Green Building Workshop Series
Eco-City Alexandria
Initiative

Workshop 3
Green Landscaping
For You and the Chesapeake Bay

May 7, 2011
9:00 am – 12:30 pm
Cora Kelly School

Alexandria, Virginia

Our Speakers Today

- **Claudia Hamblin-Katnik,** Ph.D.**,** Watershed Program Administrator, Office of Environmental Quality, City of Alexandria
- **Lauren Wheeler,** LEED AP, M.A., Landscape Design, ISA Certified Arborist
- **Kristen Buhls,** Extension Agent, Virginia Cooperative Extension
- **Sandra Leibowitz**, LEED AP, Principal, Sustainable Design Consulting, LLC

Workshop Overview

1. Background of Eco-City Alexandria Program
2. Challenges to the Chesapeake Bay
3. Designing your landscape to save water and energy and protect the Bay
4. How to construct rain gardens in Alexandria
5. Using native plants in your garden
6. Local information and resources
7. Q&A with presenters

Green Building Workshop Series

Next Workshops, Save the Dates NOW!

Green + Historic Properties = The Best of Both - **June 4, 2011**

Renewable Energy Systems and Green Power - **September 24, 2011**

Green Operations for Retail, Restaurants, and Small Offices - **TBD**

Workshop series funded by EECBG.

Eco-City Alexandria

Eco-City Charter Principles

- Land Use and Open Space
- Water Resources
- Air Quality
- Transportation
- Energy
- Building Green
- Solid Waste
- Environmental Health
- Emerging Threats & Climate Change
- Implementation

- **Environmental Action Plan**

Energy Efficiency and Conservation Block Grant Projects

- Energy Conservation (Green Building Phase II)
- Energy Audits and Energy Efficiency Retrofits for City Buildings
- Green Fleet
- Green Jobs Training
- Green Loans
- LED Traffic Signals/LED Street Lights
- Renewable Energy Installation at City Facility

Challenges to the Chesapeake Bay

Claudia Hamblin-Katnik, Ph.D
Watershed Program Administrator
Office of Environmental Quality
City of Alexandria

What is a Watershed?

A watershed is the total land area that drains water into a given river, lake, estuary or other body of water. A watershed can be quite large (e.g., the Chesapeake Bay watershed) or small (e.g., the watershed of a local stream). More than 64,000 square miles of land drain into the Chesapeake Bay and its rivers.

Why Study Watersheds?

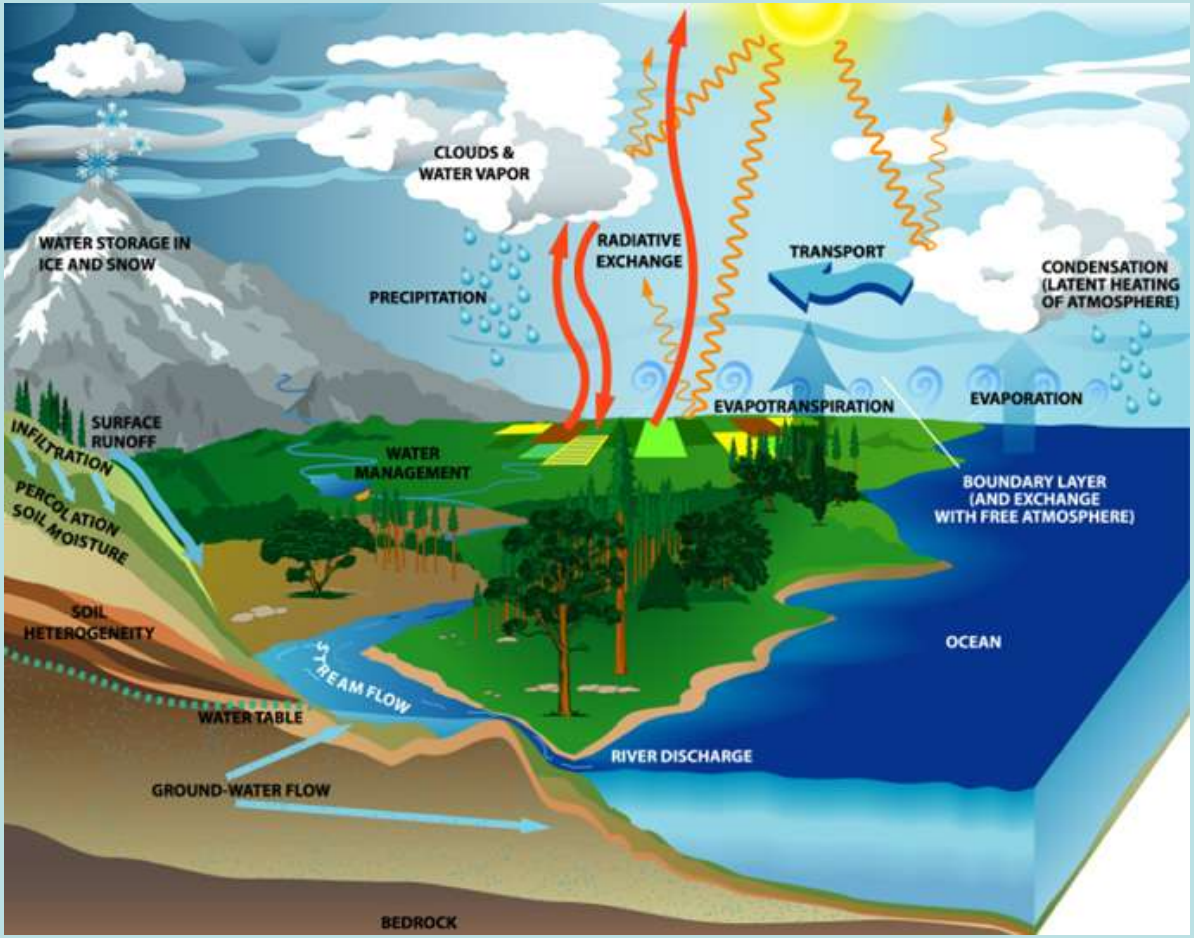
Water is the unifying force of all life

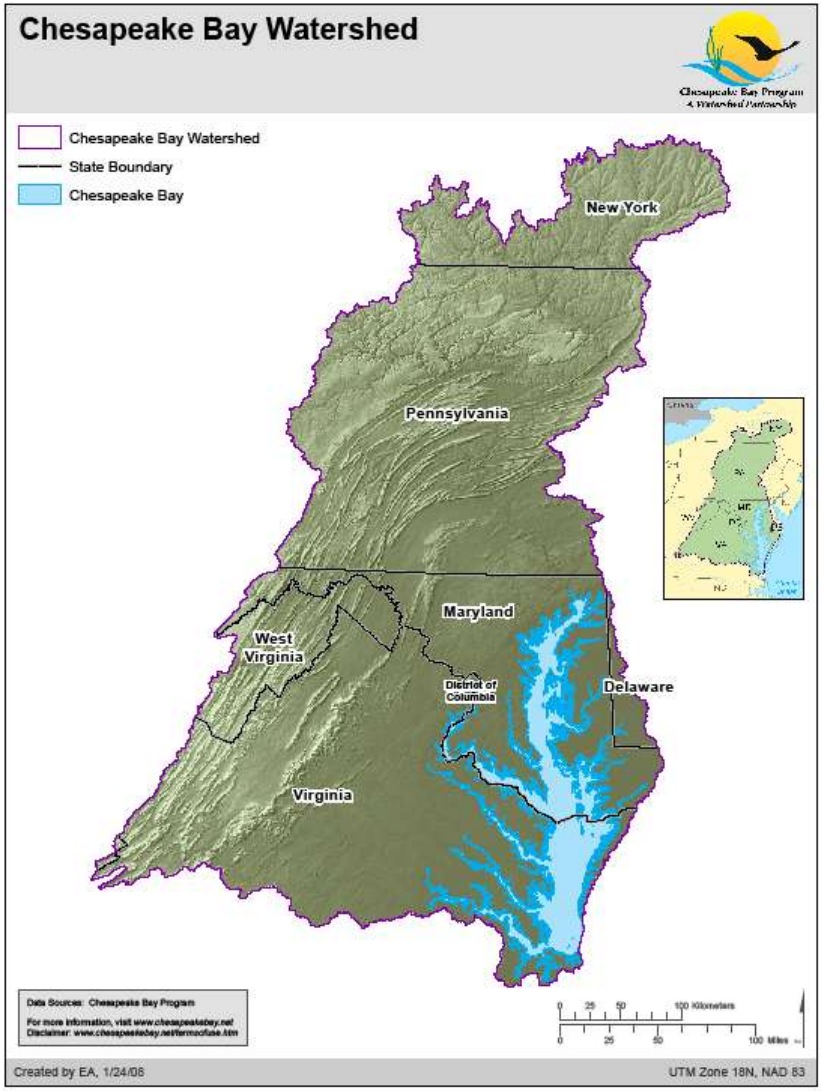
The land over which it flows contributes to the health of all who consume or live in water.

Waterways connect the lives and actions of people, animals

Freshwater terrestrial watersheds feed oceans, which then seed clouds to refresh terrestrial waterways. Water is a cycle.

The Hydrologic Cycle




Chesapeake Bay Watershed
Chesapeake Bay Program
A Watershed Partnership
Chesapeake Bay Watershed
State Boundary
Chesapeake Bay
New York
Pennsylvania
Maryland
West Virginia
District of Columbia
Delaware
Virginia
Data Sources: Chesapeake Bay Program
For more information, visit www.chesapeakebay.net
Disclaimer: www.chesapeakebay.net/termsofuse.htm
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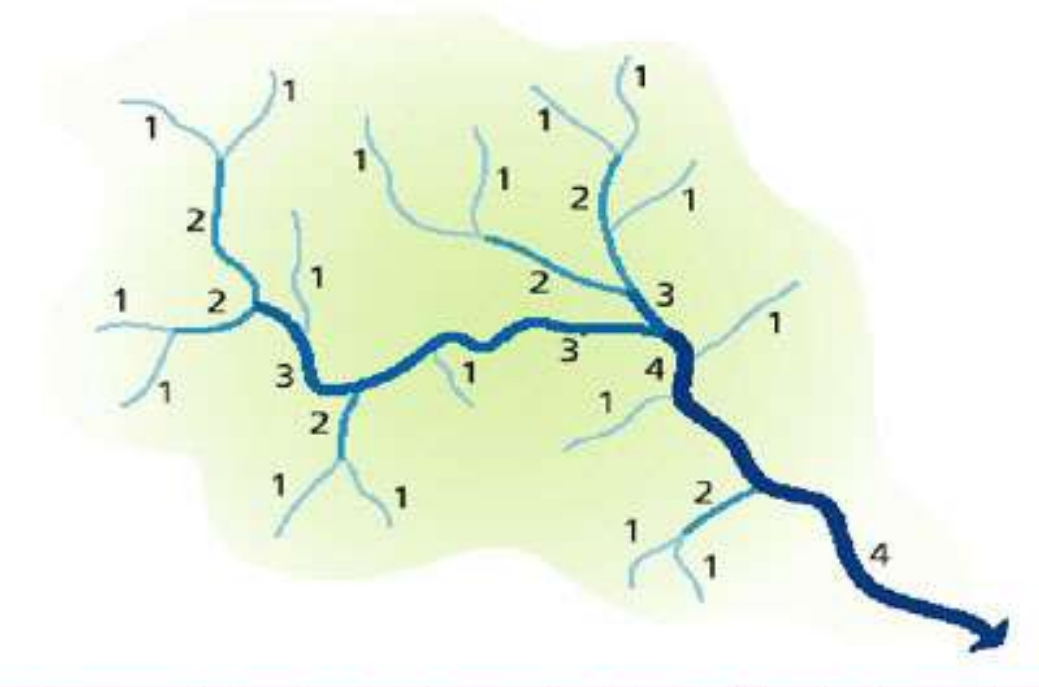
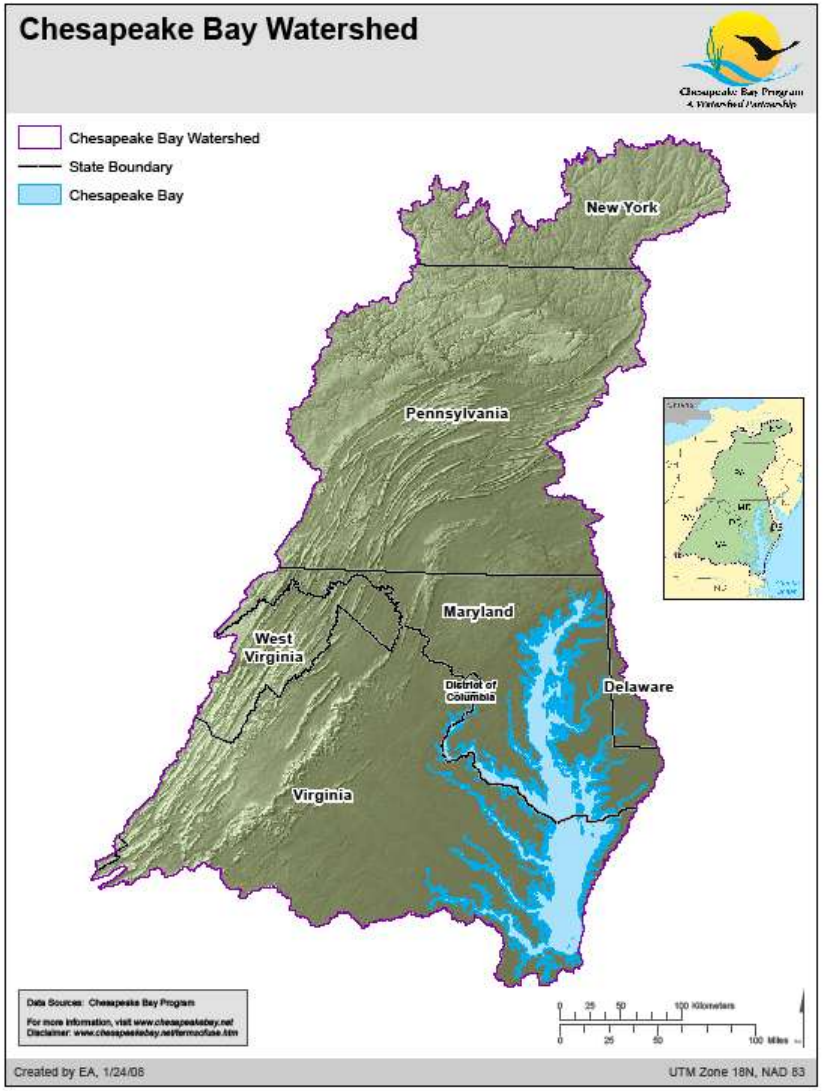
Created by EA, 1/24/06
UTM Zone 18N, NAD 83

