All\_SPP

Jesse Wood

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## INDIVIDUAL SPECIES

setup for all

library("unmarked")

## Loading required package: reshape

## Loading required package: lattice

## Loading required package: parallel

## Loading required package: Rcpp

library("AICcmodavg")  
library("VGAM")

## Loading required package: stats4

##   
## Attaching package: 'stats4'

## The following object is masked from 'package:unmarked':  
##   
## mle

## Loading required package: splines

##   
## Attaching package: 'VGAM'

## The following object is masked from 'package:AICcmodavg':  
##   
## AICc

setwd("C:/Users/woodj/Documents/GRAD SCHOOL - CLEMSON/Project-Specific/R work/USDA-songbirds/USDA-songbirds")

# BHNU

bhnu.abund<- csvToUMF("bhnu\_abund.csv", long = FALSE, type = "unmarkedFramePCount")  
#summary(bhnu.abund)  
#str(bhnu.abund)  
#scale all observation covariates (covs of detection)  
obsCovs(bhnu.abund)= scale (obsCovs(bhnu.abund))  
#select particular site covariates to scale below  
#(note: NOT ALL - not year, treatment, herbicide, last years ones)  
sc <- siteCovs(bhnu.abund)  
sc[,c(6:77)] <- scale(sc[, c(6:77)])  
siteCovs(bhnu.abund) <- sc

#test for NB or Poisson - most should use Poisson  
testP.bhnu <- pcount(~1 ~1, bhnu.abund, mixture="P", K=4)  
testNB.bhnu <- pcount(~1 ~1, bhnu.abund, mixture="NB", K=4)  
fmsTEST <- fitList(testP.bhnu, testNB.bhnu)

## Warning in fitList(testP.bhnu, testNB.bhnu): Your list was unnamed, so  
## model names were added as object names

msTEST.bhnu <- modSel(fmsTEST)  
msTEST.bhnu

## nPars AIC delta AICwt cumltvWt  
## testP.bhnu 2 587.30 0.00 0.73 0.73  
## testNB.bhnu 3 589.31 2.01 0.27 1.00

#Poisson is best for bhnu.

#detection covariates first  
det.null.bhnu <- pcount(~1 ~1, bhnu.abund, mixture="P", K=15)  
det.weather.bhnu <- pcount(~ Wind + Sky ~1, bhnu.abund, mixture="P", K=15)  
det.global.bhnu <- pcount(~ Jdate + Wind + Sky + Noise +Time ~1, bhnu.abund, mixture="P", K=15)  
det.sound.bhnu <- pcount(~ Noise + Wind ~1, bhnu.abund, mixture="P", K=15)  
det.date.bhnu <- pcount(~ Jdate ~1, bhnu.abund, mixture="P", K=15)  
det.detect.bhnu <- pcount(~ Jdate + Noise + Time ~1, bhnu.abund, mixture="P", K=15)  
det.notdate.bhnu <-pcount(~ Wind + Sky + Noise ~1, bhnu.abund, mixture="P", K=15)  
det.time.bhnu <-pcount(~ Time ~1, bhnu.abund, mixture="P",K=15)  
  
fmsDC <- fitList(det.null.bhnu, det.weather.bhnu, det.global.bhnu,  
 det.sound.bhnu, det.date.bhnu, det.detect.bhnu, det.notdate.bhnu, det.time.bhnu)

## Warning in fitList(det.null.bhnu, det.weather.bhnu, det.global.bhnu,  
## det.sound.bhnu, : Your list was unnamed, so model names were added as  
## object names

msDC.bhnu <- modSel(fmsDC)  
msDC.bhnu

## nPars AIC delta AICwt cumltvWt  
## det.detect.bhnu 5 570.66 0.00 0.5571 0.56  
## det.global.bhnu 7 572.73 2.07 0.1980 0.76  
## det.time.bhnu 3 573.84 3.18 0.1138 0.87  
## det.date.bhnu 3 575.44 4.78 0.0511 0.92  
## det.weather.bhnu 4 576.10 5.44 0.0367 0.96  
## det.null.bhnu 2 577.38 6.72 0.0194 0.98  
## det.notdate.bhnu 5 578.00 7.34 0.0142 0.99  
## det.sound.bhnu 4 578.76 8.10 0.0097 1.00

#msDC.bhnu@Full  
#summary: changed with 2018 data   
#2017: 1st is Time, 2nd null, 3rd detect (Jdate,Noise,Time), 4th date (Jdate)  
#Both yrs: det.detect.bhnu is top model and only one <d2. (global is 2.07)

det.detect.bhnu #+ relationship with Date & Time

##   
## Call:  
## pcount(formula = ~Jdate + Noise + Time ~ 1, data = bhnu.abund,   
## K = 15, mixture = "P")  
##   
## Abundance:  
## Estimate SE z P(>|z|)  
## 0.838 0.265 3.16 0.00157  
##   
## Detection:  
## Estimate SE z P(>|z|)  
## (Intercept) -1.3904 0.339 -4.103 4.08e-05  
## Jdate 0.2638 0.102 2.581 9.85e-03  
## Noise 0.0119 0.107 0.112 9.11e-01  
## Time 0.2995 0.105 2.866 4.16e-03  
##   
## AIC: 570.6627

confint(det.detect.bhnu, type="det",method="normal")

## 0.025 0.975  
## p(Int) -2.05454131 -0.7262112  
## p(Jdate) 0.06349451 0.4641280  
## p(Noise) -0.19764907 0.2215470  
## p(Time) 0.09467010 0.5044128

confint(det.detect.bhnu, type="state",method="normal") #significant

## 0.025 0.975  
## lam(Int) 0.3183654 1.356925

write.table(msDC.bhnu@Full, file="C:/Users/woodj/Documents/GRAD SCHOOL - CLEMSON/Project-Specific/R work/USDA-songbirds/USDA-songbirds/bhnu\_top\_models\_msDC.xls",sep="\t")

^BHNU: detection model best fit, + relationship with survey date & time

#run this when have CSV with both years  
null.bhnu <- pcount(~Jdate + Noise + Time ~1, bhnu.abund, mixture="P", K=40)  
year.bhnu <- pcount(~Jdate + Noise + Time ~ YearCat, bhnu.abund, mixture="P", K=40)  
fms.year.bhnu<- fitList(null.bhnu, year.bhnu)

## Warning in fitList(null.bhnu, year.bhnu): Your list was unnamed, so model  
## names were added as object names

year.ms.bhnu<-modSel(fms.year.bhnu)  
year.ms.bhnu

## nPars AIC delta AICwt cumltvWt  
## null.bhnu 5 570.66 0.00 0.65 0.65  
## year.bhnu 6 571.94 1.28 0.35 1.00

^ null better fit, but year model came in under d<2 (1.28) so… imp to include?

What you can & can’t use: \*as with before, just don’t use Water, or LowDev, or Impervious HWdens\_1050 & NHW\_saplings ok 500m: evergreen & ag ok, scrubs & ag ok 1km: scrubs & ag ok

500 # fine to use evergreen & ag # fine to use scrubs & ag 1 #### can’t use evergreen & ag at 1km # fine to use scrubs & ag 5 # - can’t use Evergreen&Ag, #+ can’t use HighDev&OpenDev together #### can’t use open & water #### can’t use evergreen & open #### can’t use Ag & scrubs 30 #### can’t use evergreen & protected together!! #### can’t use evergreen & scrubs together!! #### can’t use ag & water together!! #### can’t use open & scrubs together!! #+ can’t use Water&Protected together  
#+ can’t use Ag&OpenDev together #+ can’t use Grass&Ag together #- can’t use Protected&Ag together #- can’t use Ag&HighDev together #- can’t use HighDev&OpenDev together #- can’t use Evergreen&Ag together #- can’t use Schrubs&OpenDev together #+ fine to use Schrubs&HighDev together

updated detection covariates, inserted YearCat but DIDN’T UPDATE CORRELATIONS YET

#other detection covariates (Detection best model given msDC.bhnu)  
null.bhnu <- pcount(~ Jdate + Noise + Time ~1, bhnu.abund, mixture="P", K=40)  
global.bhnu <- pcount(~ Jdate + Noise + Time  
 ~ Treatment + Herbicide + BA + Nsnags +Ccover  
 + Ldepth + TreeHt + Age + TimeSinceB + TimeSinceT + Nthins  
 + NP\_over\_20cm + Rel\_HW2P\_canopy   
 + PISoils + NSoilTypes  
 + Parea + ShapeIndex + YearCat  
 , bhnu.abund, mixture="P", K=40) #FPSiteIndex removed  
local.bhnu <- pcount(~ Jdate + Noise + Time  
 ~ Ccover + TreeHt + Ldepth + YearCat  
 , bhnu.abund, mixture="P", K=40) #can only include BA OR CCover  
lh.bhnu <- pcount(~ Jdate + Noise + Time  
 ~ Ccover + Age + Nsnags + TreeHt  
 + NP\_over\_20cm + Rel\_HW2P\_canopy + YearCat  
 , bhnu.abund, mixture="P", K=40)  
landmetrics.bhnu <- pcount (~ Jdate + Noise + Time  
 ~ Parea + ShapeIndex + YearCat  
 , bhnu.abund, mixture="P",K=40)  
landscape500.bhnu <- pcount(~ Jdate + Noise + Time  
 ~ Evergreen500m + HighDev500m + OpenDev500m + YearCat  
 , bhnu.abund, mixture="P", K=40)  
landscape1.bhnu <- pcount(~ Jdate + Noise + Time  
 ~ Evergreen1km + HighDev1km + OpenDev1km + YearCat  
 , bhnu.abund, mixture="P", K=40)  
landscape5.bhnu <- pcount(~ Jdate + Noise + Time  
 ~ Evergreen5km + OpenDev5km + YearCat  
 , bhnu.abund, mixture="P", K=40)  
landscape30.bhnu <- pcount(~ Jdate + Noise + Time  
 ~ Evergreen30km + OpenDev30km + YearCat  
 , bhnu.abund, mixture="P", K=40) #rmoved Protected  
treatment.bhnu <- pcount(~ Jdate + Noise + Time  
 ~ Treatment + Nthins + YearCat  
 , bhnu.abund, mixture ="P", K=40)  
management.bhnu <- pcount(~ Jdate + Noise + Time  
 ~ Treatment + BA + TimeSinceB + TimeSinceT  
 + Herbicide + YearCat  
 , bhnu.abund, mixture="P", K=40)  
disturbance.bhnu <- pcount(~ Jdate + Noise + Time  
 ~ TimeSinceB + TimeSinceT + YearCat  
 , bhnu.abund, mixture="P", K=40)  
siteprod.bhnu <- pcount(~ Jdate + Noise + Time ~ PISoils + NSoilTypes + YearCat  
 , bhnu.abund, mixture="P", K=40) #FPSiteIndex removed  
upstate.bhnu <- pcount(~ Jdate + Noise + Time ~ Parea + HighDev5km + BA  
 + TreeHt + YearCat  
 , bhnu.abund, mixture="P", K=40)  
coord.bhnu <- pcount (~Jdate + Noise + Time ~ Latitude + Longitude + YearCat  
 , bhnu.abund, mixture="P", K=80)  
  
  
fms <- fitList(null.bhnu, global.bhnu, local.bhnu, lh.bhnu, landmetrics.bhnu,  
 landscape500.bhnu, landscape1.bhnu, landscape5.bhnu, landscape30.bhnu,  
 treatment.bhnu, management.bhnu, disturbance.bhnu,  
 siteprod.bhnu, upstate.bhnu, coord.bhnu)

## Warning in fitList(null.bhnu, global.bhnu, local.bhnu, lh.bhnu,  
## landmetrics.bhnu, : Your list was unnamed, so model names were added as  
## object names

ms.bhnu <- modSel(fms) #note this does not include some of site.prod  
ms.bhnu

## nPars AIC delta AICwt cumltvWt  
## treatment.bhnu 10 565.16 0.00 3.8e-01 0.38  
## lh.bhnu 12 565.61 0.45 3.0e-01 0.68  
## landscape1.bhnu 9 566.82 1.66 1.6e-01 0.84  
## disturbance.bhnu 8 570.42 5.26 2.7e-02 0.87  
## local.bhnu 9 570.57 5.41 2.5e-02 0.89  
## null.bhnu 5 570.66 5.50 2.4e-02 0.92  
## management.bhnu 13 570.94 5.78 2.1e-02 0.94  
## coord.bhnu 8 571.25 6.08 1.8e-02 0.96  
## landscape500.bhnu 9 571.25 6.09 1.8e-02 0.97  
## upstate.bhnu 10 571.53 6.37 1.6e-02 0.99  
## siteprod.bhnu 8 574.25 9.08 4.0e-03 0.99  
## landmetrics.bhnu 8 574.94 9.78 2.8e-03 1.00  
## landscape5.bhnu 8 575.15 9.99 2.5e-03 1.00  
## landscape30.bhnu 8 575.87 10.70 1.8e-03 1.00  
## global.bhnu 25 582.95 17.79 5.2e-05 1.00

#ms.bhnu@Full

changed with 2018 data - now Tx is best and LH is second best, landscape 1 third best

treatment.bhnu

##   
## Call:  
## pcount(formula = ~Jdate + Noise + Time ~ Treatment + Nthins +   
## YearCat, data = bhnu.abund, K = 40, mixture = "P")  
##   
## Abundance:  
## Estimate SE z P(>|z|)  
## (Intercept) 0.4689 0.422 1.112 0.26605  
## Treatment1B 0.3055 0.337 0.907 0.36433  
## Treatment2B 0.3931 0.333 1.182 0.23732  
## Treatment3B 1.0828 0.340 3.184 0.00145  
## Nthins -0.1049 0.117 -0.894 0.37139  
## YearCatB 0.0886 0.189 0.468 0.64007  
##   
## Detection:  
## Estimate SE z P(>|z|)  
## (Intercept) -1.6975 0.4305 -3.943 8.06e-05  
## Jdate 0.2590 0.0993 2.609 9.08e-03  
## Noise 0.0499 0.1035 0.483 6.29e-01  
## Time 0.2929 0.1006 2.910 3.61e-03  
##   
## AIC: 565.1624

confint(treatment.bhnu, type="state",method="normal")

## 0.025 0.975  
## lam(Int) -0.3574214 1.2952507  
## lam(Treatment1B) -0.3545929 0.9656418  
## lam(Treatment2B) -0.2588832 1.0450492  
## lam(Treatment3B) 0.4163208 1.7492843  
## lam(Nthins) -0.3347948 0.1250666  
## lam(YearCatB) -0.2826156 0.4597194

lh.bhnu

##   
## Call:  
## pcount(formula = ~Jdate + Noise + Time ~ Ccover + Age + Nsnags +   
## TreeHt + NP\_over\_20cm + Rel\_HW2P\_canopy + YearCat, data = bhnu.abund,   
## K = 40, mixture = "P")  
##   
## Abundance:  
## Estimate SE z P(>|z|)  
## (Intercept) 0.9918 0.4159 2.385 0.01710  
## Ccover -0.0319 0.1037 -0.308 0.75846  
## Age 0.1297 0.1041 1.245 0.21299  
## Nsnags 0.0516 0.0871 0.593 0.55314  
## TreeHt 0.0491 0.1151 0.427 0.66965  
## NP\_over\_20cm -0.0777 0.1160 -0.670 0.50279  
## Rel\_HW2P\_canopy -0.3693 0.1166 -3.168 0.00153  
## YearCatB 0.2147 0.2132 1.007 0.31400  
##   
## Detection:  
## Estimate SE z P(>|z|)  
## (Intercept) -1.8148 0.4925 -3.685 0.000229  
## Jdate 0.2441 0.0983 2.484 0.012983  
## Noise -0.0116 0.1019 -0.114 0.909062  
## Time 0.3073 0.1015 3.029 0.002455  
##   
## AIC: 565.6129

confint(lh.bhnu, type="state",method="normal")

## 0.025 0.975  
## lam(Int) 0.17662367 1.8069652  
## lam(Ccover) -0.23521186 0.1714155  
## lam(Age) -0.07441479 0.3337987  
## lam(Nsnags) -0.11899473 0.2222509  
## lam(TreeHt) -0.17646267 0.2746573  
## lam(NP\_over\_20cm) -0.30502615 0.1495940  
## lam(Rel\_HW2P\_canopy) -0.59780365 -0.1408651  
## lam(YearCatB) -0.20319934 0.6325280

landscape1.bhnu

##   
## Call:  
## pcount(formula = ~Jdate + Noise + Time ~ Evergreen1km + HighDev1km +   
## OpenDev1km + YearCat, data = bhnu.abund, K = 40, mixture = "P")  
##   
## Abundance:  
## Estimate SE z P(>|z|)  
## (Intercept) 0.850 0.3181 2.672 0.00755  
## Evergreen1km 0.215 0.0929 2.312 0.02079  
## HighDev1km 0.157 0.0629 2.489 0.01279  
## OpenDev1km 0.119 0.1039 1.143 0.25324  
## YearCatB 0.159 0.1894 0.839 0.40160  
##   
## Detection:  
## Estimate SE z P(>|z|)  
## (Intercept) -1.56004 0.385 -4.0473 5.18e-05  
## Jdate 0.26683 0.101 2.6289 8.57e-03  
## Noise -0.00899 0.109 -0.0828 9.34e-01  
## Time 0.31866 0.104 3.0603 2.21e-03  
##   
## AIC: 566.8243

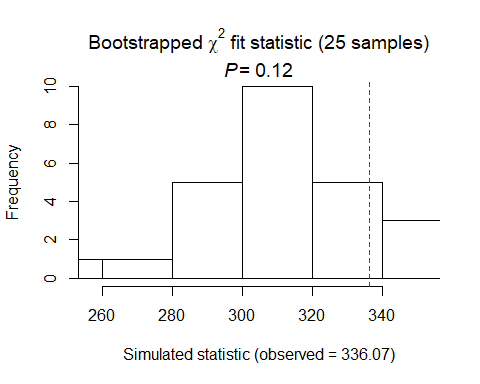
confint(landscape1.bhnu, type="state",method="normal")

## 0.025 0.975  
## lam(Int) 0.22639205 1.4732153  
## lam(Evergreen1km) 0.03267600 0.3966979  
## lam(HighDev1km) 0.03333305 0.2800887  
## lam(OpenDev1km) -0.08497141 0.3224971  
## lam(YearCatB) -0.21237716 0.5301348

BHNU treatment: only Treatment3B sig (+) BHNU life history: only Rel\_HW2P\_canopy is sig (-) BHNU landscape1: Evergreen1km(+), HighDev(+)

write.table(ms.bhnu@Full, file="C:/Users/woodj/Documents/GRAD SCHOOL - CLEMSON/Project-Specific/R work/USDA-songbirds/USDA-songbirds/bhnu\_top\_models\_ms.xls",sep="\t")

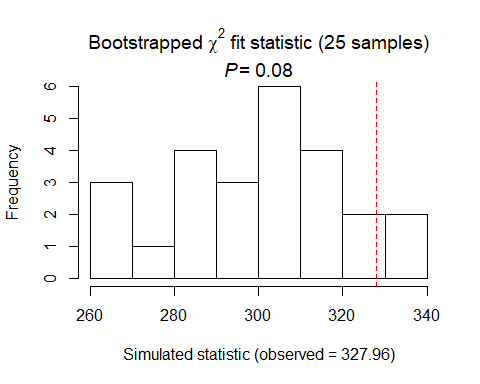
## Warning in rbinom(M \* J, size = rep(N, each = J), prob = pvec): NAs  
## produced  
  
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## produced  
  
## Warning in rbinom(M \* J, size = rep(N, each = J), prob = pvec): NAs  
## produced



##   
## Chi-square goodness-of-fit for N-mixture model of 'unmarkedFitPCount' class  
##   
## Observed chi-square statistic = 336.0727   
## Number of bootstrap samples = 25  
## P-value = 0.12  
##   
## Quantiles of bootstrapped statistics:  
## 0% 25% 50% 75% 100%   
## 257 296 307 325 352   
##   
## Estimate of c-hat = 1.09

##   
## Chi-square goodness-of-fit for N-mixture model of 'unmarkedFitPCount' class  
##   
## Observed chi-square statistic = 336.0727

## Warning in rbinom(M \* J, size = rep(N, each = J), prob = pvec): NAs  
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## Warning in rbinom(M \* J, size = rep(N, each = J), prob = pvec): NAs  
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## Warning in rbinom(M \* J, size = rep(N, each = J), prob = pvec): NAs  
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## Warning in rbinom(M \* J, size = rep(N, each = J), prob = pvec): NAs  
## produced  
  
## Warning in rbinom(M \* J, size = rep(N, each = J), prob = pvec): NAs  
## produced  
  
## Warning in rbinom(M \* J, size = rep(N, each = J), prob = pvec): NAs  
## produced  
  
## Warning in rbinom(M \* J, size = rep(N, each = J), prob = pvec): NAs  
## produced



##   
## Chi-square goodness-of-fit for N-mixture model of 'unmarkedFitPCount' class  
##   
## Observed chi-square statistic = 327.9556   
## Number of bootstrap samples = 25  
## P-value = 0.08  
##   
## Quantiles of bootstrapped statistics:  
## 0% 25% 50% 75% 100%   
## 260 287 301 312 340   
##   
## Estimate of c-hat = 1.09

##   
## Chi-square goodness-of-fit for N-mixture model of 'unmarkedFitPCount' class  
##   
## Observed chi-square statistic = 327.9556

BHNU summary: P distribution DCs: detect best model (+ date, + time, non-sig with noise) SCs, using detect model: BHNU treatment: only Treatment3B sig (+) BHNU life history: only Rel\_HW2P\_canopy is sig (-) BHNU landscape1: Evergreen1km(+), HighDev(+)

# CAWR

cawr.abund<- csvToUMF("cawr\_abund.csv", long = FALSE, type = "unmarkedFramePCount")  
#summary(cawr.abund)  
#str(cawr.abund)  
#scale all observation covariates (covs of detection)  
obsCovs(cawr.abund)= scale (obsCovs(cawr.abund))  
#select particular site covariates to scale below  
sc <- siteCovs(cawr.abund)  
sc[,c(6:77)] <- scale(sc[, c(6:77)])  
siteCovs(cawr.abund) <- sc

#run this when have CSV with both years  
null.cawr <- pcount(~Jdate + Noise + Time ~1, cawr.abund, mixture="P", K=40)  
year.cawr <- pcount(~Jdate + Noise + Time ~ YearCat, cawr.abund, mixture="P", K=40)  
fms.year.cawr<- fitList(null.cawr, year.cawr)

## Warning in fitList(null.cawr, year.cawr): Your list was unnamed, so model  
## names were added as object names

year.ms.cawr<-modSel(fms.year.cawr)  
year.ms.cawr

## nPars AIC delta AICwt cumltvWt  
## null.cawr 5 716.52 0.00 0.71 0.71  
## year.cawr 6 718.33 1.81 0.29 1.00

^null is best but year <d1.81

#detection covariates first  
det.null.cawr <- pcount(~1 ~1, cawr.abund, mixture="P", K=15)  
det.weather.cawr <- pcount(~ Wind + Sky ~1, cawr.abund, mixture="P", K=15)  
det.global.cawr <- pcount(~ Jdate + Wind + Sky + Noise + Time ~1, cawr.abund, mixture="P", K=15)  
det.sound.cawr <- pcount(~ Noise + Wind ~1, cawr.abund, mixture="P", K=15)  
det.date.cawr <- pcount(~ Jdate ~1, cawr.abund, mixture="P", K=15)  
det.detect.cawr <- pcount(~ Jdate + Noise + Time ~1, cawr.abund, mixture="P", K=15)  
det.notdate.cawr <-pcount(~ Wind + Sky + Noise ~1, cawr.abund, mixture="P", K=15)  
det.time.cawr <-pcount(~ Time ~1, cawr.abund, mixture="P",K=15)  
det.timing.cawr <-pcount(~ Time + Jdate ~1, cawr.abund, mixture="P", K=15)  
  
fmsDC <- fitList(det.null.cawr, det.weather.cawr, det.global.cawr,  
 det.sound.cawr, det.date.cawr, det.detect.cawr, det.notdate.cawr,  
 det.time.cawr, det.timing.cawr)

