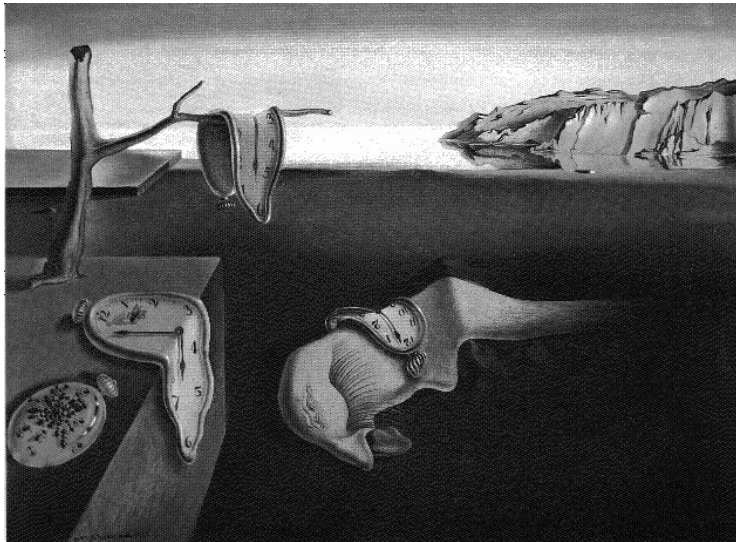


Plant Health Care
Diagnosis & Plant Disorders
Diseases & Pests
Construction Impacts



...in 2 hours!

Joseph Murray
Staunton, VA

Evolution of PHC

- < 1970s
 - Cover sprays
 - Broad spectrum pesticide
 - “control” pests
- 1970s
 - Integrated pest management
 - Started in agriculture
 - Purpose:
 - to reduce pesticide use
 - maintain profitable yield
 - recognized a threshold (economic injury level)
- 1980s
 - Plant health care



Problem With Broad Spectrum/Cover Sprays

- New problems emerge
 - predator/beneficial populations are reduced
 - pest resurgence (original pest)
 - Often with pesticide resistance
 - secondary pest outbreak (new pest)





Definition and Philosophy

A holistic and comprehensive program to manage the health, structure, and appearance of plants in the landscape.

- Plant Health Care

- Considers entire landscape (viewed as a “system”)
- Example: lawn care co. & tree care co.
 - Excessive fertilization
 - insect damage,
 - unwanted growth,
 - excess fertilizer salts in the soil...



- Proactive

- NOT a reactive response to symptoms of problems
- Starting with design, plant selection, and installation

Definition and Philosophy (cont.)

- Recognition of
 - Stress as an (the most?) important cause in tree health problems
 - Limitation of pesticides
- PHC is a contractual service
 - Focus on the client



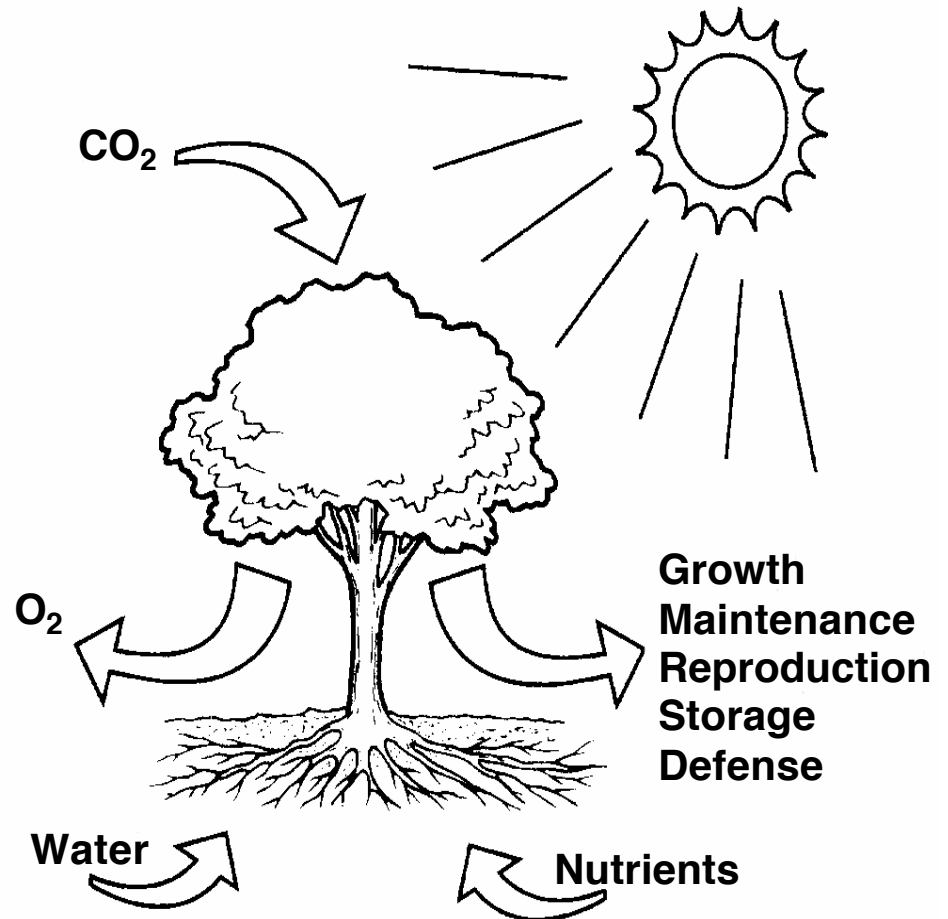
What Is a Healthy Plant?

- Appearance
 - Increases property value
- Structure
 - Increases safety, appearance, longevity
- Vitality
 - Ability to deal with stress
- Vigor
 - Genetic ability to deal with stress



Rapid growth = “Healthy” plant?

- **Resource allocation**



- (Can't do it all at the same time)



Plant Defense Mechanisms

- Physical Deterrents
 - Hairs, thorns, cuticle...
 - Cellulose & Lignin
 - CODIT
 - Resins in conifers
- Allelochemicals (for other plants or insects)
 - Tannins
 - Phenols
- Presence of allelochemicals may explain insect specificity with “host” trees

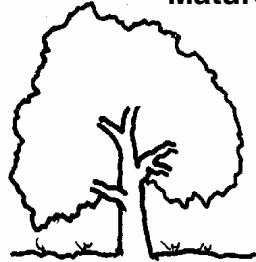
- Some stress → stimulates defense/resistance
 - Especially to leaf-chewing and leaf-sucking insects
- “complex”
 - Variety of symptoms expressed as the result of different causal agents
- Large amount of stress and/or multiple stress factors → tree decline → mortality spiral

MAINTAINING SOUND



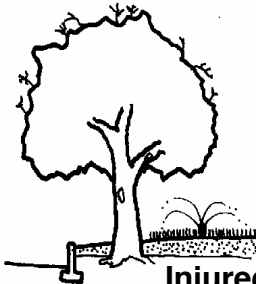
Mature

Predisposing stress, such as drought



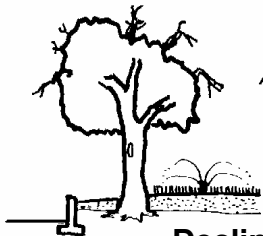
Predisposed

Additional stress such as construction, root loss, excess irrigation



Injured

Armillaria root rot; structural failure



Declining



The Process of Plant Health Care

- Monitoring
- Appropriate Response Process (ARP)
- Integrated Pest Management (IPM)
 - Borrowing the concept of “threshold”
- Client Education

Resistant Varieties and Cultural Controls

- Proper tree selection
 - The BEST way to deal with plant health problems is to avoid them!
 - Resistant varieties
 - Example: apple scab on crabapples
 - Solution – replace with resistant variety
- Irrigation practices
- Mulching
- “sanitation”
 - Pruning infected branches, egg casings, etc..

