

Preparing Urban Forests in the Boston Region for Climate Change January 24, 2017

Attendees from Cambridge included David Lefcourt, Jan Devereux, John Pitkin, several people from the Public Planting Committee and John Bolduc

Leslie Brandt, Northern Institute of Applied Climate Science (NIACS) and the U.S. Forest service. Focus on Climate Change and Forests. Online version of the tool.

1. Local impacts of climate change
2. Different adaptation strategies
3. Vulnerability of Urban Trees to Climate Change
4. Strategies

If you can't come tomorrow, Leslie can help you create a strategy one on one. Contact her.

Changing Climate in the Boston Area

Welcome to the new climate: Warmer, more rain in the winter, and perhaps more winter storms. Paul Kirschen: Director of the Sustainable Solutions lab at UMass Boston and lead author of IPCC Fifth Assessment Report and the 2014 US National Climate Assessment.
Paul.kirshen@umb.edu

This work is based on "Climate Ready Boston" which came out in 2015. SLR, Coastal Storms, Extreme Precipitation and elevated temperatures.

Baseline: 11 days above 90.

This summer we had 22 days when temp greater than 90

By 2030 - 20-40 days.

By 2070 - 90 days. up to 33 days above 100 degrees

Rainfall from storms will increase

When an engineer designs an urban drainage system, the 10 year storm 24-hour rainfall is 5 inches. 2060 - 6 inches.

If you design an urban drain system for 5 inches today, in a couple of decades, the system will be obsolete.

40 years ago, it was more like 4 inches.

Sea level rise: current rise is due to subsidence.

2030 - 4" to 8"

2050 - 1.5' to 7"

2070 - 1.3' to 3.1'

2100 - 2.4' to 7.4'

1 in 1000 chance of 10.5' sea level rise

Brag report

Coastal Storms:

Background and History

In Boston, tidal range (~10 feet) is typically larger than the storm surge

Extra tropical storms (Noreasters) have longer durations and follow tracks more favorable for flooding. They have caused most of the damage.

Projections

Tropical storm intensity will increase with a northward shift in track (more hurricanes)

Storm-induced flooding will still be greater in the future due to rising sea levels

There are no robust projections for changes in storm intensity, frequency or trajectory.

Freshwater is extremely important to urban Forests.

Annual Rainfall: Precipitation changes in NE (Zhao, 2013)

This is roughly 40 inches per year. Mean annual rainfall will increase. Globally, mean annual rainfall will increase. Around the equator it is decreasing. Dry areas are getting drier and wet areas are getting wetter.

Monthly Precipitation:

Mean monthly rainfall is pretty much the same every month (3-4" month)

A shift. More winter rainfall and less rainfall in the summer. A major problem for ecosystems.

More evaporation.

Streamflow: We may not see major changes in our mean annual streamflow, but we definitely will in monthly streamflow. (Groundwater elevation changes may be similar unless impacted by saltwater intrusion.)

More of a peak in the winter and very low flow in the summer. This is really bad. Streams will be warmer, holds less dissolved oxygen. Groundwater is very important for trees. Aquifers are going to follow this pattern shift. Right now, our aquifers are highest in in March. Under climate change, the high will be earlier in the winter.

However, as sea level rises, it will push up groundwater levels. It pushes up a "lens" of freshwater.

It doesn't necessarily mean that fresh water will be saline. But if tree roots are very deep, they could end up in saline water.

Municipalities should increase their reservoir storage capacity.

Also, how do you recharge the groundwater?

Water quality. (Sediment) When freshwater is warmer, it holds less oxygen. The sediment load might increase over time. More rainfall carries more sediment into our streams. It picks up phosphorus which will create eutrophication.

Seasonal snow:

Snow accumulation will decrease 31-48% by 2100.

Start of snow season later

big snowstorms may continue

Ice storms?

