

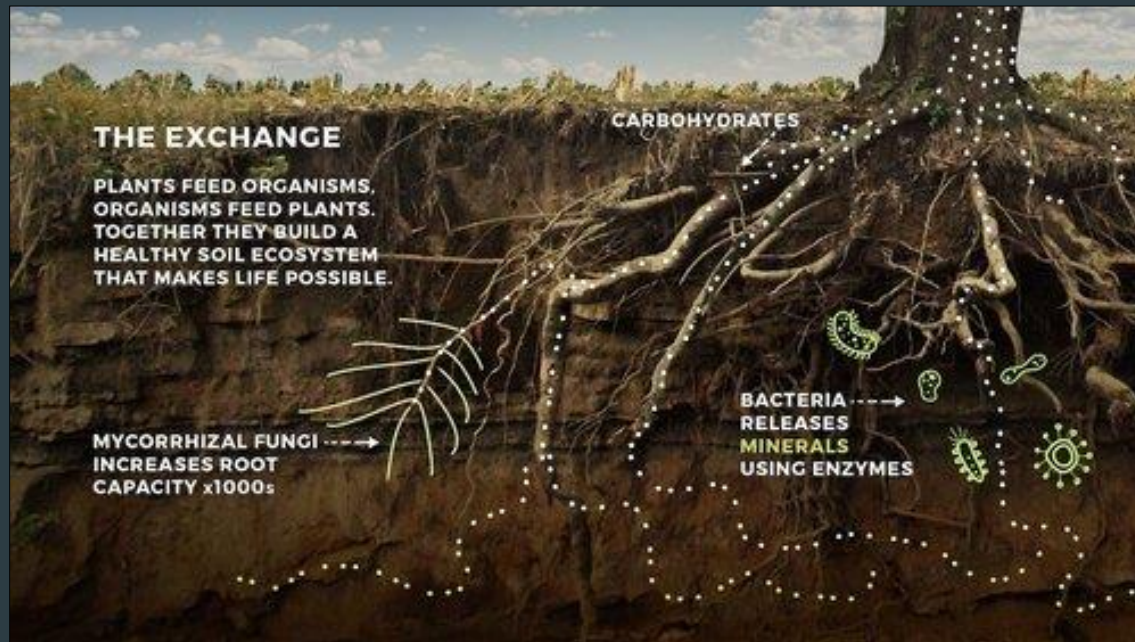
Wolcott Avenue Project

Proposed Methodology

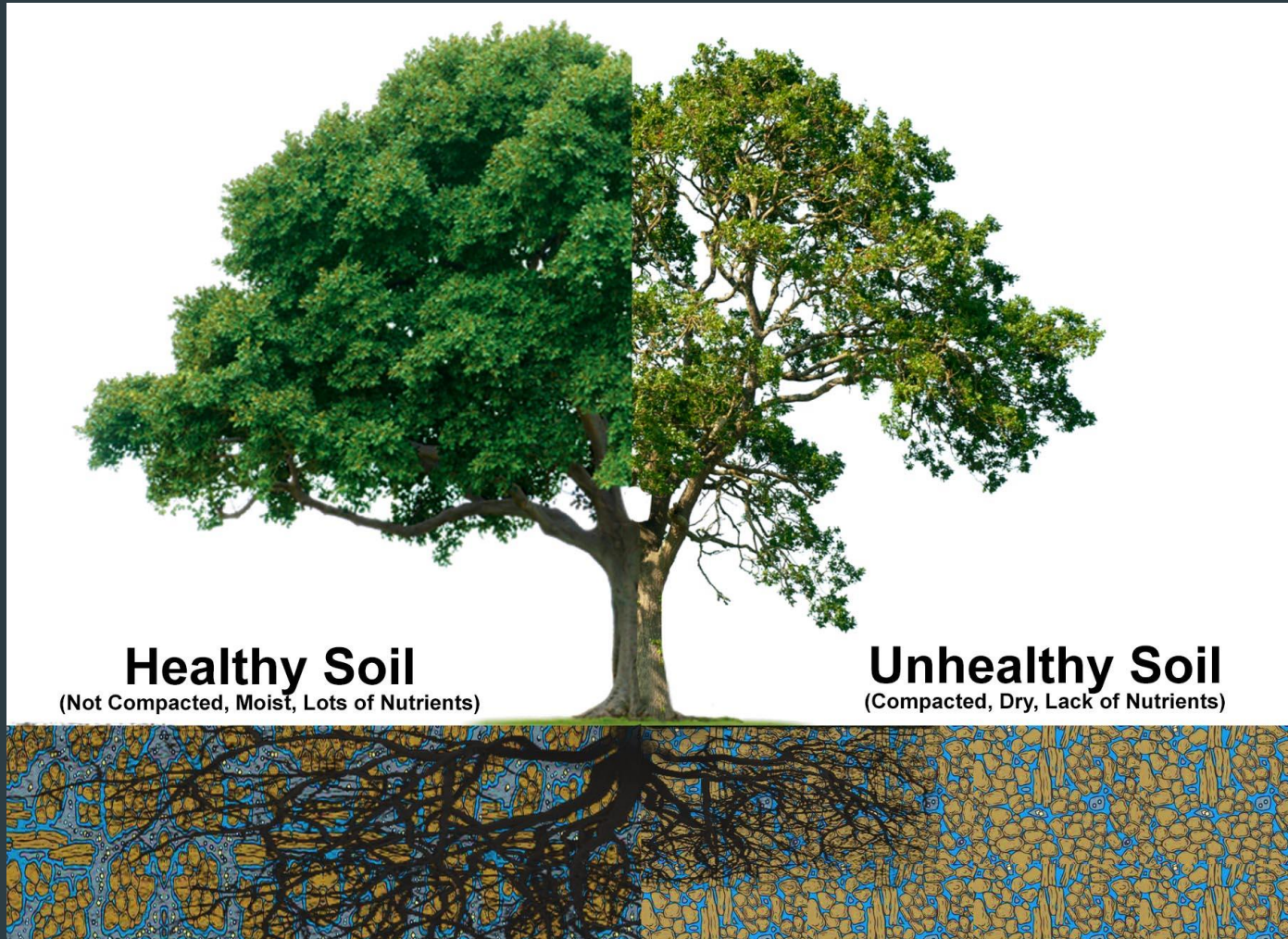
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Healthy Soil is Essential - maximize soil biology

Healthy soil is an ecosystem. Trees participate in complex chemical and biological interactions within this system.



Healthy Soil is Essential - minimize soil compaction



Compaction compromises a healthy soil ecosystem

Soil without biological life is just dirt

Healthy Soil is Essential - maximize healthy soil volume

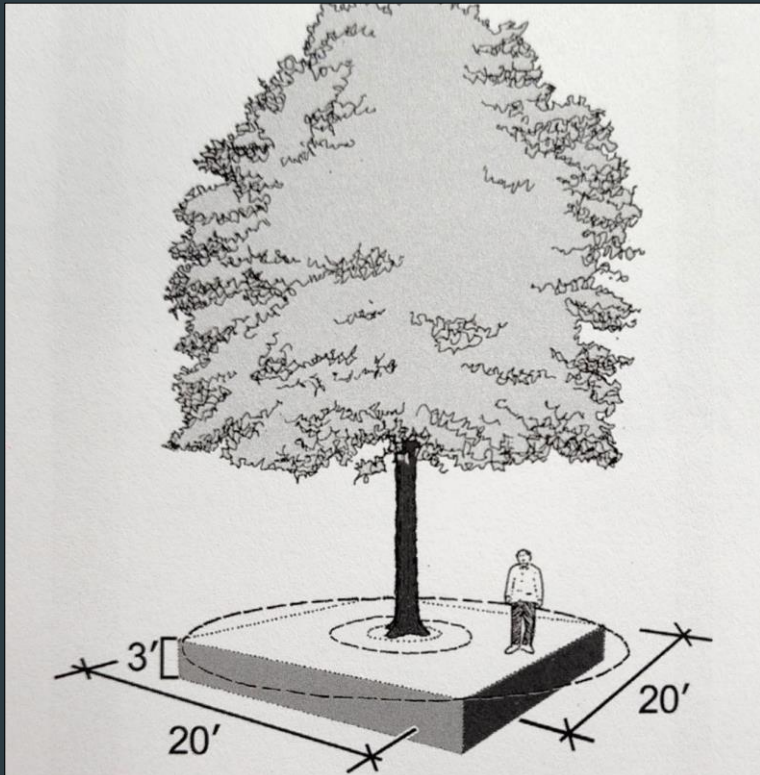


Figure 2.2.2. Minimum tree planting space. This is not to say that smaller spaces cannot be designed, only to recognize that smaller spaces are not optimum.

