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Craig Highfield, Program Manager



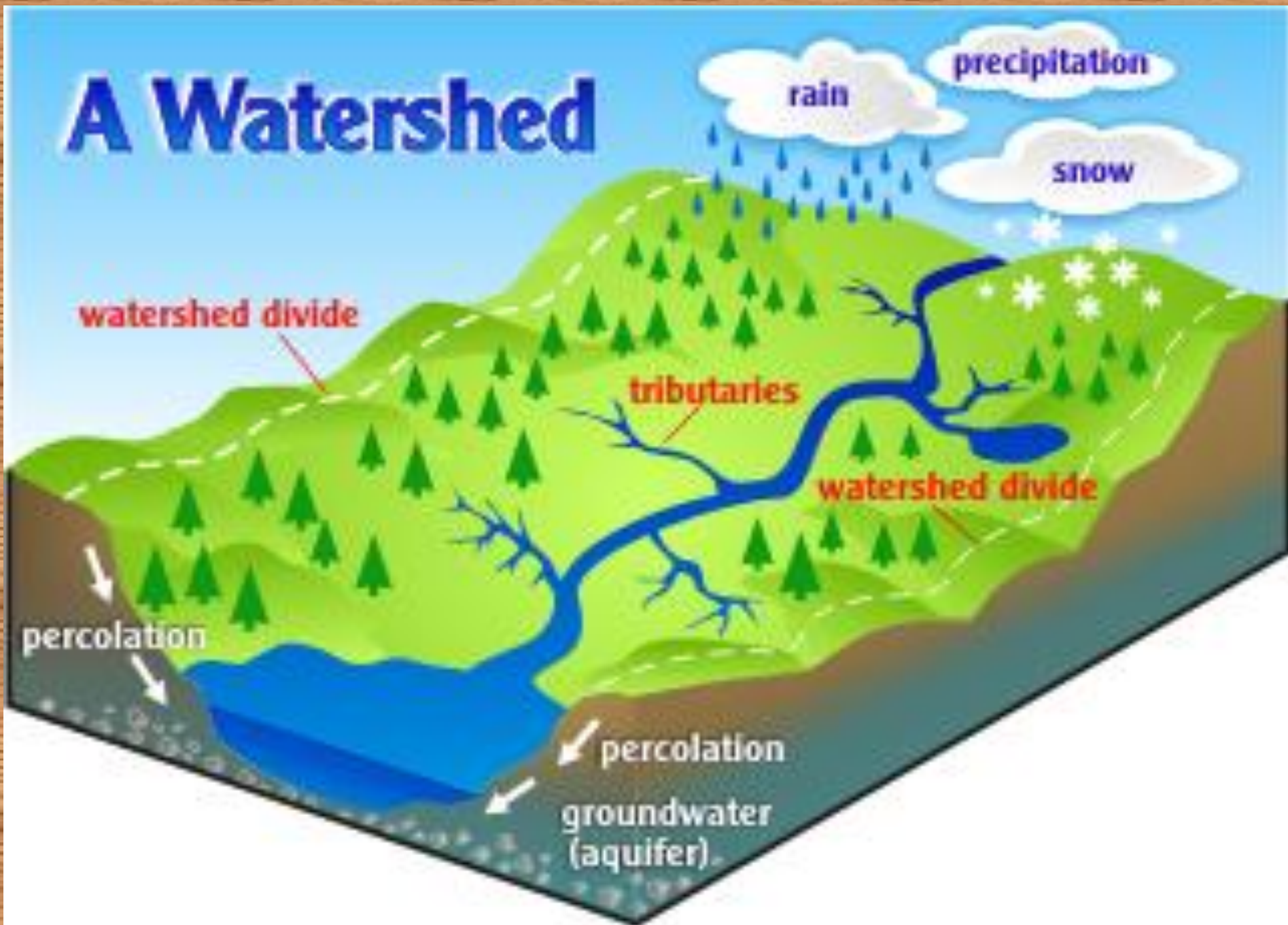
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# Woods & Watersheds






# A Watershed



# Chesapeake Bay Watershed



-  Chesapeake Bay Watershed
-  State Boundary
-  Chesapeake Bay



Data Source: Chesapeake Bay Program  
For more information, visit [www.chesapeakebay.net](http://www.chesapeakebay.net)  
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# Hydrologic Unit Boundaries - HUC 11

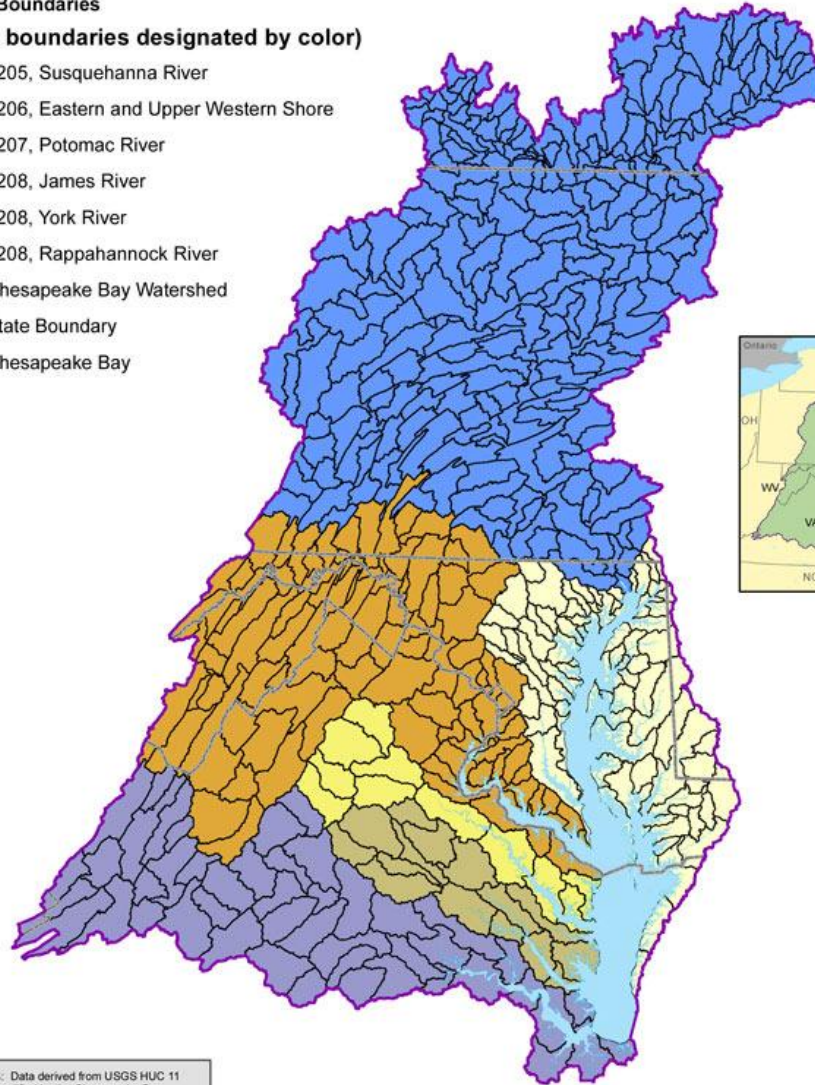
Chesapeake Bay Watershed



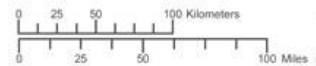
## HUC 11 Boundaries

(HUC 4 boundaries designated by color)

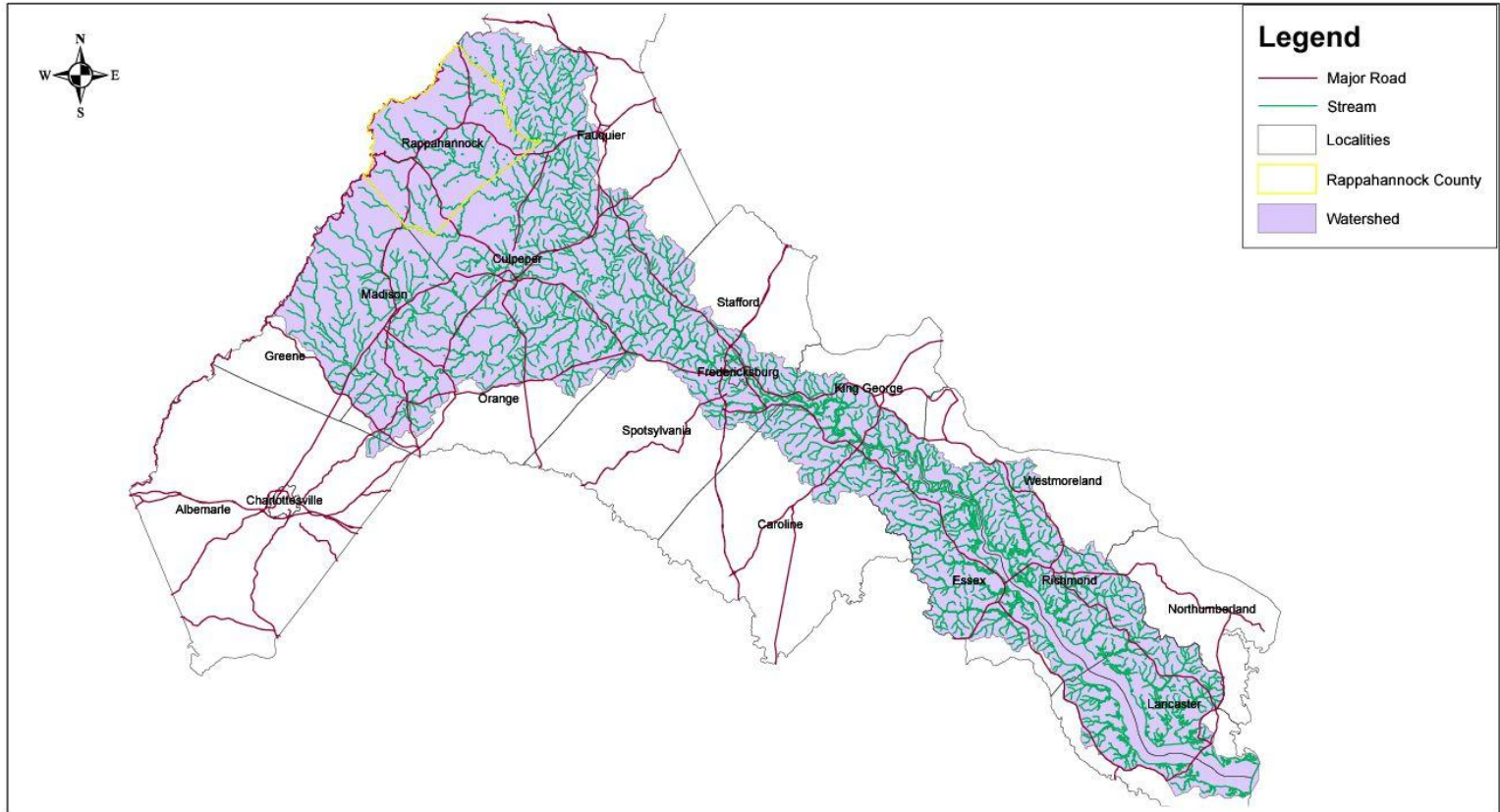
-  0205, Susquehanna River
-  0206, Eastern and Upper Western Shore
-  0207, Potomac River
-  0208, James River
-  0208, York River
-  0208, Rappahannock River
-  Chesapeake Bay Watershed
-  State Boundary
-  Chesapeake Bay

