Part I: Pacing

(1) Introduction to pacing.

(2) Three pacing courses have been established in the woods west of Horticulture Park. The courses have three segments: Flat forested, Declining forested and Inclining Forested. Each segment is 1 chain (66') of horizontal distance. The beginning and end points of the segments are flagged in yellow. Courses X, Y, and Z are marked with one, two , and three flags at each endpoint respectively.

Traverse a single course a total of three times, recording the course letter and your pacing for each segment into your field sheet (example below).

Course (X,Y,Z) _____	**Paces per Segment (to ½ pace)**		
	A- Incline	**B- Decline**	**C- Flat(ish)**
1			
2			
3			
Average			

Determine the average number of paces required to traverse 1 chain in each terrain type. You will frequently use pacing as a measure of distance when traveling through the woods or acquiring other forest measurements, so remember your personal pacing measurement. Accuracy is important.

Note: A chain is a unit of distance measure common to agricultural use in North America. One chain equals 66 feet and is divided into 100 links. One acre is equivalent to 10 square chains. Some other comparisons are below.

Distance Unit	**# of Chains**
Rod	One quarter chain
Furlong	10 chains
Statute Mile	80 chains

Compass and Pacing

Part II: Compass and Tree Measurements

(1) Introduction to direction and distance measurements.

(2) The center point is a tree marked with three bands of yellow and some strips of silver/orange flagging, surrounded by fourteen (17) trees marked with single yellow flagging and labeled A-Q. Each group will select a different labeled tree. You will need to determine the direction (azimuth in degrees) and distance to the center (in feet, using your pacing). Measure both between the facing surfaces of the trees.

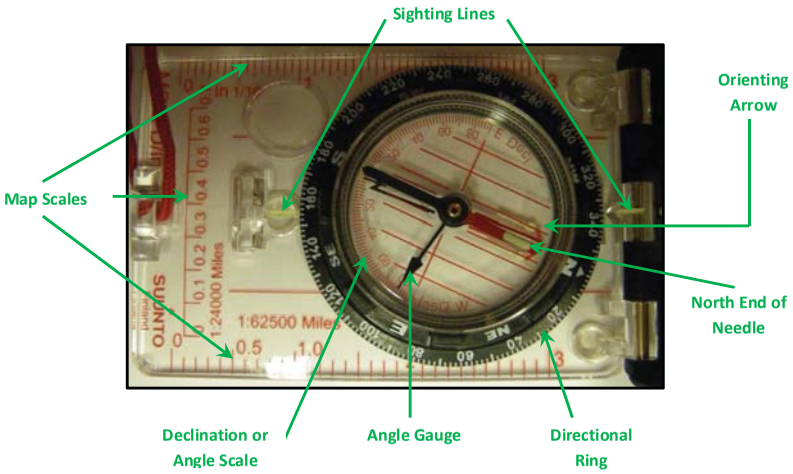
(3) Choose another tree. Repeat and complete as many as possible before the end of lab.

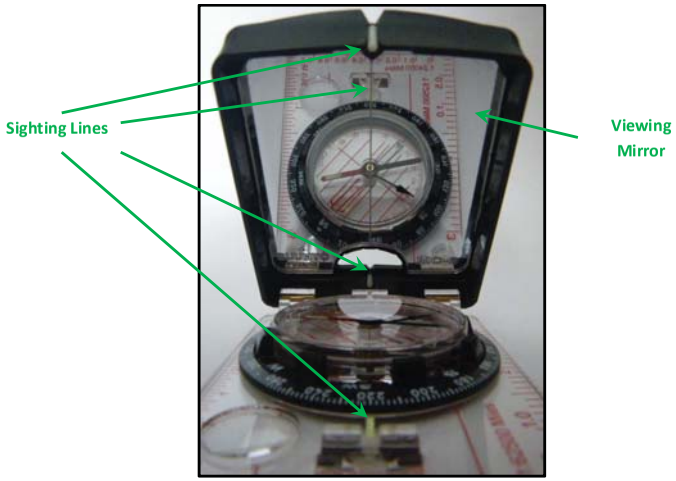
Note: Some values are given. Be certain each group member personally measures these trees to verify your compass reads and pacing. If there is a problem with the given values, let us know.

Point/Tree	Bearing to Center by Compass (°) or (N°E/W) or (S°E/W)	Distance to Center by Pacing (ft.)
A		**112**
B	**257° or S77°W**	
C		
D		**146**
E		
F		
G	**327° or N33°W**	
H		
I	**16° or N16°E**	
J		**64**
K		
L		
M	**168° or S12°E**	
N		**148**
O		
P		
Q		

Compass Basics

Components

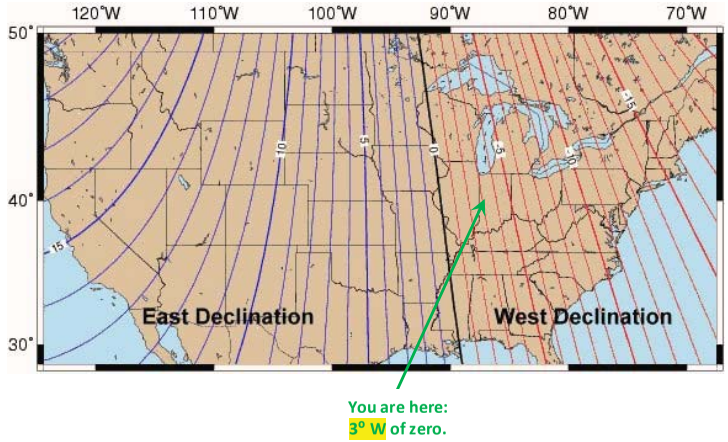




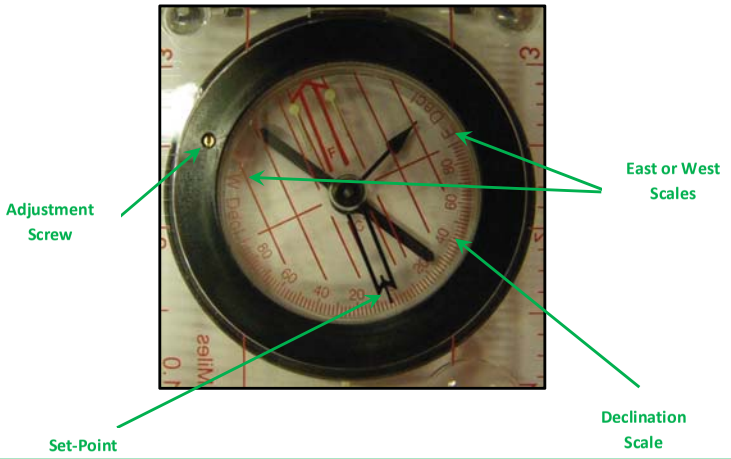
Setup and Use

Declination

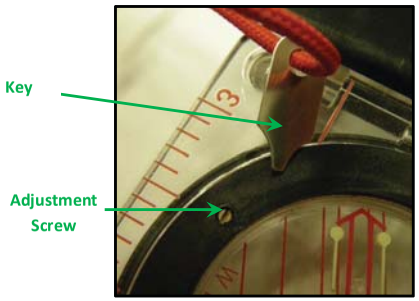
The difference between the north geographic pole and the north magnetic pole.

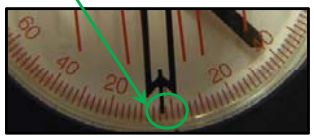


How to Set Declination



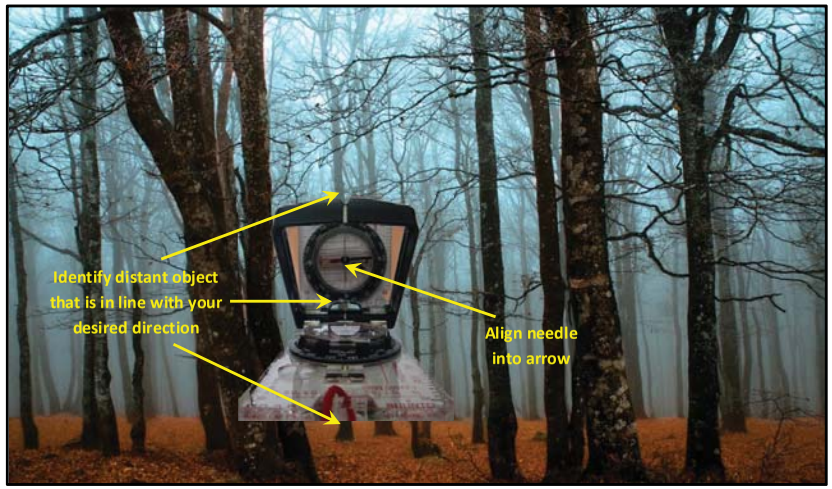
To Set: Use the key or a small screwdriver to turn the adjustment screw until the declination set-point matches the appropriate value for your locale.





