

# Cover Pole Design for Easy Transport, Assembly, and Field Use

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**ABSTRACT** Cover poles, also called Robel poles, are used to measure a variety of structural vegetation attributes commonly used in wildlife and livestock management. Although cover pole dimensions, measurement criteria, and interpretation of cover pole data vary depending on measurement objectives, the technical use of cover poles is fairly consistent. Practical use of cover poles requires that they are sturdy, lightweight, and easily transported. We describe a cover pole apparatus that can be easily constructed, transported, and assembled for use in remote locations. This self-supporting cover pole enables one person to take measurements, and can be modified for use in multiple habitats and soil types. (JOURNAL OF WILDLIFE MANAGEMENT 72(2):564-567; 2008)

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**KEY WORDS** cover pole, Robel pole, standing crop, vegetation structure, visual obstruction.

Cover poles, also called Robel poles, are used to measure a variety of structural vegetation attributes in many types of vegetation communities, including grasslands, shrublands, savannas, and forests (Table 1). Cover pole measurements are commonly used to estimate visual obstruction, standing crop, vegetation height, vertical cover, and vegetation structure. In addition, data collection using cover poles is nondestructive and rapid, enabling consistent data collection with relatively little training (Robel 1970b, Griffith and Youtie 1988, Ganguli et al. 2000). Thus, these tools have broad applications in resource management, ranging from wildlife habitat quality assessment to rangeland evaluation.

The technical use of cover poles is fairly consistent: a banded cover pole is placed vertically at a specified point, the pole is observed from a predetermined distance and height, and the amount of the pole visually obstructed by vegetation is recorded. Cover pole dimensions, contrasting band colors, and measurement criteria often vary depending on measurement objectives, the typical vegetation height in the study area, and the intended interpretation of cover pole data (Table 1). The ability to make meaningful comparisons between multiple studies may be confounded if pole dimensions and measurement criteria are applied inconsistently. The scope of inference between studies can be increased through careful selection and documentation of these dimensions and criteria (Toledo 2004).

Practical use of cover poles requires that they are sturdy, lightweight, and easily transported into field settings. However, cover pole lengths typically range between 1 m and 2 m, and the ability to easily transport cover poles decreases as pole length increases, compromising the utility of longer cover poles as efficient measurement tools. The objective of this paper is to describe a cover pole apparatus that can easily be transported, assembled, and used in

different habitats, thereby facilitating data collection in remote locations.

## METHODS

The cover pole apparatus we describe includes a self-supporting cover pole and a sight pole from which observations are made (Toledo 2004). The following instructions are for constructing a self-supporting, 2-m cover pole (Fig. 1) and a 1-m sight pole (Fig. 2). However, the specifications of the cover pole apparatus can easily be adjusted to accommodate cover pole designs requiring different dimensions. In addition, optional interchangeable spikes can be constructed for use on a range of substrates.

### Cover Pole Materials

- 1 piece of schedule 40 polyvinyl chloride (PVC) pipe, 2 m (6 feet, 7 inches [in.]) long, 2.54 cm (1 in.) diameter
- 1 threaded male PVC connector, 2.54 cm (1 in.) diameter
- 2 threaded female PVC connectors, 2.54 cm (1 in.) diameter
- 1 threaded male plug, 2.54 cm (1 in.) diameter
- 1 PVC cap, 2.54 cm (1 in.) diameter
- 1 flat-headed spike, 20 cm (8 in.) long, 1.3 cm (0.5 in.) diameter
- PVC cleaner, primer, and glue
- Epoxy
- Masking tape
- Enamel or PVC paint in contrasting colors (e.g., white, black, gray, brown, red, or orange)
- Indelible marker (if numbered bands are desired)

### Cover Pole Construction

1. Cut the PVC pipe into 2 1-m-long pieces. These pieces will become the bottom and top halves of the cover pole.
2. Use PVC cleaner and primer to prepare the unthreaded inner wall of the male and female connectors.
3. Use PVC cleaner and primer to prepare the outer wall of

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**Table 1.** Examples of reported variation in cover pole dimensions, applications, and measurement criteria.

