Small ungulate crossing structure analysis

Script to run GLMM to look at the temporal variation in small ungulate use of underpasses and jumpouts We first separate out the day/season/annual counts by structure type and explore the influence of time of day (crep/day/night) for the day counts, season for the season counts and year for the annual counts. We also explore the influence of vehicles and humans.

Model structure: count (per structure) ~ crep/day/night or season + traffic volume + human use +

Location + random = sampling effort

Small daily ungulates

```
prior<-list(R=list(V=1, nu=0.002),
            G = list(G1 = list(V = 1, nu = 0.002)))

prioexp<- list(R = list(V = 1, nu=0.002), #residuals prior
               G = list(G1 = list(V = 1,nu= 0.02,alpha.mu=0,alpha.V=1000)))
```

Underpass

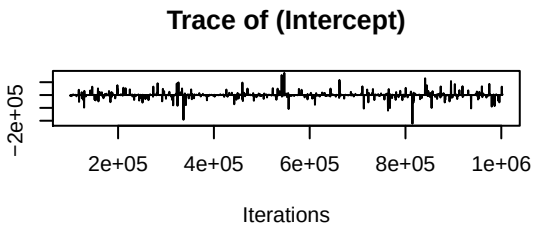
```
## Warning in MCMCglmm(Total ~ daynight + Location2 + daynight.traffic +
## daynight.human, : some fixed effects are not estimable and have been removed.
## Use singular.ok=TRUE to sample these effects, but use an informative prior!
```

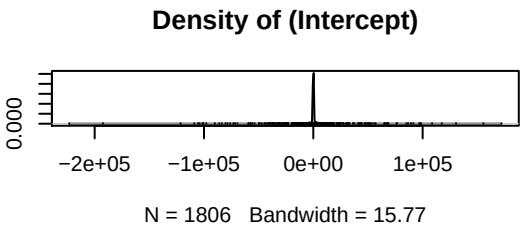
```
## Warning in MCMCglmm(Total ~ daynight + Location2 + daynight.traffic +
## daynight.human, : some fixed effects are not estimable and have been removed.
## Use singular.ok=TRUE to sample these effects, but use an informative prior!
```

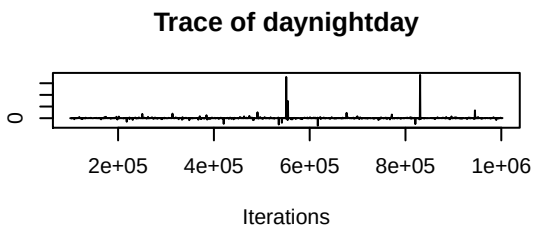
model summary and plots of IG prior and expanded prior respectively

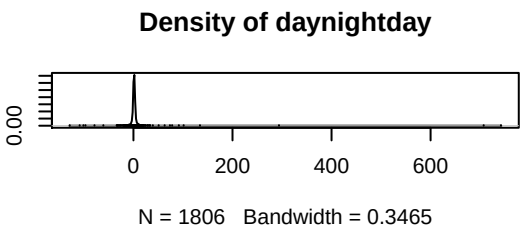
```
##
##  Iterations = 100001:1002501
##  Thinning interval  = 500
##  Sample size  = 1806
##
```

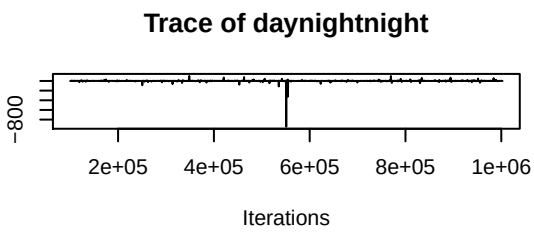
```
##  DIC: 70.33755
##
##  G-structure:  ~average.effort
##
##                post.mean l-95% CI  u-95% CI eff.samp
## average.effort 1.756e+09  0.00031 3.505e+09     1806
##
##  R-structure:  ~units
##
##       post.mean l-95% CI u-95% CI eff.samp
## units       150  0.02532    73.53     1806
##
##  Location effects: Total ~ daynight + Location2 + daynight.traffic + daynight.human
##
##                        post.mean   l-95% CI   u-95% CI eff.samp pMCMC
## (Intercept)          -2.118e+02 -4.013e+04  2.551e+04     1806 0.733
## daynightday           2.206e+00 -1.014e+01  1.148e+01     1421 0.411
## daynightnight         4.337e-01 -1.005e+01  1.010e+01     1116 0.411
## Location2Wind Valley  3.292e+01 -4.159e+04  4.844e+04     1806 0.962
## daynight.human       -3.718e+00 -4.034e+01  3.628e+01     1639 0.814


##
##  Iterations = 100001:1002501
##  Thinning interval  = 500
##  Sample size  = 1806
##
##  DIC: 70.3064
##
##  G-structure:  ~average.effort
##
##                post.mean  l-95% CI  u-95% CI eff.samp
## average.effort  2.27e+09 0.0005834 4.509e+09     1806
##
##  R-structure:  ~units
##
##       post.mean l-95% CI u-95% CI eff.samp
## units      7526  0.02528    67.83     1806
##
##  Location effects: Total ~ daynight + Location2 + daynight.traffic + daynight.human
##
##                        post.mean   l-95% CI   u-95% CI eff.samp pMCMC
## (Intercept)              255.195 -39203.563  29504.835     1806 0.852
## daynightday                3.950     -9.336     14.402     1806 0.461
## daynightnight             -2.986     -8.329     12.702     1806 0.395
## Location2Wind Valley    -476.929 -42840.586  48224.811     1806 0.982
## daynight.human           -20.642    -39.683     42.626     1806 0.836
```

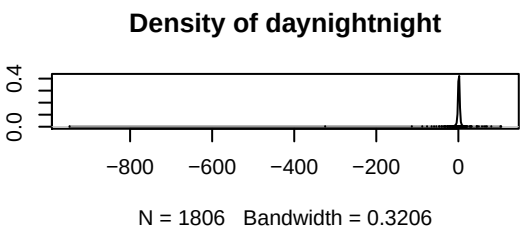

Trace of (Intercept)
−2e+05
2e+05
4e+05
6e+05
8e+05
1e+06
Iterations

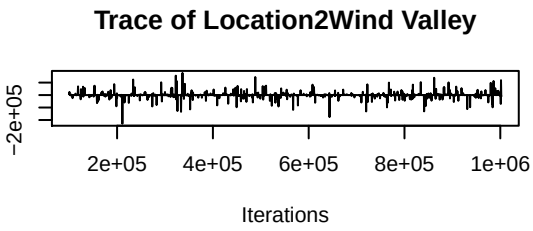

Density of (Intercept)
0.000
−2e+05
−1e+05
0e+00
1e+05
N = 1806 Bandwidth = 15.77

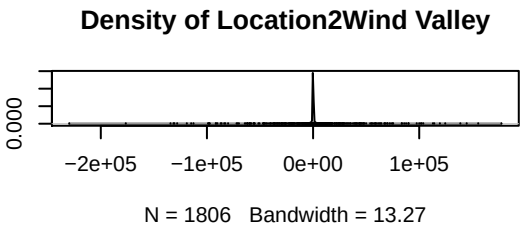

Trace of daynightday
0
2e+05
4e+05
6e+05
8e+05
1e+06
Iterations

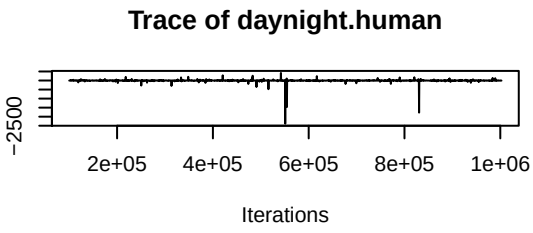

Density of daynightday
0.00
0
200
400
600
N = 1806 Bandwidth = 0.3465

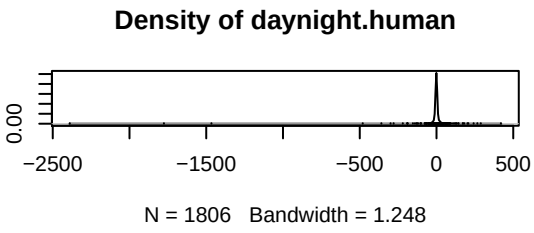

Trace of daynightnight
−800
2e+05
4e+05
6e+05
8e+05
1e+06
Iterations

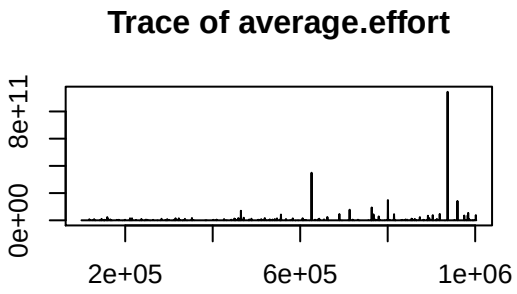

Density of daynightnight
0.0
0.4
−800
−600
−400
−200
0
N = 1806 Bandwidth = 0.3206

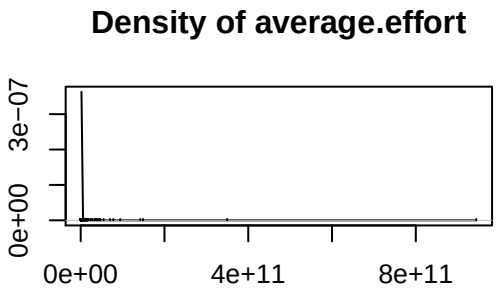

Trace of Location2Wind Valley
−2e+05
2e+05
4e+05
6e+05
8e+05
1e+06
Iterations

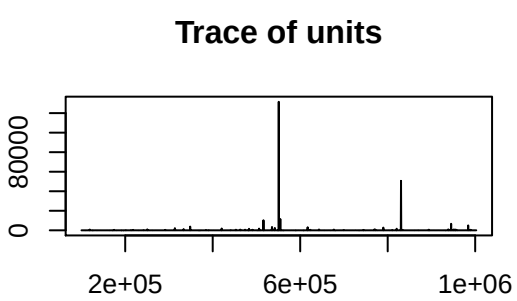

Density of Location2Wind Valley
0.000
−2e+05
−1e+05
0e+00
1e+05
N = 1806 Bandwidth = 13.27

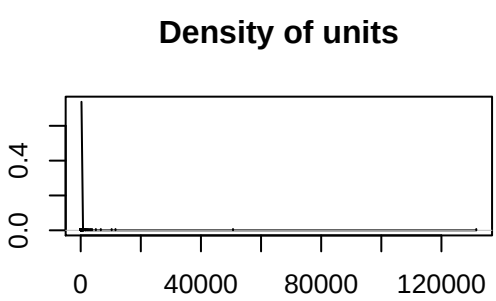

Trace of daynight.human
−2500
2e+05
4e+05
6e+05
8e+05
1e+06
Iterations

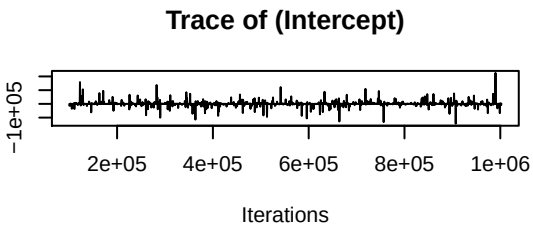

Density of daynight.human
0.00
−2500
−1500
−500
0
500
N = 1806 Bandwidth = 1.248

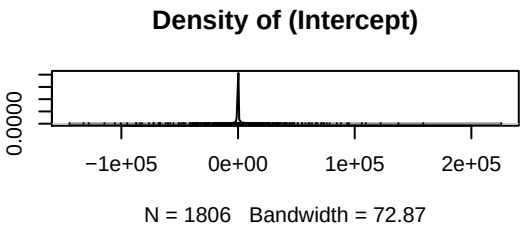

Trace of average.effort
0e+00
8e+11
2e+05
6e+05
1e+06
Iterations

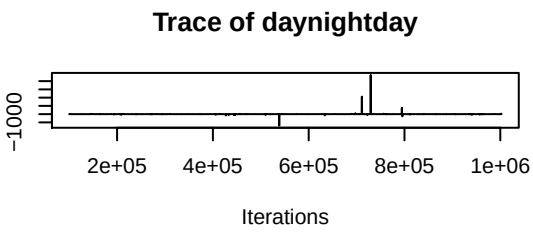

Density of average.effort
0e+00
3e−07
0e+00
4e+11
8e+11
N = 1806 Bandwidth = 1.044e+06

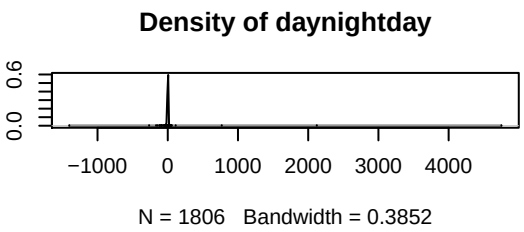

Trace of units
0
80000
2e+05
6e+05
1e+06
Iterations

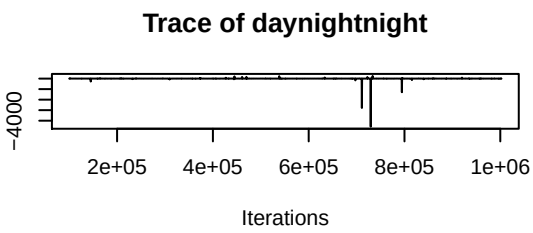

Density of units
0.0
0.4
0
40000
80000
120000
N = 1806 Bandwidth = 0.5305

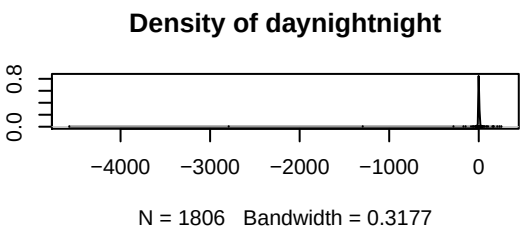

Trace of (Intercept)
−1e+05
2e+05
4e+05
6e+05
8e+05
1e+06
Iterations

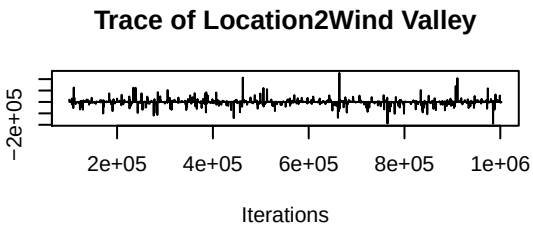

Density of (Intercept)
0.0000
−1e+05
0e+00
1e+05
2e+05
N = 1806 Bandwidth = 72.87

