Making Urban Trees Count:
A Stormwater Credit Framework for Urban Tree Planting

Center for Watershed Protection

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American Forests

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Virginia Water Monitoring Council Conference
March 21, 2018

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Leading the nation with clean water solutions

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About the Center for Watershed Protection

www.cwp.org

- Founded in 1992 – celebrating 25 years!
- 501 (c) 3 nonprofit; works to protect, restore and enhance our waterways
- Diverse client base of government agencies, foundations, watershed organizations and firms across the country
- Headquartered in Ellicott City, MD with offices in VA, PA, NY and SC.

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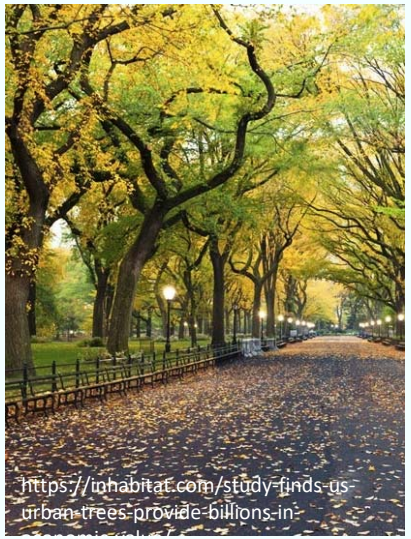
Outline

- Stormwater & Trees
  - What do we know? Why do we care?
- Existing crediting methods
- New crediting framework
- Tool development
- Research Needs & Next steps



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STORMWATER BMPs

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The Urban Tree Canopy

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Urban Trees Are Different

- No defined drainage area
- Water quality benefits inferred from volume reduction
  - Large number of variables affect performance
  - Benefits INCREASE over time
- Urban conditions

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Review of Existing Tree Stormwater Credits

Community	Type of Credit	Credit for a Deciduous Tree
Sacramento, CA	IC	100ft^2 – 200 ft^2
Seattle, WA	IC	20ft^2 – 50 ft^2
Pine Lake, GA	Volume	<12" DBH: 10 gallons/in; >12" DBH: 20 gallons/in
Washington, DC	Volume	10ft^3 (20ft^3 for preservation)
Vermont	Volume	5ft^3
Minnesota	Volume and P load	Depends on soil volume and other factors
Chesapeake Bay Program*	N, P and S load	Relative reduction % for area tree planted

*Source: Stone Environmental, 2014, *Law and Hanson, 2016*

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“Making Urban Trees Count”: A stormwater credit framework for urban tree planting

- To provide science-based credit to encourage use of trees to meet stormwater management requirements
- Elements for consideration:
  - Location
  - Regulatory context
  - Stormwater Credit Currency

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National Urban and Community Forestry Challenge Cost-Share Grant Program

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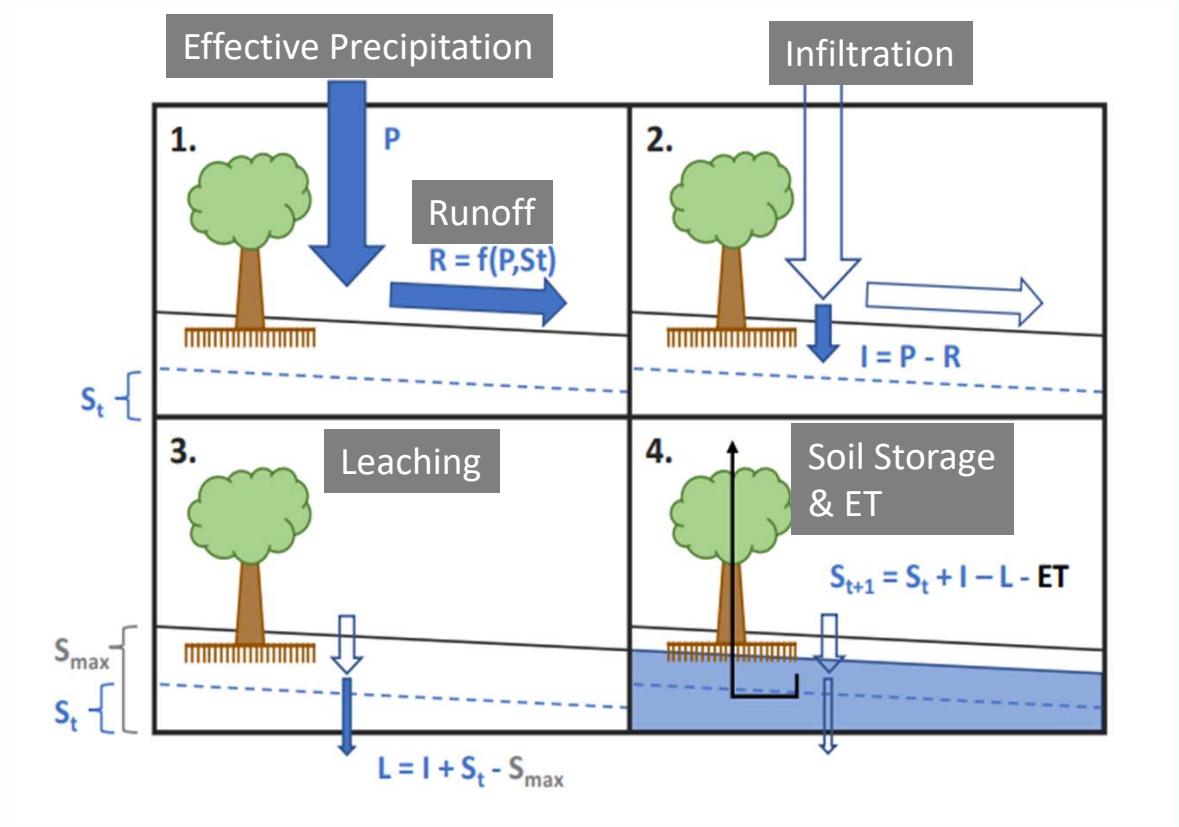
Water Balance Modeling Approach



