

Land Between Water: Landscape Changes of the Eastern Shore

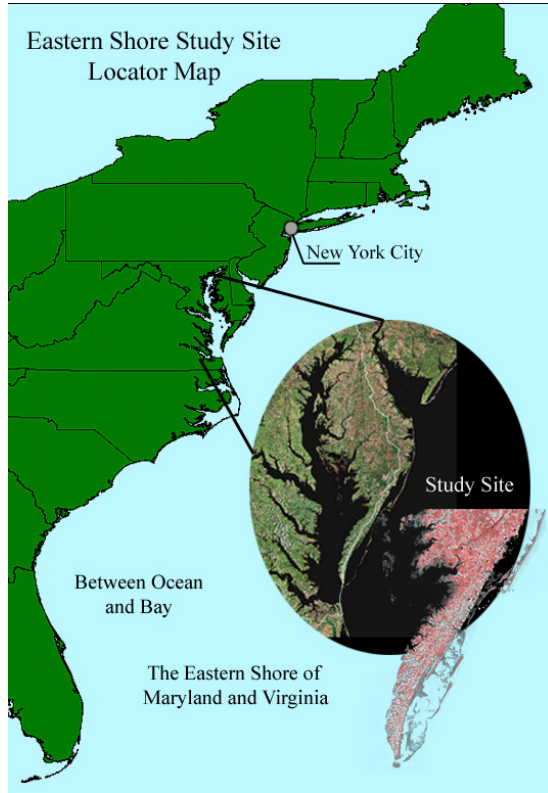


Figure 1: *Eastern Shore Locator Map with Study Site Image Expanded*

Introduction

In a description of the newly discovered Chesapeake Bay region of Virginia, Captain John Smith wrote: “The mildnesse of the aire, the fertilitie of the soil, and the situation of the rivers are so propitious to the nature and use of man as no place is more convenient for pleasure, profit, and mans sustenance” (Smith 1612 from virtualjamestown.org 2007). Early settlers saw the region as a vast wilderness, but to an enterprising man, a land of plenty. From the beginning, the Eastern Shore in present day Southeast Maryland and far Eastern Virginia was destined to see widespread change (See Figure 1). The misplaced logic, that its resources were infinite, sets the stage for 400 years of landscape transformation and degradation.

The Eastern Shore is an isolated land between ocean and bay where estuarine, marine, and terrestrial ecosystems function in concert and provide the backdrop upon which human activities take place. Wave-pounded barrier islands merge into calm back bays, and broad saltwater marshes rise to join

freshwater marshes and inland swamps. Forested flat lands gradually give way to slight uplands and more forest, only to meet marshes at the water’s edge once again. The daily rhythm of all life is shaped and reshaped by the sea, and the ebb and flow of tides are as constant as changes on the land. Barrier island, forest, swamp, marsh, and agricultural landscapes of the Eastern Shore have been altered by longstanding human occupation. It is ironic that the Eastern Shore is among the first settled lands in the United States; yet today it remains isolated and sparsely populated. Megalopolis, the great wash of American humanity, spreads north and south along the east coast and fails to engulf the region. Despite a small population, natural and cultural landscapes look nothing as they once did. As John Smith predicted the land gave up its riches for “mans sustenance” through firs, fishes, trees, and fertile soils, though human success today remains a struggle.

Study Site and Imagery

The study site is situated on the lower Delmarva Peninsula in the Middle States of the east coast (See Figure 1 and Figure 2). Form north to south the site ranges 130 kilometers and from east to west averages 40 kilometers. This narrow strip of isolated land bounded by the Atlantic Ocean to the east and the Chesapeake Bay to the west is no more than 35 kilometers wide at its widest

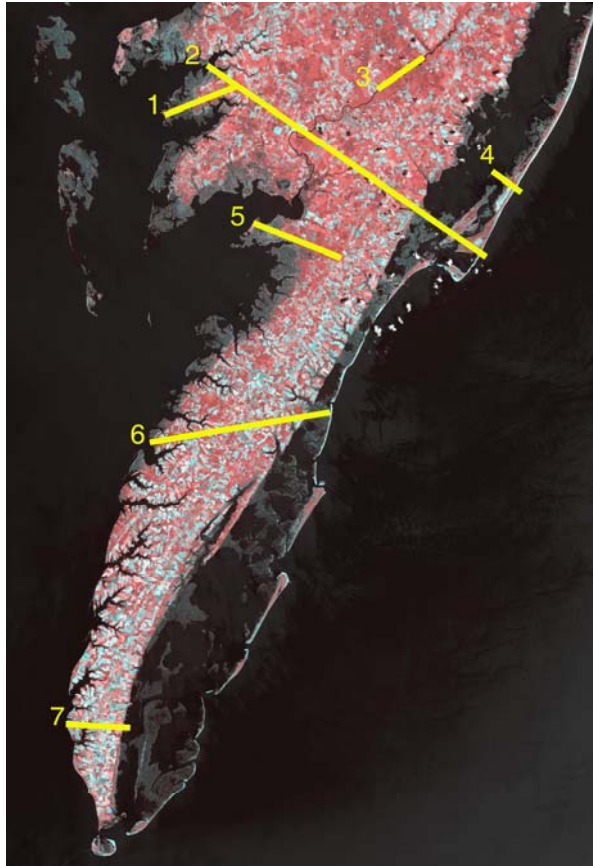


Figure 3: Landsat 7 Image of Study Site with Transect Lines

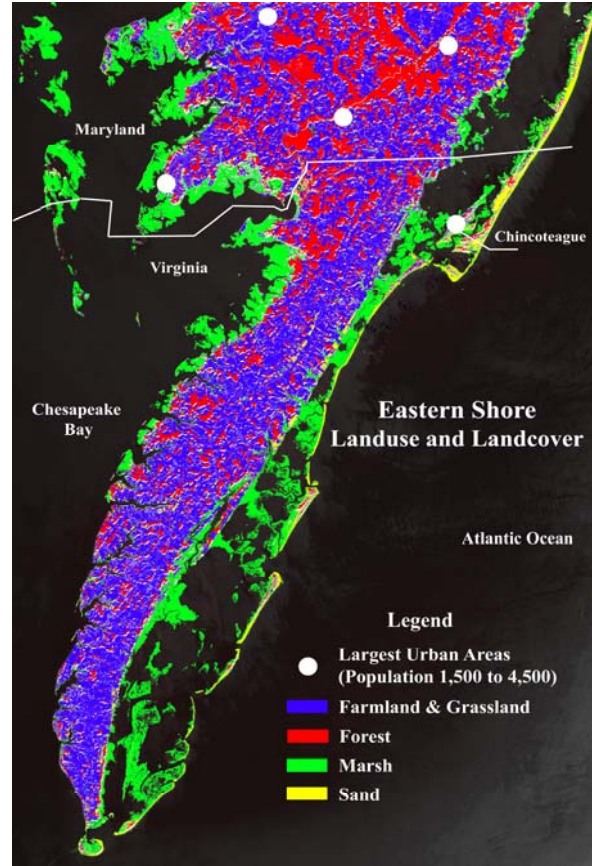


Figure 2: Landuse and Landcover of Eastern Shore with Largest Urban Areas

point in Virginia. For purposes of this study, investigating rural landscape change, it was important for the site to retain only a few small urban centers (See Figure 3). The northern extent of the study site falls just south of Salisbury (population 27,000) and Ocean City (population 8000) Maryland due to the marginally more urban nature of upper Delmarva. The populations of most towns/cities in the study site are less than 1000 with many less than 100. For example the entire population of the Temperanceville Virginia zip code area is 1074 and declining at a rate of -6.0 percent since the 2000 census. The population of Frenchtown-Rumbley Maryland is 96 and declining.