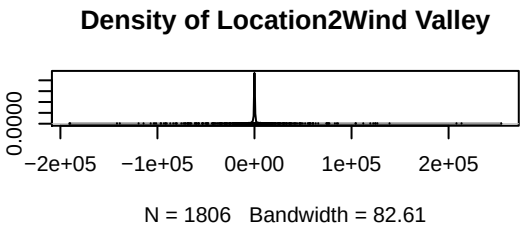

Trace of daynightday
−1000
2e+05
4e+05
6e+05
8e+05
1e+06
Iterations

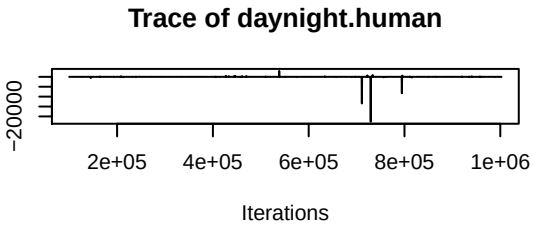

Density of daynightday
0.0
0.6
−1000
0
1000
2000
3000
4000
N = 1806 Bandwidth = 0.3852

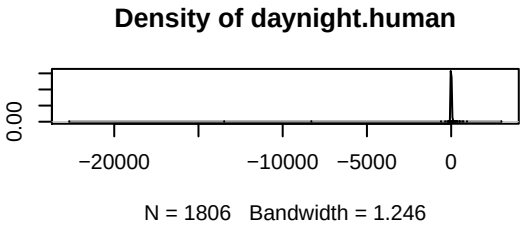

Trace of daynightnight
−4000
2e+05
4e+05
6e+05
8e+05
1e+06
Iterations

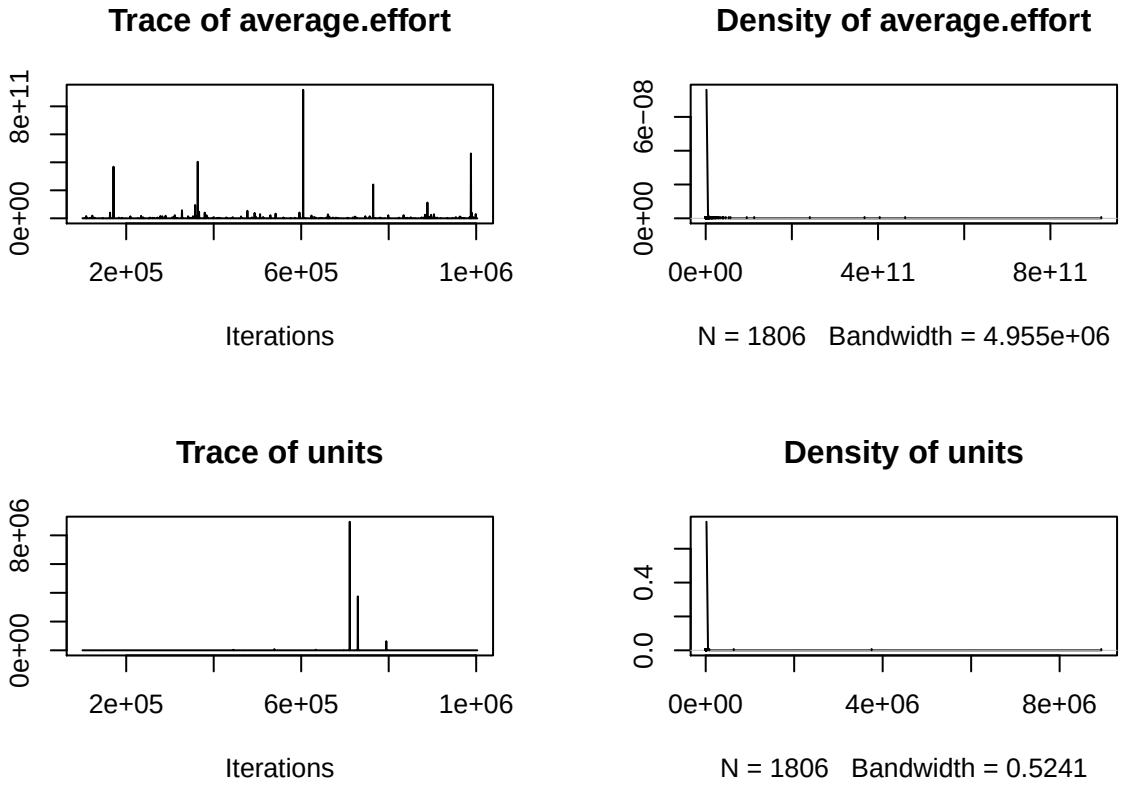

Density of daynightnight
0.0
0.8
−4000
−3000
−2000
−1000
0
N = 1806 Bandwidth = 0.3177


Trace of Location2Wind Valley
−2e+05
2e+05
4e+05
6e+05
8e+05
1e+06
Iterations


Density of Location2Wind Valley
0.0000
−2e+05
−1e+05
0e+00
1e+05
2e+05
N = 1806 Bandwidth = 82.61


Trace of daynight.human
−20000
2e+05
4e+05
6e+05
8e+05
1e+06
Iterations


Density of daynight.human
0.00
−20000
−10000
−5000
0
N = 1806 Bandwidth = 1.246



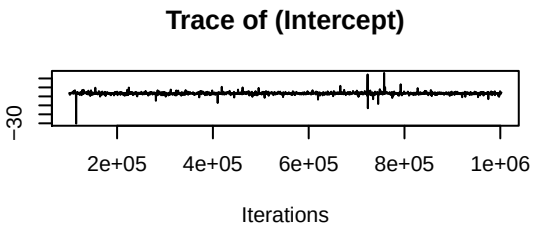
Jumpout

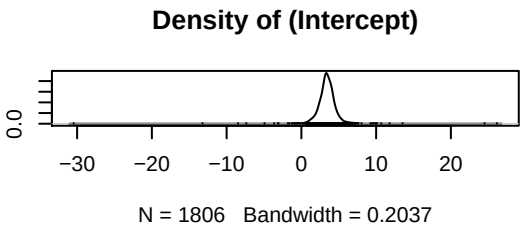
```
## Warning in MCMCglmm(Total ~ daynight + Location2 + daynight.traffic +
## daynight.human, : some fixed effects are not estimable and have been removed.
## Use singular.ok=TRUE to sample these effects, but use an informative prior!

## Warning in MCMCglmm(Total ~ daynight + Location2 + daynight.traffic +
## daynight.human, : some fixed effects are not estimable and have been removed.
## Use singular.ok=TRUE to sample these effects, but use an informative prior!
```

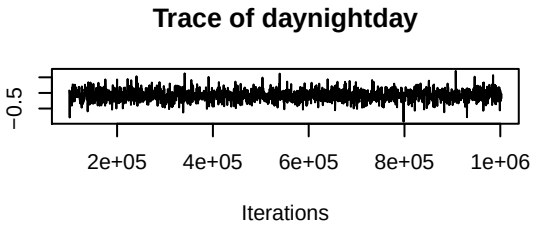
model summary and plots of IG prior and expanded prior respectively

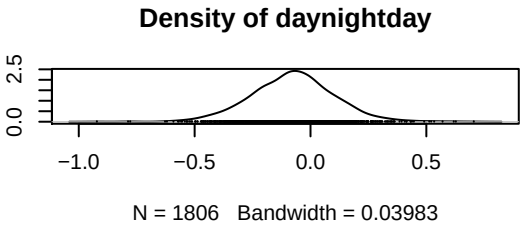
```
##
##  Iterations = 100001:1002501
##  Thinning interval  = 500
##  Sample size  = 1806
##
##  DIC: 104.2741
##
##  G-structure:  ~average.effort
##
##                post.mean l-95% CI u-95% CI eff.samp
## average.effort     11.27    0.126     18.1     1806
##
##  R-structure:  ~units
##
```

