

Land Use & Water Quality:

Watershed Connections

A partnership of the Interstate Commission on the Potomac River Basin and the Patuxent River Park, Maryland-National Capital Park and Planning Commission



Part One

Introduction to Maryland Waterways and Watersheds

Maryland's Treasures



1



2



3



4

Maryland's "Other" Waterways

Oil, toxins and road salt



5

Acid Mine Drainage



6

Channelization



7

Erosion and Sedimentation



8

Troubled waters...



9

- ▶ **46%** of Maryland's Streams are in "Poor" Condition.
 - ▶ Only **12%** are in "Good" Condition



Good Health, Poor Health — what does it mean?

Healthy streams have...

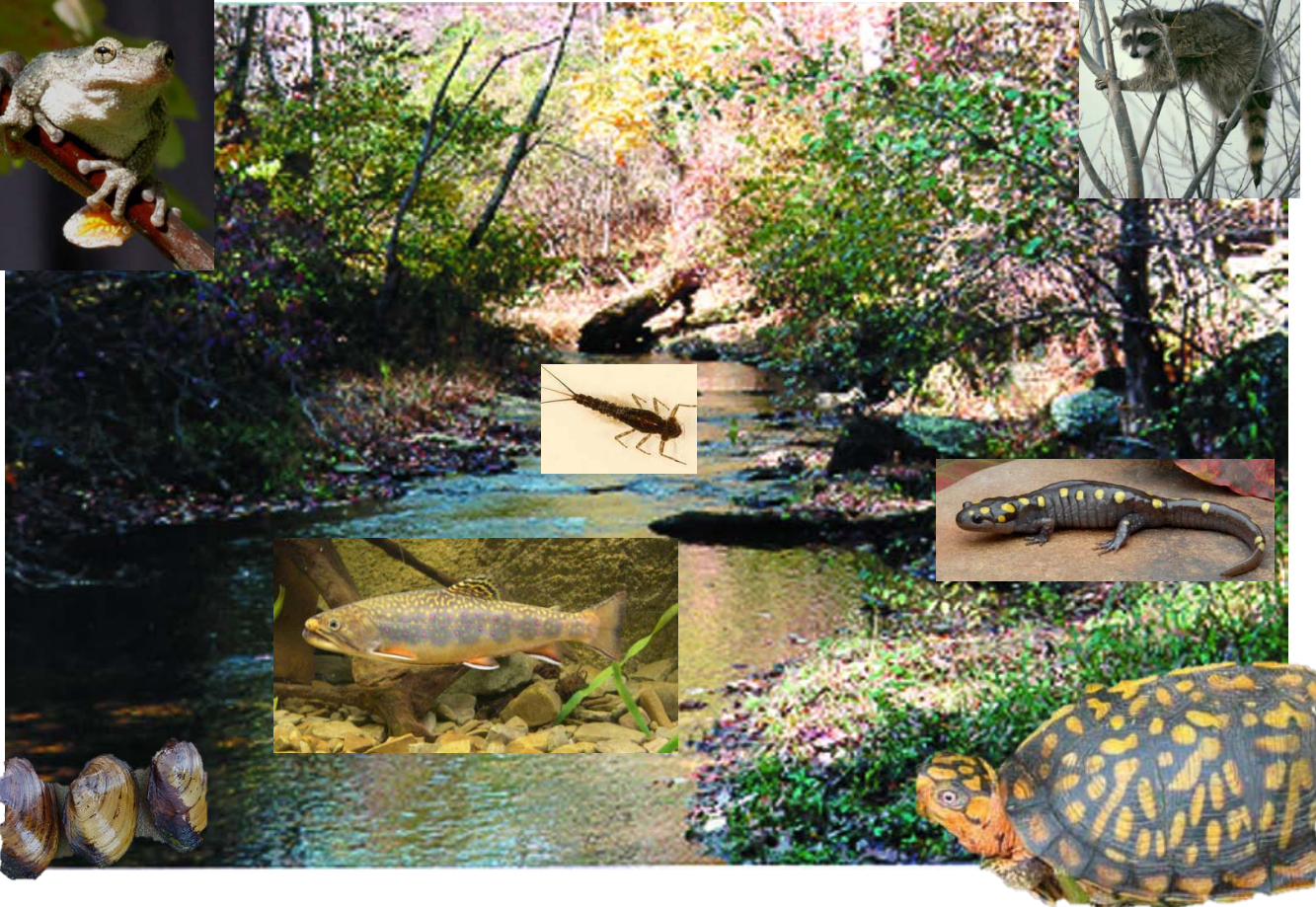


- Plants & trees growing along bank

- Diverse habitats

- Chemical and physical properties acceptable for aquatic life

- Safe water for human recreation



What makes an “unhealthy” stream?

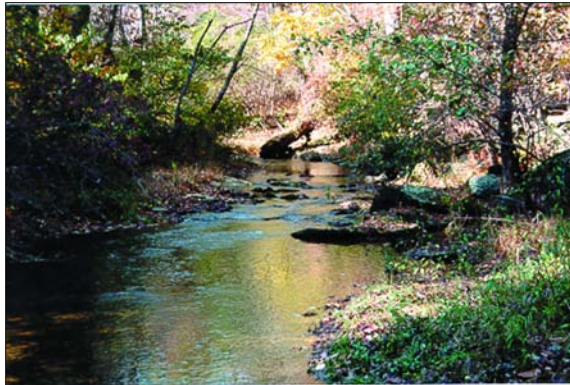
Good Streams

- Plants along bank
- Diverse habitats
- Chemical properties acceptable for aquatic life
- Safe for human recreation

Versus

Poor Streams

- Lack habitats
- Are polluted
- Lack trees, plants, and shade
- Unsafe for public use
- Filled with trash and sewage



Why it matters...

- Main source for drinking water



Why it matters...

- Lowers the beauty of a stream
- Deters swimming, wading, boating...



Why it matters...