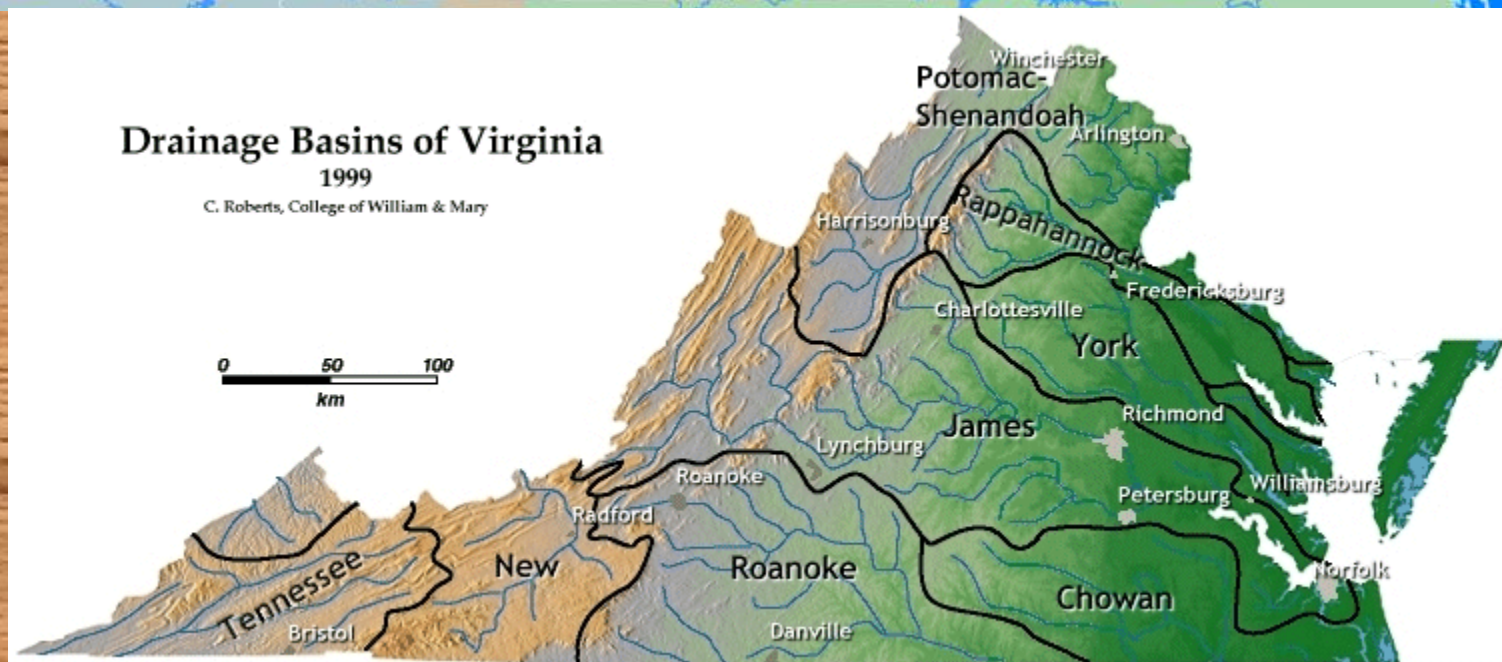


Data Sources: Data derived from USGS HUC 11 divisions as modified by the Chesapeake Bay Program.  
For more information, visit [www.chesapeakebay.net](http://www.chesapeakebay.net)  
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# Rappahannock River Watershed

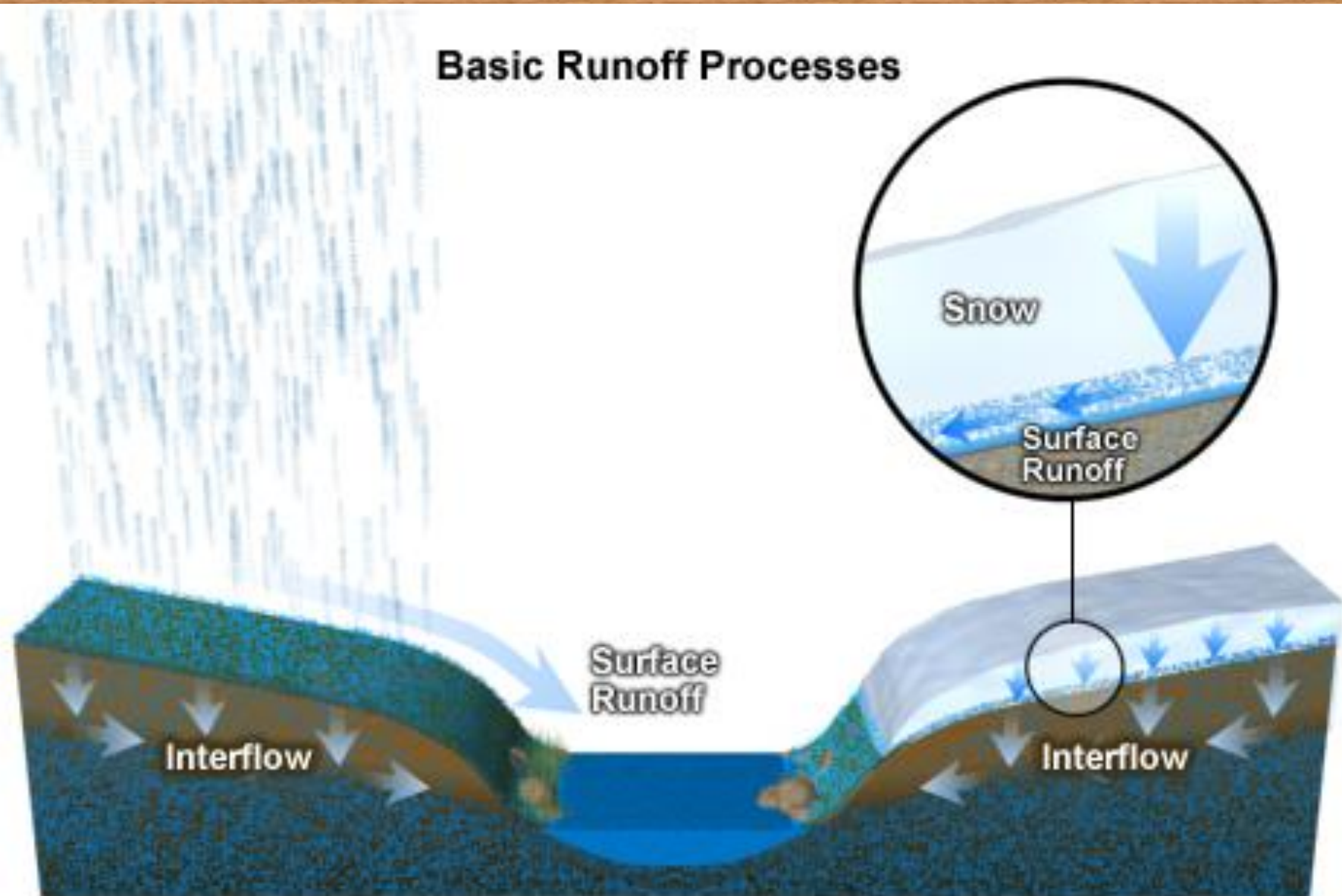








## Basic Runoff Processes



# Forest Land Cover

0% Impervious Surfaces

Rainfall

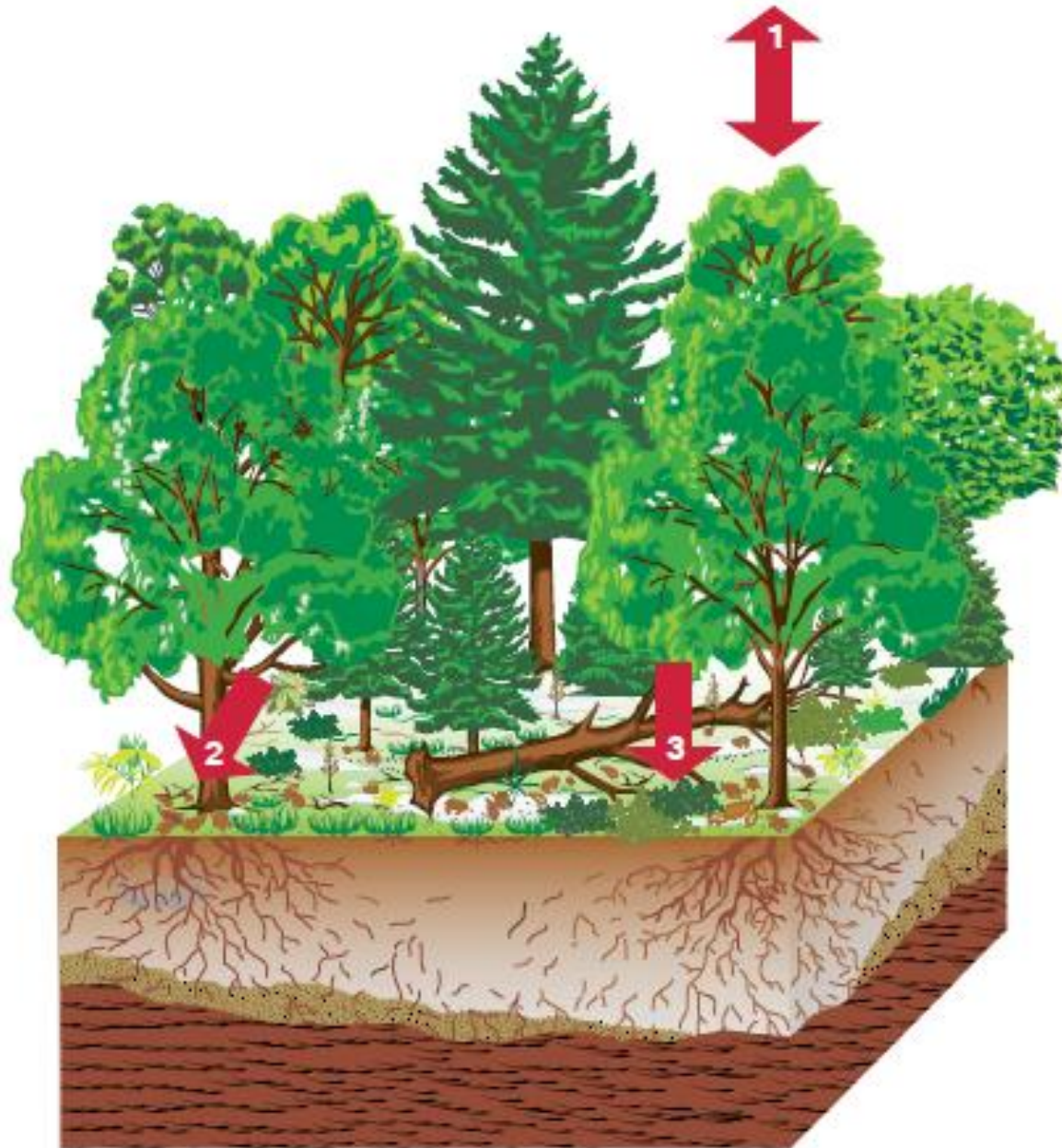
45%  
Evapotranspiration

5%  
Runoff

50%  
Infiltration



# FOREST FUNCTIONS



# Chesapeake Bay Watershed

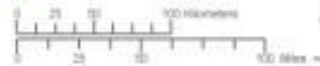


Chesapeake Bay Program  
A Watershed Partnership

- Chesapeake Bay Watershed
- State Boundary
- Chesapeake Bay



Data Source: Chesapeake Bay Program  
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Disclaimer: [www.chesapeakebay.net/frequently.htm](http://www.chesapeakebay.net/frequently.htm)



