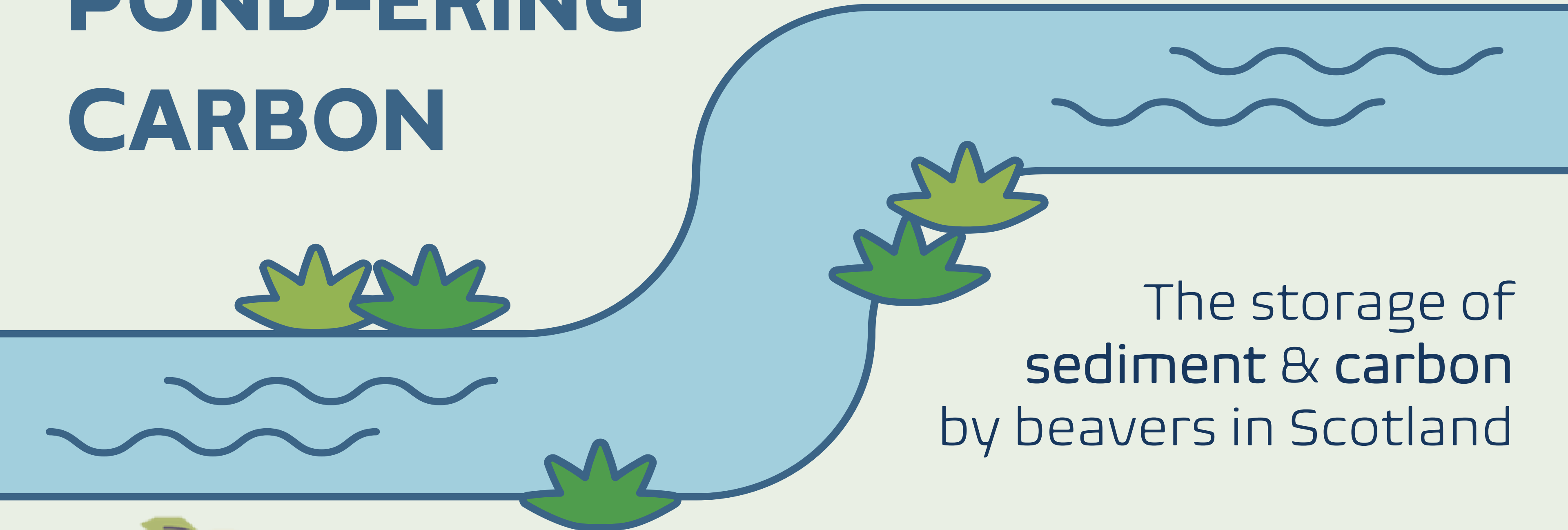


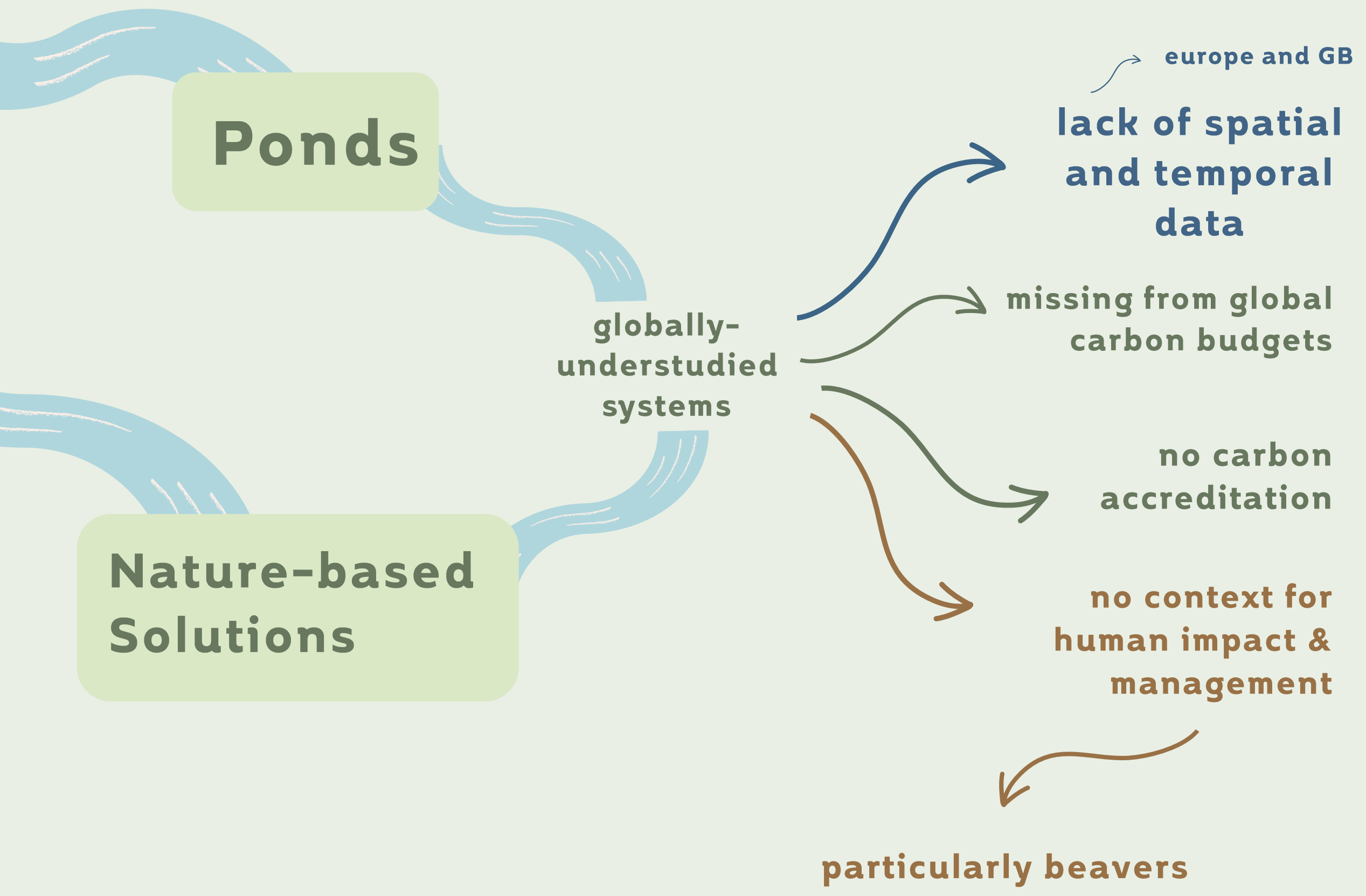
# POND-ERING CARBON



The storage of  
sediment & carbon  
by beavers in Scotland

**EMILY SIMPSON**  
emily.simpson@stir.ac.uk

Dr Alan Law, Dr Amy Pickard,  
Dr Scott Davidson,  
Dr Anna Belcher, Dr Adrian Bass



Article

## Alteration of carbon cycling by beaver: methane evasion rates from boreal forest streams and rivers

Authors: [Tim E. Ford](#) and [Robert J. Naiman](#) | [AUTHORS INFO & AFFILIATIONS](#)

Publication: Canadian Journal of Zoology • February 1988 • <https://doi.org/10.1139/z88-076>

## The role of Eurasian beaver (*Castor fiber*) in the storage, emission and deposition of carbon in lakes and rivers of the River Ob flood plain, western Siberia

