

Friendly Flames: Prescribed Fire as a Tool for Land Management

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Personal Introduction

- BS Biology, Rutgers University;
Master of Forestry, Virginia Tech
- Current PhD student, Forest
Resources and Environmental
Conservation, Virginia Tech
- Specializing in southeastern US
fire ecology, fuels and fire
behavior



Today's objectives



Tom Yawkey Wildlife Center, Georgetown, SC
March 2015

- What is prescribed fire?
- Why use prescribed fire?
- Is it right for you?



Does your forest *need* fire?

- This might seem like a strange question in this setting:
 - You would like to manage your forested property
 - You would like to manage for wildlife habitat
 - How does fire play into that equation?



Can fire be friendly?



That's not what these folks are telling me...



Most common media message



Woolsey Fire, California – November 2018

Images: kcal.com and nbc.com



Australia, 2019 (via PBS)



Canada, 2023 (via ABC)



Hawaii, 2023 (via Ty O'Neil/AP Photo))



Chile, 2024 (via CNN)

The “Fire Story” has multiple chapters



Images: Tall Timbers Research Station and Land Conservancy
Longleaf pine (*Pinus palustris*), approx. 400 years old



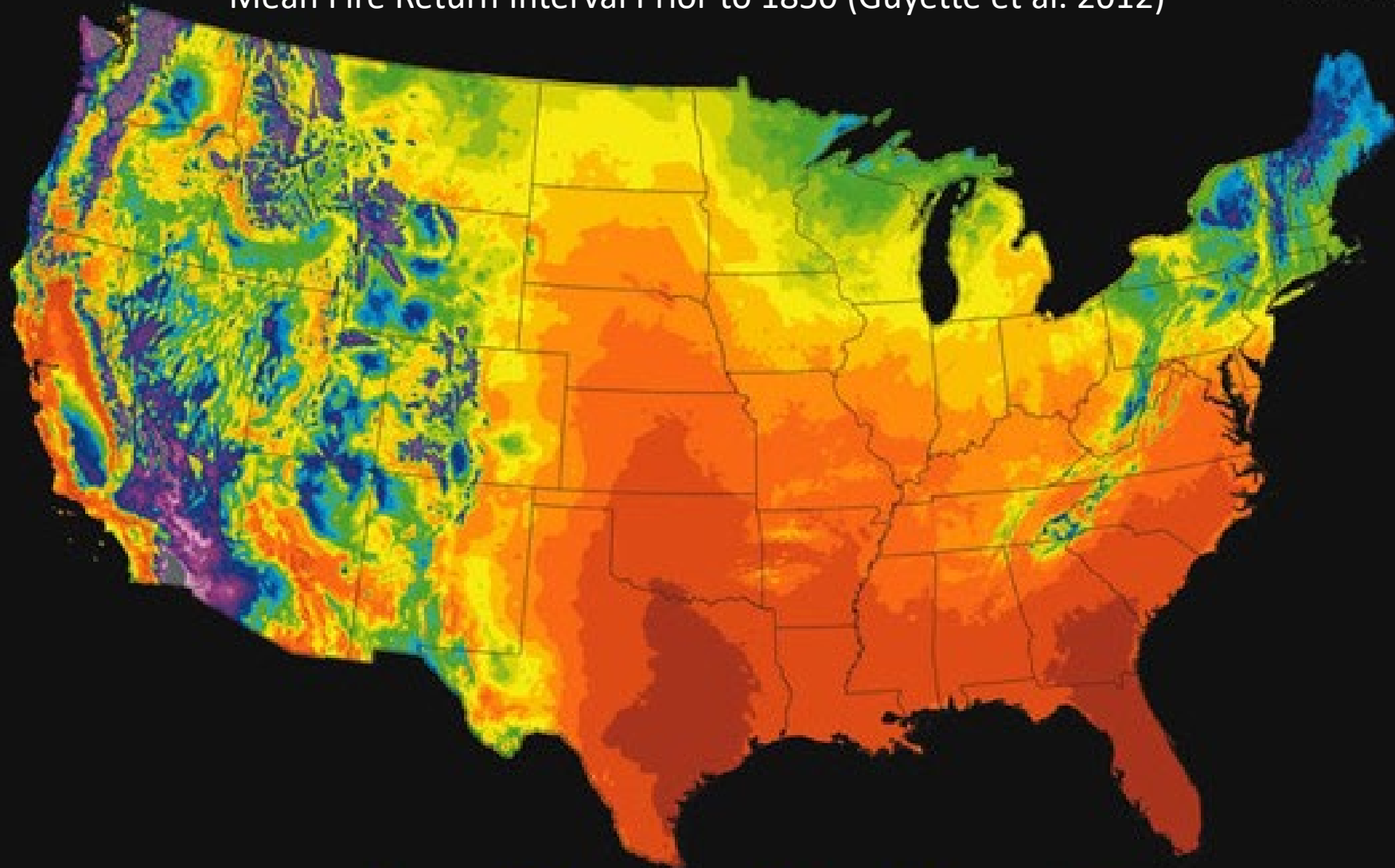
Table Mountain Pine

May 2018 Wildfire – Bland County



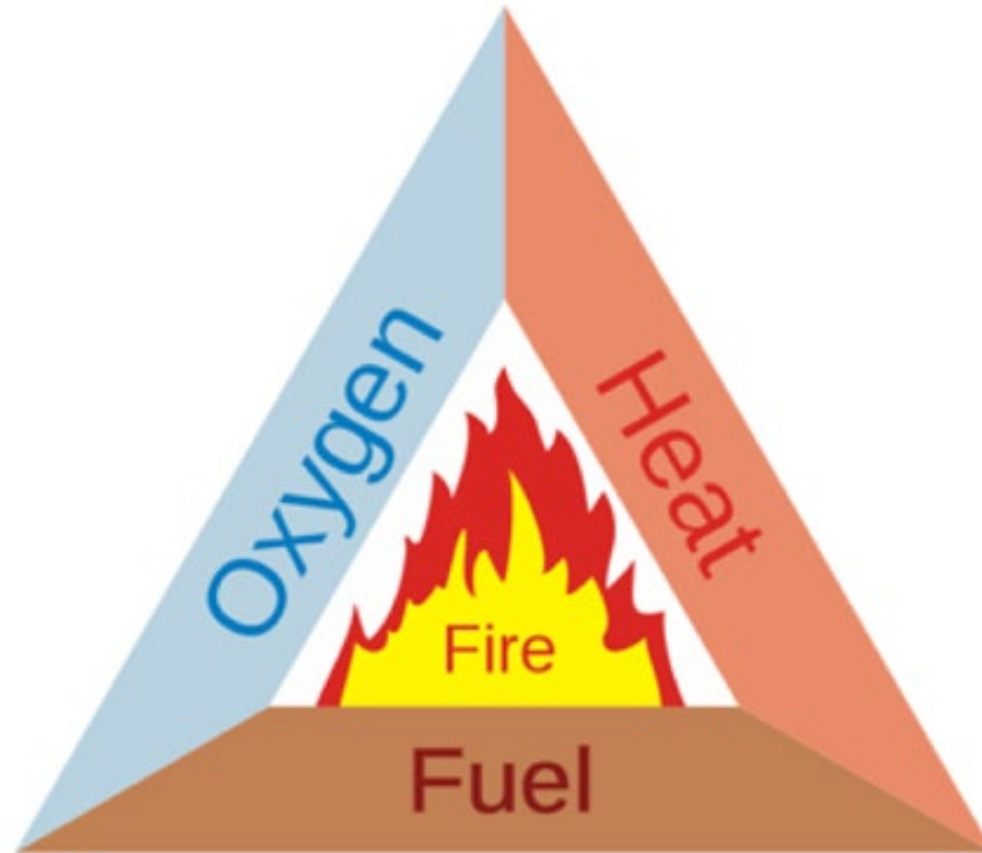
Mean Fire Return Interval Prior to 1850 (Guyette et al. 2012)

v. 9.0 MFIAR10f



Mean Fire Interval	4.01 - 6	12.1 - 14	20.1 - 22	28.1 - 30	45.1 - 50	126 - 150
years	6.01 - 8	14.1 - 16	22.1 - 24	30.1 - 35	50.1 - 75	151 - 175
< 2.01	8.01 - 10	16.1 - 18	24.1 - 26	35.1 - 40	75.1 - 100	176 - 200
2.01 - 4	10.1 - 12	18.1 - 20	26.1 - 28	40.1 - 45	101 - 125	201 - 6,360