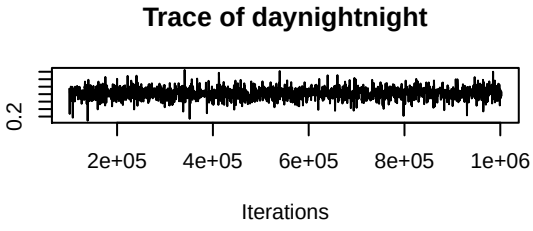
```
##       post.mean  l-95% CI u-95% CI eff.samp
## units  0.006002 0.0001646  0.02014     1806
##
##  Location effects: Total ~ daynight + Location2 + daynight.traffic + daynight.human
##
##                         post.mean l-95% CI u-95% CI eff.samp   pMCMC
## (Intercept)               3.40785  1.07114  5.83107     1956 0.02436 *
## daynightday              -0.07597 -0.43809  0.27379     1806 0.64784
## daynightnight             0.82110  0.50479  1.10034     1806 < 6e-04 ***
## Location2Stewart Creek  -0.75766 -5.45498  3.54345     1806 0.53488
## daynight.human            1.12890  0.50074  1.76399     2078 0.00221 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

##
##  Iterations = 100001:1002501
##  Thinning interval  = 500
##  Sample size  = 1806
##
##  DIC: 104.252
##
##  G-structure:  ~average.effort
##
##                post.mean l-95% CI u-95% CI eff.samp
## average.effort     38.28   0.1655    62.39     1544
##
##  R-structure:  ~units
##
##       post.mean  l-95% CI u-95% CI eff.samp
## units  0.005604 0.0001504  0.01802     1806
##
##  Location effects: Total ~ daynight + Location2 + daynight.traffic + daynight.human
##
##                         post.mean l-95% CI u-95% CI eff.samp   pMCMC
## (Intercept)               3.41261 -0.91248  7.73369     1806 0.07863 .
## daynightday              -0.06032 -0.39435  0.27839     1806 0.71207
## daynightnight             0.83309  0.55702  1.11117     1806 < 6e-04 ***
## Location2Stewart Creek  -0.94081 -9.31834  8.16480     1936 0.64120
## daynight.human            1.10441  0.48011  1.71641     1806 0.00443 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

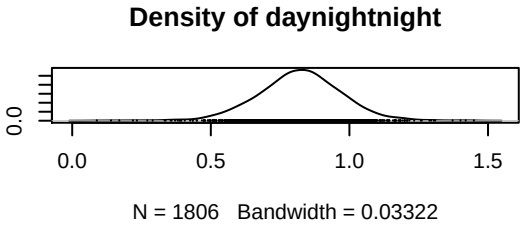

Trace of (Intercept)
−30
2e+05
4e+05
6e+05
8e+05
1e+06
Iterations

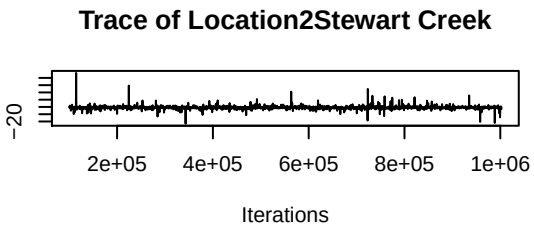

Density of (Intercept)
0.0
−30
−20
−10
0
10
20
N = 1806 Bandwidth = 0.2037

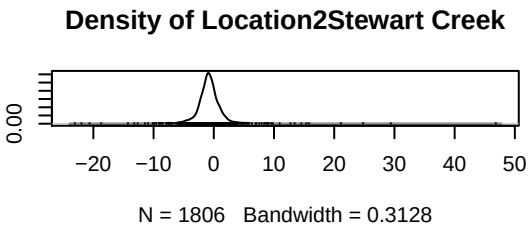

Trace of daynightday
−0.5
2e+05
4e+05
6e+05
8e+05
1e+06
Iterations

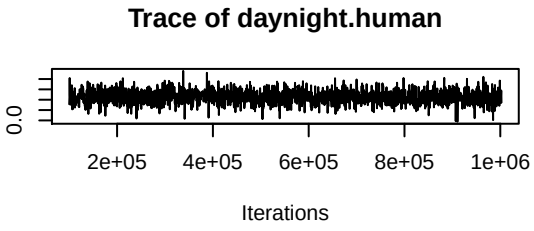

Density of daynightday
0.0
2.5
−1.0
−0.5
0.0
0.5
N = 1806 Bandwidth = 0.03983

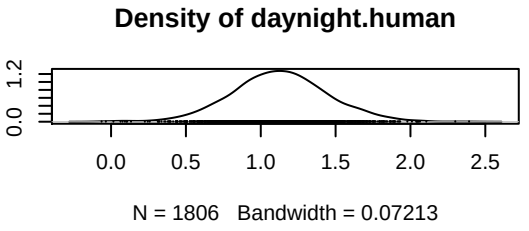

Trace of daynightnight
0.2
2e+05
4e+05
6e+05
8e+05
1e+06
Iterations

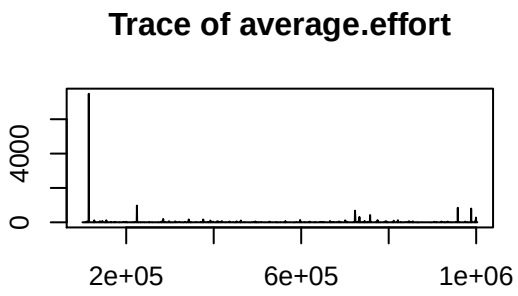

Density of daynightnight
0.0
0.0
0.5
1.0
1.5
N = 1806 Bandwidth = 0.03322

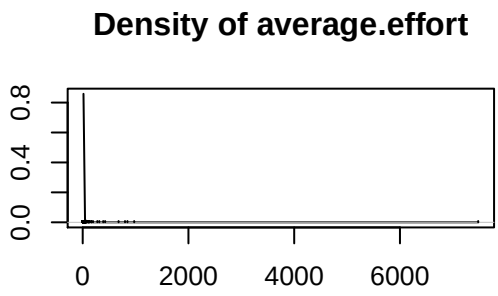

Trace of Location2Stewart Creek
−20
2e+05
4e+05
6e+05
8e+05
1e+06
Iterations

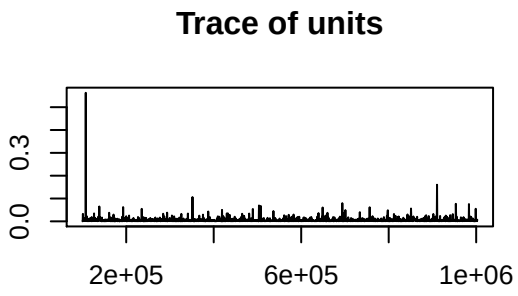

Density of Location2Stewart Creek
0.00
−20
−10
0
10
20
30
40
50
N = 1806 Bandwidth = 0.3128

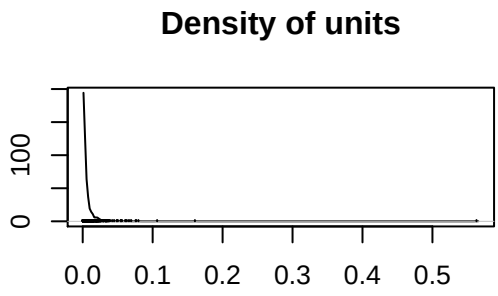

Trace of daynight.human
0.0
2e+05
4e+05
6e+05
8e+05
1e+06
Iterations

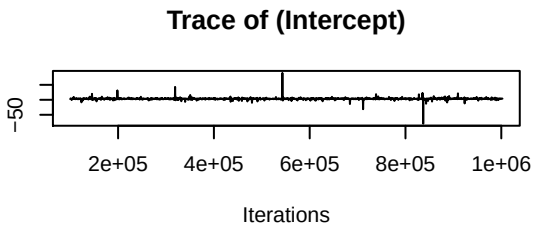

Density of daynight.human
0.0 1.2
0.0
0.5
1.0
1.5
2.0
2.5
N = 1806 Bandwidth = 0.07213

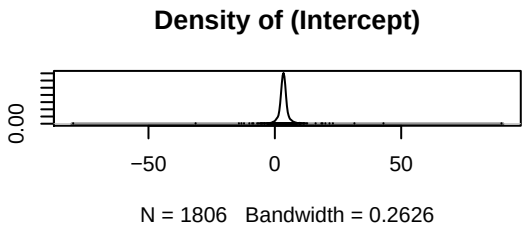

Trace of average.effort
0
4000
2e+05
6e+05
1e+06
Iterations

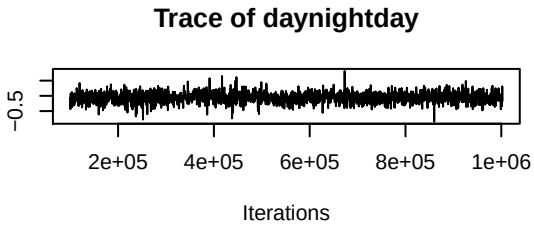

Density of average.effort
0.0
0.4
0.8
0
2000
4000
6000
N = 1806 Bandwidth = 0.448

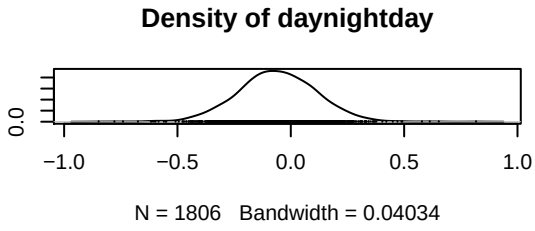

Trace of units
0.0
0.3
2e+05
6e+05
1e+06
Iterations

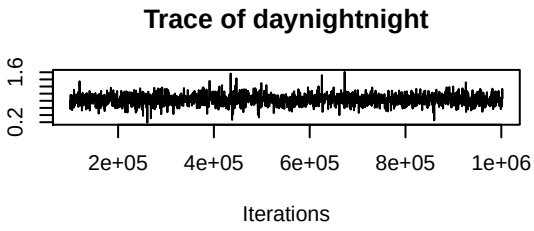

Density of units
0
100
0.0
0.1
0.2
0.3
0.4
0.5
N = 1806 Bandwidth = 0.0008458

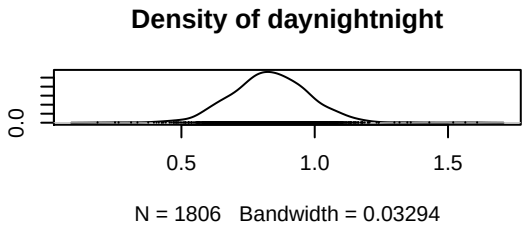

Trace of (Intercept)
−50
2e+05
4e+05
6e+05
8e+05
1e+06
Iterations

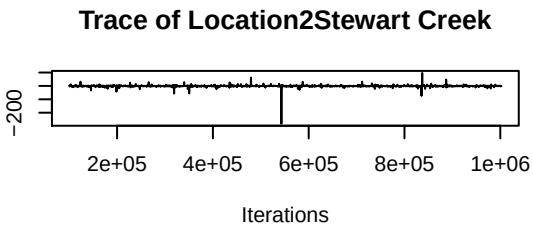

Density of (Intercept)
0.00
−50
0
50
N = 1806 Bandwidth = 0.2626

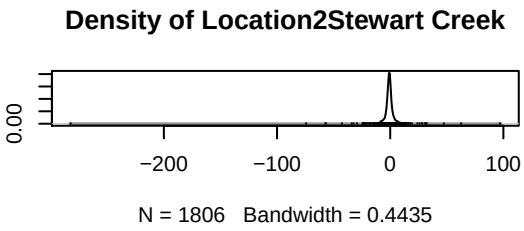

Trace of daynightday
−0.5
2e+05
4e+05
6e+05
8e+05
1e+06
Iterations

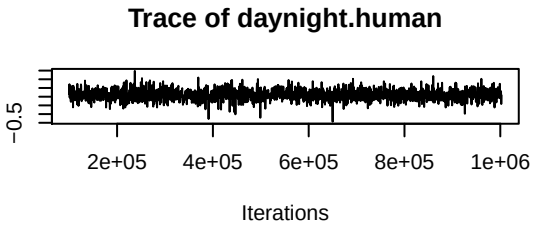

Density of daynightday
0.0
−1.0
−0.5
0.0
0.5
1.0
N = 1806 Bandwidth = 0.04034

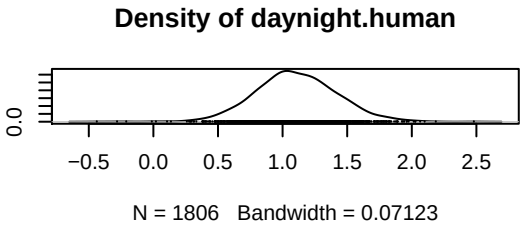

Trace of daynightnight
0.2
1.6
2e+05
4e+05
6e+05
8e+05
1e+06
Iterations

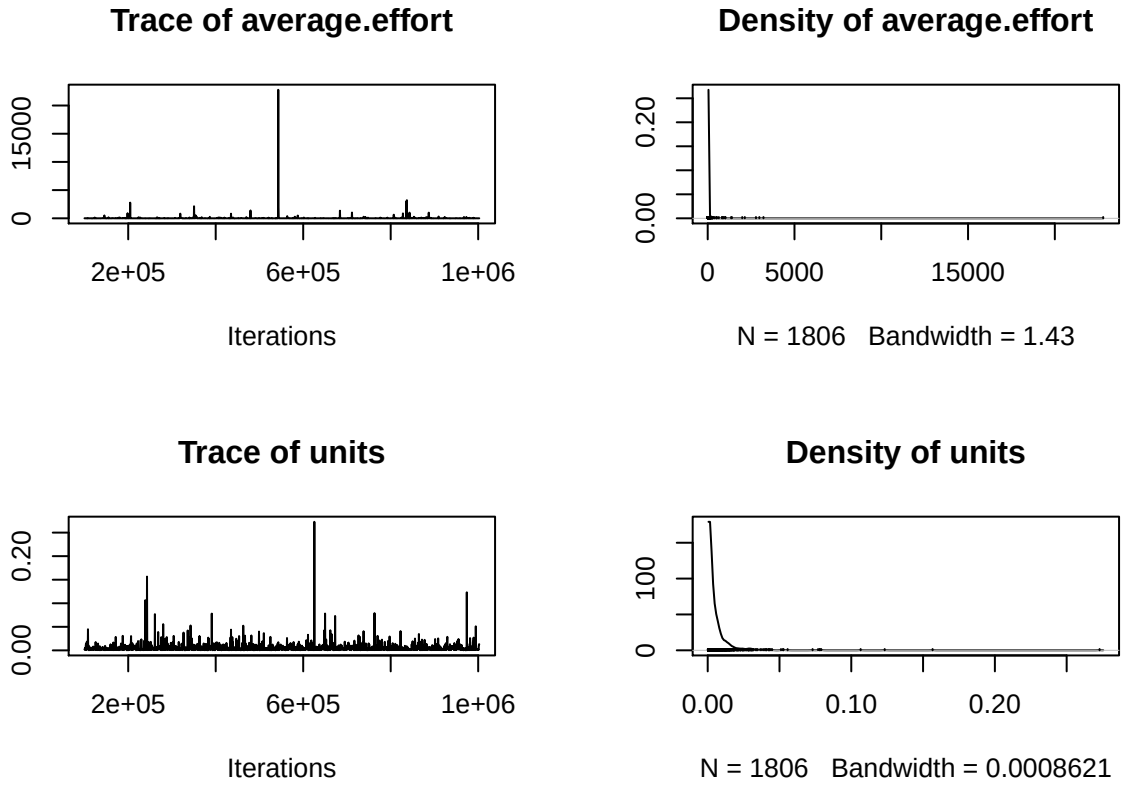

Density of daynightnight
0.0
0.5
1.0
1.5
N = 1806 Bandwidth = 0.03294


Trace of Location2Stewart Creek
−200
2e+05
4e+05
6e+05
8e+05
1e+06
Iterations


Density of Location2Stewart Creek
0.00
−200
−100
0
100
N = 1806 Bandwidth = 0.4435


Trace of daynight.human
−0.5
2e+05
4e+05
6e+05
8e+05
1e+06
Iterations


Density of daynight.human
0.0
−0.5
0.0
0.5
1.0
1.5
2.0
2.5
N = 1806 Bandwidth = 0.07123



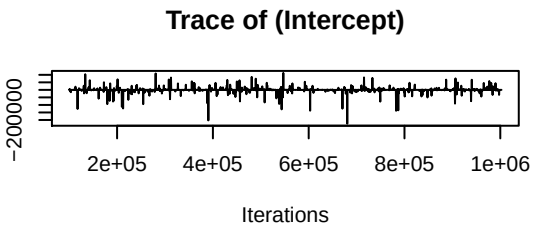
Small seasonal ungulates ## Underpass

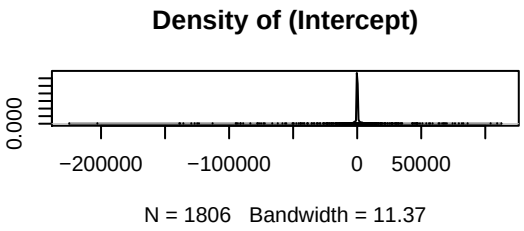
```
## Warning in MCMCglmm(Total ~ Season + Location2 + seasonal.traffic +
## seasonal.human, : some fixed effects are not estimable and have been removed.
## Use singular.ok=TRUE to sample these effects, but use an informative prior!

## Warning in MCMCglmm(Total ~ Season + Location2 + seasonal.traffic +
## seasonal.human, : some fixed effects are not estimable and have been removed.
## Use singular.ok=TRUE to sample these effects, but use an informative prior!
```

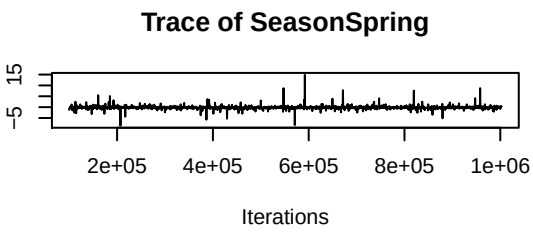
model summary and plots of IG prior and expanded prior respectively

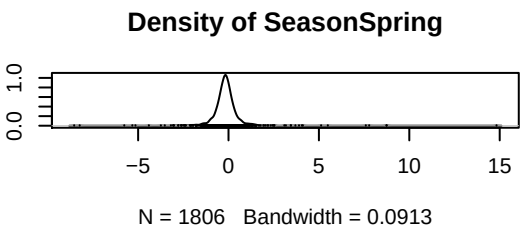
```
##
##  Iterations = 100001:1002501
##  Thinning interval  = 500
##  Sample size  = 1806
##
##  DIC: 90.35983
##
##  G-structure:  ~average.effort
##
##                post.mean l-95% CI  u-95% CI eff.samp
## average.effort  1.68e+09 0.000306 2.374e+09     1806
##
##  R-structure:  ~units
##
```

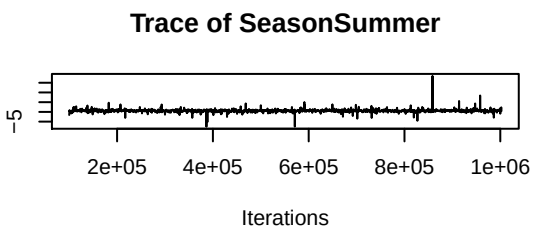
```
##       post.mean l-95% CI u-95% CI eff.samp
## units     1.114   0.0123    1.894     1806
##
##  Location effects: Total ~ Season + Location2 + seasonal.traffic + seasonal.human
##
##                       post.mean   l-95% CI   u-95% CI eff.samp  pMCMC
## (Intercept)          -5.489e+02 -2.653e+04  3.218e+04     1806 0.5714
## SeasonSpring         -1.508e-01 -1.403e+00  1.336e+00     1806 0.6368
## SeasonSummer          5.950e-01 -7.609e-01  1.855e+00     1806 0.2115
## SeasonWinter         -1.878e+00 -3.362e+00 -3.688e-01     1806 0.0343 *
## Location2Wind Valley -2.185e+02 -4.079e+04  3.151e+04     1806 0.9546
## seasonal.human       -2.516e+00 -8.767e+00  3.802e+00     1806 0.2237
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

##
##  Iterations = 100001:1002501
##  Thinning interval  = 500
##  Sample size  = 1806
##
##  DIC: 90.38753
##
##  G-structure:  ~average.effort
##
##                post.mean l-95% CI  u-95% CI eff.samp
## average.effort 1.924e+09 0.006413 4.372e+09     1806
##
##  R-structure:  ~units
##
##       post.mean l-95% CI u-95% CI eff.samp
## units    0.7319  0.01074     1.98     1291
##
##  Location effects: Total ~ Season + Location2 + seasonal.traffic + seasonal.human
##
##                       post.mean   l-95% CI   u-95% CI eff.samp  pMCMC
## (Intercept)           5.502e+02 -3.037e+04  3.287e+04     1806 0.7519
## SeasonSpring         -1.847e-01 -1.610e+00  1.034e+00     2121 0.6002
## SeasonSummer          5.756e-01 -6.485e-01  1.868e+00     1566 0.2027
## SeasonWinter         -1.918e+00 -3.155e+00 -4.603e-01     1479 0.0221 *
## Location2Wind Valley  5.673e+02 -4.316e+04  4.797e+04     1806 0.9856
## seasonal.human       -2.563e+00 -8.155e+00  3.707e+00     2116 0.2115
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