[Roberto Cazzolla Gatti](#)<sup>a</sup> ✉, [Terry V. Callaghan](#)<sup>a e</sup>, [Inna Rozhkova-Timina](#)<sup>a</sup>, [Anastasia Dudko](#)<sup>b</sup>, [Artyom Lim](#)<sup>a</sup>, [Sergey N. Vorobyev](#)<sup>a</sup>, [Sergey N. Kirpotin](#)<sup>a</sup>, [Oleg S. Pokrovsky](#)<sup>c d</sup>

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*Earth Surf. Process. Landforms* **43**, 2358–2370 (2018)  
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 (wileyonlinelibrary.com) DOI: 10.1002/esp.4398

## Sediment and nutrient storage in a beaver engineered wetland

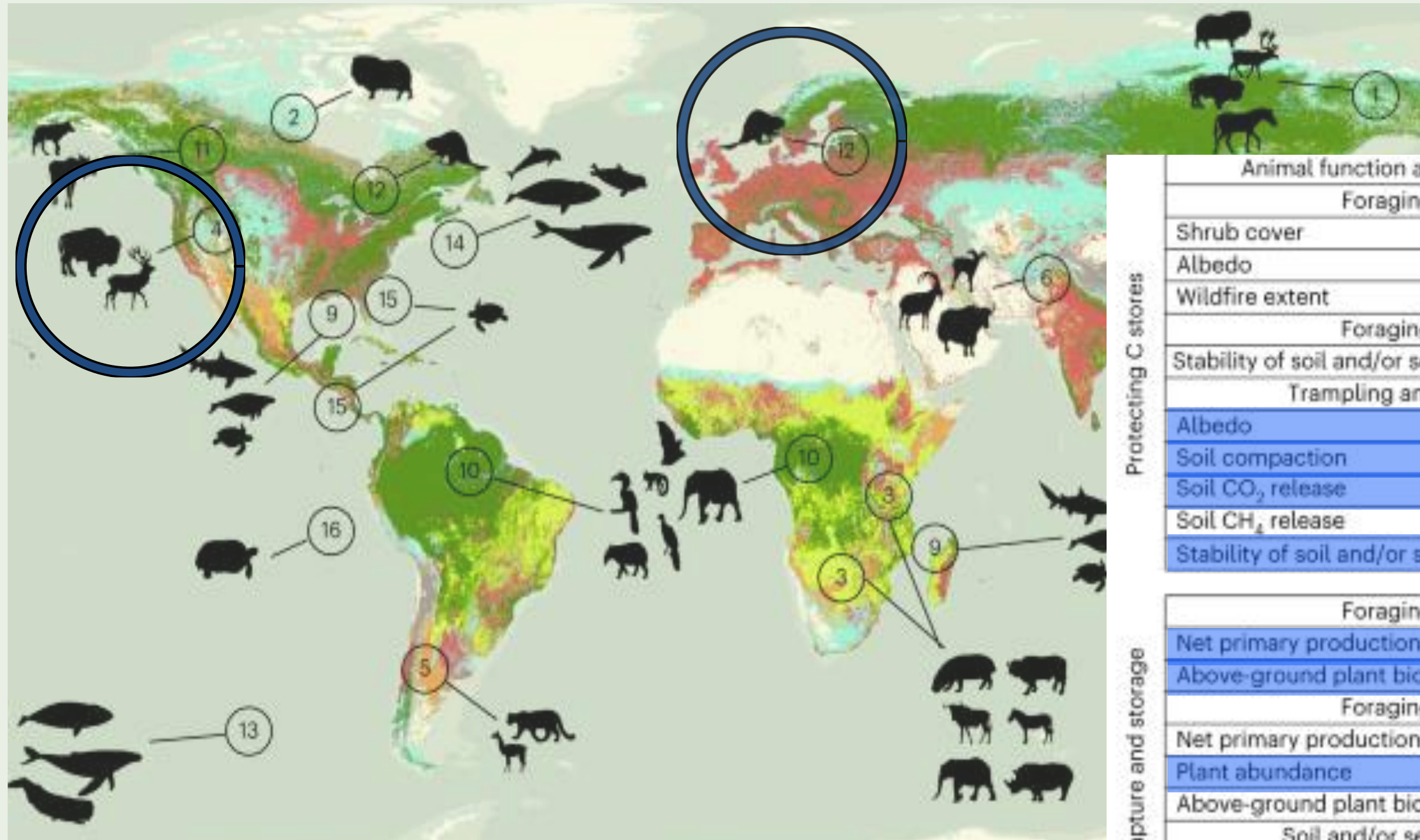
[Alan Puttock](#)<sup>\*</sup>, [Hugh A. Graham](#), [Donna Carless](#) and [Richard E. Brazier](#)  
 Geography, University of Exeter, Exeter, UK, EX1 2EG

Received 22 August 2017; Revised 20 March 2018; Accepted 24 March 2018

<sup>\*</sup>Correspondence to: Alan Puttock, Geography, University of Exeter, Exeter, UK, EX1 2EG. E-mail: a.k.puttock@exeter.ac.uk  
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# 'animating' the carbon cycle

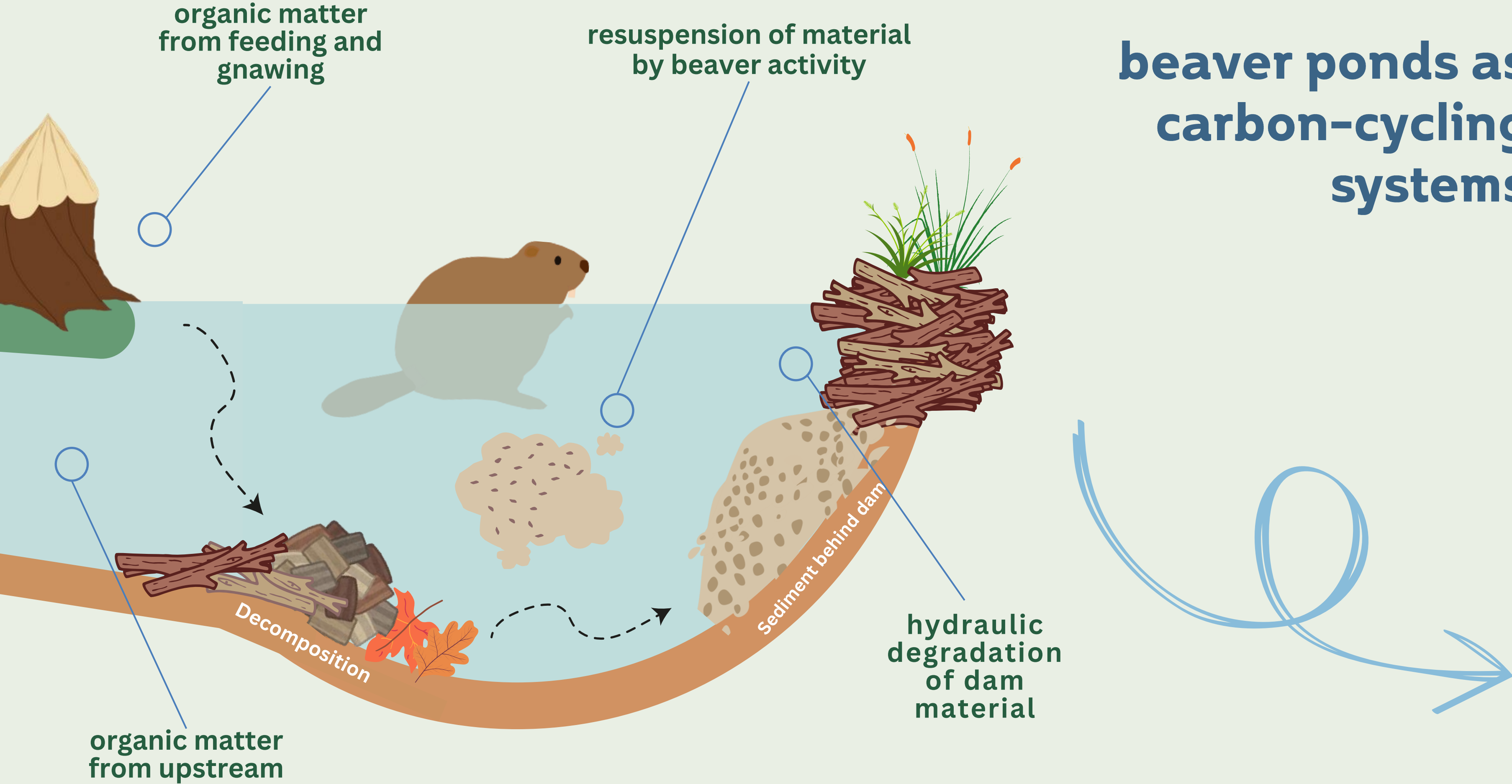
Using wild animal ecosystem functions explicitly to enhance ecosystem services



