Assignment 3

The exercises for Weeks 5 and 6 cover the essential skills: (1) tree and plant identification, (2) vegetation classification, (3) forest measurements, and (4) avian surveys. These exercises are presented below by week. All of the exercises are mandatory to fulfill the requirements of certification for the Environmental Field Skills program.

This assignment includes both field and office-based activities. The environmental technician does more than only field work but often needs to complete office work to understand their sites of work prior to going into the field or afterward when writing reports and documentation on work done. The vegetation (ecological) classification exercise is intended to introduce you to this background information that will help you better understand your field sites.

Vegetation (Ecological) Classification, and Tree and Plant Identification

Office Work:
Vegetation (Ecological) Classification:

Determine the ecological classification of the area in which you live using the Eco-Regions of North America located here: https://www.epa.gov/eco-research/ecoregions-north-america.

With this website the first page will show you Levels I, II, and III of the ecological classification. Scroll about three quarters of the way down the page and you will see a section called “Downloads”. Within that section are links to three maps. There is one map for each of the levels I, II, and III. When you open the map you will have to expand or magnify sections of the map in order to see the numbers associated with the area you live and to then look those up in the legend to see what the name of the area is. Record the names of each of Level I, Level II, and Level III for your area in your field notebook.

To identify your Level IV ecological classification we will actually be looking at the state level. Staying on the same page that you first landed on, if you look on the right side of the page there is a section called “Related Links” and near the bottom of that list is a title saying “Level III and IV Ecoregions by State”. Click on that link. You can then select the state in which you live, and under maps select the poster view. That will then give you a magnified image of your state and allow you to see the Level IV classification in which you live. There is a brief bit of written text describing each unit of this level. Select the level IV unit in which you live and read a little bit on the ecological classification in your neighborhood.

Note also, either on the back side of the map page or as a separate document are characteristics of each of these Level IV classifications. Look up the Potential Natural Vegetation for your area and record those in your notebook. These are indicator species and what we look for as representative of this ecological community. You will be looking for these indicator species while you are out in the field.

Create a data table (Data Table 1) on a piece of paper (not in your field notebook as this is not field work) as below. Record the ecological classification of Levels I to IV, and the indicator plants of your Level IV classification, on the data sheet. Be sure to include your location in the table as well.

Data Table 1: Vegetation (ecological) classification of my home area.
State: _____
Site location (describe): _____

Classification level	Name of level	Indicator plant species (Level IV)
Level I		
Level II		
Level III		
Level IV		

Field Work:
Tree and Plant Identification:

Part 1: Practicing the Fundamentals of Plant Identification

The first part of tree and plant identification is observing deeply and carefully. This first activity is a practice of doing just that. If you live in an area where the leaves are out on the plants, choose one plant, ideally a tree or a shrub, and observe the leaves on a twig as well as an individual leaf. If leaves are not on your plants, try this with a houseplant or an indoor plant. To assist with the observation, we’re going to do two sketches.

- First, sketch a single leaf that you see and label the parts. The parts to be labeled are the blade, the petiole, and the veins. Make notes on leaf shape (linear, elliptic, lanceolate, etc.) and margin (entire?, serrated? lobed?). Note whether the leaf is simple or compound.
- Now examine the twig with multiple leaves on it. Are they arranged in an alternate pattern, or are they opposite, or are they whorled? Sketch the twig in your notebook.

We'll now move from looking at parts to looking at the whole. Select three trees or shrubs that appear to be different species. Carefully examine each tree or shrub noting:

- **Leaves:** Does it have leaves or needles? If leaves, are they simple or compound? What are the leaf margins like? What is the leaf shape? If they are needles, are they long or short? Bunched together or distributed uniformly along the branch? Describe the leaves in your notebook.
- **Bark:** What is the color of the bark? What is its texture (smooth, rough, furrowed, etc.). Are there any unusual features to the bark? Describe the bark in your notebook.
- **Shape of the tree or shrub:** Does it grow straight and tall, like a church spire? Is it low and spreading? Are there multiple stems or only one? Is it bushy? How high off the ground before the first branches? Describe the shape in your notebook. Better yet, sketch the shape in your notebook.

Photograph the bark, the leaves, an individual leaf, and then step back far enough to photograph the entire tree or shrub from top to bottom.

Try to identify each of these trees or shrubs. There are many online sources (google 'plant identification' or 'tree identification' if you want to know where to start). Try searching for trees and shrubs of your state, as many states have guides online specific to their area alone. Use your photos to compare with photographs in guides, but then use your notes and sketches on leaves, bark, and growth form to confirm your identification.

