Small stream predators rely heavily on terrestrial matter energy input in the Fall, regardless of riparian buffer size

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Waterways Map

- Introduction: Aquatic-terrestrial linkages and forest buffer widths
- Methods: Stable isotope analysis and forest buffers
- Results: Predators rely heavily on terrestrial matter

J. Marker, E. Bergman, R.E. Bowes, D. Lafage (2023). Small stream predators rely heavily on terrestrial matter energy input in the fall, regardless of riparian buffer size. Food Webs 36 e00302.

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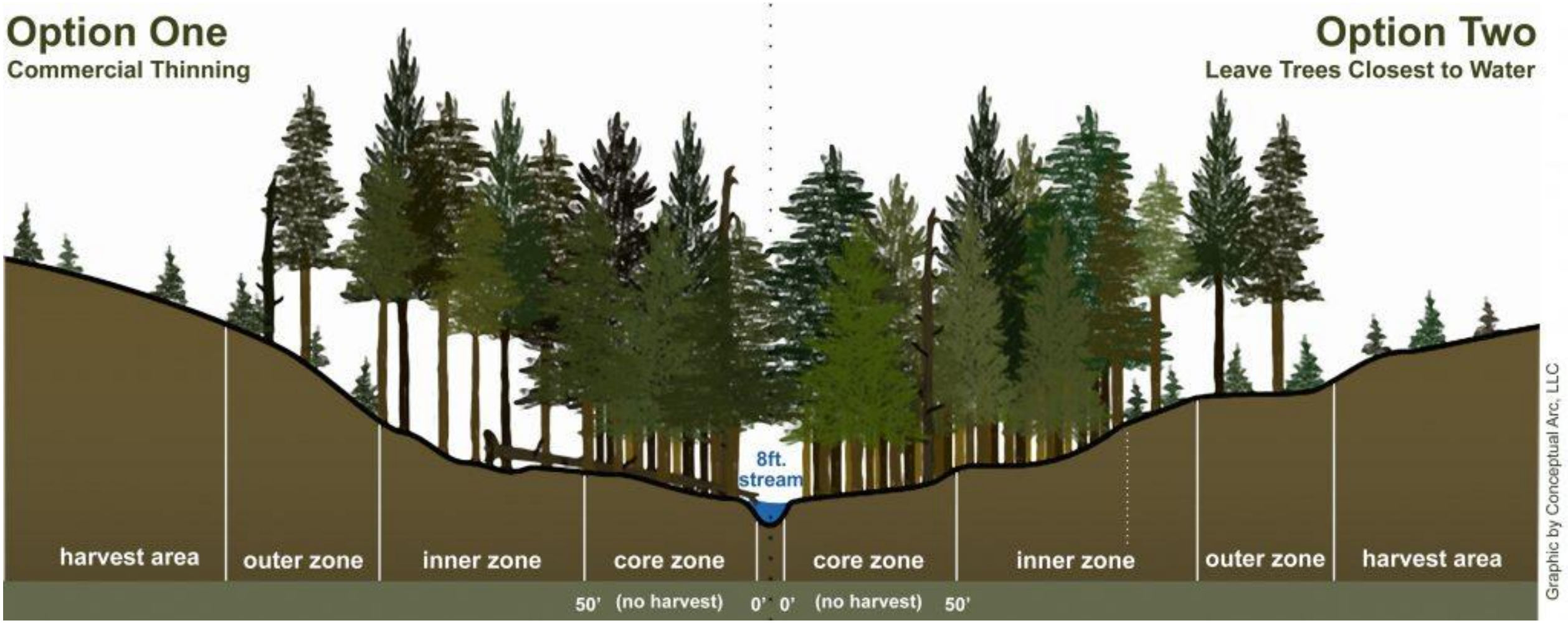
Aquatic-Terrestrial Linkages

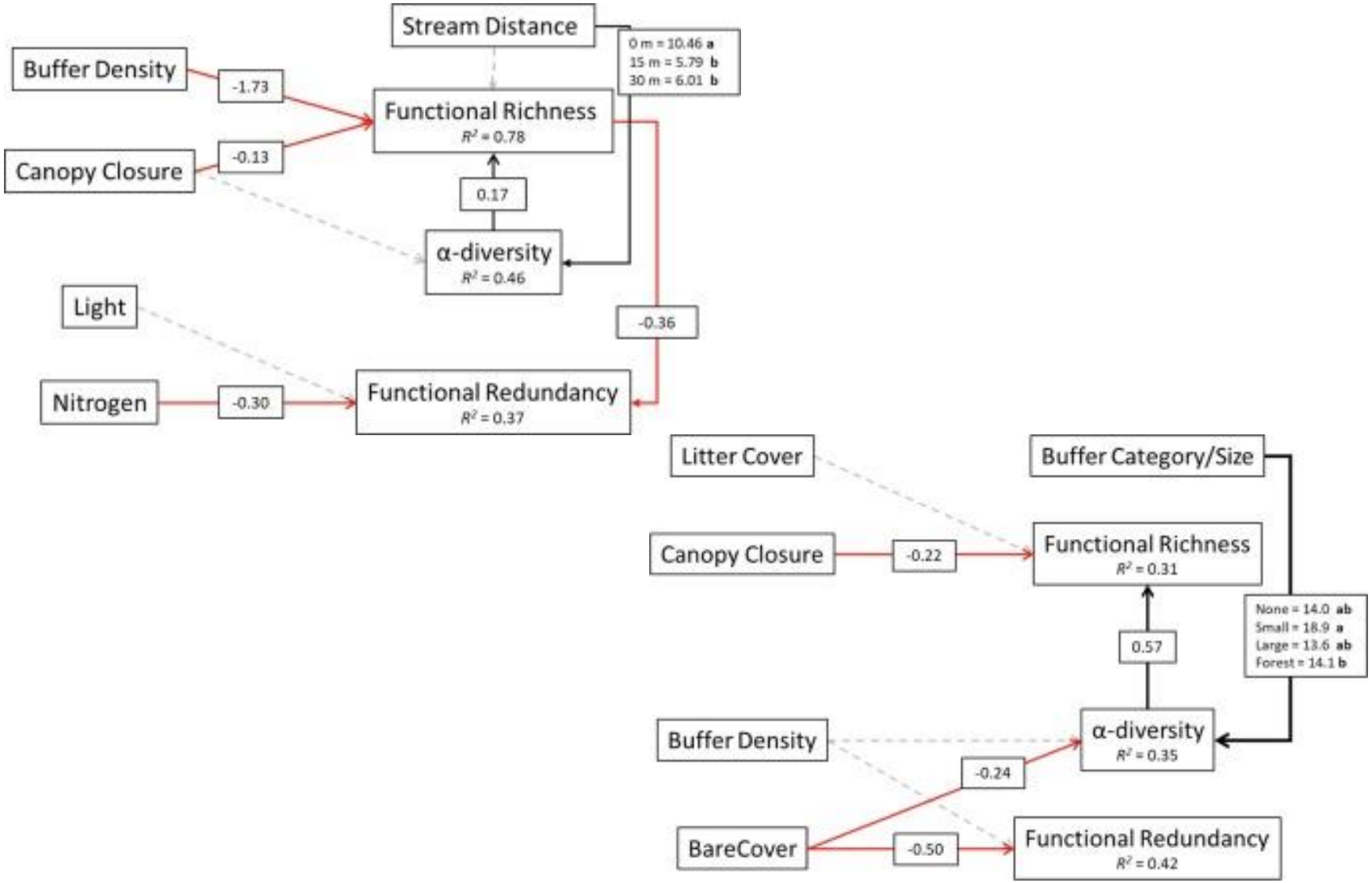
Does forest buffer width affect food web dynamics in streams?

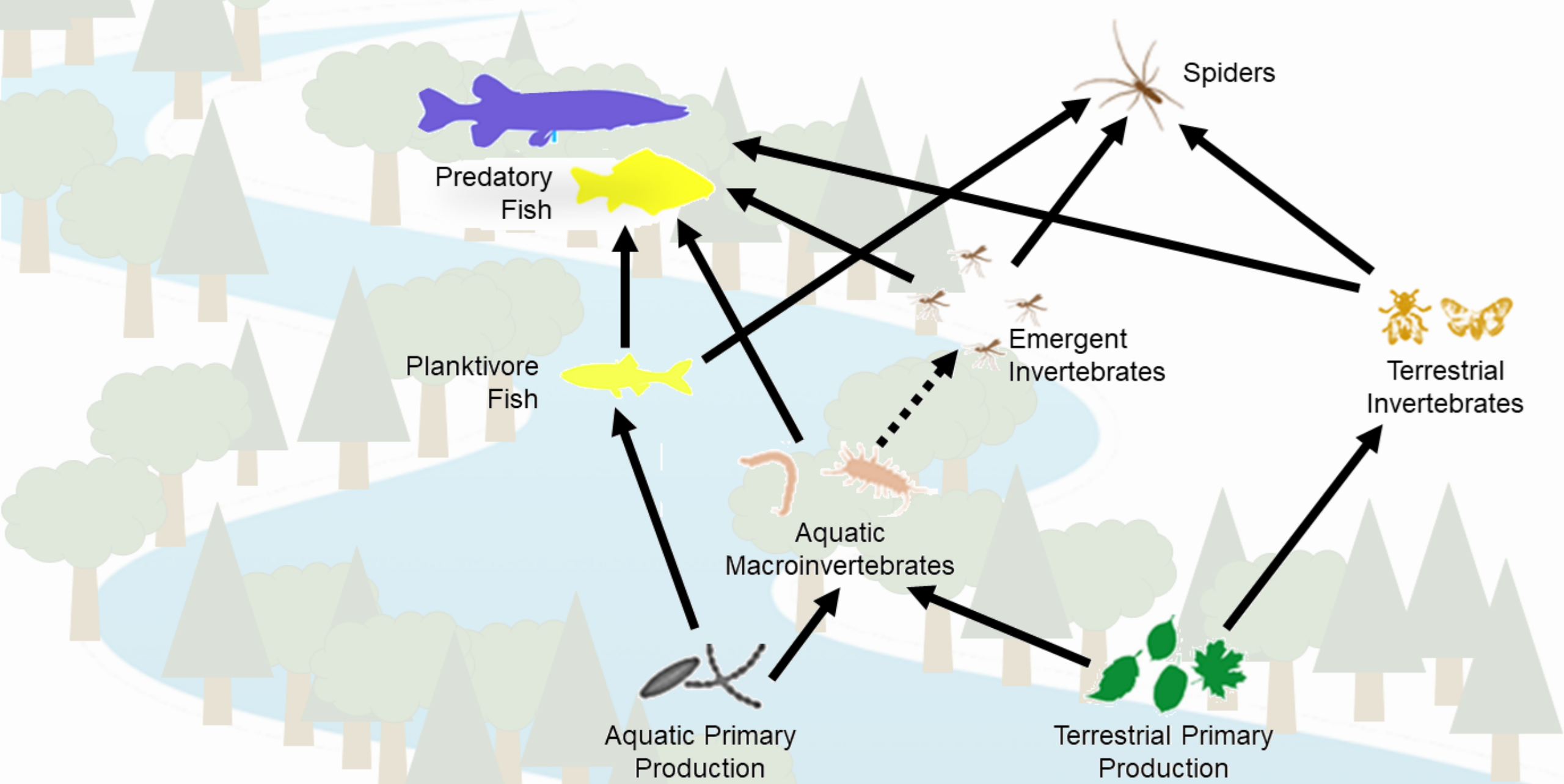

Option One
Commercial Thinning
Option Two
Leave Trees Closest to Water
8ft.
stream
harvest area
outer zone
inner zone
core zone
core zone
inner zone
outer zone
harvest area
50' (no harvest) 0' 0' (no harvest) 50'
Graphic by Conceptual Arc, LLC

