

## Plants and Animals

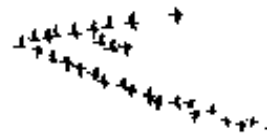
Accomack County supports populations of a wide variety of species of plants and animals. Many of these species have economic or recreational importance to the county and several are rare, threatened, or endangered species which have found habitat suitable for survival on the Eastern Shore.

**Biodiversity:** Biodiversity is a term used to describe the collection of plants, animals and other living organisms which make up an ecosystem. For example, the Chesapeake Bay is home to an estimated 2,700 species. These species make up the Bay's biodiversity. Scientists have found that maintaining this diversity of species in an ecosystem is important because the survival of each of these species is interconnected. Managing for biodiversity is not so much a matter of keeping all the parts of every community, but maintaining balance in the community. A broad range of species need to be present in any community in large enough numbers to fulfill their roles in that community. For example, it is speculated that the oyster population in the Bay was once great enough to filter all of the Bay's waters every few days. It would take today's reduced oyster population about a year to accomplish this task. Thus, decrease in the oyster population effects water quality which, in turn, has an impact on many other species.

**Habitats:** Accomack County offers large areas of undeveloped wildlife habitats. Important habitats include forests, open fields, creeks and creek corridors, wetlands, and the barrier islands. These areas provide sustenance to wildlife which are important to the county's seafood industry, hunting, tourism, nature watching, and sport fishing. Accomack County's natural areas and the rich wildlife and fin and shell fish communities it supports are a part of the area's heritage and important to many industries as well as the quality of life for county residents.

**Forests:** Large amounts of Accomack County are covered in woodlands (33%). Loblolly pine is the primary tree species in these areas due to the fact that it thrives in poorly drained, sandy soils. Most of the soils which would support hardwood stands have been cleared and converted to cropland or residential uses. About a quarter of the county's forest land contains solid hardwood stands, the remainder is made up of pine or a pine/hardwood mix. Wooded areas provide habitat for white-tailed deer, raccoon, gray squirrel, opossum, cottontail rabbit, otter, wild turkey, quail, thrushes, mourning dove, woodcock, and songbirds. Maintaining diversity in forest type and age class will provide habitat for the greatest number of species. Forest acreage can be increased by reforesting abandoned and unsuitable cropland, providing opportunities to grow both traditional forest crops such as pine and specialty crops such as Christmas trees and Paulownia.

**Open Land:** Cropland, pasture, meadows, and areas overgrown with grasses, herbs, shrubs, and vines provide habitat for several species of wildlife, including bobwhite quail, pheasant, meadowlark, field sparrow, cottontail rabbit, and red fox.



*The irregular "V" formation of migrating Canada Geese*

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**Barrier Islands:** The Atlantic coast barrier islands provide habitat for shorebirds such as rails, sandpipers, plovers, oyster catchers, godwits, and dowitchers. Assateague Island also provides habitat for a herd of wild ponies. The barrier islands of Virginia's Eastern Shore, the last basically undisturbed coastal area on the eastern seaboard, comprise a community which is not only unique in this country, but the world. The string of islands owned and managed by the Nature Conservancy, which includes Parramore Island, Revel Island, and parts of Cedar and Metompkin Islands, has been designated by the United Nations as a World Biosphere Reserve in recognition of its great ecological value.

The barrier islands in Accomack County include Assateague Island, Wallops Island, Assawoman Island, Metompkin Islands, Cedar Island, Revel Island, and Parramore Island. The remaining Virginia barrier islands are located in Northampton County.

**Wetlands:** The county has about 109,508 acres of tidal wetlands. Tidal wetlands have been identified as some of the most productive ecosystems in the world. Because tidal wetlands trap nutrients from both land and sea, their productivity dwarfs that of all but a few other exceptional ecosystems. They provide essential resting, wintering and nesting grounds for many species of migratory waterfowl, other waterbirds and songbirds. These birds, along with other wildlife, find nourishment and rest in the same lush marsh grass which produces detritus. Detritus, bacterially decomposing grass, is the basis of the food chain that feeds oysters, clams, scallops, crab larvae and newborn fish. It has been calculated that 90% of the commercial fish and shellfish caught in the area are dependent, during at least part of their lives, upon tidal wetlands. Among these are menhaden, oysters, clams, and crabs. In addition, tidal flats attract thousands of birds during their spring and fall migrations, and the numerous creeks and channels provide refuge for a wide variety of ducks and geese.

Tidal wetlands in the Commonwealth of Virginia have been defined, by the Wetlands Act, Title 62.1, Section 13.2, Code of Virginia, as "all land lying between and contiguous to mean low water and an elevation above mean low water equal to the factor 1.5 times the mean tide range at the site..." The definition is further specified to include tidal vegetated wetlands and tidal non-vegetated wetlands. Tidal vegetated wetlands include such features as swamps, marshes, bogs and similar areas. Non-vegetated tidal wetlands include such features as beaches, tidal flats and similar areas. The general location of tidal wetlands areas in Accomack County are shown on Map H.

Vegetated Tidal Wetlands: Vegetated tidal wetlands in Accomack County are divided into two natural categories, the massive salt marshes along the Atlantic Ocean shoreline situated behind the barrier islands and the extensive brackish marshes on the Chesapeake Bay shoreline and bay islands.

The salt marshes, dominated by salt marsh cordgrass, total approximately 46,452 acres. The brackish marshes, most of them dominated by Black Needlerush,

Map G  
Tidal Wetlands

total approximately 23,918 acres. The total for the county, the largest acreage of tidal marshes for any county in Virginia, is approximately 70,470 acres.

The ecological significance of an area can be estimated on the basis of the number of species of vegetation present, the potential productivity of the dominant forms and the relative value of those forms to wildlife, both terrestrial and aquatic. Not all grasses and shrubs in tidal wetlands have equal values to all types of animal life that might be present, and these variations provide the means for placing varying levels of significance on different wetland units.

The Virginia Institute of Marine Science (VIMS) has identified twelve marsh types and grouped them into five classifications based on the estimated total environmental value of an acre of each type.

*Group One* marshes have the highest values in productivity, wildfowl and wildlife utility and are closely associated with fish spawning and nursery areas. They also have high values as erosion inhibitors, which is important to the shellfish industry.

*Group Two* differs from Group One only in the fact that the amount of detritus produced is less readily available to the marine environment. This is because Group Two marshes grow at higher elevations and consequently less tidal action exists to flush the detritus into adjacent waterways. However, these marshes have very high values in protection of water quality and acting as buffers against coastal flooding.

*Group Three* contains two marshes that are quite dissimilar in properties. The yellow pond lily marsh is not a significant contributor to the food chain, but it does have high value to wildlife and waterfowl. Black Needlerush has a high productivity factor but a low availability value because it grows at higher elevations. Black Needlerush does rank high as an erosion and flood buffer.

*Group Four* is valued primarily for the diversity and bird nesting area it adds to the marsh ecosystem and somewhat as an erosion buffer.

*Group Five* marshes have very few values as either a habitat, detritus producer or erosion control agent.

The most vegetatively diverse area of tidal marsh in Accomack County is found between Pitts Creek (Maryland State line) and Holden's Creek. The only tidal freshwater marsh in Accomack County is found in this area at the upper end of Pitts Creek, near the Maryland border. This tidal marsh contains a rich variety of marsh grasses. Because of the uniqueness of this marsh, consideration should be made for its preservation.

