^{15}N Enrichment of the Forest Floor and Soil After Whole-Watershed ^{15}N Tracer Addition To A Paired Forested Watershed in Maine, USA



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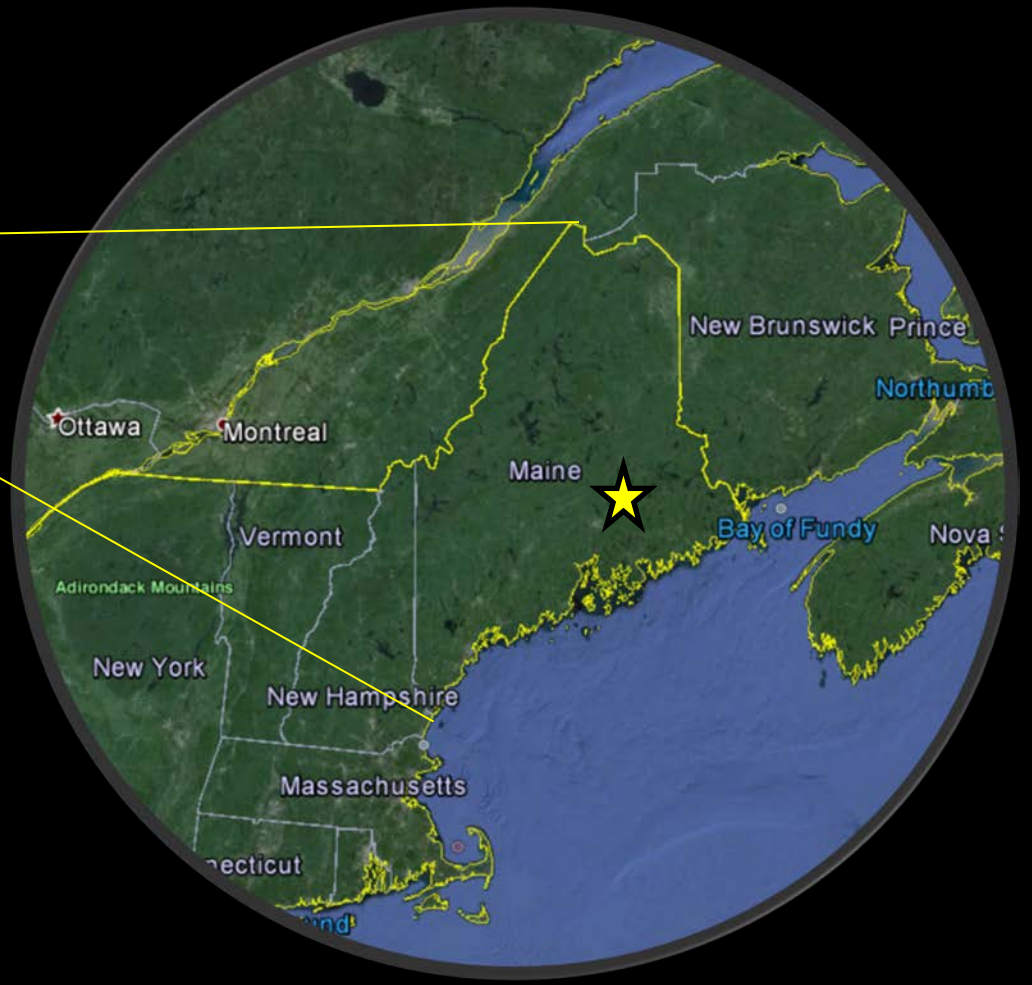
BIOGEOMON 2014

The Study Site: The Bear Brook Watershed in Maine (BBWM)