## Warning in fitList(det.null.cawr, det.weather.cawr, det.global.cawr,  
## det.sound.cawr, : Your list was unnamed, so model names were added as  
## object names

msDC.cawr <- modSel(fmsDC)  
msDC.cawr

## nPars AIC delta AICwt cumltvWt  
## det.null.cawr 2 713.85 0.00 0.325 0.32  
## det.date.cawr 3 715.17 1.31 0.169 0.49  
## det.time.cawr 3 715.60 1.74 0.136 0.63  
## det.sound.cawr 4 716.21 2.36 0.100 0.73  
## det.detect.cawr 5 716.52 2.67 0.086 0.82  
## det.timing.cawr 4 716.62 2.77 0.082 0.90  
## det.weather.cawr 4 717.65 3.80 0.049 0.95  
## det.notdate.cawr 5 718.13 4.27 0.038 0.98  
## det.global.cawr 7 719.81 5.96 0.016 1.00

#msDC.cawr@Full  
#summary: null best, date second best 0.21, detect (Jdate+Noise+Time) 1.57, then sound, time

Null model, then date (none sig), then time (none sig) (all under 2.0)

det.date.cawr

##   
## Call:  
## pcount(formula = ~Jdate ~ 1, data = cawr.abund, K = 15, mixture = "P")  
##   
## Abundance:  
## Estimate SE z P(>|z|)  
## 1.05 0.278 3.79 0.000152  
##   
## Detection:  
## Estimate SE z P(>|z|)  
## (Intercept) -0.8510 0.3938 -2.161 0.0307  
## Jdate -0.0604 0.0732 -0.824 0.4097  
##   
## AIC: 715.1653

confint(det.date.cawr, type="det",method="normal")

## 0.025 0.975  
## p(Int) -1.622794 -0.07926845  
## p(Jdate) -0.203937 0.08316404

confint(det.date.cawr, type="state",method="normal")

## 0.025 0.975  
## lam(Int) 0.5089802 1.600275

det.time.cawr

##   
## Call:  
## pcount(formula = ~Time ~ 1, data = cawr.abund, K = 15, mixture = "P")  
##   
## Abundance:  
## Estimate SE z P(>|z|)  
## 1.07 0.288 3.73 0.000195  
##   
## Detection:  
## Estimate SE z P(>|z|)  
## (Intercept) -0.8759 0.4043 -2.166 0.0303  
## Time -0.0377 0.0746 -0.506 0.6131  
##   
## AIC: 715.596

confint(det.time.cawr, type="state",method="normal")

## 0.025 0.975  
## lam(Int) 0.5080768 1.636347

write.table(msDC.cawr@Full, file="C:/Users/woodj/Documents/GRAD SCHOOL - CLEMSON/Project-Specific/R work/USDA-songbirds/USDA-songbirds/cawr\_top\_models\_msDC.xls",sep="\t")

##site covariates next  
#null detection covariates (this was the best model...run)  
#CAWR (open woodlands, insects, cavity, foliage gleaner - brushy thickets, shrubby)   
# covariates: density (BA not Ccover), Nsnags, midstory (NHW\_saplings, midstory), OpenDev  
  
Nnull.cawr <- pcount(~1 ~1  
 ,cawr.abund, mixture="P", K=40)  
Nglobal.cawr <- pcount(~ 1  
 ~ Treatment + Herbicide + BA + Nsnags +Ccover  
 + Ldepth + TreeHt + Age + TimeSinceB + TimeSinceT + Nthins  
 + HW\_dens\_1050 + FG\_herb + FG\_shrub + NHW\_saplings  
 + PISoils + NSoilTypes  
 + Parea + ShapeIndex + YearCat  
 , cawr.abund, mixture="P", K=40) #FPSiteIndex removed + Rel\_HW2P\_canopy + NP\_over\_20cm   
Nlocal.cawr <- pcount(~ 1  
 ~ Ccover + TreeHt + Ldepth + YearCat  
 , cawr.abund, mixture="P", K=40)  
Nlh.cawr <- pcount(~ 1  
 ~ BA + Nsnags + HW\_dens\_1050 + FG\_herb + FG\_shrub + NHW\_saplings + YearCat  
 , cawr.abund, mixture="P", K=40)  
Nlandmetrics.cawr <- pcount (~ 1 ~ Parea + ShapeIndex + YearCat  
 , cawr.abund, mixture="P",K=40)  
Nlandscape500.cawr <- pcount(~ 1 ~ Evergreen500m + OpenDev500m + HighDev500m + Schrubs500m + YearCat  
 , cawr.abund, mixture="P", K=40)  
Nlandscape1.cawr <- pcount(~ 1 ~ Evergreen1km + OpenDev1km + HighDev1km + Schrubs1km + YearCat  
 , cawr.abund, mixture="P", K=40)  
Nlandscape5.cawr <- pcount(~ 1 ~ Evergreen5km + HighDev5km + Schrubs5km + YearCat  
 , cawr.abund, mixture="P", K=40)  
Nlandscape30.cawr <- pcount(~ 1 ~ Evergreen30km + OpenDev30km + YearCat  
 , cawr.abund, mixture="P", K=40)  
Ntreatment.cawr <- pcount(~ 1 ~ Treatment + Nthins + YearCat  
 , cawr.abund, mixture ="P", K=40)  
Nmanagement.cawr <- pcount(~ 1 ~ Treatment + BA + TimeSinceB + TimeSinceT + Herbicide + YearCat  
 , cawr.abund, mixture="P", K=40)  
Ndisturbance.cawr <- pcount(~ 1 ~ TimeSinceB + TimeSinceT + YearCat  
 , cawr.abund, mixture="P", K=40)  
Nsiteprod.cawr <- pcount(~ 1 ~ PISoils + NSoilTypes + YearCat  
 , cawr.abund, mixture="P", K=40) #FPSiteIndex removed  
Nupstate.cawr <- pcount(~ 1 ~ Ag5km + Parea + YearCat, cawr.abund, mixture="P", K=40)  
Ncoord.cawr <- pcount (~1 ~ Latitude + Longitude + YearCat  
 , cawr.abund, mixture="P", K=40)  
  
fmsN <- fitList(Nnull.cawr, Nglobal.cawr, Nlocal.cawr, Nlh.cawr,  
 Nlandmetrics.cawr,  
 Nlandscape500.cawr, Nlandscape1.cawr, Nlandscape5.cawr, Nlandscape30.cawr,  
 Ntreatment.cawr, Nmanagement.cawr, Ndisturbance.cawr,  
 Nsiteprod.cawr, Nupstate.cawr, Ncoord.cawr)

## Warning in fitList(Nnull.cawr, Nglobal.cawr, Nlocal.cawr, Nlh.cawr,  
## Nlandmetrics.cawr, : Your list was unnamed, so model names were added as  
## object names

msN.cawr <- modSel(fmsN)  
#msN.cawr@Full  
msN.cawr

## nPars AIC delta AICwt cumltvWt  
## Nupstate.cawr 5 713.38 0.00 3.6e-01 0.36  
## Nnull.cawr 2 713.85 0.48 2.9e-01 0.65  
## Nlandscape5.cawr 6 716.06 2.69 9.5e-02 0.74  
## Nlandscape1.cawr 7 716.76 3.38 6.7e-02 0.81  
## Nlandscape30.cawr 5 716.91 3.53 6.2e-02 0.87  
## Nlandmetrics.cawr 5 718.06 4.68 3.5e-02 0.91  
## Nsiteprod.cawr 5 719.03 5.66 2.1e-02 0.93  
## Ndisturbance.cawr 5 719.31 5.93 1.9e-02 0.95  
## Ncoord.cawr 5 719.59 6.22 1.6e-02 0.97  
## Nlandscape500.cawr 7 719.76 6.39 1.5e-02 0.98  
## Nlh.cawr 9 721.37 8.00 6.7e-03 0.99  
## Nlocal.cawr 6 721.43 8.06 6.5e-03 0.99  
## Ntreatment.cawr 7 721.46 8.08 6.4e-03 1.00  
## Nmanagement.cawr 10 726.51 13.14 5.1e-04 1.00  
## Nglobal.cawr 24 744.77 31.40 5.5e-08 1.00

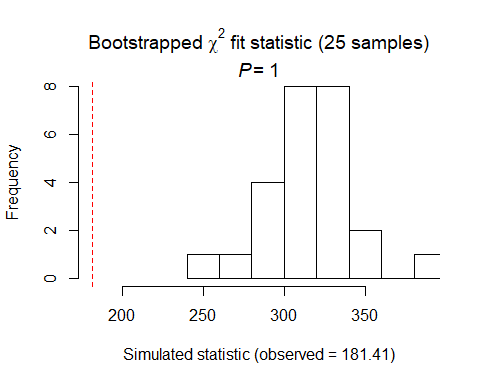
# summary: upstate best model (+ with Ag5km), null second best (same as below using date!)  
Nupstate.cawr

##   
## Call:  
## pcount(formula = ~1 ~ Ag5km + Parea + YearCat, data = cawr.abund,   
## K = 40, mixture = "P")  
##   
## Abundance:  
## Estimate SE z P(>|z|)  
## (Intercept) 1.1951 0.3765 3.174 0.0015  
## Ag5km 0.1623 0.0708 2.293 0.0219  
## Parea -0.0750 0.0819 -0.916 0.3596  
## YearCatB -0.0681 0.1516 -0.449 0.6534  
##   
## Detection:  
## Estimate SE z P(>|z|)  
## -1.02 0.506 -2.03 0.0428  
##   
## AIC: 713.3762

confint(Nupstate.cawr, type="state",method="normal")

## 0.025 0.975  
## lam(Int) 0.45709406 1.9330722  
## lam(Ag5km) 0.02354981 0.3010386  
## lam(Parea) -0.23550279 0.0854759  
## lam(YearCatB) -0.36522003 0.2290730

write.table(msN.cawr@Full, file="C:/Users/woodj/Documents/GRAD SCHOOL - CLEMSON/Project-Specific/R work/USDA-songbirds/USDA-songbirds/cawr\_top\_models\_msN.xls",sep="\t")



##   
## Chi-square goodness-of-fit for N-mixture model of 'unmarkedFitPCount' class  
##   
## Observed chi-square statistic = 181.4138   
## Number of bootstrap samples = 25  
## P-value = 1  
##   
## Quantiles of bootstrapped statistics:  
## 0% 25% 50% 75% 100%   
## 241 305 315 333 387   
##   
## Estimate of c-hat = 0.57

##   
## Chi-square goodness-of-fit for N-mixture model of 'unmarkedFitPCount' class  
##   
## Observed chi-square statistic = 181.4138

# using second best DC model (Jdate)  
null.cawr <- pcount(~ Jdate ~1, cawr.abund, mixture="P", K=40)  
global.cawr <- pcount(~ Jdate  
 ~ Treatment + Herbicide + BA + Nsnags +Ccover  
 + Ldepth + TreeHt + Age + TimeSinceB + TimeSinceT + Nthins  
 + HW\_dens\_1050 + FG\_herb + FG\_shrub + NHW\_saplings  
 + PISoils + NSoilTypes  
 + Parea + ShapeIndex + YearCat  
 , cawr.abund, mixture="P", K=40)  
local.cawr <- pcount(~ Jdate  
 ~ Ccover + TreeHt + Ldepth + YearCat  
 , cawr.abund, mixture="P", K=40) #can only include BA OR CCover  
lh.cawr <- pcount(~ Jdate  
 ~ BA + Nsnags + HW\_dens\_1050 + FG\_herb + FG\_shrub + NHW\_saplings + YearCat  
 , cawr.abund, mixture="P", K=40)  
landmetrics.cawr <- pcount (~ Jdate  
 ~ Parea + ShapeIndex + YearCat  
 , cawr.abund, mixture="P",K=40)  
landscape500.cawr <- pcount(~ Jdate  
 ~ Evergreen500m + OpenDev500m + HighDev500m + Schrubs500m + YearCat  
 , cawr.abund, mixture="P", K=40)  
landscape1.cawr <- pcount(~ Jdate  
 ~ Evergreen1km + OpenDev1km + HighDev1km + Schrubs1km + YearCat  
 , cawr.abund, mixture="P", K=40)  
landscape5.cawr <- pcount(~ Jdate  
 ~ Evergreen5km + HighDev5km + Schrubs1km + YearCat  
 , cawr.abund, mixture="P", K=40)  
landscape30.cawr <- pcount(~ Jdate  
 ~ Evergreen30km + OpenDev30km + YearCat  
 , cawr.abund, mixture="P", K=40)  
treatment.cawr <- pcount(~ Jdate  
 ~ Treatment + Nthins + YearCat  
 , cawr.abund, mixture ="P", K=40)  
management.cawr <- pcount(~ Jdate  
 ~ Treatment + BA + TimeSinceB + TimeSinceT + Herbicide + YearCat  
 , cawr.abund, mixture="P", K=40)  
disturbance.cawr <- pcount(~ Jdate  
 ~ TimeSinceB + TimeSinceT + YearCat  
 , cawr.abund, mixture="P", K=40)  
siteprod.cawr <- pcount(~ Jdate ~ PISoils + NSoilTypes + YearCat  
 , cawr.abund, mixture="P", K=40) #FPSiteIndex removed  
upstate.cawr <- pcount(~ Jdate  
 ~ Ag5km + Parea + YearCat, cawr.abund, mixture="P", K=40)  
coord.cawr <- pcount (~Jdate + Noise + Time ~ Latitude + Longitude + YearCat  
 , cawr.abund, mixture="P", K=40)  
  
  
fms <- fitList(null.cawr, global.cawr, local.cawr, lh.cawr, landmetrics.cawr,  
 landscape500.cawr, landscape1.cawr, landscape5.cawr, landscape30.cawr,  
 treatment.cawr, management.cawr, disturbance.cawr,  
 siteprod.cawr, upstate.cawr, coord.cawr)

## Warning in fitList(null.cawr, global.cawr, local.cawr, lh.cawr,  
## landmetrics.cawr, : Your list was unnamed, so model names were added as  
## object names

ms.cawr <- modSel(fms)  
ms.cawr

## nPars AIC delta AICwt cumltvWt  
## upstate.cawr 6 714.81 0.00 3.6e-01 0.36  
## null.cawr 3 715.17 0.35 3.0e-01 0.65  
## landscape5.cawr 7 717.38 2.57 9.9e-02 0.75  
## landscape1.cawr 8 718.24 3.43 6.4e-02 0.82  
## landscape30.cawr 6 718.34 3.53 6.1e-02 0.88  
## landmetrics.cawr 6 719.34 4.53 3.7e-02 0.91  
## siteprod.cawr 6 720.37 5.56 2.2e-02 0.94  
## disturbance.cawr 6 720.65 5.83 1.9e-02 0.96  
## landscape500.cawr 8 721.17 6.36 1.5e-02 0.97  
## coord.cawr 8 722.24 7.43 8.7e-03 0.98  
## treatment.cawr 8 722.69 7.88 6.9e-03 0.99  
## lh.cawr 10 722.71 7.89 6.9e-03 0.99  
## local.cawr 7 722.76 7.95 6.7e-03 1.00  
## management.cawr 11 727.74 12.93 5.5e-04 1.00  
## global.cawr 25 746.03 31.22 5.9e-08 1.00

#ms.cawr@Full

# same results as with null DCs  
  
null.cawr # second best model

##   
## Call:  
## pcount(formula = ~Jdate ~ 1, data = cawr.abund, K = 40, mixture = "P")  
##   
## Abundance:  
## Estimate SE z P(>|z|)  
## 1.05 0.278 3.79 0.000152  
##   
## Detection:  
## Estimate SE z P(>|z|)  
## (Intercept) -0.8510 0.3938 -2.161 0.0307  
## Jdate -0.0604 0.0732 -0.824 0.4097  
##   
## AIC: 715.1653

upstate.cawr # best model - Land Use type and Patch Area (+ with Ag5km)

##   
## Call:  
## pcount(formula = ~Jdate ~ Ag5km + Parea + YearCat, data = cawr.abund,   
## K = 40, mixture = "P")  
##   
## Abundance:  
## Estimate SE z P(>|z|)  
## (Intercept) 1.1708 0.3588 3.263 0.0011  
## Ag5km 0.1603 0.0712 2.251 0.0244  
## Parea -0.0766 0.0822 -0.932 0.3516  
## YearCatB -0.0680 0.1522 -0.447 0.6549  
##   
## Detection:  
## Estimate SE z P(>|z|)  
## (Intercept) -0.9925 0.4855 -2.044 0.0409  
## Jdate -0.0535 0.0718 -0.746 0.4557  
##   
## AIC: 714.8125

confint(upstate.cawr, type="state",method="normal")

## 0.025 0.975  
## lam(Int) 0.46751523 1.8739890  
## lam(Ag5km) 0.02074068 0.2998154  
## lam(Parea) -0.23778246 0.0845686  
## lam(YearCatB) -0.36629258 0.2302398

write.table(ms.cawr@Full, file="C:/Users/woodj/Documents/GRAD SCHOOL - CLEMSON/Project-Specific/R work/USDA-songbirds/USDA-songbirds/cawr\_top\_models\_ms.xls",sep="\t")

CAWR summary: P distribution DCs: Null model, then date, then time (all under 2.0) Using null model for detection covariates: upstate model best (+ with ag5km) null model second best Using Date for detection covariate, same results & sig.

# CACH

cach.abund<- csvToUMF("cach\_abund.csv", long = FALSE, type = "unmarkedFramePCount")  
#summary(cach.abund)  
#str(cach.abund)  
#scale all observation covariates (covs of detection)  
obsCovs(cach.abund)= scale (obsCovs(cach.abund))  
#select particular site covariates to scale below  
sc <- siteCovs(cach.abund)  
sc[,c(6:77)] <- scale(sc[, c(6:77)])  
siteCovs(cach.abund) <- sc

#run this when have CSV with both years  
null.cach <- pcount(~Jdate + Noise + Time ~1, cach.abund, mixture="P", K=40)  
year.cach <- pcount(~Jdate + Noise + Time ~ YearCat, cach.abund, mixture="P", K=40)  
fms.year.cach<- fitList(null.cach, year.cach)

## Warning in fitList(null.cach, year.cach): Your list was unnamed, so model  
## names were added as object names

year.ms.cach<-modSel(fms.year.cach)  
year.ms.cach

## nPars AIC delta AICwt cumltvWt  
## year.cach 6 786.85 0.00 0.939 0.94  
## null.cach 5 792.33 5.48 0.061 1.00

^year is definitely best! null far above d2

#test for NB or Poisson - most should use Poisson ...   
testP.cach <- pcount(~1 ~1, cach.abund, mixture="P", K=12)  
testNB.cach <- pcount(~1 ~1, cach.abund, mixture="NB", K=12)  
fmsTEST <- fitList(testP.cach, testNB.cach)

## Warning in fitList(testP.cach, testNB.cach): Your list was unnamed, so  
## model names were added as object names

msTEST.cach <- modSel(fmsTEST)  
msTEST.cach

## nPars AIC delta AICwt cumltvWt  
## testP.cach 2 787.53 0.00 0.73 0.73  
## testNB.cach 3 789.53 2.00 0.27 1.00

## P is best for this species.

#detection covariates first  
det.null.cach <- pcount(~1 ~1, cach.abund, mixture="P", K=15)  
det.weather.cach <- pcount(~ Wind + Sky ~1, cach.abund, mixture="P", K=15)  
det.global.cach <- pcount(~ Jdate + Wind + Sky + Noise + Time ~1, cach.abund, mixture="P", K=15)  
det.sound.cach <- pcount(~ Noise + Wind ~1, cach.abund, mixture="P", K=15)  
det.date.cach <- pcount(~ Jdate ~1, cach.abund, mixture="P", K=15)  
det.detect.cach <- pcount(~ Jdate + Noise + Time ~1, cach.abund, mixture="P", K=15)  
det.notdate.cach <-pcount(~ Wind + Sky + Noise ~1, cach.abund, mixture="P", K=15)  
det.time.cach <-pcount(~ Time ~1, cach.abund, mixture="P",K=15)  
det.timing.cach <-pcount(~ Time + Jdate ~1, cach.abund, mixture="P", K=15)  
  
fmsDC <- fitList(det.null.cach, det.weather.cach, det.global.cach,  
 det.sound.cach, det.date.cach, det.detect.cach, det.notdate.cach,  
 det.time.cach, det.timing.cach)

## Warning in fitList(det.null.cach, det.weather.cach, det.global.cach,  
## det.sound.cach, : Your list was unnamed, so model names were added as  
## object names

msDC.cach <- modSel(fmsDC)  
msDC.cach

## nPars AIC delta AICwt cumltvWt  
## det.null.cach 2 787.52 0.00 0.310 0.31  
## det.time.cach 3 788.80 1.27 0.164 0.47  
## det.weather.cach 4 789.41 1.88 0.121 0.60  
## det.date.cach 3 789.47 1.95 0.117 0.71  
## det.sound.cach 4 789.58 2.06 0.111 0.82  
## det.timing.cach 4 790.58 3.05 0.067 0.89  
## det.notdate.cach 5 790.77 3.24 0.061 0.95  
## det.detect.cach 5 792.33 4.80 0.028 0.98  
## det.global.cach 7 793.12 5.59 0.019 1.00

#msDC.cach@Full  
#summary: null best, time second best, then weather, then date

^ null best, time second best, then weather, then date

#det.time.cach #second best model  
#confint(det.time.cach, type="det",method="normal")  
#confint(det.time.cach, type="state",method="normal")

write.table(msDC.cach@Full, file="C:/Users/woodj/Documents/GRAD SCHOOL - CLEMSON/Project-Specific/R work/USDA-songbirds/USDA-songbirds/cach\_top\_models\_msDC.xls",sep="\t")

##site covariates next  
#null detection covariates (this was the best model)  
Nnull.cach <- pcount(~1 ~1  
 ,cach.abund, mixture="P", K=40)  
Nglobal.cach <- pcount(~ 1  
 ~ Treatment + Herbicide + BA + Nsnags +Ccover  
 + Ldepth + TreeHt + Age + TimeSinceB + TimeSinceT + Nthins  
 + Rel\_HW2P\_canopy  
 + PISoils + NSoilTypes  
 + Parea + ShapeIndex + YearCat  
 , cach.abund, mixture="P", K=40) #FPSiteIndex removed + HW\_dens\_1050 + FG\_herb + FG\_shrub + NHW\_saplings + NP\_over\_20cm   
Nlocal.cach <- pcount(~ 1  
 ~ Ccover + TreeHt + Ldepth + YearCat  
 , cach.abund, mixture="P", K=40)  
Nlh.cach <- pcount(~ 1  
 ~ TreeHt + Ccover + Nsnags + Rel\_HW2P\_canopy + YearCat  
 , cach.abund, mixture="P", K=40)  
Nlandmetrics.cach <- pcount (~ 1  
 ~ Parea + ShapeIndex + YearCat  
 , cach.abund, mixture="P",K=40)  
Nlandscape500.cach <- pcount(~ 1  
 ~ Evergreen500m + OpenDev500m + Schrubs500m + Ag500m + YearCat  
 , cach.abund, mixture="P", K=40)  
Nlandscape1.cach <- pcount(~ 1  
 ~ Evergreen1km + OpenDev1km + Schrubs1km + YearCat  
 , cach.abund, mixture="P", K=40)  
Nlandscape5.cach <- pcount(~ 1  
 ~ Evergreen5km + OpenDev5km + Schrubs1km + YearCat  
 , cach.abund, mixture="P", K=40)  
Nlandscape30.cach <- pcount(~ 1  
 ~ Evergreen30km + OpenDev30km + YearCat  
 , cach.abund, mixture="P", K=40)  
Ntreatment.cach <- pcount(~ 1 ~ Treatment + Nthins + YearCat  
 , cach.abund, mixture ="P", K=40)  
Nmanagement.cach <- pcount(~ 1 ~ Treatment + BA + TimeSinceB + TimeSinceT + Herbicide + YearCat  
 , cach.abund, mixture="P", K=40)  
Ndisturbance.cach <- pcount(~ 1 ~ TimeSinceB + TimeSinceT + YearCat  
 , cach.abund, mixture="P", K=40)  
Nsiteprod.cach <- pcount(~ 1 ~ PISoils + NSoilTypes + YearCat  
 , cach.abund, mixture="P", K=40) #FPSiteIndex removed  
Nupstate.cach <- pcount(~ 1 ~ TreeHt + Ccover + Parea + YearCat, cach.abund, mixture="P", K=40)  
Ncoord.cach <- pcount (~1 ~ Latitude + Longitude + YearCat  
 , cach.abund, mixture="P", K=40)  
  
fmsN <- fitList(Nnull.cach, Nglobal.cach, Nlocal.cach, Nlh.cach,  
 Nlandmetrics.cach,  
 Nlandscape500.cach, Nlandscape1.cach, Nlandscape5.cach, Nlandscape30.cach,  
 Ntreatment.cach, Nmanagement.cach, Ndisturbance.cach,  
 Nsiteprod.cach, Nupstate.cach, Ncoord.cach)