Chemical Controls

- Evolution of pesticides
 - Broad spectrum/residual → narrow/short-lived
 - Influence on beneficials?
- -cides
 - Insecticides
 - Fungicides
 - Foliar & root
 - Injection (vascular wilt fungi in xylem; Dutch Elm Disease)
 - Bactericides
 - Nematicide

Types of Pesticides

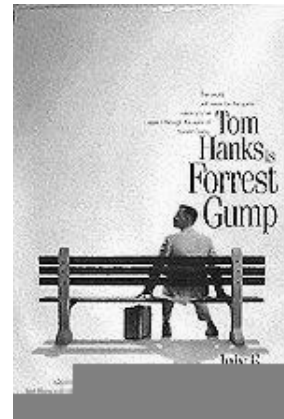
- Protectant
 - Fungicides & Bactericides
- Contact (spray or residue)
 - Insecticides
- Systemic
 - Insecticides
 - Translocated through the plant

Pesticide Safety

- Follow the label
- Follow the state department of agriculture's guidelines

Alternative “Pesticides”

- Insecticidal soaps
- Horticultural oils
- Botanicals
- Insect growth regulators
- Pheromones – not really a “pesticide”
- Microbial extracts



University of Illinois

<http://www.ipm.uiuc.edu/index.html>



Diagnosis and Plant Disorders



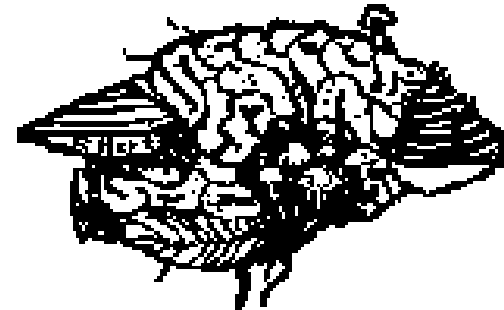
**THIS
IS YOUR
BRAIN...**



**...THIS
IS
PATHOLOGY...**



**...THIS IS
YOUR BRAIN
ON PATHOLOGY**



Any Questions?

Recommended steps for diagnosing tree problems

1. Accurately ID the
plant – Most
Important!

2. Look for patterns of
abnormalities

Tree Identification

Is tree identification really that important?

**YES! The tree must be identified
BEFORE**

- Attempting a diagnosis
- Prescribing a treatment
- Applying a pesticide.



Photo courtesy of R.L. Anderson



3. Examine site



4. Foliage



Sycamore 2,4-D

5. Trunk & branches

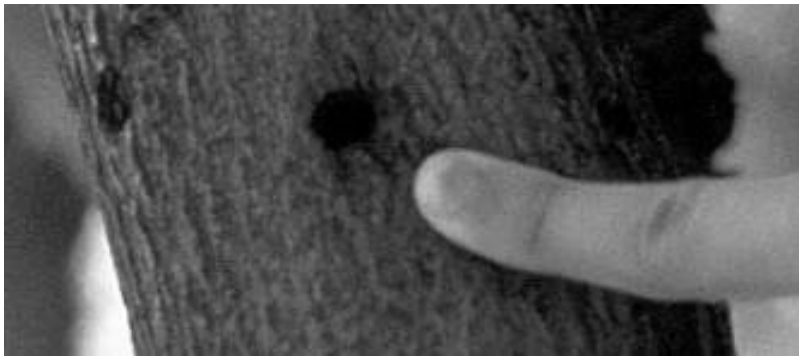


Fig. 5 (W. F. Wilcox)



Fig. 6 (W. F. Wilcox)

6. Roots & root collar



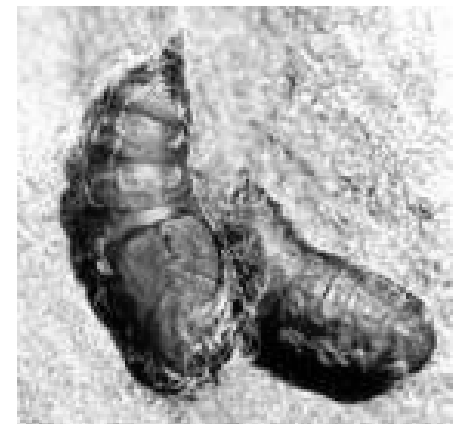


Wallis
MISS-KILL

Symptoms and Signs

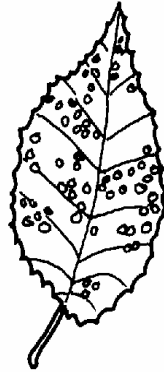
- Symptoms
- Signs

- Primary v. Second pathogen





blotch



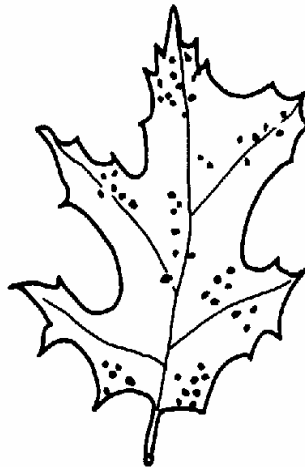
shot-hole



leaf-blisters



anthracnose



spot



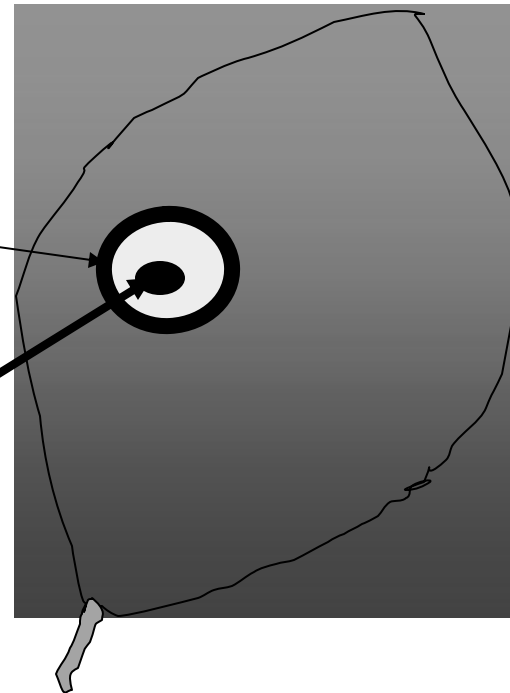
mildew

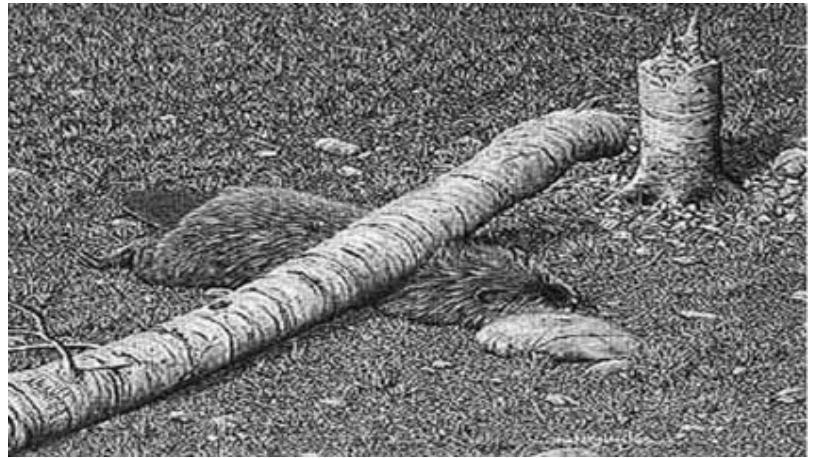
Symptoms

- Leaf Spot

Chlorotic tissue
forming a halo

Necrotic tissue





Symptoms

- Leaf Blotch
 - (Sycamore anthracnose)



- Blight
 - (fireblight on pears)



Symptoms

- Scorch
 - (abiotic)



- wilt



Symptoms

- Canker



- Stunting



Symptoms

- Gummosis



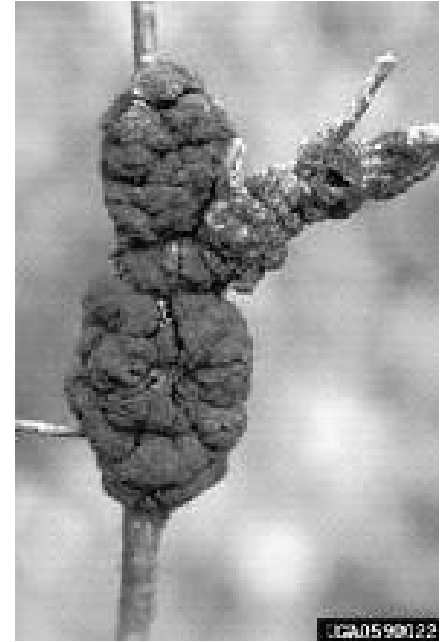
- Rust
 - (Cedar-apple rust)



