Oysters in Virginia:

Restoration, Wild fishery & Aquaculture

Mark W. Luckenbach

Maryland Oyster Advisory Commission
January 9, 2017

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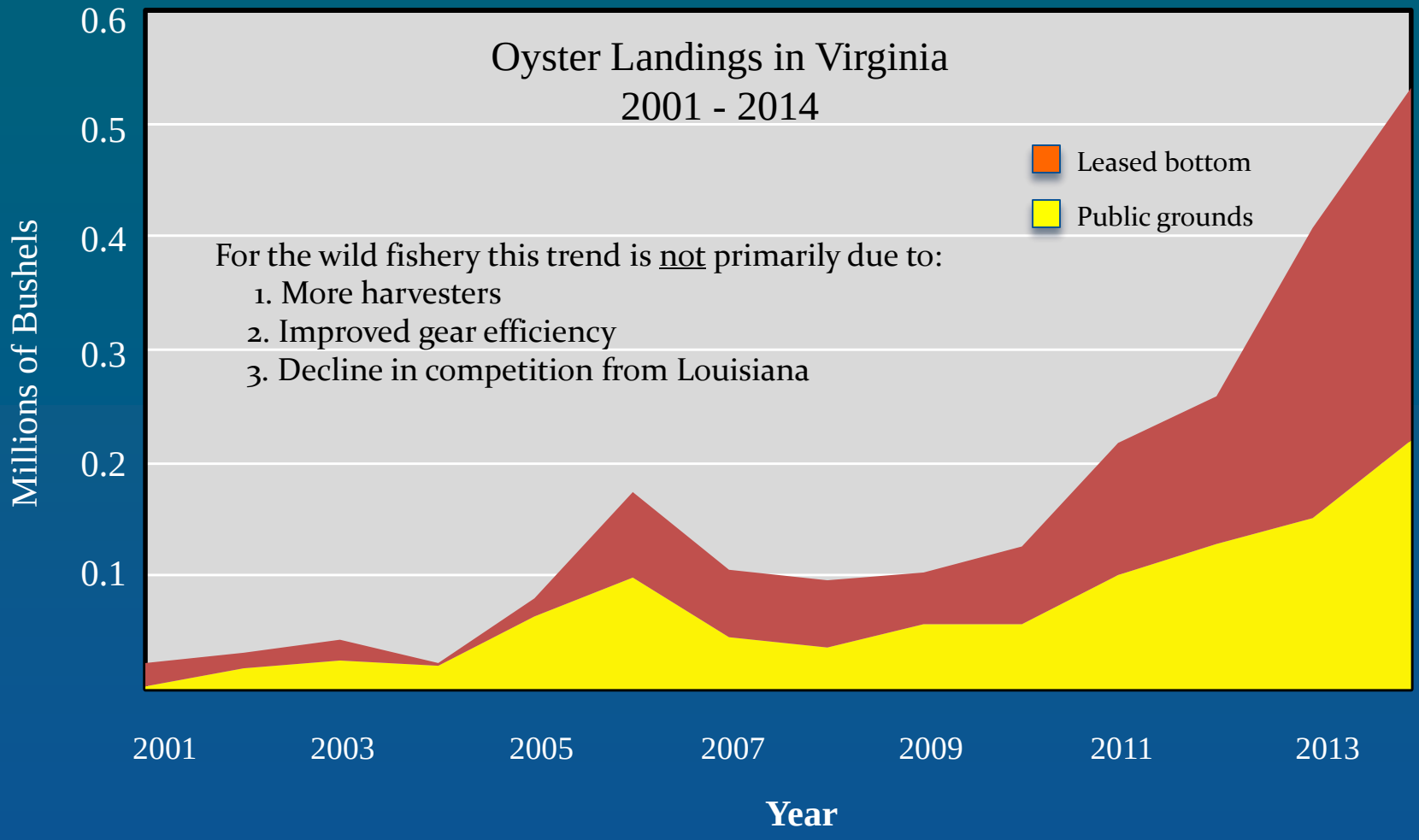
1940-2015 75 Years



