





















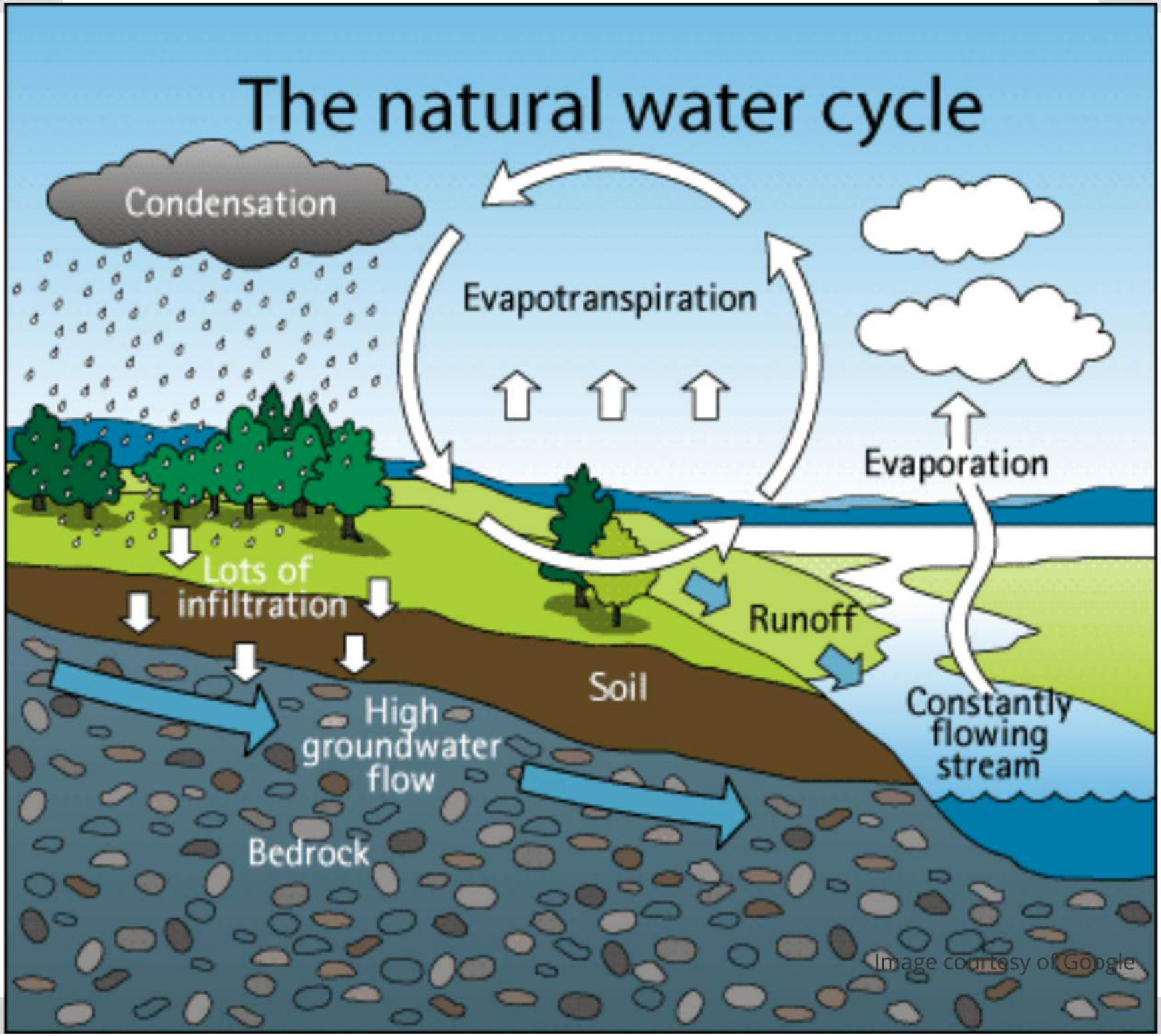








Amanda Rockler, Watershed Specialist, UMD Sea Grant


The natural water cycle
Condensation
Evapotranspiration
Evaporation
Lots of infiltration
Runoff
Soil
High groundwater flow
Constantly flowing stream
Bedrock
Image courtesy of Google

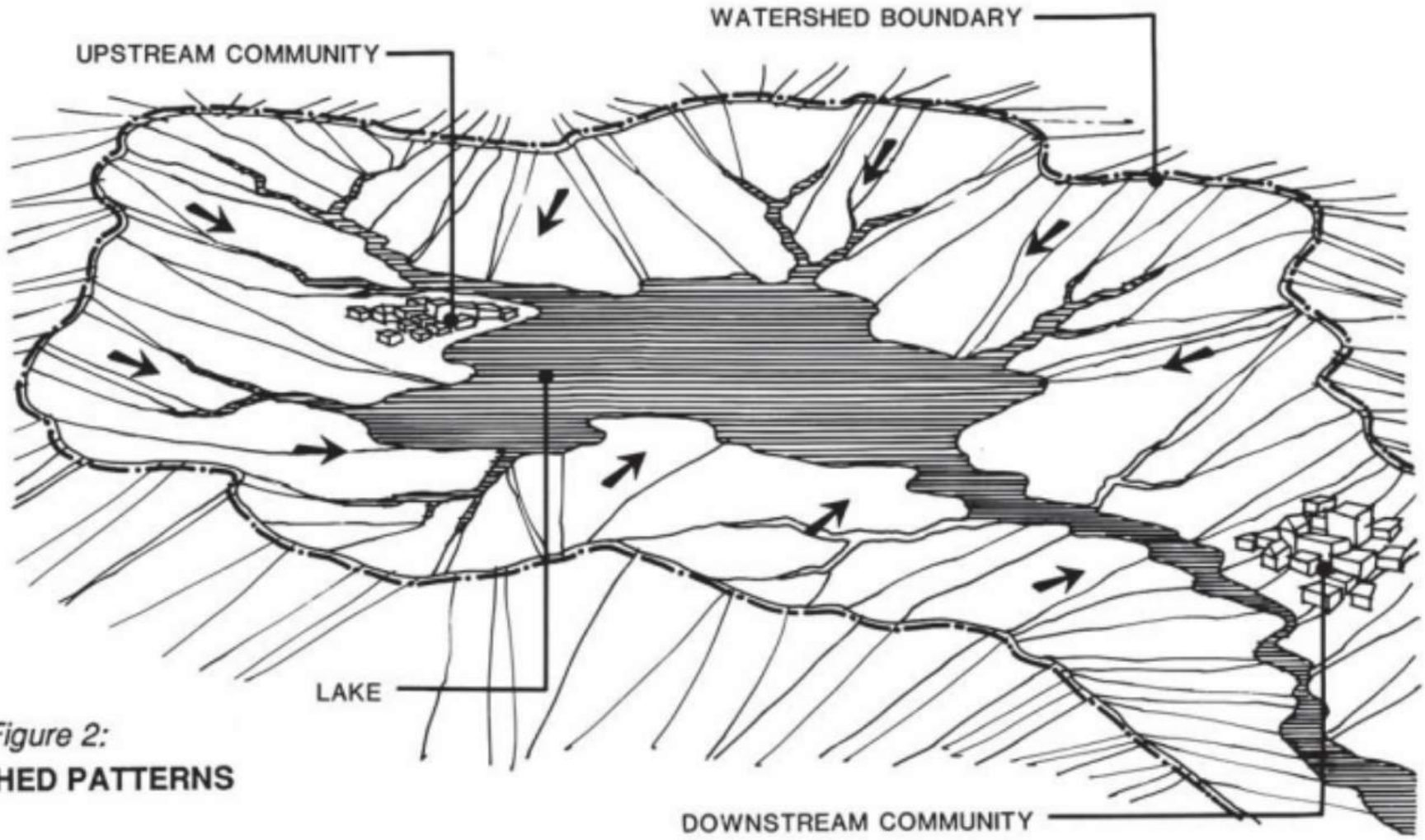


Figure 2:
WATERSHED PATTERNS

Image courtesy of Florida DEP

Our Chesapeake Bay Habitat: By the Numbers

3.8 million acres of turf

1.5 million acres of impervious cover (75% untreated)