Non-vegetated Tidal Wetlands: Non-vegetated tidal wetlands are those coastal environments between mean higher high water and mean lower low water in which no vascular plants grow. They occur adjacent to tidal marshes, beaches and other

shorelines. The seaside, because of its greater tidal range, contains non-vegetated intertidal flats at least as extensive as tidal marshes.

Non-vegetated tidal wetlands are among the most valuable of coastal environments in supporting coastal resources. They share valuable attributes with both tidal marshes and subaqueous estuarine habitats. Primary productivity in intertidal areas is larger than in open waters because of the greater supply of light and nutrients available in very shallow areas.

Intertidal areas are widely recognized as important nursery and feeding grounds for important fishes and crustaceans and for the prey which support them. In addition, shellfish such as oysters and clams inhabiting non-vegetated wetlands constitute a resource of notable commercial and recreational importance. Non-vegetated tidal wetlands constitute the principal feeding ground of shorebirds and many waterfowl which exploit benthic animal prey. Some birds specialize in protected mud flats, while others forage only on exposed sandy beaches.

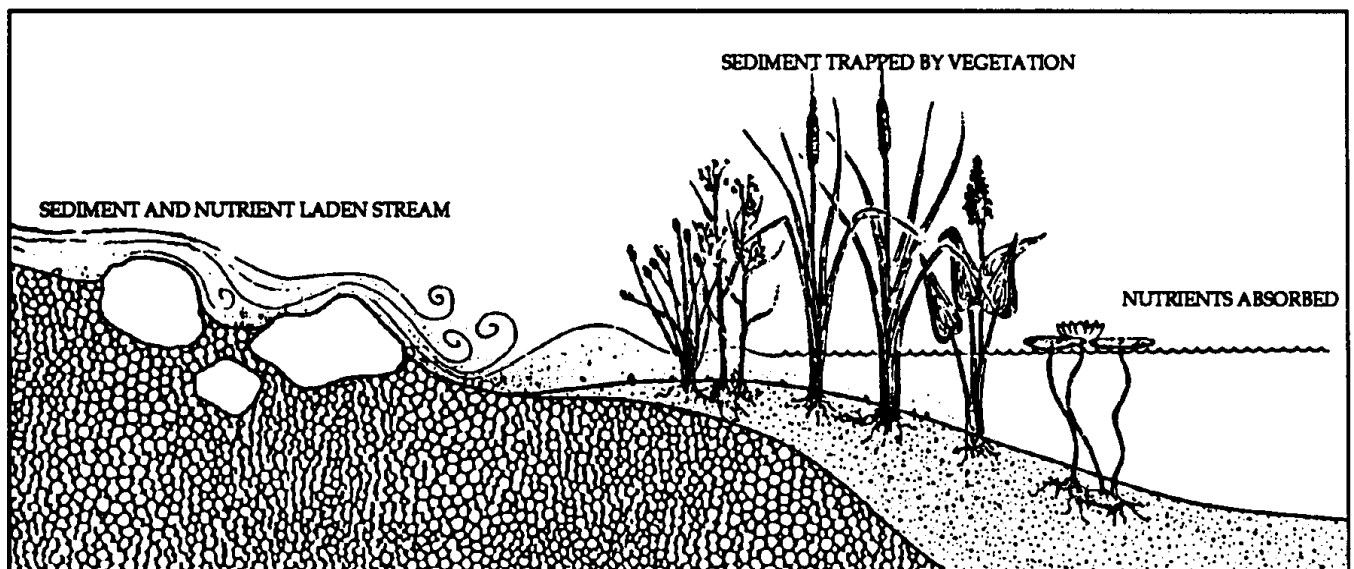
Impacts on Wetlands: According to the Accomack County Tidal Marsh Inventory, 1977, by the Virginia Institute of Marine Science, in Accomack County the major damage to tidal wetlands stem from dredge and fill operations. Dredging is usually performed to create or to maintain existing channels in order to provide water access to land or to other waterways. Sometimes it is performed to obtain fill to create land; in many of these situations channels are dredged to create “waterfront” properties to which high real estate values may be attached.

Dredging may destroy productive bottoms directly by mechanical disruption or indirectly through the creation of silt which drifts with the currents and smothers the oysters, clams, fish eggs and larvae, and beds of marine vegetation in areas

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Vegetated tidal wetlands filter sediment and nutrients from runoff.

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beyond the actual site of dredging. In addition, the dredging of a channel may alter the velocity of water flow in and out of the tidal marsh. This may lead to sedimentation problems in the future or may affect the rate in which beneficial marsh detritus is flushed into the marine environment.

When tidal marshes are filled, their biotic productivity and diversity is greatly reduced, and only slowly do these areas recover to viable natural segments of the environment. Their recovery, in addition, is to a habitat more upland in nature. This reduces the amount of detritus that contributes to the food chain and subsequently causes reduced values to the marine ecosystem.

The Island District, because of the high values of its tidal wetland areas and the high development pressure affecting those wetlands was selected by the United States Environmental Protection Agency (EPA) for any extensive wetland survey. The results of the survey, which were presented to Chincoteague in 1986, are to be used by the agencies which manage tidal and non-tidal wetlands.

Massive damage to tidal wetlands has taken place from Swans Gut Creek to the vicinity of Powell Creek, an area now known as Captain's Cove. Dredged channels have been cut through the tidal marsh and spoil deposited on the marsh surface. Damage has also occurred in the tidal wetlands of the Greenbackville-Franklin City area, again by dredge and fill operations.

Overwash and spoil disposal have adversely affected the tidal marshes on Upper Metompkin Island, immediately south of Gargatha Inlet. There are a number of tidal wetlands that have been altered by dredge and fill operations in the area around Metompkin Bay to Wachapreague. These include Parker Creek, Walston Creek, the mouth of Folly Creek and the western shoreline of Burton's Bay. A number of tidal marshes have been impacted by unconstrained spoil.

Wetlands Protection: Much of the wetlands area in Accomack County is protected through conservation ownership. The remainder of the area is protected by federal, state and local regulations. The Virginia Wetlands Act delegated the task of managing the Commonwealth's tidal wetlands to the Virginia Marine Resources Commission (VMRC). The act also enables localities to manage the wetlands within their jurisdiction through the adoption of a local wetlands act and the creation of a local Wetlands Board. However, the VMRC retains the authority to veto any local board's action. Accomack County has an active local Wetlands Board.

The Accomack County Wetlands Board operates under the general criteria established by the Virginia Institute of Marine Science (VIMS). This general criteria states that, provided significant marine fisheries, wetlands and wildlife resources are not unreasonably detrimentally affected, alteration of the shoreline or construction of shoreline facilities may be justified in order to (1) gain access to navigable waters by commercial, industrial, and recreational interests for which it has been clearly demonstrated that waterfront facilities are required or by owners of

land adjacent to waters of navigable depth or waters which can be made navigable with only minimal adverse impact on the environments, and (2) protect property from significant damage or loss due to erosion or other natural causes.

Alteration of the shoreline is ordinarily not justified (1) for purposes or activities which can be conducted on existing fastlands and which have no inherent requirement for access to water resources, (2) for purposes of creating waterfront property from lots and subdivisions which are not naturally contiguous to waters of navigable depth or waters which can be made navigable by substantial alteration or destruction of marine resources, (3) when damage to properties owned by others is a likely result of the proposed activity, (4) when the alteration will result in discharge of effluents which impair wetlands, water quality or other marine resources, or (5) when there are viable alternatives which can achieve the given purpose without adversely affecting marshes, oyster grounds or other natural resources. Other general criteria followed by the Wetlands Board include that the utilization of open-pile type structures for water access are preferred over the construction of solid structures or dredging and filling, that channels, fills and structures should be designed to withstand the stress of the marine environment and minimize the need for future maintenance activities, and that high density development in or immediately adjacent to wetlands and/or other floodplains is discouraged.

