

# RestoreNet GLMMs, Tables S3 through S10

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## Description of variables

Response variables: - **Count**: Number of individuals per 0.0625 m<sup>2</sup>, the size of the subplots. - **Cover**: Percent cover.

**Table S3. Density of Sonoran Desert desirable species**

```
## Family: nbinom2 ( log )
## Formula:
## Count ~ Perc_dev_cum_abs + AridityIndex + Treatment + PlantSource2 +
##      PlotMix_Climate + Duration + Lifeform + MAT + Since_last_precip +
##      Days_elapsed + (1 | Site/Plot)
## Data: sonoran.des
##
##      AIC      BIC   logLik deviance df.resid
## 14425.1 14544.5 -7192.6 14385.1    2869
##
## Random effects:
##
## Conditional model:
##      Groups      Name      Variance Std.Dev.
## Plot:Site (Intercept) 0.03578  0.1892
## Site      (Intercept) 0.01636  0.1279
## Number of obs: 2889, groups: Plot:Site, 216; Site, 6
##
## Dispersion parameter for nbinom2 family (): 1.05
##
## Conditional model:
##
##      Estimate Std. Error z value Pr(>|z|)
## (Intercept)      -6.492e+00  1.965e+00  -3.304 0.000953 ***
## Perc_dev_cum_abs    3.253e-01  2.180e-01   1.492 0.135658
## AridityIndex        1.471e+01  3.433e+00   4.284 1.83e-05 ***
## TreatmentConMod     9.704e-02  8.108e-02   1.197 0.231364
## TreatmentControl   -1.706e-01  1.097e-01  -1.555 0.119887
## TreatmentMulch     -2.862e-02  8.233e-02  -0.348 0.728127
## TreatmentPits       2.570e-01  7.899e-02   3.253 0.001140 **
## PlantSource20      -1.352e+01  3.100e+01  -0.436 0.662704
## PlantSource2Seeded -1.555e-01  7.521e-02  -2.067 0.038732 *
## PlotMix_ClimateNone      NA      NA      NA      NA
## PlotMix_ClimateProjected 1.650e-02  5.624e-02   0.293 0.769183
## Duration0            NA      NA      NA      NA
## DurationPerennial    -4.051e-01  7.437e-02  -5.447 5.12e-08 ***
## DurationUnknown      4.362e-01  5.783e-02   7.543 4.59e-14 ***
```

```
## Lifeform0                NA          NA          NA          NA
## LifeformGrass            -3.386e-02  6.424e-02  -0.527  0.598108
## LifeformShrub            -6.544e-01  6.171e-01  -1.060  0.288989
## MAT                      2.595e-01  7.095e-02   3.657  0.000255 ***
## Since_last_precip        1.714e-04  2.067e-04   0.829  0.406823
## Days_elapsed             1.175e-04  8.826e-05   1.331  0.183265
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

## # R2 for Mixed Models
##
##   Conditional R2: 0.950
##   Marginal R2: 0.947
```