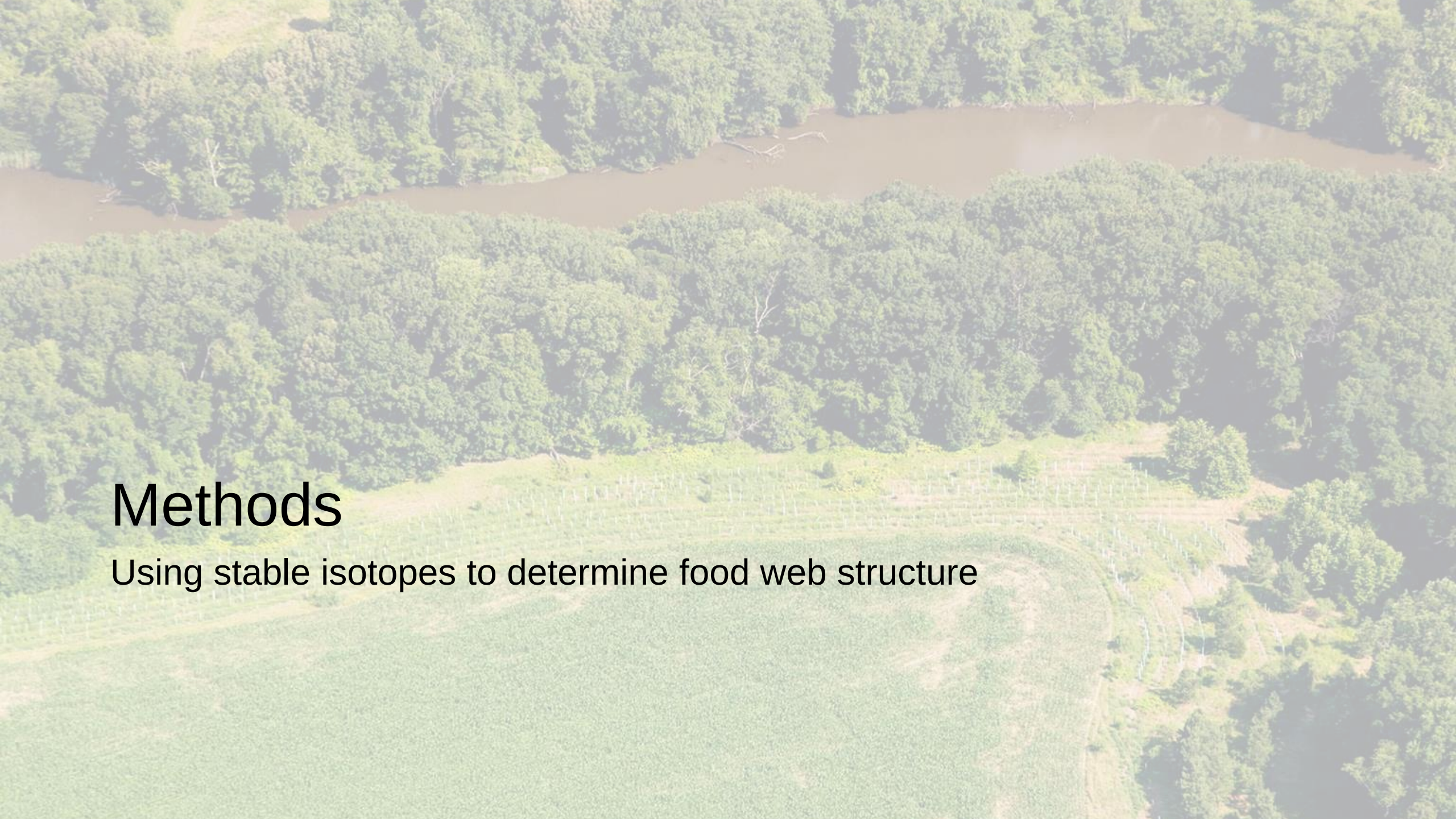
Land use influences the reciprocal exchange of energy subsidies, through riparian zones, between aquatic and terrestrial ecosystems at local, catchment, and global scales.

Functional diversity is influenced by forest buffer width.

Marker, J., Bergman, E., Eckstein, R. L., & Lafage, D. (2022). *Forest Ecology and Management*, *526*, 120599.




Spiders
Predatory Fish
Planktivore Fish
Emergent Invertebrates
Terrestrial Invertebrates
Aquatic Macroinvertebrates
Aquatic Primary Production
Terrestrial Primary Production

