

Smithsonian Associates

ENTERTAINING. INFORMATIVE. ECLECTIC. INSIGHTFUL.

Before The Facts & Figures - A few thoughts

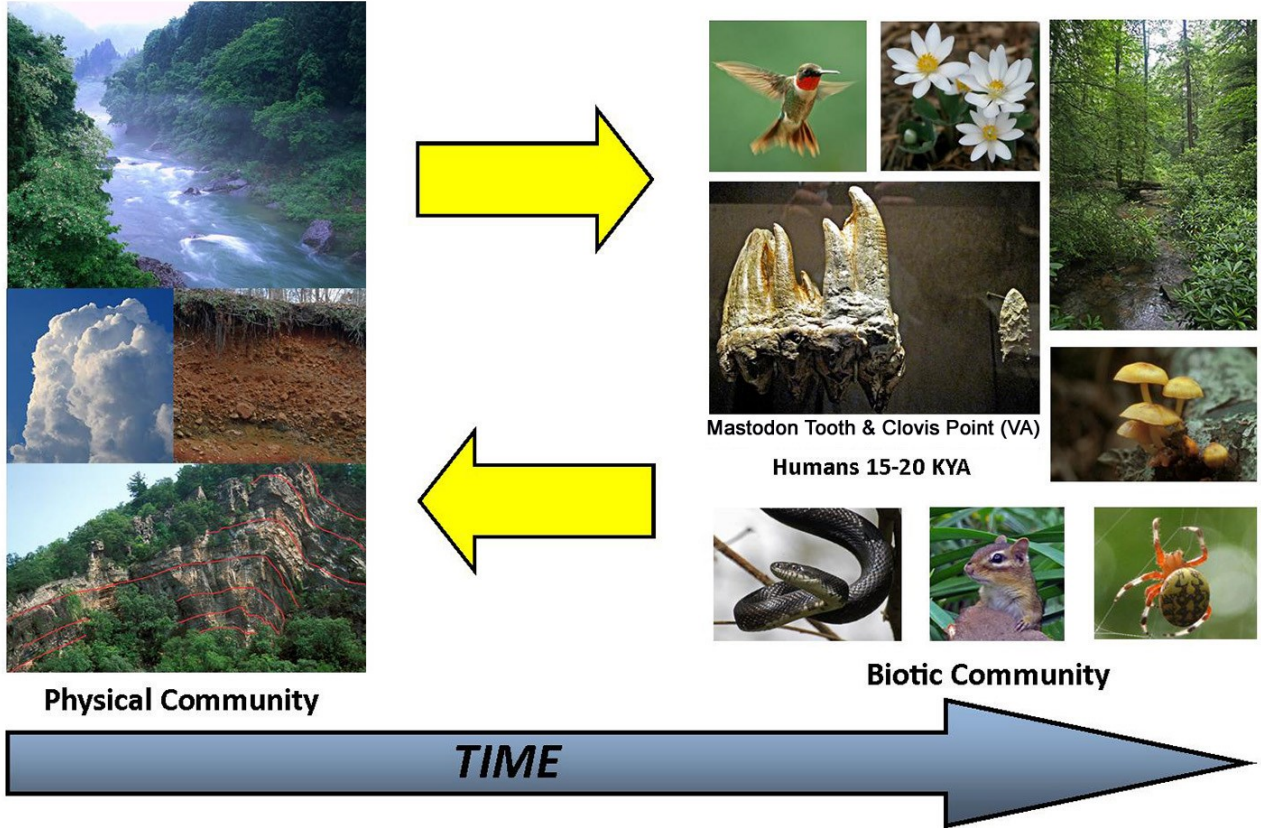
On today's tour, Chris Cerino and I will interpret Bay ecology, geology, natural history, cultural history, architecture and ship-building in ways we hope you find informative and engaging. But that said, consider journeying past the facts and figures, letting your intellectual self take a rest, and using your senses and emotional self to capture very personal and thus, more lasting impressions of Chester-town and the Sultana than you might take away in digital images or brochures. Take a moment to read the following quote and consider taking a 'deeper dive' into your experiences on the tour today.

“There is a great deal of talk these days about saving the environment. We must, for the environment sustains our bodies. But as humans we also require support for our spirits, and this is what certain kinds of places provide. The catalyst that converts any physical location -any environment if you will -into a place, is the process of experiencing deeply. **A place is a piece of the whole environment that has been claimed by feelings.** Viewed simply as a life-support system, the earth is an environment. Viewed as a resource that sustains our humanity, the earth is a collection of places. We never speak, for example, of an environment we have known; it is always places we have known -and recall. We are homesick for places, we are reminded of places, it is the sounds and smells and sights of places which haunt us and against which we often measure our present.”

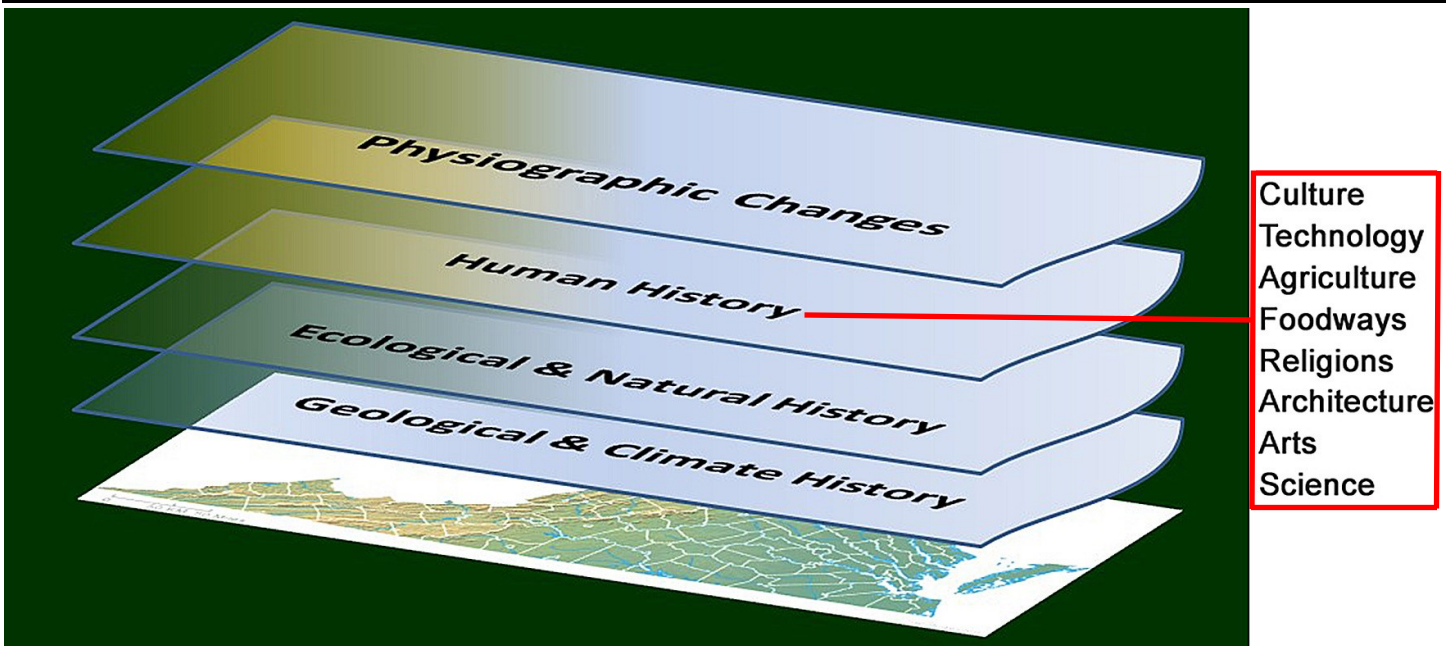
Alan Gussow

From '*A Sense of Place*' (1970)

Environmental History

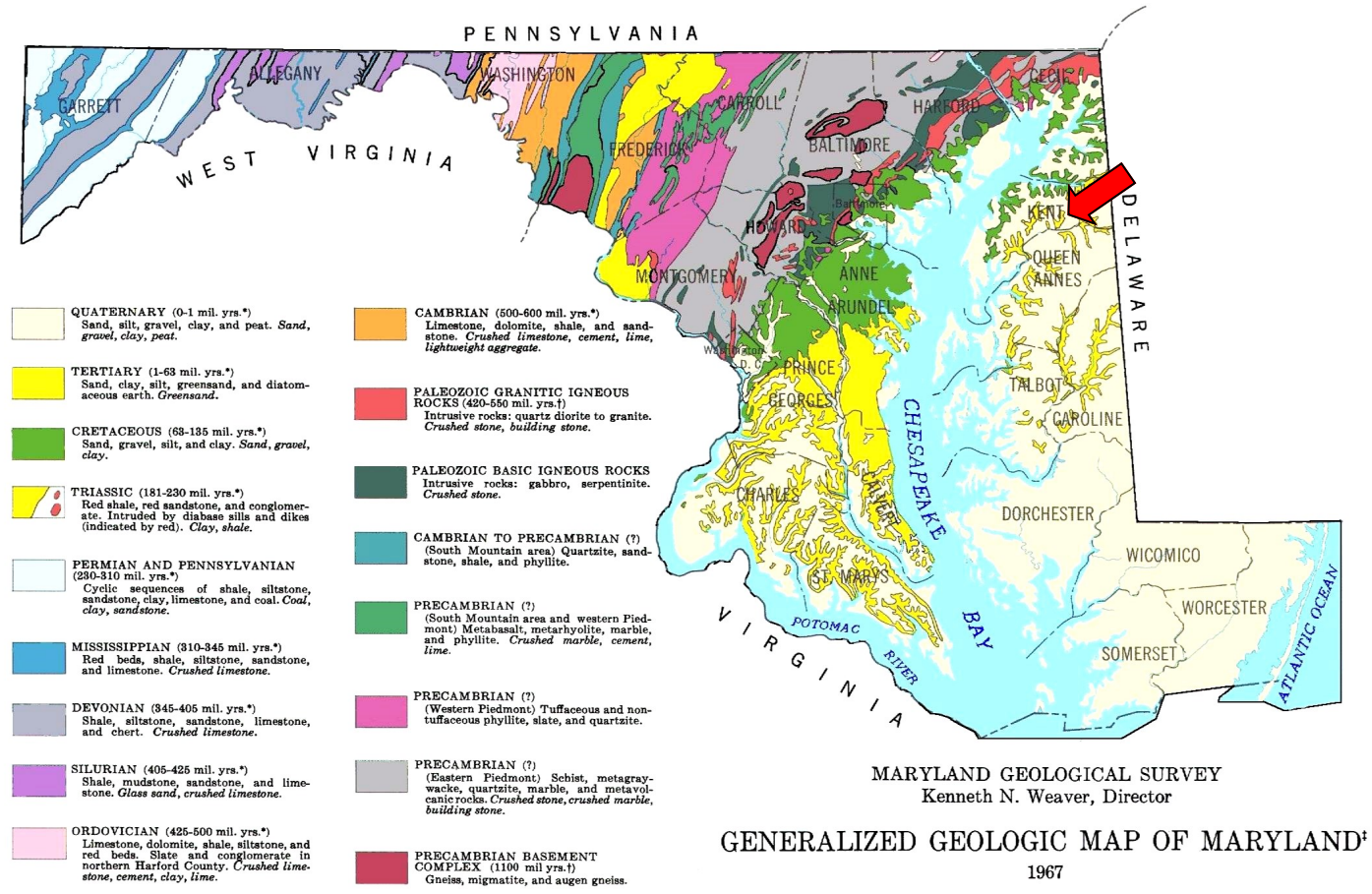
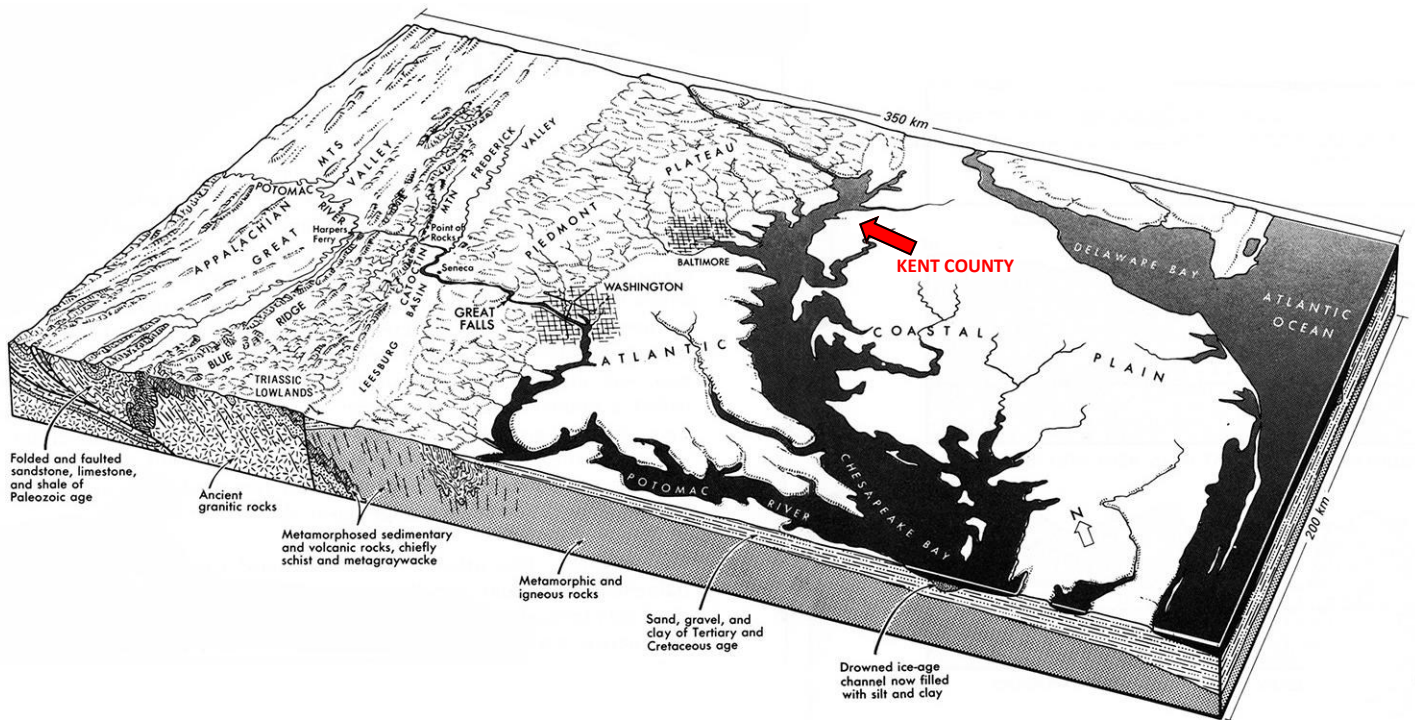


In any given region of Planet Earth, the **Physical Community** is constantly interacting with and affecting the regional **Biotic Community** and vice versa. These interactions began on Earth an estimated 3.8 Billion Years ago and continue today with the tectonic plates still in movement, changes in climatic conditions, discoveries of new plants and animals while others disappear into extinction, and of course, changes to the Earth's surface as our populations swell. An apt summary of Human history could be 'The Land Changes Us and We Change The Land'. Thus, the history of any place is comprised of many different layers with human history being only one of many layers (see graphic below).



Amazing Geological History

The landscape we will traverse today is part of the Coastal Plain physiographic province which consists of gravel, sand, and clay all of which are eroded remnants of an ancient (320 MYA) range of mountains that were over 15,000 feet tall. The Coastal Plain is very flat and the highest spots near Chestertown are only 75 feet above sea level. With changing sea levels over time ([see page 6 for the most recent](#)) the area of the modern day Coastal Plain has been under the sea many times and there are layers of marine sediments as reminders of those incursions, the Calvert Cliffs (25 MYA old) being one place they can be easily seen.