Authors	Yr	Vegetation community	Attribute measured <sup>a</sup>	Pole ht (m)	Observation ht (m)	Observation distance (m)	Segment width (cm)	Segment measurement criteria
Bello et al.	2001	Brushland	VO, vertical (hiding) cover	2	Not specified	15	10	% visual obstruction of each 50-cm stratum
Benkobi et al.	2000	Grassland	VO, SC	Not specified	1	4	2.54	Top band totally obstructed
Ganguli et al.	2000	Grassland	VO, SC	1.2	1	4	2	Highest band visible on the pole
Griffith and Youtie	1988	Grassland, shrubland, forest	VO, vertical (hiding) cover	2	Not specified	15	10	No. of 0.1-m bands that were $\geq 25\%$ concealed by vegetation
Harmonye et al.	1997	Pasture	VO, SC	1	1	4	2	Ht of the band below the lowest visible band
Reece et al.	2001	Grassland	VO, vegetation structure	1.2	1	4	2.54	Lowest band not fully obstructed by vegetation
Robel et al.	1970 <sup>a</sup>	Grassland	VO, SC	1.5	0.5, 0.8, 1	2, 3, 4	5	Lowest band at least half-visible on the pole
Robel et al.	1970 <sup>b</sup>	Grassland	VO, SC	1.5	0.5, 0.8, 1	2, 3, 4	5	Lowest band at least half-visible on the pole
Sveum et al.	1998	Grass-shrub, brushy riparian	Vertical cover	Not specified	1	4	Not specified	% visual obstruction for each 10-cm stratum
Toledo	2004	Grassland, shrubland, savanna	VO, vegetation structure	2	1.5	7	10	Proportion of bands that were $\geq 25\%$ obstructed by vegetation
Vermeire and Gillen	2001	Grassland	VO, SC	1	1	4	2.5	Lowest band visible on the pole
Volesky et al.	1999	Grassland	VO, SC	1.2	1	4	2.54	No. of the lowest band not obstructed by vegetation
Wight	1938	Not specified	Visibility, concealment	1.83	Not specified	20.12	30	Not specified

<sup>a</sup> Attributes: SC = standing crop, VO = visual obstruction.

- one end on one pipe and prepare both ends of the other pipe; these will become the top and bottom halves of the cover pole, respectively.
- Glue a female connector to a prepared end on each pipe. Each pipe will have one female connector.
- Glue the male connector to the remaining prepared end of the bottom pipe.
- Drill a 1.3-cm (0.5-in.) hole in the center of the flat end of the threaded male plug. Insert the spike fully through the hole until the spike head is firmly seated against the inside of the plug. Inject epoxy into the plug, covering the spike head and filling the plug. Ensure that the spike is straight, and allow the epoxy to harden.
- After the PVC glue and epoxy have dried, assemble the cover pole: screw the top and bottom halves together, and screw the plug into the female end of the bottom pipe. Tighten connections until they are snug, but avoid overtightening. Some threads on the connectors will remain exposed when the pole is fully assembled. Attach the remaining PVC cap (unglued) to the open end of the top of the cover pole.
- Measure the cover pole and mark the top end at the 2-m mark.
- Remove the cap and trim the open end of the top pipe to produce a 2-m-long (cap to plug) pole.
- Reassemble the pole. Use masking tape and paint to paint alternate segments in contrasting colors on the assembled pole. The design in Fig. 1 shows alternating 10-cm white and black segments, with every fifth segment painted red.
- If desired, use the indelible marker to number bands in each segment, numbering sequentially from the bottom of the pole.

*Optional: interchangeable spikes.*—Use additional plugs and spikes to modify the cover pole for use on a range of substrates: use a longer, flat spike for looser, sandy soils; a shorter nail-like spike for compacted, less penetrable soils; or a spikeless plug for impenetrable surfaces such as bedrock.