SOIL VOLUME REQUIREMENTS

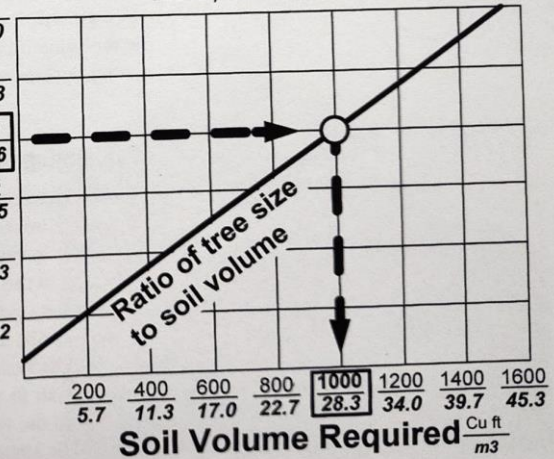
The volume of soil available for rooting must be large enough to support the intended tree size. Calculate the total usable soil volume using Table 2.4.1. The table assumes a loam soil with good drainage and no irrigation in a climate zone that receives adequate rainfall, 30 inches or more per year, to grow trees without supplemental irrigation or fertilizer. Adding irrigation or fertilizer will increase the tree size prediction for a given volume of soil. There is no data to support a specific tree size increase as a result of adding irrigation or fertilizer, but it may be as much as a 100 percent increase. These trees are then dependent on the continuation of high levels of maintenance and may go into a steep decline if maintenance practices are stopped or cut back.

Table 2.4.1. Tree size to soil volume relationships (Urban 1992).

Ultimate tree size

Crown Spread	DBH-Trunk Diameter
Sq Ft	Inch
m ²	mm
1200	24
111	610
1000	20
92	508
800	16
74	406
550	12
51	305
350	8
32	203
150	4
14	102

Example: A 16 inch/406 mm diameter tree requires 1000 cu ft/28.3 m³ of soil.

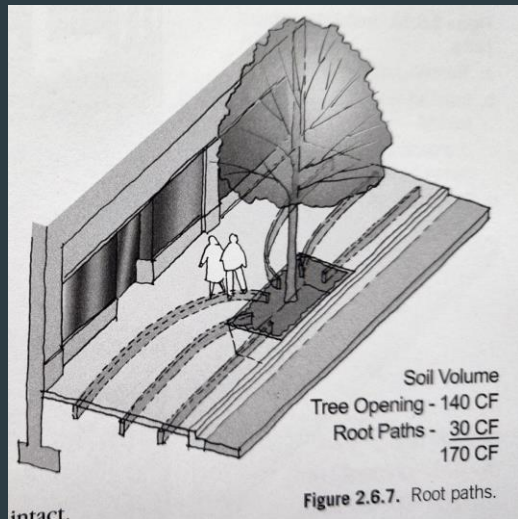


Ratio of tree size to tree volume, but this depends on conditions
City of Toronto has adopted minimum volume of 1000cf

Healthy Soil is Essential - maximize strategies



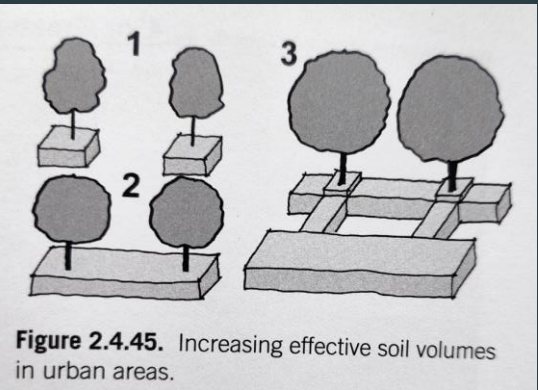
The standard (but entirely inadequate) city tree pit. It's not surprising that trees in these situations have shorter lifespans.



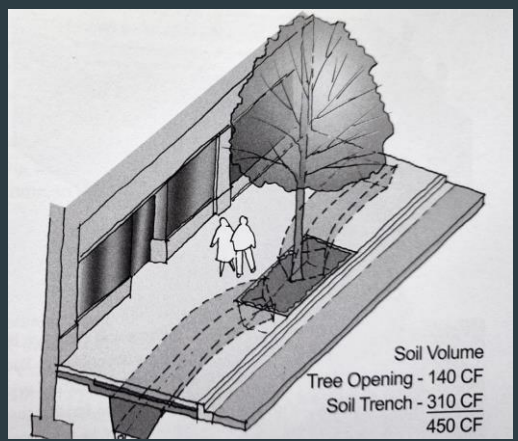
Underground Structural Cells



Bump-outs (also consider bump-outs where sidewalk section abuts low-speed road so that tree can access ROW and front lawn space without sidewalk between?)



Surface Connect



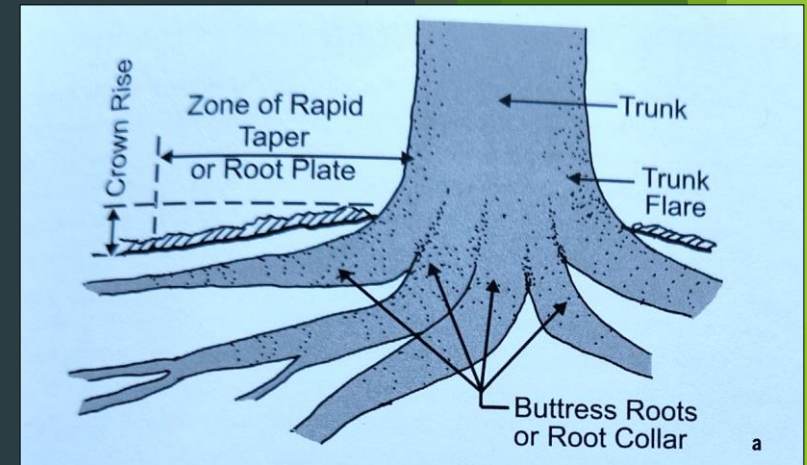
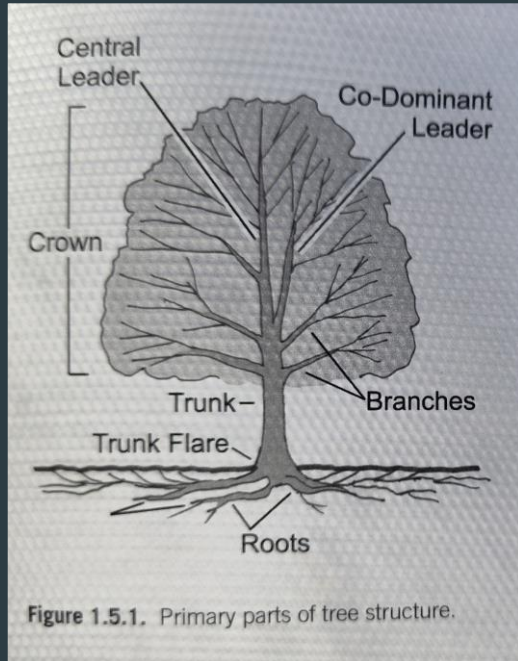
Trench Connect

