

# Portland Ecoroof Symposium The Bottom Line on Portland Green Rooftops



**Friday May 18, 2012**

[World Trade Conference Center](#)

121 SW Salmon Street, 2WTC

Portland, OR 97204

8:30 am - 6:00 pm

EVENT SUMMARY  
AND PROCEEDINGS

August 2012

**TABLE OF CONTENTS**

EXECUTIVE SUMMARY .....3  
INTRODUCTION.....4  
KEYNOTE ADDRESS .....5  
SYMPOSIUM PROGRAM.....6  
DISCUSSION: EXAMINING THE RETURN ON INVESTMENT OF GREEN ROOFS.....8  
APPENDICES ..... 11

## **EXECUTIVE SUMMARY**

The 2012 Portland Ecoroof Symposium took place on Friday, May 18<sup>th</sup>. The event marks the 4<sup>th</sup> consecutive year for the BES Ecoroof Program's major outreach event. In addition, the format of this year's event was a further refinement of an ongoing dialogue between the City of Portland, municipal and non-profit partners, and the private sector, focusing on the Business Case for Ecoroof development in the City of Portland. The full proceedings from the Symposium will provide a status update of the ecoroof industry, and will be integral to planning ecoroof implementation for the next several years.

<p><u>Ecoroof Symposium, by the numbers</u> Over 150 attendees Over 90 companies and organizations represented 9 speakers and presentations 18 vendors from across the ecoroof industry 6 facilitators from Greenroof Info Think-tank</p>
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The program for this year's event was developed to attract members of the design and development communities. Outreach to these groups was more targeted than it's been for past events, and the attendee list showed that this approach was effective. Presentation topics focused on ecoroof costs and benefits, energy benefits, public health and aesthetics, maintenance, and case studies. Experts from Gerding Edlen and Turtle Island Development companies addressed the "Bottom Line on Portland Green Rooftops."

Members of the Ecoroof Team and GRIT (Greenroof Info Think-tank) facilitated breakout discussions over lunch. Attendees were divided into four groups to discuss prevalent challenges and barriers to ecoroof implementation. Facilitators documented the discussion with notes, and participants filled out and submitted questionnaires with responses to guiding discussion questions. In addition, eighteen companies participated in the Vendor Showcase after the Symposium sessions. The Showcase was hosted by the GRIT and BES and included donations from HUB Brewing.

Surveys for the event were mostly positive and supportive:

- 90% of responders reported being either moderately or very satisfied with the event
- 75% indicated the information covered was about the right amount
- All of the program presentations were rated either 'good' or 'great'
- Respondents reported that the most important topics covered were costs and benefits, design, and monitoring
- Nearly all responders indicated they would 'possibly' or 'definitely' attend future Ecoroof Symposiums.

The emphasis on greenroof return on investment allowed for an industry status update. The biggest challenges to green roof implementation remain costs and lack of education, and with a shifting political climate there may need to be developed and expanded for implementation to be sustained. (something going on with that sentence) Portland's ecoroof industry is working, but much more can be done to expand the use of ecoroofs here.

The Symposium provided a great deal of information about the multiple benefits of green roofs. Still, research and support are needed to consider ecoroofs as a permanent fixture on Portland's rooftops. As a city, Portland will continue to face challenges as it grows and gets denser, particularly with uncertain shifts in climate conditions, so utilizing untapped resources like roof space will help us achieve greater resilience.

## **INTRODUCTION**

As cities learn more about resilience, green infrastructure continues to evolve as a tool for improving a city's long-term health and vibrancy. Efforts to address urban challenges are adapting to meet multiple benefits so that costs and complexities no longer slow implementation.

The same goes for how we account for our investments. No longer can we afford to address single problems with single solutions. Cities are learning more about the pervading costs to operate and maintain aging infrastructure, protect public health, and promote sustainable, resilient communities. Without accounting for the added costs and missed opportunities of single-solution approaches, we cannot truly account for the value of work that produces multiple benefits.

