Ocupación, bajo el modelo estático (MacKenzie et al. 2002) para para las especies de mamíferos en el Parque Nacional Machalilla

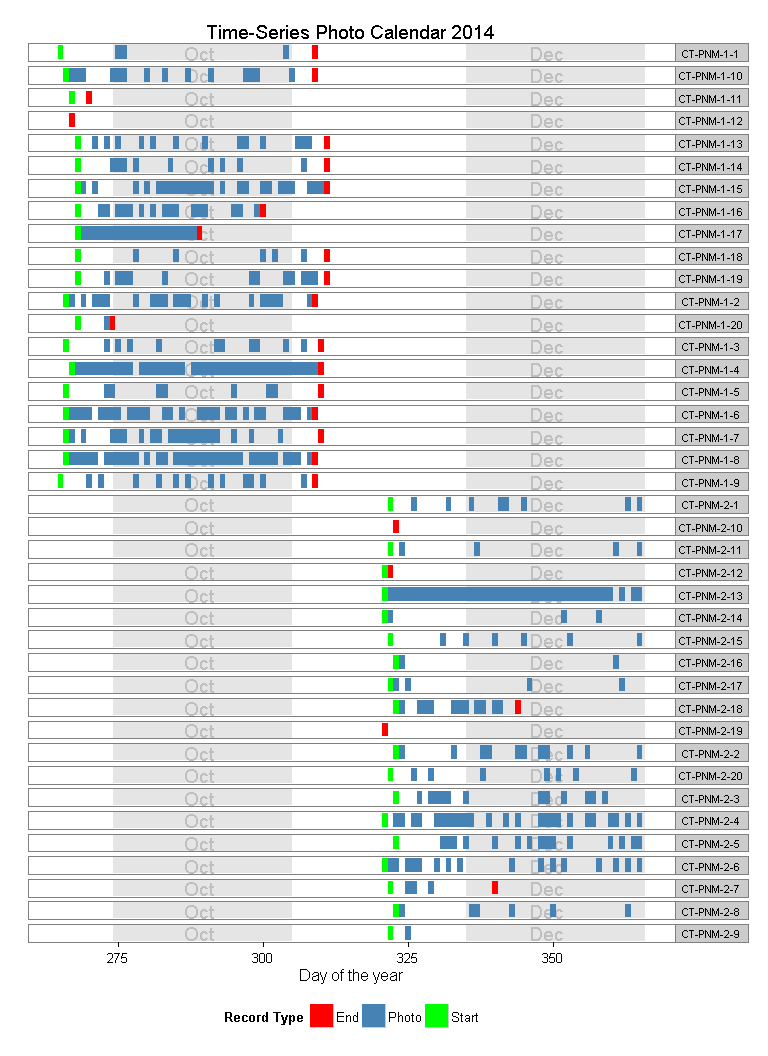
Departamento Central de Investigaciones (DCI), Universidad Laica Eloy Alfaro de Manabi (ULEAM)

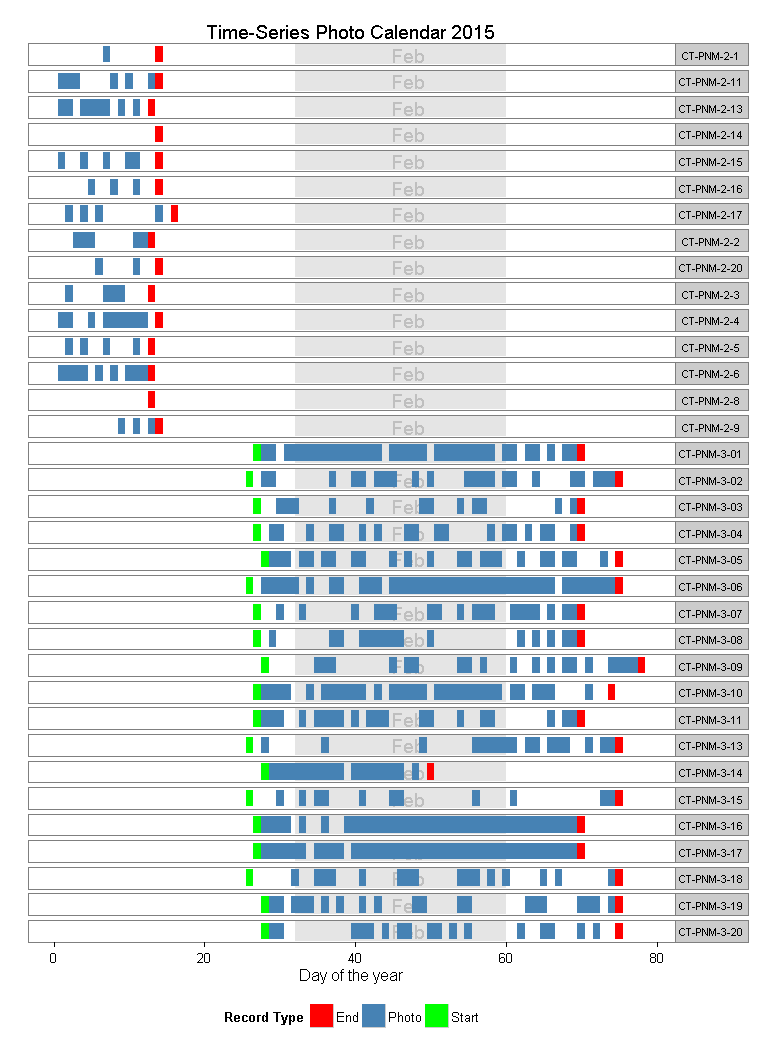
Abril, 2015

Diego J. Lizcano

# Duración del muestreo

Las trampas cámara permanecieron activas desde final de septiembre 204 hasta comienzos de marzo 2015.





