

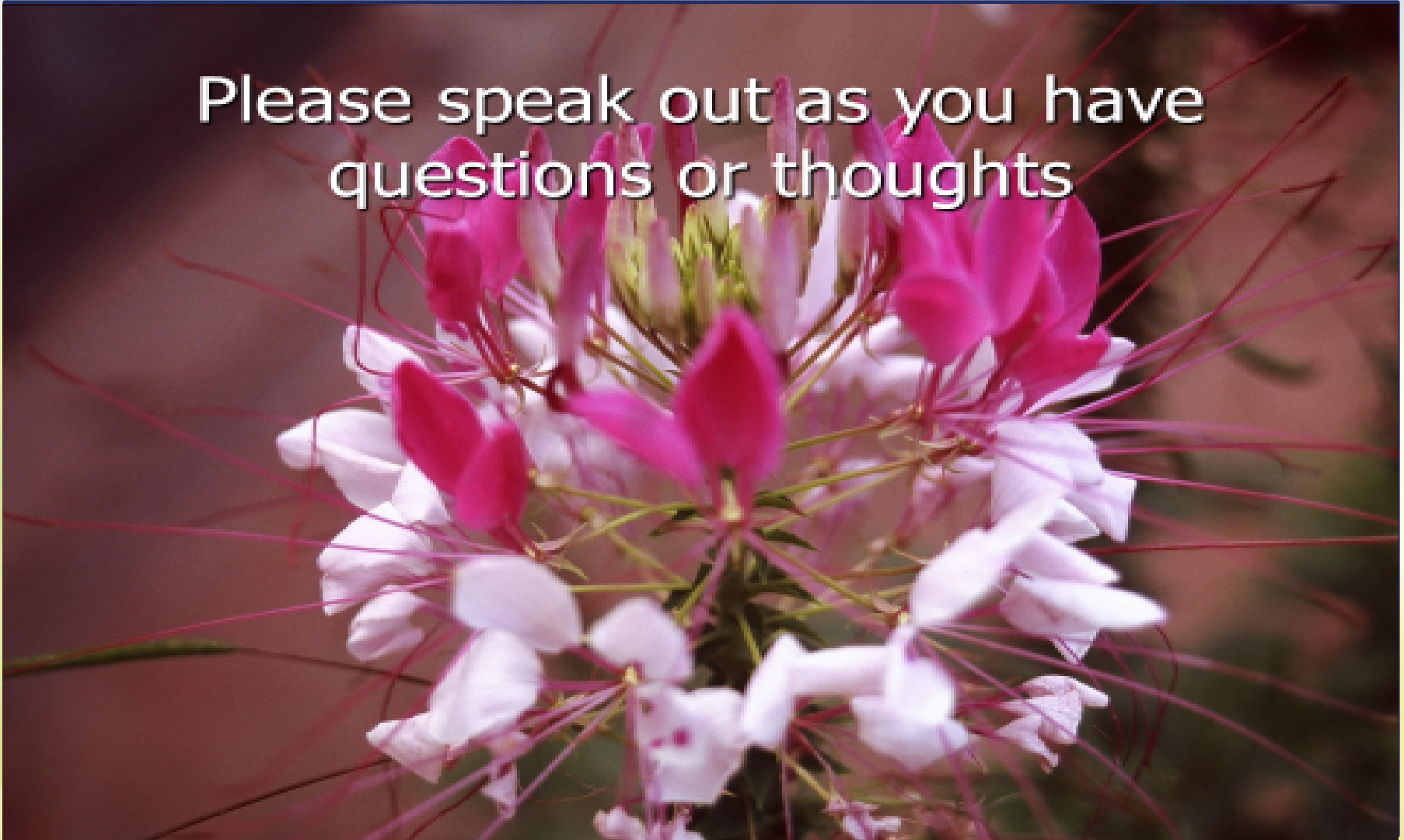
PRO  Green EXPO
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Denver, CO | February 5 – 8

Abiotic Disorders and Related Issues in Trees and
Shrubs

Mike Schnelle

Please speak out as you have
questions or thoughts



Abiotic Disorders do not Include
Insects/Related Pests 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!

