

# Research Accomplishment Report

August 2013



GREEN  
CITIES  
RESEARCH  
ALLIANCE









## GREEN CITIES RESEARCH ALLIANCE

The Green Cities Research Alliance (GCRA) was initiated by the USDA Forest Service, Pacific Northwest Research Station in 2009 to build a program of social and biophysical research sciences on urban ecosystems in the Puget Sound region. Through an integrated social-ecological research program, GCRA meets the practical needs and concerns of organizations and agencies that links to investigations in other U.S. urban areas.

GCRA pairs scientists with practitioners and local decision makers to co-design and implement research and programming efforts that provide relevant and practical information. Major collaborators include the University of Washington, King County, and Forterra.

Initial funding for this work was provided in part by the American Recovery and Reinvestment Act (ARRA).

In accordance with Federal law and U.S. Department of Agriculture (USDA) policy, this institution is prohibited from discriminating on the basis of race, color, national origin, sex (in education and training programs and activities), age, disability, or retaliation.

For more information, visit:  
[www.fs.fed.us/pnw/research/gcra/](http://www.fs.fed.us/pnw/research/gcra/)

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# FORTERRA

# W

## UNIVERSITY of WASHINGTON



### King County



### City of Seattle



### Institute for Culture and Ecology



## OSU

Oregon State  
UNIVERSITY



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# Green Cities Research Alliance: A Wide Net

This report presents findings from over three years of socio-ecological systems research in the Pacific Northwest. The GCRA focus has been to develop forest assessment tools, ecosystem valuation methods, and applied approaches that provide value but also lay a framework for future research.

- ➡ **Practical and Needed** - Municipal and private land managers have already begun to incorporate new data sets, research findings, and evidence-based best practices into planning and operations. Applications include urban forest management plans, tools such as field guides, public engagement processes, and resources for landowners.
- ➡ **Efficient** - The GCRA collaborative model has been extremely efficient. The return on investment from initial ARRA funding exceeded expectations, with dozens of publications and presentations, and widely applied results. Federal funds have been leveraged, producing a nearly 3 to 1 return rate.
- ➡ **Fresh and Pioneering** - GCRA research uses new approaches. With a full gradient landscape view, a coupled human-biophysical approach, and partnering scientists and practitioners to co-design and conduct science, GCRA delivers results in innovative ways.

This work is crucial for providing knowledge that serves citizens and society through the applied understanding of the improvement of our natural resources, and effective science delivery. Further research is needed to ensure programmatic successes.

## Accomplishments to Date

GCRA has had much success in its first three years, indicated by the number and quality of products produced. For a full list, see the GCRA Publications and Presentations section at the end of this report.

**28** Peer-Reviewed Publications

**38** Scientific and Academic Presentations

**12** Professional Publications

**50+** Professional Presentations

**15+** Papers in Progress/Review

## ARRA Positions Supported

The American Recovery and Reinvestment Act supported a range of positions at a variety of science and management organizations, achieving one of its goals of job creation.

**3.5** Full Time Employees for  
**3+** Years

Positions supported include: post-doctoral positions at the University of Washington; restoration and research manager positions at Forterra; field crew members at King County Parks; foresters with American Forest Management; USDA Forest Service research scientists; University of Washington, Oregon State University, and University of Vermont social scientists; and researchers at the Institute for Culture and Ecology.

# Recent Science and Management Results

Presented below are the research programs and initial results that have been the central work of the Green Cities Research Alliance over the past three years. A wide range of scientific and science delivery products have been derived from primary data collection, and many of the products directly translate science to policy or management needs. Research was conducted in the Pacific Northwest, in and around Seattle and other urban centers. An initial list of publications and presentations based on this work is provided at the end of this report.

## Stewardship Engagement

### Assessment of Volunteer Experiences in Urban Forest Restoration

**Project Leads:** Weston Brinkley, Forterra; Kathleen Wolf, PhD, University of Washington

**Project Partners:** City of Seattle, King County Parks, EarthCorps, USDA Forest Service PNW Research Station, and University of Washington

**Key Findings:**

- Social themes, such as improving one's community, were found to be at least as important as ecological factors in motivating stewardship participants
- Volunteers frequently traveled far outside of their neighborhood to conduct volunteer stewardship
- Findings support the improved recruitment and retention of thousands of volunteers across the region

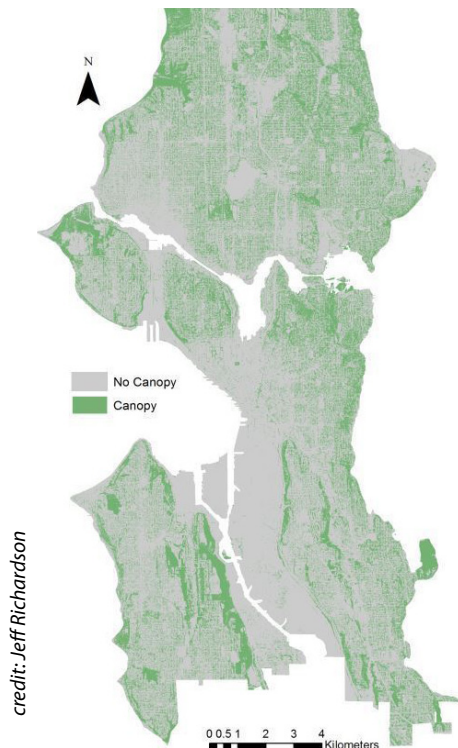
Nearly 500 volunteers were surveyed at over 50 different parks and public lands located across the Seattle metropolitan region to ask about their experiences carrying out environmental stewardship. Volunteer stewardship is a viable strategy for ecosystem restoration and management, and stewards contribute to grassroots community building and social cohesion. This research is elevating visibility and awareness of stewardship outcomes. In addition, it provides tools for organizations to improve the stewardship experience, while increasing the efficiency and effectiveness of field programs.





