Introduction

In response to a request for assistance from the Norfolk District office of the U.S. Army Corps of Engineers (COE), staff of the Virginia Institute of Marine Science (VIMS) and Virginia Marine Resources Commission (VMRC) have prepared the following atlas of potential Oyster Reef Restoration Sites for the Virginia portion of the Chesapeake Bay. The COE wishes to devote efforts to restoration of oyster stocks in the Chesapeake Bay for environmental and water quality improvement. In tandem, the Chesapeake Bay Program is coordinating the production of The Baywide Comprehensive Oyster Plan for Maryland and Virginia. VIMS and VMRC are preparing the Virginia component of this plan cooperatively. This map atlas illustrates the potential location of future oyster reef restoration projects in Virginia waters, under that plan.

The atlas compiles a series of maps enhanced by overlays that summarize diverse historical and current data relevant to oyster distribution and current and projected habitat options. Building from original maps generated by Lt. Baylor of the U.S. Navy in 1894, the atlas incorporates detail describing most recent substrate maps, limits of public and leased oyster grounds, bathymetry relevant to possible operation of vessels and barges in restoration work, and current and potential restoration sites. Planned additions to the maps include seasonal salinity contours (isohalines) as barometers of the potential effect of storm induced freshwater flows from upstream and disease incursion from downstream higher salinity water.

Restoration Siting Protocol for Future Reef Construction

Today there are 50 completed oyster reef restoration projects in the Virginia portion of the Chesapeake Bay. Considerable interest in future construction warrants the development of a technique that allows for the advanced identification of potential building sites based on best professional judgement and existing data. The location of potential restoration sites available for future projects were sited based on conditions which could be mapped using geographic information systems (GIS) and available GIS data.

The protocol considers three basic criteria. These criteria were analyzed using a hierarchical approach that combines available digital data, and GIS programming techniques. The resultant maps illustrate only the endpoints of this analysis along with ancillary supporting data.

The protocol first assumes public oyster ground will be available for all projects sponsored by federal, state, or local programs. Therefore, the Baylor grounds (public oyster grounds) mapped by Lt. Baylor in the 1800s provides the state owned bottom on which restoration sites would be constructed. This does not exclude privately leased bottom as potential sites, however they were not considered as part of this analysis. Second, it is preferred that oyster reef restoration sites are constructed on hard bottom, and preferably where oyster reefs once thrived. Geo-referenced bottom probe surveys conducted by Dexter Havens of VIMS in the 1970s and Jim Wesson of the VMRC in the 1990s-present provide data verifying bottom sediment type. These data were used to identify areas within public oyster grounds with hard bottom composed of shell or oyster rock. The third criteria used to designate suitable sites is based on the location of existing COE maintained navigation aids and channels. These data were included in the analysis to insure that reef construction would not interfere with either navigation or the maintenance of these areas. While this represents a small percent of the total number of channels and aids in Virginia waters, data were not available for other aids or channels not maintained by the COE. No targeted reef restoration sites were found to be in the vicinity of COE aids or channels.

Using the ArcMacro Language (AML) developed by Environmental Systems Research Institute (ESRI) to accompany the ArcInfo® software, the hierarchical model pulls from a GIS coverage representing the most recent survey of all public oyster grounds in Virginia. This coverage is maintained by VMRC. With this coverage as a basemap, a second coverage merging digital data from various sources of bottom type data was superimposed. The combination of these two coverages was analyzed to determine the bottom surface area within Baylor grounds with hard bottom substrate. This is the basis for designating a site as suitable for future reef restoration projects. A final query at the request of the COE verified that none of these sites will interfere with navigation or maintenance of either channels or navigation aids under their congressional responsibility. A GIS coverage of these features provided by the COE was used in this analysis.
The maps are generated to illustrate the results of the targeting effort following the protocol described above. The authors recognize this level of targeting does not preclude the need for field inspection at potential sites prior to reef construction. The atlas is comprised of a series of boxes preceded by an index locator. The scale of each box may vary. The potential restoration areas are illustrated in red. The legend reports the total acres available for restoration within the boundary of each box. At this time, the size of individual restoration sites can only be retrieved using the digital data and a capable GIS package like ArcInfo® or ArcView®. A total of 788 individual sites comprising 11,469 acres of subaqueous bottom have been targeted.