## Warning in fitList(Nnull.cach, Nglobal.cach, Nlocal.cach, Nlh.cach,  
## Nlandmetrics.cach, : Your list was unnamed, so model names were added as  
## object names

msN.cach <- modSel(fmsN)  
#msN.cach@Full  
msN.cach

## nPars AIC delta AICwt cumltvWt  
## Nsiteprod.cach 5 783.45 0.00 2.0e-01 0.20  
## Nlandmetrics.cach 5 783.63 0.18 1.8e-01 0.38  
## Ndisturbance.cach 5 784.90 1.45 9.7e-02 0.48  
## Nupstate.cach 6 785.18 1.73 8.4e-02 0.56  
## Nlandscape1.cach 6 785.37 1.92 7.6e-02 0.64  
## Nlandscape500.cach 7 785.60 2.15 6.8e-02 0.71  
## Nlandscape30.cach 5 785.87 2.42 6.0e-02 0.77  
## Ncoord.cach 5 785.96 2.51 5.7e-02 0.82  
## Nlocal.cach 6 786.31 2.85 4.8e-02 0.87  
## Nlh.cach 7 786.99 3.54 3.4e-02 0.91  
## Ntreatment.cach 7 787.04 3.59 3.3e-02 0.94  
## Nlandscape5.cach 6 787.44 3.98 2.7e-02 0.97  
## Nnull.cach 2 787.52 4.07 2.6e-02 0.99  
## Nmanagement.cach 10 790.19 6.74 6.9e-03 1.00  
## Nglobal.cach 21 806.92 23.46 1.6e-06 1.00

#summary: siteprod best model, landmetrics next, then disturbance, upstate, & landscape1

Nsiteprod.cach

##   
## Call:  
## pcount(formula = ~1 ~ PISoils + NSoilTypes + YearCat, data = cach.abund,   
## K = 40, mixture = "P")  
##   
## Abundance:  
## Estimate SE z P(>|z|)  
## (Intercept) 1.6073 0.3472 4.629 3.67e-06  
## PISoils 0.0357 0.0660 0.541 5.88e-01  
## NSoilTypes -0.1015 0.0697 -1.456 1.45e-01  
## YearCatB -0.3856 0.1400 -2.755 5.87e-03  
##   
## Detection:  
## Estimate SE z P(>|z|)  
## -1.13 0.461 -2.46 0.0138  
##   
## AIC: 783.4526

confint(Nsiteprod.cach, type="state",method="normal")

## 0.025 0.975  
## lam(Int) 0.92683086 2.28781473  
## lam(PISoils) -0.09360798 0.16502335  
## lam(NSoilTypes) -0.23818005 0.03511073  
## lam(YearCatB) -0.65988232 -0.11126884

Nlandmetrics.cach

##   
## Call:  
## pcount(formula = ~1 ~ Parea + ShapeIndex + YearCat, data = cach.abund,   
## K = 40, mixture = "P")  
##   
## Abundance:  
## Estimate SE z P(>|z|)  
## (Intercept) 1.6132 0.3486 4.627 3.71e-06  
## Parea -0.0867 0.0767 -1.130 2.58e-01  
## ShapeIndex -0.0505 0.0705 -0.716 4.74e-01  
## YearCatB -0.3811 0.1399 -2.724 6.45e-03  
##   
## Detection:  
## Estimate SE z P(>|z|)  
## -1.15 0.463 -2.48 0.0133  
##   
## AIC: 783.629

confint(Nlandmetrics.cach, type="state",method="normal")

## 0.025 0.975  
## lam(Int) 0.9298729 2.29655145  
## lam(Parea) -0.2370203 0.06362522  
## lam(ShapeIndex) -0.1887761 0.08770690  
## lam(YearCatB) -0.6552254 -0.10688742

Ndisturbance.cach

##   
## Call:  
## pcount(formula = ~1 ~ TimeSinceB + TimeSinceT + YearCat, data = cach.abund,   
## K = 40, mixture = "P")  
##   
## Abundance:  
## Estimate SE z P(>|z|)  
## (Intercept) 1.5433 0.3082 5.008 5.49e-07  
## TimeSinceB -0.0483 0.0729 -0.663 5.07e-01  
## TimeSinceT -0.0524 0.0829 -0.632 5.27e-01  
## YearCatB -0.3877 0.1418 -2.735 6.24e-03  
##   
## Detection:  
## Estimate SE z P(>|z|)  
## -1.04 0.416 -2.51 0.0121  
##   
## AIC: 784.9019

confint(Ndisturbance.cach, type="state",method="normal")

## 0.025 0.975  
## lam(Int) 0.9393671 2.14730452  
## lam(TimeSinceB) -0.1911890 0.09455542  
## lam(TimeSinceT) -0.2149768 0.11012687  
## lam(YearCatB) -0.6655524 -0.10982780

Nupstate.cach

##   
## Call:  
## pcount(formula = ~1 ~ TreeHt + Ccover + Parea + YearCat, data = cach.abund,   
## K = 40, mixture = "P")  
##   
## Abundance:  
## Estimate SE z P(>|z|)  
## (Intercept) 1.6416 0.3543 4.633 3.61e-06  
## TreeHt -0.0460 0.0783 -0.587 5.57e-01  
## Ccover -0.0490 0.0675 -0.726 4.68e-01  
## Parea -0.0903 0.0759 -1.190 2.34e-01  
## YearCatB -0.4382 0.1556 -2.817 4.85e-03  
##   
## Detection:  
## Estimate SE z P(>|z|)  
## -1.15 0.471 -2.44 0.0148  
##   
## AIC: 785.1841

confint(Nupstate.cach, type="state",method="normal")

## 0.025 0.975  
## lam(Int) 0.9470823 2.33606235  
## lam(TreeHt) -0.1993560 0.10740931  
## lam(Ccover) -0.1812217 0.08329256  
## lam(Parea) -0.2390670 0.05845091  
## lam(YearCatB) -0.7430506 -0.13329440

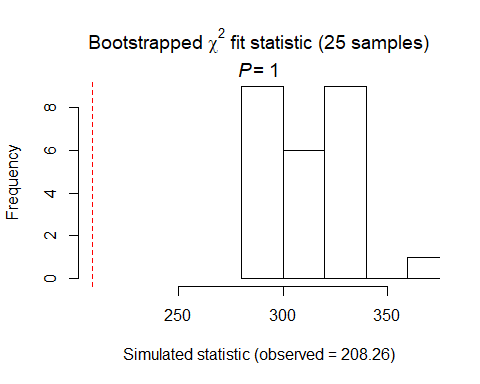
Nlandscape1.cach

##   
## Call:  
## pcount(formula = ~1 ~ Evergreen1km + OpenDev1km + Schrubs1km +   
## YearCat, data = cach.abund, K = 40, mixture = "P")  
##   
## Abundance:  
## Estimate SE z P(>|z|)  
## (Intercept) 1.58837 0.3337 4.7602 1.93e-06  
## Evergreen1km 0.00105 0.0707 0.0149 9.88e-01  
## OpenDev1km 0.10140 0.0682 1.4861 1.37e-01  
## Schrubs1km 0.04277 0.0658 0.6497 5.16e-01  
## YearCatB -0.39092 0.1405 -2.7817 5.41e-03  
##   
## Detection:  
## Estimate SE z P(>|z|)  
## -1.11 0.445 -2.48 0.013  
##   
## AIC: 785.3727

confint(Nlandscape1.cach, type="state",method="normal")

## 0.025 0.975  
## lam(Int) 0.93437775 2.2423565  
## lam(Evergreen1km) -0.13760327 0.1397122  
## lam(OpenDev1km) -0.03233517 0.2351272  
## lam(Schrubs1km) -0.08625353 0.1717990  
## lam(YearCatB) -0.66635591 -0.1154809

write.table(msN.cach@Full, file="C:/Users/woodj/Documents/GRAD SCHOOL - CLEMSON/Project-Specific/R work/USDA-songbirds/USDA-songbirds/cach\_top\_models\_msN.xls",sep="\t")



##   
## Chi-square goodness-of-fit for N-mixture model of 'unmarkedFitPCount' class  
##   
## Observed chi-square statistic = 208.2609   
## Number of bootstrap samples = 25  
## P-value = 1  
##   
## Quantiles of bootstrapped statistics:  
## 0% 25% 50% 75% 100%   
## 284 296 310 332 369   
##   
## Estimate of c-hat = 0.66

##   
## Chi-square goodness-of-fit for N-mixture model of 'unmarkedFitPCount' class  
##   
## Observed chi-square statistic = 208.2609

# using second best DC model (would be TIME but didn't put in or run yet)  
null.cach <- pcount(~ Time ~1, cach.abund, mixture="P", K=40)  
global.cach <- pcount(~ Jdate  
 ~ Treatment + Herbicide + BA + Nsnags +Ccover  
 + Ldepth + TreeHt + Age + TimeSinceB + TimeSinceT + Nthins  
 + HW\_dens\_1050 + FG\_herb + FG\_shrub + NHW\_saplings  
 + PISoils + NSoilTypes  
 + Parea + ShapeIndex + YearCat  
 , cach.abund, mixture="P", K=40)  
local.cach <- pcount(~ Time  
 ~ Ccover + TreeHt + Ldepth + YearCat  
 , cach.abund, mixture="P", K=40) #can only include BA OR CCover  
lh.cach <- pcount(~ Time  
 ~ TreeHt + Ccover + Nsnags + Rel\_HW2P\_canopy + YearCat  
 , cach.abund, mixture="P", K=40)  
landmetrics.cach <- pcount (~ Time  
 ~ Parea + ShapeIndex + YearCat  
 , cach.abund, mixture="P",K=40)  
landscape500.cach <- pcount(~ Time  
 ~ Evergreen500m + OpenDev500m + Schrubs500m + Ag500m + YearCat  
 , cach.abund, mixture="P", K=40)  
landscape1.cach <- pcount(~ Time  
 ~ Evergreen1km + OpenDev1km + Schrubs1km + YearCat  
 , cach.abund, mixture="P", K=40)  
landscape5.cach <- pcount(~ Time  
 ~ Evergreen5km + OpenDev5km + Schrubs1km + YearCat  
 , cach.abund, mixture="P", K=40)  
landscape30.cach <- pcount(~ Time  
 ~ Evergreen30km + OpenDev30km + YearCat  
 , cach.abund, mixture="P", K=40)  
treatment.cach <- pcount(~ Time  
 ~ Treatment + Nthins + YearCat  
 , cach.abund, mixture ="P", K=40)  
management.cach <- pcount(~ Time  
 ~ Treatment + BA + TimeSinceB + TimeSinceT + Herbicide + YearCat  
 , cach.abund, mixture="P", K=40)  
disturbance.cach <- pcount(~ Time  
 ~ TimeSinceB + TimeSinceT + YearCat  
 , cach.abund, mixture="P", K=40)  
siteprod.cach <- pcount(~ Time ~ PISoils + NSoilTypes + YearCat  
 , cach.abund, mixture="P", K=40) #FPSiteIndex removed  
upstate.cach <- pcount(~ Time  
 ~ TreeHt + Ccover + Parea + YearCat, cach.abund, mixture="P", K=40)  
coord.cach <- pcount (~Time + Noise + Time ~ Latitude + Longitude + YearCat  
 , cach.abund, mixture="P", K=40)  
  
  
fmsCACH <- fitList(null.cach, global.cach, local.cach, lh.cach, landmetrics.cach,  
 landscape500.cach, landscape1.cach, landscape5.cach, landscape30.cach,  
 treatment.cach, management.cach, disturbance.cach,  
 siteprod.cach, upstate.cach, coord.cach)

## Warning in fitList(null.cach, global.cach, local.cach, lh.cach,  
## landmetrics.cach, : Your list was unnamed, so model names were added as  
## object names

ms.cach <- modSel(fmsCACH)  
ms.cach

## nPars AIC delta AICwt cumltvWt  
## siteprod.cach 6 784.78 0.00 2.1e-01 0.21  
## landmetrics.cach 6 785.02 0.24 1.8e-01 0.39  
## disturbance.cach 6 786.15 1.37 1.0e-01 0.50  
## upstate.cach 7 786.63 1.85 8.2e-02 0.58  
## landscape1.cach 7 786.76 1.98 7.7e-02 0.66  
## landscape500.cach 8 786.95 2.17 7.0e-02 0.73  
## landscape30.cach 6 787.12 2.34 6.4e-02 0.79  
## local.cach 7 787.65 2.87 4.9e-02 0.84  
## treatment.cach 8 788.28 3.50 3.6e-02 0.88  
## lh.cach 8 788.39 3.61 3.4e-02 0.91  
## landscape5.cach 7 788.68 3.90 2.9e-02 0.94  
## null.cach 3 788.80 4.01 2.8e-02 0.97  
## coord.cach 7 788.93 4.15 2.6e-02 0.99  
## management.cach 11 791.62 6.84 6.8e-03 1.00  
## global.cach 25 810.70 25.92 4.9e-07 1.00

#ms.cach@Full

^# same results as with null DCs

#write.table(ms.cch@Full, file="C:/Users/woodj/Documents/GRAD SCHOOL - CLEMSON/Project-Specific/R work/USDA-songbirds/USDA-songbirds/cach\_top\_models\_ms.xls",sep="\t")

CACH summary: P distribution DCs: null best, time second best, then weather, then date SCs, using null: Site prod best (- with YearB,) landmetrics next (- with YearB) then disturbance (- with YearB) then upstate (- with YearB) then landscape1 (- with YearB)

SCs, using Time: all same.

# EABL

eabl.abund<- csvToUMF("eabl\_abund.csv", long = FALSE, type = "unmarkedFramePCount")  
#summary(eabl.abund)  
#str(eabl.abund)  
#scale all observation covariates (covs of detection)  
obsCovs(eabl.abund)= scale (obsCovs(eabl.abund))  
#select particular site covariates to scale below  
sc <- siteCovs(eabl.abund)  
sc[,c(6:77)] <- scale(sc[, c(6:77)])  
siteCovs(eabl.abund) <- sc

#run this when have CSV with both years  
null.eabl <- pcount(~Jdate + Noise + Time ~1, eabl.abund, mixture="P", K=40)  
year.eabl <- pcount(~Jdate + Noise + Time ~ YearCat, eabl.abund, mixture="P", K=40)  
fms.year.eabl<- fitList(null.eabl, year.eabl)

## Warning in fitList(null.eabl, year.eabl): Your list was unnamed, so model  
## names were added as object names

year.ms.eabl<-modSel(fms.year.eabl)  
year.ms.eabl

## nPars AIC delta AICwt cumltvWt  
## null.eabl 5 513.47 0.00 0.69 0.69  
## year.eabl 6 515.05 1.58 0.31 1.00

^null best but year <d.2

#detection covariates first  
det.null.eabl <- pcount(~1 ~1, eabl.abund, mixture="P", K=15)  
det.weather.eabl <- pcount(~ Wind + Sky ~1, eabl.abund, mixture="P", K=15)  
det.global.eabl <- pcount(~ Jdate + Wind + Sky + Noise +Time ~1, eabl.abund, mixture="P", K=15)  
det.sound.eabl <- pcount(~ Noise + Wind ~1, eabl.abund, mixture="P", K=15)  
det.date.eabl <- pcount(~ Jdate ~1, eabl.abund, mixture="P", K=15)  
det.detect.eabl <- pcount(~ Jdate + Noise + Time ~1, eabl.abund, mixture="P", K=15)  
det.notdate.eabl <-pcount(~ Wind + Sky + Noise ~1, eabl.abund, mixture="P", K=15)  
det.time.eabl <-pcount(~ Time ~1, eabl.abund, mixture="P",K=15)  
det.timing.eabl <-pcount(~ Time + Jdate ~1, eabl.abund, mixture="P", K=15)  
  
fmsDC <- fitList(det.null.eabl, det.weather.eabl, det.global.eabl,  
 det.sound.eabl, det.date.eabl, det.detect.eabl, det.notdate.eabl,  
 det.time.eabl, det.timing.eabl)

## Warning in fitList(det.null.eabl, det.weather.eabl, det.global.eabl,  
## det.sound.eabl, : Your list was unnamed, so model names were added as  
## object names

msDC.eabl <- modSel(fmsDC)  
msDC.eabl

## nPars AIC delta AICwt cumltvWt  
## det.date.eabl 3 509.83 0.000 0.3105 0.31  
## det.null.eabl 2 509.92 0.091 0.2966 0.61  
## det.timing.eabl 4 511.64 1.815 0.1253 0.73  
## det.time.eabl 3 511.91 2.088 0.1093 0.84  
## det.detect.eabl 5 513.47 3.642 0.0503 0.89  
## det.sound.eabl 4 513.80 3.978 0.0425 0.93  
## det.weather.eabl 4 513.82 3.996 0.0421 0.98  
## det.notdate.eabl 5 515.76 5.937 0.0160 0.99  
## det.global.eabl 7 517.27 7.448 0.0075 1.00

#msDC.eabl@Full  
#summary: date is best, closely followed by null, timing is also <2

det.date.eabl #non-sig with Jdate

##   
## Call:  
## pcount(formula = ~Jdate ~ 1, data = eabl.abund, K = 15, mixture = "P")  
##   
## Abundance:  
## Estimate SE z P(>|z|)  
## 0.213 0.177 1.2 0.229  
##   
## Detection:  
## Estimate SE z P(>|z|)  
## (Intercept) -0.606 0.260 -2.33 0.0199  
## Jdate 0.157 0.109 1.43 0.1515  
##   
## AIC: 509.8266

confint(det.date.eabl, type="det",method="normal")

## 0.025 0.975  
## p(Int) -1.11594103 -0.09569987  
## p(Jdate) -0.05746383 0.37091676

confint(det.date.eabl, type="state",method="normal")

## 0.025 0.975  
## lam(Int) -0.1344351 0.5607625

write.table(msDC.eabl@Full, file="C:/Users/woodj/Documents/GRAD SCHOOL - CLEMSON/Project-Specific/R work/USDA-songbirds/USDA-songbirds/eabl\_top\_models\_msDC.xls",sep="\t")

#site covariates using detection covariates (date)  
null.eabl <- pcount(~ Jdate ~1, eabl.abund, mixture="P", K=80)  
global.eabl <- pcount(~ Jdate  
 ~ Treatment + Herbicide + BA + Nsnags +Ccover  
 + Ldepth + TreeHt + Age + TimeSinceB + TimeSinceT + Nthins  
 + HW\_dens\_1050 + FG\_herb + NHW\_saplings  
 + PISoils + NSoilTypes  
 + Parea + ShapeIndex + YearCat  
 , eabl.abund, mixture="P", K=80)  
local.eabl <- pcount(~ Jdate  
 ~ Ccover + TreeHt + Ldepth + YearCat  
 , eabl.abund, mixture="P", K=80) #can only include BA OR CCover  
lh.eabl <- pcount(~ Jdate  
 ~ BA + FG\_herb + HW\_dens\_1050 + NHW\_saplings + Nsnags + YearCat  
 , eabl.abund, mixture="P", K=80)  
# covariates: BA, canopy cover, low height and mid-height veg (lack thereof), cavities  
landmetrics.eabl <- pcount (~ Jdate  
 ~ Parea + ShapeIndex + YearCat  
 , eabl.abund, mixture="P",K=80)  
landscape500.eabl <- pcount(~ Jdate  
 ~ Grass500m + OpenDev500m + Schrubs500m + Ag500m + YearCat  
 , eabl.abund, mixture="P", K=80)  
landscape1.eabl <- pcount(~ Jdate  
 ~ Grass1km + OpenDev1km + Schrubs1km + Ag1km + YearCat  
 , eabl.abund, mixture="P", K=80)  
landscape5.eabl <- pcount(~ Jdate  
 ~ Grass5km + OpenDev5km + Schrubs5km + YearCat  
 , eabl.abund, mixture="P", K=80)  
landscape30.eabl <- pcount(~ Jdate  
 ~ Grass30km + OpenDev30km + YearCat  
 , eabl.abund, mixture="P", K=80)  
treatment.eabl <- pcount(~ Jdate  
 ~ Treatment + Nthins + YearCat  
 , eabl.abund, mixture ="P", K=80)  
management.eabl <- pcount(~ Jdate  
 ~ Treatment + BA + TimeSinceB + TimeSinceT + Herbicide + YearCat  
 , eabl.abund, mixture="P", K=80)  
disturbance.eabl <- pcount(~ Jdate  
 ~ TimeSinceB + TimeSinceT + YearCat  
 , eabl.abund, mixture="P", K=80)  
siteprod.eabl <- pcount(~ Jdate ~ PISoils + NSoilTypes + YearCat  
 , eabl.abund, mixture="P", K=80) # + FPSiteIndex  
#upstate.eabl <- pcount(~ Jdate ~ X + Y + Z, eabl.abund, mixture="P", K=80)  
coord.eabl <- pcount (~Jdate + Noise + Time ~ Latitude + Longitude + YearCat  
 , eabl.abund, mixture="P", K=80)  
  
fmsEABL <- fitList(null.eabl, global.eabl, local.eabl, lh.eabl, landmetrics.eabl,  
 landscape500.eabl, landscape1.eabl, landscape5.eabl, landscape30.eabl,  
 treatment.eabl, management.eabl, disturbance.eabl,  
 siteprod.eabl, coord.eabl)

## Warning in fitList(null.eabl, global.eabl, local.eabl, lh.eabl,  
## landmetrics.eabl, : Your list was unnamed, so model names were added as  
## object names

ms.eabl <- modSel(fmsEABL) #note this does not include upstate  
ms.eabl

## nPars AIC delta AICwt cumltvWt  
## lh.eabl 9 503.23 0.00 7.3e-01 0.73  
## landmetrics.eabl 6 505.77 2.53 2.0e-01 0.93  
## null.eabl 3 509.83 6.59 2.7e-02 0.96  
## local.eabl 7 510.22 6.99 2.2e-02 0.98  
## landscape1.eabl 8 512.92 9.68 5.7e-03 0.98  
## management.eabl 11 513.64 10.41 4.0e-03 0.99  
## landscape30.eabl 6 514.27 11.03 2.9e-03 0.99  
## landscape5.eabl 7 514.48 11.25 2.6e-03 0.99  
## disturbance.eabl 6 514.68 11.44 2.4e-03 1.00  
## siteprod.eabl 6 514.77 11.53 2.3e-03 1.00  
## coord.eabl 8 516.77 13.53 8.4e-04 1.00  
## landscape500.eabl 8 517.14 13.90 6.9e-04 1.00  
## treatment.eabl 8 519.01 15.77 2.7e-04 1.00  
## global.eabl 24 521.44 18.20 8.1e-05 1.00

#ms.eabl@Full  
#LH best and only under 2.0 (land metrics pushed out)

lh.eabl

##   
## Call:  
## pcount(formula = ~Jdate ~ BA + FG\_herb + HW\_dens\_1050 + NHW\_saplings +   
## Nsnags + YearCat, data = eabl.abund, K = 80, mixture = "P")  
##   
## Abundance:  
## Estimate SE z P(>|z|)  
## (Intercept) 0.1575 0.2510 0.627 0.530362  
## BA -0.3408 0.1270 -2.683 0.007290  
## FG\_herb -0.1226 0.1332 -0.920 0.357695  
## HW\_dens\_1050 0.1949 0.1334 1.461 0.144042  
## NHW\_saplings -0.0947 0.1174 -0.807 0.419937  
## Nsnags 0.3023 0.0905 3.342 0.000832  
## YearCatB 0.1587 0.2287 0.694 0.487651  
##   
## Detection:  
## Estimate SE z P(>|z|)  
## (Intercept) -0.808 0.309 -2.62 0.00879  
## Jdate 0.139 0.106 1.31 0.18995  
##   
## AIC: 503.2349