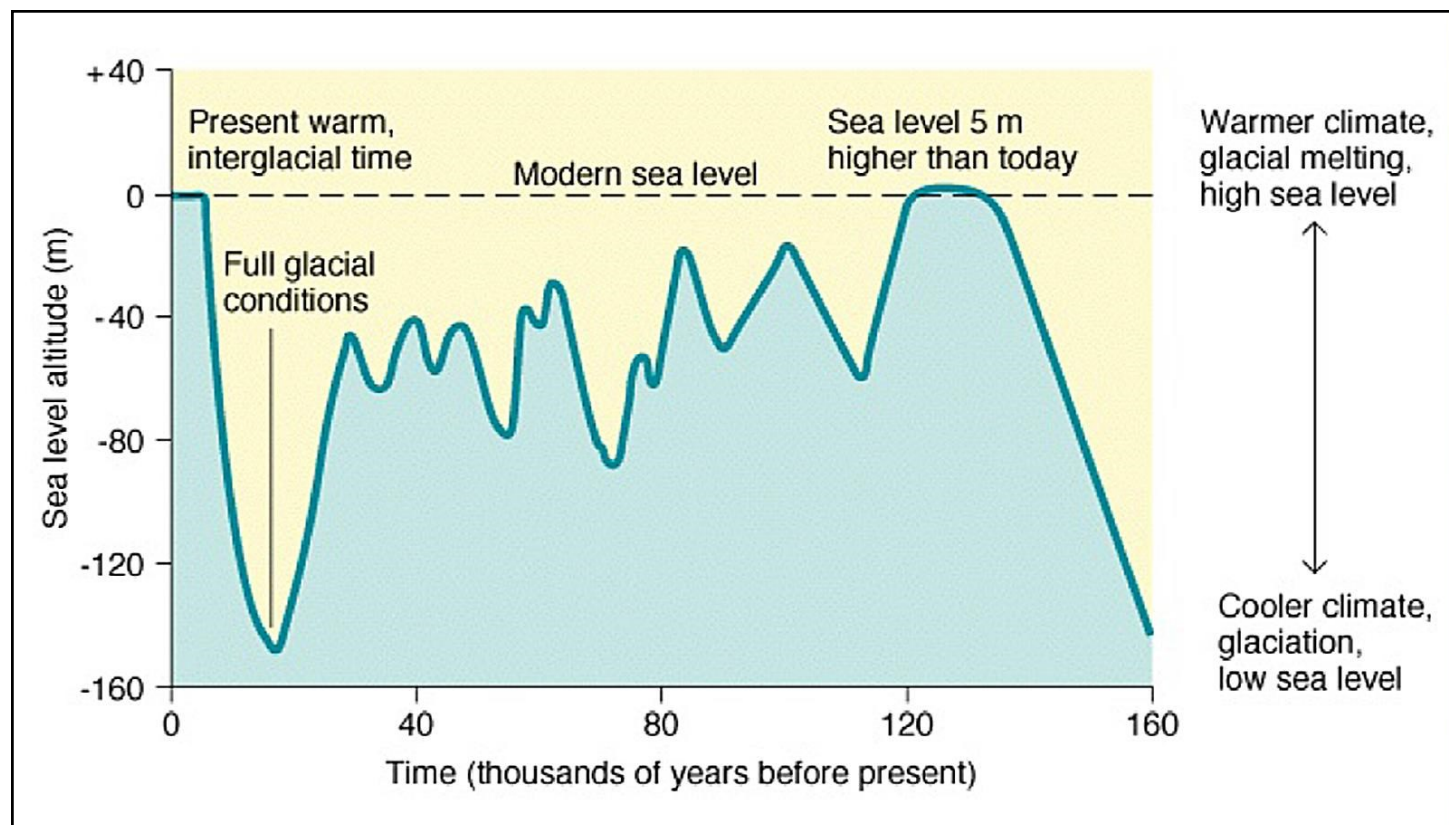


Climate History

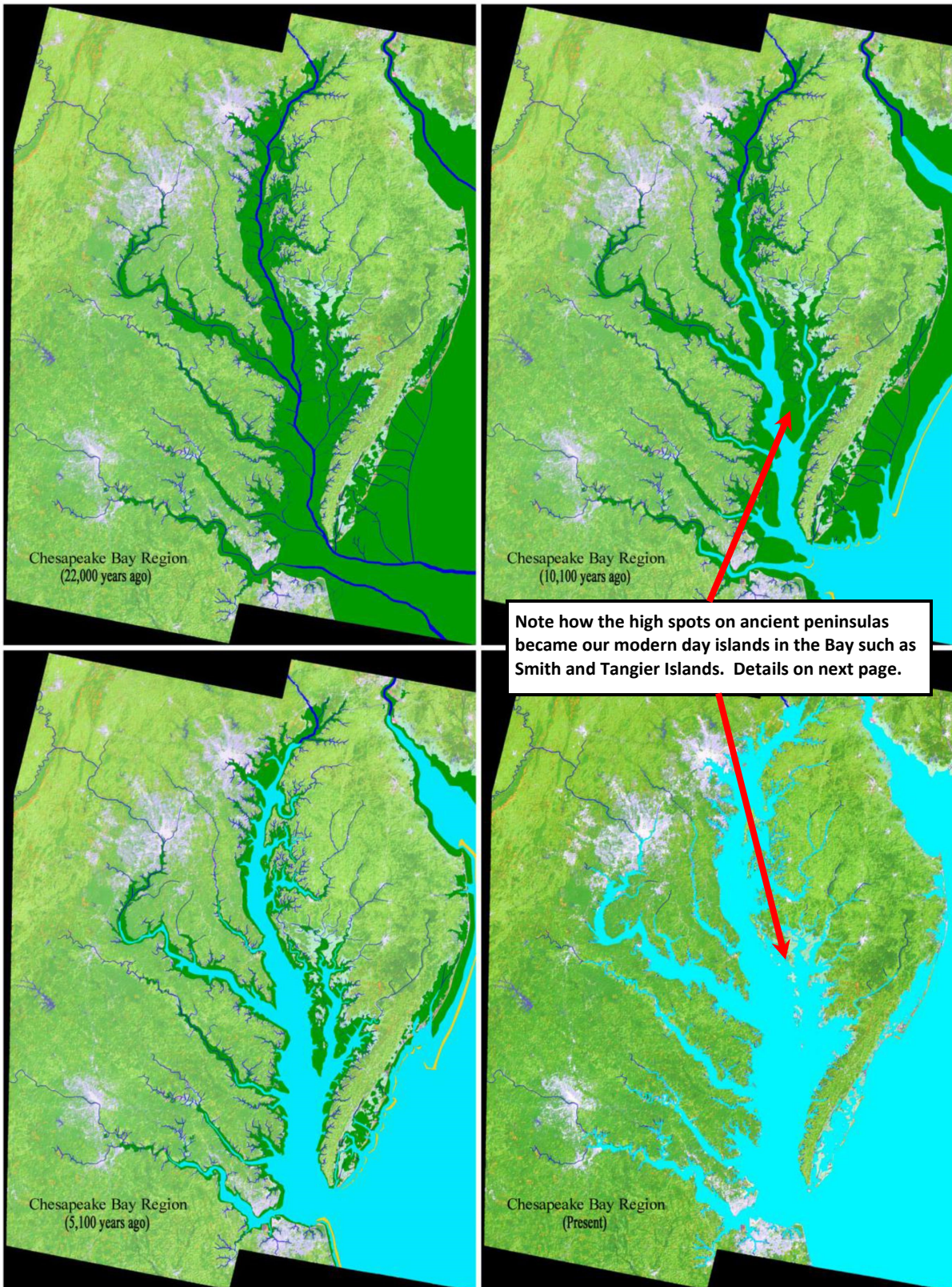


At the peak of the last Ice Age (12 KYA) the sea level was 350 feet lower, the ocean started 40 miles offshore from our present shoreline, and the climate/ecology was much like the Canadian tundra (cold, dry, grassland). The Chesapeake Bay we know did not exist but the ancestral rivers that feed it today, did. (see Pages 7 & 8) The graphic at left shows the Ice Sheet at its maximum which came to the middle of modern day Pennsylvania during the most recent dip in global temperatures shown in the graph below. [For comparison, the graph on Page 10 shows 500 Million years of climate data.] If the Earth's mean temperatures continue to warm as it appears they will, sea levels will rise as ice melts and warmer seawater expands: two important questions are how quickly and by what amount.

Sea Level Variations Over The Last 160,000 Years

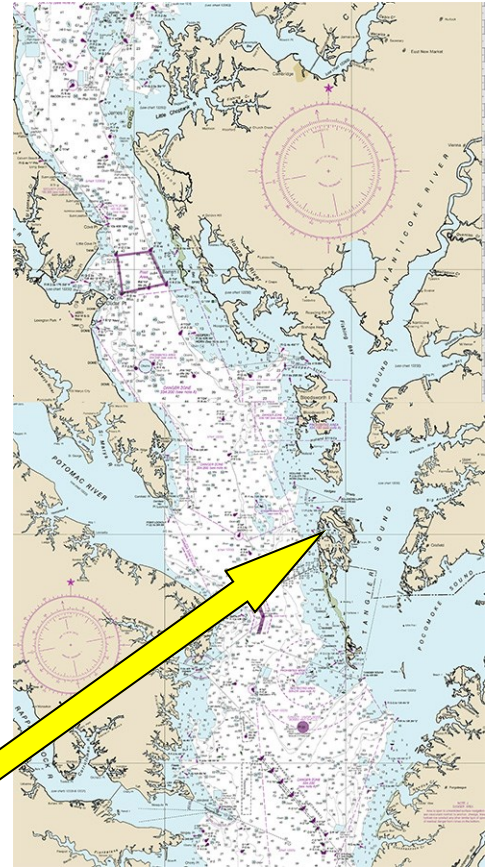


Climate History & The Formation of the Bay



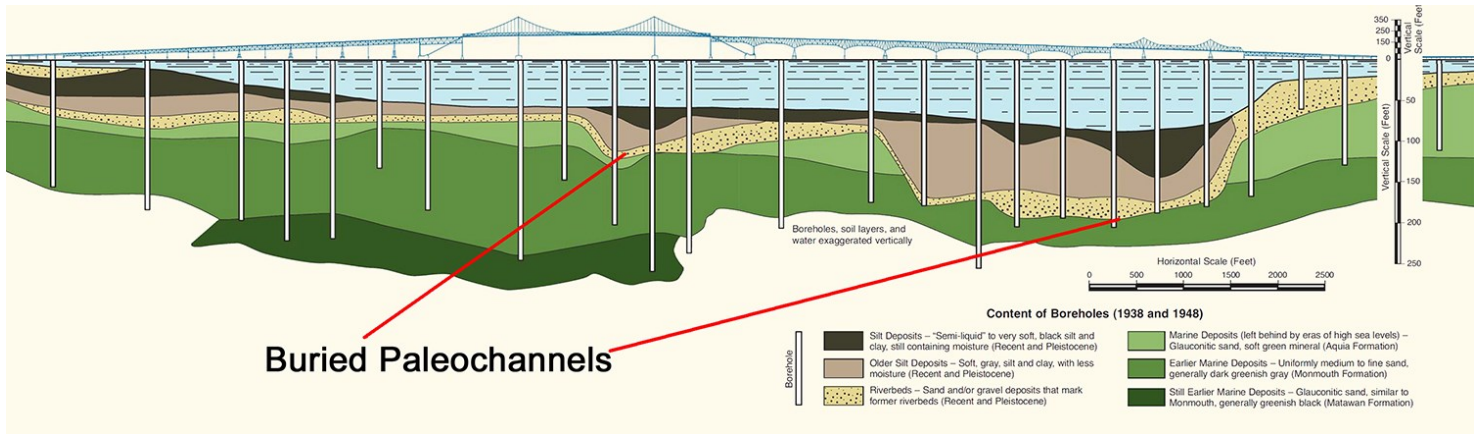
From *'Sea Level Rise in Coastal Virginia: Understanding Impacts to Archaeological Resources'* by Lowery, O'Neal, Cariso & Montini, VA Department of Historic Resources, 2012

Climate History: Buried Rivers/Lost Villages



**Ancient Peninsula to
Modern Day Island Chain**

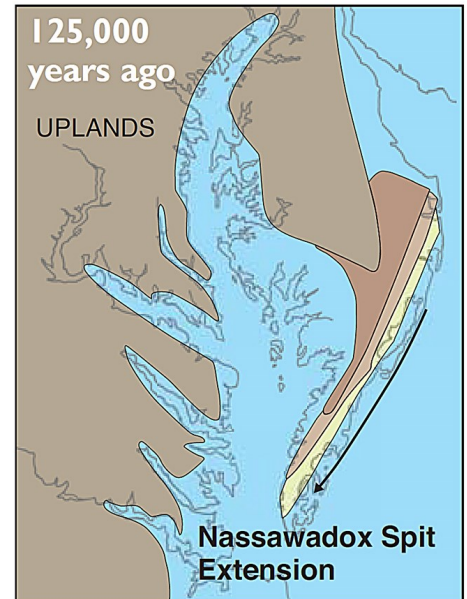
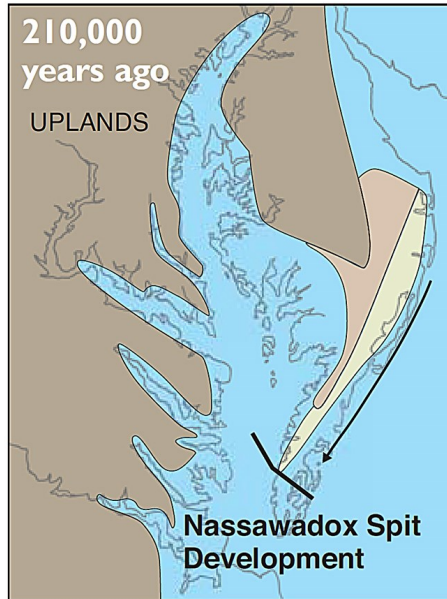
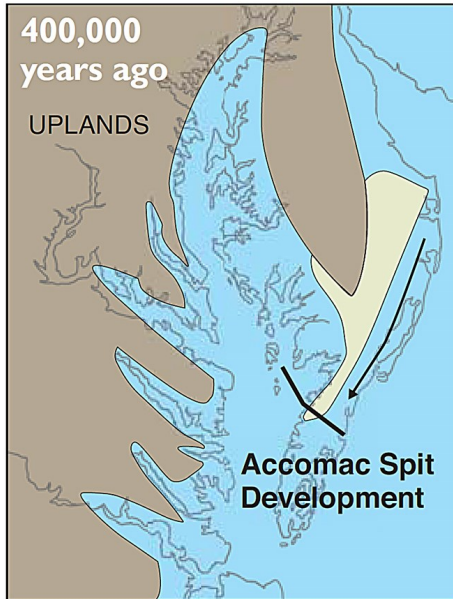
10,000 years as the Chesapeake Bay was just starting to fill up with rising sea levels, there was a long peninsula/ridge in the lower portion of the Bay with the ancient Susquehanna River flowing down its west side and an ancient river flowing down its east side as shown in the **conceptual map on the left**. As Bay sea levels continued to rise, only the high points on this peninsula were left above water and gave rise to the modern string of islands in the lower Bay (**NOAA Map on right**) that include Smith and Tangier Islands. Situated as it was between resource-rich water courses which provided the fish, shellfish, marsh plants, and waterfowl for their diets and offering hardwood forests and adequate spring water, this point of land hosted a number of Native American villages the only remnants of which are the lovely stone points found both on land and underwater in this area today. The photo is of Late Woodland points displayed in the Tangier Island Museum.



