



# Post Oak Savannah & Blackland Prairie Ecoregions and Forest Management

A Program for Texas Master Naturalist



## Diversity

### **Trees cover almost 15% of Texas**

- *22 million* acres of forests & woodlands
- *12 million* acres of forest just in E. Texas

### **Who owns the forests?**

- Of the 12 million acres of forest in E. Texas, *63%* are privately owned (NIPF), *29%*-industry/investment, *8%*- public
- USDA Forest Service- *750,000 acres* of National Forest & Grasslands in TX



# Forests of Texas

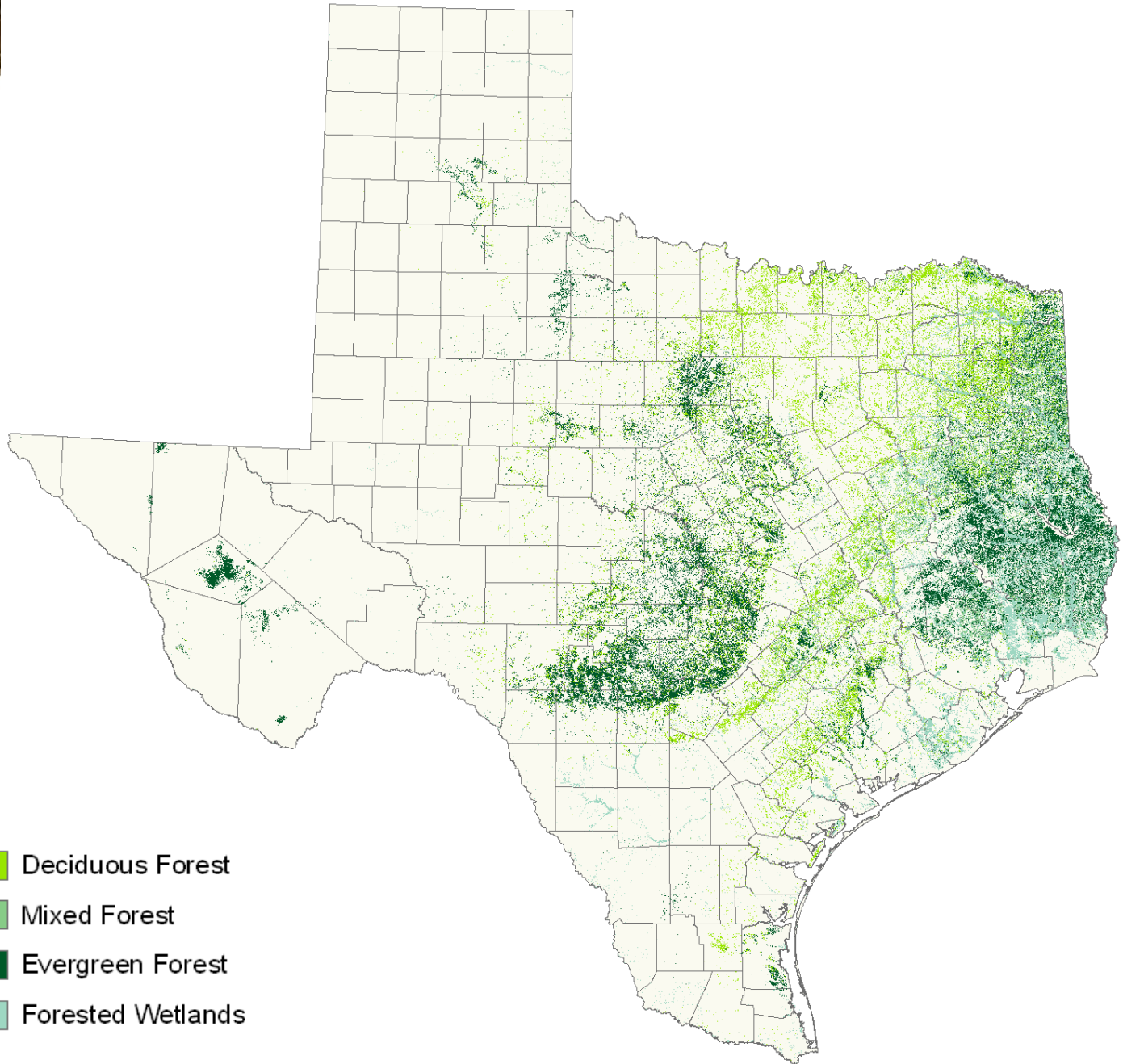
## Upland Forest Types


- Both mesic and xeric sites
- E. TX Pineywoods, Central TX Live oak/Juniper woodlands, & Post oak savannah
- Guadalupe & Chisos mountains

## Bottomland Forests

- Mesic creeks, river bottoms, and swamps
- Big Thicket Preserve
- Neches river bottom





-  Deciduous Forest
-  Mixed Forest
-  Evergreen Forest
-  Forested Wetlands





## East Texas Upland Forests

### Trees

- Oaks – Post, Blackjack, Southern red, Water, & Black
- Pines – Longleaf (south), Shortleaf (north), Loblolly
- Other Hdwds. – Black Hickory, Black Walnut, Pecan, Elms, Sweetgum,

### Shrubs

- Yaupon holly, Sparkleberry, Winged sumac, Sassafras, Red Mulberry, wax myrtle

### Vines

- Greenbriar, Muscadine grape, Virginia creeper, Cross vine







## East Texas Bottomland Forests

### Trees

- Oaks – White, Swamp Chestnut, Cherry bark, Willow, Water, and Overcup
- Other Hardwoods – American Hornbeam, Red Maple, Blackgum, Green ash, River birch, Baldcypress, Water Tupelo, Water elm



