

**Fire in Eastern Oak Forests:  
Delivering Science to Land Managers Conference  
November 15-17, 2005  
Fawcett Center, The Ohio State University, Columbus, OH  
<http://www.fs.fed.us/ne/delaware/4153/fireconf.html>**

**Meeting Notes by:  
Gregory Nowacki (R09), Beth Buchanan (R8), Charles Ruffner (Southern Illinois  
University), Todd Hutchinson (NERS), & Mark Ford (NERS)**

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Wednesday, 16 November

Fire History

08:15 **Paleoecological Evidence of Fire in Eastern Oak Forests**; William Patterson,  
University of Massachusetts

- Sediment cores are extracted from depressions, lake bottoms, bogs, etc. (areas of long-term deposition) and analyzed for contents
- Laws of superimposition are assumed (sediment layers are incrementally older from top to bottom)
- Two types of data: fossil pollen and charcoal
  - o 1) Fossil Pollen Analysis:
    - data usually reported as percentages (relative pollen frequency)
    - pollen is extremely resistant to decay in most cases, allowing for reconstruction of past vegetation over time
    - the amount of different pollen types in a layer is roughly equivalent to the amount of tree species on the surrounding land
    - some pollen can be discerned to the species level, others to the genus; for instance, oak pollen can be identified only to the genus level
    - A Global Pollen Database is maintained at:  
<http://www.ncdc.noaa.gov/paleo/pollen.html>
  - o 2) Charcoal Analysis:
    - less standardized than pollen analysis
    - larger charcoal particles are from close proximity, whereas smaller charcoal particles are from more distant sources
    - water is a very important mode of charcoal transport into lakes/streams
    - An International Multiproxy Paleofire Database is maintained at: <http://www.ncdc.noaa.gov/paleo/impd/paleofire.html>
- Fossil pollen and charcoal analyses are often put side-by-side along timelines for comparison.
- Paleoecological investigations have found an increase of charcoal in Maine after European settlement, indicating increased post-settlement fire.

- Fire seasonality has important implications on vegetation. Summer burns affects understory vegetation (via increased mortality) much more than winter burns.
- Winter burns every 4 years or so seems to encourage oak regeneration.
- Too much fire (frequency, severity) can lead to oak-to-pine conversion.
- Sediments can show >5000 year history of fire and pollen!
- Some sediment cores exhibit a low background level of charcoal indicating low intensity fires.
- Individual fires probably are stand-replacement fires

09:00 **Fire Scars Reveal Variability and Dynamics of Eastern Fire Regimes;** Richard Guyette, University of Missouri)

- Fire scars result from fires that kill cambium; bole growth around injury forms a “cat face;” repeated fire injuries result in multiple cat faces; fire histories (fire year and frequency) can be derived from fire scars.
- Trees differ in their susceptibility to scarring and data retention (rot resistance); this needs to be considered when reconstructing fire histories.
  - o For instance, small and/or thin-barked trees scar more easily than large and/or thick-barked trees
  - o Beech rots easily and retains tree-ring data only for a short while, whereas oak is rot-resistant and retains tree-ring data for a long time.
- Ninety percent of fire scars occur on the uphill (leeward) side of trees.
- May 19, 1780 was referred to as “the day of darkness” when major fires were burning and smoke filled the skies throughout the East.
- Factors controlling fire: climate, people, topography, and lightning.
- Human population densities are not static, although they do have spatial similarities that persist through time and cultures (i.e., people prefer certain places over others, so there’s some continuity where they consistently live).
- In Arkansas, human population changes correlate with fire occurrence. Regarding topography, fire-return intervals were shorter on flat areas vs. rugged areas. As such, human-topography interactions and feedback dictated past burning regimes.
- Multiple regression analysis of many variables found only temperature and population as strong predictors of fire (based on fire-scar data). Temperature explained 62% and humans 13% of fire frequency variation.
- Southeast U.S. has very little data; a few studies, though, go back to 1600s.
- While tree “cookies” may not show evidence of fires, they are *not* evidence of a *lack* of fire.
- In each of 36 studies, looking at >500 trees, there is never more than 20% of trees scarred

10:00 **Understanding the Evidence for Historic Fire Across Eastern Forests**; Charles M. Ruffner, Southern Illinois University

- There are many ways to determine disturbance/fire histories:
  - Historical documents: important information of land-use/site history from deeds, wills, sheriff sales, tax records, and collected manuscripts
  - Traveler descriptions: despite some cautions (Forman and Russell 1983) many use these primary sources from individuals who “had the unsurpassable advantage of actually having seen presettlement landscapes and aboriginal land management practices “ (Ladd 1991)
    - Outstanding examples include:
      - Wm. Strachey (1620)- described area of Hampton VA, as...”the seat sometye of a thowsand Indians and three hundred houses...which is the reason that so much ground is there cliered and opened, enough already prepared to receive come and make viniards of two or three thowsand acres
      - 1672- The Discoveries of John Lederer: In three several marches from Virginia to the west of Carolina: documents open valleys and burning pine forests near Indian settlements
      - Henry Schoolcraft’s 1821 Ozark Journals document his travels through the Ozark region where his training allowed him to accurately identify plant assemblages and report on the character and condition of many unique ecological sites and phenomenon encountered on his trips through Indian territory
  - Witness-tree studies
    - Corner trees used for metes-n-bounds surveys; true witness trees used in rectangular land surveys to “witness” a corner
    - Black & Abrams (2001) found increased hickory and walnut by Native American villages in south-central Pennsylvania
    - Whitney & DeCant (2003) found increased oak-hickory on river bottoms associated with Iroqouis sites in northwestern PA
    - Black, Ruffner, and Abrams (forthcoming) report that no single site factor influences species composition more than Native American impacts across Allegheny Plateau region of Pennsylvania. Through their use of fire, Native Americans may have facilitated oak forests to become established within a mesic northern hardwood dominated area.
  - Fire-scar data-fire free intervals range from 2-25 years across much of the oak biome and a direct relationship to human population over time
  - Old-growth literature- most reference long-term oak recruitment and periodic disturbance up through 1940s followed by encroachment of mixed mesophytic individuals into subcanopy
  - Paleocological studies Classic Examples of Human-Site Interactions