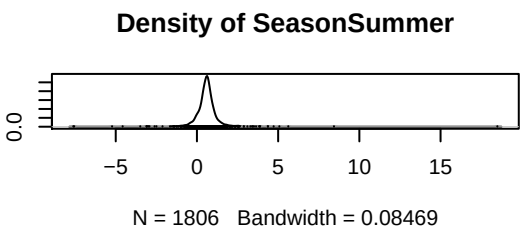

Trace of (Intercept)
−200000
2e+05
4e+05
6e+05
8e+05
1e+06
Iterations

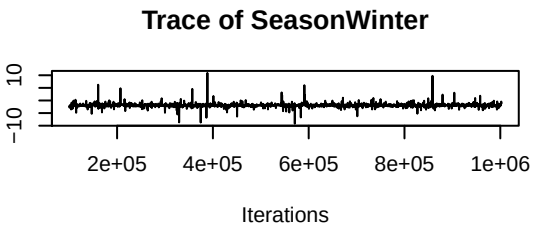

Density of (Intercept)
0.000
−200000
−100000
0
50000
N = 1806 Bandwidth = 11.37

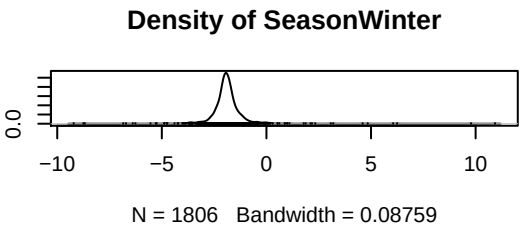

Trace of SeasonSpring
−5
15
2e+05
4e+05
6e+05
8e+05
1e+06
Iterations

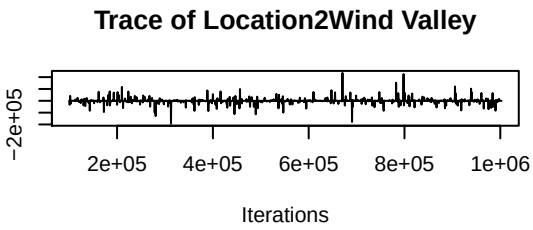

Density of SeasonSpring
0.0
1.0
−5
0
5
10
15
N = 1806 Bandwidth = 0.0913

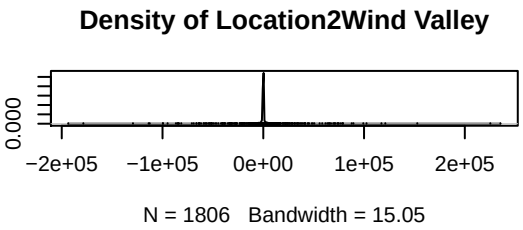

Trace of SeasonSummer
−5
2e+05
4e+05
6e+05
8e+05
1e+06
Iterations

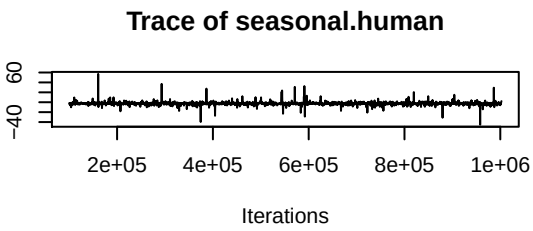

Density of SeasonSummer
0.0
−5
0
5
10
15
N = 1806 Bandwidth = 0.08469

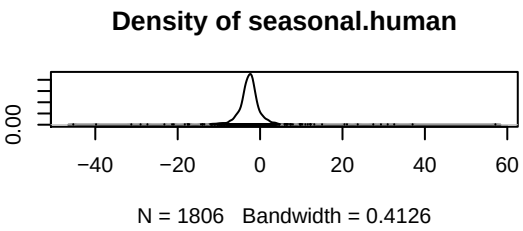

Trace of SeasonWinter
−10
10
2e+05
4e+05
6e+05
8e+05
1e+06
Iterations

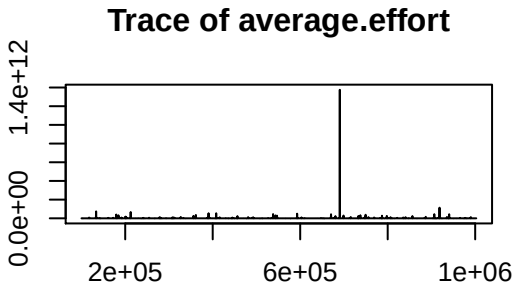

Density of SeasonWinter
0.0
−10
−5
0
5
10
N = 1806 Bandwidth = 0.08759

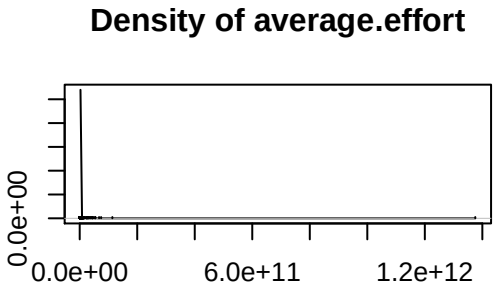

Trace of Location2Wind Valley
−2e+05
2e+05
4e+05
6e+05
8e+05
1e+06
Iterations

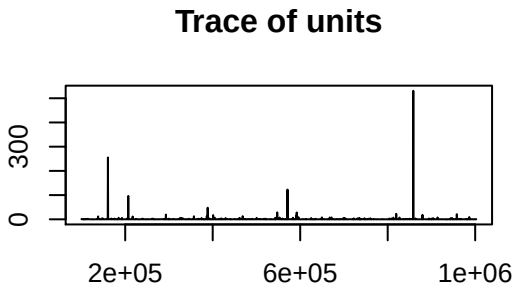

Density of Location2Wind Valley
0.000
−2e+05
−1e+05
0e+00
1e+05
2e+05
N = 1806 Bandwidth = 15.05

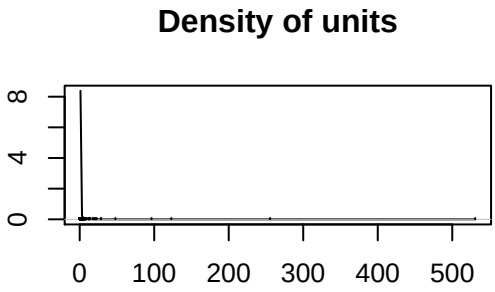

Trace of seasonal.human
−40
60
2e+05
4e+05
6e+05
8e+05
1e+06
Iterations

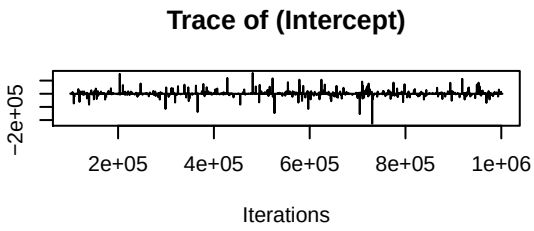

Density of seasonal.human
0.00
−40
−20
0
20
40
60
N = 1806 Bandwidth = 0.4126

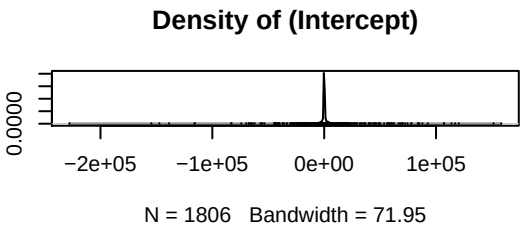

Trace of average.effort
0.0e+00
1.4e+12
2e+05
6e+05
1e+06
Iterations

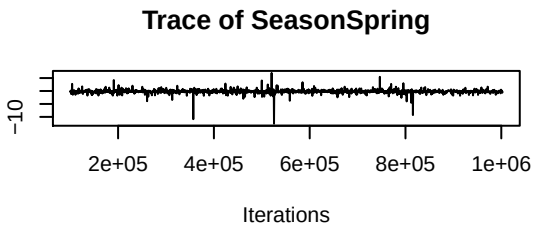

Density of average.effort
0.0e+00
0.0e+00
6.0e+11
1.2e+12
N = 1806 Bandwidth = 1.424e+06

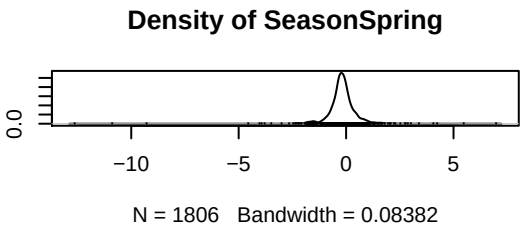

Trace of units
0
300
2e+05
6e+05
1e+06
Iterations

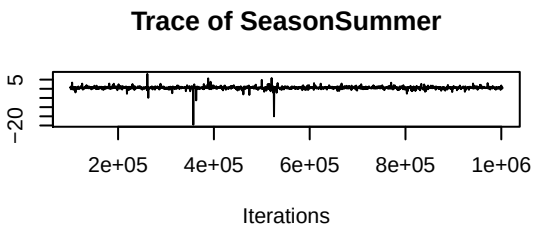

Density of units
0
4
8
0
100
200
300
400
500
N = 1806 Bandwidth = 0.04514

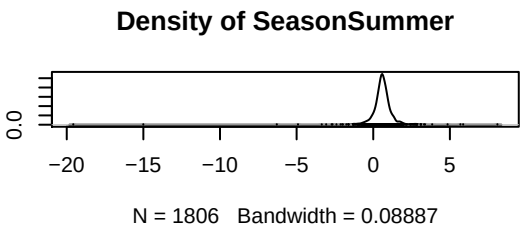

Trace of (Intercept)
−2e+05
2e+05
4e+05
6e+05
8e+05
1e+06
Iterations

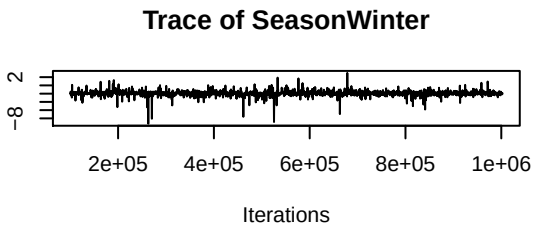

Density of (Intercept)
0.0000
−2e+05
−1e+05
0e+00
1e+05
N = 1806 Bandwidth = 71.95

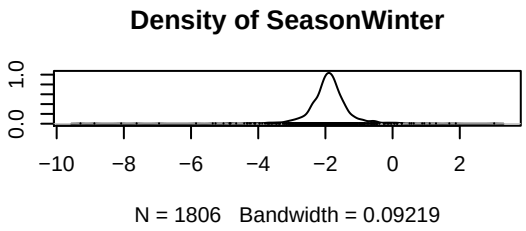

Trace of SeasonSpring
−10
2e+05
4e+05
6e+05
8e+05
1e+06
Iterations

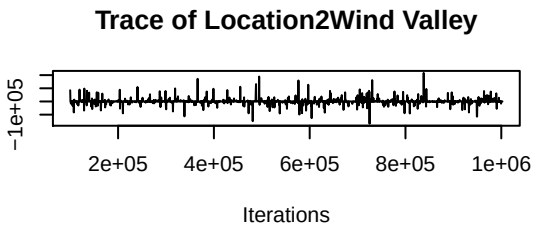

Density of SeasonSpring
0.0
−10
−5
0
5
N = 1806 Bandwidth = 0.08382

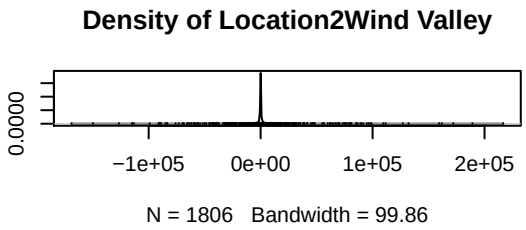

Trace of SeasonSummer
−20
5
2e+05
4e+05
6e+05
8e+05
1e+06
Iterations

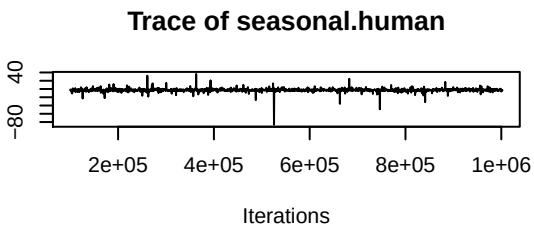

Density of SeasonSummer
0.0
−20
−15
−10
−5
0
5
N = 1806 Bandwidth = 0.08887

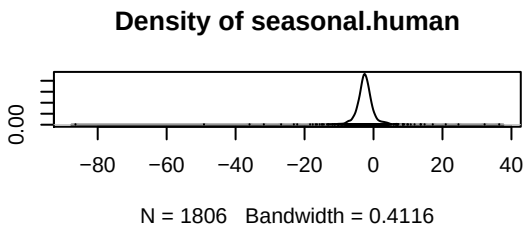

Trace of SeasonWinter
−8
2
2e+05
4e+05
6e+05
8e+05
1e+06
Iterations

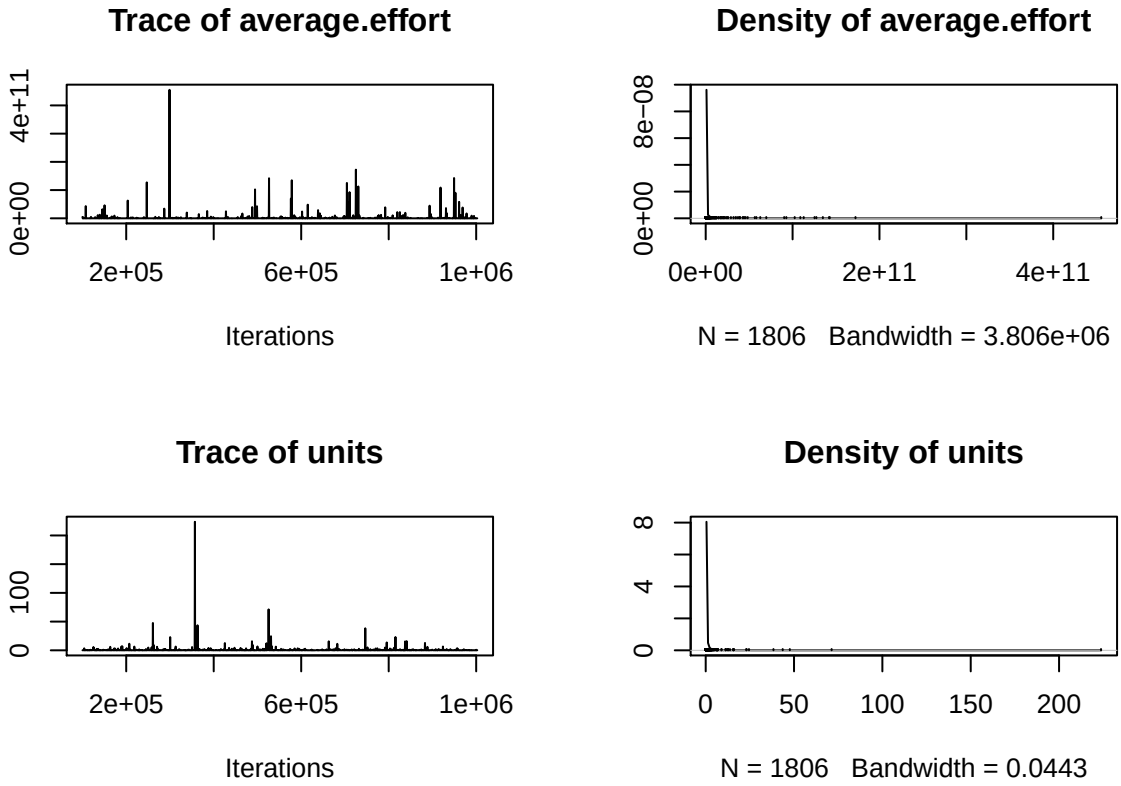

Density of SeasonWinter
0.0
1.0
−10
−8
−6
−4
−2
0
2
N = 1806 Bandwidth = 0.09219


Trace of Location2Wind Valley
−1e+05
2e+05
4e+05
6e+05
8e+05
1e+06
Iterations


Density of Location2Wind Valley
0.0000
−1e+05
0e+00
1e+05
2e+05
N = 1806 Bandwidth = 99.86


