Urban Tree Canopy Expert Panel Statement of Work
Submitted by the Center for Watershed Protection, Inc. to Virginia Tech

Expert Panel Chair:
Neely L. Law, PhD, Senior Research Analyst at the Center for Watershed Protection, will chair the Expert Panel on Urban Tree Canopy (UTC). Neely led the Chesapeake Bay Program (CBP) Expert Panel on Filter Strips/Stream Buffer Upgrades and participated on the Urban Nutrient Management, Enhanced Erosion and Sediment Control Expert Panels and is a current panel member for the Street Sweeping, Catch Basin and Storm Drain Cleaning Expert Panel. Her CV is provided as an attachment to this statement of work (SOW).

Expert Panel Membership:
The UTC Expert Panel will include three recognized topic experts, three individuals with expertise in environmental and water quality related issues, a representative from the CBP Watershed Technical Work Group (WTWG), and a representative from the CBP modeling team. The latter two will be assigned by the CBP. The individuals listed below have indicated their commitment to serve on the Panel with a letter of support and their CVs and support letters are provided as attachments to this SOW. All Panel members will be asked to disclose any potential conflicts of interest prior to serving on the Panel.

- Susan Day, PhD, Associate Professor and Director of the Urban Horticulture Center, Virginia Tech
- Peter MacDonagh, FASLA, Director of Design & Science, LEEP AP, CSLA, ISA, RHS, Kestrel Design Group
- Mike Galvin, ISA, Director of Consulting, SavATree
- Karen Cappiella, Director of Research, Center for Watershed Protection
- Sally Claggett, Program Coordinator, U.S. Forest Service
- Jessica Sanders, Director of Technical Services and Research, Casey Trees
- Thomas Whitlow, Associate Professor, Cornell University
- Quinfu Xiao, Assistant Research Water Scientist, University of California – Davis

In addition, ~~the participation of~~ David Nowak, Project Leader/Research Forester with the US Forest Service Northern Research Station ~~as a panel member is awaiting confirmation. Depending on his response, he~~ will be given the opportunity to participate as a panel guest to ~~ensure, at a minimum~~ provide input and discussion on the UFORE model.~~.~~

Project Narrative/Scope of Work:
The specific tasks to accomplish the project objectives are described below.

Task 1. Assemble Panel
Using the scope and charge of the previous UTC Panel, the Center will make revisions as needed for review by the CBP. The Panel Coordinator (Jeremy Hanson, VTech) will send a draft with the proposed list of Panelists to the source sector Workgroups, the WQGIT Chair and Vice Chair, and the other GITs for their review and comment. The

Scientific and Technical Advisory Committee (STAC) will also be afforded the opportunity to comment before final approval. The Center will revise the Panel scope and charge and membership based on input from these various stakeholders. A brief description of the key Panel roles is provided below:

- Panel Coordinator: The Panel coordinator will assist the Panel Chair and the Panel to help them deliver a quality report in the specified timeframe by providing logistical support (scheduling calls/meetings, operating webinar and conference lines, provide meeting minutes and help set the agenda etc.) and strategic guidance on the expert panel process. He/she will also serve as liaison between the Expert Panel and the wider CBP partnership.
- Panel Chair: The Chair will be the chief strategist and panel lead. The Chair will work with the Coordinator and Panel members to assign specific tasks and ensure the Panel is on schedule. The Chair will use his/her expertise to facilitate productive technical discussions among the panelists. The Panel Chair and Panel members are responsible for developing the Expert Panel report that conforms in form and content with the *Protocol for the Development, Review, and Approval of Loading and Effectiveness Estimates for Nutrient and Sediment Controls in the Chesapeake Bay Watershed Model* (CBP BMP Protocol).
- Panel Members: The Expert Panel is responsible for following the specific charge of the Panel, as well as adhering to the BMP Protocol. Panelists will participate and offer their own unbiased expertise and best professional judgment throughout the process, and will perform assigned or voluntary tasks that assist the development of the final Panel report.
- Modeling Team Representative: The modeling team representative will serve as liaison between the CBPO modeling team and the Expert Panel, relaying and responding to questions that the Panel has for the modeling team regarding the simulation or incorporation of the BMP(s) into the CBP Watershed Model, Scenario Builder, or other modeling tools. He/she will also assist with the development of the Technical Appendix, which accompanies each Panel report.
- WTWG Representative: The WTWG representative serves as a Panel member to offer his/her expertise with BMP tracking and reporting, which is a crucial piece of the Panel's final report.

Panel support will be provided by Center for Watershed Protection staff, Ari Daniels, who will compile and summarize data from the UFORE model and other similar models and assist with the final report, and Karen Cappiella who will provide support on the literature review and report development.

Deliverables: Final Panel charge and membership

Task 2. Literature Review and Synthesis

The Expert Panel Chair will coordinate a review and synthesis of the literature (published/academic and gray literature) on the water quality benefits of urban trees and the influence of various factors on their performance. The literature review conducted by the previous UTC panel will provide a baseline for this task.

The literature search will focus on the following major topic areas:

1. What is the effectiveness of urban tree canopy on reducing runoff, nutrient and sediment?
2. How does effectiveness vary by species, over time, with differences in planting sites (e.g., distance from impervious cover or other trees, soil conditions, geographic location) and with different maintenance strategies?

