
FOR PEAT'S SAKE!
Impacts, Recovery, and Restoration of the Parry Sound 33 Fire
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McMaster Ecohydrology Lab
Photo credit: Joseph Hartman
McMaster University
School of Earth, Environment & Society

Canada is a Peat Nation

Long-term net sink for atmospheric carbon

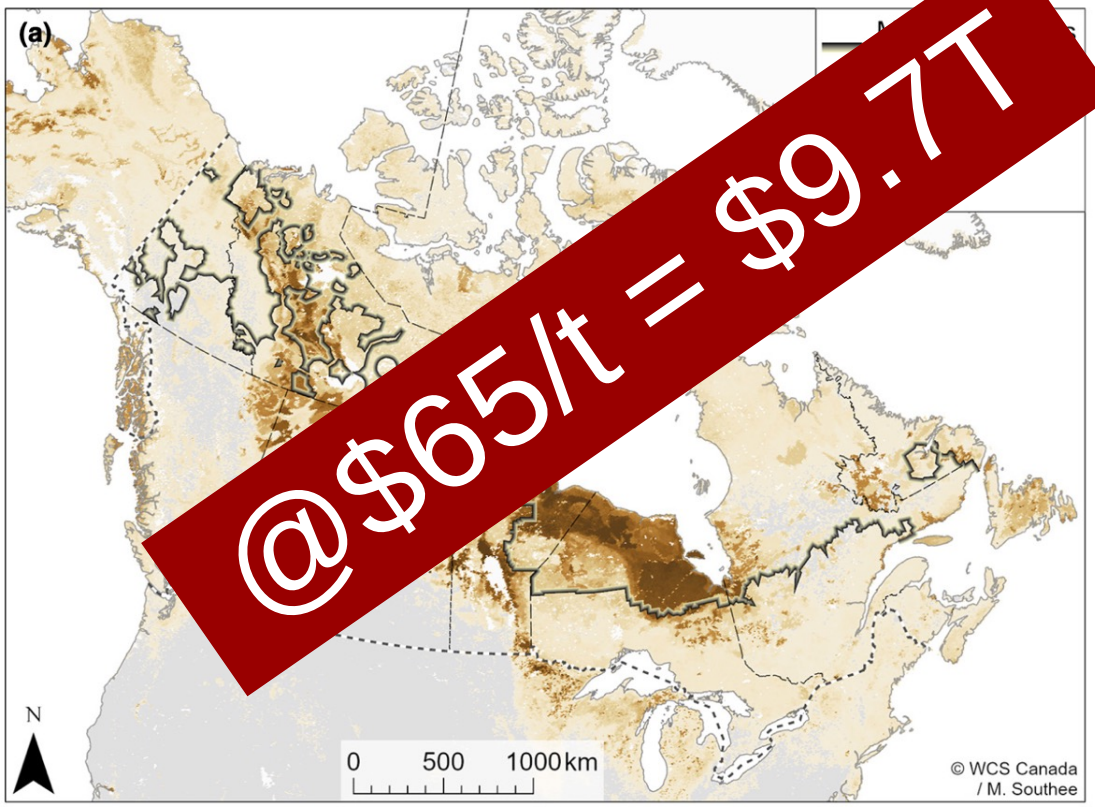


Photo: Harris et al. 2022 (Frontiers in Ecology and the Environment)

Canada is a Wildfire Nation

Annual burned area in Canada: 2.5 Mha (0.5 to 15 Mha)

9,000 fires a year

Large fires dominate (3% of fires > 200 ha, 97% of area)

Fire suppression costs: ~$1 billion/year

Annual area burned is increasing

Fire management costs are increasing greatly

Photo credit: Dan Thompson (Canadian Forest Service)

Canadian Wildfires in 2023

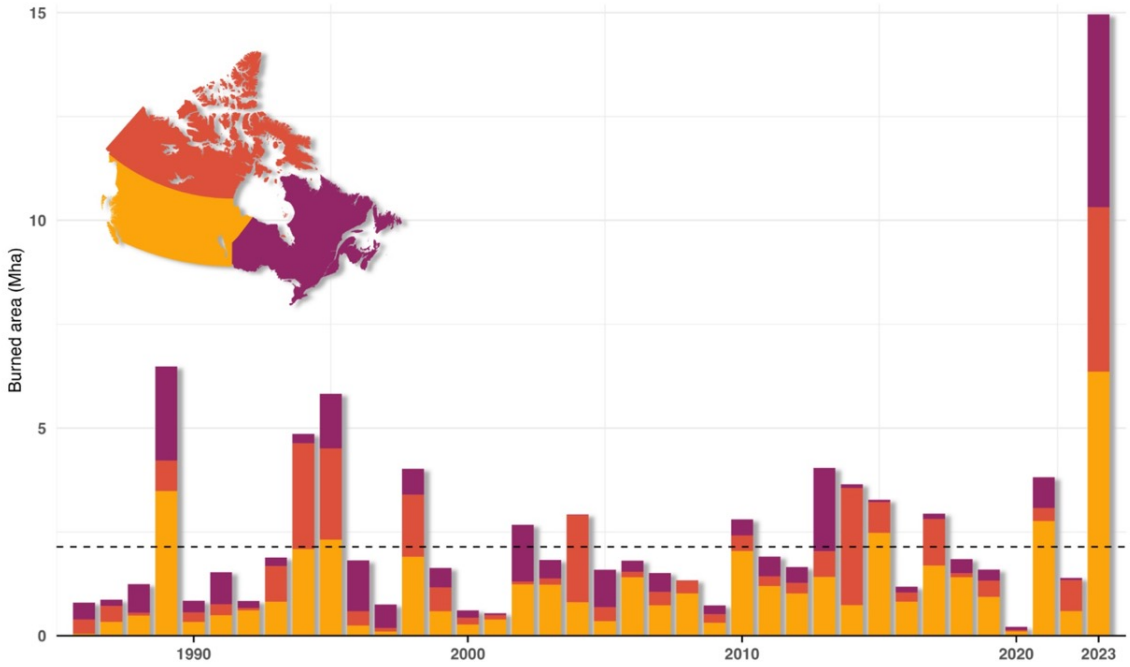
Record-breaking Canadian Wildfire Season