The 2012 Portland Ecoroof Symposium marked the 4<sup>th</sup> consecutive year for the BES Ecoroof Program's major outreach event. In addition, the format of this year's event was a further refinement of an ongoing dialogue between the City of Portland, municipal and non-profit partners, and the private sector, and focused on the green roof return on investment in the City of Portland.

The results of the Symposium provide a status update for the Portland industry, and one more event in a series of discussions between those promoting, wanting, and implementing ecoroofs. What we heard from a number of attendees was that as a city, we need to move towards triple bottom line accounting in order for ecoroof implementation to make true economic sense. As good as ecoroofs are at managing stormwater, they provide far more to the community in terms of environmental and human health benefits.

## **BACKGROUND**

Since 1996, ecoroofs in the City of Portland have grown from a backyard experiment to large-scale implementation. There has been much advancement in City programs that have prepared Portland for a boost in implementation, but of particular significance is the ongoing dialogue between city staff, ecoroof industry, and the public.

In 2006, then-Commission Sam Adams led an ecoroof summit as the public what was needed to boost the implementation of ecoroofs in Portland. The response from the community led to the development of the Ecoroof Program and the related resources leveraged through the Grey to Green Initiative in 2008, a \$50M program focused on expanding green infrastructure in Portland.

Growth in the North American greenroof industry varies by city, but Portland's industry is uniquely specialized to the Pacific Northwest climate and culture. This was especially illustrated

*"Portland is confronting a challenge, a chasm between the current levels of adoptions and levels of adoption that will fundamentally improve the ecological footprint of our urban landscape.*

*Ecoroofs are clearly part of making the city more resilient...(They are) critical to making density work....What we need to do, is we have the industry in this room talking, which have networks or their own, many whom are uninvolved. On the value side, we have businesses and property owners that have installed them. We need to reach into these networks and talk about ecoroofs and how what we're doing and what they're doing is a part of it."*

*Dan Vizzini,  
Keynote Address*

with the development of the Greenroof Information Think-tank (GRIT) in 2009, now with over 360 members. The group is “a network of businesses, government agencies, non-profit organizations, students and community members, joining together to grow the knowledge and use of green roofs in the Pacific Northwest.”

As the City of Portland approaches the end of the Grey to Green ecoroof incentive, there’s a need to convene and discuss how far we’ve come and which direction we should look to take next. The development of GRIT allowed for a broader, community- and industry-based forum for addressing barriers to ecoroof implementation. The 2012 Ecoroof Symposium was intended to get a status update on the state of the industry, and ask the question: Where do we go from here, and how do we foster an open dialogue with property owners, developers, and the professional community to determine the right next steps?

## **KEYNOTE ADDRESS**

### **Raising the Roof: Propagating Green Investments in Portland Oregon**

Dan Vizzini, Senior Analyst, Thetus Corporation

[Slides](#) [Video](#)

#### *Challenge*

- While Portland’s progress has been laudable, the pace of ecoroof installations is lagging behind our own aspirations (set by Portland’s Grey to Green Program) and the achievements of other US cities. Portland is confronting a challenge, a chasm between the current levels of adoptions and levels of adoption that will fundamentally improve the ecological footprint of our urban landscape.
- Portland might look to Stuttgart, Germany for inspiration and instruction. Stuttgart institute new building regulations that mandated the installation of ecoroofs on flat-roofed developments in 1987. Today, more than 20% of flat roofs in Stuttgart are green. The building regulation, coupled with financial incentives, has promoted the development of a robust local economy dedicated to the design, construction and maintenance of ecoroofs.
- If Portland had instituted green roof regulations on new flat roofs beginning in 1990, developments in the Pearl District and Central Eastside Industrial Area – alone – would have produced 1.8 million square feet of ecoroofs by 2011. New developments during this period – in Rivergate, Mocks Bottom and Columbia South Shore – would have added millions of additional ecoroofs.

