Tree Canopy and Water Export from Pervious and Impervious Land Uses

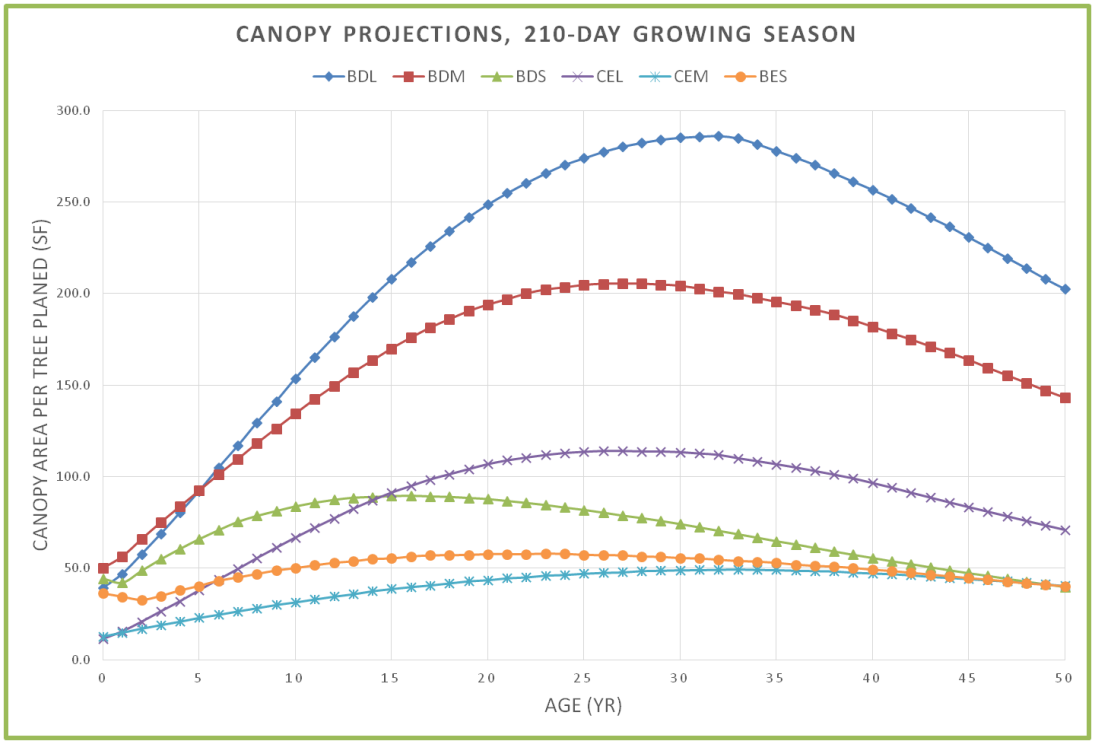
Justin Hynicka

Chesapeake Watershed Forester

MD Dept. of Natural Resources - Forest Service

This project builds on work by the Tree Canopy EP

- Use existing literature review on urban tree planting and canopy (Karen Cappiella, Center for Watershed Protection)



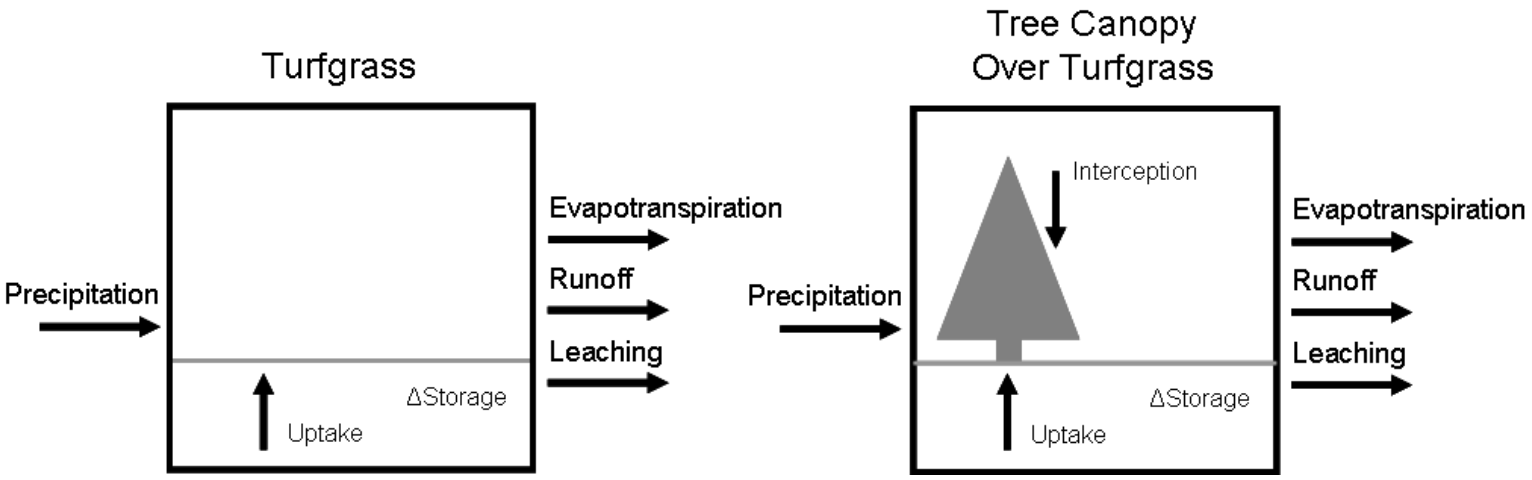
(Ari Daniels and Neely Law)