Preparing to Use

Adjust the directional ring to the desired trajectory, as indicated by the sight line below the mirror. Hold the compass at eye level with the mirror at an acute angle. Using the mirror to read the compass face, align the north end of the needle (red) within the directional arrow (red end). Identify a reference target that is in alignment with all of the sight lines. Use this point to guide you while walking the desired direction.



Verify Your Position/Direction

Once you have reached your reference target, you should verify your direction and/or position.

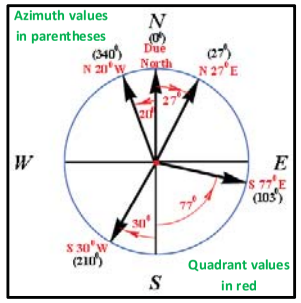
If you have a partner who is still at your starting location, have them use the compass to sight your current position. If you have gone the correct direction, the red end of the needle should line up in the red end of the arrow. If this is not the case, the partner should direct you as to which direction to move to become correctly positioned.

If you are alone, you should mark or otherwise identify each of your starting positions. At each of your target locations, use the compass to sight the starting point. The needle should align with a value that is 180° different that your desired direction. If you have a compass similar to the one above, the red end of the needle should line up with the black end of the directional arrow. If this is not the case, you will need to move laterally until everything is lined up.

At this point, you may continue to repeat the above steps to traverse whatever distance is required in the desired direction.

Azimuth

Some compasses may be labeled with quadrant bearings instead of azimuth bearings. Azimuths bearings are directional angles from 0° to 359° (a circle) as referenced from north. They are read as the angle value. Quadrant bearings are combinations of two directional names and an angle of 1° to 89°. They are read as an angle toward east or west as referenced from north or south. For example, an azimuth of 103° is equivalent to saying S 77° E.



FNR 353 Compass, Pacing and Basic Tree Measures Lab 05

Part I: Tree Measurements

(1) Introduction to height and diameter measurements.

Sample Trees: (*to gauge your measurements; marked with blue flagging*)

DBH Sample (Tree)	DBH (inches)	Height Sample (Snag)	Height to Tip (feet)
B (694)	21.5	AA (644)	30.5
W (693)	45.1	BB (695)	52
		DD (696)	30 (to fork)

(2) This lab will take place in the same location as part II of Lab 4 (center point is a tree marked with two bands of black and yellow flagging surrounded by seventeen (17) trees marked with single orange/silver flagging and labeled A-Q).

Tree G is special, so if you choose to use it, see part II below.

You will need to determine the diameter at breast height (DBH) and total height of each of the labelled trees. *For heights, remember to aim slightly below what you see as the very top (or you will overestimate).*

For tree D, measure height to the crotch of the major fork.

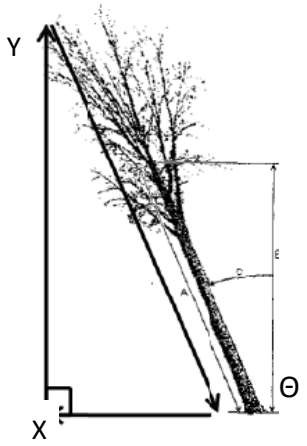
(3) Choose another tree. Complete as many as possible (plus part II) before the end of lab.

Point/Tree	Total Height	DBH	
	by Clinometer (ft)	D-Tape (0.1")	Biltmore (2")
A			
B			
…			

Part II: Leaning Tree

(1) For the sake of experience, there are two leaning trees available (one is tree G [orange/silver, north of the center], the other is tree XX [red/white, east of the center]). **Choose at least one of these trees to measure and include in your report (indicate which).**

When a tree leans more than 10-15% (6°-8°), you need to take extra measurements to get an accurate height. You are to determine the total height (along the stem) to the top of the tree. You need to record the following and use the rules of a right-triangle to get the actual stem height.

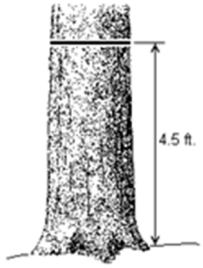


Remember tangent (Θ in degrees) = opposite / adjacent (X/Y here)
= horizontal distance / vertical distance
= % lean from vertical

Azimuth Of Lean (°)	DBH (tape, 0.1")	Amount of Lean (Θ) (° or %)	Observed Vertical Height (Y) (ft)	Horizontal Distance from Base to "Top" point (X) (ft)
		As observed perpendicular to lean		

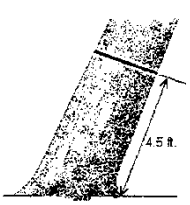
Use X and Y to get the stem length, NOT trigonometry (your angle measure is not accurate enough).

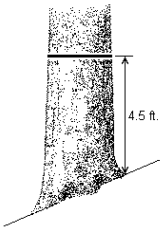
Some Special Cases



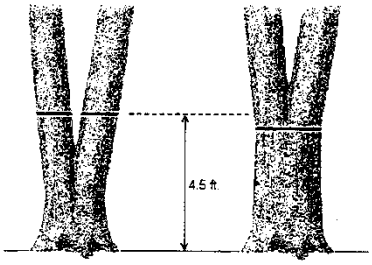
Normal tree: Measure at 4.5' above ground. Keep tape perpendicular to tree axis.

Note: ignore minor irregularities in surface or bark).





Leaning tree or Sloped ground: Always measure from the side of the acute (smaller) angle. Typically, this is the uphill side on a slope. Measure at 4.5', perpendicular to tree axis.

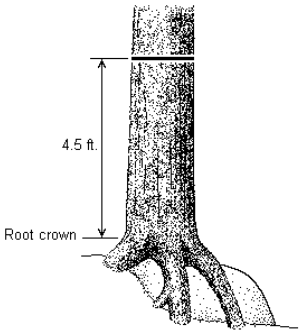


Forked tree: If the fork occurs before 4.5', each stem is considered a separate tree. Measure accordingly.

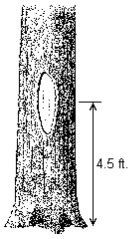
If the fork occurs after 4.5', it is measured as a single tree at 4.5'.

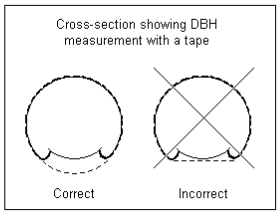
If fork is swollen, measure slightly above or below to avoid swollen area.

Heights of single trees with forks are to top of best fork (may not be tallest).

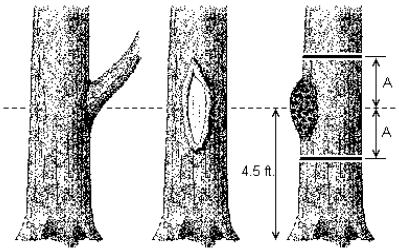


Growing on objects: If vertical, measure from intact forest floor. If no floor, measure from root crown (where floor would be to cover roots).

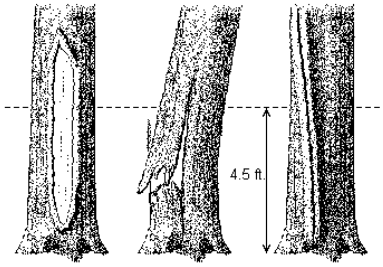


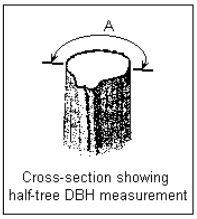


Small cat face: Measure with loose tape to complete natural stem shape (do not pull tight to flatten one side).



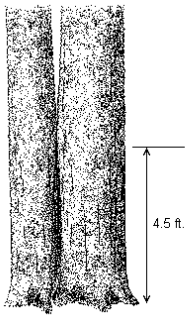
Small imperfection/obstruction: If this occurs at 4.5', measure equal distance above and below and average the results.

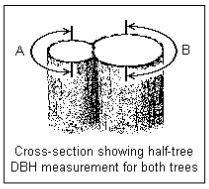




Large imperfection: If the tree qualifies for measuring, measure half distance of intact side and double.

If to be logged, may need to measure above imperfection.

