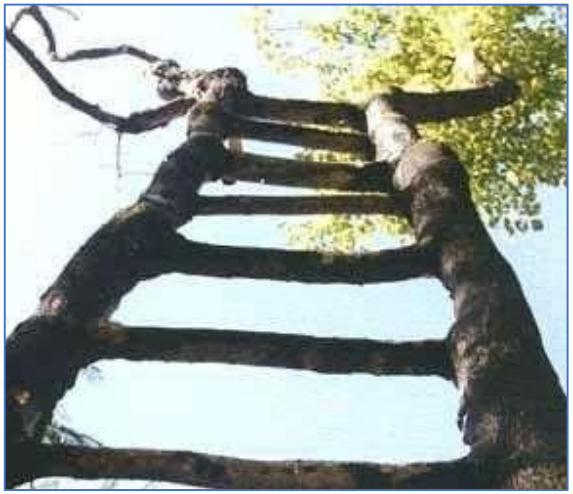
The ROOT of the matter…

Tree site selection & preparation



Adam Downing

Extension Forester

Virginia Cooperative Extension

Virginia Tech • Virginia State University

WHAT am I?

I withstand an amazing amount of abuse! Sometimes it's just too much and I'm lost. The "dirty" names I've been called... I'm constantly trampled and often shoved around, yet you can't live without me! Some folks even dump their problems on me! I am all over the world but habitually unnoticed.

WHAT AM I?

Right _ Right _

(But not political
☺)

What is the first word that comes to mind with "Right Tree Right Place"?

Right Tree Right Place Factors

Tree

Deciduous or conifer
Small or large - height and spread
Crown form
Fast growing or slow
Sun/shade requirements
Drought tolerance
Soil needs – acidity, moisture
Adaptability
Fruit/nut production
Fall color/spring flowers
Attract birds/support wildlife
Provide species diversity
Risks – pest, disease susceptibility
Maintenance needs – watering, pruning
Other:

- thorns, prickly leaves
- messy fruit
- drooping branches

Site

Hardiness zone
Slope
Aspect/orientation
Sunny or shady
Windy or sheltered
Proximity to buildings, street, sidewalk
View - provide one or block one
Provide privacy?
Soil:

- volume
- composition
- moisture
- nutrients

-acidity
-drainage
-compaction

Utility lines above and under ground
Threats:

-invasive plants
-deer
-vandalism

Outline

<u>Soils</u>

- Basics
  - Soil classes (texture)
  - pH
  - Nutrients
- So what…

<u>Right Tree, Right Place</u>

- Top (space)
- Middle (form & function)
- Bottom (tree health)

Soil Basics

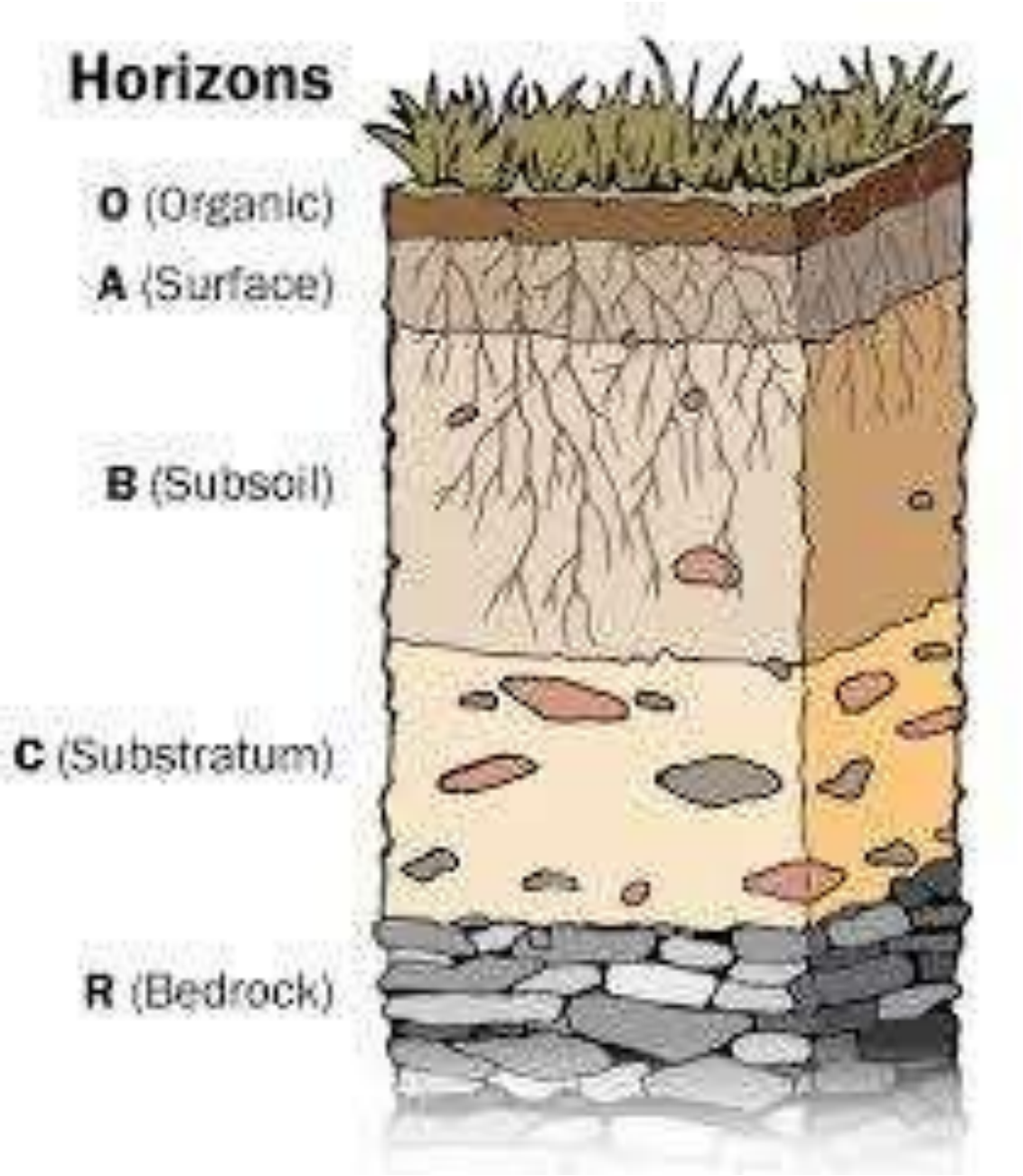
2015

International
Year of Soils

Soil Profiles

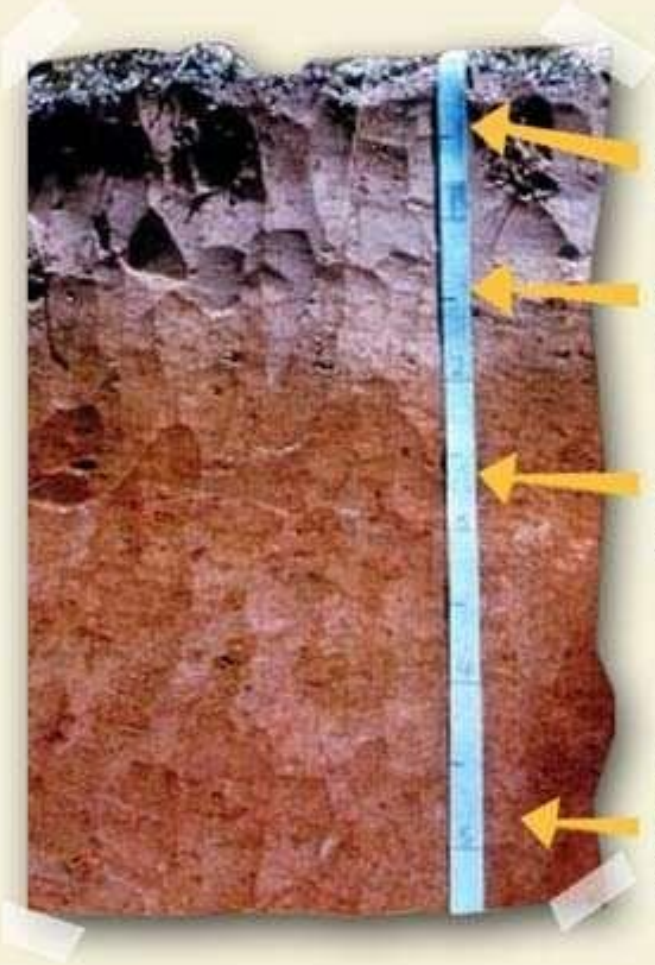
https://www.youtube.com/watch?v=Ego6LI-IjbY

6:15 to 7:26



Official State Soil: Pamunkey

What's in it?



PAMUNKEY

Forest Soils

Soil surface rich in decaying plant matter.

Seeping rain washes the reddish iron and clay out of this layer, leaving it pale.

