DNR REPLETION PROGRAM
1960 - 2006

Oyster Advisory Commission
June 12, 2017

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WHAT IS THE PURPOSE OF THIS PRESENTATION?

- The Repletion Program Ended Over 10 Years Ago -

- The OAC requested this presentation

- It was requested because at many meetings the Repletion Program has been mentioned

- However, many members have no experience or knowledge of the program and heard terms and concepts unfamiliar to them

- DNR prepared this summary of the program upon request in order to clarify its purpose and methods for the OAC

- This is simply an informational presentation, not one seeking a recommendation by OAC or direction for future action
QUESTIONS ASKED BY THE COMMISSION

*Dredged Shell and Seed Programs*

1) Purpose and why they were created?
2) How they functioned?
3) How long they existed?
4) Funding?
5) Why they ended?
6) Pros and cons?
7) How dependent was the industry on the programs?
8) Disease issues?
REPLETION PROGRAM

• DREDGED SHELL PROGRAM 1960 – 2006
  – Summer
  – Contractor hired by DNR

• SEED PROGRAM 1960 - 2006
  – April
  – Watermen hired by DNR

• FRESH SHELL PROGRAM pre 1960 – ~ 2003
  – Summer
  – Watermen hired by DNR
Initiated in 1960 to address declining harvests (fell below 2M bushels) and declining habitat.

- Plant shells to improve habitat
- Plant shells to enhance natural set
- Plant seed to augment natural production

- Plant shells on:
  - **Natural Bars**
    - leave the spat to grow
  - **Seed Areas**
    - move the spat to augment low setting areas

REPLETION PROGRAM
- requires abundant *shells* and good *spat sets* -
REPLETION PROGRAM
- components -

Tug and shell barge: ~ 30,000 bushels

Planting shells with the “pump barge”. Shells were planted in the summer
Natural spat in April.
Set the previous summer.
- Most spat were left in place to grow
- Some were moved as “Seed Oysters”

Shelled bottom.
Clean shells generate new spat sets
REPLETION PROGRAM
- components -

“Run boat”, or buy boat (JC Drewer), on a Seed Area loading seed. To be moved up bay to grow out areas where they will reach market size in about 2 years.

Harvester on a seed planting that has reached market size (Hacketts bar in the Annapolis area). This is one of many Smith Island boats in the upper bay for a few seasons, working seeded bars.
The program started to stem the decline in harvest.
MD Oyster Harvest

Harvest In Bushels


Year

Disease Outbreaks

2006 Repletion Program Ends

1960 Repletion Program Starts

Oyster Advisory Commission: 6/12/2017
DREDGED SHELL PROGRAM
1960 - 2006

The main driver of bar rehab and seeding
Dredged Shell Program Volume

Millions of Bushels per Year

Year


Million BU

No shells

Oyster Advisory Commission: 6/12/2017
Shell Dredging Areas
- Reviewed by the first OAC
- Historically Active Areas (red)
- Potential Areas (names)
Dredged Shell Program
(typical planting locations)

Upper Bay Shell Dredging Areas
- buried deposits of oyster shells
- shells are moved down-Bay

Shells Used For
- Bar Improvement (majority)
- Seed Production (minority)

Goal
- To enhance natural spat set
- To enhance harvest

Scale
- 2M to 5M bushels per year
- $1M - $2M per year
- 200 – 400 acres per year

Shells planted exceeded the amount removed via harvest
Scope of Dredged Shell Program

Eastern Bay (1960-2002)

Majority are Natural Bar Plantings

Minority are Seed Area Plantings

Seed Areas

1992-2002 Plantings
1960-1991 Plantings
Dredged Shell Strategy

- **Natural Bar Plantings**
  - The major focus for decades
  - Oysters were not moved from these sites
  - These sites yielded oysters for years