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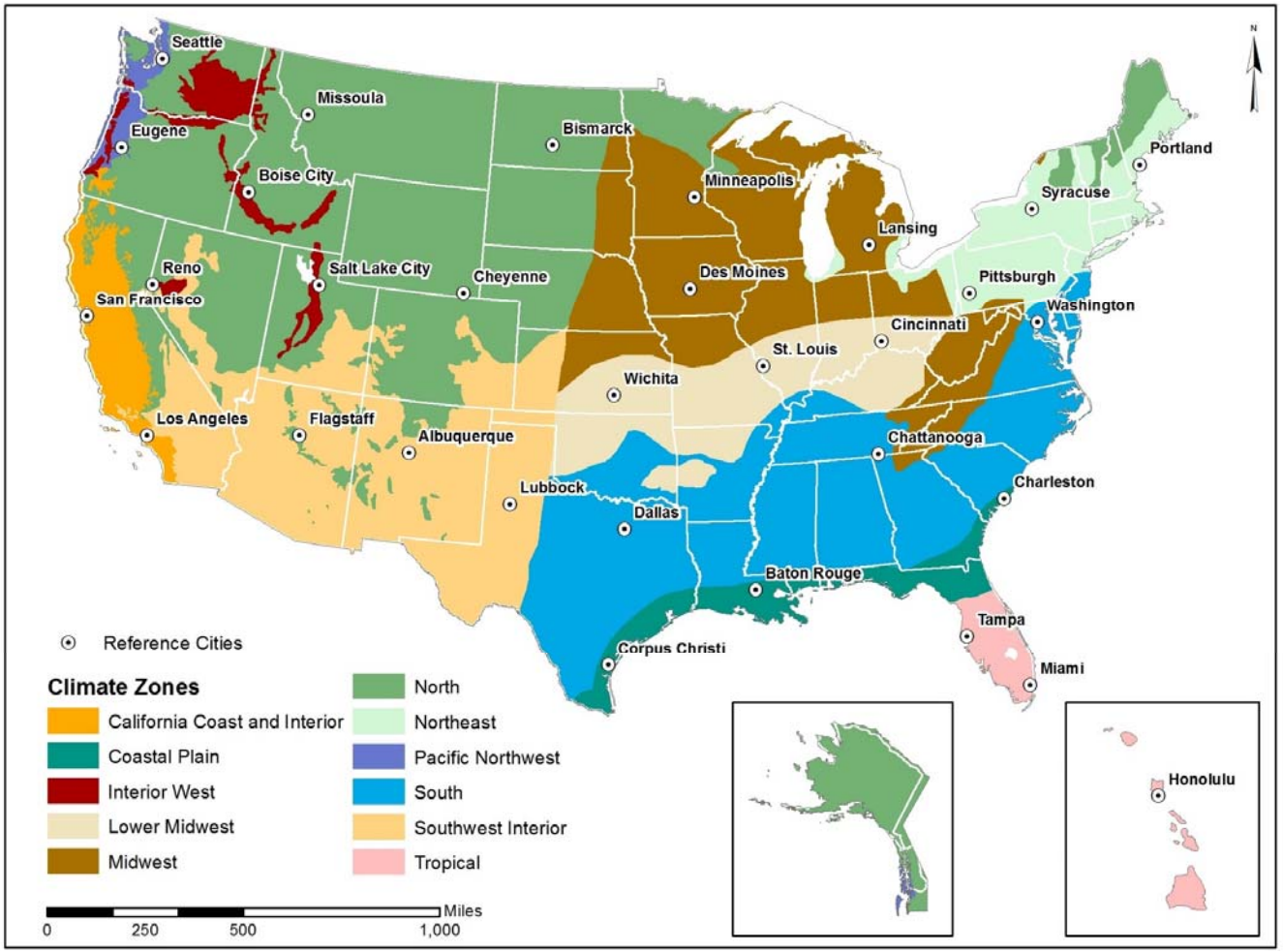
Summary of Model Scenarios

