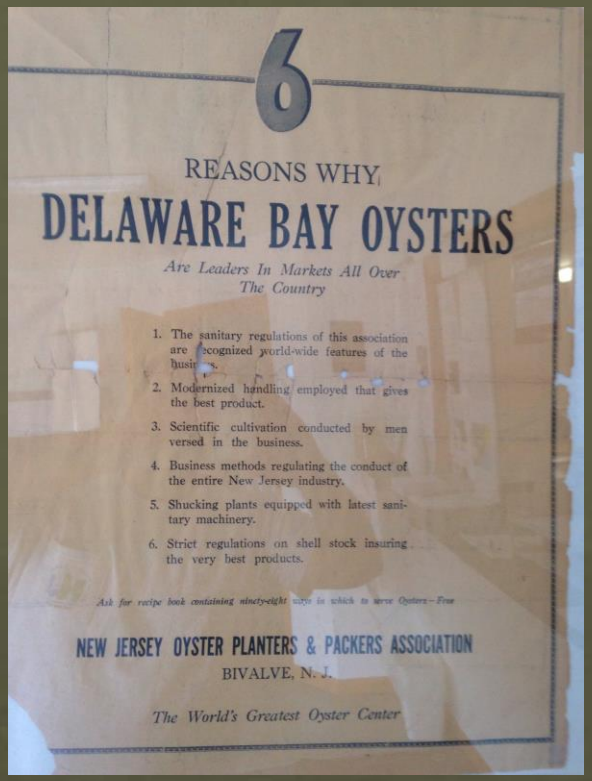
NJM lexity

- Wild Harvest
  - Hand Har
    - 1,500 F
    - No Sto
  - Dredge B
    - 80 Lice
    - Now Q

Sail & Power

Bivalve, NJ - 1928


SAILLOFT



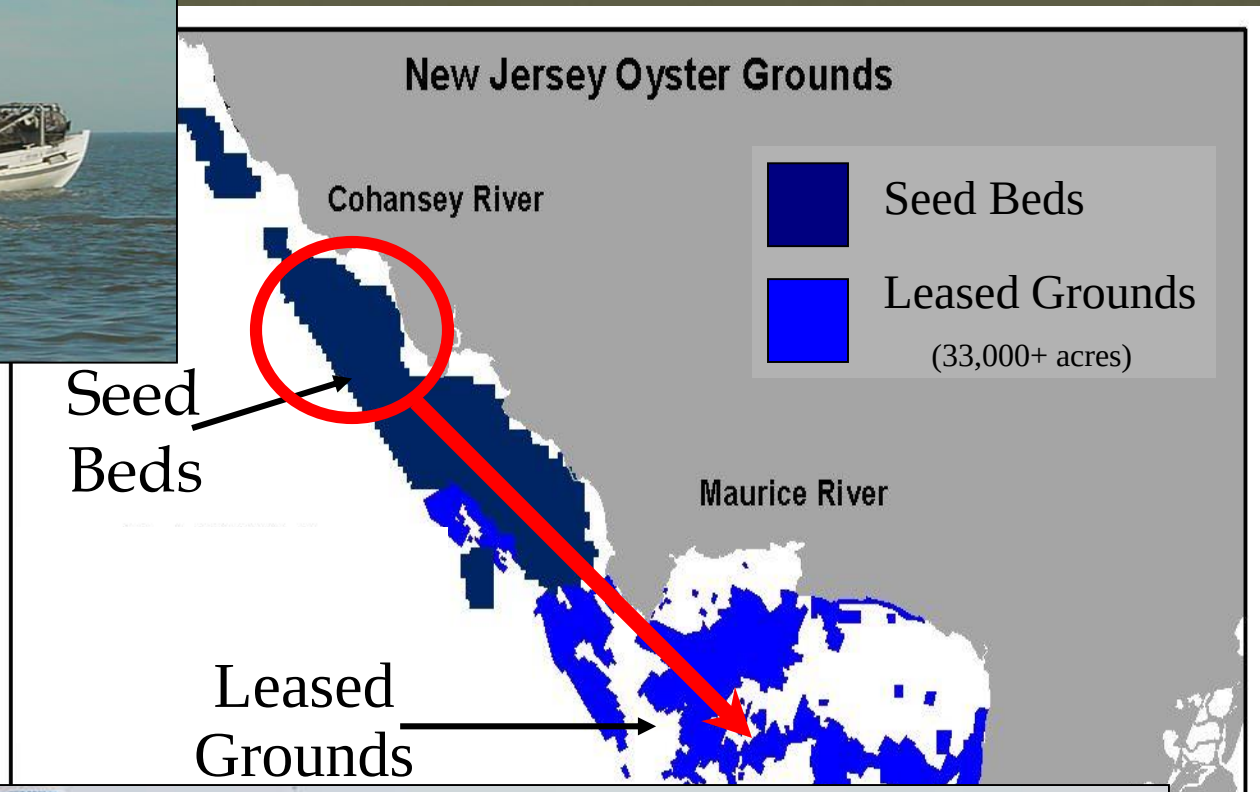
Prosperity!

1880-1930

Annual harvests from 1 to 2 million bu.

