



Role of fire and permafrost in governing boreal carbon dynamics



Catherine Dieleman

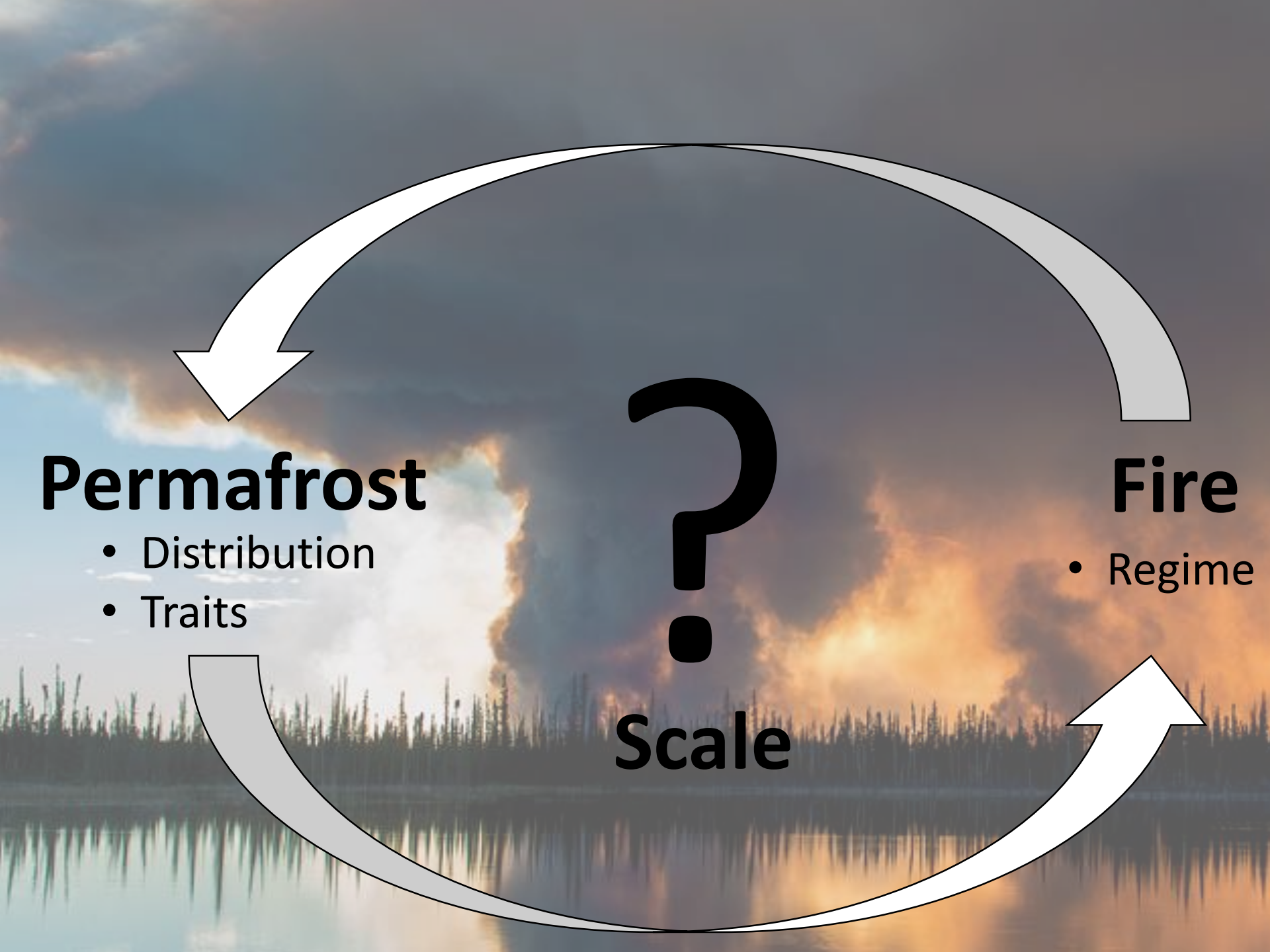
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Permafrost

- Distribution
- Traits

?

