Design Solutions for Sustainable Streets & Roadsides

a presentation to

EVERSOURCE ENERGY

August 2, 2017

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Design Solutions for Sustainable Streets & Roadsides

www.unri.org/research-documents

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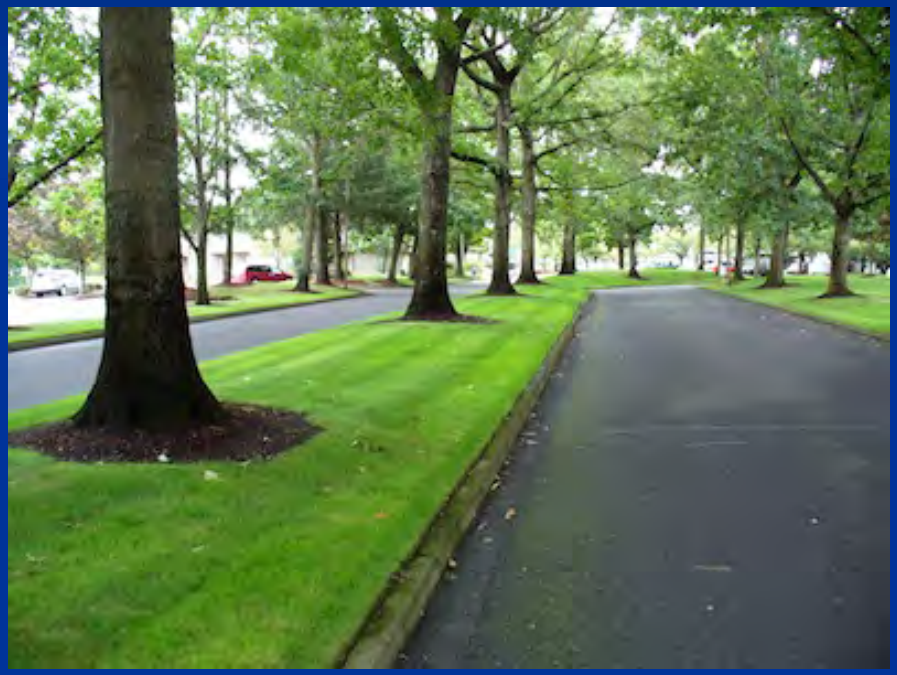
Topics for today's presentation

- Tree values
- Design as a process
- Trees as design and landscape elements
- Constraints in urbanized landscapes
- Streetscape scenarios
- A few solutions

Urban design to encourage tree canopy



- Trees often grow poorly in urban areas for a variety of reasons.
- Poor design is often one of those reasons.

Few people want cities without trees

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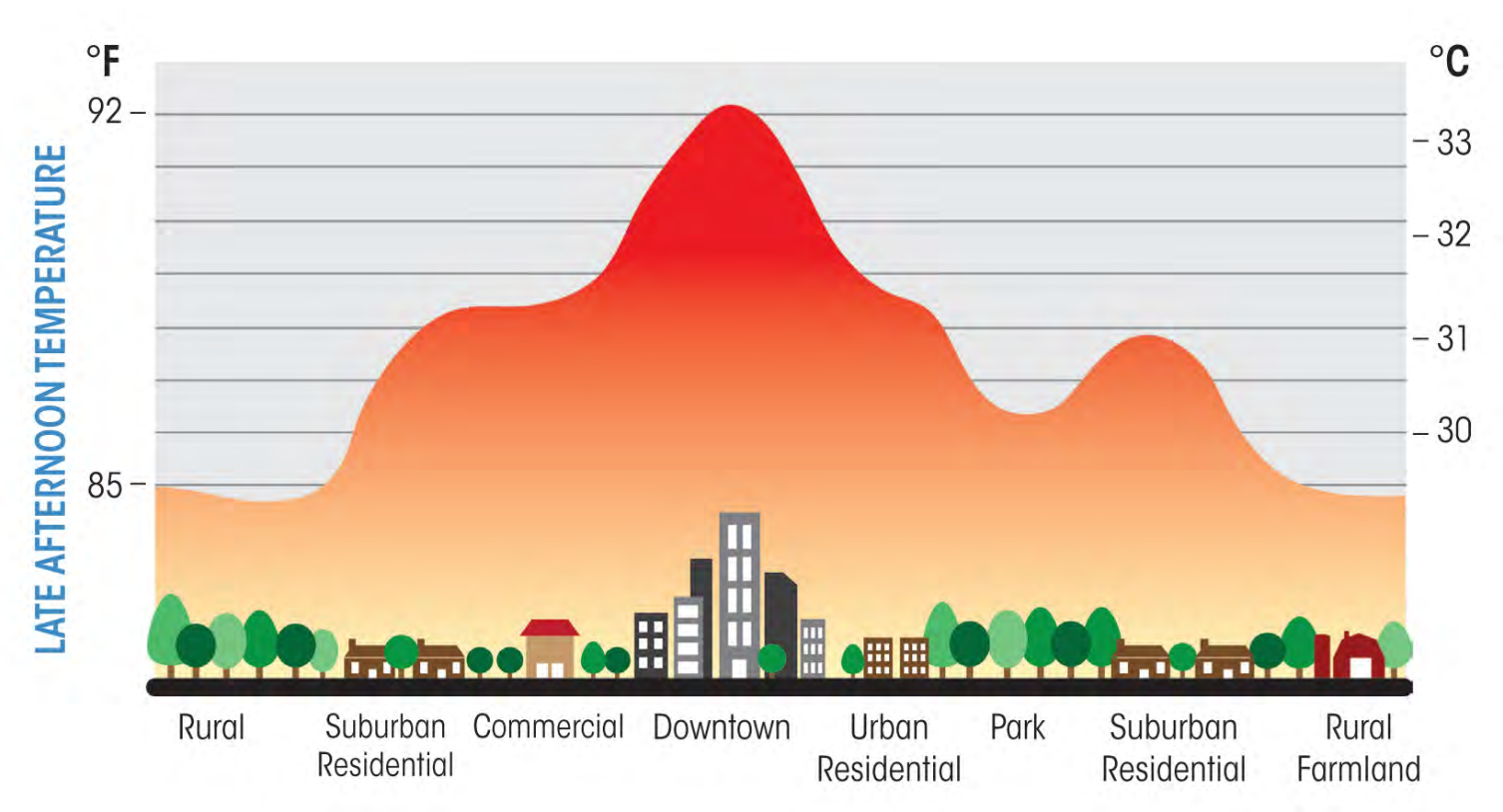
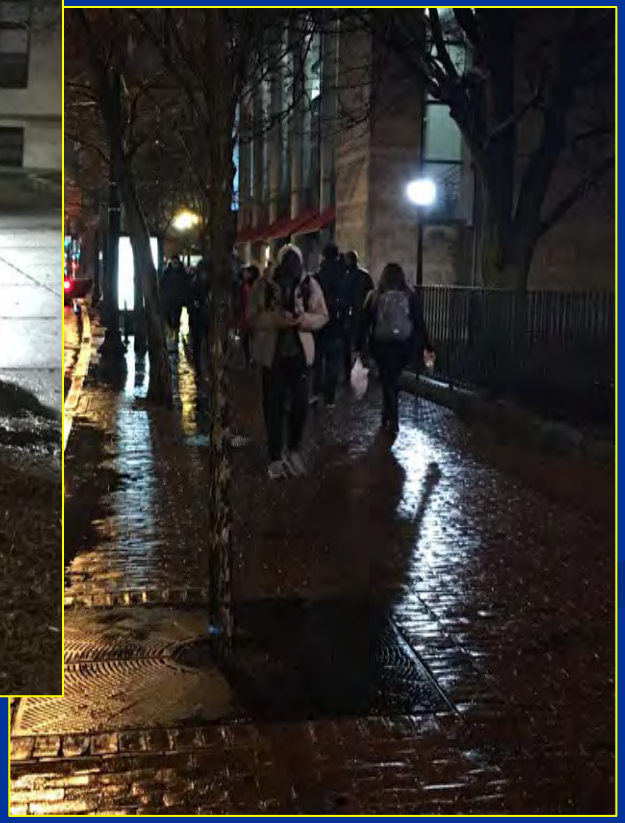
- A city without trees is hotter in summer, receives less rainfall, has greater runoff following storms, has fewer shoppers, and is not inviting

Urban Heat Island



Impact of Stormwater & Impervious Area

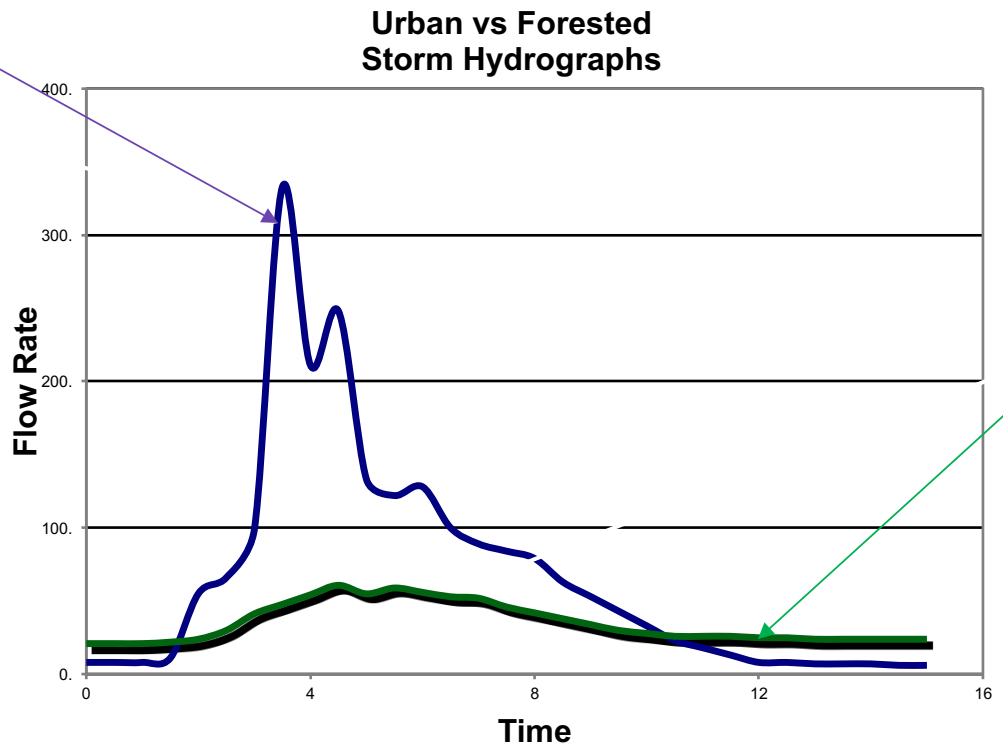


The Urban Storm Hydrograph

Greater Peaks & Volume

å

Urban



Forested

Poor design leads to failure

- Trees struggle unless spaces are designed appropriately
- When lots of money is thrown at tree projects without guidance from knowledgeable professionals, waste occurs and no one wins

Poor design leads to failure

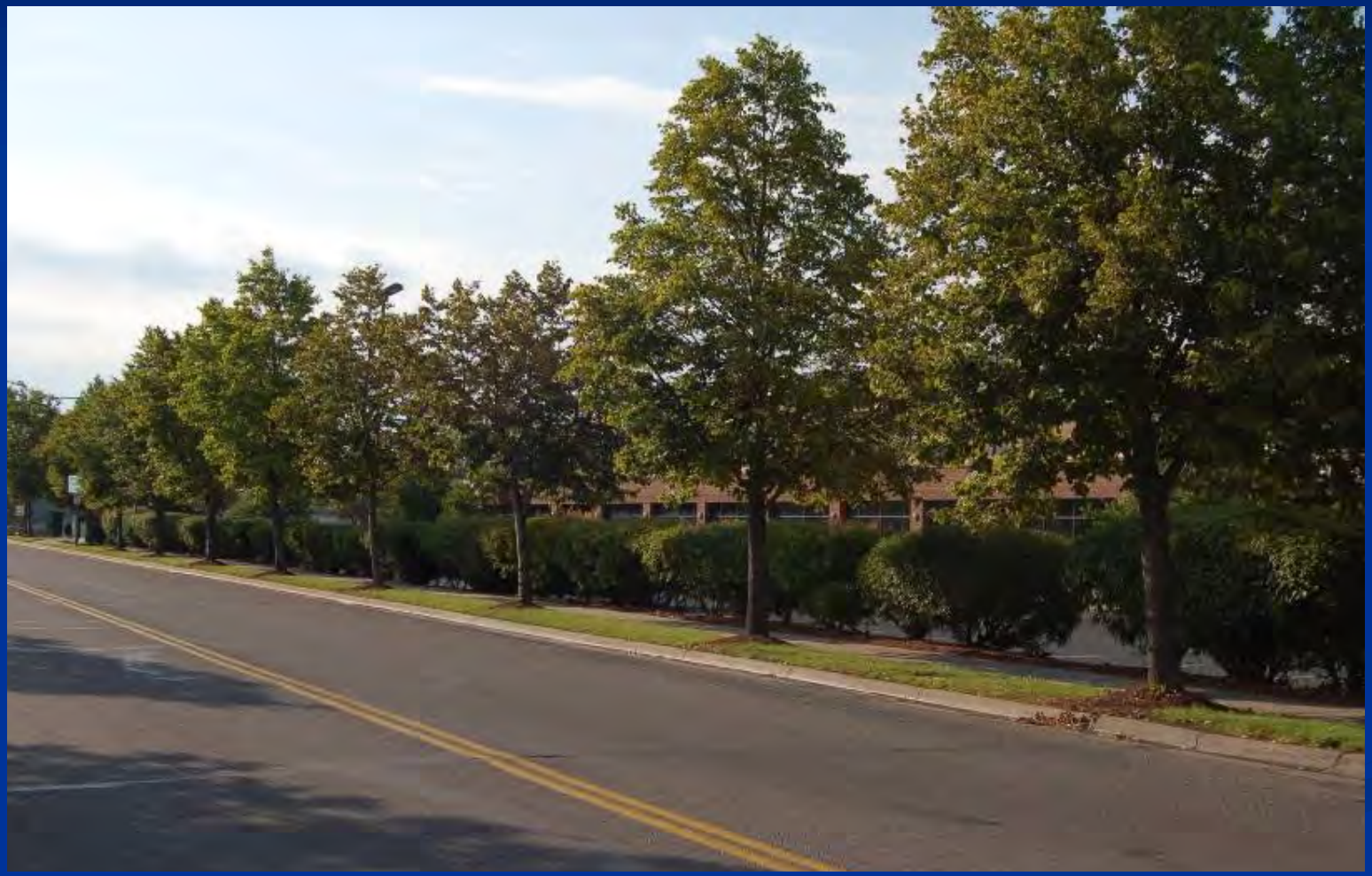
Poor design leads to failure

Poor design leads to failure

Good design leads to success

- Trees thrive when good designs are executed properly
- Healthy trees increase property value, intercept air pollutants, buffer temperatures, reduce wind speed, cool the city, reduce runoff from storms, encourage people to visit and spend money at shops, and create a more inviting community

