

## Analysis Results - Random Forest

| importance_mean                                                                                                           |
|---------------------------------------------------------------------------------------------------------------------------|
| regression                                                                                                                |
| 0.345638690529327                                                                                                         |
| 0.12295229864276656                                                                                                       |
| 52.23280572270131                                                                                                         |
| 7.541087891533945                                                                                                         |
| bookkeeping fields; high importance for them usually reflects row ordering, not biology. Consider excluding them.'])      |
| OVER_SHANNON_AUG', 'LAT', 'LONG', 'PASTURE_TOTALAREA', 'SUBPASTURE_TOTALAREA', 'PASTURE_FORESTAREA', 'PASTUR              |
| 38333333333, 15.487625, 23.975075000000007, 19.327741666666668, 17.4549, 15.241141666666664, 18.077516666666668, 11.26980 |
| 0.10581545866623181                                                                                                       |
| 0.06782614231427267                                                                                                       |
| 0.06245887019405166                                                                                                       |
| 0.05818591560341483                                                                                                       |
| 0.05185781953996077                                                                                                       |
| 0.04935628545652692                                                                                                       |
| 0.04399616087108105                                                                                                       |
| 0.043994946025141236                                                                                                      |
| 0.04299319632237191                                                                                                       |
| 0.03736143427527017                                                                                                       |
| 0.03717139475449366                                                                                                       |
| 0.03541196479511028                                                                                                       |
| 0.02999009245312659                                                                                                       |
| 0.026359835504559476                                                                                                      |
| 0.02616140540771854                                                                                                       |
| 0.021487381920337032                                                                                                      |
| 0.02148142081672542                                                                                                       |
| 0.02146565780631389                                                                                                       |
| 0.02130092457255353                                                                                                       |
| 0.021130544887428836                                                                                                      |
| 0.019089065117876673                                                                                                      |
| 0.018976806903796325                                                                                                      |
| 0.017435435088194447                                                                                                      |

|                      |
|----------------------|
| 0.015585509959001454 |
| 0.0153775414225072   |
| 0.014189531720847469 |
| 0.014157707604403361 |
| 0.013846239138687433 |
| 0.012954413370658724 |
| 0.009778927626821275 |
| 0.007867002341129196 |
| 0.007536520912957616 |
| 0.007398446606428602 |

### Pre-Modeling Statistics

| Feature            | Pearson r | Pearson FDR | Spearman rho | Spearman FDR | ANOVA F  | ANOVA FDR | Sig? |
|--------------------|-----------|-------------|--------------|--------------|----------|-----------|------|
| PLOT               | -0.3602   | 0.0000      | -0.2762      | 0.0000       | 58.3020  | 0.0000    | Yes  |
| ENV_SOILNH4        | 0.0825    | 0.1209      | 0.1837       | 0.0003       | 2.6781   | 0.1209    | Yes  |
| ENV_SOILNO3        | 0.0367    | 0.5144      | 0.0909       | 0.0791       | 0.5285   | 0.5144    | No   |
| ENV_SOILP          | 0.2028    | 0.0001      | 0.1248       | 0.0157       | 16.7772  | 0.0001    | Yes  |
| ENV_SOILOC         | 0.4835    | 0.0000      | 0.4601       | 0.0000       | 119.2943 | 0.0000    | Yes  |
| ENV_SOILTN         | 0.4808    | 0.0000      | 0.4570       | 0.0000       | 117.5512 | 0.0000    | Yes  |
| ENV_SOILTC         | 0.4834    | 0.0000      | 0.4595       | 0.0000       | 119.2008 | 0.0000    | Yes  |
| ENV_PH             | -0.0157   | 0.7558      | -0.0387      | 0.4727       | 0.0968   | 0.7558    | No   |
| ENV_SOILCLAY       | 0.3548    | 0.0000      | 0.3541       | 0.0000       | 56.2918  | 0.0000    | Yes  |
| ENV_SOILSILT       | 0.4313    | 0.0000      | 0.4004       | 0.0000       | 89.3405  | 0.0000    | Yes  |
| ENV_SOILSAND       | -0.4132   | 0.0000      | -0.3831      | 0.0000       | 80.5038  | 0.0000    | Yes  |
| ENV_SOILMOIS       | 0.4618    | 0.0000      | 0.4453       | 0.0000       | 105.9672 | 0.0000    | Yes  |
| COVER_RICHNESS_JUN | -0.1236   | 0.0180      | -0.2224      | 0.0000       | 6.0689   | 0.0180    | Yes  |
| COVER_TOTAL_JUN    | 0.3246    | 0.0000      | 0.3628       | 0.0000       | 46.0578  | 0.0000    | Yes  |
| COVER_SHANNON_JUN  | -0.1289   | 0.0139      | -0.2211      | 0.0000       | 6.6112   | 0.0139    | Yes  |
| COVER_RICHNESS_JUL | -0.0952   | 0.0724      | -0.1762      | 0.0005       | 3.5783   | 0.0724    | Yes  |
| COVER_TOTAL_JUL    | 0.3040    | 0.0000      | 0.4258       | 0.0000       | 39.8262  | 0.0000    | Yes  |
| COVER_SHANNON_JUL  | -0.0290   | 0.6032      | -0.1081      | 0.0366       | 0.3289   | 0.6032    | Yes  |
| COVER_RICHNESS_AUG | -0.1788   | 0.0005      | -0.2615      | 0.0000       | 12.9125  | 0.0005    | Yes  |
| COVER_TOTAL_AUG    | 0.3803    | 0.0000      | 0.4278       | 0.0000       | 66.1066  | 0.0000    | Yes  |

