Juvenile proportions GAM by zone

Effects of year

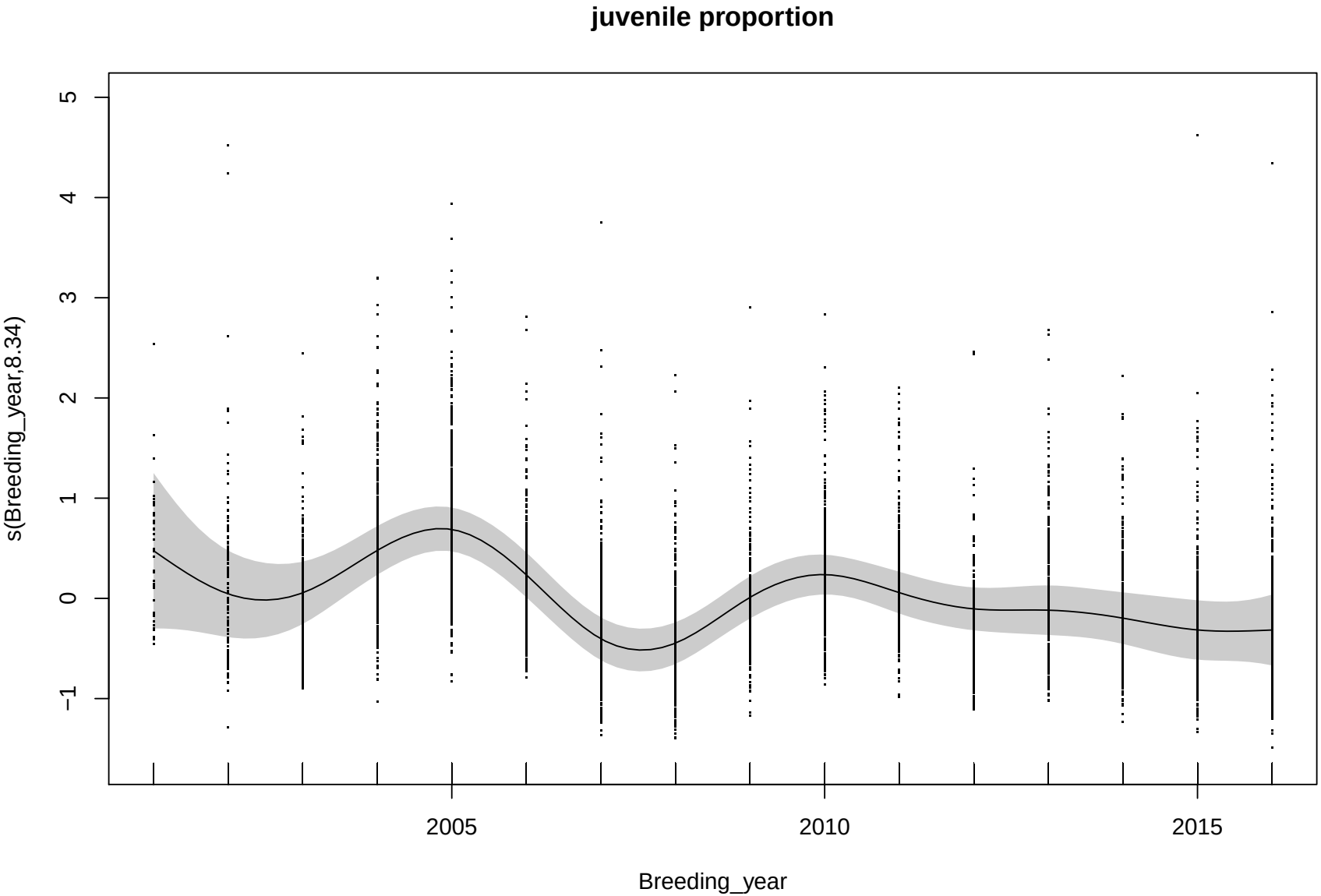
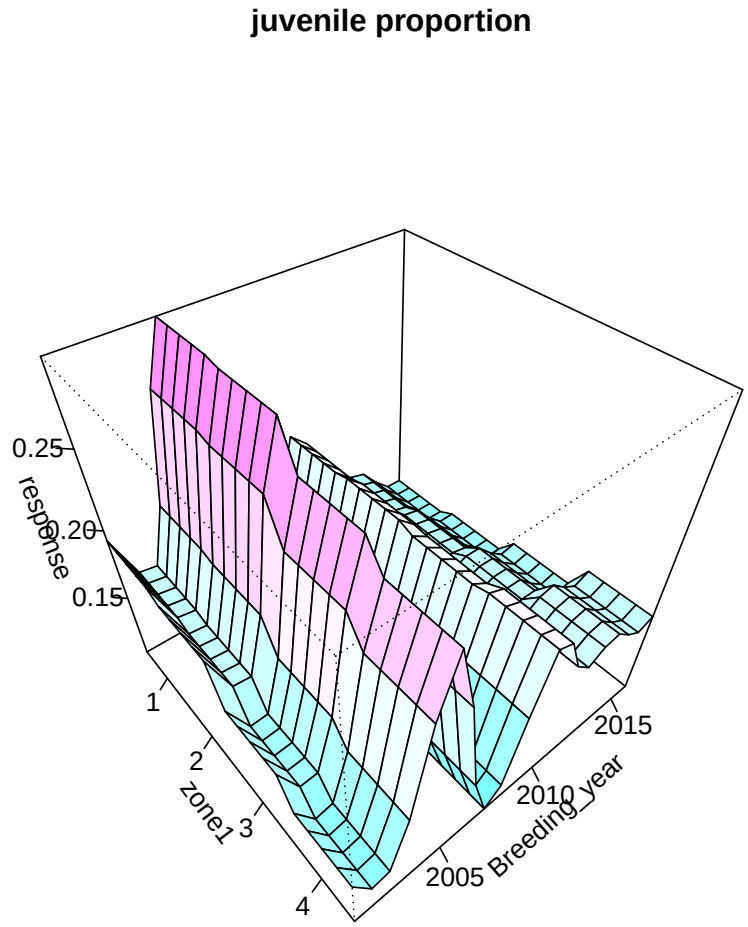