- **Seed Area Plantings**
  - High setting areas
  - To create seed oysters
  - Seed were transplanted to low setting areas
  - The transplanted seed produced market oysters for a few years
  - Additional plantings followed

All maps represent typical Repletion activities. But every year was different.
Seed Program
(typical planting locations)

From: Seed Areas

To: Low setting areas
Survival areas

Strategy:
a) Enhance market production in low setting areas
b) Manage around disease move oysters to survival zones, away from mortality zones

Scale:
~ 200K bushels ± per year
~ $200K to $300K per year
~ 300+ acres per year
~ 100M to 500M spat ±
  (~40M lowest….~1B highest)

Seed Program Costs near the end of the program
Cost ~ .18 cent to .5 cents per spat
Cost ~ $8 to $13 invested to produce a BU of market oysters
Seed Areas

EASTERN BAY
Parsons Is
Mill Hill
Bugby

HARRIS CREEK
Mill Point
Tilghman Wharf
Wild Cherry Tree

HONGA RIVER
Tar Bay
Lakes Cove

TANGIER SOUND
Back Cove
Kedges Strts

BROAD CREEK
Mulberry Pt
Brown Bar
Deep Neck

ST MARYS RIVER
Green Pond
Butlers
St Jerome
Gravelly Run

LITTLE CHOPTANK
Cedar Pt
Town Pt
Lot 1
Ragged Pt

POTOMAC
Calvert Bay
Jones Shore
Seed Areas

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Repletion Program Summary

Accomplished
- Shell plantings exceeded harvest removed: positive shell budget
- Shells enhanced habitat and spat set
- Seed augmented low spat set areas
- Shells & Seed enhanced the fishery (the goal) for decades
- Scale was large, but not the full extent of MD’s oyster bars

Did Not Accomplish
- Harvest recovery over the longterm
- Compromised by disease post 1986

Required
- Abundance of: shells, spat, and funds
- All three are in short supply now
## Harvest & Dockside Value vs Program Cost

<table>
<thead>
<tr>
<th>Season</th>
<th>Bushels</th>
<th>Dockside Value</th>
<th>Repletion Cost</th>
<th>Dockside/Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>1996-97</td>
<td>177,600</td>
<td>$3,769,923</td>
<td>$1,183,255</td>
<td>3.2</td>
</tr>
<tr>
<td>1997-98</td>
<td>284,980</td>
<td>$5,742,280</td>
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<tr>
<td>1998-99</td>
<td>423,219</td>
<td>$7,829,111</td>
<td>$1,514,740</td>
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<tr>
<td>1999-00</td>
<td>380,675</td>
<td>$7,231,980</td>
<td>$1,299,256</td>
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<tr>
<td>2000-01</td>
<td>347,968</td>
<td>$6,864,247</td>
<td>$1,913,799</td>
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<tr>
<td>2001-02</td>
<td>148,155</td>
<td>$2,923,560</td>
<td>$2,082,314</td>
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<tr>
<td>2002-03</td>
<td>55,840</td>
<td>$1,621,748</td>
<td>$1,814,201</td>
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<td>2003-04</td>
<td>26,495</td>
<td>$731,797</td>
<td>$1,587,990</td>
<td>.5</td>
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<tr>
<td>2004-05</td>
<td>72,218</td>
<td>$1,125,074</td>
<td>$2,223,115</td>
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<tr>
<td>2005-06</td>
<td>154,436</td>
<td>$4,734,818</td>
<td>$2,173,942</td>
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<tr>
<td>2006-07</td>
<td>165,059</td>
<td>$5,000,000</td>
<td>$2,057,306</td>
<td>2.4</td>
</tr>
</tbody>
</table>

| Total   | $47.467 M | $19.048 M | 2.5       |

“Repletion Cost” in this table are costs for dredged shells, fresh shells and seed oysters. The table is not to suggest all the harvest was from the Repletion investment.

