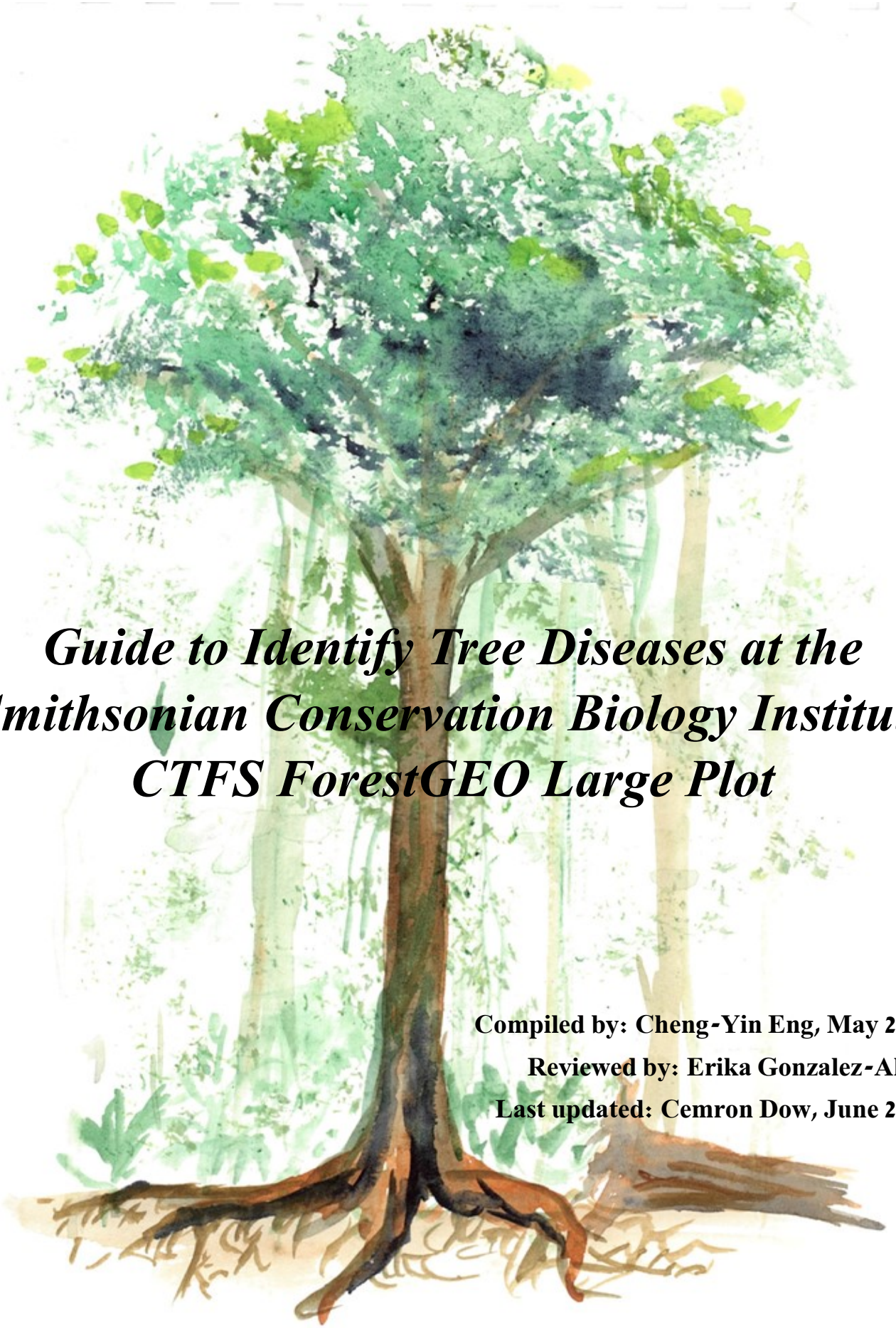

Guide to Identify Tree Diseases at the Smithsonian Conservation Biology Institute CTFS ForestGEO Large Plot

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Last updated: Cemron Dow, June 2020

