

# Abiotic Disorders

A photograph of a garden scene. In the foreground, a brick path leads towards a wooden bench. The bench is surrounded by various plants, including a large green plant in the lower left and a small fountain in the lower right. In the background, there is a brick wall and a house with large windows.

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Abiotic Disorders do not Include  
Bugs or Diseases as Direct  
Causal Agents



# Issues in the Landscape Boil Down to Two Major Categories

- Biotic – living organisms such as bacteria, fungi, etc. that can be infectious and harm plants
- Abiotic – often nonliving factors that may lead to stress or demise of plants
- Today's presentation has both categories included with an emphasis on abiotic issues, human error and negligence, etc.

# Biotic vs. Abiotic

- Biotic diseases are often randomly found in the landscape. They rarely affect the majority of species present.
- Abiotic disorders (diseases) often can be found in patterns and may be uniform in their appearance throughout landscape.
- Bottom line: Living organisms (biotic) have their favorite species to prey upon but often not the case for abiotic (non-living) factors. Abiotics do not discriminate!

# Biotic Issues – Are They the Root of Your Problem?

- Predisposed trees may indeed come down with a pathogen, but was/is it secondary?
- Note pecan, that due to environmental stress(es), has now contracted Hypoxylon (Biscogniauxia) canker
- I respectfully disagree when people tell me they can “turn this problem around”
- Abiotic issue, primary culprit



# Biotic Issues – Are They the Root of Your Problem?

- Honeylocust (*Gleditsia triacanthos* var. *inermis*), while beautiful can become sick when grown in cultivation (in other words where it never really wanted to be).
- *Thyronectria* and *Nectria* cankers {see Colorado State University F.S. 2.939 (Jacobi)} are a reality when trees are stressed (biotic problems)
- Excessive/improper pruning, line trimmer, SW injury, etc. will put them in a tailspin (mortality spiral)
- The first problem was/were abiotic in nature
- We should first blame ourselves and then point fingers at pathogens, borers, other which are usually opportunistic in nature.
- If we just look at honeylocust wrong, in Oklahoma, they get sick - yet a great species when understood!



# Scout to Eliminate Biotic Possibilities



# Rapid Diagnostic Test Kits

- Sometimes these kits can let you know if a suspected pathogen exists
- Olson, Jen and Mike Schnelle. 2017. *Rapid Diagnostic Tests for Greenhouse and Nursery Crop Monitoring*. OSU EPP-7090.





# People: The No. 1.0 Problem!

- So far, no legal control for our species
- Most problems in the landscape can be traced back to human activity, poor judgment, etc.



We Should First Determine  
Plants of Value Right Here in the  
U.S.



# Non-native Plants

- American plants are not automatically exempt from biotic and/or abiotic problems
- Plant selection must be made on a species by species basis. Asian plants or “exotics” elsewhere can out-compete native plants on occasion (doesn't mean invasiveness)
- Again, abiotic problems can occur regardless of the species' origins

# Damage from Mammals

- Deer, rabbits, birds and rodents

- Google OSU Wildlife Extension Specialist



# Tree Wraps

- When used properly and temporarily, tree wraps can prevent problems
- Deters animals and mitigates SW injury
- Wrap from the ground up (Oct. – April)
- In addition to, NOT in lieu of weed and turf-free zone; accomplished with pre and post tank mix



# Southwest Injury & Related Issues

- Damage often occurs in the winter months, right now, when temperatures are at or below freezing. During sunny days, the southwest side of young trees' trunks are warmed. At night, temperatures may plummet with the side of the tree "re-freezing" and cells destroyed.
- This is commonplace on ash, birch, honeylocust, maples and other thin-barked species.
- Do not overly-prune newly-planted susceptible species.
- Consider tree wraps with the understanding they probably should be removed by May and then re-applied that October until at least year 3.0 for the establishing species.
- Bark blasting, happens during the spring season when a rapid dip in temperature can freeze a vertical strip of bark which then splits or blasts (this phenomenon needs more attention)
- Sunscald, happens in the summer, and looks like SW Injury. Keep new trees well watered. Use summer trunk wraps as a last resort. Could be justified in my mind for red maple and others with "thin skins".