Satellite imagery and multiple on-site transects throughout the peninsula provide the means to survey the study site (see Figure 2). Figure 2 was acquired by the Landsat 7 and Enhanced Thematic Mapper Plus earth observing satellite on July 05, 1999 (The Global Land Cover Facility Earth Science Data Interface). Landsat 7 and the Enhanced Thematic Mapper Plus build on the capabilities of Landsat 5 by enabling better global change functions and land cover assessment. The ground resolution of the image is 30 meters. The image was cropped from 31,000 sq kilometers to approximately one quarter the original. A simple landuse and landcover classification delineating farmland/grassland, forest, marsh and sand was preformed. To generally check the accuracy of the image classification and to carry out a more detailed study of the landscapes, 7 on-site transects were conducted. The transect lines indicated on Figure 2 are approximate, as it was not always possible to stay the course. Most of the transect lines were

carried out by car and boat. Observations along the transects included, among others, barrier island morphology and species composition, marsh type and vigor, wetland alteration, forest type, swamp occurrence, agricultural practice, cropping practice, grazing effects, and development type.

The results from the image classification are revealed in Figure 3. Farmland is by far the most common landcover followed by marsh, forest and finally sand. Non-marsh grassland is included in the farmland classification to account for moderate grazing of mostly cattle. Additionally, some grassland could be abandoned farmland or development sites returning to an early seral stage of succession. Clearly forests that once spread across the area have been decimated and replaced by farmland. At best forests are patchwork. Saltwater and fresh water marshes are commonly found behind barrier islands on the ocean side and on islands and coastal lowlands on the protected Chesapeake Bay side. Marshes do not completely fringe the coastal areas of the study site as should be expected. Both low and high marshes are noticeably undersized in harbors and inlets. Freshwater riparian and palustrine wetlands are likewise lacking.

Settlement

By his own accounts, the first white man to visit the Eastern Shore was Giovanni de Verrazano in 1524. However, Captain John Smith was the first to explore, map, and chronicle his exploits in great detail and the first to advocate regional settlement. In 1608 he left Jamestown and crossed the Chesapeake to the little known Eastern Shore where he surveyed the waters, lands, plants, animals, and peoples of the



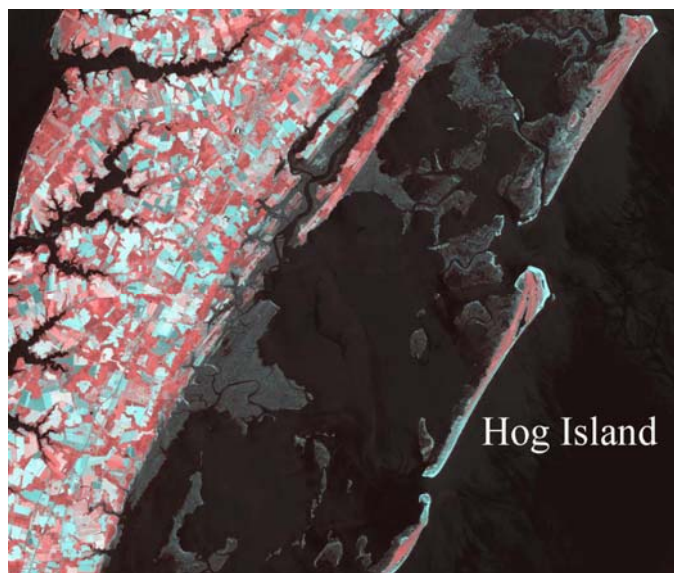
Figure 4: Captian John Smith's 1612 Map of Virginia
Source: Crandall Shifflett © 1999-2007. Virtual Jamestown,
<http://www.virtualjamestown.org/>

region. Published in 1612, he penned the first map of the Chesapeake Bay region (See Figure 4). Alluding to the Eastern Shore's longstanding isolation, there is only one English name on the peninsula - Cape Charle. Present day Cape Charles was named after reigning King James's son. The region is largely illustrated on the map as forest; a resource in great demand in deforested England. In his book, also published in 1612, entitled *A Map of Virginia: With a Description of the Countrey, the Commodities, People, Government and Religion*, Smith clearly sees the

resource potential of the region “The country is overgrowne with trees...wood that is most common is Oke and Walnut: many of their Okes are so tall and straight., that they will beare two foot and a hlafe square of good timber for 20 yard long.” Smith points out the abundance of other available resources to “industrious men” in such statements as: “The have plenty of fruits as well planted as naturall, as corne greene and ripe, fish, fowle, and wilde beasts exceeding fat”, and “...an abundance of fish, lying so thicke with their heads aboue the water as for want of nets we attempted to catch them with a frying pan” (Crandall Shifflett 1999-2007). Convenient water availability, scores of firs of price, and fertile soil marketed the region to adventurous entrepreneurs. There is a general consensus in the literature that Smith tended to on occasion exaggerated. Smith plays the role of a “New World salesman” and benefits from his explorations; however, scholars have substantiated many of Smith’s accounts (Lepore 2007). Following Smiths lead and positive testimony, settlers made the difficult journey to the Eastern Shore, albeit in small numbers.

The first permanent English settler on the Eastern Shore was Thomas Savage. Savage arrived in Virginia in 1608 at the age of 13. As a gesture of friendship, Captain Christopher Newport calling Savage is “son” gave him to Chief Powhatan. Later Savage was able to establish good working relations with the Indians because he had spent three years living and learning their culture. In 1619 Savage left Jamestown and his position as the colony’s chief interpreter and moved to the Eastern Shore. Chief Debedeavon or the “Laughing King of Accomac” gave Savage 9,000 acres on the bayside of the peninsula (Virginia Conservation and Development Commission 1947). Today the area is known as Savage’s Neck and is just North of Cape Charles. Many early settlers followed Savage and left the hardships of Jamestown behind for a better life on the Eastern Shore. During the 1622 Jamestown Massacre the new inhabitants of the Eastern Shore remained in good stead with Indian populations largely due to Savage. By 1624 the Plantation of Accomac rose to importance to become a trading post for furs, timber, and crops. Savage was often called upon to be the Plantation interpreter to the Indians. More settlers and plantations soon followed. They drained the soils, and cut the timber to grow corn for food and tobacco as a cash crop (Burghard 1974). According to "A Muster of the Inhabitation of the Easterne Shore Over the Baye" in "Musters of the Inhabitants of Virginia 1624/5" there were 50 permanent settlers living on the Eastern Shore in 1625 (Meyer and Dorman 1987).