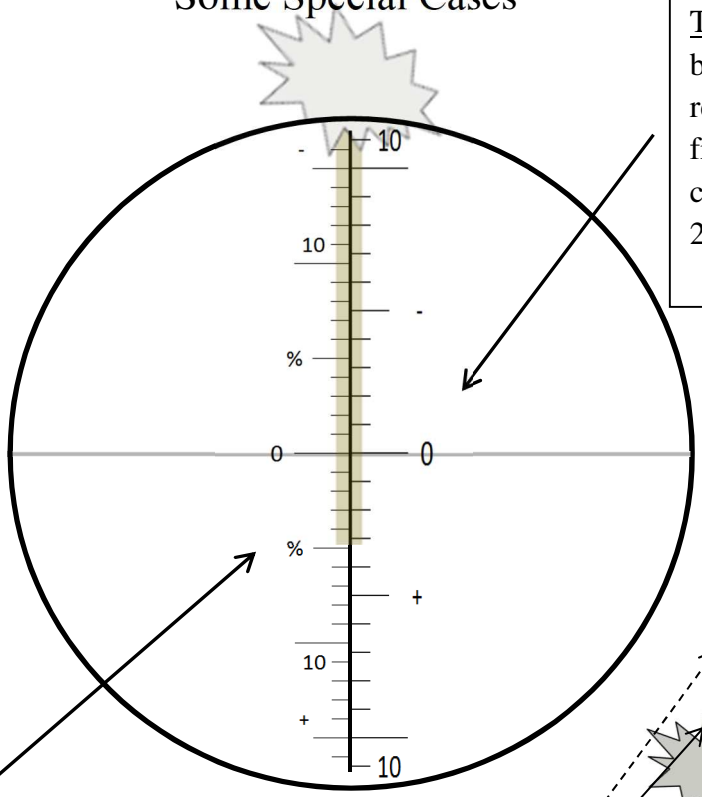




Trees growing together: Do not treat as forked trees no matter where the fork appears (bark will separate wood along whole stem). Use half-diameter method for each stem.

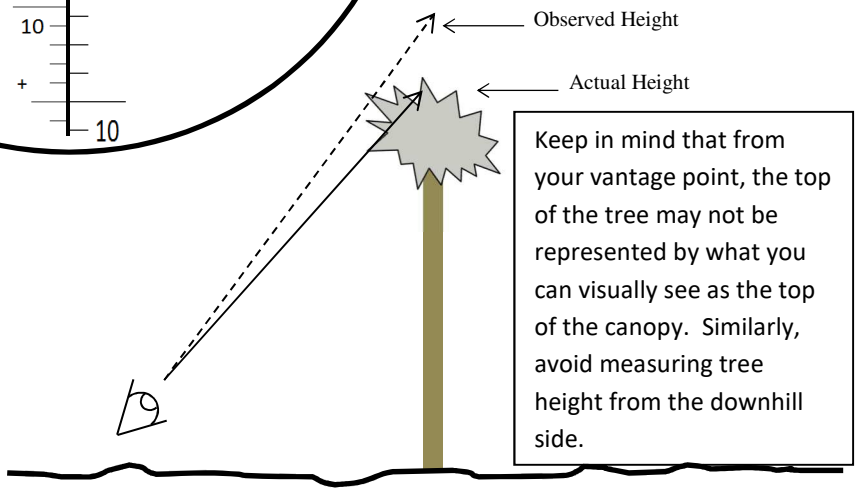
Some Special Cases

Reading the Clinometer:



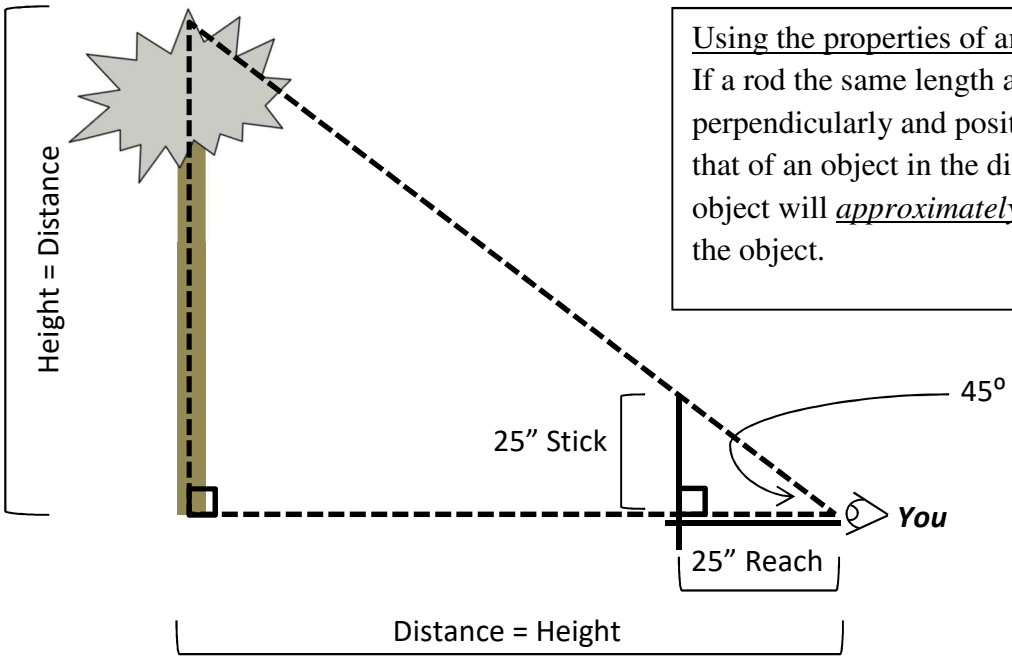
Topo Scale: Take difference between top and bottom readings. Read height directly from scale if you are 66 feet (1 chain) from object. If you are at 2 chains, double scale value, etc.

Percent Scale: Take difference between top and bottom readings. Read height as percentage of your distance from the object (e.g. 32% total at 80 feet represents 25 feet height).



Keep in mind that from your vantage point, the top of the tree may not be represented by what you can visually see as the top of the canopy. Similarly, avoid measuring tree height from the downhill side.

Using a measuring stick:



Using the properties of an equilateral right triangle: If a rod the same length as your reach is held perpendicularly and positioned so its height matches that of an object in the distance, the height of the object will *approximately* equal your distance from the object.

FNR 353 # Measuring Standing Trees- Merchantable Heights, Crown Class, Tree Age Lab 6

Objective: Continued introduction to basic tree measurements.

Part I: Measurements

You will group into groups of three. There are eleven labeled trees marked with orange and silver striped flagging surrounding a center tree marked with yellow and black flagging. **For each tree**, complete the measurements in the following table. You should make your measurements using paces and the clinometer **before** you use the laser. Use the laser to learn how to adjust your standard measurement techniques.

Note: We are not using tree "G" from last week's lab; Tree H has red striped flagging as well.

Note: Report total height to the following locations for the specified trees:

A	To 1st Fork	**D**	To Top	**G**	To Top	**J**	To Top
B	To Top	**E**	To Top	**H**	To 1st Fork	**K**	To 1st Fork
C	To Top	**F**	To 1st Major Fork			**L**	To Top

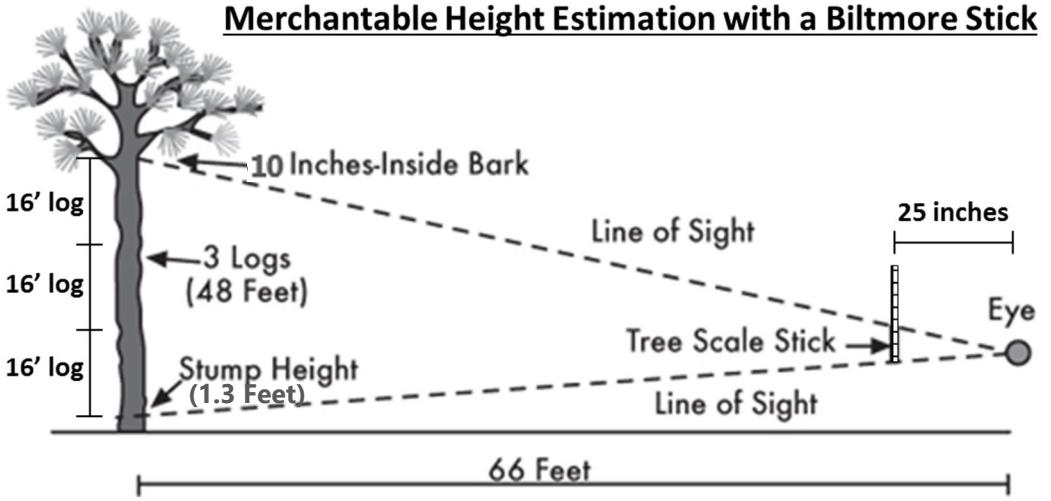
Tree (A-L)	**Azimuth to Center Tree**	**Distance to Center Tree**		**Total Tree Height**		**Merchantable Height** (see below)	**DBH**	**Crown Class** (D,CD,I,S)
	Compass (°)	**Laser** (ft)	**Check with Pacing** (ft)	**Laser** (ft.)	**Check with Clinometer** (ft)	**Biltmore** (16' logs)	**D-Tape** (0.1")	
A								
B								
C								
D								
E								
F								
G								
H								
J								
K								
L								