# Yellow Bellied Sapsucker

- Damage will be in pattern vs. random holes that could indicate borers
- Illegal to shoot this species
- Older trees normally tolerate damage
- Other



# Staking Gone Bad

- Busyness – neglect
- Ideally, use strap and grommet method
- Few trees require staking past year 2.0
- Too rigid or prolonged staking slows tree growth





# Staking



# Chemical injury

- Almost always herbicide or salts
- People often have “amnesia” when asked about past chemical inputs in landscape
- You almost have to be a detective to make a diagnosis
- Soil test may be helpful

# Chemical Injury



# Construction Damage



# Construction Damage Consequences

- Established trees rarely fare well when their root systems experience a grade change
- Many other symptoms can be “Googled” but note sycamore throwing out sucker growth – last gasps and common response from most species
- Have yet to see a plant be “helped” at this point

# More on Construction Damage

- Folks routinely cordon off or only set barricades based on tree's dripline – this is never adequate – important roots extend far beyond periphery of tree
- Important roots are often believed to be feet down in the soil vs. the reality of just inches down
- Schnelle, Michael A., James R. Feucht and James E. Klett. 1989. *Root Systems of Trees-Facts and Fallacies*. Journal of Arboriculture (15)9: 201-205.

# Raising the Grade



# Grade Change

- Much less of a grade change would still have been deleterious to this oak
- Chain-link fence only made people feel better
- Oaks (*Quercus* spp.) are particularly sensitive
- Other



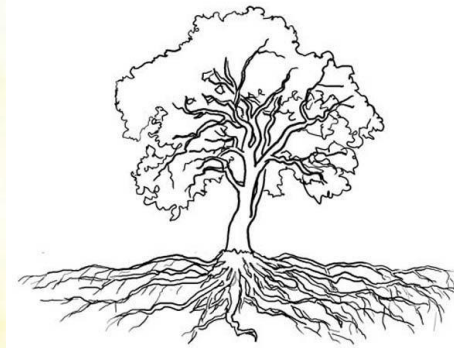


# In Your Neighborhood

- You won't have to drive far to find one or more older trees that mysteriously died in the neighborhood. A significant percentage of those deaths are attributable to raising the grade or some other "assault" to the root system.
- Flowers beds should be installed simultaneously with new trees – older trees struggle with grade changes!
- Google Phil Pratt and Mike Schnelle, *Site Disturbance and Tree Decline*

# Tree Root System

- Roots far exceed dripline
- Many shallow
- Most trees cannot develop an adventitious root system at all or fast enough to compensate for grade being raised
- Don't buy the argument that "all is well" as long as one half/side of the root system is not affected by fill or trenching, etc.
- Other



# Rehabilitate or Remove?

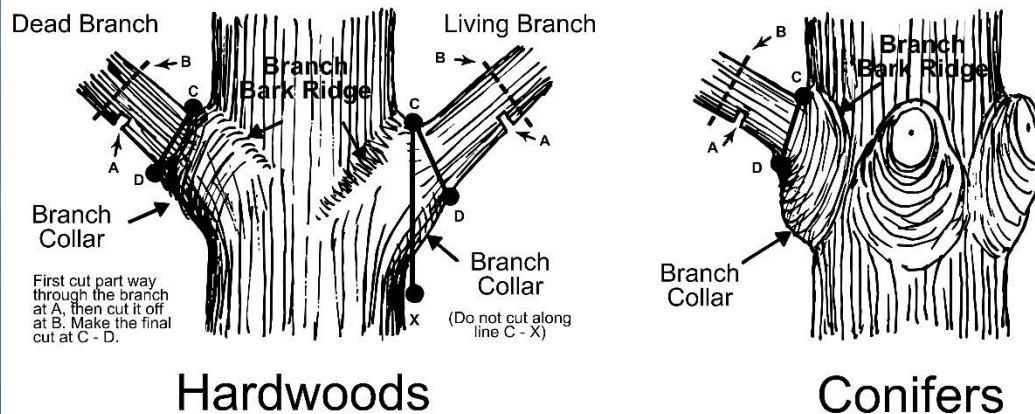
- Fruiting bodies are often a warning sign
- Google “Hazardous Trees” for more info
- **Look up** at the tree’s canopy as well!



