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Estimating Grazeable Acreage for Cattle

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Stocking decisions can be difficult to make. Forage supplies vary from season to season and from year to year, and with more brush on our rangelands than ever before, old stocking rates may be of little value. Many land managers are also realizing that their cattle use only a portion of the land available. The goal of recent research was to determine why cattle use some areas but not others and how ranchers can use such information to estimate the number of grazeable acres they have.

How Grazeability was Studied

Research using cattle fitted with Global Positioning System (GPS) collars shed light on how cattle behave in response to different features of the landscape. The research was conducted on ranches in different regions of Texas to demonstrate the influence of landscape features such as brush density, rock cover, surface slope, water and forage species on livestock grazing. Test sites were in the Davis Mountains, Edwards Plateau and South Texas Plains.

Digital aerial photographs of the test ranches and overlays showing the various ecological sites within each photograph were obtained. An ecological site is an area of land with specific physical characteristics that differs from other kinds of land in the types and amounts of vegetation it produces. Descriptions of these ecological sites define certain landscape features. For example, an ecological site designated as gravelly redland has 36 percent or less surface rock cover. The ecological site maps and aerial photographs enabled researchers to predict which areas cattle would not use because of their apparent brush and rock cover, slope, or inaccessibility. (Landowners can contact a local USDA Natural Resources Conservation Service office for help acquiring digital aerial photographs and ecological site overlays for their property.)

Next, areas that appeared ungrazeable from the maps were observed on the ground. Observers measured brush density and rock cover and determined the herbaceous plant species growing in each area. Again, researchers predicted grazeability from their ground observations.

To test the map and ground observation prediction methods, researchers fitted cattle with GPS collars and recorded their positions for 23 days. Collars were programmed to take a position fix every 5 minutes and are accurate to within 10 to 16 feet of the true location. As Table 1 shows, both map estimates and ground estimates were fairly accurate, as validated by the actual GPS locations of cattle on the ranches. However, ground observation is clearly the more accurate method for predicting the grazeability of an area.

Table 1. A comparison of the accuracy of predicting grazeable areas from map and ground estimates, as validated by GPS studies.

Research area	Map estimates, % correct	Ground estimates, % correct
Edwards Plateau	80	93
South Texas Plains 1*	67	-
South Texas Plains 2	92	92
South Texas Plains 3	88	100
Average	82	95

*No ground observation was done at this site.

What the Research Shows

Brush Density

While aerial photographs can give a general estimate of the brush cover on your property, they do have limitations. If photographs are taken at the time of year when brush plants such as mesquite have dropped their leaves, the extent of brush cover may not be apparent. Photographs are helpful in pinpointing areas that might be too brushy for cattle so that these areas can be checked on the ground. There is often more brush in the pasture than can be seen on an aerial photograph.

Actual brush density should be checked and scored in several areas on the property. Walk a straight line through each area and assign a brush density score every 20 steps. Use Figure 1 as a guide in determining brush density scores.

The GPS collar research showed that, overall, **only 25 percent of areas with a brush density score of 3 were visited by cattle, and that cattle completely avoided areas with scores of 4 or 5 (Fig. 2).** This relationship was true in both the Edwards Plateau and South Texas Plains, regions with very different brush species.

Figure 1. Brush density scores.

BDS = 0
(no brush present, foreground clear to tree line)

BDS = 1
(very light brush, only a few scatted plants)

BDS = 2
(light brush, brush common, but mobility or access not limited)

BDS = 3
(brush thick enough to limit mobility, but cattle can maneuver through it)

BDS = 4
(brush thick, mobility possible only in pathways)

BDS = 5
(very thick brush, mobility through it nearly impossible)

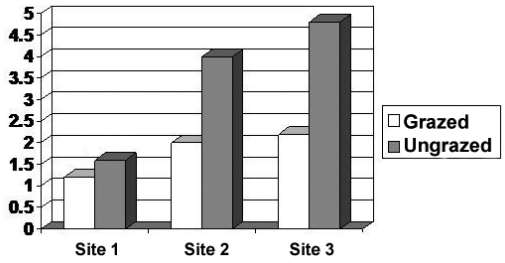

Figure 2. Average brush density scores of grazed and ungrazed areas at three research sites in the South Texas Plains.

