



ECOSYSTEM RESPONSES TO A UNIQUE WHOLE-WATERSHED ISOTOPIC TRACER EXPERIMENT:

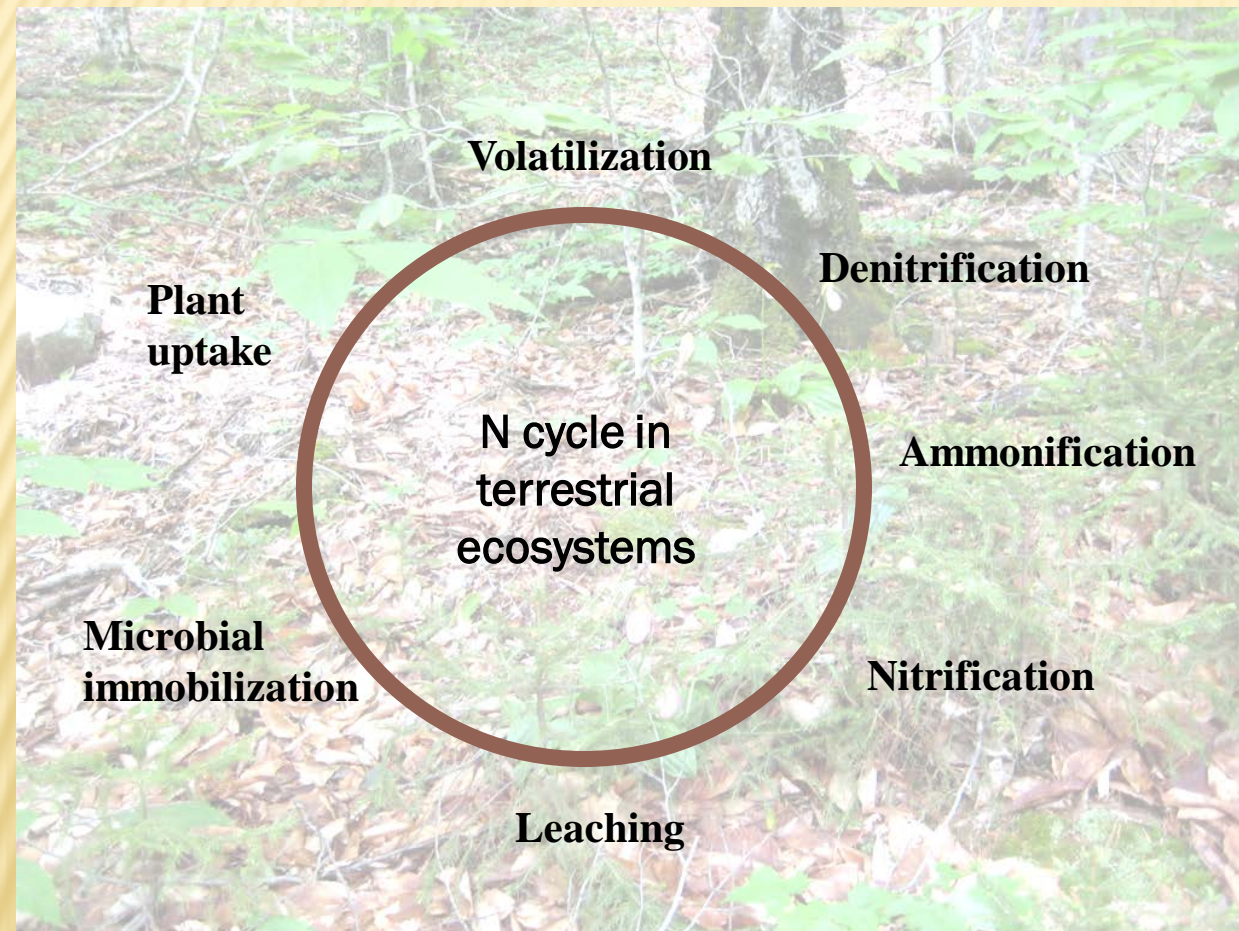
WHERE DID THE ^{15}N GO?

