Tree Conservation in New Developments
Student Activity Sheet
Part 1

Raleigh is known as the "City of Oaks" due to the widespread tree canopy coverage throughout the city and surrounding areas. With the increase in development and mass grading, municipalities have required that various types of tree surveys be conducted prior to mass grading or site alterations that result in the changing of the natural landscape. One method to determine the average tree density throughout a tree conservation area (TCA) is the use of calculating the basal density and trees per acre (TPA). TCA's can include stream buffer areas which are a specific horizontal offset distance from a creek/stream centerline. The vegetation within it cannot be altered without specific permitting to maintain natural vegetation and canopy coverage to benefit water quality and wildlife/reptile habitat. Figure 1 (below) is an example of a topographic survey where a 60-acre parcel of land is going to be purchased by a development group to build housing. The brown lines reflect the contours of the earth and slope towards the low-lying areas such as the creeks or pond. The building contractors will grade the land with construction equipment in order to make specific areas flat for housing and roadways. Areas such as TCA's and stream buffers typically are not altered and serve as an important part of our natural ecosystem.
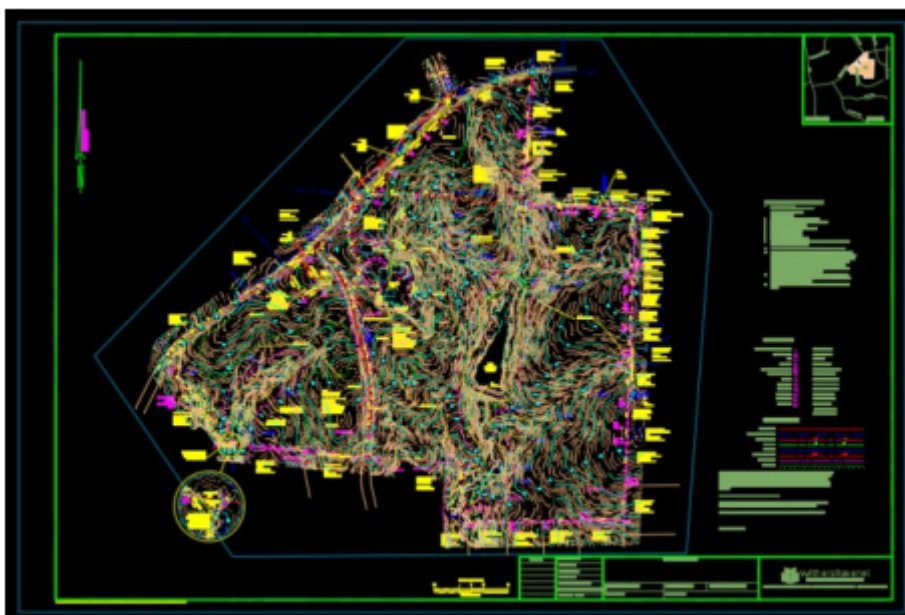

Figure 1: Digital Survey Map

Another type of TCA area is that which is chosen by the client or site developer to preserve a specific amount of acreage on a site to meet requirements recommended by municipal regulations. These sporadic TCA areas ensure that trees will be part of the future layout to assist with aesthetics and environmental benefits and keep trees a part of our Raleigh skyline. These areas may not be stream buffers, but could be a buffer between the adjacent properties or undevelopable areas. Often greenways, playgrounds, or dog areas can be incorporated in additional TCA areas.

🌳 You need to know about the tree coverage in this entire 60-acre site. What do we mean by "tree coverage"? How could you measure this? Is it reasonable to survey ALL the trees? Is this a practical strategy? Why or why not?

Typically when a survey of this nature is carried out, a plot center is marked with a pin flag and a flexible distance tape measure is used to physically define the limits of the plot boundary. Once the horizontal plot boundary is defined, then the trees within the plot can be tallied (taking note of the tree diameter and species), and then marked with flagging or paint so they will not be recorded again. This procedure can be replicated across a site to determine a specific sample dataset that is representative of the entire site.

How many square feet are in one acre? Determine the plot radius, and square feet within a $^1/_{10}$-acre plot.

🌳 Below is an overhead view of a plot of trees. Which trees would you consider to be inside the circle? What criteria did you use to determine which trees to include in your sample?
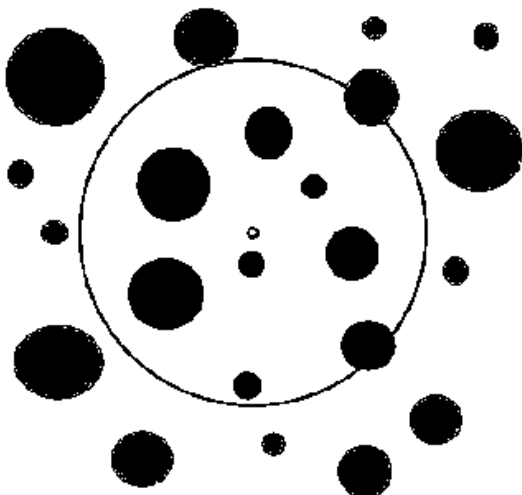
Part 2