Good design leads to success



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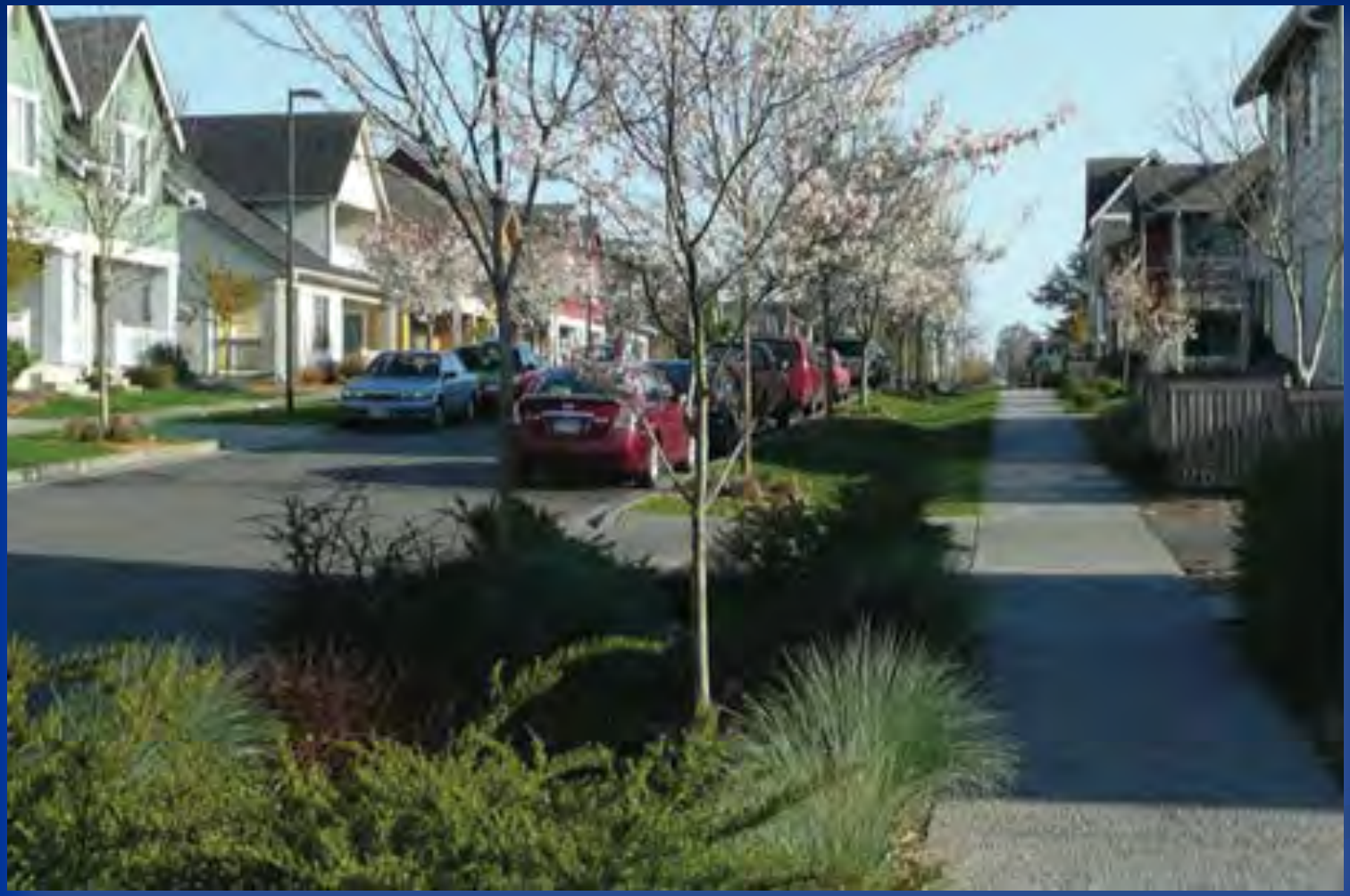
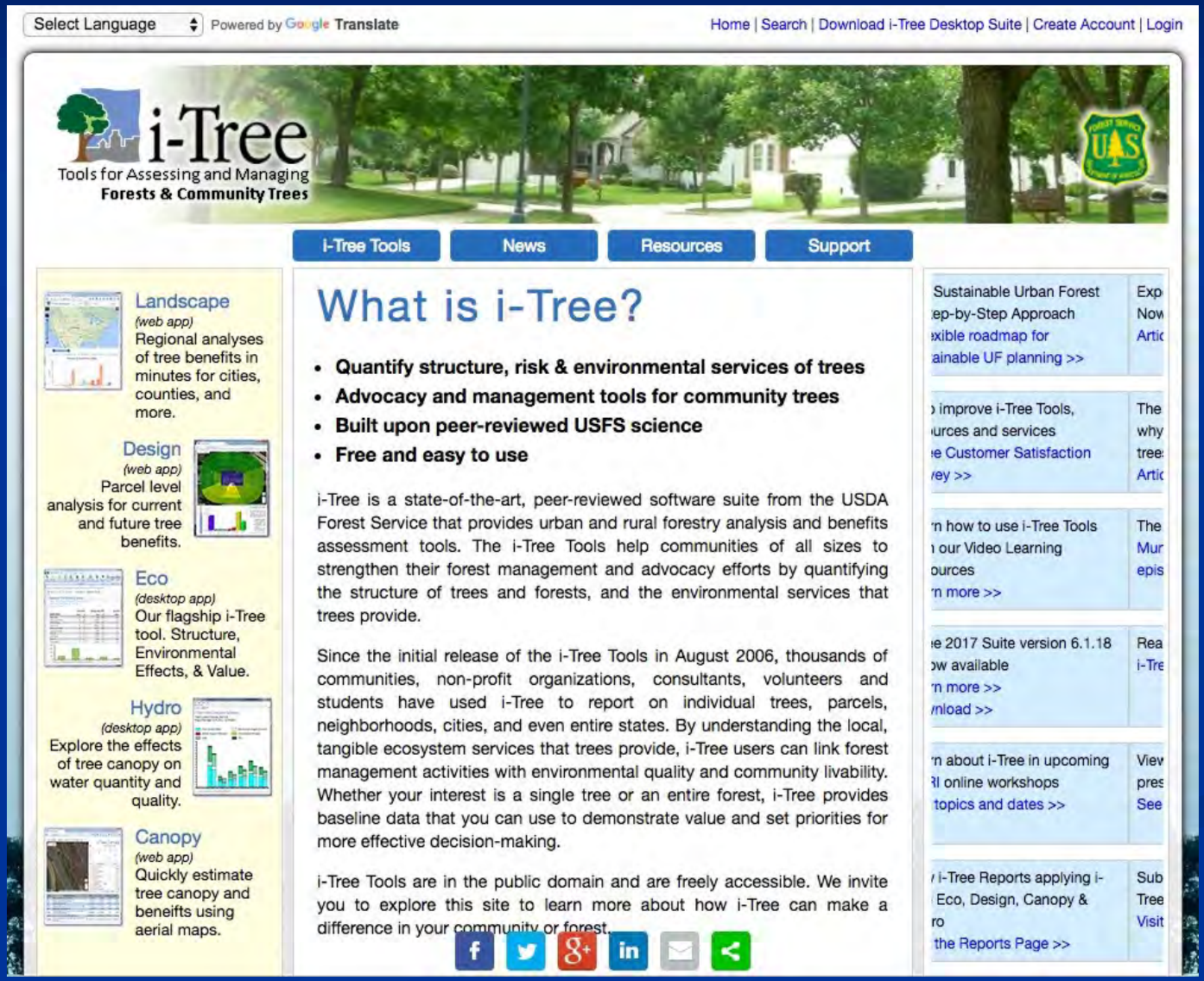


Good design leads to success

Good design leads to increased value - economic & environmental

Good design leads to increased value - economic & environmental



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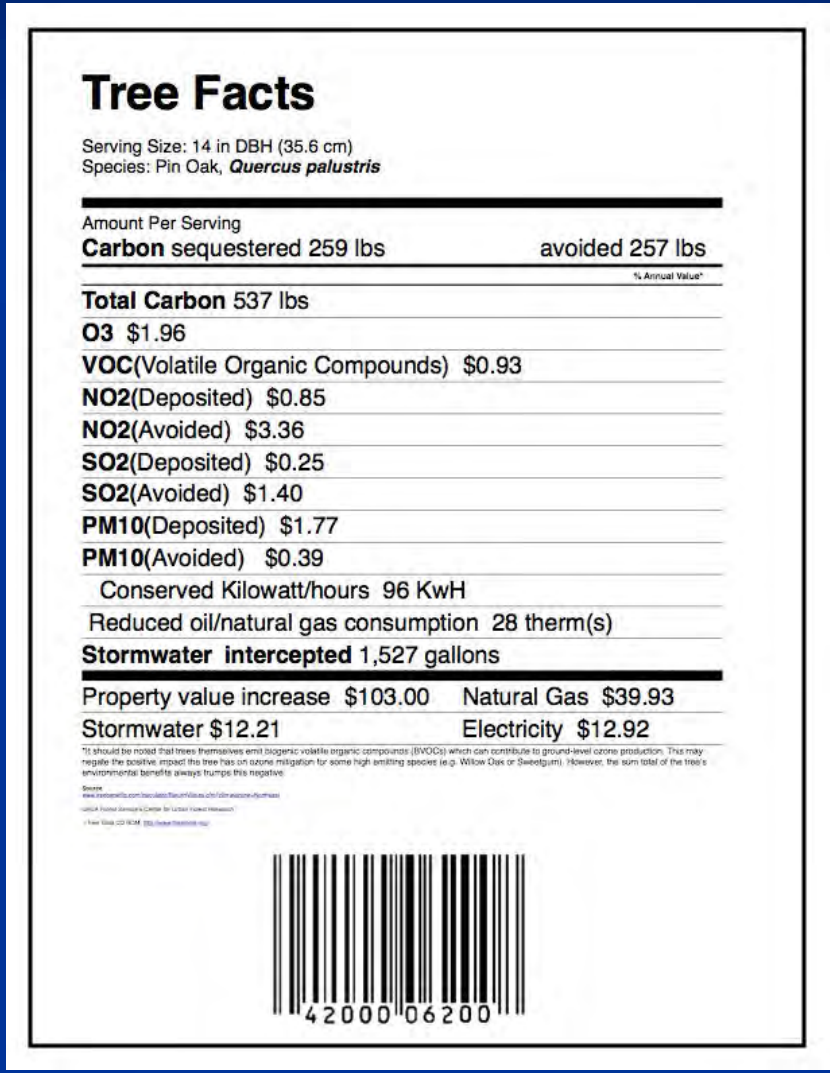


Tree Facts

Serving Size: 14 in DBH (35.6 cm)
Species: Pin Oak, ***Quercus palustris***

Amount Per Serving

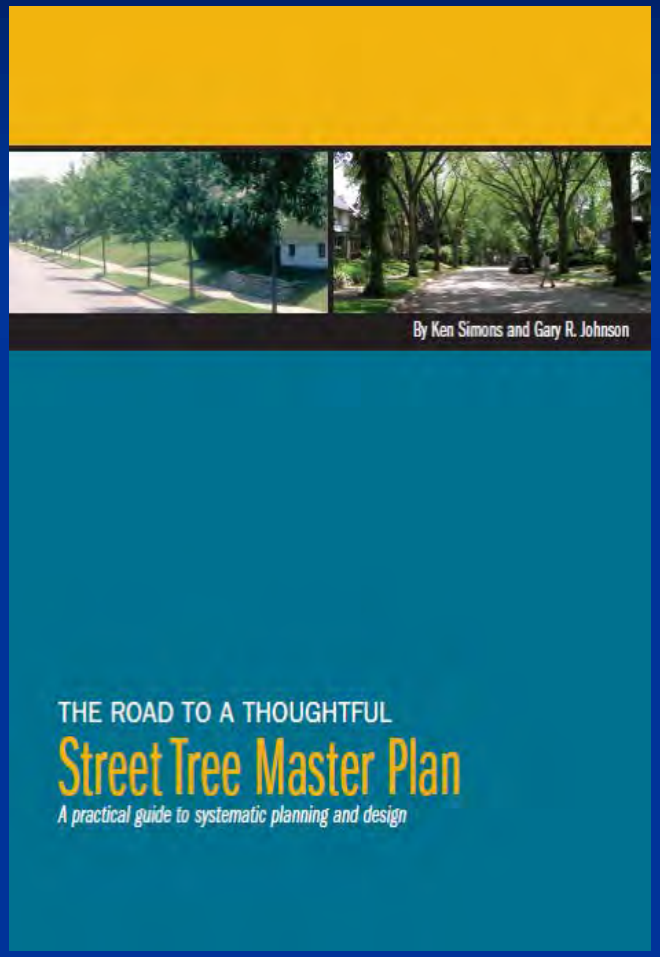
Carbon sequestered 259 lbs	avoided 257 lbs
	% Annual Value*
Total Carbon 537 lbs	
O3 $1.96	
VOC(Volatile Organic Compounds) $0.93	
NO2(Deposited) $0.85	
NO2(Avoided) $3.36	
SO2(Deposited) $0.25	
SO2(Avoided) $1.40	
PM10(Deposited) $1.77	
PM10(Avoided) $0.39	
Conserved Kilowatt/hours 96 KwH	
Reduced oil/natural gas consumption 28 therm(s)	
Stormwater intercepted 1,527 gallons	
Property value increase $103.00	Natural Gas $39.93
Stormwater $12.21	Electricity $12.92

*It should be noted that trees themselves emit biogenic volatile organic compounds (BVOCs) which can contribute to ground-level ozone production. This may negate the positive impact the tree has on ozone mitigation for some high emitting species (e.g. Willow Oak or Sweetgum). However, the sum total of the tree's environmental benefits always trumps this negative.

Source

42000 06200

Good design leads to increased value - economic & environmental

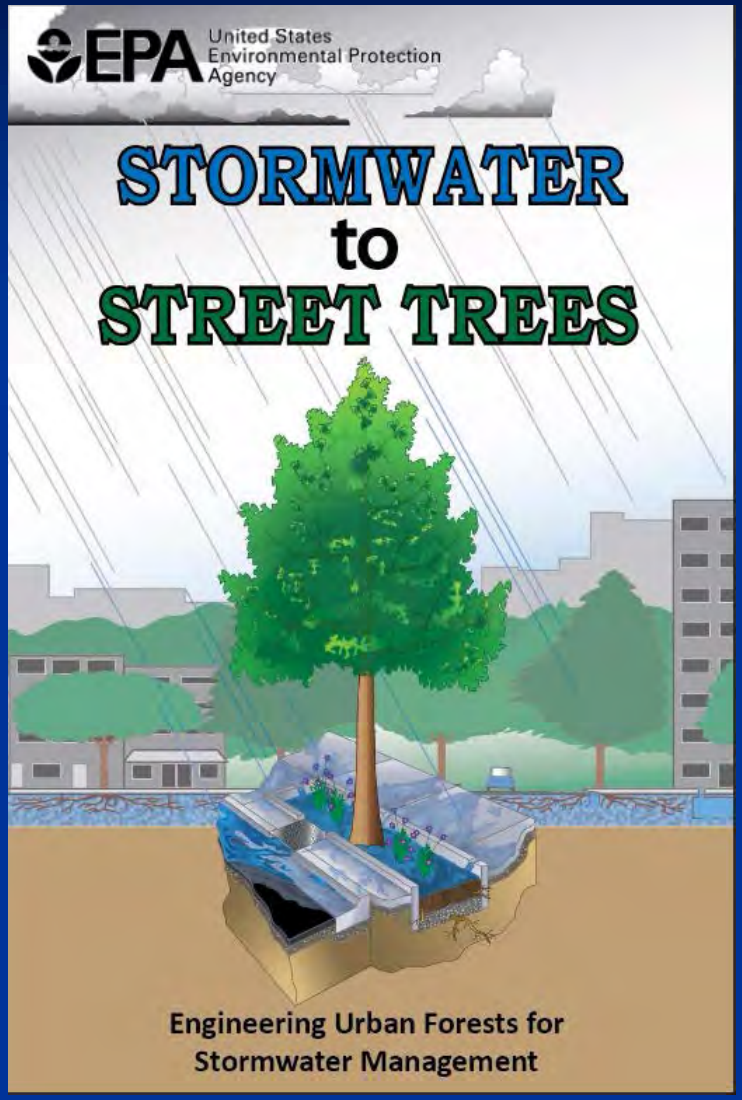


THE ROAD TO A THOUGHTFUL

Street Tree Master Plan

A practical guide to systematic planning and design

Ken Simons[1]
and
Gary R. Johnson[2]