Data source: Mitch Tarnowski, MD-DNR

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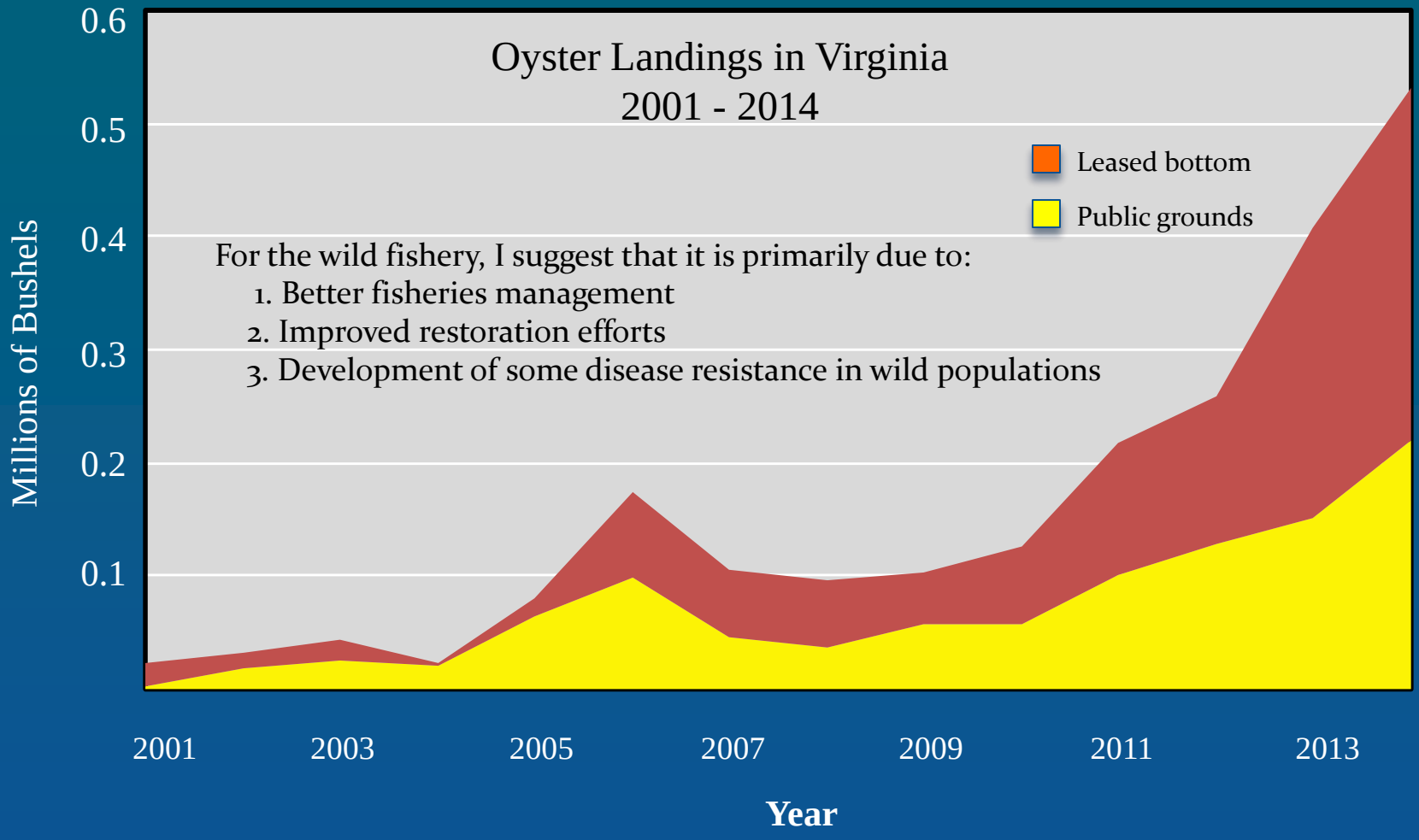

Data source: Jim Wesson, VMRC

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What has worked and what has not?

In most, but not necessarily all, locations planting a thin veneer of shells has not been sufficient to promote the development of a sustainable reef.

Recruitment + New shell growth < Shell loss rate

Shell loss rate = *f* (burial, fouling, dissolution, harvest)

What has worked and what has not?