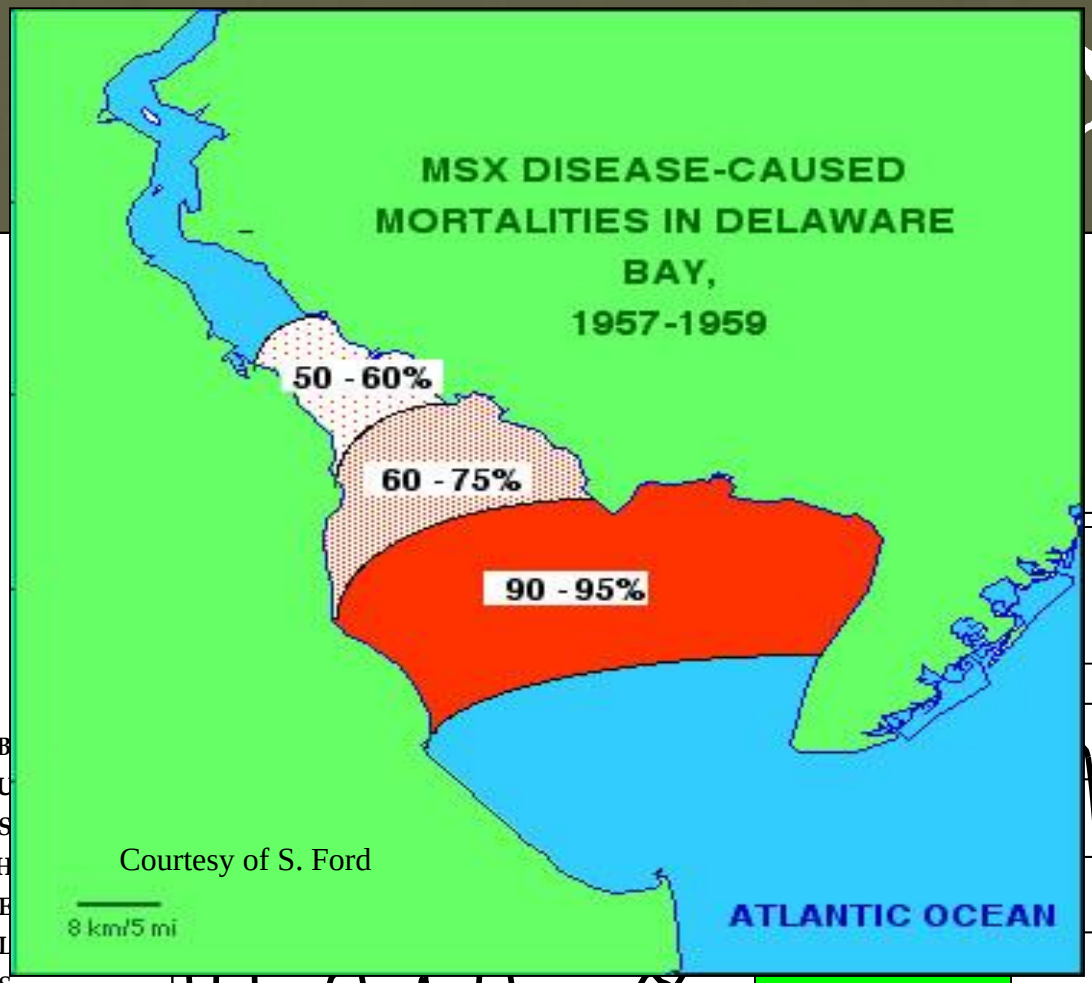
Important to note that this harvest was augmented from oyster seed imported from southern states.

Not really sustainable!



- Wild oyster seed harvested from seed beds in upper bay (good survival *but* slow growth)
- Seed transplanted to leased grounds in lower bay (good growth and market-quality meats)

X & Dermo!



Delaware Bay

A Change In Management

1995: Due to Dermo --- Direct Market Program allows oystermen to harvest oysters (> 2.5 inches) for direct sale. No transplanting required.

