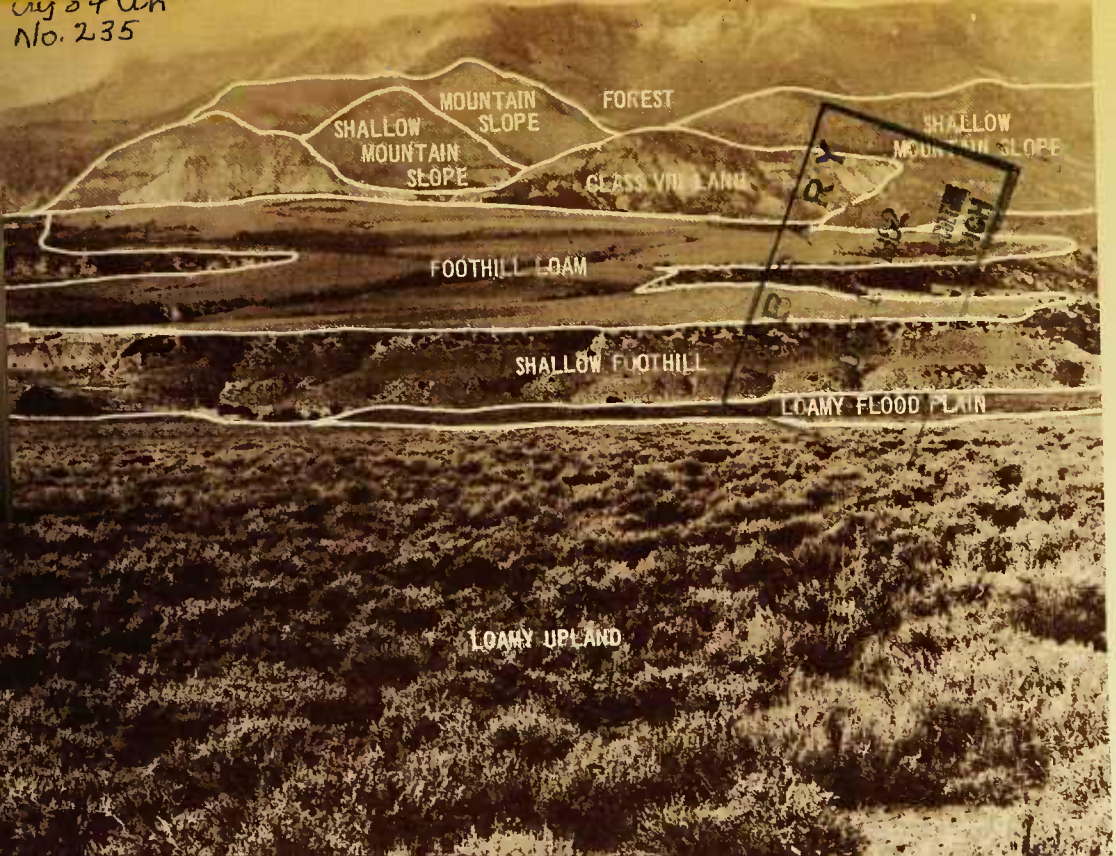

CLASSIFYING RANGELAND FOR CONSERVATION PLANNING

Agriculture Handbook No. 235

U.S. Department of Agriculture
Soil Conservation Service

CONTENTS

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Cover picture: A range landscape showing six range sites. Each range site has distinctive kinds of soil and is capable of producing a distinctive kind and amount of native forage plants.

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Classifying Rangeland for Conservation Planning

by F. G. Renner, former *Head Range Conservationist,* and B. W. Allred, *Head Range Conservationist,* Soil Conservation Service

Attempts to appraise the resources of rangeland and to develop information useful in its management have been underway in the United States for about 50 years. This problem has been approached in many ways, and the opinions on the kind of information needed have been as varied as the methods proposed for its collection and evaluation.

Rangeland is land on which the climax, or potential, plant community consists principally of native grasses, forbs, and shrubs that are valuable for forage and are in sufficient quantity to justify its use for grazing. It includes natural grassland, savannas, and certain kinds of woodland and chaparral useful for grazing.

Some workers have attempted to evaluate rangeland on the basis of the digestible nutrients produced. Others have emphasized chemical analysis of individual plant species. Still others have sought the key to successful management in plant indicators, in stages of plant succession, in forage types and "forage acres," and in the relation of forage production to annual rainfall.

From this experience it is clear that the successful management of rangeland has two requirements. The landowner needs to know the capability of different kinds of rangeland in terms of the kind and quantity of forage they can be expected to produce, and he must be able to appraise their present condition in relation to what can be expected.

This bulletin describes the procedures used in the Soil Conservation Service to collect information on the capability of rangeland, explains the ecological basis for range sites, and shows how this information is used in conservation planning.

Range Sites

Simply defined, a range site is a distinctive kind of rangeland that has a certain potential for producing range plants. Its inherent productive capacity, like that of other agricultural land, depends on the combined effect, or interaction, of the soil and climate peculiar to it. The ultimate expression of its particular combination of environmental conditions is the characteristic plant community that occurs on it. Furthermore, the range site retains its capacity to reproduce this climax plant community so long as the environment remains unchanged.

Relation to the Environment

A range site is the product of all its environmental factors, and its distinctive climax community is relatively uniform throughout the site. Accordingly, a range site is not only an entity of the environment but is also a specific area of land whose characteristic features can be recognized and described.

Determining the Climax Plant Community

Because of variations in the microenvironment within a site, the relative composition of any natural plant community varies. Consequently, the native plant community that represents the climax for the site consists of a characteristic grouping of species and not of precisely defined proportions. Several methods, of which the following are the most important, are used to determine the nature of the climax plant community.

1. Evaluation of the relict vegetation and the soil on protected or relatively undisturbed areas.
2. Evaluation of grazed areas that have similar soil, topography, and climate where grazing records are available.
3. Evaluation of data from ecological and soil research.
4. Observations on areas currently receiving various degrees of grazing use and on areas excluded from this use.
5. Historical accounts, including early photographs and ecological and botanical literature.

Evidence from any single source is not likely to be conclusive. Furthermore, particular care must be taken to evaluate the facts to be certain that they are not the result of some abnormal condition such as drought, excessive soil removal or deposition by wind or water, fire, too many rodents, or too much snow or water. Some degree of disturbance is normal on all sites, and the disturbance may or may not be the result of grazing. Generally, however, it may be assumed that the plant community on areas that have not been subject to pronounced disturbance most nearly represents the potential community for that site.

Permanence of the Range Site

Range sites are subject to many disturbances that modify or temporarily destroy the vegetation but do not preclude the reestablishment of the climax plant community. Examples are drought, grazing, fire, and short-term tillage. Unless particularly severe, the effect of these disturbances usually is corrected by time or by improved management or other measures, and the potential of the range site itself is not permanently changed.

But if these disturbances are so severe and so prolonged that they cause severe erosion, reduce fertility, change the position of the water table, or otherwise change soil conditions to the extent that revegetation is seriously affected, the productive capacity of the site is changed. In such places, a different range site consistent with the altered potential is recognized.

On some ranges of California characterized by a Mediterranean climate, the original, or native, plant communities have been replaced by equally, or more highly, productive annuals. On these ranges, the goal of management may be improvement of the present vegetation rather than restoration of the original perennials.

Distinctions Between Range Sites

Different range sites are recognized because of (1) differences in the kinds or the proportions of plants that make up the potential plant communities or (2) differences in the total yield if the vegetation in the potential plant communities is nearly the same.

To be useful in conservation planning, the difference in the kind or amount of vegetation must be great enough to require some change in management, such as a different rate of stocking. Different range sites are not recognized because of differences in soil or in climate unless these factors result in a significant difference in the potential plant communities.

Individual factors of the environment are useful in distinguishing one range site from another only to the degree that they regularly occur with differences in the climax vegetation. The effect of differences in some factors is obvious. In soil, for

example, the presence or absence of a water table in the root zone, or a high degree of salinity as contrasted to a nonsaline condition, is dramatically reflected in the kind or amount of vegetation produced. Differences in soil texture, in soil depth, or in topographic position may also be used to distinguish range sites if these factors are known to result in significant differences in plant composition or in yield. Examples are sands as contrasted to clays, deep soil as contrasted to very shallow soil, and uplands as contrasted to bottom lands subject to overflow. These different areas are usually in different range sites.

Distinguishing between range sites is more difficult in areas with similar soil, relatively uniform topography, and gradual changes in climate—since changes in composition and yield are gradual. Consequently, the need for site differentiation may not be apparent until the cumulative effect on the vegetation has been studied over a broad area. Commonly, these differences are reflected first in differences in yield and second in changes in composition.

