GREENING
THE GATEWAY
CITIES

Tree planting and retention for demand-side energy use reduction

Overview

- The Massachusetts Office of Energy and Environmental Affairs (EEA) is developing innovative strategies to reduce energy use in homes through the benefits gained from increased urban tree canopy

- This includes planting new trees or retaining existing trees to save energy

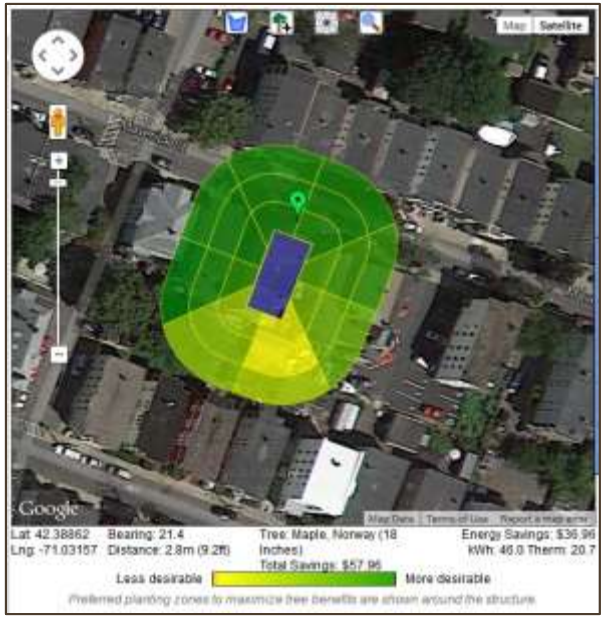
- In low-income neighborhoods in the state's Gateway Cities, the strategy is focused on planting new trees with a goal of increasing tree canopy by 10% in the target neighborhoods

- In other neighborhoods and communities, programs to retain existing mature canopy threatened by new construction or redevelopment can have similar benefits

Overview continued

- Both programs are based on research that shows tree canopy brings greatest benefits when established over a **neighborhood area**, by lowering wind speeds and reducing summertime air temperature.

- For every 1% increase in tree canopy above a minimum 10% canopy cover, the energy benefit is **1.9% reduction in energy for cooling**, and **1.1% reduction in energy for heating**.

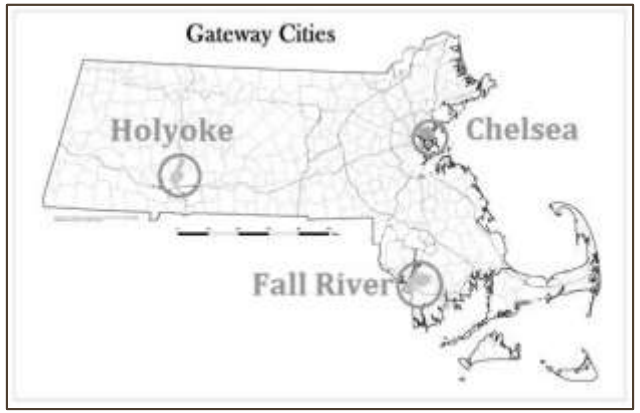


- This benefit is experienced by all households in a neighborhood, not just the ones with trees directly adjacent.

What are Gateway Cities?

- The General Laws of Massachusetts, Chapter 23A, Section 3A defines **Gateway Cities** as: "a municipality with a population greater than 35,000 and less than 250,000, a median household income below the commonwealth's average and a rate of educational attainment of a bachelor's degree or above that is below the commonwealth's average."
- There are currently 26 Gateway Cities in the state. Initial piloting locations are:

Chelsea: Spring 2014
Holyoke: Fall 2014
Fall River: Spring 2015



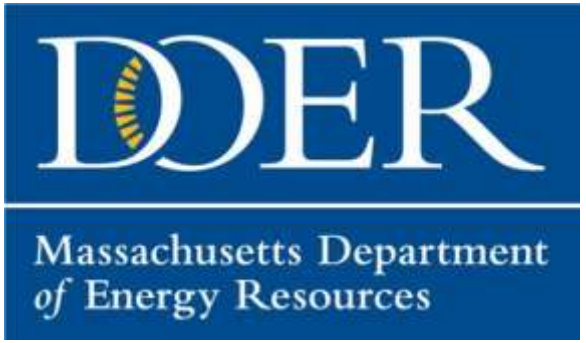
Why Gateway Cities?

- Older, less insulated housing benefits the most from shading and reduced wind speeds.
- This program targets the parts of Gateway Cities that have lower tree canopy, older housing stock, higher wind speeds, and a larger renter population.
- Study areas are set up to track the energy savings of local residents provided by the trees over time.
- Plantings will mostly occur in Environmental Justice neighborhoods.

Partners


EXECUTIVE OFFICE of ENERGY
& ENVIRONMENTAL AFFAIRS


dcr
Massachusetts


DOER
Massachusetts Department
of Energy Resources


dhcd
Massachusetts


CHELSEA
INCORPORATED 1824
A TOWN 1739
A CITY


INDUSTRIA ET COPIA
CIVIC REGIMINE DONATA 1873
HOLYOKE


UMASS
AMHERST


1887
CLARK
UNIVERSITY


Chelsea Collaborative


NUESTRAS
RAICES


FALL RIVER

A new program with old concepts

When you want to beat the heat, find some shade!

Technology?

If you were told there was a machine that can:

- Clean the Air
- Clean the Water
- Reduce your electric bill
- Reduce your heating bill
- Increase your property value
- Improve your health

WOULD YOU WANT ONE???

Trees… all that and then some

Hearts and Minds

- Door to door outreach
- One-on-one site visits with DCR Urban Foresters to select trees.