This project builds on work by the Tree Canopy EP

- Use existing literature review on urban tree planting and canopy (Karen Cappiella, Center for Watershed Protection)
- **For a long-term practice in complex watersheds modeling is the best approach to estimate relative loading rates among land classes**
- Combine lit review with other data on plant physiology into a generalizable water balance model (and ultimately TN, TP, and sediments)

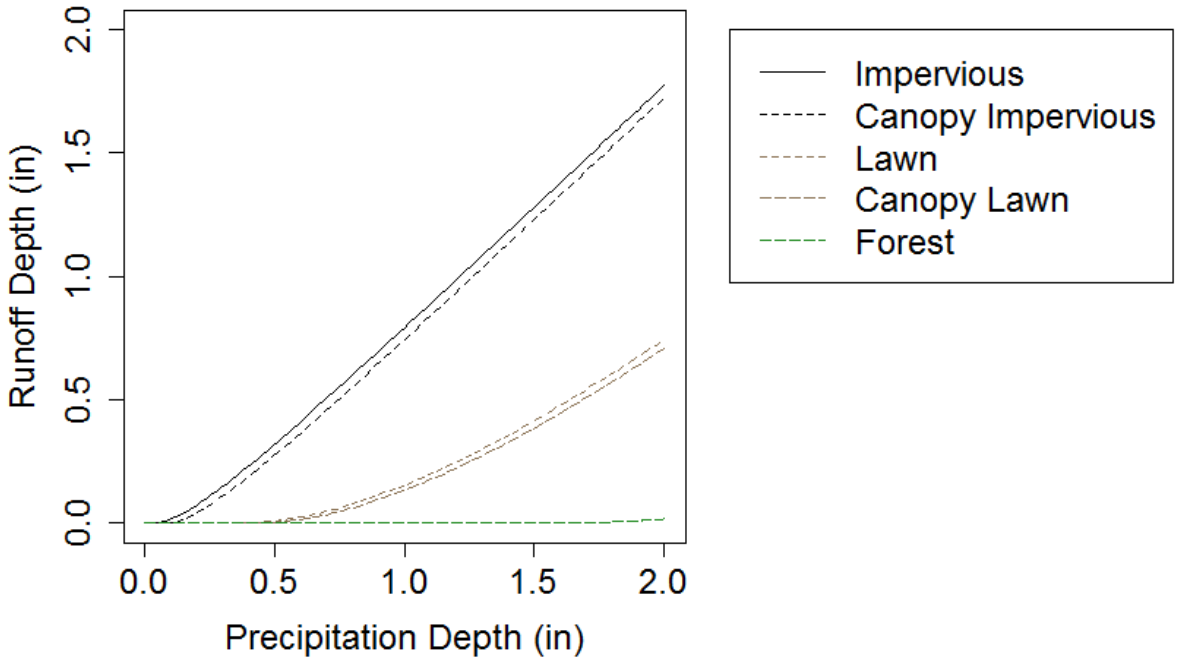
Why water balance, and what does it look like?

