

Introduction

- The ecological effects of fire and post-fire management are poorly understood.
- Microbial biomass and enzymatic activity were measured to assess the effects of fire and post-fire management on microbial processes.
- We hypothesized that microbial abundance and enzymatic activity would differ across burned sites due to different post-fire treatments and that enzymatic activity would be positively correlated with each other and microbial abundance.

Methods

- Soil was sampled from unburned (U), naturally recovering burned (N), and hydroseeded burned (H) chaparral sites behind CSUSM.
- NAGase and Phosphatase activities were measured according to Jackson et al. (2013)
- Microbial biomass was assessed using chloroform fumigation and extraction (Brookes et al. 1985).
- Data were analyzed using one-way ANOVA and regression analyses

Results

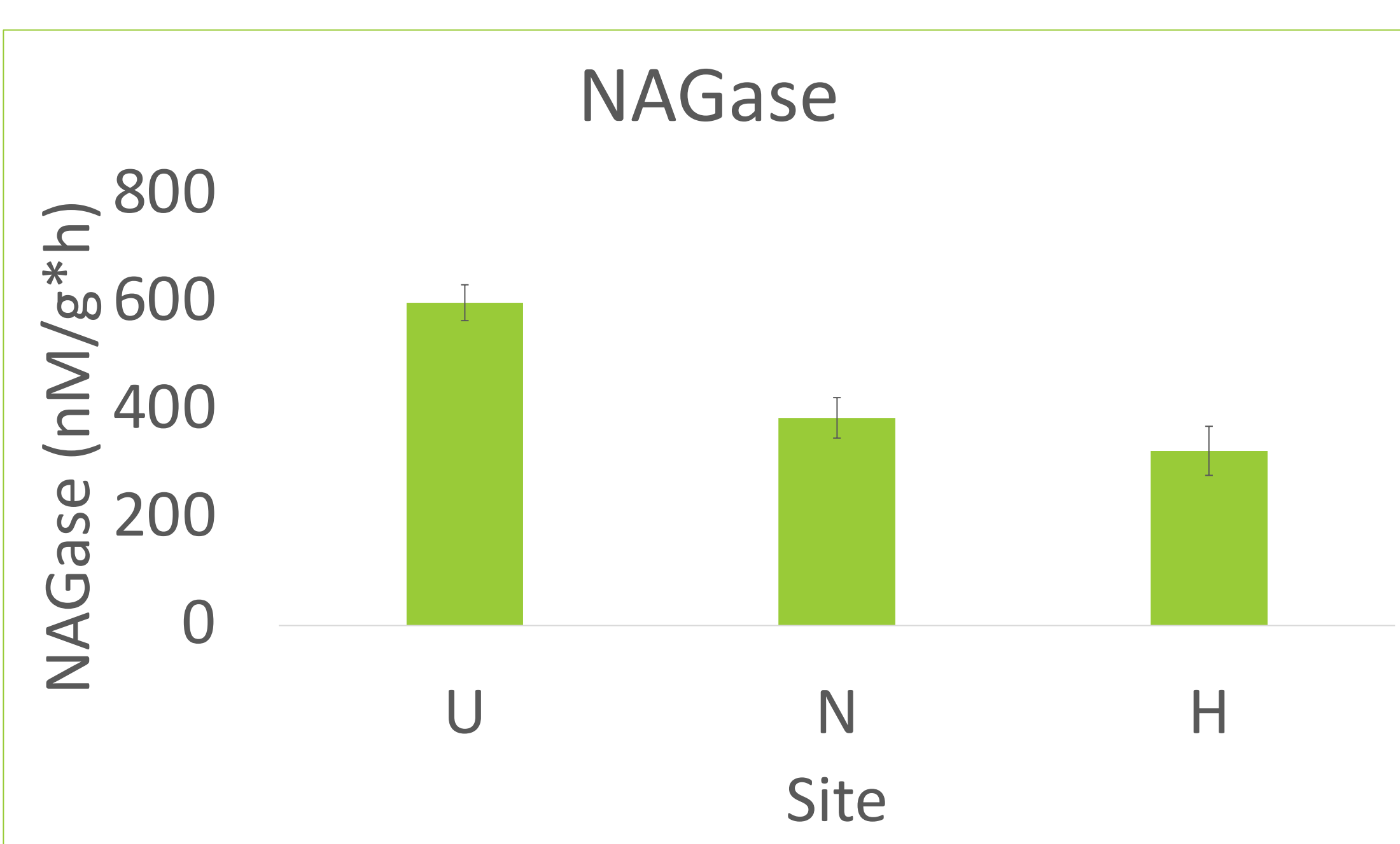


Figure 1. Mean (\pm SE; n = 8) of NAGase activity (nM/g*h) in each site. One-way ANOVA $F_{2,23} = 13.61$; $p < 0.05$.