Google Earth 2014

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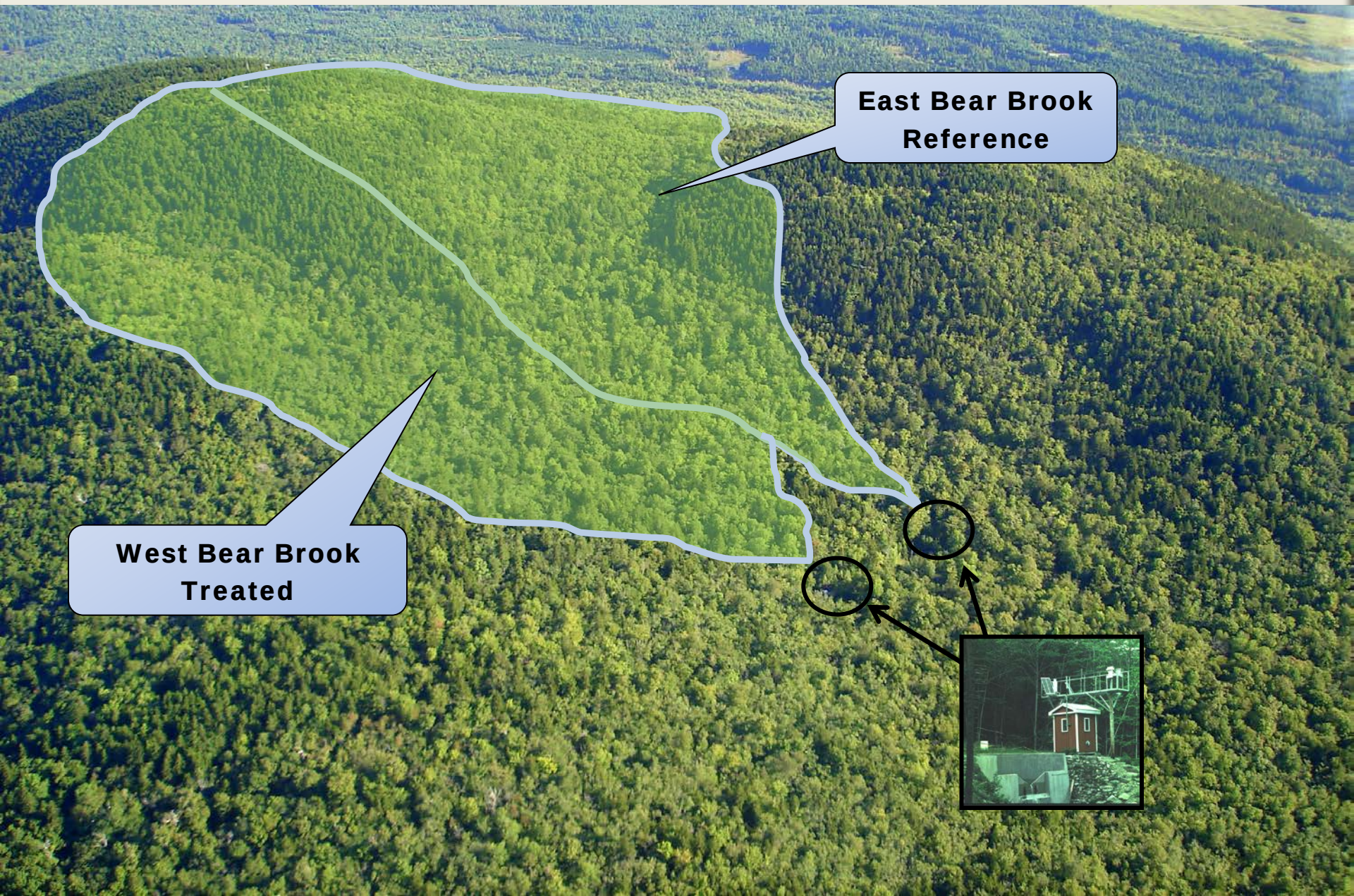
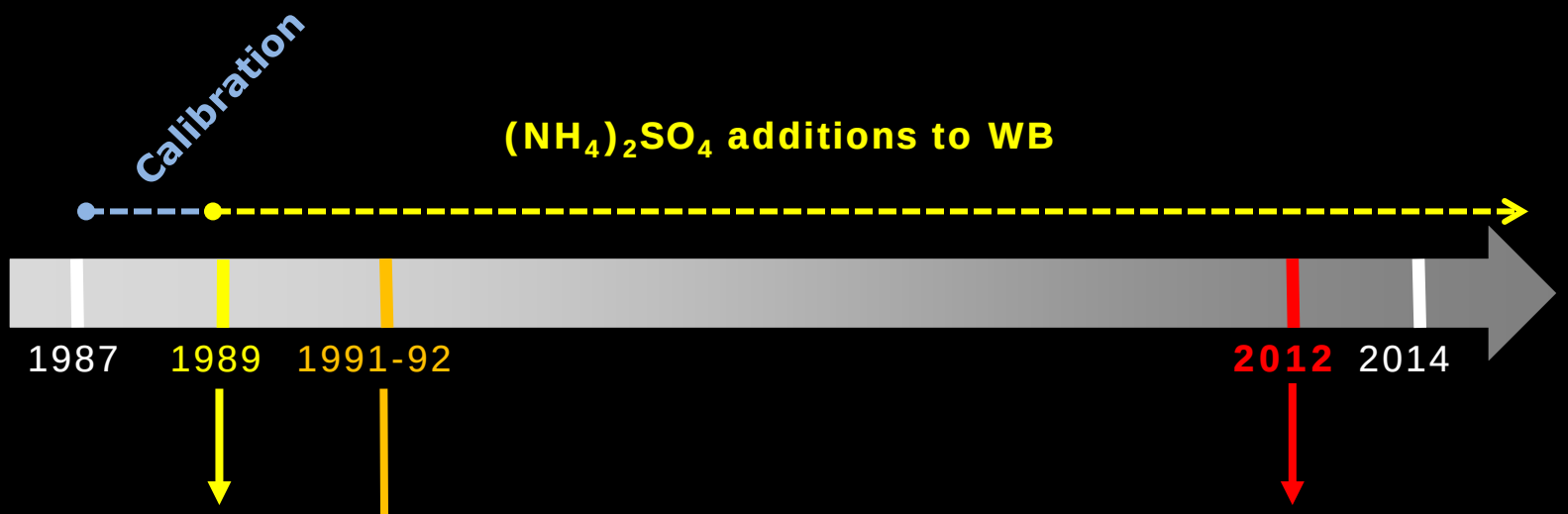


