Section 3 | **Existing Resources**

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Geological Conditions

The Hampton Roads region relies on groundwater to support many community water systems and self-supplied commercial and industrial users. The entire region is located in the Virginia Coastal Plain physiographic province.

The Coastal Plain is underlain by a seaward-thickening wedge of eastward-dipping layers of aquifers and confining units. The sediment wedge in Virginia ranges from zero feet at its western margin near Richmond to more than 6,000 feet along the Atlantic coast. Coastal Plain sediments in Virginia were further affected by the impact of an asteroid or comet that crashed near the mouth of the Chesapeake Bay (Powars and Bruce, 1999). The Chesapeake Bay impact crater is greater than 50 miles in diameter and extends across a large part of the southeastern Virginia Coastal Plain.

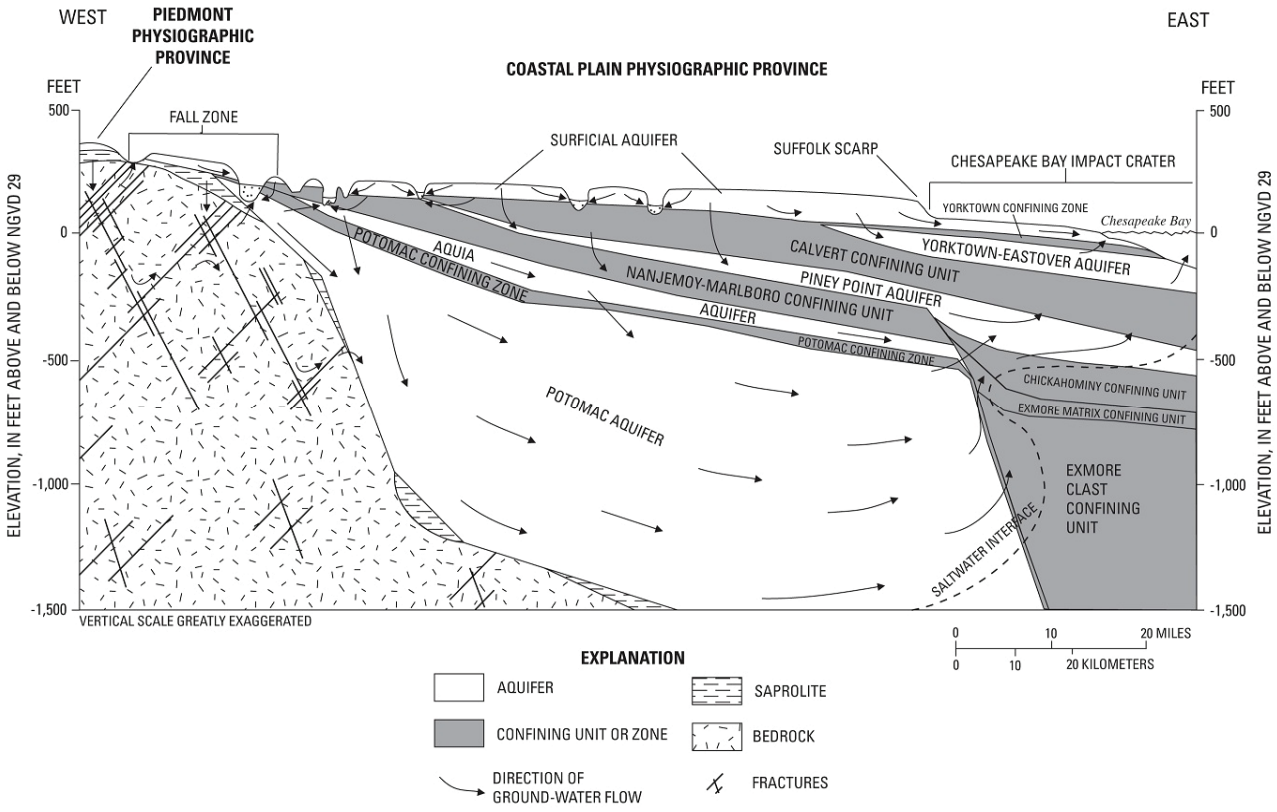
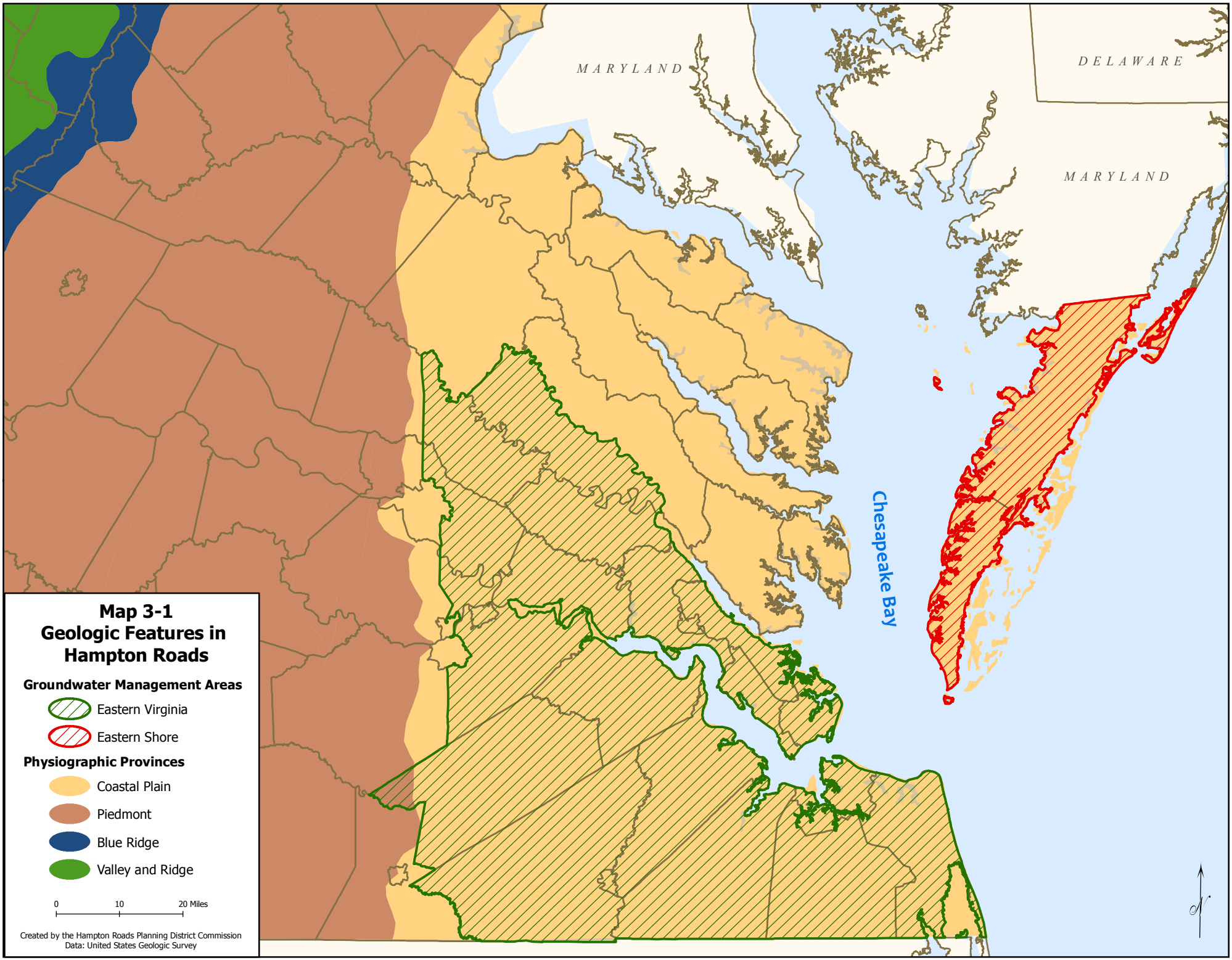


Figure 3-1: Cross-section of Coastal Plain aquifer system (McFarland & Bruce, 2006).

The crater was formed over 35 million years ago and has impacted the groundwater quality and flow pattern within the region. Additional information on the Chesapeake Bay impact crater is discussed in the "Unusual Geologic Formations" section of this chapter.

The permitted groundwater users in the Coastal Plain have reported withdrawal rates totaling approximately 100 mgd for the last decade. Additionally, the unregulated withdrawal rates are estimated to be 20-30 mgd. As a result of long-term withdrawals, groundwater levels in the Coastal Plain aquifers have declined by as much as 200 feet near large withdrawal centers. Flow gradients have been altered from a previously seaward direction to a landward direction (Harsh and Laczniak, 1990), creating the potential for saltwater intrusion.

All localities in the Hampton Roads region except Gloucester County are in the Eastern Virginia Ground Water Management Area (see Map 3-1). All users in the management area that withdraw over 300,000 gallons per month must receive a permit from DEQ.


MARYLAND
DELAWARE
MARYLAND
Chesapeake Bay
Map 3-1
Geologic Features in
Hampton Roads
Groundwater Management Areas
Eastern Virginia
Eastern Shore
Physiographic Provinces
Coastal Plain
Piedmont
Blue Ridge
Valley and Ridge
0
10
20 Miles
Created by the Hampton Roads Planning District Commission
Data: United States Geologic Survey

Groundwater withdrawal permits continue to receive a lot of scrutiny due to concerns that the groundwater resource might not support all the requested withdrawals. The overall yield of the aquifer system cannot be determined because of the complexity of the system.

The USGS report "The Virginia Coastal Plain Hydrogeologic Framework" by McFarland and Bruce provides a comprehensive description of the aquifer system in the Hampton Roads region.

Hydrologic Conditions

Hydrologic Units

Hydrologic units are drainage areas delineated within a multi-level hierarchical drainage system. Hydrologic units may accept water from one or more points outside of the unit's boundary or have multiple outlet points in addition to the surface waters collected within the boundary.

A numeric code is used to identify hydrologic units. Regions are the largest hydrological units and are designated by two-digit codes. The hydrologic conditions of Hampton Roads can best be visualized through the U.S. Geological Survey Hydrologic Unit Code (HUC) at the eight-digit level (HUC 8). HUC 8 codes are used to designate sub-basins or major watersheds. Map 3-2 shows the HUC 8 sub-basins that are located entirely or partially within the Hampton Roads region. A short description of the Hydrologic Unit Region, Subregion, Basin and Sub-basin or watersheds of Hampton Roads follows below.

Map 3-2 was created with a U.S. Department of Agriculture, National Cartography & Geospatial Center dataset compiled to provide the National Water Quality Assessment (NAWQA) study units with intermediate-scale river basin boundaries. The data set is designed for use as a reference source and not as a regulatory tool.

Mid-Atlantic Region (02)

Part of the Hampton Roads Planning District lies within the Mid-Atlantic Region of the United States. This region contains all drainage within the United States that ultimately discharges into the Atlantic Ocean (between the states of New York and Virginia), Long Island Sound (south of the New York-Connecticut State Line), and the Riviere Richelieu (tributary of the St. Lawrence River). This region includes all of Delaware, New Jersey, and the District of Columbia, and parts of Connecticut, Maryland, Massachusetts, New York, Pennsylvania, Vermont, Virginia, and West Virginia.

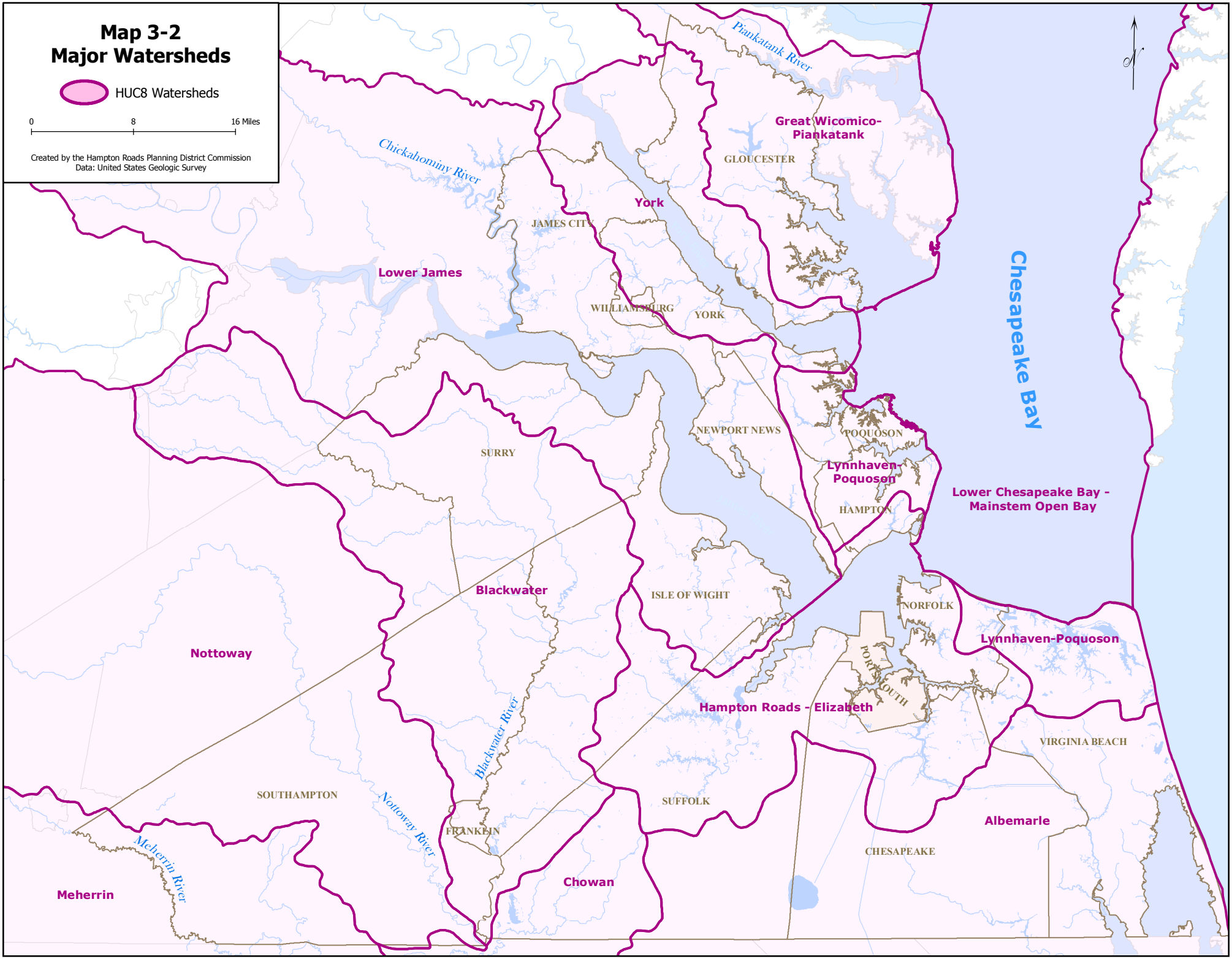
The Mid-Atlantic Region is further divided into subregions, identified by a four-digit hydrological unit code. The Lower Chesapeake subregion (0208) is contained within Virginia and West Virginia and includes drainage to the Chesapeake Bay and its tributaries south of the Maryland-Virginia state line, excluding the Pocomoke River drainage, and the Coastal drainage from the Chincoteague Inlet on the Delmarva Peninsula to the Back Bay drainage boundary. The total area of the Lower Chesapeake Region is 18,500 square miles.

Lower Chesapeake Subregion (0208)

The Lower Chesapeake subregion is split into several major river basins. Hampton Roads contains portions of three of those basins: the James River Basin, the York River Basin and the Chesapeake Bay and Small Coastal Basin.

James River Basin

The James River Basin occupies the central portion of Virginia and covers 10,200 square miles or approximately 25 percent of the Commonwealth's total land area as Virginia's largest river basin. The James River headwaters originate along the Virginia and West Virginia state line. The James River Basin begins in the Alleghany Mountains and flows in a southeasterly direction to Hampton Roads where it enters the Chesapeake Bay.


Map 3-2
Major Watersheds
HUC8 Watersheds
0
8
16 Miles
Created by the Hampton Roads Planning District Commission
Data: United States Geologic Survey
Pamunkey River
Chickahominy River
Great Wicomico-Piankatank
GLOUCESTER
York
JAMES CITY
Lower James
WILLIAMSBURG
YORK
Chesapeake Bay
NEWPORT NEWS
POQUOSON
SURRY
Lynnhaven-Poquoson
Lower Chesapeake Bay - Mainstem Open Bay
HAMPTON
Blackwater
ISLE OF WIGHT
NORFOLK
Lynnhaven-Poquoson
Nottoway
PORTSMOUTH
Hampton Roads - Elizabeth
Blackwater River
VIRGINIA BEACH
SOUTHAMPTON
Nottoway River
SUFFOLK
Albemarle
Meherrin River
FRANKLIN
CHESAPEAKE
Chowan
Meherrin

The James River is formed by the confluence of the Jackson and Cowpasture Rivers, and flows 228 miles to the Fall Line at Richmond and another 111 miles to the Chesapeake Bay. Major tributaries to the James River include the Jackson River, Cowpasture River, Craig Creek, Maury River, Tye River, Rockfish River, Slate River, Rivanna River, Willis River, Appomattox River, Chichahominy River, Pagan River, Chuckatuck Creek, Nansemond River, and the Elizabeth River.

The James River Basin is divided into seven smaller sub-basins identified by HUC 8 codes (see Table 3-1).

Table 3-1: James River Basin USGS HUC 8 Sub-Basins

Sub-Basin Name	Area (square miles)	HUC 8 Code
Upper James (Beginning in West Virginia)	2,210	02080201
Maury	818	02080202
Upper Middle James - Buffalo	1,990	02080203
Rivanna	758	02080204
Middle James - Willis	948	02080205
Lower James	1,440	02080206
Appomattox	1,590	02080207
Hampton Roads - Elizabeth	425	02080208

Portions of the Lower James and Hampton Roads - Elizabeth sub-basins are located in Hampton Roads. The James River Basin is divided into 92 different watersheds.

York River Basin

The York River Basin lies in the central and eastern section of Virginia and covers 2,626 square miles or 7 percent of the Commonwealth's total area. The headwaters of the York River begin in Orange County and flow in a southeasterly direction for approximately 220 miles to its mouth at the Chesapeake Bay. The basin is comprised of the York River and its two major tributaries, the Pamunkey and the Mattaponi Rivers. The York River itself is only about 30 miles in length.

The York River Basin is divided into USGS HUC 8 sub-basins as listed in Table 3-2. Portions of the York sub-basin are located within Hampton Roads. The York River Basin is divided into 23 watersheds.

Table 3-2: York River Basin USGS HUC 8 Sub-Basins

Sub-Basin Name	Area (square miles)	HUC 8 Code
Mattaponi	901	02080105
Pamunkey	1,450	02080106
York	275	02080107

Chesapeake Bay and Small Coastal Basin

The Chesapeake Bay and Small Coastal Basin is located in the eastern part of Virginia and covers 3,003 square miles. The basin encompasses the small bays, river inlets, islands and shoreline immediately surrounding the Chesapeake Bay and the southern tip of the Delmarva Peninsula. This basin also includes the Chesapeake Bay.

Major tributaries flowing into the Chesapeake Bay from the western shore are the Great Wicomico River, Piankatank River, Fleets Bay, Mobjack Bay including the East, North, Ware, and Severn Rivers, Poquoson River, Back River and Lynnhaven River. Tributaries in the

Eastern Shore portion that drain into the Bay include Pocomoke, Onancock, Pungoteague, Occohannock, and Nassawadox Creeks. The Machipongo River, Assawoman Creek, Parker Creek, Folly Creek, and Finney Creek drain east directly into the Atlantic Ocean.

The Chesapeake Bay and Small Coastal Basin is divided into HUC 8 sub-basins as listed in Table 3-3.

Table 3-3: Chesapeake Bay and Small Coastal Basin USGS HUC 8 Sub-Basins

Sub-Basin Name	Area (square miles)	HUC 8 Code
Lower Chesapeake Bay - Mainstem Open Bay	1,390	02080101
Great Wicomico-Piankatank	605	02080102
Lynnhaven - Poquoson (Lower Western Shore)	213	02080108
Western Lower Delmarva	338	02080109
Eastern Lower Delmarva	457	02080110

Portions of the Lower Chesapeake Bay - Mainstem Open Bay, Great Wicomico - Piankatank, and Lynnhaven - Poquoson sub-basins are located within Hampton Roads. The Chesapeake Bay and Small Coastal Basin is divided into 31 watersheds.

South Atlantic-Gulf Region (03)

A portion of Hampton Roads is within the South Atlantic-Gulf Region of the United States which contains all areas where the drainage ultimately discharges into:

- the Atlantic Ocean between the states of Virginia and Florida; and
- the Gulf of Mexico between the states of Florida and Louisiana and associated waters.

This region includes all of Florida and South Carolina, and parts of Alabama, Georgia, Louisiana, Mississippi, North Carolina, Tennessee, and Virginia.

The South Atlantic - Gulf Region is further divided into subregions. The Chowan - Roanoke subregion is contained within Virginia and North Carolina and includes the coastal drainage and associated waters from and including the Back Bay drainage to Oregon Inlet. The total area of the Chowan-Roanoke subregion is 18,300 square miles.

Chowan - Roanoke Subregion (0301)

The Chowan - Roanoke subregion is split into several major river basins. Hampton Roads contains portions of one basin, the Albemarle - Chowan Basin.

Albemarle - Chowan Basin

The Albemarle - Chowan River Basin is located in southeastern Virginia and northeastern North Carolina and covers 8,651 square miles. The total land area within the Commonwealth is 4,061 miles or approximately 10 percent of the Commonwealth's total area. The Basin extends eastward from Charlotte County to the Chesapeake Bay. The basin is approximately 145 miles in length and varies from 10 to 50 miles in width.

Major tributaries of the Chowan River are the Meherrin, the Nottoway and the Blackwater. The Nottoway and the Blackwater join at the Virginia/North Carolina state line to form the Chowan River. The Dismal Swamp portion is mostly flat with many swamp and marshland areas. The Chowan and Roanoke rivers are the largest of many streams flowing into Albemarle Sound. The Chowan River-Dismal Swamp Basin is divided into five sub-basins as listed in Table 3-4. The Albemarle - Chowan Basin is divided into 44 watersheds.

Table 3-4: Albemarle - Chowan Basin USGS HUC 8 Sub-Basins

Name	Area (square miles)	HUC 8 Code
Nottoway (North Carolina and Virginia)	1,700	03010201
Blackwater (North Carolina and Virginia)	744	03010202
Chowan (North Carolina and Virginia)	857	03010203
Meherrin (North Carolina and Virginia)	1,600	03010204
Albemarle (North Carolina and Virginia)	3,750	03010205

Meteorological Conditions

The entire Hampton Roads region enjoys mild winters with warm, humid summers. In addition to summer thunderstorms, Nor'easters and tropical storms bring significant rainfall to the region. According to the National Climatic Data Center (NCDC), the most frequently reported weather events in the region are thunderstorms, severe lightning, high winds, and flash flooding. Hurricanes occasionally bring heavy rain, high winds, and tidal flooding. The most significant weather events in recent years were the 2009 Nor'easter, Hurricane Isabel, which struck on September 18, 2003, and Hurricane Floyd, which struck on September 16, 1999. All three storms caused flooding and extensive damage throughout the Hampton Roads region.

The average annual rainfall and temperature data for the region were gathered from the Southeast Regional Climate Center, a national climate services program supported by the National Climatic Data Center (NCDC). For the purposes of this report, NCDC data from four selected weather stations, listed in Table 3-5, is presented as representative of the Hampton Roads region. The weather station locations are depicted on Map 3-3.

Throughout Hampton Roads January is the coldest month on average, while July is the hottest. More than 40 inches of annual rainfall is well distributed throughout the year, with the wettest months typically being July and August. The Hampton Roads coastal communities are subject to onshore winds that moderate temperature extremes. Table 3-6 provides a regional climate summary.