The Wetlands Board also follows specific criteria for certain types of projects including shoreline protection strategies and filling and dredging material disposal. Specific criteria for shoreline protection strategies include that shoreline protection structures are justified only if there is active, detrimental shoreline erosion which cannot be otherwise controlled, that the planting of marsh grass is the preferred means of stabilization for shores experiencing mild to moderate erosion, that erosion control structures should ordinarily be placed land-ward of any existing and productive marsh vegetation, and that sloped rock or riprap revetments and gabions are generally preferred over vertical structures. Specific criteria for filling and dredge material disposal include that filling should be confined to the area land-ward of any wetlands, that controlled disposal of dredged material on highland property is the preferred method, and that dredge spoil disposal areas should be constructed to minimum criteria to ensure that sedimentation is controlled.

**Natural Communities:** Accomack County is home to many significant natural communities, including some that are found nowhere else in Virginia.

**Sea-level Fens:** A unique and extremely rare type of coastal wetland, sea-level fens are only documented in Sussex County, Maryland, and Accomack County, Virginia. These fens are distinguished from a marsh or a bog by unique hydrological regimes and vegetation associations. In general, sea-level fens, are open, freshwater wetlands located at the upland edges of wide, ocean side tidal marshes. Vegetation consists of an unusual combination of northern bog plants and southern tidal freshwater wetlands plants. The number of rare species documented in fens

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### Habitat Creation

The improper placement and containment of dredge spoil material can adversely impact wetlands and destroy habitat. The U.S. Fish and Wildlife Service's Atlantic Coast Piping Plover Recovery Plan recommends the use of dredge spoil deposition to create shore bird habitat. The plan states that spoil of suitable material (sand, pebble, shell mix) has proven to be suitable habitat for beach nesting birds such as the piping plover and least tern.



is significant. For some of these species, the Virginia sea-level fens represent the southernmost extent of their range and the only habitat that supports these species in the state. The greatest threat to sea-level fens is groundwater pollution. Possible movement of fertilizers and wastes into the groundwater from nearby developments or agricultural fields could lead to increased nutrient levels in the fen. Increased nutrient levels could disrupt soil characteristics and plant species that naturally exist in fen conditions.

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### Migratory Songbirds

In 1993, the Department of Environmental Quality released a report on Neotropical Migratory Songbird Migration that resulted from observation of songbird migration patterns over the Delmarva and Cape May peninsulas. The report stresses the importance of protecting migratory stopover habitats.

The study found that migratory songbirds concentrate within certain geographical areas. Specifically, migrants are more abundant in areas close to all coastlines (within 0-0.9 miles) than in equivalent areas farther from the coast (0.9-1.9 miles); Bay coastal zones have higher densities of migrants than seaside coastal zones or interior regions; migratory songbirds are more abundant on barrier islands than the coastal mainland; and migrants are associated with particular habitats on a species specific basis.



***Chesapeake Bay Beach Habitat of the federally threatened Northeastern Tiger Beetle:*** This species primarily inhabits the Chesapeake Bay region of Maryland and Virginia. Historically found from the Chesapeake Bay north to Massachusetts, only two remnant populations remain in Massachusetts, while all other historical populations along the east coast outside the Chesapeake Bay area are extirpated. This species inhabits wide, white, highly dynamic, sandy beaches bordering the eastern and western shores of the Chesapeake Bay. Threats to this species include shoreline development, beach stabilization, high recreational use, pesticides, and natural events including winter beach erosion, flood tides, and hurricanes.

***Migratory Songbird Corridor:*** The Atlantic migratory flyway covers the entire Atlantic coast. Significant stopover areas for land birds in this flyway occur within coastal habitats from Cape May, New Jersey to Cape Charles, Virginia. Migration is extremely hazardous for the songbirds. Half of the birds that leave their northern range in the autumn will not make it back in the spring. One reason for this is the high amount of energy required to make the journey of several hundred to several thousand miles. Many migrants are unable to find the food they need to maintain their energy reserves. Another reason for such high mortality rates is predation. Long flights across open areas make migrants vulnerable to predators. Forested and scrub-shrub habitats, particularly large tracts, provide crucial staging and nesting areas for migrant land birds traveling between northern breeding grounds and southern wintering grounds. Large forest blocks, particularly deciduous and mixed forests, provide suitable habitat for the greatest number of species. Forests consisting of several layers of vegetation provide more feeding and resting niches for migratory songbirds and the dense undergrowth and closed canopy of trees provide cover from predators. Important shrub-scrub habitats include those occurring along shorelines and dominated by bayberry and high tide brush.

***Extensive Marshes for Marsh Nesting Birds:*** These habitats provide resting, nesting and feeding habitat for several rare bird species including Little Blue Heron, Black-crowned Night Heron, Virginia Rail, Black Rail, Sora, and Northern Harrier. Recent studies in Virginia, conducted by the Center for Conservation Biology, College of William and Mary, suggest that the number of bird species found in a marsh is directly related to the size of the marsh. It can therefore be assumed that Accomack County's extensive marshes provide important habitat for a large variety of marsh-nesting birds. The minimum marsh size to support significant marsh bird communities appears to be between 10 and 15 acres. The primary

threat to marsh nesting birds is loss or degradation of marsh habitat. Where marsh vegetation is disturbed by heavy equipment or water chemistry changes, common reed, a tall wetland grass, often invades the area. Once established, common reed aggressively displaces native vegetation and produces large stands which have little value to wildlife.

**Natural Heritage Resources:** The Code of Virginia established a program within the Department of Conservation and Recreation to protect habitats of rare, threatened, and endangered plant and animal species; exemplary natural communities, habitats, and ecosystems; and other natural features of the Commonwealth. These protected resources are given the label of “Natural Heritage Resources.” The Department of Conservation and Recreation has provided the county with a list of Natural Heritage Resources in Accomack County. Species which are believed to be sufficiently rare or threatened to merit an inventory of their status and location are listed on the tables that follow.

**Ranking System:** Ranking systems have been developed to designate a species’ rarity based on its range-wide status. A species’ global rank is based on its level of occurrence world-wide, whereas its state rank is based on its occurrence within the boundaries of the state of Virginia. Species which are fairly common in other parts of the country but seldom found in Virginia will have different global and state ranks.

**Protection Status:** The U.S. Fish and Wildlife Service and the National Marine Fisheries Service identify species which receive protection under the Federal Endangered Species Act. Federal status lists a species as endangered, threatened, or as proposed or candidates for listing.

**Fin Fish Management:** The Virginia Marine Resources Commission is responsible for tracking finfish and shellfish landings in Virginia waters. This provides information on the economic contribution to the County as well as an inventory of aquatic life in County waters. During 1992, 2,351,459 pounds of finfish were sold dock-side in Accomack at a value of \$1,209,789. Total landings for shellfish were 845,956 pounds with an economic value of \$1,258,308. The economic value of the landings represent 4% of all landings in Virginia. This data is anticipated to change drastically in future years as the method of reporting this data has changed. Prior to 1993, the Virginia Marine Resources Commission reporting system for catches was voluntary reporting by seafood dealers. Information is now being assembled from mandatory reporting by fishermen and not the dealer.