# Urban Forest Canopy Assessment

## New Tools for Forest Managers



The Remote Sensing and Geospatial Analysis Lab (RSGAL) at the University of Washington provides original research and support to the GCRA team. Research projects have focused on developing regional urban land use/land cover assessments, investigating uncertainty in urban canopy cover assessment, and assessing the urban food production potential for Seattle and surrounding areas. In addition, RSGAL created and maintains a web-based data portal that allows streamlined access to geospatial data relevant to GCRA's urban forest research.

**Project Lead:** L. Monika Moskal, PhD, University Of Washington

**Project Partners:** USDA Forest Service PNW Research Station, Forterra, and King County Parks

### Key Findings:

- Object Based Image Analysis (OBIA) can generate accurate and repeatable Land Use/Land Cover (LULC) classifications suitable for tree cover assessment in urban areas
- Spectral content is often more important than spatial detail of hyperspatial data in OBIA based urban LULC assessments
- Assessing uncertainty when estimating urban forest canopy can be difficult due to the high degree of spatial heterogeneity

## Health Implication of Urban Trees

### Human Health and Well-being

Nearly 40 years of research shows that the experience of nature is profoundly important to human functioning, health, and well-being. We may intuitively accept that urban nature is important for public health, however new research presents supporting evidence, confirming intuitions and expanding our knowledge. There is increasing proof that greenness can improve the health of urban residents. Research has concluded that the natural environment in general, and trees specifically, can improve human well-being. Both specific research investigations as well as a catalog of the research to date have been completed.

**Project Leads:** Kathleen Wolf, PhD, University of Washington; Geoffrey Donovan, PhD, USDA Forest Service PNW Research Station

**Project Partner:** USDA Forest Service, Urban and Community Forestry

### Key Findings:

- A 10% increase in tree-canopy cover within 50 meters of a house was found to reduce the number of small-for-gestational-age births by 1.42 per 1000 births
- We have identified over 2,400 scientific publications spanning nearly 40 years of research connecting human health benefits to urban trees and greening







credit: King County Parks

## Forest Landscape Assessment Tool

### Rapid Data Collection Method for Forest Management

**Project Lead:** David Kimmett, King County Parks

**Project Partners:** Forterra, American Forest Management, USDA Forest Service PNW Research Station, University of Washington

#### Key Results:

- Of the 21,500 forested acres managed by King County Parks, nearly 30% is dominated by red alder stands, while 25% is big-leaf maple, and another 25% is Douglas-fir
- A field manual has been developed and is available for ongoing King County assessments and for use by other local governments

This project provided a comprehensive understanding of forest conditions that will inform long term strategic decisions. Through the development and implementation of this new rapid assessment technique, project partners for the first time captured data for 25,000 acres of King County parklands distributed across 150 sites. Park managers can now use the data for long term forest stewardship planning. In addition, these rapid forest assessment protocols are now available for use on other public lands.

## Stewardship Mapping and Assessment Project (Stew-MAP)

### Mapping the Positive Environmental Footprint of Stewardship Organizations

What kinds of organizations participate in environmental stewardship? Where do they work? Mapping stewardship organizations in the Seattle area has begun to reveal the impacts of their environmental work. In addition, a social network analysis is exploring the relationships of these organizations. Subsequent goals will develop an interactive directory of stewardship organizations, and aid other research using network analysis.

**Project Lead:** Kathleen Wolf, PhD, University of Washington

**Project Partners:** Forterra, USDA Forest Service Pacific Northwest Research Station, City of Seattle, University of Vermont

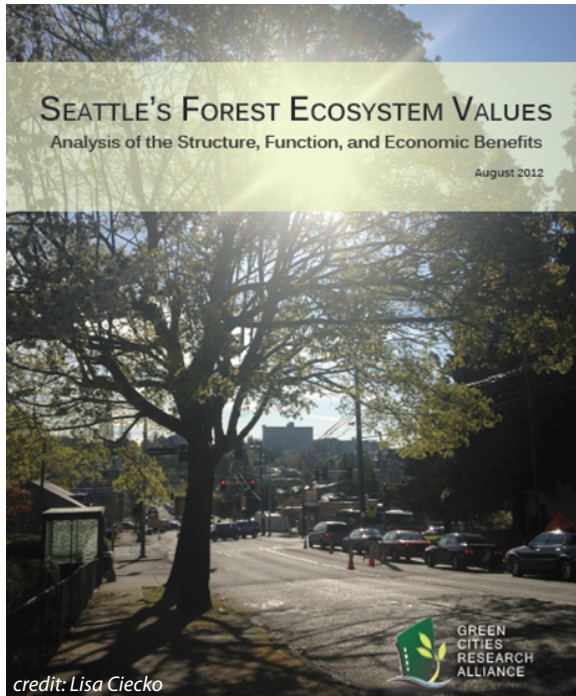
#### Key Results:

- An initial census identified 697 stewardship organizations in King County
- A survey collected detailed data on 196 organizations
- A map of these organizations is now available online that presents their stewardship turf



# Forest Ecosystem Values

## Urban Forest Structure, Functions, and Values



This project was designed to improve knowledge about the structure, function, and value of King County's urban forest. i-Tree Eco data was collected for three projects - City of Seattle, the Green-Duwamish Watershed, and King County parks. The focus of this effort went beyond a traditional i-Tree study, exploring applicability of the tool in the Pacific Northwest. Study results and valuations are supporting the City of Seattle's Urban Forest Management Plan update, and will aid similar management at the watershed and county levels.