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OUTLINE

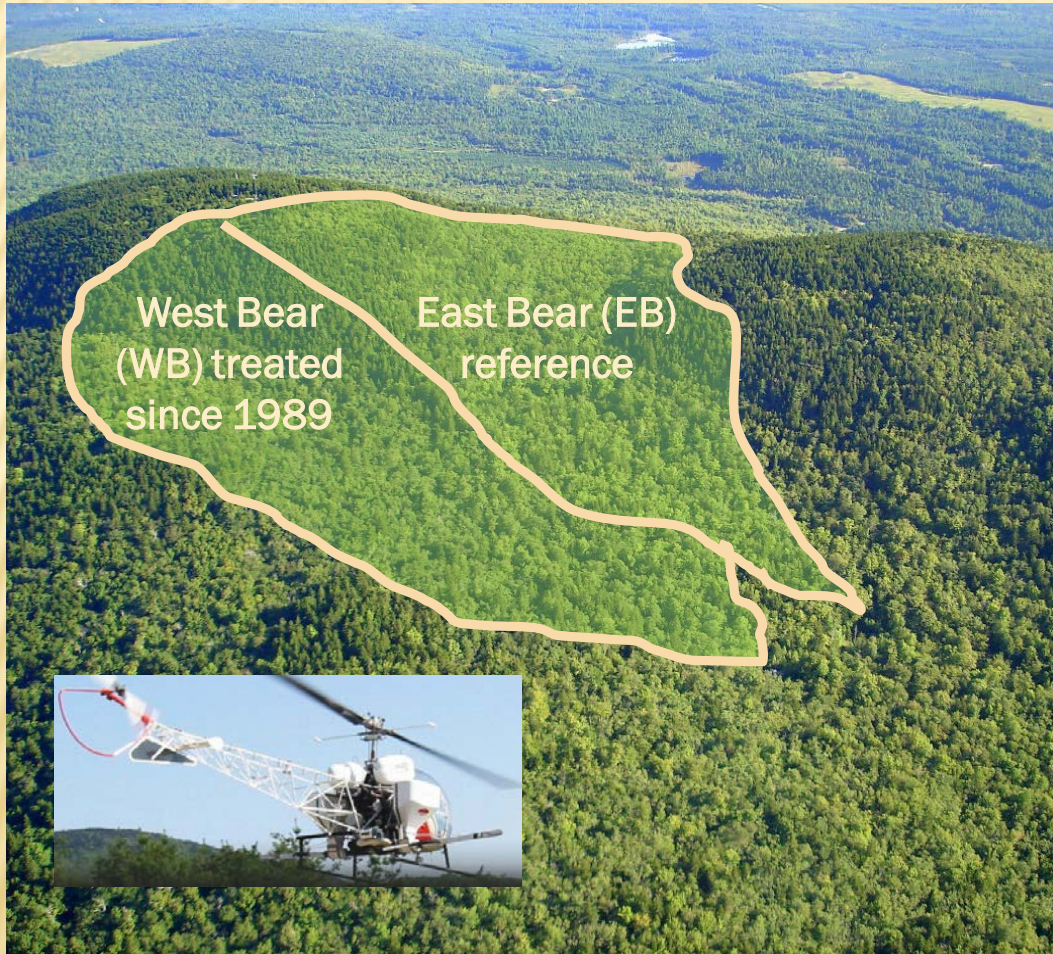
- ✘ Background
- ✘ The Bear Brook Watershed in Maine
- ✘ ^{15}N natural abundances
- ✘ ^{15}N tracer enrichments
- ✘ Conclusions

BACKGROUND



- ✘ Most processes in the N cycle discriminate against ^{15}N and favor ^{14}N .
- ✘ Products are depleted and substrates enriched in ^{15}N .

THE BEAR BROOK WATERSHED IN MAINE



N+S additions as ammonium sulfate at WB (ongoing)
Rate: 28.8 kg S and 25.2 kg N ha⁻¹ yr⁻¹

Evidence of accelerated N cycling in West Bear:

increased net nitrification rates, NO₃⁻ in soil solution and in stream water, and tree foliar N concentrations.

