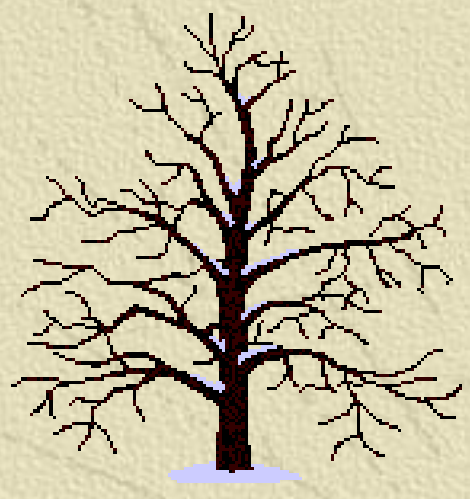


Trees and Shrubs

Master Gardener Program

UW Extension Service

Laramie County

- Trees are the tallest, most massive, longest-lived organisms ever to grow on earth.

  Trees, like other plants, cannot move. However, trees, unlike other plants, are big, woody, and perennial, which means they are easy targets for constant wounding.

  Trees are super survivors mainly because they grow in ways that give them defense systems that are highly effective against infections from wounds.

  Trees have the capacity to adjust rapidly to changes that threaten their survival.

  Animals move to get food, water, and shelter. They move to avoid destructive agents. When animals are injured and infected, processes of restoration and repair start. Animals heal after wounding.

  When trees are injured and infected, processes of boundary formation starts. Trees do not restore or repair wood that is injured and infected. In this sense, trees do not heal. Instead, trees compartmentalize wound infections.

- Compartmentalization is the tree's defense process after injuries where boundaries form that resist the spread of infections. The boundaries also protect systems involving water, air, energy storage, and mechanical support. In a sense, the boundaries are like an inside bark. Dr Shigo.
  http://www.shigoandtrees.com

Arborist

- Someone who makes a career of the caring for trees in an urban setting.
- Planting, transplanting, pruning, diagnosing problems, recommending treatments, disease care fertilizing, pest management and appraisals.

Tree City USA Designation

- Sponsored by The National Arbor Day Foundation in cooperation with the USDA Forest Service and the National Association of State Foresters.
- City that has a tree program, a plan of action for tree care.
- --47% of Tree City USA communities have a certified arborist or access to one.

Why Plant Trees?

Forests across the United States -- and especially forest soils -- store massive amounts of carbon, offsetting about 10 percent of the country's annual greenhouse gas emissions and helping to mitigate climate change.

The researchers found that reforesting topsoils across the country are currently adding 13 million to 21 million metric tons (13-21 teragrams) of carbon each year, an amount equivalent to about 10 percent of the total U.S. forest-sector carbon sink and offsetting about 1 percent of all U.S. greenhouse gas emissions.

University of Michigan, Feb 25, 2018

Trees in General

- Reduce air pollutants by 25%.
- Reduce noise pollution.
- Use about 26 lbs of Carbon Dioxide/year.
- Can cut air conditioning cost by 10 to 50%.
- Windbreaks can reduce heating costs by 10-40%.
- "*Healthy*, mature trees add an average of 10 percent to a property's value." -USDA Forest Service

Trees in General

- "The net cooling effect of a young, healthy tree is equivalent to ten room-size air conditioners operating 20 hours a day." -U.S. Department of Agriculture
- Tree roots grow **surface to 24 inches** deep.
- Anchoring roots go **3 to 7 feet** deep.
- Roots **do not** go dormant in the winter.
- Best time to plant a tree? Any time the ground isn't frozen.

Some General Rules

1. SELECT HEALTHY TREES:

   Do not buy or plant trees that have roots crushed or crowded in a bag or container.

2. PLANT PROPERLY:

   Do not plant too deep.

3. PLANT THE RIGHT TREE IN THE RIGHT PLACE:

   Do not plant large-maturing trees near buildings or power lines.

4. PRUNE BRANCHES CORRECTLY.

Do not remove branch collars or leave stubs.

5. PRUNE TREES CORRECTLY.

Do not top trees.

Trees and Water

Do you have enough water to support your tree?

A number of tree species require water saturated soils and saturated throughout most of their active summer growth cycle (Cottonwoods and Aspen).

This means they release more water vapor through their leaves every day increasing ambient humidity.

An oak on a stony hillside loses about 36 gallons of water vapor through its leaves every day.

A willow (Salix fragilis) can release 122 gallons a day.

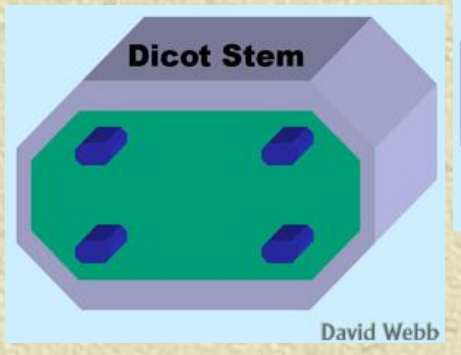
Tree Biology

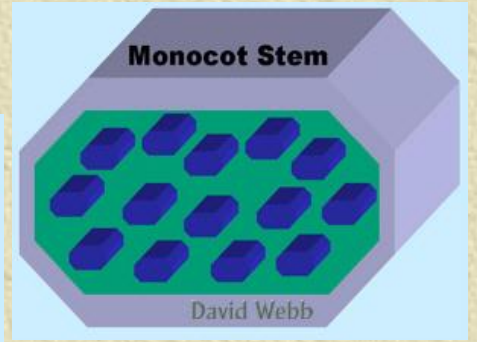
- Monoecious
  - Bears both types of flowers.
    - Pine trees, lindens.
- Dioecious
  - Bears only one type of flower.
    - Cottonwoods, willow, pistachio, holly