Rock Cover

With ecological site descriptions you can identify areas where rock cover might be a problem and spot-check these on the ground at the same time you determine brush density scores. Walk a 300-foot line through the area. At 20-foot intervals, place a PVC frame on the ground as a guide. Examples of various rock cover percentages are shown in Figure 3. The frames used in this study had an outside measurement of about 29 inches and were divided into quarters to make it easier to visualize percent rock cover. To build a frame you will need tubing, four 90-degree elbows, four tees and one cross fitting.

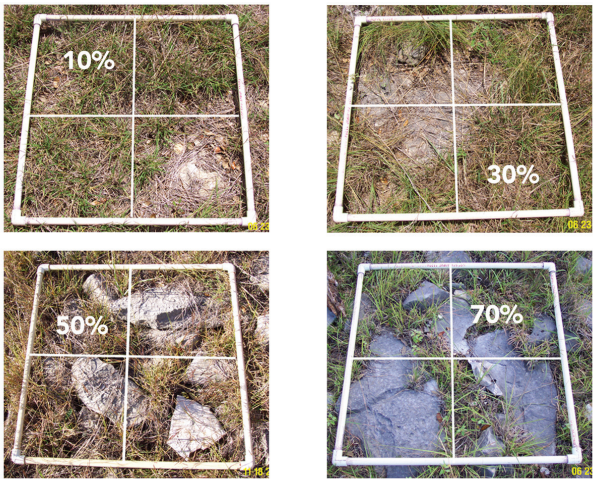

Figure 3. Rock cover percentages.

The GPS collar study showed that **cattle tend to avoid areas with 30 percent or more rock cover.** When determining a rock cover percentage, remember that if an area is uncomfortable for a person to walk on, it will also be uncomfortable for cattle.

Slope

Percent slope is calculated as the change in elevation over a 100-foot distance. Cattle prefer flat areas or broad, gentle slopes and are usually deterred by steep slopes. In the GPS collar study at the Davis Mountains site, **95 percent of cow locations were on slopes of 11 percent or less**. Table 2 shows how slope affects whether or not cattle will use an area. Ecological site descriptions can help you identify areas where slope could limit cattle use.

Table 2. Expected effect of slope on cattle use.

Percent slope	Percent reduction in use
0-10	0
10-30	30
31-60	60
> 60	100

Water

The distance cattle have to travel to find water affects their use of a pasture. In general, **cattle graze within about 1 mile of water**, as was shown in the Davis Mountains study where about 73 percent of cow locations were within a 1-mile radius of either of the two water sources available.

Forage

Another consideration when determining grazeable acreage is what cattle will and will not eat. So you will need to be able to identify some of the major plant species, especially grasses. Grasses such as threeawn (*Aristida* spp.), red grama (*Bouteloua trifida*) and Texas grama (*Bouteloua rigidiseta*) are very unpalatable to cattle. Cattle will avoid areas dominated by these species if more palatable grasses are available elsewhere. Likewise, cattle will not use areas with heavy concentrations of certain perennial weeds such as goldenweed (*Isocoma drummondii*) and wolfweed (*Leucosyris spinosa*).

The frequency of herbaceous species was estimated at the South Texas Plains locations. No dominant grasses emerged as attractants or deterrents in grazed or ungrazed areas. However, at two of these locations the average number of herbaceous species was greater in the grazed areas (Fig. 4).

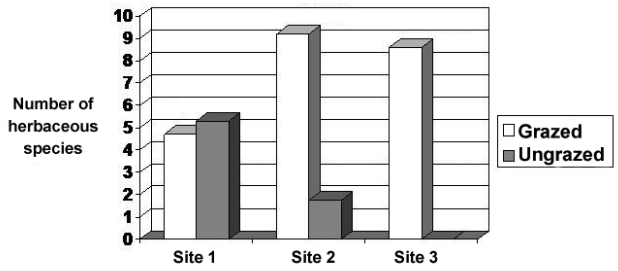

Figure 4. The number of herbaceous species was generally greater in grazed areas than in ungrazed areas at the South Texas locations.