The effect of any individual factor of the environment varies, depending on the other factors of the environment. Greater soil depth, for example, usually means more on a site that receives moisture from repeated overflow than it does on a sloping upland site. An additional 2 inches of rainfall annually may be highly important in an arid area but of minor importance in a humid area. Similar variations in the degree of importance are true of most factors of the environment. Consequently, in determining a range site, the total environment must be considered as well as the individual factors.

In evaluating the differences in plant composition of rangeland in "excellent" condition, the relative proportion of individual species may indicate whether there is one range site or more. For example, the potential plant community on one range area may include 60 percent big bluestem (*Andropogon gerardi*) and 10

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Left: A deep sandy loam that has a moderate water-holding capacity and a deep root zone. Right: A deep clay underlain by marl. This fine-textured soil is slowly permeable; it has a high water-holding capacity and a deep root zone.

Left: A moderately deep, gravelly sandy loam. Because of the large amount of gravel, the soil has a low water-holding capacity and is droughty. Right: A shallow silt loam over weakly consolidated chalk, which limits water-holding capacity and root development.

percent little bluestem (*A. scoparius*), and these proportions may be reversed in another area. Intensity of grazing and season of use should be based primarily on the requirements of big bluestem in the first area and on those of little bluestem in the second area, and two range sites should be recognized even though the difference in their total yield is minor.

The point at which a difference in composition or in yield makes it necessary to recognize another range site varies. For example, a difference in yield of 100 pounds of air-dry herbage per acre is of minor importance on sites capable of producing 2,000 to 3,000 pounds per acre but is highly important on sites capable of producing only 200 to 300 pounds per acre.

A single factor of the environment, or a combination of factors, is not used to differentiate range sites unless the effect of one or all is clearly reflected in significant differences in composition or in yield. Nor are factors used that may influence the distribution of grazing but have little, if any, effect on composition or on yield.

In summary, the criteria for differentiating range sites should be based on—

1. Significant differences in the kind of vegetation in the potential plant community.
2. Significant differences in the amount of herbage produced by the potential plant community.

Naming Range Sites

Range sites are named to help ranchers to recognize and to remember the important kinds of rangeland in their locality. Therefore, site names should be brief and should be based on readily recognized, permanent physical features such as the kind of soil, climate, topography, or combinations of these features.

Since the vegetation changes or, in some places, disappears, plant names alone are not adequate for this purpose. Combinations of a permanent physiographic feature and the kind of potential vegetation characteristic of the site are more helpful.

Examples of range-site names are Deep sand, Sandy plains, Clay upland, Saline lowland, Gravelly outwash, Limestone breaks, Pumice hills, Wet meadow, and Sandy savanna.

Correlation of Range-Site Names

Because of the limited number of permanent physiographic or other features that can be used in naming range sites, some duplication of names is inevitable. Deep sands, for example, occur in areas of widely different climate, and these different areas support different natural communities. The name "Deep sand" is appropriate for each area and, thus, is used throughout the country to designate several range sites. Range-site names should not be duplicated, however, in any one land-resource area or soil association.

Range areas with similar soil and topography may have significantly different potential plant communities as the result of climatic differences. The average annual precipitation of the sandy plains in the Oklahoma Panhandle, for example, ranges from 16 to 23 inches. Quantitative evaluation indicates that there is a significant difference in the amount of vegetation produced in the 16- to 19-inch precipitation zone as contrasted to that in the 20- to 23-inch zone. In such places, two range sites are recognized and are distinguished by including the precipitation zone (p.z.) in the site name, e.g., "Sandy plains, 16- to 19-inch p.z." and "Sandy plains, 20- to 23-inch p.z."

An example of range sites that have been named and correlated with soil surveys follows.

Land-resource area	*Range site*	*Principal soils*
High Plains	Deep sands (16- to 19-inch p.z.)	Dalhart loamy fine sand.
	Deep sands (20- to 23-inch p.z.)	Vona loamy fine sand.
		Otero loamy fine sand.
	Sandy plains	Dalhart fine sandy loam.
		Mansker fine sandy loam.
		Berthoud fine sandy loam.
Rolling Red Plains.	Alkali flats	Port-Solonetz.
		Drummond-Solonetz.
	Deep sands	Pratt loamy fine sand.
		Pratt-Tivoli loamy fine sands.
		Enterprise loamy fine sand.
		Likes loamy fine sand.
	Deep sand savanna	Brownfield loamy fine sand.
		Nobscott loamy fine sand.
	Heavy bottom land	Port clay loam.
		Spur clay loam.
	Sandy plains	Pratt fine sandy loam.
		Miles fine sandy loam.
		Enterprise fine sandy loam.
		Dill fine sandy loam.
		Dalhart fine sandy loam.

Descriptions of Range Sites

In the Soil Conservation Service, after a range site has been identified and named, a description of the site is prepared and placed in the work unit's technical guide. It includes—

1. The site name, including the precipitation zone if it is needed to identify the site, and the land-resource area.
2. The geographic location of the site (soil conservation district or work unit).
3. The pertinent features of the climate, including the amount and distribution of precipitation and the season when the dominant forage plants make their maximum growth.
4. The approximate elevation and a brief description of the topography.

5. The soil types and phases in the range site and a brief description of their characteristics that directly influence the growth of range plants.
6. A brief description of the climax plant community for the site, naming the more important decreasers and increasers.
7. The approximate yield of the site in excellent condition, expressed in pounds of air-dry herbage per acre, in favorable years and in less favorable years.
8. The location of a typical example of the range site.

An example of a range-site description follows.

1. RANGE-SITE NAME: Sandy land, Rolling Plains land-resource area.
2. LOCATION: Hemphill County Soil Conservation District.
3. CLIMATE:
   a. Precipitation averages 19 to 25 inches annually. Most of the rain falls from May through October, with 2 inches or more in each of those months. The amount fluctuates from year to year, and there are frequent droughts. Summer rainfall is characterized by torrential showers that result in rapid runoff on unprotected soils. Winter precipitation averages less than 1 inch a month and is in the form of snow or rain.
   b. Wind velocities in this area are high compared with those in the rest of the United States. High winds in March and April cause much erosion on unprotected areas.
   c. The growing season of the native warm-season plants extends from the last killing frost in spring, April 10 to April 21, to October 29, the average date of the first killing frost in fall, if moisture is available. Winters are characterized by frequent northers (wind) that bring severe cold; a low of −16° F. has been recorded. The maximum summer temperature on record is 108° F.; humidity is low and evaporation, high.
4. TOPOGRAPHY AND ELEVATION: Gently to moderately hummocky.
5. SOILS:
   a. The soils in this range site are loamy fine sands, loamy sands, fine sands, and alluvial sands that are 20 inches or more deep. The soils are moderately permeable to rapidly permeable. If unprotected by vegetation, they are highly susceptible to wind erosion. If protected by vegetation, the soils have a high moisture-intake rate, little runoff occurs, and more water is available for plants.
   b. One or more of the following soil types or phases occur in this range site: Enterprise loamy fine sand, Pratt loamy fine sand, Likes loamy fine sand, Springer loamy fine sand, Miles loamy fine sand, deep phase, and Miles loamy fine sand.
   c. Complete descriptions of the soils are in the soil survey descriptive legend.
6. CLIMAX VEGETATION:

Decreasers	*Increasers*	*Invaders*
Little bluestem	Big sandreed	Annuals
Sand bluestem	Blue grama	Red lovegrass
Indiangrass	Sideoats grama	Queensdelight
Switchgrass	Silver bluestem	Western ragweed
Canada wildrye	Hairy grama	Tumble lovegrass
Needle-and-thread	Threeawns	Gummy lovegrass
Texas bluegrass	Sand dropseed	
Sand lovegrass	Sand sagebrush	
Climax forbs	Shinnery oak	
	Small soapweed	
	Sand plum	
	Skunkbush	
	Climax forbs	

Decreasers make up 40 percent of the vegetation (35 percent tall grasses, 5 percent mid grasses); increasers the remainder. In some places, 10 percent is woody vegetation.

7. YIELD:
   The annual yield of this site in excellent condition, based on plot clipping, is 4,000 to 6,000 pounds per acre. Basal herbage covers 5 to 10 percent of the ground.
8. SPECIFIC TYPE LOCATION:
   4 miles northeast of Canadian, Texas, along U.S. Highway.

Range Sites and Standard Soil Surveys

It is the policy in the Soil Conservation Service to make one soil survey that will collect essential soil information to use in conservation planning, to meet the needs of other users of soil maps, and to meet the requirements of the National Cooperative Soil Survey. Soil surveys on rangeland are made in the detail consistent with the need for soil information for ranch conservation planning. The establishment of mapping legends for these surveys, therefore, requires an understanding of the soil-water-plant relationships of rangeland and of the need for and use of soil information in ranch planning.

