

MEETING NOTES



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MEETING DATE

Apr 25, 2019

LOCATION

Cambridge
Rindge and
Latin School

CLIENT

City of
Cambridge

PROJECT

Name/Number
Urban Forest
Master Plan
2953

RE

Task Force
Meeting 11

ATTENDEES

City of
Cambridge
City of
Cambridge
Task Force
Reed
Hilderbrand

Introduction

Opening remarks by Owen O'Riordan

Owen noted that tonight is the last Task Force meeting until the fall. We have a cake tonight to celebrate the effort and diligence of the Task Force.

RH reviewed the project schedule:

Noted that we are at the end of a conversation, but the design team will be bringing more information to you in the form of the report. As the analytical component and findings review closes now, the team will think through some of the impacts and ideas and will have a draft document in June. Some of the questions we have are: how can we communicate this with the public, how can the City use this document to make guidelines and how might this impact the process of drafting regulations.

Design Team Presentation

We focus on three things today: understanding potential causes of canopy loss; reviewing the scenario testing, climate change impacts, and their relation to urban heat island; and reserving 45 mins in the end to talk as a group.

Summary of the presentation and task force comments follows:

1- Canopy Loss Investigations

The first map in the presentation shows the canopy loss, gain and no change between 2009 and 2018. When we first showed the canopy change data, we used 2014-2018 data, then we broadened that and used 2009-2018 data. City is working with UVM on this, peer review. Data is corrected. Currently, Cambridge has 26% of its land area covered with canopy.

Task Force: What was the number you showed before?

Response: 29% in 2014

TF: From when is the data?

R: LIDAR was taken in April 2018.

Canopy Loss Investigations

- 1- Is loss associated with increased impervious area?
- 2- Is loss associated with property sales?
- 3- What other causes are there for canopy loss?

The loss investigation sites are distributed across the city.

Increased impervious: We used the data from aerial mapping, overlaying change in impervious cover between 2010-2018 and change in canopy cover between 2009-2018. However, aerial mapping is not very precise.

The chart shows the canopy loss and gain associated with increased impervious and no increased impervious area, showing the gross areas. 156 acres of land with increased impervious surface, showed canopy gain. It may mean that people are planting trees, while there is increased impervious.

Ownership change: Using the aerial mapping and city records, we overlaid the property sales from 2015-2017 and change in canopy cover between 2014 and 2018 to assess correlation. The map shows the parcels that changed ownership and percent canopy change on that parcel.

TF: Does it also show replanting?

R: No, this only shows canopy loss.

TF: Did you differentiate residential and commercial?

R: We didn't but we can.

Here are some findings from this study:

- 2,945 parcel sales took place from January 1, 2015 to December 31, 2017 in Cambridge
- 22.3 acres of canopy loss (of 330 total gross loss) was on land sold during that time.
- 10.5 acres (almost half) of 22.3 acre loss was associated with just 179 parcels.
- 1,100 parcels showed only minor losses.

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- 29 parcels contributed 2.9 acres of new canopy.
- 313 parcels contributed 4.1 acres of new canopy.

Ground truthing: This category also shows loss but we didn't know why, tried to find out the reasons. These studies suggest an association between four conditions and canopy loss:

- New construction
- Renovation and site improvements
- Mortality (declining health)
- Miscellaneous decisions by individual owners.

The keymap locates the site within the city. Study number 1 is loss associated with increased impervious surface. Number 2 is loss associated with parcel sales and number 3 is miscellaneous decisions.

New development built multiple houses and some large trees were removed. New trees were planted as part of the project (Cambridge Housing Authority project)

New construction removed trees on the property but also the trees in the median.

Lesley university, relocation of church is associated with loss, they tried to save the street trees but they couldn't. There are a few small new trees.

New construction on the back parcel property sold.

Novartis project replaced the parking lot but provides open space and planted new trees.

During the restoration of Anderson Memorial Bridge, most of the trees on DCR land were removed.

New construction on Mount Auburn, took down a couple of trees

Large backyard tree was removed due to renovation on Copley street.