Trace of seasonal.human
−80
40
2e+05
4e+05
6e+05
8e+05
1e+06
Iterations


Density of seasonal.human
0.00
−80
−60
−40
−20
0
20
40
N = 1806 Bandwidth = 0.4116



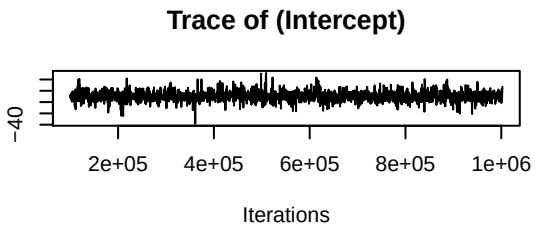
Jumpouts

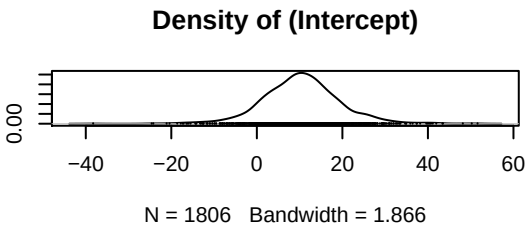
```
## Warning in MCMCglmm(Total ~ Season + Location2 + seasonal.traffic +
## seasonal.human, : some fixed effects are not estimable and have been removed.
## Use singular.ok=TRUE to sample these effects, but use an informative prior!

## Warning in MCMCglmm(Total ~ Season + Location2 + seasonal.traffic +
## seasonal.human, : some fixed effects are not estimable and have been removed.
## Use singular.ok=TRUE to sample these effects, but use an informative prior!
```

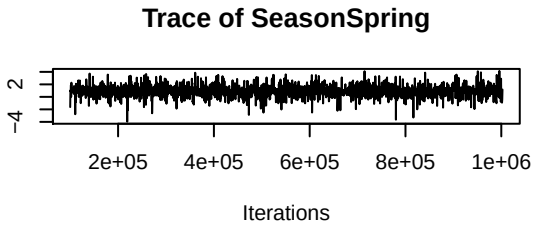
model summary and plots of IG prior and expanded prior respectively

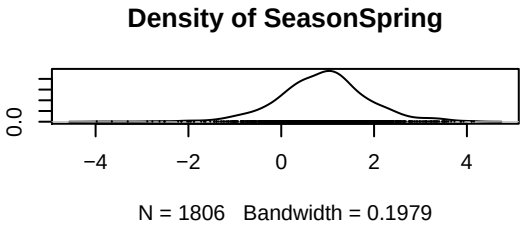
```
##
##  Iterations = 100001:1002501
##  Thinning interval  = 500
##  Sample size  = 1806
##
##  DIC: 134.5927
##
##  G-structure:  ~average.effort
##
##                post.mean  l-95% CI u-95% CI eff.samp
## average.effort     10.13 0.0002765    25.54     1806
##
##  R-structure:  ~units
##
```

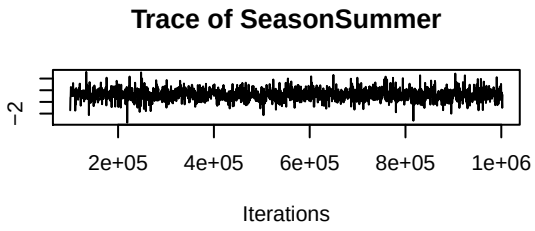
```
##       post.mean l-95% CI u-95% CI eff.samp
## units     1.853   0.2525    4.602     1806
##
##  Location effects: Total ~ Season + Location2 + seasonal.traffic + seasonal.human
##
##                         post.mean l-95% CI u-95% CI eff.samp pMCMC
## (Intercept)               10.4659  -8.0681  28.1753     1806 0.189
## SeasonSpring               0.9028  -1.1718   2.8190     1934 0.299
## SeasonSummer               1.2058  -0.5951   3.2806     2014 0.177
## SeasonWinter              -0.9470  -3.4657   1.2531     1806 0.368
## Location2Stewart Creek     0.9204  -5.2631   7.5937     1806 0.685
## seasonal.human            -3.6598 -14.9119   7.2766     1806 0.455

##
##  Iterations = 100001:1002501
##  Thinning interval  = 500
##  Sample size  = 1806
##
##  DIC: 134.5926
##
##  G-structure:  ~average.effort
##
##                post.mean  l-95% CI u-95% CI eff.samp
## average.effort     71.44 0.0003618    74.07     1806
##
##  R-structure:  ~units
##
##       post.mean l-95% CI u-95% CI eff.samp
## units     1.664   0.3215    4.185     1806
##
##  Location effects: Total ~ Season + Location2 + seasonal.traffic + seasonal.human
##
##                         post.mean l-95% CI u-95% CI eff.samp pMCMC
## (Intercept)               10.4540  -7.9701  26.2928     1932 0.185
## SeasonSpring               0.9143  -0.8787   2.9973     1806 0.278
## SeasonSummer               1.2242  -0.4978   3.2756     1806 0.158
## SeasonWinter              -0.9632  -3.2857   1.0756     1806 0.321
## Location2Stewart Creek     0.8906  -9.2221  10.6326     1806 0.759
## seasonal.human            -3.6755 -13.1553   6.7464     1806 0.435
```

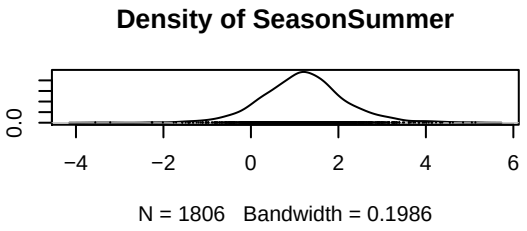

Trace of (Intercept)
−40
2e+05
4e+05
6e+05
8e+05
1e+06
Iterations

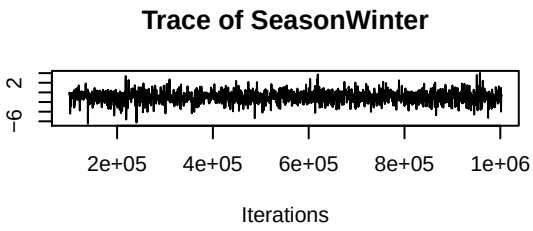

Density of (Intercept)
0.00
−40
−20
0
20
40
60
N = 1806 Bandwidth = 1.866

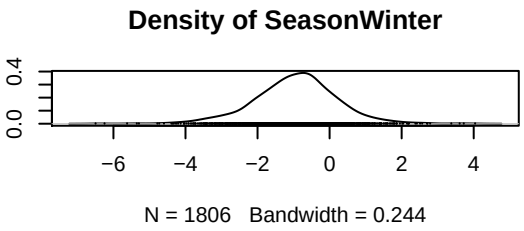

Trace of SeasonSpring
−4
2
2e+05
4e+05
6e+05
8e+05
1e+06
Iterations

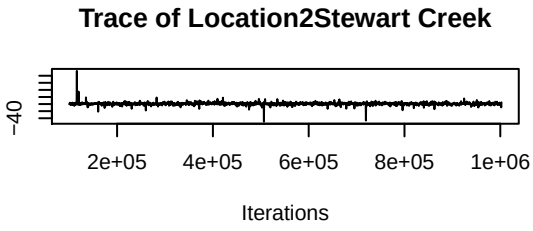

Density of SeasonSpring
0.0
−4
−2
0
2
4
N = 1806 Bandwidth = 0.1979

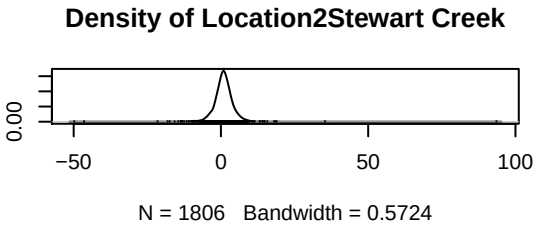

Trace of SeasonSummer
−2
2e+05
4e+05
6e+05
8e+05
1e+06
Iterations

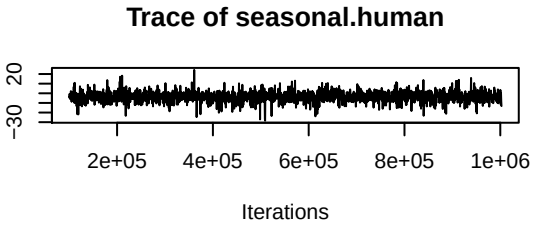

Density of SeasonSummer
0.0
−4
−2
0
2
4
6
N = 1806 Bandwidth = 0.1986

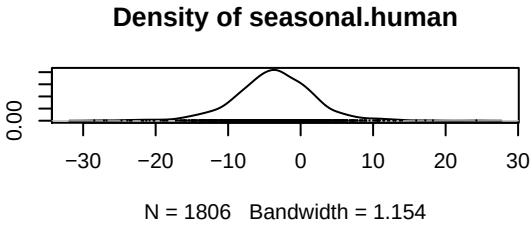

Trace of SeasonWinter
−6
2
2e+05
4e+05
6e+05
8e+05
1e+06
Iterations

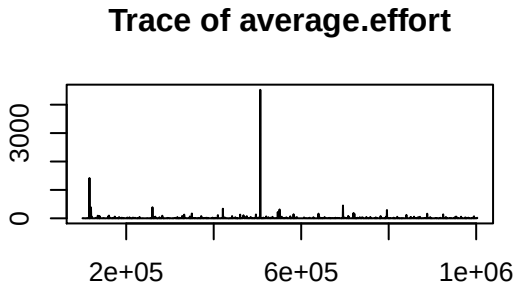

Density of SeasonWinter
0.0
0.4
−6
−4
−2
0
2
4
N = 1806 Bandwidth = 0.244

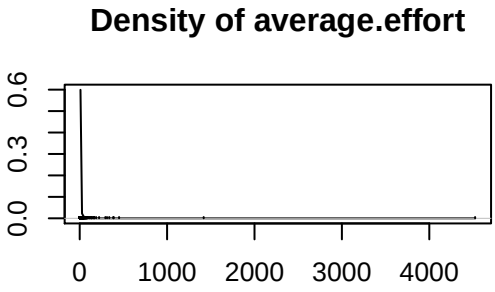

Trace of Location2Stewart Creek
−40
2e+05
4e+05
6e+05
8e+05
1e+06
Iterations

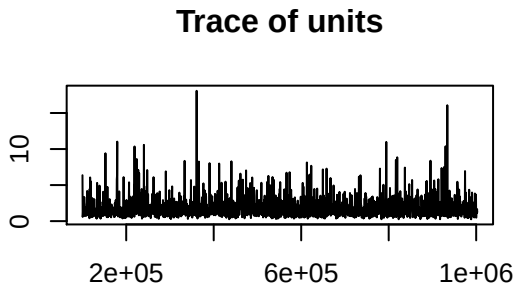

Density of Location2Stewart Creek
0.00
−50
0
50
100
N = 1806 Bandwidth = 0.5724

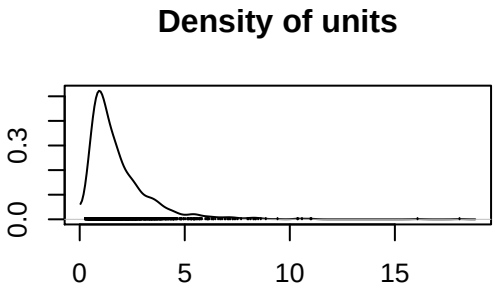

Trace of seasonal.human
−30
20
2e+05
4e+05
6e+05
8e+05
1e+06
Iterations

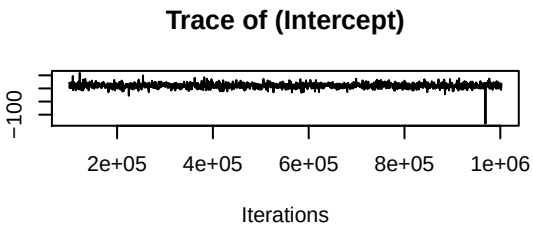

Density of seasonal.human
0.00
−30
−20
−10
0
10
20
30
N = 1806 Bandwidth = 1.154

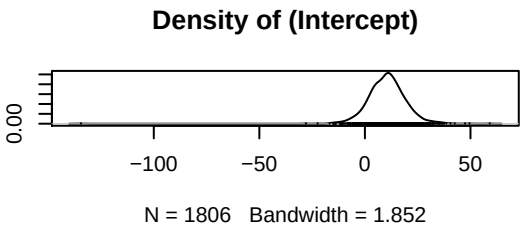

Trace of average.effort
0
3000
2e+05
6e+05
1e+06
Iterations

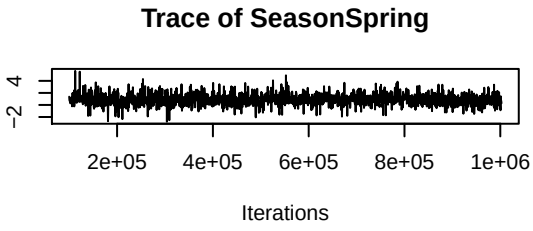

Density of average.effort
0.0
0.3
0.6
0
1000
2000
3000
4000
N = 1806 Bandwidth = 0.6166

