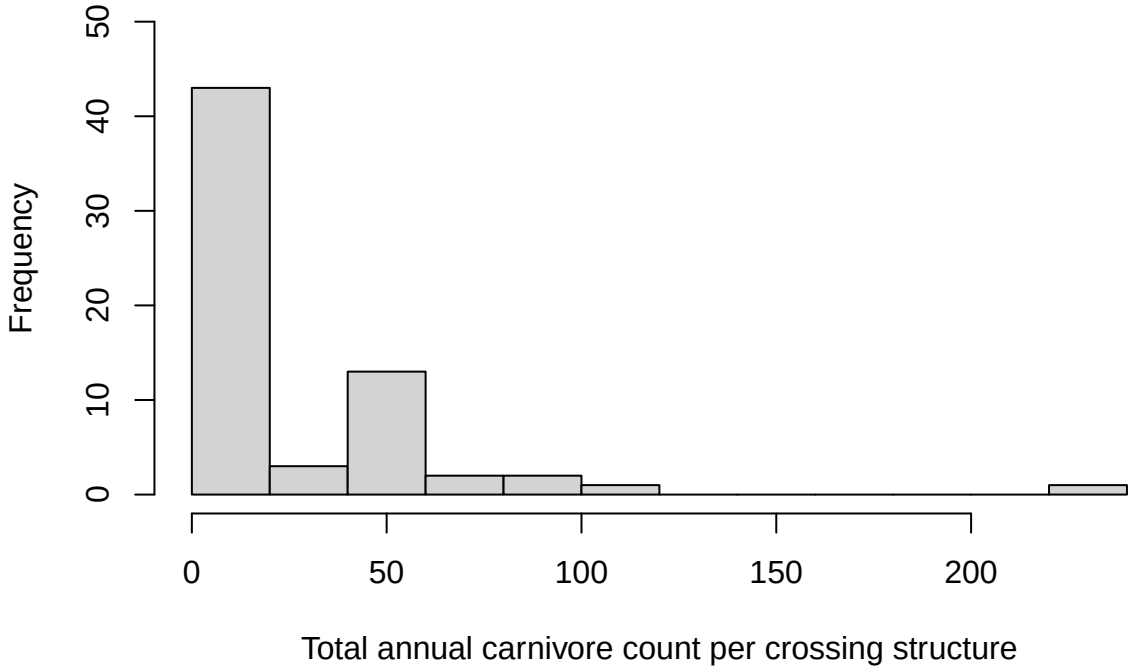
Crossing structures data exploration

#----------Look for outliers in guild count----------

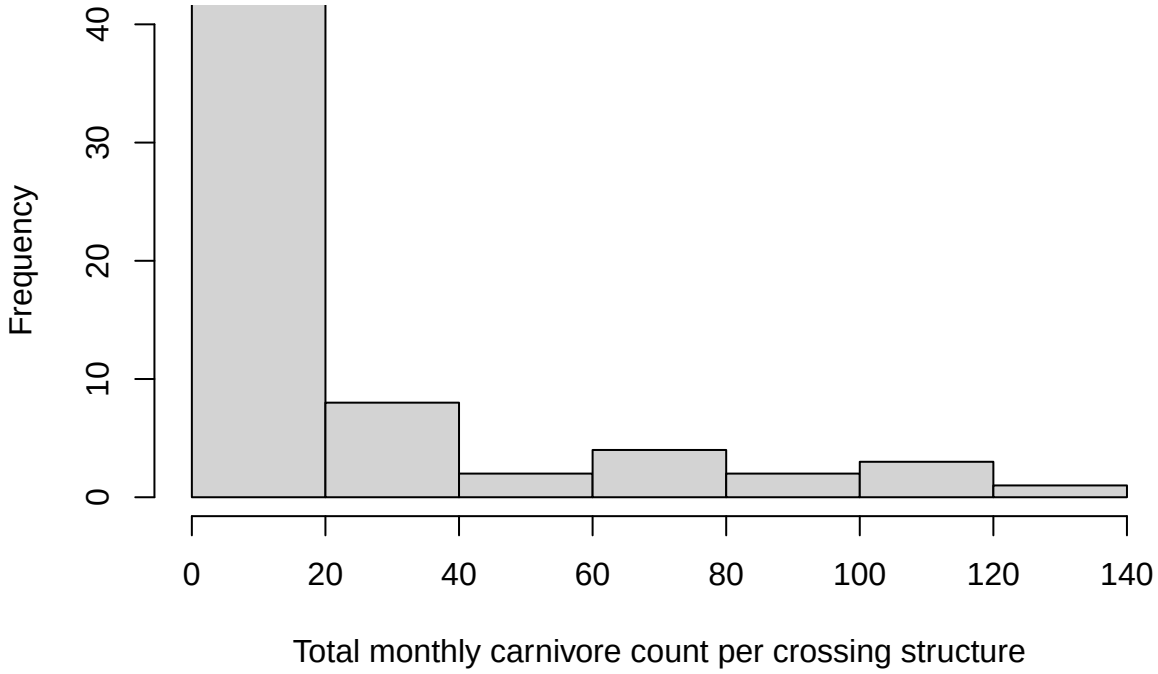
```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##    0.00    3.00   10.00   25.43   46.00  221.00
```

Figure 1



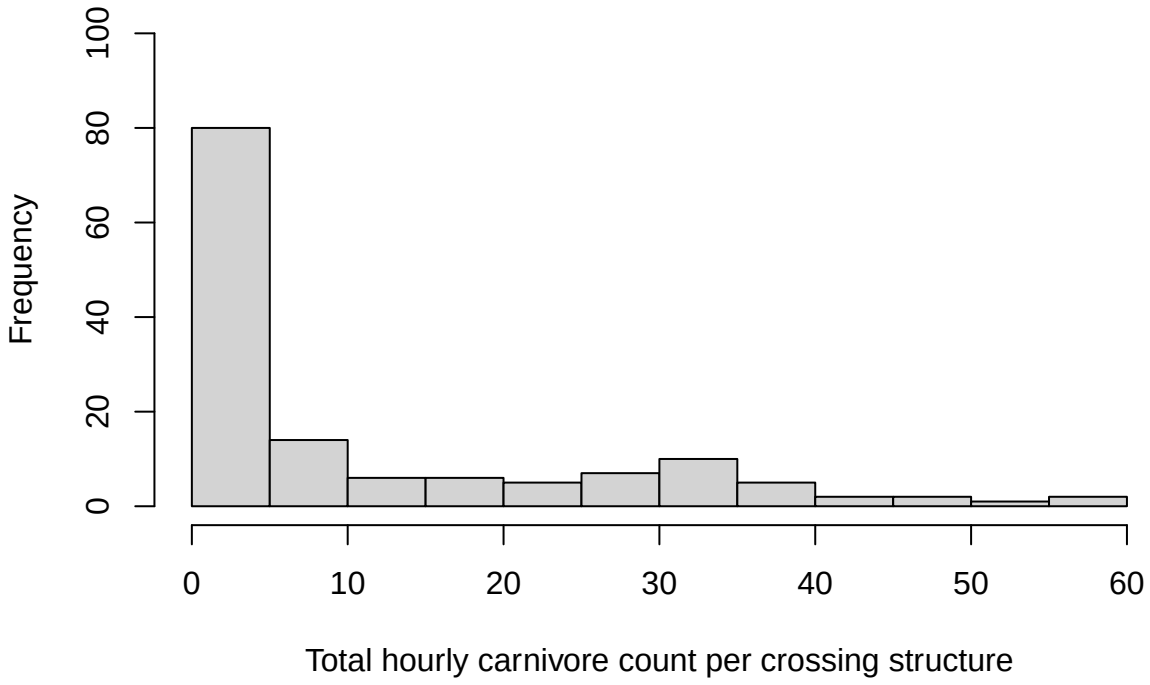

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##    0.00    3.00    8.50   22.85   25.25  121.00
```

Figure 2



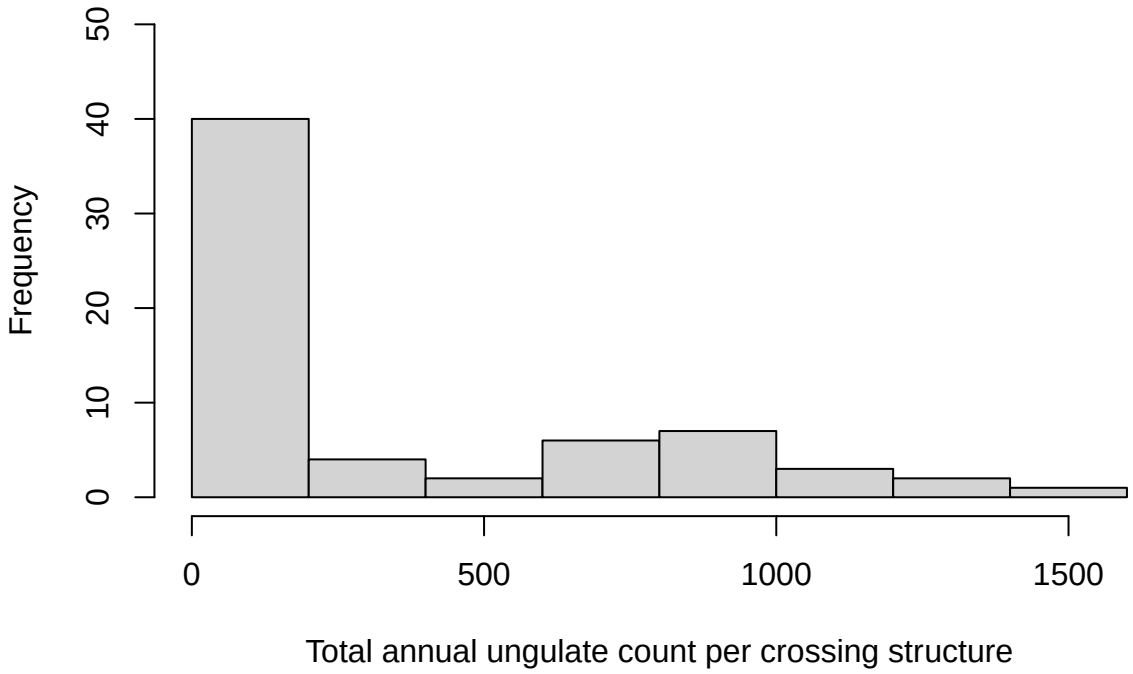

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##    0.00    2.00    5.00   11.76   20.00   59.00
```

Figure 3



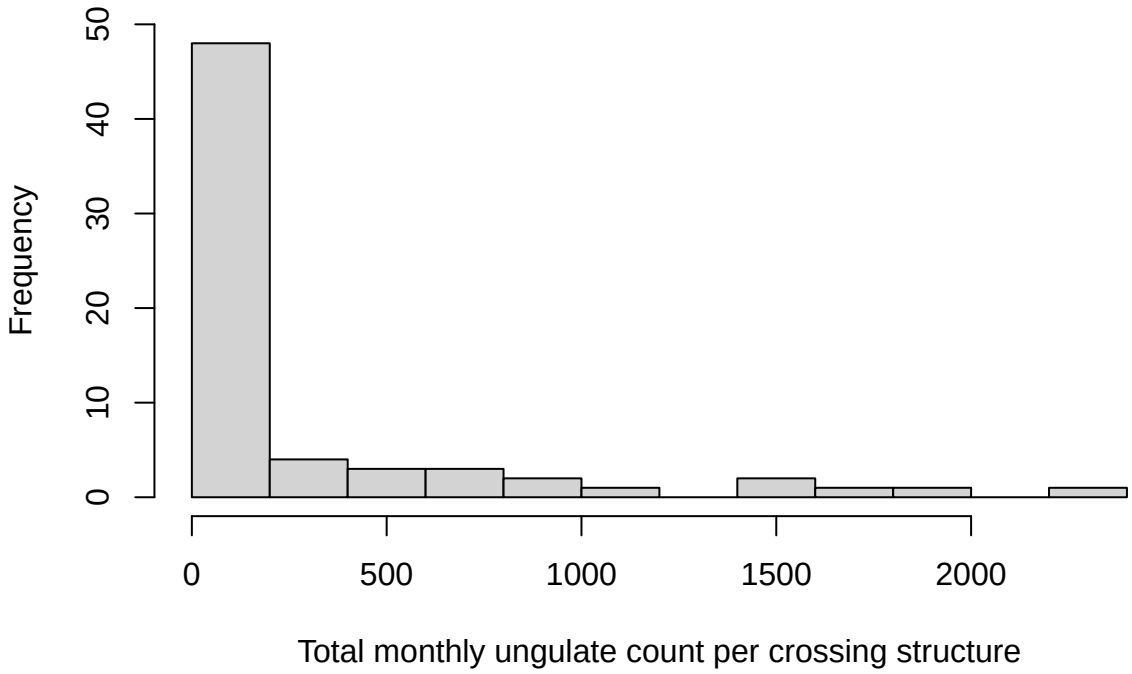

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##     5.0    35.0   111.0   339.3   656.0  1459.0
```

Figure 4



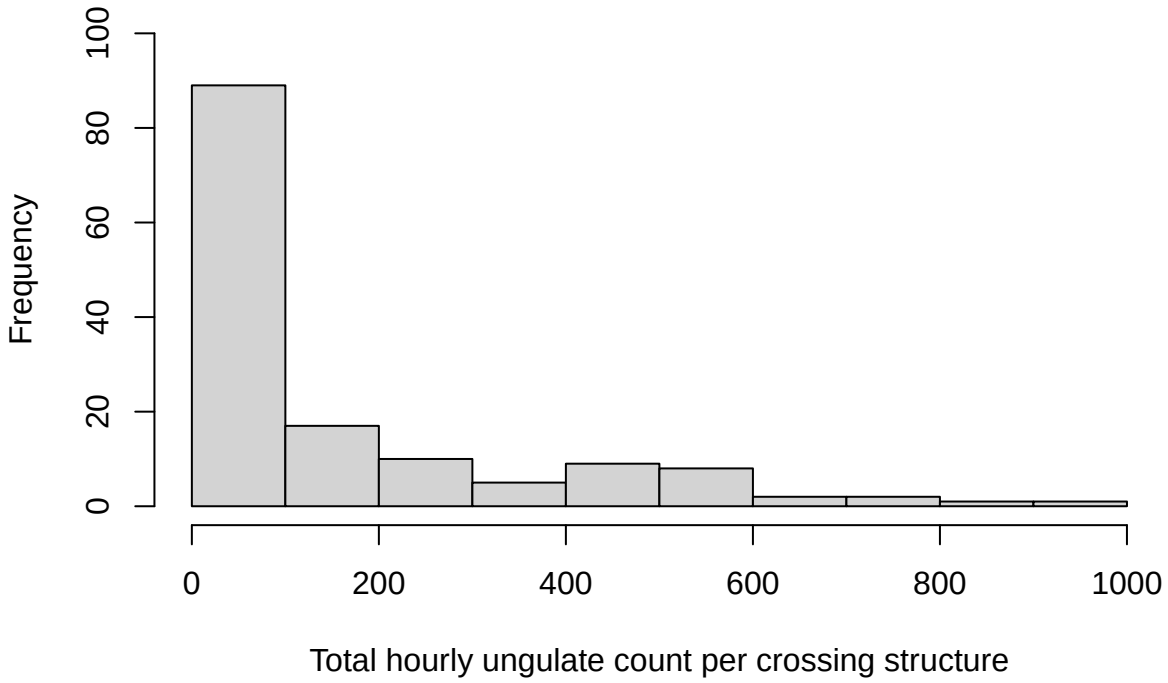

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##     0.0    21.0    78.5   287.4   228.0  2233.0
```