Just Add Water

- Property owners sign 2 year tree watering commitment
- DCR leaves tree care literature, conducts follow-up visits

Depreciation vs. Appreciation

- Green infrastructure **appreciates** in value over time
- Gray infrastructure **does not**

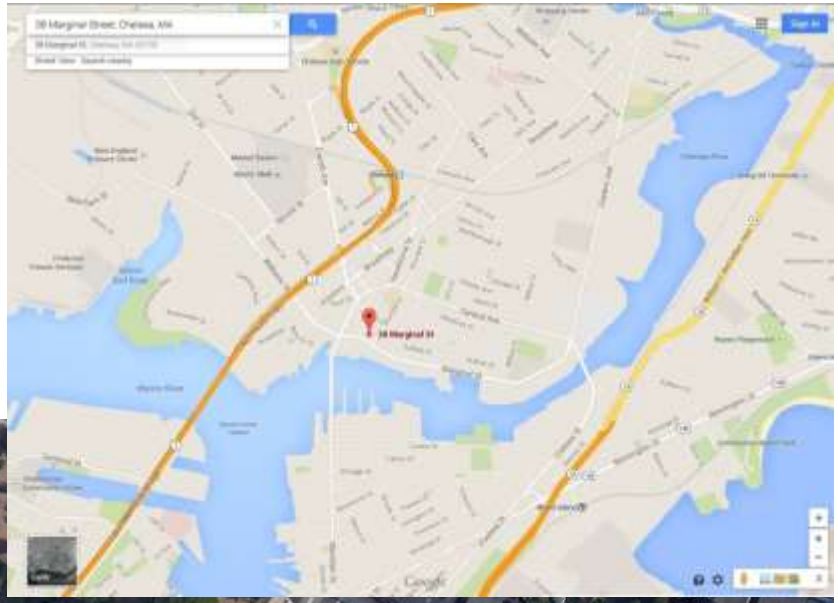
Reasons to Plant Trees

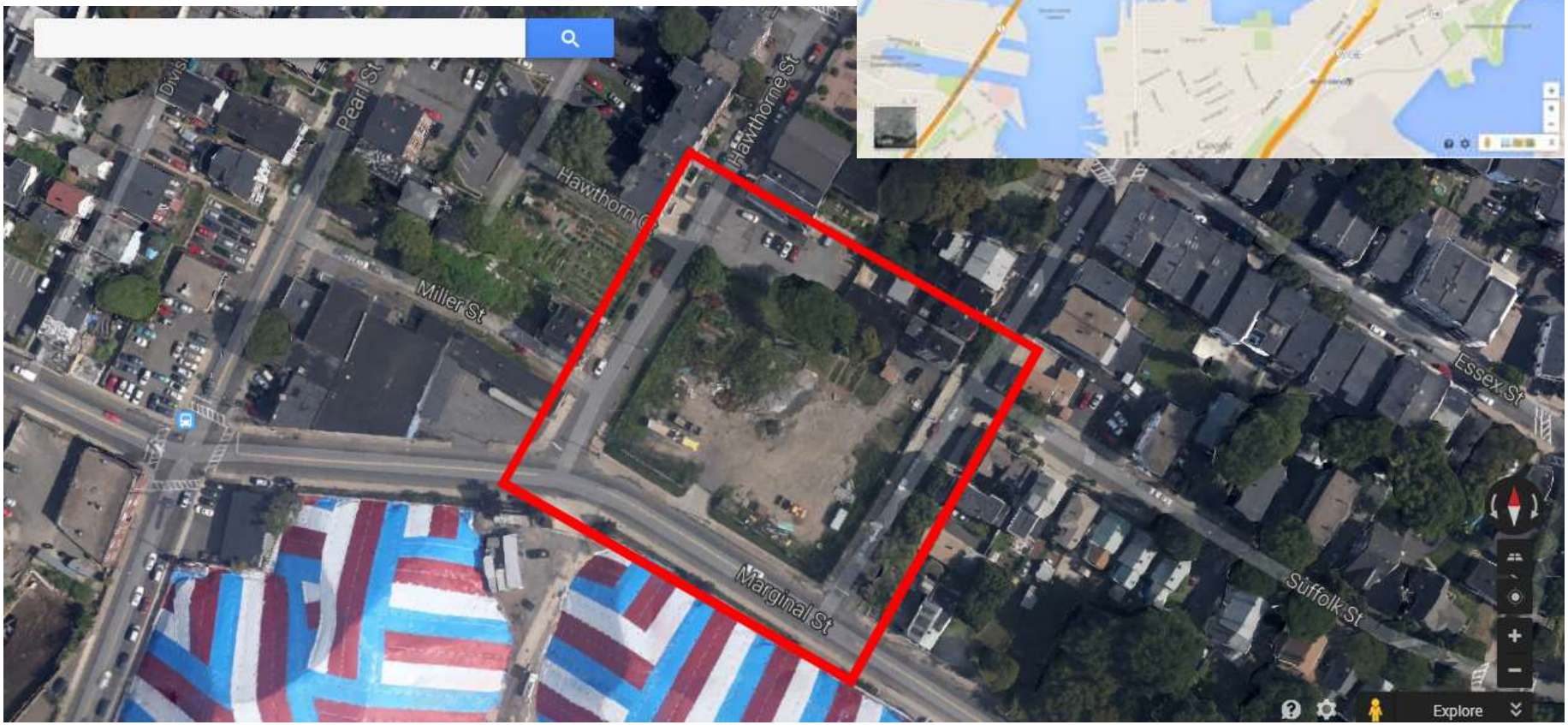
- Tree canopy in urban areas directly shades homes
- Reduces the Urban Heat Island effect by reducing summer air temperatures as much as 4°F and surface temperatures by 30°F
- Reduces / intercepts airborne pollutants & parti

- Urban tree canopy reduces heating and cooling costs for residents and businesses
- Increases road pavement / gray infrastructure lifetime
- Reduces storm water runoff and demand on Combined Sewer Overflows (CSO)

Watershed Benefits

- 38 Marginal St, Chelsea





Neighborhood Level Benefits

Other Water Quality Benefits

- USFS support from a Water Quality Grant to support the outreach efforts of GGC non-profit partners
- Take a tree, get a rain barrel!
- Roughly 300 rain barrels per community

- Potential collaboration in Fall River to reduce property owner CSO fee through tree planting
- Stormwater tree pits in development