In addition to the targeted sites, additional GIS data are included to provide assistance in site selection. Illustrated in gray, shellfish condemnation zones represent waterways that have been designated by the Virginia Department of Health, Division of Shellfish Sanitation as closed for the taking of shellfish. These closures are based on regular fecal coliform monitoring by the Division. The GIS data is a modified version of AutoCAD files developed and maintained by the VMRC survey division.

General bathymetry is provided on the basis of water depths greater than or less than 2 meters. These data were developed and maintained by the Chesapeake Bay Program, and are available through their website.

The location of existing restoration sites is denoted as solid black triangles. Geographic positions for reef sites were collected using Global Positioning Systems (GPS) in the field. These sites represent restoration activities that have occurred in Virginia waters with support from a variety of agencies and organizations. VMRC has been responsible for overseeing the construction of these sites.

Sentinel monitoring stations are long-term monitoring stations where oyster populations have been recorded over time. Monitoring is being performed by VIMS and VMRC. A ten year monitoring plan is in place to evaluate the rate at which restoration activities progress toward baywide oyster population goals. They are denoted with a solid black circle.

The public oyster ground boundaries are illustrated using a thick black line. The private leases, which are administered by the VMRC, are illustrated with a thin black line.

Acknowledgements

The preparers would like to thank the COE for their financial sponsorship of this product. Gerry Showalter, Royce Bridger, and Alan Godshall of the Virginia Marine Resources Commission were instrumental in providing digital data to support this project. Photographs are courtesy of the VMRC. The VIMS Publications Center assisted with printing and text layout.
Oyster Reef Restoration Targeting

Index Map
**Nomini Creek**

**Location:** Nomini Creek

**History of location:** Small southern tributary of the Potomac River. Most westward tributary of the Potomac River. Infrequent natural spat settlement. Baylor and private productivity maintained by movement of seed from elsewhere.

**Current status:** Low population levels subject to both freshet mortality and disease (predominantly Dermo). Cultch condition on Baylor Grounds is relatively good. Three sentinel sites present. Occasional additional data collected as needed. Data held by VIMS and VMRC.

**Restoration potential:**

Modest because of low spat set and consistent disease risk.

**Lower Machodoc Creek**

**Location:** Lower Machodoc Creek

**History of location:** Small southern tributary of the Potomac River. Infrequent natural spat settlement. Baylor and private productivity maintained by movement of seed from elsewhere.

**Current status:** Low population levels subject to both freshet mortality and disease (predominantly Dermo). Cultch condition on Baylor Grounds is relatively good. Three sentinel sites present. Occasional additional data collected as needed. Data held by VIMS and VMRC.

**Restoration potential:**

Modest because of low spat set and consistent disease risk.

**Yeocomico River**

**Location:** Yeocomico River

**History of location:** Small southern tributary of the Potomac River. Occasional natural spat settlement. Baylor and private productivity mostly maintained by movement of seed from elsewhere.

**Current status:** Low population levels on Baylor Grounds subject to consistent disease (predominantly Dermo) mortality. Freshet impacts are rare. Recent incidence of algal blooms and associated low oxygen events. Cultch condition on Baylor Grounds is relatively good. Two sentinel sites present. Occasional additional data collected as needed. Data held by VMRC. Private lease activity is relatively high. Recent restoration activity (reefs and other) to date. Numerous seed movements and shell plants. One reef constructed in 1997 and two built in 2002. The risk to private oyster production is high because of disease.

**Restoration potential:**

Modest because of low spat set and consistent disease risk.

**Glebe and Coan Rivers**

**Location:** Glebe and Coan Rivers

**History of location:** Small southern tributary of the Potomac River. Baylor and private productivity mostly maintained by movement of seed from elsewhere.