Earth is a fire planet



Fire Triangle

Image: idahofirewise.org

Think of all the things we'd lack without fire



Image: prague-guide.co.uk

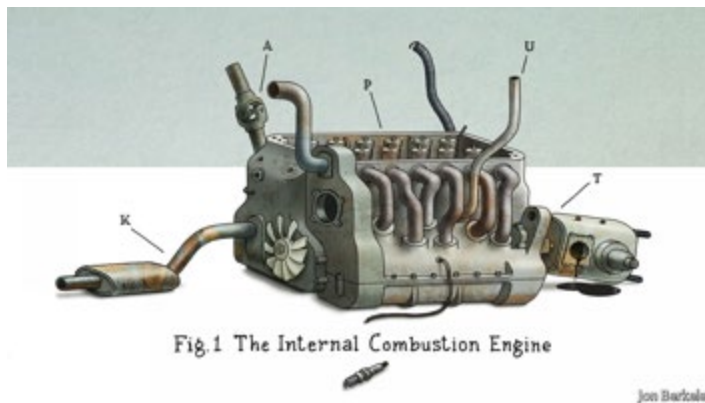


Image: pricetags.wordpress.com



Image: lightningquickreads.com



Image: writeopinions.com



Image: allsaintsmarple



Image: pxhere.com

Fire is a cornerstone in civilization

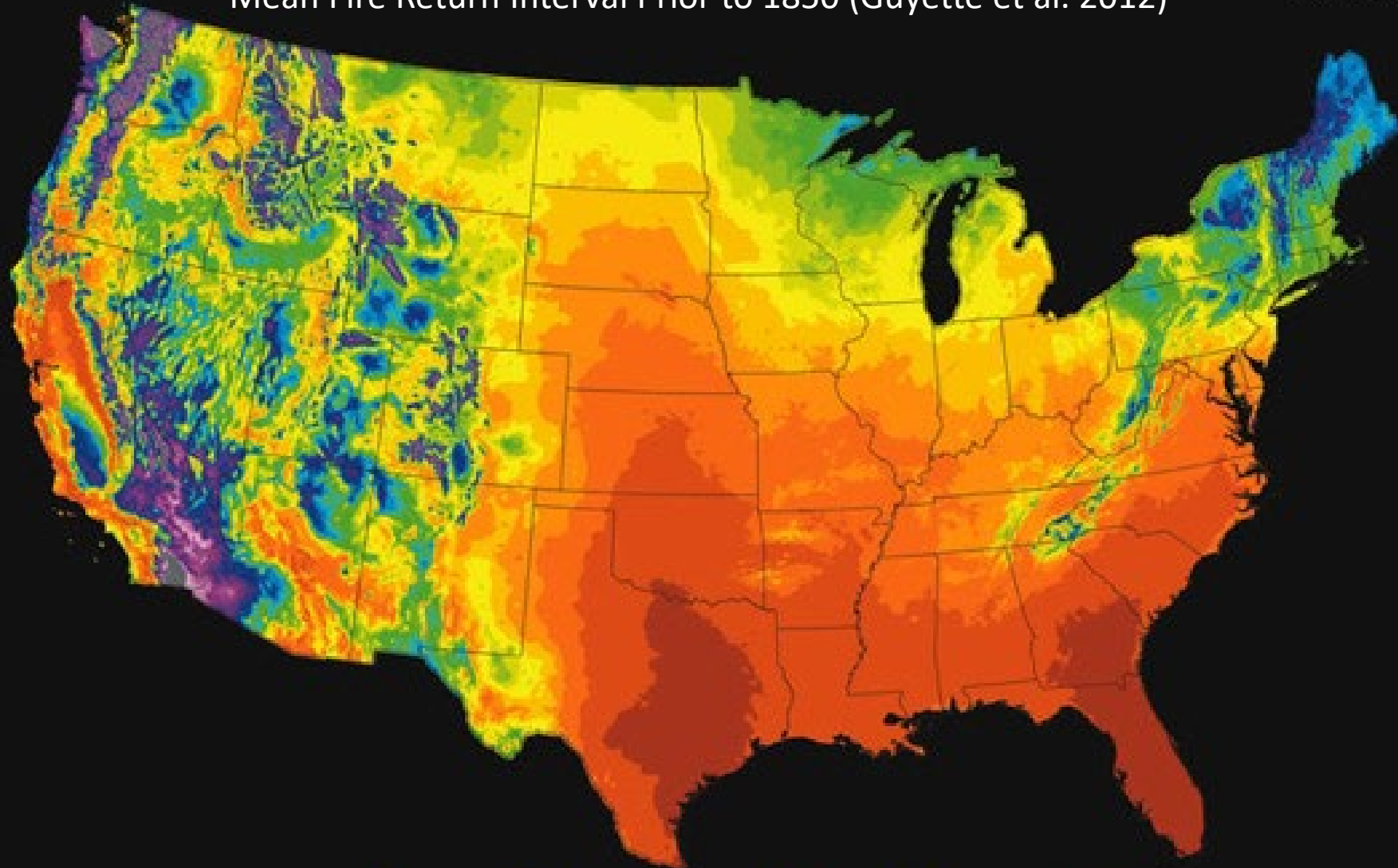
- Despite our fire dependence, we often view it as an anomaly and malice
- It must be contained, confined, and constrained within a civilized society
 - This is especially true when it comes to our natural landscapes



Image: pixshark.com

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v. 9.0 MFIAR10f



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George Percy (1607)

“Two days after first sighting the coast of Virginia in 1607, the Jamestown colonists noticed “...great smokes of fire...” rising from deep in the woods. “We marched to these smokes,” recalled George Percy, “and found that the [Native Americans] had been burning down the grass as, we thought, either to make their plantation there or else to give signs to bring their forces together, and so to give us battle.”

Wood (1634)

- “There is no underwood saving in swamps and low grounds that are wet...for it being the custome of the [Native Americans] to burne the wood in November...it consumes all the underwood and rubbish...there is scarce a bush or bramble or any cumbersome underwood to bee seene”

William Bartram (1773)

- *“This plain is mostly a forest of the great long-leaved pine the earth covered with grass, interspersed with an infinite variety of herbaceous plants, and embellished with extensive savannas, always green...”*
- *“...riding through high open, pine forests, green lawns and flowery savannas in youthful verdure and gaiety, having been lately burnt, but now overrun with a green enamelled carpet...”*

Real evidence



- He might possibly refer to something like this
- This is less than one month after a prescribed burn on the Tom Yawkey Wildlife Center in Georgetown, South Carolina
- This was 4th burn that had occurred on this particular tract in the last 5 years