# Especies registradas

Las especies registradas en el Parque Nacional Machalilla fueron 36

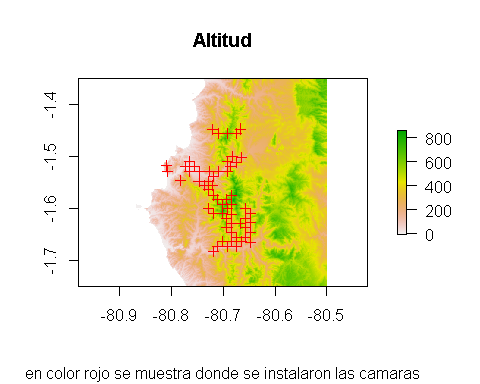
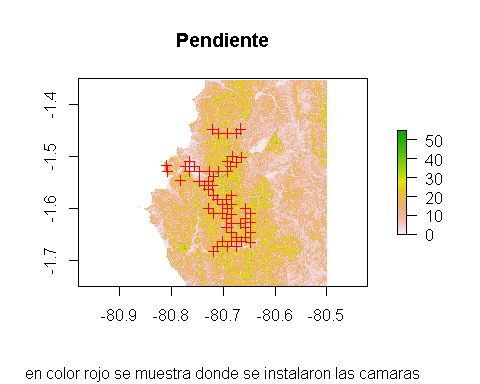
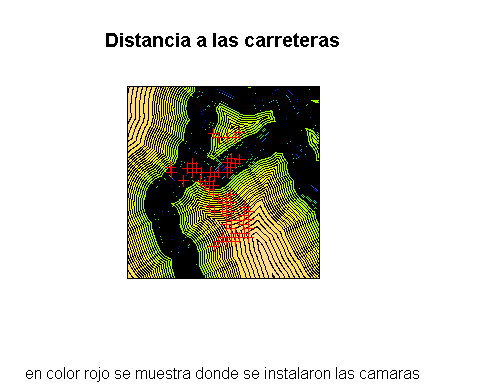
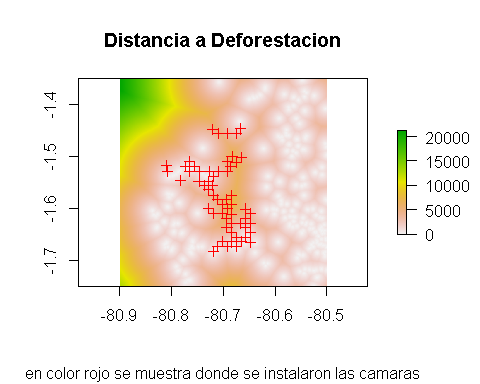
Numero\_de\_fotos especie 1 701  
2 315 Capra aegagrus 3 68 Bos primigenius 4 63 Equus ferus 5 58 Dasyprocta punctata 6 52 Equus africanus 7 45 Sciurus stramineus 8 37 Leptotila verreauxi 9 33 Odocoileus virginianus 10 31 Cuniculus paca 11 31 Pecari tajacu 12 30 Eira barbara 13 25 Homo sapiens 14 23 Canis lupus 15 21 Dasypus novemcinctus 16 19 Sus scrofa 17 15 Tamandua mexicana 18 15 Sylvilagus brasiliensis 19 10 Leopardus wiedii 20 9 Mazama americana 21 8 Procyon cancrivorus 22 5 Leopardus pardalis 23 5 Didelphis marsupialis 24 4 Nasua narica 25 3 Buteogallus urubitinga 26 3 Rattus rattus 27 3 Puma yauguaroundi 28 3 Ortalis vetula 29 1 Tinamus major 30 1 Pipistrellus pipistrellus 31 1 Heliomaster longirostris 32 1 Myotis myotis 33 1 Momotus momota 34 1 Zenaida auriculata 35 1 Gallus gallus 36 1 Cathartes aura 37 1 Pheucticus chrysogaster

# Covariables

Inicialmente se probó con cinco covariables para ajustar los modelos de ocupación. Estas cinco covariables fueron: Altitud (elev), Pendiente (slope) y Distancia a la carretera pavimentada (dis\_rd) como covariables geográficas y altura del dosel, cobertura del dosel y área basal como covariables que se midieron momento de retirar las cámaras. Estas medidas se tomaron usando la metodología del cuadrante centrado en un punto.

La Altitud se obtuvo de una imagen SRTM del repositorio de [CGIAR](http://srtm.csi.cgiar.org/). La pendiente se infirió a partir de la altitud y la distancia a las carreteras se obtuvo de un mapa del Ministerio del Medio Ambiente del Ecuador.