15.6 million people

5.7 million homes

12 million cars

200,000 miles of roads

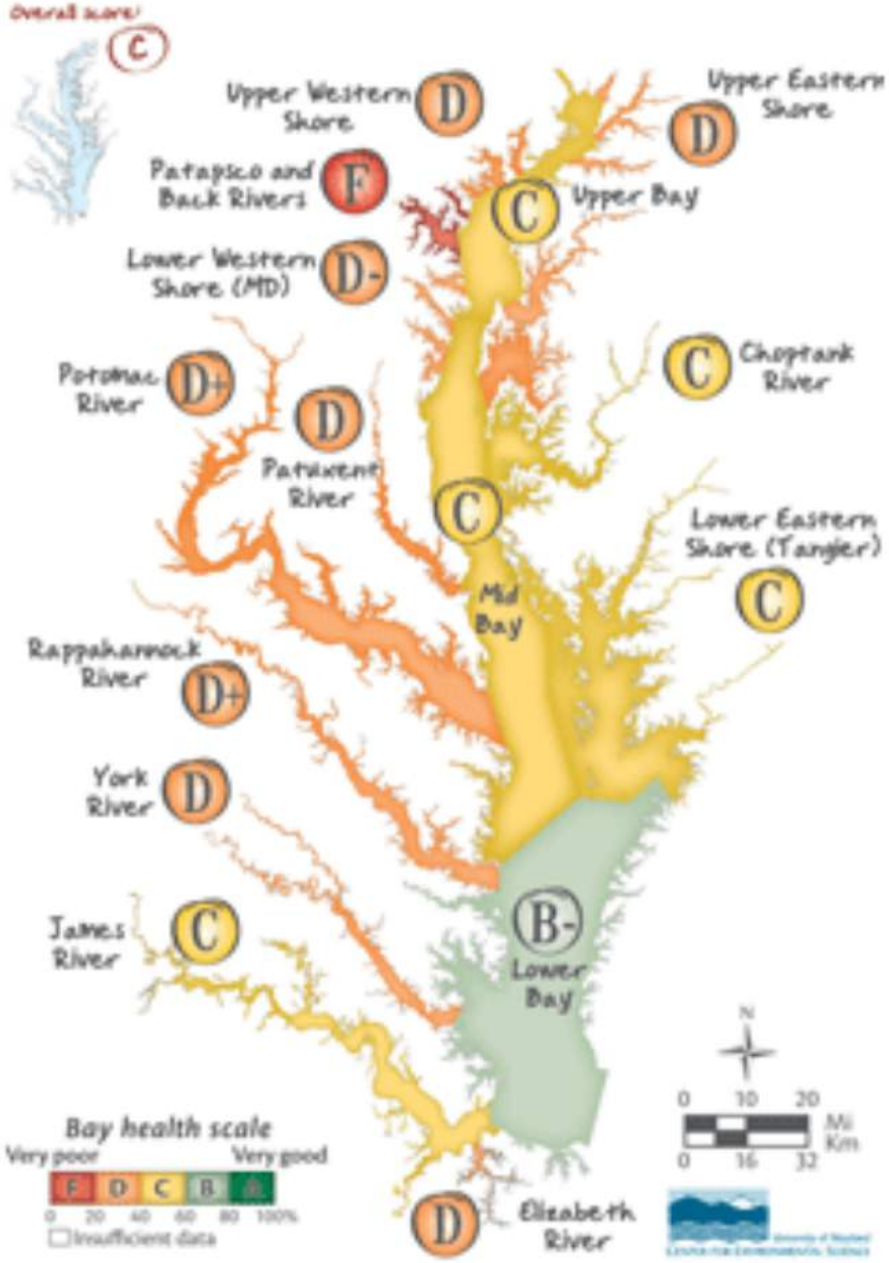
6.7 million dogs

Slide courtesy of Tom Schueler

Bay Restoration History

- *1972-Clean Water Act*
- *1972- Coastal Zone Management Act (CZMA)*
- *1983- Bay Partnership*
- *1987- Bay Agreement*
- *1990- CZMA reauthorized*
- *2000- Chesapeake Bay Agreement*

Chesapeake Bay Health 2013



Chesapeake Bay Grade: **C**

15 regions

7 indicators

9% from 2011

photo from ian.umces.edu/ecocheck/report-cards/chesapeake-bay/2012/

Bay Today
Federal "Accountability Framework"

- Clean Water Act: Bay TMDL and generally greater regulatory influence
- Watershed Implementation Plans
- Tracking & Evaluating Progress
- 2-Year Implementation Milestones
- Federal "Consequences"

Reductions needed by 2025

Nutrient	Pound Reduction from 2010 (millions of lbs)	Percent Reduction from 2010
Nitrogen	11.60	22
Sediment	26	1.9
Phosphorus	.49	14.9

ors Impacting Bay and Watershed Healt

What is Stormwater Runoff?

Stormwater is water that originates during precipitation events.

Photo courtesy of CWP, Kelly Collins

- Stormwater runoff picks up pollution (fertilizer, pesticides, sediment, motor oil, litter, and pet and yard waste)

- Pollution is then carried to local streams and rivers.