Tracking fire on the landscape

- Settler accounts
- Soil charcoal
- Pollen records
- Tree rings

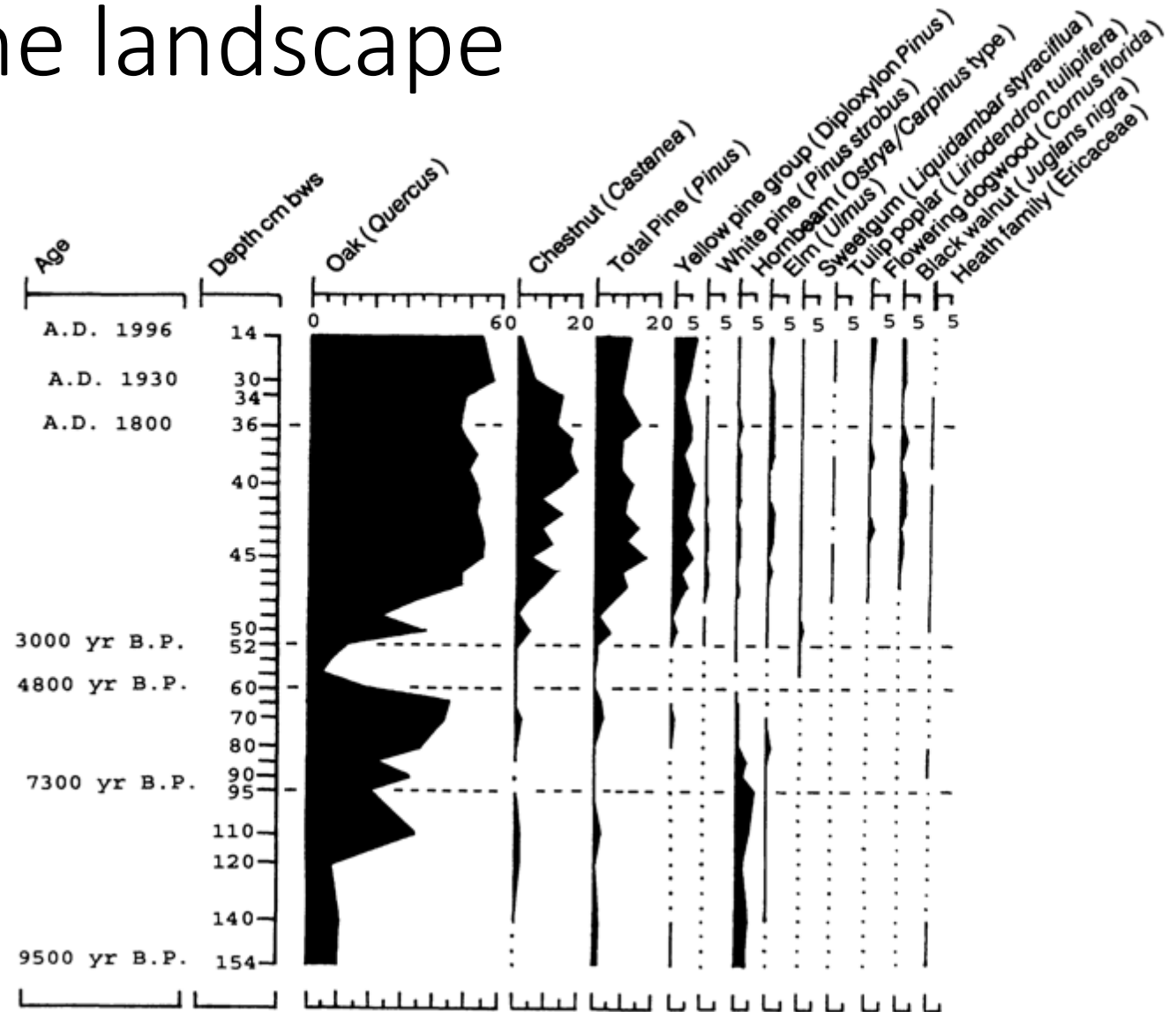


Image: Delcourt and Delcourt, 1998

