**Summary**

* Considerable overlap in % soil, root, and foliar N between woody and herbaceous vegetation types across NEON sites.
* Weakly negative effects of VPD on these pools across NEON sites (VPD explains little cross-site variance in N pools), though the relationships are significant
* Most analyses were disproportionately represented by Woody-dominated vegetation types. Herbaceous veg types, such as grasslands, made up a small amount of the data. Thus, these inferences are mostly driven by (spatial) relationships in woody systems.
* Total soil N bears little relationships to plant N pools across NEON sites
* Inorganic soil N shows clearer linkages to plant N pools than total soil N, specifically for root N. There are significant relationships between inorganic soil N with root N, and with litter N and soil inorganic N.
* The clearest signal was when N was constrained by C through considering C:N stoichiometry; there were significant relationships for soil C:N with both root and foliar C:N. Also a significant relationship between litter C:N and soil C:N.
* Indicates that plant available N and C:N stoichiometry hold promise for understanding relationships of N pools between plants and soils across NEON sites.

**Analyses summary – red highlight means significant relationships**

Total and inorganic soil N analyses

*Bivariate relationship between % foliar and % total soil N*

- 23 sites to compare. 6=herb, 17=woody

-Relationship not significant

*Bivariate relationship between % root and % total soil N*

-22 sites to compare. 6=herb, 16=woody

-Relationship not significant, but close (P=0.074). Positive effect of soil N on root N (slope=0.79)

*Bivariate relationship between % foliar and % inorganic N*

-21 sites to compare. 6=herb,15=woody.

-Relationship not significant

*Bivariate relationship between % root and % inorganic N*

-22 sites to compare. 6=herb,16=woody.

-Relationship is moderately significant:

|  |  |  |  |
| --- | --- | --- | --- |
|  | **rootNPercent** | | |
| *Predictors* | *Estimates* | *CI* | *p* |
| (Intercept) | 0.75 | 0.54 – 0.95 | **<0.001** |
| inorganicN | 0.36 | -0.00 – 0.71 | 0.050 |
| Observations | 22 | | |
| R2 / R2 adjusted | 0.178 / 0.137 | | |

*Bivariate relationship between % foliar and N mineralization*

-20 sites to compare, 6=herb,14=woody

-Relationship is moderately significant:

|  |  |  |  |
| --- | --- | --- | --- |
|  | **foliarNPercent\_mean** | | |
| *Predictors* | *Estimates* | *CI* | *p* |
| (Intercept) | 1.57 | 1.27 – 1.87 | **<0.001** |
| netNminugPerGramPerDay | 1.04 | -0.01 – 2.09 | 0.052 |
| Observations | 20 | | |
| R2 / R2 adjusted | 0.194 / 0.149 | | |

*Bivariate relationship between % root and N mineralization*

-19 sites to compare, 6=herb,13=woody

-Relationship is not significant

*Bivariate relationship between % root and % foliar N (root N predicting foliar N)*

-20 sites, 5=herb,15=woody

-relationships is significant:

|  |  |  |  |
| --- | --- | --- | --- |
|  | **foliarNPercent\_mean** | | |
| *Predictors* | *Estimates* | *CI* | *p* |
| (Intercept) | 0.44 | -0.59 – 1.46 | 0.385 |
| rootNPercent | 1.50 | 0.35 – 2.65 | **0.014** |
| Observations | 20 | | |
| R2 / R2 adjusted | 0.293 / 0.254 | | |

*Mixed effects models of foliar N and total soil N*

-55 herb observations for 6 herb sites

-152 woody observations for 17 woody sites

-total soil N shows up as significant

-conditional R-squared=0.51, marginal R-squared=0.068

*Mixed effects models of root N and total soil N*

-28 herb observations for 7 herb sites

-73 woody observations for 17 woody sites

-total soil N shows up as significant

-conditional R-squared=0.63, marginal R-squared=0.22

*Mixed effects models of foliar N and inorganic N*

-52 herb observations for 6 herb sites

-136 woody observations for 15 woody sites

-Only significant main effect is inorganic N

-Conditional R-squared=0.68, marginal=0.20

*Mixed effects models of root N and inorganic N*

-24 herb observations for 6 herb sites

-64 woody observations for 16 woody sites

-Only significant effect is inorganic N.