**Project Lead:** Lisa Ciecko, Forterra

**Project Partners:** City of Seattle, King County Parks, and USDA Forest Service PNW Research Station, University of Washington

### Key Results:

- A structural value of \$4.9 billion for Seattle's trees
- Seattle's forest removes 725 metric tons of pollution from the environment every year, providing a pollution removal value of \$5.6 million annually
- Per acre, Seattle's urban forest stores 9.9 metric tons of carbon, and sequesters 0.7 metric tons of carbon annually

# Urban Foraging

## Exploring the Use of Natural Systems for Non-Market Values

**Project Leads:** Melissa Poe, PhD and Rebecca McLean, PhD, Institute for Culture and Ecology

**Project Partner:** USDA Forest Service Pacific Northwest Research Station

### Key Findings:

- More than 433 plant and 53 fungal species have socio-cultural value for foragers in Seattle
- Gathering creates opportunities for people to become involved in stewarding plants, trees, and soils in our communities
- Many foragers have detailed knowledge about urban green spaces and species, which could enhance understandings of ecological relationships and change

This project offers a unique perspective on the benefits of urban forests and landscapes, exploring people's use of plants for food and cultural purposes. The research investigated the roles that non-timber forest products gathering, and stewardship practices play in the development and management of healthy forest ecosystems in Seattle. Seventy-six semi-structured interviews with 58 gatherers and 18 conservation leaders were conducted.



credit: Melissa Poe

# Additional Research:

## Ongoing Projects and New Prospects

### **Veterans and Urban Forest Stewardship**

Veterans are at risk for various emotional stresses and disorders. Both nature-based activity (such as stewardship) and passive encounters (such as nature views from one's home) can provide benefit. Stewardship is but one way that people can interact with nature and ecology. This study will explore how veterans who are working in a range of urban forestry green jobs can benefit in mind and body. Contact Kathleen Wolf, PhD at [kwolf@uw.edu](mailto:kwolf@uw.edu).

### **The Relationship Between Trees and Human Health Evidence from Emerald Ash Borer**

Several recent studies have identified a relationship between the natural environment and improved health outcomes. Research is showing there was an increase in mortality related to cardiovascular and lower-respiratory-tract illness in counties infested with the emerald ash borer. The magnitude of this effect was greater as infestation progressed, and in counties with above-average median household income. Across the 15 states in the study area, the borer was associated with an additional 6,113 deaths related to illness of the lower respiratory system, and 15,080 cardiovascular-related deaths. Contact Geoffrey Donovan, PhD at [gdonovan@fs.fed.us](mailto:gdonovan@fs.fed.us).

### **Remote Sensing for Urban Agriculture**

Trees provide many benefits to cities, but can compete with alternative horticultural land use applications such as urban agriculture. We are examining the impact of the urban forest and other land uses on the food production capacity of Seattle using remote sensing technology. In addition, we are delineating the area contiguous to Seattle required to provide the annual food needs of the population of the city. Contact Jeff Richardson, PhD at [jeffjr@uw.edu](mailto:jeffjr@uw.edu).

### **Trees and Business Districts**

The basis of consumer behavior has changed in recent decades, and the retailer-consumer relationship is strongly influenced by a variety of non-economic factors. A series of studies have explored shopper response to urban forest canopy in central business districts, finding consistently positive responses. Business investment in urban forestry is important to promote urban sustainability, and also to enhance the appeal and success of business centers in cities and towns. Contact Kathleen Wolf, PhD at [kwolf@uw.edu](mailto:kwolf@uw.edu).

### **Economic Valuation of Volunteer Stewardship**

Volunteer environmental stewardship represents a critical component of ecological restoration efforts. There are also substantial economic contributions that have gone unconsidered. Tools, time, and transportation are all donated to these events. Two tiers of consideration are being explored. The first are the contributions made by the volunteers themselves. The second are the contributions provided by volunteer event leaders or hosts, as well as sponsors. Contact Jean Daniels, PhD at [jdaniels@fs.fed.us](mailto:jdaniels@fs.fed.us).

### **Collaborative Partnerships**

Through collaboration, gains in efficiency and practicality can be achieved, making research more applicable and valuable. An evaluation of the Green Cities Research Alliance structure and process is underway to better understand why particular components of the Alliance have been successful, and to identify improvements. A review of existing collaborative research structures has shown that key operations and functions may result in more lasting and effective partnership. Contact Dale Blahna, PhD at [dblahna@fs.fed.us](mailto:dblahna@fs.fed.us).





credit: Lisa Ciecko

### Residential Location Choice

This study seeks to understand the factors leading to growth and development along the wildland to urban interface with a special focus on suburban and exurban areas. Goals include identifying the implications for natural resources and environmental stewardship. The research will provide local and regional planners and community officials with an understanding of the motives and preferences of exurban residents regarding their residential location decisions. The study team is gathering data and information using a combination of interviews, surveys, and focus groups involving residents, homeowner associations, real estate professionals, outdoor recreation groups, and land use planning professionals. Contact Lee Cervený, PhD at [lcervený@fs.fed.us](mailto:lcervený@fs.fed.us).

### Measuring Watershed and Climate Impacts of Civic Environmental Stewardship: Developing an Outcomes Framework for the Green- Duwamish River Watershed

The most promising solutions for addressing environmental issues, particularly in urbanized areas, will include social ecological research. Little is known about the actual or potential consequences of citizen-based environmental stewardship on ecosystem function, nor are there accepted methodologies for assessing these influences. This pilot study will investigate the relationship between citizen-based environmental stewardship activities and ecosystem-scale change, using the Green-Duwamish watershed as a case study. A framework of potential ecological and social co-benefits will guide the research development. Contact Clare Ryan, PhD at [cmryan@uw.edu](mailto:cmryan@uw.edu).

### Motivations for Stewardship Commitment

This survey identified the reasons people participate in volunteering activities, and their level of commitment to environmental volunteering and the groups with which they participate. We conducted a web-based survey with 242 environmental stewardship volunteers from 34 stewardship events in 2011 in the Puget Sound region. We found that the environment was the highest ranked reason provided for stewardship volunteering, but community, social interaction, and ego defense (as-suage feelings of personal guilt) were more important as predictors of both participation and commitment. This suggests the environment is less important as the specific motivator of action, and environmental stewardship groups can improve messages to address these interests. Contact Stanley Asah, PhD at [stasah@uw.edu](mailto:stasah@uw.edu).



# Looking Forward:

## Research Directions and Emerging Themes

### *Landscape Restoration and Stewardship*

Understanding the positive impact people have on the environment requires ongoing scientific research. Projects will examine the impact of urban natural resource stewardship on a gradient of landscapes. Identifying, quantifying, and reinforcing these activities will provide direct value to natural resource managers and programmatic operations.

