The problem with absolute measures:

Another perspective on MD oyster restoration
Native oyster restoration in MD has been judged a failure:

- MD-DNR proposal to introduce fertile, diploid, 'Oregon strain' *C. ariakensis* to Chesapeake Bay

- Intent is to finish evaluation and have diploids in the water by 2005
But is native oyster restoration hopeless?

It depends on whether we assume we know how to do restoration.

Sanctuaries, or no-take reserves, have never been used for any species challenged by both overfishing and disease.

High densities potentially increase disease transmission.

This doesn’t mean it’s impossible, only that restoration needs to be approached as an experiment.
Oyster restoration in MD has generally not been done in a consistent, comparative way that allows us to learn what gains we could make relative to fished sites receiving no restoration effort….

Different densities, different seed, different reef configurations at different locations & times
Planned fished:unfished comparison

Metrics:
- Oyster density
- Oyster survival
- Oyster growth
- Disease prevalence (dermo and MSX)
- Disease intensity (dermo)

All in fished vs unfished reefs

All in high vs low density
But is native oyster restoration hopeless?

It depends on how we measure success

- whether the measures reflect the manipulation we’re actually doing in the restoration efforts,
- whether we have the appropriate controls against which to measure progress,
- what time frame is used

It depends on whether we use absolute or relative measures
Is this success or failure?

![Graph showing % survival over time with two groups labeled "sanctuary" and "fished".]
Most restoration during drought
Important to include climate variability in metrics
Should results of wet & dry periods be compared to project long term gain (if any) relative to fished areas?
Does high mortality in recent attempts imply failure?
Appropriate expectations:

EX: What is the expected survival when spat seeded at densities of up to 30 ind/shell?

If 3/shell survive, mortality is 90%
How long should we wait to declare success or failure?

Native oyster restoration in MD has been judged a failure:

• MD-DNR proposal to introduce fertile, diploid, 'Oregon strain' C. ariakensis to Chesapeake Bay

• Intent is to finish evaluation and have diploids in the water by 2005
Title: The problem with absolute measures
Oyster restoration in MD declared a failure

Consequence is intention to introduce non-native oyster to Ches Bay
    if successful, will spread throughout atlantic coast & maybe beyond

But how do we decide it’s a failure? A failure relative to what?
Primary strategy has been sanctuaries; never applied to marine pops stressed by both disease & overfishing
    problem w/ densities
What do sanctuaries (no-take marine reserves) do?
    remove fishing pressure
So, important metrics for success are measures care about (oyster survival, growth, etc) in sanctuaries vs.
    fished areas.
Instead: abs survival
Need to incorporate climate variability in metrics
    Oyster restoration success vs. failure based on 3 year drought

Need to consider long-term...
Unless goal is an absolute: e.g., restore fishery to a certain level and a put & take fishery as the total focus
    of restoration is acceptable.
    Agencies need to be honest about goal
Table 1. Paired sanctuary and reserve sites to be tested. Some sites are listed more than once because very large shelled areas (e.g., up to 40 acres) can be planted with separate spat plants each only a few acres. *Background shell may include historical shell additions >5 years old.

<table>
<thead>
<tr>
<th>Pair</th>
<th>Location</th>
<th>Bar</th>
<th>Sanctuary or Open Harvest or Reserve</th>
<th>Year shell added</th>
<th>Year of spat addition to be tested</th>
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<tbody>
<tr>
<td>1</td>
<td>Chester River</td>
<td>Strong Bay -04</td>
<td>Sanctuary</td>
<td>2002-2003</td>
<td>2004</td>
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<tr>
<td></td>
<td></td>
<td>Wickes Beach</td>
<td>Open Harvest</td>
<td>2003</td>
<td>2004</td>
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<td>Strong Bay – 03</td>
<td>Sanctuary</td>
<td>2002-2003</td>
<td>2003</td>
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<tr>
<td></td>
<td></td>
<td>Blunts (NOB 7-3)</td>
<td>Reserve</td>
<td>2003</td>
<td>2003</td>
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<tr>
<td>3</td>
<td>Choptank River</td>
<td>Shoal Creek 2</td>
<td>Sanctuary</td>
<td>2003</td>
<td>2004</td>
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<tr>
<td></td>
<td></td>
<td>Black Buoy -03</td>
<td>Reserve</td>
<td>2003</td>
<td>2004</td>
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<tr>
<td>4</td>
<td>Choptank River</td>
<td>States Bank</td>
<td>Sanctuary</td>
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<td>Black Buoy-04</td>
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<td>5</td>
<td>Main Bay</td>
<td>Poplar Island Sanc.</td>
<td>Sanctuary</td>
<td>2003</td>
<td>2004</td>
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<td>Poplar Island Res.</td>
<td>Reserve</td>
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<td>Severn River</td>
<td>Tolly Point</td>
<td>Sanctuary</td>
<td>1999</td>
<td>2004</td>
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<td></td>
<td></td>
<td>Tolly Point</td>
<td>Reserve</td>
<td>Background*</td>
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<tr>
<td>7</td>
<td>Main Bay</td>
<td>St. Mary’s</td>
<td>Sanctuary</td>
<td>Background*</td>
<td>2004</td>
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<tr>
<td></td>
<td></td>
<td>St. Mary’s</td>
<td>Open Harvest</td>
<td>Background*</td>
<td>2004</td>
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