

Monitoring Manual

for Grassland,
Shrubland and
Savanna Ecosystems

Volume II: Design, supplementary methods and
interpretation

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Cover illustration:
Collecting Line-point intercept data
in a south-central New Mexico desert grassland.

Chapter 11

Vegetation structure

The Vegetation structure method provides information on visual obstruction and habitat structure (and thus suitability) for various wildlife species. Visual obstruction methods have also been used to estimate plant biomass. A large amount of literature exists related to various uses of this method and associated indicators (e.g., Flather et al. 1992, Interagency Technical Reference 1996, MacArthur and MacArthur 1961, Robel et al. 1970, Nudds 1977).

There are many ways to measure vegetation structure based on visual obstruction. There is no standard method, nor is there a standard set of indicators. The Vegetation structure method described here is similar to methods that have been used historically for research and monitoring, such as a Robel pole, cover board, vegetation profile board or density board.

The dimensions of the cover pole can be easily modified to address different objectives.

Materials

- The same transect(s) used for Line-point and Gap intercept
- Cover pole (see Appendix A for construction)
- 1 m (3 ft) PVC sighting pole
- Clipboard, Vegetation Structure Data Forms, pencil(s)

Standard methods (rule set)

Before beginning the measurements, record the length of each segment on your cover pole at the top of the data form. The four segments are numbered from the top to the bottom of the pole. Each segment is subdivided into five equal bands. A typical segment length is 0.5 m (1 ft 8 in) on a 2 m (6 ft 8 in) pole. Each band is then 10 cm (4 in).

1. Randomly select five positions along each transect.

Rules

- 1.1 Record the transect or line number under "Line" on the data form.
- 1.2 Record each position under "Position" on the data form.



Figure 11.1. Observer stands 5 m (15 ft) from the cover pole, along the transect.

- 1.3 Positions must be at least 7 m (22 ft) apart.

2. Place the cover pole at the first position.

Rules

- 2.1 The recorder places the cover pole at the sample position.

3. Collect Vegetation structure data.

Rules

- 3.1 The observer stands 5 m (15 ft) from the cover pole, along the transect.
- 3.2 Using the "sighting pole" to maintain a constant observation height, the observer records whether or not each band is covered by vegetation.
- 3.3 A band is considered covered by vegetation if at least 25 percent of the band is visually obstructed by vegetation.
- 3.4 Record "1" on the data form if the band is visually obstructed. Record "0" if the band is not obstructed.
- 3.5 The observer repeats steps 3.1 through 3.4, standing 5 m (15 ft) from the cover pole in the opposite direction, along the transect.

4. Repeat steps 1 through 3 for all sample positions along a transect and for all transects.

Vegetation structure

Vegetation structure indicator calculations

1. Calculate the average percent of visual obstruction.

Rules

- 1.1 Add the number of bands within each segment obstructed by vegetation.
- 1.2 Percent visual obstruction = $100\% \times (\text{number of bands obstructed} \div \text{total number of bands})$
- 1.3 Calculate the plot average for each segment. Add up all percent visual obstructions (Vis. obst.). Then divide this total by the number of Vis. obst.

2. **OPTIONAL.** Calculate the foliage height diversity (FHD, the vertical structural diversity). *Note: This indicator requires a calculator or computer, so it is not included on the field data form.*

Rules

- 2.1 The formula for foliage height diversity is:
$$\text{FHD} = \sum p_i \ln p_i$$
- 2.2 For each segment at each observation, add the number of bands obstructed by vegetation.
- 2.3 Sum the number of bands in each segment for the entire plot.
- 2.4 Calculate the proportion of total hits found in each segment:
 p_i = proportion of hits in the i^{th} segment,
where $i = 1$ to 5 .
- 2.5 Multiply the proportion of hits in each segment (from rule 2.4) by its natural log
 $p_i * \ln p_i$
- 2.6 Add up all $p_i * \ln p_i$.



Figure 11.2. Example of a cover pole with some visual obstruction.