Stormwater to Street Trees:

Engineering Urban Forests for Stormwater Management

U.S. Environmental Protection Agency

Office of Wetlands, Oceans and Watersheds

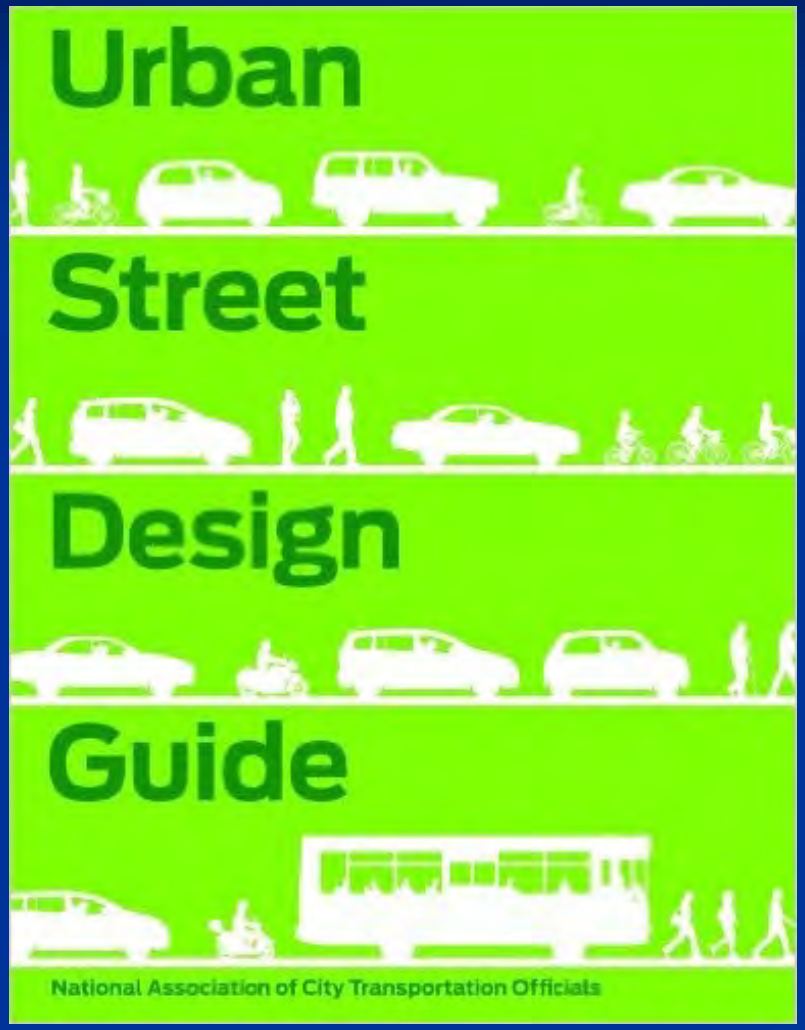
Nonpoint Source Control Branch (4503T)

1200 Pennsylvania Ave., NW

Washington, DC 20460

September 2013

EPA 841-B-13-001


Urban
Street
Design
Guide
National Association of City Transportation Officials


Urban Street
Design Guide
NACTO
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City Transportation Officials
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NACTO

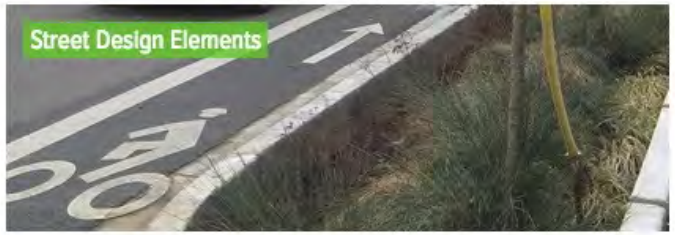
MENU

National Association of City Transportation Officials

Urban Street Design Guide

PURCHASE GUIDE

GUIDE NAVIGATION



Good design must be realistic

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Good design is contextual

Good design shapes the community

Good design should be comprehensive

Good design can provide vision

Principles of Design

Unity
Balance
Transition
Proportion
Rhythm
Repetition
Simplicity

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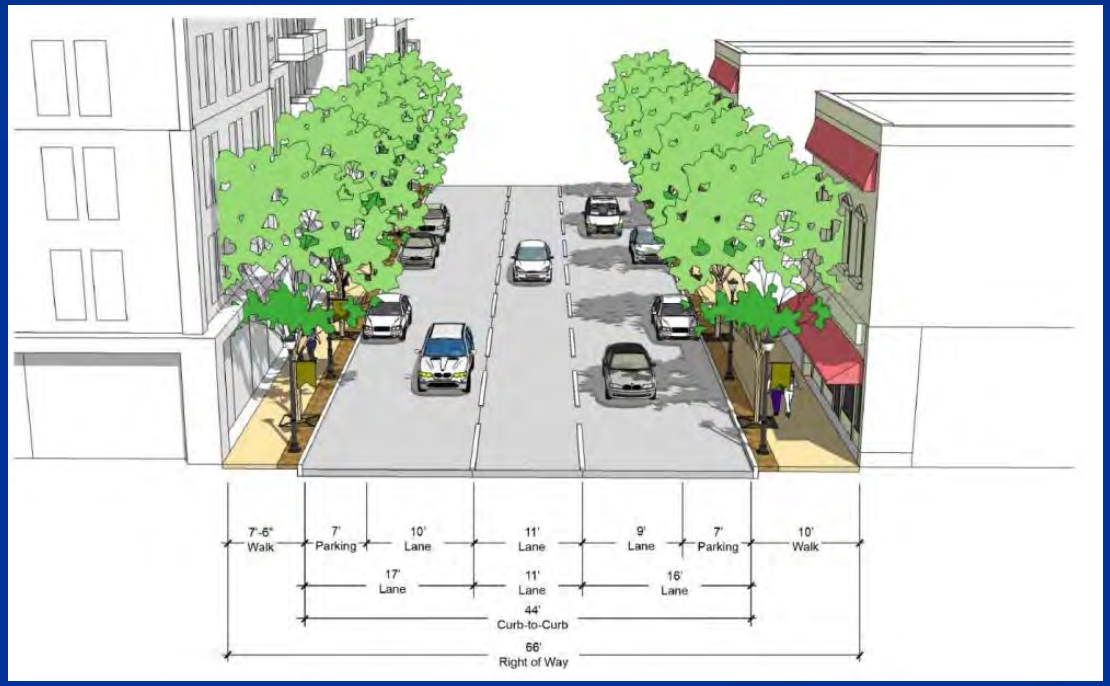
Simplicity



Elements of Art

Color

Line

Form

Texture

Scale

Elements of Art

Color

Line

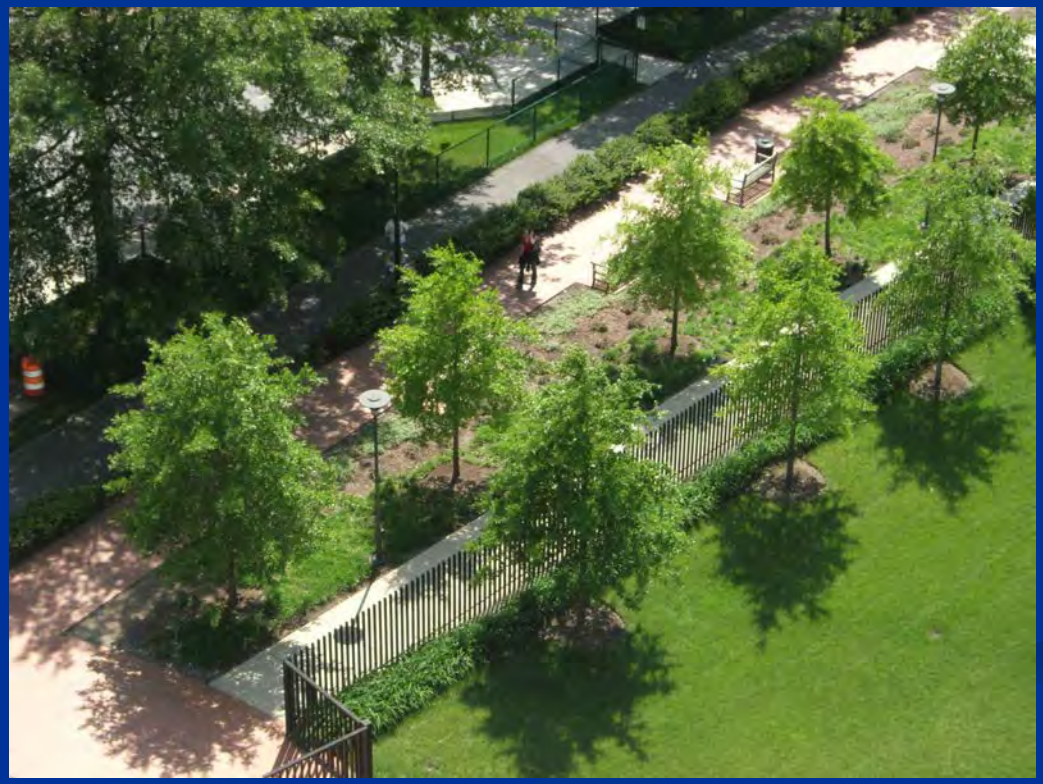
Form

Texture

Scale

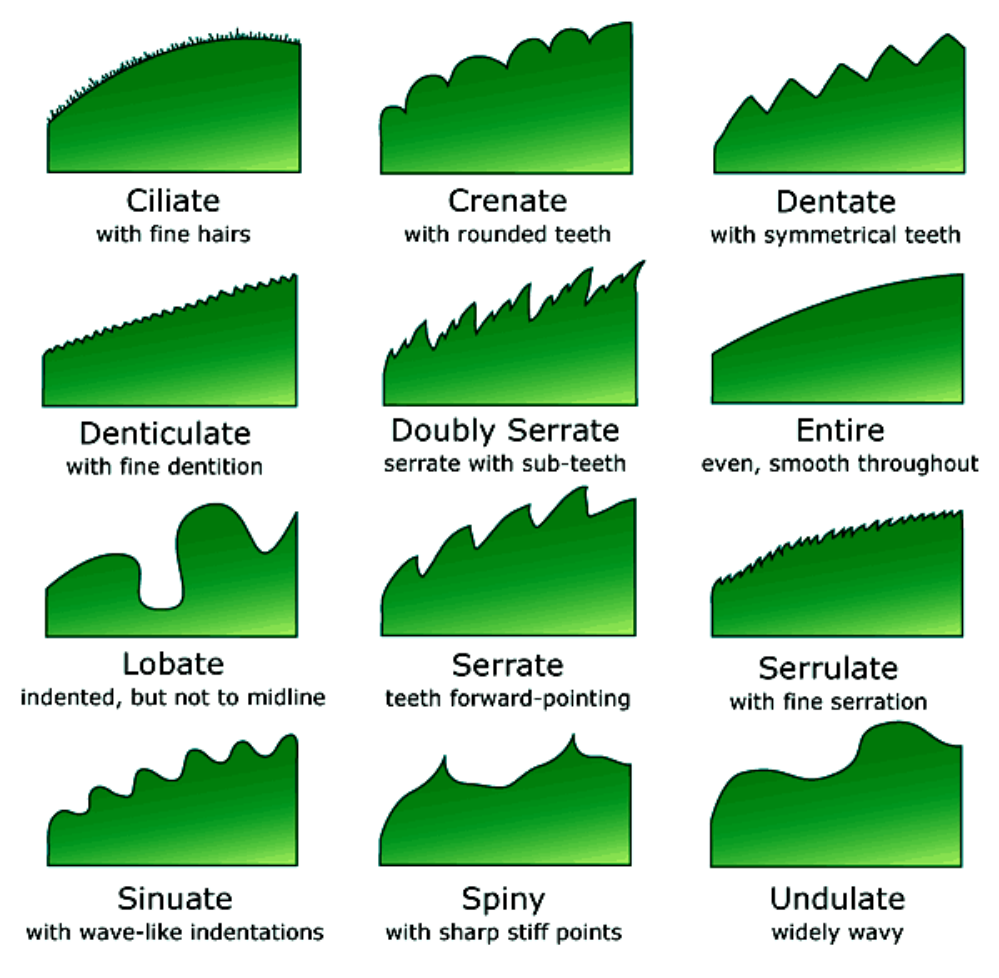
Principles of Science

- Horticulture
  - Plant needs
  - Insect and diseases
  - Hardiness zones
  - Physiological Constraints
- Engineering
  - Materials
  - Methods
  - Soils and drainage
  - Irrigation systems