Mandates to Plant Trees

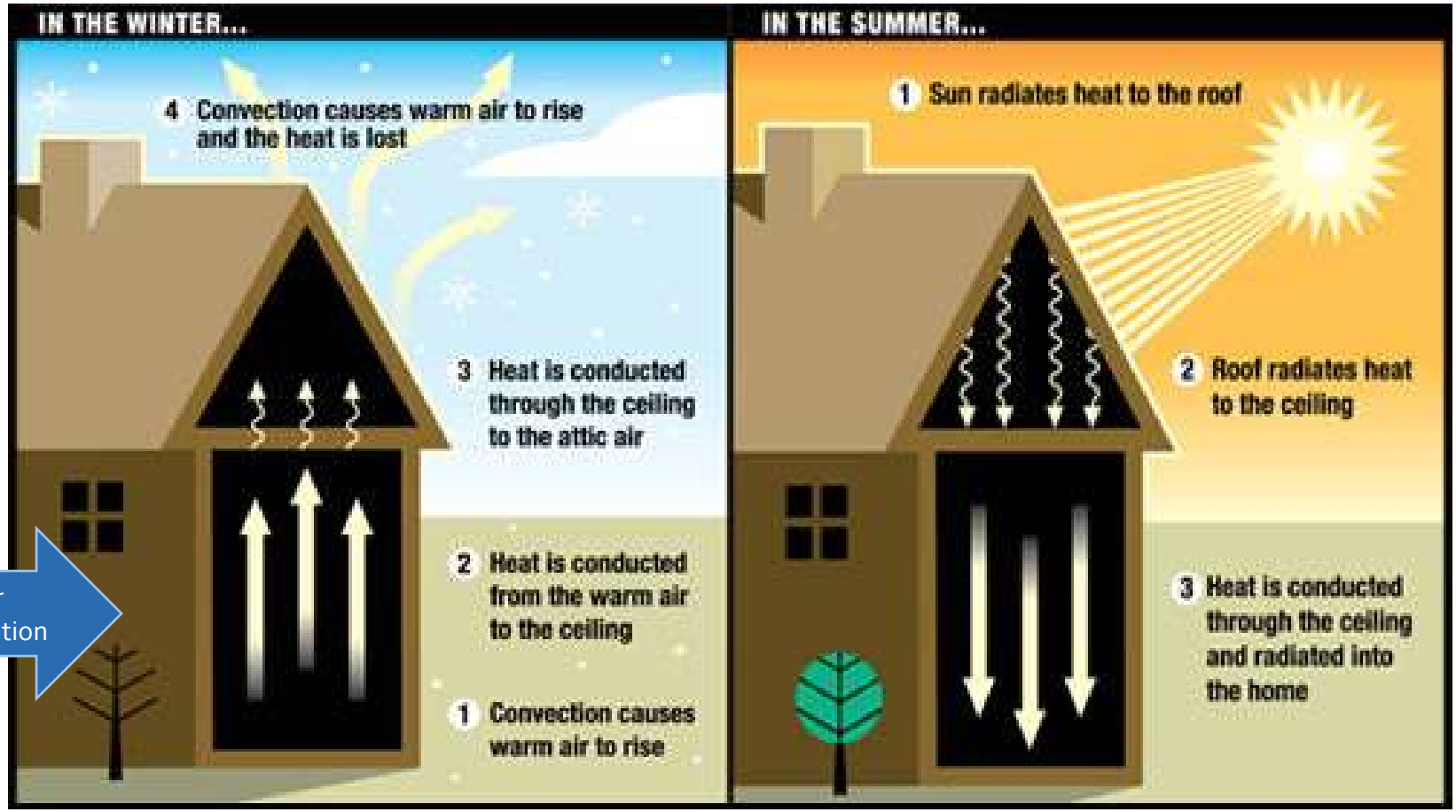
- Green Communities Act

  Planting trees is the best way to "Go Green!" GCA requires all cost-effective energy efficiency measures be adopted before construction of new power plants.

- Global Warming Solutions Act:

  The Commonwealth is committed to reducing its CO_2 emission levels by 25% by 2020 and 80% by 2050. Tree planting is a long-term demand reduction strategy.