General mortality causes

Fall cankerworm

- Target: hardwoods
- Prefer maples, hickories, ashes and oaks
- Widespread defoliation
- Successive defoliations and environmental stressors lead to die-back and death

Gypsy moth

- Prefer oaks, hickories, beech, birch, willow and spruce
- Trees can be killed by ≥ 2 defoliations
- Evergreens (e.g. juvi) can be killed by 1 defoliation
- Egg masses are tan colored
- Egg masses can be seen on the trunks and upper branches

Verticillium wilt (fungi)

- Wilting and death of branches
- Leaves are yellowish and smaller than normal
- Leaf fall and limb die-back
- Early fall colors
- Protruding branches
- Infected sapwood has dark or olive green stain (not always)

References

General leaf diseases on hardwood trees (caused by fungi)

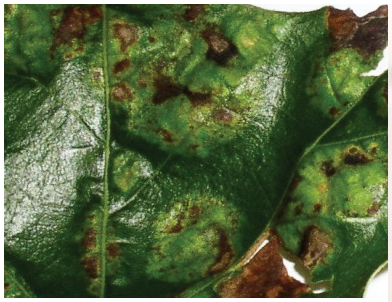
Anthracnose : group of diseases caused by several closely related fungi that attack many of our finest shade trees. Could occur on: sycamore, white oak, elm, dogwood, maple, linden (basswood), tulip tree, hickory, birch, and walnut.

Leaf Spot

Leaf Blotch

Shot-holes

Powdery Mildew

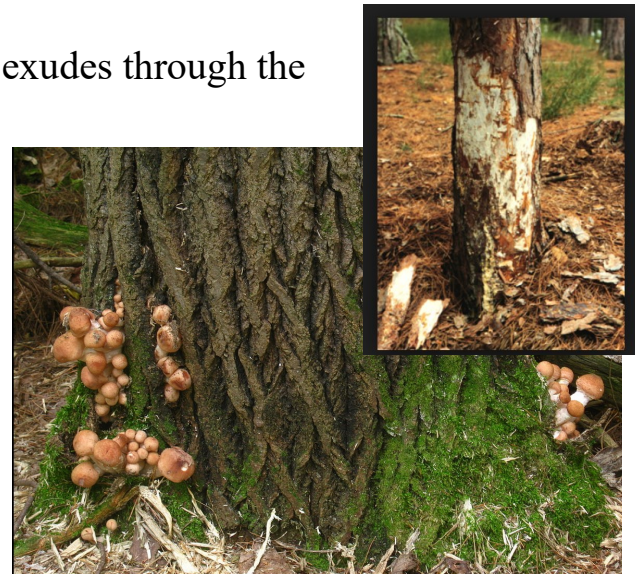


Leaf Blisters

Anthracnose in ash causes irregular brown lesions that often follow veins.

Armillaria root disease

- The fungus could be at the root collar, resin exudes through the bark of the lower bole .
- Dead and diseased trees usually occur in "disease centers," which appear as openings in the canopy.
- Look for fruiting bodies at the base of trees



References

1. http://pods.dasnr.okstate.edu/docushare/dsweb/Get/Document-2831/EPP-7634web.pdf

Acer negundo (acne), Acer platanoides (acpl), Acer rubrum (acru)

Box Elder, Norway Maple, Red Maple

Girdling Roots

- Look at he base of the trunk: lack of trunk flare
- Roots grow around the base of the trunk, rather than growing away from it.
- Tree crown shows early fall colors

Carya cordiformis (caco), Carya glabra (cagl), Carya ovalis (caovl), Carya tomentosa (cato)

Bitternut Hickory, Pignut Hickory, Red Hickory, Mockernut/White Hickory

Hickory Bark Beetle

- Browning of leaves
- Adult exit holes are round (about 3mm in diameter)
- Feeding galleries are centipede-shaped and etched on sap-wood (width 5-6 cm)
- Usually happens after droughts

References

1. http://hort.ufl.edu/database/documents/pdf/tree_fact_sheets/acenega.pdf
2. http://pnwhandbooks.org/plantdisease/node/3531/print
3. http://www.thetreegeek.com/problems/verticillium-wilt/
4. http://www.bartlett.com/resources/Stem-Girdling-Roots.pdf