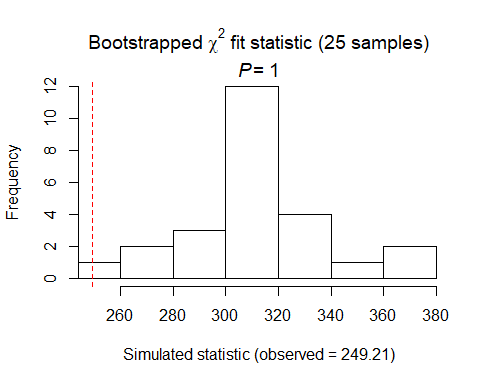
confint(lh.eabl, type="state",method="normal")

## 0.025 0.975  
## lam(Int) -0.33450946 0.64953734  
## lam(BA) -0.58967641 -0.09186212  
## lam(FG\_herb) -0.38370189 0.13859843  
## lam(HW\_dens\_1050) -0.06658363 0.45640465  
## lam(NHW\_saplings) -0.32481200 0.13542374  
## lam(Nsnags) 0.12501799 0.47959065  
## lam(YearCatB) -0.28945686 0.60685194

LH (- with BA, + with Nsnags)

write.table(ms.eabl@Full, file="C:/Users/woodj/Documents/GRAD SCHOOL - CLEMSON/Project-Specific/R work/USDA-songbirds/USDA-songbirds/XXX\_top\_models\_msX.xls",sep="\t")

## Warning in rbinom(M \* J, size = rep(N, each = J), prob = pvec): NAs  
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## produced



##   
## Chi-square goodness-of-fit for N-mixture model of 'unmarkedFitPCount' class  
##   
## Observed chi-square statistic = 249.2052   
## Number of bootstrap samples = 25  
## P-value = 1  
##   
## Quantiles of bootstrapped statistics:  
## 0% 25% 50% 75% 100%   
## 255 301 314 321 376   
##   
## Estimate of c-hat = 0.8

##   
## Chi-square goodness-of-fit for N-mixture model of 'unmarkedFitPCount' class  
##   
## Observed chi-square statistic = 249.2052

EABL summary P distribution SCs: date (non-sig), null, timing all under 2.0 DCs using date model: LH only top model (- with BA, + with Nsnags)

# EAWP

# EAWP (forests (prefer deciduious or more edgy?), tree-nester, flycatching, insectivore)

# covariates: less canopy cover? less dense stand? hardwoody?

eawp.abund<- csvToUMF("eawp\_abund.csv", long = FALSE, type = "unmarkedFramePCount")  
#summary(eawp.abund)  
#str(eawp.abund)  
#scale all observation covariates (covs of detection)  
obsCovs(eawp.abund)= scale (obsCovs(eawp.abund))  
#select particular site covariates to scale below  
sc <- siteCovs(eawp.abund)  
sc[,c(6:77)] <- scale(sc[, c(6:77)])  
siteCovs(eawp.abund) <- sc

#run this when have CSV with both years  
null.eawp <- pcount(~Jdate + Noise + Time ~1, eawp.abund, mixture="P", K=40)  
year.eawp <- pcount(~Jdate + Noise + Time ~ YearCat, eawp.abund, mixture="P", K=40)  
fms.year.eawp<- fitList(null.eawp, year.eawp)

## Warning in fitList(null.eawp, year.eawp): Your list was unnamed, so model  
## names were added as object names

year.ms.eawp<-modSel(fms.year.eawp)  
year.ms.eawp

## nPars AIC delta AICwt cumltvWt  
## null.eawp 5 596.87 0.00 0.68 0.68  
## year.eawp 6 598.34 1.47 0.32 1.00

^ null ranked higher but year 1.47 <2

#detection covariates first  
det.null.eawp <- pcount(~1 ~1, eawp.abund, mixture="P", K=15)  
det.weather.eawp <- pcount(~ Wind + Sky ~1, eawp.abund, mixture="P", K=15)  
det.global.eawp <- pcount(~ Jdate + Wind + Sky + Noise +Time ~1, eawp.abund, mixture="P", K=15)  
det.sound.eawp <- pcount(~ Noise + Wind ~1, eawp.abund, mixture="P", K=15)  
det.date.eawp <- pcount(~ Jdate ~1, eawp.abund, mixture="P", K=15)  
det.detect.eawp <- pcount(~ Jdate + Noise + Time ~1, eawp.abund, mixture="P", K=15)  
det.notdate.eawp <-pcount(~ Wind + Sky + Noise ~1, eawp.abund, mixture="P", K=15)  
det.time.eawp <-pcount(~ Time ~1, eawp.abund, mixture="P",K=15)  
det.timing.eawp <-pcount(~ Time + Jdate ~1, eawp.abund, mixture="P", K=15)  
  
fmsDC <- fitList(det.null.eawp, det.weather.eawp, det.global.eawp,  
 det.sound.eawp, det.date.eawp, det.detect.eawp, det.notdate.eawp,  
 det.time.eawp, det.timing.eawp)

## Warning in fitList(det.null.eawp, det.weather.eawp, det.global.eawp,  
## det.sound.eawp, : Your list was unnamed, so model names were added as  
## object names

msDC.eawp <- modSel(fmsDC)  
msDC.eawp

## nPars AIC delta AICwt cumltvWt  
## det.weather.eawp 4 592.28 0.00 0.242 0.24  
## det.null.eawp 2 592.46 0.18 0.221 0.46  
## det.time.eawp 3 593.84 1.56 0.111 0.57  
## det.notdate.eawp 5 594.01 1.73 0.102 0.68  
## det.date.eawp 3 594.28 2.00 0.089 0.76  
## det.global.eawp 7 594.42 2.15 0.083 0.85  
## det.sound.eawp 4 594.56 2.28 0.077 0.93  
## det.timing.eawp 4 595.41 3.13 0.051 0.98  
## det.detect.eawp 5 596.87 4.59 0.024 1.00

#msDC.ybch@Full  
#summary: weather best model (wind, sky) then null then time then notdate <2

det.weather.eawp

##   
## Call:  
## pcount(formula = ~Wind + Sky ~ 1, data = eawp.abund, K = 15,   
## mixture = "P")  
##   
## Abundance:  
## Estimate SE z P(>|z|)  
## 0.275 0.123 2.23 0.0255  
##   
## Detection:  
## Estimate SE z P(>|z|)  
## (Intercept) -0.0222 0.199 -0.112 0.911  
## Wind -0.1493 0.111 -1.341 0.180  
## Sky 0.1771 0.109 1.619 0.105  
##   
## AIC: 592.2759

confint(det.weather.eawp, type="det",method="normal")

## 0.025 0.975  
## p(Int) -0.41248214 0.36806052  
## p(Wind) -0.36752496 0.06886577  
## p(Sky) -0.03723459 0.39145868

confint(det.weather.eawp, type="state",method="normal")

## 0.025 0.975  
## lam(Int) 0.03375248 0.5164475

write.table(msDC.eawp@Full, file="C:/Users/woodj/Documents/GRAD SCHOOL - CLEMSON/Project-Specific/R work/USDA-songbirds/USDA-songbirds/eawp\_top\_models\_msDC.xls",sep="\t")

#more appropriate detection covariates (weather - wind + sky)  
null.eawp <- pcount(~ Wind + Sky ~1, eawp.abund, mixture="P", K=40)  
global.eawp <- pcount(~ Wind + Sky  
 ~ Treatment + Herbicide + BA +Ccover  
 + Ldepth + TreeHt + TimeSinceB + TimeSinceT + Nthins  
 + NHW\_saplings + Rel\_HW2P\_canopy  
 + PISoils + NSoilTypes  
 + Parea + ShapeIndex + YearCat  
 , eawp.abund, mixture="P", K=40)  
#took out: Nsnags, Age, FPSiteIndex + HW\_dens\_1050 + FG\_herb + FG\_shrub + NP\_over\_20cm  
local.eawp <- pcount(~ Wind + Sky  
 ~ Ccover + TreeHt + Ldepth + YearCat  
 , eawp.abund, mixture="P", K=40) #can only include BA OR CCover  
lh.eawp <- pcount(~ Wind + Sky  
 ~ Rel\_HW2P\_canopy + Ccover + NHW\_saplings + YearCat  
 , eawp.abund, mixture="P", K=40)  
landmetrics.eawp <- pcount (~ Wind + Sky  
 ~ Parea + ShapeIndex + YearCat  
 , eawp.abund, mixture="P",K=40)  
landscape500.eawp <- pcount(~ Wind + Sky  
 ~ Evergreen500m + Ag500m + HighDev500m + YearCat  
 , eawp.abund, mixture="P", K=40)  
landscape1.eawp <- pcount(~ Wind + Sky  
 ~ Evergreen1km + HighDev1km + YearCat  
 , eawp.abund, mixture="P", K=40)  
landscape5.eawp <- pcount(~ Wind + Sky  
 ~ Evergreen5km + HighDev5km + YearCat  
 , eawp.abund, mixture="P", K=40)  
landscape30.eawp <- pcount(~ Wind + Sky  
 ~ Evergreen30km + HighDev30km + YearCat  
 , eawp.abund, mixture="P", K=40) #protected removed  
treatment.eawp <- pcount(~ Wind + Sky  
 ~ Treatment + Nthins + YearCat  
 , eawp.abund, mixture ="P", K=40)  
management.eawp <- pcount(~ Wind + Sky  
 ~ Treatment + BA + TimeSinceB + TimeSinceT + Herbicide + YearCat  
 , eawp.abund, mixture="P", K=40)  
disturbance.eawp <- pcount(~ Wind + Sky  
 ~ TimeSinceB + TimeSinceT + YearCat  
 , eawp.abund, mixture="P", K=40)  
siteprod.eawp <- pcount(~ Wind + Sky ~ PISoils + NSoilTypes + YearCat  
 , eawp.abund, mixture="P", K=40) #FPSiteIndex out  
#upstate.eawp <- pcount(~ Wind + Sky ~ X + Y + Z, eawp.abund, mixture="P", K=40)  
coord.eawp <- pcount (~ Wind + Sky ~ Latitude + Longitude + YearCat  
 , eawp.abund, mixture="P", K=40)  
  
fms <- fitList(null.eawp, global.eawp, local.eawp, lh.eawp, landmetrics.eawp,  
 landscape500.eawp, landscape1.eawp, landscape5.eawp, landscape30.eawp,  
 treatment.eawp, management.eawp, disturbance.eawp,  
 siteprod.eawp, coord.eawp)

## Warning in fitList(null.eawp, global.eawp, local.eawp, lh.eawp,  
## landmetrics.eawp, : Your list was unnamed, so model names were added as  
## object names

ms.eawp <- modSel(fms) #note this does not include upstate or FPSiteIndex  
ms.eawp

## nPars AIC delta AICwt cumltvWt  
## treatment.eawp 9 586.81 0.00 0.42450 0.42  
## disturbance.eawp 7 588.48 1.67 0.18448 0.61  
## landscape500.eawp 8 588.87 2.06 0.15180 0.76  
## management.eawp 12 589.58 2.77 0.10641 0.87  
## landscape5.eawp 7 591.90 5.09 0.03333 0.90  
## local.eawp 8 592.23 5.42 0.02827 0.93  
## null.eawp 4 592.28 5.47 0.02759 0.96  
## lh.eawp 8 593.04 6.23 0.01884 0.98  
## landscape1.eawp 7 593.98 7.17 0.01178 0.99  
## coord.eawp 7 595.70 8.89 0.00498 0.99  
## landscape30.eawp 7 596.65 9.84 0.00310 1.00  
## siteprod.eawp 7 596.94 10.13 0.00268 1.00  
## landmetrics.eawp 7 597.49 10.69 0.00203 1.00  
## global.eawp 22 601.88 15.07 0.00023 1.00

#ms.eawp@Full  
#summary: treatment, disturbance

treatment.eawp

##   
## Call:  
## pcount(formula = ~Wind + Sky ~ Treatment + Nthins + YearCat,   
## data = eawp.abund, K = 40, mixture = "P")  
##   
## Abundance:  
## Estimate SE z P(>|z|)  
## (Intercept) -0.33761 0.319 -1.0588 0.2897  
## Treatment1B 0.47063 0.372 1.2636 0.2064  
## Treatment2B 0.74097 0.351 2.1091 0.0349  
## Treatment3B 0.95130 0.370 2.5725 0.0101  
## Nthins 0.08504 0.107 0.7936 0.4274  
## YearCatB 0.00397 0.198 0.0201 0.9840  
##   
## Detection:  
## Estimate SE z P(>|z|)  
## (Intercept) -0.127 0.227 -0.559 0.576  
## Wind -0.147 0.111 -1.321 0.186  
## Sky 0.169 0.107 1.582 0.114  
##   
## AIC: 586.8088

confint(treatment.eawp, type="state",method="normal")

## 0.025 0.975  
## lam(Int) -0.9626065 0.2873787  
## lam(Treatment1B) -0.2593672 1.2006292  
## lam(Treatment2B) 0.0523871 1.4295497  
## lam(Treatment3B) 0.2265158 1.6760856  
## lam(Nthins) -0.1249862 0.2950739  
## lam(YearCatB) -0.3833404 0.3912847

disturbance.eawp

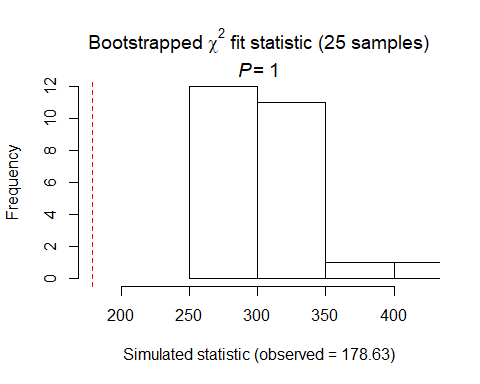
##   
## Call:  
## pcount(formula = ~Wind + Sky ~ TimeSinceB + TimeSinceT + YearCat,   
## data = eawp.abund, K = 40, mixture = "P")  
##   
## Abundance:  
## Estimate SE z P(>|z|)  
## (Intercept) 0.2379 0.169 1.406 0.15978  
## TimeSinceB -0.3667 0.131 -2.790 0.00527  
## TimeSinceT 0.0946 0.104 0.914 0.36084  
## YearCatB 0.0400 0.196 0.203 0.83878  
##   
## Detection:  
## Estimate SE z P(>|z|)  
## (Intercept) -0.0953 0.220 -0.434 0.664  
## Wind -0.1477 0.112 -1.324 0.185  
## Sky 0.1609 0.107 1.501 0.133  
##   
## AIC: 588.4756

confint(disturbance.eawp, type="state",method="normal")

## 0.025 0.975  
## lam(Int) -0.09375929 0.5694852  
## lam(TimeSinceB) -0.62426313 -0.1090747  
## lam(TimeSinceT) -0.10830305 0.2974900  
## lam(YearCatB) -0.34514116 0.4250940

write.table(ms.eawp@Full, file="C:/Users/woodj/Documents/GRAD SCHOOL - CLEMSON/Project-Specific/R work/USDA-songbirds/USDA-songbirds/eawp\_top\_models\_ms.xls",sep="\t")

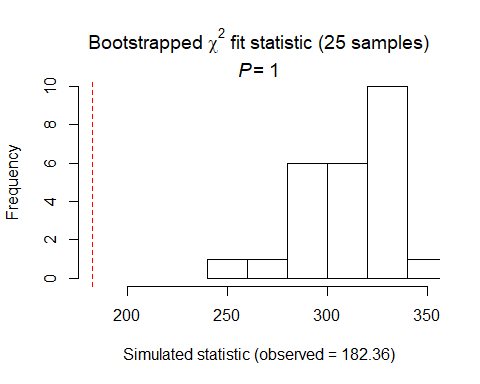
## Warning in rbinom(M \* J, size = rep(N, each = J), prob = pvec): NAs  
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## Warning in rbinom(M \* J, size = rep(N, each = J), prob = pvec): NAs  
## produced



##   
## Chi-square goodness-of-fit for N-mixture model of 'unmarkedFitPCount' class  
##   
## Observed chi-square statistic = 178.6298   
## Number of bootstrap samples = 25  
## P-value = 1  
##   
## Quantiles of bootstrapped statistics:  
## 0% 25% 50% 75% 100%   
## 251 282 301 319 424   
##   
## Estimate of c-hat = 0.59

##   
## Chi-square goodness-of-fit for N-mixture model of 'unmarkedFitPCount' class  
##   
## Observed chi-square statistic = 178.6298

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## produced  
  
## Warning in rbinom(M \* J, size = rep(N, each = J), prob = pvec): NAs  
## produced  
  
## Warning in rbinom(M \* J, size = rep(N, each = J), prob = pvec): NAs  
## produced  
  
## Warning in rbinom(M \* J, size = rep(N, each = J), prob = pvec): NAs  
## produced  
  
## Warning in rbinom(M \* J, size = rep(N, each = J), prob = pvec): NAs  
## produced  
  
## Warning in rbinom(M \* J, size = rep(N, each = J), prob = pvec): NAs  
## produced



##   
## Chi-square goodness-of-fit for N-mixture model of 'unmarkedFitPCount' class  
##   
## Observed chi-square statistic = 182.3636   
## Number of bootstrap samples = 25  
## P-value = 1  
##   
## Quantiles of bootstrapped statistics:  
## 0% 25% 50% 75% 100%   
## 248 294 318 333 350   
##   
## Estimate of c-hat = 0.58

##   
## Chi-square goodness-of-fit for N-mixture model of 'unmarkedFitPCount' class  
##   
## Observed chi-square statistic = 182.3636

EAWP Summary P distribution DCs: weather (none actually sig), null, time, notdate SCs using weather: Treatment (+ with 2B, + with 3B) Disturbance (- with TimeSinceB)

# INBU

# (foliage gleaner, shrub-nesting, insects, open woodland habitat & EDGES)

# covariates: grasses, shrub density, within a meter above ground, low branches, tree age

inbu.abund<- csvToUMF("inbu\_abund.csv", long = FALSE, type = "unmarkedFramePCount")  
#summary(inbu.abund)  
#str(inbu.abund)  
#scale all observation covariates (covs of detection)  
obsCovs(inbu.abund)= scale (obsCovs(inbu.abund))  
#select particular site covariates to scale below  
sc <- siteCovs(inbu.abund)  
sc[,c(6:77)] <- scale(sc[, c(6:77)]) #from 26 to 74 +landscape+soils  
siteCovs(inbu.abund) <- sc

#run this when have CSV with both years  
null.inbu <- pcount(~Jdate + Noise + Time ~1, inbu.abund, mixture="P", K=40)  
year.inbu <- pcount(~Jdate + Noise + Time ~ YearCat, inbu.abund, mixture="P", K=40)  
fms.year.inbu<- fitList(null.inbu, year.inbu)

## Warning in fitList(null.inbu, year.inbu): Your list was unnamed, so model  
## names were added as object names

year.ms.inbu<-modSel(fms.year.inbu)  
year.ms.inbu

## nPars AIC delta AICwt cumltvWt  
## year.inbu 6 621.62 0.00 0.968 0.97  
## null.inbu 5 628.43 6.81 0.032 1.00

^ definite year effect - null model is way above 2.0

#detection covariates first  
det.null.inbu <- pcount(~1 ~1, inbu.abund, mixture="P", K=15)  
det.weather.inbu <- pcount(~ Wind + Sky ~1, inbu.abund, mixture="P", K=15)  
det.global.inbu <- pcount(~ Jdate + Wind + Sky + Noise +Time ~1, inbu.abund, mixture="P", K=15)  
det.sound.inbu <- pcount(~ Noise + Wind ~1, inbu.abund, mixture="P", K=15)  
det.date.inbu <- pcount(~ Jdate ~1, inbu.abund, mixture="P", K=15)  
det.detect.inbu <- pcount(~ Jdate + Noise + Time ~1, inbu.abund, mixture="P", K=15)  
det.notdate.inbu <-pcount(~ Wind + Sky + Noise ~1, inbu.abund, mixture="P", K=15)  
det.time.inbu <-pcount(~ Time ~1, inbu.abund, mixture="P",K=15)  
det.timing.inbu <-pcount(~ Time + Jdate ~1, inbu.abund, mixture="P", K=15)  
  
fmsDC <- fitList(det.null.inbu, det.weather.inbu, det.global.inbu,  
 det.sound.inbu, det.date.inbu, det.detect.inbu, det.notdate.inbu,  
 det.time.inbu, det.timing.inbu)

## Warning in fitList(det.null.inbu, det.weather.inbu, det.global.inbu,  
## det.sound.inbu, : Your list was unnamed, so model names were added as  
## object names

msDC.inbu <- modSel(fmsDC)  
msDC.inbu

## nPars AIC delta AICwt cumltvWt  
## det.detect.inbu 5 628.43 0.00 4.7e-01 0.47  
## det.global.inbu 7 629.32 0.89 3.0e-01 0.78  
## det.date.inbu 3 630.60 2.16 1.6e-01 0.94  
## det.timing.inbu 4 632.46 4.02 6.3e-02 1.00  
## det.sound.inbu 4 645.98 17.54 7.3e-05 1.00  
## det.time.inbu 3 646.49 18.05 5.7e-05 1.00  
## det.null.inbu 2 646.59 18.16 5.4e-05 1.00  
## det.notdate.inbu 5 647.78 19.34 3.0e-05 1.00  
## det.weather.inbu 4 649.98 21.55 9.9e-06 1.00

#msDC.inbu@Full  
#summary: detect (Date+Noise+Time) first, then global

det.detect.inbu

##   
## Call:  
## pcount(formula = ~Jdate + Noise + Time ~ 1, data = inbu.abund,   
## K = 15, mixture = "P")  
##   
## Abundance:  
## Estimate SE z P(>|z|)  
## 0.444 0.129 3.45 0.000552  
##   
## Detection:  
## Estimate SE z P(>|z|)  
## (Intercept) -0.29571 0.205 -1.4444 1.49e-01  
## Jdate 0.42357 0.105 4.0295 5.59e-05  
## Noise -0.27113 0.111 -2.4383 1.48e-02  
## Time -0.00882 0.104 -0.0846 9.33e-01  
##   
## AIC: 628.433

confint(det.detect.inbu, type="det",method="normal")

## 0.025 0.975  
## p(Int) -0.6969860 0.10556422  
## p(Jdate) 0.2175462 0.62960162  
## p(Noise) -0.4890688 -0.05319096  
## p(Time) -0.2131413 0.19550033

confint(det.detect.inbu, type="state",method="normal")

## 0.025 0.975  
## lam(Int) 0.1920285 0.695858

^ Detect best model (+Date,-Noise), global next best model

write.table(msDC.inbu@Full, file="C:/Users/woodj/Documents/GRAD SCHOOL - CLEMSON/Project-Specific/R work/USDA-songbirds/USDA-songbirds/inbu\_top\_models\_msDC.xls",sep="\t")

#not using for now  
#predict(det.detect.inbu, type="det") #gave me 204 rows...  
#backTransform(det.detect.inbu, "psi", method=normal)