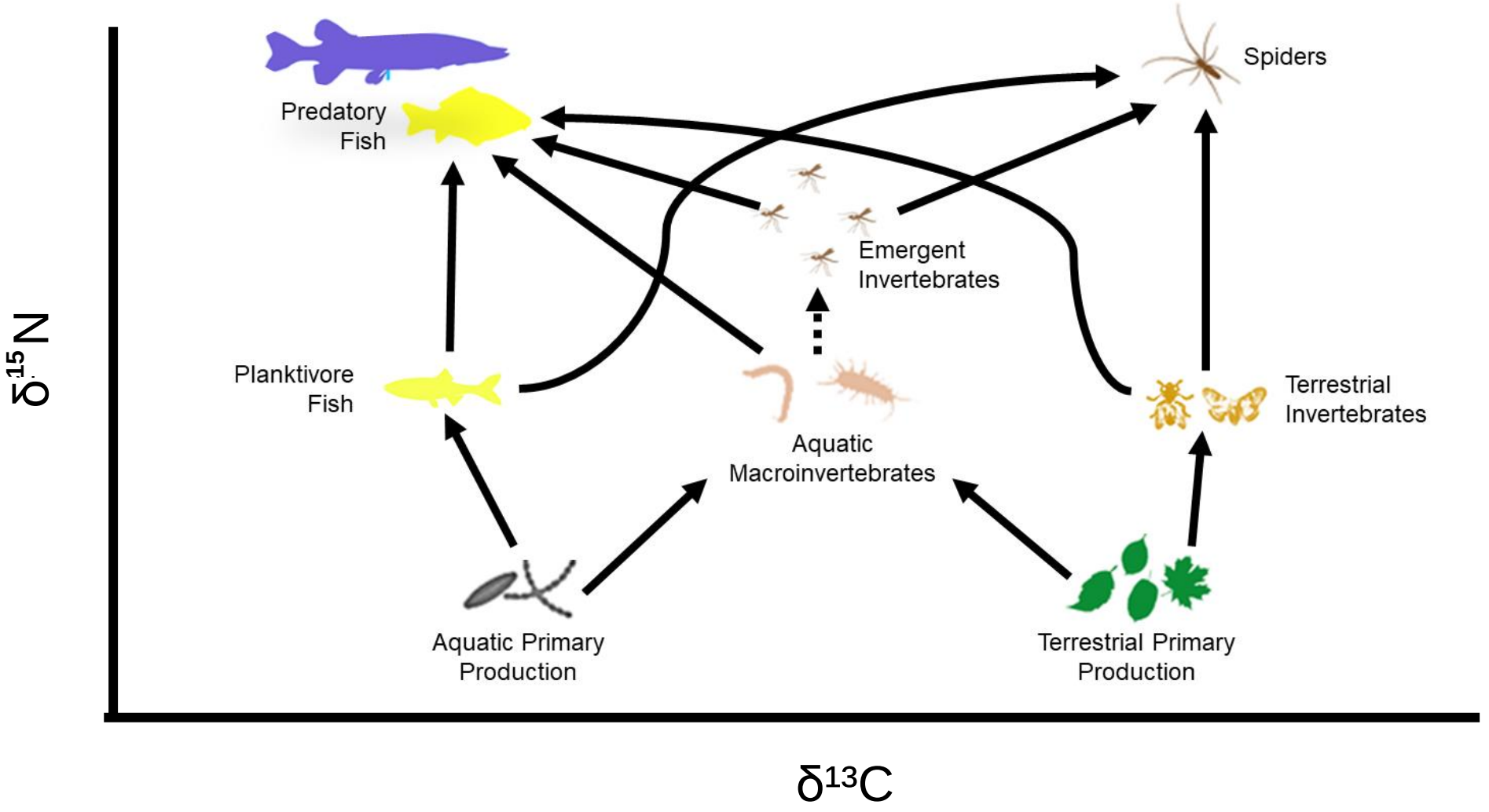


Methods

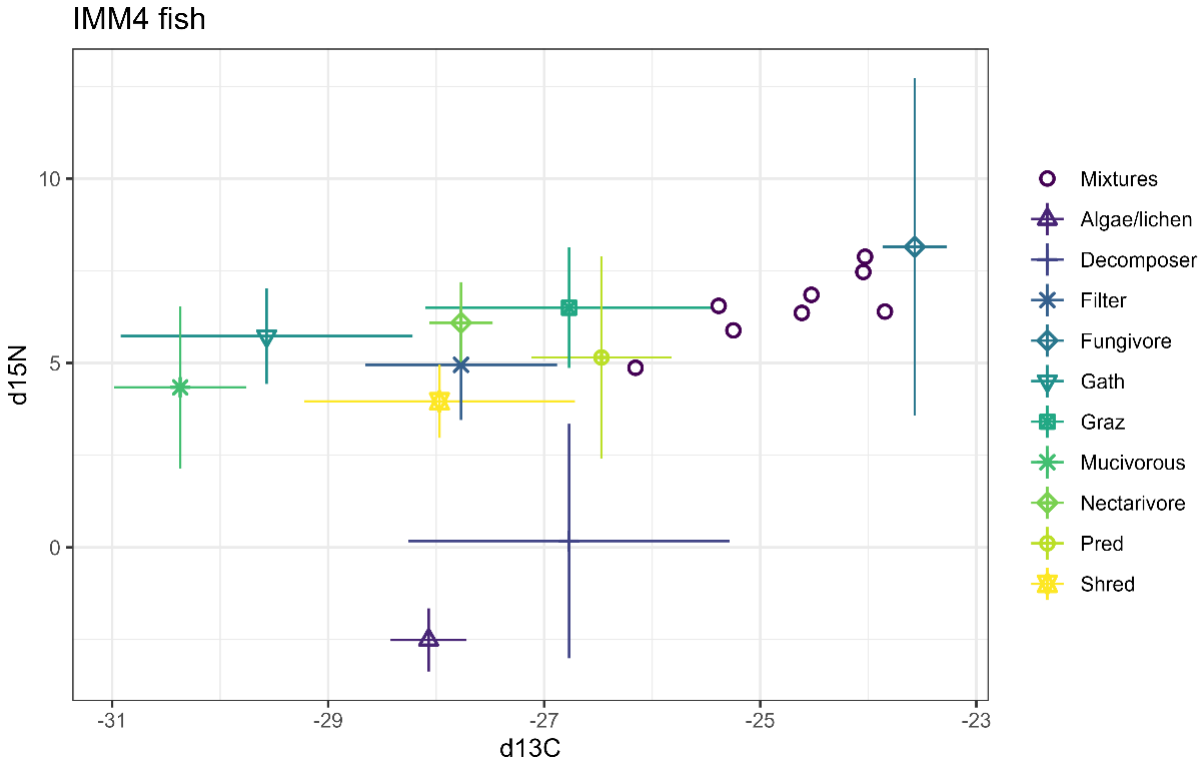
Using stable isotopes to determine food web structure

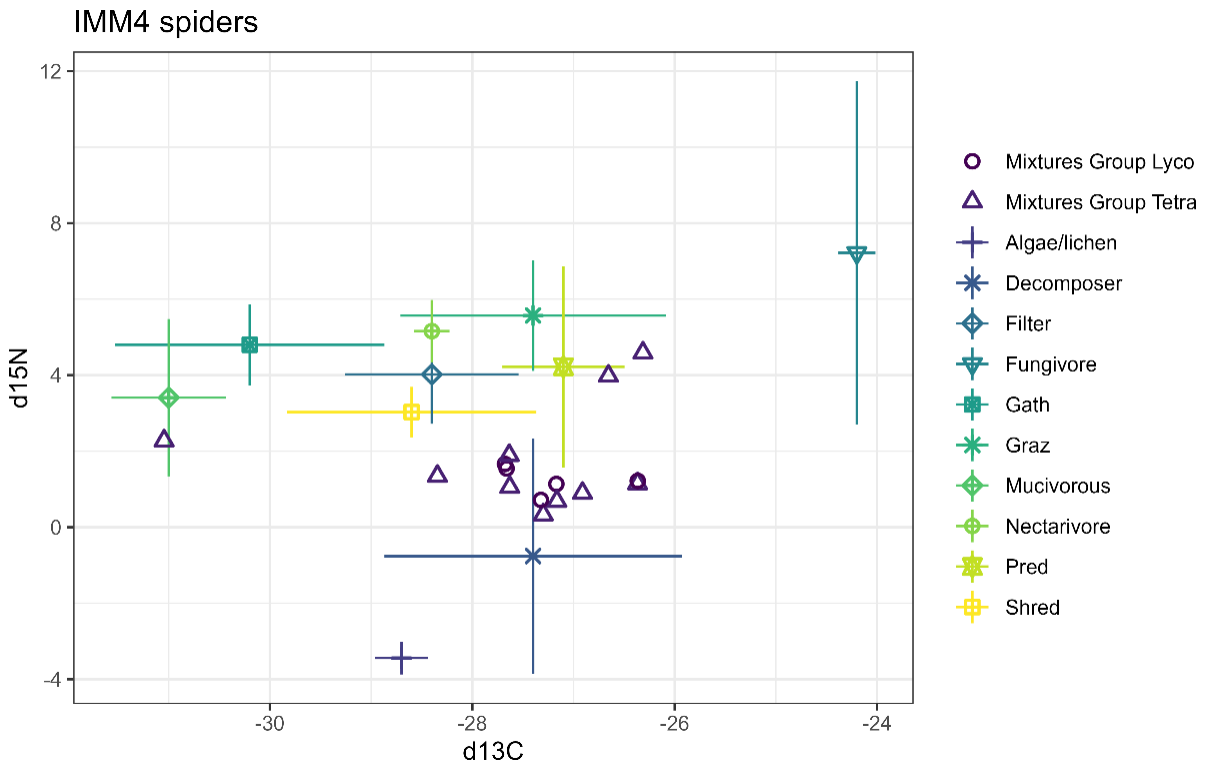
We used spiders (*Tetragnathidae and Lycosidae*), and brown trout (*Salmo trutta*), as the main aquatic-terrestrial interface organisms.

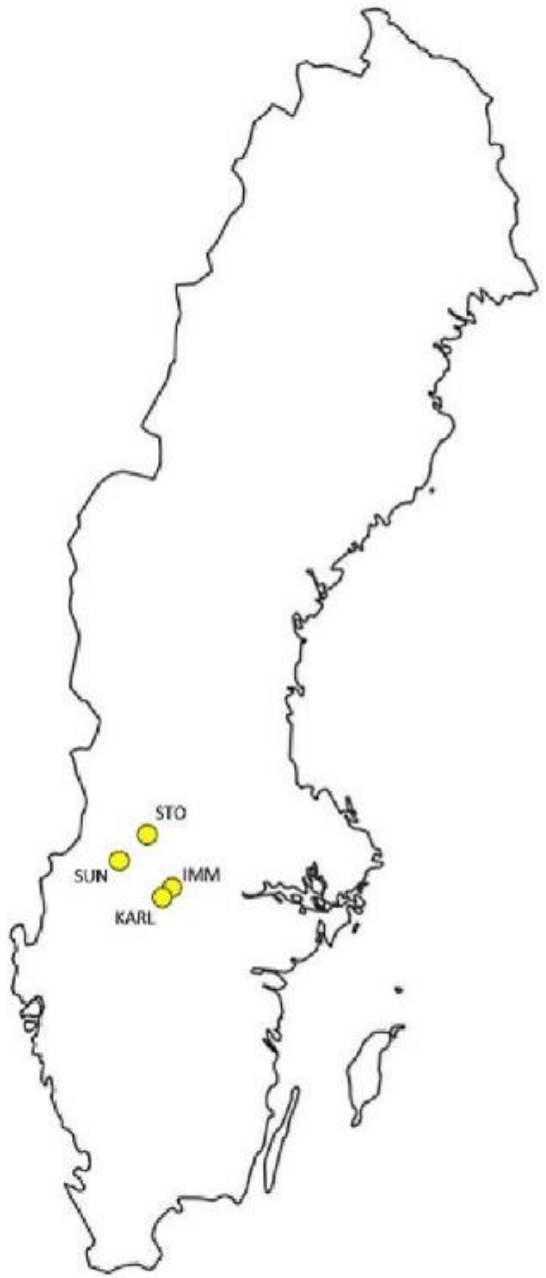
Stable isotopes can be used to see how forest buffers affect food web structure.

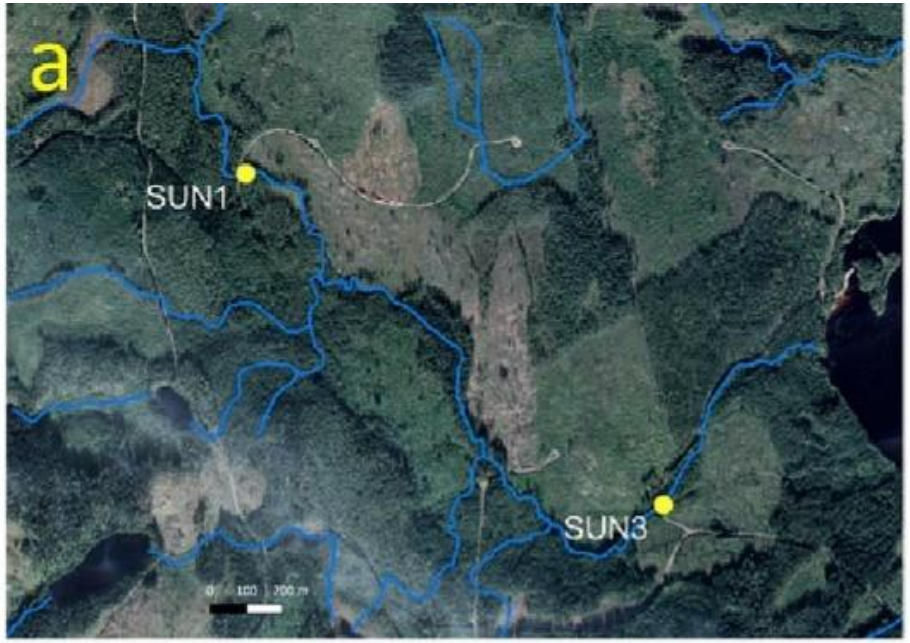


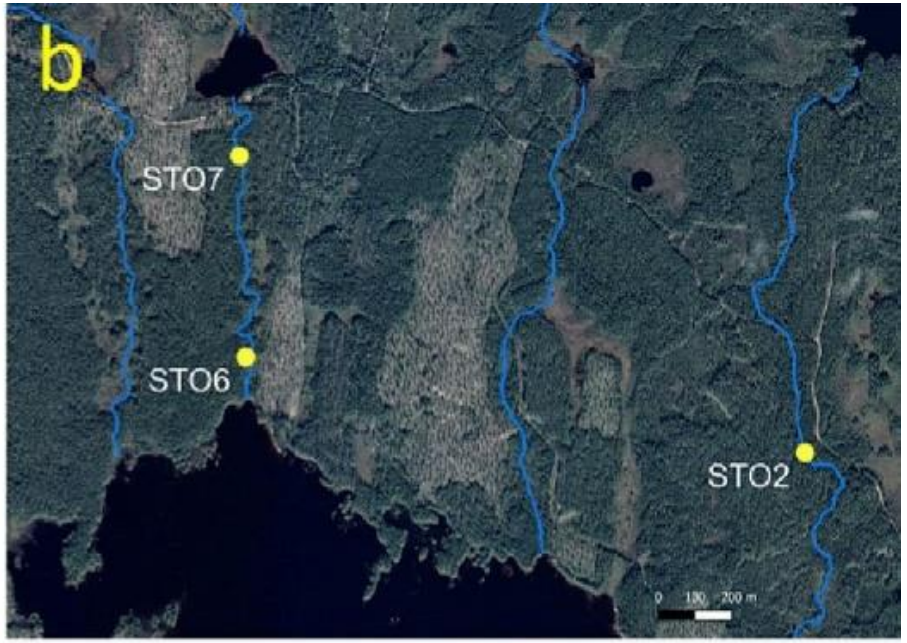
Using $\delta^{15}N$ and $\delta^{13}C$ isotopic signatures and Bayesian mixing models (MixSIAR), we estimated the proportion of aquatic versus terrestrial reliance in the diets of brown trout and each spider family.

