

Forest Health

Woods and Wildlife Conference

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Overview

Trees and Pests & Disease

Integrated Pest Management

Non-natives Pests and Disease

Are We Doomed?

Pests and Disease

- Vertebrates
 - Mammals
 - Reptiles
 - Birds
 - Invertebrates
 - Sucking
 - Chewing
 - Boring
 - Rasping
 - Fungi
 - Bacteria
 - Viruses
- Affect
- Leaves
 - Trunks
 - Roots

Oaks Support 518 Species of Moths and Butterflies

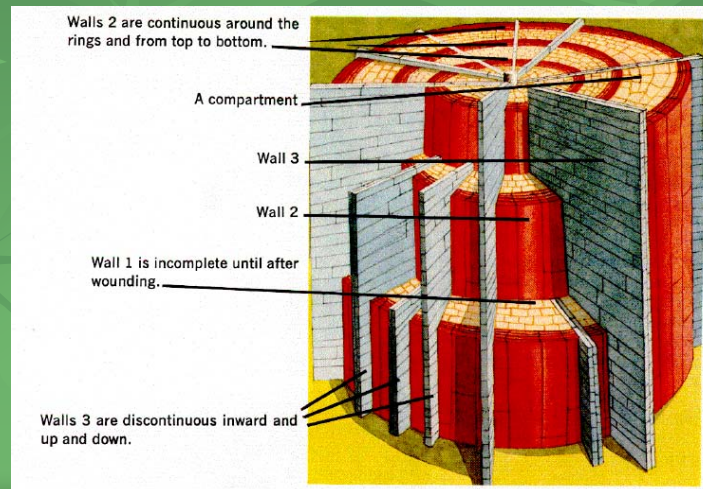
How Do Trees Deal With This?

- External Allies
 - 96% of All Bird Species Feed Their Young Bugs – Primarily Grazers
 - 75 % of All Forest Bird Species Nest Within 15 Feet of the Ground
 - Other Insect Eating Mammals, Reptiles and Amphibians and Bugs
 - Environment – temperature, fire
- Tree Immune System

Tree Immune System

- Not Like Animal Immune System
- Static Defense
- Chemically Based
 - Pesticides
 - Fungicides
 - Antibiotics
- CODIT (Compartmentalization Of Decay In Trees)

CODIT



Common Compounds

- Glycosides – cyanide found in almonds
- Phenols – tannins found in oaks; salicylic acid
- Terpenes – saponins found in horse chesnuts
- Alkaloids – nicotine found in black walnuts

The genus *Juglans* is reported to contain the following "toxins": folic acid, furfural, inositol, juglone, nicotine, and tryptophane.

These Taste Bad and are Toxic

Toxins Are Secondary Compounds

- Leaves Focus on Photosynthates and Compounds Necessary for Growth and Life
- Produce Toxins When There is Time and Extra Energy
- Stressed Plants Have Less Extra Energy For Defense

**Reducing Stress and
Maintaining a Healthy
Forest is Best Way to
Protect Trees**

Sources of Stress

- Air Pollution
- Water – Too Little; Too Much
- Competition for Light
- Climate Change
- Excessive Feeding

Healthy Forest

- Vertical Structure
 - Canopy, Sub-Canopy, Shrub, Herbaceous, and Forest Floor
- Herbivore Control – Deer
- Invasive Plant Control
- Integrated Pest Management – Maintain Predator/Prey Balance by Protecting the Integrity of the Ecosystem.

Non-Native Pests and Disease

- Gypsy Moth
- Hemlock Woolly Adelgid
- Emerald Ash Borer
- Asian Long Horned Beetle
- Sirex Wood Wasp
- Chestnut Blight
- Dutch Elm Disease
- Bacterial Leaf Scorch
- Anthracnose
- Butternut Canker
- Oaks
 - Decline
 - Wilt
 - Sudden Oak Death

Gypsy Moth

- Chewer – larvae feed on leaves – primarily oak
- Imported on purpose in 1869 for silk industry – escaped and has been spreading since
- Reached Virginia in 1980s
- 1995 estimated 850,000 acres defoliated
- Naturally controlled by fungus, virus, parasites and predators – white footed mouse
- Aerial spray control possible

Gypsy Moth



Gypsy Moth Forest Management

- Healthy trees can stand one or two years of complete defoliation
- Maintain healthy forest – control deer population (20-40 per square mile)
- Select cut to reduce competition
- Contact county, DOF or extension about spraying