Projected river flooding

Small, more frequent floods (5 year floods) will increase 10-35%

Climate Ready Boston Findings - Climate Change Consensus Report

Low emissions scenarios for precipitation and temperature are based on RCP 4.5

A scenario where we don't go to zero emissions by mid century

I asked Paul Kirschen whether he expected that the level of uncertainty around short term changes in climate would increase. He wasn't sure. The more we learn, the more uncertain we are.

Precipitation is more difficult to model than temperature increases.

Julie Conroy from MAPC

Subregional areas are broken out by community types. Cambridge is part of the Inner Core Committee.

2011- what is a climate assessment? 2014 - created a regional climate strategy. Strategic planning process. How will the Climate Plan fit into our future. It's one of our four strategic priorities.

It's always called a "working draft." Includes regional/subregional vulnerability assessment.

Adaptation/mitigation goals and objectives, implementation strategies. Resources/References.

We worked with the state to make sure our recommendations were consistent. Pioneer Valley did a strategy that included GHG mitigation analysis.

A summary of what we're seeing:

Forest impacts. OAK TREES. Nothing but OAK Trees by 2070.

Strategy Goals and Objectives: Natural resources: Protection, Management and Restoration.

Resiliency = Adaptation + Mitigation

1. Vulnerability Assessment

1. Assess urban forestry conditions
 1. Spatial Analysis
 2. Urban Forest Resource Inventory
 3. Open Space Plan
2. Determine impacts to forest resources

1. Additional spatial analysis
 2. Quantitative Analysis
 3. Qualitative Analysis: info from officials, conservation orgs, residents, etc.
3. Linkages: What happens when we lose green infrastructure?
 1. Stormwater management
 2. Public health
 3. Built Environment

some of the MAPC climate planning projects include South Shore, Minuteman subregional, and inland like Newton and Brookline.

Layer up together where are open space areas in conflict with other land uses. R&D: How can we quantify floodplain expansion to accurately project. Right now, we're showing 500 year flood as a surrogate for projections.

What is the benefit to the community: Carbon sequestration is a real critical element to resiliency.

Action plan:

Didn't hear most of it.

What policy and regulatory changes need to be made.

Implementing an Action Plan

Anticipate constraints of policy change (e.g. Government, development, community opposition)

Education and outreach

Project planning

Kirkland WA Urban Forestry Strategic plan - good example.

Metro Mayor's coalition.

Decision support tool for Massachusetts communities is in beta. Will be covered this afternoon.

Need to think outside of the box. I can't emphasize this enough. Existing stormwater management practices aren't going to work. How are we rethinking the problem.

Julie will make copies of slides available. Jconroy@mapc.org

[Http://www.mapc.org/regional-climate-change](http://www.mapc.org/regional-climate-change)

Patrick Roche, Energy Coordinator

Managing Gas Leaks for a Resilient Urban Forest

Good example of resiliency strategy.

An overlooked threat to trees. May compromise future investments.

Impact: Forces the oxygen and moisture out of the soil. Kills and/or weakens trees and other plants. Gas moves uphill.

Study this summer with HEET.

Cost of lost trees includes Lost resilience and ecosystem values, aesthetic value, removal cost, damages to property from weakened trees, replanting cost.

Gas Leaks: 5,000 miles of leak prone pipe in 2015. 20,000 active leaks. 20% of leaks contained a tree (MAPC/HEET) study.

Test for gas: Test the tree pit prior to planting. Newton Tree Conservancy is an independent non-profit that plants 100 trees a year. They work with Bob Ackley, who surveys their tree pits after they plant. You can also test a tree after it is dead. Test trees of significance. Flag those and test on a regular basis.

Tools: Combustible Gas Indicator and others

Get annual leak data. Unrepaired leaks. HEET maps it.

Get pipe data. Know where the leak-prone pipe is. Request from gas company GIS layer and/or map. Mel rose did this.

Coordinate: Synchronize street opening projects. Pre-season planning meeting. Focus on Public Works departments with paving and sewer projects. Forestry and planning professionals should also be involved.