Stream Ordering System

- We can define where we are at in the longitudinal drainage network by determining stream orders
- The rules for stream ordering are fairly simple:
  - Headwater streams are order 1
  - Stream order increases by 1 when two stream of the same order come together.



Stream ordering in a drainage network classifies the hierarchy of channels in a watershed.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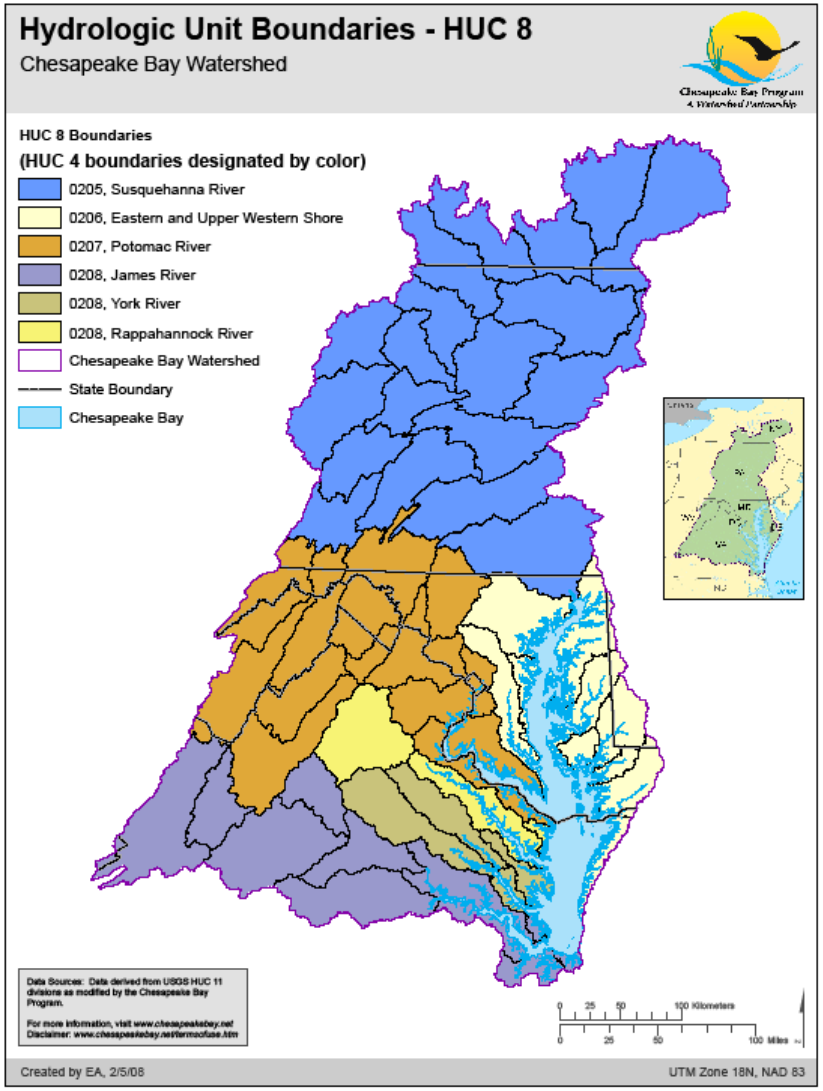
Hydrologic Unit Boundaries - HUC 8
Chesapeake Bay Watershed
Chesapeake Bay Program
A Watershed Partnership
HUC 8 Boundaries
(HUC 4 boundaries designated by color)
0205, Susquehanna River
0206, Eastern and Upper Western Shore
0207, Potomac River
0208, James River
0208, York River
0208, Rappahannock River
Chesapeake Bay Watershed
State Boundary
Chesapeake Bay
Data Sources: Data derived from USGS HUC 11 divisions as modified by the Chesapeake Bay Program.
