Some Rx Fire Do's And Don'ts

55+ Years of Learning

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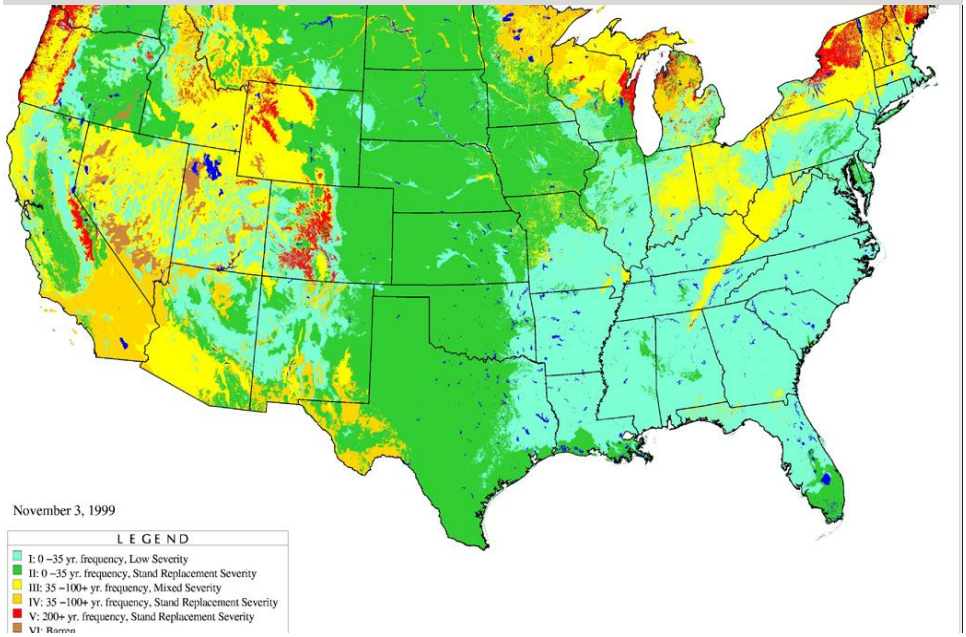
The Worldview Of A Society Is Often Written More Truthfully On The Land Than In Its Documents.

Kimmerer and Lake 2001

Too Many Land Managers Say They Advocate the Use of Fire, But Have a Plethora of Excuses Why They Have Yet to Use It - None of Them Valid! Cost Per Acre May Be High, But I Rarely See A Parcel Of Land That Can Not Be Safely Burned.

Most Southern & Atlantic State Ecosystems Historically Burned at Least Once Every 35 Years



Terrestrial Flora & Fauna Evolved with Periodic Fire and Developed Strategies to Cope

- **Fire is THE Ecological Imperative!**
- **There are NO Long-term Surrogates!**
- **Fire Adapted Ecosystems WILL Burn**
- **You Determine How – No Decision is A Decision**

Your Fire Program will Determine how Your Landscape Looks and the Fauna it will Attract

- **Benefits of Fire Are Many, But Temporary**
- **Most Objectives Can be Achieved with Fire Every 1 – 4 Yrs**

- Every Expert Started as A Novice.
- Burn with Others at Every Opportunity. Ask Questions.
- Talk to Folks at Your Local State Fire Mgt Office.
- What Tools Does Your State Fire Mgt Website Offer?
- Join The Closest Fire Council.

- Look at Other Ownerships – What Do You Like/Don't Like ?
- Make Sure Every Prescription Promotes Your Mgt Goals.
- Know and Follow all Federal, State and Local Statutes, Regulations and Rules

Take Certified Burner Training

Book Knowledge is Good, But the Successful Application of Fire is as Much Art as Science

- **Walk your Lands Frequently – Keep Written Notes**
- **Establish 1 or More Photo Points - Take Photos Prior to, During, and Annually Post-Burn in Late Summer**
- **Don't Unnecessarily Limit Burn Days When Planning**
- **Vary Season & Weather Conditions Over Time**