#### *Recommended Strategies for Success*

Even in Portland, appeals to environmental stewardship and climate action are not enough to dramatically accelerate the pace of ecoroof installations. The path forward requires...

- Leadership: set a goal, establish public policies (regulations and incentives) to achieve the goal, sustain a commitment to ecoroof policies and programs across political administrations, and encourage and recognize private policies and initiatives by local businesses and institutions. Washington DC is pursuing a 20-20-20 program to construct 20 million square feet of ecoroofs by 2020.
- Partnerships and Liquid Networks: Portland has been very successful in developing a network of ecoroof professionals, and a local capacity for research, training and development of a local ecoroof economy. Current efforts must be sustained as the marketplace for ecoroof projects increases in size and reach.

- Engagement: build on Portland's existing public outreach and engagement strategies to expand public awareness, interest and support for a campaign to green up Portland rooftops. Work with local businesses and institutions to celebrate new installations. Foster job training and employment activities to increase Portland's population of ecoroof professionals.
- Reframe the Message: move beyond environmental and climate action messages. Focus on positive messages related to public health, social and economic resilience, operating efficiencies and cost reductions, marketplace differentiation and market branding, and messaging that aligns the coolness and wholesomeness of ecoroofs to the image, identity and marketing strategies of local businesses and institutions.

## ***SYMPOSIUM PROGRAM***

### **Assessing the Year-Round Thermal Benefits of a Green Roof**

Dr. Brad Bass, University of Toronto's Centre for Environment

[Slides](#) [Video](#)

Even on an individual building, green roofs operate at different spatial scales to reduce energy consumption, from the roof top unit (RTU) that controls the sensible load of the building, to the rooftop as a whole. At the building scale, a green roof reduces heat flux into and out of a building through the roof during the summer and winter, respectively. A green roof may even reduce sub-building scale energy consumption, such as the energy required used by the roof top units (RTUs) to cool and heat the air in a large building by reducing the temperature of the air entering the building through this machinery during the summer. This presentation will include the analysis of a two-year monitoring campaign of a green roof in Chicago and the resulting year-round energy savings that would be possible in both a cold and a warm climate city. Some suggestions will be made as to how these savings might be increased by designing the roof to increase biodiversity.

### **Growing Value: Green Roof Financial Analysis**

Kirstin Weeks, ARUP Consulting

[Slides](#) [Video](#)

Green roofs must often be justified financially for owners and policymakers to choose to invest in them. City policies and incentives have a huge impact on the financial case for a green roof, but in order for them to be enacted, a community-scale financial case must generally also be made. Arup has recently led two financial analyses of green roofs to address the need for data in these areas - one for a US Federal Government Agency, and one for a major retail developer. The retail study analyzed under what circumstances a green roof constituted a better investment than a white roof. The federal study quantified the benefits and opportunities of green roofs to building owners, occupants and the greater community (compared to conventional black roofs). For the retail study, 20yr costs and benefits were calculated for eight different US cities. Costs for meeting stormwater policies with and without a green roof were compared. The analysis was grounded in a three-year field study on a half-green, half-white, 150,000 sf roof. The federal study began with a comprehensive literature review on green roof performance across a wide range of criteria. Costs and benefits from the studies were used to calculate fifty-year net present value (NPV) for each roof and stakeholder group.

Both studies show that green roofs can be financially competitive with black or white roofs for an individual owner, particularly if life cycle costs are considered. The retail study highlights the importance of local factors and policy in determining the individual financial case for a green roof project. The federal agency study points out that real estate values not typically quantified in payback analysis can have a much greater impact on the bottom line than simple costs and utility savings. Further, it shows that the value to the community of green roofs can be more than triple

the first cost, suggesting local incentives are a very good investment. Results will be discussed in more detail in the session.

