

# Virginia's Principal Watersheds and Rivers

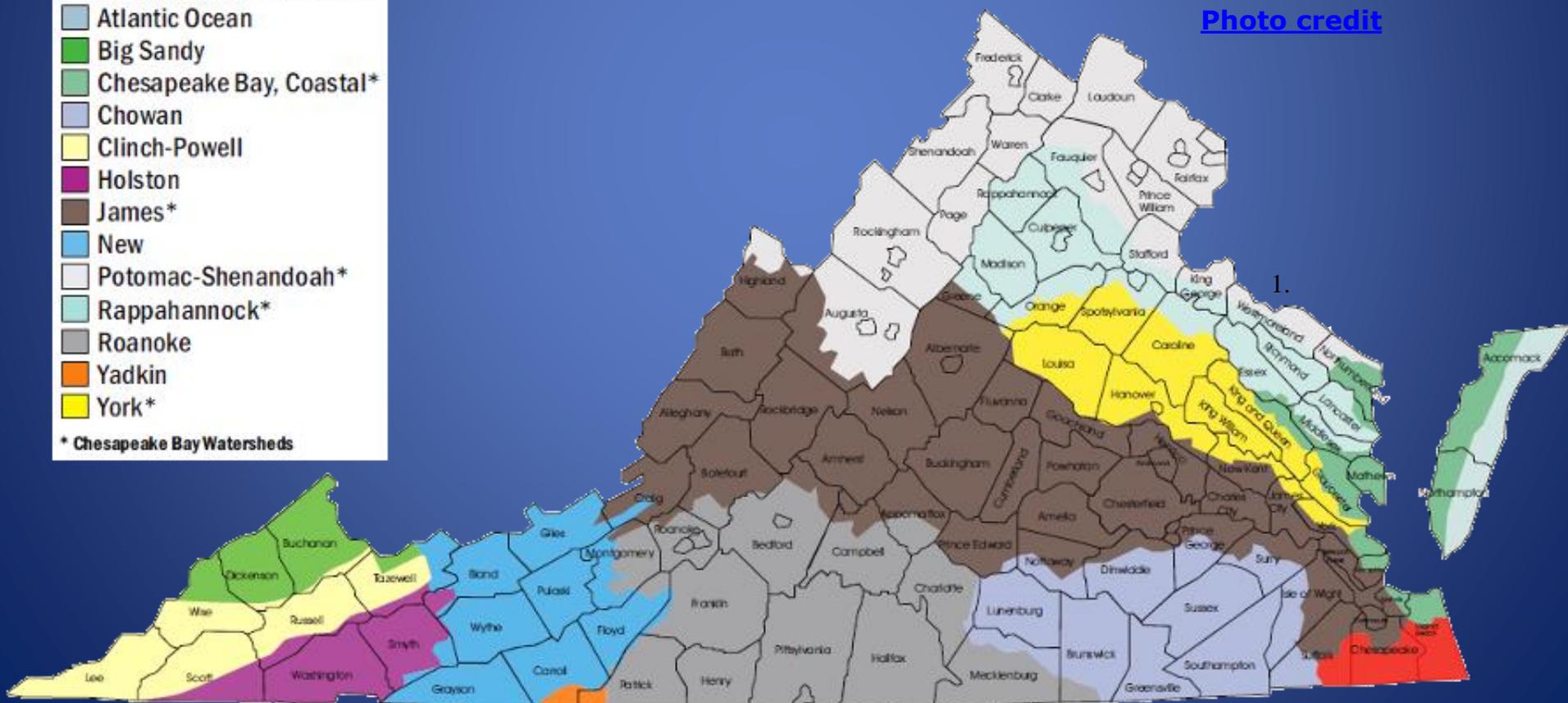
Excerpted from a presentation developed by  
Barry Fox, Extension Specialist, VA State  
University, Petersburg, VA  
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**WATERSHED:** The land that water flows across or through on its way to a stream, lake, wetland, or other body of water. Watersheds are natural and vary based on differences in geography and hydrology. (Va. Dept. Conservation & Recreation)

Areas of higher elevations, such as ridgelines or divides separate watersheds. There are 14 watersheds in Virginia

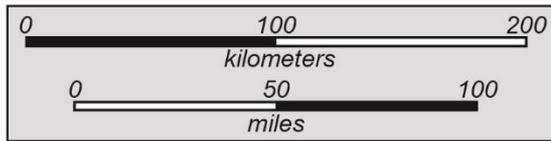
[Watersheds](#)  
 Photo credit

- Albemarle Sound, Coastal
  - Atlantic Ocean
  - Big Sandy
  - Chesapeake Bay, Coastal\*
  - Chowan
  - Clinch-Powell
  - Holston
  - James\*
  - New
  - Potomac-Shenandoah\*
  - Rappahannock\*
  - Roanoke
  - Yadkin
  - York\*
- \* Chesapeake Bay Watersheds

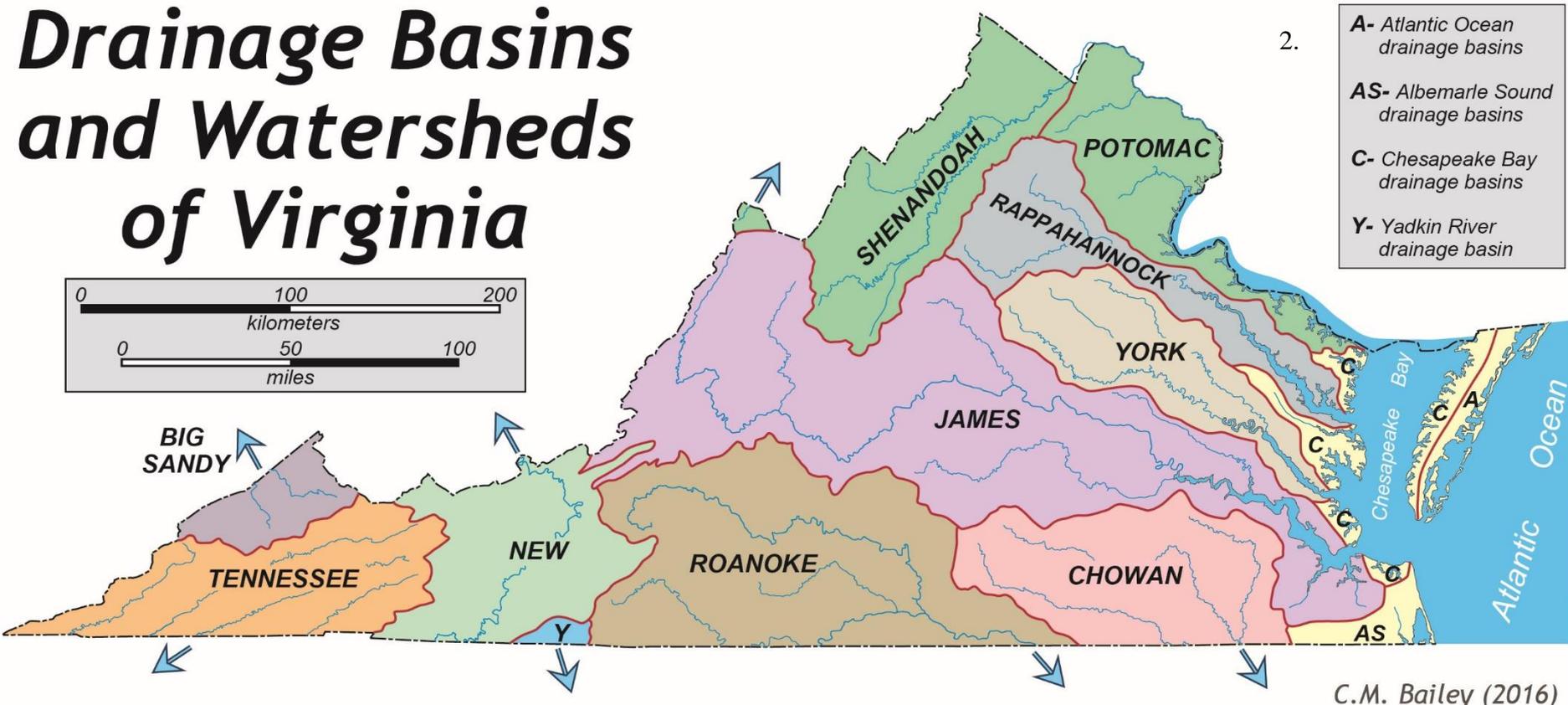


Virginia is drained by nine major watersheds, called Drainage Basins. [Drainage Basins](#). Photo credit

# Drainage Basins and Watersheds of Virginia



- 2.
- A- Atlantic Ocean drainage basins
  - AS- Albemarle Sound drainage basins
  - C- Chesapeake Bay drainage basins
  - Y- Yadkin River drainage basin



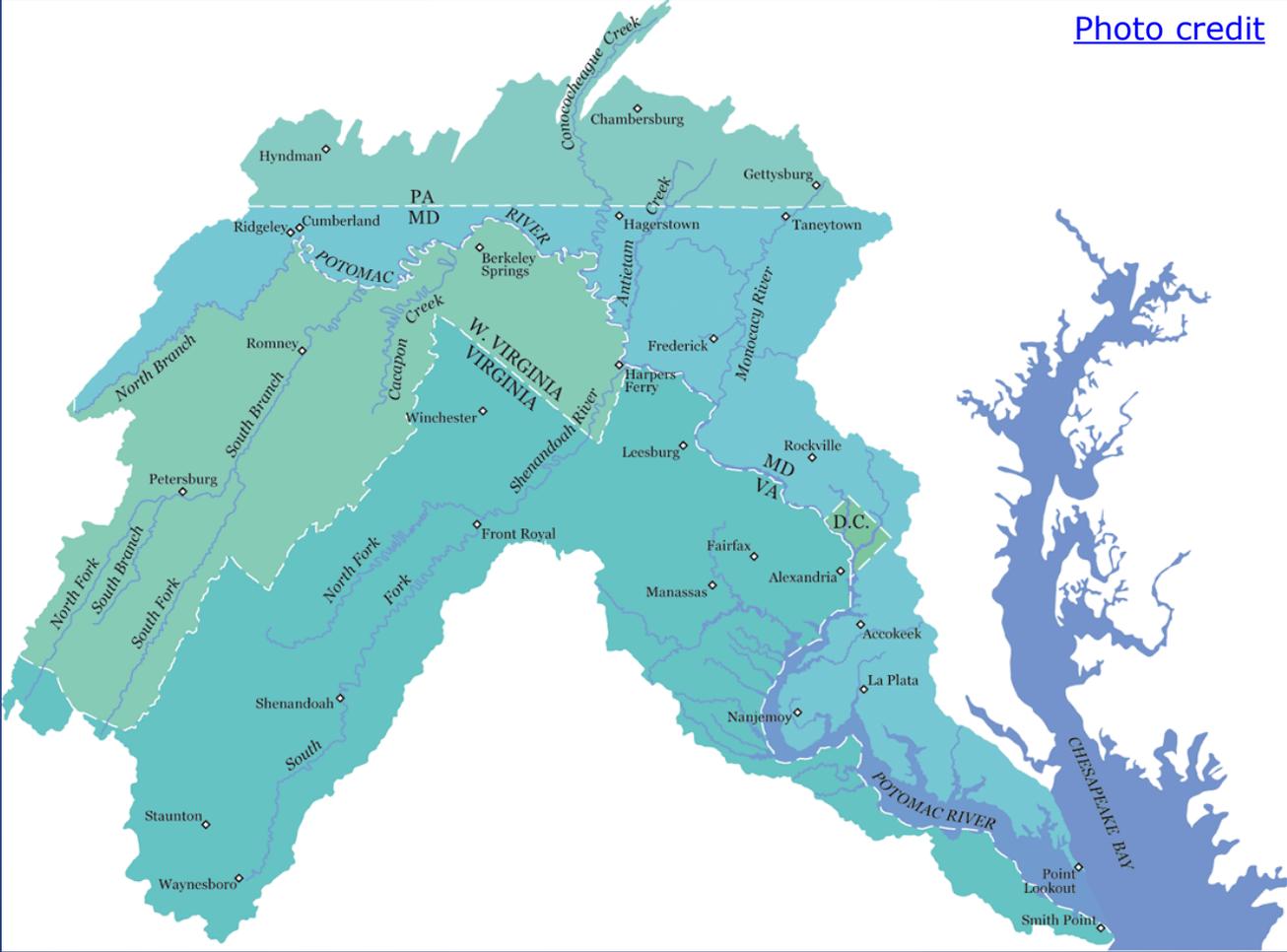
C.M. Bailey (2016)

The watersheds in Virginia join to form three regional watersheds based on where they empty into the ocean: the Chesapeake Bay, the North Carolina Sounds (Albemarle Sound) or the Gulf of Mexico via the Mississippi River).  
[Regional Watersheds.](#)



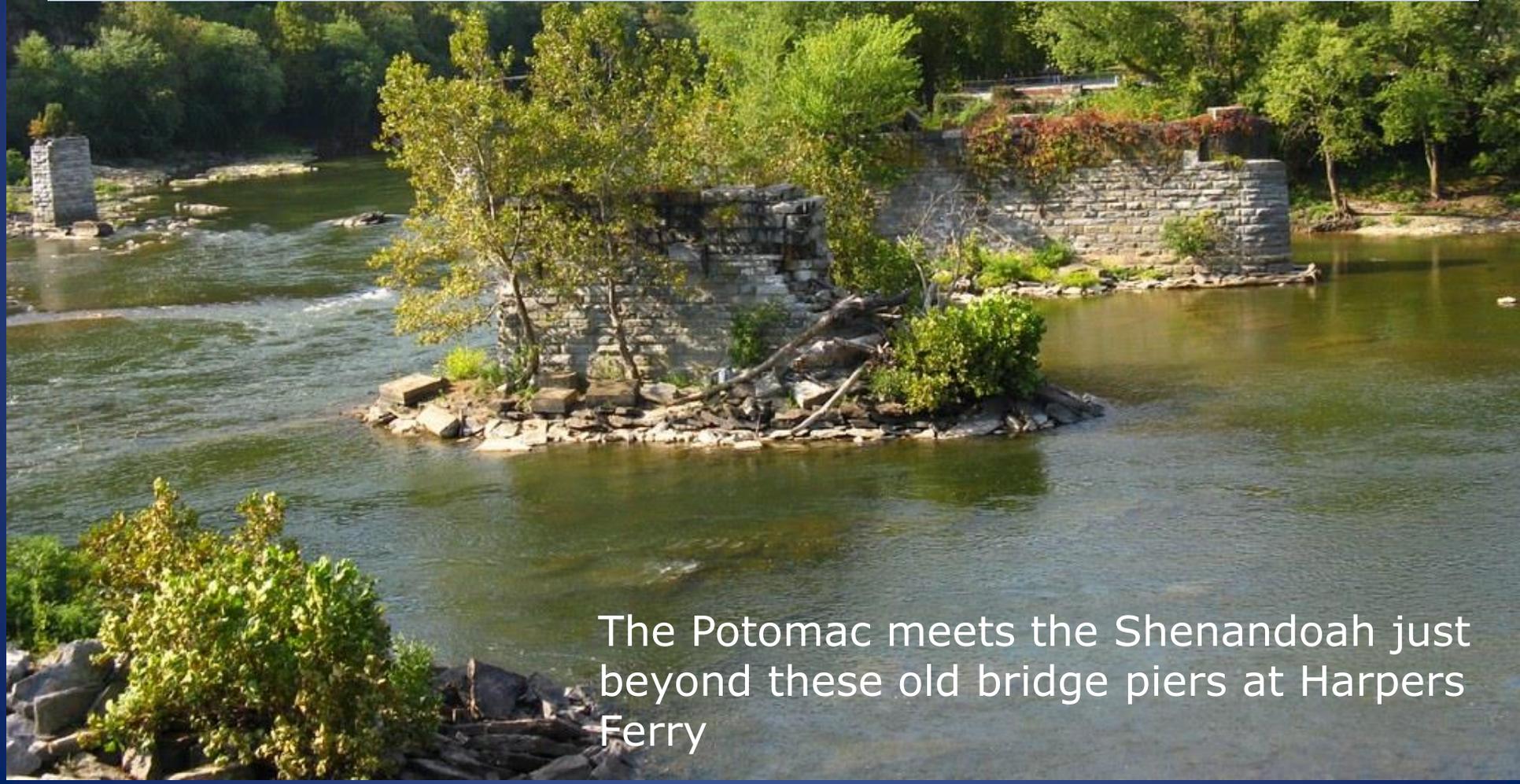
[Photo credit](#)

# Potomac – Shenandoah Watershed



The Potomac River is more than 380 miles long and ten miles wide at its mouth. The river is known for its rapids, called the "Great Falls."