Greater attention to habitat architecture and location

Sufficient 3-D structure to:

- **Enhance growth and survival**
- **Provide persistence of shell substrate**

Attention to shell budget:

Recruitment + New shell growth > Shell loss rate

- Good spat set
- High growth rates

- Minimize shell loss
- Low siltation
- Control harvest

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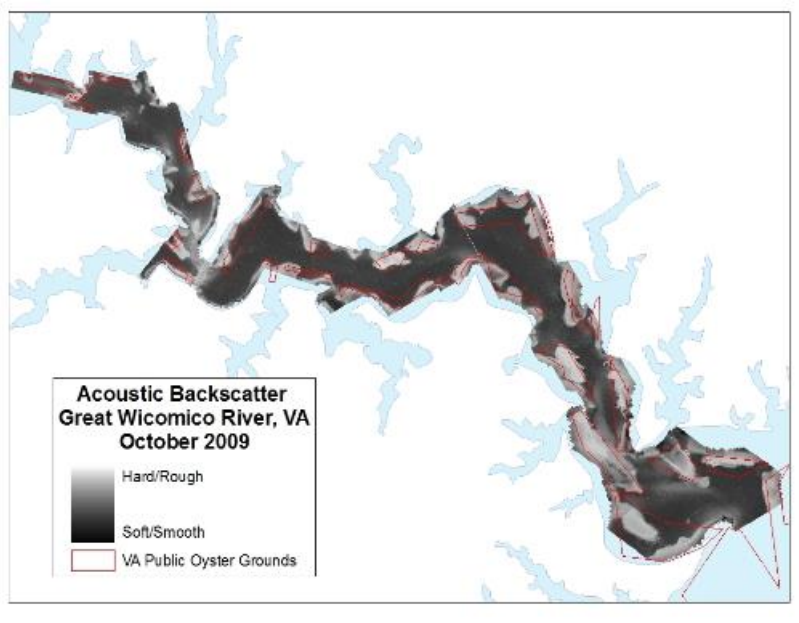
Restoration: what has work and what has not?

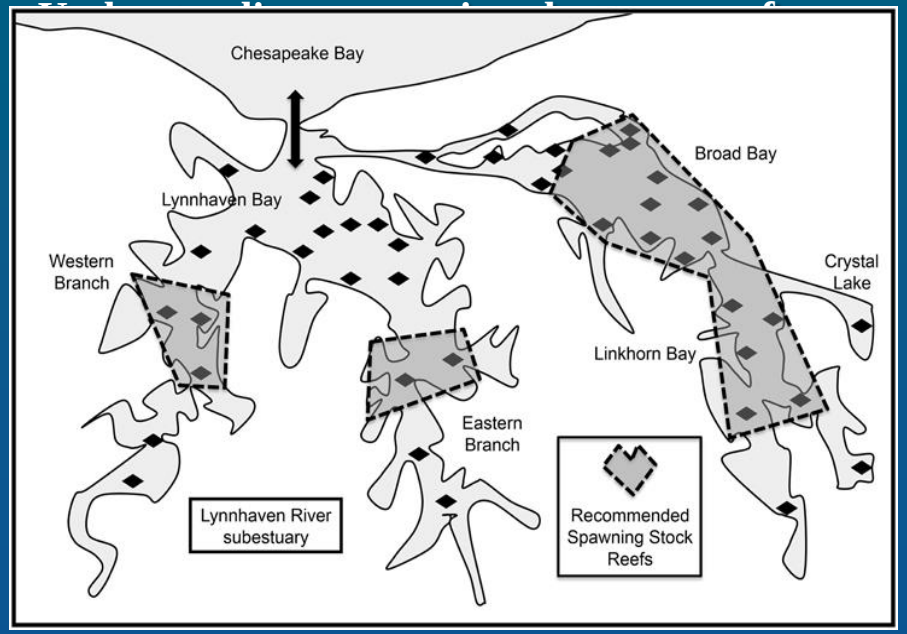
Tributary-scale restoration plans that include:

Detailed bottom mapping:
Identifying the right locations



From NOAA Ches. Bay Office

Metapopulation dynamics, Source-sink modeling:



From Lipcius et al. 2015. Front. Mar. Sci.