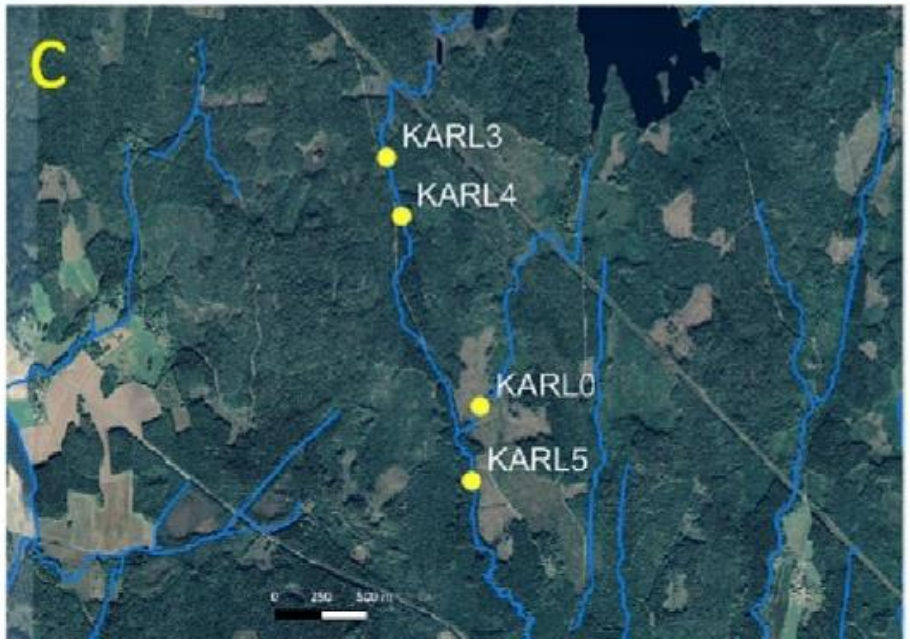


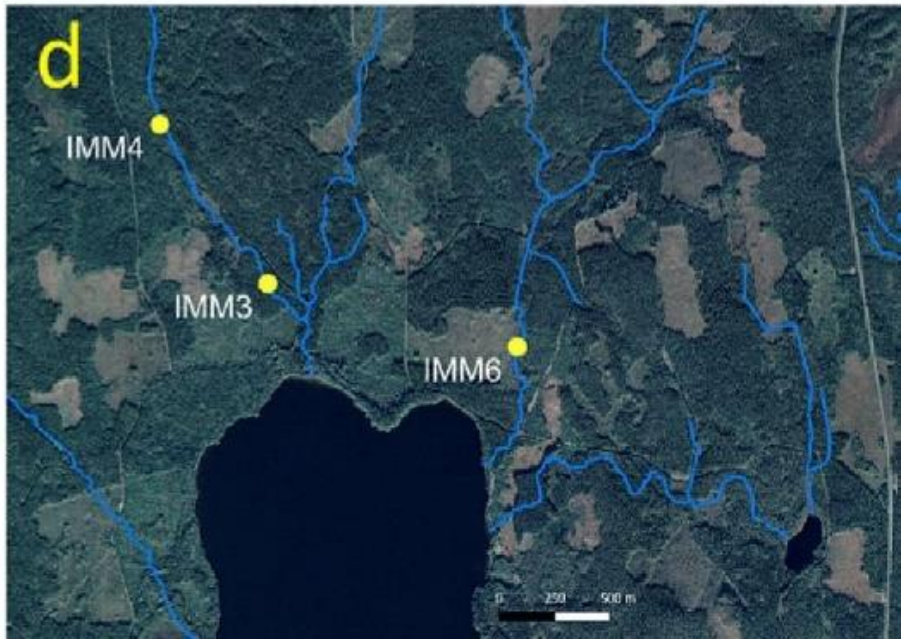


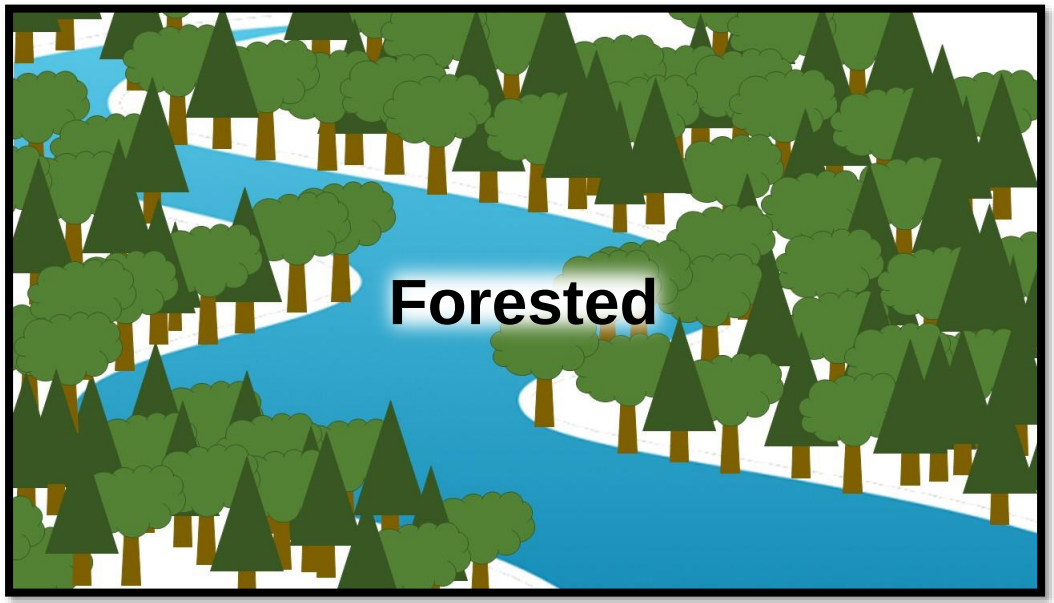

STO
SUN
IMM
KARL

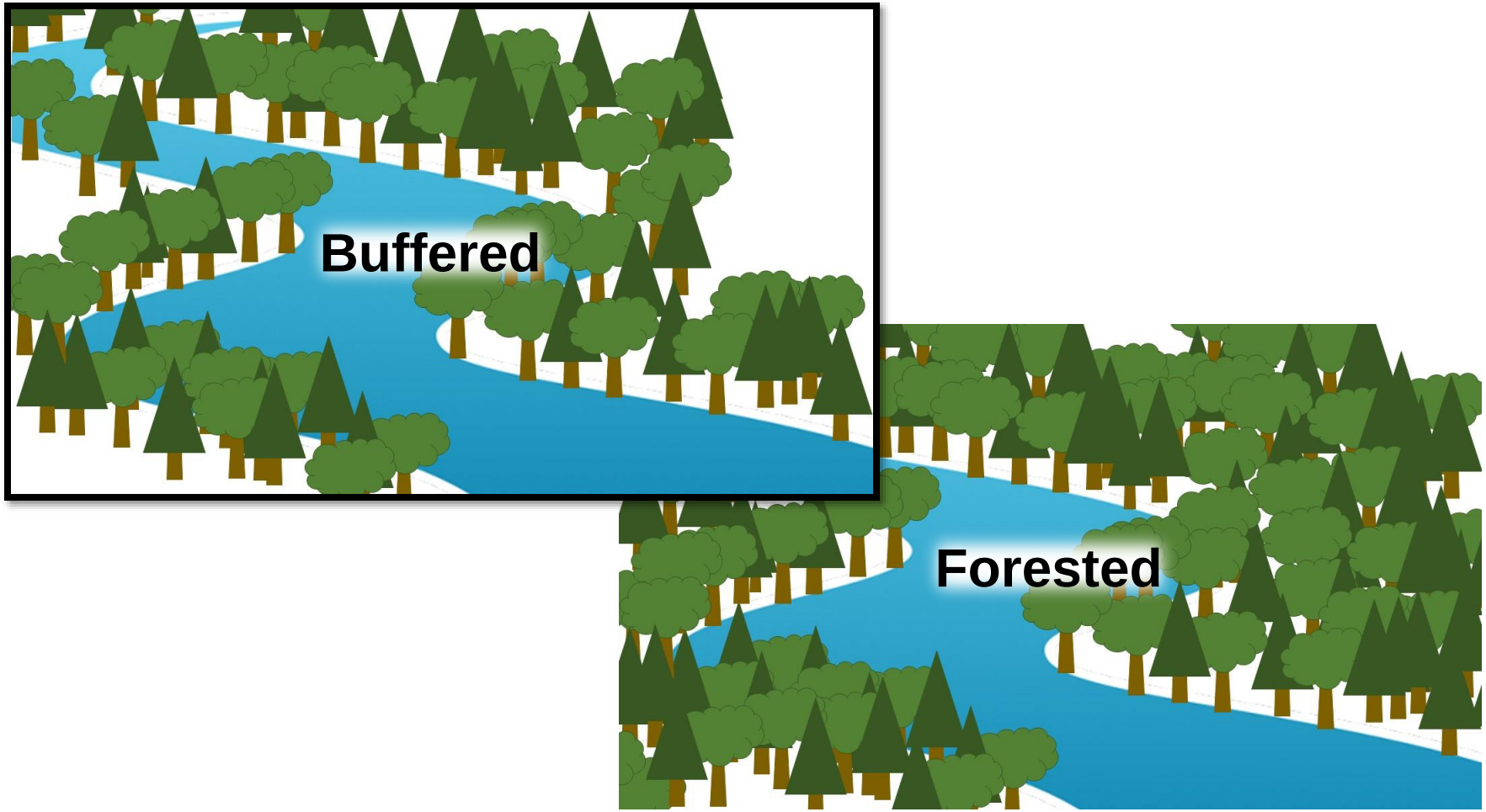

a
SUN1
SUN3

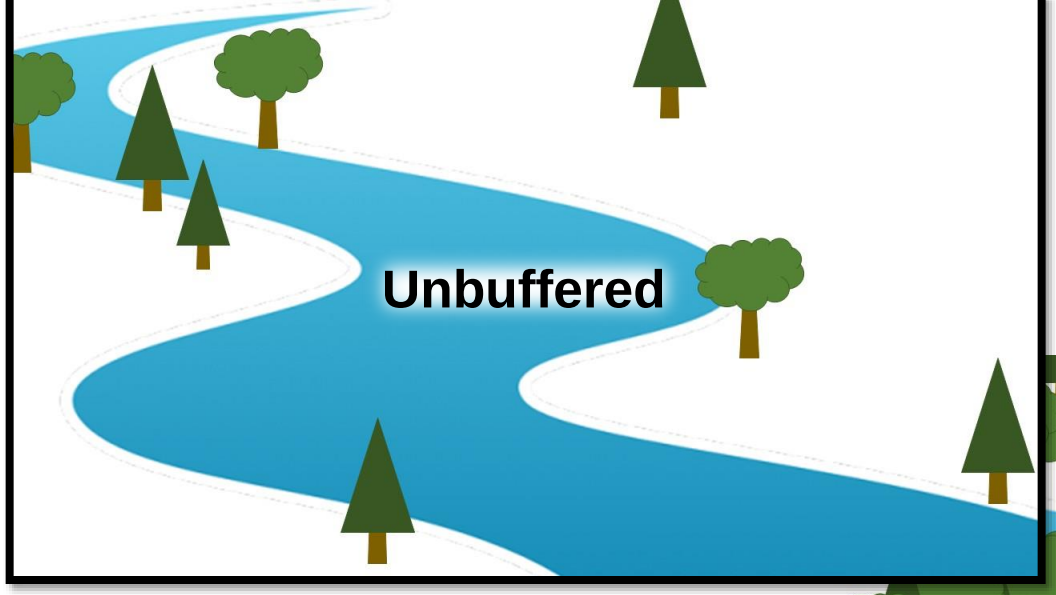

b
STO7
STO6
STO2

