Arboriculture 101
presented by the CTPA

Non-parasitic Conditions of Trees

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What Is a Non-Parasitic Condition?

- This is a condition that affects a wide variety of trees, not just a single species.
- A condition that's not caused by a disease or insect pest, because these are very host specific.

Class Outline

- We'll review about fifty common non-parasitic conditions.
- Tonight we're going to do this with slides from the field.
- No scientist tonight, just an arborist!
- Our goal is to make you able to walk on any property and diagnose almost any non-parasitic condition you come across.

Samples of Conditions

- Beyond these slides, we have examples of many of these conditions for you to look at.
- But you have to wait for the “hands on class” in a few weeks!

The Whole Tree

- There are many parts of the tree, but think roots and leaves first when diagnosing problems.

The Whole Tree

- When thinking about a tree, consider that about 1/3 of the tree's biomass is in the crown, 1/3 in the trunk, and 1/3 in the roots.

Roots and Leaves

- Two obvious functioning parts of the tree are the leaves and the roots.
- Leaves convert solar energy to stored energy in the form of sugars.
- Roots absorb moisture and nutrients from the soil.

The Root of Happiness

- Roots need to have loose soil so they can grow and so that there can be a gaseous exchange through the soil.
- This loose soil needs to have a proper balance of moisture and air.
- And, the environment the roots are used to must stay the same.

Root Zone

- Understand that the root zone is its own complex ecosystem.
- Composed of roots, soil, microbes, fungi, insects, animals, mycorrhizae, water, etc.

The Whole Tree

- Realize that any changes to the root zone ecosystem can be a problem for the tree.

Diagnosing

- Why am I out to the property looking at this tree?
- Client is looking at what?
- Brown leaves?
- Consider the total picture.
- Okay, maybe the tree is declining.
- What's gone on around the tree?

Stress Factors

- Acute – occur suddenly and cause immediate damage.
- Chronic – occur slowly over time.

Acute Damage – Examples

- Mechanical injuries
- Frost and freeze damage
- Incorrect pesticide sprays
- Lightning

Chronic Damage – Examples

- Soil compaction
- Low light
- Girdling roots
- Nutritional deficiency

Classify Non-parasitic Conditions Into Categories:

- Environmental – meteorological
- Environmental – man made
- Physiological
- Nutritional
- Mechanical & animal

Environmental-meteorological

- Lightning
- Frost cracks
- Winter injury
- Sunscald
- Leaf scorch
- Salt spray
- Storm damage

Lightning

- Sometimes lightning completely destroys a tree.
- Debris from this strike scattered for hundreds of yards.

Lightning

- Here, two white pines were each struck.
- The strike followed a steel deer fence support wire to other adjacent trees.

Lightning

- The strike used the bottom 8 feet of these adjacent trees to get to ground.

Lightning

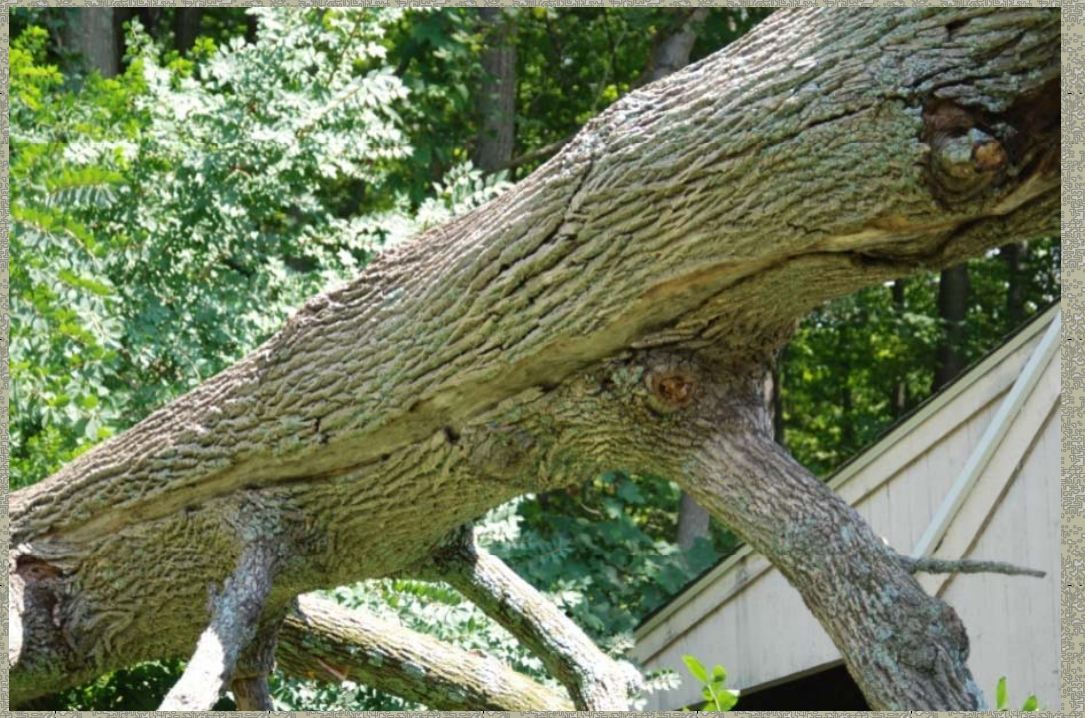
- This tree struck by lightning in 2002.
- The canopy was fine in 2003.

Lightning Strike

- Another tree 11 years after strike.
- Plenty of foliage.
- Lots of trunk decay.
- A clear hazard.

Ash Hit by Lightning

- This ash looks as though it got struck about two years ago.
- Fully leafed out in 2011.



Ash

- Cross section shows pretty extensive cracking of trunk.

Ash

- Not a good day for the house.

Ash

- It’s anyone’s guess how much the root system was damaged by the lightning.

Lightning

- Large pine hit by lightning in summer 2010.
- I drive by the tree every day and noticed it was looking “off”.

Lightning

- Tree shows only one route where the lightning went to ground.

Lightning

- Now the tree is almost all dead.
- If that had been a tree on your clients property, maybe you could have prevented the loss!

Lightning Protection

- You can help prevent damage by installing lightning protection.
- Done for large and important trees.

Lightning Protection

- Similar to protection for buildings, but some materials are different.
- A sample of tree materials.

Lightning Protection

- A climber installs copper wire from top of tree to the base.
- Copper wire is held away from trunk by using bronze tree drives.

Lightning Protection

- Copper wire is placed in trench in ground, running to ground rod driven deep into ground outside the dripline of tree.

Frost Cracks

- Continual freezing and thawing.
- Bark and some outer wood form longitudinal cracks.
- No prevention or treatment.

Winter Rhododendron

- Leaves tightly curled in winter.
- Why?

