**Supporting Information.** Seabloom, E.W., P.B. Adler, J. Alberti, L. Biederman, Y.M. Buckley, M.W. Cadotte, S.L. Collins, L. Dee, P.A. Fay, J. Firn, N. Hagenah, W.S. Harpole, Y. Hautier, A. Hector, S.E. Hobbie, F. Isbell, J.M.H. Knops, K.J. Komatsu, R. Laungani, A. MacDougall, R.L. McCulley, J.L. Moore, J.W. Morgan, T. Ohlert, S.M. Prober, A.C. Risch, M. Schuetz, C.J. Stevens, and E.T. Borer. 2020. Increasing effects of chronic nutrient enrichment on plant diversity loss and ecosystem productivity over time. Ecology.

Appendix S1

*Methods for Soil Analyses*

A subsample (~80-100g) from each plot was homogenized by grinding the soil with two steel beads (Daisy Premium 3/8" steel slingshot ammo) with 90 minutes of vigorous shaking using a paint shaker. Approximately 20 (18-25) mg of ground, homogenized soils were then packed into 5 x 9 mm tin capsules for carbon and nitrogen analysis using dry combustion gas chromatography on an Elemental Analyzer (Costech ECS 4010 CHNSO Analyzer, Valencia, California, USA) calibrated with the analytical standard, atropine ($C_{17}H_{23}NO_3$). 20g of the ground, homogenized soils were sent to Waypoint Analytical (Memphis, TN, USA) to measure major nutrients, micronutrients, soil pH, organic matter, cation exchange capacity, and texture of the soil (percent sand, silt and clay; only measured in the Control Plots). Phosphorus, potassium, calcium, magnesium, sulfur, boron, copper, iron, manganese, zinc, and sodium (in parts per million) were measured using the Mehlich-3 method. Soil pH was measured with a water pH meter on a 1:1 soil:water suspension. Cation exchange capacity (CEC), reported here as meq/100 g (milliequivalents of charge per 100 g of dry soil), is a measure of the capacity of soil surfaces to retain cations and is used as an indicator of quality and productivity of the soil. CEC was calculated using the ppm of Ca, Mg, and K reported from the Mehlich-3 method using the following relationship: CEC = (ppm Ca / 200) + (ppm Mg / 120) + (ppm K / 390)). Soil percent organic matter was measured using the Loss on Ignition (LOI) method (combustion for two hours at 400 °C). Values of organic matter reported here were not treated with acid prior to combustion. Texture was measured using the hydrometer method. In brief, the soil sample was shaken with Sodium Hexametaphosphate (HMP) solution, and then transferred to a settling cylinder and mixed. The percent sand, silt, and clay particles were calculated from hydrometer density readings taken at 40 seconds and two hours.

**Table S1.** Change in the effect of nutrient enrichment on live biomass, dead biomass, and plant diversity over time at 47 globally distributed grassland sites. Year is a random effect in these models, but treatment effects are not allowed to vary among sites. Parameter codes as specified in model formula are shown in parentheses.

**Effects of Factorial Nutrient Addition on Live Biomass**

Formula: live.lg ~ n * p * k * yr.lg + (yr.lg | site)

| Source | Estimate | Std. Error | DF | t | p |
|---|---|---|---|---|---|
| Intercept | 2.364 | 0.063 | 54 | 37.547 | <0.001 |
| N (n) | 0.055 | 0.027 | 9883 | 2.020 | 0.043 |
| P (p) | 0.005 | 0.027 | 9883 | 0.189 | 0.850 |
| K (k) | -0.028 | 0.027 | 9883 | -1.041 | 0.298 |
| Duration (yr.lg) | -0.045 | 0.060 | 71 | -0.757 | 0.451 |
| N*P | 0.016 | 0.039 | 9882 | 0.409 | 0.682 |
| N*K | 0.030 | 0.039 | 9882 | 0.776 | 0.438 |
| P*K | 0.057 | 0.039 | 9882 | 1.454 | 0.146 |
| N*Duration | 0.037 | 0.040 | 9884 | 0.925 | 0.355 |
| P*Duration | 0.048 | 0.040 | 9884 | 1.195 | 0.232 |
| K*Duration | 0.040 | 0.040 | 9884 | 0.986 | 0.324 |
| N*P*K | -0.045 | 0.055 | 9881 | -0.811 | 0.417 |
| N*P*Duration | 0.054 | 0.057 | 9882 | 0.945 | 0.345 |
| N*K*Duration | -0.013 | 0.057 | 9882 | -0.228 | 0.820 |
| P*K*Duration | -0.050 | 0.057 | 9882 | -0.866 | 0.386 |
| N*P*K*Duration | 0.005 | 0.081 | 9881 | 0.062 | 0.951 |

**Effects of Factorial Nutrient Addition on Dead Biomass**

Formula: dead.lg ~ n * p * k * yr.lg + (yr.lg | site)

| Source | Estimate | Std. Error | DF | t | p |
|---|---|---|---|---|---|
| Intercept | 1.916 | 0.099 | 48 | 19.271 | <0.001 |
| N (n) | -0.054 | 0.045 | 7952 | -1.202 | 0.230 |
| P (p) | -0.006 | 0.045 | 7953 | -0.136 | 0.892 |
| K (k) | 0.037 | 0.045 | 7953 | 0.819 | 0.413 |
| Duration (yr.lg) | -0.050 | 0.098 | 57 | -0.507 | 0.614 |
| N*P | 0.060 | 0.065 | 7951 | 0.926 | 0.355 |
| N*K | 0.031 | 0.064 | 7951 | 0.488 | 0.626 |
| P*K | -0.037 | 0.064 | 7951 | -0.571 | 0.568 |
| N*Duration | 0.114 | 0.066 | 7953 | 1.728 | 0.084 |
| P*Duration | 0.076 | 0.066 | 7953 | 1.142 | 0.253 |
| K*Duration | -0.024 | 0.066 | 7953 | -0.356 | 0.722 |
| N*P*K | -0.021 | 0.091 | 7950 | -0.233 | 0.815 |
| N*P*Duration | -0.092 | 0.095 | 7951 | -0.967 | 0.333 |
| N*K*Duration | 0.026 | 0.095 | 7951 | 0.275 | 0.783 |
| P*K*Duration | 0.016 | 0.095 | 7952 | 0.167 | 0.868 |
| N*P*K*Duration | -0.011 | 0.134 | 7950 | -0.080 | 0.936 |

**Effects of Factorial Nutrient Addition on Plant Diversity**

Formula: div.lg ~ n * p * k * yr.lg + (yr.lg | site)

| Source | Estimate | Std. Error | DF | t | p |
|---|---|---|---|---|---|
| Intercept | 0.526 | 0.029 | 58 | 18.435 | <0.001 |
| N (n) | −0.007 | 0.015 | 9883 | −0.443 | 0.657 |
| P (p) | −0.014 | 0.015 | 9883 | −0.958 | 0.338 |
| K (k) | −0.020 | 0.015 | 9883 | −1.322 | 0.186 |
| Duration (yr.lg) | 0.003 | 0.030 | 75 | 0.088 | 0.930 |
| N*P | 0.015 | 0.021 | 9881 | 0.692 | 0.489 |
| N*K | 0.032 | 0.021 | 9881 | 1.502 | 0.133 |
| P*K | 0.029 | 0.021 | 9881 | 1.343 | 0.179 |
| N*Duration | −0.062 | 0.022 | 9884 | −2.794 | 0.005 |
| P*Duration | −0.008 | 0.022 | 9884 | −0.378 | 0.706 |
| K*Duration | −0.001 | 0.022 | 9884 | −0.029 | 0.977 |
| N*P*K | −0.028 | 0.030 | 9880 | −0.928 | 0.354 |
| N*P*Duration | −0.035 | 0.031 | 9882 | −1.108 | 0.268 |
| N*K*Duration | −0.020 | 0.031 | 9882 | −0.631 | 0.528 |
| P*K*Duration | −0.022 | 0.031 | 9882 | −0.686 | 0.492 |
| N*P*K*Duration | −0.003 | 0.045 | 9880 | −0.063 | 0.949 |

**Effects of Factorial Nutrient Addition on Plant Richness**

Formula: rich.lg ~ n * p * k * yr.lg + (yr.lg | site)

| Source | Estimate | Std. Error | DF | t | p |
|---|---|---|---|---|---|
| Intercept | 0.987 | 0.032 | 54 | 30.914 | <0.001 |
| N (n) | −0.012 | 0.014 | 9883 | −0.822 | 0.411 |
| P (p) | 0.002 | 0.014 | 9883 | 0.140 | 0.888 |
| K (k) | −0.019 | 0.014 | 9883 | −1.365 | 0.172 |
| Duration (yr.lg) | −0.028 | 0.034 | 65 | −0.825 | 0.412 |
| N*P | 0.004 | 0.020 | 9881 | 0.200 | 0.841 |
| N*K | 0.021 | 0.020 | 9881 | 1.056 | 0.291 |
| P*K | 0.002 | 0.020 | 9881 | 0.116 | 0.907 |
| N*Duration | −0.077 | 0.021 | 9884 | −3.728 | 0.000 |
| P*Duration | −0.022 | 0.021 | 9884 | −1.049 | 0.294 |
| K*Duration | 0.008 | 0.021 | 9884 | 0.398 | 0.691 |
| N*P*K | −0.014 | 0.028 | 9880 | −0.505 | 0.614 |
| N*P*Duration | −0.035 | 0.030 | 9882 | −1.169 | 0.242 |
| N*K*Duration | −0.024 | 0.030 | 9882 | −0.798 | 0.425 |
| P*K*Duration | −0.024 | 0.030 | 9882 | −0.817 | 0.414 |
| N*P*K*Duration | 0.017 | 0.042 | 9880 | 0.411 | 0.681 |