Barrier Islands



Barrier islands stretch along the entire eastern seaboard of the study site. It is the longest expanse of coastal wilderness remaining on the eastern coast of the United States. Figure 5 is a close-up view of barrier islands off the coast of Virginia. These islands are the most well preserved barrier islands left in the United States. Major ecosystems are linear, trending north and south and parallel to the Atlantic Ocean. Such a pattern clearly reflects the

Figure 5: Barrier Islands

inescapable influence of the ocean. On a typical island, from east to west ecosystems naturally change in this order: ocean, beach, primary dune, freshwater wetland swale, backdune, barrier flat forest, high salt marsh, low salt marsh, tidal flat, and bay. Vegetation has to be very hardy and adapt to frequent inundation, salt spray, permeable soils, hurricanes and herbivory. The slightest rise and fall of the land determines the ecosystem type. The primary dune is wind and salt blasted and extremely permeable to water; thus, only salt tolerant xeric beach grass can survive. A higher freshwater table between the dunes in the swales allows for herbaceous plants. The back dune is more protected from wind and salt spray and is home to diverse scrub/shrub species. Desert like backdune scrub may be dominated by southern bayberry, wax myrtle, and seaside little bluestem. The barrier flats are the most interior regions of the island; thereby, can sustain forests. Interesting, loblolly and scrubby oak forest are no taller than the primary dune. Trees match height to the foredune or are subjected to salt spray aloft. On the bay side a gradual rise inland to the mean high tide mark separates low from high salt marshes.

Barrier islands have escaped much of the human influenced landscape changes that the rest of the Eastern Shore has experienced. Eastern Shore barrier islands are a harsh environment for human activities. From destructive storms off the Atlantic Ocean to incessant mosquitoes, barrier islands were not settled when other land was readily available. Occasionally settlements were established on the islands. The town of Broadwater used to be home to more than 250 permanent residents and 80 buildings. Residents earned their living by working cattle, fishing, and from the thriving tourist industry. In the 1930's hunters, fishermen, and beachgoers flocked to the Island. Not one person or building remains today (Samarrai 2000). Barrier island sands are eroded and reshaped constantly by storms especially during hurricane season. The people of Broadwater abandoned their town after fighting a losing battle with erosion.

Grazing and development have caused the most human induced landscape change on barrier islands of the Eastern Shore. Early settlers found natural fencing in the islands. Surrounding water made it nearly impossible for livestock to escape. Pigs, cattle, and horses were left on their own to graze the marsh grasses and swale green stems and fatten. The name of one of the Islands – Hog Island - is testimony to this practice (See Figure 5). After the animals overgrazed the palatable saltmeadow cordgrass upland European grasses were seeded in drained or drier areas to compensate. These grasses are now naturalized on the barrier islands (Scott 1991)

Wild pony's graze the Chincoteague/ Assateague barrier island (See Figure 6). The actual arrival of the ponies is not known; however, most likely they are descendents from colonial livestock. A more romanticized version is that the ponies arrived by ship wreck. The Spanish ship, San Lorenzo, in 1821 is said to have run aground off Pope's island carrying blind ponies used for mining. Regardless, they do cause minor erosion by beating paths for grazing in the marsh grasses and swales. While the pony's

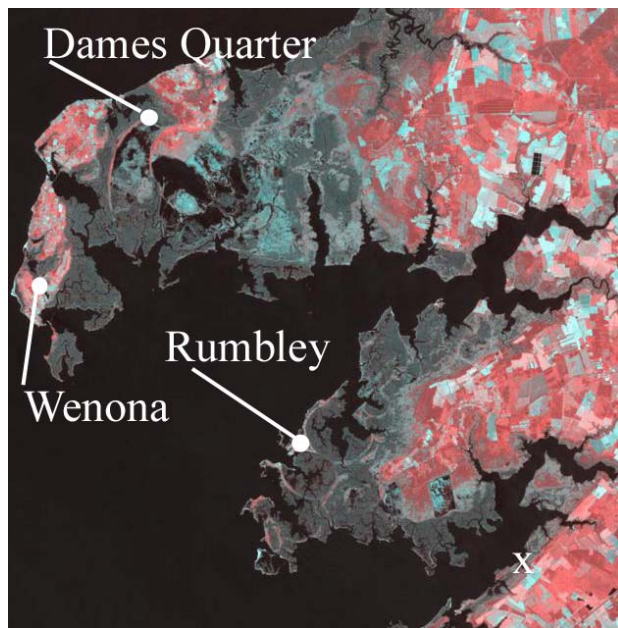


Figure 6: Wild Pony's on Barrier Island Beach

populations are kept low, they out-compete other herbivores. When mosquitoes are at their worst, and the heat is intolerable, they follow eroded paths across the primary dunes for the beach to seek wind and relief. While the famed pony's directly impact the islands little, indirectly they are the cause for much tourism and development. During Chincoteague's Wild Pony Swim approximately 40,000 visitors clamor along the over crowded shoreline to glimpse the wild ponies. The ponies have become indispensable as a tourist attraction.

Development is a threat to the barrier islands. Development follows tourism. The road across the shallow marsh backbay to Chincoteague is marked by dozens of large billboards all advertising tourist attractions. In the 1960s as tourism rapidly grew, developers began to buy barrier island beach front land with the intent of building seaside resorts like Ocean City to the north and Kitty Hawk to the south. Fortunately, the Nature Conservancy owns 14 of the 18 barrier islands along Virginia's eastern shore. Nearly 40 thousand acres are protected from development and habitat encroachment. However islands or portions of islands that are not owned by the Nature Conservancy, such as Cedar Island, continue to be threatened. From the Virginia boarder north to Ocean City Maryland, the Assateague Island National Seashore is managed and protected by the National Park Service.

Marshes



A marsh is a flat, shallow wetland that is dominated by grasses, rushes, sedges, reeds, and cattails. Figure 7 is a close-up view of coastal marshes in Maryland's lower Eastern Shore. Grey to teal colors on the image indicates marsh. Tidal salt marshes are most common; however, brackish and freshwater marshes mark the transition inland to terrestrial vegetation. Salt marshes are monotonous as they are almost entirely composed of cordgrass. Saltmarsh cordgrass is found in regularly flooded areas below mean high tide or low marsh. High marsh is discernible by a transition of shorter saltmarsh cordgrass to saltmeadow cordgrass in irregularly flooded areas above mean high tide.

