WFC 198 “Sampling Animal Populations” – Homework Week 6

Due May 16th, 11:59pm

Please complete the following exercises in R, “knit” your script into a Word or html report and submit it on Canvas under Assignments. If you cannot knit, submit your R script. We will take off 10% of your points (between 1 and 3 points) for not knitting.

Knitting tips:

1. Always comment out install.packages commands
2. Contrary to what we said previously, do not comment out library(unmarked) – Rmarkdown needs that to find the unmarked functions you’re using
3. Make sure your script is saved in the same folder where you saved your data; make sure that folder is also your working directory. Otherwise, Rmarkdown is unable to find the data file.
4. When you correct any errors in your script in order to knit, always save your changes before knitting again.

The point of this assignment is for you to practice fitting occupancy models in R. If you’re having trouble with some of the tasks, look back at the code from Lab 6 on occupancy models – you will find everything you need in there. Remember: the complete and commented lab code is available on Canvas.

Please preface every piece of code with a comment that states to which question the code belongs, for example: “#Task 3a” before the code used to tackle Task 3a. If we cannot follow your code, we cannot grade it. Work through the questions in order, as they build on each other.

Data for this homework assignment are located on Canvas, in the file “flycatcher data.csv”. Species detection/non-detection data (columns “y.1” to “y.3”) were collected on American fly catchers at 50 sites, each visited 3 times. For each site, the amount of woody habitat (as a percentage) was recorded (column “woody” in the data frame). For each survey, the Julian date (day of the year, where 0 = January 1) was also collected (columns “date.1” to “date.3” in the data frame).

Task 1: Reading in and formatting data (5 Pts)

Read the data into R and use them to create an unmarkedFrameOccu object with detections, site covariates and observation covariates. Tip: Site covariates are those that have a single value for each site. Observation covariates are those that have a value for each site and visit.

Task 2: Raw occupancy (5 Points)

Calculate raw occupancy (percentage of sites where species was observed at least once) – make sure your “knitted” report contains both the R code and the value for raw occupancy.

Task 3: Running occupancy models (10 Pts)

1. Run all possible models (meaning, models representing all possible covariate combinations). Tip 1: there are 8 models total. Tip 2: Remember that site covariates can be used for both the detection and occupancy components of the model, whereas observation covariates can only be used for the detection component. (8 Pts)

Note: Producing summaries for some of the models will result in a warning message. You can ignore that message.

1. Compare all models based on their AIC using the appropriate R commands (make sure that your “knitted” report shows the model selection table) (2 Pt)

Note: Producing the model selection table will cause a warning message. You can ignore that message.

Task 4: Plotting covariate relationships (5 Pts)

Plot the relationship of occupancy with the covariate in the top model from Task 3 c. In your plot, use the “ylim” argument to set the range of your y axis from 0 to 1. Label your axes. Tip: To make this plot, first create a sequence of possible values for the covariate (be careful: the covariate is a percentage so can only take on certain values); then use the predict() function to calculate expected values of occupancy for these new covariate values.

ATTENTION: The predict() function does not always work – that seems to depend on the version of unmarked that you have installed on your computer. If it does not work, manually calculate the predicted values of occupancy probability, psi, based on the parameter estimates from the top model from Task 3c, and plot those values (remember to back-transform) against the new covariate values. Code for both options is in the lab R script.

Task 5: Interpreting model output (10 Pts)

Look at the summary results of the top model from Task 3c (make sure the summary output is included in your “knitted” report) to address the following tasks. Add answers into your R script but make sure to comment them out.

1. In words, describe the relationship(s) between occupancy probability and the covariate(s) in the top model. Your statement should contain the appropriate number(s) form the model output, as well as appropriate units. Your statement should also address whether the relationship(s) are statistically significant, and on which number in the output your answer is based. (4 Pts)
2. In words, describe the relationship(s) between detection probability and the covariate(s) in the top model. Your statement should contain the appropriate number(s) form the model output, as well as appropriate units. Your statement should also address whether the relationship(s) are statistically significant, and on which number in the output your answer is based. (6 Pts)

TOTAL POINTS: 35