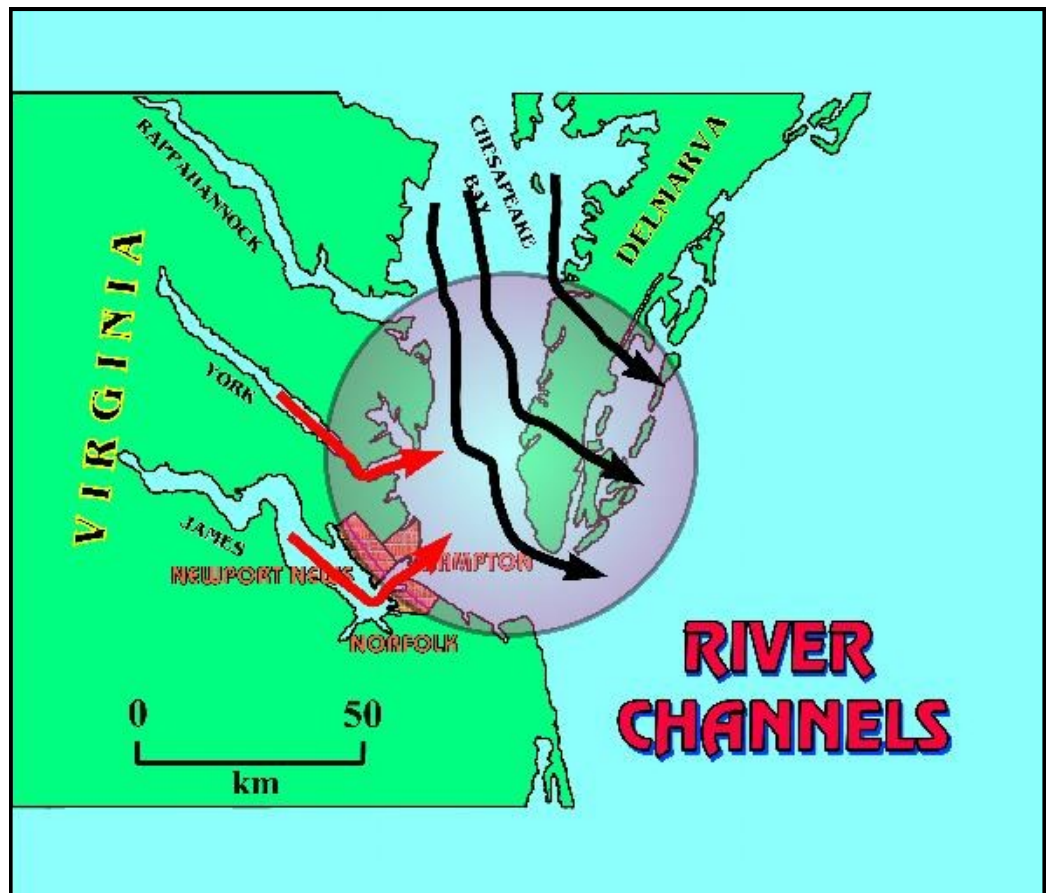
The above illustration depicts the sedimentary layers forming the bottom of the Bay beneath the Bay Bridge. **Note:** The thickness of the layers is exaggerated with respect to the bridge itself to more clearly show the layers. You can clearly see the remnants of two ancient channels with the deepest lying beneath the bridge’s eastern span. The yellow layer with stippling reflects gravels left over from ancient river bottoms.

Shifting Sands & Crater Help Shape the Bay

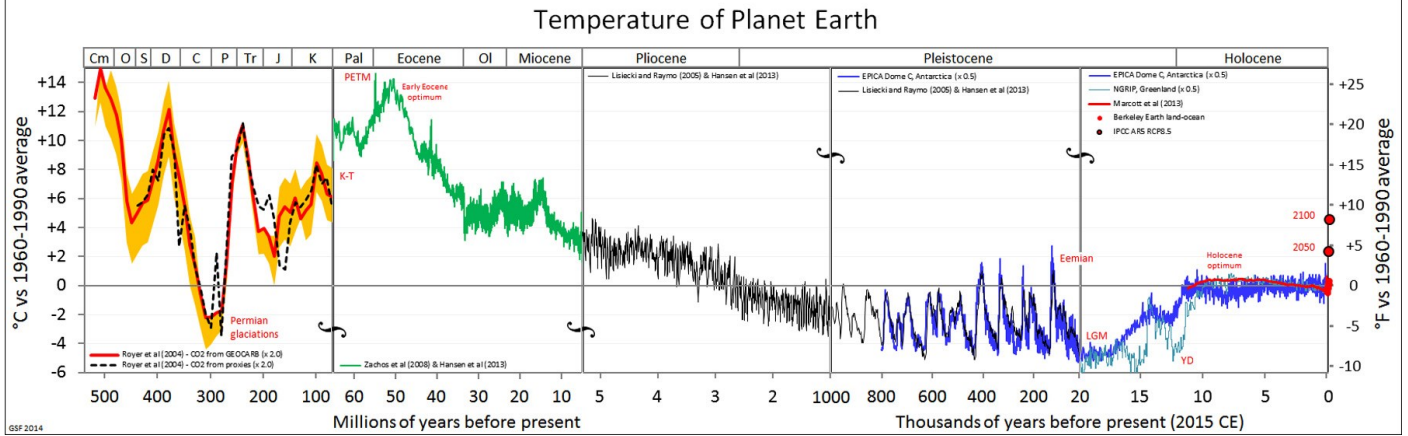
Evolution of the Delmarva Peninsula



The Bay is essentially a flooded valley formed by ancestral rivers (see [page 7](#)). About 35 Million years ago an extra-terrestrial object over 3 miles in size slammed into the shallow ocean that covered what is now the lower Bay making a crater one mile deep and 50 miles across (see *shaded circle at right*). During subsequent periods of low sea level, it seems probable that this crater altered the course of the ancestral York and James Rivers. Note the red 'zags' to NE which align with the crater's center.

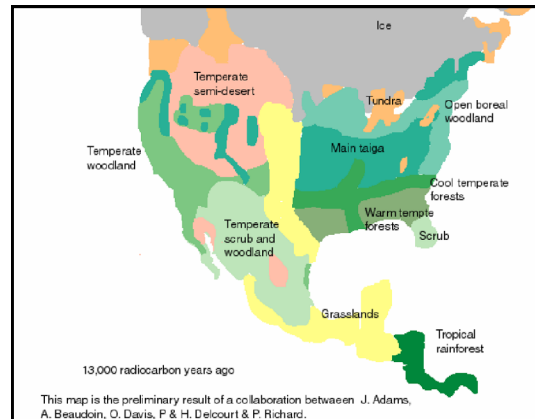
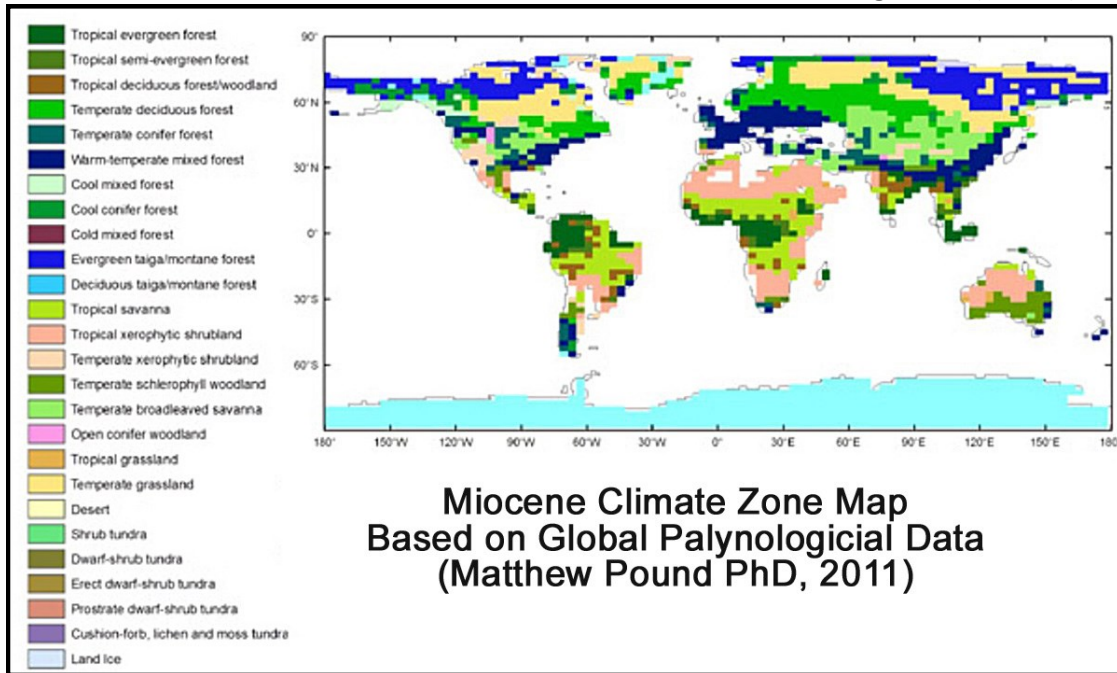


Changing Climate - Changing Ecosystems



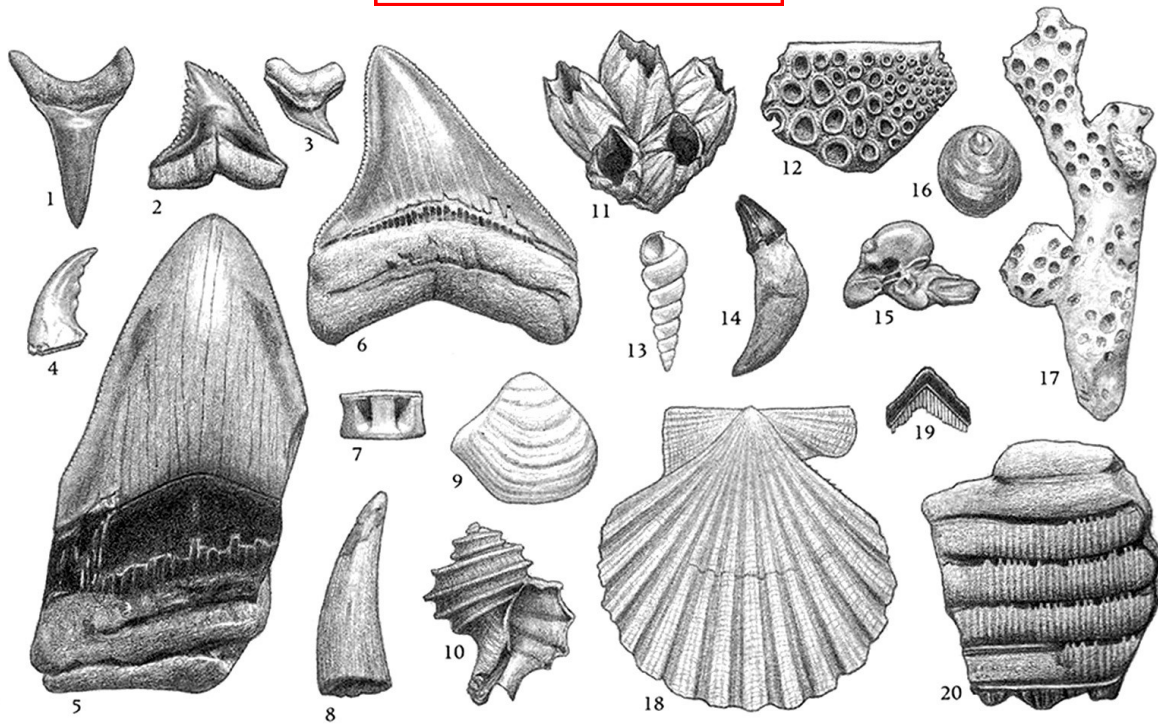
Tropical Miocene (22-12 MYA)

Last Ice Age Peak (20 KYA)



Fossils Reflect Changes In Local Climate

15 Million Years Ago



1. Mako Shark Tooth
2. Snaggletooth Shark Tooth
3. Tiger Shark Tooth
4. Stone Crab Claw
5. Great White Shark Tooth
6. Great White Shark Tooth
7. Shark Vertebra
8. Crocodile Tooth
9. Pelecypod Shell
10. Ecophora Shell (MD State Fossil)

11. Barnacles
12. Drumfish Jaw Fragment
13. Gastropod (Turritella) Shell
14. Porpoise Tooth
15. Inner Ear Bone (Periotic) Porpoise
16. Brachiopod Shell
17. Coral (Astrhelia sp.)
18. Scallop (Chesapecten sp.)
19. Ray Dental Plate
20. Ray Dental Plate

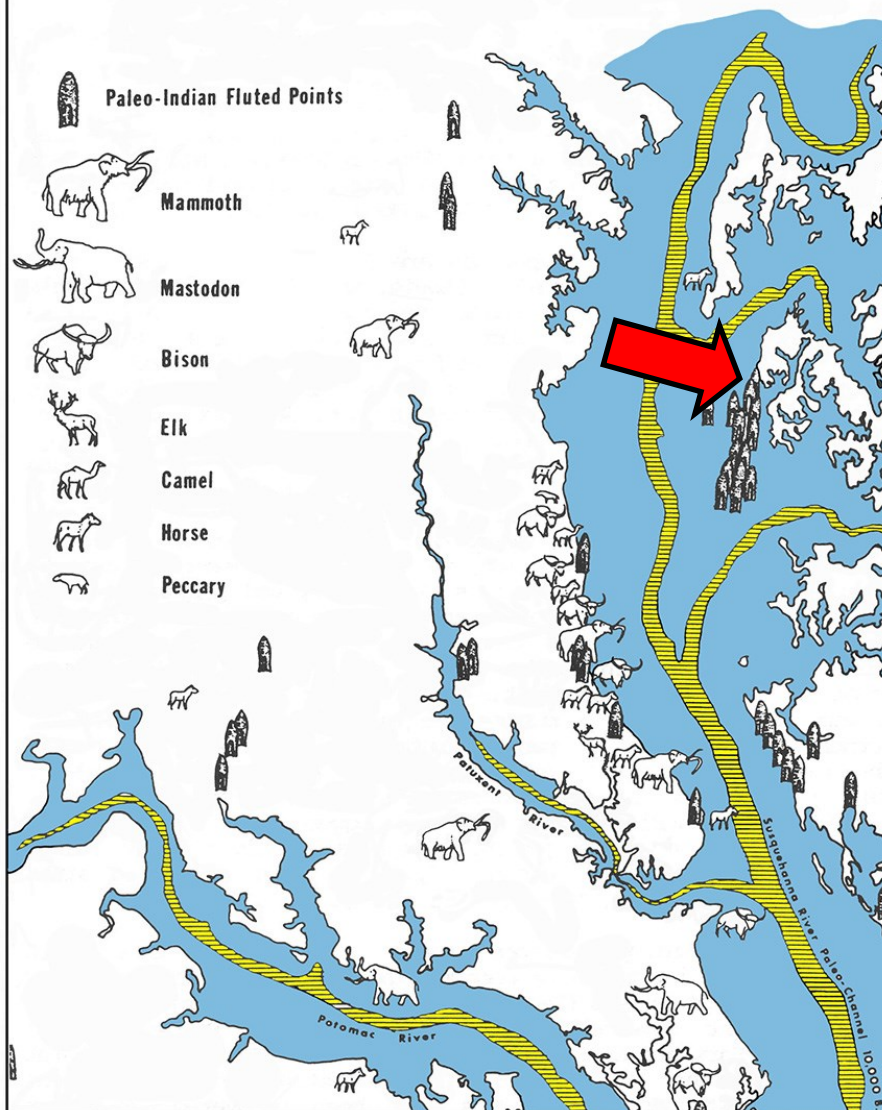
15 Thousand Years Ago

Remains of extinct animals, occasionally dug up or recovered from the bottom of the bay by watermen, provide information concerning the types of animals alive in Southern Maryland 12,000 years ago.