Figure 7: Marshes of Lower Eastern Shore Maryland

Coastal marshes throughout the Chesapeake Bay are degraded at a disturbing rate as a result of rising sea level, development, agriculture, invasive species, and increased salinity. In the lower Chesapeake Bay alone, 72 percent of the 33,585 hectares of marsh are slightly to moderately degraded or severely to completely degraded. Marsh degradation is most pronounced on the Lower Eastern Shore of Maryland (Kearney et al. 2002). The likelihood of marsh losses increase as they are progressively degraded. Not accounting for the thousands of hectares already lost, most of the remaining marshes are at risk. As marshes decline floods,

pollution, and sedimentation increase, fish, and shellfish decrease, and habitats are lost. Up to 66% of the fish and shellfish caught by commercial fishermen spend a portion of their lifecycle in these wetlands. The eastern shore is one of the poorest regions in the United States. Twenty five percent of the population lives below the federal poverty level. With a decline in marshes, the nursery ground of the fishing industry, people's livelihoods will likewise diminish.

Each of the fingers of land extending into the Bay in Figure 7 should largely be comprised of marshes. Historically marshes would have extended throughout the lowlands between the towns of Dames Quarter to Wenona. Today the greatest threat to coastal marshes on the Eastern Shore is rising sea level; however, during the settlement years marshes were more likely to succumb to draining. Settlers channelized, diked, and drained marshes because they were wild, unhealthy, and mosquito infested. Marshes harbored insects and disease and were drained for public health. Saltmeadow cordgrass in high marshes were perfect grazing areas for cattle once they were drained. This saved farmers work as they did not have to clear land to create pasturage. All in all much of the marsh landscape was lost. For example, in Figure 7 marshes along the Big Annemessex River, south of Rumbley have been drained and converted to agricultural land. On the southern shore of the River (marked with an X) only a very thin linear strip of marsh remains.

To drain a marsh the hydrologic conductivity to surrounding wetlands had to be severed. First a ditch was dug for drainage. Then the soil from the ditch was heaped to form a bank or dike. The dike keeps the water out. Dikes may reach heights of 3 meters. Floodgates on the dike controlled water flow. Roads were commonly built on top of the dikes to prevent them from flooding. The large circular arcs in Figure 7 are roads built on top of the dikes. Figure 8



Figure 8: Ditched and Diked Marsh

illustrates a ditch and dike system of drainage. The marsh is on the right and the drained land on the left of the ditch. On top of the dike is a road. The hydraulic conductivity has been lessened by the dike; thus, non-wetland species will begin to colonize the former marsh area. Because the soil is better drained on the dike and landward side of the ditch it will support woody stem shrubs such as wax myrtle and marsh elder.

Draining marshes was hard work. After slave labor was no longer available, drainage ditches and dikes became defunct allowing for some marshes to naturally recolonize. Supported by the Virginia and Maryland State Governments, ditch digging in Estuarine, riparian, and palustrine

wetlands began again in earnest in the late 1800's to support agriculture. These ditches became known as tax ditches. Tax ditches are still in use, although the focus is shifting away from agricultural land. On Maryland's Eastern Shore 75,000 hectares are drained to allow agriculture, forest, roadways, commercial areas and home sites, (Maryland Department of Agriculture).

The faulty notion that marshes and other wetlands are a public health threat still lingers today. On the official website for the State of Delaware, the Board of Ditch Commissions state "Low, wet, swampy or overflowed lands are a detriment to the public health, safety and welfare". Marshes do harbor mesquites and mosquitoes on the Eastern Shore are thick despite great efforts toward suppression. Ditches were dug in great numbers as late as the 1960's to prevent the spread of mosquitoes. The approach never worked well, but devastated marsh ecosystems. Hundreds of thousands of meters were cut until many marshes resemble a grid today. From settlers looking for a place to graze their cattle to residents seeking mosquito relief, marsh landscapes of the Eastern Shore have been ditched and drained. Not until recently has legislation and policy favored marshes. Left alone, marshes will recover.

Forests



Figure 9: Deforestation with Young Even-age Trees in Background

Historically the Eastern Shore was heavily forested throughout. Since the first white settlers arrived, every stand of forest at some point has been cleared. Forests that were not converted to another landcover have been cleared multiple times. Undoubtedly, the first to be cut were the great stands of white and Delmarva oak to supply the colonial shipbuilding industry (Scott 1991). What remains today is neither similar nor as vast as forests of the past. At best forests are patchwork with greater than 75% of the region deforested (See Figure 9). It is the single largest landscape change to occur on the Eastern Shore (See Figure 2). Forests were primarily cleared for crops, timber, grazing, charcoal, and development. Today farmland is easily the principal landscape.

The rich forest soils were perfect for agriculture once the trees were removed. Tobacco, corn, wheat, potatoes, and soybean crops have been cultivated in large quantities covering most of the region. Trees were burned or cut to create pasturage for grazing animals or for haying and feed.

Forests were leveled to produce charcoal for the iron industry, and to a lesser extent, as a key ingredient in gunpowder. One of the greatest motivators of early explorers and settlers to the region was to find gold and other precious metals. Much to their disappointment they found none. As

it turned out the real precious metal was iron. Bog iron or goethite deposited in thick layers along the Nassawango Creek a tributary of the Pocomoke River in Maryland was dug beginning in the 1830's. This source of iron played an essential role in the early development of American industry (Mountford 2004). Iron ore of better quality and greater abundance was later found in nearby Delaware eclipsing the importance bog iron. Blast furnaces fueled by locally made charcoal were used to purify the goethite and ore. Thousands of trees were cut and slow fired in a kiln to produce charcoal to keep the furnaces burning day and night. The diminished town of Furnace on Nassawango Creek is a relict from the boom years when the Maryland Iron Company smelted bog iron barged to it from the forested swamps.

Forest composition differs throughout the area largely based upon human intervention and local variations in soil, moisture, nutrients, sunlight, and slope. Overall the forest type, classified as such by using indicator species, is pine-oak. Typical overstory trees are: loblolly pine, Virginia pine, shortleaf pine pitch pine, southern red oak, Virginia live oak, black jack oak, post oak, and white oak. Soil moisture determines four major natural forest communities on the Eastern Shore – sandy dry, well drained, moist, and wet. In very sandy soils near the coasts scrubby pines and oaks adapt to more desert like conditions. Precipitation rapidly drains through the permeable sand leaving the tree little time to absorb moisture and nutrients. Trees will have thick, waxy, and hard leaves to store moisture, prevent evaporation, and discourage herbivory. In well drained, more interior, soils the forest community is dominated by hardwoods such as oaks and hickories and is mixed with loblolly. On moist bottomlands loblolly pine, red maple, white oak, pin oak, black willow, swamp cottonwood, black gum and sweet gum form a community. Northern and southern species mingle in this zone. Saturated soils require highly adaptable wetland tree species to form a community. Too much water will just as easily kill species as too little water. Standing water creates anaerobic conditions in the soil. Without oxygen to help metabolize nutrients non-adaptive trees perish. Bald cypress occupy the very wet riparian zones swamps.



