Cascadia Regional Network

Breakthrough Convening on Urban Forestry and Climate Change

October 29-30, 2014
Portland, Oregon

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Acknowledgments

USDN directors network

The Urban Sustainability Directors Network is member led and member driven, meaning that members collectively determine what priorities they have each year and lead the work to carry them out. USDN's ultimate goal is to build and strengthen the connections between members in order to quickly access each other's knowledge and expertise to achieve better, more effective outcomes at scale. Since its founding in 2008, the network has evolved and added new collaborative activities, while continuing to focus first and foremost on peer-to-peer exchange. USDN's programs mobilize members to pursue collaborative projects that address urgent challenges and timely opportunities facing multiple cities. The project's members work together to allow us to assess which innovation areas are the most strategically important and yield the most effective outcomes.

INSTITUTE FOR
Sustainable
Communities

Since its founding in 1991, Institute for Sustainable Communities has led 80 transformative, community-driven projects in 24 countries. ISC specializes in developing and delivering training and technical assistance programs that improve the effectiveness of communities, their leaders, and the institutions that support them. ISC recently launched the Sustainable Communities Leadership Academy website to make the valuable, high-caliber information from our first-class peer-learning and training workshops available to practitioners in any community.

WORLD
FORESTRY
CENTER

The World Forestry Center is a non-profit educational institution founded in 1964 in Portland, Oregon. Its mission is to educate and inform people about the world's forests and trees, and environmental sustainability. WFC operates the 20,000 square foot Discovery Museum, which is family-friendly and designed to engage visitors to learn about the sustainability of forests and trees of the Pacific Northwest and around the world.

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Introduction & Overview

This conference summary and resource guide supplements the Cascadia Regional Network Breakthrough Convening on Urban Forestry and Climate Change held October 29-30, 2014 in Portland, Oregon. Cascadia Region members of USDN, including Vancouver, Seattle, Portland, and led by City of Eugene, pursued and were awarded a competitive grant to convene urban forestry professionals to initiate a regional discussion about integrating climate adaptation principles into municipal urban forestry management. The funding goals of the USDN are to spur active collaboration among members, accelerate on-the-ground impact of key practice fields, and position local government leaders as "go to" sources for sustainability innovation.

Regional USDN members have identified an important gap between the fields of urban forestry and climate adaptation that presents a critical barrier to city and regional-scale climate adaptation efforts. Urban forests are unique in that they are both heavily impacted by changing climate patterns and are a means to lessen the impacts of climate change through urban heat island mitigation efforts and stormwater retention, for example. Regional professionals must capitalize on their collective knowledge and expertise to implement the innovative solutions necessary to ensure urban forests remain a healthy, productive climate adaptation and resilience tool.

The short-term objective of the Breakthrough Convening on Urban Forestry and Climate Change is to organize and sponsor an interdisciplinary, regionally-focused event where participants can learn about current research, explore best management practices and build strong working relationships with allied professionals throughout the Pacific Northwest.

In the longer term, we hope to advance the practice of both urban forestry and climate adaptation planning through a set of shared strategies and practices that aim to bridge, and ultimately, unite the two fields.

The Cascadia Regional USDN Network has demonstrated that it is well-positioned to initiate and succeed with this collaborative effort. Most, if not all, of its member cities have established and/or implemented advanced climate adaptation planning efforts. Furthermore, in discussions at the regional network's annual meeting and in subsequent communications between members, urban forestry and climate adaptation were widely recognized as the next generation of topics to pursue. This also presented the opportunity to consider regional approaches to the subject, given similar geographic and climatic conditions.

Maritime northwest communities stretching from Eugene, Oregon to Vancouver, British Columbia experience common climatic conditions, whereby urban forestry challenges and solutions from one community often are transferable to other communities in the region. Although the political and organizational context varies between cities, the practice of integrating climate preparedness has universal application within the region. Urban forest managers are grappling with many of the same challenges (and opportunities) to focus a climate lens to such strategies as maintenance practices, sourcing of appropriate species, and forest monitoring and evaluation.

The intended outcome of the Breakthrough Convening on Urban Forestry and Climate Change was to provide a framework for Cascadia Regional USDN Network member cities to discuss and build a shared knowledge and practice with their regional forestry partners. The summaries provided in this guide document and illustrate the depth and reach of the conversation.

The agenda from the convening appears on the following pages as a reference to the range of topics and presenters.

The synopsis that follows is not intended as a transcript of the proceedings, but rather a distillation of the concepts and conversations offered during the 2-day gathering.

CASCADIA REGIONAL NETWORK
BREAKTHROUGH CONVENING ON URBAN FORESTRY & CLIMATE CHANGE

AGENDA

Portland, Oregon
October 28-30, 2014

TUESDAY, OCTOBER 28, 2014

7:00 – 9:00 PM   Connecting, Refreshments & Networking
McMenamin's Ringlers Pub,
1332 W. Burnside, Portland (1 block from the Crystal Hotel)

WEDNESDAY, OCTOBER 29, 2014

8:00 – 9:00   Registration, Breakfast & Networking

The World Forestry Center
4033 SW Canyon Rd., Portland

9:00 – 9:30   Welcoming Remarks

Steve Adams, Master of Ceremonies, *Senior Program Director, US Climate Adaptation Program, Institute for Sustainable Communities*

Eric Vines, *Executive Director, World Forestry Center*

Jon Ruiz, *City Manager, City of Eugene*

9:30 – 10:20   Urban Forestry Goals & Perspectives on Success
Moderator:
Steve Adams, *ISC*

Presenter:
Greg Nickels, *51st Mayor of Seattle*

Topic:
Climate adaptation and urban forestry – perspectives on innovation at the local level

| 10:20 – 10:50 | Plenary I: Setting the Stage – looking into the future |

Moderator:
Matt McRae, *Climate and Energy Analyst, City of Eugene*

Presenters:
Roberta Jortner, *Senior Environmental Planner, Portland Bureau of Planning and Sustainability*

Richard Gelb, *Performance Management /Equity and Social Justice Lead, King County Dept. of Natural Resources and Parks*

| 10:50 – 11:00 | Networking Break |

| 11:00 – 12N | Full Group Work Session: *Fitting Urban Forestry into Urban Adaptation Planning* |

Moderator:
Matt McRae, *City of Eugene*

Framing Presenter:
Jenn Cairo, *City Forester/ City Nature Zone Manager, City of Portland*

Mark Mead, *Forester, Seattle Parks and Recreation*

| 12N – 1:15 PM | Lunch |

| 1:15 – 2:30 | Small Group Work Session: *Toward an Appropriate Suite of Trees* |

Framing Presenter:
Jim Gersbach, *Homeowner Education / Planting Crew Leader, Friends Of Trees*

Parallel Discussions
Tools facilitating a non-verbal dialogue during the workshop

Open Space

Instructions for proposing Open Space session topics

Include session topic, host name, room/location

Post/write session info on white board

Urban Forestry Goals & Perspectives on Success

Poster lists existing PNW local government urban forestry and climate adaptation goals

Question for participants:
What does successful climate adaptation within urban forestry look like?

Write on dry erase board or 3x5 cards

Epiphanies and Inquiries

Participants share insights and lingering questions.

Write on 3x5 cards. Color A for insights, color B for inquiries.

Post on cork board

2:30 – 2:45	Networking Break

2:45 – 4:00	Full/Small Group Work Session: *Monitoring Protocols for Urban Forests*

Framing Presenter:
John Mills, *Research Forester, Resource Monitoring and Assessment Program, USFS Pacific Northwest Research Station*

4:00 – 5:00	Listeners Circle & Group Conversation

Listeners:
Bart Johnson, *Associate Professor, Department of Landscape Architecture, University of Oregon*

Kristen Ramstad, *Community Assistance Forester, Urban and Community Forestry Assistance Program – Oregon Department of Forestry*

5:00	Adjourn

6:00, 7:00, 8:00	Dinner (self-organized)

Meet in the hotel lobby every hour to join others for dinner out in Portland.