Forestry plans can influence what pipes get taken out.

FixOurPipes.org

Climate Smart Cities:

Harnessing Big Data for Community Scale Green Infrastructure Solutions

Shaun O'Rourke, also Darcy Schofield

Green Infrastructure Director

Trust for Public Land

Parks and urban trees are a tier one climate change solution.

Cities are struggling to site multiple-benefit green infrastructure. We can't afford to solve just one problem at a time anymore. Stretch limited resources.

Challenges we are facing nationally. How we are applying locally.

Climate Equity is a major driver of TPL's work. Urban heat, flooding and other challenges are hitting the most vulnerable. Elderly and low income in response to increasing heat. Emory predicts a 10x increase in heat-related deaths by 2057.

Elderly can't get out of their apartments. Can't afford air condition. If you can't cool apartment at night, cycle repeats itself. Link between wealth and tree canopy coverage. "Trees grow on money."

Connect, cool, absorb and protect.

Connect: Get people out of their cars

Cool: Urban heat island

Absorb: Managing water where it falls

Protect: Coastal vulnerabilities, riverine flooding.

Boston is already leading the nation on many of these issues. TPL and Tufts came up with strategy to mitigate urban heat: Tree planting. Creating edible "green sponges" creation of urban farms. Environmental education, new food, soaking up stormwater.

Climate-Smart Cities Process in 20 cities.

Boston, Providence, New York City, Philadelphia, Camden, Washington DC, Chattanooga, New Orleans, Dallas, etc.

Here in Boston, we've signed an MOU with the City of Boston, research with Tufts, decision support tool, funding to develop projects at scale. Community Preservation Act will help provide add'l funding for parks and open space.

Applied Research - partners include JPL at CALTech. CO2 Emissions, Modeling storm and floodwater dynamics with Drexel University (does green infrastructure minimize flood damage?)

Integrating across silos for Climate-Smart Boston

Boston DOT, Boston Public Health Commission, BRA, Boston Water and Sewer, Boston Parks. Common goals, common data. "Multiple benefit greening"

Decision Support Tool:

Climate-Smart Cities Decision Support Tool Guides. Investment and Partnerships for Impact.

Data Library

Prioritization Analysis.

For connect: Connect low income communities to job-rich districts.

90,000 Bostonians live in a flood zone. Allows you to answer critical questions. People of color, etc.

Query: Tool helps link analysis to action. Look for all parcels in the city of boston that have runoff potential, vacant lots, low-income households. Drill down to some parcels that present multiple benefit opportunities.

Connecting data to people. Five buckets: Green infrastructure schoolyards, Green Alleys, Linear parks and connective corridors, Community agriculture, Water smart parks (stormwater management)

Measure CO2 emissions from transportation related projects. Park projects. Lowest tree canopy coverage, lowest income, highest heat island effect. Managing stormwater pollution. Chronic flooding.

Alleyway - back of house. Start thinking about a connecting system of alleyways. There are 500,000 miles of alleyways in California. Participatory process, how do we start greening this. The critical success factor in this community was the Latino mothers. But before we realized that, no one was coming to any of the meetings. Know the place you are working. [Sean might be able to help us with the Neighborhood Trees project.]

Community tree planting was a part of the project. The tree planting happened around the alleyway because there was no space in the alley.

Capturing water from 4.5 acres. Dry wells infiltrate water down to the ground.

Catch basins and infiltration trenches. Green teams do all of the plant maintenance. We included water hookups that the Equipo Verde is able to access with a key.

Evaluation: Metrics, how we partner with academic institutions. Over 85% of the area in this part of Los Angeles is impermeable.

The decision support tool is available. It's hosted online. You can go on and get a password. Queries and functionalities are where it starts to shine. User-defined functionalities.

TPL is developing the tool in 20 cities. Only four have been completed.