Winter Injury

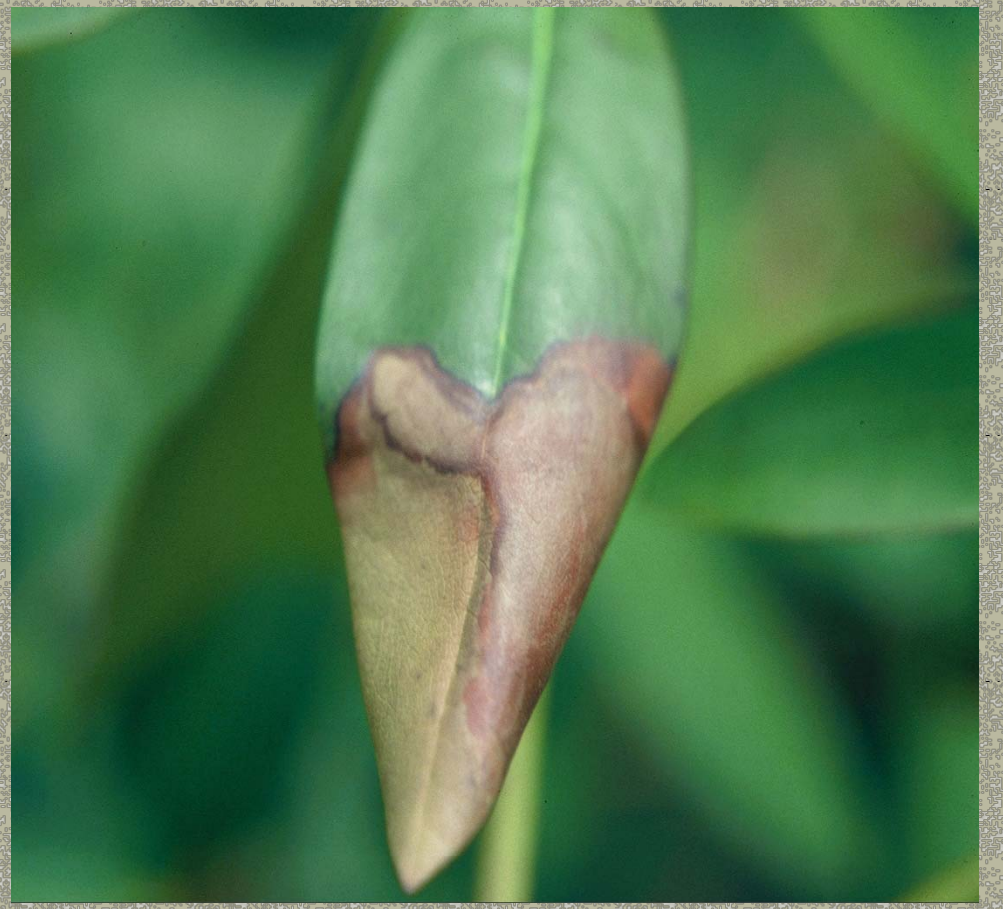
- Extreme temperature changes.
- Often occurs more on southern side of plant.
- Why?

Winter Injury

- Here it's on a rhody.

Winter Injury

- Rhododendron leaf.
- General death of leaf tissue.
- Usually most of leaf dies.



Winter Injury

- Close up of holly leaves.

Winter Injury

- These Japanese hollies don’t look too good.

Winter Injury

- The deep snow in 2010-2011 covered the bottom of these rhodys so only the top half showed winter damage in the spring.

Winter Injury Treatment

- Young trees and shrubs can be sprayed with an anti-desiccant material in late fall.
- Sometimes burlap fences are erected around shrubs.

Sunscald

- Usually a result of improper pruning.
- Heavy pruning opens up the center of tree to increased sun exposure.
- Tender bark dies.

Sunscald

- Young weeping beech.
- Don’t prune in late spring or summer.
- Weeping beech are very prone to this.
- No treatment, but you can prevent it.

Sunscald

- Hemlock hedge.
- Be careful, don’t cut back too hard.
- Especially in summer.

Leaf Scorch

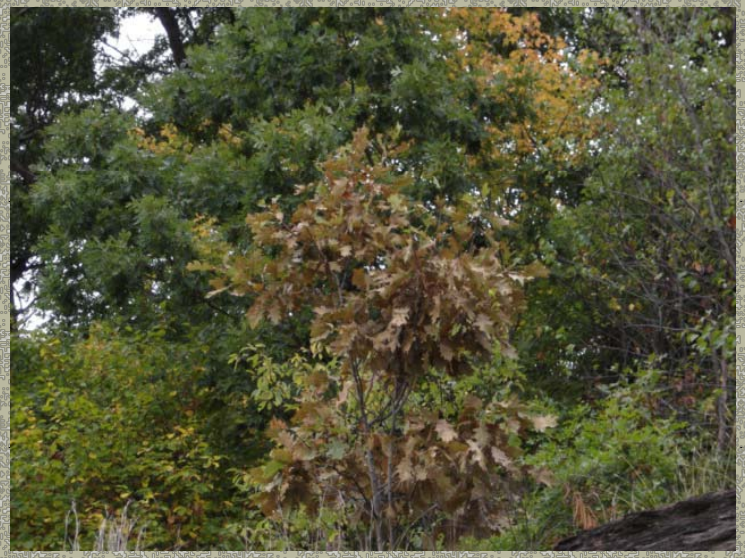
- Happens when tree can't supply enough water to leaves.
- Can be because of lack of soil moisture, a natural drought.
- Sometimes caused by too much water.
- Damaged root system can cause the problem.
- Reflective heat from nearby building can add to the problem.

Leaf Scorch

- Leaves turn brown, first between the veins.
- Browning of canopy will occur mostly on the side of the tree that has the lack of water.

Leaf Scorch

- Summer of 2005 was very dry.
- Top photo in mid-August 2005 shows early signs.
- Other photo shows dying trees in early September.



Drought

- The summer of 2010 was very dry.
- Probably the worst I've seen.
- Many dead limbs on maple.

Leaf Scorch

- More trees along roadside in trouble.
- Typical damage to a maple.

Leaf Scorch

- Trees on residential properties, too.
- Here an old beech shows severe stress.
- Irrigation system was not used during 2005 summer.

Leaf Scorch

- Minimal planting strip.
- Reflected heat from asphalt.
- More reflected heat from the building.

Leaf Scorch

- Drought conditions can be naturally occurring or man-made.
- This shows newly planted trees that didn't get watered.
- Treatment?

Salt Spray

- Prevailing winds off salt water cause dieback on the waterside of tree.
- Plant the proper species!

Salt Spray

- Tropical storm Irene along the coast.
- Lots of brown leaves.

Storm Damage

- Ice storms are the worst.
- Best to clear the trees of broken limbs; only do basic pruning.
- Wait a season to finish trimming.

ENVIRONMENTAL – Man Made

- Construction damage.
- Soil compaction.
- Soil added.
- Soil removed.
- Air pollution.
- Natural gas.
- Salt damage.
- Excess water.
- Pesticide damage.
- Planted too deep.

Construction Damage

- This was a wooded area.
- Grade wasn't changed too much.
- Soil temperature and moisture content was changed a lot.
- All trees died.

Construction Damage

- This beech had been severely encroached upon in 2004.
- Its future was bleak.
- Tree removed in 2005.

Construction Damage

- Sugar maple has gone through a lot of site changes.

Construction Damage

- Notice the fall color, earlier than neighboring trees.
- Why?

Soil Compaction

- Usually caused by vehicle traffic.
- Can have direct impact to the roots by crushing injury.
- Changes the root zone environment.
- Previous gaseous exchange through soil is changed.
- Tree is unable to absorb moisture and nutrients in its usual manner.

Soil Compaction

- Results in general decline.
- Soil under this tree was very compacted.