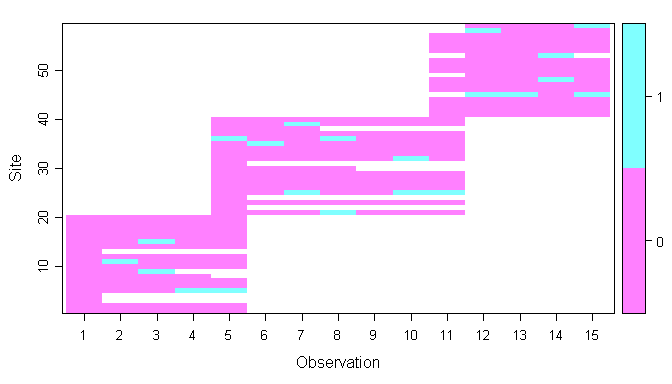
##   
## Attaching package: 'raster'  
##   
## The following objects are masked from 'package:Hmisc':  
##   
## mask, zoom  
##   
## The following object is masked from 'package:dplyr':  
##   
## select  
##   
##   
## Attaching package: 'dismo'  
##   
## The following object is masked from 'package:ggmap':  
##   
## geocode  
##   
## Loading required package: parallel  
## biomod2 3.1-64 loaded.  
##   
## Type browseVignettes(package='biomod2') to access directly biomod2 vignettes.  
##   
## Attaching package: 'biomod2'  
##   
## The following object is masked from 'package:dismo':  
##   
## evaluate  
##   
##   
## spatstat 1.38-1 (nickname: 'Le Hardi')   
## For an introduction to spatstat, type 'beginner'  
##   
## Attaching package: 'spatstat'  
##   
## The following object is masked from 'package:dismo':  
##   
## domain  
##   
## The following objects are masked from 'package:raster':  
##   
## rotate, shift  
##   
## The following object is masked from 'package:scales':  
##   
## rescale  
##   
## The following object is masked from 'package:Hmisc':  
##   
## asNumericMatrix  
##   
## The following object is masked from 'package:lattice':  
##   
## panel.histogram

## El Cabeza de Mate (*Eira barbara*)

![](data:text/html; charset=utf-8;base64,) El Cabeza de Mate (*Eira barbara*)

### Matriz de datos colapsada a 15 dias



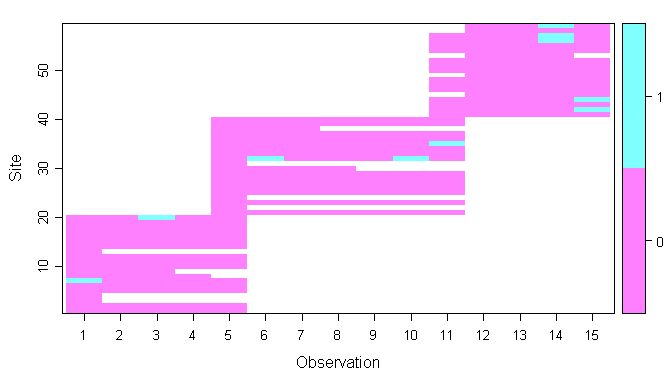
### Seleccion de Modelos

## \_Eira barbara\_ models nPars AIC delta AICwt cumltvWt  
## 1 p(.)psi(.) 2 150.3688 0.000000 2.618686e-01 0.2618686  
## 11 p(.)psi(canopy\_c) 3 151.8488 1.480042 1.249385e-01 0.3868071  
## 8 p(basal\_a)psi(.) 3 151.9808 1.612061 1.169577e-01 0.5037648  
## 2 p(.)psi(elev) 3 152.0500 1.681204 1.129834e-01 0.6167482  
## 3 p(.)psi(slope) 3 152.0506 1.681770 1.129514e-01 0.7296996  
## 5 p(elev)psi(elev) 4 152.1837 1.814887 1.056783e-01 0.8353779  
## 6 p(elev)psi(slope) 4 153.3954 3.026661 5.765702e-02 0.8930349  
## 9 p(basal\_a)psi(elev) 4 153.4397 3.070876 5.639636e-02 0.9494312  
## 10 p(basal\_a)psi(canopy\_c) 4 153.6616 3.292818 5.047275e-02 0.9999040  
## 7 p(elev)psi(dist\_rd) 4 166.1912 15.822394 9.600508e-05 1.0000000  
## 4 p(.)psi(dist\_rd) 3 187.8541 37.485315 1.897801e-09 1.0000000

## El tigrillo (*Leopardus wiedii*)

![](data:text/html; charset=utf-8;base64,)