- Paul and Hazel Delcourt (and others) extensive work in the Tennessee Valley and Cliff Palace Pond, Ky
- Patterson and Sassaman (1988) documentation of human fires near coastal and riverine settlements in New England
- James Adovasio's work at Meadowcroft Rockshelter, Pa
- James Clark's work at Crawford Lake Ontario
- Ethnohistory/anthropology
- 1. Cultural Uses of Fire: Classic papers include Maxwell 1910, Bromley 1935, Day 1953, Doolittle 1991, 2003
  - Reduce rattlesnake populations
  - Encourage berry and browse production
  - Lure deer into hunting range
  - Reduce understory debris to aid movement
  - Expose acorns on ground for collection
  - Drive game for hunting
  - Clear and maintain fields
  - Encourage resprouting species
  - Deny forage to other groups
  - Reduce unwanted species
  - Girdle trees for felling
- 2. Prehistoric Subsistence Patterns:
  - PaleoIndians (20,000-8500 BC)
    - Migratory groups hunted caribou, white-tailed deer and gathered hickory, walnut, and hackberry nuts (Adovasio 1993)
  - Archaic (8500 BC-1000 BC)
    - Seasonally sedentary, groups experienced increased cultural diversity, food specialization, rapid population increases
    - Balanoculture- successful nut management led to "Primary forest efficiency" (Caldwell 1958)
    - Manipulating areas of more abundant food resources led to a higher degree of residential stability offering more opportunities for craftsmanship and ornamentation to flourish
    - Hopewellian Interaction Sphere (Moundbuilders) influences cultures across eastern deciduous biome
  - Woodland Period (1000 BC- AD 1550)
    - Horticulturalists living in semi-permanent villages practicing various crafts and ceremonies
    - Dependent on Three Sister's Agriculture (maize-beans-squash)
    - Extensive fields maintained for 8-15 yrs, then fallowed and burned
    - Augmented substantially by hunting and gathering wild resources
    - Acorn caches and nut shell middens common
  - Historic Period (AD 1550-post Contact)
    - Anthropogenic landscape resembled mosaic pattern
    - Croplands near settlements
    - Abandoned clearings with early successional taxa
    - Open forest stands dominated by fire adapted species

- Influence of Native land use spans a wide continuum
- Early Euro-Americans actually increase burning over much of the eastern U.S. compared to Native Americans!
- When you look at the current vegetation, consider geology, soil, successional pathways, Native American and European American management, land use (maple syrup collection, coppicing, charcoal, grazing, timbering and others), disturbances (fire, hurricanes, tornadoes, wind, ice) and range of variability
- Many historical descriptions by respectable authors with minimal bias exist.

10:45 **Trends in Oak Abundance in the Eastern United States**; Keith Moser, FIA

- Oak basal area is actually increasing in the eastern U.S. mainly due to trees getting larger in size rather than recruitment. Oaks are not being over cut.
- Non-oak competition is establishing and growing faster than oaks.

Vegetative and Forest Floor Responses to Fire

11:30 **Ecological and Ecophysiological Adaptations and Responses to Fire in Eastern Oak Forests**; Marc Abrams, Pennsylvania State University

- A dynamic equilibrium maintained oak over millennia in the eastern U.S.
- An ecological cycle perpetuating oak for thousands of years has been broken this last century -- reasons equivalent to “A Perfect Storm” (logging + clearing + catastrophic fire + suppression + non-native insects & diseases + deer (NE))
- Natives had a large impact on vegetation and greatly facilitated oak.
  - o For instance, “fingers of oak” jutting into the northern hardwood system in Pennsylvania were established and maintained by Natives near villages and travel corridors.
- There has been an incredible explosion of red maple across the landscape recently. Red maple referred to as the “swamp thing” because in presettlement times it was largely restricted to wet areas (swamps and riparian areas; areas that didn’t burn). This fire-sensitive species has benefited tremendously by the cessation of landscape burning.
- White oak was least opportunistic among the oak species to chestnut blight; northern red and chestnut oak were most opportunistic to chestnut blight and increased their representation sizably.
- Oak occurred in uneven-aged stands historically, maintained by surface fires and regenerated in canopy gaps.
- Blackgum = the red maple of the south.
- Deer browsing has been a problem for oak in certain locations.
- White oak was King across the east. Also black oak (22 of 26 studies)
- Red maple “swamp maple” now a big player (#1 species in 12 of 17 studies).
- Red oak and chestnut oak increased post-logging boom. Seem to respond better to clear cuts, and responded well to loss of chestnut too
- Lots of adaptations: thick bark, rot resistant, tyloses, deep roots, sprouting ability, increased germination post-fire; drought resistant: thick leaves, high overnight hydration, increased photosynthesis, high stomate level, low wilting point, retains leaves after drought; seedlings: large cotyledon, emphasis on root growth, relatively high photosynthesis

12:15 **Why Sustain Oak Forests?**; David Smith, Virginia Tech [retired]

13:45 **Research Efforts on Fuels and Fuel Models in Eastern Hardwood Forests**;

Tom Waldrop, SRS

- Various fuel models compared.
- Fuel loading does not change much across topography or by topographic position; for instance, south- and north-facing slopes have similar fuel loads.
- Ericaceous shrubs (mountain laurel; rhododendrons) burn very vigorously when ignited. (but won't burn in many cases).
- At a large geographic scale across the eastern U.S., hardwood fuels vary widely from north to south.
- Past disturbances and shrubs are important variables re: fuel loading in hardwood systems.
- BEHAVEPlus 13 fuel models + 40 custom models. ROS under-predicted, mortality over-predicted for FMs 8 and 9
- FARSITE can use >1 fuel model
- LANDFIRE 30 m resolution of vegetation (GIS). East should be mapped by 2008 (landfire.gov)
- National Photo Series a work in progress <http://www.fs.fed.us/pnw/fera/>
- FIA data shows that woody debris and duff decrease to the south, shrub/herb layer and litter increase to the south
- LANDIS tracks fuel loading over time (Ozark Mountains)

14:30 **Earth, Wind, Water, and Fire: How the Elements Conspire in the Forest**

**Context**; Ralph Boerner, Ohio State University

- Presents data re: fire effects on organisms and ecological processes...
- By what mechanism can fire impact soil biota?
  - o Direct heating
  - o Volatilization & ash convection
  - o Deposition of ash & altered fuels
  - o Exposure of mineral soil
- How much does the soil heat up during fire?
  - o Not much, except beneath smoldering wood heaps/slash piles where soil temps might reach lethal biological thresholds ( $\approx 50^{\circ}\text{C}$ ). As such, don't pile slash and burn!
- How does ash deposition affect soil fertility?
  - o Soil pH increases with burning, roughly 0.5 of a pH unit (a 5-fold increase!).
  - o Available calcium increases with burning.
  - o Periodic burns are better than annual burning in regards to nutrients over the long term.
- How does fire affect the ability of the forest to store carbon removed from the atmosphere?
  - o Fire has no significant affects over the short term.
  - o Fire has no significant affects over the long term.
- Eastern hardwood surface burns:

- Consume less of the forest floor and cause less mineral soil exposure.
- Usually doesn't consume root systems, hence there is little or no treatment of mass wasting/major erosion.
- Doesn't induce hydrophobicity.
- Burning shifts plant phenology:
  - Black surface residue warms up more quickly.
  - Root growth/green-up begins earlier and ends later after a burn; burning essentially extends the growing season (weather permitting)!
- Periodic burns are usually good for animals.
- Fire leads to greater fungal activity but reduced microbial activity.
- In conclusion:
  - Direct heating typically doesn't harm soils.
  - Fire can affect the timing of ecological processes (green-up; biological activity).
  - Overall, fire effects are modest, often benefiting soil communities/microbes/animals.
- Direct heating: no good data for hardwoods. Study in longleaf pine: soil doesn't heat up enough to kill microorganisms. Study in New Zealand: temp under jackpots can kill microorganisms
- Soil pH: increased compared to unburned sites. Less acidic; buffers acid rain
- Available calcium: increased calcium and nutrient capacity
- In a 30 year study in Ozark Mtns, no change in pH and Calcium over 30 years
- Erosion: no evidence in eastern hardwoods
- Microclimate: very large difference until leaf fall. In soil, not much difference
- Things warm up and cool down earlier with fire: by one month. Could lead to changes in root growth, vegetation growth and Nitrogen cycling patterns
- Soil animals in leaf litter: they get burned up, but may increase with periodic fire
- Soil animals in mineral soil: no change
- Bacterial activity: improved activity for decomposers, no change over time, though

### 15:30 Responses of Oak and Other Hardwood Regeneration to Prescribed Fire:

#### **What We Know as of 2005;** Patrick Brose, NERS

- When to use and not use fire for oak regeneration according to Oliver and Larson's (1996) stand development stages:
- Understory Reinitiation Stage (Mature Stands):
  - Fire can be used as a site preparation treatment to increase germination success and understory light levels
  - Best seedbed: acorns 1" into the mineral soil or in the fermentation layer of duff; uncompacted soil for easy root penetration
  - Blue jays and squirrels like to bury acorns in post-fire conditions.
  - Acorn fire resistance: NRO > Black, Chestnut, Scarlet Oak > White Oak.
  - Burning frequency for oak success?
    - Single burns don't do much.

- Multiple fires conducted periodically probably best; there is a point of diminishing returns however (burning too much).
    - Don't underestimate damage to existing dominant trees!
- Stand Initiation Stage:
  - Thinning from below probably best way to jump-start oak regeneration.
  - If oak regeneration is taller than its competitors, don't burn.
  - If oak regeneration is shorter than its competitors, than burn.
  - Sprouters respond best to burning:
    - Excellent: oak, hickory, locust, aspen, sassafras, ash, walnut.
    - Intermediate: pin cherry, red maple, blackgum, beech, magnolia, black cherry.
    - Poor: birch, tulip poplar, sugar maple, hemlock, white pine, striped maple.
  - Tree mortality to fire is lowest in winter and highest in the summer.
  - Mortality increases with fire intensity.
  - Oaks have a root collar that is recessed in the duff layer, hence more protected to surface burning.
  - Once the stand achieves crown closure, don't burn!
- Stem Exclusion Stage:
  - Don't burn!
- The above was summarized from 53 papers, 36 that dealt with a single fire and 17 with >1 fire
- Looked at #s, relative abundance, height of oaks vs. other species
- Grouped studies by age/phase of stand: Stand Initiation (1-10 yrs), Crown Closure (10-15 yrs), Stem Exclusion (15-80 yrs), Understory Initiation (80+ yrs)
- Grouped studies by whether there was cutting involved
- Commonalities of a single burn in young (1-10 yr) stands that led to negative results for oak regen: low vigor seedlings, low intensity fire, dense shade that is not decreased after the fire, high quality sites. Lost the oak seedlings but didn't increase the sunlight
- Commonalities of a single burn in young (1-10 yr) stands that lead to positive results for oak regen: larger oak regen, higher fire intensity, medium quality site, less shade. Increased relative or absolute density and height of oaks.
- Commonalities of a multiple burn study in young stands (1-10 yr) that led to negative results for oak regen: a light cut without much change in sunlight, only 1 or 2 years between cut and fire, low vigor oaks, good sites, little other change to vegetation. Possible deer browsing
- Commonalities of a multiple burn study in young stands (1-10 yr) that led to positive results for oak regen: big increase in sunlight, at least four years between cut and burn, good quality sites but growing season burn. Regen from root sprouts
- Don't cut till after a good acorn crop. Then open up canopy at least 50%. Will increase root system size substantially. Burn when the competition is taller

than the oaks, during dormant season when understory is leafing out. Then wait 2-3 years before evaluating.

- Few studies of stands in Stem Exclusion phase. Stem damage to saplings/poles. Up to ¾ trees damaged
- Few papers quantify fire behavior – this would help. Use paints, thermocouplers.
- Document pre burn conditions, including fuels and seedling height!
- Wait to report results

16:15 **Fire and the Herbaceous Layer of Eastern Oak Forests;** Todd Hutchinson, NERS

- The herbaceous layer is defined as the vegetation less than 1 meter in height.
- Forbs are the most diverse life form in the herb layer, followed by graminoids (grasses and sedges), tree seedlings, and shrubs.
- What is most lacking from our knowledge is how long-term fire exclusion has affected herb layer vegetation and also how the herb layer will respond to the long-term application of prescribed fire.
- Most herbaceous plants are not directly affected (damaged) by typical dormant season fires. By contrast, tree seedlings and shrubs are top-killed, but resprouting is widespread.
- Most herbs have neutral or positive responses to fire.
- Herb layer will usually increase in diversity and cover with burning.
- Compositional changes to the herb layer will not be large due to burning.
- Fire creates a response from the herb layer vegetation that is not replicated by mechanical treatments (e.g., thinning) alone, primarily by stimulating germination from the buried seed bank.
- In oak landscapes, the majority of rare plant species are threatened by shading due to lack of disturbance. Fire could benefit many of these species, but it is seldom applied as a management tool for rare species in forests.
- Fire season and intensity are important.
- Potential problems exist with NNIS & fire, especially disturbance-based spp.
- Results of a single late-spring burn: one year decrease in perennial monocots, but then they increased again. Probably went dormant
- Fall fires probably consume at least some seeds
- Smoke positively affects germination (!)
- Indirect effects: light penetrates to seeds in soil, soil warms earlier, sometimes plants flower more, post-fire
- Direct effects: may increase species richness, decrease tree seedlings, increase cover, seedbank species show up everywhere (in dry and mesic sites)
- Succession is a primary threat to many T&E species
- rare plants in mesic sites: no effect if a dormant season burn
- Summary: no effect or positive effect. Some increase in diversity, increase in cover, not much change in overall composition
- Seasonality and intensity are important

Thursday, 17 November

Fire - Fauna Interactions

08:00 **Do Fire and Insects Interact in Eastern Oak Forests?**; Lynne Rieske-Kinney, University of Kentucky