Healthy Soil is Essential - maximize strategies



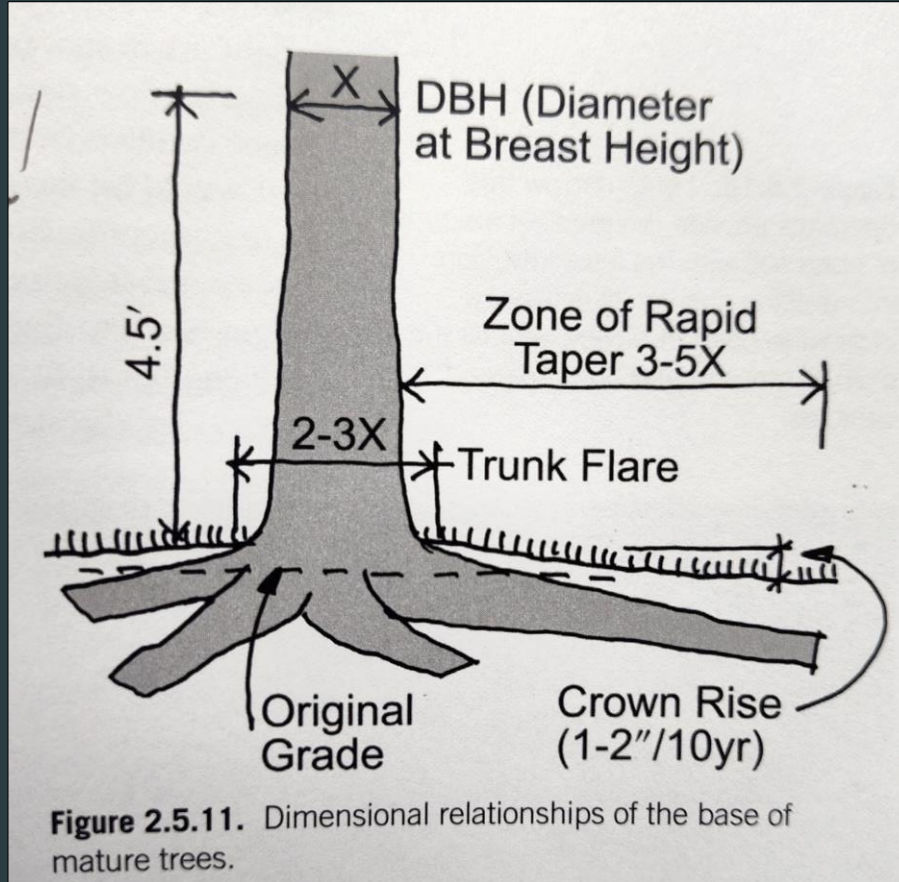
Example only: Before construction, if proven helpful could consider selected locations where mitigation is installed under the sidewalk to facilitate roots accessing soil in front lawns (but need adequate room for root plate, which is not provided here)

Roots & Root Plate are critical - maximize structure, support, resilience



A tree is a vertical cantilever. The tree stabilizes itself with the root plate and root system.

Roots are critical - maximize space for the root plate



If: 20" DBH = X

Trunk Flare

$2 * 20'' = 3' \pm$ diameter

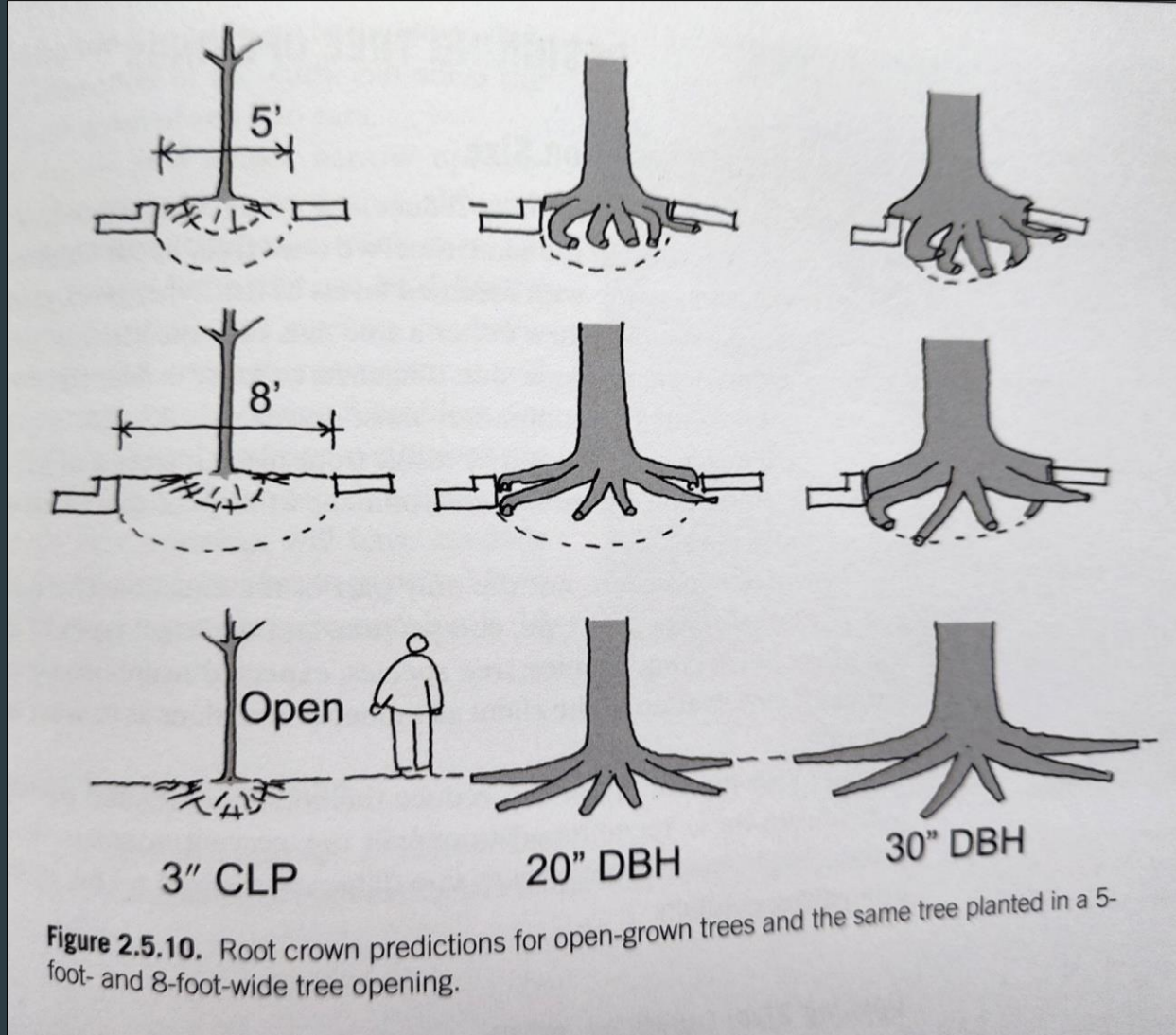
$3 * 20'' = 5'$ diameter

Zone of Rapid Taper

$3 * 20'' = 5'$ radius

$5 * 20'' = 8' \pm$ radius

Roots are critical - maximize space for the root plate



When planting space is smaller than the Zone of Taper

Roots & Root Plate are critical - trees grow and interact with environment

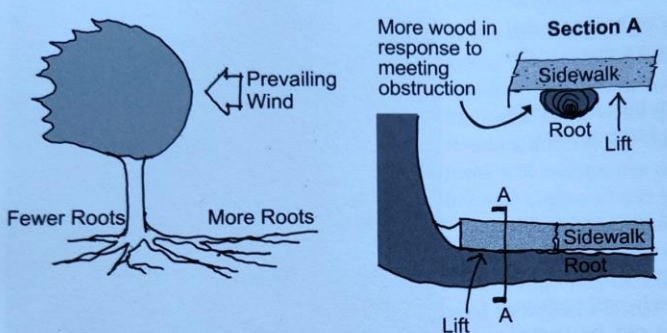
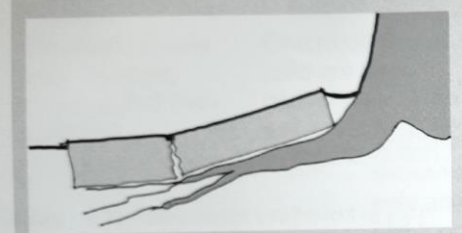


Figure 1.5.31. Root responses to load stress.