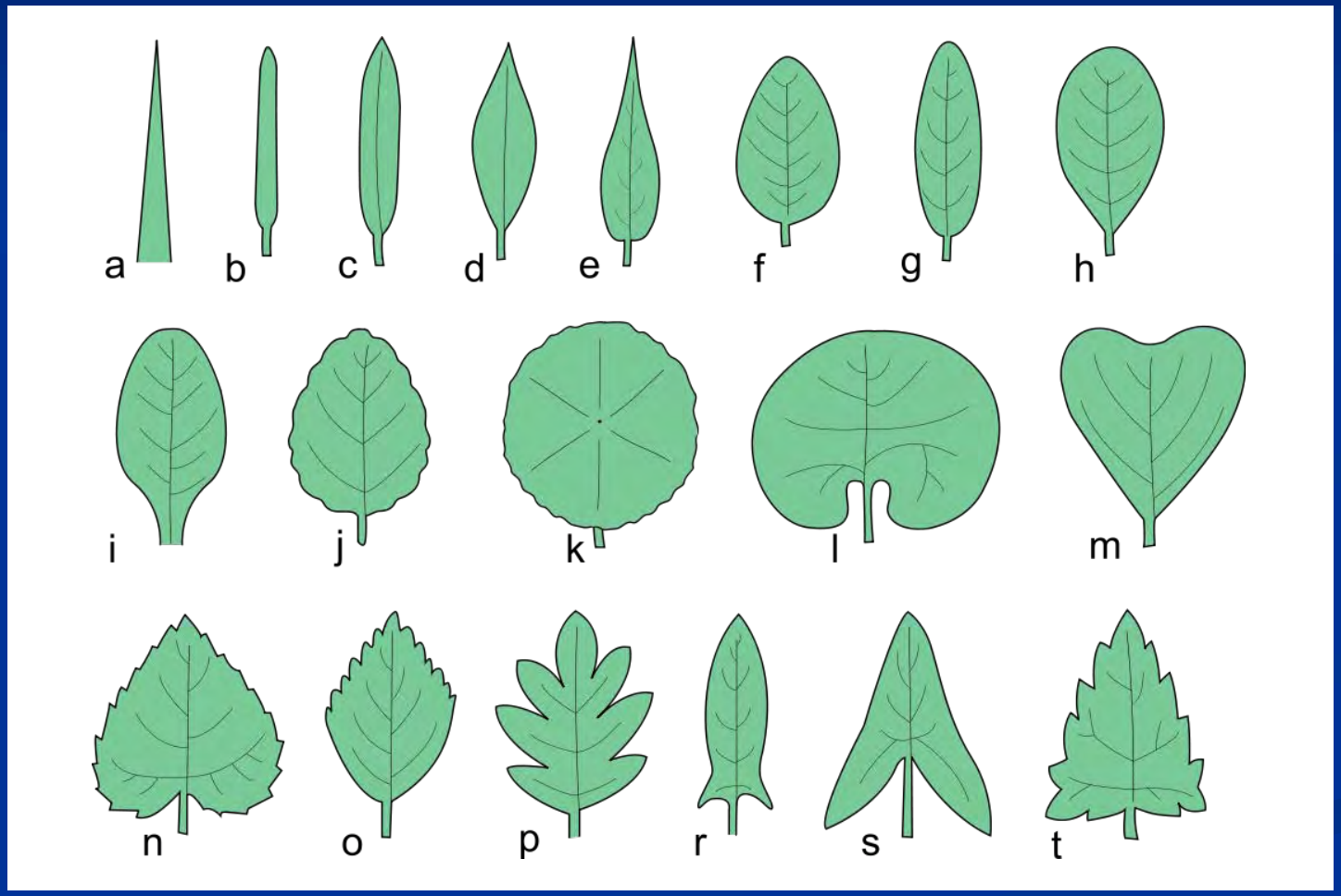
Trees as Landscape Elements

Trees as Landscape Elements



Design Principles

Trees as Landscape Elements



Design Principles

Trees as Landscape Elements

Design Principles


Military Dr

Trees as Landscape Elements

Constraints

Trees as Landscape Elements

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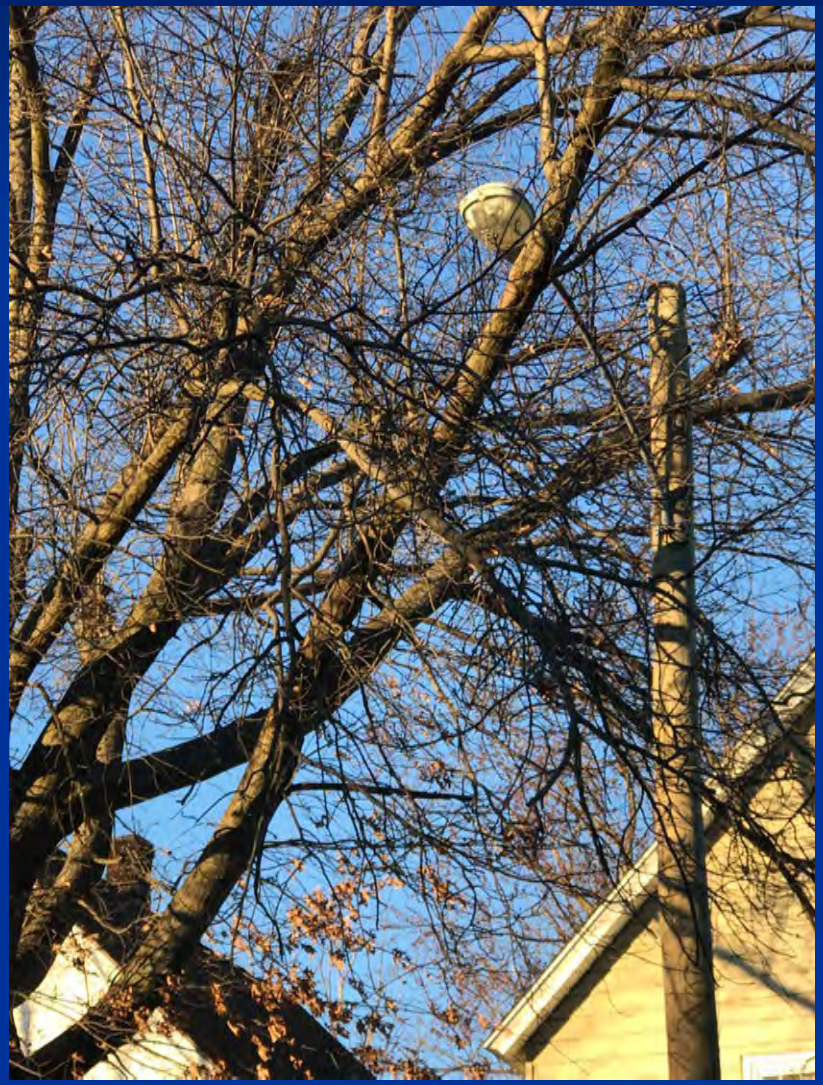
Trees as Landscape Elements



Constraints

Trees as Landscape Elements

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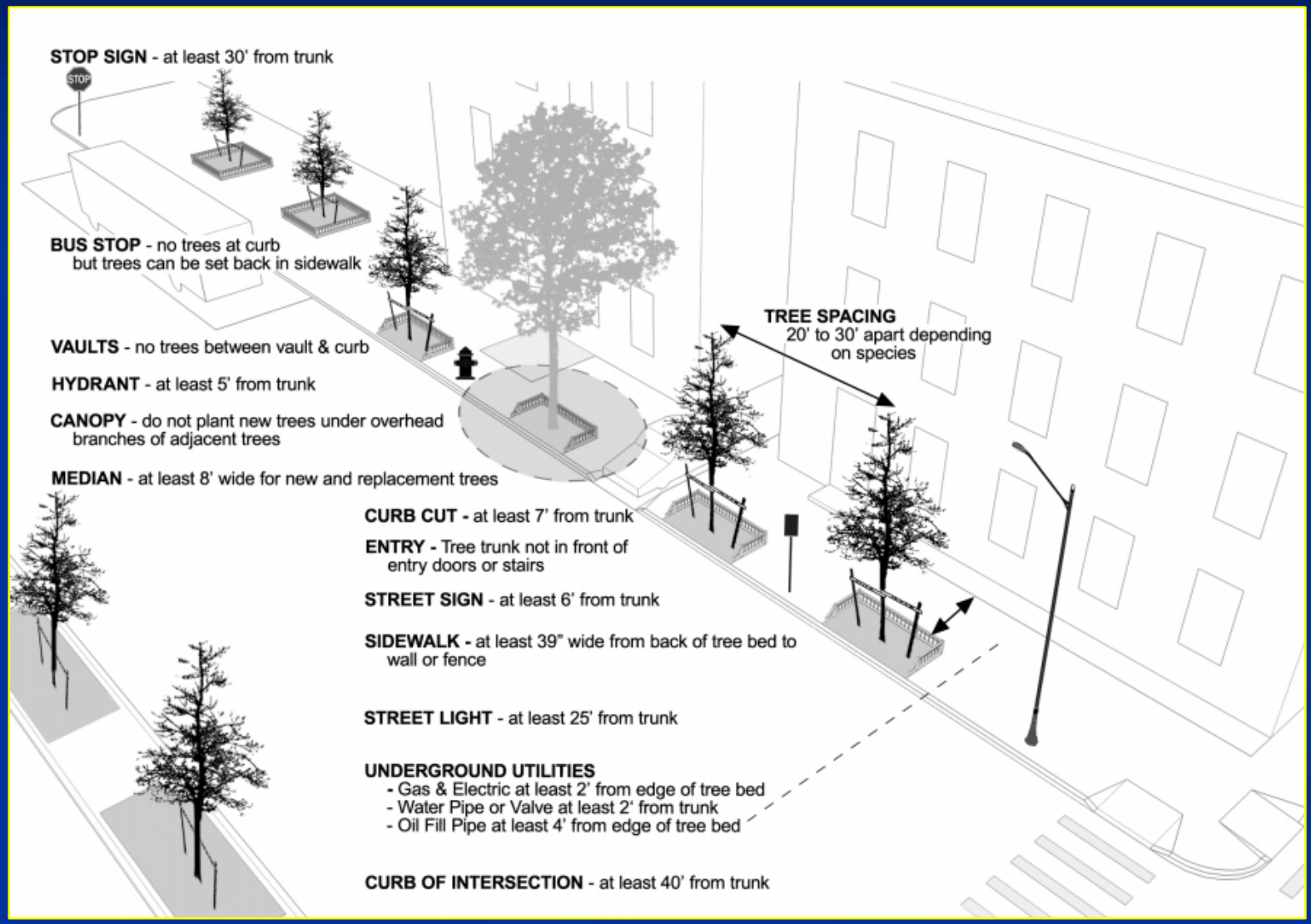
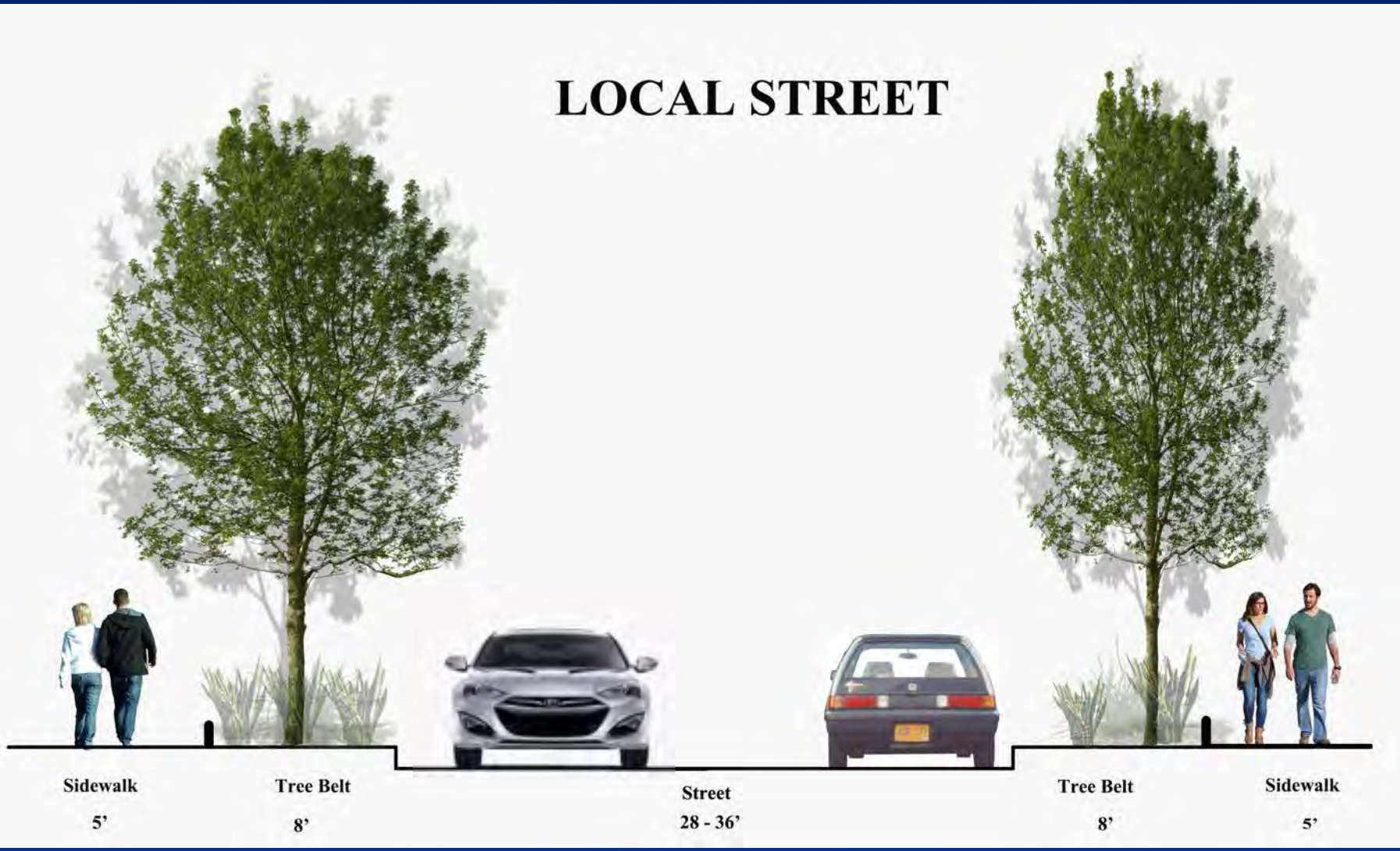
Trees as Landscape Elements