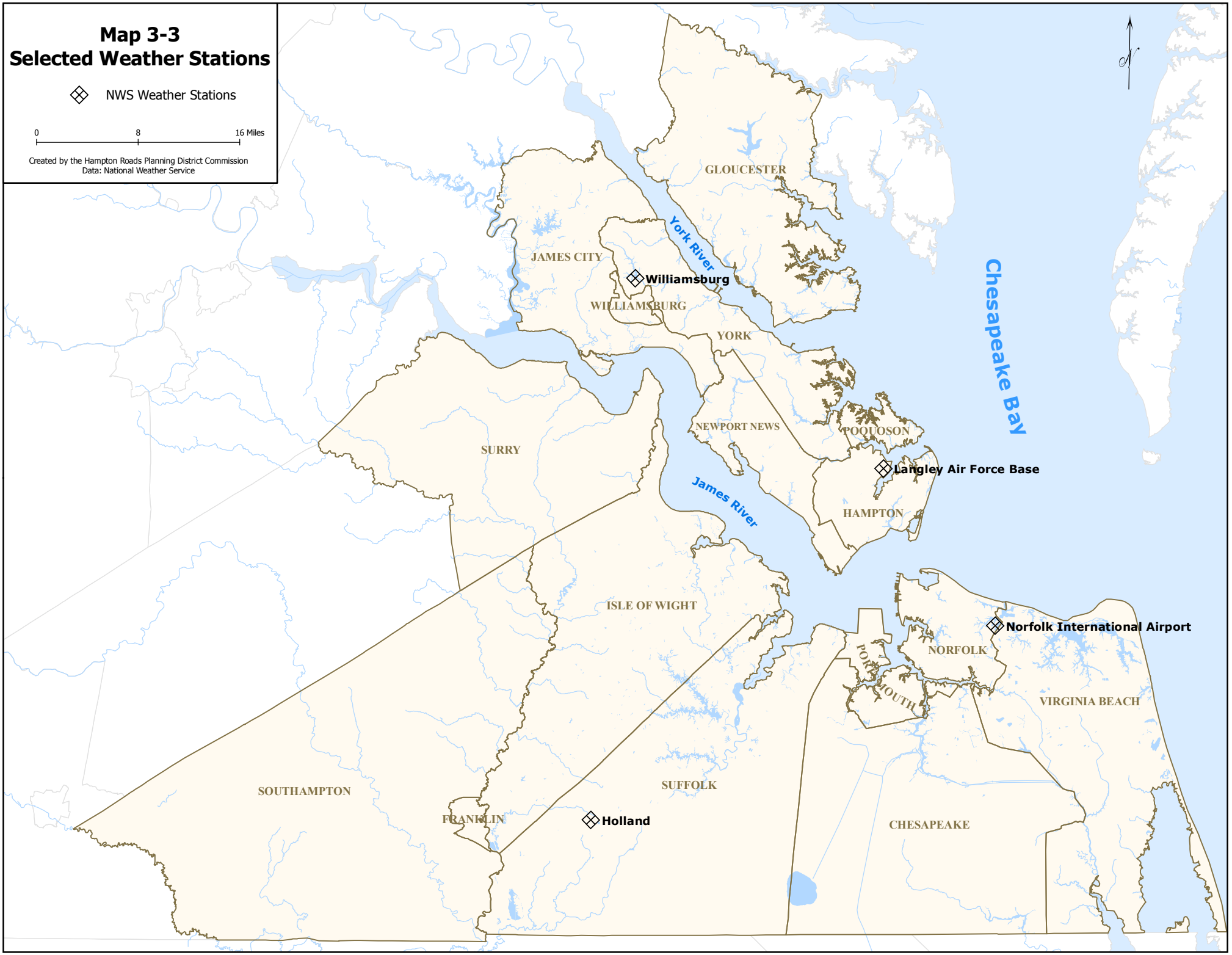
Figures 3-2 to 3-5 depict monthly Historic Climate Data for the four selected Hampton Roads Weather Stations.

Table 3-5: Selected Weather Stations

Name	Location	Subregion	Period of Record
Langley Air Force Base	Hampton	Peninsula	1918 – 2007
Williamsburg	Williamsburg	Peninsula	1948 – 2008
Holland	Suffolk	Southside and Western Tidewater	1933 – 2008
Norfolk Weather Service Office (WSO) Airport	Norfolk	Southside	1946 – 2008

Table 3-6: Annual Meteorological Averages

Weather Station	Maximum Temperature (Fahrenheit)	Minimum Temperature (Fahrenheit)	Mean Temperature (Fahrenheit)	Total Precipitation (Inches)
Langley Air Force Base	67.5	51.3	59.4	43.59
Williamsburg	69.9	47.6	58.7	47.46
Holland	70.2	47.4	58.8	48.36
Norfolk Weather Service Office (WSO) Airport	68.5	51.4	59.9	45.26


Map 3-3
Selected Weather Stations
NWS Weather Stations
0
8
16 Miles
Created by the Hampton Roads Planning District Commission
Data: National Weather Service
GLOUCESTER
JAMES CITY
Williamsburg
WILLIAMSBURG
YORK
York River
Chesapeake Bay
NEWPORT NEWS
POQUOSON
SURRY
Langley Air Force Base
James River
HAMPTON
ISLE OF WIGHT
Norfolk International Airport
NORFOLK
PORTSMOUTH
VIRGINIA BEACH
SOUTHAMPTON
SUFFOLK
FRANKLIN
Holland
CHESAPEAKE

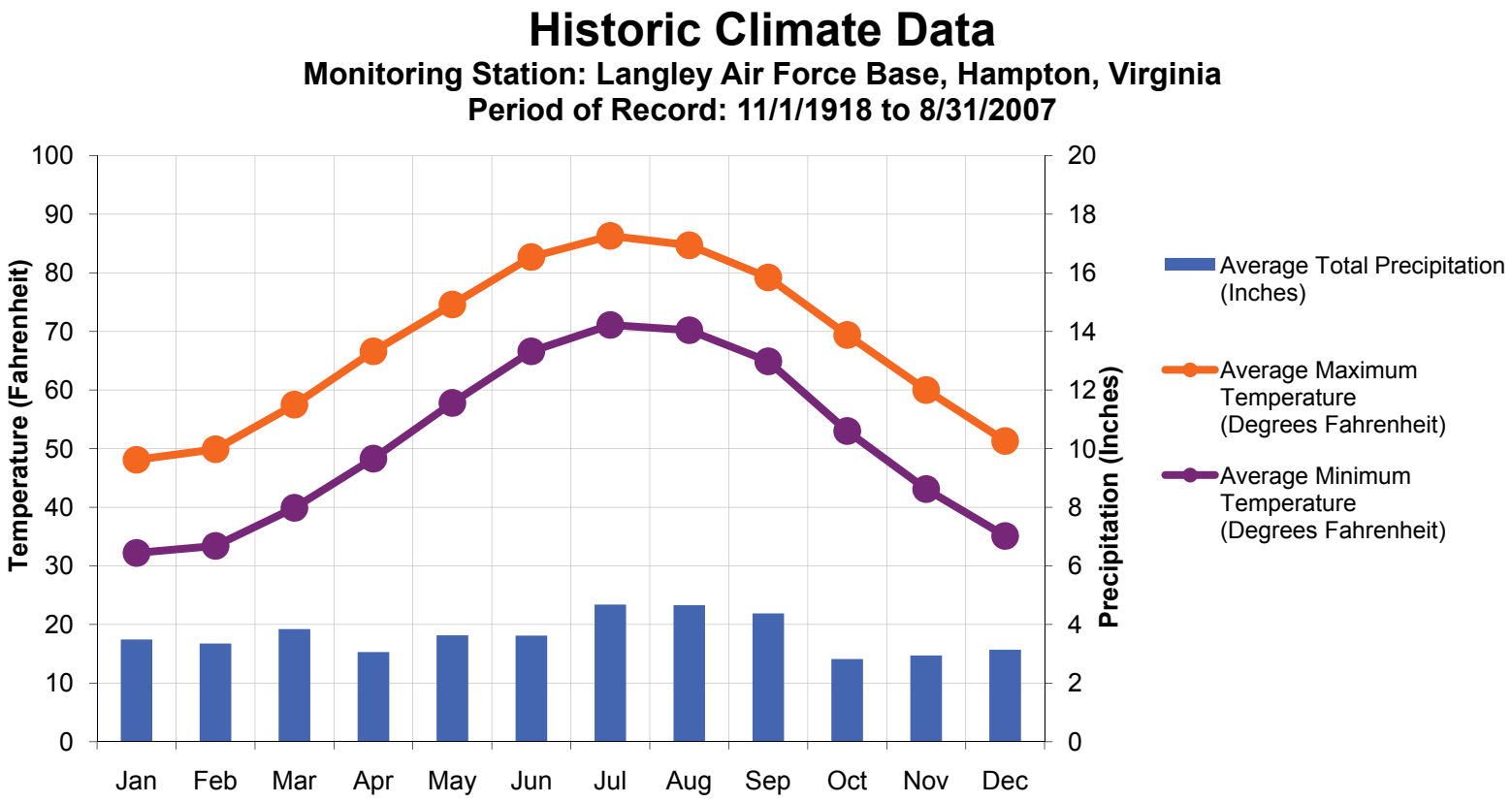


Figure 3-2: Historic climate data from monitoring station in Hampton, Virginia.

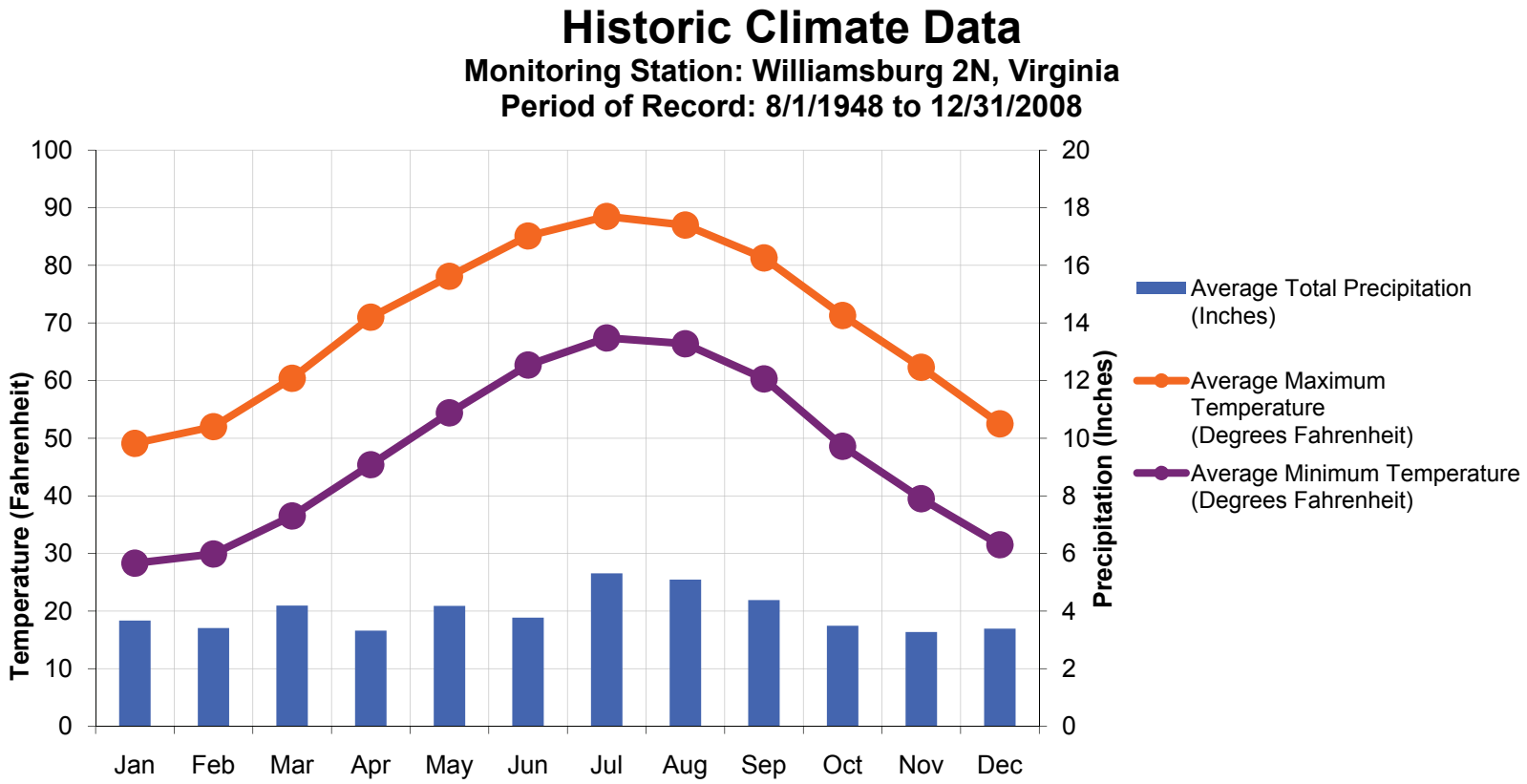


Figure 3-3: Historic climate data from monitoring station in Williamsburg, Virginia.

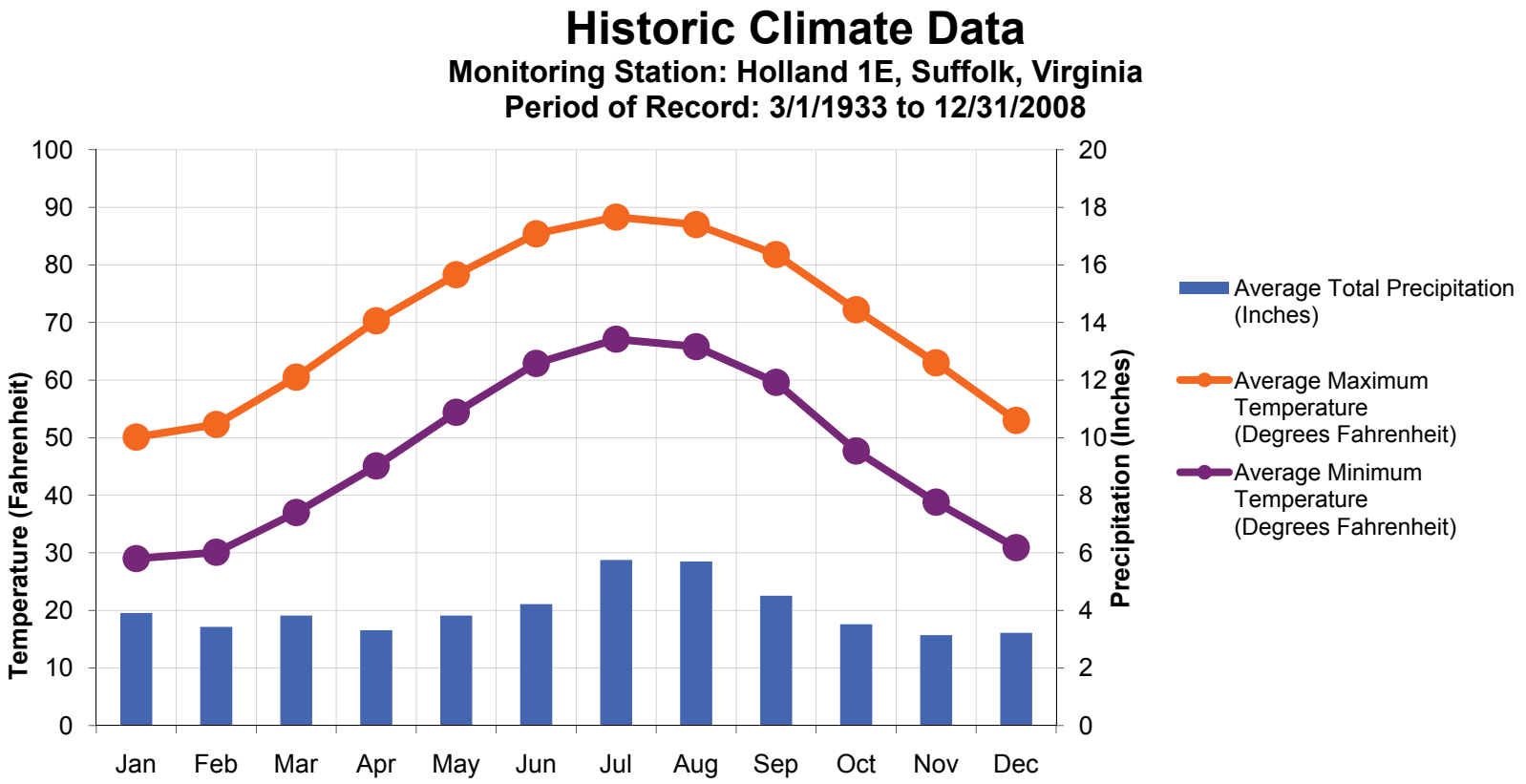


Figure 3-4: Historic climate data from monitoring station in Suffolk, Virginia.

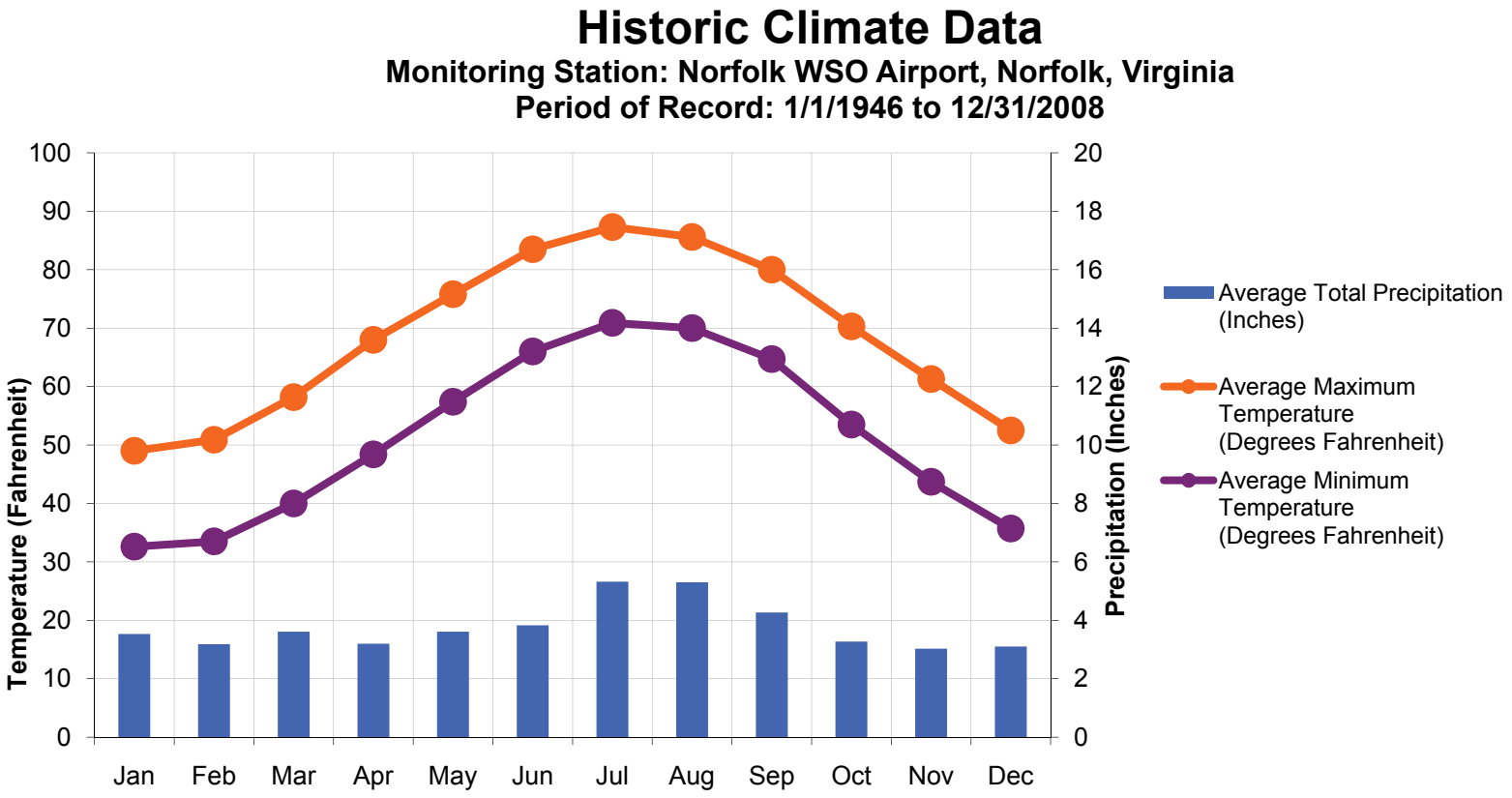


Figure 3-5: Historic climate data from monitoring station in Norfolk, Virginia.

State and Federal Listed Threatened or Endangered Species and Habitats of Concern

The Virginia Fish and Wildlife Information Service (VFWIS) online database contains a list of species known or likely to occur within defined administrative units. The dataset identifies those species that are listed as state or federal threatened or endangered species or habitats of concern and includes the species' common name, the species' scientific name, the species' code, and the protective status of the species. The list of species from the Hampton Roads region is extensive. The list can be accessed by becoming a registered subscriber at http://vafwis.org/fwis/.

The Virginia Department of Conservation and Recreation (DCR) maintains a natural heritage inventory that is the most comprehensive statewide inventory documenting the location and ecological status of Virginia's natural heritage resources, which are defined as the "habitat of rare, threatened, or endangered plant and animal species, rare or state significant natural communities or geologic sites, and similar features of scientific interest" (DCR). Habitats are classified by DCR according to ecological community groups. Ecological community groups that pertain to, or may affect, in-stream flow, in-stream uses, and water resources that currently provide water sources to Hampton Roads communities are as follows:

- **Pine/Scrub Oak Sandhills:** Suitable habitats for pine / scrub oak sandhills are mainly the slightly elevated sand deposits stretching along the eastern sides of the Blackwater and Nottoway Rivers in Sussex, Southampton, and Isle of Wight Counties and the City of Suffolk (DCR). Figure 3-6 shows longleaf pine, giant cane, and huckleberries at Blackwater Ecological Preserve, Isle of Wight County (photo by Gary P. Fleming / © DCR Natural Heritage).

Figure 3-6: Blackwater Ecological Preserve

- **Fluvial Terrace Woodlands:** Occurrences have been documented along the Nottoway River, Chickahominy River, Dragon Swamp, and Mattaponi River. The first two sites are current water supplies for localities in Hampton Roads (DCR).
- **Bald Cypress – Tupelo Swamps:** Valuable wildlife habitat and resources exist in this ecological community. Old-growth stands of bald cypress-dominated swamps, with trees up to 800 years old, occur along the Blackwater River in Surry and Isle of Wight Counties. The largest bald cypress and water tupelo trees grow in swamps along the Nottoway River in Southampton County (DCR). Figure 3-7 shows a bald cypress forest in Carbell Swamp, Isle of Wight County (photo by Gary P. Fleming / © DCR Natural Heritage).

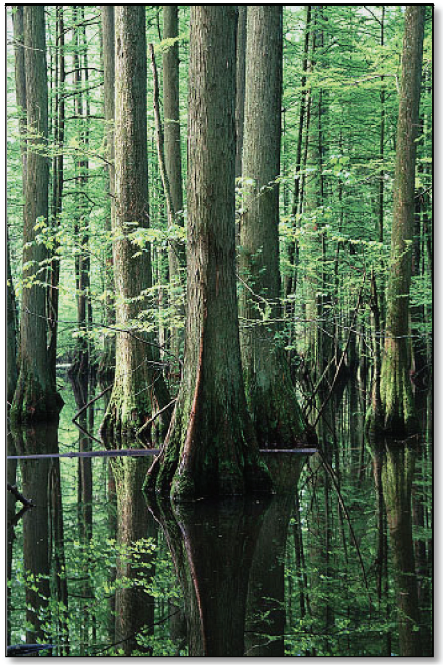


Figure 3-7: Carbell Swamp

- **Coastal Plain / Piedmont Swamp Forests:** This group includes forested, seasonally and semi-permanently flooded bottomland Coastal Plain sites and outer Piedmont sites that are not occupied by Bald Cypress - Tupelo Forests (DCR), including the Chickahominy River. Figure 3-8 shows a seasonally flooded swamp forest with green ash and lizard's-tail at Beaverdam Creek, Colonial National Historical Park, York County (photo by Gary P. Fleming / © DCR Natural Heritage).

Figure 3-8: Beaverdam Creek swamp forest

- **Coastal Plain / Piedmont Floodplain Forests:** This forest group is located in temporarily flooded, well-drained floodplains and bottomland terraces of the Coastal Plain and outer Piedmont, which includes the Nottoway River (DCR). Figure 3-9 shows a small-stream floodplain forest along Beaverdam Creek, Colonial National Historical Park, York County. Dominant trees include sweetgum, tulip-poplar, and sycamore (photo by Gary P. Fleming / © DCR Natural Heritage).