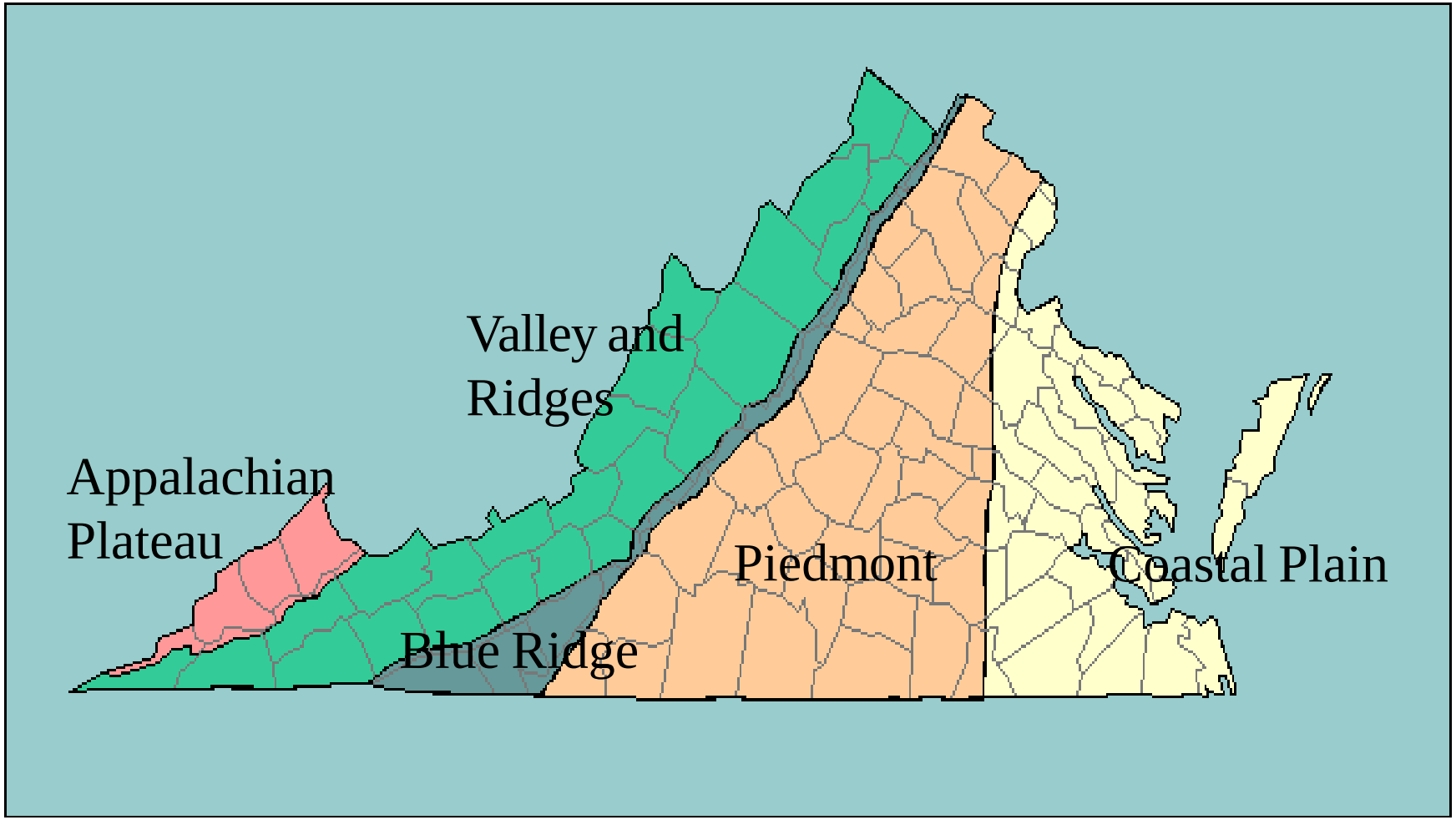
Layer is rich in reddish iron and clay. It accumulates minerals washed down from above.

Lower layers are "parent" soil. They look similar to the whole soil profile when it first began to form.

Soils in Virginia

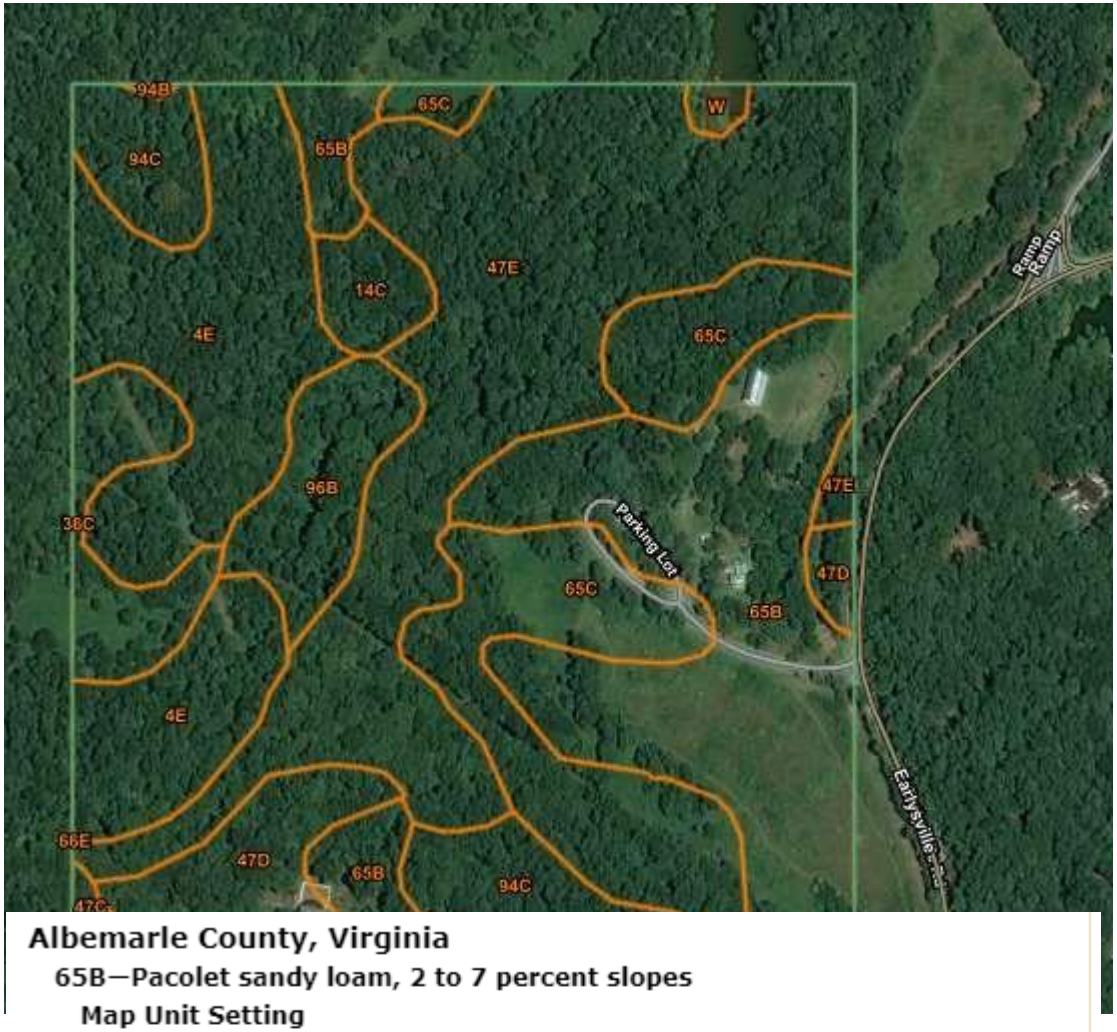
- > 600 soil series mapped in Virginia
- Differences relate to parent materials as well as local topography
- Major Soil Divisions
  - Appalachian – west of Blue Ridge
  - Blue Ridge - self-explanatory
  - Piedmont – largest region in VA; line n/s between Arlington & Emporia
  - Coastal Plain – self explanatory

Virginia Geology



Piedmont Division

- Predominant Parent Material of Majority of Soils
  - Gneiss, schist, granite with quartz, feldspar, mica as dominant minerals
- Form acid, infertile soils with sandy loam surface
- Clayey subsoils are red or yellowish-red due to oxidized iron weathered from parent material
- Respond well to liming & fertilization



Albemarle County, Virginia

65B—Pacolet sandy loam, 2 to 7 percent slopes

Map Unit Setting

National map unit symbol: kbd7
Mean annual precipitation: 25 to 65 inches
Mean annual air temperature: 54 to 59 degrees F
Frost-free period: 195 to 231 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Pacolet and similar soils: 80 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Albemarle County, Virginia

47E—Philomont sandy loam, 25 to 45 percent slopes

Map Unit Setting

National map unit symbol: 2v7jc
Elevation: 360 to 1,540 feet
Mean annual precipitation: 25 to 65 inches
Mean annual air temperature: 54 to 59 degrees F
Frost-free period: 195 to 231 days
Farmland classification: Not prime farmland

Map Unit Composition

Philomont and similar soils: 75 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Philomont

Setting

Landform: Hillslopes
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Residuum weathered from granite and gneiss

Typical profile

Ap - 0 to 5 inches: sandy loam
Bt - 5 to 79 inches: sandy loam

Properties and qualities

Slope: 25 to 45 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Moderate (about 6.6 inches)

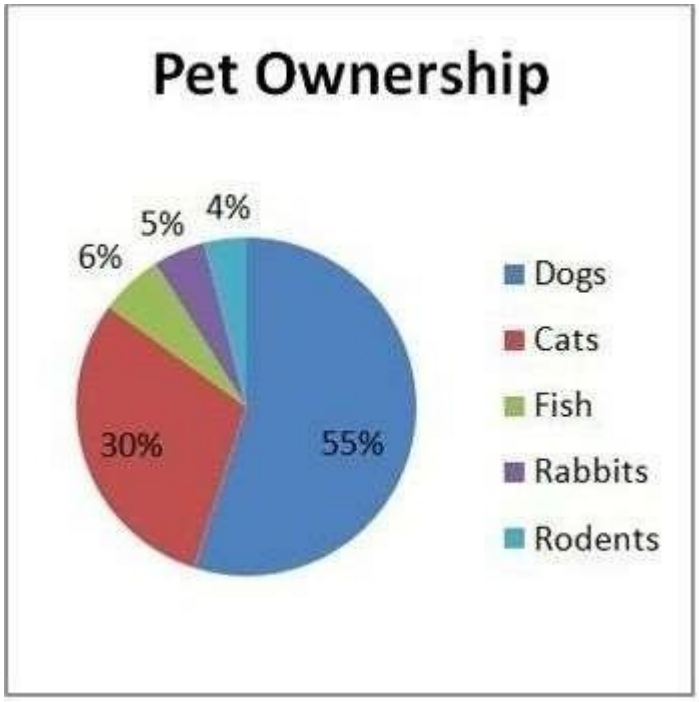
Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: A
Hydric soil rating: No