Streetscape design scenarios

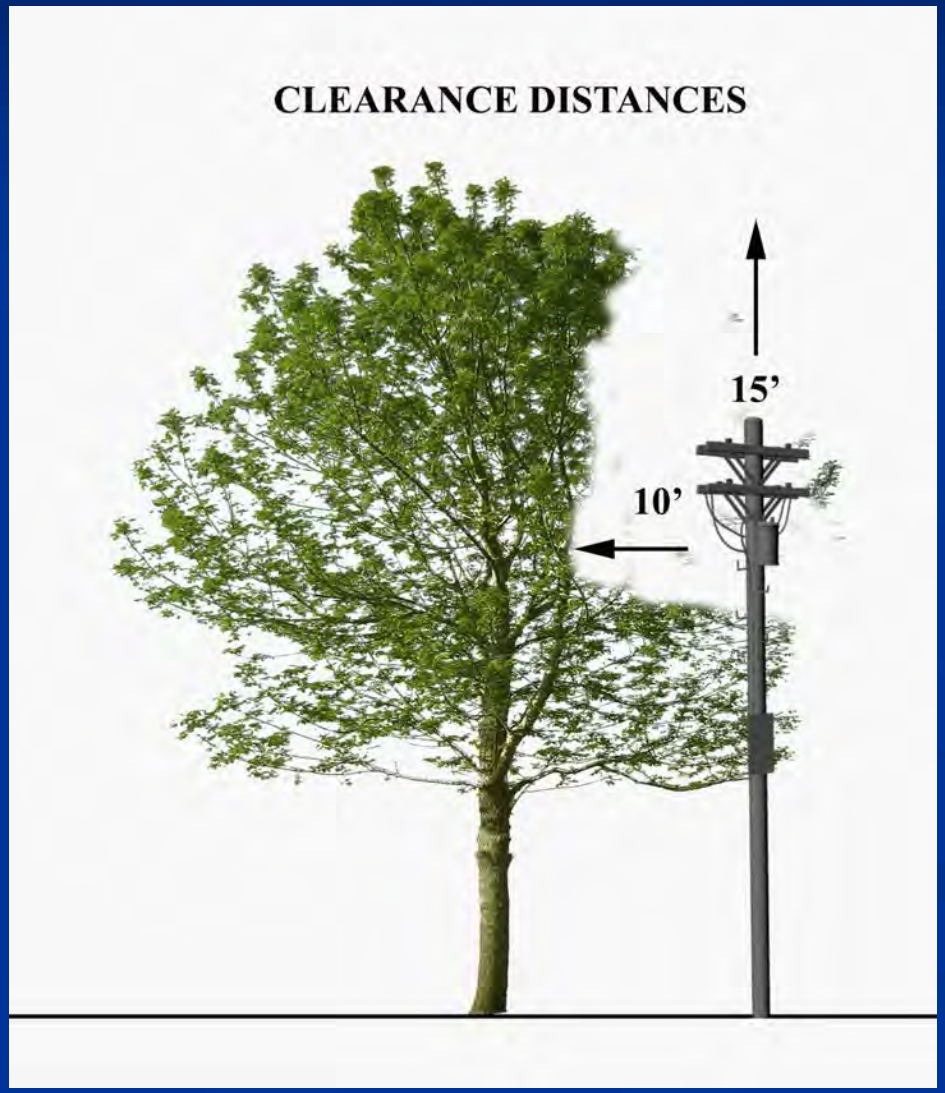
Streetscape design scenarios



Streetscape design scenarios

Streetscape design scenarios

Streetscape design considerations



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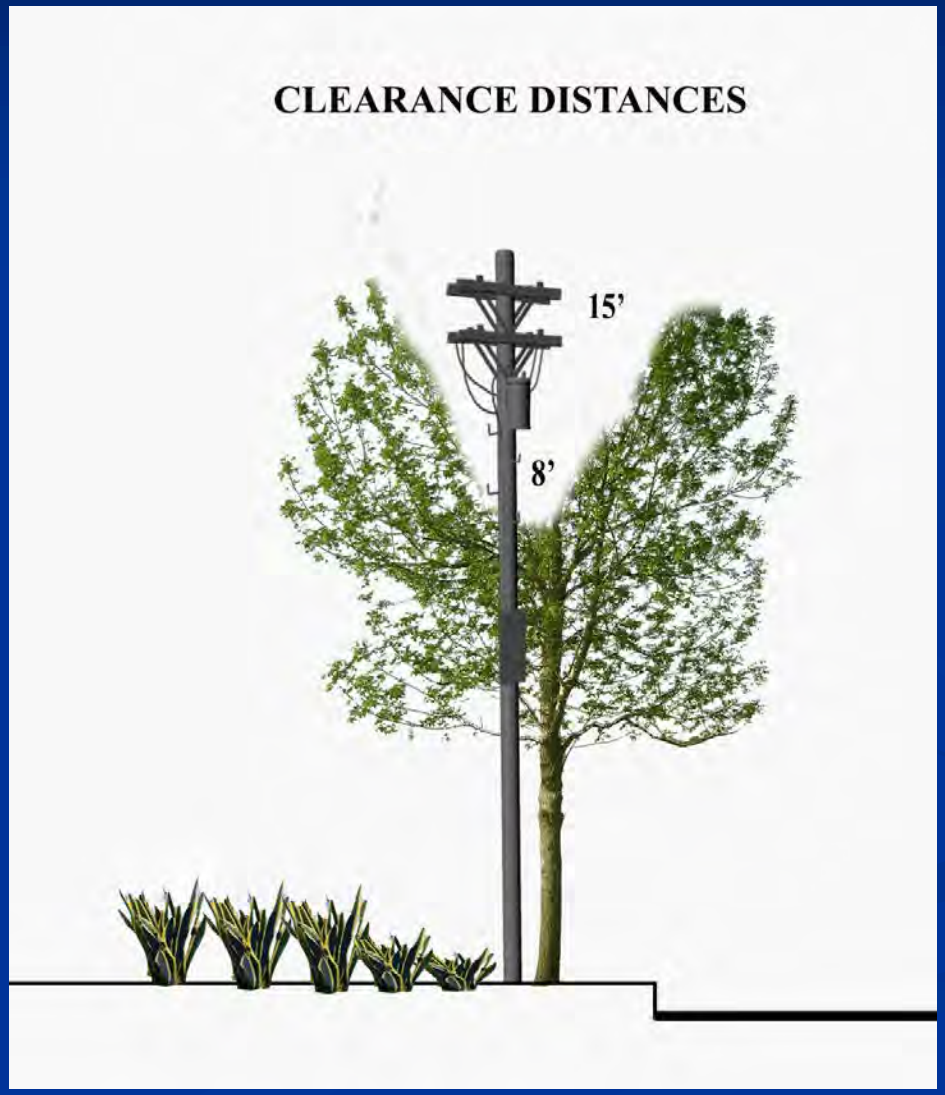

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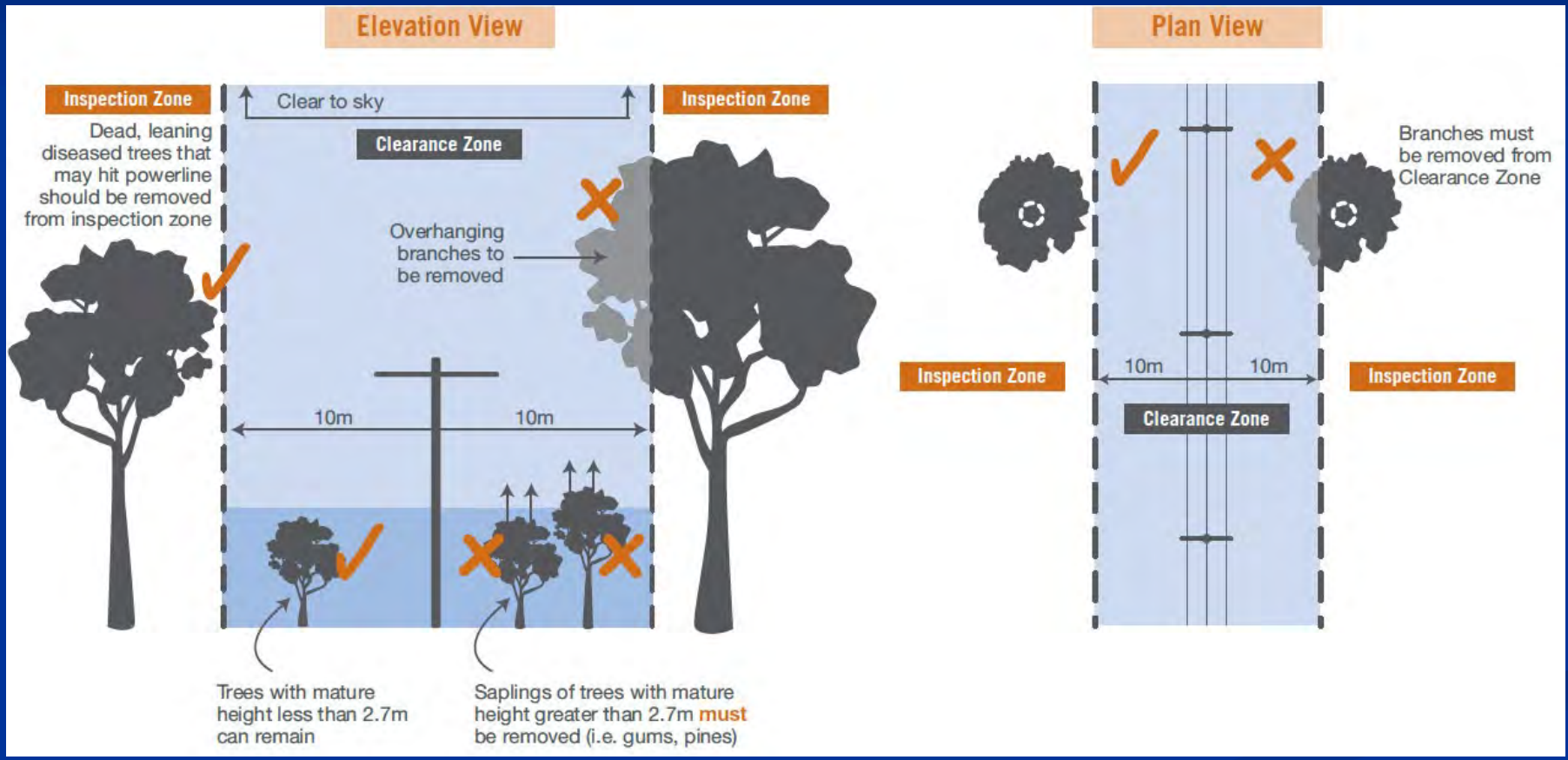

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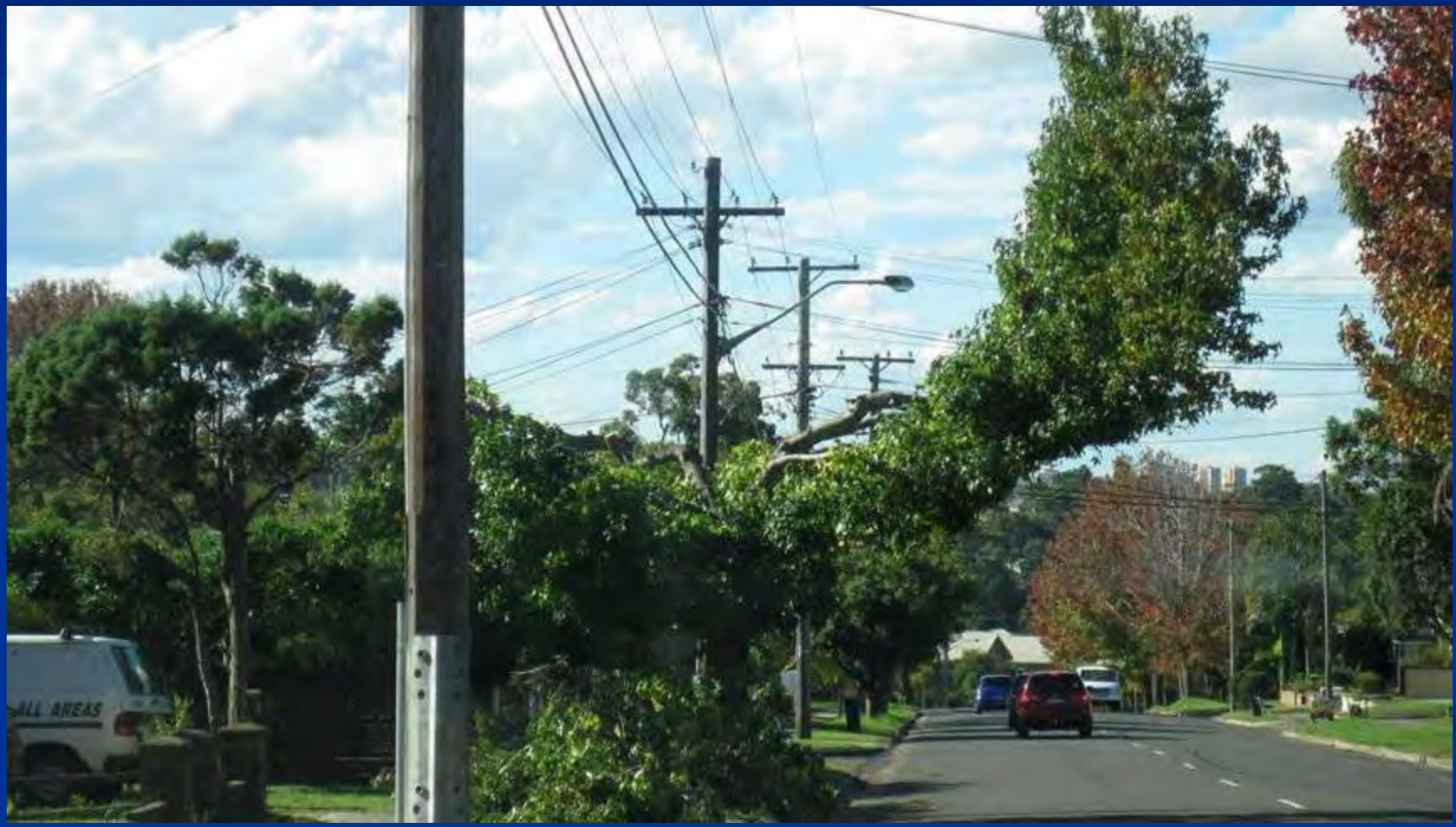

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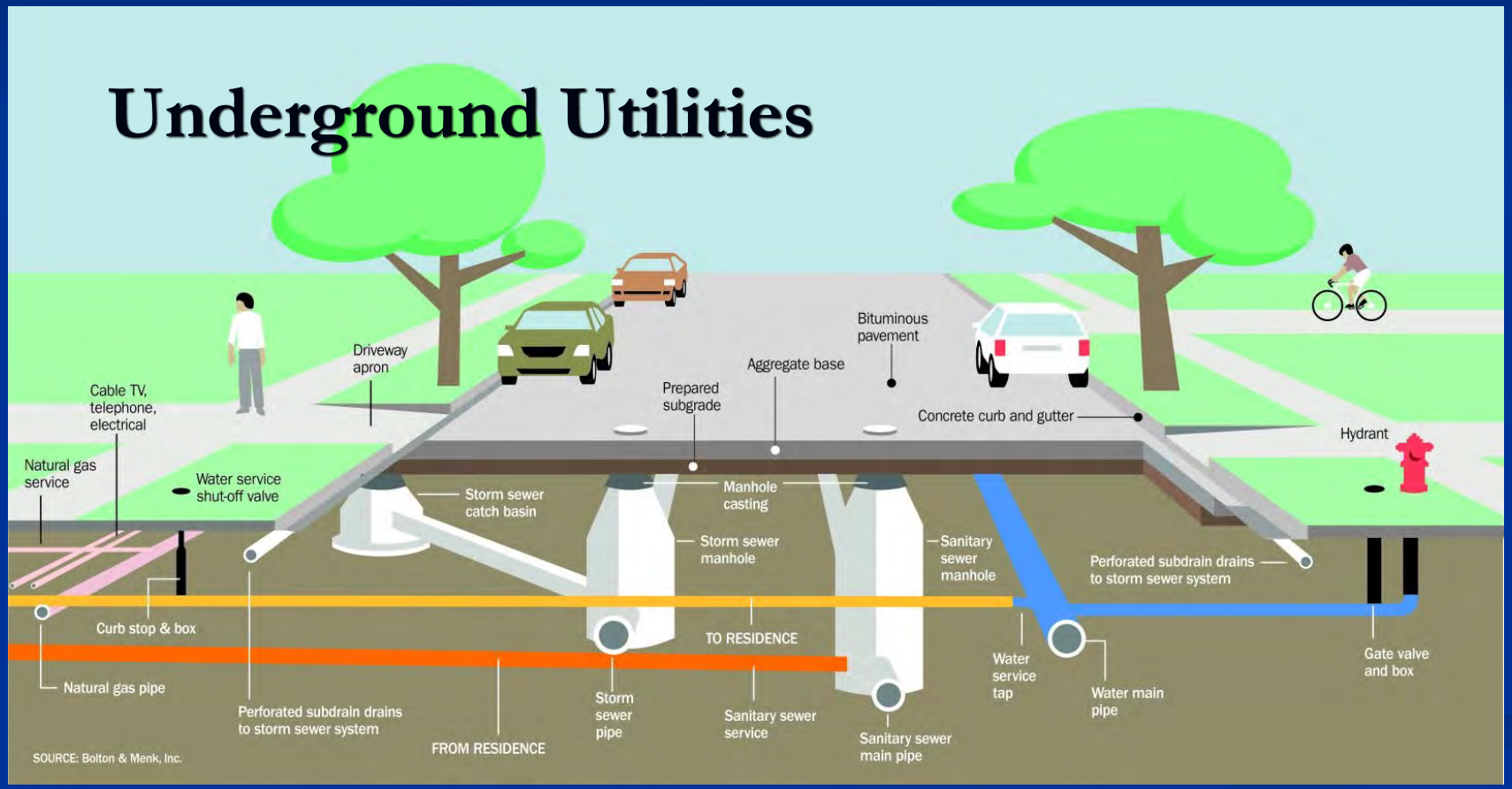