MIT Westgate, removal and reservation of trees (TF: Sugar maples were planted around playground)

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Harvard Winthrop House, trees in courtyards are gone

Porter square parking lot, most of the trees are replanted, small trees

Mass Ave, trees are removed due to utility project

Public library, large tree didn't survive the construction

Two trees were removed, but we were unable to determine a cause.

Response strategies, moments people have to make decisions, how do you communicate with people?

TF: Are causes ranked?

R: Analysis allowed us to zoom in and try to understand what it was. We can't say the number overall the city. Instance by instance.

TF: It is interesting to see individual sites, can we see all of them?

R: The scale of loss on this project is immense. In some of them you see replanting, good decisions. Seeing the new trees is good but the LiDAR analysis doesn't pick up all the small trees.

Owen: The increase in new impervious area is disturbing

TF: Pervious/ impervious is big. We have permeable area requirements in the zoning.

Owen: It is part of Envision too.

TF: Does impervious cover include buildings or roads?

R: Yes, it includes any surface that has changed to impervious. It is the same data came from LIDAR, like canopy change. New buildings and new pavement

TF: Even on the surface, when you have a construction project, contractor says those trees have to come down. There is a tendency to empty the site. Some of them are decisions from the client.

TF: We face that at the Public Planting Committee too. Park or private

development. Architects don't want to deal with trees but you can't replace it. Tree preservation is important for our town.

TF: We can do a better job as an institution to investigate at Harvard

TF: Constraints with the site development, use of the site whether you are capturing stormwater, trees sometimes disappear, sometimes replanted. MIT is not a bucolic as Harvard, there are fewer existing trees to start with. The forest is not static and always changes, we need to maintain it as a forest, not as individual trees. We need a comprehensive management plan.

TF: Harvard has done some successional plantings in the Yard. The work of the Task Force has prompted Harvard University to think more about tree planting.

Advocating for the value, but also we need to do things systematically as landscape architects.

TF: When trees are replaced, do you know what species?

R: Often the replacements are understory trees, it is a problem. They won't ever get large.

These studies will help us understand how the forest is changing and how to manage it.

2- Scenario Modeling

Modeling has been a pretty big effort, preliminary results from October. We made some updates to October's model.

Updates:

- Rename the "climate model" to "canopy change model"
- Model loss using canopy area rather than individual trees
- Define a baseline net loss rate (1.55% of canopy per year)
- Project a conservative and an accelerated loss rate for the scenarios

Conservative scenario looks at the historical rate, some species will not do well with climate change, will disappear from the palette with pest and diseases such as emerald ash borer.

Accelerated scenario: if climate change accelerates and also new

diseases appear. The risk ranking is calibrated to each species, we assigned low, medium, high ratings.

Species composition of future is depended on each individual flooding and drought impacts. Findings will inform species recommendations.

Scenarios: 2030, 2050, 2070 baseline scenarios, 2030 flooding and 2050 drought scenarios.

Baseline Scenario

First map shows the current condition of forest, with 26% canopy cover. Species that are more resistant to

2030 Conservative Scenario: Considering temperature shifts/EAB threat the loss rate of 1.55% increases to 1.8%, resulting in 21.0% total canopy cover.

2030 Accelerated Scenario: Doubling the impact of pests/diseases on each species the total annual loss rate increases to 3.2%, resulting in 17.6% total canopy cover.

TF: Red Maple, why is the score so low?

Combination of vulnerability to pests and diseases and not being drought tolerant

TF: Native plants and trees are good at ecosystem services, biodiversity is important

R: On our previous presentation, we discussed the species recommendations but these are only findings

TF: Definition of forest? 25% is not a forest, canopies are not touching each other

R: We looked at that, single tree standing alone would be considered a savannah from an ecology point of view.

Flooding scenario

We removed trees that are flood intolerant, standing water for 24 hours, increase in mortality.

The flooding event resulted in 0.2% additional mortality (~0.7 acres of loss)

from the 2030 baseline scenario— resulting in minimal reduction of canopy in 2030.