The Panel will search for relevant academic literature through university databases that provide access to numerous journals in the ecological, hydrologic and biological sciences. Internet searches will also be conducted to look for other relevant materials such as technical reports and state or local stormwater manuals that may provide documentation of sources for tree pollutant load reduction credits. The abstracts of all relevant articles will be obtained and read and, if the data presented is relevant to the research questions, the publication will be obtained and entered into a catalog. The Center for Watershed Protection will catalog publications with complete reference information using Endnote. The Panel Chair and Coordinator will determine the interface most suitable to share publications with the Expert Panel (i.e., Sharepoint or other web-based sharing software)

All of the literature entered into the catalog will be read to extract key information and to make an assessment of the study's relevance as well as the reliability of the resource. Key information that will be summarized includes: type of study, methods used, timeframe, geographic location, and relevant findings, including ancillary benefits of urban trees. Where studies with negative pollution reduction data are found, they will be considered the same as all other data. Data sources will be characterized according to the data source characterization matrix and other considerations described in the CBP BMP Protocol in order to determine how much influence (i.e. 'weight') the data should have on resulting estimates. A summary of the literature will be developed as part of the Expert Panel report that synthesizes the major findings of the literature review.

Deliverables: Catalog of relevant research studies

Task 3. Panel Meetings

The Panel Chair will convene up to six Panel meetings, including a stakeholder forum, to facilitate productive technical discussions among the panelists. Meetings #2 and #5 will be held at the CBP in Annapolis and the rest will be held by telephone conference. The Panel Chair will prepare materials for presentation at each Panel meeting and identify key questions to guide the discussion. At least one Panel meeting will be dedicated to review/discussion of the literature review results and one meeting will be centered around preliminary (strawman) recommendations for developing effectiveness estimates.

The second Panel meeting will be dedicated to an open forum where interested parties, other than the Expert Panel members, can share and present scientific data with the Panel members. The intent is to provide an open exchange of information that may help inform the Panel as it moves forward with its deliberations. The Center will lead the

Forum, which will be a half day meeting to be held at the CBP in Annapolis. At this meeting, the Panel Chair will present the charge of the Panel and will solicit feedback from attendees on specific issues to address with the Panel and relevant resources and research. The first part of the meeting will be open to stakeholders and the second part will constitute just the Panel members.

Deliverables: Minutes from the stakeholder forum and the Panel meetings

Task 4. Draft Expert Panel Report and Recommendations
The Expert Panel will develop a draft report that includes the following:

- Identity and expertise of Panel members
- ~~Land Use or p~~Practice name/title
- Detailed definition of the ~~land use or~~ practice
- Recommended nitrogen, phosphorus, and sediment loading or effectiveness estimates
- Justification for the selected effectiveness estimates, including a list of references used and a detailed discussion of how each reference was considered, or if another source was investigated, but not considered.
- Description of how best professional judgment was used, if applicable
- Land uses to which the BMP is applied
- Load sources the BMP will address and potential interactions with other practices
- Description of pre-BMP and post-BMP circumstances, including the baseline conditions for individual practices
- Conditions under which the BMP works/does not work/or varies in its effectiveness
- Temporal performance of the BMP including lag times between establishment and full functioning (if applicable)
- Unit of measure (e.g., feet, acres)
- Locations within the Chesapeake Bay watershed where this practice is applicable
- Useful life; effectiveness of practice over time
- Cumulative or annual practice
- Description of how the BMP will be tracked, reported, and verified:
- Suggestion for a review timeline
- Outstanding issues that need to be resolved in the future and a list of ongoing studies, if any
- Documentation of any dissenting opinion(s) if consensus cannot be reached
- Operation and Maintenance requirements and how neglect alters performance
- Any ancillary benefits or unintended consequences beyond impacts on nitrogen, phosphorus and sediment loads.
- A technical appendix that describes changes that will be made to the modeling and reporting tools to accommodate the BMP(s).

Deliverables: Draft Panel report with recommendations

Task 5. Approval Process

The Panel Chair will work with the Panel Coordinator to go through the CBP review and approval process. This will involve presenting the draft recommendations to the Forestry Workgroup, Urban Stormwater Workgroup, Watershed Technical Workgroup and the Water Quality Goal Implementation Team and addressing and responding to any comments received during the comment period. The budget and schedule assume one meeting with each workgroup plus two additional meetings with the Modeling Team if needed. Any additional meetings would be subject to additional expenses and an extension of the timeline. The Chair will seek the Panel's input in the event that significant comments are made, or major revisions are requested, as the report is reviewed by the CBP partnership. Although the Panel Chair and Coordinator are responsible for managing the comment process, Panel members may be expected to address and respond to comments received during the comment period, as appropriate.

Deliverables: Final approved report with recommendations

Project Timeline:
The project will be completed over a 10-month timeframe as shown in Table 1. The assumed period of performance for this work is February 9, 2015- December 9, 2015.