Tree Biology

- Mono-cot
  - Palm trees, grass

- Dicot
  - Pine tree

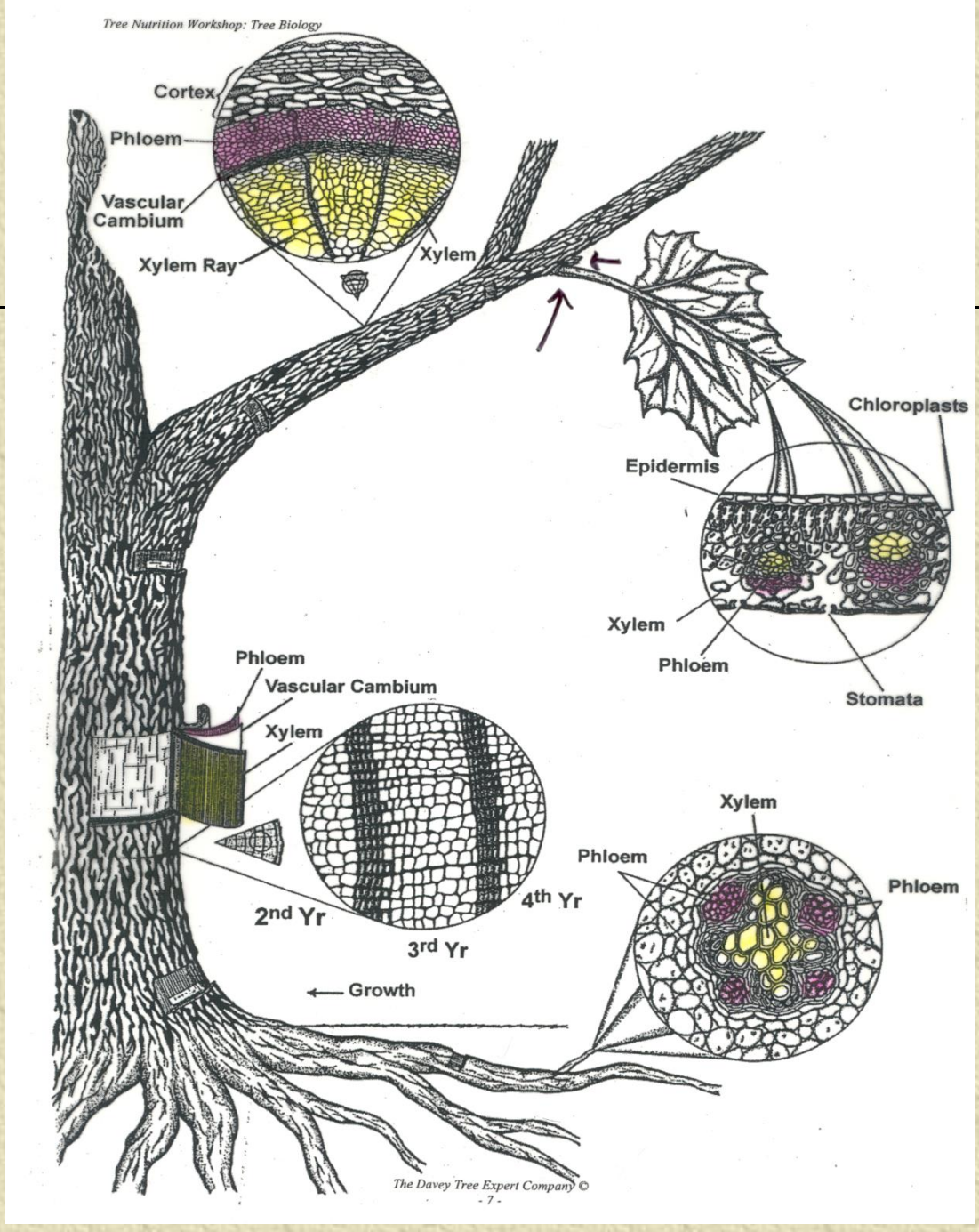




Tree Biology

- A. Bark
- B. Phloem
- C. Cambium
- D. Xylem/sapwood
- E. Heartwood/pith

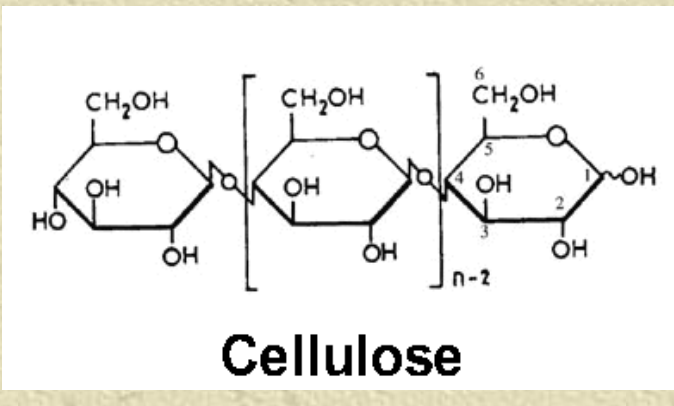
Tree Biology



Tree branches from the inside

Cellulose

- Trees contain cellulose.
  - It forms the primary structural component of green plants.
- Cellulose is made up of glucose units.
- Glucose is used for energy.
  - By the tree and insects.



Cellulose

Tree Biology

- Woody Twigs:
  - Primary growth is typically herbaceous, transition into a woody from.
  - Lenticels: scattered bumps that may look like scale insects on smooth young bark are breathing pores.
  - Leaf Scars: remains of a previous years leaf, method of ID, specific to that species.

Tree Wound Healing

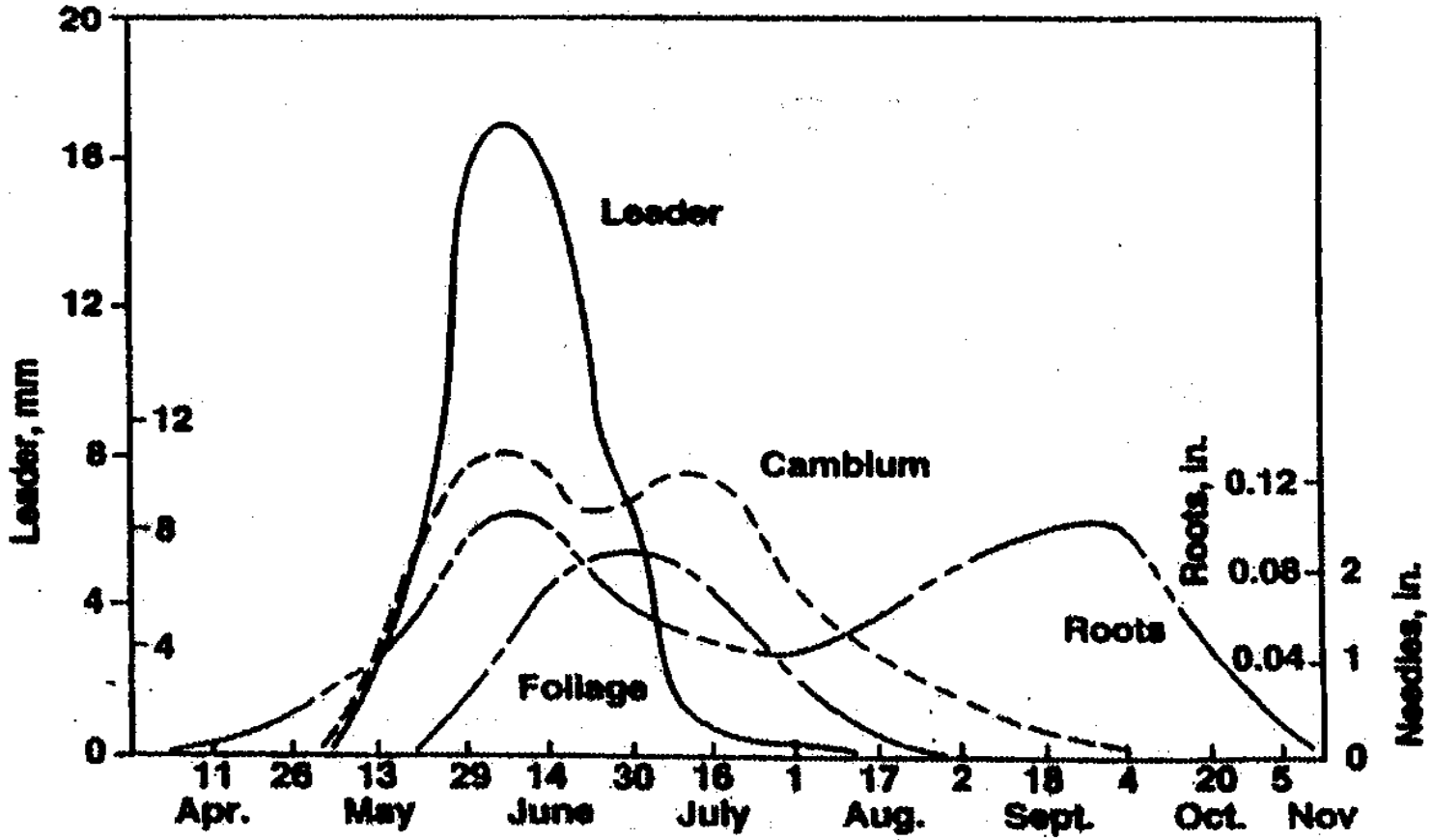
Scars are first covered with callus, arising from the division of cells near the wound surface.

Cork slowly encroaches from the area around the injury.

For healing to be effective it is important that woody branches be cut as close as possible to the supportive trunks since is difficult for cork to grow over stumps.