Part 2: Identifying Indicator Plants

Now to apply these fundamental skills to identifying specific species. Having identified your ecological classification, now go out and look for the characteristic (indicator) vegetation – what are called 'Potential Natural Vegetation' in the ecological classification system. We will focus our plant identification on those species representing the ecological zone in which you live. Look for examples of those species listed in the ecological classification. Identify these plants as you encounter them. They should be common since they represent the environment of the region. Record those indicator plant you identify in your field notebook.

Upload a photo of one of your indicator species to PadLet. Include your identification of the plant and what the characteristics are that make you think it is that plant.

Vegetation and Ecosystem Surveys:

Part 1: Quadrat plot (visual estimate of cover)

Go to an area with some vegetation. Lay out a quadrat here by pushing four stakes or twigs into the ground in a square approximately 1 meter by 1 meter and use string to go from stake to stake to create a square shape enclosing the plot of ground. Now we're going to do a quadrat sample for percent cover. You aren't expected to identify the plants within the quadrat as they're likely to be very similar and difficult to identify, but hopefully you'll have three or four species that at least look different.

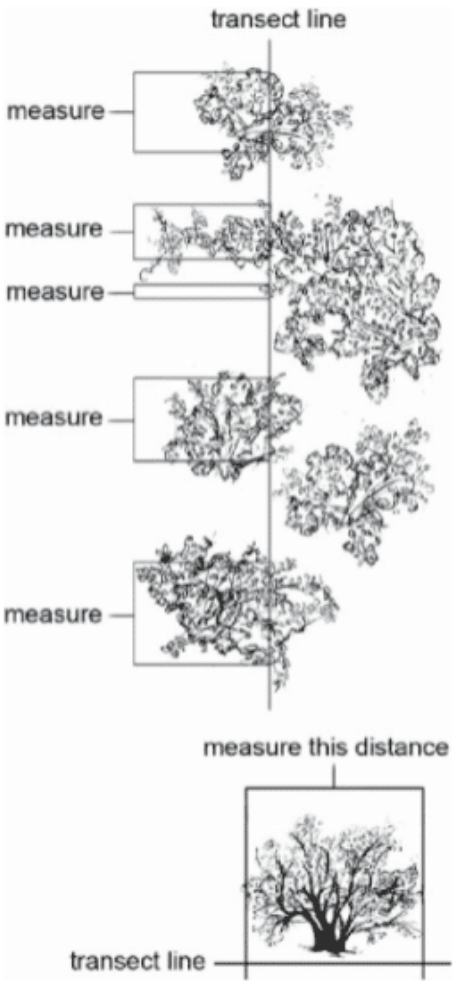
For each of these different-looking species, estimate the percent cover by that species of the square that you've created. If you're working in a group or with at least one other person, each observer will do this by themselves and record their data in their field notebook. You can then compare with your colleague's data to see how close you are in estimating cover. When we have differences of opinion based on these visual estimates, we then discuss and negotiate with the others to try to arrive at estimates that we all can agree with. This means explaining to others why you think the cover is what you estimated. All observers have a chance to describe why they think the cover is what it is, then we try to find the common ground we can all agree to in terms of what the best cover estimates are. This process applies whenever we're estimating (areas, distances, number of geese in a huge flock, etc.) as we're all biased in our estimates and people are typically quite poor at estimating until they've had a lot of practice.

Photograph the plot from directly above to the best of your ability in order to show the entire plot.

Try this in one or two other locations as well with different vegetation cover.

Part 2: Line-intercept transect (measured estimate of cover)

In addition to the quadrat, we'll also do a line intercept transect. Here you'll take your string and lay out a straight line along a compass bearing. Try to select an area with overhanging vegetation, such as a forest or shrubby field, not just a level grassy yard. Record the compass bearing of the transect in your field notes. Lay out the line at least 10 meters long. Record the transect length in your field notebook. To begin the survey, start at one end of the line and walk slowly along the transect. We'll include any plant more than 10 cm (3 inches) above the ground that crosses this line (this is why we want a forest or shrubby field; we're only interested in plants greater than grass height for this exercise). Where part of a plant – a leaf, a limb, a twig, a log – crosses the line, record the length of tape over which the plant lies or passes under (see figure below). For example, a pine branch may extend over 10 cm of the length of the transect. Record that in your field notebook for each plant that crosses the line.



When you've completed the transect, calculate the percent cover along that line. This is done by adding all of the individual measures of plants that crossed the line and dividing that by the total length of the line. Be sure you're using the same measurement system for both the transect length and the individual measurements; either metric or imperial. You may have to covert units if you measure the transect length in meters and the plant crossing in centimeters.

Forest Measurements and Avian Surveys

Field Work:

Forest Measurements:

For the field work, choose an area close to where you live that has trees and preferably as natural a forest or landscape as you can practically get to. A nearby park (city, municipal, State, or National) would work very well, but failing that, choose as natural an area as you can find nearby. You will need access to a patch of trees where you will be able to measure at least five trees. We will be establishing a fixed-radius plot, determining diameter at breast height (DBH) and height of the tree for a smaller sub-sample, and identifying the trees to species.