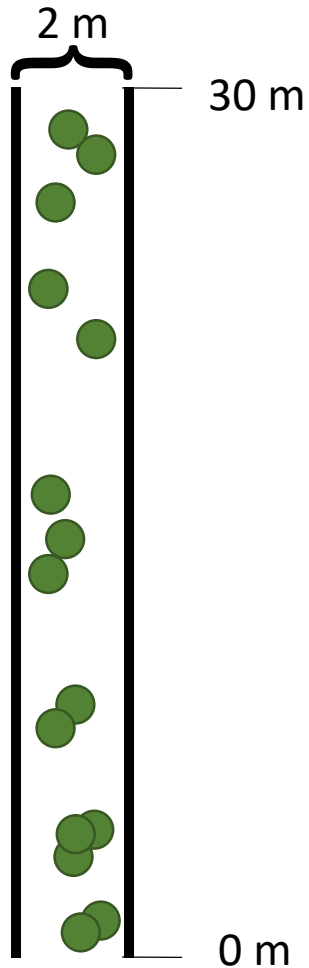
Scale

Fire

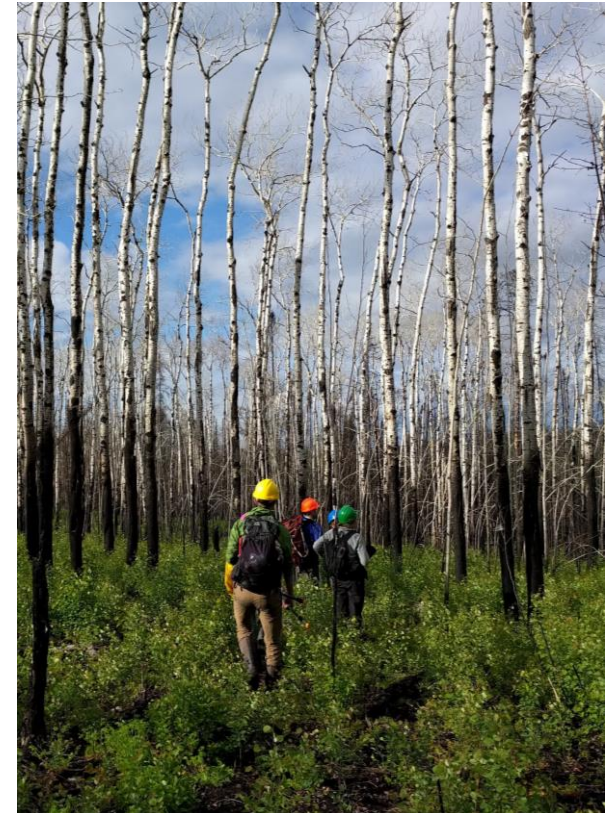
- Regime

Experimental Design

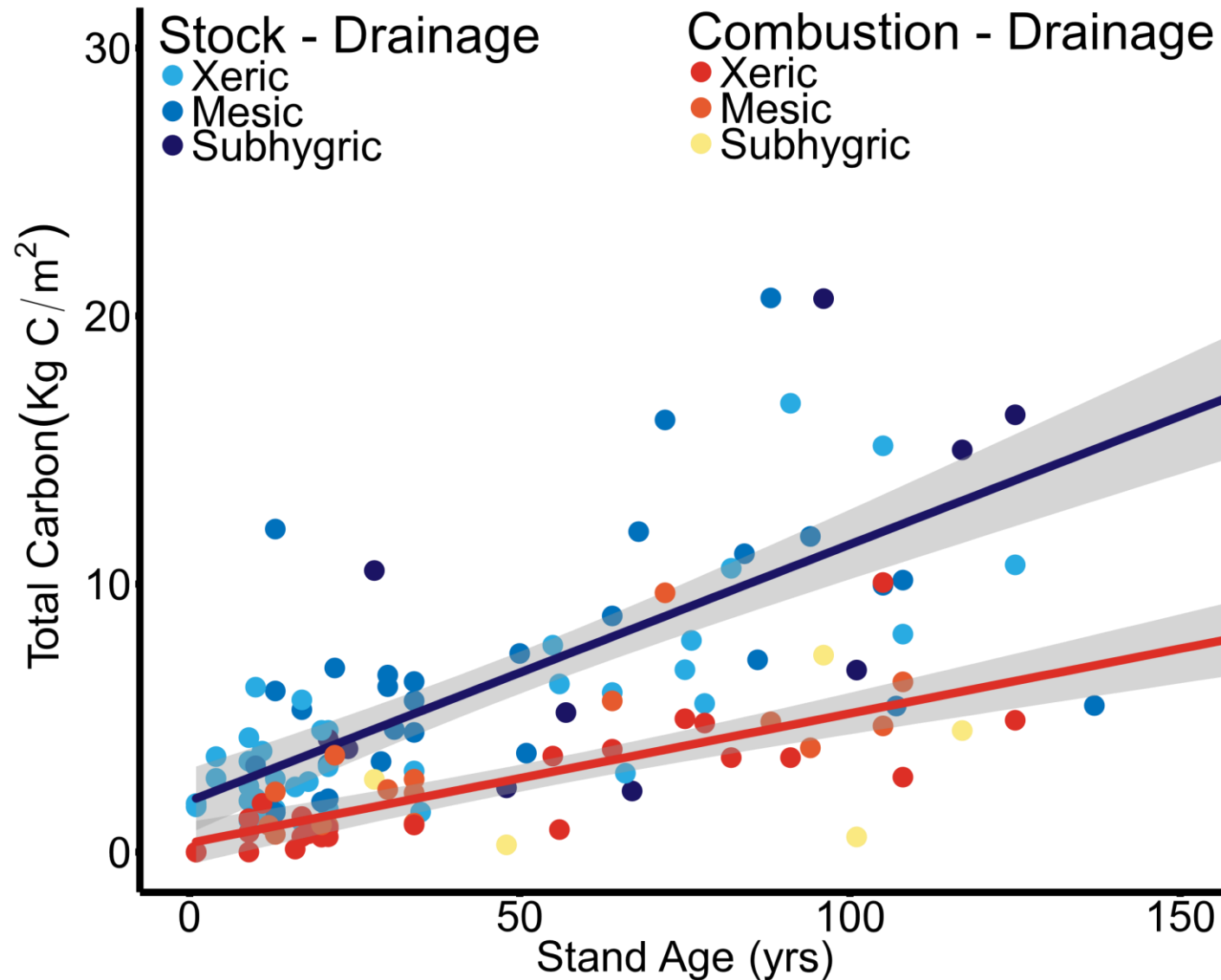
Site Transect



- Total Carbon Stocks
- Total Carbon Combustion Rates
- Landscape Variables



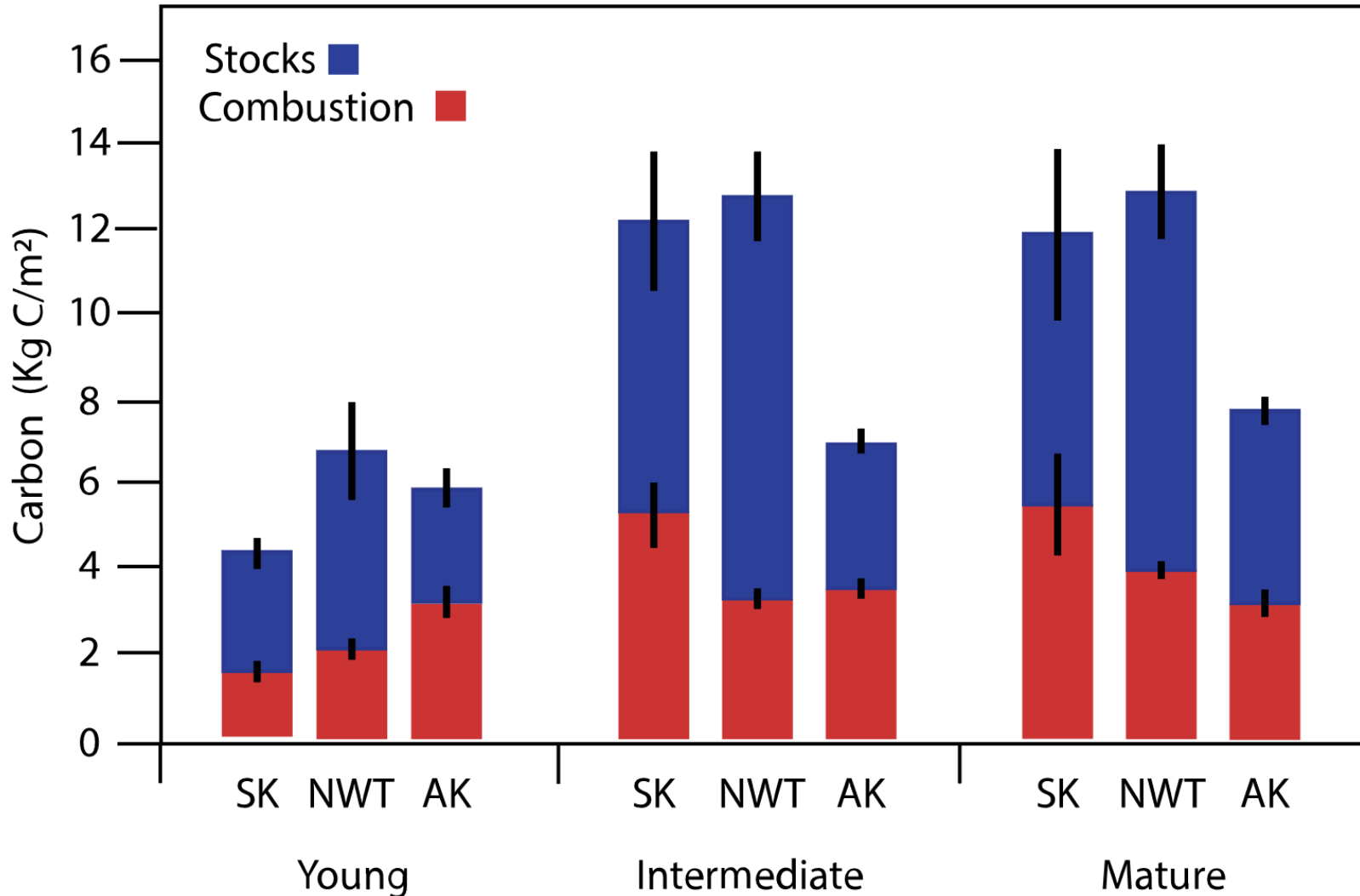
Drivers of Carbon Recovery and Combustion