### Shrubs

- Swamp Privet, Pawpaw, Buttonbush, Possumhaw Holly, Wax Myrtle

### Vines

- Alabama Supplejack, Peppervine, Honeysuckle, Wisteria

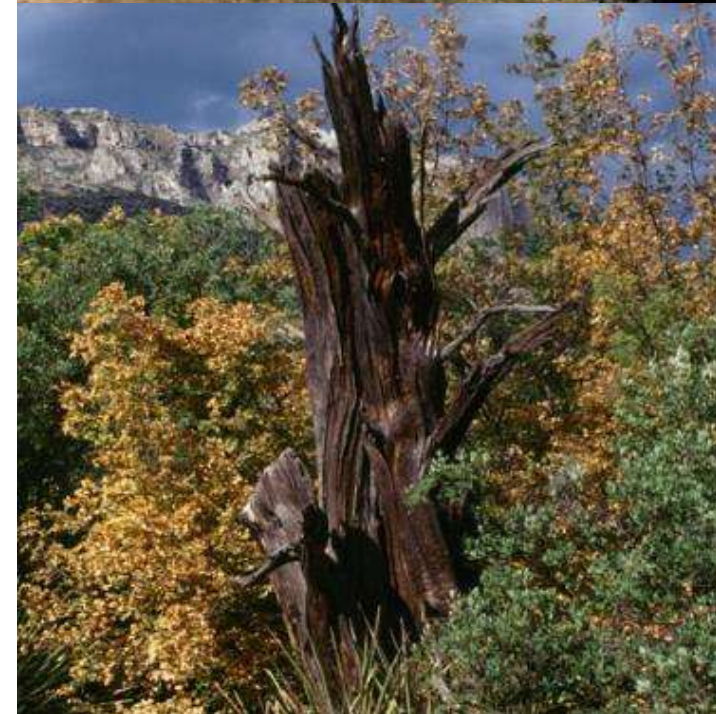


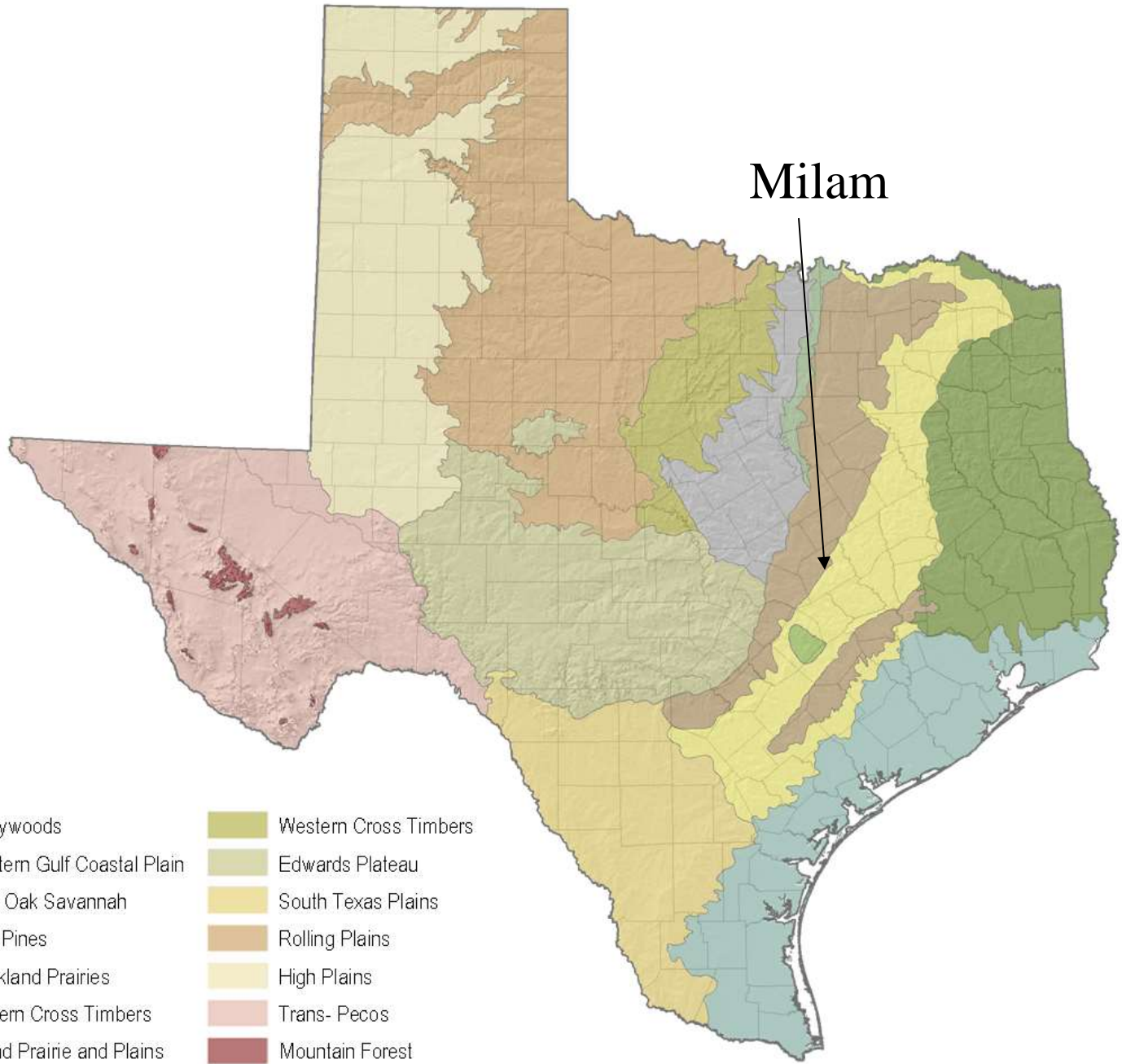




## Other Texas Forests

- Pecan-Elm Forest (Brazoria County)
- Ponderosa Pine-Douglas Fir Park/Forest (Culberson County)
- Live Oak-Mesquite-Ashe Juniper Parks (Llano County)









## Post Oak Savannah

- Gently rolling to hilly land characterized by scattered and clustered oaks (post) and expanses of grassland
- Avg. annual rainfall 35 to 45 inches
- Settlers preferred this area as a compromise between the dense thickets of the Piney woods and the open exposure of the Plains
- As this area was settled, scattered mottes of trees nestled within native grasslands eventually gave way to the development of more dense tree coverage with the exclusion of fire and clearing the underbrush



## Post Oak Savannah

- The surviving post oak relics of this age are now dwindling in number. Even though these trees do not fit our typical mental image of giant old trees, these survivors are around 100 to 400 years old.
- “Improved” pasture (bahia, Bermuda) or development for rural homes or ranchettes is the typical land use for this ecoregion now.