Vertical Mulching

- Might want to try to loosen soil in root zone.
- Use a two-inch diameter soil augur to drill vertical holes.
- The auger is powered by a large, gas engine powered drill.

Vertical Mulching

- Another method of drilling is with an air spade.
- With either method, the idea is to make lots of holes and fill these with a loose material, such as compost or vertical mulching product.

Vertical Mulching

- Here, holes are made about two feet apart under the drip line of the tree.
- You also want to go out farther than the drip line, if the site allows.

Soil Added

- Adding more soil inhibits the gaseous exchange through the soil.
- The roots can't breathe.
- When the roots can't breathe they don't function properly.
- This condition results in similar tree problems as compacted soil, a general decline, ending in death.

Soil Removed

- Most tree roots are in top one foot of soil.
- Removing soil destroys roots immediately.
- Removal of natural leaf litter also raises the soil temperature a great deal.
- Does this affect all trees the same?

What Went Wrong?

- Property was re-done in 2004.
- Plantings look healthy.
- Nice green turfgrass in September 2005.

Dying Oak

- Why is oak dying?

Construction Damage

- Sometimes a tree adjacent to work area is exposed to more winds.

Construction Damage

- Wind throw.

Hurricane Ivan 2004

- Why did this tree fail?

Examine the area of failure.

- Note the basal decay.

Tropical Storm Ernesto

- Mature oak fell.
- Tree didn’t appear to be hazardous before it fell.

T.S. Ernesto

- Examination of base shows extensive rot and decay.
- Easy to see why it fell.
- Why so much decay?

Air Pollution

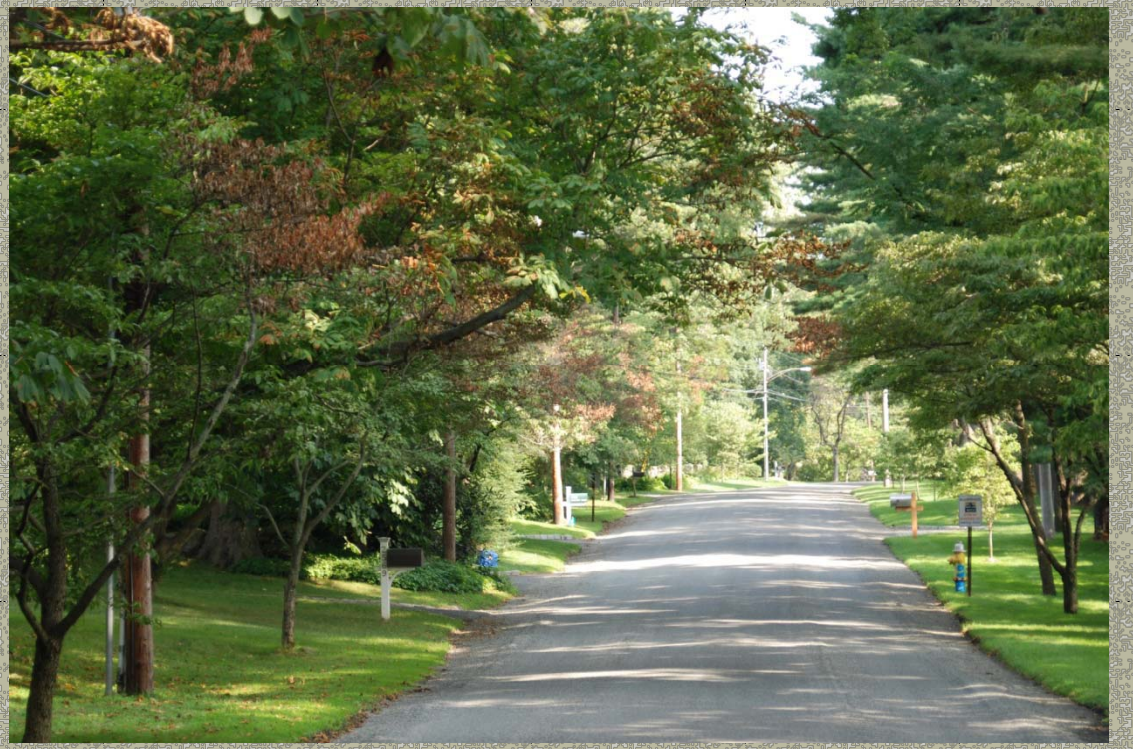
- Most pollution problems are chronic.
- High pollution levels can cause a general decline in tree health.
- Some pollution is acute.
- The exhaust of equipment blowing on foliage will kill sections of the tree or plant.

Equipment Exhaust

- Street paving equipment had upward pointing exhaust.
- Here white pines show injury.

Equipment Exhaust

- This shows damage to all trees along the side of this road.



Natural Gas

- Underground gas lines can leak.
- The gas itself isn't the problem.
- The gas replaces the oxygen in the soil so roots can't function properly.

Salt Damage

- Salted sand is spread on road in winter.
- Spray from passing cars is very salty.
- Causes direct needle injury.
- Salt in soil affects roots.

Salt Damage

- Close up of needle damage from road salts.

Salt Damage

- More close-up

Volcano Mulch

- Mulch is piled high against trunk.
- Trunk bark is not the same as root bark.
- This can result in trunk decay.
- Many small roots develop in mulch.

Excess Water

- Creates an improper balance of oxygen and moisture in the soil.
- Roots can’t function properly and soon start to die.

Excess Water

- Close up of the declining maples from excess water.

Pesticide Damage

- Herbicide damage on linden.
- Absorbed through soil and causes unusual growth of leaves.

Pesticide Damage

- Usually the growth is elongated and twisting.
- Often the herbicide is from a lawn application.

Pesticide Damage

- Tree injected with bidrin.
- Or, rather, over-injected with bidrin.

Pesticide Damage

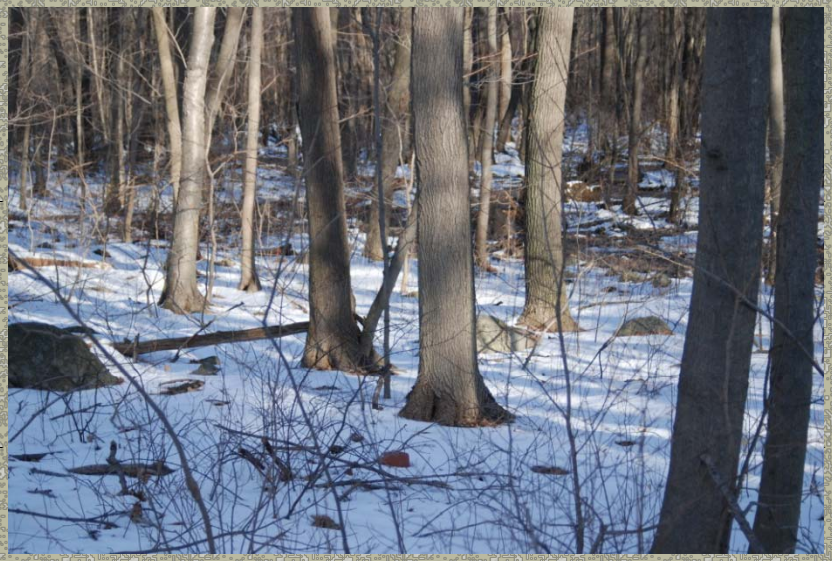
- Close up of leaves of bidrin injected elm.

