# M. Visual Obstruction Method - Robel Pole

1. *General Description* This method is used for determining standing plant biomass on an area. It has primarily been used to determine the quality of nesting cover for birds on the Great Plains and is commonly referred to as the Robel Pole Method. This method is applicable to other ecosystems throughout the western U.S. where height and vertical obstruction of cover are important. The following vegetation attributes are monitored using this method:

   - Vertical cover
   - Production
   - Structure

   It is important to establish a photo plot (see Section V.A) and take both close-up and general view photographs. This allows the portrayal of resource values and conditions and furnishes visual evidence of vegetation and soil changes over time.

2. *Areas of Use* The Robel Pole Method is most effective in upland and riparian areas where perennial grasses, forbs, and shrubs less than 4 feet tall are the predominant species.

3. *Advantages and Disadvantages* Robel Pole measurements are simple, quick, and accurate. This method can be used to monitor height and density of standing vegetation over large areas quickly. Statistical reliability improves because numerous measurements can be taken in a relatively short time. Limitations of the method may stem from infrequent application in a variety of rangeland ecosystems. While the Robel Pole Method has been used with great success on the Great Plains, there needs to be more research in a variety of plant communities.

4. *Equipment* The following equipment is needed (see also the equipment listed in Section V.A, page 31, for the establishment of the photo plot):

   - Study Location and Documentation Data form (see Appendix A)
   - Robel Pole form (Illustration 25)
   - Cover classes for the area or plant community
   - Robel pole (Illustration 26)
   - One stake: 3/4- or 1-inch angle iron not less than 16 inches long
   - Hammer
   - Permanent yellow or orange spray paint
   - Compass
   - Steel post and driver

5. *Training* The accuracy of the data depends on the training and ability of the examiners. They must receive adequate and consistent training in laying out transects, determining cover classes, and reading the Robel pole.

6. *Establishing Studies* Careful establishment of studies is a critical element in obtaining meaningful data. Select study sites that are representative of much larger areas in terms of similar cover levels.

a **Site Selection** The most important factor in obtaining usable data is selecting representative areas (critical or key areas) in which to run the study (see Section II.D). Study sites should be located within a single plant community within a single ecological site. Transects and sampling points need to be randomly located within the critical or key areas (see Section III).

b **Pilot Studies** Collect data on several pilot studies to determine the number of samples (transects or observation points) and the number and size of quadrats needed to collect a statistically valid sample (see Section III.B.8).

c **Vertical Cover Classes** Establish the number of vertical cover classes and height limits for each class based on objectives. These cover classes must be developed locally for each ecological site or plant community. The following is an example of cover classes established for upland bird nesting cover on the Fort Pierre National Grasslands:

| Cover Classes | Visual Obstruction Height |
|---|---|
| 1 | 0.0 - 1.9 |
| 2 | 2.0 - 2.9 |
| 3 | 3.0 - 3.9 |
| 4 | 4.0 + |

d **Number of Transects** Establish the minimum number of transects to achieve the desired level of precision for the key species in each study site (see Section III.B).

e **Number of Observation Points** The number of observation points will depend on the objectives, level of precision required, etc.; however, it is recommended that a *minimum* of 50 be read per transect. Additional observation points should be read, depending on the pilot study.

f **Study Layout** Data can be collected using the baseline, macroplot, or linear study designs described in Section III.A.2 beginning on page 8. The linear technique is the one most often used.

g **Reference Post or Point** Permanently mark the location of each study with a reference post and a study location stake (see beginning of Section III).

h **Study Identification** Number studies for proper identification to ensure that the data collected can be positively associated with specific sites on the ground (see Appendix B).

i **Study Documentation** Document pertinent information concerning the study on the Study Location and Documentation Data form (see beginning of Section III and Appendix A).

7. *Taking Photographs* The directions for establishing photo plots and for taking close-up and general view photographs are given in Section V.A.

8. *Sampling Process* In addition to collecting the specific studies data, general observations should be made of the study sites (see Section II.F).

This technique is most effectively accomplished with two individuals.

a Determine the transect bearing and select a prominent distant landmark such as a peak, rocky point, etc., that can be used as the transect bearing point.

b Start a transect by randomly selecting a point along the transect. Two Visual Obstruction (VO) measurements are taken at each observation point from opposite directions along the contour. One examiner holds the Robel pole at the observation point, while the second examiner holds the end of the cord perpendicular to the transect. The Visual Observation (VO) measurement is made by determining the highest 1-inch band totally or partially visible and recording the height on the Robel Pole form (Illustration 25).

c Continue the transect by taking readings at specified intervals along the transect bearing until the transect is complete. The distance between observation points can be increased to expand the area sampled.

