PCB 6466: Homework 3 DUE MON Sept 30

Instructions: Graphing here can be done using packages and commands we used in lab – artistic embellishments are optional and not required. Data sets are available from the course web site's schedule for this week: https://sciences.ucf.edu/biology/d4lab/methods-1
Your answer to each question should include (a) a graph or statistical result and (b) a sentence or two that clearly answers the question, based on the graph.
Remember to provide your code, and submit your answers as a pdf.

Questions 1-5: England is pretty far north, but its weather is buffered by the Gulf Stream. Thus, climate change is uncertain there. The SilwoodWeather data set shows upper and lower temperatures (^{o}C), and rainfall (mm), for each day 1987-2005, at the Imperial College's Silwood campus, west of London.

1. Make boxplots, where you obtain one box & whiskers per month (i.e., 12 box & whiskers in your graph). Describe the typical annual pattern in rainfall at Silwood.
2. Rainfall is famously variable – a better approach may be to calculate a monthly total rainfall [hint – remember dplyr?], and then try boxplots per month again.
3. Calculate the average daily upper temperature for each month of each year, and then graph those values where your X-axis is months). Based on your graph, what month(s) get warmest at Silwood?
4. Using the same data as in #3 above (but making a different graph): Have the high temperatures increased through time, consistent with global warming projections?
5. Calculate the daily temperature range (i.e., upper – lower), and then the monthly average of those daily ranges; to yield a monthly average of daily ranges for every month of every year. Now graph those monthly average ranges through time. Have temperatures become more variable through time, as predicted by climate change models?

Questions 6-10 use the speciespH.txt data set, which represents the count of the number of zooplankton species and their collective biomass (g/L) in three experimental pH treatments of ponds.

6. Make histograms and normality plots for the variable Species for each of Low, Mid, and High pH treatments in this data set. Do you think each data set looks normally distributed?
7. Conduct Shapiro-Wilk tests on those same data – How do these results compare to your visual interpretations from Question #1 above?
8. Now evaluate homogeneity of variance. Explain your result in English.
9. Try one transformation – explain your choice of a transform, and then explain in English how it changed results (if it did), and make it clear what information you used to support your answer.
10. How should we proceed if we were to keep trying to meet assumptions?