- Forest anthropods
  - o Important in soil formation and stability
  - o Aid in decomposition, aeration, nutrient cycling; disturbance agents.
  - o Are mainly mites (69%) followed by collembolans (20%).
- Mammals (grazing) have a much larger, disproportionate affect on oak seedlings than anthropods.
- Burning has a negative affect on anthropods:
  - o 6-fold decrease in mites
  - o 4-fold decrease in collembolans
- Leaf litter diversity was not affected by burning; however leaf litter abundance. It's probably the latter mechanism that in turn affects anthropods.
- Indirect effects on arthropods include changes in plant growth/vigor/survival, herbivory, foliar (leaf) chemistry
- White oak seedlings grew better post-fire
- Diversity: no change
- Abundance: decrease within the same burn year but some recovery or increases in year two
- Directly related to litter cover and depth
- It is very difficult to get good results on insect/fire studies for several reasons
- Changes in insect/plant relations should not unduly influence burning

08:45 **Does Fire Affect Amphibians and Reptiles in Oak-Hickory Forests?**; Rochelle Renken, Missouri Department of Conservation

- Why is this important?
  - o Significant part of biomass in forested systems is composed of invertebrates.
  - o Amphibians are tied to moisture (for reproduction and respiration), which can be affected by burning.
  - o Amphibians and reptiles travel short distances/have very small home ranges, hence can't run away from fires and must put up with the conditions given them.
- Burning reduces litter and CWD, which negatively affects amphibians and reptiles via habitat reduction.
- Burning reduces canopy cover, which increases sun penetration/intensity and promotes drying of the forest floor.
- Burning can increase rates of sedimentation and water temperatures, which can negative affect amphibians and reptiles (esp. eggs/reproduction).
- Current findings:
  - o Fire results in little direct amphibian and reptile mortality.
  - o Fire has little effect on overall amphibian abundance and diversity.
  - o Fire has increased lizards, yet little effect of amphibians and reptiles overall.

- Some salamanders lay eggs in moss or rotting logs. Herps are found in moist areas, under rocks and logs, in trees or in mammal burrows
- Current research indicates little direct mortality and little affect on overall herp abundance and diversity. Fire may decrease salamander numbers and increase reptile numbers
- No loss or appearance of species post-fire
- Why no change? some logs remain, plants rebound quickly, burn mosaic, trees still provide shade (moisture)
- There are still issues, though, if you are burning up to the stream edge

**09:30 Implications for Neotropical Migrant and Game Bird Conservation in Oak-Stands Managed with Shelterwood Cutting and Prescribed Fire;** Drew Lanham, Clemson University)

- Shelterwood/burn method offers opportunity to manage both mature forest and early-successional species
- Bird declines have been most dramatic among early-successional species (grassland and shrub) (39% woodland, 50% subshrub, 79% grassland)
- Discussed many species that can benefit from fire
- Diversity can be artificially inflated if you have hardwood intrusions into pine communities
- Birds often re-nest after fire
- “Mature forest” in his context may be 15-20 yrs old
- Minimum clear cut to benefit birds should be about 10 acres

**10:30 Fire Effects on Non-Game Mammals;** Mark Ford, NERS

- Non-game mammals are important considerations from a biodiversity and ecological function standpoint. Also, many are threatened & endangered species (TES) and are thus regulatory issues.
- Appalachians have a long history of fire compliments of Native Americans.
- Europeans had major impacts on the area, through clearing land for agriculture and logging.
- Fire is important to non-game mammals:
  - o 1) For oak regeneration
  - o 2) Maintenance of early-successional types
  - o 3) Maintenance of relict pine types
  - o 4) For habitat maintenance
- Prescribed burning has few discernible impacts on small mammals
- Slope position is the most important factor shaping species abundance.
- Loss of hard mast (acorns) negatively affects Alleghany woodrats.
- Indiana bats prefer riparian and open areas. As such, open areas are facilitated by burning. Indiana bats are bark roosters. Maternities are located in open, sun-drenched locales among rugged-barked trees.
- Very little information on central hardwoods
- Minimal/no effects on shrews, voles, mice, chipmunk
- Slope position and slope most important. Also, coarse woody debris, moisture, and boulderfields = refugia

- Salamanders: 3 yrs post-fire, no change in body condition or size classes
- Bats: most species spend most of their time in riparian areas (exceptions: Virginia big-eared and Rafinesque's bats)
- Indiana bats can forage in a "cluttered" environment, unlike many other species of bats
- An Indiana bat maternity tree was found in a logged, wildfire area with very low BA.
- Lots more is known about Indiana bats than has been published
- Caves can suck in smoke

**11:15 Fire Effects on Game Mammals; Patrick Keyser, MeadWestvaco**

- No correlation has been documented between fire and white-tailed deer! There is just no evidence.
- Oak and deer are more closely related in largely forested landscape (e.g., central WV) than in agricultural landscapes (Midwest). As such, maintaining oak is very important in the former compared to the latter.
- NO empirical data for game animals in central hardwoods
- Forage improvement lasts only about one year
- If no change in canopy (light), no change in forage nutrition
- Red maple and ash flowers are very important food to gray squirrels
- Growing season fire may reduce snails (host of meningeal worms in elk)

Obstacles and Solutions to Using Prescribed Fire in Oak Forests

**12:00 Prescribed fire: What Influences Public Approval?; Sarah McCaffrey, NCRS**

**13:30 Top 10 Smoke Management Questions for Fire in Eastern Oak Forests; Joseph Charney, NCRS**

- State, Tribal Implementation Plans (SIPs, TIPs) required for non-attainment areas. CAN include Rx fire emissions. TIPs can exclude fire as "natural background"
- Regional Haze Rules: states and tribes should make "reasonable progress" to move toward "natural visibility" in 60 years
- Baseline visibility is that from 2000-2004
- If you had a fire with funky smoke behavior, he can use model to simulate it – can help if your smoke is blamed for an accident

**14:15 Fire and Resistance of Trees to Stem Injury and Damage; Kevin Smith, NERS**

- Tree energy budgets (everything involves trade-offs!):
  - o 1) Maintenance
  - o 2) Growth
  - o 3) Reproduction
  - o 4) Protection/Defense
- Oaks can move a lot of water due to their large vessels; however, they are more susceptible to embolisms (air bubbles causing blockages).
- Protections against fire injury include:
  - o 1) Protective, constitutive features such as bark texture and thickness.

