

Introduction to VOSARA

To use VOSARA, go to <https://cmap22.vims.edu/VOSARA/>

Try it out on different reefs. With some practice, it becomes self-explanatory.

Example results below-

Harvest Table

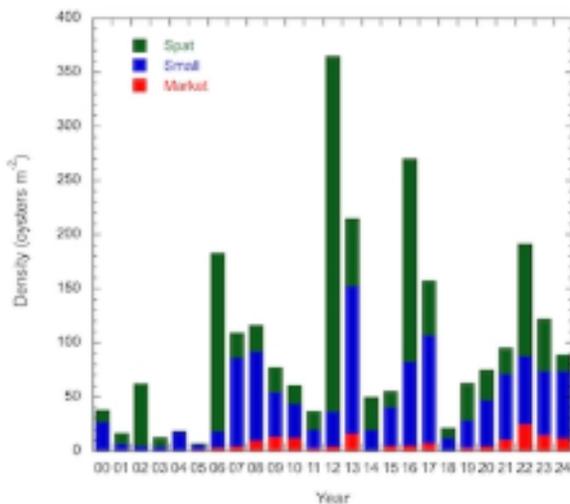
Harvest (C = Closed for all oysters; S (HS) = open for seed harvest with hand scrape; O (HT) open for market harvest with hand tongs

1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
na	na	C	C	C	S (HS)	C	C	C	C

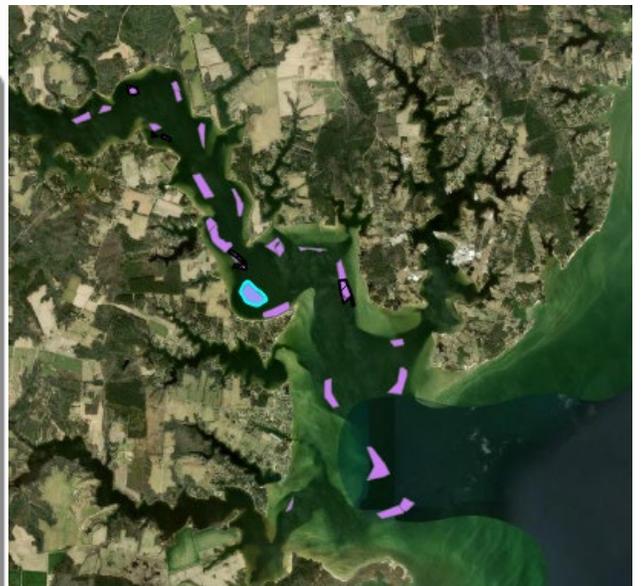
2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
C	C	C	C	S (HS)	S (HS)	S (HS)	S (HS)	C	S (HS)

2018	2019	2020	2021	2022	2023	2024
S (HS)	C	S (HS)	C	C	C	O (HT)

Graphs for Shell Bar



Oyster Graph



Observations- This reef (Shell Bar 17.70 acres in the Great/Little Wicomico R), was closed for harvesting market-size oysters from 2000 through 2023. It opened for market-size oysters in 2024. Those years with “S” were open for seed (spat) harvesting. The density of spat increased dramatically in 2005, followed by an increase in small oysters (<3in.) in 2006. Regardless of the density of spat and small oysters, market size oysters are few. Therefore, in comparison, most oysters died before reaching the market size of about 3 to 4 inches.

## **This is a quote from Jim Wesson, VMRC Retired, about the Virginia Public Oyster Reefs-**

*I think 20% reaching market size for most of the bay would be quite optimistic. It depends on what size you start with. If you start with a one inch oyster, possibly you would see 20% survival, but starting from spat it would be much less than 10%. Dermo is still around, and MSX shows up in some higher salinity areas. Low dissolved oxygen is the greatest threat right now, I think. In the rivers, 10-12 ft in depth is the max for surviving, often less than that.*

The **Virginia Oyster Stock Assessment and Replenishment Archive (VOSARA)** data web site is designed to provide graphic summaries of the status of oyster stocks in the Virginia subestuaries of the Chesapeake Bay. Data originates in annual stock assessments performed by a collaboration between the Virginia Institute of Marine Science (VIMS) and the Virginia Marine Resources Commission (VMRC). Summaries provide data by year and historical reef boundaries within each of the described subestuaries. Oyster populations are described in units of density, oysters per unit area, for each of three size classes: spat are young of the year ( $\leq 35$  mm length), small are submarket size ( $> 35$  mm and  $< 76$  mm length), and market size ( $\geq 76$  mm length) oysters.

For questions or comments about anything on this site please contact: Melissa Southworth (melsouth@vims.edu).