Table 1. Project Timeline

Task	**Completion Date (Months from Award)**
Draft scope charge and membership	Month 1
Revised scope charge and membership	Month 1
1st panel meeting	Month 1
Catalog of research studies	Month 2
2nd Panel meeting and Stakeholder Forum	Month 2
Summary report of literature reviewed	Month 3
3rd Panel meeting	Month 3
4th Panel meeting	Month 4
5th Panel meeting	Month 4
6th Panel meeting	Month 5
Draft Panel report	Month 6
Review and approval by ~~USWG~~FWG	Month 8
Review and approval by WTWG	Month 9
Review and approval by WQ GIT	Month 10

Areas of Expertise

Dr. Neely Law has over 15 years of research and work experience in urban watershed and stormwater management. She joined the Center for Watershed Protection in 2004 and brings with her extensive research experience and knowledge in urban watershed management and water quality analysis. Her areas of project management expertise include coordination of inter-disciplinary project teams, data management and facilitation. Her areas of technical expertise include modeling, monitoring study designs, survey development and data analysis. Dr. Law is also trained in various field methods to evaluate the condition of stream health and watersheds. As Senior Research Analyst, primary responsibilities include research development and data analysis related to urban watershed management and stormwater techniques. Additional areas of work include watershed monitoring, water quality modeling, and Geographic Information Systems.

Representative Projects

- Sediment Reduction and Stream Restoration Corridor Coordinator, U.S. EPA Chesapeake Bay Program, 2012 to present: To advance the implementation of the most cost-effective, efficient, and targeted nutrient and sediment reduction actions for the protection and restoration of the Chesapeake Bay. This work includes technical assistance to integrate sediment reduction strategies into the Bay modeling tools, coordination of expert panels and programmatic support to Goal Implementations Teams and Work Groups.
- Upper Neuse River Basin Nutrient Credits Project, Upper Neuse River Basin Association, NC. 2013 to present. The Center in partnership with Cardno ENTRIX are under contract to develop a more comprehensive nutrient credits toolbox for the Association that includes appropriate practices and measures for use in the Falls Lake watershed and to assist in the development of a more flexible nutrient reduction management program for the basin. The development practice standards for a set of priority BMPs and model development are the focus of the Center's efforts.
- Deriving reliable pollutant removal rates for municipal street sweeping and storm drain cleanout programs in the Chesapeake Bay Basin. Project Manager. October 2005 – July 2008. Funded through the U.S. EPA Chesapeake Bay Program, Neely was the project manager for the project to develop improved estimates of the potential nutrient and sediment reductions achievable through municipal street sweeping and storm drain cleanouts. The project involved an extensive literature review, survey, field work and paired catchment monitoring for water quality and flow.

Previous Positions

- Research Assistant, University of North Carolina at Chapel Hill, Department of Geography, 1998-2002
- Instructor, Geography of Environmental Systems, North Carolina at Chapel Hill, Spring 2002
- Planner, City of Windsor, Department of Planning, 1994-1996.
- Research Associate, Wayne State University, Detroit, MI. 1993-1994.

Education

- PhD in Geog[illegible] North Carolina at Chapel Hill, Chapel Hill, NC, 2004.

Dissertation: *Analysis of Water Quality Trends in Urban-Suburban Watersheds*

- Masters Geography, University of Toronto, Toronto, Ontario, 1996
  Thesis: *A preliminary multimedia model to estimate contaminant fate in an urban watershed*.
- Bachelors in Environmental Studies, Urban Planning, University of Waterloo, Waterloo, Ontario, 1992
  Thesis: *Urban Watershed Planning*

Publications

Fraley-McNeal, L., **N. L. Law** and J. Tasillo. 2011. Estimating forest loss with urbanization: an important step towards using trees and forests to protect and restore watersheds. *Watershed Science Bulletin (in press)*.

Drescher, S.R., **N. L. Law**, D. S. Caraco, K. M. Cappiella, J. A. Schneider and D. J. Hirshman. 2011. Research and policy implications for watershed management in the Atlantic Coastal Plain. *Coastal Management, 39: 242-258*.

N. Law, L. E. Band, and J. M. Grove. 2004. Nitrogen input from residential lawn care practices in suburban watersheds in Baltimore, County, MD, *Env.Planning and Mgt*, 47(5): 737-755.

Shields, C., L.E. Band, N. Law, P. Groffman, S. Kaushal, K. Savvas, G. Fisher, K. Belt, 2008. Streamflow Distribution Of Non-Point Source Nitrogen Export From Urban-Rural Catchments In The Chesapeake Bay Watershed. Water Resources Research, 44, W09416, doi:10.1029/2007WR006360

Pickett, S. T. A., M. L. Cadenasso, J. M. Grove, P. M. Groffman, L. E. Band, C. G. Boone, G. S. Brush, W. R. Burch, Jr., C. S. B. Grimmond, J. Hom, J. C. Jenkins, **N. L. Law**, C. H Nilon, R. V. Pouyat, K. Szlavecz, P. S. Warren, M. A. Wilson. 2007. Beyond Urban Legends: An Emerging Framework of Urban Ecology as Illustrated by the Baltimore Ecosystem Study, *Bioscience*, 58(2): 141-152.

N. Law, L. E. Band, and J. M. Grove. 2004. Nitrogen input from residential lawn care practices in suburban watersheds in Baltimore, County, MD, *Journal of Environmental Planning and Management*, 47(5): 737-755.

Groffman, P., **N. L. Law**, K. Belt, L. E. Band, and G. Fisher. 2004. Nitrogen and phosphorus fluxes in urban watershed ecosystems. Nitrogen fluxes and retention in urban watershed ecosystems. *Ecosystems*, 7:393-403.

Diamond, M.L., D. L. Priemer, **N. L. Law**. 2001. Developing a multimedia model of chemical dynamics in an urban area. *Chemosphere*, 44(7), 1655-1667.