**Effects of Factorial Nutrient Addition on Plant Evenness**

Formula: evs.lg ~ n * p * k * yr.lg + (yr.lg | site)

| Source | Estimate | Std. Error | DF | t | p |
|---|---|---|---|---|---|
| Intercept | -0.461 | 0.020 | 70 | -23.203 | <0.001 |
| N (n) | 0.005 | 0.013 | 9885 | 0.364 | 0.716 |
| P (p) | -0.016 | 0.013 | 9884 | -1.222 | 0.222 |
| K (k) | -0.001 | 0.013 | 9885 | -0.048 | 0.961 |
| Duration (yr.lg) | 0.030 | 0.022 | 101 | 1.372 | 0.173 |
| N*P | 0.011 | 0.019 | 9881 | 0.565 | 0.572 |
| N*K | 0.011 | 0.019 | 9881 | 0.575 | 0.565 |
| P*K | 0.026 | 0.019 | 9881 | 1.384 | 0.166 |
| N*Duration | 0.016 | 0.020 | 9886 | 0.791 | 0.429 |
| P*Duration | 0.013 | 0.020 | 9886 | 0.680 | 0.497 |
| K*Duration | -0.009 | 0.020 | 9886 | -0.448 | 0.654 |
| N*P*K | -0.014 | 0.027 | 9879 | -0.515 | 0.607 |
| N*P*Duration | 0.000 | 0.028 | 9882 | -0.012 | 0.991 |
| N*K*Duration | 0.004 | 0.028 | 9882 | 0.129 | 0.897 |
| P*K*Duration | 0.002 | 0.028 | 9882 | 0.087 | 0.930 |
| N*P*K*Duration | -0.020 | 0.040 | 9879 | -0.494 | 0.621 |

**Table S2.** Change in the effect of nutrient enrichment on live biomass, dead biomass, and plant diversity over time at 44 globally distributed grassland sites. In these models, nutrient effect and experimental duration vary among sites. Parameter codes as specified in model formula are shown in parentheses. Note that dead biomass p values are based on simplified random effects specification.

**Effects of Nutrient Addition on Live Biomass**

Formula: live.lg ~ trt * yr.lg + (trt + yr.lg | site)

| Source | Estimate | Std. Error | DF | t | p |
|---|---|---|---|---|---|
| Intercept | 2.358 | 0.062 | 49 | 38.043 | < 0.001 |
| NPK (trt) | 0.090 | 0.028 | 360 | 3.202 | 0.001 |
| Duration (yr.lg) | -0.019 | 0.059 | 58 | -0.331 | 0.742 |
| NPK*Duration | 0.107 | 0.039 | 2322 | 2.745 | 0.006 |

**Effects of Nutrient Addition on Dead Biomass**

Formula: dead.lg ~ trt + yr.lg + (trt + yr.lg | site)

| Source | Estimate | Std. Error | DF | t | p |
|---|---|---|---|---|---|
| Intercept | 1.901 | 0.097 | 40 | 19.699 | < 0.001 |
| NPK (trt) | 0.065 | 0.028 | 37 | 2.316 | 0.026 |
| Duration (yr.lg) | -0.022 | 0.096 | 33 | -0.229 | 0.821 |

**Effects of Nutrient Addition on Diversity**

Formula: div.lg ~ trt * yr.lg + (trt + yr.lg | site)

| Source | Estimate | Std. Error | DF | t | p |
|---|---|---|---|---|---|
| Intercept | 0.524 | 0.030 | 50 | 17.477 | < 0.001 |
| NPK (trt) | 0.011 | 0.019 | 161 | 0.589 | 0.556 |
| Duration (yr.lg) | 0.010 | 0.030 | 56 | 0.325 | 0.746 |
| NPK*Duration | -0.158 | 0.022 | 2503 | -7.169 | 0.000 |

**Effects of Nutrient Addition on Plant Richness**

Formula: rich.lg ~ trt * yr.lg + (yr.lg | site)

| Source | Estimate | Std. Error | DF | t | p |
|---|---|---|---|---|---|
| Intercept | 0.990 | 0.031 | 51 | 32.440 | < 0.001 |
| NPK (trt) | -0.015 | 0.014 | 2546 | -1.073 | 0.283 |
| Duration (yr.lg) | -0.033 | 0.034 | 54 | -0.946 | 0.348 |
| NPK*Duration | -0.156 | 0.021 | 2547 | -7.593 | 0.000 |

**Effects of Nutrient Addition on Plant Evenness**

Formula: evs.lg ~ trt * yr.lg + (trt + yr.lg | site)

| Source | Estimate | Std. Error | DF | t | p |
|---|---|---|---|---|---|
| Intercept | -0.462 | 0.021 | 52 | -21.720 | < 0.001 |
| NPK (trt) | 0.022 | 0.015 | 248 | 1.502 | 0.134 |
| Duration (yr.lg) | 0.039 | 0.024 | 58 | 1.648 | 0.105 |
| NPK*Duration | -0.002 | 0.019 | 2431 | -0.082 | 0.935 |

**Table S3.** Correlation between the change in nutrient enrichment effects over time on live biomass (`year.slope.live`), dead biomass (`year.slope.dead`), and plant diversity (`year.slope.div`). Note: These are the slopes from Figs. 1 and 2 as plotted in Fig. 3.

**Correlation between Live Biomass and Diversity Effect Slopes**

```
Formula: sma(formula = year.slope.live ~ year.slope.div, data = slopes.df)
R-squared : 0.030
P-value :   0.241
```

**Correlation between Live Biomass and Dead Biomass Effect Slopes**

```
Formula: sma(formula = year.slope.live ~ year.slope.dead, data = slopes.df)
R-squared :  0.288
P-value :   < 0.001
```

**Correlation between Dead Biomass and Diversity Effect Slopes**

```
Formula: sma(formula = year.slope.div ~ year.slope.dead, data = slopes.df)
R-squared : 0.055
P-value :   0.136
```

**Table S4.** Models of site level variables determining the change in nutrient effects on biomass, dead biomass, and plant diversity over time at 38 globally distributed grassland sites. Note: The responses are the slopes from Fig. 1 as plotted in Fig. 3. Variables in full model include Aridity Index (`ai.lg`), pre-treatment soil, pre-treatment soil base cations, pre-treatment soil N, pre-treatment soil C:N, and experimental duration (`max.trt.yr`). Models also include pre-treatment values of the response variable, e.g., live biomass (`live.lg.0`), dead biomass (`dead.lg.0`), and diversity (`div.lg.0`), and they include the change in nutrient enrichment effects over time on live biomass (`year.slope.live`), dead biomass (`year.slope.dead`), and plant diversity (`year.slope.div`). Models are combined using model averaging (dredge and model.avg in the MuMIn library in R). Here we only show the results of models without soil chemistry included, as not all sites had data available or pre-treatment soil chemistry and soil chemistry was not included in any of the final models. Full averages show effects across all models within 4 AICc units of the best (i.e., lowest AICc) model, and the conditional averages are effects averaged only across models in which the variable is included.

**Drivers of Live Biomass Slopes**

Formula: year.slope.live ~ ai.lg + max.trt.yr + live.lg.0 + year.slope.div + year.slope.dead

**Full Averages**

| Source | Estimate | Std. Error | z | p | Importance | Number of Models |
|---|---|---|---|---|---|---|
| (Intercept) | 0.111 | 0.006 | 16.772 | < 0.001 | | |
| year.slope.dead | -0.039 | 0.014 | 2.721 | 0.007 | 1.00 | 10 |
| live.lg.0 | 0.021 | 0.017 | 1.204 | 0.229 | 0.74 | 6 |
| max.trt.yr | -0.010 | 0.014 | 0.723 | 0.470 | 0.49 | 5 |
| ai.lg | 0.004 | 0.010 | 0.413 | 0.679 | 0.29 | 4 |
| year.slope.div | 0.000 | 0.005 | 0.072 | 0.942 | 0.12 | 2 |

**Conditional Averages**

| Source | Estimate | Std. Error | z | p | Importance | Number of Models |
|---|---|---|---|---|---|---|
| (Intercept) | 0.111 | 0.006 | 16.772 | < 0.001 | | |
| year.slope.dead | -0.039 | 0.014 | 2.721 | 0.007 | 1.00 | 10 |
| live.lg.0 | 0.028 | 0.013 | 1.989 | 0.047 | 0.74 | 6 |
| max.trt.yr | -0.020 | 0.013 | 1.509 | 0.131 | 0.49 | 5 |
| ai.lg | 0.014 | 0.014 | 1.021 | 0.307 | 0.29 | 4 |
| year.slope.div | 0.003 | 0.014 | 0.216 | 0.829 | 0.12 | 2 |

## Drivers of Dead Biomass Slopes

Formula: year.slope.dead~ai.lg+max.trt.yr+dead.lg.0+year.slope.div+year.slope.live

**Full Averages**

| Source | Estimate | Std.Error | Z | p | Importance | Number of Models |
|---|---|---|---|---|---|---|
| (Intercept) | 0.112 | 0.016 | 6.562 | < 0.001 | | |
| year.slope.live | -0.099 | 0.036 | 2.632 | 0.008 | 1.000 | 10 |
| dead.lg.0 | -0.045 | 0.043 | 1.044 | 0.297 | 0.670 | 6 |
| year.slope.div | -0.012 | 0.026 | 0.447 | 0.655 | 0.310 | 4 |
| max.trt.yr | -0.006 | 0.020 | 0.298 | 0.766 | 0.210 | 3 |
| ai.lg | 0.001 | 0.014 | 0.048 | 0.962 | 0.150 | 3 |

**Conditional Averages**

| Source | Estimate | Std.Error | Z | p | Importance | Number of Models |
|---|---|---|---|---|---|---|
| (Intercept) | 0.112 | 0.016 | 6.562 | < 0.001 | | |
| year.slope.live | -0.099 | 0.036 | 2.632 | 0.008 | 1.000 | 10 |
| dead.lg.0 | -0.067 | 0.035 | 1.844 | 0.065 | 0.670 | 6 |
| year.slope.div | -0.038 | 0.034 | 1.082 | 0.279 | 0.310 | 4 |
| max.trt.yr | -0.029 | 0.035 | 0.786 | 0.432 | 0.210 | 3 |
| ai.lg | 0.005 | 0.036 | 0.124 | 0.901 | 0.150 | 3 |