Symptoms

- Gall
 - (black knot on cherry)

- Chlorosis
 - (iron chlorosis on Pin oak)





Symptoms

- Necrosis
 - (any dead tissue)
 - Fireblight on pears



- Dieback
 - (Juniper tip blight caused by *Phomopsis*)



Symptoms

- Powdery Mildew

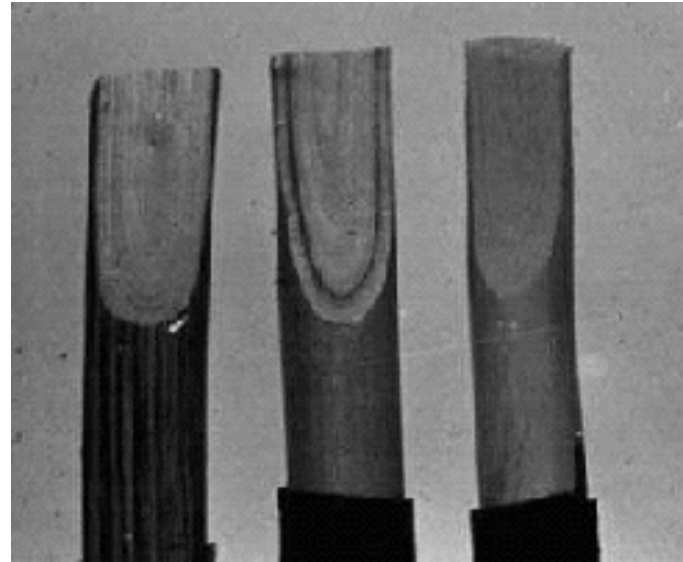


- Sooty Mold



Symptoms

- Vascular Discoloration

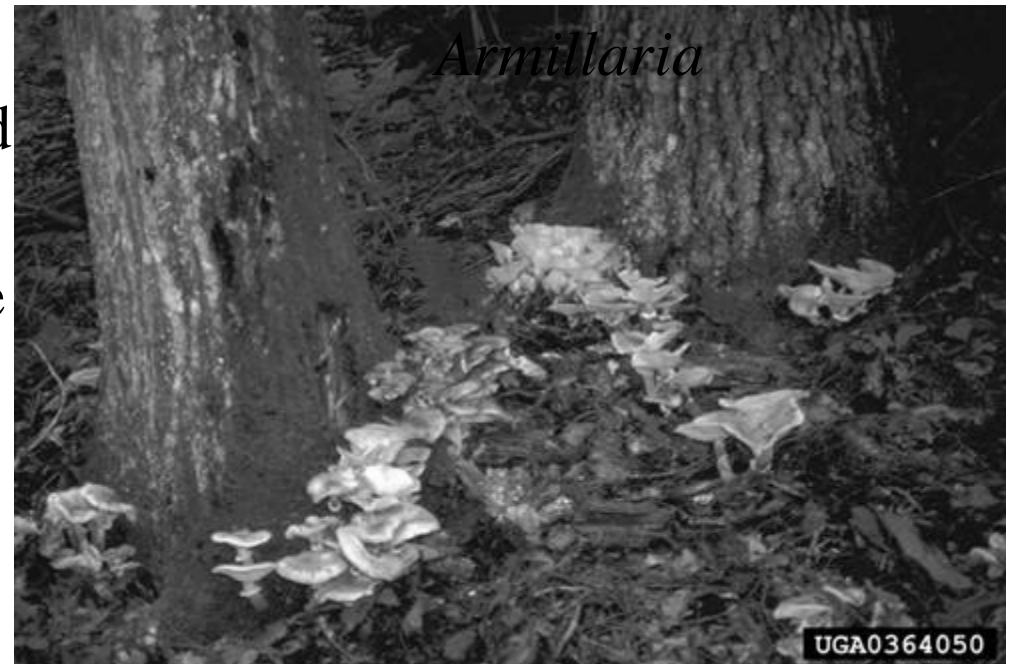


- Witches Broom



Abiotic Disorders

- Signs are not obvious
 - Tree may take a long period to respond to stress
 - Difficult to determine cause & effect
- Example
 - Trenching kills roots
 - *Armillaria* (an opportunistic root rot fungus) moves in to finish the job



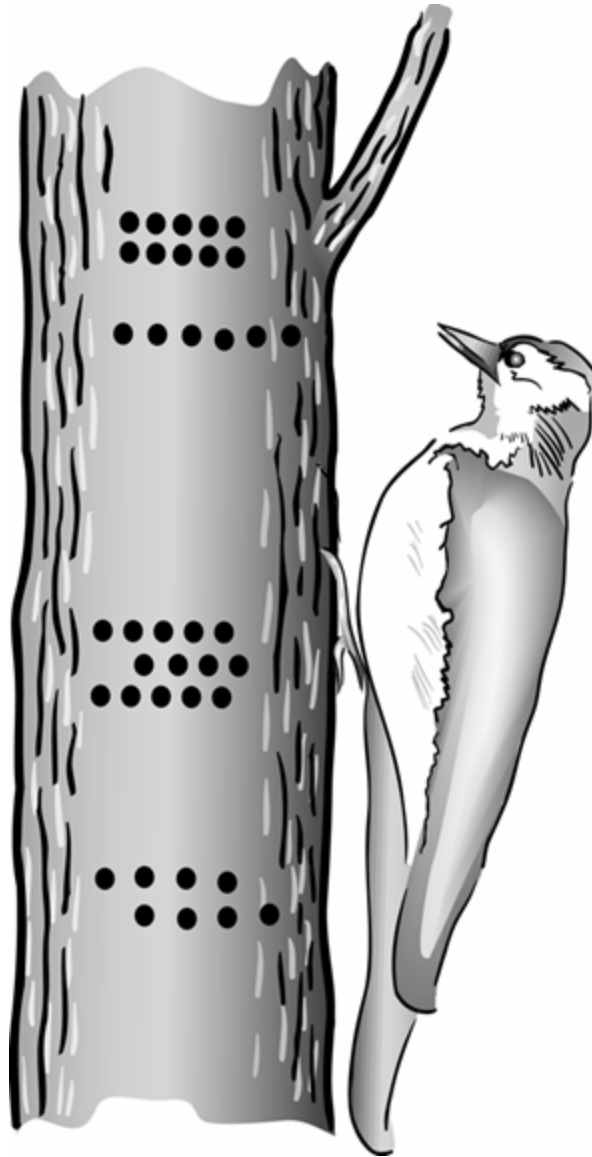
Robert Anderson, USDA Forest Service

<http://www.forestryimages.org/browse/detail.cfm?imgnum=0364050>

Sapsucker

holes –

characteristic
pattern, not as
harmful as borers.