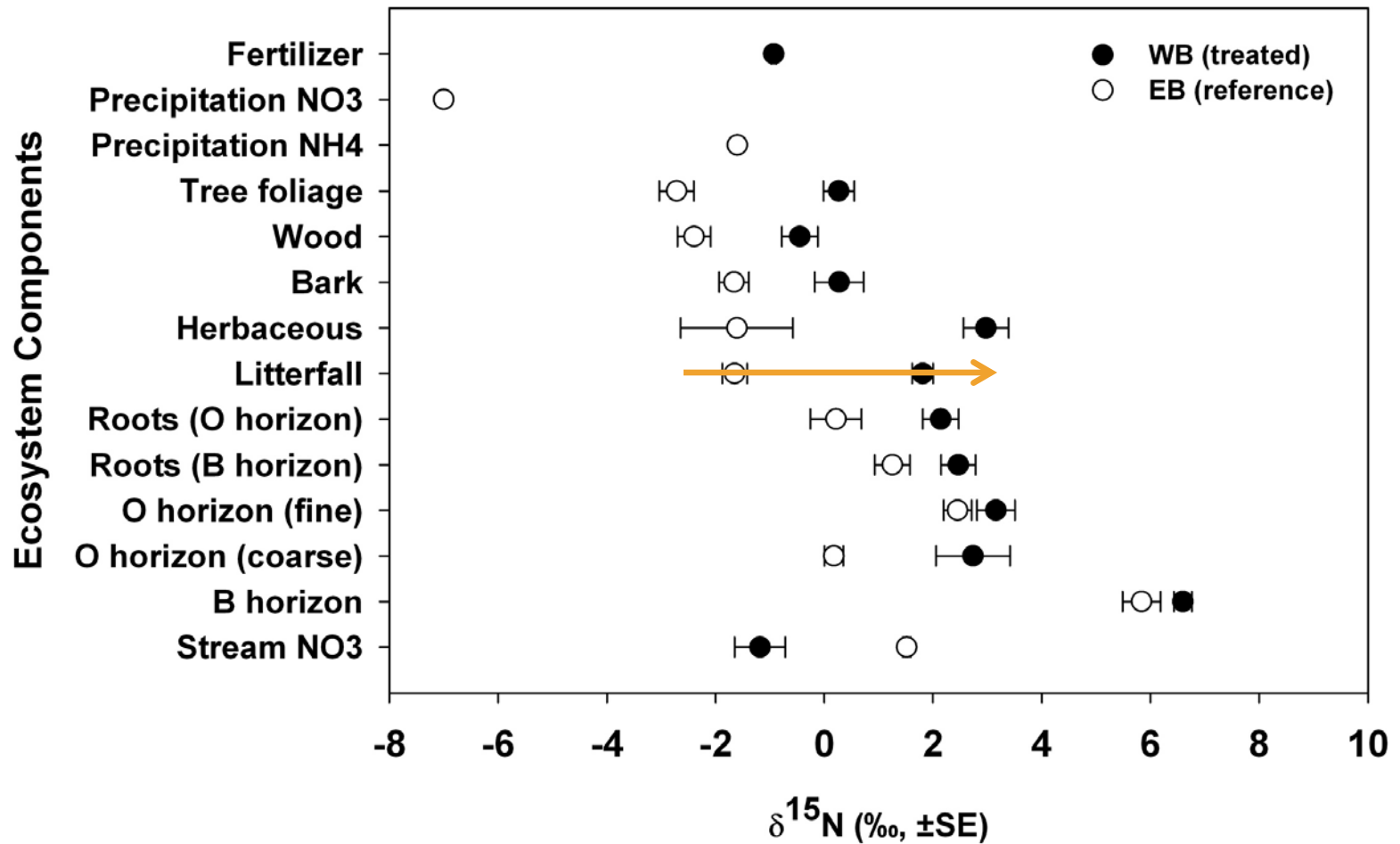
Uncomplete understanding of the mechanisms involved in altered N cycling.

Stable isotopes are useful in ecosystem ecology at two levels:

Natural abundance ¹⁵N, used as an indicator of net change in forest N cycling.

¹⁵N enrichment, used to trace N transformations in ecosystems.