Animal function and ecosystem effects		1	2	3	4	5	6	7	8	9	10	11	12
Protecting C stores	Foraging: herbivory												
	Shrub cover	-	-										
	Albedo	+	+										
	Wildfire extent			-									
	Foraging: predation												
	Stability of soil and/or sediment C storage						+		+				+
	Trampling and/or disturbance												
	Albedo	+	+		+								
	Soil compaction	+	+	+	+								
	Soil CO <sub>2</sub> release	-	-	-	-		-						
Soil CH <sub>4</sub> release	-	-											
Stability of soil and/or sediment C storage			+	+		+							
Enhancing C capture and storage	Foraging: herbivory												
	Net primary production		+		+							+	
	Above-ground plant biomass C				+								
	Foraging: predation												
	Net primary production								+	+		+	
	Plant abundance				+				+	+		+	
	Above-ground plant biomass C							+				+	
	Soil and/or sediment organic C inputs												+
	C storage pool size				+	+	+	+	+	+	+	+	-
	Nutrient inputs												
Net primary production													
Seed dispersal													
Tree germination and abundance											+		
Above-ground plant biomass C											+		

Schmitz, O.J., Sylvén, M., Atwood, T.B., Bakker, E.S., Berzaghi, F., Brodie, J.F., Cromsigt, J.P., Davies, A.B., Leroux, S.J., Schepers, F.J. and Smith, F.A., 2023. Trophic rewilding can expand natural climate solutions. *Nature Climate Change*, 13(4), pp.324-333.

