**Homework #2 – GLMs in Template Model Builder**

Goal: Practice and demonstrate ability to estimate parameters for generalized linear models in Template Model Builder.

**Part 1**:

Gorbachev's Holy Goose is an important winged beast that occurs in the temperate corn forests of Northwestern Illinois. Resource managers have asked you to do something with the decades of point count data they have collected. Your decide to determine whether count data throughout the region are related to elevation, forest cover, or an interaction between these variables.

Eq. 1

Eq. 2

Eq. 3

Eq. 2

Here, the mean count is negative binomially distributed with dispersion parameter . This is a similar model to that used in the in-class exercise, but with an additional dispersion parameter.

**Part 1:** Build and simulation test a .cpp file that fits this model and plots the distribution of maximum likelihood estimates vs. true values used in the simulation. Do this using the SIMULATE{} function in TMB. Use at least 100 replicate simulations, and keep all other parameters as in the in-class exercise.

**Part 2**: Now that you know your code is behaving, estimate the “real” data and tell the managers whatever you feel like telling them. Check to make sure it is statistically reasonable.

**Part 3:** A manager wants to know what the expected count and 95% confidence intervals of Holy Geese is at a location where no data have been collected. The covariates for this location are elevation = 0.7, cover=-0.2. Can you calculate this for them?