The History of Nitrogen Additions at BBWM

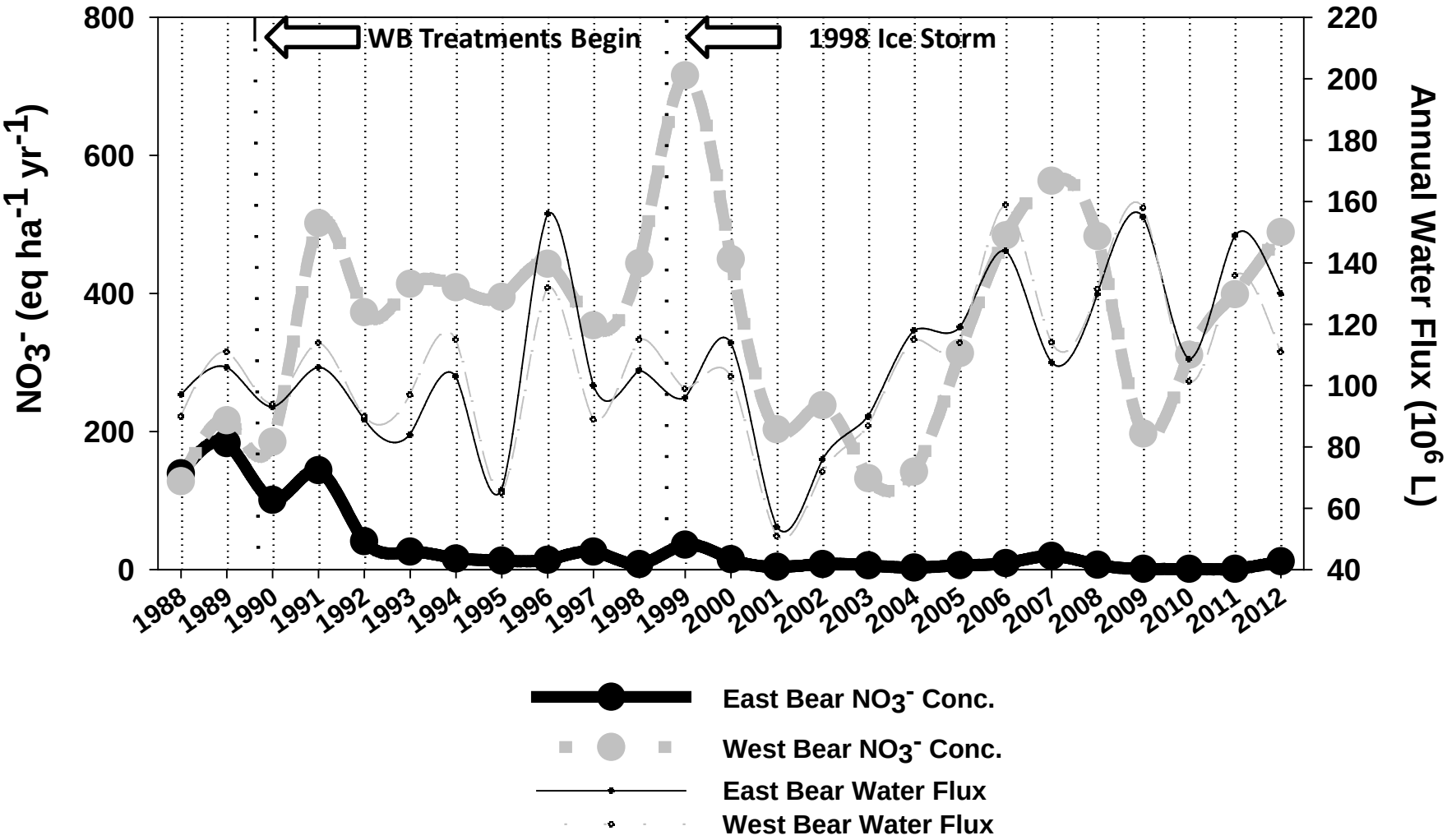


- Long-term $(NH_4)_2SO_4$ additions to WB
- Annually 25.2 kg N/ha added to WB
- Annual ambient N deposition is 4-5 kg N/ha
- 571 kg N/ha added as of 2012
- 9438 kg N/ha ecosystem N pool (Jefts et al. 2004)