Section A
More wood in response to meeting obstruction
Sidewalk
Root
Lift

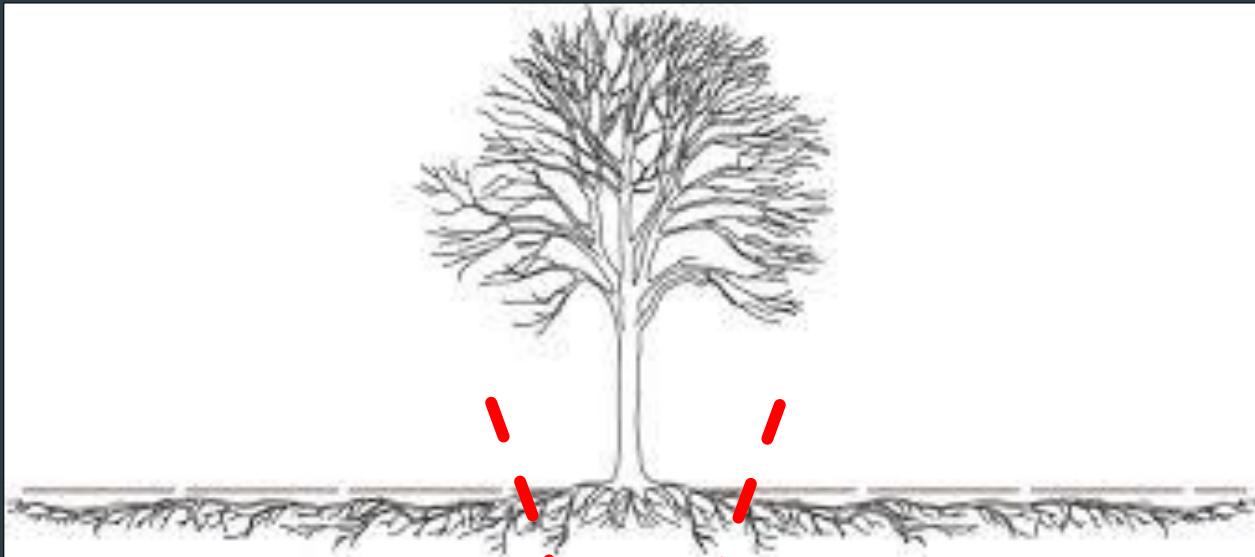
Root Response to Loading Forces
Roots respond to different load forces and form reaction wood. Roots in contact with an object, such as a curb or the underside of paving, will build up larger amounts of callus in response to the pressure of the object. The wood may start to wrap around the object and can eventually graft around it.
A tree adds more or stronger roots in the direction of a force. If wind regularly comes from one direction, larger roots will grow on the upwind side. If a tree is leaning or becoming gradually heavier on one side due to shading or loss of branches, more roots will develop in the opposite direction of the lean. When designing rooting spaces and making decisions about construction around large existing trees, this principle must be taken into account.



The Root Under the Pavement
The space between pavement and its compacted subgrade would not seem like a good place for a root, but roots grow there anyway. As the subgrade soil dries, it shrinks slightly, leaving a small air space between the underside of the paving and the soil. On hot days, water condenses on the underside of the pavement, and the paving allows little of this water to evaporate. Roots can take advantage of this situation of air and water, and grow into this space. Once roots find a good growing environment beyond the paving, they will grow larger, eventually lifting the pavement above.



Nursery materials are not always ideal -
ball and burlap



Nursery materials are not always ideal - *ball and burlap*



I grabbed this example from online source, but have experienced this several times

Nursery materials are not always ideal - *container grown*

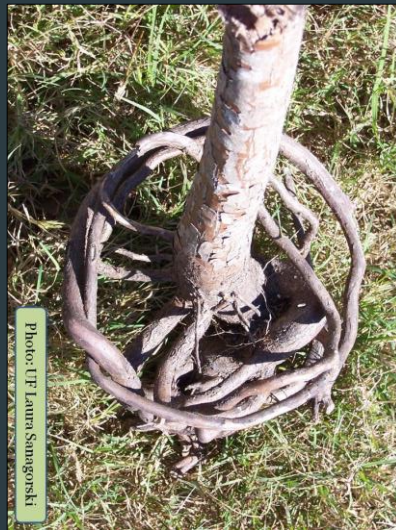


Photo: UF Laura Sanagosti



Smaller can be better- *seedlings and bare root*



Smaller can be better - *seedlings and bare root can work well on front lawns*

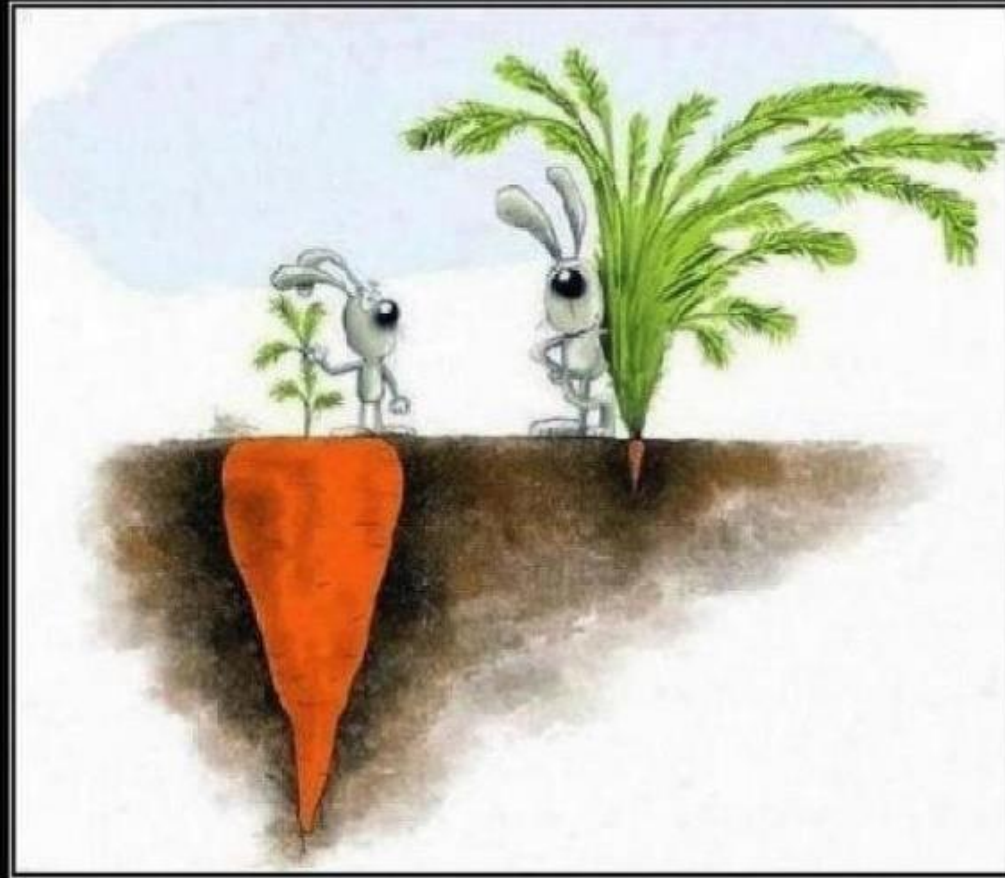


Can collect seeds from local native specimens and germinate for genetic memory bank



Tree is currently at least 12' tall (growth about 4' per year)