Planted Too Deeply

- If trees are planted too deeply, all kinds of trouble can develop.
- This maple tries to grow a new root system above the old one.

Trees in Nature

- All the trees you'll see in the woods have a basal flare.



Trees in Nature

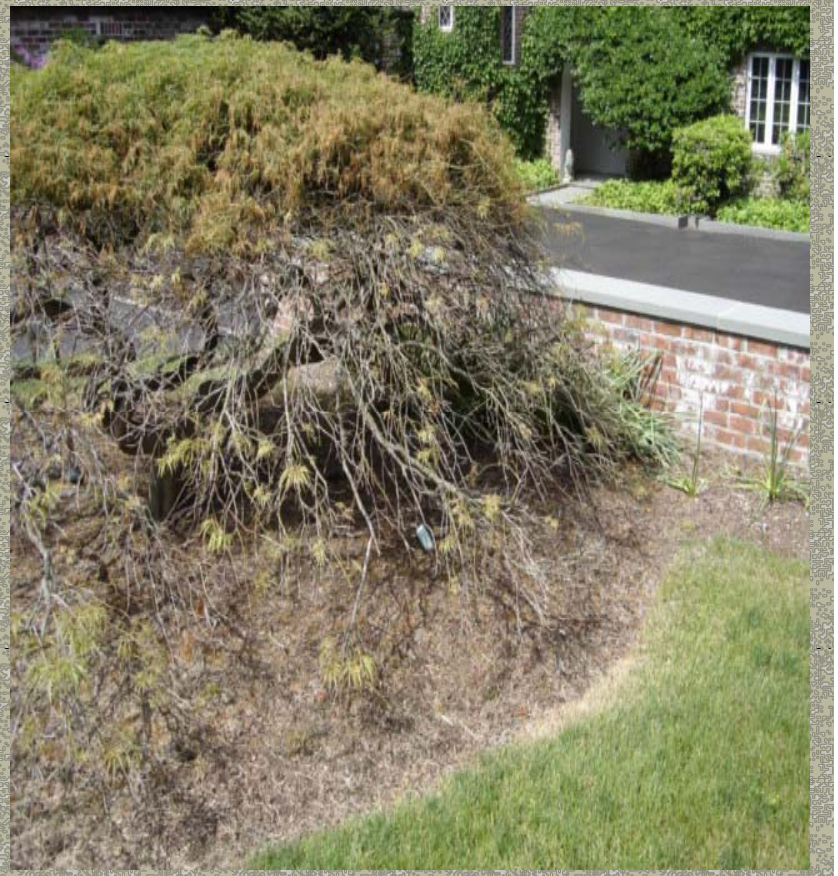
- When trees grow from seed, note the natural basal flare.
- Roots grow outward from trunk.

Deer Damage?

- Damage just up to deer browse height.
- Often a good clue that deer have been around.

Deer Damage?

- Client said she's been seeing deer feeding.
- So she sprayed with bobbex or hinder.
- We checked her spray bottle – it was Roundup she used!



Break

PHYSIOLOGICAL

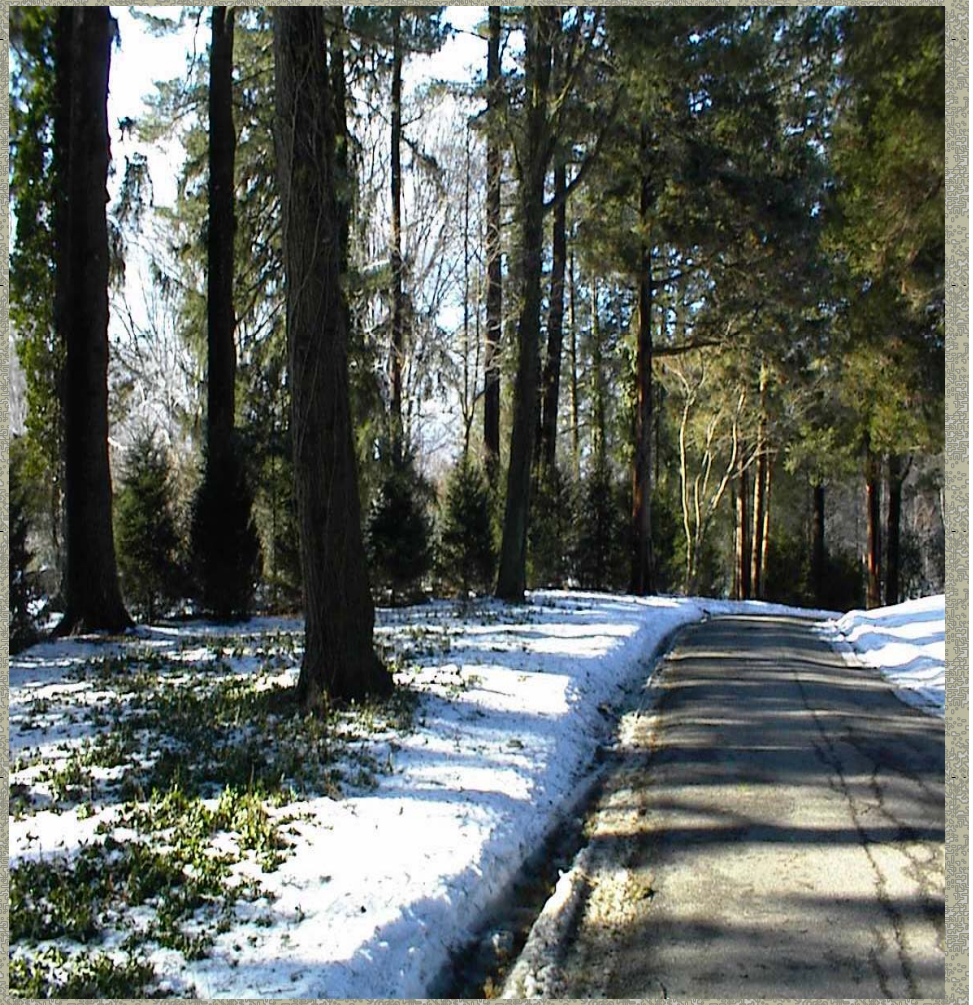
- Low light
- Nutritional
- Girdling roots
- Plastic twine & burlap

Low Light

- Often seen with new plantings.
- Evergreens used as screening.
- General decline starting with lower limbs.