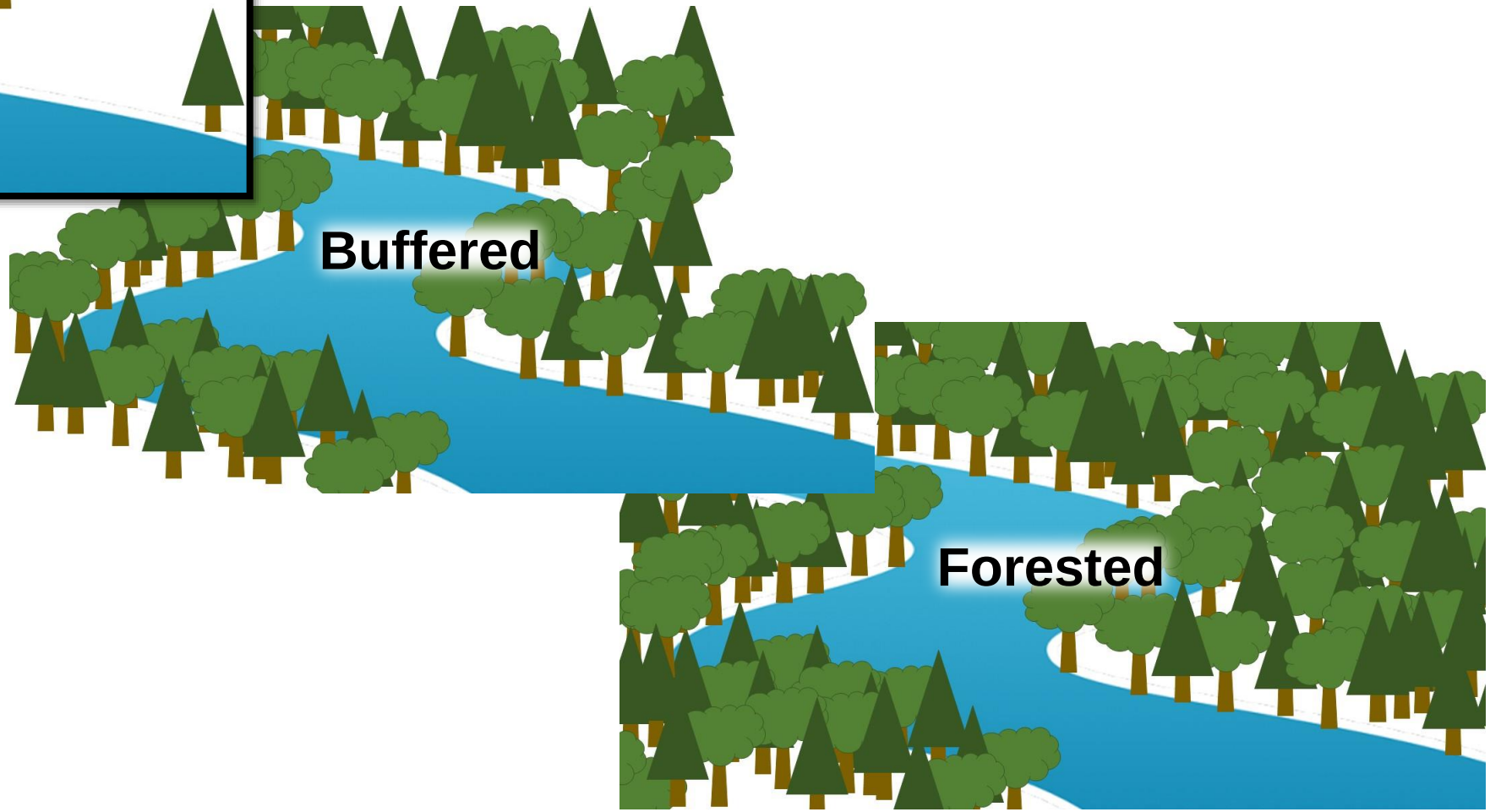

c
KARL3
KARL4
KARL0
KARL5

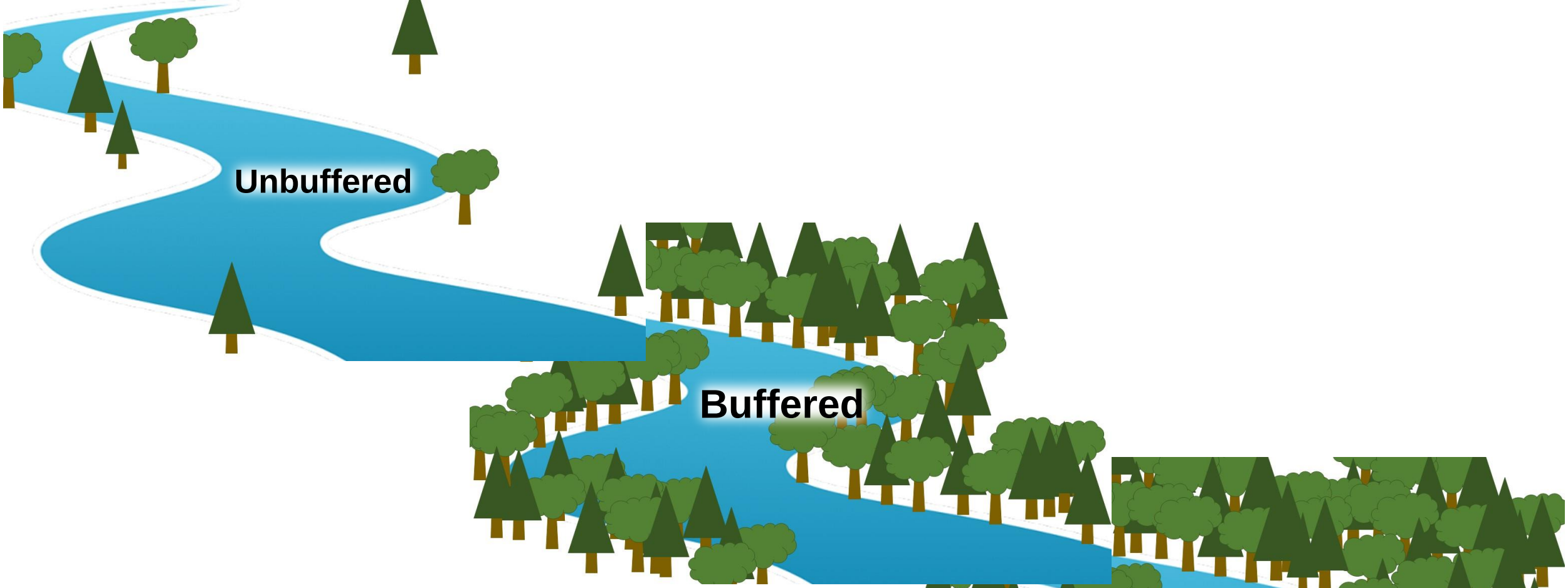

d
IMM4
IMM3
IMM6

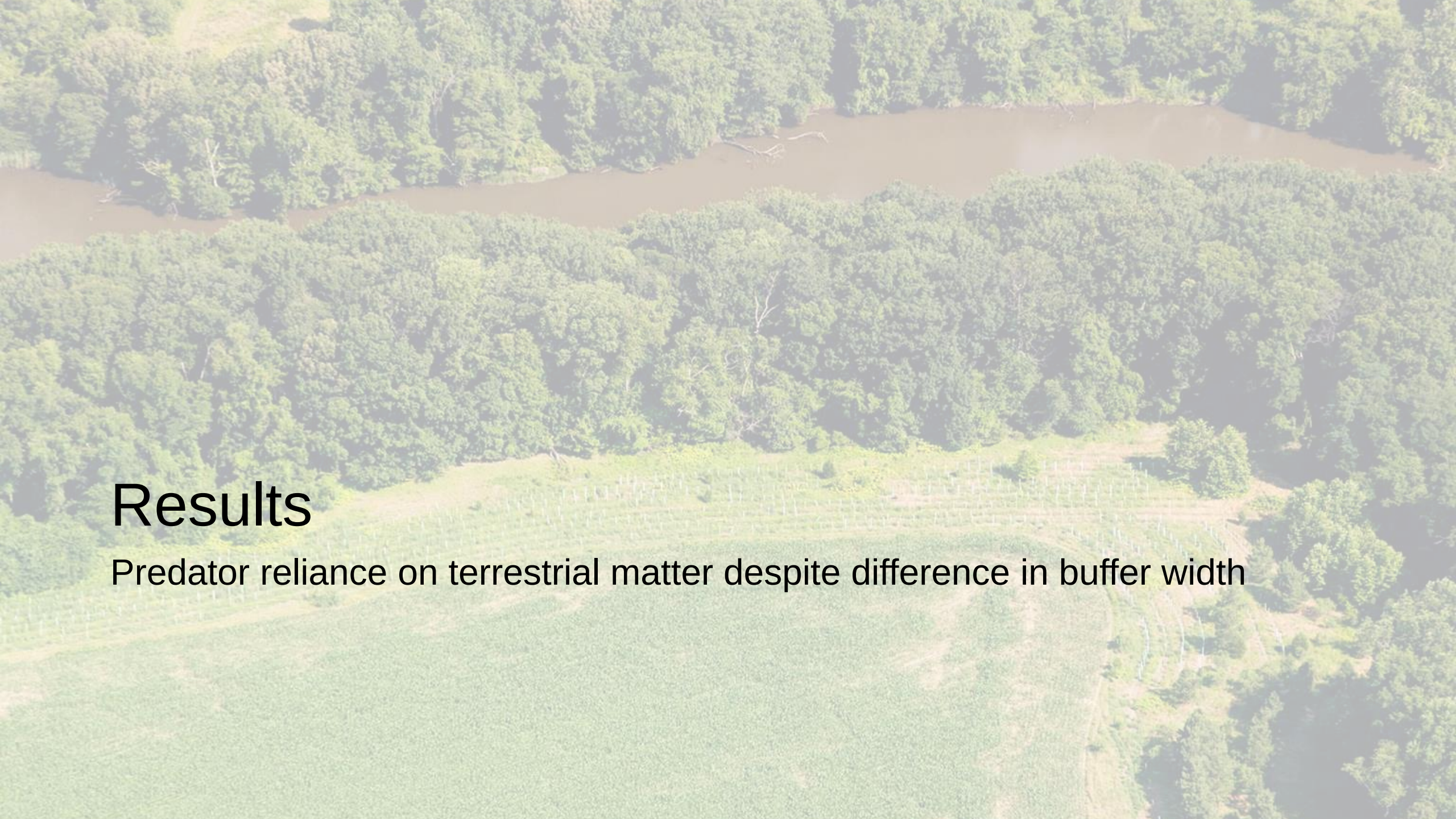

Forested


Buffered
Forested


Unbuffered

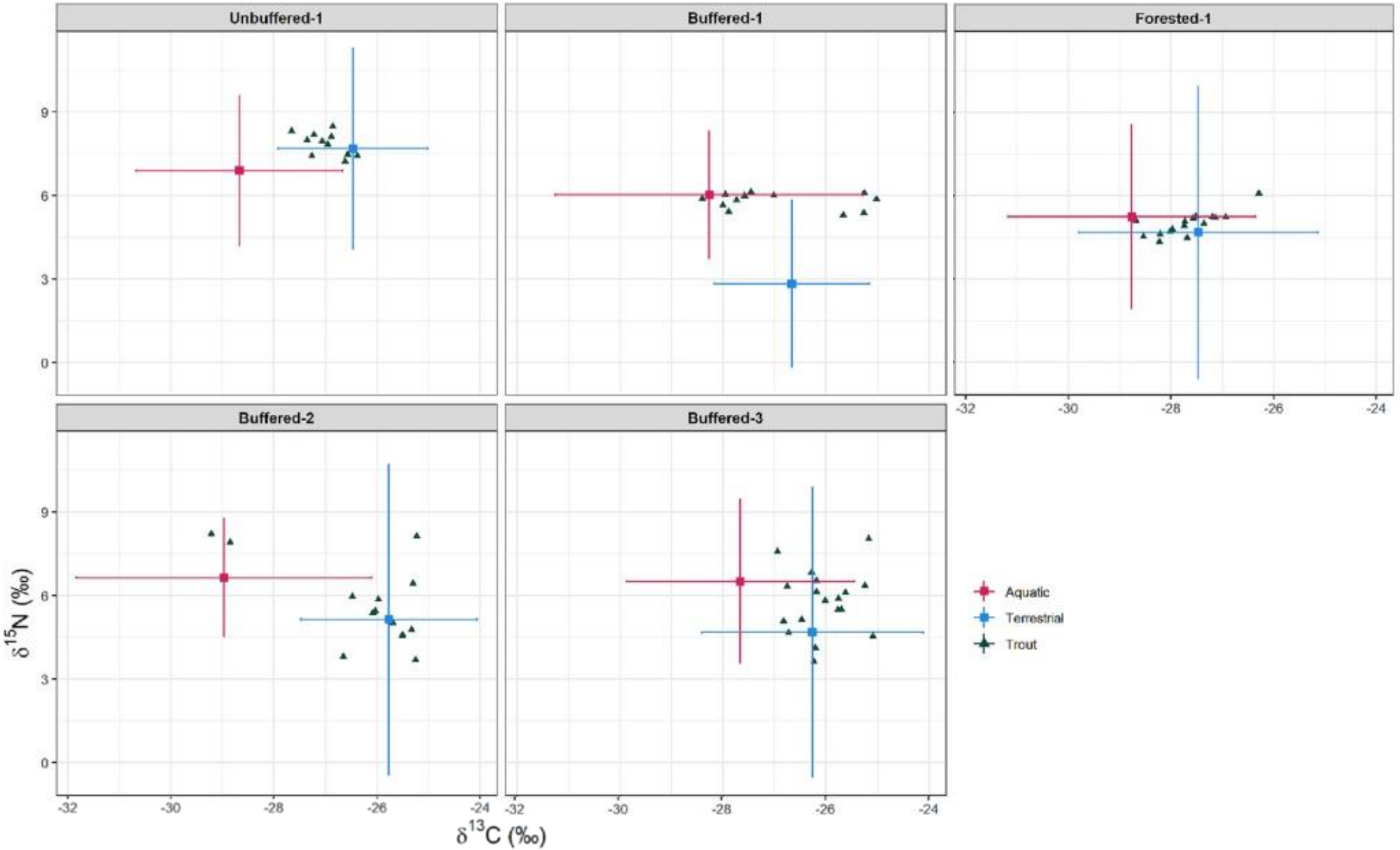

Buffered
Forested


Unbuffered
Buffered