## Drivers of Diversity Slopes

Formula: year.slope.div~ai.lg+max.trt.yr+live.lg.0+year.slope.dead+year.slope.live

**Full Averages**

| Source | Estimate | Std.Error | Z | p | Importance | Number of Models |
|---|---|---|---|---|---|---|
| (Intercept) | -0.177 | 0.017 | 9.927 | <2e-16 | | |
| div.lg.0 | -0.078 | 0.041 | 1.880 | 0.060 | 0.930 | 13 |
| max.trt.yr | 0.023 | 0.035 | 0.651 | 0.515 | 0.440 | 7 |
| year.slope.live | 0.018 | 0.032 | 0.544 | 0.586 | 0.370 | 6 |
| year.slope.dead | -0.012 | 0.028 | 0.412 | 0.680 | 0.310 | 7 |
| ai.lg | -0.002 | 0.016 | 0.110 | 0.913 | 0.180 | 5 |

**Conditional Averages**

| Source | Estimate | Std.Error | Z | p | Importance | Number of Models |
|---|---|---|---|---|---|---|
| (Intercept) | -0.177 | 0.017 | 9.927 | <2e-16 | | |
| div.lg.0 | -0.084 | 0.035 | 2.309 | 0.021 | 0.930 | 13 |
| max.trt.yr | 0.051 | 0.035 | 1.421 | 0.155 | 0.440 | 7 |
| year.slope.live | 0.048 | 0.037 | 1.260 | 0.208 | 0.370 | 6 |
| year.slope.dead | -0.039 | 0.040 | 0.951 | 0.342 | 0.310 | 7 |
| ai.lg | -0.010 | 0.036 | 0.269 | 0.788 | 0.180 | 5 |

**Table S5.** Models of site level variables determining the change in nutrient effects on biomass, dead biomass, and plant diversity over time at 38 globally distributed grassland sites. Note: The responses are the slopes from Fig. 1 as plotted in Fig. 3. Variables in full model include water availability index (`ai.lg`), mean annual precipitation (`map`), mean annual temperature (`mat`), mean diurnal temperature range (`mat_range`), mean annual temperature range (`ann_temp_range`), temperature in the wettest quarter (`temp_wet_q`), pre-treatment soil pH (`ph`), pre-treatment soil base cations (`base.cations`), pre-treatment soil N (`pct_n.lg`), pre-treatment soil C:N (`c2n.lg`), and experimental duration (`max.trt.yr`). Models also include pre-treatment values of the response variable, e.g., live biomass (`live.lg.0`), dead biomass (`dead.lg.0`), and diversity (`div.lg.0`), and they include the change in nutrient enrichment effects over time on live biomass (`year.slope.live`), dead biomass (`year.slope.dead`), and plant diversity (`year.slope.div`). Models are combined using model averaging (dredge and model.avg in the MuMIn library in R). Full averages show effects across all models within 4 AICc units of the best (i.e., lowest AICc) model, and the conditional averages are effects averaged only across models in which the variable is included.

## Drivers of Live Biomass Slopes

Formula: year.slope.live~ ai.lg + map + mat + mat_range + ann_temp_range + temp_wet_q + max.trt.yr + ph + base.cations.lg + pct_n.lg + c2n.lg + live.lg.0 + year.slope.div + year.slope.dead

**Full Averages**

| Source | Estimate | Std.Error | Z | p | Importance | Number of Models |
|---|---|---|---|---|---|---|
| (Intercept) | 0.113 | 0.008 | 13.64 | <0.001 | | |
| z.year.slope.dead | −0.034 | 0.021 | 1.54 | 0.124 | 0.86 | 58 |
| z.live.lg.0 | 0.010 | 0.018 | 0.56 | 0.576 | 0.34 | 26 |
| z.ann_temp_range | −0.010 | 0.017 | 0.56 | 0.572 | 0.34 | 21 |
| z.pct_n.lg | 0.006 | 0.015 | 0.40 | 0.690 | 0.23 | 14 |
| z.mat_range | −0.004 | 0.012 | 0.33 | 0.741 | 0.17 | 14 |
| z.base.cations.lg | −0.001 | 0.006 | 0.11 | 0.915 | 0.08 | 8 |
| z.max.trt.yr | −0.001 | 0.006 | 0.17 | 0.866 | 0.08 | 7 |
| z.mat | 0.000 | 0.006 | 0.06 | 0.950 | 0.07 | 7 |
| z.temp_wet_q | 0.001 | 0.006 | 0.10 | 0.923 | 0.07 | 6 |
| z.map | 0.001 | 0.005 | 0.12 | 0.903 | 0.07 | 6 |
| z.ai.lg | 0.000 | 0.005 | 0.07 | 0.942 | 0.06 | 5 |
| z.c2n.lg | 0.000 | 0.004 | 0.02 | 0.985 | 0.05 | 5 |
| z.ph | 0.000 | 0.004 | 0.01 | 0.989 | 0.05 | 5 |
| z.year.slope.div | 0.000 | 0.004 | 0.00 | 0.998 | 0.05 | 5 |

**Conditional Averages**

| Source | Estimate | Std.Error | Z | p | Importance | Number of Models |
|---|---|---|---|---|---|---|
| (Intercept) | 0.113 | 0.008 | 13.64 | <0.001 | | |
| z.year.slope.dead | −0.039 | 0.018 | 2.15 | 0.032 | 0.86 | 58 |
| z.live.lg.0 | 0.031 | 0.019 | 1.53 | 0.125 | 0.34 | 26 |
| z.ann_temp_range | −0.029 | 0.018 | 1.55 | 0.121 | 0.34 | 21 |
| z.pct_n.lg | 0.027 | 0.021 | 1.24 | 0.214 | 0.23 | 14 |
| z.mat_range | −0.024 | 0.019 | 1.16 | 0.245 | 0.17 | 14 |
| z.base.cations.lg | −0.008 | 0.018 | 0.40 | 0.689 | 0.08 | 8 |
| z.max.trt.yr | −0.012 | 0.016 | 0.70 | 0.484 | 0.08 | 7 |
| z.mat | 0.005 | 0.020 | 0.24 | 0.810 | 0.07 | 7 |
| z.temp_wet_q | 0.009 | 0.022 | 0.38 | 0.701 | 0.07 | 6 |
| z.map | 0.010 | 0.018 | 0.52 | 0.602 | 0.07 | 6 |
| z.ai.lg | 0.007 | 0.021 | 0.31 | 0.758 | 0.06 | 5 |
| z.c2n.lg | −0.002 | 0.017 | 0.09 | 0.932 | 0.05 | 5 |
| z.ph | 0.001 | 0.019 | 0.06 | 0.953 | 0.05 | 5 |
| z.year.slope.div | 0.000 | 0.017 | 0.01 | 0.991 | 0.05 | 5 |

## Drivers of Dead Biomass Slopes

Formula: year.slope.dead~ai.lg + map + mat + mat_range + ann_temp_range + temp_wet_q + max.trt.yr + ph + base.cations.lg + pct_n.lg + c2n.lg + dead.lg.0 + year.slope.live + year.slope.div

**Full Averages**

| Source | Estimate | Std.Error | Z | p | Importance | Number of Models |
|---|---|---|---|---|---|---|
| (Intercept) | 0.112 | 0.010 | 10.70 | <0.001 | | |
| z.dead.lg.0 | −0.102 | 0.032 | 3.15 | 0.002 | 1 | 54 |
| z.max.trt.yr | −0.038 | 0.030 | 1.22 | 0.223 | 0.75 | 39 |
| z.map | 0.039 | 0.040 | 0.95 | 0.341 | 0.61 | 31 |
| z.mat | −0.019 | 0.031 | 0.62 | 0.532 | 0.39 | 21 |
| z.ann_temp_range | 0.019 | 0.030 | 0.63 | 0.530 | 0.36 | 19 |
| z.mat_range | 0.023 | 0.036 | 0.63 | 0.528 | 0.37 | 18 |
| z.year.slope.live | −0.010 | 0.021 | 0.49 | 0.625 | 0.27 | 16 |
| z.ai.lg | 0.008 | 0.044 | 0.18 | 0.861 | 0.22 | 12 |
| z.ph | 0.005 | 0.016 | 0.31 | 0.757 | 0.14 | 8 |
| z.year.slope.div | −0.004 | 0.014 | 0.29 | 0.776 | 0.12 | 7 |
| z.pct_n.lg | 0.001 | 0.008 | 0.13 | 0.893 | 0.03 | 2 |
| z.temp_wet_q | 0.000 | 0.006 | 0.03 | 0.974 | 0.03 | 2 |
| z.base.cations.lg | 0.000 | 0.003 | 0.05 | 0.959 | 0.01 | 1 |
| z.c2n.lg | 0.000 | 0.002 | 0.00 | 0.999 | 0.01 | 1 |