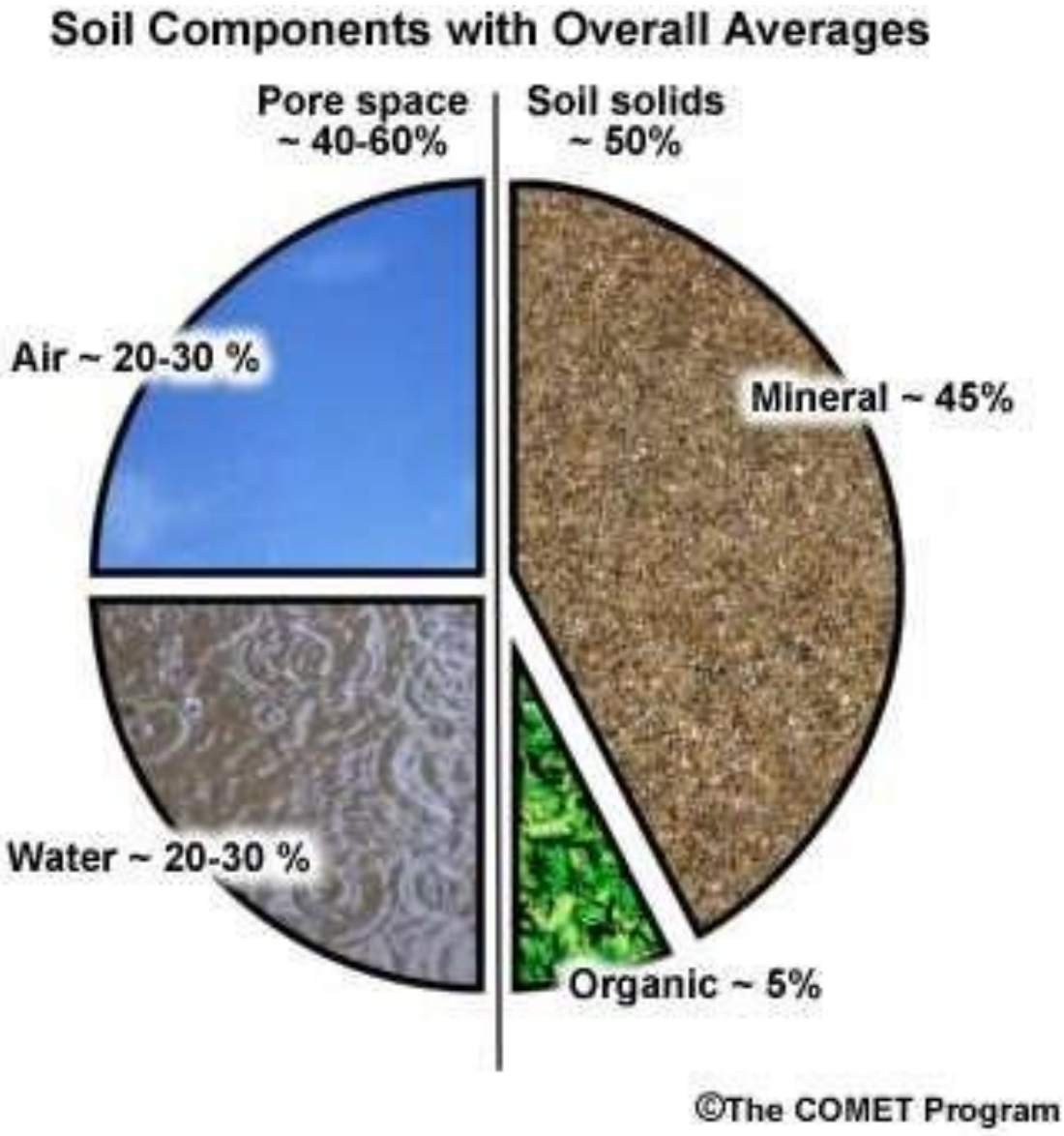
What is soil?

Draw a pie chart

- What is in soil?
  - This
  - That
  - The other
- What percentages of each make up and “ideal” soil?

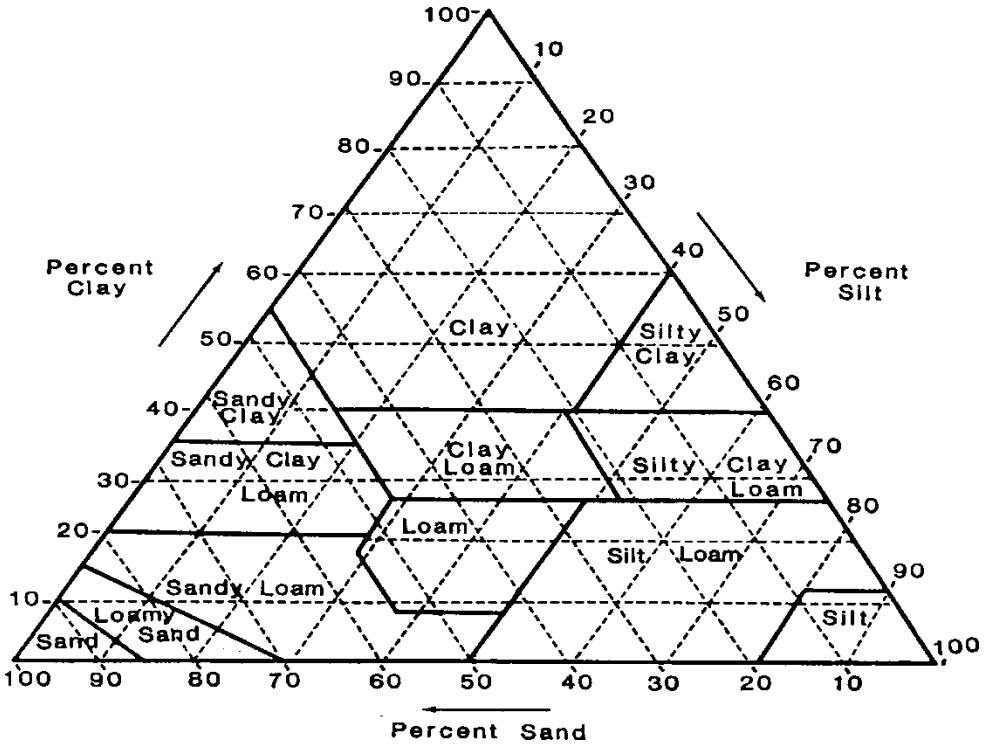


“Ideal” soil


Soil Components with Overall Averages
Pore space ~ 40-60%
Soil solids ~ 50%
Air ~ 20-30 %
Mineral ~ 45%
Water ~ 20-30 %
Organic ~ 5%
©The COMET Program

Soil Texture Triangle

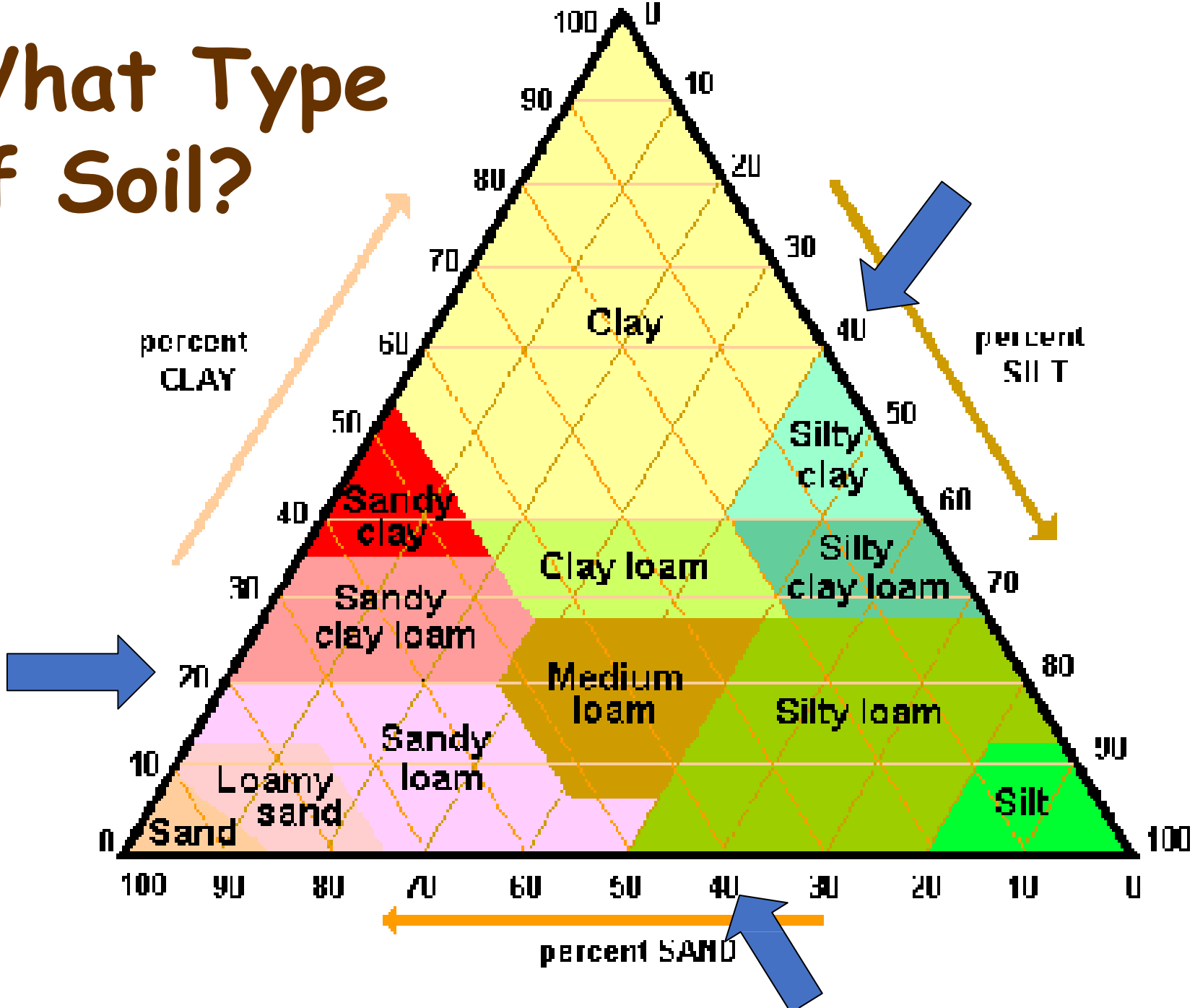
- The three sides of the triangle represent the percentage of sand, silt, or clay
- The intersection points of 3 lines from each side of the triangle determine how the soil texture will be classified
- Example:
  A soil has 20 % clay, 40 % sand, & 40 % silt
  It's a Loam