Listeners

A small number of participants will be tasked with attending all day and listening intently to discussions. At the end of the day they will be given time to help us all by:

- Linking ideas
- Reporting on common themes,
- Synthesizing concepts,
- Observing patterns

Listeners' report out will be followed by full group discussion

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THURSDAY, OCTOBER 30, 2014

8:30 – 8:35	Opening Remarks

Recap and overview of the day's agenda
Steve Adams, *ISC*

8:35 – 9:45	Full Group Work Session: Toward solutions to meet the needs of Nurseries and Local Governments

Moderator:
Steve Adams, *ISC*

Framing Presenters:
Keith Warren, *Director of Product Development, J. Frank Schmidt & Son Co., Wholesale Nursery*

Erik Burke, *Eugene Director, Friends of Trees Eugene*

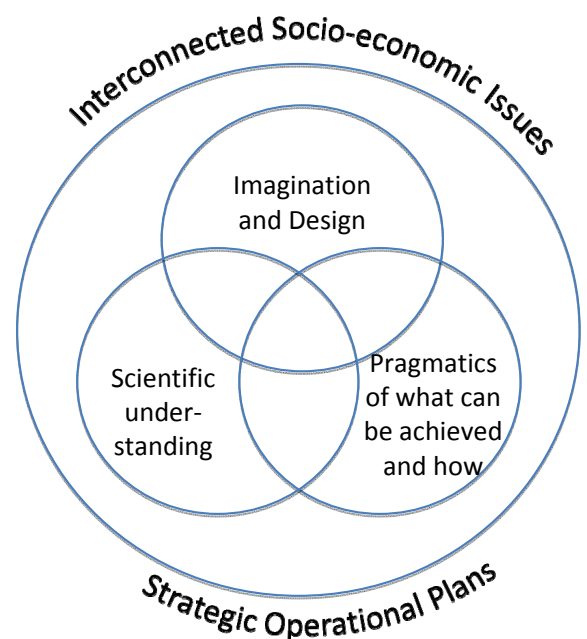|	
9:45 – 10:00	Networking Break / Finalize Open Space Proposals
10:00 – 11:50	Open Space Session:
	Self-selected topics for small group discussions
12N – 1:30 PM	Lunch
1:30 – 2:45 PM	Listeners Circle & Group Conversation
	Listeners:
	John Mills, *Research Forester, USDA Forest Service*
	Kristen Ramstad, *Community Assistance Forester, Urban and Community Forestry Assistance Program – Oregon Department of Forestry*
2:45 - 3:00 PM	**Closing**
3:00 PM	Adjourn
	Note: Our meeting space at the World Forestry Center will be available for informal conversations until 5PM

Key Lessons Learned

Don't Wait for Perfect Information

The past is no longer a good predictor of the future. We have departed from an anomalous period of climatic stability that has persisted over the last 10,000 years, and we are not likely to return to a similar level of stability anytime soon. Going forward, imperfect information and increasing variability will become the norm about the future conditions and effects of a changing climate. The storylines of urban forestry and climate change must be made more compelling and grow strength in the social, political and technical realms, in spite of uncertainty in the future condition. We must work to create an atmosphere where some risk is okay, and we will do well to take our best stab at decisions now, monitor, and learn along the way. "Don't let the perfect be the enemy of the good."

Planning for Possibilities

Due to climate change, the future may not unfold in the same ways as the past. Practitioners need to understand the predictive models of climate change for a science-based approach to problem solving. But they must also engage in strategic planning that recognizes both risks and uncertainties, and embrace alternative futures planning that enables us to learn as we go. Our efforts should, at worst, aim to "minimize maximum regret" related to different scenarios of climate change. Futures planning should look to the intersection of possibilities and prioritize robust, diverse tree infrastructure in the context of imaginative design solutions that improve the conditions and quality of the urban forest. Strategic planning should focus on the process of planning, the integration of ideas, and adaptive, incremental improvements. There is no obvious finish line for this work. Urban forestry practitioners need to make the strategic planning process (and the issues of the urban forest) visible and engaging, so everyone feels they can contribute to something larger than oneself.

Interconnected Socio-economic Issues

Imagination and Design

Scientific under-standing

Pragmatics of what can be achieved and how

Strategic Operational Plans

Intersection of Possibilities
from Bart Johnson

Urban Forests for Climate Mitigation

Urban forests may provide many climate mitigation benefits (e.g., energy reduction, carbon sequestration), but the greatest benefit with regard to greenhouse gas emissions lies in making the urban setting an appealing place to live. Cities need to be successful places where people can live, work and play. One primary aspect of the conversation about urban forestry is about what kind of place a city wants to be – framed in terms of livability, active centers, and development density as a tool not a goal. The urban forest helps mitigate and soften the impacts of density and create more appealing environments. People who live in denser cities use dramatically less energy per person than rural or suburban residents. We can make efforts to measure the amount of carbon sequestered by urban trees or energy saved from cooler urban temperatures, but in the aggregate the greatest benefit comes from increasing the percentage of people living in urban spaces and making those places more livable.

Extreme Events

Extreme events, such as a flood or hurricane, can create an opportunity for "re-setting" conditions in the urban environment. These extreme events offer opportunities to try new species or alter policies. The urban area can be rebuilt differently to accommodate the needs of trees, with wider planting strips, median planters, bump outs that trade parking space for increased planting zone, or utilize the site of a razed building to plant a large canopy trees.

Urban Conditions

The artificial and often harsh conditions of an urban setting may, in many cases, be a far more significant limiting factor for urban forest health and longevity than climate change. Climate change will very likely increase several stressors on trees - making it even more important that we manage the fundamentals of urban forest health such as soil volume, soil quality and soil oxygen availability.

Diversity of Species

Since our projections may be imperfect or unclear and because we cannot predict the timing of extreme events or shifts in conditions, we may be better served by increasing the biodiversity of the urban forest overall, rather than attempting to select the "right" species for a specific predicted future condition. We must aim to balance urban forest system maturity with system resilience.

Species Plasticity

The plasticity of a species, or its ability to thrive in a wide variety of conditions, may be more important in selection for resilience than any single variable, such as drought tolerance or temperature range, alone. Quercus garryana (Oregon White Oak) is a good example of a species with great plasticity, since it can live in a wide range of conditions from heavy soils to gravel soils, from wetlands to riparian areas to rocky outcrops.

Latitudinal Adaptability

Keith Warren, from J. Frank Schmidt and Son, indicated that it is well-known within the nursery industry that trees generally (not necessarily species by species) are better at adapting to moving from northern latitudes to southern latitudes. Trees from southern latitudes are less able to adapt to a move to northern latitudes because cold is a far more severe limitation affecting tree health. For this reason, a slightly warming regional climate may not be as significant a determinant for future urban forest health as may have been feared. At a minimum, the cold tolerance of a tree species needs to be considered, in addition to its ability to adapt to warmer and/or dryer conditions.

Over-performance

Some species taken out of their home range (and therefore away from limiting factors, like predators and pests) may "overperform" or become invasive. It will be important to evaluate the potential for invasiveness before planting new or untested species from other regions.

Diversity of Thinking

The group of professionals attending this initial convening was akin to a monoculture, with easily relatable perspectives toward programs and practices. Both the discussions and the directions for urban forestry goals will be more compelling and stronger if we include in our discussions more people who think differently than we do. This includes people from different backgrounds and different fields, such as economists and developers, who can add their unique perspectives.

Empowerment

While climate change will occur on a global scale, climate adaptation and resilience is a local and regional issue. Local organizations can play major role in framing how we plan for the future and help people directly connect and interact with the urban forest. Associations and organizations that lead and support local, collective actions that reinforce experimentation and a 'learn as you' approach will enable a cadre of locally-appropriate solutions and examples that others can follow.

Written by Matt McRae, City of Eugene and Steve Duh, Conservation Technix, Inc.

Working within the System:
On Politics, Plans & Contracting

Speaking to Be Heard

Although climate change is a global concern, climate adaptation and resilience is a local and regional issue, so local organizations can and must play a major role in establishing policies and effecting change. Urban forestry professionals, with the help of civic leaders and elected officials, must help people connect climate change planning locally to interact and connect directly.

Politicians have role to play. Technicians and technocrats need to get them as allies, since they understand the political machine. Elected officials can help by inserting urban forestry and climate into the frame of other compelling issues (i.e., race, economics) to expand public support. However, framing of urban forestry issues must be done in a way so as to capture and hold the attention of the electeds; they must be compelling. For example, urban forestry efforts could be tied to reducing households energy costs and create local jobs. Messaging and defining the return on investment and the ratio of return helps tell the story of urban forestry programs, and the linkages to economic prosperity, improving human health, and lowers costs (personal and system/infrastructure) further buttress the message.

It will be important to be aware of the half-life of politicians; they need to get things done quickly. Initial policy shifts may set the pattern and direction for subsequent mayors and city leaders. Elected officials are a competitive bunch, so how can one take advantage of the nature of politicians?

- Mayors especially like to one-up each other. Have them build upon past successes to push the envelope. Cascadia is progressive, and our constituencies simply will allow us to go further with public policy.
- Recognize the role of public service, and that return on investment for a municipality is not about profit, but it is about social good.
- Focus the argument on the balance with life safety and return on investment; rely on the technical and scientific staff to define the approaches, then have them build trust and credibility with city leadership.

Elected officials want to be in the role of setting the example. The public sector has role to play and can be entrepreneurial in its own way. Cities can lead with research and development, as well as support the introduction of new ideas (i.e., hybrids and electric vehicles). If the story of the urban forest is made compelling, politicians will acknowledge the its value, and (at least in Cascadia) people will be willing to tax themselves to address such social issues.

Planning & Strategic Thinking

Trees make living in dense, urban settings more desirable and livable. In cities where people are comfortable living with density, they generate a smaller carbon footprint (on the aggregate) over rural and suburban development. Trees offer a sense of continuity and a story of longevity and social value; there can be deeper meaning when trees are not only rooted in the ground, but also root people to the place.

Urban forestry professionals need to stay connected with the planning and development functions to seek and capitalize on opportunities as they arise, as well as advocate for policy or implementation items. A example from Portland was offered regarding the renovation of a federal building in downtown. The contract was through the GSA with aim for a LEED platinum rating. Landscape design of the site uses a step back from the sidewalk to allow for more tree canopy and to include room for understory and a shrub layer. Also, the project installed many native and regional plants. Other suggestions to engage in strategic planning included the following:

- Create the opportunity to tie private sector nurseries and growers into the tree selection discussion.
- Explore translation work with urban designers, who are in more of a position to lead design changes for more energy efficiency and reduce urban heat. Are there prototypes of development, via design competitions and/or coordination with developers and architects.
- Explore links to broader discussions about climate change planning to enable interactions and institutional buy-in.
- Seek more opportunities in parking lots - why is there resistance to having a tree forest in lots given that shade makes the most desirable parking spots.
- Capitalize on extreme weather when it happens and utilize more storytelling (i.e., recent Boulder/Denver area rain storms where green infrastructure performed well, but grey infrastructure was overwhelmed).