Reasons for heating and cooling

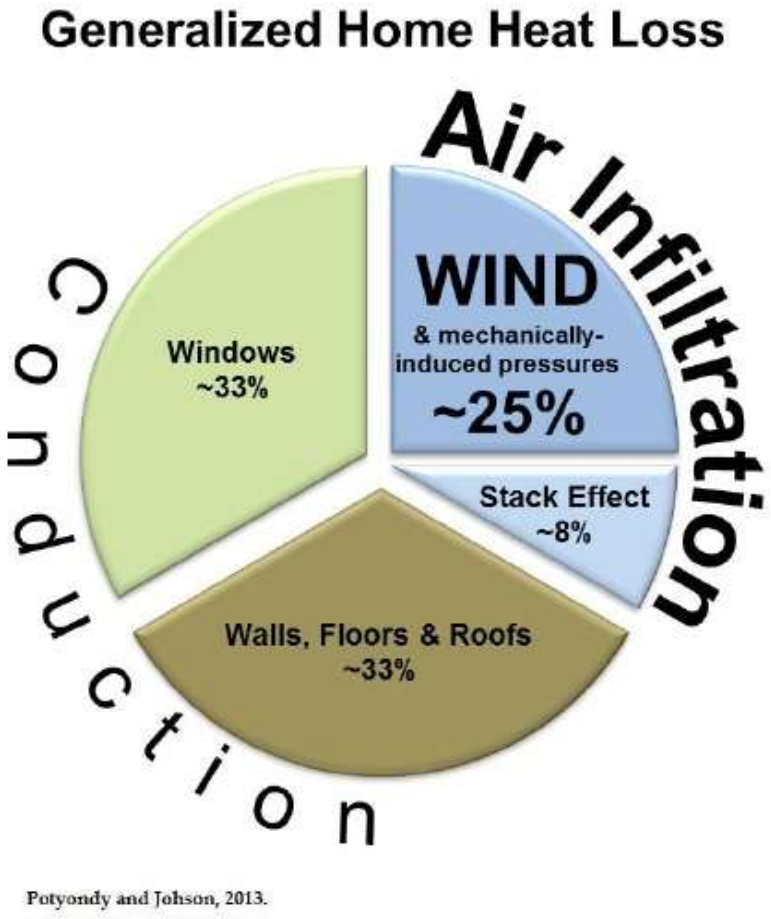


Air infiltration

Wind increases convection

Shade can decrease conduction

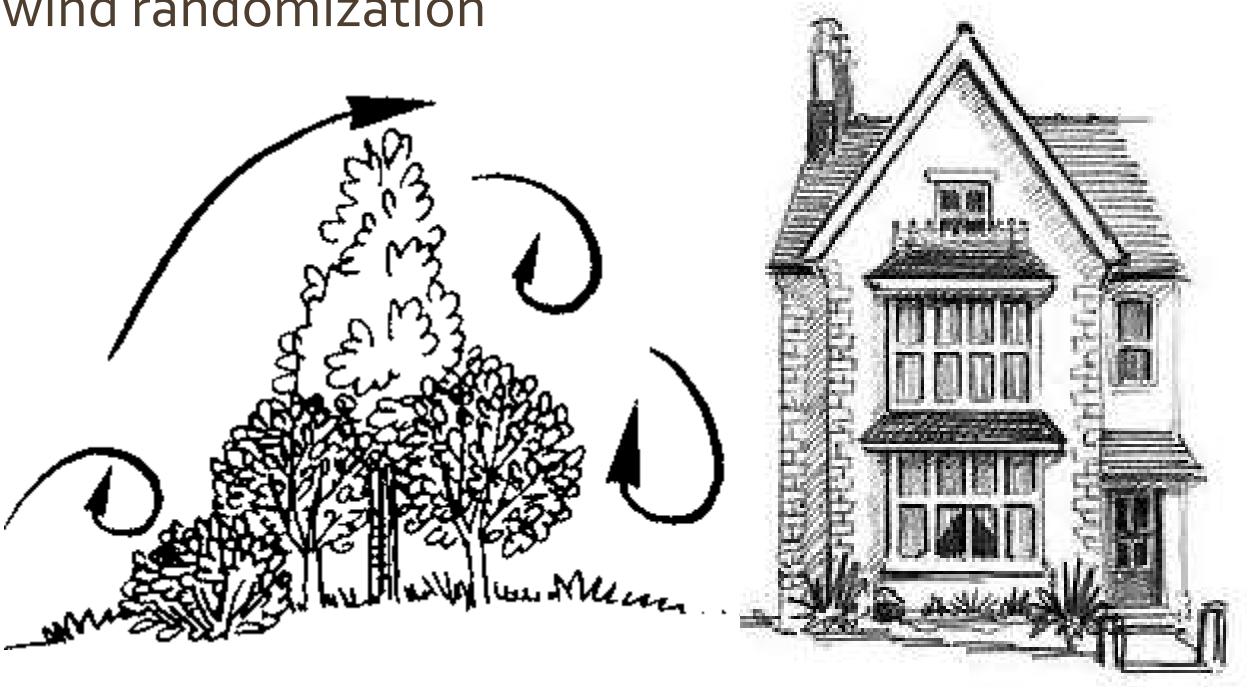
Wind speeds


Generalized Home Heat Loss
Air Infiltration
WIND
& mechanically-induced pressures
~25%
Stack Effect
~8%
Conduction
Windows
~33%
Walls, Floors & Roofs
~33%
Potyondy and Johson, 2013.