- Water balance model
- 11 Climate zones
- 31 locations
- 2 Reference land covers
- 4 Hydrologic Soil Groups
- 5 Tree Types

- "Grow trees" using i-Tree Forecast



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Tree Crediting Methods

- Two types credits:
  - Annual Pollutant Load Reduction Credit for Tree Planting (TMDL)
  - Performance-based Credit for State Stormwater Programs (event or design-storm)
- Applies to trees planted in the urban environment

Available for download at:

https://www.cwp.org/making-urban-trees-count/

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Annual TMDL Pollutant Load Reduction Credit

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Annual TMDL Credit Calculation Inputs

User Input/Scenario

- South climate zone
- HSG C soils
- Default land use loading rates
- Qualifying conditions
- 100 trees planted over turfgrass
- Broadleaf medium trees

1	The Credit Calculator calculates the credit associated with planting a specified number of trees, based on user inputs. The calculator provides an example of how the credit works and can also be				
2	incorporated into the TMDL planning and crediting process. Results reflect the annual pollutant reduction benefits provided by trees at maturity. Adopters of this credit framework may opt for a				
3	credit release schedule to incentivize tree care and ensure the tree reaches maturity.				
4					
5	**STEP 1**	**Select Climate Zone:**			
6		South			
7					
8	**STEP 2**	**Select Soil Type:**			
9		HSG C			
10					
11	**STEP 3**	**Select Land Cover:**	Default TN Concentration (mg/L)	Default TP Concentration (mg/L)	Default TSS Concentration (mg/L)
12		Pervious	1.45	0.25	140
13			User-Defined TN Concentration (mg/L)	User-Defined TP Concentration (mg/L)	User-Defined TSS Concentration (mg/L)
14	**STEP 4**	**Enter User-Defined Pollutant Concentrations (Optional) >>**			
15					
16	**STEP 5**	**Have all the qualifying conditions listed below been met?**			
17		Yes			
18		Qualifying conditions:			
19		Maintenance plan is in place			
20		Qualified professional (e.g., licensed arborist, urban forester) was consulted on selection of appropriate species, site preparation and siting to provide sufficient soil volume			
21		Leaf litter pickup program is present for the planting site (required only when seeking credit for trees planted over impervious cover)			
22					
23	**STEP 6**	**Select Tree Type:**			
24		Broadleaf Deciduous medium (BDM)			
26					
27	**STEP 7**	**Enter Number of Trees Planted:**			
28		100			
29					
30		**RESULTS:**			
31		**TN Reduction (lbs/yr)**	**TP Reduction (lbs/yr)**	**TSS Reduction (lbs/yr)**	**Runoff Reduction (gallons)**
32		2.8	0.48	267	229,204