#more appropriate detection covariates (detect best model)  
null.inbu <- pcount(~ Jdate + Noise + Time ~1, inbu.abund, mixture="P", K=40)  
global.inbu <- pcount(~ Jdate + Noise + Time  
 ~ Treatment + Herbicide + BA +Ccover  
 + Ldepth + TreeHt + Age + TimeSinceB + TimeSinceT + Nthins  
 + HW\_dens\_1050 + FG\_herb + FG\_shrub + NHW\_saplings  
 + PISoils + NSoilTypes  
 + Parea + ShapeIndex + YearCat  
 , inbu.abund, mixture="P", K=40)  
#doesn't include FPSiteIndex + NP\_over\_20cm + Rel\_HW2P\_canopy + Nsnags  
local.inbu <- pcount(~ Jdate + Noise + Time  
 ~ Ccover + TreeHt + Ldepth + YearCat  
 , inbu.abund, mixture="P", K=40) #can only include BA OR CCover  
lh.inbu <- pcount(~ Jdate + Noise + Time  
 ~ HW\_dens\_1050 + FG\_herb + FG\_shrub + Age + NHW\_saplings + YearCat  
 , inbu.abund, mixture="P", K=40)  
landmetrics.inbu <- pcount (~ Jdate + Noise + Time  
 ~ Parea + ShapeIndex + YearCat  
 , inbu.abund, mixture="P",K=40)  
landscape500.inbu <- pcount(~ Jdate + Noise + Time  
 ~ Evergreen500m + Grass500m + Ag500m + HighDev500m  
 + Schrubs500m + YearCat  
 , inbu.abund, mixture="P", K=40)  
landscape1.inbu <- pcount(~ Jdate + Noise + Time  
 ~ Grass1km + Ag1km + HighDev1km + Schrubs1km + YearCat  
 , inbu.abund, mixture="P", K=40)  
landscape5.inbu <- pcount(~ Jdate + Noise + Time  
 ~ Evergreen5km + Grass5km + HighDev5km + Schrubs5km + YearCat  
 , inbu.abund, mixture="P", K=40)  
landscape30.inbu <- pcount(~ Jdate + Noise + Time  
 ~ Evergreen30km + Grass30km + HighDev30km + YearCat  
 , inbu.abund, mixture="P", K=40) #removed Protected  
treatment.inbu <- pcount(~ Jdate + Noise + Time  
 ~ Treatment + Nthins + YearCat  
 , inbu.abund, mixture ="P", K=40)  
management.inbu <- pcount(~ Jdate + Noise + Time  
 ~ Treatment + BA + TimeSinceB + TimeSinceT + Herbicide + YearCat  
 , inbu.abund, mixture="P", K=40)  
disturbance.inbu <- pcount(~ Jdate + Noise + Time  
 ~ TimeSinceB + TimeSinceT + YearCat  
 , inbu.abund, mixture="P", K=40)  
siteprod.inbu <- pcount(~ Jdate + Noise + Time ~ PISoils + NSoilTypes + YearCat  
 , inbu.abund, mixture="P", K=40)  
#upstate n/a no data  
coord.inbu <- pcount (~Jdate + Noise + Time ~ Latitude + Longitude + YearCat  
 , inbu.abund, mixture="P", K=80)  
  
  
fms <- fitList(null.inbu, global.inbu, local.inbu, lh.inbu, landmetrics.inbu,  
 landscape500.inbu, landscape1.inbu, landscape5.inbu, landscape30.inbu,  
 treatment.inbu, management.inbu, disturbance.inbu,  
 siteprod.inbu, coord.inbu)

## Warning in fitList(null.inbu, global.inbu, local.inbu, lh.inbu,  
## landmetrics.inbu, : Your list was unnamed, so model names were added as  
## object names

ms.inbu <- modSel(fms) #note this does not include upstate or some of site.prod  
ms.inbu

## nPars AIC delta AICwt cumltvWt  
## local.inbu 9 620.47 0.000 2.2e-01 0.22  
## treatment.inbu 10 620.50 0.028 2.2e-01 0.44  
## disturbance.inbu 8 620.62 0.152 2.0e-01 0.64  
## lh.inbu 11 621.30 0.835 1.5e-01 0.79  
## siteprod.inbu 8 622.37 1.904 8.5e-02 0.87  
## coord.inbu 8 624.48 4.014 3.0e-02 0.90  
## landscape500.inbu 11 624.64 4.177 2.7e-02 0.93  
## landmetrics.inbu 8 625.23 4.764 2.0e-02 0.95  
## management.inbu 13 625.48 5.010 1.8e-02 0.97  
## landscape30.inbu 9 625.78 5.310 1.5e-02 0.98  
## landscape1.inbu 10 626.73 6.259 9.6e-03 0.99  
## null.inbu 5 628.43 7.965 4.1e-03 1.00  
## landscape5.inbu 10 628.57 8.105 3.8e-03 1.00  
## global.inbu 26 638.76 18.293 2.3e-05 1.00

#ms.inbu@Full  
#summary: local best, treatment second, disturbance third, life history 4th, siteprod also d<2

^local best (), treatment second, disturbance third, life history 4th, siteprod also d<2

write.table(ms.inbu@Full, file="C:/Users/woodj/Documents/GRAD SCHOOL - CLEMSON/Project-Specific/R work/USDA-songbirds/USDA-songbirds/inbu\_top\_models\_ms.xls",sep="\t")

local.inbu

##   
## Call:  
## pcount(formula = ~Jdate + Noise + Time ~ Ccover + TreeHt + Ldepth +   
## YearCat, data = inbu.abund, K = 40, mixture = "P")  
##   
## Abundance:  
## Estimate SE z P(>|z|)  
## (Intercept) 0.8130 0.1730 4.701 2.59e-06  
## Ccover -0.0286 0.0911 -0.314 7.54e-01  
## TreeHt -0.0513 0.1039 -0.494 6.21e-01  
## Ldepth -0.2469 0.1099 -2.246 2.47e-02  
## YearCatB -0.7528 0.2173 -3.464 5.33e-04  
##   
## Detection:  
## Estimate SE z P(>|z|)  
## (Intercept) -0.419323 0.236 -1.77978 0.075112  
## Jdate 0.399780 0.103 3.86542 0.000111  
## Noise -0.218272 0.111 -1.96026 0.049965  
## Time 0.000903 0.102 0.00889 0.992906  
##   
## AIC: 620.4677

confint(local.inbu, type="state",method="normal")

## 0.025 0.975  
## lam(Int) 0.4740402 1.15202478  
## lam(Ccover) -0.2071484 0.15000460  
## lam(TreeHt) -0.2550584 0.15239849  
## lam(Ldepth) -0.4622619 -0.03144949  
## lam(YearCatB) -1.1787212 -0.32681002

treatment.inbu

##   
## Call:  
## pcount(formula = ~Jdate + Noise + Time ~ Treatment + Nthins +   
## YearCat, data = inbu.abund, K = 40, mixture = "P")  
##   
## Abundance:  
## Estimate SE z P(>|z|)  
## (Intercept) 0.259 0.283 0.917 0.35922  
## Treatment1B 0.511 0.307 1.666 0.09564  
## Treatment2B 0.313 0.321 0.977 0.32875  
## Treatment3B 0.872 0.334 2.614 0.00895  
## Nthins -0.091 0.117 -0.780 0.43557  
## YearCatB -0.609 0.193 -3.158 0.00159  
##   
## Detection:  
## Estimate SE z P(>|z|)  
## (Intercept) -0.40300 0.234 -1.7200 0.085441  
## Jdate 0.40354 0.104 3.8762 0.000106  
## Noise -0.23156 0.111 -2.0786 0.037654  
## Time -0.00379 0.102 -0.0373 0.970273  
##   
## AIC: 620.4955

confint(treatment.inbu, type="state",method="normal")

## 0.025 0.975  
## lam(Int) -0.29502856 0.8136647  
## lam(Treatment1B) -0.09001733 1.1117452  
## lam(Treatment2B) -0.31551083 0.9422325  
## lam(Treatment3B) 0.21809218 1.5254836  
## lam(Nthins) -0.31982226 0.1377817  
## lam(YearCatB) -0.98636922 -0.2309299

disturbance.inbu

##   
## Call:  
## pcount(formula = ~Jdate + Noise + Time ~ TimeSinceB + TimeSinceT +   
## YearCat, data = inbu.abund, K = 40, mixture = "P")  
##   
## Abundance:  
## Estimate SE z P(>|z|)  
## (Intercept) 0.7185 0.162 4.425 9.63e-06  
## TimeSinceB -0.2139 0.111 -1.935 5.30e-02  
## TimeSinceT -0.0456 0.116 -0.392 6.95e-01  
## YearCatB -0.5835 0.191 -3.054 2.26e-03  
##   
## Detection:  
## Estimate SE z P(>|z|)  
## (Intercept) -0.3852 0.229 -1.6830 0.092380  
## Jdate 0.4012 0.104 3.8480 0.000119  
## Noise -0.2465 0.110 -2.2362 0.025338  
## Time -0.0035 0.102 -0.0342 0.972707  
##   
## AIC: 620.6196

confint(disturbance.inbu, type="state",method="normal")

## 0.025 0.975  
## lam(Int) 0.4002652 1.036695006  
## lam(TimeSinceB) -0.4305434 0.002761706  
## lam(TimeSinceT) -0.2736910 0.182458763  
## lam(YearCatB) -0.9579596 -0.209084265

lh.inbu

##   
## Call:  
## pcount(formula = ~Jdate + Noise + Time ~ HW\_dens\_1050 + FG\_herb +   
## FG\_shrub + Age + NHW\_saplings + YearCat, data = inbu.abund,   
## K = 40, mixture = "P")  
##   
## Abundance:  
## Estimate SE z P(>|z|)  
## (Intercept) 0.80067 0.1782 4.4931 7.02e-06  
## HW\_dens\_1050 0.11307 0.1076 1.0511 2.93e-01  
## FG\_herb 0.15498 0.1116 1.3882 1.65e-01  
## FG\_shrub 0.12105 0.0973 1.2436 2.14e-01  
## Age 0.00568 0.0906 0.0626 9.50e-01  
## NHW\_saplings -0.14440 0.1094 -1.3194 1.87e-01  
## YearCatB -0.71377 0.2136 -3.3422 8.31e-04  
##   
## Detection:  
## Estimate SE z P(>|z|)  
## (Intercept) -0.45855 0.250 -1.8363 0.066320  
## Jdate 0.38971 0.103 3.7763 0.000159  
## Noise -0.19654 0.112 -1.7559 0.079107  
## Time -0.00868 0.101 -0.0862 0.931290  
##   
## AIC: 621.3027

confint(lh.inbu, type="state",method="normal")

## 0.025 0.975  
## lam(Int) 0.45140787 1.14993194  
## lam(HW\_dens\_1050) -0.09775916 0.32389606  
## lam(FG\_herb) -0.06383662 0.37380617  
## lam(FG\_shrub) -0.06973239 0.31182329  
## lam(Age) -0.17196369 0.18331870  
## lam(NHW\_saplings) -0.35891581 0.07010785  
## lam(YearCatB) -1.13234525 -0.29518722

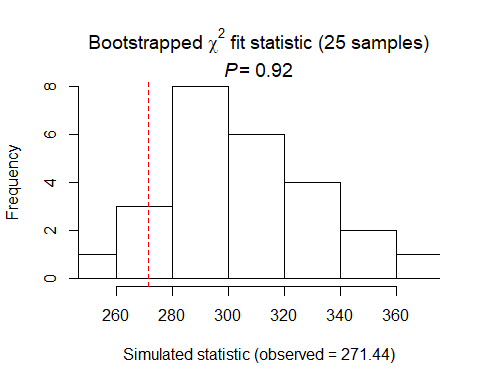
siteprod.inbu

##   
## Call:  
## pcount(formula = ~Jdate + Noise + Time ~ PISoils + NSoilTypes +   
## YearCat, data = inbu.abund, K = 40, mixture = "P")  
##   
## Abundance:  
## Estimate SE z P(>|z|)  
## (Intercept) 0.73470 0.1650 4.452 8.50e-06  
## PISoils 0.16395 0.0884 1.854 6.37e-02  
## NSoilTypes 0.00983 0.0923 0.107 9.15e-01  
## YearCatB -0.55758 0.1897 -2.939 3.29e-03  
##   
## Detection:  
## Estimate SE z P(>|z|)  
## (Intercept) -0.416224 0.236 -1.76633 7.73e-02  
## Jdate 0.406937 0.103 3.93498 8.32e-05  
## Noise -0.244583 0.110 -2.22025 2.64e-02  
## Time -0.000189 0.102 -0.00186 9.99e-01  
##   
## AIC: 622.3713

confint(siteprod.inbu, type="state",method="normal")

## 0.025 0.975  
## lam(Int) 0.411268616 1.0581291  
## lam(PISoils) -0.009332344 0.3372270  
## lam(NSoilTypes) -0.170994231 0.1906595  
## lam(YearCatB) -0.929381547 -0.1857798

## Warning in rbinom(M \* J, size = rep(N, each = J), prob = pvec): NAs  
## produced  
  
## Warning in rbinom(M \* J, size = rep(N, each = J), prob = pvec): NAs  
## produced  
  
## Warning in rbinom(M \* J, size = rep(N, each = J), prob = pvec): NAs  
## produced  
  
## Warning in rbinom(M \* J, size = rep(N, each = J), prob = pvec): NAs  
## produced  
  
## Warning in rbinom(M \* J, size = rep(N, each = J), prob = pvec): NAs  
## produced  
  
## Warning in rbinom(M \* J, size = rep(N, each = J), prob = pvec): NAs  
## produced  
  
## Warning in rbinom(M \* J, size = rep(N, each = J), prob = pvec): NAs  
## produced  
  
## Warning in rbinom(M \* J, size = rep(N, each = J), prob = pvec): NAs  
## produced  
  
## Warning in rbinom(M \* J, size = rep(N, each = J), prob = pvec): NAs  
## produced  
  
## Warning in rbinom(M \* J, size = rep(N, each = J), prob = pvec): NAs  
## produced  
  
## Warning in rbinom(M \* J, size = rep(N, each = J), prob = pvec): NAs  
## produced  
  
## Warning in rbinom(M \* J, size = rep(N, each = J), prob = pvec): NAs  
## produced  
  
## Warning in rbinom(M \* J, size = rep(N, each = J), prob = pvec): NAs  
## produced  
  
## Warning in rbinom(M \* J, size = rep(N, each = J), prob = pvec): NAs  
## produced  
  
## Warning in rbinom(M \* J, size = rep(N, each = J), prob = pvec): NAs  
## produced  
  
## Warning in rbinom(M \* J, size = rep(N, each = J), prob = pvec): NAs  
## produced  
  
## Warning in rbinom(M \* J, size = rep(N, each = J), prob = pvec): NAs  
## produced  
  
## Warning in rbinom(M \* J, size = rep(N, each = J), prob = pvec): NAs  
## produced  
  
## Warning in rbinom(M \* J, size = rep(N, each = J), prob = pvec): NAs  
## produced  
  
## Warning in rbinom(M \* J, size = rep(N, each = J), prob = pvec): NAs  
## produced  
  
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## produced  
  
## Warning in rbinom(M \* J, size = rep(N, each = J), prob = pvec): NAs  
## produced  
  
## Warning in rbinom(M \* J, size = rep(N, each = J), prob = pvec): NAs  
## produced  
  
## Warning in rbinom(M \* J, size = rep(N, each = J), prob = pvec): NAs  
## produced  
  
## Warning in rbinom(M \* J, size = rep(N, each = J), prob = pvec): NAs  
## produced



##   
## Chi-square goodness-of-fit for N-mixture model of 'unmarkedFitPCount' class  
##   
## Observed chi-square statistic = 271.4434   
## Number of bootstrap samples = 25  
## P-value = 0.92  
##   
## Quantiles of bootstrapped statistics:  
## 0% 25% 50% 75% 100%   
## 251 283 307 321 371   
##   
## Estimate of c-hat = 0.89

##   
## Chi-square goodness-of-fit for N-mixture model of 'unmarkedFitPCount' class  
##   
## Observed chi-square statistic = 271.4434

### not using yet  
#backTransform(linearComb(disturbance.inbu, coefficients = c(1,0), type= "det"))  
##YAY!  
#backTransform(linearComb(disturbance.inbu, coefficients = c(1,0,0), type= "state"))  
  
#or:  
#newData.inbu<-data.frame(TimeSinceT=0, TimeSinceB=0:20)  
#round(predict(disturbance.inbu, type="state", newdata=newData.inbu, appendData=TRUE, 2))  
##or "det"  
##confint(disturbance.inbu,type="det")

INBU Summary: P distribution DCs: detect best, global second SCs using detect model: local best (), treatment second, disturbance third, life history 4th, siteprod also d<2 local best (- with Ldepth, - with YearB) treatment second (+ with Treatment 3B, - with YearB) disturbance third (- with TimeSinceB, - with YearB), life history 4th (- with YearB,), siteprod (+ with PI soils, - with YearB) also d<2

# NOBO

# (grasslands - open woodlands, ground nester, ground forager, plants)

# covariates: low BA, fires/disturbance, litter, low-medium HW cover?

nobo.abund<- csvToUMF("nobo\_abund.csv", long = FALSE, type = "unmarkedFramePCount")  
#summary(nobo.abund)  
#str(nobo.abund)  
#scale all observation covariates (covs of detection)  
obsCovs(nobo.abund)= scale (obsCovs(nobo.abund))  
#select particular site covariates to scale below  
sc <- siteCovs(nobo.abund)  
sc[,c(6:77)] <- scale(sc[, c(6:77)])  
siteCovs(nobo.abund) <- sc

#test for NB or Poisson - most should use Poisson ...   
testP.nobo <- pcount(~1 ~1, nobo.abund, mixture="P", K=4)  
testNB.nobo <- pcount(~1 ~1, nobo.abund, mixture="NB", K=4)  
fmsTEST <- fitList(testP.nobo, testNB.nobo)

## Warning in fitList(testP.nobo, testNB.nobo): Your list was unnamed, so  
## model names were added as object names

msTEST.nobo <- modSel(fmsTEST)  
msTEST.nobo

## nPars AIC delta AICwt cumltvWt  
## testNB.nobo 3 479.98 0.00 0.927 0.93  
## testP.nobo 2 485.06 5.08 0.073 1.00

## NB is best for this species. Change below to correspond!

#run this when have CSV with both years  
null.nobo <- pcount(~Jdate + Noise + Time ~1, nobo.abund, mixture="NB", K=40)  
year.nobo <- pcount(~Jdate + Noise + Time ~ YearCat, nobo.abund, mixture="NB", K=40)  
fms.year.nobo<- fitList(null.nobo, year.nobo)

## Warning in fitList(null.nobo, year.nobo): Your list was unnamed, so model  
## names were added as object names

year.ms.nobo<-modSel(fms.year.nobo)  
year.ms.nobo

## nPars AIC delta AICwt cumltvWt  
## year.nobo 7 433.60 0.00 0.85 0.85  
## null.nobo 6 437.08 3.48 0.15 1.00

^ year definite effect, null is much over d2

#detection covariates first  
det.null.nobo <- pcount(~1 ~1, nobo.abund, mixture="NB", K=15)  
det.weather.nobo <- pcount(~ Wind + Sky ~1, nobo.abund, mixture="NB", K=15)  
det.global.nobo <- pcount(~ Jdate + Wind + Sky + Noise +Time ~1, nobo.abund, mixture="NB", K=15)  
det.sound.nobo <- pcount(~ Noise + Wind ~1, nobo.abund, mixture="NB", K=15)  
det.date.nobo <- pcount(~ Jdate ~1, nobo.abund, mixture="NB", K=15)  
det.detect.nobo <- pcount(~ Jdate + Noise + Time ~1, nobo.abund, mixture="NB", K=15)  
det.notdate.nobo <-pcount(~ Wind + Sky + Noise ~1, nobo.abund, mixture="NB", K=15)  
det.time.nobo <-pcount(~ Time ~1, nobo.abund, mixture="NB",K=15)  
det.timing.nobo <-pcount(~ Time + Jdate ~1, nobo.abund, mixture="NB", K=15)  
  
fmsDC <- fitList(det.null.nobo, det.weather.nobo, det.global.nobo,  
 det.sound.nobo, det.date.nobo, det.detect.nobo, det.notdate.nobo,  
 det.time.nobo, det.timing.nobo)

## Warning in fitList(det.null.nobo, det.weather.nobo, det.global.nobo,  
## det.sound.nobo, : Your list was unnamed, so model names were added as  
## object names

msDC.nobo <- modSel(fmsDC)  
msDC.nobo

## nPars AIC delta AICwt cumltvWt  
## det.global.nobo 8 433.89 0.00 4.3e-01 0.43  
## det.date.nobo 4 434.30 0.41 3.5e-01 0.78  
## det.timing.nobo 5 436.27 2.38 1.3e-01 0.91  
## det.detect.nobo 6 437.11 3.22 8.6e-02 1.00  
## det.weather.nobo 5 448.76 14.87 2.5e-04 1.00  
## det.notdate.nobo 6 450.64 16.76 9.9e-05 1.00  
## det.null.nobo 3 463.47 29.58 1.6e-07 1.00  
## det.time.nobo 4 465.24 31.35 6.7e-08 1.00  
## det.sound.nobo 5 467.33 33.45 2.4e-08 1.00

#msDC.nobo@Full  
#summary: NB is better fit than Poisson. Global is best detection model.  
## date only is the second best model.

det.global.nobo # positive w date, neg with sky

##   
## Call:  
## pcount(formula = ~Jdate + Wind + Sky + Noise + Time ~ 1, data = nobo.abund,   
## K = 15, mixture = "NB")  
##   
## Abundance:  
## Estimate SE z P(>|z|)  
## 0.494 0.374 1.32 0.186  
##   
## Detection:  
## Estimate SE z P(>|z|)  
## (Intercept) -1.4610 0.468 -3.12 0.001796  
## Jdate 0.6483 0.167 3.88 0.000103  
## Wind 0.2638 0.147 1.79 0.073033  
## Sky -0.3041 0.151 -2.01 0.044233  
## Noise -0.1596 0.139 -1.15 0.250877  
## Time -0.0847 0.139 -0.61 0.541762  
##   
## Dispersion:  
## Estimate SE z P(>|z|)  
## -0.187 0.42 -0.446 0.656  
##   
## AIC: 433.8879

confint(det.global.nobo, type="det",method="normal")

## 0.025 0.975  
## p(Int) -2.37827710 -0.543813733  
## p(Jdate) 0.32110618 0.975561982  
## p(Wind) -0.02462519 0.552222377  
## p(Sky) -0.60034387 -0.007846544  
## p(Noise) -0.43207211 0.112841135  
## p(Time) -0.35680804 0.187394010

confint(det.global.nobo, type="state",method="normal")

## 0.025 0.975  
## lam(Int) -0.2378986 1.226226

write.table(msDC.nobo@Full, file="C:/Users/woodj/Documents/GRAD SCHOOL - CLEMSON/Project-Specific/R work/USDA-songbirds/USDA-songbirds/nobo\_top\_models\_msDC.xls",sep="\t")

det.date.nobo #positive with date

##   
## Call:  
## pcount(formula = ~Jdate ~ 1, data = nobo.abund, K = 15, mixture = "NB")  
##   
## Abundance:  
## Estimate SE z P(>|z|)  
## 0.447 0.367 1.22 0.223  
##   
## Detection:  
## Estimate SE z P(>|z|)  
## (Intercept) -1.336 0.461 -2.9 3.73e-03  
## Jdate 0.702 0.153 4.6 4.21e-06  
##   
## Dispersion:  
## Estimate SE z P(>|z|)  
## -0.302 0.398 -0.76 0.447  
##   
## AIC: 434.3022

confint(det.date.nobo, type="det", method="normal")

## 0.025 0.975  
## p(Int) -2.2382171 -0.4330202  
## p(Jdate) 0.4030491 1.0013037

confint(det.date.nobo, type="state", method="normal")