Species that are impacted in this scenario.

Current net loss, we are carrying it to 2050, then we run the drought model, it is a one-time event in 2050.

It is an assumption with the science we have, that there won't be an extreme drought in 30 years.

Additional mortality is higher, hemlock is high in mortality number.

Summary graph: colors relate to the event or scenario, conservative loss scenario and accelerated. There's a large range of impacts, so 2050 and 2070 outcomes overlap with each other. The scenarios assume that there isn't any large planting strategy.

Next we investigated how much can tree planting mitigate heat island and what strategies move the needle.

Indrani Gosh, Kleinfelder: This slide shows the methodology behind the Urban heat island model. It is the most robust that we have. We are using land sat data, an image of land surface, taken on a particular time, high temperature, hottest day on record, August 2010, output of the data, calculating emissivity. The resolution of the data is 100'x100' "pixels."

Ambient air temperature is important, we estimated the surface temperature and established a connection between the CCVA analysis, relative humidity.

For the model we are only using ambient air temperature.

The model is fairly flexible. 2018 UHI temperatures, canopy coverage, cooling relationship was used to determine what the future heat island would look like in different canopy coverages.

UHI map, using 2018 canopy, on a day average Cambridge temperature is 90 °F, there are certain spots 8-10 degrees higher in the city.

Then we correlated how the UHI was exacerbated by changes between 2009-18. 164 acres net canopy loss, differences between 2009 map and 2018 map. Red spots are 4 degrees warmer than 2009. 39% experienced an increase in temperature 0.5°F, 42% didn't change, 2% change for, more than 4 degrees.

Stephanie: So in 2030, what would the canopy look like with the current loss rate?

Accelerated loss scenario in 2030, 17.8% canopy cover. 38% of the city experienced an increase in temperature ($>0.5^{\circ}\text{F}$)

ROW planting (12,000 new trees), increase of canopy to 29.4%, 12.5 diameter trees, 30' spacing.

25% of the city experienced a decrease in temperature ($>0.5^{\circ}\text{F}$).

Cooling, corridors, 100x100, more temperature decrease under a tree, Thick increase in Alewife, envision planting scenario.

There isn't a change in West Cambridge, because there is significant canopy there currently.

Neighborhood Case Studies

These are not proposals, but scenarios to test planting strategies.

We did two studies: Mid Cambridge (20% current canopy cover) and East Cambridge (15.1% current canopy cover).

East Cambridge: Residential areas are paved. Opportunities that we found are increasing ROW canopy, lane diets, encouraging backyard planting, increasing canopy cover on parking lots, buffering existing open spaces with more trees.

Calculations in terms of number of trees (1814 trees), what it would look like with canopy. Change is significant, 62% of East Cambridge experiences cooling.

Mid Cambridge: Here the canopy cover is lower than city average. Largely single family homes, with limited setbacks. In this scenario, we looked at increasing ROW planting, increasing canopy cover on parking lots, encouraging front yard plantings, diversifying and staggering trees on major streets. It required in total 2019 trees and resulted in 51% cooling.

Model showed pretty impactful effects, and helped us to understand what was possible.

TF: Did you look at only tree planting? In Alewife, trees plus green infrastructure, a lot more significant compared to only trees

TF: How about dense and light shaded trees?

R: We didn't look at that, we only looked at the area covered by the canopy

Taking targeted actions feels impactful. What it takes to accomplish it is 20-30 years but it is meaningful.

3- Task Force Takeaways

Collective information and questions that you asked were important, and your questions have taken us to this point. We saw your photos and letters. We are aware of the challenges, and we look into the aspiration from different parts of world.

What do you think are the most important things you learned? Where should we focus our energy?

TF: Cambridge's good intentions create built environment but who is the overarching person that thinks about the ecology? We need a central authority that can represent the biodiversity, really critical.

TF: At the DCR JFK bridge project there were colliding interests making it ADA accessible, pressure on planting on that area. It incurred a lot of canopy loss. One of the challenges is getting advocates and specialists involved in projects to enforce the canopy protections. Should be addressed in practical ways.