-conditional R-squared is 0.59, marginal is 0.22

**Plant feedbacks to soil N**

*Bivariate relationship between % litter and inorganic soil N*

-12 sites to compare, all woody.

-One outlier removed, and the relationships is significant:

|  |  |  |  |
| --- | --- | --- | --- |
|  | **inorganicN** | | |
| *Predictors* | *Estimates* | *CI* | *p* |
| (Intercept) | 0.03 | -0.18 – 0.25 | 0.739 |
| litterNPercent\_mean | 0.37 | 0.14 – 0.60 | **0.006** |
| Observations | 11 | | |
| R2 / R2 adjusted | 0.592 / 0.546 | | |

*Bivariate relationship between N resorption and inorganic soil N*

-9 sites to compare, all are woody

-not significant

*Bivariate relationship between % litter and total soil N*

-13 sites to compare, all are woody.

-not significant

*Bivariate relationship between N resorption and total soil N*

-9 sites to compare, all are woody

-not significant

**Mixed effects models for plant feedbacks to soil N. Site as random effect.**

*Total soil N as predicted by litter, vpd (not resorption)*

-9 sites with 4 replicates, all woody, so can’t compare land cover class

-No factors significant.

Conditional R-squared=0.86, Marginal R-squared=0.076

*Inorganic soil N as predicted by litter, vpd (not resorption)*

-9 sites with 4 replicates, all woody

-No factors significant

-Conditional R-squared = 0.92, marginal r-squared = 0.088

**C:N Analyses**

*Bivariate relationship between root C:N and soil C:N*

-17 sites to compare, 1=herb,16=woody

-Relationship is significant:

|  |  |  |  |
| --- | --- | --- | --- |
|  | **rootCNratio** | | |
| *Predictors* | *Estimates* | *CI* | *p* |
| (Intercept) | 32.00 | 12.88 – 51.12 | **0.003** |
| soilCNRatio\_MHoriz\_mean | 1.63 | 0.68 – 2.58 | **0.002** |
| Observations | 17 | | |
| R2 / R2 adjusted | 0.471 / 0.436 | | |

*Bivariate relationship between foliar C:N and soil C:N*

-17 sites to compare, 1=herb,16=woody

-Relationship is significant:

|  |  |  |  |
| --- | --- | --- | --- |
|  | **foliarCNRatio\_mean** | | |
| *Predictors* | *Estimates* | *CI* | *p* |
| (Intercept) | 3.97 | -6.34 – 14.27 | 0.425 |
| soilCNRatio\_MHoriz\_mean | 1.51 | 0.96 – 2.06 | **<0.001** |
| Observations | 17 | | |
| R2 / R2 adjusted | 0.695 / 0.675 | | |

*Bivariate relationship between foliar C:N and root C:N*

-20 sites to compare, 5=herb,15=woody

-Weakly significant (P=0.07), positive effect.

**Mixed effects models for C:N**

*Foliar C:N predicted by soil C:N, vpd, and veg*

-17 sites with at least 4 replicates

-10 herb replicates for 1 herb site

-145 woody replicates for 16 woody sites

-Soil CN is only significant effect. Conditional R-squared is 0.55, marginal=0.40

*Root C:N predicted by soil C:N, vpd, and veg*

-17 sites with at least 4 replicates

-4 herb replicates for 1 herb sites, 70 woody replicates for 16 woody sites

-Soil CN is only significant effect. Conditional R-squared is 0.66, marginal=0.32

**Plant feedbacks to soil C:N**

*Bivariate relationship between litter C:N and soil C:N*

-13 sites, all woody

-Relationship is significant:

|  |  |  |  |
| --- | --- | --- | --- |
|  | **soilCNRatio\_MHoriz\_mean** | | |
| *Predictors* | *Estimates* | *CI* | *p* |
| (Intercept) | 6.99 | -0.41 – 14.39 | 0.062 |
| litterCNRatio\_mean | 0.20 | 0.09 – 0.30 | **0.001** |
| Observations | 13 | | |
| R2 / R2 adjusted | 0.616 / 0.581 | | |

*Bivariate relationship between N resorption and soil C:N*

-9 sites, all woody

-Relationship is not significant

*Mixed effects models of plant C:N feedbacks to soil C:N*

-60 replicates, all 14 sites woody, so can’t use veg type as covariate

-nothing significant, r-squared conditional=0.75, r-squared marginal=0.055