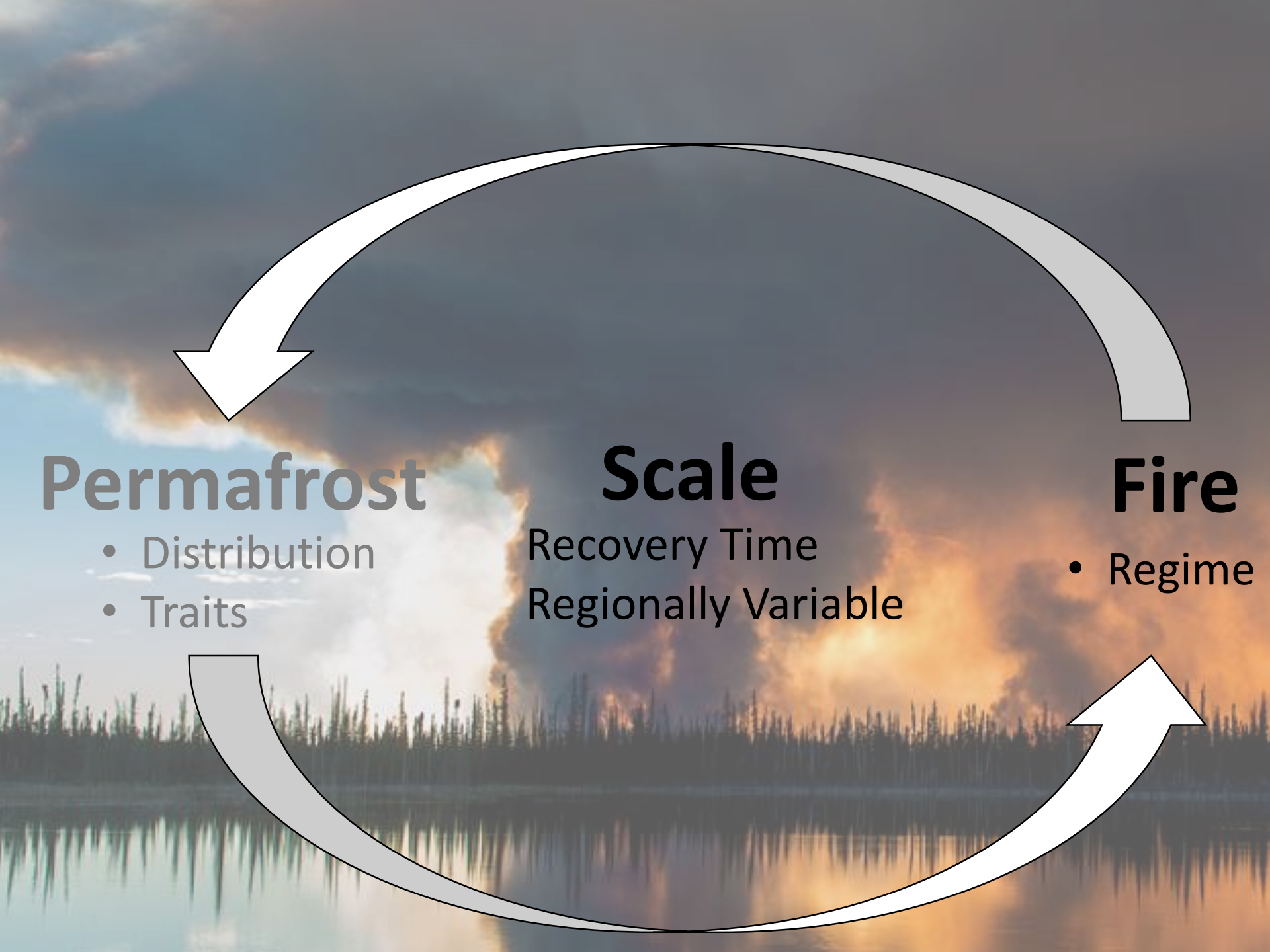


Pan-Regional Data



Pan-Regional Carbon





Permafrost

- Distribution
- Traits

Scale

Recovery Time
Regionally Variable

Fire

- Regime

Experimental Design

Permafrost Core

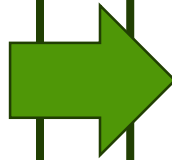


} Seasonal Thaw
(20-50 cm)

} Transition zone
(50-80 cm)

} Permafrost zone
(80-110 cm)

} Basal Permafrost
zone
(>110 cm)