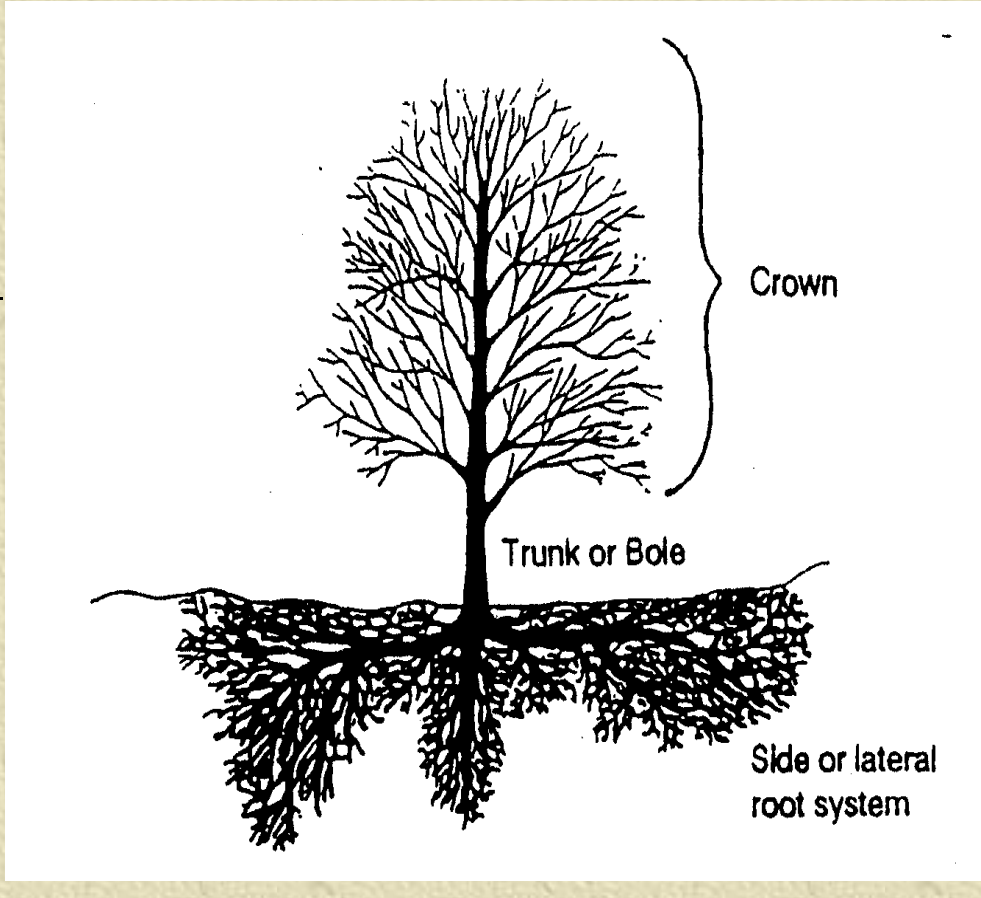
Tree Growth Cycle

1. Season, temperature, photoperiod, water



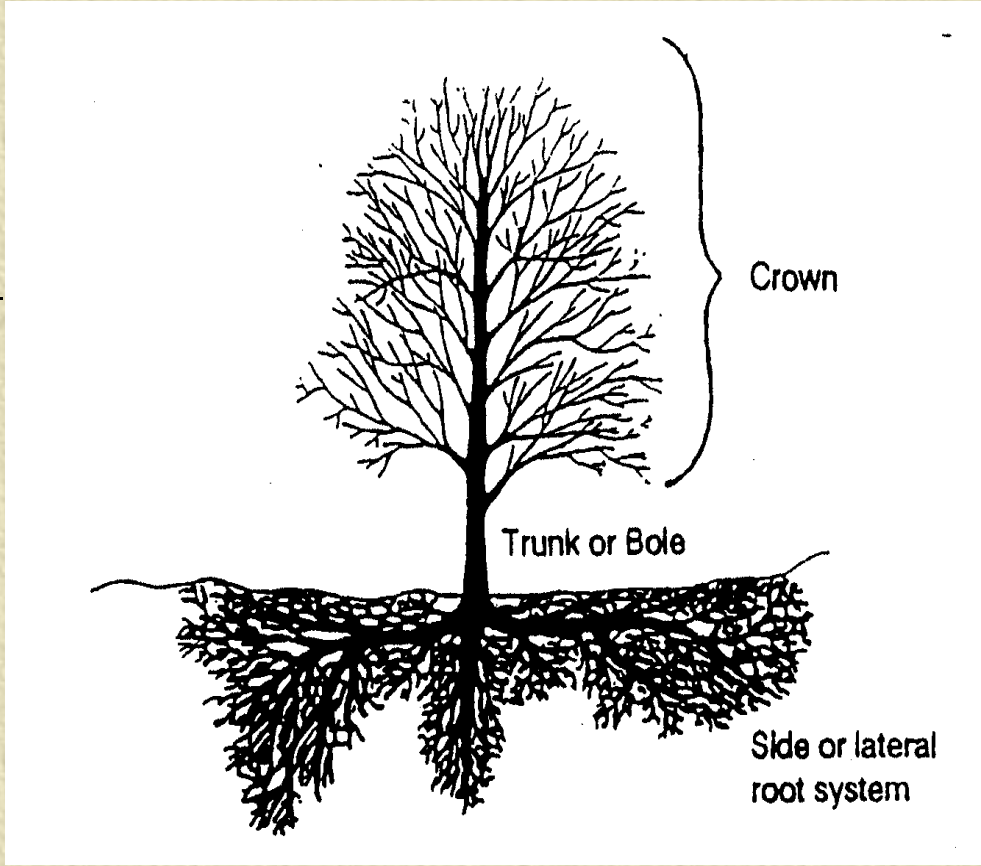
Tree Structure

- 5% Leaves.
- 15% Stems.
- 60% Trunk.
- 15% Wood Roots.
- 5% Absorbing Roots.



Tree Structure

- Root Growth Form is a function of:..
  - Genetics.
  - Stage of maturity.
  - Soil conditions.



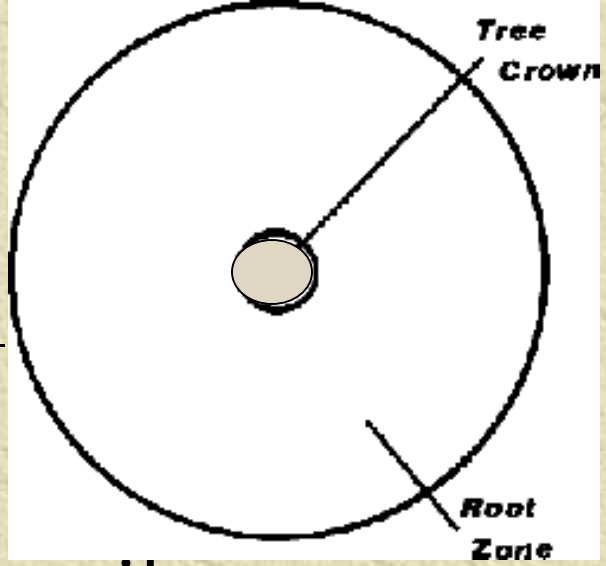
Tree Roots

- Are aggressive and active most of the year.
- Do not enter a dormant period.
- Always ready to take advantage of favorable soil conditions.
- Will grow beneath or into materials
- Will find structural faults and take advantage of that weakness.

Tree Roots

- Tree root systems consist of large perennial roots and smaller, short-lived, feeder roots.
- Large, woody tree roots and their primary branches increase in size and grow horizontally.
- Do not grow deeper than 3 to 7 feet.
- Root functions include water and mineral conduction, food and water storage, and anchorage.

Tree Roots



- Most tree roots are located in the top 6 to 24 inches of the soil.
- Occupy an area two to four times the diameter of the tree crown.
- Roots obtain water, oxygen, and minerals from soil.
- They do not grow toward anything or in any particular direction.

Tree Roots

- Soil compaction, change in soil depth and improper watering can injure roots, increasing stress, and susceptibility to disease and Insects.
- To avoid root disease, maintain a healthy, vigorous environment around a tree.
- Once a root system is severely affected, the tree usually must be removed.

Tree Roots

- Compaction
  - Trees biggest problem:
    - Roads.
    - Parking lots.
    - Foot traffic.
    - Poor soil prep.
    - Animals.

Cold Hardiness

- 3-stages
  - Short days, cool nights.
  - Frost below 32 degrees.
  - Super cooled cells that do not freeze.

Cold Hardiness

- Tissues of plants vary in hardiness
  - Leaf bud.
  - Twigs.
  - Roots.

Tree Diseases

- A 'Tree Disease' is defined as any abnormal condition of a plant that impairs plant functions, associated with specific symptoms and signs.

- Diseases in trees are often caused by fungi, but other organisms such as nematodes, bacteria, and viruses are also able to cause diseases in trees.

Two Main Type of Diseases

- Biotic or Pathogenic Disease
  - Need three factors for this
    - A host plant.
    - A parasitic organism.
    - Environmental conditions.
- Abiotic Disorders

Biotic or Pathogenic Disease

- **Canker**: dead areas on the stem, bark or cambial area caused by: fungi, bacteria or other living agents.
  - Plant stress.
  - Drought.
  - Freeze damage.
  - Soil conditions.
  - Insects.

Types of Canker

- Cytospora canker.
- Siberian Elm canker.
- Black canker on Aspen.
- Thyronectria canker on Honeylocust.

- The disease especially affects trees with root damage, which are often found in areas under construction, or trees that have been recently transplanted.

Treatment of Canker

- Increase plant vigor and sanitation.
- Remove all infected limbs and other areas.
- Clean wounds to avoid further spread of infection.
- Remove dead bark to dry out the diseased area and help the tree defend itself against insect and fungal attacks on the cankered area.
- **DO NOT** apply any tar, oil-based paint or other wound dressing, allow the cleaned tissue to dry out on its own. However……

Fungus

- Verticillium wilt.
- Anthracnose.
- Apple scab.
- Dutch Elm disease.
- Horseshoe fungus.
- Mushrooms.
- Blue Stain.
- Marssonina blight.
- Needle cast.
- Powdery mildews.
- Septoria leaf spot.

Fungus

- Anthracnose --often called leaf, shoot, or twig blight.
- Infections on deciduous plants are more severe in areas where prolonged spring rains occur after new growth is produced.
- Anthracnose fungi need water to be disseminated and infect; they do not spread under dry conditions.
- Symptoms vary with the plant host, weather, and time of year infection occurs.

Virus

- Symptoms vary dependent on host.
  - Prunus necrotic ring spot virus.
  - Tomato ringspot virus.
  - Grapevine fanleaf virus.
  - Apple mosaic virus.
  - Rose mosaic complex.

Abiotic Diseases
75% of the problems

- Iron chlorosis.
- Leaf scorch.
- Misapplied herbicides.
- Drought (winter and summer).
- Lawn mowers.
- Too much water.
- Squirrels and other mammals.
- Wind induced spirals and cracks.
- Lightning.

Late Frost (causal agent)

Yard Call..

- "The tree: poor thing, they planted it too deep for starters, then they placed the kiddy pool on one side of it so it never received water on that side and of course compacted the soil to concrete with the weight of the pool. They have moved the pool and will move the soil away from the base of the tree. They will also try and get the soil loosened up from the pool area. The tree actually looks pretty good, other than the side that had the pool sitting on its roots."

What Not To Do

Grass

- Grass is highly competitive, energy demanding plant.
  - Hotter in the summer.
  - Colder in the winter.
  - Drier than those growing in natural cover or with a mulch.

Drought,
Mitigating the Effects on Trees

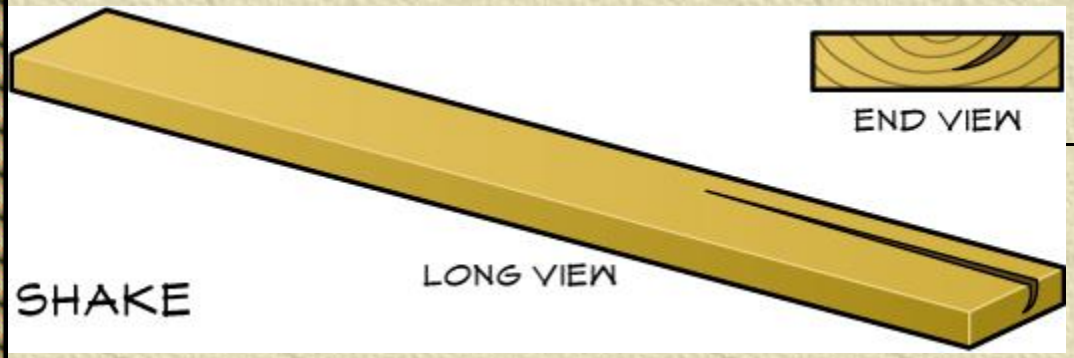
- Avoid extensive pruning.
- Avoid planting in shallow soils.
- Mulch for winter and summer protection.
- Remove competing groundcover.
- Deep water.
- Fertilize properly, if at all.
- **Mulch.**

Cold Damage

- Int**ra**cellular freezing (within the cell), ice crystals form within the cell causing the cell to rupture. Similar to an abscess.
- Sunscald, dehydration of bark tissue resulting from sudden temp changes usually December through Febuary.