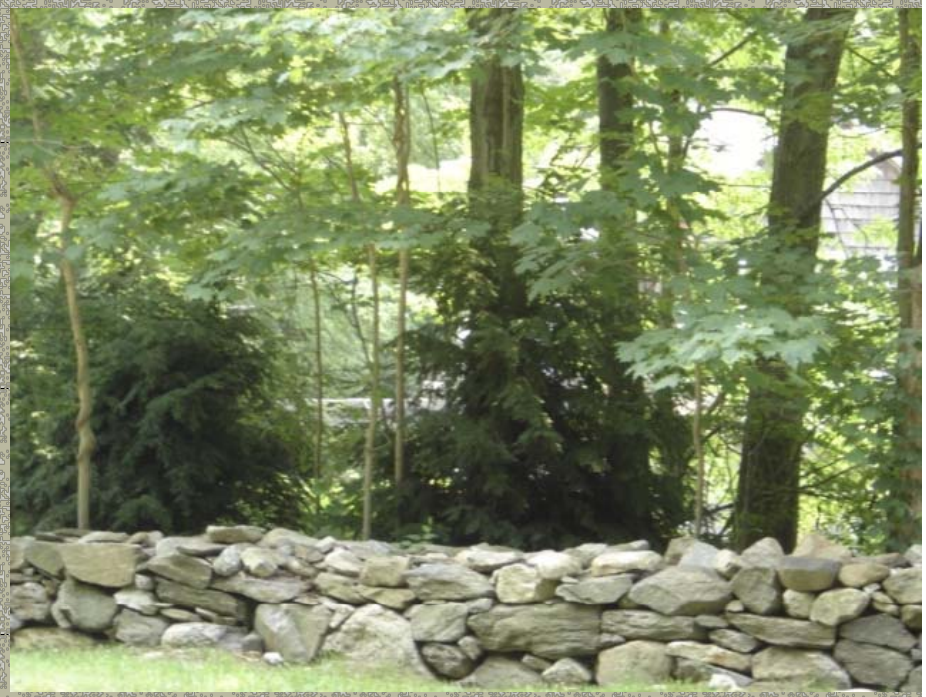
Low Light

- Tough to “fix” the problem.
- Best to do good planning right from the start.
- This photo shows the heavy canopy over the young spruces.



Low Light

- These spruce were planted in fall 2006 to shield road noise.
- Not much chance they'll thrive.



Low Light

- Same trees in December 2007.
- Not doing too well.
- Many have been replaced.

Internodal Growth

- A twig will have nodes, or seams, between the growth for each year.
- Some trees are more distinct than others.

Internodal Growth

- Can be a gauge of how healthy a tree is.
- When did that stress happen?

Declining Maple – Why?

- General thinning of crown.
- Dieback in top center of tree.
- Early fall color a powerful stress sign, but from what?

Declining Maple

- Approach tree and see the trunk goes into ground without root flare.

Girdling Root

- Evident girdling roots.
- Should this be removed?
- Why or why not?

Girdling Roots – young dogwood

- Obvious sign of early trouble.
- Dig carefully with hand tools or use an air spade.
- Then use mallet and chisel to remove section of root.

Girdling Root Removal

Girdling Root – Air Spade

- An air spade is the easiest and best method to excavate soil.
- No harm to roots and it's quick.

Girdling Root – Air Spade

- This shows how well an air spade clears out the root zone.
- Quite a mess of a bad root system.
- Any thoughts about why there's such a mess here?

Girdling Root Removal

- Sometimes you can use a chain saw.

Girdling Root Removal

- Finish up removing roots with mallet and chisel.

Declining Hornbeams – Why?

- Row of hornbeams showing decline in some of the trees.

Hornbeams

- The worst specimen.
- Significant overall decline.

Hornbeams

- Newly planted site seemed okay.
- Closer inspection showed trunks had no flare.

Hornbeams

- Digging showed that plastic twine was never cut or removed at planting.
- Worse than a girdling root.

MECHANICAL & ANIMAL

- Mowers and trimmers
- Deer damage
- Mouse damage
- Japanese maple
- Sapsucker feeding
- Woodpeckers

Mowers & String Trimmer

- Mowers and string trimmers often kill bark on young trees.

Mowers & String Trimmers

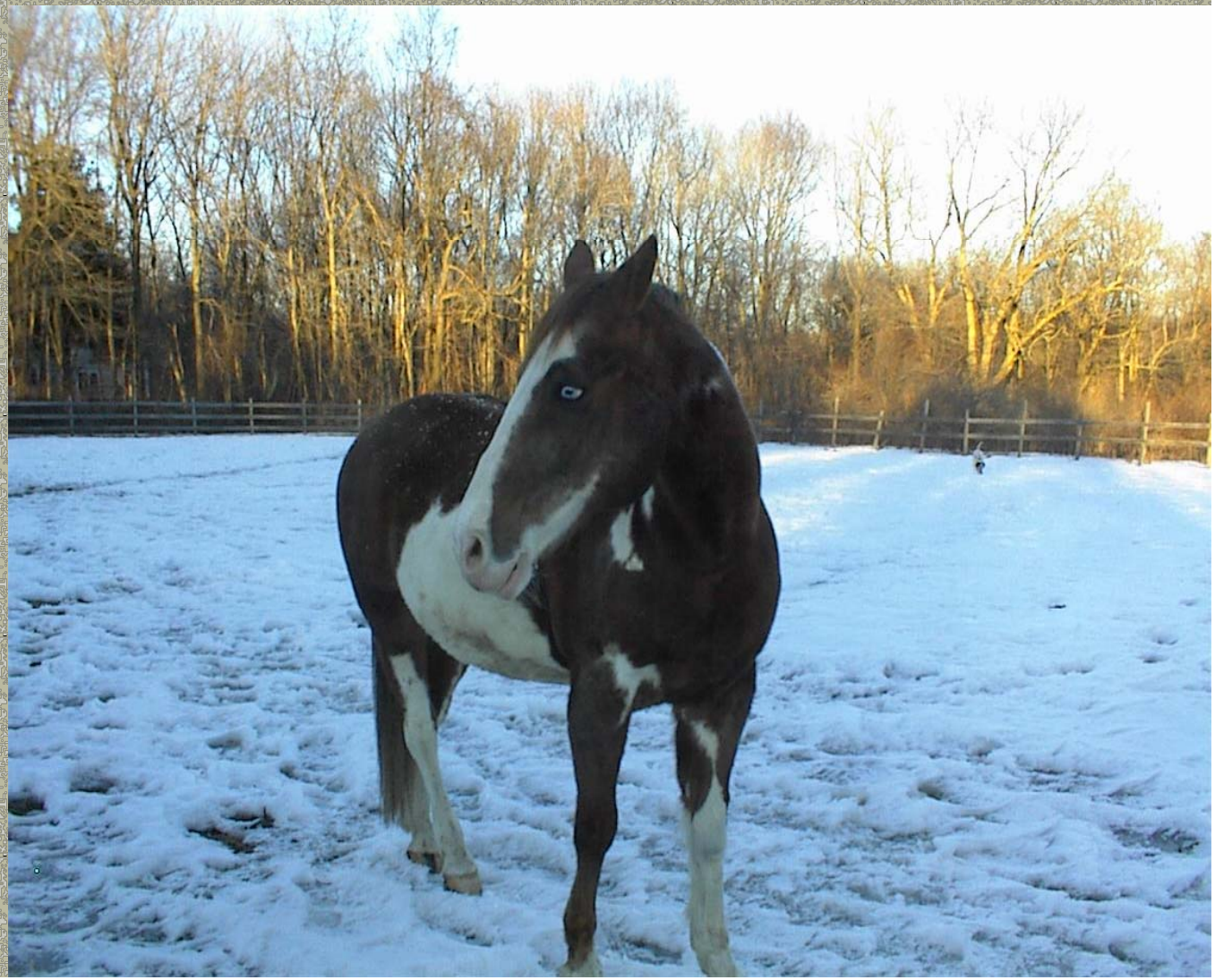
- Why not plant or mulch around trees?
- Everyone's happy!

Bark Damage & Borers

- Very often the damaged trunks of dogwood trees allow easy entry for borers.
- Stressed trees signal to borers and bark beetles.