*Note: The above timeframe experienced elevated mortality due to disease. When disease was less of an impact the Value:Cost Ratio was greater: Ex. 1986 7.5 to 1 (~$16.6M Value, Cost ~ $2.2M)*
Harvest, Dockside Value vs Cost of Shells & Seed

Value > Cost for most years
Spat Set Results
Dredged Shells vs Natural Shells

Dredged shells are effective

Year

Spat Per Bushel
0 100 200 300 400 500 600

Dredged Shells  Natural Shells

A comparison prepared for the first OAC
Shell & Seed Benefits: Two Cases

**Eastern Bay – shells**  see next slides

- Heavily shelled for decades. Oystermen work the shelled areas.
- Shells obtained spat sets and yielded oyster harvests
- Provided harvest for many years but dropped severely due to disease
- Efficiency of the shells was very high, but then was severely impacted

**Chester River – seed**  see next slides

- Heavily seeded for decades. Oystermen work the seeded areas
- Seed grew and provided harvests
- When seed plantings declined so did harvest
- When seed plantings increased so did harvest
- When seed was no longer planted in the river, harvest crashed
Old shells can be biologically successful. Multiple results from one investment. Shells up to 13 years old received very high sets.
## Eastern Bay: Shell Benefits and Impact of Disease

<table>
<thead>
<tr>
<th>Year</th>
<th>Harvest (K bu)</th>
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<tbody>
<tr>
<td>1974</td>
<td>865K</td>
</tr>
<tr>
<td>1986</td>
<td>256K</td>
</tr>
<tr>
<td>1994</td>
<td>2</td>
</tr>
<tr>
<td>1995</td>
<td>4</td>
</tr>
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<td>49</td>
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<td>2007</td>
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</tr>
<tr>
<td>2008</td>
<td>8</td>
</tr>
<tr>
<td>2009</td>
<td>4</td>
</tr>
</tbody>
</table>

- Strong harvests due to abundant shells.
- Declining harvests due to disease.

But then a steeper decline occurs after 1986 due to increased disease.

- Historic lows due to disease.

- Low dockside value of only $60K due to disease.

- Harvest and value increase due to 1997 set on shells, mostly old shells.

- Increase due to shells & abundant 1997 set growing & surviving.

- Decline in harvest and value occurs due to 99-02 drought and disease.

- Historic low levels again. Disease impact is due to 99-02 drought.

- Harvest increases slightly due to benefit of 2003-04 rainfall.

- Harvest increases again due to benefit of 2006 rainfall.

- Harvest decreases due to rising disease & low sets (2003-04 = low sets).

- Harvest collapses (again) due to disease & low sets.

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**Bottom Line**

Shells once yielded abundant oysters & value (1970’s for ex), but disease compromised the program. Yet, some slight, short-lived rebounds are possible (2000-01 and 2006-07), showing shells provide longterm benefits.
<table>
<thead>
<tr>
<th>Year</th>
<th>Bushels</th>
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<tr>
<td>1985</td>
<td>37,000</td>
</tr>
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<td>1986</td>
<td>24,000</td>
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<td>1987</td>
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<td>2007</td>
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<td>2008</td>
<td>5,000</td>
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<tr>
<td>2009</td>
<td>4,000</td>
</tr>
</tbody>
</table>

**Chester River: Seed Benefits**

Poor setting river. Low natural spat set
Natural set could not support these harvests.

- **Strong harvests**
  - due to abundant natural seed
  - transplanted to the river
  - that grew to market size

- **Natural Seed**
  - ~ 80% to 90% of Chester harvest

- Low harvest: due to lack of natural seed

- Rebound due to increased natural seed

Since 2004….No more natural seed planted in the Chester River.
Only hatchery seed was planted.
Result ~ 4K to 5K bushel harvest without natural seed.
Loss of dockside value ~ $750K per year

Oyster Advisory Commission: 6/12/2017
Later in the life of the program when MSX and Dermo became a rising issue, the seed moved by the Seed Program were infected. Disease was moved. 