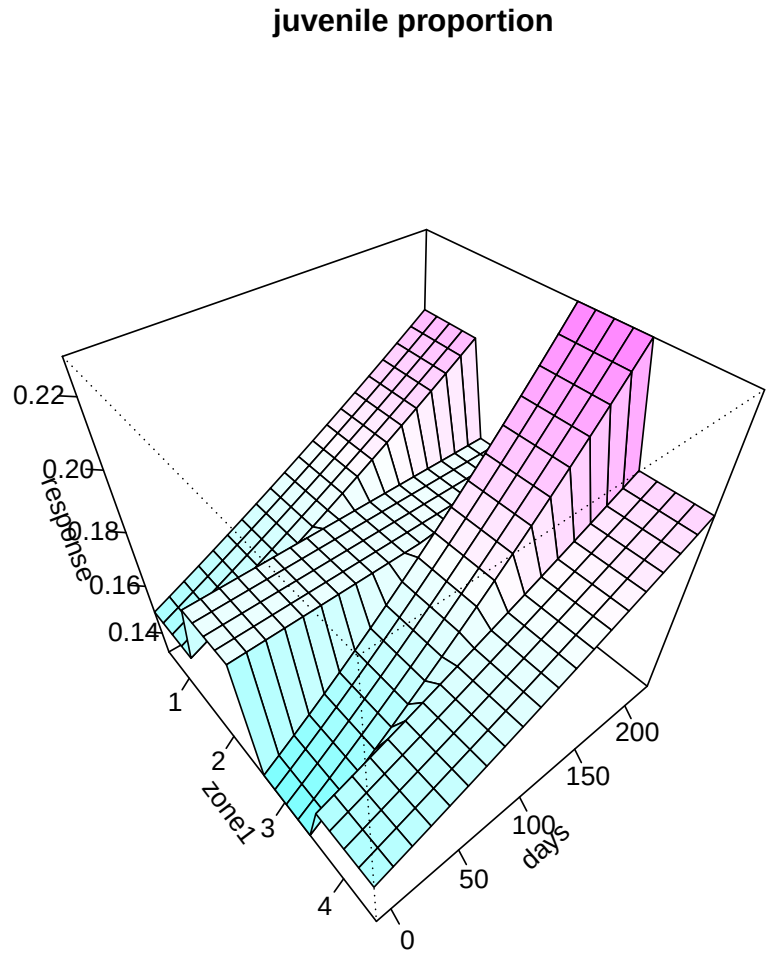
Figure 1: Lemming cycle effect appears dampened in more recent years.

With random effects

```
##
## Family: binomial
## Link function: logit
##
## Formula:
## propjuv ~ s(Breeding_year) + s(Breeding_year, by = zone1) + +s(days) +
##     s(days, by = zone1) + s(Food_type, Breeding_year, bs = "re") +
##     s(Observer, Breeding_year, bs = "re") + s(flocksize, Breeding_year,
##     bs = "re")
##
## Parametric coefficients:
##             Estimate Std. Error z value Pr(>|z|)
## (Intercept) -1.54149    0.04969  -31.02   <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Approximate significance of smooth terms:
##                                       edf Ref.df Chi.sq  p-value
## s(Breeding_year)                 8.1077172  8.766 67.784 5.35e-11 ***
## s(Breeding_year):zone1IJsselmeer 1.0000483  1.000  0.021  0.88471
## s(Breeding_year):zone1Rhinelands 1.0000359  1.000  0.831  0.36214
## s(Breeding_year):zone1Southwest  1.0000200  1.000  2.381  0.12282
## s(days)                          1.0000074  1.000  0.851  0.35634
## s(days):zone1IJsselmeer          1.0000622  1.000  0.284  0.59434
## s(days):zone1Rhinelands          1.0001023  1.000  0.327  0.56770
```

Effect of year and days by zone





Including mixed effects

- Including mixed effects reduces AIC significantly.
- AIC (GAM without mixed effects): 2490.3678094
- AIC (GAM with mixed effects): 2133.6031601