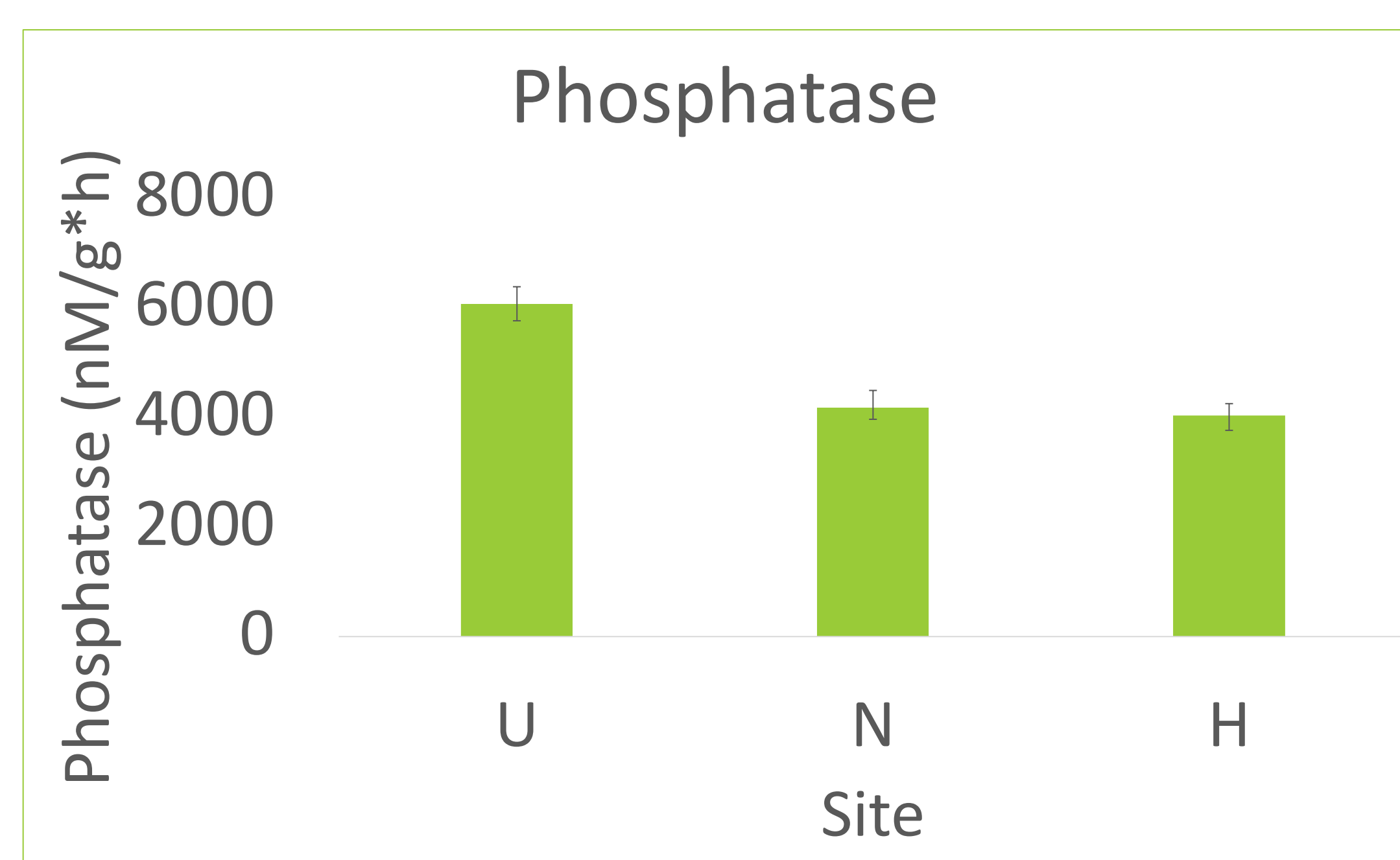


Figure 2. Mean (\pm SE; n = 8) of phosphatase activity (nM/g*h) in each site. One-way ANOVA $F_{2,23} = 17.88$; $p < 0.05$.