N. Law and M.L. Diamond. 1998. The role of organic films and the effect on hydrophobic organic compounds in urban areas: An hypothesis. *Chemosphere*, 36:2607-2620.

J.H. Hartig, **N.L. Law**, D. Epstein, K. Fuller, J. Letterhos, and G. Krantzberg. 1995. Capacity-building for restoring degraded areas in the Great Lakes. *Int. J. Sustain. Dev. World Ecol.*, 2:1-10.

J.H. Hartig, G.H. Weaver, and **N. Law**. 1994. Applying a total quality management framework to remedial action planning. *J. Environmental Engineering and Management*, 4: 23-27.

J.H. Hartig and **N. Law**. 1994. Institutional frameworks to direct the development and implementation of Great Lakes remedial action plans. *Environmental Management*, 4: 855-864.

Areas of Expertise

Karen joined the Center for Watershed Protection, Inc. in 2000 and directs the Center's Research Program, which conducts applied research to better understand the influence of land use change on water resources and how best to prevent or mitigate these impacts. She has over 14 years of experience providing technical assistance and guidance to communities on responsible land and water management techniques. Karen is co-editor-in-chief of the Center's peer-reviewed journal *Watershed Science Bulletin* and edits the Center's e-newsletter *Runoff Rundown*. Her areas of interest include protecting forests and wetlands through watershed planning, use of GIS to analyze land cover impacts and costs and benefits of water quality management practices for MS4 and TMDL compliance. Karen was a member of the Chesapeake Bay Program's Urban Tree Canopy Expert Panel that convened in 2012.

Representative Projects

- Cost-Effective Approaches to Achieve Urban Stormwater TMDL Goals in the James River Basin, VA. Project Manager. December 2011- November 2013. To help support localities in the development of cost-effective and feasible plans to meet water quality goals, the Center completed a study to: 1) identify the most cost-effective urban stormwater management strategies that can be used by James River Basin localities to meet pollutant removal goals of the Chesapeake Bay TMDL, and 2) assess the extent to which local TMDL implementation plans can also address pollutant reductions required of localities as part of the Bay TMDL.
- Using Trees to Protect and Restore Urban Watersheds. Project Manager. June 2003-December 2006.
  The Center worked with the USDA Forest Service to conducted research on urban forestry, facilitate design workshops on incorporating trees into stormwater treatment practices, produce a 3-part guidance manual that presents new methods in urban watershed forestry, and develop six training modules that provide instruction on these methods. Karen was project manager and lead author on the 3-part *Urban Watershed Forestry Manual* series.
- Urban Forestry Toolkit Website. Project Manager. July 2007-December 2008.
  The Center is working with the USDA Forest Service to develop a comprehensive resource website for urban forestry. The website will contain tools, links and additional information on forest planning and assessment, using trees to reduce stormwater runoff, forest-friendly development and planting and maintaining urban trees. Karen is project manager and is developing the content for this website.

Previous Positions

- Adjunct Faculty, University of Maryland University College, 2006
- Program Manager, Center for Watershed Protection, 2006 -2006
- Environmental Analyst, Center for Watershed Protection, 2002-2006
- Watershed Technician, Center for Watershed Protection, 2000-2002
- Geographer, U.S. Census Bureau, 1999-2000
- Earth Science Intern, Environmental Careers Organization, 1998-1999
- Research Assistant, East Carolina University, 1996-1998

Education

- MA East Carolina University. Geography. 1998
- BA Millersville University. Geography. Studio Art minor. 1996

Selected Publications

Cappiella, K., Hirschman, D., and B. Stack. 2013. Using Nutrient Credits and Offsets To Achieve Stormwater Compliance with the Chesapeake Bay TMDL: A Discussion Paper. *Watershed Science Bulletin* December 2013 issue.

Lehman, S., **Cappiella. K**., Schneider, J., and L. Woodworth. 2012. Tracking the Progress of Watershed Planning: Two Views. *Watershed Science Bulletin* 3(2): 7-20.

Cappiella, Karen, Stack, W.P., Fraley-McNeal, Lisa, Lane, Cecilia, and McMahon, Gerard, 2012, *Strategies for managing the effects of urban development on streams*: U.S. Geological Survey Circular 1378, 69 p.

Drescher, S.R., Law, N. L., Caraco, D.S., **Cappiella, K. M.**, Schneider, J.A., and Hirschman, D.J. 2011. Research and policy implications for watershed management in the Atlantic coastal plain. Coastal Management 39: 242-258.

Law, N.L., **Cappiella, K.,** and M. Novotney. 2009. The Need for Improved Pervious Land Cover Characterization in Urban Watersheds. *Journal of Hydrologic Engineering* 14(4): 305-308

Schueler, T., Fraley-McNeal, L., and **K. Cappiella**. 2009. Is Impervious Cover Still Important? A Review of Recent Research. *Journal of Hydrologic Engineering* 14(4): 309-315.

Cappiella, K., Collins, K., Hirschman, D., and M. Novotney. 2008. *New Approaches to "Greening" Stormwater*. WEF Sustainability 2008 Conference Proceedings. Water Environment Federation. Alexandria, VA.