>15 Mha burned

> 400 MtC emissions

$2B in fire suppression

Record air quality alerts



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Publication: Jain et al., 2024 (Pre-print)

Peatland Fire Danger

Toxic smoke

High $PM_{2.5}$ emissions

Health risk

>30,000 deaths/year

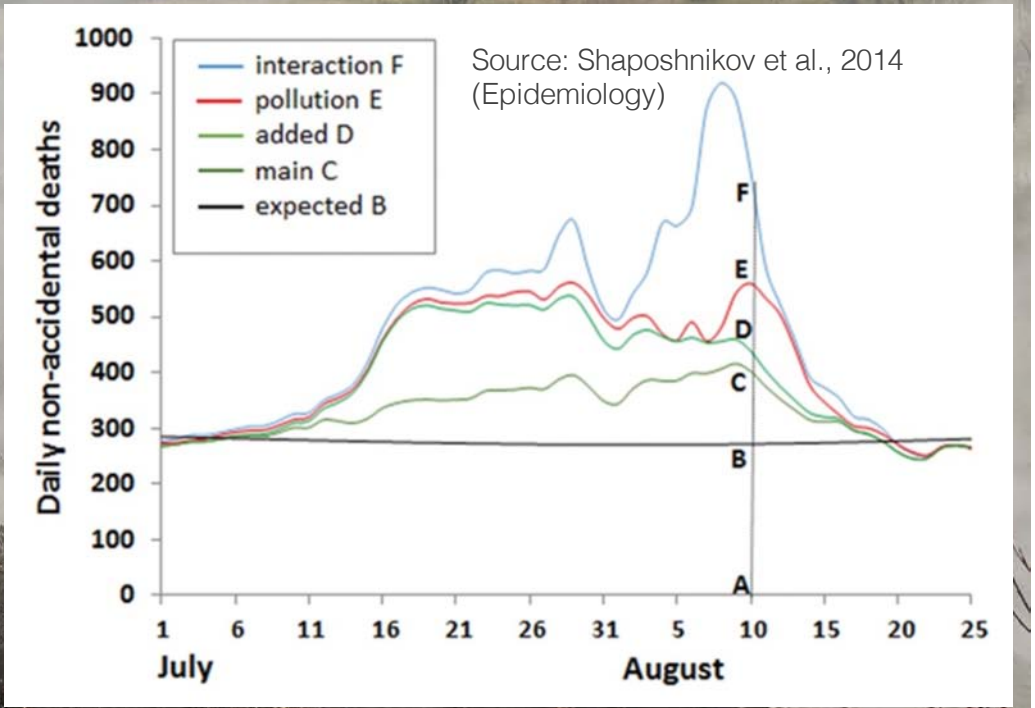

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Photo: James Hill, The New York Times (http://www.nytimes.com/imagepages/2010/08/13/world/RUSSIA1.html)