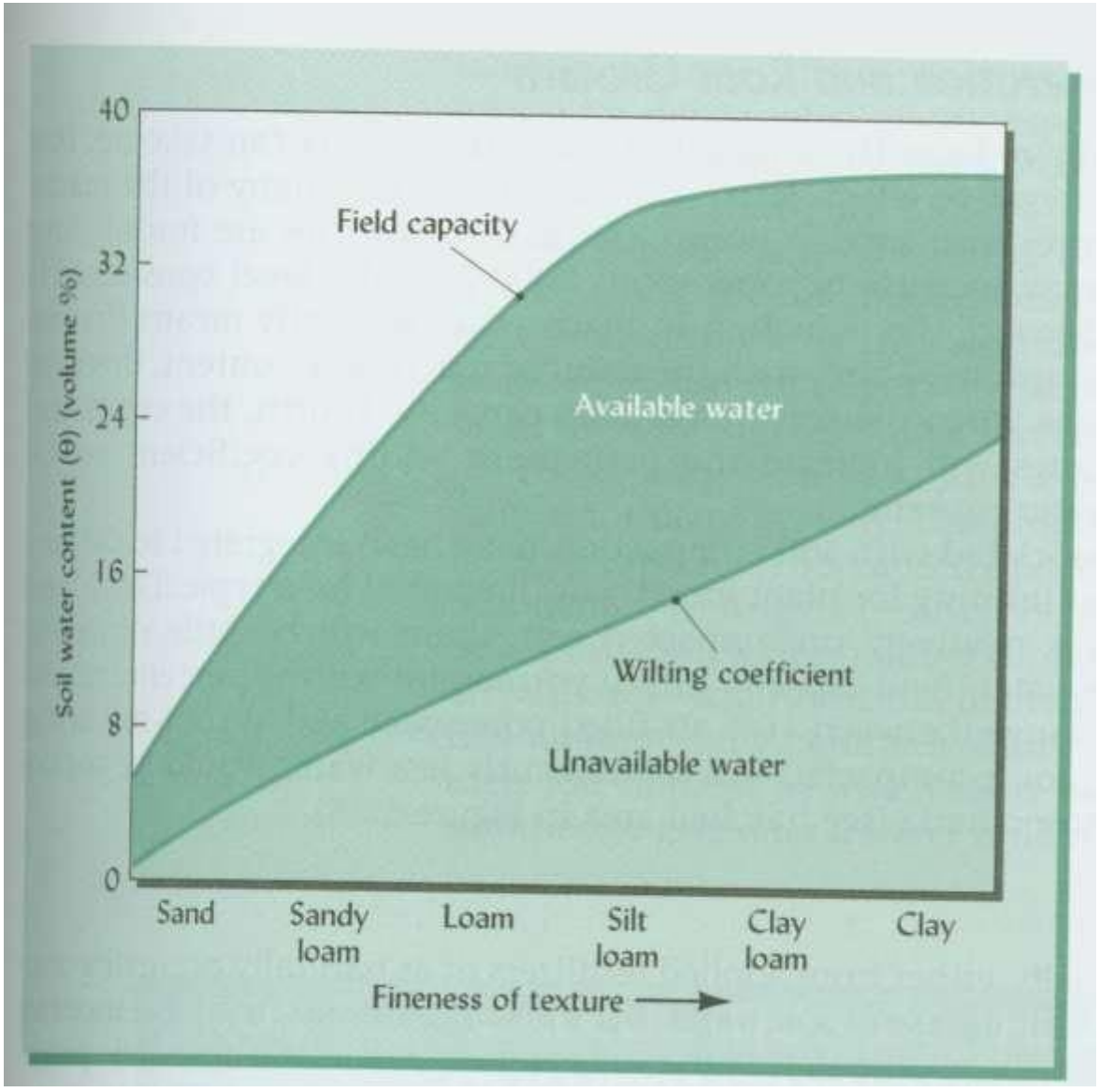
5 Principal Soil Classes in VA

- **Loam**
  - equal amounts sand, silt, clay
- **Sandy loam**
  - varies from very fine to coarse
  - contains some silt, small amt of clay
- **Silt loam**
  - silt is dominant particle
- **Silty clay loam**
  - noticable amounts of silt & clay, but silt is dominant
- **Clay loam**
  - clay dominant, but silt & sand present

What Type of Soil?



Texture and Water Capacity



Soil pH

- Measure of hydrogen activity in soil
- Scale ranges from 1 – 14, 1 = extremely acid, 14 = extremely alkaline
- pH - inverse log of hydrogen ions (H^+)
  - low pH = high free H^+
  - pH value changes 10 fold for each number
- most plants prefer pH of 6.0 - 7.0

MACRONUTRIENTS

- Nitrogen-N
- Phosphorous-P
- Potassium-K

- Primary nutrients added in commercial fertilizer
- Make up 3% of the dry weight of plants

MACRONUTRIENTS

- Calcium-Ca
- Magnesium-Mg
- Sulfur-S

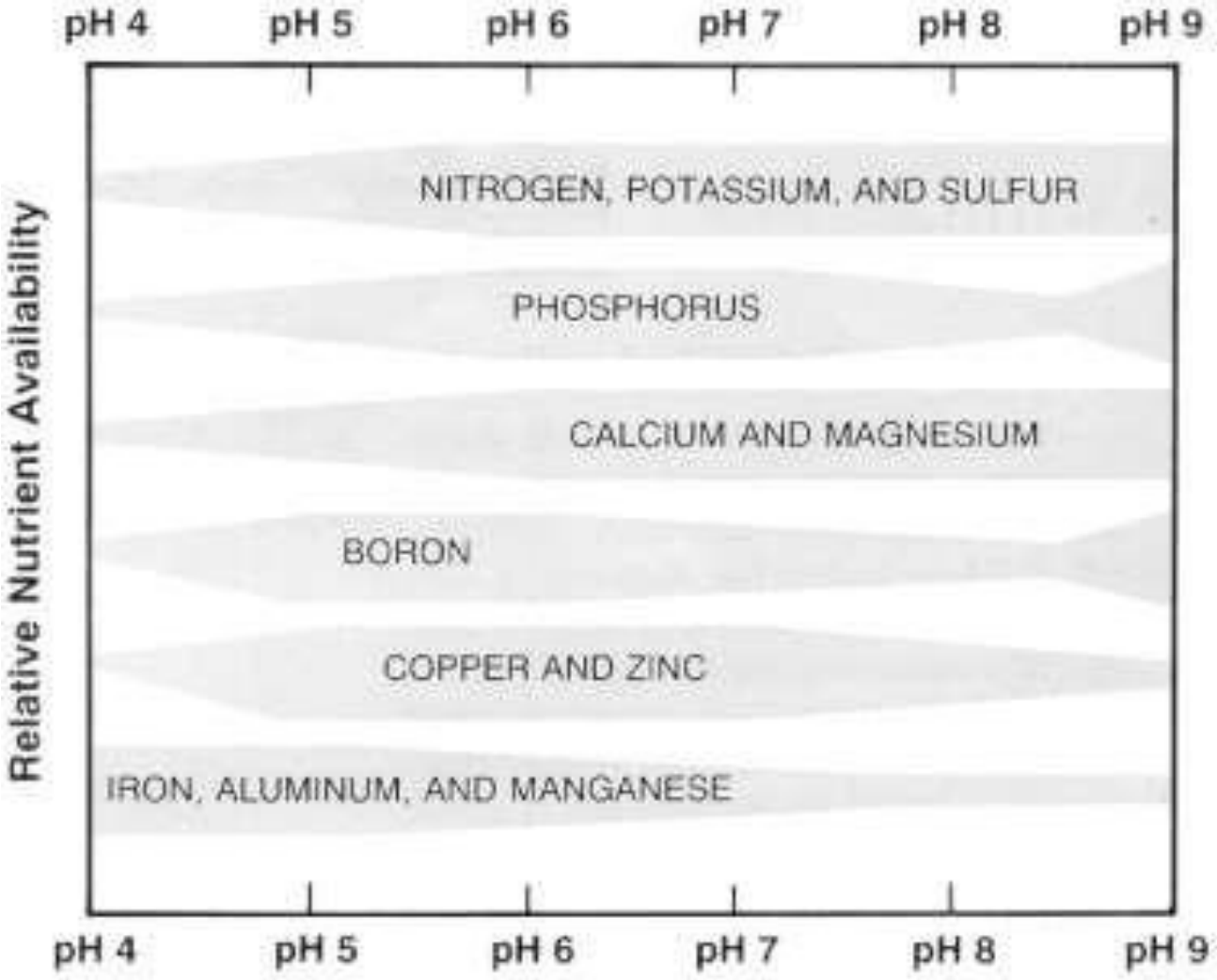
- Ca and Mg usually come from soil or lime
- S comes from soil or the air or agricultural sulfur
- Make up 1% of the dry weight of plants

MICRONUTRIENTS

- Iron-Fe
- Manganese-Mn
- Boron-B
- Molybdenum-Mo
- Copper-Cu
- Zinc-Zn
- Chlorine-Cl

- Make up 1% of the dry matter of plants
- With a few exceptions, they are not usually added to the soil
- Compost or Humus contains all of these

pH and Nutrient Availability



So what…

- Texture… is what it is
- pH… generally ok for trees
- Nutrients… sometimes can benefit

What are the biggest deals with trees and soil?