[Photo credit](#)



The Potomac meets the Shenandoah just beyond these old bridge piers at Harpers Ferry

The Chesapeake and Ohio Canal was built around the Great Falls in the 1800s. This made the Potomac an important shipping route. Today, this canal system is a national park.





The River belongs to Maryland, but nearly thirty percent of Virginians live within its watershed.

The Shenandoah River is the Virginia tributary of the Potomac. The Shenandoah, which means “Daughter of the Stars,” is considered one of Virginia’s most beautiful rivers.

[Photo credit](#)





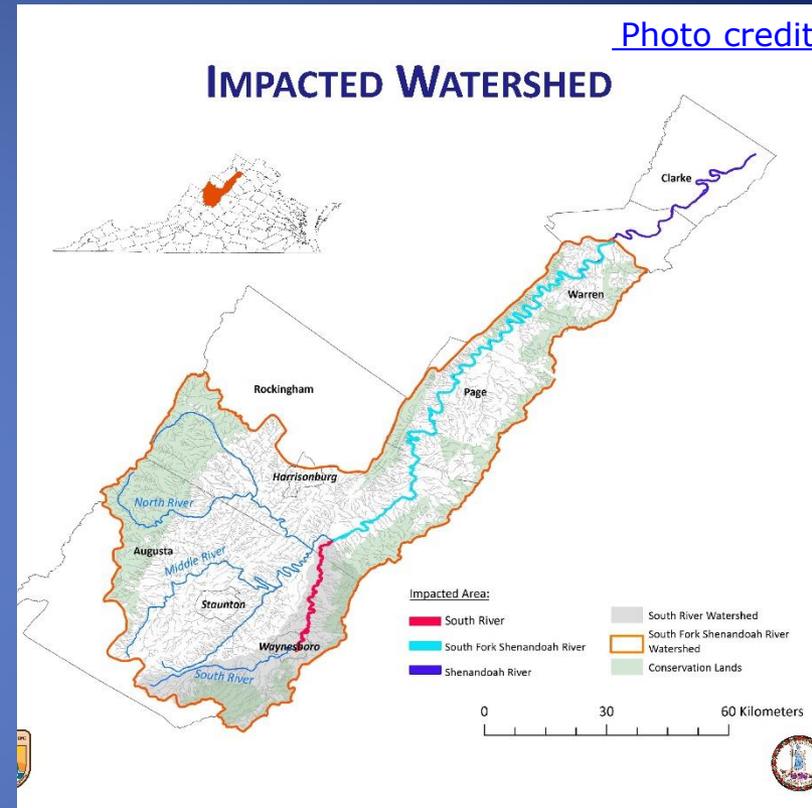
**Despite its beauty, pollution has taken a heavy toll. Sediment and nutrient loading from livestock, agricultural and urban sources have affected water quality.**

The Potomac Riverkeeper network reports, October, 2019, that there are 73 herds of cattle with direct access to the North Fork, South Fork, and mainstream Shenandoah River.



[Photo credit](#)

Mercury from industrial activities at a former DuPont facility in Waynesboro, VA, contaminated the South River and South Fork Shenandoah River, impacting fish, wildlife, and their habitats, including over 100 miles of river and associated floodplain and riparian habitat. Natural Resource Trustees, U.S. Fish and Wildlife Services and Commonwealth of Virginia, worked cooperatively with DuPont for over 10 years to study the impacts of mercury on natural resources. In July, 2017, the Trustees received a settlement of \$42,069,916.78 to address natural resource damages. The funds are being used to implement restoration projects.

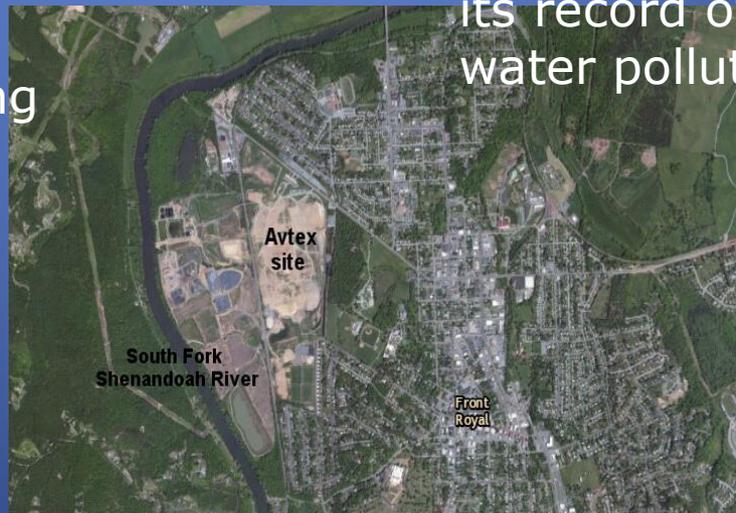


## Impacted Watersheds

# Both the North and South Forks of the Shenandoah are polluted with PCB. The Avtex Corporation, closed in 1989, was responsible for the pollution.

After 25 years of remediation costing \$150 million, much of the site was suitable for new building, while 240 acres above the old disposal basins were designated for long-term protection to keep remaining contaminated soil undisturbed. Groundwater was contaminated as much as 400 feet deep

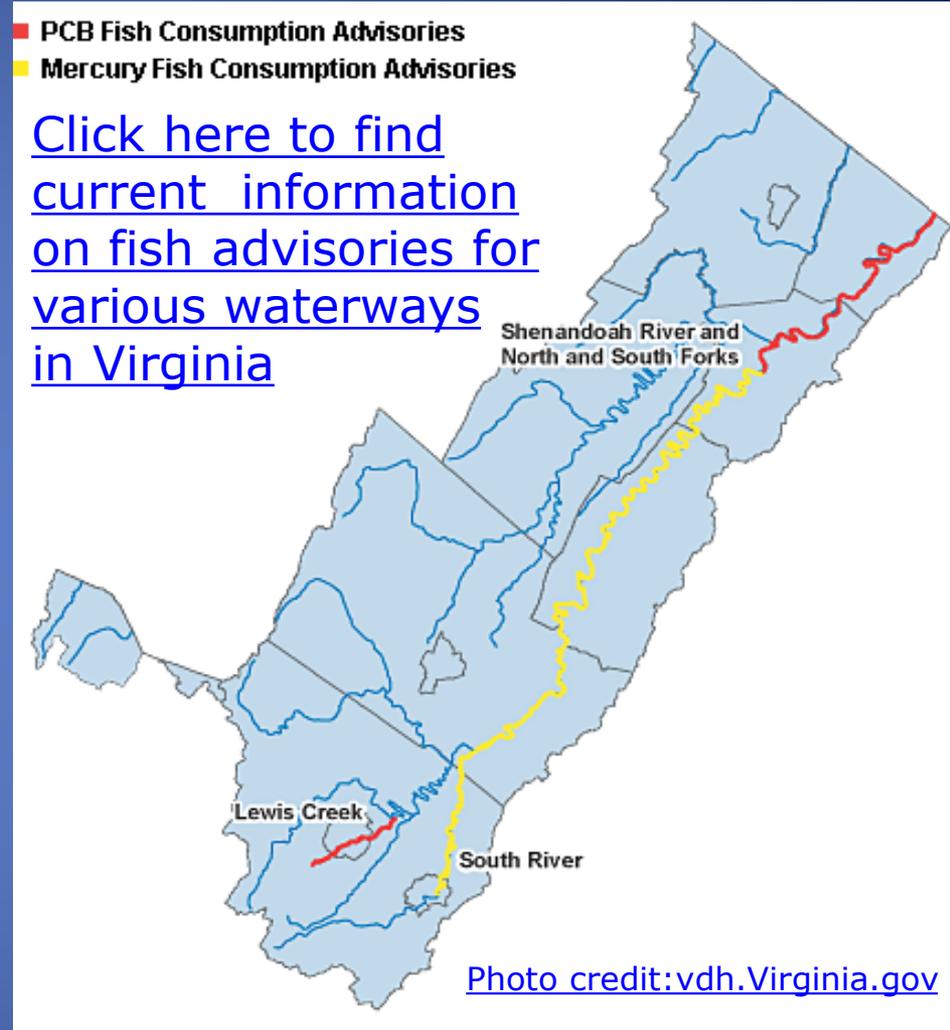
The Federal government had rescued Avtex in 1988, and extended the years of pollution by awarding NASA and Air Force contracts to Avtex despite its record of repeated water pollution violations



[Photo credit](#)

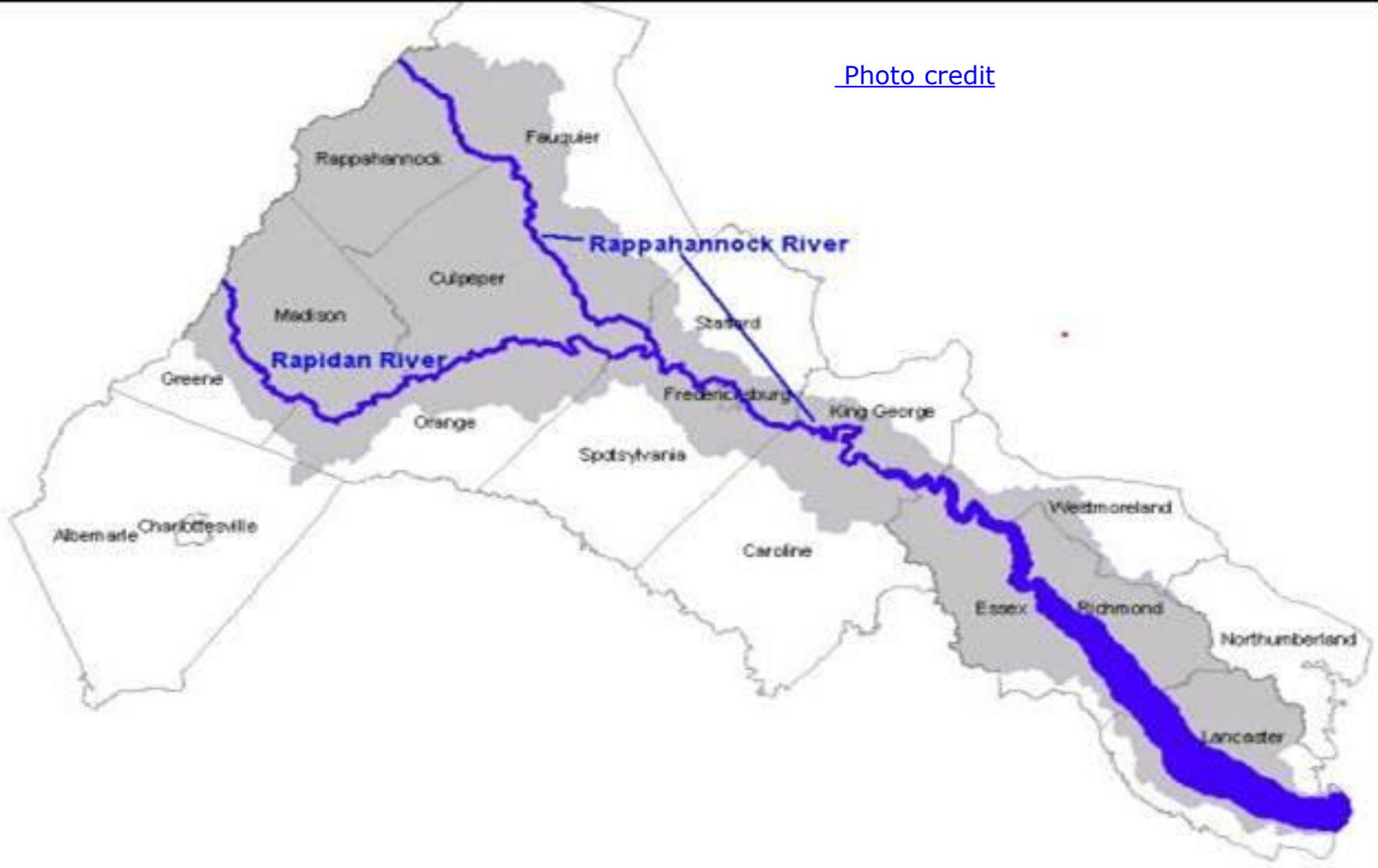
Fish advisories remain in effect today. State and local agencies are working to reduce pollution levels. However, this river will not see a clean bill of health for many years to come. 226 waterways in the Potomac / Shenandoah watershed were considered impaired in 2018

[Virginia DEQ](#)



# Rappahannock Watershed

[Photo credit](#)



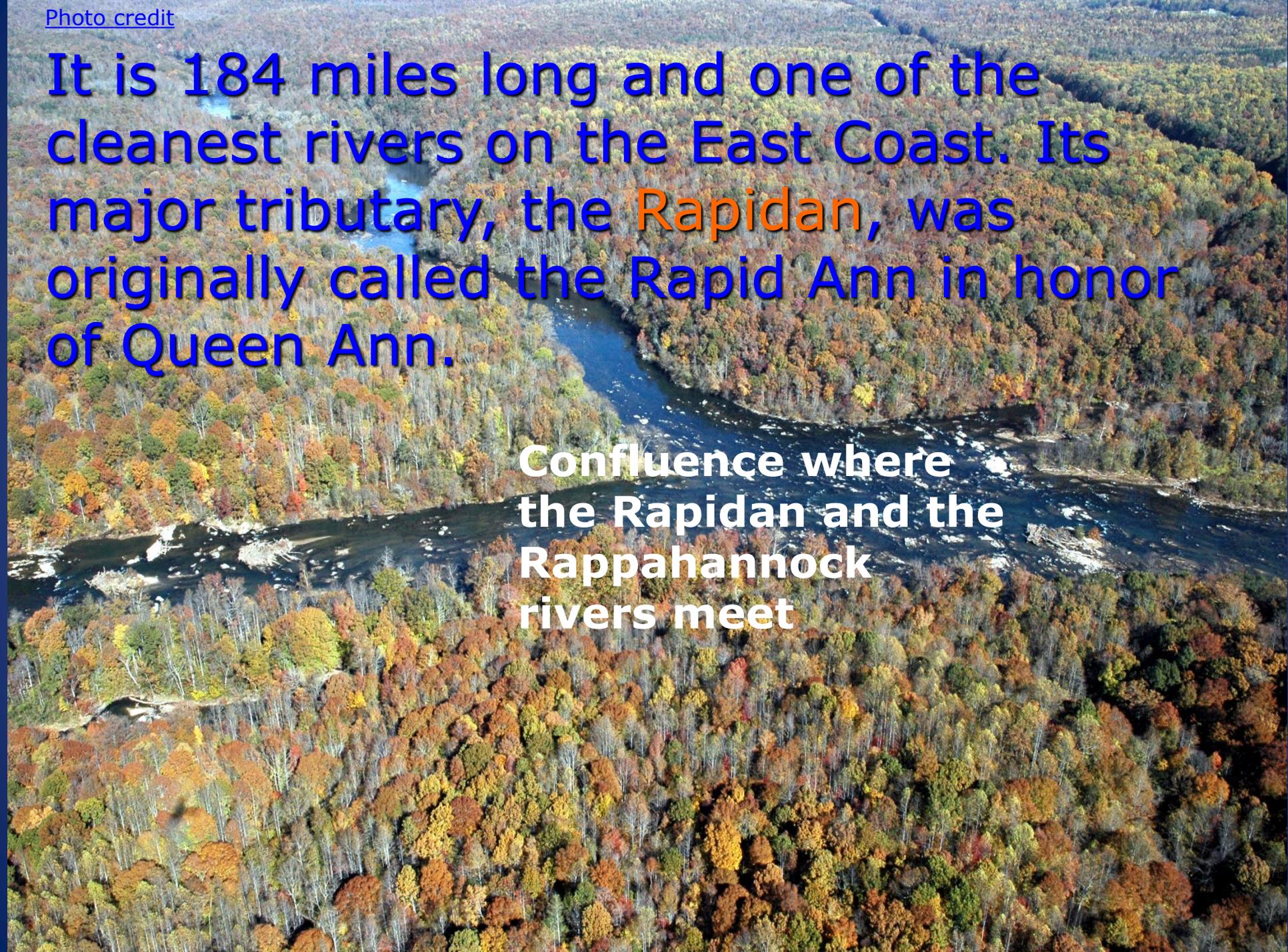
The **Rappahannock River** was named for the Native American Tribe who were called the “people of the alternating stream.” This is because the river has strong tidal flows.