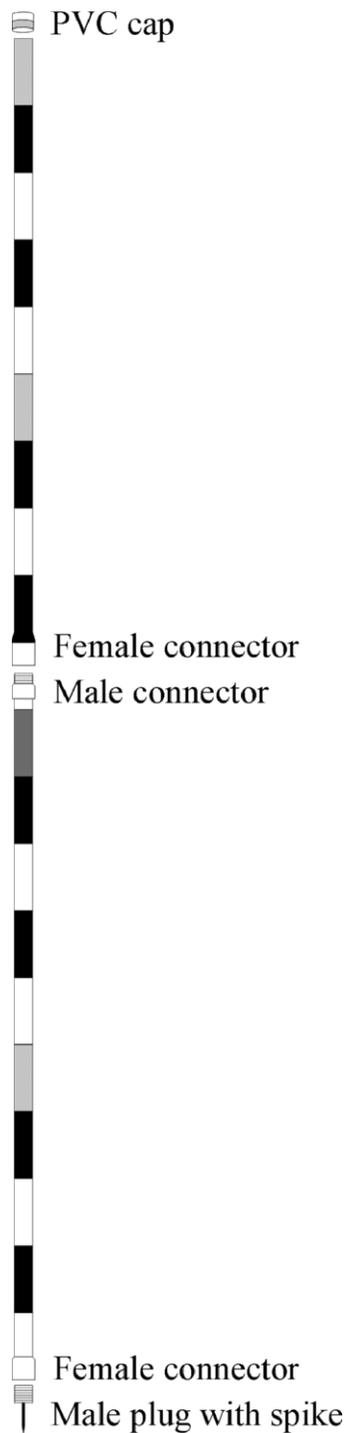
### Sight Pole Materials

- 1 schedule 40 PVC pipe; 1.10 m (5 feet, 1 in.) long, 1.3 cm (0.5 in.) diameter
- 2 PVC caps; 1.3 cm (0.5 in.) diameter

### Sight Pole Construction

- Using the cleaner, primer, and glue, attach one PVC cap to one end of the PVC pipe.
- Drill a 0.6-cm- (0.25-in.) diameter hole through the PVC pipe, 1 m from the bottom of the capped end of pipe (approx. 10 cm from the uncapped, open end).
- Attach the remaining PVC cap (unglued) to other end of pipe.

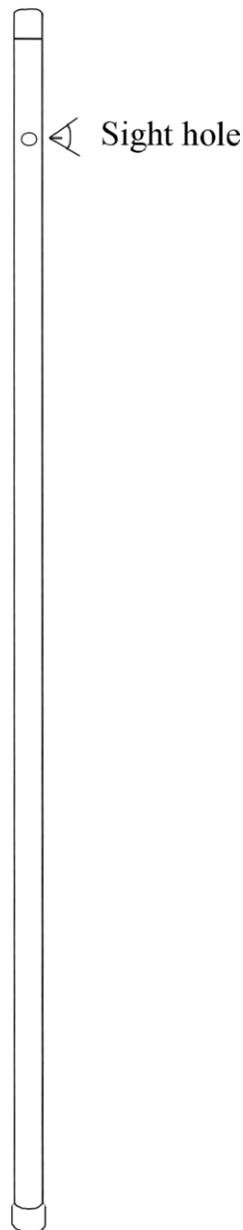
*Optional tether.*—If desired, use a predetermined length of cord to tether the 2 poles, thus ensuring that measurements are consistently taken from the desired distance without needing to measure distances at every point.



**Figure 1.** Diagram of cover pole constructed for easy transport, assembly, and field use.

### Assembly and Use

For convenient transport to the field, bundle the sight pole and unassembled halves of the cover pole together; alternatively, store the sight pole inside the assembled cover pole. We recommend disconnecting the spiked cap from the pole during transport, and embedding spike points in a rubber stopper or similar material to prevent injury; a spikeless male plug can be used to cap the pole during transport if desired. Store line point intercept pins inside the



**Figure 2.** Diagram of a sight pole used to take measurements with a cover pole.

capped sight pole to reduce potential damage to pins in transit. To use, assemble the cover pole (with or without the optional tether), and firmly insert the spike vertically into the ground; the cover pole is self-supporting. On bedrock or other impenetrable surfaces, use a spikeless cap; the cover pole is no longer self-supporting using this configuration and therefore requires 2 people to take measurements. Make observations by looking at the cover pole through the holes drilled on the sight pole, ensuring that cover pole measurements are made from a consistent height (Fig. 3).

### Management Implications

Cover poles are relatively simple to use and allow rapid, consistent, and nondestructive vegetation measurement in a variety of different environments. The cover pole apparatus described here is easily adapted for use in a



**Figure 3.** Diagram demonstrating cover pole use in a shrubland community.

variety of habitats and soil types, can facilitate the process of taking measurements from a consistent height and distance, and reduces the number of people needed to take measurements on most substrates. Interpretation and comparison of data collected with cover poles can be confounded by inconsistent pole design and measurement criteria. Therefore, we recommend carefully considering the intended applications of these data to guide selection of dimensions and criteria.

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