**Conditional Averages**

| Source | Estimate | Std.Error | Z | p | Importance | Number of Models |
|---|---|---|---|---|---|---|
| (Intercept) | 0.112 | 0.010 | 10.70 | <0.001 | | |
| z.dead.lg.0 | −0.102 | 0.032 | 3.15 | 0.002 | 1 | 54 |
| z.max.trt.yr | −0.050 | 0.024 | 1.99 | 0.047 | 0.75 | 39 |
| z.map | 0.064 | 0.033 | 1.89 | 0.059 | 0.61 | 31 |
| z.mat | −0.050 | 0.030 | 1.60 | 0.109 | 0.39 | 21 |
| z.ann_temp_range | 0.052 | 0.026 | 1.89 | 0.059 | 0.36 | 19 |
| z.mat_range | 0.062 | 0.032 | 1.86 | 0.064 | 0.37 | 18 |
| z.year.slope.live | −0.038 | 0.024 | 1.55 | 0.121 | 0.27 | 16 |
| z.ai.lg | 0.035 | 0.088 | 0.39 | 0.693 | 0.22 | 12 |
| z.ph | 0.037 | 0.026 | 1.33 | 0.183 | 0.14 | 8 |
| z.year.slope.div | −0.034 | 0.025 | 1.32 | 0.187 | 0.12 | 7 |
| z.pct_n.lg | 0.035 | 0.030 | 1.12 | 0.264 | 0.03 | 2 |
| z.temp_wet_q | 0.006 | 0.033 | 0.18 | 0.856 | 0.03 | 2 |
| z.base.cations.lg | 0.012 | 0.023 | 0.48 | 0.629 | 0.01 | 1 |
| z.c2n.lg | 0.000 | 0.022 | 0.02 | 0.988 | 0.01 | 1 |

## Drivers of Diversity Slopes

Formula: year.slope.div~ai.lg + map + mat + mat_range + ann_temp_range + temp_wet_q + max.trt.yr + ph + base.cations.lg + pct_n.lg + c2n.lg + div.lg.0 + year.slope.live + year.slope.dead

**Full Averages**

| Source | Estimate | Std.Error | Z | p | Importance | Number of Models |
|---|---|---|---|---|---|---|
| (Intercept) | -0.178 | 0.020 | 8.60 | <0.001 | | |
| z.div.lg.0 | -0.133 | 0.042 | 3.05 | 0.002 | 1 | 65 |
| z.max.trt.yr | 0.044 | 0.048 | 0.90 | 0.367 | 0.6 | 37 |
| z.ai.lg | -0.053 | 0.089 | 0.59 | 0.556 | 0.36 | 26 |
| z.base.cations.lg | -0.032 | 0.058 | 0.54 | 0.592 | 0.32 | 21 |
| z.pct_n.lg | 0.039 | 0.076 | 0.51 | 0.611 | 0.28 | 18 |
| z.ph | -0.008 | 0.028 | 0.29 | 0.768 | 0.15 | 13 |
| z.map | 0.015 | 0.049 | 0.31 | 0.759 | 0.15 | 13 |
| z.year.slope.live | 0.008 | 0.024 | 0.32 | 0.751 | 0.17 | 12 |
| z.temp_wet_q | -0.003 | 0.018 | 0.19 | 0.848 | 0.09 | 8 |
| z.ann_temp_range | -0.002 | 0.017 | 0.14 | 0.890 | 0.08 | 6 |
| z.mat | -0.003 | 0.023 | 0.14 | 0.893 | 0.06 | 6 |
| z.c2n.lg | 0.004 | 0.017 | 0.21 | 0.838 | 0.08 | 5 |
| z.mat_range | 0.001 | 0.012 | 0.06 | 0.953 | 0.05 | 5 |
| z.year.slope.dead | -0.001 | 0.010 | 0.10 | 0.923 | 0.04 | 3 |

**Conditional Averages**

| Source | Estimate | Std.Error | Z | p | Importance | Number of Models |
|---|---|---|---|---|---|---|
| (Intercept) | -0.178 | 0.020 | 8.60 | <0.001 | | |
| z.div.lg.0 | -0.133 | 0.042 | 3.05 | 0.002 | 1 | 65 |
| z.max.trt.yr | 0.073 | 0.040 | 1.73 | 0.084 | 0.6 | 37 |
| z.ai.lg | -0.149 | 0.090 | 1.61 | 0.108 | 0.36 | 26 |
| z.base.cations.lg | -0.100 | 0.062 | 1.56 | 0.120 | 0.32 | 21 |
| z.pct_n.lg | 0.141 | 0.081 | 1.69 | 0.090 | 0.28 | 18 |
| z.ph | -0.055 | 0.050 | 1.05 | 0.292 | 0.15 | 13 |
| z.map | 0.101 | 0.085 | 1.16 | 0.246 | 0.15 | 13 |
| z.year.slope.live | 0.047 | 0.041 | 1.11 | 0.266 | 0.17 | 12 |
| z.temp_wet_q | -0.037 | 0.046 | 0.79 | 0.433 | 0.09 | 8 |
| z.ann_temp_range | -0.032 | 0.054 | 0.56 | 0.574 | 0.08 | 6 |
| z.mat | -0.051 | 0.079 | 0.63 | 0.530 | 0.06 | 6 |
| z.c2n.lg | 0.044 | 0.042 | 0.98 | 0.326 | 0.08 | 5 |
| z.mat_range | 0.015 | 0.051 | 0.28 | 0.783 | 0.05 | 5 |
| z.year.slope.dead | -0.025 | 0.045 | 0.54 | 0.593 | 0.04 | 3 |

**Table S6.** Effects of nutrient addition in soil fertility.

**Soil N (log10 %)**

| Source | Estimate | Std.Error | DF | t | p |
|---|---|---|---|---|---|
| Intercept | -0.654 | 0.064 | 33 | -10.288 | 0.000 |
| N | 0.055 | 0.014 | 862 | 3.990 | 0.000 |
| P | 0.001 | 0.014 | 861 | 0.059 | 0.953 |
| K | 0.019 | 0.014 | 861 | 1.366 | 0.172 |
| N*P | -0.041 | 0.020 | 861 | -2.067 | 0.039 |
| N*K | -0.013 | 0.020 | 861 | -0.637 | 0.524 |
| P*K | 0.011 | 0.020 | 861 | 0.543 | 0.587 |
| N*P*K | 0.039 | 0.028 | 862 | 1.391 | 0.165 |

**Soil P (log10 ppm)**

| Source | Estimate | Std.Error | DF | t | p |
|---|---|---|---|---|---|
| Intercept | 1.471 | 0.070 | 31 | 20.928 | <0.001 |
| N | 0.008 | 0.026 | 1009 | 0.292 | 0.771 |
| P | 0.603 | 0.026 | 1009 | 23.200 | <0.001 |
| K | -0.008 | 0.026 | 1009 | -0.297 | 0.767 |
| N*P | -0.038 | 0.037 | 1010 | -1.033 | 0.302 |
| N*K | -0.016 | 0.037 | 1009 | -0.438 | 0.661 |
| P*K | -0.001 | 0.037 | 1009 | -0.020 | 0.984 |
| N*P*K | 0.047 | 0.053 | 1009 | 0.887 | 0.376 |

**Soil K (log10 ppm)**

| Source | Estimate | Std.Error | DF | t | p |
|---|---|---|---|---|---|
| Intercept | 2.264 | 0.050 | 40 | 44.951 | <0.001 |
| N | -0.007 | 0.016 | 1010 | -0.459 | 0.646 |
| P | -0.017 | 0.016 | 1011 | -1.069 | 0.285 |
| K | 0.192 | 0.016 | 1010 | 12.036 | <0.001 |
| N*P | -0.015 | 0.023 | 1011 | -0.637 | 0.525 |
| N*K | -0.001 | 0.023 | 1010 | -0.023 | 0.982 |
| P*K | 0.013 | 0.023 | 1010 | 0.577 | 0.564 |
| N*P*K | -0.003 | 0.032 | 1010 | -0.088 | 0.930 |

**Soil C (log10 %)**

| Source | Estimate | Std.Error | DF | t | p |
|---|---|---|---|---|---|
| Intercept | 0.475 | 0.063 | 35 | 7.562 | <0.001 |
| N | 0.044 | 0.014 | 867 | 3.075 | 0.002 |
| P | 0.007 | 0.014 | 867 | 0.499 | 0.618 |
| K | 0.029 | 0.014 | 867 | 2.052 | 0.041 |
| N*P | -0.045 | 0.020 | 867 | -2.214 | 0.027 |
| N*K | -0.024 | 0.020 | 867 | -1.179 | 0.239 |
| P*K | -0.005 | 0.020 | 867 | -0.234 | 0.815 |
| N*P*K | 0.062 | 0.029 | 867 | 2.128 | 0.034 |

**Soil C:N (log10)**

| Source | Estimate | Std.Error | DF | t | p |
|---|---|---|---|---|---|
| Intercept | 1.126 | 0.021 | 19 | 53.945 | <0.001 |
| N | -0.011 | 0.006 | 866 | -1.882 | 0.060 |
| P | 0.006 | 0.006 | 866 | 1.034 | 0.301 |
| K | 0.010 | 0.006 | 866 | 1.710 | 0.088 |
| N*P | -0.004 | 0.009 | 866 | -0.482 | 0.630 |
| N*K | -0.011 | 0.009 | 866 | -1.315 | 0.189 |
| P*K | -0.016 | 0.009 | 866 | -1.783 | 0.075 |
| N*P*K | 0.023 | 0.012 | 866 | 1.817 | 0.070 |

**Soil Organic Matter (log10 %)**

| Source | Estimate | Std.Error | DF | t | p |
|---|---|---|---|---|---|
| Intercept | 0.763 | 0.064 | 37 | 11.885 | <0.001 |
| N | 0.059 | 0.014 | 1010 | 4.309 | <0.001 |
| P | 0.017 | 0.014 | 1010 | 1.238 | 0.216 |
| K | 0.027 | 0.014 | 1010 | 1.976 | 0.048 |
| N*P | -0.048 | 0.020 | 1010 | -2.469 | 0.014 |
| N*K | -0.024 | 0.019 | 1010 | -1.243 | 0.214 |
| P*K | -0.009 | 0.019 | 1010 | -0.450 | 0.653 |
| N*P*K | 0.030 | 0.028 | 1010 | 1.073 | 0.283 |

