Impacts of Prescribed Fire Intensity and Seasonality on Woody Vegetation

Considerations for Re-expanding Our Fire Regimes

Nathan Holoubek
WDNR Wildlife Management
Fire is integral to land management in the Midwest
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Just burn it!!
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Not so fast, we have challenges ...
• How often should we burn?
• How intense?
• What time of the year?
• How complete or incomplete?

We are (relatively) far removed from an “intact” fire regime
Our reference data is relative...

Curtis’ sites were already 10-40 years removed from a “natural” disturbance regime

Fire years (WI Dells)

Curtis’ surveys

Fire exclusion

Fire history data from: Meunier, Holoubek, and Brown
Without disturbance, habitat can change quickly.

The difference fire makes in ~ 20 years.
Fire seasonality in a historical context

**NW Sands**
- 14% Dormant Season
- 61% Growing Season
- 25% Fall

Fire history data from: Meunier, Holoubek, and Brown

**N. Highlands and NE Sands**
- 83% Dormant Season
- 11% Growing Season
- 6% Fall

**Southern Relicts**
- 47% Dormant Season
- 46% Growing Season
- 7% Fall
Fire seasonality in a historical context

Fire history data from: Meunier, Holoubek, and Brown

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Fire Effects and Brush Control

Focused on 3 factors we can alter:
- fire intensity
- fire season
- fire frequency

73 burn units statewide

Fire effects: Holoubek and Meunier
Burn day data collection:

Thermocouple
(records temp. every second)
Our current Rx fire regime

Prescribed fire in Southern WI 2004-2014

Data from: Meunier and Gorby-Knoop
Great fire behavior
Higher FL = Higher Temperature

Headfire Flamelength

Maximum Fire Temperature (Fahrenheit)

Fire effects data: Holoubek and Meunier
Higher FL = Higher Temperature

Headfire Flamelength

Maximum Fire Temperature (Fahrenheit)

Fire effects data: Holoubek and Meunier
Higher FL = Higher Temperature
But there are lots of factors, and FL is ONLY a proxy

How accurately can we estimate FL, and how accurately do we need to estimate it?

Fire effects data: Holoubek and Meunier
Higher FL = Higher Temperature
But there are lots of factors, and FL is ONLY a proxy

Avoid overly-precise prescriptions

How accurately can we estimate FL, and how accurately do we need to estimate it?

Fire effects data: Holoubek and Meunier
Intensity increases top-kill (spring burns)

Number of Mature Stems Killed vs. Maximum Temperature (Fahrenheit)

- Good top-kill

Fire effects data: Holoubek and Meunier
Spring fires have highest flame lengths
And also have the best top-kill rates

Fire effects data: Holoubek and Meunier
Shrub Response to Spring Rx Fire on Nagel Wildlife Area

Top-kill

- Mature stems

Great top-kill!
Shrub Response to Spring Rx Fire on Nagel Wildlife Area

But...

Overall 151% stem increase

Great top-kill!

Re-sprouting stems

Mature stems

pre-burn

post-burn
Is this a pointless burn?
Brush is more sensitive to summer fire

Topkill Category

- 100% dead
- >75% dead
- 25-75% dead
- <25% dead

Johnson, Meunier, Holoubek, Kuhmen, and Strobel
Brush is more sensitive to summer fire

Topkill Category
- 100% dead
- >75% dead
- 25-75% dead
- <25% dead

Success of summer fires is very dependent on fuel load and continuity

Johnson, Meunier, Holoubek, Kuhmen, and Strobel
Summer reduces re-sprouting by ~80%

Re-sprouts from Rx fires June-early Sept.

Fire effects data: Holoubek and Meunier
South Central WI Remnant Prairie

- 0.77 tons/acre dead
- 0.78 tons/acre live herb
- 0.03 tons/acre live woody

Weather

- 82° F
- 2.0 mph wind
- 59% RH
Immediately after the burn
One week after the burn
One week after the burn
South Central WI Restored Prairie

- 2.1 tons/acre dead
- 1.9 tons/acre live herb
- 0.2 tons/acre live woody

Weather
- 68°F
- 2.25 mph wind
- 57.5% RH
One week after the burn
Rx Fire Season

Traditional Burn Seasons

- Burn Months
- Non-burn Months
Rx Fire Season

Traditional Burn Seasons

Potential Burn Opportunities

- Burn Months
- Non-burn Months

Rx Fire Season

Traditional Burn Seasons

Potential Burn Opportunities

With plenty of caveats!
There is a lot to learn about T&E impacts, community shifts, etc.
Different Seasons Fit Different Roles

**Spring fires**
- Higher intensity
- Good burn coverage
- High top-kill rate, but high re-sprouting

**Fall fires**
- Moderate-high intensity
- Variable fire effects
- May be more patchy

**Summer fires**
- Low intensity
- Patchy burn (both good and bad)
- Good re-sprout suppression
Thank you!

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