1996-2022: Range of 35 to 84 licenses participating annually

State of Delaware follows suit and begins direct market program in 2001

Stock Assessment Workshop

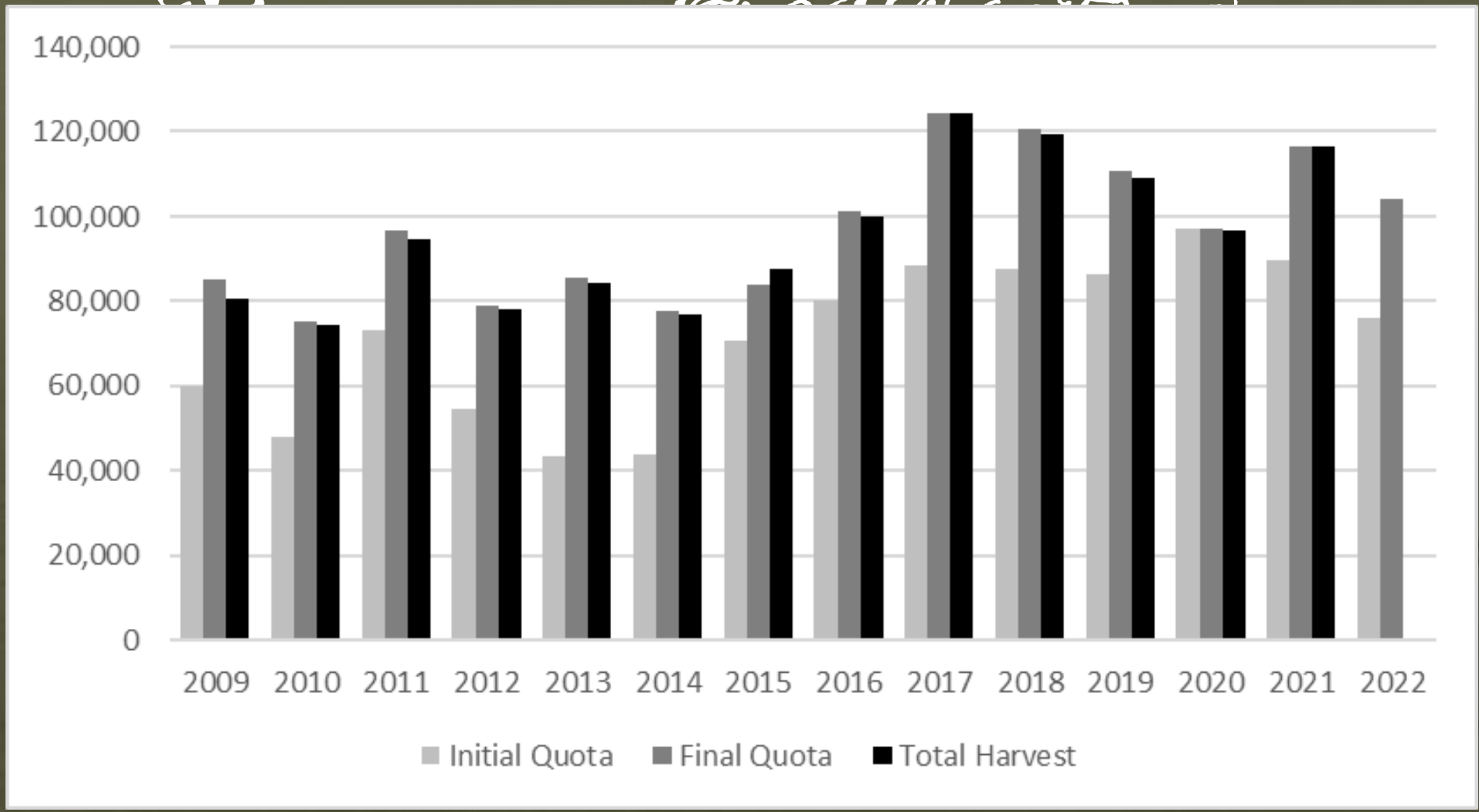
- Formally started in 1999
- SARC Members from Rutgers, Industry*, DNREC, Academia, Fisheries Management, Shellfisheries Council, and NJDEP.
- Used as an arena to discuss
  - Exploitation levels for oyster harvest
  - Shell planting
  - Transplant programs
  - Monitoring and assessment
  - Management Advice

Transplant Regions[1]

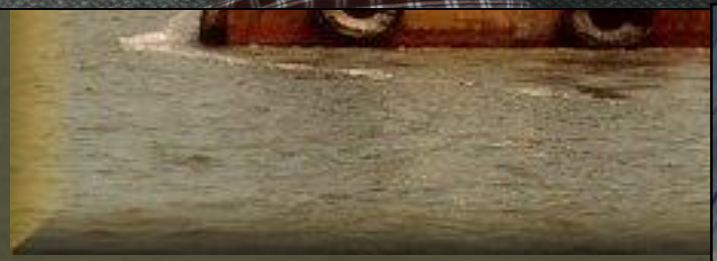
Region	Label	Exploitation Rates of All Sizes	Regional Abundance	Removals	Oysters /Bushel	Approx. Deck Bushels	Proportion Of Oysters That Are Markets From Survey	Estimated Potential Quota Bushels**
VLM		0.0193	76,912,803	1,484,417	503	2,951	10%	295
LM	Min	0.0076	203,366,048	1,545,582	449	3,442	21%	723
LM	*w/ transplant*	0.0149	203,366,048	3,030,154	449	6,749	21%	1,417
MMT	Max	0.0246	224,563,154	5,524,254	330	16,740	54%	9,040

Direct Market Regions[2]

Region	Label	Exploitation Rates of Market Sizes	Regional Market Abundance	Removals	Oysters/ Market Bushel	Quota Bushels	Transplant Required?
MMM	Median	0.0303	220,765,767	6,689,203	268	24,960	No
SR*	Median	0.0370	132,054,042	4,886,000	268	18,231	No
SR*	Max	0.0488	132,054,042	6,444,237	268	24,046	Yes
HM*	Median	0.0749	117,420,284	8,794,779	268	32,816	No
HM*	Max	0.0982	117,420,284	11,530,672	268	43,025	Yes


140,000
120,000
100,000
80,000
60,000
40,000
20,000
0
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
Initial Quota
Final Quota
Total Harvest

It's Not Rocket Science!