**Current status:** Low population levels on Baylor Grounds subject to consistent disease (MSX and Dermo) mortality. Freshet impacts are rare. Recent incidence of algal blooms and associated low oxygen events. Cultch condition on Baylor Grounds is relatively good. One sentinel site present. Occasional additional data collected as needed. Data held by VIMS and VMRC. Private lease activity is relatively high. Recent restoration activity (reefs and other) to date. Numerous seed movements and shell plants. One reef constructed in 1997. The risk to private oyster production is high because of disease.

**Restoration potential:**

Modest because of low spat set and consistent disease risk.

**Smith Point and Little Wicomico River**

**Location:** Smith Point and Little Wicomico River

**History of location:** Small southern tributary of the Potomac River on the northwestern shore of the Chesapeake Bay. Occasional natural spat settlement. Baylor and private productivity mostly maintained by movement of seed from elsewhere.

**Current status:** Low population levels on Baylor Grounds subject to consistent disease (MSX and Dermo) mortality. Cultch condition on Baylor Grounds is relatively good. One sentinel site present. Occasional additional data collected as needed. Data held by VMRC. Private lease activity is relatively low. Recent restoration activity (reefs and other) to date. Occasional seed movements and shell plants. The risk to private oyster production is high because of disease.

**Restoration potential:**

Modest because of low spat set and consistent disease risk.

**Great Wicomico River**

**Location:** Great Wicomico River

**History of location:** Small tributary on the northwestern shore of the Chesapeake Bay. Trap type estuary with history of significant natural spat settlement and seed oyster production. Baylor and private productivity mostly maintained by seed production and regular addition of shell cultch.

**Current status:** Low population levels on Baylor Grounds subject to consistent disease (MSX and Dermo) mortality. Cultch condition on Baylor Grounds is relatively good. Three sentinel sites present. Occasional additional data collected as needed. Data held by VIMS and VMRC. Private lease activity is modest. Recent restoration activity (reefs and other) to date. Reefs constructed in 1996 and 1998. Occasional seed movements (export) and shell plants. The risk to private oyster production is high because of disease.

**Restoration potential:**

Limited because of consistent disease risk.
Oyster Reef Restoration Targeting
Box 1. Nomini Creek, Nomini and Currioman Bays
Oyster Reef Restoration Targeting

Box 2. Lower Machodoc Creek

- Potential Restoration Area (50 acres)
- Depth < 2 Meters
- Depth > 2 Meters
- Condemnation Zones
- Completed Reef Restoration Sites
- Sentinel Monitoring Sites

Public Ground Boundary

Private Leases
Oyster Reef Restoration Targeting

Box 3. Yeocomico River

- Potential Restoration Area (57 acres)
- Depth < 2 Meters
- Depth > 2 Meters
- Condemnation Zones
- Completed Reef Restoration Sites
- Sentinel Monitoring Sites

Public Ground Boundary
Private Leases
Oyster Reef Restoration Targeting

Box 4. The Glebe and Coan River
Oyster Reef Restoration Targeting

Box 5. Smith Point and Little Wicomico River

• Potential Restoration Area (48 acres)
  - Depth < 2 Meters
  - Depth > 2 Meters
  - Condemnation Zones
• Completed Reef Restoration Sites
• Sentinel Monitoring Sites
• Public Ground Boundary
• Private Leases
Oyster Reef Restoration Targeting