Incubation Set-up



Mason jar
with
cellophane

Nalgene
filtering
Unit

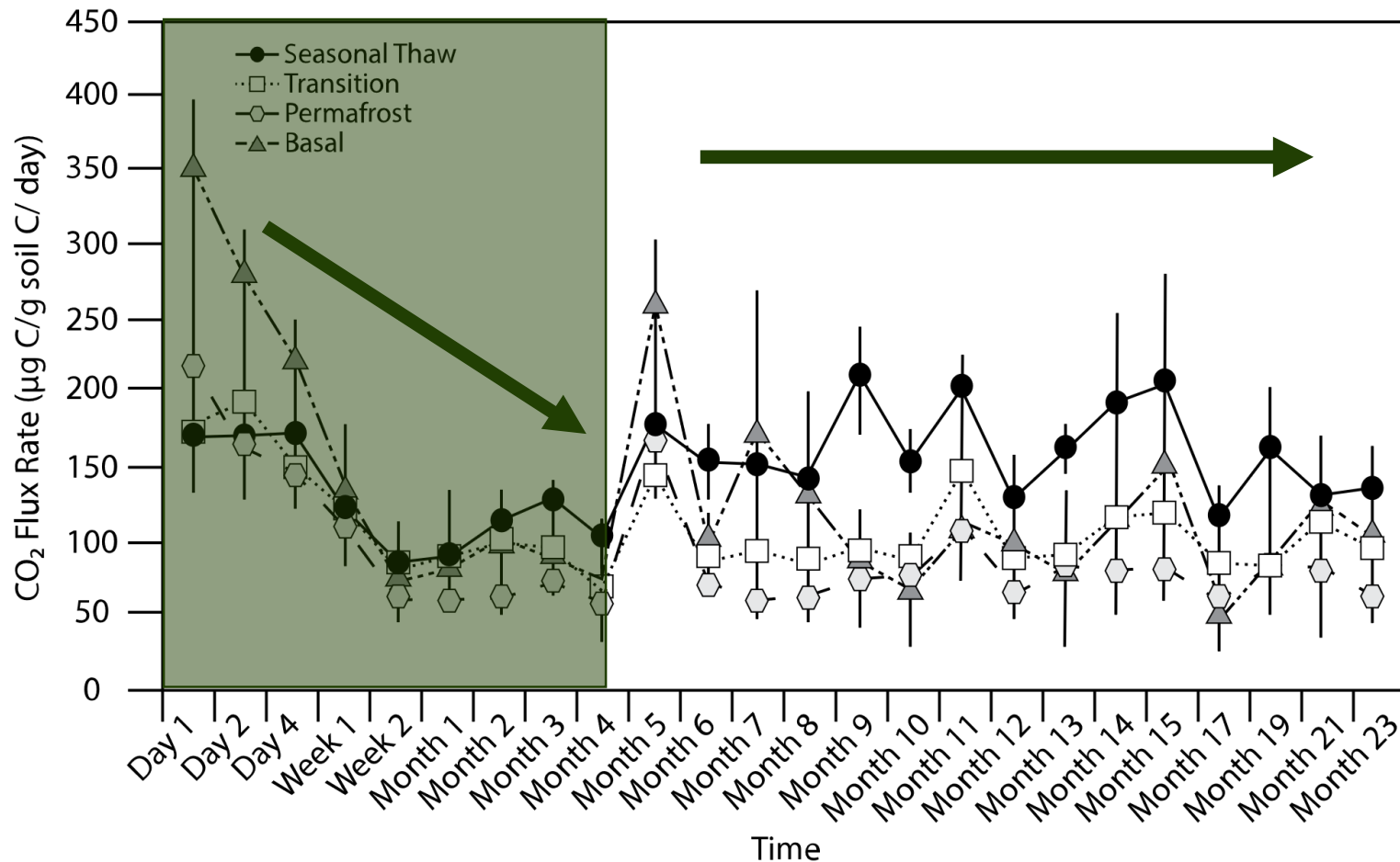
10 g sample

Glass wool
and
glass filter

Long-Term Carbon Release

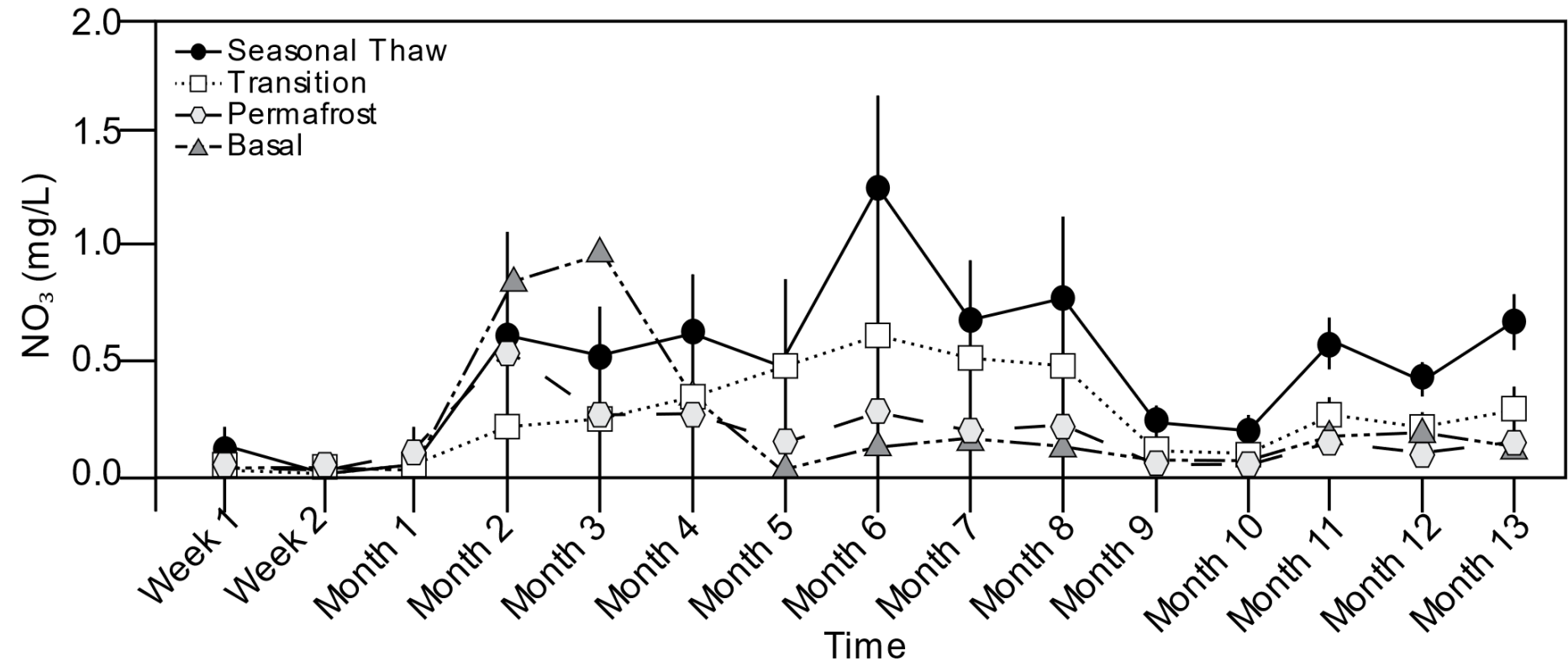
Sustained recovery in seasonal thaw layer production