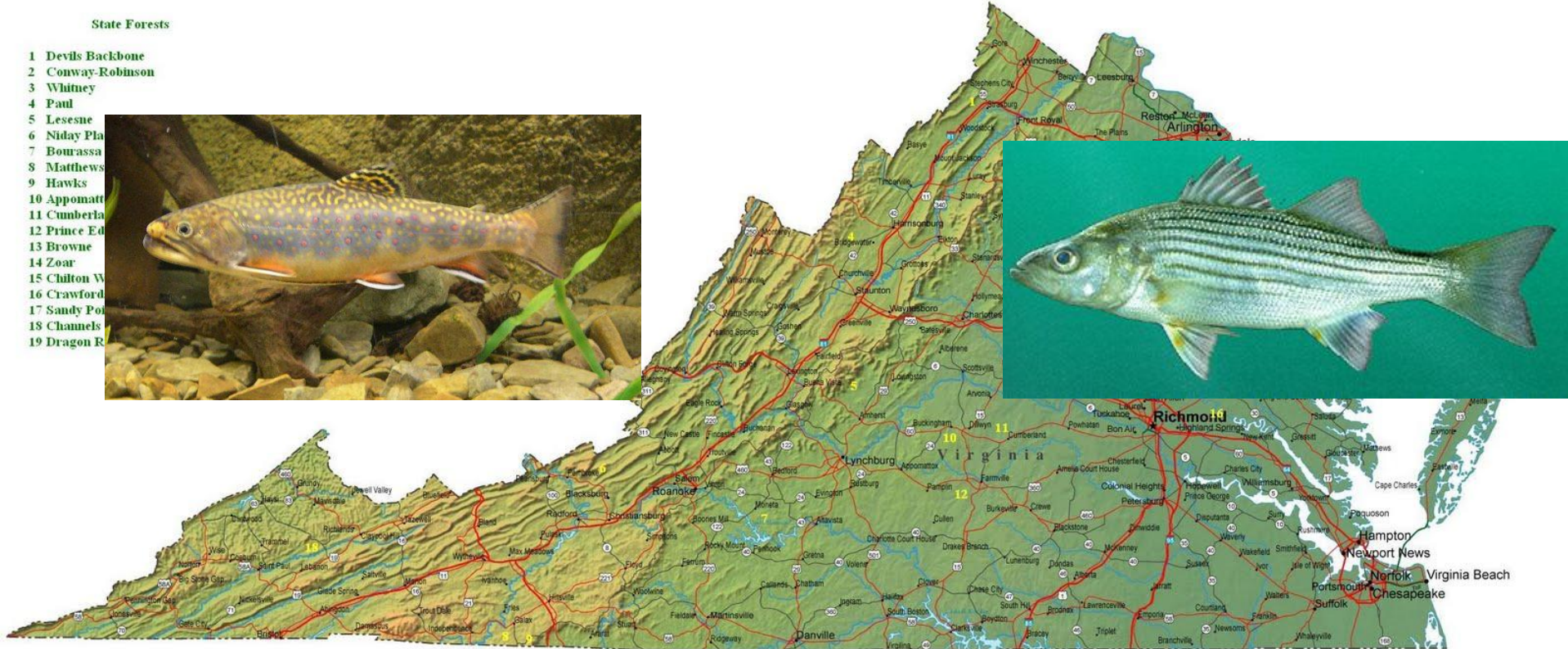


# *A tail of two fish*



State Forests

- 1 Devils Backbone
- 2 Conway-Robinson
- 3 Whitney
- 4 Paul
- 5 Lesesne
- 6 Niday Pla
- 7 Bourassa
- 8 Matthews
- 9 Hawks
- 10 Appomatt
- 11 Cumberla
- 12 Prince Ed
- 13 Browne
- 14 Zoar
- 15 Chilton W
- 16 Crawford
- 17 Sandy Poi
- 18 Channels
- 19 Dragon R







# Water Temperature



© 2008 John McLaughlin

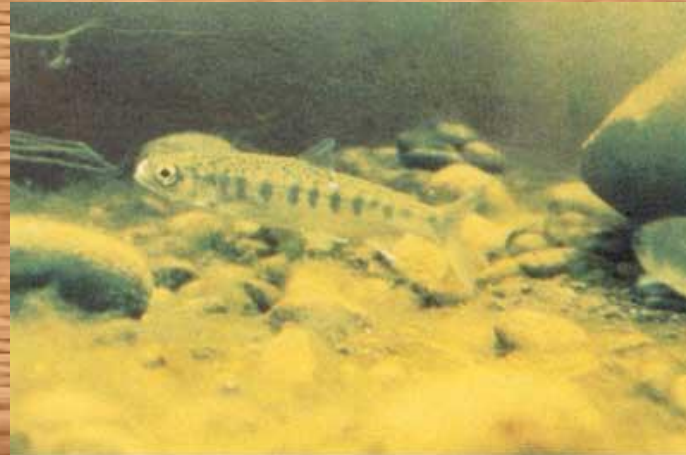
# Habitat Structure




# Food Availability




# Sediment Flux



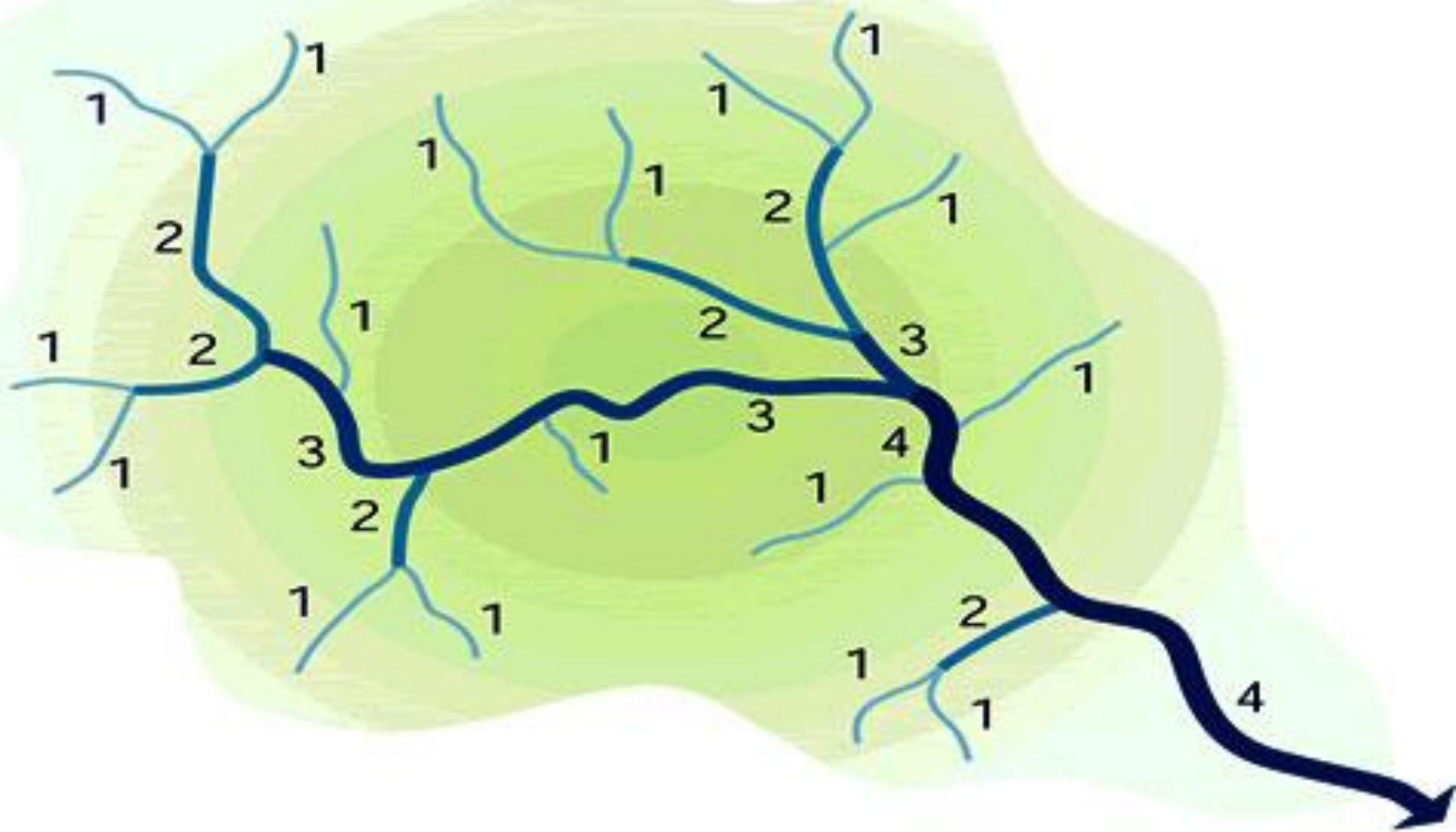
 A newly hatched Salmonid.

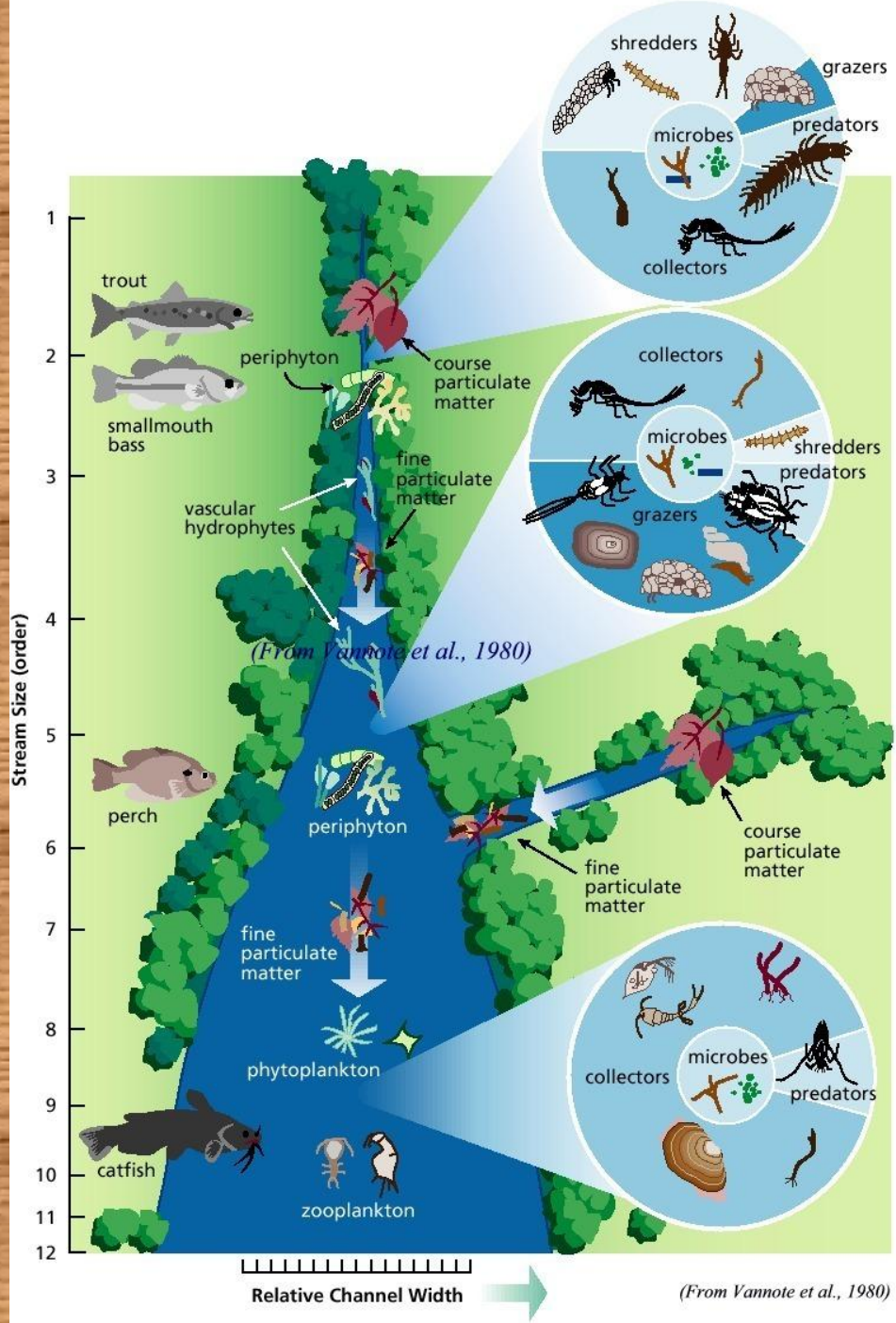
USDA Forest Service



 Incubation eggs.