Figure 5




```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##    0.00   13.75   39.00  152.34  225.75  971.00
```

Figure 6



#————————————————-Look for zeros in the data————————————————

#Proportion of zeros in the carnivore dataset

Table 1: .

	Proportion of zeros
Annual_carnivore_count_jumpout	0.12
Annual_carnivore_count_underpass	0.00
Monthly_carnivore_count_jumpout	0.18
Monthly_carnivore_count_underpass	0.00
Hourly_carnivore_count_jumpout	0.21
Hourly_carnivore_count_underpass	0.00

#Proportion of zeros in the ungulate dataset

Table 2: .

	Proportion of zeros
Annual_ungulate_count_jumpout	0.00
Annual_ungulate_count_underpass	0.00
Monthly_ungulate_count_jumpout	0.07
Monthly_ungulate_count_underpass	0.00
Hourly_ungulate_count_jumpout	0.02
Hourly_ungulate_count_underpass	0.00

#————————————————Check for autocorrelation———————————————— # Run Box-Pierce and Ljung-Box test on the raw data # Build a model of the mean (lm(count~1)) and run Durbin Watson test to test residuals

#Annual carnivore count for jumpouts

```
##
##  Durbin-Watson test
##
## data:  car.ann.count.jump.mod
## DW = 2.0761, p-value = 0.598
## alternative hypothesis: true autocorrelation is greater than 0
```

```
##
##  Box-Pierce test
##
## data:  car.ann.count.jump
## X-squared = 0.087096, df = 1, p-value = 0.7679
```

```
##
##  Box-Ljung test
##
## data:  car.ann.count.jump
## X-squared = 0.093469, df = 1, p-value = 0.7598
```

Figure 7

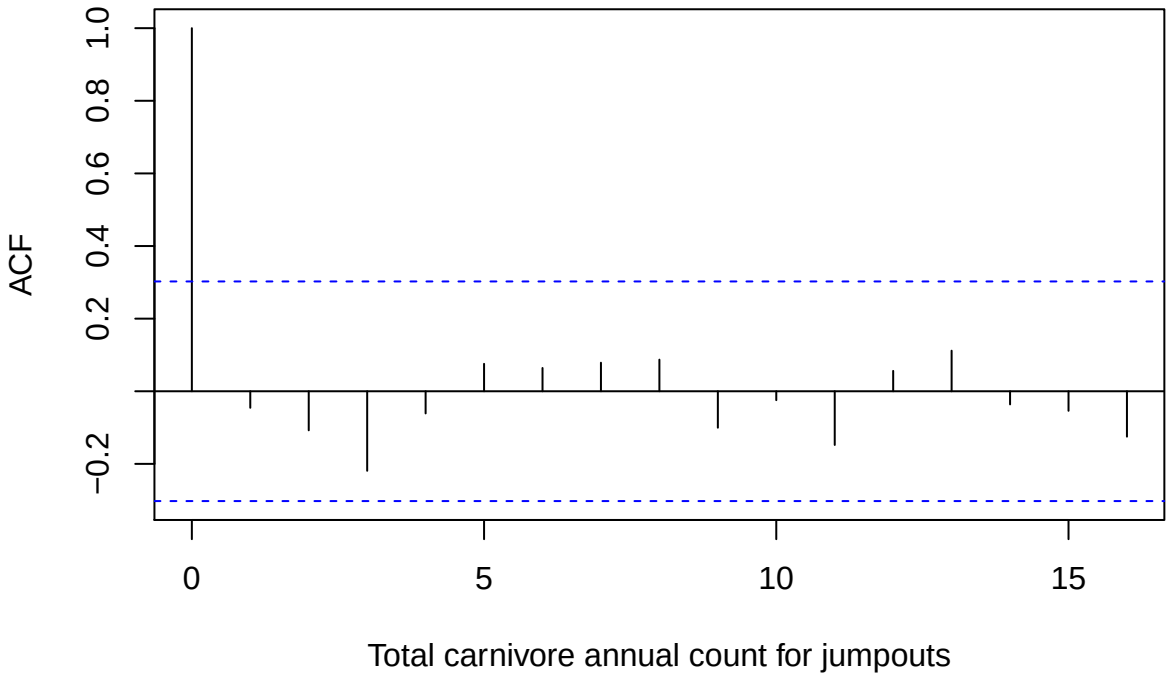
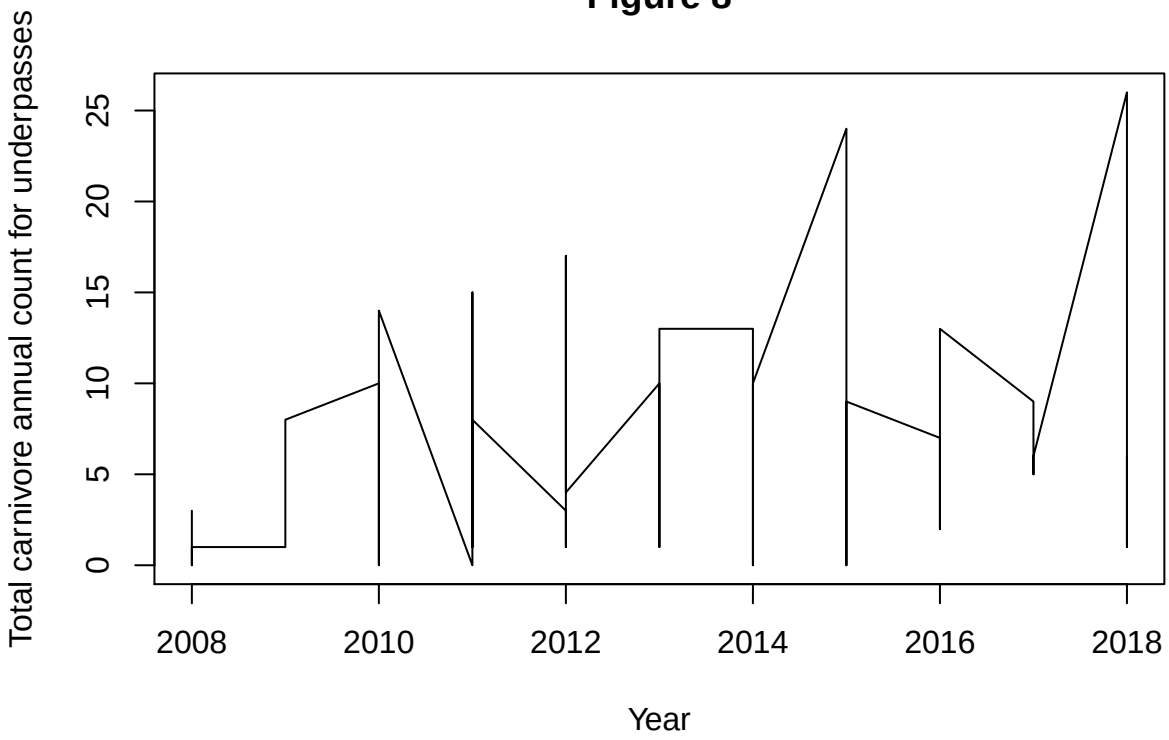


Figure 8




```
## [1] 39.76829
```

```
## [1] 6.5
```

#Annual carnivore count for underpasses

```
##
##  Durbin-Watson test
##
## data:  car.ann.count.under.mod
## DW = 1.9502, p-value = 0.4518
## alternative hypothesis: true autocorrelation is greater than 0
```

```
##
##  Box-Pierce test
##
## data:  car.ann.count.under
## X-squared = 0.00059175, df = 1, p-value = 0.9806
```

```
##
##  Box-Ljung test
##
## data:  car.ann.count.under
## X-squared = 0.00067244, df = 1, p-value = 0.9793
```

Figure 9

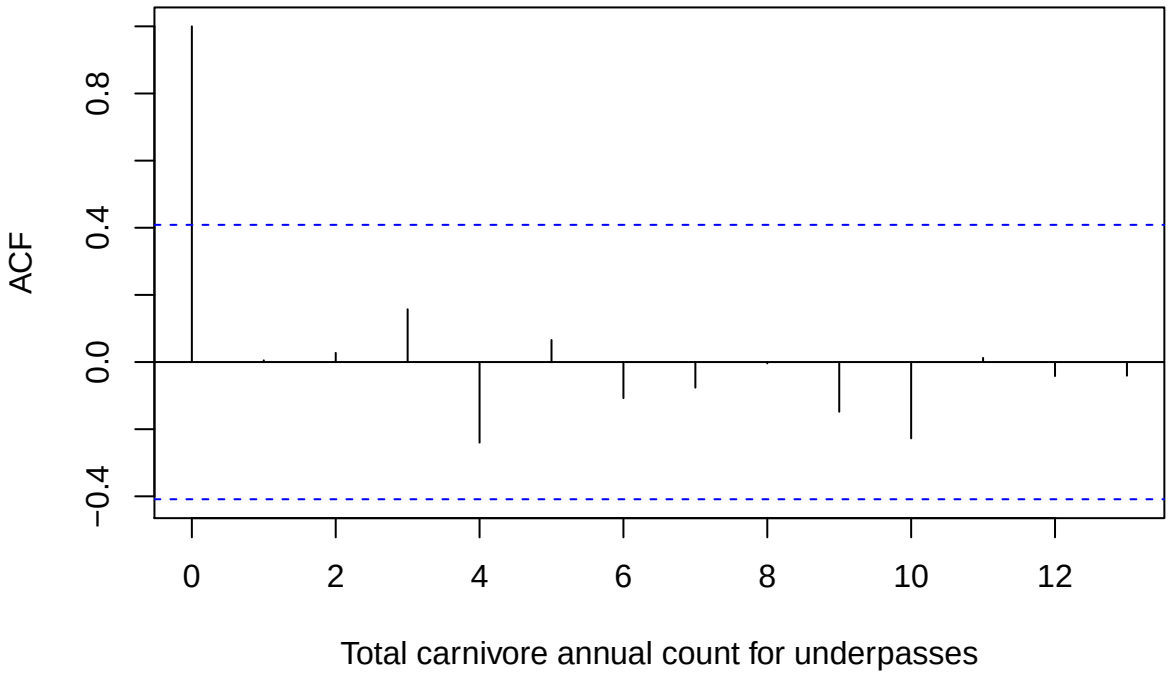
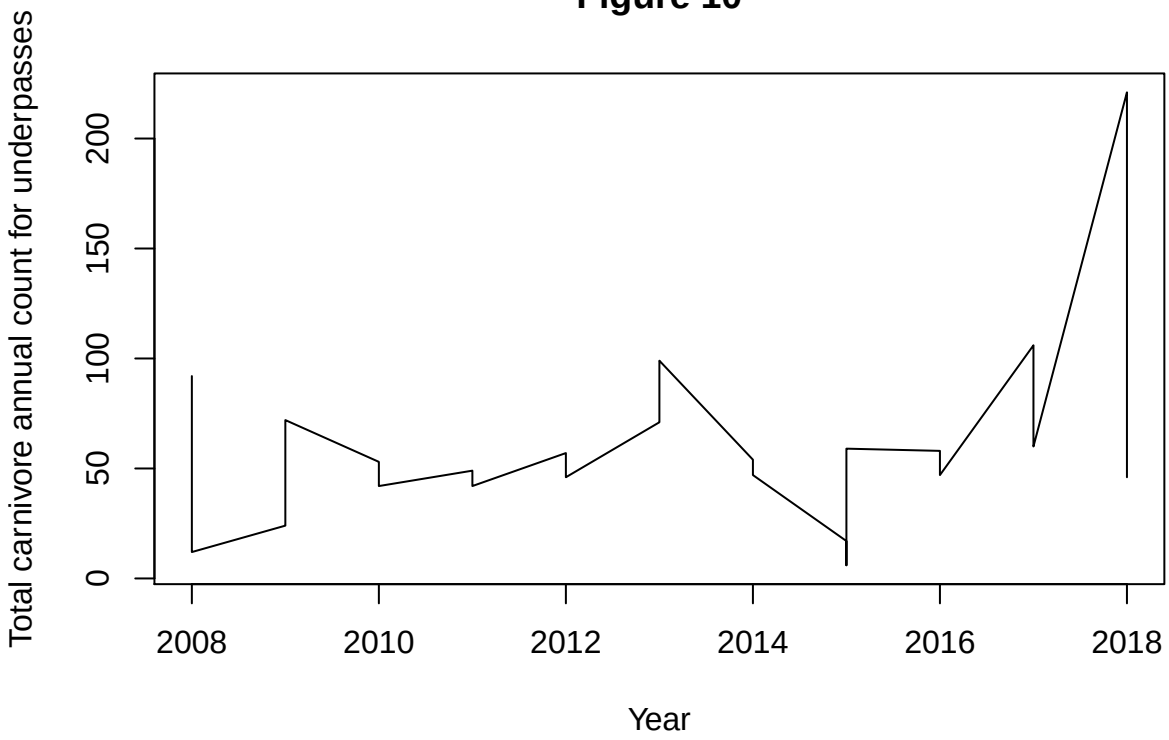

