

Cover

Rangeland Monitoring and Measurements

RS332 & RS532
Elzinga, Chapter 8, pages 178-186

Announcements

- Problem Set 3 – DUE
- Problem Set 2 – Return
- Exam is approaching.....
 - Lecture and lab material through cover
 - EXCLUDING utilization
- Field Trip – TUESDAY!
 - Dress accordingly
 - Meet in classroom
 - Head to vans promptly after announcements

Cover

- An area of vegetation, or other surface features, in relation to the area of ground.

Types of Cover

Ground cover: Percent of soil surface that is covered by litter, rocks, vegetation, etc.

Basal area or basal cover: Area of plants at ground surface.

Canopy cover: Vertical projection of PERIMETER of plant canopy to ground. Ignores small gaps in canopy.

Foliar cover: Area of ground covered by leaves. Canopy cover MINUS gaps.

Basal & Canopy Cover

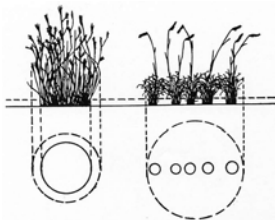


Fig. 14. *Arctostaphylos* (left) and *Abutilon* (right) showing the difference between maximum spread of the foliage and basal area. (Lusk, 1952)

Foliar & Canopy Cover



Figure 6. Foliar cover.

Figure 7. Canopy cover.

Expressions of Cover

Leaf area index: Total area of all leaves relative to ground surface. May exceed 100%. Indicator of photosynthetic potential.

Absolute cover: Plant cover relative to ground surface. Area covered by species X / total area.

Relative cover = Percent composition by cover: Proportional contribution of one species' cover to total vegetation cover. Cover of species X / total vegetation cover.

Interpretations of Cover

- Good indicator of:
 - ecological dominance
 - community composition
 - exposed bare ground, therefore infiltration
 - wildlife habitat

Uses of Cover

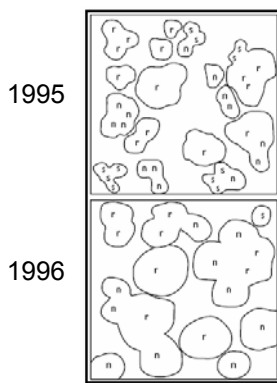
- Vegetation classifications and inventories
- Changes in vegetation over time
- Rapid assessments

Advantages of Cover

- Applicable to many types of plants
- Equalizes contributions of small but abundant, and large but rare plants
- Does not require distinguishing individuals

- Closely related to biomass

- Easily visualized and intuitive
- Unitless – percentages



Disadvantages of Cover

- Can vary greatly between:
 - Years
 - Seasons
 - Observers
 - Light environments
- Sensitive to changes in:
 - plant number (to some extent)
 - plant vigor

Ground Rules for Cover

- Clarify attribute measured!
 - canopy vs. foliar vs. basal cover
 - dead vs. live
 - flowering parts vs. vegetation parts vs. both
- Clarify rules for overlapping canopies
- Determine timing of sampling
 - Sample at the **same time** each year?
 - Sample to capture particular plants?

Which cover attribute & method to use?

- Is vegetation:
 - Sparse or dense?
 - Clumped, random, or uniform in distribution?
 - Bunch grasses vs. sod grasses?
 - Shrubs vs. minor forbs?
 - Single canopy vs. multiple canopies?
- 3 main types of methods:
 - Plots
 - Points
 - Lines

Plot-based Methods

- Semi-quantitative
- Fast
- Easy
- Potential for observer bias
- May lack repeatability

Plot-based Methods

- **Direct estimation:**
 - estimate cover to a single, percentage point
 - total vegetation cover or by species
 - takes time!
- **Cover class methods:**
 - cover assigned to a “class”
 - midpoint of class used for analyses
 - assumption: actual values are symmetrically dispersed around midpoints

Daubenmire Cover Class Method

- Originally: 20 x 50 cm rectangular plot

LIKE THIS!

Plot-based Methods

Daubenmire Cover Class Method

<u>Class</u>	<u>Percent cover</u>	<u>Midpoint</u>
1	<5%	2.5%
2	6-25%	15%
3	26-50%	37.5%
4	51-75%	62.5%
5	76-95%	85%
6	96-100%	97.5%

Why aren't the intervals evenly spaced?

Plot-based Methods

Daubenmire Cover Class Method

- Originally: 20 x 50 cm rectangular plot
- Sampling unit:
 - Plot
 - Transect with multiple plots

Does this work for all veg types?