### Matriz de datos colapsada a 15 dias

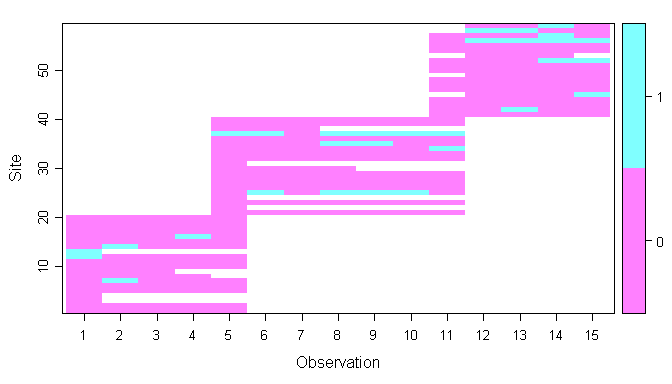


### Seleccion de Modelos

## \_Leopardus wiedii\_ models nPars AIC delta AICwt cumltvWt  
## 3 p(.)psi(slope) 3 87.24495 0.000000 0.518213569 0.5182136  
## 6 p(elev)psi(slope) 4 89.25316 2.008203 0.189859851 0.7080734  
## 1 p(.)psi(.) 2 90.77881 3.533861 0.088540242 0.7966137  
## 11 p(.)psi(canopy\_c) 3 92.14954 4.904591 0.044615972 0.8412296  
## 2 p(.)psi(elev) 3 92.49988 5.254926 0.037446927 0.8786766  
## 8 p(basal\_a)psi(.) 3 92.75732 5.512370 0.032924013 0.9116006  
## 4 p(.)psi(dist\_rd) 3 92.99447 5.749520 0.029242620 0.9408432  
## 5 p(elev)psi(elev) 4 93.90216 6.657207 0.018574389 0.9594176  
## 10 p(basal\_a)psi(canopy\_c) 4 94.12223 6.877274 0.016639018 0.9760566  
## 9 p(basal\_a)psi(elev) 4 94.46259 7.217639 0.014035190 0.9900918  
## 7 p(elev)psi(dist\_rd) 4 95.15900 7.914048 0.009908209 1.0000000

## La vaca (*Bos primigenius*)

### Matriz de datos colapsada a 15 dias

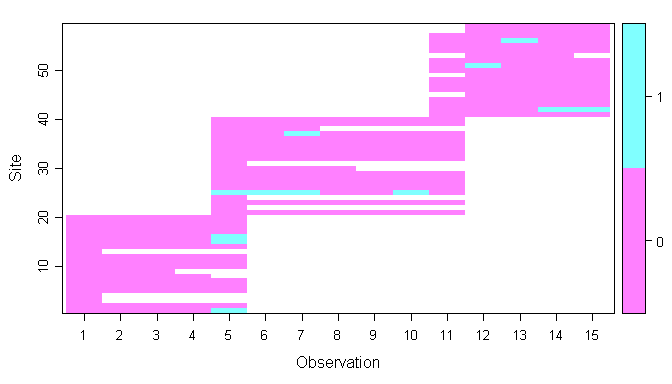


### Seleccion de Modelos

[1] "Bos primigenius" *Bos primigenius* models nPars AIC delta AICwt 10 p(basal\_a)psi(canopy\_c) 4 165.1082 0.000000 6.845527e-01 11 p(.)psi(canopy\_c) 3 168.1573 3.049119 1.490387e-01 8 p(basal\_a)psi(.) 3 169.8527 4.744489 6.384903e-02 3 p(.)psi(slope) 3 171.2600 6.151753 3.159154e-02 6 p(elev)psi(slope) 4 171.5402 6.431996 2.746102e-02 9 p(basal\_a)psi(elev) 4 171.7887 6.680525 2.425210e-02 1 p(.)psi(.) 2 173.6386 8.530347 9.617574e-03 5 p(elev)psi(elev) 4 174.6183 9.510062 5.892821e-03 2 p(.)psi(elev) 3 175.5255 10.417306 3.743844e-03 4 p(.)psi(dist\_rd) 3 193.4925 28.384275 4.697209e-07 7 p(elev)psi(dist\_rd) 4 195.4925 30.384275 1.728007e-07 cumltvWt 10 0.6845527 11 0.8335914 8 0.8974405 3 0.9290320 6 0.9564930 9 0.9807451 1 0.9903627 5 0.9962555 2 0.9999994 4 0.9999998 7 1.0000000