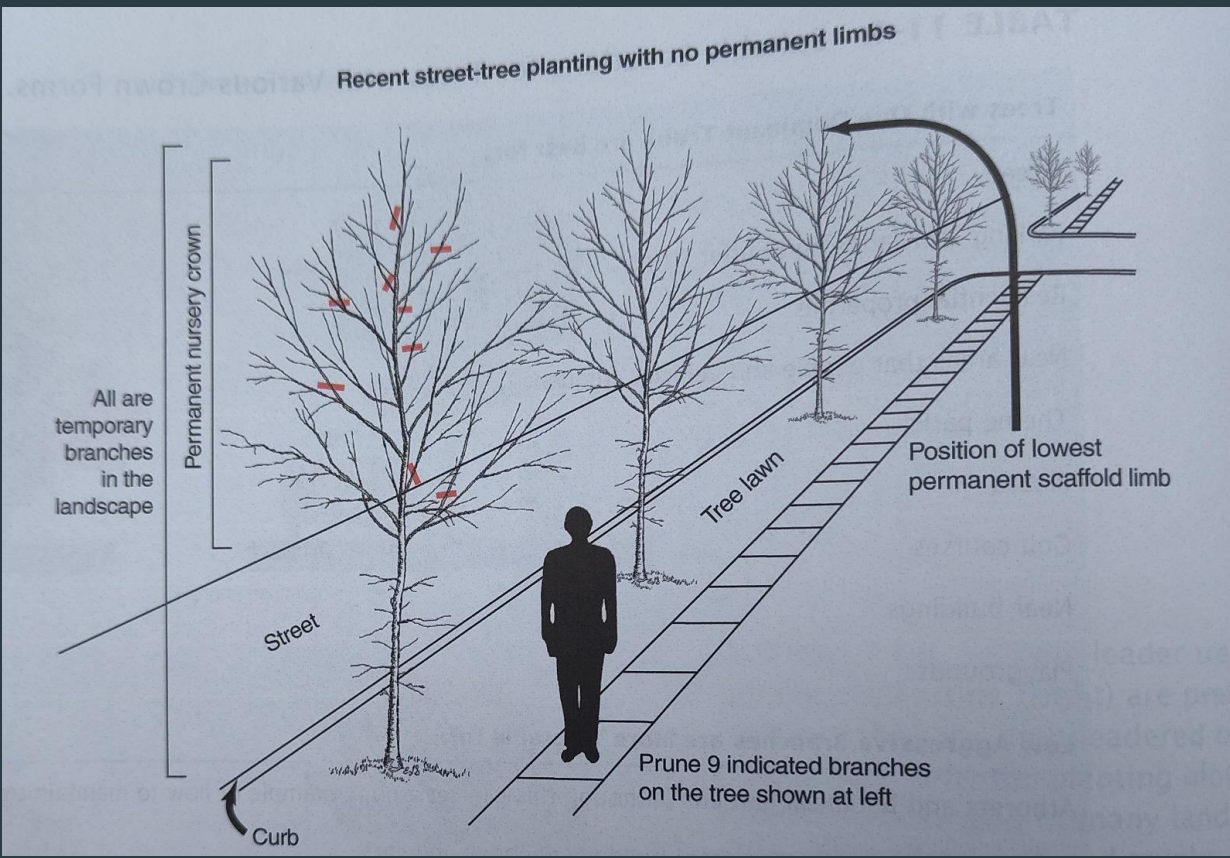
However, people get distracted by “bigger is better”



SUCCESS

it's not always what you see

Lifecycle Pruning - a critical investment



Young trees need structural pruning to achieve strong central leaders and proper height clearances for vehicles and pedestrians. Trees are pruned differently depending on age.

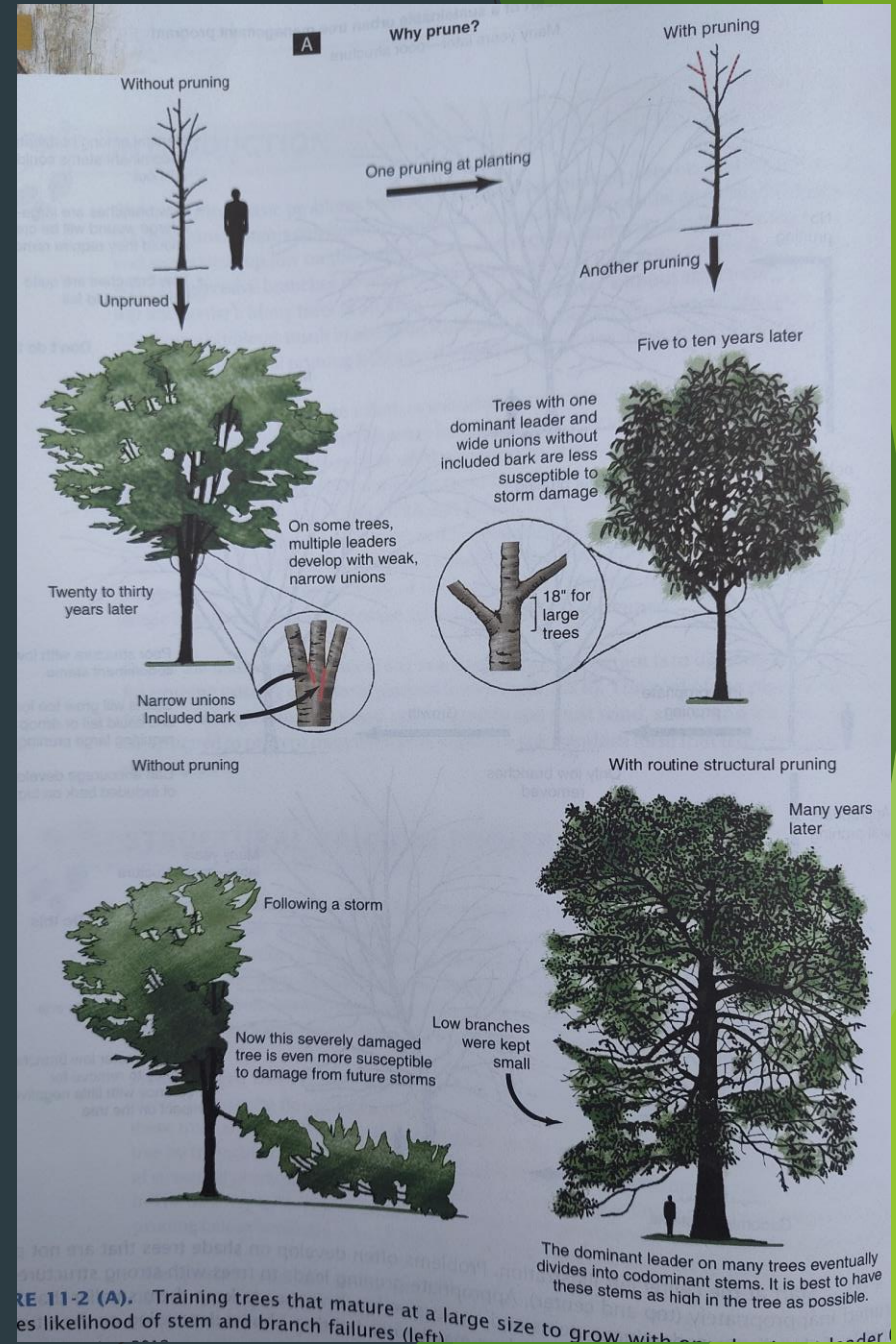


FIGURE 11-2 (A). Training trees that mature at a large size to grow with a single leader reduces the likelihood of stem and branch failures (left).

Proper Pruning is not about fixing bad planting practices

Proper pruning in an urban forest is about determining goals and objectives, maximizing the long term health of the tree and safety of those who interact with it

Proper pruning in an urban forest is not about hedging a tree down to an artificial size and shape because it was put in the wrong place to begin with, or because someone doesn't understand the beauty of naturalized forms

There is a place in gardens for topiary done correctly, but it is not appropriate where ecosystem services are needed

**It's easy to laugh at this picture but proper pruning requires a public who values it and is willing to pay professionals to achieve it*