- Pollution affects our food supply



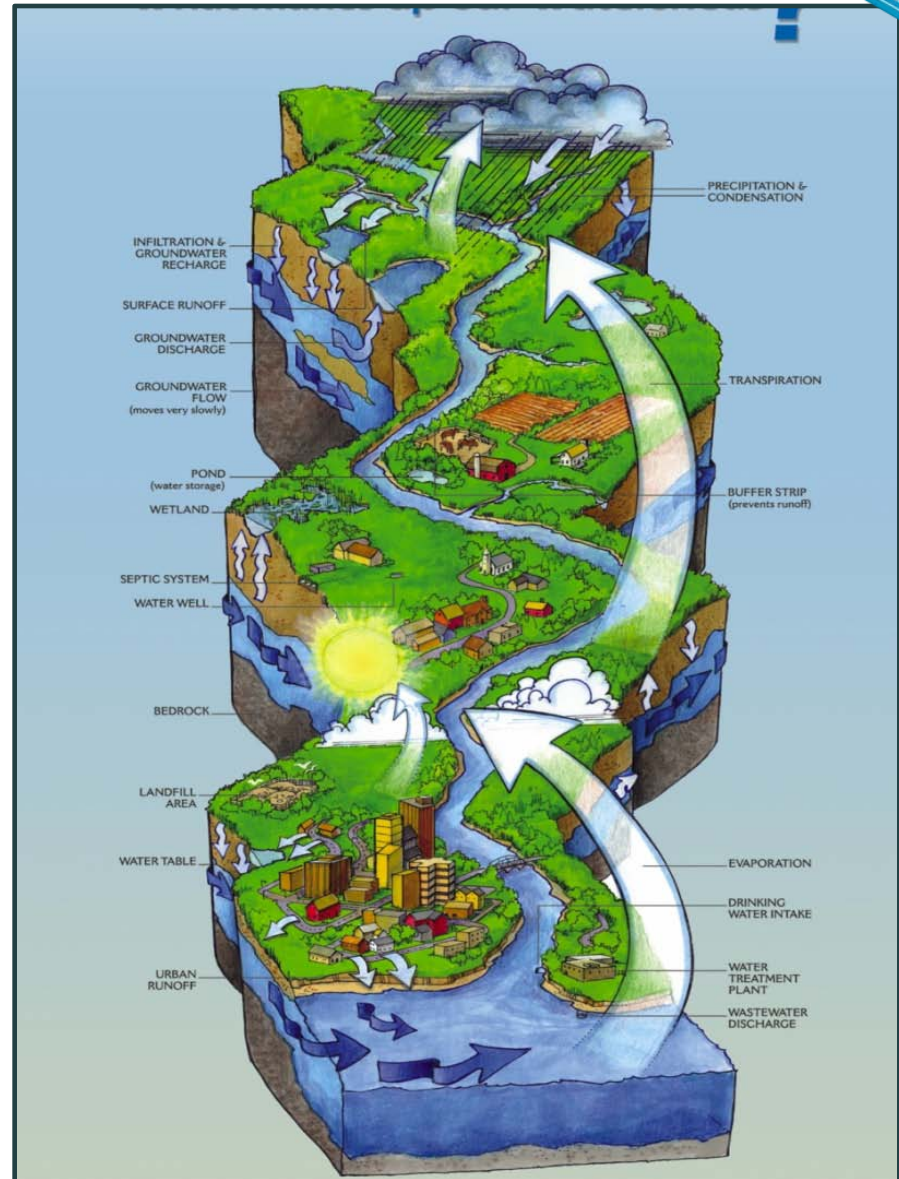


Why it matters....

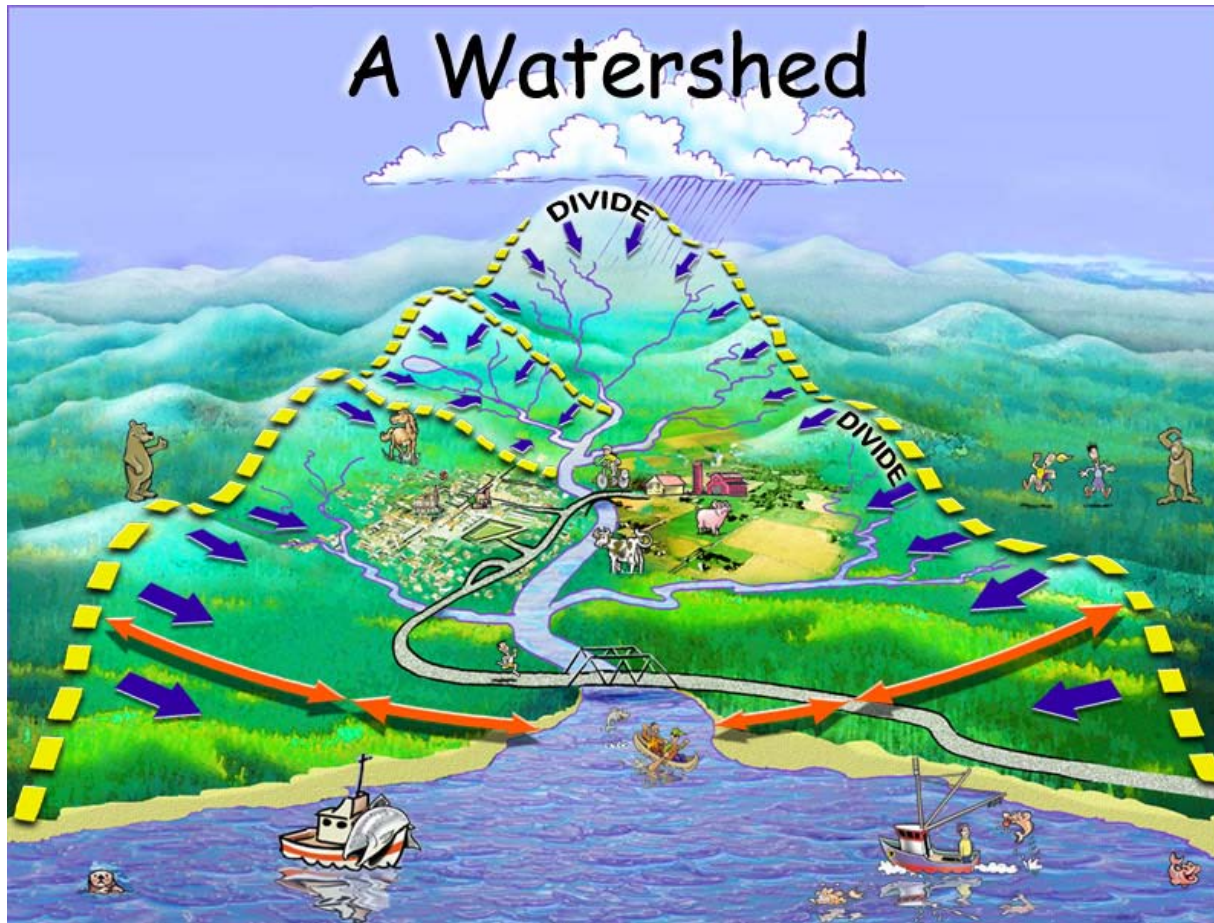


Protecting Our Water Resources

To protect and restore water quality, we need a *watershed perspective.*



So what is a watershed?