'x' (Clean Shell) + 'y' (

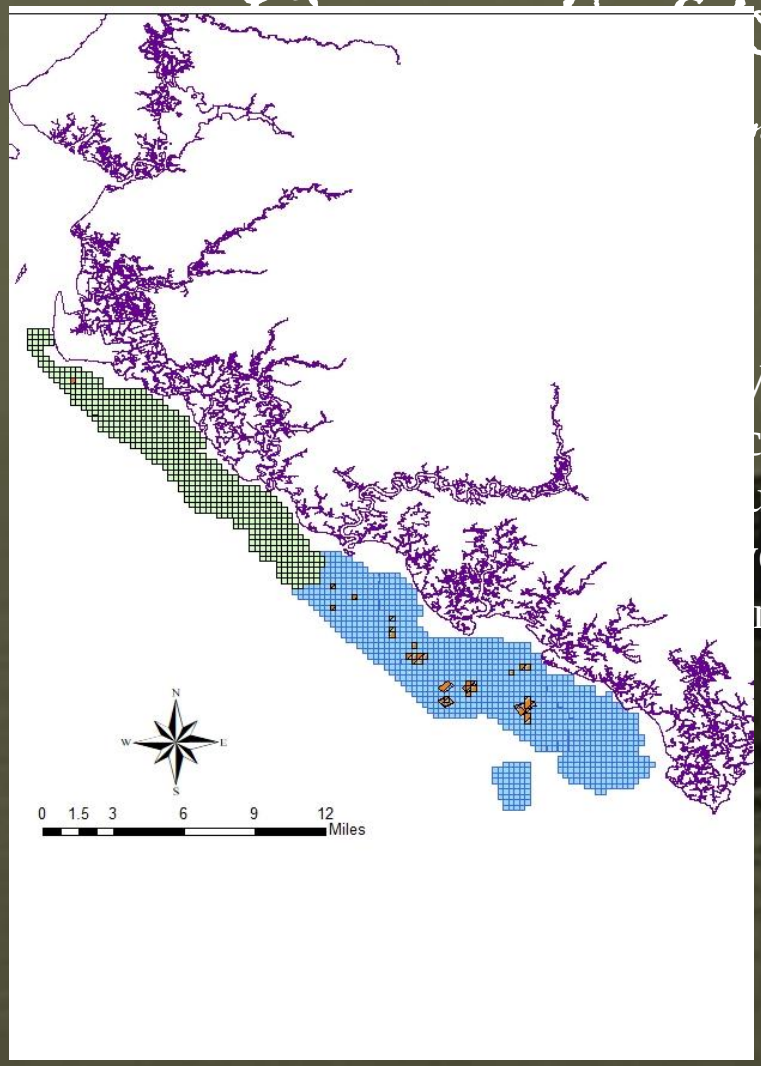
= 'a' (

Oyster Bed Enhancement

Tools Of the Trade

- Seed Planting
- Transplanting
- Shellplanting
  - Small Scale
  - Large Scale
    - Direct Plant
    - Replants

Enhancement



Ves

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uota and/or Enhance Bed Area