# beaver ponds as carbon-cycling systems



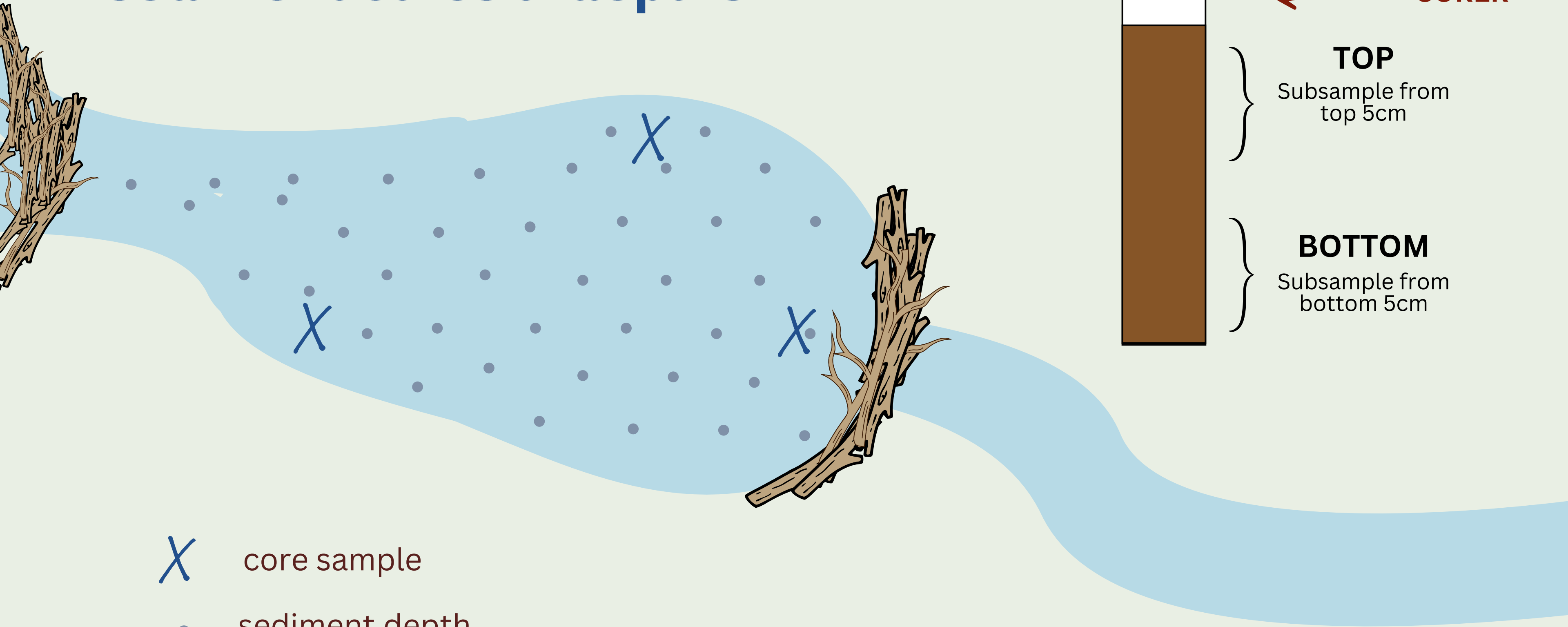


**Bamff Wildland**

- Bamff Wildland Boundary
- Pond Extents



# sediment cores & depths



**GRAVITY  
CORER**

**TOP**  
Subsample from  
top 5cm

**BOTTOM**  
Subsample from  