- Soil volume
- And… the silent killer…

  O_2

  - Compaction
  - Fill soil
  - Saturation

Soil Volume

- More is better
- “Tree coffins” are nice for dead trees
- In our region, a useful rule of thumb is that each inch of dbh (trunk diameter at 4.5’ above the ground) requires about 20-25 ft^2 of open ground with **uncompacted** soil.
  - A 12” oak would need 240 ft^2 or 16’ x 16’

Soil compaction

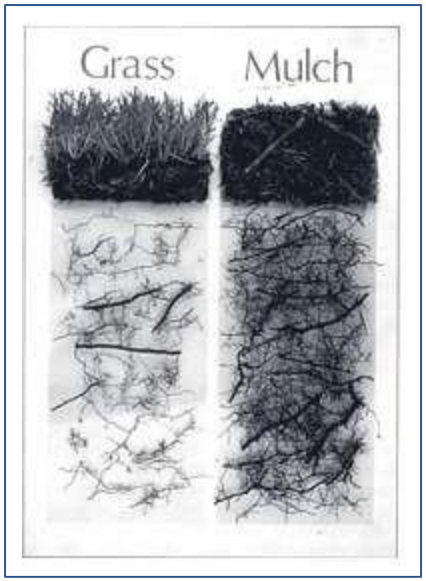
And mulch…

- What can be done for compaction?
  - Organic matter
  - Air spade https://www.youtube.com/watch?v=Xl2dBk9tqMw

And Mulch! reduces compaction

Organic

- Wood chips
- Bark mulch
  - Color die
  - Double shredded
- Pine straw
- Leaves



Inorganic

- Rubber
- Rock
- Plastic

Doughnuts, not Volcanoes!

Good

Bad

Mulch Donuts/ 3-3-3 Rule

Three inches deep

Spread at least 3 feet out from trunk in all directions

(Spread mulch about 1 foot further out yearly for the first three years after planting)

Leave a donut – ***no mulch*** within three inches of the trunk

More is better!... mulch islands

What is a bad word to use when talking with a soil scientist?

soil

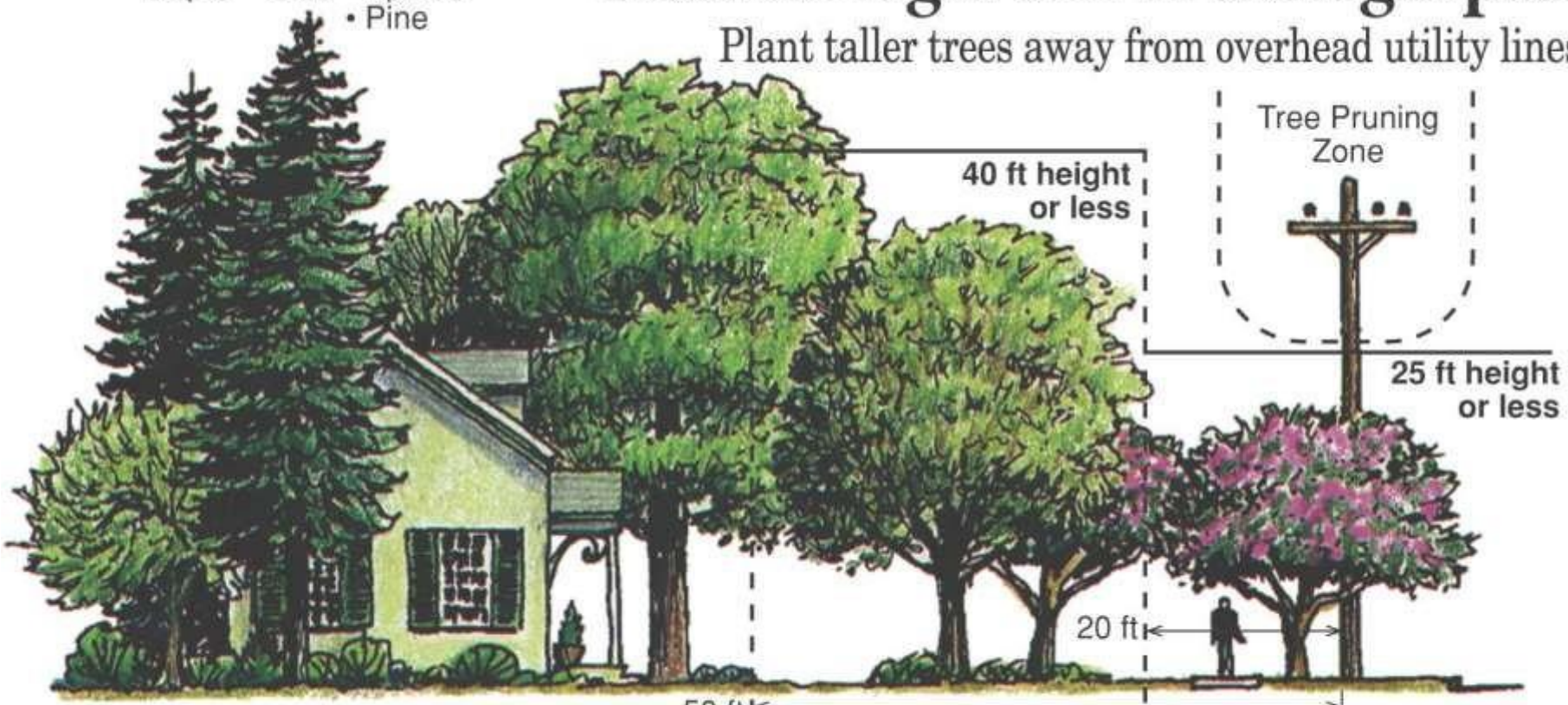
dirt

Start the presentation to see live content. Still no live content? Install the app or get help at **PollEv.com/app**

Right Tree
Right Place

Plant the right tree in the right place

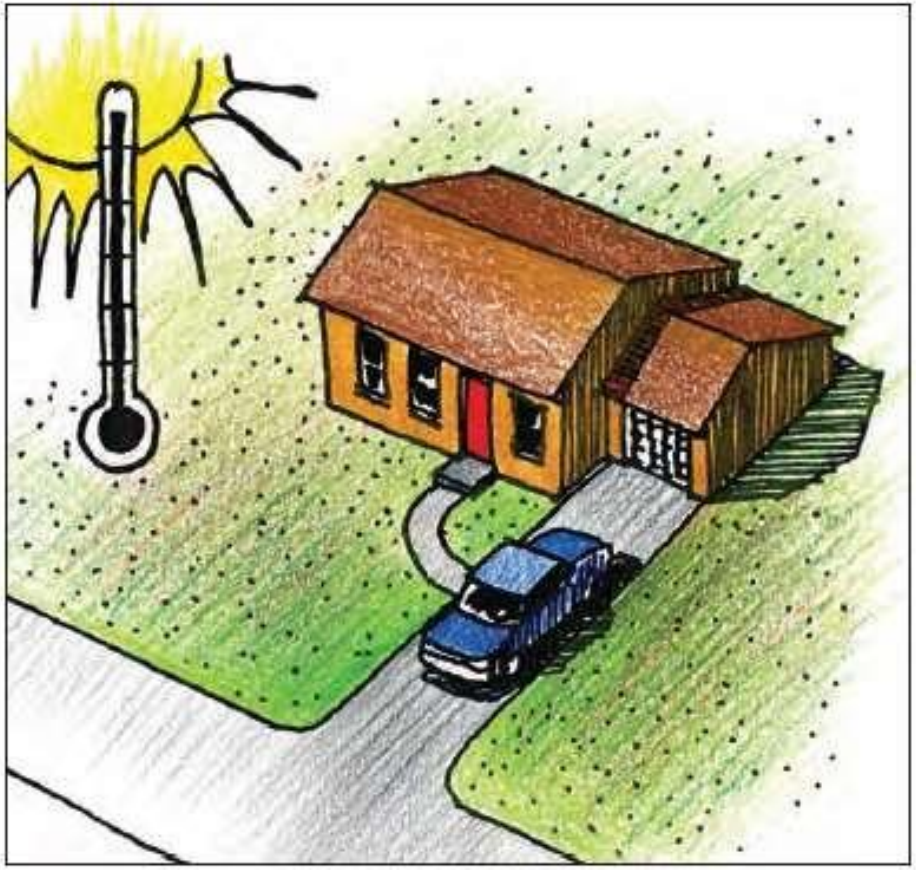
Plant taller trees away from overhead utility lines



The National Arbor Day Foundation®

arborday.org

Carefully positioned trees can save up to 25% of a household's energy needs for heating and cooling. According to the U.S. Department of Energy, this can save the average household between $100 and $250 in energy costs each year. What could your family do for fun with the money saved from cutting energy costs?