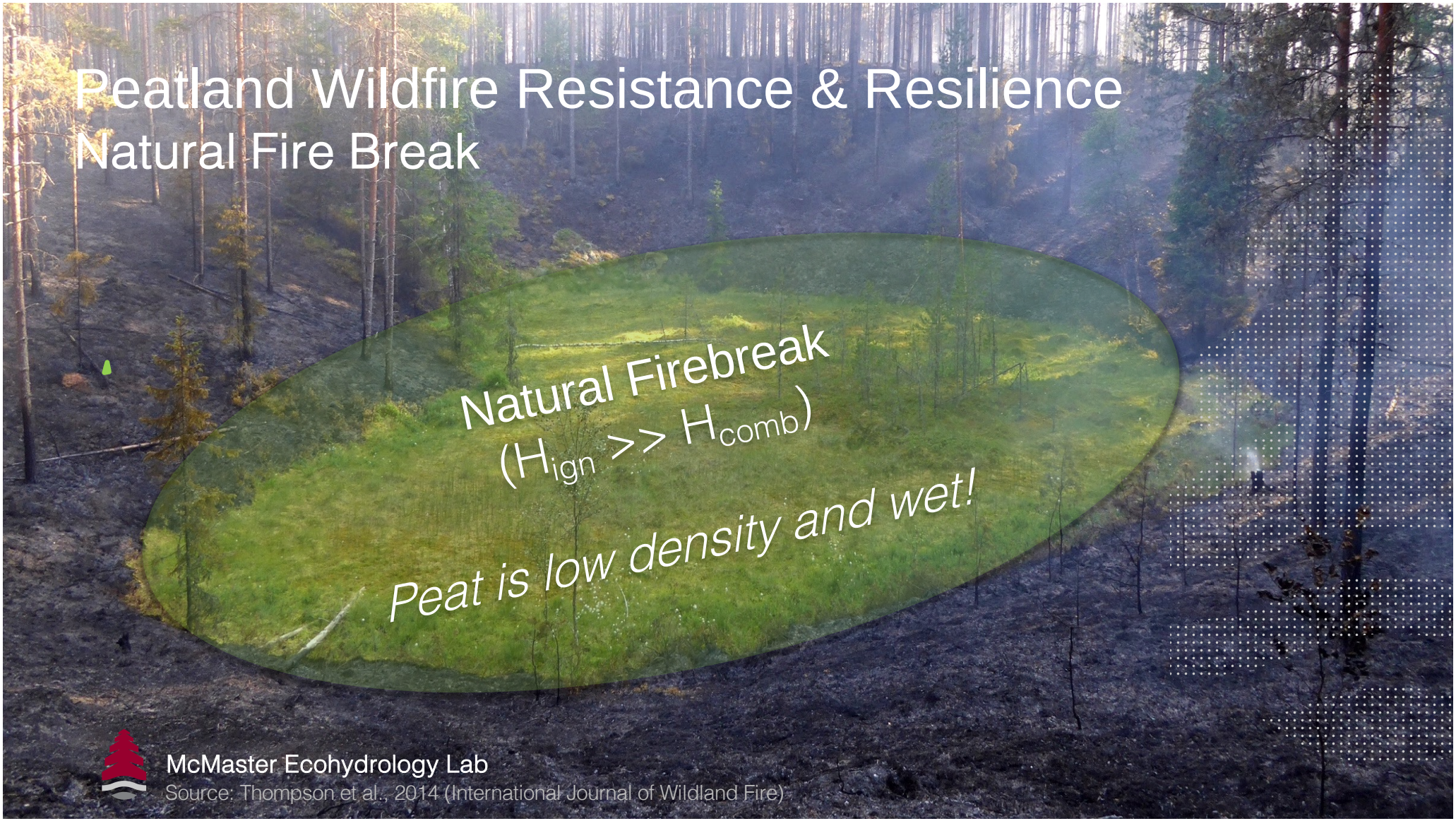
Peat Fires (aka Fire Swamps)

Fire Swamps, Wil O' the Wisp, and Zombie Fires

Buttercup: That's the fire swamp! We'll never survive.

Wesley: Nonsense! You're only saying that because no one ever has.

Source: The Princess Bride (Movie, 1987)


Peatland Wildfire Resistance & Resilience
Natural Fire Break
Natural Firebreak
(H_{ign} >> H_{comb})
Peat is low density and wet!
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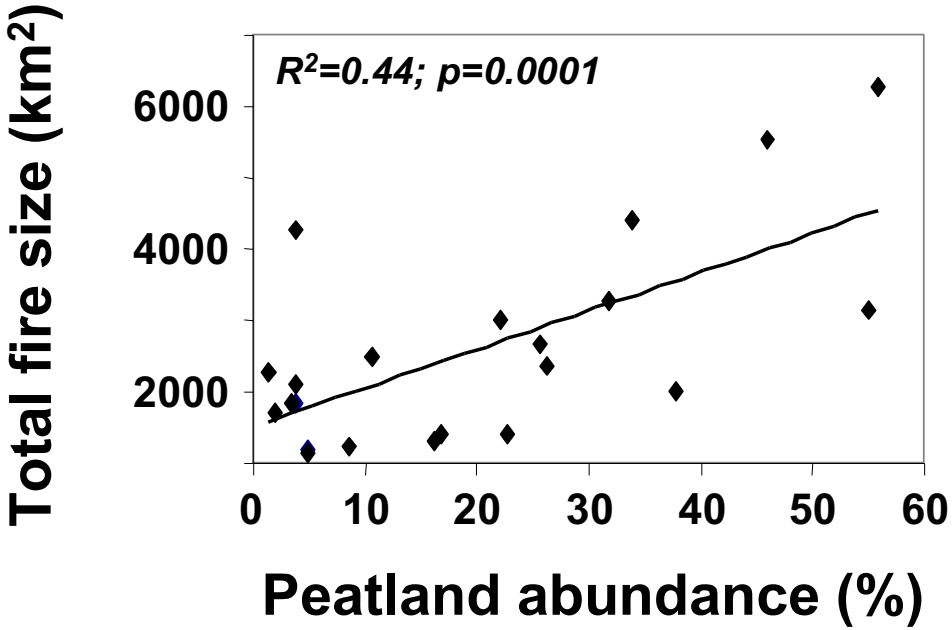
Source: Thompson et al., 2014 (International Journal of Wildland Fire)