- Early ^{15}N labeling experiment on WB (Nadelhoffer et al. 1999)
- Added 63 kg/ha N over 2 years
- 0.336 to 0.437 atom $\%^{15}N$

^{15}N Pulse-Chase Experiment on both WB and EB

Long-Term Integrated Stream N Export



Objectives

1. Use the isotopic ^{15}N tracer to understand potential differences in N dynamics after 25 years of whole-watershed N additions.

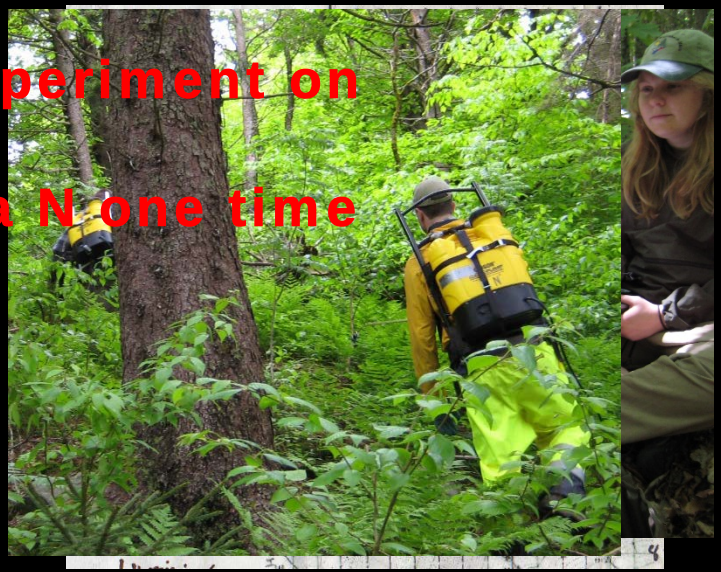
2. Describe the initial temporal pattern of response in litter, O horizon, and mineral soil $\delta^{15}N$ to tracer additions.

3. Determine the efficacy of the whole-watershed ^{15}N tracer pulse-chase approach.

Methods

1. Whole-watershed ^{15}N enrichment of <u>both</u> watersheds.

- ^{15}N pulse-chase experiment on both WB and EB
- Added 0.402 kg/ha N one time
- 98+ atom % ^{15}N