Ring analyses can identify fire seasonality



Images: missouri.edu

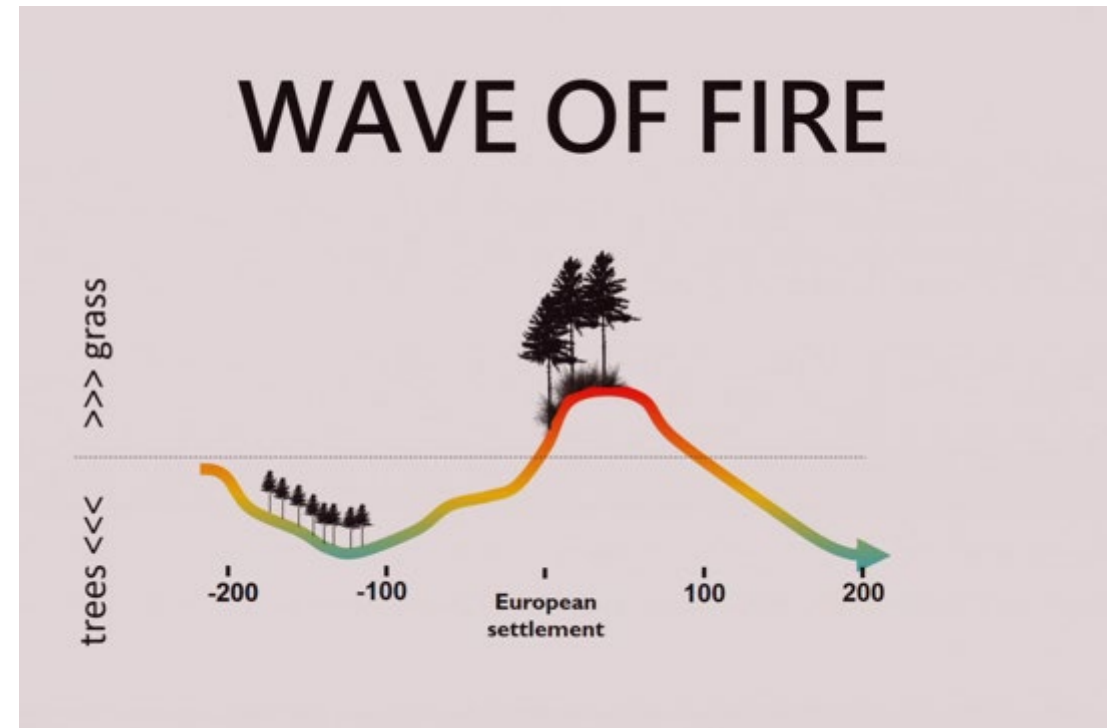
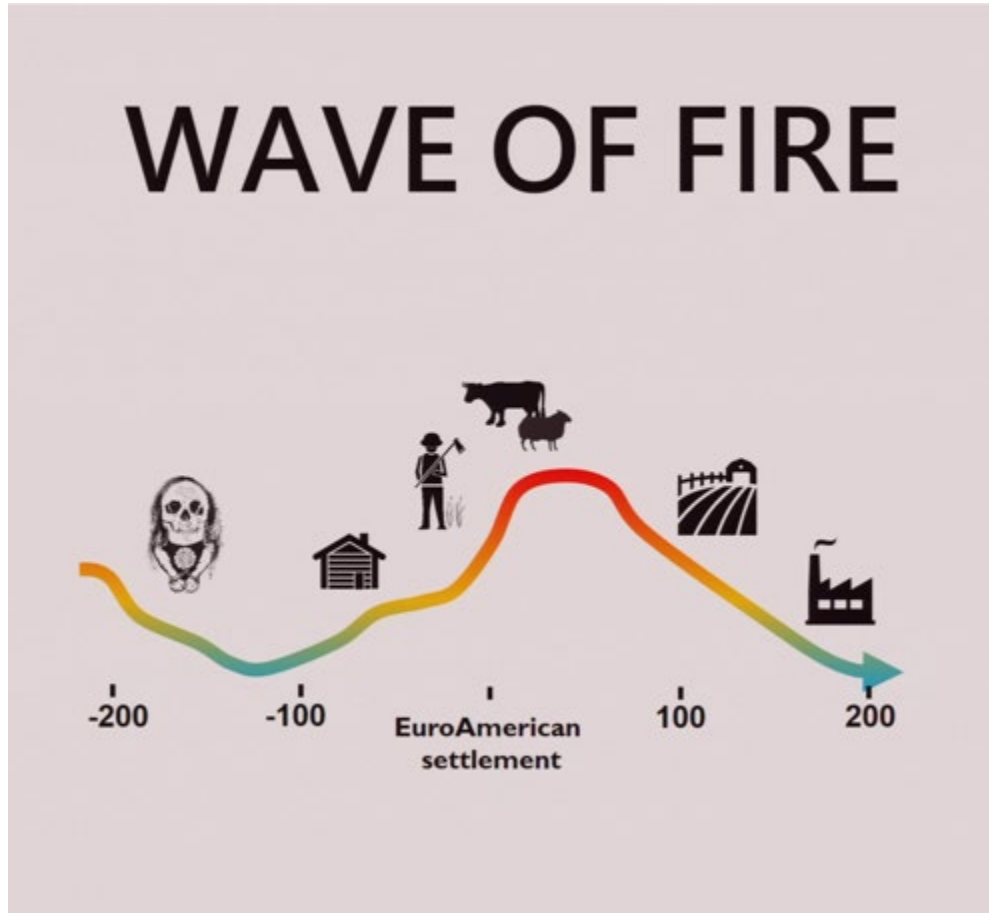
Why Native burning?