Temperature Extremes

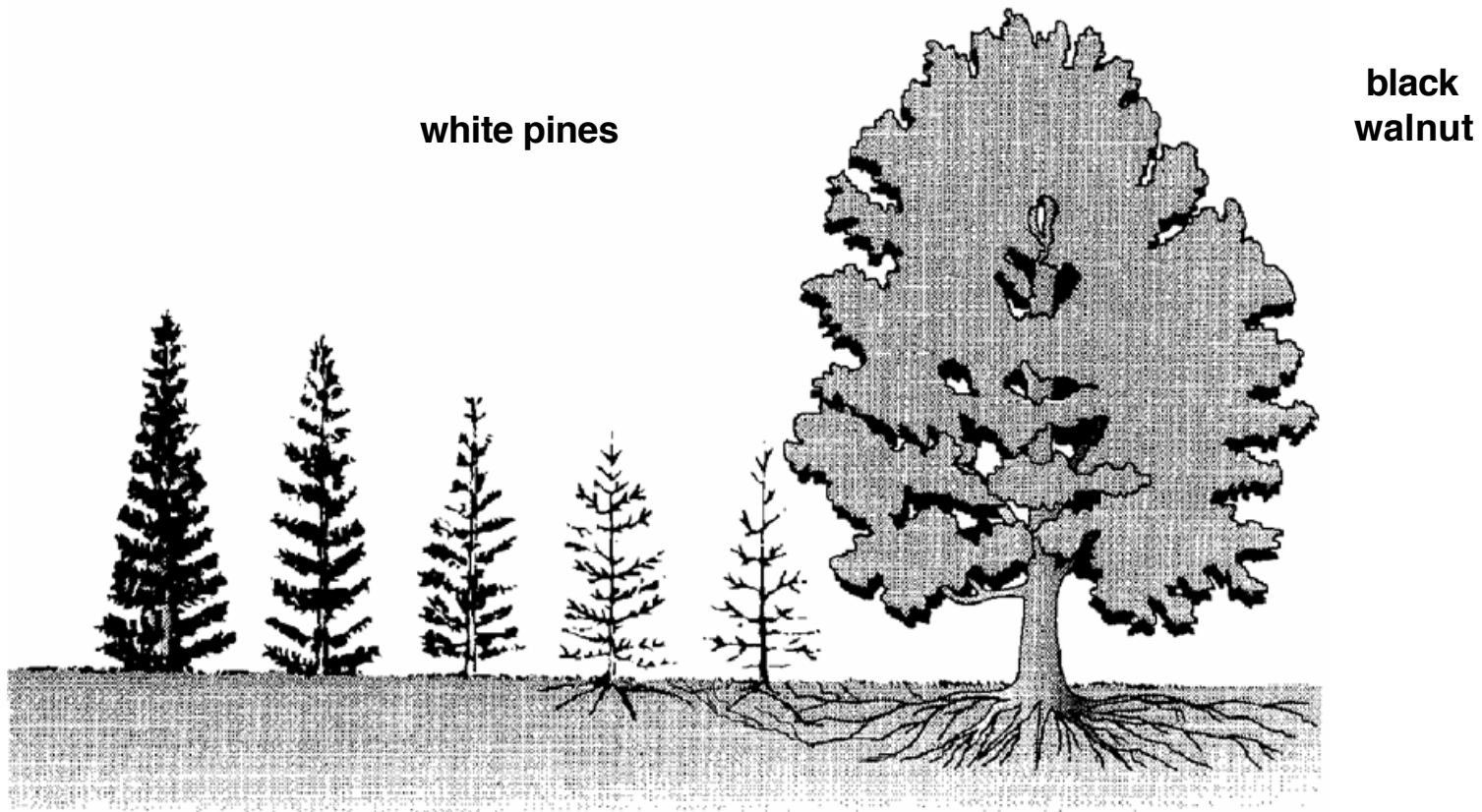
- Radial crack started with wounded/dead tissue from sunscald or a frost crack



Colorado State University, Extension

<http://www.coopext.colostate.edu/TRA/PLANTS/index.html#http://www.colostate.edu/Depts/CoopExt/TRA/PLANTS/frostcrk.html>

Competition & Allelopathy

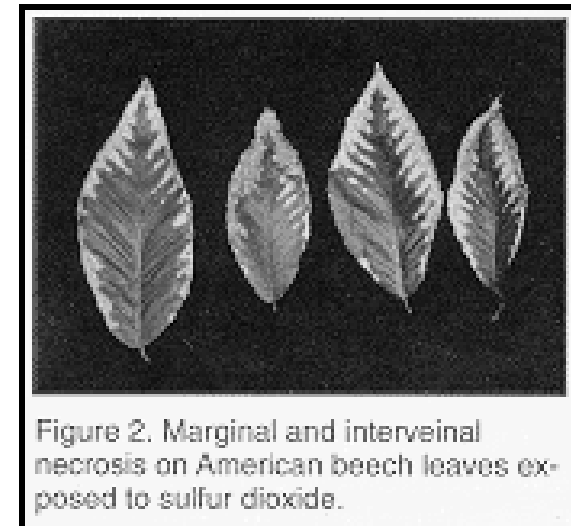
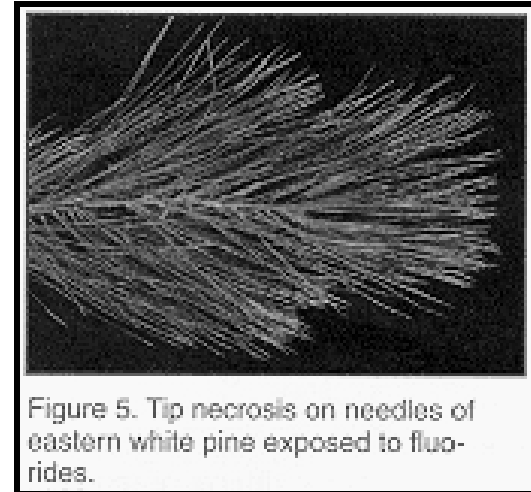


Sensitive trees growing near roots are injured or killed.

Toxic chemicals are produced by the tree roots.

Pollution Damage

- 4 major pollutants
 - Sulfur dioxide
 - Fluoride
 - Ozone
 - Peroxyacetyl nitrates (PAN)
- Symptoms
 - Dieback on leaf tips, along margins, or between veins
 - Stippling or spots on leaf surface
 - Reduced growth



Sikora & Chappelka

<http://www.aces.edu/departments/ipm/poldmge.htm>

Chemical Injury

- Most frequent cause
 - Herbicides
- *Systemic*
 - Herbicides that move through the plant
- Symptoms
 - Leaves curl & cup
 - Stout tips become twisted
 - Foliage becomes chlorotic then dies and falls off



Redbud

(drift; growth regulator)

Karen Rane

http://ppdl.org/dd/id/growth_regulator_injury.html

Chemical Injury (cont.)

- More dangerous herbicides
 - Nonselective
 - Soil sterilants



How to decrease drift

- Spray on cool, calm days
- Use low pressure
- Increase droplet size

Iowa State University

<http://www.ent.iastate.edu/imagegal/misc/spraynozzles.html>

LIPS THAT
TOUCH LIQUOR
SHALL NOT
TOUCH OURS



Biotic Disorders

- Insects and Other Pests
 - Feed on a variety of host plants
 - Japanese beetles
 - Aphids
 - Some scales
 - Most insect damage comes from
 - Feeding
 - Egg-laying (i.e. ovipositing cicadas)



Chewing Mouthparts

- Caterpillars, webworms, beetles & weevils
 - Eastern tent caterpillar, gypsy moth & cankerworm eat entire leaf
 - Black vine weevil feed along leaf margins



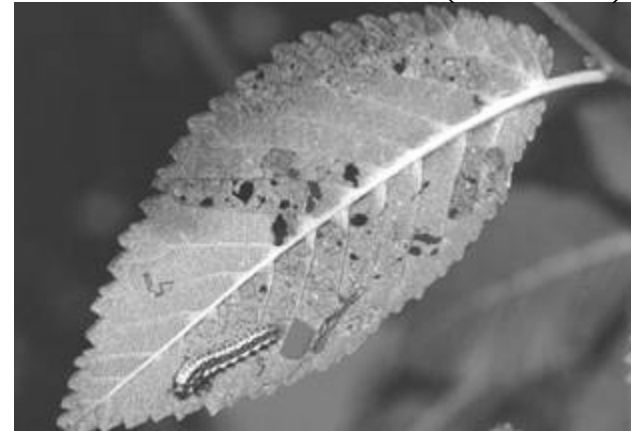
KB LTBR Site

http://lter.kbs.msu.edu/GypsyMoth/GM_IMAGES.html

Chewing Mouthparts (cont.)