^{15}N NATURAL ABUNDANCES

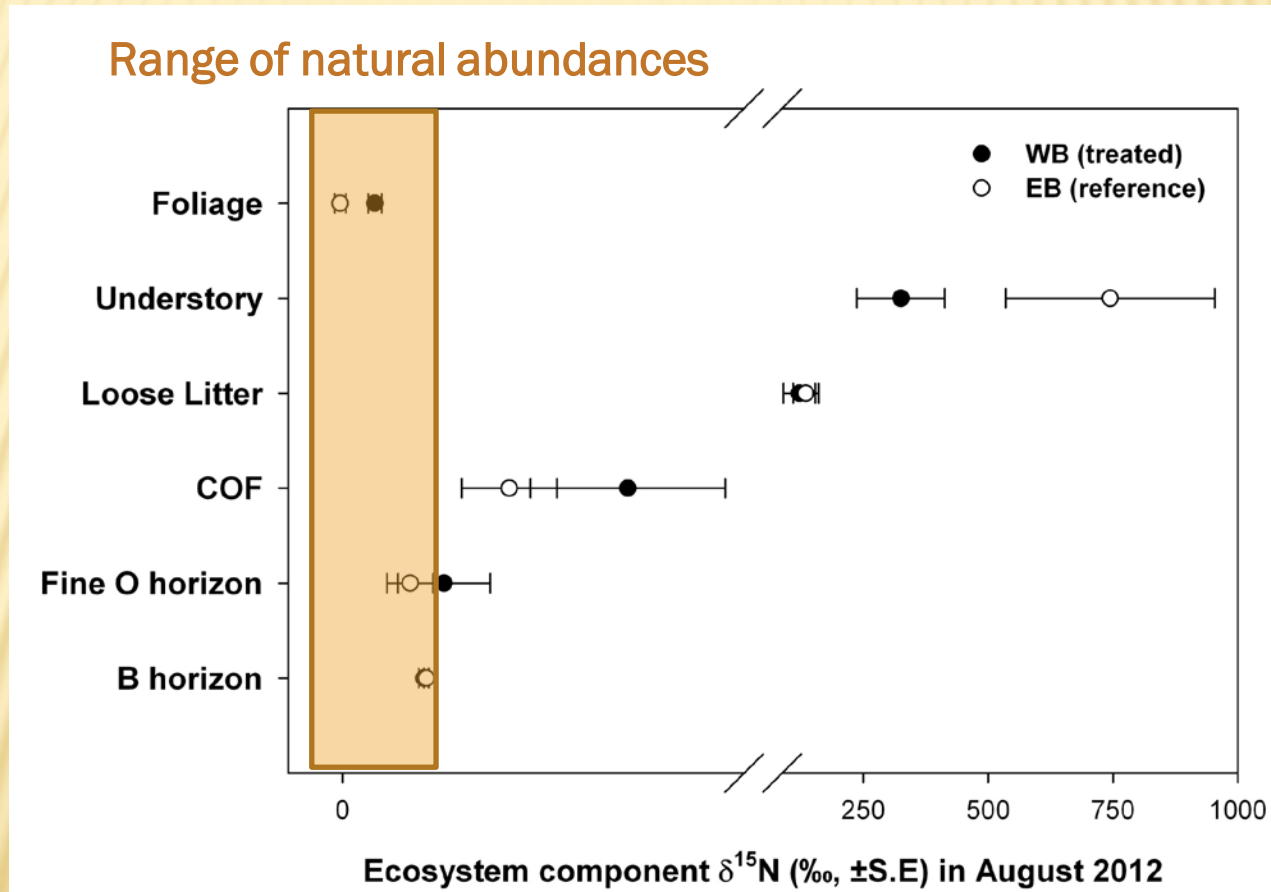


JUNE 2012 ^{15}N PULSE-CHASE EXPERIMENT

$(^{15}\text{NH}_4)_2\text{SO}_4$ (98 atom-%)
(load: 0.402 kg ha^{-1})