Box 6. Great Wicomico River

Potential Restoration Area (248 acres)
Depth < 2 Meters
Depth > 2 Meters
Condemnation Zones
Completed Reef Restoration Sites
Sentinel Monitoring Sites
Public Ground Boundary
Private Leases
| Location: Rappahannock River: Wares Wharf to Punchbowl Point | Location: Rappahannock and Corrotoman Rivers | Location: Rappahannock River: Lowerys Point to Neals Point | Location: Mouth of Piankatank River and Gwynns Island |
| History of location: Large tributary on the western shore of the Chesapeake Bay. History of significant natural spat settlement and market oyster production. Baylor and private productivity mostly maintained by regular addition of seed oysters and shell cultch. | History of location: Large tributary on the western shore of the Chesapeake Bay. History of significant natural spat settlement and market oyster production. Baylor and private productivity mostly maintained by regular addition of seed oyster and shell cultch planting. The risk to private oyster production is high because of disease. | History of location: Large tributary on the western shore of the Chesapeake Bay. History of infrequent natural spat settlement and significant market oyster production. Baylor and private productivity mostly maintained by regular addition of seed oysters and shell cultch. | History of location: Small tributary on the western shore of the Chesapeake Bay. History of modest (intensity) and consistent natural spat settlement. Baylor and private productivity mostly maintained by regular addition of shell cultch. |
| Current status: Low population levels on Baylor Grounds subject to consistent disease (MSX and Dermo) mortality. Cultch condition on Baylor Grounds is relatively poor. Two sentinel sites present. Regular collection of additional data. Data held by VIMS and VMRC. Private lease activity is low. Recent restoration activity (reefs and other) to date. Six reefs constructed in 2000 and 2001. Significant shell plants in 2000 and 2001 as part of the Oyster Heritage Program. The risk to private oyster production is high because of disease. | Current status: Low population levels on Baylor Grounds subject to consistent disease (MSX and Dermo) mortality. Cultch condition on Baylor Grounds is relatively good. Two sentinel sites present. Regular collection of additional data. Data held by VIMS and VMRC. Private lease activity is low. Recent restoration activity (reefs and other) to date. Four reefs constructed in 2000, 2001 and 2002. Significant shell plants in 2000, 2001 and 2002 as part of the Oyster Heritage Program. The risk to private oyster production is high because of disease. | Current status: Low population levels on Baylor Grounds subject to consistent disease (Dermo) and occasional freshet mortality. Cultch condition on Baylor Grounds is relatively poor. One sentinel site present. Regular collection of additional data. Data held by VIMS and VMRC. Private lease activity is low. Recent restoration activity (reefs and other) to date. Occasional seed oyster and shell cultch planting. The risk to private oyster production is high because of disease and freshets. | Current status: Low population levels on Baylor Grounds subject to consistent disease (MSX and Dermo) mortality. Cultch condition on Baylor Grounds is relatively poor. One sentinel site present. Regular collection of additional data. Data held by VIMS and VMRC. Private lease activity is low. Recent restoration activity (reefs and other) to date. Occasional shell cultch planting. The risk to private oyster production is high because of disease. |
Oyster Reef Restoration Targeting

Box 7. Mouth of the Rappahannock River

- Potential Restoration Area (762 acres)
- Depth < 2 Meters
- Depth > 2 Meters
- Condemnation Zones
- Completed Reef Restoration Sites
- Sentinel Monitoring Sites
- Public Ground Boundary
- Private Leases
Oyster Reef Restoration Targeting
Box 8. Rappahannock and Corrotoman Rivers

- Potential Restoration Area (579 acres)
- Depth < 2 Meters
- Depth > 2 Meters
- Condemnation Zones
- Completed Reef Restoration Sites
- Sentinel Monitoring Sites
- Public Ground Boundary
- Private Leases
Oyster Reef Restoration Targeting

Box 2: Rappahannock River: Punchbowl Pt. - Towles Pt.

- Potential Restoration Area (1076 acres)
- Depth < 2 Meters
- Depth > 2 Meters
- Condemnation Zones
- Completed Reef Restoration Sites
- Sentinel Monitoring Sites

Public Ground Boundary
Private Leases
Potential Restoration Area (1054 acres)
Depth < 2 Meters
Condemnation Zones
Completed Reef Restoration Sites
Sentinel Monitoring Sites
Public Ground Boundary
Private Leases

Oyster Reef Restoration Targeting
Oyster Reef Restoration Targeting


Potential Restoration Area (20 acres)
Depth < 2 Meters
Depth > 2 Meters
Condemnation Zones
Completed Reef Restoration Sites
Sentinel Monitoring Sites
Public Ground Boundary
Private Leases
Oyster Reef Restoration Targeting

