**Name:**

**Population Modeling in Ecology**

**Spring 2023**

**Week 10 – Robust Design with Temporary Emigration in RMark**

Complete the questions below and email to [gbarrile@uwyo.edu](mailto:gbarrile@uwyo.edu) with the subject line: **Week 10 Lab Report**

During our capture-mark-recapture study of black-footed ferrets, in addition to precipitation data, we also recorded a field-derived metric of rangeland health. This rangeland health measurement constitutes a site-level covariate, as we derived one value for rangeland health at each site (but that value did not change over time at a given site). Values for this site-level covariate can be found in **Site\_Health.csv** within the data folder for this week.

For this lab report, run one “RDHuggins” model in RMark with the black-footed ferret data. Use the same structure for capture probability as we did in class (i.e., *p* = *c* and capture probability varied across our four sites). For the gamma parameters, use the best structure from class (i.e., gammadoubleprime = gammaprime and temporary emigration was constant). Finally, **model survival probability as a function of rangeland health**.

Answer the following questions:

Were there any singular parameters in this model?

Based on the beta coefficients, was there evidence that rangeland health influenced survival?

Plot the relationship between rangeland health and survival probability of black-footed ferrets. Include a sequence from 0 to 1 (for rangeland health values) when predicting and plotting this covariate relationship. Paste your figure into this document and include a detailed figure caption.

Next, create a predictive raster surface for survival probability based on your model. Use the **rangehealth.tif** in the data folder for this exercise. After reading the raster into R, convert NAs in the raster to a value of -1 (not zero like in class). Then, just like in class, aggregate the raster by a factor of 50 to change the resolution. Now, create the predictive raster surface as we did in class. Mask the predictive raster surface for survival to exclude anything less than a value of zero for rangeland health. Plot the survival raster and rangeland health raster side by side and paste that figure in this document. Include a detailed figure caption and describe how someone would make inference on these rasters in relation to how rangeland health correlates with black-footed ferret survival.