Methods

1. Whole-watershed ^{15}N enrichment of both watersheds.

2. Serial sampling of loose litter, COF, FOF, mineral soil (B horizon @ 0-25 cm).

Chase Sampling Days

1, 14, 34, 62, 136, 406, and 468 days

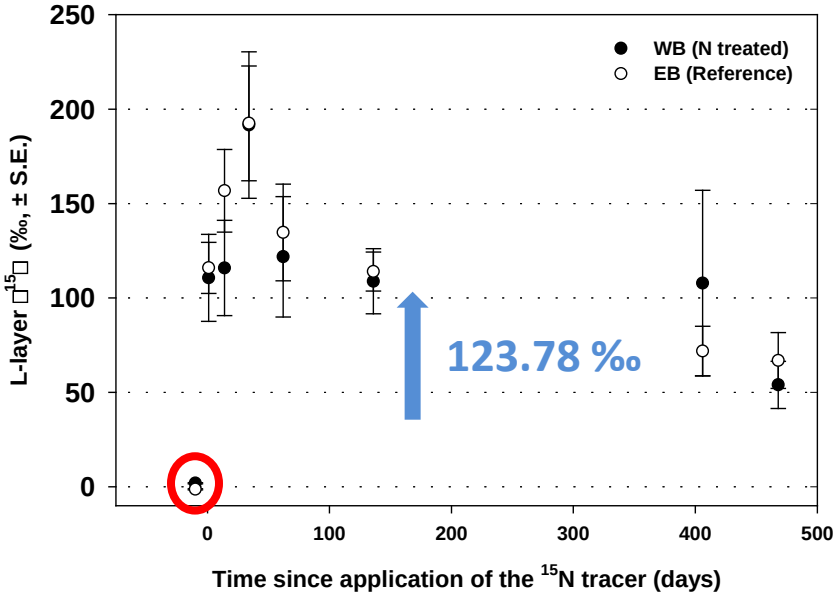
Methods

1. Whole-watershed ^{15}N enrichment of both watersheds.

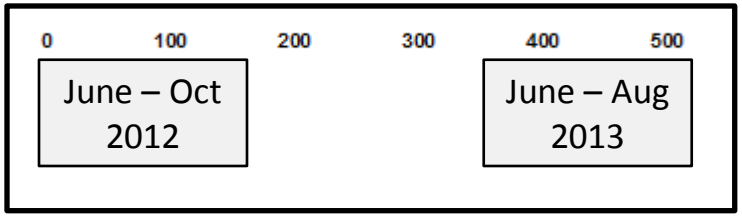
2. Serial sampling of loose litter, COF, FOF, mineral soil (B horizon @ 0-25 cm) for ^{15}N analysis.

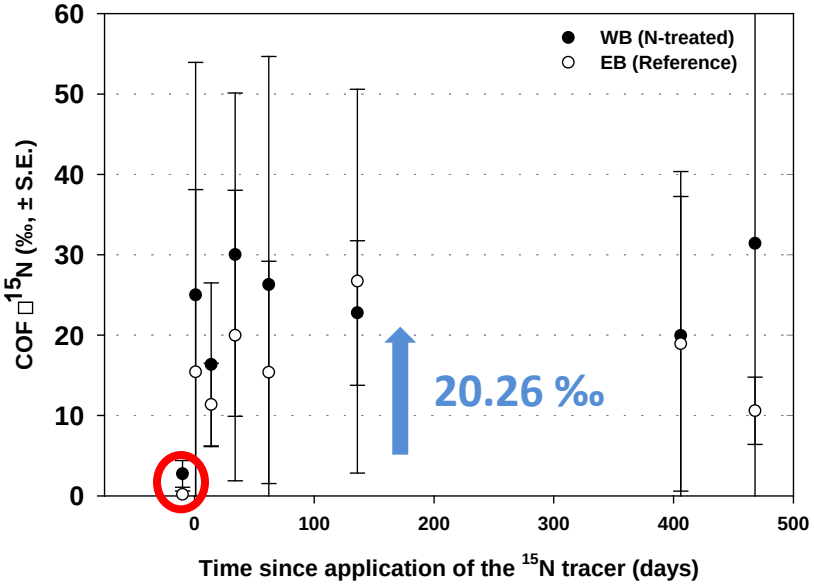
3. ^{15}N diffusion of 2 M KCl soil extracts.