In some regards, climate change and related devastating storms may be seen as a positive opportunity to shift local discussions about trees and green infrastructure. Following massive storms, other areas of the country have been reset to zero (e.g., New Orleans following Katrina; New Jersey following Sandy).

What would urban forester need to do to be ready for disaster recovery? It was suggested that we need to do it all: advocate, teach, plan and plant. Trees are a component of green infrastructure, and strategically planning for future conditions may include ideas such as resetting planter strip widths to accommodate larger canopy trees. Unfortunately, FEMA cut off money for trees, since the administration does not see trees as critical infrastructure. Yet during Katrina and the Japanese tsunami of 2011, trees acted as breakwater for incoming surges and helped lessen the potential for greater damage.

Contracting with Growers

The tree nursery business is a business and is market driven. Tree availability is market driven. Considering that it takes 10 years of labor and expense to go from a seed to a 2.5" caliper tree, the nursery industry needs to be able to acknowledge the following before committing to grow tree varieties:

- confidence in sales
- ramping up production
- suitability - able to grow, withstand freeze
- competitive and profitable

The nursery industry needs reliable, paying customers, and cities should consider contract growing that includes down payments to reduce risk for the nursery businesses.

Municipalities struggle with issues related to procurement and transparency of ensuring the wise expenditure of public dollars. This has resulted in systems that facilitate purchasing from the lowest cost bidder. Standards, specifications and qualifications can be written into contracting documents, but they must be clear, defensible and competitively based. Local governments also might not be able to commit to funding at the beginning of a project, or they may seem unreliable due to changing policies and politics. These are challenges indeed, but examples exist where creative contracting solutions worked to the advantage of citizens. For example, in New York City during the Michael Bloomberg administration, the City began to implement its goal of planting one million trees. The City created and utilized a long-term contract with growers with financial penalties for the City for cancelation, and the contract with growers was for a five-year term with one year extensions for up to an additional five years.

Regarding multi-year contracts with growers, most contracts are in the private sector and driven by demand. They are typically coordinated through architecture or landscape architecture offices. For municipal contracts, it will be important to address payment terms; Keith Warren referenced that it is typical to ask for 25% down with the balance due on delivery, with a 4% maintenance cost for over-term growing. It is also important to stipulate the size of stock (caliper) at time of demand. While it is hard to put standards on quality, other considerations, such as the following, should be added to the contract specifications for clarify:

- dominant straight central leader with high straight leader for future trimming for clearance
- limb up height
- roots - depth of root system: 4" out, 3" down, structural roots
- diameter
- root ball size at time of delivery

Also, Erik Burke referenced the Cascadia Oak Prairie Partnership for having a library for contracts, plans, documents and distribution list (http://cascadiaprairieoak.org).

Written by Steve Duh, Conservation Technix, Inc.

Acknowledgements
Thank you to Jon Ruiz, Greg Nickels, Jenn Cairo and Mark Mead, among others.

For More Information
Sources:

http://www.urban-forestry.com/assets/documents/Stephens_TreeProcurementsContracts.pdf
http://cascadiaprairieoak.org

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Photo credit: Kelly Punteney

Preparing for Climate Change:
## Tree Adaptability & Species Plasticity

Climate Change Modeling

Projections of climate change vary greatly in terms of the types, intensities and spatial extents of change. Numerous predictive models have been developed to help explore and understand these potential changes. One such tool is the climate envelope model, which describes the climate variables of a species current distribution (its "envelope") and then models the geographic shift of that climate envelope to predict the potential future distribution of that species. Two major classes of variables include:

- Heat: e.g., annual mean temperature, minimum temperature coldest month, maximum temperature warmest month
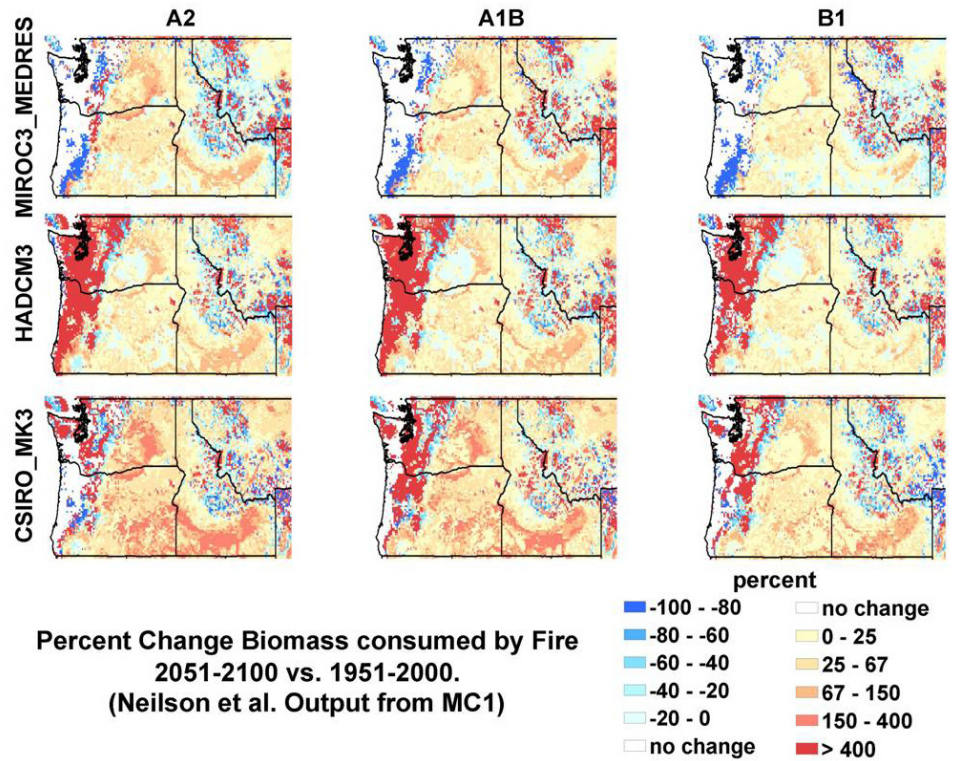- Moisture: e.g., annual precipitation, precipitation warmest quarter, and precipitation coldest quarter

The primary utility of such models is that they show the relationship between the current climatic conditions in which a species occurs and where those conditions are projected to occur in the future; however, the models do not distinguish a species fundamental niche (i.e., where a species can live) from its realized niche (i.e., where a species does live). The model does not account for important, non-climatic factors that may limit a species' realized distribution nor its dynamics of change (e.g., competition, herbivory, soils, land use, dispersal ability, genetic adaptation to climate change, etc.). The consequences are not trivial. The realized niche described by a climate envelope model could be much narrower than the fundamental niche required by that species. It is possible that individual street trees, with little competition, may be able to persist under a far wider range of climatic conditions than that same species in an urban forest where it will compete with other trees for survival.

Urban Street Trees?
Fundamental Niche

Precipitation

Realized Niche
Urban Forests?

Temperature
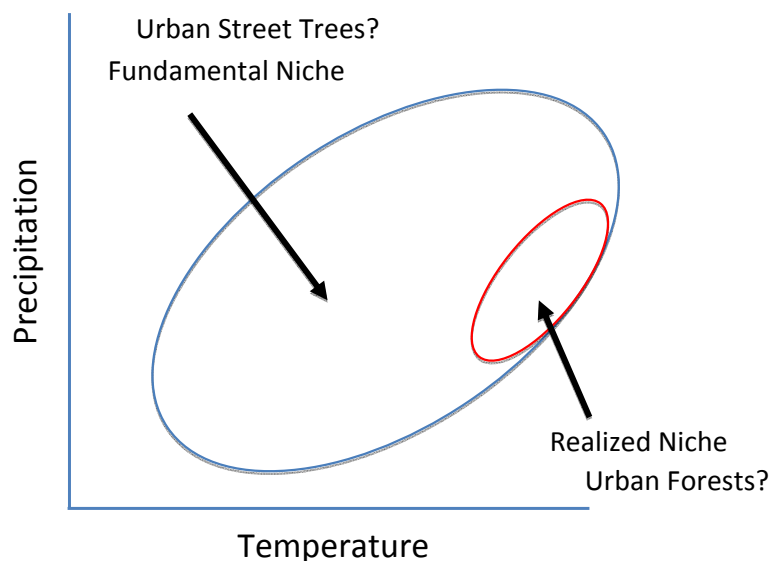
Fundamental vs. Realized Niche
from Bart Johnson

The variability of both future greenhouse gas emissions scenarios (e.g., A2, A1B, B1), representing different societal approaches to mitigating climate change, and complex global circulation models, present researchers and practitioners difficult choices for how to plan ahead. For example the projected biomass burned by wildfire in the Pacific Northwest varies enormously in nine potential futures represented by 3 climate models and 3 emissions scenarios.