Soil scientists and range conservationists work as a team in developing the soil survey work plan, in determining the mapping units and preparing the legend, in reaching agreement on the intensity of mapping needed, in grouping the kinds of soil and miscellaneous land types into range sites, and in conducting field reviews. The final responsibility for determining the mapping units, however, is assumed by the soil scientist and that of grouping the kinds of soil into range sites, by the range conservationist.

Identifying Range Sites Where Standard Soil Surveys Are Available

In areas where a recent standard soil survey and the field coordination necessary to insure the correct interpretation of range sites from the soil map have been completed, the boundaries of range sites can be determined directly from the soil map. These boundaries can be transferred to the conservation-plan map of an individual ranch unit. They are checked in the field while the conservation plan is being prepared, and any needed adjustments can be made at that time.

The degree of correlation between the number of soil mapping units and the number of range sites varies. If the land is mostly arable, the number of soil mapping units generally exceeds that needed for ranch planning, since differences in slope and in other soil characteristics are more important in the management of cropland than of rangeland. On large areas of nonarable rangeland, the boundaries of soil mapping units and of range sites commonly are the same.

Identifying Range Sites Where There Is No Standard Soil Survey

In areas where a recent standard soil survey has not been made and, thus, where the soils have not been named, described, and mapped, range sites are described on the basis of the dominant characteristics of the landscape. For this purpose, a tentative mapping legend is prepared. The soil scientist and the range conservationist work together in determining the general soil characteristics, such as depth, texture, and drainage, that are important to range planning in the area. These are described for the major kinds of landscape and are the basis for making broad delineations of range sites. These preliminary studies also contribute to the subsequent soil survey.

Cartographic Considerations

The intensity and detail to be used in mapping range sites are determined locally. Major consideration is given to delineations that are significant in the proper use and management of individual pastures or range units.

It is not practical to establish a minimum size for the range sites that are to be shown on a map. The smallest area that needs to be delineated varies with the productivity of the site, with the mapping scale, and with the patterns of grazing use. Range sites capable of producing high yields generally are mapped in more detail than range sites of low potential productivity, but mapping in more detail than necessary on a large-scale map should be avoided.

In areas of extensive rangeland, surveys are of low intensity and the maps usually are at a scale of 2 inches to the mile. In areas where rangeland and cropland are interspersed, surveys are of medium intensity and the maps are at a scale of either about 3.2 inches (1:20,000) or 4 inches to the mile.

Range sites are shown on the conservation-plan map as either a large area of a single range site or a complex of two or more range sites so intermingled that their separate delineation is not practical or meaningful. As much as 20 percent of an area shown as a single range site may be inclusions of other sites. Where a single range site is delineated, the name of the range site is shown on the map. Where a complex of range sites is shown within one delineation, the name of each range site and the approximate percentage of each is shown, e.g., Loamy upland, 65 percent—Limestone breaks, 35 percent.

Range Condition

Range condition, as used here, is the present state of the vegetation compared with that of the climax for that range site. The purpose in classifying range condition is to provide an approximate measure of any deterioration that has taken place in the plant cover and, thereby, provide a basis for predicting the degree of improvement possible.

Range condition has been called range health. Like health, condition is relative. If a particular range site is described as being in "good condition" or in "poor condition," the description is always relative to the kind and amount of native vegetation that range site is capable of producing. In the range-condition classification four classes are used to express the degree to which the composition[1] of the present plant community has departed from that of the climax plant community. These four range-condition classes are defined as follows:

Range-condition class:	*Percentage of present vegetation that is climax for the range site*
Excellent	76 to 100
Good	51 to 75
Fair	26 to 50
Poor	0 to 25

Determining Range-Condition Classes

To help in determining the range-condition class for a range site, the plant species in the potential plant community for that site are classified according to their response to grazing. The categories are decreasers, increasers, and invaders.

Decreasers are species in the potential plant community that decrease in relative abundance under continued moderately heavy to heavy grazing use. They generally are perennials that are

[1] Plant composition is determined by an ocular estimate of the relative production, by weight, of the species making up the plant community. This estimate is checked often enough to insure reasonable accuracy by weighing the total amount of herbage taken from selected plots. On plots 9.6 square feet in size, the weight of the herbage in grams multiplied by 10 is equivalent to pounds-per-acre.

palatable to livestock and, for the most part, are dominant species in the potential plant community. In determining the range-condition class, the total of all such species now present is tallied.

Increasers are species in the potential plant community that normally increase in relative abundance as the decreasers decline. But increasers do not always react in this simple fashion. Species that increase at first may decrease later as moderately heavy to heavy grazing use continues. Increasers commonly are the shorter, less productive, subdominant species in the potential plant community. Their forage value ranges from low to high. Under grazing use, those of low forage value tend to increase more rapidly than those of high value. The proportion of increasers in the potential plant community is determined, and the proportion in the present vegetation up to, but not exceeding, this maximum is tallied as a part of the potential cover. Ordinarily, by adding this total to that of the decreasers, the range-condition class can be determined.

Invaders are species that are not members of the potential plant community for the range site, since they cannot withstand the competition for moisture, nutrients, and light in the climax vegetation. They come in and grow along with the increasers after the climax vegetation has been reduced by grazing. They are not restricted to exotics, since they may be members of the climax plant communities on other range sites in the same general locality. Some are annual weeds and herbaceous perennials and some are woody shrubs; many have some grazing value but others have little. Invaders are not tallied in determining the range-condition class.

On page 10 is an example of a worksheet used in the Soil Conservation Service to compare the present vegetation on a specific range site with the potential vegetation and to determine the range-condition class of the site.

Special situations.—In some places pronounced irregularities in the stand may make it necessary to lower the condition-class rating. Although the potential native-plant community does not consist of rigid proportions and spacing of plants, it has a characteristic appearance and usually consists of a characteristic grouping and spacing of individual species. These characteristics are modified to different degrees by a decline in range condition. With a change in condition, the range may look like the potential plant community or have a radically different appearance. For example, the amount of ground covered by vegetation may be sharply reduced or, if bunch grasses are replaced by sod grasses, it may be increased. The ground surface exposed by the loss of decreaser plants is occupied regularly by annuals where rainfall is plentiful but not on more arid range sites. Significant departures of this kind may make it necessary to lower the condition-class rating. Thus additional, locally suitable guidelines are developed for range sites where marked irregularities in the vegetation require the lowering of a condition-class rating that has been determined by evaluating only plant composition.

Special criteria for the classification of range condition are used for the annual ranges in a Mediterranean climate where it is desirable to manage the range for species other than those in the native, or original, vegetation.

Guides for determining range condition.—In the Soil Conservation Service, guides for determining range condition are prepared for each range site in a work unit and filed in the work-unit technical guide. They may be prepared as a separate guide for each range site or as a spread sheet showing all the range sites in the work unit (pp. 11 and 12). In either case, the significant decreasers and increasers for each range site should be indicated. If needed, supplemental lists are prepared that show the increasers, decreasers, and invaders not included in the guide for determining range condition but present on the various sites.

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Site: **Deep sand (16- to 19-inch p. z.)**

Location: **High Plains, Okla.**

Ranch unit: **Cimarron**

Pasture No.: **2**

Examiner: **Sam Arid**

Date: **9/12/60**

Plant species	Maximum percentage of climax	Percentage of present vegetation	Percentage used in determining range condition
Decreasers:			
Sand bluestem	no limit	5	5
Sideoats grama		15	15
Little bluestem		10	10
Switchgrass		Trace	
Increasers:			
Blue grama and hairy grama	30	45	30
Sand dropseed	10	5	5
Perennial forbs	5	Trace	
Sand sagebrush	5	10	5
Invaders:			
Annuals	none	10	0
Cactus		Trace	
Total	100	100	70
Condition class			good

Example of a worksheet used in determining range-condition class.