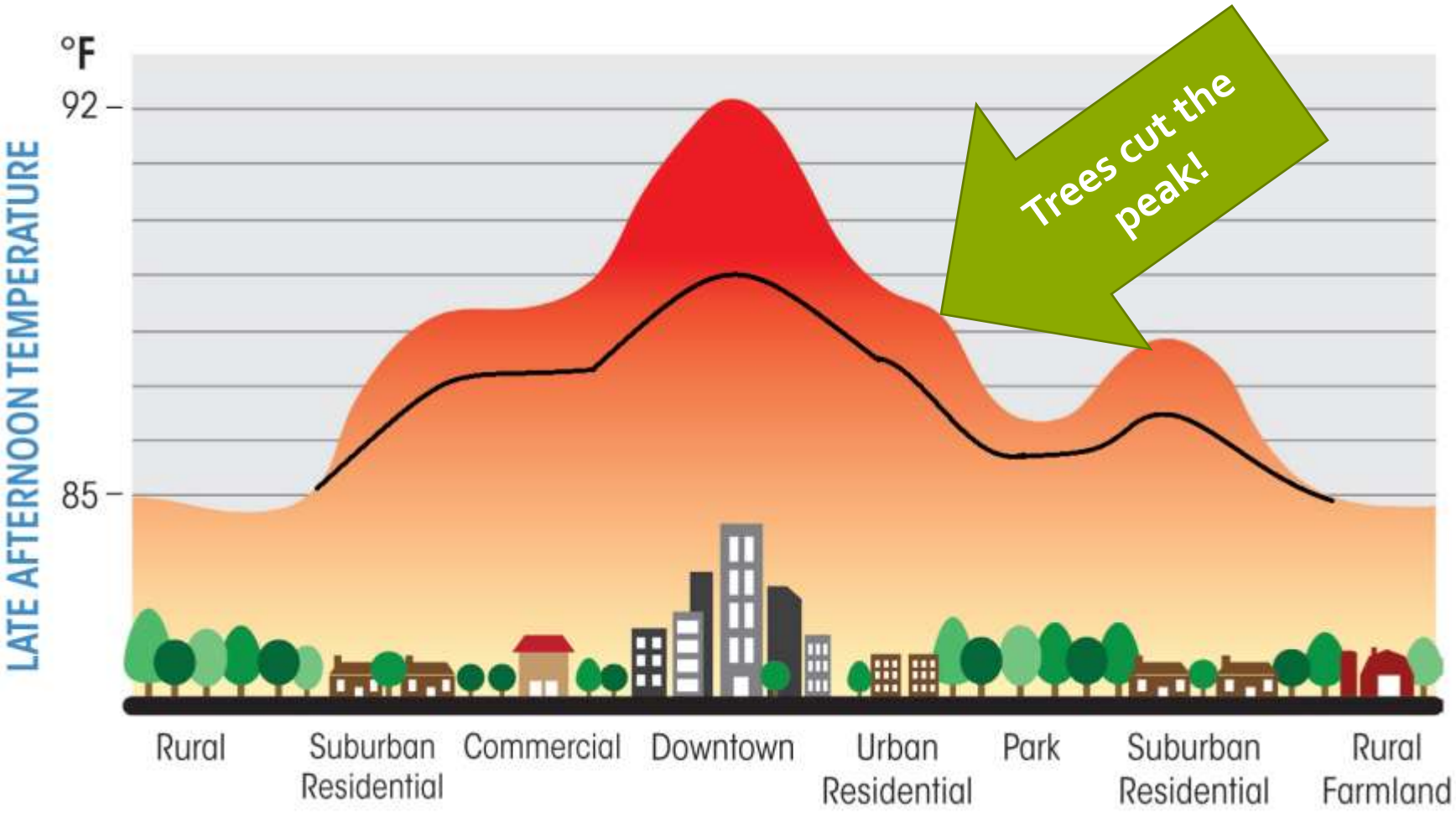
How trees save energy

- Direct shade, reduction UHI and ambient air temps, reduction of conductive heat gain

- wind randomization



Urban Heat Island: the peak in peak load



Background

- Tree canopy brings greatest benefits when established over a **neighborhood area**, by lowering wind speeds, providing shade, and reducing summertime air temperature.

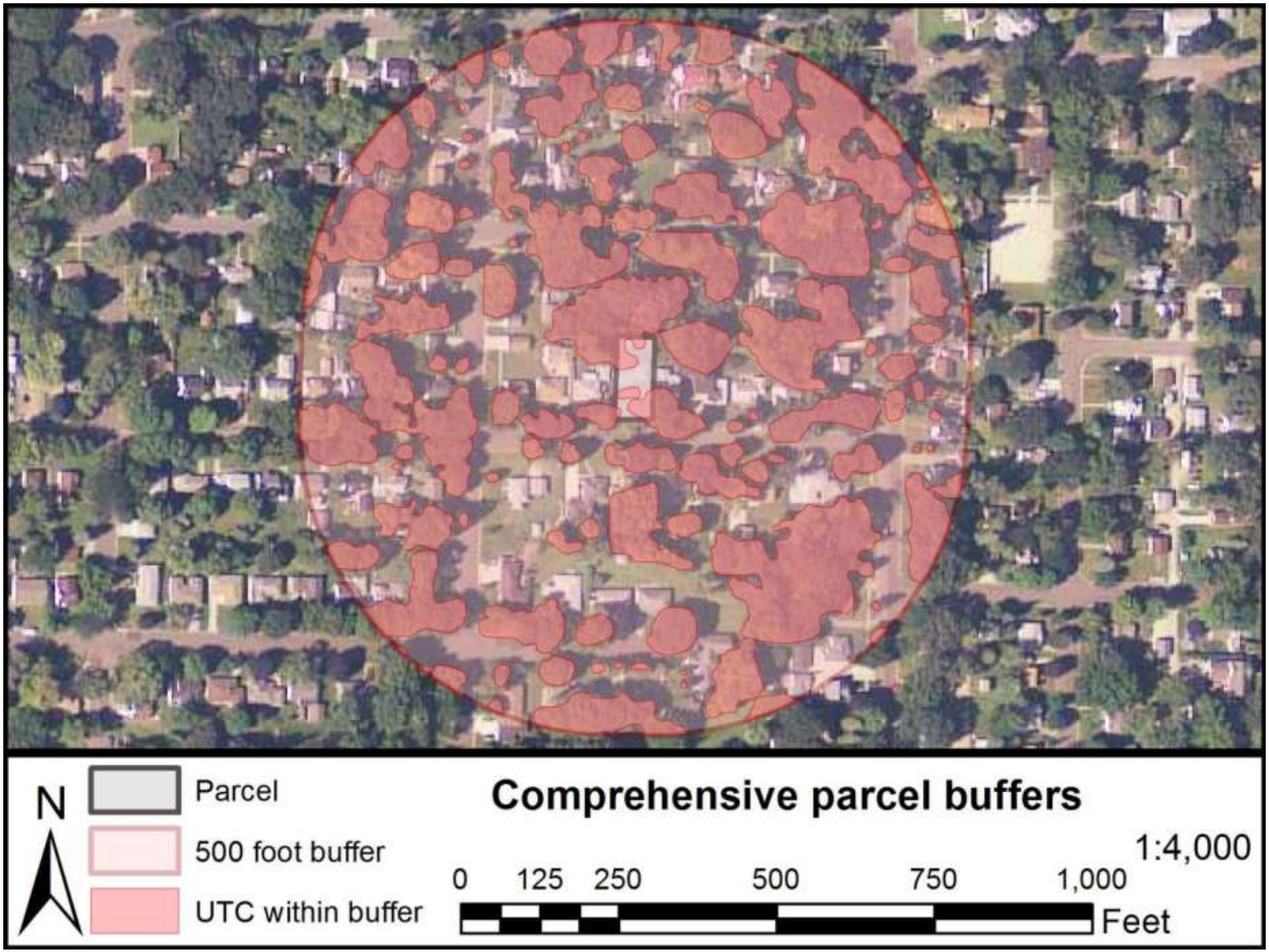
Canopy increase : energy savings

HEAT SAVINGS 1:1.1%

COOLING SAVINGS 1:1.9%

- **The whole neighborhood benefits,** not just homes with trees directly adjacent.