**Natural Heritage Resources (Animals) of Accomack County**

<b>Common Name</b>	<b>Global Rank</b>	<b>State Rank</b>	<b>Federal Status</b>	<b>State Status</b>
Saltmarsh Sharp-Tailed Sparrow .....	G4 .....	S2 .....		SC
Great Egret .....	G5 .....	SB2,S4 .....		SC
Piping Plover .....	G3 .....	S2 .....	LT .....	LT
Wilson's Plover .....	G5 .....	S1 .....		LE
Northern Harrier .....	G5 .....	S1,S2 .....		SC
Little Blue Heron .....	G5 .....	S2B,S4 .....		SC
Snowy Egret .....	G5 .....	S2 .....		
Tricolored Heron .....	G5 .....	S2B,S4 .....		SC
Peregrine Falcon .....	G4 .....	S1 .....	LE .....	LE
Bald Eagle .....	G4 .....	S2,S3 .....	LE .....	LE
Black Rail .....	G4 .....	SU .....	SOC .....	
Black-Crowned Night-Heron .....	G5 .....	S2,S3 .....		
Brown Pelican .....	G4 .....	SB1,S4 .....		SC
Glossy Ibis .....	G5 .....	S2 .....		SC
Sora .....	G5 .....	S1 .....		
Virginia Rail .....	G5 .....	S2 .....		
Black Skimmer .....	G5 .....	S2 .....		
Least Tern .....	G4 .....	S2 .....		SC
Caspian Tern .....	G5 .....	S1 .....		SC
Gull-Billed Tern .....	G5 .....	S2 .....		LT
Northeastern Beach Tiger Beetle .....	G4T2 .....	S2 .....	LT .....	
Sectral Tiger Beetle .....	G4 .....	S2 .....		
Delta-Spotted Spiketail .....	G5 .....	S1 .....		
Delmarva Peninsula Fox Squirrel .....	G5T3 .....	S1 .....	LE .....	LE

**Natural Heritage Resources (Plants) of Accomack County**

<b>Common Name</b>	<b>Global Rank</b>	<b>State Rank</b>
Sea-Beach Sedge .....	G5 .....	S1
A Sedge .....	G4 .....	S1S2
Coast Sandbur .....	G5 .....	S2
Atlantic White Cedar .....	G4 .....	S2
Sawgrass .....	G5T5 .....	S1
Hazel Dodder .....	G5 .....	S2?
Saltmeadow Sprangle-Top .....	G5 .....	S2S3
Horse-Tail Spikerush .....	G4 .....	S1
Salt-Marsh Spikerush .....	G4 .....	S1
White-Top Fleabane .....	G5 .....	S2
White Buttons .....	G5 .....	S1
Ten-Angle Pipewort .....	G5 .....	S2
Carolina Fimbristylis .....	G4 .....	S1
Coast Bedstraw .....	G5 .....	S2
Seaside Heliotrope .....	G5 .....	S1
Brown-Fruited Rush .....	G5 .....	S1
Big Floating Heart .....	G5 .....	S1
Joint Paspalum .....	G5 .....	S1
Seaside Plantain .....	G5 .....	S1
White Beakrush .....	G5 .....	S2
Few-Flowered Beakrush .....	G5 .....	S1
Long-Beaked Baldrush .....	G4 .....	S1
Slender Marsh Pink .....	G5 .....	S2

One-Flower Sclerolepis .....	G4 .....	S1
Silky Camellia .....	G4 .....	S2
Low Sea Blite .....	G5 .....	S1
Large Marsh St. John's-Wort ..	G4G5 .....	S1
Southern Bladderwort .....	G5 .....	S2
Large Cranberry .....	G4 .....	S2
Columbia Water-Meal .....	G5 .....	S1

### **Global Ranking System**

<b>Rank</b>	<b>Description</b>
G1 .....	Extremely rare and critically imperiled with 5 or fewer occurrences or very few remaining individuals; or because of some factor(s) making it especially vulnerable to extinction.
G2 .....	Very rare and imperiled with 6 to 20 occurrences or few remaining individuals; or because of some factor (s) making it vulnerable to extinction.
G3 .....	Either very rare and local throughout its range or found locally (even abundantly at some of its locations) in a restricted range; or vulnerable to extinction because of other factors.
G4 .....	Common and apparently secure globally, though it may be rare in parts of its range, especially at the periphery.
G5 .....	Very common and demonstrably secure globally, though it may be rare in parts of its range, especially at the periphery.
GH .....	Formerly part of the world' biota with expectation that it may be rediscovered.
GX .....	Believed extinct throughout its range with virtually no likelihood of rediscovery.
G? .....	Unranked, or, if following a ranking, rank uncertain (ex. - G3?).
G_Q .....	The taxon has a questionable taxonomic assignment, such as G3Q.
G_T .....	Signifies the rank of subspecies or variety. For example, a G5T1 would apply to a subspecies of a species that is demonstrably secure globally (G5) but the subspecies warrants a rank of T1, critically imperiled.

### **State Ranking System**

<b>Rank</b>	<b>Description</b>
S1 .....	Extremely rare and critically imperiled with 5 or fewer occurrences or very few remaining individuals in Virginia; or because of some factor(s) making it especially vulnerable to extirpation in Virginia.
S2 .....	Very rare and imperiled with 6 to 20 occurrences or very few remaining individuals in Virginia; or because of some factor(s) making it vulnerable to extirpation in Virginia.
S3 .....	Rare to uncommon in Virginia with between 20 and 100 occurrences; may have fewer occurrences if found to be common or abundant at some of these locations; may be somewhat vulnerable to extirpation in Virginia.
S4 .....	Common and apparently secure with more than 100 occurrences; may have fewer occurrences with numerous large populations.
S5 .....	Very common and demonstrably secure in Virginia.
SH .....	Formerly part of Virginia biota with expectation that it may be rediscovered.
SX .....	Believed extirpated from Virginia with virtually no likelihood of rediscovery.
SE .....	Exotic; not believed to be a native component of Virginia's flora.
SU .....	Possibly rare, but status uncertain and more data needed.
S_? .....	Rank uncertain; for example, an S2? denotes a species with rarity that may range from S1 to S3, an SE? means a species may or may not be native to Virginia.

## Shoreline Erosion

Accomack and Northampton Counties possess approximately 70% of Virginia's total oceanfront shoreline and 15% of the state's tidal shoreline. The inland sea-side shoreline is relatively protected by the barrier islands, marshes and bays that lie between the shoreline and the Atlantic Ocean. The barrier island shoreline and bayside shoreline are susceptible to erosion.

**Bayside:** Erosion on Accomack County's Bayside shore is generally less than that of most of the counties having Bay shorelines. This is attributable to the extremely broad near shore zone, the sheltering of the subaqueous platform west of Tangier Sound, and the great extent of the marsh areas. Wind generated waves are the primary cause of erosion on the Bayside. The growth and height of wind generated waves are factors of the over water distance across which the wind blows (known as fetch), wind speed, wind duration, and water depth. In Accomack County, most severe erosion occurs from northeasters and storm fronts that bring strong north and northwest winds. Northeasters force additional water into the Bay, causing storm surges that can reach two or three feet above the normal high tide level. As the storm passes, the winds shift to the northwest or north and pile up water on the western side of the Shore. The average erosion rate for Bay shoreline in Accomack County (excluding Tangier Island) is 2.2 feet per year. This average dips to 1.6 feet per year for areas with marsh margins and rises to almost 3 feet per year for shorelines with sand beaches.

