Robel pole technique and data interpretation

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The Robel pole technique of measuring residual forage after grazing has received considerable attention. Unfortunately, the use of any tool may sometimes result in outcomes unfavorable to some. To separate the method from outcomes, explaining Robel pole data collection and interpretation is useful.

The Robel pole only measures the biomass of vegetation present at the time of measurement. It is consistent, reliable, cost effective, and covers a large area in a short amount of time if established procedure is followed. The Robel pole is generally not applicable to areas with low productivity, such as many Bureau of Land Management lands or where shrubs are abundant. Calibrating this measurement to local vegetation, proper selection of key areas, and developing site specific guidelines when used as a grazing use assessment tool are essential for effective management applications.

Robel Pole Description

The Robel pole used in the northern Great Plains and the Bighorn Mountains consists of a 4-foot long white rod with 0.5-inch bands alternating white and gray on the lower 18 inches. These bands are numbered consecutively from the bottom starting with 0. A 4-meter (approx 4.4 yards) string is attached at 1 meter (39 inch) height on the pole. The reading taken with the base firmly on the soil surface is the number of the last band visible when viewed from a distance of 4 meters and 1 meter height.

The formula for estimating vegetation weight (pounds-per-acre dry) on rangelands that are open grasslands of the northern Bighorn Mountains is 580 + 168.5 times the pole reading plus or minus 341. The formula determines that the actual average weight from the sample is within a range defined by the mean of estimated vegetation weight plus or minus 341 pounds per acre. If the residual forage measured averaged five bands on the pole, then 580 + (168.5 x 5) = 1,423 + or - 341 lb dry matter/ac). To have the specified level of precision, use the sampling protocol below.

The formula for determining vegetation weight in the Bighorn National Forest (BHNF) from Robel pole readings was calculated from published data. Robel pole readings were made in the center of 0.25 meter^2 plots subsequently clipped, dried, and weighed distributed over 130 transects on the grassland ranges in the Tongue District of the BHNF. The predominant alternative sampling method of determining vegetation weight is to clip, dry, and weigh vegetation on small plots.

Robel Pole Use

To use the Robel pole method, identify a location such as a key area. Four transects with randomly located starting points and that do not cross each other are determined across the area. Twenty sample points are located along each transect a minimum of 10 full paces apart. At each sample point, four observations are made on the pole from opposing directions, usually the four cardinal directions. The actual reading on the pole consists of identifying the last band visible on the pole before the pole disappears in the vegetation when viewed at a distance of 4 meters with the observer's eyes at a height of 1 meter above the ground. Customarily, a 4-meter string is attached to the pole at a 1-meter height to provide the standard distance from the pole. Those taking Robel pole readings must be aware the last visible band must be recorded even if viewed through a hole in the vegetation and not at the

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top of the vegetation. The sample point can be moved if it falls in a hole or cow/game trail, although a sample point on a bare spot such as a gopher mound should not be moved.

Using the Robel pole is not appropriate where sagebrush or similar-sized shrubs frequently restricts the ability to see the pole in herbaceous vegetation. For management purposes, the average reading of all 320 observations will be used for the key area.

Improved Interpretation

The specific number recorded is affected by the height and optical density of the vegetation. The equation describing the vegetation weight and pole reading relationship is more accurate when applied in the local area where developed. Generally, grazing utilization assessments are based on key areas representative of the pastures or allotments. Flawed selection of key areas will result in flawed assessments.

Using the key area concept removes the option of replication and limits interpreting results. Users should agree on key areas in advance.

The residual forage guideline used to judge the amount of forage after grazing should be selected based on recognized values that move vegetation trends toward resource management goals. As productivity and plant species composition vary locally, the best guidelines are those developed for individual sites and validated with trend monitoring.

Technique Developed in Kansas

The Robel pole was developed in Kansas by wildlife biologist Robert Robel to measure the visual obstruction (hiding cover) provided by herbaceous vegetation for prairie grouse nesting cover. A significant correlation of the weight of the vegetation with how much pole height is obscured was determined by clipping plots around the base of the pole. The method has since been used on U.S Forest Service (USFS) national grasslands in South Dakota to ensure enough residual forage is left to provide nesting cover for sharptail grouse and greater prairie chicken. As originally used by the USFS in Wyoming, there was a single residual forage amount expressed in bands on the Robel pole used across a region of the BHNF, Tongue Ranger District. There have been minor adjustments in the number of bands for sites with shallow soils.

Assessing Grazing Use

To assess grazing use, the weight of vegetation remaining after grazing can be measured and compared to a predetermined criteria. Alternatively, weight measurements made before grazing can determine how much weight should be left after grazing if a predetermined percentage removal of vegetation is desired. These interpretations can be made with criteria applied over an entire region (ie. a ranger district) or, perhaps more appropriately, criteria developed on individual ecological sites, pastures, or key areas. Historically, percent of forage produced that was utilized was the accepted guideline. If information correlating trend and residual forage amount is lacking, an appropriate initial residual forage guideline may be based on productivity and acceptable percent utilization.

Using residual forage to assess grazing use levels is a significant conceptual shift. For decades, a percent utilization (forage disappearance) shown to yield desired trends in vegetation composition has been used as the standard for determining appropriate grazing use.

A Better Tool

Residual forage amount guidelines should provide the manager with a better tool to assess soil surface protection from erosion, forage remaining for other users, or adequacy of remaining forage to sustain livestock. A transition between these concepts will allow rangeland users to adjust.

Determining forage amounts before-and-after grazing allows a manager to calculate percent of forage utilized and the residual forage amount. To select a residual forage guideline for adjusting grazing use, the choices are 1) to hypothesize a residual amount to provide appropriate soil and vegetation protection, or 2) develop a site-specific guideline for the local variation in vegetation potential.

Normal weather variation year-to-year and variation among sites due to soil depths, slopes, and aspect greatly affect vegetation potential. Before and after grazing Robel pole readings provides data to calculate percentage use within a grazing season or to develop an average residual forage level that could be the annual target for reaching vegetation goals for the site.

Subjectivity, Bias, or Cooperation

Commonly used measurement methods for determining percentage use can be subjective or too laborious to yield reliable results. For example, using small cages to protect a few areas from grazing and provide an estimate of production usually has too few cages to provide a reliable sample and is too labor intensive for frequent use. The Landscape Appearance Method as found in the Wyoming Rangeland Monitoring Guide relies on an ocular comparison of sample points with guidelines regarding patchiness of use and seed stalks remaining. This method can be effectively used in cooperative monitoring plans where the agency specialist and permittee have trained together.

As with any sampling strategy and method, there are opportunities for bias and arguments over whether the results are representative. Where the samples are taken is an issue that can only be addressed by all parties agreeing on the site selection in a management unit. Locating individual transects and sample points may also be influenced by the individual doing the sampling; agreement and trust among all parties is desired. Cooperative monitoring is a process that develops the trusting relationship leading to long-term satisfactory grazing management.