Sustained productivity in all permafrost layers

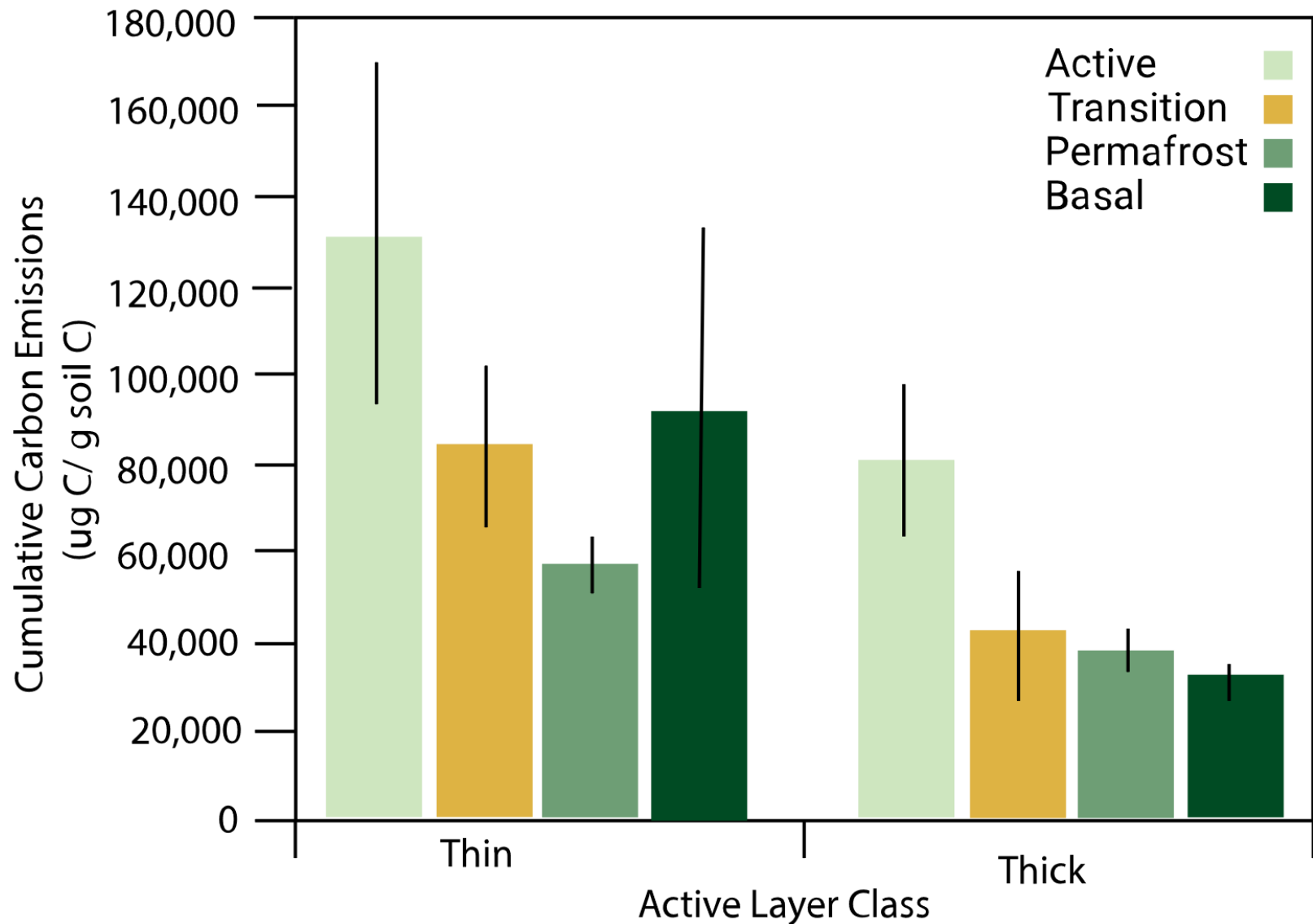


Long-Term Nitrogen Release

Trends reflective of sustained carbon productivity



Carbon Release and Permafrost Traits

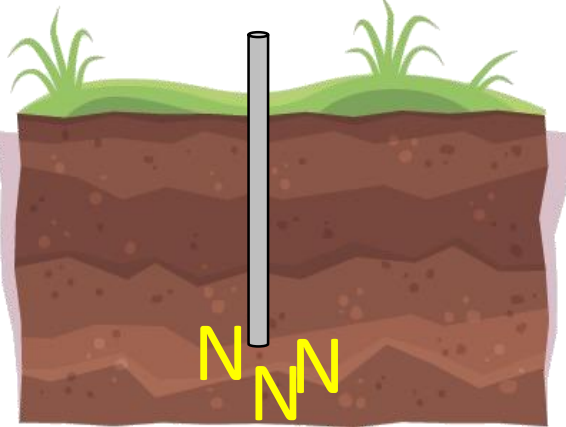


Experimental Design

Depth

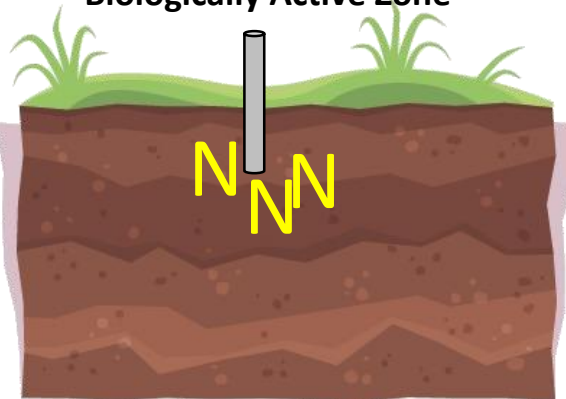
70+ cm

Permafrost Interface