Peatland Wildfire Resistance & Resilience

Natural Fuel Supply



Source: Turetsky et al., 2002 (Geophysical Research Letters)

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Photo: Merritt Turetsky

The Parry Sound 33 Wildfire

Key River Fire

July 18, 2018 to October 31, 2018

Area burned: 11,363 ha

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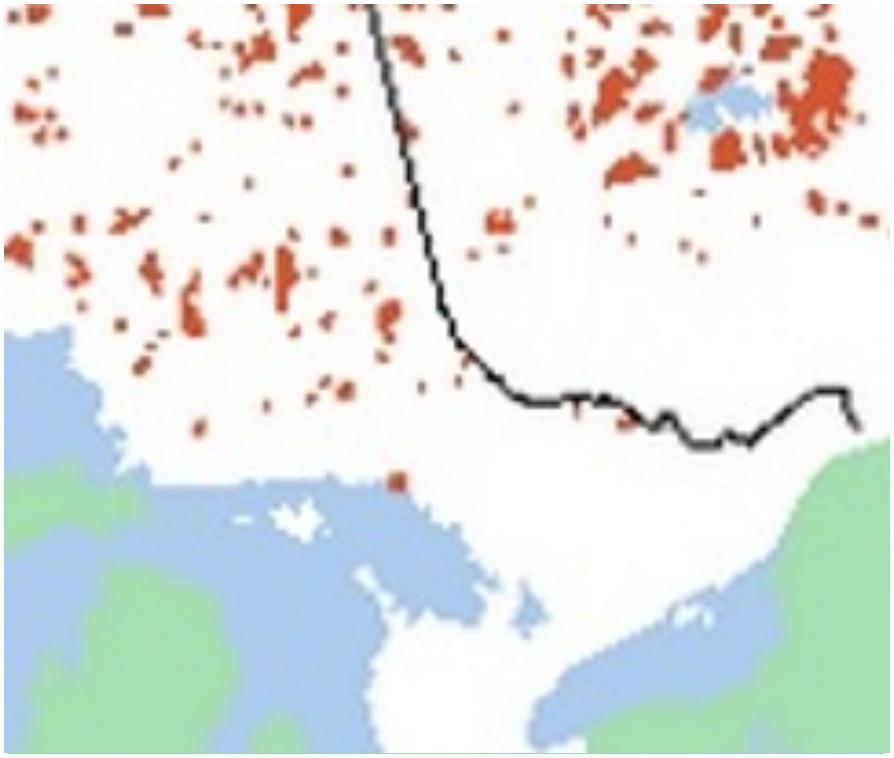
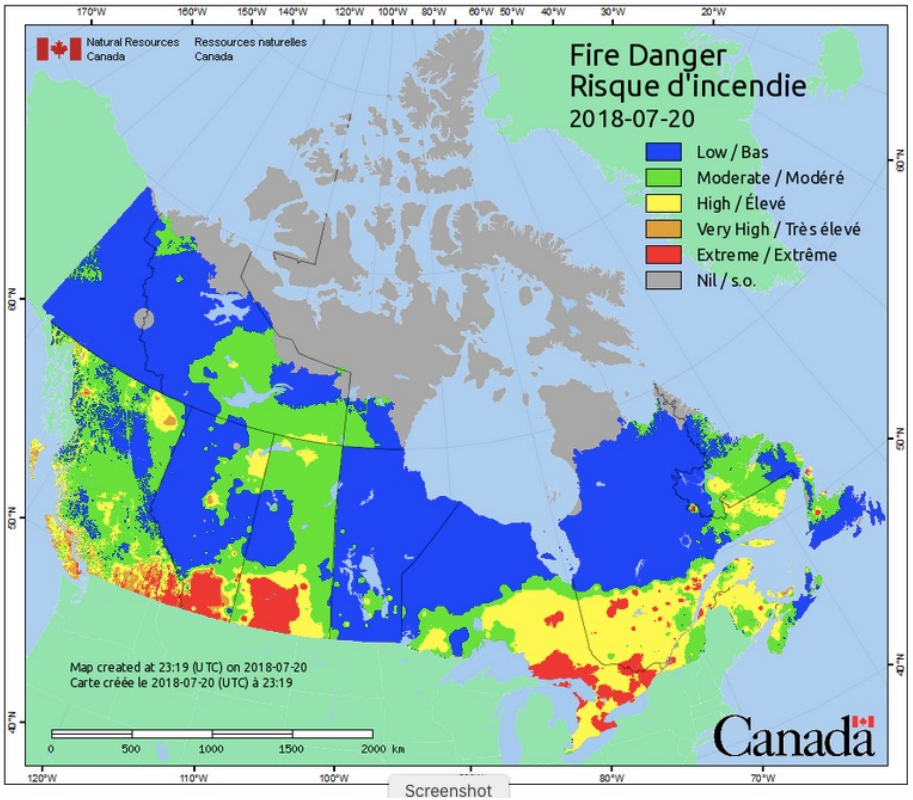
Photo credit: Dan Leonard/Ministry of Natural Resources and Forestry

The PAR33 Wildfire





Source: Ontario Ministry of Natural Resources and Forestry

Photo credits: Sudbury.com; SaultStar.com; Dan Leonard/Ministry of Natural Resources and Forestry

The PAR33 Wildfire in Photos

Upland Forests

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Bringing our expertise to studying the PAR33 wildfire

wildfire futures

Severity?
Refugia?
Regime Shift?

species at risk habitat

Turtle nesting
Rattlesnake overwintering

landscape restoration

Constructed habitat?
Kick-start moss growth?