Scout to Eliminate Biotic Possibilities



Start with a 10x Lens



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!

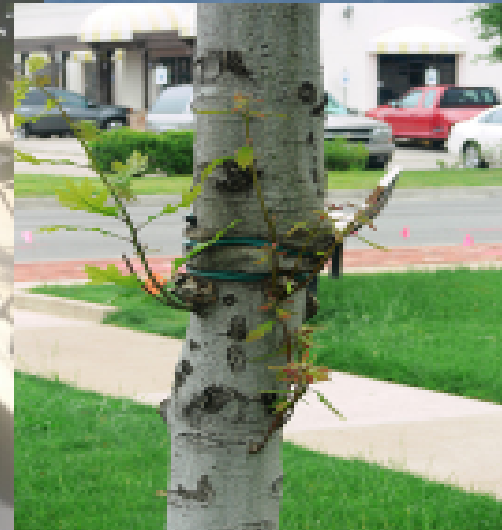
- So far, no legal control for our species
- Most problems in the landscape can be traced back to human activity, poor judgment, etc.



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 (this is backed with field observations and research)

Staking



Embedded wire



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 when you suspect a specific chemical to test for

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 still would 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*

Rehabilitate or Remove?

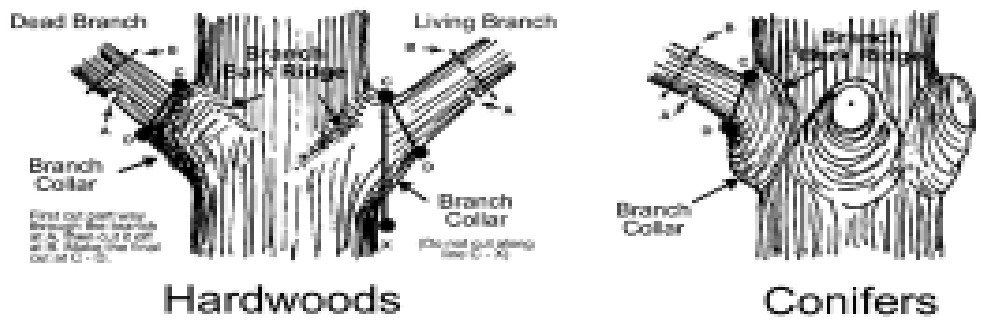
- Fruiting bodies are often a warning sign
- Google “Hazardous Trees” for more info
- Look at the tree’s canopy as well!



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”

Damage from Mammals & Birds

- 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 tank mix of pre and post emergent herbicide



Yellow Bellied Sapsucker

- Damage will be in pattern vs. random holes that could indicate borers
- Illegal to shoot this species – see Migratory Bird Treaty Act
- Older trees normally tolerate damage
- Some genera such as Acer (maples) have higher mortality rates than others when birds repeatedly “visit” them



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 climate
- Should you knowingly plant a species out of its temperature range, at least find a microhabitat that will give it a fighting chance for long-term survival

Cold/Dehydration Damage?

- Lack of hardiness not the culprit
- Newly planted trees allowed to go through winter without moisture
- Evergreens transpire all year long
- Let's discuss how to be proactive and prepare for the worst case scenario



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



Non-native Plants

- However, 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-perform native plants on occasion (doesn’t mean invasiveness)
- Again, abiotic problems can occur regardless of the species’ origins

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 Damage

- “Checker-board” appearance common
- Case by case judgment call whether to remove or patiently wait for recovery that doesn’t always materialize
- Plant within hardiness zone
- Mulch and do not allow plants to enter winter with dry roots