Watershed: An area of land where the water drains into a common source, such as a stream, pond, or bay

A **watershed perspective** looks at how our land use affects our waterways.



Our Chesapeake Bay Watershed

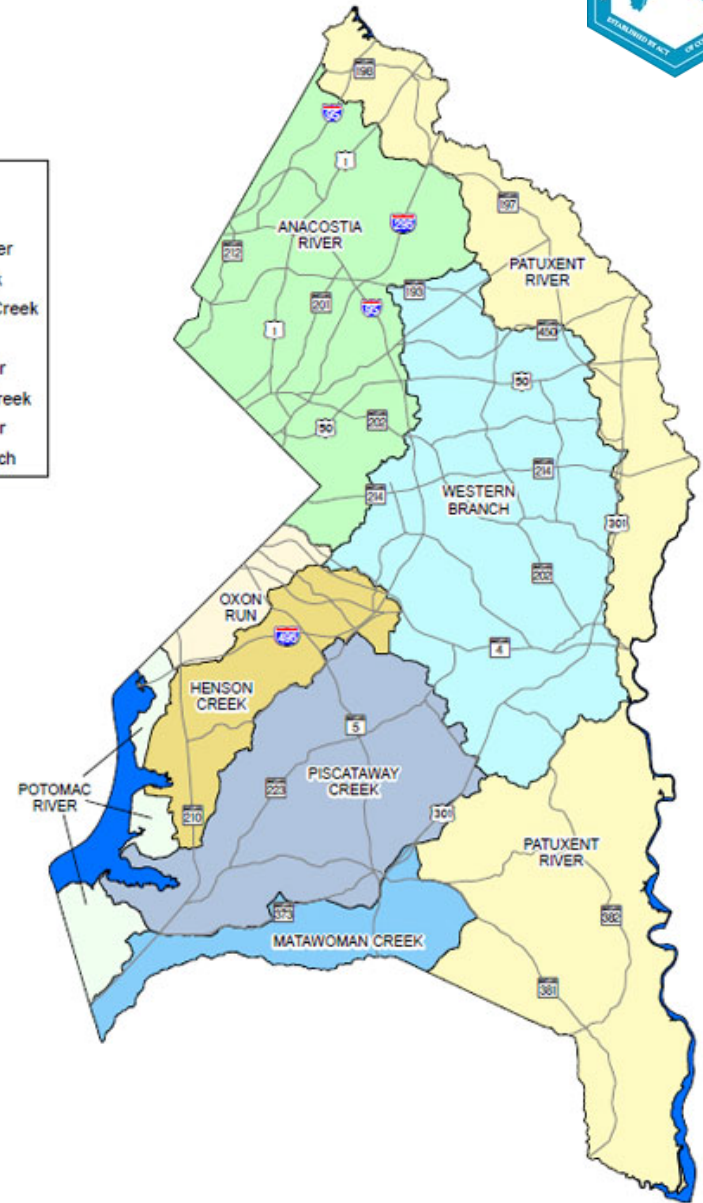
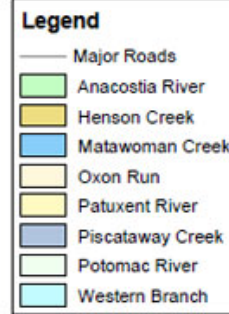
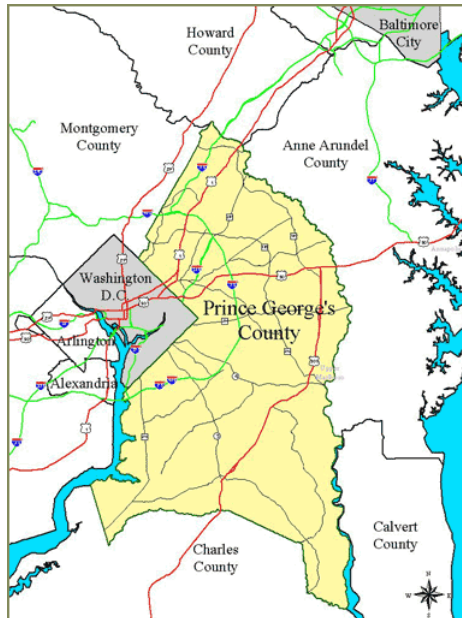


- Maryland is nested in one of largest watersheds on the East Coast, the Chesapeake Bay drainage basin.
- What other states are part of the Chesapeake Bay Watershed?