Photo courtesy of CWP, Kelly Collins

Stormwater is how pollution enters our streams

Bacteria

Trash

Erosion/Sediment

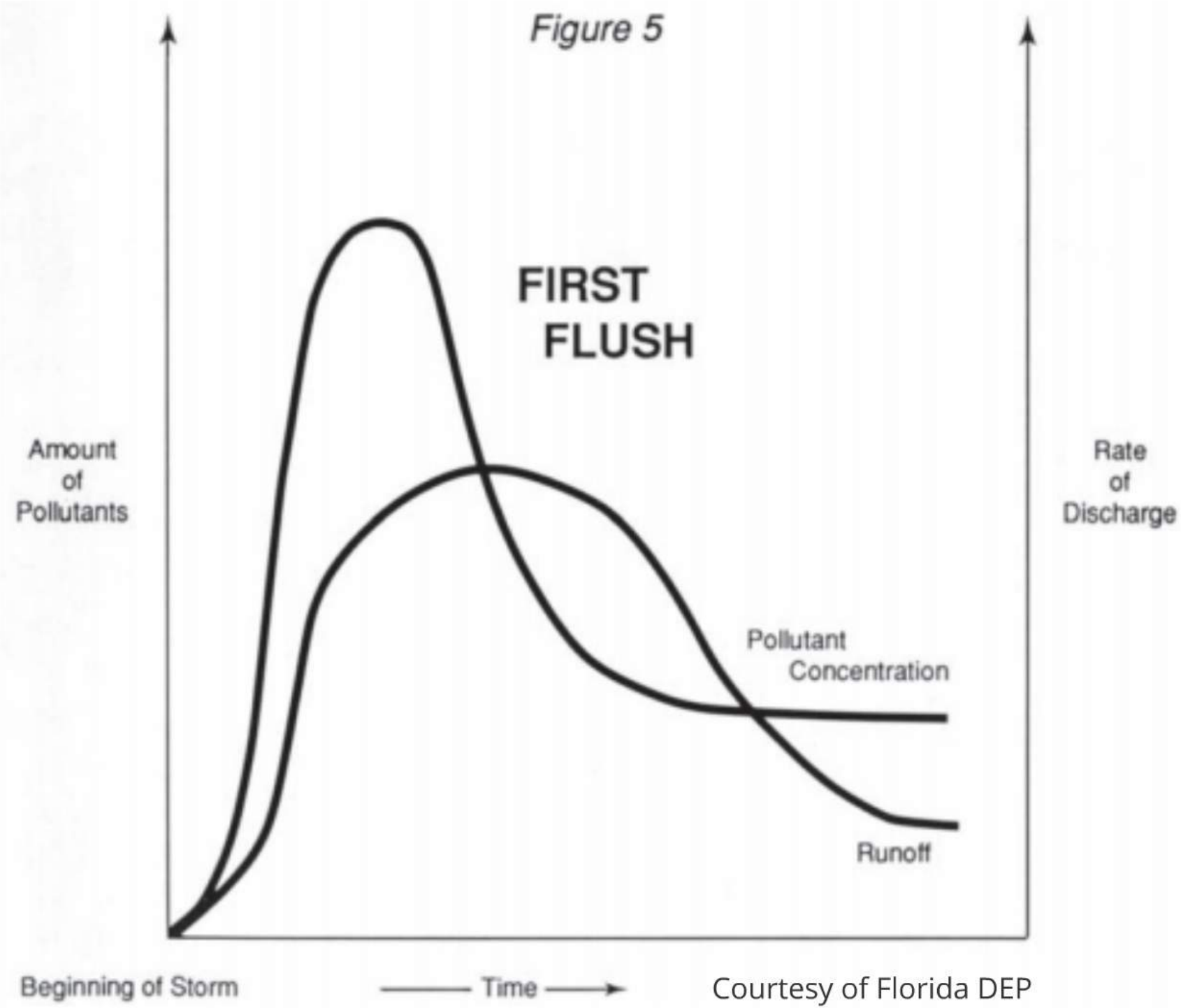
Stormwater

Toxics

Nutrients

Images Courtesy of Google

Figure 5



Courtesy of Florida DEP

Typical community scenario

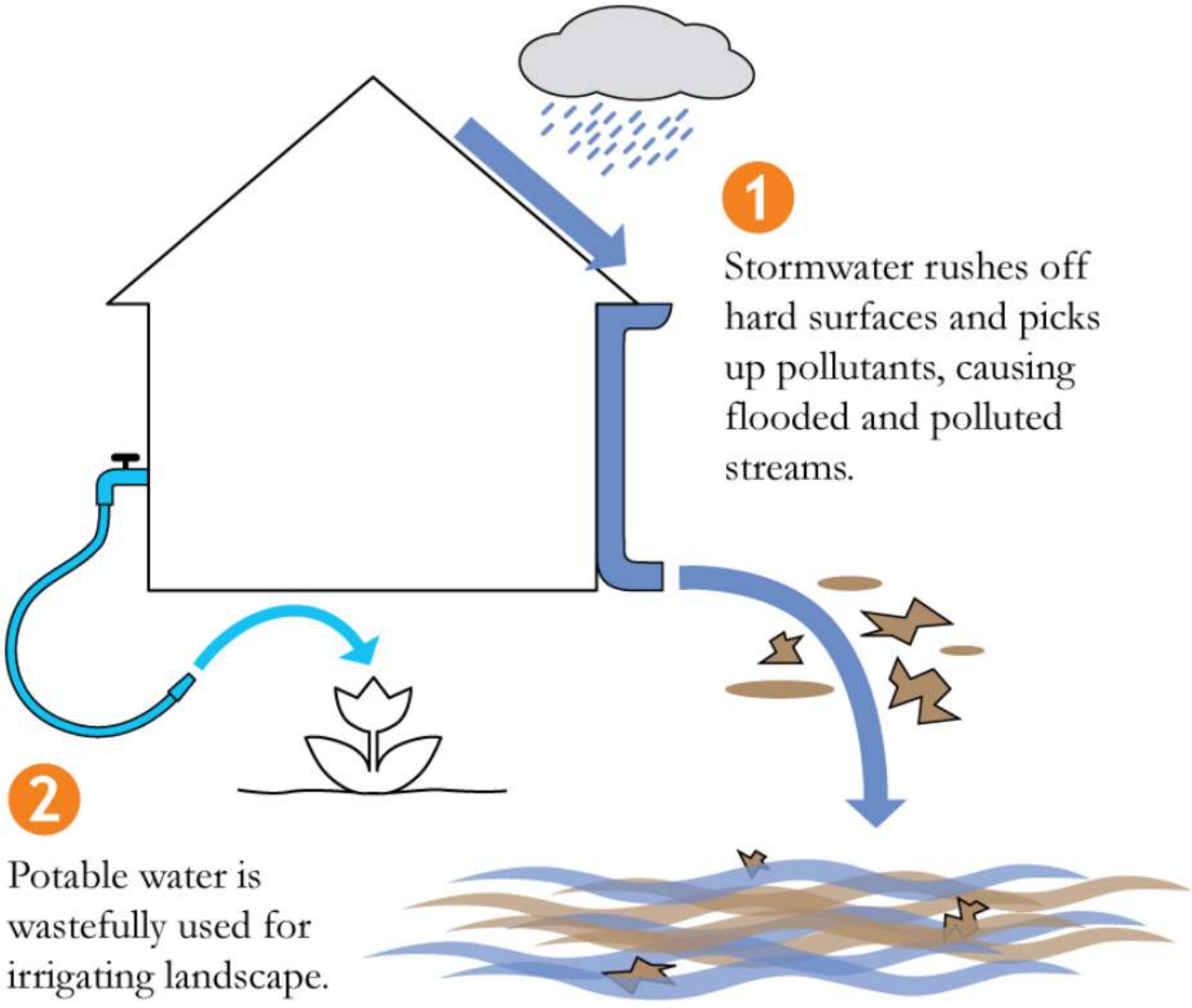


Image Courtesy of City of Rockville

No-o-o-o-o-o-o-o!