Fixed-Radius Plot Sampling of Trees

Walk a short way into the patch of trees and find a comfortable place to work with some trees around you. **For purposes of this exercise and the need to calculate tree heights, establishing your plot on level ground will make tree height calculations easier.**

Establish a centre point of your plot. Often we drive a shovel into the ground and call that the centre of the plot. For our purposes, select a small tree or a shrub that you can identify as the centre point. Tie a piece of flagging tape to it or wrap a piece of masking tape on a branch to identify the plant you have selected as the centre. All radius measurements will be taken from this point.

Based on the visual density of your stand, determine an appropriate radius to be used in your plot from the table below. Selection of this radius determines the area of your plot.

Plot Radius (ft)	Plot Radius (m)	Assessed Area (ft^2)	Assessed Area (m^2)	Where used
13.1	3.99	540	50	Forest regeneration plots, silvicultural surveys, high density stands
18.5	5.64	1,075	100	Young forest plots, understory surveys
26.2	7.98	2,160	200	Mature forest stand of medium density
37.0	11.28	4,300	400	Mature forest stands of low density

Measure out your radius from the centre point. Stretch your tape out from the plot centre in various directions to determine the edge of your plot. As you walk out each distance, flag or put masking tape on each tree that is at the outer edge of the plot. If you do this in 5-8 directions you can then mark those trees that are along the outer edge of your plot. You will be assessing all of the trees within the plot, including these ones that represent the outer edge or circumference.

Standing back at the centre, count the number of trees in your plot and create a table in your field notebook similar to the one below (Date Table 2). Provide a row in the table for each tree and number the rows. Note the table has a title; always include a descriptive title to a table or map or figure in your notebook so you know what it is of. Note also the radius used and the area of the plot (area is from the table above once you have chosen your radius).

Data Table 2: Forest measurements: Fixed-radius plot surveying
Radius of plot = _____ (include whether in metres or feet)
Area of plot = _____ (include whether in m2 or ft2)

Tree	Species	DBH	Slope angle (%) to top of tree	Slope angle (%) to base of tree	Slope angle (%) to eye level on tree	Distance from observer to tree
1						
2						
3						
4						
Etc.						

Tree density of plot: _____

Summary of Diameter at Breast Height
Mean Diameter at Breast Height: _____
Median Diameter at Breast Height: _____
Range (minimum and maximum) Diameter at Breast Height: _____

Summary of Trees Heights
Mean tree height: _____
Median tree height: _____
Range (minimum and maximum) tree height: _____

Prior to actually conducting the survey, draw a survey sketch map in your notebook indicating the trees in your plot. Make sure your site sketch includes all the essential information as outlined earlier in the course.

At each tree, collect the following information and complete Data Table 2:

- Tree species (identify to the best of your ability)
- Diameter at breast height (DBH): Since you are unlikely to have a DBH tape, which is a specialty tool for this, using a tape measure, measure the circumference of the tree by wrapping the tape around the tree at breast height and recording the circumference of the tree. We present in Office Work below how to convert from circumference to DBH.

Typically for a forest plot we also use our clinometer to collect the data to calculate the height of each tree in the plot. For the sake of this exercise, **collect tree height data for a minimum of three trees.** You'll use the clinometer, or one of the alternatives discussed in Week 4, just as you did previously for the slope surveys. Using the clinometer, determine the:

- Slope angle to the top of the trees (in percent)
- Slope angle to the base of the tree (in percent)
- If on uneven ground, slope angle to your eye height on the tree (this is the slope angle of the ground itself and is necessary to calculate horizontal distance)
- Measure also the distance from where you're sighting on the tree to the tree itself. Record these in your data table.

Avian and Herpetofaunal Surveys:

One form of wildlife survey is a casual walk along a trail or little-used road, any area where animals will be relatively little disturbed. For this exercise, go out for a walk, minimum 45 minutes and watch for birds, reptiles, and amphibians (the abundance and activity of these animals will be seasonally dependent upon when you are taking the Environmental Field Skills program). For best effectiveness, when looking for birds the earlier in the morning the better (dawn is the best time if you can get out for that time); for reptiles late morning – the period between when it is too cold for them to be very active and the afternoon when heat drives them back into cover – is best. And for amphibians late afternoon and evening is best. Whatever time of day you go out, keep an eye and ear out for all of these.

As you go on your walk through the landscape pay attention to the presence and abundance of birds and potentially reptiles and amphibians. Walk quietly and slowly to create as little disturbance as possible.