Figure 10: Loblolly Pine Monoculture

Loblolly pine was encountered with greatest frequency on the transects (See Figure 10). These trees are very adaptive and can outcompete other species; however, it does need full sun for maximum growth. In ideal conditions, it can grow so rapidly, two feet per year that it quickly towers over other vegetation and shades-out its competition. The name loblolly means low wet place; yet, it can grow in a wide range of soils from moist to dry. Dwarfed loblolly even grows in xeric conditions. Loblolly pine is an early colonizer and quickly moves into abandoned fields, and timber harvested areas seeking sunlight; thus, humans have played a key role in making loblolly pine the most common tree in the region. It is the tree of choice for replanting a clear-cut area because it grows straight and fast, and the wood is strong and valuable. With the frequent use of herbicides to remove competition, loblolly pine monocultures are secure in their dominance despite recent infestations of southern pine beetles. The fact that there are so many loblolly pines indicates that the regions forests have been cut repeatedly. Loblolly pine is an

early successional tree. Following a disturbance the tree moves in and, if left alone, will continue to develop to maturity. There are scattered mature loblolly pines on the Eastern Shore: however, their seedlings cannot endure the high degree of shade found on the floor of an older forest. When humans harvest trees, thereby creating a disturbance that allows sunlight to reach the ground, succession is essentially reset allowing pioneering loblolly pine the opportunity to invade.

Interestingly stands that mature, perhaps because they are protected as park land, refuge etc., do not accurately reflect past forest communities. If left alone, pine forest is replaced by deciduous hardwoods. Even if humans had not intervened by favoring one species over another, loblolly pine and Virginia pine still would be exceedingly widespread. Historically fire must have been common to the region. After a fire disturbance, pines will quickly invade and preclude stands of pure deciduous hardwoods the chance to mature. Fire favors the growth of pines. Pitch pines in the area actually require fire to heat their cones and release their seeds. Because forests are valuable, are near development, and/or are a tourist attraction, fire suppression is practiced throughout the region. Subsequently, protected forests are changing to become dominated by hardwoods and the good intent to recreate patches of the past is misguided.

Forested Wetlands and Swamps

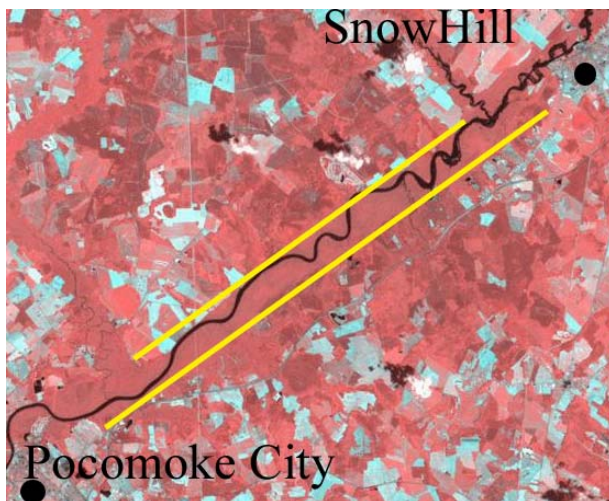


Figure 11: Floodplain Forested Wetlands and Swamp

Giovanni da Verrazano sent a landing party into the wilderness of the Eastern Shore after entering what was most likely Chincoteague Bay in 1524. After only two leagues (about 10 kilometers) of interior ward exploration, they were stopped by an impenetrable barrier of shallow water, trees, muck, and mud (The Mariners' Museum, 2007). The remnants of this vast swamp still persist today along the Pocomoke River, though it is much changed and depleted. Like the demise of other forest in the region, most forested wetlands and swamps have been cut, drained or burned.

When considering the many rivers, creeks and interior depressions, it is not surprising that there is nearly double the amount of forested wetlands and swamps than marsh on the Eastern Shore (Scott 1991). As salinity levels drop and becomes freshwater, marshes give way to inland riparian wetlands with trees. Grasses and other freshwater emergent aquatics are rare. Only in scattered locations, mostly in upper reaches, do they form narrow linear strips along each side of a stream. The area between Pocomoke City and Snow Hill on the main stem of the Pocomoke River is tidal and experiences daily inundations, thereby forming a vast treed wetland inland of marshes by about two miles (See Figure 11). The wetland falls fully within the floodplain, illustrated on the image by the two yellow lines, and is completely confined by farmland.

Forested wetlands and swamps, in the absence of disturbances, are an edaphic climax which has replaced marsh (Beaven and Oosting 1939)

While forested wetlands and swamps are similar, thus difficult to differentiate in this classification scheme from other forest, they do differ greatly to an observer on the ground. Swamps are a type of forested wetland as they are both dominated by trees. The primary difference is that true swamps are wetter, with standing water throughout all or most of the growing season. Far more common are forested wetlands that are periodically flooded and primarily composed of hardwoods that adapt to wet and drier conditions. Variations in the length of inundation are critical for creating a mixture of community types. Swamp species that have best adapted to prolonged or constant inundation along rivers and streams are cypress, in standing water, and black gum, a short distance inland with white cedar in the transition zone to slightly upland surroundings. Where the ground is mostly above swamp level, loblolly pine is the most plentiful tree. Forested wetlands with frequent inundation are less wet than swamp and are abundant in various species of wetland oaks, red maple, loblolly pine, sweet gum, green ash, and river birch. In a mature system these trees get large, and maintain open, poorly developed understories where the floor is littered with rotting logs and other debris deposited by flood waters. In contrast, drier circumstances prevail toward the margins of the floodplain which are marked with multiple natural levees with distance from the stream that act as dams to smaller floods and impede the landward spread of over channel flow. Where flooding is not as prolonged, upland and lowland species mix forming a transition zone to higher forest with greater diversity. Oaks, maples, pines, hickories, gums, ashes, birches, alder, poplar, sycamore, and beech combine with greater density and have an understory of smaller shade tolerate trees. Because the forest floor is not covered in water, woody shrubs and herbaceous plants may grow.

Forested wetlands can be converted to rich farmland. Once trees were removed and the land drained, crops were planted to take advantage of the mineral rich alluvial soils. After harvesting crops the stream served as an easily assessable highway to markets. Forested wetlands were reduced to thin ribbons paralleling the stream. Even these buffers would have been cut had they not been highly flood prone. In places where forested wetlands have returned in abandoned agricultural lands the composition of the forest has changed. Fast growing loblolly pine prevails in acidic soil. Red maple is also common to these disturbed forested wetlands. It grows rapidly, is shade tolerant, is a prolific sprouter, and can survive in a wider range of edaphic conditions than most any other tree in North America. Because red maple is considered a subclimax species, disturbed areas over time and left alone should return to its pre-disturbed forest composition.

True swamps are found largely in the Maryland region of the eastern shore. The Pocomoke Swamp which extends along tributaries to Delaware's Great Cypress Swamp is unusual in that it is the most northern of all large baldcypress swamps. It was once considered an almost impenetrable wilderness, yet early settlers managed to exploit it for its valuable timber. Baldcypress wood is rot resistant and extremely durable so it was in great demand for boat building, siding, fencing, and shingles. Homes in the region surviving from this era still feature cypress. Consequently the swamp was cut at an early stage of settlement over its entire extent (Beaven and Oosting, 1939). Fortunately, parts of the lower swamp which were not drained for

agriculture because of constant flooding or did not burn were logged many years ago and have returned to resemble the original forest.