Forested

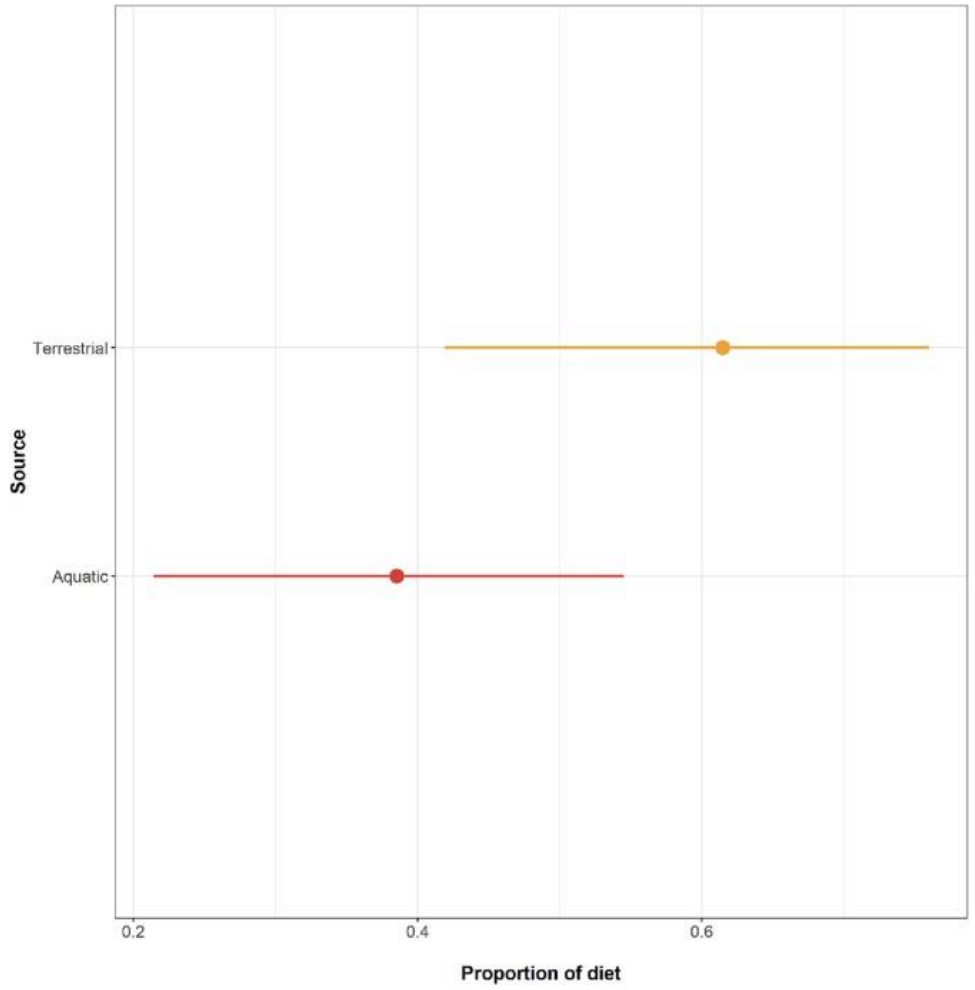


Results

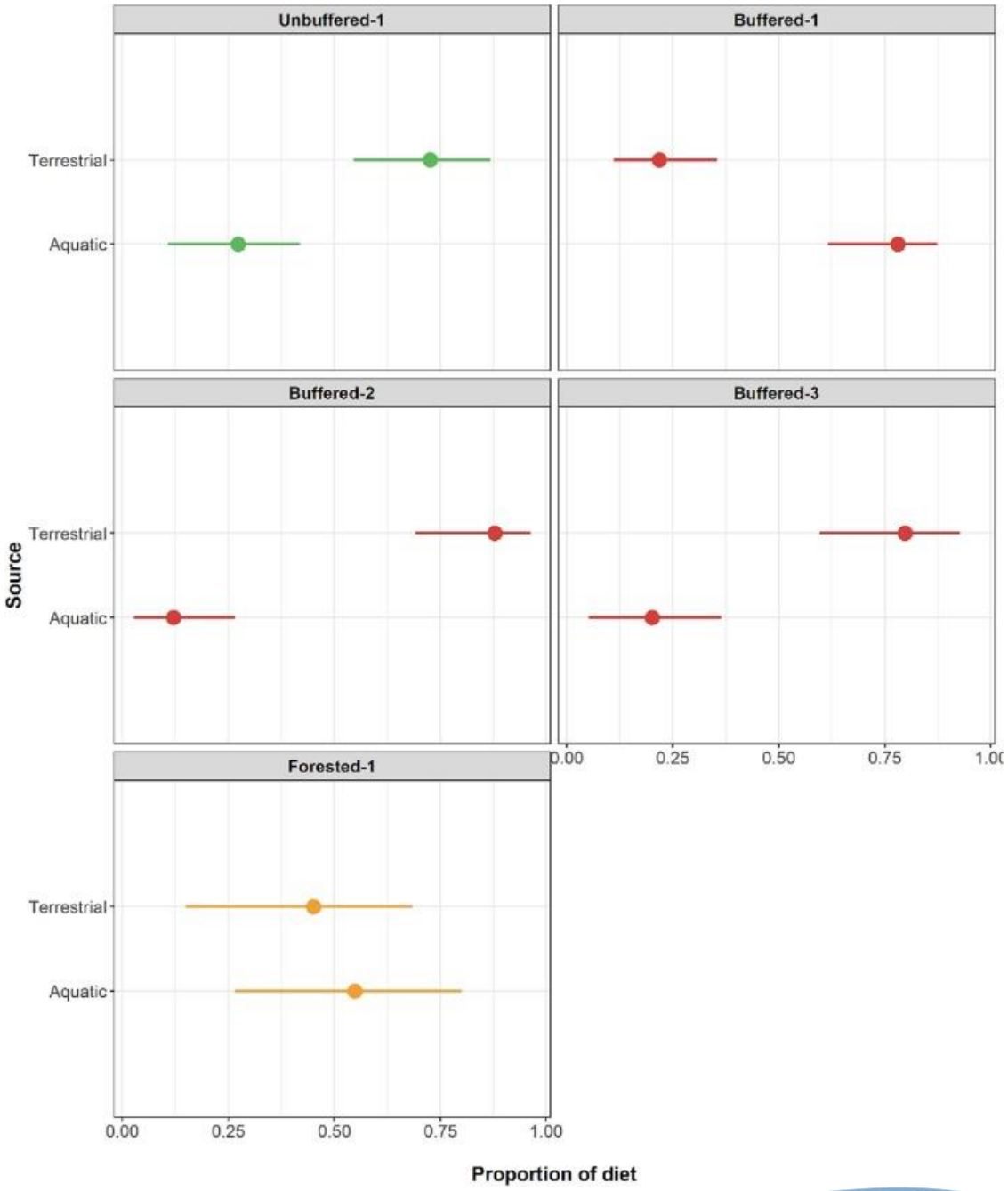
Predator reliance on terrestrial matter despite difference in buffer width

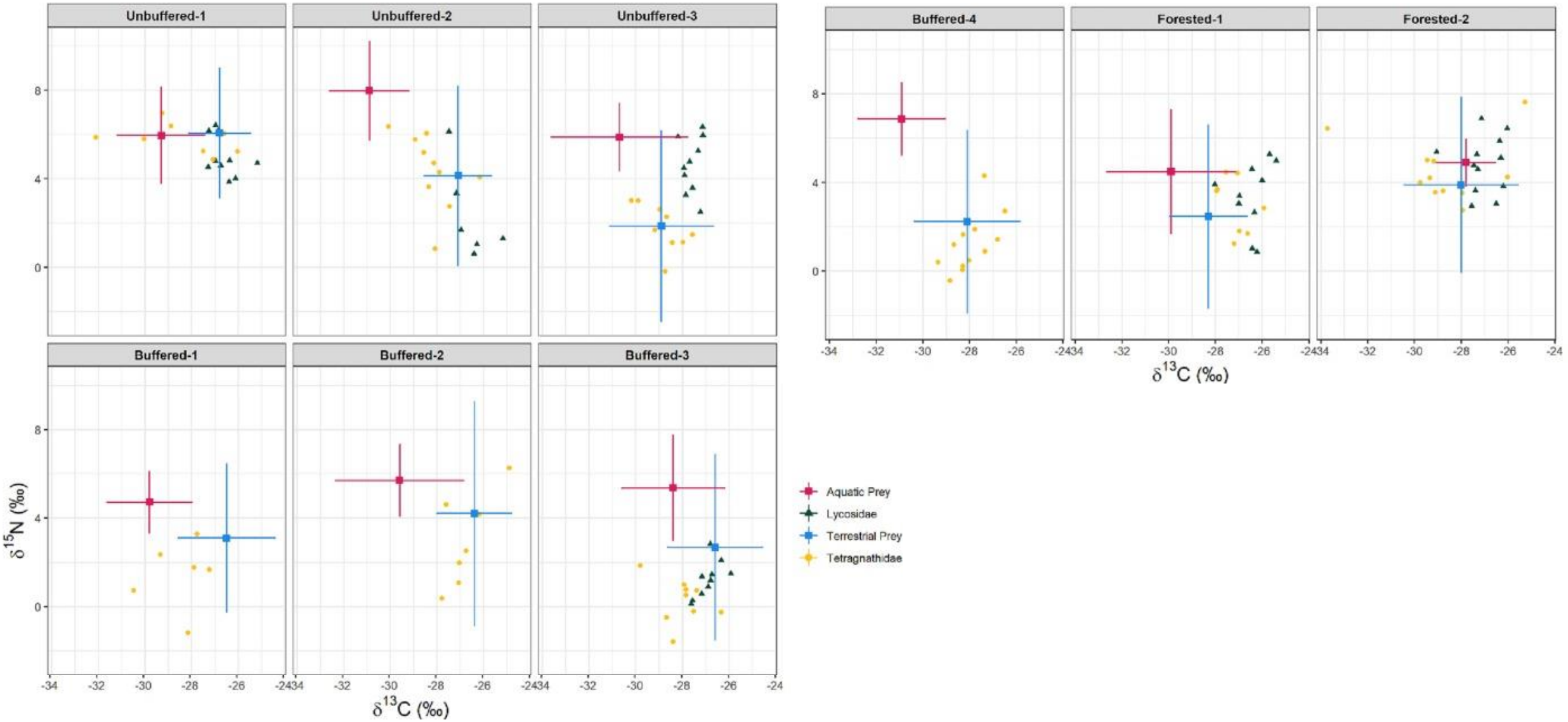

Unbuffered-1
Buffered-1
Forested-1
Buffered-2
Buffered-3
Aquatic
Terrestrial
Trout
δ15N (‰)
δ13C (‰)
9
6
3
0
-32
-30
-28
-26
-24

Overall, brown trout ultimately relied on terrestrial organic matter.

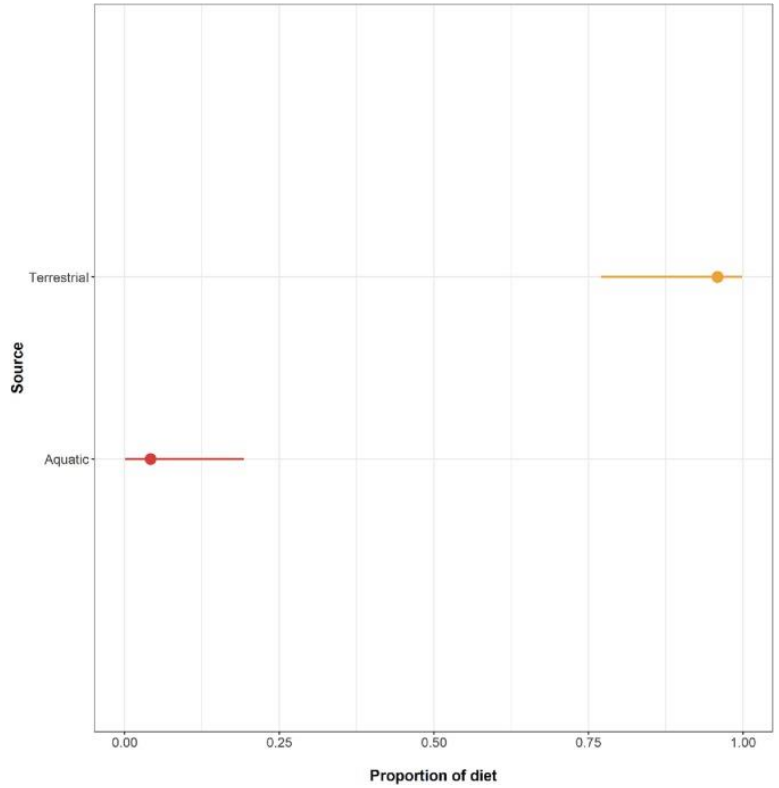


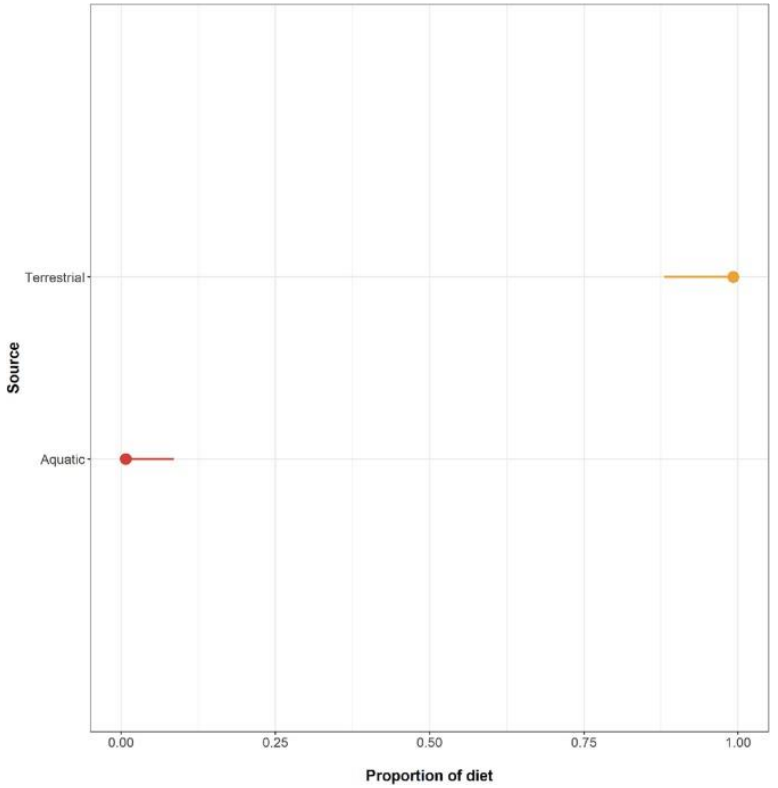
Despite the width of the forest buffer.