Cappiella, K., Schueler, T., Tomlinson, J., and T. Wright. 2006. *Urban Watershed Forestry Manual. Part 3: Urban Tree Planting Guide.* NA-TP-01-06. USDA Forest Service, Northeastern Area State and Private Forestry. Newtown Square, PA.

Cappiella, K., Schueler, T., and T. Wright. 2006. *Urban Watershed Forestry Manual. Part 2: Conserving and Planting Trees at Development Sites.* NA-TP-01-06. USDA Forest Service, Northeastern Area State and Private Forestry. Newtown Square, PA.

Cappiella, K., Schueler, T., and T. Wright. 2005. *Urban Watershed Forestry Manual. Part 1: Methods for Increasing Forest Cover in a Watershed.* USDA Forest Service Northeastern Area State and Private Forestry. NA-TP-04-05. Newtown Square, PA.

Cappiella, K. and T. Schueler. 2002. Crafting A Lake Protection Ordinance. *LakeLine* 22(2): 15-22.

Cappiella, K. and K. Brown. 2001. Land Use/Impervious Cover Relationships in the Chesapeake Bay. *Watershed Protection Techniques* 3(4): 835-840.

Cappiella, K., Malzone, C., Smith, R. E., and B. Jaffe. 1999. *Sedimentation and Bathymetry Changes in Suisun Bay: 1867-1990*. USGS Open-File Report 99-563.

Phillips, J. D., Golden, H., **Cappiella, K.,** Andrews, B., Middleton, T., Downer, D., Kelli, D., and L. Padrick. 1999. Soil Redistribution and Pedologic Transformations in the Coastal Plain. *Earth Surface Processes and Landforms* 24: pp. 23-39.

Susan Downing Day, Ph.D.

Associate Professor, Departments of Forest Resources & Environmental Conservation and Horticulture
Virginia Tech, Blacksburg, VA 24061
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Overview

I am the co-leader of the urban forestry program at Virginia Tech (urbanforestry.frec.vt.edu). My research focuses on discovering and quantifying the parameters that both influence and accrue from tree growth in urban settings with a particular focus on urban soils, root ecology, and stormwater management. With this knowledge we can develop innovative methods for overcoming impediments to increasing urban tree canopy and enhancing the sustainability of cities.

Professional Preparation

Yale University, New Haven, CT	Philosophy	B.A. 1985
Cornell University, Ithaca, NY	Horticulture	M.S. 1993
Virginia Tech, Blacksburg, VA	Forestry	Ph.D. 1999

Appointments

Associate Professor, 2014-present, Virginia Tech Dept. of Forest Resources & Environmental Conservation and Dept. of Horticulture

Assistant Professor, 2008-2014, Virginia Tech Dept. of Forest Resources & Environmental Conservation and Dept. of Horticulture

Research Assistant Professor 2004-2008, Virginia Tech, Department of Forestry

Visiting Assistant Professor 2000-2004, Virginia Tech, Department of Forestry

Cunningham Fellow 1995-1999, Virginia Tech

Extension Research Associate 1993-1995, Virginia Tech, Department of Horticulture

Liberty Hyde Bailey Fellow 1990-1993, Cornell University

Selected Publications

(* indicates student under my supervision)

1. Kimball, L., Wiseman, P.E., Day, S.D., and J.F. Munsell. 2014. Use of urban tree canopy assessments by localities in the Chesapeake Bay Watershed. Cities and the Environment 7(2):9.

2. Chen*, Y., S.D. Day, A.F. Wick, K. McGuire. 2014. Influence of urban land development and subsequent soil rehabilitation on soil aggregates, carbon, and hydraulic conductivity. Science of the Total Environment 494: 329-336. DOI:10.1016/j.scitotenv.2014.06.099.

3. Wang, C.-Y., Sample, D.J., Day, S.D., and Grizzard, T.J. 2014. Floating treatment wetland nutrient removal through vegetation harvest and observations from a field study. Ecological Engineering DOI: 10.1016/j.ecoleng.2014.05.018.

4. Chen*, Y., S.D. Day, R.K. Shrestha, B.D. Strahm, and P.E. Wiseman. 2014. Influence of urban land development and soil rehabilitation on soil-atmosphere greenhouse gas fluxes. Geoderma 226-227: 348-353. DOI: 10.1016/j.geoderma.2014.03.017

5. Plumb*, P., S.D. Day, T. Wynn-Thompson, and J.R. Seiler. 2013. Relationship between woody plant colonization and *Typha* L. encroachment in stormwater detention basins. Environmental Management 52:861–876.

6. Chen*, Y., S.D. Day, A.F. Wick, B.D. Strahm, P.E. Wiseman, and W.L. Daniels. 2013. Changes in soil carbon pools and microbial biomass from urban land development and subsequent post-development soil rehabilitation. Soil Biology and Biochemistry 66:38-44.

7. Wiseman, P.E., S.D. Day, and J.R. Harris. 2012. Organic amendment effects on soil carbon and microbial biomass in the root zone of three landscape tree species. Arboriculture and Urban Forestry 38(6): 262-275.

8. McGee, J.A., S.D. Day, R.H. Wynne, and B. White. 2012. Using geospatial tools to assess the urban tree canopy: Decision support for local governments. Journal of Forestry 110(5): 275-286.

9. Bartens*, J., H. Grissino-Mayer, S.D. Day, and P.E. Wiseman. 2012. Evaluating the potential for dendrochronological analysis of live oak (Quercus virginiana Mill.) from the urban and rural environment—An explorative study. Dendrochronologia 30:15 21.