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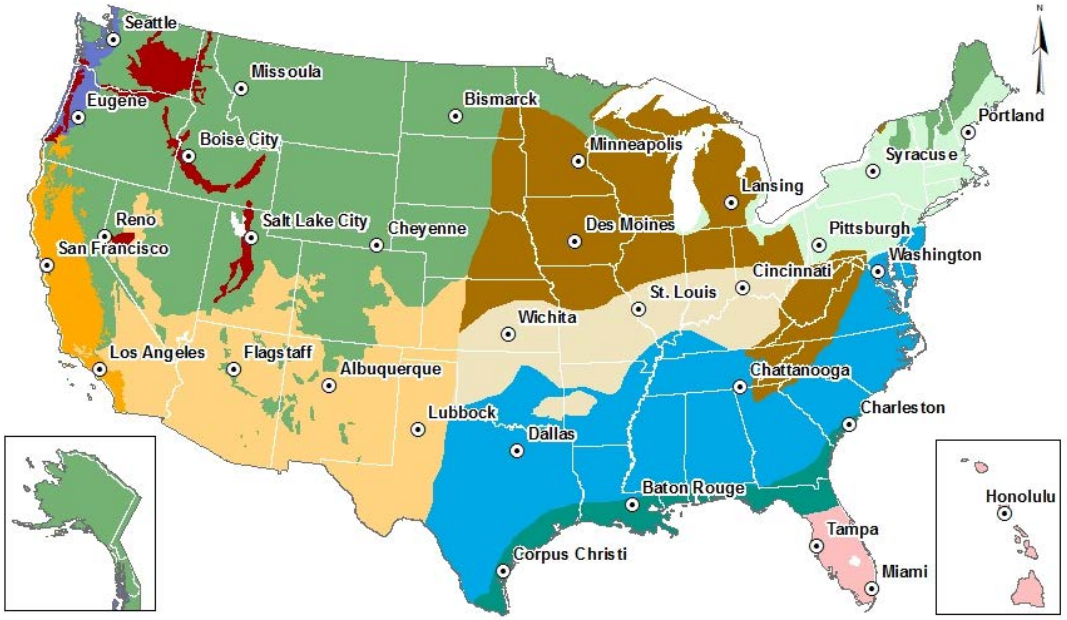
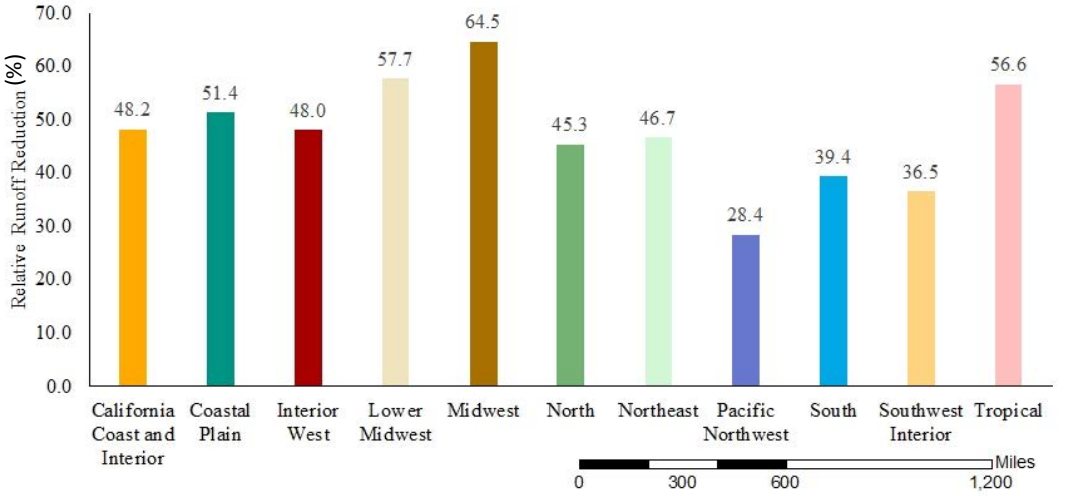
Runoff reduction (%) by climate region





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Performance-based State Stormwater Credit Method

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Performance-based State Stormwater Credit Method

How effective are trees planted to reduce stormwater runoff for stormwater compliance?

How can I use trees to meet the site specific stormwater requirements for the site?

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Performance-based State Stormwater Credit Method

User Input

- Location (nearest city)
- Soil type and land cover
- Tree Type
- Number of trees planted
- Site area
- Design storm

Scenario

- South climate zone, Washington DC
- HSG C soils
- 10 trees planted over turfgrass
- Broadleaf large
- Site area of 2-acre
  - 20% turfgrass
  - 80% impervious cover

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Performance-based State Stormwater Credit Method: Results

Runoff Reduction Benefit (Credit) for the 90th Percentile Storm Event (1")

- Canopy scale: 98%
- Site scale: 3%

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Future Research Needs & Next Steps

- Direct measurement of urban tree performance
  - Nutrient cycling, specifically N.
  - Accounting for leaf litter on impervious surfaces
  - Current study funded by Chesapeake Bay Trust (CWP, UMD, VTech, Conservation Fund)
- Project deliverables available at *cwp.org* and our Online Watershed Library (OWL)
  - Spreadsheet tools & documentation
  - Water balance model documentation
  - Fact sheet
  - Literature review
  - Design criteria for urban tree planting