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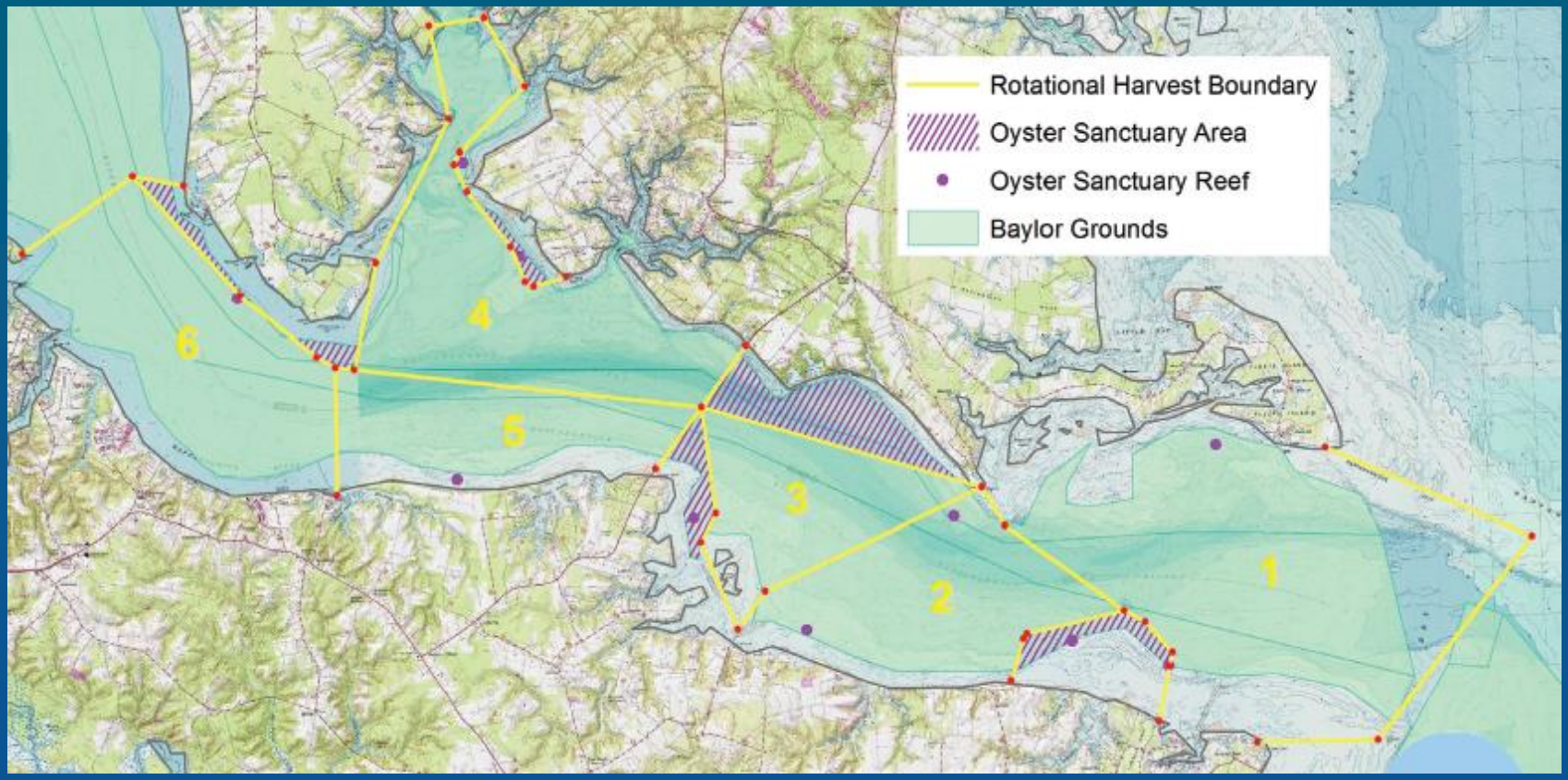
What has worked and what has not?

Fisheries management: Holistic approach which includes, harvest targets based on recent surveys, rotational harvest, and sanctuary reefs.



