BIOS 737 Homework 1:

Due Wednesday, September 4 (beginning of class)

1. Work through the Myrtle tree example (code and data on Canvas under HW).
   a. **What to turn in:** In three paragraphs, describe the ecological spatial question (what are we trying to figure out?), the data available and methodology used, and your results. Include Monte Carlo p-values for Pielou's statistic for all of the myrtle trees, the disease trees, and the healthy trees.
   b. In addition to the R code provided for the class, also try the csrplus package that includes a pielou function. Do you get the same answer? If not, why not?
   c. Include maps of all three sets of trees, and histograms of the simulated test statistic values and the results from csrplus.
2. The Anasazi (or Ancestral Pueblans) represent an ancient group of Native Americans who thrived in the American Southwest during the period from approximately 1000 B.C.E. to 1050 C.E. Their descendants make up many of the Pueblo tribes of today including the Hopi and Zuni. The Anasazi are often known as "cliff dwellers" due to elaborate structures built in to canyon walls and cliffs (e.g., Mesa Verde in Colorado), but ranged widely over New Mexico, Arizona, Colorado, and Utah. Many archeological studies of their past residential sites reveal a sharp growth in population between 1000 C.E. to a sudden and fairly simultaneous abandonment of most sites around 1050 C.E. The is great interest into possible patterns in the growth and subsequent dispersal of the Anasazi during this period.
   a. In northwestern Arizona, the Peabody Coal Company obtained a lease to mine for coal in an area known as Black Mesa. U.S. legislation requires survey and study of historic and prehistoric resources before they are disturbed by major construction, mining projects, etc. Consequently, in the fall of 1975, a site inventory was conducted on the Peabody lease site. The survey involved teams covering the entire area and mapping any settlement sites. While some past settlements (particularly those predating the widespread use of ceramics) likely escaped detection, more than 700 sites were found. Sites were dated by pottery types (for those with ceramic artifacts) and tree-ring dating (dendrochronology). We are interested in about 500 of these site locations from two different time periods, one prior to the sudden population growth, and one spanning the time from the population growth to the abandonment of settlements around 1050 C.E.
   b. **Data:** There are two data sets on Canvas:
      i. `anasazi.old.txt` contains site locations dated between 850 and 949 C.E.
      ii. `anasazi.new.txt` contains site locations dated between 950 and 1050 C.E.
   c. **Goals:** Your goal, as a consulting spatial statistician, is to assess the spatial patterns in the two sets of sites. To start, please use Pielou's statistic to see if each of three data patterns (old, new, and all sites combined) differs from complete spatial randomness.