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Photo credits: Joseph Hartman (JosephHartman.ca)

PAR33 Wildfire Research Objectives

Quantify the PAR33 wildfire severity

Determine the impacts of the PAR33 wildfire on soil combustion, vegetation, water levels, SAR reptile habitat, & CO_2 exchange

Determine the recovery rate of rock barrens ecosystems to guide potential restoration/regeneration strategies

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Photo credit: Dan Leonard/Ministry of Natural Resources and Forestry

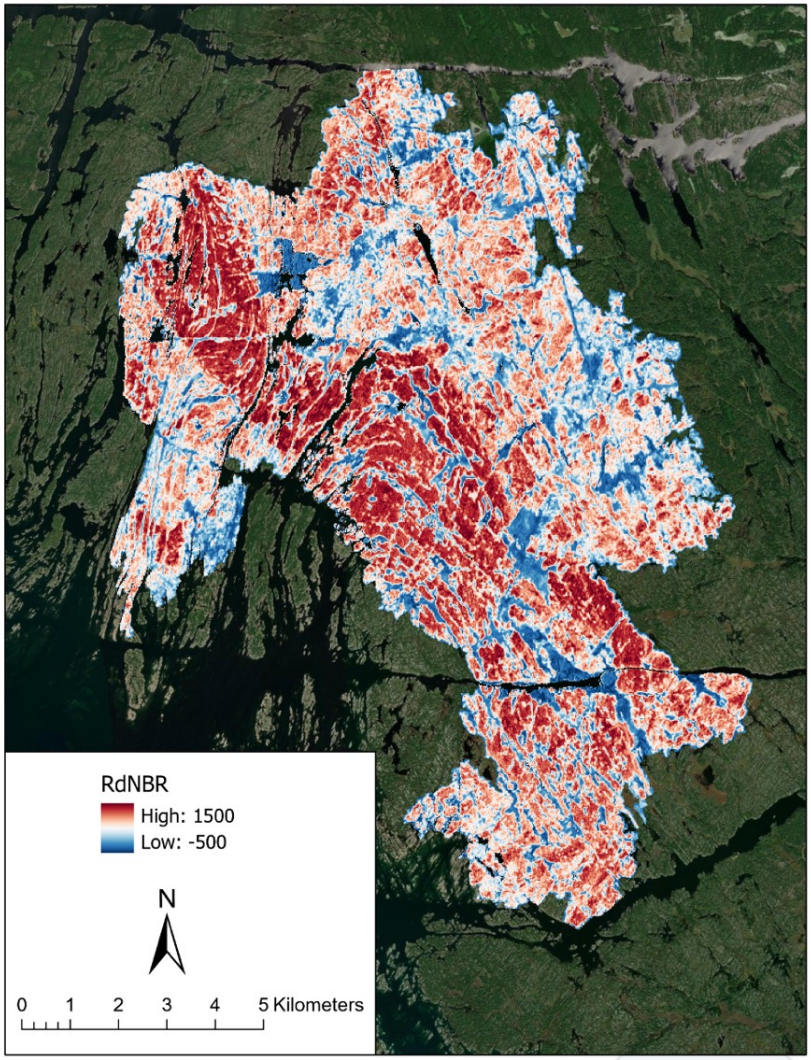
PAR33 Wildfire Severity

Satellite data to determine wildfire severity (relative differenced Normalized Burn Ratio)

High fire severity on upland rock barrens

Lower fire severity in lowland wetlands

Deep peatlands = fire refugia



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Lab publication: Tekatch et al. in review (CJFR)

PAR33 Burn Severity

Combustion of organic soil

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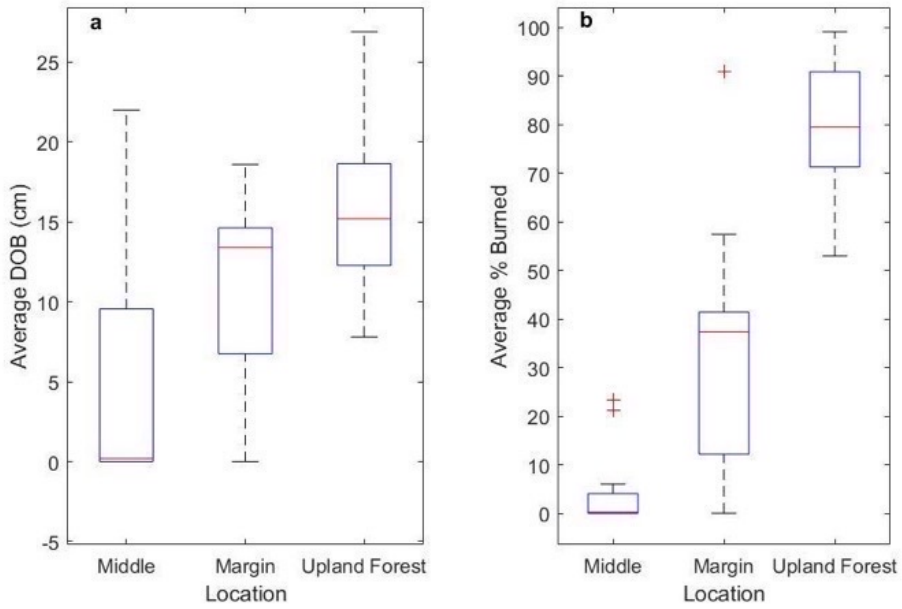
Research Lead: Dr. Sophie Wilkinson (Postdoctoral Fellow)