e shown increase in bed

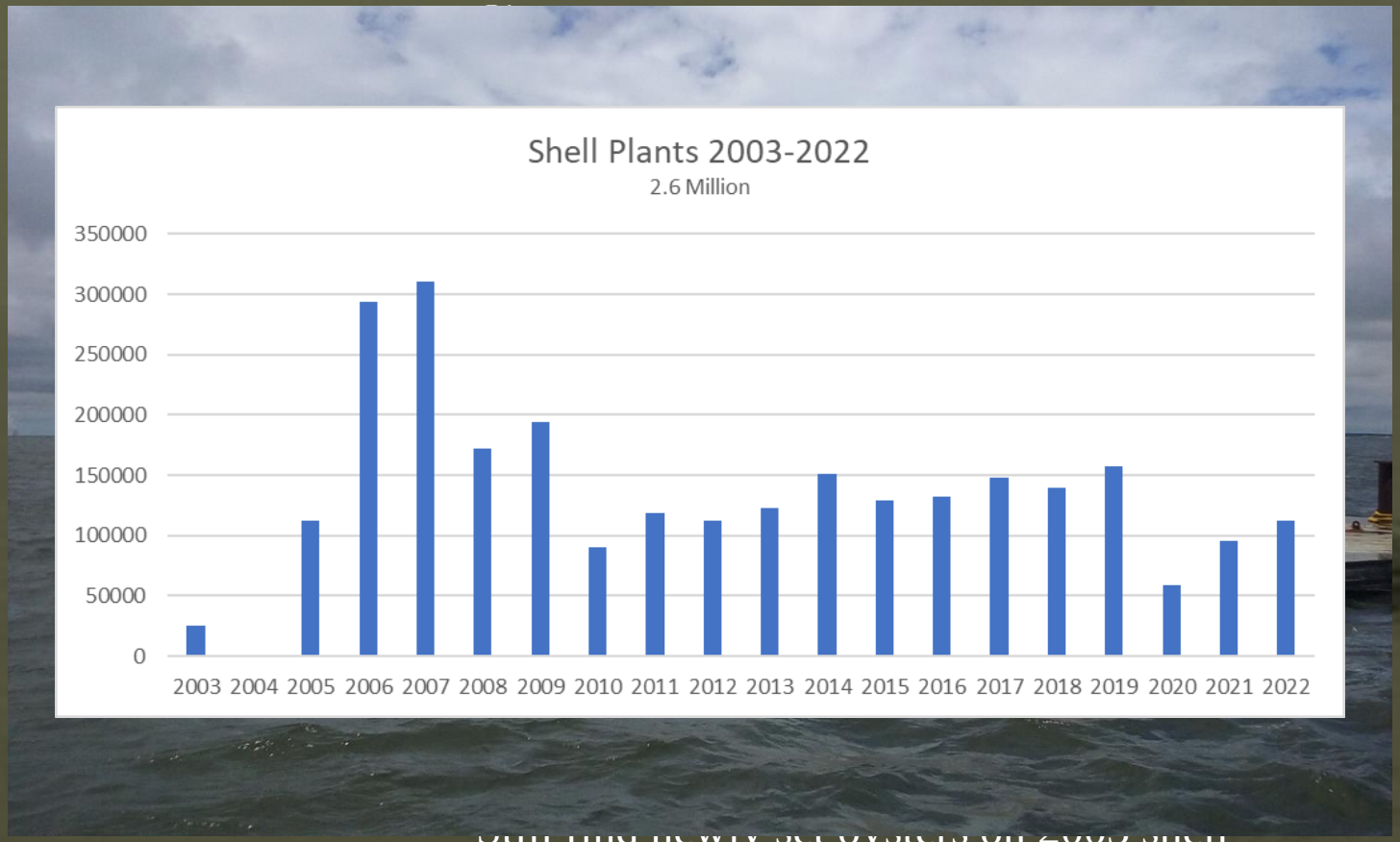
nt grid as well as surrounding

Oyster Bed Enhancement

Small Scale Shellplanting

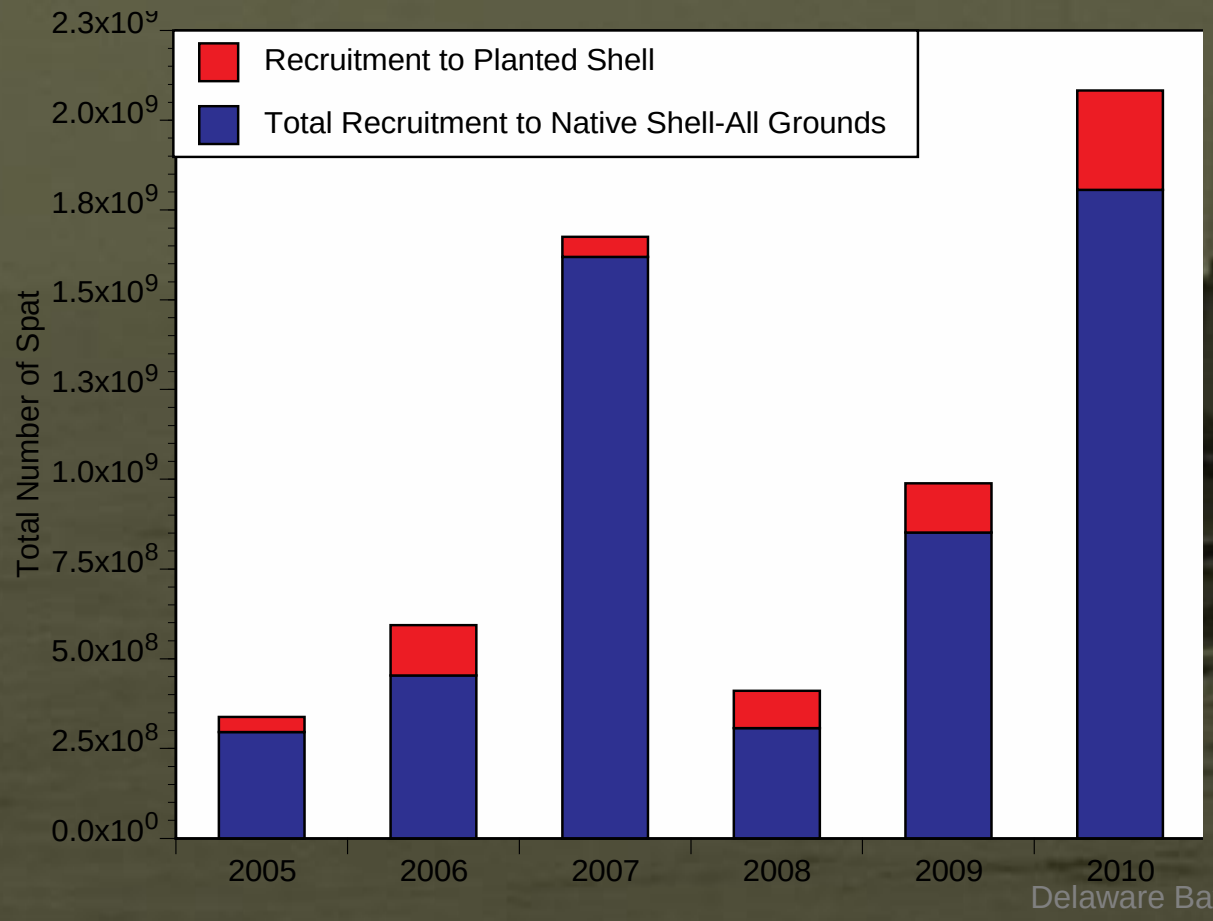
Oyster Reef Enhancement

Oyster Bed Enhancement



Still find newly set oysters on 2005 shell

Shell Plants Make Noticeable Impact on Total Recruitment



Delaware Bay, NJ

Oyster Bed Enhancement

Lessons Learned and Future

- Planting on existing reefs works well in NJ
  - Timing is a key factor for year one to be successful
  - Location is key a key factor for multi year success
  - Experiments show surf clam shell, oyster shell, quahog shell, and limestone work well
- Industry involvement/buy in has been key
- Sanctuary have not been pursued in NJ
- Need to be inventive for future sources of cultch

Oyster Management

Lessons Learned and Future

- Three Prong approach seems to work well
  - Researchers, Managers, Industry/Council
- Constant open communication with researchers and management, allow industry to trust process
- Area management is only as accurate as data
  - Looking into new ways to increase accuracy from harvesters
- We need mandatory reporting of aquaculture product to Bureau of Shellfisheries
- Need to be able to write rules that are flexible enough to be able to meet needs of future


Questions?
Craig.Tomlin@dep.nj.gov
856-785-0730

Bang for the Buck: Shell Planting in Delaware Bay

By Kathryn Ashton-Alcox, Field Researcher, Rutgers University, Haskin Shellfish Research Laboratory

U.S. Rep. Mike Castle, R-Del., congratulates members of the Delaware Bay Oyster Restoration Task Force during a bayside ceremony on October 4 where the group received a Coastal America Partnership Award, the only environmental award of its kind given by the White House.

How many taxpayer-funded programs can you think of that recycle a waste product, enhance a declining fisheries species, improve the environment, and provide a $40 return on every dollar spent? Not many, right? Well, the Delaware Bay Oyster Restoration Task Force's shell-planting program does all of those things.

Since 2005, the Task Force has been "planting," or strategically placing clam shell (a byproduct of clam processing) on the oyster beds of Delaware and New Jersey in order to enhance the oyster population on the beds. Oysters reproduce by releasing eggs and sperm into the water where fertilization occurs. The larvae then spend two to three weeks as plankton before they sink to the bottom in search of a clean, hard "substrate," or surface on which to cement themselves and continue shell growth, then never moving independently again. Since researchers knew there were larvae in the water, but few were showing up as "spat," or baby oysters, they identified the lack of clean substrate on the oyster beds as the likely reason for low oyster reproduction in Delaware Bay since 2000.