Cold Damage

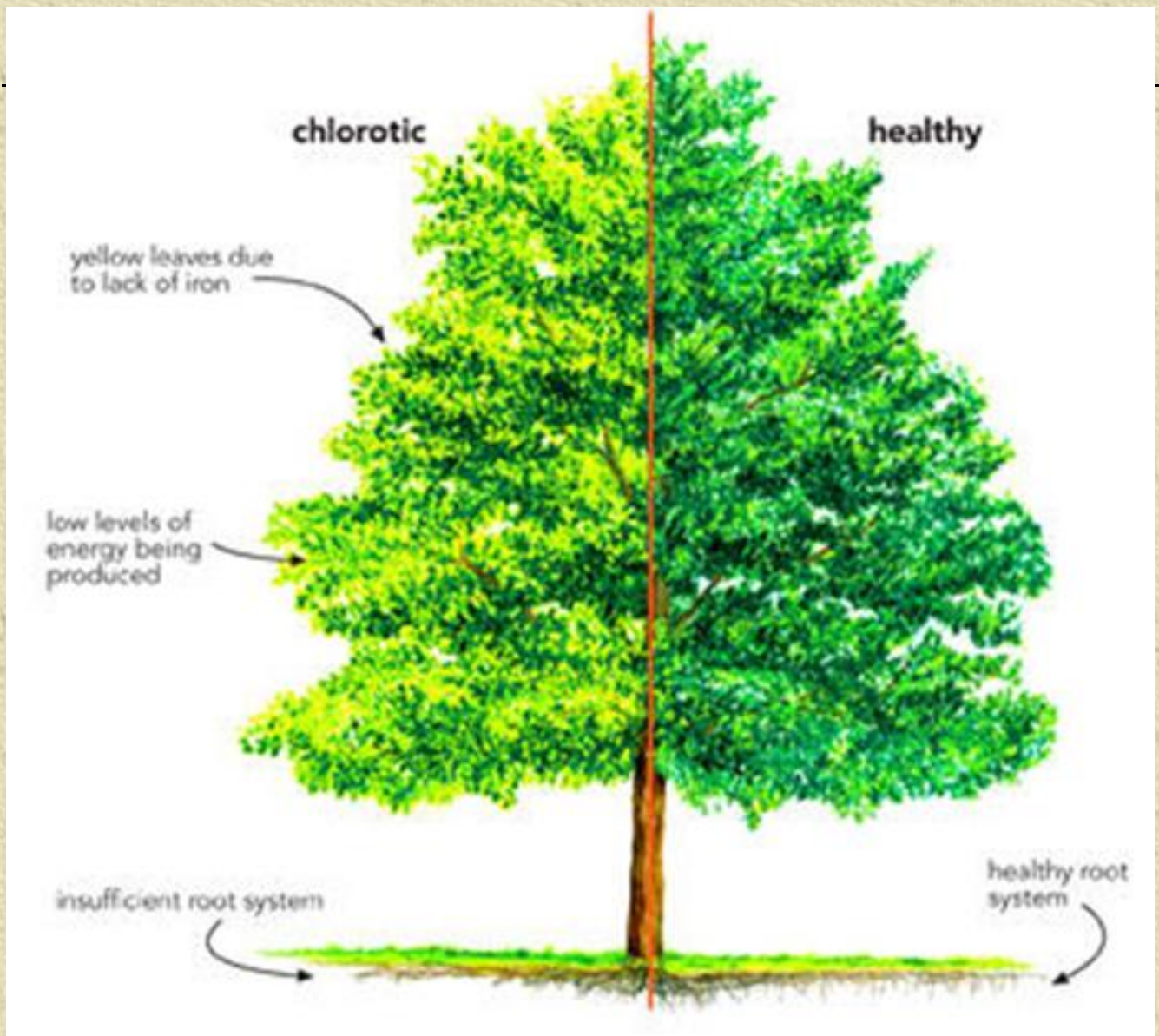
- Extra-Cellular Freezing (between the cells), desiccation of the cell wall, can survive if it occurs slowly.
- Frost Crack, starts on the inside of a tree as a result of defects from an injury, change of temperature or drought stress.
- Ring Shake, separation along thin walled cells in the region between annual growth rings.



Ring Shake

Frost Crack

Chlorosis in Trees



Chlorosis vs. Energy

- Trees need energy to:
  - Deal with environmental extremes
  - Flowering
  - Fruit and Seed production
  - Recovery.

Chlorosis in Trees

- Chlorophyll is the molecule that a tree utilizes to make energy.
- Chlorotic tree usually in some-type of decline.
- Soil Mineral deficiencies.
- Trees with unhealthy root systems do not extract water and nutrients for the soil efficiently.

Chlorosis and Chlorophyll

- Little to no Chlorophyll (think food) = little to no energy
- Goals are: Live Crown Ration of 60% leaves or 75% Live Crown Ration on Evergreens.

- Any less long slow decline
- Limbing up worst thing to do to an Evergreen tree.

Chlorosis – Cause –at the Root

- Severe Soil Compaction.
- Over Irrigation.
- Lawn Herbicides.
- Root Severing.
- Deicing Salt.
- Root rots.
- Repeated Drought.
- Out grew it’s location.

Treating Chlorosis

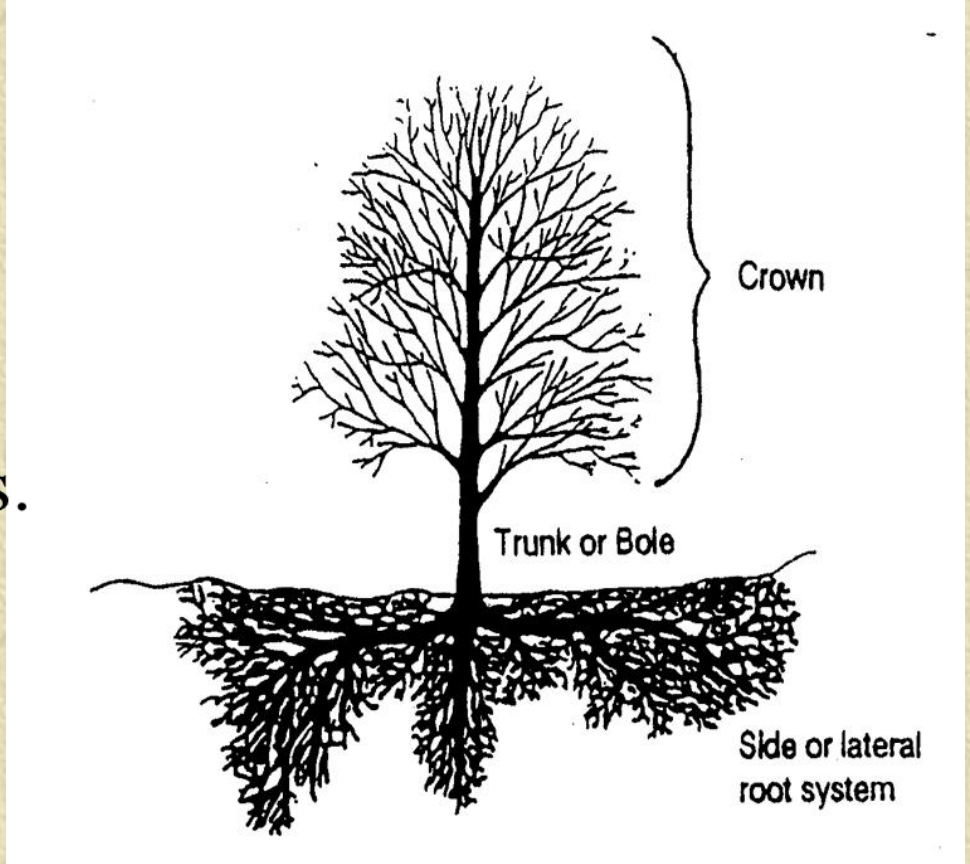
- $6CO_2+12H_2O \xrightarrow{(light)} C_6H_{12})_6+6O_2+6H_2O$
- Water regulates CO_2 uptake.
  - Limited Soil Volume =Limited Water Uptake.
  - Don’t over thin the tree.
  - Healthy Soil = Healthy Plant.