**Seaside:** Accomack County's seaside is bordered by a series of barrier islands. The most serious barrier island erosion occurs when northeasters and hurricanes bring storm surge and intense wave action. The storm surge lifts the water level to one to three feet above normal, allowing high waves to wash over the island, pulling sand into the ocean, filling marsh and inlets and sometimes breaching the island. A barrier island's natural response to storm impact is to roll over on itself; the beach front retreats, former marsh deposits are excavated and washover raises marshland behind the island. Erosion rates on Accomack County's barrier islands range from seven to seventeen feet per year. The land on the seaside's interior is, for the most part, protected from erosion by the complex of barrier islands, marsh and bays that lie between the mainland and the Atlantic Ocean.

The Virginia Institute of Marine Science (VIMS) conducted a shoreline situation report for Accomack County in 1975. The report defines greater than three feet per year of erosion as "severe," between one and three feet per year as "moderate," and less than one foot per year as slight or none. Locations with moderate and severe ratings are further specified as being critical or non-critical. The erosion is considered critical if buildings, roads, or other structures are endangered. The following evaluation of shoreline erosion is from that report. Map I depicts areas with moderate to severe rates of erosion.

Map H  
Shoreline Erosion

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## SEAS

The Virginia Department of Conservation and Recreation's Shoreline Erosion Advisory Service (SEAS) promotes environmentally acceptable shoreline erosion control measures to protect private property and reduce sediment and nutrient loads to the Chesapeake Bay and other waters of the Commonwealth. SEAS was created in 1980 by the General Assembly to work one-on-one with landowners experiencing erosion problems. Since its creation SEAS has provided technical advice about shoreline erosion problems to more than 6,300 clients. In addition, the program promotes research for improved shoreline management techniques to protect and enhance Virginia's shoreline resources.

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### **Critically Eroding Areas:**

***Sluitkill Neck (Segment 6A):*** 1.9 miles along the boundary between Klondike Point on Pungoteague Creek and Indian Point on Matchotank Creek. Includes Finneys, Scarborough and Parkers Islands. Erosion rate on the bayshore of the islands is 4 to 5 feet per year. The erosion rate on the mainland is 1.5 feet per year. The large expanse of marsh shore both on the islands and the mainland, together with the general low elevation and relief of the subsegment preclude any major development either for residential use or recreation.

### **Severely Eroding Areas:**

***Scarboroughs Neck (Segment 2A):*** 3.2 miles from Powells Bluff at the entrance to Occohannock Creek to the marshy point at the entrance of Craddock Creek. Erosion rate is 5 feet per year. Low potential for residential use primarily due to the high flood hazard and secondarily to the expense involved in constructing effective shore erosion defenses. Best use is to remain with agricultural and tree crop production. Recreational camping, particularly in the Bull Cove area, may be developed to advantage, provided no substantial permanent structures are involved and that adequate sewage disposal facilities are established.

***Parkers Marsh (Segment 8A):*** 2.4 miles along the shore-fastland boundary between Onancock and Chesconessex Creeks. Crystal Beach at the end of Route 782 and the inland part of South Chesconessex are included in this section. Erosion rate is 5 feet per year and there is a 1 foot per year accretion rate to the south at Ware Point. No erosion is indicated by the study in the area north of Back Creek, but local property owners state that there is about 1 foot per year loss along the sand area at Crystal Beach. The marsh areas to the south of Back Creek are already well designated as a state natural area (Parkers Marsh Natural Area). It would seem desirable to reserve the marshes to the north for the same purpose as they are more or less contiguous. The fastland area near Crystal Beach is too low to justify extensive development and probably should be restricted to occupation by relatively low value seasonal residences.

***Freeshool Marsh (Segment 11B):*** 4.7 miles along the shore-fastland boundary between Messongo Creek and Holdens Creek. This segment includes the peninsula south of the Pocomoke Sound, on which the town of Saxis is located. Erosion rates of 3.2 feet per year between Pig Point and North End Point, 4.9 feet per year between North End Point and Starling Creek (Saxis waterfront), 3.6 and 4.4 feet per year between Starling Creek and Long Point, and 1.9 feet per year between Long Point and Back Creek. Nearly the whole of Freeshool Marsh is set aside as a wildlife refuge. Saxis Island is very limited in area, has no satisfactory beaches, and is probably developed to near its maximum for shellfish industry and supporting population.

### **Moderately Eroding Areas:**

***Hyslop Marsh (Segment 2C):*** 2.9 miles from the mouth of Craddock Creek across the mouth of Back Creek to Milbys Point at the north end of Hyslop Marsh. Erosion rate is 2-3 feet per year. At present the area should be left as is.

***Nandua Creek (Segment 3):*** 5.1 miles along the main axis of Nandua Creek, including Back Creek, Curratuck Creek, McLean Gut, Boggs Gut and Kusian Cove. Erosion rate is between 2 to 3 feet per year at exposed beach areas in the lower creek; no erosion noted on the upper creek. Nandua Creek is very attractive in its present state. It appears undesirable to develop the creek as it is surrounded by creeks of greater commercial capacities. The fastland surrounding the lower creek is too low in elevation to be suitable for residential development. The upper creek seems well suited for its present use, agriculture and low density residential.

***Broadway Neck (Segment 6B):*** 1.9 miles along the shore-fastland between Matchotank Creek and the northeast end of East Point. Erosion rate south of Thicket point is 2 feet per year. No figures are given for the rate at Broadway Landing or East Point, but the presence of old groins and bulkheads indicates a history of moderate erosion along the shore north of Thicket Point also. No erosion is evident in Matchotank creek or in the smaller creeks. Replacement of existing beach defenses will improve presently developed areas. High flood hazard should be considered before future development.

***Onancock Creek (Segment 7):*** 4 miles from the bayside boundary to the head of Central Branch. Moderate erosion at sand beaches, such as at the end of Bailey Neck. On the upper creek, where low bluffs are close to the water, there are local areas of erosion. The lower part of Onancock Creek is too susceptible to flood damage to permit a recommendation for additional development. There are some areas on the upper reaches and branches which would permit additional low density residential development. There is already considerable boating, and increasing the traffic would also increase the danger of water pollution.

***Big Marsh (Segment 8C):*** 1.5 miles along the shorefast boundary between Chesconessex Creek and Deep Creek. Erosion rate is moderate at present but the development area might become critical during floods. Erosion rates vary from 0 to 3 feet per year. There is not enough fastland behind the marsh between Chesconessex and Deep Creek for any sort of development other than low density residential or agricultural. The present development at Schooner Bay was probably unwise. No other development on the marshes should be permitted, both because of the low elevation and unstable substrate and because of the value of the natural marsh to the estuarine food chain.

***Parksley (Segment 10B):*** 3 miles along the shore-fastland boundary between the north bank of Hunting Creek and the middle of Young Creek. Erosion rate is slight to moderate, critical along the bay shore. Erosion rates are up to 2 feet per year at various exposed sand beach areas. There is no erosion noted in the creeks. The area is primarily marshland which should be preserved as a primary food source for shore and near shore life. The adjoining fastland is low and suitable for lumber and agriculture.

**Michael Marsh (Segment IIA):** 1.9 miles along the shore-fastland boundary between Cattail Creek and Messongo Creek. Erosion rate is 1.3 to 1.7 feet per year along the part of the shore facing Beasley Bay. Almost the total marsh is set aside as part of the Saxis Wildlife Management Area. The adjacent fastland area is low and suitable for timber production. The creeks are shallow and, being within or adjacent to the wildlife sanctuary, should not be exploited.