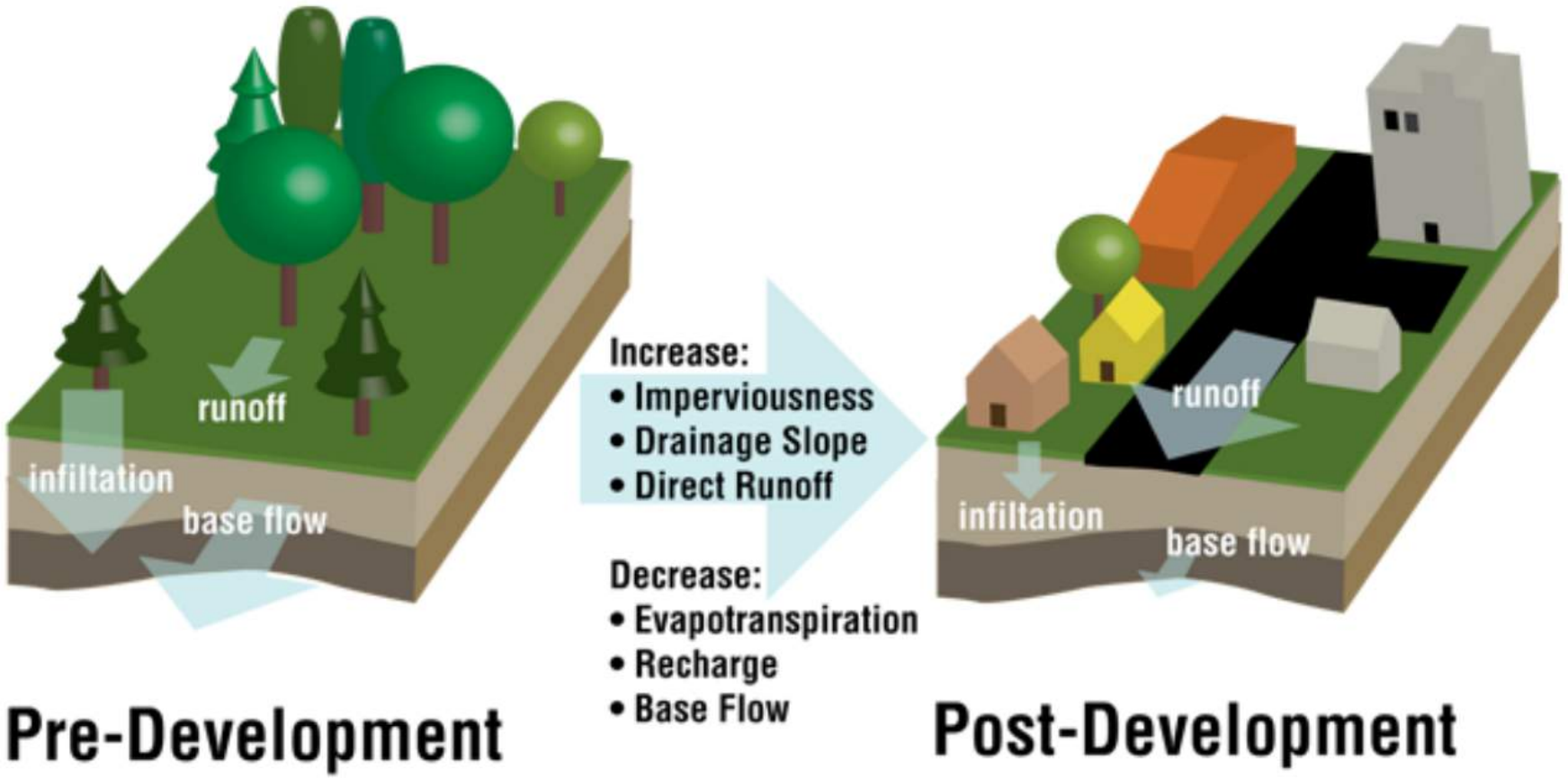


Image courtesy of Invisiblestructures.com

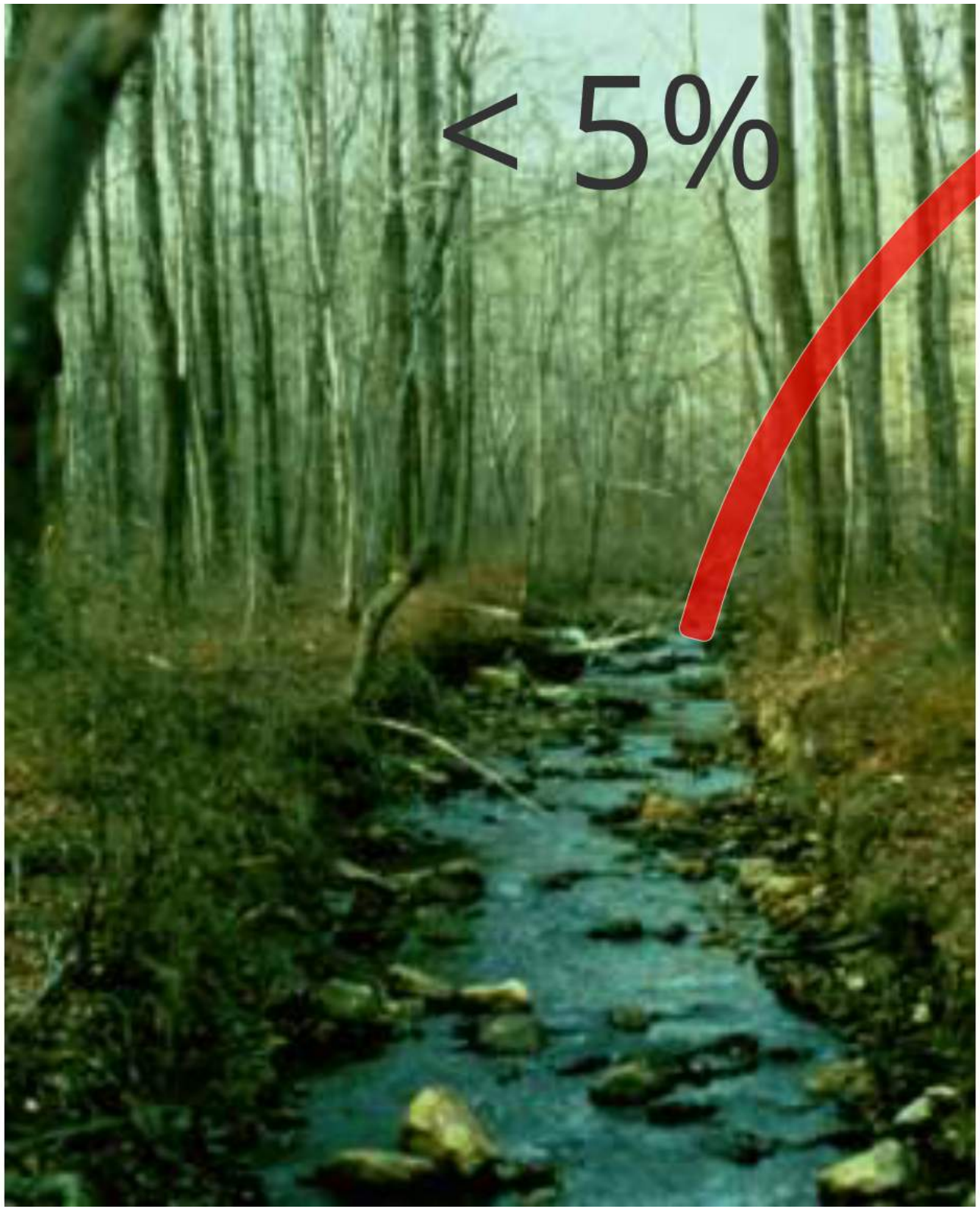
We have met the enemy and that is excess impervious cover!