Become Familiar with Plant Communities on Your Property

- Exotic Species Can Cause Fire Problems
- If They Burn Well, They are not Likely to be Controlled By Fire Alone
- Talk To Your County Extension Agent
- Photo Shows Backfire in Cogon Grass

I Like To Save Snags For Aesthetics & Wildlife But Not Within 150-200FT of the Line Depending on Fuel Type

- Burnout at Least 30ft Around Snag Prior to Burning Unit & Hope
- Burning Ember Can Easily Ignite Top & Then You Have a Problem if Near the Line.
- Situation in Slide Spells Trouble Because Fire Will Climb Vines Into Treetop

Threatened & Endangered Species Require Special Precautions

I Burn out 15+ Feet Around RCW Cavity Trees with 2 People – One With Torch & 1 with Bladder Bag to Contain Fire Prior to Burning Unit

CANEBRAKES

- Canebrakes are Both Fire Dependent & Fire Sensitive
- Too Little or Too Much Fire is Detrimental
- Should be Burned Every 3-6 Years

Burning Every 1 - 2 Years Maximizes Aesthetics

- Generally Not Enough Fuel To Carry Annual Growing Season Burns in Mixed Pine-Hardwood/Hardwood
- Low-intensity Fires Often Go Out at Dogwood Drip-line Due to High Calcium Content of Leaf Litter

SEEPS ARE FIRE-MAINTAINED & SEPARATE WET AREAS FROM UPLAND

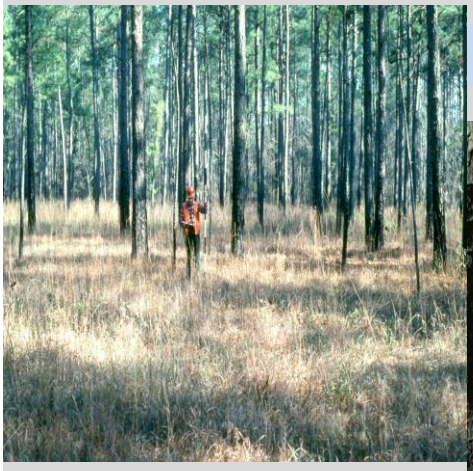
WITHOUT PERIODIC FIRE, SWAMP SPECIES MARCH UPHILL COMPETING WITH FIRE-ADAPTED SPECIES.

- **Solution is to Run a Fairly Intense Headfire 'Downhill' Forcing These Species Back Into Wet Areas**

WINTER VERSUS SUMMER BURNS

- **In Winter One Can Plan Ahead With Certainty**
- **In Summer Can't Predict Location or Amount of Rain**
  - **Place empty can on-site & check morning of planned Burn**
- **I Try to Conduct Growing Season Burns Within 1st Two Months After Green-up when Occasional Cold Fronts Still Cross Area & Before Extensive Lightning**
- **Summer Burning Harder on Crew - Heat Stress.**
- **Many Objectives Best Met With Growing Season Burns; e.g., Hardwood Topkill. Fires Tend to be Safer**

ANNUAL WINTER FIRES CAN CREATE A HERBACEOUS GROUND COVER



12 annual winter burns

12 years of fire exclusion

SUMMER BURNS PROMOTE SEED PRODUCTION IN MOST SPECIES; E.G.; MUHLY GRASS

Annual Growing Season Burn Regime

Triennial Growing Season Burn Regime

Fire Can Be Used In Hardwood.
Oak/Hickory Stand on the Cumberland Plateau, TN
After 10 Annual Spring Burns