RANGE-CONDITION GUIDE

Range-site name: **Moderately deep uplands, 12- to 15-inch p. z.**

Resource area: **6**

Ritzville Soil Conservation District

Major soils: **Anders silt loam**
Benge silt loam

Date: **8/27/60**

Climax decreasers (Use all in determining range-condition class)	Climax increasers (Use no more than percentage shown in determining range-condition class)	Percent by weight	Invaders (Use none in determining range-condition class)
Idaho fescue	**Sandberg bluegrass**	**10**	**Cheatgrass**
Bluebunch wheatgrass	**Squirreltail**	**1**	**Pacific fescue**
Prairie junegrass	**Woolgrass**	**4**	**Mustard**
Big bluegrass	**Needle-and-thread**	**T**	**Tarweed**
Giant wildrye	**Balsamroot**	**1**	**Thistle**
	Yarrow	**1**	**China lettuce**
	Lupine	**1**	
	Astragalus	**1**	
	Daisy	**1**	
Hawksbeard	**Phlox**	**1**	
	Biscuitroot	**1**	
	Buckwheat	**1**	
	Threetip sagebrush	**1**	
	Rabbitbrush	**2**	
	Big sagebrush	**2**	
	Sumac	**1**	
	Thurber needlegrass	**1**	

	Approximate yield of air-dry leaves and twigs by range-condition class			
	Excellent	Good	Fair	Poor
Percentage of present vegetation that is climax for the site.	**100 to 76**	**75 to 51**	**50 to 26**	**25 to 0**
Pounds of usable forage per acre produced in:				
Favorable years	**650 to 400**	**450 to 250**	**300 to 150**	**100 to 500***
Unfavorable years	**450 to 300**	**350 to 200**	**250 to 100**	**75 to 50***

***Shows extreme variation in cheatgrass production.**

Example of range-condition guide and guide to the approximate yield of air-dry forage by range-condition class for a single range site.

RANGE-CONDITION GUIDE: **Bowie work unit**

Key climax plants and plants that invade range sites if overgrazed. Range sites are (name, land-resource area, principal soils)--

1. **Sandstone hills, Reddish Prairie, soils in Darnell series.**
2. **Sandy loam, Reddish Prairie, Zaneis fine sandy loam.**
3. **Bottom land, Cross Timbers, Gowen fine sandy loam.**
4. **Tight land, Reddish Prairie, Kirkland silty clay.**
5. **Loamy prairie, Reddish Prairie, Chickasha fine sandy loam.**
6. **Sandy upland, Cross Timbers, Windthorst and Stephenville fine sandy loams.**
7. **Deep sand, Cross Timbers, Stephenville and Nimrod fine sandy loams.**

Key climax plants[1] and maximum percentage of increasers by range site								Invaders
	1	2	3	4	5	6	7	
Little bluestem	-	-	-	-	-	-	-	**All annuals**
Big bluestem	-	-	-	-	-	-	-	**Windmillgrasses**
Indiangrass	-	-	-	-	-	-	-	**Hairy tridens**
Switchgrass	-	-	-	-	-	-	-	**Texas grama**
Canada wildrye	-	-	-	-	-	-	-	**Tumblegrass**
Western wheatgrass			15					**Red grama**
Sideoats grama	20	10	10	-	25	5	INV	**Silver bluestem**
Blue grama		5	5	-	10		INV	**Splitbeard bluestem**
Hairy grama	10	5	INV	5	INV	5	INV	**Weak lovegrasses**
Texas wintergrass	5	5	5	5	5	5		**Low panicums**
Buffalograss	INV	5	INV	15	5	INV	INV	**Low paspalums**
White tridens		INV	INV	5	INV	INV		**Sand dropseed**
Vine-mesquite	INV	5	5	15	5	5		**Threeawns**
Tall dropseed	10	10	10	-	15	10	5	**Western ragweed**
Purpletop	-	-	10		-	10	15	**Mesquite**
Sand lovegrass	-	-	-	-	-	-	-	**Opuntia**
Woody plants	5	5	10	INV	INV	10	10	
Maximum percentage of all increasers in climax generally does not exceed---	30	30	25	40	25	30	20	

[1] Blank space indicates that plant is not important on range site; minus sign indicates a decreaser, all of which are to be counted in determining range condition; a figure indicates an increaser and the percentage in climax; INV indicates that plant is an invader on the site.

Initial safe-stocking rate by range-condition class

Range-condition class and percentage of present vegetation that is climax for site	Acres per animal unit per year by range site								
	1	2	3	4	5	6	7		
Excellent (100 to 76)	25	13	8	16	10	13	15		
Good (75 to 51)	35	17	10	22	14	17	22		
Fair (50 to 26)	55	23	16	34	21	23	32		
Poor (25 to 0)	55	38	25	52	35	38	45		

Example of range-condition guide and guide to the initial safe-stocking rate by range-condition class for all the range sites in a work unit.

FORAGE-CONDITION GUIDE

Resource area: **Coastal flatwoods site, Lower Coastal Plain**

Decreasers (Plants in climax that decrease if woodland is heavily grazed; use all on the site in determining forage condition.)	Increasers (Plants in climax that increase if woodland is heavily grazed; use no more than percentage shown in determining forage condition.)	Percent by weight	Invaders (Plants that invade the site if woodland is heavily grazed; use none in determining forage condition.)
Pinehill bluestem	**Slender bluestem**	10	**All annuals**
Indiangrass	**Cutover muhly**	5	**Broomsedge bluestem**
Switchgrass	**Low panicums**	10	**Smutgrass**
Toothachegrass	**Beaked panicum**	5	**Yankeeweed**
Switchcane	**Perennial three-awns**	5	**Eastern baccharis**
Swamp sunflower	**Paspalums**	5	
	Dropseeds	5	
	Carpetgrass	5	
	Sedges, rushes	10	
	Grassleaf goldaster	5	

Initial safe-stocking rate by forage-condition class and timber-canopy class

Forage-condition class	Acres per animal unit per year by timber-canopy class			
	Open	Sparse	Medium	Dense
Excellent	10	12	18	30
Good	12	15	24	42
Fair	15	20	36	56
Poor	18	34	48	70

Example of forage-condition guide and guide to the initial safe-stocking rate by forage-condition class and timber-canopy class for a woodland-forage site.

Evaluating Forage on Grazed Woodland

Forage plants form a significant part of the plant community on some woodland. Examples are the understory grasses, forbs, and browse plants palatable to livestock in the ponderosa pine and pinon pine forests of the West and in the longleaf pine and slash pine forests of the South. The woodland-forage crop may be secondary in importance to timber to the landowner but still have economic value. Studies of woodland that is suitable for grazing and the past grazing history have shown that conservative grazing is compatible with the objectives of woodland management.

Forage production on a specific woodland site depends on the inherent capacity of the site, on any changes that have resulted from past grazing use, and on the density of the crown canopy of the timber overstory. The potential plant community for a specific woodland site can be determined in the same way as for a rangeland site—by evaluating the relict, or near relict, vegetation; by studying the kinds of soil; by observing the vegetation on both grazed and protected woodland; by studying the grazing history of grazed woodland; and by evaluating research data.

Cattle are just as selective of the plants they graze on woodland as on rangeland. Thus, woodland-forage species also can be classified as decreasers, increasers, and invaders, and the present condition can be determined in relation to that of the potential vegetation for a particular site.

The composition of the understory plant cover on woodland sites and its yield vary with the extent to which the plants are shaded by the canopy as the timber stand grows. Canopy classes are determined by estimating the proportion of the ground shaded by the overstory canopy at midday. They are designated in the following manner.

Canopy class:	*Percentage of ground shaded*
Open	0 to 25
Sparse	26 to 50
Medium	51 to 75
Dense	76 to 100

On woodland where a part of the ground is covered by nonforage brush to the exclusion of forage plants, the area covered is estimated and deducted from the total area available for grazing.

Guides for determining woodland-forage sites, forage-condition classes, and timber-canopy classes are prepared for each woodland-forage site in a work unit (p. 13). In addition to lists of decreasers, increasers, invaders, and of the percentages of increasers natural to each site, these guides may contain the initial safe-stocking rate for each forage-condition class and each canopy class. The initial safe-stocking rate for a site usually is expressed in acres per animal unit for a specified period and for a specific condition class and canopy class.

To protect both the timber and forage resources, grazing on woodland must be carefully controlled.

Examples of Range Sites and Range-Condition Classes

Six range sites in different parts of Western United States are described and illustrated in the following pages. For each range site, the soils are described and a soil profile is shown, as well as the changes in the appearance and character of the vegetation that occur as range condition improves.

Sands range site, 10- to 14-inch p.z., Wyoming

The soils are loamy sands that formed in sands reworked by wind. They are coarse textured, noncalcareous, and well drained. The surface of the soil generally is hummocky or dune-like. The surface layer, about 5 to 6 inches thick, is moderately dark colored and is underlain by deep, loose, pale brown sand or loamy sand. Darker colored, buried A horizons are common and are former surface layers that have been covered by shifting sands.

WYO.—715

Profile of a soil in Sands range site, 10- to 14-inch p.z. Wyoming.