PAR33 Burn Severity



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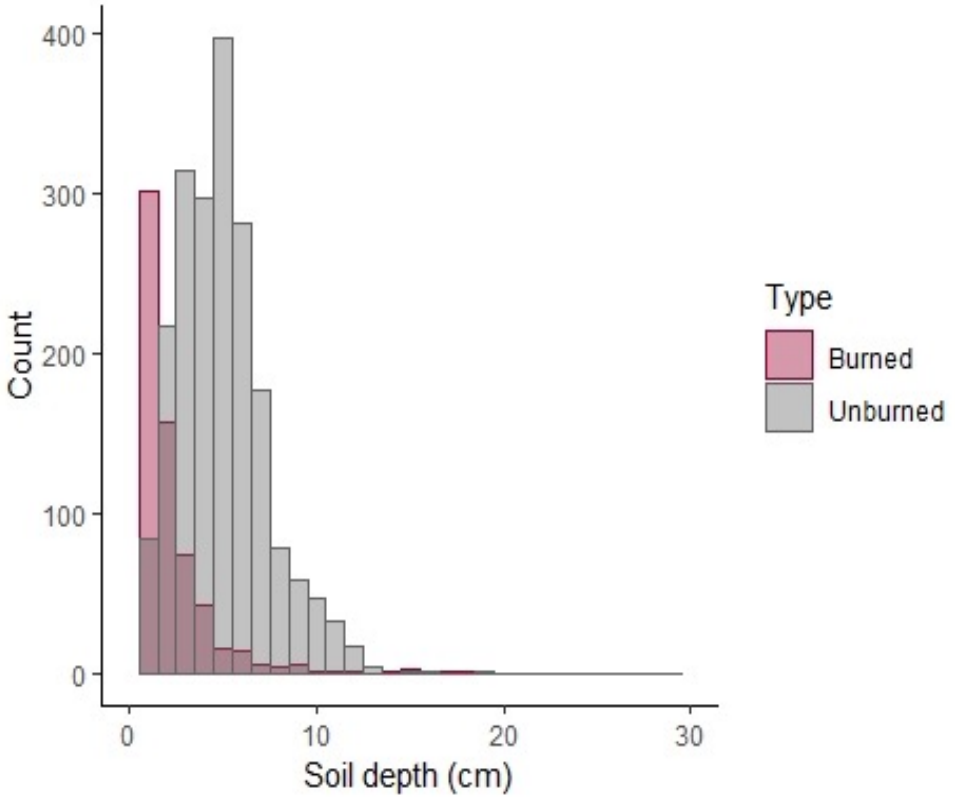
Research Lead: Dr. Sophie Wilkinson (Postdoctoral Fellow)

Impacts on Turtle Nesting Habitat



Burned open rock barrens had 71–73% fewer sites with suitable soil depth and volume for a nest chamber

Need more soil!