TWO-MONTH ^{15}N TRACER ENRICHMENTS

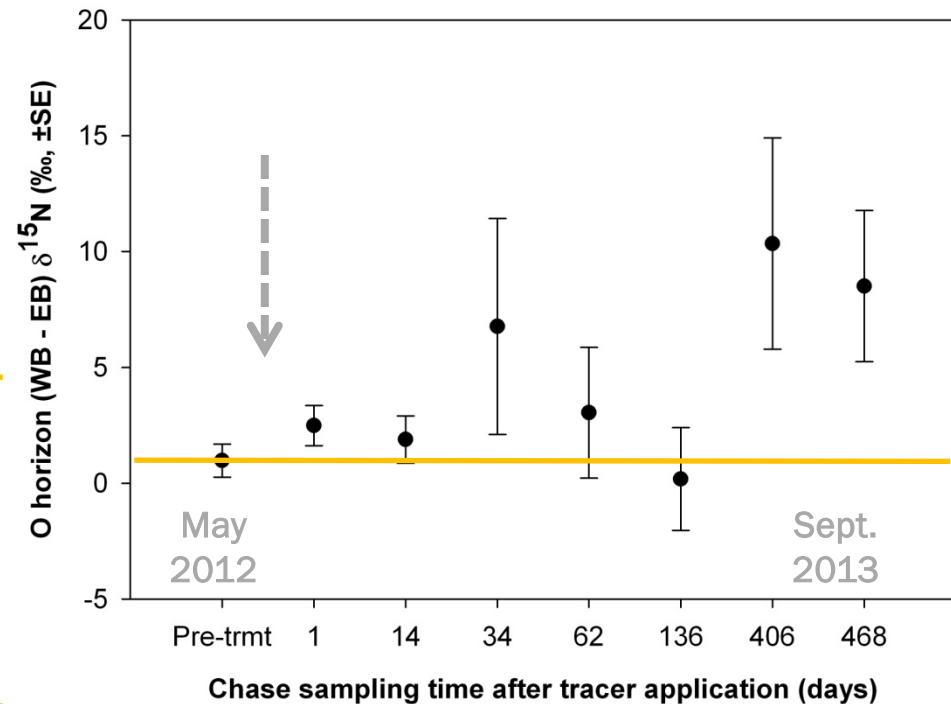
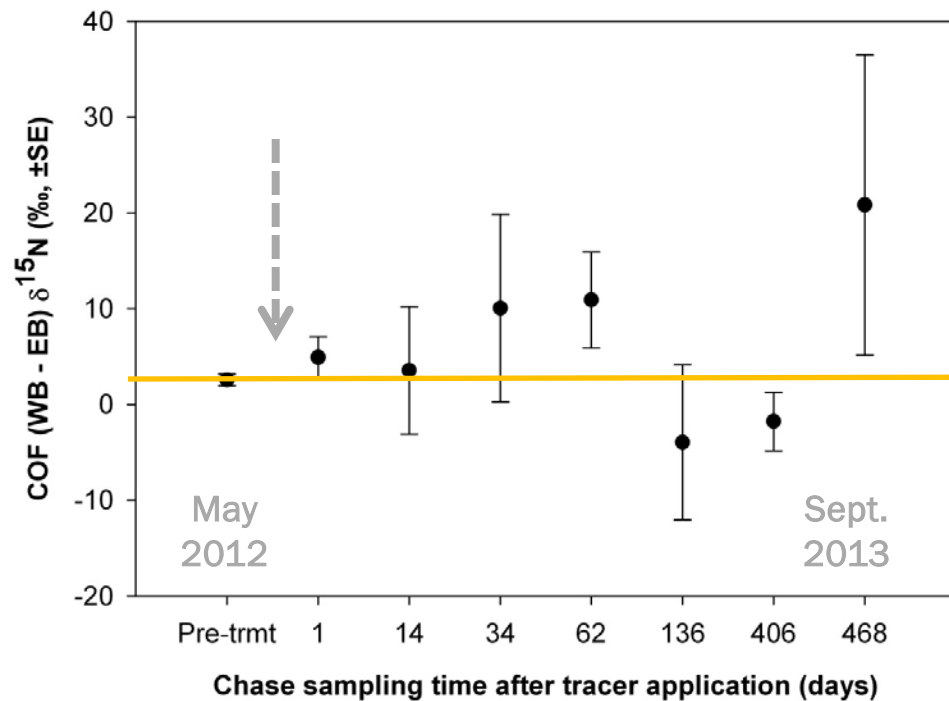


CHASE ^{15}N TRACER ENRICHMENTS

Difference (treated West Bear $\delta^{15}\text{N}$ – reference East Bear $\delta^{15}\text{N}$)

Coarse organic fraction (COF)

Fine organic fraction



CONCLUSIONS

- ✘ The **natural abundance** results show an ecosystem shift towards accelerated N cycling (higher $\delta^{15}\text{N}$) in West Bear.
- ✘ The **tracer pulse-chase** short-term results show highest enrichment of the understory vegetation followed by the forest floor components.
- ✘ The fundamental understanding of the mechanisms at play in altered ecosystem N cycling will come with our multi-year chase enrichment results.

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