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0 25 50 100 Miles
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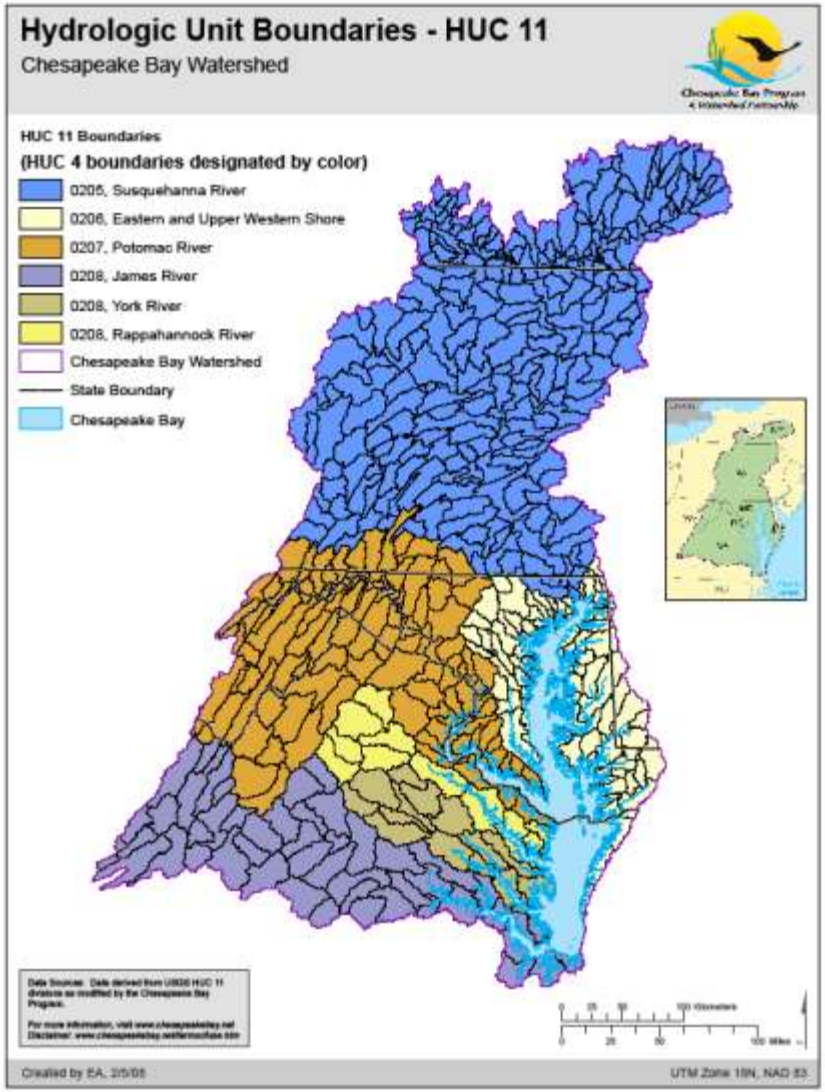
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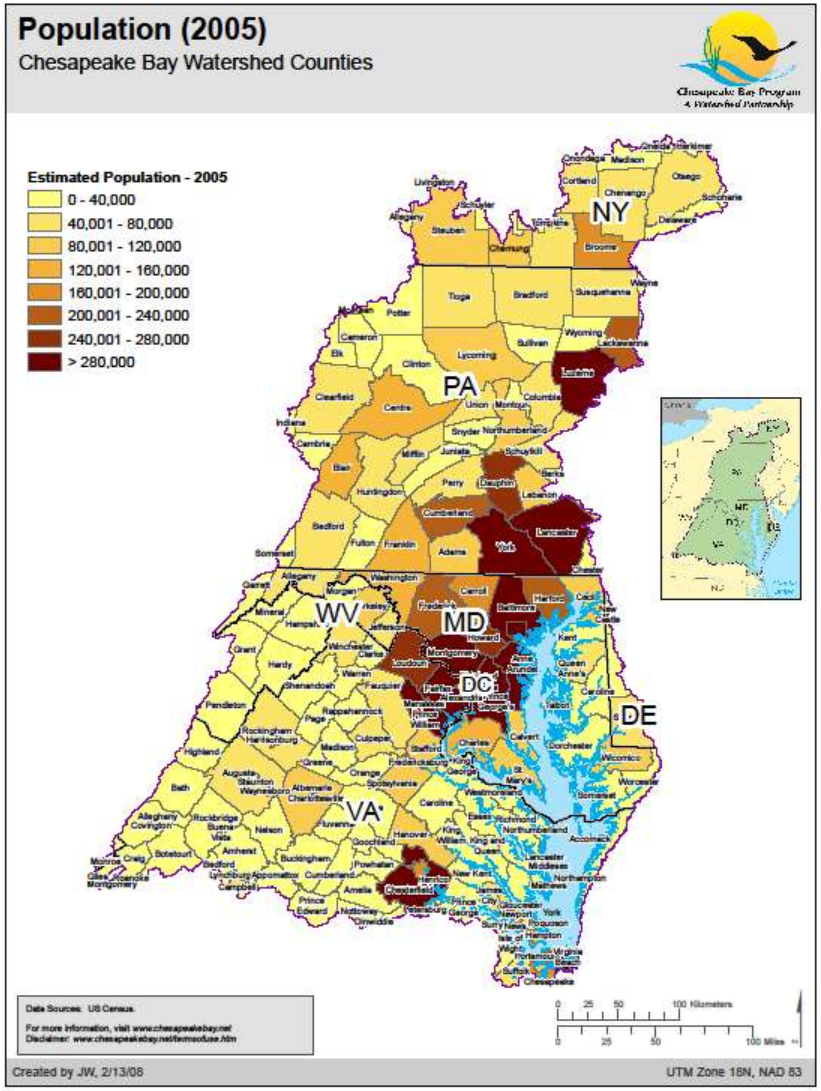
Population (2005)
Chesapeake Bay Watershed Counties
Chesapeake Bay Program
A Watershed Partnership
Estimated Population - 2005
0 - 40,000
40,001 - 80,000
80,001 - 120,000
120,001 - 160,000
160,001 - 200,000
200,001 - 240,000
240,001 - 280,000
> 280,000
NY
PA
WV
MD
DC
DE
VA
Data Sources: US Census.
For more information, visit www.chesapeakebay.net
Disclaimer: www.chesapeakebay.net/termsofuse.htm
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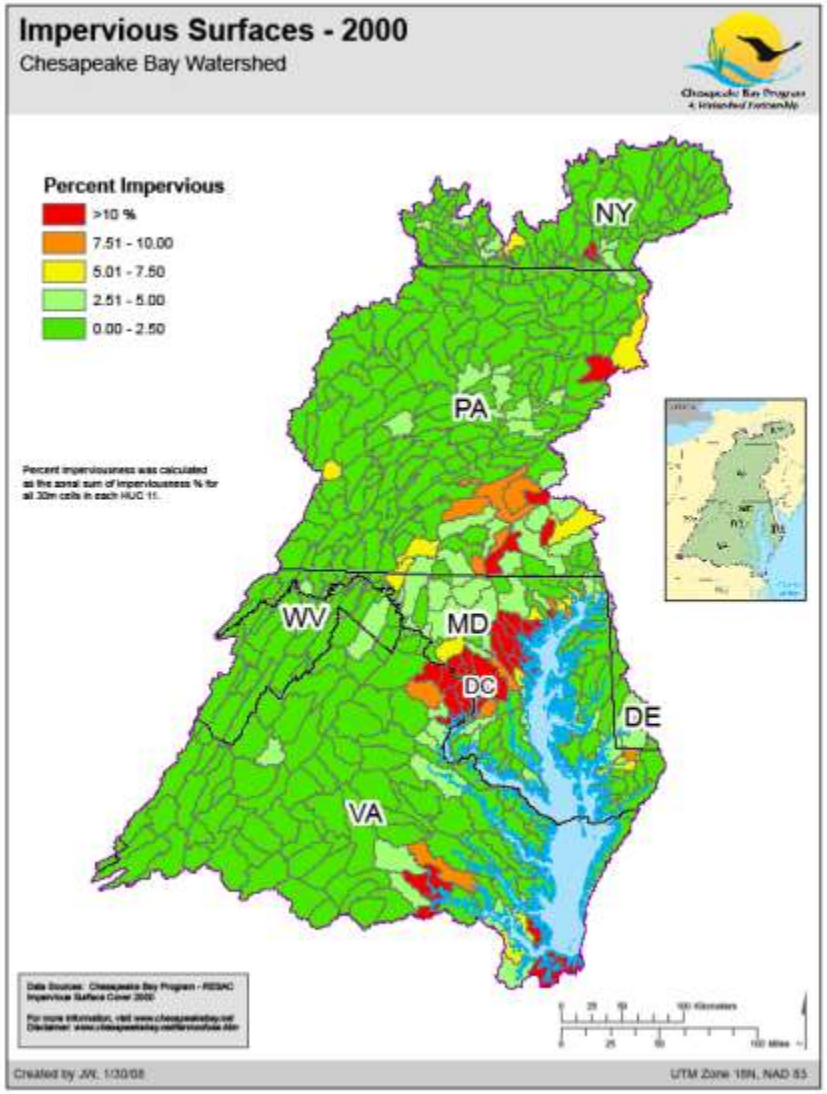
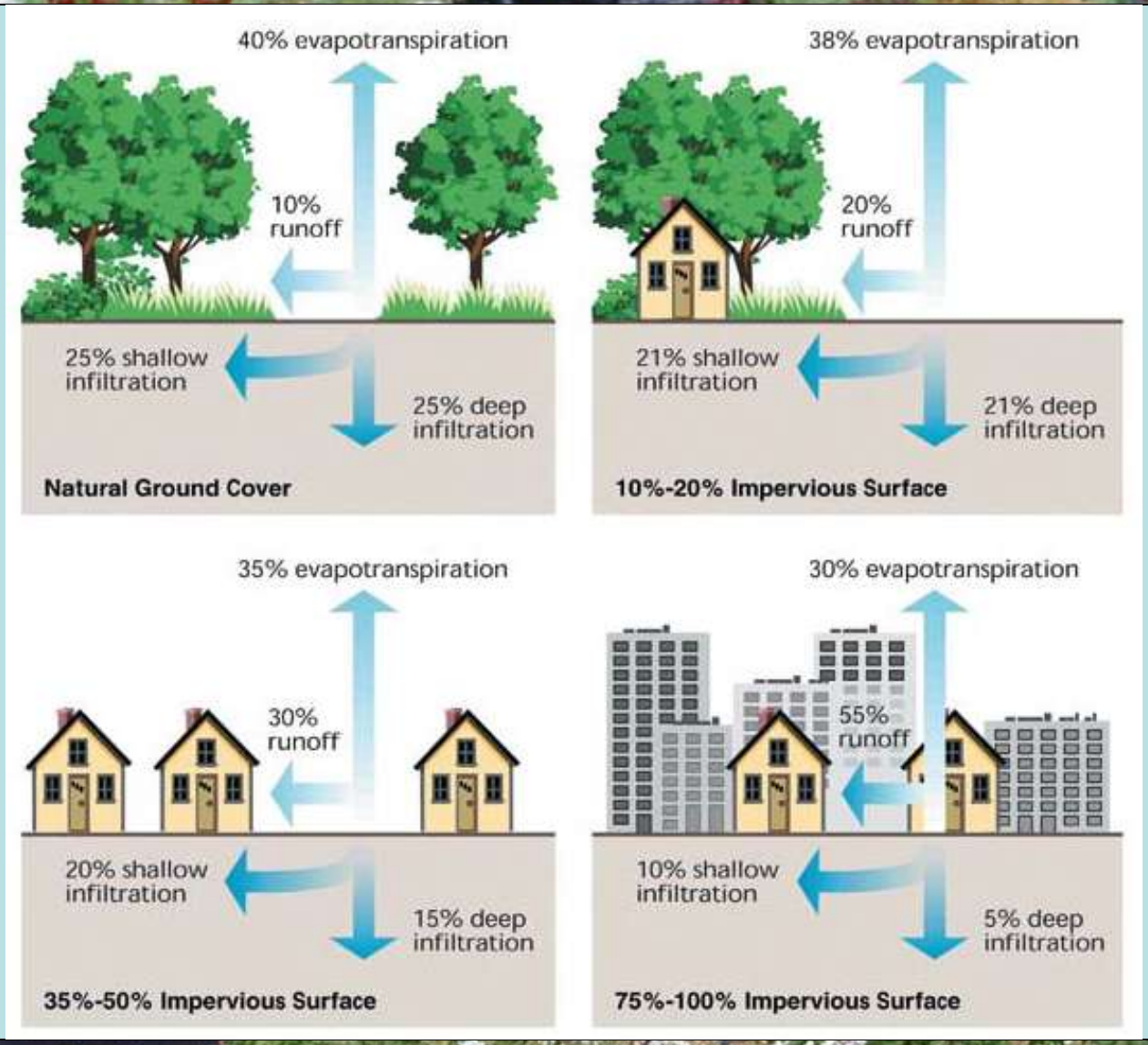
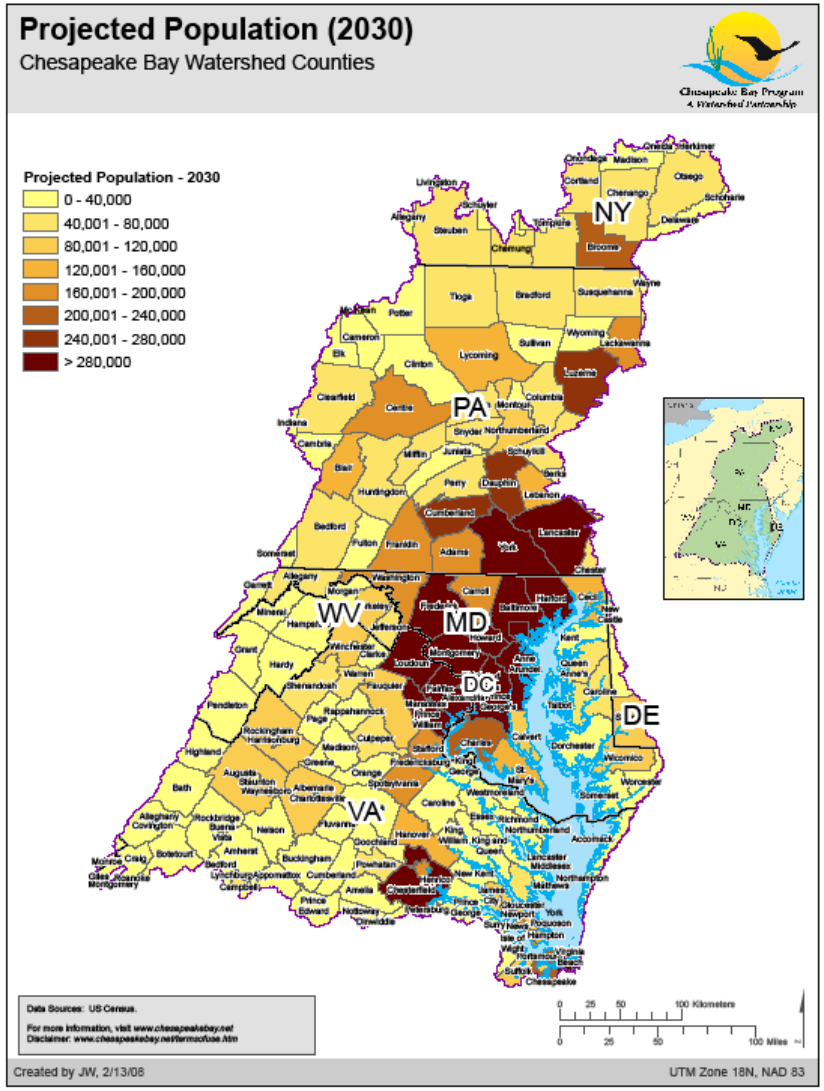
0 25 50 100 Miles
Created by JW, 2/13/08
UTM Zone 18N, NAD 83