USDA Forest Service





### State Forests

- 1 Devils Backbone
- 2 Conway-Robinson
- 3 Whitney
- 4 Paul
- 5 Lesesne
- 6 Niday Place
- 7 Bourassa
- 8 Matthews
- 9 Hawks
- 10 Appomattox-Buckingham
- 11 Cumberland
- 12 Prince Edward Gallion
- 13 Browne
- 14 Zoar
- 15 Chilton Woods
- 16 Crawfords
- 17 Sandy Point
- 18 Channels
- 19 Dragon Run











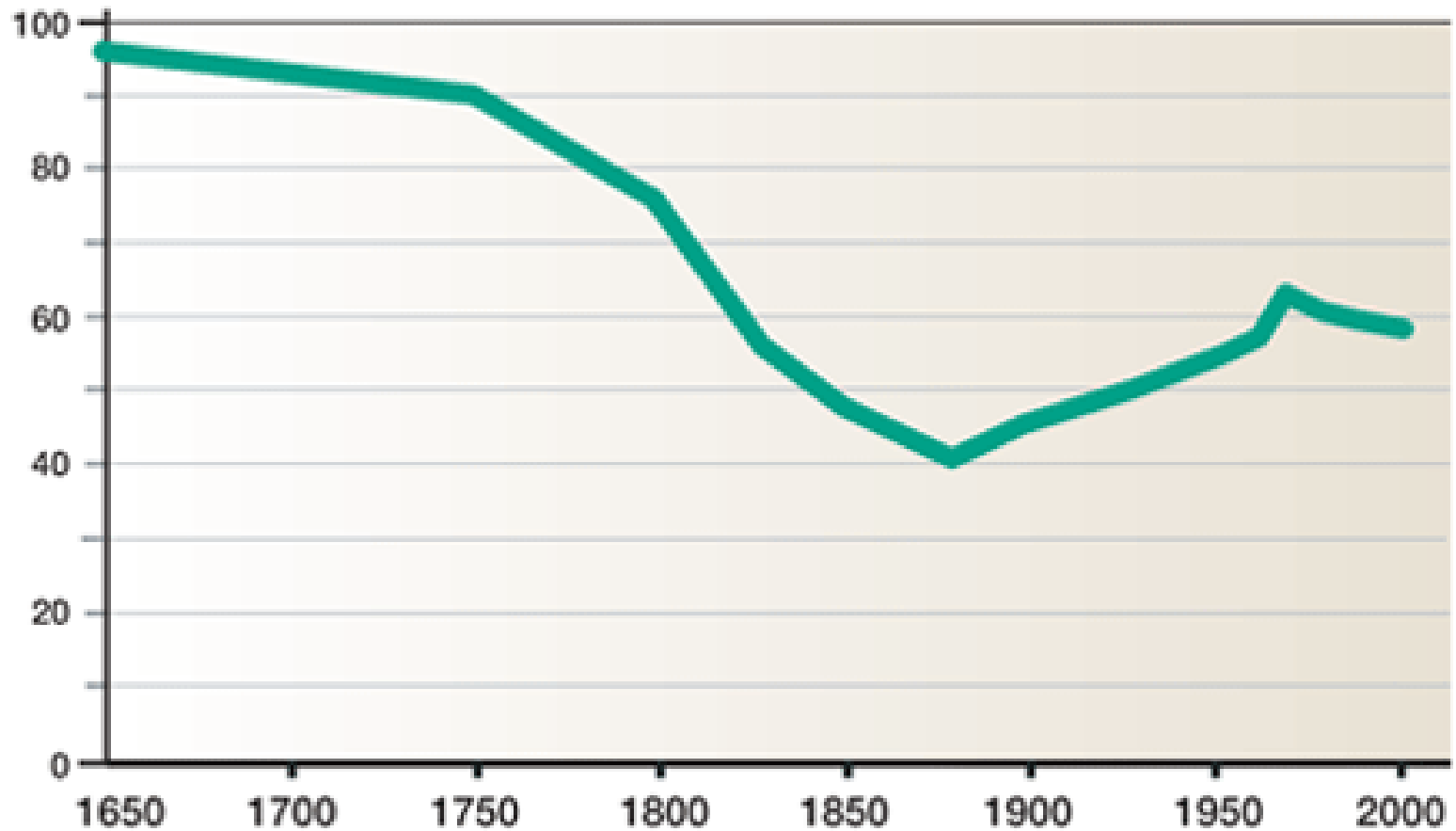




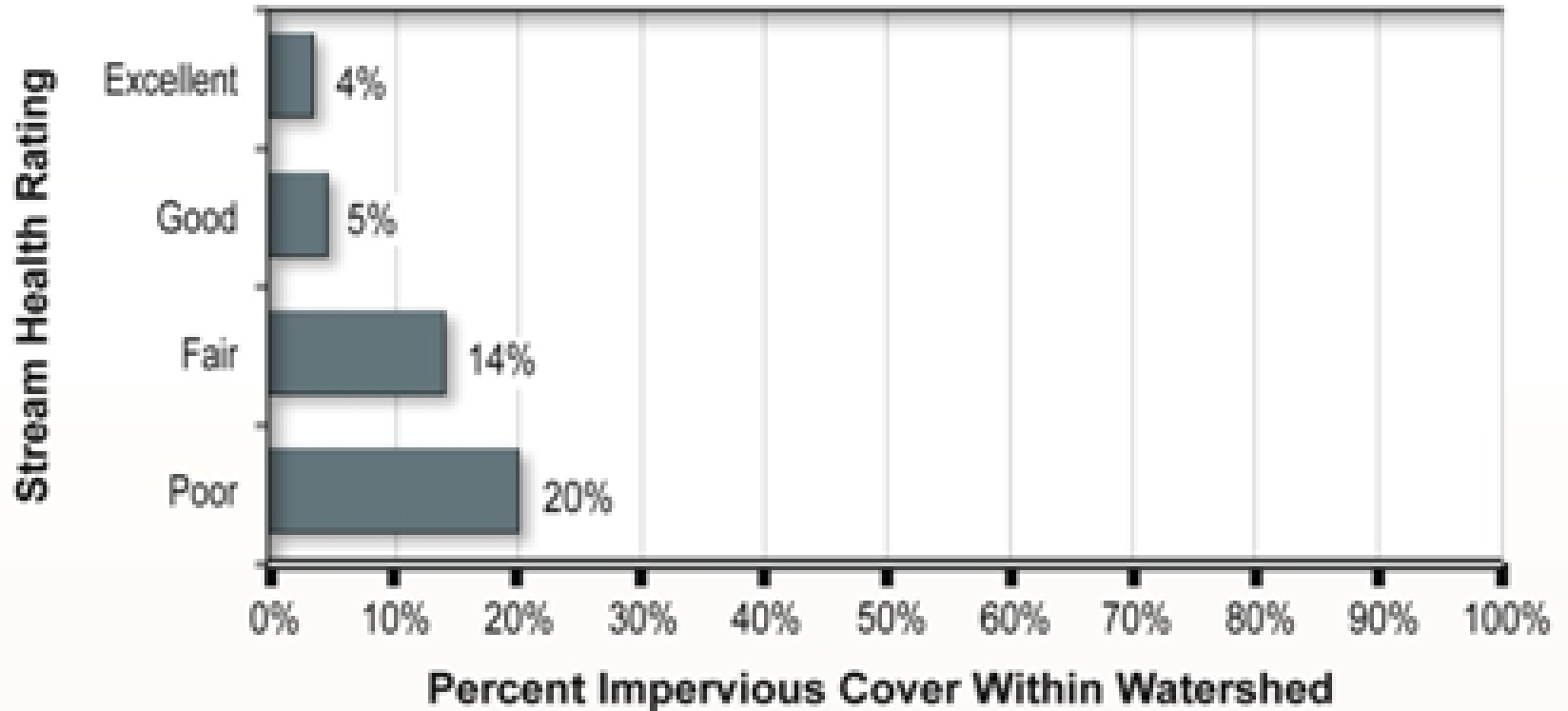


## Bay Watershed Forest Cover

Percent  
Forest Cover

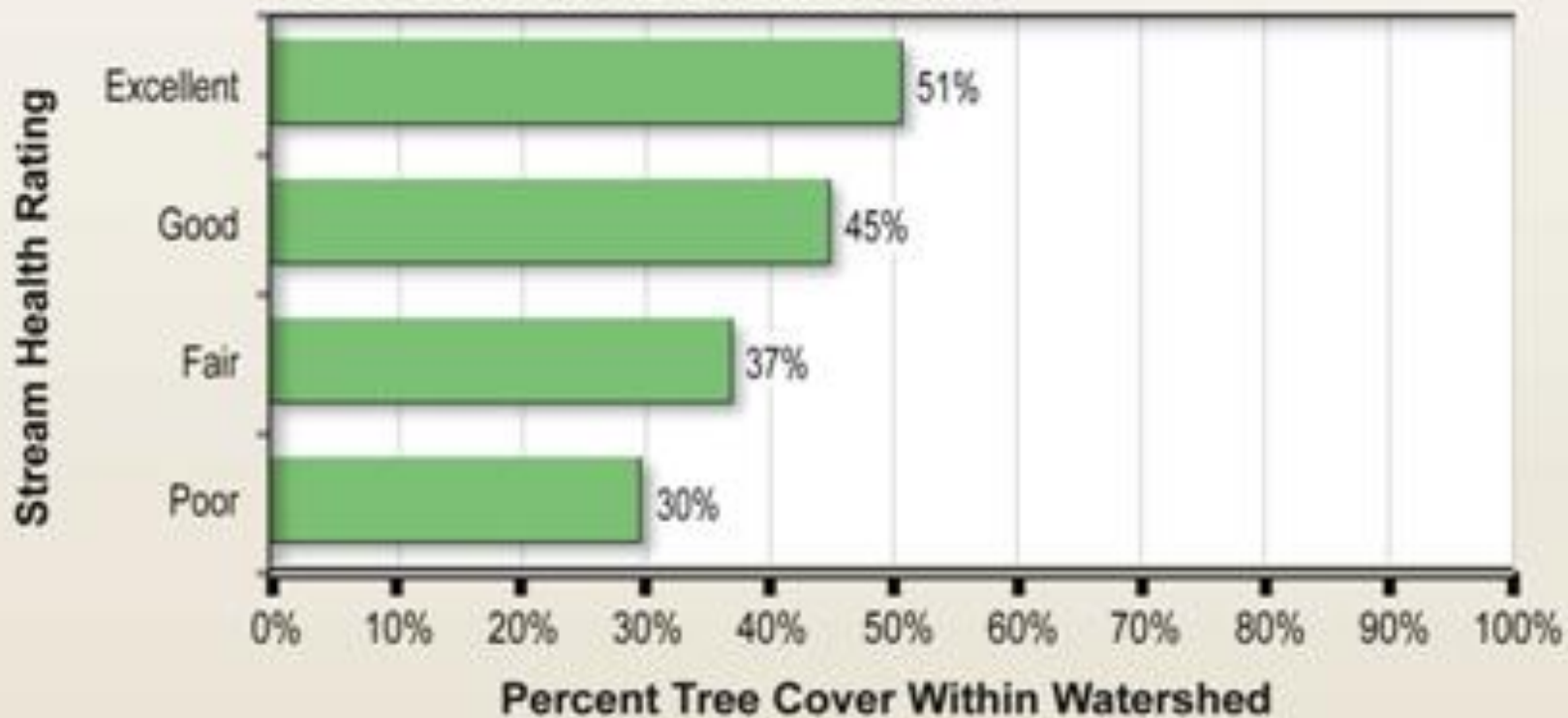


## Impervious Cover and Stream Health



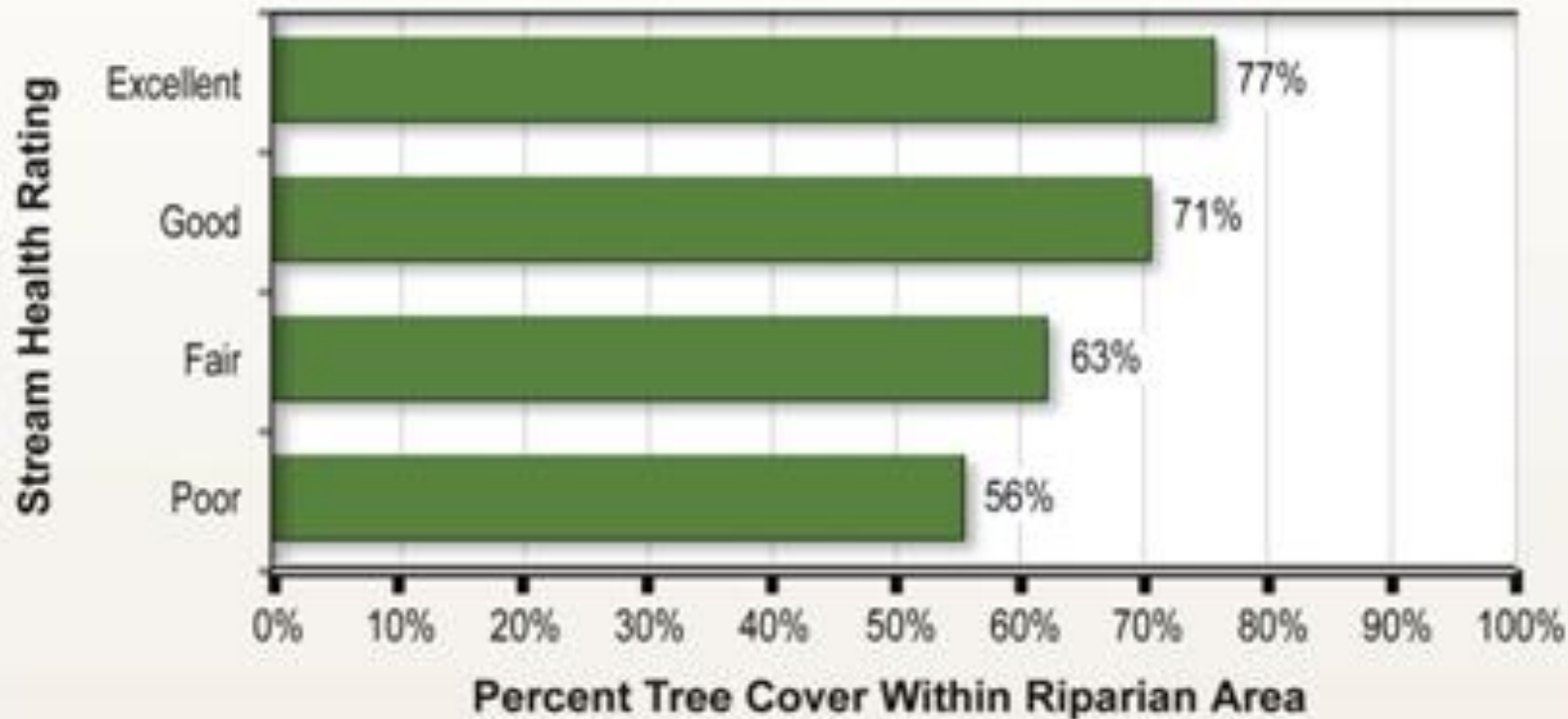


## Tree Cover and Stream Health



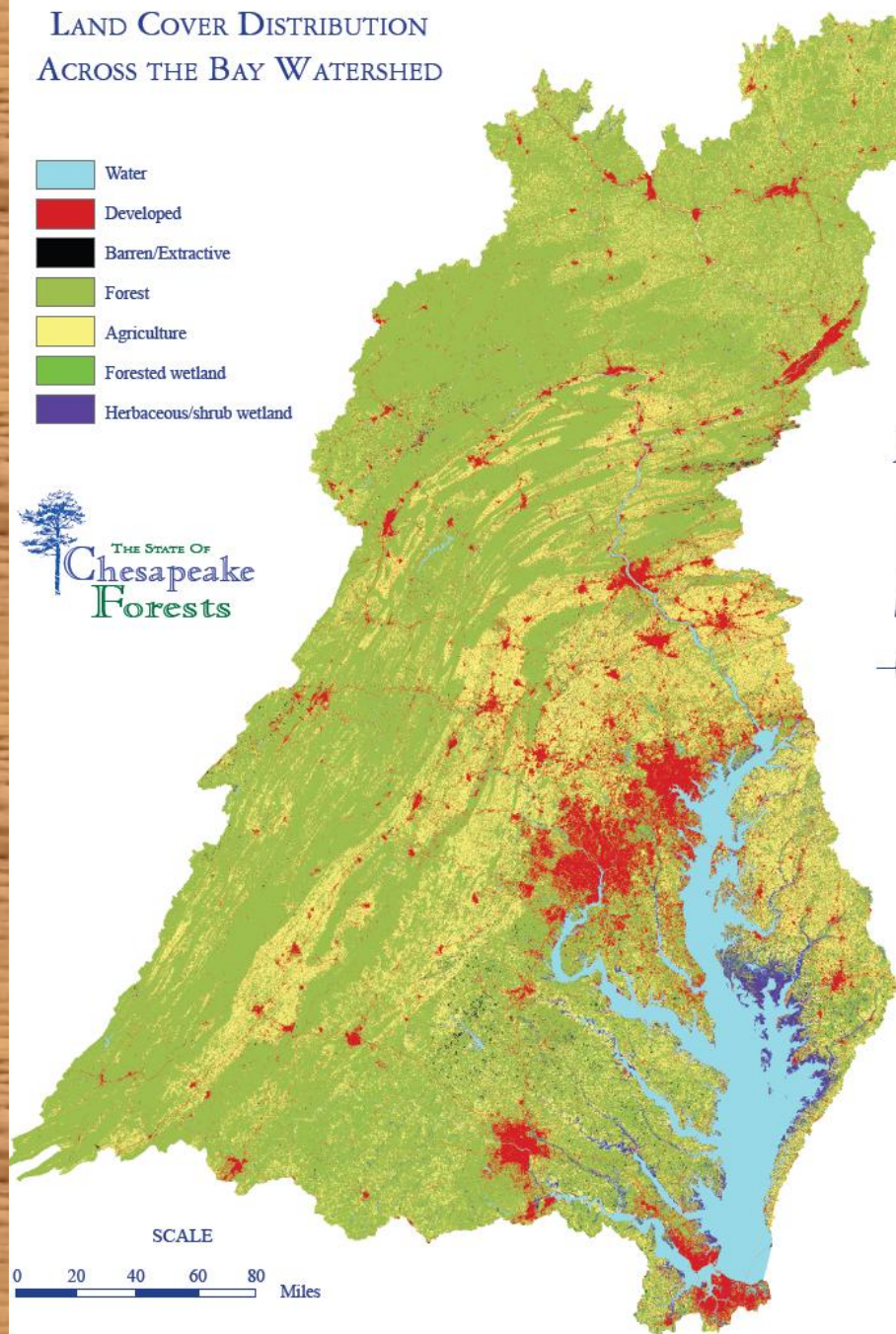