- Regardless of the source, it is how nutrients and sediment are transported by water that determines the impacts to the quality of streams, rivers, and estuaries

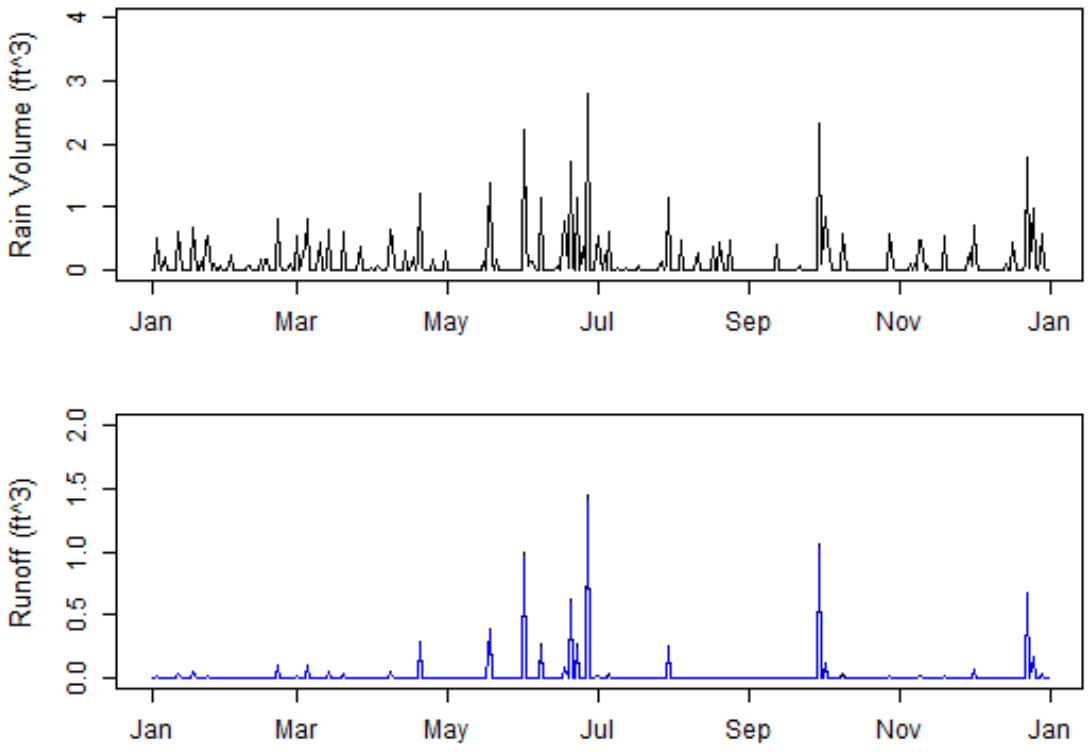


SCS Curve Number Method used to estimate runoff

- Widely used method that can be applied to multiple land cover types
- Runoff estimated from local weather data

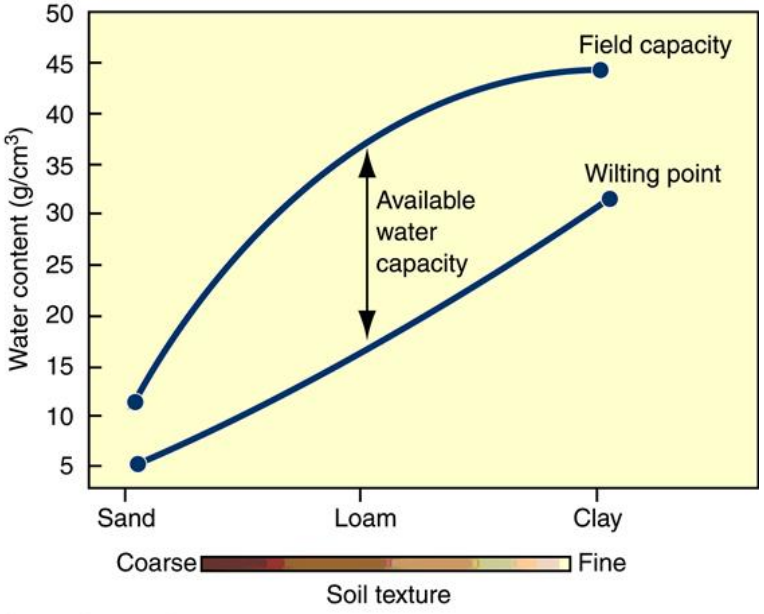


Rainfall and runoff for pervious land in Baltimore (2015)