30 cm

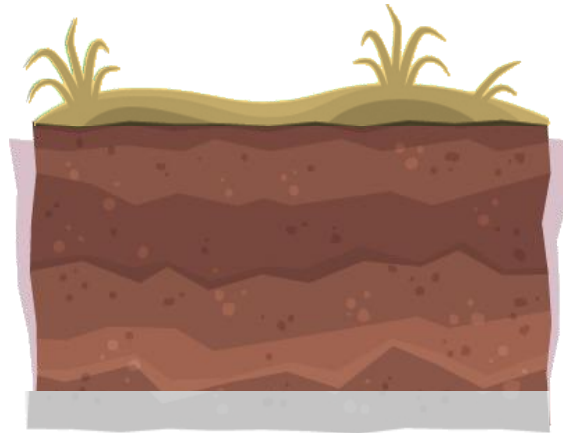
Biologically Active Zone



Time

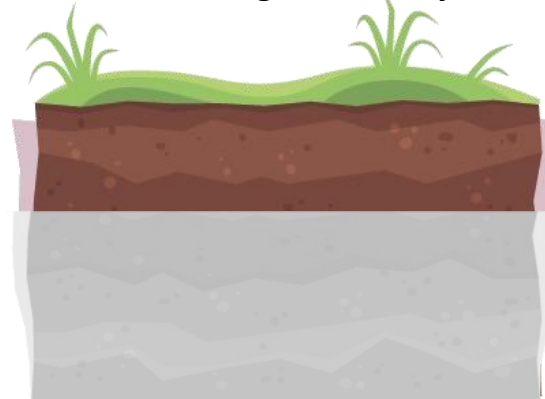
Sept

Max Permafrost Thaw



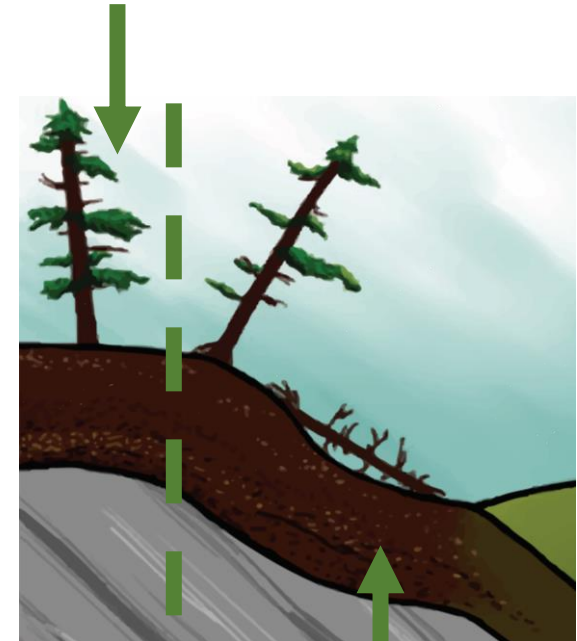
July

Max Biological Activity



Thaw State

Permafrost
Plateau

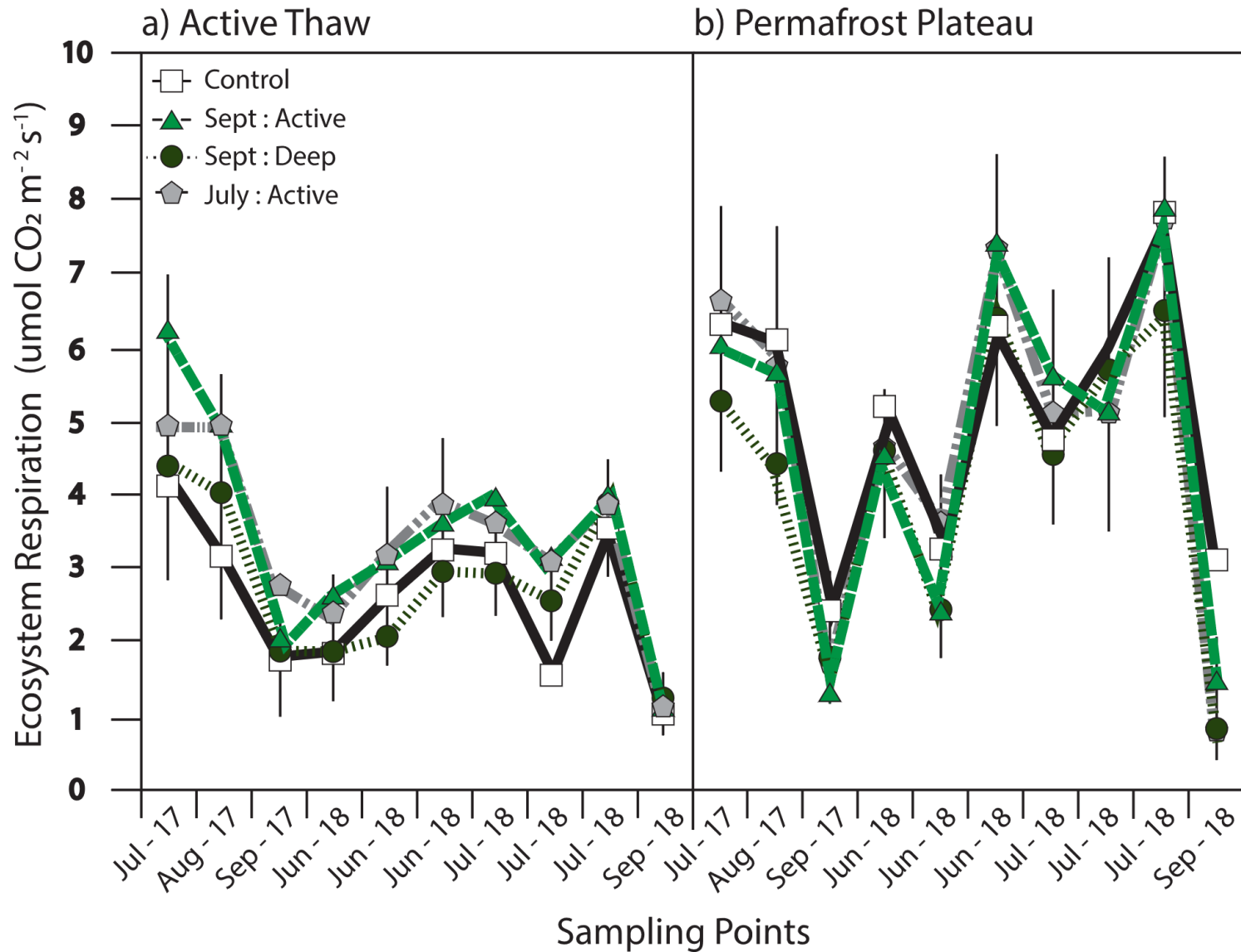


**BONANZA
CREEK
LTER**
*Boreal