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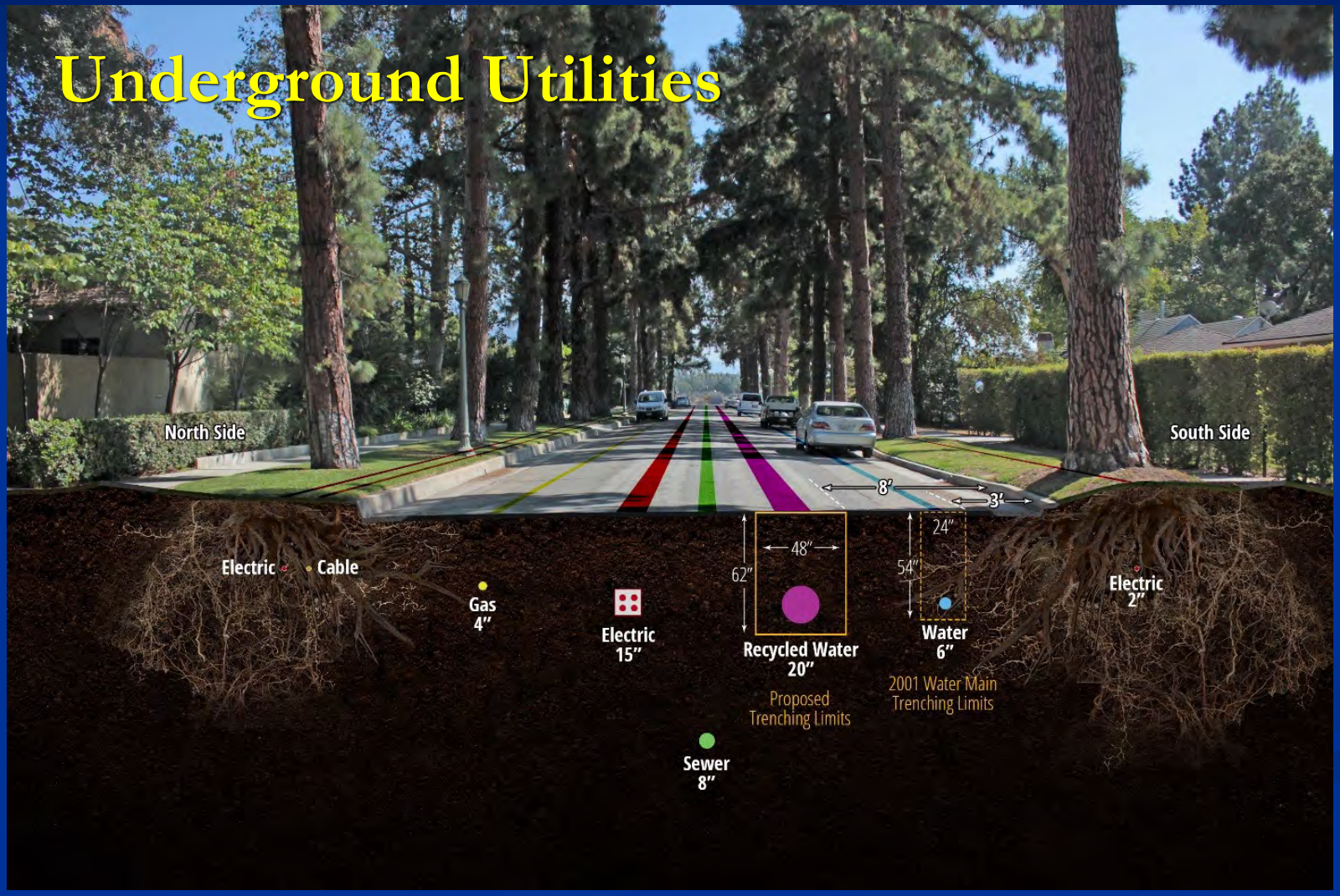

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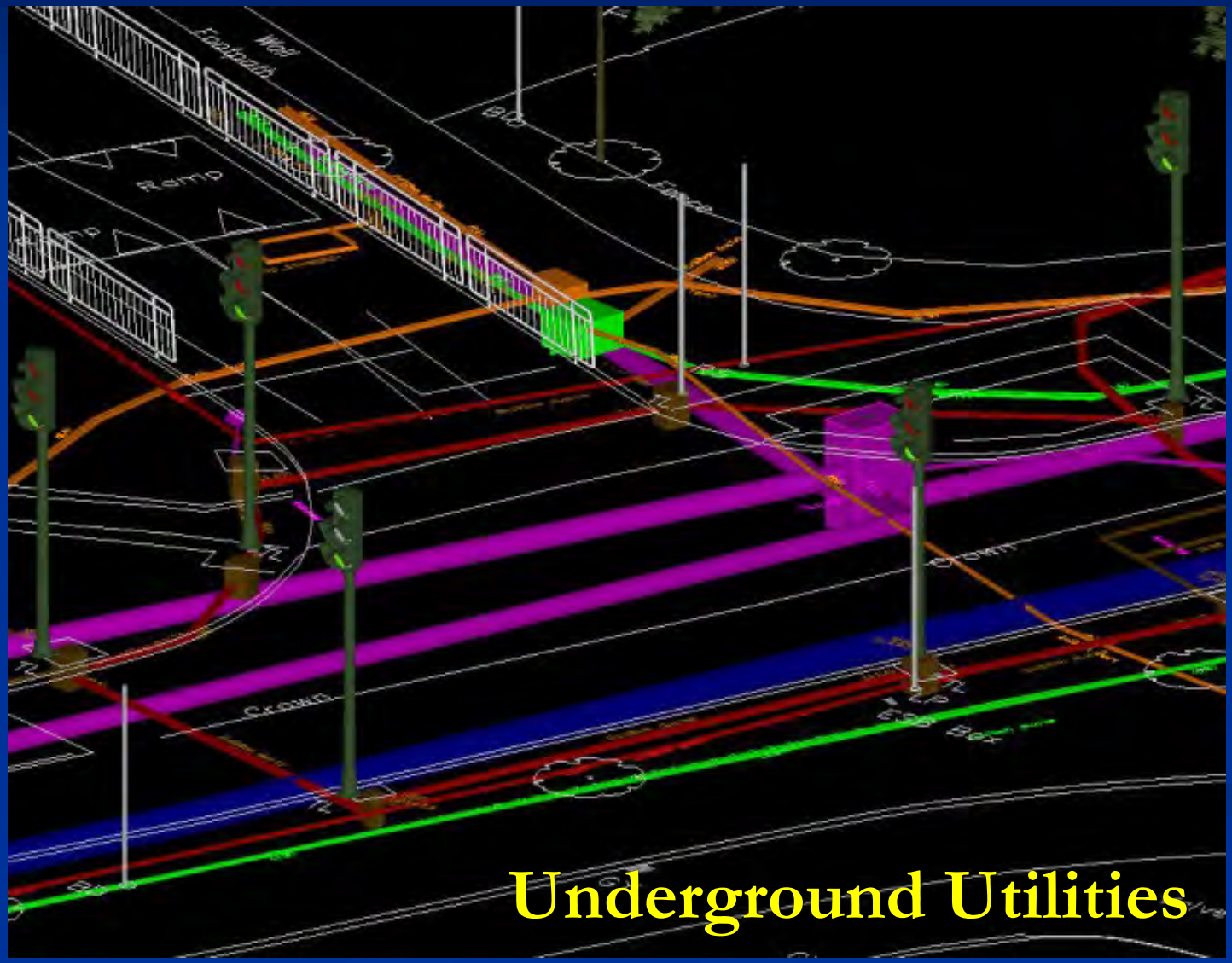

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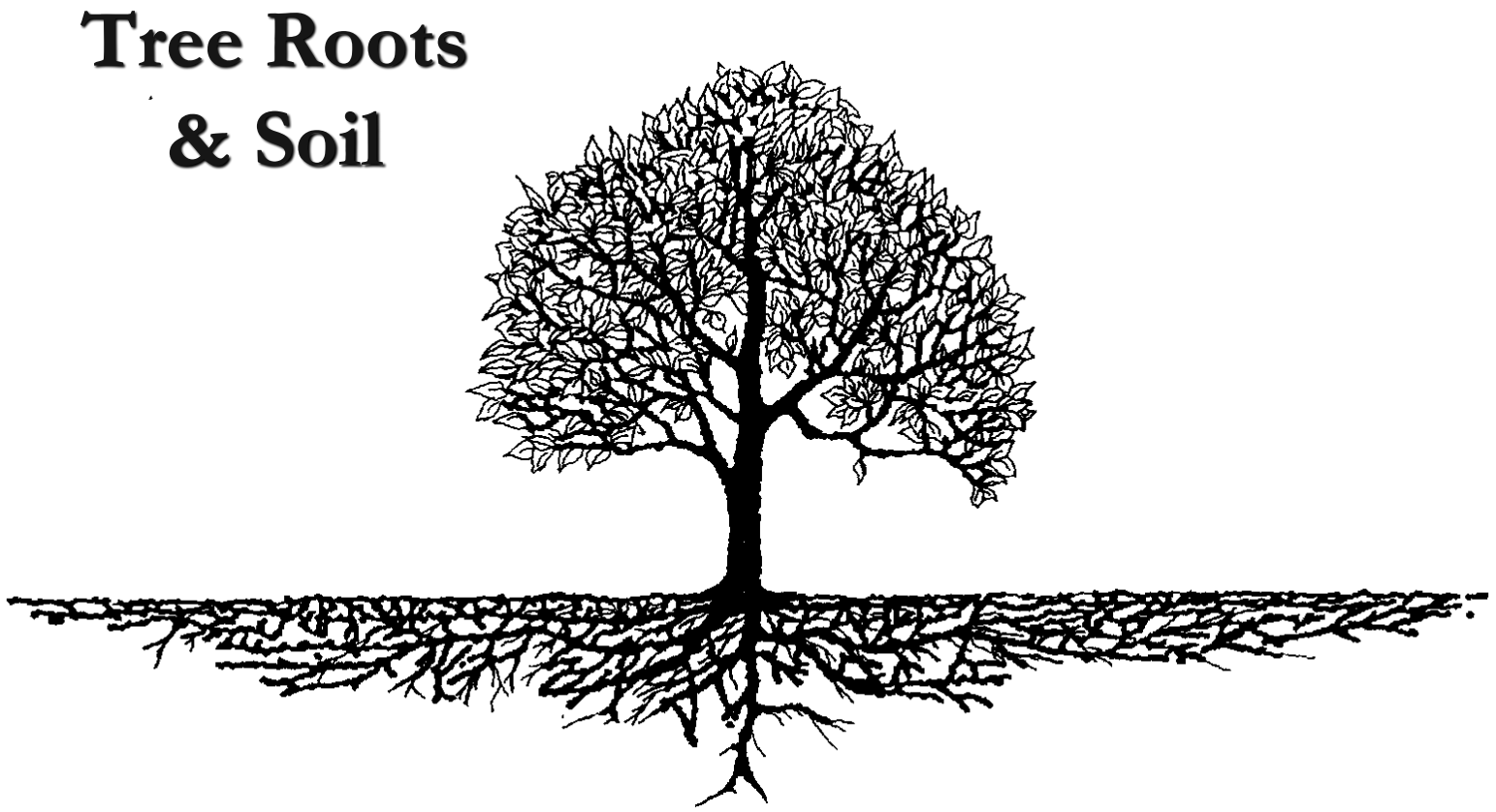

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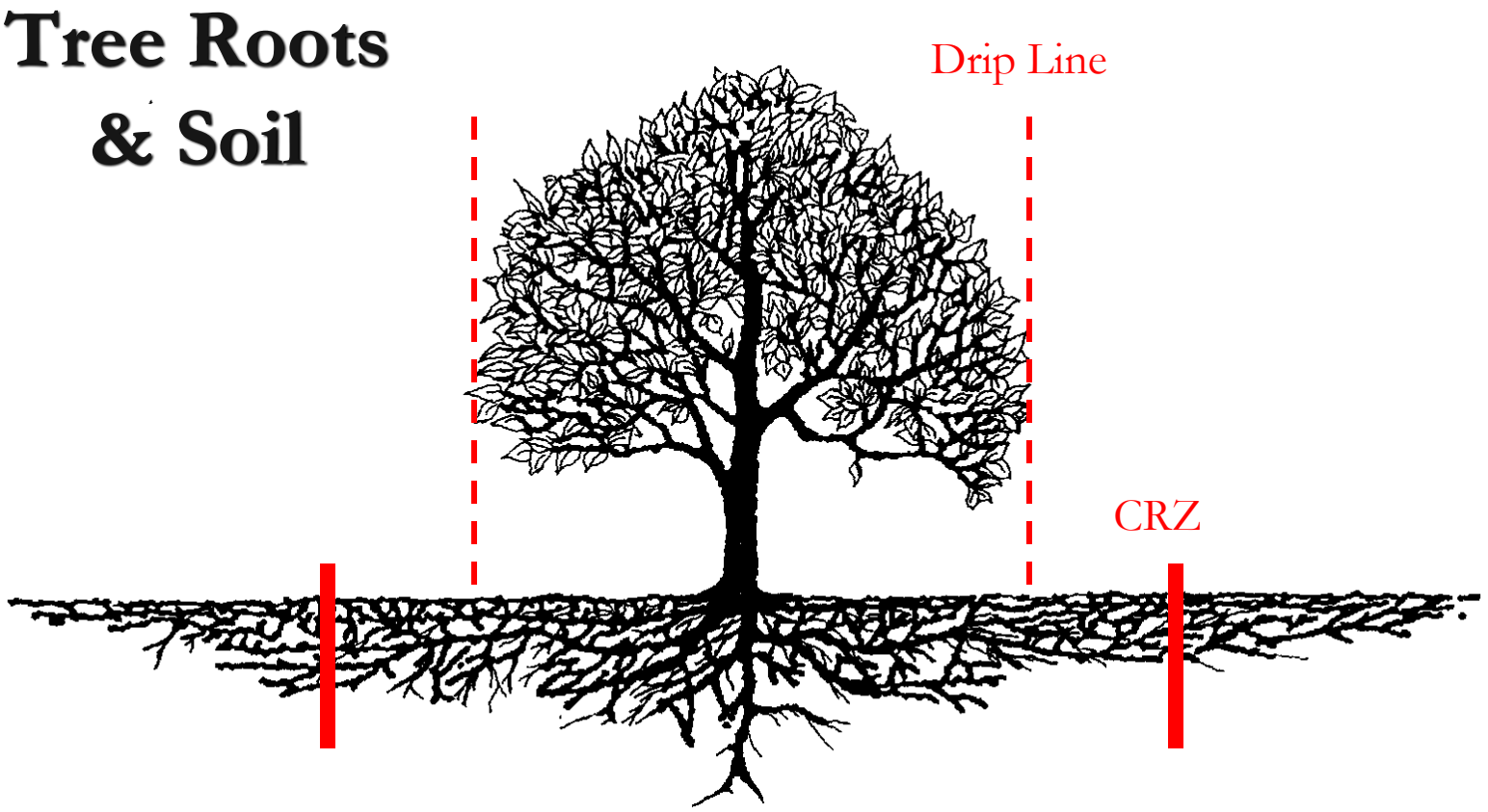