Impervious Surfaces - 2000
Chesapeake Bay Watershed
Chesapeake Bay Program
A Watershed Partnership
Percent Impervious
>10 %
7.51 - 10.00
5.01 - 7.50
2.51 - 5.00
0.00 - 2.50
Percent imperviousness was calculated as the zonal sum of imperviousness % for all 30m cells in each HUC 11.
NY
PA
WV
MD
DC
DE
VA
Created by JW, 1/30/08
UTM Zone 18N, NAD 83

Too much Information? – Brains being sucked out? Just you wait!


40% evapotranspiration
10% runoff
25% shallow infiltration
25% deep infiltration
Natural Ground Cover
38% evapotranspiration
20% runoff
21% shallow infiltration
21% deep infiltration
10%-20% Impervious Surface
35% evapotranspiration
30% runoff
20% shallow infiltration
15% deep infiltration
35%-50% Impervious Surface
30% evapotranspiration
55% runoff
10% shallow infiltration
5% deep infiltration
75%-100% Impervious Surface


Projected Population (2030)
Chesapeake Bay Watershed Counties
Chesapeake Bay Program
A Watershed Partnership
Projected Population - 2030
0 - 40,000
40,001 - 80,000
80,001 - 120,000
120,001 - 160,000
160,001 - 200,000
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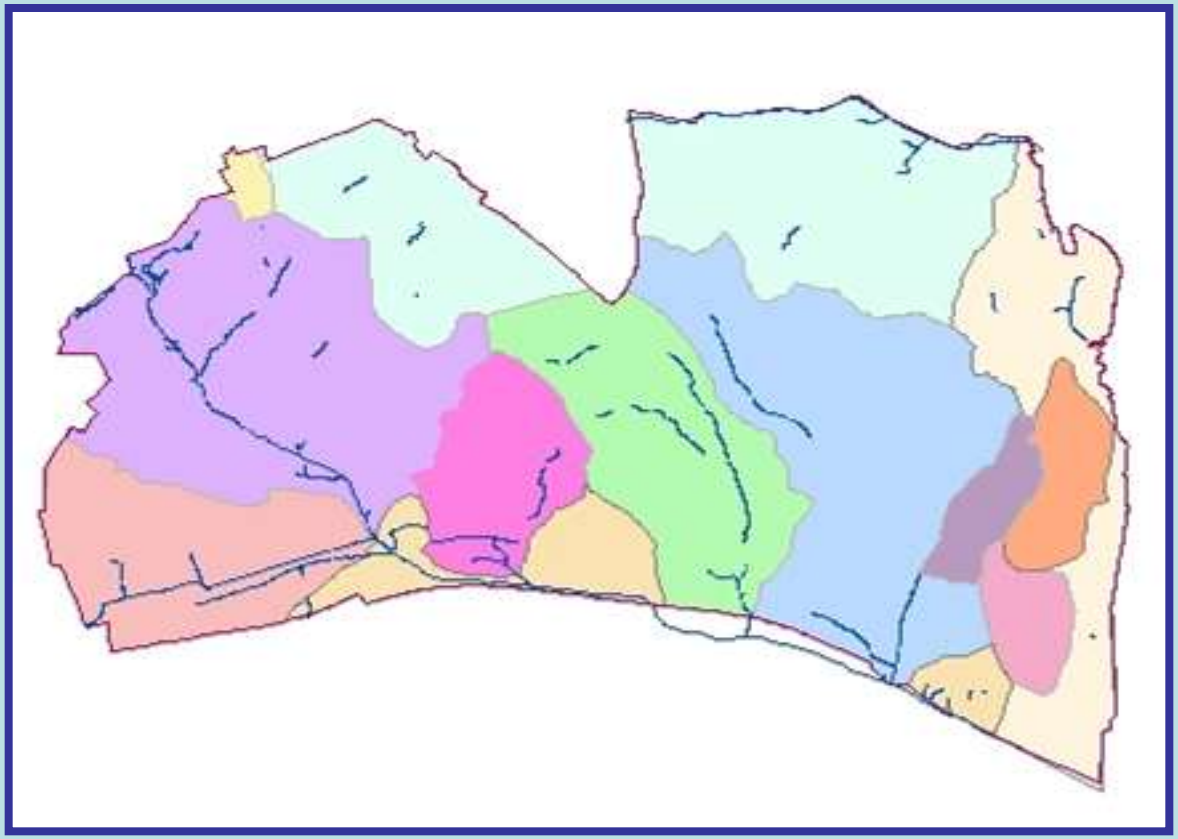
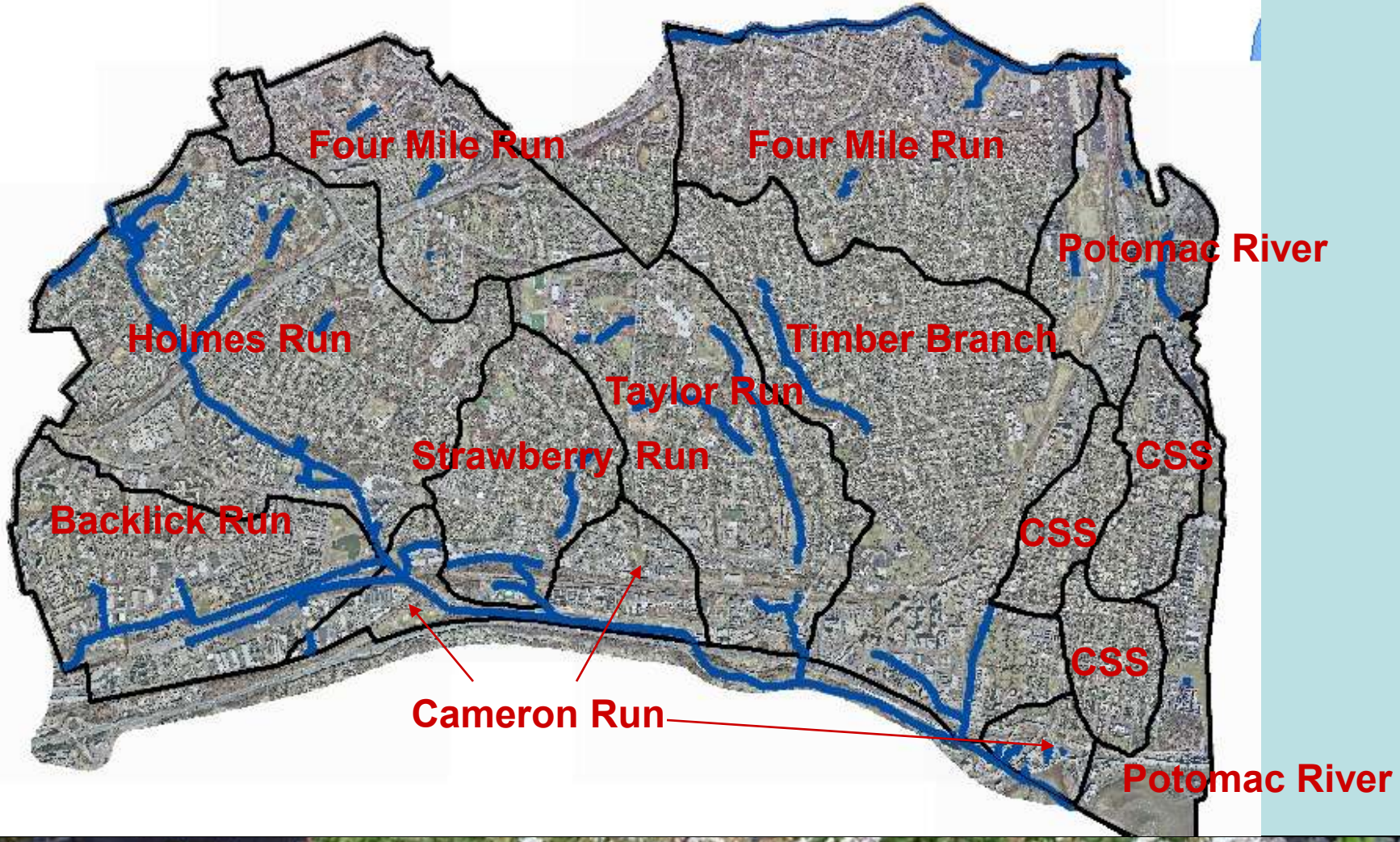
I didn’t know that!

City of Alexandria



- Home to >140,000 people
- Area = 15.75 mi2
- 30 ft. above sea level
- ~25 miles of streams drain to the Potomac
- 12 watersheds
- 41% of the City is covered with impervious surface
- 185 miles of storm sewer

Alexandria Watersheds



http://mddnr.chesapeakebay.net/NASAimagery/EyesintheSky_archive.cfm#picview

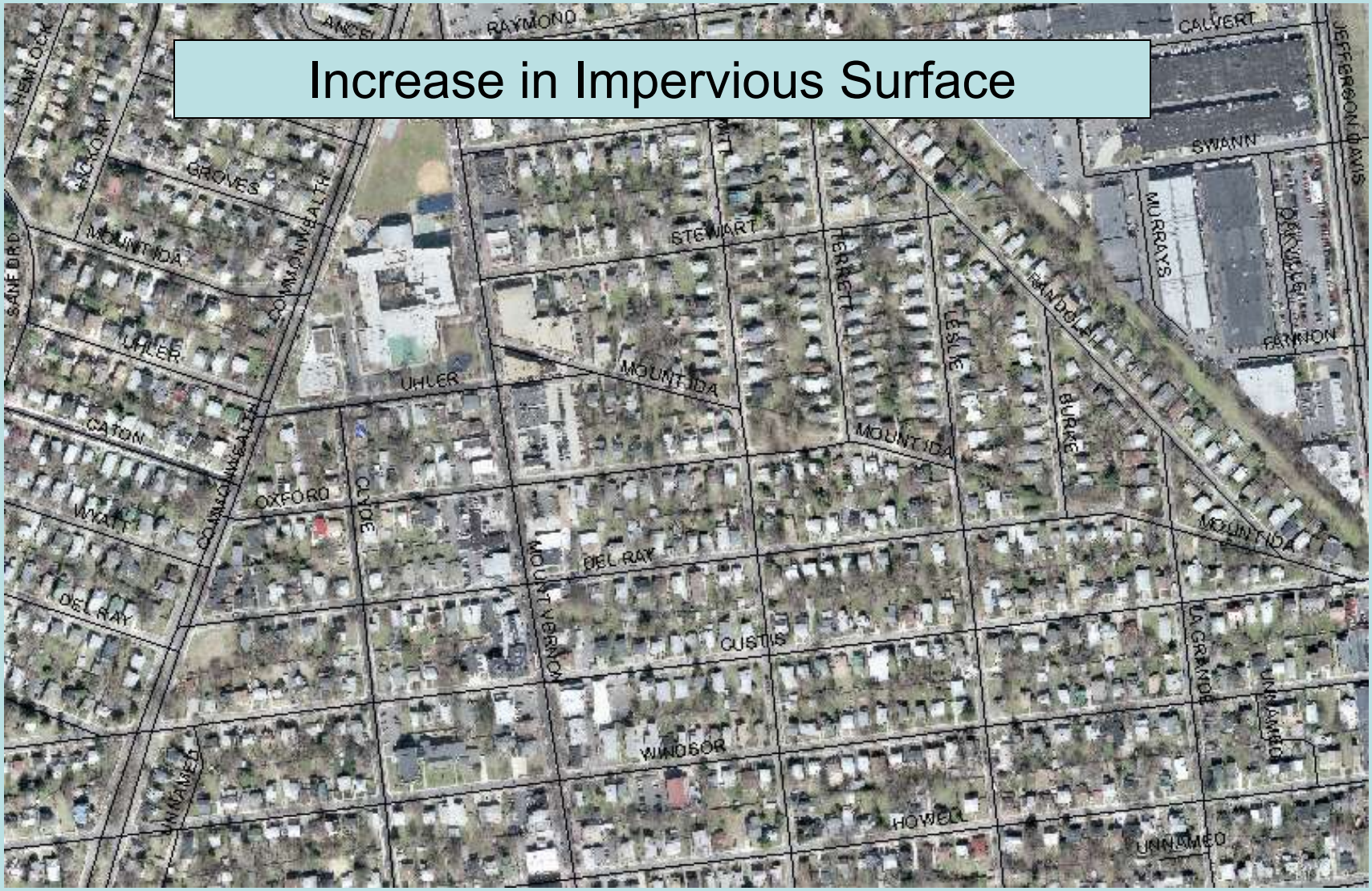
So What Does This Mean?

It Means…

- Nutrient Enrichment
  - Algal blooms
    - Biomass die-off
      - Decreased Oxygen
- Increased Sediment (suspended solids)
  - Turbidity
    - Low light penetration
      - Lower photosynthesis
        - Lower Oxygen
- Toxins
  - Genetic mutations
    - Death

And the Point Is?

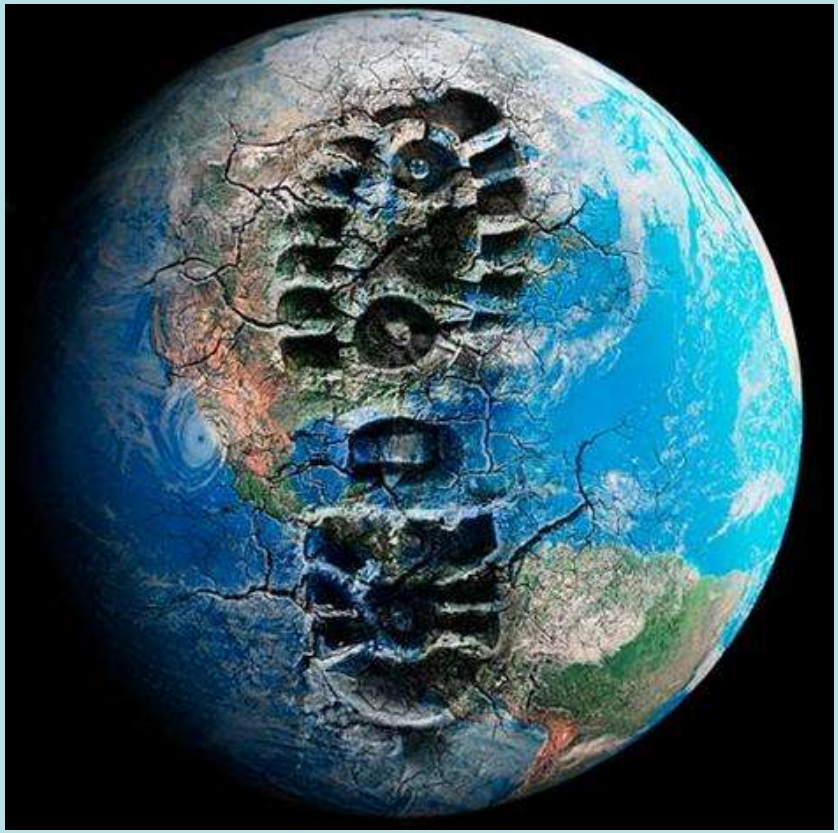
Increase in Impervious Surface



Our Urban Area is over 41% Impervious

Behind Victory Center

We are All in the Same Boat



Reduce your footprint

- Change your outlook – value Sustainability
- Decrease impervious surface
- Improve your soil
- Landscape with native plants
- Use less water, reuse water
- Reduce the use of fertilizer
- Demand less snow response

Take personal actions to reduce volume and velocity of stormwater

Green Landscaping
For You and the Chesapeake Bay

Lauren Wheeler, M.A. Landscape Design
Natural Resources Design, Inc.

Objectives

To provide sustainable design options for our homes that are beautiful and ecologically sound

- What is Conservation Landscaping?
- CCLC 8 Principles
- Sustainable Solutions
  - Water
  - Native Plants
  - Soil
  - Wildlife Habitat

Perfect Landscape….right?

Conservation Landscaping

Respects resources

- Water
- Soil
- Existing plant communities
- Native plants
- Wildlife habitat

Chesapeake Conservation Landscaping Council's

8 Essential Elements of Conservation Landscape

A conservation landscape ….

1. Benefits the environment and to function well for human use.
   - Does your landscape provide dual functions for the environment and humans?
2. Removes invasive plants and prevent their spread.
   - Does your home landscape have any invasive plants in it? If so, do you have a reasonable invasive management plan?
3. Uses native plants appropriate for the site.
   - What percentage of your garden's plants are native? Are they native to the Mid-Atlantic region?
4. Conserves water and promotes good water quality.
   - How do you manage stormwater on your property? Are your downspouts disconnected? Do you have a cistern? A rain garden? Infiltration areas?