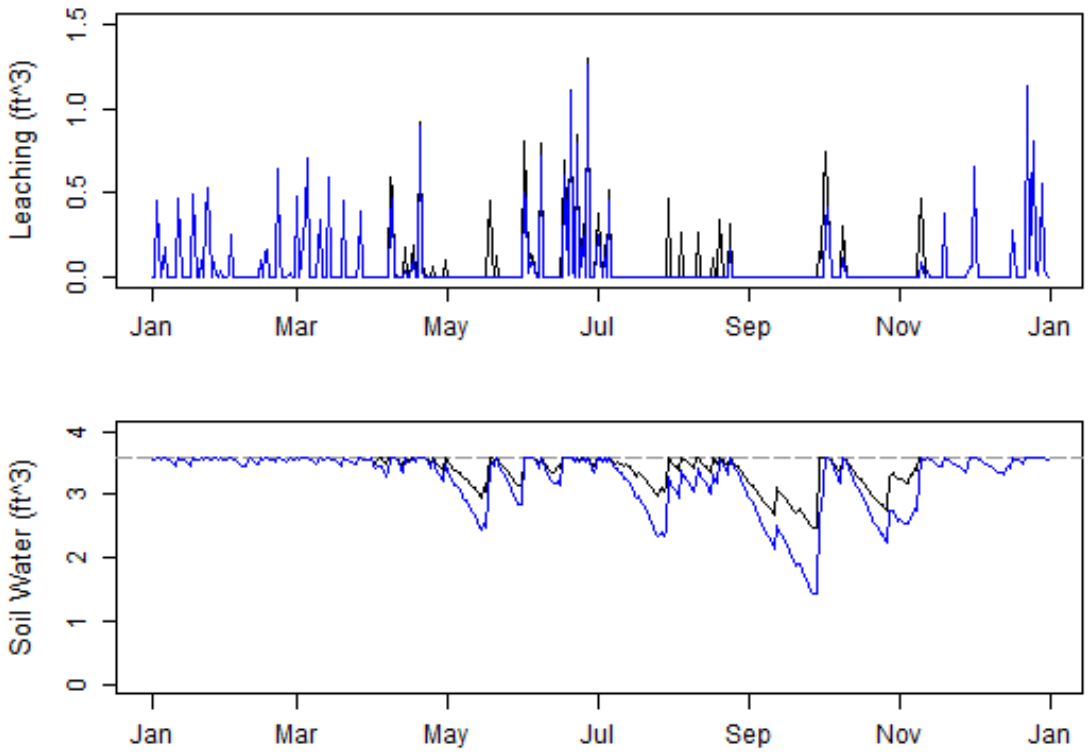
Plants transpire water from the soil

- Average daily evapotranspiration (ET) rates for trees and turfgrass from the literature
- Limit ET based on the volume of soil water available to plants (silt clay loam)