**Table S4. Density of Sonoran Desert weedy species**

```
## Family: nbinom2 ( log )
## Formula:
## Count ~ Perc_dev_cum_abs + AridityIndex + Treatment + PlantSource2 +
##   PlotMix_Climate + Duration + Lifeform + MAT + Since_last_precip +
##   Days_elapsed + (1 | Site/Plot)
## Data: sonoran.weed
##
##      AIC      BIC   logLik deviance df.resid
##  7607.8   7714.5  -3783.9   7567.8     1512
##
## Random effects:
##
## Conditional model:
##   Groups      Name      Variance Std.Dev.
## Plot:Site (Intercept) 0.03767  0.1941
## Site      (Intercept) 0.17329  0.4163
## Number of obs: 1532, groups: Plot:Site, 216; Site, 6
##
## Dispersion parameter for nbinom2 family (): 1.14
##
## Conditional model:
##
##              Estimate Std. Error z value Pr(>|z|)
## (Intercept)    -2.760e+00  5.483e+00  -0.503  0.614673
## Perc_dev_cum_abs  2.241e+00  2.490e-01   9.001  < 2e-16 ***
## AridityIndex     1.079e+01  9.295e+00   1.161  0.245500
## TreatmentConMod  -1.916e-02  9.525e-02  -0.201  0.840581
## TreatmentControl  3.880e-02  1.247e-01   0.311  0.755694
## TreatmentMulch   -5.992e-02  9.863e-02  -0.608  0.543468
## TreatmentPits     2.242e-01  9.736e-02   2.303  0.021265 *
## PlantSource20    -1.869e+01  4.077e+02  -0.046  0.963431
## PlantSource2Introduced/Invasive 5.297e-01  2.236e-01   2.369  0.017820 *
## PlotMix_ClimateNone      NA          NA      NA      NA
## PlotMix_ClimateProjected  5.486e-03  6.876e-02   0.080  0.936415
## Duration0              NA          NA      NA      NA
## DurationPerennial    -4.904e-01  2.125e-01  -2.308  0.021006 *
## DurationUnknown      3.529e-01  1.898e-01   1.859  0.062980 .
## Lifeform0              NA          NA      NA      NA
## LifeformGrass         2.766e-01  7.701e-02   3.591  0.000329 ***
## LifeformUnknown     -9.756e-01  8.769e-01  -1.113  0.265880
```

```
## MAT          9.265e-02  2.022e-01  0.458 0.646857
## Since_last_precip -1.627e-03  2.918e-04 -5.575 2.47e-08 ***
## Days_elapsed    -7.492e-06  1.290e-04 -0.058 0.953684
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

## # R2 for Mixed Models
##
##   Conditional R2: 0.986
##   Marginal R2: 0.982
```

**Table S5. Density of Sonoran Desert seeded species**

```
## Family: nbinom2 ( log )
## Formula:
## Count ~ Perc_dev_cum_abs + Treatment + PlotMix_Climate + Duration +
##   Lifeform + MAT + Since_last_precip + Days_elapsed + (1 | Site/Plot)
## Data: sonoran.seed
##
##      AIC      BIC   logLik deviance df.resid
##  1680.6   1744.9   -824.3   1648.6      394
##
## Random effects:
##
## Conditional model:
## Groups      Name      Variance Std.Dev.
## Plot:Site (Intercept) 0.074042 0.2721
## Site      (Intercept) 0.009235 0.0961
## Number of obs: 410, groups: Plot:Site, 132; Site, 6
##
## Dispersion parameter for nbinom2 family (): 4.41
##
## Conditional model:
##              Estimate Std. Error z value Pr(>|z|)
## (Intercept)    0.3947546  0.7892047   0.500 0.616939
## Perc_dev_cum_abs -0.3877575  0.2707698  -1.432 0.152128
## TreatmentConMod -0.0946512  0.1410636  -0.671 0.502232
## TreatmentMulch  -0.1180542  0.1379143  -0.856 0.392000
## TreatmentPits    0.1193101  0.1308002   0.912 0.361687
## PlotMix_ClimateProjected 0.3892982  0.1016482   3.830 0.000128 ***
## DurationPerennial -0.7407386  0.1424693  -5.199 2.00e-07 ***
## DurationUnknown  -0.3312622  0.1886781  -1.756 0.079140 .
## LifeformGrass     0.3027246  0.1450088   2.088 0.036831 *
## LifeformShrub    -0.0651090  0.8374143  -0.078 0.938027
## MAT               0.0424975  0.0374815   1.134 0.256867
## Since_last_precip  0.0013493  0.0005395   2.501 0.012380 *
## Days_elapsed     -0.0011372  0.0001729  -6.579 4.75e-11 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

## Warning: Can't calculate model's distribution-specific variance. Results are not
##   reliable.
##   A reason can be that the null model could not be computed manually. Try
##   to fit the null model manually and pass it to `null_model`.

## # R2 for Mixed Models
```

```

##
## Conditional R2: 1.000
## Marginal R2: 0.754