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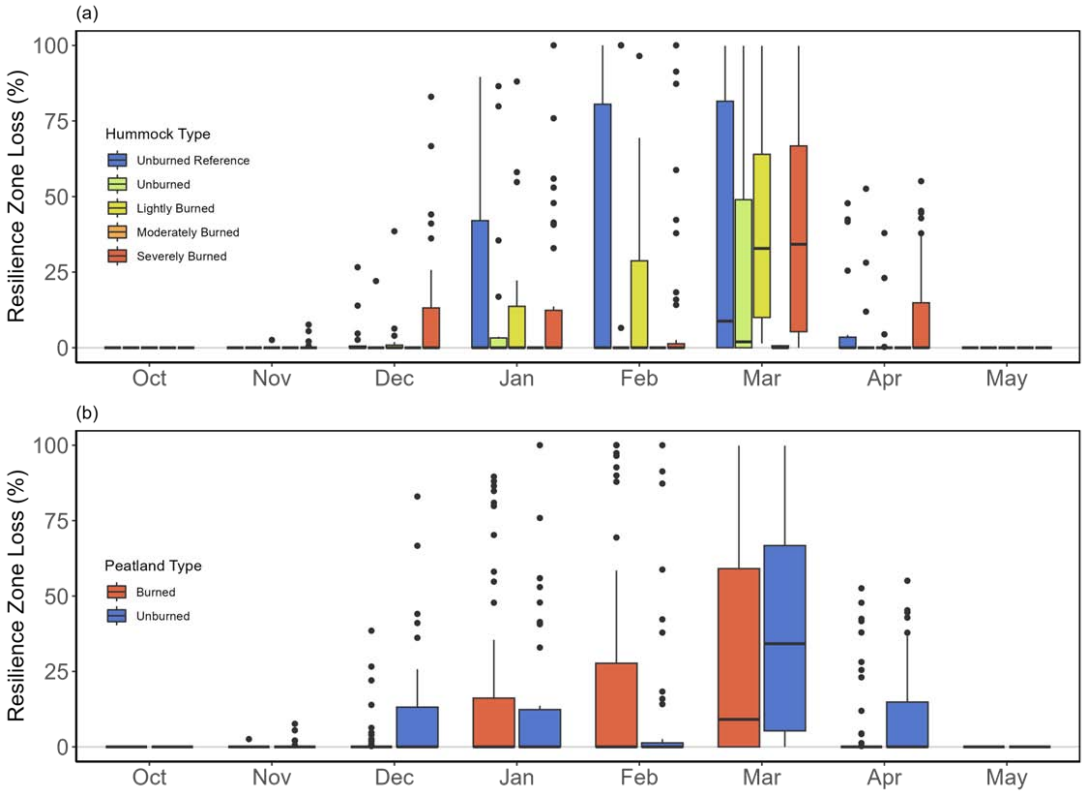
Research Lead: Dr. Chantel Markle (Postdoctoral Fellow)

Impacts on Wetland Water Levels & Rattlesnake Overwintering Habitat



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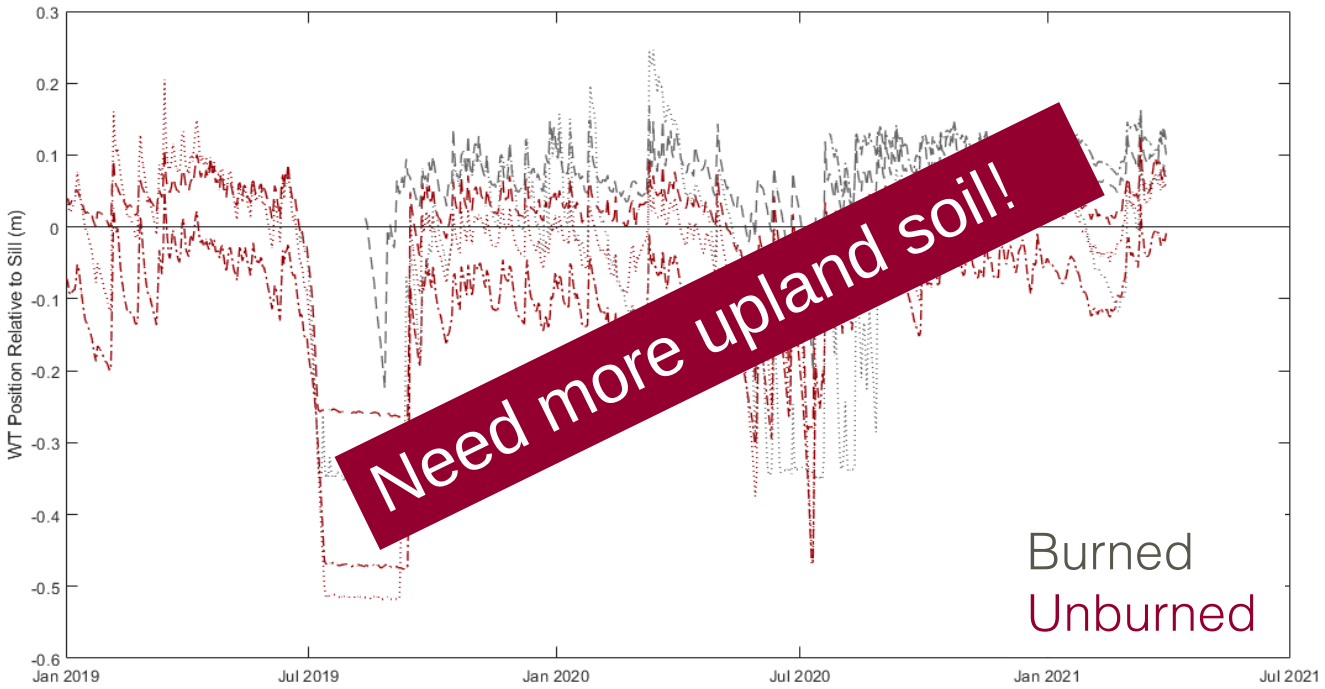
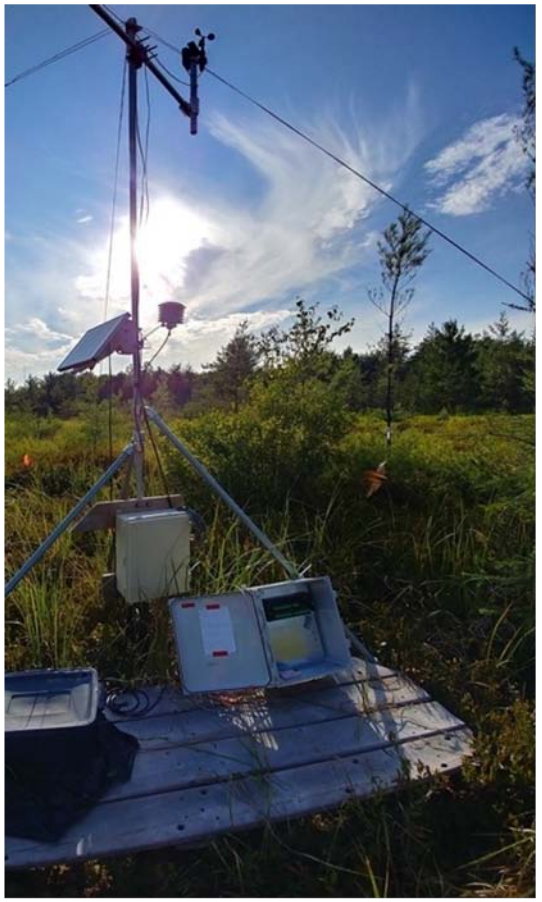
Research Lead: Taylor North (M.Sc. Student)