**Soil pH**

| Source | Estimate | Std.Error | DF | t | p |
|---|---|---|---|---|---|
| Intercept | 6.146 | 0.154 | 38 | 40.024 | <0.001 |
| N | -0.180 | 0.038 | 1011 | -4.729 | <0.001 |
| P | -0.033 | 0.038 | 1011 | -0.855 | 0.393 |
| K | -0.053 | 0.038 | 1011 | -1.405 | 0.160 |
| N*P | 0.045 | 0.054 | 1011 | 0.818 | 0.413 |
| N*K | 0.008 | 0.054 | 1011 | 0.141 | 0.888 |
| P*K | 0.041 | 0.054 | 1011 | 0.761 | 0.447 |
| N*P*K | -0.053 | 0.077 | 1011 | -0.692 | 0.489 |

**Soil Base Cations (log10 ppm)**

| Source | Estimate | Std.Error | DF | t | p |
|---|---|---|---|---|---|
| Intercept | 3.221 | 0.055 | 38 | 58.893 | <0.001 |
| N | -0.012 | 0.012 | 1010 | -0.984 | 0.325 |
| P | 0.043 | 0.012 | 1011 | 3.469 | 0.001 |
| K | 0.013 | 0.012 | 1010 | 1.087 | 0.277 |
| N*P | -0.016 | 0.018 | 1011 | -0.930 | 0.352 |
| N*K | 0.001 | 0.018 | 1010 | 0.085 | 0.933 |
| P*K | 0.001 | 0.018 | 1010 | 0.051 | 0.960 |
| N*P*K | 0.008 | 0.025 | 1010 | 0.311 | 0.756 |

**Cation Exchange Capacity (log10 meq 100 $g^{-1}$ soil)**

| Source | Estimate | Std.Error | DF | t | p |
|---|---|---|---|---|---|
| Intercept | 0.992 | 0.050 | 38 | 19.913 | <0.001 |
| N | 0.006 | 0.011 | 1010 | 0.542 | 0.588 |
| P | 0.040 | 0.011 | 1010 | 3.504 | <0.001 |
| K | 0.007 | 0.011 | 1010 | 0.589 | 0.556 |
| N*P | -0.013 | 0.016 | 1010 | -0.790 | 0.430 |
| N*K | -0.001 | 0.016 | 1010 | -0.089 | 0.929 |
| P*K | 0.002 | 0.016 | 1010 | 0.118 | 0.906 |
| N*P*K | 0.010 | 0.023 | 1010 | 0.438 | 0.661 |

**Table S7.** Sites used in analyses.

| Continent | Country | Site Name | Site Pis | Experiment Duration | Latitude | Longitude | Elevation (m) | Mean Annual Precipitation (mm) | Live Biomass (g/m2) | Dead Biomass (g/m2) | Diversity (*ENSPIE*) | Richness (sp m-2) | Domestic Grazing |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Africa | ZA | Ukulinga | Michelle Tedder; Kevin Kirkman | 9 | -29.67 | 30.40 | 842.50 | 832 | 508 | 358 | 5.4 | 16.7 | FALSE |
| Asia | IN | Kibber (Spiti) | Mahesh Sankaran | 6 | 32.32 | 78.01 | 4241.00 | 400 | 41 | 9 | 2.9 | 5.5 | TRUE |
| Australia | AU | Bogong | Joslin Moore; John Morgan | 10 | -36.87 | 147.25 | 1760.00 | 1678 | 553 | 109 | 3.2 | 19.3 | FALSE |
| Australia | AU | Burrawan | Jennifer Firn | 11 | -27.73 | 151.14 | 425.00 | 643 | 195 | 36 | 2.5 | 8.6 | TRUE |
| Australia | AU | Kinypanial | John Morgan | 11 | -36.20 | 143.75 | 90.00 | 408 | 312 | 468 | 2.3 | 8.2 | FALSE |
| Australia | AU | Mt. Caroline | Suzanne Prober | 10 | -31.78 | 117.61 | 285.00 | 324 | 199 | 28 | 4.3 | 14.0 | TRUE |
| Australia | AU | Pingelly Paddock | Jodi Price; Rachel Standish | 5 | -32.50 | 116.97 | 338.00 | 456 | 240 | 40 | 3.2 | 7.7 | FALSE |
| Australia | AU | Pinjarra Hills | John Dwyer | 5 | -27.53 | 152.92 | 38.00 | 1085 | 777 | 698 | 2.1 | 3.8 | TRUE |
| Australia | AU | Yarramundi | Raul Ochoa Hueso; Sally Power | 5 | -33.61 | 150.73 | 19.00 | 844 | 199 | 138 | 2.4 | 5.6 | FALSE |
| Europe | CH | Fruebuel | Sabine Güsewell; Yann Hautier; Andy Hector | 7 | 47.11 | 8.54 | 995.00 | 1546 | 853 | NA | 6.6 | 13.9 | FALSE |
| Europe | CH | Val Mustair | Martin Schuetz; Anita Risch | 10 | 46.63 | 10.37 | 2320.00 | 681 | 231 | 32 | 8.7 | 29.4 | FALSE |
| Europe | DE | Papenburg | Helmut Hillebrand | 6 | 53.09 | 7.47 | 0.50 | 788 | 930 | 318 | 2.0 | 4.5 | FALSE |
| Europe | FI | Kilpisj‰rvi | Anu Eskelinen; Risto Virtanen | 5 | 69.06 | 20.87 | 700.00 | 569 | 207 | 38 | 8.0 | 26.6 | FALSE |
| Europe | FR | CEREEP - Ecotron IDF | Beatriz Decencière; Amandine Hansart | 6 | 48.28 | 2.66 | 83.00 | 632 | 506 | NA | 4.1 | 13.4 | FALSE |
| Europe | PT | Companhia das Lezirias | Miguel Bugalho; Maria Caldeira | 7 | 38.83 | -8.79 | 200.00 | 564 | 272 | 21 | 6.7 | 19.9 | FALSE |
| Europe | UK | Heronsbrook (Silwood Park) | Mick Crawley | 5 | 51.41 | -0.64 | 60.00 | 668 | 509 | 155 | 4.3 | 15.5 | FALSE |

| Continent | Country | Site Name | Site Pis | Experiment Duration | Latitude | Longitude | Elevation (m) | Mean Annual Precipitation (mm) | Live Biomass (g/m2) | Dead Biomass (g/m2) | Diversity (*ENSPIE*) | Richness (sp m-2) | Domestic Grazing |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Europe | UK | Lancaster | Carly Stevens | 9 | 53.99 | -2.63 | 180.00 | 1522 | 105 | 5 | 3.2 | 10.6 | TRUE |
| Europe | UK | Rookery (Silwood Park) | Mick Crawley | 5 | 51.41 | -0.64 | 60.00 | 685 | 180 | 29 | 3.8 | 10.5 | FALSE |
| North America | CA | Cowichan | Andrew MacDougall | 11 | 48.81 | -123.63 | 50.00 | 762 | 516 | 428 | 1.5 | 4.3 | FALSE |
| North America | CA | Koffler Scientific Reserve at Joker's Hill | Marc Cadotte; Arthur Weiss | 8 | 44.02 | -79.54 | 301.00 | 853 | 544 | 200 | 3.8 | 10.0 | FALSE |
| North America | US | Boulder South Campus | Brett Melbourne; Kendi Davies | 8 | 39.97 | -105.23 | 1633.00 | 487 | 91 | 103 | 3.0 | 8.3 | FALSE |
| North America | US | Bunchgrass (Andrews LTER) | Elizabeth Borer; Eric Seabloom | 11 | 44.28 | -121.97 | 1318.08 | 1618 | 248 | 92 | 4.2 | 8.6 | FALSE |
| North America | US | Cedar Creek LTER | Johannes Knops | 11 | 45.43 | -93.21 | 270.00 | 740 | 175 | 211 | 3.9 | 9.5 | FALSE |
| North America | US | Cedar Point Biological Station | Kirsten Hofmockel; Lori Biederman; W. Harpole; Lauren Sullivan | 11 | 41.20 | -101.63 | 965.00 | 456 | 163 | 89 | 4.4 | 11.5 | |
| North America | US | Chichaqua Bottoms | Elizabeth Borer; Adam Kay; W. Harpole; Eric Seabloom | 9 | 41.79 | -93.39 | 275.00 | 871 | 449 | 513 | 3.1 | 9.1 | FALSE |
| North America | US | Doane College Spring Creek Prairie | Ramesh Laungani | 5 | 40.70 | -96.85 | 418.19 | 739 | 363 | 383 | 2.6 | 4.9 | FALSE |
| North America | US | Elliott Chaparral | Elsa Cleland | 11 | 32.88 | -117.05 | 200.00 | 344 | 302 | 147 | 3.3 | 8.6 | FALSE |
| North America | US | Hall's Prairie | Jim Nelson; Rebecca McCulley | 7 | 36.87 | -86.70 | 193.60 | 1289 | 528 | 279 | 2.6 | 5.2 | FALSE |
| North America | US | Hart Mountain | Nicole DeCrappeo; David Pyke | 5 | 42.72 | -119.50 | 1508.00 | 259 | 74 | 13 | 4.4 | 9.7 | FALSE |