Treating Chlorosis

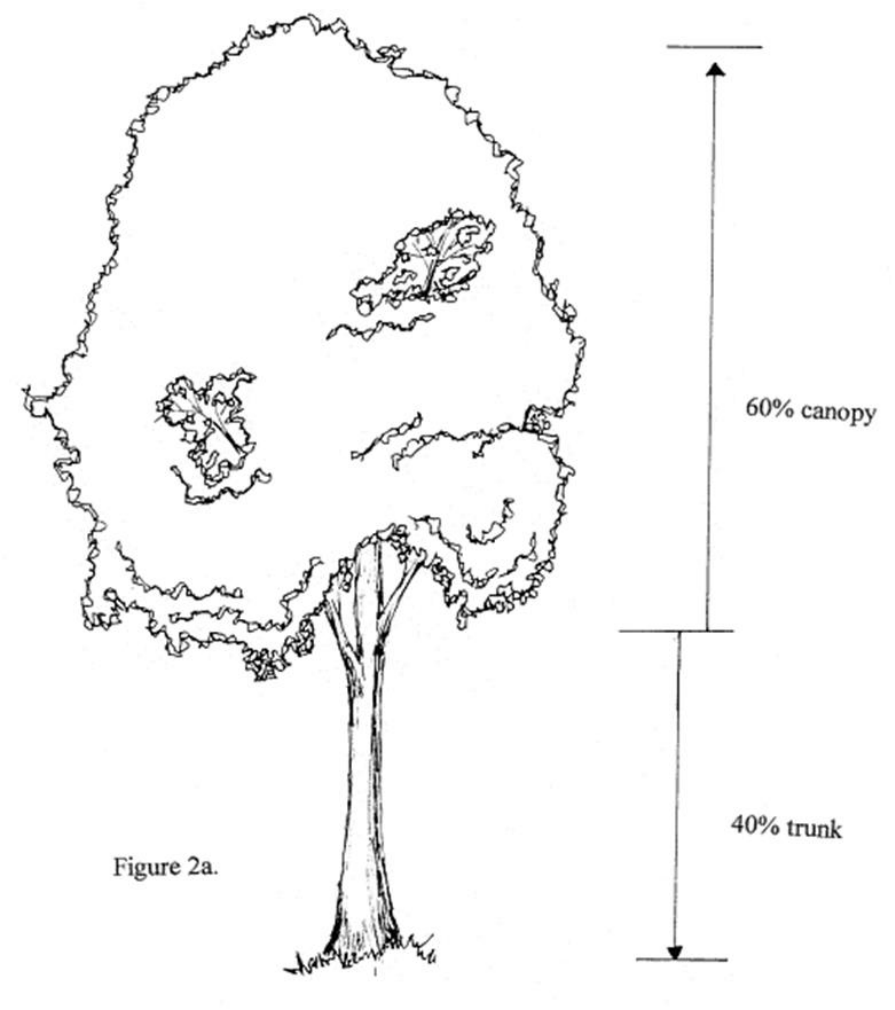
- Intervention is needed.
- Foliar spray.
- Soil treatments
- Stimulate the root system to grow.
- Mulch ring to provide a more favorable growing environment for roots.
- Iron, Nitrogen, *Magnesium*.

Ratios

- 5% Leaves.
- 15% Stems.
- 60% Trunk.
- 15% Wood Roots.
- 5% Absorbing Roots.



Canopy to Trunk Ratio



C/T = LCR %

C=Canopy

T= Trunk

LCR= Leaf to Canopy Ratio

http://www.sustland.umn.edu/implement/protecting_trees.html

Salt Tolerance (EC) of Trees and Shrubs.

- **Low salt tolerance**
  - Maple (some)
  - Roses
  - Viburnum
  - Willows
  - Euonymus
  - Barberry
  - Linden
  - Walnut
- **Moderate salt tolerance**
  - Birch
  - Spruce
  - Firs
  - Privet
  - Pyracantha
  - Current
  - Boxelder
  - Juniper
  - Arbor Vitae
  - Buffalo berry
  - Ponderosa
  - Green Ash
  - Red Cedar

Fertilizers and Fertilizing

All fertilizers are salts.

Do not:

- Use high nitrogen fast release fertilizers.
- Fertilize late summer or fall in cold climates.
- Use tree fertilizer spikes.
- Inject directly into the tree.
- Fertilize after the month of June.

Fertilizers

Do:

- A soil test to know what is needed.
- Fertilize in early to later spring.
- Use a low nitrogen slow release fertilizer
- Trees do NOT need routine fertilization.

Note: Foliar feeding: quick fix, short term, may burn leaves.

Environmental Tolerances

- Moisture: crucial factor, site analyzed as to water potential.
- Water Spenders: use water freely but in deep soils has extensive root systems that absorb water from a large volume of soil. As long as some of their roots are in moist soil they can survive.
  - Black walnut, mulberry, cottonwood.

Environmental Tolerances

- Drought Evaders: avoid water stress by drying up or dropping their leaves or becoming virtually dormant during dry periods.
- Air Pollution: many species will weaken, reduce their growth, suffer leaf injury.
  - Tolerant: Ginkgo and Pin Oak.

Planting a Tree

- Site Analysis.
- Species Selection.
- Ordering/Purchasing.
- Site Preparation.
- Physical Planting.
- Watering, mulching, wrapping.

How much soil volume- Plan ahead-Site Analysis

- 2 cubic feet of soil per one square foot of crown area.
- 20” diameter trunk needs a 40’x40’ area or 80 to 120 cubic feet of soil.

- To determine the **square footage** of the area of a **circle**, multiply 3.1416 times the radius (in **feet**) squared**.**
- Professor Mike Kuhn, USU, October 2011

Planting a Tree

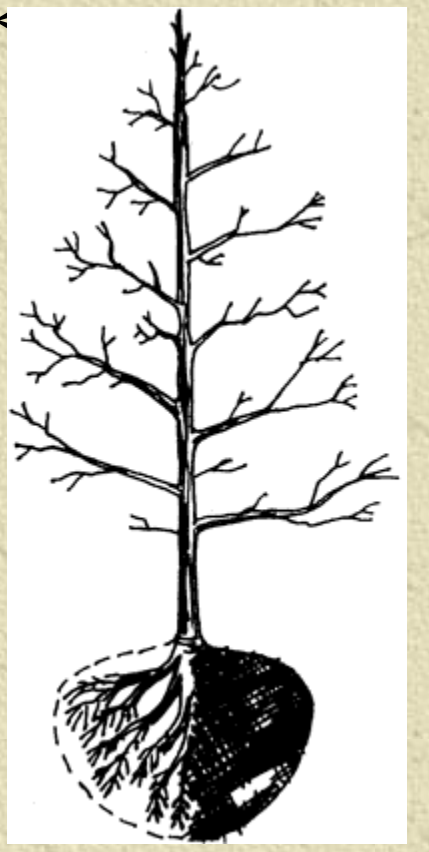
- Call before you dig:
- Wyoming One Call:

811

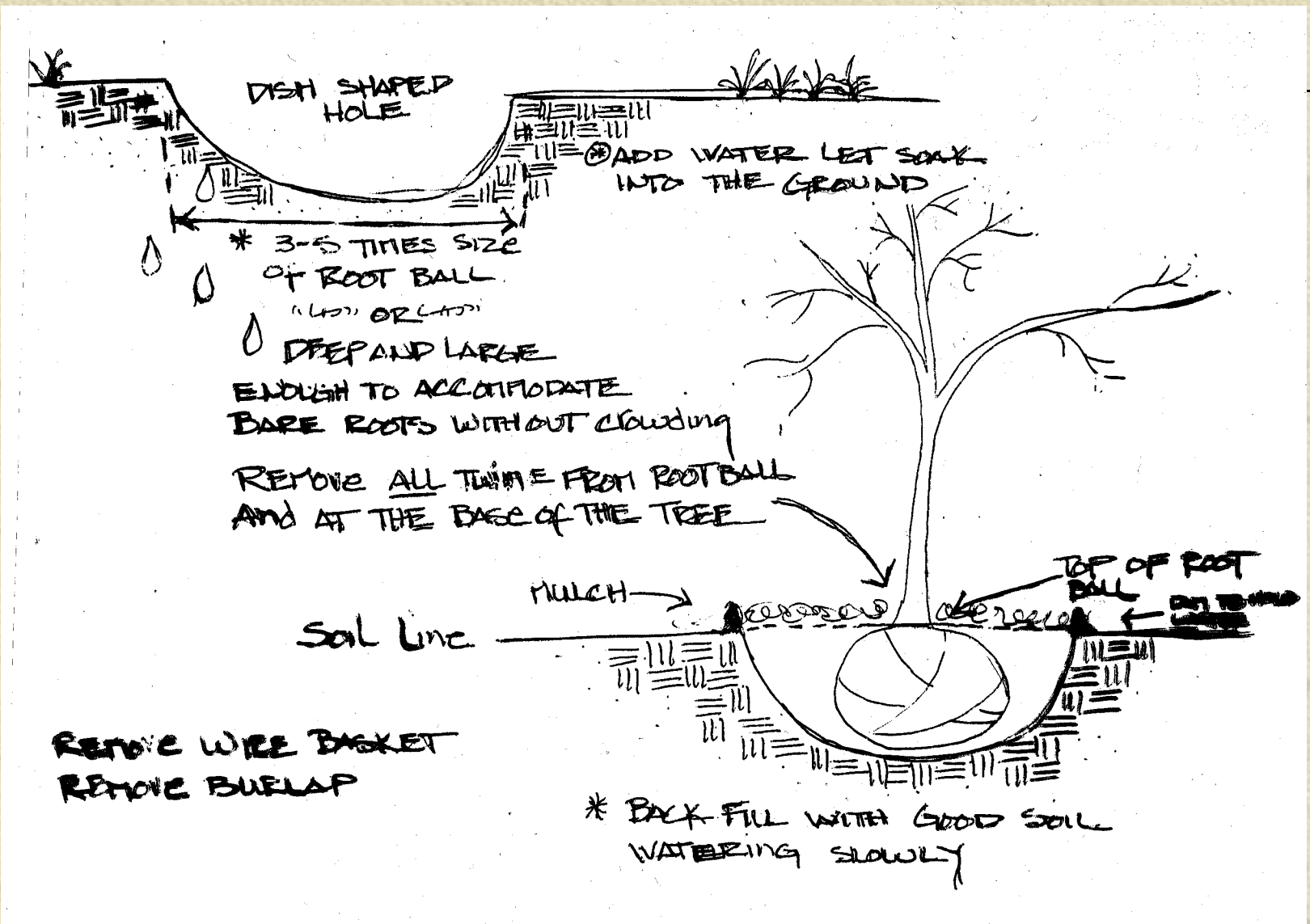
Buying a Tree

- For every 10-12 inches of root ball there should be 1 inch of trunk caliper*
- Trunk and limbs free of insect or mechanical injury.