### *Public Health and Well-being*

Knowing more about the role of natural resources in public health and epidemiology is critical. Public health is quickly becoming a major field of investigation both nationally and locally. Placing the role of natural resources within this movement will be important in capturing an accurate accounting of our communities' connections to these resources.

### *Ecosystem Services*

Further research is needed in the valuation of the range of services provided by natural resources. Particularly in urban areas the vast amounts of regulating, cultural, and supporting services are poorly understood. Target research includes not only health benefits, but stormwater, climate, and a range of other increasingly valuable functions.

### *Urban Waters*

Our urban waterways are economic, environmental, and cultural focal points. We seek to better explain the relationship between the impacts of humans, both restorative and degrading. Similarly, scientific research on the influence that urban waterway condition has on the surrounding communities is important in understanding the link to human health and livelihood.





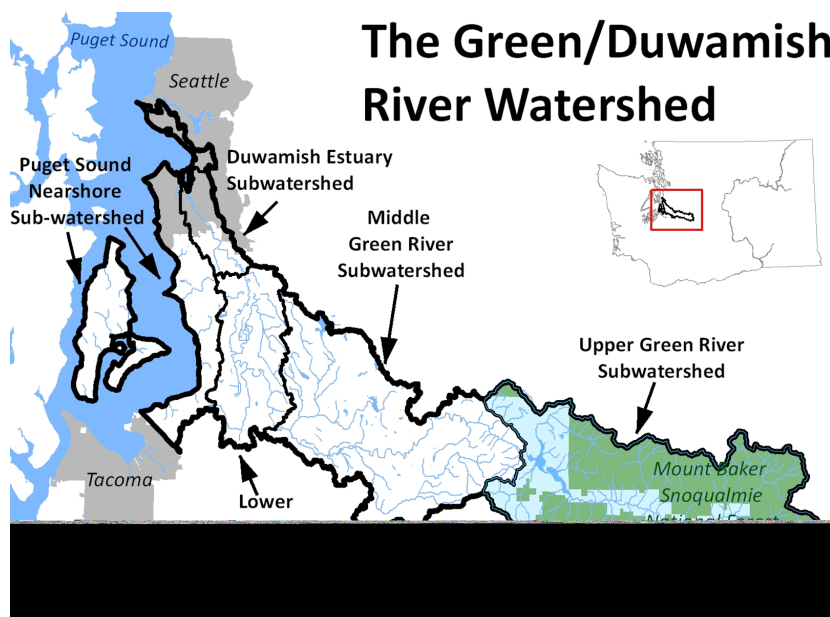
# Looking Forward:

## Green-Duwamish Urban Waters Federal Partnership

The Urban Waters Federal Partnership is a collaboration between the USDA Forest Service, National Resource Conservation Service, Environmental Protection Agency, and US Geological Survey, focused on the health of our nation's urban waters. The 2013 designation of the Green-Duwamish as one of these waterways has led to a partnership that will work directly with the Puget Sound Federal Caucus and the Green Cities Research Alliance to meet project goals.

### Project Goals:

- Promote clean urban waters
- Reconnect people to their waterways
- Use urban water systems as a way to promote economic revitalization and prosperity
- Encourage community improvements through active partnerships
- Focus on measuring results



### Management Agencies

Use existing programs to co-fund implementation

### Research Organizations

Identify sites for restoration, assess biophysical and social status and trends

### Non-Governmental Organizations

Conduct outreach, recruit landowners for assistance programs, access external funding sources

The partnership will focus on engagement and research geared towards the needs of: American Indian tribes, densely populated urban communities, small urban fringe communities and urbanizing areas, rural forest and farm communities in the middle subwatershed, economically disadvantaged communities, ethnically diverse communities, the state delineated Water Resource Inventory Area (WRIA 9), salmon recovery community-based organizations, and an environmental science center and its visitors.

For more information on the Urban Waters Federal Partnership contact:

Dale Blahna, PhD, USDA Forest Service, 206-732-7833, [dblahna@fs.fed.us](mailto:dblahna@fs.fed.us)

Tracy Stanton UWFP Ambassador, 301-520-0668, [tstanton@earthconomics.org](mailto:tstanton@earthconomics.org)

# GCRA Publications and Presentations

These lists, presented chronologically with the most recent at the top, represent the breadth of academic and professional products prepared by the Green Cities Research Alliance scientists, technicians, and partners.

## Publications: Peer-Reviewed

Dilley, J., and K.L. Wolf. (in press). Homeowner Interactions with Residential Trees in Urban Areas . Urban Forestry and Urban Greening.

Wolf, K.L. 2012. The changing importance of ecosystem services across the landscape gradient (pp. 127-146). In: Laband, D.N., B.G. Lockaby, and W. Zipperer (eds), Urban–Rural Interfaces: Linking People and Nature. American Society of Agronomy, Soil Science Society of America, Crop Science Society of America.

Asah, S.T., D.J. Blahna. (in press). Practical implications of understanding the influence of motivations on commitment to voluntary urban conservation stewardship. Conservation Biology. DOI:10.1111/cobi.12058.

Richardson, J.J. and L.M. Moskal. (in press). Uncertainty in urban forest canopy assessment: lessons from Seattle, WA USA. Urban Forestry and Urban Greening.

Styers, D.M., L.M. Moskal, and J.J. Richardson. (in review). Evaluation of the contribution of LiDAR data and post-classification clean-up to object-based classification accuracy.

Romolini, M., and K.L. Wolf. (in review). What Is Urban Environmental Stewardship? Comparing Professional Perceptions In Baltimore And Seattle. Arboriculture and Urban Forestry.

Poe, M., J. Lecompte-Mastenbrook, and R.J. McLain. (in review). Urban foraging and the relational ecologies of belonging. Social and Cultural Geography.

McLain, R.J., P.T. Hurley, M.R. Emery, and M. Poe. (in review). Gathering ‘wild’ food in the city: Rethinking the role of foraging in urban ecosystem planning and management. Local Environment.