Hemlock Woolly Adelgid

- Sucker – adults and nymphs feed on starch reserves in young Hemlock (and maybe spruce) stems
- First found in Richmond area in 1951, now from Maine to Georgia
- Arboricultural control using systemic pesticides and horticultural oils is possible
- Some natural biological controls – introduced bio-controls as well

Hemlock Woolly Adelgid

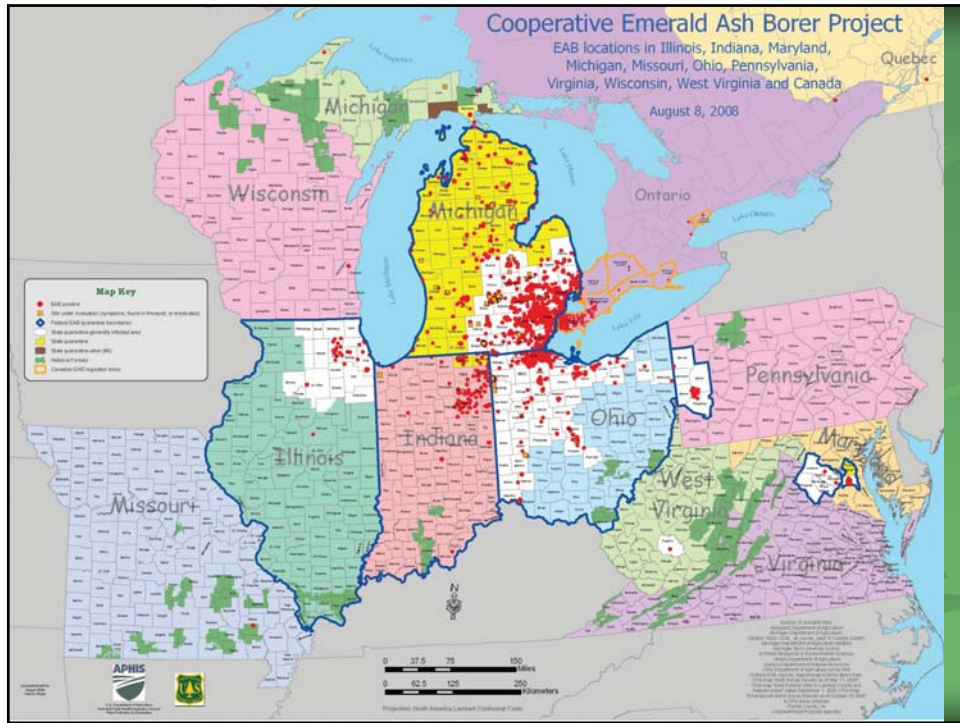


Forest Management HWA

- HWA kills trees in 4-15 years
- Do nothing – as Hemlocks die increased light will allow succession of other species
- Select cut – remove dead and dying Hemlocks and manage succession of other species
- Clear cut – replant with other species; only when income is primary management goal

Emerald Ash Borer

- Borer – larvae eat phloem tissue of Ash trees
- Entered US in packing material in 1998 or so – first ID in 2002 in Detroit
- Spread rapidly in Ash products – particularly firewood
- Identified in Fairfax County July and August 2008
- Arboricultural control – no forestry control
- Experimenting with imported parasites and predators



Forest Management EAB

- 1.5% of forest statewide – 5% - 10% of riparian hardwood
- 100% mortality
- Loss of a species is ALWAYS a bad thing
- DON'T MOVE FIREWOOD

To keep every cog and wheel is the first precaution of intelligent tinkering. ~ Aldo Leopold

Asian Long Horned Beetle

- Very similar to Emerald Ash Borer
- Likes Maple, Boxelder, Horsechestnut, Buckeye, Birch, Willow and Elm
- Will eat Ash, Mimosa, Plane Tree, Poplar, and Mountain Ash
- First found in 1996 in Brooklyn, separate introductions in Chicago and New Jersey. Last summer found in Massachusetts.