|                      |         |        |         |        |          |        |     |
|----------------------|---------|--------|---------|--------|----------|--------|-----|
| COVER_SHANNON_AUG    | -0.1623 | 0.0017 | -0.2305 | 0.0000 | 10.5809  | 0.0017 | Yes |
| LAT                  | 0.3925  | 0.0000 | 0.2620  | 0.0000 | 71.1924  | 0.0000 | Yes |
| LONG                 | 0.3863  | 0.0000 | 0.2380  | 0.0000 | 68.5667  | 0.0000 | Yes |
| PASTURE_TOTALAREA    | -0.3975 | 0.0000 | -0.3756 | 0.0000 | 73.3916  | 0.0000 | Yes |
| SUBPASTURE_TOTALAREA | -0.3140 | 0.0000 | -0.3013 | 0.0000 | 42.7582  | 0.0000 | Yes |
| PASTURE_FORESTAREA   | 0.2970  | 0.0000 | 0.2509  | 0.0000 | 37.8304  | 0.0000 | Yes |
| PASTURE_WETLANDAREA  | -0.0718 | 0.1766 | 0.0063  | 0.9004 | 2.0286   | 0.1766 | No  |
| ENV_AIRTEMP          | 0.0248  | 0.6440 | -0.0134 | 0.8151 | 0.2400   | 0.6440 | No  |
| GH_COUNT             | -0.3009 | 0.0000 | -0.2971 | 0.0000 | 38.9156  | 0.0000 | Yes |
| PC_HEIGHT            | 0.4491  | 0.0000 | 0.4438  | 0.0000 | 98.8059  | 0.0000 | Yes |
| ENV_PROBEMOIS_AUG    | 0.5002  | 0.0000 | 0.4429  | 0.0000 | 130.4838 | 0.0000 | Yes |
| ENV_PROBEMOIS_JUL    | 0.3386  | 0.0000 | 0.2924  | 0.0000 | 50.6438  | 0.0000 | Yes |
| ENV_PROBEMOIS_JUN    | 0.2328  | 0.0000 | 0.2335  | 0.0000 | 22.4076  | 0.0000 | Yes |

### Permutation Importance

| Feature              | Mean   | SD     |
|----------------------|--------|--------|
| SUBPASTURE_TOTALAREA | 0.0838 | 0.0756 |
| COVER_TOTAL_JUL      | 0.0371 | 0.0111 |
| PC_HEIGHT            | 0.0330 | 0.0050 |
| PLOT                 | 0.0211 | 0.0139 |
| COVER_TOTAL_AUG      | 0.0172 | 0.0119 |
| ENV_PROBEMOIS_AUG    | 0.0169 | 0.0441 |
| ENV_SOILP            | 0.0165 | 0.0035 |
| LAT                  | 0.0143 | 0.0060 |
| ENV_SOILTC           | 0.0143 | 0.0472 |
| LONG                 | 0.0112 | 0.0091 |
| ENV_PROBEMOIS_JUN    | 0.0106 | 0.0036 |
| ENV_SOILOC           | 0.0091 | 0.0160 |
| ENV_SOILTN           | 0.0091 | 0.0128 |
| COVER_RICHNESS_AUG   | 0.0083 | 0.0063 |
| PASTURE_WETLANDAREA  | 0.0079 | 0.0022 |
| PASTURE_FORESTAREA   | 0.0068 | 0.0217 |
| COVER_RICHNESS_JUN   | 0.0060 | 0.0045 |