Watersheds within watersheds

Youghiogheny

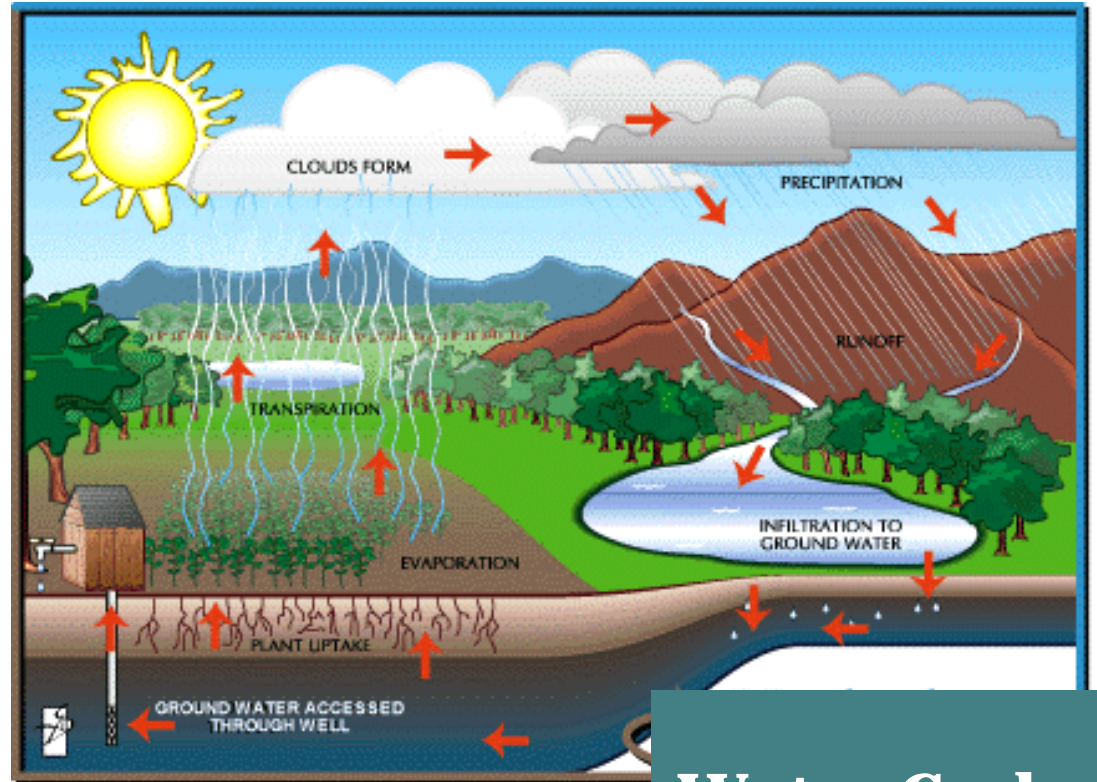
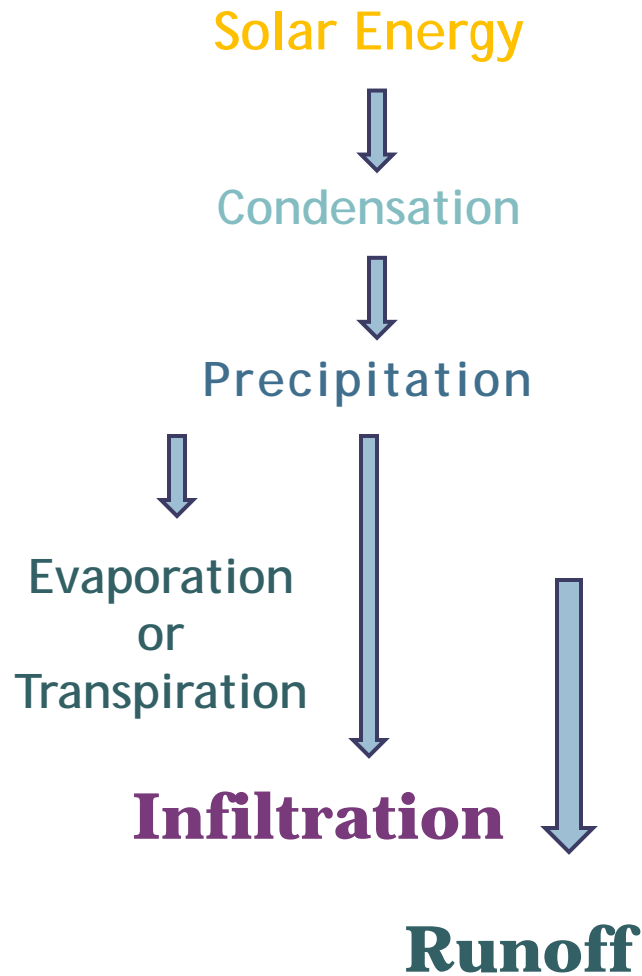


<http://www.anacostiaws.org/explore/maps>

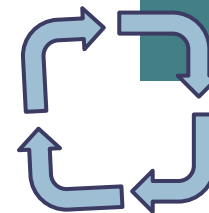


True or False?

- A watershed only includes the land surface.
 - **FALSE**
- A watershed is a building for holding run-off water after a rainstorm.
 - **FALSE**
- The way land is used in a watershed affects water quality.
 - **TRUE**
- Everyone lives in a watershed.
 - **TRUE**
- Watersheds are drawn on maps according to political jurisdictions.
 - **FALSE**
- Some watersheds are hilly; others are relatively flat.
 - **TRUE**



Water Cycle





Part Two

Land Use:

How infiltration, runoff,
and water quality
differ in different landscapes...

Land Use:

Wetlands

Wetlands include :

Forested swamps in the low-lying flood-plains of rivers.

Marshes bordering the Chesapeake Bay and our large tributaries.



Wetlands now only cover 10% of Maryland;
73% have been destroyed since pre-colonial times.

Land Use:

Wetlands

Act as natural water filters

- Plants absorb pollutants
- Roots & leaves slow water flow and catch sediment in the water

And sponges

- Organic-rich soil hold water
- Water-loving plants draw up and transpire water.



Land Use:

Forests



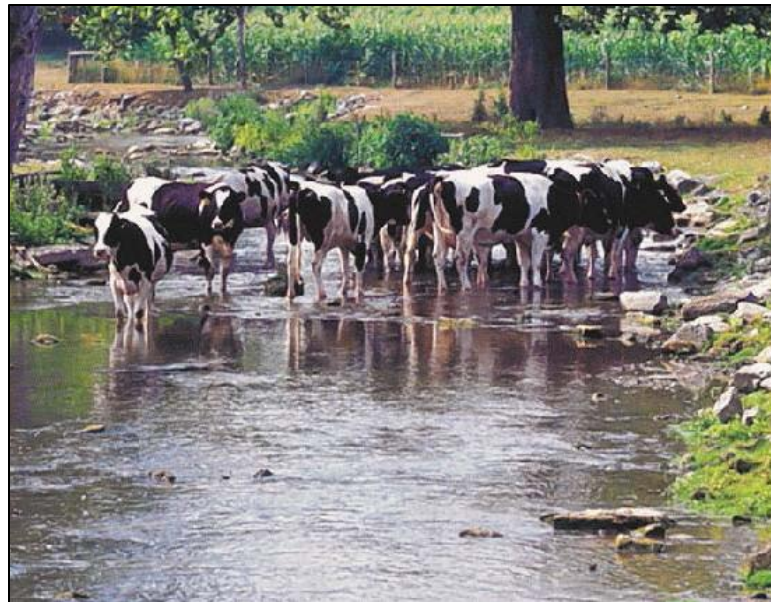
Let's
discover
some
connections
between
forests and
water
quality.

Where does
the rain go
in this
scene?

Land Use:

Agriculture

- Where does the rain water go?
- What does the runoff carry?





