Shrub loss models

**One variable:**

Call: glm(formula = NewNoShrubEnd ~ NoShrubProportionStart, family = binomial, data =

shrubLossAdjacency)

Deviance Residuals:

Min 1Q Median 3Q Max

-2.102 -0.041 -0.041 -0.041 3.764

Coefficients:

Estimate Std. Error z value Pr(>|z|)

(Intercept) -7.081454 0.005347 -1324.3 <2e-16 \*\*\*

NoShrubProportionStart 9.501841 0.028021 339.1 <2e-16 \*\*\*

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Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

(Dispersion parameter for binomial family taken to be 1)

Null deviance: 677206 on 39944361 degrees of freedom

Residual deviance: 620066 on 39944360 degrees of freedom

AIC: 620070

Number of Fisher Scoring iterations: 9

McFadden’s R squared: 0.08438

**Two variables:**

Call: glm(formula = NewNoShrubEnd ~ NoShrubProportionStart + SoilType, family = binomial, data = shrubLossAdjacency)

Deviance Residuals:

Min 1Q Median 3Q Max

-2.2781 -0.0402 -0.0402 -0.0402 3.8035

Coefficients:

Estimate Std. Error z value Pr(>|z|)

(Intercept) -6.99662 0.02576 -271.645 < 2e-16 \*\*\*

NoShrubProportionStart 9.03757 0.02983 302.936 < 2e-16 \*\*\*

SoilTypeBottomland 1.18616 0.08506 13.944 < 2e-16 \*\*\*

SoilTypeGravelly and Calcic -0.23599 0.03246 -7.269 3.61e-13 \*\*\*

SoilTypeLoamy-Clayey 0.78786 0.02987 26.375 < 2e-16 \*\*\*

SoilTypeSandy and Deep Sand -0.12592 0.02627 -4.794 1.63e-06 \*\*\*

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Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

(Dispersion parameter for binomial family taken to be 1)

Null deviance: 677206 on 39944361 degrees of freedom

Residual deviance: 617214 on 39944356 degrees of freedom

AIC: 617226

Number of Fisher Scoring iterations: 10

McFadden’s R squared: 0.08858

**Three variables (ordinal treated as categorical):**

Call: glm(formula = NewNoShrubEnd ~ NoShrubProportionStart + SoilType + yearType, family = binomial, data = shrubLossAdjacency)

Deviance Residuals:

Min 1Q Median 3Q Max

-2.4841 -0.0395 -0.0395 -0.0395 3.8738

Coefficients:

Estimate Std. Error z value Pr(>|z|)

(Intercept) -6.49782 0.02837 -229.019 < 2e-16 \*\*\*

NoShrubProportionStart 9.05531 0.02988 303.024 < 2e-16 \*\*\*

SoilTypeBottomland 1.20133 0.08502 14.129 < 2e-16 \*\*\*

SoilTypeGravelly and Calcic -0.23420 0.03247 -7.212 5.52e-13 \*\*\*

SoilTypeLoamy-Clayey 0.79336 0.02987 26.559 < 2e-16 \*\*\*

SoilTypeSandy and Deep Sand -0.12388 0.02628 -4.714 2.42e-06 \*\*\*

yearTypeNormal -0.53194 0.01414 -37.628 < 2e-16 \*\*\*

yearTypeWet -0.77049 0.01939 -39.728 < 2e-16 \*\*\*

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Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

(Dispersion parameter for binomial family taken to be 1)

Null deviance: 677206 on 39944361 degrees of freedom

Residual deviance: 615518 on 39944354 degrees of freedom

AIC: 615534

Number of Fisher Scoring iterations: 10

McFadden’s R squared: 0.09109

**Three variables (ordinal treated as continuous):**

Call: glm(formula = NewNoShrubEnd ~ NoShrubProportionStart + SoilType + yearTypeId, family = binomial, data = shrubLossAdjacency)

Deviance Residuals:

Min 1Q Median 3Q Max

-2.4474 -0.0402 -0.0402 -0.0402 3.9056

Coefficients:

Estimate Std. Error z value Pr(>|z|)

(Intercept) -6.19823 0.03257 -190.289 < 2e-16 \*\*\*

NoShrubProportionStart 9.05872 0.02988 303.138 < 2e-16 \*\*\*

SoilTypeBottomland 1.20505 0.08502 14.174 < 2e-16 \*\*\*

SoilTypeGravelly and Calcic -0.23413 0.03247 -7.210 5.58e-13 \*\*\*

SoilTypeLoamy-Clayey 0.79360 0.02987 26.568 < 2e-16 \*\*\*

SoilTypeSandy and Deep Sand -0.12382 0.02627 -4.713 2.44e-06 \*\*\*

yearTypeId -0.39806 0.01017 -39.124 < 2e-16 \*\*\*

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Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

(Dispersion parameter for binomial family taken to be 1)

Null deviance: 677206 on 39944361 degrees of freedom

Residual deviance: 615684 on 39944355 degrees of freedom

AIC: 615698

Number of Fisher Scoring iterations: 10

McFadden’s R squared: 0.09085

Treating the ordinal variable as continuous decreases the goodness of the model’s fit. Try a dummy variable next.

**Three variables (ordinal treated as dummy variable):**

**Three variables with an interaction term:**

Call: glm(formula = NewNoShrubEnd ~ NoShrubProportionStart \* yearType + SoilType, family = binomial, data = shrubLossAdjacency)

Deviance Residuals:

Min 1Q Median 3Q Max

-2.7541 -0.0396 -0.0396 -0.0396 3.8642

Coefficients:

Estimate Std. Error z value Pr(>|z|)

(Intercept) -6.55794 0.02907 -225.623 < 2e-16 \*\*\*

NoShrubProportionStart 9.86780 0.08088 122.013 < 2e-16 \*\*\*

yearTypeNormal -0.47054 0.01569 -29.991 < 2e-16 \*\*\*

yearTypeWet -0.67524 0.02129 -31.714 < 2e-16 \*\*\*

SoilTypeBottomland 1.20939 0.08502 14.225 < 2e-16 \*\*\*

SoilTypeGravelly and Calcic -0.23225 0.03249 -7.148 8.83e-13 \*\*\*

SoilTypeLoamy-Clayey 0.80028 0.02989 26.776 < 2e-16 \*\*\*

SoilTypeSandy and Deep Sand -0.12160 0.02630 -4.624 3.76e-06 \*\*\*

NoShrubProportionStart:yearTypeNormal -0.86618 0.08716 -9.938 < 2e-16 \*\*\*

NoShrubProportionStart:yearTypeWet -1.26454 0.11295 -11.196 < 2e-16 \*\*\*

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Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

(Dispersion parameter for binomial family taken to be 1)

Null deviance: 677206 on 39944361 degrees of freedom

Residual deviance: 615383 on 39944352 degrees of freedom

AIC: 615403

Number of Fisher Scoring iterations: 10

McFadden’s R squared: 0.09129 (df = 10)

Adding a third variable improves the fit of the model and all predictor variables are significant. Adding an interaction term improves the model fit even more with no change in significance of predictor variables.