Rappahannock River, Virginia

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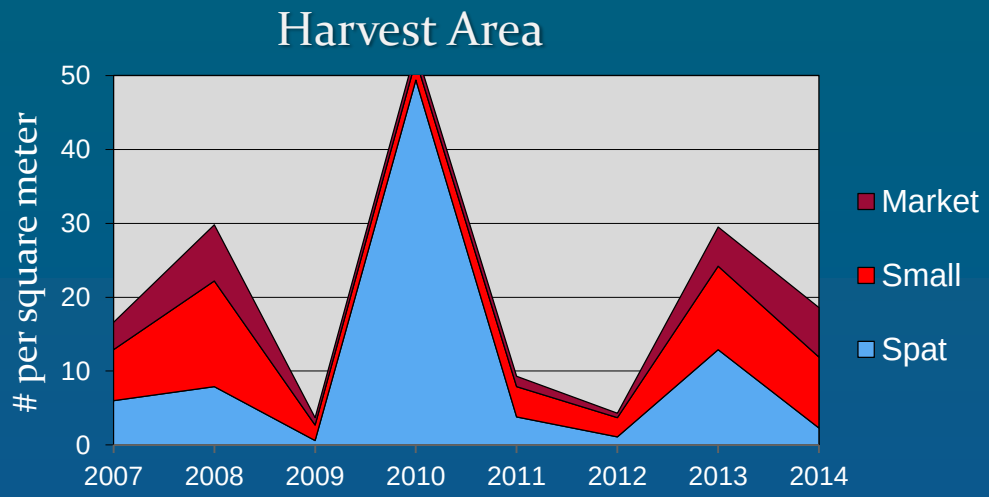
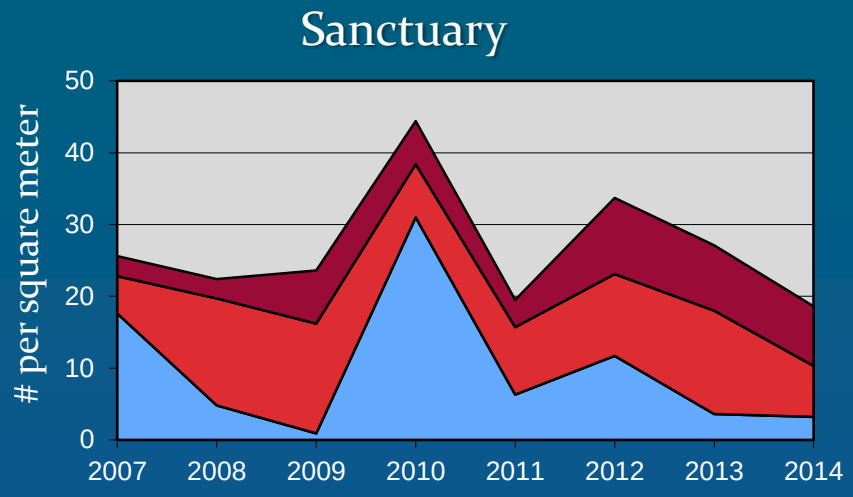
What has worked and what has not?

Sanctuary reefs preserve broodstock and DO NOT reduce spatfall





Throw away the notion that the reefs "have to be worked to be productive."

Data from Jim Wesson, VMRC

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What has worked and what has not?

Sanctuary reefs and improved fisheries management support the development of disease resistance

Vol. 432: 1–15, 2011
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FEATURE ARTICLE:

Declining impact of an introduced pathogen: *Haplosporidium nelsoni* in the oyster *Crassostrea virginica* in Chesapeake Bay

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Virginia Institute of Marine Science, College of William & Mary, Gloucester Point, Virginia 23062, USA

ABSTRACT: Disease caused by the parasite *Haplosporidium nelsoni* has devastated *Crassostrea virginica* in Chesapeake Bay, exacerbating effects of overharvesting and adversely impacting the ecology of the bay. *H. nelsoni* is thought to persist as an impediment to oyster restoration because strong reproductive contributions from oysters in low-salinity refugia from parasitism have prevented development of disease resistance. On the contrary, long-term data indicate that while infection pressure on naïve sentinels has grown, *H. nelsoni* levels in wild oysters have fallen, with prevalence typically below 20% and advanced infections uncommon. A transplant experiment comparing naïve sentinels with oysters from disease-enzootic populations indicated that these observations represent true disease resistance, and its geographical distribution was revealed by annual fall surveys, and by intensive sampling in 2007 and 2008. Resistance is best de-

Haplosporidium nelsoni spores (S) and plasmodia (P) in a rare heavy infection of an oyster, *Crassostrea virginica*, from lower Chesapeake Bay

Image: Ryan Carnegie

- Strong evidence for MSX resistance
- Evidence for Dermo resistance

This can only happen if sufficient numbers of oysters that survive disease challenge remain in the water.