- Control of pests and diseases
- Clearing land for pasture/agriculture
- Access to water
- Control of understory for access/corridors
 - Travel
 - Hunting
- Warfare
- Toolmaking
- Fertilization effects



Image: wikipedia

Picture the presence of fire as a wave



Images: Stambaugh, 2017 – Association for Fire Ecology
Orlando, Florida

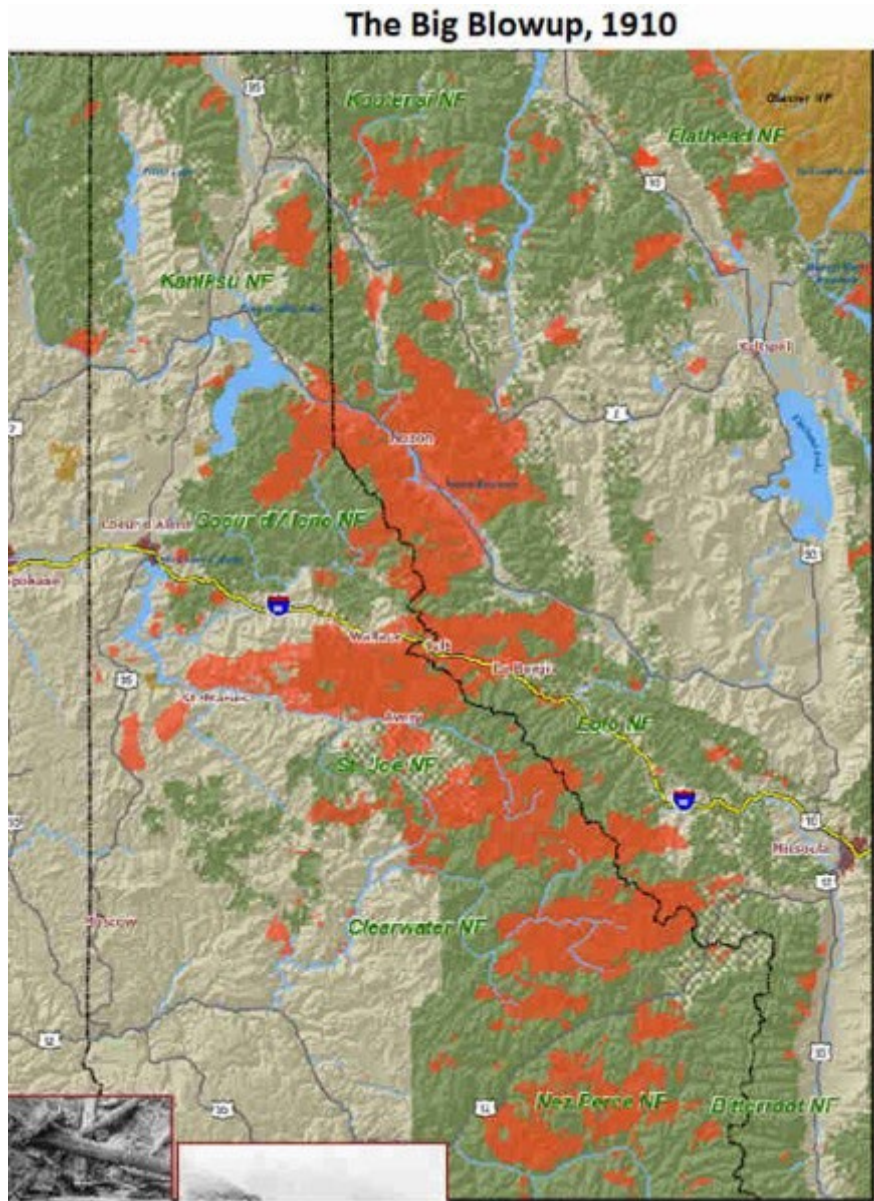


Image: kulr8.com

Fire exclusion

- Federal land management in the United States has been marked by our opinion of and response to fire
- 1910 – Big Blowup occurred in the Western US
- 10 AM Policy unofficial policy
- Attitude persisted through 1970s
 - “Prevent (all) forest fires”

Lack of fire changes ecosystems

Fire dependent species & communities



Image: lucyconklin.com

Fire adapted species & communities



Image: conservationgateway.org

How many SE locations look like this?



Piedmont



Mountains

Example: Gatlinburg/Southeast, 2016



Image: www.rt.com/usa/368497-gatlinburg-fire-evacuations-arson/



Image: wjhl.com



Vintage



Today

Reasons to consider prescribed fire

- Site preparation
- Intermediate treatments
- Fuel hazard reduction
- Wildlife habitat improvement
- Vegetative species control
- Aesthetics
- Pest/disease reduction



Image: workgreen.ca

Fire manipulation

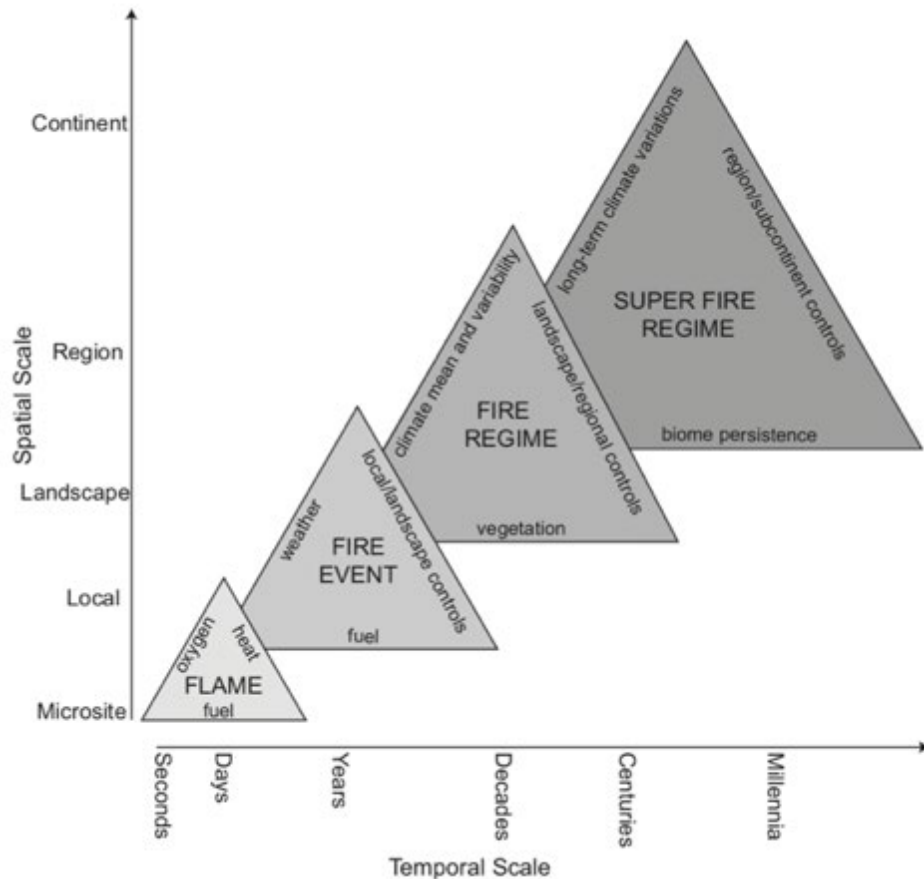