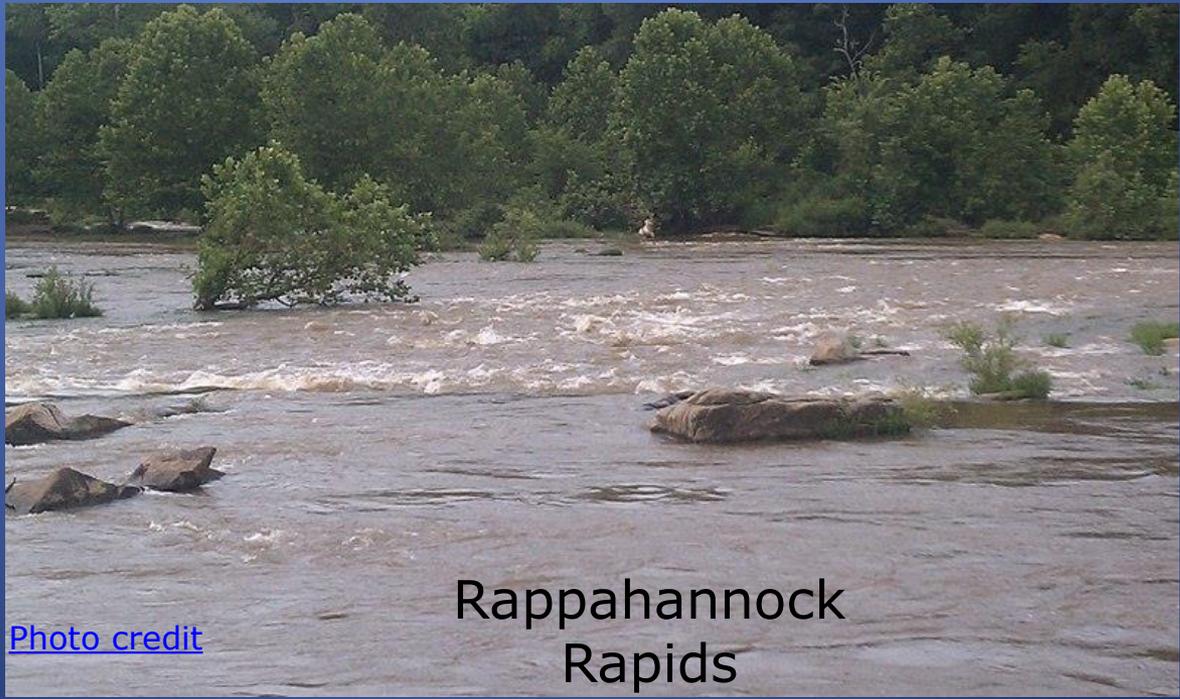
Photo  
credit

It is 184 miles long and one of the cleanest rivers on the East Coast. Its major tributary, the **Rapidan**, was originally called the Rapid Ann in honor of Queen Ann.

**Confluence where  
the Rapidan and the  
Rappahannock  
rivers meet**



Fredericksburg is located along the River at the **fall line**. Canals were built during the 1700s and 1800s to move goods around the rapids of the river. Today, the rapids provide excellent whitewater recreation.



[Photo credit](#)

Rappahannock  
Rapids

[Photo credit](#)



About sixty percent of the watershed is forested. Thirty-five percent is in agriculture.

Non-point source pollution, such as agriculture runoff, is a major source of pollution. Because of this, sediment and nutrients affect the lower Rappahannock.



Oyster and shad harvests have dwindled to a fraction of earlier times. Over-harvest and diseases have taken a toll. Dams reduced fish migrations.

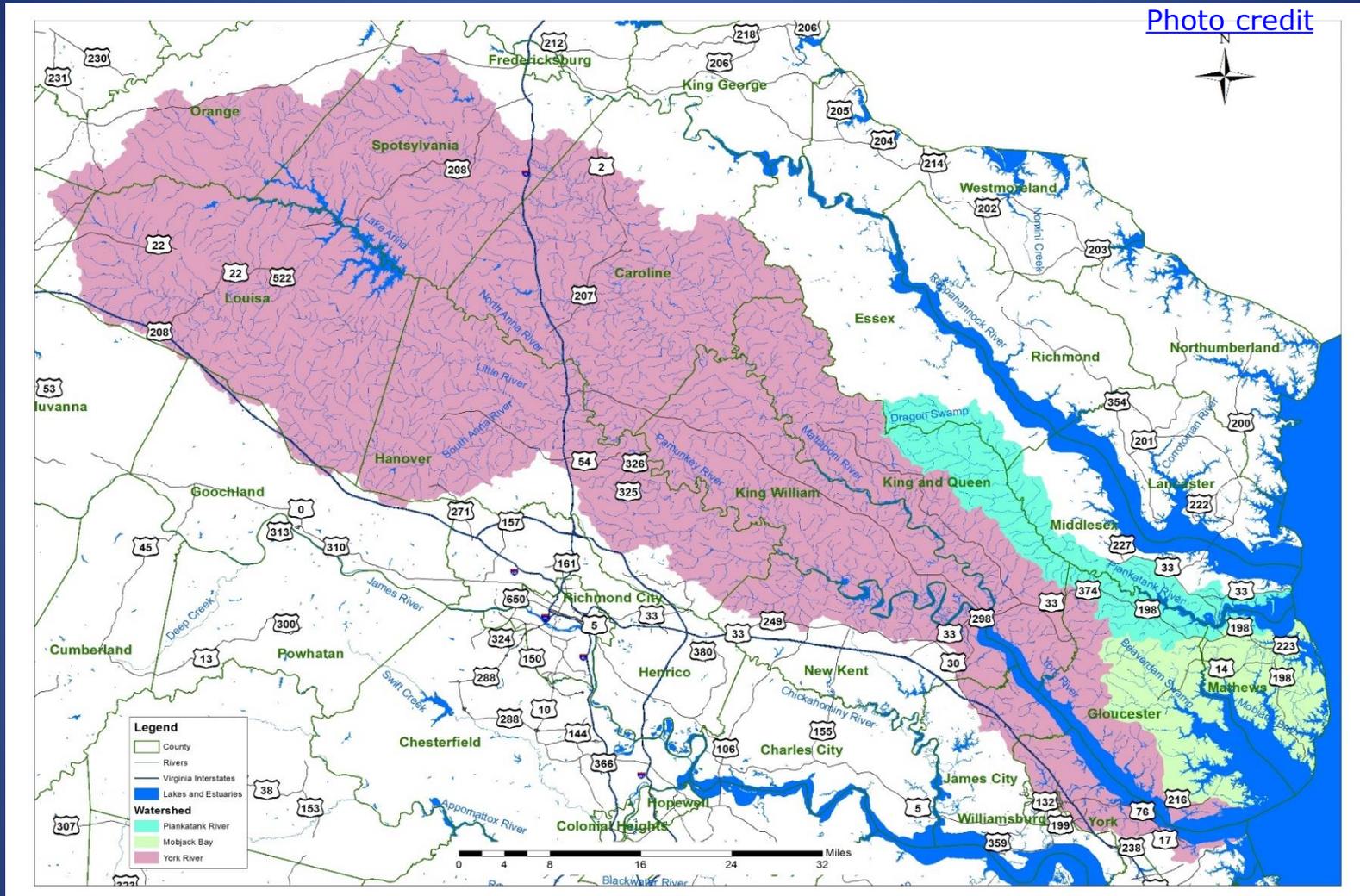


Aquaculture raising oysters. [Photo credit](#)



Shad. [Photo credit](#)

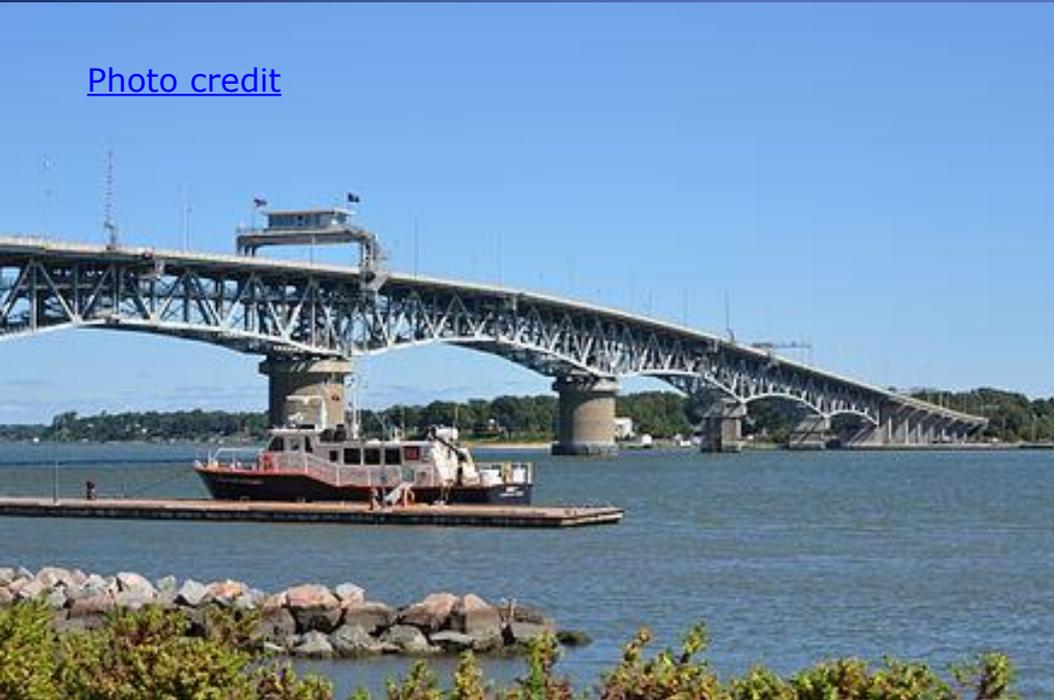
# York River Watershed



Includes 109 miles of streams. The York River is a tidal river, navigable estuary; tidal fluctuations can be more than 10 feet; About 27% of the area is protected land

English settlers changed the Indian name, Pamunkee River, to **York** in honor of Charles I, Duke of York.

[Photo credit](#)



[Photo credit](#)



The only vehicular crossing of the York River is a swing type drawbridge between Yorktown and Gloucester Point.

The port of Yorktown was one of Virginia's best inland harbors in Colonial times. It was very important in the nation's early history.



Surrender at Yorktown,  
1781. [Photo credit](#)

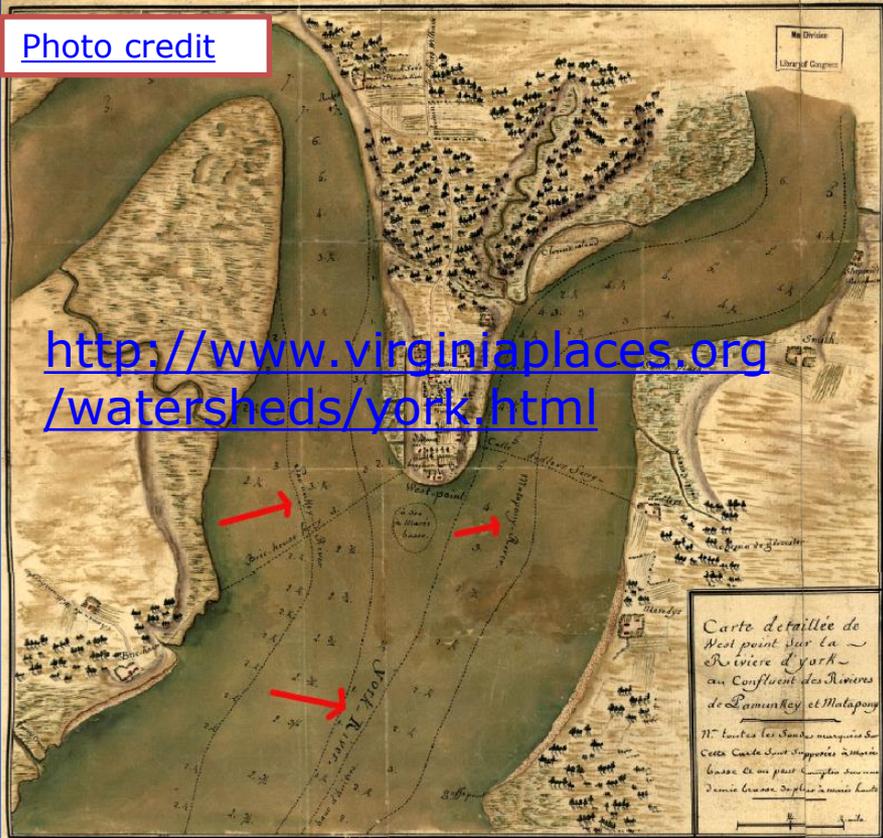
The "Alliance" in Yorktown  
harbor

[Photo credit](#)



The **Mattaponi** and **Pamunkey Rivers** are major tributaries of the York and named after our Native American Tribes.

[Photo credit](#)



<http://www.virginiaplaces.org/watersheds/york.html>

Carte détaillée de West point sur la Riviere d'York au Confluent des Rivières de Pamunkey et Matapony  
N. toutes les Sandes marquées sur Cette Carte sont supposées d'être la base de un pied simple sur un Demi-bras de plus à moins haute

The WestRock paper mill at the confluence of the Mattaponi and Pamunkey rivers released 852,914 pounds of toxic materials in 2017 (the majority through the air)

[Photo credit](#)



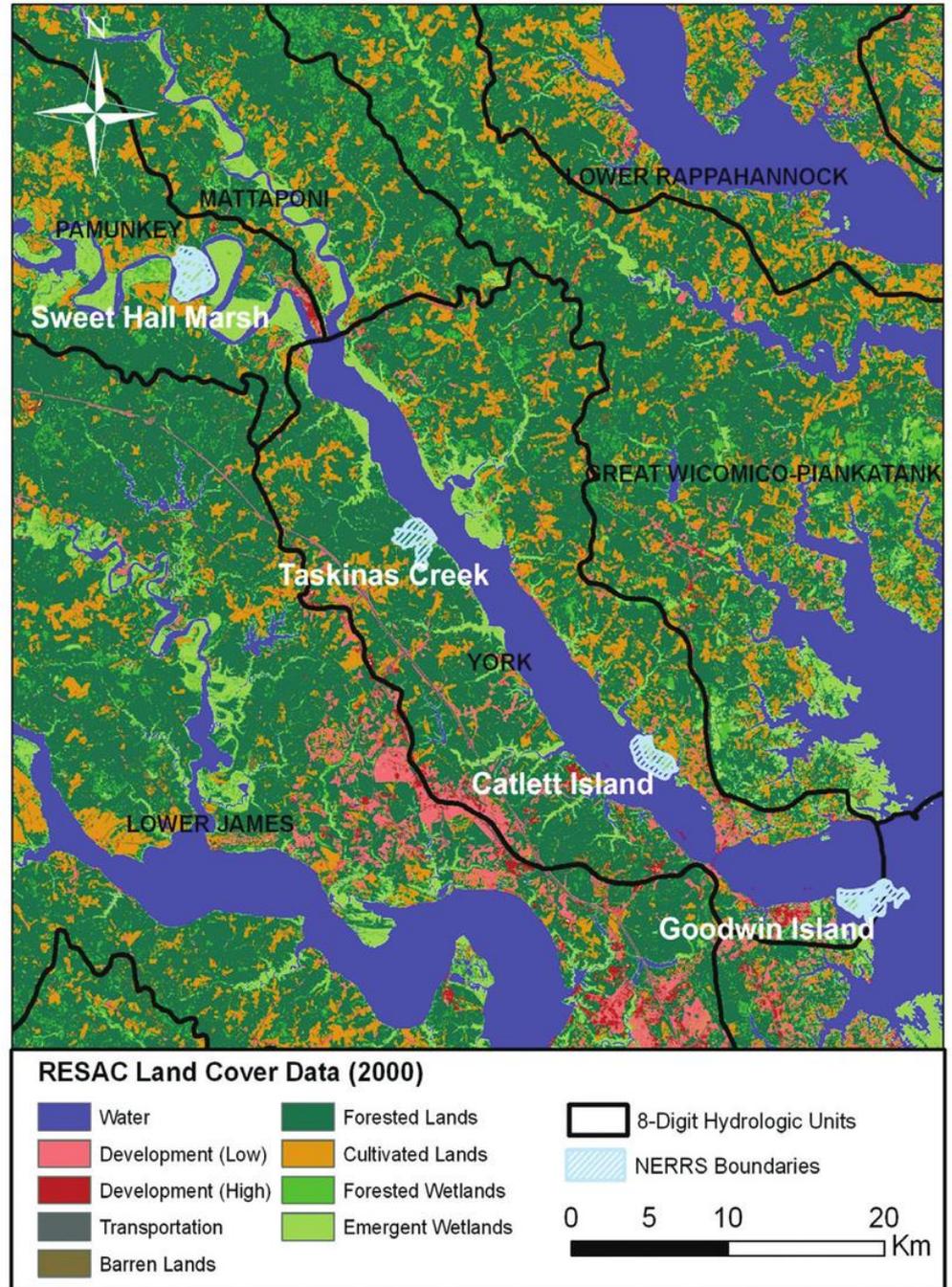
The Mattaponi has three branches, the **Matta**, the **Po** and the **Ni**. Tributaries of the Pamunkey include the **North and South Anna Rivers**. Virginia Power's North Anna Nuclear Power Plant is located here.