bottom 5cm

- X core sample
- sediment depth

# sediment cores



# initial results

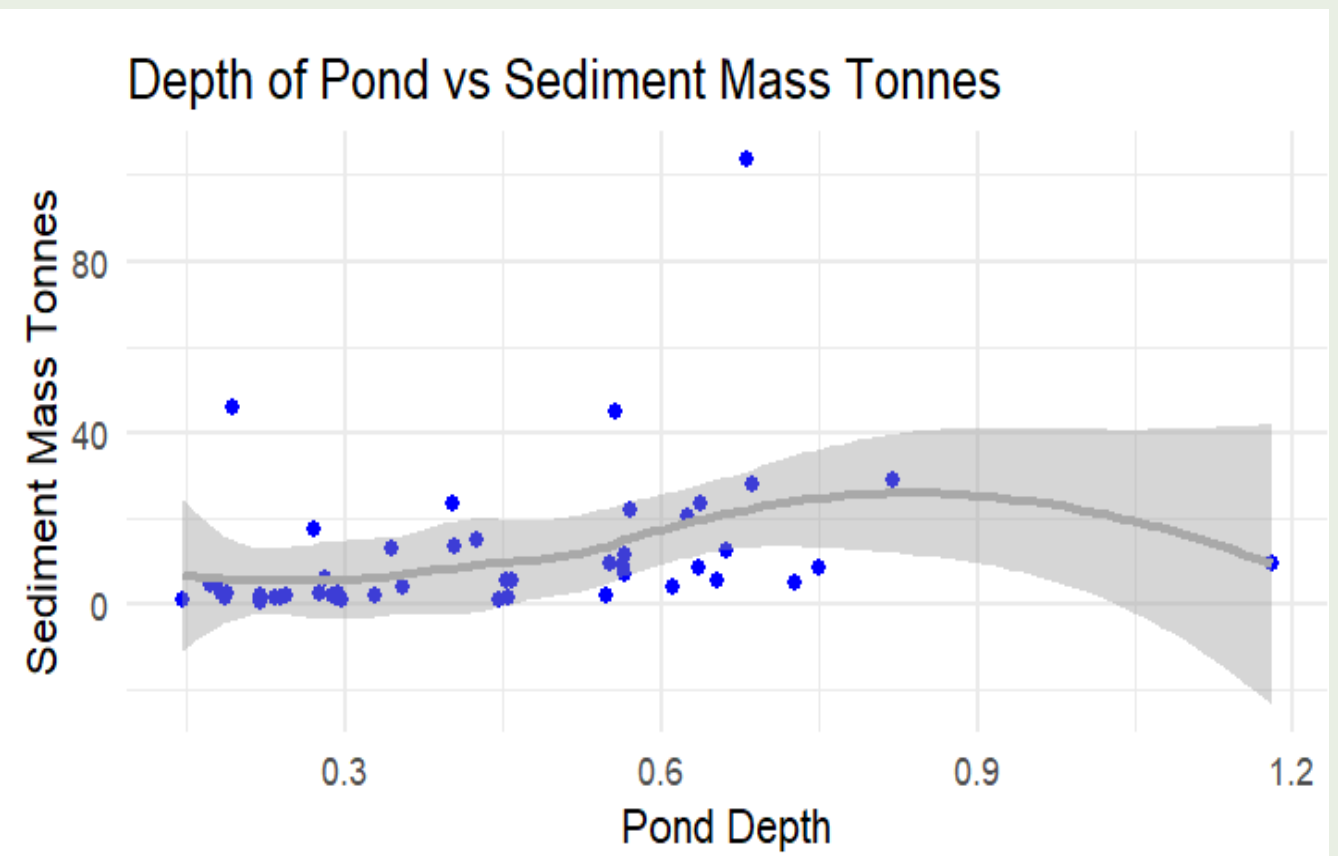
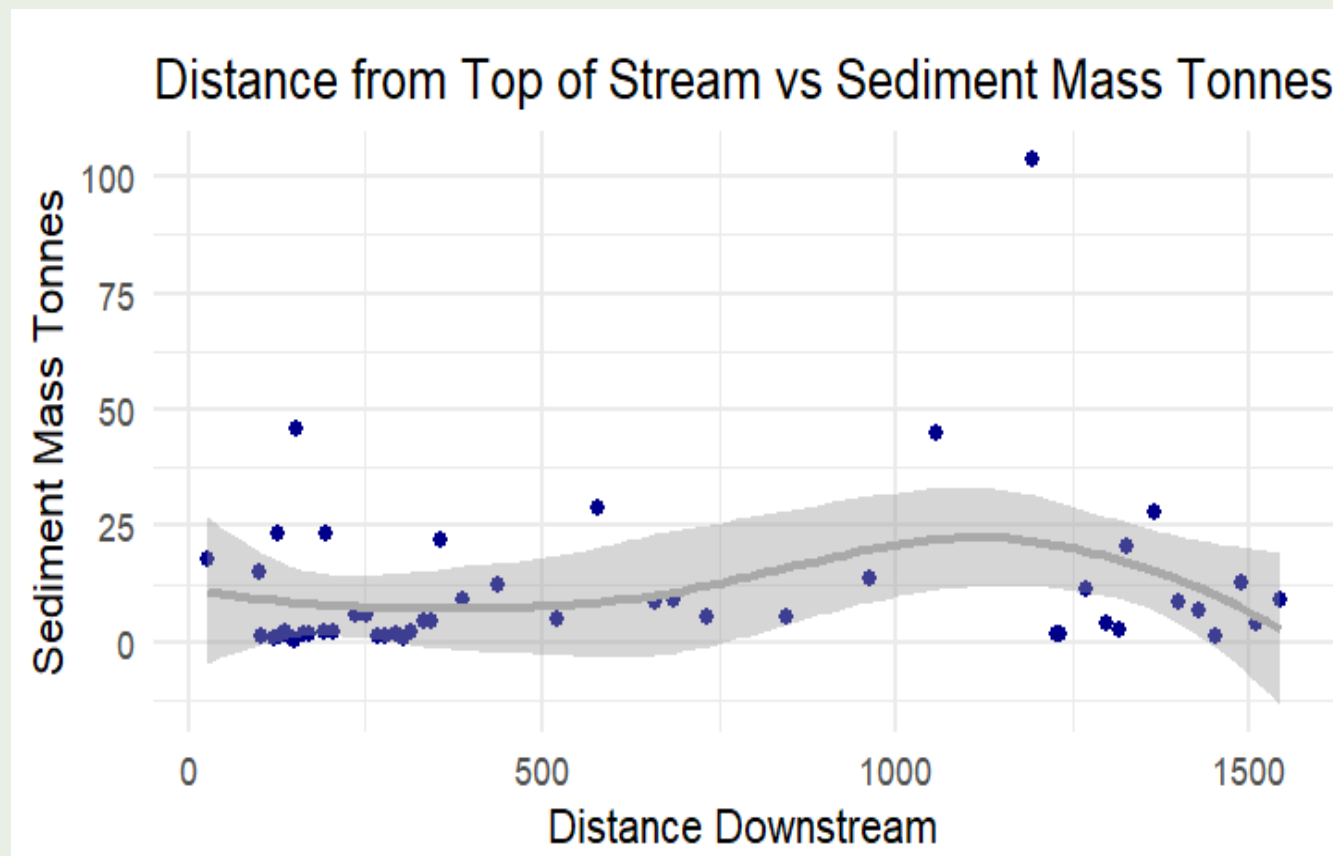
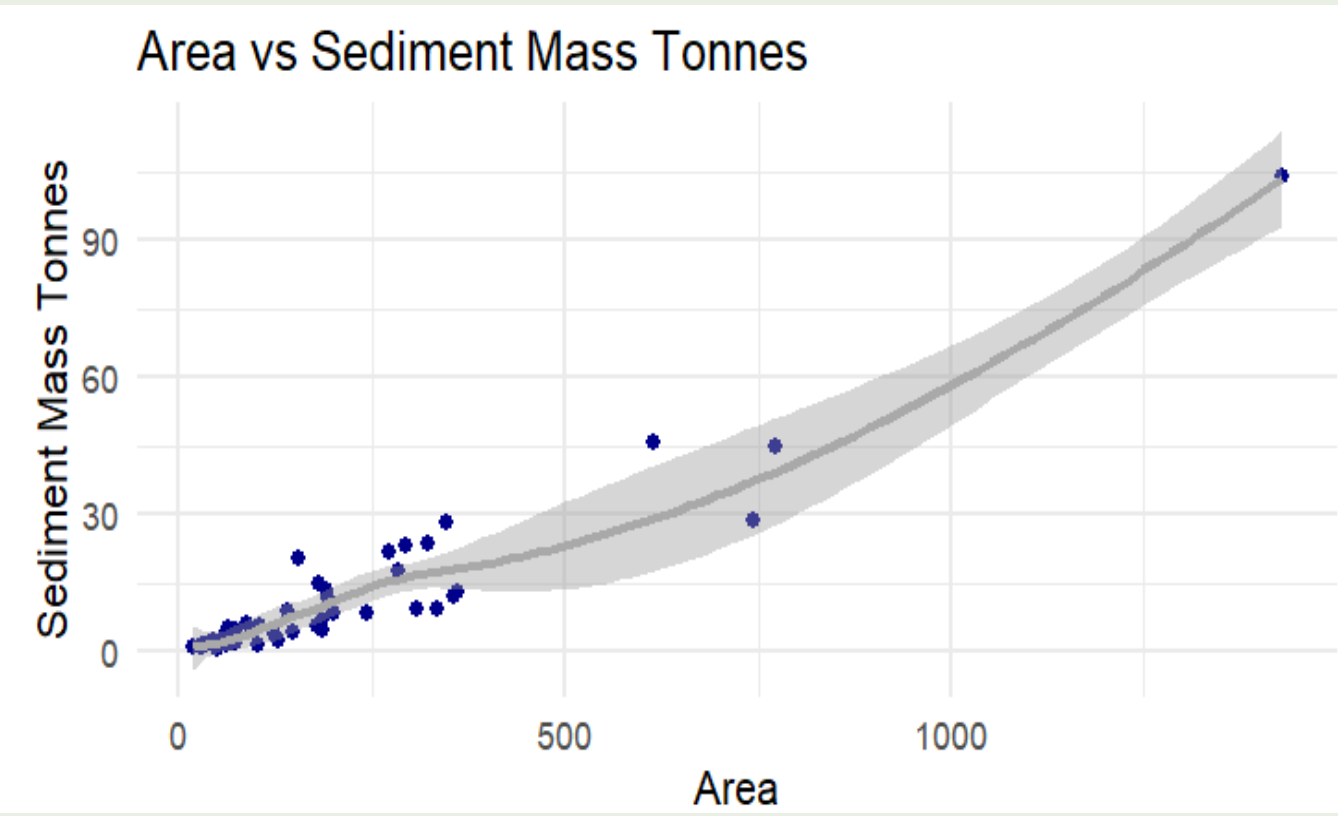
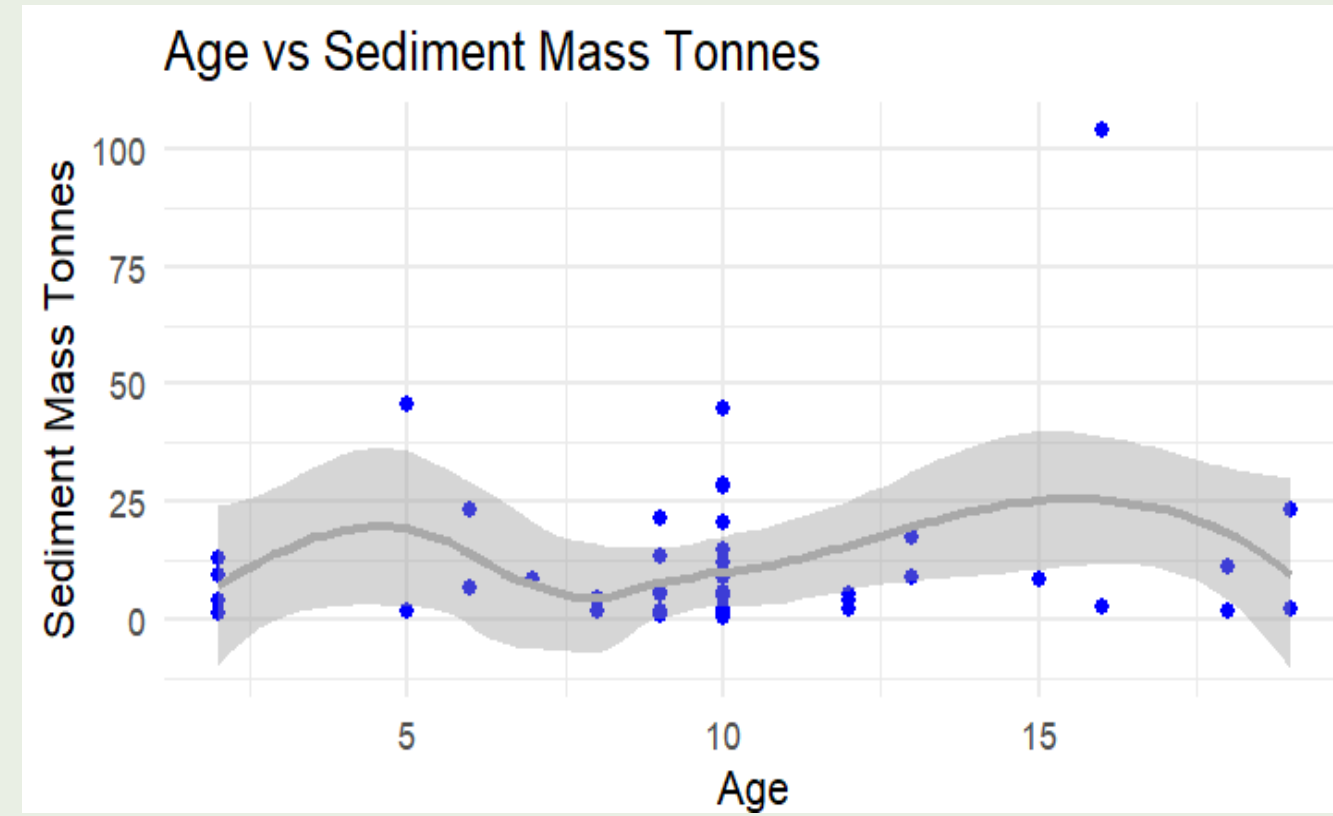
549 tonnes  
of  
sediment