| Continent | Country | Site Name | Site Pis | Experiment Duration | Latitude | Longitude | Elevation (m) | Mean Annual Precipitation (mm) | Live Biomass (g/m2) | Dead Biomass (g/m2) | Diversity (*ENSPIE*) | Richness (sp m-2) | Domestic Grazing |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| North America | US | Hopland REC | W. Harpole; Eric Seabloom; Elizabeth Borer | 11 | 39.01 | -123.06 | 598.30 | 1065 | 227 | 156 | 6.5 | 17.6 | FALSE |
| North America | US | Konza LTER | Kimberly La Pierre; Melinda Smith | 11 | 39.07 | -96.58 | 440.00 | 889 | 469 | 223 | 4.3 | 14.8 | FALSE |
| North America | US | Lookout (Andrews LTER) | Eric Seabloom; Elizabeth Borer | 11 | 44.21 | -122.13 | 1500.49 | 1877 | 242 | 97 | 3.6 | 6.8 | FALSE |
| North America | US | Mclaughlin UCNRS | W. Harpole; Eric Seabloom; Elizabeth Borer | 11 | 38.86 | -122.41 | 641.80 | 936 | 272 | 227 | 3.3 | 7.6 | FALSE |
| North America | US | Sagehen Creek UCNRS | Daniel Gruner; Louie Yang | 6 | 39.43 | -120.24 | 1920.00 | 831 | 127 | 59 | 5.3 | 12.9 | FALSE |
| North America | US | Saline Experimental Range | Kimberly La Pierre; Melinda Smith | 8 | 39.05 | -99.10 | 440.00 | 608 | 244 | 358 | 4.0 | 10.8 | FALSE |
| North America | US | Savannah River | Lars Brudvig; Ellen Damschen; John Orrock | 5 | 33.34 | -81.65 | 71.00 | 1184 | 92 | 274 | 4.0 | 9.4 | FALSE |
| North America | US | Sedgwick Reserve UCNRS | Eric Seabloom; W. Harpole; Elizabeth Borer; Carla D'Antonio | 10 | 34.70 | -120.02 | 550.00 | 478 | 356 | 414 | 1.9 | 5.7 | FALSE |
| North America | US | Sevilleta LTER | Scott Collins; Laura Ladwig | 7 | 34.36 | -106.69 | 1600.00 | 252 | 59 | NA | 3.2 | 7.7 | FALSE |
| North America | US | Sheep Experimental Station | Dana Blumenthal; Julia Klein; Cynthia Brown; Alan Knapp | 9 | 44.24 | -112.20 | 910.00 | 246 | 154 | NA | 4.9 | 16.5 | TRUE |
| North America | US | Shortgrass Steppe LTER | Peter Adler | 11 | 40.82 | -104.77 | 1650.00 | 369 | 150 | 30 | 2.9 | 8.1 | FALSE |

| Continent | Country | Site Name | Site Pis | Experiment Duration | Latitude | Longitude | Elevation (m) | Mean Annual Precipitation (mm) | Live Biomass (g/m2) | Dead Biomass (g/m2) | Diversity (*ENSPIE*) | Richness (sp m-2) | Domestic Grazing |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| North America | US | Sierra Foothills REC | W. Harpole; Eric Seabloom; Elizabeth Borer | 11 | 39.24 | -121.28 | 197.20 | 936 | 308 | 177 | 3.3 | 7.9 | FALSE |
| North America | US | Smith Prairie | Janneke Hille Ris Lambers; Jonathan Bakker | 8 | 48.21 | -122.62 | 62.00 | 605 | 378 | 137 | 5.8 | 20.7 | FALSE |
| North America | US | Spindletop | Jim Nelson; Rebecca McCulley | 11 | 38.14 | -84.50 | 271.30 | 1152 | 402 | 21 | 4.1 | 10.1 | FALSE |
| North America | US | Temple | Philip Fay | 9 | 31.04 | -97.35 | 184.00 | 877 | 509 | NA | 6.1 | 12.3 | FALSE |
| North America | US | Trelease | Andrew Leakey; Xiaohui Feng | 9 | 40.08 | -88.83 | 200.00 | 992 | 1003 | 387 | 2.9 | 4.6 | FALSE |
| South America | AR | Las Chilcas | Enrique Chaneton; Laura Yahdjian | 6 | -36.28 | -58.27 | 15.00 | 955 | 720 | 412 | 2.9 | 8.4 | FALSE |
| South America | AR | Mar Chiquita | Juan Alberti; Pedro Daleo | 7 | -37.72 | -57.42 | 6.00 | 907 | 686 | 582 | 2.7 | 10.9 | FALSE |

**Table S8.** Author Contributions

| Name | Developed and framed research question(s) | Analyzed data | Contributed to data analyses | Wrote the paper | Contributed to paper writing | Site coordinator | Nutrient Network coordinator | Site Acknowledgments |
|---|---|---|---|---|---|---|---|---|
| Eric W. Seabloom | X | X | | X | | X | X | |
| Peter B. Adler | | | | | X | X | | |
| Juan Alberti | | | | | X | X | | |
| Lori Biederman | | | | | X | X | | |
| Yvonne M Buckley | | | | | X | X | | |
| Marc W. Cadotte | | | | | X | X | | |
| Scott L Collins | | | | | X | X | | |
| Laura Dee | | | X | | X | | | |
| Philip A. Fay | | | | | X | X | | |
| Jennifer Firn | | | | | X | X | | |

| Name | Developed and framed research question(s) | Analyzed data | Contributed to data analyses | Wrote the paper | Contributed to paper writing | Site coordinator | Nutrient Network coordinator | Site Acknowledgments |
|---|---|---|---|---|---|---|---|---|
| Nicole Hagenah | | | | | X | X | | |
| W. Stanley Harpole | | | | | X | X | | |
| Yann Hautier | | | X | | X | X | | |
| Andy Hector | | | | | X | X | | |
| Sarah E. Hobbie | | | X | | X | | | |
| Forest Isbell | | | X | | X | | | |
| Johannes M H Knops | | | | | X | X | | |
| Kimberly J Komatsu | | | | | X | X | | |
| Ramesh Laungani | | | | | X | X | | |
| Andrew MacDougall | | | | | X | X | | |

| Name | Developed and framed research question(s) | Analyzed data | Contributed to data analyses | Wrote the paper | Contributed to paper writing | Site coordinator | Nutrient Network coordinator | Site Acknowledgments |
|---|---|---|---|---|---|---|---|---|
| Rebecca L McCulley | | | | | X | X | | |
| Joslin L Moore | | | | | X | X | | |
| John W. Morgan | | | | | X | X | | |
| Timothy Ohlert | | | | | X | X | | |
| Suzanne M Prober | | | | | X | X | | We thank Georg Wiehl for field and lab assistance and Denise and Malcolm French for use of their site at Mt Caroline. We acknowledge support through the Terrestrial Ecosystems Research Network (Great Western Woodlands Supersite). |
| Anita C. Risch | | | | | X | X | | |
| Martin Schuetz | | | | | X | X | | |
| Carly J. Stevens | | | | | X | | | |
| Elizabeth T. Borer | X | | X | | X | X | X | |

**Figure S1.** Effect of nutrient enrichment on live aboveground plant biomass in grassland ecosystems. Models were fit using $\log_{10}$ (Treatment/Control) versus $\log_{10}$ (Number of Years of Treatment), and back-transformed for plotting as the difference between Treatment and Control plots. Site descriptions are available in Table S7.

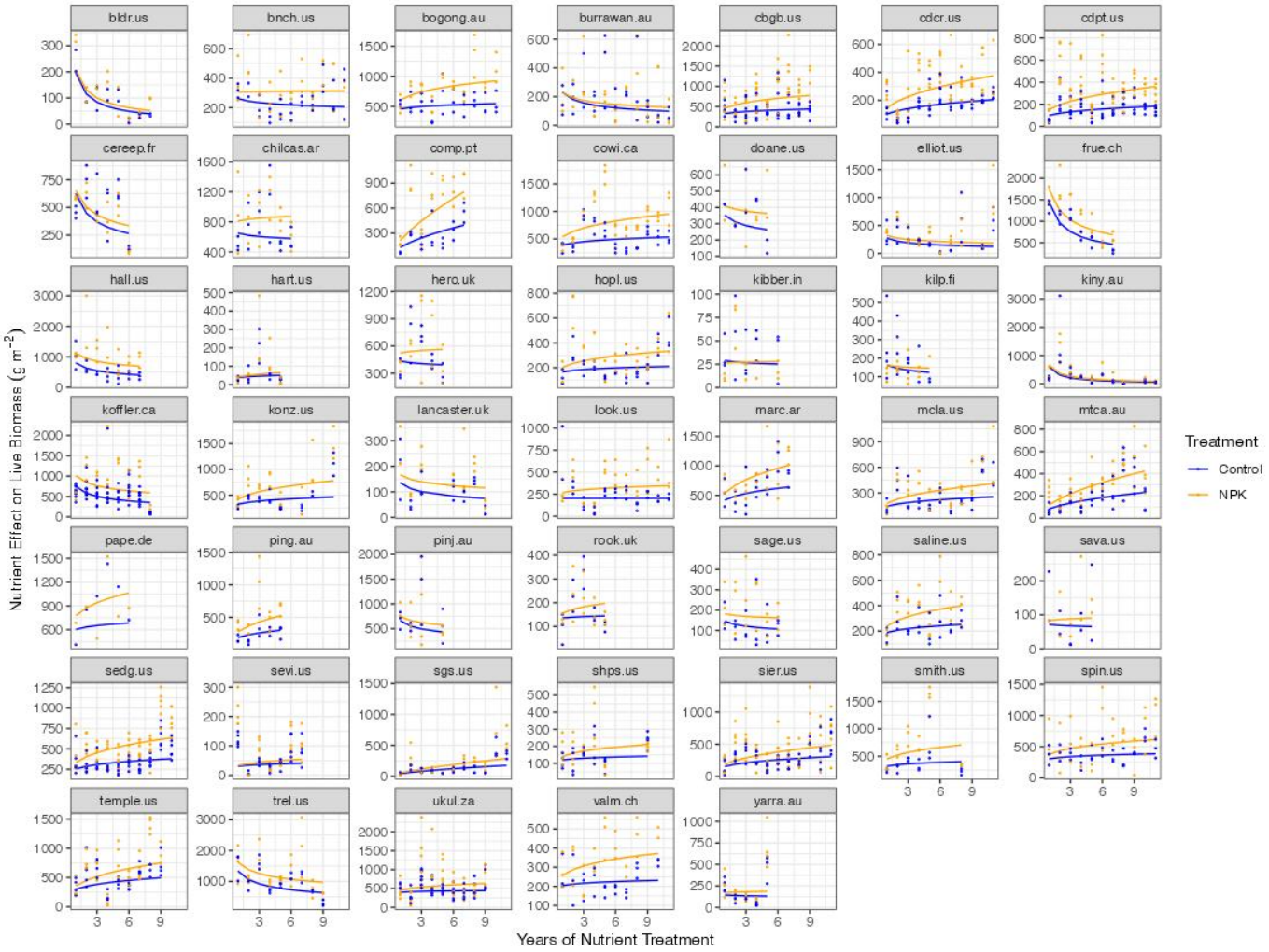

**Figure S2.** Effect of nutrient enrichment on dead aboveground plant biomass in grassland ecosystems. Models were fit using $\log_{10}$ (Treatment/Control) versus $\log_{10}$ (Number of Years of Treatment), and back-transformed for plotting as the difference between Treatment and Control plots. Site descriptions are available in Table S7.