- Japanese beetles, elm leaf beetles
 - Eat interveinal tissue (skeletonizers)
- Leafminers
 - Hollow out tunnels inside leaves

Elm leaf beetle (larvae)

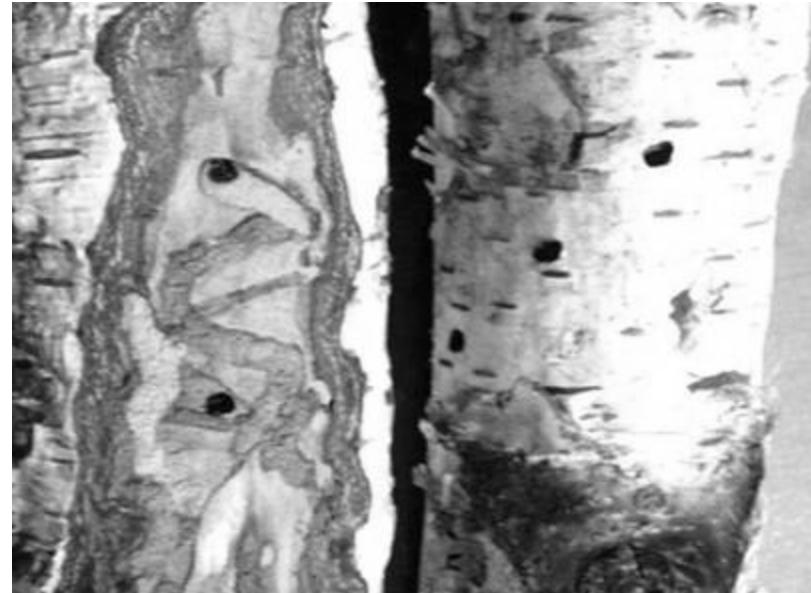


University of Illinois

<http://www.ipm.uiuc.edu/index.html>

Chewing Insect Larvae

- Tunnel under bark and in wood
 - Borers
 - Characteristic tunnel pattern helps identify borers (including hole & frass)
 - Results in crown dieback (or structural damage with Asian longhorned beetle)

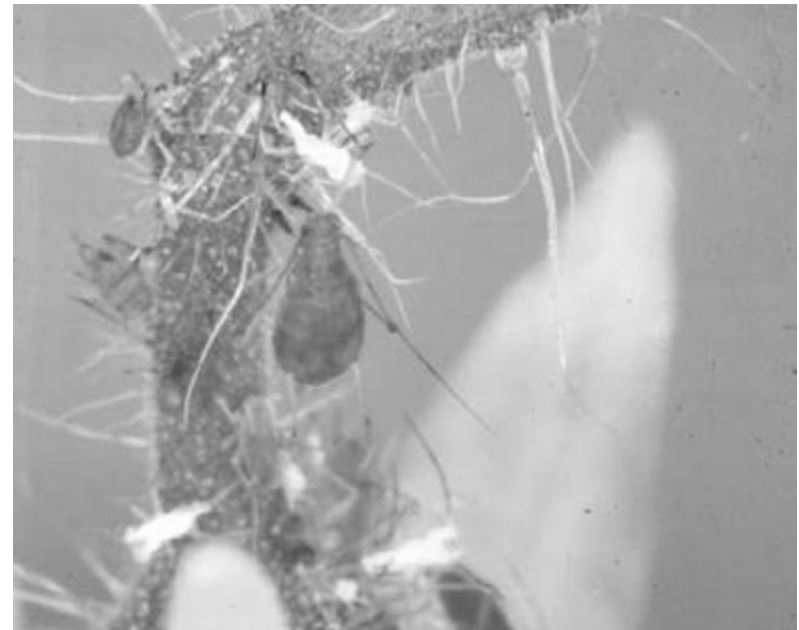


University of Illinois

<http://www.ipm.uiuc.edu/index.html>

Piercing and Sucking

- Aphids, adelgids and leafhoppers
 - Symptoms
 - Chlorosis, stippling, distortion
 - usually won't *kill* tree
 - Does contribute to stress
 - Causes drippings which attracts ants, sooty mold, and dirty windshields

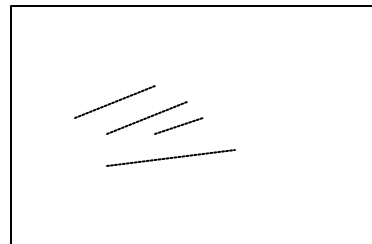


University of Illinois

<http://www.ipm.uiuc.edu/index.html>

Piercing and Sucking (cont.)

- Mites (spider mites)
 - NOT insects
 - They're Arachnids
 - Cause stippling or bronzing of foliage
 - Eriophyid mites cause galls
 - Test for mites
 - Shake & rub



University of Illinois

<http://www.ipm.uiuc.edu/index.html>

Vectors

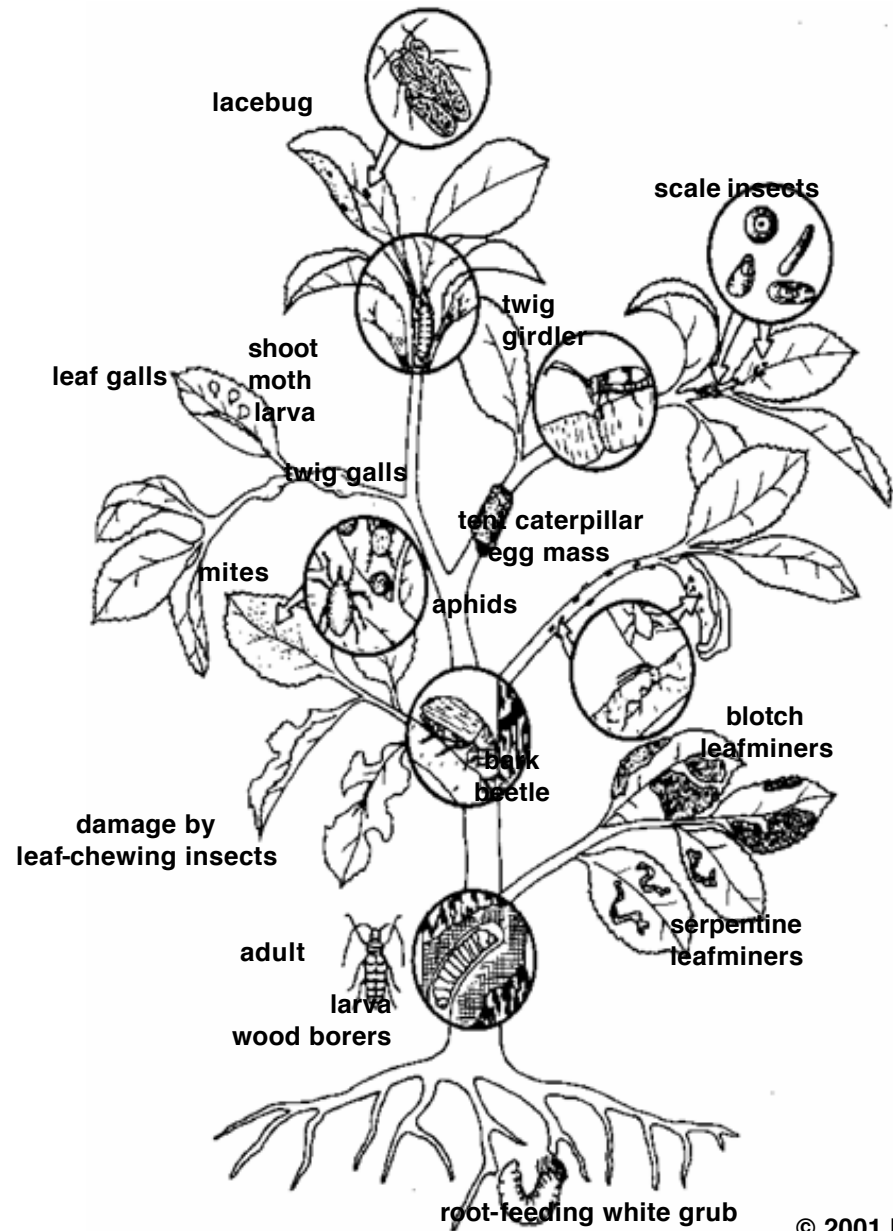
- Bark beetles
 - and Dutch elm disease (fungus)
- Bees
 - and fireblight (bacteria)
- Aphids & leafhoppers
 - and viruses