## El Perro domestico (*Canis lupus*)

### Matriz de datos colapsada a 15 dias

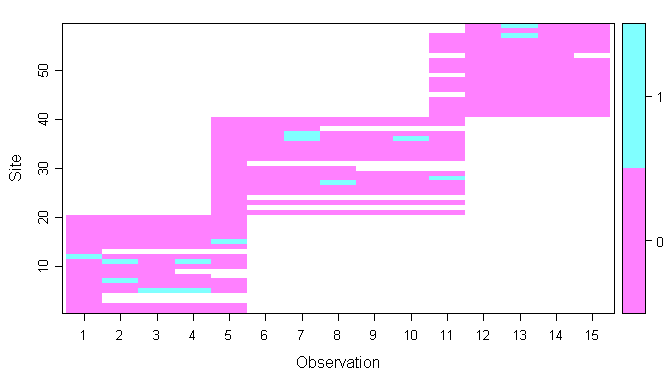


### Seleccion de Modelos

[1] "Canis lupus" *Canis lupus* models nPars AIC delta AICwt 6 p(elev)psi(slope) 4 91.82497 0.000000 5.921574e-01 3 p(.)psi(slope) 3 94.32232 2.497348 1.698811e-01 1 p(.)psi(.) 2 96.26670 4.441732 6.425800e-02 11 p(.)psi(canopy\_c) 3 96.86830 5.043329 4.756551e-02 5 p(elev)psi(elev) 4 97.62678 5.801808 3.255296e-02 8 p(basal\_a)psi(.) 3 97.90488 6.079913 2.832701e-02 10 p(basal\_a)psi(canopy\_c) 4 98.24901 6.424042 2.384921e-02 2 p(.)psi(elev) 3 98.25946 6.434497 2.372487e-02 9 p(basal\_a)psi(elev) 4 99.89898 8.074009 1.045174e-02 4 p(.)psi(dist\_rd) 3 100.63767 8.812707 7.224074e-03 7 p(elev)psi(dist\_rd) 4 114.20292 22.377955 8.187023e-06 cumltvWt 6 0.5921574 3 0.7620384 1 0.8262964 11 0.8738619 5 0.9064149 8 0.9347419 10 0.9585911 2 0.9823160 9 0.9927677 4 0.9999918 7 1.0000000

## El Oso Hormiero (*Tamandua mexicana*)

### Matriz de datos colapsada a 15 dias

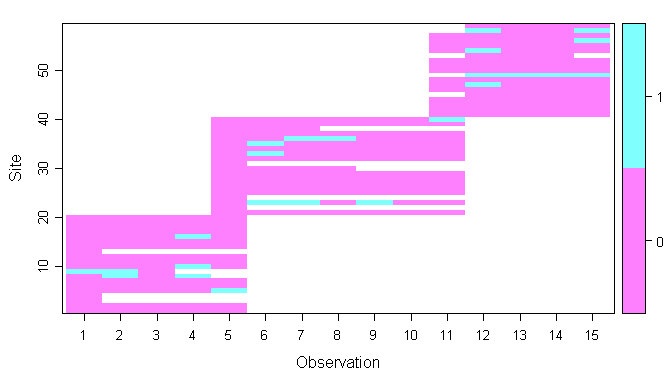


### Seleccion de Modelos

[1] "Tamandua mexicana" *Tamandua mexicana* models nPars AIC delta AICwt 1 p(.)psi(.) 2 114.3732 0.00000000 0.22720840 11 p(.)psi(canopy\_c) 3 114.4556 0.08232378 0.21804594 2 p(.)psi(elev) 3 115.7646 1.39140462 0.11331430 3 p(.)psi(slope) 3 116.3697 1.99648577 0.08373230 8 p(basal\_a)psi(.) 3 116.3728 1.99959126 0.08360238 10 p(basal\_a)psi(canopy\_c) 4 116.3736 2.00037500 0.08356963 4 p(.)psi(dist\_rd) 3 117.3271 2.95389889 0.05187921 5 p(elev)psi(elev) 4 117.5049 3.13161894 0.04746811 9 p(basal\_a)psi(elev) 4 117.7688 3.39553871 0.04159992 6 p(elev)psi(slope) 4 118.3725 3.99929547 0.03076015 7 p(elev)psi(dist\_rd) 4 119.3552 4.98193210 0.01881965 cumltvWt 1 0.2272084 11 0.4452543 2 0.5585686 3 0.6423009 8 0.7259033 10 0.8094730 4 0.8613522 5 0.9088203 9 0.9504202 6 0.9811803 7 1.0000000

## El Venado (*Odocoileus virginianus*)

### Matriz de datos colapsada a 15 dias

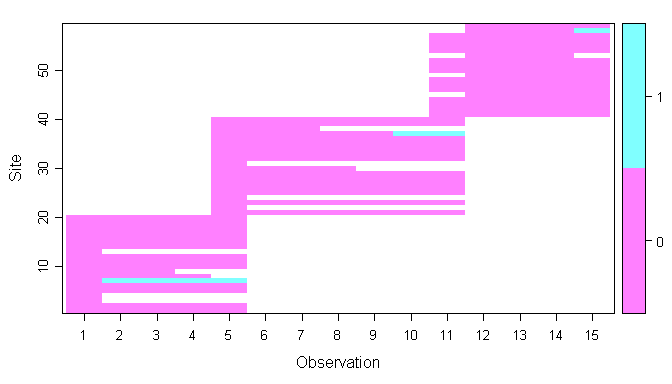


### Seleccion de Modelos

[1] "Odocoileus virginianus" *Odocoileus virginianus* models nPars AIC delta AICwt 9 p(basal\_a)psi(elev) 4 154.8966 0.0000000 0.2604572626 6 p(elev)psi(slope) 4 155.3951 0.4985378 0.2029926688 5 p(elev)psi(elev) 4 156.0911 1.1945154 0.1433345055 10 p(basal\_a)psi(canopy\_c) 4 156.8677 1.9710672 0.0972130727 2 p(.)psi(elev) 3 157.1556 2.2589615 0.0841800589 8 p(basal\_a)psi(.) 3 157.5572 2.6605550 0.0688659105 11 p(.)psi(canopy\_c) 3 157.5822 2.6855699 0.0680099369 3 p(.)psi(slope) 3 158.5537 3.6571066 0.0418413659 1 p(.)psi(.) 2 159.1228 4.2262108 0.0314794010 7 p(elev)psi(dist\_rd) 4 165.0534 10.1568086 0.0016226076 4 p(.)psi(dist\_rd) 3 177.5048 22.6082200 0.0000032094 cumltvWt 9 0.2604573 6 0.4634499 5 0.6067844 10 0.7039975 2 0.7881776 8 0.8570435 11 0.9250534 3 0.9668948 1 0.9983742 7 0.9999968 4 1.0000000