The birds: Look up in trees and the sky as well as close to the ground. As you walk along, attempt to identify and count the birds you see. As a beginner, taking it to the level of songbird, warbler, jay, crow, hawk, and so on is fine. Identify those species that you can. When you don't know a species, use characteristics like body size and shape, and colour pattern to identify. For an unknown species, record as many identifying characteristics (colour of patches, where they are located, size (i.e., hummingbird size, sparrow size, crow size, eagle size, etc.). Record the number of each species seen, to the best of your ability. If possible photograph the bird or make a quick sketch in your field notebook showing the relevant features.

Do not worry about seeing and identifying every bird. Bird identification is a learned skill and takes a long time to become proficient with a large number of species. Focus on the common and distinctive (easily recognized) birds that you see.

While doing this look for more than just the birds themselves. Keep an eye out for nests, cavities in trees, feathers on the ground, carcasses, etc. You are looking for sign of birds, as well as the presence of the living animal. Record in your notebook any observed sign and approximate location. If you have a GPS, record the location using that. Record, and draw or photograph, nests, cavities, or feathers you may find.

For those birds that you could not identify easily in the field, once back at home try to identify them from your memory of the bird, photographs if you managed to capture any, or notes and sketches you may have made. A field guide is valuable for this and they can be bought in second hand book stores for less than $5; the field guide is meant to be used in the field while still looking at the bird. If you do not have a field guide, try using one of the online resources to identify your bird(s)

The reptiles and amphibians: While on your walk keep an eye out for any reptiles you see (snakes, lizards, turtles). Also listen for any calling amphibians (frogs or toads). Record in your notes and observations or hearing of these animals.

Office Work:

The collected forest measurement field data will require a bit of workup to be meaningful for describing the site. These data are to be worked up back at home, not in the field.

Once back at home copy Data Table 2 onto a clean piece of paper. You will be summarizing your data here as these are office calculations and data summaries, not notes collected in the field. Then:

1. Calculate density of trees in your plot:
This is done by dividing the number of trees in your plot by the area of the plot. Your density will be expressed as trees per m2 or ft2. Write your estimated density on the data sheet below Data Table 2.

2. Convert tree circumference to Diameter at Breast Height

You recorded the circumference of the trees in your plot. To convert to diameter-at-breast height (DBH) simply divide your recorded circumference by π (=3.14). For example:

If my circumference is 34 cm my DBH is 10.8 cm (that is, 34 cm ÷ 3.14 = 10.8 cm)

Calculate the DBH for each of your measured trees and write these in the Data Table 2. Calculate the mean and median DBH for the trees in your plot.

3. Calculate height of trees
Calculate the heights of your measured trees (minimum of three trees) as presented in the online module and discussed in the live session. As a reminder, the calculation is:

Rise tree height = ((% angle to top of tree + % angle to base of tree)*distance to tree) / 100

Note: Recall that this is only the height of the tree on level ground. If you measured your trees from upslope or downslope, the calculation is slightly more complicated. See the online module and recording of the live session if you need clarification on calculating tree-heights on non-level ground.

Record your tree heights in Data Table 2. Calculate the mean and median tree height for the trees in your plot.

Information to be Submitted to NRTG

In this assignment we have continued the use of data tables, but also included the requirements for calculations of field collected data. The submission requirements for these exercises are photographs of your: (i) data tables, (ii) quadrat plot, and (3) an indicator plant species in your area. In addition, inclusion of calculated results of a variety of field data are required on Data Table 2. Also note, that we ask that you submit some particular information in the body of the email that you are submitting your assignment. **Do not submit more than is requested (that is, do not submit the tile page or your sketch map or anything else not explicitly requested below)**

When submitting photographs please attach all photographs to a single email. Multiple emails risk being lost in the large number of emails we receive and so ensure all of your submission is attached to a single email. Specifically, the submission requirements for the assignment of Weeks 5 and 6 are:

- Vegetation (Ecological) Classification
  - ◊ Data Table 1: Ecological classification of home area
- Tree and Plant Identification
  - ◊ Uploading a photo of an indicator plant to PadLet, with identification of species and identifying features that make you think it is that species.
- Vegetation and Ecosystem Surveys
  - ◊ A photograph of one of your quadrat plots for cover. **Within the email in which you submit the assignment provide your estimate of percent cover within the plot by the different plant species.**
- Forest Measurements
  - ◊ Data Table 2: Forest measurements: Fixed-radius plot surveying
  - ◊ Data analyses:
    - Tree Density of plot
    - Summary of Diameter at Breast Height
    - Summary of tree heights
- Avian and Herpetofaunal Surveys
  - ◊ **Within the email in which you submit the assignment, describe your avian/herpetofaunal survey. Include data, location, time spent (=effort), observations, and confidence in accuracy of identification.**