Photo courtesy of CWP, Kelly Collins


EXXON

Geomorphological Impacts

8-10%


< 5%

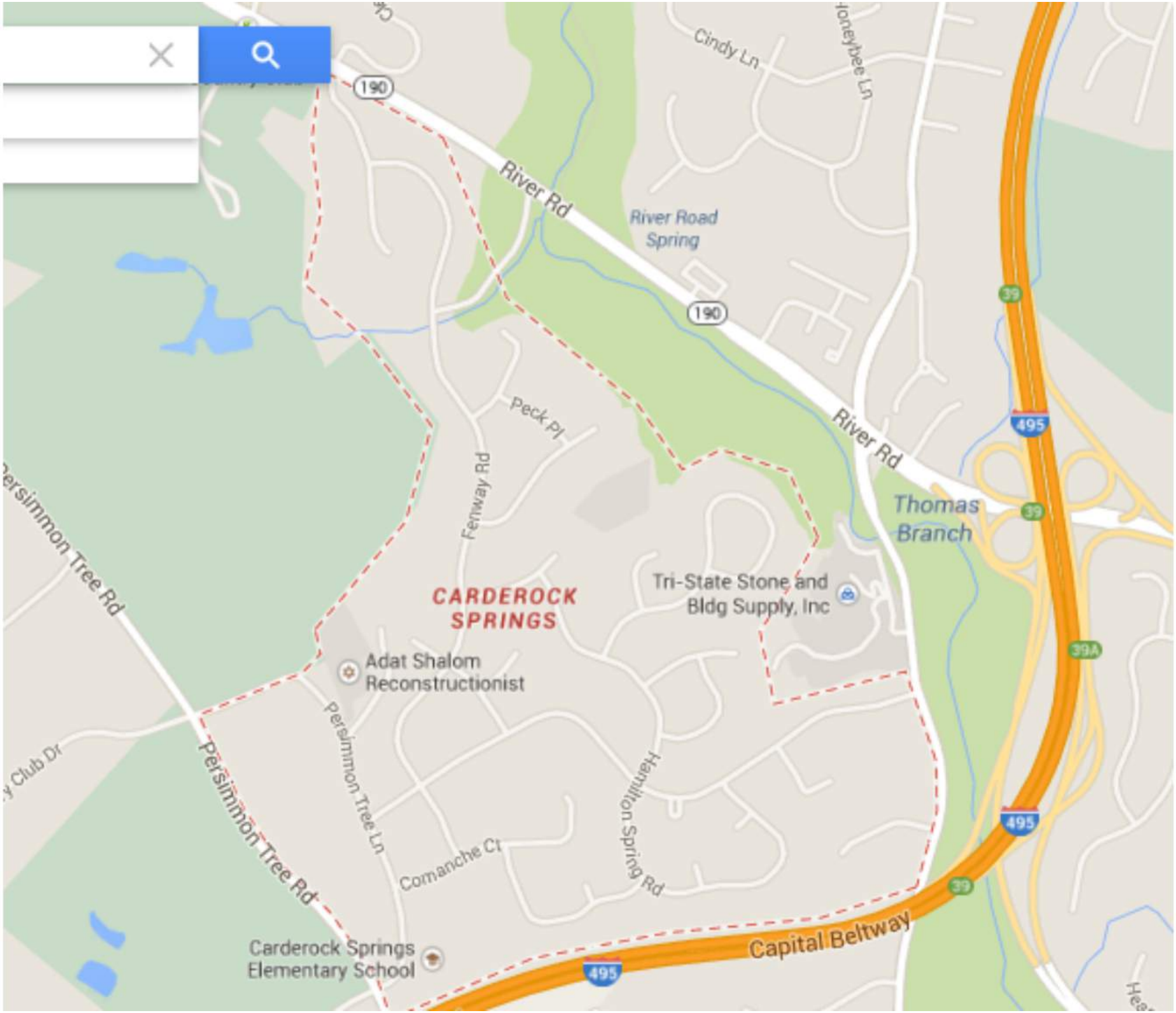

20%

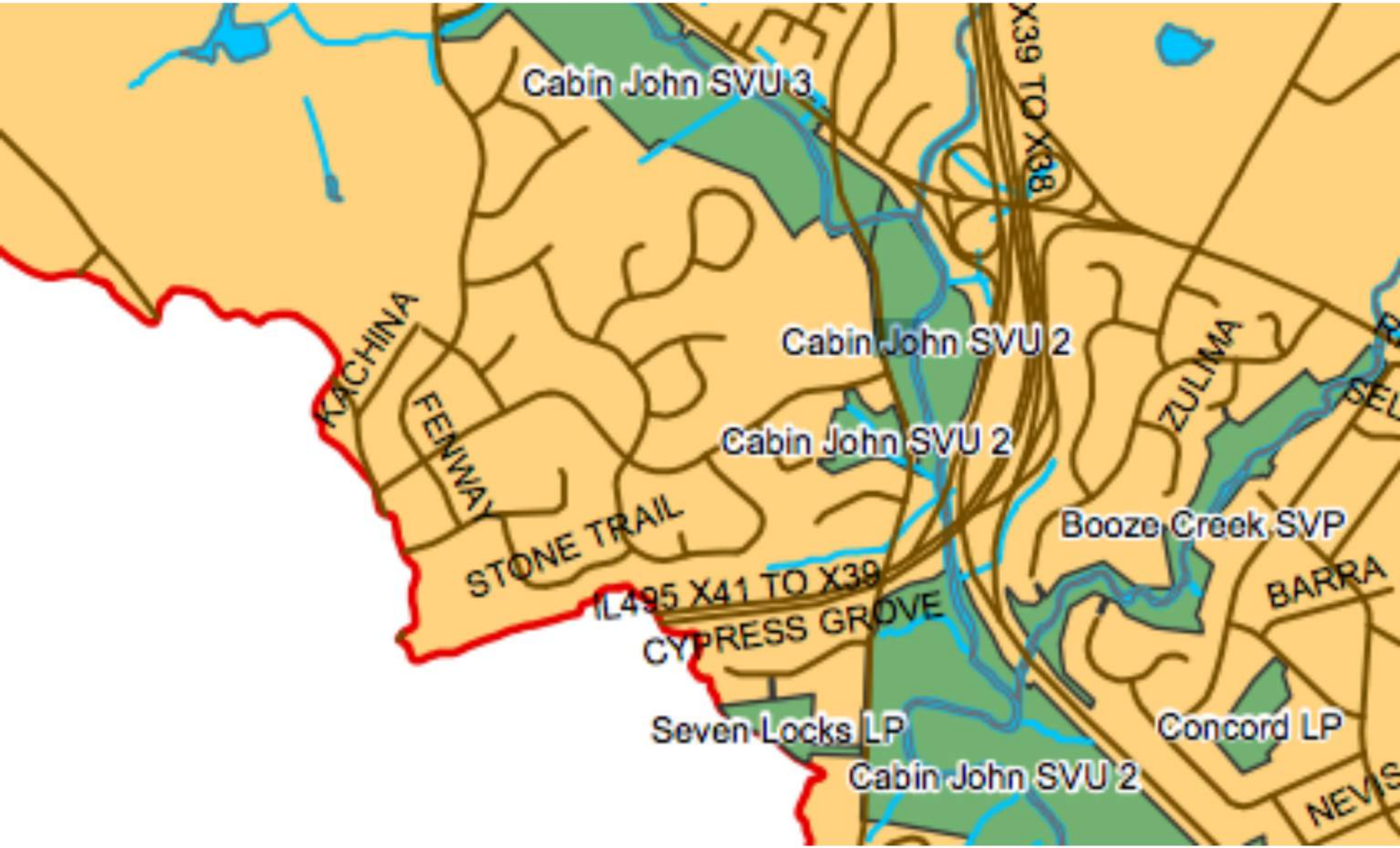

30%

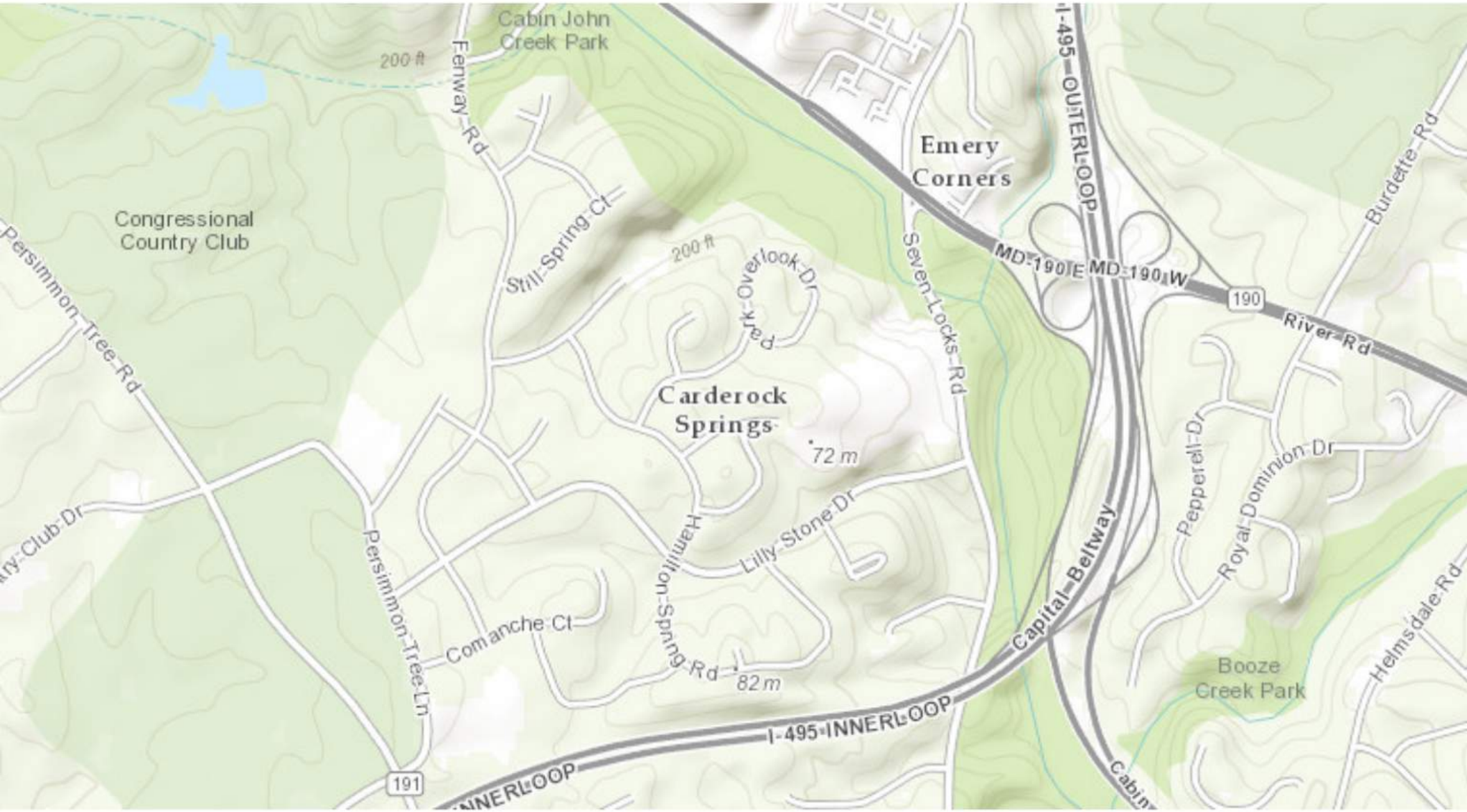

> 65%

Photo courtesy of Kate Fritz

Photo courtesy of Kate Fritz

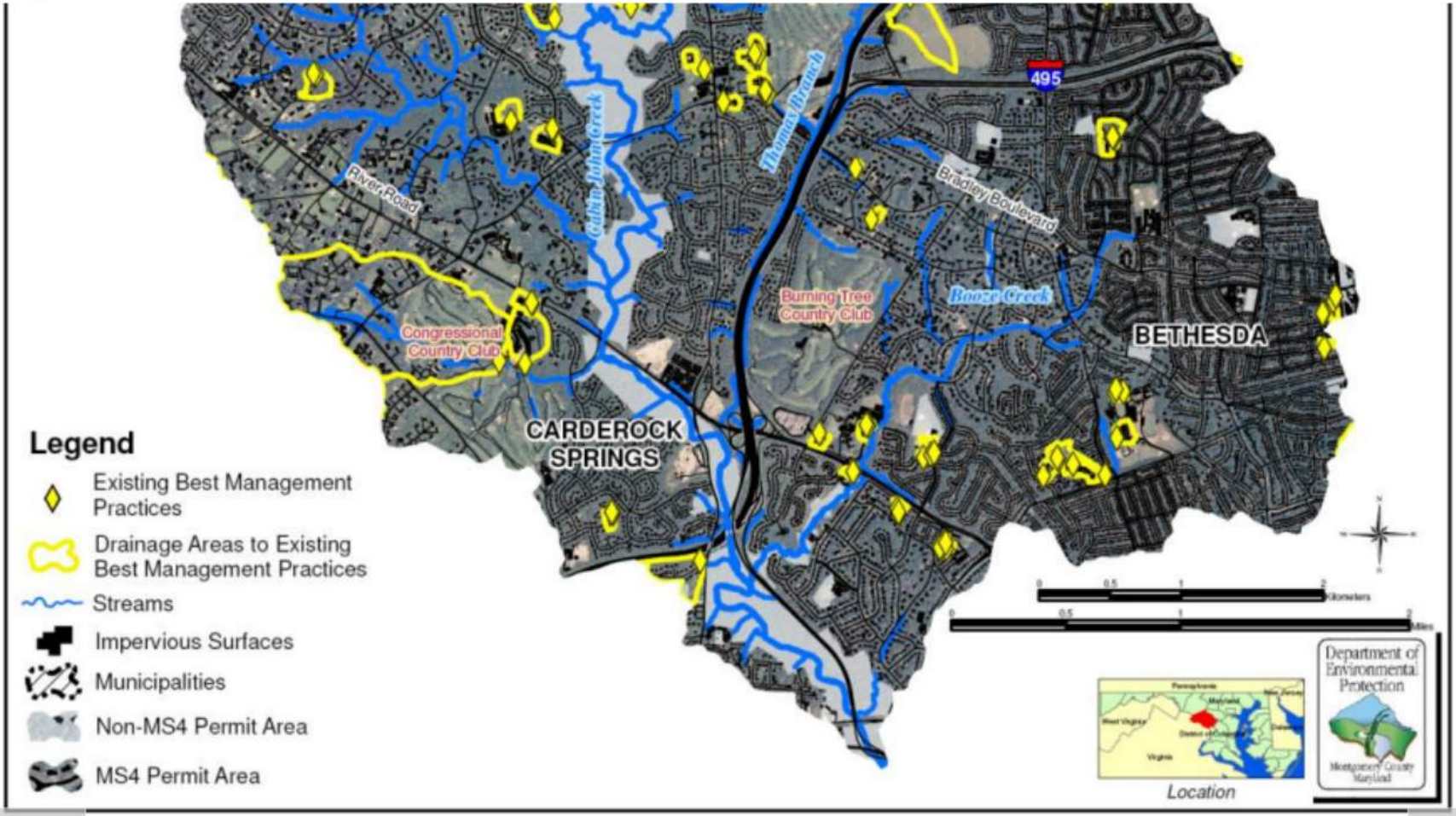

Cindy Ln
Honeybee Ln
190
River Rd
River Road Spring
190
River Rd
Peck Pl
Fenway Rd
495
39
Thomas Branch
Persimmon Tree Rd
CARDEROCK SPRINGS
Tri-State Stone and Bldg Supply, Inc
39A
Adat Shalom Reconstructionist
Persimmon Tree Rd
Persimmon Tree Ln
Hamilton Spring Rd
Comanche Ct
495
39
Capital Beltway
Carderock Springs Elementary School
495


Cabin John SVU 3
X39 TO X38
KACHINA
FENWAY
Cabin John SVU 2
ZULIMA
Cabin John SVU 2
STONE TRAIL
Booze Creek SVP
BARRA
IL495 X41 TO X39
CYPRESS GROVE
Seven Locks LP
Concord LP
Cabin John SVU 2
NEVIS


Cabin John Creek Park
200 ft
Fenway Rd
Still Spring Ct
Congressional Country Club
Persimmon Tree Rd
Park Overlook Dr
200 ft
Carderock Springs
72 m
Seven Locks Rd
I-495 OUTER LOOP
MD 190 E
MD 190 W
190
River Rd
Emery Corners
Burdette Rd
Pepperell Dr
Royal Dominion Dr
Lilly Stone Dr
Hamilton Spring Rd
82 m
Comanche Ct
Persimmon Tree Ln
Capital Beltway
I-495 INNER LOOP
191
Booze Creek Park
Helmsdale Rd

Metric	*Acres*	*Percent of Watershed*
Watershed Drainage Area	16,022	100%
Impervious Cover	3,402	21%
Watershed Area Subject to County MS4 Permit[1]	11,880	74%
Impervious Cover Subject to County MS4 Permit[1]	2,422	20%
Pervious Cover (e.g., forest, turf, meadow, farm fields)[1]	9,458	80%

[1] Excluded areas include Rockville, rural zoning, all MNCPPC lands, Federal and State property, and Federal and State roads.