### **Greenroofs and the Triple Bottom Line: Rethinking Sustainability ROI**

Renee Loveland, Gerding Edlen Development Company

[Slides](#) [Video](#)

This presentation will focus on how green roofs and other sustainable elements factor in to the design and construction of Gerding Edlen Development Company. In their approach to sustainable development, Gerding Edlen pays close attention how their projects are designed for people, and how the end product creates amenable spaces that contribute to community and livability. Green roofs have been included on a number of Gerding Edlen developments, including the Cyan and the Indigo at 12 West.

### **Gardens in Healthcare: Rehabilitation, Recovery & Restoration**

Teresia M. Hazen, Legacy Health

[Slides](#) [Video](#)

### **Healing Gardens**

Brian E. Bainson, Quatrefoil, Inc

[Video](#)

Well-designed gardens in hospitals, human service agencies and senior living help to meet a number of client, patient and resident goals. Characteristics of these spaces support movement/exercise, sense of control, benefits of the nature experience and social support. Customer satisfaction examples will be presented. In these therapeutic settings, garden elements support the clinical and client program goals.

### **A Case Study of the Ramona Apartments**

Ed McNamara, Turtle Island Development LLC

[Slides](#) [Video](#)

In 2011 Ed McNamara's company completed the Ramona Apartments, 138 units of affordable family housing in the Pearl District with public school classrooms and a non-profit community center on the ground floor, and lots of gathering spaces throughout the building. The Ramona Apartments building is extremely energy-efficient and treats stormwater on site. In this presentation Ed explains the decisions that led to the inclusion of Portland's largest continuous ecoroof at 32,000 ft<sup>2</sup>.

### **Green Roof Maintenance: Lessons learned at OHSU**

Chad Sorber, Oregon Health and Science University

[Slides](#) [Video](#)

OHSU is leading the Portland area in total square footage of green roofs. The OHSU grounds crew has attempted a few different maintenance strategies on their green roofs, with varying levels of success, and they have learned some lessons along the way. In this presentation Chad will discuss lessons learned at OHSU and outline keys to a successful green roof maintenance program.

## **DISCUSSION: EXAMINING THE RETURN ON INVESTMENT OF GREEN ROOFS**

The Symposium included breakout sessions over lunch and a panel discussion at the end of the day to continue the dialogue between attendees. Since most of the program was about delivering information to the attendees, the breakout sessions opened the opportunity for dialogue amongst attendees. GRIT members and BES staff facilitated these discussions to frame, guide, and document the information shared *from* the attendees.

The theme of the Symposium is the *green roof bottom line and return on investment*. Breakout sessions were intended to check the pulse of the industry by engaging attendees in an open discussion. The groups focused on perceived barriers to think of when they consider a green roof investment.

*“(We need to) move beyond environmental and climate action messages. Focus on positive messages related to public health, social and economic resilience, operating efficiencies and cost reductions, marketplace differentiation and market branding, and messaging that aligns the coolness and wholesomeness of ecoroofs to the image, identity and marketing strategies of local businesses and institutions.”*  
Dan Vizzini

### **What are the biggest challenges to implementation?**

#### **Cost**

The prominent barrier to implementation remains cost. In terms of actual costs, structural costs and permit costs are the greatest barriers to project implementation. Further, there is limited affordable access to professionals that can help with the technical aspects of the process. In general, costs are often misunderstood or reported incorrectly which leads to greater confusion about actual costs and perceived costs. Costs vary for each element of an ecoroof project, to the extent that it can be difficult to explain them consistently and sufficiently. Further, companies provide various products and services that range in costs to the property owner. There remains a need for documented, researched costs from built projects to inform actual costs for varying types of buildings and scenarios. Finally, a better understanding of life cycle costs and how they relate to the actual return on investment.

#### **Misinformation**

There remains confusion about the purpose of ecoroofs and the actual benefits they provide, as well as unrealistic expectations of costs, maintenance, and aesthetics. With various approaches to green roof design and installation, there lacks a consistent and reliable set of information to provide consumers so their expectations are realistic. Most barriers mentioned in the discussions were about perceived costs related to permits, design, and maintenance. When costs are perceived as being high, ecoroofs tend to be value engineered out of a project. Finally, the insurance industry is slow to adapt to green roof technology, thus getting involved more in the design process which increases costs and can result in an over-designed, over-engineered system to address perceived risk.