Molar from an immature mammoth
 Molar from an immature mastodon
 Teeth from an extinct horse
 4. Leg bone from an extinct horse

Ice Age Mammals and Early Peoples In Southern Maryland



The graphic to the left shows the types of Ice Age vertebrates that lived in Southern Maryland and where their fossils have been found. All Blue and White areas were forest and grassland. The only major water features were the rivers of the time which are shown in YELLOW crosshatch. The cool dry climate and the extensive grasslands favored large herbivores and their predators. Note the findings of Paleo-Indian Fluted projectile points in many locations that attest to the presence of Paleo-Indian hunters during this period. Numerous stone points dating to 15,000 years BCE or possibly earlier have been found on Tilghman Island (**see red arrow**)

Ice Age Animals of the Mid-Atlantic (*ca. 12,000 Years Ago*)

Herbivores:

Ground Sloth
Horse
Camel
Bison
Woodland Musk Oxen
Woolly Mammoth
Mastodon
Giant Beaver
Peccary
Tapir
Elk

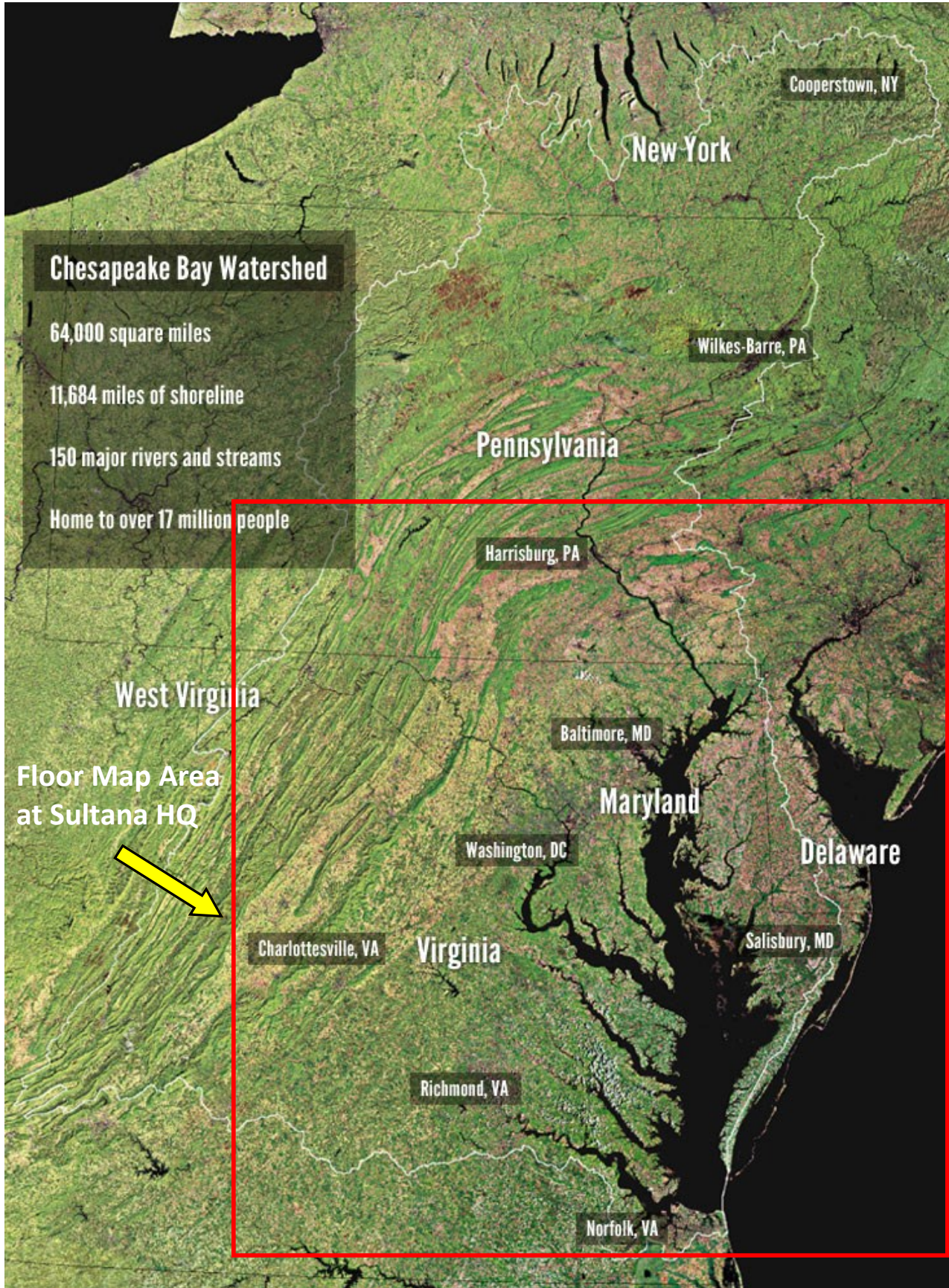
Carnivores:

Saber-toothed Cats
Dire Wolf
Wolf
Short-faced Bear

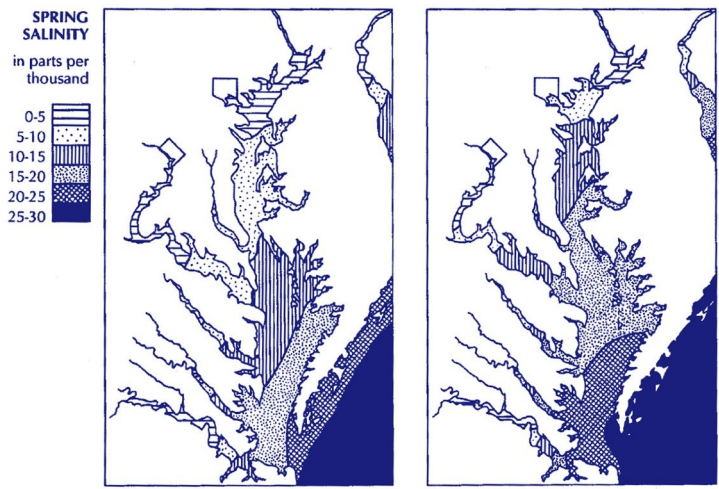
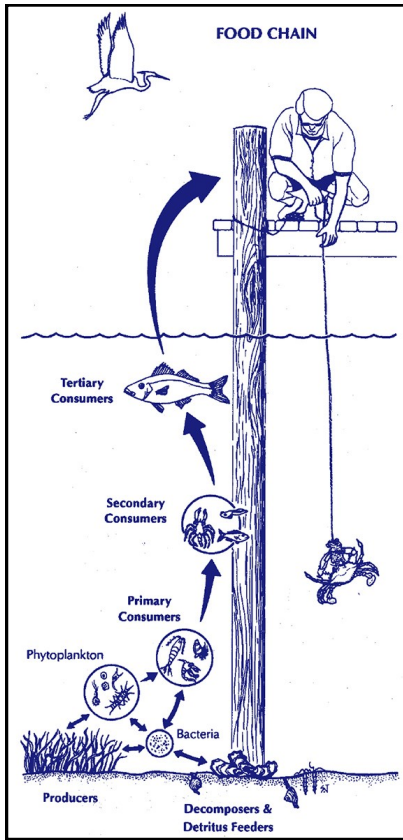
Omnivores:

Humans

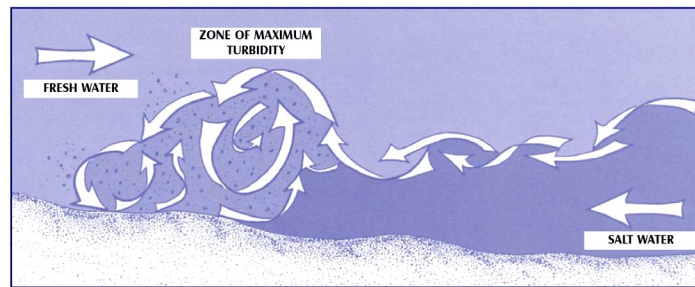
Bay Watershed - *Large Drainage Area - Small Bay*



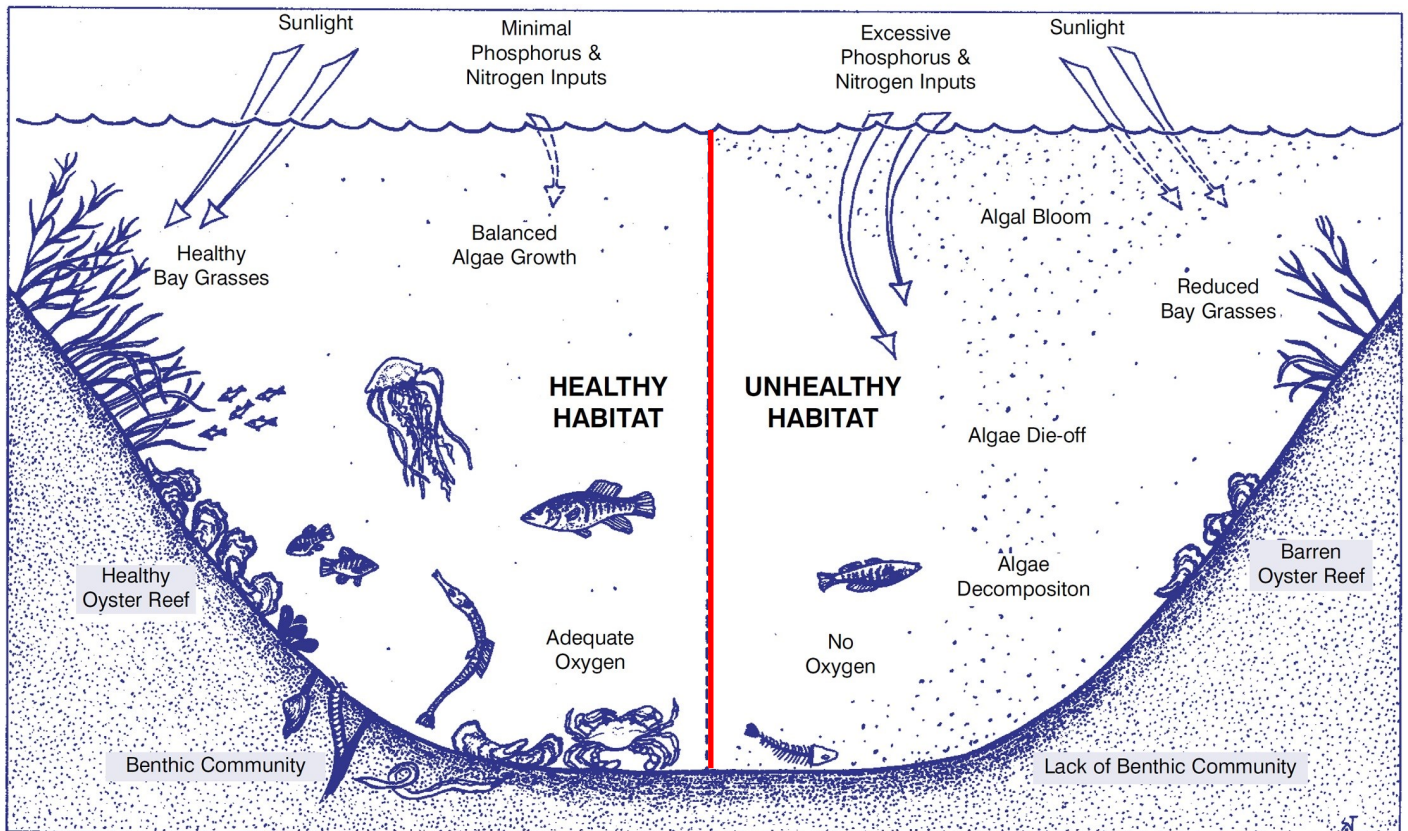
The Bay: **Estuary** with a Vulnerable Ecology



Isohalines mark the salt content of surface water. The salinity gradient varies during the year due to freshwater input: fresher during spring rains, saltier during the drier months of autumn.



The Bay is an **ESTUARY** because it is an enclosed body of water where salt (ocean) water and fresh water mix. The Bay is least salty at its northern end and most salty at its southern end.



The Bay Today - 3,600 Species

Chesapeake Bay Watershed



Bay Watershed Facts:

Population	18,130,000 (2016)
Area (sq miles)	66,388
Average Depth (ft) (w/o rivers)	27
Miles of shoreline (Bay only)	~4,000
Miles of shoreline (Total)	11,684
Length (miles)	193
Number of Plant and Animal Species	3,600

Land Drainage Area/Water Volume Ratio:
23 times greater than for the Great Lakes.

Six Major Rivers feeding into the Bay and watersheds

- Susquehanna River 27,500 square miles
- Patuxent River 937 square miles
- Potomac River 14,700 square miles
- Rappahannock River 2,848 square miles
- York River 2,669 square miles
- James River 10,432 square miles

Combined Drainage 59,086 sq. mil. (89% of total)

Some of the Bay's Important Species



Terrapin

Common Underwater Bay Grasses



Blue Heron



Male blue crab.
 Note his blue tipped claws.

Blue Crab

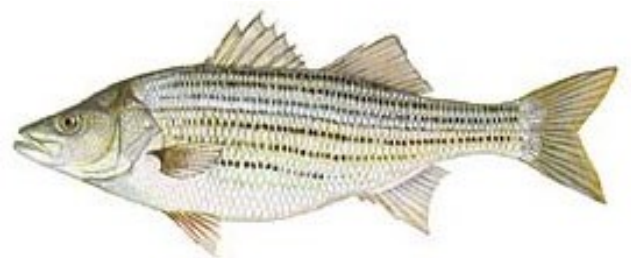
1. Oyster Spat
2. Skillefish
3. Hooked Mussels
4. Whip Mud Worms
5. Sea Squirts
6. Sea Anemone
7. Barnacles
8. Fan Worms
9. Mud Crab



Oyster Bar Community



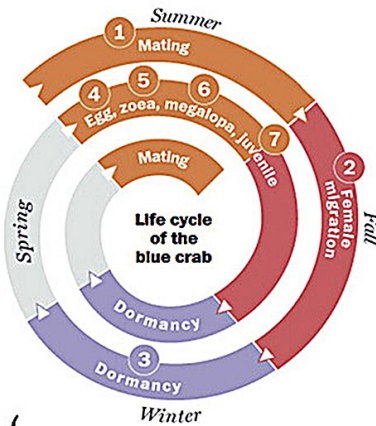
Menhaden



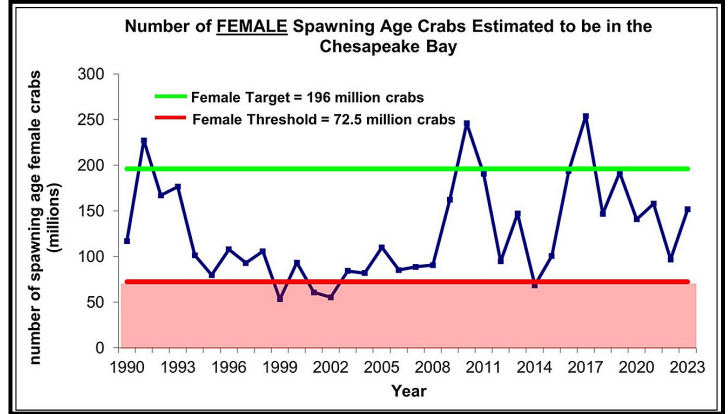
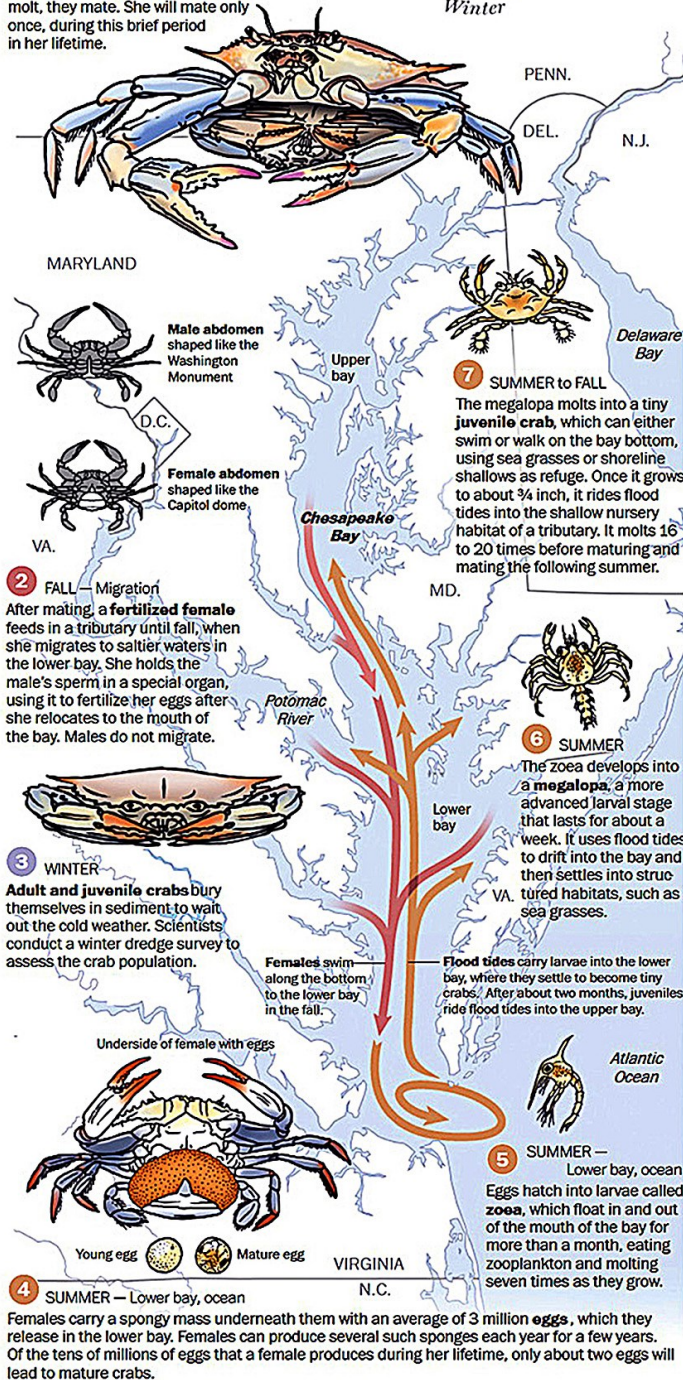
Rockfish (Striped Bass)

The Blue Crab - A Key Bay Species

By February in the lower Chesapeake Bay, mature female blue crabs are buried in the sediment, waiting for the arrival of summer to hatch their eggs and continue a life cycle that takes about two years to complete.



