**Best things learned from Murray’s course:**

* Factorizing a binary 0/1 variable will screw up emmeans backtransformations later on! Needs to fit as numeric with glm
* Binomial model coefficients can be used to calculate the LD50 for survival data: LD50 = -intercept/slope
* Interactions between continuous variables **REQUIRE** the covariates to be centered first, otherwise they WILL be collinear
* Can keep in the transformation of predictors (e.g., scale(…, scale=FALSE), log(…)) and then the original variables can be used as inputs in emmeans, etc.
* emmeans package requires TRUE and FALSEs to be spelled out to work properly
* Cook's distance is not needed if you only have categorical predictors
* Use emmeans on link scale %>% regrid %>% pairs %>% confint to get absolute differences (X is # units higher than Y) rather than fractional differences
* *nlme* was the first way of doing mixed-effect models, it uses quasi-likelihood by re-fitting the models different ways, so isn’t as modern as *lme4* or *glmer*, but these are limited in the families that it supports, including zero-inflated models. Thus *glmmTMB* to fit the broad range of models used in ecology
* 'group' works similar to 'by', just that group is more versatile when it comes to mapping, etc. because it will automatically group by polygon, while by needs a named list as input. Otherwise, they work very similarly.
* Allowing a random slope and intercept model is ok with minimum evidence of non-parallel lines, as the model will tell us if this is unnecessary.
* (1|random) is interpreted as ‘do the intercept [‘1’] by [‘|’] the random factor’
* Can fit random slopes using both covariates and factor variables!
* Different random effect structures include correlated vs. non-correlated:
  + Correlated random intercept and slope:   
    x+(x|g) = > 1+x+(1+x|g)
  + Uncorrelated random intercept and slope:   
    x+(x||g) => 1+x+(1|g)+(0+x|g)

MISSED: planned contrast grid using emmeans

(Davis, Shaw, & Etterson, 2005)

Davis, M. B., Shaw, R. G., & Etterson, J. R. (2005). Evolutionary responses to changing climate. *Ecology*, *86*(7), 1704–1714.

Gienapp, P., Teplitsky, C., Alho, J., Mills, J., & Merilå´, J. (2008). Climate change and evolution: disentangling environmental and genetic responses. *Molecular Ecology*, *17*, 167–178. doi:10.1111/j.1365-294X.2007.03413.x

(Gienapp, Teplitsky, Alho, Mills, & Merilå´, 2008)