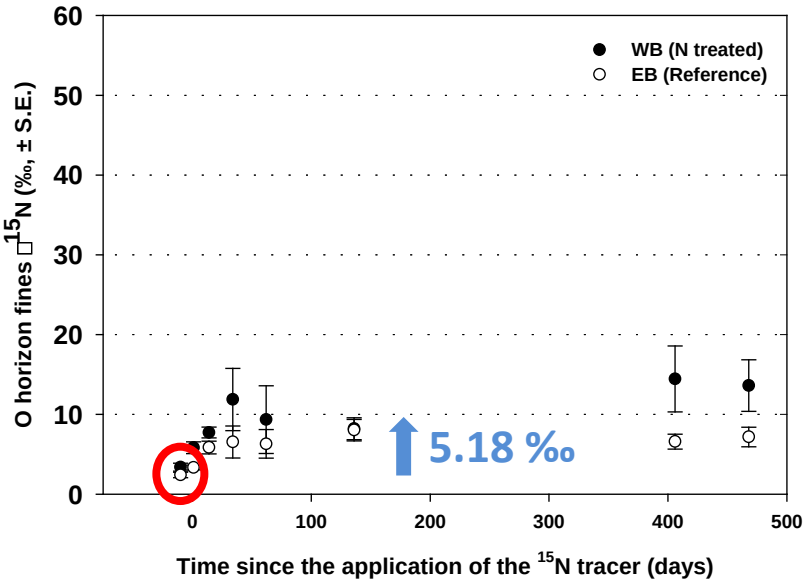
Results – The Chase



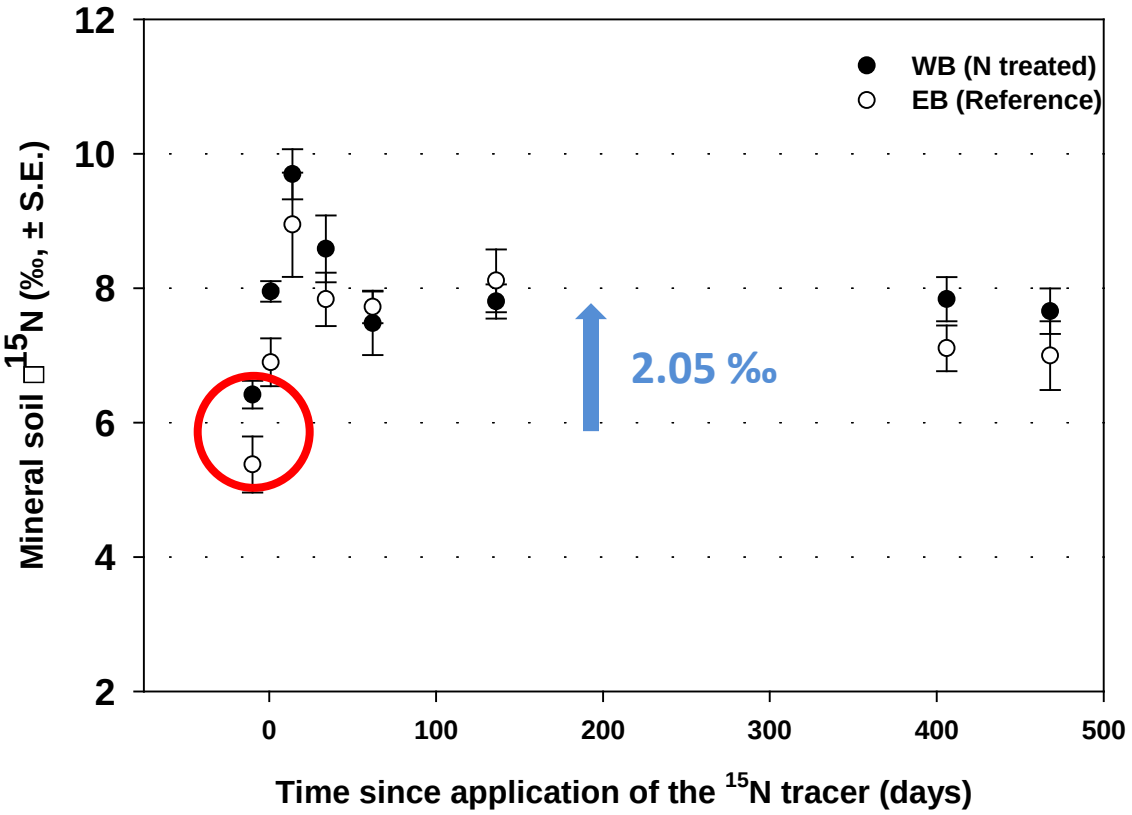
Loose litter and O horizon coarse organic fraction (COF) and fine $\delta^{15}N$.