Daniels, J.M., A.S.T. Robbins, W. Brinkley, K.L. Wolf, and J.M. Chase. (in review). Estimating the economic value of environmental stewardship volunteer events: A cost-based approach in King County, Washington. Urban Forestry and Urban Greening.

Poe, M., R. McLain, M.R. Emery, and P.T. Hurley. 2013. Urban Forest Justice and the Rights to Wild Foods, Medicines, and Materials in the City. Human Ecology, 41, 3, 409-422.

Wolf, K.L., D. Blahna, W. Brinkley, M. Romolini. 2013. Environmental Stewardship Footprint Research: Linking Human Agency and Ecosystem Health in the Puget Sound Region. Urban Ecosystems 16, 13-32.

Wolf, K. L. 2012. Open Space and Parks. In: Carswell, A.T. (ed.) The Encyclopedia of Housing, Second Edition. Sage Publications, 928 pp.

Asah, S.T. and D. J. Blahna. 2012. Motivational functionalism and urban conservation stewardship: implications for volunteer involvement. Conservation Letters 5:470–477. Copyright and Photocopying: 2012 Wiley Periodicals, Inc.

Donovan, G.H., and J.P. Prestemon. 2012. The effect of trees on crime in Portland, Oregon. Environment & Behavior. DOI: 10.1177/0013916510383238.

McLain, R.J., M.R. Poe, P.T. Hurley, J. Lecompte-Mastenbrook, and M. Emery, M. 2012. Producing edible landscapes in Seattle’s urban forests. Urban Forestry and Urban Greening. DOI: 10.1016/j.ufug.2011.12.002.

Moskal, L.M., and G. Zheng. 2012. Retrieving forest inventory variables with terrestrial laser scanning (TLS) in urban heterogeneous forest. Remote Sensing 4, 1, 1-20.

Moskal, L.M., D.M. Styers, and M. Halabisky. 2011. Monitoring urban tree cover using object-based image analysis and public domain remotely sensed data. Remote Sensing 3, 2243-2262.

Styers, D.M., A.H. Chappelka, and G.L. Somers. 2011. Determination of alterations in forest condition using various measures of land use change along an urban-rural gradient in the West Georgia Piedmont, USA. ISRN Ecology Vol. 2011, Article ID 461310, 12 pp. DOI: 10.5402/2011/461310

Donovan, G.H., Y.L. Michael, D.T. Butry, A.D. Sullivan, and J.M. Chase. 2011. Urban trees and the risk of poor birth outcomes. Health & Place 17, 1, 390-393.

White, Rachel E., G. H. Donovan, and J. P. Prestemon. 2011. Trees thwart shady behavior. Nursery Management and Production. February: 30-33.



Wolf, K.L. 2011. Green cities for good health: a tool for urban forestry advocacy. *City Trees: Journal of the Society of Municipal Arborists* 7, 2, 8-15.

Donovan, G.H. and D.T. Butry. 2011. The effect of urban trees on the rental price of single-family homes in Portland, Oregon. *Urban Forestry & Urban Greening* 10, 3, 163-168.

Wolf, K.L. 2010. City trees, nature and physical activity. *Facility Management Journal* 20, 1, 50-54.

Donovan, G. H. and D.T. Butry. 2010. Trees in the city: valuing street trees in Portland, Oregon. *Landscape and Urban Planning* 94, 77-83.

Wolf, K.L. and L.E. Kruger. 2010. Urban forestry research needs: a participatory assessment process. *Journal of Forestry* 108, 1, 39-44.

Joye, Y., K. Willems, M. Brengman, and K. Wolf. 2010. The effects of urban retail greenery on consumer experience: reviewing the evidence from a restorative perspective. *Urban Forestry and Urban Greening* 9, 1, 57-64.

Styers, D.M., A.H. Chappelka, L.J. Marzen, and G.L. Somers. 2010. Developing a land-cover classification to select indicators of forest ecosystem health in a rapidly urbanizing landscape. *Landscape and Urban Planning* 94, 3-4, 158-165.

Wolf, K.L. 2010. Urban ecosystem services: metro nature and human well-being. In: Laband, D.N. (ed), *Linking Science and Society: Proceedings of Emerging Issues Along Urban/Rural Interfaces III*. Atlanta GA.

Styers, D.M., A.H. Chappelka, L.J. Marzen, and G.L. Somers. 2010. Scale matters: Indicators of ecological health along the urban-rural interface near Columbus, Georgia. *Ecological Indicators* 10, 2, 224-233.

Donovan, G.H. and D.T. Butry. 2010. Trees in the city: Valuing street trees in Portland, Oregon. *Landscape and Urban Planning* 94, 77-83.

Styers, D.M. and A.H. Chappelka. 2009. Urbanization and atmospheric deposition: use of bioindicators in determining patterns of land-use change in west Georgia. *Water, Air, and Soil Pollution* 200, 1-4, 371-386.

Kuhns, M. and D. Reiter. 2009. Tree care and topping beliefs, knowledge, and practices in six western U.S. cities. *Arboriculture & Urban Forestry* 35, 3, 122-128.

Wolf, K.L. 2009. Strip malls, city trees, and community values. *Arboriculture & Urban Forestry* 35, 1, 33-40.

## Publications: Professional

Wolf, K.L. (in press). *Greening the City for Health*. Communities & Banking.

Wolf, K.L. 2013. Why Do We Need Trees? Let's Talk About Ecosystems Services. *Arborist News* 22, 4, 32-35.

Hurley, P.T., M. Emery, R. McLain, M. Poe, C. Goetcheus, and B. Grabatin. (in review). Whose urban forest? Plant foraging and the political ecology of urban nontimber forest products.

Wolf, K.L. 2013. The Urban Forest. *Communities & Banking* 24, 2, 25-27.

Wolf, K.L. 2013. Why Do We Need Trees? Let's Talk About Ecosystem Services. *Arborist News*. 22, 4:32-4:35.