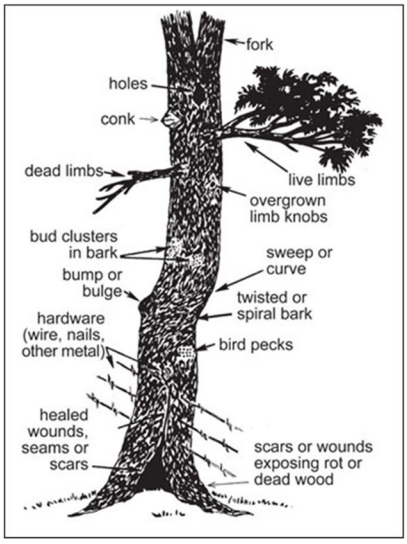
Questions

- How do the laser measurements for distance and height compare to those of your pacing and clinometer?
- Why do you think your values vary from the laser?
- How do you intend to improve the accuracy of your pacing and clinometer usage?
- What problems to you foresee in relying on the laser over traditional measures?

Notes

Merchantable Height Estimation with a Biltmore Stick





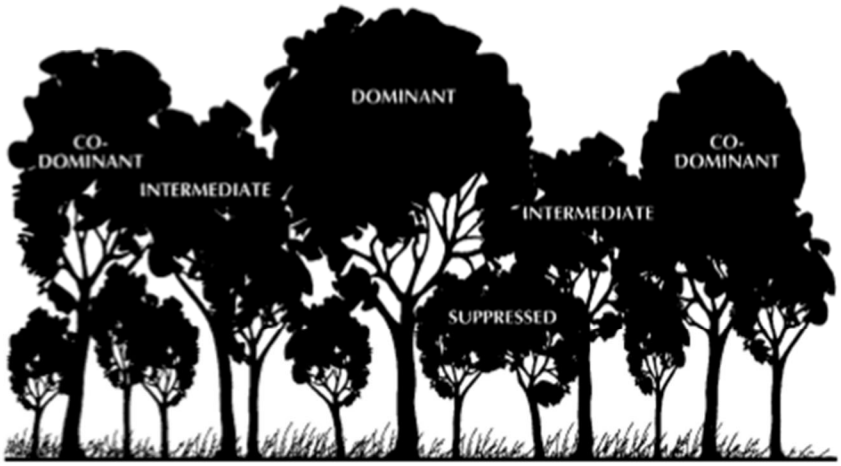
Common Flaws Limiting Merchantable Timber

For your purposes, merchantable height will include the usable portion of stem, from stump to minimum top diameter, found to be free of:

- **Rot**
- **More than minor wounds or damage**
- **Twists or sweeps**
- **Limbs**
- **Forking**
- **Deadwood**

Other issues pictured must be considered depending upon accepted guidelines and the intended use of the lumber (e.g., veneers).

Crown Class / Crown Position



Dominants

- Crowns receive full light from above, and partly from the side. Trees extend above the general crown levels.

Co-Dominants

- Crowns form at the general level of the canopy. Crowns receive full light from above, but little from the sides.

Intermediates

- Crowns generally below the dominants and co-dominants, but extending up into the general canopy level. They receive little or no direct light from above, nor the sides.

Suppressed

- Crowns entirely below the general level of the canopy. They receive no direct light from above, nor the sides.

FNR 353

GPS Data Collection

Objective: To familiarize yourself with the Avenza Maps free App and transfer GPS data into ArcMaps.

Part I: iPad Setup

- There are enough iPads for 10 groups of 2-3 students. We will use these today for uniformity.
- Please refer to the instructions on Blackboard for questions regarding the use of Avenza and data transfer into and out of the App.
- For the map pre-loaded onto your iPad, create two layers/features
    - Trees
        - Please use green markers for the tree points
        - For Trees, also create a Species attribute
    - Paths
        - Please use red lines for the paths
- Select the icons

Part II: Exported Data File into ArcMap

- Please use the sample TIFF and KML file posted on Blackboard to import data into ArcMap on the lab PC
    - Download the files
        - Save them someplace easy to access, such as Q:\Arc (i.e. in a folder named Arc in the root of your career account, whatever drive letter that is)
    - Follow the given instructions

Part III: Collect Some Data

- Go across the street to the Memorial Mall
    - Please use the crosswalks or mind the traffic
- Collect 10 point samples of tree locations
    - Name each location (e.g. T001, T002, …)
    - Include species information in the attribute (e.g. white oak or QUAL)
- Collect 4 individual paths along or around any of the sidewalks
    - Name each path (e.g. P001 or whatever is appropriate)
- Try to keep the point and path data assigned to their own layer
    - Note, you can select the points and paths after they have been collected and move them to a different layer if needed

Part IV: Create a Dropbox Account

- This is probably the easiest way to get the data off of these iPads
- Export the data to Dropbox according to the posted instructions

Part V: Import to ArcMap

- Import the base map and exported KML file into ArcMap (as we did above)
- Save the map showing the data and incorporate it into your report

Part VI: Report

- Write up a lab report (same format as usual). Include:
    - Introduction: What we do in the lab?
    - Results: Show the final map with the overlay data visible
    - Discussion: Include any problems you encountered and how you solved them.
    - Everyone submits a report, so share the exported data with your group.

Notes

Notes:

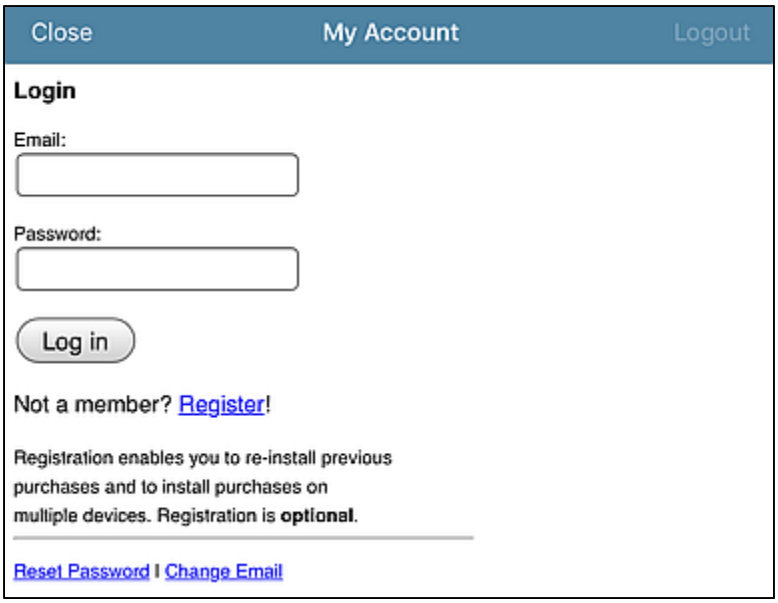
- To access Wi-Fi on the iPad, tap on the Settings App
    - Wi-Fi is listed on the left, near the top
    - Tap on PAL3.0 or attwifi as the network
        - PAL is faster but requires your username and password
        - attwifi will prompt you to confirm connection when first set it up
    - Tap the info icon to the left of a network and choose Forget to clear the stored information
        - Do this if you have trouble connecting and try again
- If you enter Dropbox logins information while in Avenza, make sure you sign out when finished.
    - Act as if you are adding a new map, select Dropbox as the source
        - If Avenza is already connected, tap on Log Off or Sign Out in the corner of the window
        - If Avenza is not connected but Dropbox is, select Sign Out in the upper right corner to clear your login information from the iPad
- **Make sure you clear any login information you entered before returning the iPad for use by another**

- Turn off Auto-Correction and Check Spelling
    - Entering tree species and technical data with auto-correct on is troublesome
    - Under Settings:General, tap Keyboard (on right, 2/3 of the way down)
    - Tap the green button to the right of each setting to turn them off

1. **Go to App Store or Google Play**
    a. Search for Avenza Maps
    b. Install or Get Avenza Maps App (free version if there is a choice)

    c. Wait for install to finish

2. **Start Avenza Maps**
    a. It may ask to allow access to your location
        i. Tap Allow
    b. For first run, tap I'm New
    c. You can register an account with Avenza to maintain any purchases and share between devices. You can also use the app without registering
        i. Either register an account or tap Close to get back to the Maps screen



    d. First map entry is Getting Started, which gives some basic instructions
        i. Tap on the entry to open
        ii. More detailed instructions are available at
            1. http://help.avenzamaps.com/?b_id=13810
        iii. Tap on back arrow to go back to maps
    e. Set GPS parameters
        i. While on Map screen, tap Settings icon in lower right corner
        ii. Set the following in GPS Settings
            1. Horizontal Accuracy = 26.25 ft.
            2. Distance Threshold = 6.6 ft.