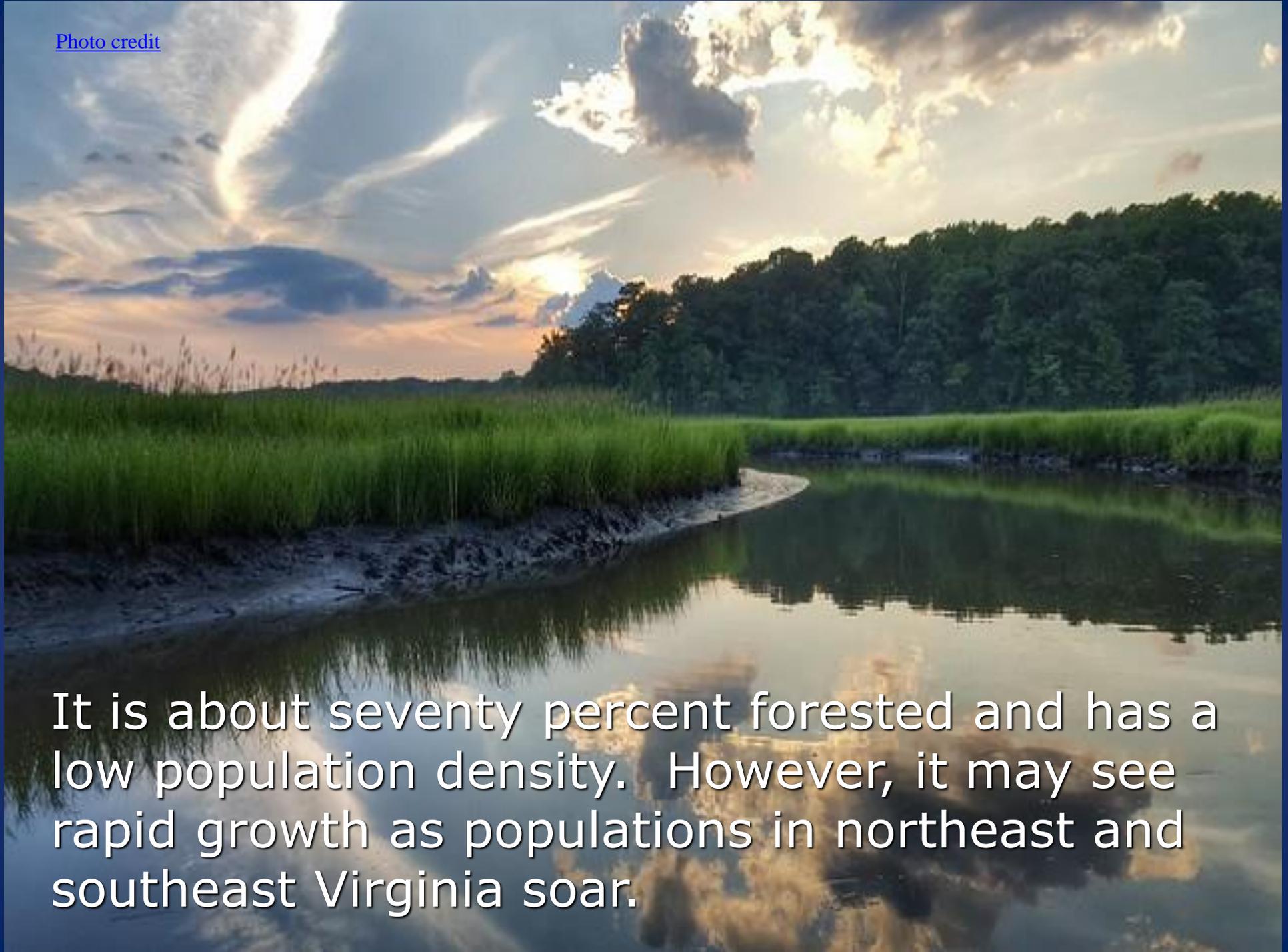
[Photo credit](#)

[Photo credit](#)

The York is 140 miles long. Its watershed covers about twelve percent of the state.



[Photo credit](#)



It is about seventy percent forested and has a low population density. However, it may see rapid growth as populations in northeast and southeast Virginia soar.

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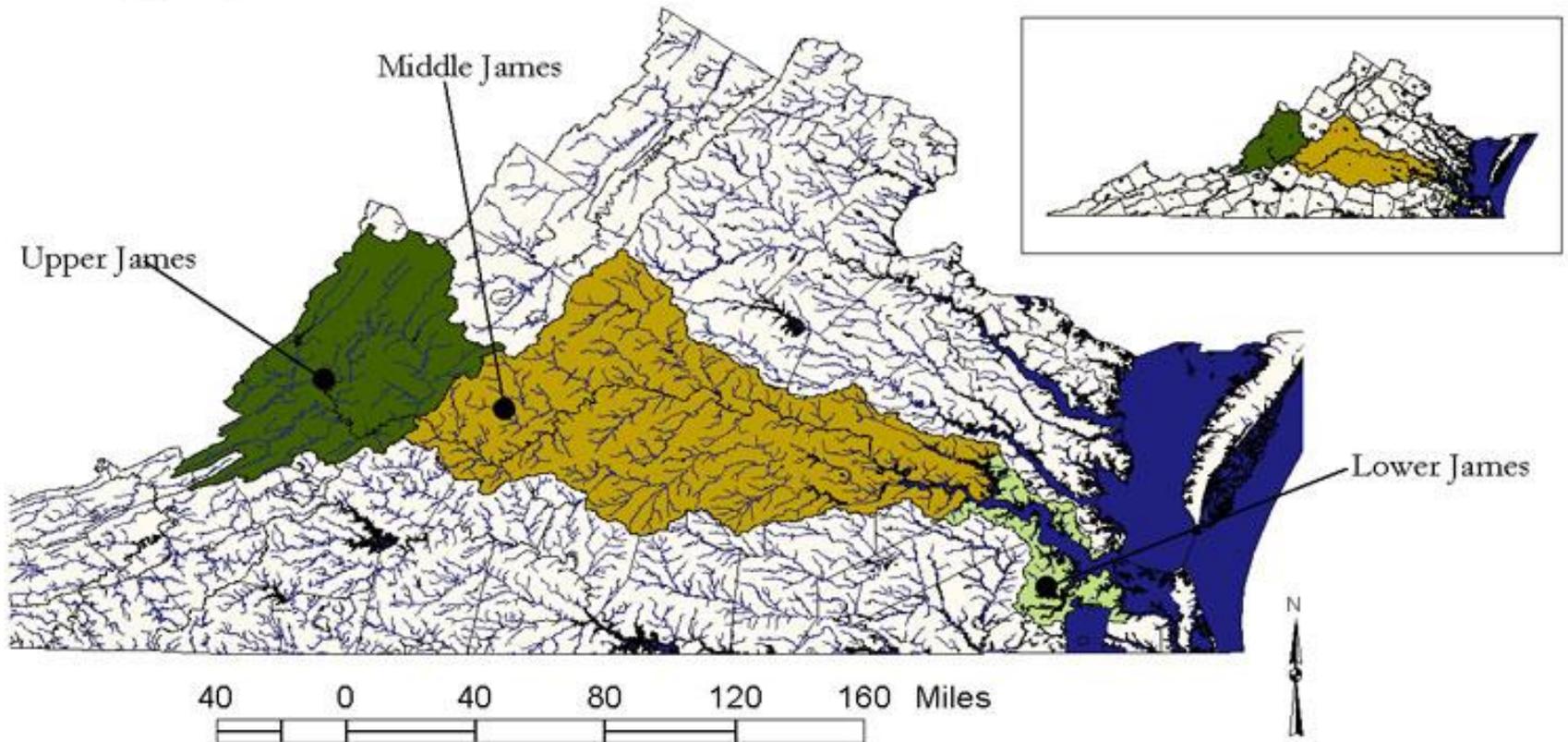


Much of the upper York has good water quality. However, the lower York has water quality problems similar to those of the James River – excess sediment and nutrients.

[Photo credit](#)

# James River Watershed

Upper, Middle and Lower Roundtable Watershed Boundaries



Native Americans called the river the Powhatan. English settlers renamed it after King James I. The **James River** is 340 miles long (10,236 square miles) and drains almost one-fourth of the state.



Jamestown: the first port for ocean-going ships in Virginia. [Photo credit](#)

[Photo credit](#)



More than one-third of all Virginians live in this watershed. The river is navigable to the **fall line**. More than 2.7 million people rely on the James River for water, making it Virginia's largest source of drinking water

The James River ends at one of the nation's busiest ports, the Port of Virginia at Hampton Roads.

[Photo credit](#)

An aerial photograph of the Port of Virginia at Hampton Roads, showing the Elizabeth River and surrounding urban areas. Several terminals are marked with yellow arrows and labels: NNMT (Newport News Marine Terminal) at the top, NIT (Norfolk International Terminal) in the middle, and PMT (Portsmouth Marine Terminal) at the bottom. The Elizabeth River is visible on the right side of the image.

**Terminals in Hampton Roads include Newport News Marine Terminal (NNMT), Norfolk International Terminals (NIT), Portsmouth Marine Terminal (PMT), APM/Maersk Terminal (APM) - now Virginia International Gateway (VIG), and the future Craney Island Marine Terminal (CIMT) (*the privately-owned coal terminal at Lamberts Point, used by Norfolk Southern railroad to load coal, is visible between PMT and NIT on the east side of the Elizabeth River*)**

Source: Port of Virginia, [State of the Port](#) (2009)

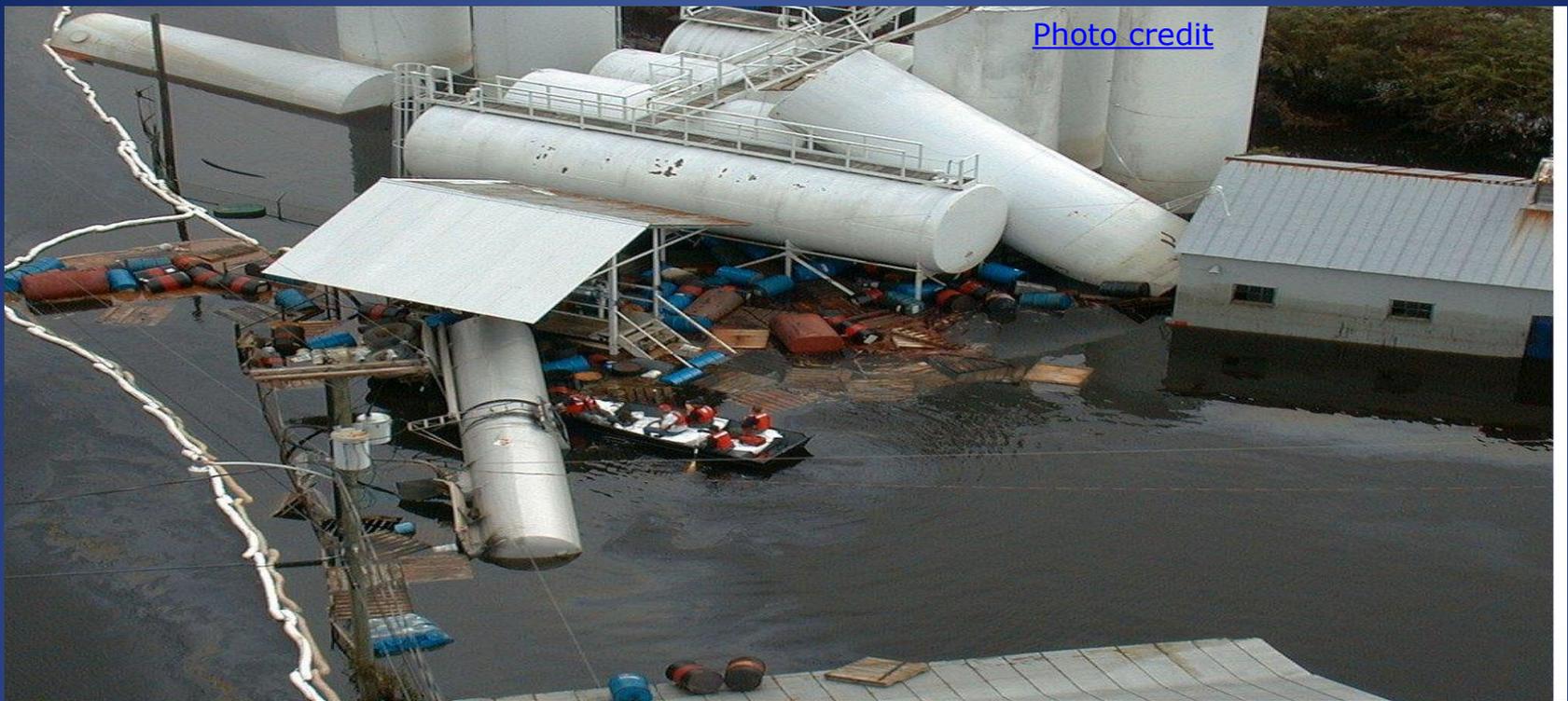


More than a dozen tributaries flow into the James. These include the **Rivanna, Chickahomony, Appomattox and Elizabeth Rivers.**



[Photo credit](#)

Water quality in the upper James is relatively good. However, the lower James suffers from excess sediment and nutrients from agriculture, animal waste, urban development and other sources.



The James River watershed faces higher than average sea-level rise and increased hurricane risks. Major storms cause serious and potentially toxic flooding; In 2017 and 2018, extreme rainfall and storm surge from hurricanes let loose contaminants into the James River watershed.

# Chesapeake Bay Watershed

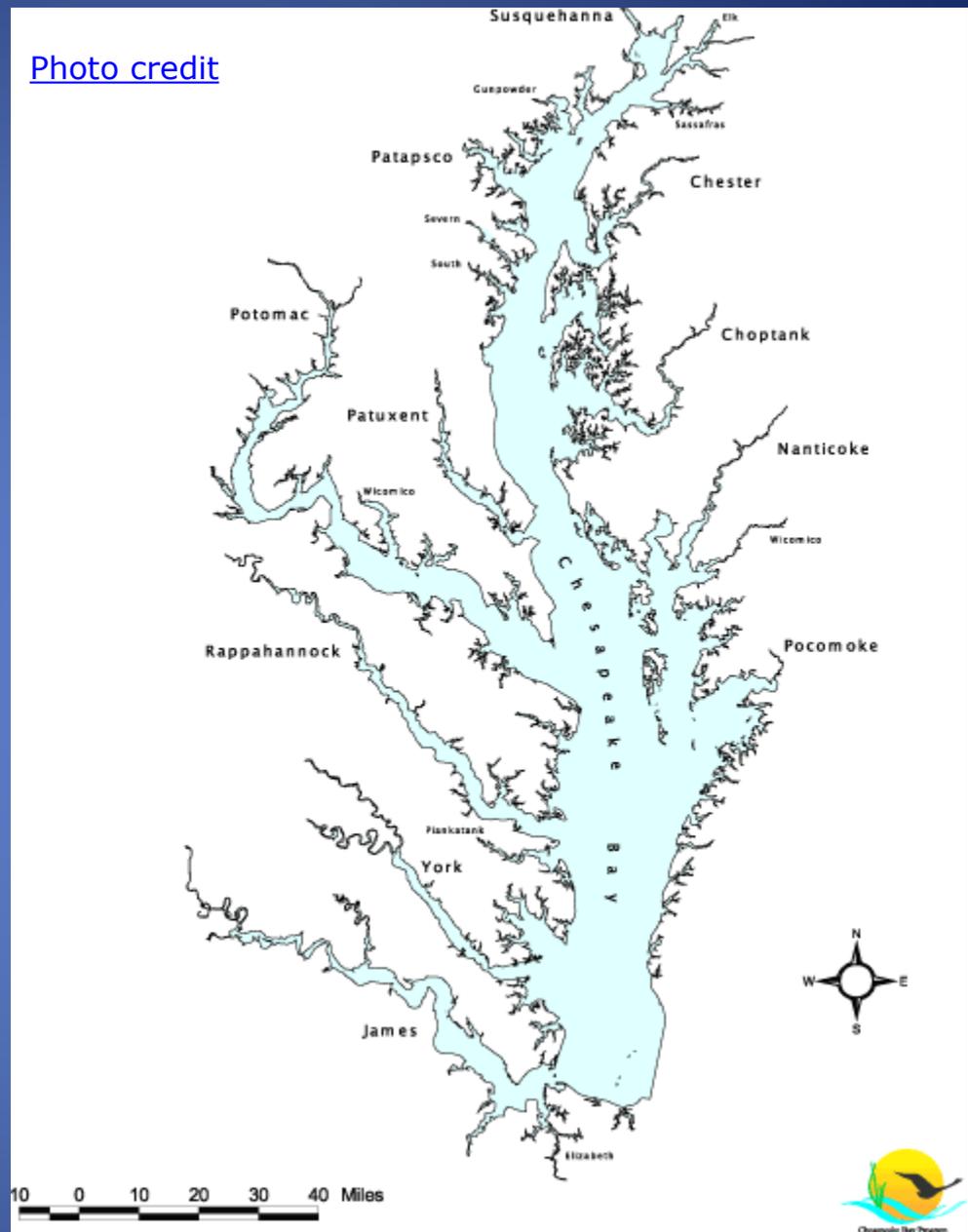
The largest watershed of the Atlantic seaboard of North America; Includes much of Virginia and Maryland, parts of West Virginia, Delaware, Pennsylvania and New York and all of Washington D.C.