## Tree Species Of The Post Oak Savannah

Post oak	Yaupon holly	W. Soapberry
Bur oak	Honey mesquite	Retama
Blackjack oak	E. Redbud	Gum bumelia
Chinkapin oak	Mex. Redbud	Rusty blackhaw
Water oak	R. Leaf dogwood	Hercules club
Monterrey oak	Mex. Plum	Mex. Buckeye
Pecan	E. Redcedar	Am. Sycamore
Black walnut	Tx. Mtn. laurel	E. Cottonwood
Texas walnut	Osage orange	Honey locust
Black hickory	Possumhaw	Black locust
Sugarberry	C. Buckthorn	Winged sumac
Am. elm	Desert willow	Flameleaf sumac
Cedar elm	Eve's necklace	Am. beautyberry
Winged elm	Loblolly pine	
Tx. Persimmon	C. laurel cherry	



## Blackland Prairie

- Dark fertile alkaline soils with a high clay content that are some of the richest soils in the world. Separated into 2 belts by the Post oak savannah.
- This region was shaped by the periodic large fires and bison herds that stimulated the growth of the tallgrass ecosystem.
- Mostly used for crops and pasture now. Less than 1% of the original native tall grass prairie remain (Most endangered large ecosystem in N. America)
- Annual rainfall 30 to 40 inches





## Tree Species Of The Blackland Prairie

Bald cypress

Shumard oak

Water oak

Chinkapin oak

Durand oak

Monterrey oak

Bur oak

Live oak

Carolina buckthorn

Eastern Cottonwood

Cedar elm

American elm

Slippery elm

Winged elm

Texas ash

Hercules club

Green ash

Berlandier ash

Osage orange

Gum bumelia

Rusty blackhaw

Roughleaf Dogwood

Texas Mountain Laurel

Black Willow

Red Mulberry

Eastern Redbud

Sugarberry

Black hickory

Pecan

Black Walnut

Desert Willow

Possumhaw Holly

Mexican Buckeye

American Sycamore

Boxelder

Western Soapberry

Common Persimmon

Honey locust



## Challenges to Forest Health

- Northeast Texas ice storm, 2000-2001
- Southeast Texas hurricane damage, September 2005
- Record breaking wildfires 1996, 1998, 2000, 2001, 2006, 2009, 2011
- Insects and disease following stress events
- Loss of topsoil due to erosion







## Natural Stand Level Forest Disturbance

Wildfire, ice storms, tornados,  
floods, drought, hurricanes,  
mud-slides, insects, disease,  
invasive plants

Pics from S. E. Texas  
hurricane, September 2005







## Human Caused Succession Disturbances

- Ag. Clearing
- Land Development/ conversion
- Harvesting
- Wildfires/Prescribed fires







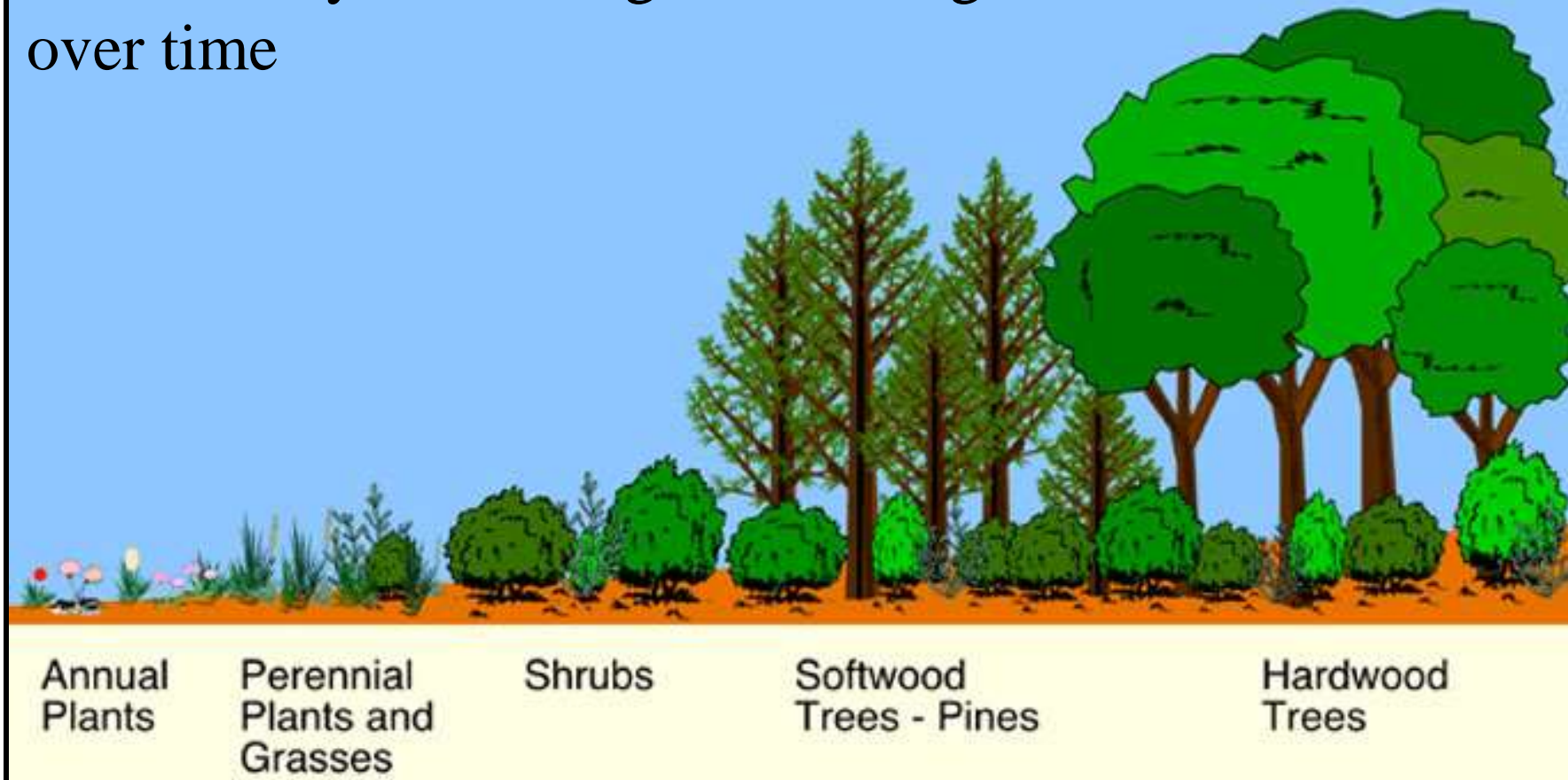
## Forest Succession

- Succession is the vegetative change in community, composition, and structure through time
- Types of succession
  - **Primary** (First plants to ever grow on a site)
    - Scale in thousands of years
      - Glacial movement, Lava flows, Sandbar
  - **Secondary** (Plant growth after disturbance)
    - Scale in decades to hundreds of years
      - Fire, agriculture (old-field succession), natural disasters, landslides, large scale sedimentation