Box 12. Mouth of the Piankatank River and Gwynn Island

Potential Restoration Area (1.99 acres)
Depth < 2 Meters
Depth > 2 Meters
Condemnation Zones
Completed Reef Restoration Sites
Sentinel Monitoring Sites
Public Ground Boundary
Private Leases
<table>
<thead>
<tr>
<th>Location</th>
<th>History of location</th>
<th>Current status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Piankatank River</td>
<td>Small tributary on the western shore of the Chesapeake Bay. Trap type estuary. History of high (intensity) and consistent natural spat settlement. Baylor and private productivity mostly maintained by regular addition of shell cultch.</td>
<td>Low population levels on Baylor Grounds subject to consistent disease (MSX and Dermo) mortality. Cultch condition on Baylor Grounds is relatively good. Three sentinel sites present. Regular collection of additional data. Data held by VIMS and VMRC. Private lease activity is low. Recent restoration activity (reefs and other) to date. Four reefs constructed in 1993 and 1995. Regular shell cultch planting and seed movement (export). The risk to private oyster production is high because of disease. Restoration potential: Limited because of consistent disease risk.</td>
</tr>
<tr>
<td>Chesapeake Bay</td>
<td>Western shore of the Chesapeake Bay. No public or private activity since the arrival of MSX.</td>
<td>Low population levels on Baylor Grounds subject to consistent disease (MSX and Dermo) mortality. Cultch condition on Baylor Grounds is unknown. No regular data collection. Recent restoration activity (reefs and other) to date. None. Restoration potential: Limited because of consistent disease risk.</td>
</tr>
<tr>
<td>East River</td>
<td>Northern tributary of the Mobjack Bay on the western shore of the Chesapeake Bay. History of significant spat settlement and market oyster production prior to MSX.</td>
<td>Low population levels on Baylor and private grounds subject to consistent disease (MSX and Dermo) mortality. Cultch condition on Baylor Grounds is poor. One sentinel site present. Occasional data collection from other sites. Data held by VIMS and VMRC. Recent restoration activity (reefs and other) to date. One reef built in 1999. Occasional shell planting activity. Restoration potential: Limited because of consistent disease risk.</td>
</tr>
<tr>
<td>North and Ware River</td>
<td>Tributaries of the Mobjack Bay on the western shore of the Chesapeake Bay. History of significant spat settlement and market oyster production prior to MSX.</td>
<td>Low population levels on Baylor and private grounds subject to consistent disease (MSX and Dermo) mortality. Cultch condition on Baylor Grounds is poor. Occasional data collection. Data held by VMRC. Recent restoration activity (reefs and other) to date. Two reefs constructed in 1999 and 2000. Occasional shell planting activity. Restoration potential: Limited because of consistent disease risk.</td>
</tr>
<tr>
<td>Severn River</td>
<td>Southern tributary of the Mobjack Bay on the western shore of the Chesapeake Bay. History of significant spat settlement and market oyster production prior to MSX.</td>
<td>Low population levels on Baylor and private grounds subject to consistent disease (MSX and Dermo) mortality. Cultch condition on Baylor Grounds is poor. One sentinel site present with occasional other data collection. Data held by VIMS and VMRC. Recent restoration activity (reefs and other) to date. Occasional shell planting activity. Restoration potential: Limited because of consistent disease risk.</td>
</tr>
<tr>
<td>York River to Gloucester Point</td>
<td>Large tributary on the western shore of the Chesapeake Bay. History of significant spat settlement and market oyster production prior to MSX.</td>
<td>Low population levels on Baylor and private grounds subject to consistent disease (MSX and Dermo) mortality. Cultch condition on Baylor Grounds is poor. One sentinel site present with occasional other data collection. Data held by VIMS and VMRC. Recent restoration activity (reefs and other) to date. None within map area. One reef built on private lease. Restoration potential: Limited because of consistent disease risk.</td>
</tr>
</tbody>
</table>
Oyster Reef Restoration Targeting

Box 13. Piankatank River
Oyster Reef Restoration Targeting

Box 14. Chesapeake Bay

Potential Restoration Area (24 acres)
Depth < 2 Meters
Depth > 2 Meters
Condemnation Zones
• Completed Reef Restoration Sites
• Sentinel Monitoring Sites
넷 Public Ground Boundary
넷 Private Leases
Oyster Reef Restoration Targeting

Box 15, East River

Potential Restoration Area (138 acres)