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Where is this going and how do we sustain it?

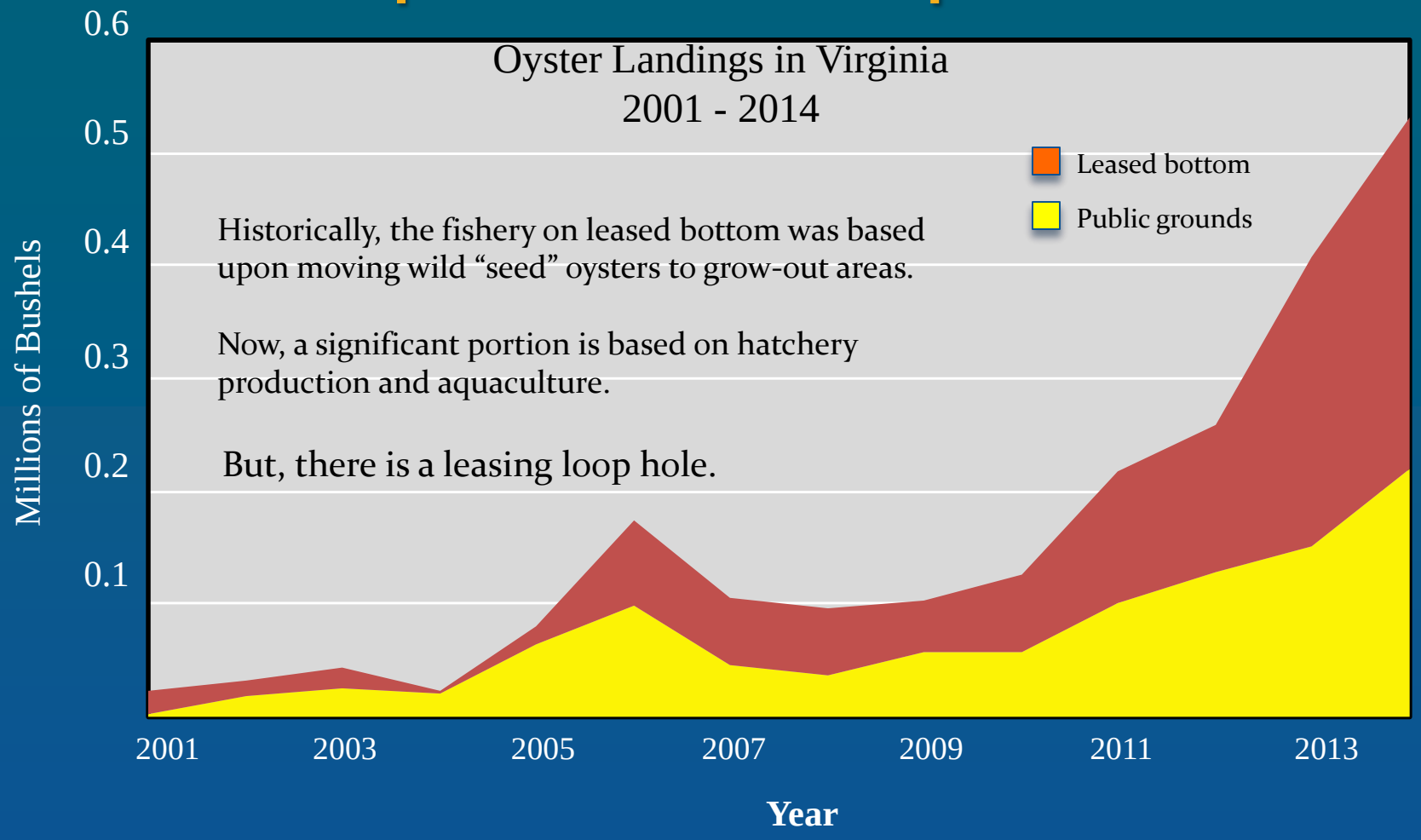
Restoration - Sanctuaries

- Working in some places, but not others. Requires *good* locations.
- Emergence of natural disease resistance
- Currently limited by the availability of shell – need alternatives