# Succession

Forest ecosystem changes occurring over time







## Forest Succession Cont.

### Stages of Succession

Stage 1: development of pioneer species of shade intolerant grasses, shrubs, and weeds

(rodents, deer, rabbit, snakes, lizards, hawks, seed foraging birds)

Stage 2: shade intolerant tree and shrub species dominate  
(bobcat, rodents, snakes, lizards, deer)

Stage 3: shade tolerant tree species develop in understory of shade intolerant trees (mammals, birds, squirrels, opossums, raccoons)



Stage 4: development of climax forest of shade tolerant oak and hickory that is maintained until something changes.

- As shade intolerant species die out they are not replaced.
- A self-sustaining stage of succession, but it can be set back to earlier stages with disturbance.





## Forest Succession as a tool

- Forest succession is commonly used in forest management to keep a forest within a particular successional stage to provide a desired forest product.
- A prescribed burn following harvest, sets back succession, to a more primary level, that allows for the re-establishment of a new stand of pine by planting or regen (shade intolerant tree cover)
- Prescribed burns can also set back establishment of hardwoods to maintain a stand in a mid-level stage of succession to continue/lengthen growth stage of pine
- (TSI – another way to accomplish same end with herbicide)



- Wildfire can burn out hardwoods and pines setting succession back to stage 1. However stump sprouting remnant species (po, bj, yaupon, farkleberry, A. beautyberry) can jump start succession
- Insect infestation of pine engraver beetles can speed up succession by killing out pine and improving conditions for shade tolerant hardwoods to dominate as a climax level of succession.
- In BSP and other unmanaged stands (not managed for timber). Forests were already moving to a stage 4 level of succession. As fires were suppressed more quickly, and p-burns were prohibited due to HT, pines that died out left holes that were filled in with shade tolerant hardwoods already present in the understory.





## Reasons for Prescribed burns

- Site preparation
- Fuels reduction/ reduce wildfire risks
- Wildlife habitat improvement
- Aesthetics
- Reduce understory
- Endangered species
- Change species composition / remove competing vegetation
- Improve soil nutrients
- Improve recreational opportunities
- Inexpensive management tool



# Site Preparation Burning

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# Wildfire















## Reforestation

- Natural Regeneration
  - Natural seeding (seed tree)
  - Direct seeding
- Artificial Regeneration
  - Hand planting
  - Machine planting









## 6 – Year Totals for Bastrop Replant

	Planted Acres	Planted Acres	Planted Acres	Planted Acres	Planted Acres	Planted Acres	Planted Acres
Year	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19
Tree Folks	104	1900	1244	772	680	52	
TPWD	600	900	1160	735	488	420	
BSA	100	280	655	580	540	0	
EFRP	551	438	0	0	0	0	
Aggie Replant	30	30	18	12	No data	0	
Private						75	
<b>Yearly Totals</b>	<b>1,285</b>	<b>3,548</b>	<b>3,081</b>	<b>2,099</b>	<b>1,708</b>	<b>547</b>	
<b>Cumulative total</b>	<b>1,285</b>	<b>4,833</b>	<b>7,914</b>	<b>10,013</b>	<b>11,721 acres</b>	<b>12,268 acres</b>	
*L.O. Planted				70	18	51	
* Not included in cumulative totals							

5,937,700 trees planted. (Assuming avg. spacing of 9 by 10 ft.)





# Natural Regeneration











## Competition

Competition is always present between species and individual plants through all stages of succession

Is dependent upon availability of light, water & nutrients, & susceptibility to temperature

Competition between tree species affects the composition of the forest (ex. Yaupon, pine, cedar)



## Effects of Competition

Trees develop small canopy and/or curved stems (phototropism)

Insects and diseases spread easier in dense stands

Competition for sunlight, water, and nutrients will stress trees making them more susceptible to insects and disease

Can encourage trees to produce height growth quickly





## Functions of Forests

- Protective - water cycle, soil protection, water filtering, sustains biodiversity, global and micro-climate, carbon sequestration, habitat for animal diversity.
- Productive – timber as a raw material for over 30,000 applications worldwide, forest fruit, mushrooms, herbs, medicine, meat from game animals.
- Social – environment for recreation, increases environmental awareness and culture of society, enhances labor market. Values of the forest for our social well being far exceed the productive function.