5. Provides wildlife habitat.
   - Do you have sources of food (native plants), shelter, nesting sites, water?
6. Promotes good air quality and is not a source of air pollution.
   - How much lawn do you have? Do you mow it with a gas mower? How can you improve air quality in your landscape?
7. Promotes healthy soils, compost on site, amend disturbed soils.
   - Do you compost your yard waste? How do you actively improve your soils?
8. Works with nature to be more sustainable with less input.
   - One a scale from 1-10 how sustainable is your garden? Do you take advantage of “free” resources - water, native plants, soils?

1. **A conservation landscape:**
   is designed to benefit the environment and to function well for human use;

Chevy Chase Community Center

Friends of Rock Creek Environment – DDOE RiverSmart Program

Existing Design – Cross Sidewalk

2. Remove invasive plants & prevent their spread.

Invasive Plants in the Landscape
"The Hit List"

(no native plants… so what?)

- English Ivy
- Burning Bush
- Barberry
- Nandina
- Japanese Maple
- Miscanthus
- Pennisetum

3. Use Native Plants

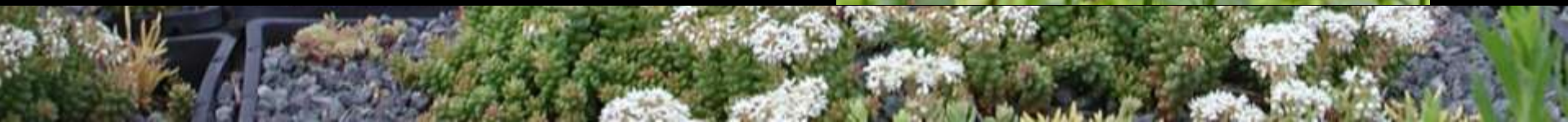
Appropriate for the site

Plant communities

- plants grow together with symbiotic relationships

Look for plant combinations found in nature

Helenium aumtumnale &
Lobelia siphilitica



Designed landscape using plant combinations found in nature

Tree Canopy
White Oak

- Feeds 28 species of birds and supports 517 species of lepidoptera

Groundcovers

- Erosion control
- Minimizes maintenance

4. conserves water and promotes good water quality;

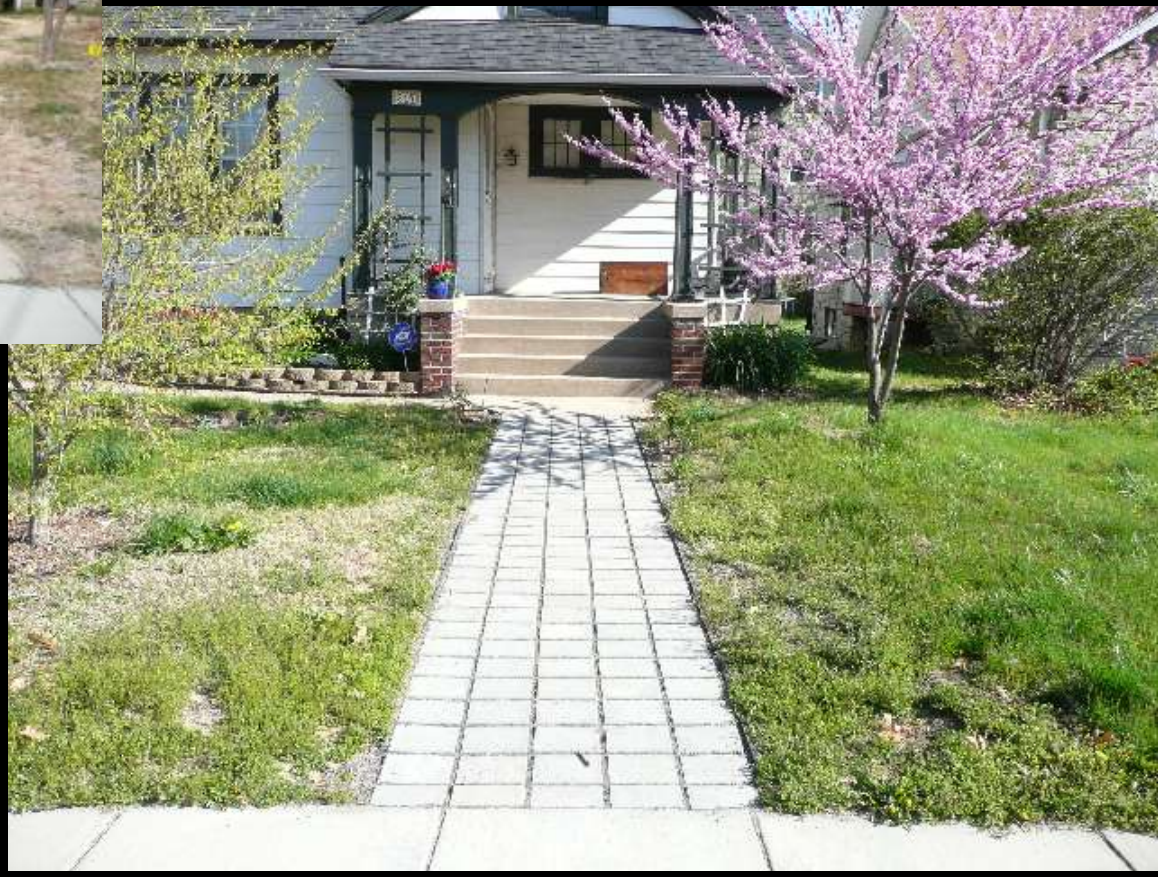
Storing and Reuse of Rainwater

Rain barrels &
cisterns

Rainwater Harvesting

Storing & Infiltration Rainwater via Pervious Surfaces

RiverSmart Home



RiverSmart Home

Walkways

Patios

Rain Gardens

Rain gardens traditionally designed as a single isolated bed. Design it better to be integrated into the entire landscape.

Simple rain gardens

Rain gardens

Rain Garden is integrated into the design

5. Provide wildlife habitat.

Nineteen species of plants have co-evolved with hummingbirds including cardinal flower and columbine

Complexity over simplicity

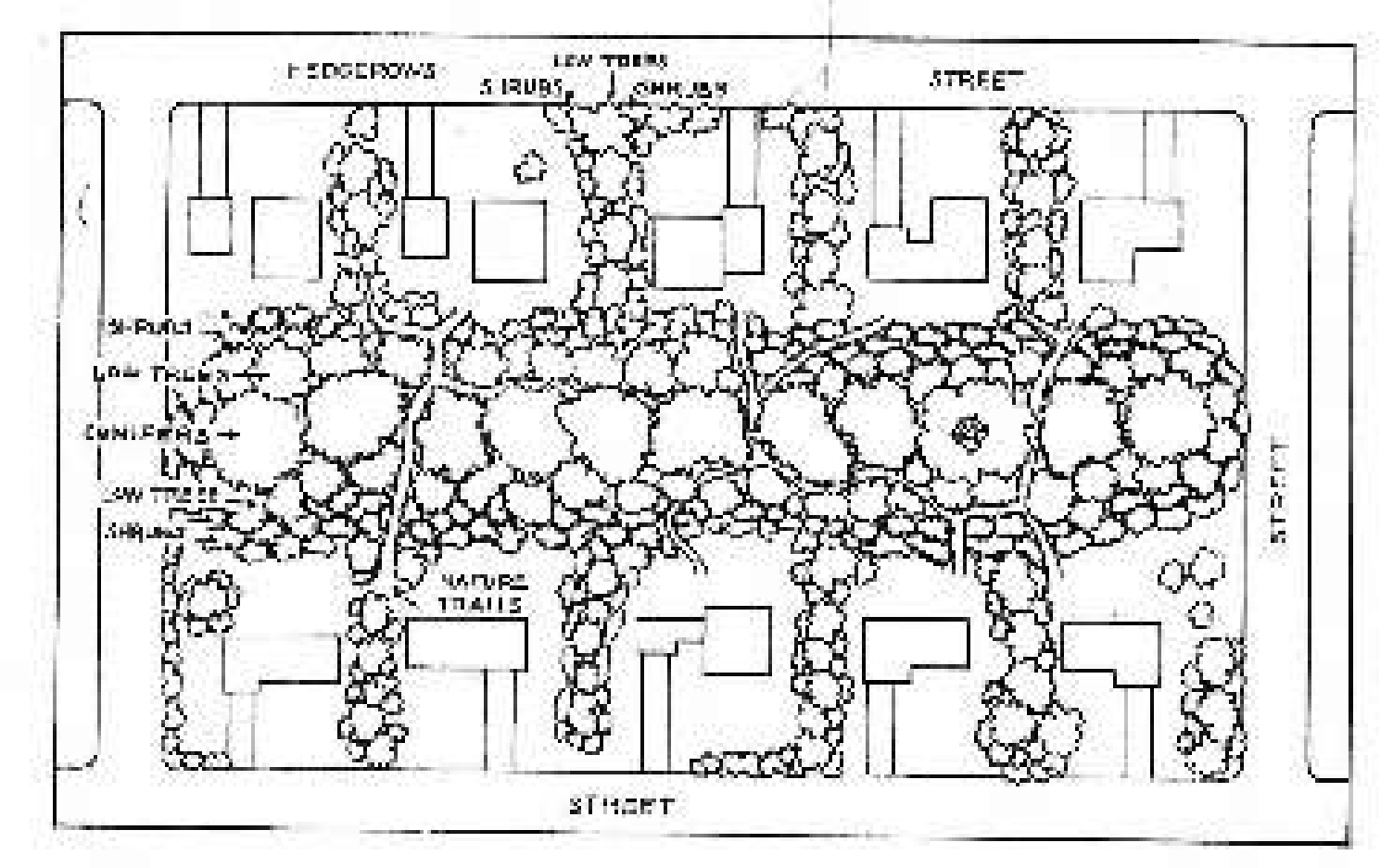
Wildlife Needs:

- Water source
- Food
- Nesting sites
- Shelter

Mimic natural systems:

- Variety of berries, fruits, seeds
- Succession of food sources
- Migration and available food source intrinsically timed
- Fallen leaves provide insect habitat which in turn provides bird food during drought.

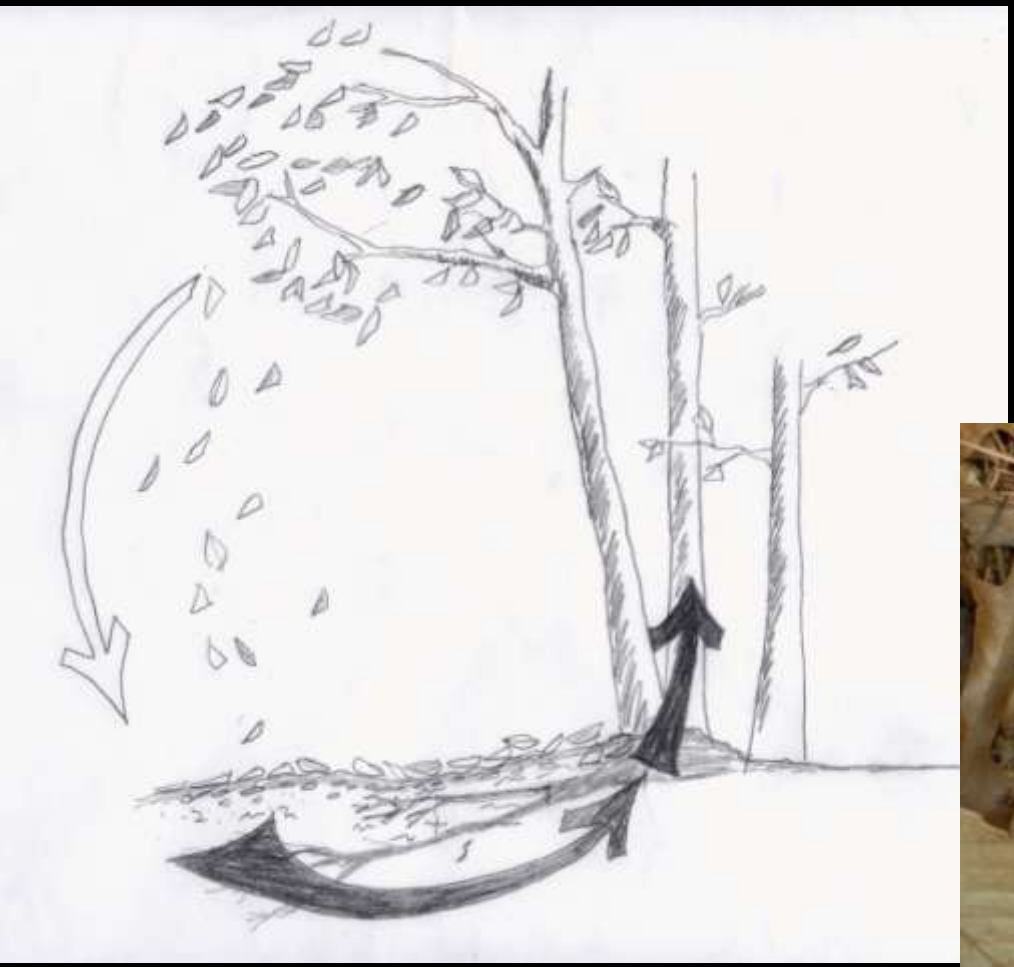
Suburban Greenways



6. promotes good air quality and is not a source of air pollution

7. promotes healthy soils, compost on site, amend disturbed soils

Trees & Soil



Avoid Compaction

Poor construction practice

Tree preservation plan

Mulch, protective fencing, plywood

8. works with nature to be more sustainable with less input.