**Percent Change Biomass consumed by Fire
2051-2100 vs. 1951-2000.
(Neilson et al. Output from MC1)**

percent

-100 - -80	no change
-80 - -60	0 - 25
-60 - -40	25 - 67
-40 - -20	67 - 150
-20 - 0	150 - 400
no change	> 400

Willamette Valley Case Study - Which to Choose?
from Bart Johnson, figure courtesy of Ron Neilson

Other research (Cregg, et al.) has suggested that attributes from northern climates may shift southward.

Regional Climatic Shift
from Keith Warren
by Bert Cregg
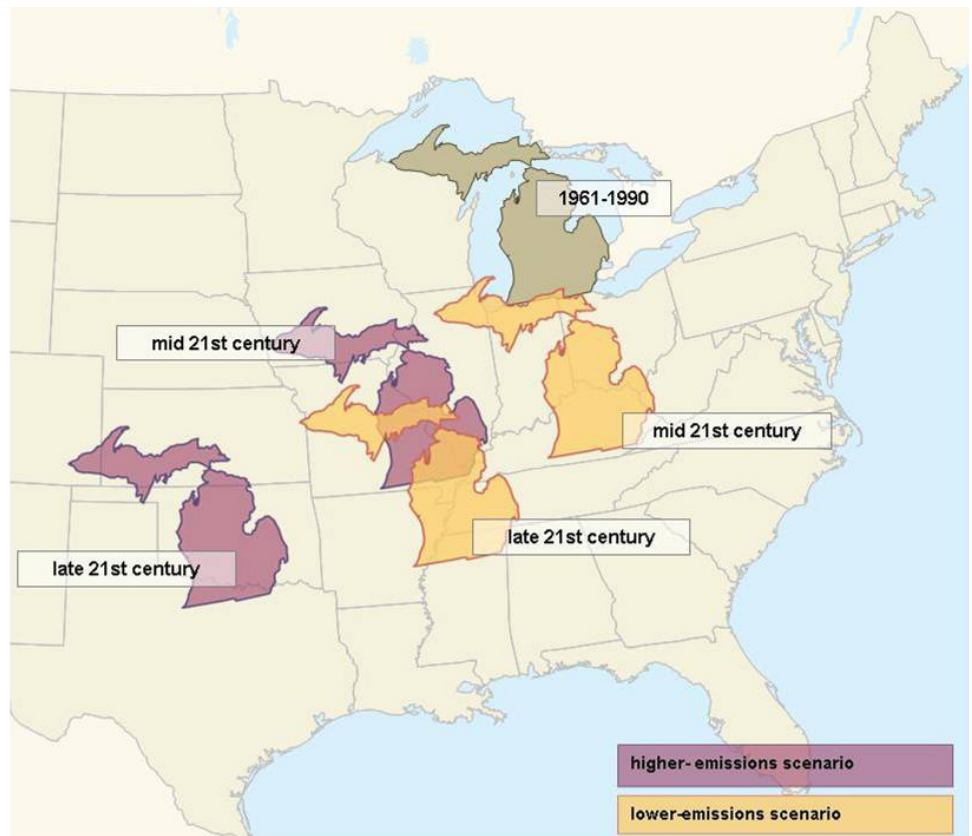
Limits & Adaptability

The limits of the native range of a tree are generally determined by environmental conditions (physiological limits) and ecological competition. The long-term, ecological adaptation of a population is a very different issue than the life or death of individual urban trees. Keith Warren's experience as a nurseryman is that native deciduous trees are often limited to the north by the environment (cold hardiness) and limited to the south by competition (faster growing plants). In the artificially-built urban context, one upside is that city streets have no ecological competition - potentially opening the door for a wider range of species from which to choose.

The nursery industry knows by experience that northern plants move south better than southern plants move north, and it's more than just temperature. Latitude changes day length, and that changes tree physiology and end of season maturity. Regarding the wider season changes in daylight to the north, southern trees are not used to the added daylight, which may result in delayed maturity or hardening and a greater susceptibility to freeze. Southern trees might still be pushing new growth due to the longer season or extra daylight, rather than hardening off earlier. This condition is species specific, so practitioners should look at species characteristics for summer drought and daylight.

In identifying potential species for consideration, urban foresters should look at empirical data from on-the-ground sources, plus compare with cohort regions (i.e., other biomes that are similar) with gardens and parks. For example, trees from the eastern US and Europe, where it is wet in summer, are less likely to succeed in the Pacific Northwest.
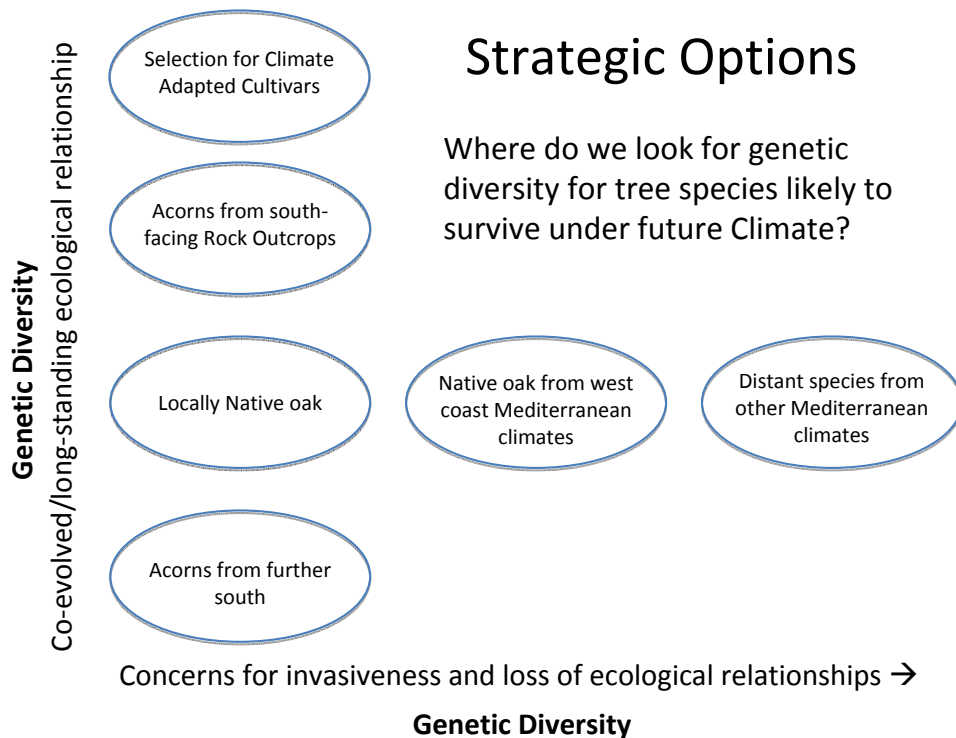
One potential take-away from the current debates on the range and extent of climate change may be that one shouldn't overreact to issues of climate change as they relate to urban (street) trees. When considering how to select trees with greater heat or drought tolerance, for example, it may be possible to find genotypes of local species that already exhibit these characteristics and select propagules from nearby or regionally that have already experienced enhanced heat or drought. If one does want to explore new species, starting with those already found in the region may reduce risks and maximize ecological benefits compared to species from further away. An example for oaks is shown below.

Furthermore, concrete, asphalt, tall buildings and tree pits have already changed the urban tree's environment more than climate change may. Due to these factors, an artificial climate has been created for urban trees, and climate change may impact natural forests and urban natural areas differently than urban (street) trees. One should focus more attention toward addressing soil (volume and quality), cultivars and other local needs for tree planting.

Selecting a Suite of Trees

Setting aside the basic assumption that urban forestry professionals will select (or guide the selection of) the right tree in the right place, a number of choices exist concerning the selection of an appropriate suite of trees for urban areas resulting from potential climate change scenarios. The challenges associated with tree selection include:

- shade tolerant vs. drought tolerant
- wet soil vs. dry soil
- fast growing canopy vs. longevity
- size vs. durability

Strategic Options

Genetic Diversity

Co-evolved/long-standing ecological relationship

- Selection for Climate Adapted Cultivars
- Acorns from south-facing Rock Outcrops
- Locally Native oak
- Native oak from west coast Mediterranean climates
- Distant species from other Mediterranean climates
- Acorns from further south

Where do we look for genetic diversity for tree species likely to survive under future Climate?