It is a misnomer to simply refer to swamps of the Pocomoke region as cypress swamps. In fact there are many tree species found in the swamp with transition to upland forests. What grows where is largely edaphically controlled. Baldcypress is most abundant adjacent to the stream where high water excludes other less adaptive species. From the stream's edge inland baldcypress quickly mixes with black gum until it is no longer dominant. Black gum becomes the most important species but is mixed with red maple, sweet gum, smaller green ash and occasional swamp cottonwood. White cedar is situated closer to the transition zone with upland forest, but still within the swamp. Unusual for a transition zone species, white cedar forms nearly pure stands. The conditions under which white cedar live are very harsh and have led to the elimination of much of its competition. White cedar thrives in highly acidic peat soils. Overtime peat accumulates until there is little standing water making a habitat suitable for white cedar. This explains why white cedar is seldom found directly adjacent to the river. It prefers partially drained spongy soil. On the border of the transition zone, soils are less wet and less peaty allowing the pure stands of white cedar to mix with water oak, swamp oak, white oak, red maple, river birch and others. Scattered through the swamp are islands of uplands where loblolly and pond pine persist.

White cedar like baldcypress was in such demand that it was nearly eradicated from the region (Scott 1991). It grew in less saturated conditions and in pure stands making it easier to harvest. Being rot resistant and nearly unsinkable ships and fishing boats were built from it in great numbers. Certainly swamps were degraded or outright destroyed by logging and draining, but they were also burned. Settlers were responsible for the devastation brought about by burning even if they did not directly start the fire. They were successful in their endeavor to dry the peaty soils by building drainage ditches. Timber harvests increase sunlight and evaporation causing the watertable to drop and likewise dry out the peat. Dry peat is extremely flammable. During drought years fires were common. One fire in the 1930's lasted for eight months and so devastated the swamp that it is still referred to today as The Burnt. In burned locales there is little peat accumulation and most of the land is under water. With less peat and vegetation in burnt areas of the Pocomoke, water flow is faster thus hindering reestablishment of swamp.

Agriculture

Unlike the natural landscapes discussed thus far, agriculture is part of the built environment. Nonetheless it deserves attention as a landscape because it is so widespread. While agriculture is necessary, it is a common factor in the alteration or destruction of natural landscapes. Marsh, forest, and swamp landscapes have particularly yielded to agriculture. From early settlement the agricultural landscape has changed many times to reflect the demands of a growing population and a



Figure 12: Large Corn Field with Recent Growth
Forest Boundary

declining resource base. The one constant is that agriculture was and still is the mainstay of the eastern shore economy.

Three counties are entirely situated in the study region: Accomack and Northampton Virginia and Somerset Maryland. Of all possible combinations of natural landcover or human landuses fully one third of the total land area in these three counties is farm (United States Department of Agriculture, National Agricultural Statistics Service 2002). In reality over the course of human occupation of the region nearly all land that could be easily converted to farm was changed. The survival of settlers required the principle landcover of forest to be converted to farmland. Even the woodlots that once accompanied farmland used for, fuelwood, fencing, and fertilizer sources, were diminished. Woodlots made up as much as one third of a farmers land and were especially prized as a source of leaves and needles for humus and soil fertility. Electricity, metal posts, and widespread availability of fertilizer ended the necessity of woodlots and farmland grew.

Scattered farming and small family farms with natural cover between properties never really had a chance on the Eastern Shore. From the beginning four factors emerged which were conducive to the extensive development of farmland and to the emergence of large individual farm landholdings: an uninterrupted flat terrain, widespread rich soils, a supply of cheap labor, and sizeable land grants. The ease to which farmers could work their land was favored by flat to slightly rolling terrain. Twenty to 25 meters marks the highest elevations in the region with most areas between lying between 0 and 5 meters. Level farmland with few topographic interruptions like gullies or boulder fields, especially along the interior spine of the peninsula, allowed for larger plots. Soils throughout the region that are not continuously saturated or overly permeable are naturally fertile. Beneath forests, accumulation of leaf litter form deep rich organic and humus layers particularly in those areas which are dominantly hardwood. Streams have played an important part in regional soil fertility by depositing mineral rich alluvium. Predominantly the soils are a sandy loam and are ideal for most agriculture. After the Jamestown Government began to settle the Eastern Shore in the 1620s, Africans were brought in to work as slave laborers on the growing number of plantations. Preparing the land for farming was an immense undertaking, not to mention growing the crops, and without slave labor and indentured servants the pool of workers would have been too small to clear and maintain plantations. Land grants were given with the intention of establishing settlements and farms. In an effort to persuade immigration into the colony, the Virginia Company passed a provision in 1618 that granted 50 acres of land to any person that settled in Virginia or paid for the transportation cost of another person who settled in Virginia (Gentry no date on line). This system favored the rich and the creation of large individual landholdings as the wealthy could send many individuals and collect a Headright – fifty acres per head- on each. King James I revoked the Virginia Company's Charter in 1624; however, the provision continued to be used because it was in the King's interest to dispose land titles that would earn him a profit and reward allies (Gentry no date).

Although some families can trace their land back to the original grant, most land has changed hands many times. Large farm estates on Virginia's Eastern Shore were divided and subdivide to account for the population boom years of 1880 to 1925 following the arrival of the New York, Philadelphia, and Norfolk Railroad system; however, average farm size remained reasonably significant. In 1880 there were 2,997 farms in the region and by 1925 the number of farms had increased by 1,859 (Thomas, W. III, Barnes, B., Szuba, 2007). Accommodating such rapid

growth, average farm size decreased from 35 to 19 hectares during the same period. Because average farm size was inexorably tied to prosperity, farms rarely shrank to areas so small that working the land could not possibly earn a living (Thomas, W. III, Barnes, B., Szuba, 2007). Overworked small plots failed and farm size reached a practical minimum that was sufficiently large. Since 1925 average farm size has increased to the point that it reflects colonial proportions. The average farm size in Virginia's Eastern Shore is 115 hectares consisting of merely 505 farms. Maryland's Eastern Shore (Somerset County) has 301 farms with an average size of 76 hectares (United States Department of Agriculture, National Agricultural Statistics Service 2002). Farming is big business and farm size is more a function of huge machinery operating more efficiently on large uninterrupted plots of land. The consequence is a monotonous agricultural landscape that lacks the frequency of "patchy nature" that would otherwise be shaped along the borders of smaller plots.