Source: Goetz et al. 2003

## Forest Buffers and Stream Health



# LAND COVER DISTRIBUTION ACROSS THE BAY WATERSHED

- Water
- Developed
- Barren/Extractive
- Forest
- Agriculture
- Forested wetland
- Herbaceous/shrub wetland



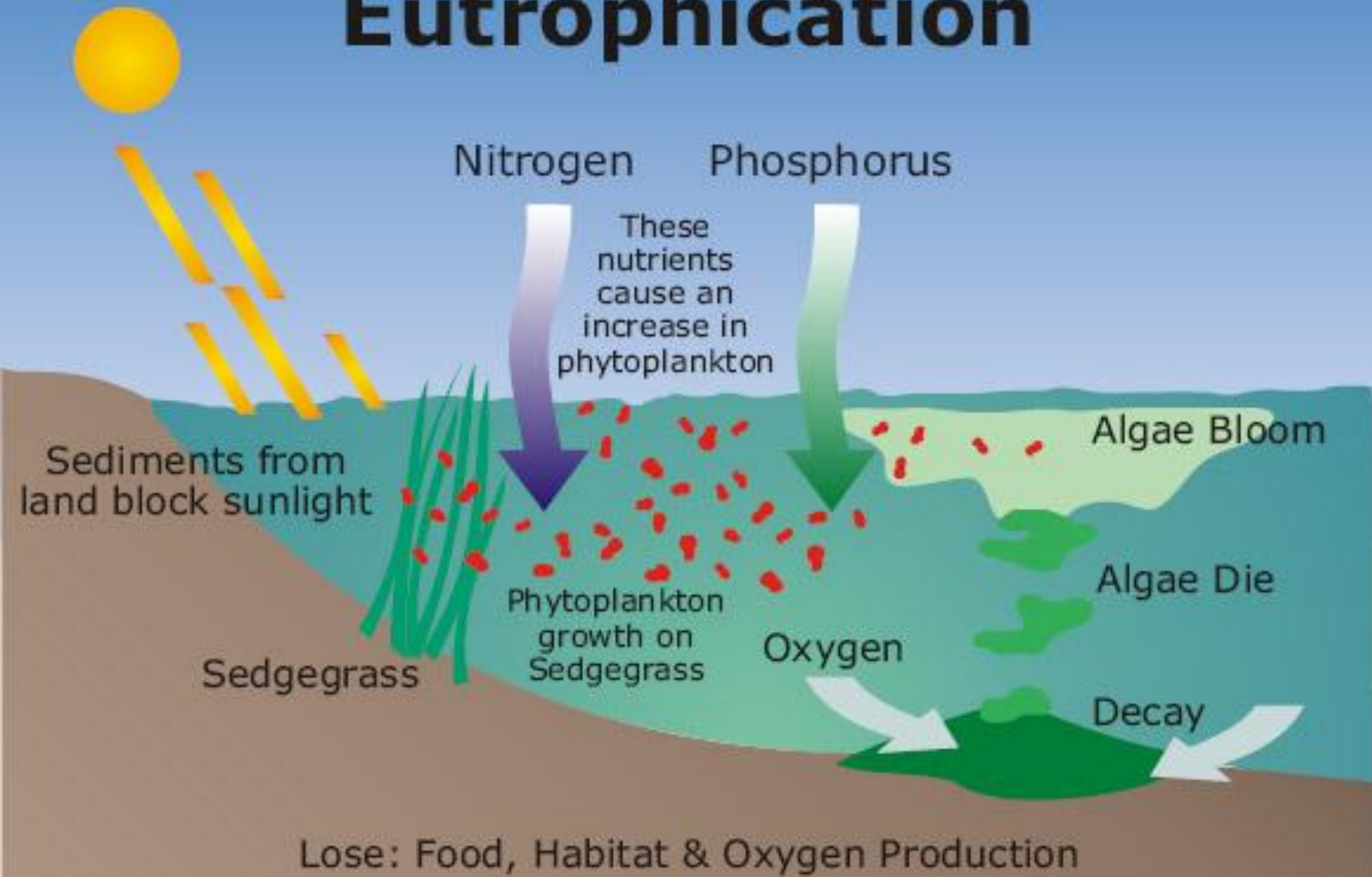
# Forests are the best land cover for improving water quality

## Chesapeake Bay Program Water Quality Goals

	Current Nutrient Loads	Chesapeake 2000 Goals	If All Watershed Land Use Was Forest
<b>Nitrogen</b> (million pounds per year)	275	175	60.6
<b>Phosphorus</b> (million pounds per year)	19	13	1.1
<b>Sediment</b> (million tons per year)	5	4	1.5

Source: Chesapeake Bay Program 2005

# Eutrophication



Typical algae bloom.