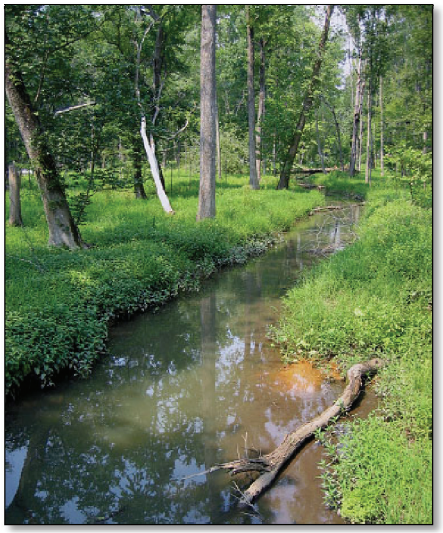


Figure 3-9: Beaverdam Creek floodplain forest

- **Tidal Bald Cypress Forests and Woodlands:** Examples of this coniferous or mixed swamp forest and woodlands dominated by bald cypress are documented in the Chickahominy River (DCR). Figure 3-10 shows a tidal bald cypress forest along the James River near Swanns Point, Surry County. Floating and submersed aquatics such as common duckweed and common hornwort dominate the herbaceous flora (photo by Gary P. Fleming / © DCR Natural Heritage).

Figure 3-10: James River near Swanns Point

- **Tidal Freshwater and Oligohaline Aquatic Beds:** Examples of this vegetation are found along the Northwest River and the Chickahominy River (DCR). Figure 3-11 shows a large aquatic bed along a tributary of the wind-tidal Northwest River in the City of Chesapeake. American water-lily, common hornwort, and greater bladderwort are abundant here (photo by William H. Moorhead III / © DCR Natural Heritage).

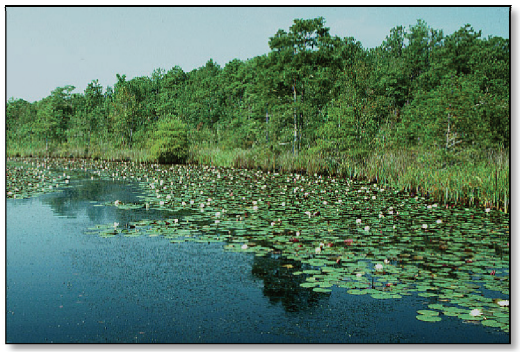


Figure 3-11: Northwest River tributary

Anadromous, Trout and Other Significant Fisheries

Anadromous Fish

Anadromous fish are those that spend all or part of their adult life in salt water and return to freshwater streams and rivers to spawn. Several common anadromous fish found in Virginia include alewife (Alosa pseudoharengus), blueback herring (Alosa aestivalis), American shad (Alosa sapidissima), hickory shad (Alosa mediocris), striped bass (Morone americana), and some populations of yellow perch (Perca flavescens).

Several anadromous fish use areas have been identified within or adjacent to the Hampton Roads regional water supply planning area. Areas with anadromous fish presence are indicated on Map 3-4 and are described in additional detail in the Virginia Department of Game and Inland Fisheries Fish and Wildlife Information service website (http://vafwis.org/fwis/). Information for the map was acquired from the Virginia Department of Game and Inland Fisheries. The Chickahominy, Blackwater, and Nottoway Rivers are used as sources for community water system supply and confirmed anadromous fish reaches are located along each river.

Trout

Several species of trout are found within the Commonwealth of Virginia (brook trout, brown trout and rainbow trout), yet few species are present in the Southeast portion of the State. According to the Virginia Fish and Wildlife Information Service, rainbow trout have been reported in James City County.

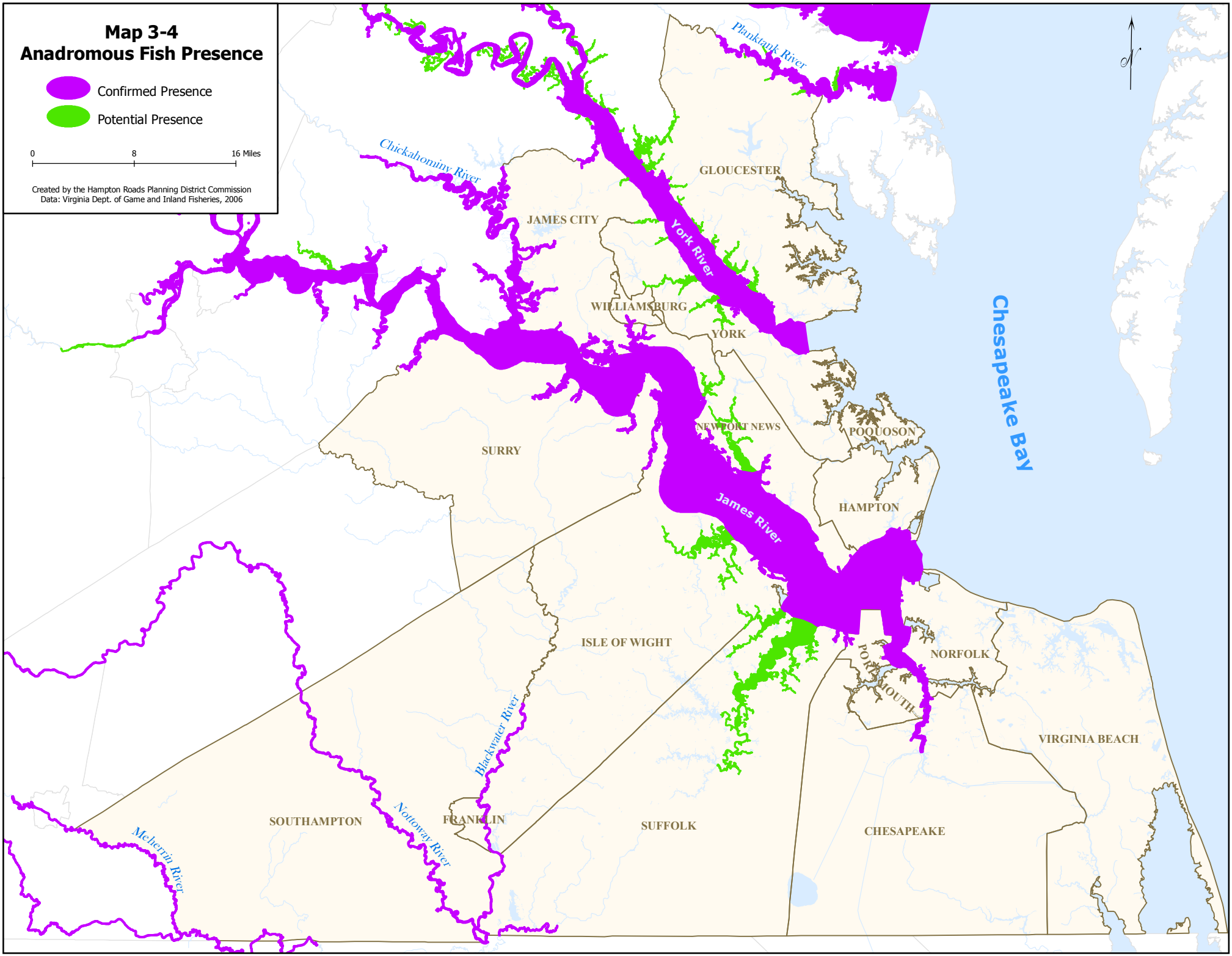
Fish Hatcheries

Based on data from the Virginia Fish and Wildlife Information Service, no fish hatcheries are located within the regional water supply planning area.

Shellfish Management Areas

The purpose of establishing shellfish management areas is to protect and promote the shellfish in the designated areas. Per the Virginia Marine Resources Commission regulation pertaining to shellfish management areas (4 VAC 20-560), the following shellfish management areas are located within the regional water supply planning area:

- **York River shellfish management area, along the York River.** This area consists of all public grounds located inshore of a line beginning at the entrance to the Virginia Institute of Marine Science boat basin at Gloucester Point, running Northwesterly to Buoy #30, thence Northwesterly to Buoy #32, thence Northwesterly to Buoy #34, then Northwesterly to Pages Rock Buoy, thence Northwesterly and ending at Clay Bank Wharf.
- **Poquoson River shellfish management area, along the Poquoson River.** This area consists of all public grounds bounded by a line beginning at Hunts Point Survey Taylor and running Northwesterly to Survey Station Spit, thence Northeasterly to Survey Station Cabin North, thence East to Survey Station Cabin South, thence Southeasterly following the general shoreline (not to include any creeks or canals) to the flag pole near Survey Station 80 at York Point, thence 175 degrees to Day Marker #14 and returning to Hunts Point Survey Taylor.
- **Back River shellfish management area, along the Back River.** This area consists of all current public clamming grounds bounded by a line from, corner 3 on Shell Plant 115 through corner 17, a daymarker, on Shell Plant 115, 237.42 feet to a point being the point of beginning; thence Southeasterly to corner number 1 Public Clamming Ground (PCG#12); thence Southeasterly to corner number 3A Public Clamming Ground (PCG#12); thence Northeasterly to corner number 3 Public Clamming Ground (PCG#12); thence Northwesterly to corner number 2 Public Clamming Ground (PCG#12); thence Southwesterly to the point of beginning (POB).


Map 3-4
Anadromous Fish Presence
Confirmed Presence
Potential Presence
0
8
16 Miles
Created by the Hampton Roads Planning District Commission
Data: Virginia Dept. of Game and Inland Fisheries, 2006
Planktank River
Chickahominy River
GLOUCESTER
JAMES CITY
York River
WILLIAMSBURG
YORK
Chesapeake Bay
NEWPORT NEWS
POQUOSON
SURRY
James River
HAMPTON
ISLE OF WIGHT
NORFOLK
PORTSMOUTH
Blackwater River
VIRGINIA BEACH
SOUTHAMPTON
Nottoway River
FRANKLIN
SUFFOLK
CHESAPEAKE
Meherrin River

River Segments with Recreational Significance

Virginia Scenic Rivers

The Virginia Scenic Rivers program began in 1970 with passage by the General Assembly of the Virginia State Scenic River Act. Since then, 20 river segments totaling approximately 474 miles have been designated state scenic rivers. The Virginia Department of Conservation and Recreation (DCR) administers the program, and the Virginia Scenic Rivers Board, which was created by the enabling legislation, discusses issues and make recommendations on the stewardship of existing scenic rivers and expansion of the program with other eligible river segments.

The intent of the Virginia Scenic Rivers program is to identify, recognize, and provide a level of protection to those rivers whose scenic beauty, historic importance, recreational value, and natural characteristics make them resources of particular importance. Table 3-7 identifies the state designated scenic rivers located within the regional water supply planning area.

Map 3-5 describes the river segments and bodies of water in and around the regional water supply planning area that have been designated into the scenic rivers program. The map also indicates segments that qualify after evaluation for program acceptance but have not yet joined the program, or are worthy of further study to determine suitability. Future water development projects or significant proposed withdrawals from such rivers should be evaluated with respect to impacts on scenic river program significance criteria.

Table 3-7: Designated Scenic Rivers in the Hampton Roads

River	Designated Reach		Total Miles	Date Approved
	From	Downstream to		
Blackwater	Proctor's Bridge (Route 621	Confluence with Nottoway River at VA/NC state line	56	2010
James (lower)	1.2 miles east of Trees Point	Lawnes Creek (James City / Surry County)	25	1988
North Landing	NC/VA state line	North Landing Road (Route 165)	26.7	1988
Nottoway	Route 40 Bridge at Stoney Creek	Route 653 (Carey's bridge)	39.5	1979

Source: Virginia Department of Conservation and Recreation

One of Hampton Roads finest resources is its coastal location. Additional recreational and economical opportunities are afforded through public access to waterways. Map 3-5 also depicts public beaches, fishing piers and selected boat ramps throughout the region.

Nationwide Rivers Inventory

The Nationwide Rivers Inventory (NRI) was compiled by the National Park Service in partial fulfillment of federal requirements of the 1968 National Wild and Scenic Rivers Act. The NRI is a register of river segments that potentially qualify as national wild, scenic or recreational river areas. In order to be listed on the NRI, a river must be free-flowing and possess one or more Outstandingly Remarkable Values (ORV).

The eligibility analysis for ORV consists of an examination of the river's hydrology, including any man-made alterations, and an inventory of its natural, cultural, and recreational resources. In order to be assessed as outstandingly remarkable, a river-related value must be a unique, rare, or exemplary feature that is significant at a comparative regional or national scale

While the spectrum of resources that may be considered is broad, all values should be directly river-related. That is, they should:

- Be located in the river or on its immediate shore lands, within 1/4 mile;
- Contribute substantially to the functioning of the river ecosystem; and/or
- Owe their location or existence to the presence of the river.

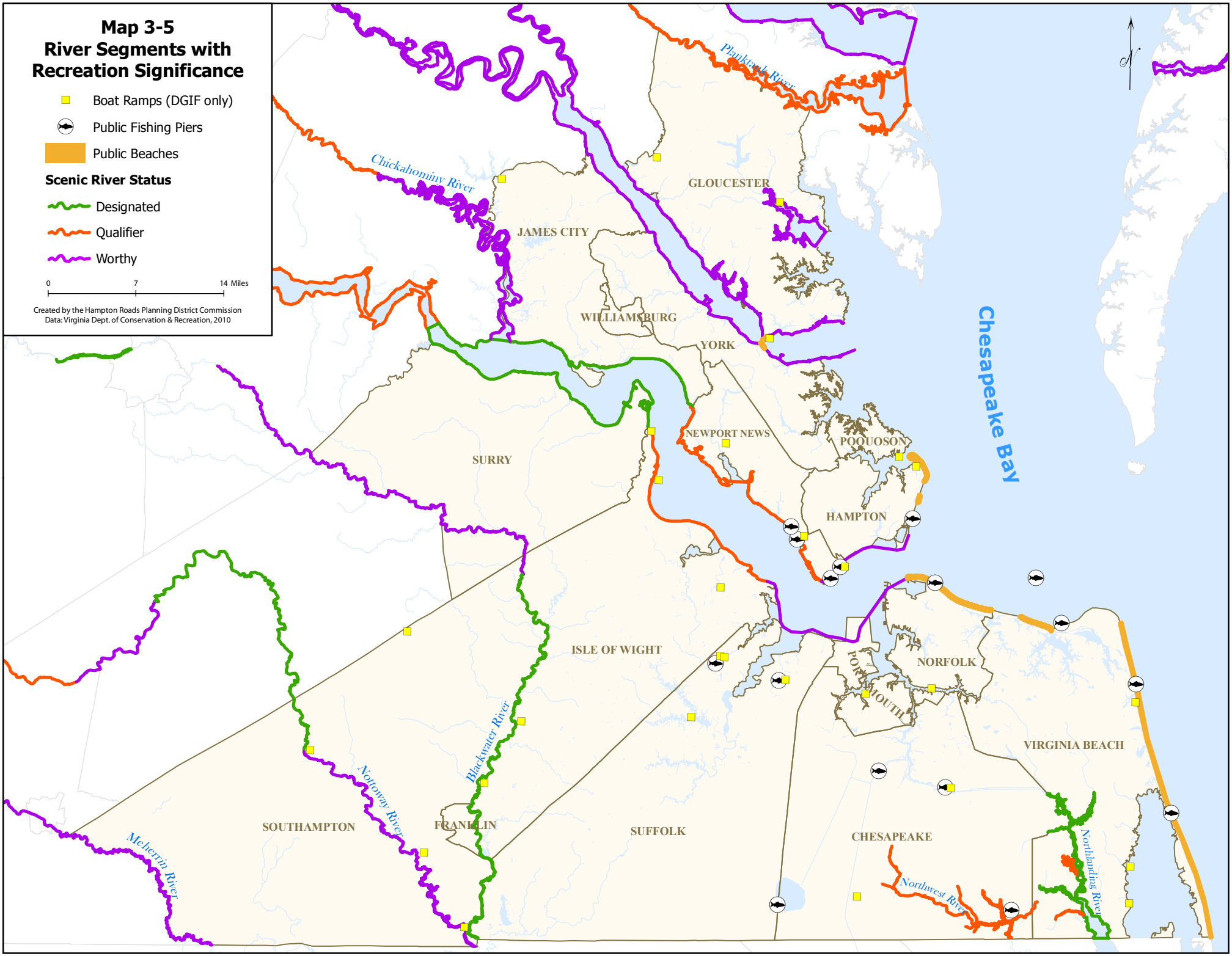

Map 3-5
River Segments with
Recreation Significance
Boat Ramps (DGIF only)
Public Fishing Piers
Public Beaches
Scenic River Status
Designated
Qualifier
Worthy
0
7
14 Miles
Created by the Hampton Roads Planning District Commission
Data: Virginia Dept. of Conservation & Recreation, 2010
Chickahominy River
Plankatank River
GLOUCESTER
JAMES CITY
WILLIAMSBURG
YORK
NEWPORT NEWS
POQUOSON
SURRY
HAMPTON
Chesapeake Bay
ISLE OF WIGHT
PORTSMOUTH
NORFOLK
VIRGINIA BEACH
Blackwater River
Nottoway River
Meherrin River
SOUTHAMPTON
FRANKLIN
SUFFOLK
CHESAPEAKE
Northwest River
Northlanding River

Table 3-8: National Rivers Inventory Outstandingly Remarkable Values Threshold Criteria

Category	Code	Criteria Description
Scenery	S	The landscape elements of landform, vegetation, water, color, and related factors result in notable or exemplary visual features and/or attractions.
Recreation	R	Recreational opportunities are, or have the potential to be, popular enough to attract visitors from throughout or beyond the region of comparison or are unique or rare within the region.
Geology	G	The river, or the area within the river corridor, contains one or more example of a geologic feature, process or phenomenon that is unique or rare within the region of comparison.
Fish	F	Fish values may be judged on the relative merits of fish population, habitat, or a combination of these river-related conditions.
Wildlife	W	Wildlife values may be judged on the relative merits of either terrestrial or aquatic wildlife populations or habitat or a combination of these conditions.
Prehistory	P	The river, or area within the river corridor, contains a site(s) where there is evidence of occupation or use by Native Americans.
History	H	The river or area within the river corridor contains a site(s) or feature(s) associated with a significant event, an important person, or a cultural activity of the past that was rare or one-of-a-kind in the region.
Cultural	C	The river or area within the river corridor contains archaeological sites or areas significant to traditional cultures.
Other Values	O	While no specific national evaluation guidelines have been developed for the "other similar values" category, assessments of additional river-related values consistent with the foregoing guidance may be developed -- including, but not limited to, hydrology, paleontology and botany resources.

Source: National Park Service, National Rivers Inventory

Table 3-8 lists the eligibility criteria offered to foster greater consistency within the federal river-administering agencies. They are intended to set minimum thresholds to establish ORVs and are illustrative but not all-inclusive. Table 3-9 lists the rivers within the regional water supply planning area that have been listed with the National Park Service in the National Rivers Inventory.

Table 3-9: National Rivers Inventory Segments in Hampton Roads

River	County	Reach	Length (miles)	ORV Code	Description
Blackwater River	Southampton, Nansemond	Confluence with Nottoway and Chowan Rivers to George Bend	7	O	Botanic - Part of 10,000 acres of bogs and pine barrens with rare plants including northern and southern relicts.
Blackwater River	Prince George, Southampton, Sussex, Isle of Wight, Surry	Franklin to headwaters	62	O	Botanic - Rare bog plants, extensive stands of cypress, northern and southern vegetation relicts. Also near Virgin Cypress-Gum Swamp presently adjacent near Dendron.
Chickahominy River	James City, Charles City, New Kent	James River to Providence Forge	30	O	Botanic - An extensive, well developed cypress-gum swamp forest and bottomland hardwood forest which includes three rare, endemic and possibly endangered species of plants.
				G	Geologic - Extreme topographic diversity including cliffs up to 100 feet high at Fish Hole Landing.
Dragon Swamp River	King & Queen, Middlesex, Gloucester, Essex	Piankatank River to Powcan	38	O	Botanic - A wild freshwater Cypress-Gum swamp forest.
				H	Historic - Deer Chase is a nearby National Historic Register Site.
James River	York, Isle of Wight, Surry, James City, Charles City, Prince George	Mogarts Beach to Hopewell	62	H	Historic - One of the most significant historic, relatively undeveloped rivers in the entire northeast region. Within or adjacent to the corridor are 4 National Historic Register Sites and one National Historic Park.
Northwest River	Chesapeake	Virginia/North Carolina State line to headwaters at Cornland	12	O	Ecologic - The last remaining complete and representative example of a free flowing, undeveloped river within the Great Dismal Swamp area. The Swamp is a National Natural Landmark.
				W	Wild - Corridor and surrounding watershed is essentially undeveloped.

Table 3-9: National Rivers Inventory Segments in Hampton Roads (continued)

River	County	Reach	Length (miles)	ORV Code	Description
Nottoway River	Southampton, Sussex	North Carolina border to Fort Nottoway	82	O	Botanic - 5 to 10,000 acres of cypress forest; longest river swamp in the entire northeast region. Corridor and surrounding area include significant amounts of cypress.
Poropotank River	King and Queen, Gloucester	Confluence with the York River to headwaters	12	O	See York River comments.
Ware River	New Kent, James City	Confluence with the York River to Richardson Millpond	5	O	See York River comments.
Yarmouth Creek	James City	Chickahominy River to headwaters	7	O G	See Chickahominy River comments. (segment from James River to Providence Forge)
York River	James City, Gloucester	Almondsville to Plum Point	12	O	Hydrologic - A unique segment of sparsely developed, high order tidal river.

Source: National Park Service, National Rivers Inventory

Sites of Historic or Archaeological Significance

The Virginia Department of Historic Resources

The Virginia Landmarks Register is the state's official list of properties important to its history and is housed at the Virginia Department of Historic Resources (DHR), which functions as the State Historic Preservation Office under the National Historic Preservation Act of 1966. DHR also administers the National Register of Historic Places in Virginia. The National Park Service manages the Register, which serves as the official list of structures, sites, objects, and districts that embody the historical and cultural foundations of the nation.

The Hampton Roads region contains an abundance of historic sites, both archaeological and architectural. With a built environment that dates to the earliest permanent English settlement in the United States, there are few locations in the region where no historic resources exist. The list of historic resources can be accessed through the Virginia Landmarks Register, National Register of Historic Places, http://www.dhr.virginia.gov/. Town resources are included with the county in which they are located. The resource list includes the name of the structure or site, the date it was identified by the Virginia Landmarks Register, and the date of acceptance to the National Register of Historic Places. There are no known conflicts between historic resources and existing or proposed water supply sources. Future water development projects should be evaluated with respect to potential impacts to sites of historic or archaeological significance.

Other Information Sources

The Code of Virginia provides local governments with a number of tools that support the preservation of historic sites and structures. Included among them are the ability to designate historic districts and the authority to adopt local ordinances that govern the treatment of historic resources. Thus, some local governments have their own lists of historic sites and structures that they considered to be important to local history. Locally designated historic sites and structures were not gathered as a part of this planning effort.

Unusual Geologic Formations

Chesapeake Bay Impact Crater

In the 1990s, a large impact crater beneath the Chesapeake Bay was discovered. The discovery prompted a revision of the hydrogeologic framework in the Virginia Coastal Plain. The 56-mile-wide Chesapeake Bay impact crater is located beneath the lower Chesapeake Bay, its surrounding peninsulas, and a small part of the Atlantic Ocean (see Map 3-6). The approximate center of the crater is beneath the Town of Cape Charles on the eastern shore of Virginia.

The Chesapeake Bay impact crater was formed when a large comet or meteorite crashed into the mouth of the Chesapeake Bay approximately 35 million years ago. The impact produced an inverted, sombrero-shaped crater that was immediately filled with chaotically mixed sediments and seawater. Subsequent sediment deposition has buried the crater approximately 1,000 ft below the present-day land surface.

The low permeability of the sediments along the crater's rim created an unusual distribution of salinity in the groundwater around the crater (see Figure 3-12). The ocean level has risen and fallen many times since the crater was created. When the ocean moved inland or receded, the fresh groundwater moved around the crater rim rather than through the crater sediments. The exact location, as well as the geometry, of the outer rim of the crater beneath the lower York-James Peninsula and beneath the area between Norfolk and Virginia Beach is poorly defined. The outer rim coincides with an increase in concentrations of total dissolved solids and chlorides; therefore, groundwater in these areas is typically brackish and requires additional treatment for potable use.