Effects of Land Use: Farm Land

INPUTS

- Fertilizer --excessive nitrogen and phosphorous downstream
- Pesticides
- Animal waste runoff

RESULTS

- **Algae blooms**
 - **Reduced oxygen**
 - **Reduced aquatic life**

INPUT

- Excessive sediment in rivers

RESULTS

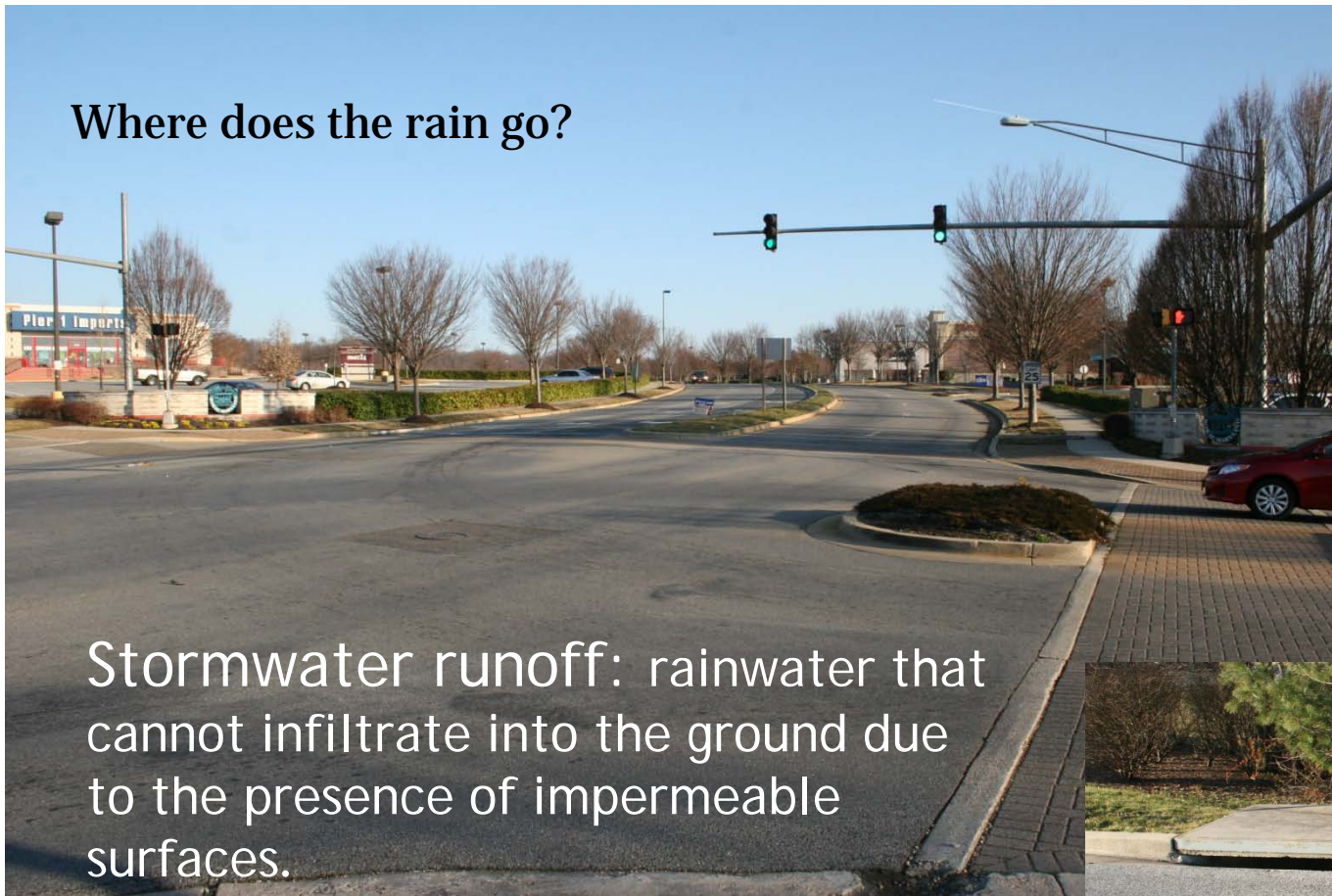
- **Murky waters: less sunlight reaches plants**
- **Fewer underwater plants = reduced dissolved oxygen**
- **Buried bottom habitat**
- **Clogged gills for fish and smaller invertebrates**



Land Use:

Cities and Suburbs

Where does the rain go?



Stormwater runoff: rainwater that cannot infiltrate into the ground due to the presence of impermeable surfaces.





Urban



Our Main Focus: Stormwater Runoff



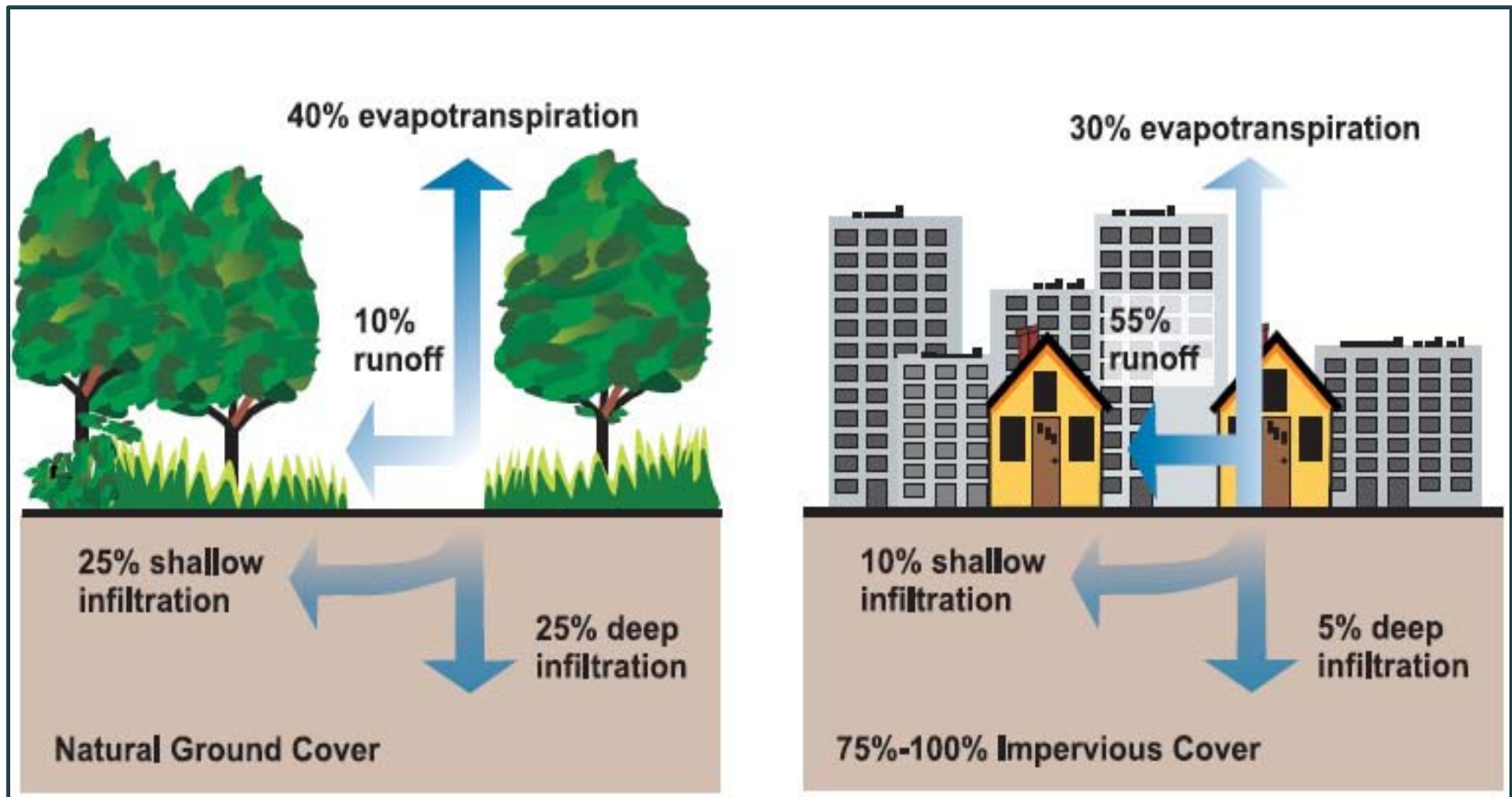
**Stormwater runoff
is the only growing
source of water
pollution.**