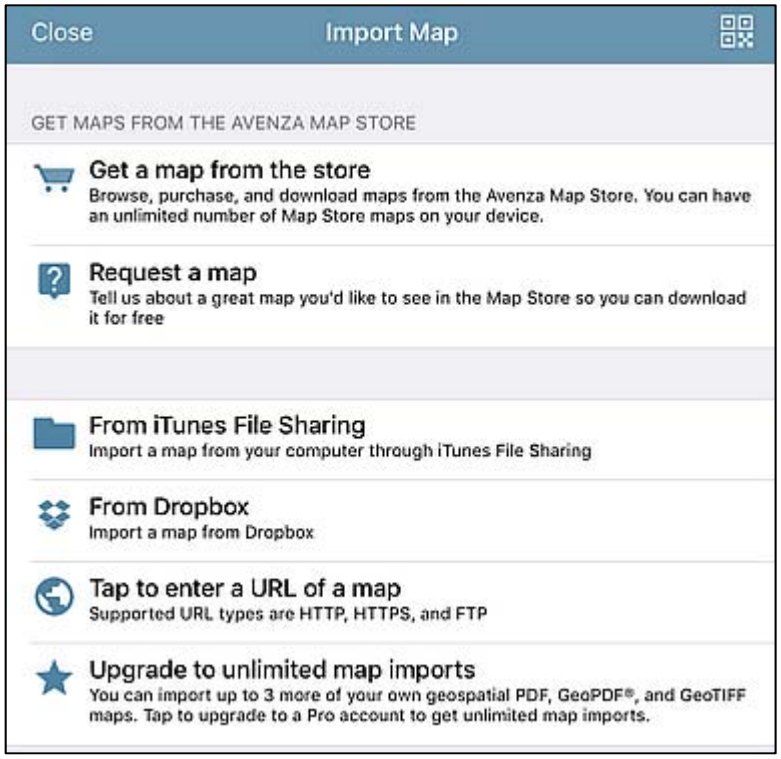
3. Time Threshold = 2 s
4. Ignore Suspicious Fixes = On

iii. Tap on back arrow to go back to maps

f. Add a base map

i. While on Map screen, tap add

1. There is a map file (*lab08.tiff*) on Blackboard in the Lab 08 folder
2. Use whatever method from the list you prefer to move the map onto your device (i.e. iTunes or Dropbox)



3. The file will download (it is 100MB, so it will take some time)
4. The map should appear under the Imported list
    a. Note: You can add up to three external maps in the free app.

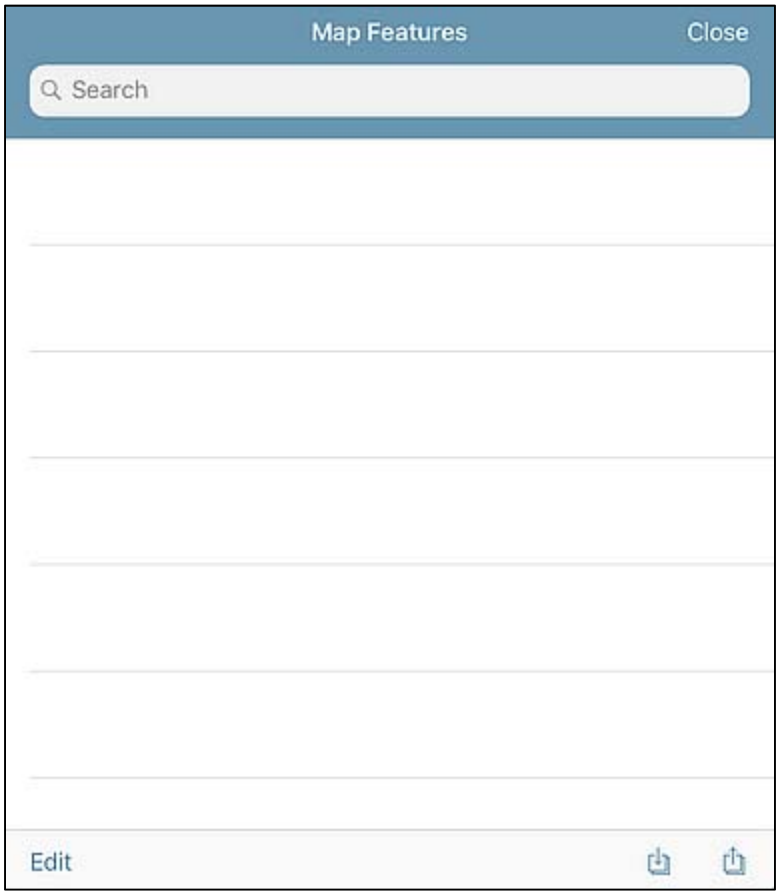
ii. Tap on the new map entry

1. You should see the area north of State Street, including the Memorial Mall

   a. Zoom in an out as usual to adjust your image
   b. If you rotate the image, you can realign it with north by tapping the compass icon in the top right corner
   c. The icon in the center is the active location

2. Tap the map settings at the bottom right

a. The features for this map will display



i. Tap Edit

ii. Tap the add layer icon at the bottom

1. A new layer will appear
    a. Tap the info icon
        i. If you see an orange check appear, you selected the item (useful if you wish to delete it)
        ii. Tap again on the name to deselect and try again
    b. Give the layer a name, such as
        i. Points, Lines, Polygons
        ii. Something relevant to your work
        iii. You need to tap to change the name
    c. Tap Set As Active Layer to make it the default
    d. Change the default icon and tracks style if desired
        i. Color and shape
        ii. Width and line type
        iii. Select to go back to the Layer
    e. Tap next to Add New Attribute
        i. As you did above, change the name (e.g. Species for a tree) and select the data type

ii. Select to go back to the Layer
iii. Add more attributes if desired

f. Go Back to Map Features

2. Add additional layers if desired
   a. One for each type of data (e.g. point, area, line, etc.)

iii. Tap Close on Map Features when done

3. The arrow icon in the bottom left corner sets the mode
   a. Sets map only mode (no GPS map tracking)
      i. Moving the map by hand will show the coordinates under the icon at the bottom
      ii. Placemarks will be placed at the display location (rather than where you actually are)
      iii. Your location will show on the map but the will not follow you
   b. Set GPS tracking on the map
      i. If you are in the map range, the icon will show at your location on the map
      ii. Placemarks will be placed at this location
      iii. If you are not on the map, it will say this at the bottom
      iv. If you manually move the map, the mode will change back to the one described above
   c. Set GPS tracking with map rotation
      i. As above, but map will orient to the direction you are facing
4. Placemarks
   a. Tap to mark the current location
      i. Note which mode you are in (map tracking or not)
      ii. An Add Placemark windows will open
         1. Give it and appropriate name under Title
         2. Select the symbol to use
         3. At the bottom under attributes, the layer designation for the data point is listed
            a. If the choice is not correct (i.e. if there is more than one layer available)
               i. Tap Move (to the right) to select a different layer
            b. If the layer has any attribute data (e.g. Species) then they will be listed below the layer name
               i. Tap on the attribute to enter the value
         4. When the information is complete, tap Submit to save the data
            a. A marker will appear on the map at the current location
   b. Repeat for all data points to collect.
5. Tracks

a. If you want to trace a feature (e.g. stream, path)