Ciecko, L., K. Tenneson, J. Dilley, and K.L. Wolf. 2012. *Seattle's Forest Ecosystem Values: Analysis of the Structure, Function, and Economic Benefits*. USDA Forest Service, Pacific Northwest Research Station and City of Seattle, 26 pp.

Romolini, M., W. Brinkley, and K.L. Wolf. 2012. What is urban environmental stewardship? Constructing a practitioner-derived framework. Research Note PNW-RN-566. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 41 pp.

McLain, R.J., M.R. Poe, K. MacFarland, L. Brody, L.B. Buttolph, J. Hebert, P. Hurley, N. Gabriel, M. Emery, and S. Charnley. 2012. *Gathering in the City: An annotated bibliography on urban non-timber forest products gathering*. Pacific Northwest Research Station General Technical Report, PNW-GTR-849.

Moskal L.M. and D. Styers. 2011. *Geospatial Canopy Cover Assessment Workshop Workbook*.

Brinkley, W., K.L. Wolf, and D.J. Blahna. 2010. Stewardship footprints and potential ecosystem recovery: Preliminary data for Seattle and Puget Sound. In: Laband, D.N. (ed), *Linking Science and Society: Proceedings of Emerging Issues Along Urban/Rural Interfaces III*. Atlanta GA.

Ciecko, L. 2010. *Forest Ecosystem Values: Residential Private Property Outreach Report*.

Wolf, K.L. 2009. Trees mean business: city trees and the retail streetscape. *Main Street News* 263, 1-9.

Wolf, K.L. 2009. More in store: research on city trees and retail. *Arborist News* 18, 2, 22-27.

## Selected Presentations: Scientific and Academic

Hurley, P., M. Emery, R. McLain, and M. Poe. 2013. Gatherable Landscapes? Developing a methodological framework for assessing Nontimber Forest Product usage in cities. Association of American Geographers, Los Angeles CA.

Ciecko, L. and K. Tenneson. October 2012. Characterizing and Valuing Urban Forests: Three i-Tree Eco Project Examples. 2012 Society of American Foresters National Convention, Spokane WA.

Kimmitt, D. October 2012. Forest Assessment of King County's Park Lands. 2012 Society of American Foresters National Convention, Spokane WA.

Wolf, K.L., W. Brinkley, J. Daniels, A. Robbins, and D. Blahna. October 2012. Civic Environmental Stewardship and Urban Forestry. 2012 Society of American Foresters National Convention, Spokane WA.

Bazinet, O., M. Romolini, and D. Blahna. October 2012. Mapping Stewardship Organizations and Projects in the Seattle Metropolitan Region. 2012 Society of American Foresters National Convention, Spokane WA.

Sheppard, J., C. Ryan, and D. Blahna. October 2012. An Analytical Framework for Biophysical Impacts of Citizen Environmental Stewardship. 2012 Society of American Foresters National Convention, Spokane WA.

Brinkley, W. and D. Blahna. October 2012. Green Cities Research Alliance: A Review and Reflection. 2012 Society of American Foresters National Convention, Spokane WA.

Daniels, J., A. Robbins, W. Brinkley, K.L. Wolf, and J. Chase. October 2012. Valuing Environmental Stewardship: A Cost Approach in King County, Washington. 2012 Society of American Foresters National Convention, Spokane WA.

Wolf, K.L. September 2012. Puget Sound Science Update: Chapter 2B Review. Meeting of the Puget Sound Science Panel. Western Washington University, Bellingham WA.

Poe, M., J. LeCompte-Mastenbrook, R. McLain, and P. Hurley. February 2012. Urban Foraging and Ecologies of Belonging. Association of American Geographers Annual Conference, New York City NY.

Brinkley W., K.L. Wolf, and S. Schell. February 2012. Exploring steward experiences: Volunteerism in the Puget Sound region as social and ecological solution. Association of American Geographers Annual Conference, New York NY.

Brinkley, W. and L. Ciecko. August 2012. A Science Program for Urban Natural Resource Planning and Management. International Society of Arboriculture 88th Annual Conference, Portland OR.

Wolf, K.L. August 2012. The Nature and Health Connection: Social Capital and Urban Greening Ecosystems. International Society of Arboriculture 88th Annual Conference, Portland OR.

Daniels, J., A. Robbins, W. Brinkley, K.L. Wolf, and J. Chase. August 2012. Estimating the economic value of environmental stewardship volunteer events. Ecological Society of America 97th Annual Meeting, Portland OR.

Wolf, K.L. March 2012. Investing in Trees is an Investment in Your Community. Women's Arboricultural Conference 2012, Parksville BC, Canada.

Wolf, K.L. March 2012. Creating Better Human Habitat: The Evidence Says It All. Women's Arboricultural Conference 2012, Parksville BC, Canada.

Wolf, K.L. February 2012. Social Benefits of Nature Experience: Urban Greening for Community Sustainability and Resilience. Smart Growth National Conference, San Diego CA.

Wolf, K.L. November 2011. Supporting Partnerships for Green Cities & Good Health. Partners in Community Forestry Conference, Orlando FL.

Ciecko, L. November 2011. Seattle i-Tree in Three Acts: Hydrology, Outreach, and Canopy. Partners in Community Forestry Conference, Orlando FL.

Wolf, K.L., W. Brinkley, and D. Blahna. November 2011. Civic Environmental Stewardship and Urban Forestry. Society of American Foresters 91st National Convention, Honolulu HI.

Brinkley, W. October 2011. Increasing Ecosystem Knowledge and Application through Collaborative Research: Green Cities Research Alliance. 2011 Salish Sea Ecosystem Conference, Vancouver BC, Canada.

Ciecko, L. October 2011. Urban Forest Ecosystem Services: Existing Tools, Model Limitations, and Policy Applications. 2011 Salish Sea Ecosystem Conference, Vancouver BC, Canada.

Wolf, K.L. June 2011. Urban Greening: Community Design for Health. National Healthy Homes Conference: Leading the Nation to Healthy Homes, Families, and Communities, Denver CO.

Moskal, L.M. April 2011. Hyper-Resolution in Remote Sensing: What's All the Hype About? Association of American Geographers Annual Meeting, Seattle WA.