1 SUMMER — Bay tributaries
When an **immature female** is about to become an adult, she releases chemicals to attract males. A male will cradle her for a couple of days until she sheds her exoskeleton, or molts. After her molt, they mate. She will mate only once, during this brief period in her lifetime.



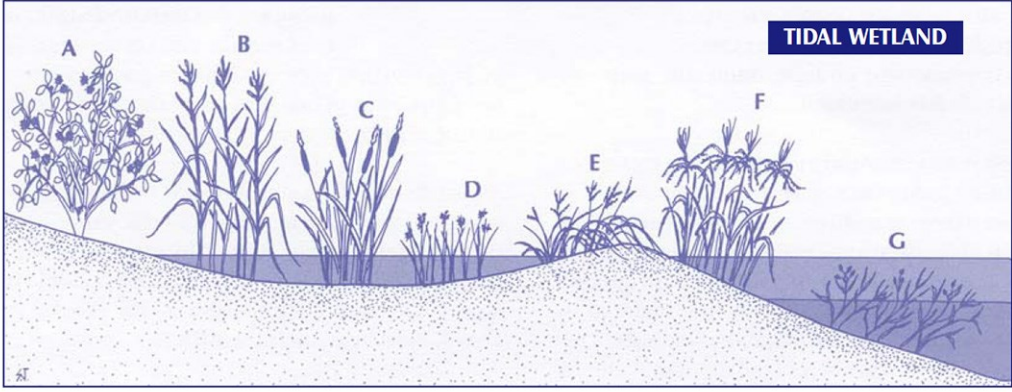
The Blue Crab

Callinectes sapidus ('Beautiful swimmer')

The graphic to the left depicts the life cycle of the Blue Crab and the migrations of the crabs up and down the Bay during the year. This life cycle and the crab migrations will be brought to life during the animated program at The Sultana Foundation HQ.

Blue crabs are probably the most iconic species of the Chesapeake Bay. Prized for their delectable meat, they have been one of the most profitable catches in the Bay for many years along with Bay oysters. Both crab and oyster populations have plummeted from their historic highs at the turn of the century, each for different reasons. For the drop in crab numbers (see graph above), many forces are involved but the two most significant are overharvesting and loss of underwater grasses. If the young, vulnerable crabs are unable to find cover in grasses, they are easy prey for fish, most notably the Striped Bass (Rockfish) and are therefore unable to reproduce and replenish crab stocks. The loss of underwater grasses is driven by loss of water clarity (driven in turn by chemical and sediment pollution) which prevents sunlight from reaching the bottom areas where the grasses grow (See graphic Page 13).

Biodiversity: One Bay - Many Habitats

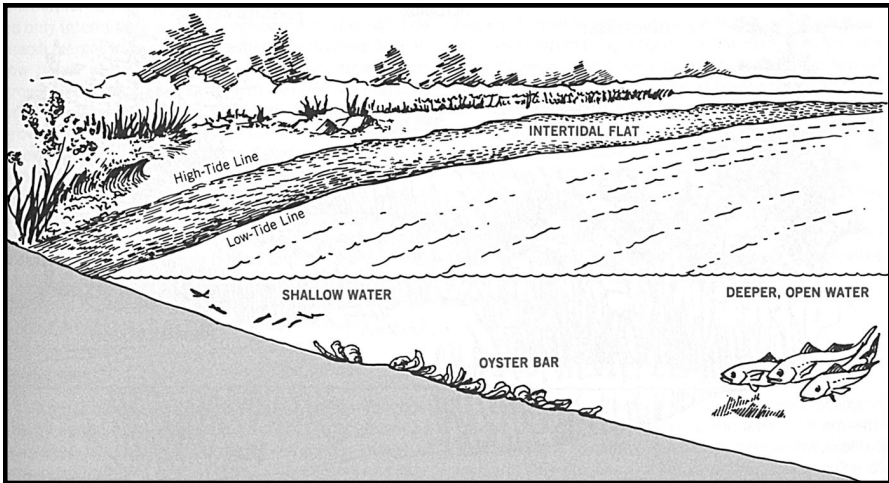


TIDAL WETLAND

Hightide

Lowlide

<p>A Button bush (<i>Cephalanthus occidentalis</i>)</p> <p>B Big cordgrass (<i>Spartina cynosuroides</i>)</p>	<p>C Narrow-leaved cattail (<i>Typha angustifolia</i>)</p> <p>D Black needlerush (<i>Juncus roemerianus</i>)</p> <p>E Saltmeadow cordgrass (<i>Spartina patens</i>)</p>	<p>F Wild rice (<i>Zizania aquatica</i>)</p> <p>G Widgeon grass (<i>Ruppia maritima</i>)</p>
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As we cross the Bay Bridge and come on to Kent Island, look at the marshes to the right side of the bus (South) and notice the different 'zones' in the marshes where you can see 'bands' of similar plants grouped at a certain distance and/or elevation from the water's edge. Plants have different tolerances to temperature, sunlight, wind, salinity, and soil type and will thus be abundant in zones that meet their needs and absent in those that do not.

The same type of 'sorting' by 'comfort zone' and life requirements applies to life IN the bay under the water. Some animals and plants can survive in the tidal zone where they can be out of water for up to 6 hours at a time; others must be submerged at all times or risk drying out. Some animals move to catch their food; others remain stationary and let the currents bring the food to them. Some burrow; others swim. Some eat only plant material; others only flesh; others eat both depending on what's available. And so it is: one Bay but with many different habitats that support over 3,600 species of plants and animals.

BENTHIC COMMUNITY

<p>A Hard clam (<i>Mercenaria mercenaria</i>)</p> <p>B Atlantic oyster drill (<i>Urosalpinx cinerea</i>)</p> <p>C Common clam worm (<i>Nereis succinea</i>)</p> <p>D Red ribbon worm (<i>Micrura leidy</i>)</p> <p>E Soft-shelled clam (<i>Mya arenaria</i>)</p>	<p>F Glassy tubeworm (<i>Spiochaetopterus oculatus</i>)</p> <p>G Black-fingered mud crab (<i>Panopeus herbstii</i>)</p> <p>H Whip mudworms (<i>Polydora ligni</i>)</p> <p>I Sea squirts (<i>Molgula manhattensis</i>)</p>	<p>J Oyster spat</p> <p>K Ivory barnacle (<i>Balanus eburneus</i>)</p> <p>L Skilletfish (<i>Gobiosox strumosus</i>)</p> <p>M American oyster (<i>Crassostrea virginica</i>)</p>
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Health Status of the Bay & Its Rivers 2021

The graphic from UMD CES on the following page presents the health of the Bay in different locations that include both the main stem (upper, middle, lower) and the tributary rivers and streams that flow into the Bay. These 'grades' are composites of a variety of health factors including: water clarity; dissolved Oxygen levels; health of bottom grasses; the levels of Nitrogen and Phosphorus; algal concentrations; and the diversity and integrity of the plant/animal communities on the bottom.

Of special attention to us going to Chestertown today are the data for the 'Upper Eastern Shore' which includes Chestertown and the Chester River. Its 'C-' grade speaks to the challenges of maintaining the health of the waters as more and more land is developed and farmed and increasingly heavy rain events wash more and more nutrients and pollutants into the Chester River and the Bay.

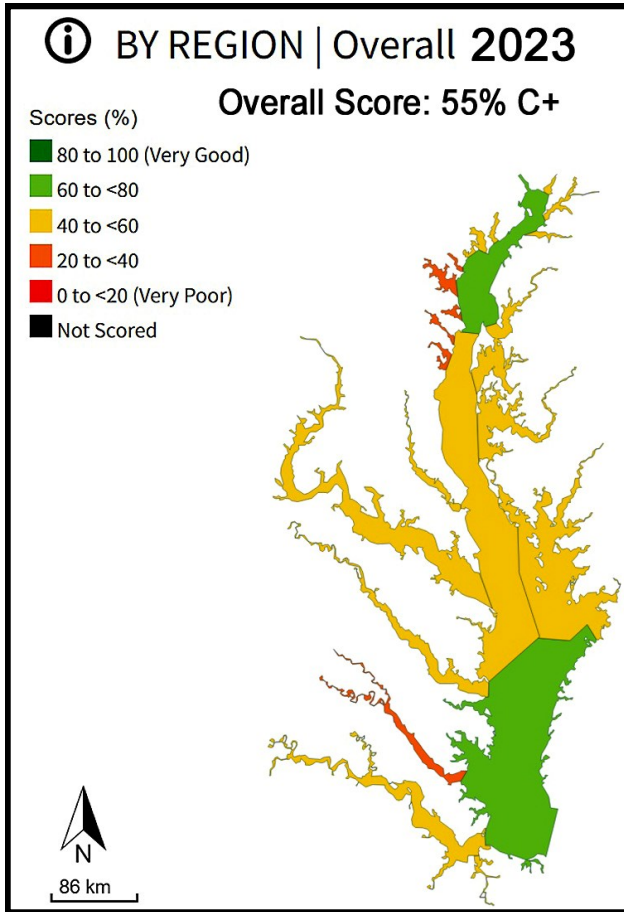
Pressures from Bay Watershed's human population of 18.1 Million people, the increased harvesting of fish and shellfish from the Bay, the catastrophic effects of two parasites (Dermo and MSX) on Bay oysters, and periods of very heavy rain and run-off, the **Bay's health grade** is only **55 out of 100 (a 'C+')**. Increased citizen awareness of what can be done to alleviate this situation will hopefully lead to concerted actions at home, at work, and in the field that will create lasting positive change in the health of the largest and most productive estuary in the USA.

Upper Eastern Shore

The Upper Eastern Shore watershed drains approximately 1,300 square miles of land. This area includes portions of Cecil, Queen Anne's, and Talbot Counties and all of Kent County. Major bodies of water include the Chester, Elk, Bohemia, Sassafras, and Northeast Rivers, and Eastern Bay. Almost half of the land in the Upper Eastern Shore watershed is agricultural, and a third of the land is covered in forest. Major towns in the area include Elkton, Chestertown, Grasonville, Centreville, and North East. Census population for the watershed in 2000 was 125,000. There are eight major wastewater treatment plants in the watershed. (Based on [MD DNR Tributary Strategy Report](#) by Aadland et al., 2007 and updated 2000 land use classifications).

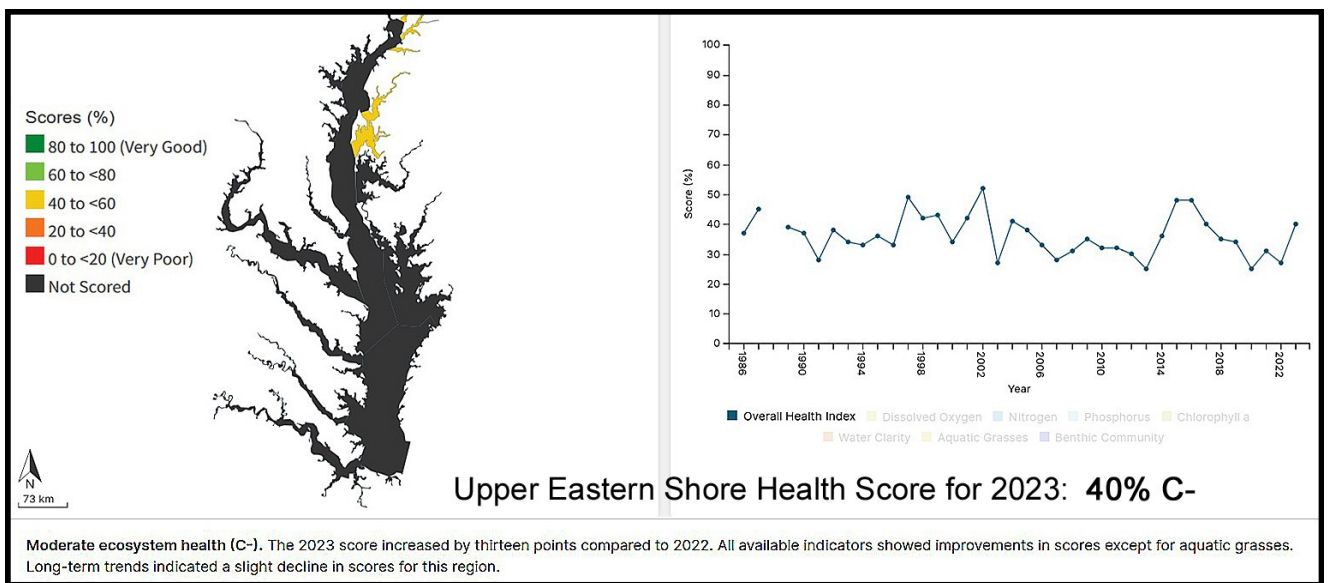


Health Status of the Bay and Upper Eastern Shore



The graphic to the left presents the health of the Bay over its entire length. This 'grade' is the average of ten (10) regional scores which are in turn averages of the eleven (8) factors that reflect the health of the water chemistry and of the plant and animal communities. This score is a slight improvement over 2022's **C** grade.

The lower graphic shows the health of the Upper Bay area (including the Chester River) which improved from a **D** grade in 2022.



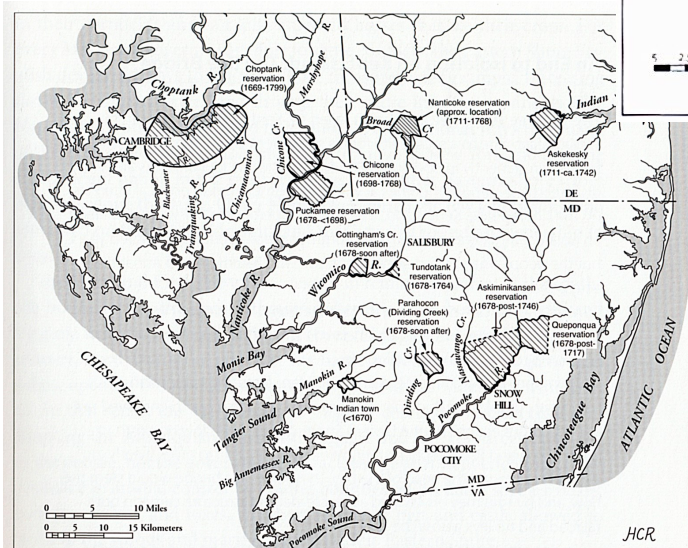
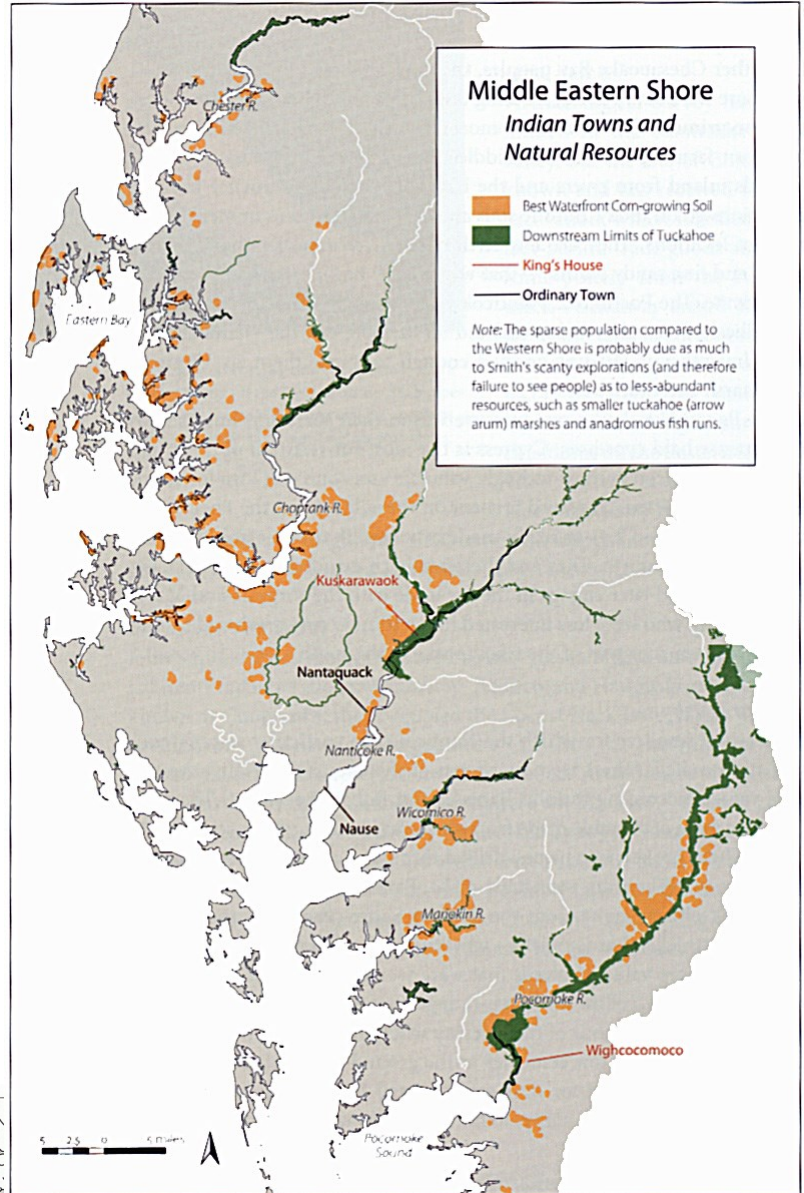
Eastern Shore Tribes: Diet Reliant on Plants

The map (right) shows Indian towns noted by John Smith on his 1612 map. Also shown in color are the areas supporting the two important sources of food for local tribes: corn and Tuckahoe (arrow arum).