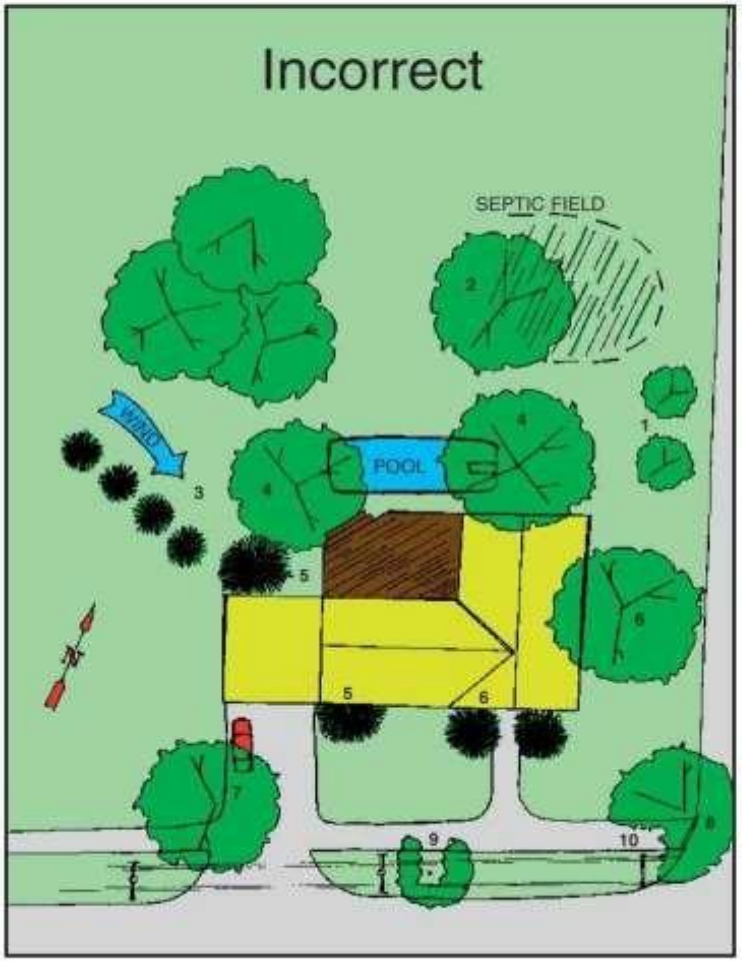


A lack of trees around houses means less comfort and higher energy costs.

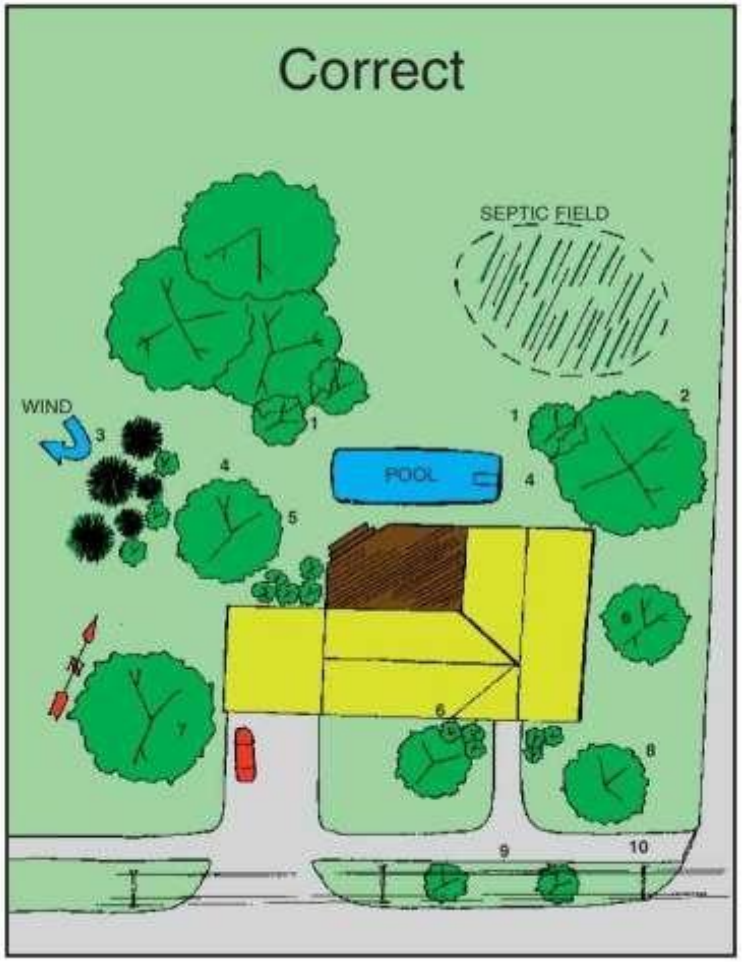
Carefully planned trees annually save money and add comfort to a home.

Right Tree/Right Location

Even the most correctly planted tree will not grow well or meet your expectations if it is selected for or planted in the wrong location. Take the time to carefully plan your landscape before you plant your trees. Remember that a tree is a long term investment -- *plant the right tree in the right location!*



1. Plant understory trees, like dogwoods, in shade, not in full sun.
2. Do not plant water-loving trees, like willows, near septic fields or water sources. Relocate or change species.
3. Align trees for wind screens where they will block winter wind, not where wind will funnel around or between them.
4. Avoid planting trees with leaf or fruit "litter" near pools, decks and paving. Locate where they shade and self mulch.
5. Avoid planting evergreens where they block winter sun. Instead, plant deciduous trees for summer shade and winter solar radiation.
6. Avoid planting trees too close to the house. Plant further away, or plant smaller trees and shrubs.
7. Cars often scrape and bruise tree trunks. Locate trees away from parking spaces or areas where they can be vandalized.
8. Branches can create hazards or block views. Locate trees away from street corners, or vehicle and pedestrian traffic.
9. Avoid planting trees directly under utility lines. Locate trees away from lines or plant smaller, low-growing trees or large shrubs.
10. Plant trees away from sidewalks to allow root expansion without pavement buckling.



Poster Design by:
Dr. Bonnie Appleton
Virginia Tech University
Illustrations/Layout: S.K. Kane

Funds provided by the Urban and Community Forestry Assistance Grants Program of the U.S. Forest Service in cooperation with the Virginia Department of Forestry © 1995

Important Information from Prior Slide 39

1. Plant understory trees, like dogwoods, in shade, not in full sun.

2. Do not plant water-loving trees, like willows, near septic fields or water sources. Relocate or change species.

3. Align trees for wind screens where they will block winter wind, not where wind will funnel around or in between them.

4. Avoid planting trees with leaf or fruit "litter" near pools, decks and paving. Locate where they provide shade and can self-mulch (somewhere that you don't have to rake).

5. Avoid planting evergreens where they will block winter sun. Instead, plant deciduous trees for summer shade and winter passive solar heating.

Important Information from Prior Slide 39

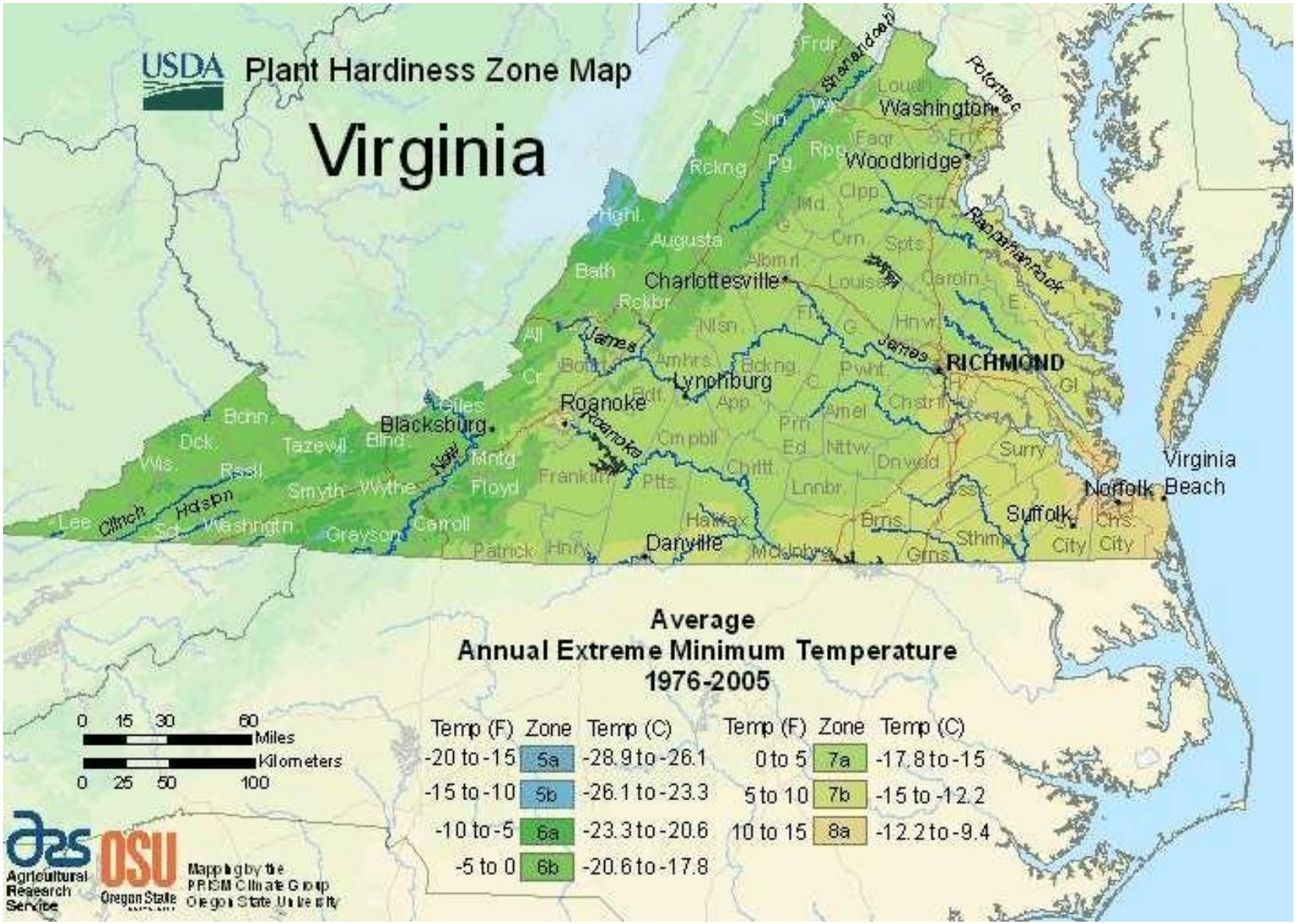
6. Avoid planting trees too close to the house. Plant further away to provide space for mature size and plant smaller trees and shrubs near structures.