Cornus alternifolia (coal), Cornus florida (cofl)

Pagoda Dogwood, Flowering Dogwood

Twig Canker

- Twigs turn yellow. Small orange raised bumps on the bark
- Bark turns bright yellow to tan (healthy bark is purplish green)
- Cankers mostly at branch tips, but progress to larger branches and main stems

Dogwood anthracnose

- Leaves with small, circular spots to irregularly-shaped blotches
- Purple-bordered leaf spots, scattered across the blade
- Scorched tan blotches, usually affecting leaf tips or margin

Dogwood borer

- Early symptom: peeling of wood bark
- Crown die-back. Girdling
- Infested parts appear swollen.
- Sawdust-like excrement around burrows

Fagus grandifolia (fagr) American beech

Beech Bark Disease

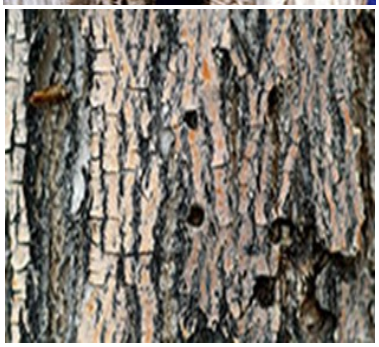
- Disease results when bark, attacked by the beech scale, *Cryptococcus fagisuga*, is invaded and killed by fungi (*Nectria coccinea var. faginata*)
- Bleeding canker forms cankers from which a brownish liquid oozes.
- Leaves of smaller size and lighter green color than normal.
- Fungus will cause cankers , girdle, and occasionally kill branches.

Bleeding spots

- Premature leaf browning

Fraxinus americana (fram), Fraxinus nigra (frni), Fraxinus pennsylvanica (frpe)

White Ash, Black Ash, Green Ash



Lilac Ash Borer

- Damage at lower trunk, especially near soil line
- Round to oval-shaped exit holes on trunk
- Swelling and cracking of the bark
- Saw-dust excrement
- Irregular gouging wounds under the bark
- Newly infested: poop near the holes

Emerald Ash Borer

- D-shaped exit holes with no saw-dust excrement
- Attacks mainly on upper crown of the trunk
- Look for winding S-shaped tunnels under the bark
- Sparse leaves or branches in upper part of the tree
- Vertical splits in the bark
- Increased woodpecker activity

- New sprouts on the lower trunk/branches (epicormic growth)

References

1. http://www.ext.colostate.edu/pubs/insect/05614.html
2. http://treedoctor.anr.msu.edu/ash/nwDshape.jpg
3. http://www.nytimes.com/2014/07/01/science/earth/ash-forests-after-emerald-ash-borers-destroy-them.html?_r=0
4. http://extension.missouri.edu/treepests/EABsigns.aspx
5. http://ncforestservice.gov/forest_health/fh_eabfaq.htm

Juglans cinerea (juci), Juglans nigra (juni) White walnut, Black walnut

Thousand Cankers Disease

- Small cankers or open holes on trunks and branches
- Girdling twigs and branches
- Thinning or dead branches top down
- Resin weeping may be around holes
- Beetle galleries found under the bark

Liriodendron tulipifera (litu) -Tuliptree or Yellow-Poplar

Variety of fungi

- Root and stem lesions
- Yellowing of leaves
- Wilting and death of leaves
- Sparse crown
- Protruding branches

Root Collar Borer (*Euzophera ostricolorella)*

- Holes at the tree base (above and below the ground surface)
- Yellow foliage
- Crown die-back