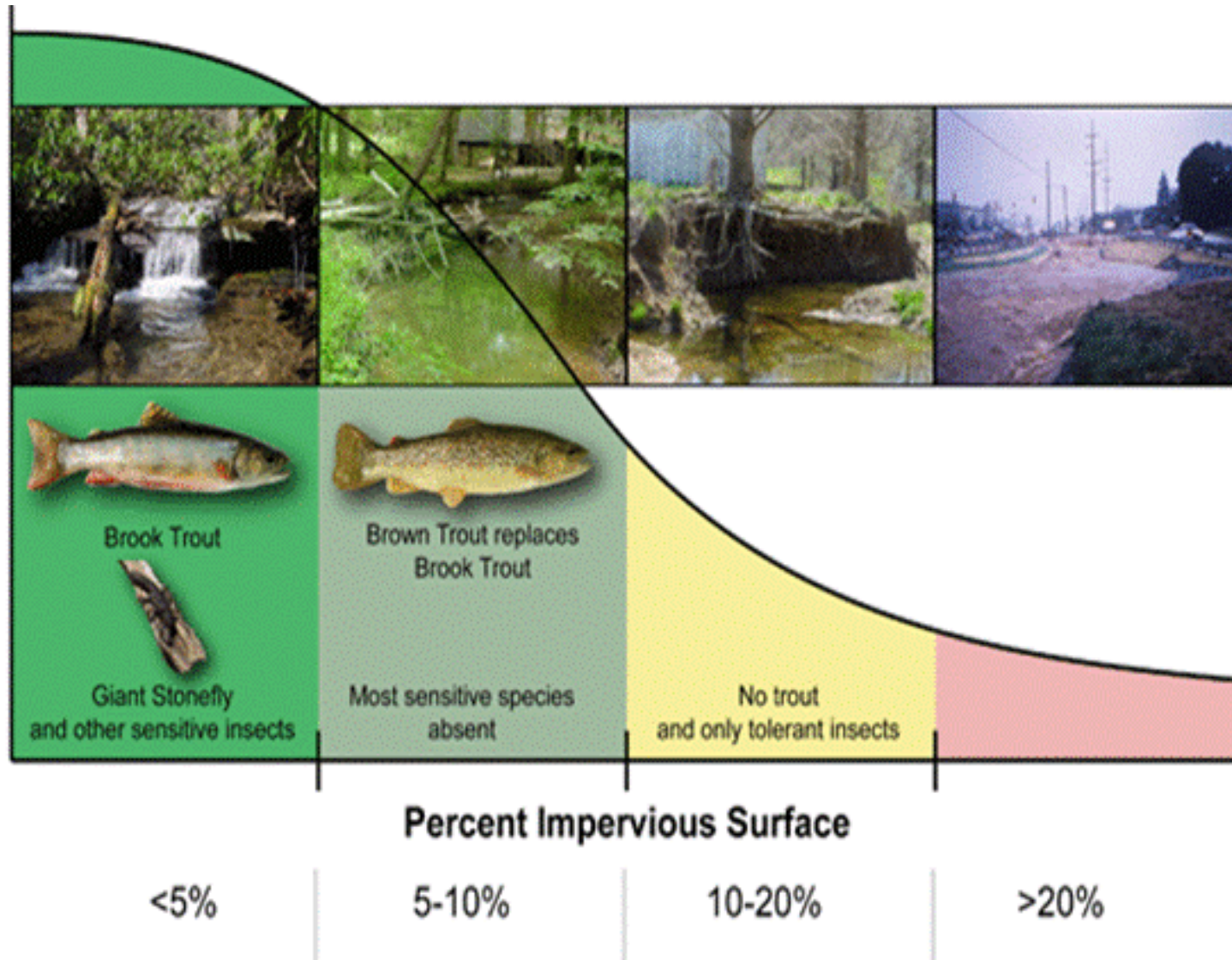
- Why is increased impervious surface linked to stream erosion?
- What are some effects of stream erosion?

Forests versus Cities





Land Use and Water Quality

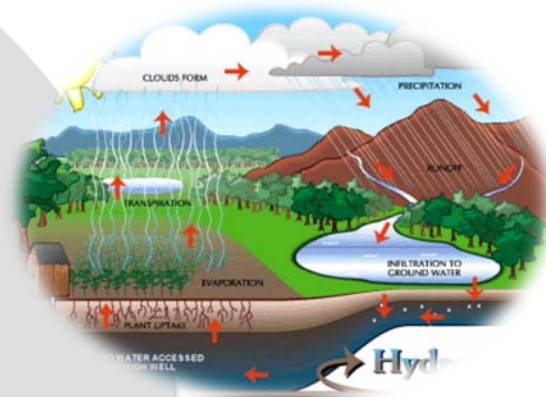


It's All Connected

The Water Cycle –
*Infiltration, Runoff,
Evaporation*

**Land Use &
Land Cover**

Healthy Water Resources





Part Three

Best Management Practices and
Stormwater Solutions:
Enough of the Bad Stuff!
What can we do to
protect our streams?



Protecting Our Watershed

- *Best Management Practices for farms:*

- Tree buffers by streams
- Fences around animals
- Less fertilizer
- Crop rows parallel to slope
- No-till farming



Protecting our Watershed:

Stormwater Pollution Solutions

Conservation Gardens

- Slow down the runoff.
- Spread it out.
- Let it soak in.