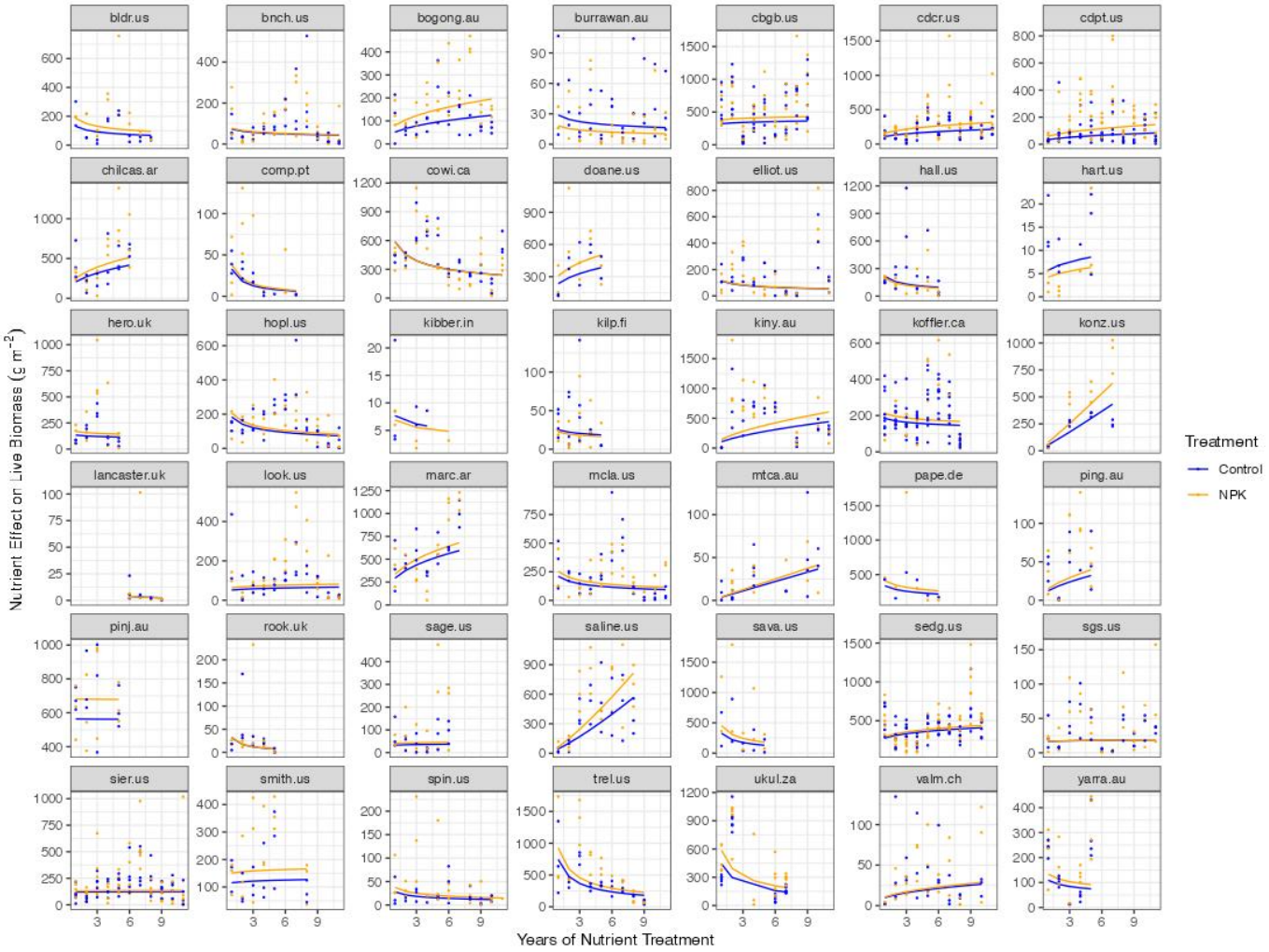

**Figure S3.** Effects of nutrient enrichment on diversity ($ENS_{PIE}$) in grassland ecosystems. Models were fit using $\log_{10}$(Treatment/Control) versus $\log_{10}$(Number of Years of Treatment), and back-transformed for plotting as the difference between Treatment and Control plots. Site descriptions are available in Table S7.

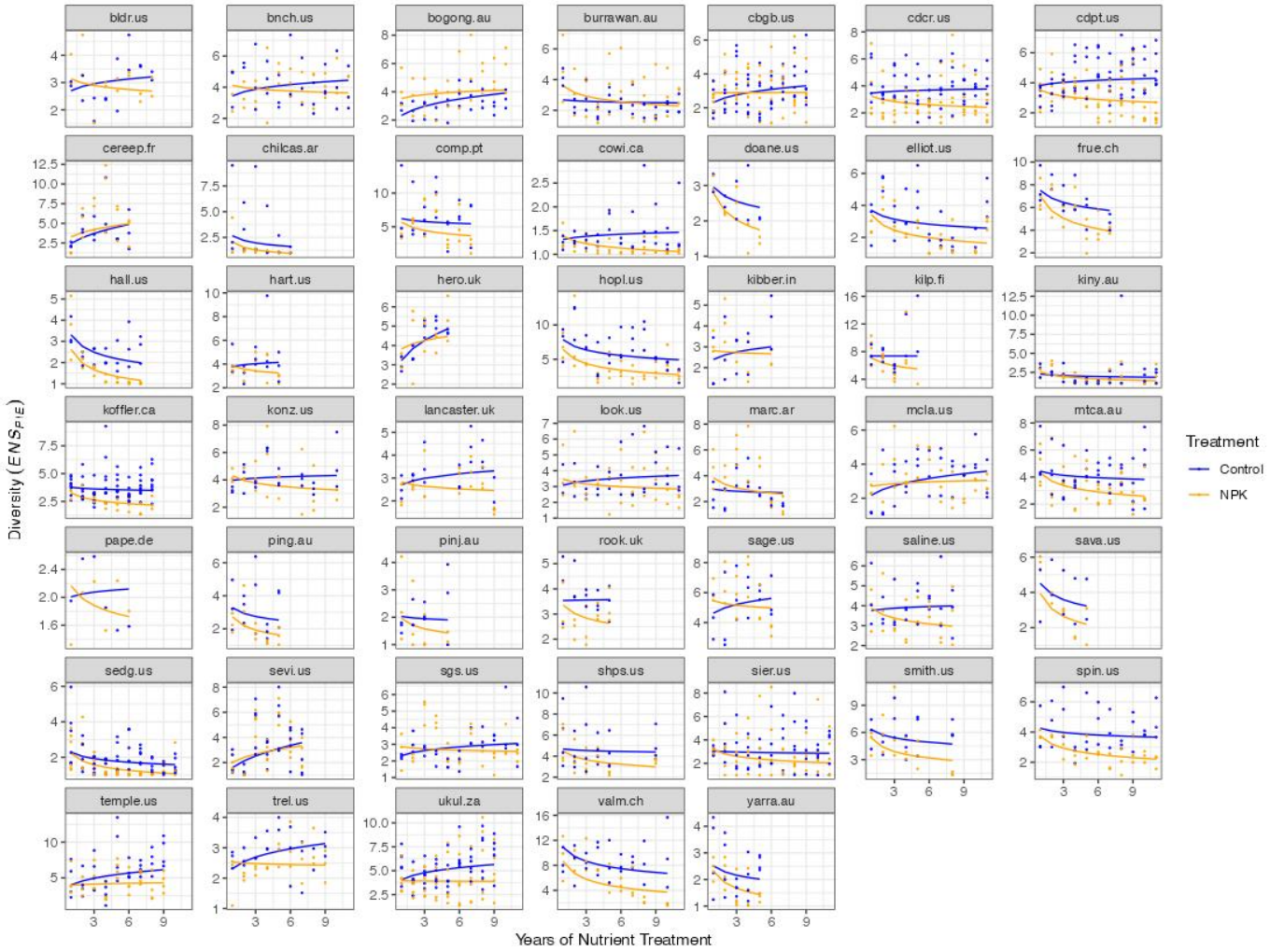

**Figure S4.** Effects of nutrient enrichment on richness (*S*, species $m^{-2}$) in grassland ecosystems. Models were fit using $\log_{10}$(Treatment/Control) versus $\log_{10}$(Number of Years of Treatment), and back-transformed for plotting as the difference between Treatment and Control plots. Site descriptions are available in Table S7.