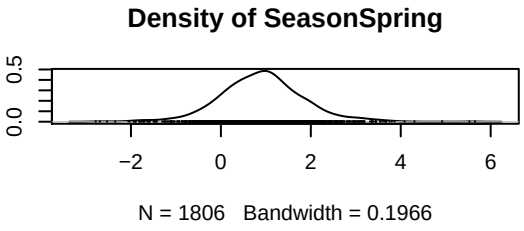

Trace of units
0
10
2e+05
6e+05
1e+06
Iterations

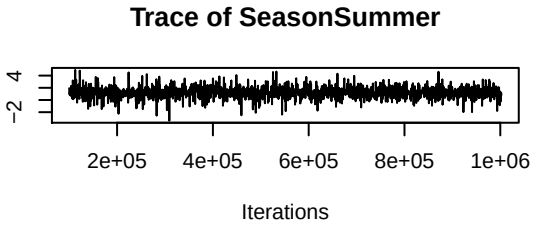

Density of units
0.0
0.3
0
5
10
15
N = 1806 Bandwidth = 0.2498

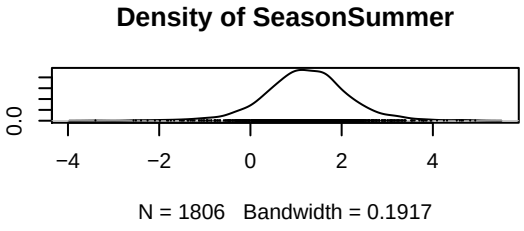

Trace of (Intercept)
−100
2e+05
4e+05
6e+05
8e+05
1e+06
Iterations

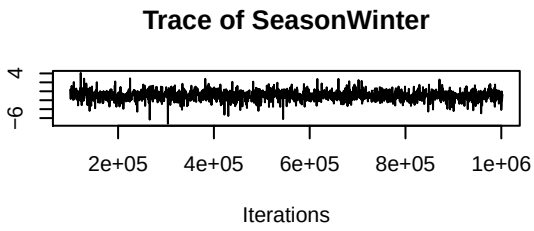

Density of (Intercept)
0.00
−100
−50
0
50
N = 1806 Bandwidth = 1.852

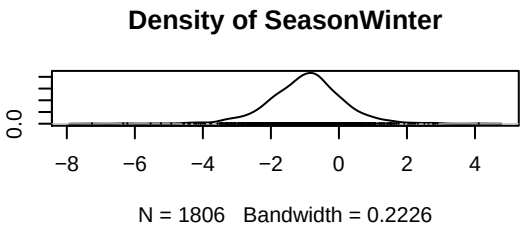

Trace of SeasonSpring
−2 4
2e+05
4e+05
6e+05
8e+05
1e+06
Iterations

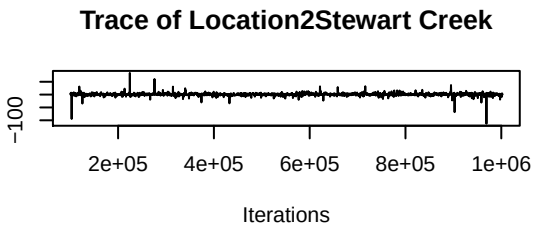

Density of SeasonSpring
0.0 0.5
−2
0
2
4
6
N = 1806 Bandwidth = 0.1966

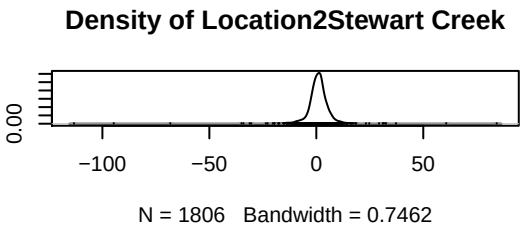

Trace of SeasonSummer
−2 4
2e+05
4e+05
6e+05
8e+05
1e+06
Iterations

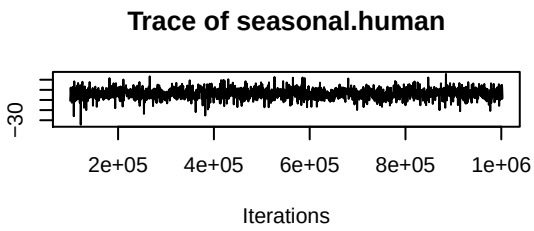

Density of SeasonSummer
0.0
−4
−2
0
2
4
N = 1806 Bandwidth = 0.1917

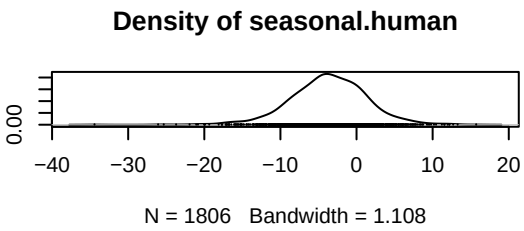

Trace of SeasonWinter
−6
4
2e+05
4e+05
6e+05
8e+05
1e+06
Iterations

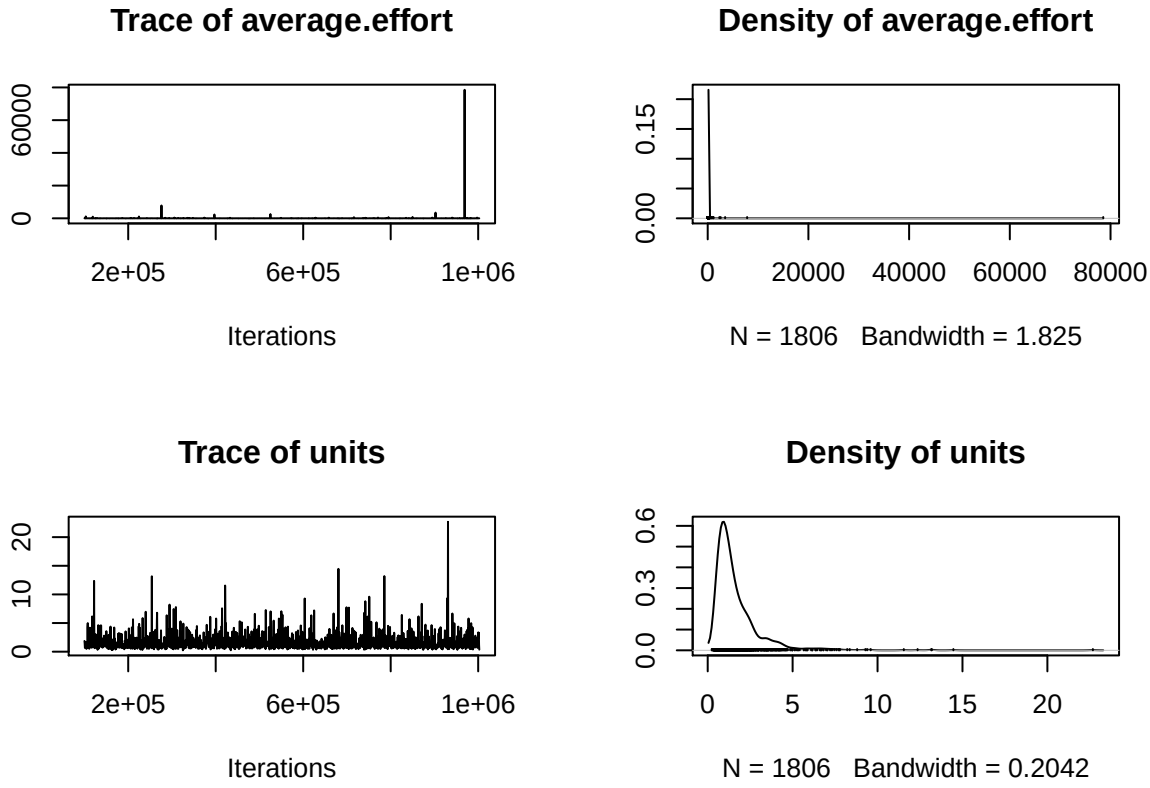

Density of SeasonWinter
0.0
−8
−6
−4
−2
0
2
4
N = 1806 Bandwidth = 0.2226


Trace of Location2Stewart Creek
−100
2e+05
4e+05
6e+05
8e+05
1e+06
Iterations


Density of Location2Stewart Creek
0.00
−100
−50
0
50
N = 1806 Bandwidth = 0.7462


Trace of seasonal.human
−30
2e+05
4e+05
6e+05
8e+05
1e+06
Iterations


Density of seasonal.human
0.00
−40
−30
−20
−10
0
10
20
N = 1806 Bandwidth = 1.108

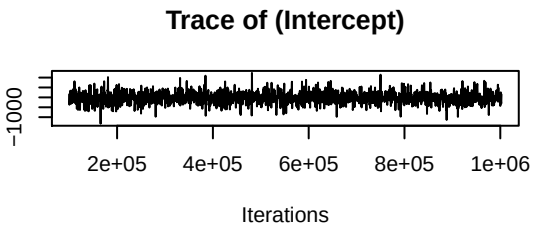


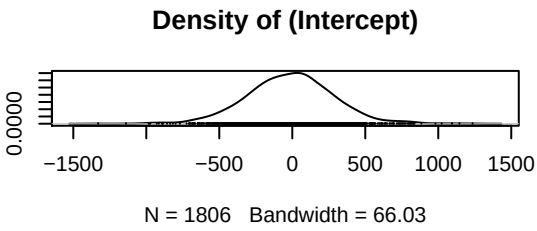
Small annual ungulates ## Underpass

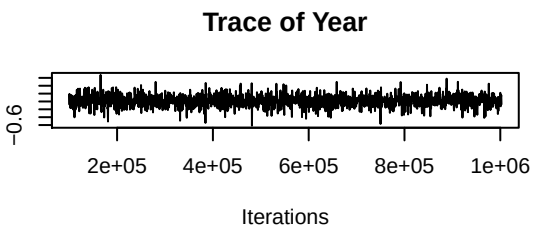
model summary and plots of IG prior and expanded prior respectively

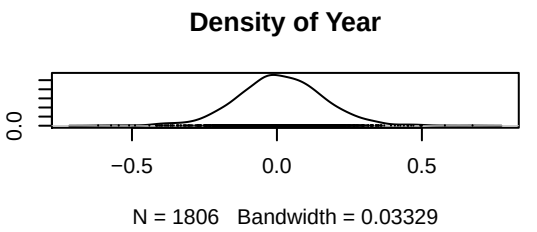
```
##
##  Iterations = 100001:1002501
##  Thinning interval  = 500
##  Sample size  = 1806
##
##  DIC: 241.1658
##
##  G-structure:  ~annual.effort
##
##               post.mean  l-95% CI u-95% CI eff.samp
## annual.effort     0.273 0.0002794   0.6875     1982
##
##  R-structure:  ~units
##
##       post.mean l-95% CI u-95% CI eff.samp
## units    0.1286   0.0278   0.3036     1806
##
##  Location effects: Total ~ Year + Location2 + annual.traffic + annual.human
##
##                       post.mean   l-95% CI   u-95% CI eff.samp pMCMC
## (Intercept)          -1.335e+01 -5.995e+02  5.696e+02     1806 0.980
## Year                  1.184e-02 -2.820e-01  3.060e-01     1806 0.944
```

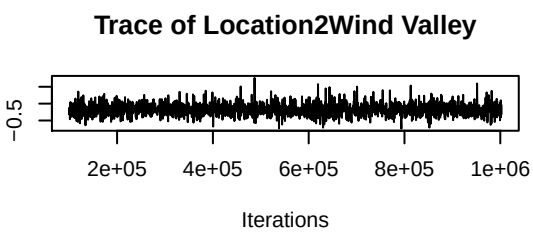
```
## Location2Wind Valley -1.707e-01 -5.183e-01  1.939e-01     2114 0.309
## annual.traffic       -4.859e-03 -1.429e-02  5.454e-03     1806 0.291
## annual.human          3.940e-02 -4.623e-01  6.196e-01     1806 0.907

##
##  Iterations = 100001:1002501
##  Thinning interval  = 500
##  Sample size  = 1806
##
##  DIC: 241.1434
##
##  G-structure:  ~annual.effort
##
##               post.mean  l-95% CI u-95% CI eff.samp
## annual.effort      0.37 0.0001549    0.926     1806
##
##  R-structure:  ~units
##
##       post.mean l-95% CI u-95% CI eff.samp
## units    0.1134  0.02771   0.2414     1806
##
##  Location effects: Total ~ Year + Location2 + annual.traffic + annual.human
##
##                       post.mean   l-95% CI   u-95% CI eff.samp pMCMC
## (Intercept)          -1.170e+01 -5.840e+02  5.636e+02     1806 0.987
## Year                  1.120e-02 -2.770e-01  3.010e-01     1806 0.957
## Location2Wind Valley -1.953e-01 -5.308e-01  1.583e-01     1806 0.238
## annual.traffic       -5.293e-03 -1.451e-02  3.937e-03     1806 0.270
## annual.human          2.704e-02 -4.934e-01  5.713e-01     1806 0.922
```

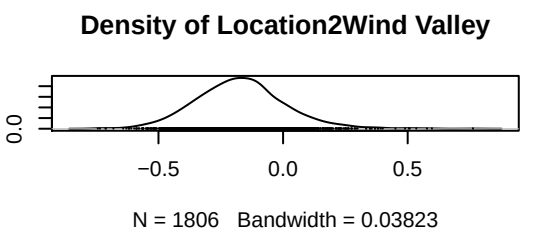

Trace of (Intercept)
−1000
2e+05
4e+05
6e+05
8e+05
1e+06
Iterations

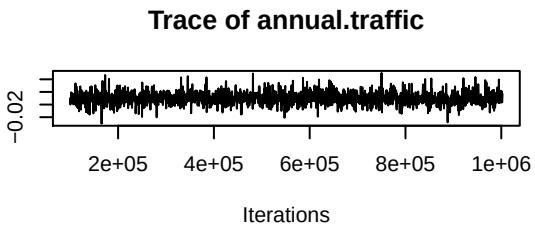

Density of (Intercept)
0.0000
−1500
−500
0
500
1000
1500
N = 1806 Bandwidth = 66.03