Heat

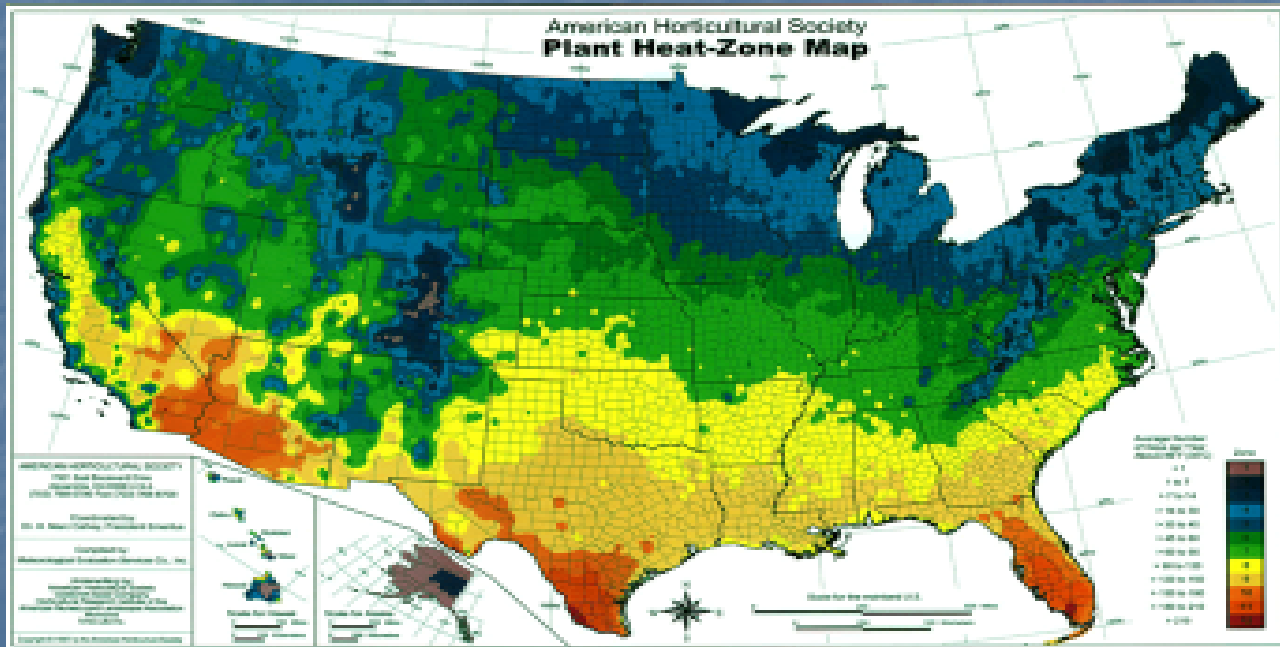
- Know your heat hardiness zone. See AHS if you want detailed information. Someday when you buy plants, they all will be tagged with cold AND heat hardiness ranges on them.
- Just like people, plants can become predisposed to other issues when they are too hot or too cold.
- Heat Hardiness Zone 5

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AHS Heat Zone Map



Air Pollution

- Ozone injury
- Other – particularly in highly populated areas
- Discussion

Acts of Nature Storm Damage

- Rehabilitation or removal?
- Must continue to remind public to NOT support “tree toppers”/“dehorner’s”
- Consider odds of opportunistic pathogens moving in (*Biscognauxia atropunctata*)
- Anticipate and monitor for wood-boring insects
- Other

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

Nutrition/Chlorosis



pH Matters!

- Good news is that many species can handle a wide pH range
- pH scale is logarithmic – this is important 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

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
- Butterfly technique
- For an existing problem, remove girdling root if possible
- May not be fortunate enough to see the offending root above-ground