Neighborhood impacts: 500 ft parcel buffer



Sudden loss of mature canopy trees

Worcester

40% increase in electricity usage during cooling season

Springfield

66% increase in wind speed (causes heat loss in winter)

Greendale neighborhood, Worcester, MA:

2007: 40% cover

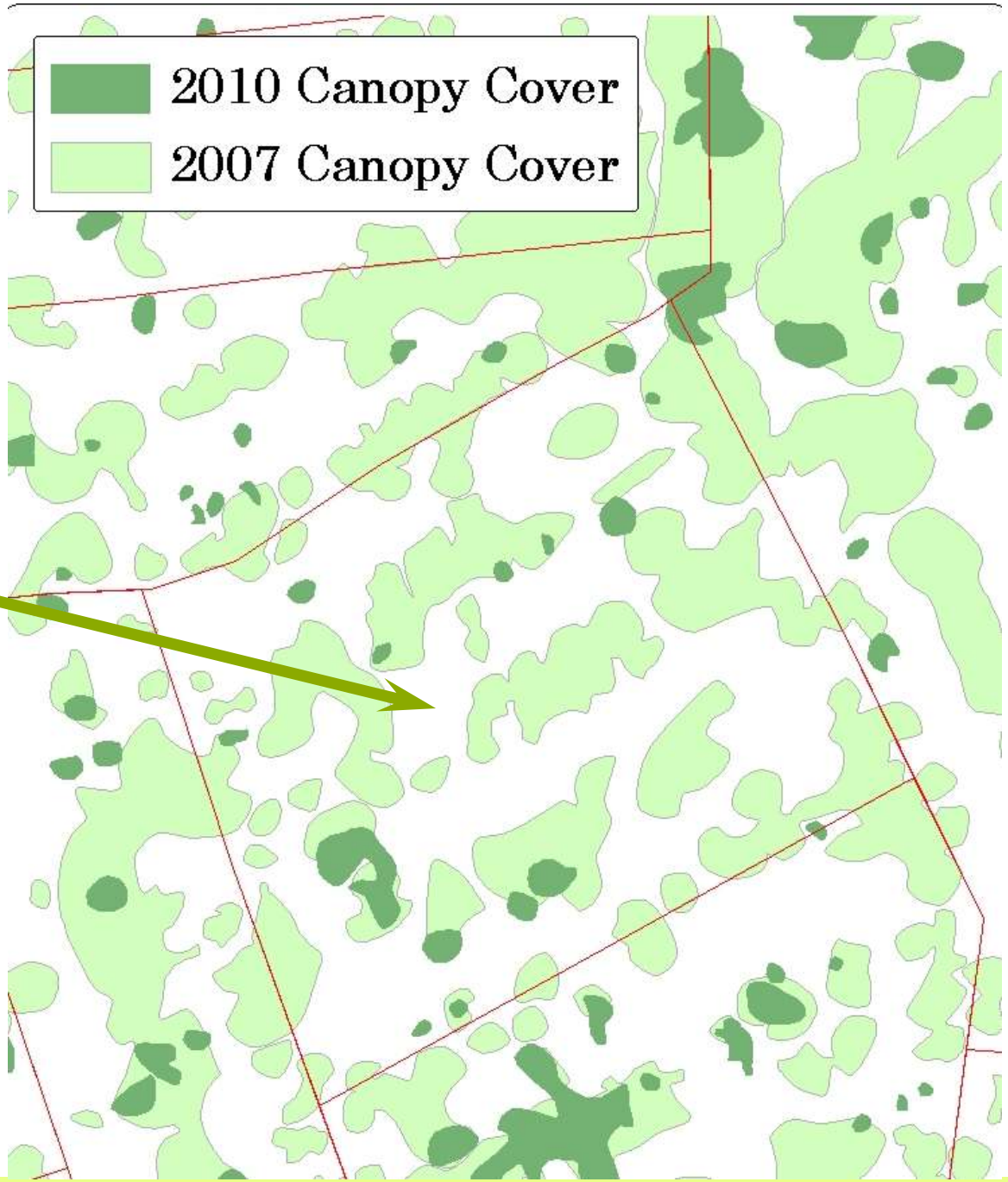
-

2010: 4 % cover

37% increase in summer electricity use

S. Nye

Block 11



2007

2010

Granville St. before tree removal

After tree removal

4 years after replanting

Goals of GGC Program

- 15,000 trees planted in the next three years
- Focusing on high density urban neighborhoods, planting on average 10 trees per acre. This will increase canopy by 1% in eight years, and 10% in 30 years