Concerns for invasiveness and loss of ecological relationships →

Genetic Diversity

Strategic Considerations for Genetic Diversity
from Bart Johnson

Urban tree needs to be adapted to the local challenges of the built urban environment. Given that the typical urban tree has a life span of 7-15 years, practitioners must work with the reality of urban sites and select appropriate trees related to how long it will likely live in the confines of the tree wells. Guidance in tree selection for private lots or frontages is critical. For example, New York City, on one end of the spectrum, does not allow the resident to pick or plant the tree; they send an official city representative to select the right tree to minimize utility conflicts. In Gresham, Oregon, the City sends the resident to an internet link for picking a tree. In the City of Eugene, Erik Burke of Friends of Trees helped establish three tiers of tree options:
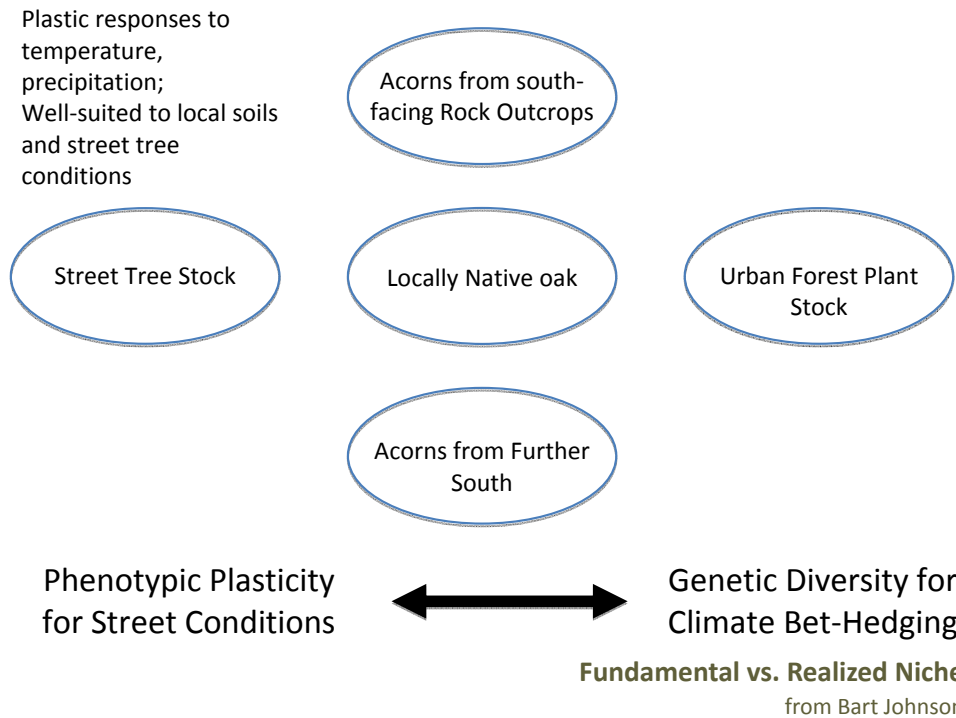
1) already on Eugene's approved tree list
2) proven performers and on approved street tree lists in other cities, largely in California - built from "Rating Bay Areas Trees" by Dave Muffly
3) possible candidates, untried

Similarly, Keith Warren of J. Frank Schmidt & Son Co. suggests selecting trees based on the following:

- currently proven in the locale
- proven in warmer / similar climate
- hedging your bet - plant adaptable trees that will grow in broad ranges (e.g. oaks - lots of variability within genus)

One should look at phenotype plasticity for urban street trees and at genetic diversity for urban forests. For example, returning to the oak illustration, selecting individual trees with high levels of phenotypic plasticity might provide the greatest adaptive capacity for street tree stock under climate uncertainties, while promoting genetically diverse individuals might create the greatest adaptive capacity for an urban forest.

What kind of genetic diversity might we select for?

Plastic responses to temperature, precipitation; Well-suited to local soils and street tree conditions

Acorns from south-facing Rock Outcrops

Street Tree Stock　　*Locally Native oak*　　*Urban Forest Plant Stock*

Acorns from Further South

Phenotypic Plasticity for Street Conditions ⟷ **Genetic Diversity for Climate Bet-Hedging**

Fundamental vs. Realized Niche
from Bart Johnson

To improve long-term tree health, focusing on ways to mitigate the stresses on urban trees remains crucial and includes:

■ irrigation

■ mulching

■ better soil

■ larger tree pits

■ more oxygen in the roots

Other Tree Selection Considerations

■ stratify tree selection by condition: natural area, urban tree, street tree

■ promote the best natives, especially at adjacent natural areas

■ aesthetics - match structure with tree style

■ health impacts - heat island, air quality (i.e., VOCs, pollen)

■ smaller trees, bare root

■ suggest groups of trees (i.e., red oak types) versus specific species and cultivars

Keith Warren also offered a set of broadly adaptable trees for consideration:

species level-

Gymnocladus dioicus (Kentucky coffeetree)
Gleditsia triacanthos   (Honeylocust)
Taxodium distichum   (Bald cypress)
Quercus- many species   (Oaks)
Nyssa sylvatica   (Tupelo)
Platanus x acerfolia (London Planetree)
Ulmus hybrids   (Elm hybrids)

cultivar level-

Acer rubrum Redpointe®
Acer miyabei State Street®
Liriodendron Emerald City®

Investigate & Experiment

It is okay to test ideas. It is equally important to share information about what doesn't work with others; it is helpful to make mistake and learn from them. One option for facilitating experimentation or test plots is to communicate more within bureaus or departments to find ways to integrate urban forestry into other projects or sites (i.e., working with park site master planning). Also, botanical gardens and arboreta can be experiential places for residents to get more ideas about the types of trees that might be suitable for their yards or frontages.

Written by Steve Duh, Conservation Technix, Inc. and Bart Johnson, University of Oregon

Acknowledgements

Thank you to Bart Johnson, Erik Burke and Keith Warren

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Managing & Accessing Tree Data:
Monitoring and Other Applications

Municipalities have invested heavily in creating and managing tree inventories, and some have adopted data collection standards and protocols (e.g., Washington's Evergreen Community Act, unfunded). There has been a demonstrated need from practitioners for urban tree monitoring protocols and standardized data collection. To make more use of inventory data, more attention should be directed toward adapting those inventory data and methods for use in on-going monitoring efforts to look at a range of variables over time. Monitoring is not a goal in and of itself; it is a means of answering questions related to:

- Inventory - how much, how big, what species
- Health - growth vs. mortality
- Survival - new plantings
- Early detection - insects/disease/invasives
- Hazards - maintenance needs

Founded in 2010 at the annual meeting of the International Society of Arboriculture, the Urban Tree Growth & Longevity working group is an independent collaboration of scientists and professionals interested in the growth and longevity of urban trees. The UTGL working group is leading an effort to establish urban tree monitoring protocols and have organized the monitoring data into a Minimum Data Set and four Supplemental Data Sets as follows:

Urban Tree Monitoring Protocols
from John Mills
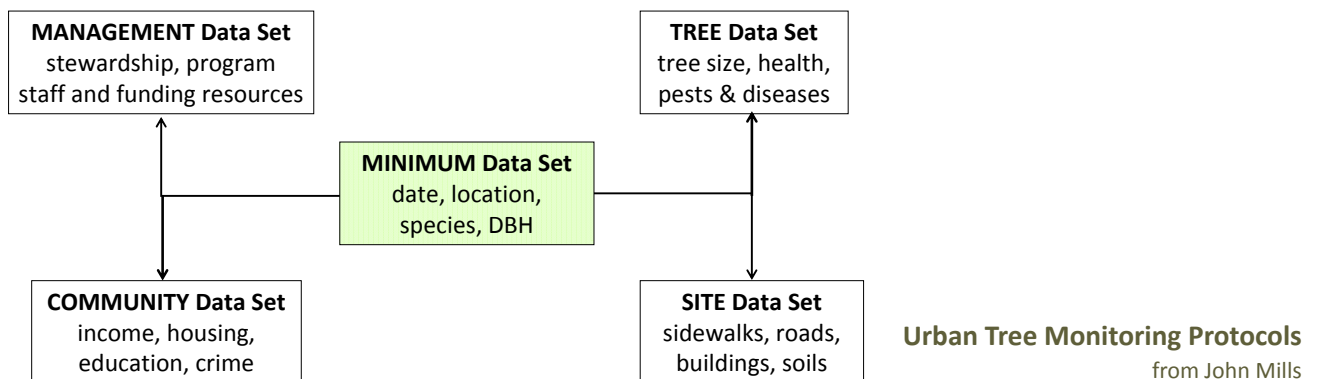
- Minimum Data Set: The core variables necessary for any urban tree monitoring project, including field crew information, tree species, location, site type, mortality status, condition rating and diameter at breast height

- Tree Data Set: Tree size, growth, and health issues, including total height, crown spread and presence of pests and diseases
- Site Data Set: The site characteristics of the urban landscape surrounding the tree, including the planting site, built environment and soils
- Management Data Set: Recommended tree care practices by local organizations, along with stewardship actions observed on the ground, plus information about the programs and institutions that plant and care for trees
- Community Data Set: Socioeconomic information about the human community surrounding the tree, extracted from existing databases such as the US Census to capture median income, housing value and population density

Much can be done with the minimum (basic) data set, and the challenge has been to link the inventory with on-going monitoring and data management. This is where municipal funding falls short. Capital projects and tree planting proceed, but there is no money for long-term maintenance. Vancouver, B.C. has fairly complete database that is mostly built and maintained around risk management. Tree data is revised following tree care activities, and the inventory is a record of when a tree was last visited or maintained, providing a solid record for use in lawsuits or landowner disputes against the City. Added value comes when data collection is systematically repeated and analyzed across time. The data is updated for new trees, tracking notes regarding stocking (i.e., bare root vs. ball + burlap), among others.

A deeper or more rich database can allow for more analysis. If standard protocols and shared data are integrated between adjacent jurisdictions, then better data can be built for regional understanding or trending and for correlating tree health, type or policy to on the ground performance. Such integration transforms the data into a an asset management tool and can be used to articulate value-based or return on investment information pertaining to the benefits of the urban forest.