**Shoreline Hardening:** Accomack County's residents have constructed miles of shoreline erosion control structures in an attempt to cease or slow erosion. There has been no comprehensive survey done of Accomack County's erosion control structures, but many applications for new erosion control structures are approved each year.

Structural practices such as jetties, groins, riprap, and bulkheads are the most expensive and most potentially damaging options for erosion control. These structures can impede the natural inland migration of wetlands and impact other natural processes such as the natural movement of sand. Sloped rock or riprap revetments and gabions are preferable to vertical structures. Non-structural alternatives can be effective in certain conditions, saving the property owner money and having less impact on the environment. Most non-structural alternatives involve the use of marsh areas for natural protection and may involve planting marsh grass or cutting trees that are shading the marsh.

**Information Needs:** The best information currently available on shoreline erosion in Accomack County is the Shoreline Situation Report prepared by the Virginia Institute of Marine Sciences in 1975. Information on shoreline structures is limited to permit information collected by the county since the 1970's. A comprehensive shoreline management plan needs to be conducted to evaluate the shoreline erosion problem in Accomack County and determine the effectiveness of erosion control structures. This plan would divide the county's shoreline into planning segments in which shoreline processes and materials are similar, identify and evaluate shoreline erosion and accretion patterns within those segments, inventory the type, location and condition of existing erosion control structures, evaluate whether structures have been effective or are aggravating erosion problems, identify areas where control structures should be avoided, identify areas which require stabilization, and examine shoreline areas characterized by high erosion rates in relation to existing and proposed land use. The Virginia Institute of Marine Science has developed a Comprehensive Coastal Inventory for the state which includes data that would be useful for such a study. Identification of erosion control structures could be achieved through review of permits issued by the local Wetlands Board, examination of aerial photography, and field surveys.

## Storms

Accomack County is subject to frequent storm activity including northeasters, tropical storms and hurricanes. These storms bring local flooding and considerable shoreline erosion.

**History:** Accomack County has experienced several major storms since the early settlement of the area. A brief history of major storms to hit the area is given in the following paragraphs:

*The August 23, 1933*, hurricane passed directly over the lower Chesapeake Bay area, then moved north up the west side of the bay. In addition to damage from tidal flooding, high winds caused much damage to roofs, communication lines and other structures.

*The hurricane of September 1936* passed approximately 20 miles east of Cape Henry on the morning of the 18th. High tides and gale force winds caused much damage throughout the lower Chesapeake Bay area and Eastern Shore as the storm moved to the northeast. The loss in crops was estimated at \$250,000 and other damage amounted to another \$250,000.

*The northeaster of October 6, 1957*, with wind gusts of 60-70 miles per hour, moved north just east of Cape Hatteras during the evening of the 5th, then turned northwest to move through the lower portion of the Chesapeake Bay on the 6th. Heavy rains and gales extended west through central Virginia. The greatest property damage occurred in the coastal areas where heavy seas and high tides battered structures, grounded vessels, and disrupted transportation. The town of Wachapreague reported tides of four feet above normal.

*Hurricane Donna, which occurred on September 12, 1960*, skirted the Virginia coast on the morning of the 12th before moving to the northeast. Strong winds, heavy seas, and severe flooding occurred along the Chesapeake Bay shoreline of the Eastern Shore from Cape Charles north, causing extensive damage. Winds of up to 100 miles per hour were recorded in Chincoteague and 4.5 inches of rain fell in a 24 hour period.

*The northeaster of March 6-8, 1962* caused flooding of major proportions from New York to Florida. This flood, which came to be known as the Ash Wednesday Storm, was unusual for a northeaster since it was caused by a low pressure cell which moved from south to north past Hampton Roads and then reversed its course to the south again. The northeaster brought with it high volumes of water and high waves which battered the mid-Atlantic coastline for several days.

*The northeaster of March 29, 1984*, caused significant flooding on the bayside of Accomack County. The storm brought winds of up to 46 mph which piled up

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### 100 Year Floods

For the purposes of managing development and assessing risk within areas prone to flooding, the Federal Emergency Management Agency (FEMA) developed the concept of the "100 year flood." The 100 year flood does not refer to a flood that happens once every 100 years, but rather a flood level that has a probability of occurring once every 100 years (i.e. has a 1% chance of occurring in any given year). A flood insurance study was prepared for Accomack County in 1982 which identifies height of flood waters during a 100 year flood and predicts the area within the county that would be flooded and at what level flooding would occur. Information from this study was used to develop Flood Insurance Rate Maps (FIRMs) which are used by insurers to determine flood insurance requirements and by the county to regulate development in flood prone areas.

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Map I  
100 Year Floodplain

tidal waters, resulting in flooding which sent water pouring into homes at East Point, Checonessex, Mears, Saxis, and Sanford.

***Hurricane Gloria, on September 27, 1985***, caused significant flooding and wind damage in Accomack County. The Chesapeake Bay Bridge Tunnel recorded winds from 79 to 90 mph and NASA recorded 4.27 inches of rainfall during the storm. Accomack County suffered an estimated \$2 million in damage to mobile homes, houses, boats, docks, and property as a result of the storm.

***The northeaster of October 30, 1991***, is also known as the “Great Halloween Storm.” A northeaster merged with passing tropical storm, Grace, to create a very powerful system. The storm remained off shore but produced considerable damage. Observations at the Virginia Coast Reserve noted sea waves of up to 35 feet in height. This storm changed the landscape of many of the barrier islands, which absorbed the brunt of the storm.

***Hurricane Fran, of September, 1996***, brought considerable wind damage to the Shore. This storm made landfall on the coast of North Carolina, September 6, 1996, as a category 3 hurricane. The Eastern Shore experienced a great deal of damage from wind and several spin-off tornados struck the area.

**Risks:** The amount and extent of damage caused by any tidal flood depends on the topography of the flooded area, the rate of rise of floodwaters, depth and duration of flooding, exposure to wave action, and extent of development in the floodplain. The depth of flooding during these storms depends on the velocity, direction and duration of the wind, and the astronomical tide. The duration of flooding depends on the duration of tide-producing forces. Fortunately, tidal flooding is usually characterized by a gradual increase in water levels, which under normal conditions, permits orderly and timely evacuation from encroaching floodwaters.

The greatest potential for flood damage in Accomack County comes from flooding of low lying shorelines along the Chesapeake Bay. Bayside areas lying lower than eight feet above mean sea level would be flooded during a 100 year storm event. The highest elevation of flood waters recorded in Accomack County is 9.2 feet above mean sea level. Map J shows the location of the 100 year floodplain.

Accomack County consists of 284,931 acres of land and marsh. Of those 284,931 acres, 126,667 acres are in the 100 year flood zone. There are approximately 11,900 houses in Accomack County, about 2,000 of which are in the flood zone. These numbers (44% of total county land and 16% of total homes in the flood zone) represent a significant potential hazard to residents of the county and demonstrate the need to take measures to lessen the possible impact of flood events on the area.

**Floodplain Management:** In January of 1995, the Accomack County Board of Supervisors adopted the Accomack County Floodplain Management Plan. The plan was developed as a comprehensive examination of sources of flooding, flooding

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### The Community Rating System

The Community Rating System (CRS) was established by the Federal Insurance Administration in 1987 to, “encourage, by the use of flood insurance premium adjustments, community and state activities beyond those required by the NFIP.” Communities which participate in CRS receive points for activities they undertake which reduce flood losses, facilitate accurate insurance rating, and promote the awareness of flood insurance. Each community is assigned a classification based on their total points. Residents of the community are rewarded with reduced premium rates. Accomack County is currently a class 8 community receiving a 10% premium reduction.