ACF
0.8
0.4
0.0
−0.4
0
2
4
6
8
10
12
Total carnivore annual count for underpasses

Figure 10




```
## [1] 1855
```

```
## [1] 60
```

#Monthly carnivore count for jumpouts

```
##
##  Durbin-Watson test
##
## data:  car.mon.count.jump.mod
## DW = 2.2132, p-value = 0.7623
## alternative hypothesis: true autocorrelation is greater than 0
```

```
##
##  Box-Pierce test
##
## data:  car.mon.count.jump
## X-squared = 0.58647, df = 1, p-value = 0.4438
```

```
##
##  Box-Ljung test
##
## data:  car.mon.count.jump
## X-squared = 0.62739, df = 1, p-value = 0.4283
```

Figure 11

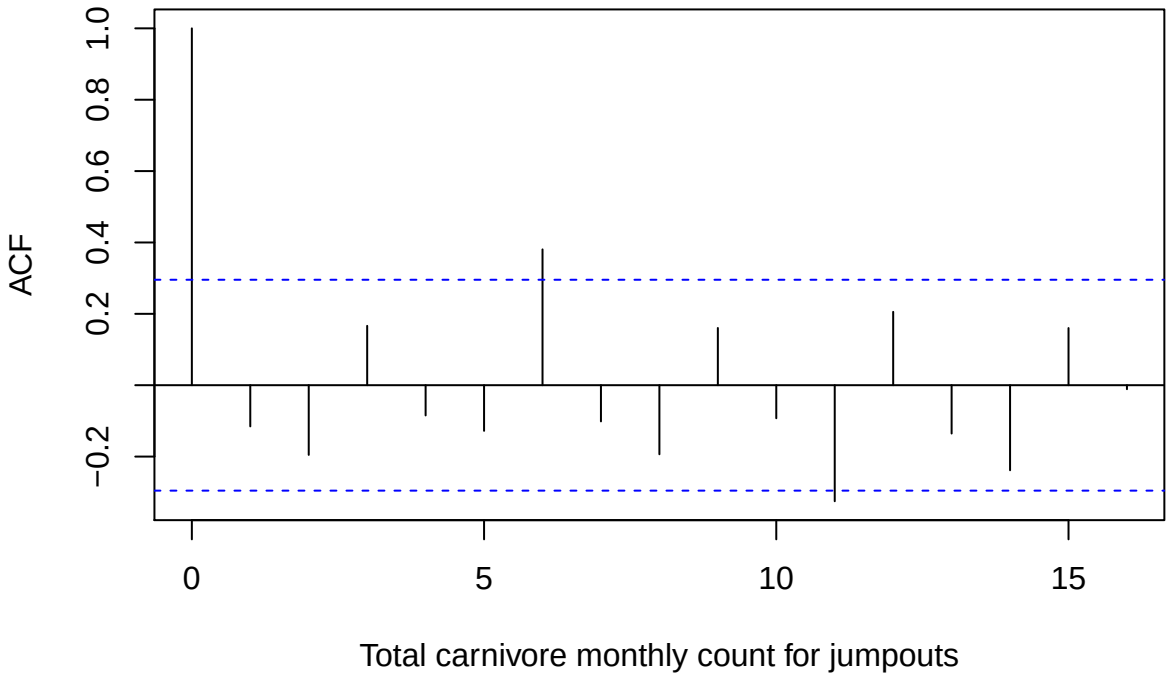
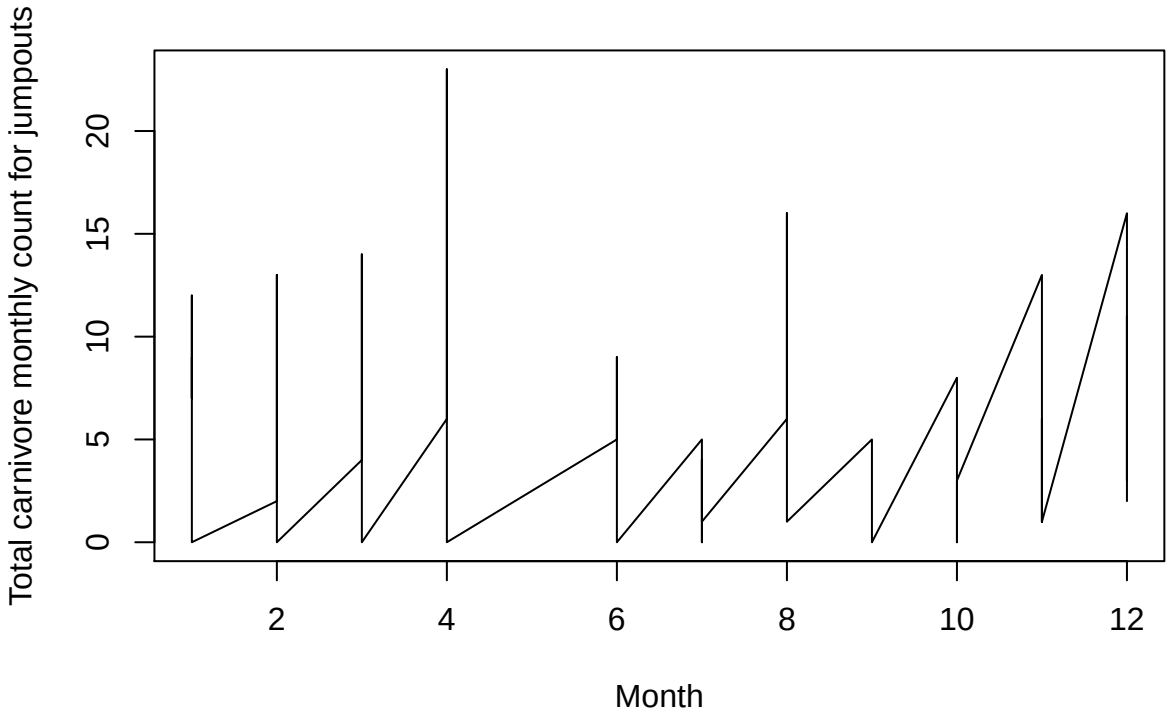

ACF
1.0
0.8
0.6
0.4
0.2
−0.2
0
5
10
15
Total carnivore monthly count for jumpouts

Figure 12




```
## [1] 29.33827
```

```
## [1] 5.681818
```

#Monthly carnivore count for underpasses

```
##
##  Durbin-Watson test
##
## data:  car.mon.count.under.mod
## DW = 1.9082, p-value = 0.4135
## alternative hypothesis: true autocorrelation is greater than 0
```

```
##
##  Box-Pierce test
##
## data:  car.mon.count.under
## X-squared = 0.012315, df = 1, p-value = 0.9116
```

```
##
##  Box-Ljung test
##
## data:  car.mon.count.under
## X-squared = 0.014074, df = 1, p-value = 0.9056
```

Figure 13

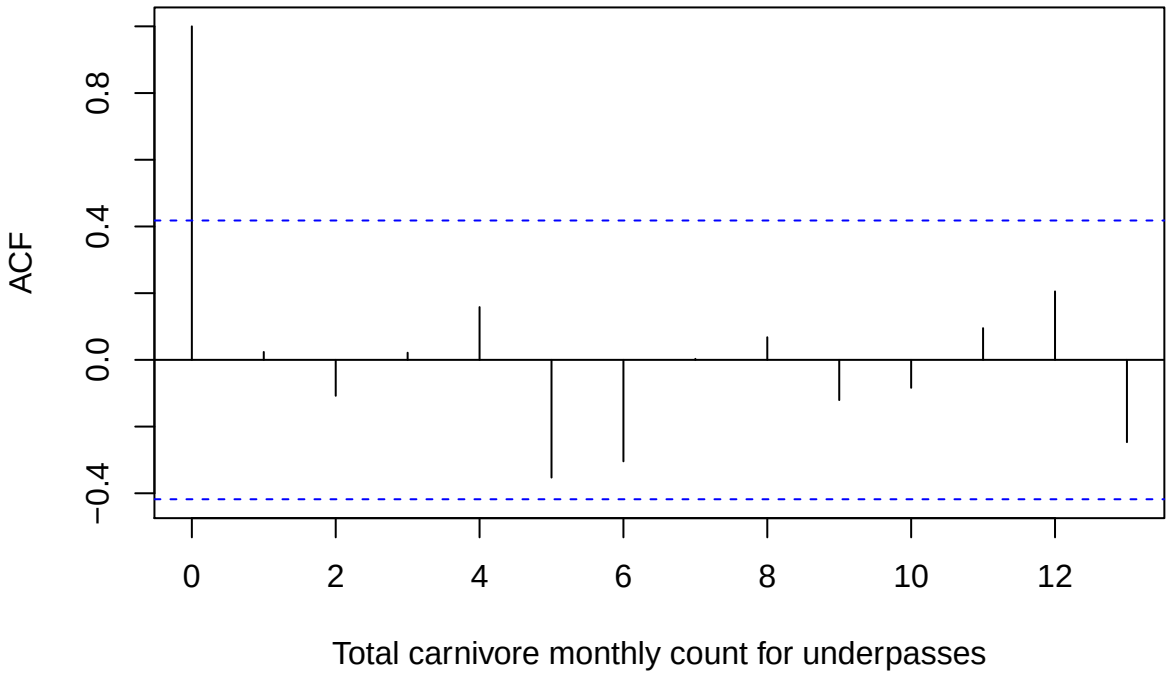
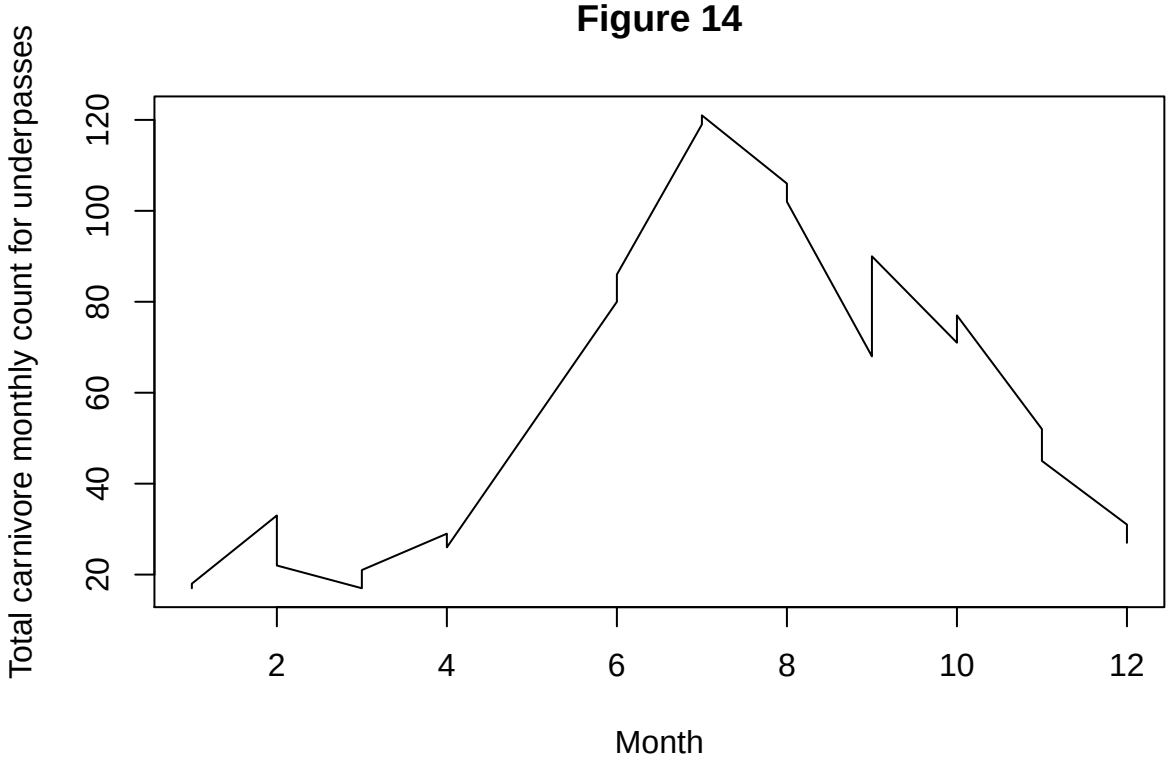

ACF
0.8
0.4
0.0
−0.4
0
2
4
6
8
10
12
Total carnivore monthly count for underpasses