Image: Scott et al. 2014

- Frequency
 - How often will you burn this property?
 - Affects fuel amount and type
- Season
 - Dormant or growing
 - Fall or winter
 - Spring or summer
 - Fuel moisture
 - Vegetative competition
- Weather
 - Ambient temperature
 - Cloudy or clear
 - Days since rain
- Ignition
 - Burning with wind
 - Against the wind

Potential threats to prescribed fire use

- State certification
 - 4 PM Burning Law
- Proper PPE and tools
 - Nomex pants and shirts
 - Perimeter creation
- Neighbors
 - What are they going to think?
- Smoke management
 - How much? How long?
 - Where will it go? Who will it affect?
 - Look at forecasts and have a plan



Image: Fishburn Forest, Blacksburg
November 29, 2018

Smoke considerations

- Firing technique
 - Head fire = more smoke
- Fuel factors
 - Unique to you
 - FOFEM, CONSUME, vSMOKE
- Atmospheric dispersion Index
 - 40-60 ADI

Daytime Smoke Management Complexity Worksheet

The following worksheet is provided as a guide to determining the complexity of a smoke management situation. Knowing the complexity can help determine the appropriate level of smoke screening required for a burn. Note this worksheet is only dealing with the daytime, active burning portion of the burn, not residual burning/smoldering or nighttime conditions.