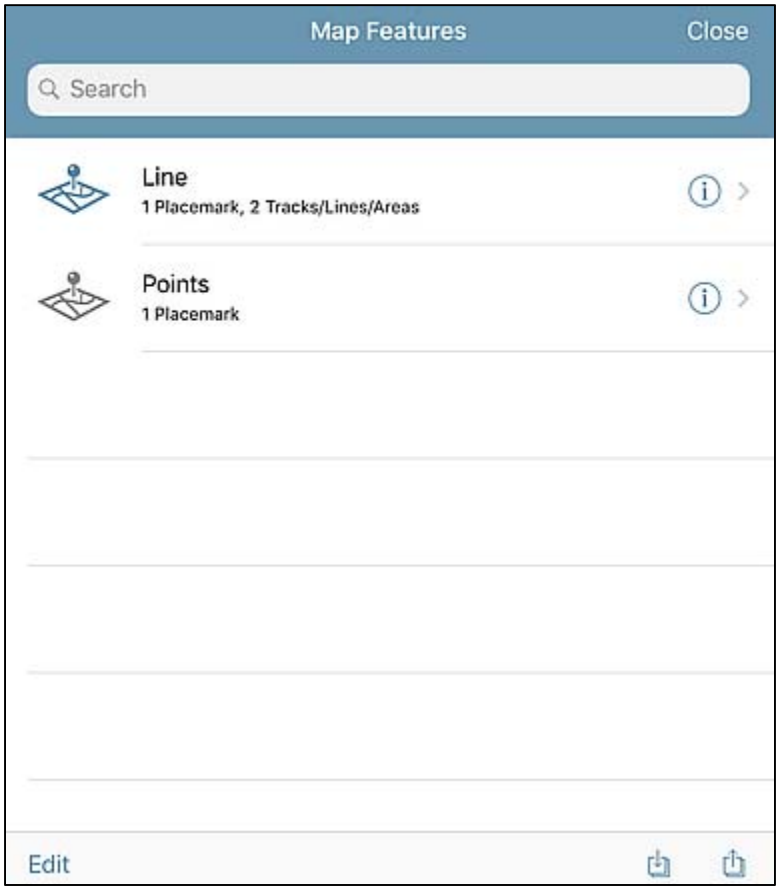
i. Tap on and select Record GPS Tracks

1. A Start and Cancel option will appear at the bottom of the screen
2. Tap start to begin
    a. GPS tracking will turn on
    b. The Start option will change to Stop
3. Walk the path to record
    a. Your path will display as a colored line on the screen
4. Tap Stop when finished
    a. A confirmation prompt to stop tracking will appear. Tap Stop
5. To name and assign the track to a layer, tap the track line on the map.
    a. Tap the icon that is next to the track name
    b. Enter the information and select the layer as you would for a placemarker (described above)

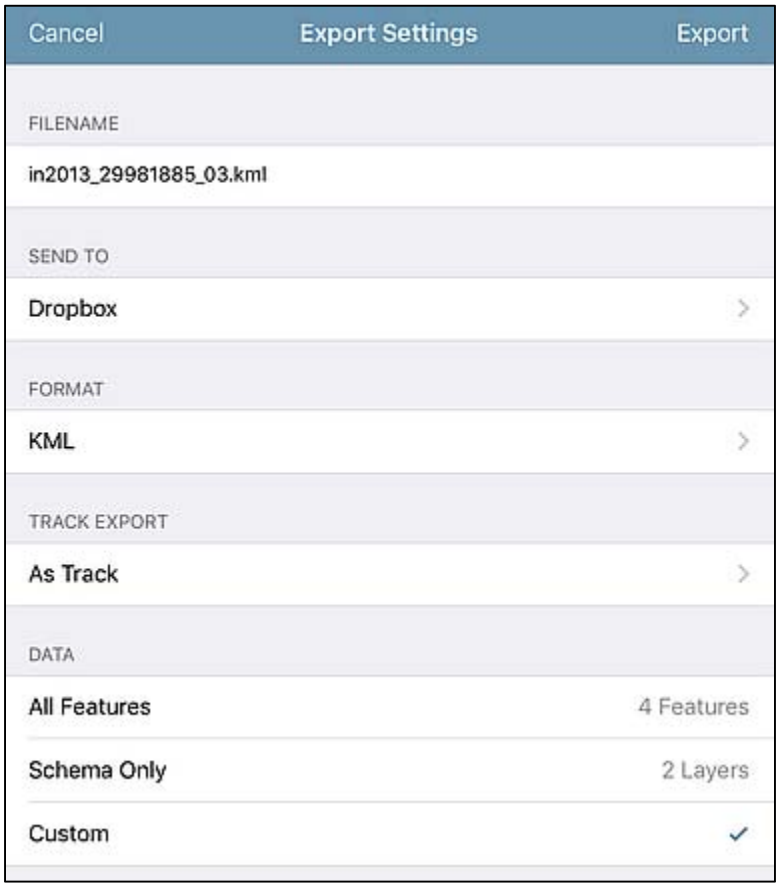
6. Getting your data

a. While viewing the map with the data points

i. Tap to view the layers



ii. Tap to export the later data

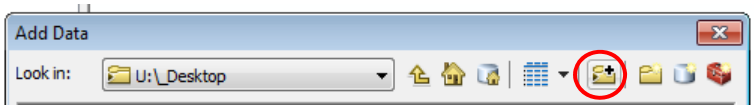


1. Under Send To, select the method to get the data
    a. Email, Dropbox, iTunes, AirDrop
    b. Choose whatever is easiest
2. Under Format, choose the file type
    a. KML (Google Earth) USE THIS
    b. CSV (comma delimited, no tracks)
    c. GPX
3. Under Data, tap All Features
    a. A checkmark should appear next to the number of features
    b. This will export all of the feature data
4. Tap Export to send the data
    a. Complete any required fields to connect to email, Dropbox or your method of choice
    b. Tap Upload if required

iii. Tap Close when finished

3. Data into ArcMap

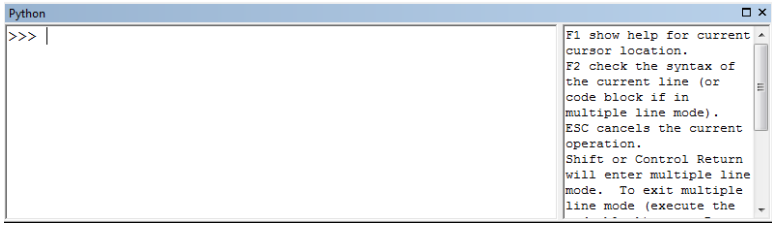
a. If you know how to get the data into ArcMap with your map file, then have at it
b. If not, follow the instructions below
    i. Start ArcMap (on desktop PC)
        1. Add Data
            a. Right click on layer or use add data icon
            b. Use Connect to Folder icon to locate image file saved above

i. 

ii. Select image file (the same tiff image file you loaded into Avenza)

c. In the menu, select Python under Geoprocessing
   i. Specific details are here
      1. http://resources.arcgis.com/en/help/main/10.1/index.html#//00120000004w000000

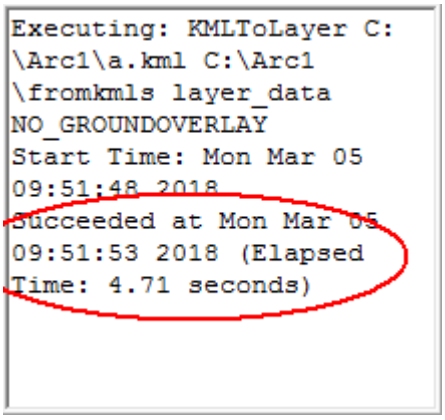
d. You will get something like this



e. The command is: **`arcpy.KMLToLayer_conversion`**
   i. The arguments are (see command example below)
      1. Input filename with path
      2. Output file path
      3. Output filename
      4. The surrounding **r** with single quotes allows for spaces in the names, so include them
      5. Example
         a. If the input file **a.kml** is in the folder **Arc1** on the **C:** drive
         b. And the output file **layer_data** will go into the folder **Arc1\fromkmls** on the **C:** drive
         c. Then the command to use is