Establishing and Integrated Climate Change Strategy for the Commonwealth. Preparing Urban Forests for Climate Change

Katie Theoharides,

Climate Tools from the Office of Energy and Environmental Affairs (Massachusetts)

Integrated action to prevent further climate change.

Climate change isn't just an environmental issue. Increases in vector-borne diseases, damage to infrastructure, failed crops, urban heat.

Many of the key strategies for dealing with climate change will come from the environment.

At the state level, there are a number of programs already. Greening the Gateway Cities tree planting program. Employs young adults in planting. Urban agriculture grant program. Vulnerability and risk assessments: Cambridge, Magic 13 towns, Fairhaven, Acushnet and New Bedford, Salem, Barnstable, Camp Edwards, Quincy, Gloucester, Cape Cod Commission, Marshfield, Northampton, etc..

GWSA - 25% by 2020 and 80% by 2050. Registry and reporting system. Every 5 years update to a clean energy and climate plan. Most recent was 2015. The law requires an adaptation report. Specific areas included: Natural Resources and Habitat, Key Infrastructure, Human Health, Local Economy and Government, Coastal and Ocean Zones.

Supreme Judicial Court of Massachusetts, the EPA must promulgate regulations to ensure that we are " establish volumetric limits on multiple greenhouse gas emission sources, expressed in CO2 equivalents, and that the emissions must decline over time."

The EPA has responded by issuing six regulations. Public comment period open until February 24th.

Section 1: Mitigation

Comprehensive energy demand study for the state

Section 2: Regulations

Section 3: Adaptation

- Publish statewide climate adaptation plan

- Establish vulnerability assessment frameworks for state agencies and municipalities

- Provide technical assistance to cities and towns to complete assessments and identify adaptation strategies

- Update at least every 5 years.

Section 4: Climate Coordinators

All cabinet secretaries will designate a climate coordinator. Serve as point person.

Section 5: Timeline. Order will be reviewed in 12/2019.

A program to provide direct support to communities who want a vulnerability assessment.

Leslie Brandt, Northern Institute of Applied Climate Science (NIACS) and the U.S. Forest Service

Urban Trees Are Vulnerable to:

Drought, Flooding, Storms and Disease

For example, we don't usually see the Southern Pine Beetle, but it is moving north.

Oak wilt is exacerbated by wet spring conditions

Vulnerability is a function of the impacts of climate change and the adaptive capacity of the system. $Vulnerability = Impacts + Adaptive Capacity$

Urban Tree impacts:

climate change tree atlas. [Http://www.fs.fed.us/nrs/atlas](http://www.fs.fed.us/nrs/atlas)

Develops a statistical model to understand the relationships between climate and soil. Better suited for natural ecosystems. Vulnerability, Swanson et al. 2016

Models and Emissions Scenarios.

PCM: Low Emissions (B1) (Least projected change)

GFDL High emissions (A1FI) (most projected change)

Eastern white pine is dying in the Boston region. Loss of suitable habitat.

Biggest Losers:

Balsam fir, Aspen, Birch, Chokecherry, Red spruce, Red pine.

Some of our more northern species that are at their southern extent.

Sugar Maple will see a decline in suitable habitat but it will be able to hang on.

Other species that can hang on:

Black cherry, American Beech, Pitch Pine, Swamp chestnut oak,

Gains Habitat:

Shagbark Hickory, American hornbeam, silver maple, mockernut hickory, flowering dogwood, eastern red cedar, white oak

New species that might survive, especially with the urban heat island effect

Sourwood. Currently common in Virginia.

Pawpaw, eastern redbud, Bald cypress, Tuliptree, Sweetgum, Persimmon

Non-native species:

caution: Could become invasive!

Dawn redwood, Kwanzan cherry, weeping willow, Chinese elm

Shifts in USDA Hardiness Zones. Average Annual Extreme Minimum temperature over a 30 year period. We are currently a zone 6. There is a lot of buffering from being along the coast.