Map 3-6
Chesapeake Bay Impact Crater
Crater Rim
0
8
16 Miles
Created by the Hampton Roads Planning District Commission
Data: United States Geologic Survey
GLOUCESTER
JAMES CITY
WILLIAMSBURG
York River
YORK
NEWPORT NEWS
POQUOSON
HAMPTON
SURRY
James River
Chesapeake Bay
Inner Crater
Outer Crater
ISLE OF WIGHT
PORTSMOUTH
NORFOLK
VIRGINIA BEACH
SOUTHAMPTON
FRANKLIN
SUFFOLK
CHESAPEAKE

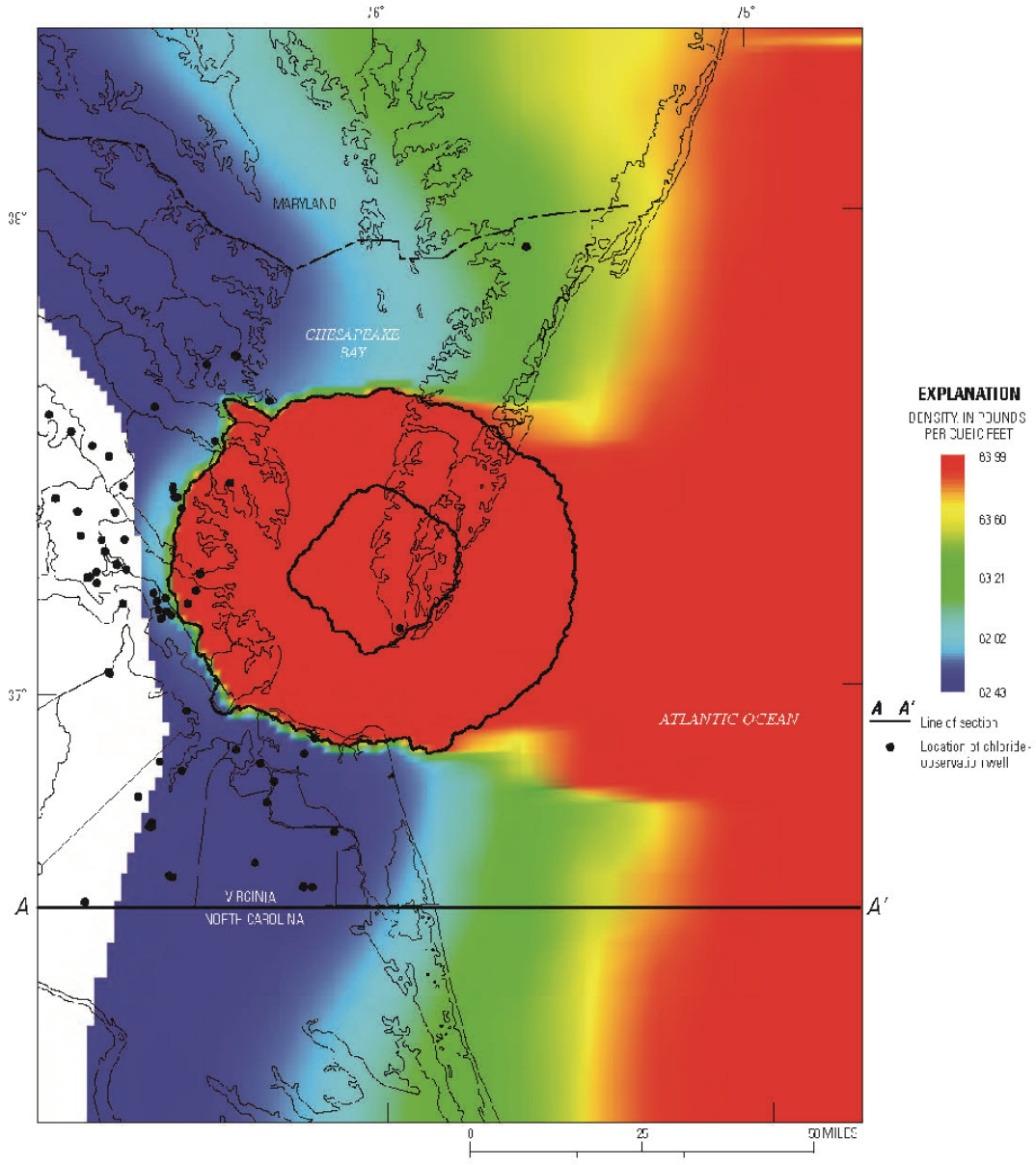


Figure 3-12: Simulated water density near the saltwater transition zone, Chesapeake Bay Impact Crater (adapted from Heywood, C.E., and Pope, J.P., 2009).

Wetlands

Wetlands are semi-aquatic lands that are either inundated or saturated by water for some period of time during the growing season. Wetlands, which include swamps, bogs, and marshes, are found along streams and rivers, in flood plains, depressions, and on the fringes of lakes and ponds. Saturation with water is the dominant factor determining the nature of soil development and the types of plant and animal communities living in and on the soil in wetlands. The single feature most wetlands share is soil or substrate that is at least periodically saturated with or covered by water.

Wetlands provide a multitude of ecological, economic and social benefits. They provide habitat for fish, wildlife and a variety of plants. Wetlands are nurseries for many saltwater and freshwater fishes and shellfish of commercial and recreational importance. Wetlands are also important landscape features because they hold and slowly release flood water and snow melt, recharge groundwater, act as filters to cleanse water of impurities, recycle nutrients, and provide recreation areas and wildlife viewing opportunities for people.

The U.S. Fish and Wildlife Service provides information to the public on the nation's wetlands. Through the National Wetlands Inventory, the agency has developed a series of topographic maps to show the extent, approximate location and type of wetlands and deepwater habitats across the country. The data were developed in conjunction with the Cowardin et al. Classification of Wetlands and Deepwater Habitats of the United States (1979). The National Wetlands Inventory should only be used as a general reference and the mapping does not constitute all of the wetland areas in Virginia, nor does it replace on-the-ground assessments or delineations of wetland areas.

Each wetland area is classified based on a hierarchy that includes systems, subsystems, classes, and subclasses. For purposes of the Hampton Roads Regional Water Supply Plan, the wetland maps are classified by type of wetland system (see Table 3-10).

Table 3-10: Wetlands Systems

System	Description
Marine	Open ocean and its associated high energy coastline
Estuarine	Deepwater tidal habitats and adjacent tidal wetlands semi-enclosed by land
Riverine	Deepwater habitats with flowing water such as rivers and streams
Lacustrine	Deepwater habitats such as lakes, reservoirs, and large ponds
Palustrine	All non-tidal wetlands such as marsh, swamp, bog, prairie, and small ponds

Each system represents wetland and deepwater habitats that share the influence of similar hydrologic, geomorphologic, chemical, or biological factors. Descriptions of each wetlands system are provided below.

Marine System. The marine system consists of the open ocean overlying the continental shelf and its associated high energy coastline. Marine habitats are exposed to the waves and currents of the open ocean. Salinity exceeds 30 parts per thousand, with little or no dilution except outside the mouths of estuaries. Shallow coastal inlets or bays without appreciable freshwater inflow, and coasts with exposed rocky islands that provide the mainland with little or no shelter from wind and waves are also considered part of the marine system because they generally support a typical marine biota.

The marine system extends from the outer edge of the continental shelf shoreward to one of three lines:

(1) The landward limit of tidal inundation (extreme high water of spring tides), including the splash zone from breaking waves;

(2) The seaward limit of wetland emergents, trees, or shrubs; or

(3) The seaward limit of the estuarine system, where this limit is determined by factors other than vegetation.

Deepwater habitats lying beyond the seaward limit of the marine system are outside the scope of this classification system.

Estuarine System. The estuarine system consists of deepwater tidal habitats and adjacent tidal wetlands that are usually semi enclosed by land but have open, partly obstructed or sporadic access to the open ocean and in which ocean water is at least occasionally diluted by freshwater runoff from the land. The salinity may be periodically increased above that of the open ocean by evaporation. Along some low energy coastlines there is appreciable dilution of sea water. Offshore areas with typical estuarine plants and animals, such as red mangroves (Rhizophora mangle) and eastern oysters (Crassostrea virginica) are also included in the estuarine system.

The estuarine system extends:

(1) Upstream and landward to where ocean-derived salts measure less than 0.5 parts per thousand during the period of average annual low flow;

(2) To an imaginary line closing the mouth of a river, bay, or sound; and

(3) To the seaward limit of wetland emergents, shrubs, or trees where they are not included in (2).

The Estuarine System also includes offshore areas of continuously diluted sea water.

Riverine System. The riverine system includes deepwater habitats contained in a channel. Water is usually, but not always, flowing in the riverine system.

The riverine system is bounded on the landward side by upland, by the channel bank (including natural and man-made levees), or by wetland dominated by trees, shrubs, persistent emergents, emergent mosses, or lichens. In braided streams, the system is bounded by the banks forming the outer limits of the depression within which the braiding occurs. The riverine system terminates at the downstream end where the concentration of ocean-derived salts in the water exceeds 0.5 parts per thousand during the period of annual average low flow, or where the channel enters a lake. It terminates at the upstream end where tributary streams originate, or where the channel leaves a lake. Springs discharging into a channel are considered part of the riverine system.

Lacustrine System. The lacustrine system includes deepwater habitats with all of the following characteristics:

(1) Situated in a topographic depression or a dammed river channel;

(2) Lacking trees, shrubs, persistent emergents, emergent mosses or lichens with greater than 30 percent coverage;

(3) Total area exceeds 20 acres.

The lacustrine system is bounded by upland or by wetland dominated by trees, shrubs, persistent emergents, emergent mosses, or lichens. Lacustrine systems formed by damming a river channel are bounded by a contour approximating the normal spillway elevation or normal pool elevation, except where palustrine wetlands extend lakeward of that boundary. Where a river enters a lake, the extension of the shoreline forms the riverine-lacustrine boundary.

The lacustrine system includes permanently flooded lakes and reservoirs, intermittent lakes, and tidal lakes with salinity levels below 0.5 parts per thousand. Typically, there are extensive areas of deep water and there is considerable wave action. Islands of palustrine wetland may lie within the boundaries of the lacustrine system.

Palustrine System. The palustrine system includes all non-tidal wetlands dominated by trees, shrubs, persistent emergents, emergent mosses or lichens, farmed wetlands, and similar wetlands that occur in tidal areas where salinity due to ocean-derived salts is below 0.5 parts per thousand. It also includes wetlands lacking such vegetation, but with all of the following four characteristics:

(1) Area less than 20 acres;

(2) An active wave formed or bedrock shoreline features are lacking;

(3) Water depth in the deepest part of a basin less than 6.6 feet at low water; and

(4) Salinity due to ocean derived salts less than 0.5 parts per thousand.

The palustrine system is bounded by upland or by any of the other four systems. The palustrine system was developed to group the vegetated wetlands traditionally called by such names as marsh, swamp, bog, fen, and prairie, which are found throughout the United States. It also includes the small, shallow, permanent or intermittent water bodies often called ponds. Palustrine wetlands may be situated shoreward of lakes, river channels, or estuaries; on river floodplains; in isolated catchments; or on slopes. They may also occur as islands in lakes or rivers. The erosive forces of wind and water are of minor importance except during severe floods.

Hampton Roads Wetlands

The following data for Hampton Roads wetlands comes from the U.S. Fish and Wildlife Service National Wetlands Inventory. Measurements and percentages shown in Tables 3-11 are estimates found through analysis of the NWI GIS Data. Wetlands in each sub-region of the planning area are shown in Maps 3-7, 3-8, and 3-9.

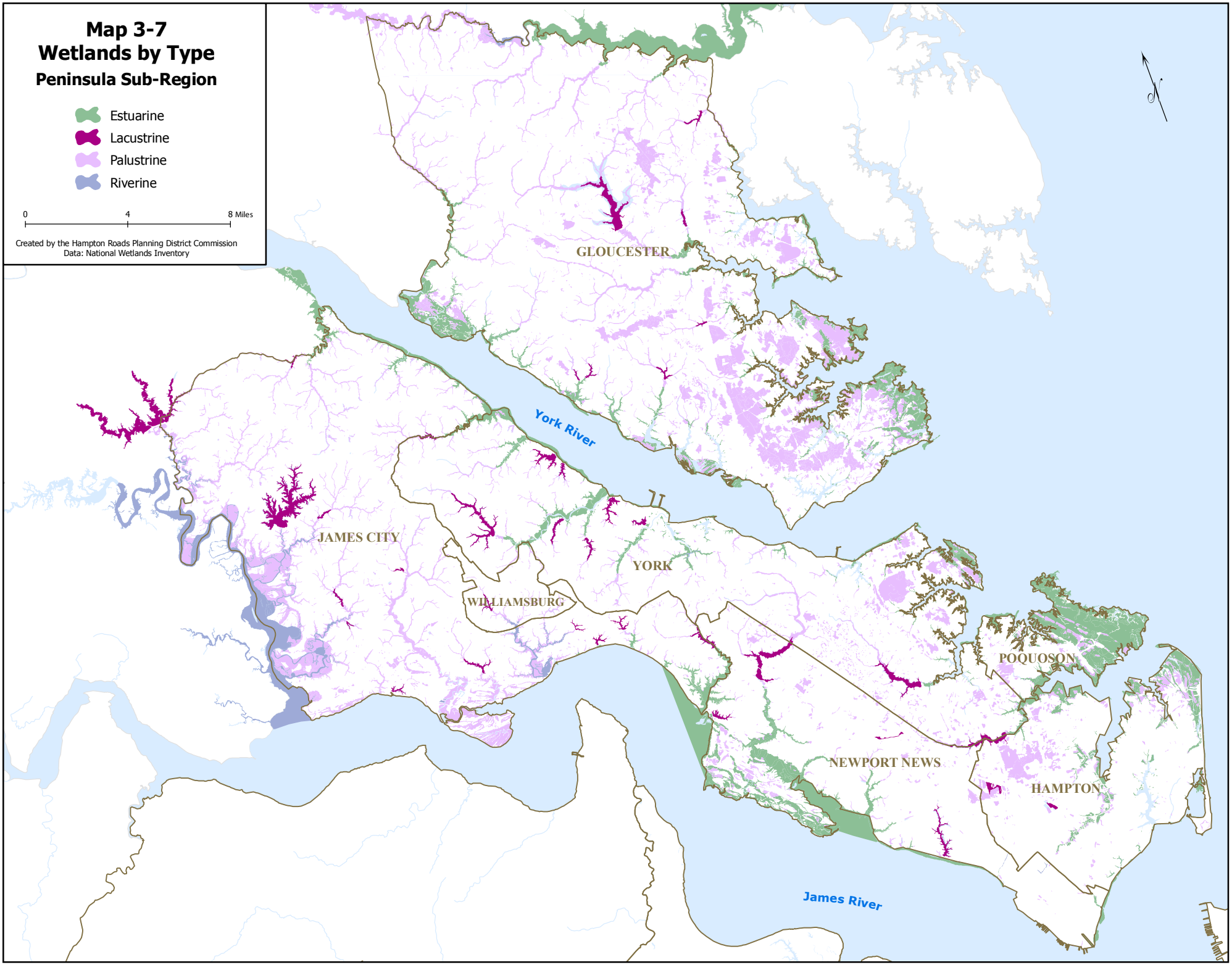
Tidal and non-tidal wetlands are a dominant physical feature in the Hampton Roads region of Virginia. The total area of the Hampton Roads region is 1,884,733 acres. Wetlands comprise 459,320 acres, or 24.4% of the total area of the region. Table 3-11 summarizes the estimated wetland area by type of wetlands system. Tidal wetlands, which encompass both vegetated marshes and nonvegetated beaches, sandflats, and mudflats, are dominated by tidal action and are flooded regularly. Vegetated marshes are categorized by salt marsh grasses such as smooth cordgrass, salt meadow grass, giant cordgrass, black needlerush, and others. Shrubs such as buttonbush and saltbush are found along their upper edges, which are not flooded on each tide. The non-tidal wetlands in Hampton Roads are generally forested and do not always have surface evidence of water. Common trees found in these areas include red and silver maple, black and sweet gum, pin and willow oak, cedar, and bald cypress. The majority of the wetlands found in Hampton Roads – about 80% – are non-tidal wetlands classified as palustrine systems. Estuarine systems account for approximately 14% of the remaining wetlands in the region, with a small percentage of riverine and lacustrine systems accounting for the rest. By definition, all man-made lakes and reservoirs are considered lacustrine wetlands. Marine wetlands have not been calculated for the Hampton Roads region.

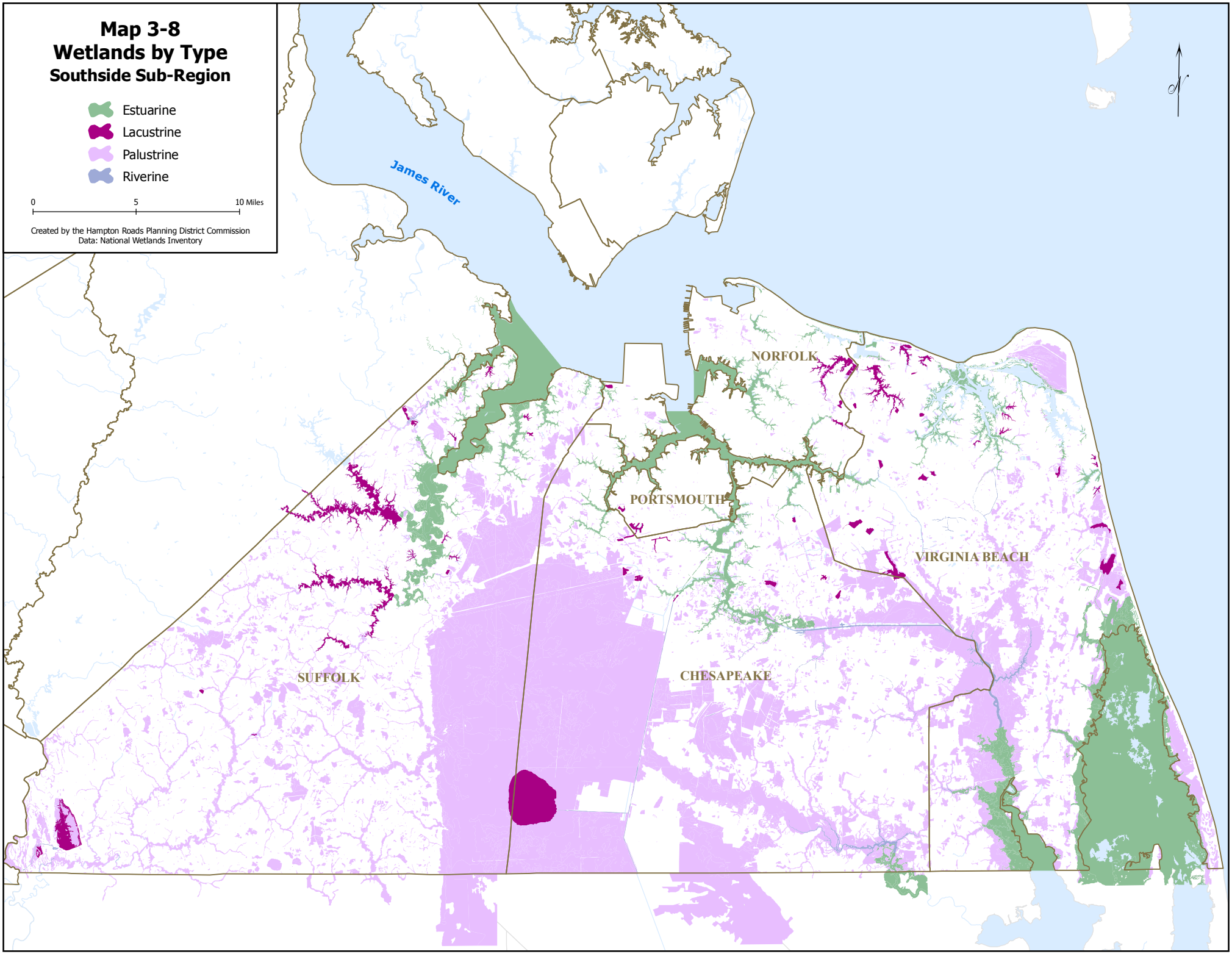
Table 3-11: Hampton Roads Wetlands Acreage Summary

Wetlands System	Acreage	Percent of Wetlands Acreage
Estuarine	65,353	14%
Riverine	7,600	2%
Lacustrine	17,245	4%
Palustrine	369,121	80%
Total Wetlands	**459,320**	**100%**

U.S. Fish and Wildlife Service. National Wetlands Inventory. NWIDBA.CONUS_wet_poly: Classification of Wetlands and Deepwater Habitats of the United States. U.S. Department of the Interior, Fish and Wildlife Service, Washington, DC. FWS/OBS-79/31. 200605

Table 3-12 lists the current water supply sources for Hampton Roads and the types of wetlands they pertain to, or may affect. Future water development projects should be evaluated with respect to potential impacts to wetland resources.


Map 3-7
Wetlands by Type
Peninsula Sub-Region
Estuarine
Lacustrine
Palustrine
Riverine
0
4
8 Miles
Created by the Hampton Roads Planning District Commission
Data: National Wetlands Inventory
GLOUCESTER
York River
JAMES CITY
YORK
WILLIAMSBURG
POQUOSON
NEWPORT NEWS
HAMPTON
James River


Map 3-8
Wetlands by Type
Southside Sub-Region
Estuarine
Lacustrine
Palustrine
Riverine
0
5
10 Miles
Created by the Hampton Roads Planning District Commission
Data: National Wetlands Inventory
James River
NORFOLK
PORTSMOUTH
VIRGINIA BEACH
SUFFOLK
CHESAPEAKE

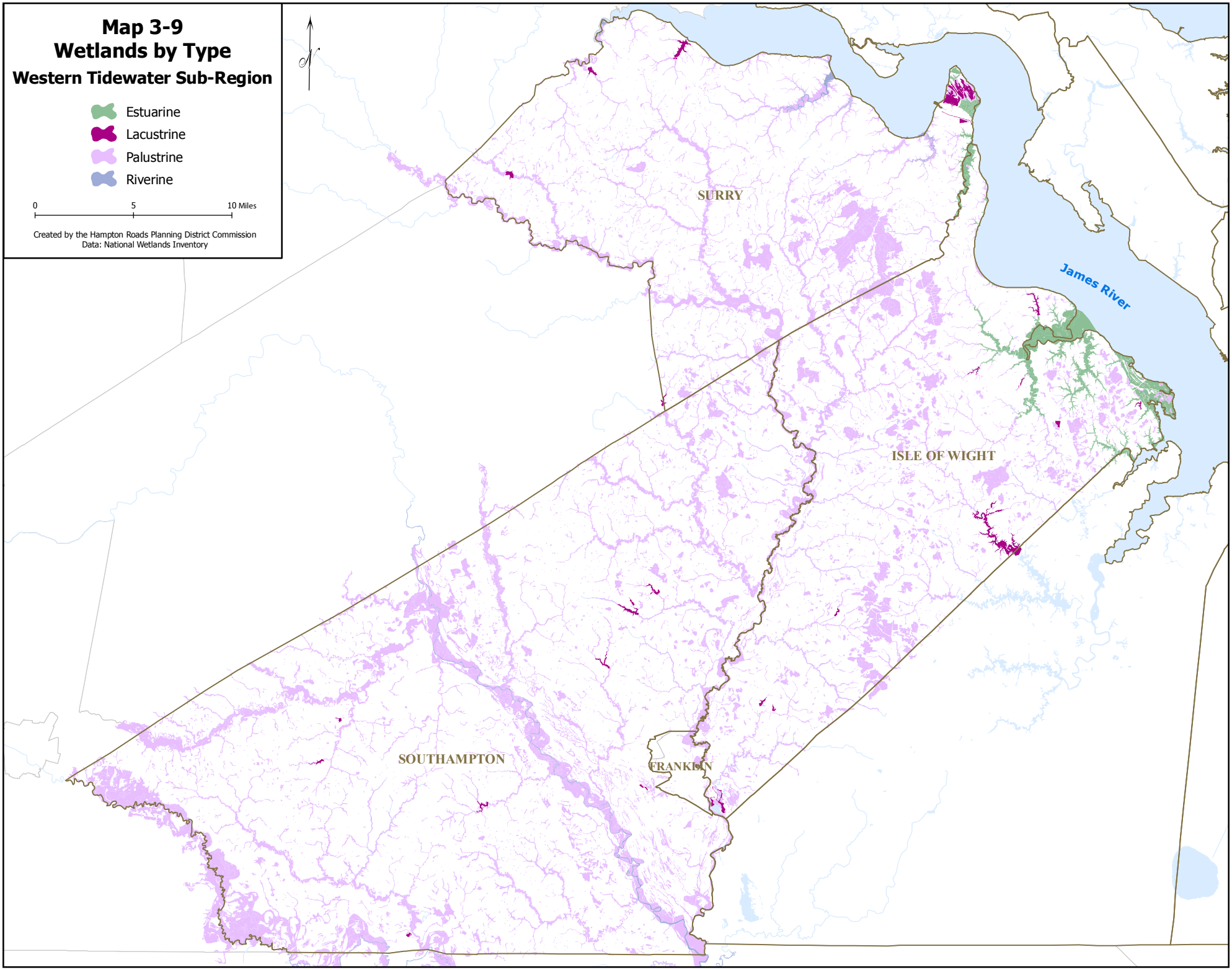

Map 3-9
Wetlands by Type
Western Tidewater Sub-Region
Estuarine
Lacustrine
Palustrine
Riverine
0
5
10 Miles
Created by the Hampton Roads Planning District Commission
Data: National Wetlands Inventory
SURRY
James River
ISLE OF WIGHT
SOUTHAMPTON
FRANKLIN

Table 3-12: Hampton Roads Surface Water Supply Sources and Wetlands Summary

Surface Water Supply Source	Type of Wetlands System	Surface Water Supply Source	Type of Wetlands System
Peninsula Sub-Region		**Southside and Western Tidewater Sub-Regions**	
Chickahominy River	Riverine	Northwest River	Riverine
Diascund Creek Reservoir	Lacustrine	Lake Lawson (Intown Reservoirs)	Lacustrine
Little Creek Reservoir	Lacustrine	Lake Smith (Intown Reservoirs)	Lacustrine
Skiffe's Creek Reservoir	Lacustrine	Lake Whitehurst (Intown Reservoirs)	Lacustrine
Lee Hall Reservoir	Lacustrine	Lake Wright (Intown Reservoirs)	Lacustrine
Harwoods Mill Reservoir	Lacustrine	Little Creek Reservoir (Intown Reservoirs)	Lacustrine
Waller Mill Reservoir	Lacustrine	Lake Burnt Mills (Western Reservoirs)	Lacustrine
Beaver Dam Reservoir	Lacustrine	Lake Prince (Western Reservoirs)	Lacustrine
		Western Branch Reservoir (Western Reservoirs)	Lacustrine
		Blackwater River	Riverine
		Nottoway River	Riverine
		Lake Kilby	Lacustrine
		Speight's Run	Lacustrine
		Lake Meade	Lacustrine
		Lake Cahoon	Lacustrine
		Lone Star Lakes	Lacustrine
		Crumps Mill Pond	Lacustrine
		Lake Gaston	Lacustrine
		Stumpy Lake	Lacustrine

Riparian Buffers and Conservation Easements

Riparian Buffers

Riparian buffers are transitional zones between surface water bodies and surrounding areas, and typically include areas of trees, shrubs, and vegetation. Riparian buffers are valued for their ability to moderate erosion and sedimentation, stabilize shorelines, improve water quality in ground water and surface water runoff, increase the base flow of streams, and provide a biologically diverse habitat for aquatic species and wildlife.