Depth < 2 Meters

Depth > 2 Meters

Condemnation Zones

▲ Completed Reef Restoration Sites

● Sentinel Monitoring Sites

Public Ground Boundary

Private Leases
Oyster Reef Restoration Targeting

Box 16. North and Ware Rivers

- Potential Restoration Area (27 acres)
- Depth < 2 Meters
- Depth > 2 Meters
- Condemnation Zones
- Completed Reef Restoration Sites
- Sentinel Monitoring Sites
- Public Ground Boundary
- Private Leases
Oyster Reef Restoration Targeting

Box 17. Severn River

- Potential Restoration Area (214 acres)
- Depth < 2 Meters
- Depth > 2 Meters
- Condemnation Zones
- Completed Reef Restoration Sites
- Sentinel Monitoring Sites
- Public Ground Boundary
- Private Leases
Oyster Reef Restoration Targeting

Box 18. York River - Gloucester Pt

Potential Restoration Area (28 acres)

Depth < 2 Meters

 Depth > 2 Meters

Condemnation Zones

Completed Reef Restoration Sites

Sentinel Monitoring Sites

Public Ground Boundary

Private Leases
Location: York River: Beaver Dam to Roosevelt Pond
History of location:
Large tributary on the western shore of the Chesapeake Bay. History of modest spat settlement and significant market oyster production prior to MSX.
Current status:
Low population levels on Baylor and private grounds subject to consistent disease (MSX and Dermo) mortality. Cultch condition on Baylor Grounds is poor. One sentinel site present with occasional other data collection. Data held by VIMS and VMRC.
Recent restoration activity (reefs and other) to date. One reef built in 1999.
Restoration potential:
Limited because of consistent disease risk.

Location: York River - Mattaponi River
History of location:
Large tributary on the western shore of the Chesapeake Bay. History of infrequent spat settlement and significant market oyster production (based on seed movement) prior to MSX.
Current status:
Low population levels on Baylor and private grounds subject to consistent disease (MSX and Dermo) mortality. Cultch condition on Baylor Grounds is poor. One sentinel site present with occasional other data collection. Data held by VIMS and VMRC.
Recent restoration activity (reefs and other) to date. None.
Restoration potential:
Limited because of consistent disease risk.

Location: Poquoson River
History of location:
Small tributary on the western shore of the Chesapeake Bay. History of regular spat settlement of modest intensity and significant market oyster production prior to MSX.
Current status:
Low population levels on Baylor and private grounds subject to consistent disease (MSX and Dermo) mortality. Cultch condition on Baylor Grounds is poor. Some occasional data collection. Data held by VMRC.
Recent restoration activity (reefs and other) to date. None.
Restoration potential:
Limited because of consistent disease risk.

Location: Back River
History of location:
Small tributary on the western shore of the Chesapeake Bay. History of regular spat settlement of modest intensity and significant market oyster production prior to MSX.
Current status:
Low population levels on Baylor and private grounds subject to consistent disease (MSX and Dermo) mortality. Cultch condition on Baylor Grounds is poor. Some occasional data collection. Data held by VMRC.
Recent restoration activity (reefs and other) to date. One reef built in 2001.
Restoration potential:
Limited because of consistent disease risk.

Location: Elizabeth and Lafayette Rivers
History of location:
Small tributaries of southern Hampton Roads. History of regular spat settlement of modest intensity and significant seed and market oyster production prior to MSX. This region has been condemned for market oyster production for many years.
Current status:
Low population levels on Baylor and private grounds subject to consistent disease (MSX and Dermo) mortality. Cultch condition on Baylor Grounds is poor. Some occasional data collection. Data held by VMRC.
Recent restoration activity (reefs and other) to date. Seven reefs built from 1998 through 2002.
Restoration potential:
Limited because of consistent disease risk, habitat degradation, and user conflicts. Potential source of fossil reef shells.