2010-2039 - 7b or 8a

2040-2069 7b-8b

2070-2099 7b-8b

[This doesn't seem credible]

Summer maximum temperatures based on the avg number of days above 86 degrees. Current AHS heat zones. We are in a heat zone four- 14-30 days above 86.

By the end of the century, we could have 90-120 days over 86 degrees.

This would be worse in an urban zone because of the heat island effect.

Heat stress requires a cooling off period at night.

Vulnerable:

Norway maple, Littleleaf linden, Japanese tree lilac, Amur Maackia

What can you say about the adaptive capacity of these trees?

How well can a species adapt?

Scoring system for tree species based on a scoring system from Steve Matthews, modified for urban trees.

Separate scores for trees under planted conditions and trees that are naturally occurring.

Species with High Adaptive Capacity

Not generally susceptible to pests

Drought tolerant

Flood tolerant

Not susceptible to breakage/mortality from wind and ice storms

Tolerates wide range of temperatures

Tolerates urban conditions like salt, pollution, restricted rooting conditions

Shade tolerance

High adaptive capacity: Kentucky coffeetree

Low adaptive capacity: Asian longhorn beetle, drought intolerant, susceptible to leaf scorch, difficult to propagate

Least vulnerable include

Eastern red cedar

Black gum/black tupelo

Mockernut hickory

Eastern hophornbeam/ironwood

American hornbeam

Service berry

Yellowwood

Kousa Dogwood

Ginkgo

Persian Ironwood (parrotia)

Cherries (various)

Japanese Zelkova

Summary:

Hardiness zones may shift by 1-2 full zones by end of the century. Heat zones may shift by 1-4 zones.

More northern trees that are susceptible to pests, disease and disturbances will be more vulnerable

Wind-pollinated trees are more allergenic

Aren't invasives part of the process of the biodiversity of the city?

Depends on what the goals are.

Adapting Urban Forests to Climate Change: Approaches for Action

Leslie Brandt

Adaptation actions are designed to specifically address climate change impacts and vulnerabilities in order to meet climate-informed goals and objectives

Forest Adaptation Resources

A workbook designed for a variety of land managers with various goals and objectives

It's tailored to eastern forests in rural and urban areas

Does not make recommendations. Menu of possible actions that lets you decide what is most relevant for you.

Tomorrow's session helps you develop specific on-the-ground plan. Or you can do it online.

Adaptationworkbook.org is the online version. Walks you through the steps and creates a PDF report.

Adaptation options include resistance, resilience, and transition

Resilience is the middle path between maintaining current conditions and changing Examples of resistance: (missed it)

Examples of resilience: enhancing biodiversity, prescribed fire, pruning, installing rain gardens.

Transition examples: Promoting new species assemblages, adapted seedlings, and creating green corridors.

Panel Presentations:

Assessing your tree canopy from above

Jarlath from UVM.

LIDAR data. Tree canopy, homes built around 1900. Who owns the trees?

Our residents control our tree canopy. It's important to understand their feelings about trees.

Who has the room to plant new trees. We're mapping from above, can't tell you the species.

Does allow you to have a complete census.

Inverse relationship between tree canopy and surface temperature.

David Bloniarz, US Forest Service

Cooperative Partnerships to Address Climate Change

iTree (the Forest Service uses it as a modeling tool)

ReGreen Springfield

From disaster comes resilience - it makes us more adaptable to change.

Tornado 6/2/2011. The devastation. Physical damage. 2,000 uninhabitable houses. 200 could never be rebuilt. Communities. How do we adapt to climate change? Work with our community and the residents who live in them.

Plant trees for energy savings. Cool the structures, less energy.

Plant a tree and cool down this summer! Save 20% on air conditioning costs! We used itree to locate the best location to plant the trees near the house.

1400 in three weeks. Big trees, 3.5" diameter. Spring 2016. Grant from US Forest Service.

Urban Trees, Stormwater and Green Streets. Community based design.

