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Estimation of Plant Cover
Exercise 6

Plant cover is an important parameter because plants "cover" the ground and protect it from the impact of falling raindrops and resulting erosive forces. Plant cover also provides shade at the soil surface ameliorating temperatures and modifying the micro-climate. Cover is one of the primary measures and is collected in most scientific and managerial inventories conducted on rangelands. In this exercise we will measure the canopy cover of plants using several different techniques.

Plant Cover from Quadrats

One means of determining cover is with the quadrat and the procedure is similar to the procedure we followed when measuring density or biomass, indeed these measurements are often taken simultaneously. The cover of each quadrat is estimated by the surveyors as they progress from sample to sample. Cover can mean several very different things depending on how the measurements are taken:

1. **Basal Cover** is the area covered by the base or stem of the plant and is the most stable measurement of cover from season to season and year to year.
2. **Foliar Cover** is the coverage of the leaves of the plant "shadow with the sun directly overhead"
3. **Canopy Cover** is the coverage of the plant ignores gaps in the canopy and can be thought of as a polygon that contains the plant "leaf tip to leaf tip"
4. **Ground Cover** includes rocks and gravel coverage along with foliar and litter cover and is a measure of the surface of the ground protected from erosion

It is important therefore, to be specific as to what was being estimated and how the estimate was generated.

Daubenmire Frame or Quadrat.

This quadrat is used to estimate cover classes in specially constructed quadrats as described by Rexford Daubenmier in 1959. He employed six separate cover classes:

Cover Class	Range of Coverage	Midpoint of Range
1	0 - 5%	2.5%
2	5 - 25%	15.0%
3	25 - 50%	37.5%
4	50 - 75%	62.5%
5	75 - 95%	85.0%
6	95 - 100%	97.5%

Quadrats are generally laid out at regular intervals along a transect and the cover is estimated for each quadrat sampled (see handout from the BLM). Daubenmier's method does not have equal sized classes which limits quantitative analysis of the data.

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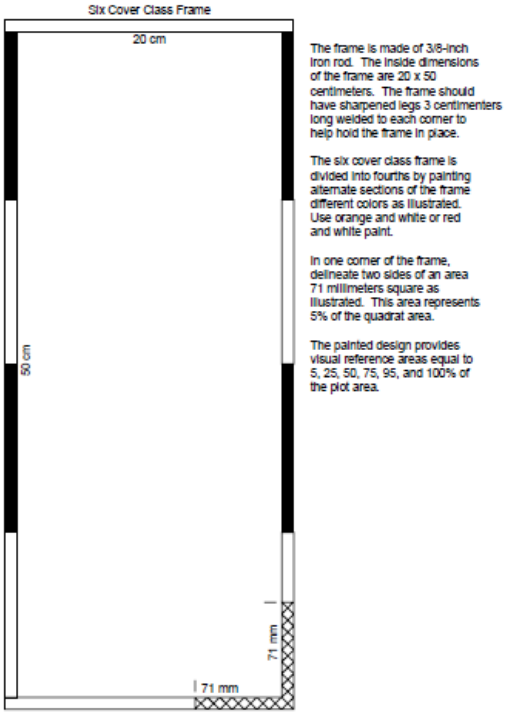
Rangeland Monitoring

Daubenmire Frame



The frame is made of 3/8-inch iron rod. The inside dimensions of the frame are 20 x 50 centimeters. The frame should have sharpened legs 3 centimenters long welded to each corner to help hold the frame in place.

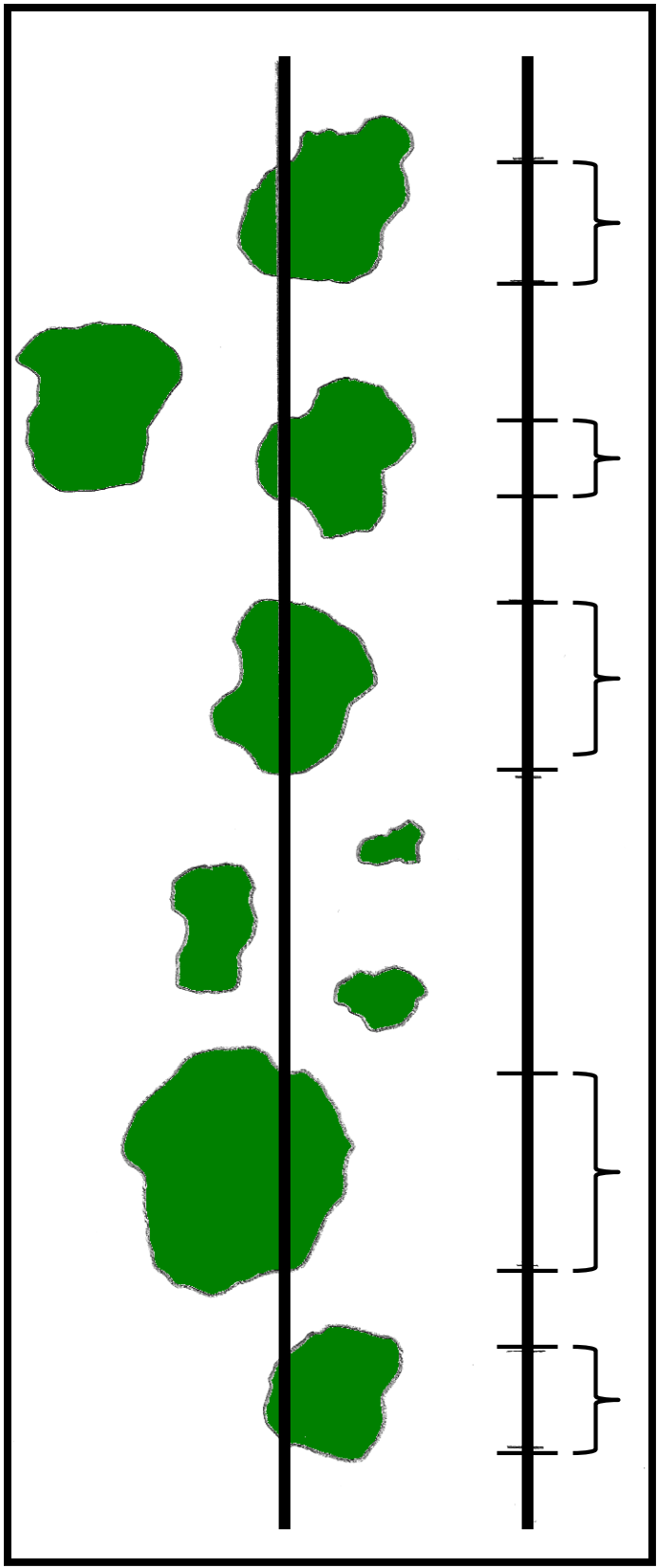
The six cover class frame is divided into fourths by painting alternate sections of the frame different colors as illustrated. Use orange and white or red and white paint.