## El Conejo (*Sylvilagus brasiliensis*)

### Matriz de datos colapsada a 15 dias

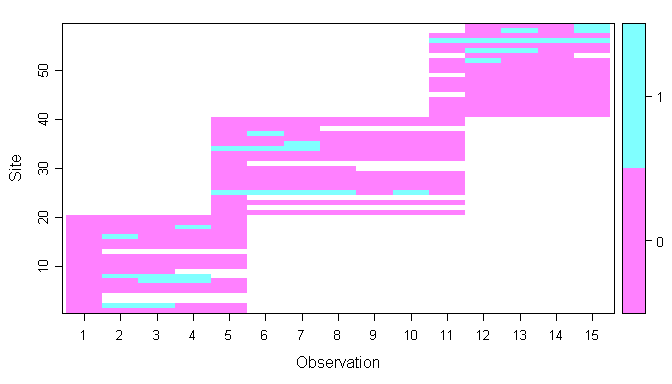


### Seleccion de Modelos

[1] "Sylvilagus brasiliensis" *Sylvilagus brasiliensis* models nPars AIC delta AICwt 6 p(elev)psi(slope) 4 42.57539 0.000000 0.4657648921 5 p(elev)psi(elev) 4 43.80291 1.227522 0.2521237308 7 p(elev)psi(dist\_rd) 4 45.61020 3.034816 0.1021326894 3 p(.)psi(slope) 3 46.27336 3.697970 0.0733099218 2 p(.)psi(elev) 3 47.17399 4.598600 0.0467297531 1 p(.)psi(.) 2 48.88744 6.312059 0.0198390347 9 p(basal\_a)psi(elev) 4 49.04269 6.467304 0.0183573292 11 p(.)psi(canopy\_c) 3 50.30162 7.726238 0.0097821752 8 p(basal\_a)psi(.) 3 50.75840 8.183014 0.0077848075 10 p(basal\_a)psi(canopy\_c) 4 52.19855 9.623163 0.0037889905 4 p(.)psi(dist\_rd) 3 56.76308 14.187699 0.0003866759 cumltvWt 6 0.4657649 5 0.7178886 7 0.8200213 3 0.8933312 2 0.9400610 1 0.9599000 9 0.9782574 11 0.9880395 8 0.9958243 10 0.9996133 4 1.0000000

## El Caballo (*Equus ferus*)

### Matriz de datos colapsada a 15 dias

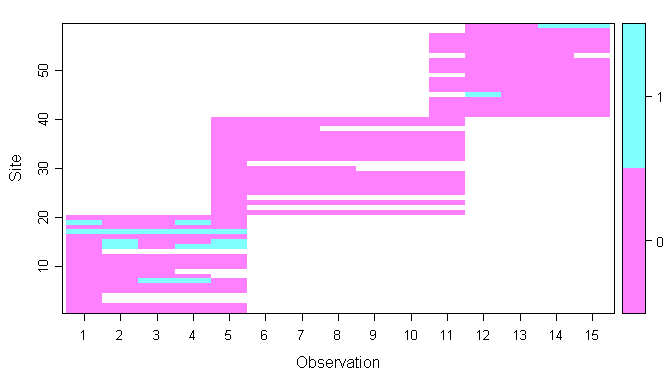


### Seleccion de Modelos

[1] "Equus ferus" *Equus ferus* models nPars AIC delta AICwt cumltvWt 3 p(.)psi(slope) 3 161.3284 0.000000 0.520874299 0.5208743 6 p(elev)psi(slope) 4 163.3310 2.002550 0.191374766 0.7122491 1 p(.)psi(.) 2 164.8663 3.537815 0.088819043 0.8010681 2 p(.)psi(elev) 3 166.0739 4.745419 0.048559961 0.8496281 11 p(.)psi(canopy\_c) 3 166.1504 4.821994 0.046735867 0.8963639 8 p(basal\_a)psi(.) 3 166.5050 5.176562 0.039143245 0.9355072 9 p(basal\_a)psi(elev) 4 167.7529 6.424483 0.020973655 0.9564808 10 p(basal\_a)psi(canopy\_c) 4 167.8617 6.533222 0.019863778 0.9763446 5 p(elev)psi(elev) 4 168.0643 6.735814 0.017950213 0.9942948 4 p(.)psi(dist\_rd) 3 170.8202 9.491762 0.004525046 0.9988199 7 p(elev)psi(dist\_rd) 4 173.5082 12.179772 0.001180128 1.0000000