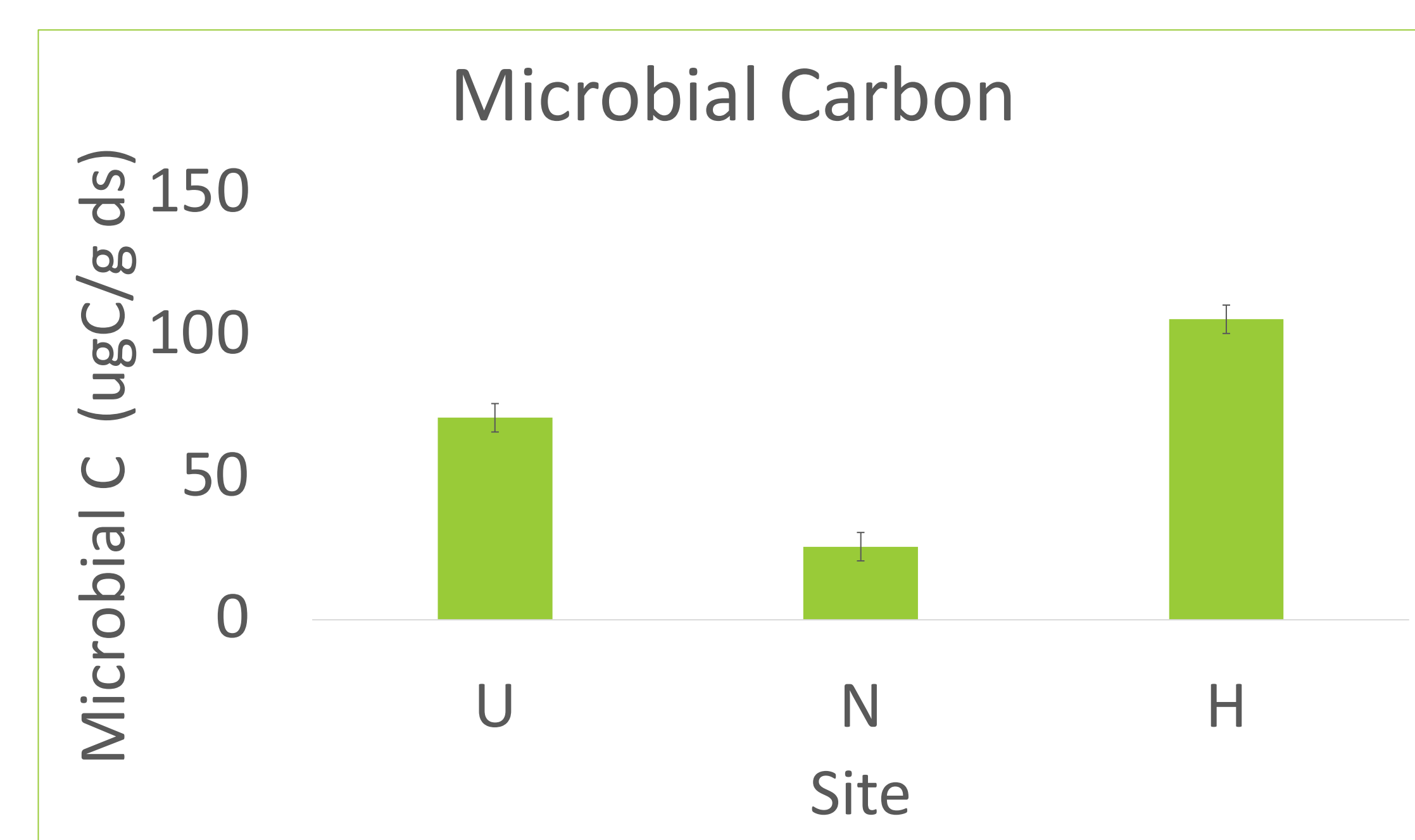


Figure 3. Mean (\pm SE; n = 8) microbial carbon ($\mu\text{gC/g}$ dry soil) in each site. One-way ANOVA $F_{2,23} = 7.86$; $p < 0.05$.

Enzyme	Soil pH	Soil Moisture	NAGase	N (%)	C (%)	C:N	NH ₄	NO ₃	TIN	Microbial C
Phosphatase	-0.61*	0.52*	0.90*	0.47*	0.51*	0.36	-0.16	0.51*	0.10	-0.07
NAGase	-0.74*	0.35	1.00	0.47*	0.53*	0.43*	0.07	0.57*	0.34	-0.11

Table 1. Correlation coefficients of each variable with phosphatase and NAGase activity with all 3 sites combined (n = 24). The asterisks represent significant correlations (R-critical value = 0.404).

Conclusions

- Both NAGase and Phosphatase activities were higher in the unburned site (Figs 1 and 2). This may imply that overall enzymatic activity is still significantly lower in burned sites even 5 years post-fire. Hydroseeding had little to no effect.
- Microbial C was significantly higher in the Hydroseeding site. This may be due to the plant species and/or the organic matter and fertilizer in the hydroseed mix.
- Enzymatic activity did not correlate with microbial C, implying a difference in microbial composition across sites.
- NAGase and Phosphatase were positively correlated, implying that they are driven by similar factors.
- Enzyme activity was positively correlated with soil C and N, implying N and C co-limitation.

References

- Brookes, P., Kragt, J., Powlson, D., & Jenkinson, D. (1985) *Soil Biology and Biochemistry*, 17(6), 831-835.
 Jackson CR, Tyler HL, & Millar JJ. (2013) *Journal of Visualized Experiments*;1:80.

Acknowledgments

This research was sponsored by a USDA-NIFA grant to Drs. George Vourlitis and Arun Sethuraman (2018-67032-27701). We would like to thank Nicolette Gordon and Bryce Summerhays for their assistance throughout the experiment.