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Girdling roots



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

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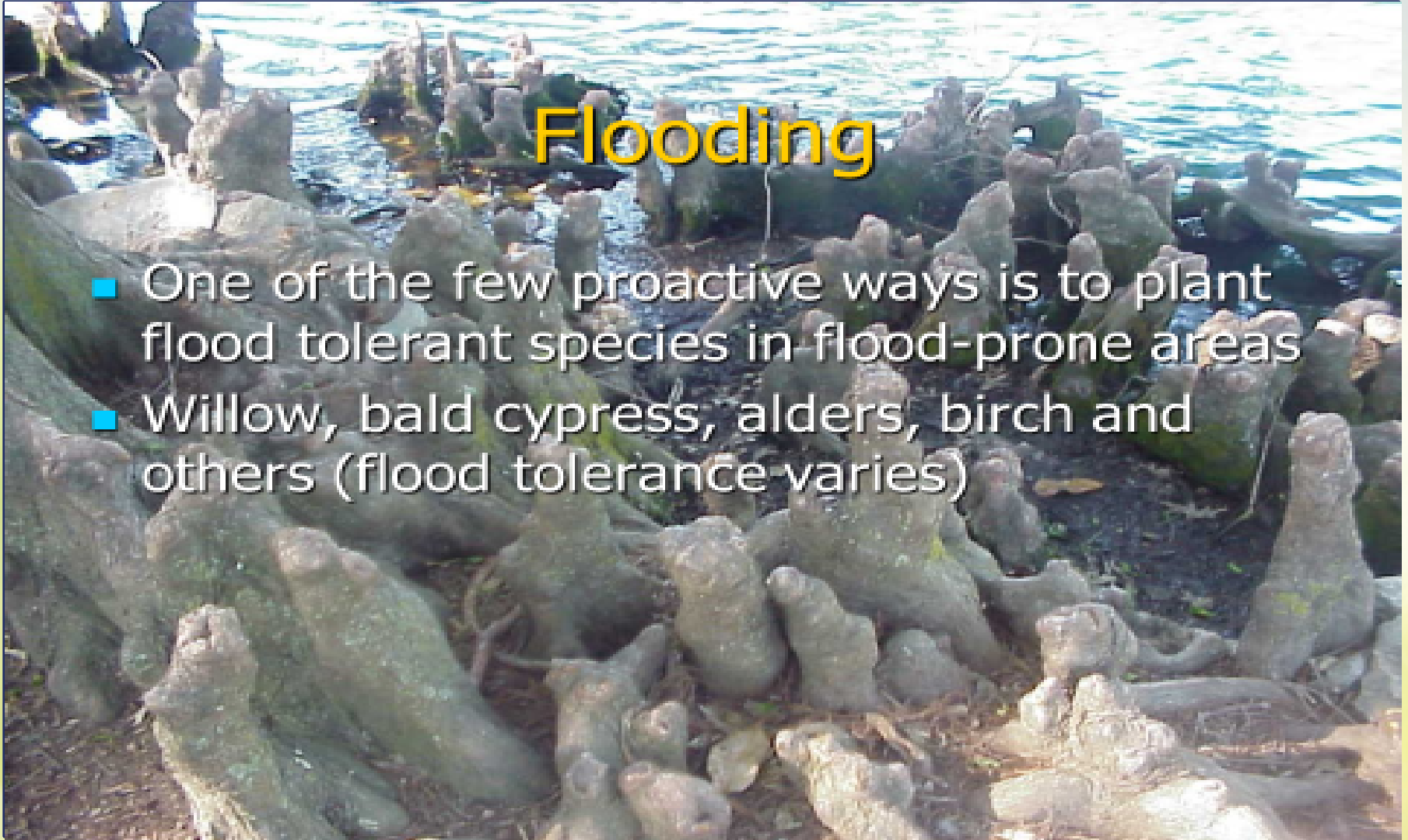


Moisture Extremes: Feast or Famine

- Both ends of the bell curve can be injurious
- Either routinely misdiagnosed for something exotic or statistically less likely
- Can be difficult to diagnose over the phone without images
- Other

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)

Abiotic Issue or Natural Phenomenon???