```

Table S6. Cover of Sonoran Desert seeded species

```

## Family: genpois ( log )
## Formula: Seeded_Cover ~ Perc_dev_cum_abs + AridityIndex + Treatment +
## PlotMix_Climate + MAT + Since_last_precip + Days_elapsed +
## (1 | Site/Plot)
## Data: sonoran.seed
##
## AIC BIC logLik deviance df.resid
## 3035.5 3099.6 -1504.8 3009.5 1011
##
## Random effects:
##
## Conditional model:
## Groups Name Variance Std.Dev.
## Plot:Site (Intercept) 0.4907 0.7005
## Site (Intercept) 0.5434 0.7371
## Number of obs: 1024, groups: Plot:Site, 192; Site, 6
##
## Dispersion parameter for genpois family (): 26.1
##
## Conditional model:
## Estimate Std. Error z value Pr(>|z|)
## (Intercept) -2.7070317 9.6961180 -0.279 0.780101
## Perc_dev_cum_abs -1.5738712 0.4097882 -3.841 0.000123 ***
## AridityIndex 1.5230424 16.6240495 0.092 0.927002
## TreatmentConMod 0.3006108 0.2251973 1.335 0.181916
## TreatmentMulch 0.3247954 0.2261894 1.436 0.151018
## TreatmentPits 0.6402406 0.2190769 2.922 0.003473 **
## PlotMix_ClimateProjected 0.5489705 0.1571736 3.493 0.000478 ***
## MAT 0.0912093 0.3556596 0.256 0.797603
## Since_last_precip 0.0052250 0.0005002 10.445 < 2e-16 ***
## Days_elapsed -0.0002576 0.0002132 -1.208 0.226964
## ---
## Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
## # R2 for Mixed Models
##
## Conditional R2: 0.834
## Marginal R2: 0.285

```

Table S7. Density of Northern Arizona desirable species

```

## Family: nbinom2 ( log )
## Formula:
## Count ~ Perc_dev_cum_abs + AridityIndex + Treatment + PlantSource2 +
## PlotMix_Climate + Duration + Lifeform + MAT + MAP + Sand_content +
## Since_last_precip + Days_elapsed + (1 | Site/Plot)
## Data: naz.des
##
## AIC BIC logLik deviance df.resid
## 18977.0 19123.1 -9466.5 18933.0 5643

```

```

##
## Random effects:
##
## Conditional model:
## Groups      Name      Variance Std.Dev.
## Plot:Site (Intercept) 0.15790  0.3974
## Site      (Intercept) 0.01289  0.1135
## Number of obs: 5665, groups: Plot:Site, 288; Site, 8
##
## Dispersion parameter for nbinom2 family (): 2.46
##
## Conditional model:
##              Estimate Std. Error z value Pr(>|z|)
## (Intercept)      3.466e-01  4.297e-01   0.806 0.419970
## Perc_dev_cum_abs    2.995e-01  5.163e-02   5.801 6.60e-09 ***
## AridityIndex      -1.135e-01  2.467e+00  -0.046 0.963286
## TreatmentConMod    -1.073e-02  9.234e-02  -0.116 0.907506
## TreatmentControl   -1.791e-01  1.266e-01  -1.415 0.156959
## TreatmentMulch     -6.683e-02  9.019e-02  -0.741 0.458698
## TreatmentPits       1.065e-02  9.223e-02   0.115 0.908060
## PlantSource20      -2.189e+01  7.709e+02  -0.028 0.977348
## PlantSource2Seeded -3.482e-01  4.121e-02  -8.449 < 2e-16 ***
## PlotMix_ClimateNone      NA          NA      NA      NA
## PlotMix_ClimateProjected -1.193e-01  6.396e-02  -1.865 0.062157 .
## Duration0              NA          NA      NA      NA
## DurationPerennial     -5.910e-01  5.466e-02 -10.813 < 2e-16 ***
## DurationUnknown      -2.731e-01  4.573e-02  -5.973 2.33e-09 ***
## Lifeform0              NA          NA      NA      NA
## LifeformGrass         2.495e-01  3.673e-02   6.795 1.09e-11 ***
## LifeformShrub        -1.436e-01  7.912e-02  -1.815 0.069498 .
## MAT                   6.584e-02  2.155e-02   3.055 0.002248 **
## MAP                   -2.582e-04  1.337e-03  -0.193 0.846904
## Sand_contentlow       4.456e-01  1.629e-01   2.736 0.006226 **
## Since_last_precip     9.084e-04  2.340e-04   3.882 0.000104 ***
## Days_elapsed         6.602e-05  1.412e-04   0.468 0.640086
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

## # R2 for Mixed Models
##
## Conditional R2: 0.993
## Marginal R2: 0.991