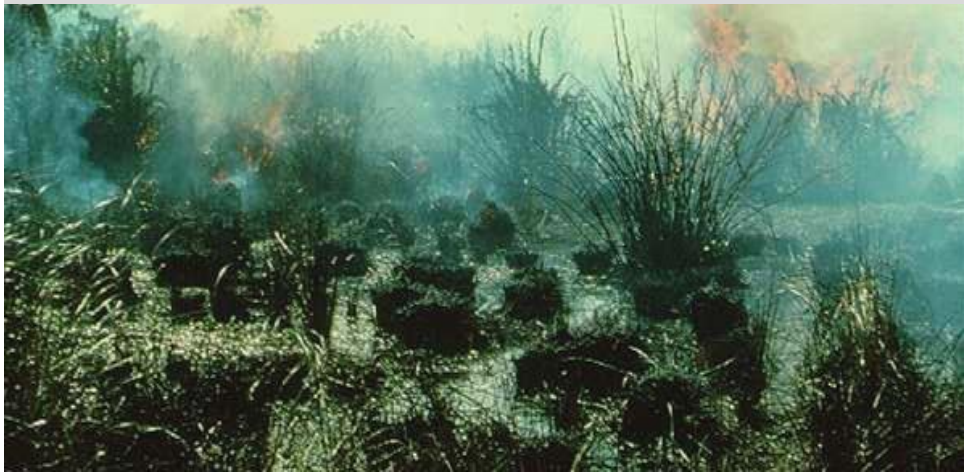
Even Shallow Plowlines Can be Insurmountable Barriers to Small Critters

- Consider Alternatives

Disked lines can be utilized by vehicles, but consider alternatives to hard lines such as ecotones, rights of way, creeks, mowed lines, hiking and wildlife trails.

FIRE MAY HEAD, BUT WILL NOT BACK ACROSS VEGETATION IN STANDING WATER

- Back fires into wet areas or ignite near water edge
- I typically use drainages & just let the fire go out as it approaches them



USE VEGETATIVE COMMUNITY CHANGES TO CONTAIN FIRE

- When Keetch-Byram Drought Index < ~450, Fire is Not Likely to Cross Drainages.
- Thus No Hard-line Needed, But Monitor

Keetch-Byram Drought Index (KBDI)

- KBDI is my 1st toggle switch in making a go – no-go decision re burning on a given day
- When KBDI exceeds 450, I typically postpone burning when a duff layer is present because of root damage, prolonged smoldering & smoke issues
- I use 550 cutoff threshold if unit is on a 1-2 year burn rotation and no duff layer present
- When burning with KBDI above 500, be realistic about your chances of controlling an escape & recognize that if you call for help, those folks may be over-extended & response to your Call may Not be Timely
- High KBDI means fewer safe zones for small critters

Fire Exclusion Results In Thick Forest Floor

- When Forest Floor >3 inches Thick, I Prefer Burning When KBDI <200 to Avoid Possible Root Mortality

KBDI >500: Fairly Complete Consumption of Most Large Dead Logs and Stumps

Fuel Weight Varies Widely By Species, Site, & Time Since Last Disturbance

Southern pine forest floor weights inc. sticks <3' dia

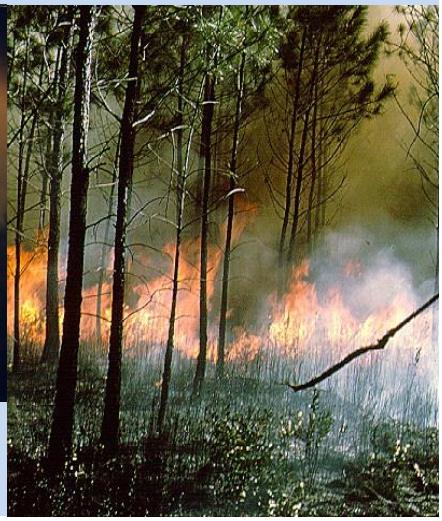
- 2 tons/ac in 1-yr rough
- 10-15 tons/ac in 20+-yr rough
- 10-35 tons/ac additional after blowdown

TOTAL LITTER WEIGHT UNDER LOBLOLLY PINE STANDS AS AFFECTED BY BA & AGE OF ROUGH

Basal Area ft^2/ac	Age of Rough (years)							
	1	2	3	4	5	7	10	15
	Tons per acre							
30	1.4	2.2	2.9	3.4	3.8	4.5	4.7	4.7
50	1.5	2.4	3.2	3.9	4.3	5.0	5.3	5.3
70	1.6	2.8	3.7	4.3	4.8	5.6	5.9	5.9
90	1.9	3.0	4.1	4.8	5.4	6.3	6.6	6.6
110	2.1	3.5	4.6	5.4	6.0	7.1	7.4	7.4
150	2.7	4.3	5.7	6.7	7.5	8.8	9.3	9.3
200	3.5	5.8	7.6	8.9	10.0	11.7	12.3	12.3

TOTAL FUEL VS AVAILABLE FUEL

How much of the total fuel load is available under the prescription?



Worst case scenario vs Good Rx Fire Conditions

AVAILABLE FUEL = FUEL CONSUMPTION

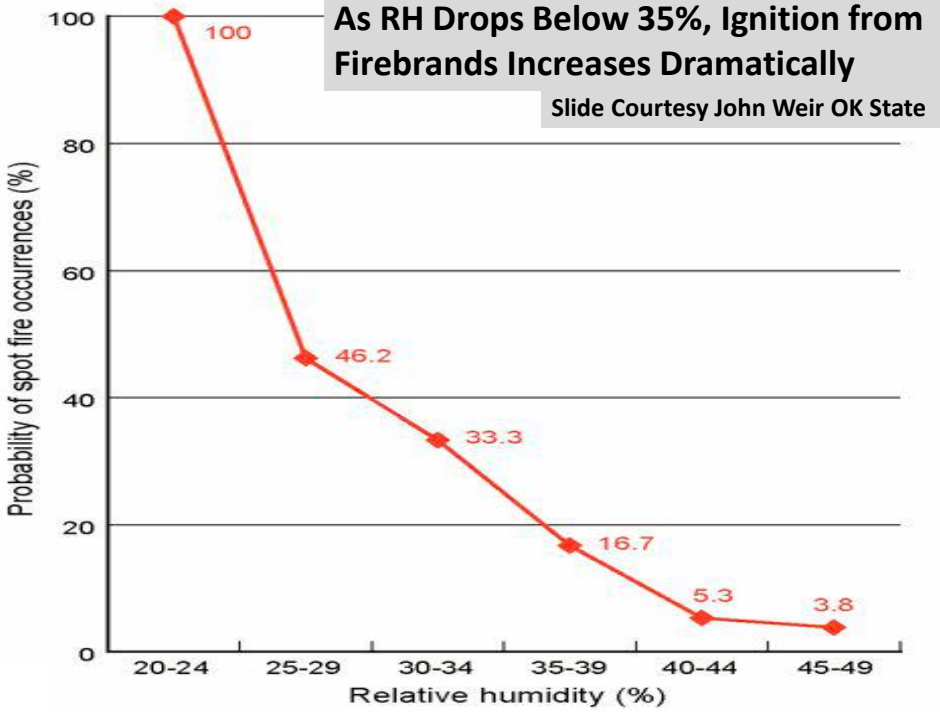
Some Numbers

- 2.5 t/ac is a good average for Rx fires in periodically burned southern upland forests
- 10 t/ac is a good average for wildfires in southern upland forests with 5+ year rough
- Double the above figures for wetland forests
- Available fuel often almost equals total fuel in grasslands
- Can exceed 15 t/ac in some marsh ecosystems

- Invest in a Weather Kit & Use It Before & During The Burn. Record Results on Burn Plan
- Does On-Site Weather Match Forecast?

As RH Drops Below 35%, Ignition from Firebrands Increases Dramatically

Slide Courtesy John Weir OK State



As RH Rises Above 60% and KBDI is Below 450, Expect a Patchy Burn and Little Fuel Consumption with a Backfire, Especially in Hardwood Litter

RELATIVE HUMIDITY

RULE: Each 20 degree rise in temperature cuts the RH in half as long as the air mass is not replaced (e.g., sea breeze).