Styers, D., L.M. Moskal, et al. April 2011. Monitoring Urban Forest Canopies Using Object-Based Image Analysis and Public Domain Remotely Sensed Data. Association of American Geographers Annual Meeting, Seattle WA.

Brinkley, W. April 2011. Understanding and Optimizing Volunteer Environmental Stewardship Motivations, Operations, and Capacity in Seattle. Association of American Geographers Annual Meeting, Seattle WA.

Styers, D.M. and M.D. Dunbar. April 2011. Urban Forestry, Ecology, & Natural Resources, Panel Session. Association of American Geographers Annual Meeting, Seattle WA.

Kazakova, A., L.M. Moskal, and D.M. Styers. April 2011. Hyperspectral Remote Sensing of Urban Tree Species. Association of American Geographers Annual Meeting, Seattle WA.

Kato, A., T. Kobayashi, and L.M. Moskal. April 2011. Evaluating Ecosystem Services of Urban Forests Using LiDAR. Association of American Geographers Annual Meeting, Seattle WA.

Romolini, M., K.L. Wolf, and D. Blahna. March 2011. From Sanitary to Sustainable: An Emerging Role and Reevaluation of Environmental Governance and Polycentric Networks in Cities. Resilience 2011, Phoenix AZ.

Wolf, K.L. March 2011. From Sanitary to Sustainable: An emerging role and reevaluation of environmental governance and polycentric networks in cities. Resilience 2011, Phoenix AZ.

Poe, M.R., R. McLain, S. Charnley, P. Hurley, M. Emery, L. Urgenson, and J. LeCompte-Mastenbrook. March 2011. Seattle Urban Foraging: A Deeply Interactive Nature Practice. Society for Applied Anthropology Annual Meeting, Seattle WA.

LeCompte, J., M. Poe, L. Urgenson, and R. McLain. March 2011. Urban Foraging and Gleaning As A Place-Making Practice Amongst Newly Arrived Seattleites. Society for Applied Anthropology Annual Meeting, Seattle WA.

Urgenson, L., M. Poe, R. McLain, and J. LeCompte-Mastenbrook. March 2011. Urban Foragers' Perceptions and Use of 'Invasive Alien Plants' in Seattle Greenspaces. Society for Applied Anthropology Annual Meeting, Seattle WA.

Wolf, K.L. January 2011. Ecosystem Services in the City: Urban Greening and Public Health - 40 year Research Review. Meeting of the National Urban and Community Forestry Advisory Council, Washington DC.

McLain, R., M. Poe, P.T. Hurley, and J. Lecompte-Mastenbrook. June 2010. Greening and Gathering in the Emerald City: Producing Edible Landscapes in Seattle – Preliminary Findings. Annual Meeting for the Association for Environmental Studies and Sciences, Portland OR.

Wolf, K.L., D. Blahna, W. Brinkley, and M. Romolini. April 2010. Stewardship Footprints and Potential Ecosystem Recovery Across the Wildland to Urban Interface: The Puget Sound Case Study. Emerging Issues Along Urban/Rural Interfaces 3: Linking Science & Society, Atlanta GA.

McLain, R., P. Hurley, M. Emery, and M. Poe. February 2010. Finding Our Way Out of the Neoliberal Forest: Green Infrastructure Planning and Urban Gathering. Association of American Geographers Annual Meeting, Washington DC.

### **Selected Presentations: Professional and Management**

Wolf, K. L. June 2013. Nearby Nature and Human Well-Being: Exploring the Linkages, Telling the Story. Urban Forest Strategies: Linking People and Landscapes. Oregon Urban and Community Forestry Conference, Portland OR.

Ciecko, L. May 2013. Valuing Ecosystem Services. Puget Sound Urban Forest Symposium, Seattle WA.

Wolf, K. L. April 2013. Urban Ecosystem Services & SITES: Plants, Nature & Sustainability. Washington Native Plant Society: Central Puget Sound Chapter Meeting, Seattle WA.

Wolf, K. L. March 2013. Be Green, Be Well! Surprising Evidence about Health and the Natural Environment. Park Pride 12th Annual Parks & Greenspace Conference, Atlanta GA.

Poe, M. and R. McLain. March 2013. Urban Foraging and Food Security research report to the Puget Sound Regional Food Policy Council, Seattle WA.

Wolf, K. L. March 2013. Research on Trees, Nature & Public Benefits: Be Green, Be Well! The 2013 North Coast Urban Forestry Conference, Mentor OH.

Ciecko, L. February 2013. Characterizing and Valuing Urban Forests. Bartlett Tree Experts Annual Client Seminar, Seattle WA.

Wolf, K. L. January 2013. From Risk to Reward: How Nature Supports Human Well-Being. GreenPrint Summit, Sacramento CA.

Wolf, K. L. January 2013. With Plants in Mind - social benefits of civic nature and human dimensions of urban forest and ecosystems. Preserving, Creating, Restoring Our Urban Habitat: APLDWA Annual Design Symposium, Seattle WA.

Wolf, K. L. January 2013. Nature in the Neighborhood: Human Habitat for Well-Being. IslandWood 'Deep Dive' Seminar, Bainbridge Island WA.

Ciecko, L. January 2013. Characterizing and Valuing Urban Forests: How to Use Research to Support Tree Ambassador Efforts. City of Seattle Department of Transportation and Seattle Public Utilities, Seattle WA.

Wolf, K.L. January 2013. From Risk to Reward: How Nature Supports Human Well-Being. GreenPrint Summit, Sacramento CA.

Wolf, K.L. December 2012. Urban Ecosystems and Public Health: Metro Nature as Provider of Cultural Services. ACES and Ecosystem Markets, Ft. Lauderdale FL.

Ciecko, L. November 2012. Characterizing and Valuing Urban Forests. ESRM 480 Class Lecture, University of Washington, Center for Urban Horticulture, Seattle WA.

Wolf, K.L. October 2012. Landscape Benefits: Balancing Risk and Livable Spaces. Green Gardening Program, Honing the Sustainable Edge: Integrating Design, Installation, and Maintenance South Seattle Community College, Seattle WA.