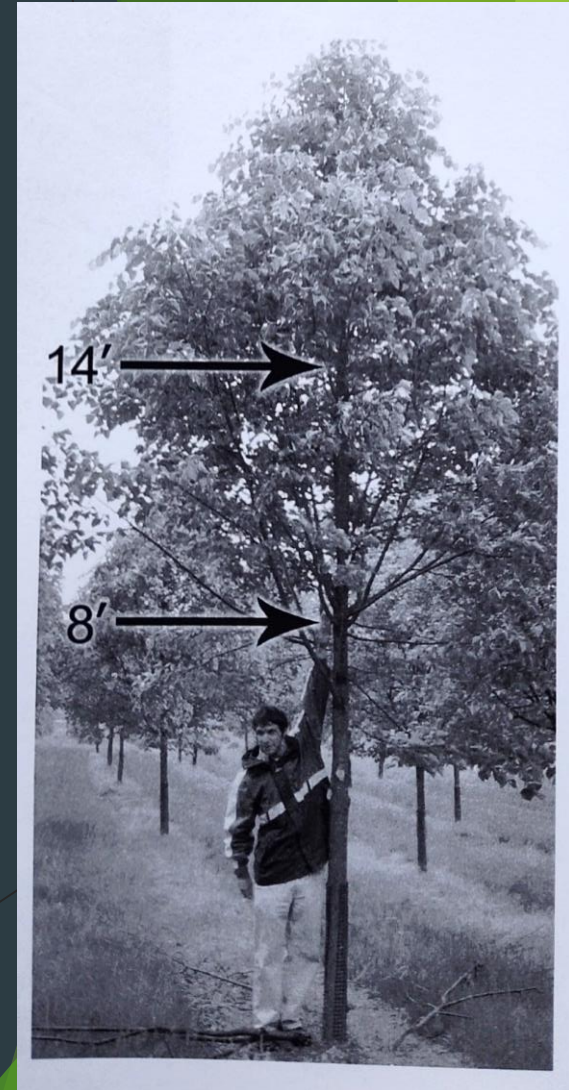
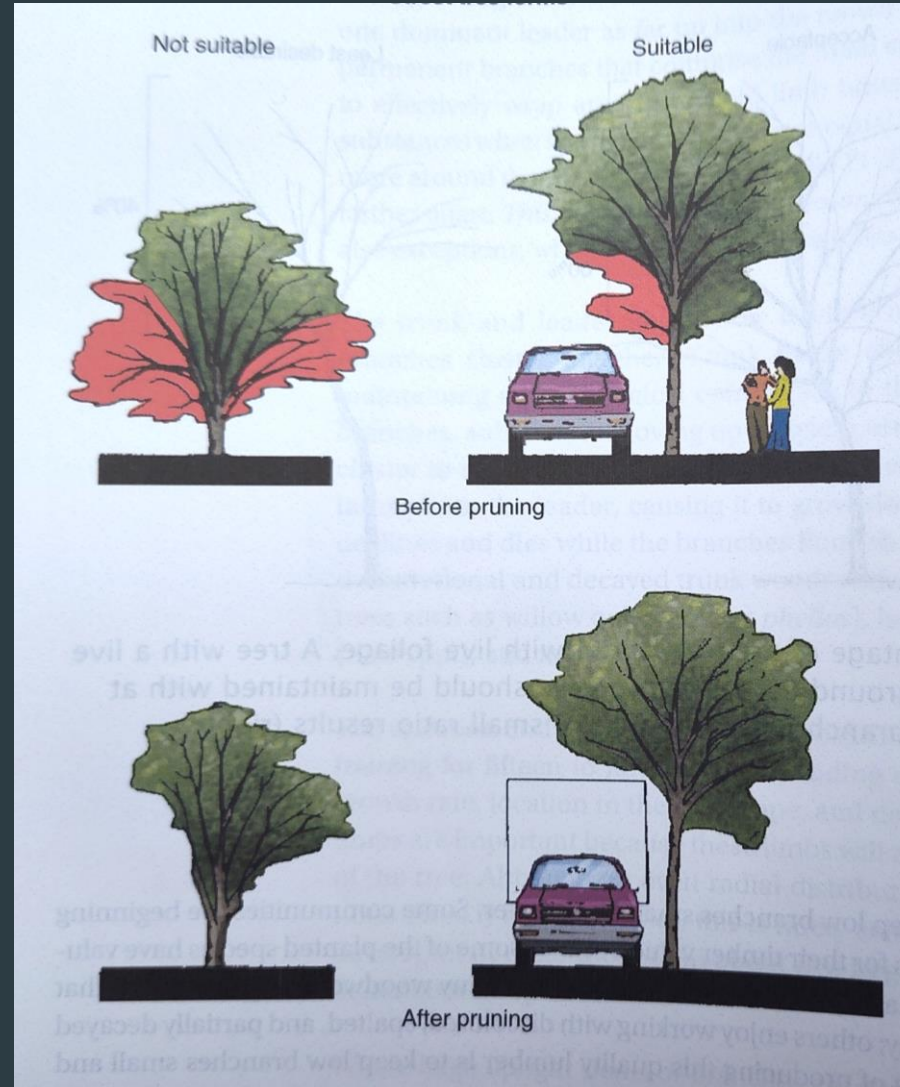
Pruning is not about fixing bad planting practices

Planting shade trees directly under overhead lines just doesn't seem to work in the long term

But planting smaller trees directly under utility wires often doesn't work either



Tree form matters when choosing a planting location



Biodiversity and climate resiliency are critically important



Native trees are host species for a wide range of insects.

Pollinators need to lay eggs on host plants to feed their caterpillars.



A single pair of breeding chickadees needs 6,000-9,000 caterpillars to rear one clutch of young.

Species matter.

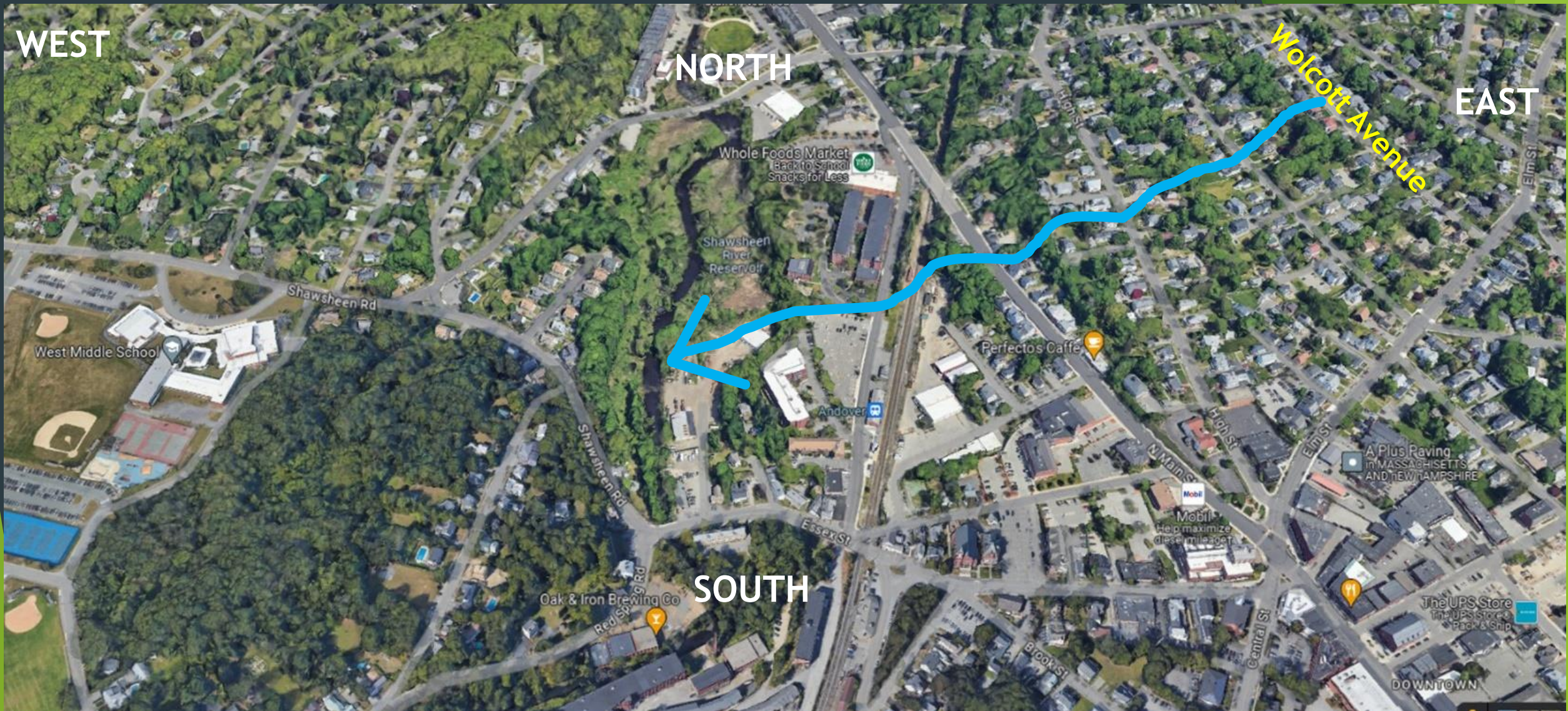
Temperatures will continue to rise in our neighborhoods. Unshaded streets will increase energy consumption in buildings and make walkable neighborhoods uncomfortable for pedestrians.