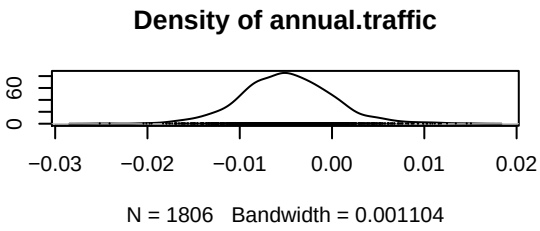

Trace of Year
−0.6
2e+05
4e+05
6e+05
8e+05
1e+06
Iterations

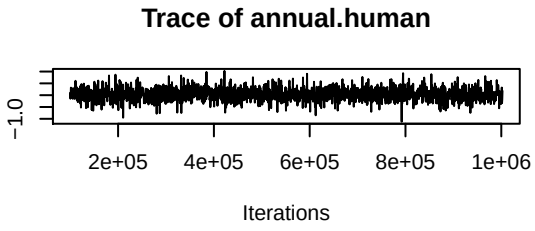

Density of Year
0.0
−0.5
0.0
0.5
N = 1806 Bandwidth = 0.03329

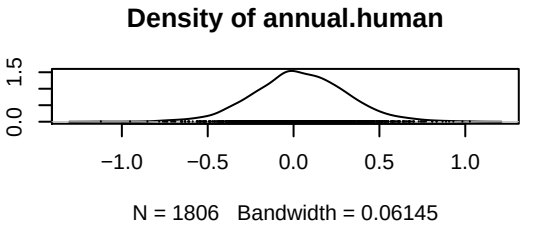

Trace of Location2Wind Valley
−0.5
2e+05
4e+05
6e+05
8e+05
1e+06
Iterations

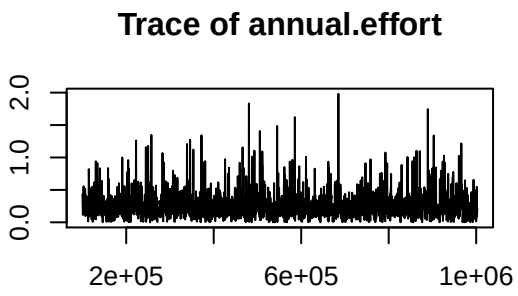

Density of Location2Wind Valley
0.0
−0.5
0.0
0.5
N = 1806 Bandwidth = 0.03823

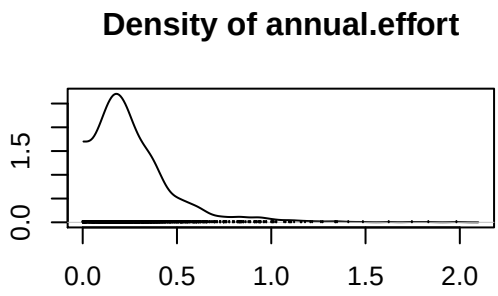

Trace of annual.traffic
−0.02
2e+05
4e+05
6e+05
8e+05
1e+06
Iterations

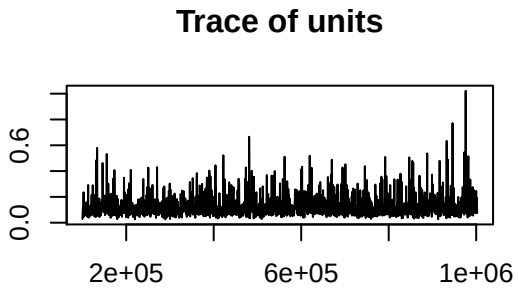

Density of annual.traffic
0
60
−0.03
−0.02
−0.01
0.00
0.01
0.02
N = 1806 Bandwidth = 0.001104

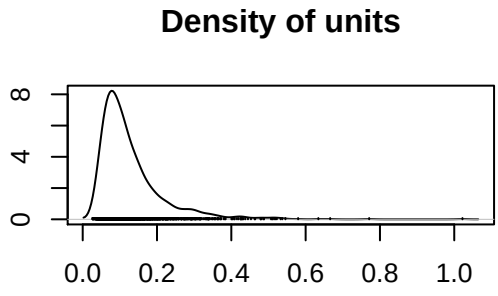

Trace of annual.human
−1.0
2e+05
4e+05
6e+05
8e+05
1e+06
Iterations

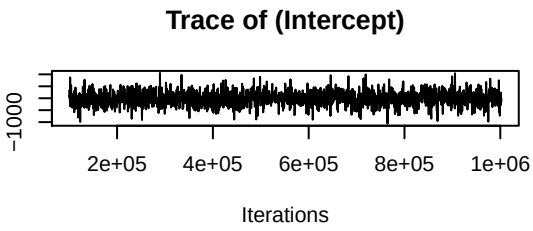

Density of annual.human
0.0
1.5
−1.0
−0.5
0.0
0.5
1.0
N = 1806 Bandwidth = 0.06145

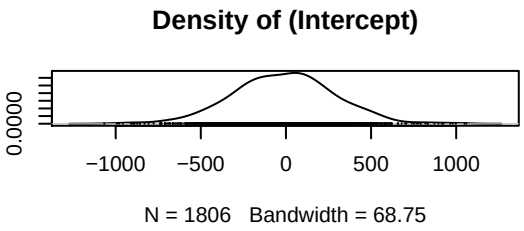

Trace of annual.effort
0.0
1.0
2.0
2e+05
6e+05
1e+06
Iterations

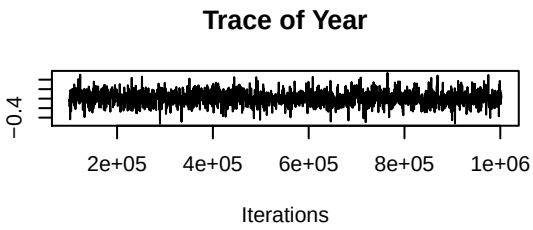

Density of annual.effort
0.0
1.5
0.0
0.5
1.0
1.5
2.0
N = 1806 Bandwidth = 0.03865

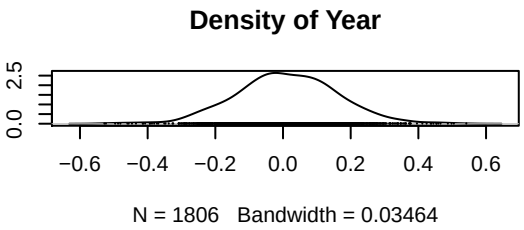

Trace of units
0.0
0.6
2e+05
6e+05
1e+06
Iterations

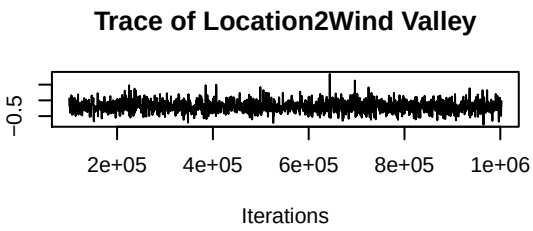

Density of units
0
4
8
0.0
0.2
0.4
0.6
0.8
1.0
N = 1806 Bandwidth = 0.01418

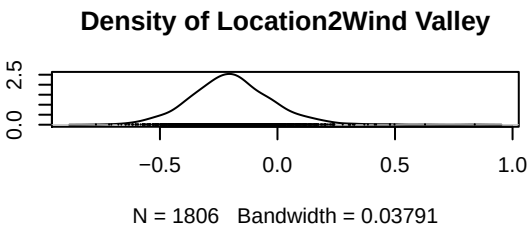

Trace of (Intercept)
−1000
2e+05
4e+05
6e+05
8e+05
1e+06
Iterations

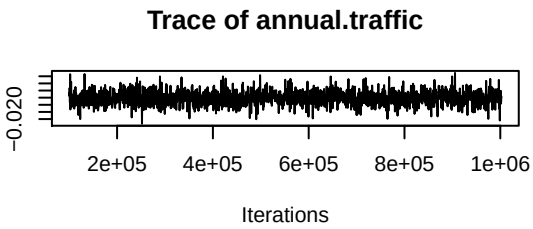

Density of (Intercept)
0.0000
−1000
−500
0
500
1000
N = 1806 Bandwidth = 68.75

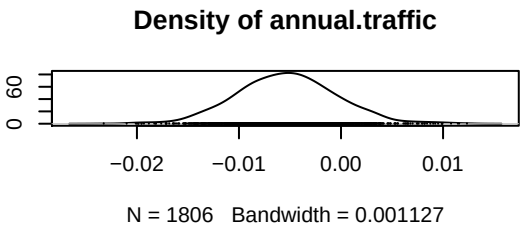

Trace of Year
−0.4
2e+05
4e+05
6e+05
8e+05
1e+06
Iterations

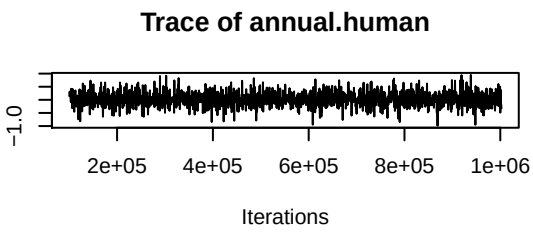

Density of Year
0.0
2.5
−0.6
−0.4
−0.2
0.0
0.2
0.4
0.6
N = 1806 Bandwidth = 0.03464

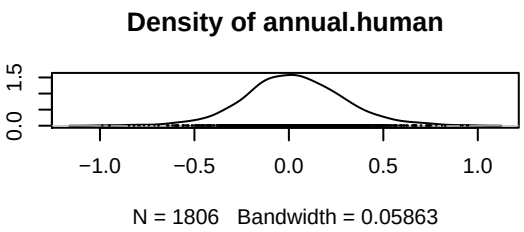

Trace of Location2Wind Valley
−0.5
2e+05
4e+05
6e+05
8e+05
1e+06
Iterations

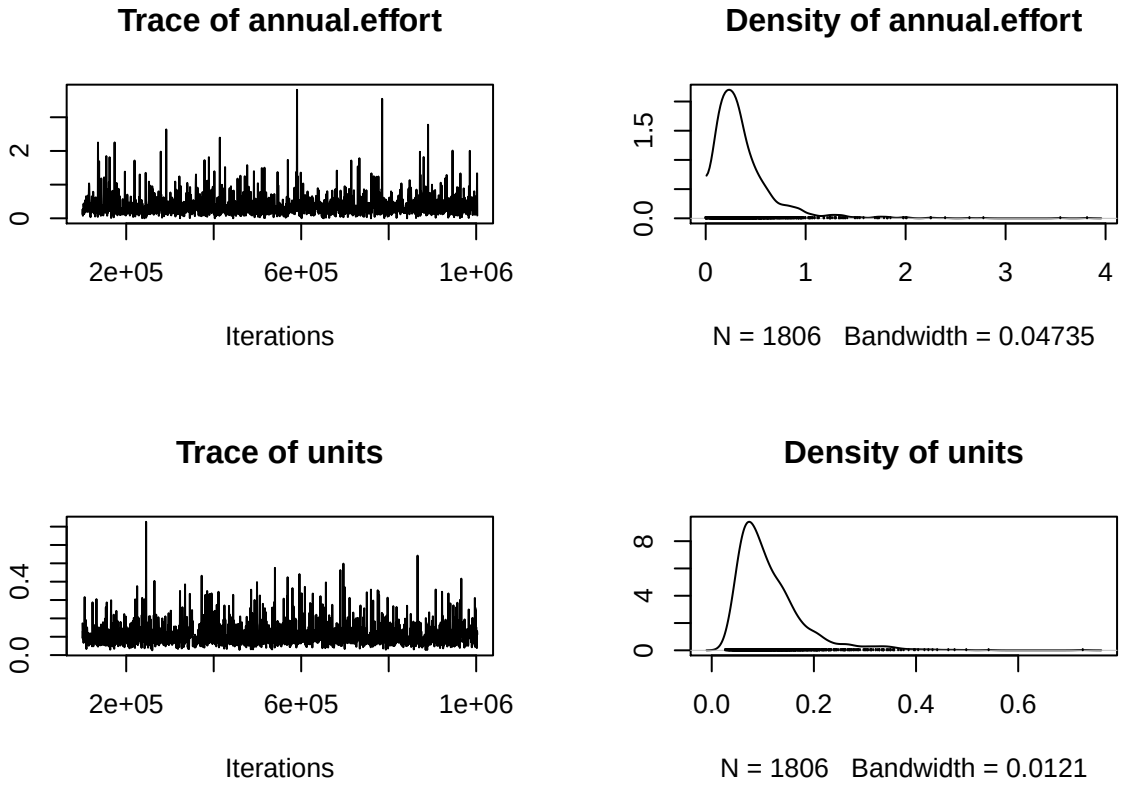

Density of Location2Wind Valley
0.0
2.5
−0.5
0.0
0.5
1.0
N = 1806 Bandwidth = 0.03791


Trace of annual.traffic
−0.020
2e+05
4e+05
6e+05
8e+05
1e+06
Iterations


Density of annual.traffic
0 60
−0.02
−0.01
0.00
0.01
N = 1806 Bandwidth = 0.001127


Trace of annual.human
−1.0
2e+05
4e+05
6e+05
8e+05
1e+06
Iterations


Density of annual.human
0.0 1.5
−1.0
−0.5
0.0
0.5
1.0
N = 1806 Bandwidth = 0.05863

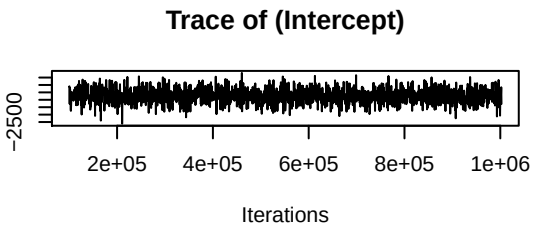


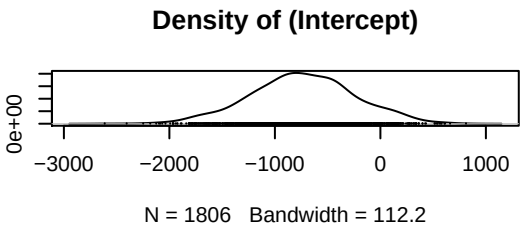
Jumpouts

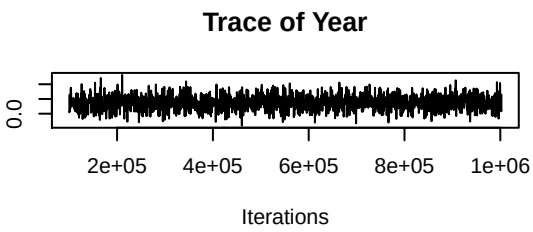
model summary and plots of IG prior and expanded prior respectively

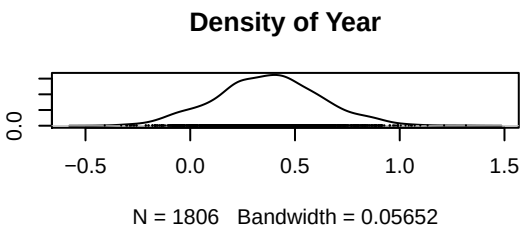
```
##
##  Iterations = 100001:1002501
##  Thinning interval  = 500
##  Sample size  = 1806
##
##  DIC: 322.793
##
##  G-structure:  ~annual.effort
##
##               post.mean  l-95% CI u-95% CI eff.samp
## annual.effort    0.2591 0.0002906   0.8314     1806
##
##  R-structure:  ~units
##
##       post.mean l-95% CI u-95% CI eff.samp
## units    0.8592   0.4042    1.364     1806
##
##  Location effects: Total ~ Year + Location2 + annual.traffic + annual.human
##
##                          post.mean   l-95% CI   u-95% CI eff.samp pMCMC
## (Intercept)            -7.369e+02 -1.763e+03  1.718e+02     1806 0.144
## Year                    3.728e-01 -8.430e-02  8.875e-01     1806 0.142
```