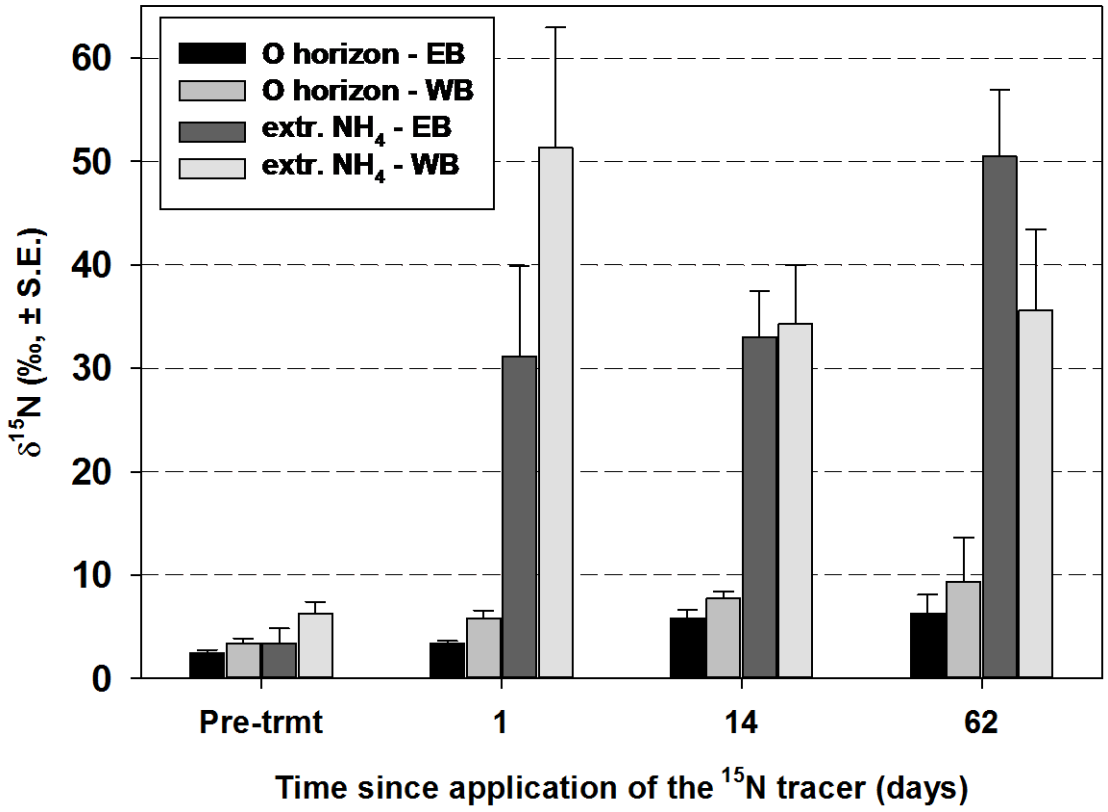




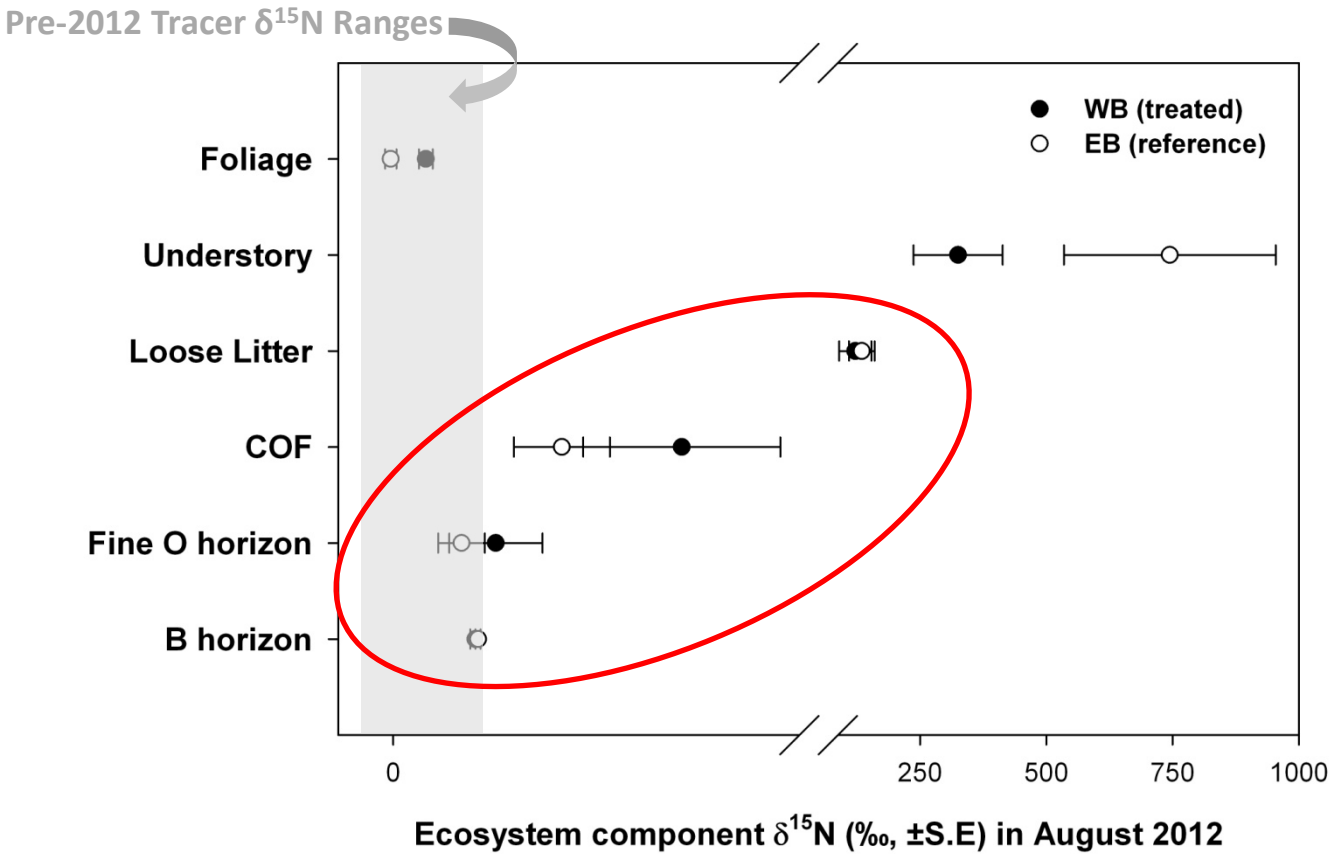
Results – The Chase (Mineral Soil $\delta^{15}N$)