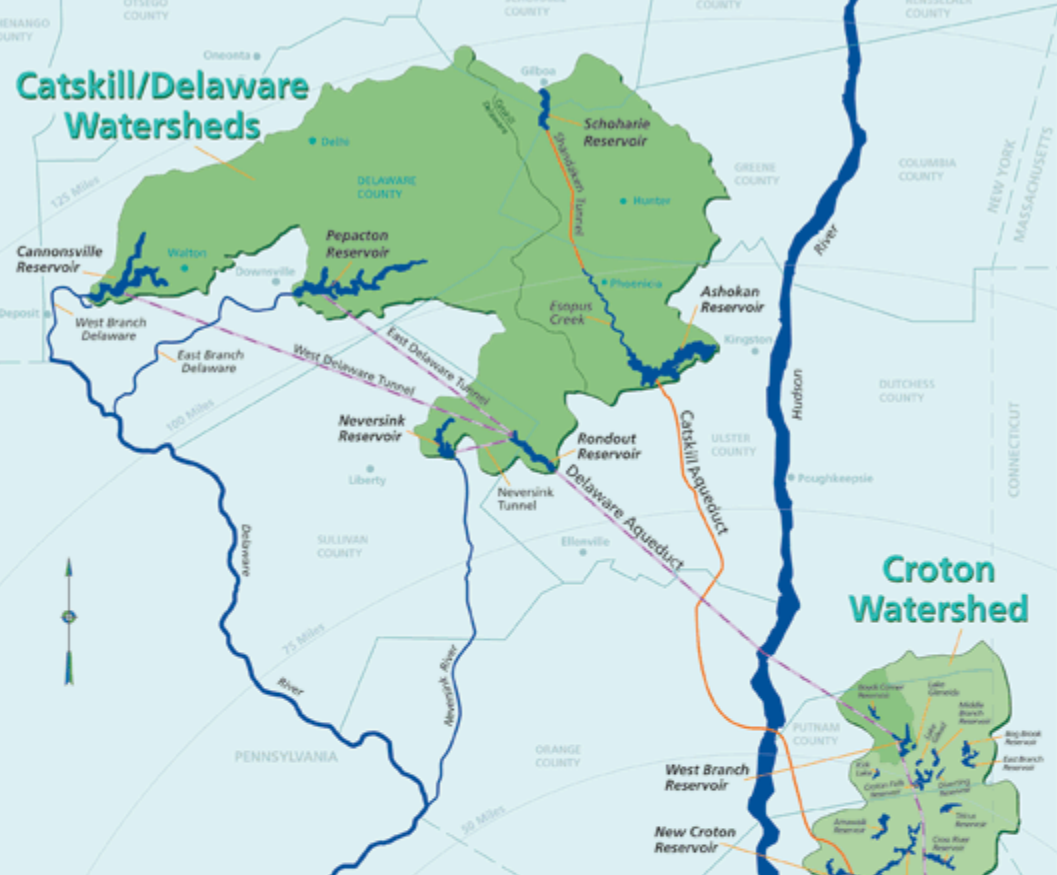








## Catskill/Delaware Watersheds



## Croton Watershed



## New York City's Water Supply System

- Catskill / Delaware Watershed Area
- Croton Watershed Area
- Rivers and Reservoirs
- Catskill Aqueduct and Tunnels
- Croton Aqueduct
- Delaware Aqueduct and Tunnels
- County Borders
- State Borders

[www.nyc.gov/dep](http://www.nyc.gov/dep)

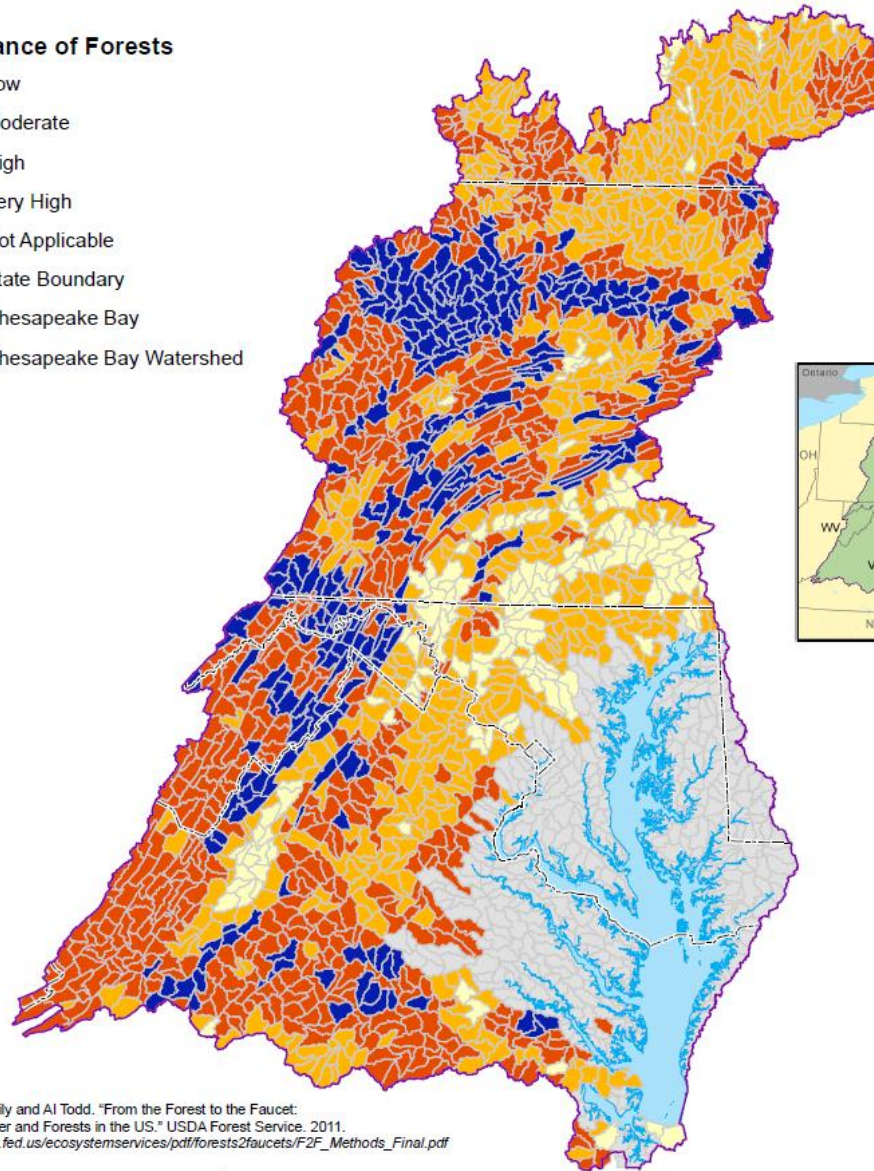
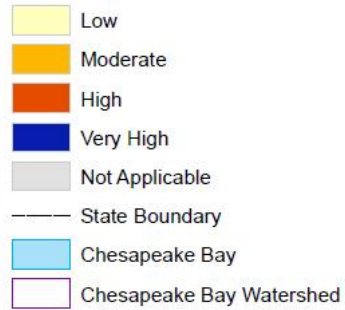
NYC DEPARTMENT OF ENVIRONMENTAL PROTECTION

ATLANTIC OCEAN

# Importance of Forest to Surface Drinking Water Supplies

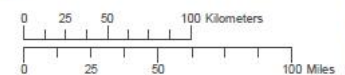


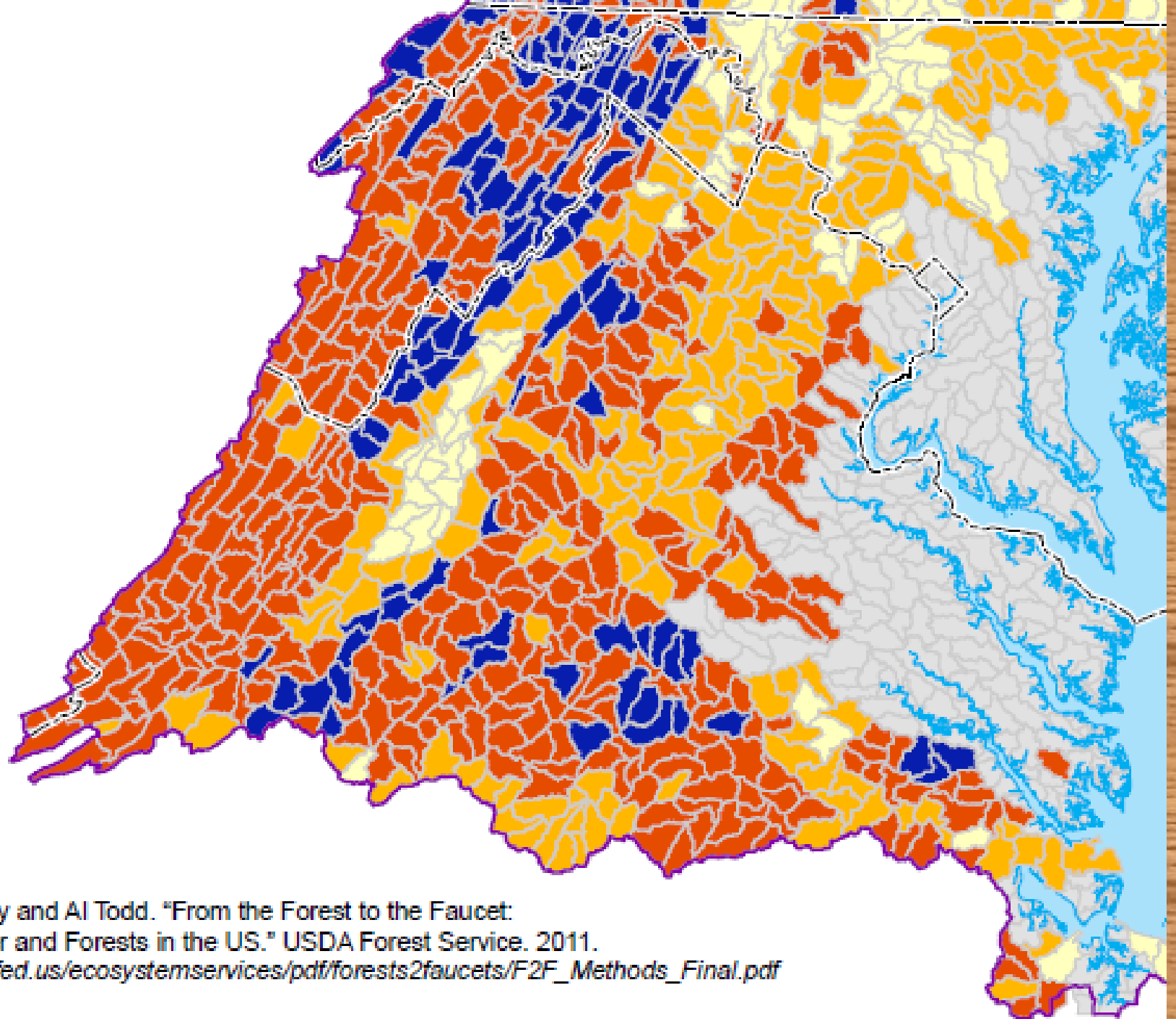
## Importance of Forests



Weidner, Emily and Al Todd. "From the Forest to the Faucet: Drinking Water and Forests in the US." USDA Forest Service, 2011.  
[http://www.fs.fed.us/ecosystemservices/pdf/forests2faucets/F2F\\_Methods\\_Final.pdf](http://www.fs.fed.us/ecosystemservices/pdf/forests2faucets/F2F_Methods_Final.pdf)