The potential utility of the data expands if it can also correlate inventory and monitoring information with accessible climate data (e.g., following a dry summer, what were the impacts on health and survivability?). This application could be used to identify susceptible trees or sites, and it potentially can look at indicator species as examples to see if there are patterns for weakness or susceptibility. However, this raises the challenge of how to obtain additional or conduct on-going data collection.
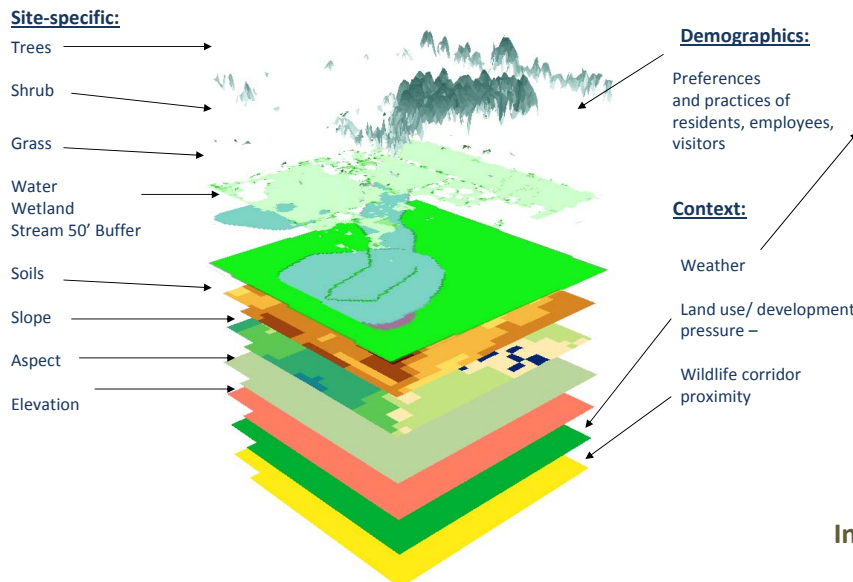
One option may be to seek partnerships with local university students. For example, the City of Surrey, B.C. has multiple graduate-level student projects underway, ranging from using lidar data to identify and assess site conditions, identifying invasive species expansion, and monitoring changes in western red cedars.

Crowdsourcing data collection may be another option. Having an accessible mobile app would be crucial, but so to is the internal need to address data management and quality. One idea that was noted was weighting a given (and repeat) data contributor based on accuracy and then filtering or sorting the database to account for contributors who offer consistent, high-quality data. Another tool is to utilize radio frequency identification (RFID) tags on new tree plantings. Alternatively, barcode (QR) tags are used in the Histree system (histree.net). Such crowdsourcing models could also link to apps that help with species identification for resident scientists or that relate data to WalkScore to correlate tree locations to a livability index and retail environment.

Another way to utilize tree data is as base information to guide policy intervention and to guide parcel-scale and program-level changes. King County, Washington, utilized inventory and other GIS data to prepare heat maps to explore the implications of heat island impacts, and the data illustrated that communities of color in the south Seattle area live in areas with more pavement and are more susceptible to heat impacts. Such data can help build evidence for future proposals and actions to optimize conditions (i.e., livability) for the community.

As Richard Gelb described, the use of the data can be scaled from site/parcel to program levels:

Understanding action effectiveness at the parcel scale

Site-specific:

Trees

Shrub

Grass

Water
Wetland
Stream 50' Buffer

Soils

Slope

Aspect

Elevation

Demographics:

Preferences
and practices of
residents, employees,
visitors

Context:

Weather

Land use/ development
pressure –

Wildlife corridor
proximity

Integrating Data Sources for Modeling
from Richard Gelb

- Assemble cohort – public, civic, academic, philanthropy
- Establish baseline characteristics
- Standardize programmatic action portfolio
- Standardize community-scale outcomes - stack of 'Urban Forest Ecosystem Services'
- Populate baselines, action and outcome inventories
- Grow the 'sample size' and strength of evidence about correlations

This approach could lead to enhanced performance monitoring and feed into urban forest practice maturity models.

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Acknowledgements

Thank you to John Mills and Richard Gelb

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It's Not Just a Tree:
Seeing (and Incentivizing) the Benefits of the Urban Forest

Global warming, ecological footprint, carbon neutral, carbon cap-and-trade, green infrastructure – these concepts have become part of today's daily vernacular and represent a broadening public awareness of the effects to and impacts of environmental change at multiple scales: global, national, regional and local. Paralleling this has been the rise in corporate environmental marketing and in educational documentaries, such as Al Gore's *An Inconvenient Truth*.

Trees, and forestry practices in general, have held a prominent role in discussions regarding environmental change, and more directly there has been a growing number of scientific studies in recent years specifically focused toward the role of trees in urban environments. Yet, urban foresters are asking about how to measure and define the benefits of urban forest trees and position for climate resiliency.

The connection between urban forestry and climate change is a policy discussion that necessitates the involvement of civic leaders and a broader understanding from the public. Are we seeing the benefits of trees in our cities, and are those benefits being made clear and apparent through marketing and other outreach?

The human health benefits of trees have been documented, and new research is on-going that looks at ways in which trees improve health and support the immune system. For example, some trees may be a source of airborne microbes or VOCs (e.g., from a pine forest) that benefit the human microbiome. In Japan, several studies have reviewed the benefits of "forest air breathing" (called Shinrin-yoku). New bodies of evidence may provide additional insights.

Concerning carbon, caution should be taken about potentially over-emphasizing the sequestration argument. All trees will return CO_2 to atmosphere when they die, so consider framing the issue as 'net' carbon and suggesting an appropriate timeframe. For example, the carbon emissions related to long-term tree care and maintenance and the fuel for pruning might be higher than the offset provided by the tree itself, especially if tree watering contracts (transport fuel) are needed for the initial establishment period. While trees provide shade for buildings (cooling buildings and reducing the need for air conditioning) and the soil itself is a carbon reserve, is there a place within the practice of urban forestry for small, fast growing trees that can rapidly uptake carbon and be harvested before they cretae a net maintenance impact?

For the urban forest, it my be beneficial to split the discussion into that of street trees (highly artificial/managed/disturbed environment) and large natural areas or forests (where you're dealing with drought, fire, disease and competition). To advance system maturity and address system resilience, one should look at phenotype plasticity for urban street trees and at genetic diversity for urban forests. In the interfaces between urban open spaces and forests, promoting the best native trees at these edges may provide additional benefits for wildlife and habitat connections.

Regarding street trees, tree planting activities have been a significant community education and outreach tool, especially in terms of being inclusive and enabling good citizen development. Some considerations about street trees include the following:

- A more dynamic approach where you plant 1-2 large trees on a street block with large species, versus many small form trees.
- A street diet to increase planter strip width.
- Small pockets of nature and diversity in planter strips where you can't have canopy trees - shrubs and others plants still offer benefits and more interesting to look at.
- Buy and plant smaller stock - providing lower risk for nurseries, quicker yield, better success for installation, lower transplant shock, and are lighter/easier to lift or have volunteers install. For example, the City of Chicago planted bare-root trees and understood that there would be an acceptable loss (20% +/-) for the trees, but with lower cost for the trees, it allowed for easier replanting.
- Are there opportunities for conifer street trees? Look at groups of trees that handle summer drought (i.e., cyprus, pine). Roots are a challenge, so look to container grown stock. Pruning prior to installation is hard, since they are slower growing trees and may look awkward at time of installation.

Incentives and Outreach

Seattle operates the "Trees for Neighborhoods" program to encourage tree planting in private yards and rights-of-way. Annually, about 1,000 trees are planted without publicity and with public demand exceeding 5,000 per year. The City uses an agreement with residents regarding planting and care of trees, and they require resident attendance at a planting workshop and pruning workshop. The program is opt-in only and focuses on a narrow selection (12 +/-) of species. The City does focus outreach to certain neighborhoods based on overall canopy needs, but the program is available and accessible citywide. Seattle City Light plants and finances trees under power lines. The City will allow the planting of trees in large private lots if there is room, and approximately 20% of the annual planting are yard trees. The program is funding in part by Seattle City Light (about 1/3rd) and the rest is from the City's general fund.

In Eugene, Friends of Trees canvasses certain neighborhoods based on need for street trees. Conversations with residents start with street trees, but can expand to include large trees for private yards. The program is now self-perpetuating, as more people are calling in based on conversations with other neighbors and friends about their experiences.

Vancouver, B.C. sells trees to residents for $10 as a means to recognize some value of the tree and utilizes neighborhood sectors as a planning framework for outreach and to focus efforts.

Portland offers a tree-bate (rebate) off stormwater charge for qualifying homeowner who purchase and plant private trees. The program is operated through the Bureau of Environmental Service and is an incentive to plant new trees that has been promoted in resident water bills. The program does not offer credit for grandfathered, existing trees. Also, Portland has a new private tree ordinance that will take effect in January 2015 related to the care and removal of trees.