- 2) Defense, induced features such as shifts in metabolism and anatomy.
- Bark scorch in primarily on the upslope side of trees (based on fire physics; temperature and flame height are higher on the lee sides of trees).
- Trees combat fire via 1) resistance to injury vs. 2) recovery (resilience).
- Trees susceptible to fire are 1) thin-barked, 2) small, and 3) any-sized Acer or Cornus.
- Trees resistant to fire are 1) thick-barked, 2) large, and 3) any-sized Quercus or Carya.
- Compartmentalization resists the loss of normal function and spread of infections associated with wounding.
  - Forms horizontally and vertically within the bole
  - “Wound wood” forms the cat face around injuries; it is stimulated wood growth that help starves oxygen to the wound and provides structural support.
  - Wound wood rings are almost always larger than the rings that were wounded >>> this response helps close the wound more rapidly and minimizes notch stress.
- Bark scorch ≠ injury
- Injury ≠ damage (damage relates to management goals)
- Oaks produce tyloses which plug up large vessels (aids compartmentalization); white oaks are better at producing tyloses than red oaks.
- Red oaks produce more tannins, suburin, and phenol-rich chemicals
- Dormant season fires are best to minimize basal injuries; avoid burning when the cambium is growing fastest (in the spring).
- Tree categorization by resistance and recovery:
  - Acer rubrum: susceptible and not resilient
  - Tulip poplar and hickory: resistant but not resilient
  - Oaks: resistant and resilient
- Other considerations:
  - Tree size: increased size, increased bark thickness, increased resistance
  - Tree condition: tree mortality is most linked to this.
- “Injury” is objective; “damage” is subjective. “Damage” implies loss; a value judgment which depends on your management objectives. Consider what word you use
- Protective features: bark thickness and texture (fissures = thick areas and thin areas), shifts in metabolisms and anatomy
- Bark scorch and flame height are higher on upslope side, regardless of fire direction
- Any size oak or hickory is generally resistant to injury
- Scorch does not equal injury
- Mortality is most related to tree condition
- White oaks compartmentalize better than red oaks, which slows decay more
- When bark is “slippery” after bud-break, even slight physical impacts can injure the cambium

15:15 **Fire and Invasive Exotic Plant Species: What We Know Thus Far**; Cynthia Huebner, NERS

- Species that might decrease after multiple burns: garlic mustard, spotted knapweed, Japanese stilt grass, Japanese honeysuckle, bush honeysuckles, multiflora rose, autumn olive, Japanese barberry, buckthorn, privet, Norway maple, kudzu (when small)
- The above-listed species may still have a seed bank that lasts for 10 years or more!
- Species that probably won't decrease even after multiple burns: Canada thistle (roots 20ft deep and 100 ft wide), leafy spurge (roots 15 ft deep; high oil content leads to intense fire behavior!; fire kills seeds), cogongrass, Oriental bittersweet, tree of heaven
- There is lots of ongoing research on fire and exotics...stay tuned

16:00 **Rx Fire Laws: Tools to Protect Fire, the Ecological Imperative**; Dale Wade, SRS [retired]

- Federal attempts to exclude fire have failed miserably. We're still suffering from the Smokey Bear policies of the past.
- Natives used fire throughout the South to manage landscapes, as did early settlers. There has been a chronic use of fire through time. As such, fire-adapted vegetation rules!
- Florida has the most lightning strikes in the East.
- Fire exclusion occurs when fire is completely removed from a system, whereas fire suppression is the extinguishment of fire within a system.
- Public sentiment is everything! Need to win over the public in order to have a successful prescribed burning program.
- The best way to achieve air quality is through prescribed burning!
- In three months, 16 million lightning strikes
- Discussed Florida fire laws as case study
- All 67 Florida counties have passed resolutions in support of rx fire
- One county has established "smoke corridors for natural areas:" if you live there, expect smoke!
- HFRA was passed after lawmakers observed the 2003 southern California fire season

16:45 **Building a Burning Program - Pitfalls and Opportunities**; Rex Mann, DBNF

- Burn when you can (holidays, weekends)
  - Think outside the box
  - Tailor your burn unit to the burn day (if it's not a great burn day, don't do a first-entry burn, for example) ...but choose wisely (don't be dumb)
  - Work with the 'ologists
- 
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**PROGRAM EVALUATION**  
**2005 Fire in Eastern Oak Forests / November 15-17, 2005**

Please complete this form and turn it in at the Conference Registration Desk at the close of the conference. Thank you for your participation.

Job title \_\_\_\_\_ Affiliation \_\_\_\_\_

Strongly agree                  Neutral                  Strongly disagree

**1. Overall conference evaluation. The information presented:**

Is immediately applicable to my work	39	28	12	4	2
Was relevant, given the issues I face in my work	39	37	4	5	3
Will be shared with my colleagues	50	27	5	5	2
Will prompt me to further investigate research findings	41	29	11	2	4

**2. Poster session. The information presented:**

Is immediately applicable to my work	16	36	25	7	1
Was relevant, given the issues I face in my work	17	38	21	8	1
Will be shared with my colleagues	14	29	31	9	1
Will prompt me to further investigate research findings	21	20	32	11	1

**3. Talks. The information presented:**

Fire History (Wednesday, November 15, 8:15-11:30)

Is immediately applicable to my work	26	29	26	7	2
Was relevant, given the issues I face in my work	26	32	27	7	1
Will be shared with my colleagues	39	33	18	7	1
Will prompt me to further investigate research findings	24	28	25	10	1

Vegetative and Forest Floor Responses to Fire (Wednesday, November 15, 11:30-5:00)

Is immediately applicable to my work	43	30	10	4	1
Was relevant, given the issues I face in my work	47	30	3	4	5
Will be shared with my colleagues	43	32	9	4	1
Will prompt me to further investigate research findings	41	26	13	5	2

Fire - Fauna Interactions (Thursday, November 16, 8:00-12:00)

Is immediately applicable to my work	32	34	10	9	2
Was relevant, given the issues I face in my work	35	31	14	4	3
Will be shared with my colleagues	29	37	13	7	1
Will prompt me to further investigate research findings	27	34	16	9	2

Obstacles and Solutions to Using Prescribed Fire in Oak Forests (Thursday, November 16, 12:00-5:30)

Is immediately applicable to my work	33	18	19	6	0
Was relevant, given the issues I face in my work	36	19	16	5	1
Will be shared with my colleagues	32	21	20	5	1
Will prompt me to further investigate research findings	31	22	16	9	0

Continued on next page.