Sands range site, 10- to 14-inch p.z., Wyoming

Range-condition class: POOR

WYO.—645

Production (air-dry herbage):
400 to 750 pounds per acre

Approximate composition:

	Percent
Sand sagebrush	35
Annuals	35
Cactus	10
Sand dropseed	10
Blue grama	5
Needle-and-thread	5
	100

Sands range site, 10- to 14-inch p.z., Wyoming

Range-condition class: FAIR

WYO.—644

Production (air-dry herbage):
750 to 1,500 pounds per acre

Approximate composition:

	Percent
Sand sagebrush	35
Annuals	15
Cactus	10
Blue grama	15
Sand dropseed	10
Needle-and-thread	10
Prairie sandreed	5
	100

644917 O—62——3

Sands range site, 10- to 14-inch p.z., Wyoming

Range-condition class: GOOD

WYO.—642

Production (air-dry herbage):
1,000 to 2,250 pounds per acre

Approximate composition:

	Percent
Prairie sandreed	35
Blue grama	15
Sand sagebrush	15
Needle-and-thread	10
Sand dropseed	10
Annuals	10
Sand bluestem	5
	100

Sands range site, 10- to 14-inch p.z., Wyoming

Range-condition class: EXCELLENT

WYO.—643

Production (air-dry herbage):
1,500 to 3,000 pounds per acre

Approximate composition:

	Percent
Prairie sandreed	35
Sand bluestem	25
Needle-and-thread	15
Blue grama	10
Sand dropseed	5
Annuals	10
	100

Choppy sandhills range site, 20- to 24-inch p.z., Nebraska

The soils are deep, loose, fine sands. The upper few inches of the surface layer are slightly darkened by organic matter. Rainfall is absorbed quickly, and internal drainage is very rapid. Consequently, the soils are droughty.

NEBR.—2054

Profile of a soil in Choppy sandhills range site, 20- to 24-inch p.z., Nebraska

Choppy sandhills range site, 20- to 24-inch p.z., Nebraska

Range-condition class: POOR

NEBR.-2045

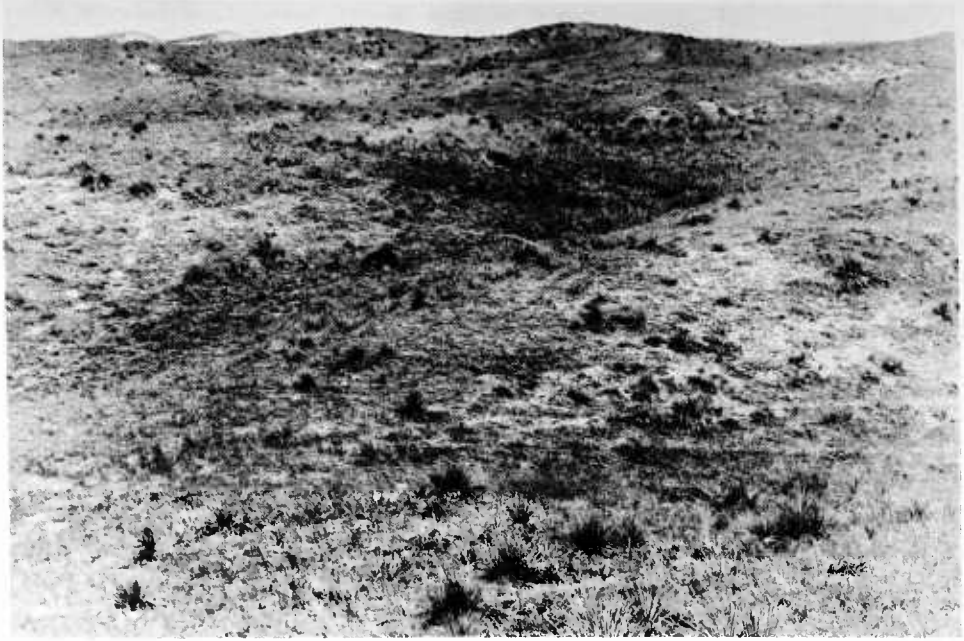
Production (air-dry herbage):
600 to 1,400 pounds per acre

Approximate composition:

	Percent
Blue grama and hairy grama	30
Prairie sandreed	15
Annual invaders	15
Needle-and-thread	10
Western ragweed	10
Woody increasers	10
Sandhill muhly	5
Green sagewort	5
	100

Choppy sandhills range site, 20- to 24-inch p.z., Nebraska

Range-condition class: FAIR



NEBR.—2044

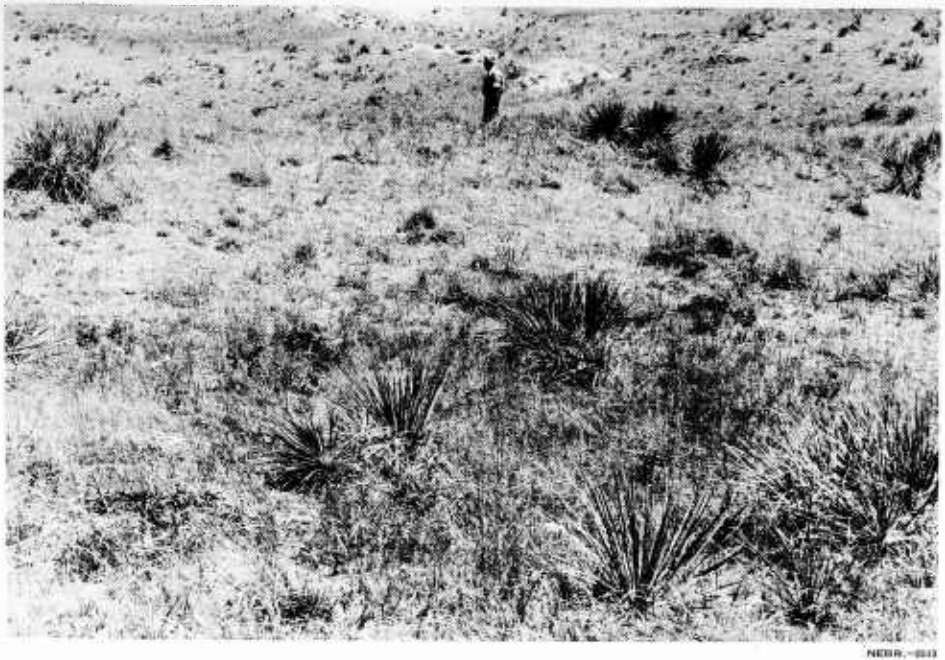
Production (air-dry herbage):
900 to 2,400 pounds per acre

Approximate composition:

	Percent
Prairie sandreed	30
Blue grama and hairy grama	20
Needle-and-thread	10
Forb increasers	10
Annual invaders	10
Sand bluestem	5
Prairie junegrass	5
Western ragweed	5
Woody increasers	5
	100

Choppy sandhills range site, 20- to 24-inch p.z., Nebraska

Range-condition class: GOOD



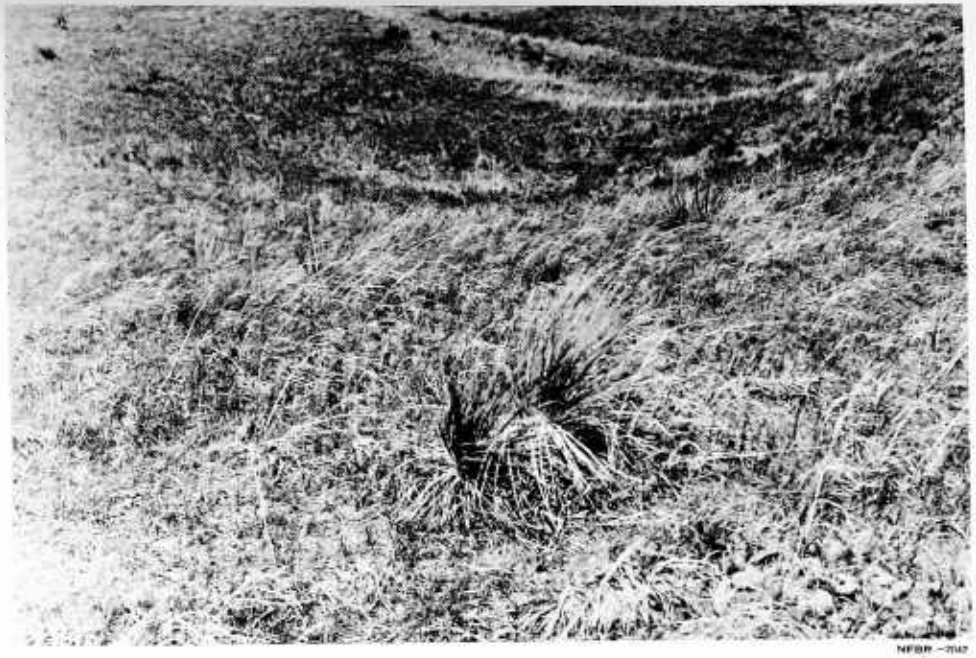
Production (air-dry herbage):
1,600 to 3,000 pounds per acre

Approximate composition:

	Percent
Prairie sandreed	30
Sand bluestem	10
Needle-and-thread	10
Blue grama and hairy grama	10
Little bluestem	5
Prairie junegrass	5
Sedges	5
Forb increasers	5
Woody increasers	5
Annual invaders	5
Sand dropseed	5
Western ragweed	5
	100

Choppy sandhills range site, 20- to 24-inch p.z., Nebraska

Range-condition class: EXCELLENT



Production (air-dry herbage):
2,200 to 3,800 pounds per acre

Approximate composition:

	Percent
Sand bluestem	25
Prairie sandreed	20
Little bluestem	15
Switchgrass	5
Sand lovegrass	5
Porcupinegrass	5
Prairie junegrass	5
Needle-and-thread	5
Sedges	5
Forb increasers	5
Woody increasers	5
	100

Limestone prairie range site, Texas

The soils are clays in the Austin series. They are shallow, fine textured, and moderately permeable and have a moderate water-holding capacity. Additional moisture is available to plant roots in the underlying chalk.