If you can utilize students, there are kids studying landscape architecture. Grab those kids and ask for help.

HUD had a billion dollar grant for National Disaster Resilience Competition. Springfield received \$17 million. Citizen scientists (20) (8 weeks) and tree stewards (40) who will be trained. Take the Mass Tree and Landscape Association exam. 16 weeks. We need people. We're in a hiring freeze. Contracting with national companies to train using HUD funding.

Community Engagement. People are the key to success in the work that we are doing.
Making the connection between people and urban landscapes.

Bob O'Connor, Commonwealth of Massachusetts

Commonwealth of Mass--Clean Energy and Climate Plan for 2020.

Greening the Gateway Cities program. A grassroots program in partnership with DCR as well as DOER. Hoping to be at \$8 million. Program is three years old.

The concept was invented after the Asian Longhorn Beetle disaster in Worcester.

DCR hires local foresters and crews - approx 100 new jobs. 80% of trees planted in yards. 20% on streets working with city DPW

OUtreach by local non-profits and DCR

Watering by residents, DCR, non-profits and City DPWs.

Thirteen cities this spring.

80-90% four year survival of the trees

Urban Heat Island: Trees cut the peak in peak load. Funding based on energy was tough. Light bulbs over trees. We were able to use two studies that were on the ground energy measurement studies. The first was the ALB/Worcester. A neighborhood that lost 90% of tree cover. A 37% increase in electricity use in one year (balanced degree days.) It wasn't a neighborhood that had central AC, they went out and bought window air conditioners. Winter savings: Hutchinson, MN. Drew circles around each home. Correlated canopy cover around that house with energy use. Each 1% increase in canopy cover reduced energy use by 1.5%. (Modeling is not as effective as actual on-the-ground studies.)

In Chelsea, planted 1,700 trees. Densely developed city. 5,000 people who live within 50 feet of these trees. Contacted 50% of the people. Social benefits were huge.

Expanding to 13 cities in 2017. Over time, Planting crews will move to adjacent cities to allow for overlap. This will minimize downtime and provide a more consistent level of tree planting.

Need to plant 10 trees per acre to effectuate a 1% increase in canopy in 8 years
10% in 30 years.

Why Gateway Cities:

Big opportunity for savings

Old, tall, poorly insulated houses

Dense residential areas

Low existing canopy cover

Big need for savings

High poverty rates

Large minority and Immigration population

Largest renter population

Limited municipal resources.

One tree can help up to 10-20 households on that acre. There's no other energy efficiency tools that can help.

Improving GGC for a Changing Climate:

Expand nursery tree offerings for residential markets

Focus on meeting tree density goals in 3 cities with UMass weather monitoring and at large public housing communities. Get baseline electricity data. Trying to get into the Mass Save Program. Mass Save gets 5-700 million dollars a year for energy efficiency. Gets money from ACP program, which is tied to the RPS.

Expand outreach capacity to exceed tree density goals--the key limiting factor is phone calls
Strive to find cost-efficient ways to plant within paved areas to reduce urban heat island and stormwater runoff

Explore carbon offset programs for tree carbon and energy saved.

"As if you were there"

Climate Adaptations in Worcester

USDA Northeast Climate Hub - help farmers and foresters

Erin Lane

Deliver science-based, regionally specific information, tools and practices to assist producers in achieving their goals in today's climate

Help farmers and foresters adjust and adapt to climate change

highlight adaptation actions that work. Viewers can "visit" places using innovative technologies.

360 degree camera, tried and and ipad.

Roundme.com "virtual Tours Made Simple"

Tie it together with a story map.

"As If You Were There" Demonstrations

ALB tree initiative in Worcester.

Dave Lefcourt

Canopy coverage - hoping to show it's increasing. New survey this fall.

Species Diversity - over 130 different tree species are installed throughout the city.

Tree inventory.

Typical planting season - 20 to 30 different species

Always working with the nursery folks - trying different things. That's how we figure out what's working.