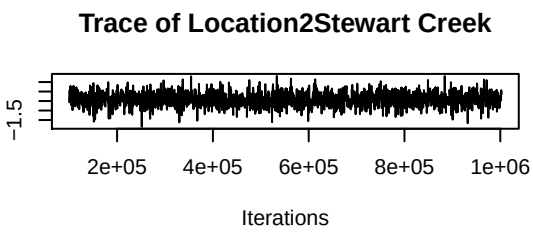
```
## Location2Stewart Creek -4.061e-01 -1.151e+00  3.015e-01     1806 0.275
## annual.traffic         -1.178e-02 -2.691e-02  3.511e-03     1806 0.141
## annual.human           -2.815e-02 -1.184e+00  1.208e+00     1806 0.978

##
##  Iterations = 100001:1002501
##  Thinning interval  = 500
##  Sample size  = 1806
##
##  DIC: 322.7527
##
##  G-structure:  ~annual.effort
##
##               post.mean  l-95% CI u-95% CI eff.samp
## annual.effort    0.4442 7.296e-08    1.188     1806
##
##  R-structure:  ~units
##
##       post.mean l-95% CI u-95% CI eff.samp
## units    0.8223   0.4148    1.312     1557
##
##  Location effects: Total ~ Year + Location2 + annual.traffic + annual.human
##
##                          post.mean   l-95% CI   u-95% CI eff.samp pMCMC
## (Intercept)            -7.237e+02 -1.783e+03  2.729e+02     1806 0.163
## Year                    3.662e-01 -1.330e-01  9.009e-01     1806 0.158
## Location2Stewart Creek -3.538e-01 -1.071e+00  4.305e-01     1806 0.349
## annual.traffic         -1.176e-02 -2.880e-02  5.250e-03     1806 0.144
## annual.human            1.653e-03 -1.182e+00  1.267e+00     1806 0.987
```

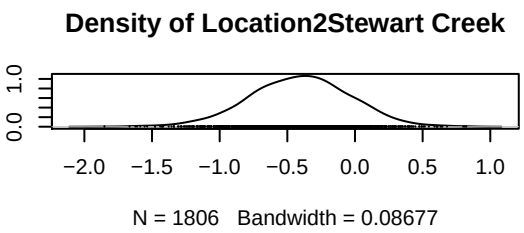

Trace of (Intercept)
−2500
2e+05
4e+05
6e+05
8e+05
1e+06
Iterations

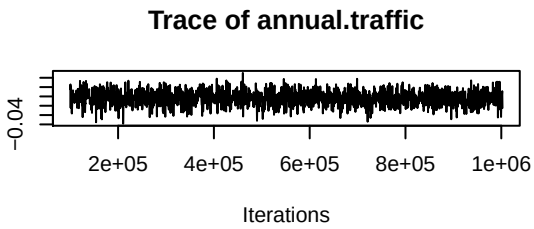

Density of (Intercept)
0e+00
−3000
−2000
−1000
0
1000
N = 1806 Bandwidth = 112.2

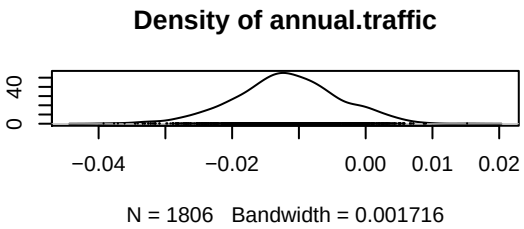

Trace of Year
0.0
2e+05
4e+05
6e+05
8e+05
1e+06
Iterations

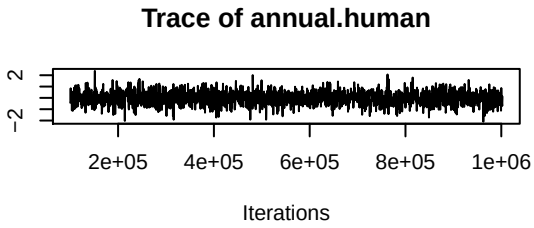

Density of Year
0.0
−0.5
0.0
0.5
1.0
1.5
N = 1806 Bandwidth = 0.05652

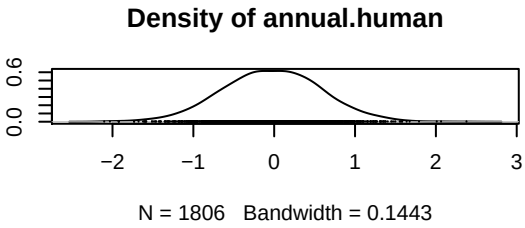

Trace of Location2Stewart Creek
−1.5
2e+05
4e+05
6e+05
8e+05
1e+06
Iterations

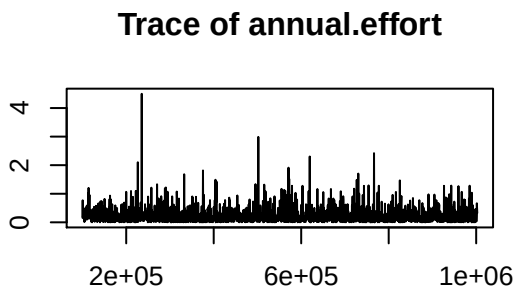

Density of Location2Stewart Creek
0.0
1.0
−2.0
−1.5
−1.0
−0.5
0.0
0.5
1.0
N = 1806 Bandwidth = 0.08677

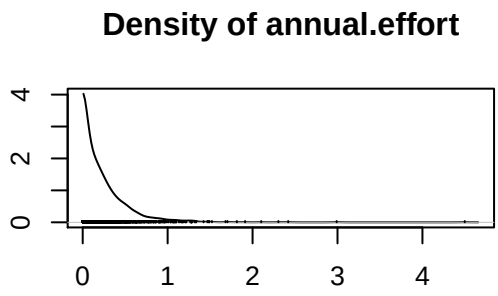

Trace of annual.traffic
−0.04
2e+05
4e+05
6e+05
8e+05
1e+06
Iterations

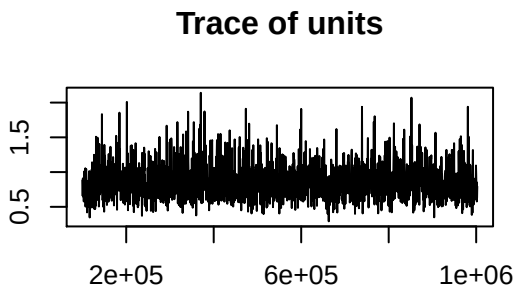

Density of annual.traffic
0
40
−0.04
−0.02
0.00
0.01
0.02
N = 1806 Bandwidth = 0.001716

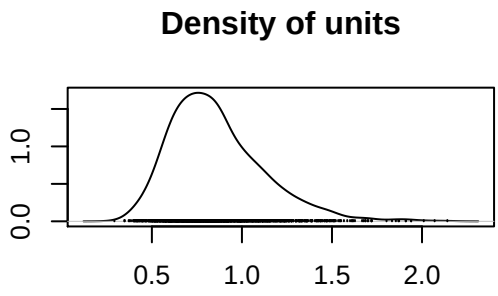

Trace of annual.human
−2
2
2e+05
4e+05
6e+05
8e+05
1e+06
Iterations

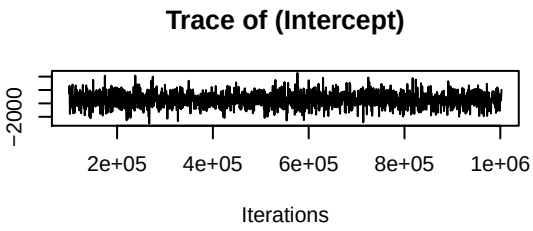

Density of annual.human
0.0
0.6
−2
−1
0
1
2
3
N = 1806 Bandwidth = 0.1443

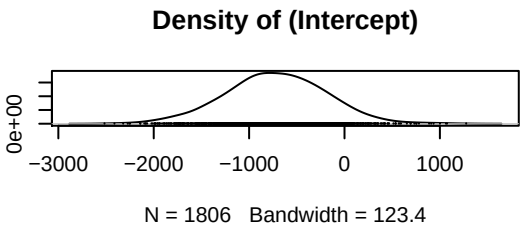

Trace of annual.effort
0
2
4
2e+05
6e+05
1e+06
Iterations

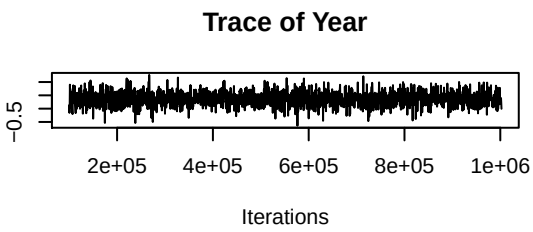

Density of annual.effort
0
2
4
0
1
2
3
4
N = 1806 Bandwidth = 0.05309

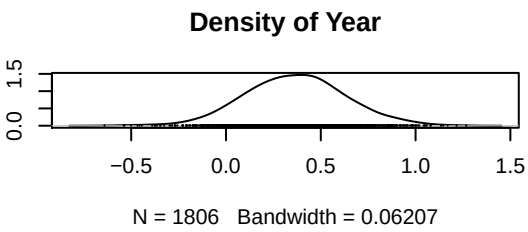

Trace of units
0.5
1.5
2e+05
6e+05
1e+06
Iterations


Density of units
0.0
1.0
0.5
1.0
1.5
2.0
N = 1806 Bandwidth = 0.05724

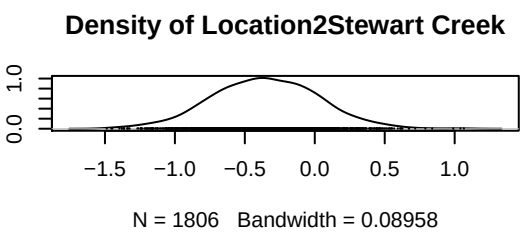

Trace of (Intercept)
−2000
2e+05
4e+05
6e+05
8e+05
1e+06
Iterations

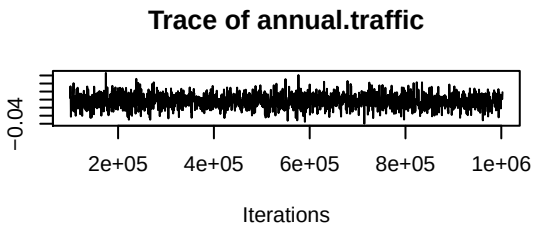

Density of (Intercept)
0e+00
−3000
−2000
−1000
0
1000
N = 1806 Bandwidth = 123.4

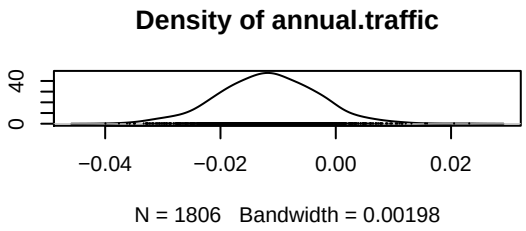

Trace of Year
−0.5
2e+05
4e+05
6e+05
8e+05
1e+06
Iterations

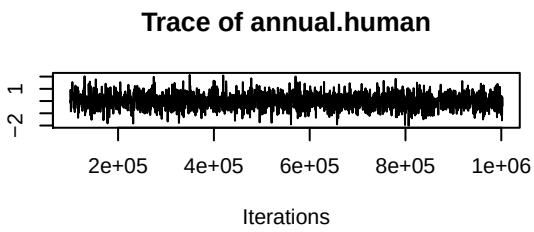

Density of Year
0.0
1.5
−0.5
0.0
0.5
1.0
1.5
N = 1806 Bandwidth = 0.06207

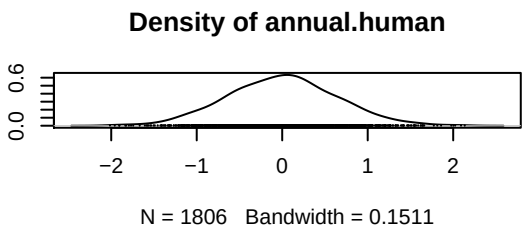

Trace of Location2Stewart Creek
−1.5
2e+05
4e+05
6e+05
8e+05
1e+06
Iterations

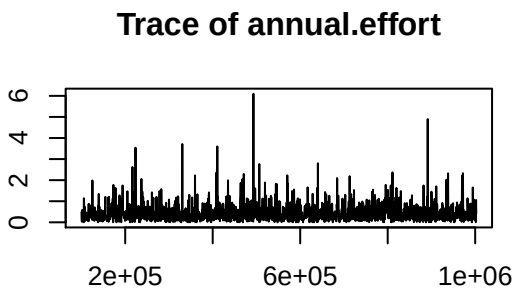

Density of Location2Stewart Creek
0.0
1.0
−1.5
−1.0
−0.5
0.0
0.5
1.0
N = 1806 Bandwidth = 0.08958

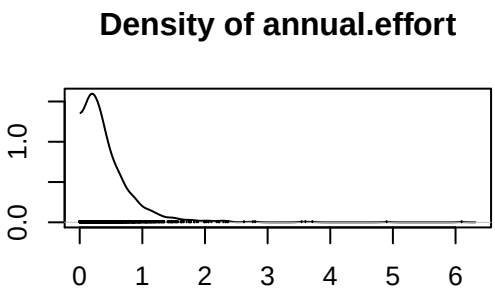

Trace of annual.traffic
−0.04
2e+05
4e+05
6e+05
8e+05
1e+06
Iterations

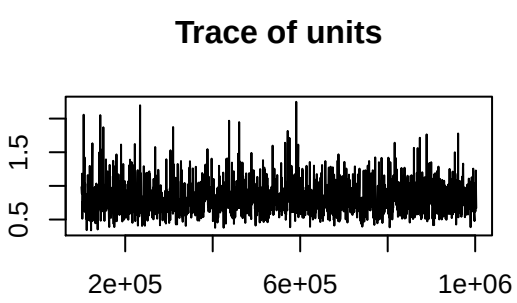

Density of annual.traffic
0
40
−0.04
−0.02
0.00
0.02
N = 1806 Bandwidth = 0.00198

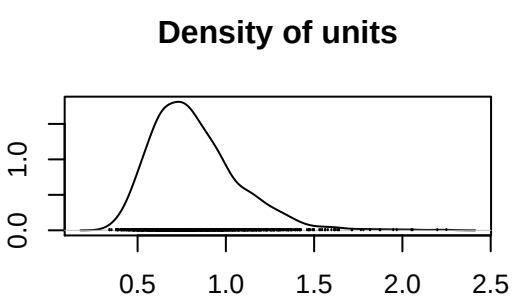

Trace of annual.human
−2
1
2e+05
4e+05
6e+05
8e+05
1e+06
Iterations


Density of annual.human
0.0
0.6
−2
−1
0
1
2
N = 1806 Bandwidth = 0.1511


Trace of annual.effort
0 2 4 6
2e+05 6e+05 1e+06
Iterations


Density of annual.effort
0.0 1.0
0 1 2 3 4 5 6
N = 1806 Bandwidth = 0.07243


Trace of units
0.5 1.5
2e+05 6e+05 1e+06
Iterations


Density of units
0.0 1.0
0.5 1.0 1.5 2.0 2.5
N = 1806 Bandwidth = 0.05452