Wild sassafras, strawberries, hickory nuts, and walnuts were gathered and traded, corn was cultivated, eaten and sold, but Tobacco was the Eastern Shore's first successful cash crop. The landscape suffered the demand. Landowners built large plantations on the success of tobacco, the gift of royal land grants, and the backs of slave laborers. Tobacco was so common that it was used to pay debts and wages. It grew well in fertile sandy soil, but like monocultures of today, at a price. When demand was high land was quickly cleared to profit from high prices and when demand was low more land was cleared to compensate for losses. Growing tobacco was so land intensive that thousands of hectares of forest were simply burned. The process for cultivating tobacco required the forest to be burned rather than harvested for the best quality crop – in effect the trees were fertilizer. To grow tobacco a field was burned and the seeds were planted in the ash layer near the surface so that the light could penetrate and begin germination. By April the young seedlings were transplanted to another field, covered with branches to prevent frost damage and then allowed to mature until harvesting. Tobacco rapidly declines soil fertility and because land was plentiful early settlers did not practice any type of field rotation. After three to four year of production the soil is exhausted and the labor and land intensive practice must move to a new area. By the early 1700's farmers commonly practiced rotation methods, out of necessity, that allowed for depleted tobacco fields to remain fallow for up to 20 years (McIlwraith Thomas F., and Muller Edward K. 2001). To compensate, fresh land had to be continuously cleared. In this manner one study estimates that in less than 150 years of European colonization in the Chesapeake Bay region virtually all of the forested landscape was removed for agriculture (Benitez, Jorge A. Fisher, Thomas R. 2004). Tobacco was the economic base upon which the early colonist of the Bay region began to build America.

Corn replaced tobacco as the main cash crop cultivated on the Eastern Shore by 1750 (Scott 1991). Market setbacks, exhausted soils, and increased pestilence associated with tobacco monoculture lead to its decline. Later grain cropping of both corn and wheat dominated the land. Mixed with grain cropping were other important types of agriculture such as strawberry and blue berry farms, peach and apple orchards, cattle and hog free ranging, dairying, and haying. The potato, like tobacco took the Eastern Shore by storm. Beginning in the late 1800's the population of the region increased due to the arrival of the rail road. The growing population put pressure on the supply of farmland requiring the land to be worked more intensively. In Virginia's Eastern Shore white potato production increased from 1,269,055 bushels in 1900 to 12,873,339 in 1924 (Thomas, W. III, Barnes, B., Szuba, T. 2007). This tiny remote area became

a worldwide force in potato production and easily competed with produce exchanges in Baltimore, Philadelphia, and New York. The number of wooden barrels used for shipping potatoes, alone put tremendous stress on the remaining forests. With widespread use of the automobile and better roads mixed farming of grains, potatoes and vegetable truck farming grew. Onions, cabbage, and tomatoes were important cash crops. The last major change to the regions agricultural landscape took place near the close of the potato heyday. Dunghill fowl or chickens rose to prominence. Several broiler hatcheries survived the Depression and by the 1950's chickens became big business. Broiler chickens are raised under controlled conditions allowing hundreds of thousand of birds to be packed into one processing barn. According to the 2002 Agricultural Census, 63.8 million broiler and other meat-type chickens were sold in Somerset Maryland and 31.7 were sold Accomack Virginia. Seemingly poultry farming should prove positive to the natural landscape because it occupies less space resulting in abandoned farmland which overtime should resemble the pre-agricultural environment. Chickens need to eat and the majority of their food source is supplied locally. Corn is by far the principal crop by quantity, followed by soybeans and then wheat. Crop rotations of corn-soybean or corn-corn-soybean, or corn-wheat-soybean have proven to be successful. More sustainable agricultural practices in the region use soybeans which can convert atmospheric nitrogen into useful compounds such as ammonia, alternated with non-nitrogen fixing corn and wheat. Chickenfeed fields of corn and soybean now prevail as the dominate landscape in the region.

Development

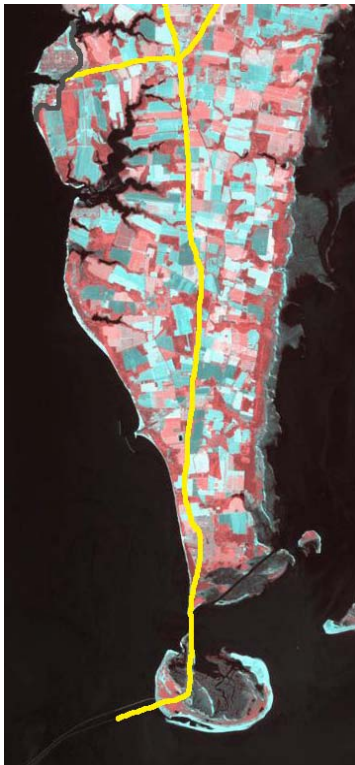


Figure 13: Chesapeake Bay Bridge Tunnel and Urban Development

Arguably the next big landscape change to be made on the Eastern Shore will favor urban development. Better transportation seems to be the key for increased development. Early settlers used the many rivers and creeks on the peninsula as transportation corridors and development followed. The principal mode of transportation for people and goods remained linked to natural and constructed waterways until 1884 when the railroad came to the Eastern Shore. The railroad linked the region with the rest of the East Coast and reduced isolation. These were boom times and prosperity, population, and development surged. Throughout the regions settlement, past and present, it was in 1910 that the highest population was reached. The total population for Accomack, Northampton, and Somerset counties at this time was 79,777, today the total population still trails at 76,145 (United States Census Bureau). The railroad stimulated commerce and made the public acutely aware of just how poor their roads were. One track dirt roads best traveled in dry weather were adequate for horses, but with the arrival of the automobile and growing commerce better roads were needed. Following the lay of the railroad a concrete road running the length of the peninsula was begun in 1923 (Thomas, W. III, Barnes, B., Szuba, T. 2007). The highway surpassed the railroad as the main form of transportation forming an inland corridor of development along its path. Principal roads are marked in yellow in Figure 13.



Figure14: Inexpensive land and houses are attracting people to the area to own a second

The area retains a pleasant rural feel which ironically could be its downfall. It is likely that the region will increase development as an outlying suburb of Norfolk and Virginia Beach metropolitan areas. The Chesapeake Bay Bride Tunnel connects the Eastern Shore near Cape Charles with Norfolk and Virginia Beach by spanning 37 kilometers of the Bay (See Figure 13). While it opened in 1964 the population of the adjacent area increased slowly, but by the year 2000 population increased dramatically. The population of Cape Charles was 1,134 in 2000 and the estimated 2006 population is 1,470 for a 29.6 percent increase (United

States Census Bureau). Two factors can account for this increase: development initiatives and fare reductions. Despite 400 years of development Accomack and Northampton counties are among the poorest areas in Virginia. Recently the counties have benefited from multiple federal and state development initiatives such as the President's Council on Sustainable Development program and The Governors Opportunity Fund. Commuters are now more willing to make the trip from the Eastern Shore to work and back because the Chesapeake Bay Bride Tunnel fare was reduced. Rather than charge the full fare of \$12 each way, the return fare is now \$5 if the commute is completed in 24 hours.