*Professor Mike Kuhns USU



Planting a Tree

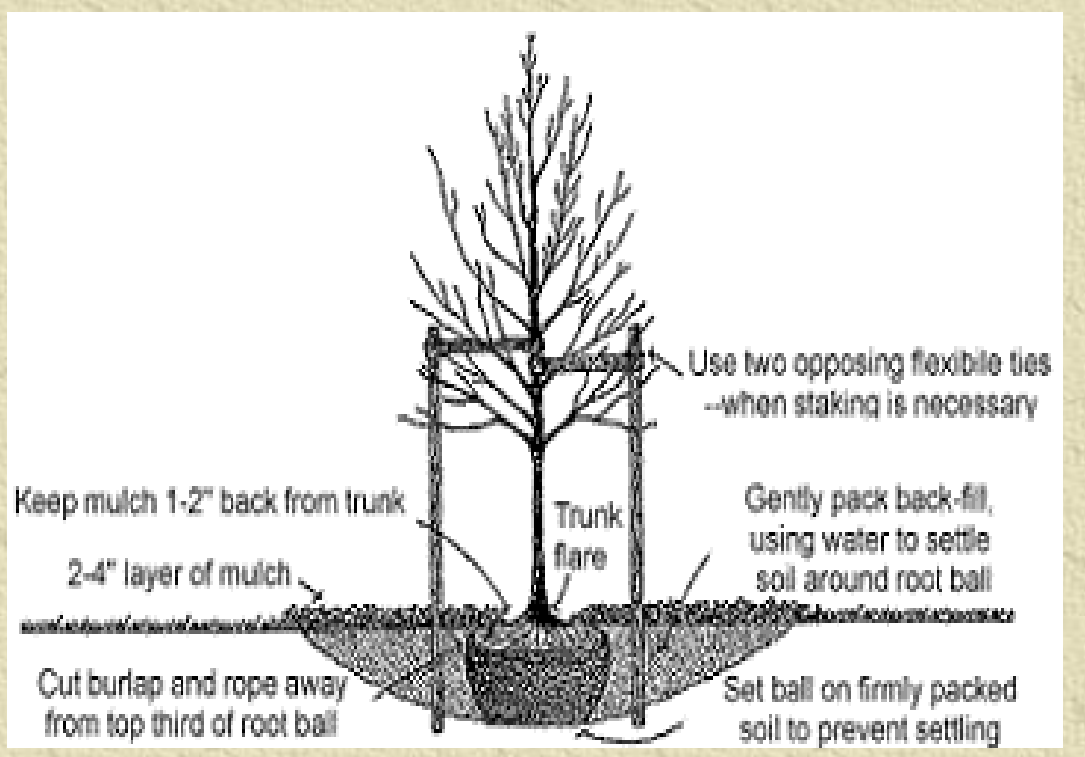


Planting a Tree

- Smaller trees establish more quickly.
- It takes 2-3 years + for tree roots to go into native soil.
- 90% of the root system is lost when dug up from the nursery.
- Back fill 90% native soil and 10% organic matter.

Best Time to Plant?

- Anytime the ground isn't frozen.
- Ideal planting time is early spring.



Tree Establishment

- Three to five years, but add one year for each inch caliper over 3”.
- This is a root growth period.

Transplanting Trees….

- Hi Catherine,
- A co-worker wants to bring some Blue Spruce trees from their property in Michigan at the end of May to plant in the Cheyenne area. She wonders how the trees would adapt to the altitude differences. Would this be a problem? She plans to dig up small trees (2-3 foot tall). If you think the trees would adapt, what are your recommendations for transport and transplanting.
- Thanks for your help.

Transplant Shock

- Failure to establish.
- Can occur up to six years after planting.
- Due to improper site preparation or lack of follow up maintenance.
- Planted too shallow, planted too deep.
- Planted into compacted soil.

Next five to ten years

- Prune every three years.
- Remove deadwood.
- Eliminate interfering branches and/or weak crotches.
- Water especially in the winter or high wind events.
- Replenish mulch.

Life of the tree

- 25 years-prune every five years for most trees to develop the structure of the tree.
- 45 to 85 years – Maturity of the tree, prune every 10 years or deadwood.
- 85+ Over maturity, remove deadwood.
- 100 years remove and replace.

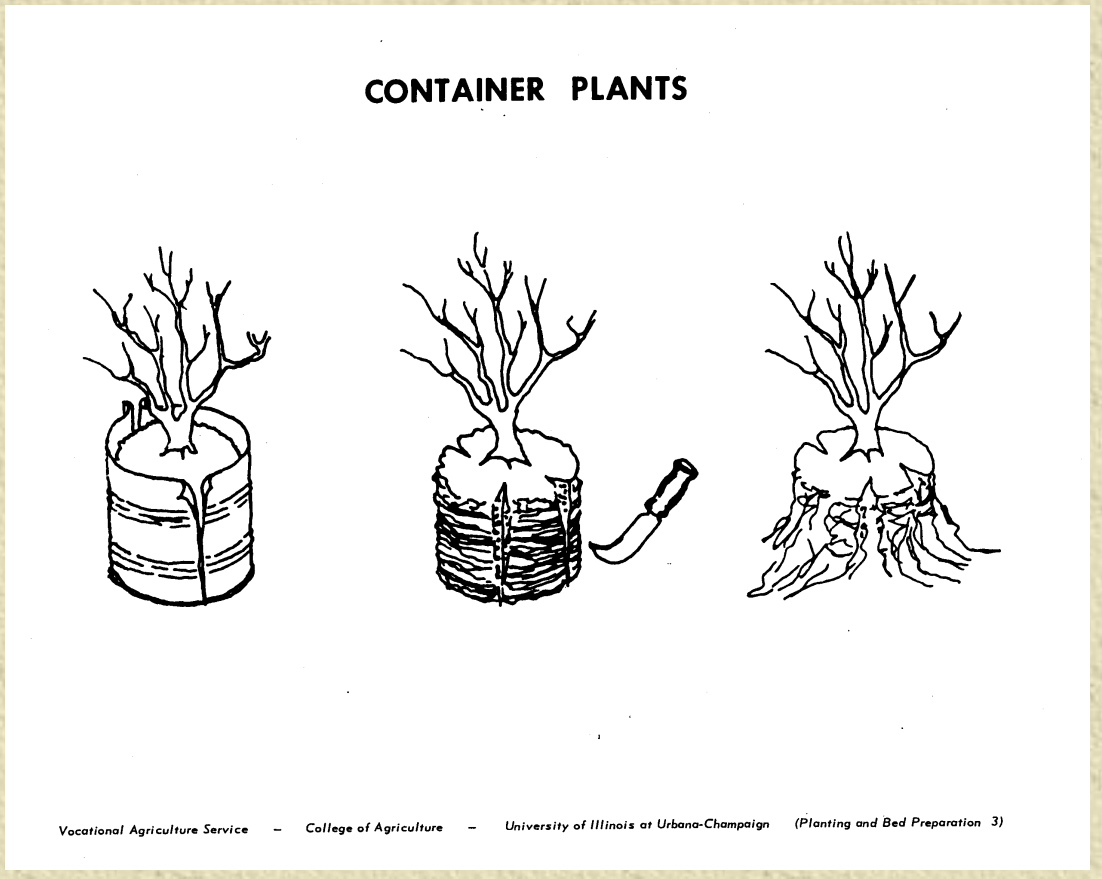
- All stages winter water.

Watering Trees

- General rule; for every inch of trunk caliper ten gallons of water.
- Watch the weather.
- Water should go as deep as the root ball.

Mulching a Tree

Planting Shrubs



Trees Part Two

Catherine Wissner

UW Cooperative Extension

Laramie County

Master Gardener Program

City Ordinances - Cheyenne

- **12.16.040 Responsibility of property owners.**
- It is the duty of the owner of property abutting any public street, alley or sidewalk rights - of - way, or other public place, to properly maintain and care for all trees, shrubs, hedges or vines located upon or affecting these areas.
- The director of forestry shall have the authority to require such property owners to provide proper maintenance, which includes, but is not limited to, providing a fourteen (14) foot clearance above street and alley surfaces and an eight (8) foot clearance above sidewalks.

Diagnosing Tree Problems

- What is the Tree?
- What's the Problem?
- What are the Clues?
- When did you notice it?
- What caused it?
- What don't know?