In one corner of the frame, delineate two sides of an area 71 millimeters square as illustrated. This area represents 5% of the quadrat area.

The painted design provides visual reference areas equal to 5, 25, 50, 75, 95, and 100% of the plot area.

the line intercept method. This method employs a tape that is stretched from a random starting point in a random direction. The coverage of each plant (or plant functional group) is measured along the line by recording the start and stop values on the tape and subtracting the larger from the smaller. This method works well with shrubs and bunch grasses. It works with trees as long as the edge of the canopy can be accurately positioned. After the transect is read, the distance of each shrub is calculated and summed to get the meters of coverage. Plant or shrub coverage/tape length) x 100 is the percent cover for that sample. Because the whole line is read for the cover value each line represents 1 sample. Some transects are shorter or longer than the ones we are reading today, for example, in desert vegetation we may use a 50 m transect or for ranch use we may choose 100 ft.

There can be some confusion on what constitutes shrub cover since there are often gaps in shrub canopy. Younger plants typically have a more regular circular shape while older shrubs are often highly irregular in outline. You must



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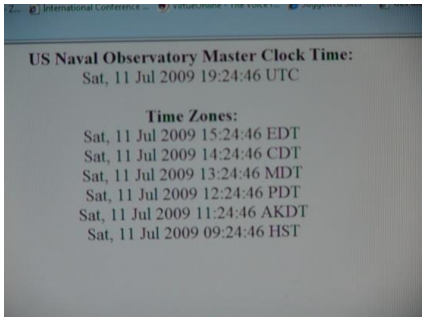
also read the tape from directly above the intersection point or you can introduce errors from parallax. Trees can pose a problem as well and it helps to have a pole with a bubble level attached for a reference so that line position is accurately assessed.

Lines that are used for vegetative cover may be permanently marked, GPS positioned, and read periodically for years. Permanent transects are often coupled with photographic samples to increase their value in detecting ecosystem change. Photos are taken on each end of the transect, looking in the direction of the line. A high angle oblique or straight down image of an area 3 ft. by 3 ft. is also usually taken at each end.

In this lab we will also be photographing our transect using digital charting methodologies developed here at OSU's Department of Rangeland Ecology and Management. Your instructor has a digital charting device that consists of a staff, camera head, compass, bubble level, GPS and digital camera. We will walk along the transect taking images every meter. The top of the camera will be pointed southward to reduce the shadows in the image. Our staff will be set so when it is leveled the camera is at a set height above the ground. The first image we will take in the field will be of a ruler on the ground which will allow us to scale the images so it can be used for measurements. The Sony camera we will use has a 3 to 2 image ratio and have a pixel size of 3264 x 2488. Prior to going to the field I took a picture of the US Naval Observatory's Master Clock via the Internet (as shown below).



This allows us to determine the offset of the camera clock with Universal Time. The offset will be used to choose the position that corresponds with each image by matching time the image was taken and applying any clock offsets. Our program will also build a photograph position file that we can open in a GIS to see where our photos were taken.

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With your group, please measure the basal area and the canopy cover of shrubs on the transect using the traditional methods described above. Also photograph the transect lines using the digital charting methodologies described. Each team will sample five 30m transects.

Transect Centimeters of Intercept % Cover

1. _____

   _____

2. _____

   _____

3. _____

   _____

4. _____

   _____

5. _____

   _____

Calculate:

Total Shrub Intercept = _____cm
Mean ± SE Shrub Cover = _____%

Total Tree Intercept =_____cm
Mean ± SE Tree Cover =_____%

Questions :

1. How much error is intrinsic to your estimates of shrub canopy cover?
2. Where does this error come from?
3. How could you improve this technique?