[Photo credit](#)

# Rivers emptying into the Chesapeake Bay watershed

[Photo credit](#)



The **Poquoson River** was named for the Native American word that means, “low wooded area that is wet in the winter and dry in the summer.”

[Photo credit](#)



The **Lynnhaven River, a sub-watershed of the Chesapeake Bay watershed** and others support important industries. Commercial and sport fishing are big business.

[Photo credit](#)



Agriculture is vital to the Chesapeake region; there are more than 83,000 farms in the watershed that make up a \$10 billion industry; Agricultural lands compose nearly 30% of the watershed



Planting trees along stream in Richmond. [Photo credit](#)



Dead loblolly pines in salt marsh at Blackwater National Wildlife Refuge in Md., 2018. Rising seas result in salty water intruding on forested land. [Photo credit](#)

The vast fresh and saltwater marshes found in these watersheds make them very productive ecosystems.

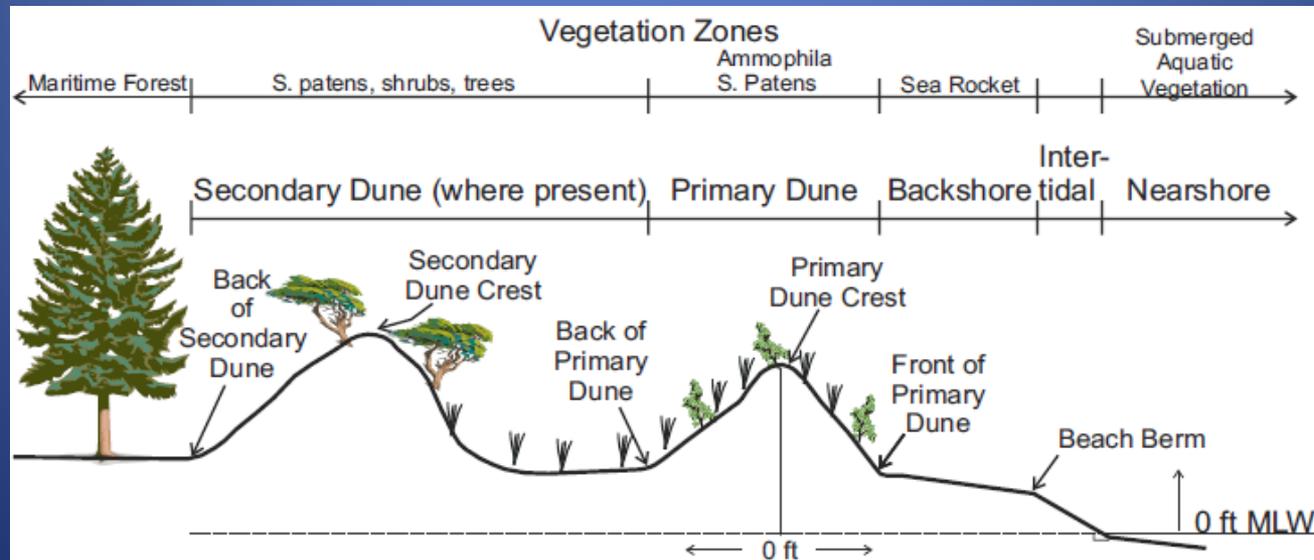
However, excess nutrient and sediment from many sources and development of waterfront property are affecting water quality.

[Photo credit](#)



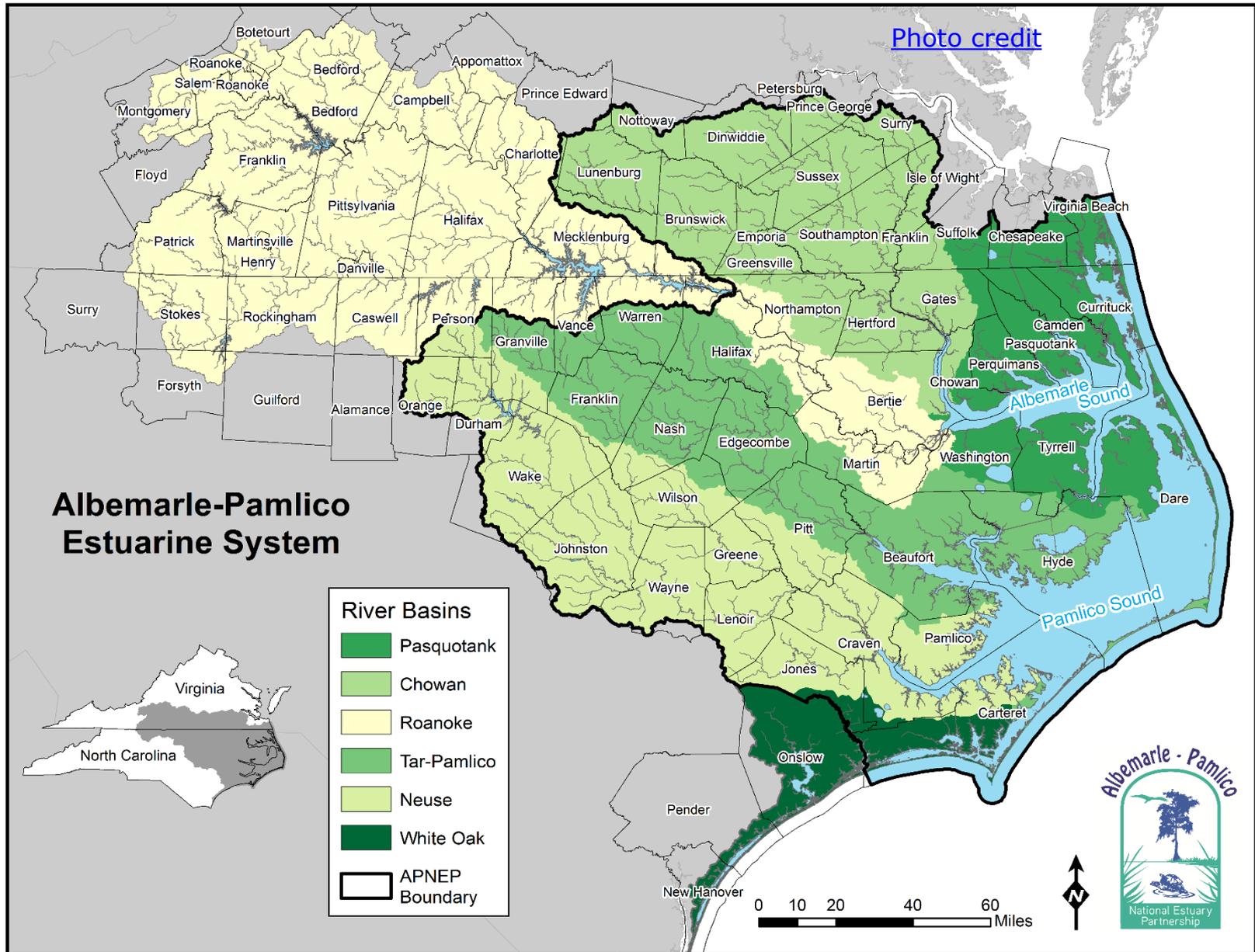
Virginia and Federal government agree that the coastal zone deserves special protection, but the two levels of government have different definitions of what is the coastal zone.

- State law: dunes are protected “to the line of woody vegetation or the nearest impermeable man-made structure.
- Chesapeake Preservation Act: a 100 foot buffer of land long the shoreline with limited development rights
- Federal: boundaries are based on land ownership as well as natural features.



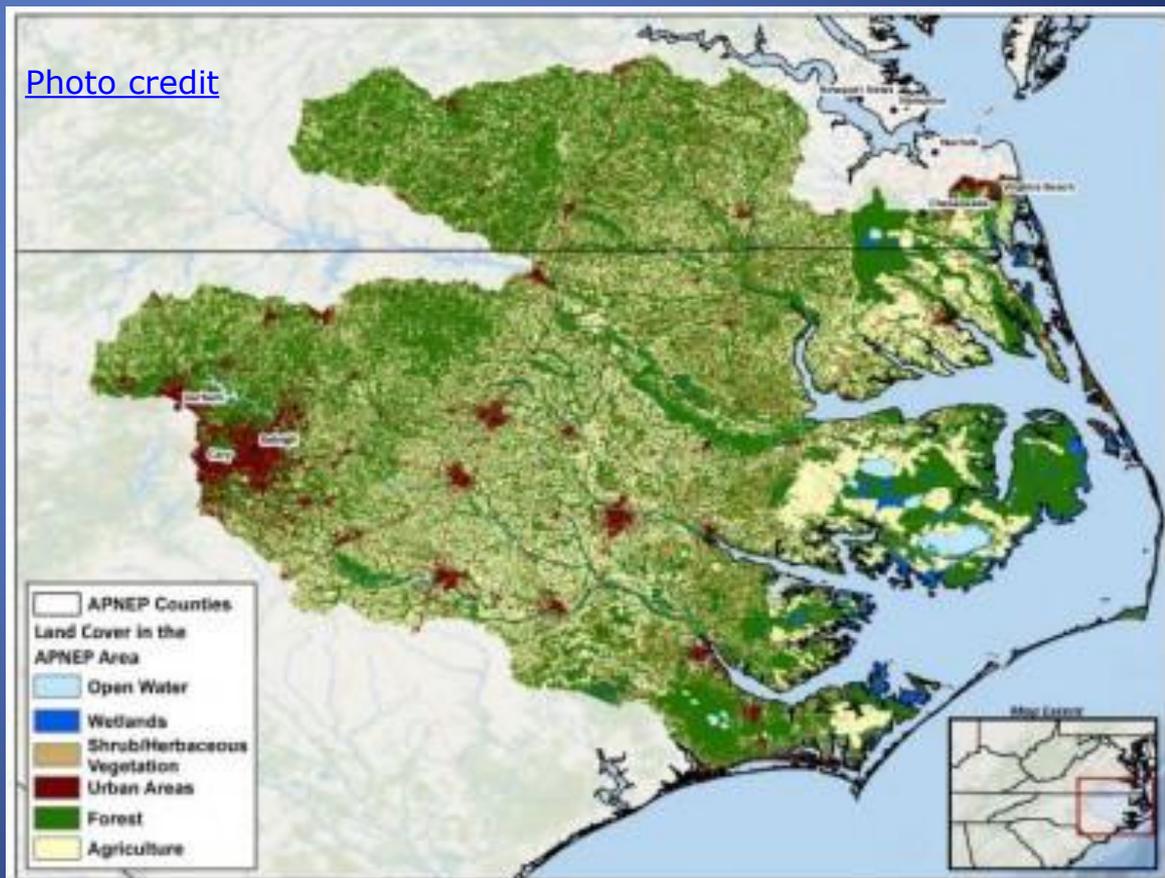
[Photo credit](#)

# Albemarle Sound Watershed



This watershed drains south into **Back Bay** and North Carolina coastal waters. The area is more than 45% wetland and 30% agriculture.

Includes: six river basins, eight sounds, and 3,000 square miles of open water

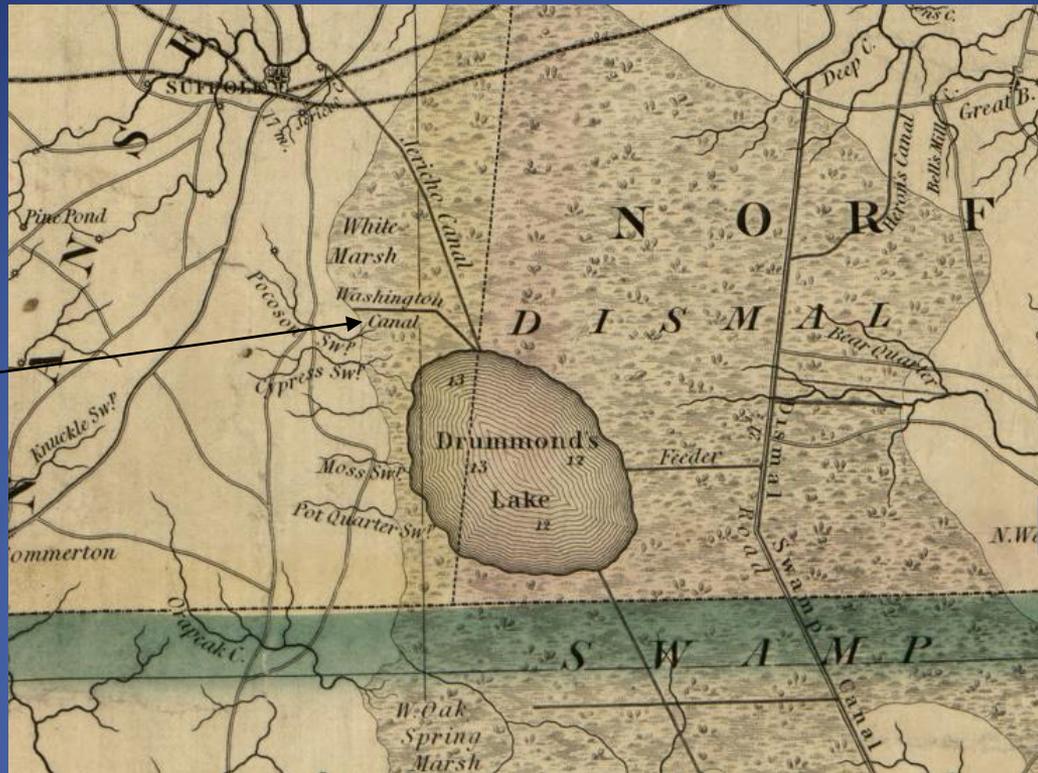




[Photo credit](#)

It is the home of the famous **Dismal Swamp**. **Lake Drummond**, in the Swamp's center, is one of Virginia's only two natural lakes.

Washington  
Canal



[Photo credit](#)

George Washington surveyed the area for ditching in the mid-1700s. A major drainage ditch is named for him. Vast amounts of the original wetlands have been ditched and drained for farming.

Back Bay was once one of the most productive wetlands in the Mid-Atlantic. However, sediment and nutrient pollution have greatly reduced water quality.

[Photo credit](#)



Introduced invasive plants, such as Eurasian Milfoil and *Phragmites*, have also affected fish and aquatic bird populations.

[Photo credit](#)



[Photo credit](#)



Tidal wetlands have long been protected. However, non-tidal wetlands were “legally” drained through a process called “Tulloch ditching.” It is illegal to drain and fill a wetland.



[Photo credit](#)

Developers were allowed to ditch near a wetland area, allow it to drain and convert to non-wetland status. This loophole was closed with protective legislation in 2000.