References

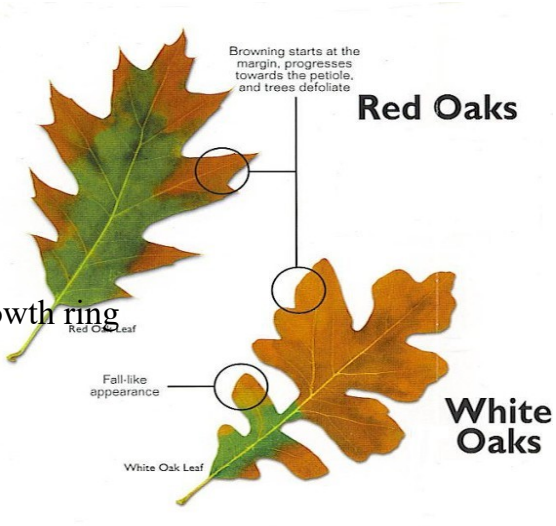
1. http://www.fairfaxcounty.gov/dpwes/news/thousandcankers.htm
2. http://www.thousandcankers.com/media/docs/NCSU_Id_Tree_disease.pdf
3. http://www.fs.fed.us/research/invasive-species/insects/walnut-twig-beetle.php

All Quercus species

Northern Red Oak, Scarlet Oak, Swamp Chestnut Oak, Chinkapin Oak, Chestnut Oak, White Oak, Black Oak .

Oak wilt

- Look at upper branches: Yellowing of leaves and wilting
- Often lower leaves attached to dead branches
- Leaves remain attached to dead branches
- Formation then death of short-lived sprouts
- Dark longitudinal streaks found occasionally in outer growth ring



Cold Damage

- Death of emerging leaves and stems
- Curling and stunting of leaves
- Leaves appear torn as they expand

Sapsucker Damage

- Holes are neatly spaced: horizontal and vertical bands OR rows of round and rectangular drill holes
- Drill holes may encircle the entire trunk or stem
- Different from wood boring insects which create randomly distributed entry holes

Oak Decline

- Progressive terminal branch die-back
- Die-back from top down and outside inward
- Sudden foliage wilt and browning, but no leaf drop
- Sprouts on main branches and stem
- Galleries and exit holes of *Agrilus bilineatus* present in stems.
- Shoestring-like rhizomorphs and fans of *A. mellea* present beneath bark or roots and root collars.

References

1. http://www.thetreegeek.com/problems/drought-stress/
2. https://www.clemson.edu/extension/horticulture/nursery/ipm/book_files/chapter_11
3. http://www.thecountryarborist.com/treecare.html

Tilia

Leaf Spots (caused by fungi)

- Circular or irregular leaf spots that may enlarge, grow together, and develop a dark margin
- Premature leaf drop

Cankers (caused by fungi)

- Leaves turn yellow or brown and wilt
- Girdling branches or stems

Powdery Mildew

- Powdery white growth on leaves and shoots
- Emerging new growth may be stunted or distorted
- Premature leaf drop

Nyssa sylvatica (nysy)- Blackgum

Fungi damage

- Leaf spots
- Leaves dying and hanging on the trees
- Branch cankers
- Shoots die-back
- Affected trees are usually in the shade

References
1. http://elmcare.com/disease/dutchelm/symptoms_of_dutch_elm_disease.htm
2. http://na.fs.fed.us/spfo/pubs/howtos/ht_ded/ht_ded.htm
3. http://www.dutchelmdisease.org/EXPERT/DED/CORE/00/00/80.HTML
4. http://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5347208.pdf

Ulmus americana (ulam), Ulmus rubra (ulru)-American Elm, Slippery Elm

Dutch Elm Disease (DED) (causes: fungi & elm bark beetle)

- Sudden wilting of leaves in the upper part of trees
- Yellowing and browning of leaves
- Peel the bark, see brown streaks in sapwood
- Only one or several branches show symptoms

Phloem Necrosis (Elm Yellows)

- Leaves turn yellow (not brown and wilted) and drop prematurely
- Emits wintergreen odor
- Brown streaks developed in the sapwood (which DED causes) is absent
- The entire crown shows symptoms simultaneously
- Inner bark develops tanned discoloration
- Witches' brooms (dense cluster of shoots of same age

Bacterial Leaf Scorch (only in ulru)

- Premature leaf browning
- Limb die-back
- The area between brown and green leaf tissue is often (but not always) separated by a yellow band.

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1. http://elmcare.com/disease/dutchelm/symptoms_of_dutch_elm_disease.htm
2. http://na.fs.fed.us/spfo/pubs/howtos/ht_ded/ht_ded.htm
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