http://www.tankonyvtar.hu/en/tartalom/tamop425/0032_talajtan/ch07s02.html

Plants transpire water from the soil in between rain events



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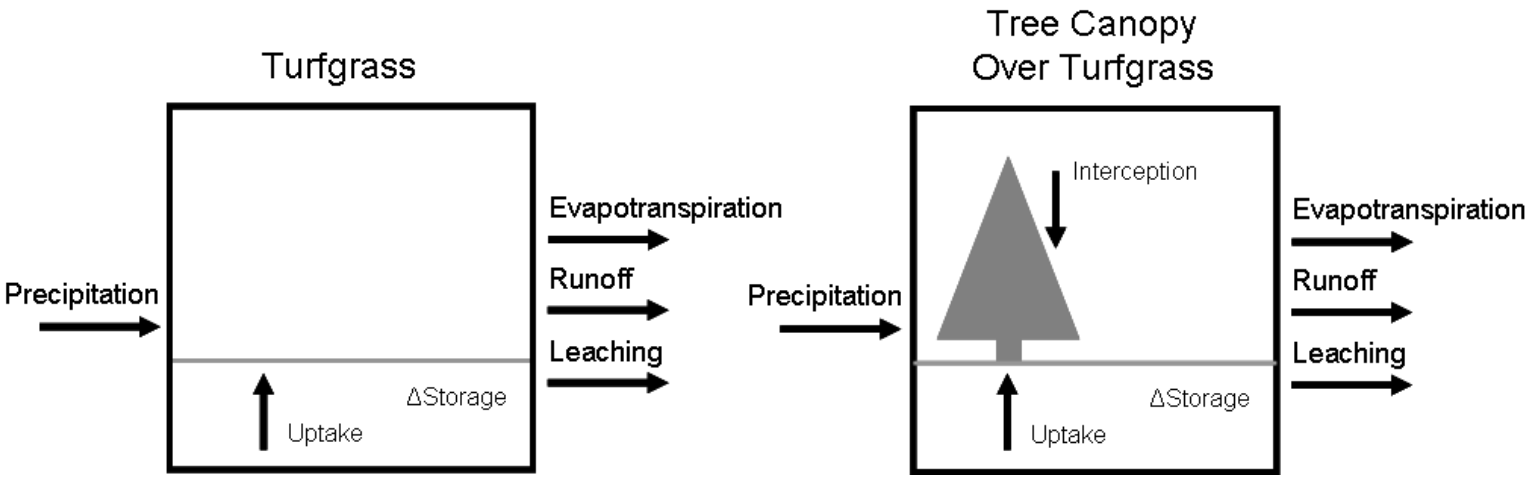
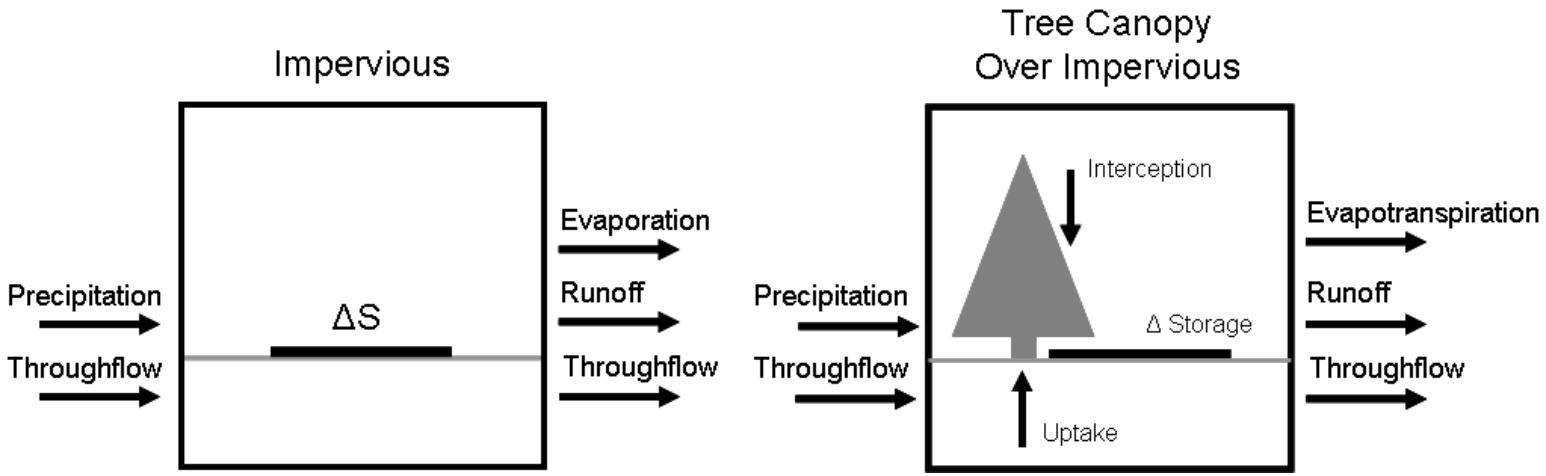


Preliminary results for tree canopy over pervious

City	Precip. (ft^3)	Runoff Red. (%)	Leaching Red. (%)	Total (%)
Baltimore, MD	45.9	5.2	23.3	**19.5**
Hagerstown, MD	25.4	11.3	48.0	**44.2**
Salisbury, MD	46.1	5.8	22.5	**19.3**
Binghamton, NY	38.3	8.1	26.0	**23.5**
Bradford, PA	35.0	10.3	28.3	**26.7**
Wilkes-Barre, PA	28.0	9.1	42.9	**37.9**
Roanoke, VA	48.9	5.9	20.7	**17.5**
Norfolk, VA	45.0	5.0	24.2	**19.7**

Canopy over impervious surfaces has unique challenges

- Requires a source of water and nutrients to build biomass that cannot be supplied by atmospheric sources
- Nutrient cycling has a net loading rate ***less than or equal to zero***



Preliminary results for tree canopy over impervious

City	Precip. (ft^3)	Runoff Red. (%)	Throughflow Red. (%)	Total (%)
Baltimore, MD	45.9	5.2	24.3	**14.5**
Hagerstown, MD	25.4	9.5	23.8	**19.2**
Salisbury, MD	46.1	5.0	23.8	**14.1**
Binghamton, NY	38.3	8.2	20.2	**14.9**
Bradford, PA	35.0	10.0	18.3	**15.1**
Wilkes-Barre, PA	28.0	9.0	23.5	**18.4**
Roanoke, VA	48.9	5.2	22.8	**13.3**
Norfolk, VA	45.0	4.8	24.5	**14.4**

Next Steps…

- Continue to synthesize data on nutrient concentrations and sediment loads in runoff and soil leachates