Benefit:
Infected seed moved to low salinity areas were purged of MSX and Dermo levels declined; and the oysters lived to market size. But other spat left in the lower bay areas suffered high mortality as they grew; and they often didn’t reach market size. The Seed Program continued to augment harvest significantly in low salinity areas, while higher salinity areas fell in harvest. Fleets of oyster boats moved up bay to continue working vs having little work down bay due to the high mortalities.

Risk:
Moving disease into low salinity areas increased Dermo in these areas, though it was already there as well. This additional “burden” of disease elevated the risk should the areas experience a severe drought, which they did a number of times, especially the 4 year drought (1999-2002). Areas previously safe and with low mortality levels saw periodic increases in mortality and loss of oysters. Not solely due to the Seed Program because disease was already in these areas, but it was a contribution. Then when disease lessened, production increased again.

The Seed Program during the 1980’s onward was one of risk management vs potential benefits.

This slide was developed after the OAC meeting due to the discussion on the topic of disease.
CURRENTLY

Policies are in place to limit the movement of diseased seed.

Disease data of the seed and the planting area are both reviewed.

Criteria exist to control, limit and prohibit movement of infected seed.

Hatchery seed is the dominant seed used today. It is disease free when it leaves the hatchery.

Natural seed movement (from VA for example) follow the procedures mentioned above.
Later in the life of the program when MSX and Dermo became a rising issue, the dredged shell plantings were compromised in their ability to produce market oysters.

- The shells were still effective for the purposes they were planted. (improve habitat and create spat sets).

- The shells produced new and large populations of smalls (sublegals) that were growing toward market size.

- But as the oysters approached and reached market size, many died due to disease.

- The productivity and effectiveness of the shell plantings declined.

- The benefit of continuing shell plantings was to keep improving the habitat for when disease would abate (it did) and productivity would increase (it did).

- Shells were a long term investment to achieve decade-plus results. Seed oysters were a short term investment for a more focused timeframe of results.

_This slide was developed after the OAC meeting due to the discussion on the topic of disease_
Funding to support the Repletion Program

Repletion – 10% to 90% subsidized. Varied year to year. Most years were 60% to 80% subsidized

Dredged Shell Program: Mostly subsidized. $1.5 to $2M annual total cost
Near the end of the program, frequently 100% subsidized. Historically, less than 100% but still highly subsidized.

- Seed Program: Marginally subsidized. $200K to $300K annual total
Most funds came from the industry (licenses, taxes, license surcharge). Public subsidy was needed when nature provided a very strong set resulting in a large amount of seed to move, or when industry revenue fell.

- Fresh Shell Program: Typically 100% subsidized. $16K to $100K annual total
Shells not used for Repletion– The shells were used in hatchery program

Sources of subsidy during the Repletion Program: State and Federal funds
Repletion Program
Summary

Accomplished
- Shell plantings exceeded harvest removed: positive shell budget
- Shells enhanced habitat and spat set
- Seed augmented low spat set areas
- Shells & Seed enhanced the fishery (the goal) for decades
- Scale was large, but not the full extent of MD’s oyster bars

Did Not Accomplish
- Harvest recovery over the longterm
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Required
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- All three are in short supply now
DISCUSSION
Additional Maps Mentioned at the OAC Meeting

- Historic Planting Areas -
Example of the scope of the Dredged Shell Program

Upper Tangier Sound Region
Shell Plantings (1960-2002)

1992-2002 Plantings
1960-1991 Plantings
Example of the scope of the Dredged Shell Program
Choptank & Tribs
Shell Plantings (1960-2002)

1992-2002 Plantings
1960-1991 Plantings
Example of the scope of the Dredged Shell Program
Little Choptank
Shell Plantings (1960-2002)
Example of the scope of the Dredged Shell Program

St Mary’s River

Shell Plantings (1960-2002)