Ch1\_Moose\_model

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May 13, 2018

Based on model selection comparison of underlying distributions and zero-inflation, I chose an nbinom2 distribution for Moose data, with zero-inflation and ActiveDays in the ZI model (see Ch1\_Moose\_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 Moose detections

### 1. Random structure

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

## dLogLik dAIC df weight  
## r2 17.3 0.0 15 0.997   
## rSite 10.5 11.6 14 0.003   
## rMonth 6.3 19.9 14 <0.001  
## r0 0.0 30.6 13 <0.001

## Environmental models

|  |  |
| --- | --- |
| Model Name | Covariates |
| E1 | None |
| E2 | low250 + pSnow + Dist2Water\_km |
| E3 | low250 + pSnow |
| E4 | pSnow + Dist2Water\_km |
| E5 | low250 + Dist2Water\_km |
| E6 | low250 |
| E7 | pSnow |
| E8 | Dist2Water\_km |

## dLogLik dAIC df weight  
## E6 1.3 0.0 7 0.306   
## E1 0.0 0.6 6 0.226   
## E3 1.3 2.0 8 0.113   
## E5 1.3 2.0 8 0.113   
## E8 0.0 2.6 7 0.085   
## E7 0.0 2.6 7 0.084   
## E2 1.3 4.0 9 0.042   
## E4 0.0 4.6 8 0.031

E6 has the most model weight and is the only model that performs better than the null, although only slightly. Examining shows that even this model does not have much explanatory power. I will continue to use only Lowland habitat.

## Line characteristics

|  |  |
| --- | --- |
| Model Name | Covariates |
| L1 | Treatment + low250 |
| L2 | VegHt + low250 |
| L3 | LD1250 + low250 |
| L4 | LineWidth + low250 |
| L5 | Treatment + LineWidth + low250 |
| L6 | LineWidth + VegHt + low250 |
| L7 | Treatment + LD1250 + low250 |
| L8 | LD1250 + VegHt + low250 |
| L9 | Treatment + VegHt + low250 |
| L10 | Treatment + LineWidth + VegHt + low250 |
| L11 | Treatment + LineWidth + LD1250 + low250 |
| L12 | Treatment + VegHt + LD1250 + low250 |
| L13 | LineWidth + VegHt + LD1250 + low250 |
| L14 | Treatment + LineWidth + LD1250 + VegHt + low250 |

Four models within 2 dAIC points of each other, with model weights between 13 - 36%

## Evidence Ratios and Cumulative model weight (calculating confidence intervals)

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

## ModelNames dLogLikelihood dAIC Modelweight CumulativeWeight  
## 1 L6 10.872121055 0.000000 3.642553e-01 0.3642553  
## 2 L13 11.258092701 1.228057 1.971228e-01 0.5613781  
## 3 L4 8.873687792 1.996867 1.342122e-01 0.6955902  
## 4 L2 8.864087411 2.016067 1.329298e-01 0.8285201  
## 5 L8 8.959517247 3.825208 5.379880e-02 0.8823189  
## 6 L10 11.718026575 4.308189 4.225660e-02 0.9245755  
## 7 L9 10.270899161 5.202444 2.702151e-02 0.9515970  
## 8 L14 12.065095282 5.614052 2.199531e-02 0.9735923  
## 9 L12 10.360181457 7.023879 1.086901e-02 0.9844613  
## 10 L5 9.126253915 7.491734 8.601941e-03 0.9930632  
## 11 L11 9.800526032 8.143190 6.210616e-03 0.9992738  
## 12 E6 1.302567853 15.139106 1.879277e-04 0.9994618  
## 13 E1 0.000000000 15.744242 1.388632e-04 0.9996006  
## 14 L3 1.509656036 16.724930 8.504200e-05 0.9996857  
## 15 E3 1.305647997 17.132946 6.934800e-05 0.9997550  
## 16 E5 1.302612668 17.139017 6.913782e-05 0.9998242  
## 17 E8 0.022662466 17.698917 5.225584e-05 0.9998764  
## 18 E7 0.003675578 17.736891 5.127303e-05 0.9999277  
## 19 E2 1.305699909 19.132842 2.551303e-05 0.9999532  
## 20 E4 0.026499740 19.691243 1.929776e-05 0.9999725  
## 21 L1 2.006099273 19.732044 1.890806e-05 0.9999914  
## 22 L7 2.218047317 21.308147 8.598060e-06 1.0000000  
## EvidenceRatio  
## 1   
## 2 1.84786025933346  
## 3 2.71402632768088  
## 4 2.74020748841937  
## 5 6.77069545237668  
## 6 8.6200809859607  
## 7 13.4801993423619  
## 8 16.5605899328304  
## 9 33.5132069318228  
## 10 42.3457109330051  
## 11 58.6504367681056  
## 12 1938.27406977871  
## 13 2623.12347978143  
## 14 4283.24002804241  
## 15 5252.57156241254  
## 16 5268.5390685621  
## 17 6970.61397970102  
## 18 7104.22869801168  
## 19 14277.2286658533  
## 20 18875.523605226  
## 21 19264.547757389  
## 22 42364.8266984094

### Summary Output for Top Model

## Family: nbinom2 ( log )  
## Formula:   
## Moose ~ LineWidth + VegHt + low250 + (1 | Site) + (1 | Month)  
## Zero inflation: ~ActiveDays  
## Data: det  
##   
## AIC BIC logLik deviance df.resid   
## 889.6 938.9 -435.8 871.6 1761   
##   
## Random effects:  
##   
## Conditional model:  
## Groups Name Variance Std.Dev.  
## Site (Intercept) 0.8085 0.8992   
## Month (Intercept) 0.5263 0.7254   
## Number of obs: 1770, groups: Site, 59; Month, 12  
##   
## Overdispersion parameter for nbinom2 family (): 0.573   
##   
## Conditional model:  
## Estimate Std. Error z value Pr(>|z|)   
## (Intercept) -4.0280 1.0476 -3.845 0.000121 \*\*\*  
## LineWidth 0.2548 0.1270 2.006 0.044883 \*   
## VegHt 0.3292 0.1641 2.007 0.044775 \*   
## low250 -0.6265 0.6817 -0.919 0.358052   
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
##   
## Zero-inflation model:  
## Estimate Std. Error z value Pr(>|z|)   
## (Intercept) 10.3636 5.3834 1.925 0.0542 .  
## ActiveDays -0.4598 0.2525 -1.821 0.0687 .  
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

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