# Pruning Issues

- Topping all too common in Oklahoma
- A qualified arborist could have lowered the canopy and preserved its health

## Proper Pruning Principles



# Consequences to Aggressive Pruning

- Potential infection courts in last images
- Limbing up young trees too fast can result in less vigor, depressed growth and potential SW Injury
- Topping older trees is an invitation for diseases and insects and for epicormic shoots (new growth that is weakly attached and subject to breakage)
- Be proactive and research genetics such as "utilitrees"

# Overly-Pruned Trees

- Less resilient regarding wind and ice resistance
- More prone to biotic problems too (pathogens and insects)
- Southwest injury
- Tree may eventually become hazardous!
- Bottom line, the tree's lifespan is needlessly abbreviated.

# Improper Mulching (Mulch Volcanoes)



# Tree Grates





# Temperature Extremes

- Worth the risk vs. planting often boring yet 100% bullet-proof plants
- Severity of damage depends upon time of season that event occurs
- Bark cracks lead to .....
- Research the “right” genetics for your area
- Should you knowingly plant a species out of its temp. range, at least find a microhabitat that will give it a fighting chance for long-term survival

# Freeze damage

- Research weather history – sudden or unusually low temps.
- Is affected growth old or new (tips)?
- Research species' track record coping with low temps.
- Other



# Cold/Dehydration Damage

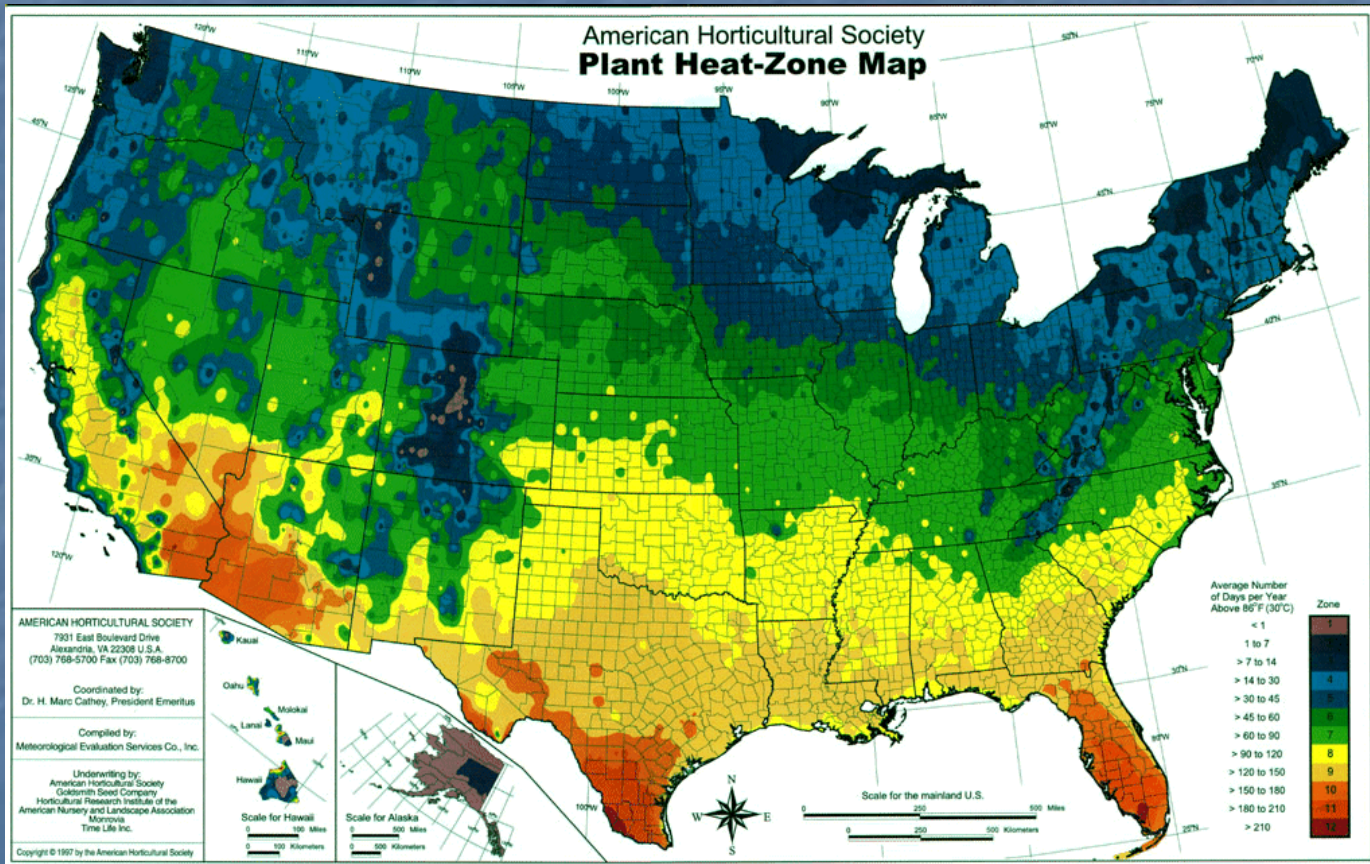
- Lack of hardiness not the culprit
- Newly planted trees allowed to go through winter without moisture
- Evergreens transpire year round
- How should we prepare for worst case scenario?