What do we know? As much as possible, for every tree in the urban forest:

- Prioritize tree health and longevity over planting designs that just look good on paper
- Maximize soil health and volume, minimize compaction
- Maximize space for the root plate and growing root system
- Start with smaller materials to minimize the development of root deformities
- Follow a professional lifecycle pruning schedule from day one of planting
- Maximize biodiversity and prioritize climate mitigation including maximizing shade in all neighborhoods
- Correctly mulch, water, and protect trees as needed



What do we know about Wolcott Avenue? - Site Analysis Context





Top photos shows current and potential impact on ROW trees by utility lines, proximity to sidewalk and root barrier of retaining walls



Bottom photos show importance of trees on front lawns on east side of street. Conical form and setback of spruce keeps it away from lines, setback and tall height of maple allows it to be pruned out of the way of the overhead wires



Top 2 photos show benefits and opportunities for front lawn planting

Note shadow cast by ROW tree in background but not enough room for trunk plate. Yew not providing any significant shade. Opportunity for residents to contribute to Andover shade infrastructure.



Small tree in ROW would need mitigation

Also note need for pruning all ROW trees



London Plane Tree on west side front lawn

- Casts shadow on sidewalk and almost half the street
- Planted back from sidewalk - no obvious obstructions
- Opportunity for resident education about how to ensure tree lives a long time
- Pruning incentives?



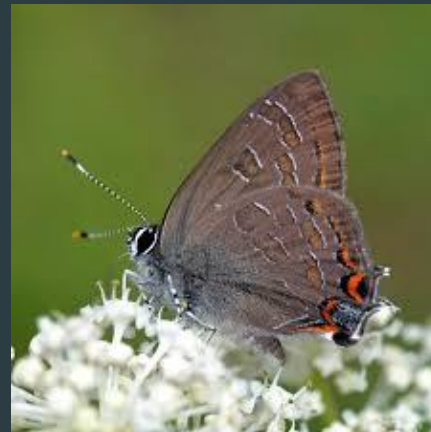


Species matter -

Norway maple is not native to North America and feeds very few caterpillars

The pignut hickory does feed caterpillars for banded hairstreak and Luna Moth

Planting the buffer strips with native perennials will also attract pollinators



Site Analysis - birds-eye view of site for orientation



Site Analysis - ACAD Plan view of site



Site Analysis Solar Aspect- heat from south and west

ALL TREES:

- ▶ To maximize cooling of houses, plant trees on south and west side of buildings
- ▶ (Also, prevailing winds coming from the west so maximize space for roots on west side)

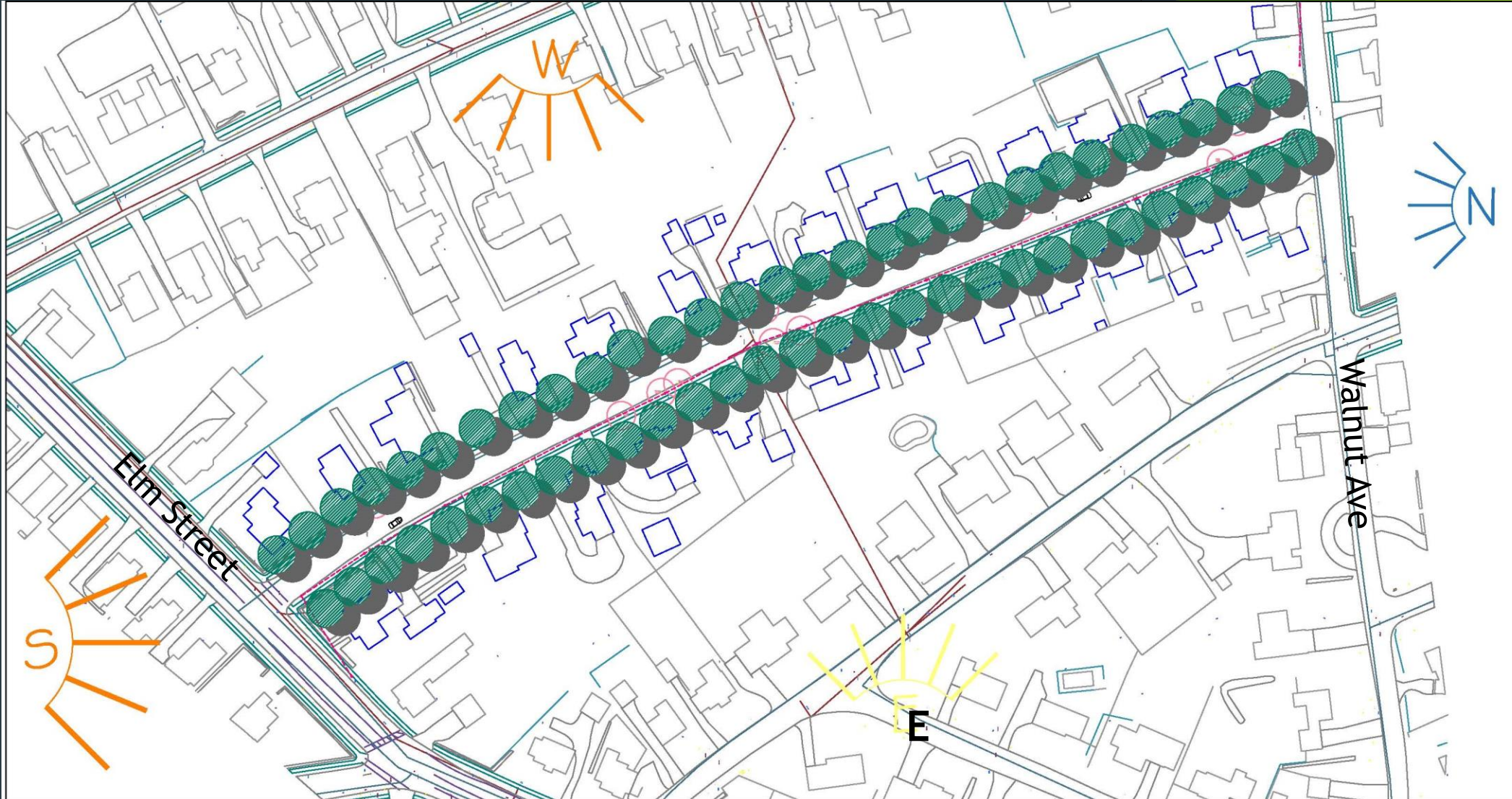


Site Analysis Shade Patterns- shade will be predominantly down and to the right

FRONT LAWN TREES:

It would be great to have lots of trees on both sides of the street. But because of sun aspect,

- ▶ Prioritize shading and cooling of street by prioritizing planting on west side of Wolcott



Site Analysis Utilities - poles and overhead wires on east side of street, prioritize planting shade trees on west side of street and ensure buffer distance from overhead lines

FRONT LAWN TREES:

- ▶ Minimum 10' setback from edge of sidewalk
- ▶ Minimum 20' setback from overhead wires (or 30' or more?) on east side greater distance better depending on property owner