Forest Ecology*

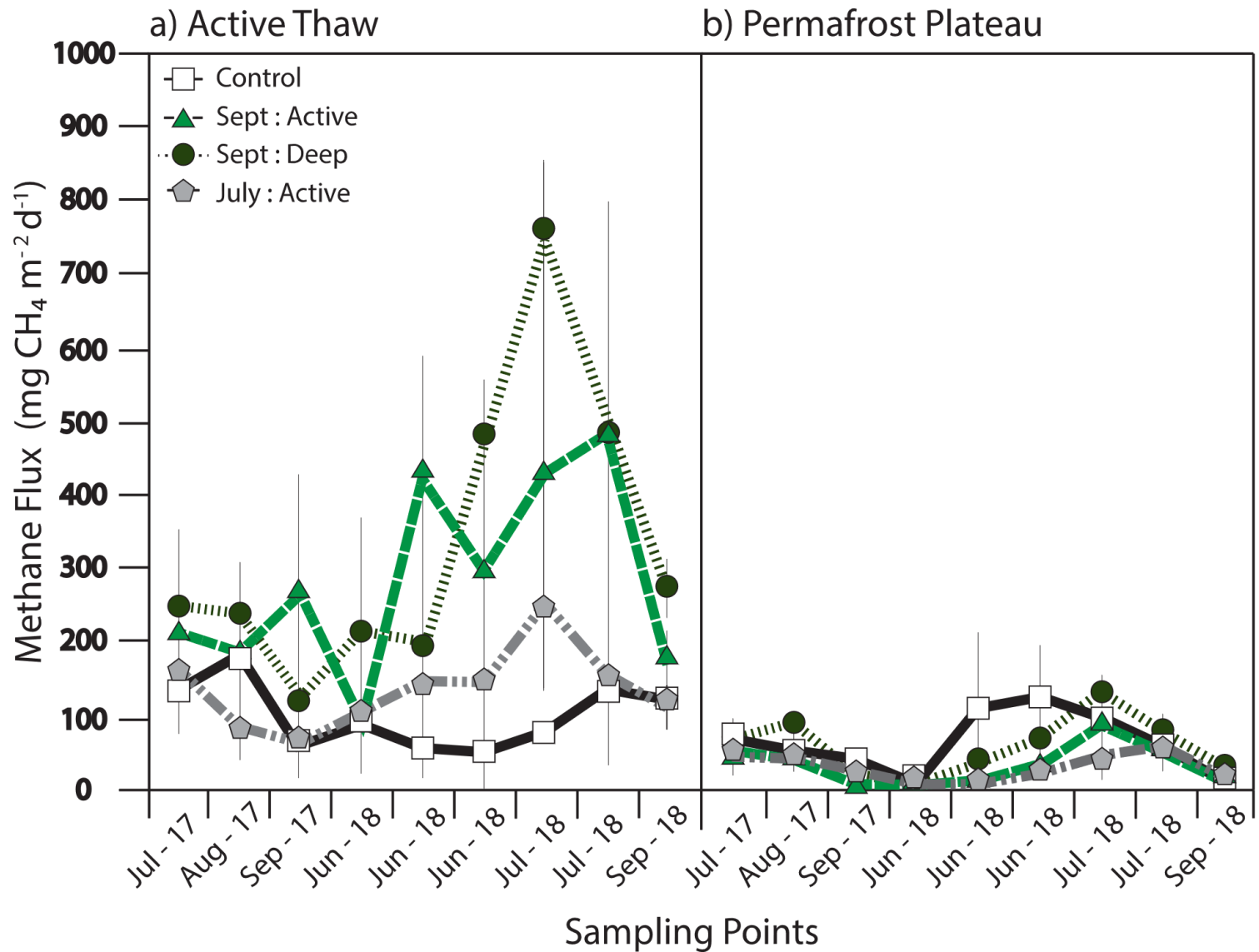
Active Thaw

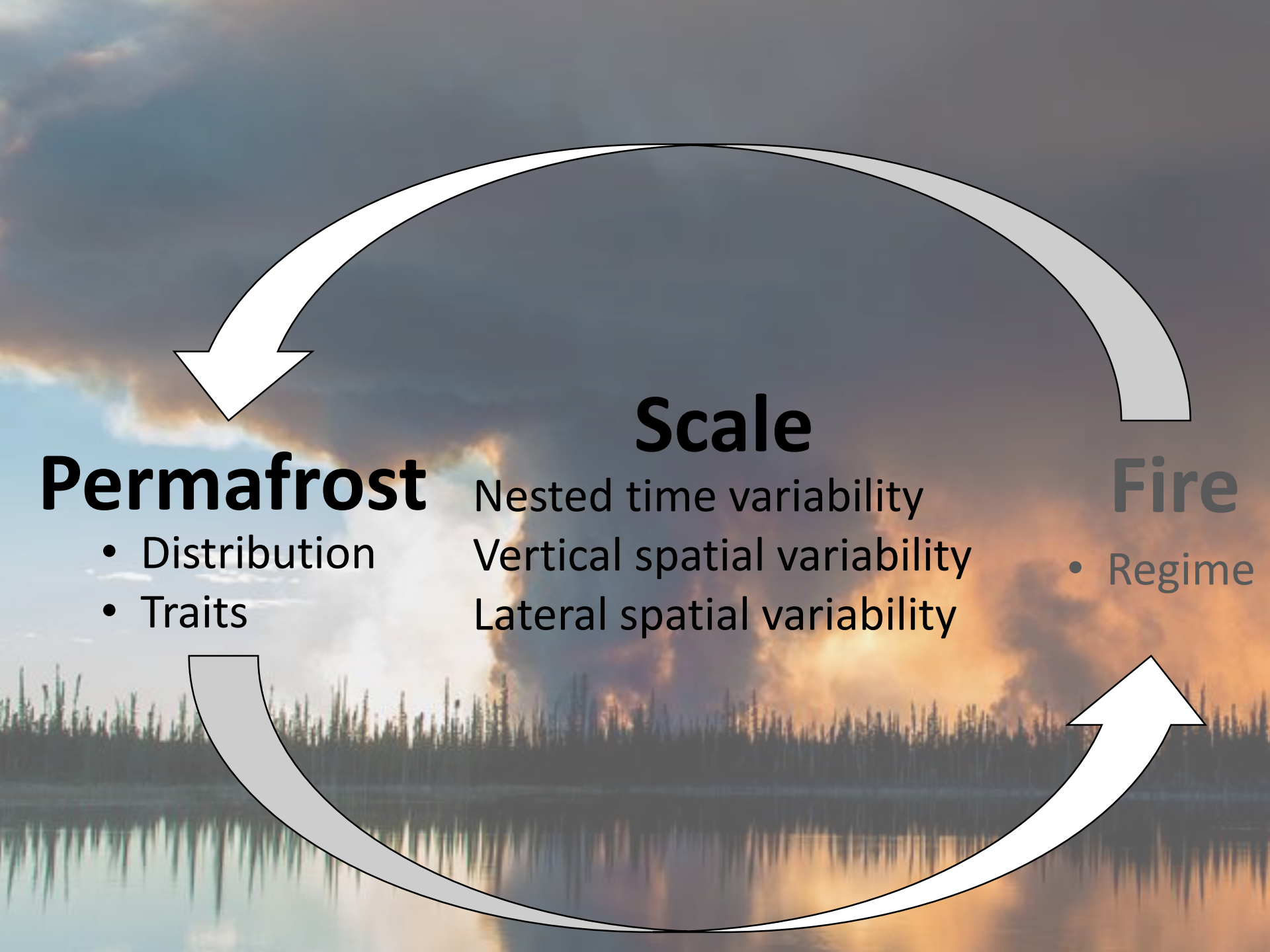


CO₂ Trends



CH₄ Trends





Permafrost

- Distribution
- Traits

Scale

Nested time variability
Vertical spatial variability
Lateral spatial variability

Fire

- Regime



Pan-Regional

Regional

Local

Final Thoughts





Questions?