Example where temp. known & 100% RH assumed at 0700

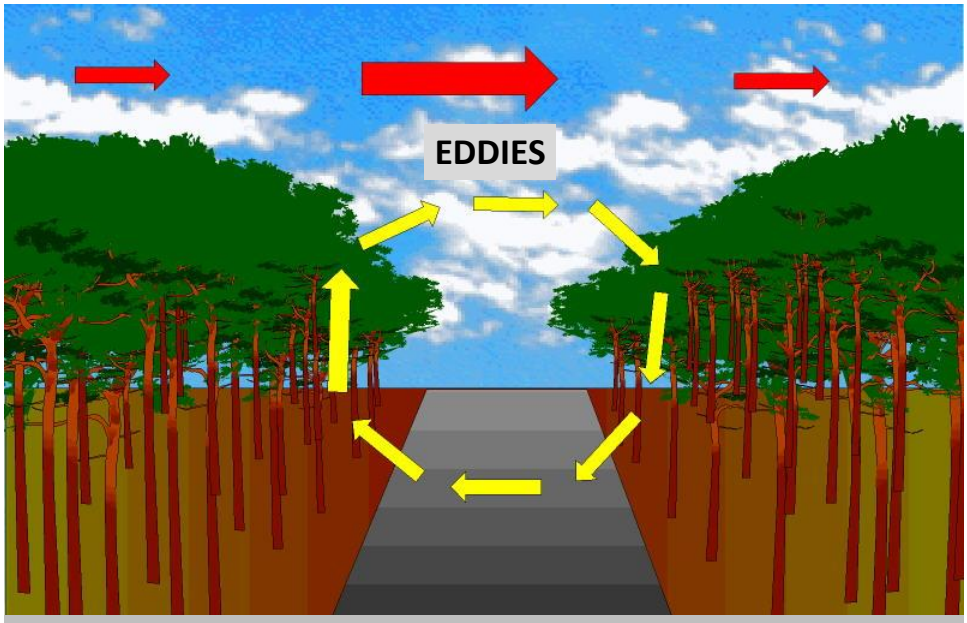
- **Conditions at 0700:**
  - **40° F temperature & 100% RH**
- **Conditions at 1000:**
  - **60° F temperature = 50% RH**
- **Conditions at 1400:**
  - **80° F temperature = 25% RH**
- **Conditions at 1700:**
  - **70° F temperature = 38 % RH**

In-Stand Winds

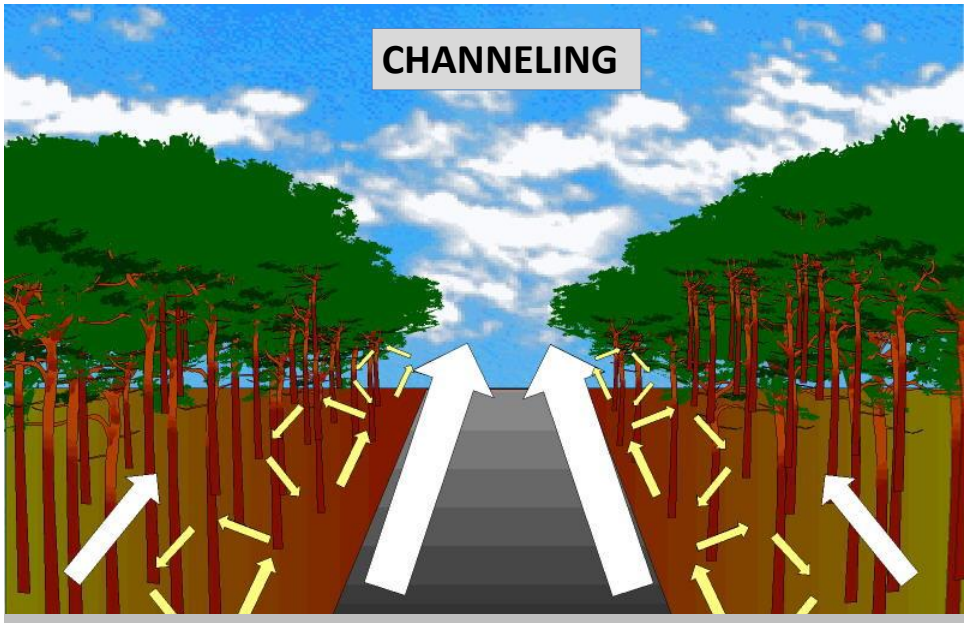
Forecast Winds Are at 20 or 30 FT Above Surface