(Plants that Look Different)

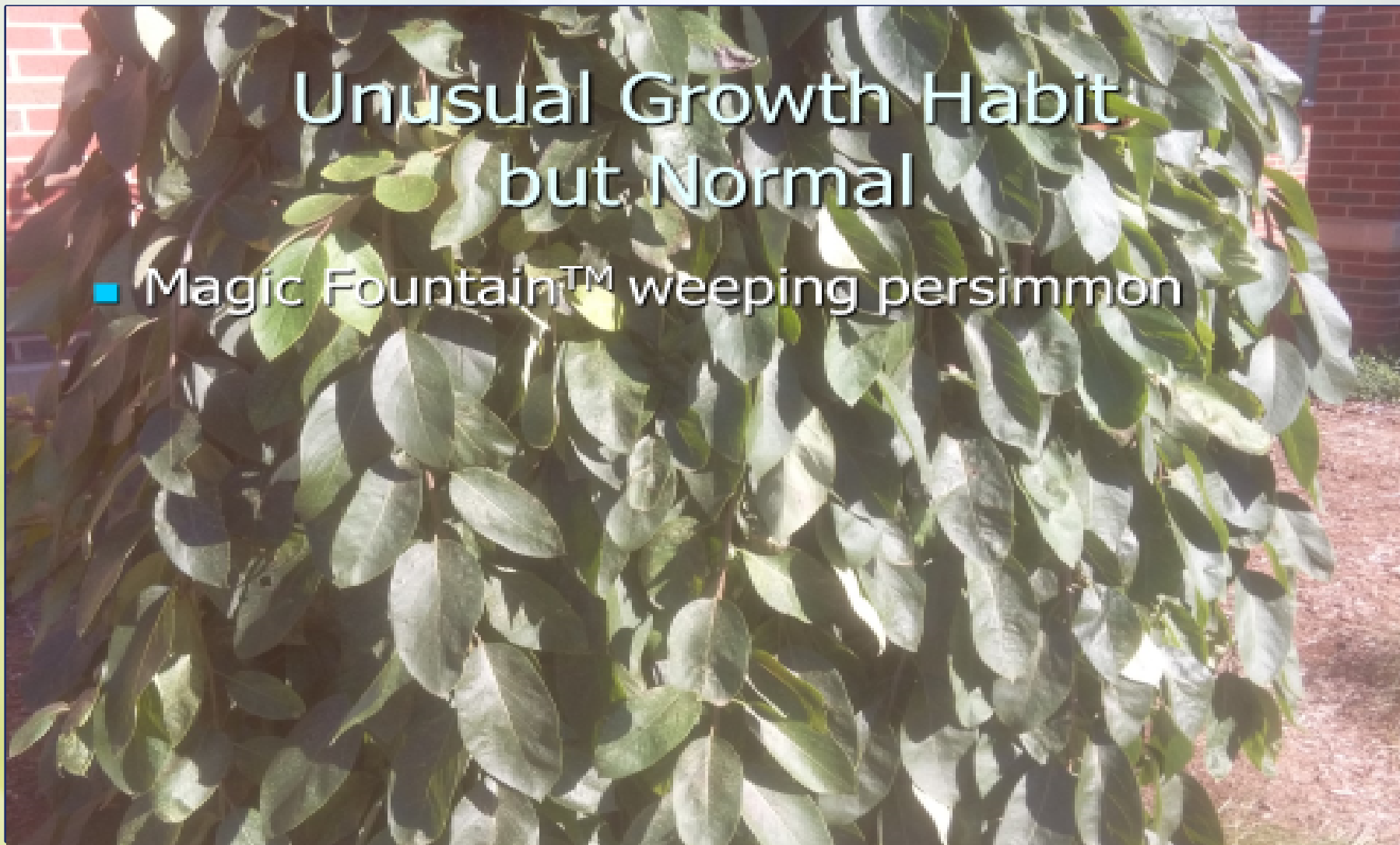
- Before making an abiotic or biotic diagnosis, rule out the possibility of the plant naturally behaving like it is supposed to.
- Many people have ended up with egg on their face diagnosing plants and throwing around fancy terms when in fact the plant is

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, many of our pines, etc.?
- Research species in question
- Other

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.
- 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.oklahomaproven.org





Thank you!

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