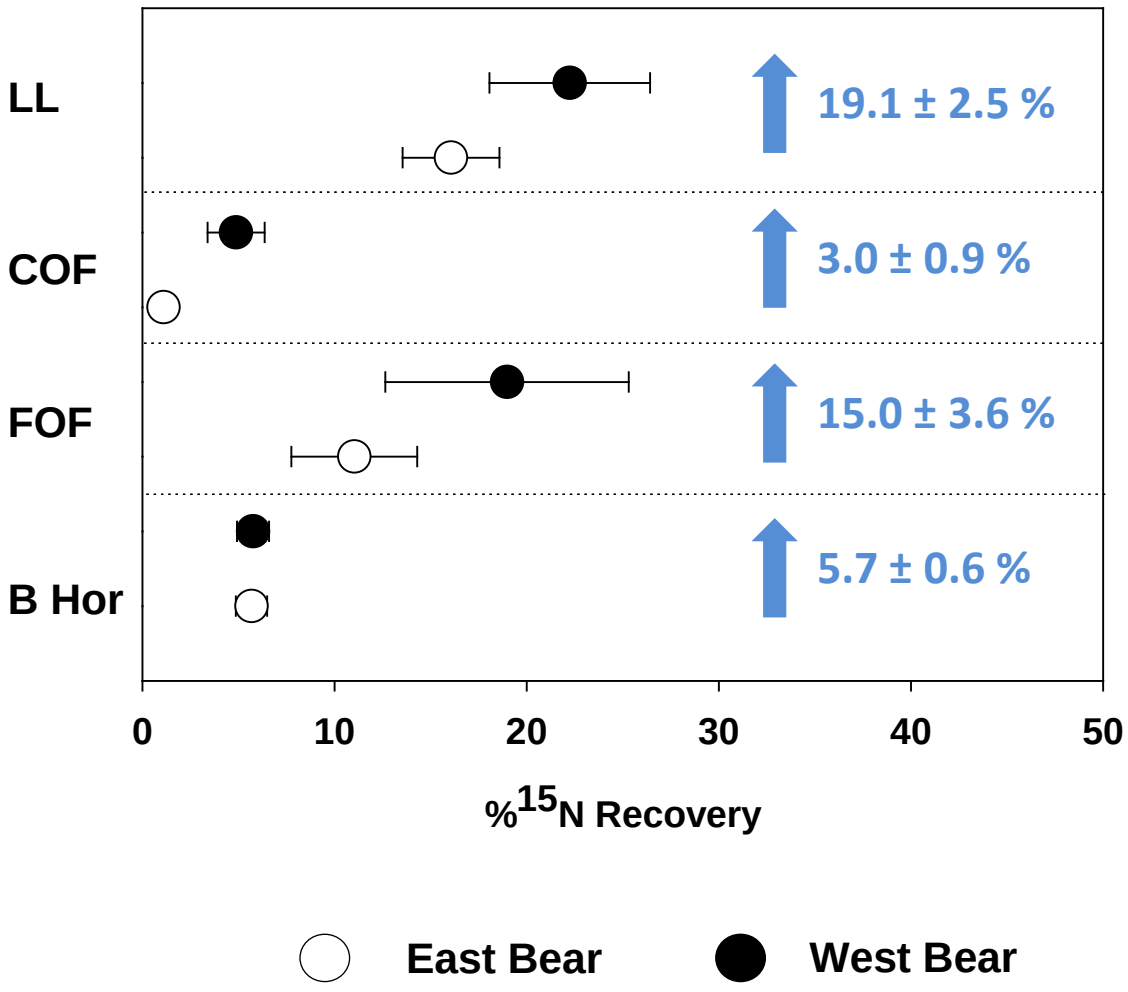
Results – O Horizon Ext. $\delta^{15}N\text{-}NH_4^+$ and Total $\delta^{15}N$



Results – First Year Whole-Ecosystem $\delta^{15}N$



Results – The Chase: Day 34 ^{15}N Retention



Conclusions

1. The whole-watershed ^{15}N tracer addition techniques were effective at labeling both watersheds.

2. For the ecosystem components reported here, approximately 40% of the^{15}N tracer was retained in the LL and soil in the first season.

3. No significant differences in ^{15}N retention between EB and WB in the first year. Some suggestion (i.e., trend) for greater retention in WB.

Acknowledgements

The authors wish to acknowledge the significant contributions of the undergraduate students, graduate students, and staff of the Forest Soils Program at the University of Maine. This research is funded through U.S. National Science Foundation grant (DEB 1056692), with support from the U.S. NSF LTREB program (DEB 1119708) and the University of Maine.


Questions?