Mount Vernon Residence

Front of House

Back of House

English ivy, lawn, liriope
and woodland trees

1st & 2nd year

Vegetated Swale

Natural Resources Design, Inc.

Before

Natural Resources Design, Inc

After

Natural Resources
Design, Inc.

Natural Resources Design, Inc.

Urban garden

- Impervious surfaces
-Extensive lawn
- Non-native plants

- Pervious concrete driveway and walkway
- pervious “stone lawn”
- rain garden
- all native plants

Michael Thilgen, RLA
Four Dimensions

Michael Thilgen, RLA
Four Dimensions

Michael Thilgen, RLA
Four Dimensions

Your conservation landscape ….

1. **Benefits the environment and to function well for human use.**
   - Create beautiful gardens that also enhance the ecological value of your garden.
2. **Removes invasive plants and prevent their spread.**
   - Phase in the removal of all invasive plants on your property.
3. **Uses native plants appropriate for the site.**
   - Increase the percentage of native plants.
4. **Conserves water and promotes good water quality.**
   - Water is life; manage it as a valuable resource.
5. **Provides wildlife habitat.**
   - Plant native plants! Design shelter, nesting sites, water into your landscape.
6. **Promotes good air quality and is not a source of air pollution.**
   - Decrease lawn, increase biomass (plants).
7. **Promotes healthy soils, compost on site, amend disturbed soils.**
   - Compost
8. **Works with nature to be more sustainable with less input**.
   - How can you make your garden sustainable?

Being a thoughtful and informed gardener plays an important role in restoration. What we do in our home landscapes mirrors our actions in the community landscape and is reflective of how we perceive our relationship to larger natural world.

Leslie Jones Sauer

Rain Gardens

What is a Rain Garden?

1.) A garden that stores and filters rain water.

2.) A landscape tool to improve water quality and reduce runoff

Rain Gardens

Benefits

- Less lawn, less maintenance
- Habitat
- Catch and filter runoff – reduce erosion
- Improve water quality
- Replenish groundwater supplies
- Aesthetically pleasing landscape feature
- Keeps water off sidewalks and driveway

Infiltration Testing

- Hole 12 inches deep
- Stake or ruler embedded in hole
- Saturate ground around hole, then add water to highest mark **NOTE TIME
- Monitor hole every 2 hours determining how long it takes to empty
- Divide water depth by how long it takes to drain. Ex: 8 in/10 hours = .8

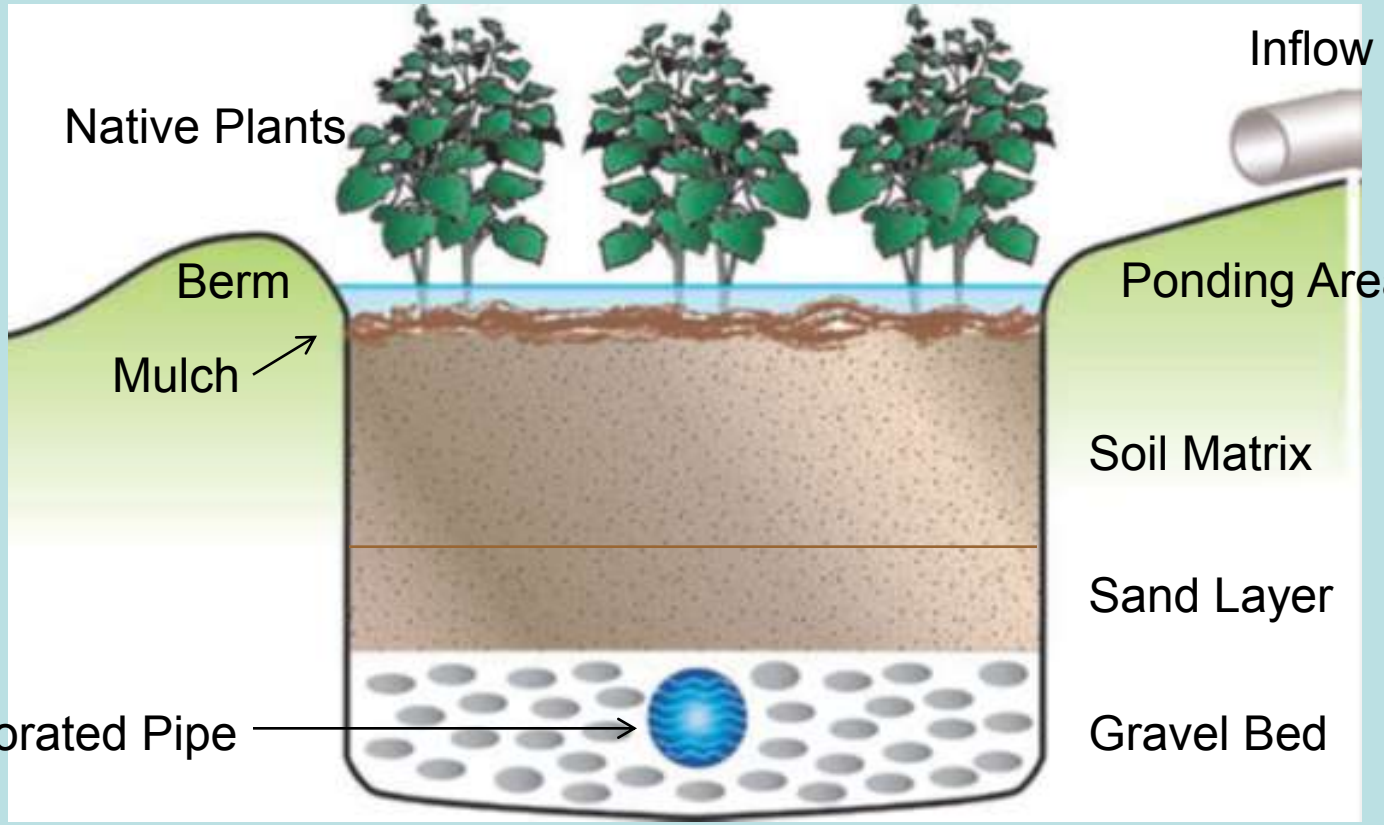
Infiltration Rate

- If your infiltration rate is 1.0 or more, you have excellent drainage

- If the rate is between 0.5-0.9, the soil is well draining enough for a rain garden.

- If it is less than 0.5, then the soil is poor draining and you need an underdrain.

Underdrains

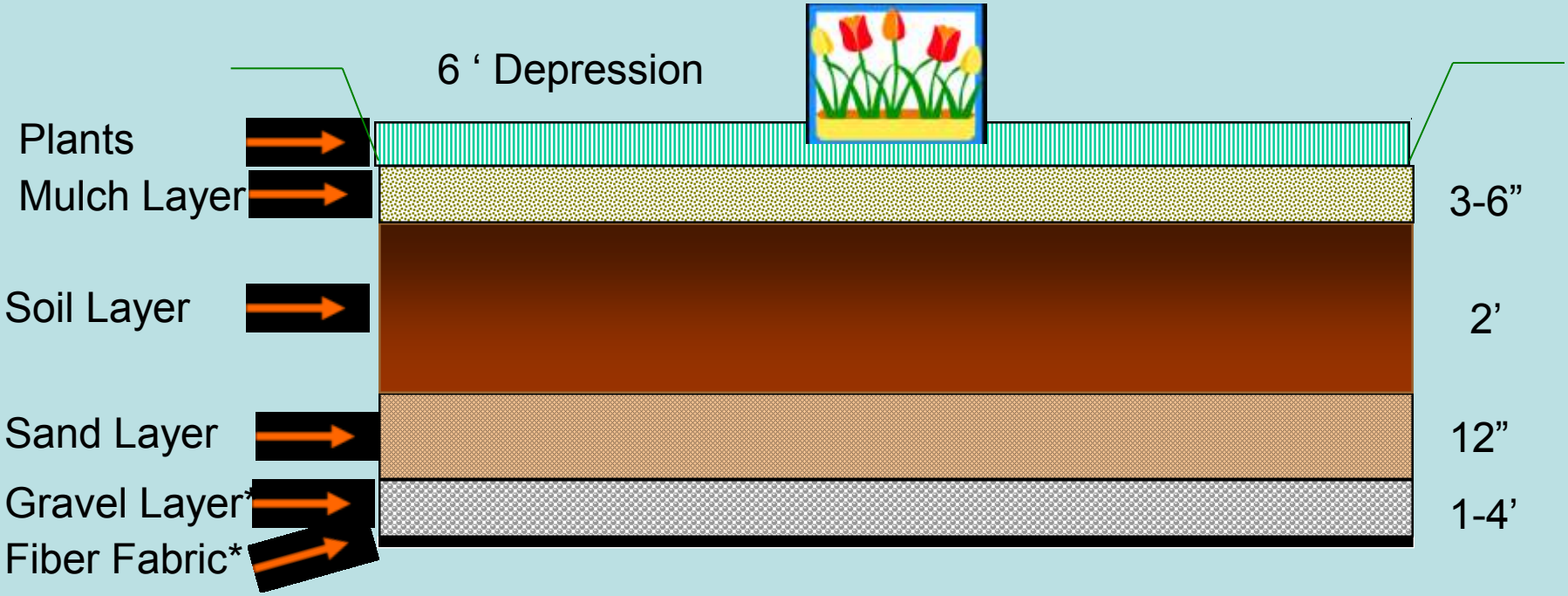


Design and Construction

- Things to consider:
  - Size (~150 ft^2)
  - Drainage area (5-7%)
  - Amount and velocity of runoff
  - Topography
  - Soil type (may need deeper layers)
  - Light exposure
  - Call before you dig!

(B/A) x 100 = Slope

Basic Layers of a Rain Garden

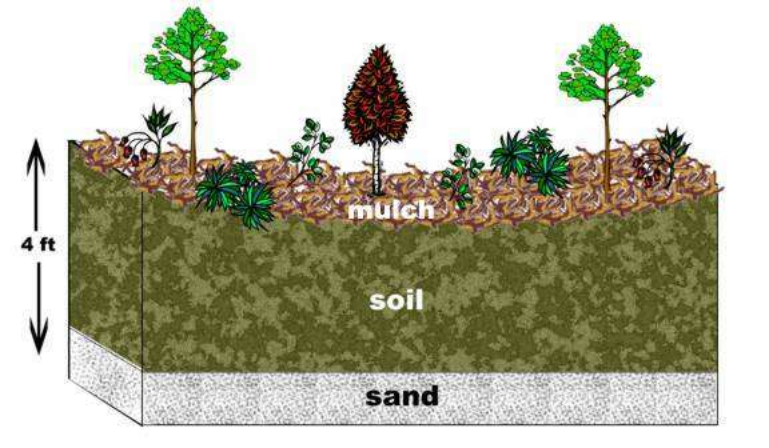


Ponding Area

- Water storage area
- 4-6 inch depression (allows for evaporation/infiltration)
- Dig down on angle to effectively catch water
- Excavated material can be used for a berm
- 3 day rule

Sand and Soil Layers

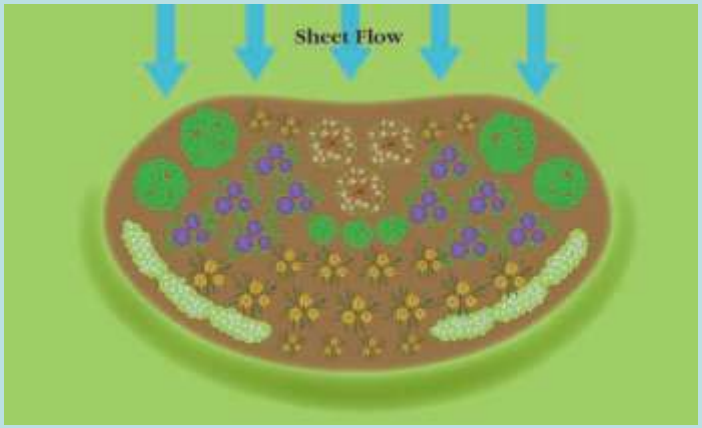
- Bottom sand layer (12”)
- Good soil mix (2’)
  - Compost or leaf mulch (20%)
  - Topsoil (30%)
  - Sandy soil mix (50%)
- Important to have little clay
- Water absorption and nutrients for plants