Maryland Department of Planning 2002 Land Cover/Land Use	*Watershed Acres*	*Percent of Total (%)*
Low Density Residential (<1 du/acre)	2,544	21%
Medium Density Residential (1-4 du/acre)	5,404	46%
High Density Residential (>4 du/acre)	180	2%
Commercial	259	2%
Industrial	360	3%
Municipal/Institutional- Intensive[1]	672	6%
Municipal/Institutional- Extensive[2]	862	7%
Roadway[3]	827	7%
Rural[4]	98	1%
Forest[5]	647	5%
Open Water	16	0.1%
Bare Ground	12	0.1%
Total Watershed	**11,880**	**100%**

[1] Institutional land use (churches, schools, municipal buildings)
[2] Open Urban Land and Bare Rock land use (parks, cemeteries, and golf courses)
[3] Combined County and private roads (excludes Federal and State roads)
[4] Orchards, Vineyards, Horticulture, Feeding Operations, Cropland, Pasture, and Agricultural Buildings land use
[5] 2002 Land Use Data.

Table 10. MS4 Permit Area Impervious Cover in Cabin John Creek Watershed

Impervious Cover Type	*Impervious Acres*	*Watershed (%)*
1. Roads		
a. Low Density Residential[1]	273.6	11.5%
b. Other[2]	553.2	23.3%
2. Parking Lot		
a. County Small Lots (<1 acre)[3]	21.0	0.9%
b. County Large Lots (>=1 acre)[3]	31.3	1.3%
c. Private	324.7	13.7%
3. Roofs		
a. County[4]	20.4	0.9%
b. Single Family Homes[5]	827.1	34.9%
c. Other	233.7	9.9%
4. Sidewalks[6]	56.3	2.4%
5. Other		
a. Schools[7]	28.2	1.2%
b. Recreational[8]	0.0	0.0%
Total Impervious Acres from GIS[9]	2,369.6	**100.0%**

[1]All roads in RE2 or R200 property zoning

Currently, the majority of the stream resource conditions in Cabin John Creek were assessed as 'Fair', with the remaining 17.5% assessed as 'Poor'. Zero stream miles were assessed as 'Excellent' or 'Good'.