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## **Methods**

Oysters are collected during the fall (late September through December) from natural oyster reefs (public Baylor grounds) in the Virginia portion of the Chesapeake Bay. A quantitative sampling program is used at all reefs using a stratified random grid with documented oyster reefs (bars) forming the strata. In most cases, these reefs adhere to the locations and names used by Lieutenant J.B. Baylor, U.S. Coast and Geodetic Survey (Baylor, 1896) and subsequently resurveyed by Haven et al. (1981). Oysters are collected from the 43-ft long VMRC research vessel J.B. Baylor with a hydraulic patent tong. The open dimensions of the tongs are such that it samples one square meter of bottom. Upon retrieval of each sample (patent tong grab), oysters are counted and categorized as young of the year (hereafter spat;  $\leq 35$  mm), small ( $\geq 36$  and  $\leq 75$  mm) or market ( $\geq 76$  mm). In general this categorization is accurate, but the error associated with it may be exacerbated in areas where oysters regularly exhibit slow growth or in years of low salinity when the oysters may temporarily exhibit slow growth. Beginning in 2000 in the Rappahannock River, in 2002 for most other reefs that were sampled at that time and in 2003 for all reefs sampled, the shell material that was collected in each tong sample was categorized as either brown shell (shell that lies above the sediment water interface, including live oysters and boxes in all size-categories) or black shell (shell exhumed during the collection process) and the volume (L) in each category was recorded. The shell material measure (brown and black shell volumes) includes gravel or any other appropriate hard substrate that may be used for repletion/restoration on the various reefs. The procedures of Bros and Cowell (1987) were used to assure adequacy of sampling within each strata (reef). As of the most recent survey (fall 2024) there were a total of 220 individual reefs sampled as part of the survey, 197 of which are a part of VOSARA (reefs are added to VOSARA once five years of data have been collected).

Mean oyster density (number m<sup>-2</sup>) was calculated for each oyster reef by averaging the number of oysters in each category collected from all samples on a reef within a year. Mean shell volume was calculated for each oyster reef by averaging the volume of shell in each category collected from all samples on a reef within a year. For comparison purposes recruitment (young of the year or spat settlement) is categorized as: less than 50 spat m<sup>-2</sup>, low; 50 – 100 spat m<sup>-2</sup>, moderate; >100 spat m<sup>-2</sup>, good; > 400 spat m<sup>-2</sup>, very good. For each individual reef, years when particular reefs have received either a shell plant (SH: plant of clean shell on the bottom in the late spring or early summer), gravel plant (GR: plant of gravel of varying sizes on the bottom in the late spring or early summer), seed plant (SD: transplant of seed from another reef) or spat on shell plant (SOS) have been noted on the shell plots. Years when a particular reef had seed removed (SDR) as part of a project not associated with regular seed harvest by the industry is also noted on the shell plots. Seed is primarily small oysters and spat transplanted from another reef in the spring of a particular year, but may also include some larger oysters and blank shells. Spat on shell (SOS) is spat produced by allowing hatchery produced larvae to set on clean shell in a controlled tank environment and is typically planted in the summer.

Harvest information is included for each reef and was obtained from the Virginia Marine Resources Commission (VMRC) published regulations. The information is meant to inform the user on whether or not an area was opened or closed in a particular year and if opened what was allowed to be taken (seed or market oysters) as well as the type of gear used. The fact that an area was open for harvest in any particular year does not necessarily mean that oysters were harvested from that area, it simply means they legally could have been. The harvest year on public Baylor grounds in Virginia typically extends from October through April or May, so for harvest year 2025, the harvest extends from October of 2024 through May of 2025, but actual season lengths on different oyster reefs vary. The survey often overlaps with the harvest season in some years/reefs, so in any given year, data for a particular reef may have been collected pre-harvest, during the harvest or post-harvest. For the most recent regulations or for more information on individual reefs visit: [https://mrc.virginia.gov/regulations/MRC\\_Scanned\\_Regs/Oyster/FR720\\_08-27-24.pdf](https://mrc.virginia.gov/regulations/MRC_Scanned_Regs/Oyster/FR720_08-27-24.pdf) or [https://webapps.mrc.virginia.gov/public/maps/chesapeakebay\\_map.php](https://webapps.mrc.virginia.gov/public/maps/chesapeakebay_map.php). Contact VMRC for additional information regarding past regulations.