Utilizing *basal area density* calculations, we can estimate the coverage of standing timber on a piece of land through statistical sampling. *Basal area* is used in forestry as a measure of how "occupied" with trees a forest site is. It would not be efficient to inventory every tree on a site as the time and resources to complete this would be exhausting and expensive.
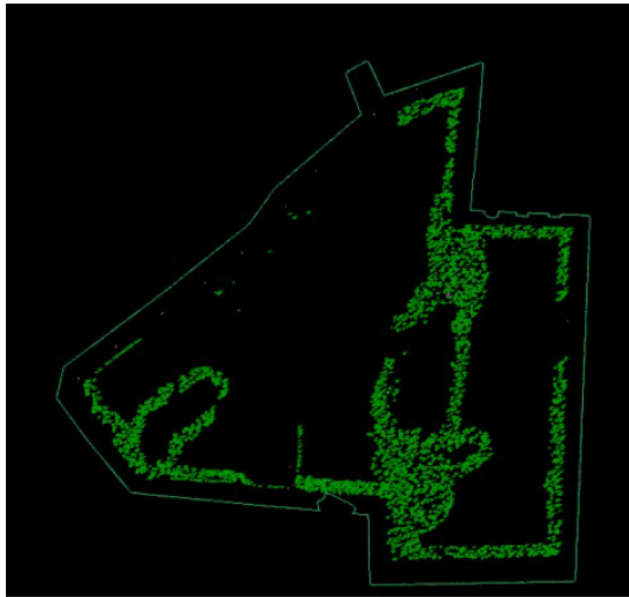

Figure 2: Tree Survey Points shown as the Green dots within the 60 acre polygon boundary
(same site as shown in Figure 1)

🌲How would you decide how many plots to take? How would you select their locations? What should a plot look like?

What do the abbreviations "D_{BH}" and "BA" mean in the context of forestry?

🌲The units used for D_{BH} are inches but BA is in square feet. $BA = 0.005454(D_{BH})^2$ The coefficient 0.005454 is known as the *Forester's constant*. What are its units of measure? Describe where it comes from.

🌲The spreadsheet provided has data collected from 7 sample plots on the 60-acre site. Each sample plot is $^1/_{10}$ of an acre. What are your impressions of the data for each plot?
      Plot 1:

      Plot 2:

      Plot 3:

      Plot 4:

      Plot 5:

      Plot 6:

      Plot 7:

You will be calculating tree diameters, basal areas, basal area per acre, and trees per acre in the spreadsheet. Use the formula **$BA = 0.005454(D_{BH})^2$** to calculate Basal Area.
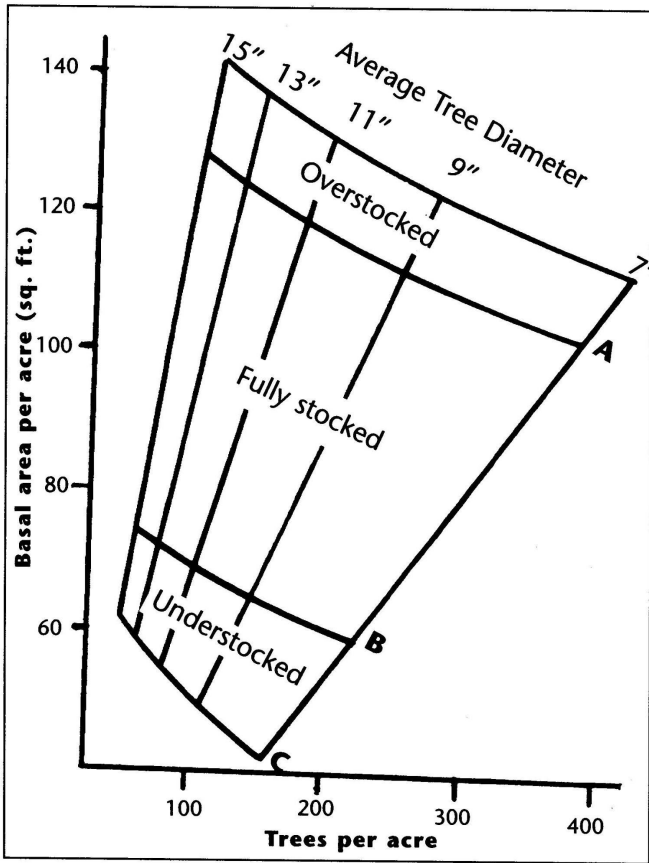
Discuss:

From your spreadsheet, find the average number of trees per acre (TPA) for all the samples AND create a data representation that shows how each plot's TPA differs from the average for the whole site. What do you notice about this information?

What factors do you think could influence these differences?

What relationship (if any) do you see between the basal area per acre and the number of trees? Create a representation showing the relationship in your spreadsheet.

According to the chart below, would we classify this site as Understocked, Fully Stocked, or Overstocked? Explain your choice and describe how you would manage trees on this site based on this classification.

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