Figure 14




```
## [1] 1278.537
```

```
## [1] 57.18182
```

#Hourly carnivore count for jumpouts

```
##
##  Durbin-Watson test
##
## data:  car.hou.count.jump.mod
## DW = 2.0209, p-value = 0.5402
## alternative hypothesis: true autocorrelation is greater than 0
```

```
##
##  Box-Pierce test
##
## data:  car.hou.count.jump
## X-squared = 0.032739, df = 1, p-value = 0.8564
```

```
##
##  Box-Ljung test
##
## data:  car.hou.count.jump
## X-squared = 0.033818, df = 1, p-value = 0.8541
```

Figure 15

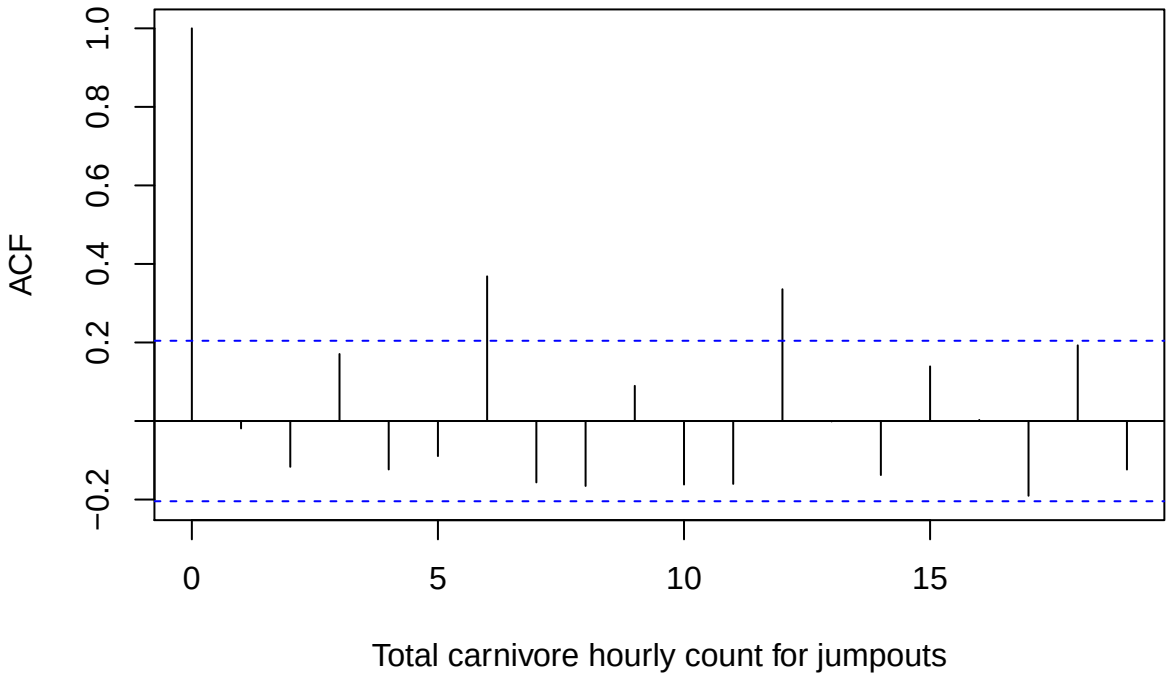
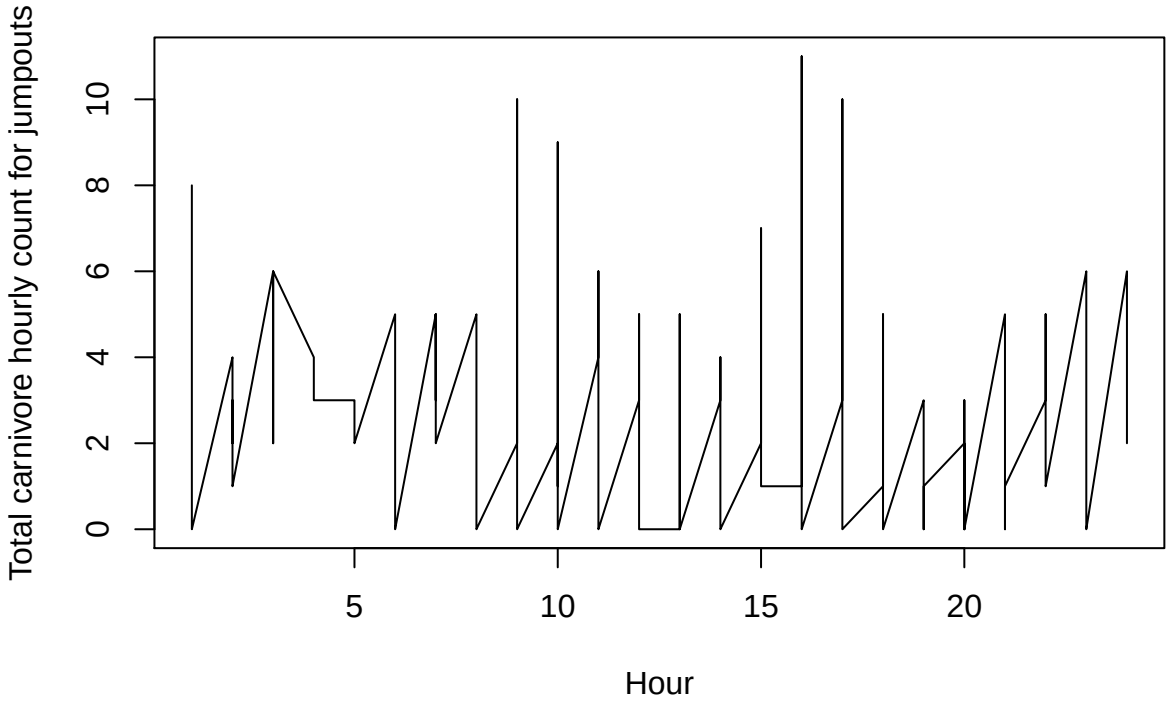

ACF
1.0
0.8
0.6
0.4
0.2
−0.2
0
5
10
15
Total carnivore hourly count for jumpouts

Figure 16




```
## [1] 6.427496
```

```
## [1] 2.967391
```

#Hourly carnivore count for underpasses

```
##
##  Durbin-Watson test
##
## data:  car.hou.count.under.mod
## DW = 1.7711, p-value = 0.2118
## alternative hypothesis: true autocorrelation is greater than 0
```

```
##
##  Box-Pierce test
##
## data:  car.hou.count.under
## X-squared = 0.29256, df = 1, p-value = 0.5886
```

```
##
##  Box-Ljung test
##
## data:  car.hou.count.under
## X-squared = 0.31124, df = 1, p-value = 0.5769
```

Figure 17

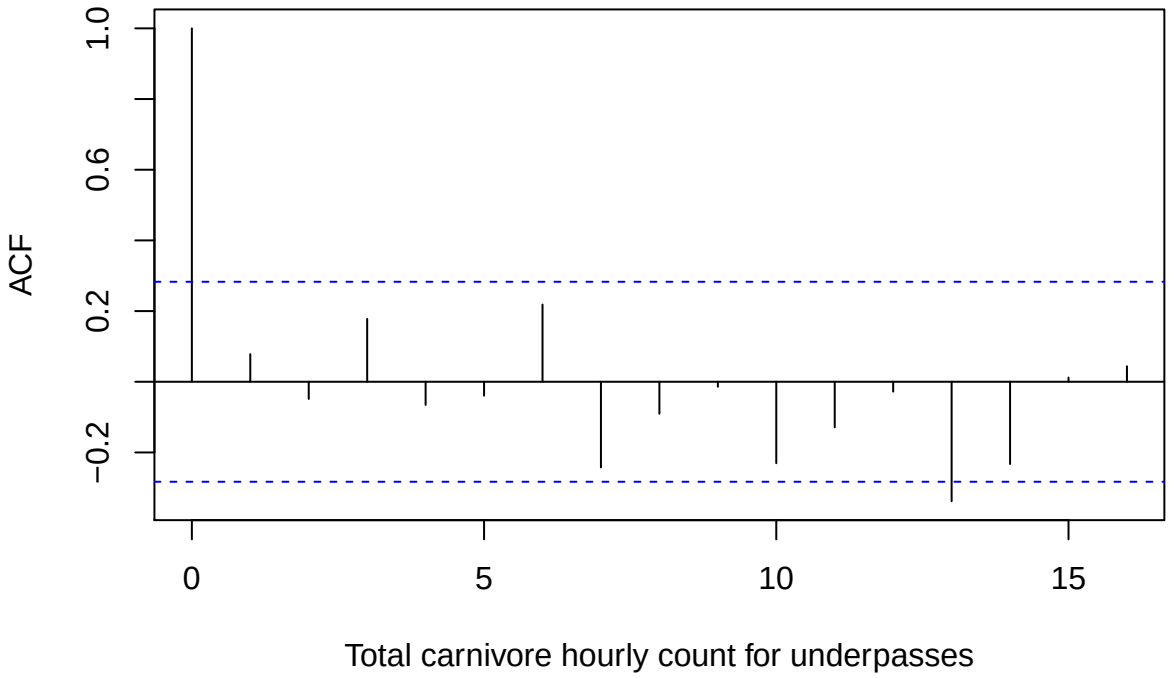
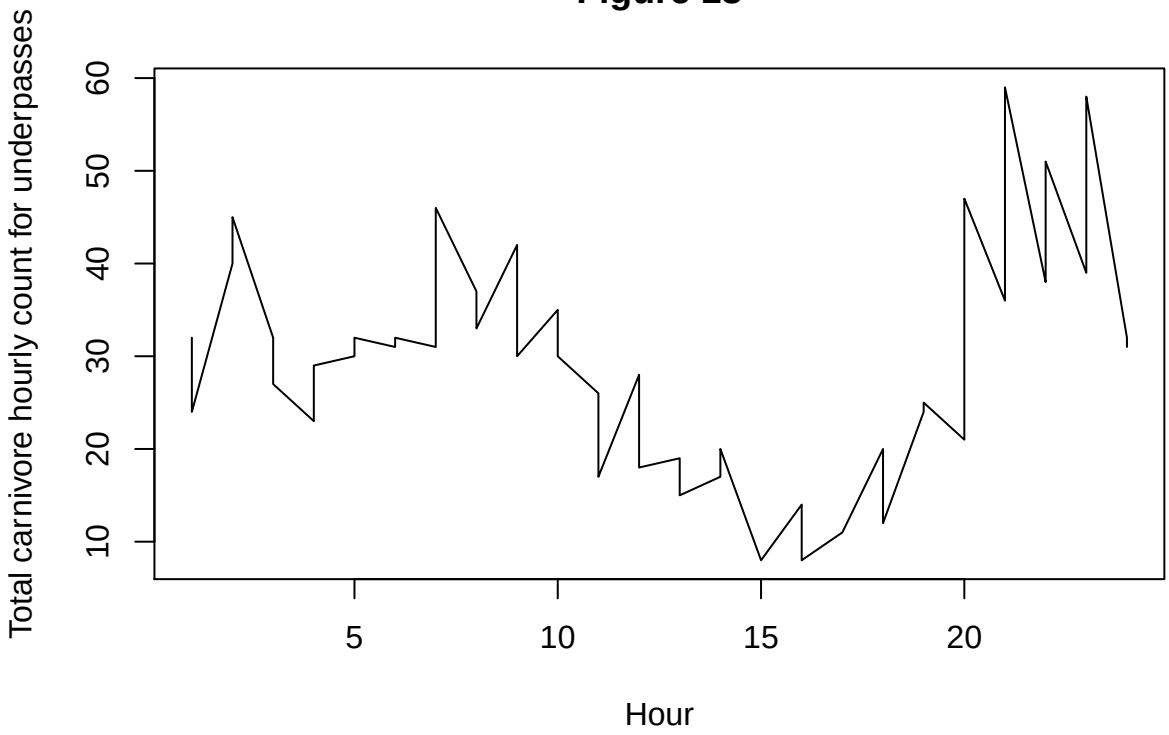

ACF
1.0
0.6
0.2
−0.2
0
5
10
15
Total carnivore hourly count for underpasses

Figure 18




```
## [1] 155.6436
```

```
## [1] 28.625
```

#Annual ungulate count for jumpouts

```
##
##  Durbin-Watson test
##
## data:  ung.ann.count.jump.mod
## DW = 2.0059, p-value = 0.5076
## alternative hypothesis: true autocorrelation is greater than 0
```

```
##
##  Box-Pierce test
##
## data:  ung.ann.count.jump
## X-squared = 0.026127, df = 1, p-value = 0.8716
```

```
##
##  Box-Ljung test
##
## data:  ung.ann.count.jump
## X-squared = 0.028039, df = 1, p-value = 0.867
```