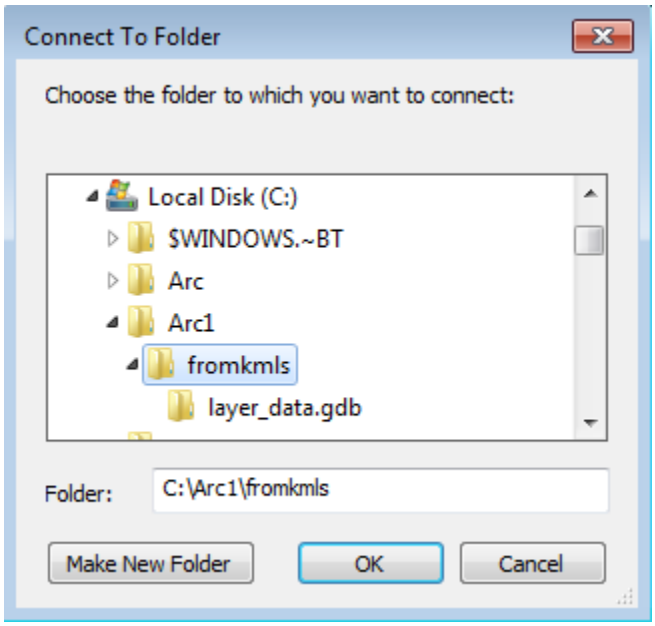
```
arcpy.KMLToLayer_conversion(r'C:\Arc1\a.kml',r'C:\Arc1\fromkmls','layer_data')
```

d. When finished, the box on the right will indicate success or failure

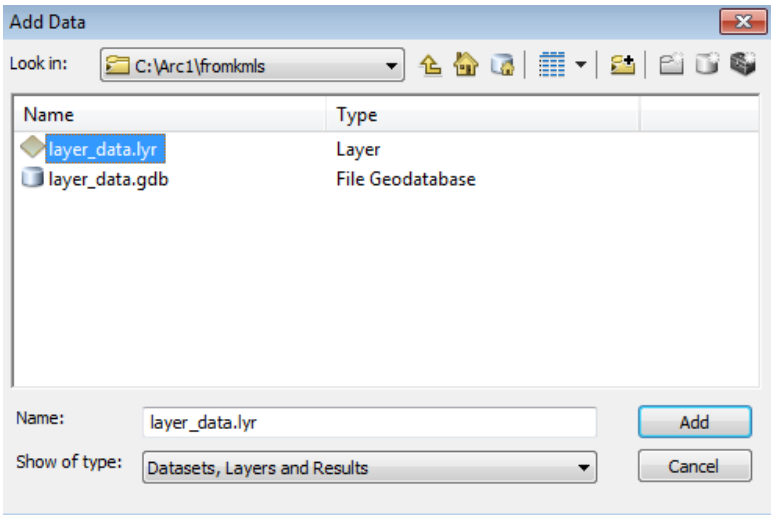


e. The data **may or may not** appear on the map and in the Layers pane. If it does not:
   i. Close the Python console
   ii. Use the add data icon

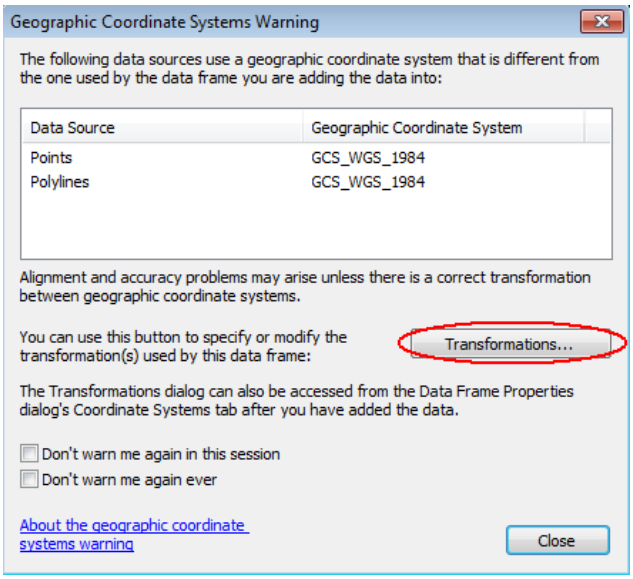
iii. Use Connect to Folder icon to locate the layer data (e.g. **`C:\Arc1\fromkmls`** above) and click OK



iv. Select the layer file and click Add



v. You may see a warning such as the following. If so, click the Transformations button to see the required conversion, make changes if needed, and then click OK



vi. Click Close in the window above to apply the transformation and the data should appear on the map

2. Save your map for later reference

4. Georeferenced map data

a. Additional map data may be acquired from here

i. Go to www.indianamap.org (on desktop PC)

1. Click: DATA and Resources

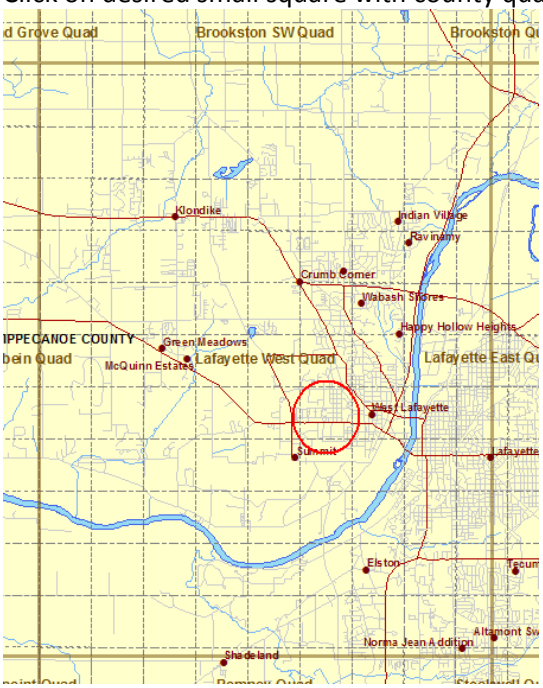
a. Click: Indiana Spatial Data Portal

i. Click: Download Data

1. Single File

a. Click on desired smaller square within county

b. Click on desired small square with county quad



   i. Note: the square to the left contains the map for Horticulture Park

c. Download desired map as follows
   i. +2013 IndianaMap Data
   ii. +RGBI Orthophotography
   iii. +GeoTiff
   iv. Choose file (in2013_29981885_03.zip for this lab)
   v. Save and Unzip (the site is SLOW so be patient)
   vi. Verify image (the .tiff file)
   vii. Save file somewhere and/or upload to Dropbox

FNR 353

Forest Inventory – Grid Plot Sampling

Objective: Introduction to conducting a forest inventory using fixed plot sampling.

For this lab, you will conduct a basic forest inventory by installing fixed area plots in a network across the woodland. You will also use the Avenza app to collect point and track data. The tree data you collect will be pooled and your reports will be based upon the overall dataset.

Inventory:

You will distribute into 10 groups of 2 or 3 in a north-south line beginning at a designated dispersal point (just inside the trail by the north lot). Groups will be 1.5 chains (99') apart. Distribute in group order (01-10) along the east side of the woods (see image and note fence line on east side).

Group number	1	2	3	4	5	6	7	8	9	10
Walk this far north to your first sample location (feet)	0	99	198	297	396	495	594	693	792	891

You will install fixed area plots spaced 3 chains apart running east to west. Your first plot will be at your first sample location. Use your GPS device to take a point reading at each plot location (record the plot number for each) and tracks between all of the points.

At each plot location, you will install a 1/20th acre fixed area circular plot (note: 1 acre = 10 chains x 1 chain) Use a tape measure to measure the plot area. **Record species and measure DBH for all live trees 6" or larger. Measure merchantable height for all live trees 14" DBH or larger**. Record each plot separately. Record two copies of the information. You will submit one copy before leaving lab.

When finished, move to your next plot location, take your GPS readings, and repeat the installation above. Repeat for a total of four or more 1/20th acre plots.

Report

Please answer all of the following:

From the pooled class data, include your determination of (by species and overall) trees per acre, basal area per acre, and volume per acre* (see below). Include standard statistics for each (mean, SD, confidence limits at 95%, etc.).

Based upon the results from the individual 1/20th acre plots, how many of these plots would be required for you to be 95% confident **of the mean basal area per acre to** within 10% error? (i.e., calculate BA for each of the 50 plots, determine variability and estimate the required number of samples needed.)

Calculate arithmetic and quadratic mean diameter for the stand. Is there a difference? Determine SDI for this stand. What is the Gingrich stocking level (%)**?

What are the shortcomings of this type of grid survey?

As usual: Turn in a separate report for each member, using the pooled data. Reports should include a title page, an introduction of what was done and how and a narrative description of the results with the actual results in captioned tables. Include copies of your field sheets and a map showing your sample locations and paths between them as an appendix.

Notes

* For volume, use International ¼", table 6 in https://www.extension.purdue.edu/extmedia/FNR/FNR-191.pdf or use the International ¼ formula from page 4.