TEX.—49778

Profile of a soil in Limestone prairie range site, Texas.

Limestone prairie range site, Texas

Range-condition class: POOR

Production (air-dry herbage):
400 to 900 pounds per acre

Approximate composition:

	Percent
Threeawns	35
Annuals	35
Tridens	15
Silver bluestem	5
Tall dropseed	5
Perennial forbs	5
	100

Limestone prairie range site, Texas

Range-condition class: FAIR

TEX.—43967B

Production (air-dry herbage):
1,000 to 2,200 pounds per acre

Approximate composition:

	Percent
Tall dropseed	20
Silver bluestem	15
Threeawns	15
Tridens	15
Annuals	15
Sideoats grama	10
Little bluestem	5
Perennial forbs	5
	100

Limestone prairie range site, Texas

Range-condition class: GOOD

TEX.—43966B

Production (air-dry herbage):
2,500 to 3,300 pounds per acre

Approximate composition:

	Percent
Little bluestem	30
Sideoats grama	25
Tall dropseed	20
Buffalograss	10
Perennial forbs	10
Threeawns	5
	100

Limestone prairie range site, Texas

Range-condition class: EXCELLENT

Production (air-dry herbage):
3,500 to 4,000 pounds per acre

Approximate composition:

	Percent
Little bluestem	40
Sideoats grama	25
Indiangrass	10
Tall dropseed	10
Perennial forbs	10
Big bluestem	5
	100

Very shallow range site, 10- to 14-inch p.z., Montana

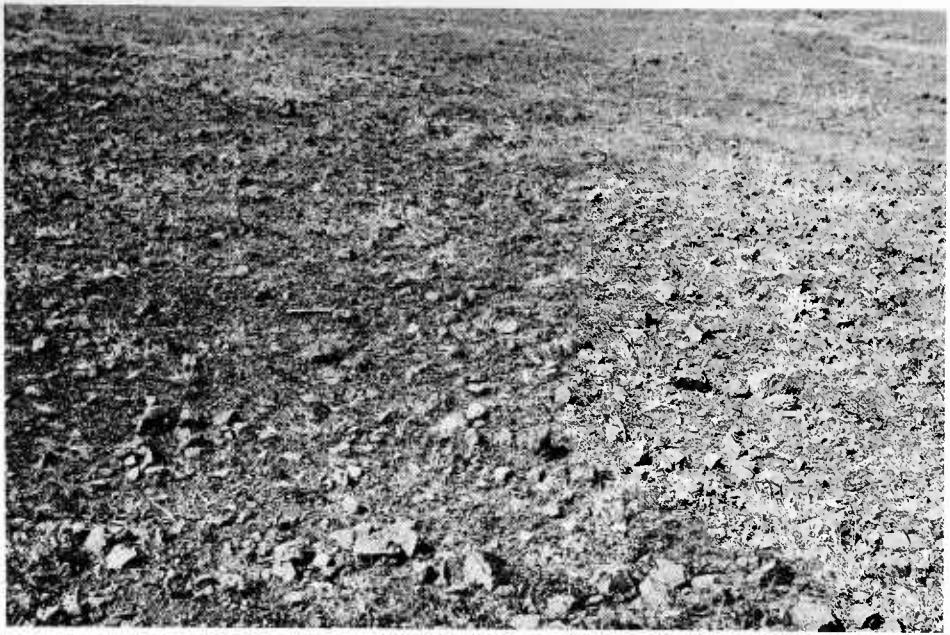
The soils are Castner stony loams. They formed in weathered, fractured sandstone formations and are very shallow, generally less than 10 inches deep. They have a low water-holding capacity and low natural fertility; consequently, they are relatively unproductive.

MONT.—204

Landscape in Very shallow range site, 10- to 14-inch p.z., Montana.

Very shallow range site, 10- to 14-inch p.z., Montana

Range-condition class: POOR



MONT.—181

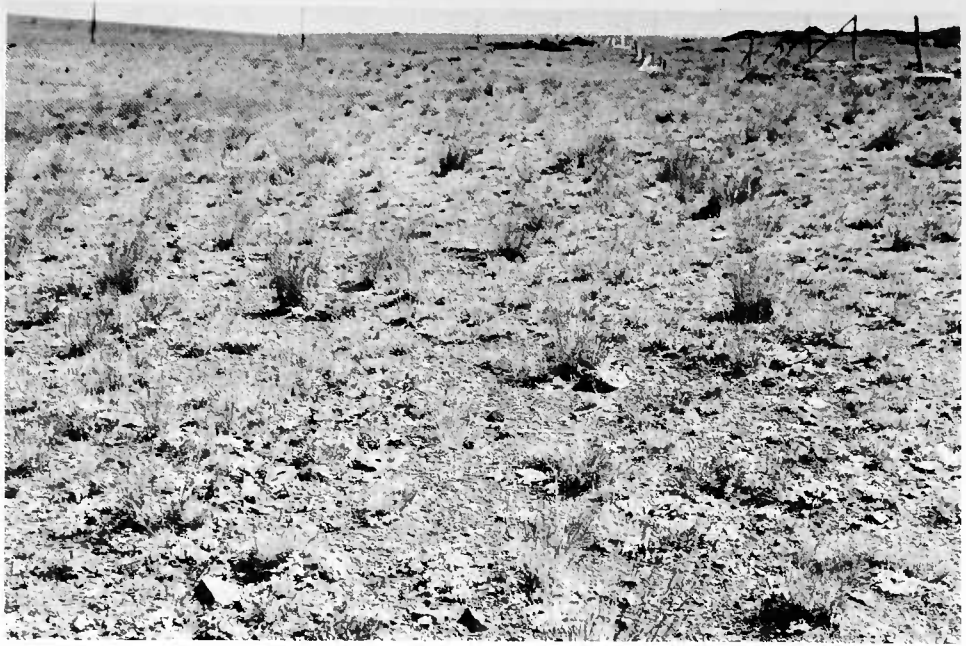
Production (air-dry herbage):
Less than 100 pounds per acre

Approximate composition:

	Percent
Fringed sagewort	20
Annuals	20
Hoods phlox	15
Eriogonum	15
Pussytoes	15
Onespike danthonia	5
Sandberg bluegrass	5
Blue grama	5
	100

Very shallow range site, 10- to 14-inch p.z., Montana

Range-condition class: FAIR



MONT.-179

Production (air-dry herbage):
100 to 200 pounds per acre

Approximate composition:

	Percent
Fringed sagewort	25
Bluebunch wheatgrass	20
Onespike danthonia	15
Pussytoes	10
Sandberg bluegrass	10
Prairie junegrass	5
Hoods phlox	5
Eriogonum	5
Annuals	5
	100

Very shallow range site, 10- to 14-inch p.z., Montana

Range-condition class: GOOD

Production (air-dry herbage):
200 to 350 pounds per acre

Approximate composition:

	Percent
Bluebunch wheatgrass	45
Onespike danthonia	10
Annuals	10
Rough fescue	5
Idaho fescue	5
Prairie junegrass	5
Hairy goldaster	5
Sandberg bluegrass	5
Pussytoes	5
Fringed sagewort	5
	100