TF: No representation for natural environment in the current city government structure. Fresh pond is managed by water department. What is the relationship of a child with nature going to be in the future? There are sociological way of designing the playground beyond using the sexiest play equipment. San Francisco and Austin have passed Children's Outdoor Bill of Rights, and we should consider a similar measure.

TF: Have a landscape architect on the planning and zoning boards.

TF: The report should include zoning changes in the recommendations section.

TF: City needs to look at restructuring, someone needs to advocate full

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time for trees and not have it spread amongst multiple entities.
How people would plug in their voices?

TF: City Hall has a door that says "Parks Commission" but that doesn't exist anymore.

TF: The new trees in Porter Sq at Lesley University where they moved the church. There is replanting but maintenance is mostly a lot of mulching. The City needs to work with private entities about practice, the current mulching is a terrible practice, there needs to be education and commitment. It is not about only replanting.

TF: The City needs to create sustainable maintenance guidelines. And there needs to be incentives to get results. If we don't give incentives to people, it won't happen. We want people to treat the city as an ecological place, not a place they make a profit.

TF: There could be a 10 year tax abatement for property owners who plant trees. People apply for a tree proposal, but we can't plant trees on private property if they won't take care.

All new street construction should require new trees, and we should identify candidate streets for conversion to one way.

We should require proof of no temperature intensification for all construction projects in the same way that the regulations require that we retain our own stormwater.

Open space requirements are generous already in the zoning ordinance. Greywater systems on buildings, drought scenarios, we waste so much water, need to rethink.

TF: As the representative of a large landowner, we're looking at ways to manage the campus as one whole system. Having overall goals and targets rather than individual tree plantings. The attrition is general and the opportunities to plant are random. We need a project in the first place in order to plant new trees and we don't often have new projects.

TF: I second that. We tend to look at trees on individual project basis, and we should be looking at it in a much more complex way, as a system.

TF: I worked in tree planting directly, you did a very broad

investigation. This is the only city doing this extent of investigation. It's exciting to see.

I think the important ideas are incentivizing new plantings, creating more partnerships, de-incentivizing cars or condensing car space. Where could streets prioritize pedestrians, like woonerfs do?

TF: There should be a required parking permit for residency. Giving parking spaces to trees.

TF: Regarding de-incentivizing car ownership, parking lots in California have a tree for every two spaces. We could replace spaces with trees.

TF: We could create non-profit partnerships, almost street by street, to engage the community. Might get more immediate results.

TF: Fruit trees would be appealing for people to encourage more planting

TF: As an ecologist not working in urban environments, it's encouraging that Dr Hayhoe's research is being used in practice beyond an academic setting. And also to see modeling being used is encouraging. I'd ask you to dream big. Surprise people, like a parking lot forest.

4. Public Comments:

Speaker 1: Relationship between retail and trees is missing. Why is it good for business or retail to have trees? They are the keepers of our trees. Trees on Mass Ave are not going too far.

Speaker 2: Thank you for all the work. It starts to give us leverage, there are other tree people and really good data. We at Green Cambridge are going to be using this data and what comes out of the plan for policy and culture, real positive change.

There is 900 acres of car storage that we can plant trees on. The city is building "Almost Complete Streets" because they don't have an ecological component. We should create true green streets.

I hope this project serves as inspiration for the rest of the state.

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Owen's closing remarks:

We are at the end of the beginning. We understand that trees are living infrastructure and we have policy direction now to maximize tree plantings in our projects. And the policy of not planting in front of certain properties needs to go away. We have an imperfect transit system that creates demand for parking and the city has sidewalks that are narrow plus very active bike lanes. We need collectively to get everyone together and we can organize workshops. We need to tackle the question of whether the moratorium de-incentivizes tree plantings. We need to empower the community and create trust. Reed Hilderbrand will continue to be involved through the Resilient Zoning process, and they will be issuing a green paper instead of a white paper that we will share with you.