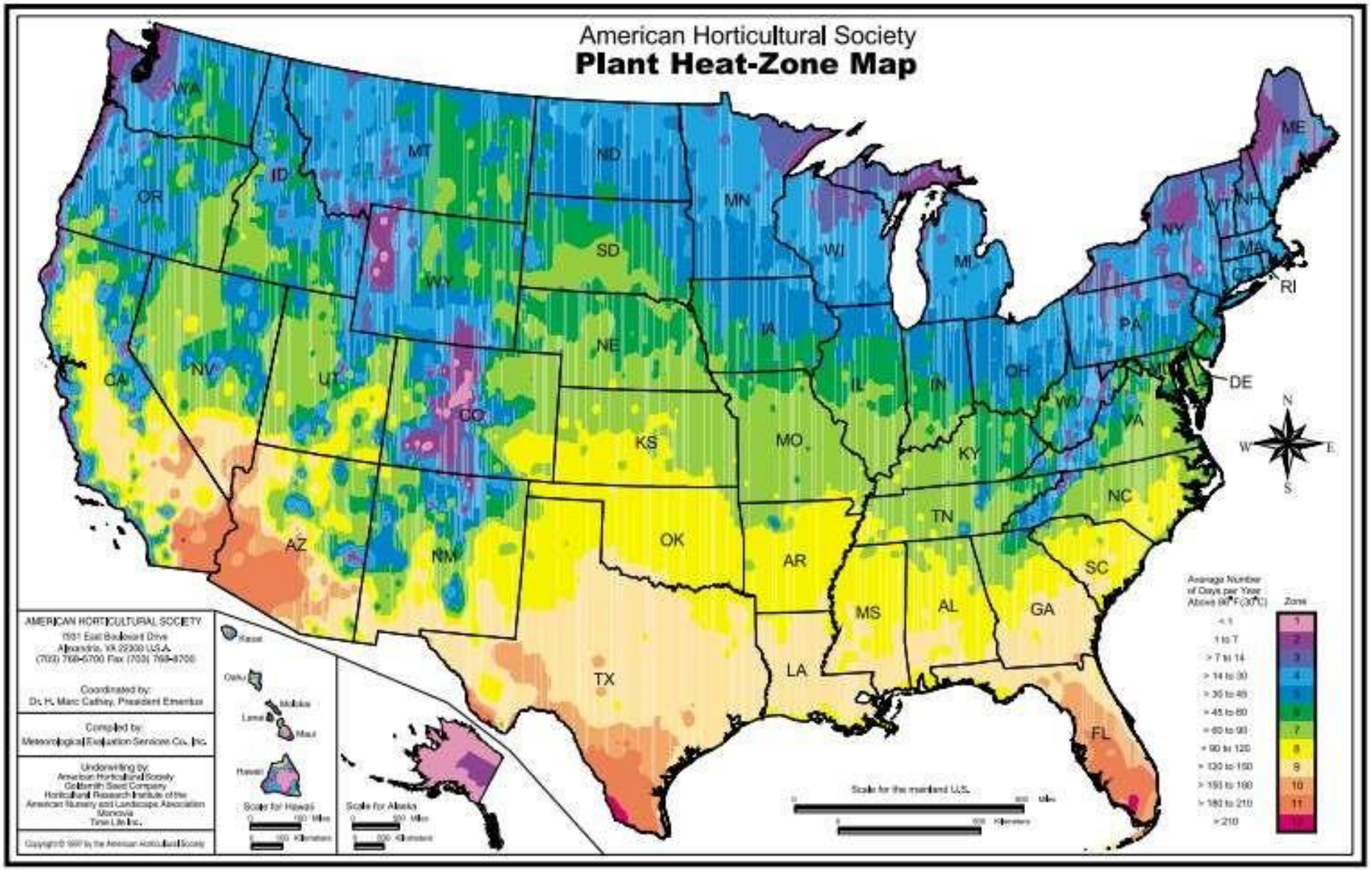
7. Cars often scrape and bruise tree trunks. Locate trees away from parking spaces or areas where they can be vandalized.

8. Branches can create hazards or block views. Locate trees away from street corners or vehicle and pedestrian traffic.

9. Avoid planting trees directly under utility lines. Locate trees away from lines or plant smaller, low-growing trees or large shrubs.

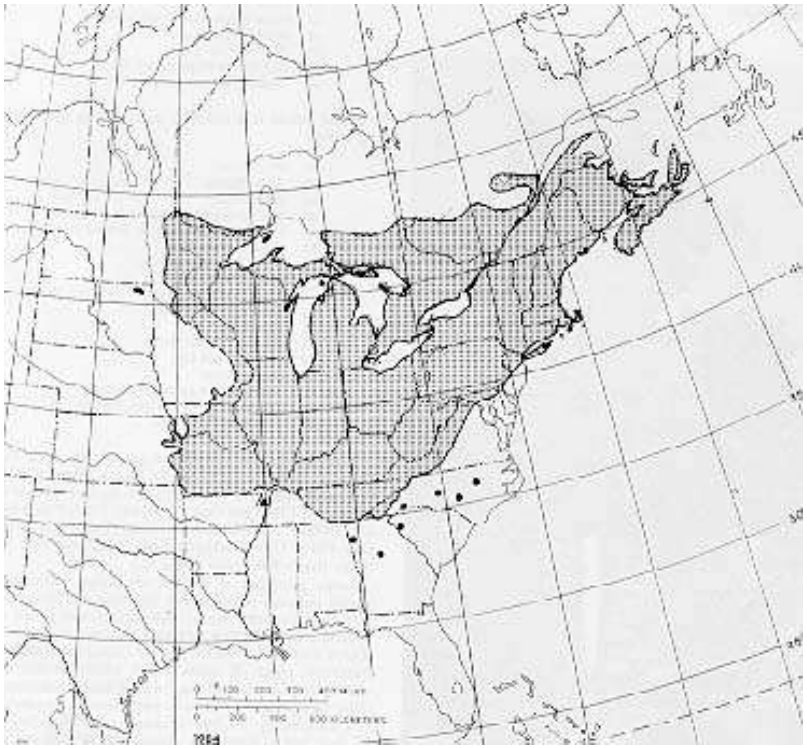
10. Plant trees away from sidewalks to allow root expansion without buckling sidewalks.


USDA Plant Hardiness Zone Map
Virginia
Washington
Woodbridge
Charlottesville
RICHMOND
Lynchburg
Roanoke
Blacksburg
Danville
Norfolk
Virginia Beach
Suffolk
Average
Annual Extreme Minimum Temperature
1976-2005
Temp (F) Zone Temp (C)
-20 to -15 5a -28.9 to -26.1
-15 to -10 5b -26.1 to -23.3
-10 to -5 6a -23.3 to -20.6
-5 to 0 6b -20.6 to -17.8
Temp (F) Zone Temp (C)
0 to 5 7a -17.8 to -15
5 to 10 7b -15 to -12.2
10 to 15 8a -12.2 to -9.4
0 15 30 60
Miles
Kilometers
0 25 50 100
Agricultural Research Service
OSU Oregon State
Mapping by the PRISM Climate Group Oregon State University

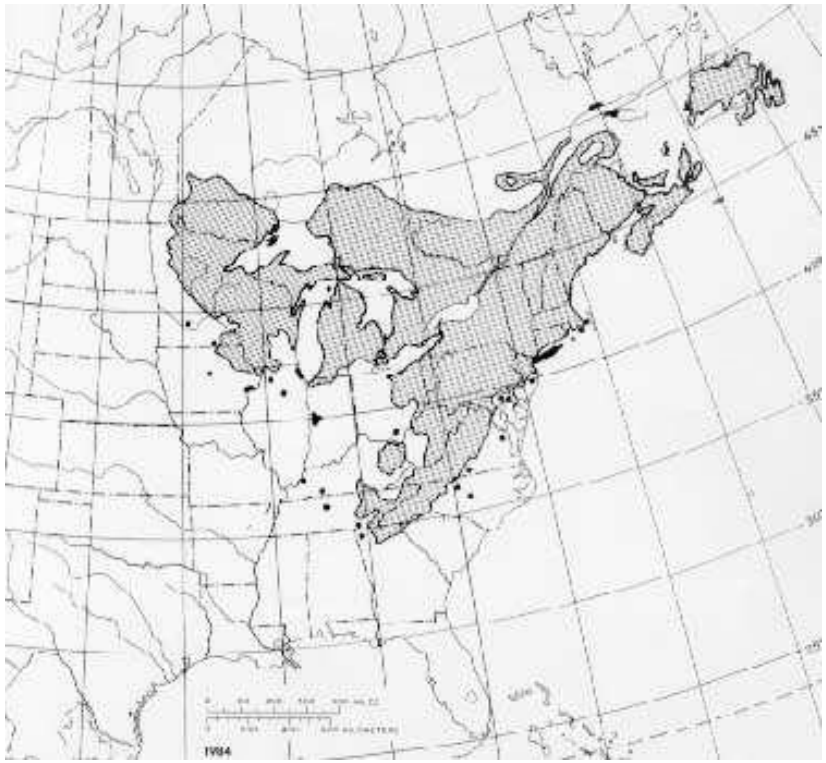

American Horticultural Society
Plant Heat-Zone Map
WA
OR
CA
ID
NV
MT
WY
UT
AZ
CO
NM
ND
SD
NE
KS
OK
TX
MN
IA
MO
AR
LA
WI
IL
MS
MI
IN
KY
TN
AL
OH
WV
GA
FL
SC
NC
VA
PA
NY
ME
VT
NH
MA
RI
CT
DE
MD
N
S
E
W
AMERICAN HORTICULTURAL SOCIETY
7931 East Boulevard Drive
Alexandria, VA 22308 U.S.A.
(703) 768-5700 Fax (703) 768-8700
Coordinated by:
Dr. H. Marc Cathey, President Emeritus
Compiled by:
Meteorological Evaluation Services Co., Inc.
Underwriting by:
American Horticultural Society
Goldsmith Seed Company
Horticultural Research Institute of the
American Nursery and Landscape Association
Monrovia
Treen Life Inc.
Kauai
Oahu
Molokai
Lanai
Maui
Hawaii
Scale for Hawaii
Scale for Alaska
Scale for the mainland U.S.
Average Number of Days per Year Above 86°F (30°C)
< 1
1 to 7
> 7 to 14
> 14 to 30
> 30 to 45
> 45 to 60
> 60 to 90
> 90 to 120
> 120 to 150
> 150 to 180
> 180 to 210
> 210
Zone
1
2
3
4
5
6
7
8
9
10
11
12