Figure 19

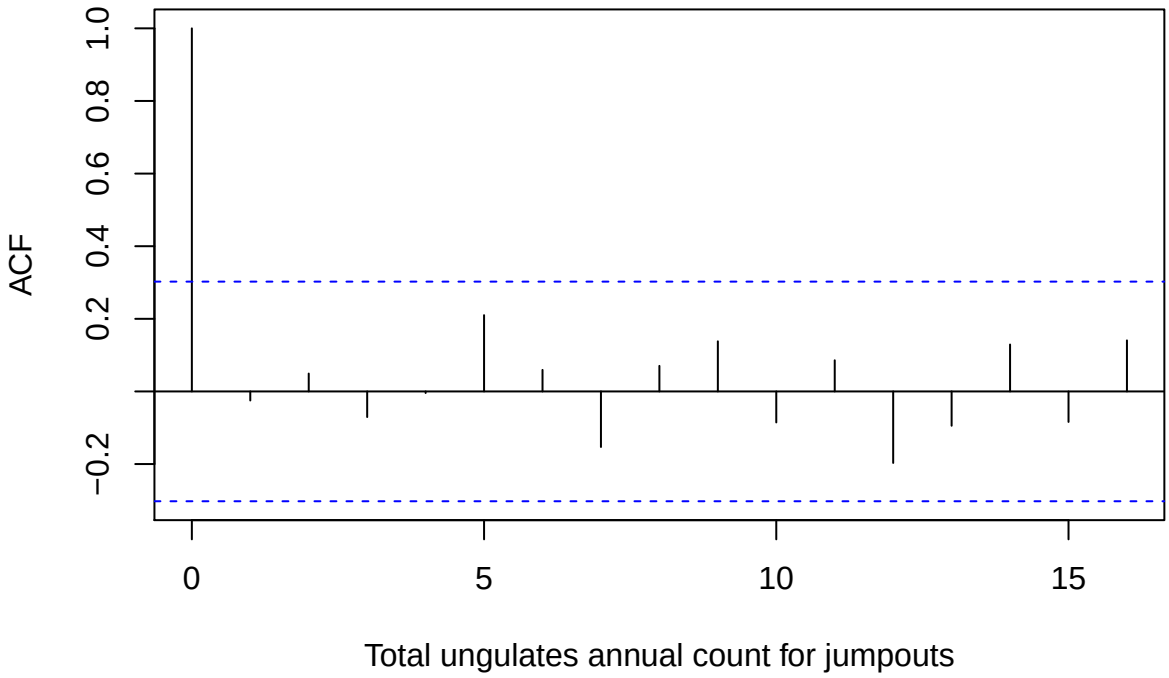
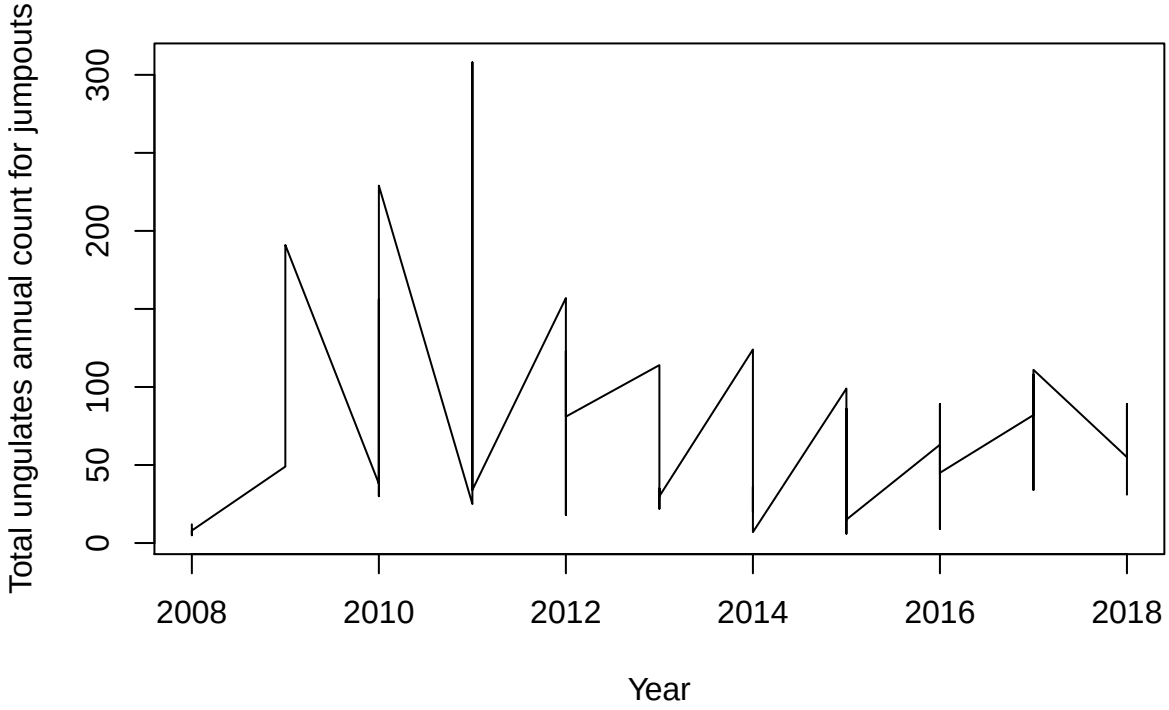

ACF
1.0
0.8
0.6
0.4
0.2
−0.2
0
5
10
15
Total ungulates annual count for jumpouts

Figure 20




```
## [1] 4612.707
```

```
## [1] 73.97619
```

#Annual ungulate count for underpasses

```
##
##  Durbin-Watson test
##
## data:  ung.ann.count.under.mod
## DW = 2.0356, p-value = 0.5345
## alternative hypothesis: true autocorrelation is greater than 0
```

```
##
##  Box-Pierce test
##
## data:  ung.ann.count.under
## X-squared = 0.17021, df = 1, p-value = 0.6799
```

```
##
##  Box-Ljung test
##
## data:  ung.ann.count.under
## X-squared = 0.19342, df = 1, p-value = 0.6601
```

Figure 21

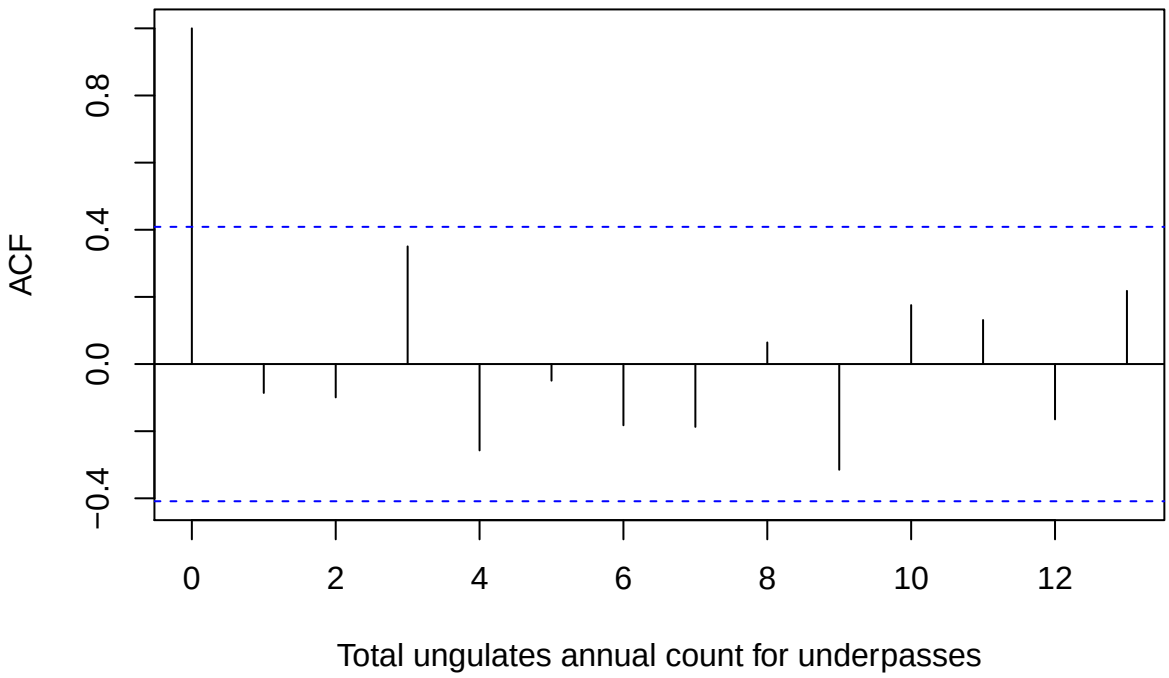
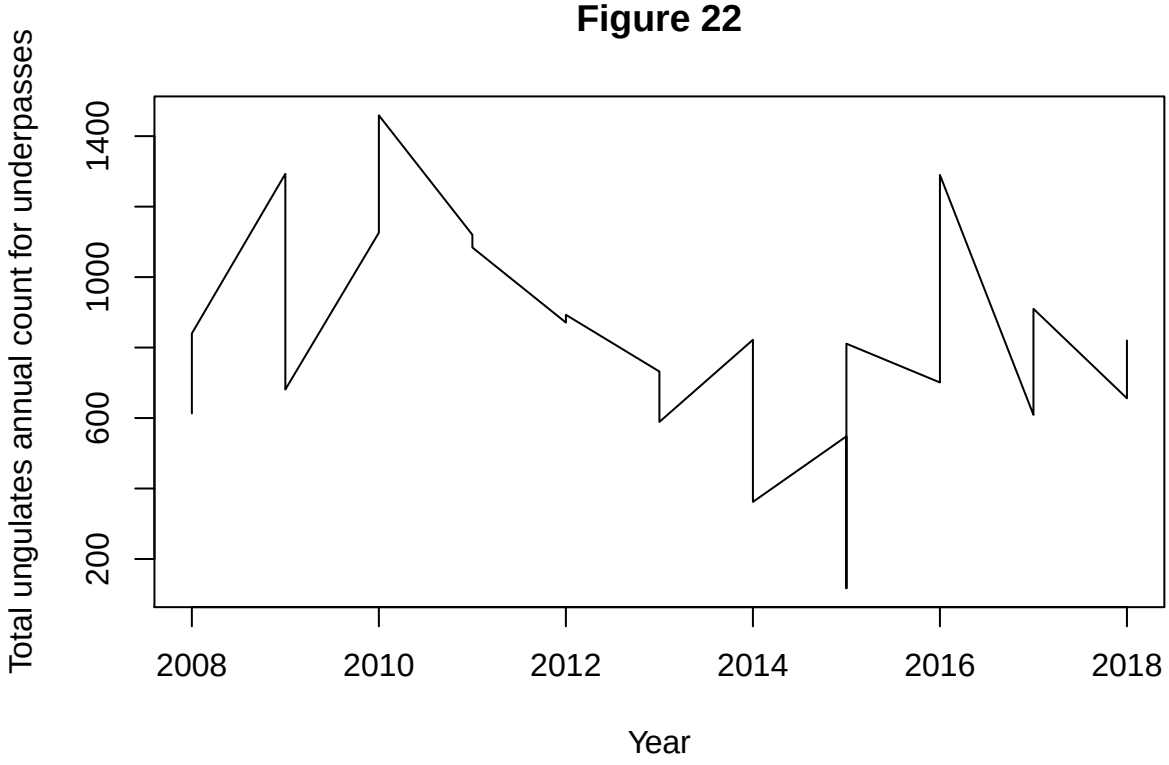

ACF
0.8
0.4
0.0
−0.4
0
2
4
6
8
10
12
Total ungulates annual count for underpasses

Figure 22




```
## [1] 95876.27
```

```
## [1] 823.7826
```

#Monthly ungulate count for jumpouts

```
##
##  Durbin-Watson test
##
## data:  ung.mon.count.jump.mod
## DW = 1.7697, p-value = 0.2202
## alternative hypothesis: true autocorrelation is greater than 0
```

```
##
##  Box-Pierce test
##
## data:  ung.mon.count.jump
## X-squared = 0.45702, df = 1, p-value = 0.499
```

```
##
##  Box-Ljung test
##
## data:  ung.mon.count.jump
## X-squared = 0.4889, df = 1, p-value = 0.4844
```