Diagnosing Tree Problems

- Abnormal vs. Normal
- Signs (evidence) and Symptoms (reaction)
- When did it happen; spring, construction?

- Mature Cottonwood

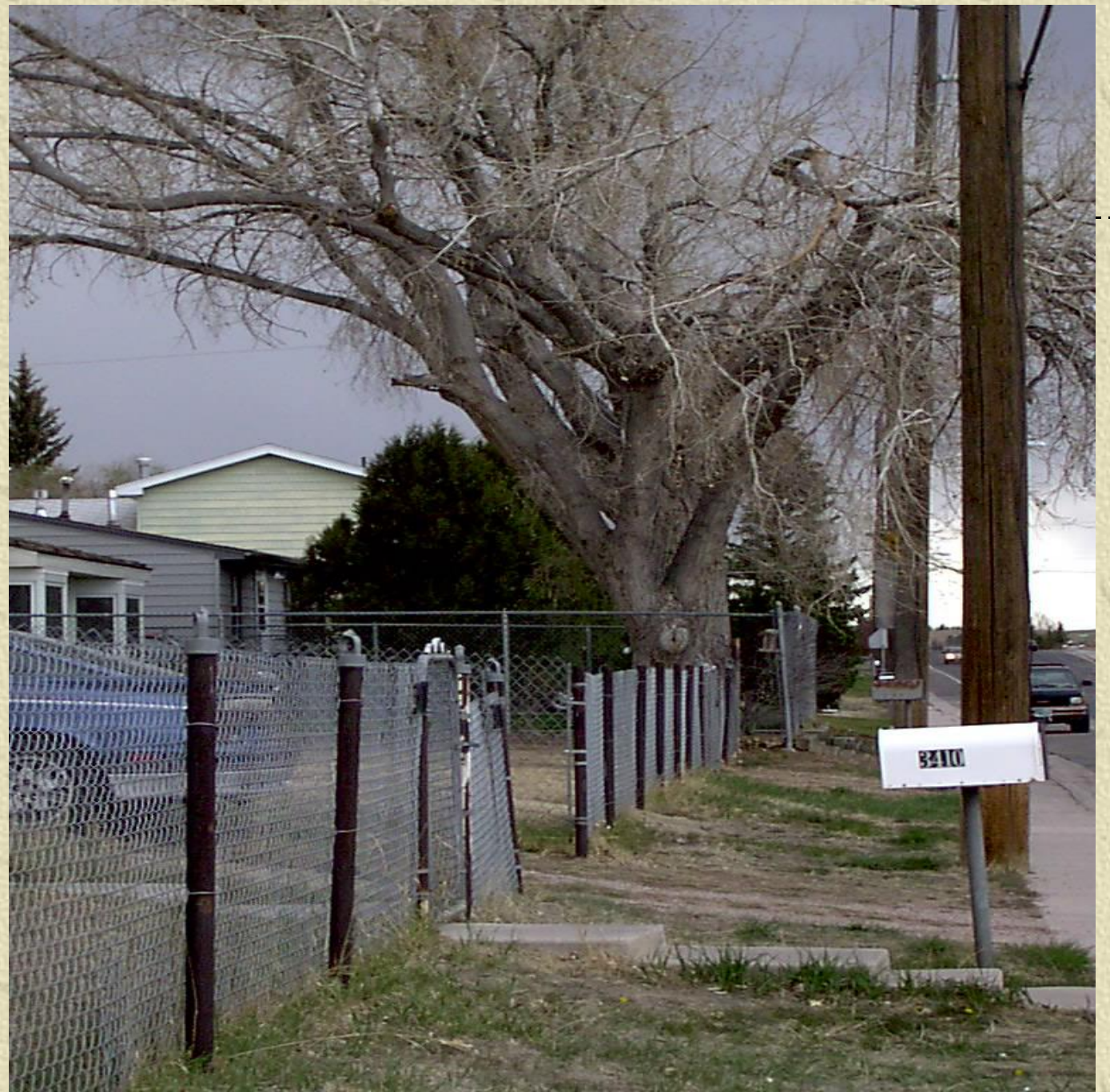
- Mature Cottonwood

Mature Cottonwoods

Cut Leaf Weeping Birch

Mature Blue Spruce

Concrete Conflict



Compatibility?