Another important corridor encouraging development is the Chesapeake Bay Bridge which was opened to traffic in 1952 and connects the Baltimore Washington Metropolitan Areas to Maryland's Eastern Shore. While too far for commuter traffic, the bridge links tourist to Assateague Island, and Chincoteague, and to historic and natural sites of the region. The tourist industry has already stimulated the development of, hotels, restaurants, antique malls, and gift shops scattered along the main north and south route. Golf courses, theme campgrounds, and second homes appear near attractions like beaches, parks, and fishing centers (See Figure 14). Tourism is the only contender that could challenge the regions agricultural dynasty as a new more diversified economic base.

Conclusion

Barrier Islands are the least changed landscape. The primary impact to the islands was grazing by swine and cattle. Tourist related activities and development poses some threat; however, most of the barrier islands are now protected by private environmental organizations and as state and federal parks. Marshes throughout the region are heavily degraded or no longer exist. As much as 72% of marshes have been moderately, severely or completely degraded. Historically most of the change was caused by diking and draining for agriculture and grazing, today the greatest threat is rising level. Forest was the principal landcover on the Eastern Shore. Greater than 75%

of the area is now deforested and there are no primary forests left. Forests were primarily cut and burned for farmland, timber, grazing, charcoal, and development. The species composition of areas that remain forested have likewise been changed. Loblolly pine is the dominant tree species and often is grown as a monoculture. Forested wetlands and swamps once occupied all the riparian lowlands and depression. Most of these areas are now cut, drained, or burned of their original habitat. Forested wetlands are found in thin patchy ribbons along streams because most were converted to rich farmland with easy access to water transportation. Overall the main changes to the swamp landscape are: drastic decrease in area, less mature forests, increased open water, and the proliferation of red maple, sweet gum and pines reducing baldcypress, black gum and white cedar habitat.

Agriculture is responsible for most of the landscape changes in the region. Fully one third of the land cover is farm. Large farms dominate the landscape and do not allow for the development of natural borders and patches that would be expected between smaller farms. Smaller plots failed because they were overworked and could not provide their owners with a living. Tobacco was the principle crop of the early settlers, but eventually failed after exhausting the areas soils. Corn replaced tobacco as the main cash crop and later white potatoes harvests brought some degree of notoriety and prosperity to the region. Today chicken farming dominates the landscape.

Smith described the region as perfect for settlement; with a caveat, those that settled had to be willing to change the land through hard work to earn prosperity...."heaven and earth never agreed better to frame a place for means of habitation being of our constitutions, were it fully manured and inhabited by industrious people" (Smith 1612 from virtualjamestown.org 2007). Despite their hard work most of the region's inhabitants have not economically prospered. Population growth is clearly not depended on initial settlement. With over 400 years to develop the regions remains largely isolated. For better and worse industrious people settled the land and changed each of the major natural landscapes – barriers island, marshes, forests, forested wetlands and swamps, to favor a land remade by agriculture.

References:

Crandall Shifflett © 1999-2007. Virtual Jamestown, <http://www.virtualjamestown.org/>. John Smith 1612. A Map of Virginia: With a Description of the Countrey, the Commodities, People, Government and Religion

Lepore, Jill. 2007. American Chronicles, "Our Town," The New Yorker, April 2, 2007, p. 40

Burghard, August. 1974. "America's First Family: The Savages of Virginia", Dorrance & Company, Philadelphia, PA, 1974

Virginia Conservation and Development Commission. 1947. Home of First Settler. Highway 8 Roadside Historic Marker,

Samarrai, Fariss, Posted July 2000. Shifting Sands. Arts and Science Magazine. University of Virginia.

"A Muster of the Inhabitation of the Easterne Shore Over the Baye" in "Musters of the Inhabitants of Virginia 1624/5" taken from Adventurers of Purse and Person Virginia 1607-1624/5 edited by Virginia M. Meyer and John F. Dorman, Order of First Families of Virginia, 1987, pp.68-71.

Chesapeake Bay Landsat 7 Image. Global Land Cover Facility Earth Science Data Interface. <http://glcf.umiacs.umd.edu/index.shtml>. Access date 2007.

Kearney, M., Rogers J. Townshend J., Rizzo E., Stevenson, J., Stutzer D., Sundborg K. 2002. Landsat Imagery Shows Decline in Coastal Marshes in Chesapeake and Delaware Bays. Eos, Transactions, American Geophysical Union, Vol.83, No 16.

Maryland Department of Agriculture. Public Drainage/Watershed Associations. http://www.mda.state.md.us/resource_conservation/pda-pwa.php

State of Delaware, The Official Website for the First State. Board of Ditch Commissioners. Department of State Public Archives. <http://archives.delaware.gov/collections/aghist/1620-004.shtml>

Scott, Jane. 1991. Between Ocean and Bay: A Natural History of Delmarva. Tidewater Publishers, Centreville, Maryland.

The Mariners' Museum, Newport News. <http://www.mariner.org/visitorinfo/copyright.php>. Exploration Through the Ages, Giovanni da Verrazzano.

George Francis Beaven and Henry J. Oosting. 1939. Pocomoke Swamp: A Study of a Cypress Swamp on the Eastern Shore of Maryland. Bulletin of the Torrey Botanical Club, Vol. 66, No. 6. (Jun., 1939), pp. 367-389.

Mountford, K. 2004. Natural treasures buried deep within Bay's cypress swamps. Bay Journal. March 2004. <http://www.bayjournal.com/article.cfm?article=1243>

White, C. 1989. Chesapeake Bay: Nature of the Estuary, A Field Guide. Tidewater Publishers: Centreville, Maryland.

United States Department of Agriculture. National Agricultural Statistics Service. 2002 Census of Agriculture. Volume 1 Chapter 2: Virginia County Level Data
<http://www.nass.usda.gov/census/census02/volume1/va/index2.htm>

Daphne Gentry, Publications and Education Services Division.
Copyright by The Library of Virginia
http://www.lva.lib.va.us/whatwehave/local/va4_headrights.htm

Thomas, W. III, Barnes, B., Szuba, T. 2007. The Countryside Transformed: The Eastern Shore of Virginia, the Pennsylvania Railroad, and the Creation of a Modern Landscape Southern Spaces: An Interdisciplinary Journal About the Regions, Place, and Cultures of the American South. Published: 31 July 2007.
<Http://www.southernspaces.org/contents/2007/thomas/4c.htm>

Benitez1, Jorge A. and Fisher, Thomas R. 2004. Historical Land-cover Conversion (1665–1820) in the Choptank Watershed, Eastern United States Ecosystems, Publisher Springer New York ISSN 1432-9840 (Print) 1435-0629 (Online) Issue Volume 7, Number 3, p 219-232.
SpringerLink Date Tuesday, June 22, 2004
<http://www.springerlink.com/content/4nyymcjwvguy4t4/>

McIlwraith Thomas F., and Muller Edward K. 2001.
North America: The Historical Geography of a Changing Continent. Second Edition. Rowman & Littlefield. Lanham, Md. and Oxford, Uk

United States Census Bureau. 2000. United States Census 2000. <http://www.census.gov/>