Plot-based Methods

Cover per species per transect is estimated by calculating a weighted mean for each species.

Example from 25 quadrats along a transect

Class	Sand dropseed	Mesquite
	Tally	Tally
<5%	1	1
6-25%	5	2
26-50%	3	3
51-75%	1	0
76-95%	0	1
96-100%	0	2

$$\begin{aligned} \text{Dropseed cover} &= [1(2.5)+5(15)+3(37.5)+1(62.5)]/25 \\ &= 252.5 / 25 \\ &= 10.1\% \end{aligned}$$

Plot-based Methods

Daubenmire Cover Class Method

Advantages

- Relatively fast and easy
- Widely used
- Classic

Disadvantages

- Subjective
- Not always repeatable

Plot-based Methods

Braun-Blanquet Scale

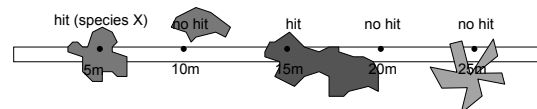
Class	Percent Cover
R (rare)	<<1%
+ (trace)	<1%
1	1-5%
2	5-25%
3	25-50%
4	50-75%
5	75-100%

What types of plants benefit from this scale?

Point Methods

- A point is a one-dimensional plot
- Plant cover estimated by sampling from population of all possible points in area.
- Several methods:
 - Line-point
 - Point frame
 - Single points
 - Grid-quadrat frame (cross hairs = points)

Line-Point Method

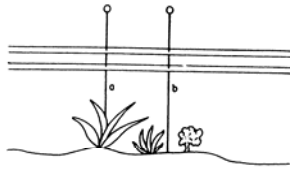


$$\text{Total cover} = \Sigma \text{hits} = \text{sum of all veg hits}$$

$$\begin{aligned} \text{Cover for species X} &= \Sigma X = \text{sum of species X hits} \\ \text{PERCENT cover for X} &= (\Sigma X / \text{total \# of points}) \times 100 \end{aligned}$$

Point Methods

Line-Point



a = first hit on plant
b = first hit is at ground level
Figure 2.3 Pin a, first hit on plant; pin b, first hit on ground.

Point Methods

Line-Point Considerations

- Systematically placed points more precise than random
- More transects with fewer points recommended – WHY?

Point Methods

Point-Intercept Methods

Point-frame:



Good for:

- dense vegetation
- recording multiple layers of vegetation
- sampling vertical plants IF angled

Point Methods

Point-Intercept Uses

- Herbaceous vegetation
- Short vegetation
- Total vegetative cover estimates
- Cover of abundant species
- Less useful for uncommon species

Point Methods

Point-Intercept Methods

Considerations

- Angle of point
- Sharpness of point

Advantages

- Objective
- Fast!
- Often most precise and accurate

Point Methods

Point-Intercept Methods

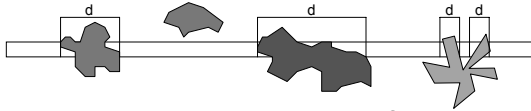
Disadvantages

- A large number of points often needed to obtain desired precision
 - For a species with 5% cover, would need 2000 points to calculate an estimate within 10% of the true mean with 95% confidence
 - See Peter Sundt's paper for discussion of power in line-point methods for monitoring
- Difficult in windy conditions
- Species with low cover are not sampled efficiently (may miss rare species)

Point Methods

Line-Intercept Method

- Measure the intercept of each plant under a line



Σd = total intercepted distance of vegetation
 Percent cover = $(\Sigma d / \text{tape length}) \times 100$

Line Methods

Line-Intercept Uses

- Basal cover of:
 - bunch grasses
 - perennial forbs
- Canopy cover of:
 - half-shrubs
 - shrubs
 - trees
- Best for clumped vegetation
- NOT good for sod grasses

Line Methods

Line-Intercept Considerations

Advantages:

- Relatively fast & easy
- Objective measure (not estimate)

Disadvantages:

- Takes more time than other measures
- Gap and canopy calls can be difficult
- Where is the edge?