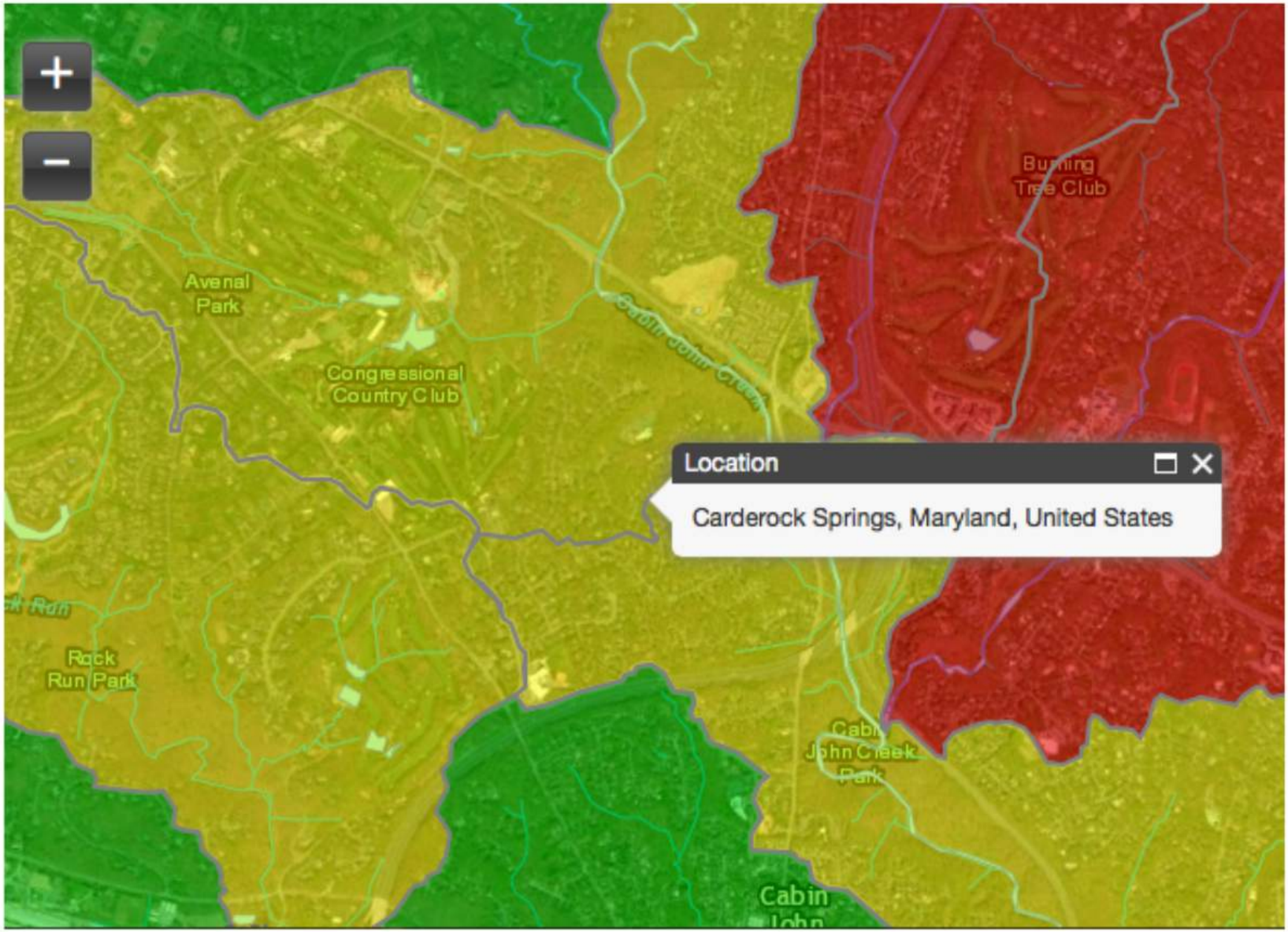


Table 9. Bacteria Baseline Loading Estimates for Cabin John Creek Watershed and Comparison Values from MDE

Parameter	***Year***	***Baseline Montgomery County MS4 load***	***Montgomery County WLA Reduction***	***Target Montgomery County MS4 load***
Bacteria (*E. coli*)	2006	44,257 billion MPN/year	30.7%	30,670 billion MPN/year

Fiscal Year		2015	2017	2020	2025	2030	TMDL WLAs
Impervious Treated (acres)		187	380	570	1,018	1,018	
ESD (% Impervious)		52%	72%	78%	87%	87%	
Cost (Million $)		23	65	114	215	219	
ESD (% Cost)		92%	91%	86%	90%	88%	
% Reduction from baseline	TN	21%	27%	39%	55%	58%	
	TP	20%	26%	35%	49%	51%	
	TSS	6%	17%	60%	91%	100%	
	Bacteria	16%	22%	27%	40%	40%	31%
	Trash	6%	12%	19%	34%	34%	

TN: Total Nitrogen
TP: Total Phosphorus
TSS: Total suspended solids
WLA: Waste Load Allocation


CARDEROCK
SPRINGS

Large scale stormwater solutions....

Image courtesy of DEP- MoCo, Turkey Thicket Restoration

Smaller scale stormwater solutions....

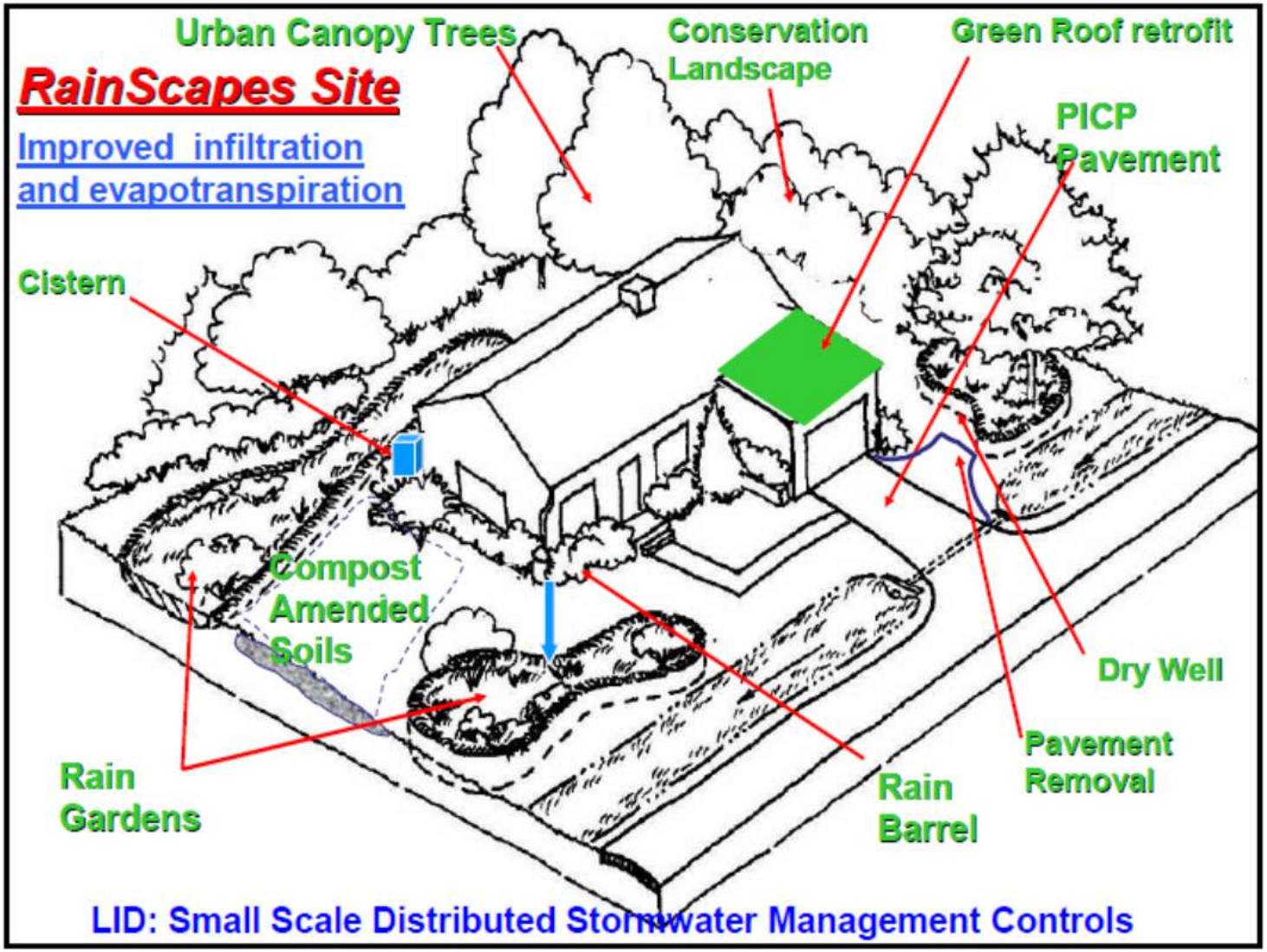
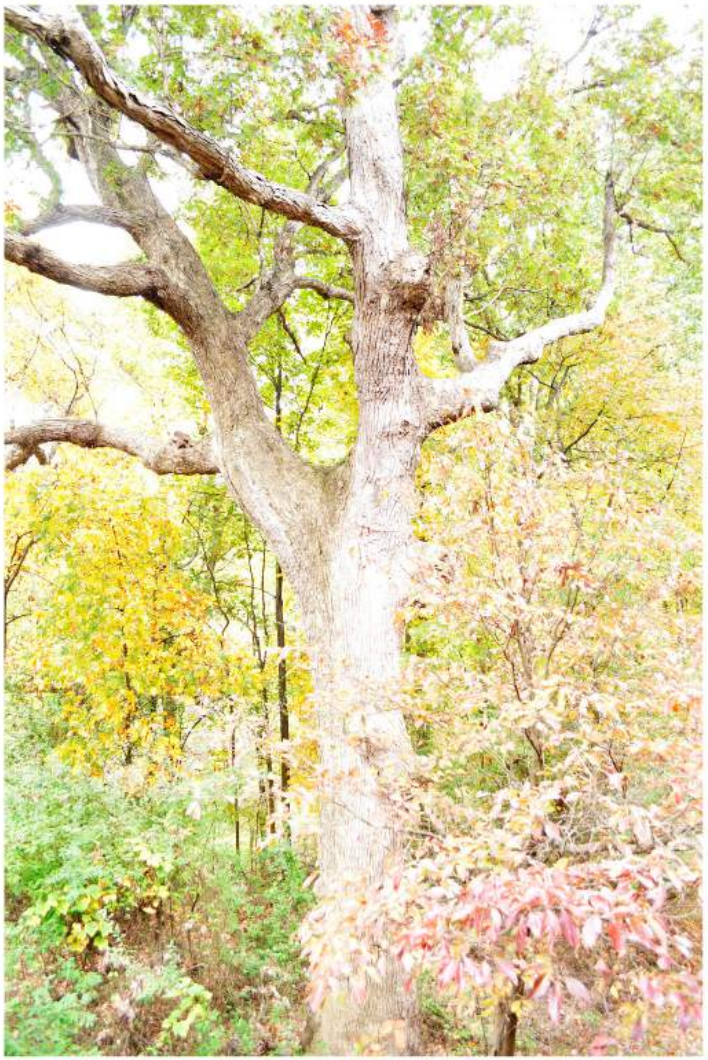