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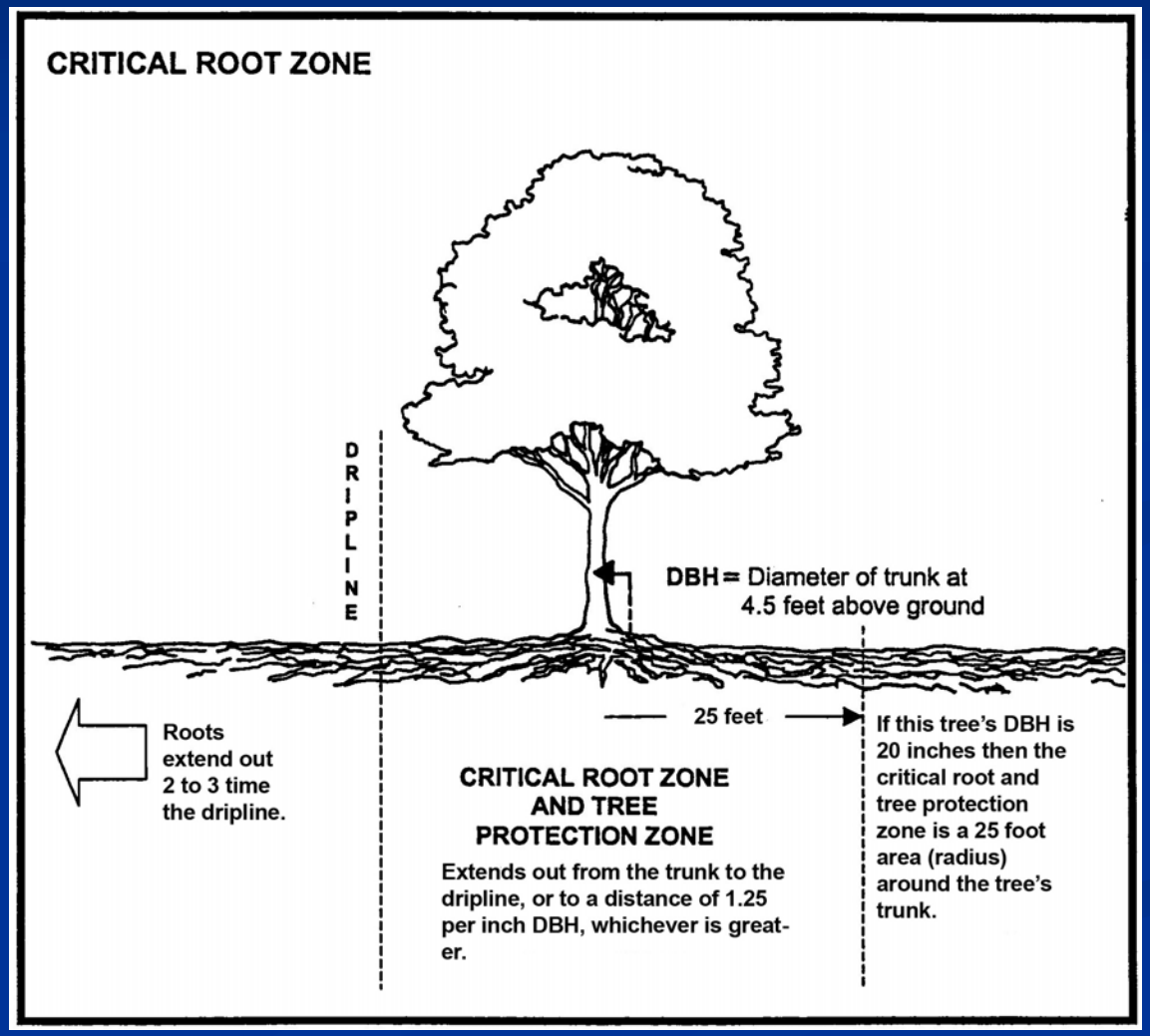


Streetscape design considerations

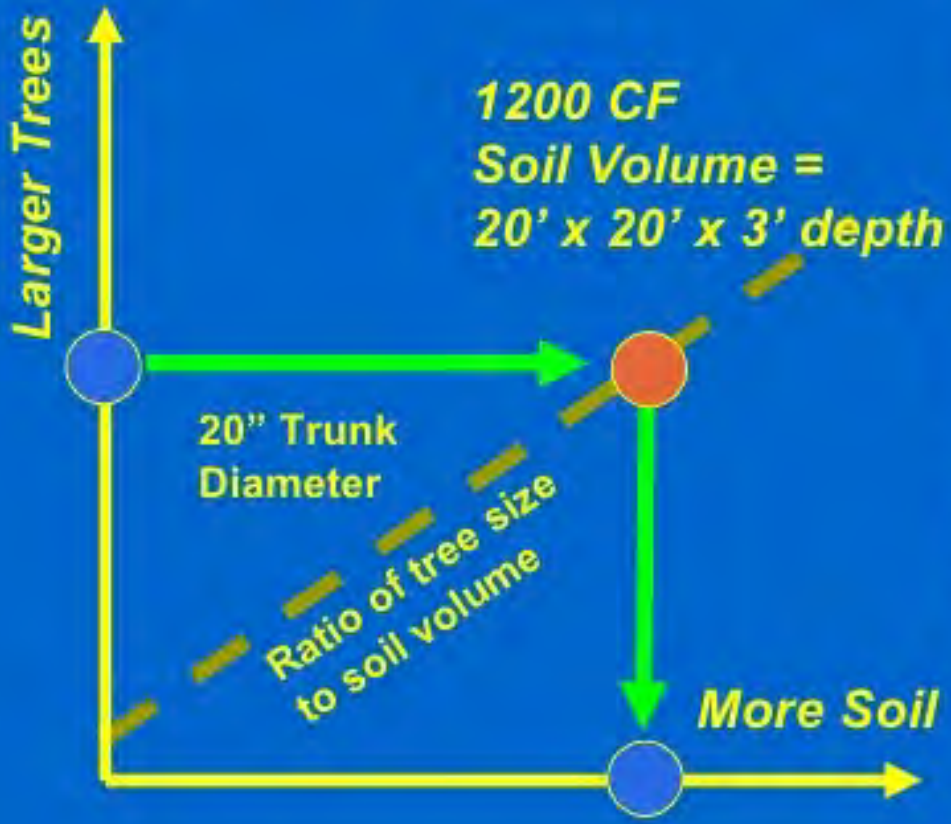
Soil Volume

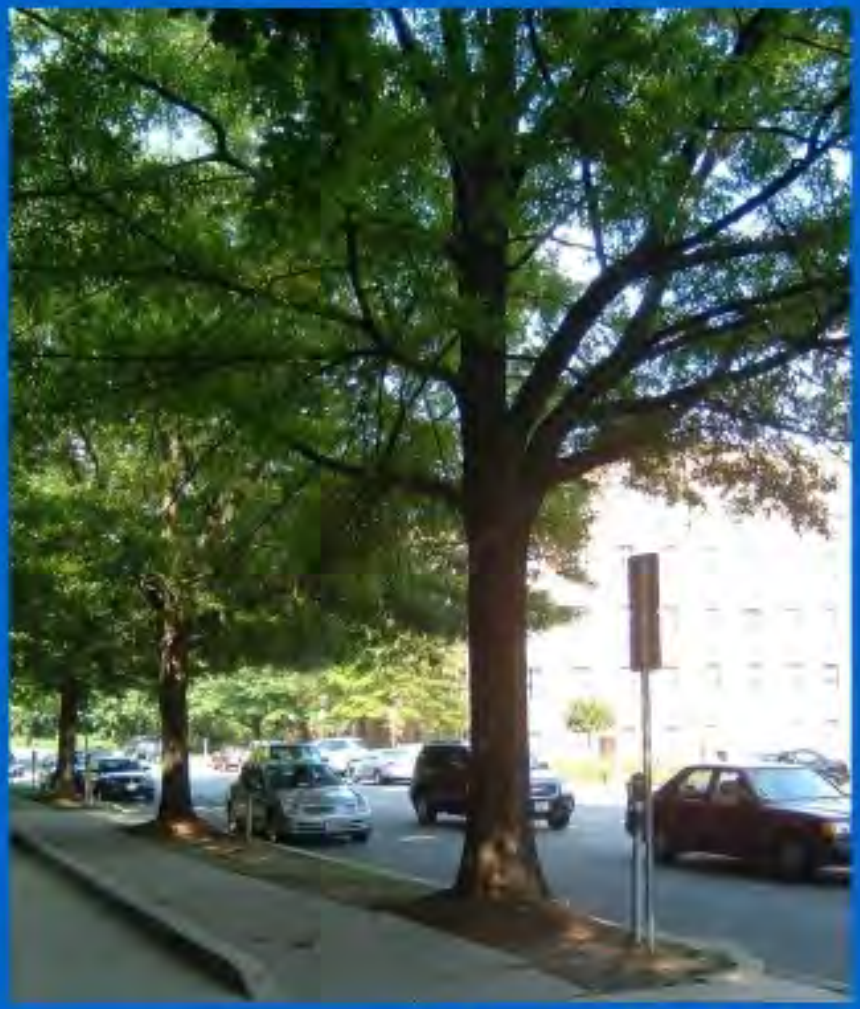
Soil Volume = 120 cubic feet

Soil Volume = 500 cubic feet

Soil Volume = 1000 cubic feet

How Much Soil ?

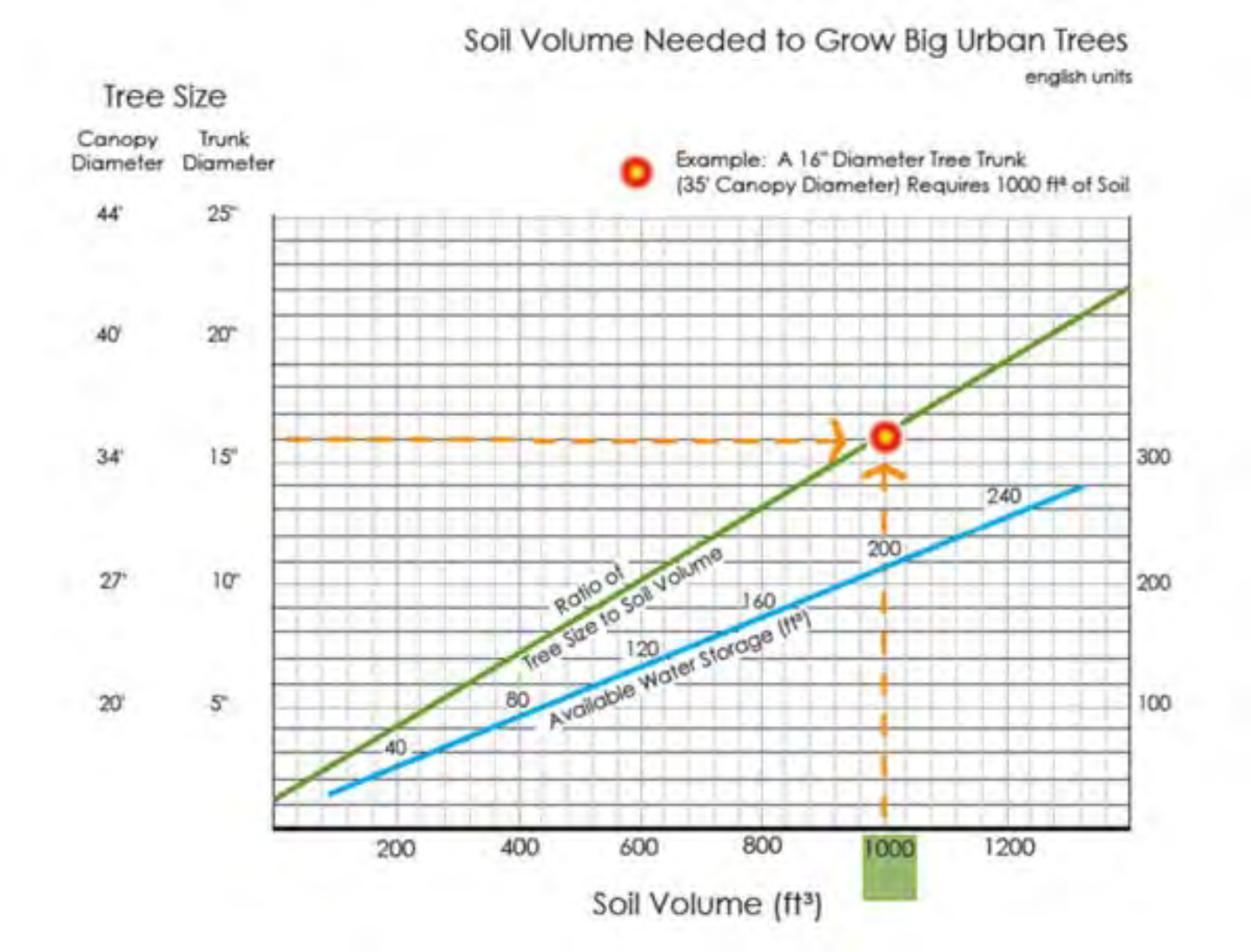




JAMES URBAN, FASLA, ISA

20" Trunk Diameter Tree will require 20' x 20' x 3' deep soil volume (min.).

Streetscape design considerations



Streetscape design considerations

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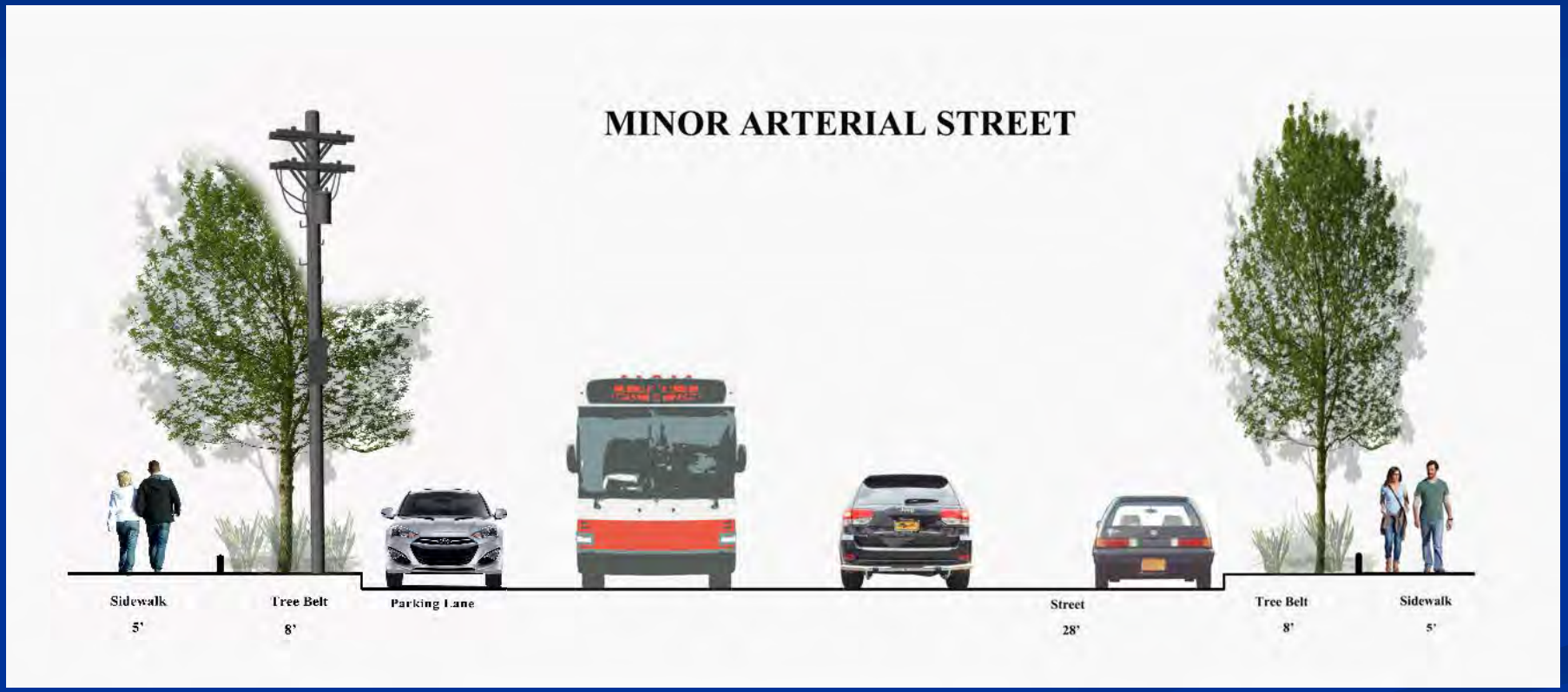
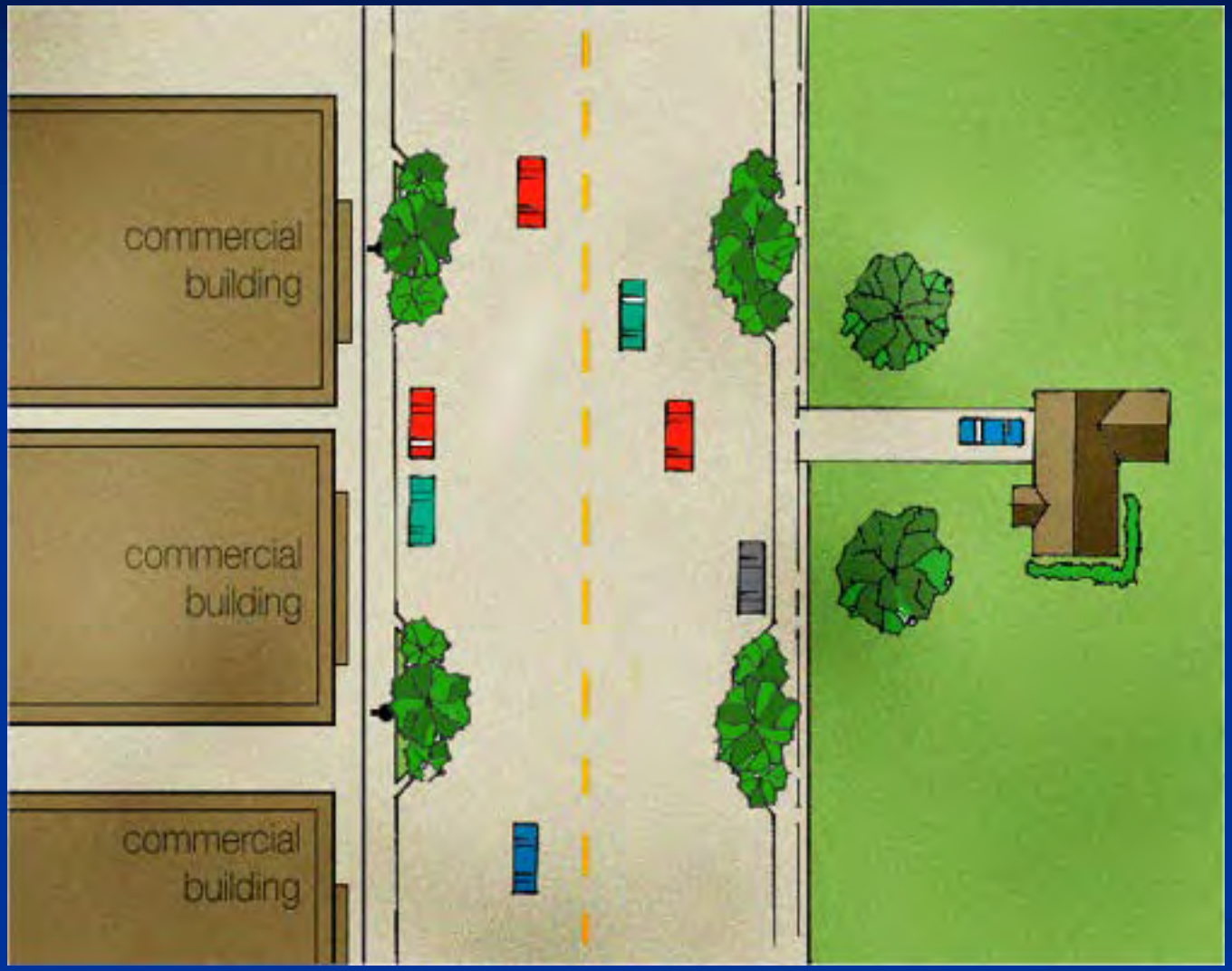