Byers, Shivira, Kohler

<http://www.wcrl.ars.usda.gov/cec/papers/ja80.htm>

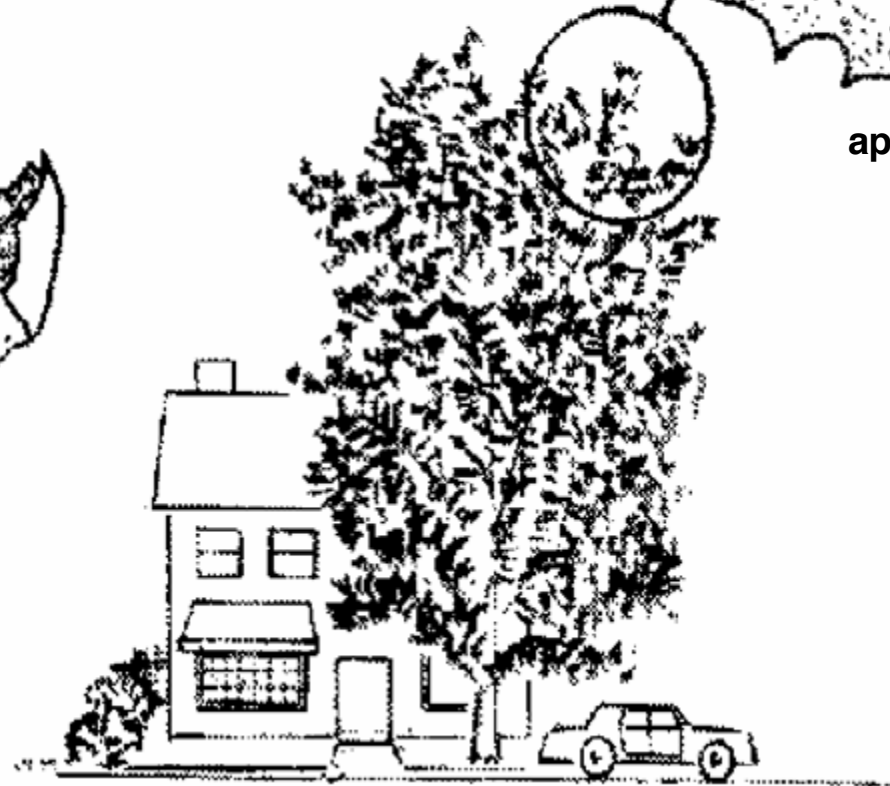
Bark beetle feeding in the crotch of
an elm.



**dark-spored fungi
grows on honeydew**



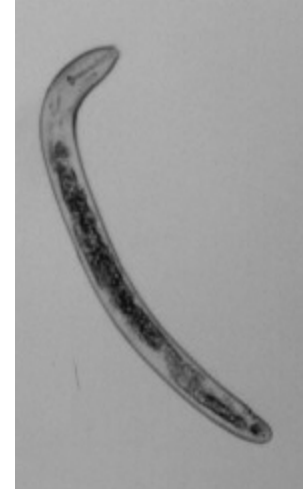
**aphid feeding
on leaf**



**honeydew falls on lower leaves, house,
understory tree, car, and sidewalk**

Nematodes

- Microscopic round worms
 - Results in swelling, deformation of plant parts, blockage of vascular tissue





Diseases

- Vascular diseases
 - Oak wilt
 - Dutch elm disease
- Are usually fatal
- Most diseases are fungal
- Other diseases
 - Bacterial
 - Fireblight & crown gall

Fireblight



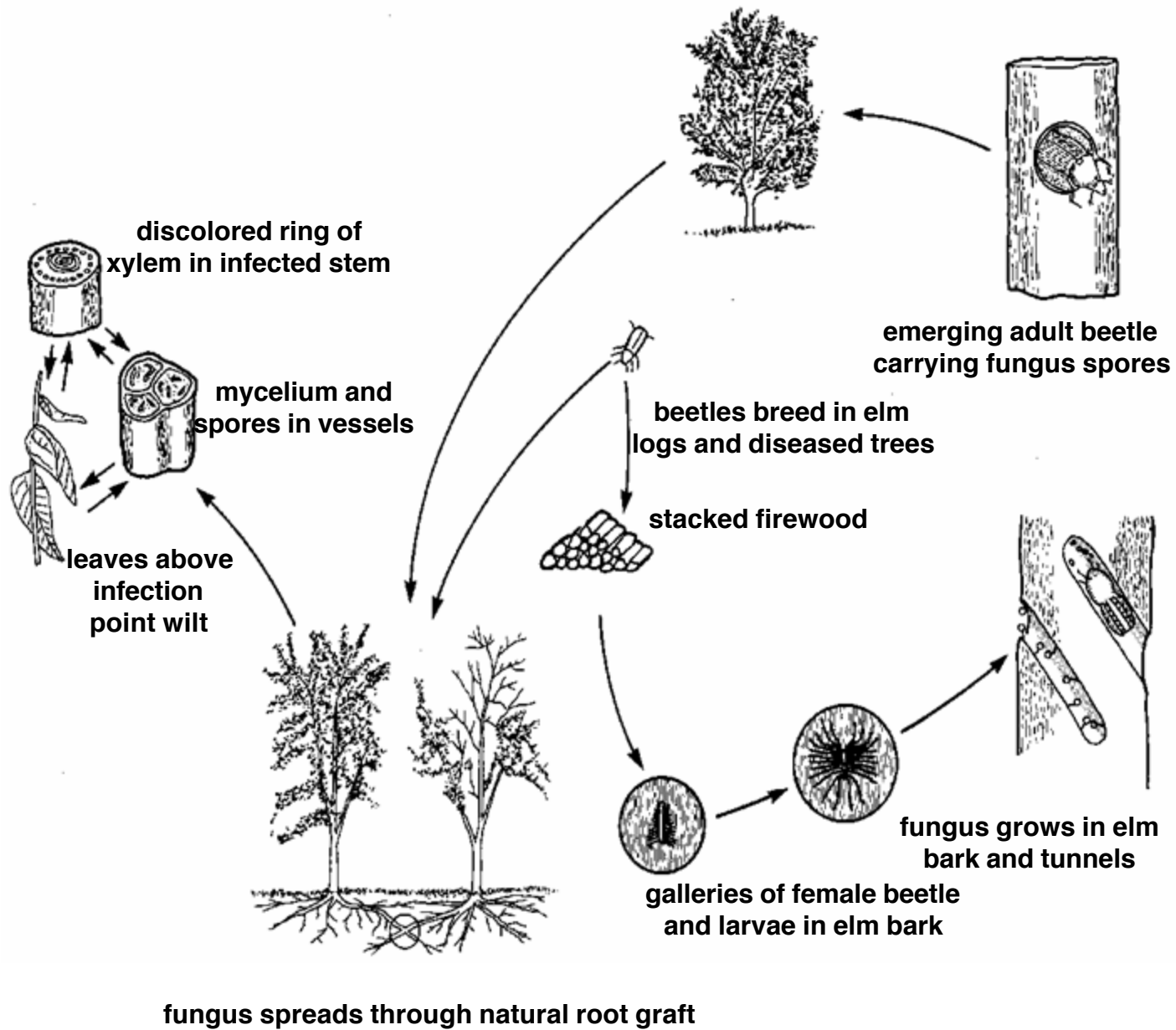
University of Illinois

<http://www.ipm.uiuc.edu/index.html>

Diseases (cont.)

- Treatment
 - Prevention
 - Maintain tree health
 - Cultural conditions
 - Pruning, raking, removing alternate hosts, etc...
 - Sprays can help prevent, but do not eliminate





Sending A Sample

- Freshly cut
- Sealed bag
- NOT wet
- Mail on Monday
- Include interface tissue
 - Between diseases & healthy tissue
- Include a detailed description of the problem