Impacts on Wetland Water Levels

Burned peatland water tables are higher





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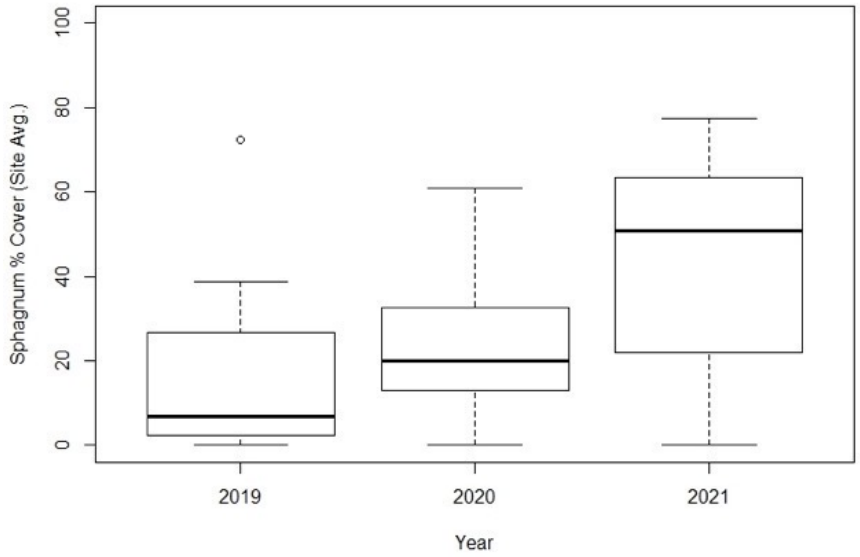
Research Lead: Dr. Paul Moore (Postdoctoral Fellow) and Greg Verkaik (M.Sc. Student)

PAR33 Wildfire Recovery

PAR33 Wildfire Recovery

Post-wildfire vegetation recovery

Sphagnum moss % cover



McMaster Ecohydrology Lab

Research Lead: Alex Tekatch and Renée McDonald (M.Sc. students)

Need more soil! Can we kick start soil development?

MAC Ecohydrology Lab Annual “Thinking Outside the Bog” workshop

McMaster Ecohydrology Lab

Research Lead: Dr. Chantel Markle (Postdoctoral Fellow)

Need more soil! Constructed Turtle Nesting Habitat

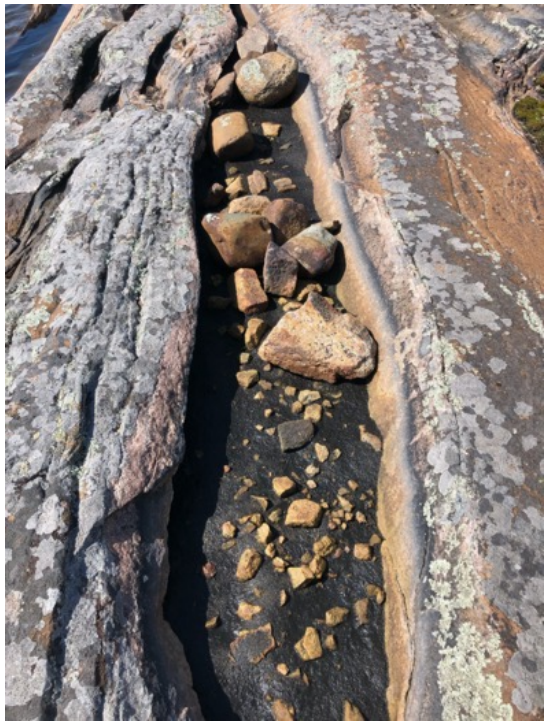
Next steps?:

Kick start regeneration of turtle nesting habitat with constructed nesting habitat!

McMaster Ecohydrology Lab

Research Lead: Dr. Chantel Markle (Postdoctoral Fellow)

Need more soil!



2023

Began trial moss and lichen regeneration study on a private island impacted by PAR33

Need more soil!

Need more soil!

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