There are currently 1,597 National Flood Insurance policies in Accomack County with a total coverage of \$129,952,000. Annual flood insurance premiums are \$527,004. There have been \$822,901 in claims in Accomack County since 1978.

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history, and existing flood protection programs to determine what further measures, if any, are needed to adequately protect the residents of the county from flood hazards. The plan discusses existing development regulations in the floodplain, the preservation of floodplain areas as open space, and suggests additional floodplain management measures such as educational outreach projects, drainage system maintenance, and lower density zoning districts in the floodplain. The county currently has a class 8 designation from the National Flood Insurance Program (NFIP) Community Rating System (CRS) which encourages community and state activities beyond those required by the NFIP.

## Climate

The climate in Accomack County is mild in the winter and hot and humid in the summer, with south/southwest prevailing winds. The tables below list average temperatures recorded at Wallops Island and Painter. Differences in temperatures at these two sites are attributed to the fact that the southern end of the county is narrower than the northern end and is thus more susceptible to the Ocean and Bay's moderating influences on temperatures.

**Temperature:** The average daily temperature during the winter at Wallops Island is 37.1° F and the average daily minimum temperature is 29.6° F. The average daily temperature in the winter at Painter is 39.1° F and the average daily minimum temperature is 30° F. The average daily temperature during the summer at Wallops is 73.7° F with an average daily maximum of 80.2° F. The average summer daily temperature at Painter is 75° F with an average daily maximum of 84.4° F.

<u>Location</u>	<u>Winter</u>	<u>Summer</u>
Wallops Island	37.1°F	73.7°F
Painter	39.1°F	75°F

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**Average daily temperatures**

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<u>Location</u>	<u>Winter</u>	<u>Summer</u>
Wallops Island	29.6° F	80.2° F
Painter	30° F	84.4° F

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**Average winter minimum and summer maximum temperatures**

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**Growing Season:** Freeze dates for Wallops Island and Painter are summarized below. The last average freeze date in the spring for Wallops Island is April 7 and the first average freeze date in the fall is November 8. For Painter, the last average freeze date in spring is April 13 and the first average freeze date in the fall is Oct. 29. The average growing season (temperatures above 32° F) is 199 days at Wallops Island and 173 days at Painter.

<u>Location</u>	<u>Last spring freeze*</u>	<u>First fall freeze**</u>
Wallops Island	April 7	November 8
Painter	April 13	October 29

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**Growing season**

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\* 32° F or lower - Probability that frost will occur later than this date: 5 years in 10.

\*\* 32° F or lower - Probability that frost will occur earlier than this date: 5 yrs in 10.

**Precipitation:** Precipitation is well distributed throughout the year and adequate for most commonly grown crops. Annual rainfall averages between 42 and 45 inches. Fifty percent of annual precipitation falls during the months of April through September. The average seasonal snowfall is 9.8 inches. The greatest snow depth at any one time during the periods of record was 6 inches.

## Air Quality

Air quality is important to human health, the health of domestic and wild plants and animals, the prevention of corrosion to materials such as paints and metals, and the maintenance of visibility levels. Air quality is measured by the concentration of pollutants in the air (referred to as “ambient concentration”). Primary ambient air quality standards have been established based on the level of pollutant concentration present in air which is considered hazardous to human health. Secondary ambient air quality standards have been established for levels which threaten human welfare (health of domestic and wild plants and animals, the prevention of soiling (corroding) of materials (paint, metal, etc.) and the maintenance of natural levels of visibility). The degree of harm associated with a pollutant depends on the exposure “dose.” The exposure dose is a function of the average concentration of the pollutant and the duration of the exposure. In order to address the dosage factor, ambient air quality standards are established for set exposure periods of the established concentration. The table below lists ambient air quality standards which have been established in the United States.

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### Federal Air Quality Standards

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<b>Pollutant</b>	<b>Averaging Time</b>	<b>Primary Standard</b>	<b>Secondary Standard</b>
TSP	Annual (mean)	75 mg m <sup>-3</sup>	60 mg m <sup>-3</sup>
24 hr <sup>a</sup>	260 mg m <sup>-3</sup>	150 mg m <sup>-3</sup>	
SOx	Annual (mean)	0.03 ppm	40 mg m <sup>-3</sup>
24 hour <sup>a</sup>	0.14 ppm	—————	
3 hour <sup>a</sup>	—————	0.05 ppm	
CO	8 hour <sup>a</sup>	9 ppm	9 ppm
1 hour <sup>a</sup>	35 ppm	40 mg m <sup>-3</sup>	
NO <sub>2</sub>	Annual (mean)	0.05 ppm	0.05 ppm
Ozone	1 hour <sup>a</sup>	0.12 ppm	0.12 ppm
Hydrocarbons, nonmethane	3 hr. (6-9 a.m.)	0.24 ppm	0.24 ppm
Lead	3 months	1.5 mg m <sup>-3</sup>	1.5 mg m <sup>-3</sup>

*a. Not to be exceeded more than once a year.*

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**Pollutants:** Air pollutants for which there are registered emission sources in Accomack County include particulates, Lead, Carbon Monoxide, Sulfur Dioxide, Nitrogen Dioxide, Volatile Organic Chemicals, Ammonia and Chlorine. A brief description of each pollutant and its potential impacts is given below.

**Particulates (PM10):** Suspended particulate matter includes dust, soot (carbon), asbestos, lead, cadmium, chromium, arsenic, beryllium nitrate, and sulfate salts. Lead compounds (all poisonous) include tetraethyl lead (formerly used as a gasoline antiknock additive) and oxides used in mortars and pigments. Continued exposure to lead, through inhalation of fumes or sprays and ingestion of food containing lead, can result in a cumulative chronic disease called lead poisoning.

**Carbon Monoxide (CO):** colorless, odorless, tasteless, extremely poisonous gas that is less dense than air under ordinary conditions. When air containing as

little as 0.1% carbon monoxide by volume is inhaled, the oxygen carried by hemoglobin is replaced by the carbon monoxide, resulting in fatal oxygen starvation throughout the body.

***Sulfur Dioxide (SO<sub>2</sub>):*** A colorless, suffocating gas which is a product of burning coal or oil. Chronic exposure can increase chances of respiratory infections and lung cancer. Causes corrosion to stone, concrete, metals, and paints.

***Nitrogen Dioxide (NO<sub>2</sub>):*** A secondary pollutant, formed in the air from a chemical reaction between nitrogen and oxygen. Nitrogen Dioxide is a yellowish brown gas with a pungent, choking odor. This gas causes a characteristic brown haze. Chronic exposure can increase chances of respiratory infections and lung cancer.

***Volatile Organic Compounds (VOC):*** Gaseous and liquid compounds containing carbon and hydrogen, including methane, butane, ethylene, benzene, and benzopyrene.

***Ammonia (NH<sub>3</sub>):*** Ammonia is a colorless gas and a common molecule given off by living organisms. It is used to make fertilizers, animal foods, synthetic fibers, glues and explosives. It may enter the environment through natural organic matter decomposition, run-off from agricultural fields or feedlots, municipal waste treatment plant discharges, oil refinery and chemical manufacturing effluents, or atmospheric fallout. Short term health effects of exposure may include irritation of the mouth, nose, and throat. Higher levels may irritate the lungs, causing coughing and/or shortness of breath.