Drainage Ditch

[Photo credit](#)

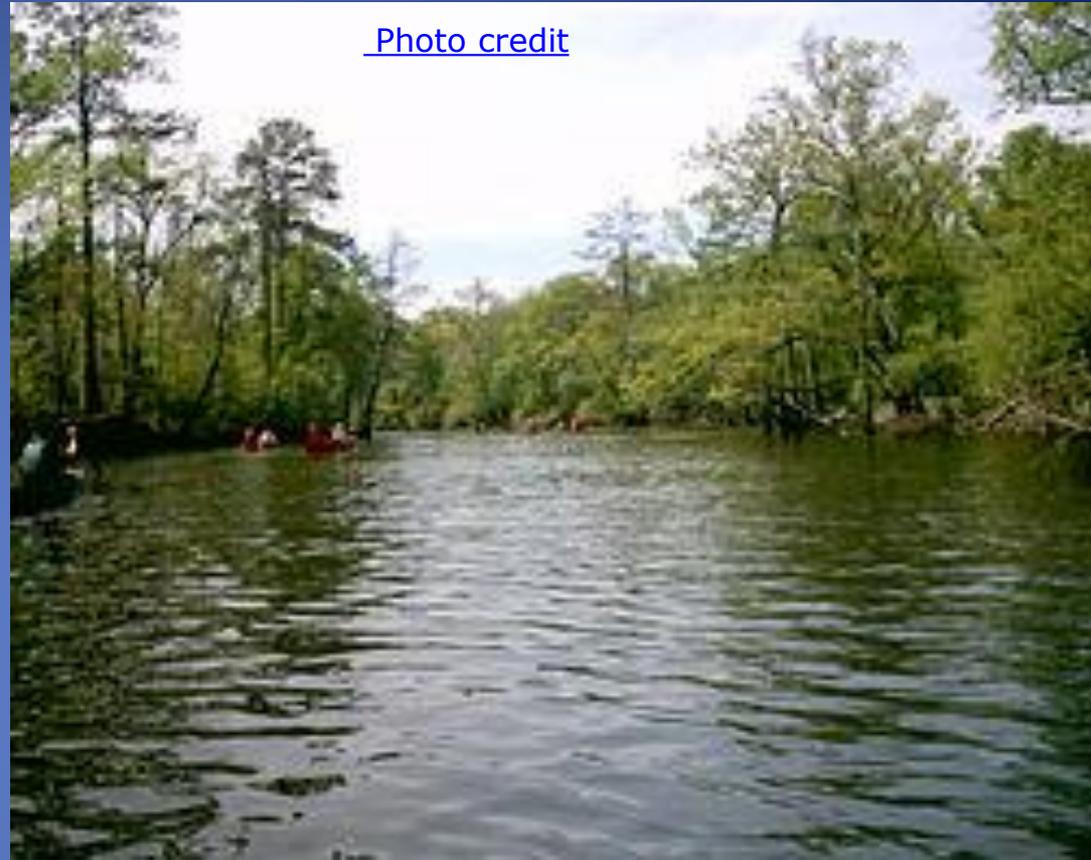


# Chowan Watershed

Three Virginia rivers are part of this watershed: the **Nottoway**, **Blackwater** and **Meherrin**. All three join to form the **Chowan River** in North Carolina. The Chowan then flows south to Albemarle Sound.



The Blackwater River got its name from its dark stained, acid waters.



River source near Petersburg, flows about 105 miles through inner Coastal Plain, joins the Nottoway to form the Chowan which empties into Albemarle Sound.

The Nottoway River was named after the Indian word for rattlesnake.

[Photo credit](#)



The Meherrin was named for the Native American Tribe in North Carolina. It meanders back and forth across the Virginia/North Carolina border to join the Chowan.

[Photo credit](#)



Most of this watershed is forested. However, agricultural activity is the greatest source of water pollution. There is much pollution from swine and poultry farms.



[Photo credit](#)



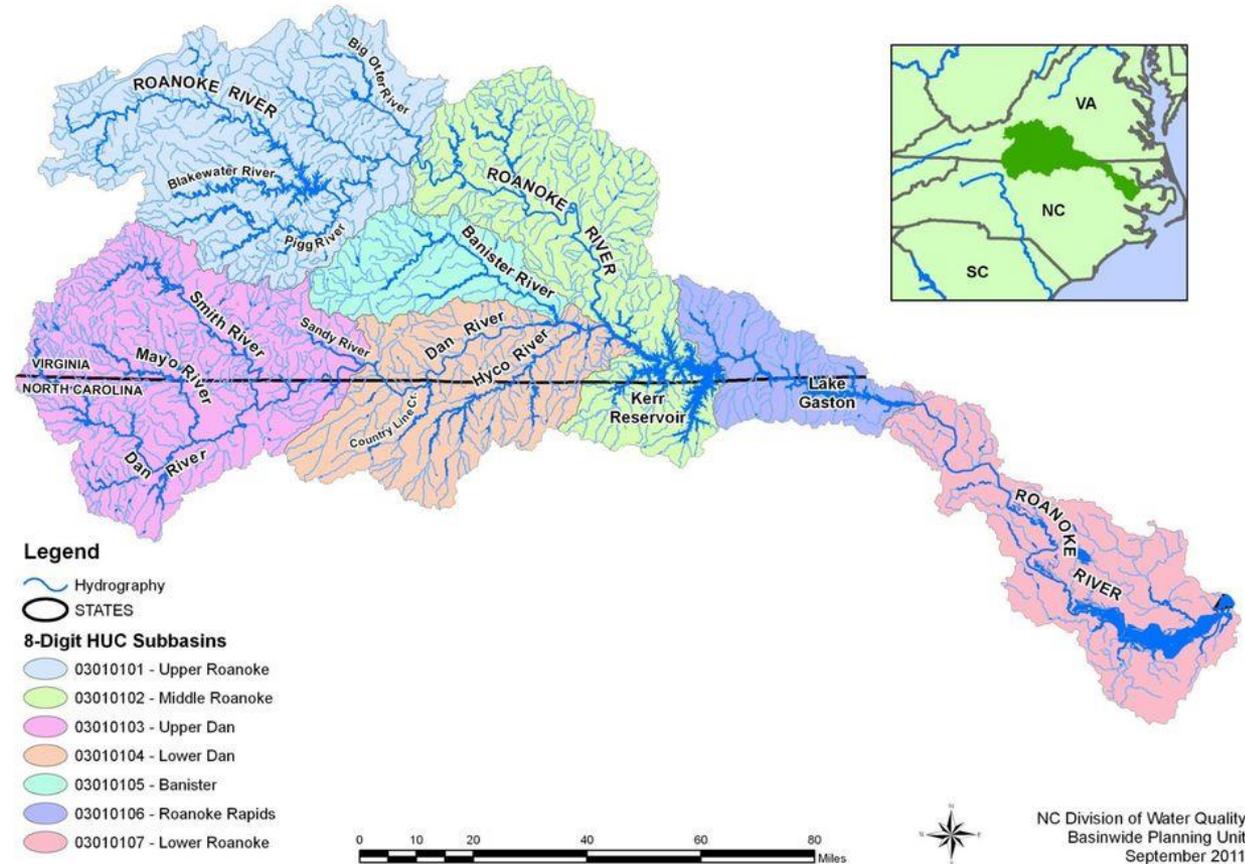
**Hog farm after hurricane flooding.** [Photo credit](#)

# Roanoke River Watershed

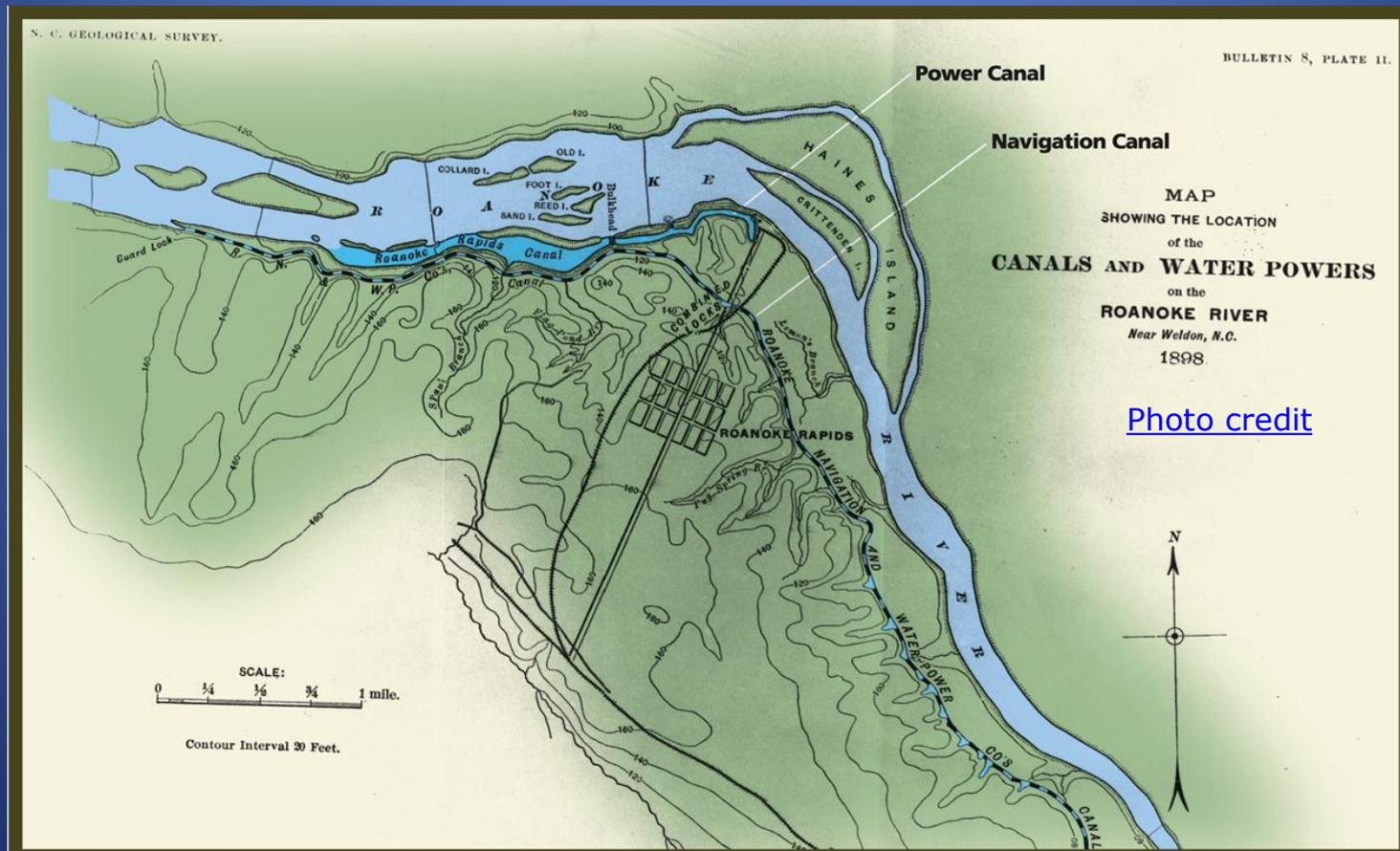
It flows 410 miles south from central Virginia to Albemarle Sound in North Carolina.

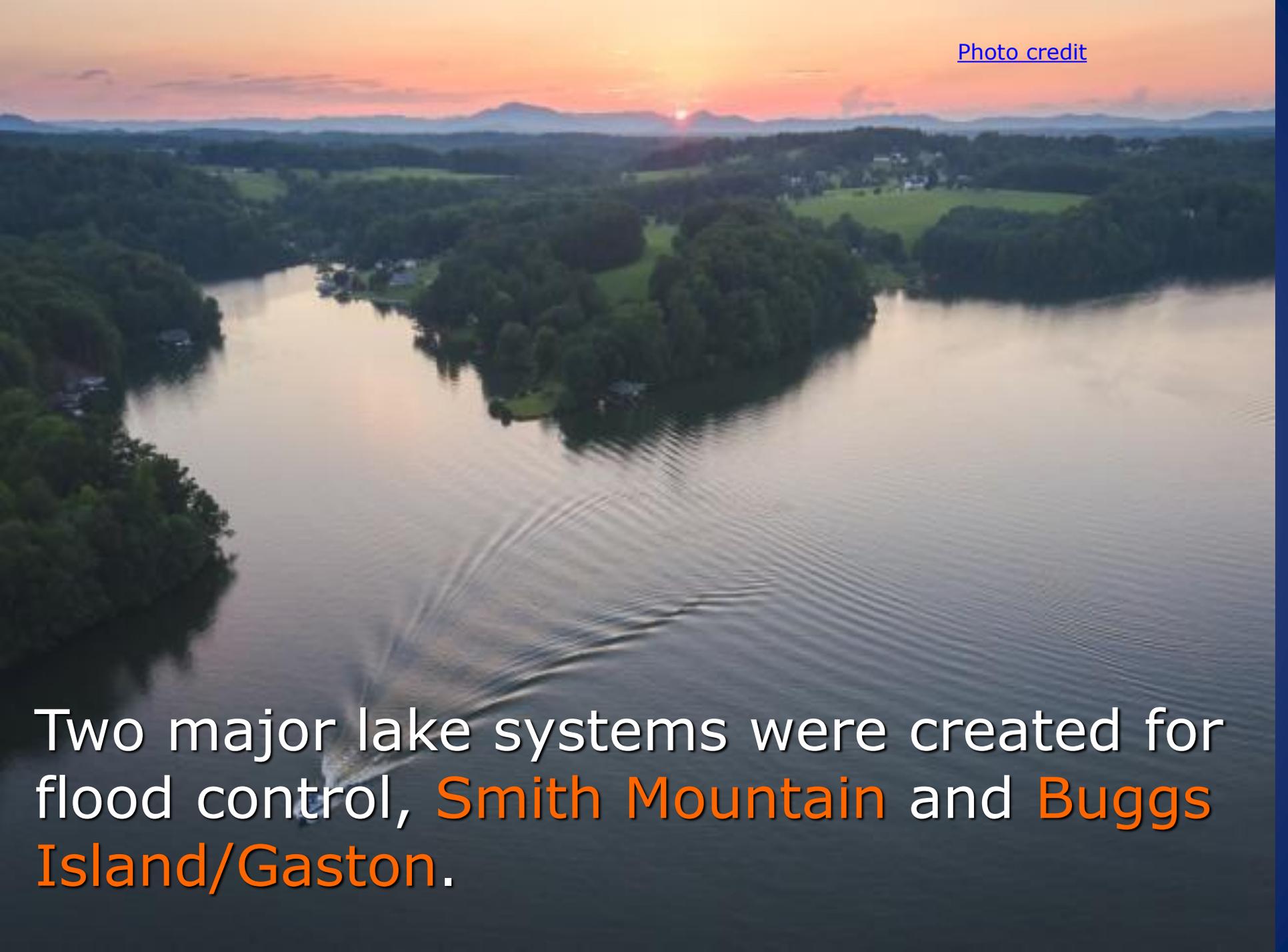
[Photo credit](#)

## Entire Roanoke River Basin



Nearly 360 miles of canals were built around its many rapids. However, most of the historic canals now lie underwater.



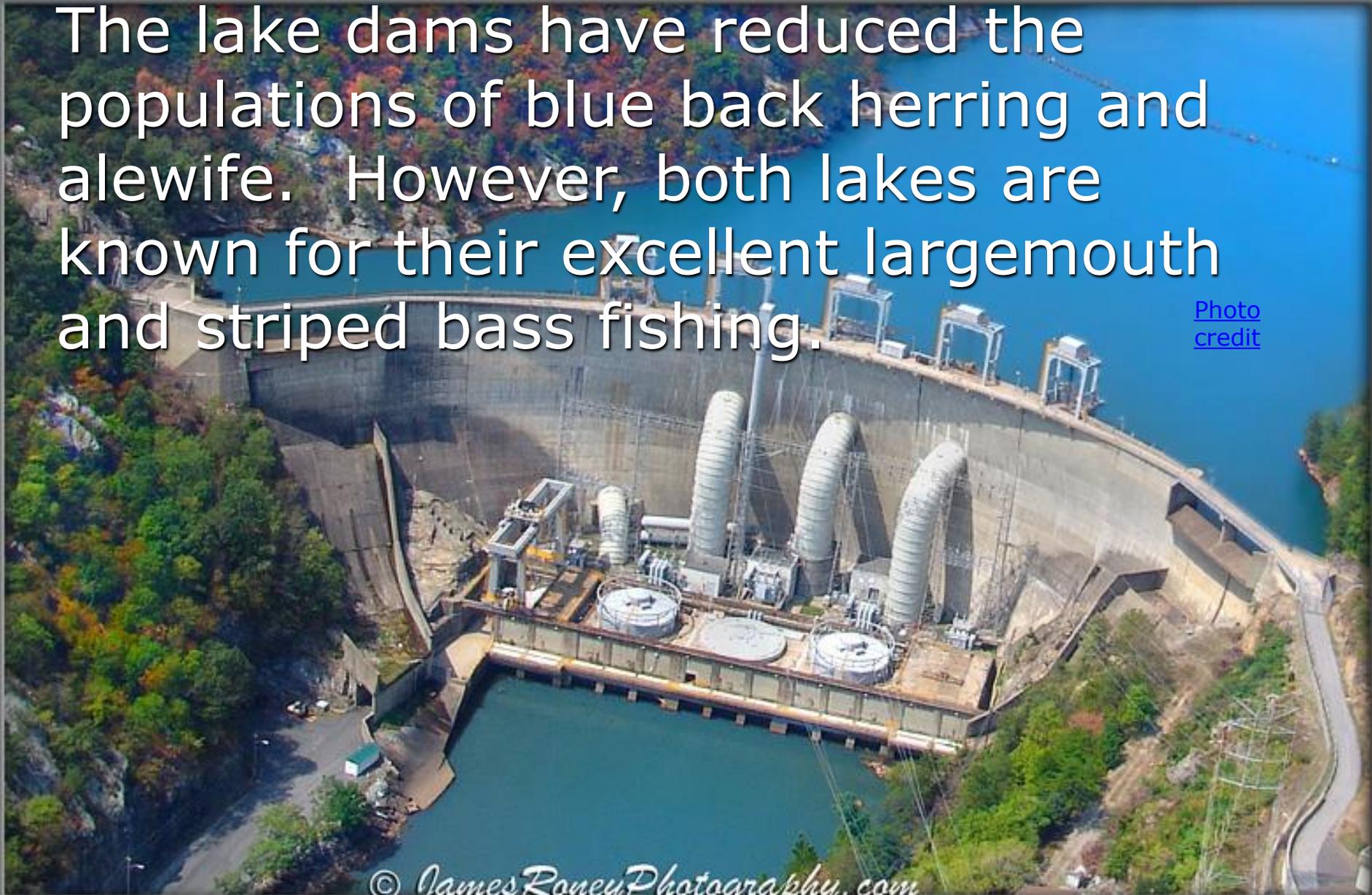
An aerial photograph of a large, winding lake system at sunset. The sun is low on the horizon, casting a warm orange and yellow glow across the sky and reflecting on the water. The surrounding landscape is lush with green trees and fields. In the foreground, a boat's wake is visible, creating a series of concentric ripples on the water's surface.