Written by Steve Duh, Conservation Technix, Inc.
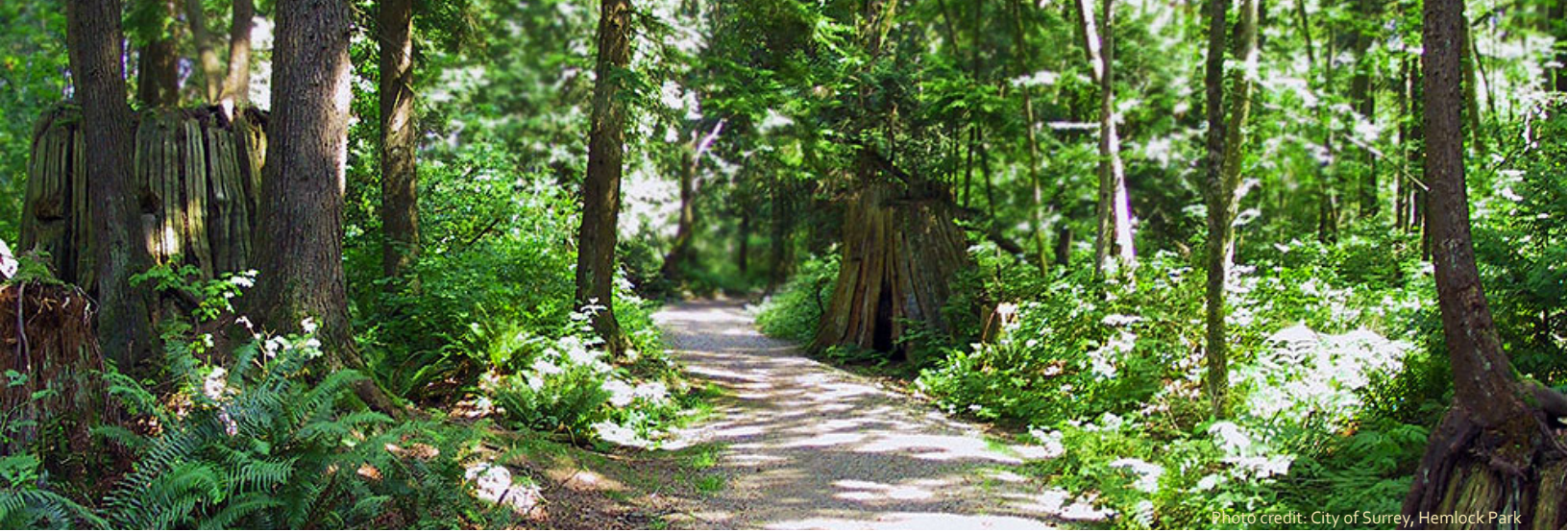
Climate Adaptation Indicators for Urban Forestry: Surrey, B.C.

The City of Surrey has developed a Climate Adaptation Strategy to prepare for climate change impacts. The Adaptation Strategy builds on existing policies and initiatives and will help the City anticipate and respond to changes in the following areas:

- Flood management and drainage;
- Infrastructure;
- Ecosystems and natural areas;
- Urban trees and landscaping;
- Human health and safety; and,
- Agriculture and food security.

The Climate Adaptation Strategy is part of Surrey's Community Climate Action Strategy, which is comprised of two complementary plans:

- the Community Energy and Emissions Plan (CEEP) provides a guide to reduce community energy spending and greenhouse gas emissions, and
- the Climate Adaptation Strategy (CAS) identifies how the City may be vulnerable to climate change impacts and proposes actions to mitigate risk and cost.

Although urban forestry and natural areas are relatively small components of the overall strategy, the plan includes several goals and corresponding indicators to assess and measure progress. One indicator of success is in the Green Infrastructure Network - the interconnected network of protected open space and natural areas that conserves both ecosystem values and functions while providing benefits to people and wildlife. Other indicators for climate adaptation related urban forest and landscape strategies include tree canopy coverage and tree mortality rates.

The City of Surrey recently adopted a Biodiversity Conservation Strategy, which acknowledges biodiversity as a foundation for a healthy, livable, sustainable and resilient community and offers a clear strategy to preserve the natural environment while accommodating urban growth objectives. The report identified that approximately 10,200 acres of land are required to be preserved in its natural state within the City's Green Infrastructure Network to maintain Surrey's biodiversity. Accounting for the current inventory, approximately 3,000 acres are needing to be conserved. To facilitate the goal for the Green Infrastructure Network, the City established two new processes to address sustainable development practices and riparian area management.

Regarding tree canopy coverage, a numeric goal is yet to be determined, but a canopy coverage target of 40% appears supported. Surrey's canopy is currently about 28% on non-agricultural land and is declining. The City has seen rapid new development and is growing at approximately 1,000 people per month. Many new trees are being

planted, but the trees are small. The City's current tree policy considers only trees over 12 inches in diameter.

Regarding tree mortality, the City has a detailed inventory monitors trees on public property by species. Staff continue to look for trends over time to adapt its planting strategies with the goal of reducing overall mortality.

The three primary goals of the Climate Adaptation Strategy address a number of elements, such as objectives to plant appropriate species, increase tree maintenance and management, encourage private tree planting, conduct tree risk and pest threat assessments, and explore requirements for private residents to water trees. To more deeply address these broad goals, the City prepared a Shade Tree Management Plan. The four strategic goals of the plan are to:

- Protect, enhance and increase the number of the City's shade trees;
- Manage the City's shade trees to achieve conservation goals defined in the Sustainability Charter, Climate Adaptation Strategy and Biodiversity Conservation Strategy;
- Develop and maintain strong community engagement, stewardship and education programs that encourage support for the City's shade trees; and
- Carry out best management practices for shade tree health and risk management in the interest of public safety and public health benefits.

Given the policy direction from numerous plans, the City of Surrey will be measuring many aspects of the urban forest, yet they will only be reporting to the public on the three primary goals of the Climate Adaptation Strategy. The City has posted a sustainability dashboard to its website as a means for residents to track the City's progress on urban forestry and other goals.
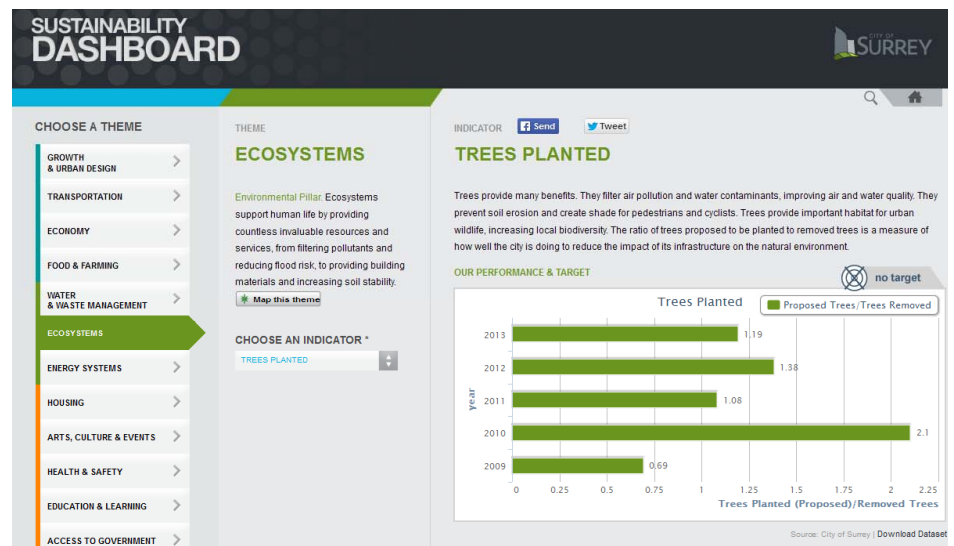
Surrey's Website Dashboard
from dashboard.surrey.ca

Written by Steve Duh, Conservation Technix, Inc.

Acknowledgements
Thank you to Neal Aven and Trevor Taylor

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Sources:

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http://www.surrey.ca/files/%2813365%29_Climate_Adaption_Strategy_-_FINAL_WEB.pdf
http://www.surrey.ca/community/14146.aspx
http://www.surrey.ca/bylawsandcouncillibrary/CR_2014-R141.pdf
http://dashboard.surrey.ca/

Learning from California's Cap & Trade Program
Carbon Offsets & Program Relevance to Urban Forestry

Introduction to California's Global Warming Legislation

The passage of Assembly Bill 32 (AB 32), called the California Global Warming Solutions Act of 2006, marked a watershed moment in California's history. By requiring in law a sharp reduction of greenhouse gas (GHG) emissions, California set the stage for its transition to a sustainable, low-carbon future. AB 32 was the first program in the country to take a comprehensive, long-term approach to addressing climate change, and does so in a way that aims to improve the environment and natural resources while maintaining a robust economy.

AB 32 directs the California Air Resources Board (ARB) to be the lead agency to implement the law. The Climate Action Team, made up of relevant state agencies, is charged with helping direct state efforts on the reduction of GHG emissions and engaging state agencies

AB 32 requires California to return to 1990 levels of greenhouse gas emissions by 2020. All programs developed under AB 32 contribute to the reductions needed to achieve this goal, and will deliver an overall 15% reduction in greenhouse gas emissions compared to the 'business-as-usual' scenario in 2020 if we did nothing at all.

The cap and trade program is a key element in California's climate plan. It sets a statewide limit on sources responsible for 85 percent of California's greenhouse gas emissions and establishes a price signal needed to drive long-term investment in cleaner fuels and more efficient use of energy. Program requirements encompass 350 businesses - representing 600 facilities, and it is designed to provide covered entities the flexibility to seek out and implement the lowest-cost options to reduce emissions.