## 0.025 0.975  
## lam(Int) -0.2722042 1.165784

#more appropriate detection covariates (global)  
null.nobo <- pcount(~ Jdate + Wind + Sky + Noise +Time ~1, nobo.abund, mixture="NB", K=80)  
global.nobo <- pcount(~ Jdate + Wind + Sky + Noise +Time  
 ~ Treatment + Herbicide + BA +Ccover + TreeHt  
 + Ldepth + Age + TimeSinceB + TimeSinceT + Nthins  
 + HW\_dens\_1050 + FG\_shrub  
 + PISoils + NSoilTypes  
 + Parea + ShapeIndex + YearCat  
 , nobo.abund, mixture="NB", K=80)  
#FPSiteIndex taken out, TreeHt, NHW\_saplings, NP\_over\_20cm, FG\_herb, Rel\_HW2P\_canopy, Nsnags  
local.nobo <- pcount(~ Jdate + Wind + Sky + Noise +Time  
 ~ Ccover + TreeHt + Ldepth + YearCat  
 , nobo.abund, mixture="NB", K=80) #can only include BA OR CCover  
lh.nobo <- pcount(~ Jdate + Wind + Sky + Noise +Time  
 ~ BA + Ldepth + HW\_dens\_1050 + FG\_shrub + Age + YearCat  
 , nobo.abund, mixture="NB", K=80)  
landmetrics.nobo <- pcount (~ Jdate + Wind + Sky + Noise +Time  
 ~ Parea + ShapeIndex + YearCat  
 , nobo.abund, mixture="NB",K=80)  
landscape500.nobo <- pcount(~ Jdate + Wind + Sky + Noise +Time  
 ~ Grass500m + HighDev500m + Schrubs500m + Evergreen500m  
 + Ag500m + YearCat  
 , nobo.abund, mixture="NB", K=80)  
landscape1.nobo <- pcount(~ Jdate + Wind + Sky + Noise +Time  
 ~ Grass1km + HighDev1km + Schrubs1km + Evergreen1km + YearCat  
 , nobo.abund, mixture="NB", K=80)  
landscape5.nobo <- pcount(~ Jdate + Wind + Sky + Noise +Time  
 ~ Grass5km + HighDev5km + Schrubs5km + Evergreen5km + YearCat  
 , nobo.abund, mixture="NB", K=80)  
landscape30.nobo <- pcount(~ Jdate + Wind + Sky + Noise +Time  
 ~ Grass30km + HighDev30km + Evergreen30km + YearCat  
 , nobo.abund, mixture="NB", K=80) #removed Protected  
treatment.nobo <- pcount(~ Jdate + Wind + Sky + Noise +Time  
 ~ Nburns + Nthins + YearCat  
 , nobo.abund, mixture ="NB", K=80) #this one I made Nburns instead of treatment for ones with many many burns  
management.nobo <- pcount(~ Jdate + Wind + Sky + Noise +Time  
 ~ Treatment + BA + TimeSinceB + TimeSinceT + Herbicide + YearCat  
 , nobo.abund, mixture="NB", K=80)  
disturbance.nobo <- pcount(~ Jdate + Wind + Sky + Noise +Time  
 ~ TimeSinceB + TimeSinceT + YearCat  
 , nobo.abund, mixture="NB", K=80)  
siteprod.nobo <- pcount(~ Jdate + Wind + Sky + Noise +Time ~ PISoils + NSoilTypes + YearCat  
 , nobo.abund, mixture="NB", K=80) #no FPSiteIndex  
#upstate.nobo <- pcount(~ Jdate + Wind + Sky + Noise +Time ~ X + Y + Z, nobo.abund, mixture="NB", K=40)  
coord.nobo <- pcount (~Jdate + Noise + Time ~ Latitude + Longitude + YearCat  
 ,nobo.abund, mixture="P", K=80)  
  
fms <- fitList(null.nobo, local.nobo, lh.nobo, landmetrics.nobo,  
 landscape500.nobo, landscape1.nobo, landscape5.nobo, landscape30.nobo,  
 treatment.nobo, management.nobo, disturbance.nobo,  
 siteprod.nobo, coord.nobo)

## Warning in fitList(null.nobo, local.nobo, lh.nobo, landmetrics.nobo,  
## landscape500.nobo, : Your list was unnamed, so model names were added as  
## object names

ms.nobo <- modSel(fms) #note this does not include FPSiteIndex or upstate OR GLOBAL  
ms.nobo

## nPars AIC delta AICwt cumltvWt  
## landscape1.nobo 13 392.46 0.00 1.0e+00 1.00  
## landscape30.nobo 12 408.16 15.70 3.9e-04 1.00  
## landscape5.nobo 13 409.24 16.79 2.3e-04 1.00  
## landscape500.nobo 14 414.04 21.58 2.1e-05 1.00  
## treatment.nobo 11 419.70 27.24 1.2e-06 1.00  
## disturbance.nobo 11 419.76 27.30 1.2e-06 1.00  
## management.nobo 16 423.13 30.67 2.2e-07 1.00  
## local.nobo 12 423.31 30.85 2.0e-07 1.00  
## coord.nobo 8 426.59 34.13 3.9e-08 1.00  
## landmetrics.nobo 11 428.75 36.29 1.3e-08 1.00  
## lh.nobo 14 430.32 37.86 6.0e-09 1.00  
## siteprod.nobo 11 433.00 40.54 1.6e-09 1.00  
## null.nobo 8 433.87 41.42 1.0e-09 1.00

#ms.nobo@Full

landscape1.nobo

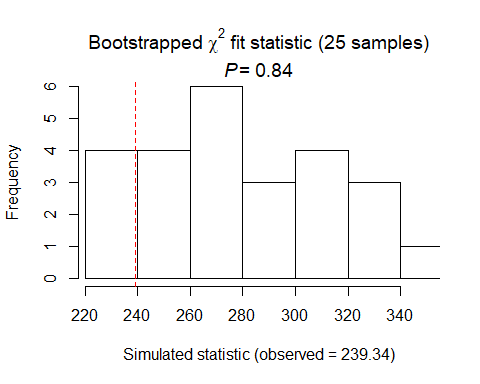
##   
## Call:  
## pcount(formula = ~Jdate + Wind + Sky + Noise + Time ~ Grass1km +   
## HighDev1km + Schrubs1km + Evergreen1km + YearCat, data = nobo.abund,   
## K = 80, mixture = "NB")  
##   
## Abundance:  
## Estimate SE z P(>|z|)  
## (Intercept) -30.6051 122.351 -0.250 0.802477  
## Grass1km 0.1342 0.149 0.901 0.367552  
## HighDev1km -136.7709 546.440 -0.250 0.802360  
## Schrubs1km 0.0589 0.132 0.447 0.655093  
## Evergreen1km 0.7227 0.192 3.770 0.000164  
## YearCatB 0.8470 0.277 3.059 0.002224  
##   
## Detection:  
## Estimate SE z P(>|z|)  
## (Intercept) -1.6789 0.608 -2.761 0.005762  
## Jdate 0.6365 0.167 3.809 0.000139  
## Wind 0.3519 0.147 2.398 0.016500  
## Sky -0.2793 0.143 -1.951 0.051048  
## Noise -0.1647 0.134 -1.233 0.217538  
## Time -0.0588 0.135 -0.434 0.664216  
##   
## Dispersion:  
## Estimate SE z P(>|z|)  
## 1.65 1.27 1.3 0.195  
##   
## AIC: 392.4572

confint(landscape1.nobo, type="state",method="normal")

## 0.025 0.975  
## lam(Int) -270.4084287 209.1981489  
## lam(Grass1km) -0.1577635 0.4262616  
## lam(HighDev1km) -1207.7731592 934.2312942  
## lam(Schrubs1km) -0.1994426 0.3171889  
## lam(Evergreen1km) 0.3469206 1.0984405  
## lam(YearCatB) 0.3042388 1.3897856

write.table(ms.nobo@Full, file="C:/Users/woodj/Documents/GRAD SCHOOL - CLEMSON/Project-Specific/R work/USDA-songbirds/USDA-songbirds/nobo\_top\_models\_ms.xls",sep="\t")

## Warning in rbinom(M \* J, size = rep(N, each = J), prob = pvec): NAs  
## produced  
  
## Warning in rbinom(M \* J, size = rep(N, each = J), prob = pvec): NAs  
## produced  
  
## Warning in rbinom(M \* J, size = rep(N, each = J), prob = pvec): NAs  
## produced  
  
## Warning in rbinom(M \* J, size = rep(N, each = J), prob = pvec): NAs  
## produced  
  
## Warning in rbinom(M \* J, size = rep(N, each = J), prob = pvec): NAs  
## produced  
  
## Warning in rbinom(M \* J, size = rep(N, each = J), prob = pvec): NAs  
## produced  
  
## Warning in rbinom(M \* J, size = rep(N, each = J), prob = pvec): NAs  
## produced  
  
## Warning in rbinom(M \* J, size = rep(N, each = J), prob = pvec): NAs  
## produced  
  
## Warning in rbinom(M \* J, size = rep(N, each = J), prob = pvec): NAs  
## produced  
  
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## produced  
  
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## produced  
  
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## produced  
  
## Warning in rbinom(M \* J, size = rep(N, each = J), prob = pvec): NAs  
## produced  
  
## Warning in rbinom(M \* J, size = rep(N, each = J), prob = pvec): NAs  
## produced  
  
## Warning in rbinom(M \* J, size = rep(N, each = J), prob = pvec): NAs  
## produced  
  
## Warning in rbinom(M \* J, size = rep(N, each = J), prob = pvec): NAs  
## produced  
  
## Warning in rbinom(M \* J, size = rep(N, each = J), prob = pvec): NAs  
## produced  
  
## Warning in rbinom(M \* J, size = rep(N, each = J), prob = pvec): NAs  
## produced  
  
## Warning in rbinom(M \* J, size = rep(N, each = J), prob = pvec): NAs  
## produced  
  
## Warning in rbinom(M \* J, size = rep(N, each = J), prob = pvec): NAs  
## produced  
  
## Warning in rbinom(M \* J, size = rep(N, each = J), prob = pvec): NAs  
## produced  
  
## Warning in rbinom(M \* J, size = rep(N, each = J), prob = pvec): NAs  
## produced



##   
## Chi-square goodness-of-fit for N-mixture model of 'unmarkedFitPCount' class  
##   
## Observed chi-square statistic = 239.3417   
## Number of bootstrap samples = 25  
## P-value = 0.84  
##   
## Quantiles of bootstrapped statistics:  
## 0% 25% 50% 75% 100%   
## 223 245 269 305 350   
##   
## Estimate of c-hat = 0.86

##   
## Chi-square goodness-of-fit for N-mixture model of 'unmarkedFitPCount' class  
##   
## Observed chi-square statistic = 239.3417

NOBO summary: NB distribution DCs: global best (+ date, - sky), date second best (+). SCs using global: Landscape1km only best model (+ Evergreen1km, +YearB)

# PIWA

# (forest, insects, tree nesting, bark forager, nest high in pines)

# covariates: HW2P ratio, canopy, tree ht, BA,

piwa.abund<- csvToUMF("piwa\_abund.csv", long = FALSE, type = "unmarkedFramePCount")  
##type may need to change for occupancy (occuRN, pcountOpen, or whichever used) ##  
#summary(piwa.abund)  
#str(piwa.abund)  
#scale all observation covariates (covs of detection)  
obsCovs(piwa.abund)= scale (obsCovs(piwa.abund))  
#select particular site covariates to scale below  
sc <- siteCovs(piwa.abund)  
sc[,c(6:77)] <- scale(sc[, c(6:77)])  
siteCovs(piwa.abund) <- sc

#run this when have CSV with both years  
null.piwa <- pcount(~Jdate + Noise + Time ~1, piwa.abund, mixture="P", K=40)  
year.piwa <- pcount(~Jdate + Noise + Time ~ YearCat, piwa.abund, mixture="P", K=40)  
fms.year.piwa<- fitList(null.piwa, year.piwa)

## Warning in fitList(null.piwa, year.piwa): Your list was unnamed, so model  
## names were added as object names

year.ms.piwa<-modSel(fms.year.piwa)  
year.ms.piwa

## nPars AIC delta AICwt cumltvWt  
## null.piwa 5 808.32 0.00 0.72 0.72  
## year.piwa 6 810.20 1.87 0.28 1.00

^ null best model but year <2

#detection covariates first  
det.null.piwa <- pcount(~1 ~1, piwa.abund, mixture="P", K=15)  
det.weather.piwa <- pcount(~ Wind + Sky ~1, piwa.abund, mixture="P", K=15)  
det.global.piwa <- pcount(~ Jdate + Wind + Sky + Noise +Time ~1, piwa.abund, mixture="P", K=15)  
det.sound.piwa <- pcount(~ Noise + Wind ~1, piwa.abund, mixture="P", K=15)  
det.date.piwa <- pcount(~ Jdate ~1, piwa.abund, mixture="P", K=15)  
det.detect.piwa <- pcount(~ Jdate + Noise + Time ~1, piwa.abund, mixture="P", K=15)  
det.notdate.piwa <-pcount(~ Wind + Sky + Noise ~1, piwa.abund, mixture="P", K=15)  
det.time.piwa <-pcount(~ Time ~1, piwa.abund, mixture="P",K=15)  
det.timing.piwa <-pcount(~ Time + Jdate ~1, piwa.abund, mixture="P", K=15)  
  
fmsDC <- fitList(det.null.piwa, det.weather.piwa, det.global.piwa,  
 det.sound.piwa, det.date.piwa, det.detect.piwa, det.notdate.piwa,  
 det.time.piwa, det.timing.piwa)

## Warning in fitList(det.null.piwa, det.weather.piwa, det.global.piwa,  
## det.sound.piwa, : Your list was unnamed, so model names were added as  
## object names

msDC.piwa <- modSel(fmsDC)  
msDC.piwa

## nPars AIC delta AICwt cumltvWt  
## det.global.piwa 7 805.07 0.00 0.3781 0.38  
## det.date.piwa 3 805.40 0.33 0.3203 0.70  
## det.timing.piwa 4 806.32 1.25 0.2019 0.90  
## det.detect.piwa 5 808.32 3.25 0.0744 0.97  
## det.weather.piwa 4 812.44 7.37 0.0095 0.98  
## det.sound.piwa 4 813.30 8.23 0.0062 0.99  
## det.notdate.piwa 5 813.99 8.92 0.0044 0.99  
## det.null.piwa 2 814.28 9.21 0.0038 1.00  
## det.time.piwa 3 816.22 11.15 0.0014 1.00

#msDC.piwa@Full  
#summary: global best, date second, timing is third

det.global.piwa

##   
## Call:  
## pcount(formula = ~Jdate + Wind + Sky + Noise + Time ~ 1, data = piwa.abund,   
## K = 15, mixture = "P")  
##   
## Abundance:  
## Estimate SE z P(>|z|)  
## 0.989 0.136 7.26 3.92e-13  
##   
## Detection:  
## Estimate SE z P(>|z|)  
## (Intercept) -0.226 0.2349 -0.962 0.335849  
## Jdate -0.293 0.0884 -3.313 0.000924  
## Wind 0.141 0.0920 1.531 0.125665  
## Sky -0.193 0.0854 -2.257 0.023990  
## Noise -0.017 0.0894 -0.190 0.849428  
## Time -0.137 0.0788 -1.741 0.081753  
##   
## AIC: 805.0701

confint(det.global.piwa, type="det",method="normal")

## 0.025 0.975  
## p(Int) -0.68636474 0.23429414  
## p(Jdate) -0.46592533 -0.11952648  
## p(Wind) -0.03943096 0.32124960  
## p(Sky) -0.36022297 -0.02539626  
## p(Noise) -0.19211498 0.15818397  
## p(Time) -0.29157613 0.01728370

confint(det.global.piwa, type="state",method="normal")

## 0.025 0.975  
## lam(Int) 0.7222843 1.256646

global (- with Date, - with Sky)

write.table(msDC.piwa@Full, file="C:/Users/woodj/Documents/GRAD SCHOOL - CLEMSON/Project-Specific/R work/USDA-songbirds/USDA-songbirds/PIWA\_top\_models\_msDC.xls",sep="\t")

#more appropriate detection covariates (global now)  
null.piwa <- pcount(~ Jdate + Wind + Sky + Noise +Time ~1, piwa.abund, mixture="P", K=40)  
global.piwa <- pcount(~ Jdate + Wind + Sky + Noise +Time  
 ~ Treatment + Herbicide + BA + Ccover  
 + Ldepth + TreeHt + TimeSinceB + TimeSinceT + Nthins  
 + NP\_over\_20cm  
 + Rel\_HW2P\_canopy + PISoils + NSoilTypes  
 + Parea + ShapeIndex + YearCat  
 , piwa.abund, mixture="P", K=40) #FPSiteIndex taken out, Age, HWs, snags  
local.piwa <- pcount(~ Jdate + Wind + Sky + Noise +Time  
 ~ Ccover + TreeHt + Ldepth + YearCat  
 , piwa.abund, mixture="P", K=40) #can only include BA OR CCover  
lh.piwa <- pcount(~ Jdate + Wind + Sky + Noise +Time  
 ~ Ccover + TreeHt + Rel\_HW2P\_canopy + NP\_over\_20cm + YearCat  
 , piwa.abund, mixture="P", K=40)  
landmetrics.piwa <- pcount (~ Jdate + Wind + Sky + Noise +Time   
 ~ Parea + ShapeIndex + YearCat  
 , piwa.abund, mixture="P",K=40)  
landscape500.piwa <- pcount(~ Jdate + Wind + Sky + Noise +Time   
 ~ Evergreen500m + HighDev500m + YearCat  
 , piwa.abund, mixture="P", K=40)  
landscape1.piwa <- pcount(~ Jdate + Wind + Sky + Noise +Time   
 ~ Evergreen1km + HighDev1km + YearCat  
 , piwa.abund, mixture="P", K=40)  
landscape5.piwa <- pcount(~ Jdate + Wind + Sky + Noise +Time  
 ~ Evergreen5km + HighDev5km + YearCat  
 , piwa.abund, mixture="P", K=40)  
landscape30.piwa <- pcount(~ Jdate + Wind + Sky + Noise +Time  
 ~ Evergreen30km + HighDev30km + YearCat  
 , piwa.abund, mixture="P", K=40) #removed Protected  
treatment.piwa <- pcount(~ Jdate + Wind + Sky + Noise +Time   
 ~ Treatment + Nthins + YearCat  
 , piwa.abund, mixture ="P", K=40)  
management.piwa <- pcount(~ Jdate + Wind + Sky + Noise +Time  
 ~ Treatment + BA + TimeSinceB + TimeSinceT + Herbicide + YearCat  
 , piwa.abund, mixture="P", K=40)  
disturbance.piwa <- pcount(~ Jdate + Wind + Sky + Noise +Time   
 ~ TimeSinceB + TimeSinceT + YearCat  
 , piwa.abund, mixture="P", K=40)  
siteprod.piwa <- pcount(~ Jdate + Wind + Sky + Noise +Time  
 ~ PISoils + NSoilTypes + YearCat  
 , piwa.abund, mixture="P", K=40) #Site Index out  
#upstate.piwa <- pcount(~ Jdate + Time ~ X + Y + Z, piwa.abund, mixture="P", K=40)  
coord.piwa<- pcount (~Jdate + Noise + Time ~ Latitude + Longitude + YearCat  
 , piwa.abund, mixture="P", K=40)  
  
  
fms <- fitList(null.piwa, global.piwa, local.piwa, lh.piwa, landmetrics.piwa,  
 landscape500.piwa, landscape1.piwa, landscape5.piwa, landscape30.piwa,  
 treatment.piwa, management.piwa, disturbance.piwa,  
 siteprod.piwa, coord.piwa)

## Warning in fitList(null.piwa, global.piwa, local.piwa, lh.piwa,  
## landmetrics.piwa, : Your list was unnamed, so model names were added as  
## object names

ms.piwa <- modSel(fms) #note this does not include upstate  
ms.piwa

## nPars AIC delta AICwt cumltvWt  
## landscape30.piwa 10 802.63 0.00 3.2e-01 0.32  
## landscape5.piwa 10 803.32 0.69 2.3e-01 0.55  
## coord.piwa 8 804.58 1.95 1.2e-01 0.67  
## siteprod.piwa 10 804.95 2.32 1.0e-01 0.77  
## null.piwa 7 805.07 2.44 9.5e-02 0.86  
## lh.piwa 12 806.52 3.89 4.6e-02 0.91  
## local.piwa 11 807.36 4.73 3.0e-02 0.94  
## landmetrics.piwa 10 808.36 5.72 1.8e-02 0.96  
## landscape500.piwa 10 808.85 6.22 1.4e-02 0.97  
## landscape1.piwa 10 809.36 6.73 1.1e-02 0.98  
## disturbance.piwa 10 810.16 7.53 7.4e-03 0.99  
## management.piwa 15 810.81 8.18 5.4e-03 1.00  
## treatment.piwa 12 811.61 8.98 3.6e-03 1.00  
## global.piwa 25 823.71 21.08 8.5e-06 1.00

#ms.piwa@Full  
#summary: landscape30, landscape5, coord models

landscape30.piwa

##   
## Call:  
## pcount(formula = ~Jdate + Wind + Sky + Noise + Time ~ Evergreen30km +   
## HighDev30km + YearCat, data = piwa.abund, K = 40, mixture = "P")  
##   
## Abundance:  
## Estimate SE z P(>|z|)  
## (Intercept) 1.0482 0.1907 5.497 3.86e-08  
## Evergreen30km 0.0217 0.0717 0.303 7.62e-01  
## HighDev30km -0.2170 0.0822 -2.639 8.32e-03  
## YearCatB 0.0983 0.1441 0.682 4.95e-01  
##   
## Detection:  
## Estimate SE z P(>|z|)  
## (Intercept) -0.4476 0.3017 -1.484 0.13792  
## Jdate -0.2452 0.0862 -2.844 0.00446  
## Wind 0.1555 0.0888 1.751 0.07988  
## Sky -0.1670 0.0825 -2.025 0.04289  
## Noise -0.0416 0.0847 -0.491 0.62308  
## Time -0.1220 0.0753 -1.619 0.10551  
##   
## AIC: 802.6307

confint(landscape30.piwa, type="state",method="normal")

## 0.025 0.975  
## lam(Int) 0.6744807 1.4219259  
## lam(Evergreen30km) -0.1188713 0.1623435  
## lam(HighDev30km) -0.3781245 -0.0558149  
## lam(YearCatB) -0.1841868 0.3807853

landscape5.piwa

##   
## Call:  
## pcount(formula = ~Jdate + Wind + Sky + Noise + Time ~ Evergreen5km +   
## HighDev5km + YearCat, data = piwa.abund, K = 40, mixture = "P")  
##   
## Abundance:  
## Estimate SE z P(>|z|)  
## (Intercept) 1.0340 0.1866 5.541 3.01e-08  
## Evergreen5km -0.2019 0.0792 -2.549 1.08e-02  
## HighDev5km -0.0127 0.0729 -0.174 8.62e-01  
## YearCatB 0.1086 0.1435 0.757 4.49e-01  
##   
## Detection:  
## Estimate SE z P(>|z|)  
## (Intercept) -0.4299 0.2947 -1.459 0.14460  
## Jdate -0.2511 0.0862 -2.912 0.00359  
## Wind 0.1494 0.0895 1.670 0.09496  
## Sky -0.1724 0.0829 -2.079 0.03763  
## Noise -0.0403 0.0860 -0.469 0.63904  
## Time -0.1221 0.0759 -1.609 0.10770  
##   
## AIC: 803.322

confint(landscape5.piwa, type="state",method="normal")

## 0.025 0.975  
## lam(Int) 0.6682849 1.39981133  
## lam(Evergreen5km) -0.3571484 -0.04663688  
## lam(HighDev5km) -0.1555464 0.13022244  
## lam(YearCatB) -0.1726786 0.38982357

coord.piwa

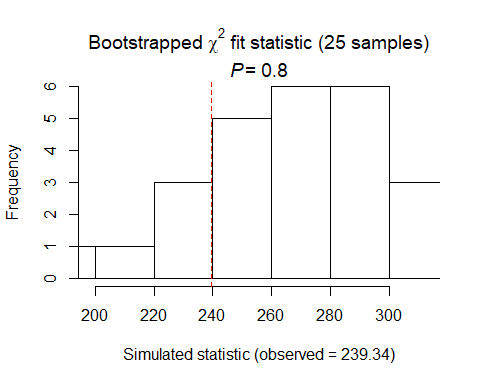
##   
## Call:  
## pcount(formula = ~Jdate + Noise + Time ~ Latitude + Longitude +   
## YearCat, data = piwa.abund, K = 40, mixture = "P")  
##   
## Abundance:  
## Estimate SE z P(>|z|)  
## (Intercept) 1.1422 0.2173 5.257 1.46e-07  
## Latitude 0.2173 0.0735 2.958 3.10e-03  
## Longitude -0.0373 0.0667 -0.559 5.76e-01  
## YearCatB 0.0434 0.1363 0.319 7.50e-01  
##   
## Detection:  
## Estimate SE z P(>|z|)  
## (Intercept) -0.5621 0.3316 -1.695 0.09012  
## Jdate -0.2097 0.0751 -2.792 0.00523  
## Noise -0.0384 0.0814 -0.472 0.63704  
## Time -0.0623 0.0687 -0.907 0.36449  
##   
## AIC: 804.5809

confint(coord.piwa, type="state",method="normal")

## 0.025 0.975  
## lam(Int) 0.71637523 1.56805915  
## lam(Latitude) 0.07330991 0.36124410  
## lam(Longitude) -0.16803739 0.09344518  
## lam(YearCatB) -0.22367466 0.31049404

write.table(ms.piwa@Full, file="C:/Users/woodj/Documents/GRAD SCHOOL - CLEMSON/Project-Specific/R work/USDA-songbirds/USDA-songbirds/piwa\_top\_models\_ms.xls",sep="\t")