150  
swimming  
pools

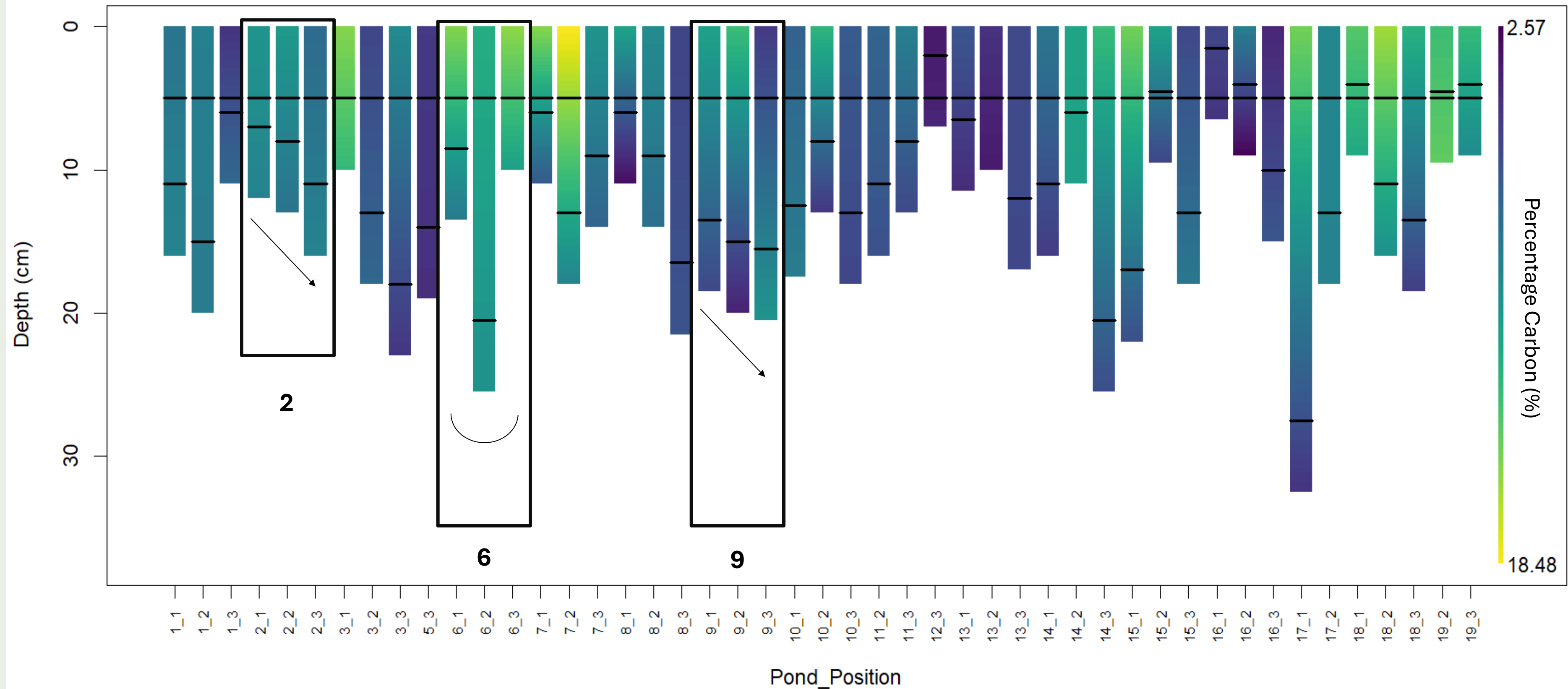
3 tonnes  
of  
nitrogen

50 tonnes  
of carbon

average age ~10 years  
average size ~220m

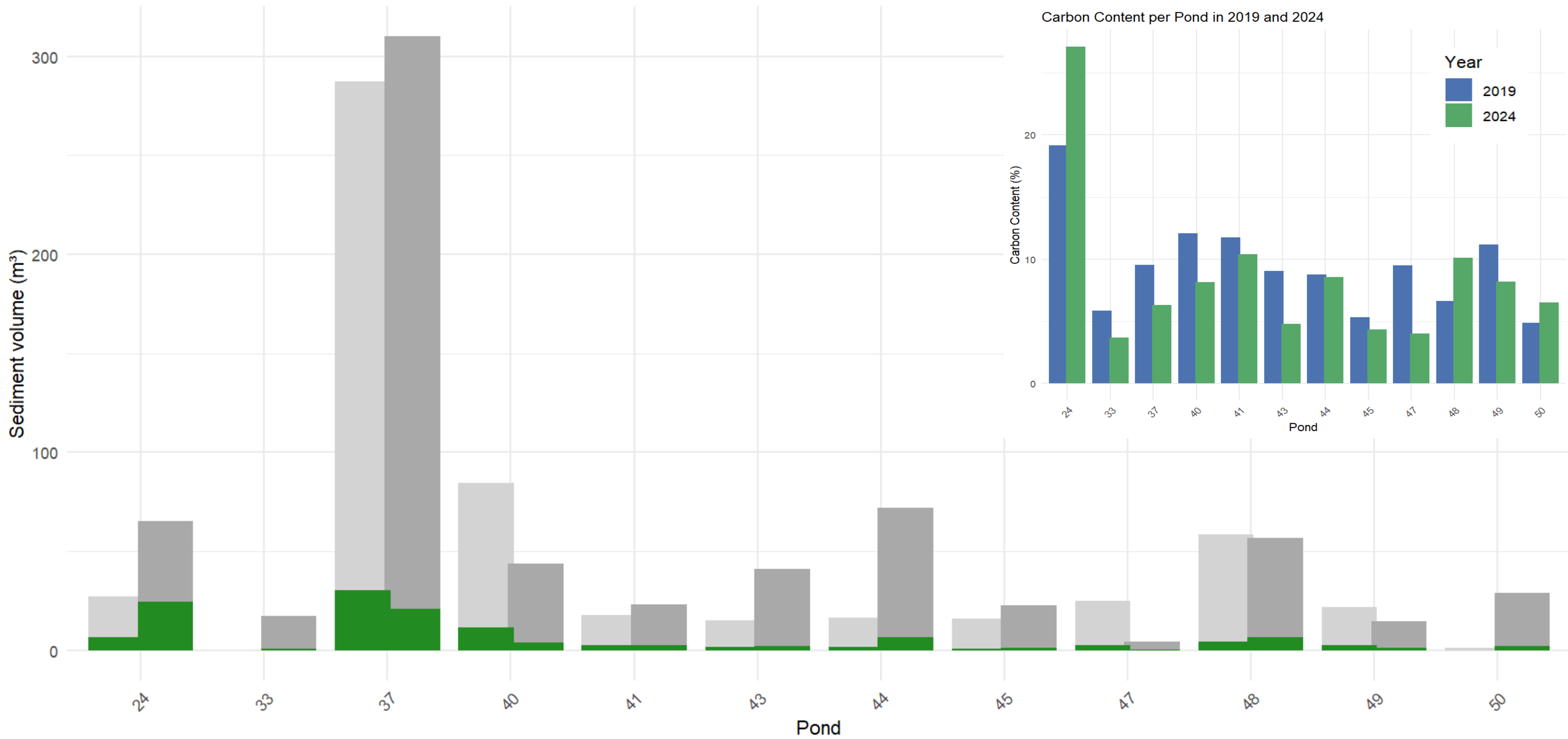


# Burnished Core Profiles with Carbon Gradient



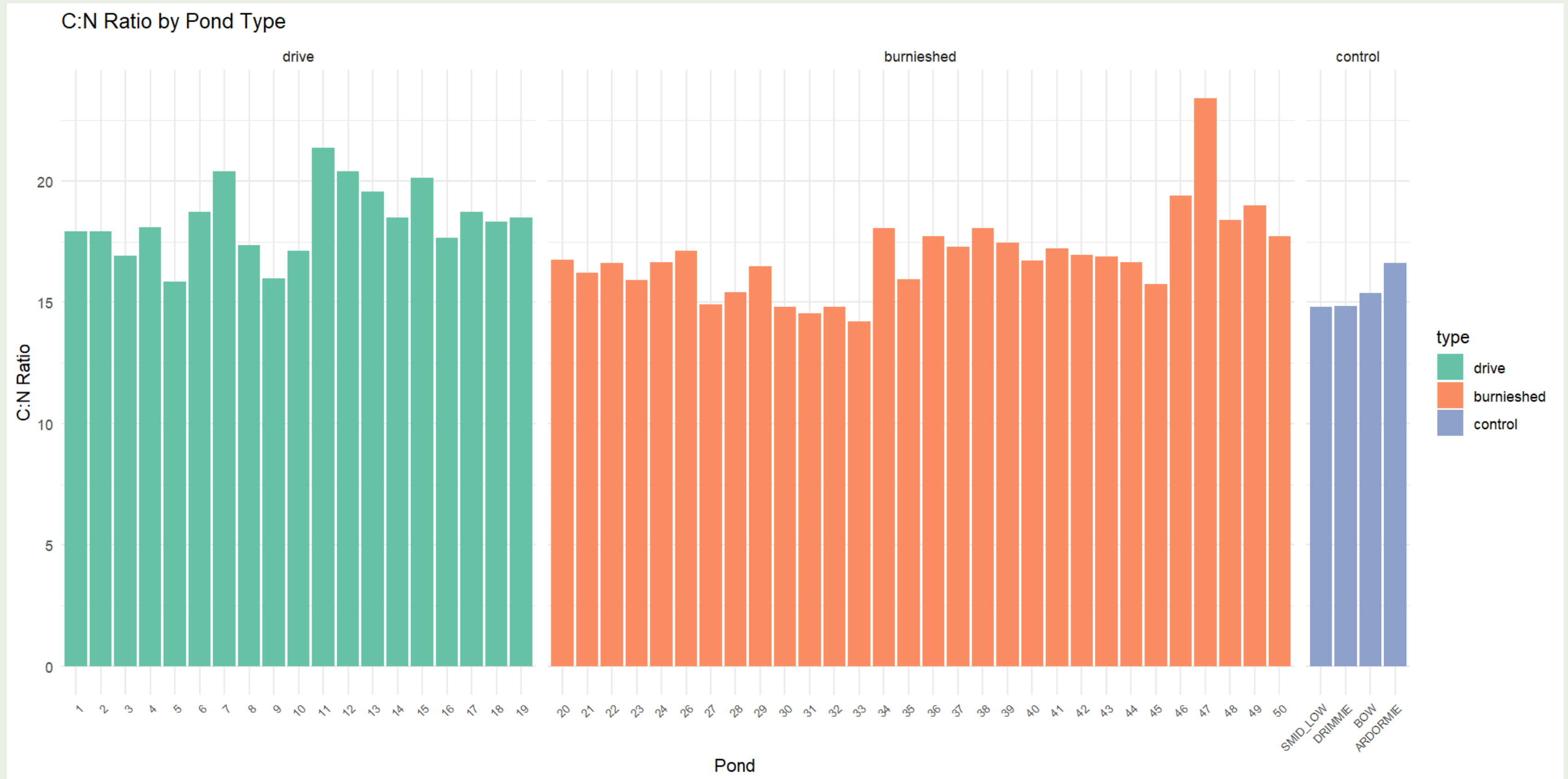
# Sediment accumulation and carbon content by pond (2019 vs 2024)