10. Day, S. D. and R. Amateis. 2011 Predicting canopy and trunk cross-sectional area of silver linden (*Tilia tomentosa*) in confined planting cutouts. Urban Forestry & Urban Greening 10(4): 317-322.

Selected Synergistic Activities

- Chair-Elect of the Urban and Anthropogenic Soils Division of the Soil Science Society of America (SSSA). I am active in the urban soil research community and am recently co-sponsored a special session, Soil and Plant Interactions in the Built Environment – Identifying Unifying Themes across Plant Community Types, at the 2014 meeting of the ASA-CSA-SSSA meetings in Long Beach, CA and am an invited speaker at the Soils in the City conference occurring this June in Chicago.
- I served on the Sustainable Sites Initiative (SITES™), Soils Technical Committee and Technical Core Committee (2007-2013) and played a key role in developing soil protection and management criteria for this voluntary certification program administered by the U.S. Green Building Council. SITES represents the cutting edge in sustainable site design and continues to be an effective means of disseminating research and new technology to practitioners and policymakers. sustainablesites.org
- I serve on the Editorial Board of the *Journal of Forestry*

Curriculum Vitae

Michael F. Galvin
Director, SavATree Consulting Group
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Experience

DIRECTOR, SAVATREE CONSULTING GROUP, BEDFORD HILLS, NY (9.11 – PRESENT)

- Lead and manage the Consulting Group
- Provide urban tree canopy assessment and prioritization for clients including: Cuyahoga County, OH; Northern Kentucky Urban and Community Forestry Council (three counties in Northern KY); and Loyola Marymount University (greater Los Angeles area)
- Serve on Chesapeake Bay UTC Expert Panel
- Provide consultant services to USFS NRS Baltimore Urban Field Station

DEPUTY DIRECTOR, CASEY TREES, WASHINGTON, DC (5.08 – 6.11)

- Lead day-to-day operations
- Set the Urban Tree Canopy goal for the Nation's Capitol
- Create the Annual Tree Report Card

SUPERVISOR, URBAN AND COMMUNITY FORESTRY, MD DNR FOREST SERVICE, ANNAPOLIS, MD (9.99 – 5.08)

- With USFS partners, create and implement UTC assessment and prioritization methods
- Perform first UTC assessments in Baltimore, Annapolis, and Frederick and beyond
- Co-author Chesapeake Bay Program's guide to UTC assessment

Publications (selected)

Battaglia, Michael; Buckley, Geoffrey L.; Galvin, Michael; and Grove, Morgan (2014) "It's Not Easy Going Green: Obstacles to Tree-Planting Programs in East Baltimore," Cities and the Environment (CATE): Vol. 7: Iss. 2, Article 6.

Dexter H. Locke, J. Morgan Grove, Michael Galvin, Jarlath P.M. O'Neil-Dunne, and Charles Murphy. Applications of Urban Tree Canopy Assessment and Prioritization Tools: Supporting Collaborative Decision Making to Achieve Urban Sustainability Goals. Cities and the Environment, Volume 6, Issue 1. September 2013.

Mary L. Cadenasso, S.T.A.Pickett, L.E. Band, G.S. Brush, M.F. Galvin, P.M. Groffman, J.M. Grove, G. Hagar, V. Marshall, B. McGrath, J. O'Neil-Dunne, B. Stack, and A. Troy. Exchanges across land-water-scape boundaries in urban systems: Strategies for reducing nitrate pollution. In Richard S. Ostfeld and William H. Schlesinger (Eds.). The Year in Ecology and Conservation Biology 2008. Annals of New York Academy of Sciences Volume 1133, May 2008.

Pickett, S.T.A., K.T. Belt, M. F. Galvin, P.M. Groffman, J. M. Grove, D.C. Outen, R. V. Pouyat, W. P. Stack, and M. L. Cadenasso. 2007. *Watersheds in Baltimore, Maryland: Understanding and Application of Integrated Ecological and Social Processes.* Journal of Contemporary Watershed Research & Education 136: 44 - 55.

Raciti, S., M. F. Galvin, J. M. Grove, J. P. M. O'Neil-Dunne, A. Todd and S. Clagett. 2006. *Urban Tree Canopy Goal Setting: A Guide for Chesapeake Bay Communities.* United States Department of Agriculture, Forest Service, Northeastern State & Private Forestry, Chesapeake Bay Program Office, Annapolis, MD.

Galvin, M.F. and D. Bliel. 2004. *Relationship among tree canopy quantity, community demographics, and Tree City USA program participation in Maryland, U.S.* Journal of Arboriculture. 30(6): 321 - 327

Irani, F.W. and M. F. Galvin. 2003. *Strategic Urban Forests Assessment: Baltimore, Maryland.* In *Proceedings from the American Society of Photogrammetry and Remote Sensing 2003 Annual Conference, "Technology: Converging at the Top of the World"*.

Presentations (selected)

'Planning a Green Future: Assessing and Prioritizing Your Urban Tree Canopy' DE/MD American Planning Association Chapters Regional Conference: Planning for Healthy and Sustainable Places. Newark, DE. October 2014.

'Novel Applications of Urban Tree Canopy Assessment and Prioritization Tools'. International Society of Arboriculture 89th Annual Conference and Trade Show. Toronto, Ontario, Canada. August 2013.