# Heat

- Know your heat hardiness zone. See AHS if you want detailed information. Someday when you buy plants, they all will be tagged with cold AND heat hardiness ranges on them.
- Just like people, plants can become predisposed to other issues when they are too hot or too cold.
- We live in Heat Hardiness Zone 8

# AHS Heat Zone Map



# Nutrition/Chlorosis



# pH Matters

- Good news is that many species can handle a wide pH range
- pH scale is logarithmic – this matters in the real world
- Long-term solutions, to raising or lowering soil pH, take persistence, patience and \$\$\$
- Other

# More on Nutrition/Chlorosis

- Is your pH in the ideal range for species in question?
- How suddenly did plant start to look sickly? If “overnight”, probably chemical injury rather than nutrient deficiency
- Is affected foliage on plant randomly found throughout canopy or is it in a pattern such as bottom of plant vs. new growth?
- Research mobile vs. immobile nutrients



# Alternatives to Spraying Trees

- Reduces possibility of damaging nearby species
- May bolster our environmental stewardship
- Trunk basal spray
- Soil injection/drenching
- Trunk injection
- Trunk implants
- See review by Utah State University Cooperative Extension

# Girdling Roots

- Often a result of purchasing a plant left too long in the container – circling roots
- To be proactive, score roots before planting trees or other plant materials
- For an existing problem, remove girdling root if possible
- May not be fortunate enough to see the offending root above-ground

Girdling roots



# Embedded wire



# Girdled trunk

- Usually from “weed-eaters”
- This rarely leads to a plants demise IF caught early and grounds person informed
- Trunk guards can backfire giving people false security to “bump” these trunks even harder and frequently
- Viable solution is to have a weed/turf-free zone as a result of postemergent/preemergent tank mix

# Line Trimmers

- Again, goes back to no legal control for human beings.
- One of the best inventions, ever, when used responsibly
- Must remind consumers that even “mild” contact to trees’ trunks, on a chronic basis, may lead to a mortality spiral



# Line Trimmers (consequences)

- Canopy can become markedly sparse
- Remaining foliage less green and robust in general
- Literally can see exposed inner tissue that was covered prior to damage inflicted
- Mobility of water and nutrients impaired both down and up the tree's trunk
- “Wounds” become infection courts and invite decay fungi and other harmful organisms
- Should line trimmer damage occur around entire trunk, tree will die
- Other





A photograph showing a dense thicket of mangrove trees, likely red mangroves, with their characteristic prop roots extending into the water. The water is a clear, light blue color, and the roots are a dark, almost blackish-brown. The scene is set in a coastal or estuarine environment.