## Forest Management Objectives

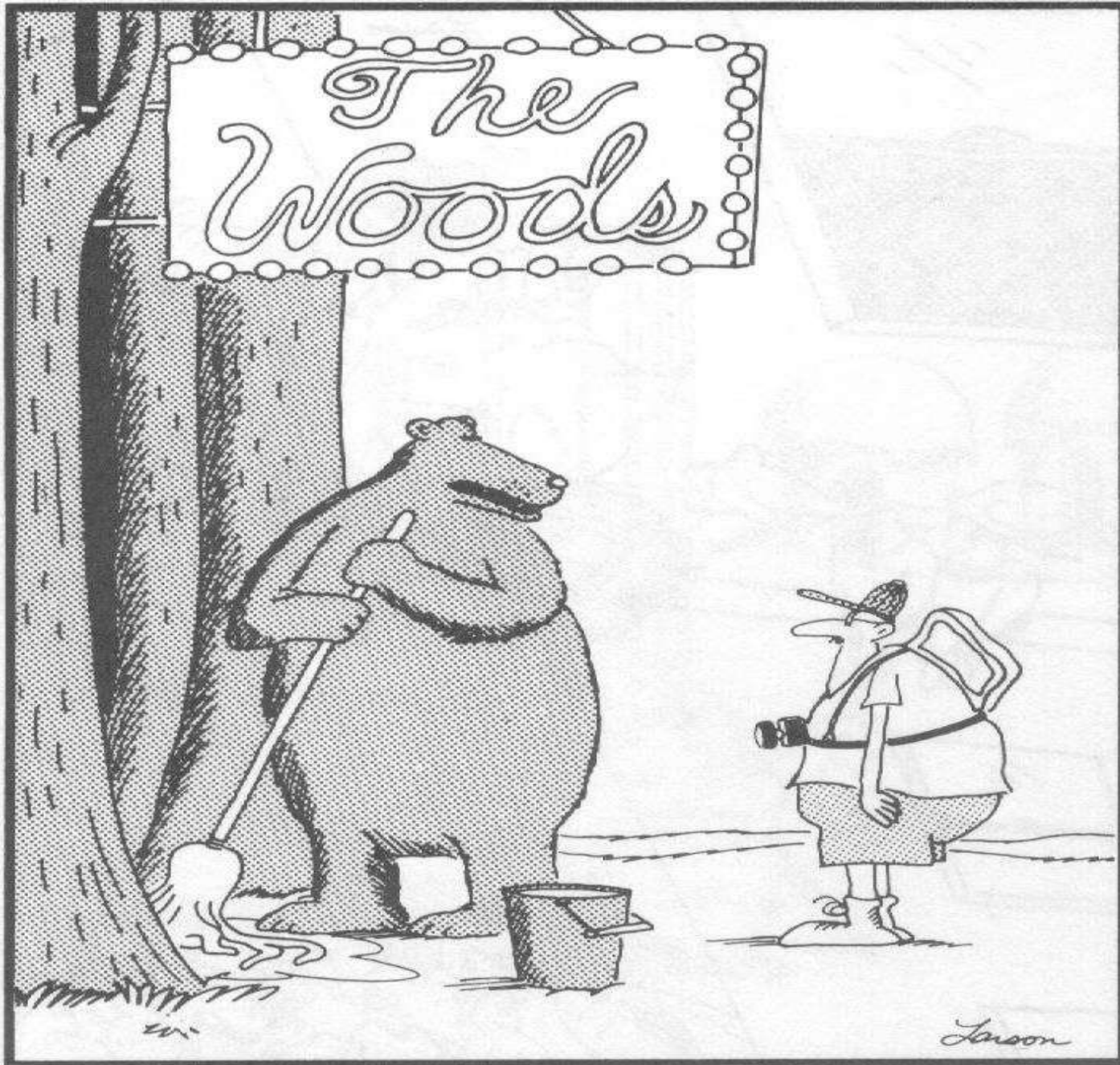
- Timber production
  - Pine plantation (site prep, planting, thinning, chemical applications, prescribed fire)
  - Even & uneven-aged stands
  - Hardwood management
- Recreation (camping/hiking, birding, hunting)
- Aesthetics
- Wildlife habitat
- Watershed
- Hunting
- Ecotourism
- Range
- Wilderness areas





AAAYYYY!!!! Need a break yet?





"Hey, look. No. 1, we're closed, No. 2, I only work here, and No. 3, we don't like your kind in here anyway."





## Forest Floor

Consists of leaf & twig debris, logs, animal scat, moss, lichen, and other detritus

### Recycling Occurs:

Insects, fungi, bacteria, and earthworms break down waste materials, creates a medium for plant growth, & return nutrients back to the soil







## Herb Layer

Primarily consists of non-woody plants such as grasses, ferns, wildflowers, weeds, and other ground cover







## Shrub Layer

Consists of woody vegetation such as vines and shrubby vegetation (yaupon, possumhaw, greenbriar, beautyberry, farkleberry, privet)







## Understory

Primarily shade tolerant trees and shrubs that are shorter than the main canopy level of the forest (oak, elm, hickory, ash, holly, cedar, laurel, viburnum, sumac)







## Canopy

Where the majority of the tree crowns meet and form a thick layer (mature dominant trees)





## Land Management Challenges for TFS

- Urban sprawl - Converts productive forestlands into subdivisions, industrial parks, ranchettes, and peace farms
- Fragmentation - Large family held tracts split up among siblings with every generation creating ever smaller tracts
- Conversion - Land use converts from one type to another (frequently motivated by property tax savings or chasing greatest potential returns)





## Local Issues

After fire recovery- Ed. workshops/programs, soil stabilization practices, replanting trees, woody regrowth, damaged tree eval. & care, fire-wise landscaping, WUI programs, fuel reduction

Land stewardship – Stewardship & forest mgt. plans, site visits, water resource mgt., logger training

Pest & Disease mgt. – Oak wilt suppression, tree health care assist, forest pest mgt./research/education, ed. programs, EAB prevention, coop. control programs



Urban tree care assist – electronic and on site, tree city USA, Arbor day, urban forestry planning resource for local govt., resource for urban forest healthcare info and programs, big tree registry

Endangered species – HT HCP, Forest mgt. guidelines for HT, safe harbor agreement for HT

All disaster response aid, Forest inventory analysis, West Texas nursery, ponderosa pine recovery in Ft. Davis, Direct management for 6 state forestlands