***Chlorine (Cl):*** Chlorine is a greenish yellow gas with an irritating odor. Chlorine is a natural element of common occurrence. It is produced as a gas to be used extensively as a fabric bleach, for purifying water, for disinfecting, and for making synthetic rubber, plastics, and a large number of chlorinated chemicals. Exposure can cause irritation of the eyes, nose, and throat, and also tearing, coughing and chest pain. Higher levels burn the lungs and can cause a build up of fluid in the lungs (pulmonary edema) and death.

**Sources of Air Pollution:** Sources of air pollution in Accomack County which are required to register with the Virginia Department of Air Pollution Control are listed in the margin of this page. Most Sulfur Dioxide and Volatile Organic Compounds are emitted from Tyson Foods, Perdue Farms, and A&N Electrical Cooperative. Major contributors of Carbon Monoxide and Nitrogen Dioxide include the Accomack County Nursing Home, Arcadia High School, J.F. Jones Lumber Company, Nandua High School, and the Town of Tangier. NASA - Wallops emits a significant amount of particulates.

**Regulation:** Air pollution sources in Virginia are regulated by the Virginia Department of Environmental Quality (DEQ), the Air Pollution Control Board, and the U.S. Environmental Protection Agency (EPA). These agencies administer programs created by the federal Clean Air Act. DEQ issues permits for emission

sources in order to maintain ambient air quality standards established by the EPA. The EPA has established standards for total suspended particulates (TSP), carbon monoxide (CO), sulfur dioxide (SO<sub>2</sub>), nitrogen oxides (Nox), Ozone (O<sub>3</sub>), and lead (Pb). Existing emission sources are required to use “reasonably available control measures,” and new emission sources are required to use “best available control technology,” to meet national ambient air quality standards.

The Department of Air Pollution Control also enforces federal standards for hazardous air emissions. EPA has established standards for eight hazardous air pollutants (arsenic, asbestos, benzene, beryllium, mercury, radionuclides, vinyl chloride, and coke oven emissions). Virginia has established threshold limits for 600 additional hazardous or toxic compounds. The threshold limit is the lowest concentration at which a pollutant is estimated to be hazardous to human health. If these limits are exceeded, the source can reduce the emission to meet the limits; prove to the Department’s satisfaction that the limits are met; or, petition the Department to raise the limit. Newly permitted emission sources are also required to use Best Available Control Technology to control offensive odors. For existing or unanticipated sources of odor, the Department takes enforcement action, beginning with analysis of the problem and requiring a plan to correct it.

Virginia’s air permit program includes existing source registration and standards, minor new or modified source construction permits, major new or modified source construction permits, Prevention of Significant Deterioration (PSD) permits, and operating permits.

***Prevention of Significant Deterioration Permit:*** Any person or entity intending to construct a new air pollution source; or to modify, relocate or reactivate an existing source that will emit 250 tons per year of any regulated pollutant or combination of regulated pollutants, must apply for a Prevention of Significant Deterioration Permit. Also, any of 28 specific industries identified by DEQ that will emit 100 tons per year of a regulated pollutant must apply for a permit. These industries include fossil fuel fired power plants of more than 250 million Btu per hour heat output, kraft pulp mills, petroleum refineries, iron and steel mill plants, and glass fiber processing plants. Typical requirements of a permit include demonstration that the design incorporated the “Best Available Control Technology,” evidence that local zoning requirements are satisfied, and extensive predictive emissions modeling.

***State and Federal Operating Permits:*** A state operating permit is required for any stationary source of air pollutants. Federal Title V operating permits are required for major stationary sources, plus any source subject to “Maximum Achievable Control Technology” requirements and those subject to “New Source Performance Standards” under the federal Clean Air Act. A major source under both state and federal operation permits is one that emits, or has the potential to emit, 100 tons or more per year of any criteria pollutant; for Title V permits, a source that emits 10 tons per year or more of any hazardous air pollutant or 25 tons per year of any combination of hazardous air pollutants. Operating permits

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### Registered Air Pollution Sources

Nandua High School  
J.W. Taylor Packing  
Arcadia High School  
NASA Wallops  
Accomack Co. Nursing Home  
J. Franklin Jones Lumber  
Tangier Incinerator  
A-N Elec. CoOp, Tangier  
Bagwell Oil Terminal  
T&W Block  
Delmarva Power & Light  
Eastern Shore Seafood  
Tyson Foods  
I.A. Construction  
Dynachem Technologies  
Byrd Foods  
Eastern Shore Comm. College  
Perdue Farms

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typically include requirements for emission rates, emission controls, fuels, fuel consumption, visibility, operation and maintenance, record keeping, reporting, inspection, and permit review.

***Existing Sources Registration and Standards:*** Registration is required for any existing (constructed before March 17, 1972 or reconstruction before December 10, 1976) stationary source that exceeds threshold amount of fugitive dust, odor or any other criteria pollutants from emission causing processes, exceeds national emission standards for hazardous air pollutants, maximum achievable control technology standards, or toxic pollutants under Virginia Air Toxics Regulation. Registered existing sources are typically required to report types and amounts of pollutants emitted, operate the source in compliance with maximum allowable levels of emissions as defined in the applicable rules, and conduct ambient air quality monitoring as directed by DEQ.

***Minor New or Modified Source Construction Permit:*** This permit is required of any person or entity intending to construct a new air pollution source, or to modify, relocate or reactivate an existing source not exempted by state regulation. A modification is any change to the facility or process, including hours of operation, which increases the potential to emit an air pollutant or causes a pollutant to be emitted that was not previously emitted. Stationary sources must control their emission using the “Best Available Control Technology” for each criteria pollutant and “Maximum Achievable Control Technology” for regulated hazardous air pollutants, certain identified toxic pollutants must be limited to specified levels, and procedures are established for measuring and recording emissions.

***Major New or Modified Source Construction Permit:*** This permit is required for any person or entity intending to construct a new stationary air pollution source, or to modify, relocated or reactivate an existing source of a “criteria pollutant” for which the area is designated nonattainment. A modification is any change to the facility or process, including hours of operation, which increase the potential to emit an air pollutant or causes a pollutant to be emitted that was not previously emitted. Stationary sources in a nonattainment area must control their emission with the “Best Available Control Technology” for the criteria pollutants that meet the standard. For volatile organic compounds and nitrogen oxides, the more restrictive “Lowest Available Emission Rate” must be achieved.

***Air Quality Monitoring:*** According to the Virginia Department of Air Pollution Control, there are no air quality monitoring stations on the Eastern Shore. Most areas of the state meet the primary ambient air quality standards, with the exception of the Northern Virginia, Richmond, and Hampton Roads areas, which are nonattainment areas for ozone. It can probably be safely assumed that air quality in Accomack County does not exceed any ambient air quality standards. The establishment of an air quality monitoring station in the county, however, would allow for the detection of any air quality deterioration and the study of long term trends.

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## B.A.C.T

Under the 1977 Clear Air Act, new sources of emission must achieve a level of control at least as good as that obtained by using the best technological system of continuous emission reduction. This requirement is referred to as the use of “Best Available Control Technology,” or “BACT.” Best Available Control Technology levels are defined by the Environmental Protection Agency for each industry, based on control system performance and costs. The control system selected as the performance standard must have been “adequately demonstrated” to be achievable in practice, although it does not have to have been routinely achieved in the industry.

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