In 1988, the Virginia General Assembly passed the Chesapeake Bay Preservation Act (Bay Act) to protect and improve the water quality of the Chesapeake Bay and its tributaries. The Bay Act applies to all 84 cities, counties, and towns in Tidewater Virginia, which encompasses some portion of all localities in the Hampton Roads regional water supply planning area, with the exception of Southampton County and the City of Franklin. Each of the localities, excluding Southampton County and the City of Franklin, has implemented a Chesapeake Bay Preservation Act Ordinance. While ordinances differ between localities, the underlying objective is to improve water quality by protecting environmentally sensitive areas from the negative effects of development.

The Bay Act requires all counties, cities, and towns in Tidewater Virginia to define and protect Chesapeake Bay Preservation Areas (CBPA), which are determined by the ecological and geographic criteria laid out in the Bay Act. According to the DCR Local CBPA Ordinances, in general, no development, land disturbance, or vegetation removal is allowed within 100-feet of water. CBPAs within Hampton Roads are shown on Maps 3-10, 3-11, and 3-12.

CBPAs are divided into Resource Protection Areas (RPA) and Resource Management Areas (RMA). RPAs are the shoreward components of CBPAs. RPAs are comprised of:

- tidal wetlands;
- non-tidal wetlands connected by surface flow and contiguous to tidal wetlands or water bodies with perennial flow;
- tidal shores;
- such lands considered necessary by the locality to protect the quality of state waters; and
- 100-foot wide vegetated buffer adjacent to, and landward of, these features.

RMAs are described by the DCR Chesapeake Bay Local Assistance Programs to "include land types that, if improperly used or developed, have a potential for causing significant water quality degradation or for diminishing the functional value of the Resource Protection Area. An RMA shall be provided contiguous to the entire inland boundary of the RPA and, where mapping resources indicate the presence of these land types as contiguous to the Resource Protection Area, should be included in designation of RMAs: floodplains; highly erodible soils; including steep slopes; highly permeable soils; and nontidal wetlands not included in the RPA."

All affected localities in Hampton Roads have designated RPA areas in accordance with state regulations. Despite protective regulations, many of these buffer areas are being impacted by shoreline development and improper management of buffer vegetation. At greatest risk are buffers in parts of the state that have rapidly growing urban and suburban areas. The following is a discussion by locality of drinking water sources that are within CBPAs.

Chesapeake: The City of Chesapeake established the Northwest River Watershed Protection District to promote public health, safety and welfare through the protection of a major public drinking water source. The District allows the City of Chesapeake to study and analyze land use within the district and identify critical resources that need protection, and implement measures to minimize disruption of the natural systems that maintain the water quality in the Northwest

River Watershed. Additionally, Chesapeake is able to acquire real property and real property interests, which includes conservation and drainage easements. Chesapeake's surface water source is not located near a CBPA.

Gloucester: Gloucester County requires the protection of buffers as necessary within CBPAs. Portions of Gloucester's Beaverdam Reservoir are located within the CBPA.

Newport News: Newport News Waterworks owns and operates the five reservoirs and more than 12,000 acres of watershed property that encompasses the reservoirs. The City has a watershed management program that promotes the health of the forests within the watershed owned by the City to protect water quality. For the portions of watersheds lying within the City of Newport News that are privately held, the City's Reservoir Protection Ordinance requires a permit for earth disturbing activities and provides for a 200 foot protective buffer along perennial streams and the reservoirs' edge. For intermittent streams, the buffer is 100 feet. York County has imposed a reservoir protection overlay district for the portions of the watersheds that lie within that County. The specific protective provisions are similar to those in Newport News. The remaining reservoir watersheds in James City and New Kent Counties receive protection as prescribed by locally approved Chesapeake Bay Preservation Act Ordinances that have also been approved by VDCR.

Norfolk: The City of Norfolk has a long-standing Watershed Protection Program, which includes a basic watershed model to evaluate the effect of land use on the reservoirs and a source water assessment to identify potential sources of contamination. The Norfolk Watershed Protection Program Framework serves as a guide for future efforts to protect Norfolk's surface water resources.

The City of Norfolk has established reservoir protection buffers around the Western Reservoirs and the Intown Reservoirs (located within the City of Suffolk). These buffer areas are owned by the City of Norfolk and the amount of land included in buffer areas varies by reservoir, depending on when the reservoir was constructed and how the property was acquired. A permit is required for the removal of trees of any size, brush, or any other material from the City's property.

Portsmouth: The City of Portsmouth's four reservoirs are located in the City of Suffolk. The City of Portsmouth owns approximately 3,100 acres including Lake Meade, Lake Kilby, Lake Cohoon, and Speights Run Reservoir and surrounding lands. Portsmouth also owns easements and right of ways for water transmission lines.

The buffer areas owned by the City of Portsmouth along the reservoir shorelines vary in area and width, encompassing an approximate area of 1,500 total acres. Large tracts of forested property are maintained under a forestry management plan; best management practices are employed and occasional timber sales are allowed. The buffer properties are also managed by a watershed protection ordinance, Chapter 38 of the Portsmouth City Code. Additionally, the City of Suffolk also recognizes the buffer properties within their zoning regulations as covered by the Chesapeake Bay Preservation Act and CBPAs.

Suffolk: Lone Star Lakes Reservoir is within a City owned park; the surrounding park provides a buffer from development. Suffolk's City and Unified Development Ordinance requires the protection of water quality stream buffers in order to minimize erosion and sedimentation, loss of habitat, and loss of vegetation and tree cover by prohibiting any activity which disrupts the soil of a site. The reservoir is located within the CBPA.

Virginia Beach: The City of Virginia Beach owns property and easements for the In-Town Lakes surface water intake, pump station facilities, and the pipelines at the Lake Gaston Reservoir. The City owns Stumpy Lake and some of the lands along the lake's perimeter; the lake is not located within a CBPA.

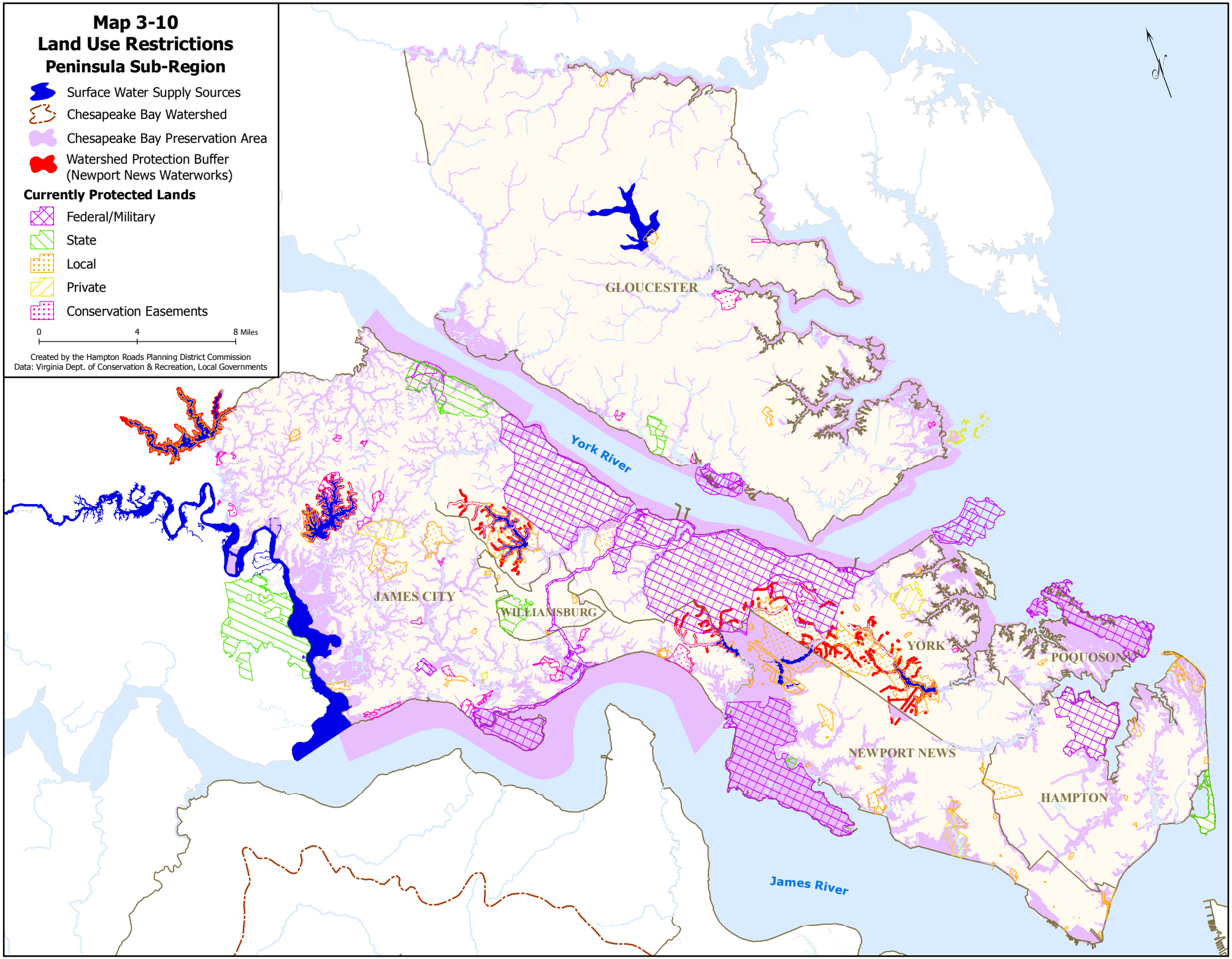
Williamsburg: Williamsburg requires the protection of buffers as necessary within Chesapeake Bay Preservation Areas. Williamsburg

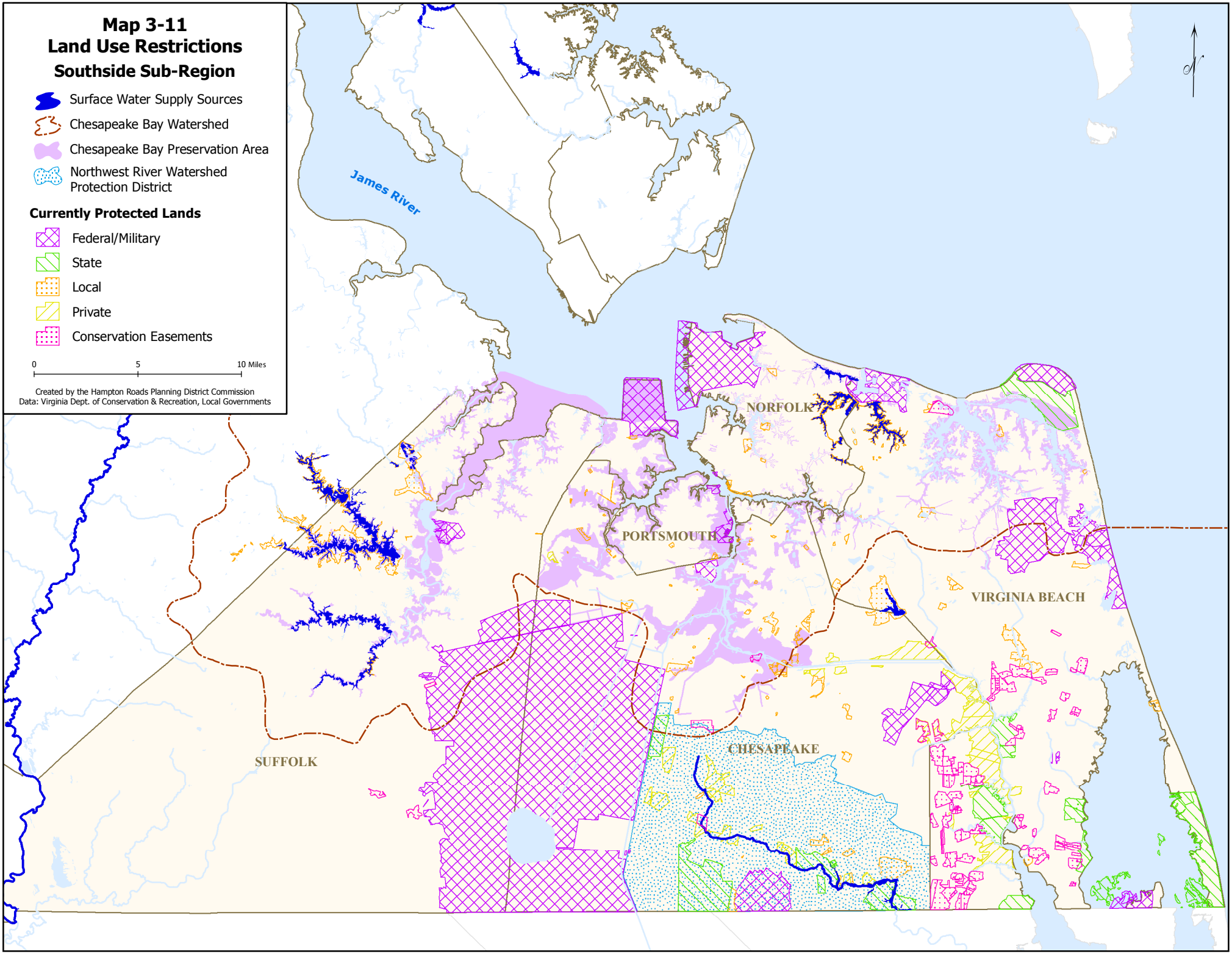
owns the land designated for conservation surrounding the Waller Mill reservoir, which is located within the CBPA.

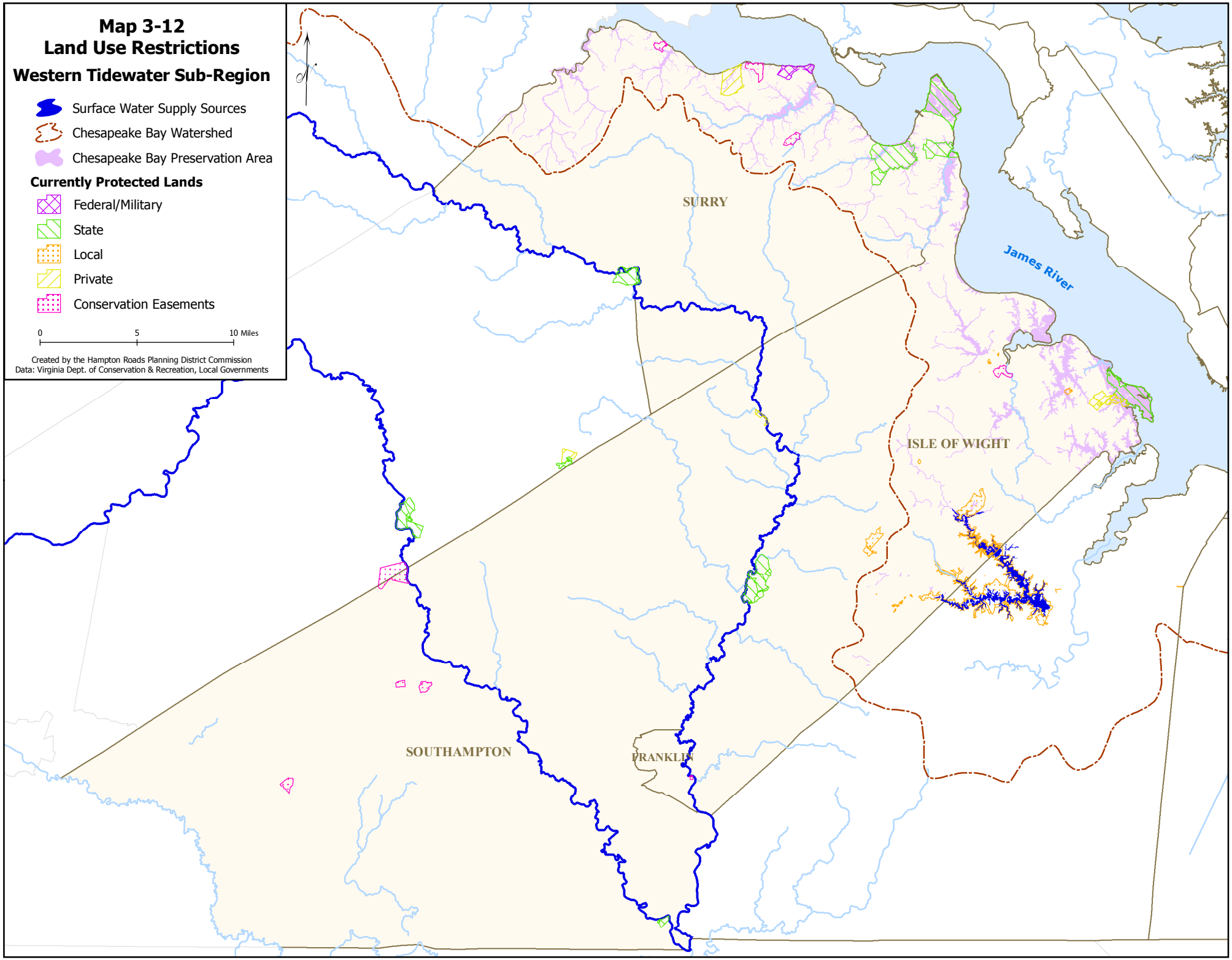
Conservation Easements

A conservation easement is an agreement between a landowner and a government agency or non-profit conservation organization that places permanent limits on the future development of the property in order to protect the conservation values of the land. Each easement is unique and permanent. Maps 3-10, 3-11, and 3-12 illustrate the Conservation Easements within Hampton Roads.

Chesapeake, Franklin, Gloucester, Isle of Wight County, James City County, Newport News, Southampton County, Suffolk, Surry County, Virginia Beach, Williamsburg, and York County have conservation easements within their borders. Virginia Beach has the highest number of conservation easements totaling 149. Many of the easements are held by the Virginia Department of Historic Resources, Virginia Outdoors Foundation, and by the localities themselves.


Map 3-10
Land Use Restrictions
Peninsula Sub-Region
Surface Water Supply Sources
Chesapeake Bay Watershed
Chesapeake Bay Preservation Area
Watershed Protection Buffer
(Newport News Waterworks)
Currently Protected Lands
Federal/Military
State
Local
Private
Conservation Easements
0
4
8 Miles
Created by the Hampton Roads Planning District Commission
Data: Virginia Dept. of Conservation & Recreation, Local Governments
GLOUCESTER
York River
JAMES CITY
WILLIAMSBURG
YORK
POQUOSON
NEWPORT NEWS
HAMPTON
James River


Map 3-11
Land Use Restrictions
Southside Sub-Region
Surface Water Supply Sources
Chesapeake Bay Watershed
Chesapeake Bay Preservation Area
Northwest River Watershed Protection District
Currently Protected Lands
Federal/Military
State
Local
Private
Conservation Easements
0
5
10 Miles
Created by the Hampton Roads Planning District Commission
Data: Virginia Dept. of Conservation & Recreation, Local Governments
James River
NORFOLK
PORTSMOUTH
VIRGINIA BEACH
CHESAPEAKE
SUFFOLK


Map 3-12
Land Use Restrictions
Western Tidewater Sub-Region
Surface Water Supply Sources
Chesapeake Bay Watershed
Chesapeake Bay Preservation Area
Currently Protected Lands
Federal/Military
State
Local
Private
Conservation Easements
0
5
10 Miles
Created by the Hampton Roads Planning District Commission
Data: Virginia Dept. of Conservation & Recreation, Local Governments
SURRY
James River
ISLE OF WIGHT
SOUTHAMPTON
FRANKLIN

Land Use & Land Cover

The National Oceanic & Atmospheric Administration (NOAA) Coastal Services Center administers the Coastal Change Analysis Program (C-CAP). C-CAP produces a nationally standardized database of land cover and land change information for the coastal regions of the U.S. based on remotely-sensed imagery. The program inventories of coastal intertidal areas, wetlands, and adjacent uplands and updates land cover maps every five years. The C-CAP program is part of the Multi-Resolution Land Characteristics (MRLC) Consortium. Other federal agencies that are a part of the MRLC include the U.S. Environmental Protection Agency (EPA), the U.S. Forest Service (USFS), the U.S. Geological Survey (USGS), the Landscape Fire and Resource Management Planning Tools Project (LANDFIRE), the Bureau of Land Management (BLM), the Natural Resources Conservation Service (NRCS), the National Park Service (NPS), the National Aeronautics and Space Administration (NASA), the U.S. Fish and Wildlife Service (USFWS), and the Office of Surface Mining (OSM).

Maps 3-13, 3-14, and 3-15 show the land cover for each Hampton Roads sub-region based on the 2005 C-CAP data. Table 3-13 shows the percentage of land in the planning area that can be classified into general land cover categories. For the purposes of this report, some C-CAP land cover categories were consolidated as appropriate for the region. Forests, wetlands, grassland, and agricultural lands accounted for about 81% of the land cover in the Hampton Roads Region, while developed land, which includes commercial, industrial and residential land uses and developed open space, accounted for about 14% of the land cover. Surface water features, unconsolidated shore (tidal flats, shoals, and intertidal areas), and bare land (bare exposed rock, sand, and soil) total approximately 4% of land cover.