Broken clamshell provides an ideal substrate for these baby oysters when put down just before the larvae are likely to settle. Comparisons have shown that it is not the type of shell that matters to the oyster larvae. What matters is that the shell is clean, or not covered with fouling organisms or other growths, so timing is critical. Where the shell is put is also important. If the area has never supported natural oyster populations, or if it is too soft and muddy, it is likely that shell planting will not result in a successful oyster set. If shell is planted in an area where here are many predators, the spat will not survive either.

Following a successful pilot program conducted by the New Jersey Department of Environmental Protection in 2003, the Task Force formed to develop funding for large-scale shell planting to alleviate the continuing problem of low recruitment on oyster beds in the Delaware Bay. From 2005 to 2008, the Task Force obtained a total of $5 million from the Section 1135 Program of the U.S. Army Corps of Engineers to purchase and plant shell. This money was divided equally between New Jersey and Delaware and funded shell plants that covered 1,044 acres (423 hectares) over four years.

Each year, shell planting resulted in positive gains for the oyster population. Compared to natural shell on the beds (the native substrate), planted shell received up to seven times as many spat on average across all the sites. The contribution to oyster population enhancement provided by the shell plantings was very high compared to the modest proportion of acreage planted. For example, in 2008 only 0.8% of the New Jersey oyster acreage was planted, yet that small area yielded over 20% of the total spat on all the New Jersey beds.

Monitoring of the shell-planting sites shows that the clam shell continues to attract spat in subsequent years, albeit at the same rate as the native substrate. Because oyster shell disappears over time in the Delaware Bay, regular shell plantings are needed to prevent the loss of the oyster beds upon which so many other species depend. A self-imposed tax on the industry provides some funding for shell planting. However, additional funding is needed to plant enough shell to get oyster populations to a level where the system can be self-sustaining.

Projections of marketable bushels of oysters show that the number

continued on page 7

sel *Geukensia demissa*. Cordgrass and ribbed mussels have a *symbiotic*, or mutually beneficial relationship. Roots of the grass provide a habitat to which mussels attach thin, but very strong, byssal threads that hold them in place. Hundreds of threads help pull each mussel down into the mud, safely away from predators. In return, the mussels fertilize the mud with nutrients that are extracted from the plankton they eat as the tides pass. Grasses nourished by the extra nutrients grow denser along the edge which slows water currents, increasing the *sedimentation*, or trapping of suspended particles. The combined active and passive trapping of sediments builds up the marsh edge, forming a strong, natural, self-maintained levee.

By exploiting this mussel-plant relationship, scientists involved in the DELSI hope to protect salt-marsh shorelines around the Delaware Estuary. With support from the National Fish and Wildlife Foundation, New Jersey Sea Grant, New Jersey Department of Environmental Protection, Rutgers University, and the Partnership for the Delaware Estuary, we have been exploring methods to enhance mussel and plant densities at sites of marsh erosion using natural materials such as coconut fibers.

Fibers from the husks of coconuts, an industry byproduct, are spun into biodegradable twine called *coir* that is stitched into 20-foot-long *biologs*. These are installed in a semicircle mimicking the natural shoreline, to connect two points along an eroding marsh edge. Mussels placed into the coir logs readily attach with their strong byssal threads, and plugs of cordgrass salvaged from eroding areas can also be planted directly into the logs. The logs immediately trap sediments within and behind them, increasing the elevation of the marsh surface. As marsh plants and mussels colonize the elevated surface, resilience should increase.

Credit: Haskin Shellfish Research Laboratory, Rutgers University

Ribbed mussels are being examined as a tactic to help prevent salt marshes from eroding into Delaware Bay. By attaching to plant roots using "byssal" threads made of proteins, colonies of mussels may effectively armor the shoreline against waves whipped up by boats, currents, and wind.

Since the first DELSI installations in 2008, we've learned that logs fail in areas with lots of wave action, but that this appears to be a useful and cost-effective tactic at the back of coves, around marinas, and along shorelines where low-to-moderate wave action necessitates protection. We are still experimenting with methodologies and hope to soon establish a demonstration site at the Heislerville Fish and Wildlife Management Area along the Maurice River in Cumberland County, New Jersey. Beginning next year, we will begin to document the use of restored- versus-eroded areas by fish and wildlife.