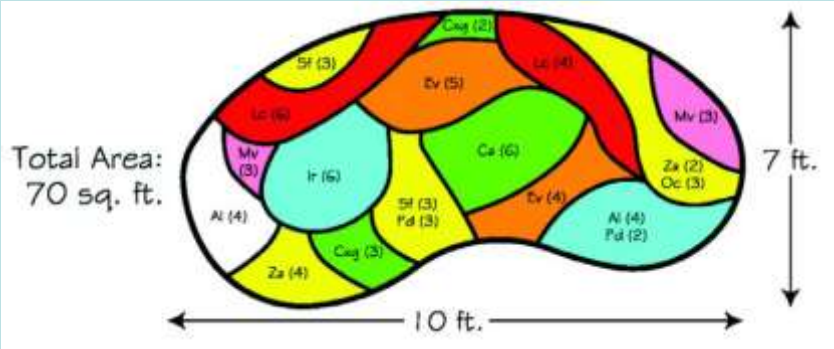


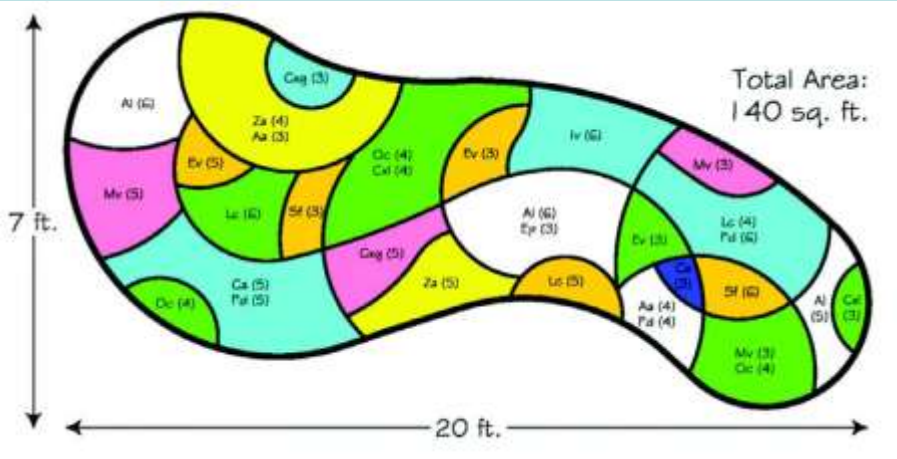
Mulch Layer

- Acts like sponge
- Filters chemicals
- Hardwood mulch
  - Resistant to washout
  - Larger surface area
- Sufficient Layer (3”)

Plant Layout







Plants

- Time to get creative!
- Many choices - perennials, trees, shrubs
- Plant natives
- Flood and drought tolerant
  - Native riparian species work well
  - More flood tolerant species toward middle
- Habitat value – food and shelter
  - Butterflies, hummingbirds, frogs & toads, dragonflies, and songbirds

Plants

Arlington County Rain Garden

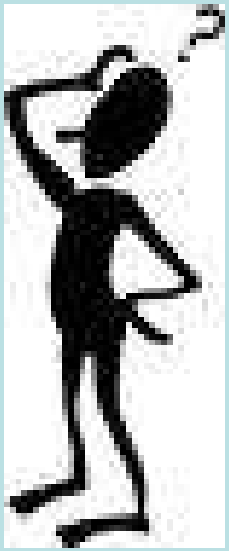
Constructed by HOA Members

Rain Garden in Councilman Krupicka's Yard

Grass-pave in Councilman Krupicka's Yard

Issues and Maintenance

- Like all gardens, rain gardens need to be maintained (mulch & plant replacement, pruning)
- Standing or stagnant water
- Mosquitoes – (3 day rule)
- Wrong location
- Wrong plants



And a Word about Mosquitos

Eliminate sources of standing water

- Flower Pots, Watering cans, bird baths, pet dishes
- Gutters, Corrugated plastic drain pipes
- Low spots, sags in tarps

Use Larvicides (BT) or make a rain garden!

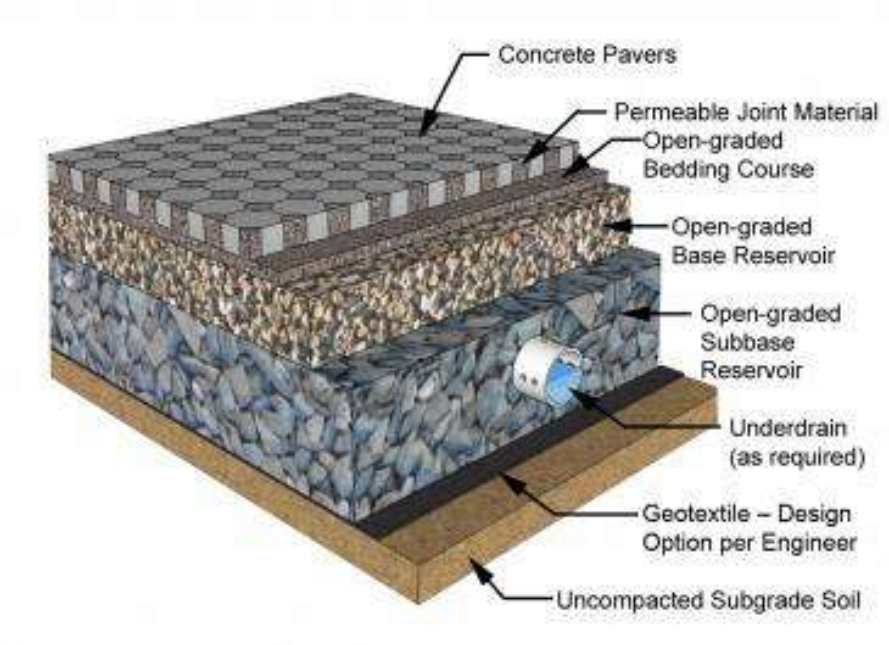
Other Ways to Reduce Runoff

- Porous Paver
- Permeable Pavers
- Porous Concrete
- Porous Asphalt

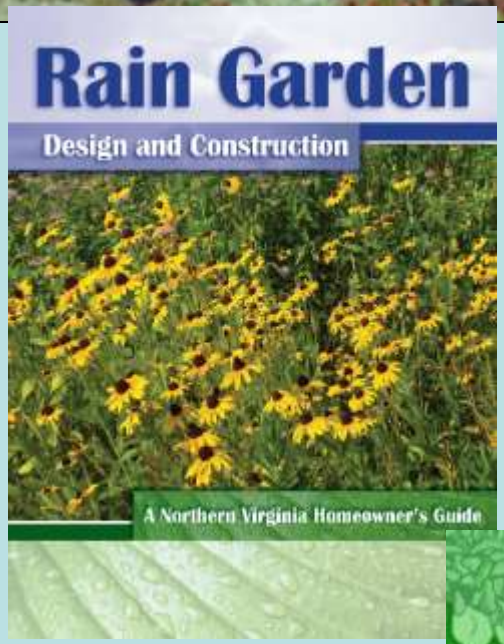
Porous pavers

Permeable pavers

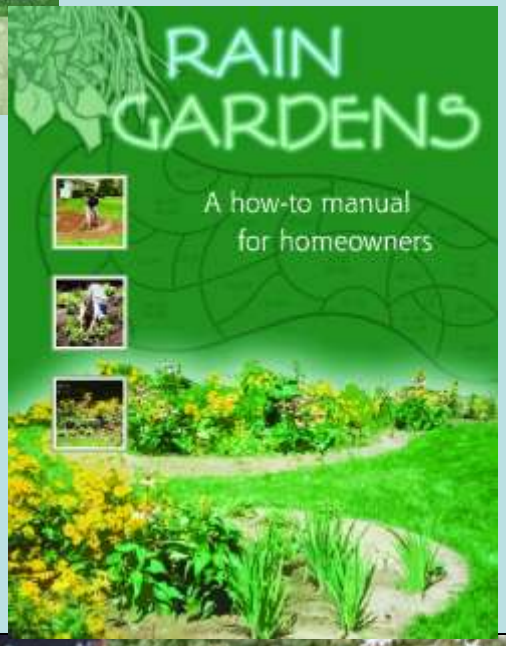
Interlocking pavers



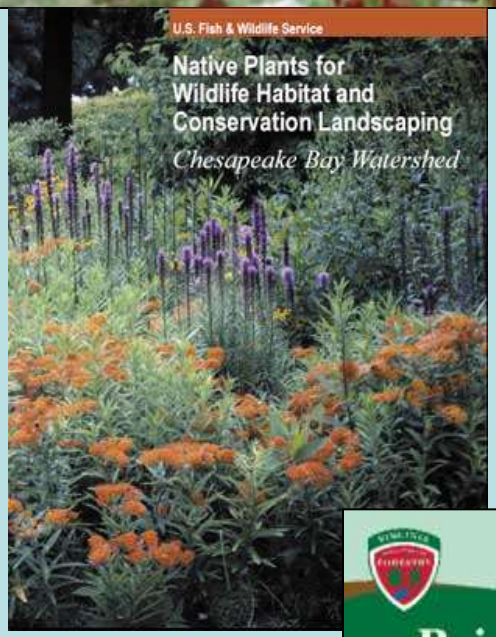
Porous Concrete



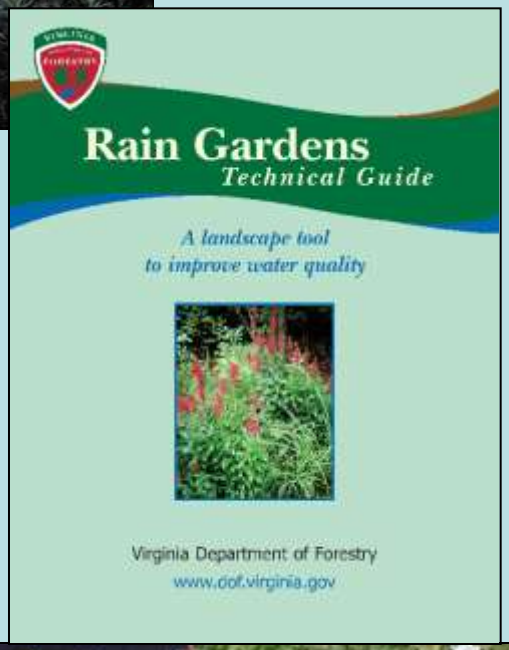
http://www.aacounty.org/DPW/Highways/Resources/Raingarden/RG_FAIRFAX%20CO.pdf



http://www.dnr.state.wi.us/org/water/wm/dsfm/shore/documents/rgmanual.pdf



http://www.nps.gov/plants/pubs/chesapeake/



http://www.dof.virginia.gov/mgt/resources/pub-Rain-Garden-Tech-Guide_2008-05.pdf

Thanks for the opportunity to introduce you to Rain Gardens!

Claudia Hamblin-Katnik
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Eco-City Alexandria Workshop 3
Green Landscaping
For You and the Chesapeake Bay

Using Native Plants in the Landscape

Kirsten Conrad Buhls, Extension Agent
Arlington County Office

Not all plants are created equal

- Unless we restore native plants to our suburban ecosystem the future of biodiversity in Alexandria is dim

What are invasive exotic non-native plants?

- Plants from other countries?
- All plants with aggressive growth habits?
- Plants with names you can’t pronounce?

Exotic vs non-native vs indigenous vs native

What makes them aggressive?

- Production of many seeds
- Rapid germination and accelerated growth
- Allelopathic chemical toxins that impede other plant's growth
- Long-lived seeds creating a persistent seed bank
- Vegetative spread by creeping roots and stems

Are all exotic plants potentially invasive?

- Only 1 out of 100 exotics have the characteristics to make them invasive.
- Less than 10 percent of introduced plants have evolved into invasive pests.

How did they get introduced?

On purpose and by accident

- Use in gardening and landscaping (Bradford Pears)
- Erosion control (Kudzu)
- Forage/Wildlife Food (Autumn Olive)
- Imported indirectly (M-A-M)
- Aquatic introductions-Aquarium plant-parrots feather

Official Approval?