## La Guanta (*Cuniculus paca*)

### Matriz de datos colapsada a 15 dias

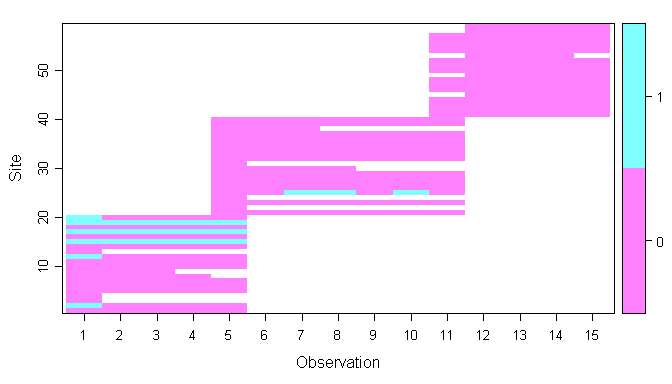


### Seleccion de Modelos

[1] "Cuniculus paca" *Cuniculus paca* models nPars AIC delta AICwt 11 p(.)psi(canopy\_c) 3 80.27405 0.000000 6.503324e-01 10 p(basal\_a)psi(canopy\_c) 4 81.61056 1.336506 3.333625e-01 2 p(.)psi(elev) 3 90.12903 9.854977 4.711448e-03 9 p(basal\_a)psi(elev) 4 90.87243 10.598380 3.248826e-03 5 p(elev)psi(elev) 4 91.17060 10.896548 2.798853e-03 1 p(.)psi(.) 2 91.47963 11.205575 2.398146e-03 8 p(basal\_a)psi(.) 3 92.44687 12.172815 1.478571e-03 3 p(.)psi(slope) 3 93.28713 13.013076 9.713635e-04 6 p(elev)psi(slope) 4 93.95833 13.684284 6.944338e-04 4 p(.)psi(dist\_rd) 3 105.21398 24.939930 2.497460e-06 7 p(elev)psi(dist\_rd) 4 107.17841 26.904357 9.352518e-07 cumltvWt 11 0.6503324 10 0.9836949 2 0.9884064 9 0.9916552 5 0.9944541 1 0.9968522 8 0.9983308 3 0.9993021 6 0.9999966 4 0.9999991 7 1.0000000

## La Guatusa (*Dasyprocta punctata*)

### Matriz de datos colapsada a 15 dias

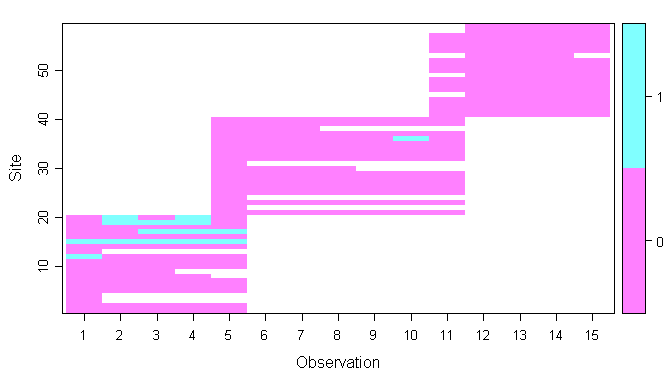


### Seleccion de Modelos

[1] "Dasyprocta punctata" *Dasyprocta punctata* models nPars AIC delta AICwt 5 p(elev)psi(elev) 4 60.16148 0.0000000 5.804916e-01 6 p(elev)psi(slope) 4 60.90157 0.7400901 4.009474e-01 9 p(basal\_a)psi(elev) 4 68.03366 7.8721803 1.133375e-02 2 p(.)psi(elev) 3 68.93410 8.7726160 7.225146e-03 10 p(basal\_a)psi(canopy\_c) 4 86.17817 26.0166864 1.301201e-06 11 p(.)psi(canopy\_c) 3 87.33211 27.1706301 7.307496e-07 8 p(basal\_a)psi(.) 3 95.39743 35.2359494 1.295409e-08 3 p(.)psi(slope) 3 96.02298 35.8614937 9.474833e-09 1 p(.)psi(.) 2 96.62541 36.4639271 7.010594e-09 4 p(.)psi(dist\_rd) 3 112.14119 51.9797053 2.996031e-12 7 p(elev)psi(dist\_rd) 4 113.22601 53.0645223 1.741732e-12 cumltvWt 5 0.5804916 6 0.9814390 9 0.9927728 2 0.9999979 10 0.9999992 11 1.0000000 8 1.0000000 3 1.0000000 1 1.0000000 4 1.0000000 7 1.0000000