Zone “fails”

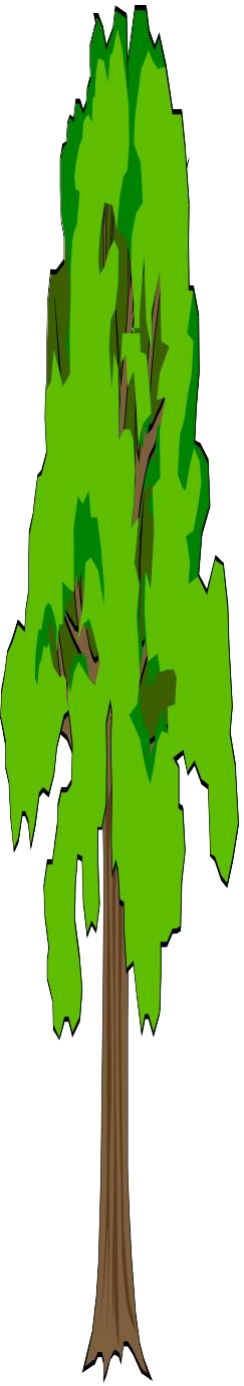
Sugar Maple



White Pine



Range maps from USDA Forest Service



What is the "right" place?

Forest Tree

- Light competition
- "pack animals"
- Value:
  - Timber, wildlife, water quality, scenic, recreation, soil conservation

City Tree

- Root competition
- Solitary
- Value
  - Green, shade, privacy, scenic, water quality, green space

Place (site) is first… species to match

- Soils
  - Wet/dry (aspect & slope position)
  - Compaction
  - volume
- Space
  - Above and below
- Light level

- ➢ Moisture preference
- ➢ Compaction tolerance
- ➢ Mature size
- ➢ Adequate soil vol.
- ➢ Shade tolerance

http://dendro.cnre.vt.edu/treeselector

- In our region, a useful rule of thumb is that each inch of dbh (trunk diameter at 4.5’ above the ground) requires about 20-25 ft^2 of open ground with **uncompacted** soil.
  - A 12” oak would need 240 ft^2 or 16’ x 16’

Human Health (energy conservation)

http://www.extension.org/trees_for_energy_conservation

eXtension
America's Research-based Learning Network™

Home | Resource Areas | About | Support Us | Recent

Search eXtension GO

Trees for Energy Conservation

Tree Planting for Lower Power Bills

Whether it is winter or summer, trees can help you save energy at home. Shade for Savings Did you know that only 17% shade over your house during the day translates...>Read More

Your Local Extension:

Virginia Cooperative Extension
Virginia Tech • Virginia State University

Local Extension offices near you
Learn more about this institution

Select a different institution

State or Zip LOCATE

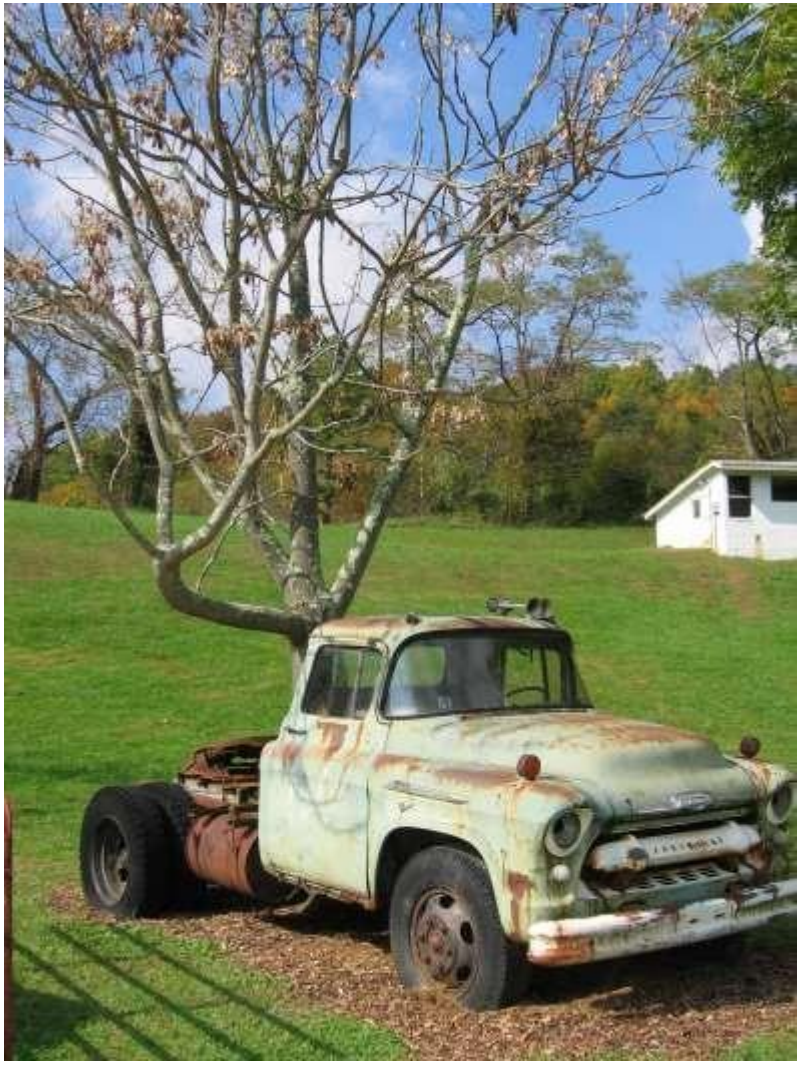
RTRP?

RTRP?

RTRP?

Other "right tree" considerations

- Native vs. Non-native
  - Invasive?
- Flammability
- Allergy & Toxicity
- Biogenic Emissions
  - Isoprene & Monoterpene



One more R.T.R.P.

Diversity

How do we get “new” trees

“Natural”

- Seed
  - Wind
  - Squirrels
  - Drop
- Sprouts
  - Stumps
  - Roots

Not “so” natural

- Seed
  - Collection
  - Treatment
  - Sowing
- Cuttings & Grafting
  - For fruit or flower (consistency)

Options when sourcing trees

- Buy
- Dig and transplant
- Steal

Nursery Trees

- From the Wholesale to Retail
  - Container
  - Balled & Burlapped
    - https://youtu.be/uIExlvhg0YE?list=PL8i6EMWlMonPaezyLMFz9NrFFuWOif8cR
    - https://www.youtube.com/watch?v=-Yf4TVGHO90
  - Bare root

The Root of the Matter

Root Problems in Container Trees

Upper left photo:

Root collar buried causing roots to sprout from stem

Upper right photo:

Circling roots result when trees not moved to larger containers as they grow

Lower left photo:

Root pruning

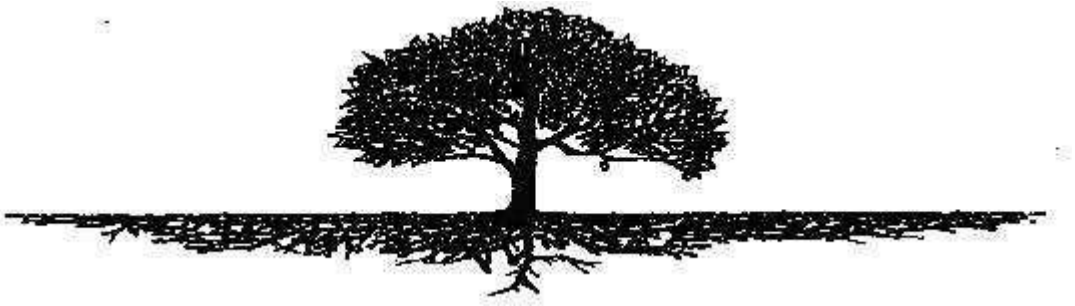
Lower right photo:

Typical root ball of container trees

The ROOT of the matter…

Typical root health/structure ranking:

1. Bare root plants
2. Balled and Burlapped (B&B)
3. Container (potted)

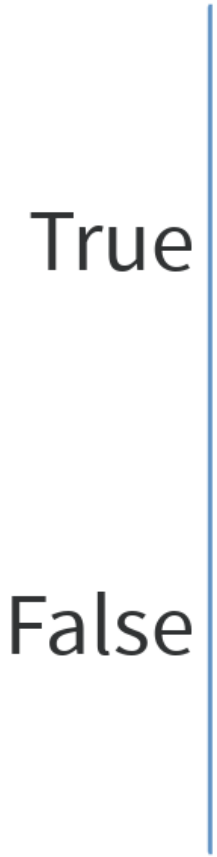


Plant like a squirrel

Plant like a squirrel

- Planting material
  - Seed
  - 1-2 yr. old seedlings
  - Bare root
  - Container
  - B&B
- Right Depth
  - To the root crown

Tree Stewards are awesome and make the world a better place



Start the presentation to see live content. Still no live content? Install the app or get help at **PollEv.com/app**