There were likely many more villages than are shown here since they were hard to see from the Bay and Smith did not come ashore often on his trip up the Eastern Shore.

Native tribes on both shores of the Bay camped close to seasonal foods: summer camps closer to oysters, crabs, and fish; winter camps closer to inland game. Fishing weirs caught large numbers of fish moving along the shore which were then dried and smoked. While corn, beans, squash and sunflowers provided a reliable source of cultivated food calories, a wide variety of native plants from marshes, woods and wetlands supplemented their diet - Tuckahoe case in point.

Tribes in the middle and southern areas of the DELMARVA spoke Algonquian dialects like Potomac River/Jamestown tribes. At the north end of the Bay, John Smith needed multiple interpreters to understand the Siouan and Iroquoian dialects of local tribes (e.g. Susquehannocks and Massawomecks). **NOTE: The Accohannock; the Nause-Waiwash; the Pocomoke; the Lenape; the Naticoke; the Mitsawokett; and the Cherokee tribes are all still active on the DELMARVA peninsula.**



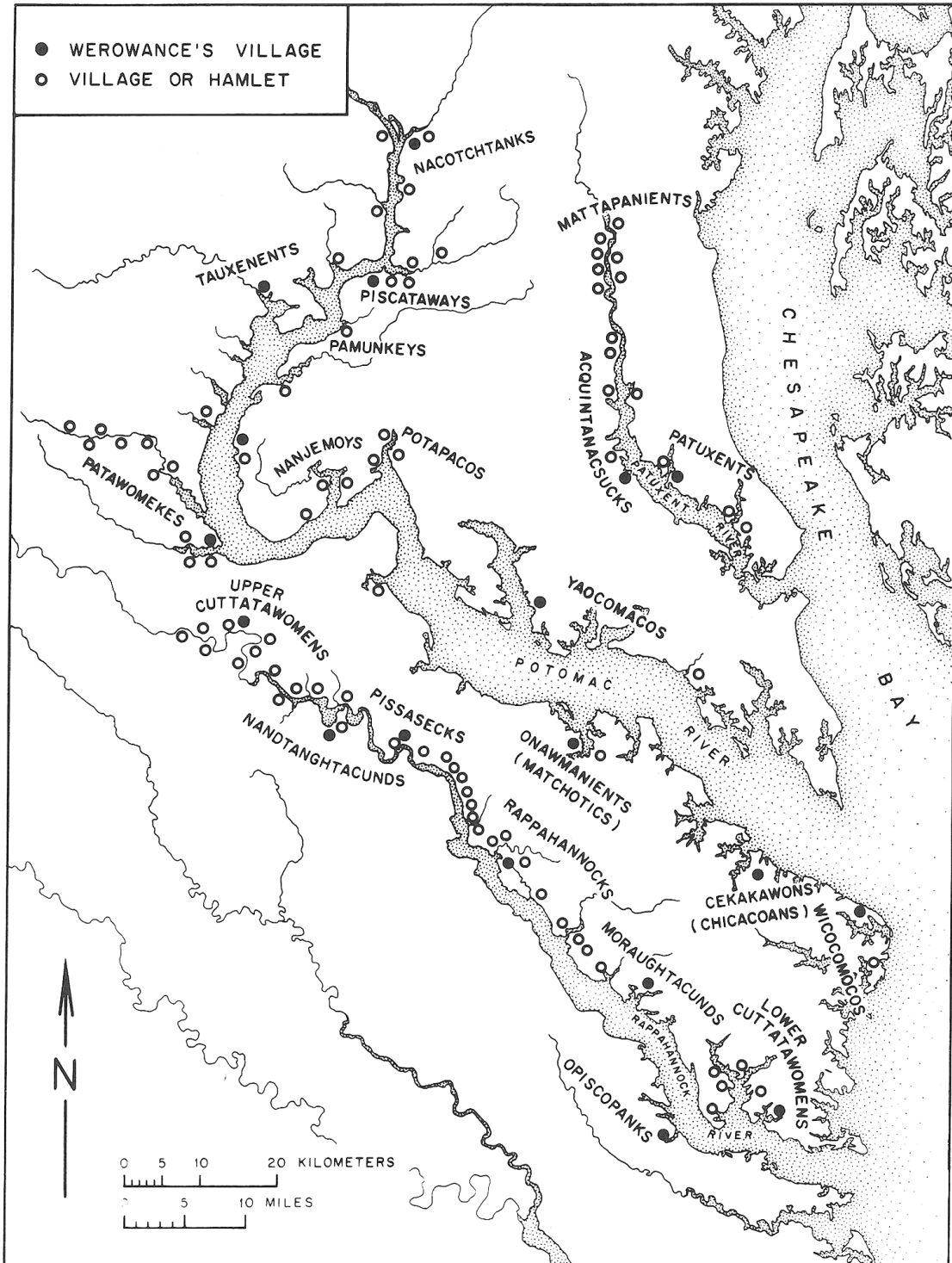
Indian reservations on the middle Eastern Shore, circa the late 1600s–mid-1700s. These places were chosen by the native people themselves; notice how they are all on the waterfront and (except for the Choptanks) located in the freshwater reaches of the rivers. (Helen C. Rountree)



A Nause fishing camp on the Chesapeake's Eastern Shore. If the natives' main town was not convenient to the spring fish runs, they built temporary summer fishing camps that might have looked like this.

Western Shore Tribes: Abundant Fish, Shellfish

Indian Villages along the Bay's western noted by John Smith in 1608. Riverside villages had access to fish and oysters. There are still many active tribal groups in MD and VA today (<https://www.nps.gov/cajo/learn/historyculture/american-indian-tribes-today.htm>)



1. Native groups and villages on the lower Patuxent, Potomac, and Rappahannock rivers, ca. 1608. (Map by G. Robert Lewis)

Annual Fish Migrations

Migratory Fishes Of the Western Shore Rivers

Anadromous

Alewife
Blueback herring
American shad
Hickory shad
Sea lamprey
Atlantic sturgeon
Shortnose sturgeon

Semianadromous

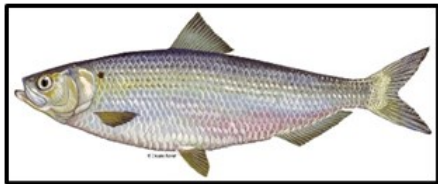
Striped bass
White perch
Gizzard shad
Yellow Perch

Spawn in Fresh Water

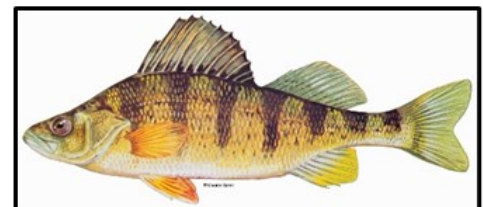
Return to the Ocean

Spawn in Ocean

Stay in the Potomac



Catadromous Fish
American Eel



During warm weather months, the Indians would dive into the rivers and Bay to gather oysters near shore. During the spring migrations of the fish shown above, tribes would trap and net thousands of pounds of fish which were then consumed or dried, salted, or smoked for preservation and later consumption. The rivers were not only the primary routes for distance travel and trade but also the source of much-needed protein in the spring after the sparse diet of the winter months for both the natives tribes and the European colonists.

Food As A Political Force & Bargaining Chip

James Rice's '4 C's Hypothesis':

Dr. Rice puts forth the following interpretation of Native American history in the Mid-Atlantic states from 800 years BCE to the time of the Jamestown settlement in 1607. It focuses on how the cultivation of, and growing dependence on, corn (which needed 120 frost-free days in its growing season) changed their social structure within and the interactions between villages over time.

Corn; Climate; Competition; & Conflict

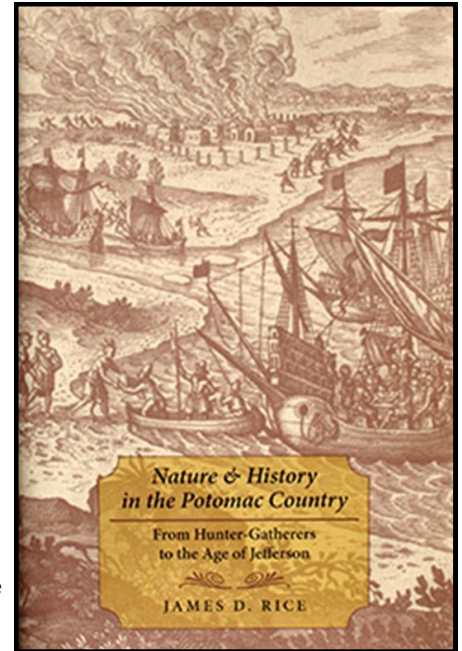
Up to 800 CE - Few fixed villages. Small roving bands. Diversified foraging & hunting

800 – 1300 CE - '*Hunters Who Farm*' - Corn part of diet after 790 CE; 'Medieval Warm Period' optimal for corn farming; pottery for storage & prep.; bow & arrow improve hunting; farming shifts to more sedentary life. Egalitarian society. Villages still open.

1300 – 1500 CE - '*Farmers Who Hunt*' - Villages now depend on corn for calories. Arrival of 'Little Ice Age' drops growing season below 120 frost-free days north of Appalachians; after 1400 most villages are palisaded as competition for prime sites increases. Inter-village competition and social stratification become more common cultural features.

Middle 1500's - Formation of the *League of Five Nations* around New York's Finger Lakes means these tribes cannot take captives from League tribes to replace tribal members lost to war, age or disease. Mourning Wars (in which captives are taken) thus move to the south; attacks begin on Potomac and Shenandoah Valley villages and further south to Carolinas. Along Potomac, tribal alliances are established with a hierarchy with tributes of goods made to the Primary Chief (e.g., Powhatan.)

1608 - The European colonists enter into an area that has already been reshaped by conflict, political alliances, trade, and the availability of food resources - it was not a 'blank slate' as is often portrayed. Tribes used their food stores and political clout when bargaining with the newly arrived and ill-prepared English colonists who founded Jamestown Settlement.

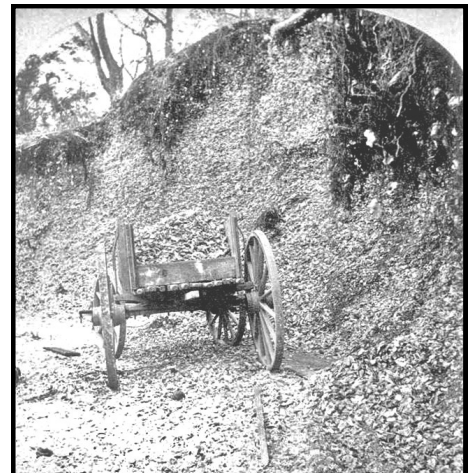


One of the factors underpinning the power of the Powhatan Confederacy was access to the enormous **oyster beds** in the Potomac River. Member tribes would harvest huge quantities of this protein rich food in the Autumn before cold weather set in and also smoked some for consumption during the Winter months. Over the centuries of such oyster feasting, shell piles ('middens') 30 to 40 feet thick in some cases, accumulated in the areas where this occurred. With limestone deposits absent in the Tidewater/Coastal Plain geology, these middens were mined for the shells from the 1600s through the 20th century and the shells were then crushed (for chicken feed, paving, industrial use in Iron-making, white wash, and liming fields to raise pH) or burned to make quicklime (CaO) for use in plaster and cement. Because of their archaeological potential, most middens are now protected and no longer mined. Currently there is a major shortage of clean oyster shells to use in restoration of oyster grounds and restaurants and packing houses are paid to keep their shells and make them available for reseeded operations.



At left: A typical exposure of ancient oyster midden found in the coastal Mid-Atlantic states (about 3 feet thick).

At right: An ancient oyster midden (Whale Back Midden) in Maine that is about 15-20 feet thick. This mound was mined for the shell for many years and is now protected.



George Washington's Preferred Route North



George Washington made many trips to Philadelphia and points north and more often than not, traveled from Mount Vernon on the Potomac River northeast to Annapolis and then took a ferry from Annapolis to Rock Hall. He would usually stay with friends [e.g. May 1773 trip, Governor Sharpe in Annapolis and the Ringgolds in Chestertown] along the way. Going across the Bay saved him many miles over bad roads going around the head of the Bay.

Map: Thomas Kitchin, 1757 (Library of Congress 74693175)

A Chesapeake Time Line (I)

Formation of the Eastern Shore Counties:

- 1642 **Kent County**-Named after Kent County, England.
- 1661 **Talbot County**– Named for Lady Grace Talbot, the wife of Sir Robert Talbot, an Irish statesman, and the sister of Cecil Calvert, 2nd Baron Baltimore.
- 1666 **Somerset County**-Named for Mary, Lady Somerset, the wife of Sir John Somerset
- 1669 **Dorchester County**-Named for the Earl of Dorset, a family friend of the Calverts (the founding family of the Maryland colony).
- 1674 **Cecil County** - Named for Cecil Calvert, the 2nd Lord Baltimore.
- 1706 **Queen Anne's County**– Named after Queen Anne of Great Britain who reigned when the county was established.
- 1742 **Worcester County**-Named for an Earl of Worcester.
- 1773 **Caroline County**– Named for Lady Caroline Eden, wife of Maryland's last colonial governor, Robert Eden.
- 1867 **Wicomico County** - Named for the Wicomico River.

18,000 Years Ago – most recent glacial ice-sheets retreat

18-25, 000 Years Ago – possible **Pre-Clovis** human occupation of the region begins in the Chesapeake Region.

13,500 Years Ago - Generally accepted date of **Clovis Culture** appearance in modern day Western US States.

10,000 Years Ago– Pleistocene megafauna become extinct at end of last Ice-Age

9,900 Years Ago – modern mixed hardwood forests begin to dominate the region

9,900 Years Ago – rising temperatures melt glacial ice forming outline of modern Chesapeake Bay

6,000 and 3,000 Years Ago – contemporary Bay shoreline and environment emerge

5,000 Years Ago – native peoples begin encouraging the growth of desirable plants

3,000 Years Ago – present–regional **appearance of pottery** begins the container revolution

500 to 1,000 AD – corn, squash, beans, and tobacco first cultivated in the region

1,100 AD – Estimated time when the **bow and arrow** were introduced to the Americas

1300 –Natives begin building settled towns in the lower Potomac Valley

1524–Giovanni da Verrazano pens the earliest written record of contact in the region

1571 to 1585–early Spanish and English colonization attempts fail

1600–**Powhatan chiefdom** develops along the James River Coastal Plain

1631 William Claiborne of Virginia places first settlement on Kent Island as a fur trading outpost.

1634–**Maryland colony founded** at Saint Mary's City

1650–war and disease **reduce regional Indian population to 2,400**, one tenth of pre-contact size; Colonial **population rises to 13,000** by this date

1675 to 1676–Susquehannocks dispersed and Jamestown burned during Bacon's Rebellion

1692 -The Church of England becomes the official religion of Maryland and taxes are raised to support it.