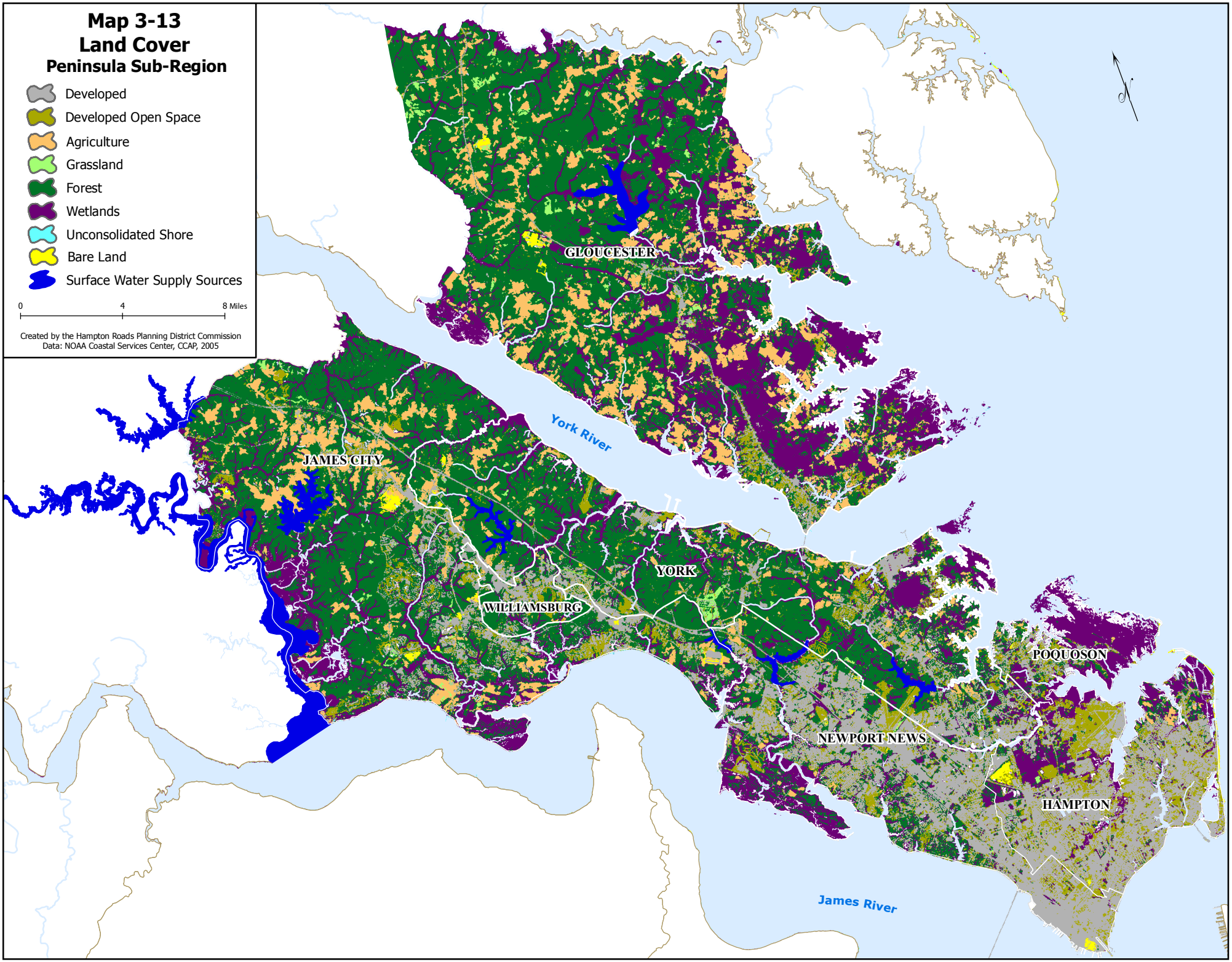
Table 3-13: Hampton Roads Land Cover Type

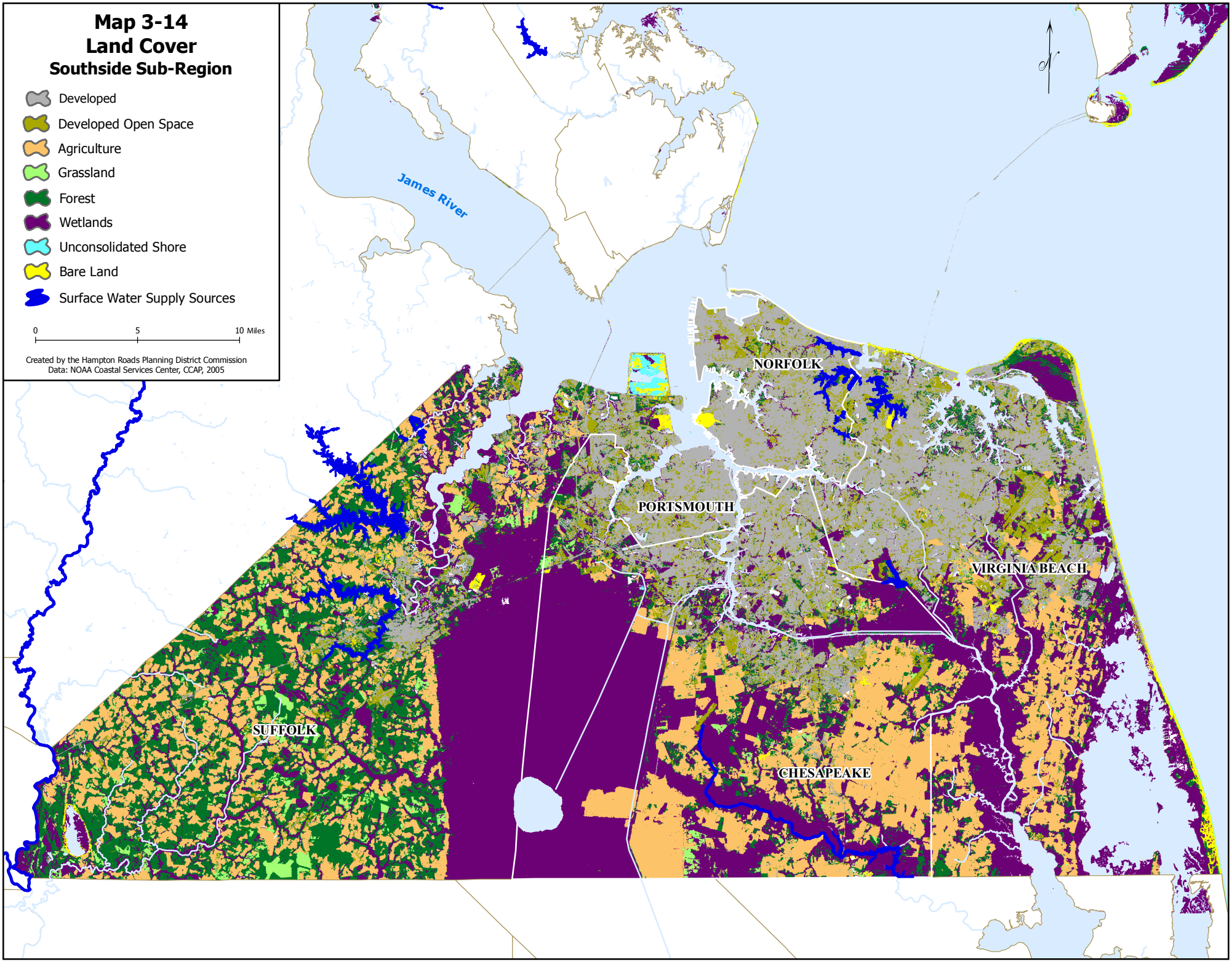
Land Cover Type	Percent of Total
Developed	10%
Developed Open Space	4%
Agriculture	22%
Grassland	2%
Forest	33%
Wetlands	25%
Unconsolidated Shore/Bare Land	1%
Water	3%
Total	**100%**

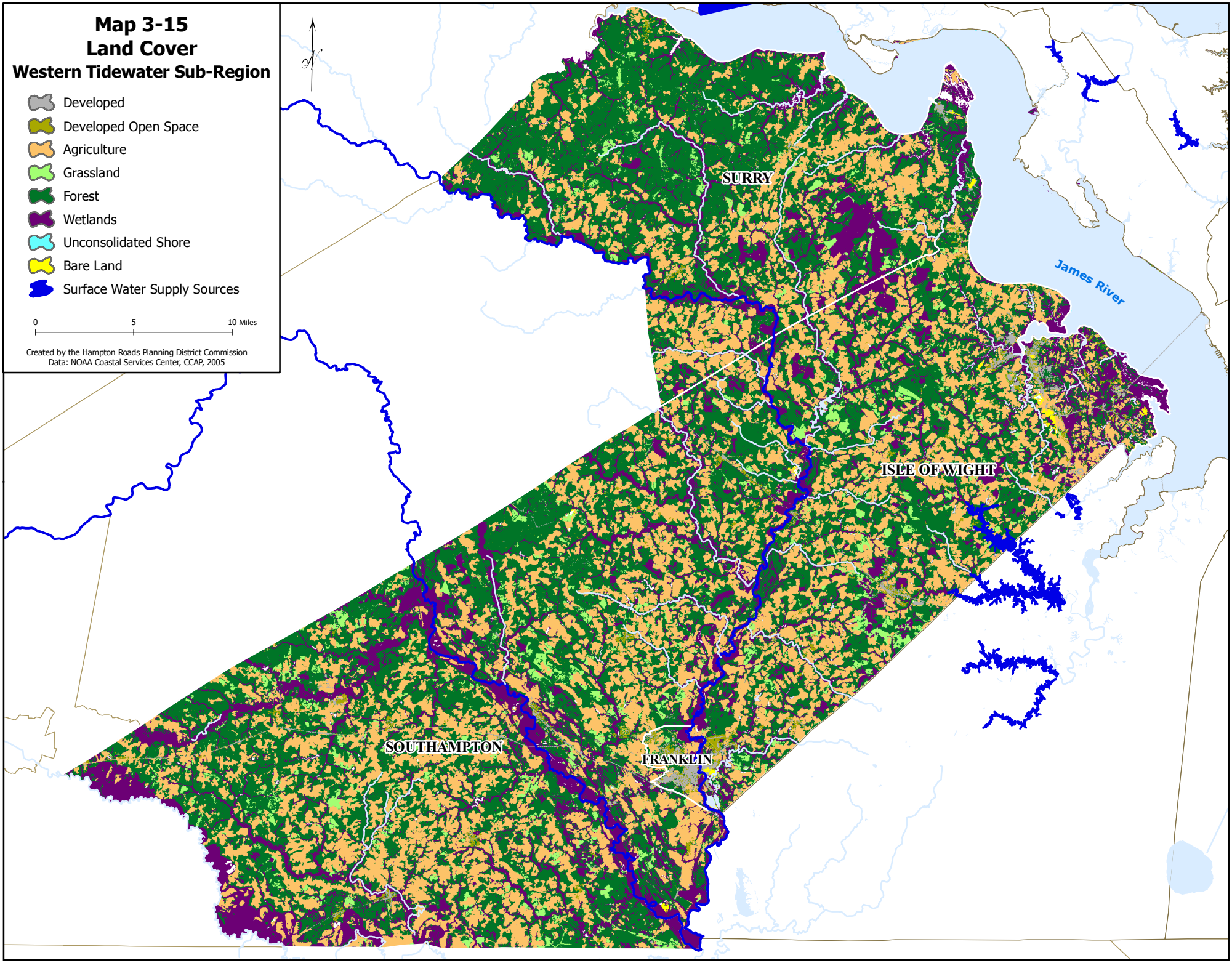
The percent of impervious cover within each jurisdiction in Hampton Roads varies greatly and is difficult to calculate accurately. The more developed central cities report imperviousness figures that range from 28 to 53 percent, while the rural localities report figures ranging from 6 to 16 percent.

Other Sources

Typically, each jurisdiction within the Hampton Roads regional water supply planning area has its own set of land use, land coverage, and/or zoning maps and ordinances. This information can generally be found in local comprehensive plans. Local land use, land cover and zoning information was not included as a part of the regional water supply plan due to the inconsistency in land use classifications between localities and the varying dates and timeframes reflected by the available local land use data.


Map 3-13
Land Cover
Peninsula Sub-Region
Developed
Developed Open Space
Agriculture
Grassland
Forest
Wetlands
Unconsolidated Shore
Bare Land
Surface Water Supply Sources
0
4
8 Miles
Created by the Hampton Roads Planning District Commission
Data: NOAA Coastal Services Center, CCAP, 2005
GLOUCESTER
JAMES CITY
York River
YORK
WILLIAMSBURG
POQUOSON
NEWPORT NEWS
HAMPTON
James River


Map 3-14
Land Cover
Southside Sub-Region
Developed
Developed Open Space
Agriculture
Grassland
Forest
Wetlands
Unconsolidated Shore
Bare Land
Surface Water Supply Sources
0
5
10 Miles
Created by the Hampton Roads Planning District Commission
Data: NOAA Coastal Services Center, CCAP, 2005
James River
NORFOLK
PORTSMOUTH
VIRGINIA BEACH
SUFFOLK
CHESAPEAKE


Map 3-15
Land Cover
Western Tidewater Sub-Region
Developed
Developed Open Space
Agriculture
Grassland
Forest
Wetlands
Unconsolidated Shore
Bare Land
Surface Water Supply Sources
0
5
10 Miles
Created by the Hampton Roads Planning District Commission
Data: NOAA Coastal Services Center, CCAP, 2005
SURRY
James River
ISLE OF WIGHT
SOUTHAMPTON
FRANKLIN

Although the National Land Cover Database data was produced in 2001, it does provide a fairly accurate picture of the land use composition of the local jurisdictions. The NLCD data was found to be the most consistent source of data for land coverage and impervious surface for the purposes of the Hampton Roads Regional Water Supply Plan. However, more current information may be available from individual jurisdictions within the planning area.

Impaired Waters & Type of Impairment

Every even-numbered year, DEQ publishes the Virginia Water Quality Assessment Integrated Report (305(b)/303(d) Report). The report satisfies the requirements of the U.S. Clean Water Act sections 305(b) and 303(d) and the Virginia Water Quality Monitoring, Information and Restoration Act. The 305(b)/303(d) Report summarizes the water quality conditions of the Commonwealth's waters during the reporting period.

The most recent and archived 305(b)/303(d) Reports are available on DEQ's Water Quality Assessments program website (see http://www.deq.state.va.us/wqa/homepage.html). Information presented in below is summarized from the 2008 305(b)/303(d) Report. Water quality conditions for the Regional water supply planning area per the report findings are discussed below.

Impaired Waterbodies

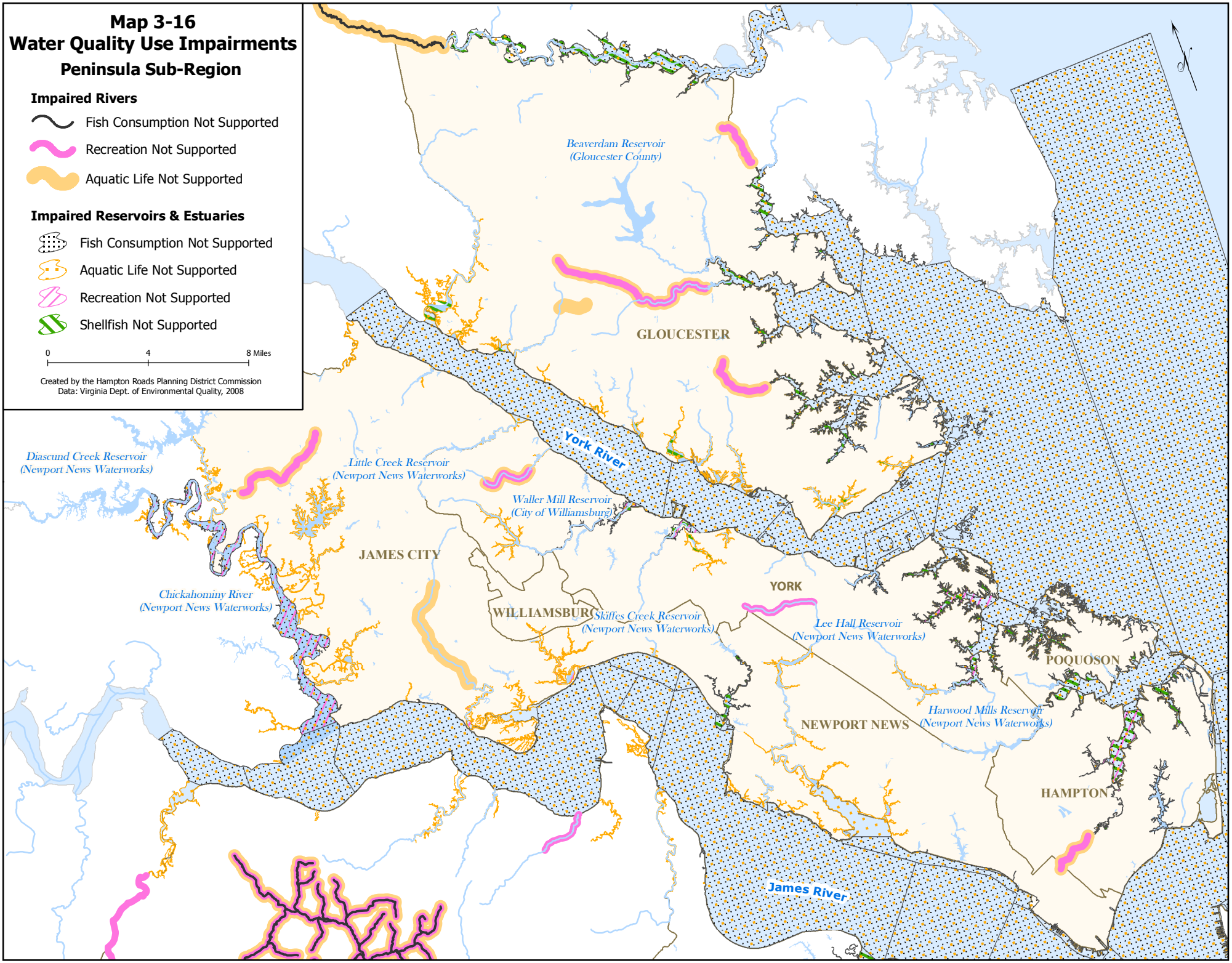
The 2008 Virginia Water Quality Assessment designates a significant portion of the Commonwealth's rivers, lakes and bays as impaired because they do not meet water quality standards. The water quality standards are established to protect drinking water supplies, aquatic life, production of edible and marketable fish and shellfish, wildlife and recreational uses of state waters, including swimming, boating, fishing and shellfish harvesting.

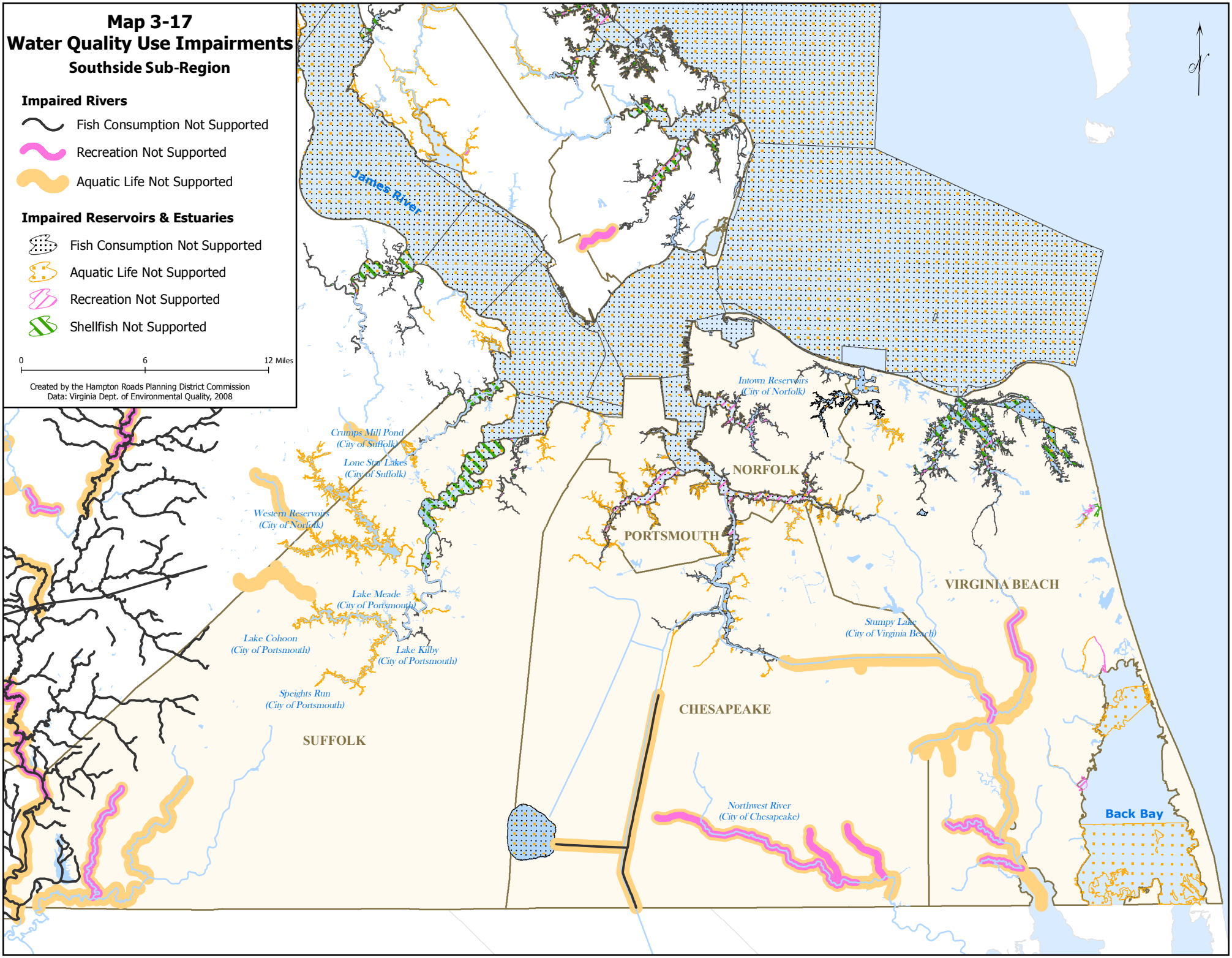
As a whole, the leading cause of impairment of designated uses in Virginia's rivers and streams is violation of the bacteria standards. In 2003, Virginia adopted three new bacteria criteria for primary recreation (swimming) use including fecal coliform, E.coli, and enterococci. (9 VAC 25-260-170). According to the Executive Summary, "Agricultural practices appear to be one of the primary sources contributing to the bacteria standards violations. However, urban runoff, leaking sanitary sewers, failing septic tanks, domestic animals and even wildlife can be significant contributing sources."

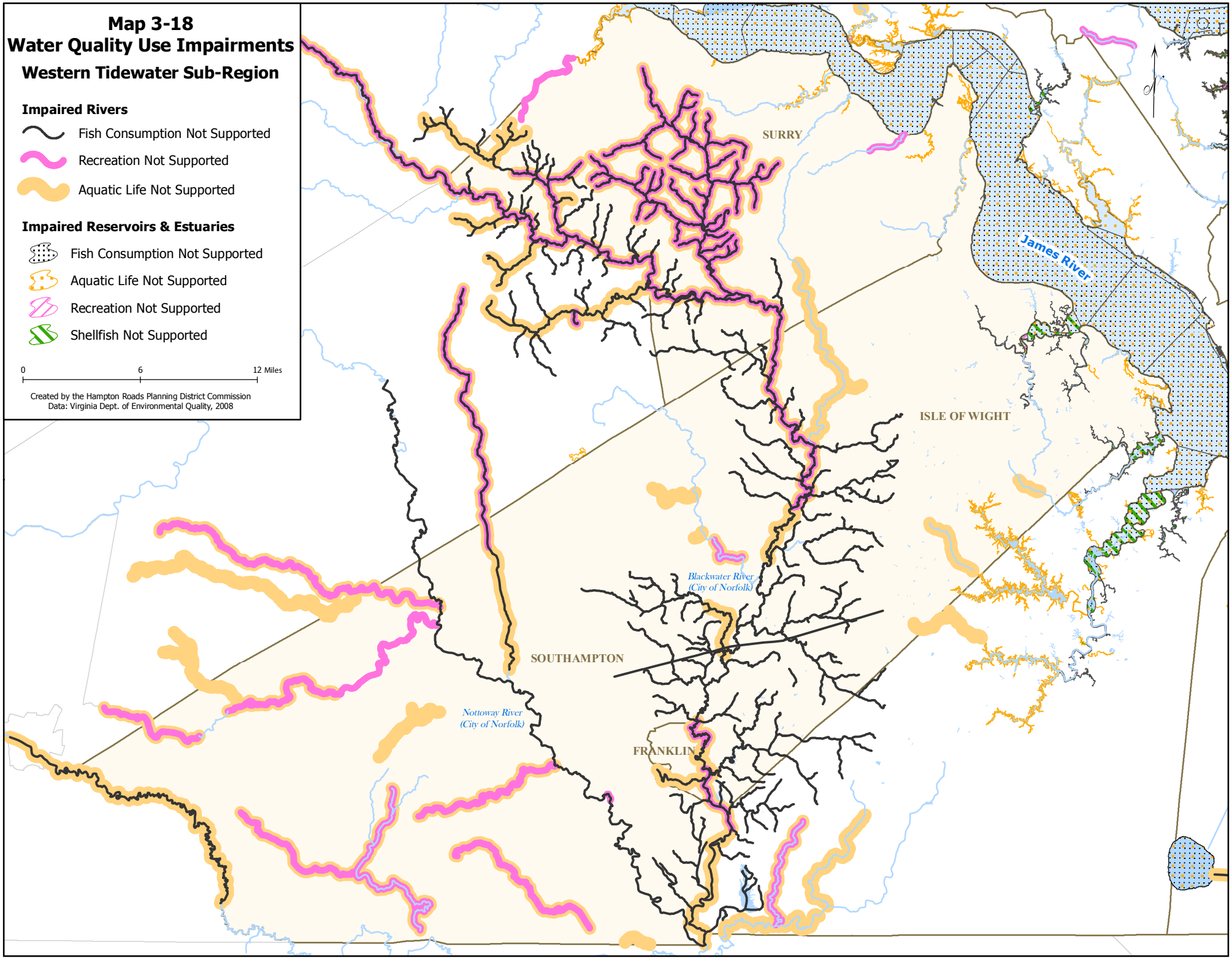
The leading cause of impairment in Virginia's estuarine waters is also dissolved oxygen and PCBs in fish tissue.