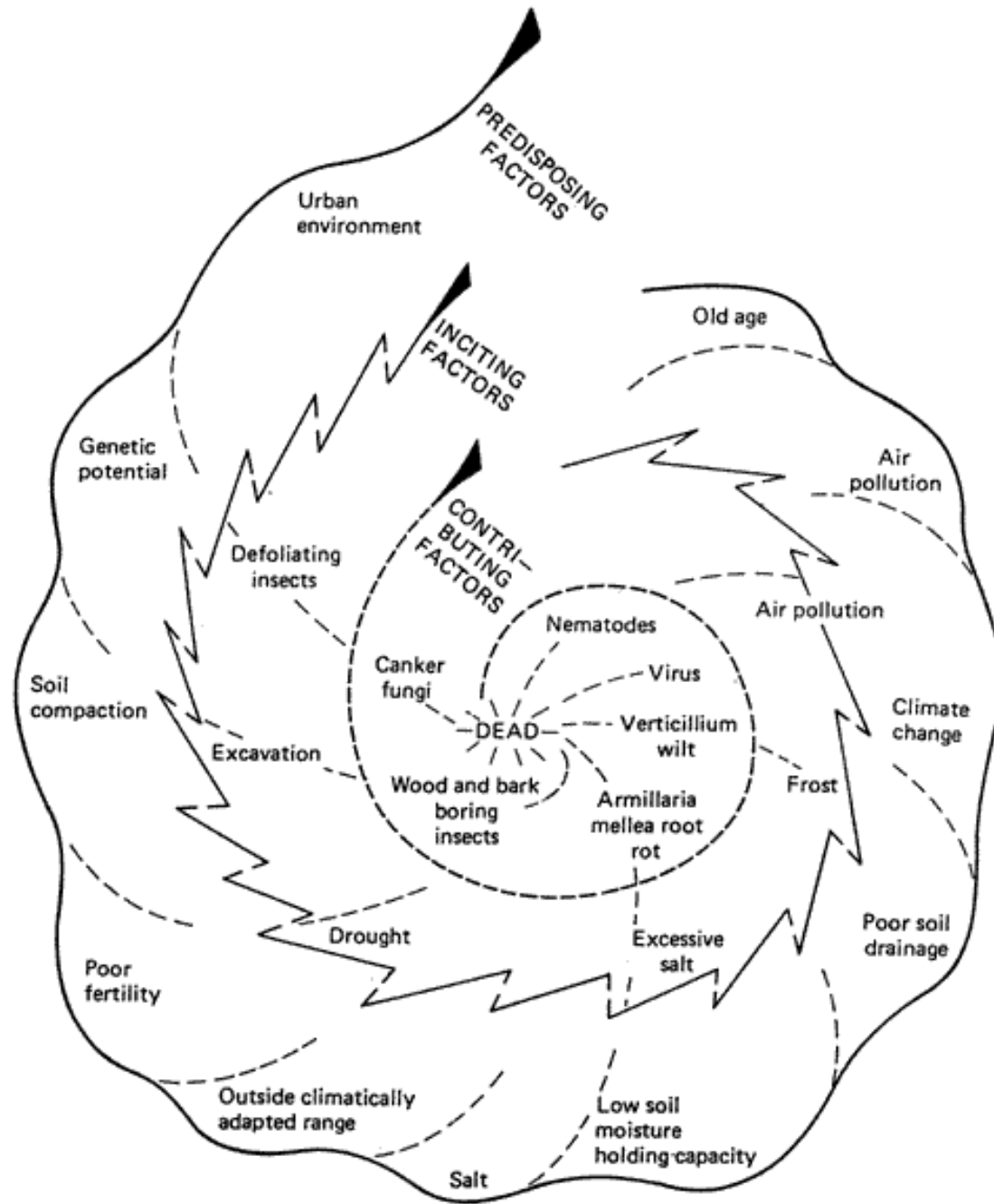




## Tree diseases and Pests



"So! . . . The little sweethearts were going to carve their initials on me, eh?"







# Drought

Drought is the absence of precipitation for a period of time sufficient to deplete soil moisture and injure plants.

Drought stress results when water loss exceeds the ability of the plant's roots to absorb soil moisture and begins to interfere with normal plant processes.



## Symptoms of Drought Injury

- Loss of turgidity – wilting
- Chlorotic leaves - yellowing
- Leaves may appear dull
- Leaves become misshapen
- Browning and / or loss of leaves
- Decreased defenses against insects and disease
- Loss of fine feeder roots
- Branch dieback from top down and from outer to inner branches

Recovery from drought stress does not take place as soon as we get rain. It may take several years of “normal” rainfall!





## Other drought related problems

Increased susceptibility to pests:

Spider mites, Borers, Twig beetles, aphids

Increased susceptibility to diseases:

Armillaria root rot, Ganoderma root rot, Hypoxylon canker, Bleeding canker, and a host of other wood rot fungi



## Adjusting our thinking on watering

- Established trees need infrequent deep watering for a slow soaking of the top 6 inches of soil
- The soil then needs some time to dry out before the next watering cycle
- Mature urban trees need watering about once or twice a month in the absence of rain (soil structure and texture)

Most of us water to meet the needs of our grass and rarely consider the very differing needs of our trees!





We need to remember where we are!



Post Oak Savannah or  
Blackland Prairie



Typical Urban landscape







# Hypoxylon Canker

*Hypoxylon atropunctatum*,  
Fungus, spread by  
wind blown spores,  
Affects oaks, elms,  
sycamores, pecans.  
Most commonly seen  
on post oaks.







## Hypoxylon Canker Symptoms



Post oaks have low tolerance to any form of root disturbance (compaction, severed roots, grade changes, overwatering)





- Hypoxylon canker is not an aggressive pathogen. Spores are spread by the wind and may remain dormant within the tree for decades.
- Hypoxylon canker takes advantage of trees already weakened by other forms of stress: other tree diseases, soil compaction, root damage/loss, extended drought, water stress, root disease, changes of grade, (adding or removing soil).
- Most urban trees succumb to Hypoxylon due to root damage from construction and overwatering.

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## Hypoxylon Symptoms

- Prolonged lack of vigor for multiple years
- Foliage changes color in spring or early summer
- Branch dieback in the canopy
- Foliage clustered along larger branches instead of tips
- Bark sloughs off to expose brown or greenish dusty spores that eventually transition to a silvery gray
- Infected wood has black lines of mycelium throughout



## Prevention Options

- Avoid injury to the trunk and limbs
- Avoid injury to root systems
- Never apply fill soil around the trees
- Do not alter drainage around trees
- Avoid compaction of soil in root zone of trees
- **Plan to build all structures and other ground disturbing activities well away from post oaks critical to your landscape!**

Most trees eventually die from a complex of problems that all contribute to the eventual death of the tree

Hypoxylon canker is frequently the “straw that broke the camel’s back”





## Armillaria (shoe string) rot

- Primarily stress related
- Fungal disease causing structural failure and mortality
- Symptoms are: thinning discolored foliage, dieback, growth reduction, sunken areas, structural failure, white mycelial mats/fans, conks, death
- Mycelial symptoms may not develop before death
- Limited control may be possible with fumigants.
- Cultural practices recommended:  
prune dead branches, avoid trunk injury, water appropriately, fertilize in fall if needed, remove rotting stumps, do not plant new trees close to infected stumps





## Ganoderma lucidium

- Stress related fungal disease
- No treatment
- Wide host range
- Produces varnished basidiocarps
- Can cause structural failure
- Spread by windblown spores, overlapping roots & wounds to trunk & roots
- Prevent with good cultural practices: prune dead branches, water appropriately, fertilize in fall if needed, avoid trunk injury, removal as necessary







## Bleeding Canker (*Phytophthora cactorum*)

- Affects trees weakened by environmental stress
- Severe infections cause tree death and structural failure
- Bleeding Cankers usually appear on lower trunk
- Spores live in soil and can enter tree through wounds
- No known treatments and affects many types of trees
- Prevent with good cultural practices: avoid overwatering, fertilizing with nitrogen, mulch, prune dead wood, water during droughts, avoid injury to trunk





## Eastern redcedar decline (drought related)

Extended periods of ongoing drought stressed junipers.