Asian Long Horned Beetle



Male

Female



Sirex Wood Wasp

- Borer – inoculates tree with fungus and feeds on fungus
- Attacks loblolly and shortleaf pine
- Upstate NY and northern tier of PA
- Biological controls available
- Closely related to native Horntail wasps
- BMP is to Maintain forest health

Chestnut Blight

- Introduced fungus in early 1900s. First found in the Bronx
- By 1940 had spread to the entire east coast and wiped out the American Chestnut
- Only top kills trees so roots sprout even today



Dutch Elm Disease

- Fungus that causes tree to block xylem tissue (CODIT reaction)
- Spread by elm bark beetles and root grafts
- American elm particularly susceptible; other native elms less so
- Maintain healthy forest to reduce beetles
- Prune out dying branches
- Fungicidal injections

Bacterial Leaf Scorch

- Bacteria spread by sucking insects (particularly leaf hoppers) infects and clogs xylem tissue and causes CODIT reaction
- Reported hosts include sycamore, mulberry, red maple, sugar maple, sweetgum, American elm, and a number of oaks such as bur, pin, scarlet, red, laurel, water, turkey, bluejack, and shingle oak

Forest Management for BLS

- Maintain a healthy forest
- Remove infected trees to prevent spread



Butternut Canker

- Found in Wisconsin in 1967 now spread through out range, including western Virginia
- Fungus that only attacks Butternut (*Juglans cineria*)
- Enters through buds, leaf scars; possible insect wounds or other bark openings
- Initially infects twigs, then flows down to larger branches and trunks

Butternut Canker



Anthracnose

- A variety of fungal diseases causing leaf and twig blight
- May cause leaf death and early drop – repeated defoliation may reduce tree vigor
- Hosts include ash, basswood, birch, catalpa, elm, hickory, horsechestnut, London planetree, maple, oak, sycamore, tuliptree, and walnut
- Thrives in damp – thinning to increase sunlight and airflow helps trees dry faster

Oak Decline

- Syndrome initiated by stress in any oak
- Leaves tree susceptible to insects and root fungi
- Eventually results in death
- Reduce stress through stand management
- May take several years for tree to spiral down and die
- Gradual die back of crown from edges

Oak Wilt

- Fungus disease caused by *Ceratocystis fagacearum*
- Vascular disease leading to leaf wilting and yellowing
- Kills quickly – 1 to 2 years
- Elicits a CODIT response
- As of 1998 only in western Virginia
- Spread by insects and root grafts

Sudden Oak Death

- Caused by *Phytophthora ramorum* fungus
- May take several years to kill trees, but once crown die-back starts very fast.
- Causes bleeding stem cankers
- Not found in the eastern US (yet)
- Will infect *Rhododendron* species – so buy plants grown locally

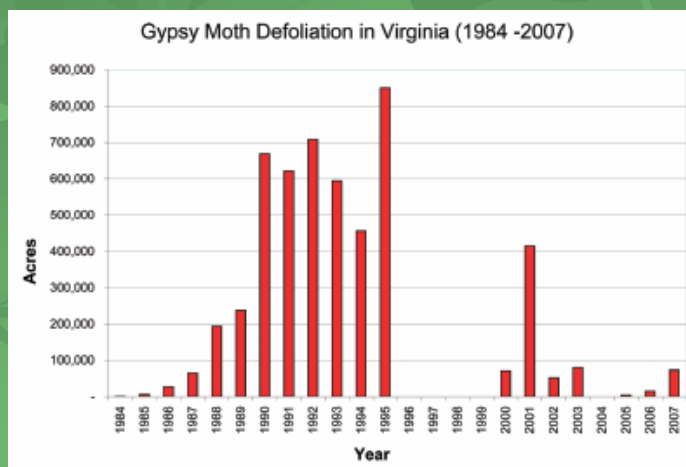
Oak Disease Comparison

- Oak decline – progressive crown die back, no stem cankers, root fungus, epicormic sprouts, exit holes of borers
- Oak wilt – leaf yellowing and shoot die back, no stem cankers, streaking in sap wood of red oak group
- Sudden oak death – bleeding stem cankers appear first followed by crown die-back

Are We Doomed?

- EAB Parasitic wasps
- Appalachian Spring Dogwood
- Resistant American elms
- Resistant (?) hybrid American Chestnut
- Gypsy Moth Fungus

Are We Doomed?



What to do About Pests and Disease?

- Use good stand management to keep forest healthy
- Monitor the forest regularly
- Manage Deer Populations
- Control Invasive Species
- **DON'T MOVE FIREWOOD IN OR OUT!**



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