What Caused This?

Blue



Horse Damage

- Chewing and stripping of bark.
- In just a few minutes work, a bored or hungry horse can strip a lot of bark.

Horse Damage

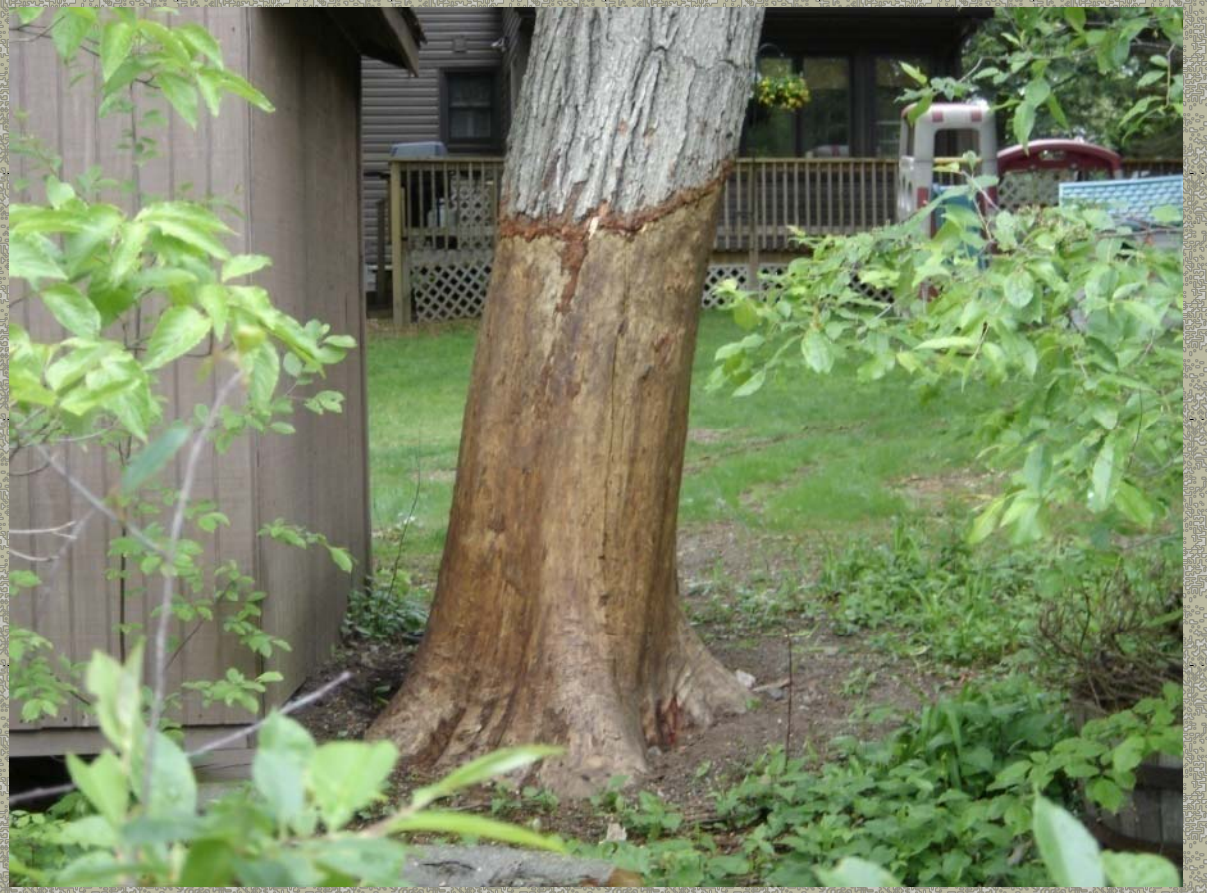
- Blue was very bored this day.

Horse Protection

- Nice horse properties will have barrier fences put up, ones the match the property's other fences.

Dog Damage

- I think this was done by a German shepherd.
- Not seen very often!



Deer Damage

- Deer browse on leaves, twigs and buds.
- Favor certain species.
- They love rhododendron like this one.

Deer

- You can do a few things to help.
- Late fall sprays with thiram will reduce winter browsing.
- A bit obvious.

Deer

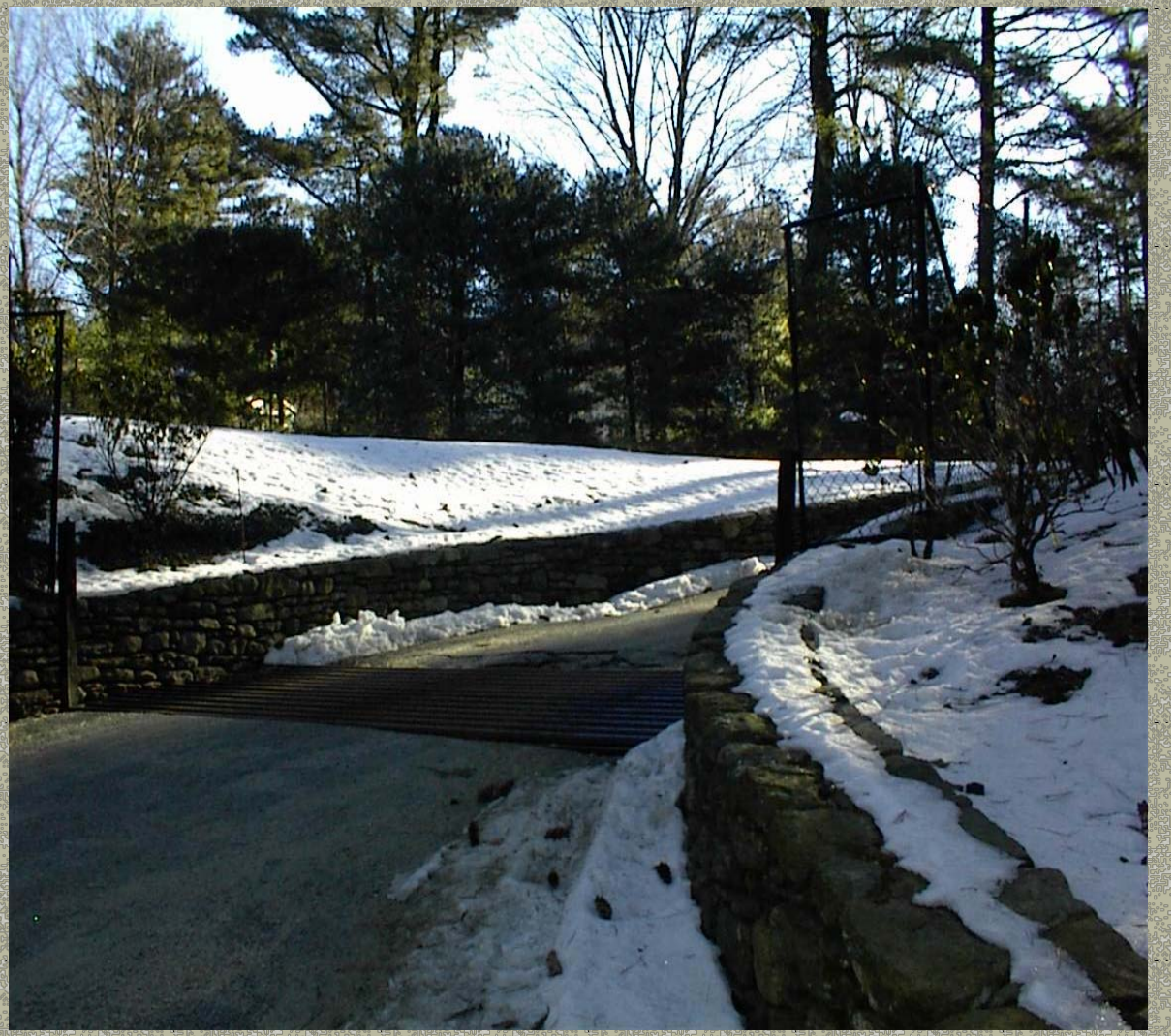
- The sprays do leave a visible residue.