Year (base sediment)  2019  2024

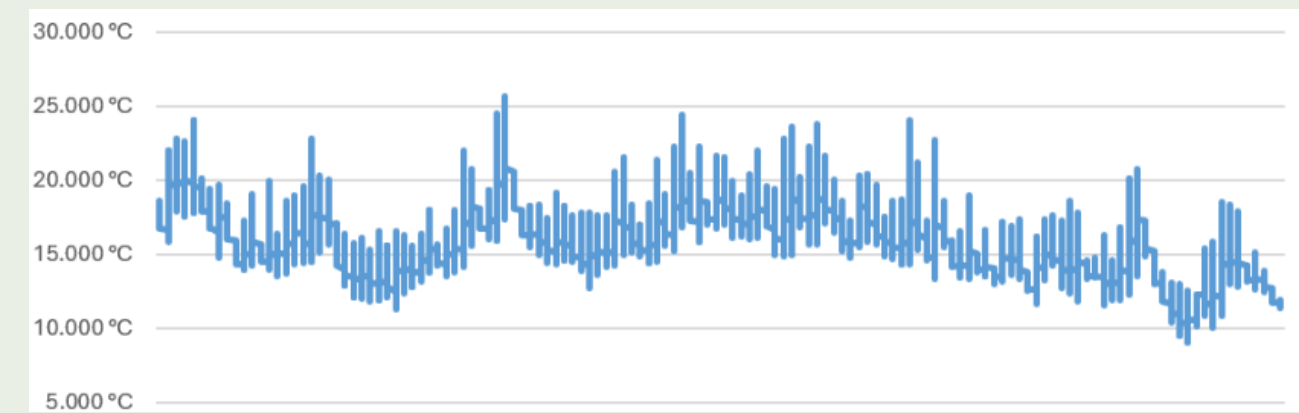
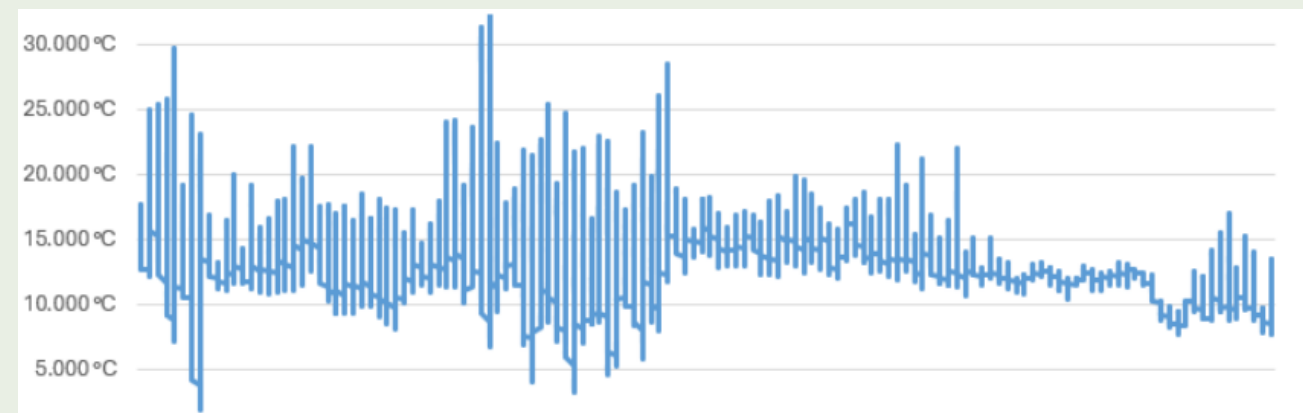
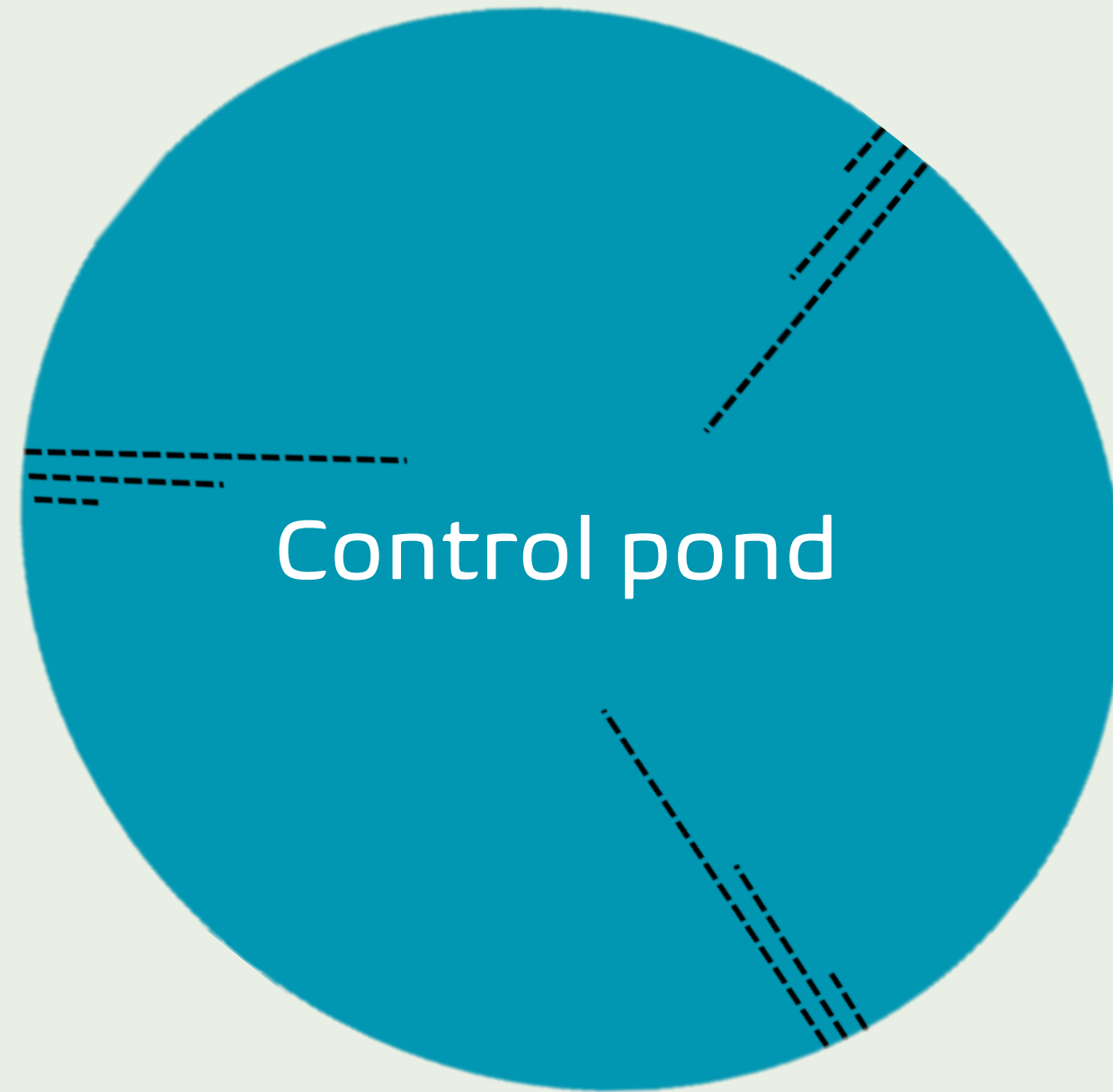
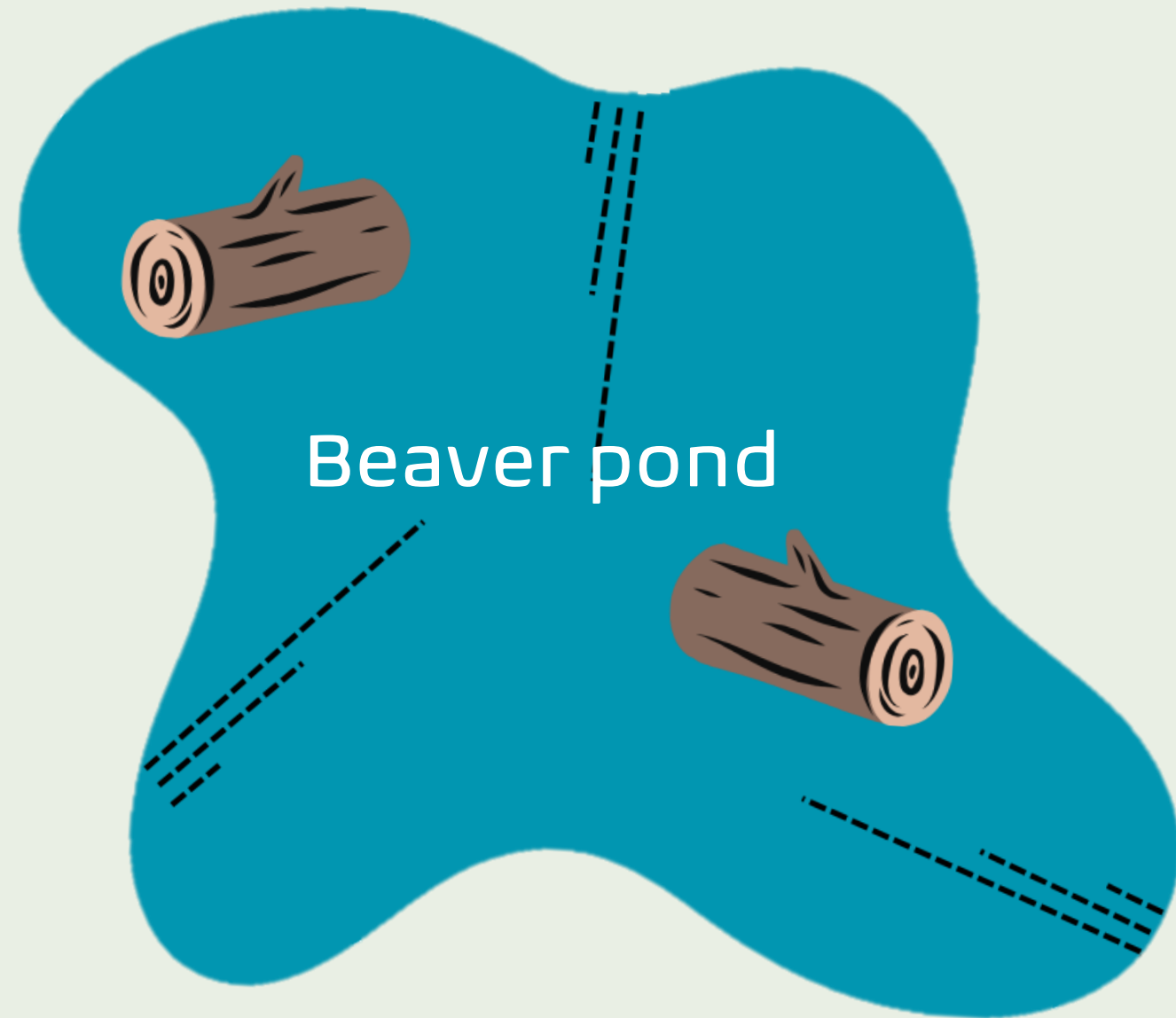


# initial results

C:N ratios vary across ponds



# Future research



Carbon storage in beaver wetlands is complex and dynamic

More research is needed to unpack these complexities within different temporal and spatial contexts

UNIVERSITY of  
**STIRLING**



**IAPETUS2**  
Doctoral Training Partnership

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Alex Maxwell



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