Figure 23

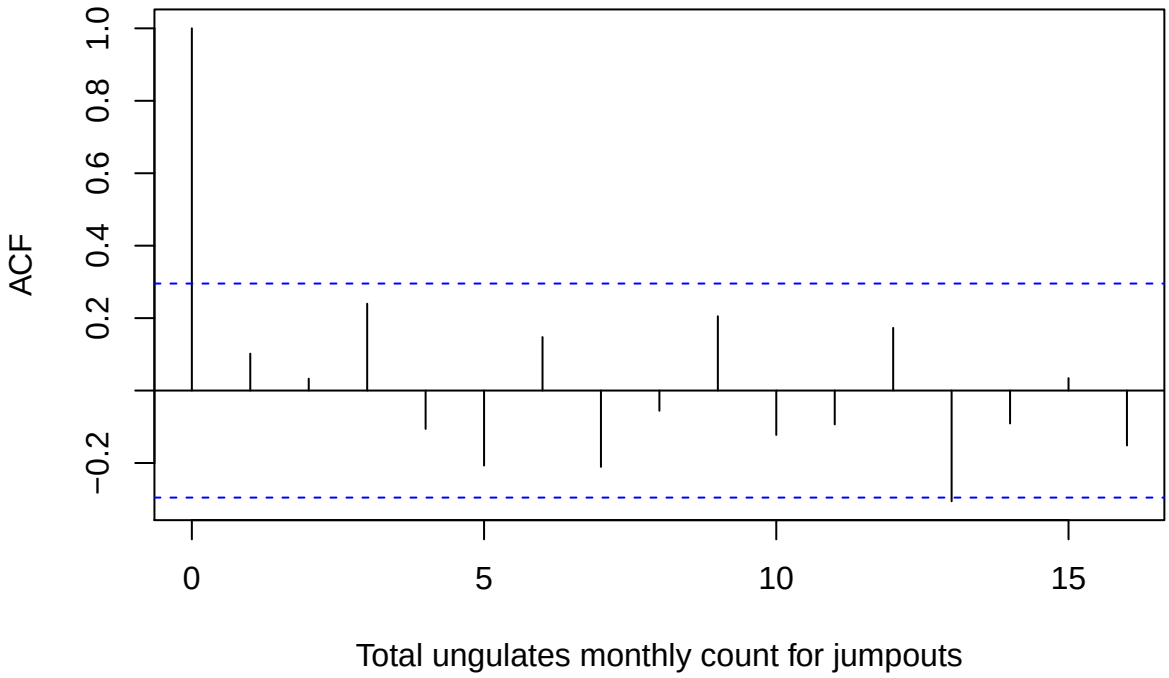
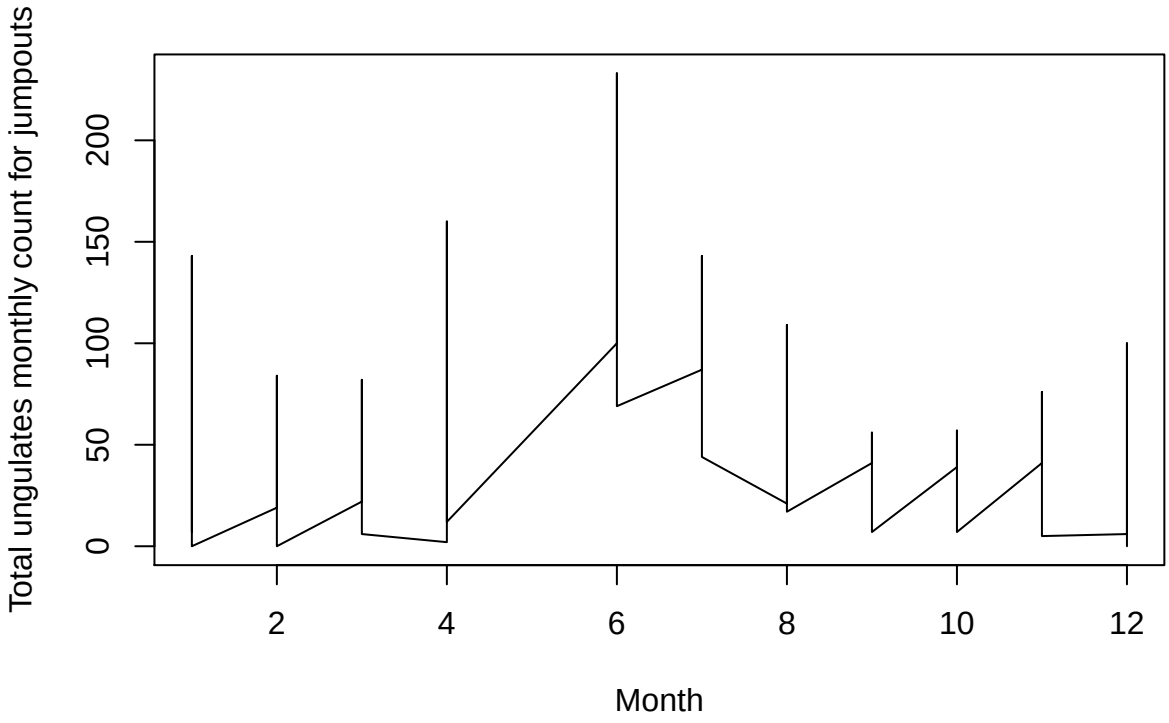

ACF
1.0
0.8
0.6
0.4
0.2
−0.2
0
5
10
15
Total ungulates monthly count for jumpouts

Figure 24




```
## [1] 3076.809
```

```
## [1] 54.43182
```

#Monthly ungulate count for underpasses

```
##
##  Durbin-Watson test
##
## data:  ung.mon.count.under.mod
## DW = 2.2158, p-value = 0.6968
## alternative hypothesis: true autocorrelation is greater than 0
```

```
##
##  Box-Pierce test
##
## data:  ung.mon.count.under
## X-squared = 0.42195, df = 1, p-value = 0.516
```

```
##
##  Box-Ljung test
##
## data:  ung.mon.count.under
## X-squared = 0.48223, df = 1, p-value = 0.4874
```

Figure 25

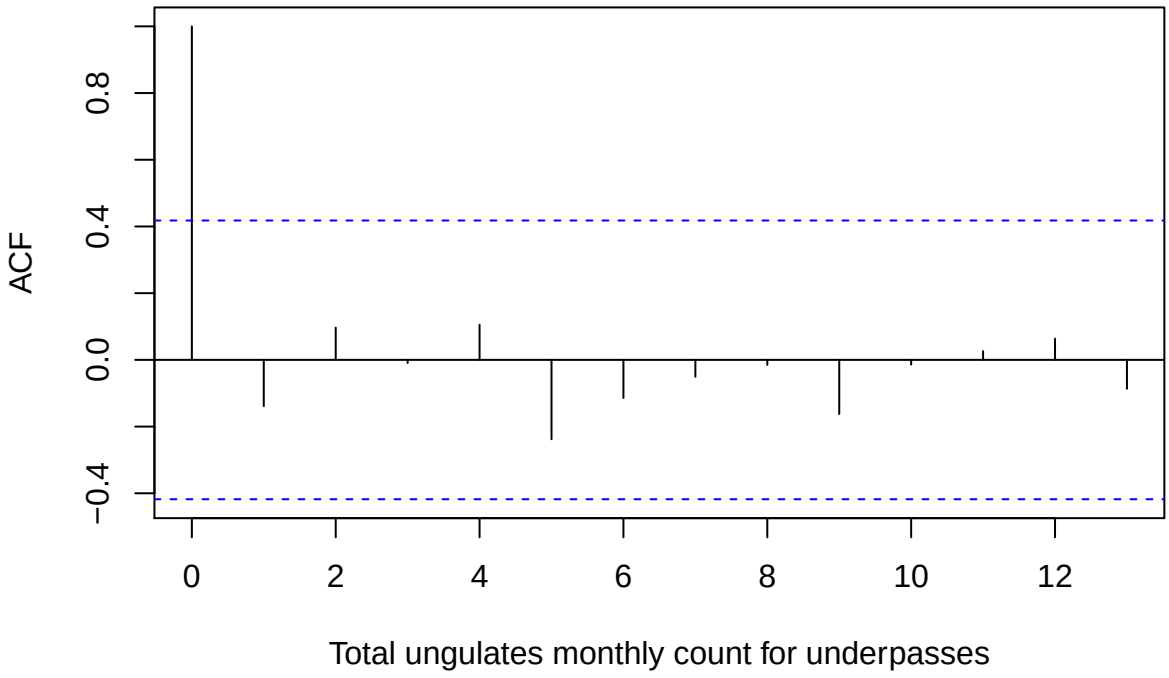
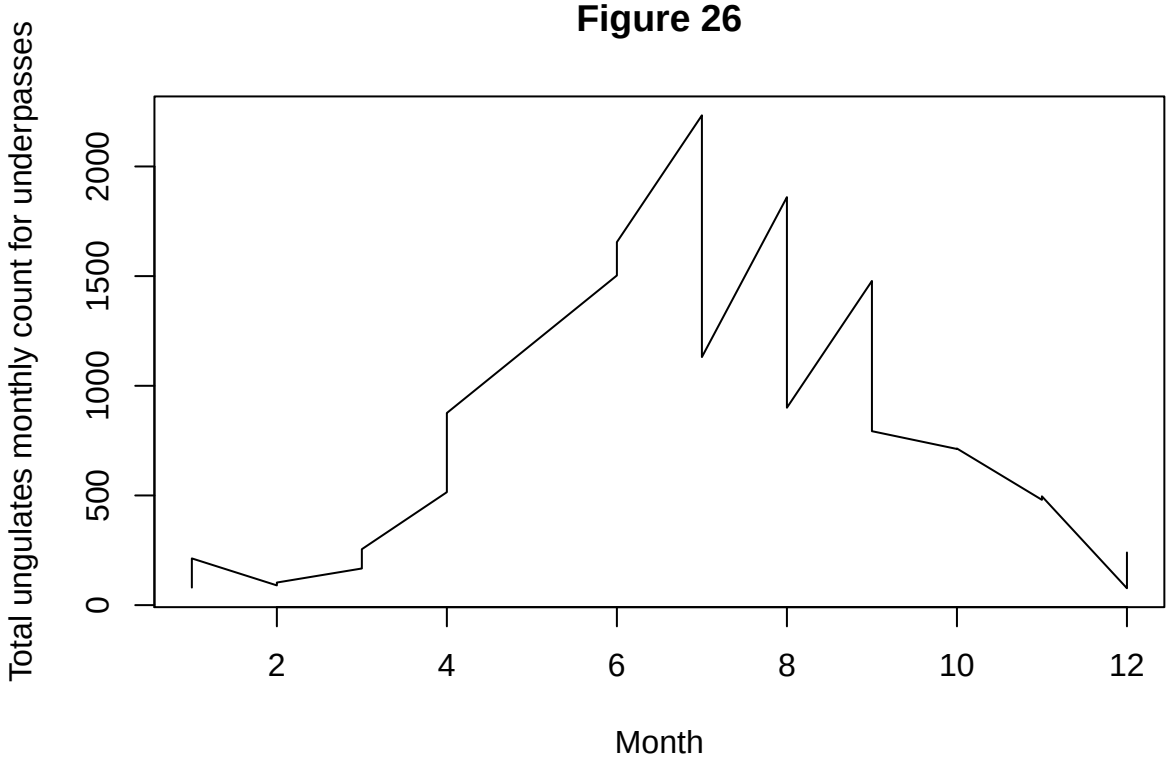

ACF
0.8
0.4
0.0
−0.4
0
2
4
6
8
10
12
Total ungulates monthly count for underpasses

Figure 26




```
## [1] 410350.8
```

```
## [1] 753.2273
```

#Hourly ungulate count for jumpouts

```
##
##  Durbin-Watson test
##
## data:  ung.hou.count.jump.mod
## DW = 1.7999, p-value = 0.1622
## alternative hypothesis: true autocorrelation is greater than 0
```

```
##
##  Box-Pierce test
##
## data:  ung.hou.count.jump
## X-squared = 0.86991, df = 1, p-value = 0.351
```

```
##
##  Box-Ljung test
##
## data:  ung.hou.count.jump
## X-squared = 0.89738, df = 1, p-value = 0.3435
```

Figure 27

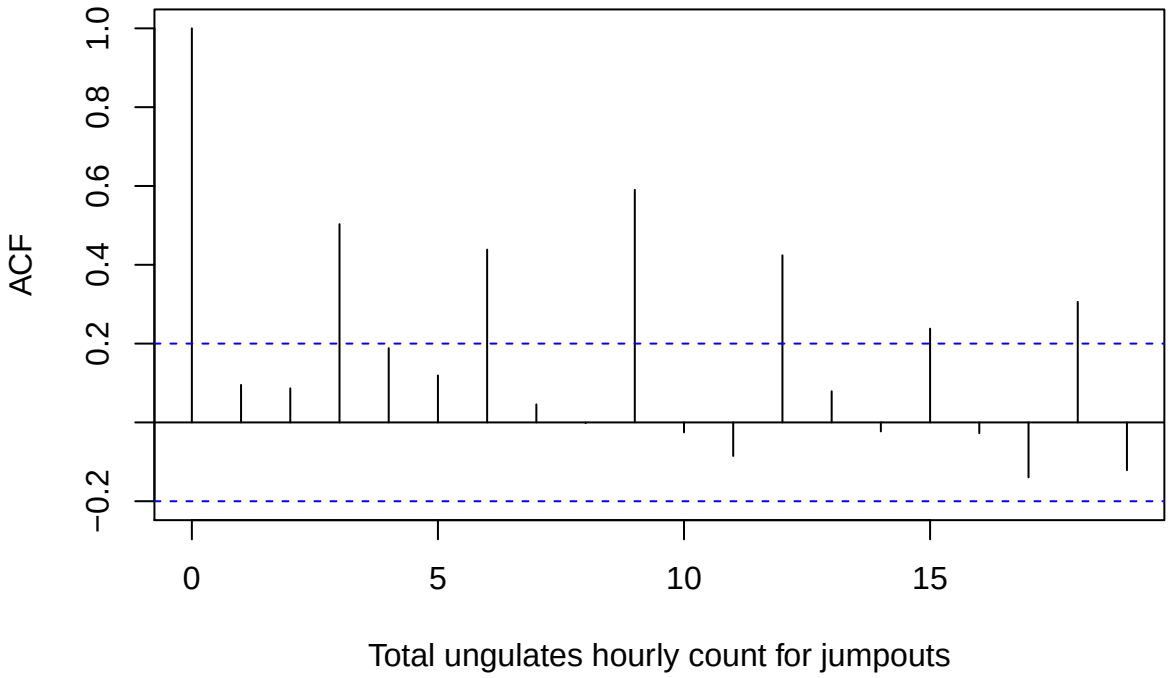
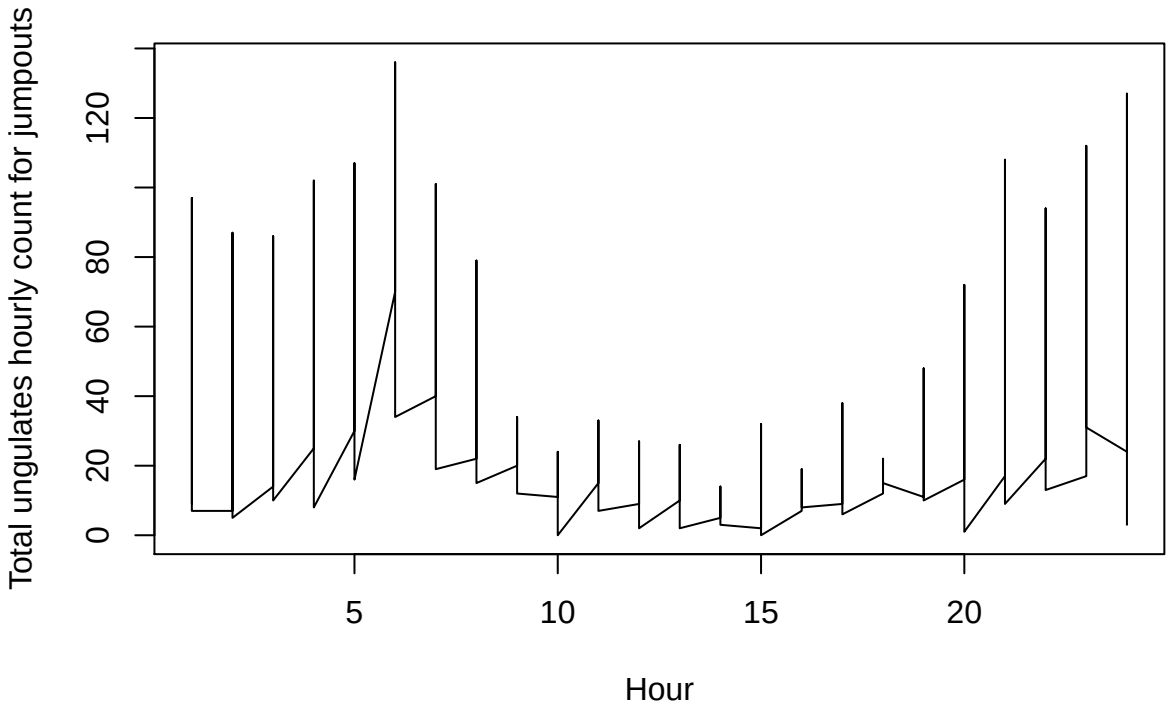