Location: James and Nansemond Rivers
History of location:
Major tributaries of the southern Chesapeake Bay. History of regular significant spat settlement of high intensity and significant seed and market oyster production prior to MSX.
Current status:
Low population levels on Baylor and private grounds subject to consistent disease (MSX and Dermo) mortality. Cultch condition on Baylor Grounds is poor. One sentinel site present. Regular data collection from other sites. Data held by VIMS and VMRC.
Recent restoration activity (reefs and other) to date. None.
Restoration potential:
Limited because of consistent disease risk. Potential source of fossil reef shells.
**Oyster Reef Restoration Targeting**

*Box 19. York River- Beaver Dam to Roosevelt Pond*

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**Potential Restoration Area** (365 acres)

- Depth < 2 Meters
- Depth > 2 Meters
- Condemnation Zones
- Completed Reef Restoration Sites
- Sentinel Monitoring Sites
- Public Ground Boundary
- Private Leases

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The map illustrates the targeted areas for potential reef restoration in the York River system, specifically focusing on the section from Beaver Dam to Roosevelt Pond. The map highlights areas that are suitable for restoration efforts, with a focus on depths of less than 2 meters, and areas that have already undergone reef restoration. Sentinal monitoring sites are also marked to track the success of the restoration efforts.
Oyster Reef Restoration Targeting
Box 20. York River-Mattaponi River

Potential Restoration Area (.4 acres)
Depth < 2 Meters
Depth > 2 Meters
Condemnation Zones
Completed Reef Restoration Sites
Sentinel Monitoring Sites
Public Ground Boundary
Private Leases
Oyster Reef Restoration Targeting
Box 21. Poquoson River

Potential Restoration Area (76 acres)
Depth < 2 Meters
Depth > 2 Meters
Condemnation Zones
Completed Reef Restoration Sites
Sentinel Monitoring Sites
Public Ground Boundary
Private Leases
Oyster Reef Restoration Targeting

Box 22. Back River

- Potential Restoration Area (5 acres)
- Depth < 2 Meters
- Depth > 2 Meters
- Condemnation Zones
- Completed Reef Restoration Sites
- Sentinel Monitoring Sites
- Public Ground Boundary
- Private Leases
Reef Restoration Targeting

Potential Restoration Area (8 acres)

Depth < 2 Meters

Depth > 2 Meters

Condemnation Zones

Completed Reef Restoration Sites

Sentinel Monitoring Sites

Public Ground Boundary

Private Leases

Oyster Reef Restoration Targeting

Box 23, Elizabeth and Lafayette Rivers
Oyster Reef Restoration Targeting
Box 24. James and Nansemond Rivers

- Potential Restoration Area (184 acres)
- Depth < 2 Meters
- Depth > 2 Meters
- Condemnation Zones
- Completed Reef Restoration Sites
- Sentinel Monitoring Sites
- Public Ground Boundary
- Private Leases
Location: James River
History of location:
Major tributary of the southern Chesapeake Bay. History of regular significant spat settlement of high intensity and significant seed and market oyster production prior to MSX.
Current status:
Low population levels on Baylor and private grounds subject to consistent disease (MSX and Dermo) mortality. Cultch condition on Baylor Grounds is variable within region from poor to good. Two sentinel sites present. Regular data collection from other sites. Data held by VIMS and VMRC.
Recent restoration activity (reefs and other) to date. One reef built in 1993.
Restoration potential:
Limited because of consistent disease risk.

Location: James River – Burwell’s Bay
History of location:
Major tributary of the southern Chesapeake Bay. History of regular significant spat settlement of high intensity and significant seed production until mid 1980’s.
Current status:
Modest population levels on Baylor and private grounds, subject to consistent disease (MSX and Dermo) mortality and occasional freshet mortality. Cultch condition on Baylor Grounds is variable within region from poor to good. Six sentinel sites present. Regular data collection from other sites. Data held by VIMS and VMRC.
Recent restoration activity (reefs and other) to date. One reef built in 1995. Occasional shell planting and seed movement (export).
Restoration potential:
Limited because of consistent disease risk, occasional freshets and slow growth of resident oysters. Seed oyster survival from this area is low limiting its use as a seed production area to support restoration and private industry in other sites.