Very shallow range site, 10- to 14-inch p.z., Montana

Range-condition class: EXCELLENT

MONT.-203

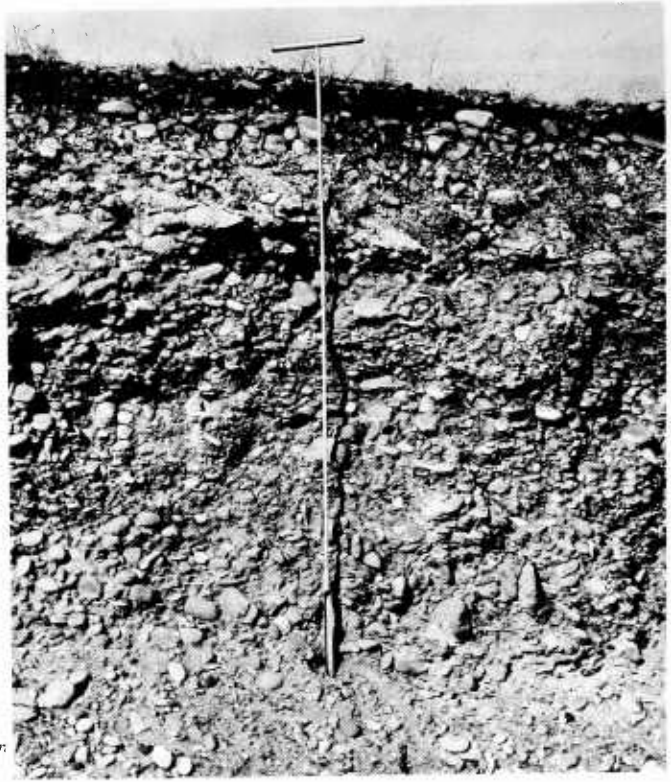
Production (air-dry herbage):
350 to 500 pounds per acre

Approximate composition:

	Percent
Bluebunch wheatgrass	35
Rough fescue	30
Idaho fescue	15
Onespike danthonia	5
Prairie junegrass	5
Hairy goldaster	5
Fringed sagewort	5
	100

Gravelly hills range site, Texas

The soils are gravelly and poorly developed. They have a rapid water-intake rate and a low water-holding capacity. Consequently, they are droughty and have a limited capacity to produce forage.



TEX.—4977

Profile of a soil in Gravelly hills range site, Texas.

Gravelly hills range site, Texas

Range-condition class: POOR

TEX.—49783

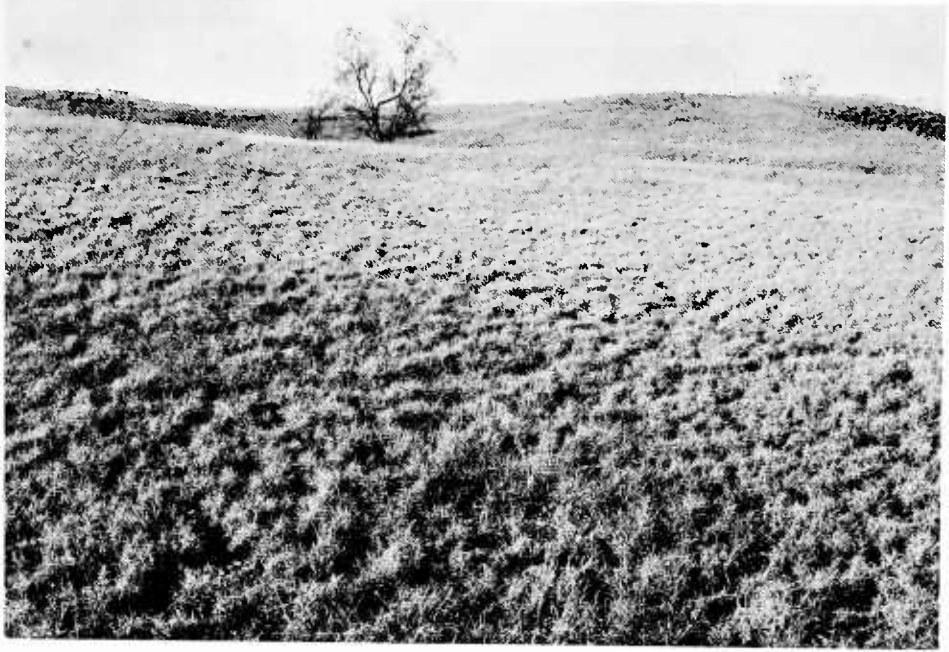
Production (air-dry herbage):
Less than 400 pounds per acre

Approximate composition:

	Percent
Threeawns	30
Hairy grama	15
Blue grama	10
Sand dropseed	10
Perennial forbs	10
Annuals	20
Woody invaders	5
	100

Gravelly hills range site, Texas

Range-condition class: FAIR



TEX.-49782

Production (air-dry herbage):
500 to 800 pounds per acre

Approximate composition:

	Percent
Hairy grama	20
Threeawns	15
Sand dropseed	15
Blue grama	10
Sideoats grama	10
Perennial forbs	10
Annuals	10
New Mexico feathergrass	5
Woody invaders	5
	100

Gravelly hills range site, Texas

Range-condition class: GOOD

TEX.—49781

Production (air-dry herbage):
900 to 1,300 pounds per acre

Approximate composition:

	Percent
Sideoats grama	25
Hairy grama	20
Blue grama	15
New Mexico feathergrass	10
Sand dropseed	10
Little bluestem	5
Threeawns	5
Woody invaders	5
Annuals	5
	100

Gravelly hills range site, Texas

Range-condition class: EXCELLENT

TEX.—49780

Production (air-dry herbage):
1,200 to 1,500 pounds per acre

Approximate composition:

	Percent
Sideoats grama	35
Little bluestem	15
New Mexico feathergrass	15
Blue grama	15
Hairy grama	10
Sand dropseed	5
Perennial forbs	5
	100

Stony mountain range site, Texas

The soils are reddish-brown loams and clay loams that formed in material derived from basalt. The upper layers contain a large amount of grit, and stones and rock fragments make up 60 percent or more of the underlying soil mass. The water-intake rate is rapid, and both water and plant roots readily penetrate these stony soils.

TEX.-47834

Profile of a soil in Stony mountain range site, Texas.

Stony mountain range site, Texas

Range-condition class: POOR

TEX.—46019D

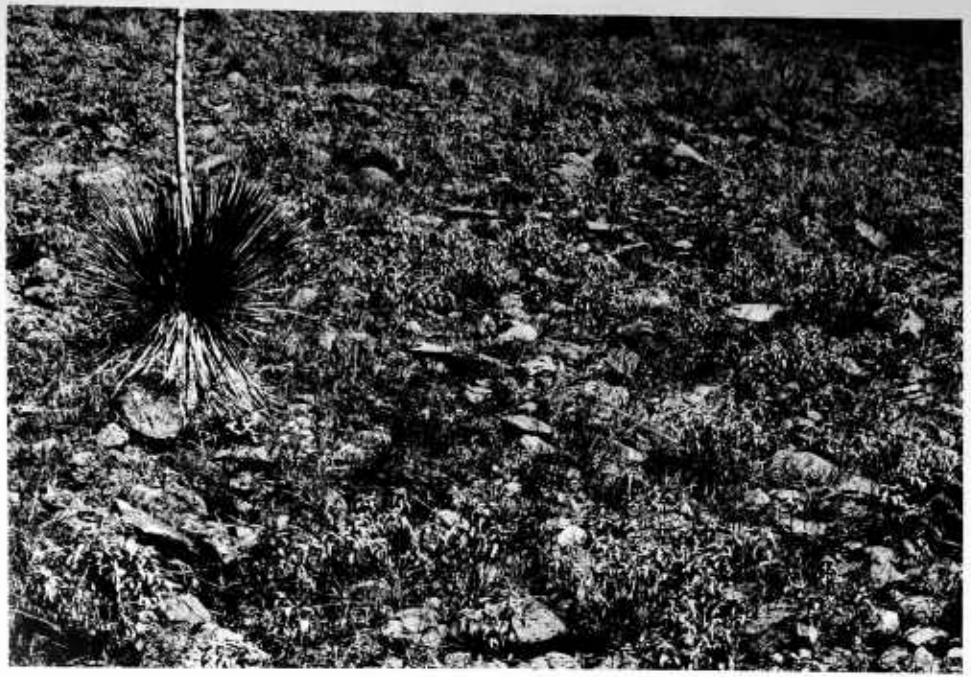
Production (air-dry herbage):
400 to 1,000 pounds per acre

Approximate composition:

	Percent
Threeawns	45
Hairy grama	15
Croton	15
Annuals	10
Muhly sp.	5
Sprucetop grama	5
Cholla	5
	100

Stony mountain range site, Texas

Range-condition class: FAIR



TEX.—46019C

Production (air-dry herbage):
1,500 to 2,000 pounds per acre

Approximate composition:

	Percent
Hairy grama	35
Sprucetop grama	15
Sideoats grama	5
Threeawns	15
Croton	15
Muhly sp.	5
Annuals	5
Yucca	5
	100

Stony mountain range site, Texas

Range-condition class: GOOD

TEX.-46019B

Production (air-dry herbage):
2,500 to 3,000 pounds per acre

Approximate composition:

	Percent
Hairy grama	20
Sideoats grama	20
Muhly sp.	15
Sprucetop grama	10
Cane bluestem	5
Little bluestem	5
Balsamscale	5
Daleas	5
Perennial forbs	5
Threeawns	5
Croton	5
	100

Stony mountain range site, Texas

Range-condition class: EXCELLENT

Production (air-dry herbage):
3,000 to 4,000 pounds per acre

Approximate composition:

	Percent
Sideoats grama	30
Hairy grama	15
Cane bluestem	10
Little bluestem	10
Muhly sp.	10
Big bluestem	5
Sprucetop grama	5
Balsamscale	5
Daleas	5
Perennial forbs	5
	100

Trend in Range Condition

Although range-condition classes express the condition of the present vegetation in relation to that of the potential vegetation for that site, they do not show whether the range is improving or deteriorating. Trend is a separate determination, often needed to plan the adjustments in grazing use and management needed to maintain or to improve the range resource. The following are among the more important indicators of trend in range condition.

Vigor of Plants

The size of a plant and its parts in relation to its age and environment reflect plant vigor. Many plants that form bunches or tufts if vigorous assume a sod form when vigor is reduced. The length of rhizomes and stolons also is a good indication of plant vigor. If the plant is weak, these parts are shorter and fewer. But care should be used in assuming that an apparent lack of vigor is caused by heavy grazing, especially in periods of drought or on sites that have obvious limitations for plant growth. Increased vigor of plants preferred by livestock indicates improving range condition.

Seedlings and Young Plants

A deteriorated range can improve only if the individual plants naturally dominant on the site can reproduce themselves. Reproduction on a site is shown by young seedlings and plants of various ages and by spreading tillers, rhizomes, and stolons. The extent to which any of these forms of reproduction occurs varies with the growth habits of individual species and with current growing conditions. Vigorous reproduction of the species most attractive to livestock also shows that the range is improving. Few seedlings, however, are able to establish themselves on range in excellent condition.

Changes in Plant Composition

Although the potential plant community, or climax, for a range site is relatively stable, it is in no sense static. Major changes in plant composition do not occur, however, unless they are induced by a pronounced disturbance, such as continued heavy grazing, severe or prolonged drought, or fire. A decrease in the perennial species most attractive to livestock and most easily damaged by grazing is an indication of deterioration caused by too heavy grazing. An increase in species of low palatibility generally indicates a trend toward lowered condition also.

When the disturbances that cause deterioration of the range cease, plant succession operates to reestablish the climax plant community for the site. Plants that have decreased with the decline in range condition increase if seed plants or vegetative parts are present. To varying degrees, plants that have increased as a result of declining range condition then decrease. Certain woody plants and some other long-lived perennials, however, are exceptions to this general rule and, once established, may persist for a long time.

Generally, the invasion of a site by plants not native to it indicates a decline in range condition. These invaders may flourish temporarily on locally disturbed areas if the site generally is in good condition. Some invaders, particularly annuals, may occupy the site temporarily in favorable years, even if the range condition is improving. There may also be a material, though temporary, increase in annuals and short-lived perennials in wet years, even though the trend in range condition is upward.

Changes in plant composition from either declining or improving range condition generally follow a pattern. Although all the changes are not predictable, the pattern of succession can be predicted for a specific kind of soil, climate, and grazing use. Study of these patterns will provide valuable information on the trend in range condition.

Plant Residues

The extent to which plant residues accumulate depends on (1) the amount of herbage the plant community can produce; (2) the amount of herbage removed by grazing and haying, by fire, or by wind or water; and (3) the amount decomposed in place. In a hot humid climate, decomposition is so rapid that there is little accumulation of plant residues. Conversely, in a cold climate, decomposition is slow. If plant residues are used to judge trend in range condition, the accumulation that can be expected on a specific site and in a specific climate must be considered. Heavy grazing, below-normal production of herbage, recent fires, and abnormal losses because of wind or water erosion may result in less accumulation of herbage than considered reasonable for that site. The progressive accumulation of plant residues, however, generally indicates improving range condition. On the annual ranges in a Mediterranean climate, plant residues are especially helpful in judging trend, since they are a measure of range use. Unless plant residues are adequate, plant composition on these ranges deteriorates and forage production drops rapidly. But if these ranges are underused, too much residue accumulates and less desirable plants replace the more desirable ones.

Condition of the Soil

The condition of the surface layer of the soil affects trend in range condition and the rate of improvement of a deteriorated range. The lack of plant residues exposes the soil to splash erosion and to surface crusting. A surface crust slows down the intake of water, retards vegetative propagation and the establishment of seedlings, and favors a high surface temperature. These conditions, in turn, increase runoff and soil loss, reduce the amount of effective soil moisture, and are generally unfavorable for the growth of plants. Soil crusting, soil compaction caused by trampling, soil erosion, plant hummocking, and any increase in the amount of bare ground on a range are all indications of a declining trend in range condition.

N. MEX.—9467

Soil crusting, severe erosion around dead and dying bunchgrass plants, and land once covered by vegetation now bare show a decline in range condition.

The relative importance of any one of these factors varies with different soils, with different plant communities, and with different climates. On a particular range site, the evaluation of any one factor may indicate whether range condition is improving or declining. But ordinarily a sounder decision can be reached if all factors are considered.

How Information on Range Sites and Range Condition Is Used in Conservation Planning

As already discussed, different range sites produce different kinds of range plants, many of which differ in their seasonal development, and different amounts of forage. The primary purpose of recognizing range sites is to help the land owner or operator to identify those areas of his rangeland that have a different potential for forage production, regardless of what they are producing now. This information also points out the areas that have the greatest capacity for forage production and suggests to the rancher where he will receive the quickest return for any expenditure for range improvement. A map showing the boundaries of his range sites provides a permanent record of their location and extent and shows their relation to each other and to the pasture layout. All these factors need to be considered in making a ranch conservation plan.

By appraising the condition of the range within each site, the rancher can tell which areas are now producing below their potential. By determining the cause of the present condition, he can decide what management changes he needs to make to improve his range. The classification of range condition also provides him with the information about the key forage plants and their relative abundance on which he must base his management to maintain or to improve his range (p. 48).

Knowing what his land can be made to produce in both quality and quantity of forage, the rancher can then decide if the measures necessary for improvement are worth what they cost. A record of range condition within each site has the further advantage of providing a "benchmark" against which to check future improvement or deterioration. The rancher can then determine whether the planned management is achieving the results desired.

Use of Initial Stocking Rates by Range Sites and Condition Classes

If the herbage-yield estimates that are made to determine the production of different range sites in different range-condition classes are made over a period of years, they will indicate the approximate yields and the variations in production that can be expected in favorable years and in unfavorable years. A rough guide to the relative productivity of different range sites can be obtained by dividing the forage yield by the presumed forage requirement per animal but, because of the many variables, a stocking rate based on this calculation alone is seldom reliable.

The most reliable basis for an initial stocking rate for a specific range site consists of a combination of use records, a determination of the degree of use, and an evaluation of the trend in condition. These records should cover a period that includes seasons in which forage production is high, low, and near average.

An initial stocking rate for each range site and each range-condition class can be used as a guide to grazing intensity, but it is not a "grazing-capacity estimate." Because of seasonal and annual variations in forage production, it should be emphasized that periodic adjustments in stocking rates will be needed to insure proper range use.

In summary, different range sites and a particular range site in different conditions produce different kinds of plants, which differ in seasonal development, and different amounts of forage. The identification of the different range sites on his ranch and the classification of the present condition of the vegetation on each site furnish the rancher a basis for making decisions on the stocking rates, the season of use, and the kind of management needed to improve his range.

KEY RANGE PLANTS AND SAFE DEGREE OF USE BY RANGE-CONDITION CLASS (CATTLE)

Ritzville, Washington

Range-condition class	Alkali bottom land 9- to 15-inch p. z.		Shallow upland, 12- to 15-inch p. z.		Moderately deep upland, 12- to 15-inch p. z.	
	Key species	Safe use[1]	Key species	Safe use[1]	Key species	Safe use[1]
		Percent		Percent		Percent
Excellent	**Giant wildrye**	50	**Bluebunch wheatgrass**	50	**Idaho fescue** **Bluebunch wheatgrass**	40 50
Good	**Giant wildrye**	50	**Bluebunch wheatgrass**	50	**Idaho fescue** **Bluebunch wheatgrass**	40 50
Fair	**Giant wildrye**	50	**Bluebunch wheatgrass**	50	**Bluebunch wheatgrass**	50
Poor	**Saltgrass**	50	**Sandberg bluegrass**	30	**Bluebunch wheatgrass** **Sandberg bluegrass**	50 30

[1]Proportion of current year's growth, by weight, that can be safely grazed.

Example of a chart showing the key range plants and the safe degree of use by range-condition class for three range sites.

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Growth Through Agricultural Progress