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MS RAPTOR BIOLOGY **EEB 622 HW 4**

GENERATIVE MODEL FOR NORTHERN GOSHAWK NEST DISTRIBUTION

Species: Northern Goshawk

A. Environmental predictor variable: canopy/forest cover (number of large trees)

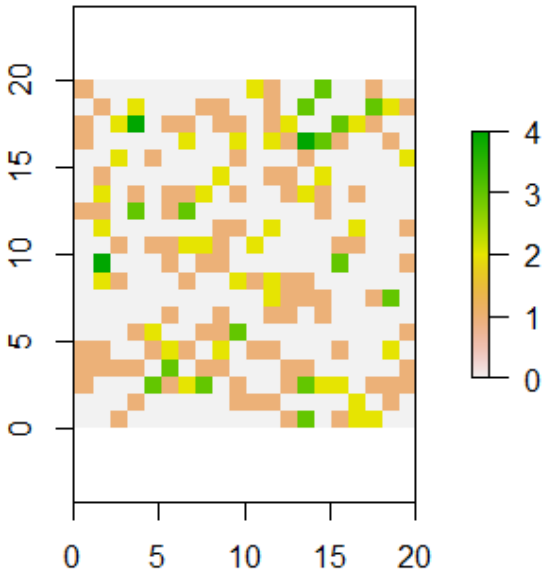

Fig.1. Simulated landscape for Northern Goshawk nest distribution given phi=3. Green plots have very high likelihood of clumped forest stand with large trees and 0 suggests no canopy cover.

-Northern Goshawks are forest-dependent species that usually nest in deciduous, conifer and mixed types of trees. Occupancy in forest stands are generally greater with >70% canopy closure. Larger forest stands (>20 ha) with large trees (>20 cm dbh) generally have more nest sightings. This predictor variable will be useful for Northern Goshawk habitat modelling given that these species have higher preference for suitable forest cover and/or presence of large trees.

B. Phi-value: 3

- At increased set phi value, spatial aggregation/clustering decreased. I set my phi at 3 because it gives a more realistic representation of low probability of observing forest stands with large trees clumped together. Fig.2 shows that my landscape is partially spatially autocorrelated (0.5) at lag distance of about 5 ha (unit assumed). This landscape seems appropriate if I assume low detection of clumped nesting sites which is expected for Northern Goshawks.

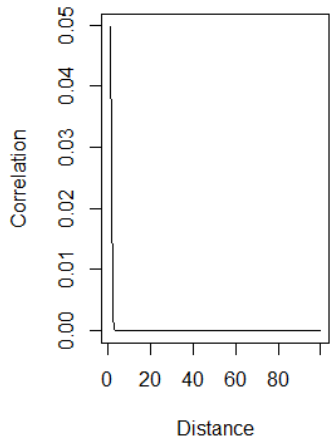

Fig.2 Correlogram of simulated landscape for Northern Goshawk nest site distribution.

C.The limiting factor for my sampling unit is the number of pixels. In this case because I chose to set a 20x20 landscape (n=400 pixels), I will not be able to sample more than 400 pixels/plots.

D. Simulated landscape with sampling unit distribution

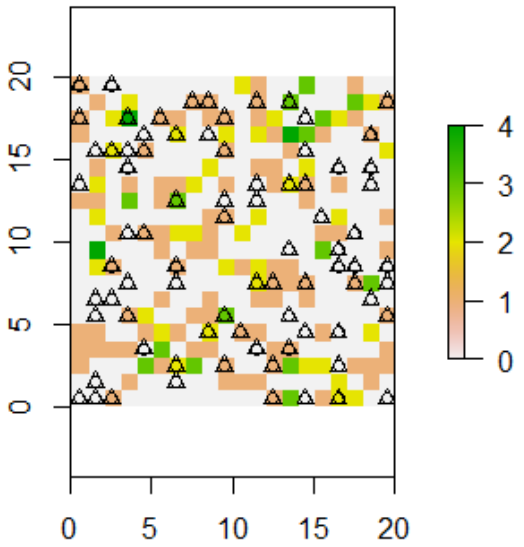

Fig.3. Simulated landscape for Northern Goshawk nest site distribution with sampling points. I have set 20% of the total pixels (n=80 sampling points) for this simulated landscape.