```

**Table S8. Density of Northern Arizona weedy species**

```

## Family: nbinom2 ( log )
## Formula:
## Count ~ Perc_dev_cum_abs + AridityIndex + Treatment + PlantSource2 +
## PlotMix_Climate + Lifeform + MAT + MAP + Sand_content + Since_last_precip +
## Days_elapsed + (1 | Site/Plot)
## Data: naz.weed
##
## AIC      BIC    logLik deviance df.resid
## 19300.7 19436.4 -9629.4 19258.7     4697
##

```

```

## Random effects:
##
## Conditional model:
##   Groups      Name      Variance Std.Dev.
## Plot:Site (Intercept) 0.2753   0.5247
## Site      (Intercept) 0.1235   0.3515
## Number of obs: 4718, groups: Plot:Site, 287; Site, 8
##
## Dispersion parameter for nbinom2 family (): 1.23
##
## Conditional model:
##
##               Estimate Std. Error z value Pr(>|z|)
## (Intercept)    -2.440e+00  1.077e+00  -2.266 0.023451 *
## Perc_dev_cum_abs  2.343e-01  7.461e-02   3.140 0.001688 **
## AridityIndex     1.577e+01  6.663e+00   2.367 0.017919 *
## TreatmentConMod   2.454e-01  1.204e-01   2.039 0.041496 *
## TreatmentControl  -5.720e-02  1.648e-01  -0.347 0.728523
## TreatmentMulch    2.654e-01  1.205e-01   2.202 0.027676 *
## TreatmentPits     4.236e-01  1.233e-01   3.435 0.000592 ***
## PlantSource20     -1.645e+01  3.887e+01  -0.423 0.672145
## PlantSource2Introduced/Invasive -6.011e-01  5.657e-02 -10.626 < 2e-16 ***
## PlotMix_ClimateNone      NA         NA      NA      NA
## PlotMix_ClimateProjected  2.430e-01  8.458e-02   2.873 0.004060 **
## Lifeform0              NA         NA      NA      NA
## LifeformGrass          -6.485e-01  5.189e-02 -12.497 < 2e-16 ***
## LifeformShrub          -1.037e+00  1.367e+00  -0.758 0.448182
## LifeformUnknown        -8.022e-01  4.700e-01  -1.707 0.087861 .
## MAT                    1.475e-01  6.042e-02   2.442 0.014613 *
## MAP                    -2.534e-03  3.597e-03  -0.705 0.481082
## Sand_contentlow        -5.228e-01  4.235e-01  -1.234 0.217046
## Since_last_precip      1.482e-03  3.377e-04   4.389 1.14e-05 ***
## Days_elapsed          7.168e-04  1.852e-04   3.871 0.000108 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

## # R2 for Mixed Models
##
##   Conditional R2: 0.987
##   Marginal R2: 0.979

```

**Table S9. Density of Northern Arizona seeded species**

```

## Family: nbinom2 ( log )
## Formula:
## Count ~ Perc_dev_cum_abs + AridityIndex + Treatment + PlotMix_Climate +
##         Duration + Lifeform + MAT + MAP + Sand_content + Since_last_precip +
##         Days_elapsed + (1 | Site/Plot)
## Data: naz.seed
##
##      AIC      BIC  logLik deviance df.resid
##  5579.6   5681.3 -2770.8   5541.6     1538
##
## Random effects:
##
## Conditional model:

```

```

## Groups      Name      Variance Std.Dev.
## Plot:Site (Intercept) 0.2030  0.4505
## Site      (Intercept) 0.0162  0.1273
## Number of obs: 1557, groups: Plot:Site, 164; Site, 8
##
## Dispersion parameter for nbinom2 family (): 8.36
##
## Conditional model:
##              Estimate Std. Error z value Pr(>|z|)
## (Intercept)   -0.0299530  0.6613934  -0.045 0.963878
## Perc_dev_cum_abs -0.0263233  0.1060834  -0.248 0.804028
## AridityIndex    1.7924927  3.3001396   0.543 0.587022
## TreatmentConMod  0.0086737  0.1479078   0.059 0.953237
## TreatmentMulch  -0.0570680  0.1367960  -0.417 0.676550
## TreatmentPits    0.1554701  0.1365557   1.139 0.254907
## PlotMix_ClimateProjected -0.3009293  0.0988008  -3.046 0.002320 **
## DurationPerennial  0.7179422  0.2900133   2.476 0.013303 *
## DurationUnknown   0.9986855  0.2898778   3.445 0.000571 ***
## LifeformGrass     0.1867239  0.0541684   3.447 0.000567 ***
## LifeformShrub    -0.5107799  0.3308319  -1.544 0.122606
## MAT              0.0028075  0.0286121   0.098 0.921834
## MAP             -0.0013619  0.0016473  -0.827 0.408386
## Sand_contentlow   0.0916028  0.2045098   0.448 0.654215
## Since_last_precip  0.0006740  0.0003694   1.825 0.068066 .
## Days_elapsed     -0.0006285  0.0002517  -2.497 0.012511 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

## Warning: Can't calculate model's distribution-specific variance. Results are not
## reliable.
## A reason can be that the null model could not be computed manually. Try
## to fit the null model manually and pass it to `null_model`.

## # R2 for Mixed Models
##
## Conditional R2: 1.000
## Marginal R2: 0.244

```

**Table S10. Cover of Northern Arizona seeded species**

```

## Family: genpois ( log )
## Formula:      Seeded_Cover ~ Perc_dev_cum_abs + AridityIndex + Treatment +
##      PlotMix_Climate + MAT + Sand_content + Since_last_precip +
##      Days_elapsed + (1 | Site/Plot)
## Data: naz.seed
##
##      AIC      BIC    logLik deviance df.resid
##  3498.9   3583.5 -1735.5   3470.9     3089
##
## Random effects:
##
## Conditional model:
## Groups      Name      Variance Std.Dev.
## Plot:Site (Intercept) 0.9647  0.9822
## Site      (Intercept) 0.6276  0.7922

```

```

## Number of obs: 3103, groups:  Plot:Site, 256; Site, 8
##
## Dispersion parameter for genpois family (): 4.14
##
## Conditional model:
##
##               Estimate Std. Error z value Pr(>|z|)
## (Intercept)    -1.017e+01  2.669e+00  -3.810 0.000139 ***
## Perc_dev_cum_abs -1.873e+00  2.341e-01  -8.000 1.25e-15 ***
## AridityIndex      3.918e+01  1.061e+01   3.692 0.000223 ***
## TreatmentConMod    3.597e-01  3.216e-01   1.119 0.263297
## TreatmentMulch     1.459e+00  2.991e-01   4.877 1.08e-06 ***
## TreatmentPits      1.560e+00  2.985e-01   5.226 1.73e-07 ***
## PlotMix_ClimateProjected 2.436e-03  2.031e-01   0.012 0.990429
## MAT               8.850e-02  1.190e-01   0.744 0.457048
## Sand_contentlow    -7.509e-01  9.237e-01  -0.813 0.416282
## Since_last_precip   8.054e-04  6.177e-04   1.304 0.192318
## Days_elapsed       9.604e-05  3.479e-04   0.276 0.782537
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

## # R2 for Mixed Models
##
##   Conditional R2: 0.823
##   Marginal R2: 0.562

```