To Estimate in-stand Wind Speed from the Forecast Wind Speed, Multiply by:

- **0.1 in Dense Pole-sized Timber or Understory > 5ft Tall.**
- **0.25 in Fully Stocked Stands with Closed Canopy (Understory < 5ft Tall).**
- **O.5 in Open Longleaf Stands or Fields < 1 Acre in Size.**
- **Surface Wind = on-site Wind in Large Open Areas (Marshes, Prairies, etc.)**



Winds perpendicular to rights of way, roads, etc will likely cause crown scorch on upwind side of opening



Winds parallel to rights of way, roads, etc will have higher speed & create eddies on both sides of opening

Estimate Fine Fuel Moisture Using Snap Test or Lumber Probe. Physically Check Forest Floor

- Is Surface litter dry? Is lower duff wet?
- Typically want a steep forest floor moisture gradient

Dispersion Index (DI)

A smoke forecast tool that estimates stability. Ventilation Factor is a less robust, but useable alternative

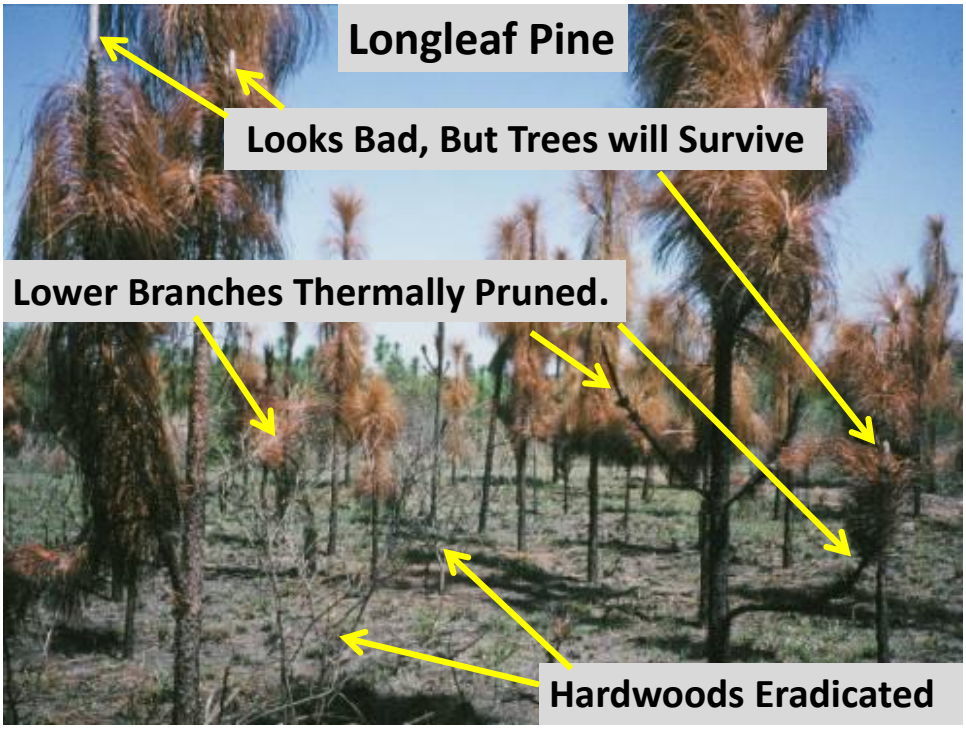
- Daytime DI above 40 generally gives adequate smoke dispersion. DI above 20 usually ok when burning small blocks (<5 acres) of dry herbaceous fuels as long as no SSA's (smoke-sensitive areas) within ¼ mile
- Higher values give better dispersion, but as DI approaches 65, consider postponing burn because of potential containment problems.
- Nighttime DI (different calculation) above 6 will give adequate dispersion in most cases.