Deer

- A property can be fenced to prevent deer access.

Deer

- You do need to keep the driveway blocked off.
- Note the cattle grate.



Deer

- Close up of cattle grate.
- This one is about six feet wide – you need twice that or the deer will jump it.

Deer

- A second grate has been installed.

Deer Damage 2

- Deer also injure tree trunks.
- In fall, bucks rub antlers on saplings to scrape off the “velvet”.
- Often seriously damages or kills young trees.

Deer 2

- To protect young trees, place rigid fencing around trees in fall.

Rodent Damage

- Mice and voles chew the tender bark, mostly in winter.
- This stem girdling kills the plant.

Rodent Damage

- Junipers in spring.
- Individual branch death.

Rodent Damage

- Closer views.

Rodent Damage

- This area showed lots of chewing in 2010-2011. They chewed maple, winged euonymus and poison ivy.

Rodent Damage

- Base of euonymus vine has been chewed.

Rodent Damage

- Come this spring they'll be quite a bit of dieback.
- Treatment?

Rodent - squirrels

- Squirrels sometimes find a sugar maple to be quite tasty.

Squirrels

- Close up of another maple being chewed.

What's This?

- Japanese Maple.
- Unusual marks on limbs.

Japanese maple

- Pock marks on limbs.
- Old marks on older limbs.
- New marks on younger limbs.

Best Clue – Bird feeders

- Heavy bird activity.
- Birds use tree as an anvil when pecking open the sunflower seeds.

Sapsucker Damage

- Holes in bark of certain trees, arranged in a fairly linear pattern around trunk or limbs.

Sapsucker Damage

- The bird is called the yellow bellied sapsucker.
- It pecks holes to get to the sap – that's its primary food in certain parts of the year.
- Sap also attracts insects for the bird to feed on.

Woodpecker

- When you see wood chipper-sized chips, it's usually the pileated woodpecker.

Pileated woodpecker

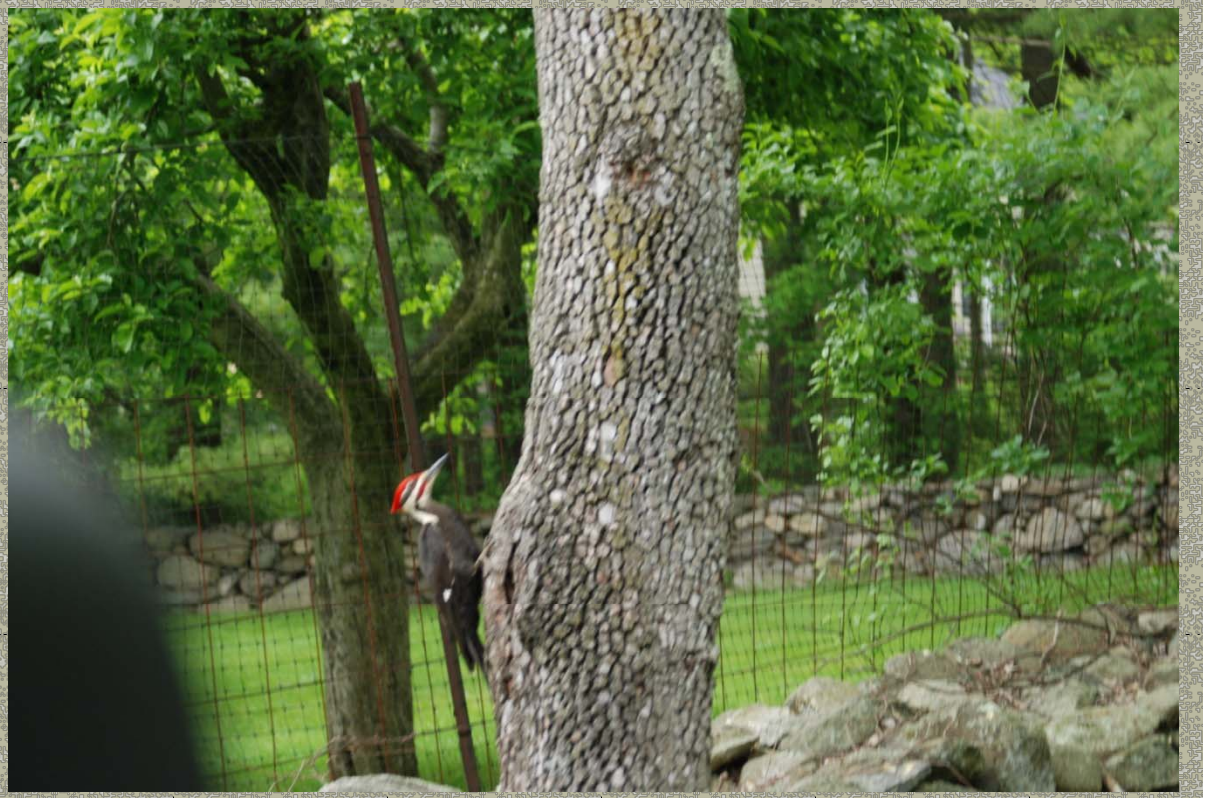
- A large bird, maybe 20 inches in length.
- Looks a lot like “woody woodpecker”.

Pileated Woodpecker

- These are feeding holes.
- Sometimes you'll find large cavities they're making. Those are nesting cavities.

Pileated Woodpecker

- Here "Woody" is pretty tame.



MISCELLANEOUS

- These don’t easily fit into categories.
- But you’ll get asked about them!

Lichens and Mosses

- Everyone has probably seen these life forms on trees before.

Lichens

- Lichens are usually a bluish/greenish color.
- Actually two forms of life in one – both fungi and an algae.

Lichens

- Each helps the other.
- Tree is used as an anchoring place; no harm to the tree.
- Normally found when the tree is in poor vigor.

Lichens

- When you find this much lichen growing on a tree or shrub, you know that it's growing slowly and in poor health.

Lichens

- Here the lichen is growing on a rock.

Mosses

- A plant that anchors to tree trunks, much as lichens do.
- Uses tree as a base to anchor to.
- No harm to trees.

Mosses

- I took this picture in the crown of an old elm tree.
- Most of the limbs were covered with moss.
- The tree seems quite happy.

Lichen, Moss ? Which?

Guy Wire

- You often come across old wires that have caused girdling.
- Why the bulge above the wire?

Wires

- These wires have been on the tree for about five years.

Wire Removed

- Able to pull them out of the grooves.

Vines

- Evergreen vines on the lower trunk of an old tree can be a nice look.

Vines

- Don’t let vines grow high into the tree.
- Competition for light.