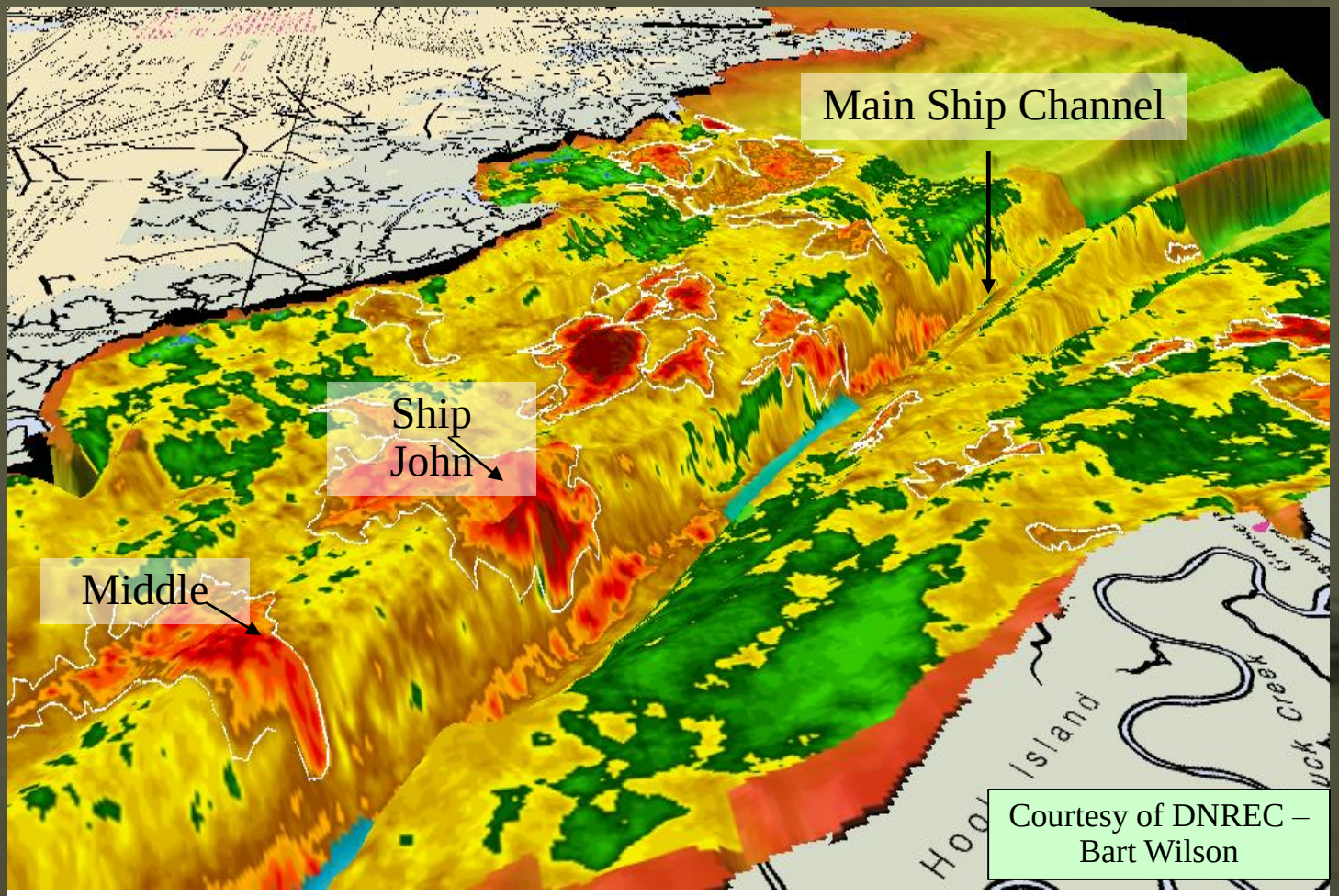
For more information about the DELSI, please visit our website at www.DelawareEstuary.org/Science_Projects_Living_Shoreline.asp. ■

Bang for the Buck continued from page 5

of oysters produced from plantings each year can equal or exceed the total quota for the harvest of oysters, thanks in part to conservative harvest management by both states. This provides an opportunity to expand the industry while retaining a sustainable population. Economic estimates show high returns for each dollar invested in this program. The dockside return for each $1 spent averages $6.70. Using a usual economic multiplier (think "platesides return) for fisheries products raises the "bang for the buck" number to an impressive $40 returned for every $1 spent! And the ecological return for this program is, of course, priceless. ■

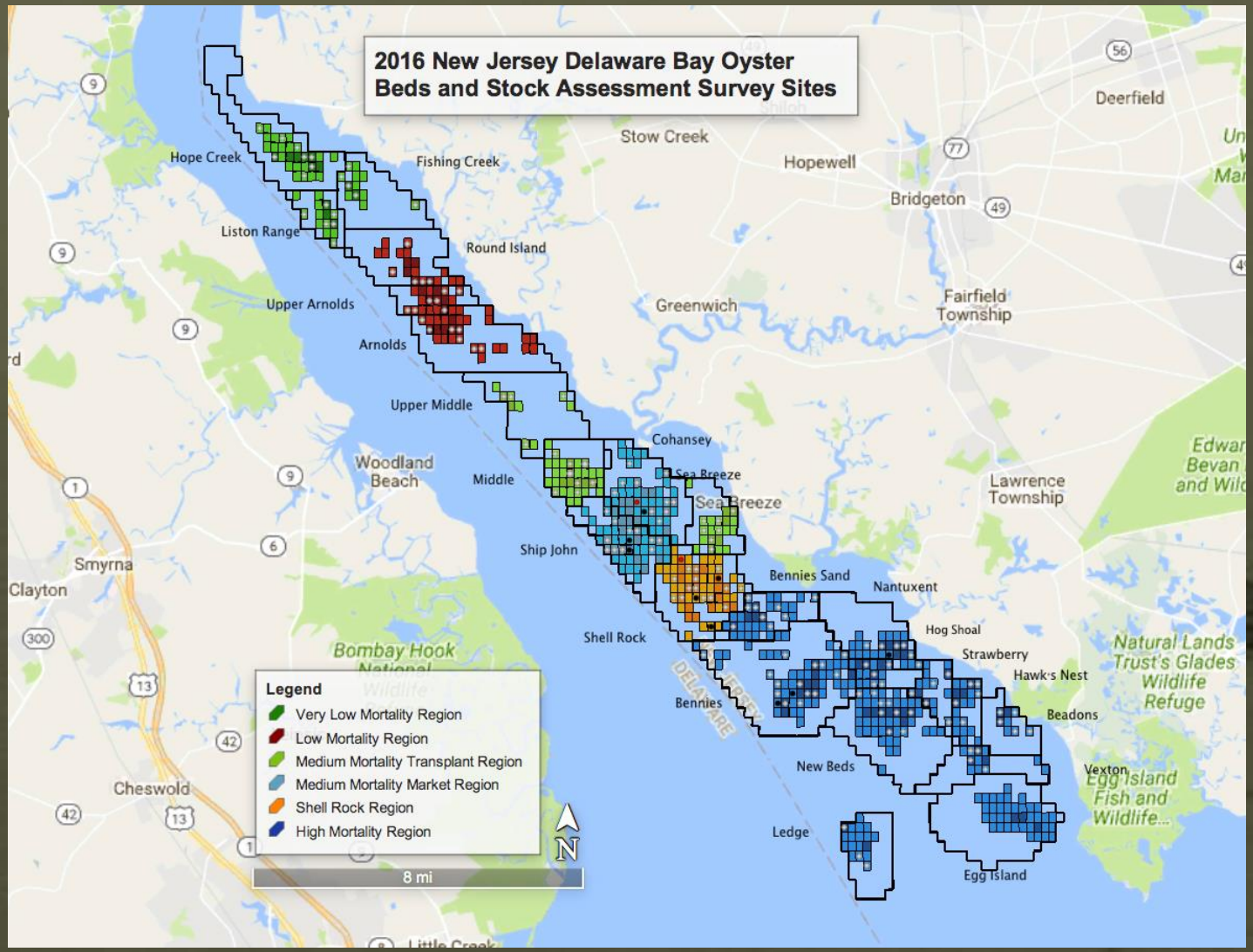
Heck of a return!