Growth Projections

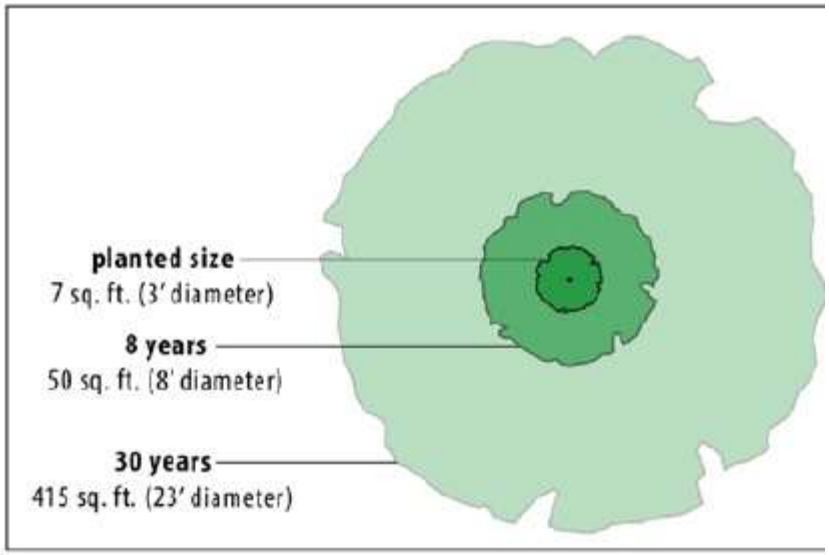


Figure 1. Average Tree Canopy Areas

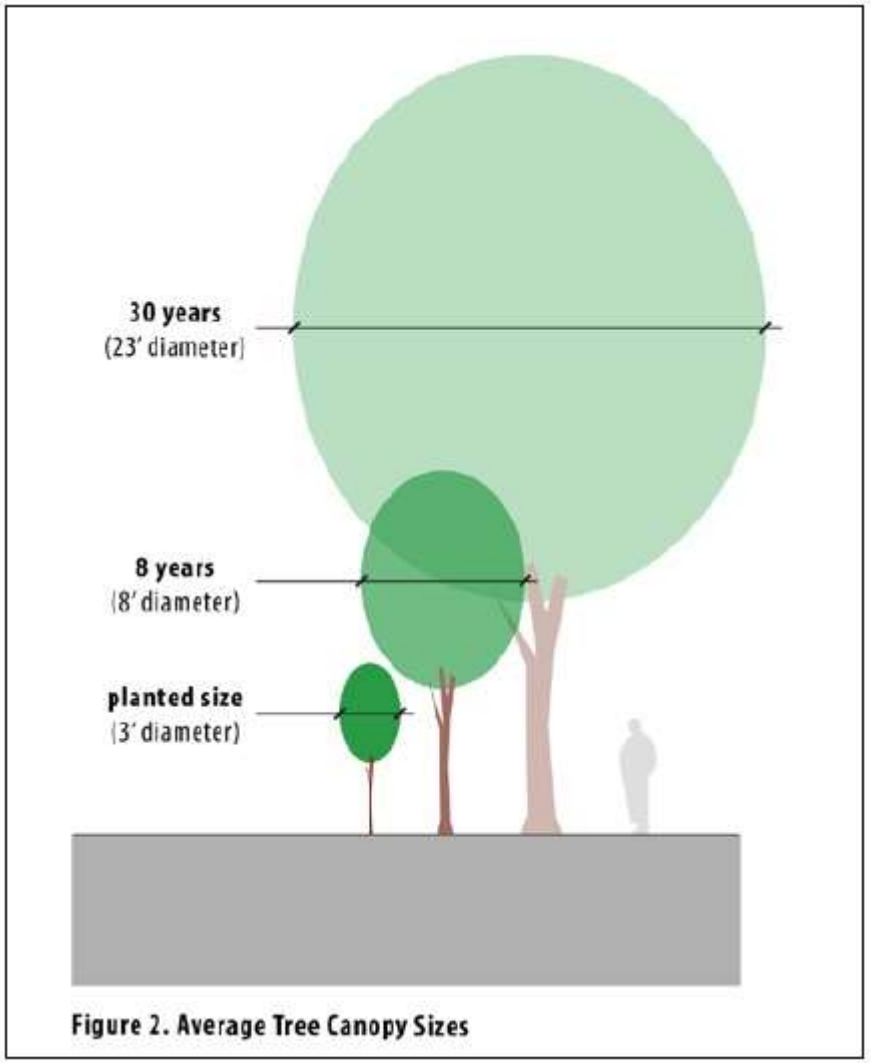


Figure 2. Average Tree Canopy Sizes

Greening the Gateway Cities

10 trees per acre= 1% in 8 years, 10% in 30 years

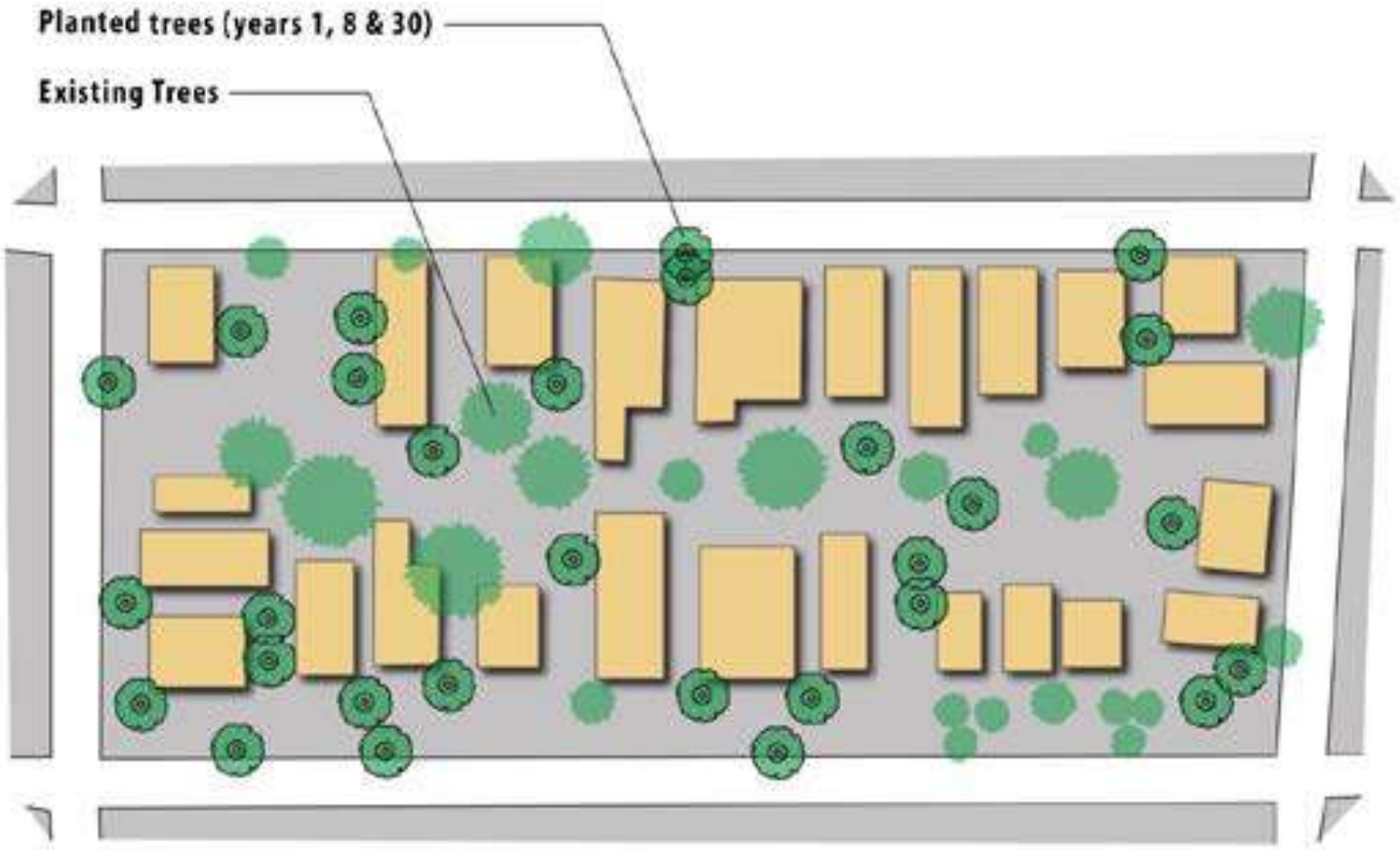


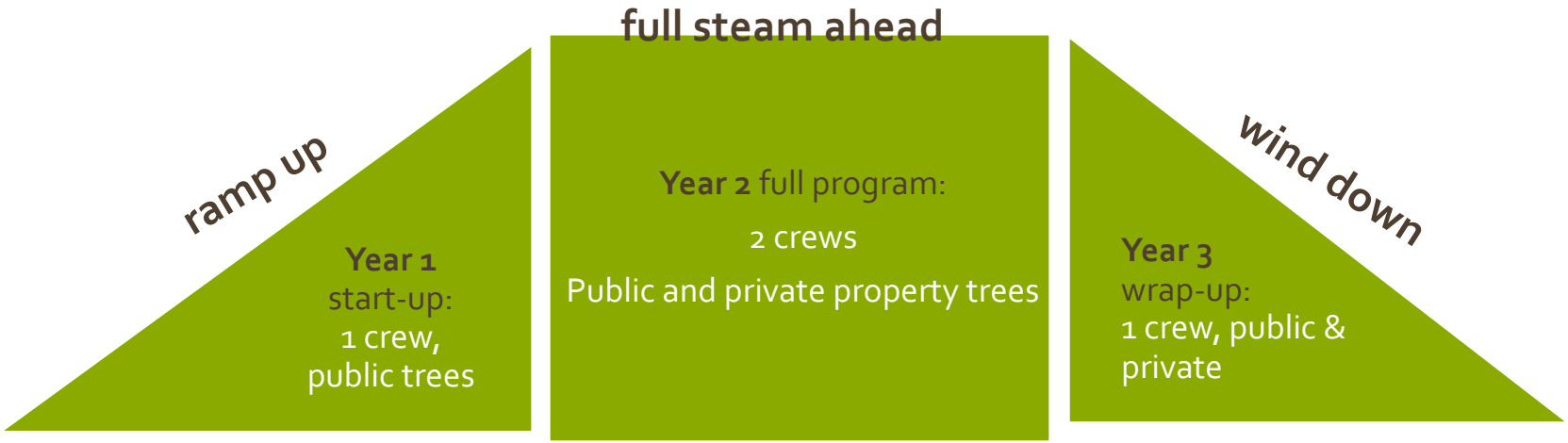
Figure 4. Tree Plantings on a Representative Block (approx. 3 acres)

Greening the Gateway Cities: Savings

Projected Households and Energy Savings per Acre				
Lot Size	Housing type	# of lots	# of HH	Savings at 1% increase
1/6 A	2&3F	5	13	$267.75
1/8A	2&3F	7	17	$357.00
Varies	**2&3F**	**8**	**20**	**$420.00**
1/10A	2&3F	9	21	$446.25
1/12A	2&3F	10	26	$535.50

Tree planting logistics

- Overall administration: DCR Urban Forestry
- Planting: DCR, municipal, contract crews, some community groups
- Outreach: community groups, DCR, municipal committees,



Tree planting crews – Chelsea, MA

Tree planting crews – Holyoke, MA

Benefits, benefits, more benefits…

- Once trees are established, they continue to grow, and the energy benefits increase through life of the tree.
- GGC program reaches areas that have been the hardest to reach with other energy saving programs.
- GGC program works with municipal partners and community groups, and directly contacts property owners.

DCR Urban & Community Forestry

- **Urban & Community Forestry Challenge Grants:**