Maps 3-16, 3-17, and 3-18 show the impaired waters (Category 5 waters) identified in the 2008 305(b)/303(d) Report that are in and adjacent to the regional water supply planning area. Impaired waters are further classified as follows:

- 5A waters: The Water Quality Standard is not attained. The assessment unit is impaired for one or more designated uses by a pollutant(s) and requires a TMDL (303d list)
- 5B waters: The Water Quality Standard for shellfish use is not attained. One or more pollutants remain requiring TMDL development.
- 5C waters: The Water Quality Standard is not attained due to suspected natural conditions. The assessment unit is impaired for one or more designated uses by a pollutant(s) and may require a TMDL (303d list). Water Quality Standards for these waters may be re-evaluated due to the effects of natural conditions.
- 5D waters: The Water Quality Standard is not attained where TMDLs have been developed, but one or more pollutants remain requiring TMDL development.


Map 3-16
Water Quality Use Impairments
Peninsula Sub-Region
Impaired Rivers
Fish Consumption Not Supported
Recreation Not Supported
Aquatic Life Not Supported
Impaired Reservoirs & Estuaries
Fish Consumption Not Supported
Aquatic Life Not Supported
Recreation Not Supported
Shellfish Not Supported
0
4
8 Miles
Created by the Hampton Roads Planning District Commission
Data: Virginia Dept. of Environmental Quality, 2008
N
Beaverdam Reservoir
(Gloucester County)
GLOUCESTER
York River
Diascund Creek Reservoir
(Newport News Waterworks)
Little Creek Reservoir
(Newport News Waterworks)
Waller Mill Reservoir
(City of Williamsburg)
JAMES CITY
Chickahominy River
(Newport News Waterworks)
WILLIAMSBURG
Skiffes Creek Reservoir
(Newport News Waterworks)
YORK
Lee Hall Reservoir
(Newport News Waterworks)
POQUOSON
Harwood Mills Reservoir
(Newport News Waterworks)
NEWPORT NEWS
HAMPTON
James River


Map 3-17
Water Quality Use Impairments
Southside Sub-Region
Impaired Rivers
Fish Consumption Not Supported
Recreation Not Supported
Aquatic Life Not Supported
Impaired Reservoirs & Estuaries
Fish Consumption Not Supported
Aquatic Life Not Supported
Recreation Not Supported
Shellfish Not Supported
0
6
12 Miles
Created by the Hampton Roads Planning District Commission
Data: Virginia Dept. of Environmental Quality, 2008
James River
Intown Reservoirs
(City of Norfolk)
Crumps Mill Pond
(City of Suffolk)
Lone Star Lakes
(City of Suffolk)
NORFOLK
Western Reservoirs
(City of Norfolk)
PORTSMOUTH
VIRGINIA BEACH
Lake Meade
(City of Portsmouth)
Stumpy Lake
(City of Virginia Beach)
Lake Cohoon
(City of Portsmouth)
Lake Kilby
(City of Portsmouth)
Speights Run
(City of Portsmouth)
CHESAPEAKE
SUFFOLK
Northwest River
(City of Chesapeake)
Back Bay


Map 3-18
Water Quality Use Impairments
Western Tidewater Sub-Region
Impaired Rivers
Fish Consumption Not Supported
Recreation Not Supported
Aquatic Life Not Supported
Impaired Reservoirs & Estuaries
Fish Consumption Not Supported
Aquatic Life Not Supported
Recreation Not Supported
Shellfish Not Supported
0
6
12 Miles
Created by the Hampton Roads Planning District Commission
Data: Virginia Dept. of Environmental Quality, 2008
SURRY
James River
ISLE OF WIGHT
Blackwater River
(City of Norfolk)
SOUTHAMPTON
Nottoway River
(City of Norfolk)
FRANKLIN

Impaired Drinking Water Sources

Maps 3-16, 3-17, and 3-18 also identify impaired waters that are sources for community water systems. Impaired drinking water sources are listed in Table 3-14. Many community water system reservoirs are impaired for recreation due to bacteria, or for aquatic life use, primarily due to natural stratification causing dissolved oxygen depletion in the hypolimnon (bottom waters). Also, exceedence of the fish tissue standard for polychlorinated biphenyls (PCBs) and mercury are major causes of fish consumption use impairment in lakes and reservoirs. Impaired segments of listed rivers may be upstream or downstream of surface water intakes.

Publicly-owned CWSs employ various technologies to address source water quality. For example, the City of Norfolk has a hypolimnetic aeration system in Lake Prince and the Western Branch Reservoir. The purpose of the system is to maintain oxygen in the bottom waters during summer stratification. The system consists of 27 aerators, nine compressors, and approximately 20 miles of piping and is designed to improve:

- Reservoir water quality by reducing nutrient (i.e., phosphorus) transport and eutrophification; and
- Treated water quality by reducing undesirable raw water characteristics (i.e., manganese, iron, and other substances).

Table 3-14: 2008 Impaired Drinking Water Sources in Hampton Roads

Sub-Region	Impaired Water Source	Associated CWS	Classification	Impaired Use	Cause
Peninsula	Lee Hall Reservoir	Newport News Waterworks	5A	Aquatic Life	Copper; Dissolved Oxygen
			5A	Wildlife	Copper
Peninsula	Harwood's Mill Reservoir	Newport News Waterworks	5A	Aquatic Life	Copper; Dissolved Oxygen
			5A	Wildlife	Copper
Peninsula	Skiff's Creek Reservoir	Newport News Waterworks	5B	Shellfishing	Fecal Coliform
Southside	Northwest River System - Upper	City of Chesapeake	5A	Recreation	Escherichia coli
			5A	Aquatic Life	Dissolved Oxygen
Southside	Northwest River System - Middle	City of Chesapeake	5A	Recreation	Escherichia coli
			5C	Aquatic Life	Dissolved Oxygen
Southside	Northwest River System - Lower	City of Chesapeake	5C	Aquatic Life	Dissolved Oxygen
Southside	Lake Smith	City of Norfolk	5A	Aquatic Life	Dissolved Oxygen
Southside	Little Creek Reservoir	City of Norfolk	5A	Aquatic Life	Dissolved Oxygen
			5A	Fish Consumption	PCB in Fish Tissue
Southside	Lake Whitehurst	City of Norfolk	5A	Aquatic Life	Dissolved Oxygen
			5A	Fish Consumption	PCB in Fish Tissue
			5A	Fish Consumption	Mercury in Fish Tissue
Southside	Lake Burnt Mills	City of Norfolk	5A	Aquatic Life	Dissolved Oxygen
Southside	Western Branch Reservoir	City of Norfolk	5A	Aquatic Life	Dissolved Oxygen
Southside	Speights Run	City of Portsmouth	5A	Aquatic Life	Dissolved Oxygen
Southside	Lake Kilby	City of Portsmouth	5A	Aquatic Life	Dissolved Oxygen
Southside	Lake Cahoon	City of Portsmouth	5A	Aquatic Life	Dissolved Oxygen
Southside	Lake Meade	City of Portsmouth	5A	Aquatic Life	Dissolved Oxygen
Southside	Lone Star Lakes	City of Suffolk	5A	Aquatic Life	Dissolved Oxygen
Western Tidewater	Blackwater River	City of Norfolk	5A	Recreation	Escherichia coli
			5A	Aquatic Life	Dissolved Oxygen
			5A	Aquatic Life	Benthic-Macroinvertebrate Bioassessments
			5A	Fish Consumption	Mercury in Fish Tissue
Western Tidewater	Nottoway River	City of Norfolk	5A	Recreation	Escherichia coli
			5A	Aquatic Life	Benthic-Macroinvertebrate Bioassessments
			5A	Fish Consumption	Mercury in Fish Tissue

Source: Virginia Department of Environmental Quality, Final 2008 305(b)/303(d) Water Quality Assessment Integrated Report (Integrated Report), December 22, 2008

Point Source Discharges

The National Pollutant Discharge Elimination System (NPDES) permit program controls water pollution by regulating point sources that discharge pollutants into waters of the United States. The NPDES program is authorized by Section 402 of the Clean Water Act to limit pollutant discharges into streams, rivers, wetlands, lakes, and bays. Water pollution degrades surface waters, making them unsafe for drinking, fishing, swimming, and other activities.

Point sources of water pollution are discrete conveyances such as pipes or man-made ditches. Individual homes that are connected to a municipal system, use a septic system, or do not have a surface water discharge do not need an NPDES permit; however, industrial, municipal, and other facilities must obtain permits in order to emit discharges directly to surface waters.

The Virginia Pollutant Discharge Elimination System (VPDES) permit program is authorized under the State Water Control Law. The Virginia Pollutant Discharge Elimination System Permit Regulation (9 VAC 25-31) incorporates the federal permitting requirements and sets forth the policies and procedures for state-level program administration. The Virginia Department of Environmental Quality (DEQ) and the Department of Conservation and Recreation (DCR) coordinate separate programs that regulate the management of pollutants carried by storm water runoff. DEQ regulates storm water discharges associated with "industrial activities" and DCR regulates storm water discharges from construction sites and from municipal separate storm sewer systems (MS4s).

VPDES Permitted Facilities in Hampton Roads

According to DEQ, there were 137 industrial and municipal VPDES permitted facilities in Hampton Roads in 2005 (see Table 3-15 and Map 3-19). These permitted facilities include Phase I Municipal Separate Storm Sewer Systems (MS4s), local government water and wastewater treatment plants, correctional facilities, military facilities, and Virginia Department of Transportation (VDOT) tunnels. The majority of the VPDES permitted facilities are industrial in nature.

Although DEQ requires VPDES permits for all point source discharges to surface waters, the EPA maintains the authority to review applications and permits for major dischargers, a distinction based on discharge quantity and content.

Source Water Assessment Program

Regulations promulgated by the EPA to implement the Safe Drinking Water Act (SDWA) Amendments of 1996 provide a greater focus on pollution prevention as an approach to ensuring safe drinking water that complements the traditional treatment approach. This approach aims to prevent problems by increasing the capacity of community water systems to provide safe drinking water and by protecting the drinking water supply (source water).

The Source Water Assessment Program (SWAP) is the regulatory first step in developing programs to protect drinking water sources from pollution. Each state is required to conduct a source water assessment for each community water system within the state. VDH is the state agency responsible for developing and implementing programs under the federal SDWA. For Hampton Roads, VDH contracted with the HRPDC to conduct the source water assessments for public utilities that utilize surface water sources. The HRPDC SWAP (August 2002) concentrated on eight area water utilities that primarily rely on surface water sources; 21 surface water sources and 31 conjunctive use wells. The eight surface water dependent public utilities include Gloucester County, and the Cities of Chesapeake, Newport News, Norfolk, Portsmouth, Suffolk, Virginia Beach and Williamsburg.

HRPDC contracted with CH2M Hill to provide technical assistance to the SWAP subcommittee process. Through the subcommittee, CH2M Hill delineated the source assessment areas, inventoried the land use activities, assessed the susceptibility of each source according to the VDH guidance and developed the HRPDC SWAP database integrated with Geographic Information System (GIS) data.

Table 3-15: 2005 VPDES Permitted Facilities in Hampton Roads

Facility	Locality	VPDES Number	Municipal or Industrial	Facility	Locality	VPDES Number	Municipal or Industrial
1. Allied Terminals Incorporated - Chesapeake	Chesapeake	VA0053686	Industrial	18. Chesapeake Bay Bridge and Tunnel District	Chesapeake Bay	VA0006203	Industrial
2. Amerada Hess Corporation - Chesapeake	Chesapeake	VA0053082	Industrial	19. Chesapeake City - Lake Gaston WTP	Chesapeake	VA0091405	Industrial
3. Apex Oil Company - Chesapeake Terminal Division	Chesapeake	VA0053473	Industrial	20. Chesapeake City - Mains Creek Well Pump Station	Chesapeake	VA0073598	Industrial
4. Ashby Subdivision Water Supply	Isle of Wight	VA0088692	Industrial	21. Chesapeake City - MS4	Chesapeake	VA0088625	Municipal
5. Associated Naval Architects	Portsmouth	VA0087599	Industrial	22. Chesapeake City – WTP	Chesapeake	VA0088404	Industrial
6. Atlantic Energy Incorporated	Chesapeake	VA0074454	Industrial	23. Chesapeake Municipal Airport	Chesapeake	VA0068209	Municipal
7. Atlantic Wood Industries Newsoms	Southampton	VA0059056	Industrial	24. Ciba Specialty Chemicals Corporation	Suffolk	VA0058254	Industrial
8. Atlantic Wood Industries Portsmouth	Portsmouth	VA0004189	Industrial	25. Citgo Petroleum Corporation - Chesapeake Terminal	Chesapeake	VA0054623	Industrial
9. BASF Corporation - Portsmouth	Portsmouth	VA0003387	Industrial	26. Clydes Dale Mobile Home Park	Isle of Wight	VA0067318	Municipal
10. BASF Corporation - Williamsburg	James City County	VA0003654	Industrial	27. Cogentrix Virginia Leasing Corporation	Portsmouth	VA0074781	Industrial
11. Bayshore Concrete Products Corp. - Chesapeake	Chesapeake	VA0064645	Industrial	28. Colonial Pipeline Company – Hill	Chesapeake	VA0051853	Industrial
12. Boykins Town – WWTP	Southampton	VA0026417	Municipal	29. Colonial Pipeline Company – Norfolk	Chesapeake	VA0051845	Industrial
13. Brewers Creek Subdivision Water Supply	Isle of Wight	VA0089184	Industrial	30. Colonial Pipeline Company – Yorktown	James City County	VA0051870	Industrial
14. C and M Industries Incorporated	Norfolk	VA0089222	Industrial	31. Colonial Pipeline Surry	Surry	VA0085481	Industrial
15. Capron Town - Elementary School	Southampton	VA0027375	Municipal	32. Colonna Marine LLC - Colonna Yachts	Norfolk	VA0004391	Industrial
16. Carrollton Court	Isle of Wight	VA0088072	Municipal	33. Colonnas Shipyard	Norfolk	VA0053813	Industrial
17. Center Terminal Company - Norfolk	Norfolk	VA0058572	Industrial	34. Columbia Gas Transmission Corp – Chesapeake	Chesapeake	VA0086835	Industrial

Table 3-15: 2005 VPDES Permitted Facilities in Hampton Roads (continued)

Facility	Locality	VPDES Number	Municipal or Industrial	Facility	Locality	VPDES Number	Municipal or Industrial
35. Commonwealth Atlantic Limited - Chesapeake	Chesapeake	VA0087441	Industrial	52. Gloucester County WWTP	Gloucester County	VA0078778	Industrial
36. Commonwealth Wood Preservers Incorporated	Newport News	VA0073555	Industrial	53. Gloucester Lumber Products Incorporated – Dutton	Gloucester County	VA0077879	Industrial
37. Concrete Precast Systems Inc - Chesapeake	Chesapeake	VA0089818	Industrial	54. Grays Creek Marina and Restaurant	Surry	VA0091308	Municipal
38. Courtland Town – WWTP	Southampton	VA0061859	Municipal	55. Hampton City MS4	Hampton	VA0088633	Municipal
39. Davis Boat Works Inc	Newport News	VA0089664	Industrial	56. Hercules Incorporated – Franklin	Southampton	VA0003433	Industrial
40. DMA Air National Guard	Virginia Beach	VA0087912	Industrial	57. HRSD - Army Base STP	Norfolk	VA0081230	Municipal
41. DOC - Southampton Correctional Facility	Southampton	VA0062499	Municipal	58. HRSD - Atlantic STP	Virginia Beach	VA0081248	Municipal
42. DOC - St. Brides Correctional Center	Chesapeake	VA0060526	Municipal	59. HRSD - Boat Harbor STP	Newport News	VA0081256	Municipal
43. Dominion – Yorktown	York County	VA0004103	Industrial	60. HRSD - Chesapeake-Elizabeth STP	Norfolk	VA0081264	Municipal
44. Dominion Terminal Associates	Newport News	VA0057576	Industrial	61. HRSD - James River STP	Newport News	VA0081272	Municipal
45. Dominion Virginia Power – Chesapeake	Chesapeake	VA0004081	Industrial	62. HRSD - Nansemond STP	Suffolk	VA0081299	Municipal
46. Dominion Virginia Power – Southampton	Southampton	VA0082767	Industrial	63. HRSD - Virginia Initiative Plant	Norfolk	VA0081281	Municipal
47. Dominion Virginia Power - Surry and Gravel Neck	Surry	VA0004090	Industrial	64. HRSD - Williamsburg STP	James City County	VA0081302	Municipal
48. Ecolochem Incorporated	Norfolk	VA0053554	Industrial	65. HRSD - York River STP	York County	VA0081311	Municipal
49. ExxonMobil Oil Corporation - Chesapeake Terminal	Chesapeake	VA0053911	Industrial	66. IMTT Chesapeake	Chesapeake	VA0056138	Industrial
50. Franklin City – STP	Franklin	VA0023922	Municipal	67. Indian Cove Campground	Virginia Beach	VA0062391	Municipal
51. Giant Yorktown Refinery	York County	VA0003018	Industrial	68. International Paper - Franklin Mill	Suffolk	VA0004162	Industrial

Table 3-15: 2005 VPDES Permitted Facilities in Hampton Roads (continued)

Facility	Locality	VPDES Number	Municipal or Industrial	Facility	Locality	VPDES Number	Municipal or Industrial
69. JH Miles & Company Incoporated	Norfolk	VA0003263	Industrial	86. Norfolk Oil Transit Incorporated	Norfolk	VA0054828	Industrial
70. Kinder Morgan Bulk Terminals - Pier IX	Newport News	VA0057142	Industrial	87. Norfolk Shiprepair and Drydock	Norfolk	VA0004405	Industrial
71. Kinder Morgan Energy Partners - ERT	Chesapeake	VA0081418	Industrial	88. Norfolk Southern Railway Company - Lamberts Point	Norfolk	VA0003409	Industrial
72. Koch Materials Company	Newport News	VA0055832	Industrial	89. Norshipco - Berkley	Norfolk	VA0004383	Industrial
73. Lyon Shipyard - Sealift Drydock	Norfolk	VA0089168	Industrial	90. Ocean Marine Yacht Center	Portsmouth	VA0090778	Industrial
74. Lyon Shipyard Inc	Norfolk	VA0085855	Industrial	91. Peck Marine Terminal	Chesapeake	VA0004821	Industrial
75. Metro Machine Corporation	Norfolk	VA0073091	Industrial	92. Perdue Farms Incorporated - Chesapeake	Chesapeake	VA0004448	Industrial
76. Moon Engineering Company Incorporated	Portsmouth	VA0089699	Industrial	93. Port Allen Marine Services	Chesapeake	VA0086533	Industrial
77. Nansemond Precast Concrete Company	Suffolk	VA0088781	Industrial	94. Portsmouth City - Lake Kilby Treatment Facility	Suffolk	VA0006301	Industrial
78. Newport News City - Lee Hall WTP	Newport News	VA0089451	Industrial	95. Portsmouth City - MS4	Portsmouth	VA0088668	Municipal
79. Newport News City - Lee Hall WTP	Newport News	VA0050032	Industrial	96. Praxair Incorporated	Hampton	VA0057541	Industrial
80. Newport News City Harwood's Mill Water Filtration	York County	VA0005975	Industrial	97. Rappahannock Community College - Glenns Campus	Gloucester County	VA0028461	Municipal
81. Newport News City MS4	Newport News	VA0088641	Municipal	98. Royster-Clark Inc - Chesapeake - Weaver Lane	Chesapeake	VA0003875	Industrial
82. Newport News Shipbuilding	Newport News	VA0004804	Industrial	99. S W Rawls Incorporated - Franklin	Franklin	VA0055841	Industrial
83. Newport News Williamsburg International Airport	Newport News	VA0089681	Industrial	100. Sentry Services Inc. - Suffolk	Suffolk	VA0086134	Industrial
84. Norfolk City of - MS4	Norfolk	VA0088650	Municipal	101. Siemens VDO Automotive Corporation - Newport News	Newport News	VA0005282	Industrial
85. Norfolk International Airport	Norfolk	VA0089737	Industrial	102. SPSA - Refuse Derived Fuel Plant	Portsmouth	VA0089923	Industrial

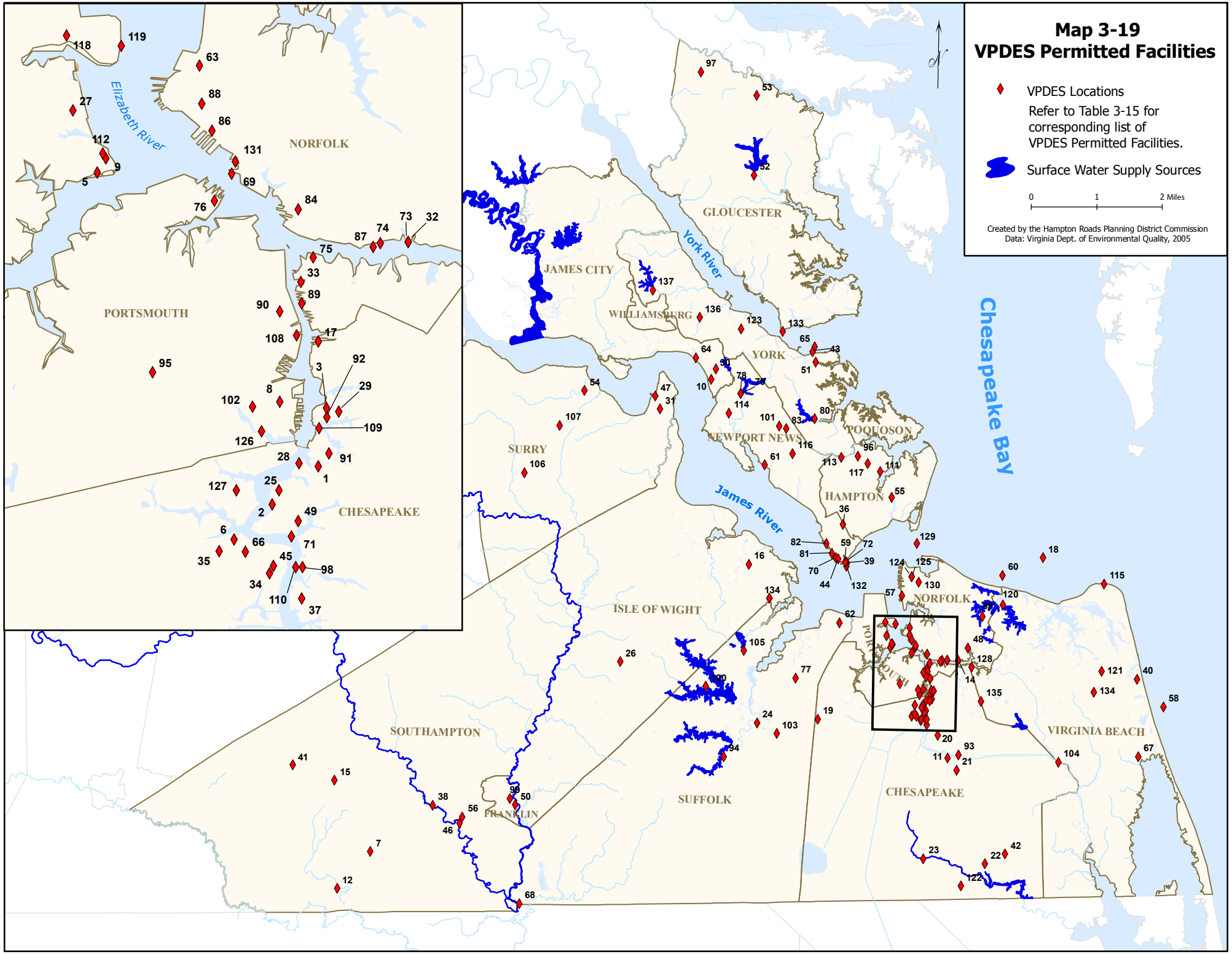
Table 3-15: 2005 VPDES Permitted Facilities in Hampton Roads (continued)