#### **Lack of Regulation**

Another barrier identified by the group was a lack of regulation. Green roofs often get value-engineered out of a project because developers tend to use less expensive and more familiar alternatives, and there are no requirements for them to do otherwise. The incentive the city offers is effective but limited and developers are often well-underway in the design process before the concept of a green roof is brought to the table. It was also noted that the lack of regulation is

allowing green roofs to be overlooked in areas where they might be of greatest value. For example, developments in environmentally sensitive areas such as riparian areas or significant wildlife habitat have no existing regulations for their roof space.

### ***Looking ahead: What's needed?***

Portland is constantly changing, and the ecoroof industry needs to be ready to adapt. The political climate may change, the financial incentives will go away, and the economic uncertainties over the past several years persist and affect development and investment.

### **Triple Bottom Line**

While the City of Portland is focusing on stormwater management benefits of ecoroofs, most attendees agreed that for ecoroofs to make economic sense they should be based on triple bottom line accounting. Thus, a more strategic approach to implementation is needed, one that considers other urban challenges like food deserts, congested transit corridors with poor air quality, fragmented habitat corridors and riparian areas, unregulated development, and large expanses of impervious surfaces contributing to the urban heat island. Ecoroofs can manage stormwater *and* address these problems. Further, ecoroofs can contribute to public health and the overall resilience of a city, particularly as it relates to quality of life in an uncertain, changing climate.

### **Information Sharing**

It's apparent that the continued evolution of GRIT is necessary to sustain a future for ecoroofs in Portland. Considering the barriers and solutions described in the previous section, the relationships between the city government, private sector, and GRIT could offer a solid foundation from which to take action. Strengthening these relationships should improve our collective ability to share information and promote, educate, and advocate for green roofs. We need to develop our network to assure that everyone with a vested interest is involved in all levels of discussion. GRIT should look towards expanding the network of collaborators by identifying more regional and national players. GRIT may also be integral to improving the feedback infrastructure and make sure it's not so broad that it excludes our local market and industry. What's needed is an honest exchange about ecoroof challenges and failures so that the industry as a whole can continue to evolve and improve.

*"We'll never lead the nation in square footage – we innovate, and other cities look to us for the next innovation. So (we should) look towards the next phase of innovation."*

*Jason King*

### **Innovation**

Portland has always been an innovator in ecoroof technologies. How can the industry help guide innovation with ecoroof design and application to meet the demands of a growing city, particularly with a changing climate? With costs as the most significant barrier, an emphasis on low-cost, low-maintenance designs may be helpful. Low-weight designs may help with the frequent up-front costs of structural upgrades for certain types of buildings. Many recommendations were made for developing more innovative funding strategies. Bonding, re-investment, loan funding, and considering a model similar to Energy Trust's residential Solarize program to take advantage of economies of scale.

### **Documentation and Research**

There remains a need for local research and data to support ecoroof implementation. Portland has hundreds of green roof projects to learn from, and significant effort should be placed on developing case studies of these projects that evaluate performance, particularly how they provide multiple benefits.

**Advance Policies**

So far the menu of policies in Portland has been incentive in nature. The City's Stormwater Management Manual is effective at requiring on site stormwater management, but ecoroofs are an option often left out for other more familiar approaches. In some cases the value of an ecoroof would be significant enough to have more stringent policies and requirements.

## **APPENDICES**

### **A. PROGRAM CATALOG**

All presentations were videotaped and the entire catalog is available [online](#). Slides and individual presentations can be accessed by clicking on the links below.