50 km

20 mi

Earthstar Geographics

## Help

- Data is currently available for oyster reefs located in Great Wicomico River, James River, Lynnhaven Bay, Piankatank River, Pocomoke and Tangier Sounds, Rappahannock River, York River, and the main stem of the Chesapeake Bay.
- Use the + and - buttons (left side of map) to zoom in and zoom out. Note: The zoom in and zoom out buttons are not available on a mobile device.
- To return to the default map extent, click the home icon on the left side of the map.
- Use the pull-down menu to view river choices; select river; river outline will highlight and map will zoom to river location. A mouse click anywhere on the map will remove the highlight.
- In the upper right corner of the map, click the layer icon to open the layer list. Map layers can be checked on or off. River Basins will display at a scale of 1:750,000 and smaller. Oyster Reefs display at a scale of 1:750,000 and larger. Reef labels will display at 1:80,000 and larger. Reef labels show the VMRC name with the VIMS name in parentheses.
- Legends for each layer are shown below each layer's name within the layer list. To hide or show a legend, click the icon to the right of the layer name.

- Below the layer icon is the information icon . Click to show information about this viewer, methods used to collect the data, help on how to navigate the viewer, and summaries for the Chesapeake Bay Main Stem and each of the major tributaries containing oyster reef data.
- On mobile devices, tap the map to dismiss/hide the information panel and the layer list panel.
- Zoom into a location to show the oyster reefs. Click on an oyster reef containing data (those reefs without hatching) and an infowindow will pop-up in the lower left side of the map. The popup displays the reef name and acreage a brief summary about the reef, a harvest table, and graphs (oyster and shell). On mobile devices, the popup displays at the bottom of the screen. If the popup contents are not visible, tap the popup header to expand the contents.

## Chesapeake Bay Main Stem

### CHESAPEAKE BAY MAIN STEM

There are seven public oyster reefs monitored in the Chesapeake Bay mainstem (approximately 100 acres) and one reef (Milford Haven; approximately 1 acre) that is located in the area known as “Hole in the Wall” (an area with Gwynn’s Island to the north and Mathew’s County to the south). Six of the seven reefs in the mainstem of the bay are part of the Deep Rock Management Area located east of Gwynn’s Island. The remaining mainstem Chesapeake Bay reef (Blackberry Hang) and Milford Haven are both managed separately. Blackberry Hang is located just north of the mouth of the Great Wicomico River. There are between eight and twenty-three years of data included, depending on when monitoring began for a particular reef. Recruitment at all of these sites is typically very low, with only 28 out of the possible 129 year/site combinations having moderate ( $>50$  spat  $m^{-2}$ ) or good ( $>100$  spat  $m^{-2}$ ) recruitment. Since 2003, in the Deep Rock Management Area, 2015, 2019, 2021, 2023 and 2024 were notable year classes, with 2024 being the only year with an overall average across the six reefs with greater than 100 spat  $m^{-2}$ . On Blackberry Hang, 2015, 2016, 2019, 2022 and 2023 were notable and 2015 and 2022 were notable on Milford Haven. In general recruitment on all of the reefs in the mainstem of the bay has been higher since 2015. From 2003 to 2014, average recruitment on the Deep Rock Management Area reefs and Blackberry Hang ranged from 1 to 14 and from less than 1 to 21 spat  $m^{-2}$ , respectively. In contrast, average recruitment from 2015 to 2024 in the two areas (Deep Rock Management Area and Blackberry Hang), ranged from 10 to 100 and from 15 to 146 spat  $m^{-2}$ , respectively .

In recent years, the density of market oysters on all of these reefs has tended to be higher than in earlier years. From 2003 to 2008, the overall average density of market oysters on the reefs in the Deep Rock Management Area was less than 1  $m^{-2}$ , whereas from 2009 to 2024, the average density of market oysters ranged from 2 to 29  $m^{-2}$  and has remained above 5  $m^{-2}$  since 2012 and above 10  $m^{-2}$  since 2020. Although it should be noted that the density of market sized oysters has decreased some over the past two years (from 29  $m^{-2}$  in 2022 down to 20  $m^{-2}$  in 2024). From 2004 to 2016 market oyster density on Blackberry Hang was never more than 5  $m^{-2}$ , but from 2017 to 2024, market oyster density ranged from 11 to 40  $m^{-2}$ , with a relatively large increase in 2024, two years after the largest recruitment event on the reef. Similar to the increase in market oysters on all of these reefs in recent years, there has also been an increase in brown shell volume. Average brown shell volume across the six reefs in the Deep Rock Management Area has remained above 10 liters  $m^{-2}$  since 2020 and brown shell volume on Blackberry hang has remained above 10 liters  $m^{-2}$  since 2017.

Great Wicomico River  
James River  
Lynnhaven Bay  
Piankatank River  
Rappahannock River  
Tangier & Pocomoke Sounds  
York River & Mobjack Bay

### Suggested Literature

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