Two major lake systems were created for flood control, **Smith Mountain** and **Buggs Island/Gaston**.

The lake dams have reduced the populations of blue back herring and alewife. However, both lakes are known for their excellent largemouth and striped bass fishing.

[Photo credit](#)

© JamesRoneyPhotography.com



The **Staunton River** connecting the lakes was named for Henry Staunton, a Revolutionary War hero.

Actually, an 81 mile segment of the Roanoke River. Provides recreation for bird watchers, anglers, hunters, and canoeists



[Photo credit](#)

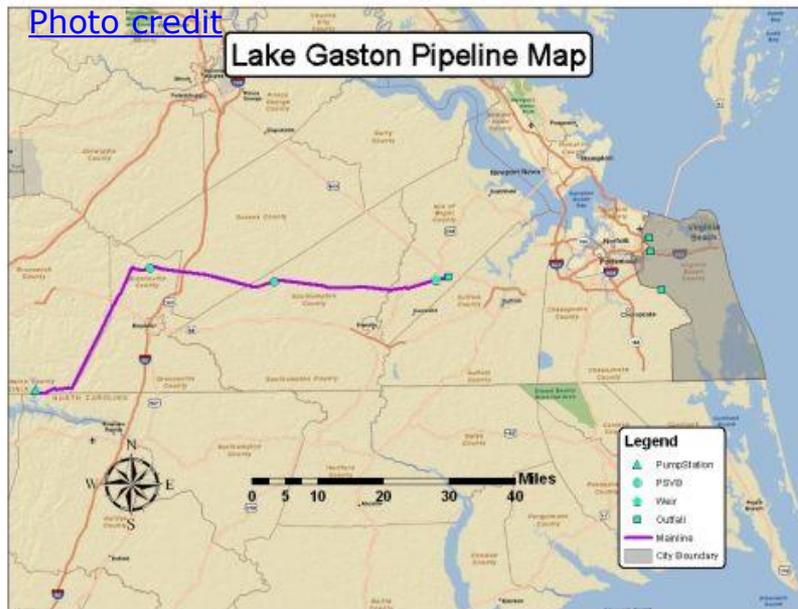
Cat Rock Sluice  
on the Staunton  
River

Gaston Lake also serves as a water source for Virginia Beach. A seventy-mile pipeline was constructed to carry water to the city.

[Photo credit](#)

[Photo credit](#)

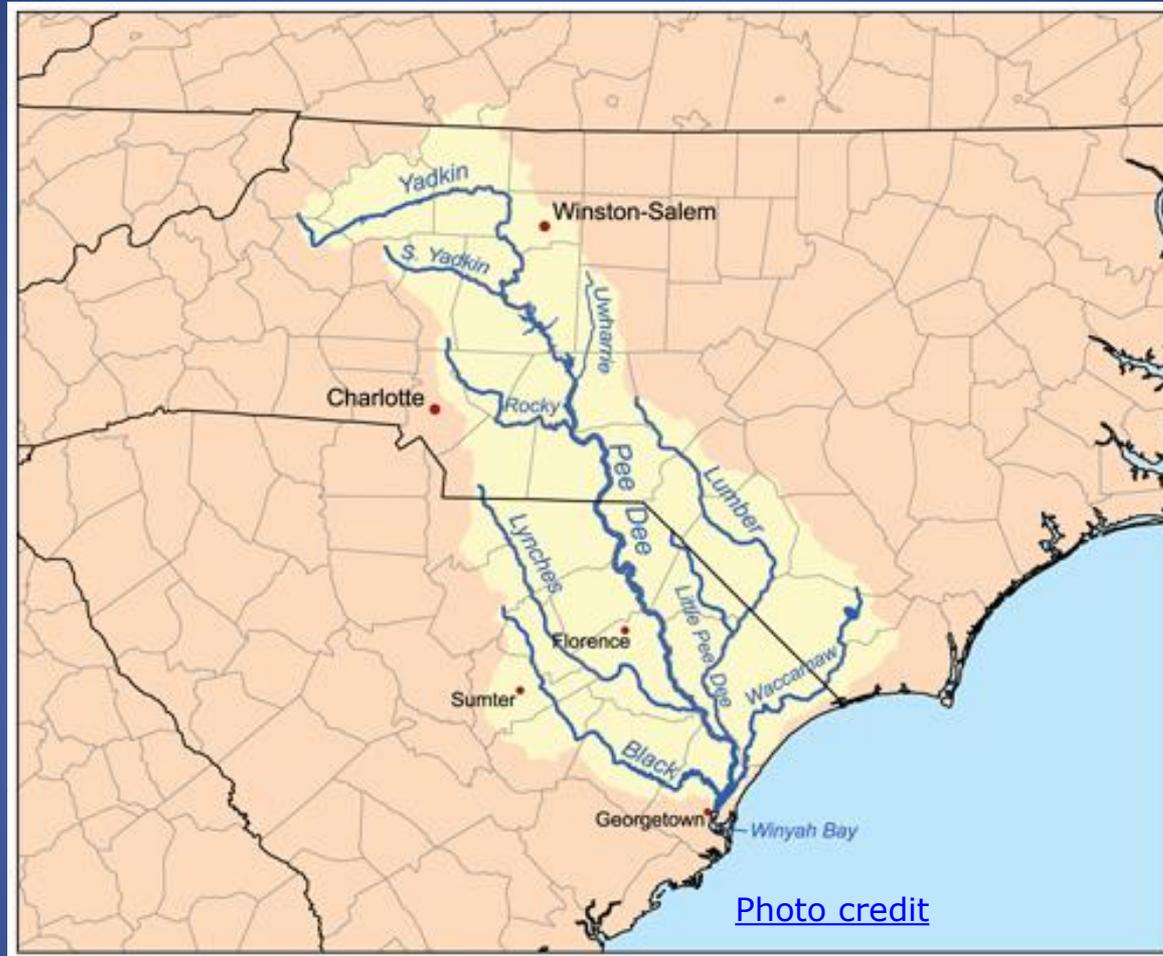
Lake Gaston Pipeline Map



Virginia and North Carolina are working to help protect and improve the River's health. Although most of the river is relatively healthy, fish advisories regarding **PCBs** were issued in 1999 for the Staunton River and are still in effect in 2019.

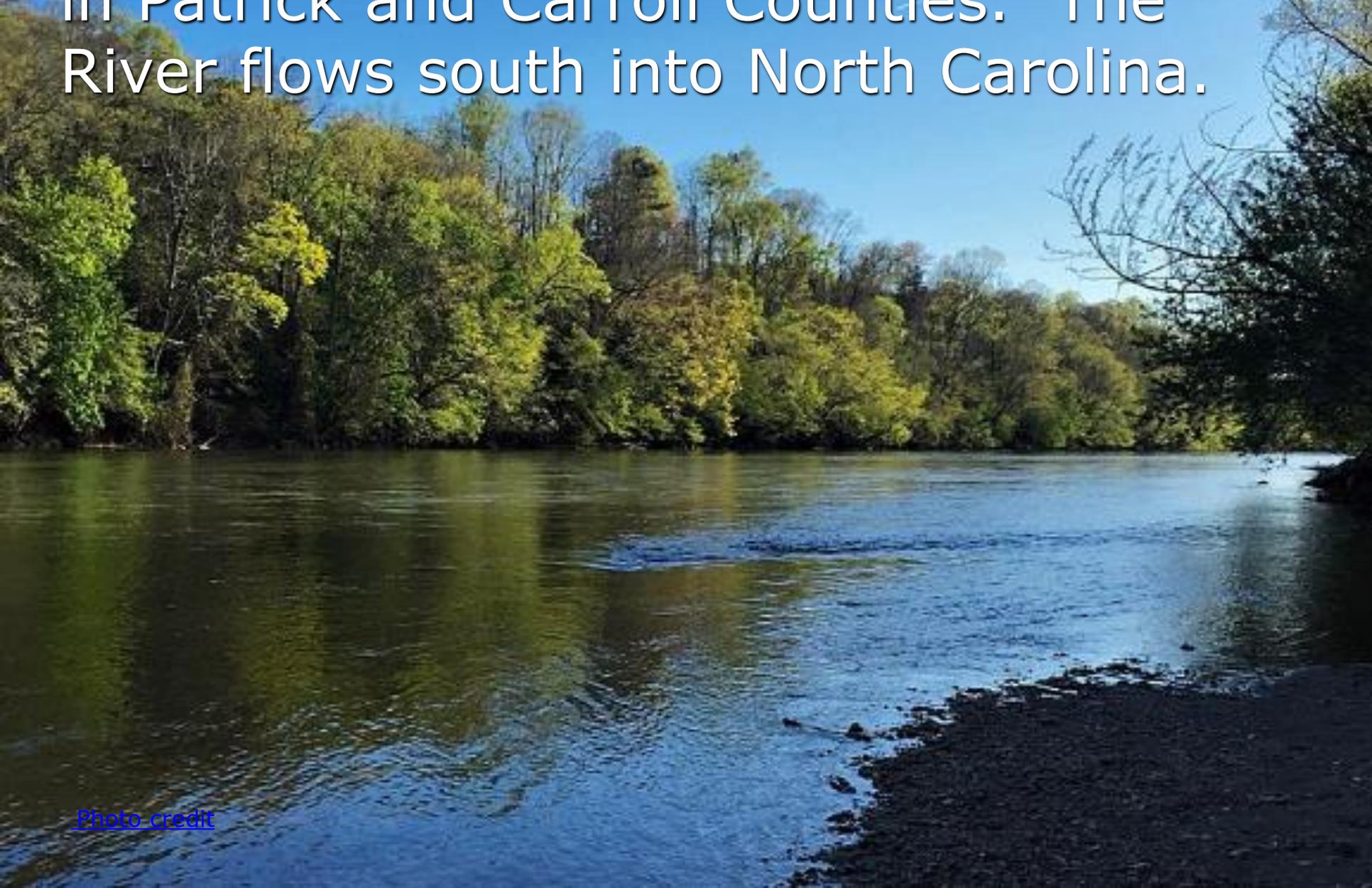
[Click to go to "Fish Consumption Advisories" to find up to date fish consumption advisories for any river or lake in Virginia](#)

# Yadkin River (Pee Dee River) Watershed

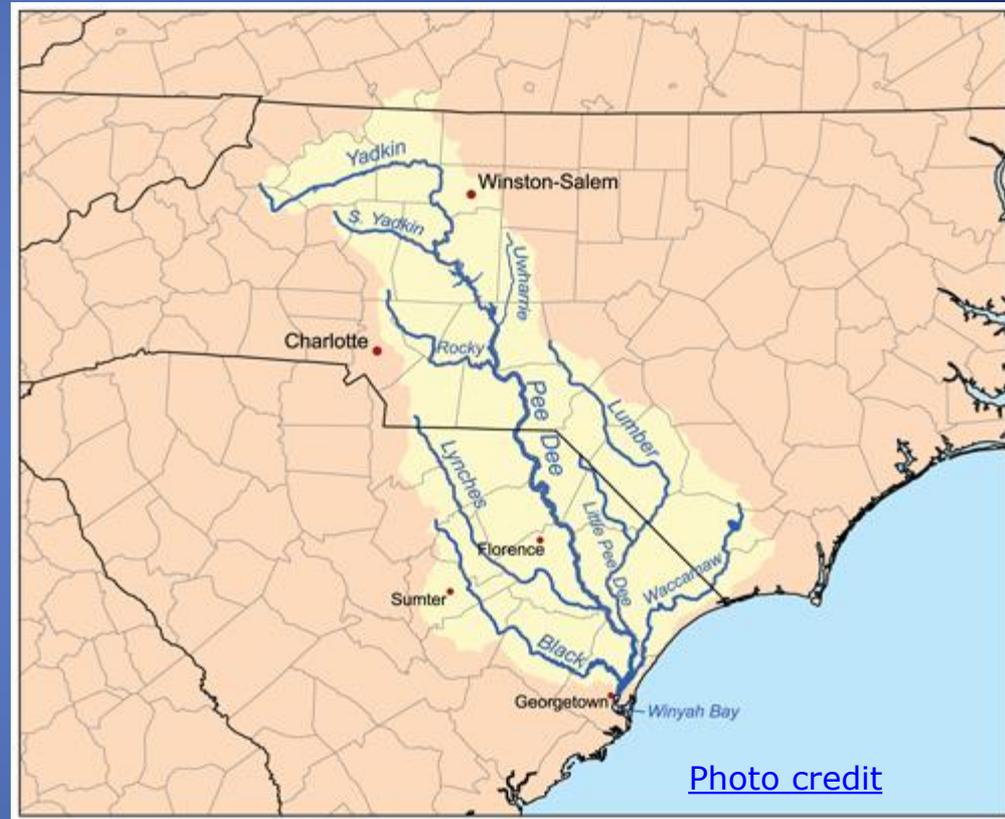


This is the smallest watershed in Virginia;  
known as the Yadkin River / Pee Dee  
watershed in North Carolina.

The headwaters of the **Yadkin River** are in Patrick and Carroll Counties. The River flows south into North Carolina.



There it joins the **Uwharrie River** to form the **Pee Dee River**. The Pee Dee River flows through South Carolina to the Atlantic Ocean.



The North Carolina portion of the basin contains approximately 5,991 miles of freshwater streams and rivers. The Virginia section is nearly 80% forested and 20% agriculture.