Stress weakens the trees and they became more vulnerable to: Spider mites, bud worm, *Chrysobothris texana*, Western cedar bark beetle, and perhaps others.

Stressed trees are also more vulnerable to diseases: Seridium canker, Fusarium, Botryosphaeria canker.





## Care Supplements We Can Provide

- Water Management
- Mulch
- Fertilization
- Pruning
- Damage Avoidance
- Insect and Disease Intervention
- Soil aeration and amendments

Buffer the losses of trees on your property by planting a variety of plant and tree species. The increase in species diversity will help make your landscapes more resilient and visually interesting throughout the seasons.

Make sure you have young plants and trees as well as established.



## Things to Do During Drought

- Water: slowly, and thoroughly but not too much or too long
- Mulch properly
- Monitor for secondary pest invasions & problems, intervene if necessary
- Avoid damaging the plant in any way
- Wait: if the plant partially turns brown or appears dead; correct any imbalances and wait and see. Let the tree show you what it will do but be patient.





## Mulch

- Adds carbon and other nutrients over time
- Reduces soil temperature and thus increases root growth during the growing season
- Reduces competition from grass and weeds for soil moisture
- Moderates soil moisture



## Mulch

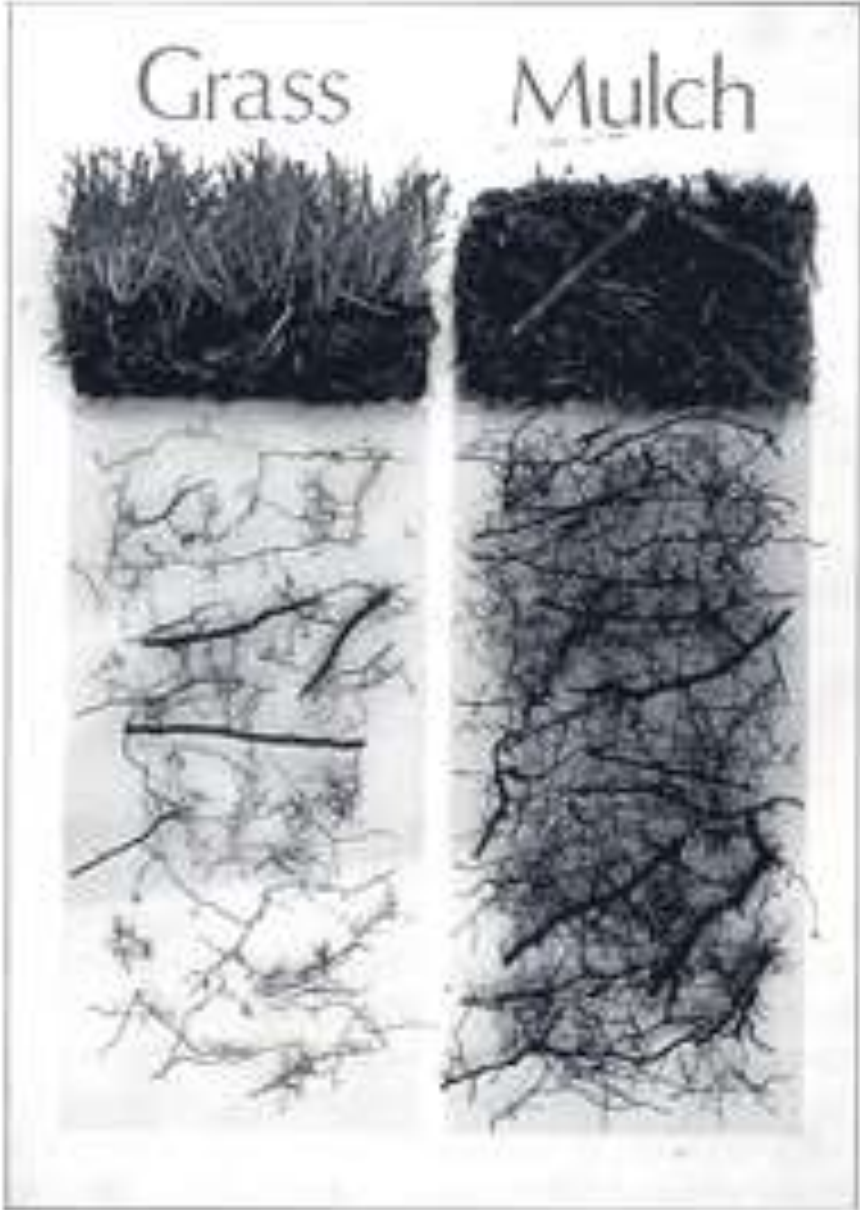
### Types

- Inorganic – permeable fabric sheets, rubber chunks, etc.
- Organic –bark mulch, shredded wood, leaves, pine straw (mimics the forest floor)