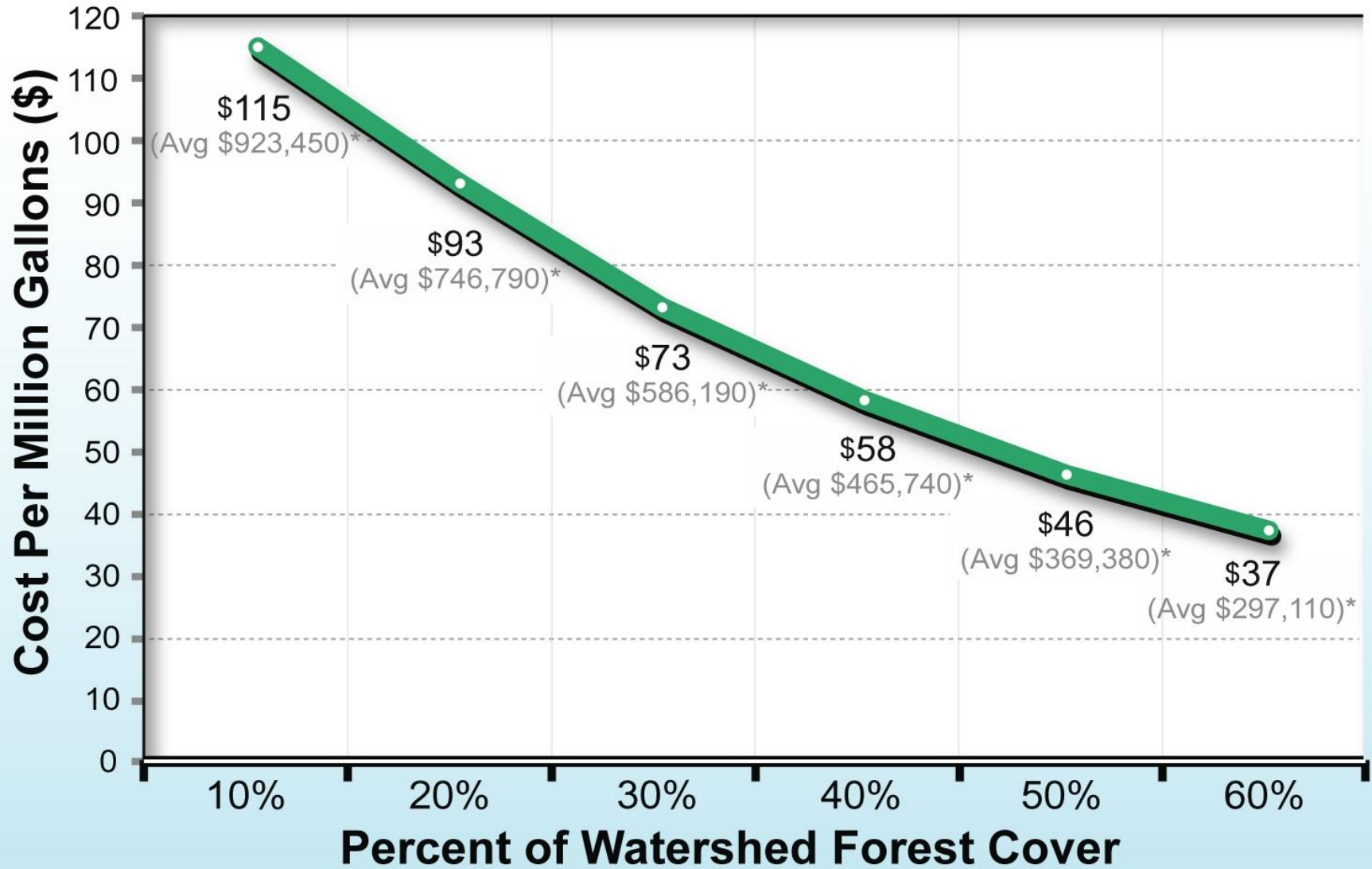
Data Sources: USDA Forest Service  
For more information, visit [www.chesapeakebay.net](http://www.chesapeakebay.net)  
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er, Emily and Al Todd. "From the Forest to the Faucet:  
g Water and Forests in the US." USDA Forest Service. 2011.  
[www.fs.fed.us/ecosystemservices/pdf/forests2faucets/F2F\\_Methods\\_Final.pdf](http://www.fs.fed.us/ecosystemservices/pdf/forests2faucets/F2F_Methods_Final.pdf)

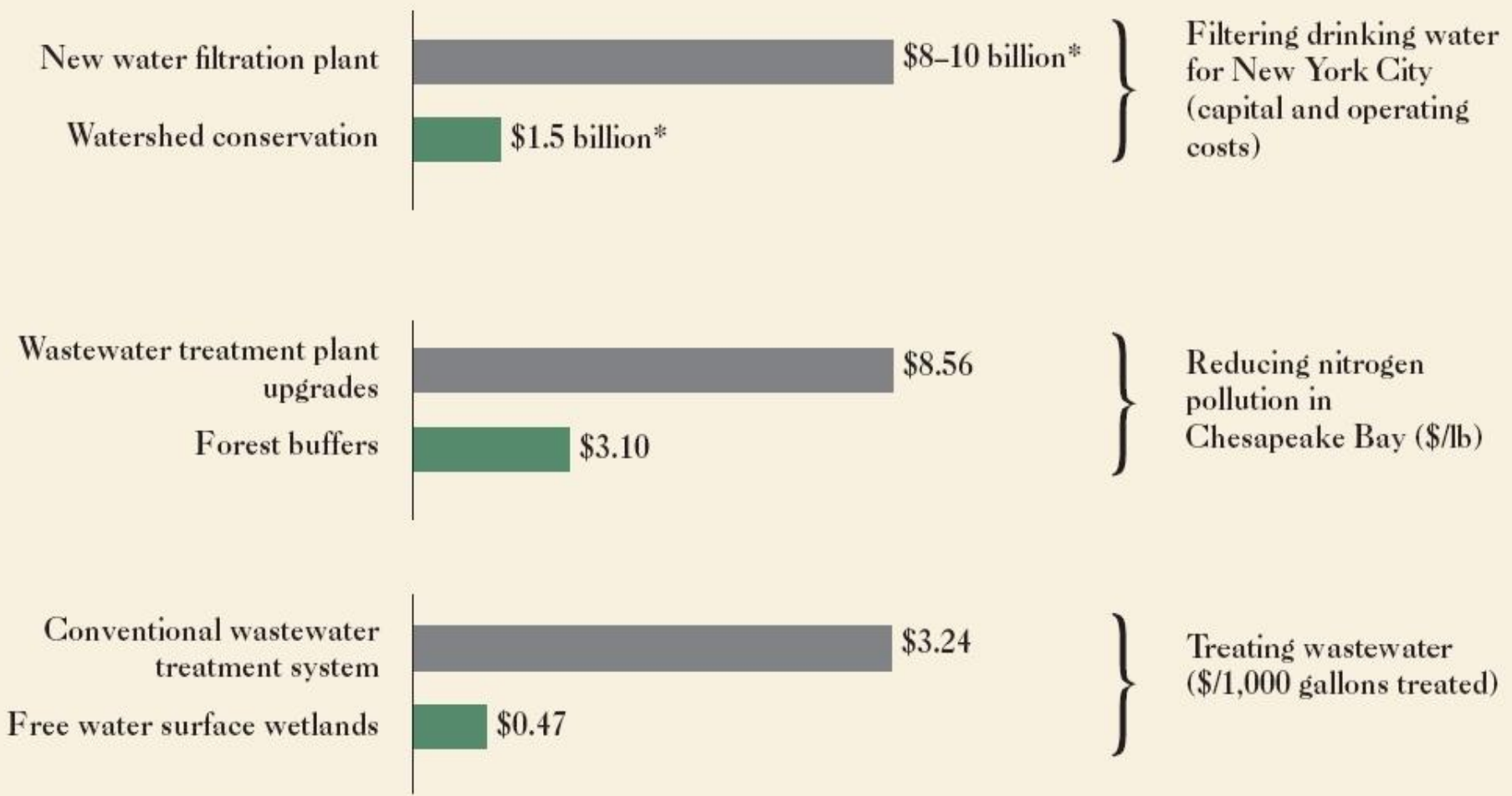
# Relationship Between Forest Cover and Water Treatment Costs



\*Average treatment costs are based on a per plant per year average of 8,030 million gallons.

Source: Ernst et al. 2004

# Green Infrastructure Can Be Less Expensive than Gray Infrastructure



\* Figures represent 2006 U.S. dollars.

Source: Kenny 2006; Wieland et al. 2009; Chesapeake Bay Commission 2004; Corps of Engineers 2003.

# Woodland owners are part of the solution





# Springs and Seeps



A spring seep on Twin Branch, Monongahela National Forest, West Virginia, shows the broad shallow character of the flow.

*Bill Healy / U.S. Forest Service*





Wild turkeys, *Meleagris gallopavo*, use spring seeps for snow-free foraging in early spring.