Wild Fishery Enhancement

- Dependent on success of above
- Virtually all of the harvest bars are limited by the availability of shell
- Will need to reduce latent capacity in the fishery – limited entry
- Develop & enforce quotas that are coupled to oyster abundance

Aquaculture Development



From Jim Wesson, VMRC

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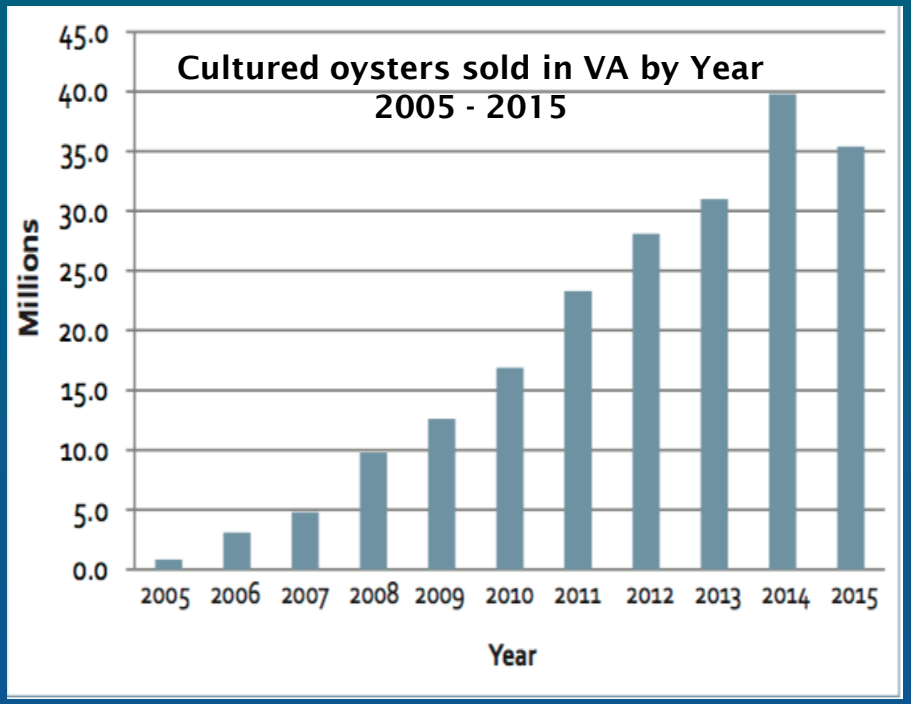
Aquaculture Development



From Hudson and Murray 2016

In 2015:

135.6 M single oyster seed planted

35.4 M aquacultured oysters sold

$14.5 M farm gate value

U.S. East Coast leader in oyster aquaculture production

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Aquaculture Development

This development has been enabled by:

- Favorable leasing laws in VA
- Selective breeding for disease resistance and rapid growth
- Triploid development and production
- Formal and informal training programs
- Private investment and innovation
- Strong supporting science—breeding, genetics, disease diagnostics, water quality monitoring

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Aquaculture

- Market would appear to support further growth
- Need to manage use conflicts in our coastal waters
- Must maintain a strong science-based development programs – selective breeding, disease diagnostics & public health

Policy Issues – Fisheries & Aquaculture

Restoration efforts and sanctuaries are critical to the success of the wild oyster fishery. Creating sanctuaries in the "last best places" is more cost effective than restoration in poor location.

- This is not ecology vs. the fishery
- It is the current fishery vs. the future fishery

Leasing laws (in VA) need clarification and effective enforcement tools.

Managing use conflicts, both within the Bay and with adjacent upland uses, will be crucial to the expansion of the oyster aquaculture industry.

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Questions?

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