Year	Projected Yield	Dockside Value (~$40/bu)	**Federal Investment**	**Dockside Economic Return**
2005	87,379 bu	$3,495,160	$300,000	$70 : $1
2006	336,037 bu	$13,441,480	$2,000,000	$40 : $1
2007	198,510 bu	$7,940,000	$2,000,000	$24 : $1
2008	89,382 bu	$3,575,280	$813,000	$26 : $1
Total	**711,308 bu**	**$28,451,920**	**$5,113,000**	**$33 : $1**



Bottom sediment distribution on NOAA bathymetry chart, showing the slumping of oyster shell from the Middle / Ship John beds into channel.


They are still fishing!!!!


2016 New Jersey Delaware Bay Oyster Beds and Stock Assessment Survey Sites
Hope Creek
Fishing Creek
Stow Creek
Hopewell
Deerfield
Bridgeton
Liston Range
Round Island
Upper Arnolds
Arnolds
Greenwich
Fairfield Township
Upper Middle
Cohansey
Woodland Beach
Middle
Sea Breeze
Lawrence Township
Ship John
Smyrna
Clayton
Bennies Sand
Nantuxent
Hog Shoal
Shell Rock
Strawberry
Hawk's Nest
Natural Lands Trust's Glades Wildlife Refuge
Bombay Hook National Wildlife
Bennies
Beadons
New Beds
Vexton
Egg Island Fish and Wildlife...
Cheswold
Ledge
Egg Island
Legend
Very Low Mortality Region
Low Mortality Region
Medium Mortality Transplant Region
Medium Mortality Market Region
Shell Rock Region
High Mortality Region
N
8 mi

Many Thanks to Delaware Coastal Mgmt. Program!!!

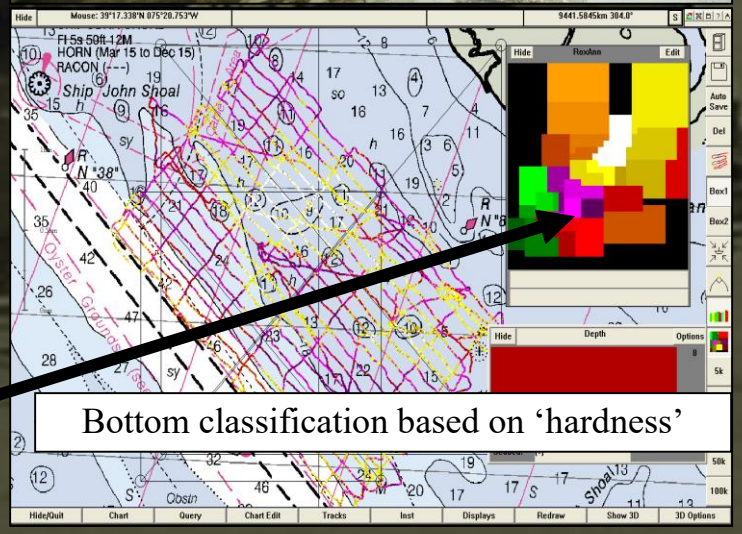
DCMP
DELAWARE COASTAL MANAGEMENT PROGRAM

Coastal Management Program

DE Coastal Program

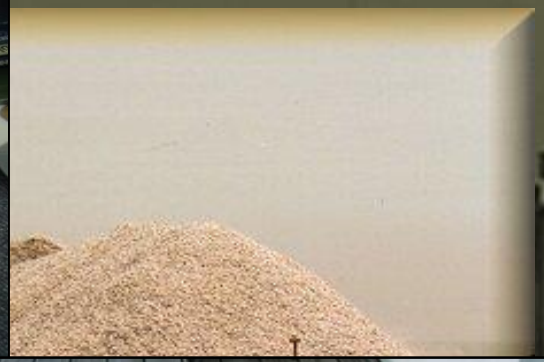
Bart Wilson, Dave Carter

Purple = shell



Bottom classification based on ‘hardness’

It's Not Rocket Science!



'x' (Clean Shell) + 'y' (

= 'a' (

Towed Camera

Divers