1694 - Capital moved from St. Mary's City to Annapolis (Anne Arundel Town)

A Chesapeake Time Line (II)

1700—African Americans comprise half the region's workforce and forty percent of its population

1706 - Chestertown is founded as an official Port on Entry in Maryland.

1729—Baltimore, Maryland founded

1738 to 1745— Methodist **Great Awakening** religious revival catches fire in many colonies but not on the Eastern Shore. However, Methodism is the dominant Eastern Shore religion by 1810 and continues to dominate to this day.

1750—colonial **population rises to 380,000** (African Americans comprise more than one-third of population); 20 year period of cooler and wetter weather begins

1764-67 - Parliament passes 3 hated tax laws: The Sugar Act, the Stamp Act and the **Townsend Acts** which taxed tea etc.

1767—survey completed on Mason-Dixon Line between Maryland and Pennsylvania

1774 - Drafting and acceptance of '**The Chestertown Resolves**' (allegiance to King but No Taxation w/o representation). Purported year in which the **Chestertown Tea Party** was held taking tea from the ship 'Geddes' in Chestertown.

1782 - Washington College is established in Chestertown with funding and blessing of Geo. Washington.

1800—regional **population reaches 1 million**

1810 - Property requirement to vote is abolished. Marylanders who do not own land can now legally vote.

1813—**First commercial steamboat on Chesapeake Bay** waters begins service

1814 - (August) **British troops burn Washington** and besiege Baltimore. '**Battle of Caulk's Field**' fought near Chestertown.

1828—work begins on **Baltimore and Ohio Railroad** and the Chesapeake and Ohio Canal

1829—**Chesapeake and Delaware Canal opens**

1830—Peter Cooper's **steam engine**, the Tom Thumb, makes first trip from Baltimore to Ellicott's Mills

1830's - Agriculture exports from Kent County surge thanks the rise of large 'truck farms.' **Steamboats** and **arrival of railroads** in the 1860's leads to increased demand for all products produced on and harvested by the Eastern Shore farmers and watermen.

1831—Nat Turner leads unsuccessful **slave revolt** in Southampton County, Virginia

1832—worldwide cholera epidemic strikes region

1832- **Chesapeake and Ohio Canal and B&O Railroad** stalled at Point of Rocks, MD with right of way dispute pending in the courts.

1833 - The steamship 'Chesapeake' begins a regularly scheduled run between Rockhall and Baltimore.

1839—**Nation's first iron-hulled ship**, the DeRosset, built in Baltimore.

1840 - **Baltimore opens first large volume canneries** which now allow for long term preservation and shipping of Bay produce and seafood especially the very popular Bay Oysters.

1844—**nation's first telegraph** line erected between Baltimore and Washington. Dolley Madison sends second message.

1850—regional **population exceeds 1.8 million**

1855 - Harriet Shepherd, a slave, escapes from Chestertown to Wilmington along with her children and five other slaves using her former master's carriage and his horses.

1861-64 - The Union Navy allows slaves on the Eastern Shore to escape and join the Union Army. This incenses the slave owners on the Eastern Shore especially those who had remained loyal to the Union to this point in time.

A Chesapeake Time Line (III)

1860 - 50% of Kent County citizens are black and half of these are slaves.

1865 - The Chester River Steamboat Company begins regular service from Chester River landings to Baltimore.

1865–Thirteenth Amendment to Constitution abolishes slavery

1872 - The first railroad reaches Chestertown. Refrigerated rail cars start operations in Bay area in **1873.**

1881-88 Oyster dredgers terrorize oyster tongers on the Chester River especially the notorious 'pirate', **Gus Rice.**

1887 - The Emma Giles (steamship) is built and becomes the most beloved of the Bay steamers as she carries generations of happy people to the **Tolchester Amusement Park** in Kent County.

1900–region **population reaches 3 million**

1904–Great Baltimore Fire destroys city center.
Washington sends men and hose but DC hoses are useless - they do not fit the Baltimore hydrants.

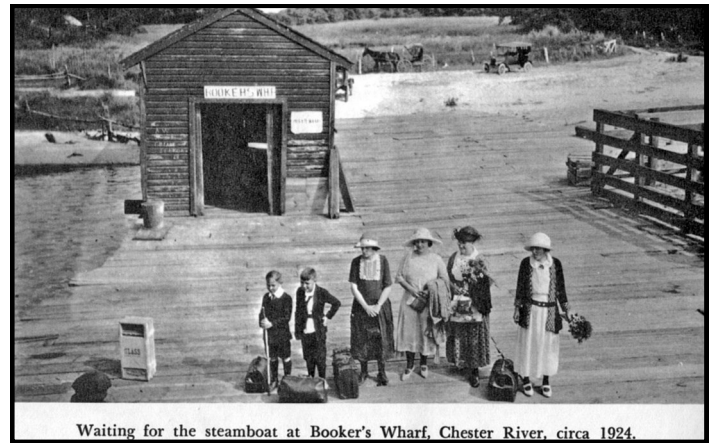
1930–regional **population reaches 5 million**

1952–**Chesapeake Bay Bridge opens**

1972–Hurricane Agnes devastates region

1973–**Chesapeake Bay Bridge–Tunnel opens**

1990–regional **population reaches 10.5 million**



Waiting for the steamboat at Booker's Wharf, Chester River, circa 1924.



It is impossible to overstate the **importance of steamboats** to the Chesapeake economy and to the social fabric of the Bay from 1813 to the 1960's when the last steamers were scrapped or abandoned. In their early days, they were dangerous (no radar, no radio, and often had boiler explosions), noisy, and brash but also elegant, fast, and noted for comfort, value and very good food. They were truly the life blood of the Bay from after the Civil War until the opening of the Bay Bridge in 1952. As you can see above, the wharves were the way to get out of town and the way goods flowed in and out of every community.

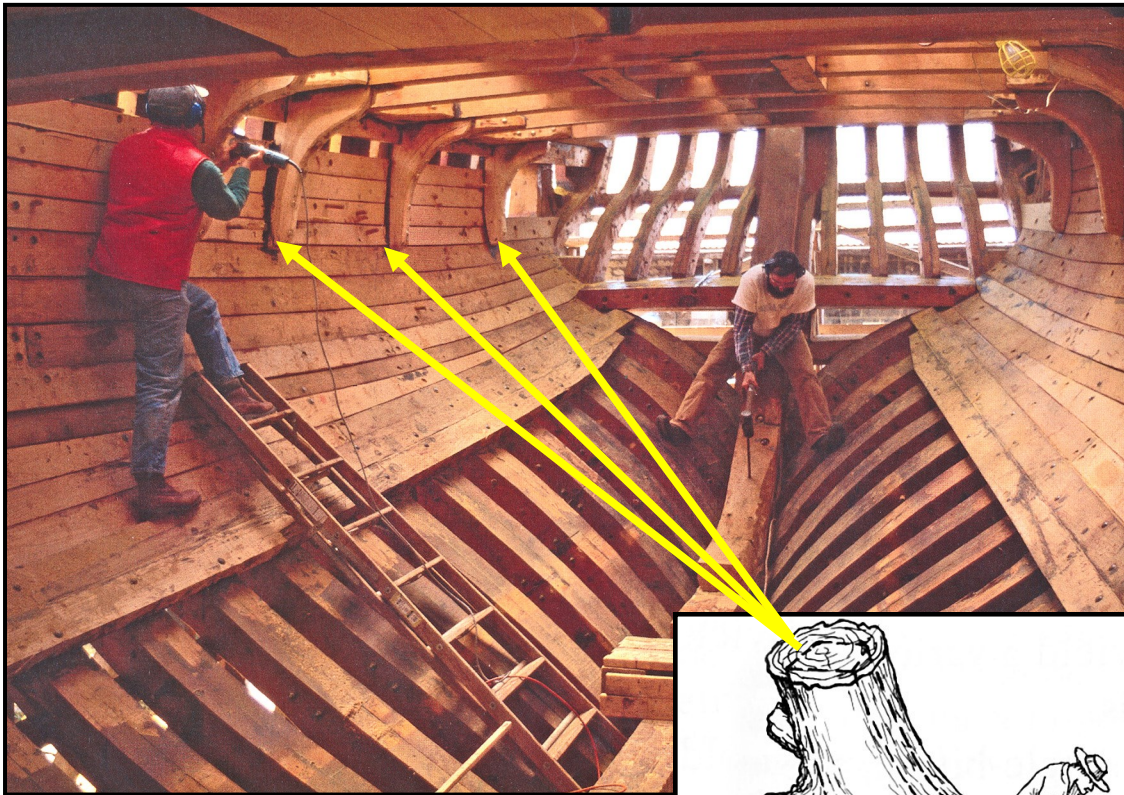
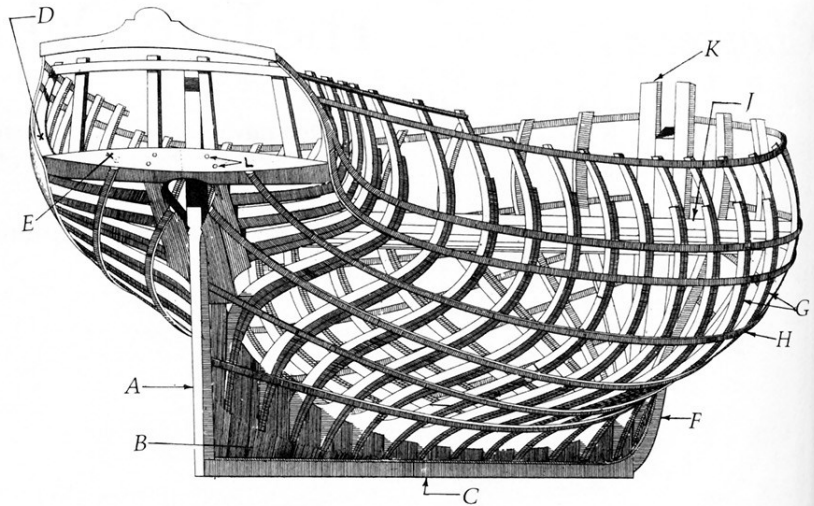


But probably the greatest service these boats rendered was taking crowds of day-trippers from Baltimore to Tolchester Park and other parks around the Bay for a day of fun, food, swimming, music and good times. The affection with which these trips are described is heart-warming.

Shipbuilding - Artistry With Timbers & Tools

The timbers of a ship.

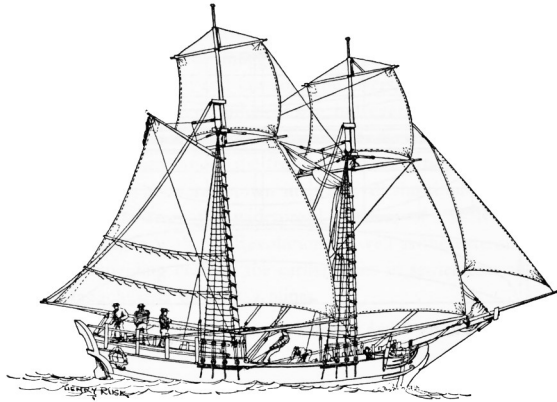
- A** Stern Post
- B** Deadwood
- C** Keel
- D** Quarter Timber
- E** Transom Beam
- F** Stem
- G** Futtocks (frames)
- H** Battens
- J** Breasthook
- K** Knighthead
- L** Treenails



Hewing out a knee

The picture above shows the interior of Sultana's hull during construction in 2001. The frames (futtocks) spread up and out from the ship's keel (center). Planks are joined to frame sections with wooden nails (and bolts where needed). Note the 'knees' that help support the deck timbers. These are made from tree limbs or roots that come out from the trunk at a slant. The picture at right shows a much larger knee for a much larger ship (e.g. 'Old Ironsides') being roughed out with a hand axe.

The 'Sultana' - A Ship With History



Sultana, SCHOONER, 1768

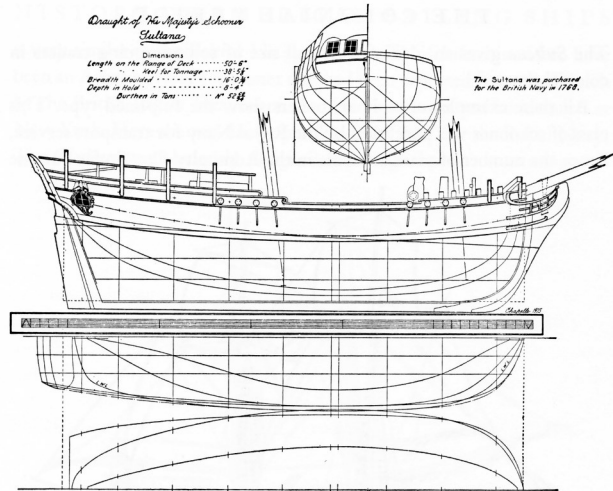


Figure 8. Lines of the British schooner SULTANA.

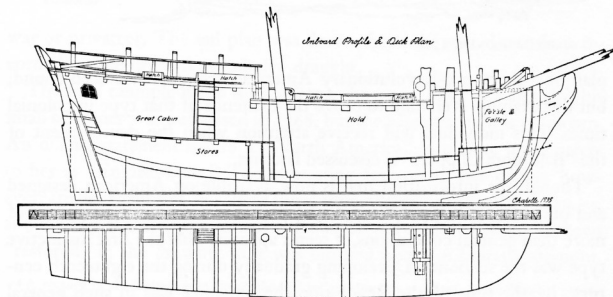


Figure 9. Inboard details and deck plan of SULTANA.



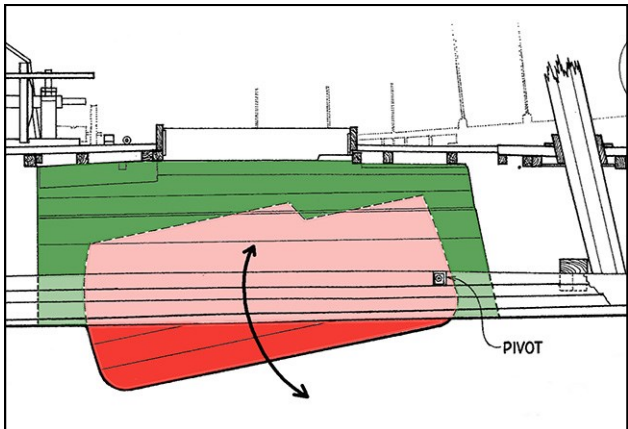
If you look at the **ship in the lower left** of the above painting, you will see that the basic sail plan and hull are very similar to the Sultana except for the foremast and the small square spritsail at the bow instead of the Sultana's triangular jib sail. Ships built in Chestertown and in Annapolis in the early 18th century were highly regarded on both sides of the Atlantic.

The Sultana's Oystering 'Dockmates'

As you get ready to board the 'Sultana' take a moment to look for the two boats pictured here, which if we are lucky will be docked next to Sultana. Both boats are part of Bay Oyster history.

In the 1880's the oyster trade was booming and watermen wanted a cheap, easily built, sailboat to dredge for oysters. With the availability of affordable plank lumber from local mills, the Skipjack design became widespread in the Bay. It was a V-bottomed (hard chine), planked boat with a large carrying capacity, the power to drag the oyster dredges over the bottom, and a simple design that did not require special carpentry skills.

With the introduction of the **retractable Centerboard** in 1820 (see below), even large bay craft were able to access the shallow waters where crabs and oysters were most prolific. Oysters were originally taken in shallow water with hand tongs, but as stocks were depleted, dredge and patent tongs were used to harvest in deeper water. First Bugeyes and later Skipjacks were the chosen boats for 'Arstering' and 'Drudg'in'. Skip-



jacks were made to be worked hard and then discarded. Most of the thousands that were built were beached and left to rot when they got old enough to need an overhaul.

The **Annie D.** is a perfect example of the once prevalent 'buy boats' who would go among the oyster boats at the end of the day, buy the oysters direct from the boat captains and then go to port where they would sell to shucking/packing houses or dealers who would transport the oysters further on.



Skipjack: 'Elsworth' (1901)

Length 57 feet , Beam: 14.3 feet
Mast Height: 57 feet
Draft 3.1 feet with the centerboard up . Draft about 9 feet with centerboard down.