Acres in Flaming Combustion Stage per Hour

- (1) Size in acres _____ acres
 (2) Expected duration of flaming combustion stage for burn _____ hours
 (3) Divide (1) by (2) _____ acres/hour

(4) Select values based on (3)

- < 150 acres/hr = 0
 150-300 acres/hr = 1
 > 300 acres/hr = 2

Score _____

Fuel Load Consumed

- < 4 tons per acre = 0
 4-8 tons per acre = 1
 > 8 tons per acre = 2

Score _____



Introduction to Prescribed Fire in Southern Ecosystems



_____ miles downwind of the burn unit = 0

_____ miles downwind of the burn unit = 1

Score _____

(www.airnow.gov)

Score _____

(in weather section)

Score _____

_____ site = 0

_____ within _____ 60 mile downwind = 1

Mobley (2007)

Score _____

Total _____

_____ of 2) = Low complexity smoke situation

_____ of 2) = Moderate complexity smoke situation

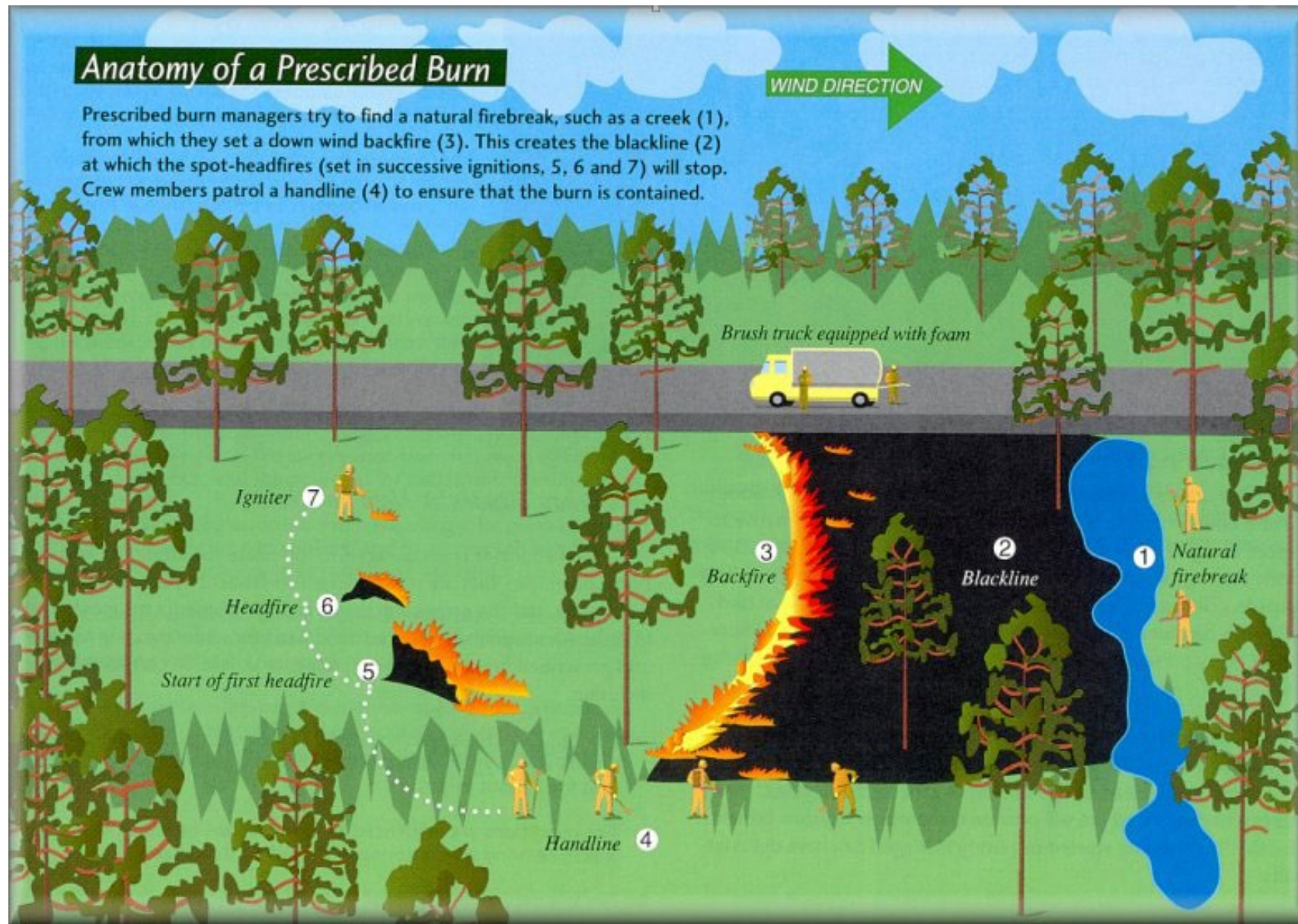
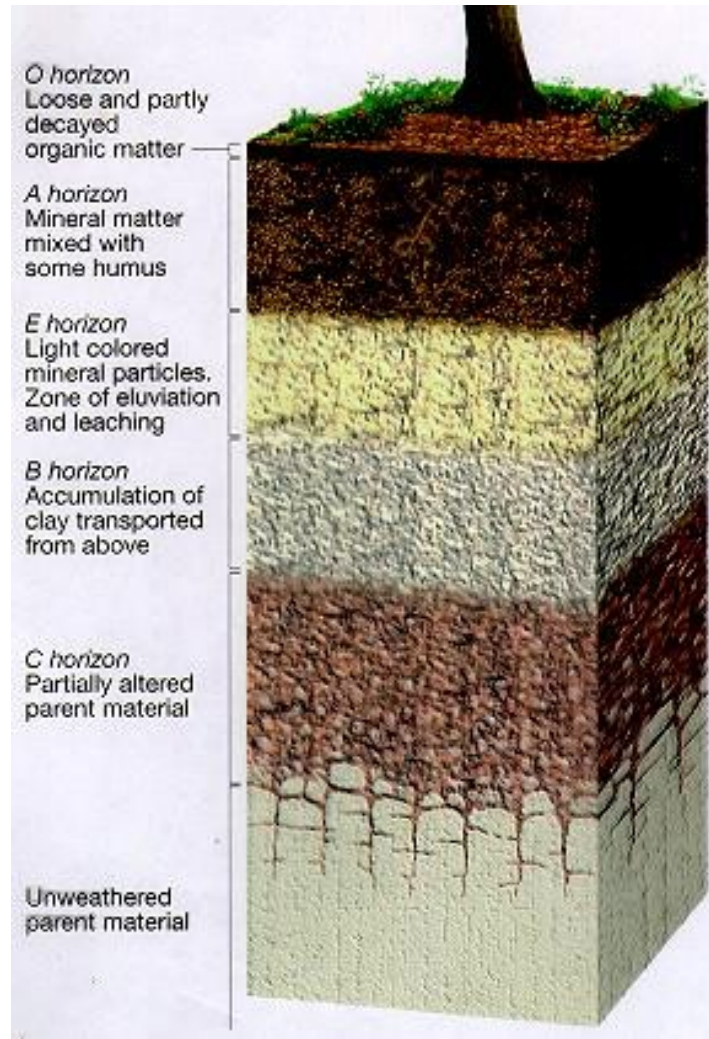