Although there was little difference in the number of herbaceous species within the grazed and ungrazed areas at site 1, the grazed areas did have less Kleberg bluestem, a relatively unpalatable grass. It may be that cattle avoid this grass when possible.

Accessibility

Some areas of pastures may have low brush density scores, little rock cover, adequate water, gentle slopes and palatable forage species, but still not be grazed because they are inaccessible. These areas may be surrounded by dense brush, heavy rock cover and/or steep slopes. Aerial photographs with ecological site layers and descriptions can be very helpful in identifying such areas. If possible, creating roads or trails into these areas will make them more accessible to cattle.

How to Use this Information

Begin by visiting your local NRCS office and requesting up-to-date aerial photographs of your property. There is no charge for these photographs. NRCS personnel can also provide ecological site overlays for the aerial maps and help you figure out how many acres of each kind of ecological site there are. Use these maps and overlays to identify areas that might have dense brush, extensive rock cover or steep slopes. Then, check these areas on the ground; calculate brush density scores and rock cover percentages and make note of the abundance of various forage species. Also verify the accessibility or inaccessibility of suspect areas on the maps.

Here are typical ecological sites, with their surface rock and slope characteristics, for the Edwards Plateau and South Texas Plains regions.

Table 3. Typical ecological sites in the Edwards Plateau and their rock and slope characteristics.

Ecological site	Surface rock, %	Slope, %
Deep redland	7	0-5
Redland	7	0-5
Gravelly redland	≤36	1-12
Low stony hill	≤50	0-15
Steep rocky	35-65	15-45 (some 20-60)

Table 4. Typical ecological sites in the South Texas Plains and their surface rock and slope characteristics.

Ecological site	Surface rock, %	Slope, %
Clay loam	0	<3
Claypan prairie	0	0
Gray sandy loam	0	<2
Lakebed	0	<1
Sandy loam	0	0-5
Tight sandy loam	0	0-3

Use these guidelines to estimate the number of grazeable acres you have.

Total acreage available		_____
Subtract acres with brush density scores of 3 or higher.	–	_____
Subtract acres with 30 percent or more rock cover (unless already subtracted for brush density).	–	_____
Subtract acres dominated by undesirable plants (unless already subtracted for brush density and/or rock cover).	–	_____
Subtract acres with slopes of 10 percent or more (unless already subtracted for brush density, rock cover and/or undesirable plants).	–	_____
Subtract acres 2 miles or more from water (unless already subtracted).	–	_____
Total Grazeable Acreage	=	_____

The Importance of Estimating Grazeable Acreage

It is often possible to increase the amount of grazeable acreage by controlling brush, improving access to certain areas or adding water sources. Seeding rangeland with desirable grass species is another option. So taking time to estimate your grazeable acreage might prove beneficial by revealing management measures that would improve the productivity of your land.

But the major benefit is in determining the proper stocking rate. As this research shows, the number of grazeable acres on a ranch may be much lower than the total acreage, which can have a dramatic effect on stocking rate. At one Edwards Plateau ranch (Fig. 5), the GPS collar study revealed that cattle were using only 39 percent of the total area. The ranch had been stocked at 20 acres per cow based on total acreage, but the effective stocking rate was 9 acres per cow.

By using these guidelines, you will be able to estimate the number of grazeable acres on your property. Then you should make stocking decisions on the basis of the amount of forage available on that acreage.

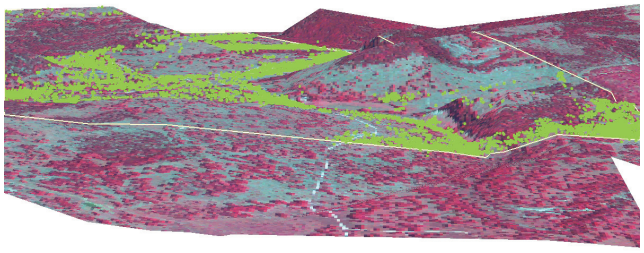

Figure 5. In this three-dimensional photograph, the green dots are cattle locations. Areas with no dots are mostly within the Steep Rocky ecological site or surrounded by this site, which had the most rock cover and slope and the greatest brush density.

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