Buy Boat 'Annie D' (1957)

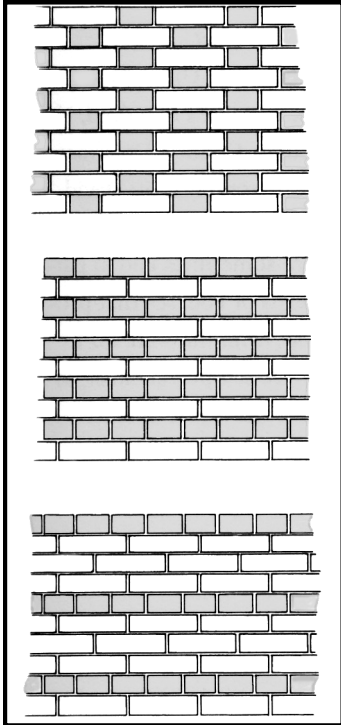
Length: 50 feet Beam: 14.4 feet
Draft 3.9 feet empty

Georgian Architecture Primer (I)

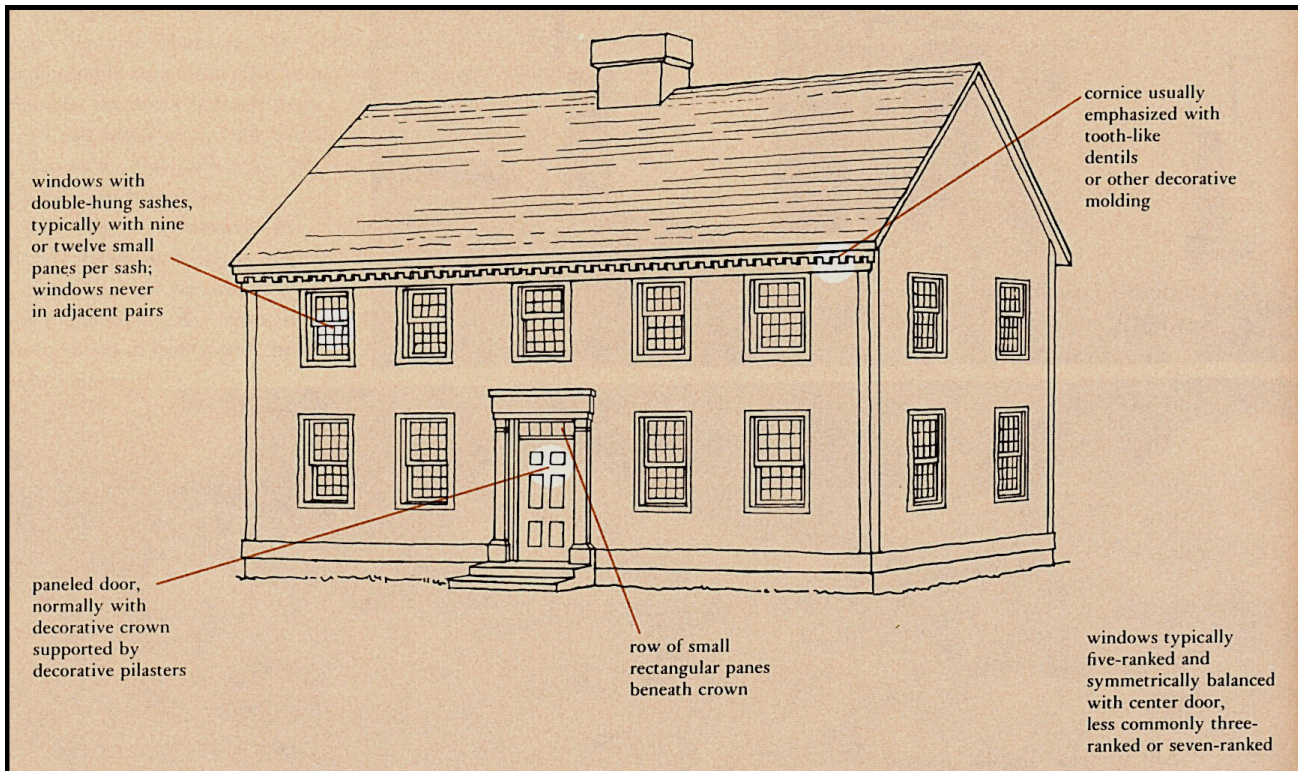
The diagram is divided into several sections:

- Top Row:** Six simple line drawings of two-story houses with varying window and door arrangements.
- Map:** A map of the eastern United States showing principal settled areas in 1780. Major cities and towns are marked, including Portsmouth, Salem, Boston, Providence, Hartford, New Haven, Newport, New York, Perth Amboy, Burlington, New Castle, Philadelphia, Baltimore, Annapolis, Williamsburg, Norfolk, Wilmington, Charles Town (Charleston), and Savannah. A legend indicates that dots represent principal towns and cities. Sources cited are Fries (1968), Kagan (1966), and Chitwood (1961).
- COMMON NORTHERN VARIANTS:** Usually wood frame, upper window touches cornice in most two-story examples.
 - MOST COMMON IN NORTHERN COLONIES:** side-gabled, open; gambrel.
- MIDDLE COLONIES:** usually stone or brick, most northern and some southern variants found here.
 - COMMON ONLY IN MIDDLE COLONIES:** side-gabled, closed or pedimented; pent.
- COMMON SOUTHERN VARIANTS:** usually brick, raised foundation, belt course between stories (also on northern masonry examples).
 - MOST COMMON IN SOUTHERN COLONIES AND IN HIGH-STYLE EXAMPLES, ALL COLONIES:** hipped; double-hipped.
- CHARLESTON HOUSE:** short side turned to street, galleries along one side. Accompanied by three line drawings of house elevations.
- CHIMNEY PLACEMENT:**
 - MOST COMMON IN NORTHERN COLONIES:** central chimney.
 - COMMON IN ALL COLONIES:** paired interior chimneys.
 - COMMON IN SOUTHERN AND MIDDLE COLONIES:** paired end chimneys.
 - FOUND IN HIGH-STYLE EXAMPLES—ALL COLONIES:** paired double interior chimneys; paired double end chimneys.
- ROOF SHAPE:** A section on the right side of the diagram showing hipped and double-hipped roof shapes.

Georgian Architecture Primer (II)



Flemish Brick Bond (Upper at far left) alternates stretchers and headers (bricks laid on the side & bricks laid end on) and can be seen at left on both the upper and lower courses on the Ringgold 'Customs House' at the corner of Water and High Streets. On the upper courses, the ends (headers) have been salt glazed to give them a gray, shiny look that creates a striking visual pattern. It was common practice on many Tidewater homes in both Virginia and Maryland to show the date and owner's initials on the end gable using glazed or off-colored headers such as 'C 1786 P.'



The above illustration shows some of the characteristic features of 'Georgian' architecture as translated from European design books onto the American Colonial landscape. The preceding page shows some of the regional variations and some of the recurring 'themes' that were found in Colonial houses built on the Eastern seaboard up to and after the Revolution. Many New England houses were built along this design using clapboards instead of the bricks you see in Chestertown. **Any large stones in Chestertown foundations had to be shipped from a non-local source.**

Architectural Gems of Chestertown



The Ringgold 'Customs' House (1746)



The White Swan Tavern (1733)



Wide Hall (Smythe House) (1770)



Stams Hall (1886)



The Wickes House (1767)



The Hynson Ringgold House (1743)

The six houses pictured above are just a few of the extraordinary 18th (and 19th) Century houses still on their original foundations in Chestertown. Only Annapolis has an equivalent number of Georgian era houses. As you visit these houses, take a moment to appreciate the details (brickwork, molding, door and window trim, etc.) and get a sense of the craftsmanship that went into these houses. Rooms from two Chestertown houses were removed, restored and are on display at the Baltimore Museum of Art and at the DuPont's Winterthur Museum. **Brochures for a walking tour and historical house descriptions are available at the Visitor's Center.**

Sea Level Rise & Climate Change (DC & MD)

CLIMATE CHANGE IMPACTS FOR DC

In order to plan for climate change, we first must understand the changes we are likely to experience. DOEE worked with leading climate scientists to identify likely changes for the District from today through the 2080s. The results of that study are summarized below.

The District's Climate Future

As a result of climate change, DC will experience:

- Much warmer average temperatures
- Up 2-3 times as many dangerously hot days
- Longer, hotter, and more frequent heat waves
- More frequent and intense heavy rain events
- Higher tides as a result of rising sea level

While scientists are not yet able to model the local effects of climate change on extreme weather like the 2012 derecho, the likelihood of severe storms fueled by warmer temperatures and more water in the atmosphere is expected to grow in the future.

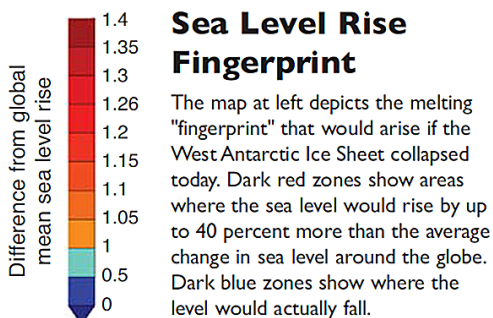
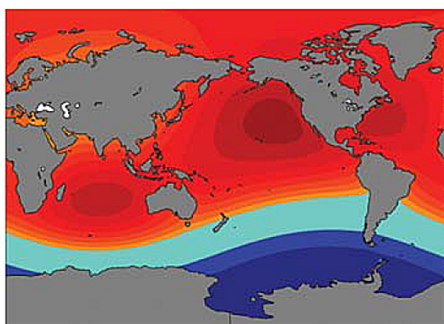
These are excerpts from two brochures on Climate Change and Sea Level Rise prepared by the Maryland Commission of Climate Change (MCCC) and Climate Ready DC (CRDC). While many Maryland citizens of the Eastern Shore are highly skeptical of human-driven Climate Change as a cause of the land erosion that they can see, legislators in Annapolis are working to get out front on these issues and planning for how to mitigate the impacts. You can download the Maryland Fact Sheets at: <http://mde.maryland.gov/programs/Air/ClimateChange/MCCC/Pages/index.aspx>; and the CRDC brochure at: <https://doee.dc.gov/climateready>.

What's Driving Sea Level Rise

Sea level is rising along Maryland's coasts faster than the global average increase. Scientists identified causes and estimated the likely contribution of each.

Year	Maryland							World-wide
	Amount of sea level rise (in feet)							(in feet)
	Ocean thermal expansion	Antarctica melting	Greenland melting	Other glaciers melting	Gulf Stream change	Sinking land	Total	Total
By 2050	0.3	0.3	0.1	0.2	0.3	0.2	1.4	0.9
By 2100	0.8	1.0	0.3	0.4	0.6	0.5	3.7	2.7

Note: Subtotals are rounded and so may not sum to total.



A dangerous mix, sea level rise along the Chesapeake Bay stems from a variety of factors, according to a scientific review led by the University of Maryland Center for Environmental Science (table, above). Together, these factors make the region a "hot spot" for sea level rise and include the impacts of sinking land, melting ice in Antarctica, and changes to the flow of the Gulf Stream. TABLE SOURCE, "UPDATING MARYLAND'S SEA-LEVEL RISE PROJECTIONS" REPORT; MAP, COURTESY OF CARLING HAY AND ELSEVIER

Climate-Related Impacts Around the Bay:

- **Sea Level Rise:** One foot rise in the 20th Century. Up to 4-6 Feet projected for the 21st C.
- **Water Temperature:** Increased water temps reduce suitable habitat for crabs and oysters.
- **Heavier Rains:** More frequent and more intense rains and floods.
- **Heat Waves & Droughts:** Higher power demand in summer. Greater risks to crops with greater economic impacts.
- **Tourism Impacts:** Less snow for winter recreation and increased loss of recreational waterfront along the Bay and ocean.

Resources for Continued Exploration

1. Books:

- **Schooner Sultana: Building a Chesapeake Legacy**, Drew McMullen and Lucian Niemeyer, Tidewater Publishers, 2009 A beautifully photographed book that documents the construction of the ‘Sultana’ and provides some interesting historical context as well.
- **Life In the Chesapeake Bay**, 2nd Edition, A.J. and R. L. Lippson, Johns Hopkins Press, 1997 The **best** Bay Natural History guide.
- **The Roadside Geology of Maryland, Delaware and Washington, DC** by John Means, Mountain Press Publishing, 2010 If you want to learn about the truly amazing geological history of this region, this is THE book. Highly recommended.
- **From Blue Ridge to Barrier Islands** ed. by Minichiello and White, Johns Hopkins, 1997. A wonderful anthology of writings from colonial times to the present day that offer looks at this region and those who lived there through the eyes of many different travelers. A sinfully enjoyable book if you love local history.
- **Chesapeake Requiem: A Year with the Watermen of Vanishing Tangier Island** by Earl Swift, Mariner Books, 2018 An intimate and heartfelt look into the lives of Tangier Island residents as they face the challenges of climate, ecological and cultural change.
- **John Smith’s Chesapeake Voyages** by Helen Rountree, Wayne Clark and Kent Mountford, University of Virginia, Press, 2002 Combines ecology, environmental history, and current science with the Journals of Captain John Smith and his bay voyages of 1607-1609. Truly a marvel of cross-disciplinary interpretation.
- **A Biography of a Map In Motion: Augustine Herrman’s Chesapeake** by Christian Koot, NY University Press, 2018 The backstory of the second most famous 17th Century map of the Chesapeake that illuminates the influence of 17th C. Dutch-English trade.
- **Maryland’s Eastern Shore: A Journey In Time And Place** by John R. Wennersten, Tidewater Publishers, 1992 A well-researched and readable book that provides an overview of Eastern Shore history from the 1600’s to the 1990’s. Highly recommended.
- **Eastern Shore Indians of Virginia and Maryland** by Helen Rountree and Thomas E. Davidson, University of Virginia Press, 2007

2. Music, Ecology and Culture (all in one):

- ‘The Bard of the Chesapeake,’ Tom Wisner, Tom Wisner, was lost to us in 2010 but his extraordinary musical and educational legacy lives on. Tom was a one-of-a-kind bundle of warmth, energy, science, and storytelling who loved sharing his first hand experiences of the Bay—it’s ecology, its boats and ships, and especially the people that work on and around the Bay. Available from **Smithsonian Folkways Records** at: <http://www.folkways.si.edu> and **CHESTORY** at <http://chears.org/chestory/cd.htm>. Also take time to explore his educational legacy at **CHEARS**: <http://www.chears.org/>.

3. Internet Resources:

- **Geologic History of the Potomac River Corridor**: <https://www.nps.gov/pohe/learn/nature/geology.htm> Highlights of regional geology presented with brevity and clarity.
- **Introduction to an Ecosystem**: http://www.chesapeakebay.net/content/publications/cbp_13039.pdf A very informative document that encapsulates the ecological science that Chris includes in his presentation at Sultana HQ.
- **Chesapeake Bay Program**: <https://www.chesapeakebay.net/> The EPA website for the Bay. Great info for downloading.
- **Bay Journal**: <https://www.bayjournal.com/> A well balanced publication that discusses current Bay issues and solutions.
- **Chesapeake Quarterly**: <http://www.chesapeakequarterly.net> - Very highly recommended.
- **Chesapeake Eco-Check** (ian.umces.edu/ecocheck) is an informative, fast way to get the straight scoop on how the Bay and its tributaries are fairing on a year-to-year basis. A variety of excellent materials can be downloaded.
- **Bay, Plain and Piedmont** – (www.chesapeakebay.net/content/publications/cbp_19653.pdf) A document that details the history of the Bay Region from deep geological time to the present day. **Very Highly Recommended**.
- **Videos** on Watermen produced by MPT:
 - ‘**Another Dawn: Tilghman In Transition**’: <http://video.mpt.tv/video/2365232114/>
 - ‘**Water’s Edge: Black Watermen of the Chesapeake**’: <https://video.mpt.tv/video/waters-edge-black-watermen-of-the-chesapeake-lo9iwaq/> A loving look at the black men and women who have contributed so much to Bay culture.
 - **The Skipjacks**: <https://video.mpt.tv/video/mpt-specials-the-skipjacks/>
- **High Tide In Dorchester County**: A great film on sea level rise in the Bay. Full length version at <https://vimeo.com/262556485>.
- **Evolution of the Chesapeake Bay and Eastern Shore of Virginia - 3D Visualization and Animation**: (<https://www.youtube.com/watch?v=f7KaJBRcbDg>) A fascinating digital visualization of the Chesapeake Bay’s changes over the last 200,000 years.
- **Sultana Foundation Videos and Learning Materials**: <https://sultanaeducation.org/videos-and-resources/> Want to recap the presentation you saw at the Sultana HQ? This is where you can find all that and more.