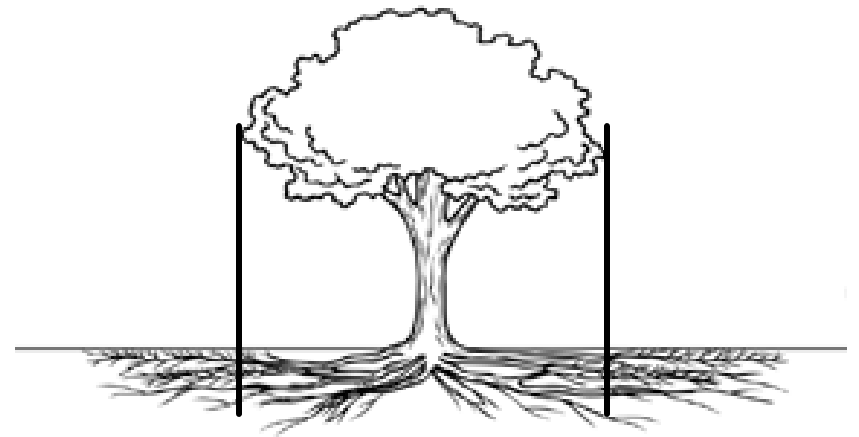
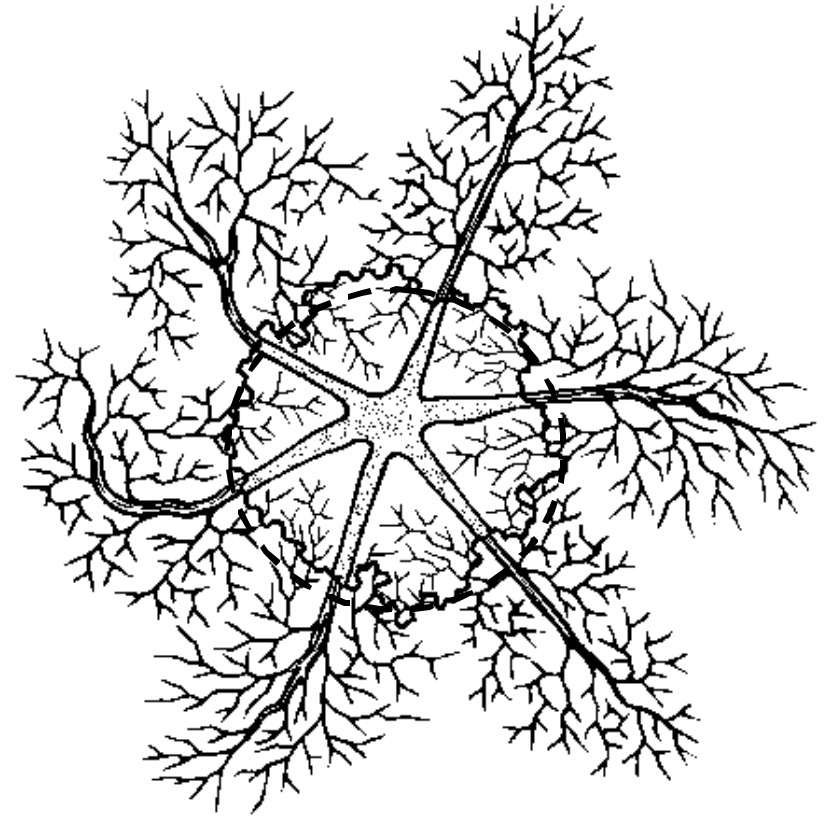


Trees and Construction



root zone area

- difficult to predict
- difficult to protect

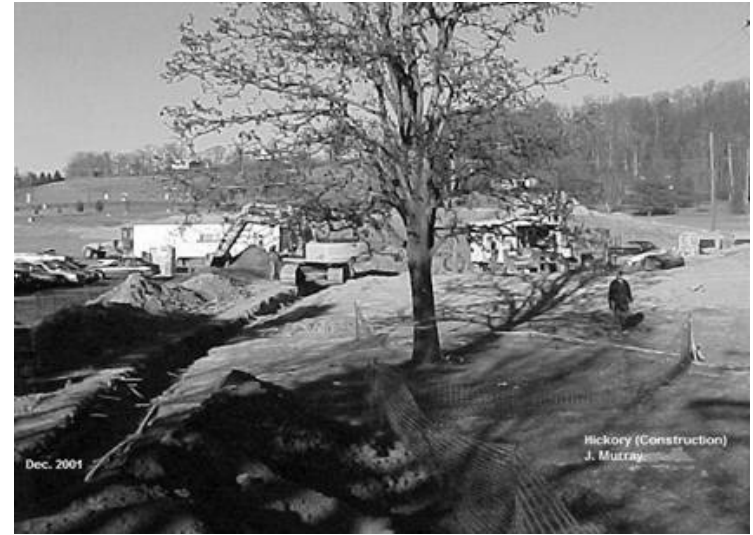
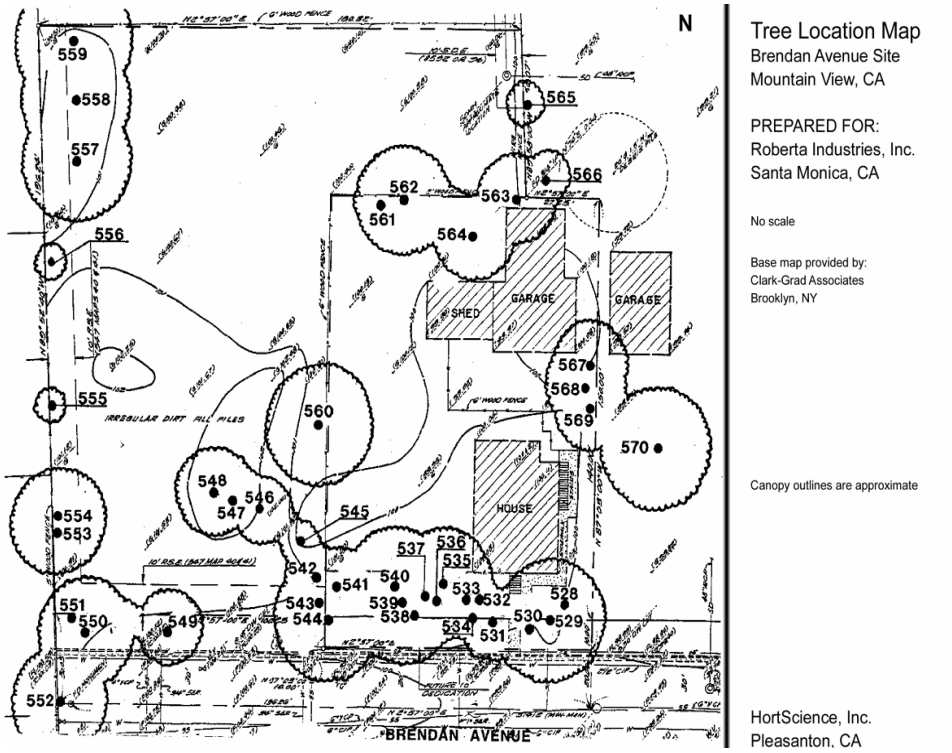


Trees Have Value

- Cost of Cure
- Trunk Formula Method
- Influence on Real Estate Value







A tree survey map showing location of individual trees and their canopy outlines.

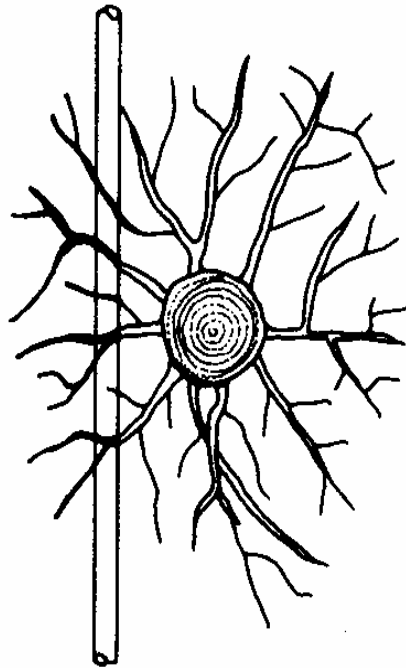
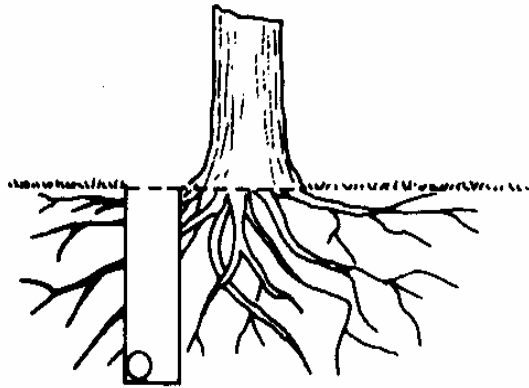
Can also be used to show root protection zones



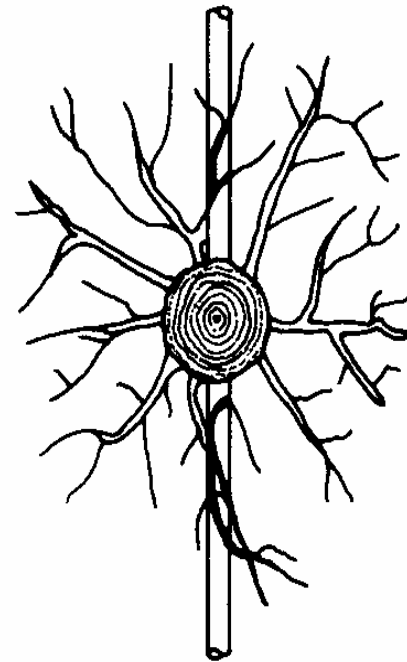
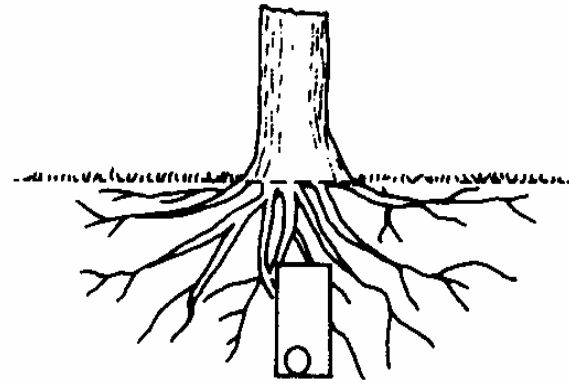