Tree planting. Improved tree planting specifications. We spent the last year updating our tree planting specifications to the most recent industry standards.

Trees come from the nurseries stressed out missing 80 to 90% of the root system. If we plant them incorrectly we are just throwing our money away.

New Street Tree Wells.

City is installing structural soil behind many new tree wells to help increase soil volume and encourage the roots to spread out.

As the tree matures, the roots will go underneath the sidewalk and into the surrounding lawn.

Construction coordination:

Flexi-pave.

JFK street in Harvard Square 4-5 years ago--our oldest location

Litter cleanup is easier. Have been told that it's easy to chip away the inner circle when it's time to enlarge the opening.

Trees don't come down in Cambridge for tree root issues. We work around the trees.

SBSS: Engineering Division is now creating expanded tree areas utilizing Sand Based Structural Soil and irrigation where possible. The Engineering Division paid the bill for creating the ideal planting environment.

New Cycle Track with SBSS:

Additional volume of soil to take advantage of.

Water by Bike:

For the past five summer, the DPW has employed water-by-Bike/Tree Ambassadors to help care for the young trees throughout the City.

Flexipave needs to be flushed out with water or it will stop being porous.

DPW sends out a daily watering crew during the growing season .

All new trees installed by the City have a two year warranty. Contractor gets paid for both planting the tree and watering the tree.

Tree Pruning - 6 Zones, 19,000 trees total

City currently maintains a proactive 6 year pruning cycle.

Frequent pruning reduces problems

Nonprofits can get discounted price on trees through the City. Replant with a species that is vulnerable. Like Tulip Trees. Plant different species for maximum resilience.

I-Tree species

Energetic, informed, understand the issues. They must have a

National arbor day foundation why do people want to volunteer? Focus them on what they are good at? Tree city bulletin. You can't burn them out. They need to have a baseline of

understanding. Street Tree inventory in Brookline. How much training do you have to give a volunteer?

Thirteen different grassroots groups. Every city doesn't have a tree regressing group. Most of the ones were not. Representing the community. It's as important to be able to represent the community. Groundworks Lawrence. If you are missing that community aspect. Bring lots of people to the meetings. Have hispanic people show up. Community groups that work with the City. Chicopee doesn't have grassroots groups. In Holyoke, there were fortyfive people there. DCR folks working the . In fall river, they have very strong neighborhood associations. Using something that's already there and adding that to the portfolio.

Germantown in Quincy had MIT come and do a study. 800 trees are going in. Eversource paid for it.

Utilities must increase their RPS. That has been a godsend for our program.

Families finding their house and picking out trees that a landscape architect was going to plant. Does the state plan on starting a carbon credit exchange. California has the best system for carbon credits for forests. It's very bureaucratic. There's an effort in Westfield, West Springfield and Holyoke - the state has been funding an effort to put the forests into a carbon offset program. They have done the inventory work. They need to get a local business to pay for the credits. They need a big company locally that wants to get the credit for doing this. It might be six months before we know where it's going.

Jarlath O'Neil-Dunn

1. Using less electricity to cool buildings
2. Rejuvenation of urban areas. Cut back on commuting because they make cities more livable

How do you get people to plant more trees in their yards. With our Greening program. Outreach. Community events, Facebook, Yard Signs - "I planted a sign" Worcester Polytech students. Educating them on the value of that tree. Bigger picture of what the tree does.

How many tons of pollutants can they collect? How much dust will it take out of the atmosphere. It's difficult in the beginning, but it just spreads. That's one of the reasons people volunteer.

There were people who couldn't wait to get home from work to take care of their tree.

Cost/Benefit analysis.

If you can show that, policy-makers will listen.

Arborist will be pulled in different directions. There are different emergent issues. The advocacy group keeps the focus on whatever their mission is. Basis of understanding of their function is. It's easier for the city to fund tree planting through a nonprofit.

We're focused on the urban canopy.