Facility	Locality	VPDES Number	Municipal or Industrial	Facility	Locality	VPDES Number	Municipal or Industrial
103. SPSA - Regional Landfill	Suffolk	VA0090034	Industrial	119. US Navy - Craney Island - WWTP	Portsmouth	VA0089605	Industrial
104. ST Services	Virginia Beach	VA0087548	Industrial	120. US Navy - Little Creek Amphibious Base	Virginia Beach	VA0079928	Industrial
105. Suffolk City of - G Robert House WTP	Suffolk	VA0076473	Industrial	121. US Navy - Naval Air Station - Oceana	Virginia Beach	VA0005266	Industrial
106. Surry County Wastewater Treatment Facility	Surry	VA0088463	Municipal	122. US Navy - Naval Security Group Activity Northwest	Chesapeake	VA0024244	Municipal
107. Surry Town of WWTF	Surry	VA0061646	Municipal	123. US Navy - Naval Weapons Station - Yorktown	York County	VA0087408	Industrial
108. TransMontaigne Product Services Inc - Terminal 1	Portsmouth	VA0023272	Industrial	124. US Navy - Norfolk Naval Base - Sewells Point	Norfolk	VA0004421	Industrial
109. TransMontaigne Product Services Inc - Terminal 2	Chesapeake	VA0053074	Industrial	125. US Navy - Norfolk Naval Base - Sewells Point	Norfolk	VA0089532	Industrial
110. Tri-Port Terminals	Chesapeake	VA0083313	Industrial	126. US Navy - Norfolk Naval Shipyard	Portsmouth	VA0005215	Industrial
111. US Air Force - Langley Air Force Base	Hampton	VA0083194	Industrial	127. US Navy - St Juliens Creek Annex	Chesapeake	VA0089761	Industrial
112. US Amines LLC - Portsmouth	Portsmouth	VA0090298	Industrial	128. VDOT - Downtown Tunnel	Virginia Beach	VA0005851	Industrial
113. US Army - Big Bethel Water Treatment Plant	Hampton	VA0005924	Industrial	129. VDOT - Hampton Roads District - Bridge Tunnel	Chesapeake Bay	VA0005657	Industrial
114. US Army - Fort Eustis - Transportation Center	Newport News	VA0025216	Industrial	130. VDOT - I-564 Tunnel	Norfolk	VA0005835	Industrial
115. US Army - Fort Story	Virginia Beach	VA0031917	Industrial	131. VDOT - Midtown Tunnel	Norfolk	VA0005860	Industrial
116. US DOE - Thomas Jefferson National Accelerator Fac	Newport News	VA0089320	Industrial	132. VDOT - Monitor Merrimac Memorial Bridge Tunnel	Newport News	VA0080179	Industrial
117. US NASA - Langley Research Center	Hampton	VA0024741	Industrial	133. VIMS Toxicology Laboratories	Gloucester County	VA0071528	Industrial
118. US Navy - Craney Island - Fuel Terminal	Portsmouth	VA0005487	Industrial	134. Virginia Beach City - MS4	Virginia Beach	VA0088676	Municipal

Table 3-15: 2005 VPDES Permitted Facilities in Hampton Roads (continued)

Facility	Locality	VPDES Number	Municipal or Industrial	Facility	Locality	VPDES Number	Municipal or Industrial
135. Virginia Beach City – Mt Trashmore Landfill II	Virginia Beach	VA0086169	Industrial	137. Williamsburg Water Filter Plant	York County	VA0056537	Industrial
136. Water Country USA	York County	VA0089826	Industrial				

Source: Virginia Department of Environmental Quality, 2005.
Notes: STP: Sewage Treatment Plant
WTP: Water Treatment Plant
WWTP: Wastewater Treatment Plant


Map 3-19
VPDES Permitted Facilities
VPDES Locations
Refer to Table 3-15 for corresponding list of VPDES Permitted Facilities.
Surface Water Supply Sources
0
1
2 Miles
Created by the Hampton Roads Planning District Commission
Data: Virginia Dept. of Environmental Quality, 2005
Elizabeth River
York River
James River
Chesapeake Bay
NORFOLK
PORTSMOUTH
CHESAPEAKE
GLOUCESTER
JAMES CITY
WILLIAMSBURG
YORK
SURRY
NEWPORT NEWS
POQUOSON
HAMPTON
ISLE OF WIGHT
SOUTHAMPTON
SUFFOLK
FRANKLIN
VIRGINIA BEACH

The Hampton Roads source water assessment contains the following elements:

- Source water assessment area delineation.
- Inventory of Land Use Activities that are, or could become, potential sources of contamination for a drinking water source.
- Water supply susceptibility determination.

The HRPDC SWAP reports (August 2002) are compiled by jurisdiction, with one report for each of the eight water utilities with surface water sources and conjunctive use wells. The reports were distributed to each water utility and to the host jurisdictions of the SWAP areas. A two-volume document prepared for HRPDC contains all eight reports. All documents, the database and associated GIS data, database user's guide, metadata, and raw data files were provided on CD ROM to each of the sixteen jurisdictions in Hampton Roads. Section 1, Existing Sources, summarizes the findings of the VDH SWAP evaluations and HRPDC SWAP (August 2002) for publicly-owned community water system sources and indicates any determination on susceptibility to contamination.

Active Solid Waste Management Facilities in Hampton Roads

As of April 2008, DEQ listed 47 active permits for solid waste management facilities in Hampton Roads (see Table 3-16). A majority of these facilities are transfer stations operated by the Southeastern Public Service Authority (SPSA) or the Virginia Peninsulas Public Services Authority (VPPSA). Other facilities include sanitary landfills, construction and demolition debris landfills, industrial landfills, yard waste composting facilities, materials recovery facilities, regulated medical waste management facilities, and energy recovery and incineration facilities.

Underground Storage Tanks

Underground storage tanks can contain hazardous substances, such as petroleum, gasoline, diesel fuel, acetone, or kerosene. Over time, these underground storage tanks may corrode and begin to leak. Small leaks in a tank are usually not detected, and have minimal impact on water resources if the leak occurs in shallow, well-aerated soils. Under these conditions, petroleum products will attach to clay and organic material in the soil and naturally occurring bacteria can decompose these products over time. Larger leaks or leaks in very permeable sandy soils do not provide an adequate barrier and can easily result in ground water contamination.

DEQ is charged with regulating underground storage tanks in Virginia. Underground storage tank regulations require that after December 22, 1998, all new tanks be made of non-corrodible materials and be equipped with overfill and spill prevention devices. Tanks already in existence are required to be replaced or retrofitted to meet the new standards. Underground storage tank regulations do not apply to residential underground storage tanks.

Underground storage tank data for the localities within Hampton Roads was obtained from DEQ. In 2008, there were 3,590 registered petroleum underground storage tank sites in the region. Of these, only 213 were classified as open or in use.

Superfund Sites

Superfund is the name given to the federal government's environmental program to clean up uncontrolled hazardous waste sites. Superfund allows the EPA to clean up sites and to compel responsible parties to perform cleanups or reimburse the government for EPA-lead cleanups. Table 3-17 lists the Superfund sites in Hampton Roads as of 2008.

Other Resources

The EPA provides "EnviroFacts," an online resource mapping several environmental databases including: the Toxic Release Inventory (TRI), Aerometric Information Retrieval System (AIRS), Permit Compliance System (PCS), Information Collection Rule (ICR), Superfund and Safe Drinking Water Information System (SDWIS) database. EnviroFacts can be used to query point source discharges and other environmental information such as superfund sites, toxic release sites, water discharges, air emission, and hazardous waste locations by geographic location. EnviroFacts is available online at http://epa.gov/enviro/.

Table 3-16: 2008 Active Solid Waste Management Facilities in Hampton Roads

Facility Name	Locality	Permit Number	Type of Facility
American Environmental Group	Suffolk	PBR542	Regulated Medical Waste Storage Facility
Bay Disposal Incorporated Material Recovery Facility	Norfolk	PBR504	Materials Recovery Facility
Dominion - Chesapeake Energy Center	Chesapeake	SWP440	Industrial Landfill
Dominion - Yorktown Power Station	Yorktown	SWP457	Industrial Landfill
Hampton City - NASA Steam Plant	Hampton	SWP297	Energy Recovery/Incineration Facility
Higgerson Buchanan Incorporated	Chesapeake	SWP493	Construction and Demolition Debris Landfill
Industrial Resource Technology	Gloucester	PBR115	Materials Recovery Facility
International Paper LF No 2 - Isle of Wight	Franklin	SWP504	Industrial Landfill
John C Holland Enterprises Landfill	Suffolk	SWP280	Industrial Landfill
Maryview Hospital	Portsmouth	PBR172	Regulated Medical Waste Steam Sterilizer
Middle Peninsula Landfill	Glenns	SWP572	Sanitary Landfill
Middle Peninsula Landfill	Glenns	PBR125	Yard Waste Composting Facility
Newport News City – Yard Waste Composting Facility - Warwick Blvd	Newport News	PBR096	Yard Waste Composting Facility
Old Dominion University	Norfolk	PBR157	Regulated Medical Waste Steam Sterilizer
Portsmouth City - Craney Island Landfill	Portsmouth	SWP041	Construction and Demolition Debris Landfill
Reclamation Incorporated	Hampton	PBR062	Materials Recovery Facility
Riverside Regional Medical Center	Newport News	PBR165	Regulated Medical Waste Alternate Treatment
Soilex Corporation - Chesapeake	Chesapeake	PBR510	Materials Recovery Facility
Soilex Corporation - Suffolk	Suffolk	PBR155	Materials Recovery Facility
Spivey Disposal LLC	Hampton	PBR533	Materials Recovery Facility
SPSA - Boykins Transfer	Boykins	SWP484	Transfer Station
SPSA - Chesapeake Transfer	Chesapeake	PBR194	Transfer Station
SPSA - Consolidated Yard Waste Facility	Virginia Beach	PBR519	Yard Waste Composting Facility
SPSA - Franklin Transfer Station	Franklin	PBR192	Transfer Station
SPSA – Incinerator	Portsmouth	PBR500	Energy Recovery/Incineration Facility
SPSA - Isle Of Wight Transfer Station	Smithfield	PBR193	Transfer Station
SPSA - Ivor Transfer Station	Ivor	SWP539	Transfer Station
SPSA - Landstown Transfer	Virginia Beach	PBR191	Transfer Station

Table 3-16: 2008 Active Solid Waste Management Facilities in Hampton Roads (continued)

Facility Name	Locality	Permit Number	Type of Facility
SPSA - Norfolk Transfer Station	Norfolk	PBR195	Transfer Station
SPSA - Oceana Transfer Station	Virginia Beach	PBR190	Transfer Station
SPSA - Regional Landfill	Suffolk	PBR518	Transfer Station
SPSA - Regional Landfill	Suffolk	PBR072	Materials Recovery Facility
SPSA - Regional Landfill	Suffolk	SWP417	Sanitary Landfill
United Disposal Incorporated	Norfolk	PBR522	Materials Recovery Facility
US - AFETA Camp Peary	Williamsburg	PBR097	Transfer Station
US Army - Fort Eustis - Transportation Center	Ft Eustis	PBR119	Regulated Medical Waste Incinerator
US Navy - Norfolk Naval Shipyard	Portsmouth	PBR135	Materials Recovery Facility
USA Waste of Virginia Landfills - Bethel Landfill	Hampton	SWP580	Sanitary Landfill
Virginia Beach City - Landfill No 2	Virginia Beach	SWP398	Sanitary Landfill
Virginia Department of Forensic Science - PMS	Norfolk	PBR511	Regulated Medical Waste Steam Sterilizer
Virginia Materials Inc - Norfolk	Norfolk	PBR117	Materials Recovery Facility
Virginia Peninsula Public Services Authority – James City County	Williamsburg	PBR021	Transfer Station
Virginia Peninsula Public Svc Authority York County	Yorktown	PBR022	Transfer Station
VPPSA - YWCF - York County	Yorktown	PBR013	Yard Waste Composting Facility
Waste Industries LLC	Chesapeake	PBR077	Materials Recovery Facility
Waterway Marine Terminal	Chesapeake	PBR506	Materials Recovery Facility
Western Refining Yorktown Incorporated	Yorktown	SWP363	Industrial Landfill

Source: Virginia Economic Development Partnership, Solid Waste Management Facilities in Virginia, May 2008.

.

Table 3-17: 2008 Superfund Sites in Hampton Roads

Site Name	Locality	EPA ID
2020 Chestnut St	Portsmouth	VA0002366946
Abex Corp	Portsmouth	VAD980551683
Atlantic Wood Industries	Portsmouth	VAD990710410
Basic Tool Company	Hampton	VAD988212429
Chesapeake PLT	Chesapeake	VAD001704808
Chisman Creek	York	VAD980712913
Fine Petroleum/Mariner Hi Tech	Norfolk	VAD023837628
Former Nansemond Ordnance Depot	Suffolk	VAD123933426
Fort Eustis	Newport News	VA6210020321
Goodwin Junkyard	Isle of Wight	VAD988187076
Hampton Industrial Plating	York	VAD988201992
Langley AFB/NASA Research Center	Hampton	VA2800005033
Macson's, Inc.	Chesapeake	VA0001118207
Naval Air Station, Oceana	Virginia Beach	VA2170024606
Naval Amphibious Base	Virginia Beach	VA5170022482
Naval Weapons Station Yorktown	York	VA8170024170
Naval Weapons Station Yorktown - Cheatham Annex	Williamsburg	VA3170024605
Norfolk Naval Base	Norfolk	VA6170061463
Norfolk Naval Shipyard	Portsmouth	VA1170024813
St Julien's Creek Annex, US Navy	Chesapeake	VA5170000181
Saunders Supply Company	Suffolk	VAD003117389
Suffolk City LF	Suffolk	VAD980917983
Sutton Enterprises, Inc.	Chesapeake	VAD988173548
Naval Radio Transmitting Facility - Driver	Suffolk	VA9170022488

Source: EPA. Virginia Superfund Sites, http://www.epa.gov/reg3hwmd/super/va.htm.

Uranium Mining

Virginia Uranium, Inc. has proposed a uranium mine at Coles Hill in Pittsylvania County, Virginia. This mine would be located in the Roanoke River Basin, which flows into Kerr Reservoir and Lake Gaston. The Lake Gaston intake is owned by Virginia Beach. Lake Gaston water is blended with Norfolk's water sources and treated at Norfolk's water treatment plants before distribution to Virginia Beach and Chesapeake.

In 1983, the Virginia General Assembly enacted a legislative moratorium on the mining of uranium in Virginia. In 2009, the Virginia Coal and Energy Commission (VCEC) contracted with the Virginia Center for Coal and Energy Research (VCCER) to study the consequences of repealing the moratorium and developing a regulatory framework for uranium mining in Virginia. In addition, the Commonwealth of Virginia has proposed for the National Academy of Sciences to conduct a wide-ranging study of the impact of uranium mining.

The City of Virginia Beach adopted a Resolution opposing the Mining of Uranium in the Commonwealth of Virginia until it is demonstrated to a reasonable degree of scientific certainty that there would be no significant release of radioactive contamination downstream, even as a result of a rainfall event of Probable Maximum Precipitation (PMP) similar to what struck Nelson County in 1969.

Potential water supply threats associated with uranium mining include:

- Significant or PMP rainfall event may erode and fragment virtually any earthen structure, man-made or natural,
- Structure erosion or fragmentation may result in the release of radioactive sediments downstream,
- Radioactive uranium mining tailings are highly susceptible to both air and water transport, and
- Radioactive seepage into groundwater.

Fluoride

Fluoride naturally occurs in the groundwater supplies of many private and publicly owned community water systems in Hampton Roads. The federally established maximum contaminant level (MCL) for fluoride is 4.0 milligrams per liter.

There were approximately fifty-seven systems whose naturally elevated fluoride levels exceeded the MCL in 2000. These systems relied solely on groundwater and were concentrated in the Western Tidewater sub-region of Hampton Roads. Many systems have completed remediation efforts and are now in compliance with fluoride levels. Table 3-18 and Map 3-20 summarize the 24 community water systems that were in violation of fluoride contamination levels as of February 2010, according to the Virginia Department of Health.

The EPA recognizes both benefits and risks associated with fluoride in drinking water.

Potential Water Supply Benefits

The EPA recommends that CWSs fluoridate drinking water to prevent dental caries (tooth decay). The optimum fluoride concentration in the drinking water is from 0.8 to 1.0 milligram per liter.

Water fluoridation is considered the most cost effective and beneficial means for persons unable to afford preventative dentistry to take care of their teeth.

Potential Water Supply Risks

Dental fluorosis is the staining or mottling of the teeth resulting from ingestion of excessive fluoride in drinking water. Studies show that children exposed to daily concentrations of 2.0 milligram per liter or higher may develop dental fluorosis. Although dental fluorosis is not a life threatening disease, the EPA has established a Secondary MCL for fluoride of 2.0 milligrams per liter to protect the consumer from developing dental discoloration. Community water systems producing water in violation of the Secondary MCL must notify their customers of the potential health effects.

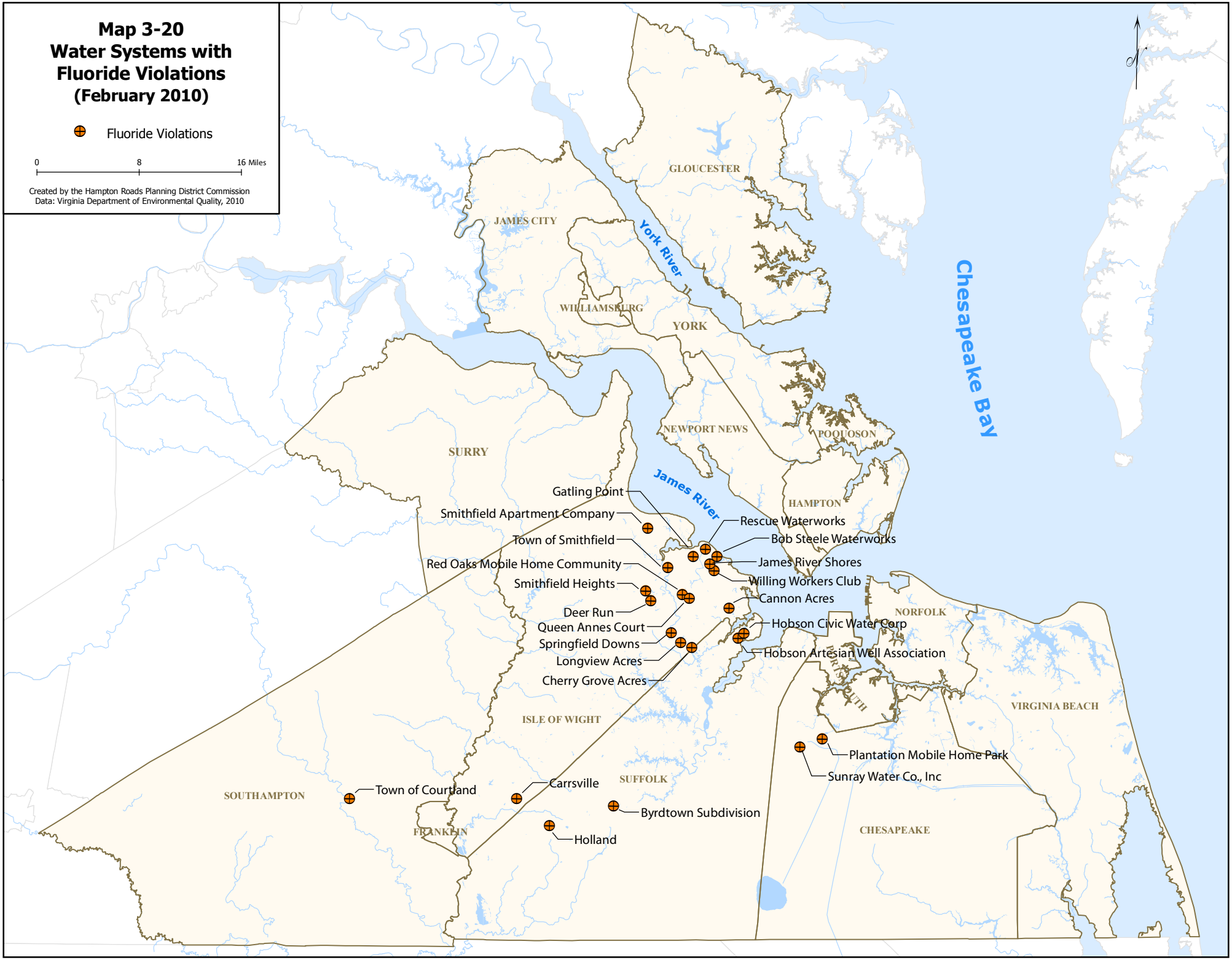
Skeletal fluorosis is a serious bone crippling disorder that resembles osteoporosis. It may also result in dental malformation, decalcification, mineralization of tendons, and digestive and nervous disorders. Skeletal fluorosis is usually only found in areas of the world where long-term exposure to fluoride concentrations of 10 milligram per liter and higher are present. Although there is disagreement within the health community over the concentration at which long-term exposure may result in skeletal fluorosis, this condition can occur in people exposed to very different levels of fluoride. The EPA established the Primary MCL for fluoride in drinking water to protect the consumer from developing skeletal fluorosis.

Table 3-18: Community Water Systems in Violation of Fluoride Levels (February 2010)

System Name	Location	Status
Cannon Acres	Isle of Wight	Referred to EPA, Under Consent Order
Bob Steele	Isle of Wight	Referred to EPA, Under Consent Order
Carrsville[1]	Isle of Wight	Under Consent Order
Cherry Grove Acres	Isle of Wight	Referred to EPA, Under Consent Order
Deer Run	Isle of Wight	Under Consent Order
Red Oaks Mobile Home Park	Isle of Wight	Under Consent Order
James River Shores	Isle of Wight	Referred to EPA, Under Consent Order
Long View Acres	Isle of Wight	Referred to EPA, Under Consent Order
Queen Anne's Court[2]	Isle of Wight	Under Consent Order
Rescue	Isle of Wight	Still needs action by owner
Smithfield Apartments	Isle of Wight	Potential system
Smithfield Heights[1]	Isle of Wight	Under Consent Order
Springfield Downs	Isle of Wight	Referred to EPA, Under Consent Order
Town of Smithfield	Isle of Wight	Under Consent Order
Gatling Pointe	Isle of Wight	Under Consent Order
Willing Workers Club	Isle of Wight	Still needs action by owner
Town of Courtland	Southampton	Under Consent Order
Plantation MHP	Chesapeake	Still needs action by owner
Sunray Water Co.	Chesapeake	Still needs action by owner
Birdsong (Byrdtown)	Suffolk	Still needs action by owner
Hobson Village	Suffolk	Still needs action by owner
Hobson Mt. Lebanon	Suffolk	Still needs action by owner
Holland	Suffolk	Under Consent Order

Source: Virginia Department of Health.

1. As of December 2010, the Carrsville and Smithfield Heights systems were no longer under consent order.
2. In late 2010, Isle of Wight County purchased the infrastructure for the Queen Anne's Court System and connected it to the Western Tidewater Water Authority Source, which is not subject to fluoride violations.


Map 3-20
Water Systems with
Fluoride Violations
(February 2010)
Fluoride Violations
0
8
16 Miles
Created by the Hampton Roads Planning District Commission
Data: Virginia Department of Environmental Quality, 2010
GLOUCESTER
JAMES CITY
York River
WILLIAMSBURG
YORK
Chesapeake Bay
NEWPORT NEWS
POQUOSON
SURRY
James River
HAMPTON
Gatling Point
Smithfield Apartment Company
Town of Smithfield
Red Oaks Mobile Home Community
Smithfield Heights
Deer Run
Queen Annes Court
Springfield Downs
Longview Acres
Cherry Grove Acres
Rescue Waterworks
Bob Steele Waterworks
James River Shores
Willing Workers Club
Cannon Acres
NORFOLK
Hobson Civic Water Corp
Hobson Artesian Well Association
PORTSMOUTH
VIRGINIA BEACH
ISLE OF WIGHT
Plantation Mobile Home Park
Sunray Water Co., Inc
SUFFOLK
Carrsville
Byrdtown Subdivision
SOUTHAMPTON
Town of Courtland
FRANKLIN
Holland
CHESAPEAKE

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