Vines

- Too much leaf surface from vines subjects the tree to more wind.

Vines

- Too much wind and the tree can be blown over.

Vines

- Vines can hide a problem, so look carefully.
- This looks innocent enough.

Vines

- Close examination shows a lot of trunk decay, hidden by the ivy.
- This tree has to go.

Vines

- Note how extensive the ivy has become on this tree.

Vines

Vines

- Sycamore has been removed because…

Vines

- Not much solid wood left.

Fall Color

- Every evergreen has to lose some inner leaves or needles each fall.
- Some years it's a dramatic change.

Galls

- Not very well understood.
- Sometimes caused by a virus, bacteria, or ?
- Maybe a tree's response to… ?

Galls Can Be Useful

- Large trunk galls on certain tree species are sometimes used for wood working.
- Have you ever heard of burl wood used in woodworking?

Burl Wood

- A tree burl that starts out like this…

Burl Wood

- Might end up as something like this.

Witches Broom

- Occasionally you'll find a piece of a branch where the needles grow in a tight bunch.
- In many trees it looks like a broom.

Witches Broom

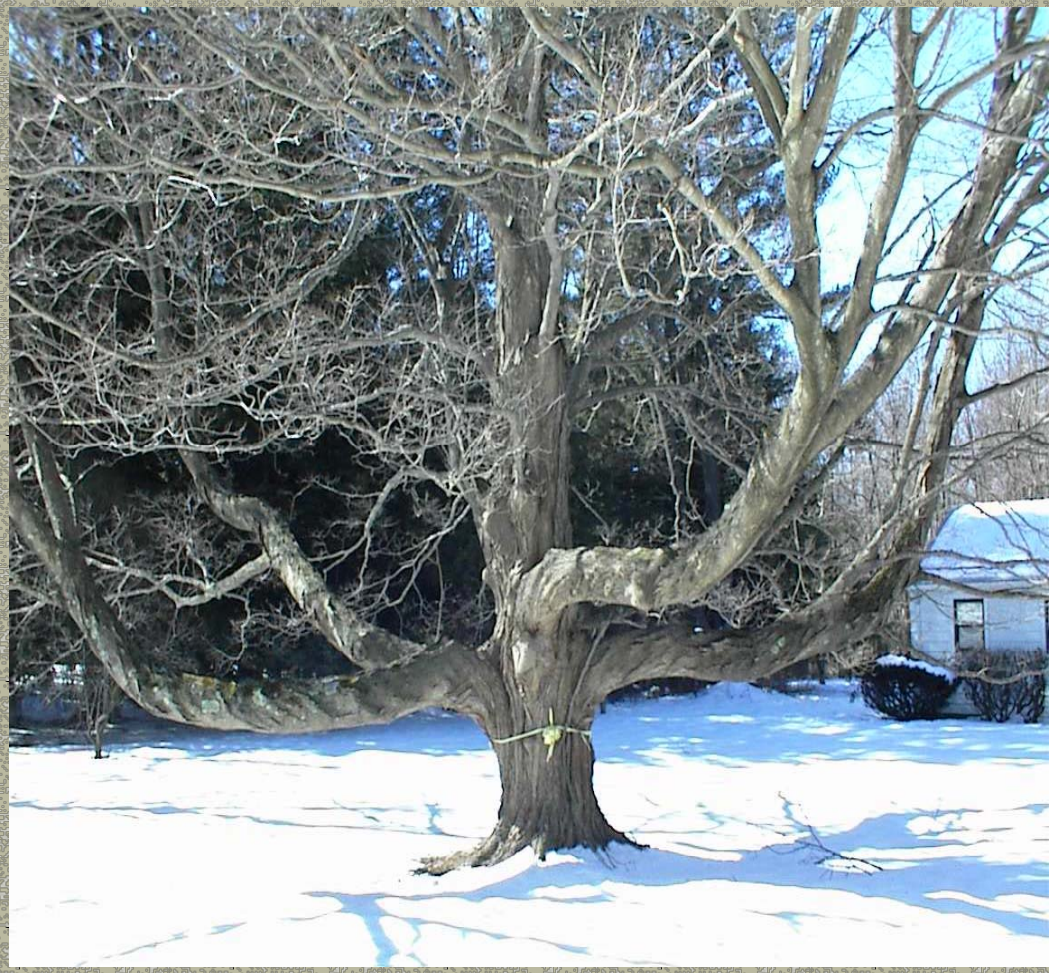
- I’m not sure that we know what causes this.
- You won’t see it often, so it’s good to be aware that it does exist.

“Twisting” Growth

- Notice the pronounced “twist” to the lower limbs.
- Not a real common condition.

“Twisting” Growth

- Seems to be a reaction to weight and stress.
- Sometimes you’ll also see oval shaped lower limbs.



“Twisting” Growth

- Sugar maple showing same condition on one limb.
- Not really a twist in the grain, but more of side plates grown for strength.

Pruning

- A good example of pruning.
- A good example of bad pruning, that is!

Pruning

- Severe crown reduction.
- Poor final cuts.
- No plan or attempt to follow a plan.

Pruning - Topping

- Notice that this silver maple tree had been topped about 25 years ago.
- Not a good idea.

Pruning - Topping

- Here I'm looking down between my feet into the decayed area where a cut was made in that previously "topped" silver maple tree.

Pruning - Topping

- Close up of decayed leader.
- Extensive decay.
- A wonder the tree is still up!

Topping

- This other silver maple had been topped 20 years ago.
- Most of the leaders were now hollow.

Pollarding

- Pruning a tree each year, cutting all last year's growth back to the same point.
- This is a recognized pruning technique to achieve a specific look.

Older Pollarded Maple

- This maple used to be pollarded regularly.
- Now that it hasn't been, what do you expect to find in crown?

Lion Tailing is a no-no!

- Sometimes you can get carried away with pruning, thinning out all the inside growth.
- You want to take it easy when removing inside growth.

Asked to Give Opinion

- London plane trees planted too deeply.
- Also pruned a bit oddly.

Asked to Give Opinion

- Attempt by landscaper to start to train to pollard form, at time of transplanting.

Tree Paint

- Arborists used to use tree paint.
- Not for the past 25 years though.
- This fellow must think blue paint looks more appealing.

What's going on here?

What's going on here?

- Dwarf Alberta Spruce.
- As with most unusual plant varieties, this was developed by nurserymen.
- Same with weeping forms, variegated leaves etc.

Alberta Spruce

- Another example.

Two Trees?

- One weeping cherry tree, in flower.
- One upright cherry tree.

Two trees?

- Actually just one tree showing branches of both forms.

Street Project

- For the past two years there has been a street improvement job going on. The project came in at 9.4 million dollars.

Street Project

- The project allowed for a planting zone for the landscaping detail.
- Note the compacted road base fill.

Street Project

- I counted a total of 97 trees of pretty good size.
- Stuffed into their planting strip.

Street Project

- Not actually a very ideal planting location.

Street Project

- Branches on street side are already being “trimmed” by passing vehicles.

Street Project

- There will be some arborist asked the question in 5 or 10 years…
- “How come these trees look so bad?”

That’s All Folks!

Questions?

For next week…

Question for Next Week

- Construction impact can be a big problem for trees. What is the most likely type of damage that occurs? How does this activity actually hurt the tree?