9. *Calculations*

a Total the visual obstruction measurements on the Robel Pole form (Illustration 25) for both readings at each observation point and record at the bottom of the form. Add these two totals and divide by the total number of readings. This will yield the average visual obstruction.

b The average height or visual obstruction value can be used to determine the cover class.

10. *Production* Data from the Robel pole method can be correlated to forage production or standing crop. This correlation can be established by clipping and weighing the standing crop within a specified quadrat frame directly in front of the Robel pole after the readings are made. Depending on the vegetation community approximately 25 quadrat frames need to be clipped to get a good correlation between visual obstruction readings and standing crop. Note that this will be an estimate of standing plant biomass. It will include not only this year's production, but also herbage remaining from prior years. After the correlation is made between the pole readings and production, the pole can then be used to quickly estimate production across the entire plant community.

11. *Data Interpretation* The average Visual Obstruction value can be used to determine success at meeting objectives. The average Visual Obstruction value determined from the Robel Method form is compared with the cover classes and the residue levels to determine if overall objectives have been meet.

12. *Data Analysis* This technique involves destructive sampling (clipped plots), so permanent transects or quadrats are not recommended. Since the transects are not permanently marked, use the appropriate nonpaired test. When comparing more than two sampling periods, use ANOVA.

## 13. *References*

Robel, R.J., J.N. Briggs, A.D. Dayton, and L.C. Hulbert. 1970. Relationships Between Visual Obstruction Measurements and Weight of Grassland Vegetation, J. Range Manage. 23:295.

Robel, R.J. 1970. Possible Role of Behavior in Regulating Greater Prairie Chicken's Populations, J. Wildlife Manage. Vol 34:306-312.

Snyder, W.D. 1991. Wheat stubble as nesting cover for ring necked pheasants in northern Colorado. Wildlife Soc. bulletin vol 19(4).

USDA, Forest Service. 1994. Rangeland Analysis and Management Training Guide, Rocky Mountain Region USDA Forest Service Denver, Colorado.

## Robel Pole

| Study Number | | Date | Examiner |
|---|---|---|---|
| Allotment Name & Number | | Pasture | |
| Sampling Interval | Study Location | | |

| Transect | #- 1 | | #- | | #- | | #- | |
|---|---|---|---|---|---|---|---|---|
| Station | VO | VO | VO | VO | VO | VO | VO | VO |
| 1 | | | | | | | | |
| 2 | | | | | | | | |
| 3 | | | | | | | | |
| 4 | | | | | | | | |
| 5 | | | | | | | | |
| 6 | | | | | | | | |
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| 8 | | | | | | | | |
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| 10 | | | | | | | | |
| 11 | | | | | | | | |
| 12 | | | | | | | | |
| 13 | | | | | | | | |
| 14 | | | | | | | | |
| 15 | | | | | | | | |
| 16 | | | | | | | | |
| 17 | | | | | | | | |
| 18 | | | | | | | | |
| 19 | | | | | | | | |
| 20 | | | | | | | | |
| 21 | | | | | | | | |
| 22 | | | | | | | | |
| 23 | | | | | | | | |
| 24 | | | | | | | | |
| 25 | | | | | | | | |
| Total | | | | | | | | |
| Grand Total | | | | | | | | |
| Average | | | | | | | | |