Wolf, K.L. October 2012. Urban Ecosystems & Human Health: Expanding Considerations of Cultural Services. EcoSummit, Columbus OH.

Wolf, K.L. September 2012. Human Response to Nature: human dimensions & evaluation for Sustainability in Prisons programs. Sustainability in Prisons Network Conference, Evergreen State College, Olympia WA.

Brinkley W. and K.L. Wolf. July 2012. Volunteer Experiences in King County Forested Parks, 2011. King County Department of Natural Resources and Parks, Capital Planning and Land Management Team, Seattle WA.

Wolf, K.L. June 2012. Money Doesn't Grow on Trees, But...The Retail Benefit of Trees. Trees as a Legacy in Design & Development Symposium, Chicago Botanic Gardens, Chicago IL.

Brinkley W. May 2012. Green Cities Research Alliance: Sustainable Cities through Science, Policy, and Action. Puget Sound Urban Forest Symposium, Seattle WA.

Wolf, K.L. May 2012. Be Green-Be Well: Research on Trees, Nature, and Public Benefits. Sixth Annual South Florida Tree Summit, Florida International University, Miami FL.

Wolf, K.L. April 2012. Green Urban Communities: Commitment :: Human Habitat :: Climate. Biophilia Revisited Graduate Seminar, Department of Plant and Soil Sciences, University of Delaware, Newark DE.

Wolf, K.L. March 2012. Urban Greening and the Livable Community: What Does the Research Tell Us? Peak to Prairie Landscape Symposium, University of Colorado, Colorado Springs CO.

Wolf, K.L. February 2012. Sustainability Solutions: Urban Greening for Human Well-Being Benefits. 17th Water Conservation and Xeriscape Conference, Albuquerque NM.

Wolf, K.L. February 2012. Is Tree Management Worth the Trouble? Justifying Project Budgets. Forest Resource Institute, Myrtle Beach SC.

Wolf, K.L. February 2012. Creating Healthy Places to Live. Mississippi Urban Forest Council Annual Conference, Jackson MS.

Wolf, K.L. November 2011. Economic and Social Values of the Urban Forest: What is the Research? Texas Emerging Communities: Lower Rio Grande Valley Regional Workshop, McAllen TX.

Ciecko, L. November 2011. Forest Ecosystem Values Project. City of Seattle Urban Forest Commission, Seattle WA.

Brinkley, W. June 2011. Understanding and Optimizing Volunteer Environmental Stewardship Motivations, Operations, and Capacity in Seattle, Autumn 2010. Seattle Department of Parks and Recreation, Seattle WA.

Brinkley, W. June 2011. Understanding Volunteer Environmental Stewardship: Motivations of Seattle Volunteers. Forterra Board of Directors, Seattle WA.

Wolf, K.L. May 2011. Urban Ecosystem Services & Their Value. The Science, Services and Performance of Sustainable Sites Workshop. University of Washington Botanic Gardens, Seattle WA.

Moskal, L.M. and D. Styers. May 2011. Monitoring Seattle, Olympia and Tacoma Forest Canopies Using Object-Based Image Analysis and Public Domain Remotely Sensed Data. Annual Washington URISA Conference, Lynnwood WA.

Wolf, K.L. April 2011. The Social and Economic Values of Trees in Urban Neighborhoods. Friends of Jefferson the Beautiful Tree School, New Orleans LA.

Wolf, K.L. April 2011. The Landscape Performance Series: A Database of Resources to Make the Case. Washington Chapter of the American Society of Landscape Architects 2011, Our Challenge - Shaping the Future of the Built Environment, Seattle WA.



Brinkley, W. and K.L. Wolf. March 2011. Understanding Volunteer Stewardship Experiences in Seattle. REI Puget Sound Stewardship Conference, Seattle WA.

Wolf, K.L. February 2011. Ecosystem Services & Urban Green Infrastructure: Urban Greening & Public Health. National Green Infrastructure Conference 2011, National Conservation Training Center WV.

Moskal, L.M. and D. Styers. February 2011. Mapping Impervious Surfaces and Canopy Cover in Seattle, Olympia & Tacoma Using Object-Based Image Analysis (OBIA) & Public Domain Remotely Sensed Data. 2011 UW Water Symposium, Seattle WA.

Wolf, K.L. January 2011. Green Cities & Good Health. 2011 Austin State of the Urban Forest Summit, Austin TX.

Ciecko, L. December 2010. Forest Ecosystem Values Project. King County Department of Natural Resources and Parks, Seattle WA.

Brinkley, W. December 2010. Stewardship Engagement and Capacity Project. King County Department of Natural Resources and Parks, Seattle WA.

Wolf, K.L. December 2010. Ecosystem Services in the City: Urban Greening and Public Health. ACES: A Community on Ecosystem Services, Phoenix AZ.

Wolf, K.L. October 2010. Geospatial Linkages of Green Infrastructure and Positive Public Health. ESRI Health GIS Conference, Denver CO.

Wolf, K.L. September 2010. Keynote: Trees and Community Economics - A Social Perspective. Trees Mean Business: 31st Texas Tree Conference, College Station TX.

Wolf, K.L. August 2010. Opening up the Treasure Chest: An Overview of Research on Human Health and Well-Being. Social Landscaping: Creating and Marketing Healthy and Livable Communities. California Releaf Network Retreat, Sacramento CA.

Wolf, K.L. March 2010. Human Health & Well-Being: Evidence for an Expanded Framework of Ecosystems Services in Cities. Million Trees NYC, Green Infrastructure, and Urban Ecology: A Research Symposium, New York NY.

Wolf, K.L. March 2010. Parking and Trees in Urban Areas: Legal and design approaches. In: Parking and Trees in Urban Areas: Ordinances, Design, and Soil, California ReLeaf, Davis CA.

Wolf, K.L. March 2010. Trees for Livable Cities: Science for Urban & Community Forestry. Sustainable Urban Forests Coalition, Congressional Briefing, Washington DC.