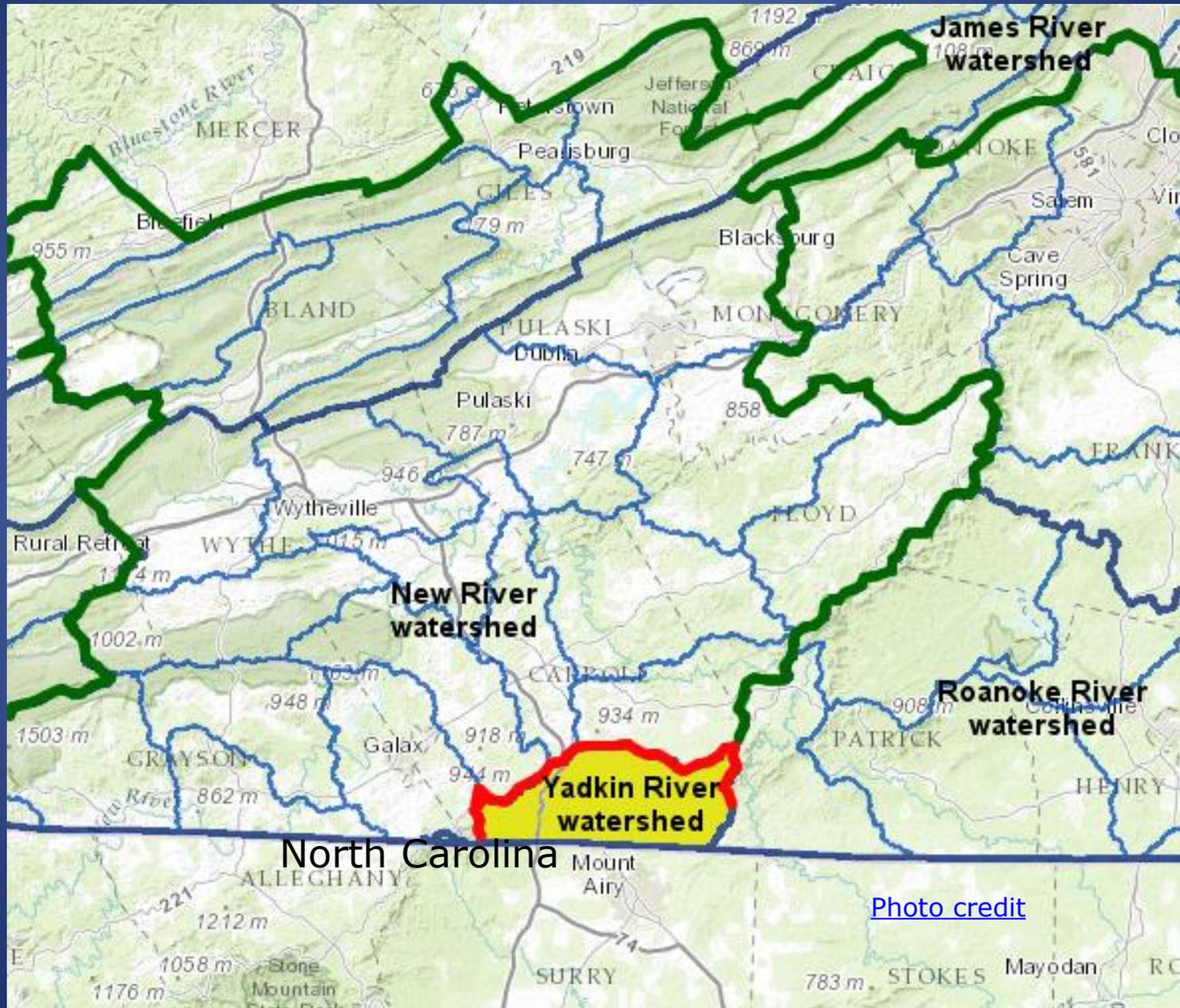
Alcoa's Narrows Dam with Badin Lake in background on Yadkin River. [Photo credit](#)



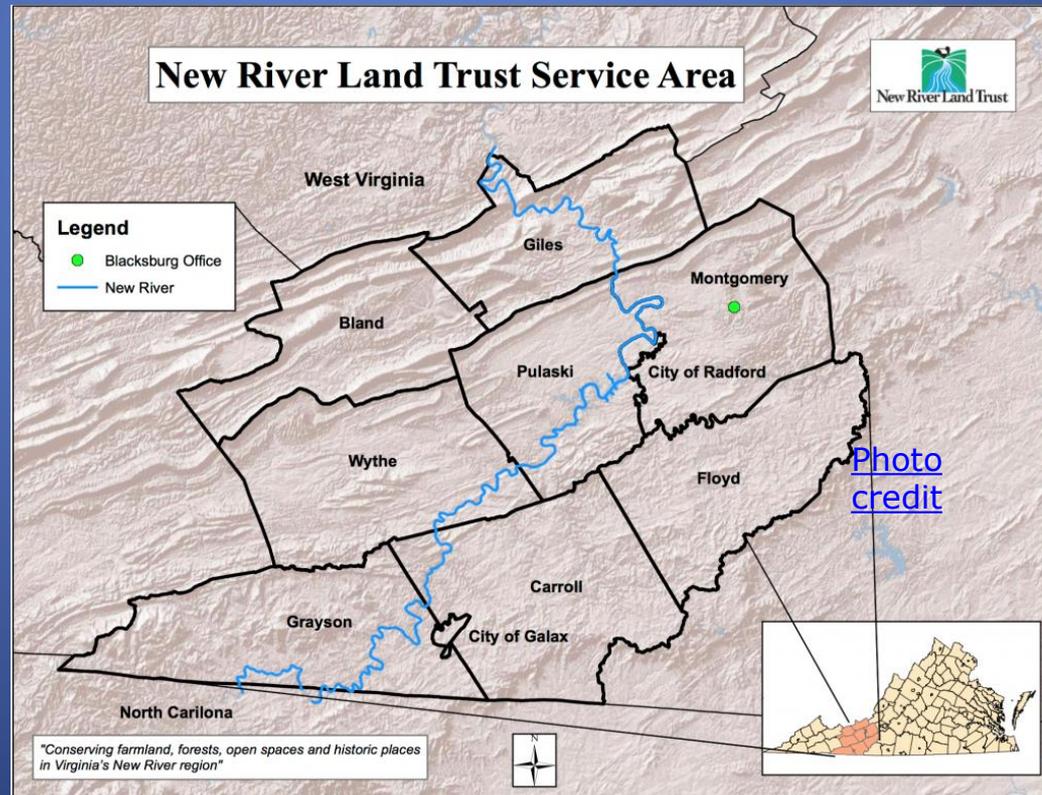
The W. Kerr Scott Dam located just over the border in North Carolina is 148 feet tall and 1,750 feet long. It creates a ten-mile reservoir.



# New River Watershed



An American Heritage River, the **New River** begins in the Blue Ridge Mountains of North Carolina. It flows northward through Virginia and into West Virginia.



There it joins the **Gauley River** to form the **Kinawa**.  
The waters then flow to  
the **Ohio River** and on to  
the **Mississippi River**.



[Photo credit](#)



[Photo credit](#)

New River Gorge

Eighty-seven of the river's 115 miles lie within Virginia. About sixty percent of the watershed is forested and thirty-five percent is in agriculture.



[Photo credit](#)

## Mountain Lake Resort



Today, the valley is known for its geology, natural beauty, rapids and music festivals. One of only two natural lakes, **Mountain Lake**, is located near Blacksburg.

Populations of native mussels and non-game fish species are rapidly declining. Many of these are listed as endangered or threatened.



[Photo credit](#)

This river system is easily polluted from surface runoff and groundwater contamination due to the large [karst](#) areas within the watershed.

[Photo credit](#)

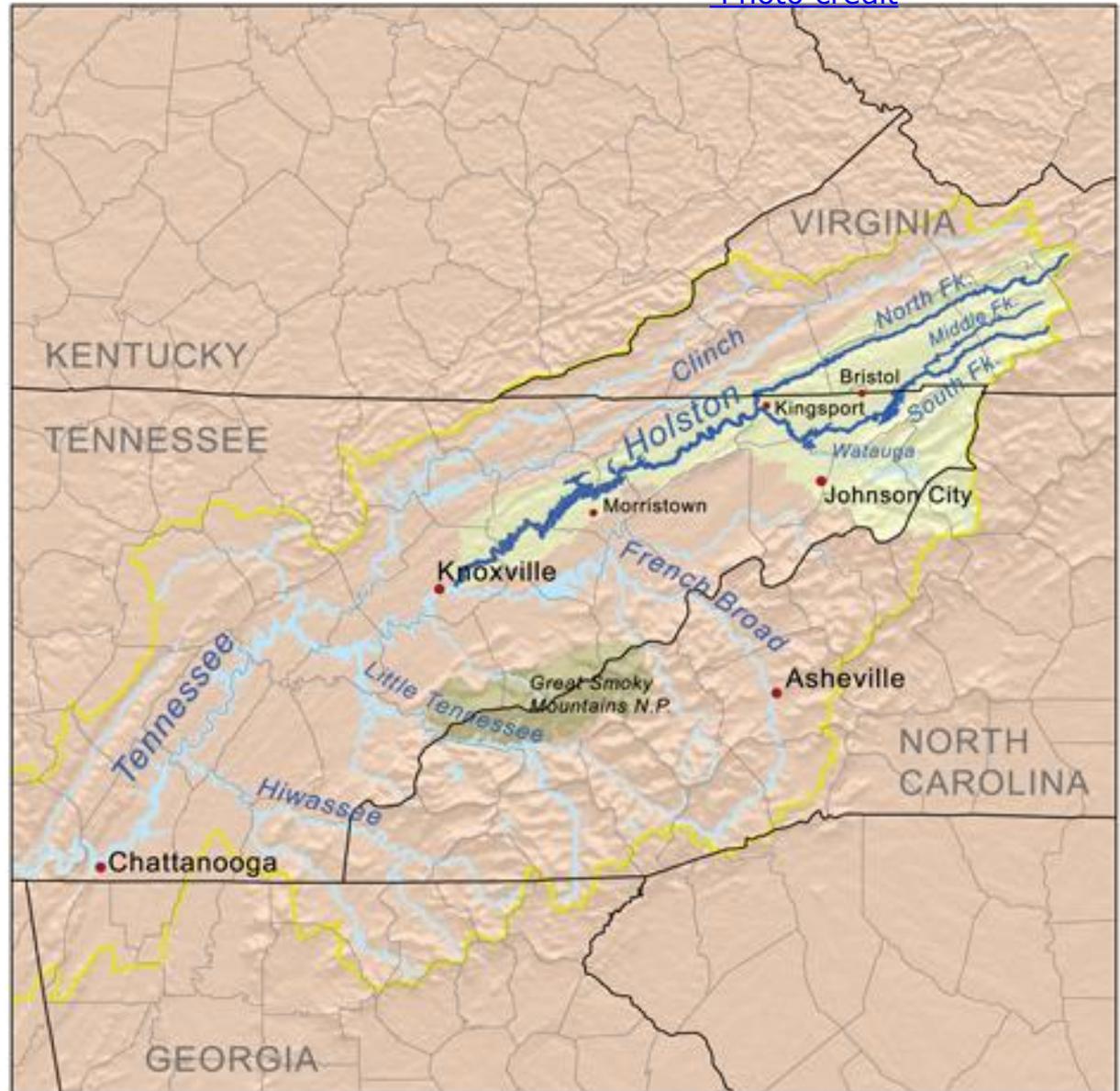


Karst: landscape developed in limestone, dolomite, marble or other soluble rocks characterized by subsurface drainage systems, sinking or losing streams, sinkholes, springs, and caves

[Photo credit](#)

# Holston Watershed

Drains into much of northeastern Tennessee and southwestern Virginia





[Photo credit](#)

## North fork of Holston River near Weber City, VA

The Holston River originates in Smythe County, Virginia. In the 1940's and 50's the Tennessee Valley Authority built four dams on the Holston River to provide electricity and flood control.

# Clinch Powell Watershed



[Photo credit](#)





The **Clinch, Powell and Holston Rivers** flow to the **Tennessee River**. The Tennessee then flows into the **Ohio River**, a major tributary of the **Mississippi**.

# Big Sandy Watershed

[Photo credit](#)

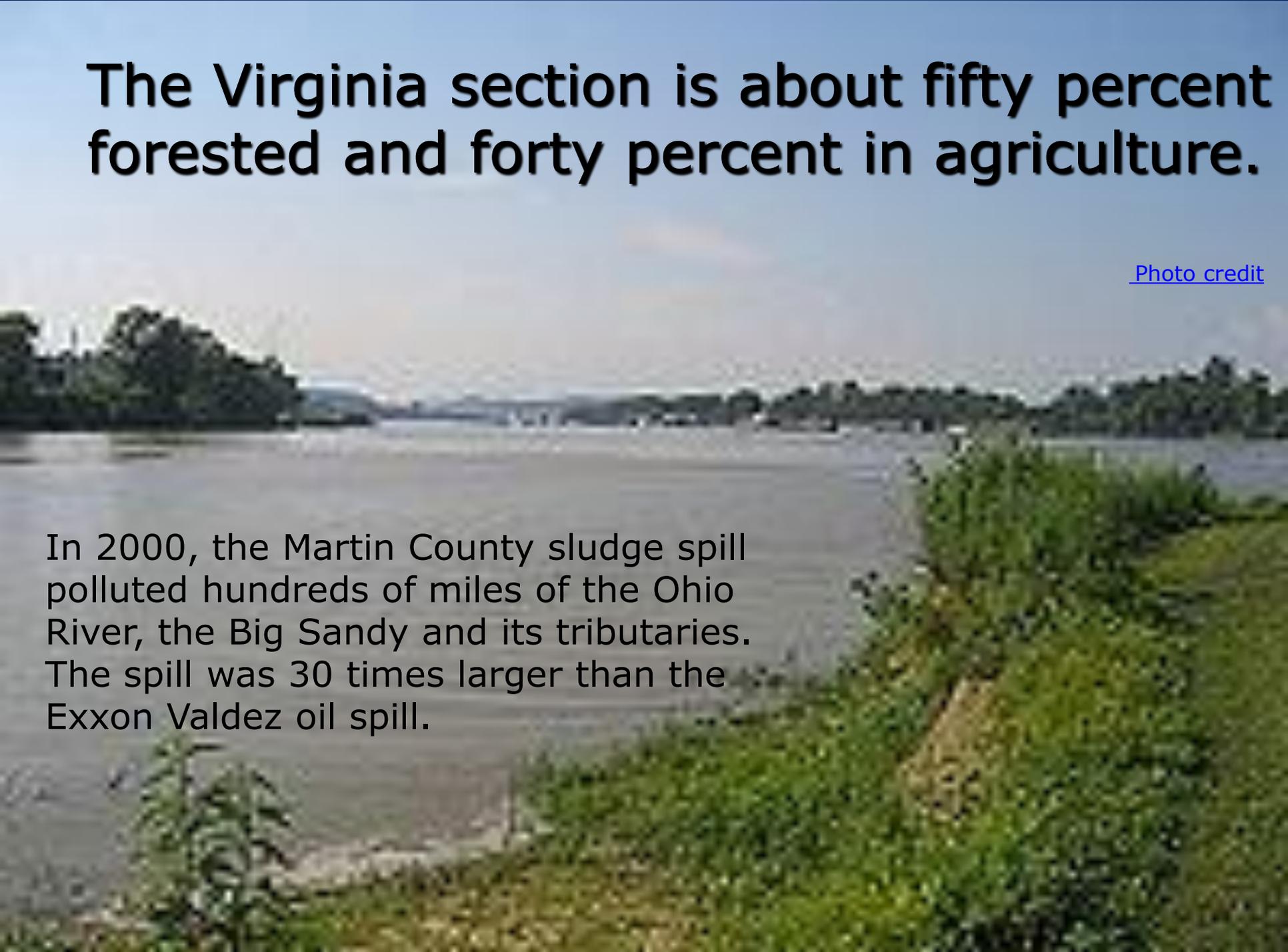
A tributary of the Ohio River. It is part of the larger Mississippi watershed. The Big Sandy River is navigable and carries coal mined in the region. The name comes from extensive sand bars



**The Virginia section is about fifty percent forested and forty percent in agriculture.**

[Photo credit](#)

In 2000, the Martin County sludge spill polluted hundreds of miles of the Ohio River, the Big Sandy and its tributaries. The spill was 30 times larger than the Exxon Valdez oil spill.

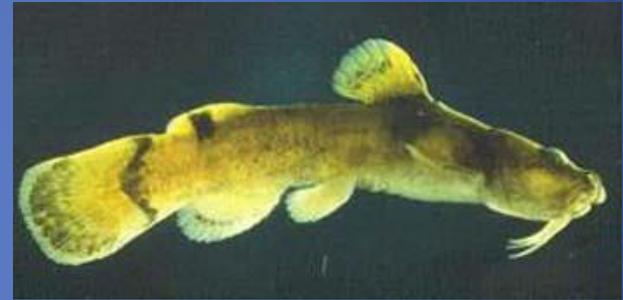


More than 300 rare, freshwater mussel species live in these watersheds. Nearly two-thirds of all the freshwater fish species in the eastern United States are found here.



[Photo credit](#)

Slender Chub has one of the smallest ranges of any North American minnow.; Threatened by dam construction, silt, pollution



[Photo credit](#)

Yellowfin Madtom thought to be extinct; found in the Clinch and Powell Rivers



[Photo credit](#)

Duskytail Darter; threatened by impoundment of waterways, silt, logging, coal mining

The differences in boundaries between watersheds and states / counties complicates the efforts to control pollution.

“Everyone lives downstream”

Sometimes the factories or urban areas who generate the pollution are in another state and are not harmed by the bad water flowing away, while those affected by the pollution may have limited influence to ensure upstream problems are fixed.

For example, a major chemical plant in Saltville (now a [Superfund site](#)) degraded the water quality for Kingsport, Tennessee for 80 years. Virginia politicians were well aware that Virginia residents received benefits from operating the plant without paying the costs of controlling the excessive chlorides from salt dumped into the North Fork of the Holston River. Those who suffered from the pollution... lived out of state, and could not vote in Virginia. The state of Tennessee finally went to court to force Virginia to impose realistic pollution control standards on the company - which then closed down, eliminating 1,000 jobs in a community of about 2,000 people.<sup>1</sup>

<http://www.virginiaplaces.org/watersheds/3wsheds.html>