Streetscape design considerations

Streetscape design considerations

Consider These Alternatives

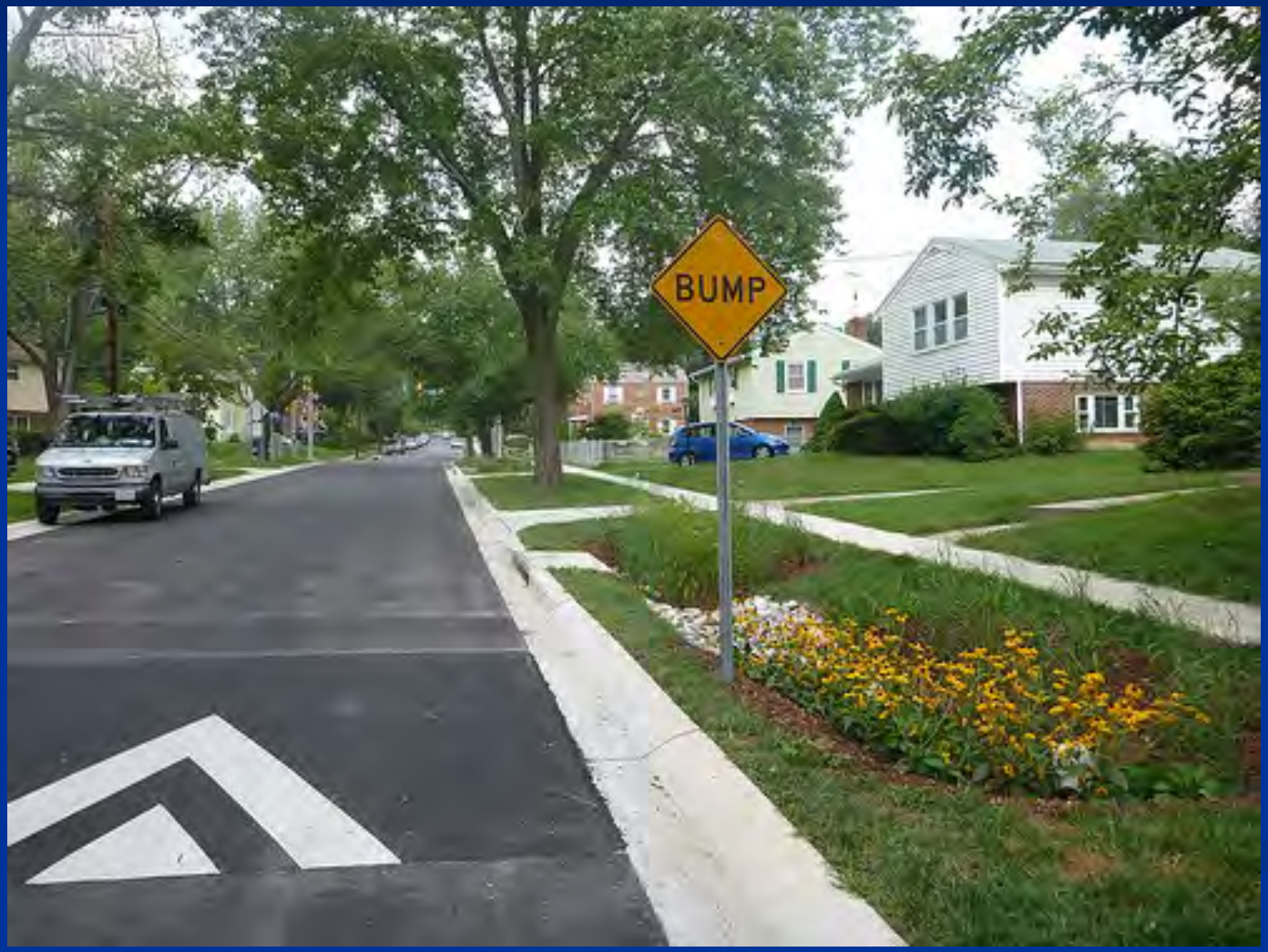
- Proper species selection, so that only trees that will not interfere with wires, building and other infrastructure.
- Setback planting appropriate species and shape
- Planting trees in locations within the right of way other than directly below the wires – bump out and terrace plantings.


commercial building
commercial building
commercial building

Bump Out Planting

Bump Out Planting

Bump Out Planting




utility lines

Set Back Planting

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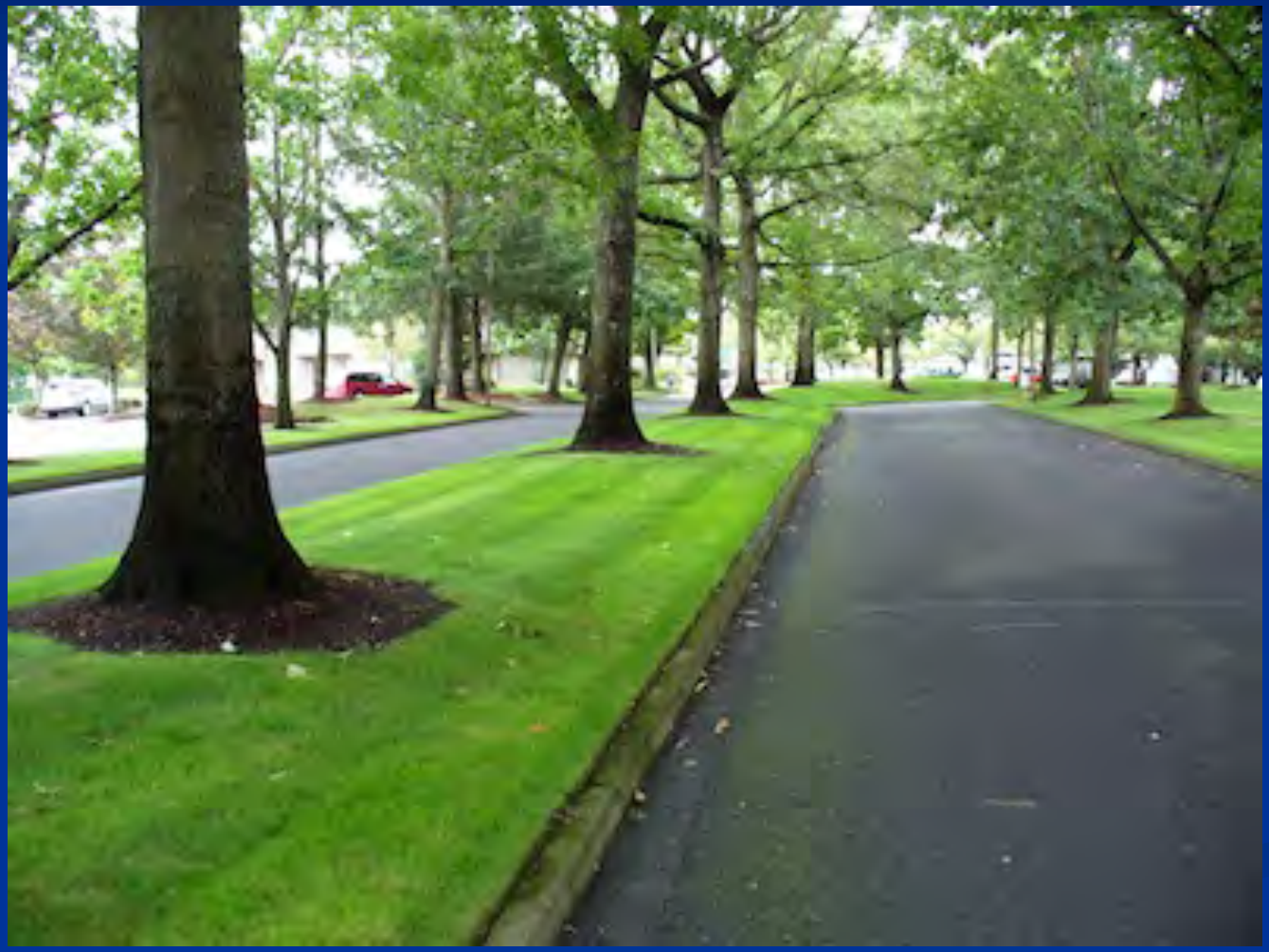
Set Back Planting

Set Back Planting

Space – Tree Species Match



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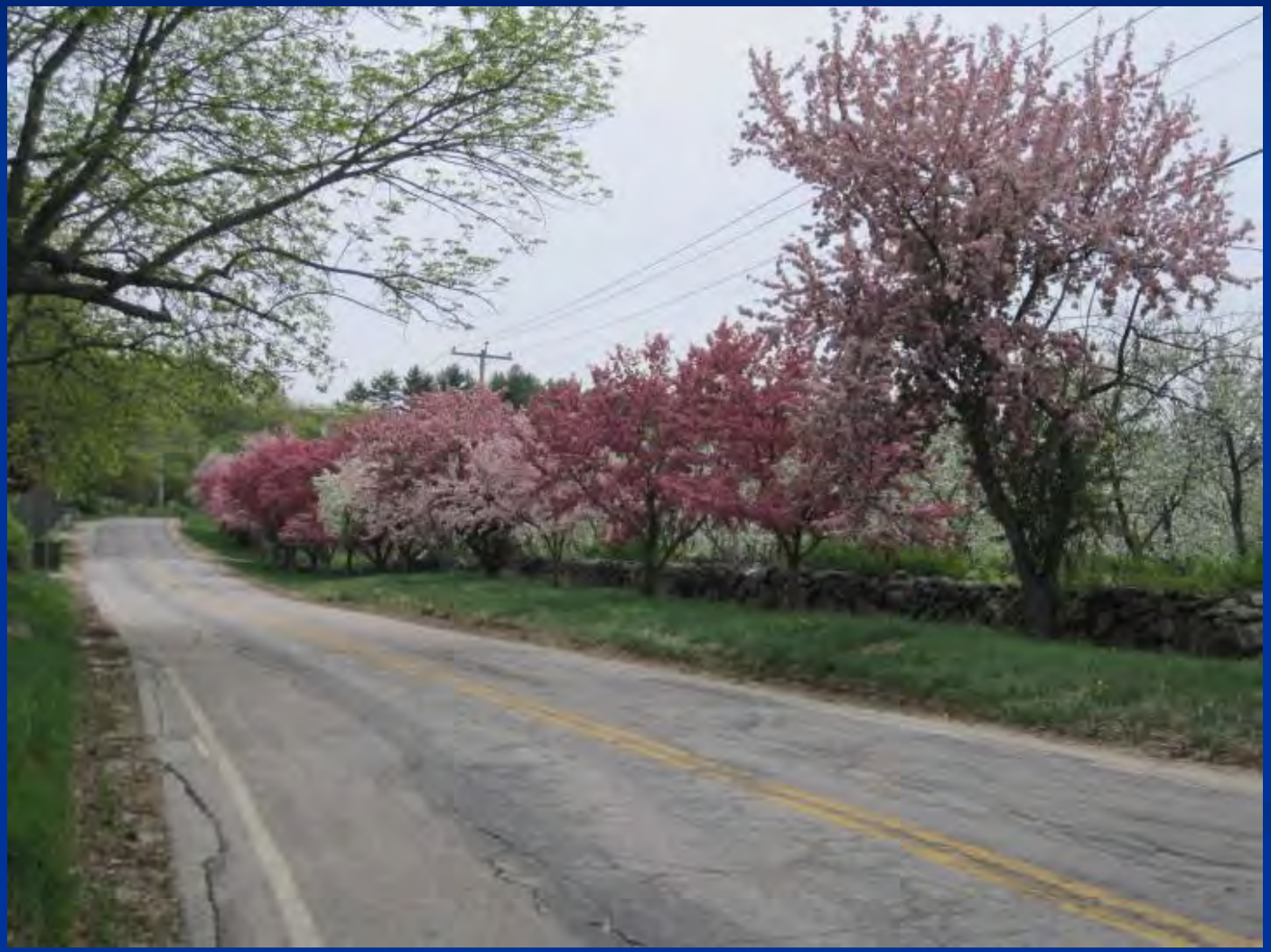

Be Creative

Be Creative

Be Creative


Plants
Aluminium profile
Irrigation line
Waterproof back layer
Fytotextile inner layer
Fytotextile breathable layer

Be Creative

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SPEED
LIMIT
30

Design Solutions for Sustainable Streets & Roadsides

David Bloniarz
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