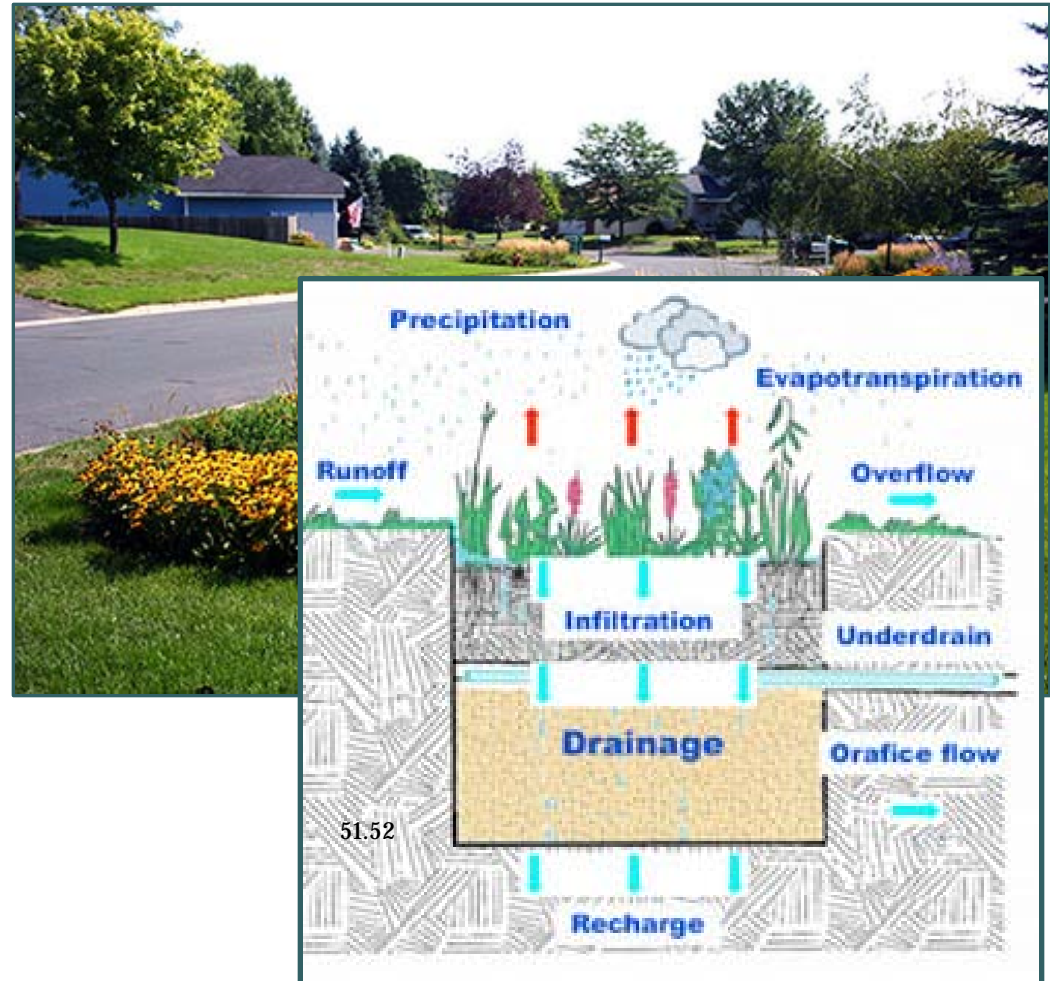
Better yet...

- Plant and protect forests



Rain Gardens: multiple benefits

- The basin catches runoff and allows it to infiltrate.
- The plants and soil bacteria clean the stormwater.
- Provides food for butterflies, birds, insects, rabbits, squirrels, mice....



Catch it: Rain Barrels

- Catch storm water from gutters.
- Direct it over garden and lawn.
- Reduce water use during droughts.
- Use for water education.



Contest Fairfax
County website

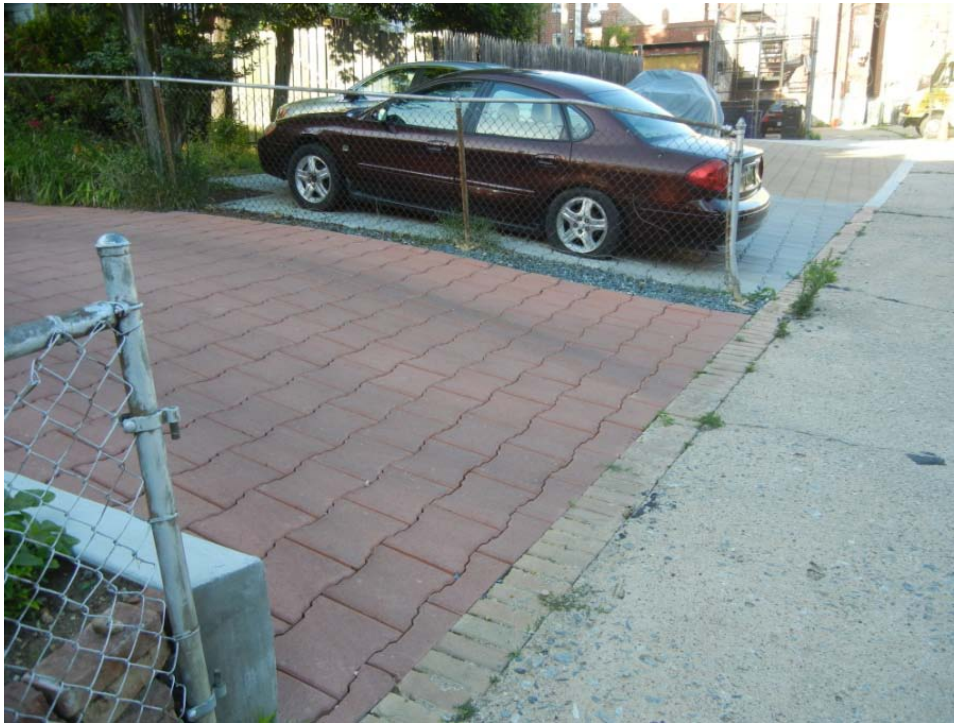
Change impervious surfaces to natural ones.

From Green Roofs to Grass Swales...



55.56.57

...to Pervious Pavement



What YOU can do everyday...

- Scoop the poop.
- Recycle and dispose trash properly.
- Use less fertilizer and pesticides.
- Keep waste out of storm drains.
- Raise Awareness.



It's your
world.
Envision it.