4. Please rate the relevance/applicability of the topic of each talk to your work.

	Very low	Low	Moderate	High
<u>Fire History</u> (Wednesday, November 15, 8:15-11:30)				
Paleoecological evidence of fire in oak forests	1	15	43	28
Fire scars and eastern fire regimes	2	16	43	28
Understanding the evidence for historic fires	1	11	42	36
Trends in oak abundance in eastern US	1	8	32	48
<u>Vegetative and Forest Floor Responses to Fire</u> (Wednesday, November 15, 11:30-5:00)				
Ecological adaptations and responses to fire	0	3	34	49
Why sustain oak forests?	1	3	32	50
Fuels and fuel models in eastern hardwoods	2	12	39	36
Earth, wind, water, and fire	0	3	27	55
Responses of oak regeneration to prescribed fire	0	3	18	67
Fire and the herbaceous layer of oak forests	0	4	36	45
<u>Fire - Fauna Interactions</u> (Thursday, November 16, 8:00-12:00)				
Fire and insects	1	16	39	31
Fire and amphibians and reptiles	2	22	38	25
Birds and shelterwood cutting and prescribed fire	1	7	33	47
Fire effects on non-game mammals	0	11	39	39
Fire effects on game mammals	4	17	33	31
<u>Obstacles and Solutions to Using Prescribed Fire in Oak Forests</u> (Thursday, November 16, 12:00-5:30)				
Prescribed fire: what influences public approval?	0	8	31	46
Top 10 smoke management questions	2	11	36	33
Fire and resistance of trees to stem injury/damage	1	11	30	36
Fire and invasive exotic plant species	1	11	18	44
Rx fire laws	5	11	30	24
Building a burning program	3	10	18	30

5. Are you likely to attend a future conference of this kind?

"Yes" - 81  
 "Unknown"  
 "Indeed"  
 "Absolutely" - 4  
 "If it is within 200 miles from Ohio"  
 "Maybe"  
 "Sure"  
 "Yes, if in Ohio or adjacent state and price is cheap"

6. What additional subject areas would you like to see covered in a future conference?

"More Silvicultural responses to fire"  
 "Liability - practical applications"  
 "Case studies of prescribed fires (successes and failures), Burn plans and prescriptions"  
 "More talks with current or past research info."  
 "Ignition technologies"  
 "Public objections or cultural facts on research that finally covers this area - results"  
 "Impacts of mountain top renovations"  
 "More info of just why National forests burned - create better grazing for woodland bison, elk, etc. (especially Pre European times)"  
 "Invasive species, TSI/Crop tree mgt."  
 "Anthropology and historic role of Indians influence on oak forest"  
 "Social Science as relates to fire"  
 "Effects of smoke from Rx on bats hibernating in caves/mines"  
 "More info about summer burn impacts - oaks, other plants and animals"  
 "Pests and pathogens in eastern forests, invasives, and herbivory impacts"  
 "Nothing only a follow up session with in the next 5 years"  
 "More specific management implications; talks by practitioners in addition to

*researchers*  
*"Panel discussions with opposing views regarding burning frequency and seasonality"*  
*"More on invasive species control"*  
*"Spring burning vs. fall burning in controlling Red Maples in Oak Forests"*  
*"More soil research and mammal impact of Rx burn"*  
*"Additional research of fire with oak silviculture"*  
*"Oak regeneration/ silviculture"*  
*"Similar conference about fire in eastern grasslands; include savanna management"*  
*"Rx burn effects on water quality (for streams within the burn area)"*  
*"Field trips – more practical application"*  
*"Gosh, pretty well covered it all! More on modeling for smoke when more is available"*  
*"More on exotic invasives if available and smoke control as well"*  
*"It would be great to have an annual regional silviculture/timber management meeting"*  
*"Updates an new research that relates to eastern Oak Forest Management w/ Fire use"*  
*"Let's find more info on what type of fire behavior we should be trying to use, which will benefit us best"*  
*"Challenges to applying on small tracts and private lands"*  
*"Updated fire behavior"*  
*"Presentation on amphibians/ reptiles was weak – really didn't answer any questions"*  
*"Prescribed fire as a tool for private landowners"*  
*"Oak silvics/biology"*  
*"Some case studies, success stories from managers who are doing it"*  
*"Would like to see info on potential for Rx fire to include exotics not just control"*  
*"More info on landscape level burning"*  
*"More focus on examples of Rx fire and results"*  
*"Building multi landowner partnerships to allow landscape level burns to occur to restore oak ecosystems"*  
*"Fire effect on Non-Oak species (pine, hickory, etc.), Long term effects"*  
*"More on invasive species control"*  
*"More on actual application, more Rex!"*  
*"More specifics on invasives control"*  
*"For myself, more information on savannah and grasslands"*  
*"Fire use in wilderness, how best to use fire without mechanical technologies, when fire scarring on mature trees is not an issue."*  
*"Pretty thorough already"*  
*"Nutrient cycles/ response to fire"*  
*"More detail regarding fire and herps; more emphasis on application in all talks"*  
*"If time could include "Poster Time" on Wed. and Thurs."*  
*"Success and failures over the next 5 years: Individual experiences"*  
*"Dr. John Maerz Cornell – Research European Earthworm impact on Forest Litter"*  
*"Food general overview, maybe next conference could have talks more specific to oaks in different ecozones"*  
*"Subject areas good – More good research on the subjects"*  
*"Communicating fire science to the public"*  
*"Ticks! Nobody mentioned ticks and fire/ The big three – Fire, Deer, Invasives"*

**7. What ideas did you gain at the conference that will help you with your work?**

*"Timing of burning on age of stand"*  
*"That fire was an important part of the ecosystem in the past"*  
*"New strategy for oak region"*  
*"More rounded approach"*  
*"Lots – To answer public questions"*  
*"Good solid background"*  
*"Sources of information for projects involving communicating about fire to the public and internal audiences"*  
*"Ideal burning conditions regarding temp., duration, and timing"*  
*"References, research ideas"*  
*"Knowledge of fire history research; how to do it and the limits"*  
*"Research needs; site specific concerns"*