Pruning

lightening

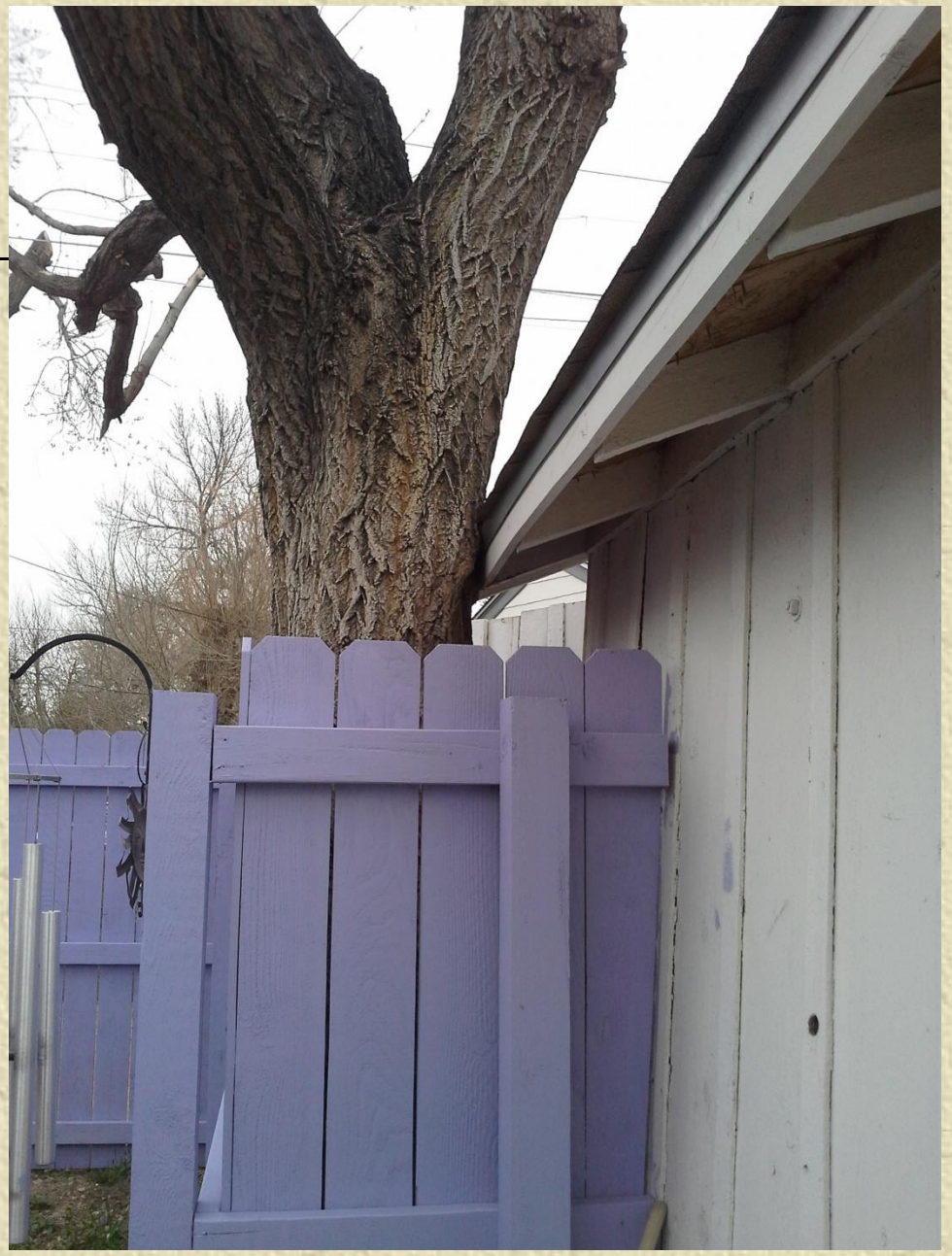
Aspen

Aspen

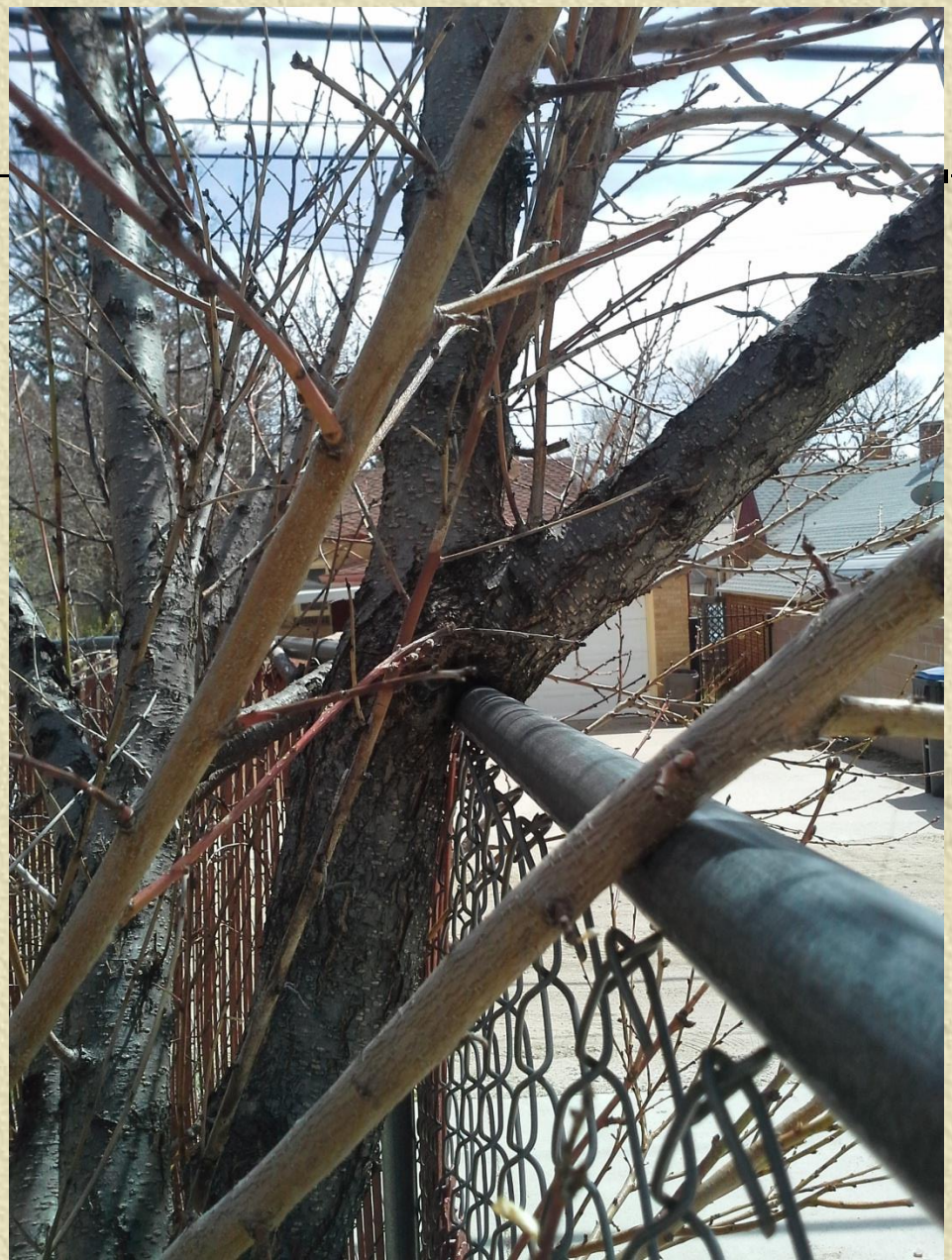
Aspen

Pine tree vs. Garage

Garage vs. Box-elder



Chain Link Fence vs. Peach Tree



Aspen Grove in Utah

the Trembling Giant in Utah is actually a colony of a single Quaking Aspen tree.

All of the trees (technically, "stems") in this colony are genetically identical (meaning, they're exact clones of one another).

All are part of a single living organism with an enormous underground root system.

This grove is composed of about 47,000 stems spread throughout 107 acres of land. It estimated to weigh 6,600 tons, making it the heaviest known organism.

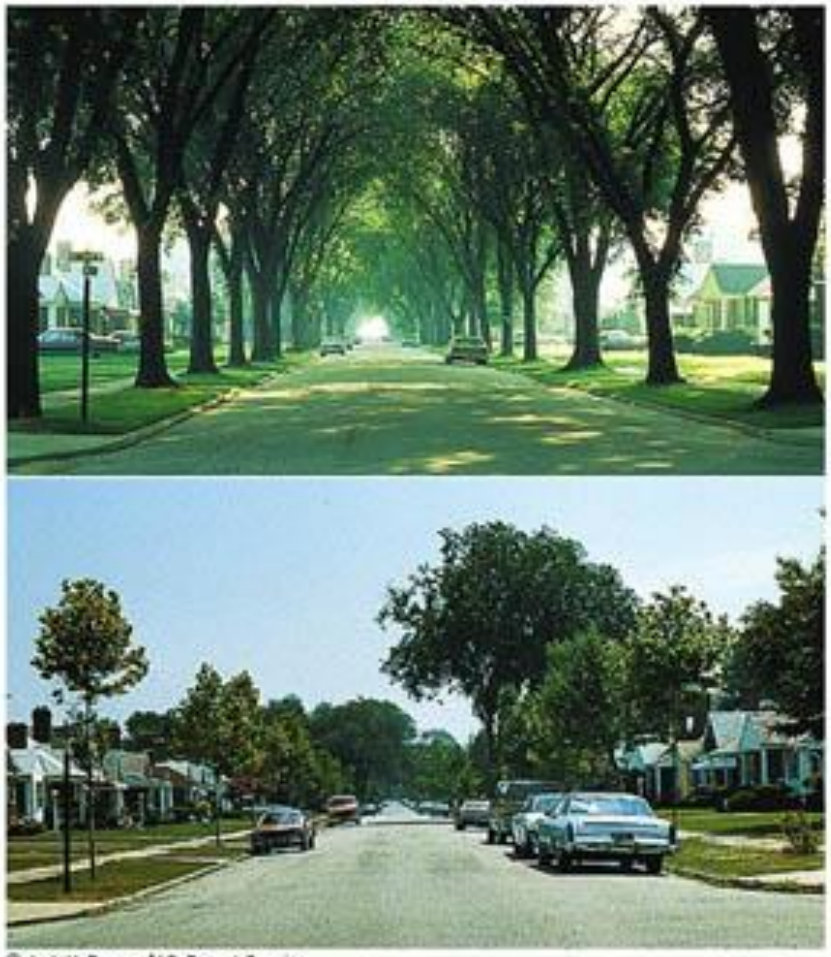
Although the average age of the individual stems are 130 years, the entire organism is estimated to be about 80,000 years old!

Elm Trees

Beetles

Borers

Aphids



©Jack H. Barger/U.S. Forest Service

An elm-lined street in Detroit in 1971 (top), and the same view in 1984 after a Dutch elm disease pandemic.


GET FUZZY
TAKE THAT YOU FILTHY RODENT!
WHAT'S UP, BUCK?
darb
I HAVE DECREED THAT ALL SQUIRRELS ARE TERRORISTS.
THUSLY, I AM PELTING THEM WITH THIS BAG OF LITTLE HARD THINGS.
2/13
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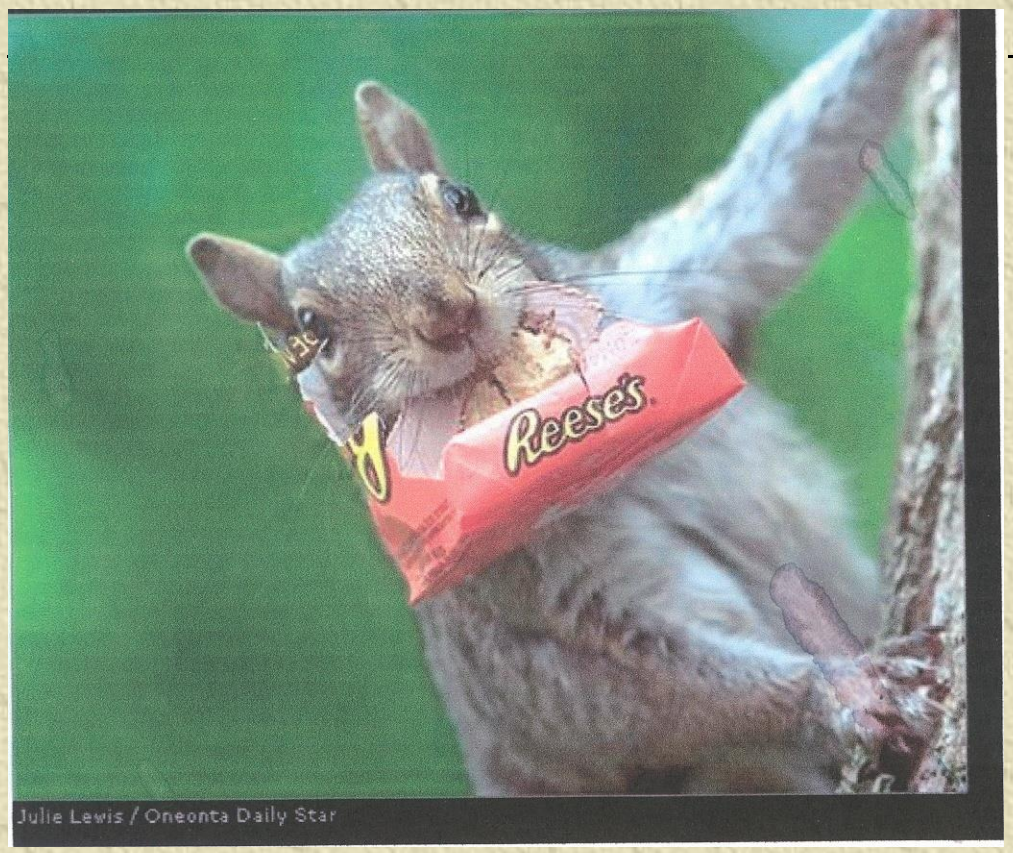
YOU REALIZE YOU'RE THROWING PEANUTS AT THEM, RIGHT? THEY EAT PEANUTS. YOU'RE FEEDING THE TERRORISTS.
HM. THAT'S NOT OPTIMAL.

Squirrels a.k.a. Tree Rats



Happy Gardening