Image Courtesy of Anne English Rainscapes Power Point

Planting Trees



Fertilize wisely or not at all??

Rain Barrels

- A device for small-scale rainwater harvesting
- A stormwater management tool
- Collect, store, reuse rainwater
- Recycled or purpose-built
- Often 55 gallons

http://prezi.com/-vf5n3ungpzs/?utm_campaign=share&utm_medium=copy&rc=ex0share

Sizing

Consider roof area in relation to volume of rain barrel(s)
How much water can you use?
How much space is available?

Rule of thumb:

1" rain over 1000 sq. ft. roof produces 600 gallons of rain runoff

Conservation Landscaping

"Landscaping with specific goals of reducing pollution and improving the local environment."

USFWS Slattery, Reshetiloff, and Zwicker (2003)

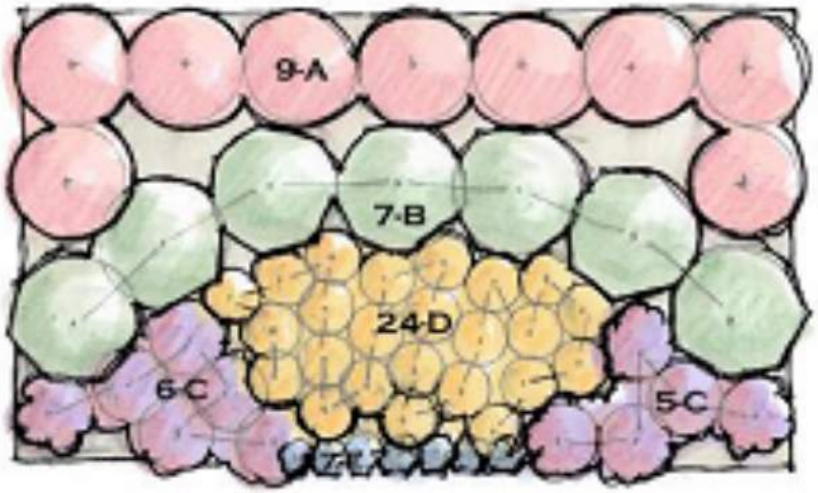
Why Conservation Landscaping?

Reduces pollution of our air and water
Conserves non-renewable resources such as fuel and water
Helps maintain regional biodiversity
Helps eradicate non-native invasive species

Shady Flower Garden

Rhododendron periclymenoides
Pinxterbloom Azalea

Clethra alnifolia
sweet pepperbush



Chrysogonum virginianum
Green-and-Gold

Eurybia divaricata
White Wood Aster

Phlox stolonifera
Creeping Phlox

Scale: 1/8"=1'

N

Permeable/Porous

Slide Courtesy of WEF, Mark Walker


YouTube

Green Roofs

Rain Gardens


YouTube

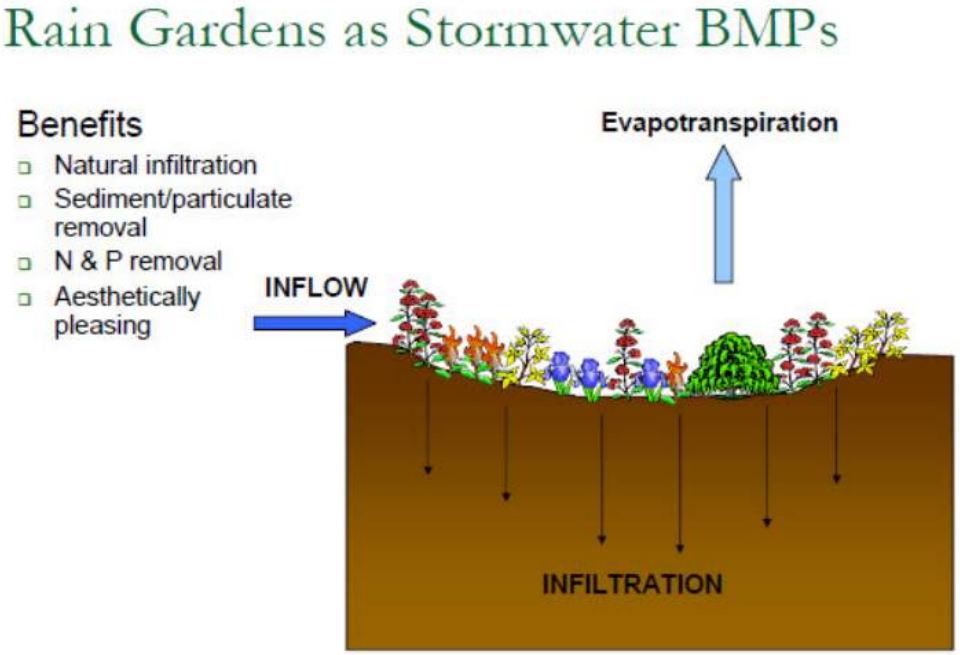
What is a rain garden?

Shallow depression that captures and filters stormwater runoff

http://water.unl.edu/c/document_library/get_file?uuid=bb3e4c0c-73bb-4295-b529-738f20609d0d&groupId=1882&.swf

Rain garden principles and benfits

- Rain gardens are placed between stormwater runoff sources (roofs, driveways, parking lots) and runoff destinations (storm drains, streets, streams).
- SLOW it DOWN and SOAK it UP



Slide Courtesy of Anne English and Montgomery County Rainscapes

Image courtesy of NRCS

Native Species!!

Photos courtesy North Creek Nurseries

http://prezi.com/7zspkwnln6ji/native-plants/

Recommendations

- Maintenance
- Behavior Change Campaign
- Implementation of small scale practices on residential properties
- Pet Waste campaign
- Maintain exisiting tree canopy and Reforest

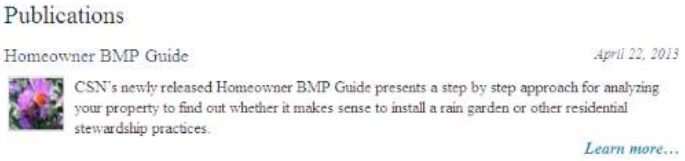
Resources

- RainScape Rewards Program http://www.montgomerycountymd.gov/dep/water/rainscapes-rebates.html
  - $2500 homeowner
  - $10,000 commercial, hoa, multi family, institutional
- Chesapeake Bay Trust
- National Fish and Wildlife Foundation

Resources

Rain Gardens Across Maryland https://extension.umd.edu/learn/rain-gardens-across-maryland

Chesapeake Stormwater Network: Homeowner BMP Guide http://chesapeakestormwater.net/category/publications/



UCONN CLEAR Rain Garden App: http://extension.umd.edu/watershed/regional-rain-garden-app

Interlocking Concrete Pavement Institute (ICPI)
http://www.icpi.org/

City of Rockville Rain Barrel Videos
http://www.rockvillemd.gov/index.aspx?NID=828

Stormwater Video

http://earthfix.opb.org/water/article/drained-how-we-got-into-such-a-mess-with-stormwate/


YouTube

Thank you! Questions.....

Amanda Rockler
arockler@umd.edu
410-313-2708

http://extension.umd.edu/watershed

UNIVERSITY OF MARYLAND EXTENSION

Solutions in your community