Location: Lynnhaven Rivers and Broad Bay
History of location:
Minor tributaries of the southern Chesapeake Bay. History of regular spat settlement of modest intensity and significant private market oyster production prior to MSX. No Baylor Grounds of significance.
Current status:
Low population levels on private grounds subject to consistent disease (MSX and Dermo) mortality and significant sedimentation on leases. Many leases are inactive. Cultch condition is poor. Regular data collection from reef sites. Data held by VMRC.
Restoration potential:
Limited by consistent disease risk, sedimentation, cultch availability, and user conflicts.

Location: Nassawadox and Occohannock Creek
History of location:
Minor tributaries of the eastern shore of the Chesapeake Bay. History of regular spat settlement of market oyster production prior to MSX.
Current status:
Low population levels on Baylor and private grounds and subject to consistent disease (MSX and Dermo) mortality, significant sedimentation on leases. Many leases are inactive. Cultch condition is poor. No regular data collection.
Recent restoration activity (reefs and other) to date. None.
Restoration potential:
Limited by consistent disease risk, sedimentation, and cultch availability.

Location: Tangier Island and Sound
History of location:
Major embayment on the eastern shore of the Chesapeake Bay. History of regular spat settlement of market oyster production prior to 1980’s.
Current status:
Low population levels on Baylor Grounds subject to consistent disease (MSX and Dermo) mortality. Cultch condition is poor. One sentinel site present. Regular data collection. Data held by VIMS and VMRC.
Recent restoration activity (reefs and other) to date. Five reefs and significant shell plants built in 2002. Occasional seed and shell plants in prior years.
Restoration potential:
Limited by consistent disease risk and cultch availability.

Location: Pocomoke Sound
History of location:
Major embayment on the eastern shore of the Chesapeake Bay. History of regular spat settlement of market oyster production prior to 1980’s.
Current status:
Low population levels on Baylor Grounds, subject to consistent disease (MSX and Dermo) mortality. Cultch condition is poor. One sentinel site present. Regular data collection. Data held by VIMS and VMRC.
Recent restoration activity (reefs and other) to date. Three reefs and significant shell plants built in Pocomoke Sound in 2002. One reef built in Pungoteague Creek in 1997. Occasional seed and shell plants in prior years.
Restoration potential:
Limited by consistent disease risk and cultch availability.
Oyster Reef Restoration Targeting

Box 25. James River

Potential Restoration Area (2218 acres)
Depth < 2 Meters
Depth > 2 Meters
Condemnation Zones
Completed Reef Restoration Sites
Sentinel Monitoring Sites
Public Ground Boundary
Private Leases
Oyster Reef Restoration Targeting
Box 26. James River - Burwells bay

- Potential Restoration Area (1921 acres)
- Depth < 2 Meters
- Depth > 2 Meters
- Condemnation Zones
- Completed Reef Restoration Sites
- Sentinel Monitoring Sites
- Public Ground Boundary
- Private Leases
Oyster Reef Restoration Targeting
Box 27. Lynnhaven Rivers and Broad Bay

- Potential Restoration Area (0 acres)
- Depth < 2 Meters
- Depth > 2 Meters
- Condemnation Zones
- Completed Reef Restoration Sites
- Sentinel Monitoring Sites
- Public Ground Boundary
- Private Leases
Oyster Reef Restoration Targeting

Box 28. Nassawadox and Occohannock Creek

Potential Restoration Area (8 acres)
Depth < 2 Meters
Depth > 2 Meters
Condemnation Zones
Completed Reef Restoration Sites
Sentinel Monitoring Sites
Public Ground Boundary
Private Leases
Oyster Reef Restoration Targeting
Box 29. Tangier Island

Potential Restoration Area (523 acres)
Depth < 2 Meters
Depth > 2 Meters
Condemnation Zones
Completed Reef Restoration Sites
Sentinel Monitoring Sites
Public Ground Boundary
Private Leases
Oyster Reef Restoration Targeting
Box 30, Pocomoke Sound

- Potential Restoration Area (1439 acres)
- Depth < 2 Meters
- Depth > 2 Meters
- Condemnation Zones
- Completed Reef Restoration Sites
- Sentinel Monitoring Sites
- Public Ground Boundary
- Private Leases