Resources for Student Research

- Daniels. M, Pennington. J, Sharpley. A. Best Management Practices for Livestock Farms, University of Arkansas Cooperative Extension
- *Maryland Department of Natural Resources*. Web. 2 Dec. 2011.
<<http://www.dnr.state.md.us/streams/OurMDStreams.asp>>.
- <http://www.dnr.state.md.us/streams/publications.asp>
- http://www.dnr.state.md.us/streams/pdfs/state_factsheet.pdf
- <http://www.dnr.state.md.us/streams/pdfs/md-streams.pdf>: interactive map to find the health of your stream and watershed. No special software needed.
- Impervious Surface and Flooding: <http://ga.water.usgs.gov/edu/impervious.html>



Picture References INCOMPLETE

1. Northwest Branch, Montgomery County, MD, *Maryland Streams Take a Closer Look*, Maryland Department of Natural Resources, Photo Library, Copyright 1999.
2. Great Falls, MD, *Maryland Streams Take a Closer Look*, MDNR.
3. Patuxent River at Patuxent River Park Overlook, Rebecca Wolf
4. Coastal Plain stream, *Maryland Streams Take a Closer Look*, MDNR.
5. Maryland Streams Take a Closer Look, MDNR.
6. Maryland Streams Take a Closer Look, MDNR.
7. Maryland Streams Take a Closer Look, MDNR.
8. Alan Bull: channelized stream in Anacostia watershed, Cheverly, MD.
9. Maryland Streams Take a Closer Look, MDNR.
10. Background Photo: Maryland Streams Take a Closer Look, MDNR.
11. Gray Tree Frog, John White, Maryland DNR, <http://www.dnr.state.md.us/wildlife/Plants_Wildlife/herps/Anura/GrayTreeFrog.asp>
12. Mussels, South Carolina Department of Natural Resources <<http://www.dnr.sc.gov/fish/species/shellfish/index.html>>
13. Brook Trout, Ohio Department of Natural Resources <http://www.dnr.state.oh.us/Home/species_a_to_z/SpeciesGuideIndex/brooktrout/tabid/6574/Default.aspx>
14. Spotted Salamander, John White, Field Guide to Maryland's Salamanders and Newts, http://www.dnr.state.md.us/wildlife/Plants_Wildlife/herps/Caudata/Spotted.asp
15. Box Turtle, Scott Smith, MDNR.
16. White-tailed Deer, <http://www.deer-pictures.com/white_tailed_deer.html>
17. Maryland Streams Take a Closer Look, MDNR
18. Channelized stream, Alan Bull
19. Little Girl Drinking, *Tweedy Plumbing*. Web. <http://www.tweedyplumbing.com/water-plumbing.html>
20. *Stormwater Regulatory Background*. Photograph. *Arkansas State Highway and Transportation Department*. Web. 08 Feb. 2012. <<http://arkansashighways.com/stormwater/regulations.aspx>>.
21. Distended Menhaden TO BE FOUND
22. Brown Catfish, Lip Lesion, Potomac River, <http://www.fws.gov/chesapeakebay/Newsletter/Spring12/Bullheads/Bullheads.html>
23. Brown Catfish Tail Lesion, Potomac River, TO BE FOUND
24. *Where Can I Watch a Bald Eagle in Flight?* <http://canidoit.org/where-can-i-watch-a-bald-eagle-in-flight>
25. Beaver Stripping Bark from a Twig, National Geographic http://animals.nationalgeographic.com/animals/enlarge/beaver_image.html
26. Stonefly Larvae: TO BE FOUND
27. "Our Watershed - Plum Creek Watershed Partnership." *Plum Creek Watershed Partnership*. Web. 08 Feb. 2012. <<http://pcwp.tamu.edu/our-watershed>>.
28. Chesapeake Bay Watershed image, <<http://en.wikipedia.org/wiki/File:ChesapeakeWatershedMap.png>>.
29. Prince Georges County Map, [http://www.princegeorgescountymd.gov/Government/AgencyIndex/DER/ESG/watershed-plan.asp?nivel=foldmenu\(7\)](http://www.princegeorgescountymd.gov/Government/AgencyIndex/DER/ESG/watershed-plan.asp?nivel=foldmenu(7))
30. Prince Georges County Watersheds, [http://www.princegeorgescountymd.gov/Government/AgencyIndex/DER/ESG/watershed-plan.asp?nivel=foldmenu\(7\)](http://www.princegeorgescountymd.gov/Government/AgencyIndex/DER/ESG/watershed-plan.asp?nivel=foldmenu(7))
31. State Major Watershed, MDNR
32. Hydrologic Cycle, James River Association http://www.relia.net/~thedane/soil_water.html
33. Rivulet, Woodland, Patuxent River Park, Rebecca Wolf
34. Woods, Patuxent River Park, Rebecca Wolf
35. Woods, Patuxent River Park, Rebecca Wolf
36. Parking Lot, Rebecca Wolf
37. Drain, Rebecca Wolf



Photo Sources continued

39. To Be Found
40. Sedimentation Pond, Rebecca Wolf
41. Storm Outlet, Rebecca Wolf
42. *Protecting Water Quality from Urban Runoff*. Environmental Protection Agency <http://www.epa.gov/owow/NPS/urban_facts.html>
43. *Maryland Streams Take a Closer Look*, MDNR
44. *Maryland Streams Take a Closer Look*, MDNR.
45. Crop Rows: To Do. Maybe. *Cropland*. Photograph. *Allamakee SWCD*. Web. 09 Feb. 2012. <<http://allamakeeswcd.org/conservation-practices/cropland-2/>>.
46. Crop Rows: - Source Unknown
47. Cows in stream: - Source Unknown
48. Farming Best Management Practices - *Source Unknown*
49. Marsh, Rebecca Wolf
50. http://www.dogster.com/files/post_images/e51efaf193ecf5a9718b0991a5c9f097.jpg
51. - Source Unknown
52. - Source Unknown
53. - Source Unknown
54. "LID Urban Design Tools - Rain Barrels & Cisterns." *Low Impact Development (LID) Urban Design Tools*. Web. 13 Jan. 2012. <http://www.lid-stormwater.net/raincist_specs.htm>.
55. Green Roof - Source Unknown
56. Grass Swale - Source Unknown
57. Gravel Swale - Source Unknown
58. *File:Natural Playground by The Natural Playgrounds Company.jpg*. Photograph. *Wikipedia, the Free Encyclopedia*. Web. 1 Feb. 2012. <http://en.wikipedia.org/wiki/File:Natural_Playground_by_The_Natural_Playgrounds_Company.jpg>.
- 59 a& b. Patuxent River Park Watershed Models, photo by Tarryn Lee, 2012.