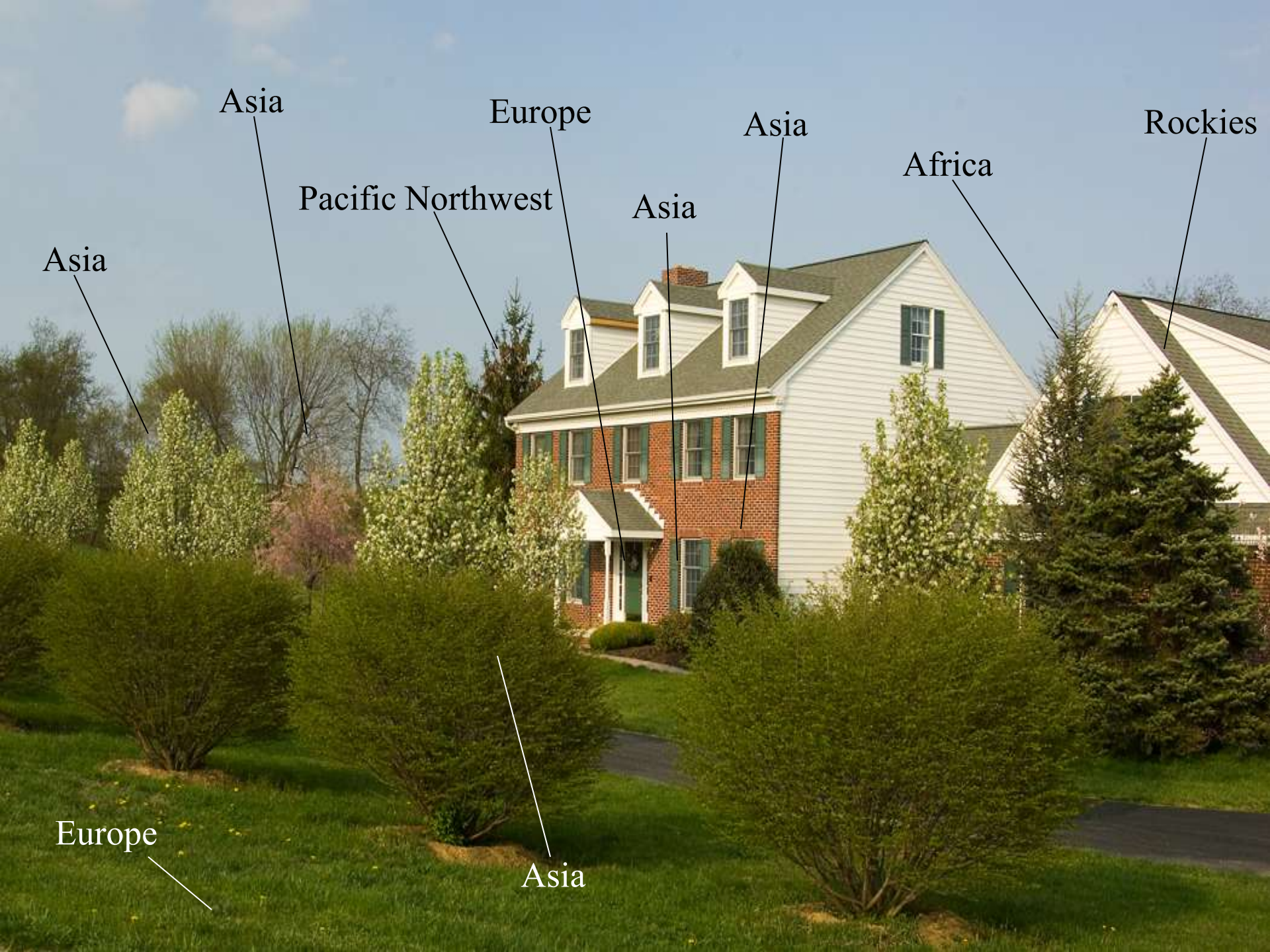
- Public buildings
- Roadside right of ways
- Nursery sales

Why are they a problem?

- Create a monoculture
- Loss of “Sense of Place”
- Green blindness
- Invasive plants require enormous amounts of time, labor and money to control or eliminate.

What are some of the most problematic invasive exotics in Virginia?

- Honeysuckle sp.
- Autumn olive
- Privet
- Multiflora rose
- Oriental bittersweet
- Japanese stiltgrass
- Burning bush
- English ivy
- Kudzu
- Lesser Celandine
- Purple loosestrife
- Garlic mustard
- Japanese knotweed
- Bradford pear
- Japanese barberry
- Wisteria
- Mile-a-minute weed
- Mahonia
- Bamboo
- Climbing Euonymous
- Periwinkle
- Porcelainberry


Asia
Asia
Europe
Pacific Northwest
Asia
Asia
Africa
Rockies
Europe
Asia

Ground Covers and Forbs

Purple loosestrife infesting a native marsh.
Photo: Randy Westbrooks, U.S. Geological Survey, Bugwood.org

Stilt Grass

Microstegium vimineum

Garlic Mustard
(*Alliaria petiolata*)

Invasive Examples

English Ivy
(*Hedera helix*)

Lesser Celandine
Ranunculus ficaria

Invasive Examples

Periwinkle *Vinca minor*

Japanese Knotweed
Polygonum cuspidatum

Milkweed
(Asclepias sp.)

Pussy Toes (*Antennaria sp.)* DRY!

Native Plants

Goldenrod
(Solidago
Sempervirens)

St. John's Wort, Gaura, Monarda, several Echinacea, Salvias, Yarrow, Helianthis, but…

Thanks to: Master Gardener Joan Arsenault

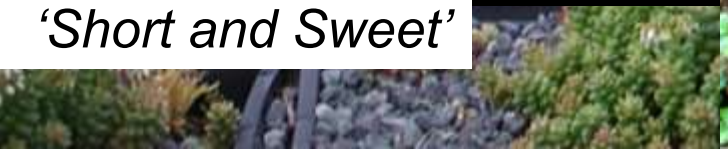
Native Ground Covers

Sedum ternatum (sedum)

Dog violet Viola conspersa

Silene carolinana 'Short and Sweet'

Partridge berry Mitchella repens



Instead of English Ivy?

Wild Ginger

Yucca
(Yucca Filamentosa)

Wild Geranium
(Geranium maculatum)

Foamflower
Tiarella sp

Native Landscaping
Courtesy of Marian Lawler

Native Groundcovers - Shade

Phlox sp.

Mayapple
Podophyllum peltatum

Coral Bells
(Heuchera americana)

FERNS!
Asplenium
Dryopteris
Polystichum

Jack-in-the-pulpit

Shade Landscaping
with Native Plants

Invasive Vines

Porcelain Berry

Ampelopsis brevipedunculata

Bittersweet

Mile a Minute

Persicaria perfoliata

Japanese Honeysuckle
(*Lonicera japonica*)

Invasive Vines

Exotic Wisterias
(*Wisteria floribunda – Japanese)*
(Wisteria sinensis - Chinese)

Native Vines

Trumpet Honeysuckle

Virginia Creeper

Virgin's Bower

Wisteria frutescens

Native Wisteria

cv. Amethyst Falls

cv. Longwood Purple

Burning Bush

Bush Honeysuckle

Multiflora Rose

Non-Native SHRUBS!

Chinese Privet

Japanese Barberry

Autumn Olive

Non-Native Shrubs

Native Shrubs

Spicebush

American Winterberry

Highbush/Lowbush Blueberry

American Beautyberry

Native Shrubs

Arrowwood Viburnum

Pinxterbloom Azalea

Native Shrub

Staghorn Sumac *(Rhus typhina)*

Red Chokeberry

Native Shrubs

Highbush Blueberry

Mountain Laurel (Kalmia latifolia)

Native Shrubs

Sweet Pepperbush (Clethra alnifolia)

Southern Bayberry (Morella caroliniensis)

Mimosa

Paulownia

NON-NATIVE TREES

Bradford Pear

Non-Native

Native Trees

Sweetbay
Magnolia

Sassafras

American Plum

Phlox, various *Asters, Liatris*, blanket flower- *Gaillardia*, *Coreopsis*, *Solidago*, *Panicum virgatum* and, of course, *Magnolia virginiana*. There's also some Prairie Coneflower(Ratibida) The fine stuff behind the *Liatris* is *Amsonia hubrichtii.* *Garden/photo: J. Arsenault*

Paw Paw

Asimina triloba

Native tree

Natives

Black Gum

Nyssa sylvatica

Red Maple

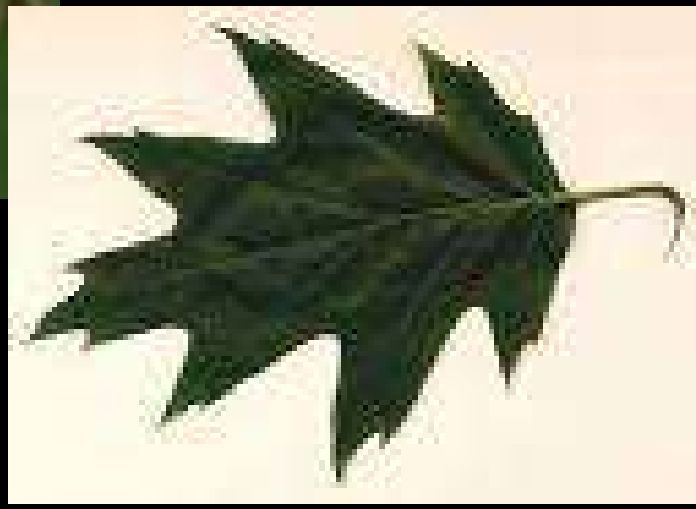
Amelanchier canadensis

Service Berry

White Oak

Natives

Red Oak



Native Trees

Flowering Dogwood

Iron wood, Blue Beech
Carpinus caroliniana

Redbud *Cercis canadensis*

Natives

Fringetree
Chionanthus virginicus

*American Holly

Evergreen Replacements for Bamboo

Hessells
Hairstreak

Natives

Atlantic White Cedar
Chamaecyparis thyoides

Natives

Eastern Arborvitae (Thuja occidentalis)
Green Giant
Emerald Green
Little Giant
Golden Globe
'Fastigiata'
'Filiformis'
Danica
DeGroots Spire
Black Cedar etc.

Eastern Hemlock -'Lewis' *(Tsuga canadensis)*

Taxodium distichum
Bald Cypress

Natives

White Pine
P.s.'Fastigiata

Pinus strobus
White Pine

Bamboo or Breeding?

‘Rubicon’

Temple’s Upright’

‘Bowhall

Questions?

Kristen Buhls

Extension Agent

Agriculture and Natural Resources

Horticulture

Virginia Cooperative Extension

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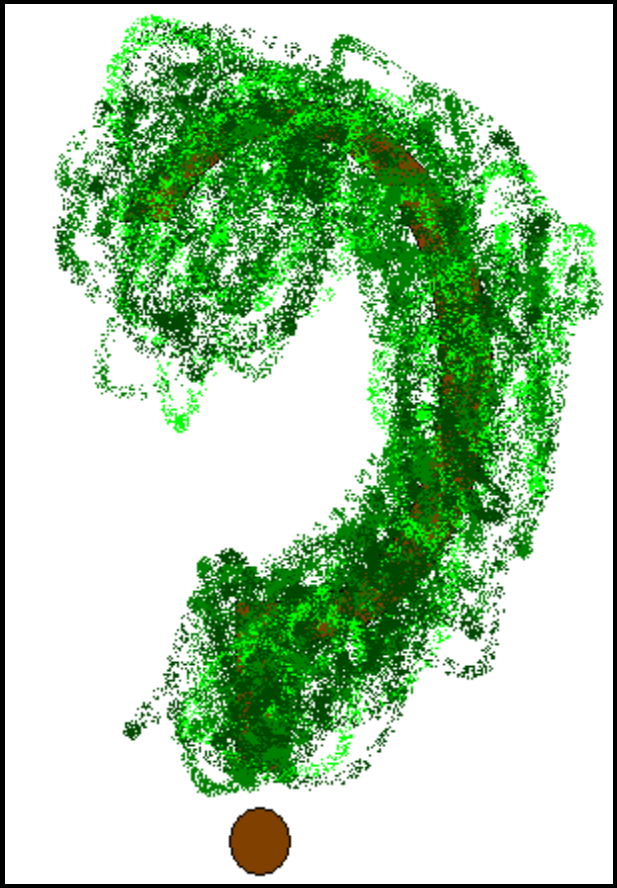

Resources from Workshop 3:
Green Landscaping for You and the Chesapeake Bay

Rain Gardens: Design and Construction
http://www.aacounty.org/DPW/Highways/Resources/Raingarden/RG_FAIRFAX%20CO.pdf

Rain Gardens: A How to Manual for Homeowner
http://www.dnr.state.wi.us/org/water/wm/dsfm/shore/documents/rgmanual.pdf

Native Plants for Wildlife Habitats and Conservation Landscaping
http://www.nps.gov/plants/pubs/chesapeake

Rain Gardens: Technical Guide
http://www.dof.virginia.gov/mgt/resources/pub-Rain-Garden-Tech-Guide_2008-05.pdf

FIND OUT MORE AT ALEXANDRIA'S GREEN BUILDING RESOURCE CENTER (http://www.alexandriava.gov/gbrc)

Helpful Websites for Workshop 3:
Green Landscaping for You and the Chesapeake Bay

www.alexandriava.gov/Environment
www.alexandriava.gov/Planning
www.offices.ext.vt.edu/arlington
www.dcr.virginia.gov
www.deq.virginia.gov
www.alliancechesbay.org
www.cwp.org
www.lowimpactdevelopment.org
www.greenroofs.org
www.vnps.org
www.smartbuildingdirectory.org

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