*"Information to communicate to others"*  
*"Shelterwood cuts and ideas for applying fire to shelterwood cuts"*  
*"Pay close attention to oak vegetation prior to burning"*  
*"understanding of historical & prehistorical use/incidents of fire – emphasis on the need to manipulate forest structure first to establish regional condition prior to Rx burn"*  
*"When it's best to burn for oak vs. wildlife"*  
*"Ideas regarding smoke management systems"*  
*"Lots to synthesize but obvious that oak forest management across the range distribution will take lots of experimentation"*  
*"A number of ideas for undergrad research projects"*  
*"Monitoring opportunities in working with research station"*  
*"Lots!"*  
*"Historical context, new management strategies"*  
*"Shelterwood/ Burn"*  
*"Biology of forest and oak organisms; value judgments are relative due to exclusion of fire and changes of oak forest over time"*  
*"How to begin an Rx program in our state"*  
*"That DNR plans are doing the right thing"*  
*"Potential use of prescribed fire to enhance regenerating oak stands"*  
*"More evidence and information to support burning in oak forests"*  
*"Gain in overall knowledge of subject and will be able to utilize the vast references cited"*  
*"Many things"*  
*"Networking"*  
*"Affects on oak region, using more smoke for natural region"*  
*"Burn Techniques/ criteria"*  
*"Field trips influence peoples perceptions"*  
*"Use of historical records to justify Rx fire my forest"*  
*"A better understanding for when to use fire for silviculture"*  
*"Education of public is key!"*  
*"Burning times"*  
*"Two stage shelterwood; Rx Burn for Delmarva fox squirrel"*  
*"New knowledge received will greatly help with career, many great ideas"*  
*"Upped my own knowledge of subject"*  
*"Public info"*  
*"I teach a fire ecology class – will definitely incorporate some of this material"*  
*"Interactions/ reactions from Rx burns"*  
*"Silvicultural options for fire/oak. Other uses not related to seedling department"*  
*"Use of prescribed fire to control competing vegetation prior to when stand is ready to be regenerated"*  
*"Better understanding of how fire and oak can work together"*  
*"Need bibliography referred to by all speakers right away to help planning effort"*  
*"Historic fire frequencies"*  
*"Appreciation of how much is unknown"*  
*"More info on why we need to burn to answer public's questions"*  
*"Practical applications"*  
*"Smoke modeling/ Reinforced our belief about advanced regeneration and growing season burns."*  
*"Knowledge to help explain PB to the public"*  
*"Fire use to enrich soil"*  
*"Effects of fire on all wildlife...history of fire in America – pre-settlement"*  
*"How to relate soil, fire, and oaks in the east"*  
*"History and soil information"*  
*"Look more closely at timing/intensity combinations of burns for desired ecosystem responses"*  
*"Information and contacts"*  
*"What time of year to burn"*  
*"Additional info to incorporate into prescribe fire plans/management"*  
*"To monitor before and after effects"*  
*"This really confirmed ideas I already had"*

*"Too many to write down – So many considerations excellent thought stimulator"*  
*"We need more fire data in our area. Other folks are finding results similar to ours and thus we need to publish"*  
*"Need to share what I learned , including the gaps!"*  
*"Sharing the results of ongoing science and incorporating historical info into info on current burns and press releases/brochures, etc."*  
*"It got me excited about pushing some management goals I have"*

#### **8. What went well with this conference?**

*"Everything"*  
*"Time line was kept"*  
*"Everything – Excellent"*  
*"The organizers did an excellent job with every aspect of the conference"*  
*"Extremely well organized"*  
*"Excellent speakers, Great facility"*  
*"Organization"*  
*"Meals and breaks"*  
*"Very well organized, agenda – on time! Poster session – Very good!"*  
*"Time was closely watched, coffee was good, very organized"*  
*"Everything, Thanks for the low cost; I brought all my managers with me"*  
*"The food, the well roundedness of the talks, the poster session"*  
*"Very well organized – Great Facilities – Diverse Subjects"*  
*"Well organized, interactivity good"*  
*"Physical facilities, pre conference information; selection/copies; group of topics"*  
*"Most everything"*  
*"Timing – Kept on time"*  
*"I thought everything was well organized/coordinated"*  
*"Everything! Excellent job!"*  
*"Providing lunch made good use of time that would have been wasted otherwise"*  
*"participants list in folder"*  
*"Timing of speakers, food, speakers were great"*  
*"Many great speakers, good value"*  
*"Everything"*  
*"Very good comprehensive talks with excellent speakers"*  
*"Everything"*  
*"Everything, Well organized, informative, and good location"*  
*"Nicely done! Good food, excellent speakers overall"*  
*"Most speakers were excellent"*  
*"Good speaker and info: objectivity of speakers varied"*  
*"Very comfortable facilities and presenter AV aides"*  
*"Most everything"*  
*"Very well organized – Great programs"*  
*"Excellent presenters and presentations; good opportunities for collegial interactions and networking"*  
*"Good topics – good speakers overall – stayed on time"*  
*"Everything, great speakers, location, facilities, food, and snacks"*  
*"Lots of good information"*  
*"Food was good"*  
*"Well run, kept on time, good facility"*  
*"The whole thing was very, very well put together. Thanks and congratulations!"*  
*"List of speakers very solid"*  
*"Food, registration fees"*  
*"Organized/kept on schedule/very nice facilities/ fabulous food and breaks"*  
*"A broad range of topics related to fire covered wall"*  
*"Top quality presenters; Especially Dale Wade"*  
*"Everything, Great presentations and information!"*  
*"Everything"*  
*"Accommodations, schedule, length"*  
*"Great slate of speakers"*

"Time moderation was good"  
 "Pretty much everything, very good!"  
 "Well organized, logistics were excellent!"  
 "Talks were excellent, enough said"  
 "All aspects were very well planned and implemented well"  
 "Very informative"  
 "Location, speakers"  
 "Generally great speakers"  
 "Excellent speakers, very engaging"  
 "Timing, refreshments served, most talks well prepared"  
 "Excellent facility, breaks, meals, presenters, great information, great chance to talk with other fire practitioners"  
 "Logistics, timing, cost, presentations"  
 "Logistics were dealt with nicely"  
 "It kept well to schedule, good speakers and information"  
 "Most of the talks were very good, R. Boerner's was outstanding"  
 "Set up of speakers"  
 "Well setup, nice price, great facilities"  
 "Everything"  
 "Everything...Great job!"  
 "Ran on time, good speakers, good seating arrangements"  
 "All went well"  
 "Great conference for \$35"  
 "Speakers, facilities, location, everything else went well – Truly exceeded expectations"  
 "Excellent all around. Comfy seats, audio and powerpoints, good temp."  
 "Good group of topics logically arranged"  
 "Kept on schedule, good info"  
 "Very well organized...our vegetarian brothers were out in the cold"

#### 9. What could we do better next time?

"Not much, well put together"  
 "More coffee and snack stations – Long lines"  
 "Longer breaks to network"  
 "Everything was great – possibly plan to have powerpoints available also"  
 "Shorten talks to 30 min. or more breaks between longer talks"  
 "This has been the best conference I've ever been to. The Amphibian talk needs help"  
 "Have a form that does not specifically reference works"  
 "Not much – perhaps an anthropologist with info on reasons why fire was used 1,000 yrs ago"  
 "For such large groups, allow a little more time at breaks"  
 "Moderators should take charge of insisting folks use mics when posing questions to speakers"  
 "30 min. talks"  
 "Longer breaks to have more time for networking and viewing posters"  
 "Nothing – excellent job"  
 "Concurrent sessions and more time for networking"  
 "More networking opportunities – More frequent breaks"  
 "Don't end it at 5:30pm"  
 "Shorten program by 1-2 sessions on the second day"  
 "End the conference earlier on the final day for travel. Recommend ½ day, then full day, and then ½ day"  
 "Handouts"  
 "Cheaper hotel"  
 "Nothing"  
 "A few speakers were poor – schedule was tight with maybe too many speakers and not enough time for interaction among attendees"  
 "More time to process all of the great info presented and more time to network"  
 "Have the conference in the same place where you stay"  
 "Evaluation asks for relevance of topic to me but not quality of presentation – They're