ACF
1.0
0.8
0.6
0.4
0.2
−0.2
0
5
10
15
Total ungulates hourly count for jumpouts

Figure 28




```
## [1] 1061.855
```

```
## [1] 32.36458
```

#Hourly ungulate count for underpasses

```
##
##  Durbin-Watson test
##
## data:  ung.hou.count.under.mod
## DW = 1.7076, p-value = 0.1528
## alternative hypothesis: true autocorrelation is greater than 0
```

```
##
##  Box-Pierce test
##
## data:  ung.hou.count.under
## X-squared = 0.7838, df = 1, p-value = 0.376
```

```
##
##  Box-Ljung test
##
## data:  ung.hou.count.under
## X-squared = 0.83383, df = 1, p-value = 0.3612
```

Figure 29

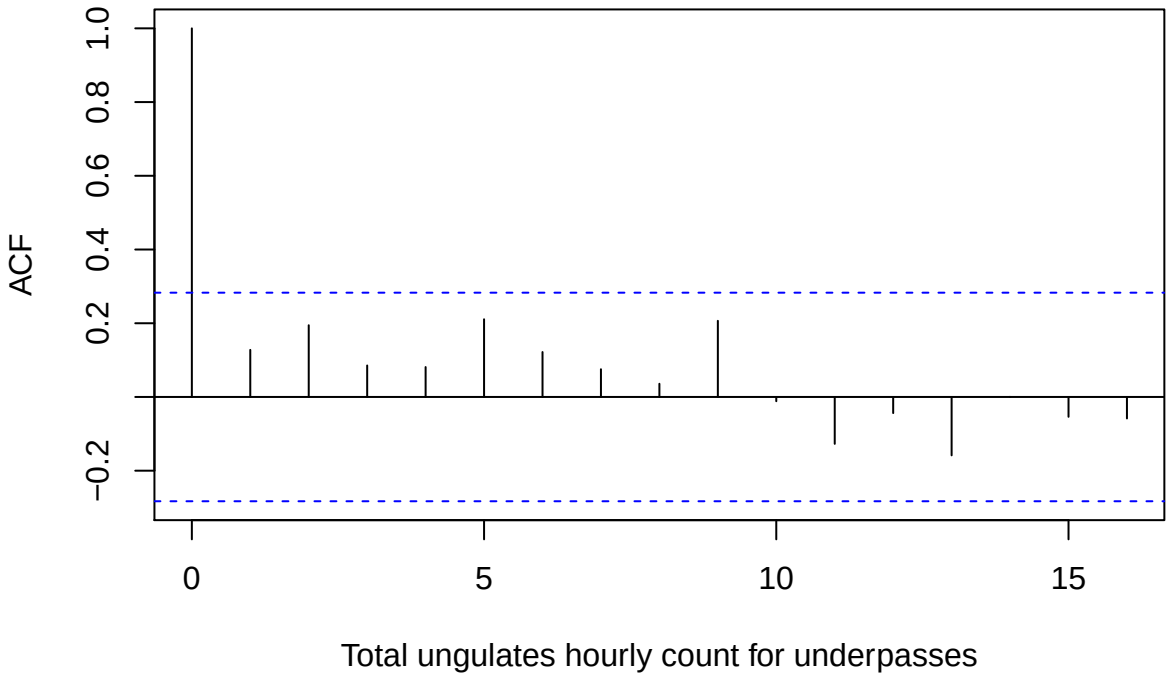
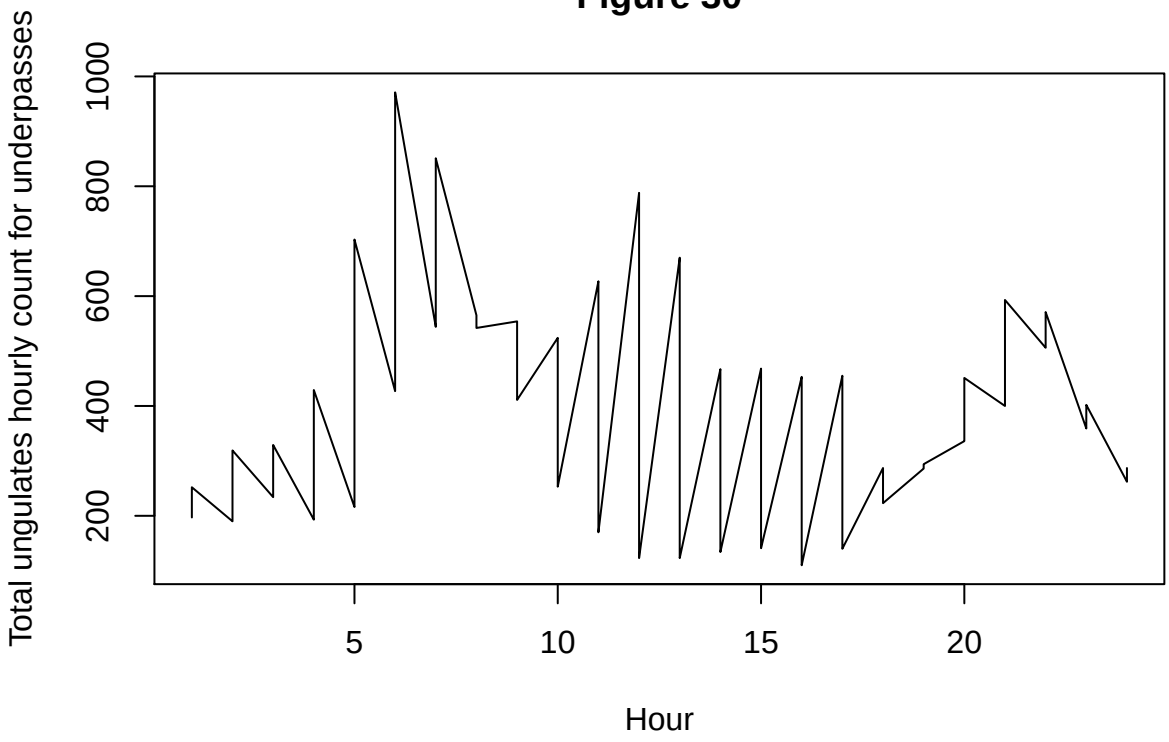

ACF
1.0
0.8
0.6
0.4
0.2
−0.2
0
5
10
15
Total ungulates hourly count for underpasses

Figure 30




```
## [1] 41362.93
```

```
## [1] 392.2917
```

#———————————————————————————Violin plots———————————————————————————

Figure 31

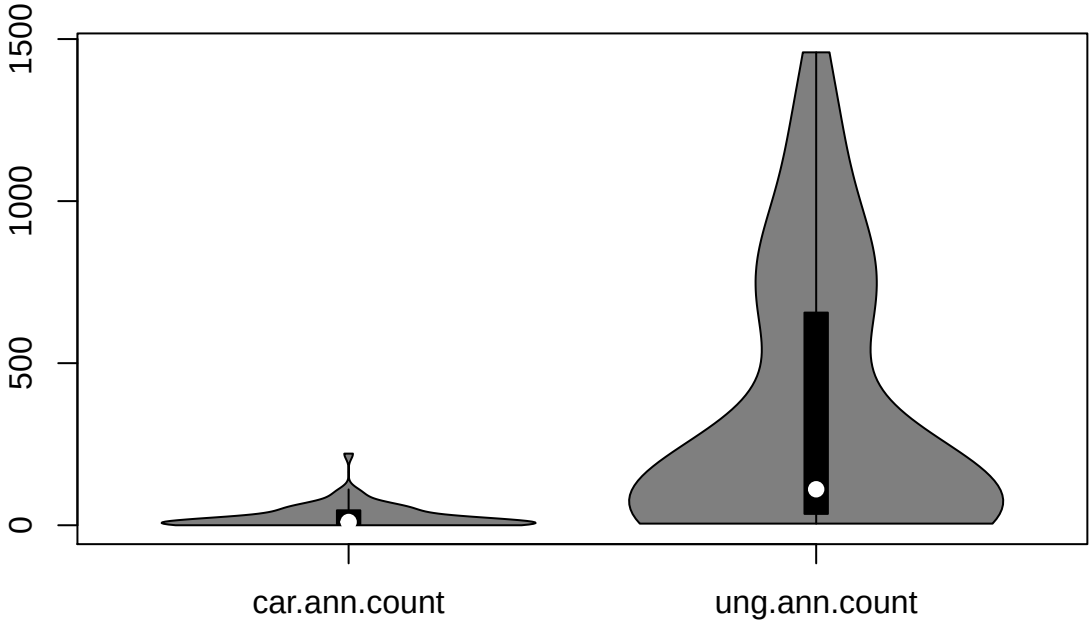


Figure 32

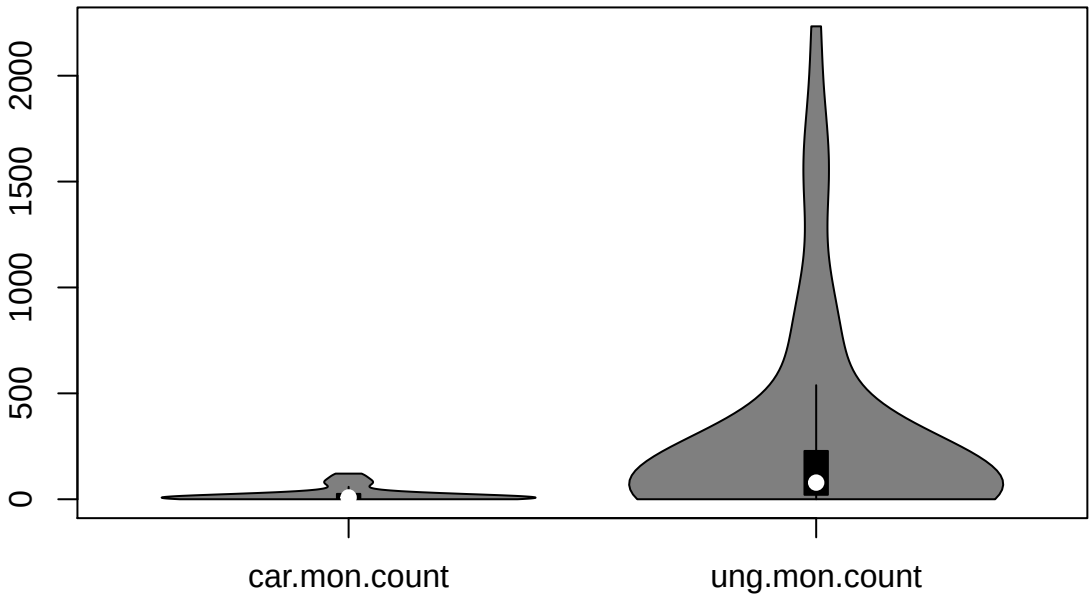
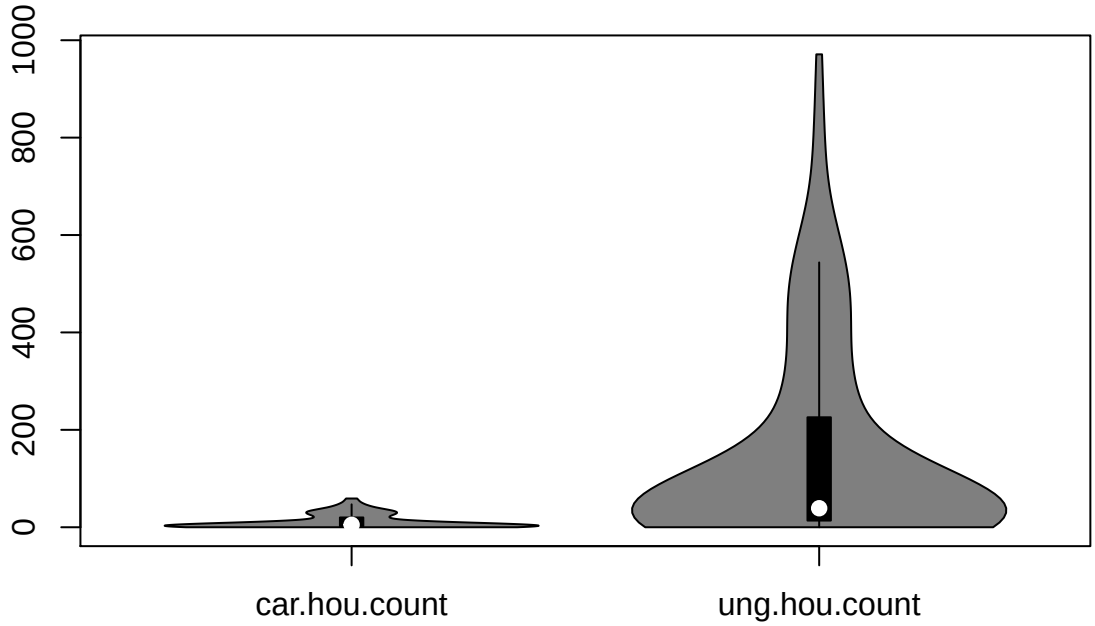