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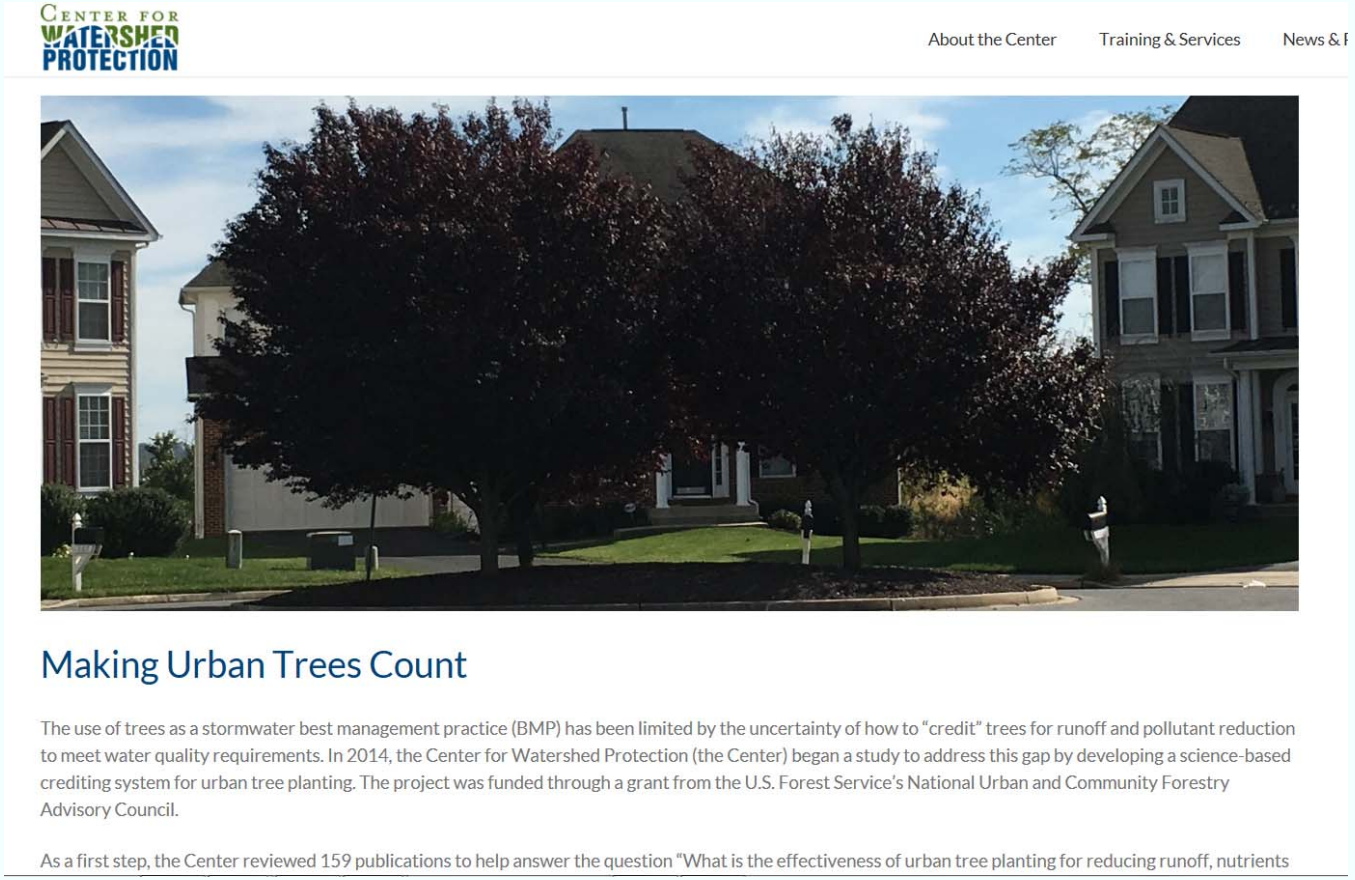
For more information

www.cwp.org

"News and Publications"



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Thank you

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2018 National Watershed and Stormwater Conference

Next Gen Watershed Protection: Fresh Ideas for Funding and Management

Tuesday, April 10, 2018

9am-5pm EST

https://www.cwp.org/2018-virginia-location/

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