#### **Opening Remarks**

Dean Marriott, Director, City of Portland Environmental Services

[Video](#)

#### **Keynote Address:**

##### **Raising the Roof – Propagating Green Investments in Portland Oregon**

Dan Vizzini, Senior Analyst, Thetus Corporation

[Slides](#) [Video](#)

##### **Assessing the Year-Round Thermal Benefits of a Green Roof**

Dr. Brad Bass, University of Toronto's Centre for Environment

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##### **Growing Value: Green Roof Financial Analysis**

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##### **Green Roofs and the Triple Bottom Line: Rethinking Sustainability ROI**

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##### **Gardens in Healthcare: Rehabilitation, Recovery, & Restoration**

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##### **Healing Gardens**

Brian E. Bainnson, Quatrefoil, Inc

[Videos](#)

##### **A Case Study of the Ramona Apartments**

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[Slides](#) [Video](#)

##### **Green Roof Maintenance: Lessons Learned at OHSU**

Chad Sorber, Oregon Health and Science University

[Slides](#) [Video](#)

## **B. CONTRIBUTORS**

**Brian Bainnson** is a Landscape Architect with over 18 years experience in planning and design on a wide range of institutional, commercial, governmental, recreational and residential projects. Mr. Bainnson has been involved in a diverse array of projects and collaborative design efforts, offering in particular his noteworthy experience in the field of therapeutic garden design. In 1998, Mr. Bainnson led the Portland Memory Garden design team, developing an award winning therapeutic garden for people with Alzheimer's and their families and caregivers, managing partnerships with volunteer groups and the City of Portland Parks Department to create an exemplary model recognized nationwide. Mr. Bainnson's design commissions within the medical field have included therapy gardens for Legacy Health System in Portland, notably, the OR ASLA Design Award winning Oregon Burn Center Garden, Behavioral Health Therapy Garden, Mt. Hood Medical Center healing garden, therapeutic gardens for the Rehabilitation Institute of Oregon (RIO) and the Emanuel Trauma Unit, as well as the latest under-construction facility at Meridian Park Medical Center.

**Dr. Brad Bass** is an adjunct professor in the University of Toronto's Centre for Environment, the past Chair of the North American Green Roof Research Committee and a member of the Mississauga's Environmental Advisory Committee. His current research interests include simulating population responses to environmental change, green infrastructure and urban sustainability, and the community energy planning. Brad has recently completed the green roof energy calculator with David Sailor of Portland State University, developed of the Resources & Energy Analysis Model (REAM), 3-D visualizations of the urban heat island, a manual on biofiltration and a curriculum for climate change, health and adaptation for high school teachers that allows students to construct their own experiments of adaptation using Brad's COBWEB simulation model. Brad teaches classes on green infrastructure, economic geography, runs workshops on adaptation for elementary and secondary school students and volunteers with a number of education programs in the City of Mississauga.

**Teresia M. Hazen, M.Ed., HTR, QMHP** has been with Legacy Health in Portland, Oregon since 1991. This is a not-for-profit integrated healthcare network including six hospitals and related services. Legacy promotes gardens in healthcare to create supportive environments of care for patients, families, visitors, staff and neighbors. Teresia is responsible for pioneering the horticultural therapy program and therapeutic gardens for Legacy's long-term care and Skilled Nursing patients, in 1991. Today, she oversees nine therapeutic gardens and horticultural therapy work through the Rehabilitation Institute of Oregon, Emanuel Children's Hospital and the Oregon Burn Center. The Good Samaritan Hospital Stenzel Healing Garden was recognized by the American Horticultural Therapy Association Therapeutic Garden Award in 1998. The Children's Hospital Garden received the same honor in 2000 and the Oregon Burn Center Garden in 2006.

**Renee Loveland** has 15 years of experience in real estate development. As part of Gerding Edlen's Sustainable Solutions group, Renee provides retrofit development services and master planning consulting services around district-scale infrastructure systems to public and private real estate portfolio owners. Renee also manages sustainability and LEED efforts across Gerding Edlen's development portfolio. This includes LEED certification efforts, energy analysis, financial incentives, sustainability marketing, green building education and outreach, and policy advocacy. With direct experience on over 40 LEED projects in many different markets, Renee has helped GED build a track record of many firsts. Renee sits on the board of the Center for Innovative School Facilities and is a LEED Accredited Professional. Renee graduated magna cum laude from the American University in Paris with a BA in International Relations and double minor in Economics and French Language.