|                    |         |        |
|--------------------|---------|--------|
| PASTURE_TOTALAREA  | 0.0048  | 0.0043 |
| COVER_SHANNON_JUN  | 0.0046  | 0.0029 |
| COVER_RICHNESS_JUL | 0.0044  | 0.0013 |
| ENV_PROBEMOIS_JUL  | 0.0036  | 0.0040 |
| ENV_SOILNO3        | 0.0034  | 0.0033 |
| ENV_SOILCLAY       | 0.0033  | 0.0046 |
| COVER_TOTAL_JUN    | 0.0030  | 0.0204 |
| ENV_SOILNH4        | 0.0018  | 0.0013 |
| ENV_PH             | 0.0012  | 0.0029 |
| ENV_AIRTEMP        | 0.0008  | 0.0029 |
| ENV_SOILSAND       | 0.0006  | 0.0048 |
| GH_COUNT           | -0.0007 | 0.0018 |
| COVER_SHANNON_AUG  | -0.0012 | 0.0049 |
| COVER_SHANNON_JUL  | -0.0016 | 0.0027 |
| ENV_SOILSILT       | -0.0058 | 0.0073 |
| ENV_SOILMOIS       | -0.0089 | 0.0305 |

## SHAP Values

| Feature              | Mean  Abs |
|----------------------|-----------|
| ENV_PROBEMOIS_AUG    | 1.6375    |
| COVER_TOTAL_JUL      | 1.2206    |
| ENV_SOILTN           | 0.7822    |
| ENV_SOILTC           | 0.7653    |
| COVER_TOTAL_AUG      | 0.6028    |
| PASTURE_TOTALAREA    | 0.5172    |
| PASTURE_FORESTAREA   | 0.4910    |
| ENV_SOILMOIS         | 0.4853    |
| PC_HEIGHT            | 0.4597    |
| SUBPASTURE_TOTALAREA | 0.4173    |
| COVER_RICHNESS_AUG   | 0.4052    |
| COVER_TOTAL_JUN      | 0.3391    |
| ENV_SOILOC           | 0.2923    |
| LONG                 | 0.2694    |

|                     |        |
|---------------------|--------|
| COVER_SHANNON_AUG   | 0.2516 |
| PLOT                | 0.2476 |
| COVER_SHANNON_JUN   | 0.2435 |
| COVER_SHANNON_JUL   | 0.2195 |
| ENV_SOILP           | 0.2172 |
| ENV_SOILSILT        | 0.1889 |
| ENV_PH              | 0.1561 |
| COVER_RICHNESS_JUL  | 0.1491 |
| LAT                 | 0.1297 |
| ENV_PROBEMOIS_JUL   | 0.1252 |
| COVER_RICHNESS_JUN  | 0.1155 |
| ENV_PROBEMOIS_JUN   | 0.1060 |
| ENV_SOILNH4         | 0.1033 |
| PASTURE_WETLANDAREA | 0.1005 |
| ENV_SOILNO3         | 0.0946 |
| ENV_SOILSAND        | 0.0713 |
| GH_COUNT            | 0.0658 |
| ENV_SOILCLAY        | 0.0653 |
| ENV_AIRTEMP         | 0.0600 |

## Per-Split Model Metrics

| Split            | R <sup>2</sup>         | MSE                     |
|------------------|------------------------|-------------------------|
|                  | 0.4729                 | 62.4129                 |
|                  | 0.3846                 | 44.3901                 |
|                  | 0.1794                 | 49.8954                 |
| <b>Mean ± SD</b> | <b>0.3456 ± 0.1230</b> | <b>52.2328 ± 7.5411</b> |