Illustration 25

# Robel Pole

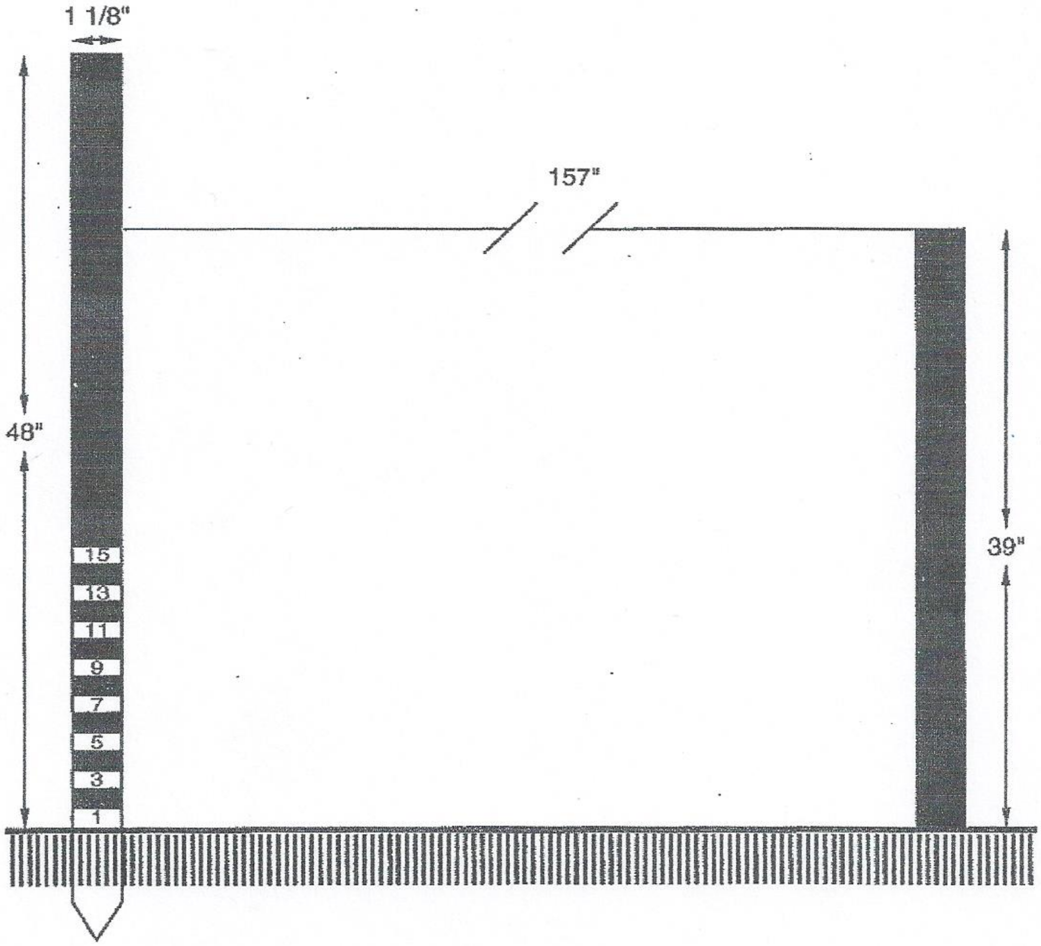
| Study Number Sand Hill #1 | | Date 6/18/94 | Examiner Scott Taylor |
|---|---|---|---|
| Allotment Name & Number Sand Hill 20216 | | Pasture 2 | |
| Sampling Interval 10 paces | Study Location 2 mi. west of Walker Well on south side of the road. | | |

| Transcect | #- 1 | | #- | | #- | | #- | |
|---|---|---|---|---|---|---|---|---|
| Station | VO | VO | VO | VO | VO | VO | VO | VO |
| 1 | 1 | 3 | | | | | | |
| 2 | 2 | 4 | | | | | | |
| 3 | 1 | 1 | | | | | | |
| 4 | 2 | 1 | | | | | | |
| 5 | 3 | 1 | | | | | | |
| 6 | 1 | 2 | | | | | | |
| 7 | 3 | 4 | | | | | | |
| 8 | 3 | 3 | | | | | | |
| 9 | 4 | 4 | | | | | | |
| 10 | 1 | 2 | | | | | | |
| 11 | 2 | 3 | | | | | | |
| 12 | 1 | 1 | | | | | | |
| 13 | 2 | 1 | | | | | | |
| 14 | 3 | 2 | | | | | | |
| 15 | 2 | 3 | | | | | | |
| 16 | 1 | 2 | | | | | | |
| 17 | 2 | 2 | | | | | | |
| 18 | 3 | 3 | | | | | | |
| 19 | 2 | 4 | | | | | | |
| 20 | 3 | 3 | | | | | | |
| 21 | 3 | 2 | | | | | | |
| 22 | 1 | 3 | | | | | | |
| 23 | 2 | 2 | | | | | | |
| 24 | 3 | 1 | | | | | | |
| 25 | 2 | 2 | | | | | | |
| Total | 53 | 59 | | | | | | |
| Grand Total | 112 | | | | | | | |
| Average | 2.24 | | | | | | | |



Illustration 25

## Robel Pole




1. Pole is 1.125 inches in diameter and 48 inches long.
2. Pole is painted with alternating 1-inch bands of flat white and gray colors, starting with white on the bottom. Alternating 1-inch bands can be extended to the top of the pole if needed.
3. A single 157-inch (4m) cord is attached to the pole at a height of 39 inches (1m) to standardize the distance and height at which readings are taken.
4. Narrow black numbers corresponding to the number of bands are painted on the white bands. For example, the bottom white band is "1," the next white band is "3," and so on.
5. A spike is attached to the bottom of the pole so that it can be pushed into the ground, allowing one examiner to make the readings. The spike can be removed if not needed.

**Illustration 26**