Trenching



Tunneling

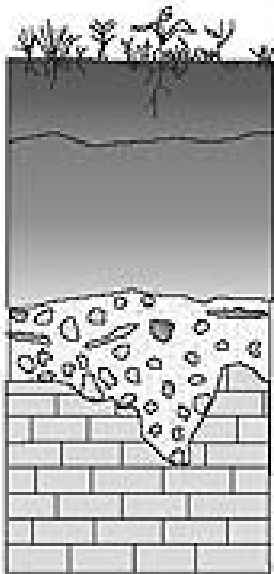








USDA Forest Service



Vegetation

Horizon A - (Topsoil, rich in humus)

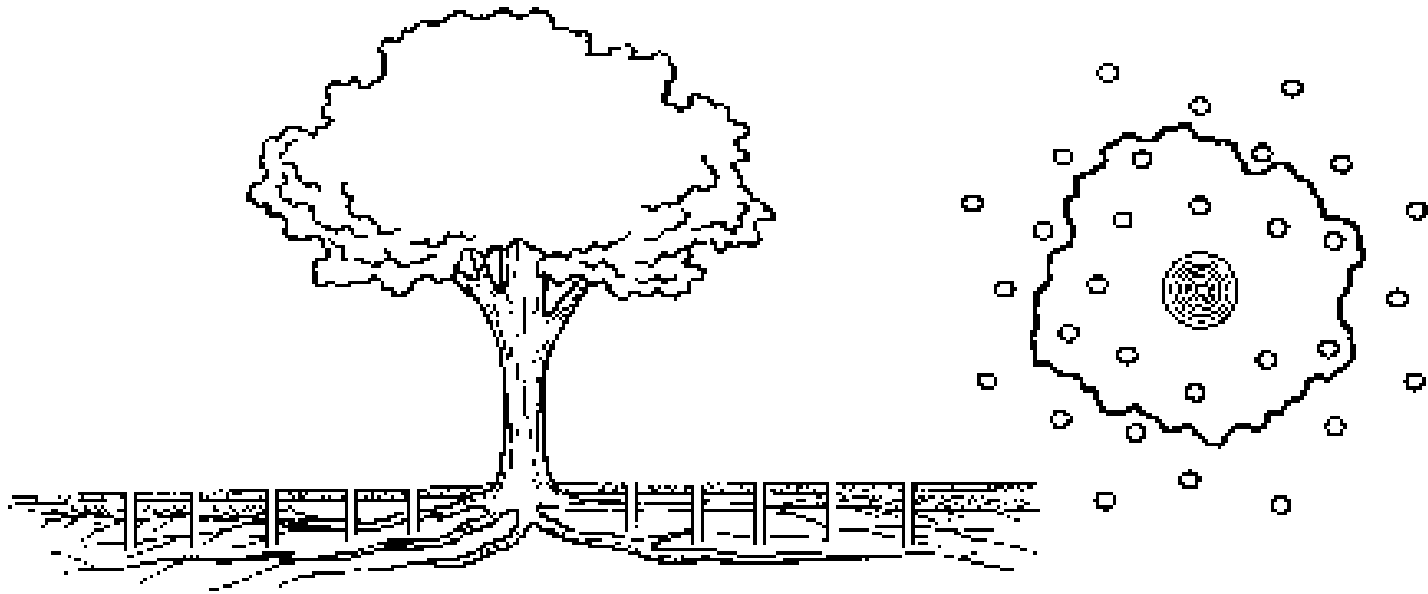
**Horizon B - (Subsoil or Light Soil)
Zone of Accumulation**

Horizon C - Partially decomposed parent material.

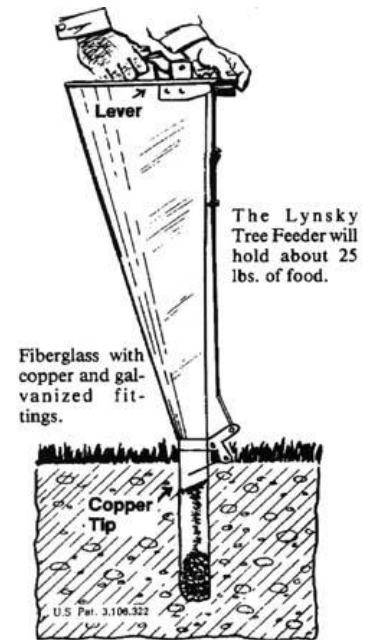
Unaltered Bedrock

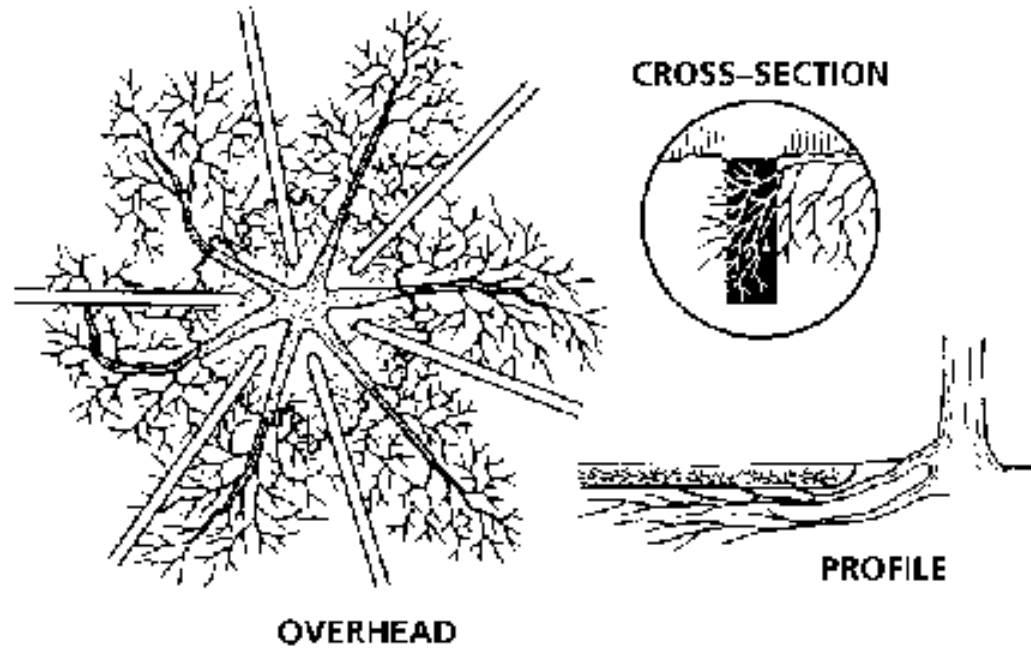






Vertical Mulching





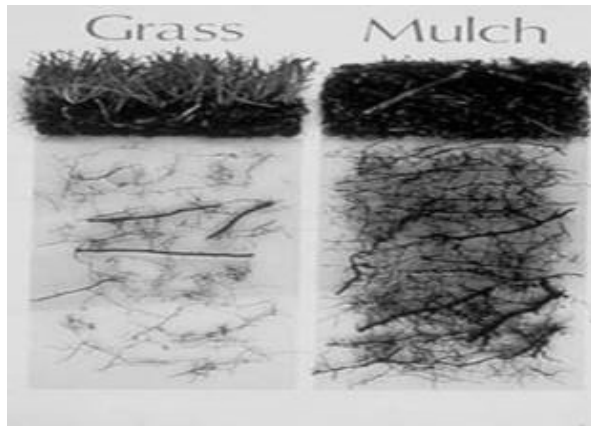
Radial Trenching



Air Excavator



Mulching



The End