## Warning in rbinom(M \* J, size = rep(N, each = J), prob = pvec): NAs  
## produced  
  
## Warning in rbinom(M \* J, size = rep(N, each = J), prob = pvec): NAs  
## produced  
  
## Warning in rbinom(M \* J, size = rep(N, each = J), prob = pvec): NAs  
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## Warning in rbinom(M \* J, size = rep(N, each = J), prob = pvec): NAs  
## produced  
  
## Warning in rbinom(M \* J, size = rep(N, each = J), prob = pvec): NAs  
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## produced  
  
## Warning in rbinom(M \* J, size = rep(N, each = J), prob = pvec): NAs  
## produced  
  
## Warning in rbinom(M \* J, size = rep(N, each = J), prob = pvec): NAs  
## produced  
  
## Warning in rbinom(M \* J, size = rep(N, each = J), prob = pvec): NAs  
## produced  
  
## Warning in rbinom(M \* J, size = rep(N, each = J), prob = pvec): NAs  
## produced  
  
## Warning in rbinom(M \* J, size = rep(N, each = J), prob = pvec): NAs  
## produced  
  
## Warning in rbinom(M \* J, size = rep(N, each = J), prob = pvec): NAs  
## produced



##   
## Chi-square goodness-of-fit for N-mixture model of 'unmarkedFitPCount' class  
##   
## Observed chi-square statistic = 239.3417   
## Number of bootstrap samples = 25  
## P-value = 0.8  
##   
## Quantiles of bootstrapped statistics:  
## 0% 25% 50% 75% 100%   
## 199 250 263 290 313   
##   
## Estimate of c-hat = 0.9

##   
## Chi-square goodness-of-fit for N-mixture model of 'unmarkedFitPCount' class  
##   
## Observed chi-square statistic = 239.3417

PIWA Summary P distribution DCs: global best (- with Date, - with Sky), date second, timing third SCs with global: Landscape30 (- with HighDev 30) Landscape5 (- with Evergreen5km) Coordinates (+ with latitude)

# PRWA

# (foliage gleaner, insects, shrub/tree nester 1-45’, open wood warbler, ESS/second growth brushy/bushy habitat)

# covariates: grasses, understory growth, midstory shrub density,

prwa.abund<- csvToUMF("prwa\_abund.csv", long = FALSE, type = "unmarkedFramePCount")  
#summary(prwa.abund)  
#str(prwa.abund)  
#scale all observation covariates (covs of detection)  
obsCovs(prwa.abund)= scale (obsCovs(prwa.abund))  
#select particular site covariates to scale below  
sc <- siteCovs(prwa.abund)  
sc[,c(6:77)] <- scale(sc[, c(6:77)])  
siteCovs(prwa.abund) <- sc

#run this when have CSV with both years  
null.prwa <- pcount(~Jdate + Noise + Time ~1, prwa.abund, mixture="P", K=40)  
year.prwa <- pcount(~Jdate + Noise + Time ~ YearCat, prwa.abund, mixture="P", K=40)  
fms.year.prwa<- fitList(null.prwa, year.prwa)

## Warning in fitList(null.prwa, year.prwa): Your list was unnamed, so model  
## names were added as object names

year.ms.prwa<-modSel(fms.year.prwa)  
year.ms.prwa

## nPars AIC delta AICwt cumltvWt  
## null.prwa 5 355.75 0.00 0.68 0.68  
## year.prwa 6 357.26 1.52 0.32 1.00

^ null ranked higher but year d1.52

#test for NB or Poisson - most should use Poisson  
testP.prwa <- pcount(~1 ~1, prwa.abund, mixture="P", K=4)  
testNB.prwa <- pcount(~1 ~1, prwa.abund, mixture="NB", K=4)  
fmsTEST <- fitList(testP.prwa, testNB.prwa)

## Warning in fitList(testP.prwa, testNB.prwa): Your list was unnamed, so  
## model names were added as object names

msTEST.prwa <- modSel(fmsTEST)  
msTEST.prwa

## nPars AIC delta AICwt cumltvWt  
## testNB.prwa 3 359.20 0.00 0.78 0.78  
## testP.prwa 2 361.75 2.55 0.22 1.00

#NB is best for prwa. Changed below to correspond!

#detection covariates first  
det.null.prwa <- pcount(~1 ~1, prwa.abund, mixture="NB", K=15)  
det.weather.prwa <- pcount(~ Wind + Sky ~1, prwa.abund, mixture="NB", K=15)  
det.global.prwa <- pcount(~ Jdate + Wind + Sky + Noise + Time ~1, prwa.abund, mixture="NB", K=15)  
det.sound.prwa <- pcount(~ Noise + Wind ~1, prwa.abund, mixture="NB", K=15)  
det.date.prwa <- pcount(~ Jdate ~1, prwa.abund, mixture="NB", K=15)  
det.detect.prwa <- pcount(~ Jdate + Noise + Time ~1, prwa.abund, mixture="NB", K=15)  
det.notdate.prwa <-pcount(~ Wind + Sky + Noise ~1, prwa.abund, mixture="NB", K=15)  
det.time.prwa <-pcount(~ Time ~1, prwa.abund, mixture="NB", K=15)  
det.timing.prwa <-pcount(~ Time + Jdate ~1, prwa.abund, mixture="NB", K=15)  
  
fmsDC <- fitList(det.null.prwa, det.weather.prwa, det.global.prwa,  
 det.sound.prwa, det.date.prwa, det.detect.prwa, det.notdate.prwa,  
 det.time.prwa, det.timing.prwa)

## Warning in fitList(det.null.prwa, det.weather.prwa, det.global.prwa,  
## det.sound.prwa, : Your list was unnamed, so model names were added as  
## object names

msDC.prwa <- modSel(fmsDC)  
msDC.prwa

## nPars AIC delta AICwt cumltvWt  
## det.time.prwa 4 351.65 0.00 0.421 0.42  
## det.detect.prwa 6 352.61 0.97 0.260 0.68  
## det.timing.prwa 5 353.60 1.95 0.159 0.84  
## det.global.prwa 8 355.54 3.89 0.060 0.90  
## det.null.prwa 3 356.36 4.71 0.040 0.94  
## det.sound.prwa 5 357.46 5.82 0.023 0.96  
## det.date.prwa 4 358.31 6.66 0.015 0.98  
## det.notdate.prwa 6 358.78 7.14 0.012 0.99  
## det.weather.prwa 5 359.13 7.48 0.010 1.00

#msDC.prwa@Full  
#summary: first time, then detect, then timing

det.time.prwa #positiv with time

##   
## Call:  
## pcount(formula = ~Time ~ 1, data = prwa.abund, K = 15, mixture = "NB")  
##   
## Abundance:  
## Estimate SE z P(>|z|)  
## -0.189 0.313 -0.605 0.545  
##   
## Detection:  
## Estimate SE z P(>|z|)  
## (Intercept) -0.909 0.414 -2.19 0.0282  
## Time 0.420 0.173 2.43 0.0151  
##   
## Dispersion:  
## Estimate SE z P(>|z|)  
## -0.0938 0.587 -0.16 0.873  
##   
## AIC: 351.6459

confint(det.time.prwa, type="det",method="normal")

## 0.025 0.975  
## p(Int) -1.72059998 -0.09713502  
## p(Time) 0.08116042 0.75797750

confint(det.time.prwa, type="state",method="normal")

## 0.025 0.975  
## lam(Int) -0.8024857 0.4239003

write.table(msDC.prwa@Full, file="C:/Users/woodj/Documents/GRAD SCHOOL - CLEMSON/Project-Specific/R work/USDA-songbirds/USDA-songbirds/prwa\_top\_models\_msDC.xls",sep="\t")

#more appropriate detection covariates (Time) #NB  
null.prwa <- pcount(~ Time ~1, prwa.abund, mixture="NB", K=60)  
global.prwa <- pcount(~ Time  
 ~ Treatment + Herbicide + BA +Ccover  
 + Ldepth + TreeHt + Age + TimeSinceB + TimeSinceT + Nthins  
 + HW\_dens\_1050 + FG\_herb + NHW\_saplings + NP\_over\_20cm  
 + PISoils + NSoilTypes  
 + Parea + ShapeIndex + YearCat  
 , prwa.abund, mixture="NB", K=60) # FPSiteIndex, Nsnags, Rel\_HW2P\_canopy   
local.prwa <- pcount(~ Time  
 ~ Ccover + TreeHt + Ldepth + YearCat  
 , prwa.abund, mixture="NB", K=60) #can only include BA OR CCover  
lh.prwa <- pcount(~ Time  
 ~ Age + FG\_herb + HW\_dens\_1050 + NHW\_saplings + NP\_over\_20cm + YearCat  
 , prwa.abund, mixture="NB", K=60)  
landmetrics.prwa <- pcount (~ Time  
 ~ Parea + ShapeIndex + YearCat  
 , prwa.abund, mixture="NB",K=60)  
landscape500.prwa <- pcount(~ Time  
 ~ Evergreen500m + Grass500m + HighDev500m + Schrubs500m + YearCat  
 , prwa.abund, mixture="NB", K=60)  
landscape1.prwa <- pcount(~ Time  
 ~ Evergreen1km + Grass1km + HighDev1km + Schrubs1km + YearCat  
 , prwa.abund, mixture="NB", K=60)  
landscape5.prwa <- pcount(~ Time  
 ~ Evergreen5km + Grass5km + HighDev5km + Schrubs5km + YearCat  
 , prwa.abund, mixture="NB", K=60)  
landscape30.prwa <- pcount(~ Time  
 ~ Evergreen30km + Grass30km + HighDev30km + YearCat  
 , prwa.abund, mixture="NB", K=60) #rmoved Protected  
treatment.prwa <- pcount(~ Time  
 ~ Treatment + Nthins + YearCat  
 , prwa.abund, mixture ="NB", K=60)  
management.prwa <- pcount(~ Time  
 ~ Treatment + BA + TimeSinceB + TimeSinceT + Herbicide + YearCat  
 , prwa.abund, mixture="NB", K=60)  
disturbance.prwa <- pcount(~ Time  
 ~ TimeSinceB + TimeSinceT + YearCat  
 , prwa.abund, mixture="NB", K=60)  
siteprod.prwa <- pcount(~ Time ~ PISoils + NSoilTypes + YearCat  
 , prwa.abund, mixture="NB", K=60)  
#upstate.prwa <- pcount(~ Time ~ X + Y + Z, prwa.abund, mixture="NB", K=40)  
coord.prwa <- pcount (~Time ~ Latitude + Longitude + YearCat  
 , prwa.abund, mixture="P", K=80)  
  
  
fms <- fitList(null.prwa, global.prwa, local.prwa, lh.prwa, landmetrics.prwa,  
 landscape500.prwa, landscape1.prwa, landscape5.prwa, landscape30.prwa,  
 treatment.prwa, management.prwa, disturbance.prwa,  
 siteprod.prwa, coord.prwa)

## Warning in fitList(null.prwa, global.prwa, local.prwa, lh.prwa,  
## landmetrics.prwa, : Your list was unnamed, so model names were added as  
## object names

ms.prwa <- modSel(fms) #note this does not include UPSTATE

## Warning in sqrt(diag(vcov(x, altNames = TRUE))): NaNs produced

ms.prwa

## nPars AIC delta AICwt cumltvWt  
## landscape5.prwa 9 329.17 0.00 5.3e-01 0.53  
## landscape1.prwa 9 329.70 0.53 4.1e-01 0.94  
## lh.prwa 10 333.68 4.51 5.6e-02 1.00  
## landscape30.prwa 8 341.53 12.37 1.1e-03 1.00  
## landscape500.prwa 9 342.70 13.54 6.1e-04 1.00  
## global.prwa 25 348.02 18.86 4.3e-05 1.00  
## management.prwa 12 349.03 19.86 2.6e-05 1.00  
## null.prwa 4 351.65 22.48 7.0e-06 1.00  
## local.prwa 8 352.26 23.10 5.2e-06 1.00  
## treatment.prwa 9 352.38 23.22 4.8e-06 1.00  
## disturbance.prwa 7 354.56 25.40 1.6e-06 1.00  
## landmetrics.prwa 7 355.93 26.76 8.2e-07 1.00  
## siteprod.prwa 7 356.79 27.62 5.4e-07 1.00  
## coord.prwa 6 358.82 29.65 1.9e-07 1.00

#ms.prwa@Full

landscape5.prwa

##   
## Call:  
## pcount(formula = ~Time ~ Evergreen5km + Grass5km + HighDev5km +   
## Schrubs5km + YearCat, data = prwa.abund, K = 60, mixture = "NB")  
##   
## Abundance:  
## Estimate SE z P(>|z|)  
## (Intercept) -0.891 0.311 -2.860 0.00423  
## Evergreen5km 0.467 0.183 2.554 0.01064  
## Grass5km -0.504 0.194 -2.594 0.00950  
## HighDev5km -0.354 0.277 -1.280 0.20046  
## Schrubs5km -0.135 0.147 -0.917 0.35902  
## YearCatB 0.463 0.293 1.579 0.11442  
##   
## Detection:  
## Estimate SE z P(>|z|)  
## (Intercept) -0.842 0.321 -2.62 0.0087  
## Time 0.470 0.173 2.71 0.0067

## Warning in sqrt(diag(vcov(obj))): NaNs produced

## Dispersion:  
## Estimate SE z P(>|z|)  
## 12.6 NaN NaN NaN  
##   
## AIC: 329.1655

confint(landscape5.prwa, type="state",method="normal")

## 0.025 0.975  
## lam(Int) -1.5011853 -0.2804367  
## lam(Evergreen5km) 0.1086532 0.8251782  
## lam(Grass5km) -0.8847391 -0.1231286  
## lam(HighDev5km) -0.8969267 0.1881531  
## lam(Schrubs5km) -0.4223502 0.1530647  
## lam(YearCatB) -0.1119175 1.0385114

landscape1.prwa

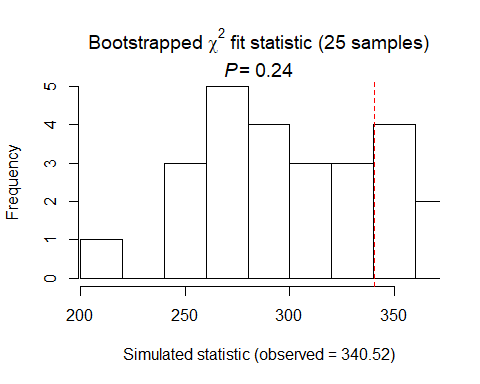
##   
## Call:  
## pcount(formula = ~Time ~ Evergreen1km + Grass1km + HighDev1km +   
## Schrubs1km + YearCat, data = prwa.abund, K = 60, mixture = "NB")  
##   
## Abundance:  
## Estimate SE z P(>|z|)  
## (Intercept) -24.6332 66.632 -0.370 0.71161  
## Evergreen1km 0.4566 0.150 3.043 0.00235  
## Grass1km -0.3060 0.185 -1.657 0.09760  
## HighDev1km -107.7950 297.596 -0.362 0.71719  
## Schrubs1km 0.0361 0.158 0.229 0.81875  
## YearCatB 0.2554 0.286 0.894 0.37108  
##   
## Detection:  
## Estimate SE z P(>|z|)  
## (Intercept) -0.838 0.322 -2.60 0.00923  
## Time 0.483 0.173 2.79 0.00523  
##   
## Dispersion:  
## Estimate SE z P(>|z|)  
## 24.6 2.76 8.91 5.25e-19  
##   
## AIC: 329.6995

confint(landscape1.prwa, type="state",method="normal")

## 0.025 0.975  
## lam(Int) -155.2291631 105.96270228  
## lam(Evergreen1km) 0.1624475 0.75067271  
## lam(Grass1km) -0.6679487 0.05602709  
## lam(HighDev1km) -691.0733708 475.48329919  
## lam(Schrubs1km) -0.2729016 0.34516542  
## lam(YearCatB) -0.3042748 0.81513608

write.table(ms.prwa@Full, file="C:/Users/woodj/Documents/GRAD SCHOOL - CLEMSON/Project-Specific/R work/USDA-songbirds/USDA-songbirds/PRWA\_top\_models\_ms.xls",sep="\t")

## Warning in rbinom(M \* J, size = rep(N, each = J), prob = pvec): NAs  
## produced  
  
## Warning in rbinom(M \* J, size = rep(N, each = J), prob = pvec): NAs  
## produced  
  
## Warning in rbinom(M \* J, size = rep(N, each = J), prob = pvec): NAs  
## produced  
  
## Warning in rbinom(M \* J, size = rep(N, each = J), prob = pvec): NAs  
## produced  
  
## Warning in rbinom(M \* J, size = rep(N, each = J), prob = pvec): NAs  
## produced  
  
## Warning in rbinom(M \* J, size = rep(N, each = J), prob = pvec): NAs  
## produced  
  
## Warning in rbinom(M \* J, size = rep(N, each = J), prob = pvec): NAs  
## produced  
  
## Warning in rbinom(M \* J, size = rep(N, each = J), prob = pvec): NAs  
## produced  
  
## Warning in rbinom(M \* J, size = rep(N, each = J), prob = pvec): NAs  
## produced  
  
## Warning in rbinom(M \* J, size = rep(N, each = J), prob = pvec): NAs  
## produced  
  
## Warning in rbinom(M \* J, size = rep(N, each = J), prob = pvec): NAs  
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## Warning in rbinom(M \* J, size = rep(N, each = J), prob = pvec): NAs  
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## Warning in rbinom(M \* J, size = rep(N, each = J), prob = pvec): NAs  
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## Warning in rbinom(M \* J, size = rep(N, each = J), prob = pvec): NAs  
## produced  
  
## Warning in rbinom(M \* J, size = rep(N, each = J), prob = pvec): NAs  
## produced  
  
## Warning in rbinom(M \* J, size = rep(N, each = J), prob = pvec): NAs  
## produced  
  
## Warning in rbinom(M \* J, size = rep(N, each = J), prob = pvec): NAs  
## produced



##   
## Chi-square goodness-of-fit for N-mixture model of 'unmarkedFitPCount' class  
##   
## Observed chi-square statistic = 340.5228   
## Number of bootstrap samples = 25  
## P-value = 0.24  
##   
## Quantiles of bootstrapped statistics:  
## 0% 25% 50% 75% 100%   
## 205 268 292 339 365   
##   
## Estimate of c-hat = 1.13

##   
## Chi-square goodness-of-fit for N-mixture model of 'unmarkedFitPCount' class  
##   
## Observed chi-square statistic = 340.5228

PRWA summary: NB distribution DCs: time (+), detect, then timing SCs using time: landcsape5 (+ evergreen, - grass) landscape1 (+ evergreen, - grass)

# RBWO

# (forest-dwelling, insectivore, cavity-nester, bark-forager)

# covariates: tree age, treeht, canopy cover, big trees, understory doesn’t matter

rbwo.abund<- csvToUMF("rbwo\_abund.csv", long = FALSE, type = "unmarkedFramePCount")  
#summary(rbwo.abund) #det at 45 sites!  
#str(rbwo.abund)  
#scale all observation covariates (covs of detection)  
obsCovs(rbwo.abund)= scale (obsCovs(rbwo.abund))  
#select particular site covariates to scale below  
sc <- siteCovs(rbwo.abund)  
sc[,c(6:77)] <- scale(sc[, c(6:77)])  
siteCovs(rbwo.abund) <- sc

#run this when have CSV with both years  
null.rbwo <- pcount(~Jdate + Noise + Time ~1, rbwo.abund, mixture="P", K=40)  
year.rbwo <- pcount(~Jdate + Noise + Time ~ YearCat, rbwo.abund, mixture="P", K=40)  
fms.year.rbwo<- fitList(null.rbwo, year.rbwo)

## Warning in fitList(null.rbwo, year.rbwo): Your list was unnamed, so model  
## names were added as object names

year.ms.rbwo<-modSel(fms.year.rbwo)  
year.ms.rbwo

## nPars AIC delta AICwt cumltvWt  
## null.rbwo 5 642.49 0.00 0.71 0.71  
## year.rbwo 6 644.25 1.76 0.29 1.00

^ null model ranked higher but year is d1.76

#detection covariates first  
det.null.rbwo <- pcount(~1 ~1, rbwo.abund, mixture="P", K=15)  
det.weather.rbwo <- pcount(~ Wind + Sky ~1, rbwo.abund, mixture="P", K=15)  
det.global.rbwo <- pcount(~ Jdate + Wind + Sky + Noise + Time ~1, rbwo.abund, mixture="P", K=15)  
det.sound.rbwo <- pcount(~ Noise + Wind ~1, rbwo.abund, mixture="P", K=15)  
det.date.rbwo <- pcount(~ Jdate ~1, rbwo.abund, mixture="P", K=15)  
det.detect.rbwo <- pcount(~ Jdate + Noise + Time ~1, rbwo.abund, mixture="P", K=15)  
det.notdate.rbwo <-pcount(~ Wind + Sky + Noise ~1, rbwo.abund, mixture="P", K=15)  
det.time.rbwo <-pcount(~ Time ~1, rbwo.abund, mixture="P",K=15)  
det.timing.rbwo <-pcount(~ Time + Jdate ~1, rbwo.abund, mixture="P", K=15)  
  
fmsDC <- fitList(det.null.rbwo, det.weather.rbwo, det.global.rbwo,  
 det.sound.rbwo, det.date.rbwo, det.detect.rbwo, det.notdate.rbwo,  
 det.time.rbwo, det.timing.rbwo)

## Warning in fitList(det.null.rbwo, det.weather.rbwo, det.global.rbwo,  
## det.sound.rbwo, : Your list was unnamed, so model names were added as  
## object names

msDC.rbwo <- modSel(fmsDC)  
msDC.rbwo

## nPars AIC delta AICwt cumltvWt  
## det.global.rbwo 7 637.95 0.00 0.5081 0.51  
## det.time.rbwo 3 639.43 1.48 0.2424 0.75  
## det.timing.rbwo 4 641.34 3.39 0.0934 0.84  
## det.weather.rbwo 4 642.47 4.52 0.0529 0.90  
## det.detect.rbwo 5 642.50 4.55 0.0522 0.95  
## det.notdate.rbwo 5 643.43 5.48 0.0328 0.98  
## det.null.rbwo 2 646.08 8.13 0.0087 0.99  
## det.date.rbwo 3 647.12 9.17 0.0052 1.00  
## det.sound.rbwo 4 647.48 9.53 0.0043 1.00

#msDC.rbwo@Full  
#summary: global best, time one shortly after,

det.global.rbwo

##   
## Call:  
## pcount(formula = ~Jdate + Wind + Sky + Noise + Time ~ 1, data = rbwo.abund,   
## K = 15, mixture = "P")  
##   
## Abundance:  
## Estimate SE z P(>|z|)  
## 1.49 0.498 3 0.00273  
##   
## Detection:  
## Estimate SE z P(>|z|)  
## (Intercept) -1.8708 0.5818 -3.216 0.0013  
## Jdate -0.1152 0.0894 -1.289 0.1973  
## Wind -0.1738 0.0912 -1.906 0.0567  
## Sky -0.1780 0.0871 -2.042 0.0411  
## Noise -0.0707 0.0880 -0.803 0.4218  
## Time 0.2132 0.0933 2.285 0.0223  
##   
## AIC: 637.9474

confint(det.global.rbwo, type="det",method="normal")

## 0.025 0.975  
## p(Int) -3.01110864 -0.730505130  
## p(Jdate) -0.29040561 0.059953362  
## p(Wind) -0.35255421 0.004938985  
## p(Sky) -0.34878790 -0.007182484  
## p(Noise) -0.24321118 0.101794546  
## p(Time) 0.03030084 0.396133892

confint(det.global.rbwo, type="state",method="normal")

## 0.025 0.975  
## lam(Int) 0.5167767 2.470312

write.table(msDC.rbwo@Full, file="C:/Users/woodj/Documents/GRAD SCHOOL - CLEMSON/Project-Specific/R work/USDA-songbirds/USDA-songbirds/rbwo\_top\_models\_msDC.xls",sep="\t")