California established a cap and trade system that applies only to these largest emissions producers. The cap requires these industries to immediately reduce carbon emissions by 10%, this reduction is outright and non-negotiable. The new total (90% of former CO_2) will be called the adjusted cap. The adjusted cap decreases until the year 2020, following the adjustment schedule noted below:

- Cap set in 2013 at about 2 percent below the emissions level forecast for 2012
- Declines about 2 percent in 2014
- Declines about 3 percent annually from 2015 to 2020

Offsets

In order to claim CO_2 reductions beyond the adjusted cap, capped industries may buy carbon offsets from non-

state entities (for up to 8 percent of a facility's compliance obligation). Carbon offset projects must meet certain requirements to be eligible and are generally based on the following concepts:

- Offsets are limited to emission-reduction projects in the U.S. - essentially the project must actually pull CO_2 out of the air
- Offsets are initially restricted to projects in four areas: forestry, urban forestry, dairy digesters and destruction of ozone-depleting substances
- Activities/projects which offset CO_2 must be those which would not have occurred without the carbon offset funding. For example, if a creek restoration project was already programmed to include tree planting, these trees would likely not be eligible for carbon offsets – offsets must be "in addition" to what was expected to happen without the offset funding.
- Offsets must be independently verified, and CO_2 offsets must continue in perpetuity for a minimum duration of time, which was defined as 100 years.

Challenges Implementing the Offset Protocol

The state established a Compliance Offset Protocol for Urban Forest Projects that provides methods to quantify and report greenhouse gas removal enhancements associated with a planned set of tree planting and maintenance activities to permanently increase carbon storage in trees. While the protocol is designed to ensure the complete, transparent and conservative quantification of GHG emission reductions associated with urban forest projects, the initial protocol was so complex that a second iteration of the protocol was developed.

One key change in the updated protocol was an expansion of the metrics utilized to include canopy growth, rather than exclusively the number of trees planted. However, both versions of the protocol limit eligibility to participate in the program to urban forestry projects by municipalities, utilities and educational institutions - presumably to rely on the stability and accountability of these entities. Aside from the complexity of the protocols themselves, one of the biggest challenges for California's system is the eligibility limitation. Many other entities participate in urban tree planting – not just utilities, municipalities and educational institutions – so the availability of eligible urban tree planting sites could evaporate fairly quickly. California passed $17 million (of $350 million) of offset allowance funding to urban forestry programs, and most programs took the money rather than trying to actually sell CO_2 offsets, ostensibly due to perceived or real difficulty in following the state's complex protocol.

Carbon Reduction Propositions in the PNW: An Opportunity for Urban Forestry

Is it possible to learn from California and have a feasible, workable protocol in Washington or Oregon?

In Washington, the governor-appointed Carbon Emissions Reduction Taskforce (CERT) released its final report in November 2014. The Taskforce was established to "provide recommendations on the design and implementation of a carbon emission limits and market mechanisms program for Washington." CERT was asked to focus on two market mechanism approaches: emissions-based (also known as cap-and-trade) and price-based (also known as carbon tax). Both mechanisms share important similarities, and CERT noted that both approaches have advantages. Revenue would be generated for the state under either system, but the report does not directly recommend how to utilize these dollars. Governor Inslee has taken stances that some revenue could be used to address basic education funding, while other uses could include paying for flood protection projects and other means of adapting to severe weather from climate change.

In Oregon, the 2013 Legislature considered several carbon tax bills and commissioned Portland State University for a carbon tax study to provide more information to the 2015 legislative session. Portland State University's Institute for Sustainable Solutions is scheduled to release its study in December 2014. At this time, it is unclear whether the state legislature will take up the issue of carbon regulation and, if they do, what form it might take.

Rick Zenn of the World Forestry Center stated that the WFC has done a lot of reforestation for CO_2 offsets (internationally). Generally, offset systems are biased for volume and for forested or natural areas that have large

spatial extents. In this way, the offset programs are easier to monitor, quantify and manage. For example, one easy way that commercial projects can get offsets is by changing the logging cycle from 40 years to say 75 years. In this way, they get CO_2 credits for 35 years of growth after 40 years maturity, and all other practices remain essentially the same. While different kinds of carbon credits exist on the international stage, perhaps smaller scale urban forestry credits should be quantified differently. It may be hard for small urban forestry programs to compete with commercial forestry.

Opportunities may still exist for urban forestry professionals to help inform and guide the carbon conversations in both states.

Opportunities for Urban Foresters to Engage

The following represent other ideas for urban foresters to engage in and expand the realm of carbon policies as they relate to the urban forest.

- California is getting nervous about no one is utilizing their protocol, perhaps representatives from the PNW region could draft a more feasible protocol that California may then adopt.
- Since commercial foresters are the big players in carbon offsets, urban foresters should find way to create alliances with commercial foresters to help keep urban forestry in the conversation about carbon.
- Urban forestry, by itself, may not gain sufficient political support for changes in carbon policy or protocols, but the urban areas these programs represent have substantial voice in terms of voters. Urban foresters should consider ways to articulate a compelling message about the role of urban trees and carbon policy to inform and motivate voters.
- In terms of advocacy, Washington could benefit from an umbrella non-profit similar to CA Releaf.

Urban forestry programs in California have to address many factors and uncertainties, which makes it difficult to meet the state's current protocols for carbon offsets. However, parks and natural areas may be good candidates for CO_2 offsets, if it can be demonstrated that they can meet the additionality and permanence requirements. For many programs, getting a portion of the allowances money, or some other earmark on urban forestry funding from the state, would likely be preferable to a rigorous protocol that quantifies CO_2 for the offset market.

Written by Steve Duh, Conservation Technix, Inc.

Acknowledgements

Thank you to Mark McPherson, Rick Zenn and Joel Grogan

For More Information

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Mark served on the Work Group at the Climate Action Reserve developing the most recent version of the Urban Forest Carbon Protocol (final on June 25, 2014) and is currently organizing efforts in Washington to advocate for urban forestry in any carbon policy such as cap and trade.

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http://www.arb.ca.gov/cc/ab32/ab32.htm
http://www.arb.ca.gov/regact/2010/capandtrade10/copurbanforestfin.pdf
http://www.governor.wa.gov/issues/climate/documents/CERT_Final_Report.pdf
http://washingtonstatewire.com/blog/climate-task-force-leaves-gov-inslee-decide-cap-trade-carbon-tax/

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Additional Resources

Assessing the Impacts of Climate Change on Urban Forests in the Puget Sound Region -- http://www.forterra.org/files/Climate_Change_Final_Report.pdf

City of Portland Draft Climate Change Preparation Strategy -- http://www.portlandoregon.gov/bps/64079

City of Seattle Urban Forest Stewardship Plan -- http://www.seattle.gov/trees/docs/2013%20Urban%20Fores%20Stewardship%20Plan%20091113.pdf

City of Surrey Sustainability Charter -- http://www.surrey.ca/community/3568.aspx

City of Surrey Climate Adaptation Strategy -- http://www.surrey.ca/community/14146.aspx

City of Surrey Biodiversity Conservation Strategy -- http://www.surrey.ca/city-services/11565.aspx

Forterra's Green Cities Program -- http://www.forterra.org/what_we_do/build_community/green_cities

Green Cities Research -- http://www.forterra.org/what_we_do/build_community/green_cities/green_cities_research

Green Cities Toolbox -- http://www.forterra.org/what_we_do/build_community/green_cities/green_cities_research

Green Seattle Partnership 20 Year Plan -- http://greenseattle.org/20-year-strategic-plan

Green Everett Partnership 20 Year Forest Management Plan -- http://www.ci.everett.wa.us/Get_PDF.aspx?PDFID=6909

King County (WA) Urban Forestry Climate Preparedness and Response -- http://www.kingcounty.gov/forestryCPR

King County (WA) Department of Natural Resources and Parks performance report -- http://your.kingcounty.gov/dnrp/measures/

King County (WA) Equity and Social Justice -- http://www.kingcounty.gov/exec/equity.aspx

Urban Forestry Management Plan Toolkit -- www.ufmptoolkit.com

Dr. Ed Gilman's Landscape Plants website -- http://hort.ifas.ufl.edu/woody/

Deep Root blog -- http://www.deeproot.com/blog/

Urban Tree Growth and Longevity Working Group -- http://www.urbantreegrowth.org/

US Environmental Protection Agency Climate Change -- http://www.epa.gov/climatechange/

The Value of Green Infrastructure for Urban Climate Adaptation -- http://ccap.org/resource/the-value-of-green-infrastructure-for-urban-climate-adaptation/

Climate Change Adaptation Options for Toronto's Urban Forest -- http://www.cleanairpartnership.org/pdf/climate_change_adaptation.pdf

The Climate Action Reserve Urban Forest Carbon Protocol -- http://www.climateactionreserve.org/how/protocols/urban-forest/

Urban Forest Connections – USFS Webinar Series -- http://www.fs.fed.us/research/urban-webinars/

Healthy Trees, Healthy People - Portland State University -- http://www.treesandhealth.org/

Green Cities: Good Health – University of Washington -- http://depts.washington.edu/hhwb/

The Intersector Project -- http://intersector.com/

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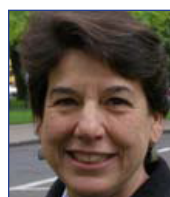
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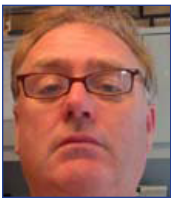City of Eugene
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