# Flooding

- One of the few proactive ways is to plant flood tolerant species in flood-prone areas
- Willow, bald cypress, alders, birch and others (flood tolerance varies)

# Drought

- Blue-green to gray foliage vs. green
- Cupped foliage
- Wilted foliage
- Early stage is often scorch on leaf margins
- Stunting
- Leaf and twig drop (Cladoptosis)
- Your clientele sometimes may confuse some of these symptoms for conditions too wet for their plants (opposite problem)



# Hail Damage

- Easiest diagnosis is to look for pattern of damage on one side of twigs
- Research past weather events
- Current thinking is to NOT treat “wounds”
- Other

# Abiotic Issue or Natural Phenomenon???

- Before making an abiotic or biotic diagnosis, rule out the possibility of the plant naturally behaving like it is supposed to.
- Many people have ended up with egg on their face diagnosing plants and throwing around fancy terms when in fact the plant is .....

# Maybe the Foliage is Supposed to be Yellow

- A yellow smoketree – relatively new to the nursery industry
- Unusual variegation patterns on other species can sometimes be misleading
- Research species and its cultivars



# Unusual Growth Habit but Normal

- Magic Fountain™ weeping persimmon

# Graft Union



- Occasionally confused with bark damage from mowers, weed eaters or other sources of abrasion
- The “clean line” and “change” in bark appearance are our clues that all is well

# Natural Shedding

- Of course needles and leaves eventually die and fall off of even narrowleaf or broadleaf evergreens!
- Note location of dead or dying leaves on the plant – this is critical – new or older growth?
- I wonder how many times we have misdiagnosed Southern magnolia?
- Research species in question



# Pine – natural shedding

- Note dead growth on OLDER needles
- Plant pathologist would be in order to rule out pathogen(s)



# Additional Resources

- Barona, Camilo Ordonez, Vadim Sabetski, Andrew A. Millward, James Steenberg, Amber Gant and James Urban. 2018. The Influence of Abiotic Factors on Street Tree Condition and Mortality in a Commercial-Retail Streetscape. *Arboriculture and Urban Forestry* 44(3):133-144.
- Hillock, David and Mike Schnelle. Selecting Deciduous Trees for Oklahoma. OSU HLA 6456.
- Oklahoma Proven. [www.oklahomaproven.org](http://www.oklahomaproven.org).
- Olson, Jen and Mike Schnelle. Rapid Diagnostic Tests for Greenhouse and Nursery Crop Monitoring. OSU EPP-7090.
- Olson, Jen. Biscogniauxia Canker and Dieback of Trees. OSU EPP-7620.
- Pratt, Philip A. and Mike Schnelle. Site Disturbance and Tree Decline. OSU HLA-6429.
- Rebek, Eric J. and Mike Schnelle. Managing Storm-Damaged Trees. OSU EPP-7323.
- Schnelle, Michael A., James R. Feucht and James E. Klett. 1989. Root Systems of Trees-Facts and Fallacies. *J. of Arbor.* 15(9):201-205.
- Solomou, Alexandra D., Eleni T. Topalidou, Rafaelia Germani, Apostolia Argiri and George Karetzos. 2019. Importance, Utilization and Health of Urban Forests: A Review. *Notulse Botanicae Horti Agrobotaniei Cluj-Napoea* 47(1):10-16.
- Whiting, David, Robert Cox and Carol O'Meara. Diagnosing Tree Disorders. Colorado State University GardenNotes #112.

# A Guide to “Solid” Plant Materials

- [www.okproven.org](http://www.okproven.org)