Below Freezing Temperatures

- When Burning With Ambient Temperature Below ~29^{0}F, Additional Heat is Required to Melt Ice in Live Cells Before Liquid Water Can be Evaporated
- This Means Less Heat Available to Preheat fuels to Ignition Temperature
- Fires Will Thus be Less Intense Than Those Conducted When Ambient Temperature is Above Freezing.

CROWN SCORCH

- Southern pines have multiple flushes. Thus even if all needles killed in a growing season burn, as long as the buds are NOT damaged, new foliage will soon appear.
- Southern pines typically survive 100% crown scorch providing NO bud damage Jan– ~mid August. There will likely be growth loss.
- If defoliated after last summer flush, trees have to live off stored reserves until 1st spring flush.
- Species that have multiple flushes don't tend to have large storage reserves so many die; the rest are severely stressed, attracting predators



ENERGY RELEASE

- A piece of fuel contains a given amount of energy
- Assuming complete combustion, a piece of fuel will release the same total amount of heat energy whether it burns fast or slow
- Heat energy is released at about the same rate all along the flame edge.
- Headfires thus distribute it along longer flames and are therefore cooler near the ground.
- Backfires concentrate released heat near ground level and thus are more likely to girdle stems and ignite rotten/punky logs

Objective is Usually Not to Eradicate Woody Plant Species, Just Relegate Them to The Ground Cover

- **Burn every 3-4 Years in Growing Season to Provide Succulent Nutritious Browse**

Backfires Concentrate Heat At Plant Base. Thus Will Topkill Larger Diameter Stems.

A Headfire Would Not Have Topkilled This Large Wax Myrtle As Backfire Did

Note Basal Sprouts

No Idea How Many Times I have Heard a Landowner Say '*I sure thought That Road Would Hold It.*'

- **Blackline, Even When You Don't Think You Need to.**
- **Can Blackline Several Weeks Prior To Actual Burn**

ALWAYS BLACKLINE

Hot Prescribed burn in 2-Year old Southern Rough

Pay attention to What You Have Just Ignited

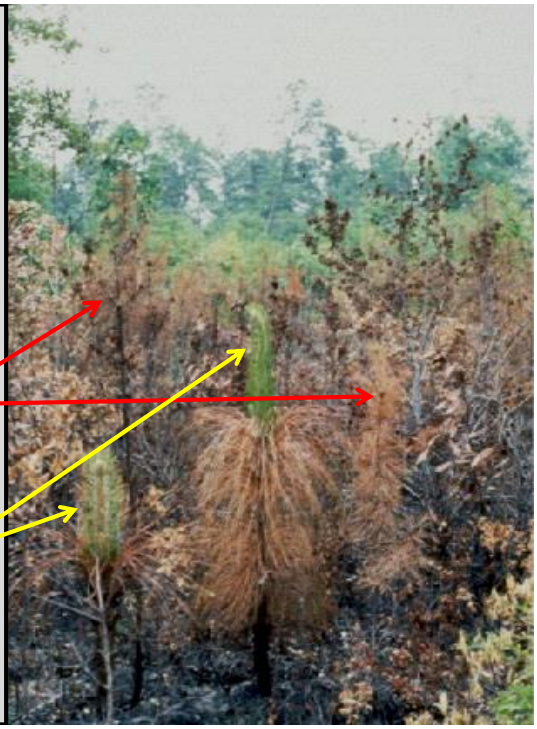
- Learn From Your Mistakes

When Utilizing A Sea Breeze Make Sure It Has Established Before Igniting Unit.

Hot Headfire in Young Longleaf. Trees Will Survive

- **Fire will kill woody competition & prune lower limbs**

Shortly After Growing Season Headfire To Control Undesirable Species & Release Longleaf



ALWAYS BE THINKING *WHAT IF*

Initial Backfire In 8-yr Old Slash Pine Plantation

180° WIND SHIFT ~ MINUTE LATER

NOW WHAT DO I DO?

QUESTIONS?

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