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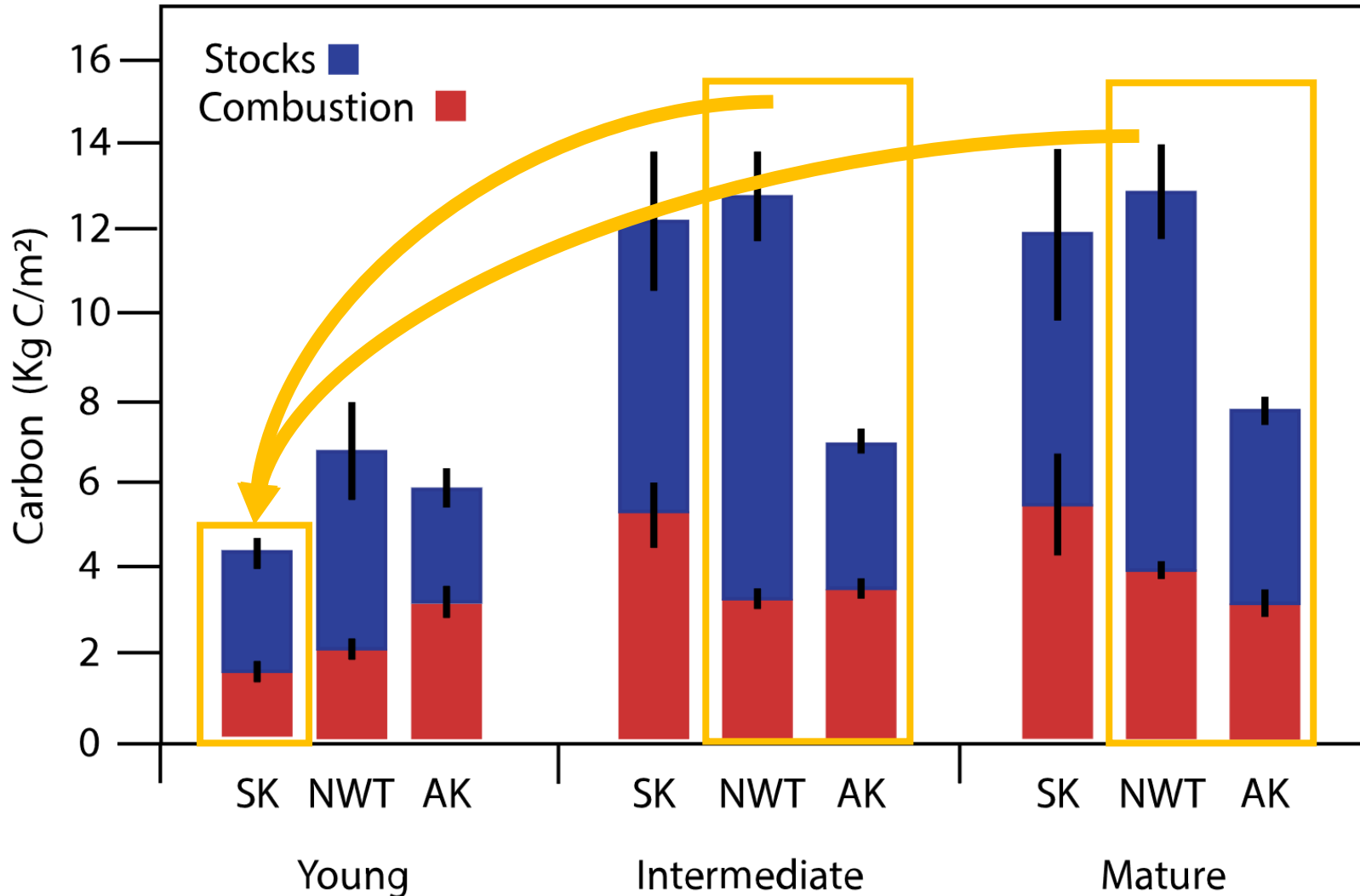


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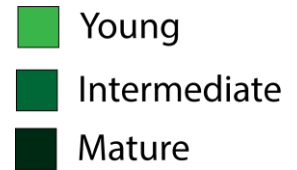


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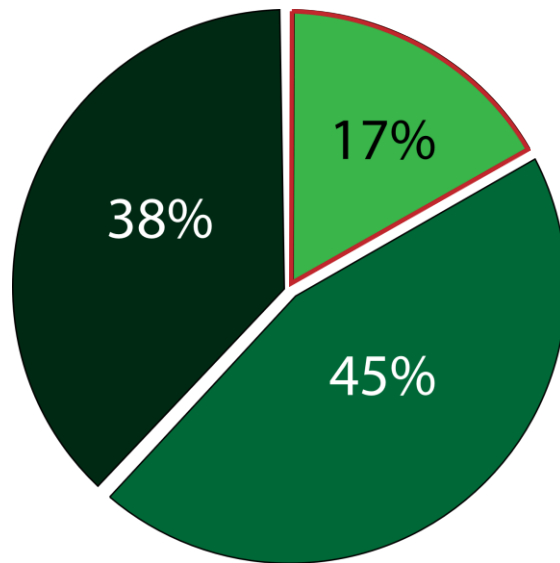
Pan-Regional Carbon



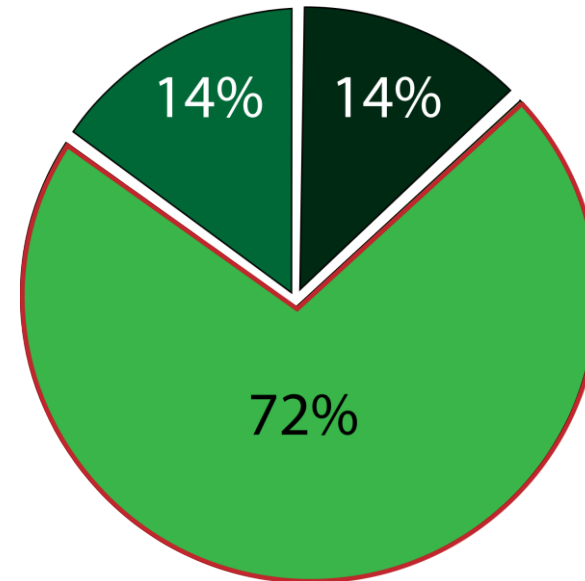
Pan-Regional Stand Age



Northern Boreal
Age



Southern Boreal
Age



Ice Rich Permafrost

Permafrost Plateau



Cooler
Drier

Active Thaw



Warmer
Wetter