Image: wildfiretoday.com

Duff accumulation



- Fuels change over time
- Forest soils are pretty unique
 - Litter layer
 - Duff layer
- Small “feeder” roots that absorb lots of water enter the duff shortly after fire is not present
- First-entry burns in long-term unburned forests can be problematic

Image: hawaii.edu

Fire regime



Image: Frequently burned loblolly pine

- In our forests, we do not want to try and accomplish every objective on the 1st burn
 - It takes time (trial and error, too!)
- Ultimately we are thinking about a **FIRE REGIME**
 - Not just 1 burn
 - A system of repeated fires
 - Probably FREQUENT and PERSISTENT

Art, science, & experience

- Think of it as “prescribed fire”
- Similar to a prescription to lose weight
 - Exercise
 - Eat better
 - Get plenty of sleep
- It requires as much art as it does science and experience



Image: washingtonpost.com

Case Studies: Mountains/Ridge & Valley

- Nearly 80 years after death of American Chestnut
- Oak component in overstory, but few quality oak sites have significant oak regeneration
 - It would seem fire played a role in their presence originally
 - Use fire again to focus on new regeneration?
- Invasive shrubs





Control



Burn-only



Mechanical-only



Mechanical & Burn

Southern Appalachian Fire/Fire Surrogate

Results : Woody tree species (stems/ha)

- Oaks: most significant increases in MB and B, by 23,400.0 and 21,700.0 stems ($P < 0.01$ and $P < 0.01$)
- Pines: increases in MB, B, M, and C, by 850.4, 650.4, 133.8, and 53.8 stems; and no differences between trts
- MHW: increases in B, M, MB, and C by 24,066.7, 6,716.7, 6,700.0, and 500.0 stems; with significance in B only ($P = 0.01$)

Southern Appalachian Fire/Fire Surrogate

Results Continued : Herbaceous species (% cover)

- Shrubs: slight decreases in C, B, and MB (-1.1, -0.4, and -0.2 %), but increases in M (4.5 %) had slight significant differences from other trts ($P=0.06$)
- Graminoids: slight increases in MB, B, and C, (2.4, 1.5, and 1.5 %) and no change in M (0.0 %); with no differences between trts
- Forbs: minimal increases and decreases in MB, B, M, and C (1.2, 1.0, 0.1, and -0.8 %), with no differences between trts



Control



Burn-only



Mechanical-only



Mechanical & Burn

Case Studies: Piedmont

- Several thousand acres acquired by The Nature Conservancy
- Planted loblolly pine (longleaf in close proximity)
- Red-cockaded woodpeckers
- Decrease hardwood competition and increase grass response with growing season burns
- RCWs utilizing loblolly pine



Case studies: Coastal Plain



- [Longleaf pine](#) – 96 million acres from eastern Texas to southeast Virginia in 1900
 - 3 million acres in 1995
- Longleaf pine – wiregrass ecosystem
 - Up to 400 plant species in 1 m²
 - Biological diversity
- Frequent burning may improve water quality and soil fertility
 - Reduced drinking water contamination

Think prescribed fire might be a good fit?

- What are your management objectives?
 - Fire is not a magic pill
 - Wildlife values
- Wildland Urban Interface?
 - Neighbors
 - Smoke Sensitive Areas
- Are you patient?



Image: Oregon State University

Resources

- Virginia Dept of Forestry
- Virginia Dept of Game and Inland Fisheries
- Virginia Dept of Conservation and Recreation
- Virginia Prescribed Fire Council
- The Nature Conservancy
- Virginia Tech
- Southern Fire Exchange
- Joint Fire Science Program

Questions?

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