- http://www.mass.gov/eea/agencies/dcr/conservation/forestry-and-fire-control/urban-and-community-forestry-challenge-grants.html
- With support from the USDA Forest Service, DCR now offers 50-50 matching grants to municipalities and non-profit groups in Massachusetts communities of all sizes for the purpose of **building local capacity** for excellent urban and community forestry at the local and regional level.
- Professional management (planting, protection and maintenance) of a municipality's public tree resources in partnership with residents and community institutions
- Enhance the region's "green infrastructure" in order to maximize social, economic and environmental quality
- Full proposals are due twice a year, May 1 and November 1
- Grant awards range from $1,000 to $30,000

Challenge Grants Con't

- Building and Strengthening Citizen Advocacy and Action Organizations
- Developing and Adopting Tree and Forest Ordinances and Policies
- Securing or Training Professional Staff
- Develop and Implement Urban Forestry Management Plan
- Attain Tree City USA Award
- Completing Strategic Community Tree Plantings and "Heritage" Tree Care Projects
- Other Projects!

DCR Urban & Community Forestry

- For more info contact:

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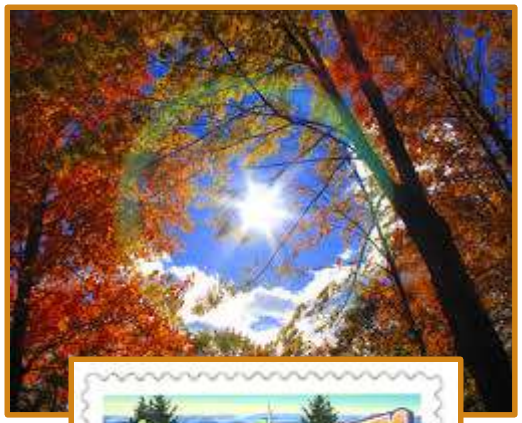
Coming soon to a city near you…



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