Vegetation Structure Data Form

Monitoring plot: 12 Date: 12 September 2003 Observer: Heather Henshaw Recorder: Hilary Brinegar
 Segment 1: 0-0.5 m or ft? Segment 3: 1.0-1.5 m or ft? Obs A = 5 m or 15 ft before Position, along the transect
 Segment 2: 0.5-1.0 m or ft? Segment 4: 1.5-2.0 m or ft? Obs B = 5 m or 15 ft after Position, along the transect
 Record a "1" if >25% of the band is covered/obstructed by vegetation. Record a "0" if <25% of the band is covered/obstructed.

Line: <u>1</u>	Band	Position: <u>5</u>		Position: <u>15</u>		Position: <u>25</u>		Position: <u>35</u>		Position: <u>45</u>	
Segment	Band	Obs A	Obs B	Obs A	Obs B	Obs A	Obs B	Obs A	Obs B	Obs A	Obs B
1	1	1	0	1	1	0	0	1	1	0	1
1	2	0	0	0	1	0	0	1	0	0	0
1	3	1	1	0	1	0	0	1	0	0	1
1	4	0	0	0	0	0	0	0	0	1	1
1	5	0	0	0	0	0	0	0	0	1	1
Total no. of bands		2	1	1	3	0	0	3	1	2	4
2	6	0	0	1	1	0	1	1	1	1	0
2	7	0	0	1	0	0	0	0	1	0	0
2	8	0	0	1	0	0	1	0	0	1	0
2	9	0	0	1	0	0	1	0	0	0	0
2	10	0	0	0	0	1	1	0	0	0	0
Total no. of bands		0	0	4	1	1	4	1	2	2	0
3	11	0	1	1	0	1	1	0	0	0	1
3	12	0	0	0	0	0	1	0	0	0	0
3	13	0	1	1	1	0	0	0	0	1	0
3	14	1	0	0	0	0	0	0	0	1	0
3	15	1	1	0	0	0	0	0	0	0	0
Total no. of bands		2	3	2	1	1	2	0	0	2	1
4	16	1	1	0	1	1	1	1	0	0	0
4	17	0	1	0	0	1	0	0	0	0	0
4	18	0	1	0	1	1	1	1	1	0	0
4	19	0	0	1	1	1	1	0	0	0	0
4	20	0	0	1	1	0	1	0	0	0	0
Total no. of bands		1	3	2	4	4	4	2	1	0	0
Segment total		17		50		34%					
Segment total		15		50		30%					
Segment total		14		50		28%					
Segment total		21		50		42%					

Visual obstruction = $100\% \times \frac{\text{Segment total}}{\text{No. of obs.}}$

Notes:

Average visual obstruction: 34%

Vegetation Structure Data Form

Monitoring plot: _____ Date: _____ Observer: _____ Recorder: _____

Segment 1: _____ m or ft? Segment 3: _____ m or ft? Obs A = 5 m or 15 ft before Position, along the transect

Segment 2: _____ m or ft? Segment 4: _____ m or ft? Obs B = 5 m or 15 ft after Position, along the transect

Record a "1" if >25% of the band is covered/obstructed by vegetation. Record a "0" if <25% of the band is covered/obstructed.

Line:	Segment	Band	Position: _____		Position: _____		Position: _____		Position: _____		Position: _____		Segment total	No. of observations	Vis. obst.
			Obs A	Obs B	Obs A	Obs B	Obs A	Obs B	Obs A	Obs B	Obs A	Obs B			
1	1														
1	1														
1	1														
1	1														
1	1														
Total no. of bands															
2	2														
2	2														
2	2														
2	2														
2	2														
Total no. of bands															
3	3														
3	3														
3	3														
3	3														
3	3														
Total no. of bands															
4	4														
4	4														
4	4														
4	4														
4	4														
Total no. of bands															

$$\text{Visual obstruction} = 100\% \times \frac{\text{Segment total}}{\text{No. of obs.}}$$

Notes:

Average visual obstruction: