

FORESTRY & RANGE MANAGEMENT

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R A N G E S U R V E Y G U I D E

Prepared under the provisions of the
Federal Aid to Wildlife Restoration Act
Montana Project W-37-R

by

Glen F. Cole

State of Montana Department of Fish and Game

1958

INTRODUCTION

This Range Survey Guide outlines procedures for conducting condition and utilization surveys on key forage species within key range areas. Survey data from different years are compared to determine trends.

A key forage species should be one of the most important big game foods on a range. Proper use on a key forage species should reflect proper use, or something less than proper use, on other important forage species.

A key range area should represent an important source of forage which must be maintained in a productive condition. In practice, the portions of a big game winter range which receive the heaviest use are usually key range areas.

Key forage species on the majority of Montana's big game winter ranges are browse plants, but certain bunchgrasses serve as key forage species for elk where snow depths are not excessive. The procedures for conducting condition and utilization surveys on key browse and key bunchgrass plants are outlined in the following sections.

CONDITION AND UTILIZATION SURVEYS
ON KEY BROWSE PLANTS

1. Equipment needed.

Clipboard and forms

Two 30-inch steel stakes for each sample unit

One numbered marker for each sample unit

One hammer

2. Period and frequency of surveys.

Surveys are conducted each spring after game has ceased to use their winter range.

3. Establishment of a sample unit.

Two steel stakes are driven about three and six feet from the base of a selected key browse plant. An imaginary line, extending through the stakes and the center of the selected browse plant, serves to orient the sample course followed in selecting plants (Figure 1). A numbered marker is wired to the steel stake furthest from the selected browse plant.

4. Measurements.

Form and age class assignments 1/ and leader use estimates are considered measurements. The various form and age classes are as follows:

Form Classes

- | | | |
|---|--|---------------|
| 1 | all available, little or no hedging | |
| 2 | all available, moderately hedged | |
| 3 | all available, severely hedged | |
| 4 | partly available, little or no hedging | |
| 5 | partly available, moderately hedged | |
| 6 | partly available, severely hedged | |
| 7 | unavailable | } dot tallied |
| 8 | dead | |

1/ Modified slightly from Dasman W. P., 1951. Some deer range survey methods. California Fish and Game 37 (1):43-52.

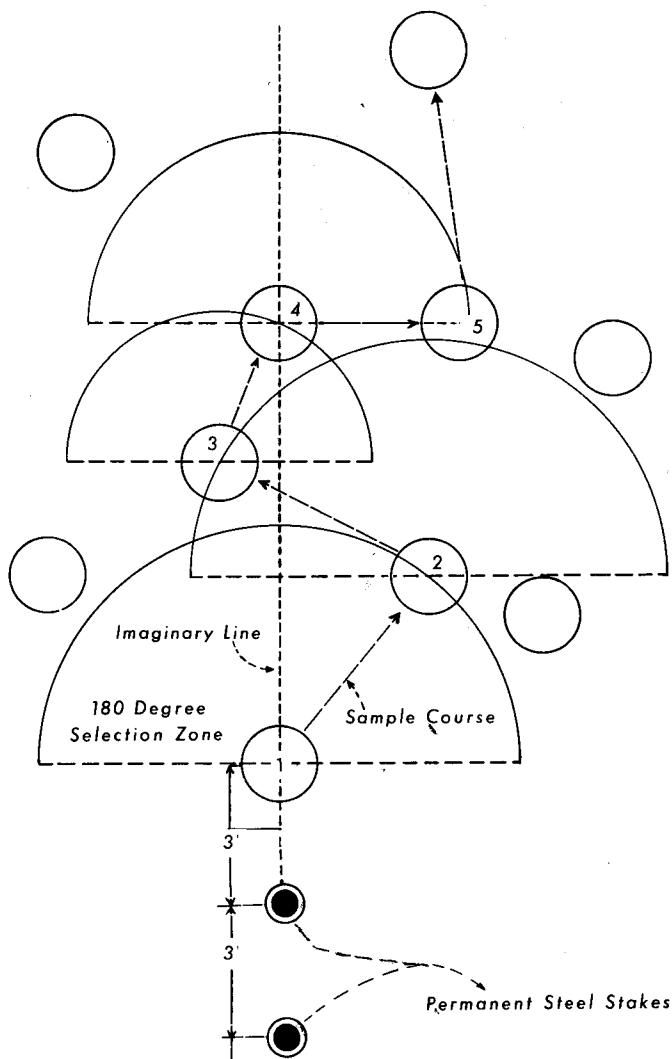


Figure 1. CLOSEST PLANT SAMPLING TECHNIQUE

Age Classes

S - Seedling
Y - Young
M - Mature
D - Decadent

} R - Resprout

Availability is gauged for snow conditions on each particular range. In general, a zero to six-foot zone is considered to include available forage in central and eastern Montana; a one or two to six-foot zone, in western Montana.

Assignments of age classes will vary with different browse species. In general, browse plants with stems up to 1/8 inch in diameter (at the base) are classed as Seedlings. Those with stems between 1/8 and 1/4 inch are classed as Young. Plants are classed as Decadent if 25 per cent or more of the crown area is dead. An "R" suffix, denoting resprouting, is added to the Young, Mature or Decadent classes if new stems are sprouting from root systems where older stems are evident.

Leader use estimates are used as an index of utilization. They are based upon the percent of the total available leaders showing use. Recorded estimates and their percentage ranges are as follows:

<u>Recorded Estimates</u>	<u>Ranges</u>
0	Non-use
5	1-10
25	10-40
50	40-60
70	60-80
90	80-100

Assignments of the three degrees of hedging (zero to light, moderate and severe) are based upon the relative length and appearance of the second year growth below current leaders (Figure 2). Second year growth is considered to be severely hedged if it is relatively short and strongly clumped, moderately hedged if it is somewhat lengthened and only moderately clumped and lightly hedged if it is only slightly clumped or unclumped.

5. Procedures for sampling and measuring key browse plants.

A "closest plant" sampling technique is used (Figure 1). The sample course is run from the starting point (the first selected plant) to the next closest key browse plant within

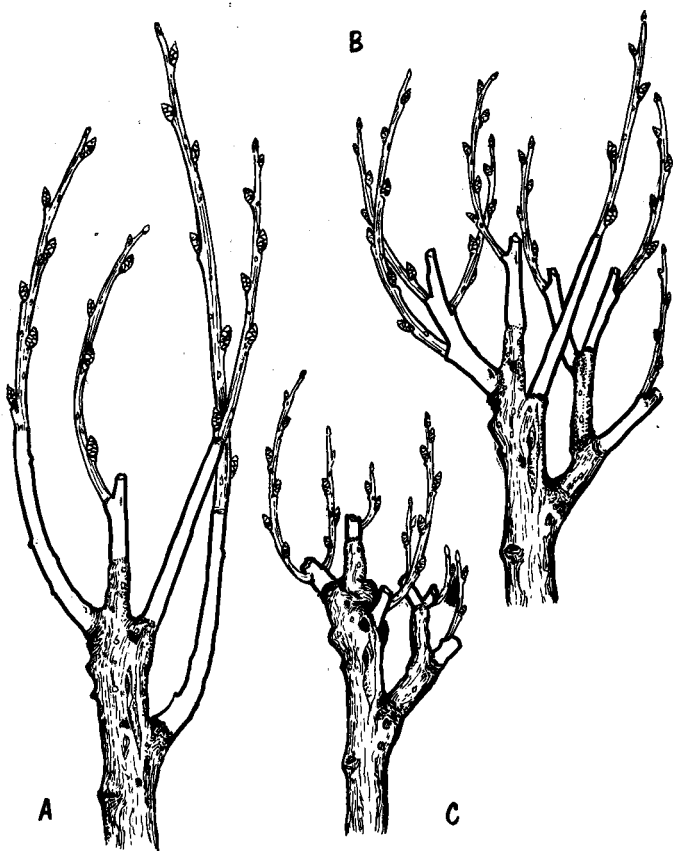


Figure 2. Degrees of hedging; A. Zero to light, B. Moderate, C. Severe.

a 180 degree selection zone, to the next closest key browse plant within a 180 degree zone, to the next closest plant, etc. Distances are gauged from the centers of browse plants. When two plants are equally distant, the one closest to the imaginary line, extending from the starting point, is selected. The 180 degree selection zone may be maintained without the aid of a compass by orienting the direction of the imaginary line straight up or down a slope or on the contour. Browse plants falling into the 7 or 8 form classes are not tallied on the field form (Form-B 1, Appendix). Age class assignments and leader use estimates are made on the form classes 1 through 6 and the data are recorded in the designated columns on the field form.

6. Sampling intensities.

Measurements should be obtained from at least 25 key browse plants (7 or 8 classes excluded) on each sample unit. At least 50 browse plants should be sampled on important winter range areas. Samples containing 100 or more plants will permit the use of confidence limits in compiling and analyzing data. One experienced person may sample, measure, and record browse survey data at only a slightly slower rate than it takes to walk between browse plants.

7. Compilation of data.

Form and age class data are expressed as percentages. Confidence limits are used when sample sizes involve 100 or more plants. Leader use estimates are expressed as an average.

8. Analyses of data.

Forage availability and age class data may be interpreted per se. The various degrees of hedging reflect the effects of leader use two or more winters ago. On ranges relieved from heavy game use, vigorous browse plants will grow out of a severely hedged condition (class 3 or 6) and reflect the lightly or moderately hedged condition after two winters. Recovery will be slower when browse plants are in poor vigor. The three degrees of hedging also provide some index of relative forage production. In most cases, current leader growth on severely hedged plants is relatively short and less forage is available than on lightly or moderately hedged plants. The allowable degree of hedging on browse plants will vary on different ranges. In general, browse plants under timber or

young plants on any site will not tolerate more than light hedging. Mature browse plants, receiving direct sunlight, will usually tolerate moderate hedging and remain productive. Certain browse species will tolerate some severe hedging, but their forage production will be reduced and they will eventually die if kept in this condition.

Leader use estimates reflect the intensity of the past winter's use on browse plants. Allowable intensities of use will vary with the species of browse plants, the vigor of plants, the particular range site and the severity of the past winter. Tentatively, about 70 percent leader use is considered allowable on vigorous browse plants during severe winters, 50 percent use during "normal" winters and 25 percent during mild winters.

Trend interpretations are made by comparing survey data from different years. Changes in form and age class percentages are analyzed by employing confidence limits or chi-square tests of significance, changes in average leader use values by a "Student's" t-test 1/.

9. Modifications.

Sampling procedures may be modified to suit vegetational conditions on a particular range as follows:

1. Inexpensive "write-on" aluminum tags may be wired on selected browse plants (along a sample course) to assure that subsequent surveys will involve the same plants.
2. Second or third closest plants may be selected where plants are close together and an extension of the sample line is desired.
3. Randomized steps or paces, with selections of the closest plant within a 180 degree zone (off the toe) may be used to extend the sample line over a large area.
4. Sampling may be by ocular reconnaissance within a defined area. Observations of form and age classes and leader use are averaged for the area as a whole.

Estimates of the relative amount of dead material in plant crowns may be made by 10 per cent intervals if a more sensitive measure of plant decadence is desired.

1/ Cole G. F., 1957. A browse survey method for use on Montana big game ranges. Montana Fish and Game Department. Memo Rept., Project W-37-R-8, 12 pp.

CONDITION AND UTILIZATION SURVEYS

ON KEY BUNCHGRASSES

Condition Surveys

1. Equipment needed.

- Clipboard and forms
- One 8-foot steel rule graduated in hundredths of feet
- One 100-foot tape
- One six-pound hammer
- One six-foot steel post and four 18-inch steel stakes for each plot
- Twelve sharpened wood laths

2. Period and frequency of surveys.

Surveys are conducted after key bunchgrass plants have matured in the late summer or fall. Annual surveys are recommended.

3. Establishment of a sample unit.

Permanent 100 by 250-foot plots are established on sites within key areas. Care is taken that a site represents an ecological entity such as a ridge-top, slope or flat. This is necessary to isolate differences in plant growth due to soil or moisture conditions.

A plot is established in the following manner. A 300-foot base line, where the 50 to 300-foot distance represents one side of the plot is measured. As this base line is measured the following markers are driven into the ground: a six-foot steel post at the zero-foot mark; an 18-inch steel stake and a wood lath at the 50-foot mark; a wood lath at the 100, 150, 200, and 250-foot marks; an 18-inch steel stake and a wood lath at the 300-foot mark.

A 100-foot line is extended 90 degrees from the horizontal base line at the 300-foot mark, forming the second side of the plot. A 250-foot line, parallel to the base line is then measured to form the third side of the plot. As this line is measured, an 18-inch steel stake and a wood lath are driven into the ground at the 0 and 250-foot marks; a wood lath at the 50, 100, 150, and 200-foot marks. The completed plot is illustrated on Figure 3. The offset six-foot steel post and the four 18-inch stakes serve as permanent markers. The wood laths serve as temporary markers for the purpose of guiding the sampling course through the plot. They are removed after the measurements on a plot are completed. See modifications in section 9.

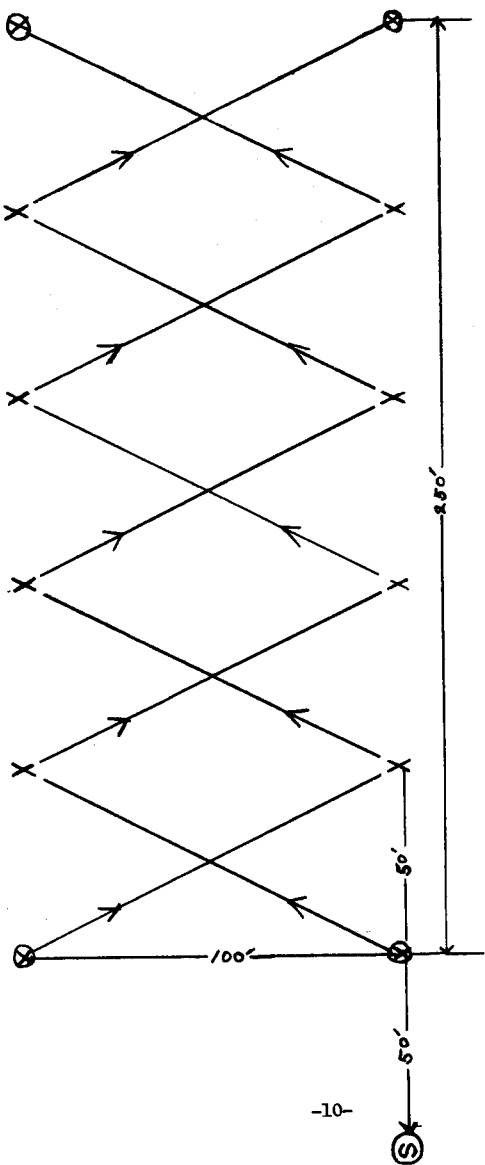


Figure 3. Physical features of a 100 by 250 foot plot and the course walked while sampling plants within the plot. S = 6 foot steel post permanent marker, O = 18 inch stake permanent marker, X = wood lath temporary marker, → = the sampling course.

4. Measurements.

The following are obtained as measurements:

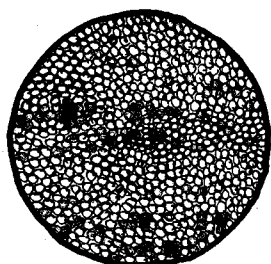
Bunchgrass form classes
An index of key bunchgrass density
Maximum leaf heights

The various form classes assigned to key bunchgrass plants are as follows:

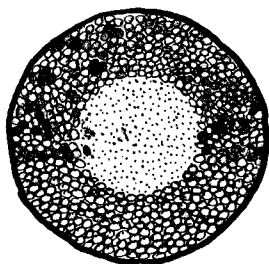
S - Seedling	
Y - Young	
N - Normal	<u>Suffixes</u>
HC - Hollow Center	} R - Recent D - Decomposed
CE - Clump Edge	
D - Dead	

The Seedling class is assigned if the basal diameter of a bunchgrass clump is one-quarter inch or less; the Young class, if the basal diameter is between one-quarter and one inch. The other four classes apply to plants with basal diameters greater than one-inch. The Normal class is assigned if all portions of a bunchgrass clump have produced current leaves (Figure 4A); the Hollow Center class, if a "ring" of leaves encircles a dead center by more than one-half the clump circumference (Figure 4B). The Clump Edge class is assigned if one or more segments of leaves grow on the edges of a clump (Figure 4C) and the largest segment does not encircle more than one-half the clump circumference. Segments are considered separate if they are more than one-fourth inch from the other segments. The Dead class is assigned if a plant has not produced current leaves. Suffixes are assigned to the Hollow Center, Clump Edge or Dead classes. An "R" suffix is assigned if vegetative structure is still evident on the surface of the dead portions of a bunchgrass clump. A "D" suffix is assigned if the dead portions of a clump are decomposed and structureless.

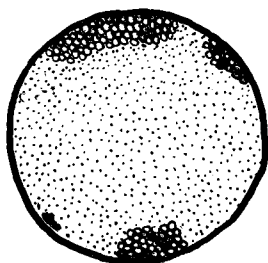
Indices of key bunchgrass density are obtained by measuring distances from the toe (using a random step sampling procedure) to the closest key bunchgrass plant ("Seedling" and "Dead" classes excluded) within an 180 degree selection zone off the toe. Maximum leaf heights are obtained by placing a rule virtually within a bunchgrass clump. The density and leaf height measurements are taken to the nearest 0.01 foot.



A



B



C

Segment



Leaves



Dead portions of bunchgrass clumps

Figure 4. Bunchgrass form classes; A. Normal,
B. Hollow Center, C. Clump Edge

5. Procedure for sampling and measuring key bunchgrass plants.

A "closest plant-random step" sampling procedure is used to select key bunchgrass plants. The course walked through a plot is illustrated on Figure 3. The starting point is the corner closest to the six-foot steel post. The wood laths serve as guides for walking the crossing diagonal lines through each 50 by 100-foot section. Plot boundary lines are not included in the sampling course.

While walking the specified course, a designated number of steps is taken before each of 100 key bunchgrass plants is selected. The number of steps to be taken is shown on the field form (Form - G1, Appendix). Steps range from one to seven and their sequence has been determined from a table of random numbers. They are counted from the corner starting point or a point where a plant has been measured. If additional plants are needed after passing through a plot, the course is retraced in an opposite direction until the full 100 plants are selected. The closest key bunchgrass plant within an 180 degree selection zone off the toe of the foot completing each designated number of steps is selected. The form class of this point is entered in the appropriate column on the field form if it is classed as Young, Normal, Hollow Center or Clump Edge. If the plant is assigned to the Seedling or Dead class it is dot-tallied on the field form and the next closest plant in the Young, Normal, Hollow Center or Clump Edge class is selected. Density index and leaf height measurements are only taken from plants which are not dot-tallied.

6. Sampling intensities.

Measurements should be obtained from 100 key bunchgrass plants (excluding Seedling and Dead classes) on each plot. At least two plots should be located on an important range area. Two men are able to establish a plot in 15 to 20 minutes. With one man recording and another measuring, about one and one-quarter to one and one-half hours are required to obtain the various measurements from 100 plants.

7. Compilation of data.

Form class data are expressed as percentages. Percentages are computed on the basis of 100 observations for both the dot-tallied and recorded (Y, N, HC and CE) classes. Density index and leaf height values are expressed as averages. Averages are multiplied by 12 to convert them to inches.

8. Analyses of data.

Hollow Center, Clump Edge and Dead form classes reflect conditions where bunchgrass plants have deteriorated in vigor and forage production. The suffixes "R" and "D" are assigned to indicate whether a deteriorated condition has resulted from recent or past overuse. The Seedling and Young categories are distinguished to isolate plants which are too small to reflect the Hollow Center and Clump Edge classes. Percentages of plants in the Hollow Center and Clump Edge classes are used to condition-class key bunchgrasses as follows:

<u>Percent HC and CE</u>	<u>Condition Class</u>
0-20	Excellent
21-40	Good
41-60	Fair
61-80	Poor
81-100	Very Poor

The density index measurement is considered to reflect the density of key bunchgrass plants. Comparisons may be made between initial and subsequent measurements on a range or different ranges can be compared. The maximum leaf height measurement is considered to provide an index of relative forage production between years and different ranges.

Trend interpretations are made by comparing survey data from different years. Changes in form class percentages are analyzed by employing confidence limits or chi-square tests of significance, changes in density index or leaf height averages, by a "Student's" t-test 1/.

9. Modifications.

Sampling procedures may be modified where plots are not easily established. Randomized steps, with selections of the closest key bunchgrass within a 180 degree zone off the toe, may be taken in a straight-line course on steep slopes and ridge tops. The sample course will be approximately 900 feet long if random steps range from one to seven. A closed course may be run by off-setting after 50 plants and running a parallel course back toward the starting point. The direction of a course and the orientation of the 180 degree zones may be maintained by running a course straight up or down a slope or on the contour.

1/ Cole G. F., 1957. A vigor measurement method for determining trends in the condition of key forage bunchgrasses on Montana elk ranges. Montana Fish and Game Dept. Memo. Rept., Project W-37-R-8, 20 pp.

(Revised 1959)

Utilization Surveys

1. Equipment needed.

Clipboard and forms
Utilization gauge 1/
Steel rule graduated in inches

2. Period and frequency of surveys.

Surveys on winter elk ranges are conducted in spring before new grass growth becomes conspicuous. Surveys on ranges grazed during other seasons are made at the end of a season or grazing period.

3. Establishment of a sample unit.

The same sample units used for bunchgrass condition surveys may be used for utilization surveys. Plots or line courses may also be established just for utilization surveys.

4. Measurements.

The stubble heights of uniformly-grazed grasses are measured or estimated to the closest $\frac{1}{4}$ inch. Direct estimates of percentage utilization are made for plants which are not uniformly-grazed. Maximum heights of ungrazed plants are measured or estimated to the nearest $\frac{1}{2}$ inch. Measurements are made by placing a rule vertically within a grass plant.

5. Procedures for sampling and measuring key grasses.

The "closest plant-random step" sampling procedure used in bunchgrass condition surveys is used. Measurements or estimates of the grazed and ungrazed heights of grass plants are recorded in separate columns on the field form (Form-C2, Appendix). Seedstalk (culm) producing plants are checked.

6. Sampling intensities.

Measurements should be obtained from 100 grass plants on each sample unit. If less than 20 of the sampled plants are ungrazed, additional ungrazed plants should be selected at random to obtain this number.

1/ Lommasson, Tom, and Chandler, Jensen. 1938. Determining the utilization of range grasses from height-weight tables. U. S. Forest Service, Region 1. 16 pp. (Mimeo.)

7. Compilation of data.

All ungrazed heights are totaled and averaged if 80 percent or more of the plants are in either the seedstalk producing (culmed) or non-seedstalk producing (culmless) class. The resulting "Average Ungrazed Height" value is set on the Utilization Gauge. Percent utilization values are then read on the culmed or culmless scale for each grazed plant.

The ungrazed heights of culmed and culmless plants are totaled and averaged separately if neither class represents 80 percent of the ungrazed plant sample. If culms are evident on grazed plants, percent utilization may be read by using the applicable "Average Ungrazed Height" and scale for culmed or culmless plants. If culms are not evident on grazed plants, the two classes are assigned in proportion to their occurrence in the ungrazed plant sample, eg., if 25 percent are culmed and 75 culmless the "Average Ungrazed Heights" value and the scale for culmed plants would be used to obtain a percent utilization value for every 4th grazed plant. Percent utilization values for the other 3 grazed plants would be based upon the "Averaged Ungrazed Height" value and scale for culmless plants. Percent utilization values from all grazed plants are totaled and multiplied by the number of grazed plants in the 100 plant sample to obtain an average utilization value for the grass species on a sample unit.

8. Analyses of data.

The levels of utilization which represent proper use on a key grass species will vary with the season of grazing on a range. Tentatively, about 50 percent utilization will be allowable for vigorous key grasses on elk winter ranges, 40 percent on spring and fall ranges and 30 percent on summer ranges. Allowable levels of utilization would be reduced where improvements in forage conditions were desired.

Utilization values may also be used to guide management where elk have been allocated a percentage of the usable forage on a range which is also used by livestock. Where elk and livestock use a range during the same season, the proportionate utilization by each may be estimated by equating their relative preferences for a key forage species to their relative use of the range. Relative preferences for a forage species are determined from food habits studies and are expressed by a ratio. Relative use on a range is determined from pellet-group and cow-chip counts. Counts are also expressed by a ratio. The forage preference ratio for each animal is multiplied by their respective use ratios. The resulting weighted values are expressed as a percentage of their total. These percentage values represent the proportion that each animal contributed to the utilization on the sampled range area. The series of calculations leading to an estimate of the proportionate utilization by elk and cattle on a range where a key species was utilized 40 percent are as follows:

	<u>Forage Pref. Ratio</u>		<u>Use Ratio</u>		<u>Weighted Value</u>	<u>Weighted Value %</u>	<u>Proportionate Util. of 40%</u>
Elk	0.5	x	0.4	=	0.2	17	7
Cattle	1.0	x	1.0	=	1.0	83	33

Where elk and livestock use a range during different seasons the proportionate utilization on key forage may be determined by conducting utilization surveys after each has ceased to use the range.

9. Modifications.

The percent of ungrazed plants in a sample may be used to obtain a supplemental average utilization value for bunchgrasses. Average utilization values are read from a "Utilization Chart" (Appendix). Numbers of grazed and ungrazed plants are obtained in conjunction with the recording of measurements on Form-G2 (Appendix). Tallies of grazed and ungrazed plants may also be made separately (along random-step sample courses) to obtain a rapid appraisal of utilization.

APPENDIX

Form-B1

Browse Field Form

Sample Unit No. _____

District _____ Area _____ Date _____ Key Sp. _____

Location _____

Forage Availability _____ Veg. Type _____

Dot-tally - Form Class 7 _____ 8 _____ Examiner _____

Plant No.	Form Class						Age Class	Leader Use	Plant No.	Form Class						Age Class	Leader Use
	1	2	3	4	5	6				1	2	3	4	5	6		
1									26								
2									27								
3									28								
4									29								
5									30								
6									31								
7									32								
8									33								
9									34								
10									35								
11									36								
12									37								
13									38								
14									39								
15									40								
16									41								
17									42								
18									43								
19									44								
20									45								
21									46								
22									47								
23									48								
24									49								
25									50								

Form ClassesPercentages

- _____ 1 all available, little or no hedging
 _____ 2 all available, moderately hedged
 _____ 3 all available, severely hedged
 _____ 4 partly available, little or no hedging
 _____ 5 partly available, moderately hedged
 _____ 6 partly available, severely hedged
 _____ 7 unavailable
 _____ 8 dead } dot-tally

RAge ClassesLeader Use Est. %Leader Use Av.

- _____ S - Seedling 0 non-use
 _____ Y - Young 5 1-10
 _____ M - Mature } R - Resprout 25 10-40
 _____ D - Decadent 50 40-60
 70 60-80
 90 80-100

REMARKS: _____

Form-B1

Browse Field Form

Sample Unit No. _____

District _____ Area _____ Date _____ Key Sp. _____

Location _____

Forage Availability _____ Veg. Type _____

Dot-tally - Form Class 7 _____ 8 _____ Examiner _____

Plant No.	Form Class						Age Class	Leader Use	Plant No.	Form Class						Age Class	Leader Use
	1	2	3	4	5	6				1	2	3	4	5	6		
1									26								
2									27								
3									28								
4									29								
5									30								
6									31								
7									32								
8									33								
9									34								
10									35								
11									36								
12									37								
13									38								
14									39								
15									40								
16									41								
17									42								
18									43								
19									44								
20									45								
21									46								
22									47								
23									48								
24									49								
25									50								

Form ClassesPercentages

_____	1	all available, little or no hedging
_____	2	all available, moderately hedged
_____	3	all available, severely hedged
_____	4	partly available, little or no hedging
_____	5	partly available, moderately hedged
_____	6	partly available, severely hedged
_____	7	unavailable
_____	8	dead } dot-tally

RAge ClassesLeader Use Est. %Leader Use Av.

_____	S - Seedling	0	non-use
_____	Y - Young	5	1-10
_____	M - Mature	25	10-40
_____	D - Decadent	50	40-60
		70	60-80
		90	80-100

REMARKS: _____

Form-G1

Bunchgrass Condition Form

District _____ Area _____ Date _____ Key Sp. _____ Plot No. _____

Location _____ Veg -type _____

Dot-tally - Seedlings _____ Dead R _____ D _____ Examiners _____

Plant No.	No. Steps	Form Class	Density Index	Max. Leaf Ht.	Plant No.	No. Steps	Form Class	Density Index	Max. Leaf Ht.
1	5				51	1			
2	4				52	5			
3	3				53	4			
4	5				54	1			
5	2				55	6			
6	7				56	1			
7	5				57	4			
8	3				58	4			
9	4				59	5			
10	6				60	2			
11	5				61	5			
12	3				62	3			
13	7				63	2			
14	6				64	7			
15	5				65	2			
16	1				66	1			
17	2				67	7			
18	1				68	7			
19	6				69	1			
20	5				70	5			
21	7				71	5			
22	5				72	5			
23	2				73	2			
24	6				74	2			
25	3				75	1			
26	4				76	5			
27	4				77	6			
28	1				78	3			
29	6				79	3			
30	6				80	2			
31	1				81	4			
32	1				82	5			
33	7				83	3			
34	2				84	6			
35	4				85	5			
36	3				86	2			
37	7				87	1			
38	6				88	5			
39	6				89	1			
40	7				90	4			
41	5				91	1			
42	7				92	1			
43	4				93	2			
44	4				94	6			
45	3				95	6			
46	6				96	4			
47	3				97	1			
48	7				98	7			
49	7				99	6			
50	4				100	7			

Form-G2

Grass Utilization Form

District _____ Area _____ Date _____ Key Sp. _____ Plot No. _____

Location _____ Veg. Type _____ Examiners _____

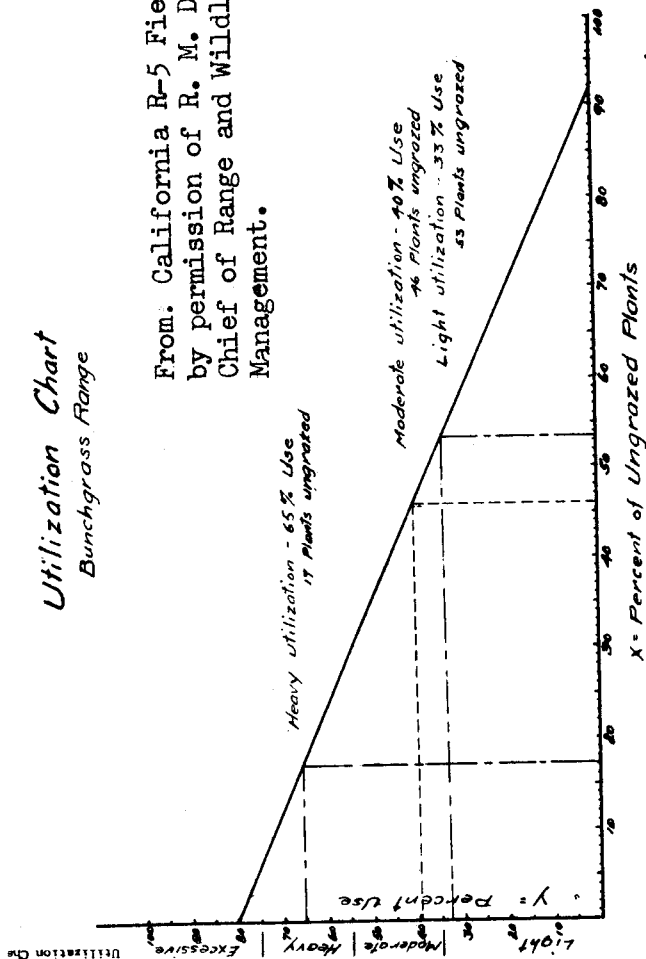
Plant No.	No. Steps	Culms	Ungrazed Heights	Grazed Heights	Percent Util.	Plant No.	No. Steps	Culms	Ungrazed Heights	Grazed Heights	Percent Util.
1	5					51	1				
2	4					52	5				
3	3					53	4				
4	5					54	1				
5	2					55	6				
6	7					56	1				
7	5					57	4				
8	3					58	4				
9	4					59	5				
10	6					60	2				
11	5					61	5				
12	3					62	3				
13	7					63	2				
14	6					64	7				
15	5					65	2				
16	1					66	1				
17	2					67	7				
18	1					68	7				
19	6					69	1				
20	5					70	5				
21	7					71	5				
22	5					72	5				
23	2					73	2				
24	6					74	2				
25	3					75	1				
26	4					76	5				
27	4					77	6				
28	1					78	3				
29	6					79	3				
30	6					80	2				
31	1					81	4				
32	1					82	5				
33	7					83	3				
34	2					84	6				
35	4					85	5				
36	3					86	2				
37	7					87	1				
38	6					88	5				
39	6					89	1				
40	7					90	4				
41	5					91	1				
42	7					92	1				
43	4					93	2				
44	4					94	6				
45	3					95	6				
46	6					96	4				
47	3					97	1				
48	7					98	7				
49	7					99	6				
50	4					100	7				

Av. Util. _____

Utilization Chart

Bunchgrass Range

From: California R-5 Field Guide
by permission of R. M. DeNio,
Chief of Range and Wildlife
Management.



at Elwood
4-28-58