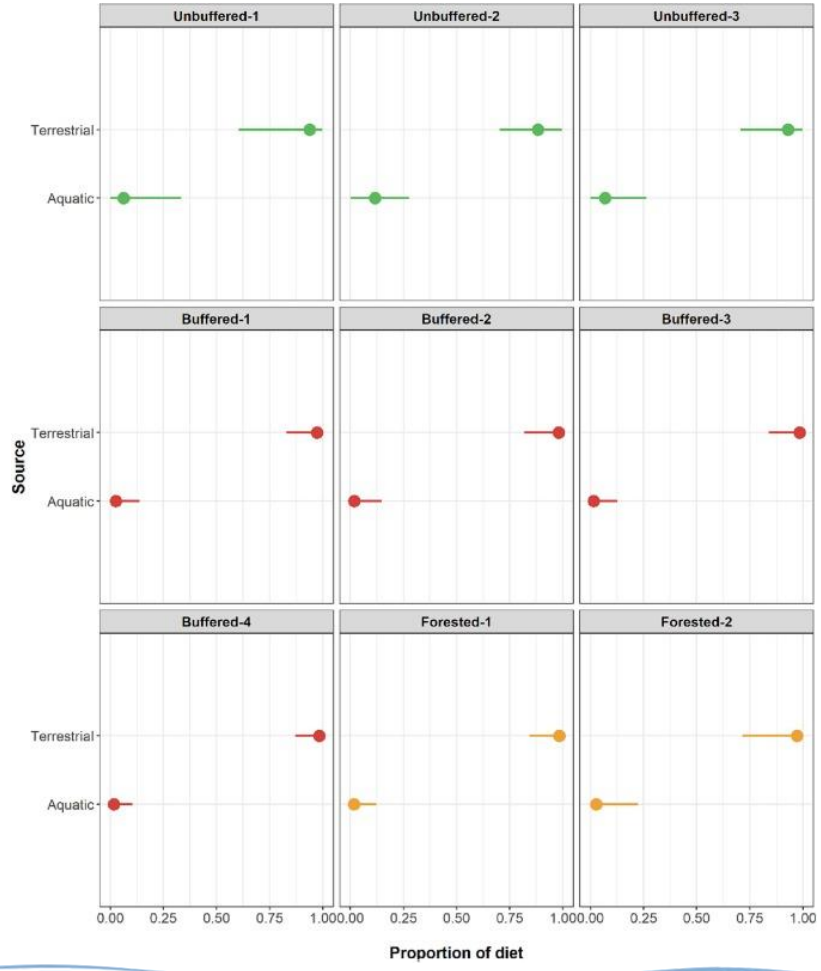

Unbuffered-1
Unbuffered-2
Unbuffered-3
Buffered-1
Buffered-2
Buffered-3
Buffered-4
Forested-1
Forested-2
δ15N (‰)
δ13C (‰)
Aquatic Prey
Lycosidae
Terrestrial Prey
Tetragnathidae

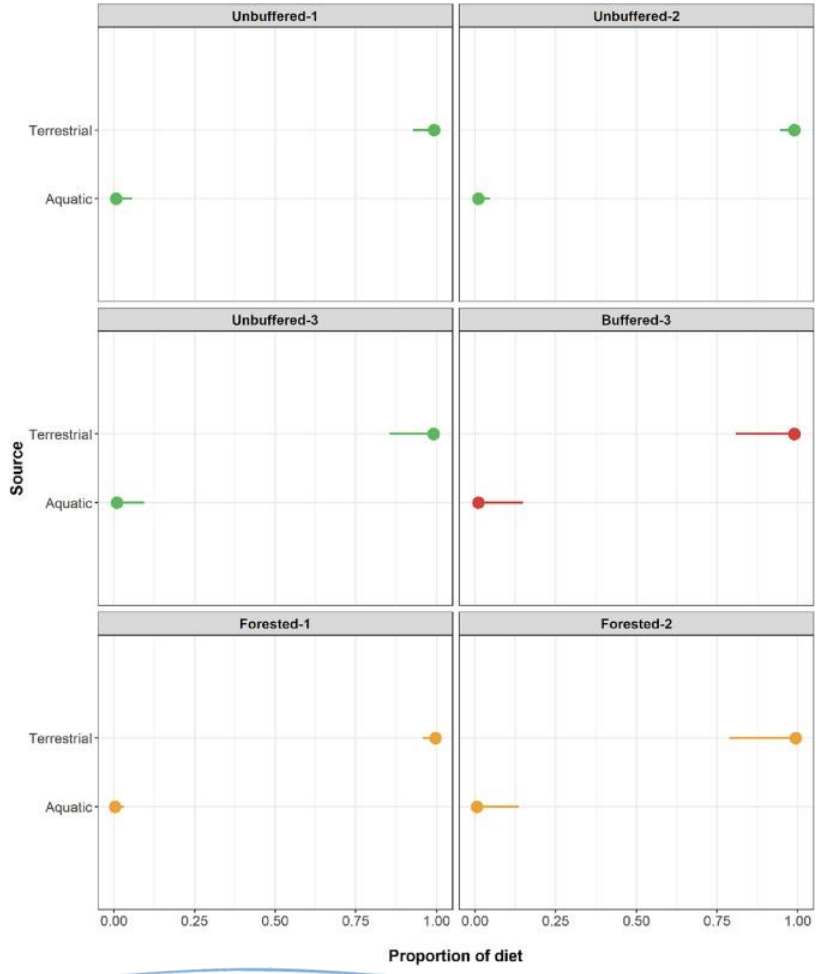
Overall, terrestrial matter was the main carbon source ultimately contributing to the diet of *Tetragnathidae and Lycosidae.*



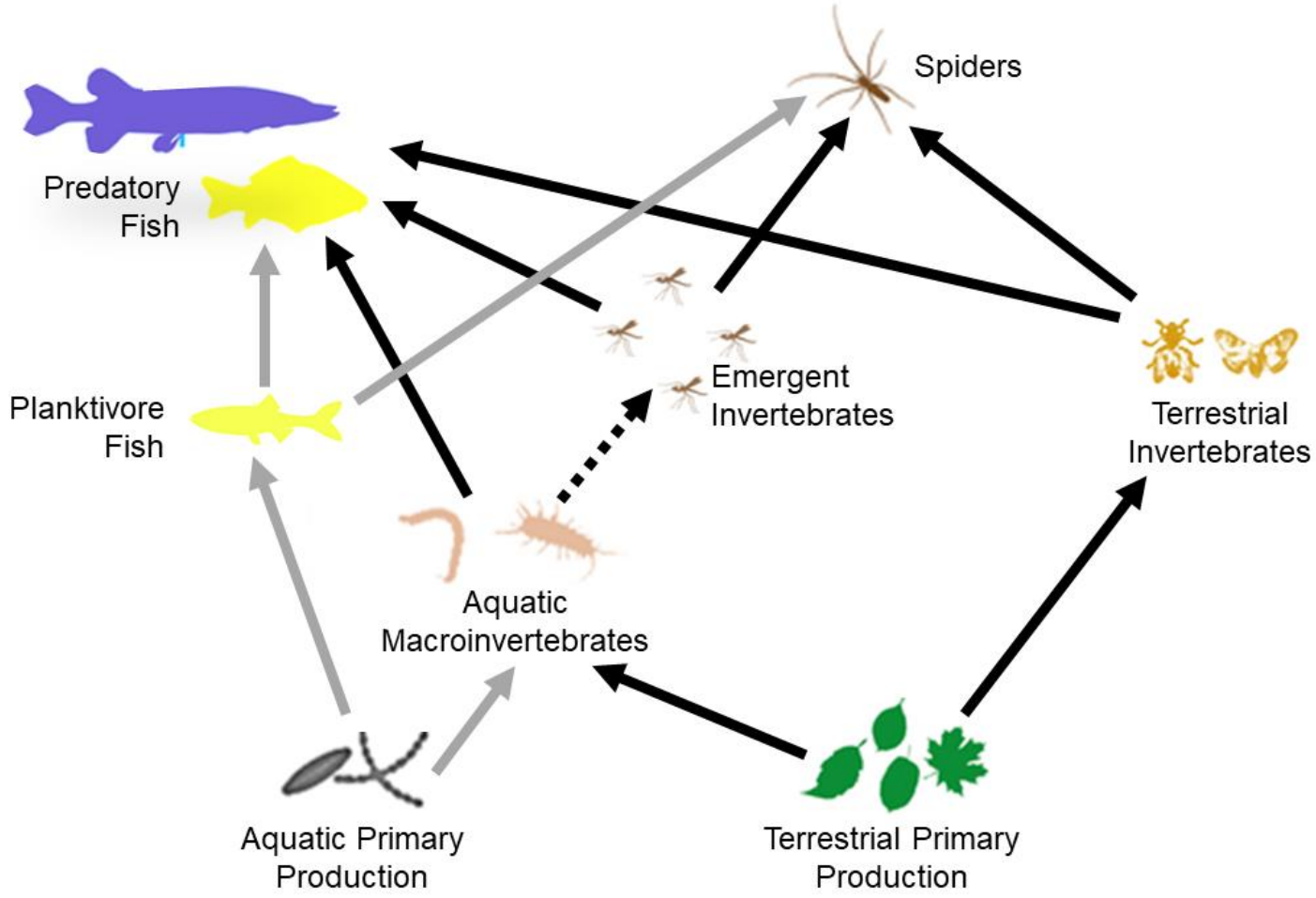


Our findings indicate that riparian spiders around small streams are highly dependent on terrestrial subsidies regardless of forested buffer size.

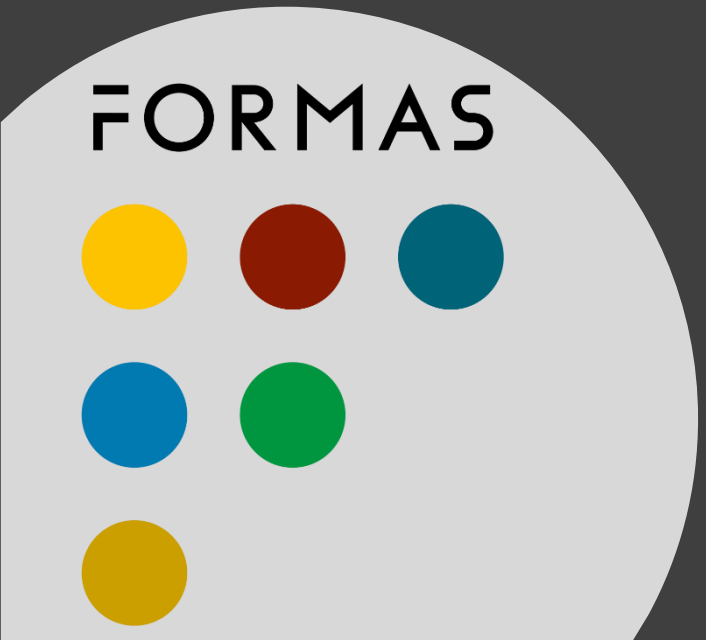




Our results present a picture of aquatic and riparian predators with a considerable dependence on terrestrial subsidies and prey items regardless of forested buffer size.



An important factor in increasing and maintaining aquatic and terrestrial prey diversity around streams and rivers is through establishing and preserving riparian habitat.



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Thank you!

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Louis Addo
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