Bill Healy / U.S. Forest Service

# Wetlands

*...those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support a prevalence of vegetation typically adapted for life in saturated soil conditions.*

# Wetlands



# Vernal Pools







J. DERRY/ TNC





B. LEPROY/PNHP

**Blister sedge**  
*Carex vesicaria*



G. GRESS/TNC

**Buttonbush**  
*Cephalanthus occidentalis*



B. LEPROY/PNHP

**Cinnamon fern**  
*Osmunda cinnamomea*



B. LEPROY/PNHP

**Winterberry**  
*Ilex verticillata*



C. EICHELBERGER/PNHP

**Northeastern bulrush**  
*Scirpus ancistrochaetus*



M. CURRIE/TNC

**Highbush blueberry**  
*Vaccinium corymbosum*







M. CURRIE/ TNC

Spotted Salamander



M. CURRIE/ TNC

Marbled Salamander



C. EICHELBERGER/ PNHP

Jefferson Salamander



M. CURRIE/ TNC

Wood Frog



M. REDMER

Eastern Spadefoot



L. KENNEY

Springtime Fairy Shrimp

# Lakes & Ponds



**If you have a water source...**

**Protect it**

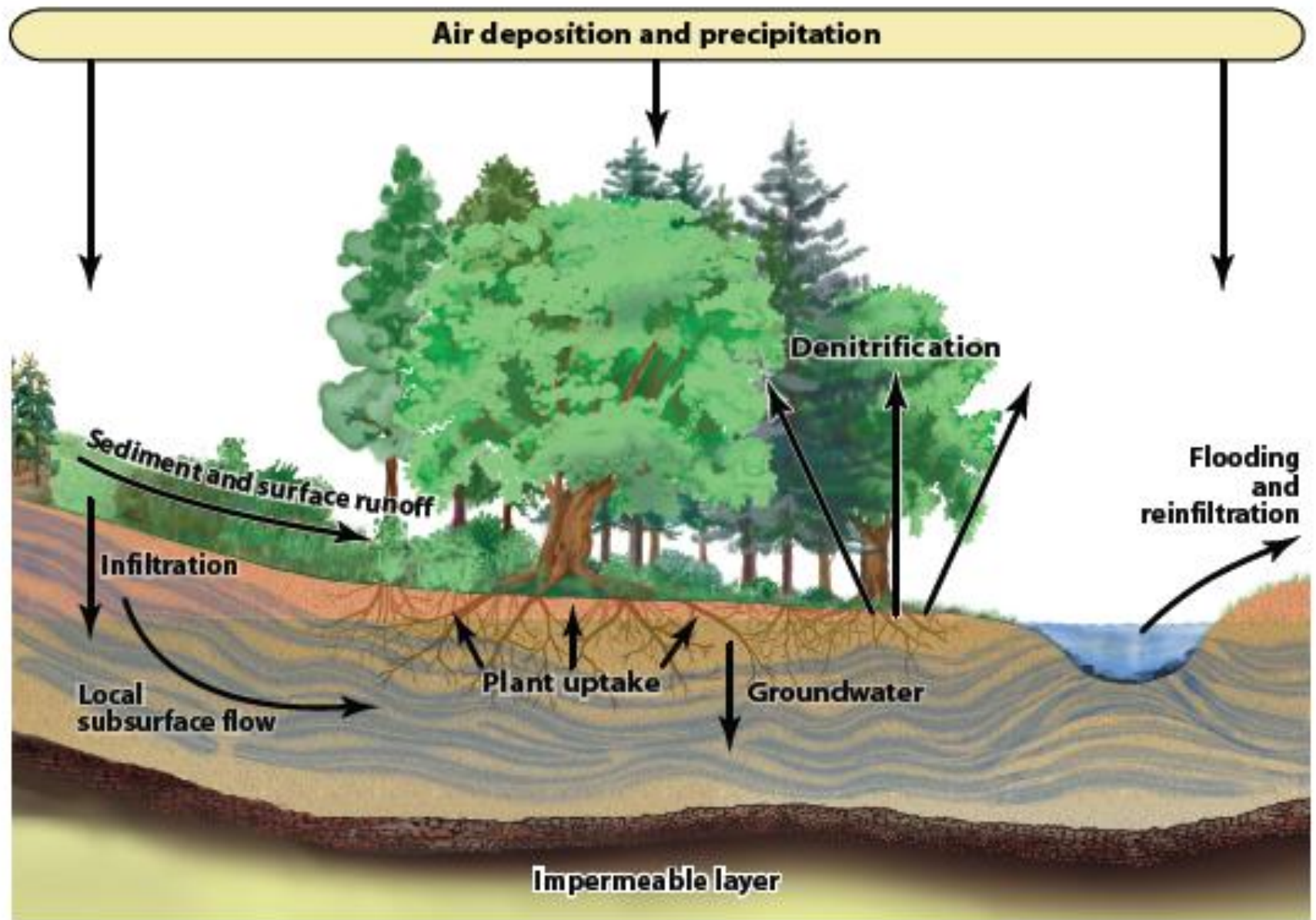




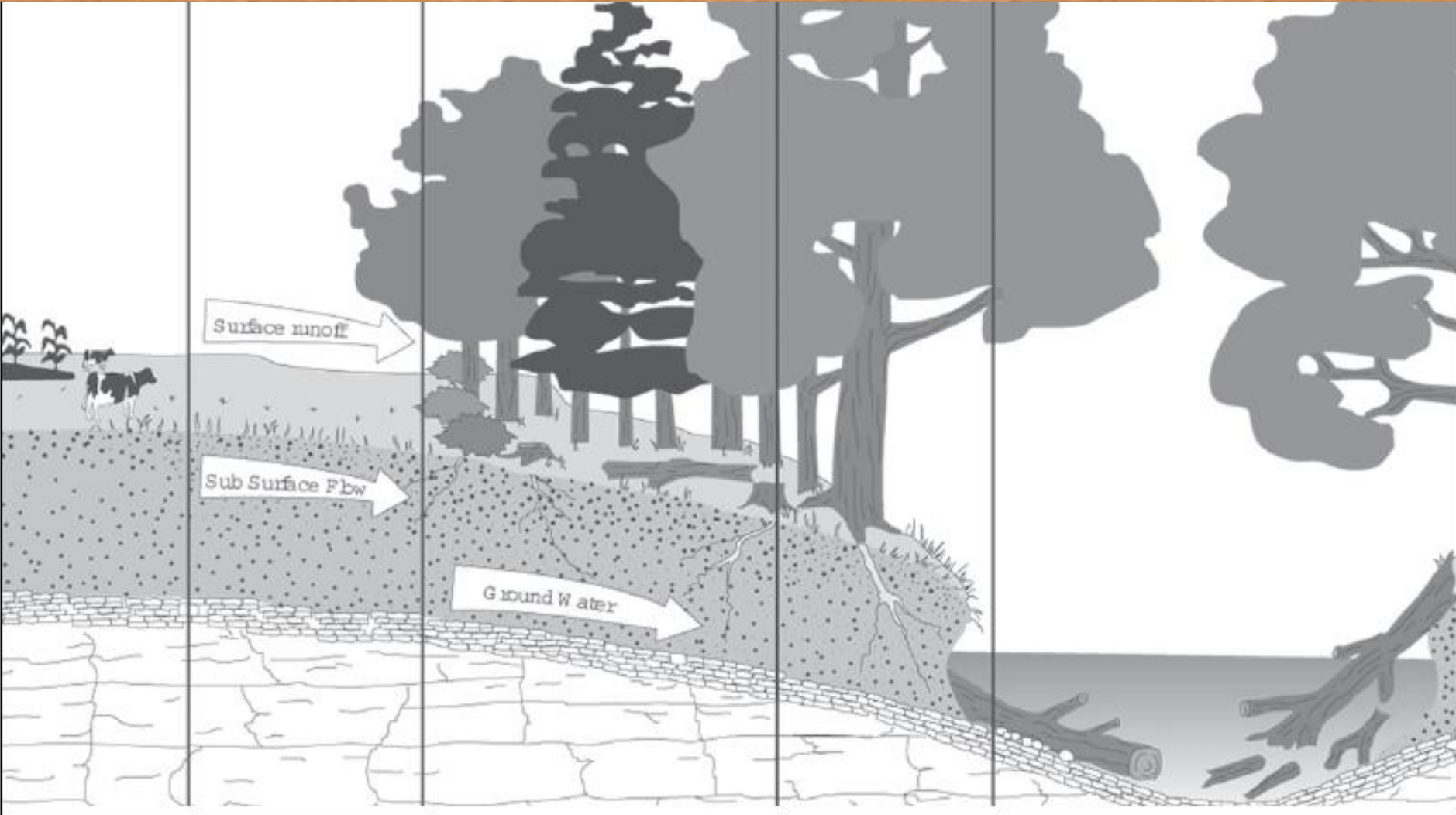
VIRGINIA'S FORESTRY  
BEST MANAGEMENT  
PRACTICES  
FOR WATER QUALITY

**Technical Manual  
2011**

# Nutrient Flows Through a Riparian Buffer







Cropland/  
Pastureland/  
Developed Areas

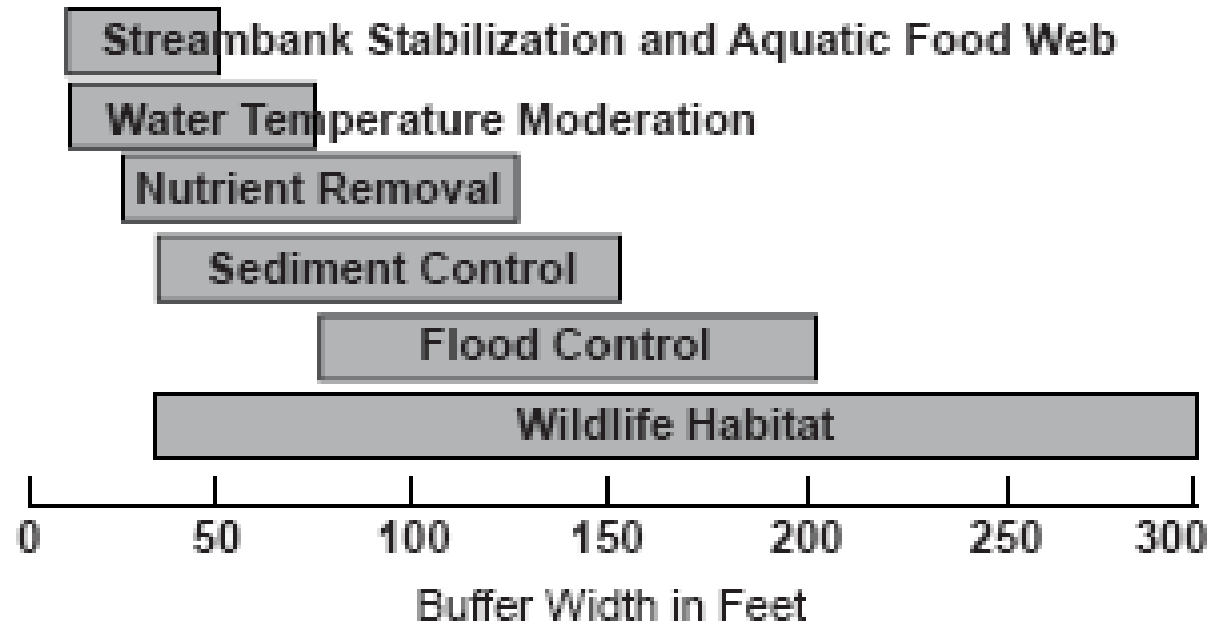
**Zone 3  
GRASS**

**Zone 2  
MANAGED FOREST**

**Zone 1  
UNDISTURBED  
FOREST**

**Streambottom/Channel**

# Recommended Minimum Buffer Widths to Achieve Specific Objectives











**United States Department of Agriculture**  
Natural Resources Conservation Service





# VIRGINIA DEPARTMENT OF FORESTRY

*Protecting and developing healthy, sustainable forest resources*



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- [Oaks](#)
- [Other Hardwoods](#)
- [Seed Mixtures](#)
- [Small Trees & Wildlife](#)
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Price: \$45.00



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[Quantity: 25](#)



# A Healthy Woodlands Partnership

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**Forestry for the Bay** is a free, voluntary membership program made up of small and medium sized landowners who, like you, are interested in actively conserving their woodland or want to restore woods to their property.



photo - Mark Prout, USFS

### How It Works

By simply completing our enrollment form you will instantly have access to the Woodlands Resource Page... [read more](#)



photo - Rob Hoelscher, USFS

### Who We Are

The program is a collaborative effort of the US Forest Service, the Chesapeake Bay Program and the Alliance for the Chesapeake Bay... [read more](#)



A Message from Craig Highfield, Forestry for the Bay Coordinator

JOIN NOW!





[www.forestryforthebay.org](http://www.forestryforthebay.org)

chighfield@chesapeakebay.net

410-267-5723