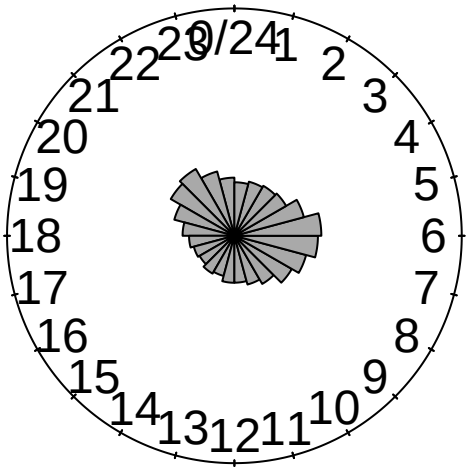
Figure 33



#————————————Look at whether there is circularity in the dataset————————————

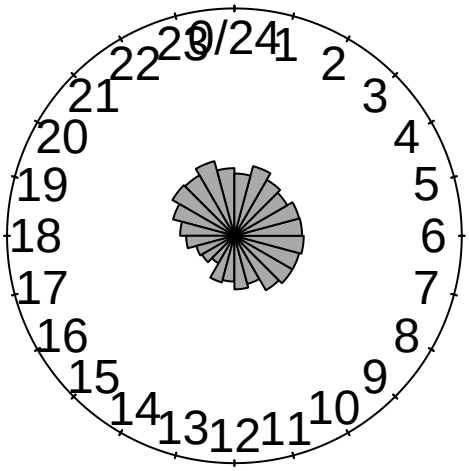
#Ungulate and carnivore hours of activity

Figure 34



Ungulate hour frequency

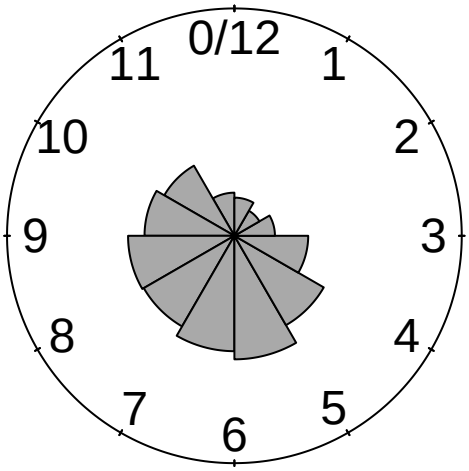
Figure 35



Carnivore hour frequency

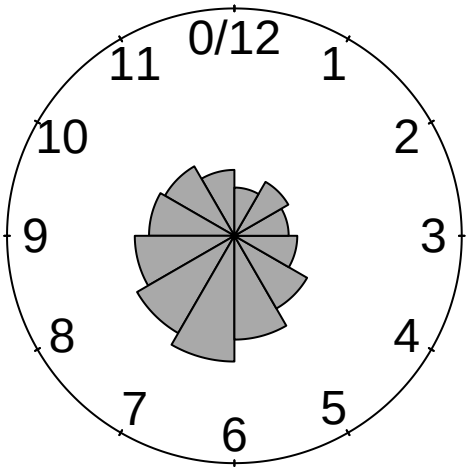
#Ungulate and carnivore months of activity

Figure 36



Ungulate month frequency

Figure 37

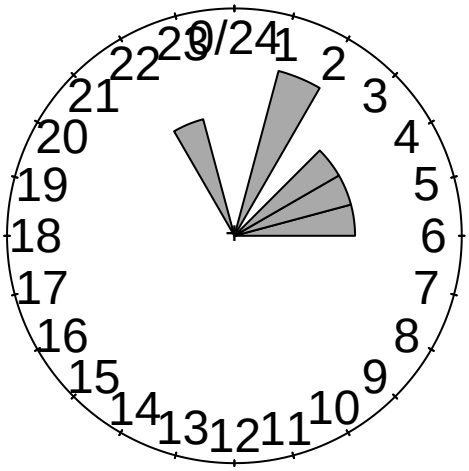


Carnivore month frequency

#Carnivores hours of activity separated by species

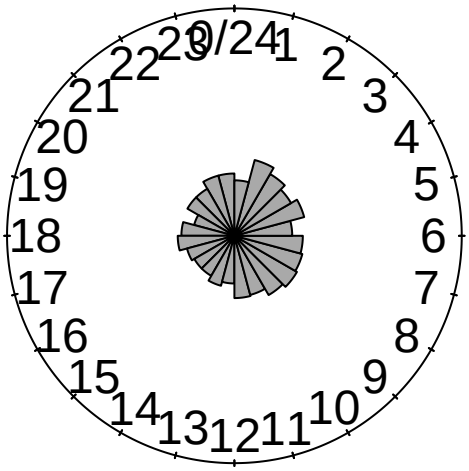
```
##    Black Bear        Bobcat        Cougar        Coyote  Grizzly Bear
##           320             6           323           653            26
##          Lynx        Marten       Red Fox Striped Skunk  Unknown Bear
##             1             1             7             1             9
##          Wolf     Wolverine
##            13             1
```

Figure 38



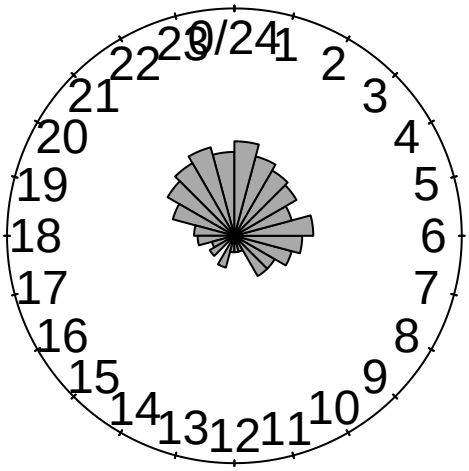
Bobcat hour frequency

Figure 39



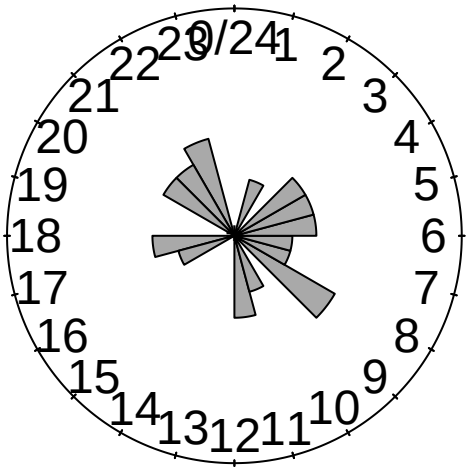
Coyote hour frequency

Figure 40



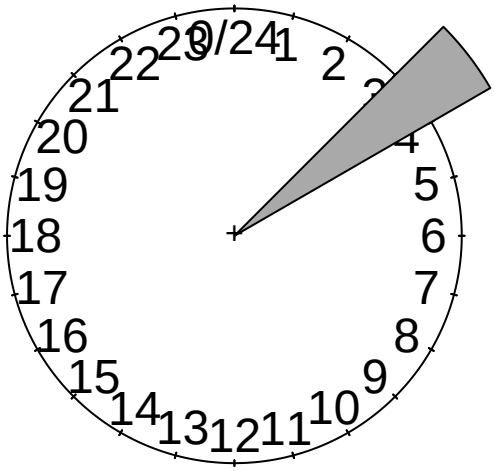
Cougar hour frequency

Figure 41



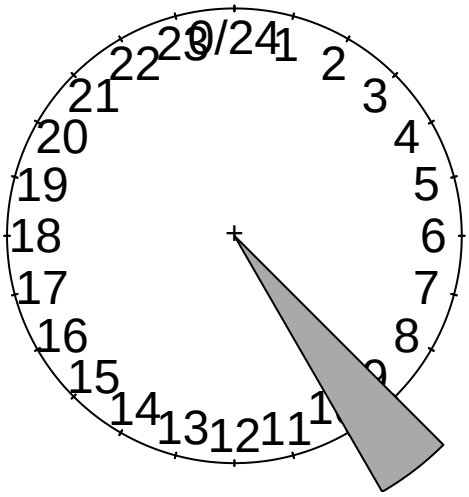
Grizzly Bear hour frequency

Figure 42



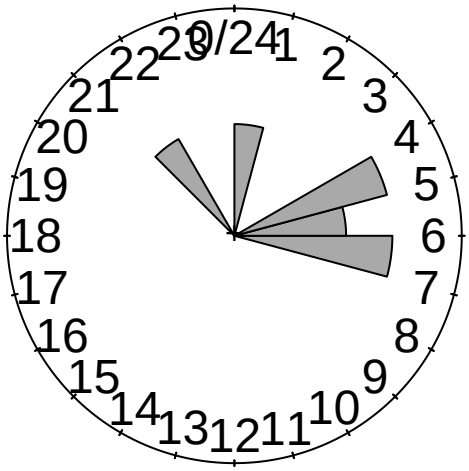
Lynx hour frequency

Figure 43



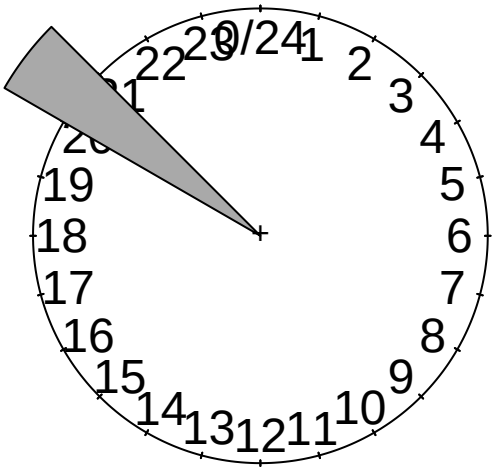
Pine Marten hour frequency

Figure 44



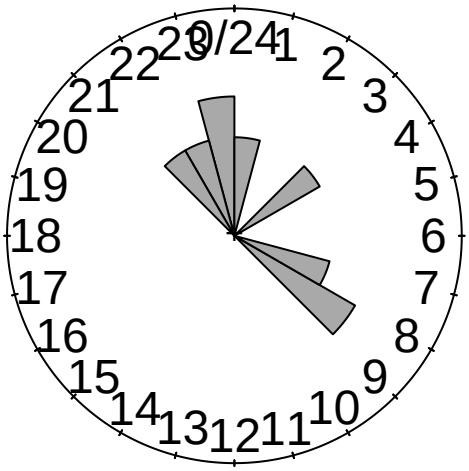
Red Fox hour frequency

Figure 45



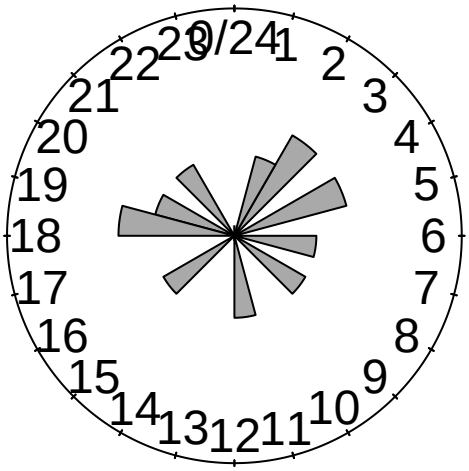
Striped Skunk hour frequency

Figure 46



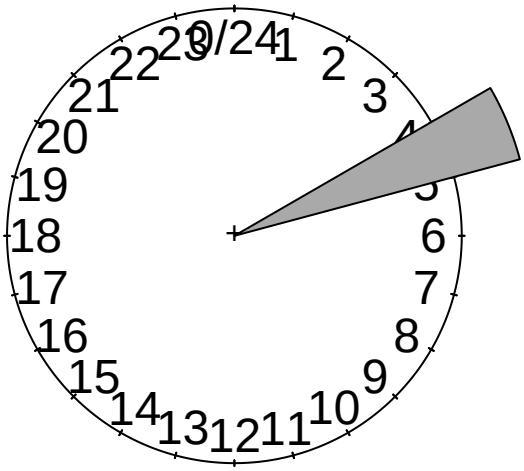
Unknown Bear hour frequency

Figure 47



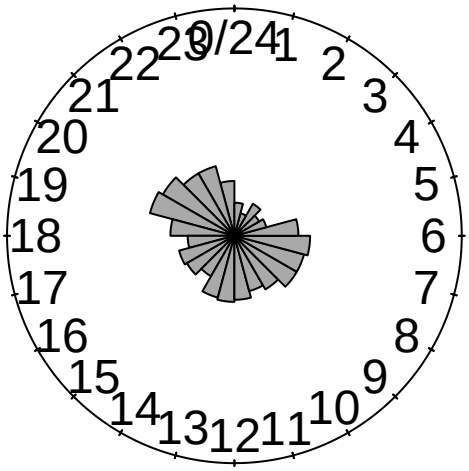
Wolf hour frequency

Figure 48



Wolverine hour frequency

Figure 48



Black Bear hour frequency