'Urban Trees and the Clean Water Act: Trees in Cities and the Chesapeake Bay'. Symposium on the Potomac River. Hood College, Frederick, MD. March 2013.

'Urban Tree Canopy: Cities and the Bay Restoration Strategy'. Chesapeake Research Consortium Ecosystem-Based Management Conference. Baltimore, MD. March 2009.

'Urban Forests and Local Mitigation Measures: Essential Tools in Climate Change Strategies'. 7th Annual New Partners for Smart Growth: Building Safe, Healthy, and Livable Communities conference. Washington DC. February 2008.

'Urban tree canopy assessment and goal setting: case studies from four cities on the Eastern coast, USA'. International Society of Arboriculture 81st Annual Conference and Trade Show. International Union of Forest Research Organizations / Arboricultural Research and Education Association session. Honolulu, HI. July 2007.

'Sustaining Urban Air Quality through Management of Urban Forests', Air & Waste Management Association's 100th Annual Conference & Exhibition. Pittsburgh, PA. June 2007.

'Urban Tree Canopy Project', American Planning Association's 99th National Planning Conference. Philadelphia, PA. April 2007.

Awards

- 2011, International Society of Arboriculture, True Professionals of Arboriculture.
- 2007, Department of Natural Resources Forest Service employee of the year.

L. Peter MacDonagh, RLA, ISACA, RASCH

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EDUCATION/ACADEMIC HONORS AND AWARDS

B.L.A., Honors, Major in Landscape Architecture, University of Minnesota, 1985
Sigma Lambda Alpha Honor Society, (June 1985)
Thomas M. and Drusilla Paist McGill Scholarship, (January 1985)
Gamma Sigma Delta Academic Honor Society, (April 1984)
Leon C. Snyder Scholarship, (February 1984)
McGill Scholarship, (March 1983)
College of Agriculture Travel Scholarship (June 1981)
Deans List, College of Agriculture (Final 8 Quarters)

Two year Certification in Ornamental Horticulture, National Botanic Garden, Dublin, 1980
Full Academic Scholarship (Fall 1977 – Spring 1980)

Royal Horticulture Exam and Certification, The Royal Horticulture Society, Wisley, London, England, 1979

INSTRUCTIONAL EXPERIENCE

Adjunct Faculty Member, University of Minnesota, College of Architecture and Landscape Architecture, (2000-present)

PROFESSIONAL LISCENSES

Registered Landscape Architect
Minnesota (2001 – Present)
CLARB (2001 - Present)
Illinois (1992 – Present)
Nebraska (2009 – Present)
South Dakota (2010 – Present)
Ontario, Canada (2008 – Present)

International Society of Arboriculture (ISA) Certified Arborist (1992)
USA (1992-Present)

PROFESSIONAL EXPERIENCE

Director of Design & Science, The Kestrel Design Group, Inc., Edina, Minnesota, (1989 – present)

Co-founded, services include: sustainable design, aquatic and terrestrial restoration, ecological stormwater management, soil bioengineering, landscape architecture. Project list available upon request.

Associate, McFadzean & Everly, Inc., Mount Prospect, Illinois, (1986 – 1989)
Associate and Project Planner, worked on master planning and construction documents for three plant community restoration projects and five zoos (Abilene, TX; Caldwell, TX; San Antonio, TX; Manitowoc, WI; Montgomery, AL) under a Registered Landscape Architect

Associate, LAIT Pride Landscape, Long Grove, Illinois, (1987)

Associate, LAIT Tropical Plant Rentals, Long Grove, Illinois, (1986-1987)

Horticulturist, Gibb Farm Museum, St. Paul, Minnesota, (1983)

Horticulturist, Conservatory, St. Paul, Minnesota, (1980-1982)

Associate Landscape Architect In Training, Schold, Saegrov & Torpe, Stavanger, Norway, (1981)

Horticulturist, Seebaeur Landschatt, Munich, Germany, (1980)

PROFESSIONAL AWARDS – List limited to last 7 years

Merit Award
Minnesota Chapter of the American Society of Landscape Architects
2012 Target Center Arena Green Roof

Analysis and Planning Award
Minnesota Chapter of the American Society of Landscape Architects
2012 Native Seed Mix Design Manual

Environmental Innovation Award
CUDE – Rochester's Committee on Urban Design and Environment
2011 Silver Lake Buffer Environmental Innovation Natural Systems

Special Recognition Awards of Excellence
Green Roofs For Healthy Cities
2010 Target Center Arena Green Roof

Merit Award
Minnesota Chapter of the American Society of Landscape Architects
2007 Green Roof for the Minneapolis Central Library

Certificate of Recognition
State of Minnesota, Office of the Governor
2007 Exceptional Contributions Using Plants as a Catalyst for Change

Honor Award
American Consulting Engineers Council of Minnesota
2007 Biorestoration of Prior Lake Channel

SALLY WILLARD CLAGGETT
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EDUCATION

Dickinson College, Carlisle, PA. Geology/Biology.
University of Colorado, Boulder. B. A. Environmental Biology
University of Oregon, Eugene. M.S. Ecology

WORK EXPERIENCE IN CONSERVATION LEADERSHIP

US Forest Service Liaison to the Chesapeake Bay Program 1/02-present
Chesapeake Bay Program, Annapolis Maryland