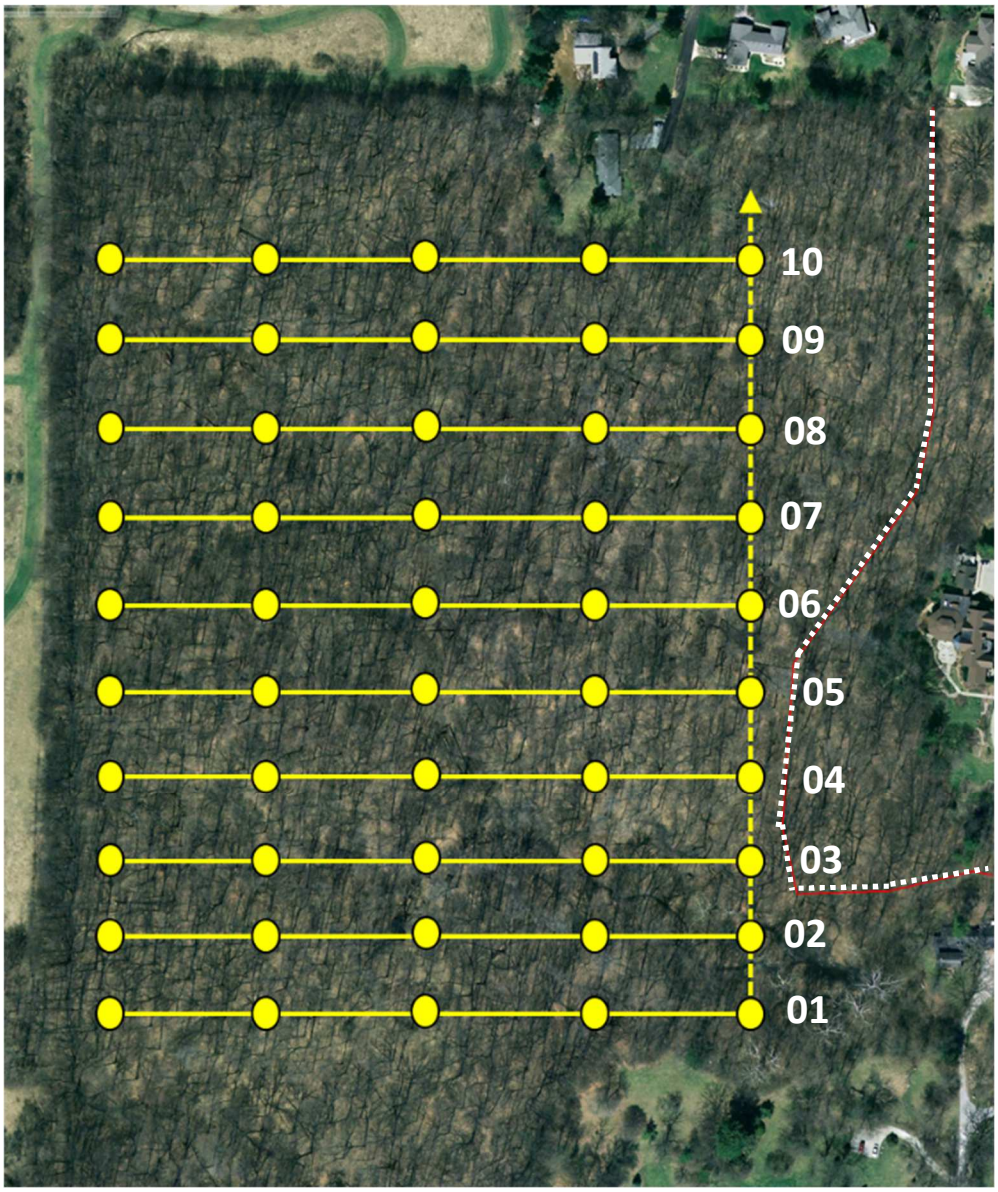
** For stocking estimates, use the following: http://oak.snr.missouri.edu/silviculture/mosilviculture/gingrich.pdf

March 19, 2018

FNR 353

Forest Inventory – Grid Plot Sampling

N



March 19, 2018

FNR 353 # Forest Inventory – Point Sampling Lab Point Plot

Objective: Introduction to conducting a forest inventory using prisms and variable radius sampling.

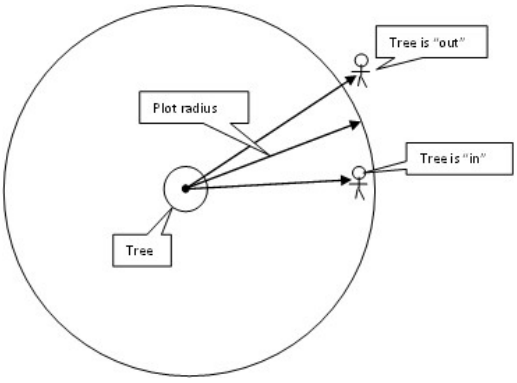
Spread apart in groups (2-3 people) from the meeting area toward the west (in group order). **Keep approximately 100 feet between groups**. Once inside the woods, pace **north** the distance indicated below.

Group	1	2	3	4	5	6	7	8	9
Distance (ft)	200	100	250	150	250	100	200	100	250

This will be your starting point. Each additional point will be 4 chains to the north. Each group will sample a total of 4 points. **The final lab report will be based on the pooled class data**.

Procedure Overview:

1. Select a BAF 20 prism
2. Locate your first sampling point
    a. Mark your center point
3. Use prism to identify trees to tally while rotating about plot center
    a. Keep prism over point center, start at azimuth 0°.
    b. Measure species and DBH (to 0.1") of tallied trees (only those living with DBH ≥ 6")
    c. Measure merchantable heights (to 0.5 log) of living trees of DBH 14" or greater
4. Verify any borderline trees with a tape measure
    a. Measure DBH
    b. Use PRF of prism (1.944 for BAF 20) to determine limiting distance for the tree in question
    c. Measure from point center to **tree center** with tape
    d. If measured distance is within limiting distance, tree is tallied
5. Move to next point and repeat.



Aside (*for non-prisms*):

To scale any object as an angle gauge (your thumb for example), use the following formula at a distance that exactly obscures the tree of interest (tree width at BH just matches object width held at arm's length):

$$BAF = \left(\frac{8.696 \times DBH\ (in\ inches)}{Distance\ from\ eye\ to\ tree\ center\ (in\ feet)}\right)^2$$

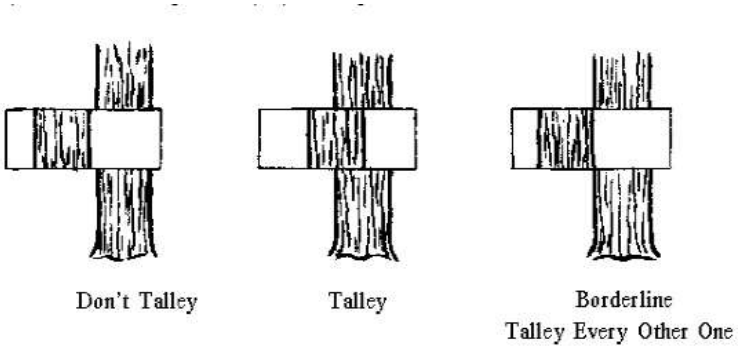
Report

From the **pooled** class data, include your determination of (by species and overall)

1. Basal area per acre
2. Trees per acre
3. Volume per acre (International ¼-inch)
4. Include standard statistics (mean, SD, confidence limits at 95%, etc.)

As usual: Turn in a separate report for each member. Reports should include a title page, an introduction of what was done and how and a narrative description of the results with the actual results in captioned tables. Include copies of your field sheets as an appendix.

Prism Use



Leaning Tree

Notes:

- Pay attention to the BAF factor marked on any prism or gauge you select
  - The prism or gauge selected should yield 5-12 trees per sample point (8-10 ideally)
- Prism must remain over center of sampling point and may be any distance from your eye
- If using an angle gauge
  - Your eye must be over the center of the sampling point
  - The gauge must be the appropriate distance from your eye
- Hold the prism so that the thicker and thinner sides are to the right or left (not the top or bottom)
- Keep the straight side of the prism parallel with the axis of the tree stem
  - If the tree is leaning, tilt the prism to match
  - The same applies to angle gauges
- If one tree obstructs another, move laterally until you have a clear view <u>but be careful you maintain the same distance to the tree of interest</u>