*more research needed by TreeCom



10 PRINCIPLES *from Up by Roots by James Urban*

SOIL BASED

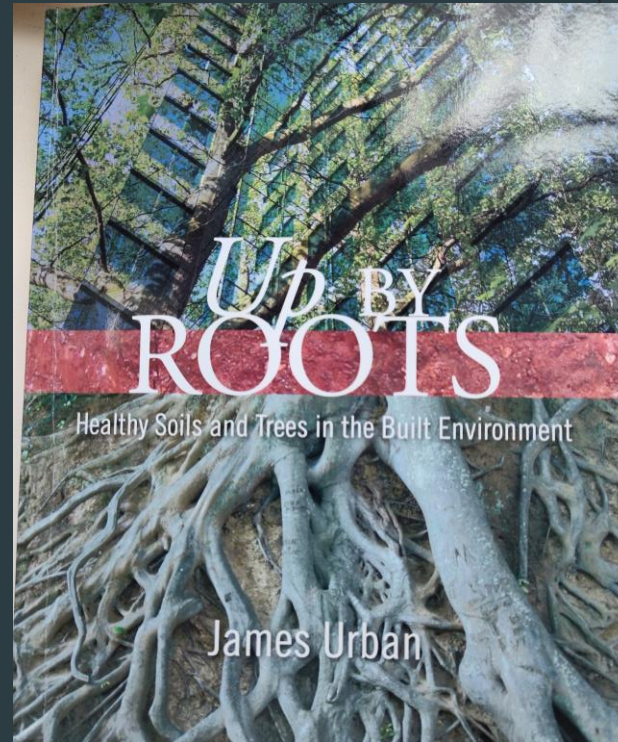
- ▶ Plant the Easy Places First
- ▶ Make Larger Planting Spaces
- ▶ Preserve and Reuse Existing Soil Resources
(not applicable post construction for Wolcott)
- ▶ Improve Soil and Drainage

TREE BASED

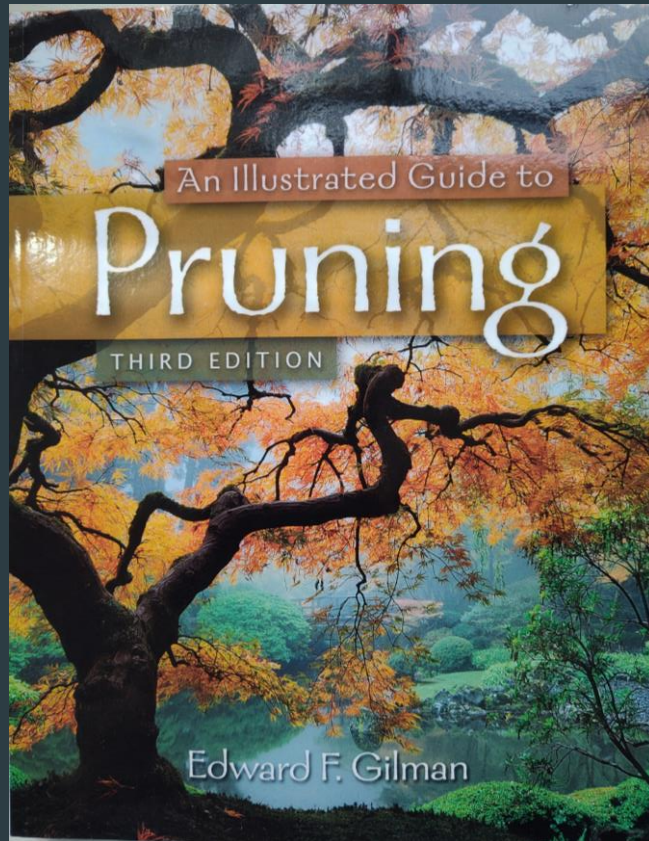
- ▶ Respect the Base of a Tree
- ▶ Make Space for Roots
- ▶ Select the Right Tree

MANAGEMENT BASED STRATEGIES (for another conversation)

- ▶ Establish Reasonable Tree and Soil Budgets
- ▶ Create Detailed Tree and Soil Construction Documents
- ▶ Design for Maintenance



Add Lifecycle Pruning - a critical investment



A Schedule for Training Shade Trees in the Urban Landscape

Trees are like children; they require about 25 years of training to create good, solid structure that will last them a lifetime.

FIRST THINGS FIRST

Establish a pruning cycle and objectives. Pruning cycle depends on quality of nursery stock, site attributes and growth rate, climate, and species. Then decide on strategies to meet objectives. Although a pruning program that begins at planting leads to the highest-quality trees, you may enter this schedule at any point.

Objectives (25 years)

1. Establish and maintain a dominant leader by subordinating all but one codominant stem.
2. Space main scaffold limbs apart by removing or shortening nearby and lower branches.
3. Position the lowest main scaffold limb high enough so it will not droop and have to be removed later.
4. Anticipate future form and function by training and pruning early to avoid cutting large branches later.
5. Prevent all branches from growing larger than half the trunk diameter.
6. Promote anchorage by ensuring roots grow radially from the trunk, not tangent to the trunk.

Strategies

At planting

- When structure is strong with one dominant leader and small-diameter branches, do not prune.
- Shorten or remove stems and branches competing with the main leader; even current-year stems at the top of the crown that compete should be removed or severely shortened.

439

Pruning should be incorporated as a part of a consistent budget line item

Methodology Wolcott Avenue

SOIL BASED

▶ Plant the Easy Places First

- ▶ healthy soil, adequate soil volumes = front lawns
- ▶ *(minimized obstructions like sidewalks and overhead utility wires)*
- ▶ *(minimized impact on sight lines- don't plant too close to street corners or driveways)*

▶ Make Larger Planting Spaces

- ▶ Plant in front lawns first with owner permission
- ▶ ROW mitigation techniques second (root trenches to connect to front lawns, etc.)
- ▶ Add bump-outs in future for both shade trees to increase soil volume and for smaller trees that need a wider branching area
- ▶ Consider at least some bump-outs where sidewalk abuts street curb (no planting strip) to maximize lawn-side soil volume

▶ Improve Soil and Drainage

- ▶ Mitigate existing ROW buffer strips by repairing compaction and amending soil, remove construction debris
- ▶ Consider goal of 30-48" depth of healthy soil in ROW buffer strips for tree roots

Methodology Wolcott Avenue

TREE BASED

- ▶ **Respect the Base of a Tree**
 - ▶ Plant trees with enough buffer from Wolcott sidewalk and curb edges
 - ▶ Install inexpensive open-mesh wire guards around new tree trunks
 - ▶ Assume the planting space will become wood and roots in future, Wolcott residents should avoid planting around developing root plate (*unless minimal digging like with annuals*)
 - ▶ Educate Wolcott residents about mulch volcanoes, delicate young bark, etc.
- ▶ **Make Space for Roots**
 - ▶ Avoid planting large trees at top of retaining walls on Wolcott
 - ▶ Avoid planting trees of certain size at maturity in ROW grass strips
- ▶ **Select the Right Tree**
 - ▶ Be mindful about height, width and form of trees selected based on where they are sited
 - ▶ Space at least 40' apart for pruning access OR space closer to encourage “natural” pruning?
 - ▶ Prioritize native shade tree species where possible, smaller native trees where suitable
 - ▶ Consider planting bare root seedlings 3-4' tall
- ▶ **Implement lifecycle pruning**

Methodology Wolcott Avenue

CLIMATE BASED

- ▶ Minimize urban heat island effect on street and in Andover by prioritizing planting and care of shade trees on west side of Wolcott
- ▶ Maximize habitat value by prioritizing native trees, especially those that are caterpillar hosts
- ▶ Educate residents on water-saving techniques to help irrigate trees during drought
- ▶ Encourage resident plantings of native perennials in existing grass strips beneath overhead wires

PEDESTRIAN & RESIDENT BASED

- ▶ Incentivize tree planting on personal property on south and west sides of buildings to help reduce energy use for cooling and maximize shade infrastructure on the street
- ▶ For Town Trees in ROW, regular training pruning of young trees and height pruning to maintain clearances for pedestrians
- ▶ Education and check-ins with residents

Concept - Existing and Proposed Shade and Ornamental Trees

NOTE:

- ▶ Blue houses requested trees
- ▶ Yellow Houses have lawn space for shade trees and should be contacted by TreeCom
- ▶ Magenta circles are existing
- ▶ Orange circles are possible swaps
- ▶ Putting trees in lawns prioritized
- ▶ If ROW trees added they should be planted on west side of street, not next to overhead wires on east side
- ▶ *green tree canopies on plan only drawn at 40' diameter, healthy trees could produce even wider canopies and more shade
- ▶ *Bump-outs TBD based on traffic study, resident interest / consider sidewalk on street edge of bumpout?