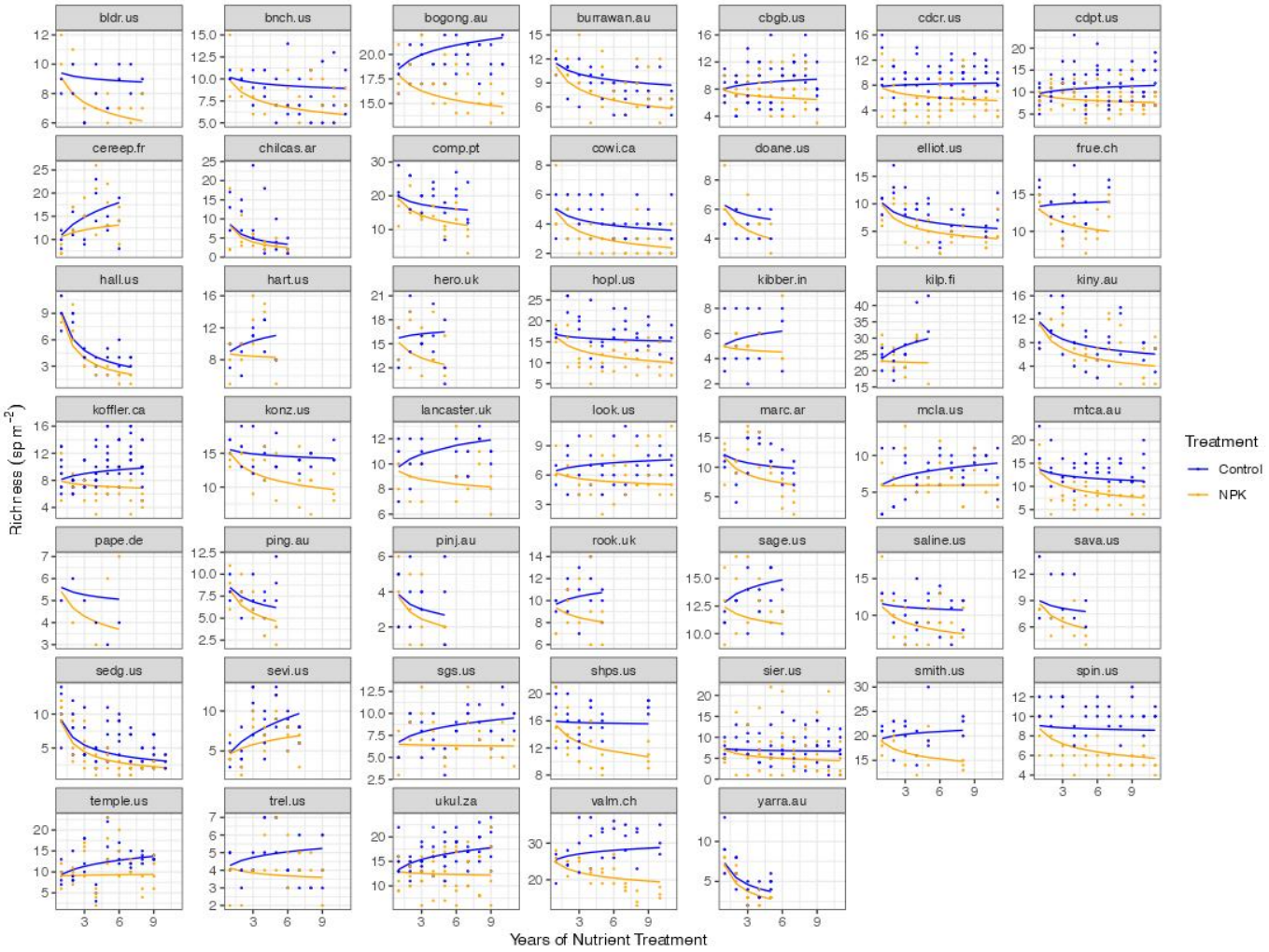

**Figure S5.** Effects of nutrient enrichment on evenness ($ENS_{PIE}S^{-1}$) in grassland ecosystems. Models were fit using $\log_{10}$(Treatment/Control) versus $\log_{10}$(Number of Years of Treatment), and back-transformed for plotting as the difference between Treatment and Control plots. Site descriptions are available in Table S7.

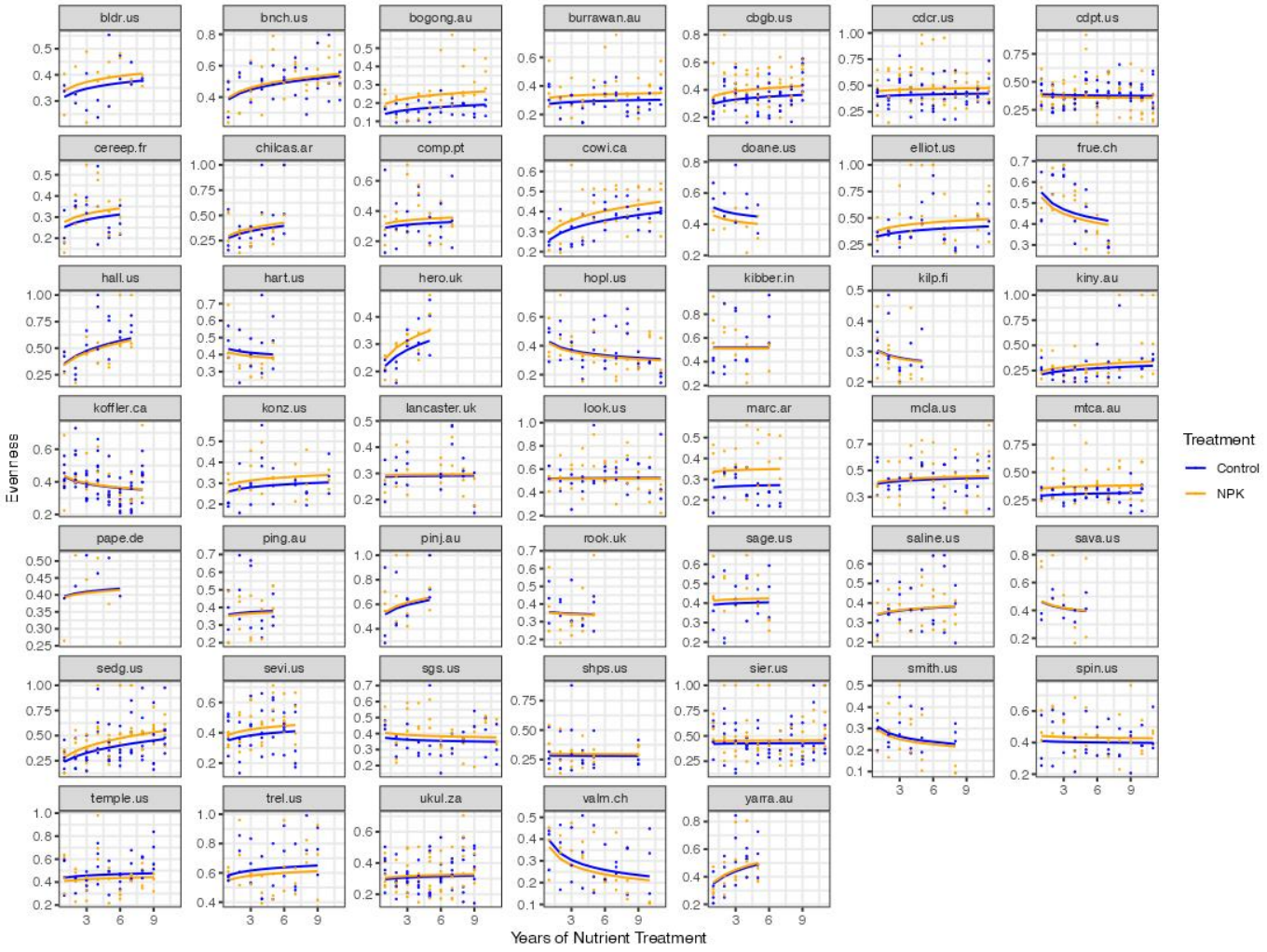

**Figure S6.** Effects of pre-treatment conditions on the slope of the nutrient effect on live biomass, dead biomass, and plant diversity.

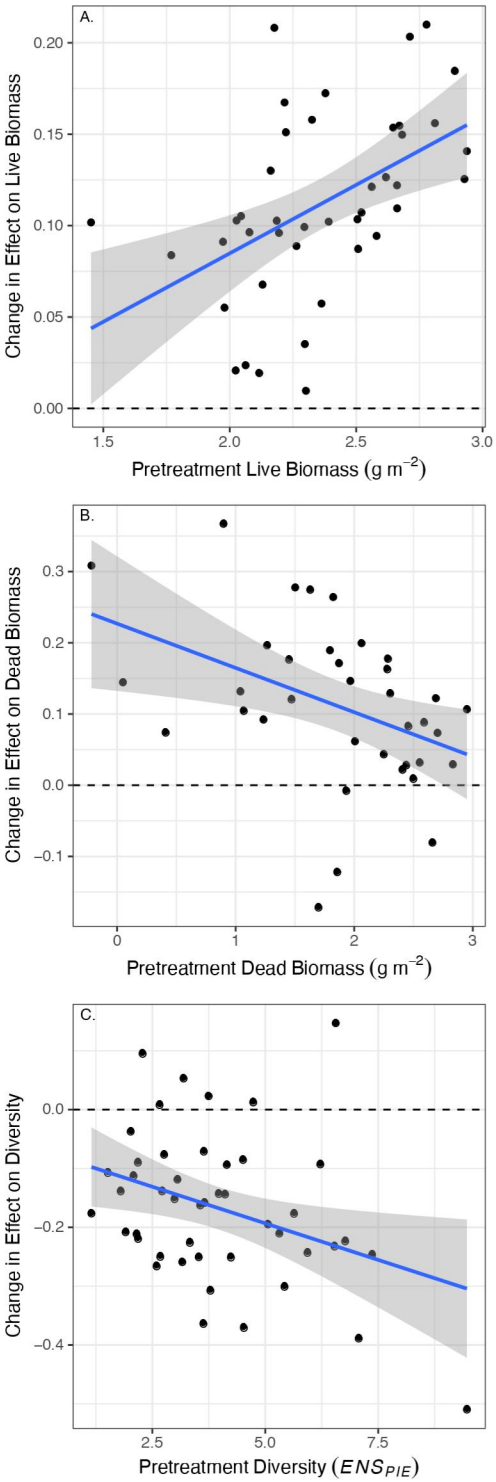

**Figure S7.** Effects of nutrient addition treatments on soil chemistry. Error bars indicate 1 standard error (SE) among site means for each treatment. Parameter estimates and standard errors for all treatment effects are shown in Table S6.