#now site covs using detection covariates (global DC)  
null.rbwo <- pcount(~ Jdate + Wind + Sky + Noise + Time ~1  
 , rbwo.abund, mixture="P", K=120)  
global.rbwo <- pcount(~ Jdate + Wind + Sky + Noise+ Time  
 ~ Treatment + Herbicide + BA + Nsnags +Ccover  
 + Ldepth + TreeHt + Age + TimeSinceB + TimeSinceT + Nthins  
 + HW\_dens\_1050 + FG\_herb + FG\_shrub + NHW\_saplings + NP\_over\_20cm  
 + Rel\_HW2P\_canopy + PISoils + NSoilTypes  
 + Parea + ShapeIndex + YearCat  
 , rbwo.abund, mixture="P", K=120) #FPSiteIndex removed  
local.rbwo <- pcount(~ Jdate + Wind + Sky + Noise + Time   
 ~ Ccover + TreeHt + Ldepth + YearCat  
 , rbwo.abund, mixture="P", K=120) #can only include BA OR CCover  
lh.rbwo <- pcount(~ Jdate + Wind + Sky + Noise + Time   
 ~ TreeHt + Ccover + NP\_over\_20cm + Rel\_HW2P\_canopy + YearCat  
 , rbwo.abund, mixture="P", K=120)  
landmetrics.rbwo <- pcount (~ Jdate + Wind + Sky + Noise + Time  
 ~ Parea + ShapeIndex + YearCat  
 , rbwo.abund, mixture="P", K=120)  
landscape500.rbwo <- pcount(~ Jdate + Wind + Sky + Noise + Time  
 ~ Evergreen500m + HighDev500m + Schrubs500m + Ag500m + YearCat  
 , rbwo.abund, mixture="P", K=120)  
landscape1.rbwo <- pcount(~ Jdate + Wind + Sky + Noise + Time  
 ~ Evergreen1km + HighDev1km + Schrubs1km + YearCat  
 , rbwo.abund, mixture="P", K=120)  
landscape5.rbwo <- pcount(~ Jdate + Wind + Sky + Noise + Time  
 ~ Evergreen5km + HighDev5km + Schrubs5km + YearCat  
 , rbwo.abund, mixture="P", K=120)  
landscape30.rbwo <- pcount(~ Jdate + Wind + Sky + Noise + Time   
 ~ Evergreen30km + HighDev30km + YearCat  
 , rbwo.abund, mixture="P", K=120) #removed Protected30  
treatment.rbwo <- pcount(~ Jdate + Wind + Sky + Noise + Time   
 ~ Treatment + Nthins + YearCat  
 , rbwo.abund, mixture ="P", K=120)  
management.rbwo <- pcount(~ Jdate + Wind + Sky + Noise + Time   
 ~ Treatment + BA + TimeSinceB + TimeSinceT + Herbicide + YearCat  
 , rbwo.abund, mixture="P", K=120)  
disturbance.rbwo <- pcount(~ Jdate + Wind + Sky + Noise + Time   
 ~ TimeSinceB + TimeSinceT + YearCat  
 , rbwo.abund, mixture="P", K=120)  
siteprod.rbwo <- pcount(~ Jdate + Wind + Sky + Noise + Time   
 ~ PISoils + NSoilTypes + YearCat  
 , rbwo.abund, mixture="P", K=120) #FPSiteIndex removed  
upstate.rbwo <- pcount(~ Jdate + Wind + Sky + Noise + Time  
 ~ Parea + HighDev5km + YearCat  
 , rbwo.abund, mixture="P", K=120) #5km was pretty arbitrary  
coord.rbwo <- pcount (~Jdate + Wind + Sky + Noise + Time  
 ~ Latitude + Longitude + YearCat  
 , rbwo.abund, mixture="P", K=80)  
  
fms <- fitList(null.rbwo, global.rbwo, local.rbwo, lh.rbwo, landmetrics.rbwo,  
 landscape500.rbwo, landscape1.rbwo, landscape5.rbwo, landscape30.rbwo,  
 treatment.rbwo, management.rbwo, disturbance.rbwo,  
 siteprod.rbwo, upstate.rbwo, coord.rbwo)

## Warning in fitList(null.rbwo, global.rbwo, local.rbwo, lh.rbwo,  
## landmetrics.rbwo, : Your list was unnamed, so model names were added as  
## object names

ms.rbwo <- modSel(fms) #remember FPSiteIndex removed from global & siteprod  
ms.rbwo

## nPars AIC delta AICwt cumltvWt  
## coord.rbwo 10 633.36 0.00 7.7e-01 0.77  
## null.rbwo 7 637.95 4.59 7.8e-02 0.85  
## landscape5.rbwo 11 639.94 6.58 2.9e-02 0.88  
## local.rbwo 11 640.50 7.14 2.2e-02 0.90  
## landscape30.rbwo 10 640.82 7.45 1.9e-02 0.92  
## treatment.rbwo 12 641.01 7.65 1.7e-02 0.93  
## landmetrics.rbwo 10 641.04 7.68 1.7e-02 0.95  
## siteprod.rbwo 10 641.21 7.85 1.5e-02 0.96  
## landscape500.rbwo 12 642.09 8.73 9.8e-03 0.97  
## upstate.rbwo 10 642.32 8.96 8.7e-03 0.98  
## disturbance.rbwo 10 642.73 9.37 7.1e-03 0.99  
## landscape1.rbwo 11 643.18 9.82 5.7e-03 1.00  
## lh.rbwo 12 644.60 11.24 2.8e-03 1.00  
## management.rbwo 15 645.20 11.84 2.1e-03 1.00  
## global.rbwo 31 665.66 32.30 7.5e-08 1.00

#ms.rbwo@Full  
#summary: coord is only top model

coord.rbwo

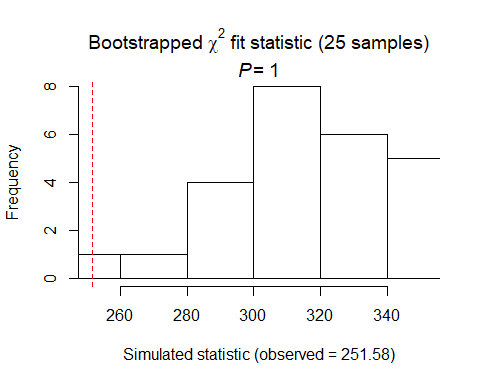
##   
## Call:  
## pcount(formula = ~Jdate + Wind + Sky + Noise + Time ~ Latitude +   
## Longitude + YearCat, data = rbwo.abund, K = 80, mixture = "P")  
##   
## Abundance:  
## Estimate SE z P(>|z|)  
## (Intercept) 2.515 1.6631 1.512 0.13041  
## Latitude -0.267 0.0857 -3.115 0.00184  
## Longitude -0.115 0.0826 -1.390 0.16443  
## YearCatB -0.154 0.1612 -0.958 0.33821  
##   
## Detection:  
## Estimate SE z P(>|z|)  
## (Intercept) -2.9558 1.7590 -1.680 0.0929  
## Jdate -0.1481 0.0855 -1.733 0.0830  
## Wind -0.1790 0.0900 -1.989 0.0467  
## Sky -0.1667 0.0826 -2.018 0.0436  
## Noise -0.0133 0.0807 -0.165 0.8687  
## Time 0.1887 0.0884 2.134 0.0328  
##   
## AIC: 633.3609

confint(coord.rbwo, type="state",method="normal")

## 0.025 0.975  
## lam(Int) -0.7442019 5.77505869  
## lam(Latitude) -0.4350982 -0.09903668  
## lam(Longitude) -0.2765872 0.04702861  
## lam(YearCatB) -0.4704486 0.16160529

write.table(ms.rbwo@Full, file="C:/Users/woodj/Documents/GRAD SCHOOL - CLEMSON/Project-Specific/R work/USDA-songbirds/USDA-songbirds/rbwo\_top\_models\_ms.xls",sep="\t")

## Warning in rbinom(M \* J, size = rep(N, each = J), prob = pvec): NAs  
## produced  
  
## Warning in rbinom(M \* J, size = rep(N, each = J), prob = pvec): NAs  
## produced  
  
## Warning in rbinom(M \* J, size = rep(N, each = J), prob = pvec): NAs  
## produced  
  
## Warning in rbinom(M \* J, size = rep(N, each = J), prob = pvec): NAs  
## produced  
  
## Warning in rbinom(M \* J, size = rep(N, each = J), prob = pvec): NAs  
## produced  
  
## Warning in rbinom(M \* J, size = rep(N, each = J), prob = pvec): NAs  
## produced  
  
## Warning in rbinom(M \* J, size = rep(N, each = J), prob = pvec): NAs  
## produced  
  
## Warning in rbinom(M \* J, size = rep(N, each = J), prob = pvec): NAs  
## produced  
  
## Warning in rbinom(M \* J, size = rep(N, each = J), prob = pvec): NAs  
## produced  
  
## Warning in rbinom(M \* J, size = rep(N, each = J), prob = pvec): NAs  
## produced  
  
## Warning in rbinom(M \* J, size = rep(N, each = J), prob = pvec): NAs  
## produced  
  
## Warning in rbinom(M \* J, size = rep(N, each = J), prob = pvec): NAs  
## produced  
  
## Warning in rbinom(M \* J, size = rep(N, each = J), prob = pvec): NAs  
## produced  
  
## Warning in rbinom(M \* J, size = rep(N, each = J), prob = pvec): NAs  
## produced  
  
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## produced  
  
## Warning in rbinom(M \* J, size = rep(N, each = J), prob = pvec): NAs  
## produced  
  
## Warning in rbinom(M \* J, size = rep(N, each = J), prob = pvec): NAs  
## produced  
  
## Warning in rbinom(M \* J, size = rep(N, each = J), prob = pvec): NAs  
## produced  
  
## Warning in rbinom(M \* J, size = rep(N, each = J), prob = pvec): NAs  
## produced  
  
## Warning in rbinom(M \* J, size = rep(N, each = J), prob = pvec): NAs  
## produced  
  
## Warning in rbinom(M \* J, size = rep(N, each = J), prob = pvec): NAs  
## produced  
  
## Warning in rbinom(M \* J, size = rep(N, each = J), prob = pvec): NAs  
## produced  
  
## Warning in rbinom(M \* J, size = rep(N, each = J), prob = pvec): NAs  
## produced  
  
## Warning in rbinom(M \* J, size = rep(N, each = J), prob = pvec): NAs  
## produced



##   
## Chi-square goodness-of-fit for N-mixture model of 'unmarkedFitPCount' class  
##   
## Observed chi-square statistic = 251.5792   
## Number of bootstrap samples = 25  
## P-value = 1  
##   
## Quantiles of bootstrapped statistics:  
## 0% 25% 50% 75% 100%   
## 256 302 312 339 352   
##   
## Estimate of c-hat = 0.8

##   
## Chi-square goodness-of-fit for N-mixture model of 'unmarkedFitPCount' class  
##   
## Observed chi-square statistic = 251.5792

RBWO Summary: P distribution DCs: global (sky -, time +, marg wind (-)), then time SCs using global: Coord is only top model (- with Latitude)

# YBCH

# (foliage gleaner, shrub nester 1-8’ max, scrub habitat, insects)

# covariates: shrub/midstory density, forbs,

ybch.abund<- csvToUMF("ybch\_abund.csv", long = FALSE, type = "unmarkedFramePCount")  
#summary(ybch.abund)  
#str(ybch.abund)  
#scale all observation covariates (covs of detection)  
obsCovs(ybch.abund)= scale (obsCovs(ybch.abund))  
#select particular site covariates to scale below  
sc <- siteCovs(ybch.abund)  
sc[,c(6:77)] <- scale(sc[, c(6:77)])  
siteCovs(ybch.abund) <- sc

#run this when have CSV with both years  
null.ybch <- pcount(~Jdate + Noise + Time ~1, ybch.abund, mixture="P", K=40)  
year.ybch <- pcount(~Jdate + Noise + Time ~ YearCat, ybch.abund, mixture="P", K=40)  
fms.year.ybch<- fitList(null.ybch, year.ybch)

## Warning in fitList(null.ybch, year.ybch): Your list was unnamed, so model  
## names were added as object names

year.ms.ybch<-modSel(fms.year.ybch)  
year.ms.ybch

## nPars AIC delta AICwt cumltvWt  
## null.ybch 5 546.27 0.00 0.73 0.73  
## year.ybch 6 548.23 1.96 0.27 1.00

^ null ranked first but year is 1.96

#detection covariates first  
det.null.ybch <- pcount(~1 ~1, ybch.abund, mixture="P", K=15)  
det.weather.ybch <- pcount(~ Wind + Sky ~1, ybch.abund, mixture="P", K=15)  
det.global.ybch <- pcount(~ Jdate + Wind + Sky + Noise +Time ~1, ybch.abund, mixture="P", K=15)  
det.sound.ybch <- pcount(~ Noise + Wind ~1, ybch.abund, mixture="P", K=15)  
det.date.ybch <- pcount(~ Jdate ~1, ybch.abund, mixture="P", K=15)  
det.detect.ybch <- pcount(~ Jdate + Noise + Time ~1, ybch.abund, mixture="P", K=15)  
det.notdate.ybch <-pcount(~ Wind + Sky + Noise ~1, ybch.abund, mixture="P", K=15)  
det.time.ybch <-pcount(~ Time ~1, ybch.abund, mixture="P",K=15)  
det.timing.ybch <-pcount(~ Time + Jdate ~1, ybch.abund, mixture="P", K=15)  
  
fmsDC <- fitList(det.null.ybch, det.weather.ybch, det.global.ybch,  
 det.sound.ybch, det.date.ybch, det.detect.ybch, det.notdate.ybch,  
 det.time.ybch, det.timing.ybch)

## Warning in fitList(det.null.ybch, det.weather.ybch, det.global.ybch,  
## det.sound.ybch, : Your list was unnamed, so model names were added as  
## object names

msDC.ybch <- modSel(fmsDC)  
msDC.ybch

## nPars AIC delta AICwt cumltvWt  
## det.detect.ybch 5 546.27 0.00 6.8e-01 0.68  
## det.global.ybch 7 548.12 1.85 2.7e-01 0.95  
## det.date.ybch 3 552.75 6.48 2.6e-02 0.97  
## det.timing.ybch 4 553.64 7.37 1.7e-02 0.99  
## det.sound.ybch 4 555.35 9.07 7.2e-03 1.00  
## det.notdate.ybch 5 557.30 11.03 2.7e-03 1.00  
## det.weather.ybch 4 562.09 15.81 2.5e-04 1.00  
## det.time.ybch 3 565.43 19.16 4.7e-05 1.00  
## det.null.ybch 2 566.29 20.02 3.0e-05 1.00

#msDC.ybch@Full  
#summary: 1st detect (Jdate + Noise +Time), 2nd is global (1.85)

det.detect.ybch #+ w date and - with noise

##   
## Call:  
## pcount(formula = ~Jdate + Noise + Time ~ 1, data = ybch.abund,   
## K = 15, mixture = "P")  
##   
## Abundance:  
## Estimate SE z P(>|z|)  
## 0.287 0.151 1.9 0.0577  
##   
## Detection:  
## Estimate SE z P(>|z|)  
## (Intercept) -0.5315 0.238 -2.229 0.02579  
## Jdate 0.4221 0.116 3.652 0.00026  
## Noise -0.4455 0.141 -3.150 0.00163  
## Time -0.0779 0.114 -0.686 0.49298  
##   
## AIC: 546.271

confint(det.detect.ybch, type="det",method="normal")

## 0.025 0.975  
## p(Int) -0.9988673 -0.0642185  
## p(Jdate) 0.1955544 0.6486050  
## p(Noise) -0.7226457 -0.1683451  
## p(Time) -0.3004380 0.1447231

confint(det.detect.ybch, type="state",method="normal")

## 0.025 0.975  
## lam(Int) -0.009334575 0.5826065

write.table(msDC.ybch@Full, file="C:/Users/woodj/Documents/GRAD SCHOOL - CLEMSON/Project-Specific/R work/USDA-songbirds/USDA-songbirds/ybch\_top\_models\_msDC.xls",sep="\t")

# SCs with appropriate detection covariates (Jdate + Noise + Time )  
null.ybch <- pcount(~ Jdate + Noise + Time ~1, ybch.abund, mixture="P", K=40)  
global.ybch <- pcount(~ Jdate + Noise + Time  
 ~ Treatment + Herbicide + BA + Ccover  
 + Ldepth + TreeHt + Age + TimeSinceB + TimeSinceT + Nthins  
 + HW\_dens\_1050 + FG\_herb + FG\_shrub + NHW\_saplings  
 + Rel\_HW2P\_canopy + PISoils + NSoilTypes  
 + Parea + ShapeIndex + YearCat  
 , ybch.abund, mixture="P", K=40) #FPSiteIndex, snags,   
local.ybch <- pcount(~ Jdate + Noise + Time  
 ~ Ccover + TreeHt + Ldepth + YearCat  
 , ybch.abund, mixture="P", K=40) #can only include BA OR CCover  
lh.ybch <- pcount(~ Jdate + Noise + Time  
 ~ BA + FG\_herb + FG\_shrub + HW\_dens\_1050 + NHW\_saplings  
 + Rel\_HW2P\_canopy + YearCat  
 , ybch.abund, mixture="P", K=40)  
landmetrics.ybch <- pcount (~ Jdate + Noise + Time  
 ~ Parea + ShapeIndex + YearCat  
 , ybch.abund, mixture="P",K=40)  
landscape500.ybch <- pcount(~ Jdate + Noise + Time  
 ~ Evergreen500m + Grass500m + HighDev500m + Schrubs500m  
 + Ag500m + OpenDev500m + YearCat  
 , ybch.abund, mixture="P", K=40)  
landscape1.ybch <- pcount(~ Jdate + Noise + Time  
 ~ Evergreen1km + Grass1km + HighDev1km + Schrubs1km  
 + OpenDev1km + YearCat  
 , ybch.abund, mixture="P", K=40)  
landscape5.ybch <- pcount(~ Jdate + Noise + Time  
 ~ Evergreen5km + Grass5km + HighDev5km + Schrubs5km + YearCat  
 , ybch.abund, mixture="P", K=40)  
landscape30.ybch <- pcount(~ Jdate + Noise + Time  
 ~ Evergreen30km + Grass30km + YearCat  
 , ybch.abund, mixture="P", K=40)  
treatment.ybch <- pcount(~ Jdate + Noise + Time  
 ~ Treatment + Nthins + YearCat  
 , ybch.abund, mixture ="P", K=40)  
management.ybch <- pcount(~ Jdate + Noise + Time  
 ~ Treatment + BA + TimeSinceB + TimeSinceT + Herbicide + YearCat  
 , ybch.abund, mixture="P", K=40)  
disturbance.ybch <- pcount(~ Jdate + Noise + Time  
 ~ TimeSinceB + TimeSinceT + YearCat  
 , ybch.abund, mixture="P", K=40)  
siteprod.ybch <- pcount(~ Jdate + Noise + Time ~ PISoils + NSoilTypes + YearCat  
 , ybch.abund, mixture="P", K=40) #FPSiteIndex  
#upstate.ybch <- pcount(~ Jdate + Noise + Time ~ X + Y + Z, ybch.abund, mixture="P", K=40)  
coord.ybch <- pcount (~Jdate + Noise + Time ~ Latitude + Longitude + YearCat  
 , ybch.abund, mixture="P", K=40)  
  
  
fmsYBCH <- fitList(null.ybch, global.ybch, local.ybch, lh.ybch, landmetrics.ybch,  
 landscape500.ybch, landscape1.ybch, landscape5.ybch, landscape30.ybch,  
 treatment.ybch, management.ybch, disturbance.ybch,  
 siteprod.ybch, coord.ybch)

## Warning in fitList(null.ybch, global.ybch, local.ybch, lh.ybch,  
## landmetrics.ybch, : Your list was unnamed, so model names were added as  
## object names

ms.ybch <- modSel(fmsYBCH) #note this does not include upstate  
ms.ybch

## nPars AIC delta AICwt cumltvWt  
## landscape1.ybch 11 515.62 0.00 9.8e-01 0.98  
## landscape5.ybch 10 524.07 8.46 1.4e-02 0.99  
## lh.ybch 12 526.28 10.67 4.7e-03 1.00  
## landscape30.ybch 8 528.33 12.72 1.7e-03 1.00  
## landscape500.ybch 12 532.62 17.00 2.0e-04 1.00  
## local.ybch 9 534.77 19.16 6.8e-05 1.00  
## management.ybch 13 538.25 22.63 1.2e-05 1.00  
## disturbance.ybch 8 541.55 25.93 2.3e-06 1.00  
## global.ybch 27 542.59 26.97 1.4e-06 1.00  
## coord.ybch 8 543.51 27.89 8.6e-07 1.00  
## null.ybch 5 546.27 30.66 2.2e-07 1.00  
## landmetrics.ybch 8 549.59 33.98 4.1e-08 1.00  
## treatment.ybch 10 549.76 34.14 3.8e-08 1.00  
## siteprod.ybch 8 552.15 36.53 1.1e-08 1.00

#ms.ybch@Full  
#Summary: Landscape1 is only top model

landscape1.ybch

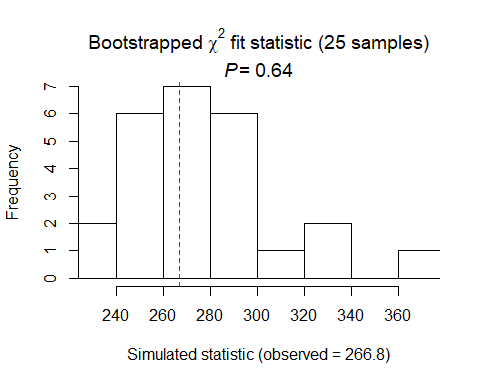
##   
## Call:  
## pcount(formula = ~Jdate + Noise + Time ~ Evergreen1km + Grass1km +   
## HighDev1km + Schrubs1km + OpenDev1km + YearCat, data = ybch.abund,   
## K = 40, mixture = "P")  
##   
## Abundance:  
## Estimate SE z P(>|z|)  
## (Intercept) -0.8901 0.9702 -0.9175 0.358906  
## Evergreen1km 0.2022 0.1370 1.4758 0.139997  
## Grass1km 0.0847 0.1161 0.7292 0.465859  
## HighDev1km -5.6553 4.3506 -1.2999 0.193638  
## Schrubs1km 0.3117 0.0863 3.6131 0.000303  
## OpenDev1km -0.3606 0.1240 -2.9084 0.003632  
## YearCatB 0.0133 0.2006 0.0664 0.947072  
##   
## Detection:  
## Estimate SE z P(>|z|)  
## (Intercept) -0.7941 0.315 -2.523 0.01162  
## Jdate 0.3327 0.112 2.982 0.00286  
## Noise -0.3184 0.131 -2.424 0.01533  
## Time -0.0999 0.107 -0.937 0.34854  
##   
## AIC: 515.616

confint(landscape1.ybch, type="state",method="normal")

## 0.025 0.975  
## lam(Int) -2.79172168 1.0114654  
## lam(Evergreen1km) -0.06634202 0.4707828  
## lam(Grass1km) -0.14287696 0.3121923  
## lam(HighDev1km) -14.18234805 2.8717159  
## lam(Schrubs1km) 0.14262504 0.4808229  
## lam(OpenDev1km) -0.60366280 -0.1176076  
## lam(YearCatB) -0.37982908 0.4064606

write.table(ms.ybch@Full, file="C:/Users/woodj/Documents/GRAD SCHOOL - CLEMSON/Project-Specific/R work/USDA-songbirds/USDA-songbirds/ybch\_top\_models\_ms.xls",sep="\t")

## Warning in rbinom(M \* J, size = rep(N, each = J), prob = pvec): NAs  
## produced  
  
## Warning in rbinom(M \* J, size = rep(N, each = J), prob = pvec): NAs  
## produced  
  
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## produced  
  
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## produced  
  
## Warning in rbinom(M \* J, size = rep(N, each = J), prob = pvec): NAs  
## produced  
  
## Warning in rbinom(M \* J, size = rep(N, each = J), prob = pvec): NAs  
## produced



##   
## Chi-square goodness-of-fit for N-mixture model of 'unmarkedFitPCount' class  
##   
## Observed chi-square statistic = 266.7951   
## Number of bootstrap samples = 25  
## P-value = 0.64  
##   
## Quantiles of bootstrapped statistics:  
## 0% 25% 50% 75% 100%   
## 230 254 273 289 372   
##   
## Estimate of c-hat = 0.97

##   
## Chi-square goodness-of-fit for N-mixture model of 'unmarkedFitPCount' class  
##   
## Observed chi-square statistic = 266.7951

YBCH Summary P distribution DCs: detect first (+ date, then - noise), then global SCs using detect model: Landscape1km only top model (+Scrubs, -OpenDev)