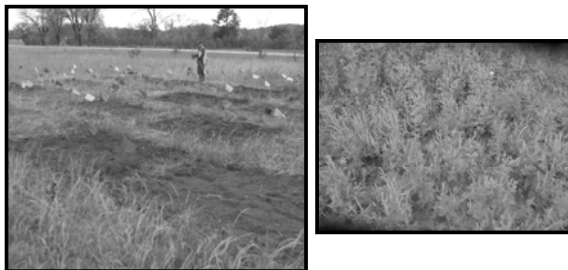
Line Methods

Points vs. Plots vs. Lines

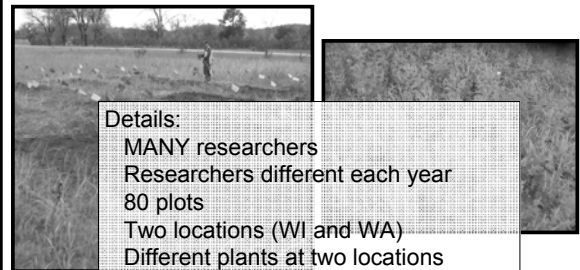
Where does bias come from?
 How can you get rid of bias?

How does this relate to protocols, crew training, etc.?

Project investigating restoration of weed-infested military lands
 Fort McCoy, WI



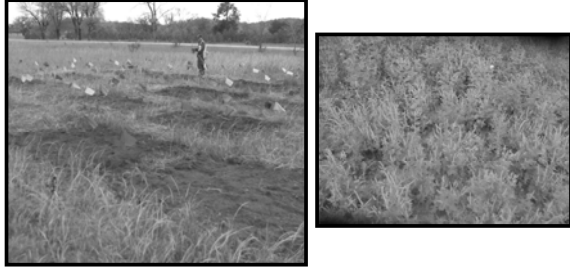
Project investigating restoration of weed-infested military lands
 Fort McCoy, WI



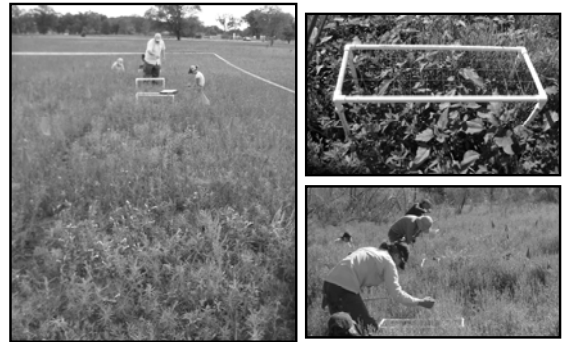
Details:
 MANY researchers
 Researchers different each year
 80 plots
 Two locations (WI and WA)
 Different plants at two locations
 Different target weeds at two locations

Project investigating restoration of weed-infested military lands
Fort McCoy, WI

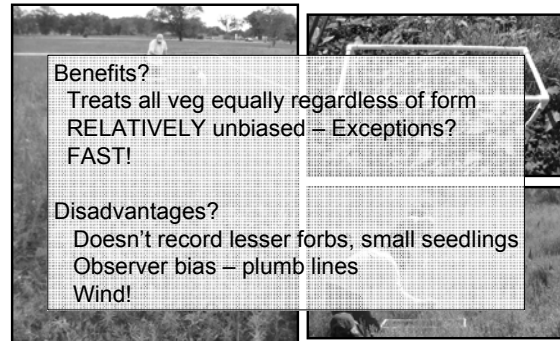
How would you measure cover in these plots?



Point Intercept method in small, rectangular plots



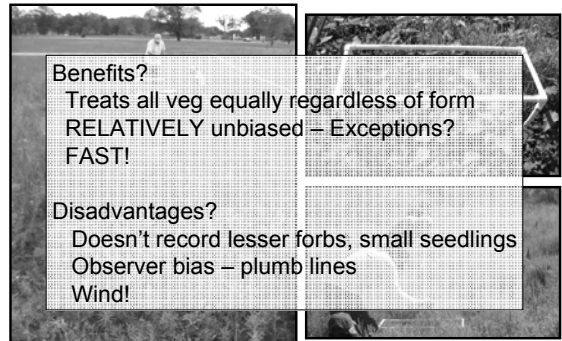
Point Intercept method in small, rectangular plots



Benefits?
Treats all veg equally regardless of form
RELATIVELY unbiased – Exceptions?
FAST!

Disadvantages?
Doesn't record lesser forbs, small seedlings
Observer bias – plumb lines
Wind!

Point Intercept method in small, rectangular plots



Benefits?
Treats all veg equally regardless of form
RELATIVELY unbiased – Exceptions?
FAST!

Disadvantages?
Doesn't record lesser forbs, small seedlings
Observer bias – plumb lines
Wind!

What about this rangeland?



Cover: Summing Up

One of the most useful and important attributes.
Widely used and relatively easy to estimate.

Type of method used depends on:

- objectives
- type of vegetation
- budget

Pilot sample strongly recommended to determine
most suitable method and sample size.