Wildfire, Prescribed Fire, and Climate Change in Florida

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Kevin Robertson, PhD
Tall Timbers Research Station
Overview:

1) Effects of fire on CO₂ emissions
2) Effects of climate change on fire
$\text{CO}_2 + \text{H}_2\text{O} + \text{heat}$

$\text{CH}_4 + 2\text{O}_2$
Wildland fire: 13 million tons

Carbon fixation: approx. 13 million tons

Fossil fuels: 260 million tons

Florida
Fire in Florida

Prescribed burning: 12.8 million tons C/yr

Wildfires: 1.6 million tons C/yr

Wade Tract, Georgia

Big Turnaround Fire, May 2007
Stoddard Plot Soil Carbon

Fire Interval

% C

0-5 cm
5-10 cm
10-20 cm
Tall Timbers Fire Plots Carbon Budget Est.
Winter 2005

[Diagram showing carbon budget for different intervals (1, 2, 3, 40 years) with categories: Hardwood trees, Pine trees, Resprouts, Herbs, Dead biomass, Roots, Soil C.]
Burned vs. Not Burned

Mineral nutrients

2 yr vs. 40 year unburned

A. B.

PPM

Mg

A

Bt

ppm

AB

AB

Mg

K

ppm

AB

AB

Mg

Ca

ppm

AB

AB

Mg

Ca
Frequent prescribed burning in pinelands:

- does not reduce soil health and sustainability and may improve it
- ensures future forest productivity (carbon sequestration)
- results in increased soil carbon storage
Wildfires:

- may cause soil sterilization and loss of plant seeds and root stocks
- have higher rates of N mineralization and subsequent leaching
- more efficiently volatize nutrients
- produce less charcoal over time
Greater concerns:

• Increased population (+10 million by 2030?)
• Loss of forest lands in Florida (2-3 million acres by 2030?)
• Increase in pine plantations relative to natural forests
• Increasing wildland-urban interface
Effects of climate change on fire?
Potential effects of climate change in Florida:

- Temperature increase, especially in summer
- Longer fire season
- Changes in total precipitation
Florida: neutral to positive change in rainfall so far
Tallahassee Rainfall Analysis
James O'Brien
June 5, 2007

Tallahassee Rainfall (in)

Cumulative Departure From Mean

Annual Rainfall (in)
Potential effects of climate change in Florida:

- Temperature increase, especially in summer
- Longer fire season
- Changes in total precipitation (+/-)?
- More extreme, more frequent droughts
- Decrease in forest health and productivity
- Sea level rise
Prescribed fire:

- Conducted under conditions that we choose
Prescribed fire:

- Conducted under conditions that we choose
- Reduces fuel loading
Pebble Hill Plantation, Georgia
Prescribed fire:

• Conducted under conditions that we choose
• Reduces fuel loading
• Less particulate emissions per event
Prescribed fire:

- Conducted under conditions that we choose
- Reduces fuel loading
- Less particulate emissions per event
- Ecosystem sustainability
Fire in Florida

Wade Tract, Georgia

Big Turnaround Fire, May 2007
General Conclusions

- Productivity (C sequestration) in Florida forests is sustainable with regard to fire.
- Frequent prescribed burning is likely more sustainable than infrequent wildfires.
- Increased population and forest loss is a greater concern than fire with regard to carbon emissions.
- Climate change is likely to make wildfires more common and severe.
- Prescribed fire will reduce impacts of wildfire.
Thanks