## El Pecari (*Pecari tajacu*)

### Matriz de datos colapsada a 15 dias

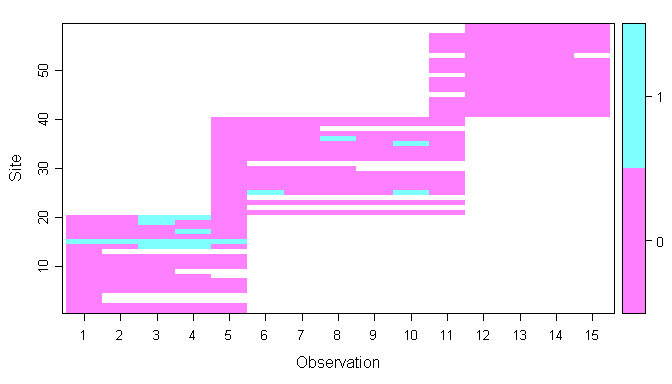


### Seleccion de Modelos

[1] "Pecari tajacu" *Pecari tajacu* models nPars AIC delta AICwt 6 p(elev)psi(slope) 4 61.57638 0.0000000 5.295752e-01 5 p(elev)psi(elev) 4 61.82913 0.2527532 4.667055e-01 2 p(.)psi(elev) 3 72.15564 10.5792627 2.670975e-03 9 p(basal\_a)psi(elev) 4 74.15151 12.5751331 9.846279e-04 11 p(.)psi(canopy\_c) 3 80.60258 19.0262030 3.912372e-05 10 p(basal\_a)psi(canopy\_c) 4 82.60155 21.0251715 1.440024e-05 3 p(.)psi(slope) 3 84.34740 22.7710158 6.015398e-06 1 p(.)psi(.) 2 85.71054 24.1341552 3.042723e-06 8 p(basal\_a)psi(.) 3 87.71052 26.1341421 1.119363e-06 7 p(elev)psi(dist\_rd) 4 102.46391 40.8875327 7.003461e-10 4 p(.)psi(dist\_rd) 3 104.31456 42.7381751 2.776200e-10 cumltvWt 6 0.5295752 5 0.9962807 2 0.9989517 9 0.9999363 11 0.9999754 10 0.9999898 3 0.9999958 1 0.9999989 8 1.0000000 7 1.0000000 4 1.0000000

## El Armadillo (*Dasypus novemcinctus*)

### Matriz de datos colapsada a 15 dias

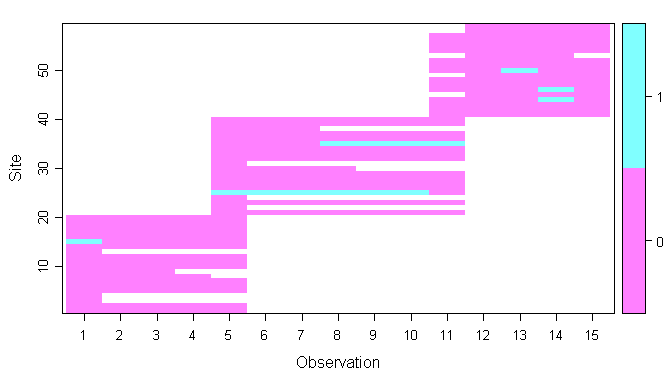


### Seleccion de Modelos

[1] "Dasypus novemcinctus" *Dasypus novemcinctus* models nPars AIC delta AICwt 6 p(elev)psi(slope) 4 93.65593 0.0000000 4.900355e-01 5 p(elev)psi(elev) 4 94.28064 0.6247052 3.585705e-01 2 p(.)psi(elev) 3 97.37545 3.7195218 7.630336e-02 9 p(basal\_a)psi(elev) 4 98.22553 4.5695939 4.988303e-02 11 p(.)psi(canopy\_c) 3 100.71485 7.0589180 1.436822e-02 10 p(basal\_a)psi(canopy\_c) 4 102.09500 8.4390679 7.206216e-03 1 p(.)psi(.) 2 104.74911 11.0931757 1.911503e-03 8 p(basal\_a)psi(.) 3 106.02061 12.3646760 1.012214e-03 3 p(.)psi(slope) 3 106.74132 13.0853876 7.059464e-04 4 p(.)psi(dist\_rd) 3 117.36235 23.7064162 3.486942e-06 7 p(elev)psi(dist\_rd) 4 128.88313 35.2272014 1.098343e-08 cumltvWt 6 0.4900355 5 0.8486060 2 0.9249094 9 0.9747924 11 0.9891606 10 0.9963668 1 0.9982783 8 0.9992906 3 0.9999965 4 1.0000000 7 1.0000000

## La Ardilla de Guayaquil (*Sciurus stramineus*)

### Matriz de datos colapsada a 15 dias



### Seleccion de Modelos

[1] "Sciurus stramineus" *Sciurus stramineus* models nPars AIC delta AICwt 1 p(.)psi(.) 2 87.05397 0.000000 2.440848e-01 8 p(basal\_a)psi(.) 3 87.91713 0.863158 1.585289e-01 2 p(.)psi(elev) 3 88.14348 1.089507 1.415655e-01 11 p(.)psi(canopy\_c) 3 88.80840 1.754433 1.015244e-01 9 p(basal\_a)psi(elev) 4 88.86094 1.806973 9.889210e-02 3 p(.)psi(slope) 3 89.05321 1.999237 8.982802e-02 10 p(basal\_a)psi(canopy\_c) 4 89.60237 2.548403 6.825934e-02 5 p(elev)psi(elev) 4 89.97210 2.918133 5.673829e-02 6 p(elev)psi(slope) 4 90.64944 3.595474 4.043836e-02 4 p(.)psi(dist\_rd) 3 102.63651 15.582539 1.008871e-04 7 p(elev)psi(dist\_rd) 4 104.51392 17.459954 3.946026e-05 cumltvWt 1 0.2440848 8 0.4026137 2 0.5441791 11 0.6457035 9 0.7445956 3 0.8344237 10 0.9026830 5 0.9594213 6 0.9998597 4 0.9999605 7 1.0000000