E. Because Northern Goshawk nesting site preference is highly dependent on suitable forest cover, I observed a hurdle model. Also, because they are forest-dependent species, their presence/absence is dictated by presence of canopy cover. Increased likelihood of greater nesting site abundance is expected in areas with more large trees (or greater forest cover).

F. I assume that the variances will be dispersed depending on the amount of spatial autocorrelation. If the sites are autocorrelated, then there is a high likelihood that there would be more 1s than 0s in the presence/absence (binomial) model as goshawks would tend to prefer nesting in forest stands with

large trees. Consequently, I expect the mean to be lower than the variance with extremely high dispersion because of skewed presence/absence data.

G. HURDLE MODEL

```
> #2 components of hurdle model
> #1: presence/absence-DISPERSAL
> presence_intercept=-2.5
> presence_slope=1.5
> PA=rbinom(80,plogis(presence_intercept+spat_dat[GO,3]*presence_slope),
+           size=1)
> #2: component-ABUNDANCE
> count_intercept=0.5
> count_slope=0.75
> over_dispersion=0.5
> abundance=PA*rnbinom(80,mu=
+                        exp(count_intercept+count_slope*spat_dat[GO,3]),
+                      size=over_dispersion)
> plot(abundance~spat_dat[GO,3])
```

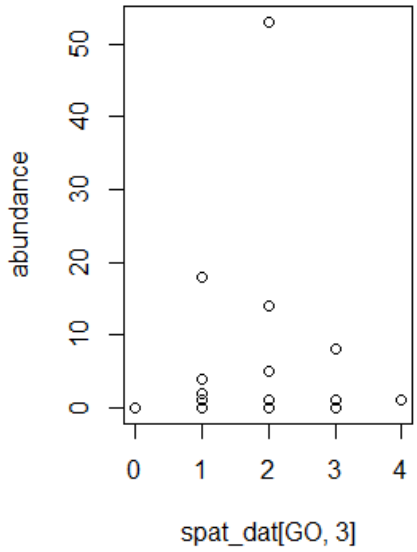

Fig.4. Abundance of Northern Goshawk nests in simulated landscape.

H. ANALYZING NEIGHBOR'S DATA: KRISTINA

```
> #Kristina's data
> #modelling distribution of snakes on rock outcropping
> str(cror) #P/A
'data.frame':  10 obs. of  2 variables:
 $ X: int  1 2 3 4 5 6 7 8 9 10
 $ x: int  1 0 375731 0 13 0 0 3 0 0
> str(CRORGO) #abundance
'data.frame':  10 obs. of  2 variables:
 $ X: int  1 2 3 4 5 6 7 8 9 10
 $ x: int  1627 2362 2279 1349 1714 1204 2470 1118 501 1268
> PAmod=glm(PA1~cror$x, family="binomial")
> coef(PAmod)
 (Intercept)       cror$x
2.456607e+01 6.514022e-15
```

```
> #count data
> abundance2<-CRORGO$x[which(CRORGO$x>0)]
> factor<-cror$x[which(CRORGO$x>0)]
> abunmod=glm(abundance2~factor, family="poisson")
> coef(abunmod)
 (Intercept)       factor
7.321554e+00 1.091047e-06
```

	Presence/Absence		Abundance	
	True value	Obtained estimate	True value	Obtained estimate
Intercept	-1	2.456607e+01	-1	7.321554e+00
slope	1.25	6.514022e-15	0.42	1.091047e-06

I was unable to recapture the "true" value of the intercept and slope of Kristina's data.

I. I would make a correlogram/ plot the correlation value for the response variable at given lag distances.