different – one large room for all the talks was confining – maybe in a theater better”  
 “More interaction time with others”  
 “Seats were uncomfortable for 8 hrs. of sitting; Having lunch speakers may be a bit too much given how intense the agenda is. Need breaks about every hour & ½. Lunch speakers were excellent though, just work into the regular agenda. Banquet lunches were great! Thanks!”  
 “Try to end earlier in day either by cutting back on presentations lengths, number of presentations, or by expanding to a 3<sup>rd</sup> (1/2) day.”  
 “Estimate attendance better so breaks would be more efficient”  
 “Better communication on posters i.e. notify presenters how posters will be presented – hung or set on tables”  
 “Fix toilets so they don’t flush when you enter a stall!”  
 “Show only new information and as many different topics as possible”  
 “Shorten day 2 – Show more practical results and applications”  
 “Have the longer day on the 1<sup>st</sup> day rather than the 2<sup>nd</sup>”  
 “More breaks - extend conference 1 day longer – no strict hurry up schedules”  
 “I was disappointed at the Job Board!”  
 “Too much seat time – work in time to view posters and interact”  
 “Make every speaker utilize wireless mic!”  
 “Shorten to day and ½”  
 “Lunch – no veggie option. I had to eat bread and dessert for lunch”  
 “Provide reference list by topic also include available models”  
 “Provide proceedings, papers, and presentations on CD”  
 “Better lunch”  
 “Longer breaks”  
 “Consider a speaker from USFWS to discuss T&E considerations, status of research, implications of habitat manipulations as correlated to short and long term effects.”  
 “Lousy chicken salad”  
 “Bigger print on name badges – I’m getting too old to read fine print”  
 “Provide a CD of the PPT presentations at the conference, no speakers at lunch”  
 “Provide specific guidelines for powerpoint presentation development – some were great -some were awful”  
 “Drop the lunch time speakers – more time to interact”  
 “No speakers during lunch! Burnout!”  
 “.PDF of all presentations included with proceedings”  
 “Have proceedings handed out at conference”  
 “Not much – Very well done”  
 “Evening breakout, interactive sessions, and attendees’ choice of session to attend”  
 “Some talks may have been too basic. Most managers have a scientific background from school or work and understand these issues already at this lay-person level”  
 “Hot soup if outside temp below 30. Canvas shopping bag rather than briefcase, more reusable. Also maybe bags could be found made in the USA”  
 “Stretch breaks. Offer concurrent sessions to allow for smaller groups and more interaction. Don’t schedule lunch time speakers. It’s rough on everyone, including the speaker, especially with a large group on a tightly packed schedule”  
 “More breaks, different room setup – tables and chairs, 5-min stretch time between sessions, lunch room not ideal for speakers – hard to hear and see from back of room too hard to pay attention, need some downtime for a walk, etc. during lunch break”

#### 10. How did you hear about the Conference?

48 - E-mail announcement                      3 -Web site  
 55 - From a friend or colleague              3 - Other : “Through work”, “Fire staff”, “mailing”

#### 11. Additional Comments:

“I was surprised that evolutionary thought was prevalent in a couple presentations when there is so much evidence from physics and biochemistry that call the theory into doubt”  
 “Lots of information that I can apply when working with State/Federal/Private contacts”  
 “Excellent conference – Well organized”  
 “Great Job!”

*"Excellent job to those involved in setting up this needed conference"*  
*"Very nice accommodations, excellent speakers – Thanks very much!"*  
*"Thank you for accommodating my special meal needs"*  
*"Would like complete set of overheads"*  
*"Oak region was more of a by-product of National American burning – their objective wasn't to grow oaks what where these main objectives?"*  
*"The conference was very informative and enjoyable"*  
*"The breaks were a disaster. I realize there was a large group but you knew that and so did the conference center. There was simply not enough time allowed for everyone to partake of the break. Then when they ran out of coffee cups, the conference employees seemed unconcerned and did not bring more cups, even when asked several times. They need to be told about this."*  
*"Mark Ford was a good presenter with great information"*  
*"Good facility for conference, good mix of expertise, good organization of schedule; exceptional bang for buck"*  
*"One of the best conferences I have ever attended"*  
*"Thanks to everyone involved with the coordination of this conference. Excellent Job!"*  
*"A few speakers seemed to have little in the field experience"*  
*"Thanks for the good program, open format, cool briefcase/bag"*  
*"I would like access to the speaker presentations via the internet for future review"*  
*"Excellent job"*  
*"Well done overall – reasonable cost. Thank you!"*  
*"Could .pdf files of the posters be included in the proceedings?"*  
*"It is obvious by the huge attendance that this information needed to be shared. This issue is very important in my work in Arkansas. I was glad to see so much information/research directly related to or performed in AR. This was a very well planned and presented conference. Need more like this! Please put powerpoint presentations on the web ASAP! I'd like access to this information to share with my unit for the upcoming burning season. Thanks!"*  
*"Good job, Thanks for you efforts!"*  
*"A very good conference"*  
*"Overall most excellent symposium"*  
*"Outstanding conference"*  
*"Don't wait 5-10 years for the next conference. The ball is rolling, continue to educate the newest generations of land managers before we loose the knowledge of the past!"*  
*"Great presenters, enjoyed everyone!"*  
*"A great conference – length, location, speaker topics, logistics, format, keeping program on schedule, price was right"*  
*"Great speakers, great facilities, did a great job of keeping on time"*  
*"Very good and continue"*  
*"Great information, thank you!"*  
*"Wonderful conference, many thanks!"*  
*"Great job! That's for all your work."*  
*"A copy of speakers' presentations and references to help me develop burn programs that promote oak restoration/regeneration"*  
*"Invite media"*  
*"When Abrams and others bad mouthed Smokey Bear my ears closed up. Descriptions of Patterson's research materials put me under"*  
*"Great conference"*  
*"Short speakers need something to stand on or get out from behind podium"*  
*"This was a well planned and conducted meeting that met an important need."*  
*"This is probably the most informative conference I have attended recently"*  
*"Very well organized and executed. I really enjoyed every talk! Thanks!"*  
*"Charge more fees to pay for publication costs, including powerpoint presentations"*  
*"Good idea to have lunch provided since lack of restaurants close by"*  
*"A grad student to synthesize the information presented into a general usable field guide to be used by land managers"*  
*"Very impressed with all aspects"*  
*"Very impressed with entire show here. I'm inspired to burn more, collect more data, and get it out to the public"*  
*"Thanks for putting this together"*