Ch1\_models\_WTDeer

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Based on model selection comparison of underlying distributions and zero-inflation, I chose an nbinom1 distribution for WTDeer data, with zero-inflation and ActiveDays in the ZI model (see Ch1\_WTDeer\_modelDistribution.Rmd)  
Here I will: 1. Double check random structure using all covariates 2. Build models with environmental covariates only  
3. Build hypothesis models with line covariates + environmental  
4. Perform model selection with AIC  
5. Calculate evidence ratios (AICwt of Best Model/ AICwt of other models)  
6. Checking residuals of Top Model 7. Model Averaging? 8. Standardize parameter estimates for easy interpretation  
Previous scale analysis showed lowland habitat and linear density measured at 1750m best explained WTDeer detections

### 1. Random structure

Random structure was previously assessed, but here I will confirm using all model covariates

## dLogLik dAIC df weight  
## r2 38.9 0.0 14 1   
## rSite 28.6 18.7 13 <0.001  
## rMonth 7.0 61.7 13 <0.001  
## r0 0.0 73.8 12 <0.001

## Environmental models

|  |  |
| --- | --- |
| Model Name | Covariates |
| E1 | None |
| E2 | low2000 + pSnow |
| E3 | low2000 |
| E4 | pSnow |

## dLogLik dAIC df weight  
## E2 14.1 0.0 8 0.64   
## E3 12.5 1.2 7 0.36   
## E4 1.5 23.3 7 <0.001  
## E1 0.0 24.3 6 <0.001

E2 has double the model weight of E3, but deviance values are only ~3 units apart. Continue with both environmental covariates for now, keeping in mind that pSnow might be better removed.

## Line characteristics

|  |  |
| --- | --- |
| Model Name | Covariates |
| L1 | Treatment + low2000 + pSnow |
| L2 | VegHt + low2000 + pSnow |
| L3 | LD750 + low2000 + pSnow |
| L4 | LineWidth + low2000 + pSnow |
| L5 | Treatment + LineWidth + low2000 + pSnow |
| L6 | LineWidth + VegHt + low2000 + pSnow |
| L7 | Treatment + LD750 + low2000 + pSnow |
| L8 | LD750 + VegHt + low2000 + pSnow |
| L9 | Treatment + VegHt + low2000 + pSnow |
| L10 | Treatment + LineWidth + VegHt + low2000 + pSnow |
| L11 | Treatment + LineWidth + LD750 + low2000 + pSnow |
| L12 | Treatment + VegHt + LD750 + low2000 + pSnow |
| L13 | LineWidth + VegHt + LD750 + low2000 + pSnow |
| L14 | Treatment + LineWidth + LD750 + VegHt + low2000 + pSnow |

Three models within 2 dAIC points of each other, with model weights between 14 - 34%

## Evidence Ratios

Calculating evidence ratios (AIC wt of best model/AIC weight of others) gives:

## ModelNames dLogLikelihood dAIC Modelweight CumulativeWeight  
## 1 L12 26.093176 0.000000 2.785830e-01 0.2785830  
## 2 L11 25.542919 1.100512 1.606873e-01 0.4392703  
## 3 L14 24.540488 1.105376 1.602970e-01 0.5995673  
## 4 L9 26.268605 1.649141 1.221373e-01 0.7217046  
## 5 L8 23.908409 2.369533 8.519559e-02 0.8069002  
## 6 L5 24.598878 2.988595 6.251577e-02 0.8694159  
## 7 L10 21.374686 3.436979 4.996021e-02 0.9193762  
## 8 L13 19.817009 4.552333 2.860409e-02 0.9479802  
## 9 L2 21.485536 5.215280 2.053388e-02 0.9685141  
## 10 L4 19.060376 6.065600 1.342228e-02 0.9819364  
## 11 L6 19.853994 6.478363 1.091933e-02 0.9928557  
## 12 L7 20.846338 8.493676 3.986359e-03 0.9968421  
## 13 L1 19.224251 9.737849 2.139969e-03 0.9989821  
## 14 L3 15.965153 12.256046 6.075586e-04 0.9995896  
## 15 E2 14.128308 13.929736 2.631183e-04 0.9998527  
## 16 E3 12.547845 15.090662 1.472513e-04 1.0000000  
## 17 E4 1.502852 37.180647 2.351147e-09 1.0000000  
## 18 E1 0.000000 38.186351 1.421981e-09 1.0000000  
## EvidenceRatio  
## 1   
## 2 1.73369716660655  
## 3 1.73791790907988  
## 4 2.28090085557157  
## 5 3.26992319743103  
## 6 4.45620428015273  
## 7 5.57609833426135  
## 8 9.73927431034529  
## 9 13.566991648575  
## 10 20.7552623967059  
## 11 25.5128367986278  
## 12 69.8840835575405  
## 13 130.180864213569  
## 14 458.528686170442  
## 15 1058.77489971746  
## 16 1891.88851358777  
## 17 118488147.119165  
## 18 195911877.336469

### Summary Output for Top Model

## Family: nbinom1 ( log )  
## Formula:   
## WTDeer ~ Treatment + VegHt + LD750 + low2000 + pSnow + (1 | Site) +   
## (1 | Month)  
## Zero inflation: ~ActiveDays  
## Data: det  
##   
## AIC BIC logLik deviance df.resid   
## 1416.5 1481.8 -695.2 1390.5 1115   
##   
## Random effects:  
##   
## Conditional model:  
## Groups Name Variance Std.Dev.  
## Site (Intercept) 1.0540 1.0267   
## Month (Intercept) 0.3617 0.6014   
## Number of obs: 1128, groups: Site, 59; Month, 12  
##   
## Overdispersion parameter for nbinom1 family (): 1.38   
##   
## Conditional model:  
## Estimate Std. Error z value Pr(>|z|)   
## (Intercept) 1.7417 0.8343 2.088 0.03683 \*   
## TreatmentHumanUse -0.4034 0.5487 -0.735 0.46224   
## TreatmentNatRegen -0.6026 0.4879 -1.235 0.21676   
## TreatmentSPP -1.4829 0.4887 -3.034 0.00241 \*\*   
## VegHt 0.2225 0.1946 1.143 0.25301   
## LD750 0.5924 0.3310 1.790 0.07351 .   
## low2000 -6.1391 1.2558 -4.888 1.02e-06 \*\*\*  
## pSnow -0.6618 0.4345 -1.523 0.12774   
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
##   
## Zero-inflation model:  
## Estimate Std. Error z value Pr(>|z|)   
## (Intercept) 4.06086 1.49654 2.713 0.00666 \*\*  
## ActiveDays -0.25568 0.07888 -3.241 0.00119 \*\*  
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

### Plotting residuals against fitted values and predicted values for all covariates