### Application

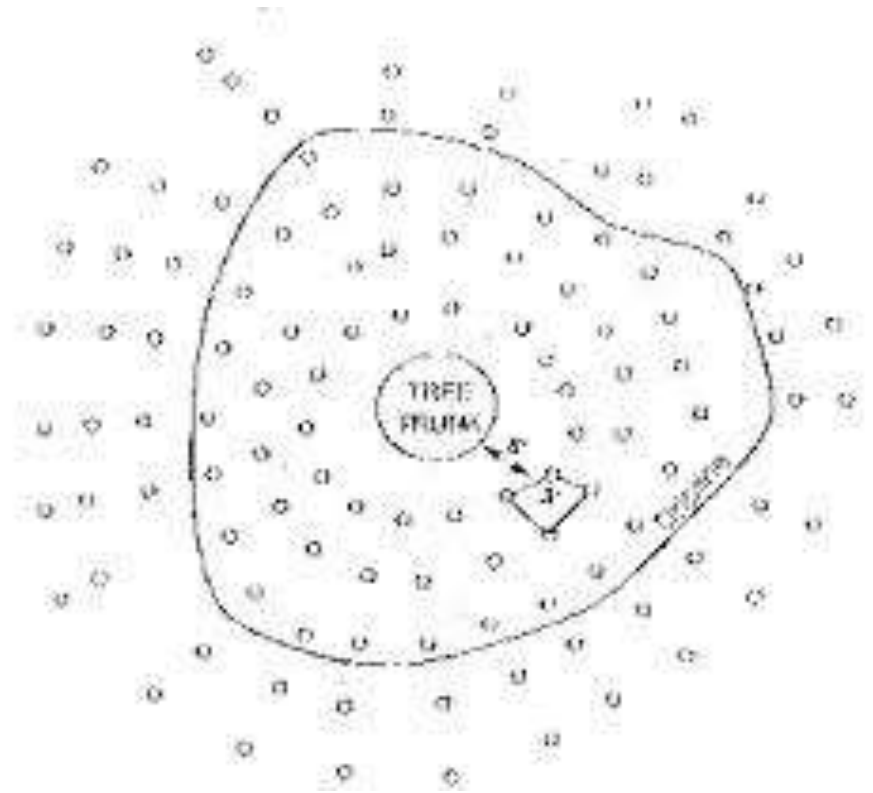
- 2-4 inches deep;
- As wide as practical but **NEVER** next to the trunk – no volcanoes
- Evaluate in May and September
- Loosen up old mulch (lightly) before adding new layer





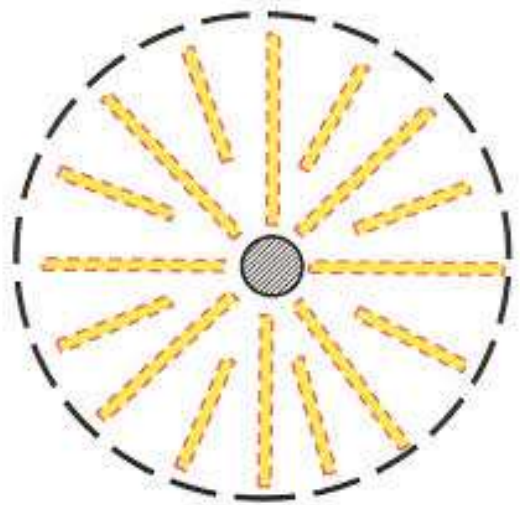
# Managing Declines

- Improve tree health
- Right tree, right place
- Fertilize when appropriate
- Watering practices
- Proper pruning
- Mulch properly
- Vertical mulching
- Reduce stress (compaction, root/trunk damage, drainage)





# Radial mulching with Air Spade





## Things You Should NOT Do During a Drought

- Fertilize: let the plant maintain what is already there
- Prune: may disrupt the process of making food, transporting water, and surviving.
- Plant new trees, shrubs, grass





String trimmers and mower decks can open wounds for fungal diseases and in extreme cases can kill trees by girdling the bark and underlying cambial tissue





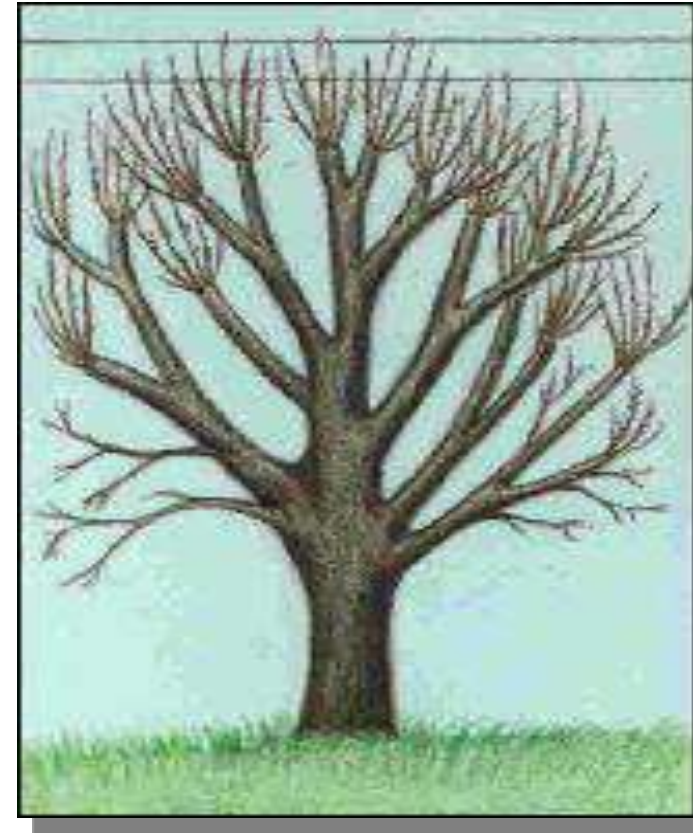


## Topping

A poor maintenance practice often attempted to control size of trees

Involves indiscriminate cutting of branches and stems leaving long stubs

Synonyms include: rounding-over, heading-back, dehorning, capping and hat-racking









## Tree response to topping

- Sprouts form weak attachments that permanently alter structural integrity!
- Open infection courts for rot at that develops further into branch
- Branch failure is certain, so the tree is now a safety hazard (liability)
- Topping is expensive now, but especially in later years
- Can promote cankers from sun scald
- Ugly
- Severely stresses tree and encourages insect pests









Thank You!



Works Cited:

Texas Forest Service, Texas A & M University System. Texas Forests Today. February, 2005.

The Dallas Morning News. Texas Almanac 2004-2005. 62 ed.

Benny Simpson. A Field Guide to Texas Trees. 1999.

Texas Parks and Wildlife. Maps of Texas.

US Forest Service, Texas Forest Service. Houston's Regional Forest. September, 2005.

Some pictures provided by Ron Billings and Gary Larson





## For More Information

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