**Ed McNamara** is a real estate developer in Portland. His company, Turtle Island Development LLC, focuses on affordable rental housing that is energy-efficient and transit-oriented. Ed tries to develop and operate buildings that are good places to live and good places to work. Ed worked as a building contractor for a number of years before going to work for a local nonprofit, REACH Community Development Inc., in 1983. He soon became the Executive Director and stayed in that field for 11 years. In 1995, Ed took a job with a for-profit developer to see if he could put the same values into practice working in the private sector.

**Chad Sorber** is a horticulturalist at OHSU specializing in sustainable landscaping. He is in charge of maintaining over 88,000 square feet of green roofs at OHSU and he has also maintained ecoroofs at Portland State University and for the City of Portland. Chad is currently a graduate student in Park & Resource Management and is a Certified Landscape Technician and a Certified Arborist.

**Dan Vizzini** is a senior analyst at Thetus Corporation, a Portland-based software developer, specializing in enterprise applications and services that help people analyze, characterize, abstract, visualize, and model complex systems. Dan helps develop planning, modeling and decision support software to advance triple-bottom-line policies and goals in the private and community sectors. Prior to embarking on this second career, Dan served for 26 years as a public finance and policy analyst at the City of Portland. During his tenure, Dan held positions as a public finance specialist, policy and legislative analyst, customer service supervisor and assessments manager in the Office of the City Auditor and Bureau of Environmental Services. At BES, Dan led the development of Portland's stormwater discount program, Clean River Rewards, from 2000 to 2006, and was the project manager for the Stormwater Marketplace Project from 2006 to 2010. Many of the principles developed by the marketplace project provided the foundation for Ecoroof Incentives and the Tabor-to-the-River private property retrofit initiatives.

**Kirstin Weeks** is an Energy and Building Ecology Specialist at Arup Consulting. She specializes in resource conservation and integration of ecological function in the built environment. She designs buildings and communities to work like ecosystems, eliminating waste by finding uses for it within systems. Kirstin works with interdisciplinary teams to close energy, water and material loops in their projects, implementing efficiencies and renewable energy and water systems, and incorporating living systems into the built environment. Kirstin holds an A.B. in Environmental Studies from Dartmouth and an M.S. in Building Science from UC Berkeley. Her credentials include LEED-AP and Green Roof Professional.

### **C. PARTICIPATING VENDORS**

Columbia Green Technologies	Lando and Associates Landscape Architecture
Diadem Roofs	Phillips Soil Products
Ecoroofs Everywhere	Snyder Roofing
Enviroscapes Northwest, Inc.	SolTerra Systems
Ernest R. Munch, Architect LLC	Swanson Bark
Ewing Irrigation	Teufel Nursery, Inc.
Greenfeathers, Inc (Blooming Nursery)	Tremco Inc
Hunter Industries	Xero Flor

#### **D. SUPPORT**

The City of Portland Environmental Services (BES) would like to thank members of GRIT, city staff, and volunteers for their countless hours and support developing the 2012 Ecoroof Symposium.

Cynthia Butler, BES

Matt Burlin, BES

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Alice Coker, BES

Jon Crumrine, Envirosapes Northwest

Casey Cunningham, BES

Linda Dobson, BES

John Edwards, Portland State University

Liz Hart, Tremco Roofing

Austin Hudson, Portland State University

Jason King, TerraFluxus Inc.

Tom Liptan, BES

Corey Omey, Ernest R. Munch Architect

Alan Proffitt, Multnomah County

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Courtney Skybak, Samuel H. Williamson Associates

Kristen Thomas, BES

Brian Wethington, BES

Desirae Williams, Dobro Design

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