- Lead the Chesapeake Watershed Forestry program (annual federal budget doubled to $1 million during my tenure)
- Coordinate the Forestry Workgroup, a diverse group of organizations and individuals representing the forestry community in the Chesapeake watershed
- Lead the passage of the Forest Conservation Directive, the only directive signed in 2007, and ratified by all six states in the watershed and Washington DC
- With other federal leaders, implement Executive Order 15308 on Restoring and Protecting the Chesapeake Bay
- Manage and co-edit *The State of Chesapeake Forests* report
- Collaborate, track, and report on 10-15 grants per year
- Lead process to pass and implement the Expanded Riparian Forests Goals including goals to increase urban tree canopies
- Led Expert Panel for Review of Riparian Forest Buffer Credit in the Chesapeake Bay Model
- Convey and interpret best water quality information to partners using forest restoration and conservation practices
- Develop and provide resources for implementing urban tree canopy goals
- Provide federal support and leadership to the Potomac Watershed Partnership
- Host an array of conferences, workshops, and field trips, from international to local, on issues related to watershed forestry
- Oversee the *Forestry for the Bay* program, a coached stewardship program for smaller forest landowners
- Write and produce publications for a variety of audiences having to do with the multiple benefits of trees in watersheds
- Help develop the Bay Bank, an ecosystem marketplace

Ecologist/Botanist for the Gifford Pinchot National Forest 4/90-1/02
Vancouver, Washington

- Managed program: designed and execute restoration projects, expand partnerships, wrote grants, oversaw contracts, collected and analyzed monitoring and survey data, analyzed program and project impact.
- Lead, wrote or served as core team member on nine analyses of six different watersheds (100,000-200,000 acres each)
- Lead and participated on interdisciplinary resource teams for specific National Forest projects (including National Environmental Policy Act)
- Implemented the Northwest Forest Plan at a supervisory level
- Managed eight Resource Natural Areas for the Districts
- Conducted surveys of lichens, bryophytes, and fungi, including doing canopy surveys for the Wind River Research Canopy Crane during its establishment
- Conducted trainings and workshops and taught college students botanical field sampling methods
- Wrote and published monthly online botany newsletter for the Pacific Northwest region
- Surveyed and managed individual species and plant communities of concern
- Inventory and manage noxious weeds on the National Forest

OTHER WORK EXPERIENCE

- Details to the USFS Washington DC Office: Acting National Program Leader and International Forestry 1990, 1992, 1993, and 2000.
- Naturalist Guide for various outfits in Costa Rica, Mexico, Wyoming, South Dakota, Caribbean.
- Botanical consultant work: The Nature Conservancy, Keammerer and Associates, Oregon Department of Fish and Wildlife.

SELECTED PAST LEADERSHIP TRAININGS

- Leadership and Communications, Virginia PolyTech
- Personal Effectiveness Seminar and Lifeworks; Innovative Learning Group, Eugene Oregon
- Natural Resource Values, Policy and Economics, Portland State University
- Managerial Grid for Facilitators

(not listed: numerous professional conferences and technical trainings)

Jessica Sanders

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http://caseytrees.org/about/news/media/jessica-sanders/

Education

Ph.D. Rutgers University, New Brunswick New Jersey – Defining and Measuring Success in the Urban Forest.

B.S. Richard Stockton College, Pomona New Jersey – Environmental Science

Select Experience

- Casey Trees - Director, Technical Services and Research — July 2012- Present
- Graduate Research Assistant – Rutgers University — Fall 2006- Spring 2012
- NSF STEM Fellow: K-12 Education — July 2011- July 2012
- Coordinating Fellow – Pre-doctoral Leadership Development Institute – Rutgers University — July 2010 – July 2012

Select Publications

- Sanders J.R., J.C. Grabosky. 20 Years Later: Does reduced soil area change overall growth? Urban Forestry & Urban Greening 13(2) 295-303. — 2014
- Sanders J.R., J. Duszak, J. Woodworth. Proactive, Not Reactive: Evolving Elm Management in the Nation's Capital. CATE http://digitalcommons.lmu.edu/cate/vol6/iss1/8/
- Sanders J.R., J. C. Grabosky, P. Cowie. Establishing Maximum Size Expectations for Urban Trees with Regard to Designed Space. Journal of Arboriculture and Urban Forestry 39 (2) — 2013
- Sanders, J.R. Defining and measuring success in the urban forest. Rutgers University – Graduate School New Brunswick. — 2012

Select Presentations

- Urban Ecology Collaborative Webinar: Using new technologies to increase efficiency and integrate research — November 2014
- Chesapeake Urban Tree Canopy Summit: Improving Urban Tree Survival — October 2014
- George Washington Design Charrette: Including Trees as part of the conversation — August 2014
- Baltimore Urban Waters: Integration of Urban Tree Canopies into — June 2014

urban planning strategies

- Wedgewood Elementary School: How I use Math and Science everyday: A study in urban forestry — May 2014
- American Association of Geographers Meeting: Buildings and Money: Gains and losses in the Nation's Capital 2006-2011 — April 2014

Selected Affiliations/Memberships

- Urban Ecology Collaborative – Co-Chair — December 2014- Present
- ISA AREA Vice-President — July 2014 - Present
- Tree Fund Governance Committee — July 2012- December 2014
- ISA Certified Arborist — April 2012 - Present